Walker County
Hazard Mitigation Plan
2024 Update

Acknowledgments

Walker County Office of Emergency Management, The City of Huntsville, The City of New Waverly, The City of Riverside, Walker County Judge and County Commissioners, Sam Houston State University, Huntsville ISD, Huntsville Memorial Hospital, Walker County EMS, and all others who were involved in the Hazard Mitigation Committee and assisted in the creation of this plan update.

Prepared by: The Houston-Galveston Area Council

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List of Acronyms

ASL	above sea level
ASTDR	Agency for Toxic Substances and Disease Registry
BCA	Benefit Cost Analysis
CDBG-MIT	Community Development Block Grant Mitigation
CDC	Centers for Disease Control and Prevention
COLE	Coefficient of Linear Extent
CPZ	Community Protection Zone
CRF	Community Risk Factor
CRS	Community Rating System
DBIR	Data Breach Investigations Report
DDoS	Distributed Denial of Service
DMA 2000	Disaster Mitigation Act of 2000
EAL	expected annual loss
EDT	Eastern Daylight Time
EDDMapS	Early Detection and Distribution Mapping System
EID	Emerging Infectious Diseases
EM	Emergency
EPA	Environmental Protection Agency
FDPO	Flood Damage Prevention Ordinance
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Fire Intensity Scale
FMA	Flood Mitigation Assistance
FPF	Federal Policy Fee
FSA	Farm Service Agency
GIS	Geographic Information Systems
GLO	Texas General Land Office
H-GAC	The Houston-Galveston Area Council
HLR	Historic loss ratio
HMA	Hazard Mitigation Assistance
HMC	Hazard Mitigation Committee
HMAP	Hazard Mitigation Action Plan
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
ICC	Increased Cost of Compliance
K	Susceptibility of the soil to water erosion
LEP	Linear Extensibility Percent
LHMP	Local Hazard Mitigation Plan
LS	Combined effects of slope length and steepness
MRLC	Multi-Resolution Land Characteristics
NCC	Network Control Center

NCEI	National Center for Environmental Information
NCHH	National Center for Healthy Housing
NDFD	National Digital Forecast Database
NFIP	National Flood Insurance Program
NHC	National Hurricane Center
NLCD	National Land Cover Database
NLDN	National Lightning Detection Network
nmi	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NRI	National Risk Index
NSSL	NOAA’s National Severe Storms Laboratory
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration
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	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	Texas Commission on Environmental Quality
TDEM	Texas Division of Emergency Management
TRI	Toxics Release Inventory
TWDB	Texas Water Development Board
TWRA	Texas Wildfire Risk Assessment
TxWrap	Texas Wildfire Risk Assessment Portal
USDA	United States Department of Agriculture
USDM	United States Drought Monitor
USLE	Universal Soil Loss Equation
VPI	Vulnerable Population Index
WSSI	Winter Storm Severity Index
WUI	wildland urban interface

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Section 1: Introduction

This section includes the introduction of the plan. This section contains background context, the planning need, purpose, scope, and organization of the plan.

Section 1: Introduction

In 2011, Walker 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, Walker County prepared a countywide multi-jurisdictional Hazard Mitigation Plan (HMP). Walker County partnered with the Houston-Galveston Area Council (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 Regional Hazard Mitigation Plan 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. In 2018, due to new regulation and planning recommendations, Walker County prepared a new multijurisdictional Hazard Mitigation Plan that included a more robust assessment of natural hazards, newly uncovered vulnerabilities, more advanced analysis techniques, and a more effective and informed mitigation strategy. Walker 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, Walker County is continuing its partnership with H-GAC.

Purpose of Plan

The purpose of Walker County's HMP 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 hazard mitigation plan as needed. A hazard mitigation plan 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 for 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 Walker

County HMP. The 2024 Walker 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 Plan

This HMP update includes the following participating jurisdictions:

- Walker County (Unincorporated)
- City of Huntsville*
- City of New Waverly
- City of Riverside

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

The HMP profiles the following hazards:

- Flooding
- Hurricanes, Tropical Storms & Depressions
- Wildfires
- Tornado & Microbursts
- Drought & Expansive Soils
- Extreme Heat
- Severe Winter Weather
- Emerging Infectious Diseases
- Windstorms
- Cyber Threats
- Severe Thunderstorms
- Lightning
- Erosion
- Dam & Levee Failure
- Water Quality and Quantity
- Biological/Hazmat
- Hailstorms
- Invasive Species

Plan Organization

The 2024 Walker 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, critical facilities, repetitive loss, and severe repetitive loss properties, NFIP and CRS participation, and NFIP policies in force information.

Section 4 outlines the risk assessment procedures, identifies hazards ranked by risk, and summarizes the hazards that affect Walker 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, number of events, fatalities and injuries, average annual events, changes in frequency, and estimated annualized losses, where applicable.

Section 7 covers the mitigation strategy summary, which provides the mitigation goals, objectives, and action items included in the Hazard Mitigation Action Plan in response to identified hazards.

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

The appendices cover the hazard summary data (Hazus), H-GAC created 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.[1]

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 Walker 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 Walker County, including the participating jurisdictions of the City of Huntsville, the City of New Waverly, and the City of Riverside. 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 presentation that included Hazard Mitigation Committee expectations to review, 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 Hazard Mitigation Committee 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 Hazard Mitigation Committee 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 regard 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 Hazard Mitigation Committee will assist with various tasks, when needed, for these types of events.

Planning Team

Walker County and H-GAC established the Planning Team in February 2023 during a pre-kickoff meeting in preparation for the full kickoff meeting held on March 27, 2023. Members were asked to attend all public meetings either in person or online (if applicable). Online materials, surveys, forms, and documentation are provided in Appendix A. 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: Walker County Planning Team Members

Representative Name & Position/Title	Jurisdiction
Butch Davis, Emergency Management Coordinator	Walker County
Sherri Pegoda, Deputy Emergency Management Coordinator	Walker County
Cheryl Mergo, Senior Manager	H-GAC
Amanda Ashcroft, AICP, Planner	H-GAC

Hazard Mitigation Committee

Walker County and H-GAC established the Hazard Mitigation Committee 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). Online materials, surveys, forms, and documentation are provided in Appendix A. 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: Walker County Hazard Mitigation Committee Members

Representative Name		Jurisdiction	Position/Title
Jamie	Sugg	AgriLife Extension	County Extension Agent
Sam	Masiel	City of Huntsville	Deputy City Manager
Brent	Slott	City of Huntsville	Network Administrator
Michael	Wagner	City of Huntsville	Systems Analyst
Jason	Sanders	City of Huntsville	Risk Manager
Kevin	Byal	City of Huntsville Building Official	Building Official
Kathlie	Jeng-Bulloch	City of Huntsville Engineer	City Engineer
Greg	Mathis	City of Huntsville Fire Dept.	Fire Chief
Adam	Winningham	City of Huntsville OEM	Emergency Management Coordinator
Wade	Roberts	City of Huntsville PD	Lieutenant Police Dept.
Kim	Kembro	City of Huntsville Public Works	Assistant Director
Brent	Sherrod	City of Huntsville Public Works	Public Works Director
Joshua	Slott	City of New Waverly Fire Department	District Chief
Virginia	Plummer	City of Riverside	Council Member
Murra	Samuel	Emergency Management Program Supervisor	Texas Department of Criminal Justice
David	Smith	Good Shepherd Mission	Reverand
Amanda	Ashcroft	Houston-Galveston Area Council	Planner, Community & Environmental Planning
Cheryl	Mergo	Houston-Galveston Area Council	Senior Manager, Community & Environmental Planning

Representative Name		Jurisdiction	Position/Title
Larry	Brown	Huntsville ISD	Director of Maintenance & Operations
Dena	Daniel	Huntsville Memorial Hospital	Executive Assistant / Emergency Management Coordinator
Lonnie	Booker	Sam Houston State University	Associate Director of Emergency Management
Amanda	Withers	Sam Houston State University	Vice President
Briana	Gallagher	San Jacinto River Authority	Water Resources Project Manager
John	Waldo	Texas Division of Emergency Management	County Liaison Officer
Viviana	Fannin	Walker County Chief Deputy	Tax A/C Office
Danny	Kuykendall	Walker County Commissioner Pct. 1	Commissioner
Bill	Daugette	Walker County Commissioner Pct. 3	Commissioner
Brandon	Decker	Walker County Commissioner Pct. 4	Commissioner
Steve	Hill	Walker County Constable Pct. 3	Constable
Leslie	Woolley	Walker County District Clerk	District Clerk
Dione	Bumpus	Walker County EMS	Administrative Assistant
Rachel	Parker	Walker County EMS	Director
Kevin	Traylor	Walker County ESD 2	District Chief
Marcus	Payne	Walker County JP2	Justice of the Peace
Colt	Christian	Walker County Judge	County Judge
Joe	Connell	Walker County OEM	CERT Coordinator
Butch	Davis	Walker County OEM	Emergency Management Coordinator
William	Humphrey	Walker County OEM	Planner
Sherri	Pegoda	Walker County OEM	Deputy EMC
Sonja	Tennant	Walker County OEM	Emergency Management Specialist
Andrew	Isbell	Walker County Planning & Development	Director
Deborah	Wilkinson	Walker County Public Safety Comms	Director
Shane	Osterman	Walker County Sheriff	Deputy
Lorne	Hollingsworth	Walker County SUD	Outside Operations
James	Morrison	Walker County SUD	General Manager
Diana	McRae	Walker County	Tax Assessor

Other Invitees

The PT reached out to various county and city departments, as well as members of the public who signed up for the HMP mailing list to be kept updated on the plan update process, those who attended past meetings or events but were not part of the HMC, and various members of organizations that support a variety of community lifelines to attend meetings and other HMP related events. These contacts are listed below.

Table 2.3: Other Invitees

Representative Name		Position/Title	Organization
Kristy	Doll	City of Huntsville Administration	City Secretary
Aron	Kulhavy	City of Huntsville Administration	City Manager

Representative Name		Position/Title	Organization
Tammy	Gannn	City of Huntsville Economic Development	Economic Development Director
Steve	Ritter	City of Huntsville Finance	Finance Director
Trey	Lamb	City of Huntsville Fire Dept.	Assistant Fire Chief
Bill	Wavra	City of Huntsville IT Dept	IT Director
Penny	Joiner	City of Huntsville Parks Dept.	Parks Director
Jim	Barnes	City of Huntsville Police Dept.	Assistant Police Chief
Curt	Landrum	City of Huntsville Police Dept.	Lieutenant Police Dept.
Darryle	Slaven	City of Huntsville Police Dept.	Police Chief
John	Herford	City of Huntsville Public Works	Streets Department
James	Ferguson	City of Huntsville Public Works	Water Department
Nate	James	City of New Waverly	Mayor
Steve	Widner	City of New Waverly	Director of Public Works
Jacob	Slott	City of New Waverly Fire Department	Chief
John	LeMaire	City of Riverside	Mayor
Stormy	Perez	City of Riverside	City Secretary
Ben	Crocker	City of Riverside Volunteer Fire Department	Chief
Clint	Weekley	Department of Public Safety	Sergeant
Bill	Roberts	Huntsville ISD	Assistant Superintendent
Kris	Drane	New Waverly ISD	Transportation Director
Darol	Hail	New Waverly ISD	Superintendent
Scott	Rohe	Phelps SUD	General Manager
Robert	Nettles	Riverside SUD	General Manager
Jennifer	Carper	Texas Department of Criminal Justice	Director of Emergency Management
Ron	Walker	Texas Division of Emergency Management	District Coordinator
Chad	Holton	Trinity River Authority	Project Manager
Kari	French	Walker County Clerk	County Clerk
Ronnie	White	Walker County Commissioner Pct. 2	Commissioner
John	Hooks	Walker County Constable Pct. 1	Constable
Shane	Loosier	Walker County Constable Pct. 2	Constable
Gene	Bartee	Walker County Constable Pct. 4	Constable
Tracy	Sorensen	Walker County Court at Law	Judge
Will	Durham	Walker County District Attorney	District Attorney
Steve	Fisher	Walker County JP1	Justice of the Peace
Randy	Jeffcoat	Walker County JP3	Justice of the Peace
Stephen	Cole	Walker County JP4	Justice of the Peace
Anthony	Tryon	Walker County Public Safety Comms	Assistant Director
Ashlyn	Hooks	Walker County Road & Bridge Pct. 2	Administrative Assistant
John	Davila	Walker County Sheriff	Lieutenant
Clint	McRae	Walker County Sheriff	Sheriff
Tim	Whitecotton	Walker County Sheriff	Chief

Representative Name		Position/Title	Organization
Amy	Klawinsky	Walker County	Treasurer

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 2.4 below outlines the participation of each jurisdiction and member of the HMC 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, lists of attendees, completed worksheets, and outreach notices for public meetings can be found in Appendix D.

March 23, 2023: Hazard Mitigation Kickoff Meeting

The PT hosted a kickoff meeting of the HMC on March 27, 2023, at the Walker County Storm Shelter located at 455 TX-75, Huntsville, Texas 77320. 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 hazard mitigation plans that took effect in April 2023, and expectations for those participating in the HMC. The committee discussed the next steps for the planning process- 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 17, 2023: Risk and Capability Assessment Meeting

The PT hosted a meeting to cover the risk and capability assessment worksheets and review topics, questions that arose at the last meeting, and recap the kickoff meeting that was hosted on March 23, 2023. This meeting took place at the Walker County Storm Shelter located at 455 TX-75, Huntsville, Texas 77320. 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 2018, 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 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, and planning for a public engagement event. 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 jurisdiction websites.

June 20, 2023: Public Outreach Strategy

The PT hosted a virtual meeting via Microsoft Teams to discuss possible dates, locations, and timing for a public engagement to solicit feedback from the public on hazards, vulnerabilities, and other pertinent information to the HMP update. The PT decided on a date, time, and location for the event- The Walker County Emergency Preparedness Fair. H-GAC was tasked with creating a flyer for the event and Walker County, as well as participating jurisdictions would post the flyer on different platforms and at city hall/offices to get the word out to citizens. Walker County was tasked with soliciting potential participants/partners to host exhibitor booths and confirm the location. This meeting was limited to PT members only.

August 19, 2023: Public Engagement Event- Walker County Emergency Preparedness Fair

A public event hosted by Walker County Office of Emergency Management in partnership with the city of Huntsville, the city of New Waverly, the City of Riverside, and H-GAC took place on August 19, 2023, from 10:00 AM - 2:00 PM at the Walker County Storm Shelter located at 455 TX-75, Huntsville, Texas 77320. This was a heavily attended event that offered community members various information about risks and resources available to them, grab bags, free food, and even raffle prizes of emergency preparedness items. Many children and adults were in attendance to walk around the fair. Input was taken from those that stopped by the H-GAC table which was set up with interactive activities for residents to provide their feedback on hazards of concern for Walker County and participating jurisdictions for this hazard mitigation plan update. Feedback activities were organized 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 city and how these communications could be improved, and a dot exercise where participants had to notate their top three hazards of concern within the city using stickers. Public input helps the project team analyze potential hazards affecting residents and recommend possible actions to reduce their impact. H-GAC also provided information about the HMP and its importance, disaster preparedness flyers with preparedness checklists for vulnerable populations on the back (translated in 4 different languages), and flyers with a QR code that linked to the online survey, where to find more information via the H-GAC website, and flyers gave a brief overview of the HMP and why input was needed. There was also a sign-up sheet provided where residents could leave their contact information on to stay updated about HMP meetings and future events.

Event Highlights:
Stakeholders/Citizens in attendance: 318

Vendors/Booths: 32

- American Red Cross
- Canon CPR
- City of Riverside
- Crime Stoppers
- Good Shepherd Mission
- Home Depot
- Houston County Electric Coop
- H-GAC
- Huntsville Fire Department
- Huntsville Memorial Hospital
- Huntsville Office of Emergency Management
- Huntsville Police Department
- Huntsville Public Works
- Justice of the Peace & Constable Pct. 4
- Kinder Morgan Pipeline
- MidSouth Electric Coop
- New Waverly Fire Department and Emergency Service District #2
- National Weather Service
- SETRAC
- Texas A&M AgriLife Disaster Assessment Recovery
- CHARM
- Texas A&M Forest Service
- Texas Animal Health Commission
- TDCJ Office of Emergency Management
- TDEM
- Tri-County Behavioral Health
- Walker County Amateur Radio Group
- Walker County CERT
- Walker County EMS
- Walker County Office of Emergency Management
- Walker County Public Safety Communications Center
- Walker County Sheriff's Office

Volunteers:
CERT Team: 16 **Kitchen Team: 5** **EMC Team: 5**
Giveaway Items included:
Bags handed out with digital thermometers and literature about hazards and preparedness.

Food was donated by Cowboy Contractors and HEB
Raffle items were donated by:

- Kinder Morgan
- Walker County, OEM weather radio
- Ann Moore Insurance Agency, hunting knife
- DSHS, pandemic game
- MidSouth Electric Coop, yeti bucket with swimming pool supplies
- Tetra Tech, backpack and a soft cooler
- Home Depot, donated 10 buckets with cleaning supplies

November 15, 2023: Our Mitigation Strategy (Goals, Actions, and the Action Plan)

The PT hosted a meeting of the HMC to discuss action items, plan goals, and the action plan. 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. H-GAC staff highlighted multiple resources to aid with the brainstorming of action items and presented those in attendance an online format to submit action items and an online SharePoint site for plan draft updates to be shared.

Table 2.4: Participation Matrix

Representative Name		Jurisdiction/ Organization	Position/ Title	Kickoff Meeting, 3/23	Risk & Capability Assessment , 4/17	Public Outreach Strategy, 6/20	Public Engagement Event, 8/19	Our Mitigation Strategy, 11/15
Jamie	Sugg	AgriLife Extension	County Extension Agent	X				
Sam	Masiel	City of Huntsville	Deputy City Manager	X	X			
Brent	Slott	City of Huntsville	Network Administrator	X				
Michael	Wagner	City of Huntsville	Systems Analyst	X				
Jason	Sanders	City of Huntsville	Risk Manager	X	X			
Kristy	Doll	City of Huntsville Administration	City Secretary					
Aron	Kulhavy	City of Huntsville Administration	City Manager					
Kevin	Byal	City of Huntsville Building Official	Building Official	X	X			
Tammy	Gann	City of Huntsville Economic Development	Economic Development Director					
Kathlie	Jeng-Bulloch	City of Huntsville Engineer	City Engineer	X	X			
Steve	Ritter	City of Huntsville Finance	Finance Director					
Trey	Lamb	City of Huntsville Fire Dept.	Assistant Fire Chief					
Greg	Mathis	City of Huntsville Fire Dept.	Fire Chief		X			
Bill	Wavra	City of Huntsville IT Dept	IT Director					
Adam	Winningham	City of Huntsville OEM	Emergency Management Coordinator		X		X	X
Penny	Joiner	City of Huntsville Parks Dept.	Parks Director					
Wade	Roberts	City of Huntsville PD	Lieutenant Police Dept.		X			
Jim	Barnes	City of Huntsville Police Dept.	Assistant Police Chief					
Curt	Landrum	City of Huntsville Police Dept.	Lieutenant Police Dept.					
Darryle	Slaven	City of Huntsville Police Dept.	Police Chief					
Kim	Kembro	City of Huntsville Public Works	Assistant Director		X			
Brent	Sherrod	City of Huntsville Public Works	Public Works Director	X				

John	Herford	City of Huntsville Public Works	Streets Department					
James	Ferguson	City of Huntsville Public Works	Water Department					
Nate	James	City of New Waverly	Mayor					
Steve	Widner	City of New Waverly	Director of Public Works					
Jacob	Slott	City of New Waverly Fire Department	Chief					
Joshua	Slott	City of New Waverly Fire Department	District Chief		X			
John	LeMaire	City of Riverside	Mayor					
Stormy	Perez	City of Riverside	City Secretary					
Virginia	Plummer	City of Riverside	Council Member	X	X			
Ben	Crocker	City of Riverside Volunteer Fire Department	Chief					
Clint	Weekley	Department of Public Safety	Sergeant					
Murra	Samuel	Emergency Management Program Supervisor	Texas Department of Criminal Justice	X				
David	Smith	Good Shepherd Mission	Reverand	X				
Amanda	Ashcroft	Houston-Galveston Area Council	Planner, Community & Environmental Planning	X	X	X	X	X
Cheryl	Mergo	Houston-Galveston Area Council	Senior Manager, Community & Environmental Planning	X		X	X	
Larry	Brown	Huntsville ISD	Director of Maintenance & Operations	X				
Bill	Roberts	Huntsville ISD	Assistant Superintendent					
Dena	Daniel	Huntsville Memorial Hospital	Executive Assistant / Emergency Management Coordinator	X	X			
Kris	Drane	New Waverly ISD	Transportation Director					
Darol	Hail	New Waverly ISD	Superintendent					
Scott	Rohe	Phelps SUD	General Manager					
Robert	Nettles	Riverside SUD	General Manager					
Lonnie	Booker	Sam Houston State University	Associate Director of Emergency Management	X	X			
Amanda	Withers	Sam Houston State University	Vice President	X				

Briana	Gallagher	San Jacinto River Authority	Water Resources Project Manager	X				
Jennifer	Carper	Texas Department of Criminal Justice	Director of Emergency Management					
John	Waldo	Texas Division of Emergency Management	County Liaison Officer	X				
Ron	Walker	Texas Division of Emergency Management	District Coordinator					
Chad	Holton	Trinity River Authority	Project Manager					
Viviana	Fannin	Walker County Chief Deputy	Tax A/C Office		X			
Kari	French	Walker County Clerk	County Clerk					
Danny	Kuykendall	Walker County Commissioner Pct. 1	Commissioner	X				
Ronnie	White	Walker County Commissioner Pct. 2	Commissioner					
Bill	Daugette	Walker County Commissioner Pct. 3	Commissioner	X	X			X
Brandon	Decker	Walker County Commissioner Pct. 4	Commissioner	X	X			
John	Hooks	Walker County Constable Pct. 1	Constable					
Shane	Loosier	Walker County Constable Pct. 2	Constable					
Steve	Hill	Walker County Constable Pct. 3	Constable	X				
Gene	Bartee	Walker County Constable Pct. 4	Constable					
Tracy	Sorensen	Walker County Court at Law	Judge					
Will	Durham	Walker County District Attorney	District Attorney					
Leslie	Woolley	Walker County District Clerk	District Clerk		X			
Dione	Bumpus	Walker County EMS	Administrative Assistant	X	X			
Rachel	Parker	Walker County EMS	Director	X				
Kevin	Traylor	Walker County ESD 2	District Chief	X				
Steve	Fisher	Walker County JP1	Justice of the Peace					
Marcus	Payne	Walker County JP2	Justice of the Peace	X				
Randy	Jeffcoat	Walker County JP3	Justice of the Peace					

Stephen	Cole	Walker County JP4	Justice of the Peace					
Colt	Christian	Walker County Judge	County Judge	X	X		X	
Joe	Connell	Walker County OEM	CERT Coordinator	X	X			
Butch	Davis	Walker County OEM	Emergency Management Coordinator	X	X	X	X	X
William	Humphrey	Walker County OEM	Planner	X	X			
Sherri	Pegoda	Walker County OEM	Deputy EMC	X	X	X	X	X
Sonja	Tennant	Walker County OEM	Emergency Management Specialist	X				
James	Morrison	Walker County SUD	General Manager	X	X			
Andrew	Isbell	Walker County Planning & Development	Director	X				
Anthony	Tryon	Walker County Public Safety Comms	Assistant Director					
Deborah	Wilkinson	Walker County Public Safety Comms	Director	X	X			
Ashlyn	Hooks	Walker County Road & Bridge Pct. 2	Administrative Assistant					
John	Davila	Walker County Sheriff	Lieutenant					
Clint	McRae	Walker County Sheriff	Sheriff					
Shane	Osterman	Walker County Sheriff	Deputy	X				
Tim	Whitecotton	Walker County Sheriff	Chief					
Lorne	Hollingsworth	Walker County SUD	Outside Operations	X	X			
Diana	McRae	Walker County	Tax Assessor		X			
Amy	Klawinsky	Walker County	Treasurer					

Table 2.5: Participation Matrix by Jurisdiction

Jurisdiction/Organization	Kickoff Meeting, 3/23	Risk & Capability Assessment, 4/17	Public Outreach Strategy, 6/20	Public Engagement Event, 8/19	Our Mitigation Strategy, 11/15
Walker County	X	X	X	X	X
City of Huntsville	X	X		X	
City of New Waverly		X		X	
City of Riverside	X	X		X	

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) An online survey
   a) The online survey was open from May 8, 2023, to October 31, 2023. In total, there were 126 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 Engagement Event- Walker County Emergency Preparedness Fair
   a) A public event hosted by Walker County Office of Emergency Management in partnership with the city of Huntsville, the city of New Waverly, the City of Riverside, and H-GAC took place on August 19, 2023, from 10:00 AM - 2:00 PM at the Walker County Storm Shelter located at 455 TX-75, Huntsville, Texas 77320. This was a heavily attended event that offered community members various information about risks and resources available to them, grab bags, free food, and even raffle prizes of emergency preparedness item. 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 opened from April 9th, 2024, until July 19th, 2024, to gather public comments regarding the finished draft of the Walker County Hazard Mitigation Plan Update for 2024. 2 responses were received regarding the draft plan. These 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 Walker 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.

Table 2.6: Plan Development Resources

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 participation, and NFIP policies in force information.

Section 3: County Profile

History of Hazard Events

Walker 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. The first disaster declaration in the County was recorded in 1989, with a total of 37 disasters within the county. 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[2]

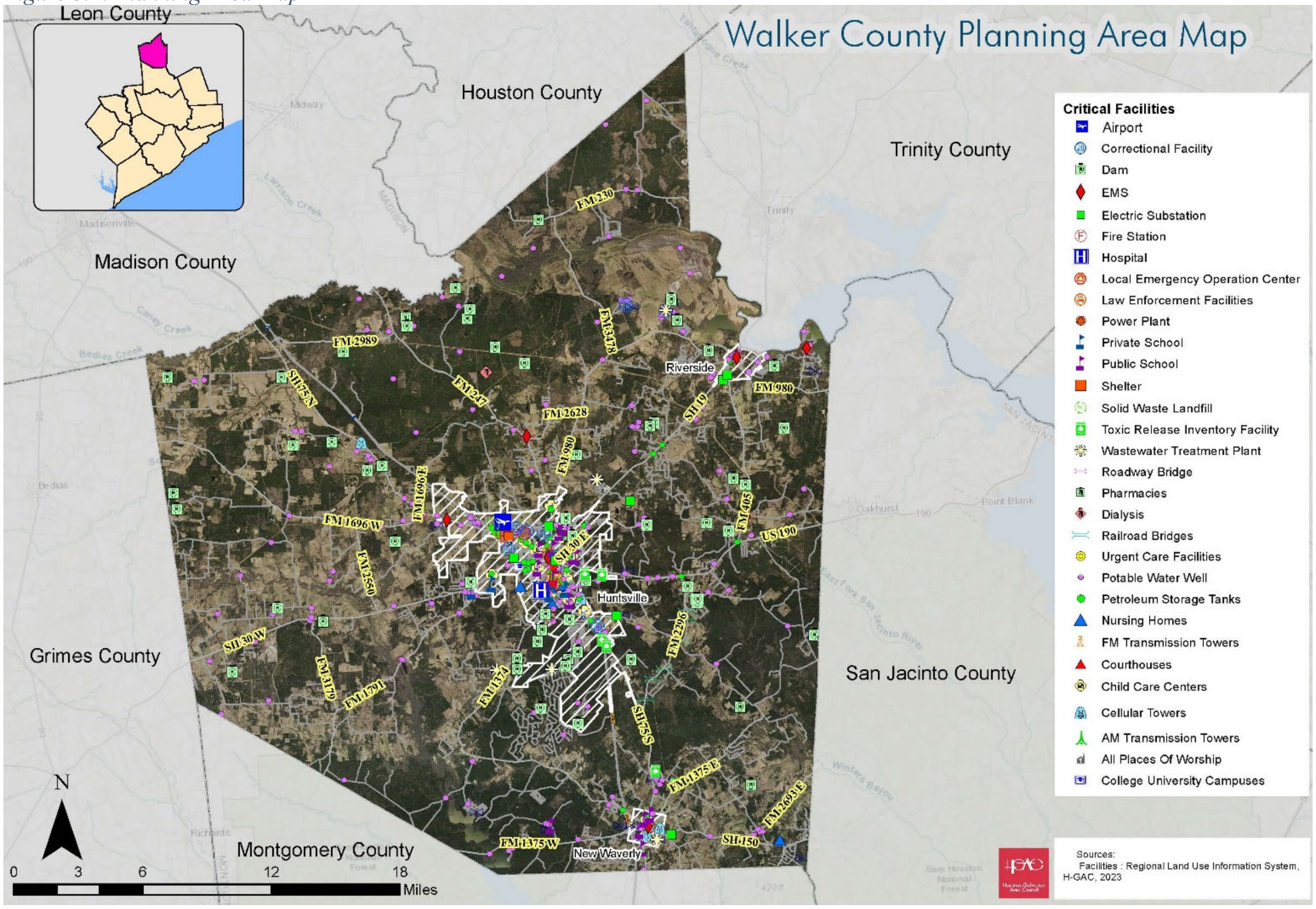
Declaration Date	Disaster No.	Declaration Type	Incident Type	Title
5/19/1989	828	Major Disaster Declaration	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING
5/2/1990	863	Major Disaster Declaration	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING
12/26/1991	930	Emergency Declaration	Flood	SEVERE THUNDERSTORMS
9/10/1993	3113	Major Disaster Declaration	Drought	EXTREME FIRE HAZARD
10/18/1994	1041	Emergency Declaration	Flood	SEVERE THUNDERSTORMS AND FLOODING
2/23/1996	3117	Major Disaster Declaration	Fire	EXTREME FIRE HAZARD
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	Major Disaster Declaration	Fire	EXTREME FIRE HAZARDS
6/9/2001	1379	Major Disaster Declaration	Coastal Storm	TX-TROPICAL STORM ALLISON-06-06-2001
11/5/2002	1439	Emergency Declaration	Severe Storm	SEVERE STORMS, TORNADOES AND FLOODING
2/1/2003	3171	Emergency Declaration	Other	LOSS OF THE SPACE SHUTTLE COLUMBIA
9/2/2005	3216	Emergency Declaration	Hurricane	HURRICANE KATRINA EVACUATION
9/21/2005	3261	Major Disaster 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
6/29/2007	1709	Emergency Declaration	Severe Storm	SEVERE STORMS, TORNADOES, AND FLOODING
8/18/2007	3277	Emergency Declaration	Hurricane	HURRICANE DEAN
3/14/2008	3284	Emergency Declaration	Fire	WILDFIRES
8/29/2008	3290	Emergency Declaration	Hurricane	HURRICANE GUSTAV
9/10/2008	3294	Major Disaster Declaration	Hurricane	HURRICANE IKE
9/13/2008	1791	Fire Management Assistance Declaration	Hurricane	HURRICANE IKE
6/20/2011	2929	Emergency Declaration	Fire	COWBOY CHURCH FIRE
7/1/2011	1999	Emergency Declaration	Fire	WILDFIRES
9/9/2011	4029	Major Disaster Declaration	Fire	WILDFIRES
5/29/2015	4223	Major Disaster Declaration	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS AND FLOODING

Declaration Date	Disaster No.	Declaration Type	Incident Type	Title
11/25/2015	4245	Major Disaster Declaration	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING
2/9/2016	4255	Major Disaster Declaration	Severe Storm	SEVERE WINTER STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING
3/19/2016	4266	Major Disaster Declaration	Flood	SEVERE STORMS, TORNADOES, AND FLOODING
6/11/2016	4272	Major Disaster Declaration	Flood	SEVERE STORMS AND FLOODING
8/25/2017	4332	Major Disaster Declaration	Hurricane	HURRICANE HARVEY
2/25/2019	4416	Emergency Declaration	Flood	SEVERE STORMS AND FLOODING
3/13/2020	3458	Major Disaster Declaration	Biological	COVID-19
3/25/2020	4485	Emergency Declaration	Biological	COVID-19 PANDEMIC
8/24/2020	3540	Emergency Declaration	Hurricane	TROPICAL STORMS MARCO AND LAURA
2/14/2021	3554	Major Disaster Declaration	Severe Ice Storm	SEVERE WINTER STORM
2/19/2021	4586	Major Disaster Declaration	Severe Ice Storm	SEVERE WINTER STORMS
5/17/2024	4781	Major Disaster Declaration	Flood	SEVERE STORMS, STRAIGHT-LINE WINDS, TORNADOES, AND FLOODING
7/9/2024	4798	Major Disaster Declaration	Hurricane	HURRICANE BERRYL

Planning Area Overview

The largest industries in Walker County, TX are public administration (4,911 people), educational services, health care, and social assistance (4,895 people), and retail trade (2,690 people). The highest-paying industries in the county are wholesale trade ($134,566), information ($110,500), professional scientific & technical services ($101,137), and health care & social assistance ($93,958). The most common job groups, by the number of people 16 years and older living in Walker County, are office & administrative support occupations (3,231 people), law enforcement workers (2,610 people), and education, instruction, and library occupations (2,543 people).[3,4] The county's unemployment rate in 2022 was 4.7%, which is higher than the 2022 national average of 3.9%.[5,6] The annual median household income within the county was reported at $44,104, far below the $73,035 median income for the State of Texas.[7]

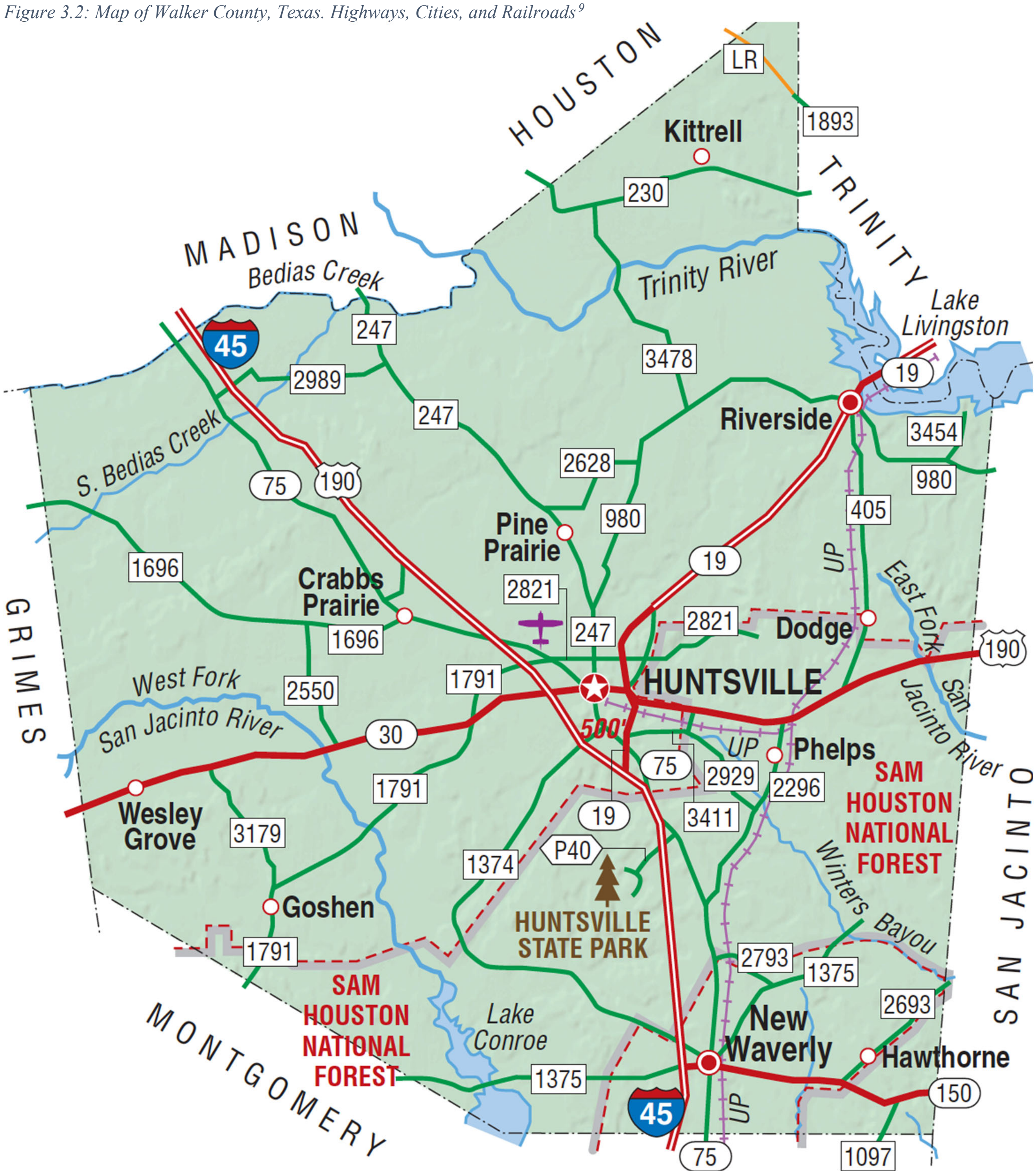
Figure 3.1: Planning Area Map



According to the US Census data, Walker County's population was 76,402 as of April 1, 2020. Population for the county, according to the Texas Demographic Center Population Estimates Program, is expected to slowly increase over time. Population change includes two major components: natural increase (births minus deaths) and net migration (in-migrants minus out-migrants). Net migration includes both international migrants from other countries and domestic migrants (those who moved from other counties in other states or other counties within Texas.) A component of change is determined to be a driver if it comprises more than 50% of the total population change. Between 2010 and 2019, population change in Texas was comprised of 51% net migration and 49% natural increase. From 2021-2022 population change in Texas was comprised of 74% net migration and 25% natural increase. Drivers of population change within Walker County are due primarily to net migration. The most recent data available shows the Walker County population at 78,870 as of July 1, 2022.

The three largest cities within the county are the City of Huntsville (52,387 people), the City of Riverside (16,851 people), and the City of New Waverly (7,162 people). The City of Huntsville also serves as the county seat.[8] Major highways within the county include Interstate 45, U.S. Highway 190, State Highway 19, State Highway 30, State Highway 75, and State Highway 150. There is 1 airport within the county, the Huntsville Municipal Airport, owned by the City of Huntsville, is a public-use general aviation airport located 2 miles northwest of Huntsville. Walker County is also home to the Sam Houston National Forest and Huntsville State Park, a 2,083-acre wooded recreational area located six miles southwest of Huntsville within the Sam Houston National Forest.

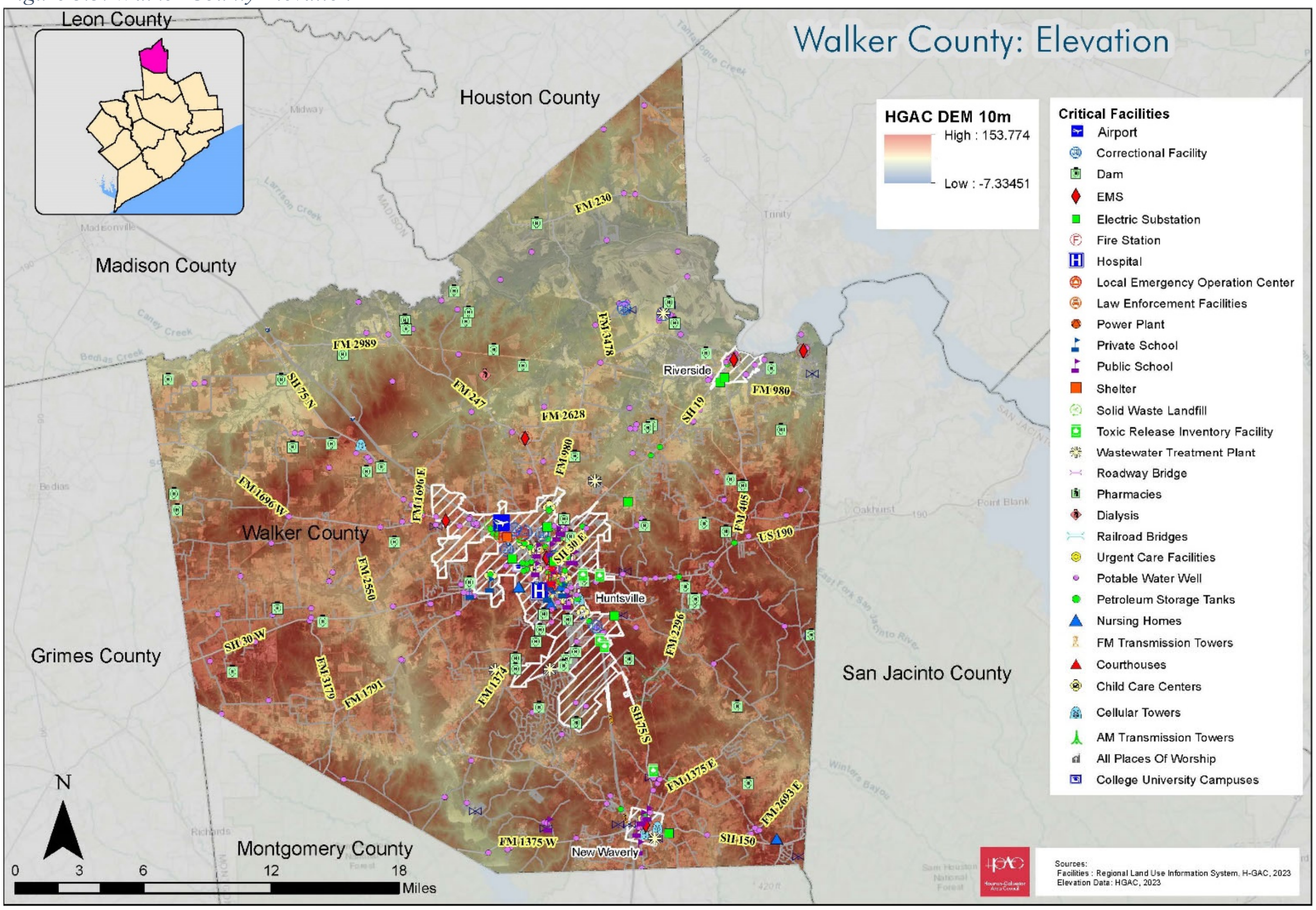
Figure 3.2: Map of Walker County, Texas. Highways, Cities, and Railroads[9]



Geographic Setting

Elevations in Walker County range from 140 to 404 feet above sea level (ASL), -7 to 153 meters respectively, and is drained by the Trinity River in the north and the San Jacinto River in the south. There are numerous creeks located throughout the county- Bedias Creek forms part of the northwestern boundary and empties into the Trinity River, as do Harmon, Carolina, and Nelson creeks. Mill, East and West Sandy, and Robinson creeks drain into the San Jacinto River in the south Neighboring counties include Houston County to the north, Trinity County to the northeast, Madison County to the northwest, San Jacinto County to the east, Montgomery County to the south, and Grimes County to the west. Elevation is depicted in Figure 3.3 below and a map of water features within the County can be found in Figure 3.5.

Figure 3.3: Walker County Elevation

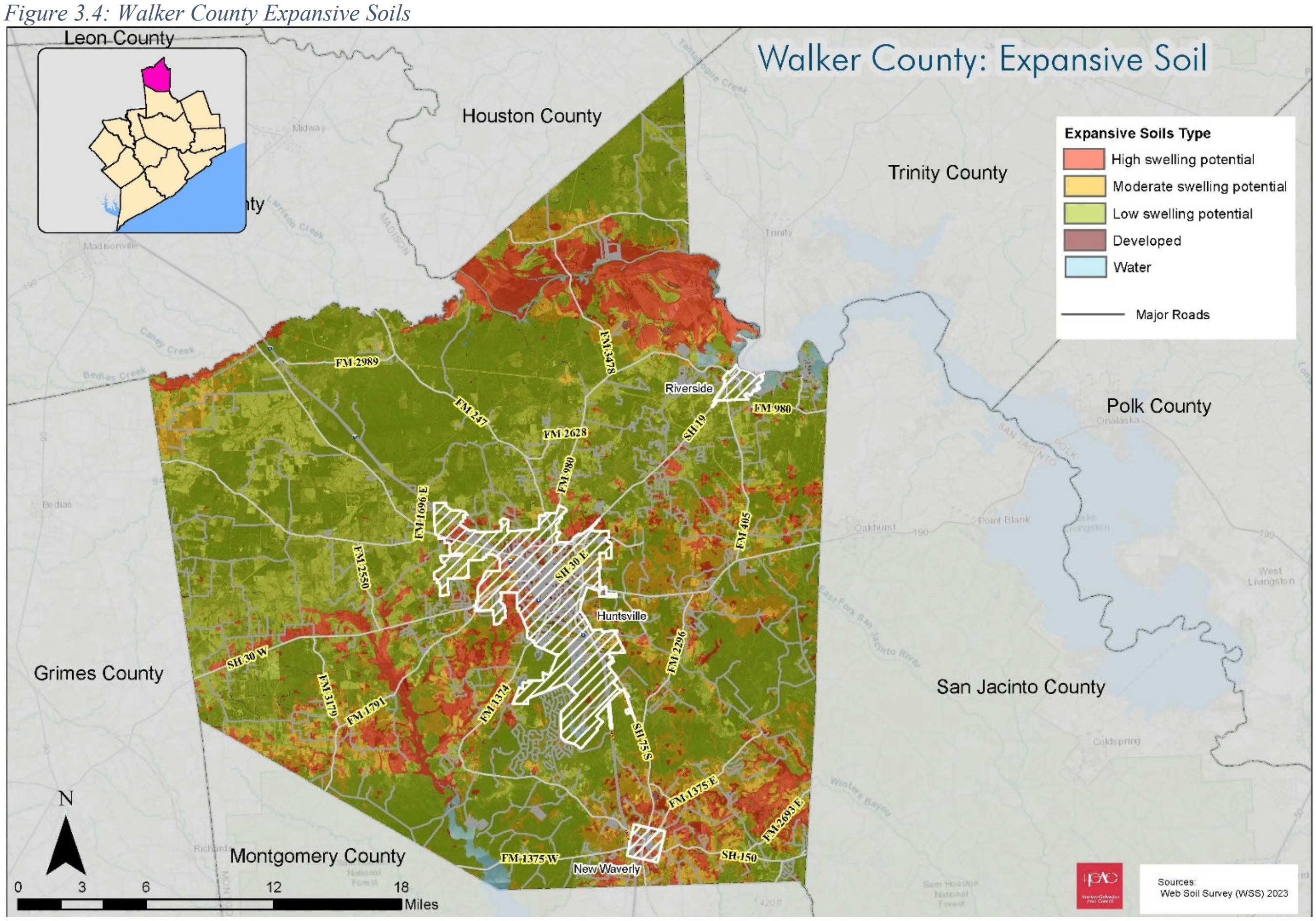


Soil Composition

Walker County soils range from dark clays, clay loams, and sandy loams from within the major land resource areas of the East Texas Timberland, Flatwoods, and Coast Prairie.[10] East Texas Timberland Soils consists of soils with surface drainage that is moderate to rapid. Most soils in this area are deep, light-colored, acid sands and loams over loamy and clayey subsoils. Flatwoods soils are located just north of the Coast Prairie and extend into Louisiana. Surface drainage for these soils is slow as the water table is near the surface at least part of the year. Coast Prairie Soils comprise about 8.7 million acres near the Gulf Coast. Much like the Flatwoods soils, the landscape is level to gently undulating with slow surface drainage. Upland soils are mostly deep, dark-gray, neutral to slightly acid clay loams and clays, while bottomland soils are mostly deep, dark-colored clays and loams along small streams but are greatly varied along the rivers.

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. Walker County is covered primarily with low swell potential soils, followed closely by soils with high swelling potentials that surround the hydrologic features within the county.[11,12] Figure 3.4 below shows the expansive soils and shrink-swell potential for Walker County and participating jurisdictions. Full-size maps produced by H-GAC can be found in Appendix B. A more in-depth look at expansive soils within the county can be found in Section 6.5- Drought & Expansive Soils.

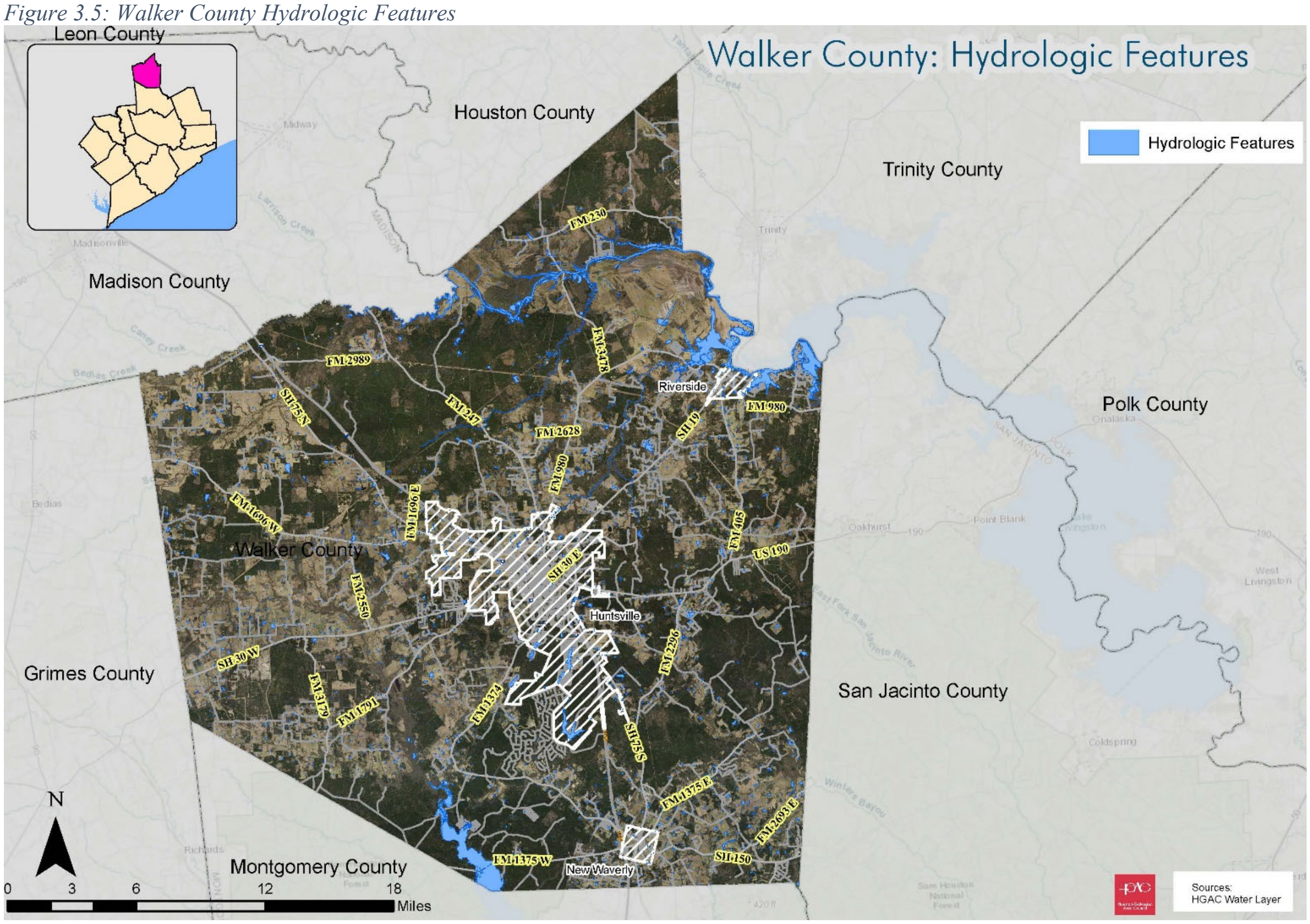
Figure 3.4: Walker County Expansive Soils



Hydrologic Features

17.9 square miles or 1.5% of Walker County is covered by surface water in rivers, creeks, and other hydrologic features. Most of the 784.2 square miles that comprise Walker County lie within the drainage basin of the Trinity and San Jacinto River Basin.[13] The figure below shows hydrologic features located across the county.

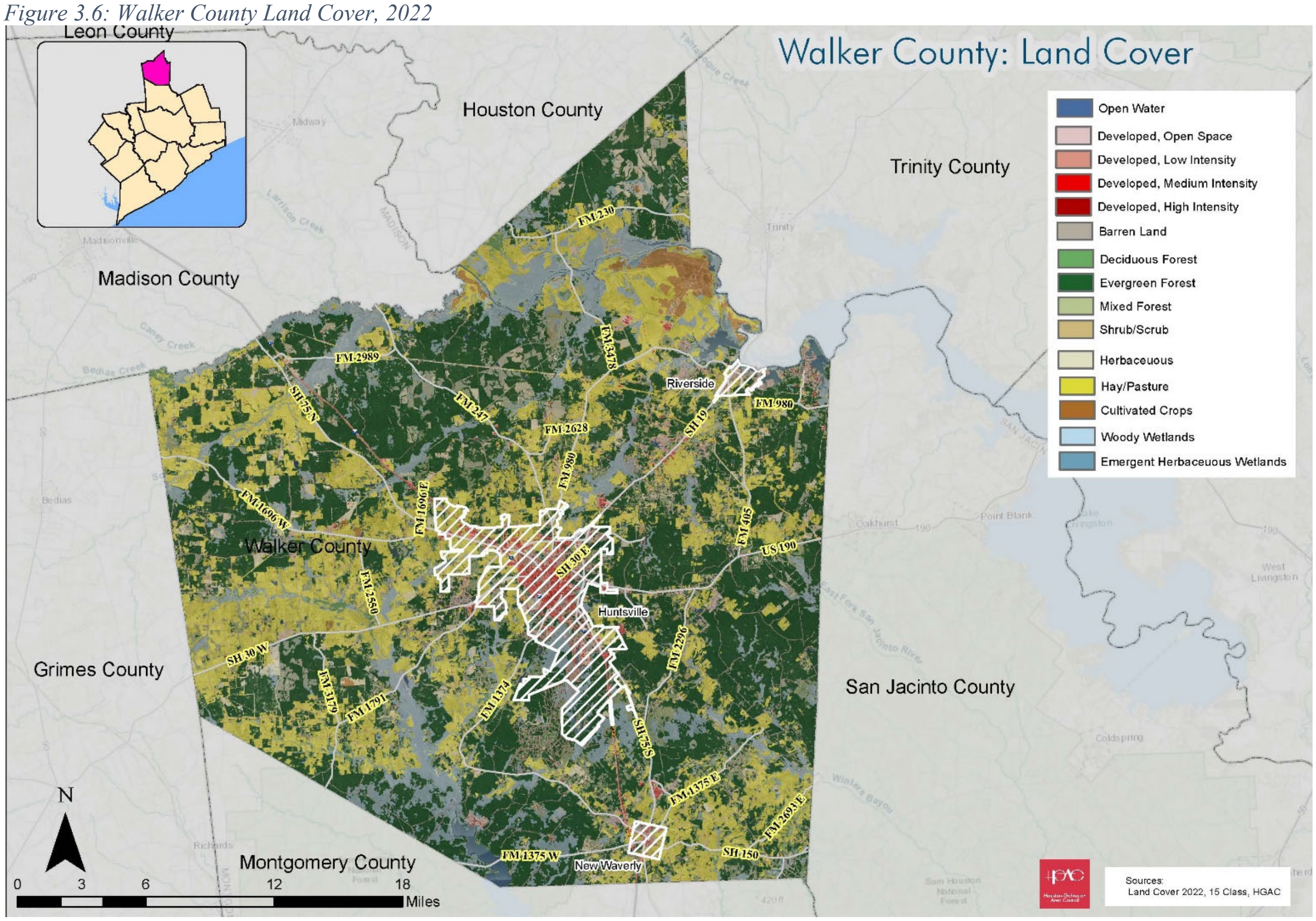
Figure 3.5: Walker County Hydrologic Features



Land Use and Land Cover

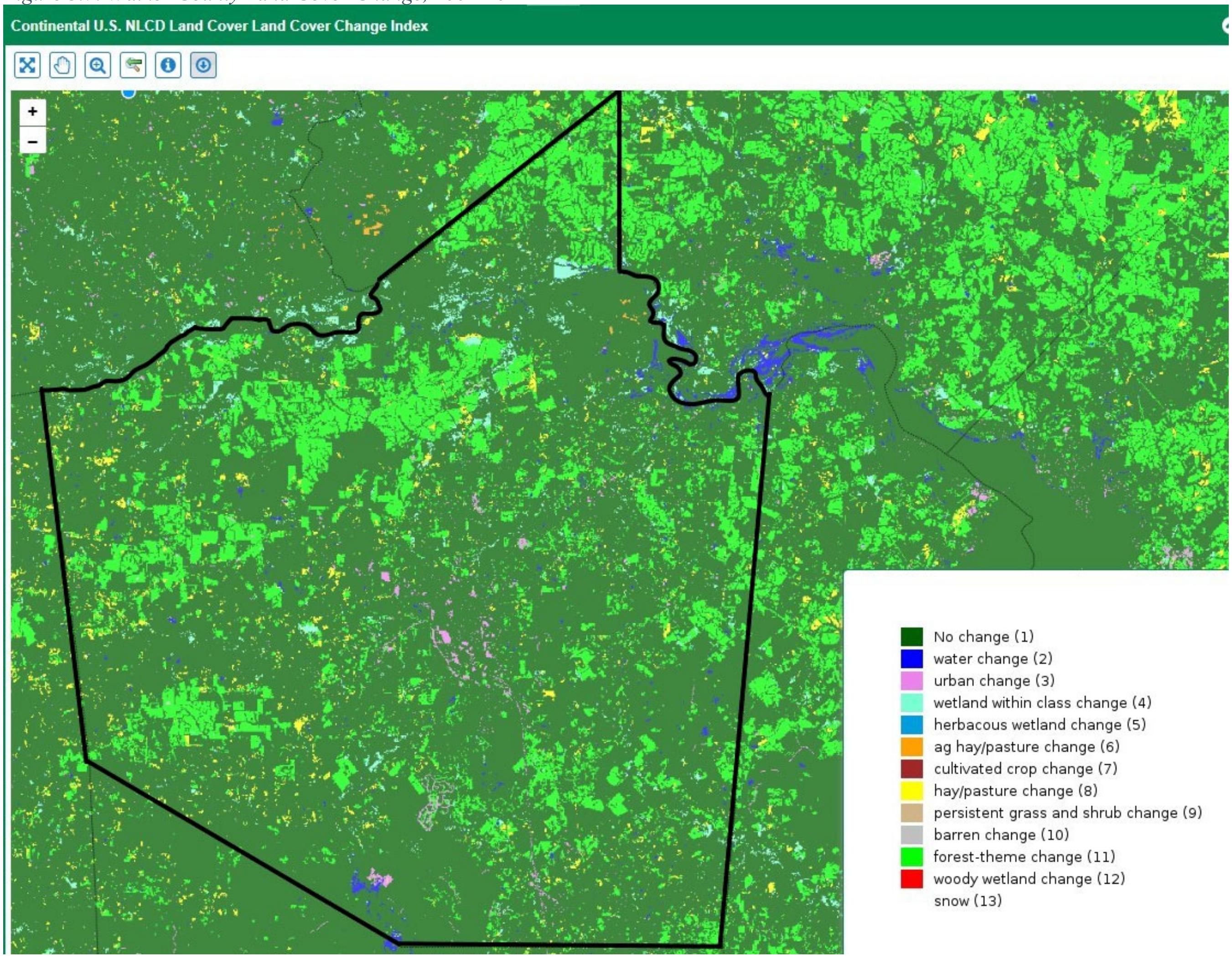
The county is largely rural with pockets of development. Land cover includes a majority of hay/pastureland and evergreen forest, followed by woody wetlands, cultivated crops, and developed areas. Figure 3.6 shows the land cover composition of Walker County.

Figure 3.6: Walker County Land Cover, 2022



Land cover change from 2001-2021, as seen in Figure 3.7, has seen an increase in forest-themed/ tree, agricultural hay/pasture, and urban change mostly within and around the City of Huntsville within the last 20 years.[14]

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



Future Development

The changes in development since the last plan update, and how they have increased or decreased the community's vulnerability are referenced in each hazard profile under "Populations at Risk". The information and figures below highlight areas of future development within the county and participating jurisdictions. Jurisdictions that had no future development updates for this HMP were omitted. Walker County has seen a steady growth in population since the last plan update, with a 12% increase from 2010 to 2020. This population growth and increase in development have increased the vulnerability of the County and participating jurisdictions to the impacts of certain hazards. For the entire planning area increases in development have increased the vulnerability to flooding from added impervious surface areas. Within the City of Huntsville development on the outer edges of the city has seen increased flood impacts. The vulnerability to wildfire has increased within all participating jurisdictions since the last plan update due to new developments expanding into wildland urban interface areas. There is also increased vulnerability from impacts due to various types of severe weather that can affect the entire planning area such as thunderstorms, lightning, tornados, microbursts, hurricanes, tropical storms, tropical depressions, windstorms, hailstorms, extreme heat, and severe winter weather. Increases in the population and development will also put more reliance on water supplies increasing the vulnerability of the planning area to water quantity and quality impacts. Additionally, impervious surfaces added over expansive soil areas, like slab-on-grade foundations, are more vulnerable and at risk for impacts within the planning area.

Since the last plan update, development within Walker County unincorporated areas has seen many new subdivisions added with plans for more residential and commercial areas. A recently developed subdivision, Texas Grand Ranch is developing future neighborhood sections that will front I-45. This community is located in the Sam Houston National Forest, next to Huntsville State Park. Additionally, Republic Grand Ranch is in development off of FM 1097. There is also a large subdivision and a multi-unit shopping center planned between FM 1374 and FM 1375, fronting I-45. Many businesses are also moving into Walker County such as a Christmas Village on I-45, Texas Roadhouse, Holiday Inn and a King Ranch Ag & Turf /John Deer dealer coming to Huntsville. There are 2 planned development districts within the City of Huntsville's Future Land Use Map, seen below. Additionally, The City of Huntsville maintains a commercial and residential developments map that is updated frequently. Future development within the City of New Waverly includes a large, planned development, New Waverly Station. This is a 1,600-home development located off FM 1375 west of I-45, adjacent to a proposed 50-acre commercial development on the northwest corner of FM 1375 and I-45. The development will feature approximately 530 acres of residential homes, 50 acres of future commercial property, and 75 acres of lakes, parks, and green space. There were no future development areas identified for the City of Riverside.

Figure 3.8: City of Huntsville, Commercial Developments

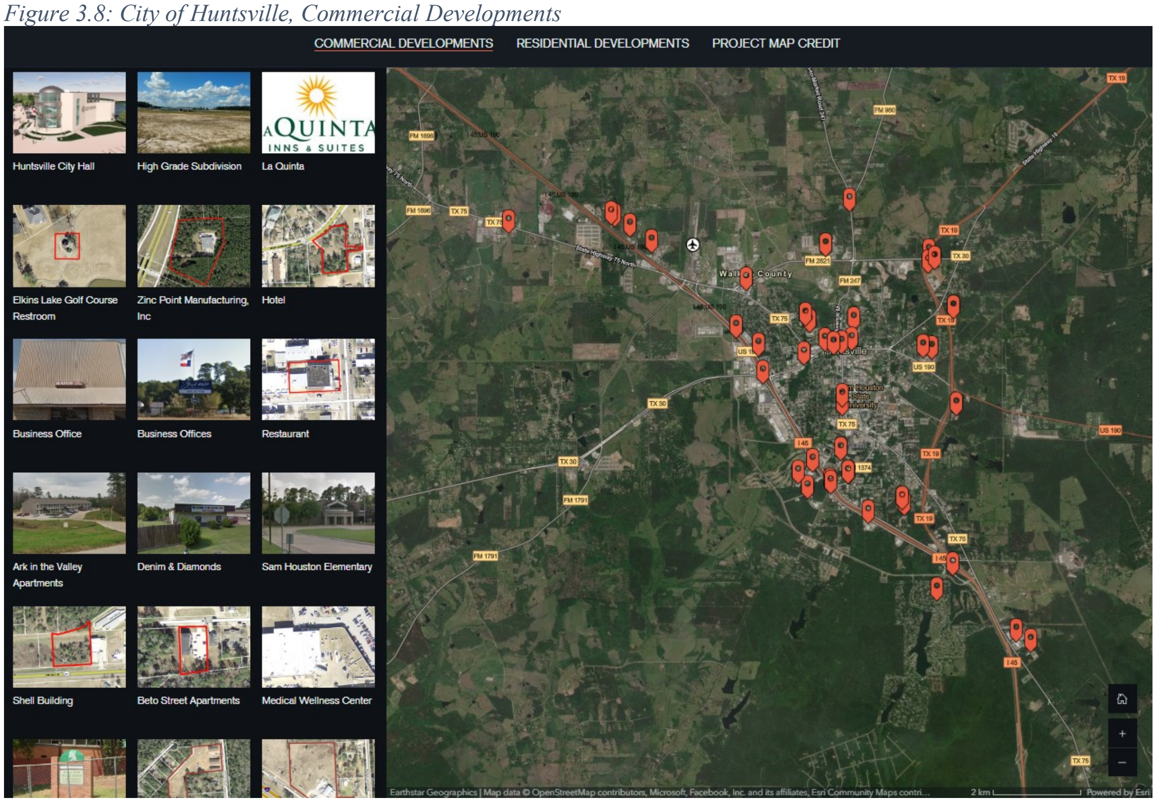
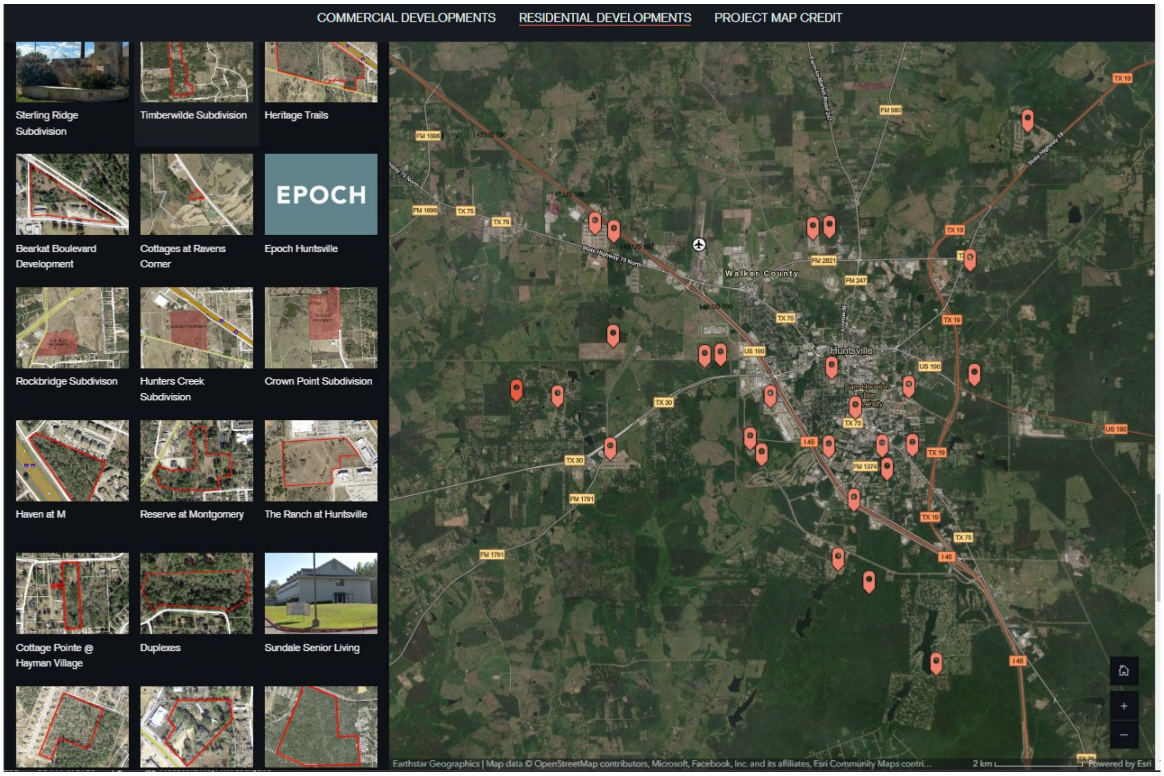


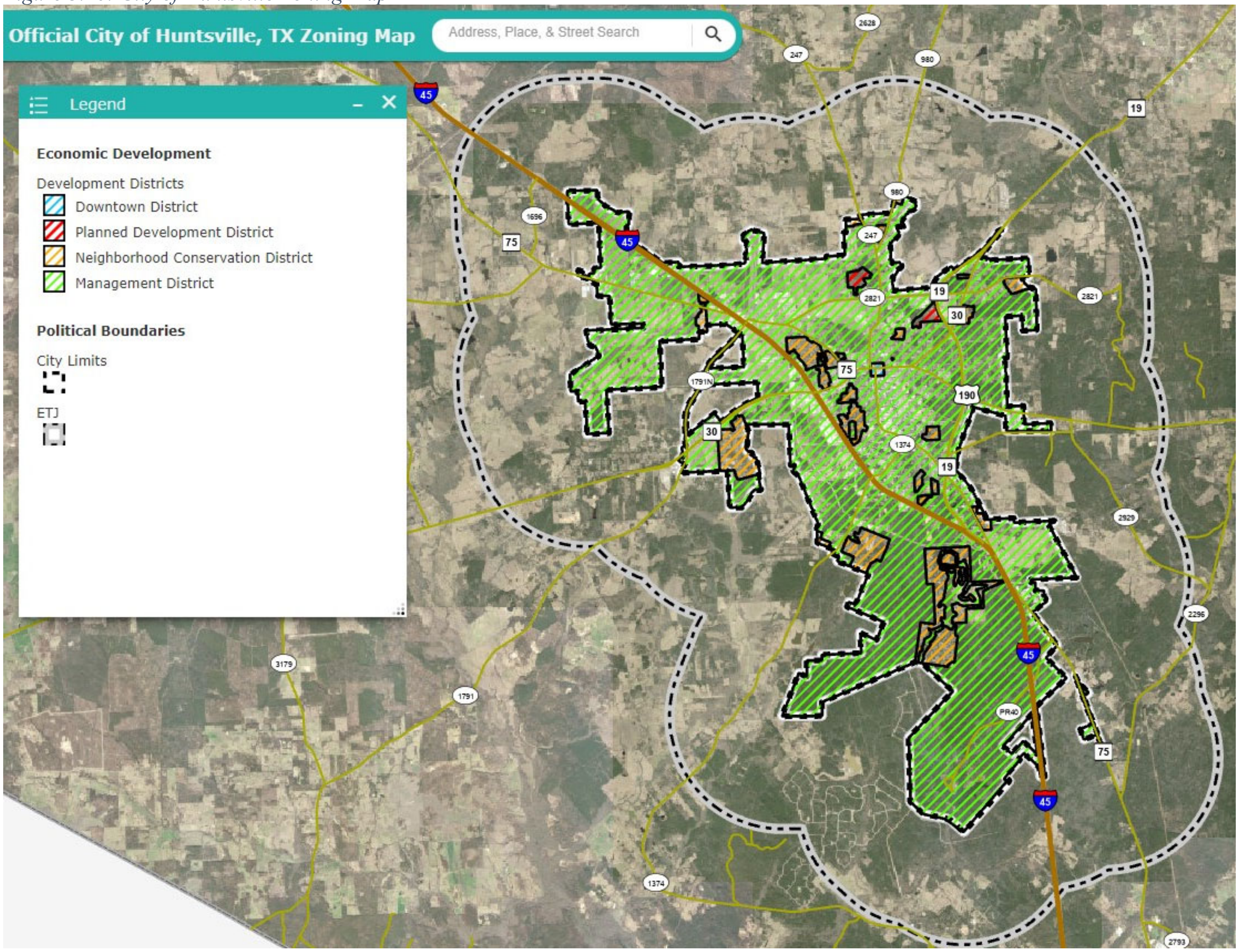
Figure 3.9: City of Huntsville, Residential Developments



Zoning

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. A zoning ordinance exists for the City of Huntsville, Figure 3.10 below, and was last updated in 2015.[16] The remaining participating jurisdictions in this HMP update do not have a zoning ordinance in place.

Figure 3.10: City of Huntsville Zoning Map



Population and Demographics

Walker County has seen its population grow steadily since 1971, with an average of a 2% increase per year. Walker County saw population increases for 44 out of the 51 years where data is available.[17] The projected population for 2040 is expected to reach 97,641, a 27.8% increase. The population from 2020-2060 is projected to see a 59.8% increase with 122,073 residents calling the county home.[18] Figure 3.11 shows the population distribution per 1000 persons by census tract, while Table 3.2 highlights population change in the county since 1970.

Figure 3.11: Population Distribution Map

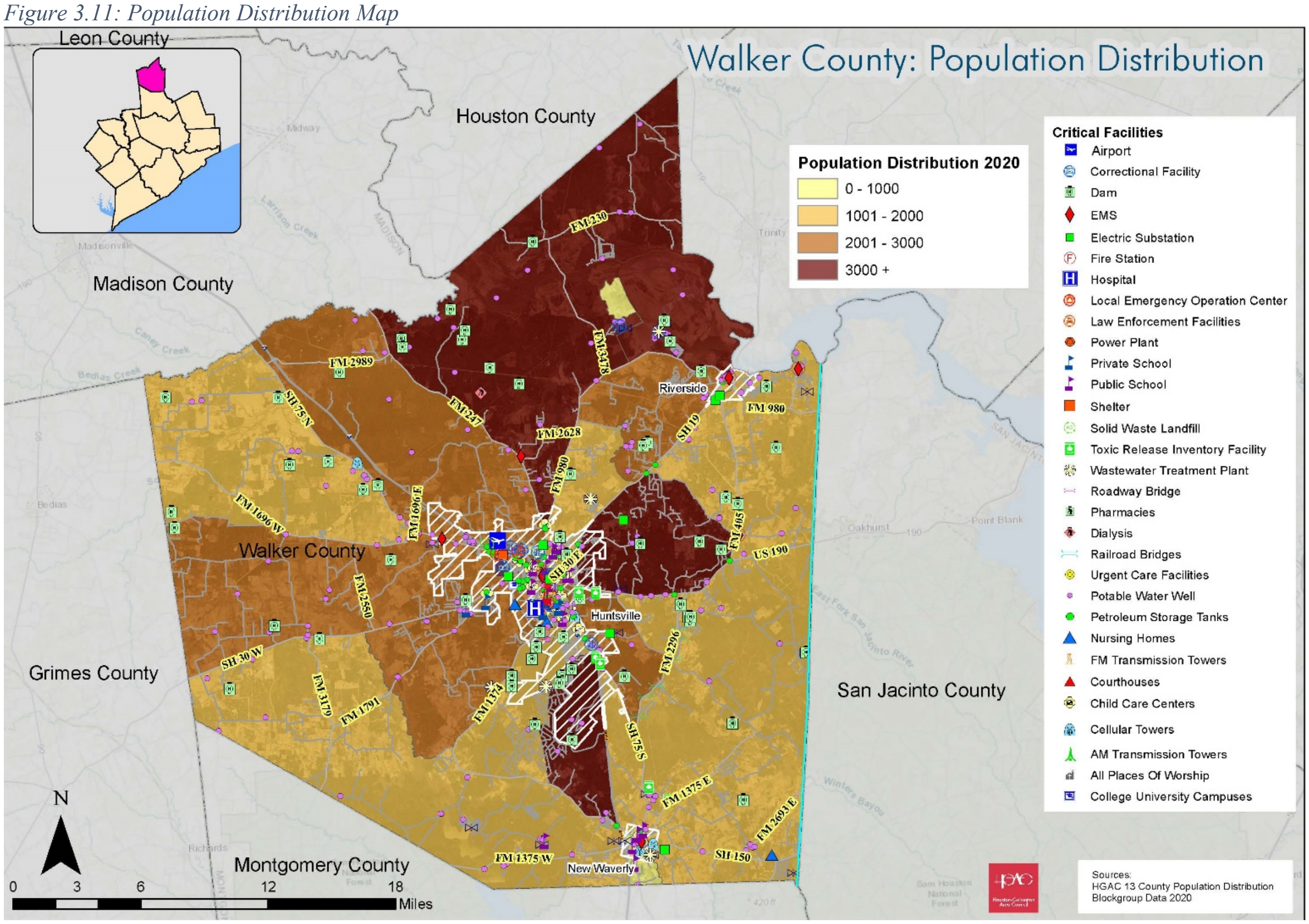


Table 3.2: Walker County Population Trends, 1970 to 2020

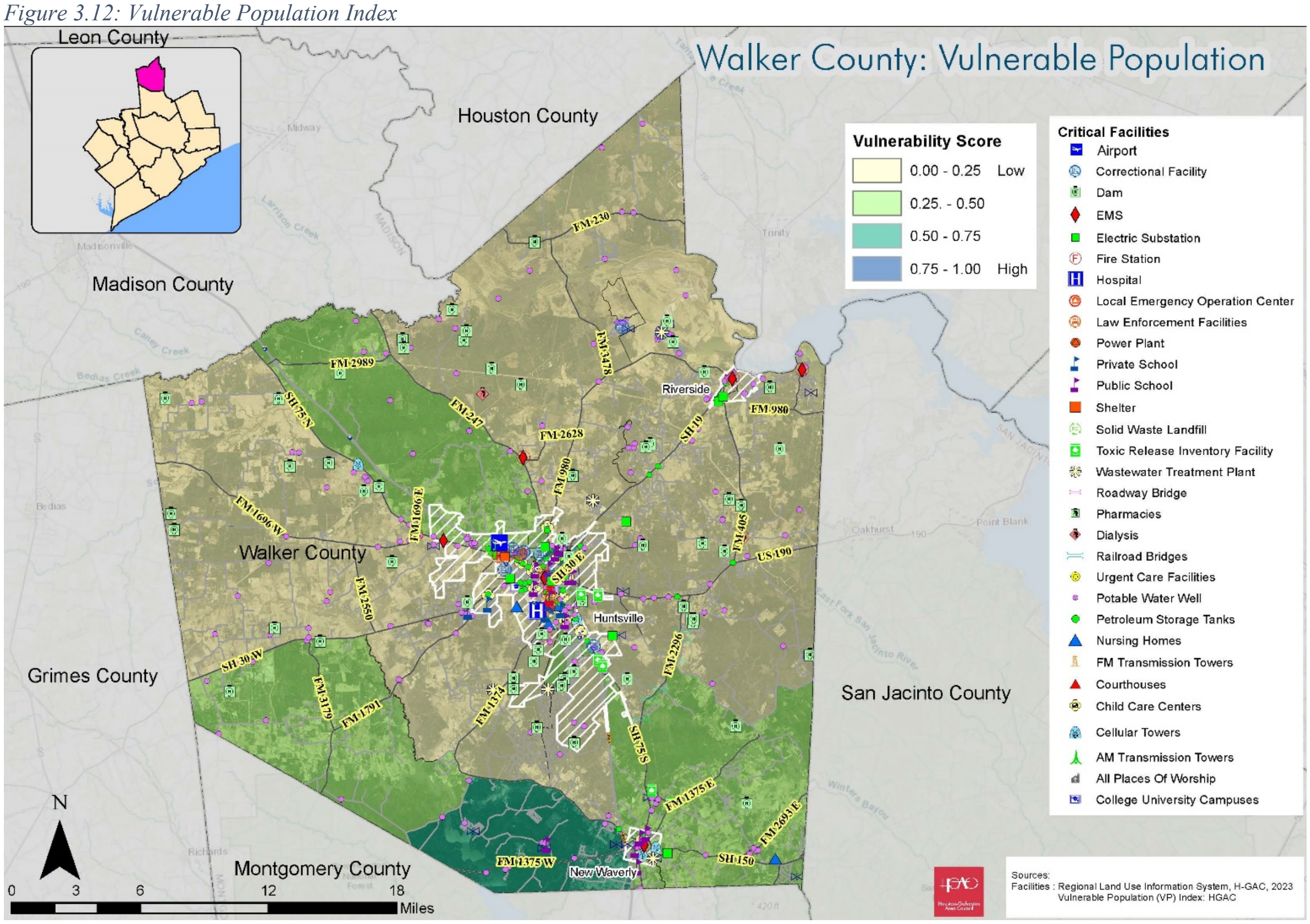
Year	Population Count	Population Change	Percent (%) Change
1970	29,796		
1980	42,045	12,249	41%
1990	51,020	8,975	21%
2000	61,768	10,748	21%
2010	68,239	6,471	10%
2020	76,544	8,305	12%

Walker County's population demographics, per the 2020 census, consists of 72.9% White population, 23.3% African American population, 1.2% Asian population, and 2.5% of the population listed as other or two or more races. 14.4% of the population in Walker County is 65 or older, this is higher than the State average of 13.4%. The poverty rate for the county is 20%, much higher than the State average of 14%.[19]

Vulnerable Population

The Vulnerable Population Index, a dataset developed by H-GAC, identifies areas throughout Walker 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 Walker County, denoted by a higher vulnerability score in Figure 3.12. Defining and mapping vulnerable populations provides the opportunity to demonstrate where the most need is throughout the county.

Figure 3.12: 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 3.13 below depicts the social vulnerability of communities in Walker 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. Walker County's social vulnerability score is 0.8412 overall. Scores range from 0-1, with 1 being the highest level of vulnerability within the nation. This indicates the county has a high level of social vulnerability.[21]

Figure 3.13: Walker County Overall CDC/ASTDR Social Vulnerability

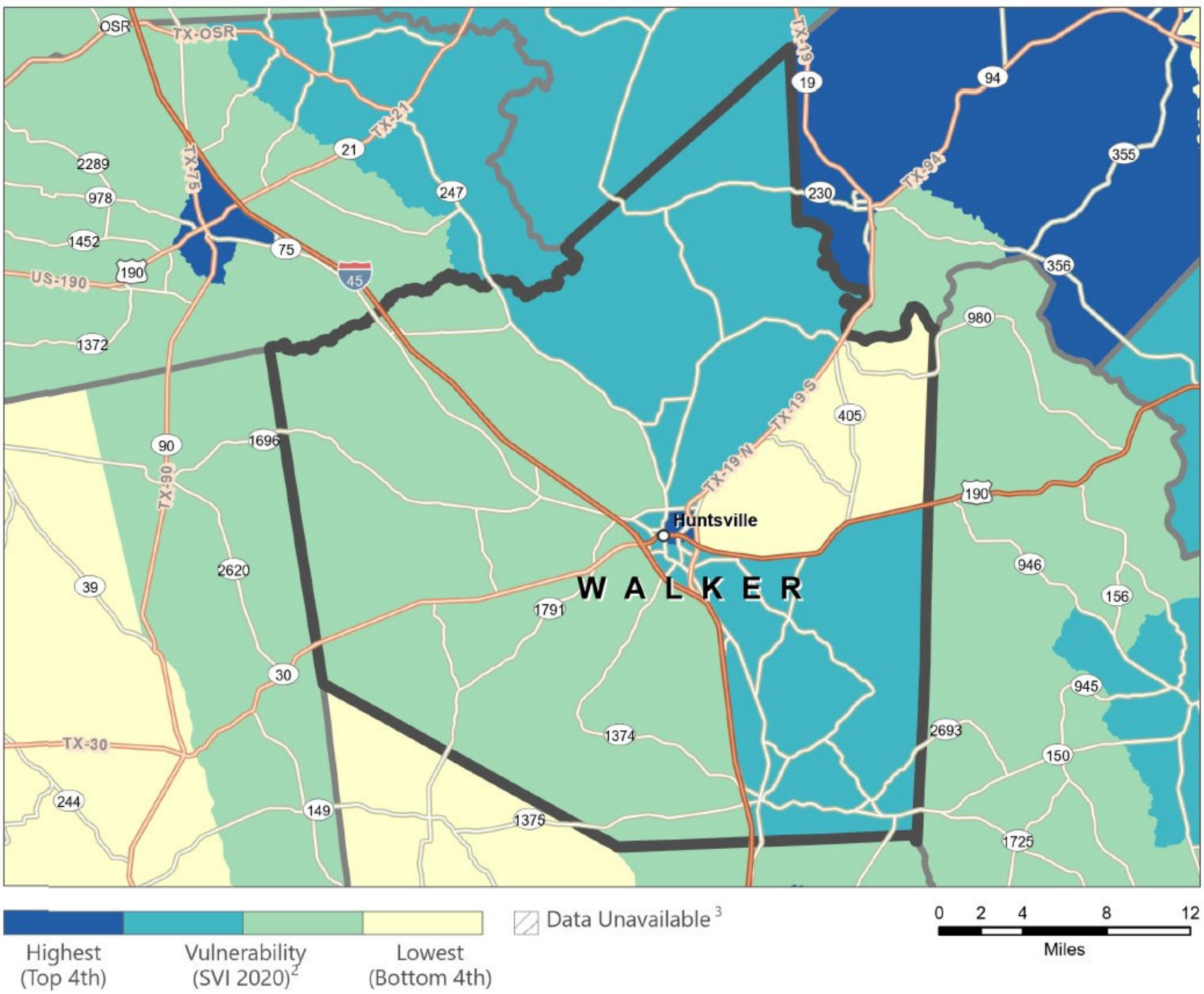
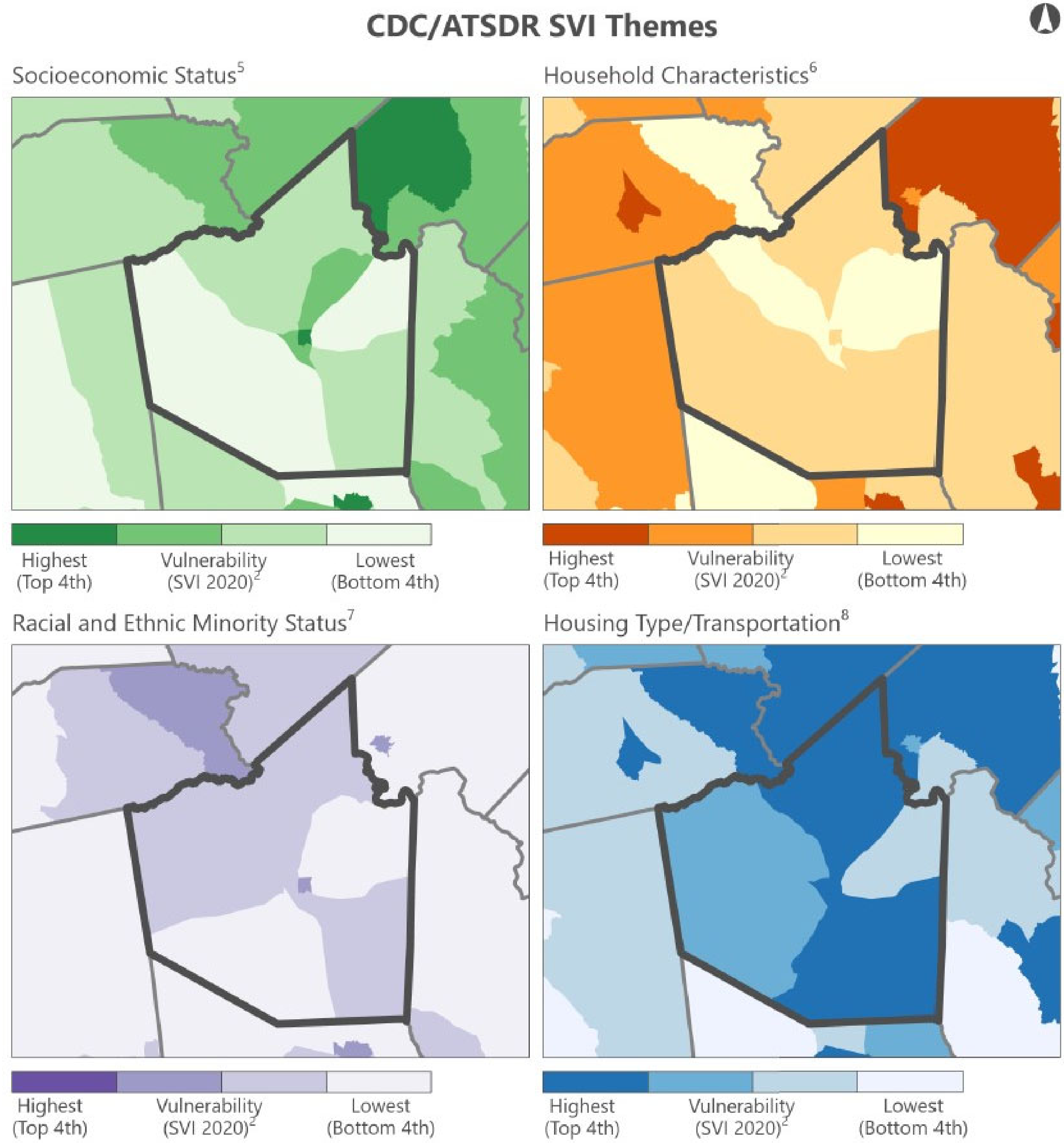


Figure 3.14: Walker County Themes for CDC/ATSDR Social Vulnerability



Housing and Living Arrangements

As of July 1, 2022, there were 30,542 housing units in Walker County, with 24,592 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 Walker County was listed at $187,200 from 2018-2021.[6]

Loss Estimations

A Hazus analysis was conducted for 4 scenarios within Walker 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.

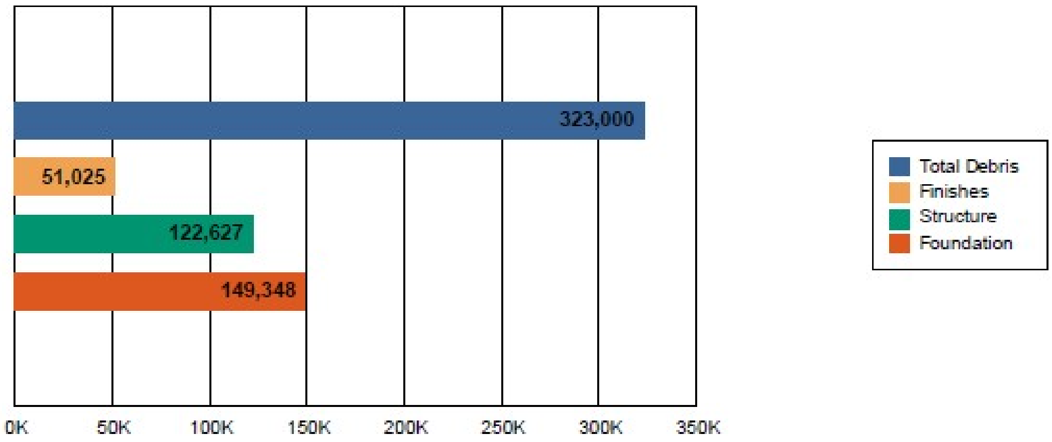
Table 3.3: Building Exposure by Occupancy Type, 100-year Flood Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	$5,681,719	56%
Commercial	$1,775,309	17.5%
Industrial	$352,809	3.5%
Agricultural	$306,109	3%
Religion	$140,303	1.4%
Government	$216,997	2.1%
Education	$1,673,182	16.5%
Total	**$10,263,742**	**100%**

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood scenario. 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 323,000 tons of debris will be generated. Of the total amount, Finishes comprises 16% of the total, Structure comprises 38% of the total, and Foundation comprises 46%. If the debris tonnage is converted into an estimated number of truckloads, it will require 12,920 truckloads (estimating 25 tons/truck) to remove the debris generated by the flood.

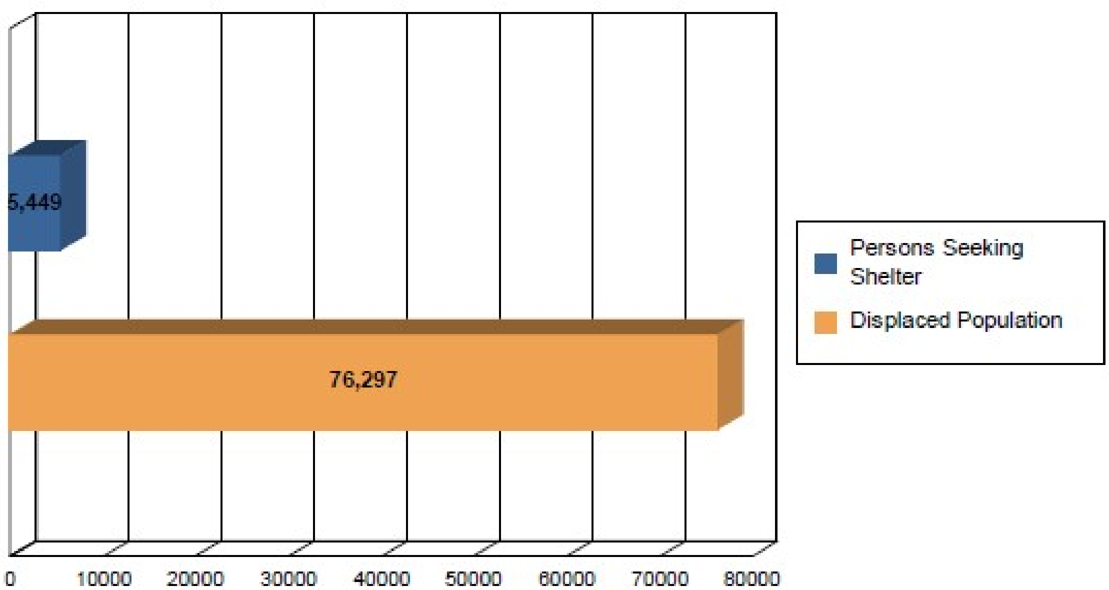
Figure 3.15: Debris Breakdown in Tons



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 25,432 households (or 76,297 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 5,449 people (out of a total estimated population of 76,297) will seek temporary public shelter.

Figure 3.16: 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 2018 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 740 facilities 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	Quantity within a Floodplain
AM Transmission Tower	3	0
Airport	1	0
Cellular Tower	4	0
Childcare Facility	21	0
College	2	1
Correctional Facility	8	0
Courthouse	1	0
Dam	58	6
Dialysis Center	2	0
Elder Care Facility	7	0
Electric Substation	9	0
EMS	8	0
Fire Station	11	0
FM Transmission Tower	7	0
Hospital	1	0
Local Emergency Operation Center	1	0
Petroleum Storage Tank	58	0
Pharmacy	8	0
Place of Worship	52	0
Police Station	5	0
Potable Water Well	207	20
Power Plant	0	0
Private Schools	4	0
Public Schools	20	0
Railroad Bridge	5	3 (listed as above water)
Roadway Bridge	204	6 (listed as above water)
Shelters	1	0
Solid Waste Landfill	1	0
Toxic Release Inventory Facility	7	0
Urgent Care	0	0
Wastewater Outfall	17	7
Wastewater Treatment Plant	7	1
Residential Units	30,542	
Commercial Units	6,087	

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 NFIP provides affordable flood insurance for property owners, renters, and businesses in participating communities. This reduces the socio-economic impacts of flooding on communities through risk reduction via flood insurance and reduces the physical impacts of flooding through beneficial floodplain regulation. Each of the participating jurisdictions has a Floodplain Administrator on staff, and/or functions under the regulatory umbrella of Walker County.

Table 3.5: NFIP Participation[27]

Jurisdiction	NFIP Participation	Date Joined	Current Effective FIRM Date	FDPO Date	Designee for NFIP Requirements
Walker County	Yes	7/19/1977	8/16/2011	8/15/2011	Floodplain Administrator, Planning & Development Director
City of Huntsville	Yes	5/24/1974	8/16/2011	8/31/2015	Floodplain Administrator, City Engineer
City of New Waverly	Yes	6/25/1976	8/16/2011	5/10/2011	Floodplain Administrator, Director of Public Works
City of Riverside	Yes	11/19/1976	8/16/2011	8/2/2011	Floodplain Administrator, City Secretary

Walker County updated its FDPO on 8/15/2011. The City of Huntsville's most recent FDPO is located in the City's Unified Development Ordinance (last updated 09/2024), Article 9- Flood Protection. The City of New Waverly updated its FDPO on 5/10/2011(Ordinance No. 2011-02) and the City of Riverside updated its FDPO on 8/2/2011(Ordinance No. 005-11). Additionally, the cities of New Waverly and Riverside have noted the adoption of an updated FDPO within their capability expansion opportunities in Section 5 of this plan. The City of New Waverly and Riverside regulate the development of land via subdivision ordinance. This includes limiting development in areas that are dangerous to public health, safety, and welfare, including those within established flood hazard areas. Walker County and the participating jurisdictions of this HMP update, as part of their FDPO, manage substantial damage and improvements as follows:

Walker County- Regulations for Flood Plain Management [28]

ARTICLE 5 PROVISIONS FOR FLOOD HAZARD REDUCTION,

SECTION 5:01 - GENERAL STANDARDS

In all areas of special flood hazard the following provisions are required:

5:01 (a) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;

5:01 (b) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;

5:01 (c) All new construction or substantial improvements shall be constructed with materials resistant to flood damage;

5:01 (g) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

SECTION B. SPECIFIC STANDARDS

In all areas of special flood hazards where base flood elevation data has been provided as set forth in the provisions of this Court Order, the following standards are required:

5:02 (a) **Residential Construction** - new construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to a minimum of twelve (12) inches above the base flood elevation. The permit recipient shall submit to the County Administrator a certification from a registered professional engineer, architect, or land surveyor that the elevation requirements or other conditions specified on the permit have been satisfied.

5:02 (b) **Nonresidential Construction** - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated to a minimum of twelve (12) inches above the base flood elevation, or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall submit a certification to the County Administrator that the design standards have been satisfied. A record of such certification which includes the specific elevation (in relation to mean sea level) to which structures are flood proofed shall be maintained by the County Administrator.

5:02 (c) **Manufactured Homes**

(a) Require that all manufactured homes to be placed within Zone A, shall be installed using methods and practices which minimize flood damage. For the purpose of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

(b) All manufactured homes shall be in compliance with Article 5, Section 5:02 (a)

City of Huntsville- Unified Development Ordinance, Article 9- Flood Protection [29]

9.700 Areas of Shallow Flooding (AO/AH Zones)

9.701 All new construction and substantial improvements of residential structures must have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the City's FIRM (at least 2 feet if no depth number is specified).

9.702 All new construction and substantial improvements of nonresidential structures:

9.702.A Must have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the City's FIRM (at least 2 feet if no depth number is specified), or;

9.702.B Together with attendant utility and sanitary facilities be designed so that all portions of such facilities below a point 2 feet above the base flood elevation are watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

City of New Waverly- Flood Damage Prevention Ordinance
ARTICLE 5 PROVISIONS FOR FLOOD HAZARD REDUCTION
SECTION A. GENERAL STANDARDS
In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:

(1) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;

(2) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;

(3) All new construction or substantial improvements shall be constructed with materials resistant to flood damage;

(4) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/ or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

(6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and,

(7) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

SECTION B. SPECIFIC STANDARDS
In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) Article 3, Section B, (ii) Article 4, Section B (8), or (iii) Article 5, Section C (3), the following provisions are required:

(1) **Residential Construction** - new construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to at least 12 inches above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in Article 4, Section C (1) a., is satisfied.

(2) **Nonresidential Construction** - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to at least 12 inches above the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/ or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

(3) **Enclosures** - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:

(a) A minimum of two openings on separate walls having a total net area of not less than 1 square inch for every square foot of enclosed area subject to flooding shall be provided.

(b) The bottom of all openings shall be no higher than 1-foot above grade.

(c) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(4) **Manufactured Homes**

(a) Require that all manufactured homes to be placed within Zone A on a community's FIRM shall be installed using methods and practices that minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

(b) Require that manufactured homes that are placed or substantially improved within Zones Al-30, AH, and AE on the community's FIRM on sites

(i) outside of a manufactured home park or subdivision,

(ii) in a new manufactured home park or subdivision,

(iii) in an expansion to an existing manufactured home park or subdivision, or

(iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(c) Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones Al-30, AH and AE on the community's FIRM that are not subject to the provisions of paragraph (4) of this section be elevated so that either:

(i) the lowest floor of the manufactured home is at least 12 inches above the base flood elevation, or

(ii) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

City of Riverside- Flood Damage Prevention Ordinance

ARTICLE 5 PROVISIONS FOR FLOOD HAZARD REDUCTION

SECTION A. GENERAL STANDARDS

In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:

(1) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;

(2) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;

(3) All new construction or substantial improvements shall be constructed with materials resistant to flood damage;

(4) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/ or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

(6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and,

(7) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

SECTION B. SPECIFIC STANDARDS

In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) Article 3, Section B, (ii) Article 4, Section B (8), or (iii) Article 5, Section C (3), the following provisions are required:

(1) **Residential Construction** - new construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to or above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in Article 4, Section C (1) a., is satisfied.

(2) **Nonresidential Construction** - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to or above the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/ or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

(3) **Enclosures** - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:

(a) A minimum of two openings on separate walls having a total net area of not less than 1 square inch for every square foot of enclosed area subject to flooding shall be provided.

(b) The bottom of all openings shall be no higher than 1-foot above grade.

(c) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(4) **Manufactured Homes**

(a) Require that all manufactured homes to be placed within Zone A on a community's FIRM shall be installed using methods and practices that minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

(b) Require that manufactured homes that are placed or substantially improved within Zones Al-30, AH, and AE on the community's FIRM on sites

(i) outside of a manufactured home park or subdivision,

(ii) in a new manufactured home park or subdivision,

(iii) in an expansion to an existing manufactured home park or subdivision, or

(iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(c) Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones Al-30, AH and AE on the community's FIRM that are not subject to the provisions of paragraph (4) of this section be elevated so that either:

(i) the lowest floor of the manufactured home is at least 12 inches above the base flood elevation, or

(ii) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

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 Walker County, including the county itself, that participate in the CRS Program.[30]

Table 3.6: Community Participation in the CRS Program

Jurisdiction	CRS Participation
Walker County	No
City of Huntsville	No
City of New Waverly	No
City of Riverside	No

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."[31]

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.[32]

According to available data from 2023, Walker County has a total of 34 RL properties, of which 7 are designated as SRL properties.[33] This does not include RL or SRL properties that have already been mitigated. Table 3.7 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 3.7: RL and SRL Properties, Walker County

Jurisdiction Name	Residential RLPs	Non-Residential RLPs	Total RLPs	SRL Properties	Number of NFIP Insured Properties
Walker County	29	0	29	7	7
City of Huntsville	5	0	5	0	3
City of New Waverly	0	0	0	0	0
City of Riverside	0	0	0	0	0

Source: FEMA Region 6, Floodplain Management and Insurance Branch, Personal Communication, January 12, 2023

NFIP Policies In-Force

Table 3.8 summarizes the NFIP policies in force for Walker 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 403 NFIP insured properties within the county. [34]

Table 3.8: NFIP Insured Properties by Community, Walker County

Community Name (Number)	Policies In-Force	Total Coverage	Total Written Premium + FPF
HUNTSVILLE, CITY OF (480639)	142	$44,746,000	$92,083
NEW WAVERLY, CITY OF (481043)	3	$359,000	$1,361
RIVERSIDE, CITY OF (481044)	5	$1,505,000	$3,399
WALKER COUNTY* (481042)	253	$71,611,000	$224,189
TOTALS:	403	$118,221,000	$321,032

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 Walker County, the County Judge and individual jurisdictions' Floodplain Administrators are responsible for handling these NFIP claims. There have been 104 NFIP claims submitted, with nearly $3 million in payments for Walker County, as seen below.

Table 3.9: NFIP Claims, Walker County

State	Number of Records	Total Payments
WALKER COUNTY	104	$2,921,584.80

Total Payments- The total amount of payments for all claims, including building, contents, and ICC payments.
Source: FEMA Region 6, Floodplain Management and Insurance Branch, Personal Communication, January 12, 2023

Section 4: Risk Assessment

This section outlines the risk assessment procedures and identifies hazards ranked by risk that affect Walker County.

Section 4: RISK ASSESSMENT

The 2023 Texas State Hazard Mitigation Plan identified 11 major natural hazards that affect the region. These include hurricanes, floods, wildfires, drought, and tornados.[35] The local planning team identified 18 hazards, 15 of which are natural hazards, which could affect the county and local jurisdictions. Severe Thunderstorms & Lightning were combined to one hazard profile (Section 6.10) Other hazards of concern brought up by the HMC that have limited data, historic occurrences, or a low-risk level combined with one of the items previously mentioned were grouped into a separate profile, Other Hazards. These Other Hazards included Cyber Threats, Biological/HazMat, and Invasive Species. Summaries of these hazards can be found in Section 6.14- Other Hazards.

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 Walker 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	Hurricanes, Tropical Storms, & Depressions
	3	Wildfires
	4	Tornado & Microbursts
	5	Drought & Expansive Soils
	6	Extreme Heat
	7	Severe Winter Weather
Moderate	8	Emerging Infectious Diseases
	9	Windstorms
	10	Cyber Threats*
Low	11	Severe Thunderstorms & Lightning
	12	Erosion
	13	Dam & Levee Failure
	14	Water Quality and Quantity*
	15	Biological/Hazmat*
	16	Hailstorms
	17	Invasive Species*

* Indicates a hazard that was not fully profiled due to a lack of data or historic occurrences but was identified as a hazard of concern by the HMC and grouped in Section 6.14- Other Hazards.

Section 5: Capability Assessment

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

Section 5: 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- Meeting Documentation.

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 Ordinance
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
Walker County (Unincorporated)			X	X	X	X	X	X	X	X	X	X		X	X	
City of Huntsville	X			X	X	X		X	X	X		X		X	X	X
City of New Waverly							X	X		X				X		
City of Riverside							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
Walker County (Unincorporated)	Identified their local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. Walker County will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Political capability within the county is listed as moderate, however participation in the HMC and meetings were heavily attended, and higher standards within floodplain management exist within the county. Overall capability is: Moderate

Jurisdiction	Capability Limitations and Expansion Opportunities
City of Huntsville	Identified funding and buy-in as factors that decrease 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. Political capability within the county is listed as high. Higher standards exist within the city for adopted codes. Additionally, the city of Huntsville maintains a grant writer position that specializes in locating and applying for grants and employs staff that have the expertise to implement projects effectively. Overall capability is: High
City of New Waverly	Identified the local budget, time, and the lack of technical and city staff that can implement the mitigation strategy. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. The city also has interlocal agreements in place with Walker County to help further implement mitigation strategies. Expansion opportunities include adopting an updated FDPO. Overall capability is: Limited
City of Riverside	Identified the local budget, time, and the lack of technical and city staff that can implement the mitigation strategy. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. The city also has interlocal agreements in place with Walker County to help further implement mitigation strategies. Expansion opportunities include adopting an updated FDPO. Overall capability is: Limited

Section 6: Hazard Identification & Risk Analysis

This section is broken down into subsections for each hazard of concern to Walker County and participating jurisdictions that were 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, number of events, fatalities and injuries, average annual events, changes in frequency, and estimated annualized losses, where applicable.

Section 6: HAZARD IDENTIFICATION & RISK ANALYSIS

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 an 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.[36] 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 the flooding section focuses on riverine and flash flooding as those are historically the types of floods that have occurred within the area. 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.[37] 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."[38]

Location

The figures below show the location of floodplains within Walker County and participating jurisdictions. Areas depicted by differentiating colors on the map show the locations of the 100-year and 500-year floodplains, as well as the floodway.

Figure 6.1.1: Floodplain Location, Walker County

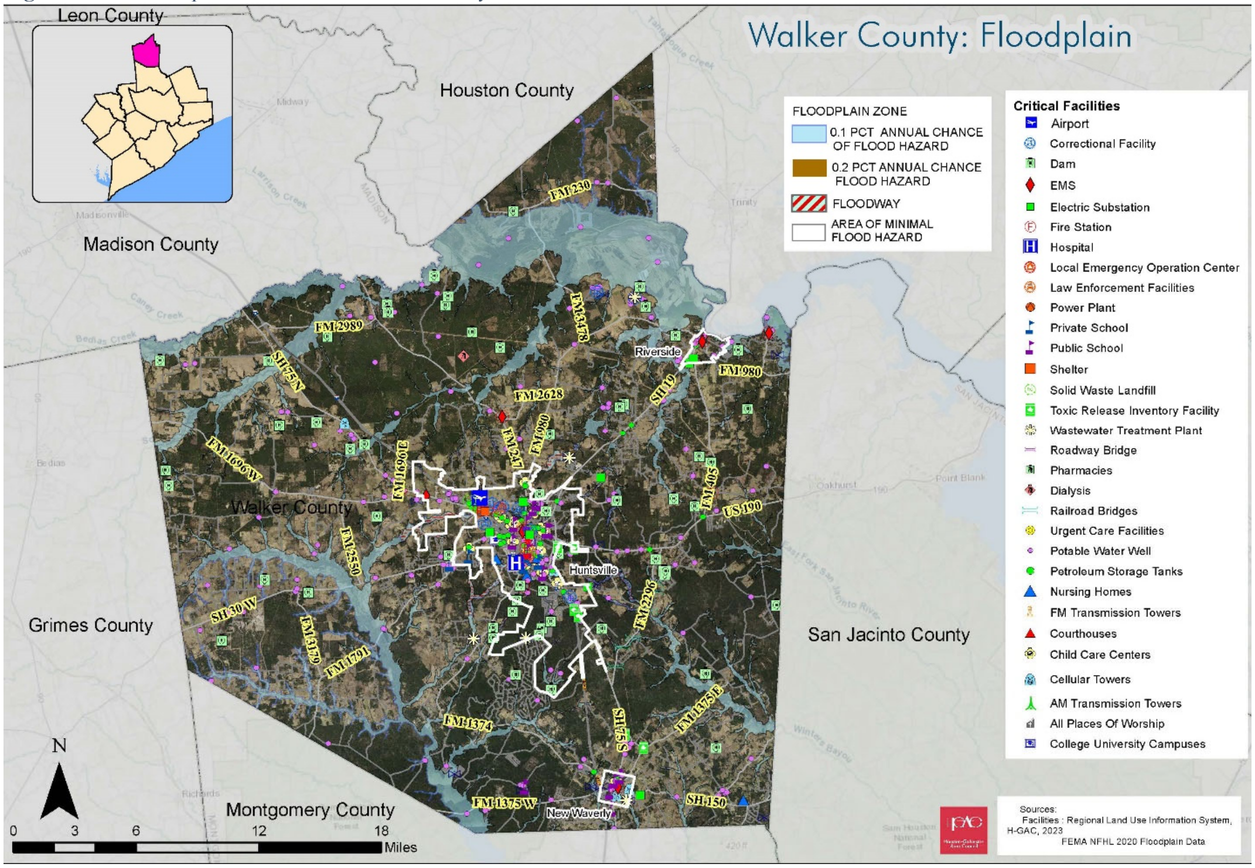


Figure 6.1.2: Floodplain Location, City of Huntsville

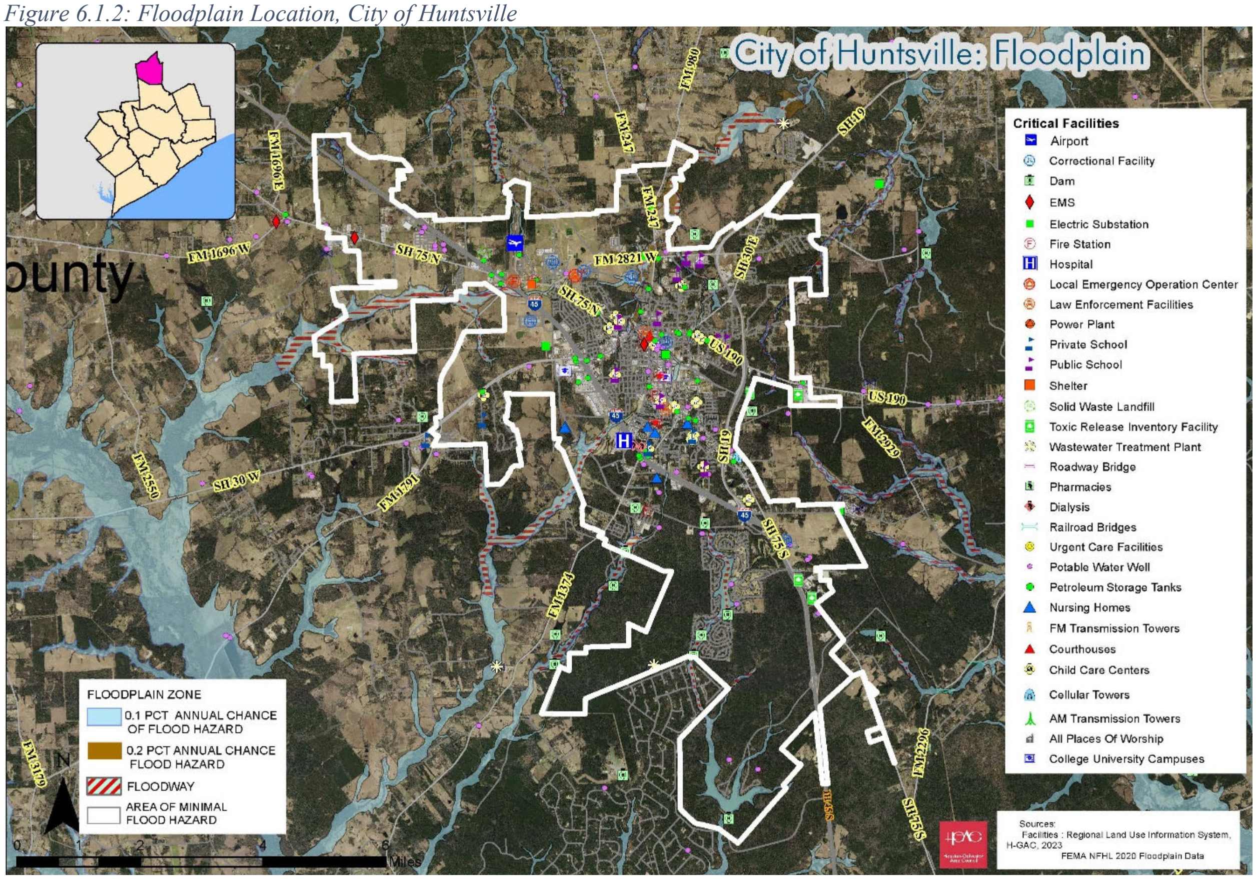


Figure 6.1.3: Floodplain Location, City of New Waverly

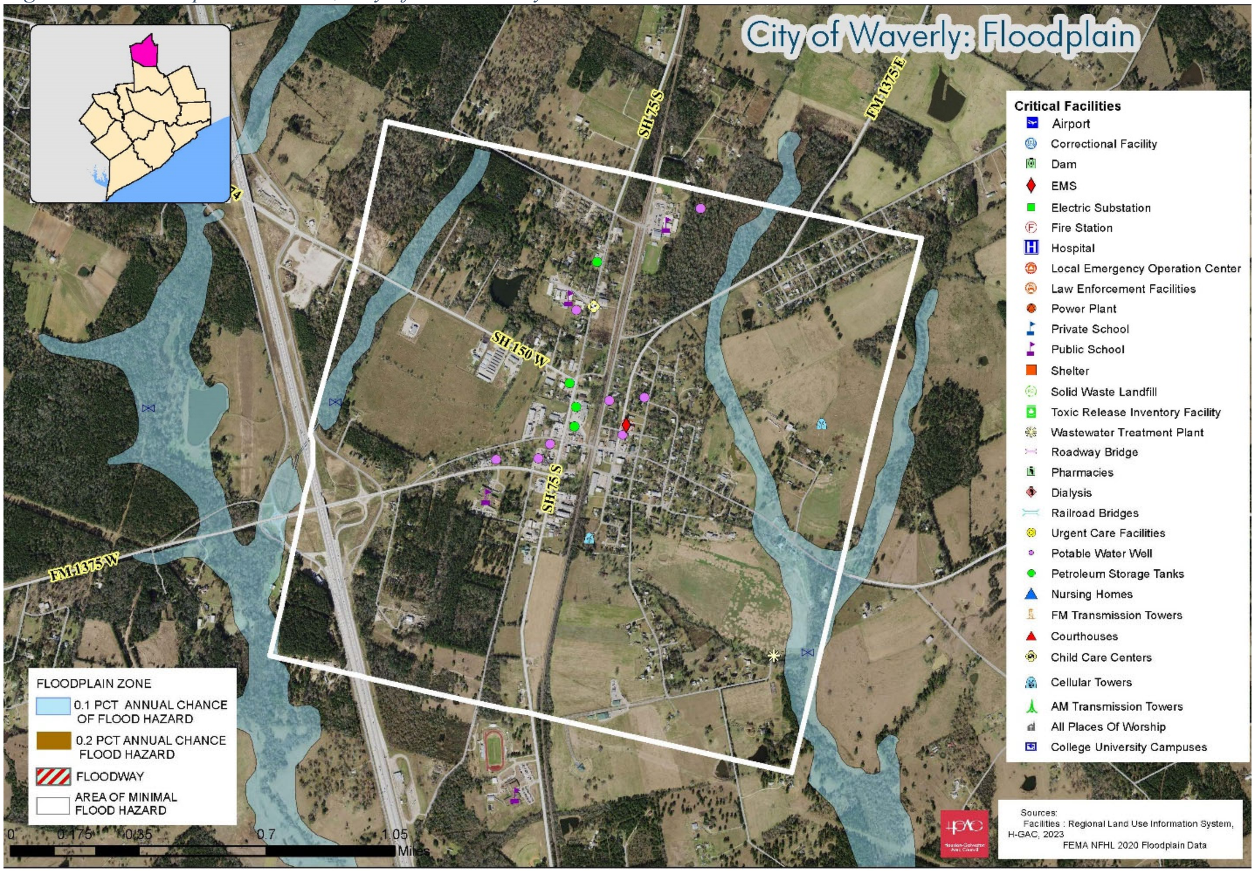
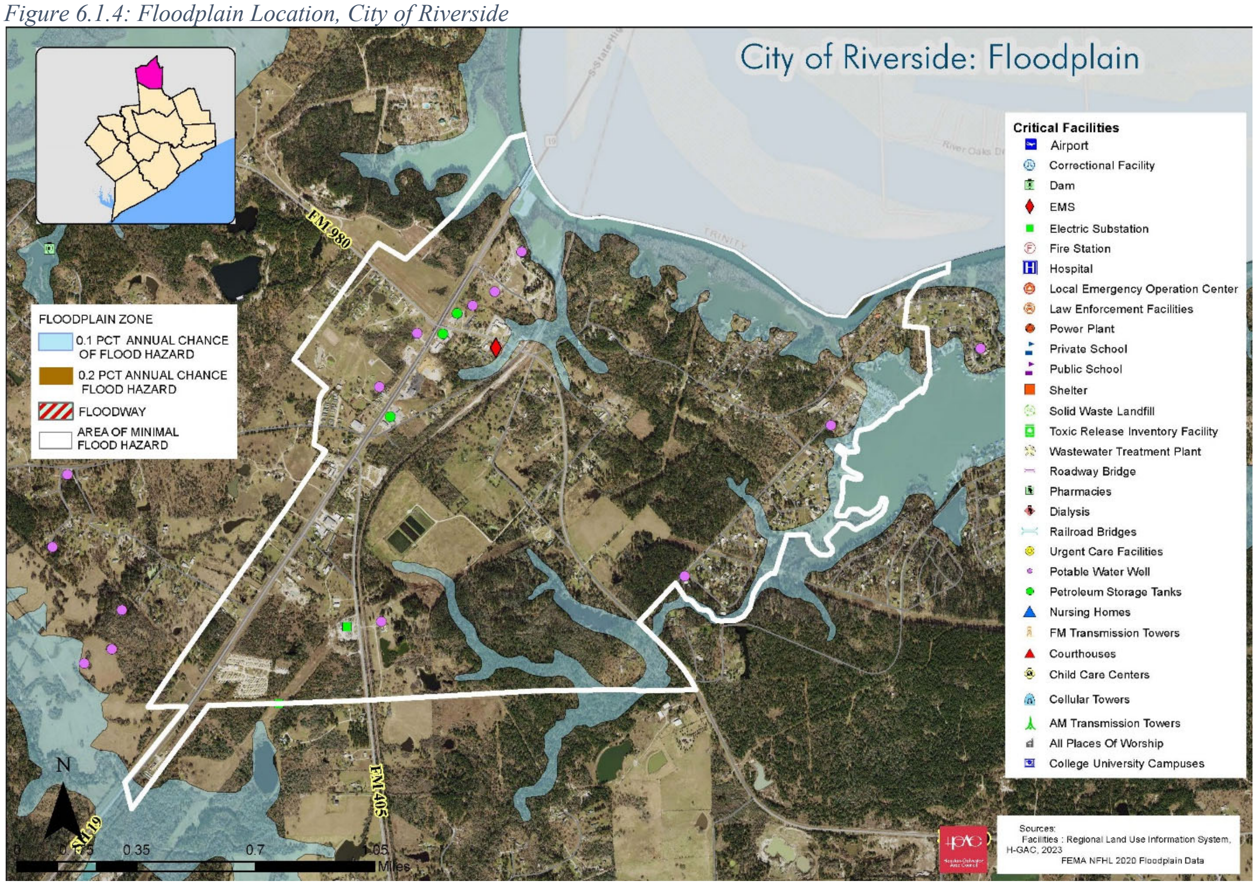


Figure 6.1.4: Floodplain Location, City of Riverside



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.[39]

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. Flooding can also cut off access to utilities, emergency services, transportation, evacuation routes, and may impact the overall economic stability of an area. The figures below highlight expected flood depths for Walker County and participating jurisdictions under 1% and 0.2% annual chance storm events based on best available data. These maps depict water depths of 5+ feet over land surfaces within city limits for all participating jurisdictions and in various unincorporated areas of the county.

Flood Depths- Walker County:

Figure 6.1.5: Flood Depths, Walker County, 0.2% (500-year) Storm

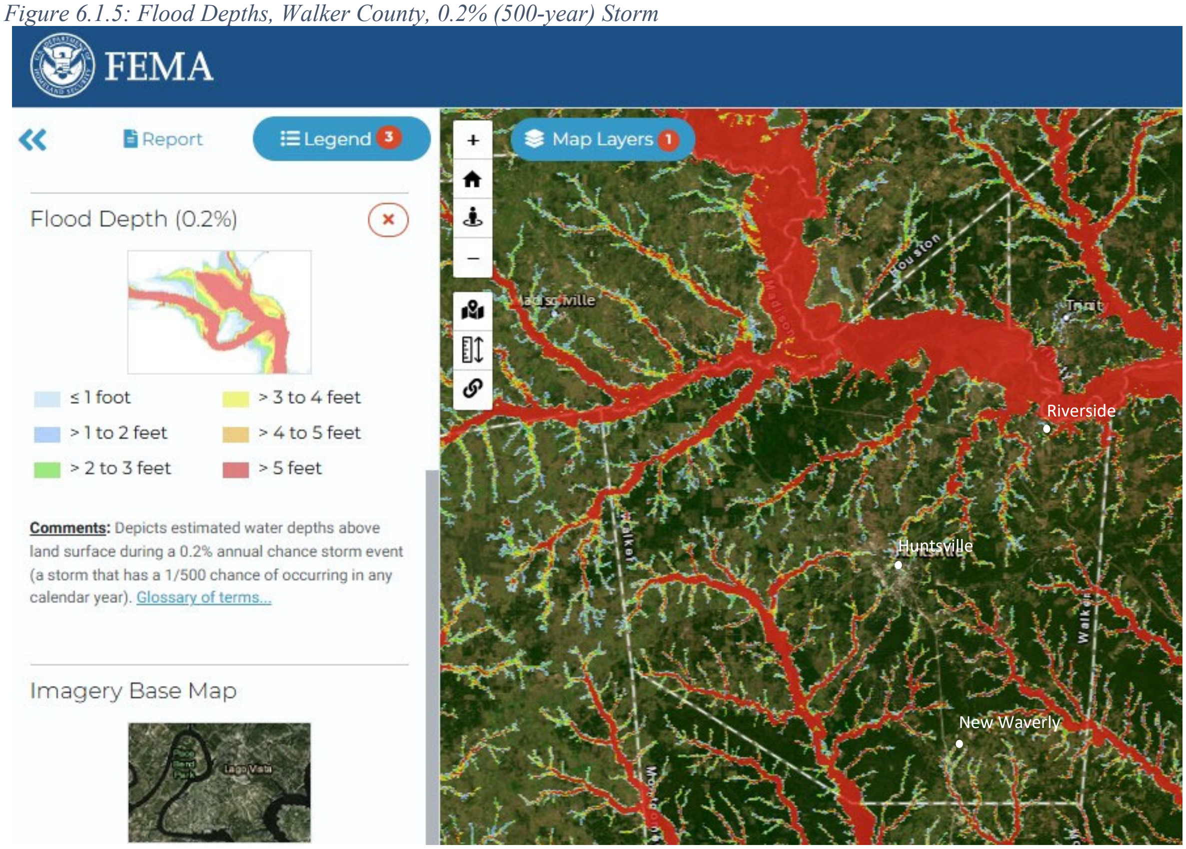
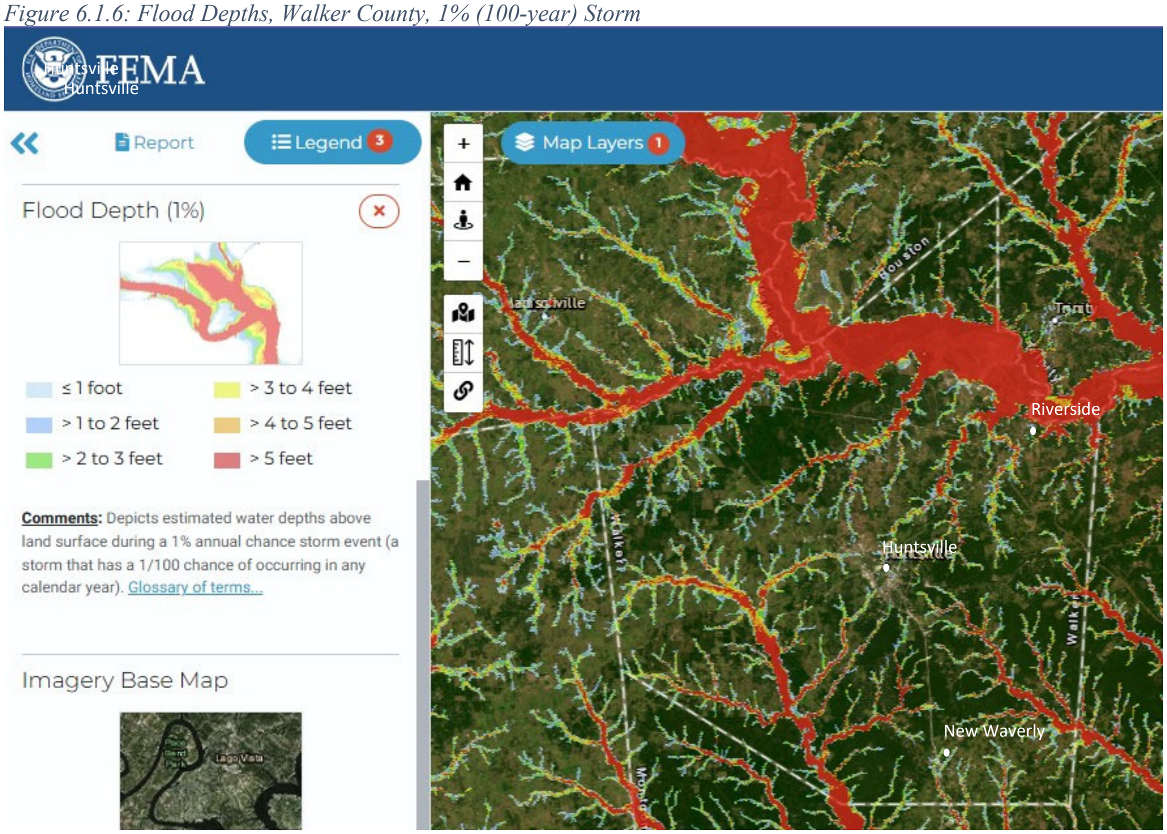


Figure 6.1.6: Flood Depths, Walker County, 1% (100-year) Storm



Flood Depths- City of Huntsville:

Figure 6.1.7: Flood Depths, City of Huntsville, 0.2% (500-year) Storm

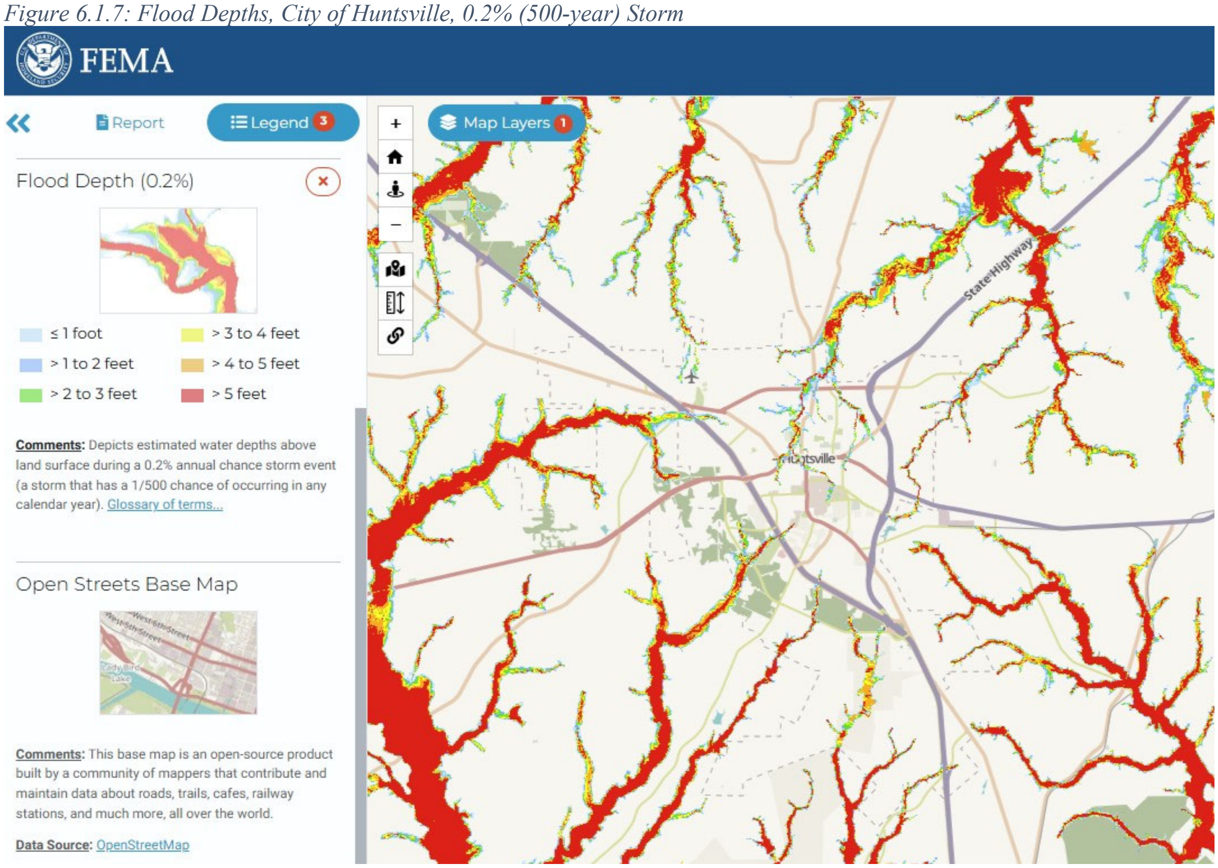
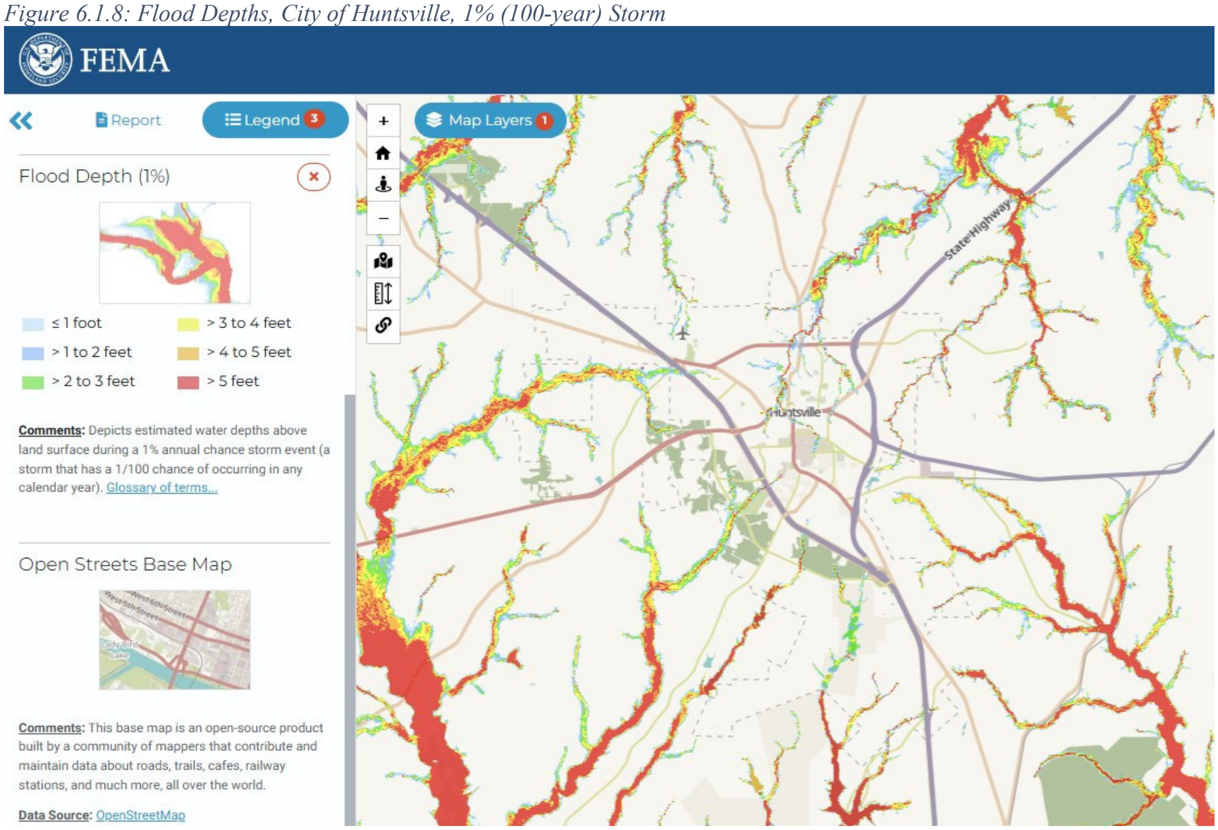


Figure 6.1.8: Flood Depths, City of Huntsville, 1% (100-year) Storm



Flood Depths- City of New Waverly:

Figure 6.1.9: Flood Depths, City of New Waverly, 0.2% (500-year) Storm

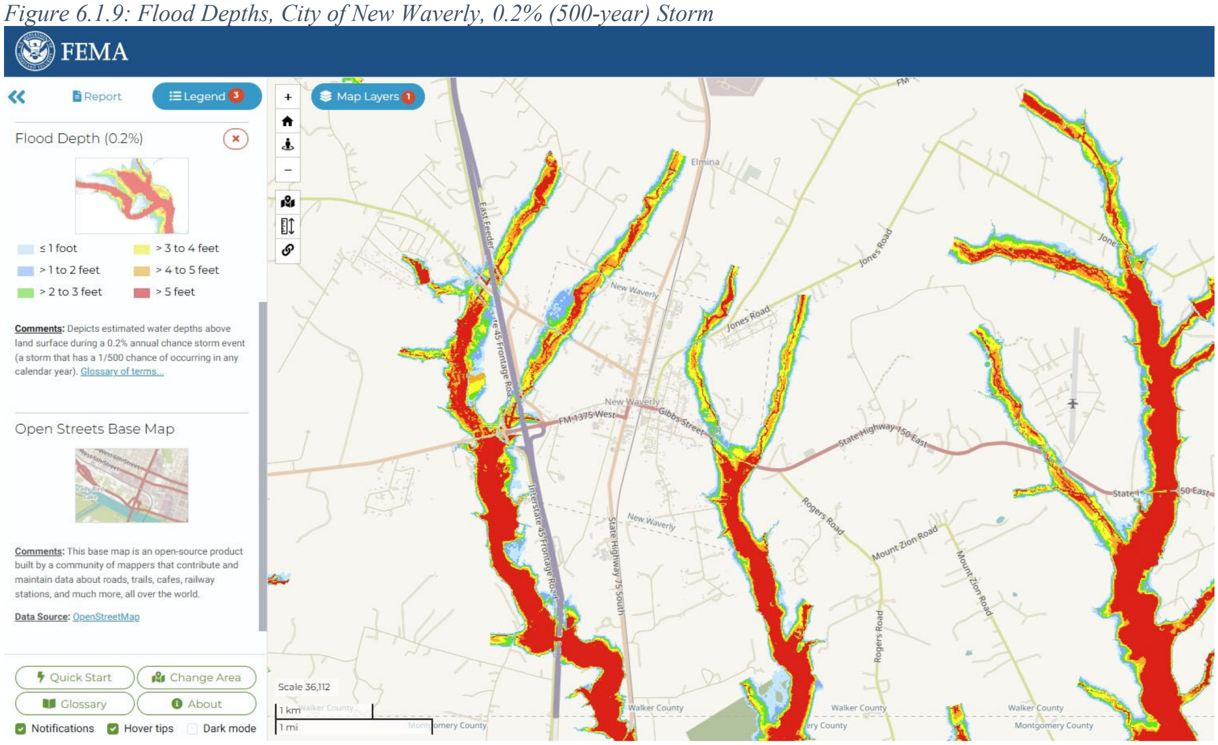
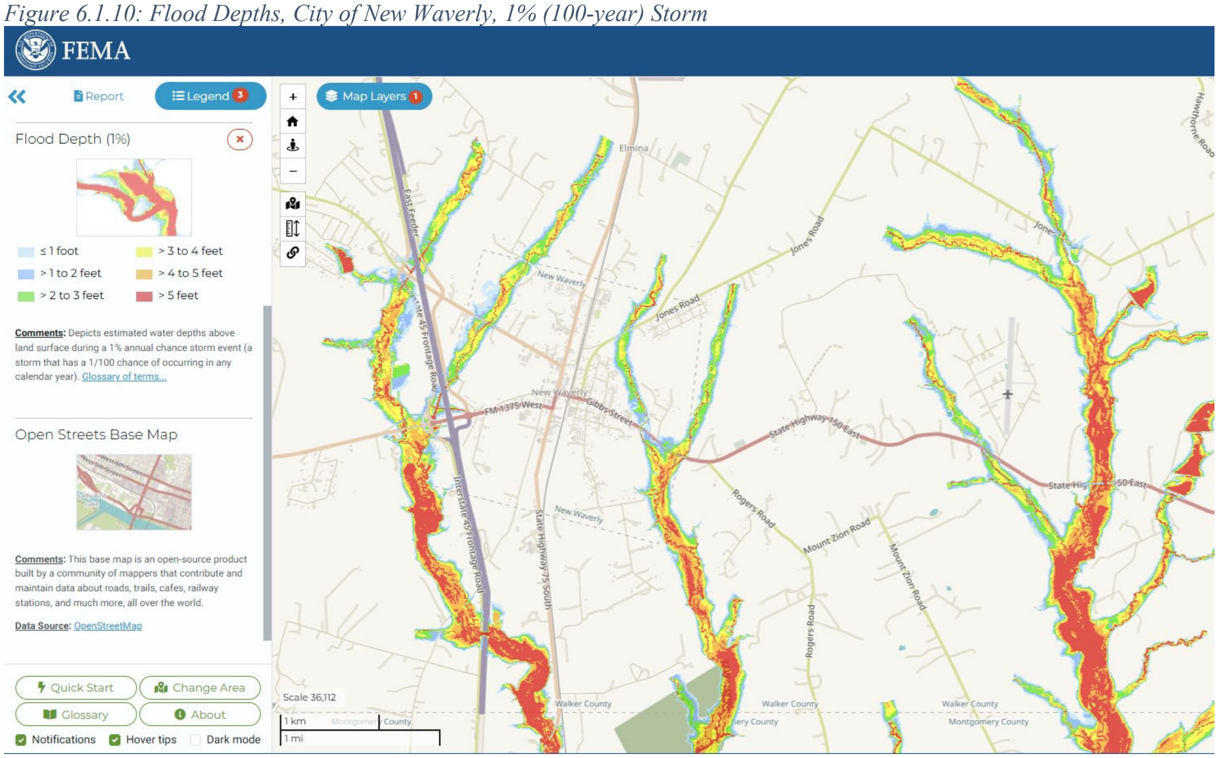


Figure 6.1.10: Flood Depths, City of New Waverly, 1% (100-year) Storm



Flood Depths- City of Riverside:

Figure 6.1.11: Flood Depths, City of Riverside, 0.2% (500-year) Storm

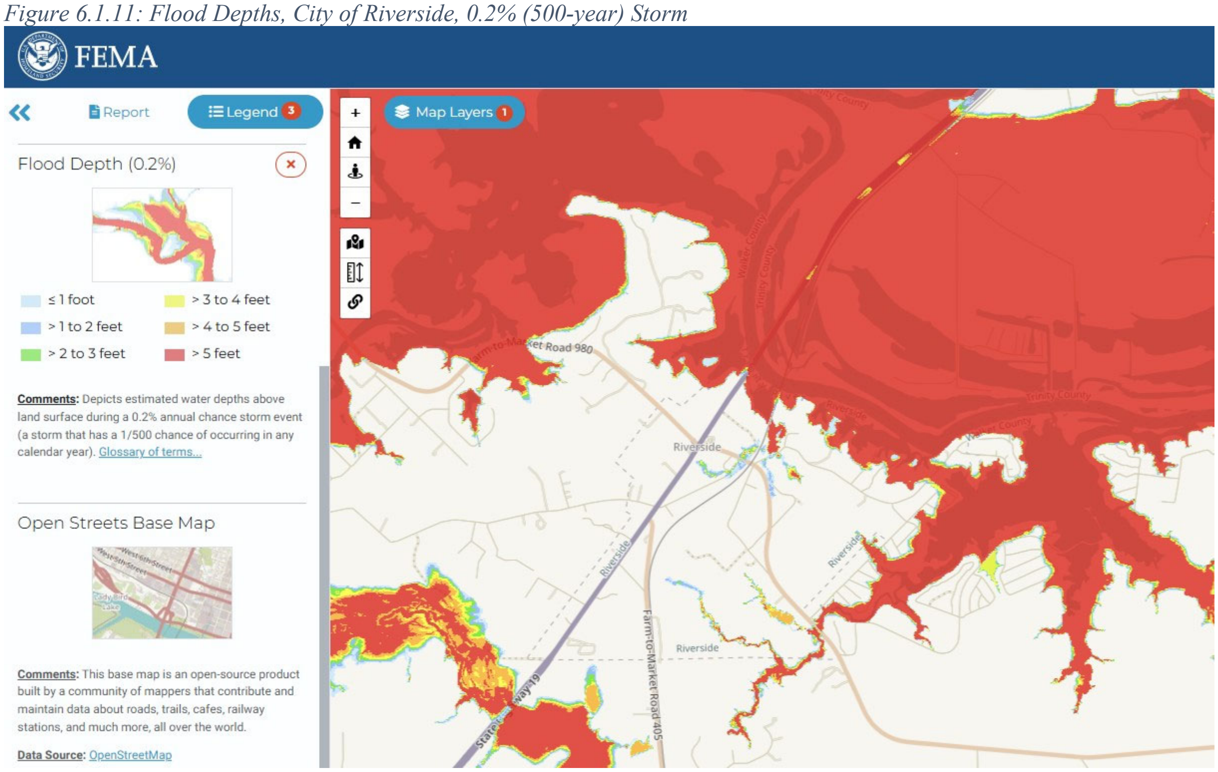
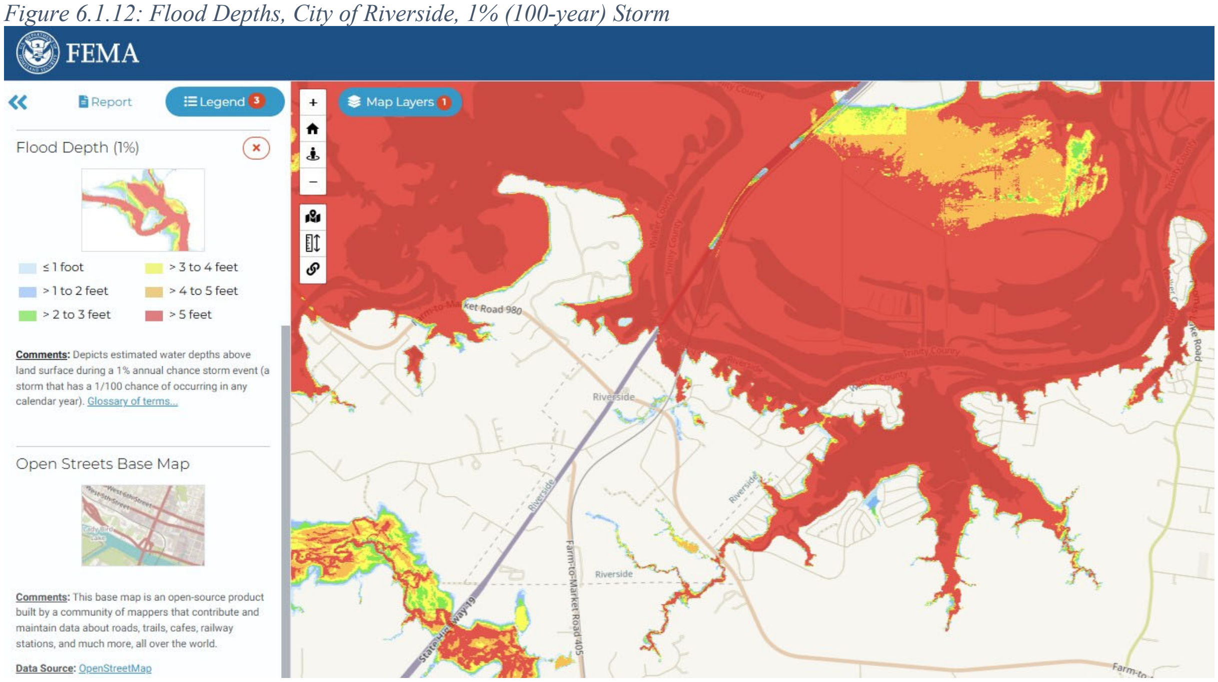


Figure 6.1.12: Flood Depths, City of Riverside, 1% (100-year) Storm



Previous occurrences within the county and participating jurisdictions have seen historic flooding, high-water rescues of stranded residents, roads, bridges and railroads washed out, surrounding rivers reaching major flood stage, and the destruction of critical facilities and infrastructure. A worst-case scenario for this hazard would include a 0.2% (500-year storm) event that results in dangerous, life-threatening, historic-level riverine and flash flooding. A storm of this severity would see flood depths of 5+ feet above land surfaces throughout the planning area, inundated roadways cutting off access to neighborhoods, emergency services, and critical facilities. Hazardous travel conditions via roads and bridges being washed out, especially at low water crossings. This would be similar to events that occurred in April and May 2024 (not yet recorded in the National Centers for Environmental Information (NCEI) flood events data seen in the table below). Additionally, a hazard of this magnitude could damage critical infrastructure and lead to a prolonged power outage. If this occurs during a heat event or a drought and disrupts power supply, secondary hazards will pose increased risks to citizens due to the heat and the inability to keep homes and buildings cool. This scenario is similar to what occurred within the region during the 2024 derecho and Hurricane Beryl. Power lines were destroyed by debris and falling trees due to the severe thunderstorms and winds. This event occurred in July when the region was under an excessive heat advisory. Power line restoration and infrastructure repairs took 10+ days to restore in some areas. This resulted in the multi-day activation of cooling centers.

Historic Occurrences

The National Oceanic and Atmospheric Administration (NOAA) collects historic climate data for the nation. NOAA's storm event data can be accessed on the NCEI storm events database. A condensed version of Walker County flood events data from 1950-2023 is provided in the table below. Events included are shown since the last plan update, from 2017-2023. In total, there have been 48 flood events in Walker County. Many of these events have occurred countywide, 11 were listed within Huntsville, 1 event in Riverside, and 1 event was listed in New Waverly.[40] There was one drowning death as the result of Hurricane Harvey in August 2017, and one flood-related fatality in 2024 from heavy rains (not yet recorded in NCEI data below).

Table 6.1.2: Walker County Flood Events (2017-2023)

Event Date	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
8/26/2017	Flash Flood	0	0	$-	$-
8/26/2017	Flash Flood	0	1	$600,000,000	$10,000
8/27/2017	Flash Flood	0	0	$-	$-
3/28/2018	Flash Flood	0	0	$-	$-
10/14/2018	Flash Flood	0	0	$-	$-
4/30/2021	Flash Flood	0	0	$-	$-
4/30/2021	Flash Flood	0	0	$-	$-
4/30/2021	Flash Flood	0	0	$-	$-
1/23/2024	Flash Flood	0	0	$-	$-
1/24/2024	Flash Flood	0	0	$-	$-
1/24/2024	Flash Flood	0	0	$-	$-
1/24/2024	Flash Flood	0	0	$-	$-
2/10/2024	Flood	0	0	$-	$-
2/10/2024	Flood	0	0	$-	$-

$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been seven federally declared flood disasters in Walker County since 1950. Additionally, seven disaster declaration events mention flooding in their title but are categorized as severe storms for incident type. Hurricane Harvey and Hurricane Beryl are also included below as these were major flooding events for the County.[2]

Table 6.1.3: Federally Declared Disasters, Flood

Declaration Year	Incident Type	Incident Title	Disaster Number	Declaration Type
1992	Flood	SEVERE THUNDERSTORMS	930	Major Disaster Declaration
1995	Flood	SEVERE THUNDERSTORMS AND FLOODING	1041	Major Disaster Declaration
1999	Flood	TX-FLOODING 10/18/98	1257	Major Disaster Declaration
2016	Flood	SEVERE STORMS, TORNADOES, AND FLOODING	4266	Major Disaster Declaration
2016	Flood	SEVERE STORMS AND FLOODING	4272	Major Disaster Declaration
2019	Flood	SEVERE STORMS AND FLOODING	4416	Major Disaster Declaration
2024	Flood	SEVERE STORMS, STRAIGHT-LINE WINDS, TORNADOES, AND FLOODING	4781	Major Disaster Declaration
Severe Storm Disaster Declarations, Flooding				
1989	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING	828	Major Disaster Declaration
1990	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING	863	Major Disaster Declaration
2003	Severe Storm	SEVERE STORMS, TORNADOES AND FLOODING	1439	Major Disaster Declaration
2007	Severe Storm	SEVERE STORMS, TORNADOES, AND FLOODING	1709	Major Disaster Declaration
2015	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS AND FLOODING	4223	Major Disaster Declaration
2016	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	4245	Major Disaster Declaration
2016	Severe Storm	SEVERE WINTER STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	4255	Major Disaster Declaration
2017	Hurricane	HURRICANE HARVEY	4332	Major Disaster Declaration
2024	Hurricane	HURRICANE BERYL	4798	Major Disaster Declaration

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 Walker County since the last HMP update are listed in the table below.[41]

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

Crop Disaster Year	Disaster Description	Designation Number
2018	**Excessive moisture and flooding**	**S4476**

National Flood Insurance Program

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.[27,28] 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.[29] The NFIP provides affordable flood insurance for property owners, renters, and businesses in participating communities. This reduces the socio-economic impacts of flooding on communities through risk reduction via flood insurance and reduces the physical impacts of flooding through beneficial floodplain regulation. Each of the participating jurisdictions has a certified floodplain manager (CFM) on staff, and/or functions under the regulatory umbrella of Walker County. Section 3, County Profile, covers NFIP participation in more detail.

As Seen in Section 3- Table 3.10: NFIP Participation

Jurisdiction	NFIP Participation	Date Joined	Current Effective FIRM Date	FDPO Date	Designee for NFIP Requirements
Walker County	Yes	7/19/1977	8/16/2011	8/15/2011	Floodplain Administrator, Planning & Development Director
City of Huntsville	Yes	5/24/1974	8/16/2011	8/31/2015	Floodplain Administrator, City Engineer
City of New Waverly	Yes	6/25/1976	8/16/2011	5/10/2011	Floodplain Administrator, Director of Public Works
City of Riverside	Yes	11/19/1976	8/16/2011	8/2/2011	Floodplain Administrator, City Secretary

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 National Flood Insurance Program (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, Walker County and participating jurisdictions to this HMP update do not participate in the CRS Program.
11

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."[23]

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.[24]

According to available data from 2023, the county has a total of 34 RL properties, of which 7 are designated as SRL properties. This does not include RL or SRL properties that have already been mitigated. Only 10 of these RL and SRL properties are insured through the NFIP. Total SRL property claim payments for Walker County are $2,921,584.80, and there is an average of 3.8 claims per SRL property.[32] The table below outlines the structure type (residential, commercial, institutional, etc.), and number of records for RL and SRL properties within the city, including the number of those structures that were insured under the NFIP.

As seen in Section 3- Table 3.127: RL and SRL Properties, Walker County

Jurisdiction Name	Residential RLPs	Non-Residential RLPs	Total RLPs	SRL Properties	Number of NFIP Insured Properties
Walker County	29	0	29	7	7
City of Huntsville	5	0	5	0	3
City of New Waverly	0	0	0	0	0
City of Riverside	0	0	0	0	0

Source: FEMA Region 6, Floodplain Management and Insurance Branch, Personal Communication, January 12, 2023

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. For Walker County and participating jurisdictions, the Floodplain Administrator is responsible for handling these NFIP claims. Table 3.5: NFIP Participation lists those who have been appointed as the Floodplain Administrator

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. The table below outlines the jurisdiction, structure type (residential, commercial, institutional, etc.), and number of records for RL and SRL properties under the FMA program within the city.

Table 6.1.5: FMA RL and SRL Properties, Walker County

Jurisdiction Name	Residential FMA RLPs	Non-Residential FMA RLPs	Total FMA RLPs	FMA SRL Properties
Walker County	5	0	5	2
City of Huntsville	0	0	0	0

Jurisdiction Name	Residential FMA RLPs	Non-Residential FMA RLPs	Total FMA RLPs	FMA SRL Properties
City of New Waverly	0	0	0	0
City of Riverside	0	0	0	0

(Source: FEMA, Floodplain Management and Insurance Branch)

NFIP Policies in Force

The table below summarizes the NFIP policies in force for Walker County. In total, there are 403 NFIP-insured properties within the county and participating jurisdictions.[32]

As seen in Section 3- Table 3.138: NFIP Insured Properties by Community, Walker County

Community Name (Number)	Policies In-Force	Total Coverage	Total Written Premium + FPF
HUNTSVILLE, CITY OF (480639)	142	$44,746,000	$92,083
NEW WAVERLY, CITY OF (481043)	3	$359,000	$1,361
RIVERSIDE, CITY OF (481044)	5	$1,505,000	$3,399
WALKER COUNTY* (481042)	253	$71,611,000	$224,189
TOTALS:	403	$118,221,000	$321,032

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.

Probability of Future Occurrences

According to RiskFactor, a site that publishes climate risk data to quantify and communicate risk for properties in the U.S., Walker County has a moderate risk of flooding over the next 30 years. This 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."[42] Flooding and flash floods will continue to occur within Walker County. The Federal Emergency Management Agency's (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. According to the FEMA NRI for riverine flooding, the risk index rating average for the county is relatively moderate. Annualized frequency values are 1.4 events per year over 24 years of record 1996-2019, with 34 events on record.[43]

Populations at Risk

Populations at risk for flooding include the entire county of Walker County as this hazard has no geographic boundaries. Those living within or near 100 or 500-year floodplains as well as floodways are at a higher risk for this hazard. Flooding can cause property damage, displacement, lack of access to critical facilities that provide food, water, medications, or other forms of medical assistance, and lack of utilities such as electricity and clean water which can increase the risk of illness. The National Center for Healthy Housing (NCHH) summarizes at-risk populations for several hazards. For flooding these include older adults, children, people experiencing homelessness, people with disabilities, and people with chronic health conditions. In addition to the dangers listed above, older adults can face social isolation, lack of electricity needed to run medical equipment, lack of access to a vehicle for evacuation, and lack of access to other critical supplies. In younger populations, such as children, flood events can disrupt schooling and the normal day-to-day routines they thrive on. This can not only jeopardize their academic success but can also cause mental and emotional stress. Children are more at risk and vulnerable to certain medical conditions like asthma, lead poisoning, allergies, and bacterial infections which can be caused by the resulting flood damage and increased moisture. For people experiencing homelessness, adequate shelter is critical in keeping populations safe during flood events. People with disabilities may require additional assistance to stay safe and prepare for these hazards such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. [44]

Likewise, those with chronic health conditions may need similar assistance as those with disabilities. People with chronic health conditions also face exposure to diseases or illnesses from standing water and increased exposure to these illnesses when utilizing a shelter or evacuation center to escape the flood. Additionally, flooding of homes and businesses can cause mold to thrive if not treated promptly. This can exacerbate illness among the general population but especially among those with chronic health conditions.[49] The vulnerability of communities to this hazard increases as impervious surface is added from new construction/future development, especially if the location is within or near the SFHA.

National Risk Index

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. [45]

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. 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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102. Risk Index Ratings according to the FEMA NRI for riverine flood events for these census tracts are listed as relatively high for 5 census tracts, relatively moderate for 5 census tracts, relatively low for one census tract, and one tract having no rating.[46] EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the historic loss ratio (HLR), a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence, for riverine flooding within Walker County as relatively low.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[47]

Figure 6.1.13: Risk Index, Walker County, Riverine Flooding

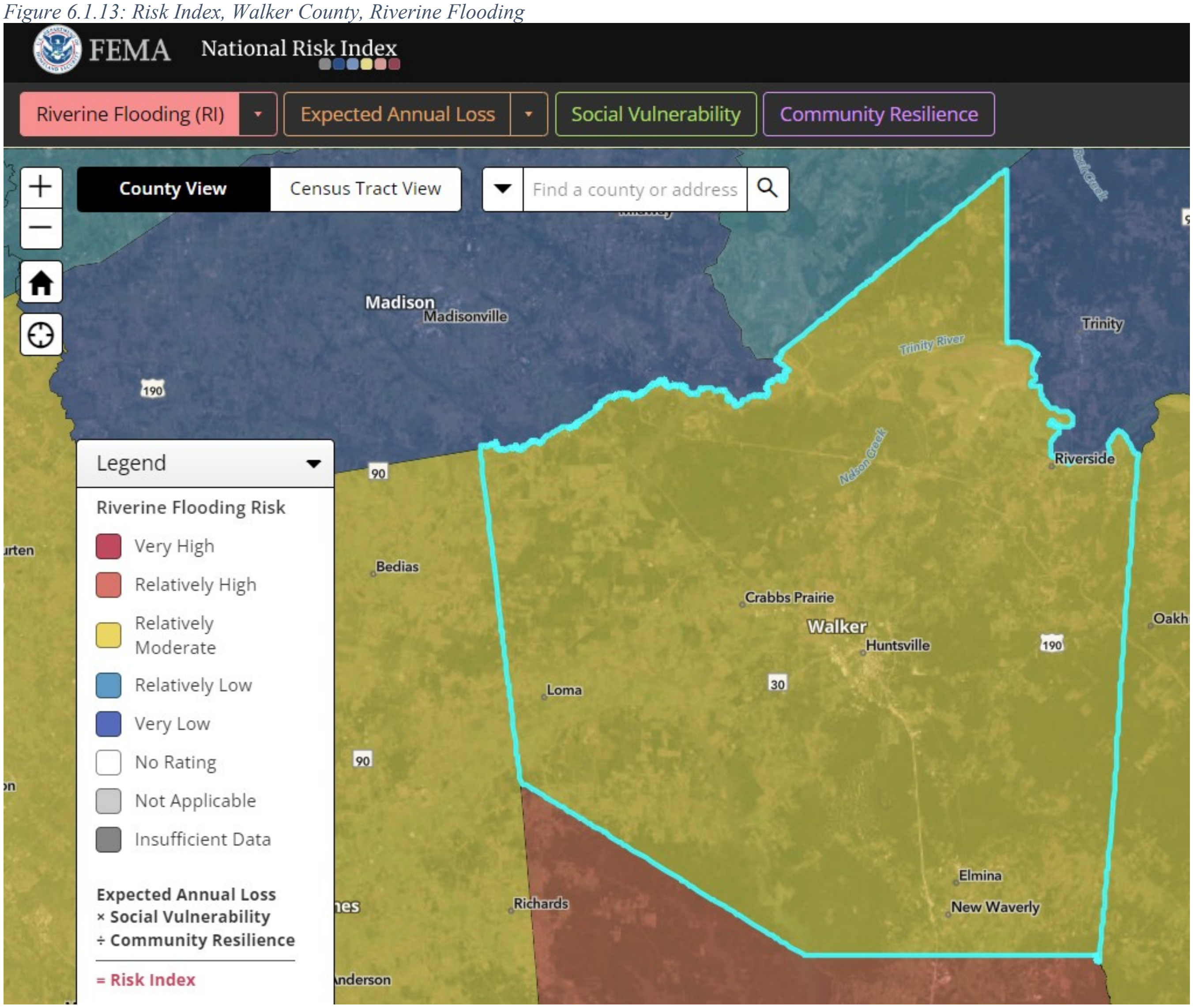


Figure 6.1.14: Risk Index by Census Tract, Walker County, Riverine Flooding

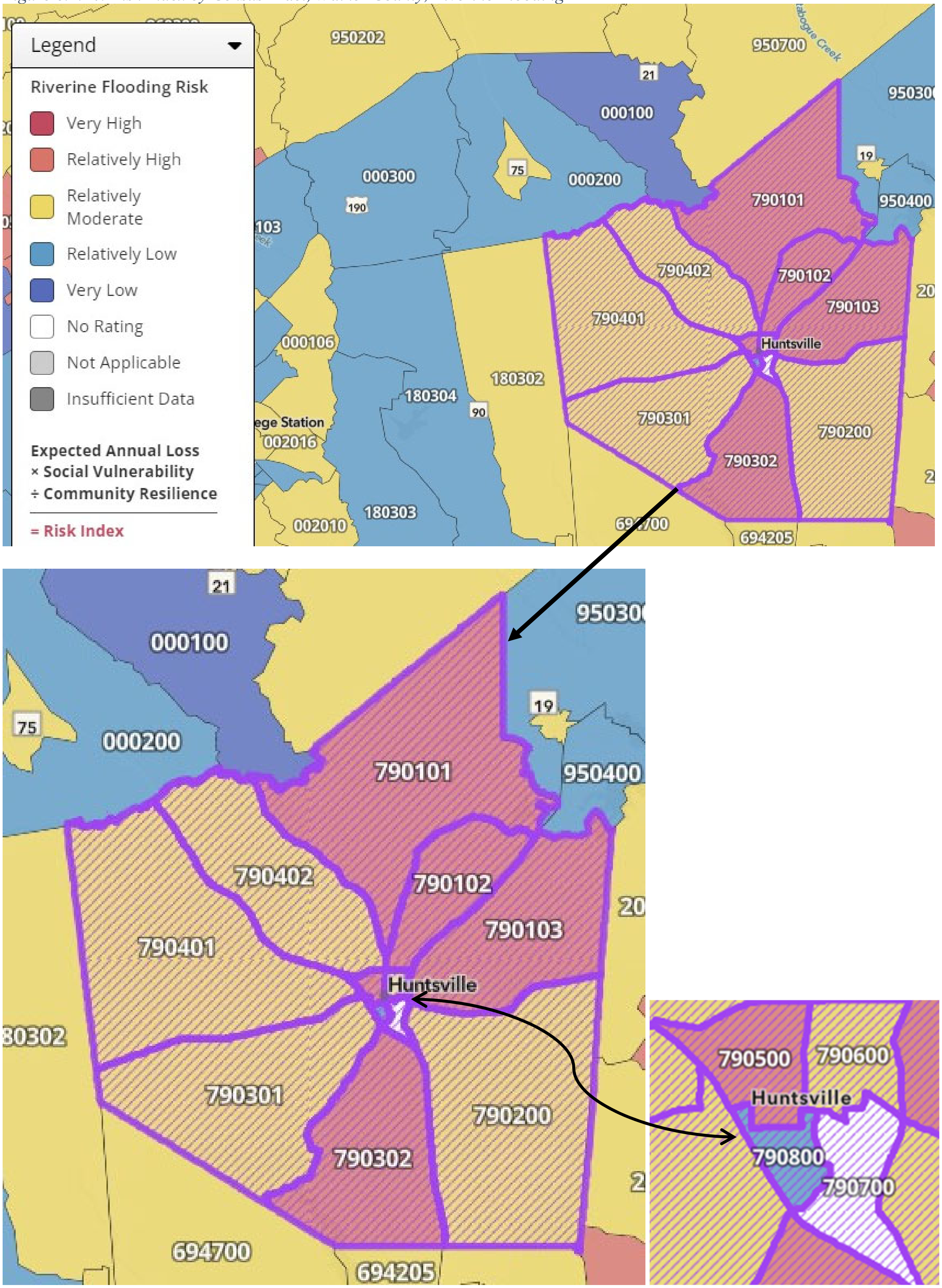


Figure 6.1.15: Social Vulnerability by Census Tract, Walker County

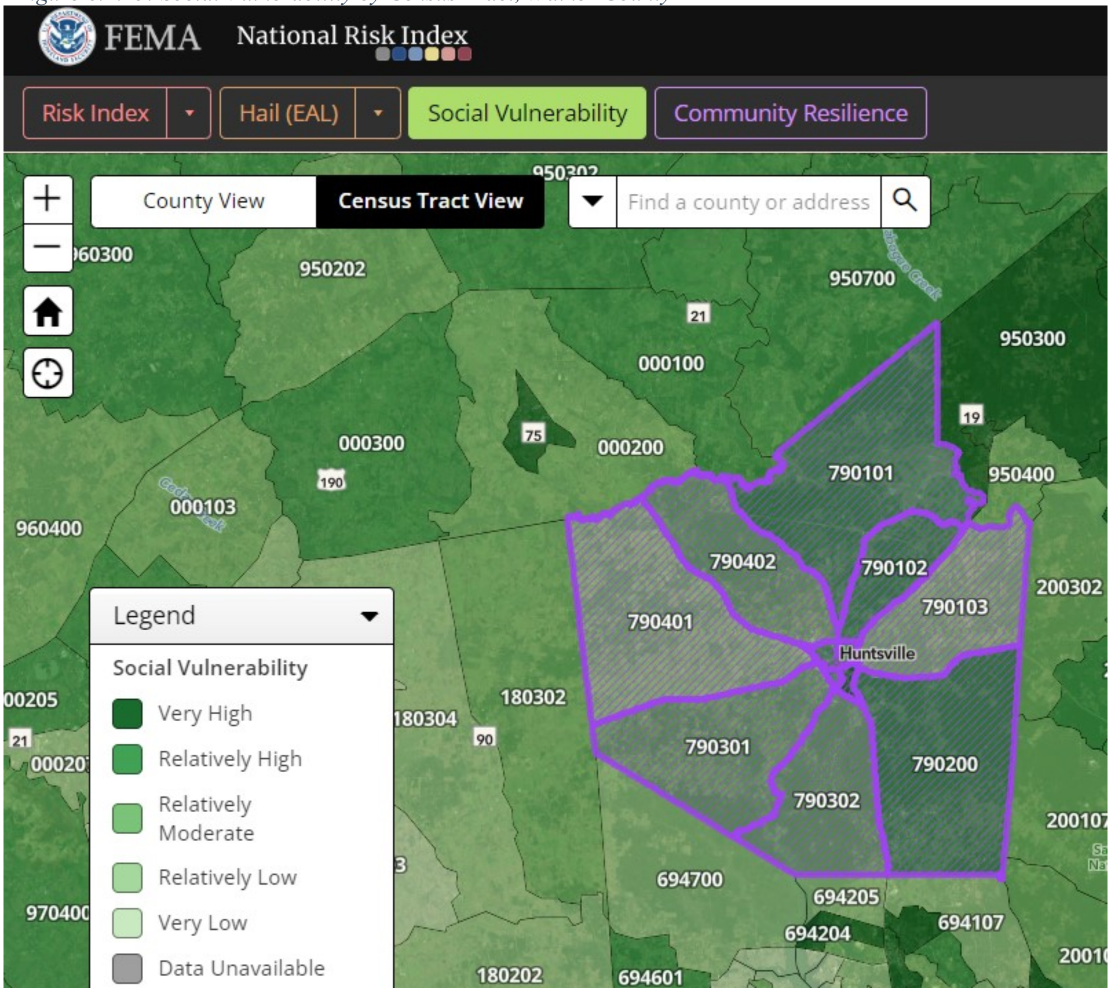


Figure 6.1.16: Social Vulnerability, Walker County

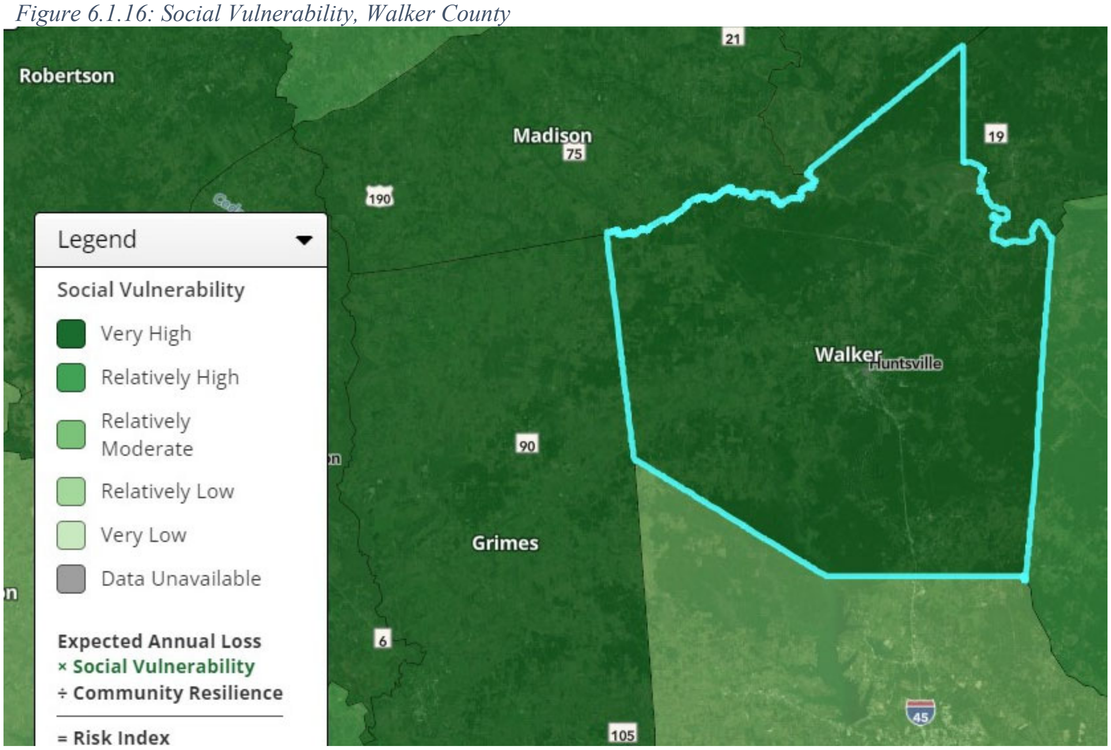


Figure 6.1.17: Community Resilience by Census Tract, Walker County

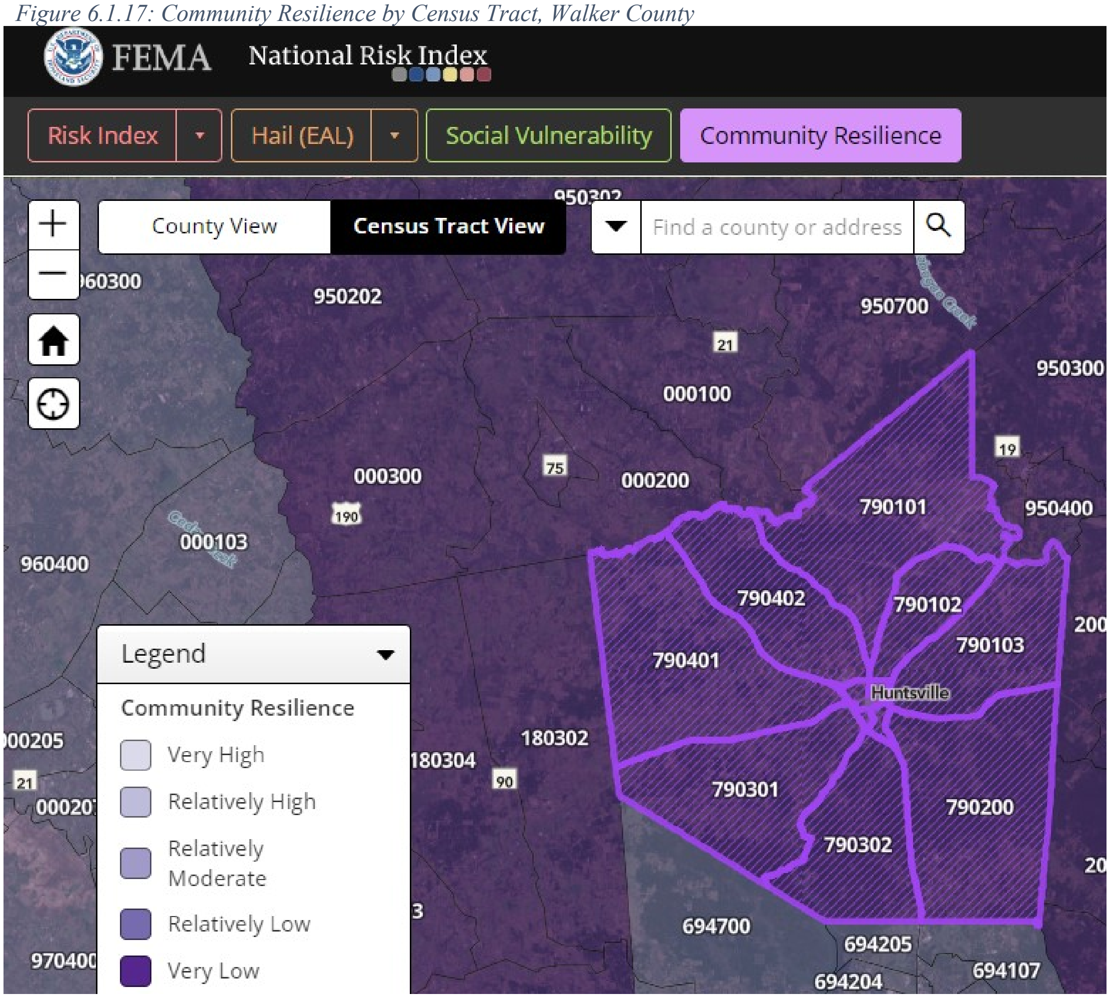


Figure 6.1.18: Community Resilience, Walker County

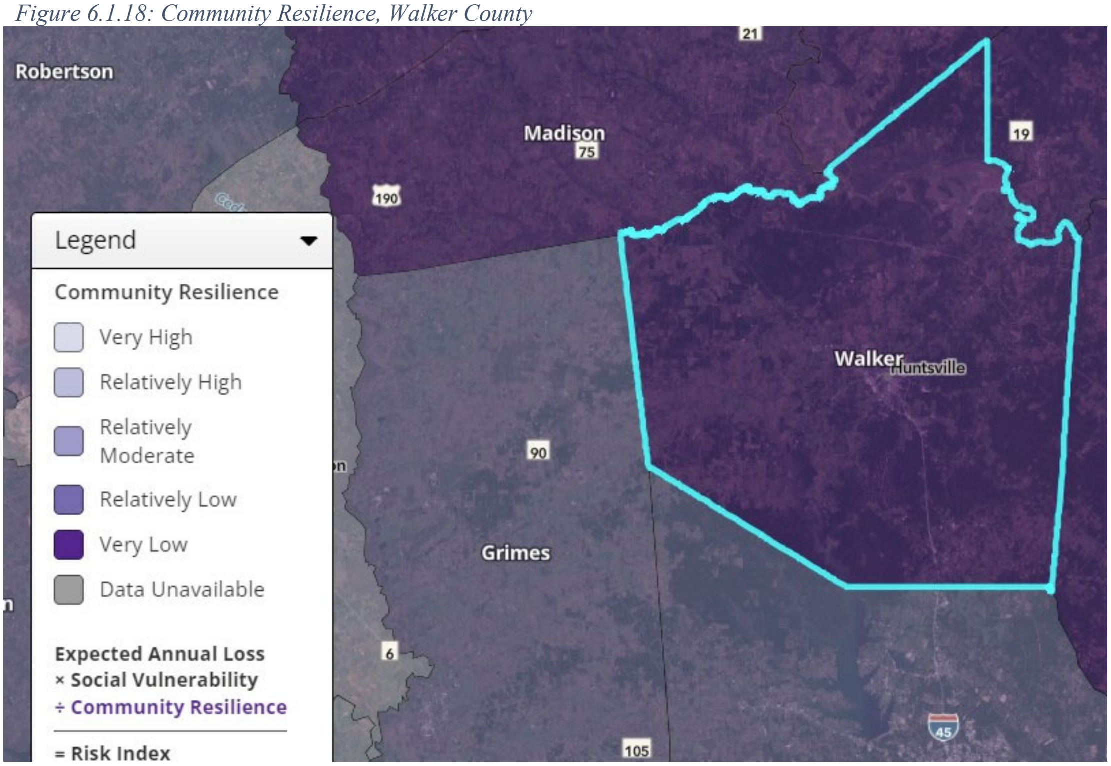


Figure 6.1.19: FEMA NRI Summary by Census Tract, Walker County, Riverine Flooding

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790101	TX	Relatively High	95.4	0 100
2	Census tract 48471790102	TX	Relatively High	95.05	0 100
3	Census tract 48471790103	TX	Relatively High	94.88	0 100
4	Census tract 48471790302	TX	Relatively High	94.61	0 100
5	Census tract 48471790500	TX	Relatively High	93.44	0 100
6	Census tract 48471790200	TX	Relatively Moderate	86.96	0 100
7	Census tract 48471790402	TX	Relatively Moderate	85.11	0 100
8	Census tract 48471790600	TX	Relatively Moderate	82.76	0 100
9	Census tract 48471790401	TX	Relatively Moderate	80.31	0 100
10	Census tract 48471790301	TX	Relatively Moderate	74.2	0 100
11	Census tract 48471790800	TX	Relatively Low	59.31	0 100
	Census tract 48471790700	TX	No Rating	0	0 100

Figure 6.1.20: FEMA NRI EAL Summary by Census Tract, Walker County, Riverine Flooding

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790700	TX	$19,677	Very High	Very Low	1.59	$31,254	95.93
2	Census tract 48471790800	TX	$18,426	Relatively High	Very Low	1.44	$26,494	95.07
3	Census tract 48471790500	TX	$17,297	Relatively High	Very Low	1.49	$25,813	94.92
4	Census tract 48471790200	TX	$16,430	Relatively High	Very Low	1.48	$24,389	94.58
5	Census tract 48471790101	TX	$16,834	Relatively High	Very Low	1.35	$22,663	94.05
6	Census tract 48471790600	TX	$11,835	Very High	Very Low	1.82	$21,595	93.66
7	Census tract 48471790302	TX	$16,189	Relatively Moderate	Very Low	1.16	$18,847	92.59
8	Census tract 48471790401	TX	$16,607	Relatively Low	Very Low	1.06	$17,536	91.92
9	Census tract 48471790103	TX	$12,914	Relatively Low	Very Low	0.98	$12,591	88.45
10	Census tract 48471790102	TX	$9,212	Relatively High	Very Low	1.34	$12,302	88.16
11	Census tract 48471790402	TX	$11,201	Relatively Moderate	Very Low	1.07	$12,017	87.89
12	Census tract 48471790301	TX	$8,501	Relatively Moderate	Very Low	1.12	$9,539	84.89

Climate Change Impacts

Factors such as climate-driven changes like increasing precipitation and warmer sea surface temperatures may affect the probability of future floods within Walker 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.[42] According to the Office of the Texas State Climatologist, 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.[48] The table below summarizes the expected climate change impacts of flooding.

Table 6.1.6: 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: Hurricanes, Tropical Storms, and Tropical Depressions

6.2 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 of more than 6 inches, resulting in heavy flooding. Other dangers associated with the formation of these storms include storm surges, damaging winds, rip currents, and tornadoes.[49] 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.[50]

Table 6.2.1: 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 landfall for the Texas coast occurs 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 National Weather Service (NWS) allows the National Oceanic and Atmospheric Administration's (NOAA) 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 a 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.[51]

Table 6.2.2: Tropical Watches and Warnings

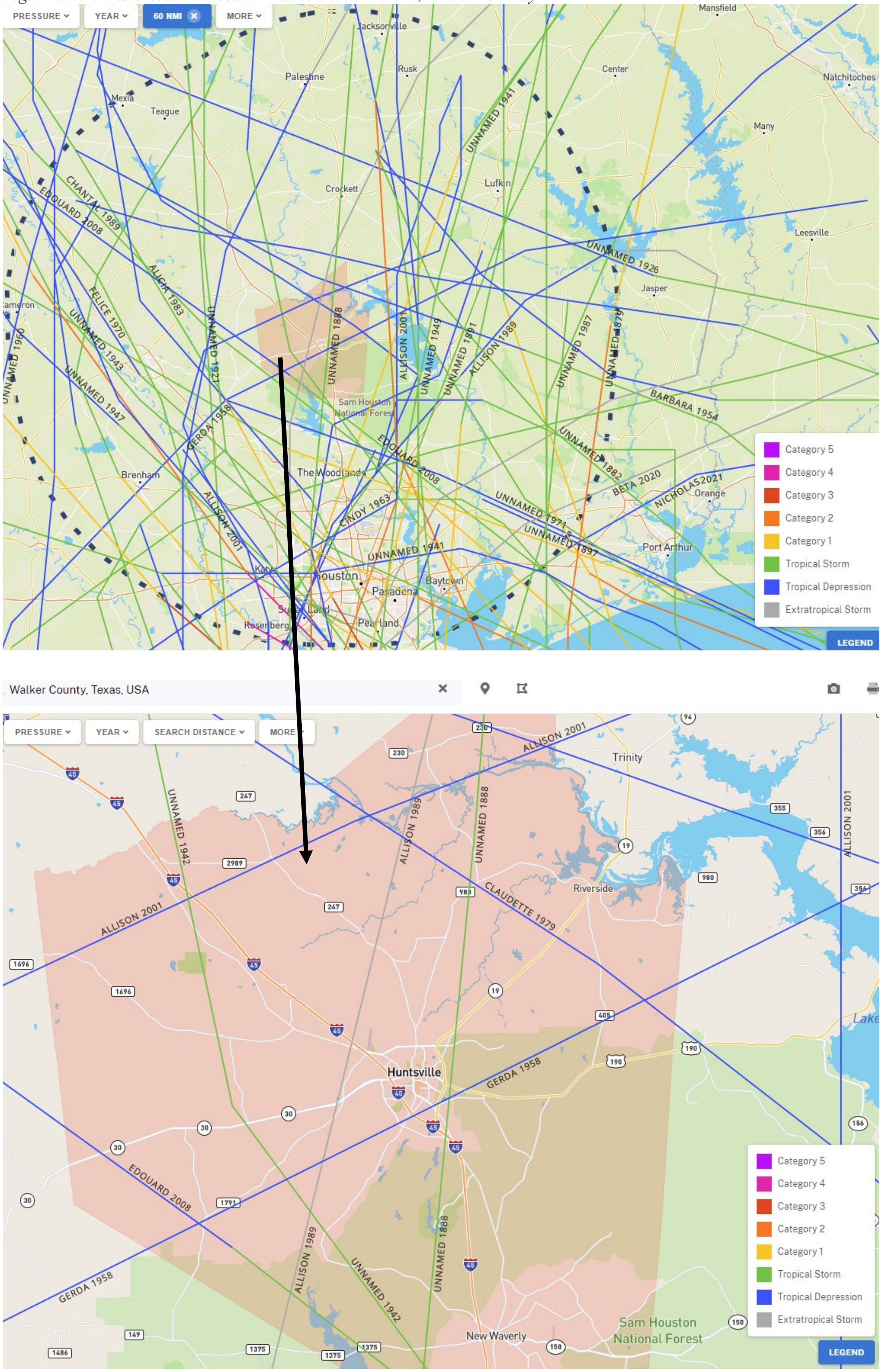
Name	Definition
Advisories	
Tropical Cyclone Public Advisory	Contains a list of all current coastal watches and warnings associated with an ongoing or potential tropical cyclone, a post-tropical cyclone, or a subtropical cyclone. Provides the cyclone position, maximum sustained winds, current motion, 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

Name	Definition
	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

Walker County is located approximately 100 miles North of the Gulf of Mexico. Wind and rains generated by hurricanes, tropical storms, and depressions do have a significant impact on flooding and windstorm-related damages within the county and participating jurisdictions. Flooding is profiled in Section 6.1 of this HMP, while the Windstorm profile can be found in Section 6.9. The figures below, based on NOAA's Historical Hurricane Tracks interactive map, show the historical hurricane, tropical storms, and tropical depression tracks that have crossed into Walker County and participating jurisdictions. It is important to remember that these storms, named or unnamed, do not have to cross the county or city boundaries for the planning area to be at risk from their impacts. There has been a total of 60 of these storms that have occurred within 60 nmi of Walker County, while 8 storms have crossed through the county directly.[52]

Figure 6.2.1: Historical Hurricane Tracks within 60 nmi, Walker County



Extent

Hurricane intensity is measured through the Saffir-Simpson Hurricane Wind Scale. Wind engineer Herb Saffir and meteorologist Bob Simpson originally developed the scale. 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 surges, 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.[53] 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 surges, rain-induced floods, and tornadoes. These hazards require people to take protective action, including evacuating from areas vulnerable to storm surges.[54]

Table 6.2.3: The Saffir-Simpson Hurricane Wind Scale

Category	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 the 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. Electric 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.

A worst-case scenario for this hazard would be a category 5 hurricane making landfall near Matagorda or Galveston County, leading to catastrophic damage and creating an environment inducive to severe thunderstorms, heavy rains, tornadoes, and hail as it passes near or through Walker County. Widespread flooding, dangerous winds, and other secondary hazards like power outages, loss of life, and extensive damage to buildings, critical facilities, and infrastructure could occur. Additionally, this hazard could damage critical infrastructure that leads to a prolonged power outage, and even result in a loss of communication within the county if a radio or cell tower is destroyed. If the storm event occurs during a heat event or drought and disrupts power supply in the area for a prolonged amount of time, secondary hazards will pose increased risks to citizens due to the heat and inability to keep homes and buildings cool. This scenario is similar to what occurred within the region during the 2024 derecho and Hurricane Beryl. Power lines were destroyed by debris and falling trees due to the severe thunderstorms and winds, in July, when the region was under an excessive heat advisory. Power line restoration/repairs took longer to address than anticipated leading to the activation of cooling centers for residents.

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCEI storm events database. These events are often shown at the county level; thus, the table below highlights all events for this hazard that have occurred within Walker County from 1950-2023.[38]

Table 6.2.4: Walker County Hurricane, Tropical Storms, and Tropical Depressions (1950-2023)

Date	Area Impacted	Event Type	Injuries	Fatalities	Property Damage	Crop Damage
9/7/1998	Walker County	Tropical Storm	0	0	$25,000	$-
6/6/2001	Walker County	Tropical Storm	0	0	$741,000	$-
9/1/2003	Walker County	Tropical Storm	0	0	$7,000	$-
9/23/2005	Walker County	Hurricane	0	0	$1,500,000	$-
9/12/2008	Walker County	Hurricane	0	1	$20,000,000	$-
6/15/2015	Walker County	Tropical Storm	0	0	$	$-
TOTALS:			**0**	**1**	**$22,273,000**	**$-**

$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been 16 federally declared hurricanes, tropical storms, or tropical depression-related disasters in Walker County since 1950. There were also 2 severe storm disasters and 2 coastal storms that mentioned a hurricane or tropical storm in their declaration title and were included in the table below.[2]

Table 6.2.5: Federal Disaster Declarations for Hurricanes, Tropical Storms, and Tropical Depressions

Date	Disaster Number	Declaration Types	Incident Type	Declaration Title
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
8/18/2007	3277	Emergency Declaration	Hurricane	HURRICANE DEAN
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

Date	Disaster Number	Declaration Types	Incident Type	Declaration Title
8/24/2020	3540	Emergency Declaration	Hurricane	TROPICAL STORMS MARCO AND LAURA

U.S. Department of Agriculture (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 USDA 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 the USDA FSA of the primary counties named in the presidential declaration. USDA disaster declarations for Walker County since 2018 are listed in the table below.[39]

Table 6.2.6: 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, developed by TDEM, estimates the occurrence of hurricanes, tropical storms, and tropical depressions is trending upward, with a 400% increase in the 5-year planning cycle between 2017-2021.[33] According to the FEMA's NRI for hurricanes within Walker County, annualized frequency values are 0.1 events per year over 73 years of record (1949-2021), with 16 events on record for this timeframe.[44]

Populations at Risk

Populations at risk for hurricanes, tropical storms, and tropical depressions include the entire county as this hazard has no geographic boundaries. Hurricanes can cause property damage, flooding, lack of access to critical facilities that provide food, water, medications, or other forms of medical assistance, and lack of utilities such as electricity and clean water, which can increase the risk of illness. The NCHH website for emergency preparedness and response includes information on at-risk populations for several hazards. For hurricanes, these include older adults, children, people experiencing homelessness, people with disabilities, and people with chronic health conditions. In addition to the dangers listed above, older adults can face social isolation, lack of electricity needed to run medical equipment, lack of access to a vehicle for evacuation, and lack of access to other critical supplies. In younger populations, such as children, flood events can disrupt schooling and the normal day-to-day routines they thrive on. This can not only jeopardize their academic success but can also cause mental and emotional stress. Children are more at risk and vulnerable to certain medical conditions like asthma, lead poisoning, allergies, and bacterial infections which can be caused by the resulting flood damage and increased moisture of hurricanes. For people experiencing homelessness, housing and adequate shelter are critical in keeping populations safe during these types of hazard events so hurricanes can be life-threatening for this population if adequate shelter is not located and utilized. People with disabilities may require additional assistance to stay safe and prepare for these hazards such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. Likewise, those with chronic health conditions may need similar assistance as those with disabilities. People with chronic health conditions also face exposure to diseases or illnesses from standing water and increased exposure to these illnesses when utilizing a shelter or evacuation center. Additionally, flooding of homes and businesses can cause mold to thrive if not treated promptly. This can exacerbate illness among the general population but especially among those with chronic health conditions.[46] People living in mobile homes are also at greater risk of injury and death from these hazards. Despite mobile homes providing a form of shelter, tornadoes and dangerous winds produced by hurricanes, tropical storms, and tropical depressions can cause mobile homes and even mobile homes that utilize anchoring to be seriously damaged or destroyed when winds gust over 80 mph.[55]

All areas of future growth and development within the county will increase the risk to this hazard as it has no geographic boundaries and a wide area of impact with various secondary hazards associated.

National Risk Index

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.[50]

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When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.2.2: Risk Index, Walker County, Hurricane

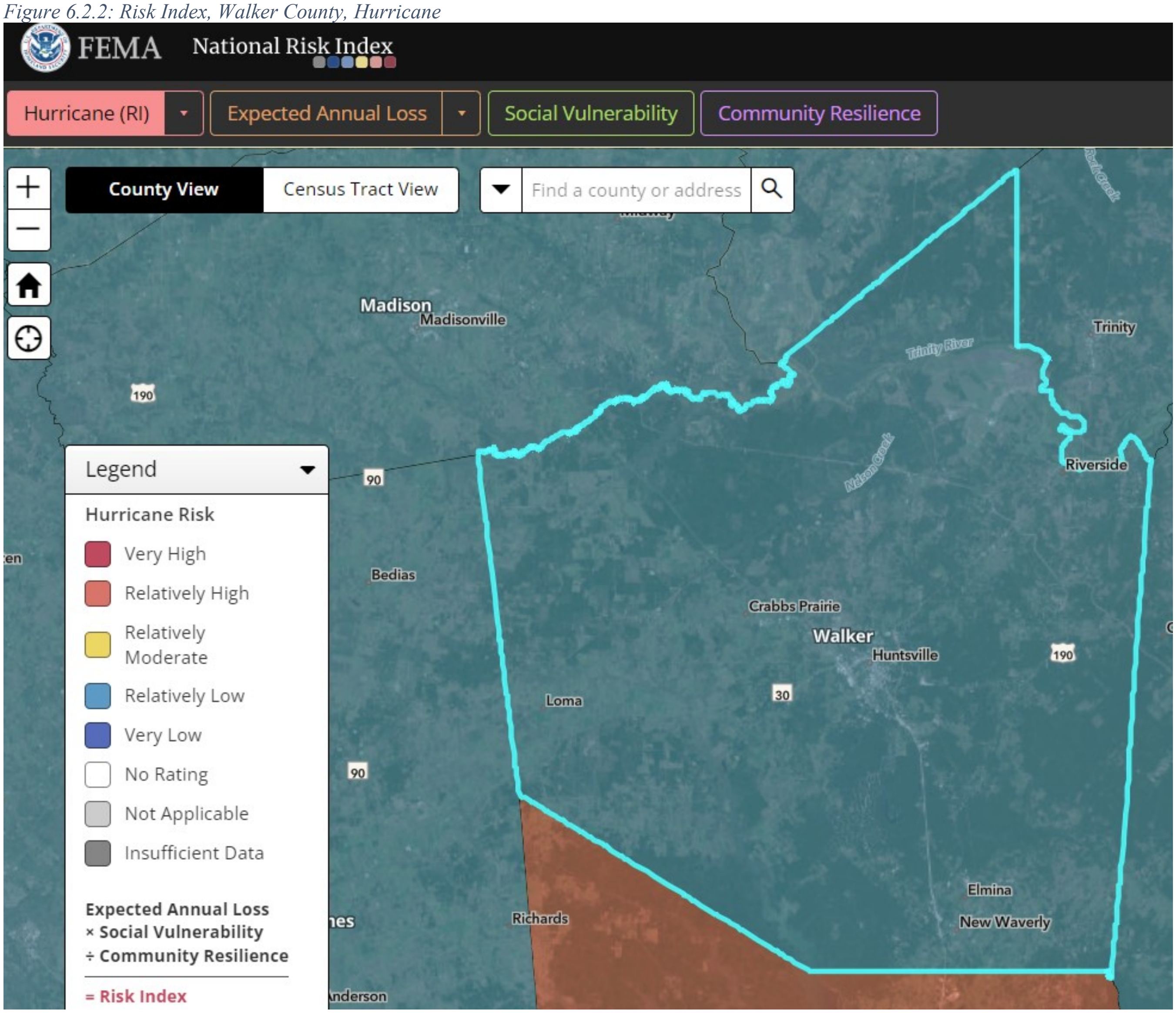


Figure 6.2.3: Risk Index by Census Tract, Walker County, Hurricanes

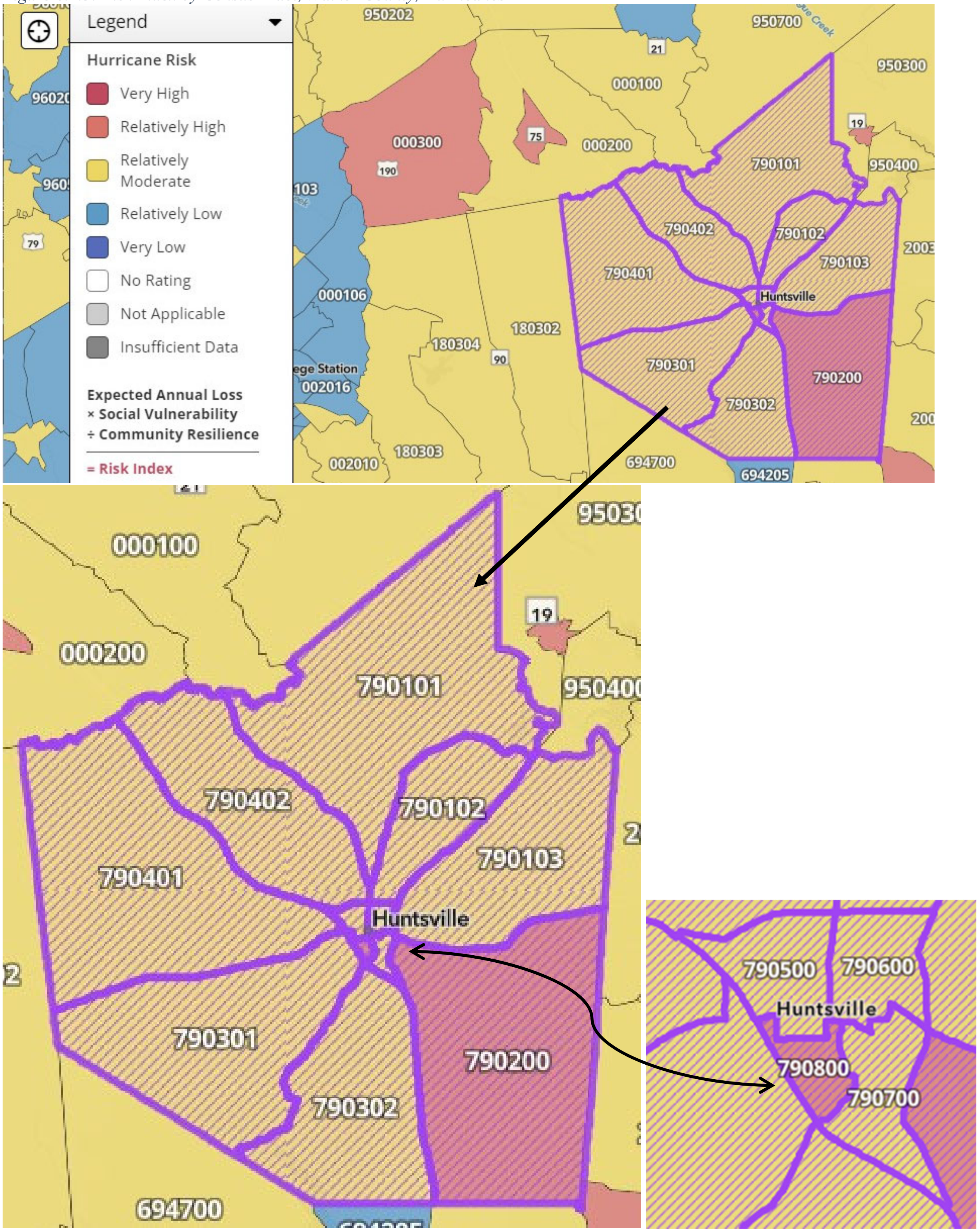


Figure 6.2.4: Social Vulnerability by Census Tract, Walker County

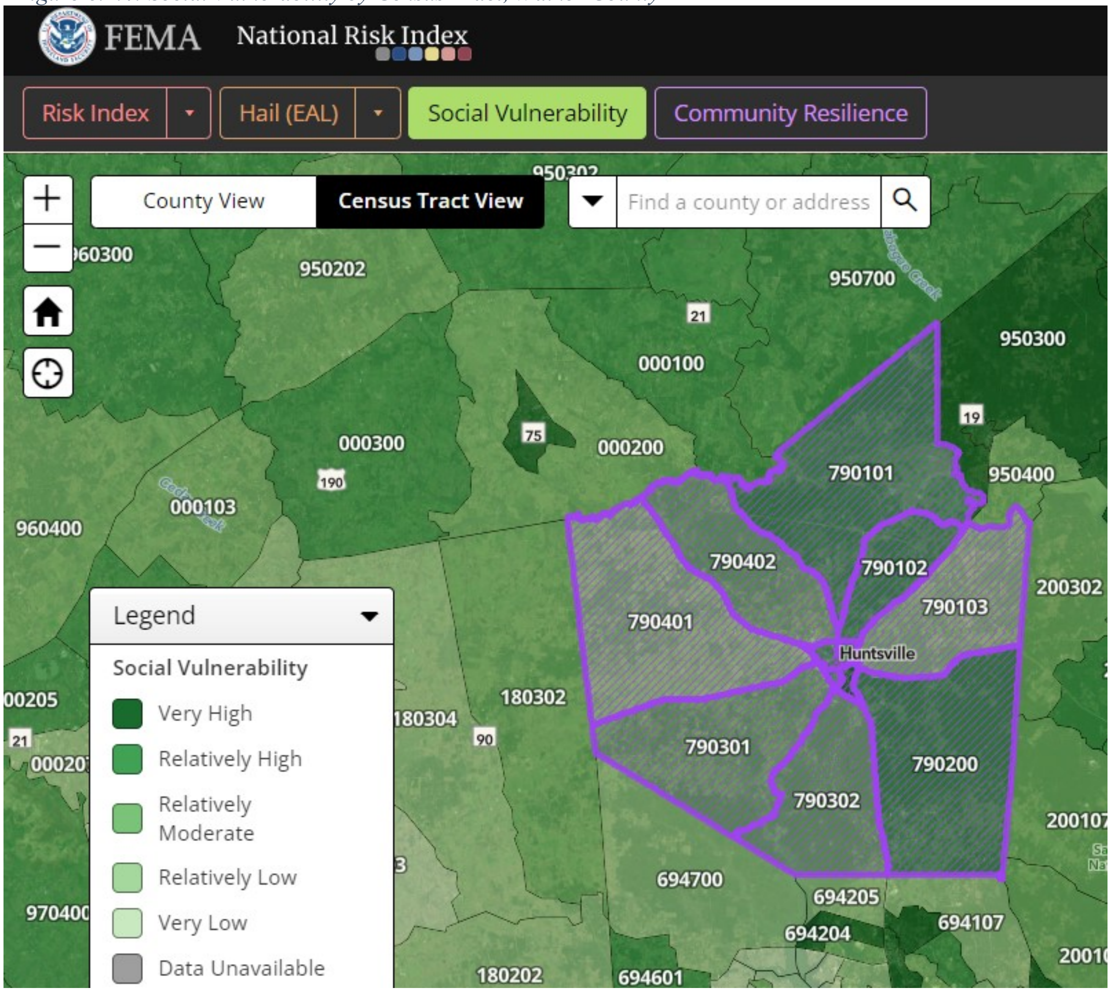


Figure 6.2.5: Social Vulnerability, Walker County

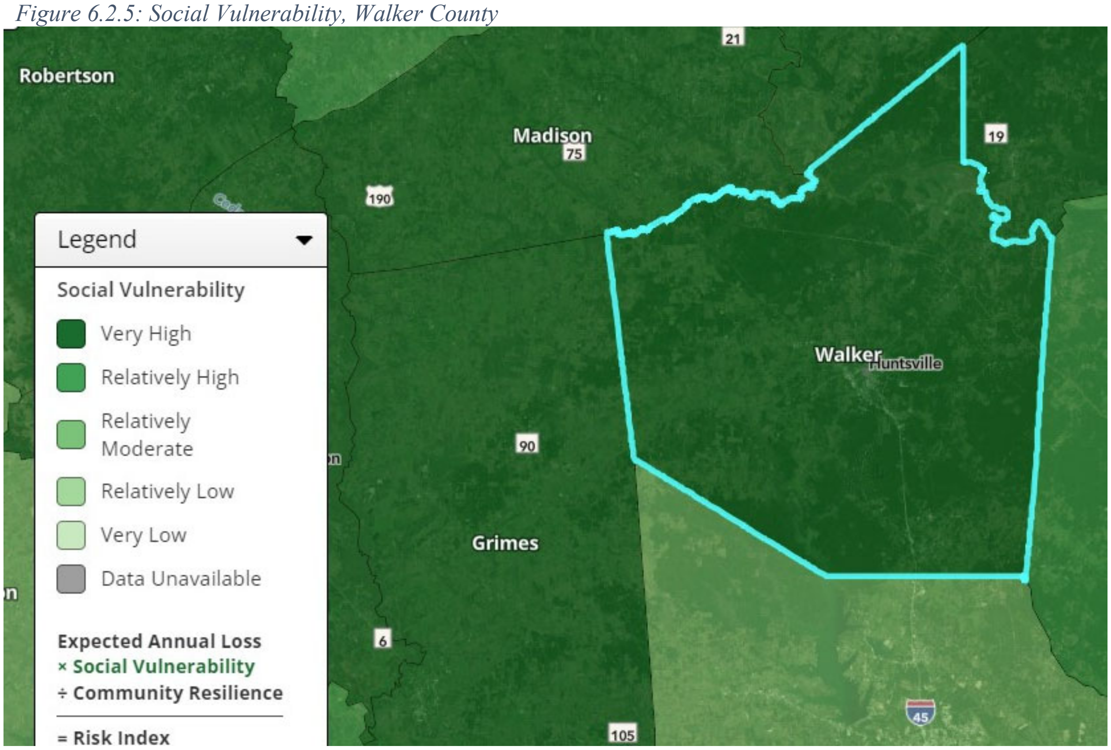


Figure 6.2.6: Community Resilience by Census Tract, Walker County

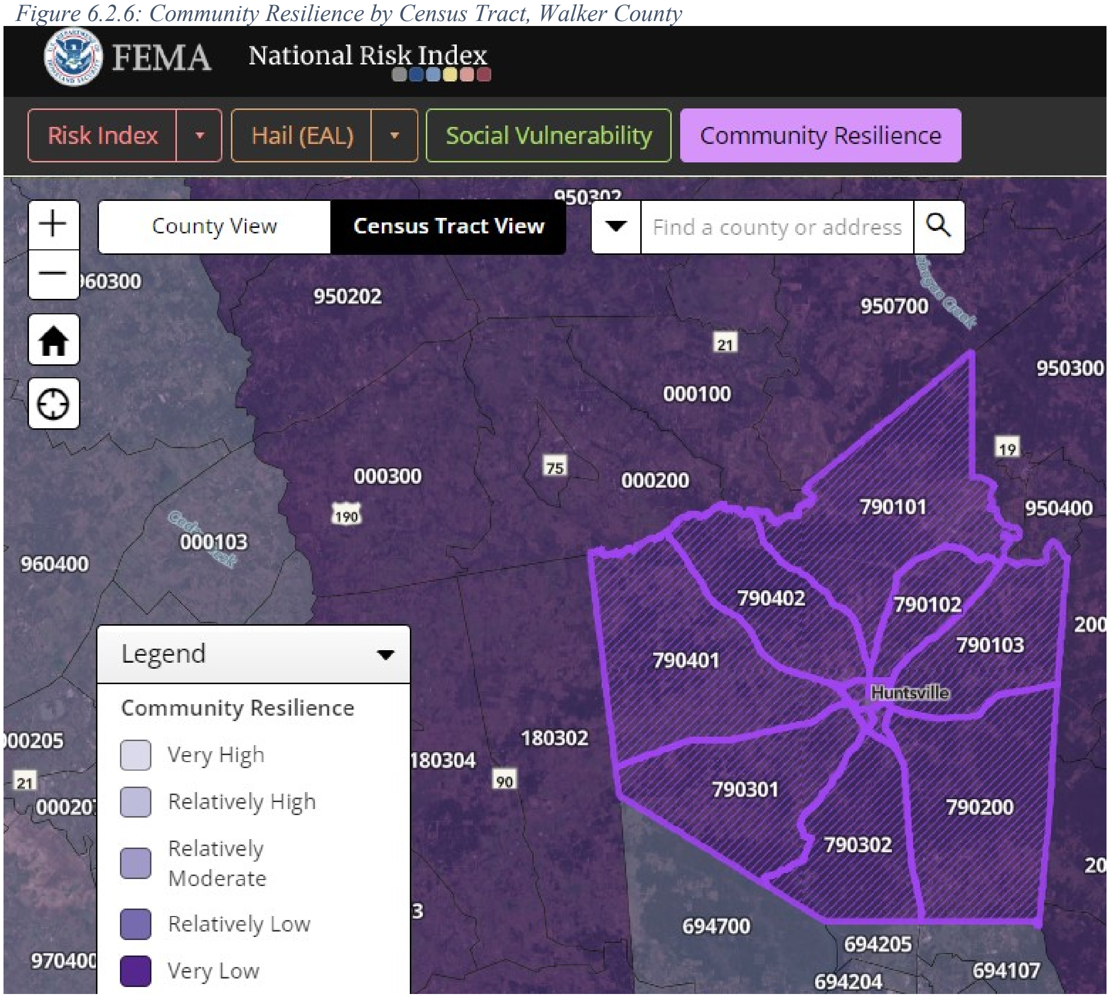


Figure 6.2.7: Community Resilience, Walker County

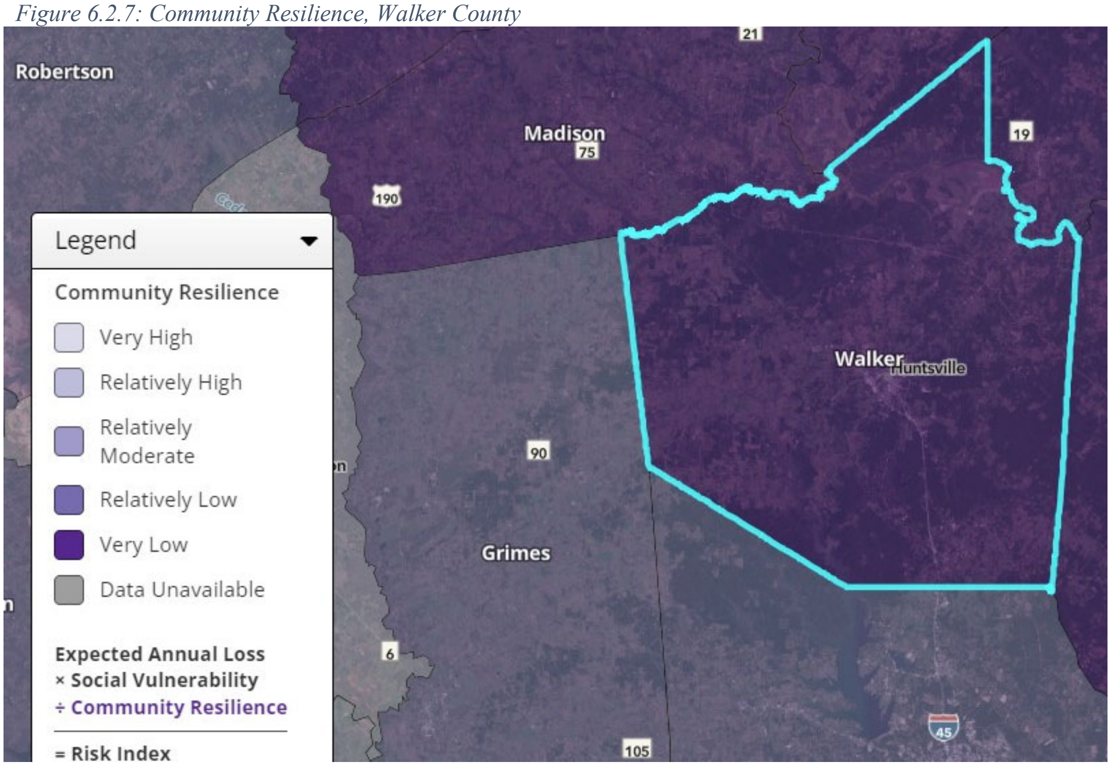


Figure 6.2.8: FEMA NRI Summary by Census Tract, Walker County, Hurricanes

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790800	TX	Relatively High	90.88	0 100
2	Census tract 48471790200	TX	Relatively High	90.26	0 100
3	Census tract 48471790500	TX	Relatively Moderate	85.04	0 100
4	Census tract 48471790700	TX	Relatively Moderate	84.43	0 100
5	Census tract 48471790302	TX	Relatively Moderate	84.33	0 100
6	Census tract 48471790101	TX	Relatively Moderate	83.01	0 100
7	Census tract 48471790103	TX	Relatively Moderate	82.48	0 100
8	Census tract 48471790600	TX	Relatively Moderate	82.21	0 100
9	Census tract 48471790301	TX	Relatively Moderate	81.67	0 100
10	Census tract 48471790401	TX	Relatively Moderate	80.72	0 100
11	Census tract 48471790102	TX	Relatively Moderate	78.12	0 100
12	Census tract 48471790402	TX	Relatively Moderate	74.39	0 100

Figure 6.2.9: FEMA NRI EAL Summary by Census Tract, Walker County, Hurricanes

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790800	TX	$877,934	Relatively High	Very Low	1.44	$1,262,359	90.88
2	Census tract 48471790200	TX	$800,487	Relatively High	Very Low	1.48	$1,188,255	90.26
3	Census tract 48471790500	TX	$414,990	Relatively High	Very Low	1.49	$619,309	85.04
4	Census tract 48471790700	TX	$359,565	Very High	Very Low	1.59	$571,109	84.43
5	Census tract 48471790302	TX	$485,812	Relatively Moderate	Very Low	1.16	$565,584	84.33
6	Census tract 48471790101	TX	$356,035	Relatively High	Very Low	1.35	$479,325	83.01
7	Census tract 48471790103	TX	$462,726	Relatively Low	Very Low	0.98	$451,174	82.48
8	Census tract 48471790600	TX	$240,302	Very High	Very Low	1.82	$438,477	82.21
9	Census tract 48471790301	TX	$368,183	Relatively Moderate	Very Low	1.12	$413,127	81.67
10	Census tract 48471790401	TX	$353,295	Relatively Low	Very Low	1.06	$373,068	80.72
11	Census tract 48471790102	TX	$219,946	Relatively High	Very Low	1.34	$293,715	78.12
12	Census tract 48471790402	TX	$207,544	Relatively Moderate	Very Low	1.07	$222,665	74.39

Climate Change Impacts

According to the Office of the Texas State Climatologist, hurricanes, tropical storms, and tropical depressions, though unpredictable in quantity between 5-year planning cycles, will continue to intensify due to other climate-related factors such as the environmental conditions for thunderstorm intensity rising, warmer temperatures, and increasing ocean temperatures. As temperatures increase, the amount of energy available to fuel these storms, especially those that form over warm tropical waters of the Atlantic Ocean and Gulf of Mexico is expected to increase.[49]

Table 6.2.7: Climate Change Impacts Summary, Hurricane, Tropical Storms, and Tropical Depressions

Location	The location of hurricanes, tropical storms, and tropical depressions is not expected to change.
Extent/Intensity	The extent and intensity of hurricanes, tropical storms, and tropical depressions are not expected to change.
Frequency	There are no clear trends in hurricanes, tropical storms, and tropical depression frequency. This is due to considerable variability in conditions that lead to these hazards 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 landfall for these hazards occurs between the beginning of June through October.
Duration	The duration of hurricanes, tropical storms, and tropical depressions is not likely to change, however, their intensity is expected to increase due to rising temperatures and the proximity of the county and city to the Gulf of Mexico, which aids in fueling thunderstorms and tropical cyclone formation when waters are warm and thunderstorm development is more likely.

Section 6.3: Wildfire

6.3 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.[56] 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 the Texas A&M Forest Service to deploy wildfire risk information and create awareness about wildfire issues across the state.[57] The Texas Wildfire Risk Assessment Portal (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 specific land areas and depicts through a set of rating areas that are most prone to wildfires.[58] 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 is 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 48,229 people or 75.3 % percent of residents within Walker County live within the WUI. For the City of Huntsville, it is estimated that 20,351 people, or 56.8 % percent of residents live within the WUI. In New Waverly, it is estimated that 908 people, or 99.9 % percent of the total project area population (909) live within the WUI. For the City of Riverside, it is estimated that 442 people, or 98.4 % percent of the total project area population (449) live within the WUI. The tables and figures below depict the population and acreage in each of the WUI zones within the county and participating jurisdictions, which closely follow housing density.

Table 6.3.1: WUI Population and Acres, Walker County

	Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
	LT 1hs/40ac	1,294	2.7 %	61,169	44.1 %
	1hs/40ac to 1hs/20ac	1,643	3.4 %	22,449	16.2 %
	1hs/20ac to 1hs/10ac	3,536	7.3 %	21,207	15.3 %
	1hs/10ac to 1hs/5ac	6,490	13.4 %	17,345	12.5 %
	1hs/5ac to 1hs/2ac	11,045	22.9 %	11,743	8.5 %
	1hs/2ac to 3hs/1ac	11,038	22.9 %	4,157	3.0 %
	GT 3hs/1ac	13,253	27.4 %	631	0.5 %
	Total	48,299	100.0 %	138,701	100.0 %

Table 6.3.2: WUI Population and Acres, City of Huntsville

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	30	0.1 %	1,571	12.6 %
1hs/40ac to 1hs/20ac	37	0.2 %	823	6.6 %
1hs/20ac to 1hs/10ac	206	1.0 %	1,303	10.4 %
1hs/10ac to 1hs/5ac	461	2.3 %	1,775	14.2 %
1hs/5ac to 1hs/2ac	3,098	15.2 %	3,383	27.1 %
1hs/2ac to 3hs/1ac	9,381	46.1 %	3,257	26.1 %
GT 3hs/1ac	7,138	35.1 %	369	3.0 %
Total	20,351	100.0 %	12,481	100.0 %

Table 6.3.3: WUI Population and Acres, City of New Waverly

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	1	0.1 %	161	11.8 %
1hs/40ac to 1hs/20ac	17	1.9 %	197	14.5 %
1hs/20ac to 1hs/10ac	31	3.4 %	203	14.9 %
1hs/10ac to 1hs/5ac	42	4.6 %	167	12.3 %
1hs/5ac to 1hs/2ac	531	58.5 %	483	35.5 %
1hs/2ac to 3hs/1ac	286	31.5 %	151	11.1 %
GT 3hs/1ac	0	0.0 %	0	0.0 %
Total	908	100.0 %	1,362	100.0 %

Table 6.3.4: WUI Population and Acres, City of Riverside

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	4	0.9 %	135	12.2 %
1hs/40ac to 1hs/20ac	14	3.2 %	102	9.2 %
1hs/20ac to 1hs/10ac	43	9.7 %	268	24.2 %
1hs/10ac to 1hs/5ac	90	20.4 %	301	27.2 %
1hs/5ac to 1hs/2ac	291	65.8 %	300	27.1 %
1hs/2ac to 3hs/1ac	0	0.0 %	0	0.0 %
GT 3hs/1ac	0	0.0 %	0	0.0 %
Total	442	100.0 %	1,106	100.0 %

Figure 6.3.1: WUI Zones, Walker County

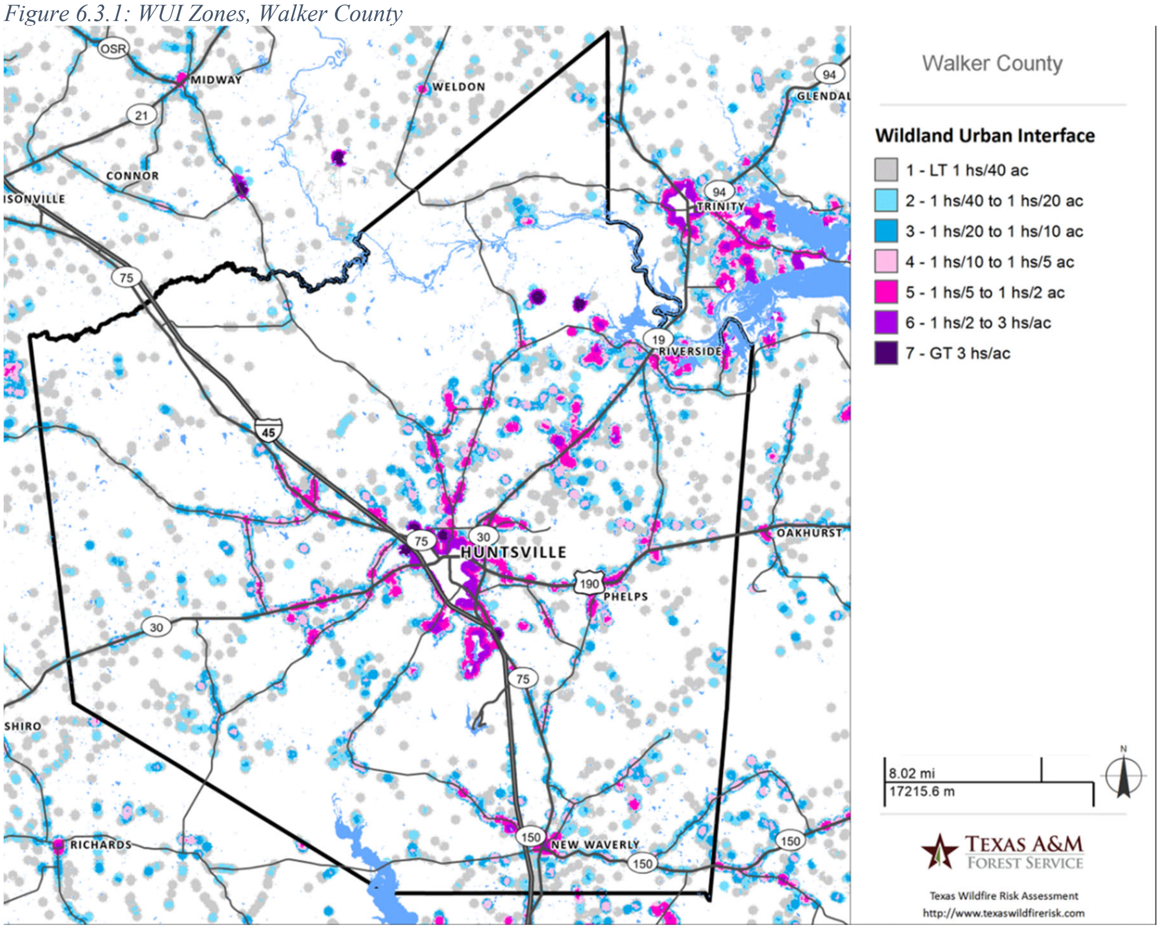


Figure 6.3.2: WUI Zones, City of Huntsville

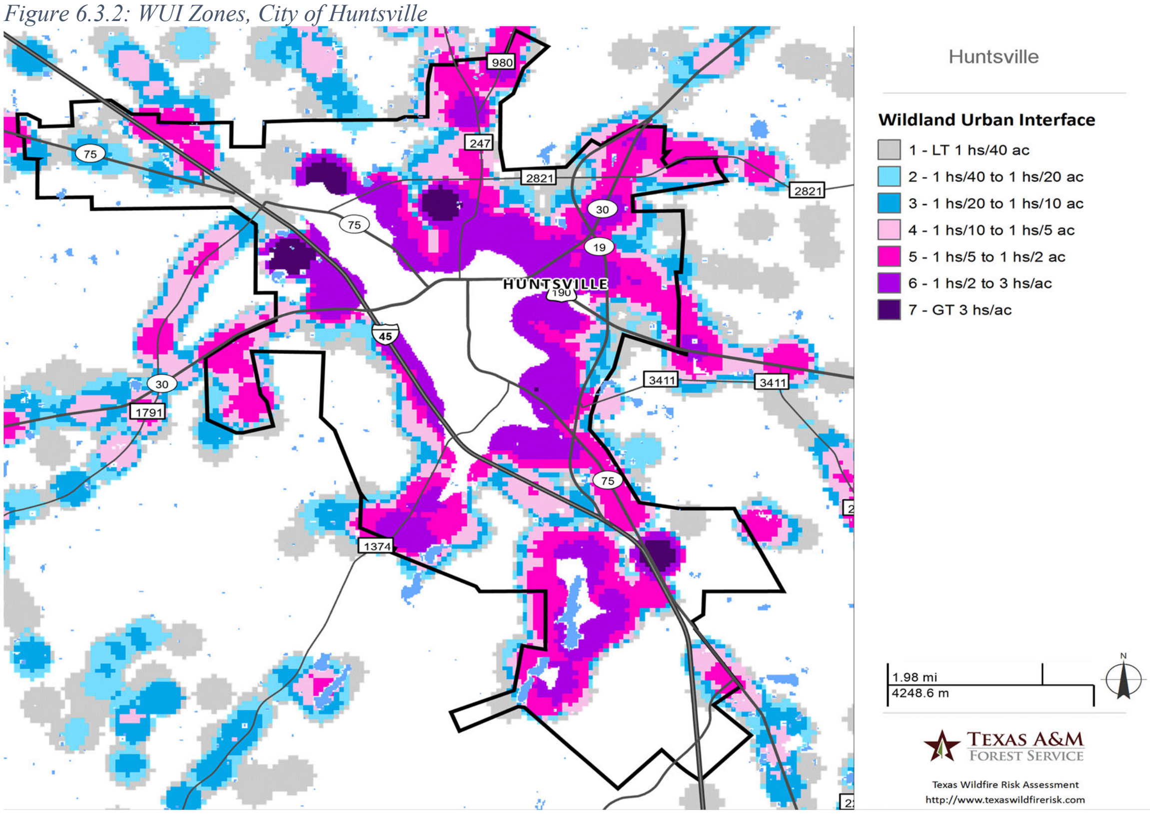


Figure 6.3.3: WUI Zones, City of New Waverly

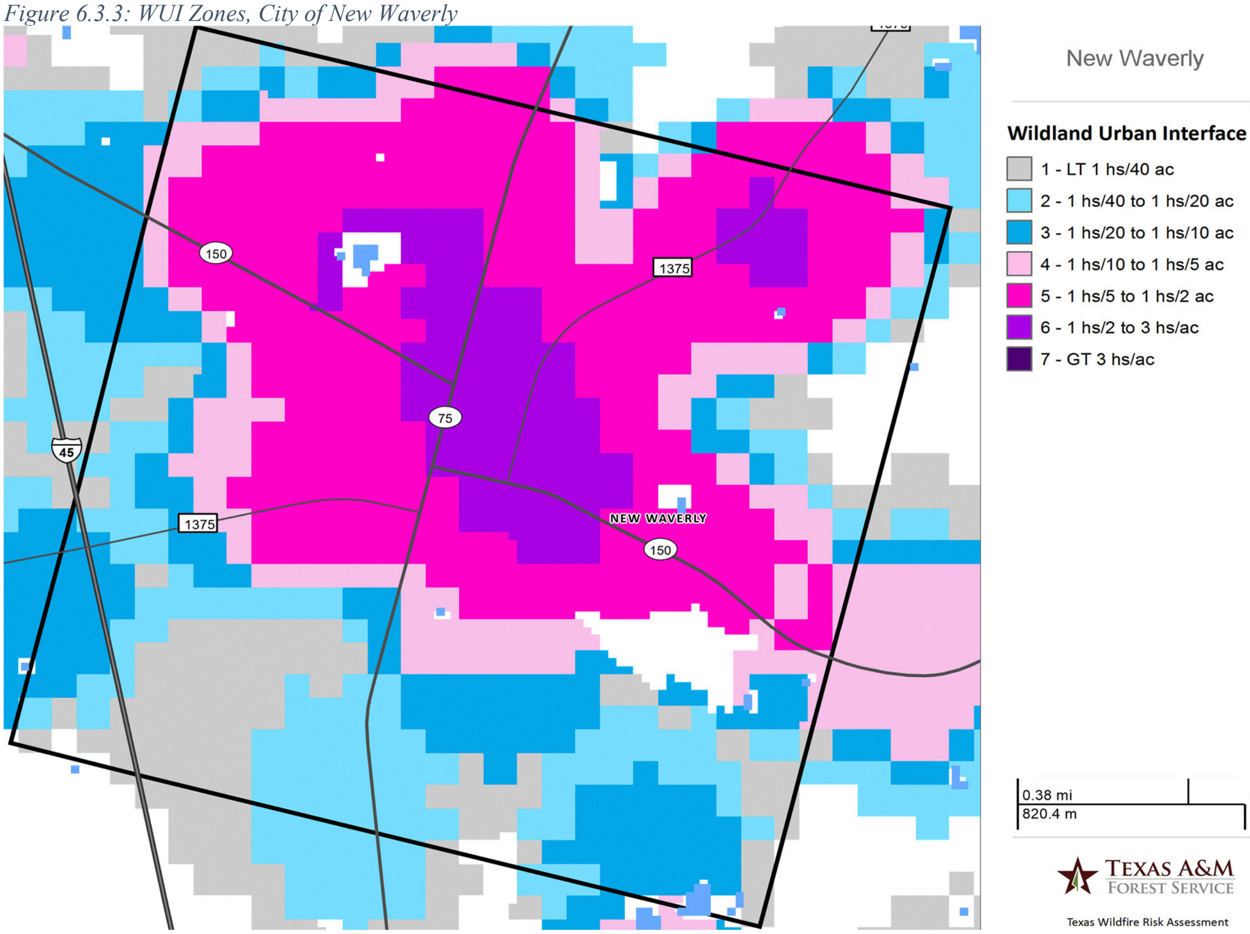
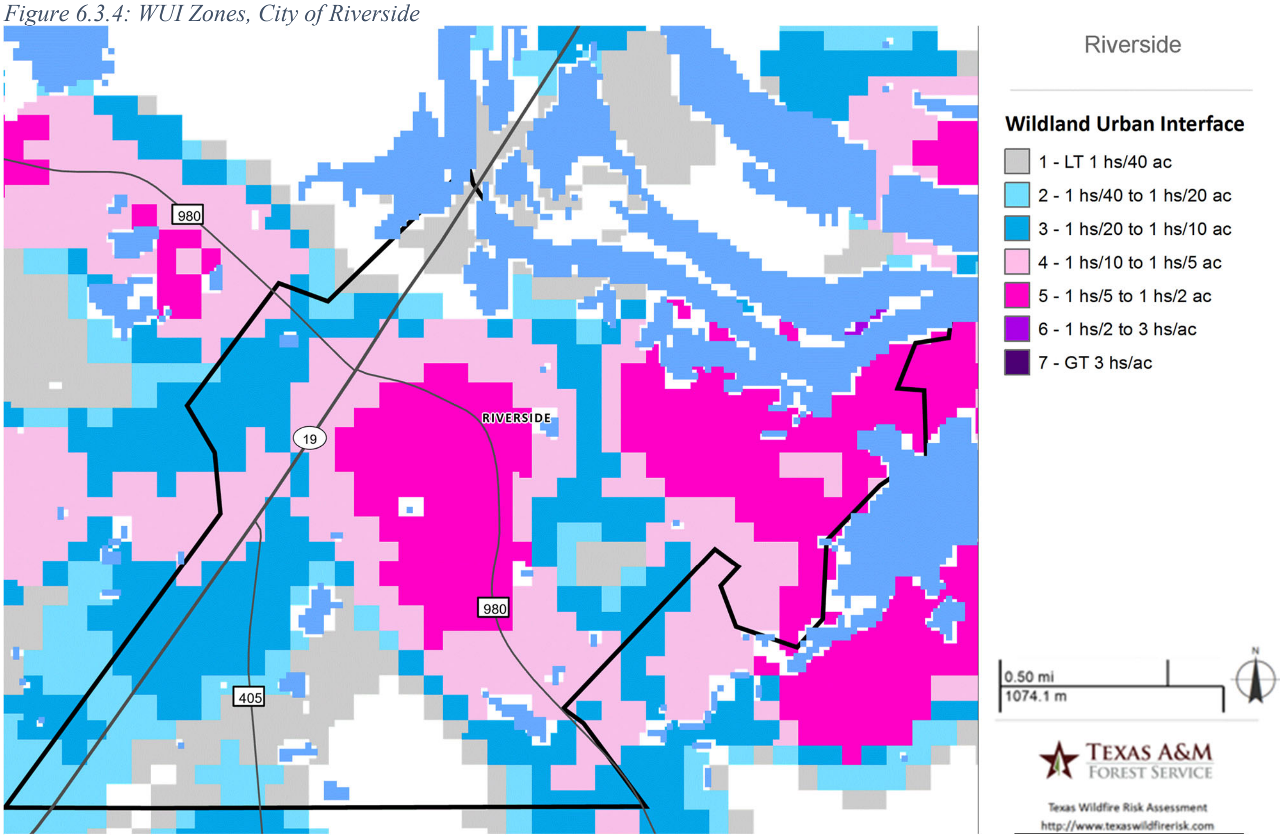


Figure 6.3.4: WUI Zones, City of Riverside



Extent

Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. This is like the Richter scale for earthquakes. FIS provides a standard scale to measure potential wildfire intensity. FIS consists 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 FIS class, including the acreage, and percentage of each FIS class within Walker County is shown in the tables below.

Table 6.3.5: 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.

Table 6.3.6: Fire Intensity Scale Acreage, Walker County

Class	Acres	Percent
Non-Burnable	55,123	10.8 %
1 (Very Low)	31,277	6.1 %
1.5	36,137	7.0 %
2 (Low)	158,415	30.9 %
2.5	101,729	19.8 %
3 (Moderate)	58,055	11.3 %
3.5	52,280	10.2 %
4 (High)	16,551	3.2 %
4.5	3,180	0.6 %
5 (Very High)	0	0.0 %
Totals:	512,747	100.0 %

Figure 6.3.5: Wildfire Risk, Walker County

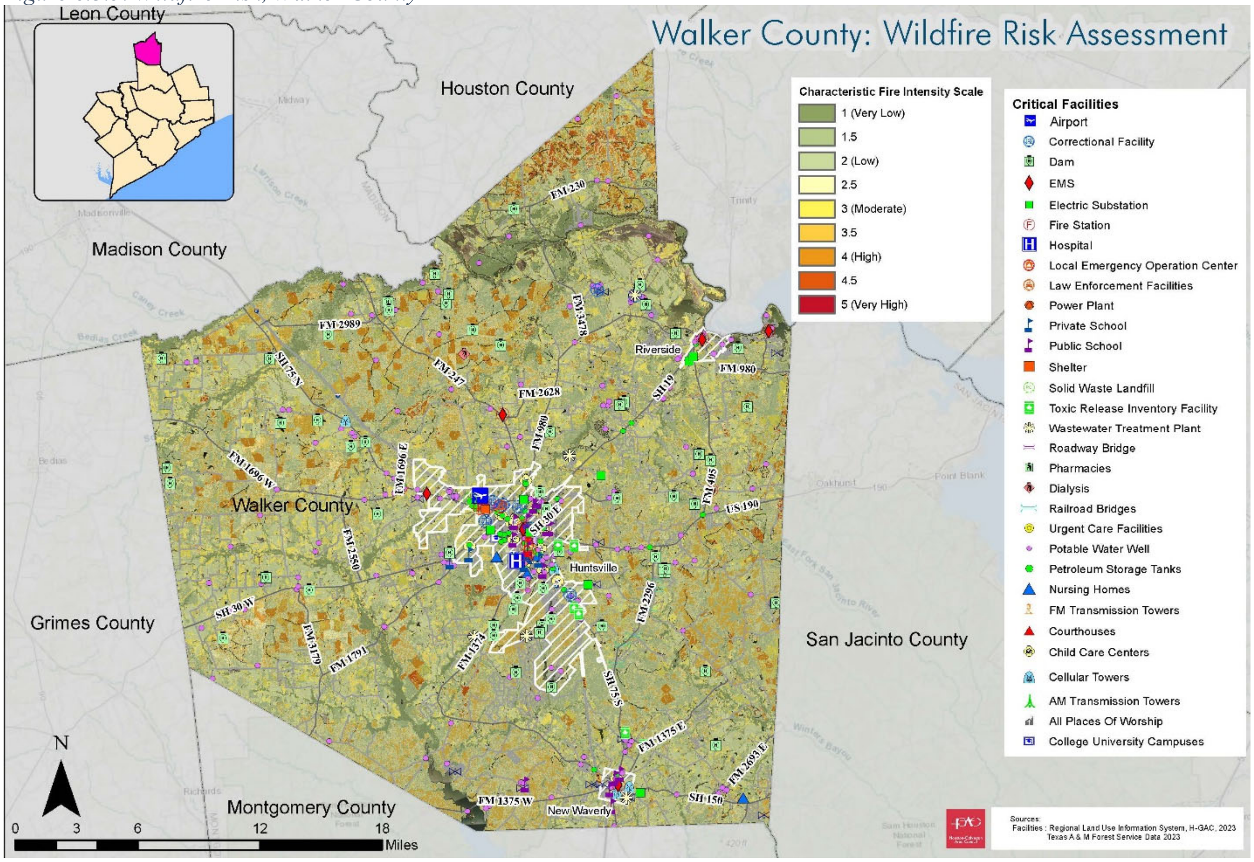


Figure 6.3.6: Wildfire Risk, City of Huntsville

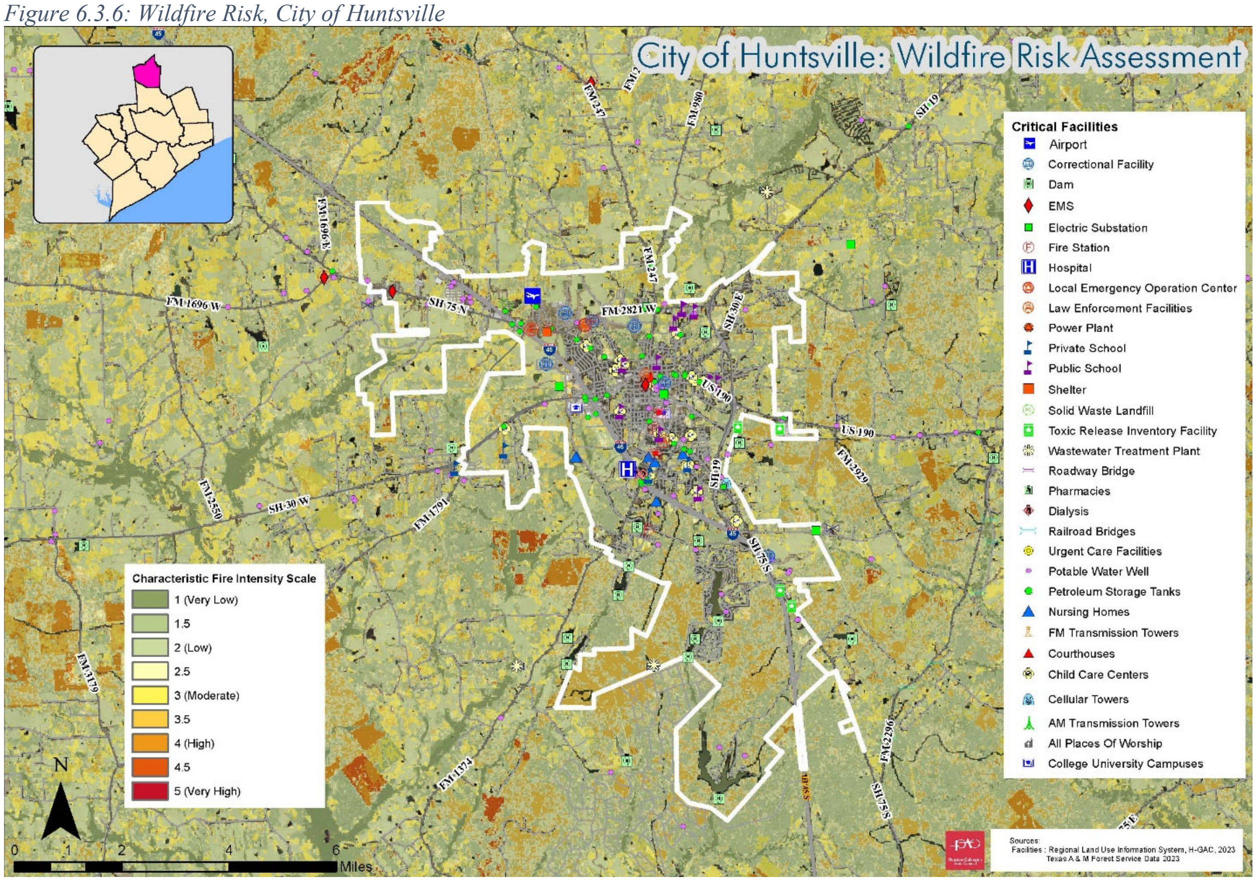


Figure 6.3.7: Wildfire Risk, City of New Waverly

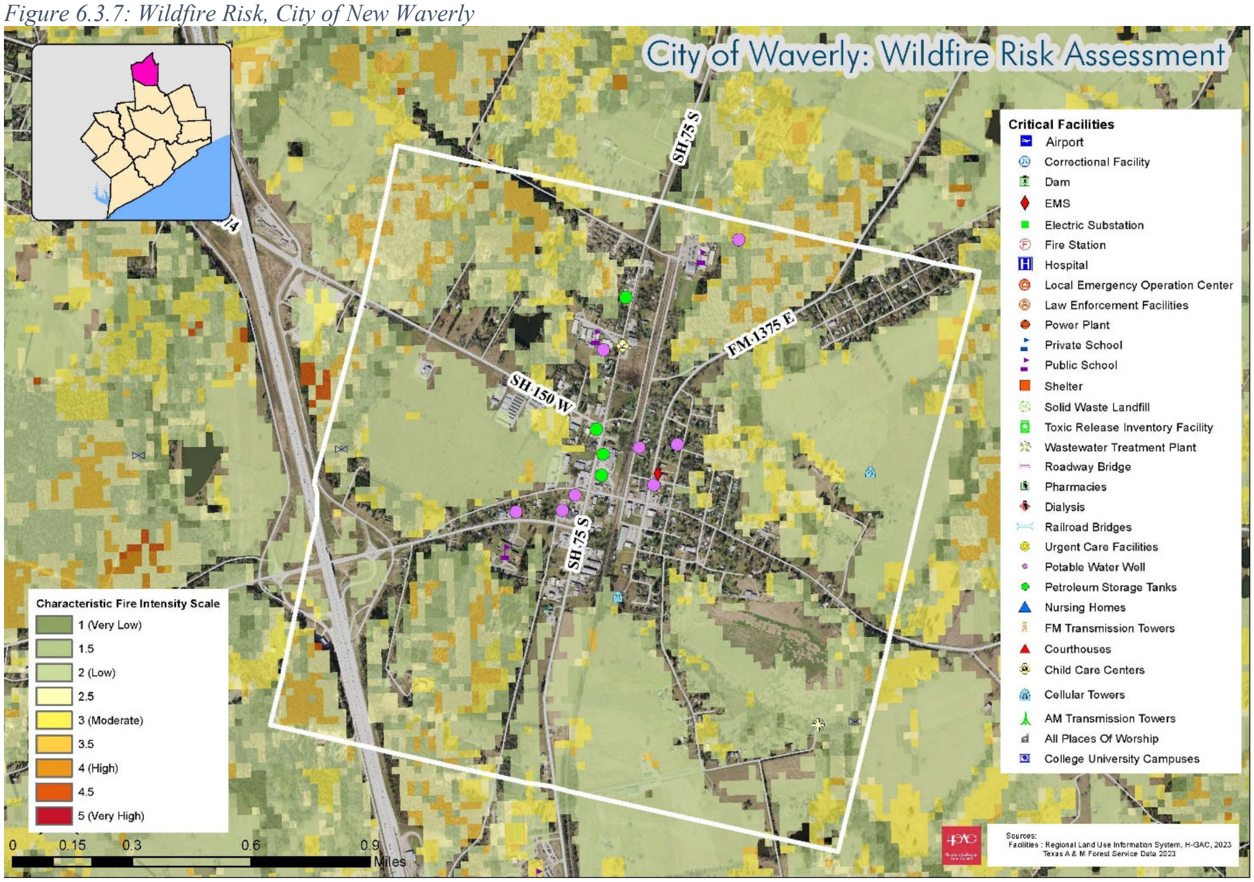
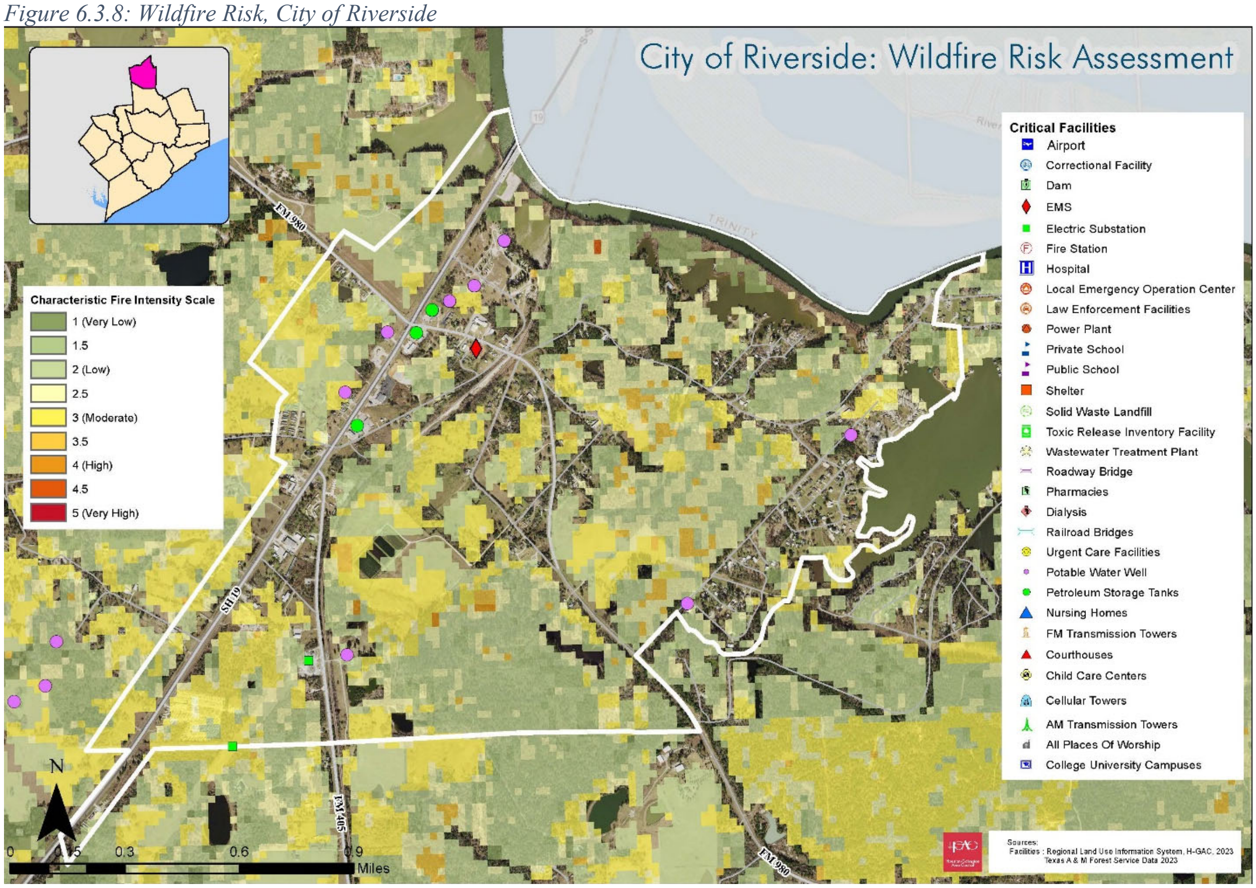


Figure 6.3.8: Wildfire Risk, City of Riverside



A worst-case scenario for this hazard would be a wildfire sparked during a drought or a heat event where temperatures are high, the ground and vegetation are dry, and water supplies may already be in high demand. Similar events occurring within counties bordering Walker County or near urban areas would further exacerbate the risks to life and property. Large-scale events could also affect transportation and evacuation corridors, power supply, and access to critical facilities, and lead to degraded air quality and health impacts. Similar events occurred in 2011 when Walker County saw 6,173 acres burned and 8 homes destroyed through a combination of the Midway/Cowboy Church Fire and other fires that occurred throughout the year.

Historic Occurrences

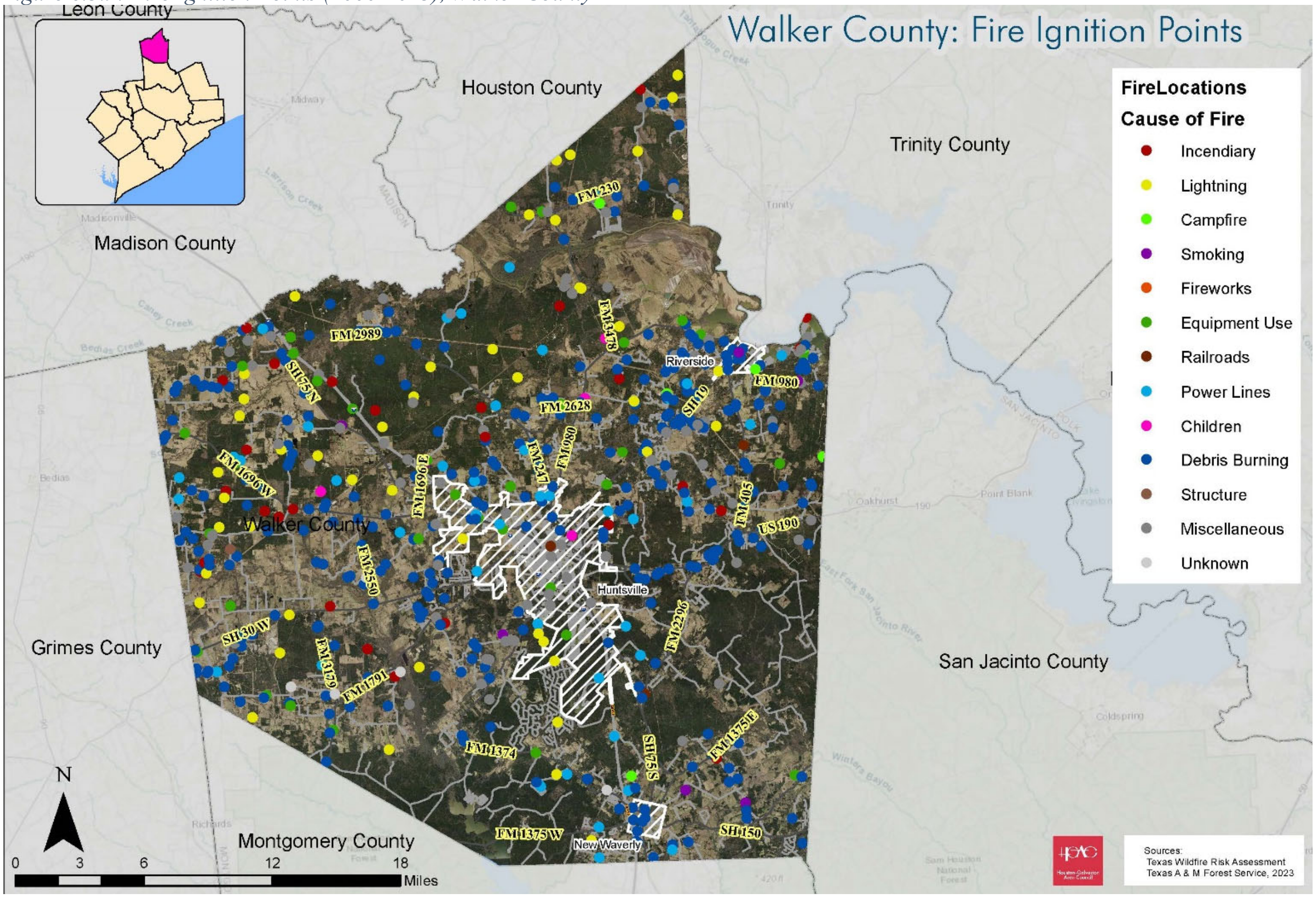
The Texas A&M Forest Service tracks wildfire events, acres destroyed, and the initial ignition cause of the fire. The table below shows the historical data associated with burns that caused recorded damage. Data is included since the last HMP update. Figure 6.3.9 shows the point location of all fire ignitions from 2005-2021, symbolized by color to depict the cause of the fire. There are 657 individual fire ignition points shown. The table below condenses fire ignition points since the last plan update, 2018-2021.

Table 6.3.7: Fire Ignition Point Causes, Walker County (2018-2021)

Start Date	Damaged Acres	Ignition Cause	Ignition Sub Cause
1/5/2018	5	Debris Burning	Brush pile burning
1/5/2018	142	Debris Burning	Brush pile burning
1/31/2018	5.75	Debris Burning	Unsafe burning of household trash
2/1/2018	1.8	Debris Burning	Brush pile burning
3/14/2018	3	Debris Burning	Brush pile burning
3/19/2018	8.5	Debris Burning	Brush pile burning
3/19/2018	10	Debris Burning	Unknown
3/20/2018	4	Lightning	Origin traceable to lightning
3/24/2018	20	Power Lines	Other
3/26/2018	1.5	Debris Burning	Brush pile burning
5/9/2018	3.3	Debris Burning	Brush pile burning
5/12/2018	2.3	Debris Burning	Unsafe burning of household trash
5/15/2018	2	Debris Burning	Control burning, no firebreaks
7/12/2018	1	Debris Burning	Unknown
7/22/2018	3.3	Debris Burning	Brush pile burning
7/24/2018	1.7	Debris Burning	Control burning, no firebreaks
7/27/2018	0.5	Debris Burning	Brush pile burning
7/27/2018	4.3	Unknown	Unable to determine
8/2/2018	1	Unknown	Investigated but Undetermined
8/4/2018	1	Debris Burning	Brush pile burning
8/9/2018	1	Debris Burning	Brush pile burning
8/9/2018	1	Debris Burning	Brush pile burning
8/13/2018	9.5	Lightning	Origin traceable to lightning
8/20/2018	14.8	Debris Burning	Unsafe burning of household trash
8/21/2018	764	Lightning	Origin traceable to lightning
8/22/2018	432	Lightning	Origin traceable to lightning
8/24/2018	400	Lightning	Origin traceable to lightning
7/26/2019	1	Debris Burning	Brush pile burning
7/26/2019	1	Power Lines	Other
9/8/2019	1	Debris Burning	Unsafe burning of household trash
9/9/2019	0.75	Debris Burning	Brush pile burning
9/29/2019	2.3	Debris Burning	Pasture and field burning (including grass, crop residues)

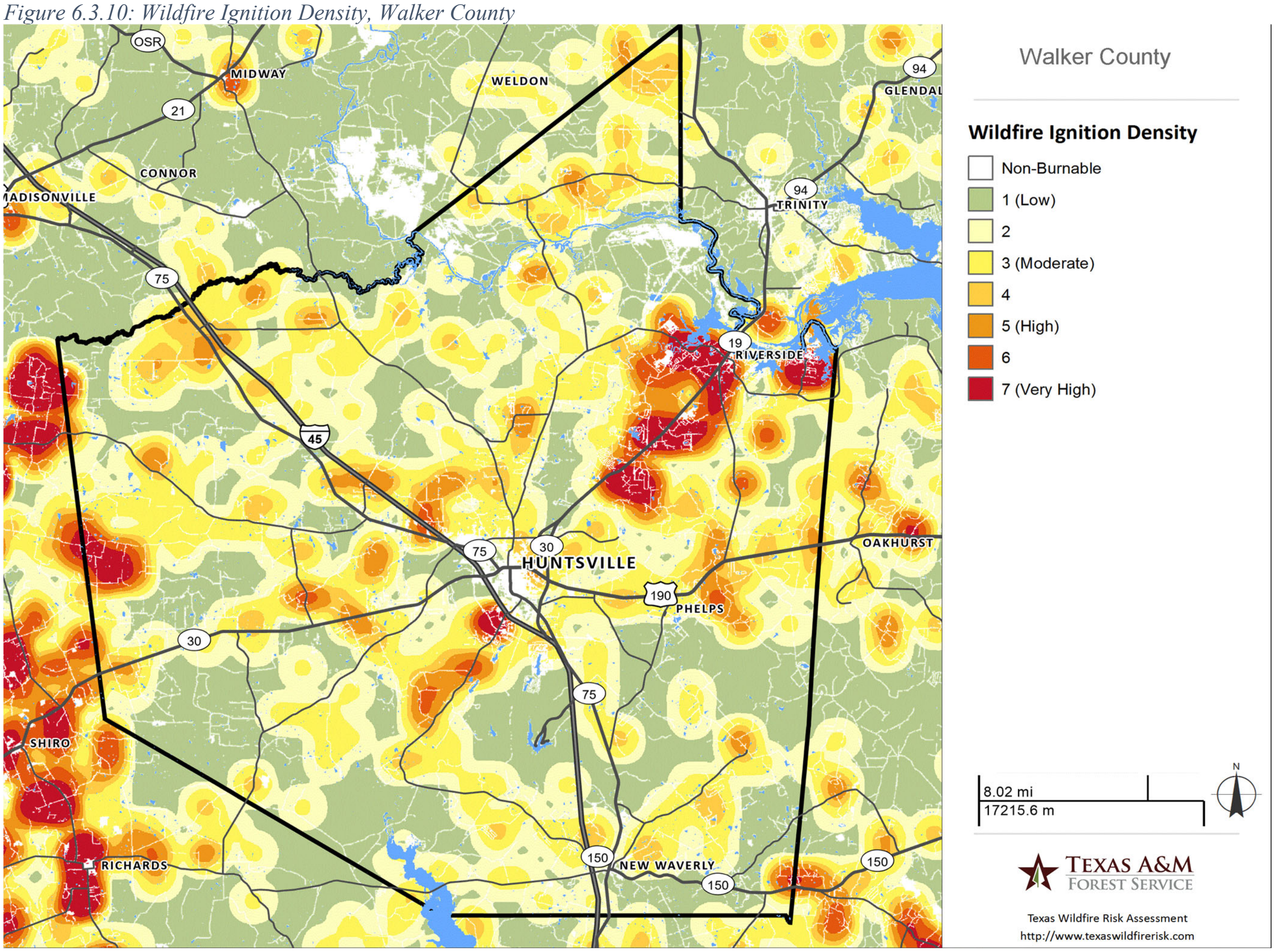
Start Date	Damaged Acres	Ignition Cause	Ignition Sub Cause
9/29/2019	1.2	Debris Burning	Unsafe burning of household trash
9/29/2019	0.5	Debris Burning	Unsafe burning of household trash
10/2/2019	3.7	Debris Burning	Brush pile burning
10/4/2019	0.5	Debris Burning	Unsafe burning of household trash
10/10/2019	10.92	Equipment Use	Farm equipment (hay balers, tractors, etc.)
10/18/2019	7.5	Debris Burning	Brush pile burning
12/19/2019	0.25	Debris Burning	Brush pile burning
1/6/2020	2.25	Debris Burning	Brush pile burning
2/2/2020	14.3	Structure	Structure Exposure
5/19/2020	1.4	Debris Burning	Brush pile burning
6/9/2020	1.5	Debris Burning	Burning leaves and garden spots
7/9/2020	1	Debris Burning	Brush pile burning
7/23/2020	4	Debris Burning	Brush pile burning
7/23/2020	10	Debris Burning	Brush pile burning
8/16/2020	25.5	Debris Burning	Brush pile burning
9/12/2020	61	Debris Burning	Brush pile burning
9/12/2020	6	Unknown	Unknown
10/1/2020	4	Debris Burning	Brush pile burning
10/20/2020	37	Debris Burning	Brush pile burning
11/15/2020	151	Debris Burning	Brush pile burning
11/16/2020	2	Debris Burning	Burning leaves and garden spots
11/17/2020	6	Debris Burning	Burning leaves and garden spots
11/17/2020	7.5	Equipment Use	Logging equipment (skidders, trucks, chainsaws)
11/17/2020	1.2	Debris Burning	Unsafe burning of household trash
11/18/2020	13	Unknown	Unable to determine
11/19/2020	2	Miscellaneous	Other
11/22/2020	3.1	Campfire	Warming or cooking
12/24/2020	1.25	Debris Burning	Trash dumps
1/4/2021	8	Debris Burning	Brush pile burning
1/16/2021	1.2	Debris Burning	Brush pile burning
2/1/2021	4.5	Equipment Use	Bush hogs, lawnmowers, weed eaters, etc.
2/2/2021	5	Debris Burning	Brush pile burning
3/5/2021	3.6	Debris Burning	Pasture and field burning (including grass, and crop residues)
3/6/2021	1.5	Debris Burning	Brush pile burning
8/22/2021	5	Debris Burning	Brush pile burning
8/26/2021	54	Lightning	Origin traceable to lightning
9/26/2021	5.6	Debris Burning	Brush pile burning

Figure 6.3.9: Fire Ignition Points (2000-2023), Walker 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.[59]

Figure 6.3.10: Wildfire Ignition Density, Walker County



Presidential Disaster Declarations

There have been 7 disaster declarations for fire/wildfire within Walker County, since 1953, as depicted in the table below.[1]

Table 6.3.8: Disaster Declarations, Wildfire

Declaration Date	Incident Type	Title	Disaster Number	Declaration Type
2/23/1996	Fire	EXTREME FIRE HAZARD	3117	Emergency Declaration
9/1/1999	Fire	EXTREME FIRE HAZARDS	3142	Emergency Declaration
1/11/2006	Fire	EXTREME WILDFIRE THREAT	1624	Major Disaster Declaration
3/14/2008	Fire	WILDFIRES	3284	Emergency Declaration
6/20/2011	Fire	COWBOY CHURCH FIRE	2929	Fire Management Assistance Declaration
7/1/2011	Fire	WILDFIRES	1999	Major Disaster Declaration
9/9/2011	Fire	WILDFIRES	4029	Major Disaster Declaration

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 Walker County since the last HMP are listed in the table below.[39]

Table 6.3.9: 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 21.4 events per year over a 22-year period of record for Walker County (2000-2021), while annualized frequency values for wildfires is 0.193% 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.[44]

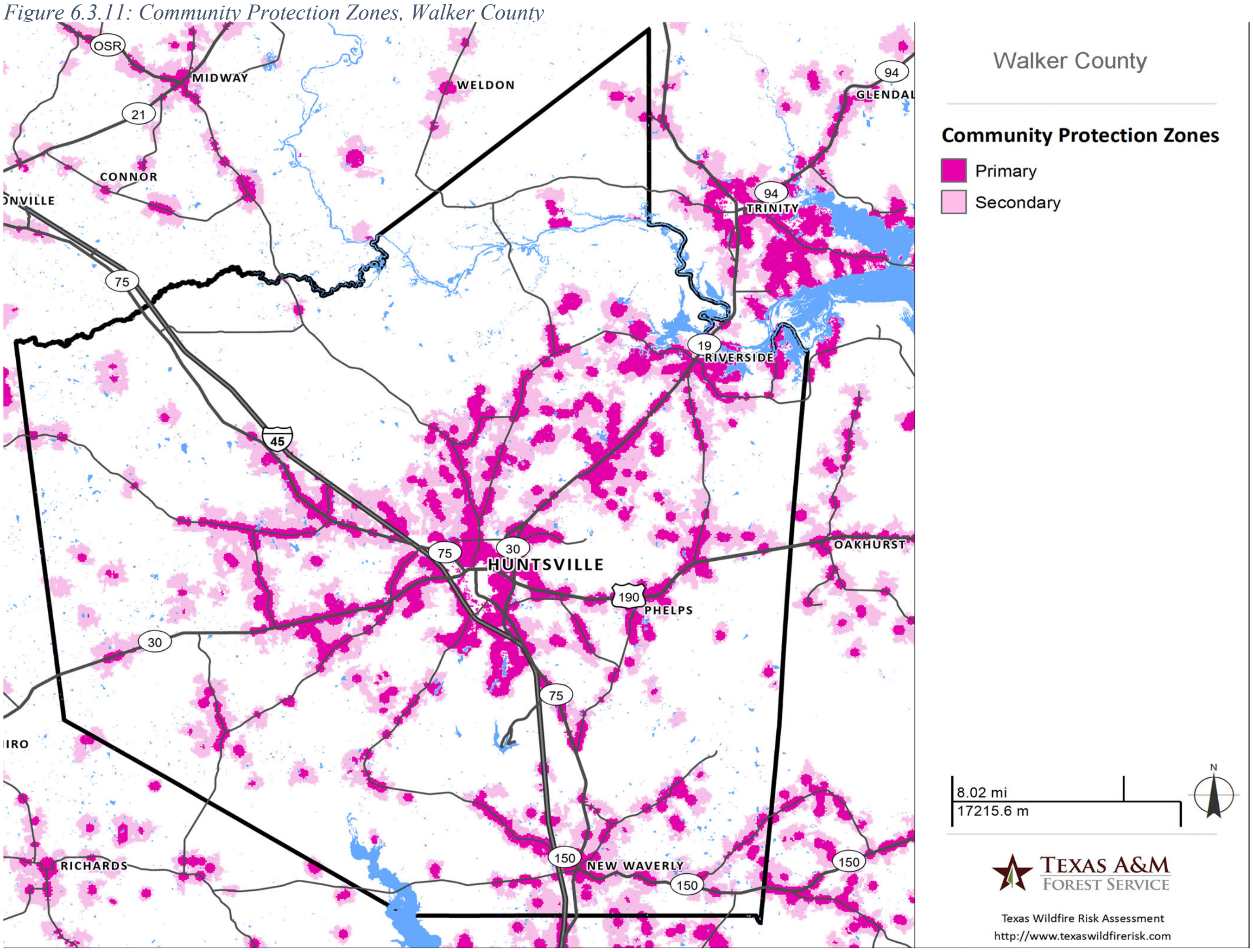
Populations at Risk

The TFS outlines Community Protection Zones (CPZ), areas that are outlined as primary and secondary and should be the highest priority for mitigation planning activities. CPZs are based on where population and housing density is highest using data regarding surrounding fire potential and fire behavior. Per the TFS "General consensus among fire planners is that for fuel mitigation treatments to be effective in reducing wildfire hazard, they must be conducted within a close distance of a community. In Texas, the WUI housing density has been used to reflect populated areas in place of community boundaries. This ensures that CPZs reflect where people are living in the wildland, not jurisdictional boundaries." The table and figure below outline these primary and secondary CPZs and their acreage within the county.

Table 6.3.10: Community Protection Zones, Walker County

	Class	Acres	Percent
	Primary	55,998	40.7 %
	Secondary	81,750	59.3 %
	Total	**137,748**	**100.0 %**

Figure 6.3.11: Community Protection Zones, Walker County



Wildfires negatively impact air quality impacting the surrounding areas and areas further away depending on how wind direction and the fire intensity distribute the smoke. This smoke exposure can put certain vulnerable populations at greater risk of adverse effects from this hazard event. According to the Environmental Protection Agency, these vulnerable populations include People with asthma and other respiratory diseases, people with cardiovascular disease, children (18 years of age or younger), pregnant people older adults, people of low socio-economic status, and outdoor workers. Underlying respiratory diseases result in compromised health status that can result in the triggering of severe respiratory responses by environmental irritants, such as wildfire smoke. Underlying circulatory diseases result in compromised health status that can result in the triggering of severe cardiovascular events by environmental irritants, such as wildfire smoke. In younger populations, children's lungs are still developing, and there is a greater likelihood of increased exposure to wildfire smoke resulting from more time spent outdoors, engagement in more vigorous activity, and inhalation of more air per pound of body weight compared to adults. Pregnancy-related physiologic changes (e.g., increased breathing rates) may increase vulnerability to environmental exposures, such as wildfire smoke. In addition, during critical development periods, the fetus may experience increased vulnerability to these exposures. In older populations, there is a higher prevalence of pre-existing lung and heart disease and a decline of physiologic processes, such as defense mechanisms. This can lead to exacerbation of heart and lung diseases and can lead to emergency department visits, hospital admissions, and even death. Those of low socioeconomic status are vulnerable to these types of hazards as they have less access to health care which could lead to a higher likelihood of untreated or insufficient treatment of underlying health conditions (asthma, diabetes), and greater exposure to wildfire smoke resulting from less access to measures to reduce exposure such as air conditioning. Outdoor workers can be more vulnerable to this hazard due to increased exposure to smoke.[60]

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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.[50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below.

Table 6.3.11: Expected Annual Loss Exposure Values, Wildfire

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Wildfire	$1,061,315,798	$120,085,227,777 / 10,352.17	$5,253,795	$121,151,797,370

Table 6.3.12: Expected Annual Loss Values, Wildfire

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Wildfire	$660,583	$119,965 / 0.01	$320

N/A- Not Applicable

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102.

Risk Index Ratings, according to the FEMA NRI for wildfires for these census tracts are listed as relatively moderate for 6 census tracts, relatively low for 4 census tracts, and 2 census tracts rating relatively high.[47] EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence. For wildfires within Walker County HLR is very low.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.3.12: Risk Index, Walker County, Wildfire

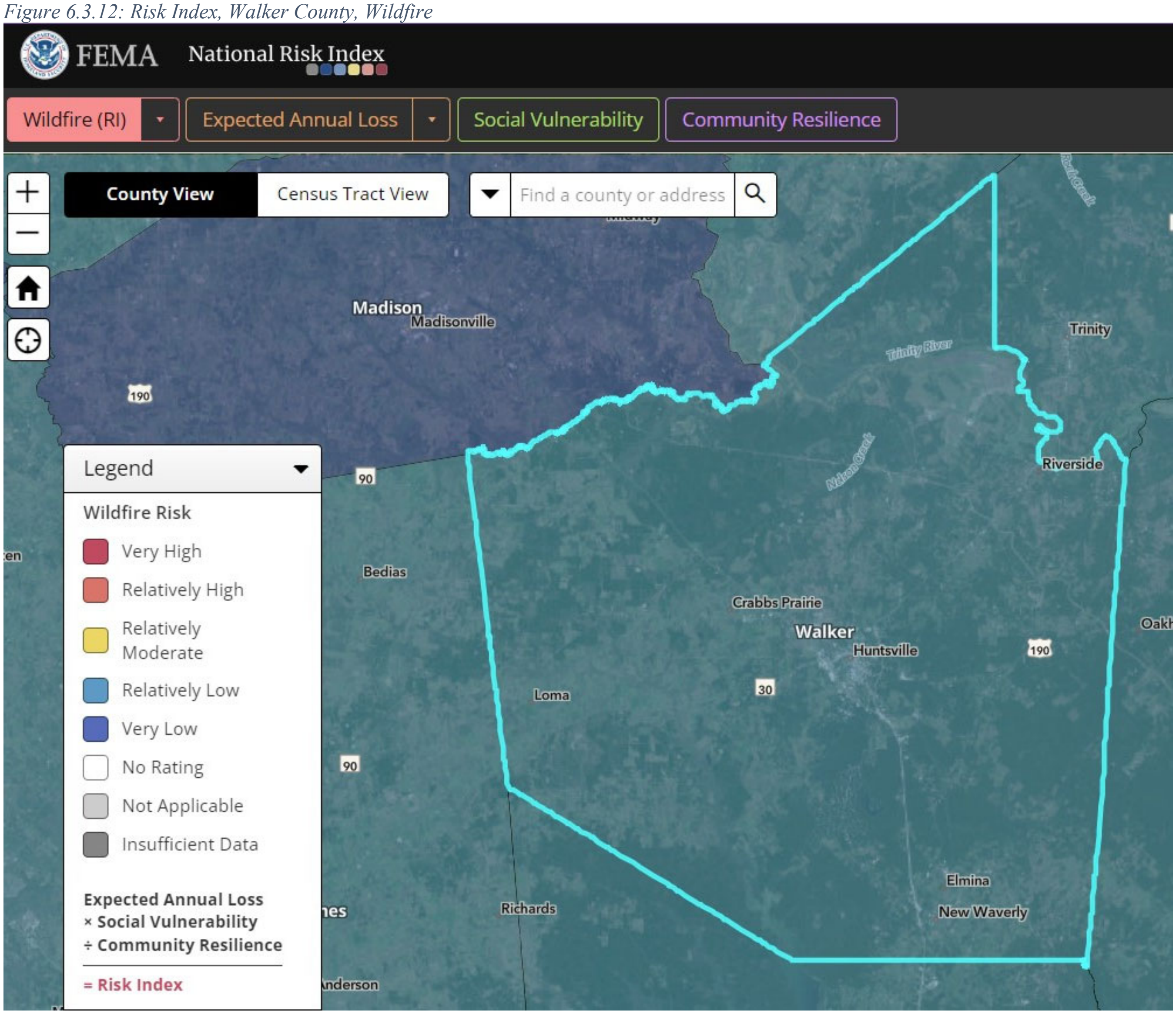


Figure 6.3.13: Risk Index by Census Tract, Walker County, Wildfire

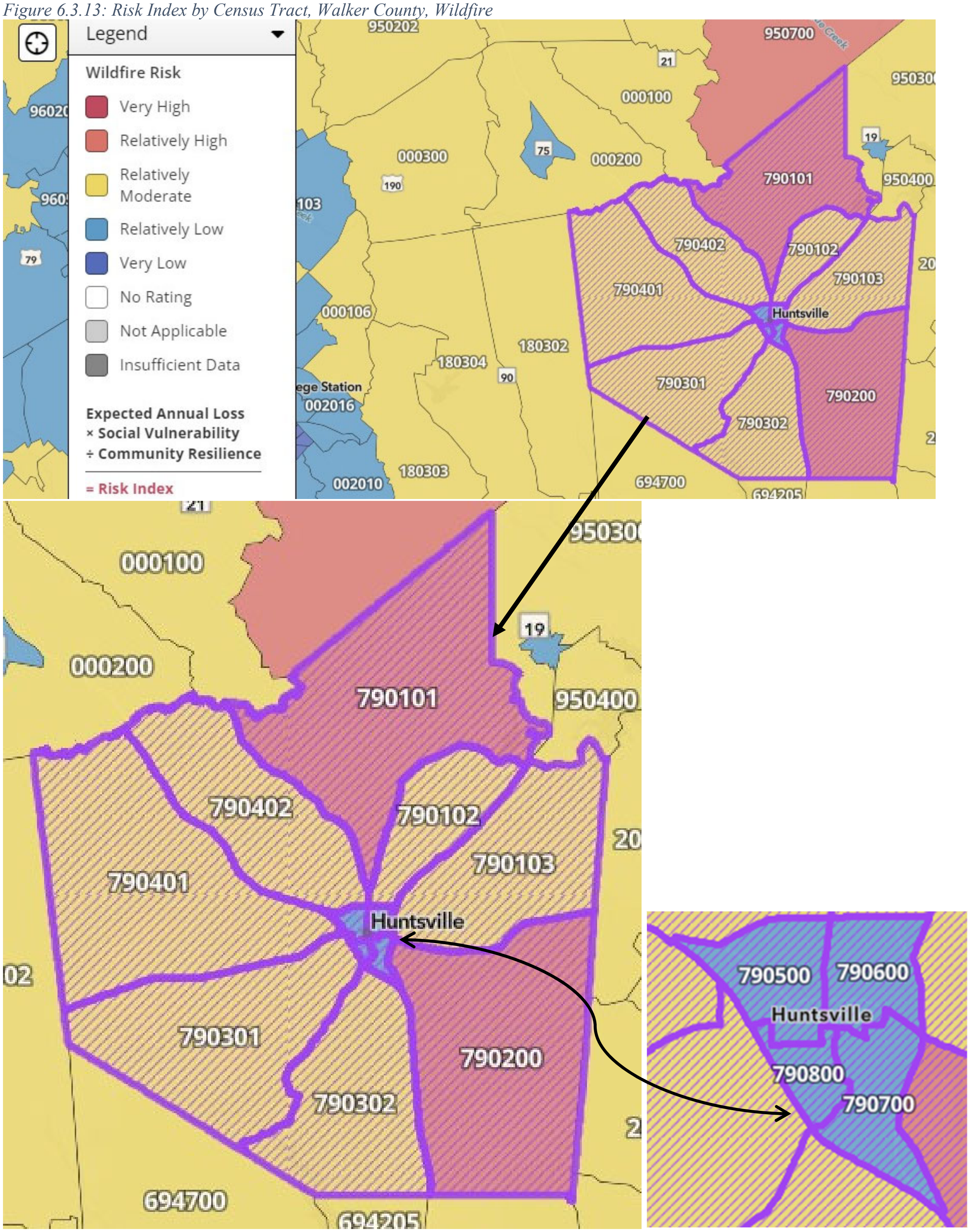


Figure 6.3.14: Social Vulnerability by Census Tract, Walker County

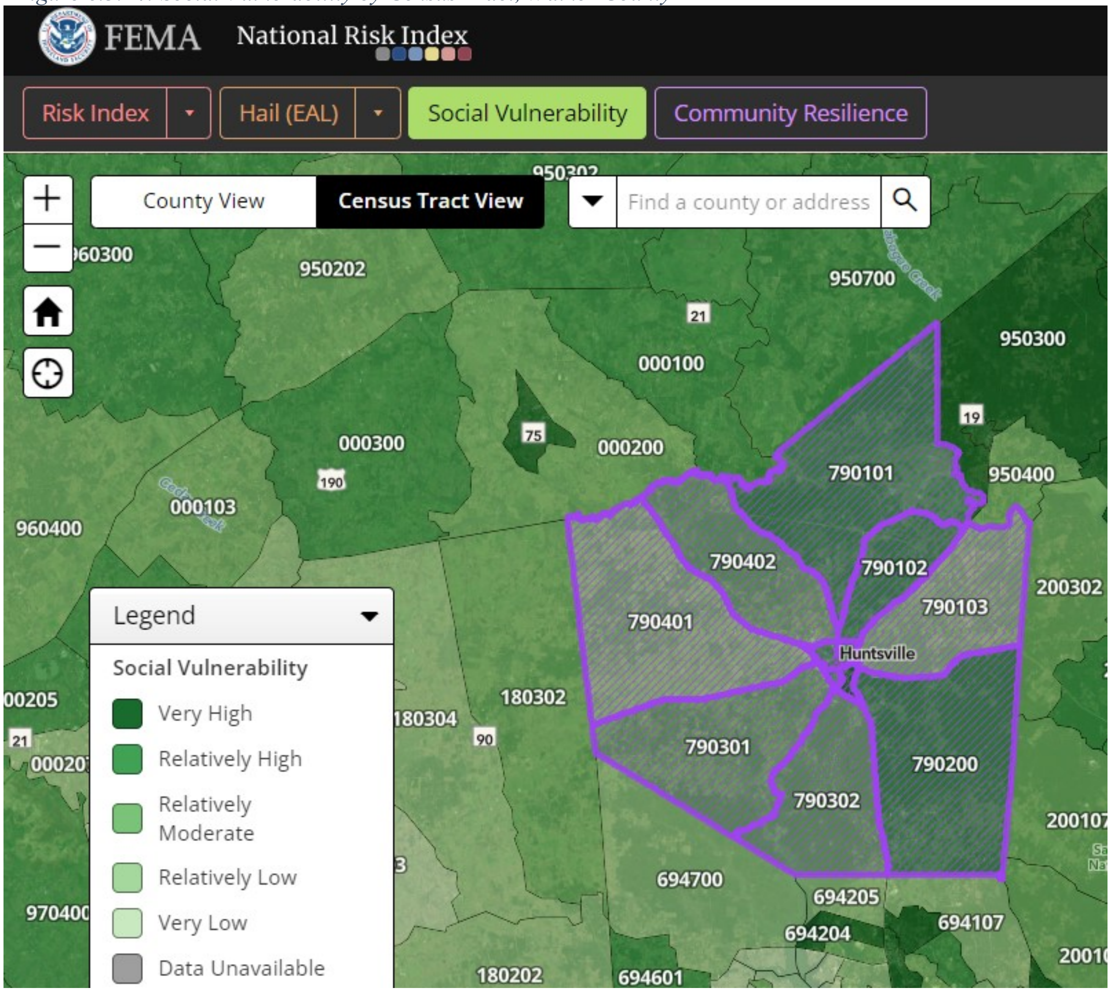


Figure 6.3.15: Social Vulnerability, Walker County

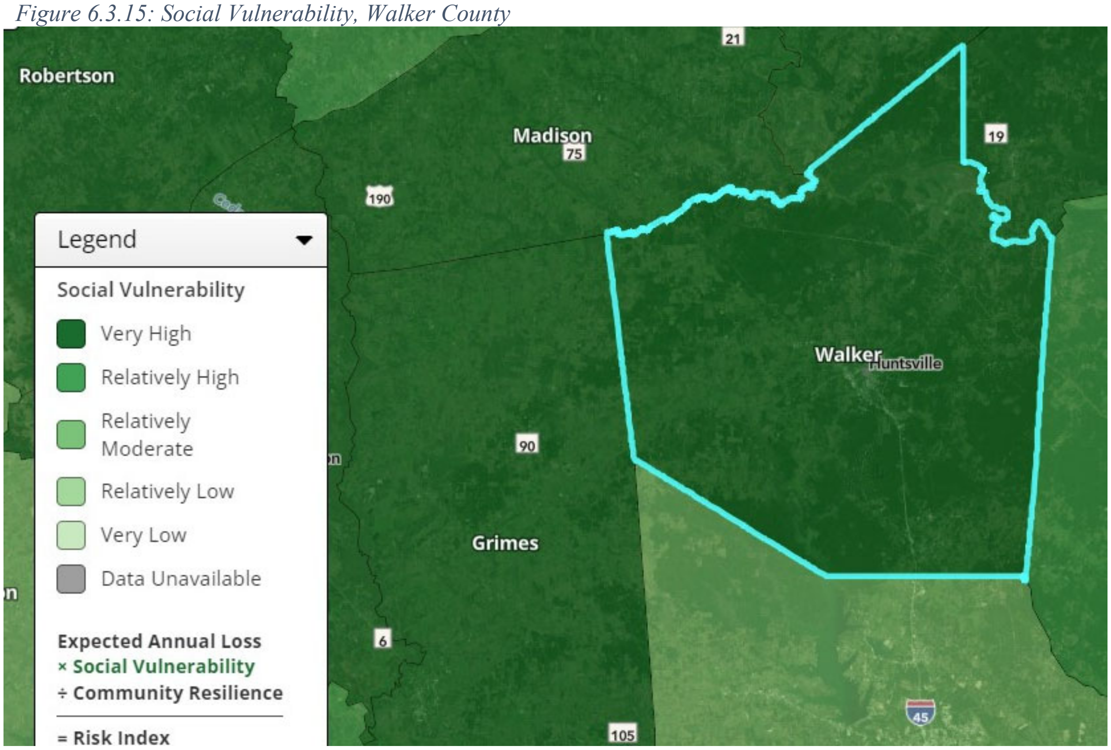


Figure 6.3.16: Community Resilience by Census Tract, Walker County

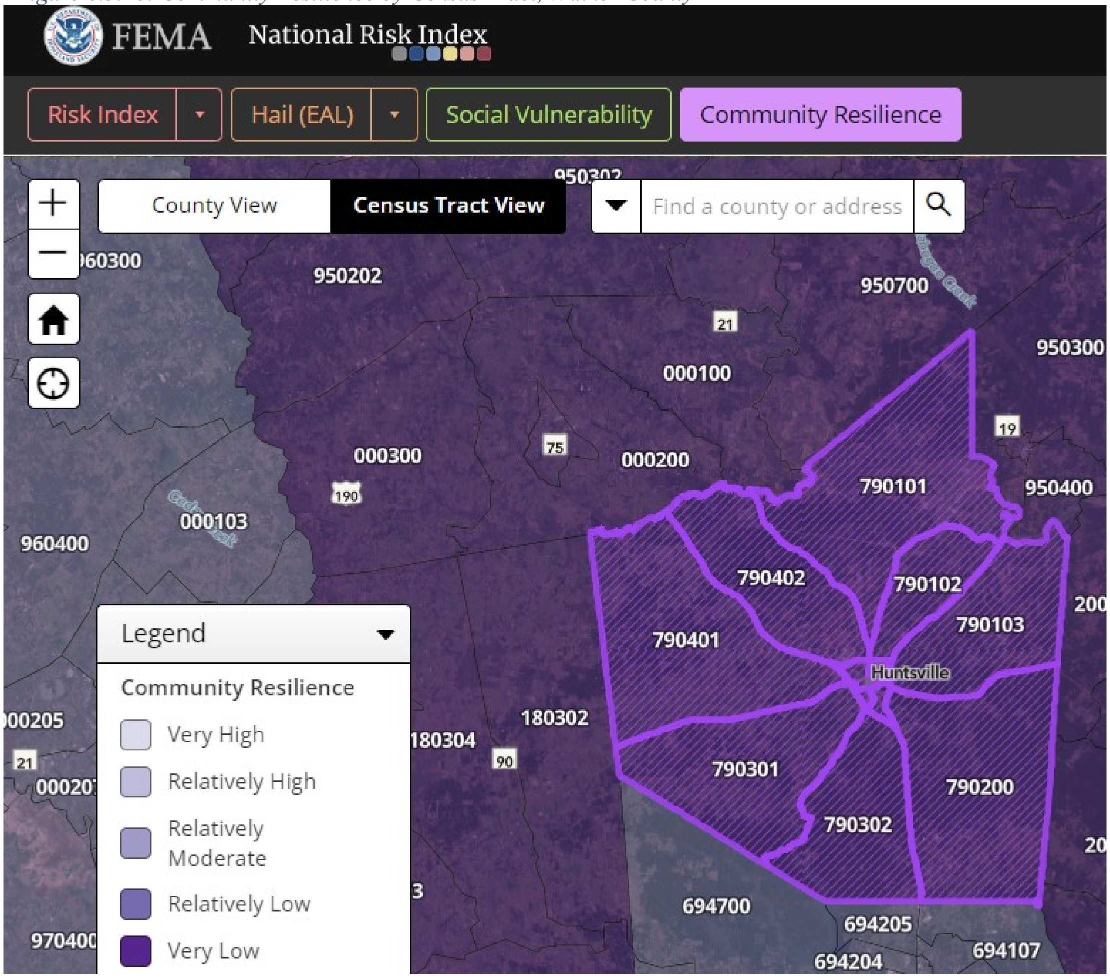


Figure 6.3.17: Community Resilience, Walker County

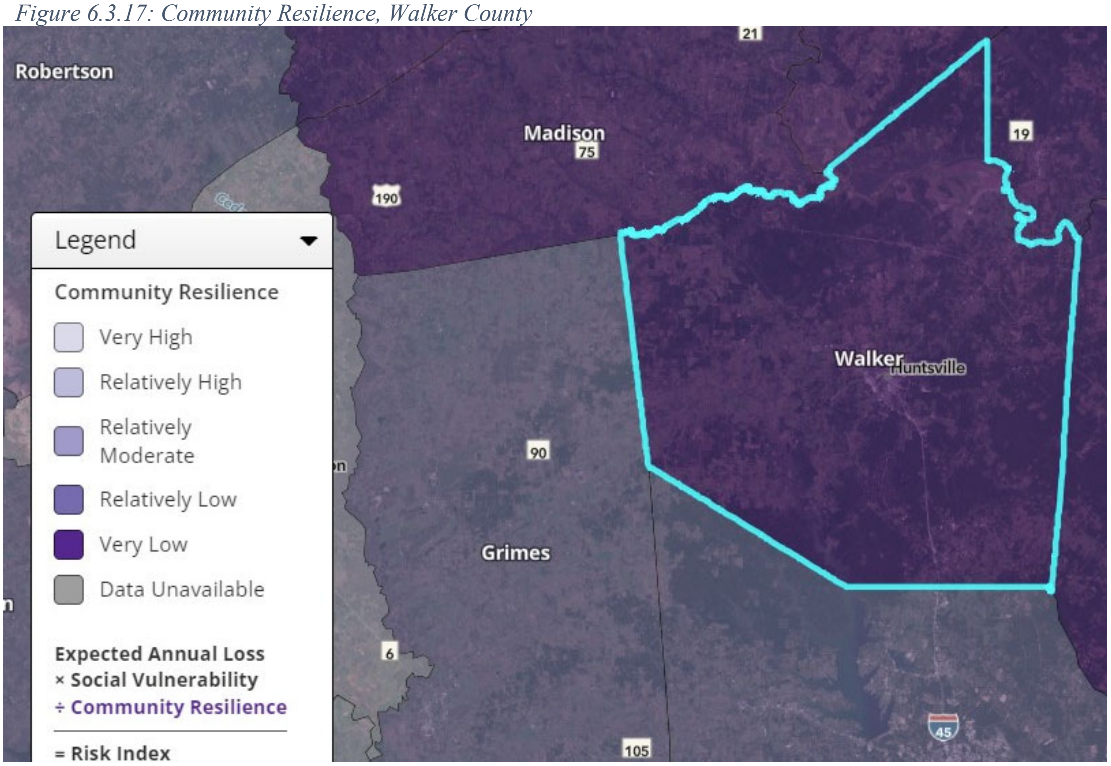


Figure 6.3.18: FEMA NRI Summary by Census Tract, Walker County, Wildfire

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790200	TX	Relatively High	96.79	0 100
2	Census tract 48471790101	TX	Relatively High	96.52	0 100
3	Census tract 48471790401	TX	Relatively Moderate	94.6	0 100
4	Census tract 48471790102	TX	Relatively Moderate	93.23	0 100
5	Census tract 48471790402	TX	Relatively Moderate	92.89	0 100
6	Census tract 48471790301	TX	Relatively Moderate	92.75	0 100
7	Census tract 48471790103	TX	Relatively Moderate	91.83	0 100
8	Census tract 48471790302	TX	Relatively Moderate	90.05	0 100
9	Census tract 48471790800	TX	Relatively Low	80.27	0 100
10	Census tract 48471790500	TX	Relatively Low	76.66	0 100
11	Census tract 48471790700	TX	Relatively Low	75.81	0 100
12	Census tract 48471790600	TX	Relatively Low	64.36	0 100

Figure 6.3.19: FEMA NRI EAL Summary by Census Tract, Walker County, Wildfire

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790200	TX	$180,632	Relatively High	Very Low	1.48	$268,133	96.79
2	Census tract 48471790101	TX	$179,413	Relatively High	Very Low	1.35	$241,542	96.52
3	Census tract 48471790401	TX	$119,216	Relatively Low	Very Low	1.06	$125,888	94.6
4	Census tract 48471790102	TX	$63,278	Relatively High	Very Low	1.34	$84,501	93.23
5	Census tract 48471790402	TX	$71,948	Relatively Moderate	Very Low	1.07	$77,190	92.89
6	Census tract 48471790301	TX	$66,129	Relatively Moderate	Very Low	1.12	$74,202	92.75
7	Census tract 48471790103	TX	$60,523	Relatively Low	Very Low	0.98	$59,012	91.83
8	Census tract 48471790302	TX	$32,673	Relatively Moderate	Very Low	1.16	$38,038	90.05
9	Census tract 48471790800	TX	$3,277	Relatively High	Very Low	1.44	$4,712	80.27
10	Census tract 48471790500	TX	$1,758	Relatively High	Very Low	1.49	$2,623	76.66
11	Census tract 48471790700	TX	$1,496	Very High	Very Low	1.59	$2,376	75.81
12	Census tract 48471790600	TX	$524	Very High	Very Low	1.82	$957	64.36

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.[61] 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.[49]

Table 6.3.13: 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 6.4: Tornado

6.4 Tornado

A Tornado is defined by the NWS as “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.[33]

Location

Tornadoes 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 months of April, May, and June, with almost one-third of the total tornadoes occurring in May.[63] The State of Texas has the highest average annual number of tornadoes per state, with an average of 136 tornadoes per year over 30 years, as seen in Figure 6.4.1.[64] Figure 6.4.2 depicts Walker County’s total number of tornadoes per year between 1-20 instances.[65]

Figure 6.4.1: Annual Tornadoes per State, 1993-2022

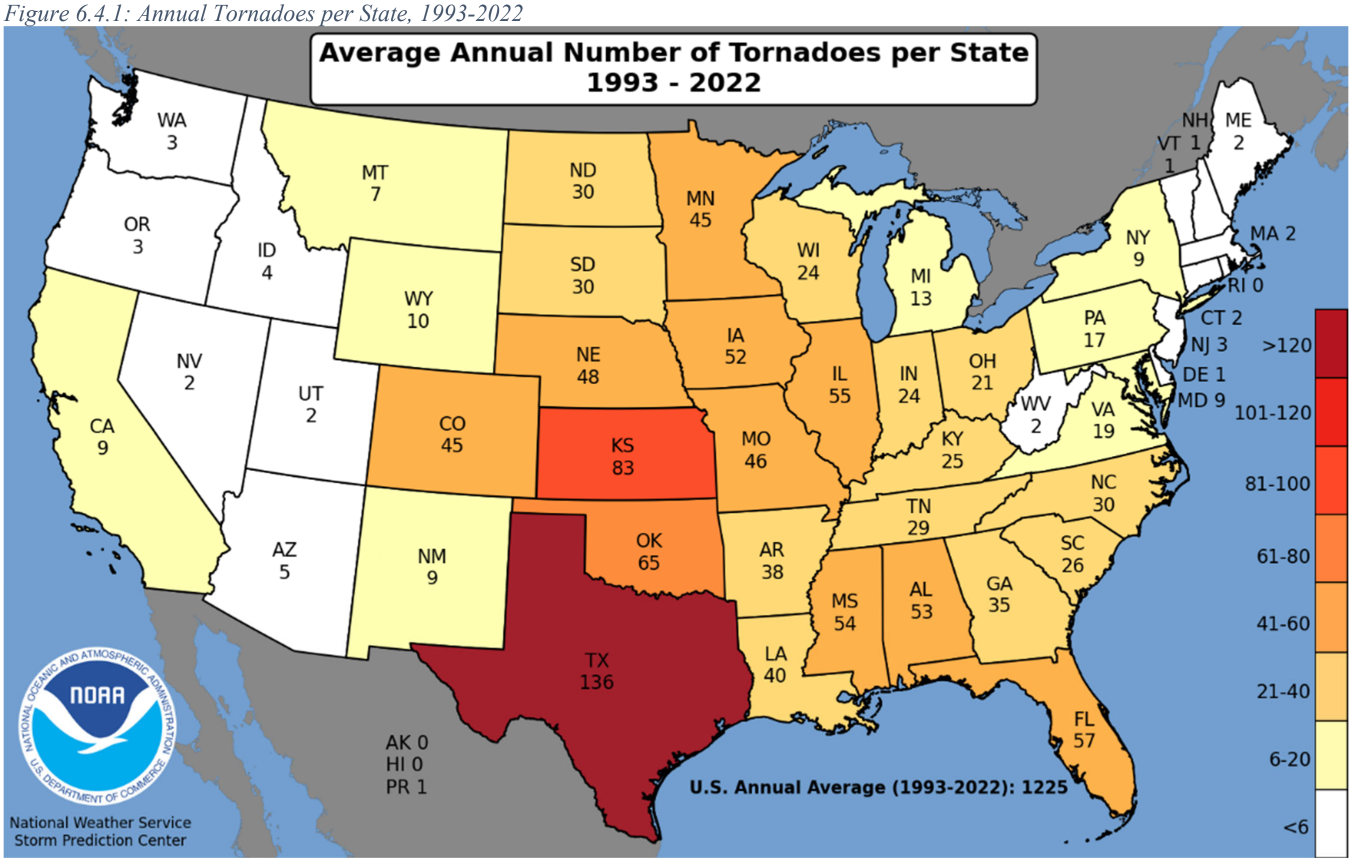
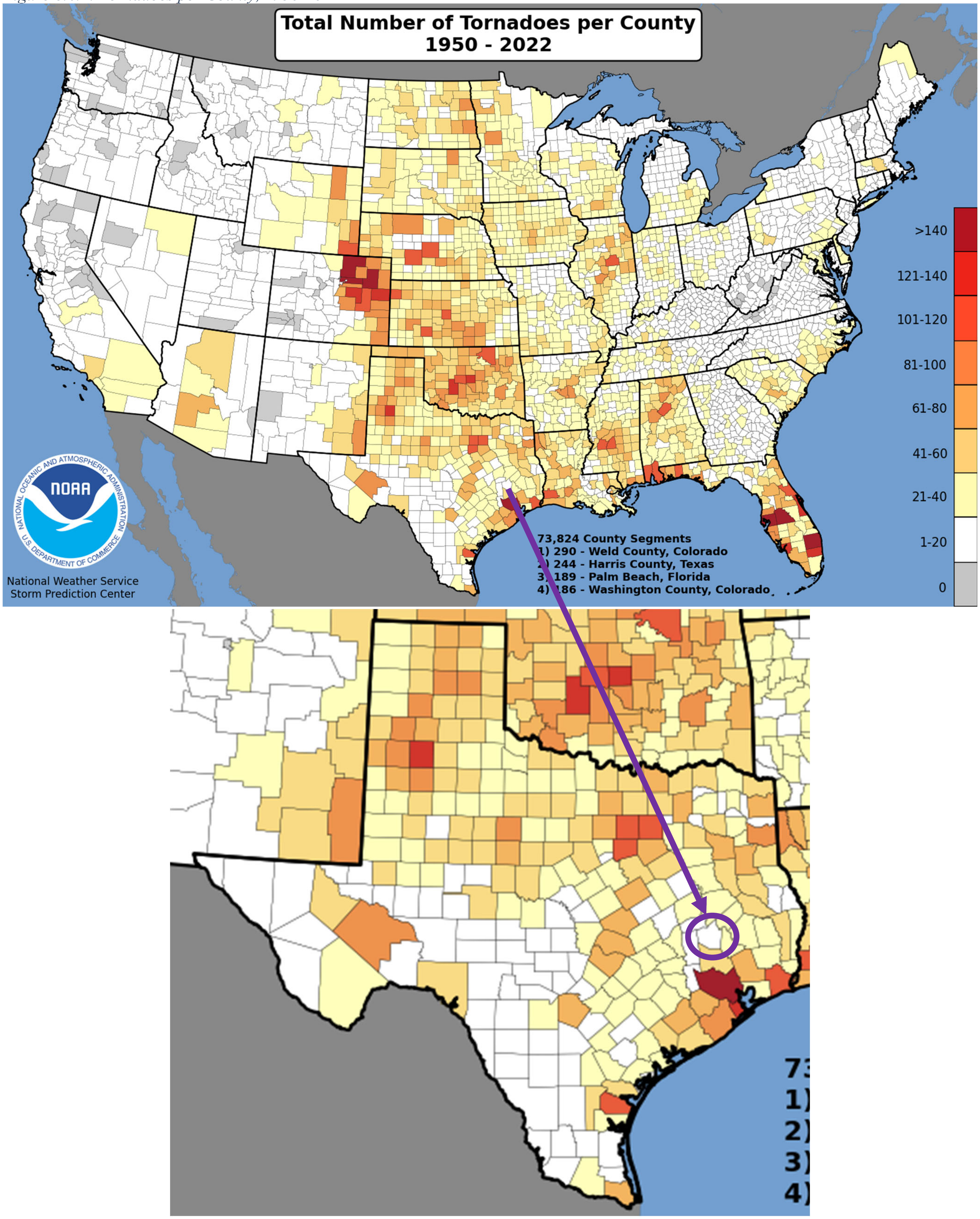


Figure 6.4.2: Tornadoes per County, 1950-2022



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.[66]

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

Number (Details Linked)	Damage indicator	Abbreviation
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

For this hazard, a worst-case scenario within Walker County would be an EF-3 or stronger tornado crossing through the county. This would be a severe event with buildings and homes damaged, vehicles becoming airborne, downed trees and power lines, debris on roadways, and critical facilities damaged or experiencing a service disruption to residents due to damages or lack of power. This scenario is based on previous occurrences of tornadoes and high winds that have occurred within the county, with the strongest tornado occurrence being an EF-2 that crossed through areas of the county within proximity to the City of Riverside (see Figure 6.4.3 below). Additionally, this hazard could damage critical infrastructure that leads to a prolonged power outage and even result in a loss of communication within the county if a radio or cell tower is destroyed. If the storm event occurs during a heat event or drought and disrupts power supply in the area for a prolonged amount of time, secondary hazards will pose increased risks to citizens due to the heat and the inability to keep homes and buildings cool. This scenario is similar to what occurred within the region during the 2024 derecho and Hurricane Beryl. Power lines were destroyed by debris and falling trees due to severe thunderstorms, tornadoes, and high winds when the region was under an excessive heat advisory. Power line restoration/repairs took longer to address than anticipated leading to the activation of cooling centers for residents.

Historic Occurrences

There have been 18 tornadoes, and 4 funnel cloud sightings within Walker County since 1950. Figure 6.4.3 below depicts historic tornado occurrences and their tracks within Walker County and participating jurisdictions, while the table below lists tornado and funnel cloud occurrences since 2018.

Figure 6.4.3: Tornado Paths, Walker County

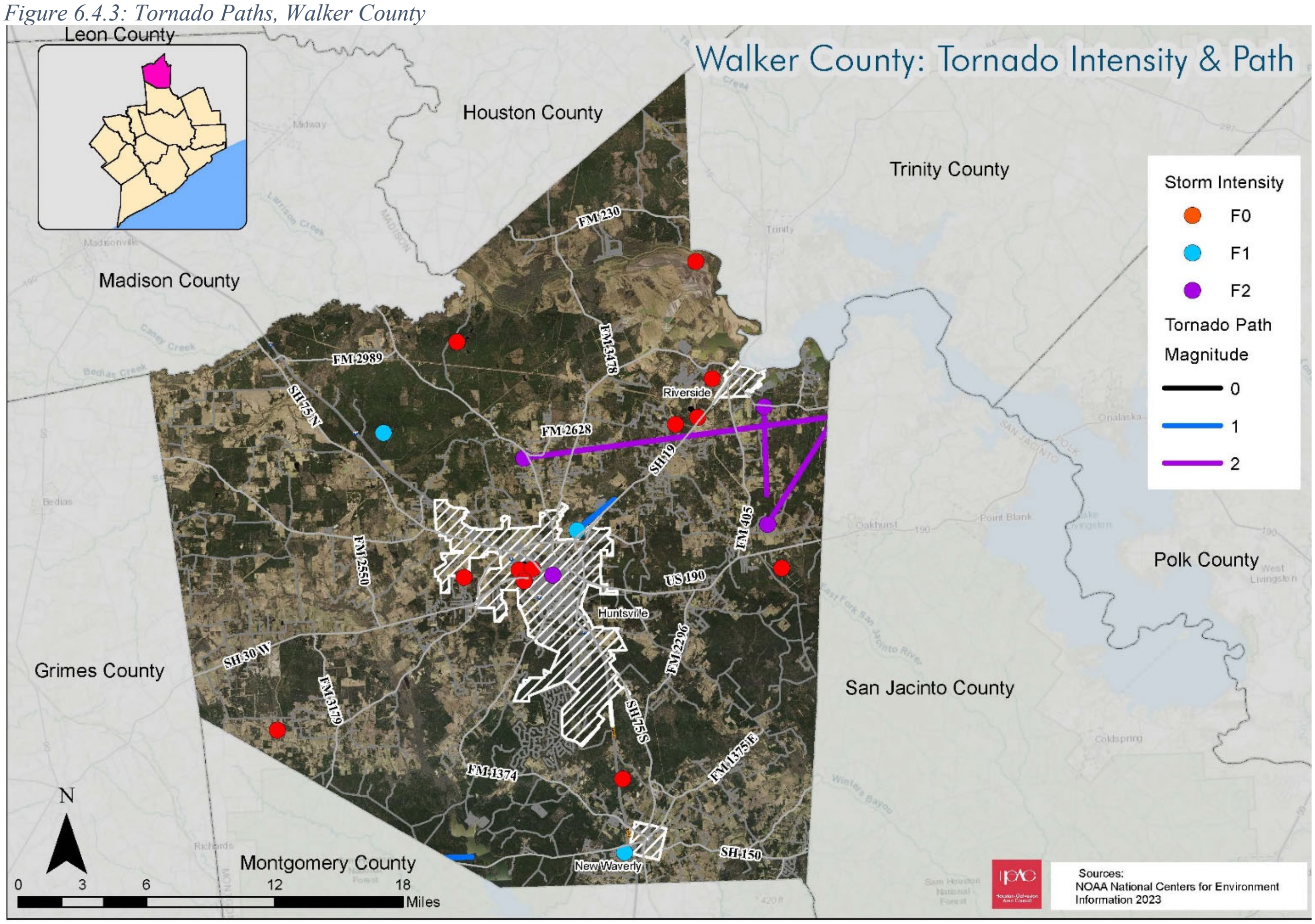


Table 6.4.3: Tornado Occurrences, Walker County

Date	Event Type	Event Rating	Location	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
3/31/1957	Tornado	F2	ND	2	0	$25,000	$-
10/16/1971	Tornado	F0	ND	0	0	$2,500	$-
6/4/1973	Tornado	F2	ND	0	1	$250,000	$-
2/10/1981	Tornado	F2	ND	8	0	$250,000	$-
2/9/1983	Tornado	F1	ND	0	0	$250,000	$-
2/9/1983	Tornado	F0	ND	0	0	$250,000	$-
5/13/1994	Tornado	F0	ND	0	0	$-	$-
10/23/1997	Tornado	F1	HUNTSVILLE	0	0	$150,000	$-
1/21/1998	Tornado	F1	NEW WAVERLY	0	0	$200,000	$200,000
1/1/1999	Tornado	F1	HUNTSVILLE	7	0	$125,000	$-
1/1/1999	Tornado	F0	RIVERSIDE	1	0	$10,000	$-
1/1/1999	Tornado	F0	HUNTSVILLE	0	0	$15,000	$-
4/3/1999	Tornado	F0	NEW WAVERLY	0	0	$25,000	$-
5/14/2008	Funnel Cloud	ND	NEW WAVERLY	0	0	$-	$-
6/20/2008	Tornado	EF0	LOMA	0	0	$-	$-
3/25/2009	Funnel Cloud	ND	PHELPS	0	0	$-	$-
1/25/2012	Tornado	EF0	HUNTSVILLE ARPT	0	0	$50,000	$-
1/25/2012	Tornado	EF0	HUNTSVILLE	0	0	$30,000	$30,000

Date	Event Type	Event Rating	Location	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
6/9/2014	Funnel Cloud	ND	HUNTSVILLE	0	0	$-	$-
4/2/2017	Tornado	EF0	COUNTRY CAMPUS	0	0	$15,000	$-
4/22/2020	Funnel Cloud	ND	KITTRELL	0	0	$-	$-
5/10/2021	Tornado	EF0	HUNTSVILLE	0	0	$30,000	$-

ND- No Data
$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been 0 disaster declarations for tornadoes, however, 9 disaster designations have included tornado in the declaration title for Walker County. The declaration incident type for these events is listed as flood and severe storms.[2]

Table 6.4.4: Federal Disaster Declarations, Tornado

Declaration Year	Incident Type	Incident Title	Disaster Number	Declaration Type
1989	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING	828	Major Disaster Declaration
1990	Severe Storm	SEVERE STORMS, TORNADOES & FLOODING	863	Major Disaster Declaration
2003	Severe Storm	SEVERE STORMS, TORNADOES AND FLOODING	1439	Major Disaster Declaration
2007	Severe Storm	SEVERE STORMS, TORNADOES, AND FLOODING	1709	Major Disaster Declaration
2015	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS AND FLOODING	4223	Major Disaster Declaration
2016	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	4245	Major Disaster Declaration
2016	Severe Storm	SEVERE WINTER STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	4255	Major Disaster Declaration
2016	Flood	SEVERE STORMS, TORNADOES, AND FLOODING	4266	Major Disaster Declaration
2024	Severe Storm	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	4781	Major Disaster Declaration

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 Walker County since the last HMP are listed in the table below.[39]

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

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. Along the Gulf Coast and surrounding region, it is earlier in the spring.[67] According to the FEMA NRI for tornadoes within Walker County, annualized frequency values are 0.5 events per year over 72 years of record (1950-2021), with 16 events on record for this timeframe.[44]

Populations at Risk

All residents within the county are exposed to this hazard. The impacts of a tornado on the life, health, and safety of Walker County residents depend on several factors, including the severity of the event and adequate warning time being provided to residents to take shelter. Tornadoes can lead to a disruption in emergency response services, shelters, electricity, clean water, and other forms of necessary medical assistance while repairs are made to critical facilities or power is being restored within the county.

The NCHH summarizes at-risk populations for several hazards. These include older adults, people experiencing homelessness, people with disabilities, and people with chronic health conditions. In addition to the dangers listed above, older adults can face social isolation, lack of electricity needed to run medical equipment, lack of access to a vehicle for evacuation, and lack of access to other critical supplies. Evacuation for these events is fast-paced, and older adults may not be able to seek adequate shelter before a tornado impacts their area. For people experiencing homelessness, adequate shelter is critical in keeping populations safe during a tornado. People with disabilities may require additional assistance to stay safe and prepare for these hazards and their after-effects such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. Likewise, those with chronic health conditions may need similar assistance as those with disabilities. 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 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. These issues disproportionately affect low-income communities and families who may lack the resources to pay for damages to their homes, lack insurance, or lack the resources to replace home contents or personal belongings.[49]

As the county continues to expand in both population and development, areas of future growth could increase the vulnerability of the county and its residents to this hazard. Those living in mobile/manufactured housing are also at greater risk from this hazard as even anchored mobile homes can be seriously damaged or destroyed when winds gust over 80 mph.[56]

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below.

Table 6.4.6: Expected Annual Loss Exposure Values, Tornado

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Tornado	$10,148,163,352	$885,068,400,000/ 76,299.00	$38,738,889	$895,255,302,241

Table 6.4.7: Expected Annual Loss Values, Tornado

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Tornado	$1,110,033	$4,413,051/ 0.38	$909

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102. Risk Index Ratings according to the FEMA NRI for tornadoes within these census tracts are listed as very high for 8 census tracts and relatively high for the remaining 4 census tracts.[47] EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence, for tornadoes within Walker County the HLR is relatively moderate.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.4.4: Risk Index, Walker County, Tornado

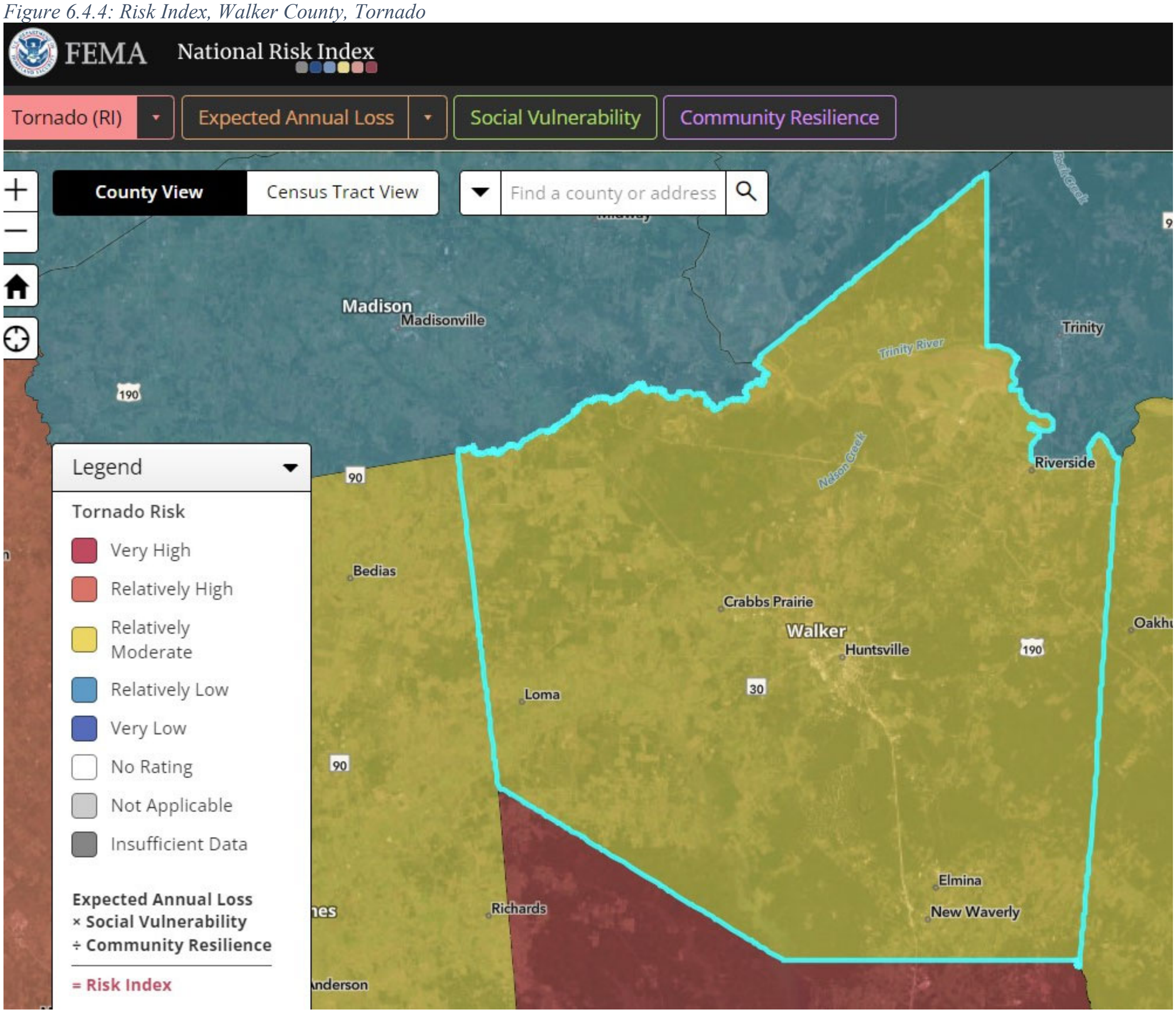


Figure 6.4.5: Risk Index by Census Tract, Walker County, Tornado

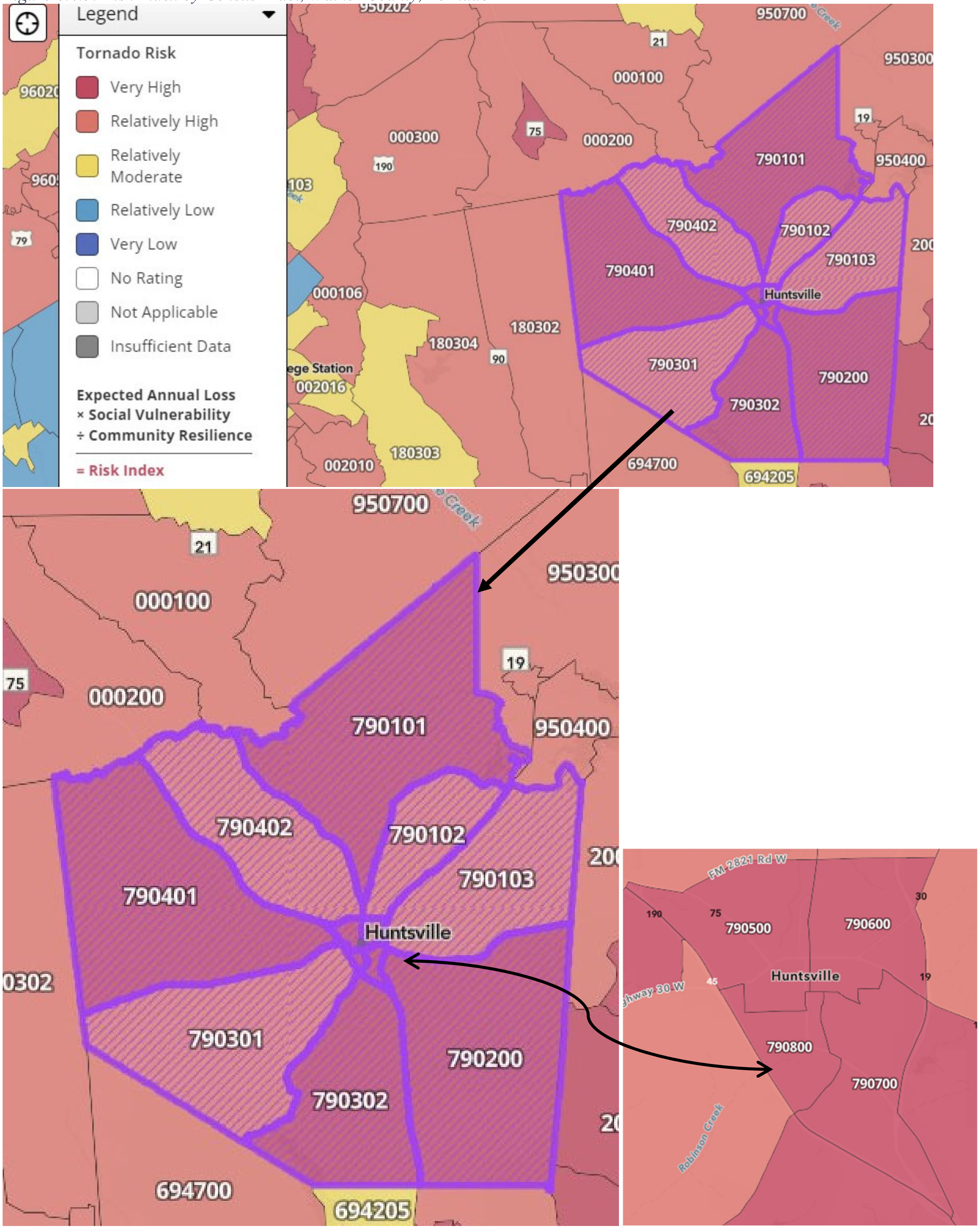


Figure 6.4.6: Social Vulnerability by Census Tract, Walker County

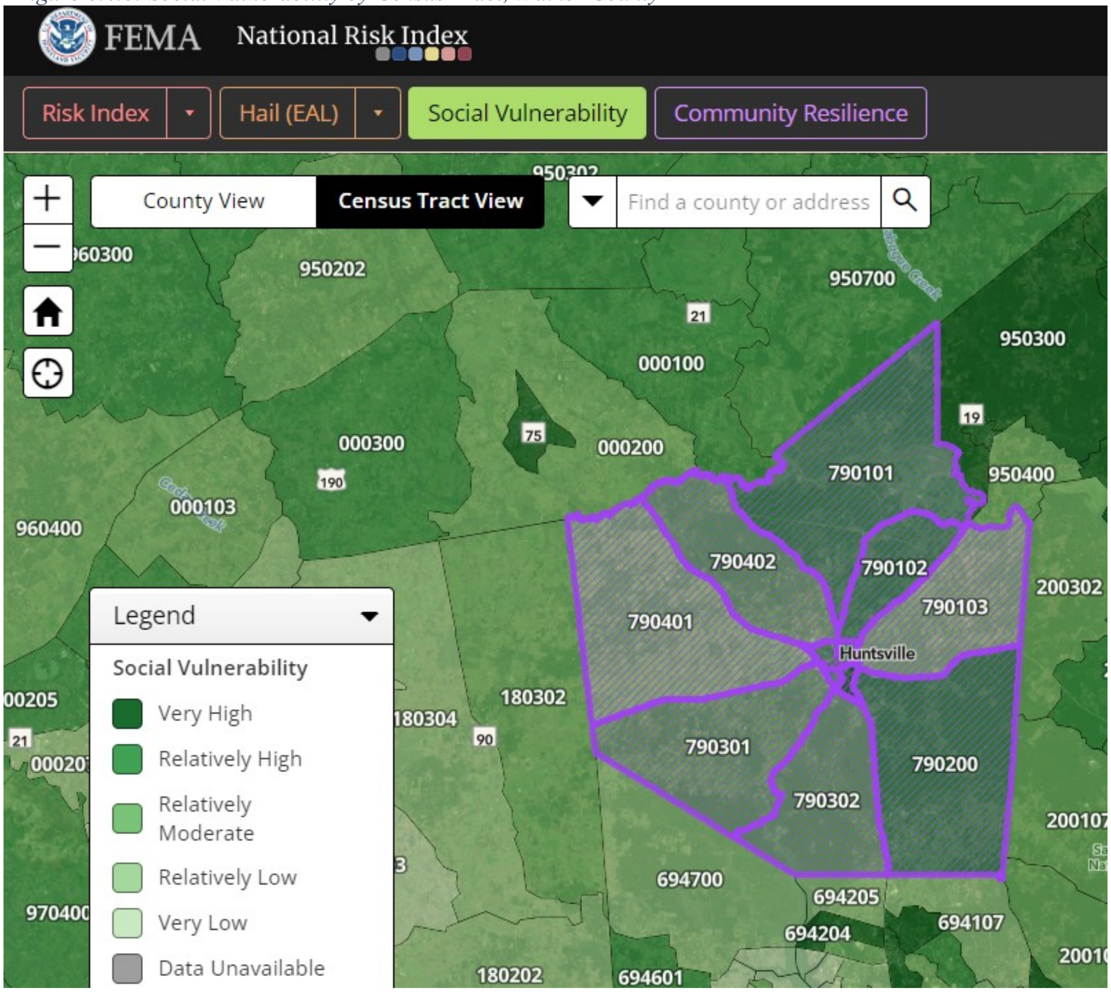


Figure 6.4.7: Social Vulnerability, Walker County

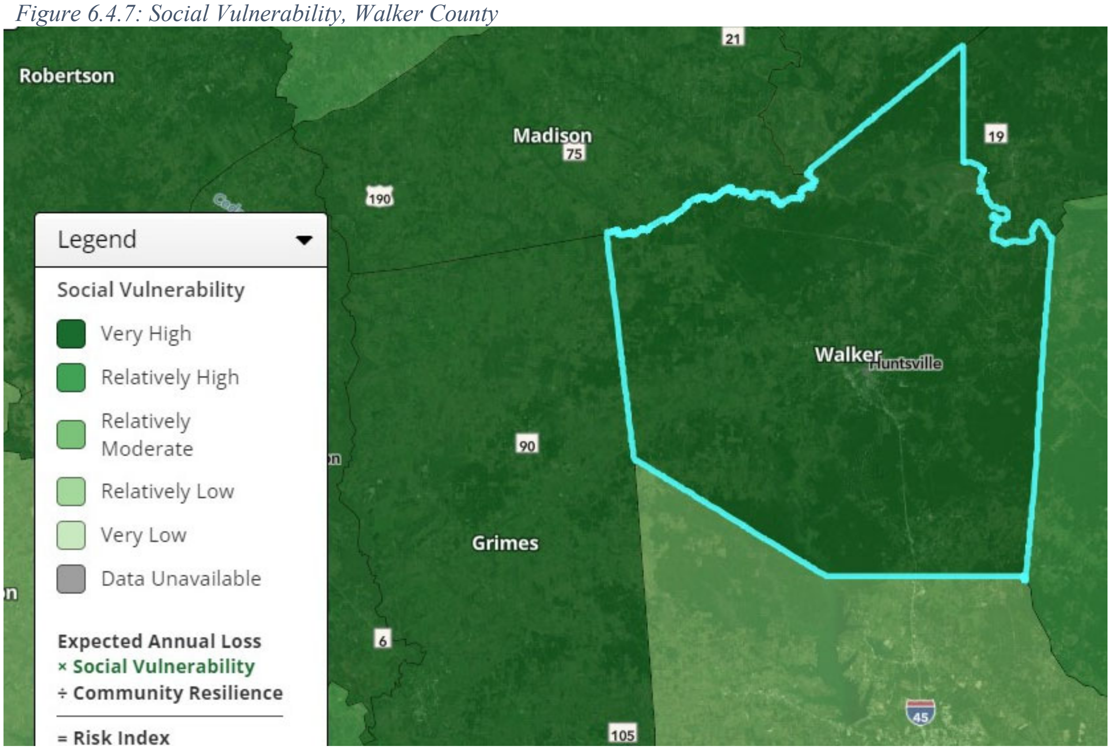


Figure 6.4.8: Community Resilience by Census Tract, Walker County

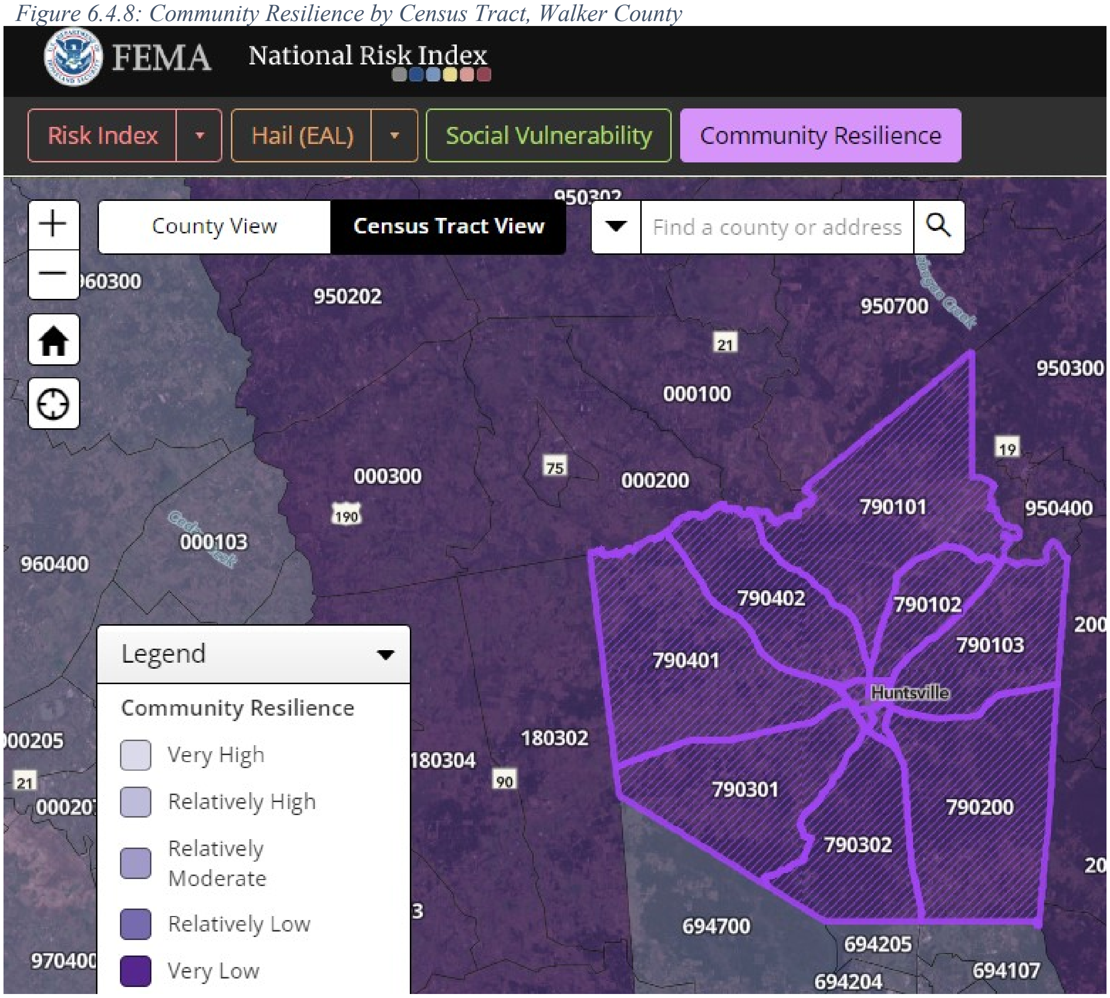


Figure 6.4.9: Community Resilience, Walker County

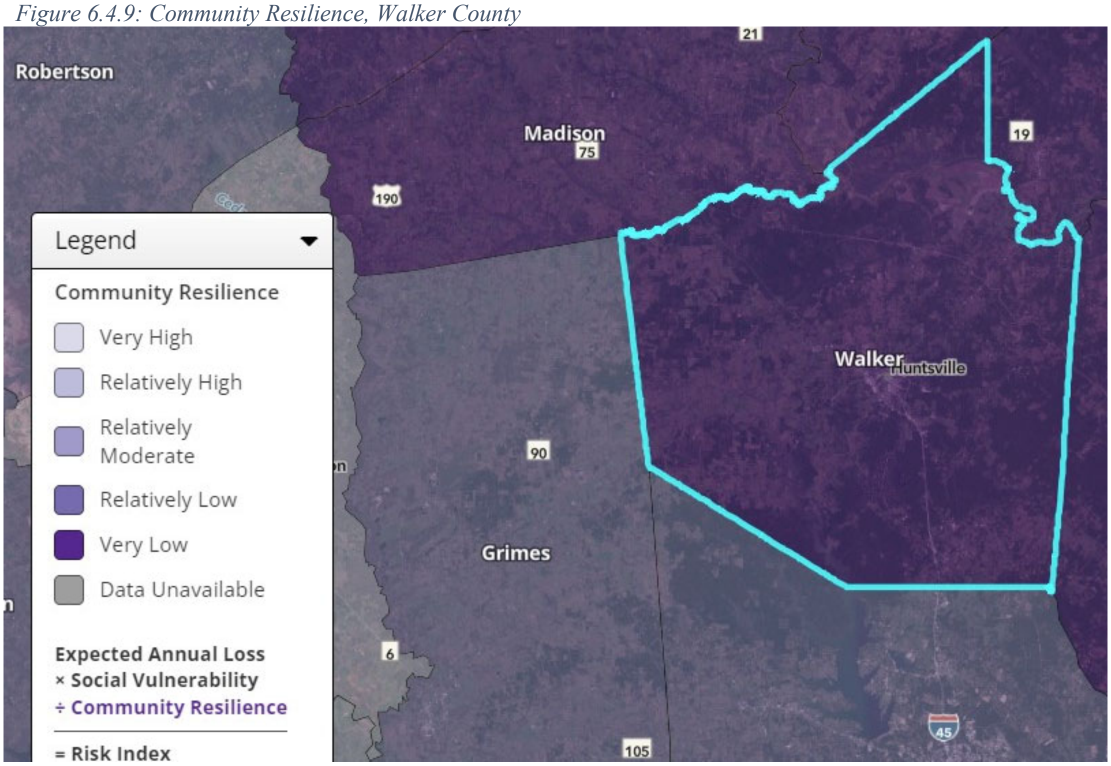


Figure 6.4.10: FEMA NRI Summary by Census Tract, Walker County, Tornado

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790800	TX	Very High	99.34	0 100
2	Census tract 48471790700	TX	Very High	99.24	0 100
3	Census tract 48471790200	TX	Very High	99.04	0 100
4	Census tract 48471790500	TX	Very High	98.76	0 100
5	Census tract 48471790600	TX	Very High	97.72	0 100
6	Census tract 48471790101	TX	Very High	97.36	0 100
7	Census tract 48471790302	TX	Very High	97.24	0 100
8	Census tract 48471790401	TX	Very High	95.82	0 100
9	Census tract 48471790103	TX	Relatively High	91.82	0 100
10	Census tract 48471790102	TX	Relatively High	90.42	0 100
11	Census tract 48471790402	TX	Relatively High	89.55	0 100
12	Census tract 48471790301	TX	Relatively High	88.31	0 100

Figure 6.4.11: FEMA NRI EAL Summary by Census Tract, Walker County, Tornado

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790800	TX	$671,598	Relatively High	Very Low	1.44	$965,674	99.34
2	Census tract 48471790700	TX	$582,835	Very High	Very Low	1.59	$925,735	99.24
3	Census tract 48471790200	TX	$577,977	Relatively High	Very Low	1.48	$857,959	99.04
4	Census tract 48471790500	TX	$535,320	Relatively High	Very Low	1.49	$798,883	98.76
5	Census tract 48471790600	TX	$356,164	Very High	Very Low	1.82	$649,888	97.72
6	Census tract 48471790101	TX	$459,865	Relatively High	Very Low	1.35	$619,109	97.36
7	Census tract 48471790302	TX	$524,604	Relatively Moderate	Very Low	1.16	$610,745	97.24
8	Census tract 48471790401	TX	$498,437	Relatively Low	Very Low	1.06	$526,333	95.82
9	Census tract 48471790103	TX	$409,998	Relatively Low	Very Low	0.98	$399,763	91.82
10	Census tract 48471790102	TX	$277,496	Relatively High	Very Low	1.34	$370,567	90.42
11	Census tract 48471790402	TX	$331,461	Relatively Moderate	Very Low	1.07	$355,611	89.55
12	Census tract 48471790301	TX	$298,238	Relatively Moderate	Very Low	1.12	$334,643	88.31

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 driving that trend are not projected to continue."[49] 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

Location	The location of tornadoes is not expected to change.
Extent/Intensity	The extent and intensity of tornadoes 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 and the surrounding region.
Frequency	Tornado 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 tornado events is not likely to change, however, the intensity of them, or outbreaks is expected to increase.

Section 6.5: Drought & Expansive Soils

6.5 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.”[68] Drought can have several different classifications for monitoring purposes. Table 6.7.1 below outlines these classifications and their definitions.

Table 6.5.1: 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.[69] 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.[70] All of Walker County and participating jurisdictions 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 6.5.1 below shows the expansive soil locations and their shrink-swell potentials within Walker County and participating jurisdictions. Areas with high shrink-swell potentials are more at risk for damage than those with low shrink-swell potential.

Figure 6.5.1: Expansive Soils, Walker County

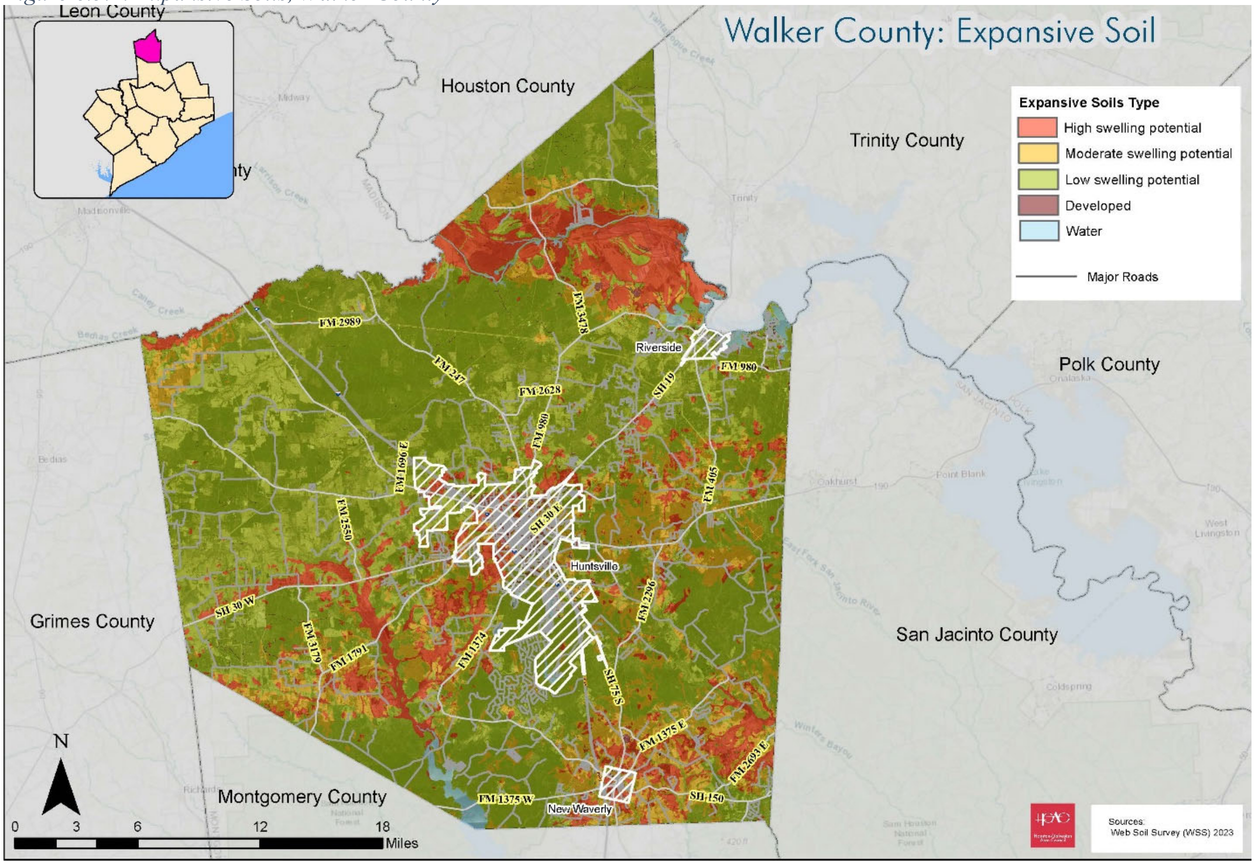


Figure 6.5.2: Expansive Soils, City of Huntsville

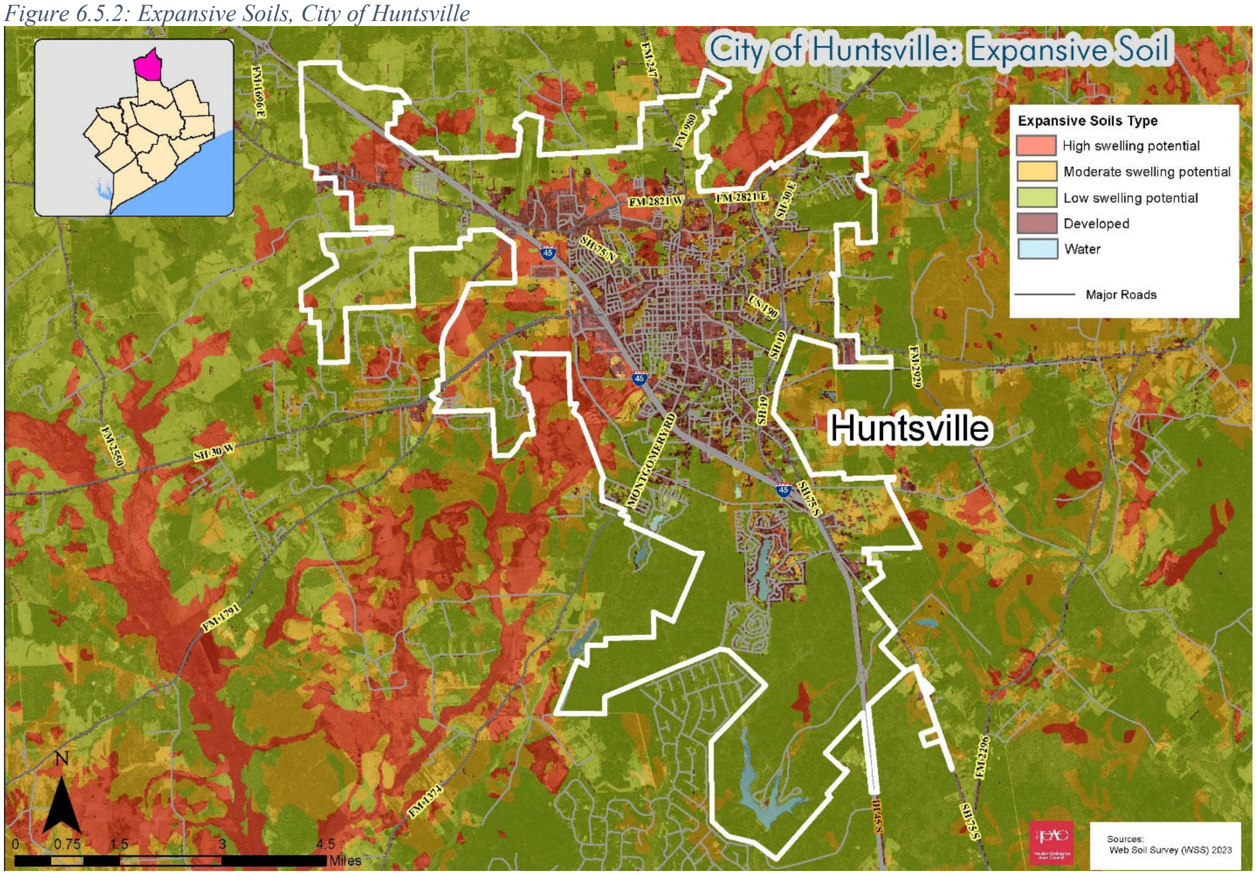


Figure 6.5.3: Expansive Soils, City of New Waverly

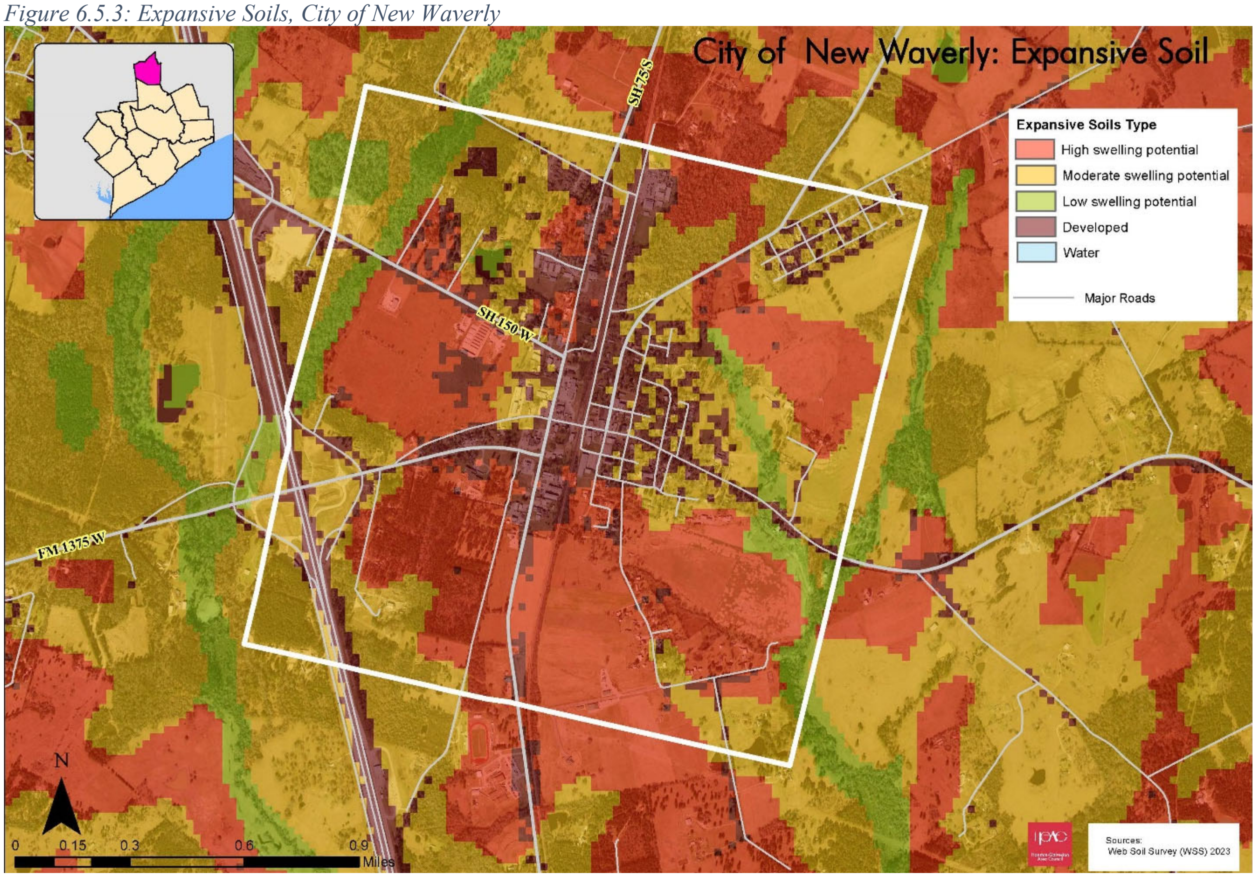
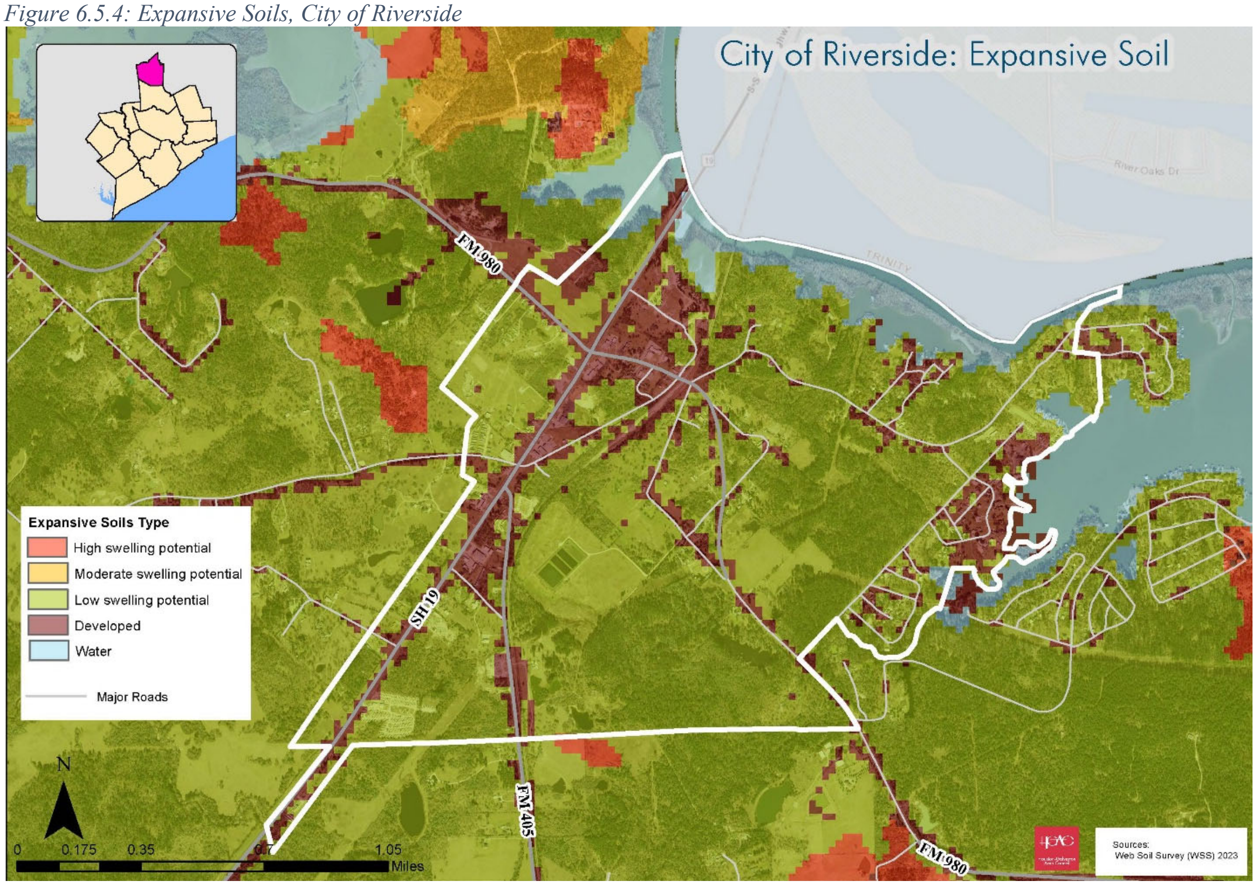


Figure 6.5.4: Expansive Soils, City of Riverside



The chart below shows the Linear Extensibility Percent (LEP) and Coefficient of Linear Extent (COLE) to show the Shrink-Swell Class of expansive soils, as pictured above. 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. The city is located almost entirely within areas that have soils with moderate and high shrink-swell potentials.

Table 6.5.2: 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

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 the figure 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.[71] Abnormally Dry (D0) shows areas that may be going into or are coming out of drought, while the remaining four categories characterize levels of drought (D1–D4).[71]

Figure 6.5.5: Drought Monitor Categories

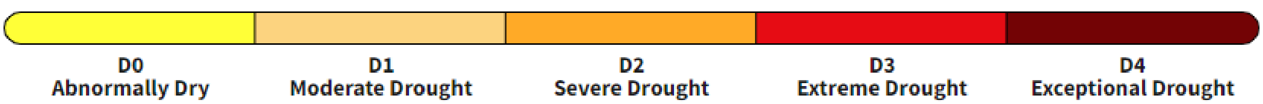
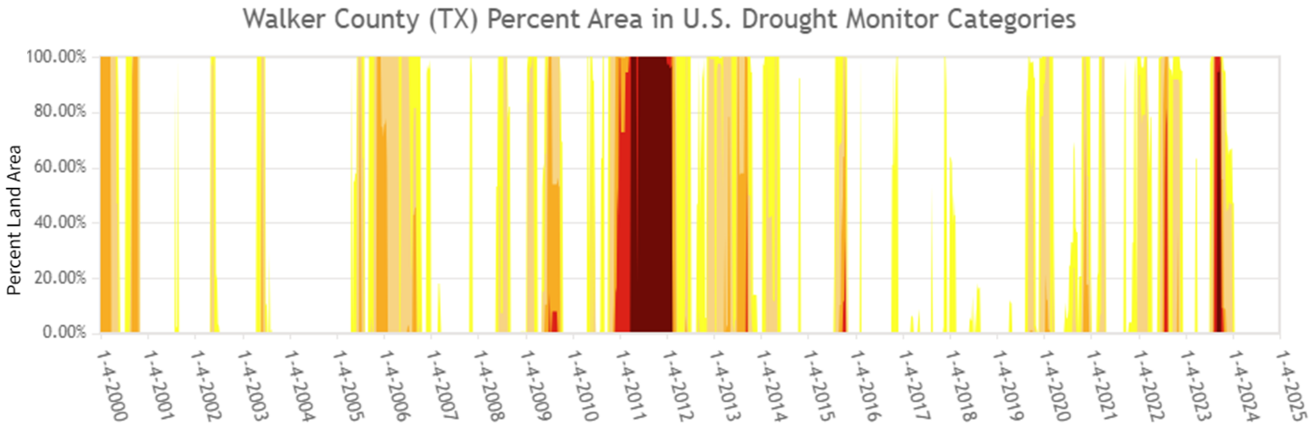


Figure 6.5.6 shows the USDM Drought Categories for Walker County since 2000. The risk of drought occurring applies the same to the entire county. There are no known factors that make one area or community more prone to drought events than another. However, drought can adversely impact individuals employed in agriculture and natural resources over other industries. Severe droughts can lead to increased wildfire risk and poor pasture conditions that can result in crop and livestock losses, impacting the food supply and economy.[72] Extreme (D3) drought conditions result in multiple sectors of the economy experiencing some level of financial burden, dry and cracked soil that leads to greater crop and livestock losses, and severe fish, plant, and wildlife loss due to low soil moisture and surface water levels, and impacted air quality from increased dust and sand storms. Exceptional drought (D4) impacts can see water levels at historic lows leading to water shortages, exceptional and widespread crop and livestock losses, widespread tree mortality, water sanitation and water quality concerns, extreme wildfire risks, and significant financial losses within the forestry, tourism, and agricultural sectors.

Figure 6.5.6: U.S. Drought Monitor for Walker County (2000-2025)



For Walker County, the worst-case scenario for drought would include a multi-year drought of D4, similar to what occurred in 2010-2014, and more recently in 2022 and 2024. Regarding expansive soils, a worst-case scenario for this hazard would be soils shifting and causing foundation and infrastructure damage to underground pipes. Expansive soil risks are exacerbated during a drought, when temperatures are high and rainfall is scarce. During the most recent droughts, the region experienced an abundance of cracked water main pipes and leaks that was attributed to the lack of rainfall and ongoing drought conditions.

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. The table below shows Walker County's drought events data from 1950-2023.[38]

Table 6.5.3: Walker County Drought Events (1950-2023)

Event Date	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
4/1/1996	Drought	0	0	$-	$-
5/1/1996	Drought	0	0	$-	$-
6/1/1996	Drought	0	0	$-	$-
5/1/1998	Drought	0	0	$-	$-
6/1/1998	Drought	0	0	$-	$-
7/1/1998	Drought	0	0	$-	$-
8/1/1998	Drought	0	0	$1,000,000	$7,300,000
8/1/2000	Drought	0	0	$-	$-
9/1/2000	Drought	0	0	$-	$-
6/14/2022	Drought	0	0	$-	$-
7/19/2022	Drought	0	0	$-	$-
7/19/2022	Drought	0	0	$-	$-
8/1/2022	Drought	0	0	$-	$-
9/1/2023	Drought	0	0	$-	$-
10/1/2023	Drought	0	0	$-	$-

$- No dollar amount ($0.00).

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.[2]

USDA Disaster Declarations

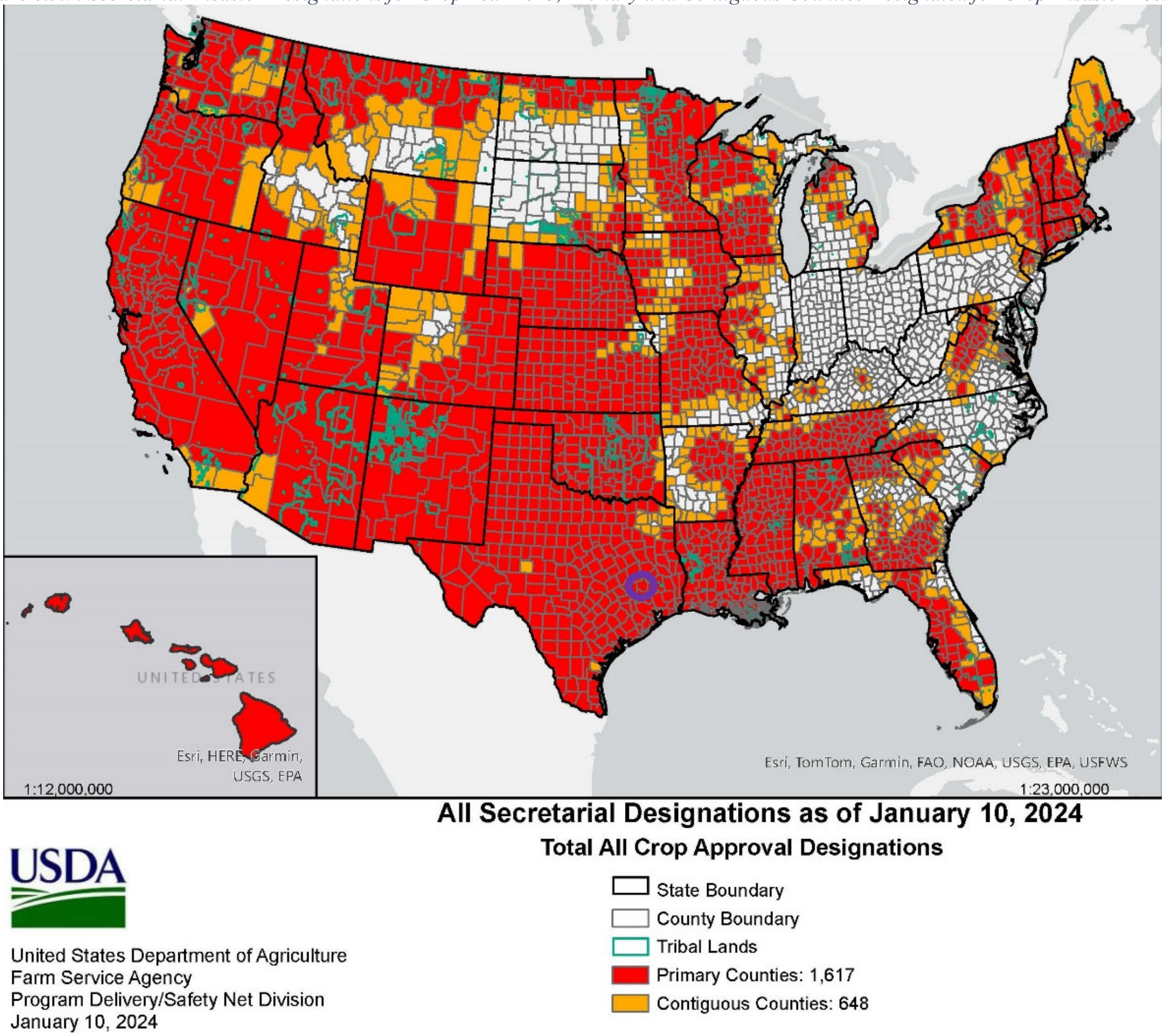
The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, 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 Walker County since 2018 are listed in the table below.[39]

Table 6.5.4: USDA Declared Disasters (2018-2023), Drought

Crop Disaster Year	Disaster Description	Designation Number
2019	Drought-FAST TRACK	S4559
2020	Drought-FAST TRACK	S4654
2021	Drought-FAST TRACK	S4924
2022	Drought-FAST TRACK	S5248
2022	Drought-FAST TRACK	S5158
2022	Drought-FAST TRACK	S5174
2022	Drought-FAST TRACK	S5252
2023	Drought-FAST TRACK	S5499
2023	Drought-FAST TRACK	S5511
2023	Excessive Heat and Drought	S5569

The figure below displays counties declared primary (red) or contiguous (orange) disaster counties, where producers may be eligible for emergency aid. Walker is listed as a primary county for crop year 2023 and is circled in purple.

Figure 6.5.7: Secretarial Disaster Designations for Crop Year 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. 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 21.4 events per year over a 22-year period of record (2000-2021).[42] There have been 525 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

Populations most at risk, or that may be disproportionately affected by drought impacts according to the National Integrated Drought Information System are people with chronic health conditions or respiratory illnesses, people with compromised immune systems, and people with mental health or mood disorders. Drought impacts on public health include changes in air quality, changes in water quality and quantity, increased incidence of illness and disease, and mental health effects. Air quality can decrease during drought events because of dust storms or wildfires. Particulates in the air irritate the lungs and bronchial passages and exacerbate chronic respiratory conditions. Drought conditions can also put those with compromised immune systems at risk as drought conditions can change how often and where certain diseases occur. Mosquitoes that carry West Nile virus can move to new locations when water bodies become stagnant and create new breeding grounds. There is also a higher risk for contracting a lung infection called Valley Fever, caused by a fungus in the soil, in dry and dusty soil conditions. Complex relationships between drought and its associated economic consequences can increase mood disorders, domestic violence, and suicide.[73]

As the county continues to grow and the population increases, so does the vulnerability of residents and property to these hazards. Droughts have been increasing in frequency and severity since the last plan update and have no set geographic boundary. Regarding expansive soils, future development in areas where soils have medium and high shrink-swell potentials faces greater risk of damages, especially during a drought where soil moisture is low, temperatures are high, and rain is scarce.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County for drought can be found below.

Table 6.5.5: Expected Annual Loss Exposure Values, Drought

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Drought	N/A	N/A	$19,455,045	$19,455,045

N/A- Not Applicable

Table 6.5.6: Expected Annual Loss Values, Drought

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Drought	N/A	N/A	$380,878

N/A- Not Applicable

Expansive soils are not included in the FEMA NRI. However, businesses and residents 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.

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102.

Risk Index Ratings according to the FEMA NRI for drought within these census tracts are listed as relatively high for 1 census tract and relatively low for 1 census tract. All other census tracts have no rating.[47] Within the FEMA NRI Technical Documentation it is noted that the periods of record vary across hazard types and risk components with the most recent source datasets including a period of record up to 2022.[74] Since a majority of recent drought risks to the county and participating jurisdictions took place in 2022 and 2023, these ratings, EAL values, and risk scores may increase as data is updated within the NRI.

EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence, for drought within Walker County the HLR is relatively moderate.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.5.8: Risk Index, Walker County, Drought

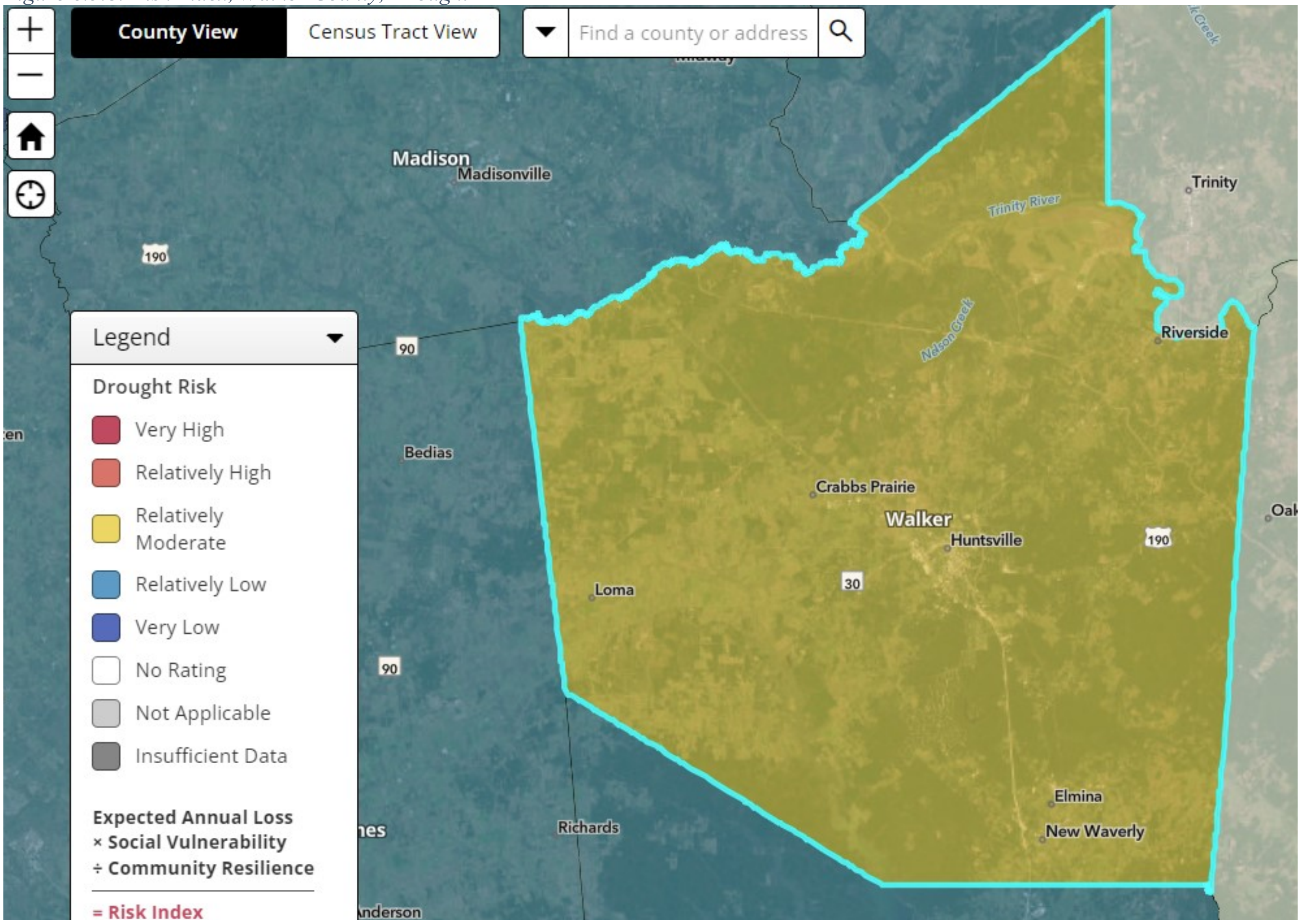


Figure 6.5.9: Risk Index by Census Tract, Walker County, Drought

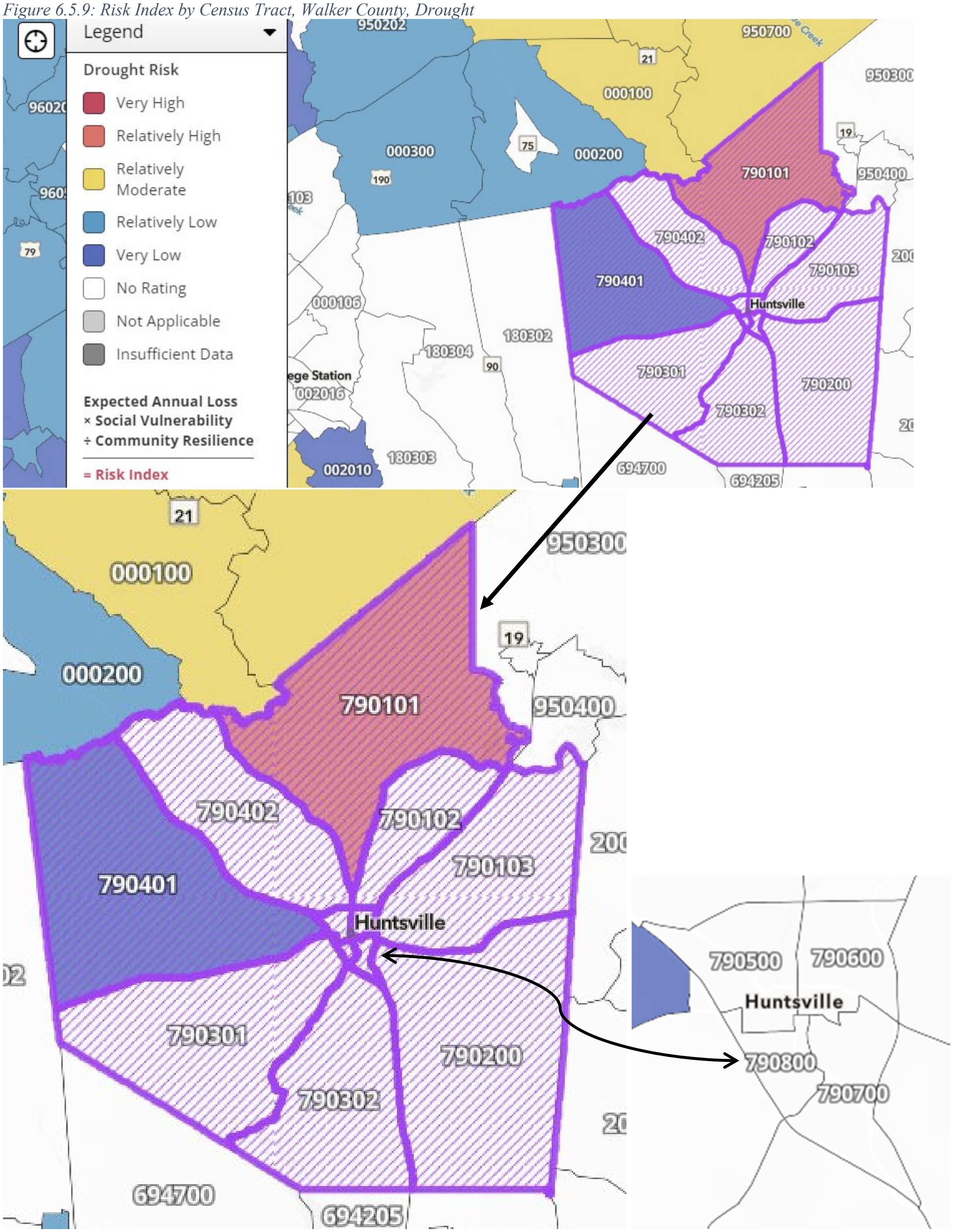


Figure 6.5.10: Social Vulnerability by Census Tract, Walker County

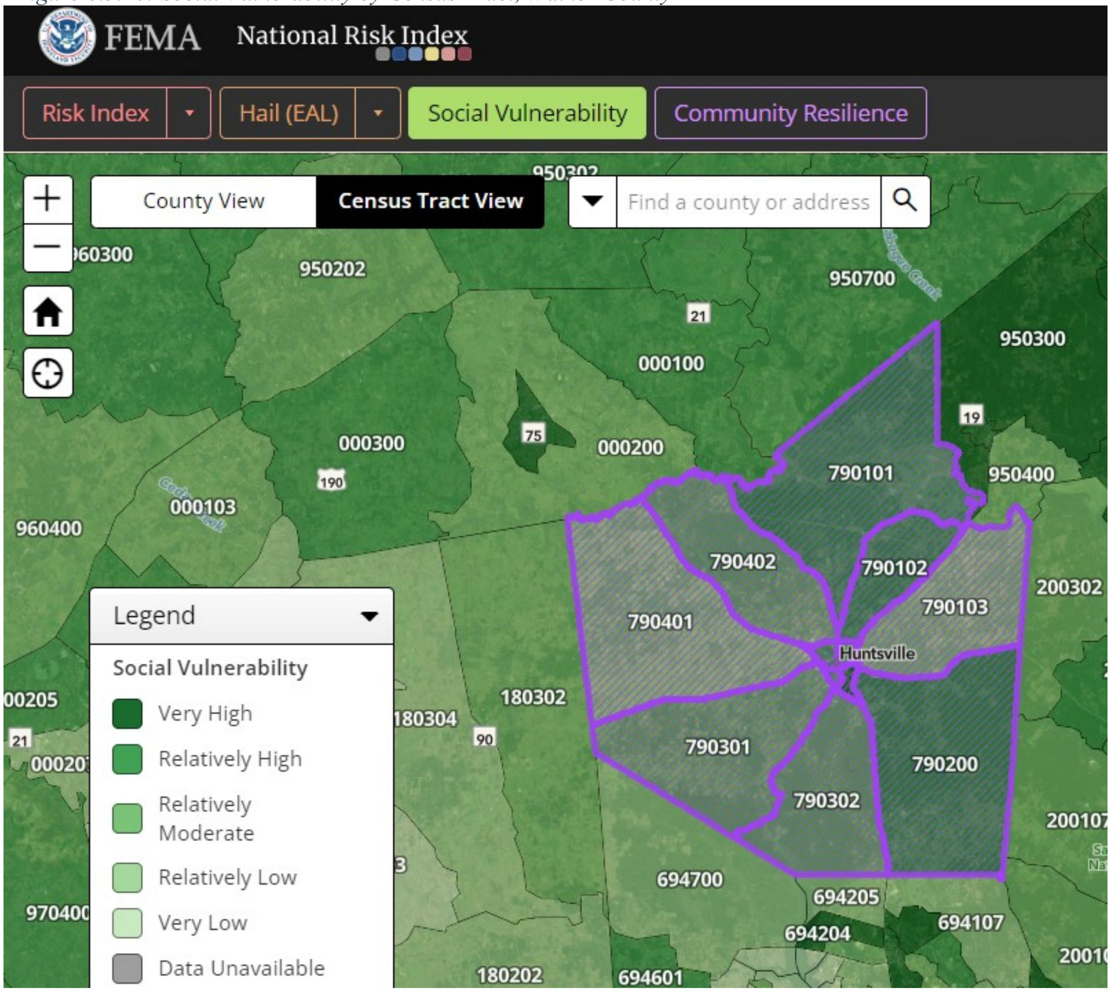


Figure 6.5.11: Social Vulnerability, Walker County

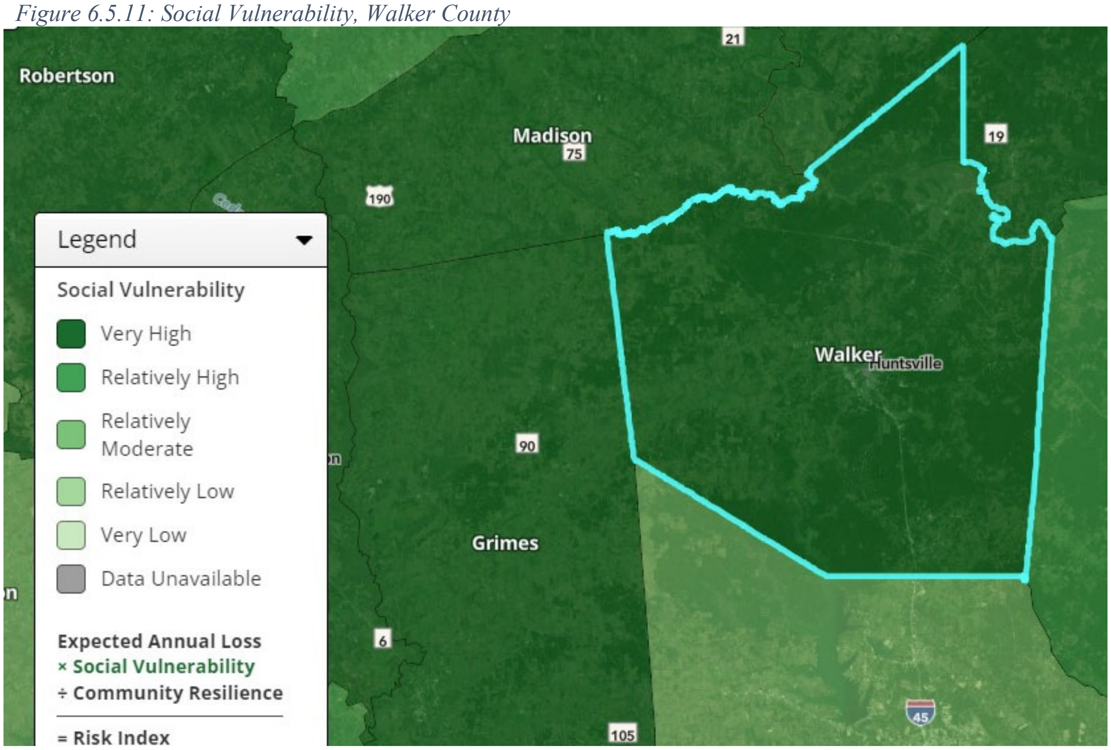


Figure 6.5.12: Community Resilience by Census Tract, Walker County

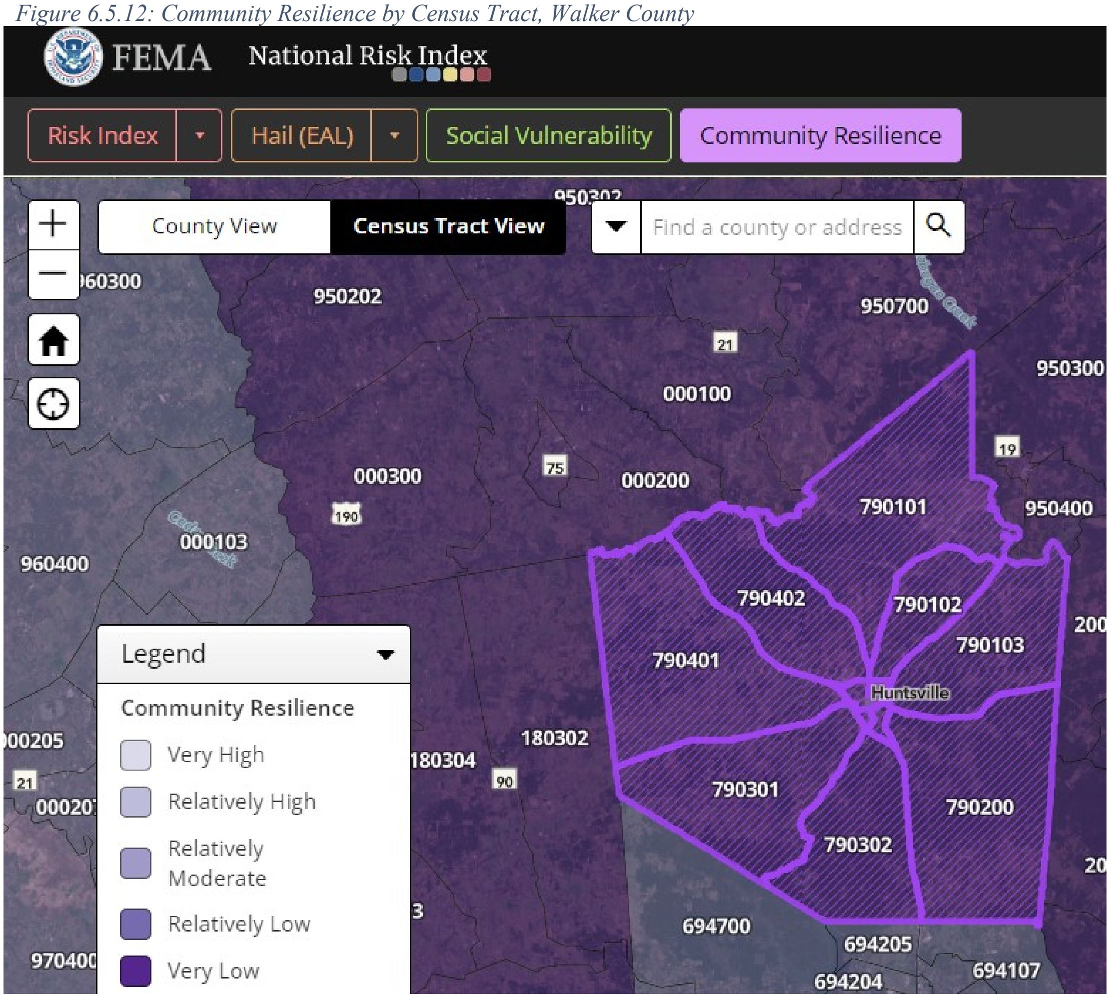


Figure 6.5.13: Community Resilience, Walker County

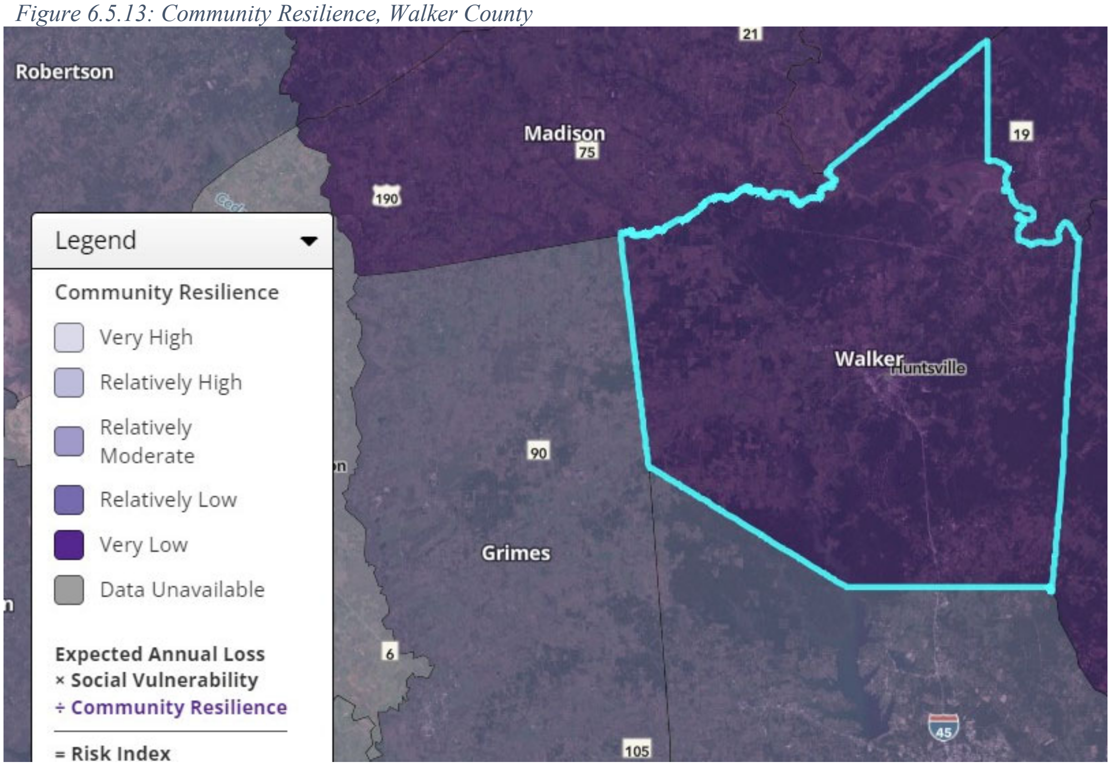


Figure 6.5.14: FEMA NRI Summary by Census Tract, Walker County, Drought

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790101	TX	Relatively High	99.44	0 100
2	Census tract 48471790401	TX	Very Low	73.97	0 100
	Census tract 48471790102	TX	No Rating	0	0 100
	Census tract 48471790103	TX	No Rating	0	0 100
	Census tract 48471790200	TX	No Rating	0	0 100
	Census tract 48471790301	TX	No Rating	0	0 100
	Census tract 48471790302	TX	No Rating	0	0 100
	Census tract 48471790402	TX	No Rating	0	0 100
	Census tract 48471790500	TX	No Rating	0	0 100
	Census tract 48471790600	TX	No Rating	0	0 100
	Census tract 48471790700	TX	No Rating	0	0 100
	Census tract 48471790800	TX	No Rating	0	0 100

Figure 6.5.15: FEMA NRI EAL Summary by Census Tract, Walker County, Drought

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790101	TX	$380,840	Relatively High	Very Low	1.35	$512,719	99.44
2	Census tract 48471790401	TX	$38	Relatively Low	Very Low	1.06	$40	73.97
	Census tract 48471790102	TX	$0	Relatively High	Very Low	1.34	$0	0
	Census tract 48471790103	TX	$0	Relatively Low	Very Low	0.98	$0	0
	Census tract 48471790200	TX	$0	Relatively High	Very Low	1.48	$0	0
	Census tract 48471790301	TX	$0	Relatively Moderate	Very Low	1.12	$0	0
	Census tract 48471790302	TX	$0	Relatively Moderate	Very Low	1.16	$0	0
	Census tract 48471790402	TX	$0	Relatively Moderate	Very Low	1.07	$0	0
	Census tract 48471790500	TX	$0	Relatively High	Very Low	1.49	$0	0
	Census tract 48471790600	TX	$0	Very High	Very Low	1.82	$0	0
	Census tract 48471790700	TX	$0	Very High	Very Low	1.59	$0	0
	Census tract 48471790800	TX	$0	Relatively High	Very Low	1.44	$0	0

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, most factors at play point to an increase in drought severity.[49] 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 6.5.7: 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 6.6: Extreme Heat

6.6 Extreme Heat

Heat events, or extreme heat, are defined by the CDC as summertime temperatures that are much hotter and/or humid than average.[75] The US Department of Homeland Security's Ready.gov website takes this definition a step further by defining extreme heat 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 annual deaths as the body must work extra hard to maintain a normal temperature.[76] 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 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.[77]

Table 6.6.1: NWS 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 an extreme heat event occurring applies the same to the entire county. Walker County experiences the highest temperatures in the months of June to August, with average temperatures between 90°F and 100°F degrees. In more developed areas, 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.[78]

Extent

The intensity of heat and extreme heat events are measured by temperature and humidity. NOAA's heat index or the "Apparent Temperature" is an accurate measure of how hot it feels when the relative humidity is added to the actual air temperature.[76] 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.[79]

Figure 6.6.1: 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 6.6.2: 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

A worst-case scenario for this hazard would include prolonged periods of increased temperatures and humidity resulting in a heat index rating of danger or extreme danger, and excessive heat warnings being issued (maximum heat index values of 113°F or above or maximum temperatures of 105°F or above). A prolonged loss of power from the increased demands placed on the power grid due to increased usage of air conditioning as people attempt to stay cool. If the heat event lasts several days or more, secondary hazards associated with extreme heat can also become a concern, such as poor air quality, loss of life, and drought.

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. Walker County heat events data from 1950-2023 is provided in the table below. There are 13 events in total, with the earliest event recorded taking place in 1999.[38] The previous 7 occurrences of heat or excessive heat all occurred within the last year, 2023.

Table 6.6.3: Heat Events (1950-2023)

Event Date	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
6/26/1999	Heat	0	0	$-	$-
8/1/1999	Heat	0	0	$-	$-
7/6/2000	Heat	0	0	$-	$-
8/29/2000	Heat	0	0	$-	$-
9/1/2000	Heat	0	0	$-	$-
6/24/2009	Heat	0	0	$-	$-
6/16/2023	Excessive Heat	0	0	$-	$-
6/25/2023	Excessive Heat	0	0	$-	$-
7/13/2023	Excessive Heat	0	0	$-	$-
7/31/2023	Excessive Heat	0	0	$-	$-
8/5/2023	Excessive Heat	0	0	$-	$-
8/23/2023	Excessive Heat	0	0	$-	$-
9/5/2023	Heat	0	0	$-	$-

$- No dollar amount ($0.00)

Presidential Disaster Declarations

There have been no federally declared heat or extreme heat disaster declarations in Walker County or participating jurisdictions since 1950.[2]

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 Walker County and participating jurisdictions since 2018 are listed in the table below.[40]

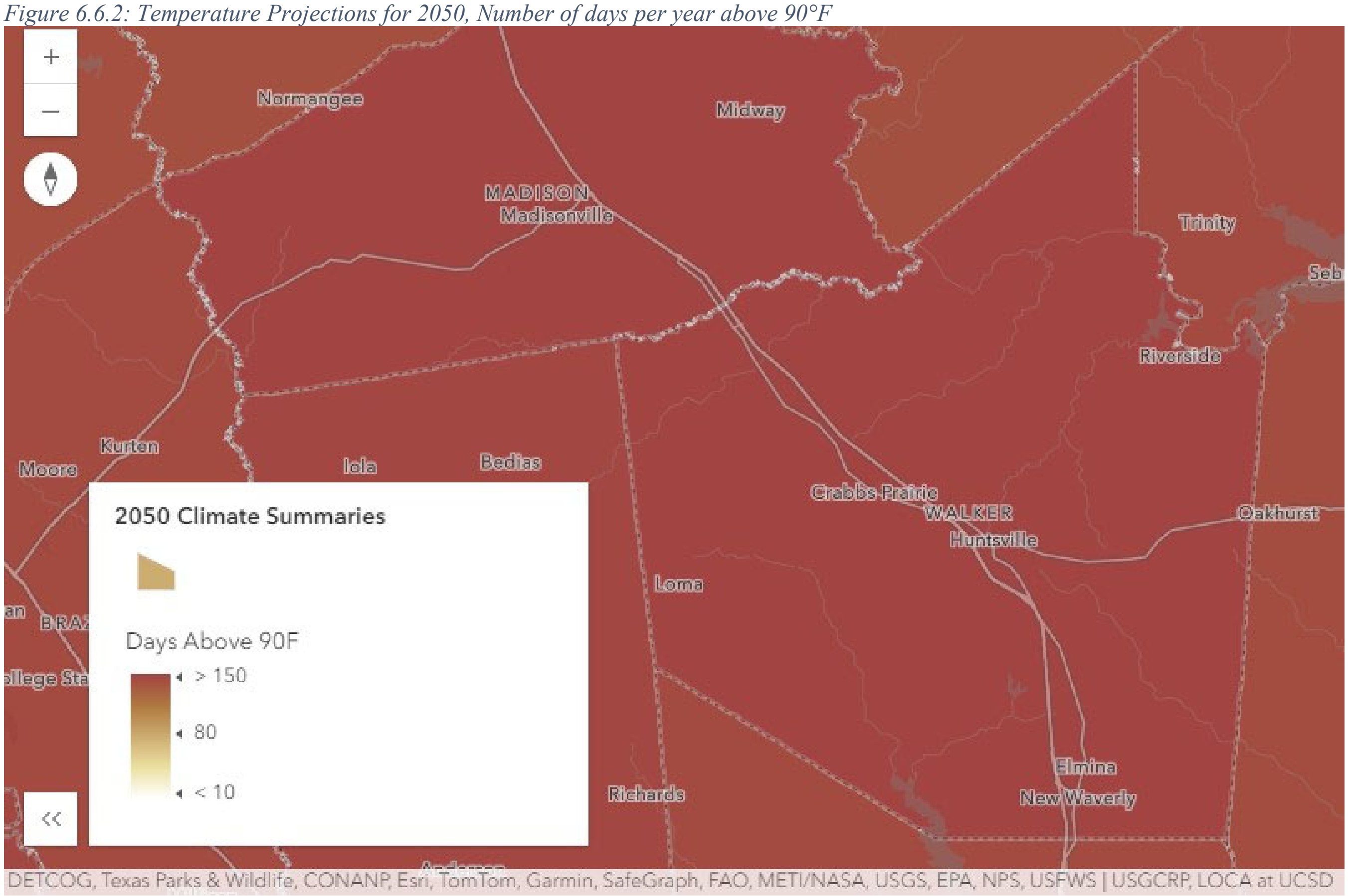
Table 6.6.4: USDA Declared Disasters (2018-2023), Extreme Heat

Crop Disaster Year	Disaster Description	Designation Number
2022	Excessive Heat	S5350
2023	Excessive Heat	S5568
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.[40] According to the FEMA NRI for heat waves in Walker 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.[44,75] This may change in the near future as NRI data is updated and more 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 the number of days per year above 90°F, and the number of days per year warmer than the top 1% historically, have both increased since previous reporting periods. These projections are expected to increase further by 2050.[80]

Figure 6.6.2: Temperature Projections for 2050, Number of days per year above 90°F



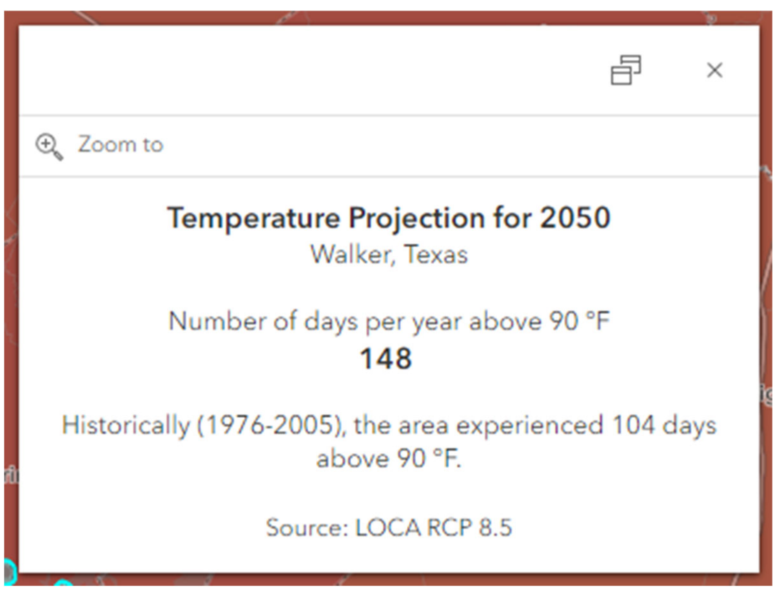
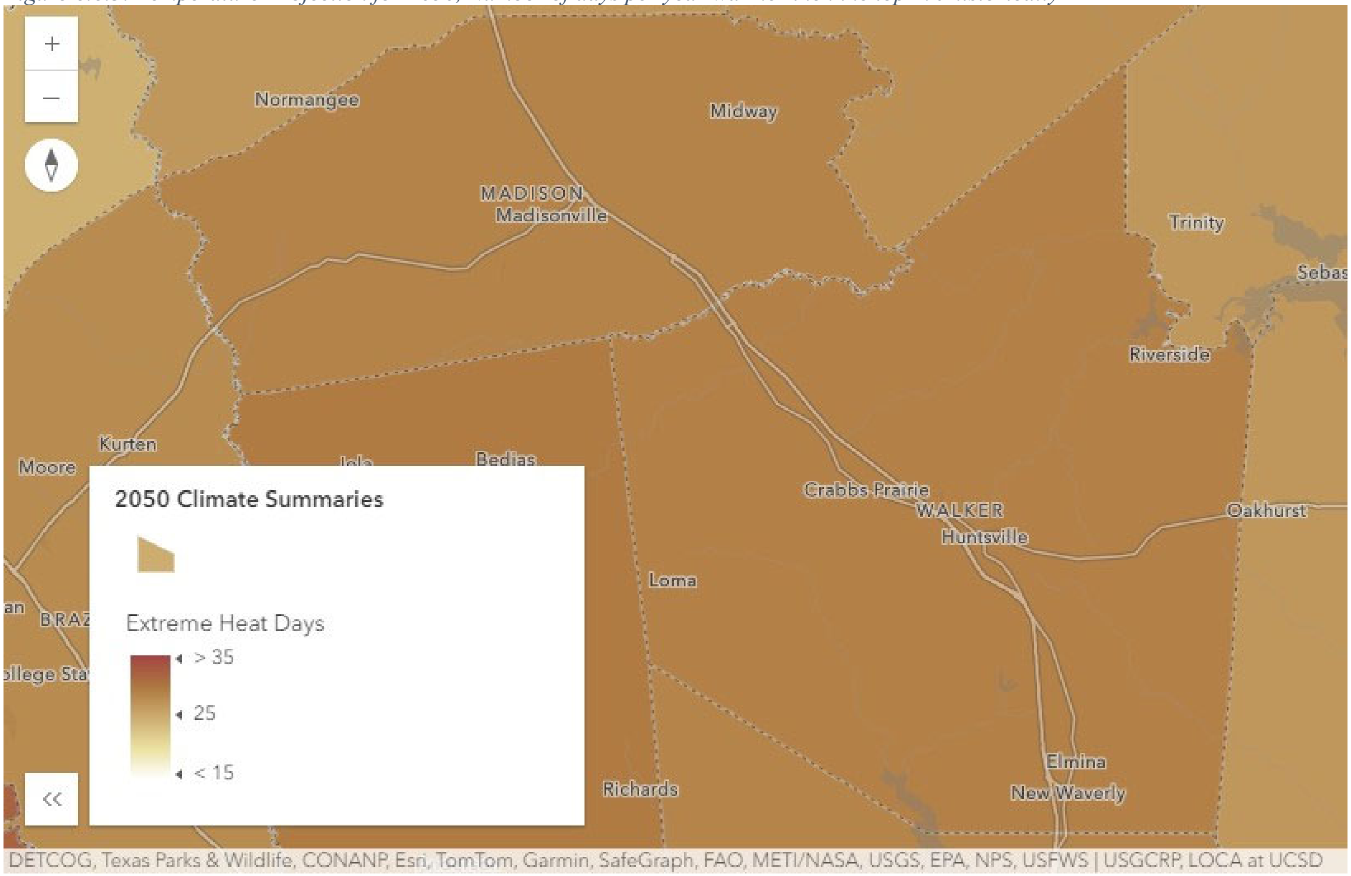
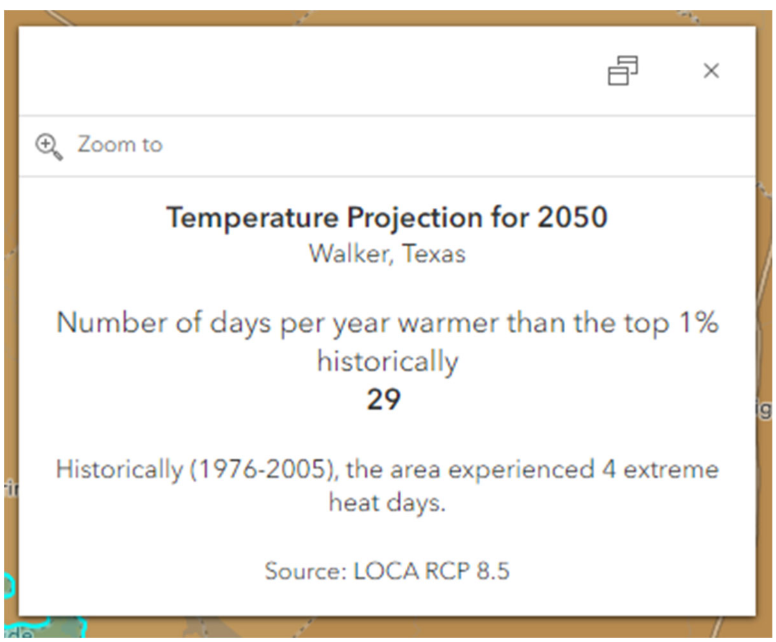


Figure 6.6.3: Temperature Projection for 2050, Number of days per year warmer then the top 1% historically





Populations at Risk

While heat events have the potential to damage buildings and crops, vulnerable populations are most at risk in the county during these events. The National Integrated Heat Health Information System lists those most at risk for extreme heat as older/elderly adults, children, athletes, pregnant people, people with disabilities, people with chronic health conditions/pre-existing conditions, homeless populations, emergency responders, pets and service animals, and outdoor/indoor workers.

In older populations, health conditions like cardiovascular issues can be exacerbated by extreme heat. During power outages that may occur during peak heat hours of the day, older populations may be disproportionately affected if they require access to life-sustaining devices. Older adults and children are more vulnerable to this hazard because they are unable to thermoregulate. Children also play outside often which exposes them to the same risks due to the combination of exposure and exertion. Athletes are similar in their risk as outdoor activities, sometimes while wearing protective gear, in combination with exposure and exertion will trap heat. As athletes are expected to push themselves physically, the line between acceptable levels of exertion and dangerous levels of exertion during heat may be blurred. Those who are pregnant are more vulnerable to this hazard due to a general increase in their core body temperature regardless of the air temperature, but also because extreme heat events can increase the likelihood of common challenges during pregnancy (excessive sweating and heat rash). Extreme heat also poses health risks for pregnant people and the developing fetus. There is increasing evidence that extreme heat can increase the risk of preterm birth, low birth weight, fetal death, and infant mortality. High temperatures can cause stress on the body which exacerbates respiratory and cardiovascular diseases, diabetes, and renal disease. Some medical conditions, such as obesity and heart disease, increase people's sensitivity to heat, putting them at greater risk of heat illnesses. In addition, some medications (such as some antidepressants, diuretics, and beta-blockers) taken for a chronic illness may increase an individual's sensitivity to heat by interfering with the body's ability to regulate temperature, fluids, or electrolytes. Homeless populations are more at risk of this hazard as they may face significant stress due to their living conditions, insomnia due to poor sleeping arrangements, and lack of food or spoiled food, which also contributes to a higher risk for heat-related illness and death. Additionally, they may not seek medical treatment during a heat event due to distance, lack of access to transportation, and lack of financial resources. Their access to cooling centers or shelters may be limited due to distance and lack of transportation, building hours of access, stigma, and several other factors. People who live in rural areas may have even less access to these resources and services. If the temperature at night remains high, homeless populations are further at risk as the body will be unable to cool itself off. Emergency responders are at a greater risk due to their often heavy and bulky equipment that can trap heat it, like firefighters. Pets and service animals have differing thermoneutral zones depending on their age, size, and breed. Pets and service animals have a higher metabolic rate which makes them more vulnerable to this hazard. Service animals also face the added risk of burning their paw pads as paved surfaces become hot during a heat wave. Those who work outdoors, or indoors without access to air conditioning are also at a higher risk for heat-related illnesses. Most often these jobs require a level of physical exertion and exposure and can also require personal protective clothing that can trap heat and prevent cooling. Workers may also not have access to water and shade.[81]

The vulnerability of communities to this hazard increases with the addition of impervious pavement from any future developments, especially those occurring in urban areas. The heat island effect will become more prominent in these areas of the county.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below.

Table 6.6.5: Expected Annual Loss Exposure Values, Heat Wave

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Heat Wave	N/A	N/A	N/A	N/A

Table 6.6.6: 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 (No Rating)

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102.

Risk Index Ratings according to the FEMA NRI for heat events within these census tracts have no rating.[47] Within the FEMA NRI Technical Documentation it is noted that the periods of record vary across hazard types and risk components with the most recent source datasets including a period of record up to 2022.[75] Since a majority of recent drought and heat-related risks to the county and participating jurisdictions took place in 2022 and 2023, these ratings, EAL values, and risk scores may increase as data is updated within the NRI.

EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence, for heat events within Walker County the HLR has no rating.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.6.4: Risk Index, Walker County, Heat Wave

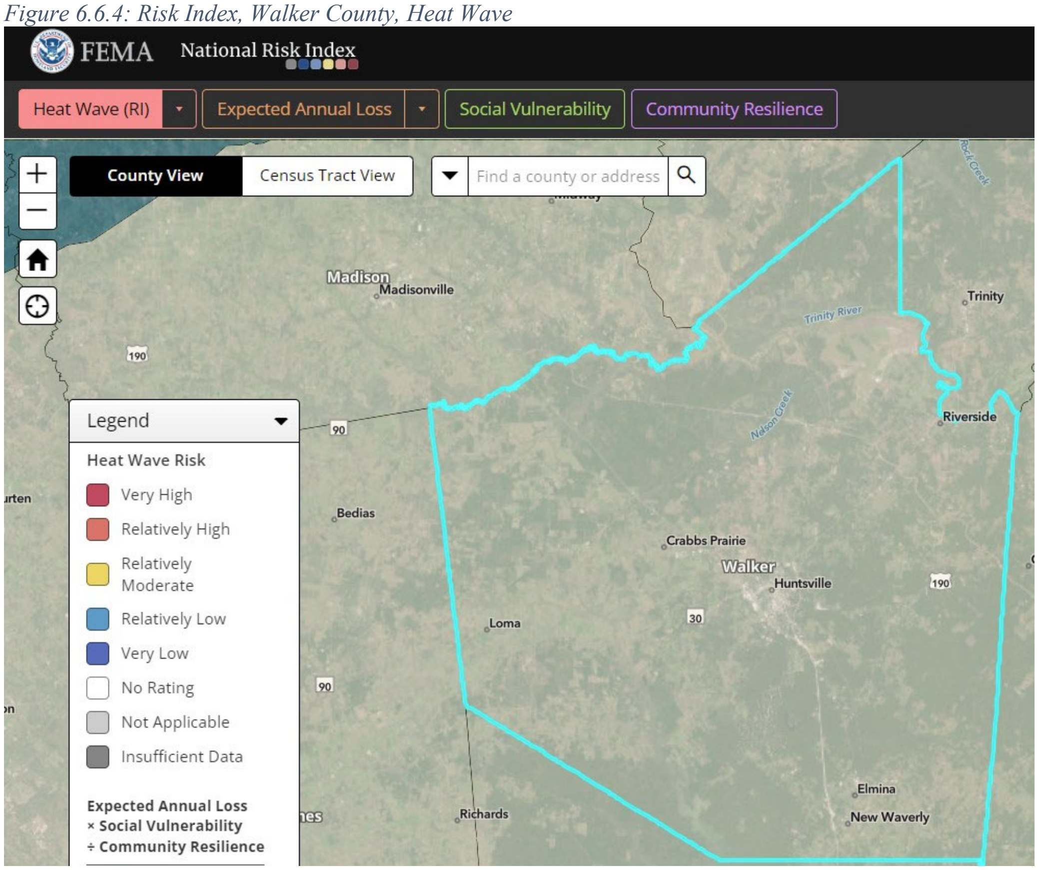


Figure 6.6.5: Risk Index by Census Tract, Walker County, Heat Wave

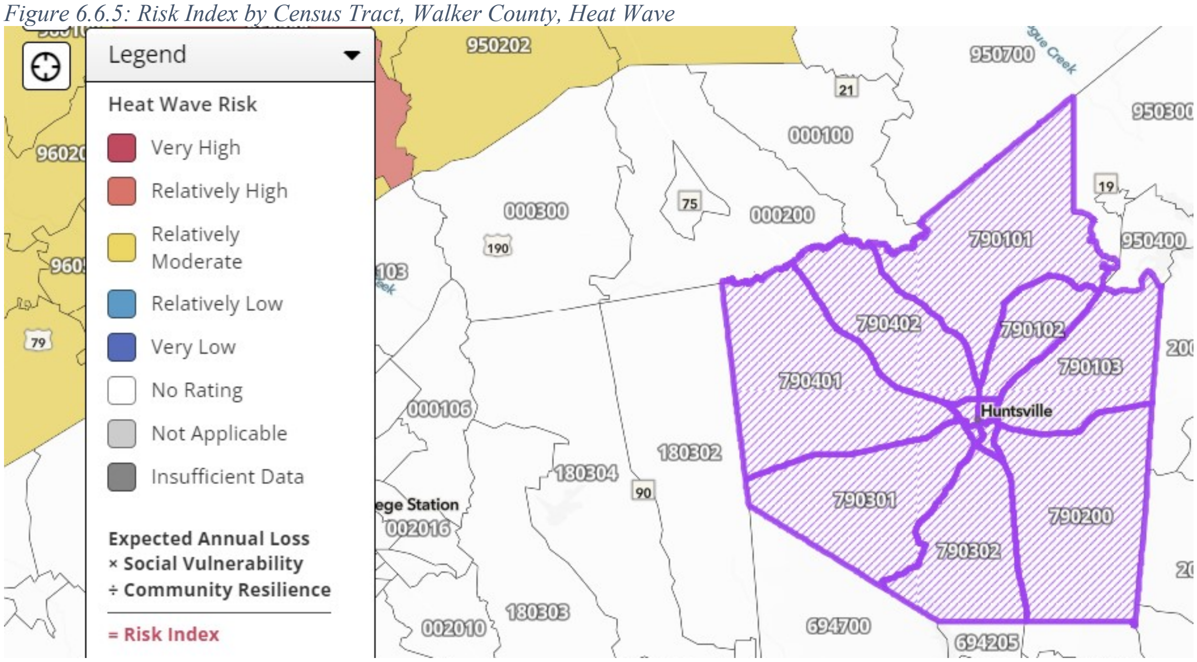


Figure 6.6.6: Social Vulnerability by Census Tract, Walker County

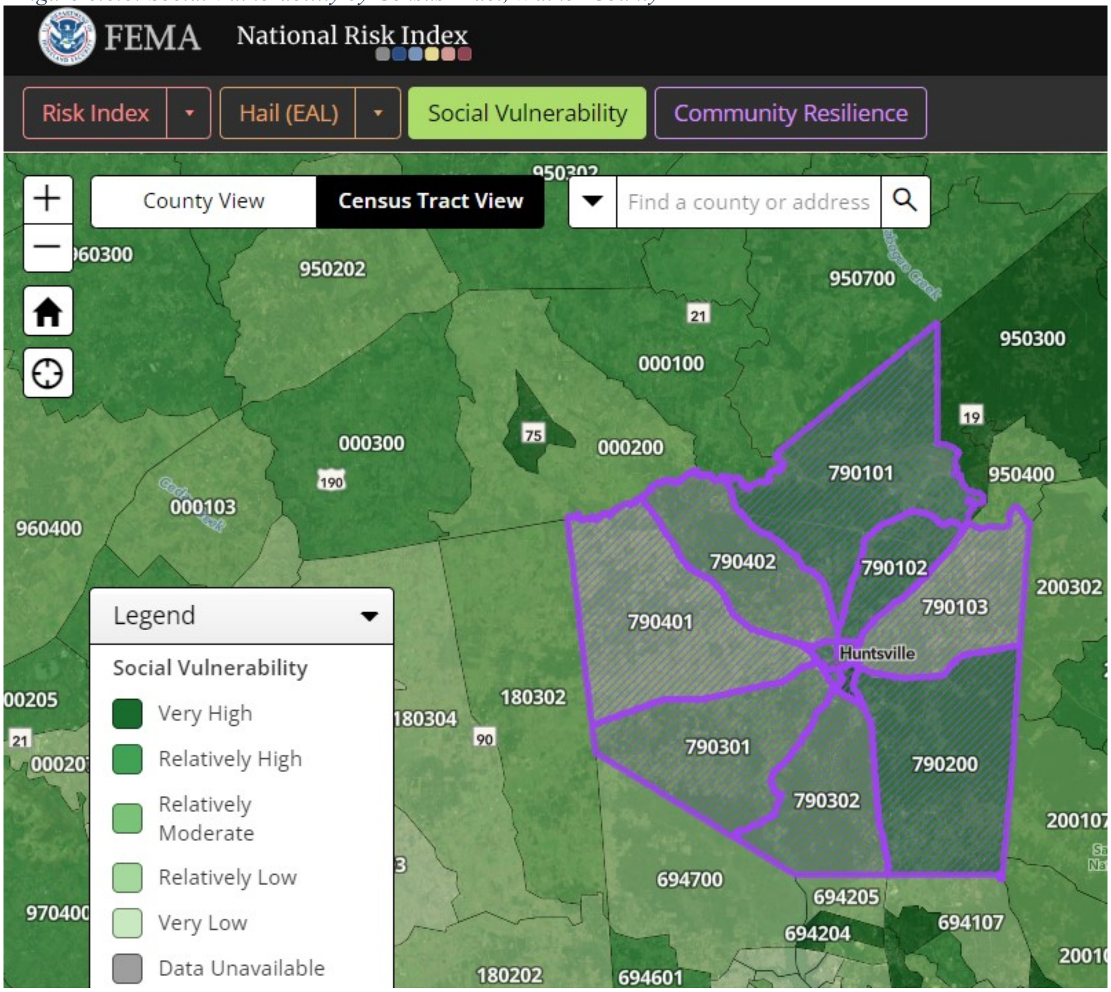


Figure 6.6.7: Social Vulnerability, Walker County

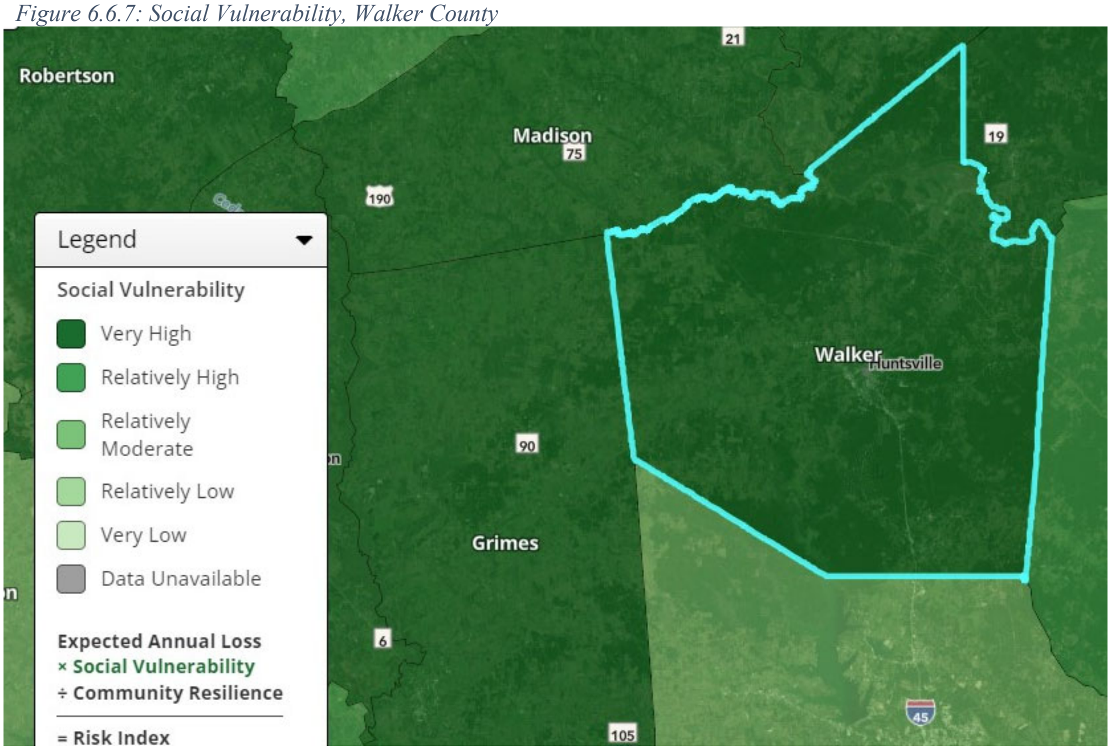


Figure 6.6.8: Community Resilience by Census Tract, Walker County

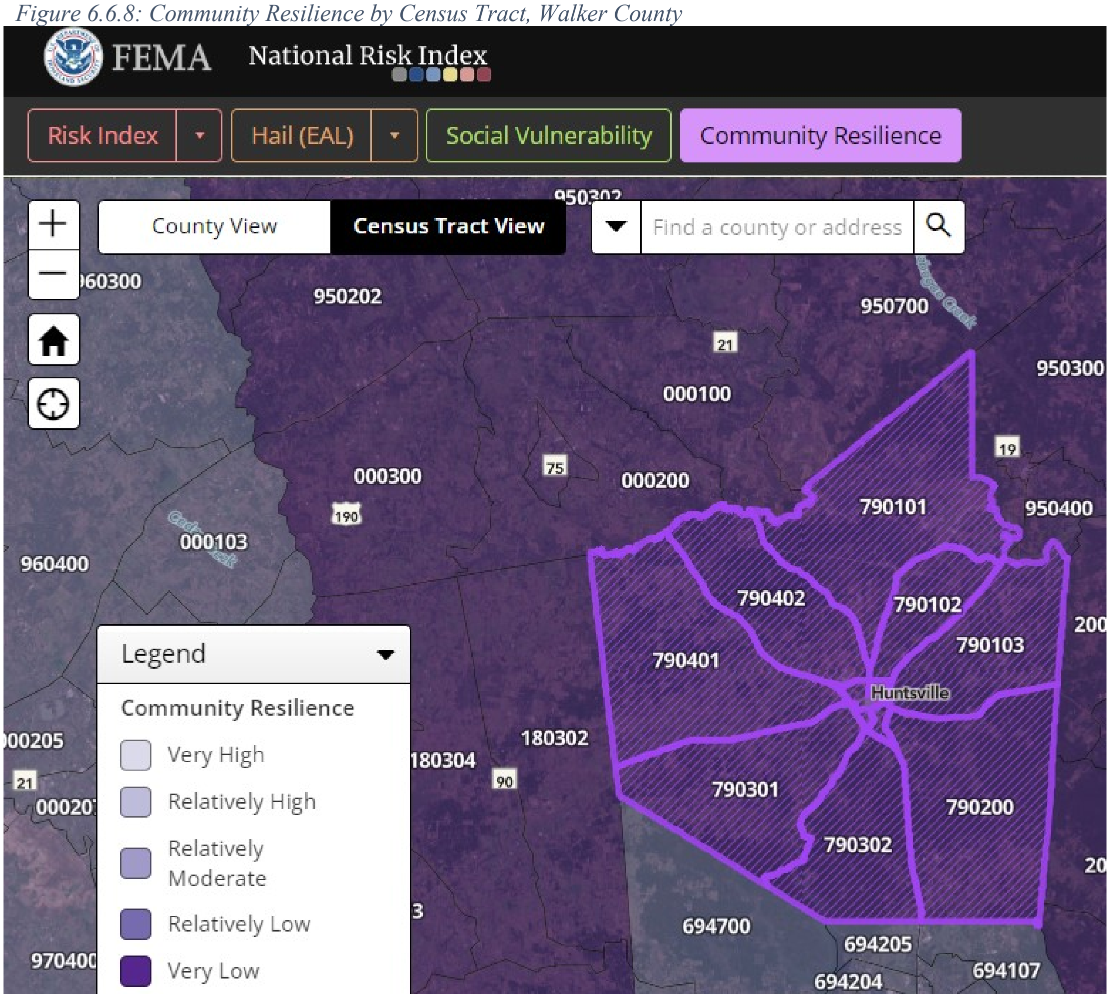


Figure 6.6.9: Community Resilience, Walker County

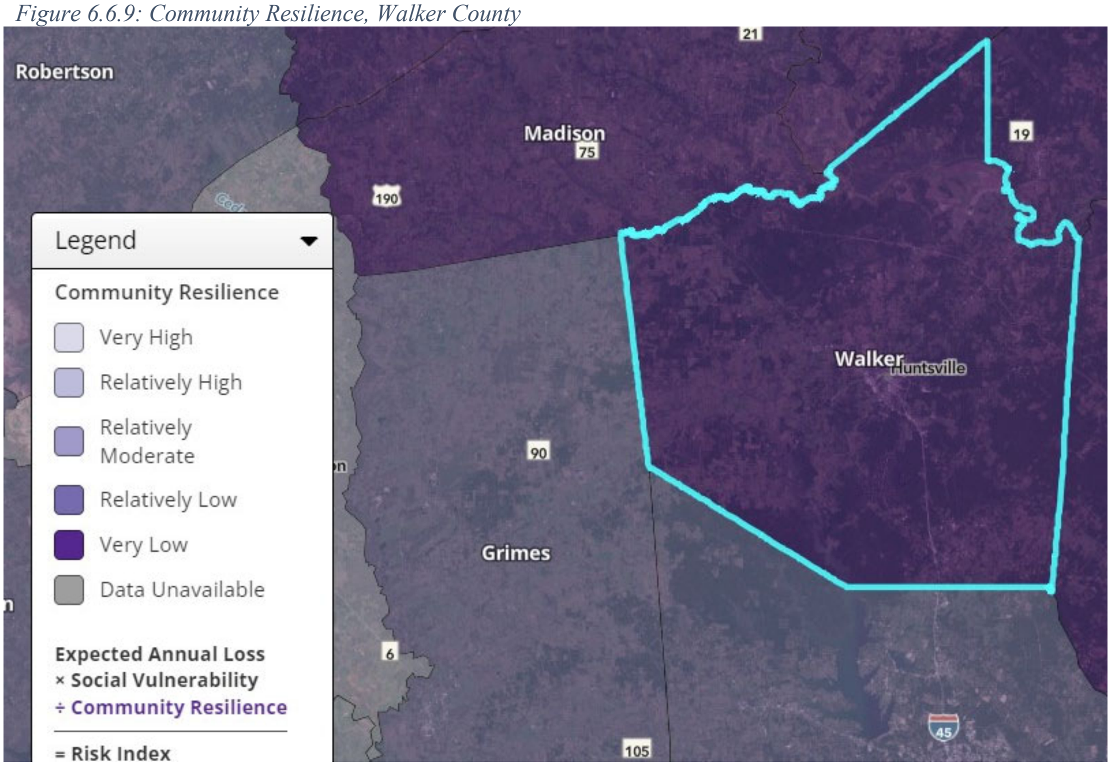


Figure 6.6.10: FEMA NRI Summary by Census Tract, Walker County, Heat Wave

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
	Census tract 48471790101	TX	No Rating	0	0 100
	Census tract 48471790102	TX	No Rating	0	0 100
	Census tract 48471790103	TX	No Rating	0	0 100
	Census tract 48471790200	TX	No Rating	0	0 100
	Census tract 48471790301	TX	No Rating	0	0 100
	Census tract 48471790302	TX	No Rating	0	0 100
	Census tract 48471790401	TX	No Rating	0	0 100
	Census tract 48471790402	TX	No Rating	0	0 100
	Census tract 48471790500	TX	No Rating	0	0 100
	Census tract 48471790600	TX	No Rating	0	0 100
	Census tract 48471790700	TX	No Rating	0	0 100
	Census tract 48471790800	TX	No Rating	0	0 100

Figure 6.6.11: FEMA NRI EAL Summary by Census Tract, Walker County, Heat Wave

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
	Census tract 48471790101	TX	$0	Relatively High	Very Low	1.35	$0	0
	Census tract 48471790102	TX	$0	Relatively High	Very Low	1.34	$0	0
	Census tract 48471790103	TX	$0	Relatively Low	Very Low	0.98	$0	0
	Census tract 48471790200	TX	$0	Relatively High	Very Low	1.48	$0	0
	Census tract 48471790301	TX	$0	Relatively Moderate	Very Low	1.12	$0	0
	Census tract 48471790302	TX	$0	Relatively Moderate	Very Low	1.16	$0	0
	Census tract 48471790401	TX	$0	Relatively Low	Very Low	1.06	$0	0
	Census tract 48471790402	TX	$0	Relatively Moderate	Very Low	1.07	$0	0
	Census tract 48471790500	TX	$0	Relatively High	Very Low	1.49	$0	0
	Census tract 48471790600	TX	$0	Very High	Very Low	1.82	$0	0
	Census tract 48471790700	TX	$0	Very High	Very Low	1.59	$0	0
	Census tract 48471790800	TX	$0	Relatively High	Very Low	1.44	$0	0

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.[49] 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 the coming decades.[82]

Table 6.6.7: Climate Change Impacts Summary, Extreme Heat

Location	The location of extreme heat and heat events are expected to increase in urban areas of the county.
Extent/Intensity	The extent and intensity of extreme heat and heat events are expected to increase.
Frequency	The 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 6.7: Winter Weather

6.7 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."[83]

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 6.7.1: 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 the table below.

Table 6.7.2: 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.[84]

Anticipated intensities for the WSSI sub-components mentioned above within the planning area, per the American Society of Civil Engineers, for determining loads for structures with a risk category of 4 (those that have the greatest impact on life, health, and welfare)[85] include:

- Snow Load Index-
  - Ground Snow Load, p_g: 11 lb/ft^2

    - 20-year MRI Value: 1.8 lb/ft^2
    - Winter Wind Parameter: 0.45
    - Mapped Elevation: 352.2 ft
- Ice Accumulation- Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values. Values provided are equivalent radial ice thicknesses due to freezing rain for 250, 500, 1,000, and 1,400-year mean recurrence intervals along with concurrent 3-s gust speeds and concurrent air temperatures.
    - Ice Thickness: 1.72 in.
    - Concurrent Temperature: 15 F
    - 3-s Gust Speed 33 mph

A worst-case scenario for this hazard within Walker County would be similar to that of Winter Storm Uri which occurred in February 2021. This historic winter storm brought snow, sleet, freezing rain, and extreme cold temperatures that lasted for several days. Walker County Emergency Management recounts Uri as being the worst the county has ever experienced; with ice accumulations of 3-4", temperatures near 0°F with windchill, and snow/sleet accumulations up to 6”. This resulted in multiday road closures (7+ days within Walker County), power outages, loss of heat, broken pipes, and other societal impacts for the region. Winter Storm Uri was the largest and most costly winter weather event in Walker County’s history, causing over $3 million in property damage. Another winter storm event of this magnitude could, again, result in risks to life and property as well as secondary hazards from prolonged power outages.

NOAA and the NWS 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. 2021 Winter Storm Uri resulted in a total of 8 days, 23 hours, and 23 minutes of winter highlights between the first Winter Weather Advisory issued on Thursday, February 11th, 2021, at 9:37 am, to when the last Hard Freeze Warning expired at 9 am on Saturday, February 20th, 2021. The table below describes the various winter weather warnings, watches, and advisories.[86]

Table 6.7.3: 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.

Watch/ Warning/ Advisory	Description
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 chill temperatures are expected to be less than or equal to -18 degrees Fahrenheit.
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. Winter weather-related events data for the county from 1950-2023 is provided in the table below.[39]

Table 6.7.4: Historic Occurrences, Winter Weather

Event Date	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)
1/12/1997	Ice Storm	0	0	$-	$-
12/22/1998	Winter Storm	0	0	$15,000	$-
12/13/2000	Ice Storm	0	0	$50,000	$-
1/16/2007	Ice Storm	0	0	$4,000	$-
2/23/2010	Heavy Snow	0	0	$-	$-
2/3/2011	Winter Storm	0	0	$-	$-
1/23/2014	Winter Storm	0	0	$-	$-
1/28/2014	Winter Weather	0	0	$-	$-
3/3/2014	Winter Storm	0	0	$-	$-
12/7/2017	Heavy Snow	0	0	$-	$-
1/10/2021	Winter Storm	0	0	$-	$-
2/14/2021	Winter Storm	0	0	$-	$-
2/15/2021	Extreme Cold/Wind Chill	0	0	$3,300,000	$-
2/17/2021	Ice Storm	0	0	$-	$-
	Totals:	0	0	$3,369,000	$-

$- No dollar amount ($0.00).

Presidential Disaster Declarations

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

Table 6.7.5: Federal Disaster Declarations, Winter Weather

Declaration Date	Incident Type	Title	Disaster Number	Declaration Type
2/14/2021	Severe Ice Storm	Severe Winter Storm	3554	Emergency Declaration
2/19/2021	Severe Ice Storms	Severe Winter Storms	4586	Major Disaster Declaration

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 Walker County since 2018 are listed in the table below.[40]

Table 6.7.6: 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 6.7.7: 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	0.9 events per year	61	1949-2021 (73 years)
Winter Weather	0.8 events per year	13	2005-2021 (16 years)

Populations at Risk

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 snow removal equipment or treatments available, such as sand or salt for icy roads.[87] 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. Winter weather and ice storms can 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 NCHH summarizes at-risk populations for several hazards. These include older adults, children, people experiencing homelessness, people with disabilities, and people with chronic health conditions. In addition to the dangers listed above, older adults can face social isolation, lack of electricity needed to run medical equipment, lack of access to a vehicle for evacuation, and lack of access to other critical supplies. In younger populations, such as children, winter weather and related hazard events can disrupt schooling and the normal day-to-day routines they thrive on. This can not only jeopardize their academic success but can also cause mental and emotional stress. Children are more at risk when their exposure to these extreme temperatures is prolonged. For people experiencing homelessness, adequate shelter is critical in keeping populations safe during winter weather and related events. People with disabilities may require additional assistance to stay safe and prepare for these hazards such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. Likewise, those with chronic health conditions may need similar assistance as those with disabilities. People with chronic health conditions also face exposure to diseases or illnesses from prolonged exposure to extreme temperatures and increased exposure to these illnesses when utilizing a shelter, warming center, or evacuation center. Additionally, freezing temperatures can cause damage to homes and businesses in the form of burst pipes, which can cause mold to thrive if not treated promptly. This can exacerbate illness among the general population but especially among those with chronic health conditions. When heating systems or power outages can't adequately maintain a safe temperature households may turn to using space heaters, fireplaces, or appliances that aren't meant for heating (such as ovens or stoves) for warmth. This increases the risk of fires and negatively impacts indoor air quality. Additionally, carbon monoxide poisoning can be a risk for those who utilize generators too close to the home or indoors. These issues disproportionately affect low-income communities and families who may lack the resources to pay for safe heating in their homes.[49]

Any areas of growth or future development within the county could be potentially impacted by this hazard as it has no set geographic boundary, and the level of vulnerability is the same throughout Walker County. As future developments are completed the risk to this hazard increases. Similarly, as the population within the county increases, more people will be at risk of the impacts from these hazards.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

The FEMA NRI accounts for winter weather in various formats, these are cold waves, ice storms, and winter weather. EAL Exposure Values for Walker County each year according to the FEMA NRI for these hazards are listed as relatively low.[44]

EAL Exposure Values and EAL Values can be found in the tables and figures below.

Table 6.7.8: Expected Annual Loss Exposure Values, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Cold Wave, Ice Storm, and Winter Weather	$57,433,464,365	$4,309,091,556,009/ 371,473.41	$91,232,428	$4,364,260,048,386

Table 6.7.9: Expected Annual Loss Values, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Cold Wave	$1,761	$209,925/ 0.02	$16,239
Ice Storm	$4,492	$269,242/ 0.02	N/A
Winter Weather	$2,638	$171,566/ 0.01	$919

N/A- Not Applicable

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102. Risk Index Ratings according to the FEMA NRI for Cold Wave, Ice Storm, and Winter Weather events within these census tracts are: [47]

Table 6.7.10: Risk Index Rating Summary, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Risk Index Rating Summary
Cold Wave	5 census tracts- Relatively High, 7 census tracts- Relatively Moderate
Ice Storm	8 census tracts- Relatively High, 4 census tracts- Relatively Moderate
Winter Weather	11 census tracts- Relatively High, 1 census tract- Relatively Moderate

EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence, for Cold Wave, Ice Storm, and Winter Weather events within Walker County the HLR is very low, relatively low, and relatively moderate respectively.

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.7.1: Risk Index Rating, Cold Wave

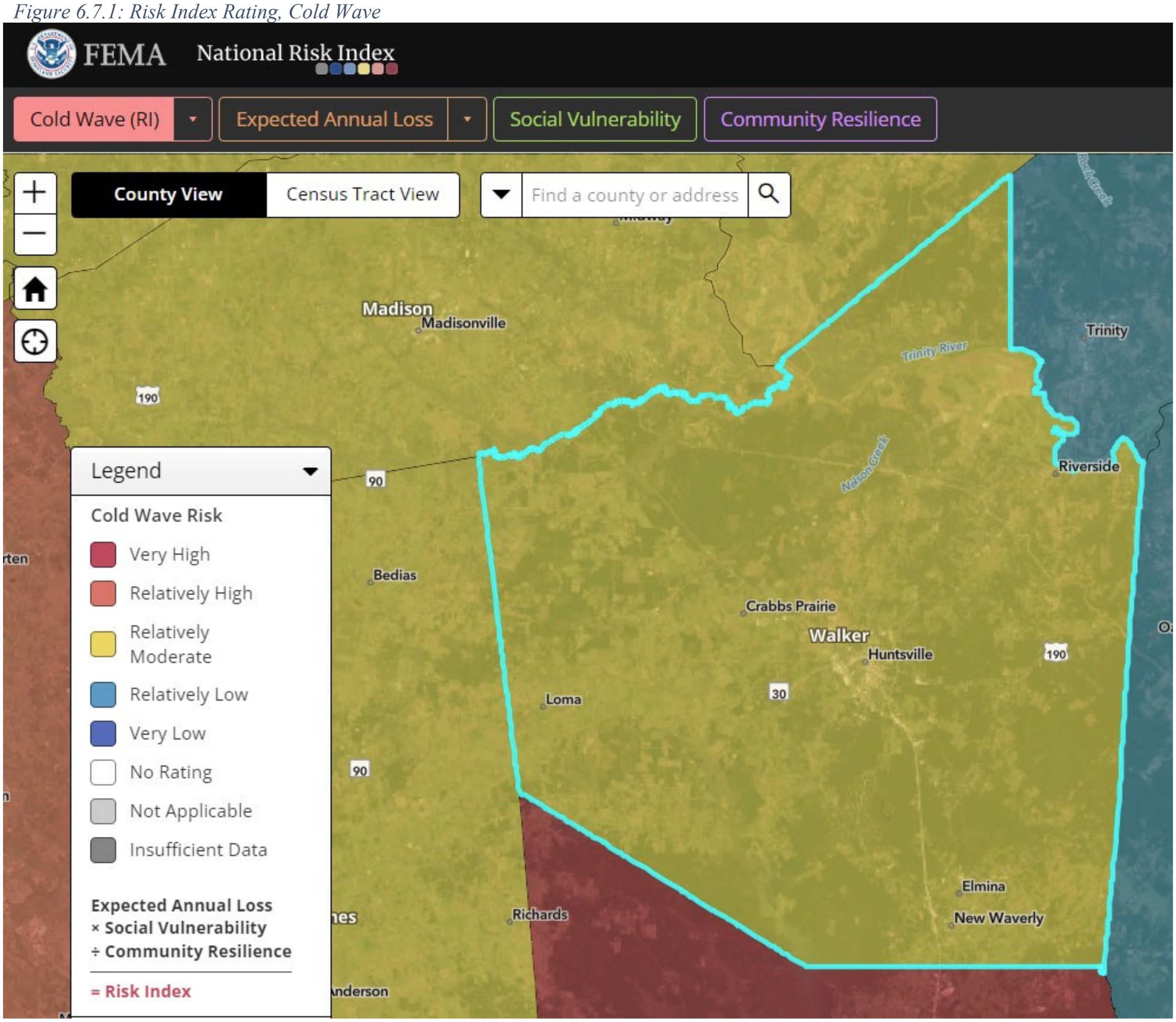


Figure 6.7.2: Risk Index by Census Tract, Walker County, Cold Wave

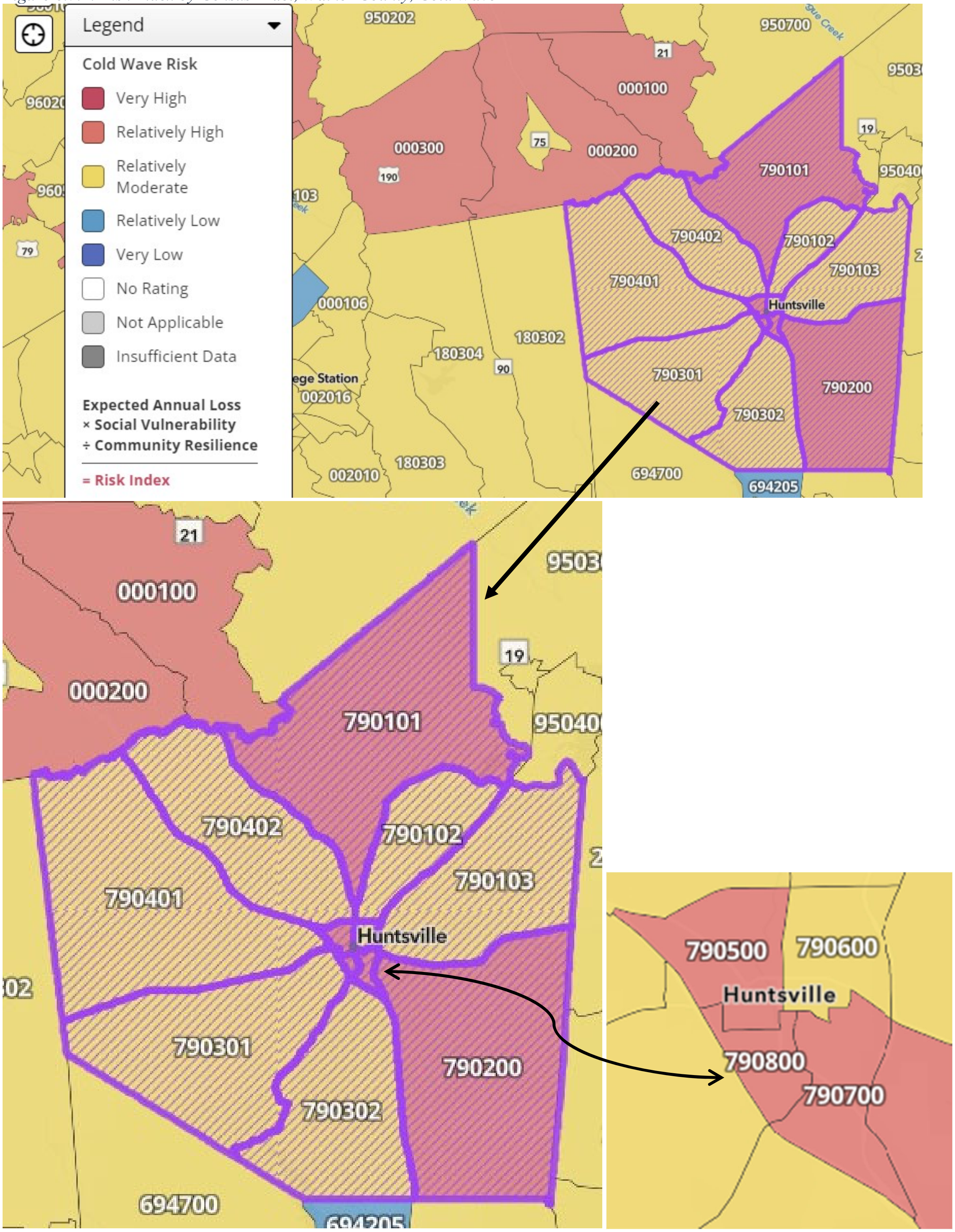


Figure 6.7.3: Risk Index Rating, Ice Storm

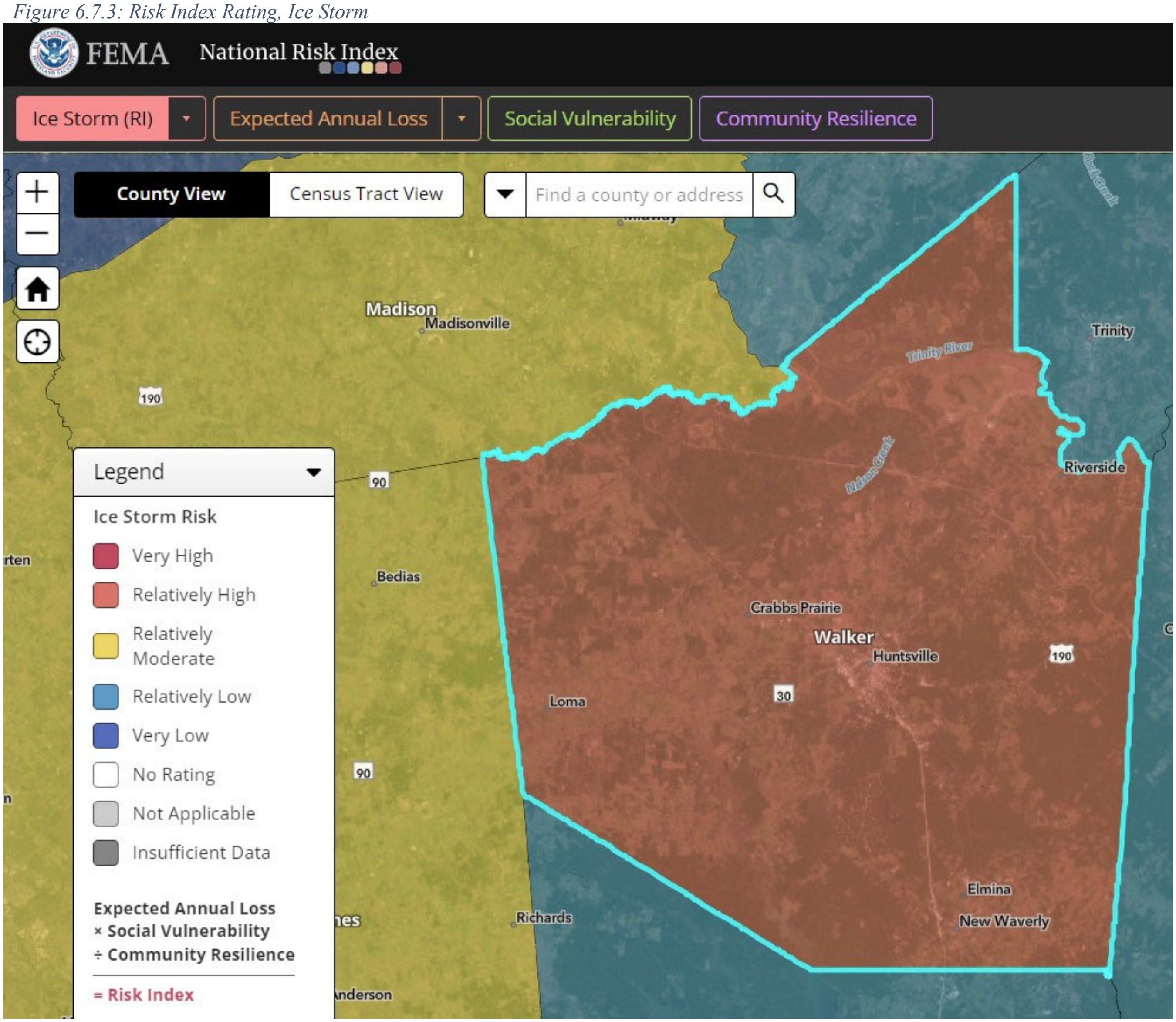


Figure 6.7.4: Risk Index by Census Tract, Walker County, Ice Storm

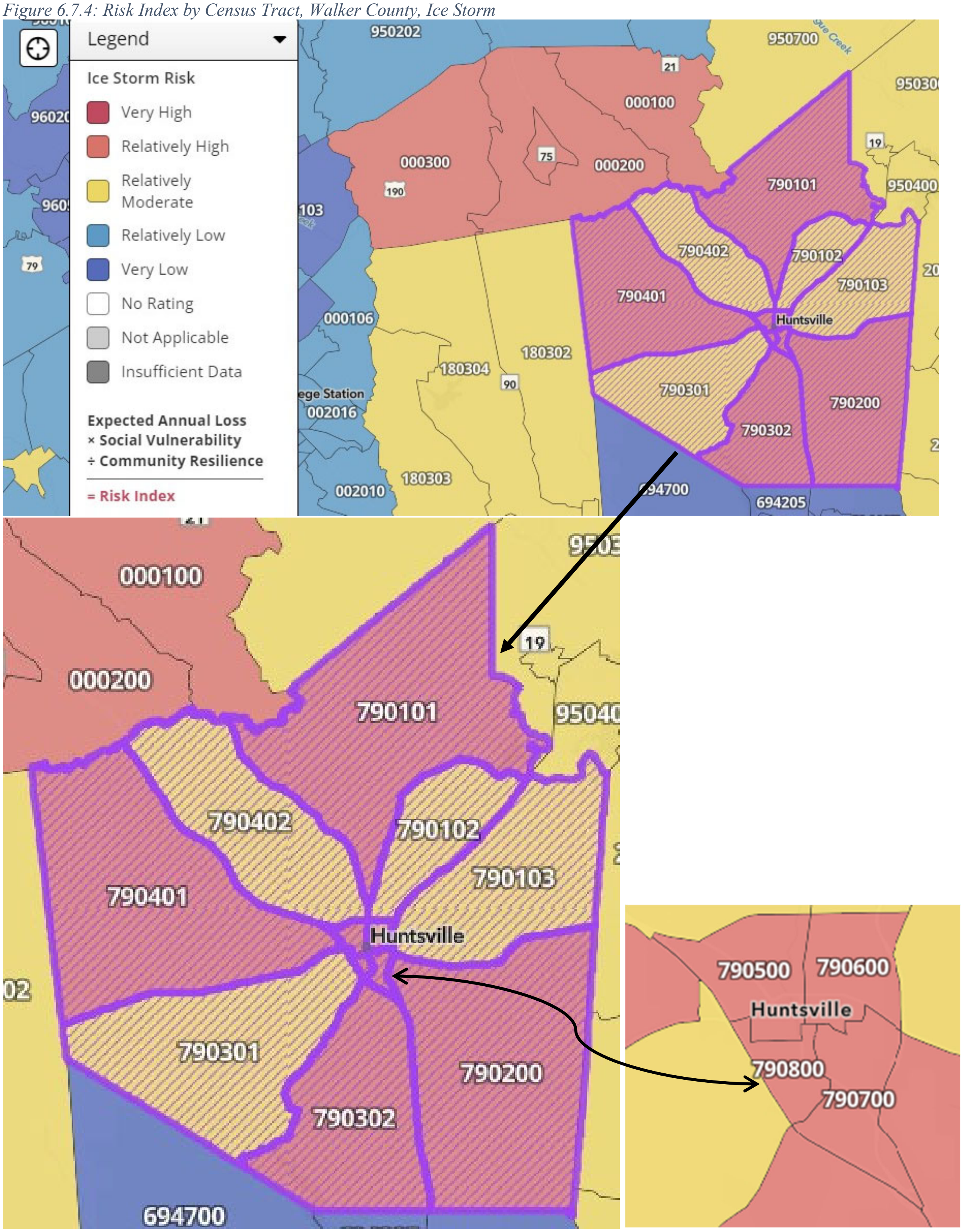


Figure 6.7.5: Risk Index Rating, Winter Weather

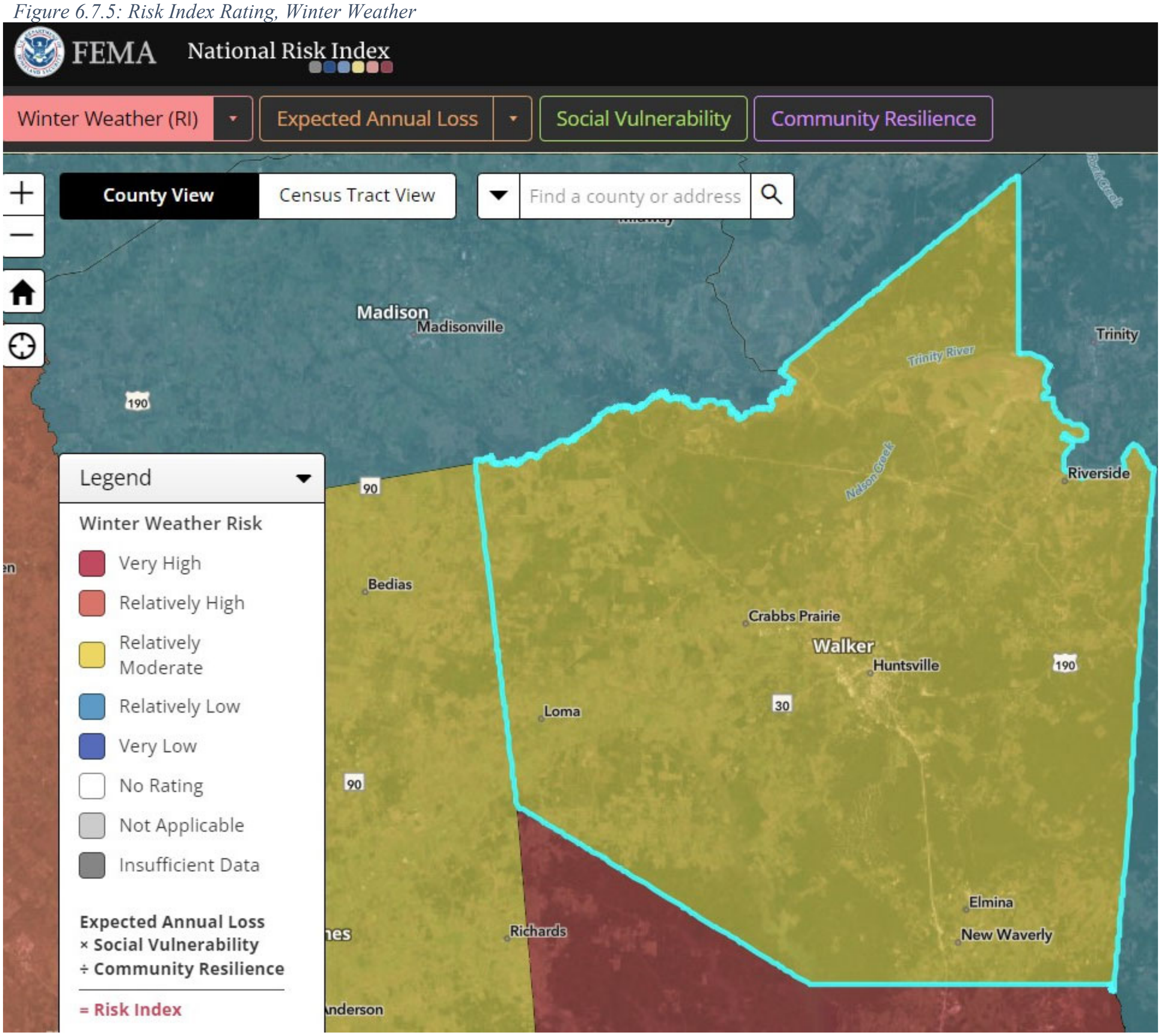


Figure 6.7.6: Risk Index by Census Tract, Walker County, Winter Weather

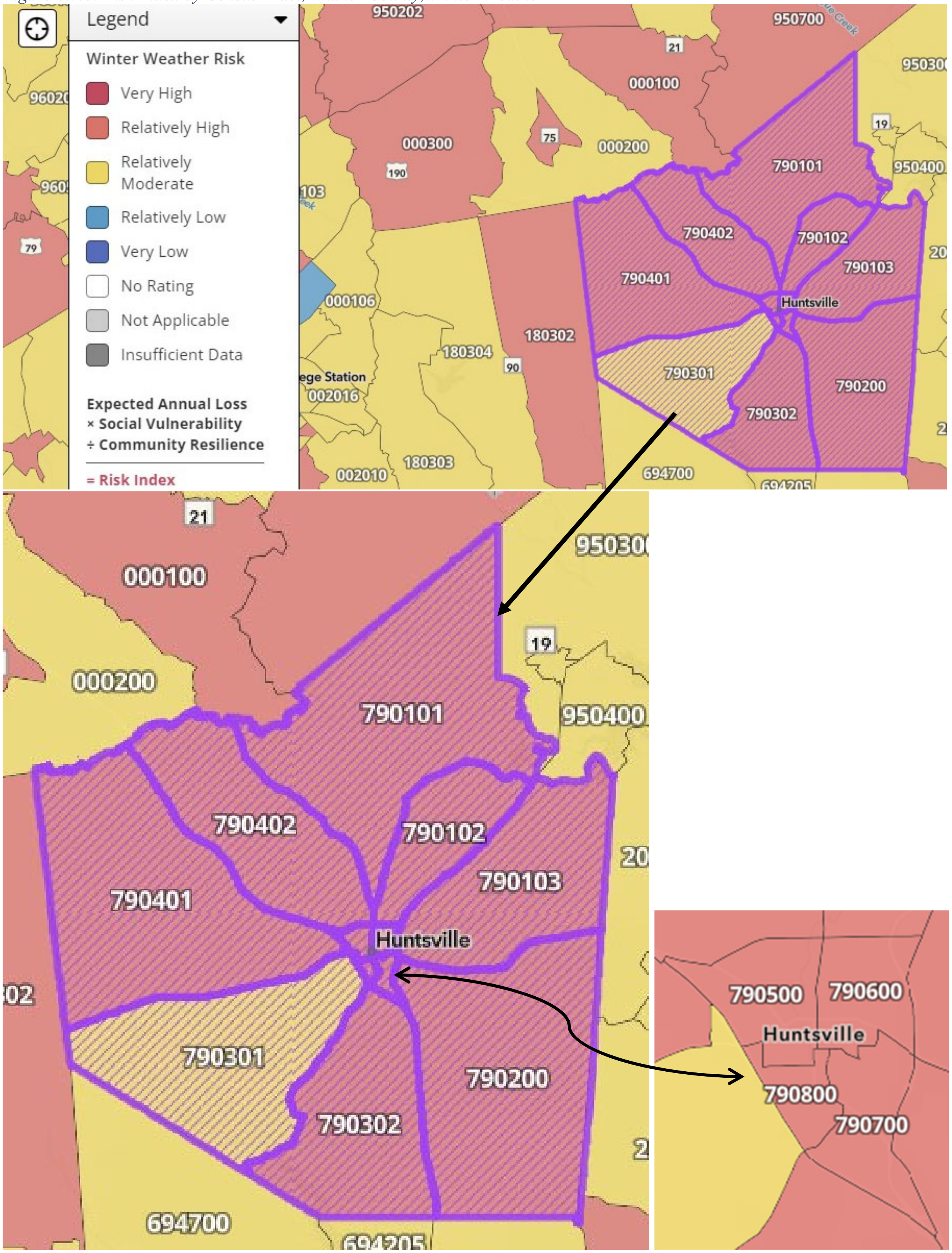


Figure 6.7.7: Social Vulnerability by Census Tract, Walker County

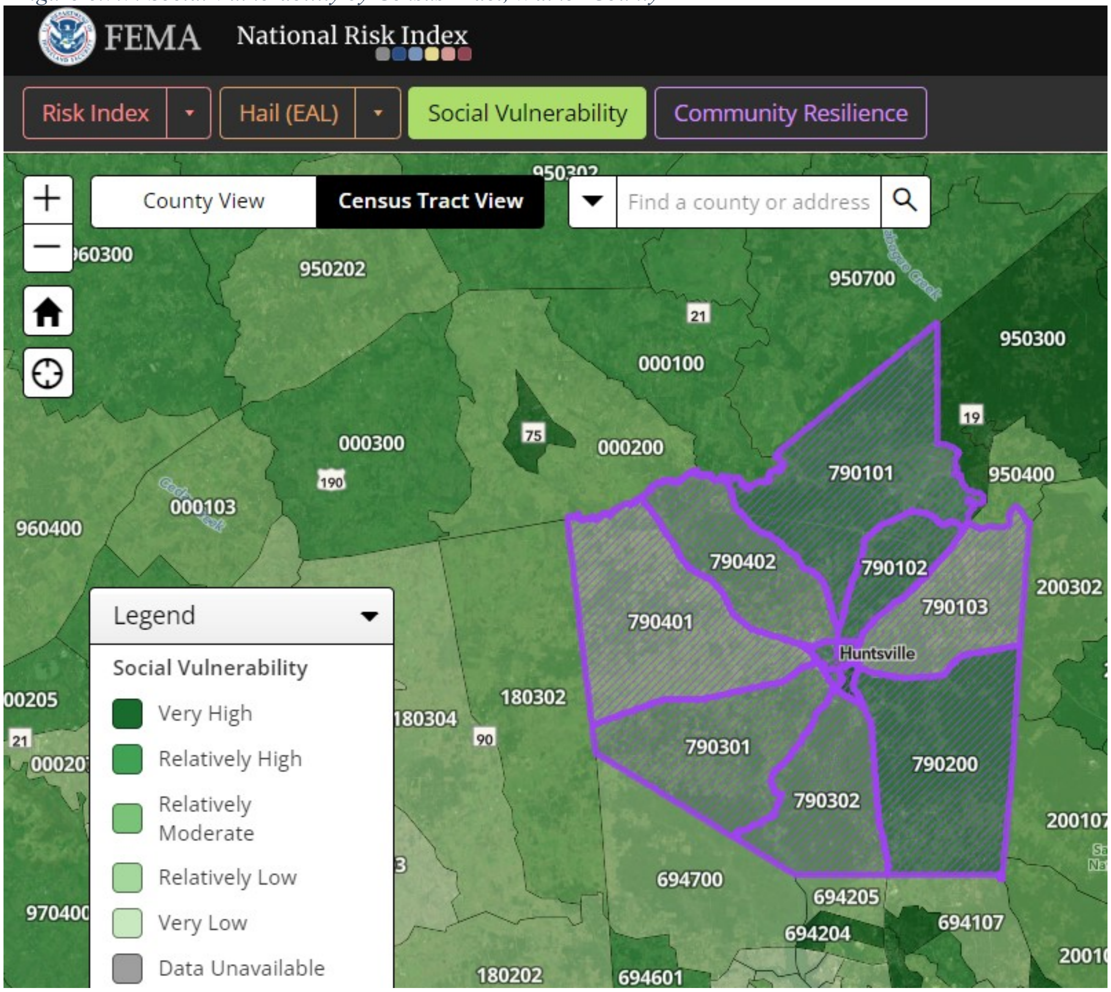


Figure 6.7.8: Social Vulnerability, Walker County

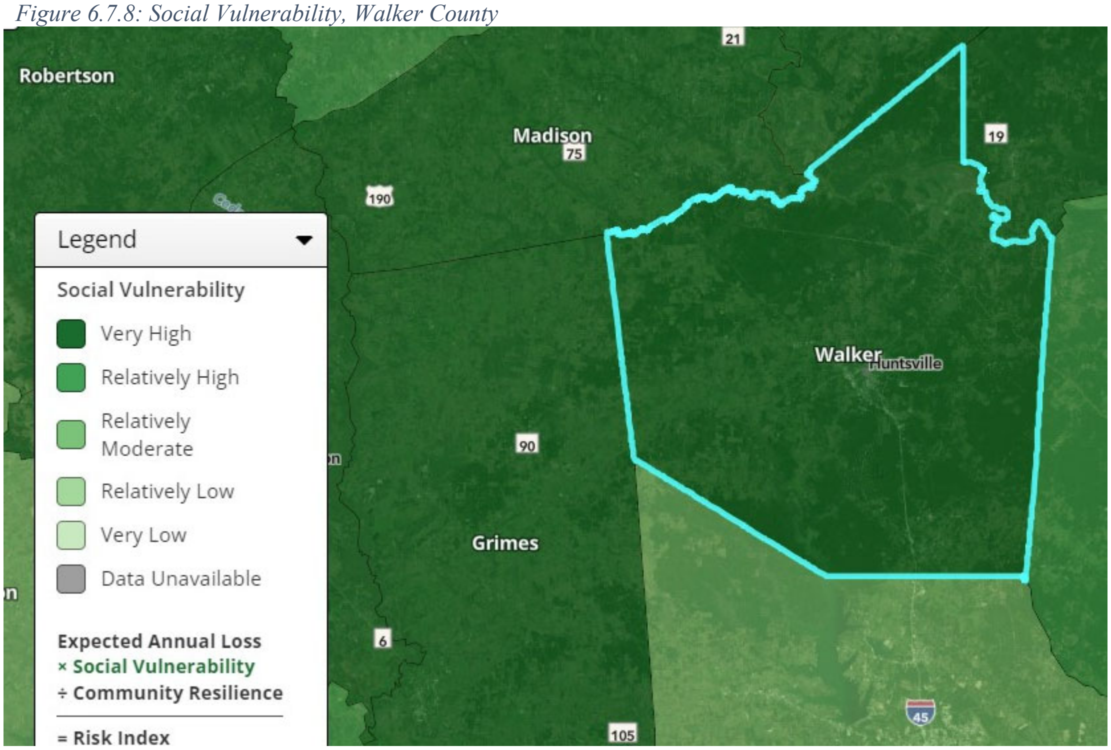


Figure 6.7.9: Community Resilience by Census Tract, Walker County

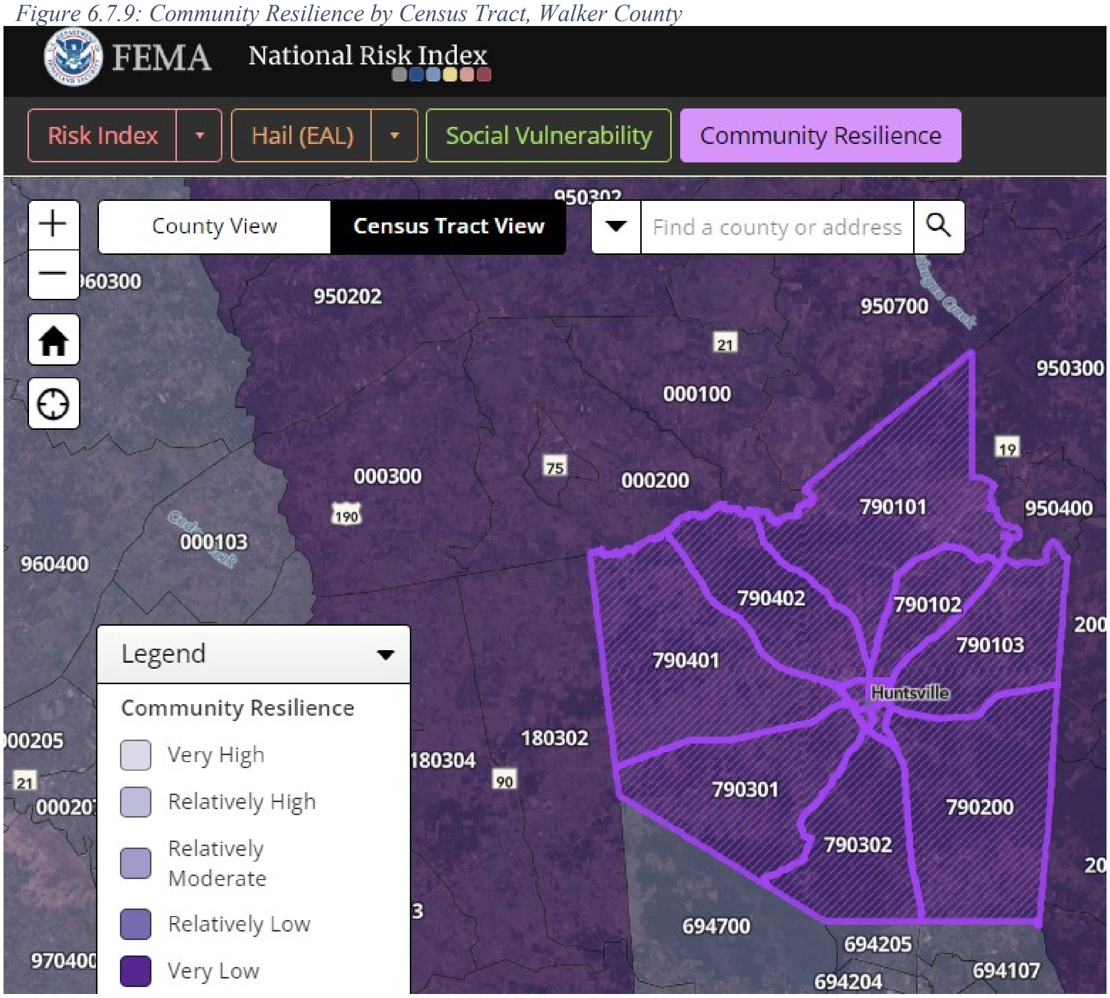


Figure 6.7.10: Community Resilience, Walker County

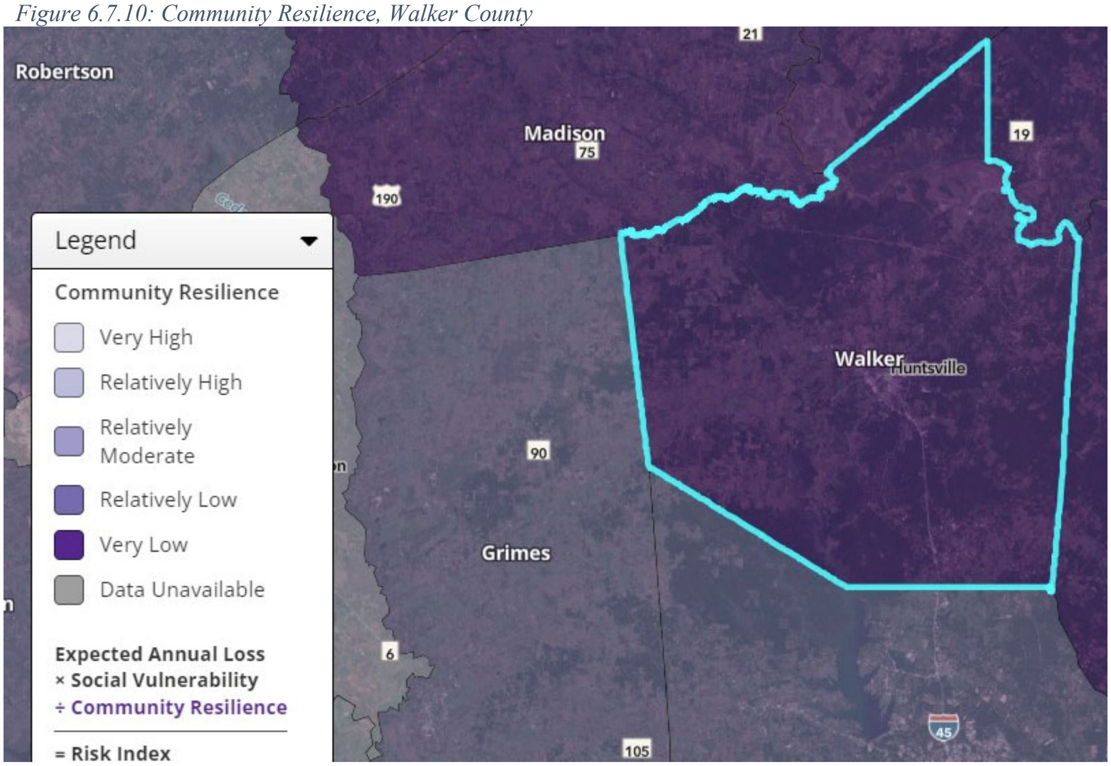


Figure 6.7.11: FEMA NRI Summary, Cold Wave

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790101	TX	Relatively High	92.86	0 100
2	Census tract 48471790700	TX	Relatively High	92.29	0 100
3	Census tract 48471790800	TX	Relatively High	90.77	0 100
4	Census tract 48471790500	TX	Relatively High	90.6	0 100
5	Census tract 48471790200	TX	Relatively High	90.48	0 100
6	Census tract 48471790600	TX	Relatively Moderate	88.8	0 100
7	Census tract 48471790401	TX	Relatively Moderate	87.47	0 100
8	Census tract 48471790302	TX	Relatively Moderate	87.4	0 100
9	Census tract 48471790103	TX	Relatively Moderate	82.66	0 100
10	Census tract 48471790102	TX	Relatively Moderate	82.38	0 100
11	Census tract 48471790402	TX	Relatively Moderate	82.03	0 100
12	Census tract 48471790301	TX	Relatively Moderate	79.77	0 100

Figure 6.7.12: FEMA NRI EAL Summary by Census Tract, Walker County, Cold Wave

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790101	TX	$30,367	Relatively High	Very Low	1.35	$40,882	92.86
2	Census tract 48471790700	TX	$23,961	Very High	Very Low	1.59	$38,058	92.29
3	Census tract 48471790800	TX	$22,256	Relatively High	Very Low	1.44	$32,002	90.77
4	Census tract 48471790500	TX	$21,040	Relatively High	Very Low	1.49	$31,399	90.6
5	Census tract 48471790200	TX	$20,919	Relatively High	Very Low	1.48	$31,053	90.48
6	Census tract 48471790600	TX	$14,405	Very High	Very Low	1.82	$26,286	88.8
7	Census tract 48471790401	TX	$22,041	Relatively Low	Very Low	1.06	$23,274	87.47
8	Census tract 48471790302	TX	$19,864	Relatively Moderate	Very Low	1.16	$23,125	87.4
9	Census tract 48471790103	TX	$16,207	Relatively Low	Very Low	0.98	$15,802	82.66
10	Census tract 48471790102	TX	$11,587	Relatively High	Very Low	1.34	$15,473	82.38
11	Census tract 48471790402	TX	$14,038	Relatively Moderate	Very Low	1.07	$15,060	82.03
12	Census tract 48471790301	TX	$11,240	Relatively Moderate	Very Low	1.12	$12,612	79.77

Figure 6.7.13: FEMA NRI Summary, Ice Storm

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790700	TX	Relatively High	95.14	0 100
2	Census tract 48471790800	TX	Relatively High	95.13	0 100
3	Census tract 48471790500	TX	Relatively High	94.07	0 100
4	Census tract 48471790200	TX	Relatively High	93.14	0 100
5	Census tract 48471790600	TX	Relatively High	92.49	0 100
6	Census tract 48471790101	TX	Relatively High	92.08	0 100
7	Census tract 48471790302	TX	Relatively High	91.96	0 100
8	Census tract 48471790401	TX	Relatively High	90.57	0 100
9	Census tract 48471790103	TX	Relatively Moderate	87.6	0 100
10	Census tract 48471790102	TX	Relatively Moderate	86.9	0 100
11	Census tract 48471790402	TX	Relatively Moderate	86.71	0 100
12	Census tract 48471790301	TX	Relatively Moderate	85.64	0 100

Figure 6.7.14: FEMA NRI EAL Summary by Census Tract, Walker County, Ice Storm

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790700	TX	$34,905	Very High	Very Low	1.59	$55,440	95.14
2	Census tract 48471790800	TX	$38,511	Relatively High	Very Low	1.44	$55,374	95.13
3	Census tract 48471790500	TX	$31,744	Relatively High	Very Low	1.49	$47,372	94.07
4	Census tract 48471790200	TX	$28,370	Relatively High	Very Low	1.48	$42,113	93.14
5	Census tract 48471790600	TX	$21,250	Very High	Very Low	1.82	$38,774	92.49
6	Census tract 48471790101	TX	$27,481	Relatively High	Very Low	1.35	$36,997	92.08
7	Census tract 48471790302	TX	$31,364	Relatively Moderate	Very Low	1.16	$36,515	91.96
8	Census tract 48471790401	TX	$29,625	Relatively Low	Very Low	1.06	$31,283	90.57
9	Census tract 48471790103	TX	$23,664	Relatively Low	Very Low	0.98	$23,073	87.6
10	Census tract 48471790102	TX	$16,175	Relatively High	Very Low	1.34	$21,601	86.9
11	Census tract 48471790402	TX	$19,820	Relatively Moderate	Very Low	1.07	$21,264	86.71
12	Census tract 48471790301	TX	$17,185	Relatively Moderate	Very Low	1.12	$19,282	85.64

Figure 6.7.15: FEMA NRI Summary, Winter Weather

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790700	TX	Relatively High	95.93	0 100
2	Census tract 48471790800	TX	Relatively High	95.07	0 100
3	Census tract 48471790500	TX	Relatively High	94.92	0 100
4	Census tract 48471790200	TX	Relatively High	94.58	0 100
5	Census tract 48471790101	TX	Relatively High	94.05	0 100
6	Census tract 48471790600	TX	Relatively High	93.66	0 100
7	Census tract 48471790302	TX	Relatively High	92.59	0 100
8	Census tract 48471790401	TX	Relatively High	91.92	0 100
9	Census tract 48471790103	TX	Relatively High	88.45	0 100
10	Census tract 48471790102	TX	Relatively High	88.16	0 100
11	Census tract 48471790402	TX	Relatively High	87.89	0 100
12	Census tract 48471790301	TX	Relatively Moderate	84.89	0 100

Figure 6.7.16: FEMA NRI EAL Summary by Census Tract, Walker County, Winter Weather

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790700	TX	$19,677	Very High	Very Low	1.59	$31,254	95.93
2	Census tract 48471790800	TX	$18,426	Relatively High	Very Low	1.44	$26,494	95.07
3	Census tract 48471790500	TX	$17,297	Relatively High	Very Low	1.49	$25,813	94.92
4	Census tract 48471790200	TX	$16,430	Relatively High	Very Low	1.48	$24,389	94.58
5	Census tract 48471790101	TX	$16,834	Relatively High	Very Low	1.35	$22,663	94.05
6	Census tract 48471790600	TX	$11,835	Very High	Very Low	1.82	$21,595	93.66
7	Census tract 48471790302	TX	$16,189	Relatively Moderate	Very Low	1.16	$18,847	92.59
8	Census tract 48471790401	TX	$16,607	Relatively Low	Very Low	1.06	$17,536	91.92
9	Census tract 48471790103	TX	$12,914	Relatively Low	Very Low	0.98	$12,591	88.45
10	Census tract 48471790102	TX	$9,212	Relatively High	Very Low	1.34	$12,302	88.16
11	Census tract 48471790402	TX	$11,201	Relatively Moderate	Very Low	1.07	$12,017	87.89
12	Census tract 48471790301	TX	$8,501	Relatively Moderate	Very Low	1.12	$9,539	84.89

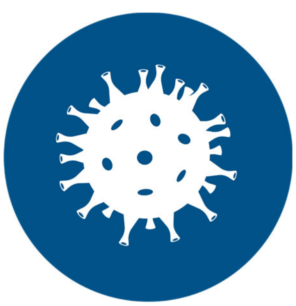
Climate Change Impacts

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 large accumulations of snow are possible. Climate model projections have shown the risk of snowfall consistently decreases in climates like that of Texas.[49]

Table 6.7.11: 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 6.8: Emerging Infectious Diseases



6.8 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."[88] 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.[89] 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. A worst-case scenario for this hazard would include an EID that spreads rapidly and has no readily available vaccine. This is similar to what was experienced in 2020 with the novel coronavirus, SARS-CoV-2, pandemic. While much was learned from the 2020 pandemic, a new EID could still lead to congestion at critical facilities such as hospitals or urgent cares, shelter in place orders, loss of wages or employment, and loss of life. Additionally, if other natural hazards occur during the same time frame as an EID that require the use of public shelters, this can increase the exposure of residents to the EID.

Historic Occurrences

Pandemics can emerge anywhere and quickly spread. It is difficult to predict when or where the next pandemic will occur.[90] According to the CDC, five pandemics have occurred in the US since 1918. The table below outlines these pandemics, when they occurred, and the underlying cause.[91]

Table 6.8.1: 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 Walker County for EID listed under biological incidents.[2]

Table 6.8.2: 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 Walker County since 2018 are listed in the table below.[39]

Table 6.8.3: USDA Declared Disasters (2018-2023), Emerging Infectious Diseases

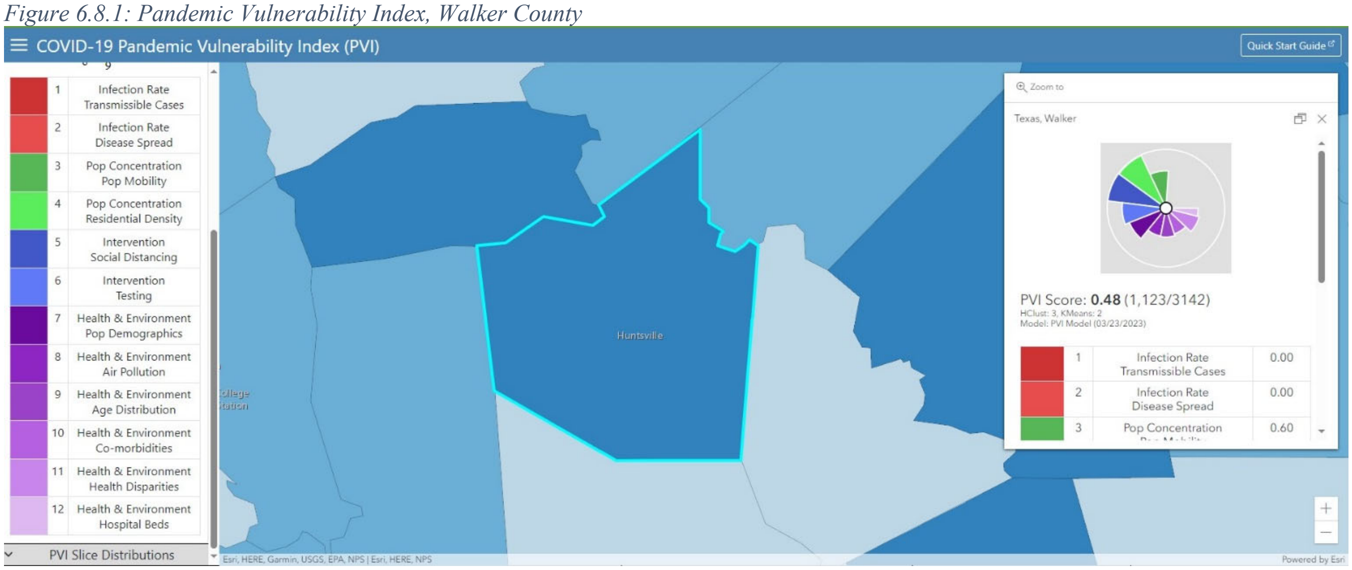
Crop Disaster Year	Disaster Description	Designation Number
	None	

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 are caused by anthropogenic influences such as increased traveling 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.[92]

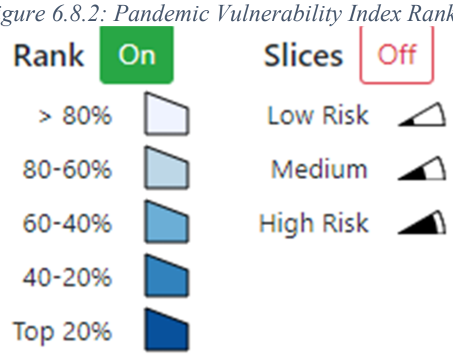
The National Institute of Environmental Health Sciences developed the COVID-19 Pandemic Vulnerability Index (PVI) Dashboard. This Dashboard creates risk profiles, called PVI Scorecards, for each county in the United States. The PVI summarizes and visualizes overall risk in a radar chart, which is a type of pie chart with various data sources comprising each slice of the pie. Walker County saw 21,959 Covid-19 cases and 215 deaths during the most recent pandemic. As seen in the figure below, Walker County's PVI score is 0.48.[93]

Figure 6.8.1: Pandemic Vulnerability Index, Walker 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 0.48 PVI score puts Walker 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 6.8.2: Pandemic Vulnerability Index Ranking Legend



Populations at Risk

EID can vary in 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.[94] As the county continues to grow, the vulnerability of residents to this hazard will increase. Any areas of future development could be exposed to this hazard if they are areas where people will congregate.

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.[95]

Table 6.8.4: 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 6.9: Windstorm

6.9 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.[96] Windstorms, or damaging winds, include many different variations. These damaging wind types and their definitions from NOAA can be seen in the table below.[97]

Table 6.9.1: 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 6.10) and Tornado (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.

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.[98] The table below outlines the measurements used by the Beaufort Wind Scale for use on land.

Table 6.9.2: 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 6.9.3 describes the various wind-related warnings, watches, and advisories below.[99]

Table 6.9.3: 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.

A worst-case scenario for this hazard would include a severe thunderstorm, hurricane, or tropical storm event that could produce hurricane-force winds of 72 mph or more, straight-line winds, downbursts, or

Derechos. These winds could damage critical infrastructure that leads to a power outage, blocked roadways, and even result in a loss of communication within the county if a radio or cell tower is destroyed. If the wind event occurs during a heat event or drought and disrupts power supply in the area for a prolonged amount of time, secondary hazards pose greater risks to citizens due to the heat. This scenario is similar to what occurred within the region during the 2024 derecho and Hurricane Beryl where power lines were destroyed by winds or tree debris in July when the region was under an excessive heat advisory, and restoration/repairs took longer to address than anticipated.

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 Walker County's strong wind events from 1950-2023 is provided in the table below. Also included in this table are Thunderstorm Wind events. Between the two incident types, there are 121 occurrences of past events, with the earliest event on record occurring in 1956.[38]

Table 6.9.4: Walker County Wind Events (2018-2023)

Date	Location	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)	Wind Speed (knots/mph)
3/18/2018	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$20,000	$-	61/70
3/18/2018	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$10,000	$-	60/69
3/28/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	60/69
3/28/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	50/57.5
3/28/2018	DODGE	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/3/2018	NEW WAVERLY	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/3/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	52/60
10/31/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$500	$-	51/58.7
9/10/2019	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$3,000	51/58.7
9/10/2019	HUNTSVILLE	Thunderstorm Wind	0	0	$3,000	$-	51/58.7
1/10/2020	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$26,000	$-	50/57.5
1/10/2020	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$19,000	$-	51/58.7
1/10/2020	PHELPS	Thunderstorm Wind	0	0	$21,000	$-	50/57.5
1/10/2020	RIVERSIDE	Thunderstorm Wind	0	0	$16,000	$-	50/57.5
4/9/2020	LOMA	Thunderstorm Wind	0	0	$9,000	$12,000	55/63
4/9/2020	SAN JACINTO	Thunderstorm Wind	0	0	$7,000	$11,000	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$14,000	$1,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$5,000	$9,000	56/64.5

Date	Location	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)	Wind Speed (knots/mph)
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$13,000	$-	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$14,000	$2,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$-	$9,000	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$41,000	$7,000	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$9,000	$-	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$6,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$19,000	$-	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$16,000	$-	56/64.5
7/12/2021	PHELPS	Thunderstorm Wind	0	0	$-	$-	50/57.5
4/28/2023	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$-	$-	50/57.5
5/23/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	50/57.5
5/23/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	61/70
5/23/2023	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/10/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$10,000	$-	52/60
6/21/2023	MOSSY GROVE	Thunderstorm Wind	0	0	$-	$-	61/70
6/21/2023	LOMA	Thunderstorm Wind	0	0	$-	$-	61/70
6/21/2023	LOMA	Thunderstorm Wind	0	0	$-	$-	61/70
TOTALS:			**0**	**0**	**$272,500**	**$60,000**	N/A

$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been 2 disaster declarations in which wind (straight-line winds) was included in the declaration title for Walker County. However, the declarations are listed as severe storms for the incident type.[2]

Table 6.9.5: Federal Disaster Declarations, Tornado/ Microburst

Declaration Date	Incident Type	Title	Disaster Number	Declaration Type
5/29/2015	Severe Storm	Severe storms, tornadoes, straight-line winds, and flooding	4223	Major Disaster Declaration
11/25/2015	Severe Storm	Severe storms, tornadoes, straight-line winds, and flooding	4245	Major Disaster Declaration

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 Walker County since 2018 are listed in the table below.[39]

Table 6.9.6: USDA Declared Disasters (2018-2023), Windstorm

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 wind events, annualized frequency values are 1.6 events per year over a 34-year period of record (1986-2021), with 56 events on record for this timeframe.[44]

Populations at Risk

Populations at risk for strong wind events include similar groups to those listed under Section 6.4 (Tornado) and Section 6.10 (Severe Thunderstorms & Lightning) hazard profiles. All residents within the county are exposed to this hazard. The impacts of strong winds on the life, health, and safety of Walker County residents depend on several factors, including the severity of the event and adequate warning time being provided to residents to secure projectiles and take shelter. Strong wind events can lead to a disruption in emergency response services, loss of electricity, loss of clean water, and delayed forms of necessary medical assistance while repairs are made to critical facilities or power is being restored within the county.

The NCHH summarizes at-risk populations for several hazards. For strong wind events, these include older adults, people experiencing homelessness, people with disabilities, and people with chronic health conditions. In addition to the dangers listed above, older adults can face social isolation, lack of electricity needed to run medical equipment, lack of access to a vehicle for evacuation, and lack of access to other critical supplies. Evacuation for these events is fast-paced, and older adults may not be able to seek adequate shelter or secure dangerous projectiles on their property before a wind event impacts their area. For people experiencing homelessness, adequate shelter is critical in keeping populations safe during these events as they are heavily associated with severe thunderstorms and even tornadoes. People with disabilities may require additional assistance to stay safe and prepare for these hazards and their after-effects such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. Likewise, those with chronic health conditions may need similar assistance as those with disabilities. Residents impacted may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by the strong winds associated with severe thunderstorms or tornadoes 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. These issues disproportionately affect low-income communities and families who may lack the resources to pay for damages to their homes, lack insurance, or lack the resources to replace home contents or personal belongings.[49]

Any areas of growth or future development within the county could be impacted by this hazard, and increase the risk of impacts from this hazard, because it has no set geographic boundary. The entire county is vulnerable to strong wind events. Those living in mobile/manufactured housing are also at greater risk from this hazard as even anchored mobile homes can be seriously damaged or destroyed when wind gusts over 80 mph.[56] As the population within the county increases, so does the vulnerability of residents to this hazard. Additionally, this hazard could damage critical infrastructure that leads to a prolonged power outage.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below.

Table 6.9.7: Expected Annual Loss Exposure Values, Strong Wind

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Strong Wind	$10,148,163,352	$885,068,400,000/ 76,299	$6,997,533	$38,738,889

Table 6.9.8: Expected Annual Loss Values, Strong Wind

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Strong Wind	$98,970	$108,568/ 0.01	$3,501

N/A- Not Applicable

EAL for Walker County and participating jurisdictions was derived by creating a report that used census tract information for all 12 tracts within Walker County. These were census tracts 48039662100, 48039662200, 48039662400, 48039662300, 48039662500, 48039663100, and 48039664100. Risk Index Ratings according to the FEMA NRI for strong wind events for a majority of these census tracts is listed as relatively moderate, with one tract rating relatively low and one tract relatively high. EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below.[44] Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence. HLR for strong wind events within Walker County is listed as very low.[44]

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.9.1: Risk Index Rating, Strong Wind

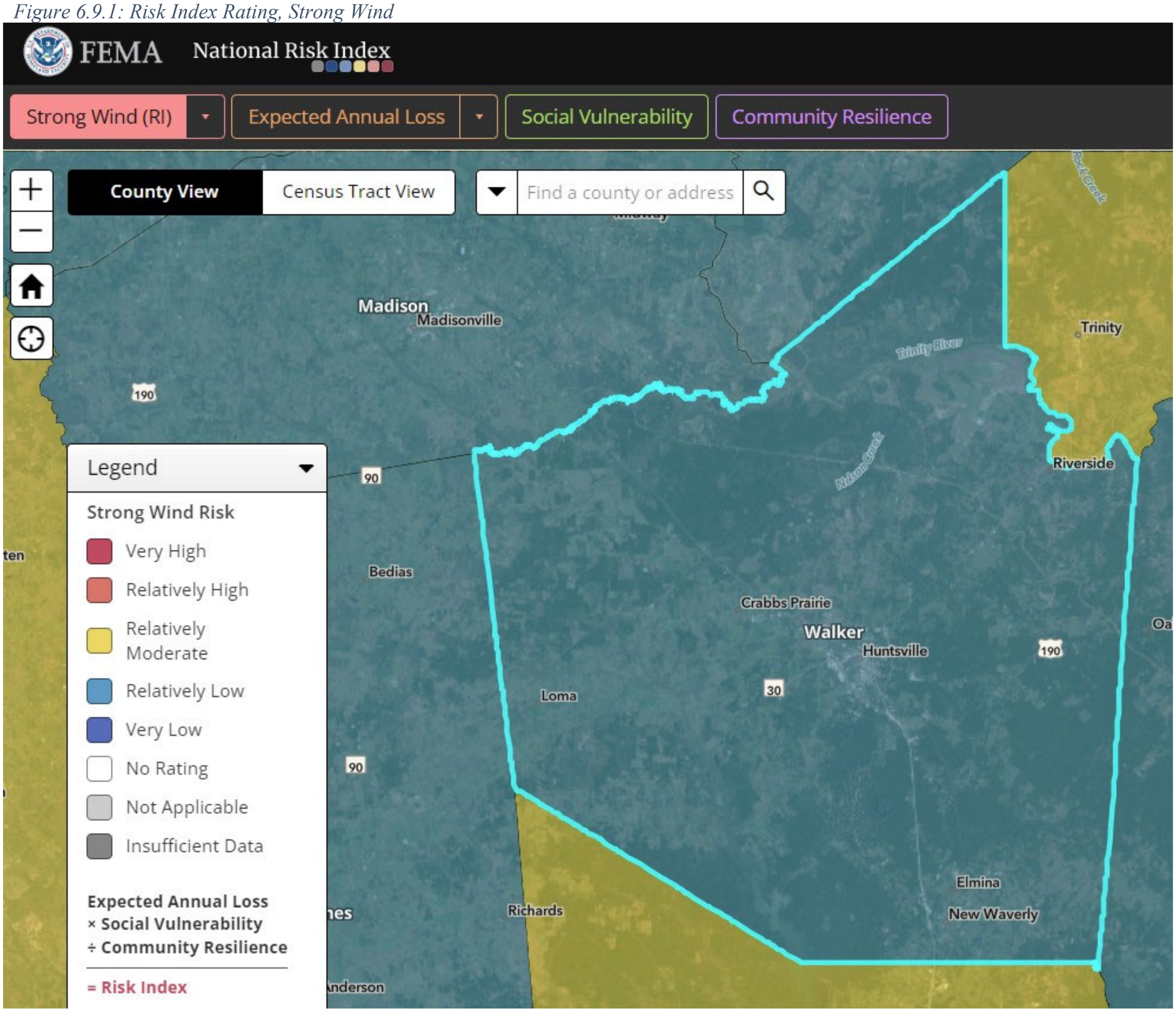


Figure 6.9.2: Risk Index by Census Tract, Walker County, Strong Wind

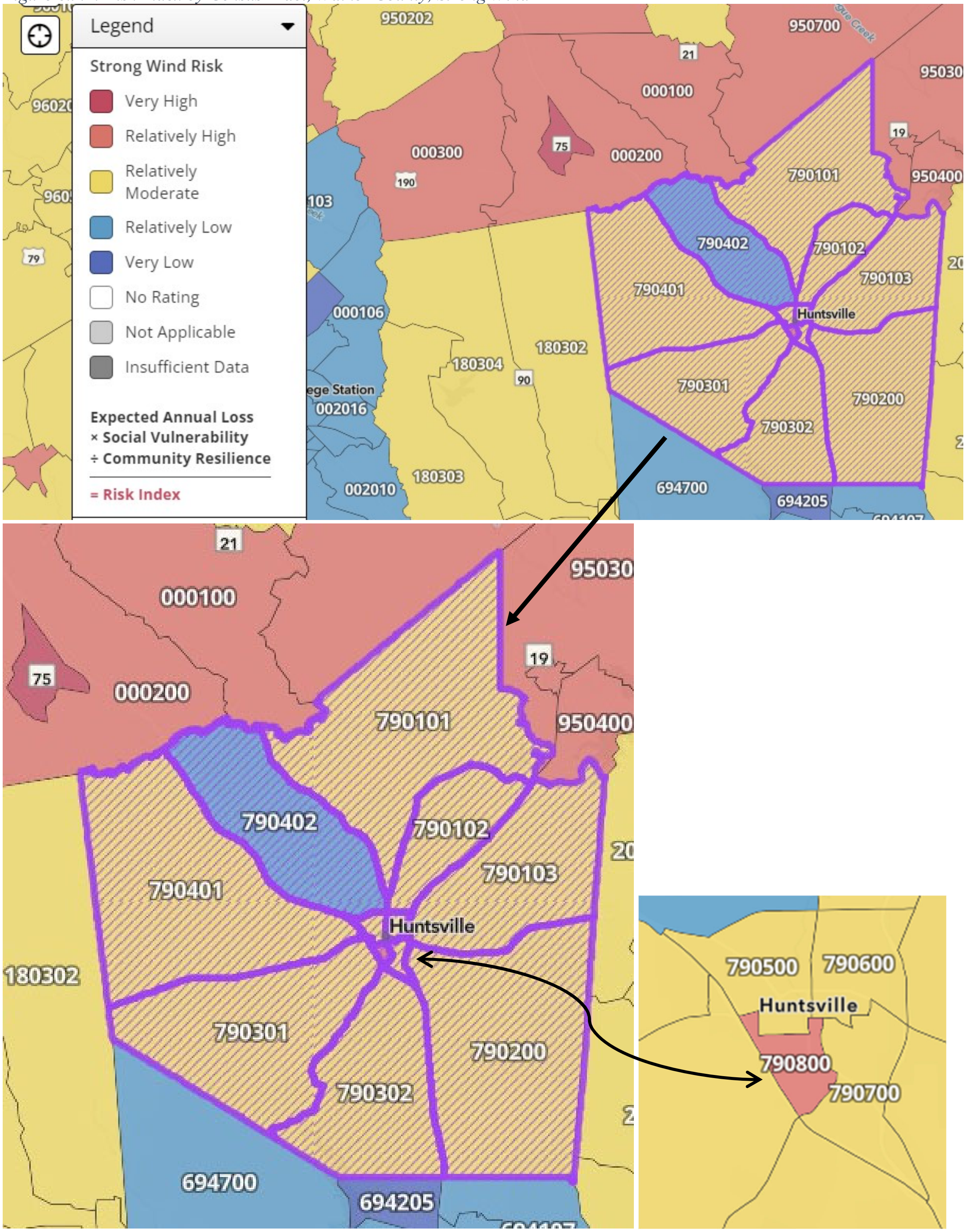


Figure 6.9.3: Social Vulnerability by Census Tract, Walker County

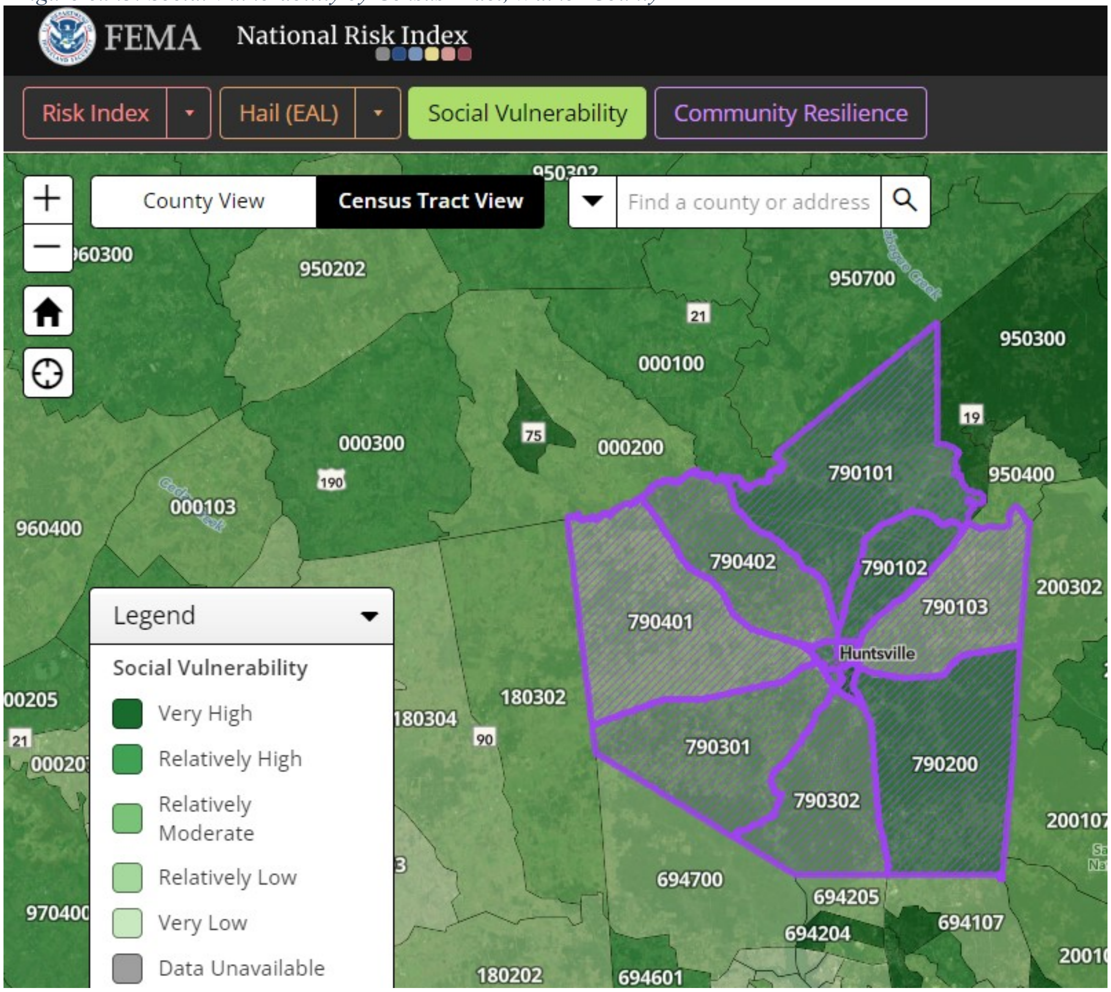


Figure 6.9.4: Social Vulnerability, Walker County

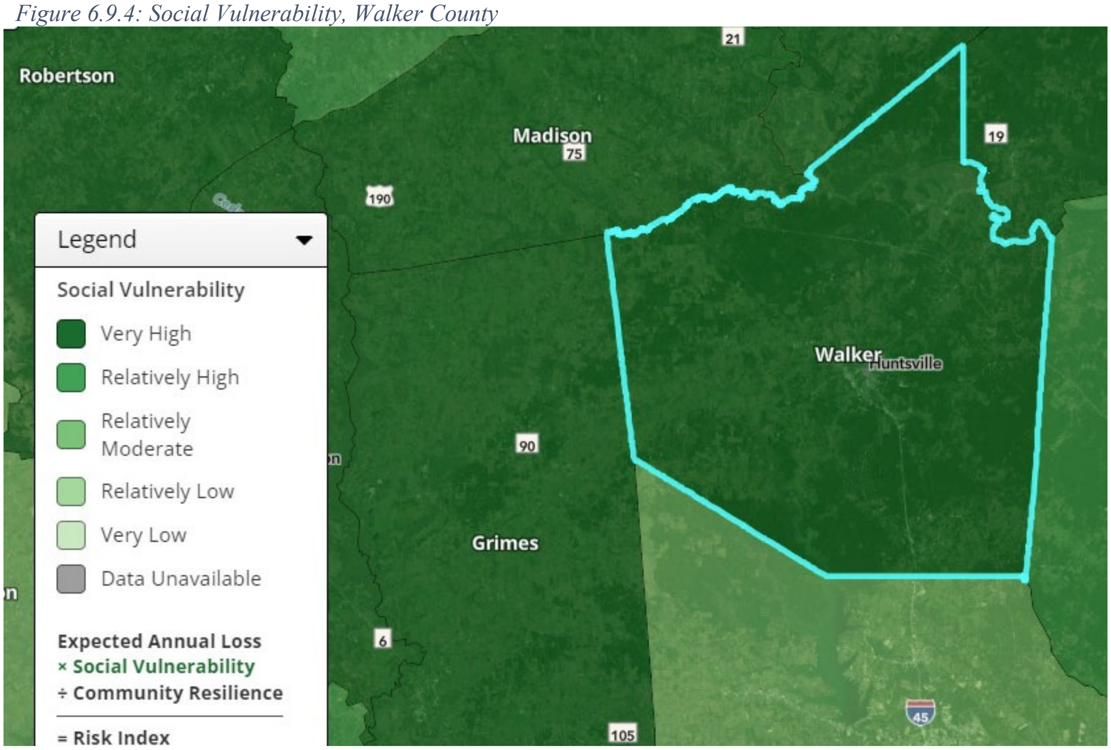


Figure 6.9.5: Community Resilience by Census Tract, Walker County

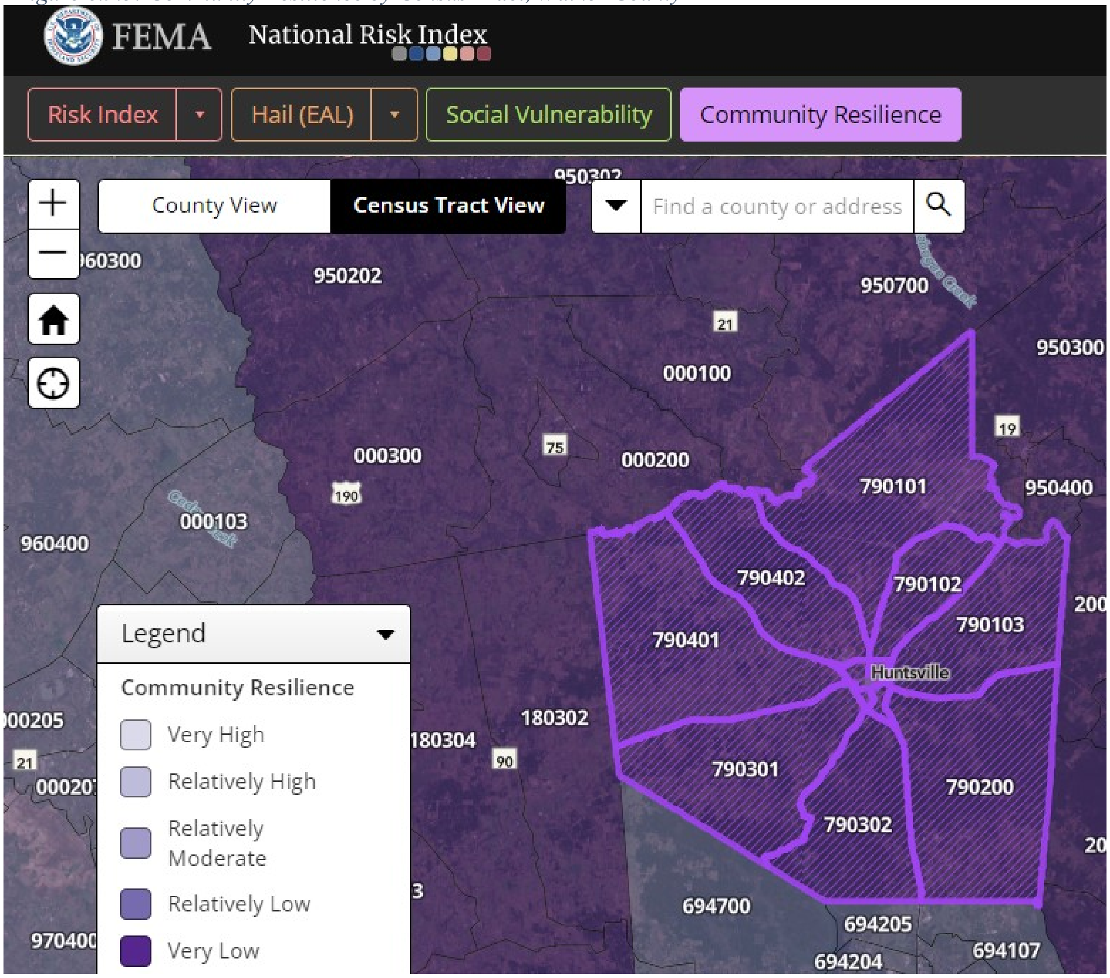


Figure 6.9.6: Community Resilience, Walker County

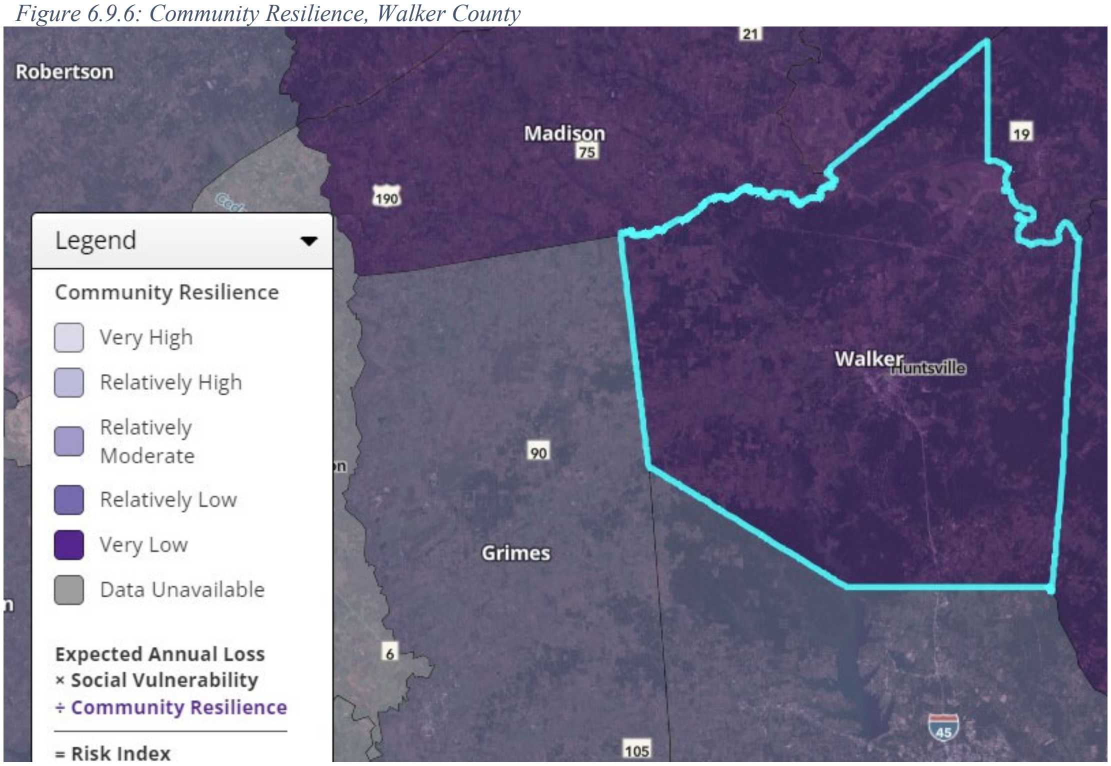


Figure 6.9.7: FEMA NRI Summary, Strong Wind

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790800	TX	Relatively High	81.85	0 100
2	Census tract 48471790200	TX	Relatively Moderate	75.73	0 100
3	Census tract 48471790700	TX	Relatively Moderate	75.21	0 100
4	Census tract 48471790500	TX	Relatively Moderate	73.52	0 100
5	Census tract 48471790101	TX	Relatively Moderate	68.04	0 100
6	Census tract 48471790302	TX	Relatively Moderate	67.97	0 100
7	Census tract 48471790600	TX	Relatively Moderate	67.82	0 100
8	Census tract 48471790401	TX	Relatively Moderate	63.48	0 100
9	Census tract 48471790103	TX	Relatively Moderate	59.74	0 100
10	Census tract 48471790301	TX	Relatively Moderate	57.88	0 100
11	Census tract 48471790102	TX	Relatively Moderate	55.55	0 100
12	Census tract 48471790402	TX	Relatively Low	53.69	0 100

Figure 6.9.8: FEMA NRI EAL Summary by Census Tract, Walker County, Strong Wind

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790800	TX	$30,617	Relatively High	Very Low	1.44	$44,023	81.85
2	Census tract 48471790200	TX	$21,925	Relatively High	Very Low	1.48	$32,546	75.73
3	Census tract 48471790700	TX	$19,998	Very High	Very Low	1.59	$31,764	75.21
4	Census tract 48471790500	TX	$19,757	Relatively High	Very Low	1.49	$29,485	73.52
5	Census tract 48471790101	TX	$17,180	Relatively High	Very Low	1.35	$23,130	68.04
6	Census tract 48471790302	TX	$19,811	Relatively Moderate	Very Low	1.16	$23,064	67.97
7	Census tract 48471790600	TX	$12,556	Very High	Very Low	1.82	$22,911	67.82
8	Census tract 48471790401	TX	$17,921	Relatively Low	Very Low	1.06	$18,924	63.48
9	Census tract 48471790103	TX	$16,572	Relatively Low	Very Low	0.98	$16,158	59.74
10	Census tract 48471790301	TX	$13,260	Relatively Moderate	Very Low	1.12	$14,879	57.88
11	Census tract 48471790102	TX	$10,005	Relatively High	Very Low	1.34	$13,361	55.55
12	Census tract 48471790402	TX	$11,436	Relatively Moderate	Very Low	1.07	$12,269	53.69

Climate Change Impacts

Since windstorms and strong winds are heavily related to severe thunderstorm development, this section will mirror that of Section 6.8 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. Strong winds associated with severe storms occur most often during 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.[49]

Table 6.9.9: 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 which provides warm air to aid in fueling thunderstorms.

Section 6.10: Severe Thunderstorms & Lightning

6.10 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."[100] 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.[101] There are different types of thunderstorms with varying characteristics and degrees of severity.[102] Descriptions of these can be found in Table 6.10.1.

Table 6.10.1: 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."[103] 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)[104], lightning kills about 20 people per year while hundreds more are injured or suffer lifelong neurological damage.[105] There are different types of lightning with varying characteristics. Most lighting starts within a thunderstorm and travels through the cloud.[106] Descriptions of these can be found in Table 6.10.2.

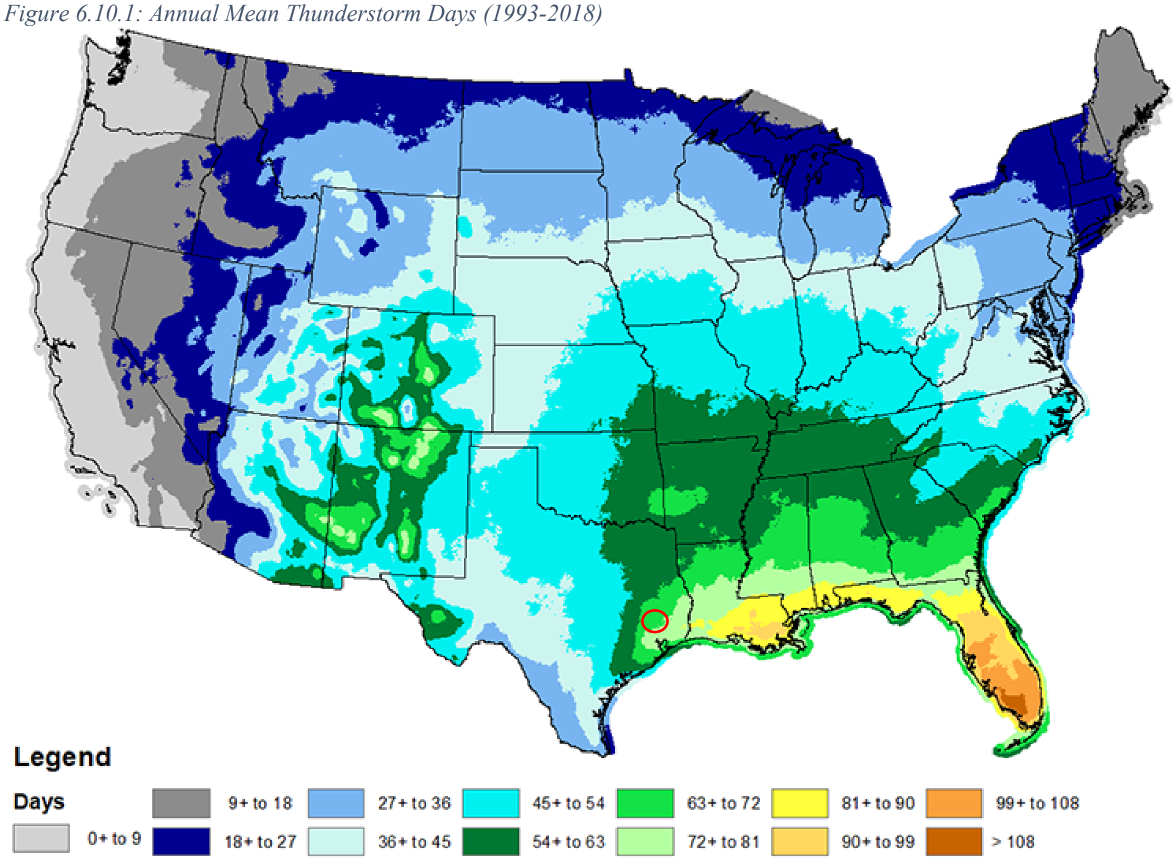
Table 6.10.2: Types of Lightning

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, at 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 6.10.1 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. Walker County is in an area that can see anywhere from 63-72 thunderstorm days per year as indicated by the red-circled area on the figure below. [107]

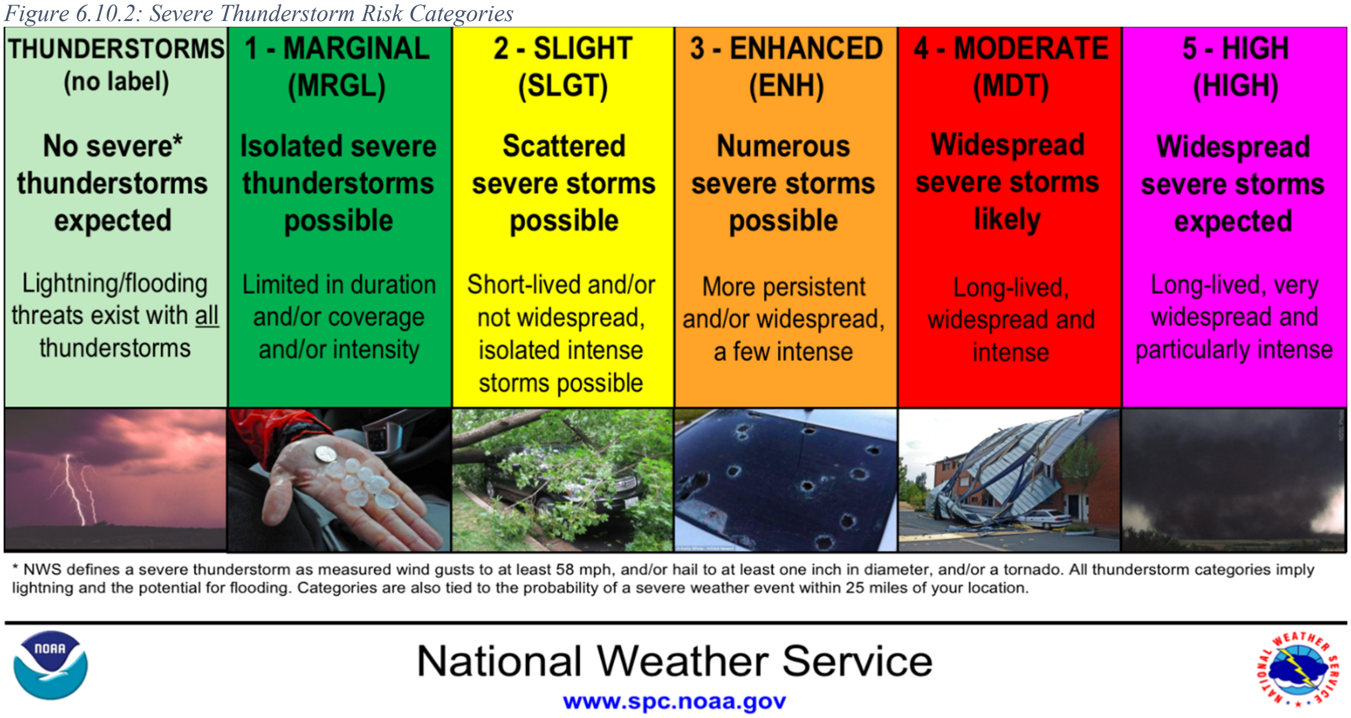
Figure 6.10.1: Annual Mean Thunderstorm Days (1993-2018)



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 the figure below. The probabilistic forecast directly expresses the best estimate of a severe weather event occurring within 25 miles of a given point.[108]

Figure 6.10.2: Severe Thunderstorm Risk Categories



Likewise, lightning intensity is measured by the NWS and defined as Lightning Threat Level. The NWS's "Lightning Hazard Map" depicts the local threat of lightning for specified areas. It is largely based on the likelihood that cloud-to-ground (CG) lightning from thunderstorms will occur combined with the anticipated flash rate. The hazard map depicts these likelihoods with varying colors along with a text narrative, as depicted in the table below[109].

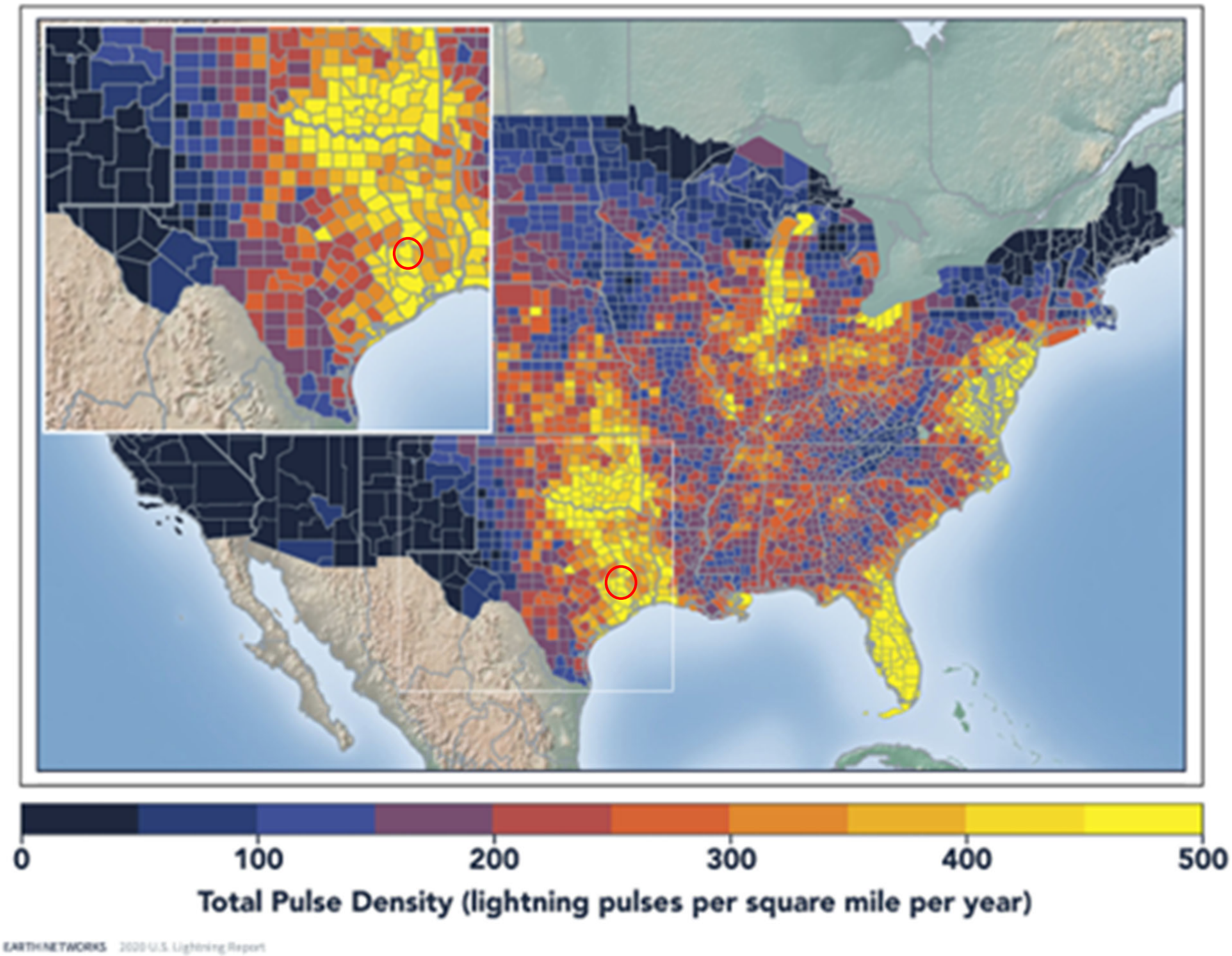
Table 6.10.3: NWS Lightning Threat Levels

Lightning Threat Level	Description
Extreme	**"An Extreme Threat to Life and Property from Lightning."** Within 12 miles of a location, a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a very high likelihood of CG lightning (or 80% to 90% thunderstorm probability), with storms capable of occasional CG lightning.

Lightning Threat Level	Description
High	**"A High Threat to Life and Property from Lightning."** Within 12 miles of a location, a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of occasional CG lightning.
Moderate	**"A Moderate Threat to Life and Property from Lightning."** Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of occasional CG lightning.
Low	**"A Low Threat to Life and Property from Lightning."** Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of occasional CG lightning.
Very Low	**"A Very Low Threat to Life and Property from Lightning."** Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of occasional CG lightning.
Non-Threatening	**"No Discernable Threat to Life and Property from Lightning."** Within 12 miles of a location, environmental conditions do not support CG lightning.
Note: With cloud-to-ground (CG) lightning, every strike is potentially lethal. • **Occasional- CG lightning at the rate of 1 to 3 flashes per minute (about 5 to 15 flashes per 5 minutes) associated with a given lightning storm.** • **Frequent- CG lightning at the rate of 4 to 11 flashes per minute (about 20 to 55 flashes per 5 minutes) associated with a given lightning storm.** • **Excessive- CG lightning rate of 12 flashes or more per minute (about 60 flashes or more per 5 minutes) and is nearly** continuously **associated with a given lightning storm.**	

According to Earth Networks 2020 Texas Lightning Report, Texas ranked #1 in total lightning pulses for 2020. Walker County ranked thirteen in lightning counts, with over 529,000 total for the year from both CG and intra-cloud pulses. This lightning report outlines pulse density, a better indicator of lightning activity than total lightning counts because it allows the comparison of different-sized areas (like states and counties). Pulses are clustered together into flashes. With every pulse detected, there is a more precise measure of lightning activity. In the figure below, areas in bright yellow experienced the highest lightning pulse density per square mile in 2020.[110] Walker County is outlined by the red circle. The county is ranked as one of the top 15 within Texas for the highest amount of thunder days (the total number of days in the year when lightning was detected by Earth Network's Total Lightning Network) at 98, with Harris County having the most thunder days, at 125 per year on average.

Figure 6.10.3: Total Pulse Density, Walker County



Previous occurrences of severe thunderstorms & lightning within the county and participating jurisdictions have seen long-lived and intense thunderstorms in the severe risk category with lightning threat levels of extreme, including frequent CG lightning at the rate of 4 to 11 flashes per minute. This is similar to what occurred during Hurricane Harvey in 2017. This event resulted in up to 20” of flooding, high-water rescues of stranded residents, dangerous outdoor conditions, roads and railroads washed out, and the destruction of critical facilities and infrastructure. A worst-case scenario for this hazard within Walker County would include a prolonged heavy or excessive severe thunderstorm event that could produce straight-line winds, tornadoes, hail, and a lightning threat level of extreme with a very high likelihood of CG lightning (or 80% to 90% thunderstorm probability). This could result in dangerous and life-threatening record-level flooding, inundated roadways cutting off access to neighborhoods and critical facilities, frequent or extreme CG lightning, and flood waters receding slowly exacerbating rescue and recovery efforts. These storms could damage critical infrastructure leading to a prolonged power outage, and even result in a loss of communications within the county if a radio or cell tower is destroyed. If such a storm event occurs during an excessive heat event or a drought, and disrupts power supply in the area for a prolonged amount of time, secondary hazards will pose increased risks to citizens due to the heat and inability to keep homes and buildings cool. This scenario is similar to what occurred within the region during the 2024 derecho and Hurricane Beryl where power lines were destroyed by winds or tree debris in July when the region was under an excessive heat advisory, and power line restoration/repairs took up to 10+ days to restore in certain areas.

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 Walker County severe thunderstorm & lightning events data from 1950-2023 is provided in the table below. Walker County has 1 reported lightning event, occurring in 2008, per the NCEI.[38]

Table 6.10.4: Walker County Severe Thunderstorm and Lightning Events (2018-2023)

Date	Location	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)	Wind Speed (knots/mph)
3/18/2018	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$20,000	$-	61/70
3/18/2018	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$10,000	$-	60/69
3/28/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	60/69
3/28/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	50/57.5
3/28/2018	DODGE	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/3/2018	NEW WAVERLY	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/3/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	52/60
10/31/2018	HUNTSVILLE	Thunderstorm Wind	0	0	$500	$-	51/58.7
9/10/2019	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$3,000	51/58.7
9/10/2019	HUNTSVILLE	Thunderstorm Wind	0	0	$3,000	$-	51/58.7
1/10/2020	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$26,000	$-	50/57.5
1/10/2020	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$19,000	$-	51/58.7
1/10/2020	PHELPS	Thunderstorm Wind	0	0	$21,000	$-	50/57.5
1/10/2020	RIVERSIDE	Thunderstorm Wind	0	0	$16,000	$-	50/57.5
4/9/2020	LOMA	Thunderstorm Wind	0	0	$9,000	$12,000	55/63
4/9/2020	SAN JACINTO	Thunderstorm Wind	0	0	$7,000	$11,000	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$14,000	$1,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$5,000	$9,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$13,000	$-	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$14,000	$2,000	56/64.5
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$-	$9,000	56/64.5
4/9/2020	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$41,000	$7,000	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$9,000	$-	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$6,000	56/64.5

Date	Location	Event Type	Injuries	Fatalities	Property Damage ($)	Crop Damage ($)	Wind Speed (knots/mph)
4/9/2020	CRABBS PRAIRIE	Thunderstorm Wind	0	0	$19,000	$-	56/64.5
4/9/2020	HUNTSVILLE	Thunderstorm Wind	0	0	$16,000	$-	56/64.5
7/12/2021	PHELPS	Thunderstorm Wind	0	0	$-	$-	50/57.5
4/28/2023	COUNTRY CAMPUS	Thunderstorm Wind	0	0	$-	$-	50/57.5
5/23/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	50/57.5
5/23/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$-	$-	61/70
5/23/2023	HUNTSVILLE ARPT	Thunderstorm Wind	0	0	$-	$-	50/57.5
6/10/2023	HUNTSVILLE	Thunderstorm Wind	0	0	$10,000	$-	52/60
6/21/2023	MOSSY GROVE	Thunderstorm Wind	0	0	$-	$-	61/70
6/21/2023	LOMA	Thunderstorm Wind	0	0	$-	$-	61/70
6/21/2023	LOMA	Thunderstorm Wind	0	0	$-	$-	61/70
TOTALS:			**0**	**0**	**$272,500**	**$60,000**	N/A

$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been 6 disaster declarations for severe storms within Walker County, in which Walker County is located, as depicted in the table below. There were 0 disaster declarations for lightning.[2]

Table 6.10.5: Federal Disaster Declarations, Severe Thunderstorm

Declaration Date	Incident Type	Title	Disaster Number	Declaration Type
5/19/1989	Severe Storm	Severe Storms, Tornadoes & Flooding	828	Major Disaster Declaration
5/2/1990	Severe Storm	Severe Storms, Tornadoes & Flooding	863	Major Disaster Declaration
8/26/1998	Severe Storm	Tropical Storm Charley	1239	Major Disaster Declaration
11/5/2002	Severe Storm	Severe Storms, Tornadoes & Flooding	1439	Major Disaster Declaration
6/29/2007	Severe Storm	Severe Storms, Tornadoes & Flooding	1709	Major Disaster Declaration
5/29/2015	Severe Storm	Severe storms, tornadoes, straight-line winds, and flooding	4223	Major Disaster Declaration
11/25/2015	Severe Storm	Severe storms, tornadoes, straight-line winds, and flooding	4245	Major Disaster Declaration
2/9/2016	Severe Storm	Severe winter storms, tornadoes, straight-line winds, and flooding	4255	Major Disaster Declaration

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 Walker County since 2018 are listed in the table below. These declarations included USDA declarations for excessive rain. There was no USDA disaster declaration categorized under severe storms or thunderstorms.[40]

Table 6.10.6: USDA Declared Disasters (2018-2023), Severe Thunderstorm and Lightning

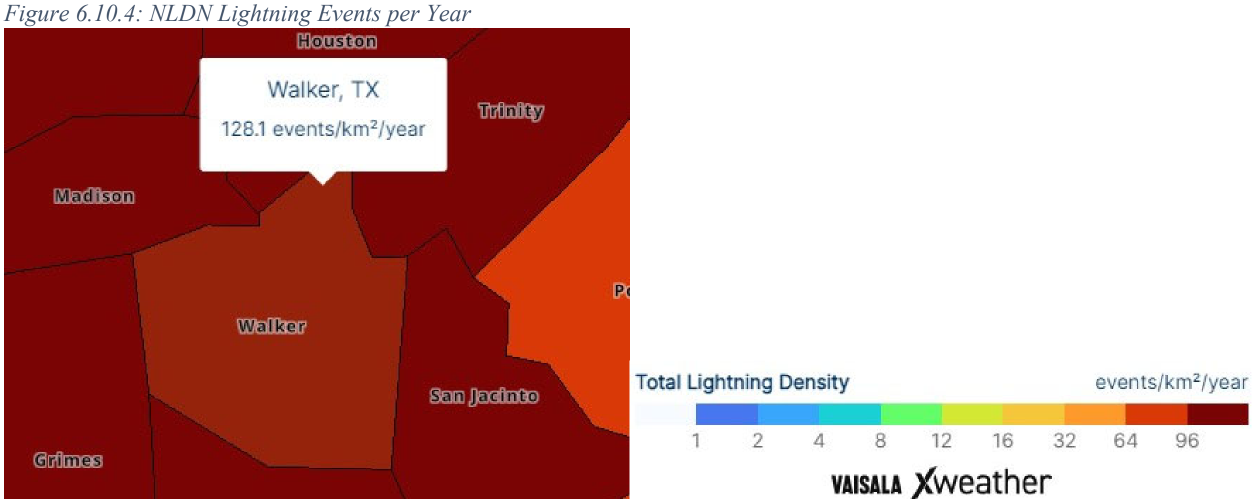
Crop Disaster Year	Disaster Description	Designation Number
2018	Excessive moisture and flooding	S4476
2021	Excessive moisture and excessive rainfall	S5054
2021	Excessive moisture	S5088

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 in Walker County are 102.9 events per year over a 22-year period of record (1991-2012), with 2,264 events on record for this timeframe. Severe thunderstorms are not included in the FEMA NRI, but it can be inferred that the probability of future occurrences will be the same as lightning.[44]

Additionally, 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, and polarity, and communicates to users across the country. Through a partnership with Vaisala and a cooperative effort with the U.S. Air Force 14th Weather Squadron, summarized daily files from 1986 to the present are archived 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. [111] Through the use of Vaisala's Interactive Global Lightning Density Map, Figure 6.10.3 shows the average number of lightning events per km2 per year for Walker County. This interactive map utilizes data from 2016 to 2022.[112]

Figure 6.10.4: NLDN Lightning Events per Year



Populations at Risk

Populations at risk for severe thunderstorms and lightning include similar groups to those listed under Section 6.1 as hurricanes, tropical storms, and tropical depressions can bring some of the same hazards to vulnerable populations. Severe storms and lightning can cause property damage, flooding, lack of access to critical facilities that provide food, water, medications, or other forms of medical assistance, and lack of utilities such as electricity and clean water, which can increase the risk of illness. According to the NCHH, those at a greater risk from these hazards include older adults, children, people experiencing homelessness, people with disabilities, and people with chronic health conditions. Older adults, in addition to the dangers listed above, can also face social isolation, lack of electricity needed to run medical equipment, and lack of access to other critical supplies. In younger populations, such as children, severe storms can disrupt schooling via power outages, the need to shelter in place during the school-day, or even necessary evacuation or early-release days due to inclement weather. This can not only jeopardize their academic success, but it can also cause mental and emotional stress, as well as add stress to adults who work full-time and rely on schooling during normal work hours to keep children occupied and safe. Children are more vulnerable to certain medical conditions like asthma, lead poisoning, allergies, and bacterial infections which can be caused by the resulting flood damage and increased moisture of severe storms. For people experiencing homelessness, housing and adequate shelter are critical in keeping populations safe during these types of hazard events. People with disabilities may require additional assistance to stay safe and prepare for these hazards such as creating a support network, finding accessible transportation to evacuate or get medical attention, and loss of power for needed medical equipment. Likewise, those with chronic health conditions may need similar assistance as those with disabilities. People with chronic health conditions also face exposure to diseases or illnesses from standing water and increased exposure to these illnesses when utilizing a shelter or evacuation centers due to power outages or the resulting flooding.[49] People living in mobile homes are also at greater risk of injury and death from these hazards. Despite mobile homes providing a form of shelter, severe storms are the catalyst for strong winds and tornadoes. Dangerous winds can cause mobile homes and even mobile homes that utilize anchoring to be seriously damaged or destroyed when winds gust over 80 mph.[56]

Any areas of growth or future development within the county could be impacted by these hazards because the entire county is vulnerable to severe thunderstorms and lightning. Those living in mobile/manufactured housing are also at greater risk from this hazard as even anchored mobile homes can be seriously damaged or destroyed when winds gust over 80 mph.[56] As the population within the county increases, so does the vulnerability of residents to this hazard.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below. The FEMA NRI does not include severe storms in its analysis, lightning is included in the tables below.

Table 6.10.7: Expected Annual Loss Exposure Values, Lightning

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Lightning	$10,148,163,352	$885,068,400,000/ 76,299	N/A	$895,216,563,352

Table 6.10.8: Expected Annual Loss Values, Lightning

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Lightning	$846	$858,450/ 0.07	N/A

N/A- Not Applicable

EAL for Walker County and participating jurisdictions was derived by creating a report that used census tract information for all 12 tracts within Walker County. These were census tracts 48039662100, 48039662200, 48039662400, 48039662300, 48039662500, 48039663100, and 48039664100. Risk Index Ratings according to the FEMA NRI for lightning for all of these census tracts is listed as very high.[47] EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below.[44] Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence. HLR for lightning events within Walker County is listed as very high.[44]

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.10.5: Risk Index Rating, Lightning

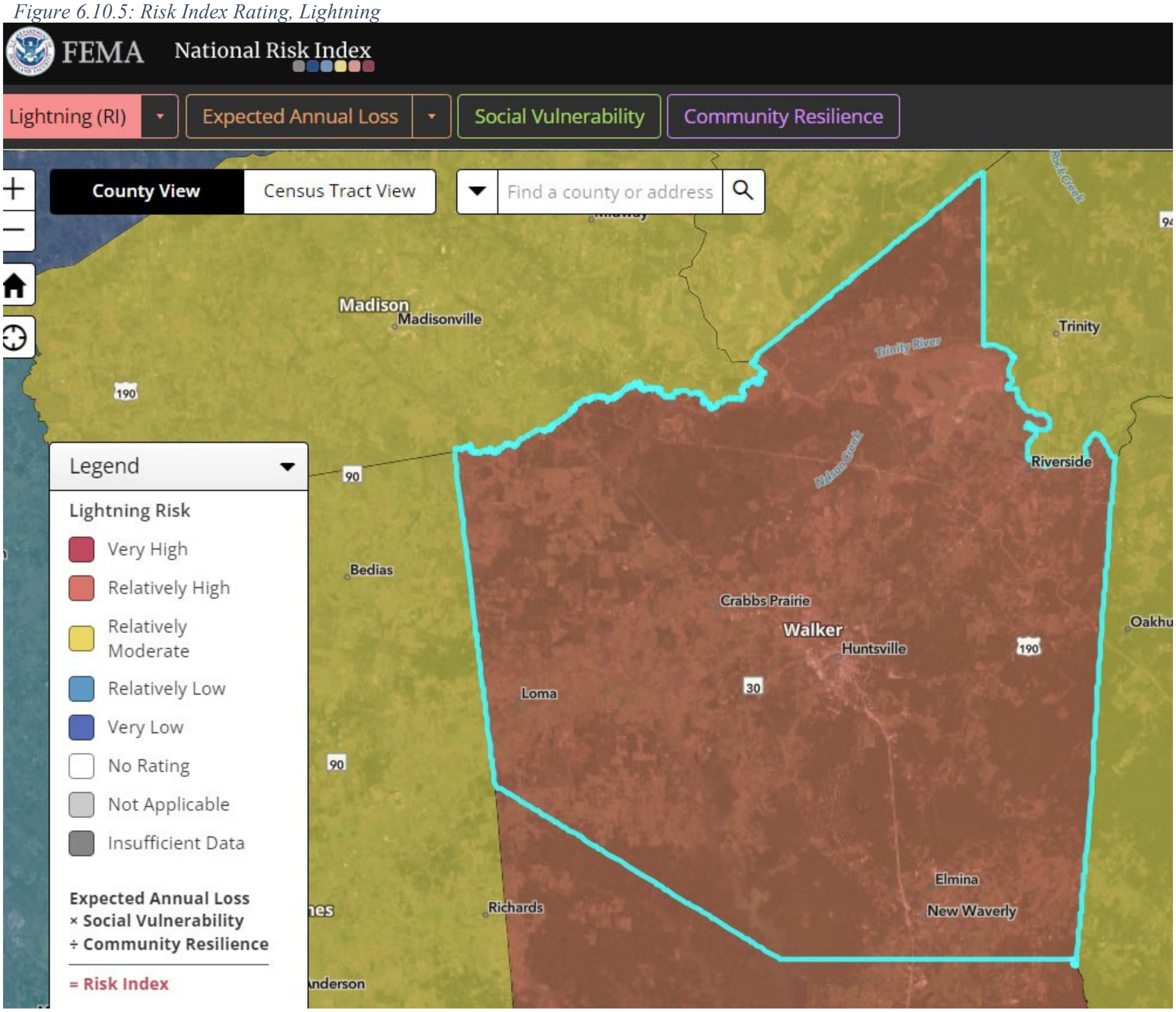


Figure 6.10.6: Risk Index by Census Tract, Walker County, Lightning

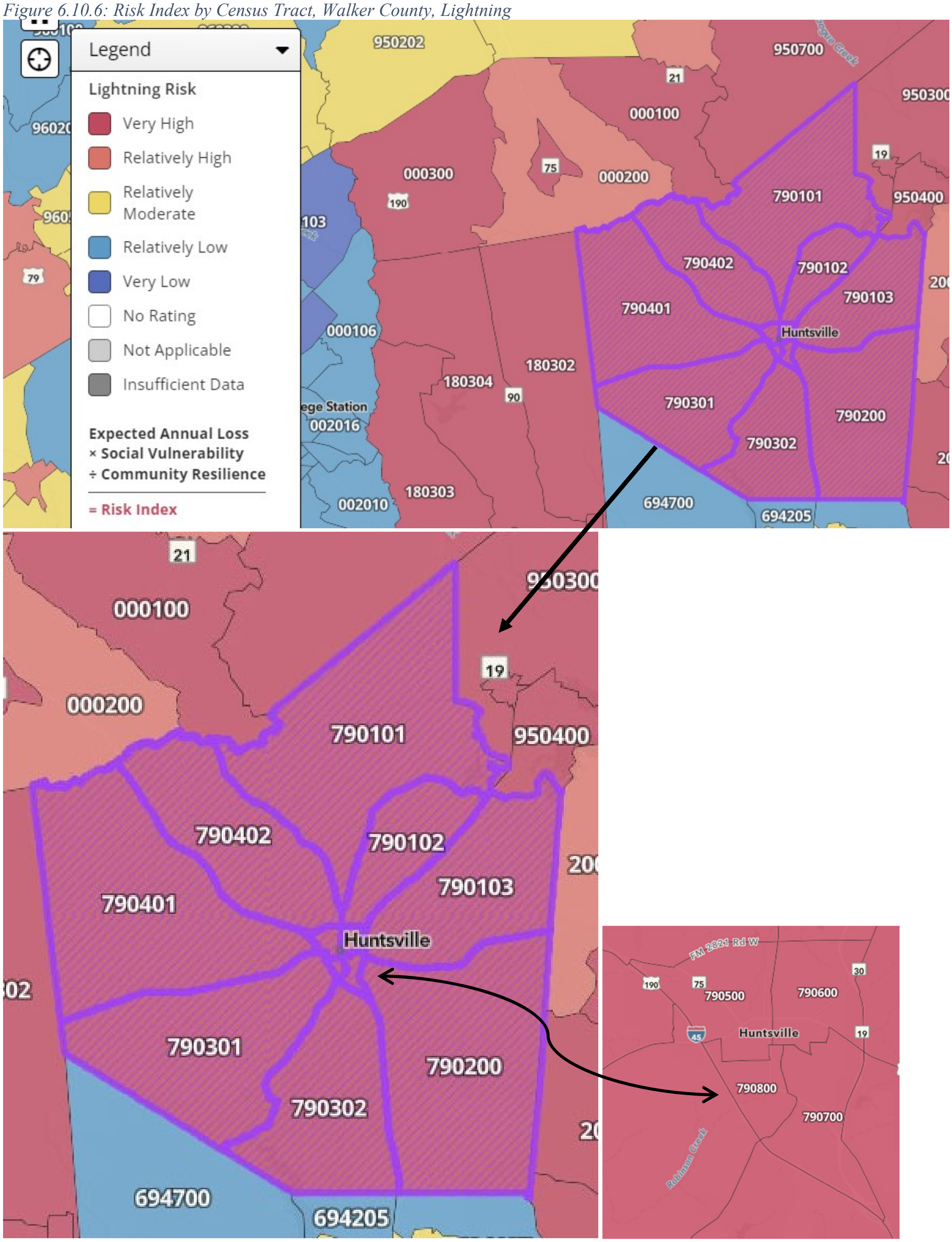


Figure 6.10.7: Social Vulnerability by Census Tract, Walker County

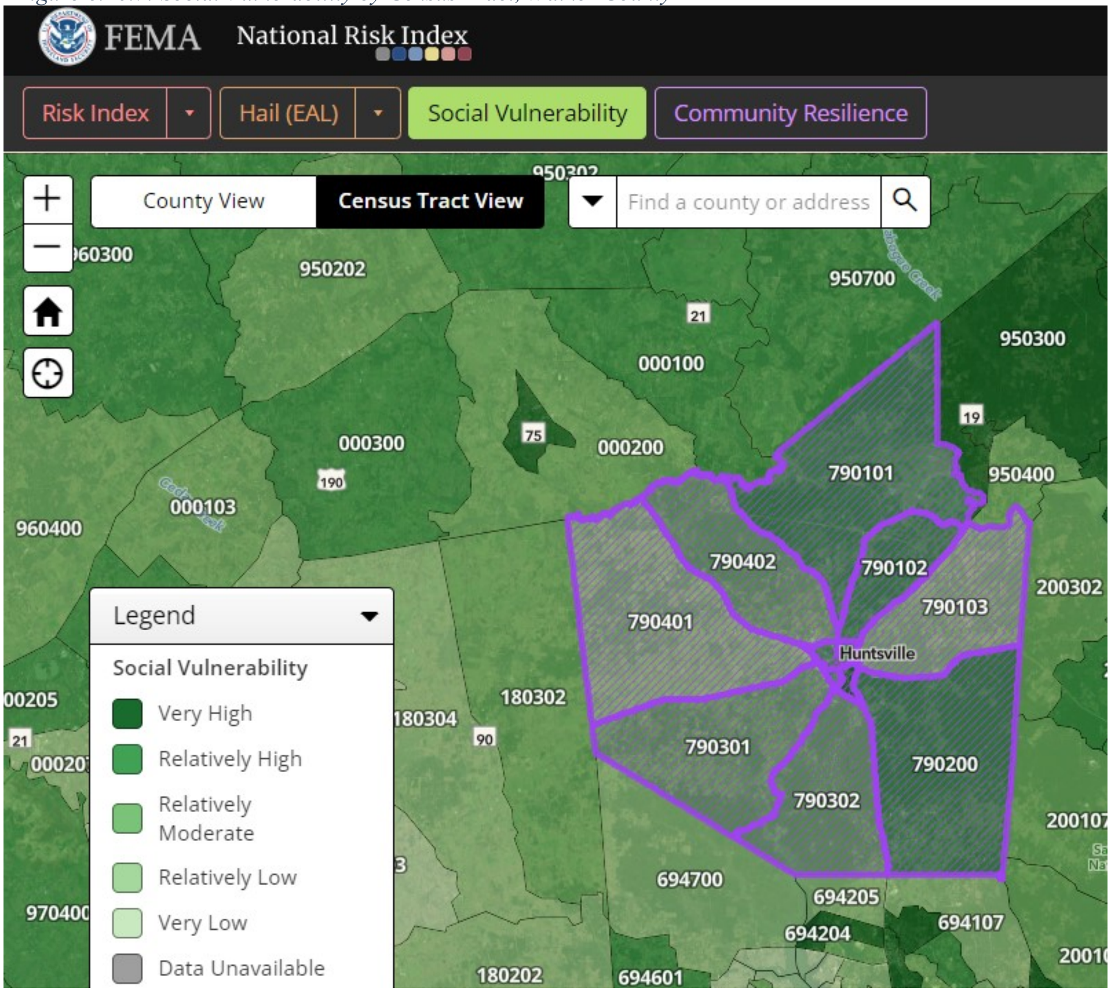


Figure 6.10.8: Social Vulnerability, Walker County

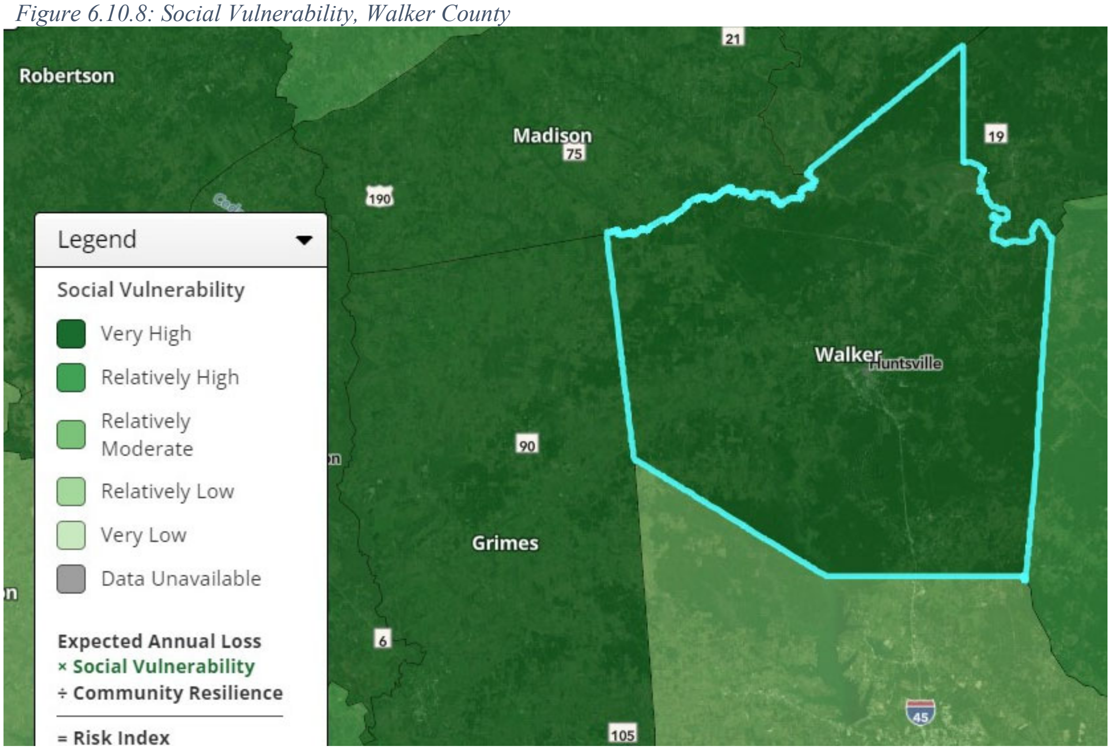


Figure 6.10.9: Community Resilience by Census Tract, Walker County

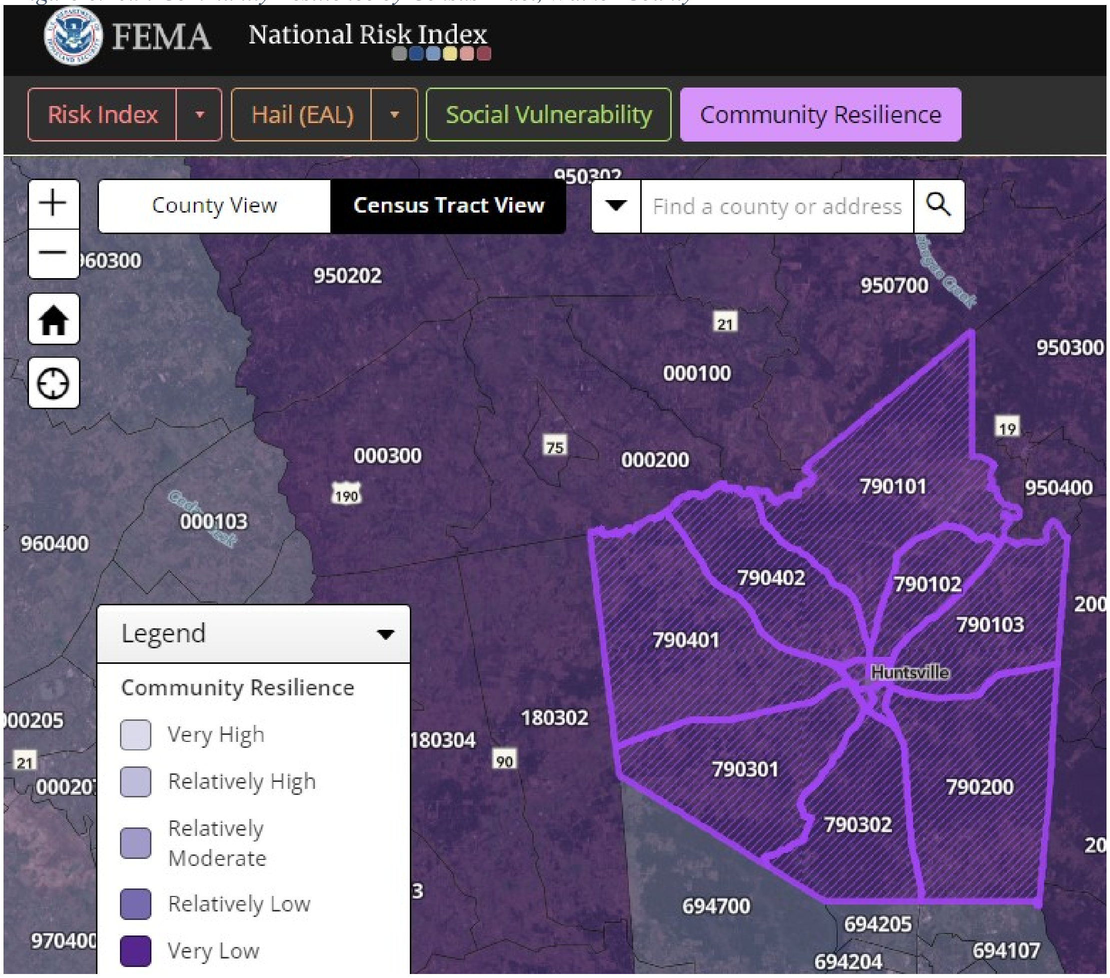


Figure 6.10.10: Community Resilience, Walker County

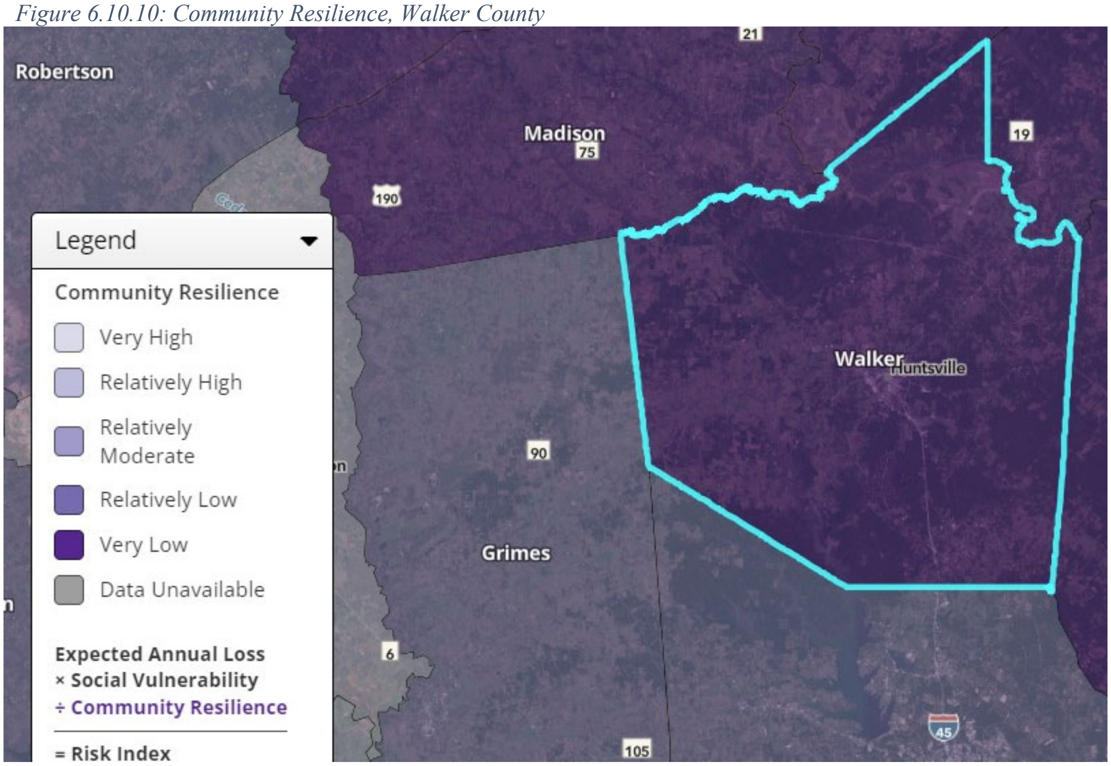


Figure 6.10.11: FEMA NRI Summary, Lightning

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790700	TX	Very High	99.95	0 100
2	Census tract 48471790800	TX	Very High	99.86	0 100
3	Census tract 48471790200	TX	Very High	99.84	0 100
4	Census tract 48471790500	TX	Very High	99.81	0 100
5	Census tract 48471790101	TX	Very High	99.72	0 100
6	Census tract 48471790600	TX	Very High	99.68	0 100
7	Census tract 48471790302	TX	Very High	99.56	0 100
8	Census tract 48471790401	TX	Very High	99.26	0 100
9	Census tract 48471790103	TX	Very High	98.61	0 100
10	Census tract 48471790102	TX	Very High	98.45	0 100
11	Census tract 48471790402	TX	Very High	97.96	0 100
12	Census tract 48471790301	TX	Very High	96.1	0 100

Figure 6.10.12: FEMA NRI EAL Summary by Census Tract, Walker County, Lightning

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790700	TX	$101,763	Very High	Very Low	1.59	$161,634	99.95
2	Census tract 48471790800	TX	$89,343	Relatively High	Very Low	1.44	$128,464	99.86
3	Census tract 48471790200	TX	$84,899	Relatively High	Very Low	1.48	$126,025	99.84
4	Census tract 48471790500	TX	$80,011	Relatively High	Very Low	1.49	$119,404	99.81
5	Census tract 48471790101	TX	$80,114	Relatively High	Very Low	1.35	$107,856	99.72
6	Census tract 48471790600	TX	$56,994	Very High	Very Low	1.82	$103,997	99.68
7	Census tract 48471790302	TX	$81,052	Relatively Moderate	Very Low	1.16	$94,361	99.56
8	Census tract 48471790401	TX	$77,977	Relatively Low	Very Low	1.06	$82,341	99.26
9	Census tract 48471790103	TX	$67,521	Relatively Low	Very Low	0.98	$65,835	98.61
10	Census tract 48471790102	TX	$47,583	Relatively High	Very Low	1.34	$63,541	98.45
11	Census tract 48471790402	TX	$53,016	Relatively Moderate	Very Low	1.07	$56,878	97.96
12	Census tract 48471790301	TX	$39,024	Relatively Moderate	Very Low	1.12	$43,788	96.1

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.[49]

Table 6.10.9: 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 thunderstorm development 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 6.11: Erosion

6.11 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.[113] 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 6.11.1 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 6.11.1: Types of Erosion[114]

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.

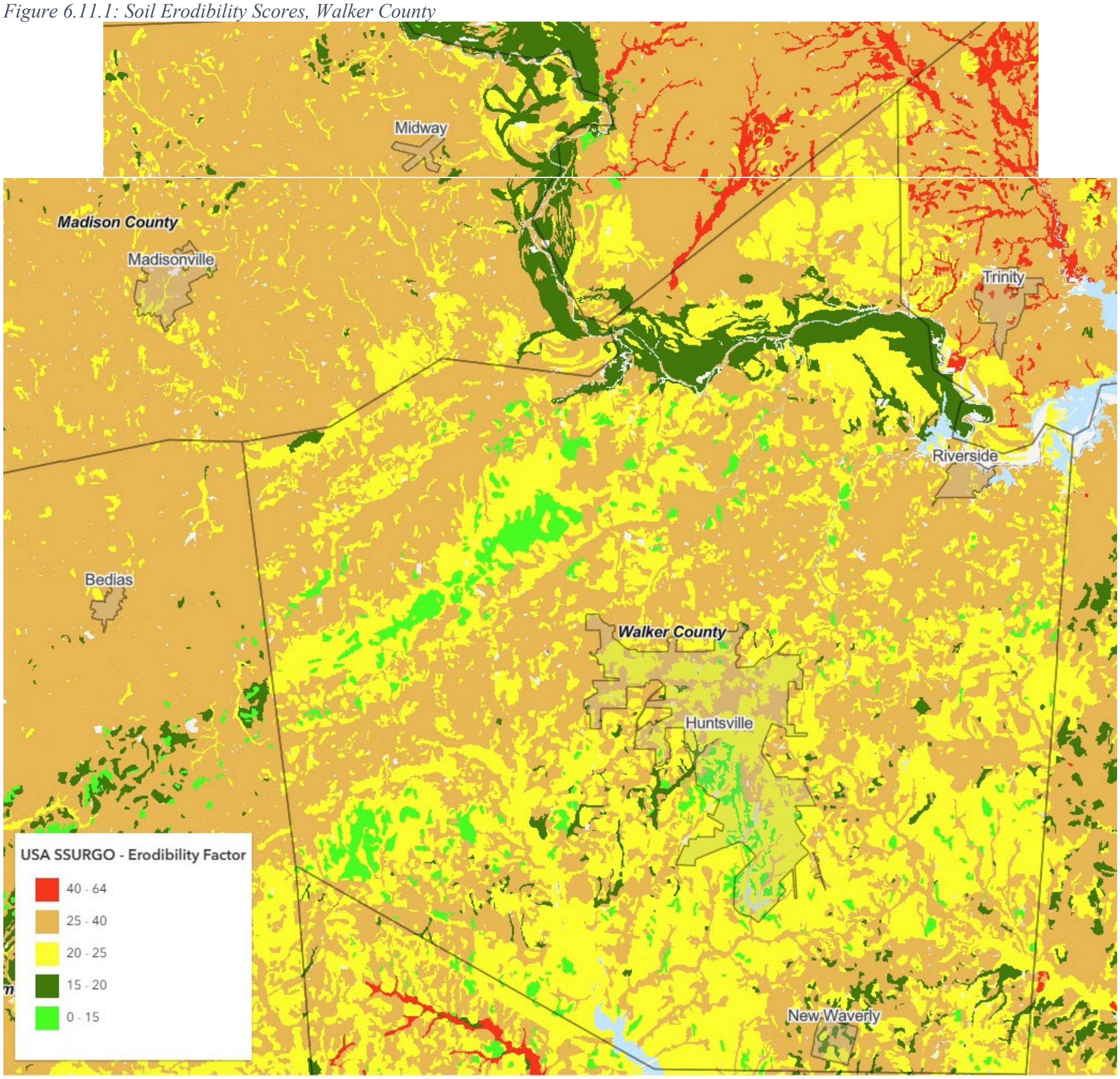
Location

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 to calculate erosion 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, which represents the susceptibility of soil to water erosion, is what will be used to identify areas susceptible to erosion within Walker County.[115] Past management or misuse of 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.[116] Table 6.11.2 below shows K factor scores, soil descriptions, and their associated soil erodibility. Figure 6.11.1 depicts these k-factors within Walker County and participating jurisdictions. 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. There are very few areas within the County that have a high erodibility score. A majority of the area is low to moderately susceptible to erosion.

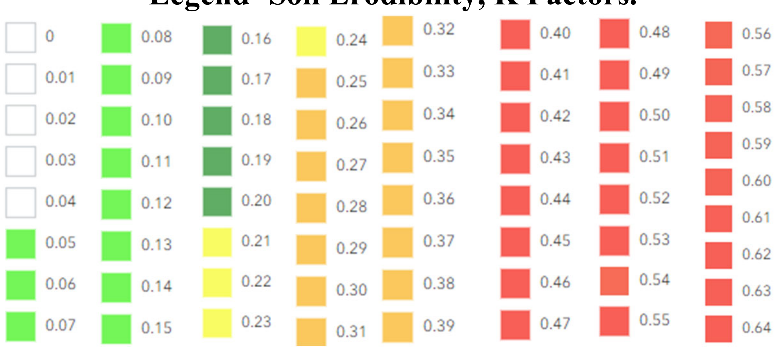
Table 6.11.2: K Factor, Soil Erodibility Scores

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 6.11.1: Soil Erodibility Scores, Walker County



Legend- Soil Erodibility, K Factors*:*



Erosion occurs within the County and participating jurisdictions whenever there is a significant rainfall event. This is seen frequently along streams, creeks, and other waterbodies that snake throughout the County as they extend out from the Trinity River to the North. The figures below highlight the various hydrology features of concern that could contribute to erosion within Walker County and participating jurisdictions. The City of Huntsville has over ten hydrologic features, including lakes, creeks, and streams, that run through the city limits and can contribute to erosion. The City of New Waverly has two creeks that are located within city limits and could contribute to erosion. The City of Riverside has two hydrologic features that can contribute to erosion. The city of Riverside is unique in that it sits directly on the Trinity River and Bethy's Creek, making areas of the city that are within proximity to these features highly susceptible to erosion during heavy rainfall or flood events.

Figure 6.11.2: Hydrologic Features, City of Huntsville

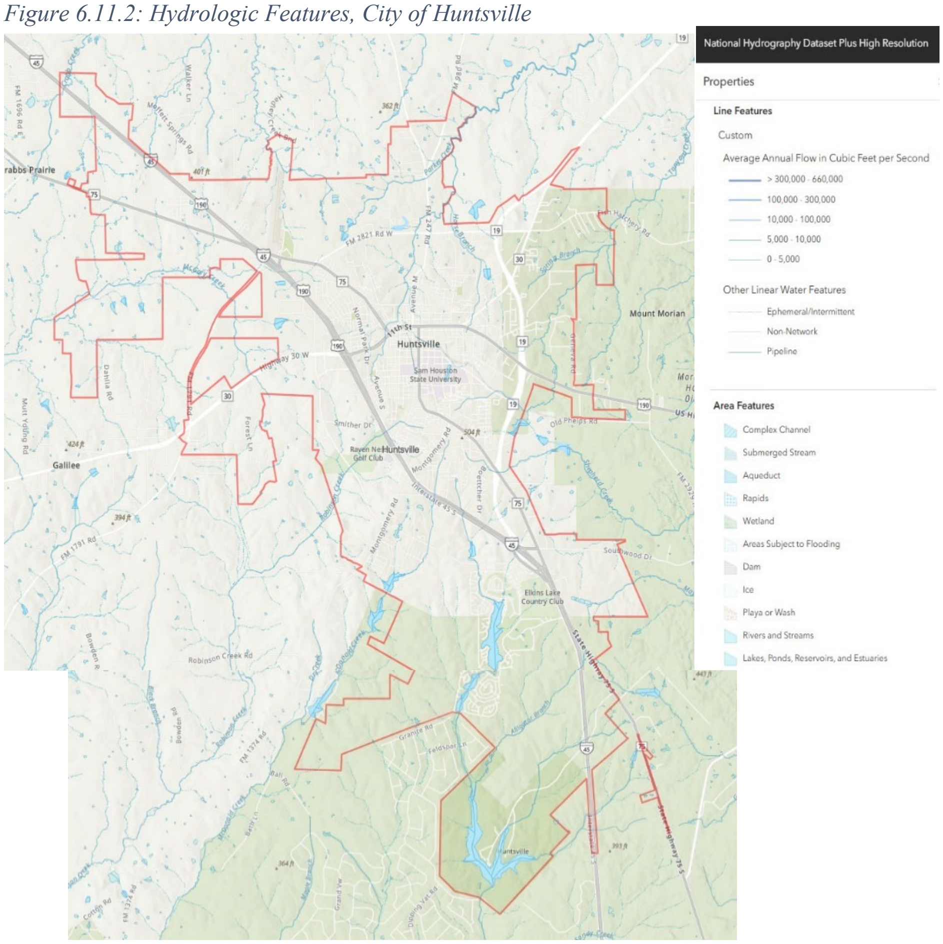


Figure 6.11.3: Hydrologic Features, City of New Waverly

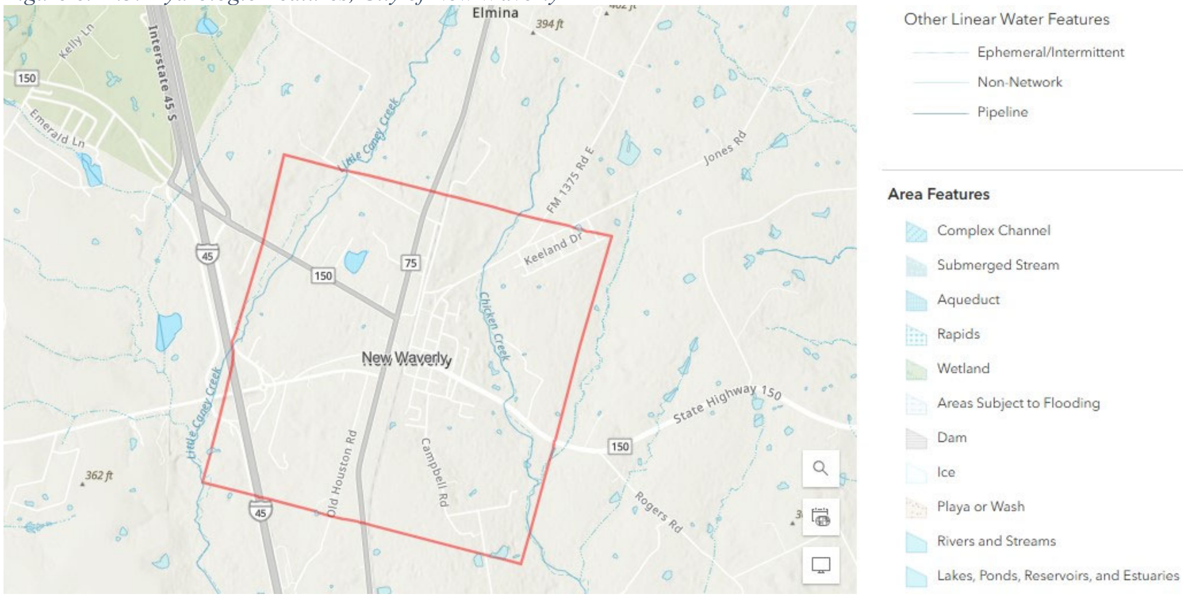
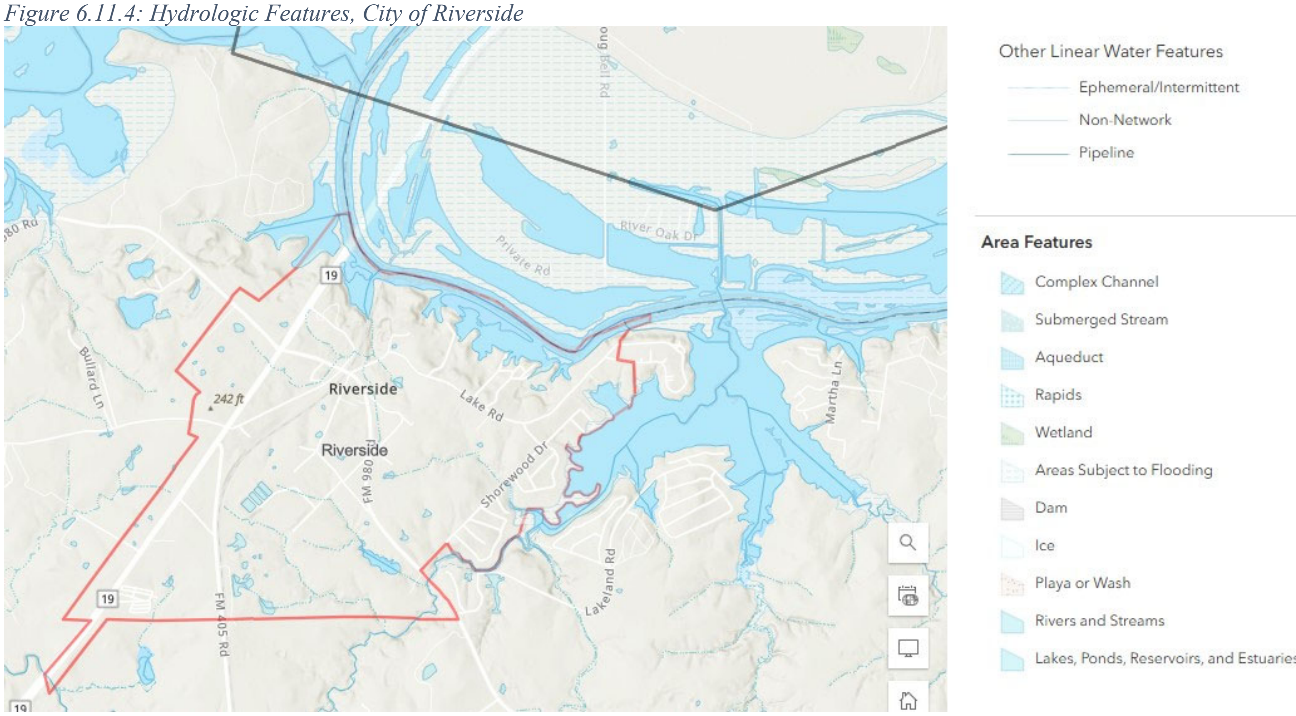


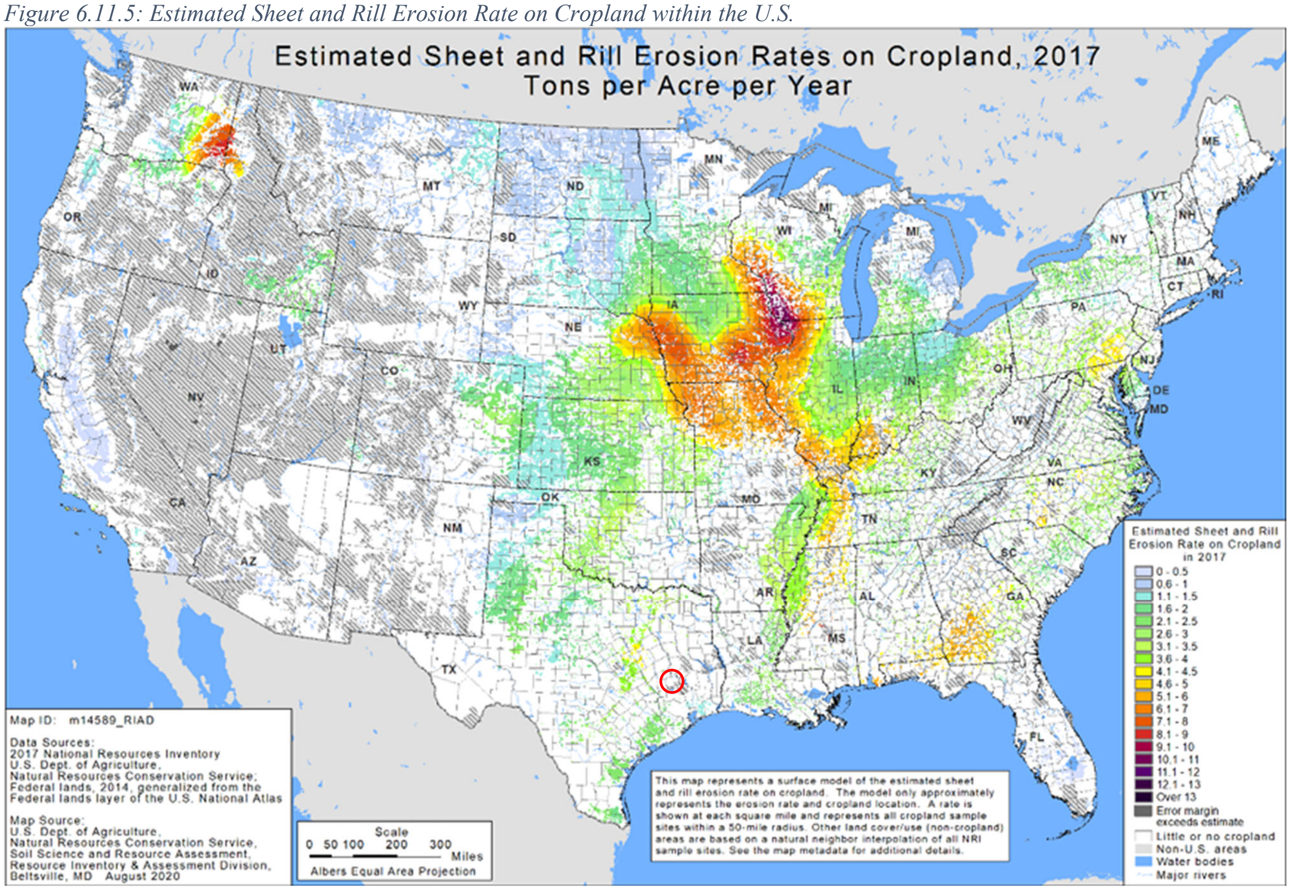
Figure 6.11.4: Hydrologic Features, City of Riverside



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. Soil erosion rates on cropland within the U.S. decreased 35% 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.[117] Figure 6.11.5 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 areas of Walker County ranged from 0-0.5 tons per acre per year according to the figure below. 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 6.11.5: Estimated Sheet and Rill Erosion Rate on Cropland within the U.S.



A worst-case scenario for this hazard would be a heavy rainfall event that created major flooding conditions within the Trinity River, creeks, and streams within the planning area resulting in stream bank erosion from the river cresting, washed out roads. This happened most recently in April and May 2024 when rainfall caused a major flood stage of the Trinity River and saw roads washed out in the areas within proximity to the river. During the May event, the river reached 140.20 ft. At 140 ft flood impacts within the City of Riverside, per the NOAA National Water Prediction Service, were listed as "major lowland flooding, water is in several homes in the Deep River Plantation and Green Rich Shores subdivisions." [118] Roads for both subdivisions mentioned above are completely inundated at 140 ft and are impassable for emergency personnel.

Historic Occurrences

Presidential Disaster Declarations

There have been no disaster declarations for erosion within Walker County since 1950.[2]

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 Walker County since 2018 are listed in the table below.[39]

Table 6.11.3: 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. It is hard to estimate the probability of future occurrence of this hazard due to a lack of data regarding previous erosion events through any formal system. This has been noted as a data deficiency for this hazard, and is addressed within Section 7: Mitigation Action Plan as an action item for all plan participants. Additionally, the FEMA NRI does not account for erosion within its various analyses of natural hazards. Walker County anticipates erosion to take place whenever a significant rainfall or flooding event occurs as inland erosion within the planning area is attributed to mainly sheet and water erosion (Table 6.11.1). Keeping this in mind, this section will mirror probabilities of future occurrences of flooding. Annualized frequency values for erosion would be at least 1 event per year.

Populations at Risk

Populations at risk from erosion include those who work in agricultural fields as erosion can greatly affect agriculture production through lost revenue. Those who own private property, particularly along areas near creeks and rivers may be more susceptible to this hazard as river crests can exacerbate erosion damage that could require costly repairs and infrastructure reinforcement. Areas of growth or future development within the county that are near the Trinity River or other hydrologic features such as streams and creeks could be impacted by this hazard. Future development and population increases by these waterbodies and hydrologic features within the county increase the vulnerability of residents, infrastructure, and property to the impacts of erosion.

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.[58]

Table 6.11.4: 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 has been decreasing across the U.S. over time. The frequency of this hazard is difficult to estimate.
Duration	The duration of erosion is not expected to change.

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.[119]

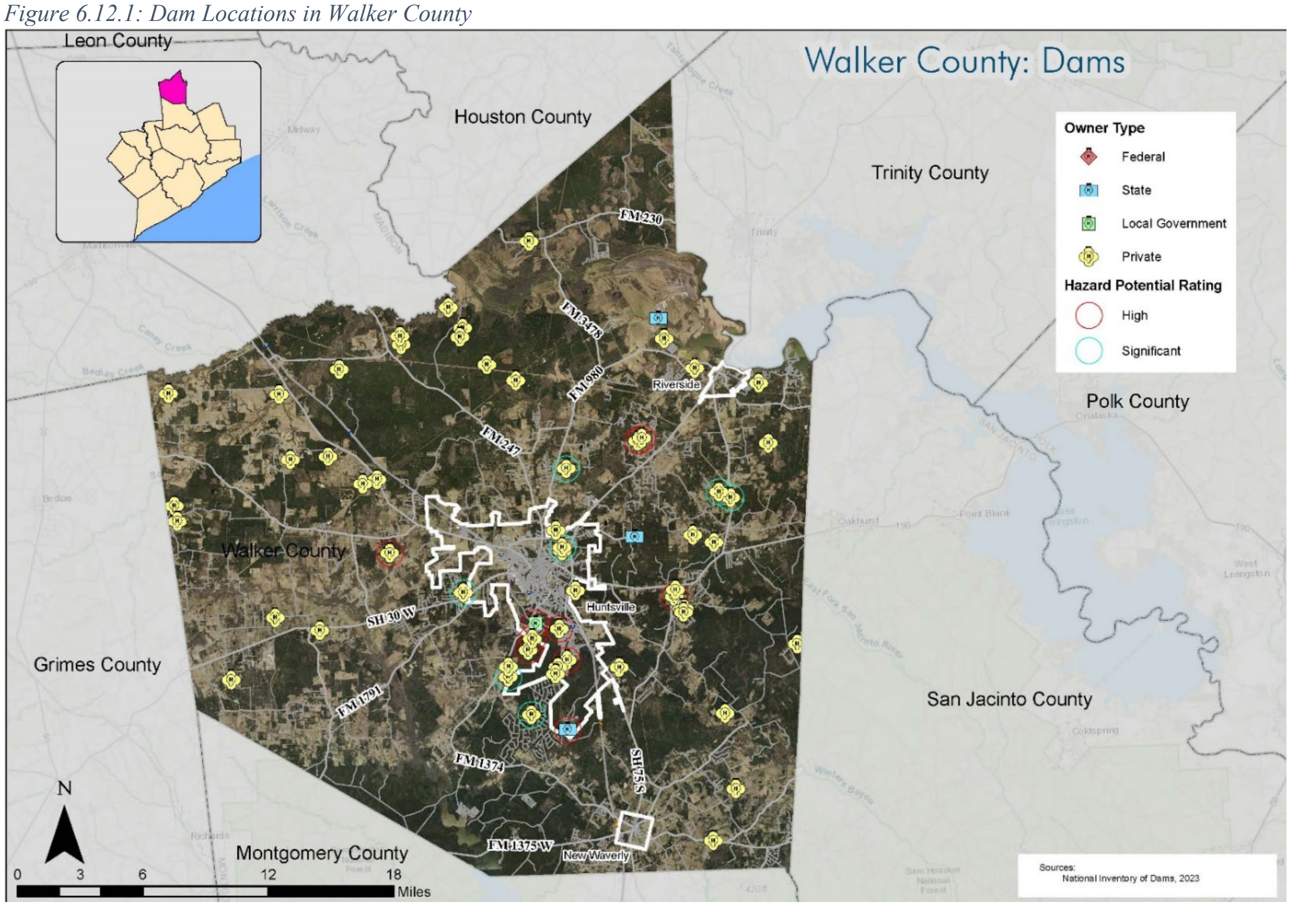
Table 6.12.1: Dam Failure Causes

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 of 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 because of problems with values and conduits.

Location

The figure below shows dam locations across Walker County, there are no levees within the county.

Figure 6.12.1: Dam Locations in Walker 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.[120] The 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 the table below.[121]

Table 6.12.2: 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 the breach inundation area downstream of the dam.)	Appreciable (located primarily in rural areas where failure may cause damage to isolated homes, damage to secondary highways, damage to minor railroads, or interruption of service or use of public utilities.)
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 58 total dams in the county with 7 being categorized as having a significant hazard potential, and 10 being categorized as having a high hazard potential. Table 6.12.3 outlines dam classifications by hazard potential and Table 6.12.4 provides additional details for those dams with both high and significant hazard potentials. 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.[122]

While the probability of a dam failure is low, a worst-case scenario for the county would be a heavy rainfall event (hurricane, tropical storm, severe thunderstorm, etc.) causing a dam failure or breech which would impact areas downstream. If a dam failure were to occur, especially in urban areas or where dams are rated as having a significant or high hazard potential, loss of life and properties, including extensive damage to critical facilities and public infrastructure can be expected. The dams listed in Table 6.12.4 are those that the county and participating jurisdictions are most concerned with due to their Significant or High hazard potential ratings.

Table 6.12.3: Walker County Dams and Hazard Potential Total

High Hazard Potential Dams	Significant Hazard Potential Dams	Low Hazard Potential Dams	Total Dams	Total Dams of Concern:
10	7	41	58	17

Table 6.12.4: High and Significant Hazard Potential Dam Details, Walker County

Dam Name	Dam ID	Hazard Potential	Distance to Nearest City (miles)	Last Inspection Date	Emergency Action Plan, Last Revision Date
Baldwin Dam	TX07084	High	No Data	2/24/2022	Yes, 2/2/2022
Dawson Lake Dam	TX07086	High	No Data	2/24/2022	Yes, 12/21/2010
Elkins Lake Dam	TX02956	High	No Data	5/18/2023	Yes, 12/18/2009
Heath Branch Fishing Club Lake Dam	TX02957	High	3 miles	3/26/2019	No
Horseshoe Lake No. 1 Dam	TX02981	High	No Data	3/26/2019	No
Horseshoe Lake No. 2 Dam	TX04398	High	No Data	3/26/2019	No
Huntsville State Park Dam	TX02952	High	No Data	7/24/2023	Yes, 9/12/2012
Muecke Lake Dam	TX02954	High	No Data	3/28/2019	Yes, 1/12/2011
Spring Lake Dam	TX02958	High	3 miles	2/24/2022	Yes, 12/31/2010
Tillie Lake Lower Dam	TX02949	High	No Data	3/28/2019	Yes, 12/6/2012
Armadillo Drive Lake Dam	TX07087	Significant	12 miles	9/13/2017	Not Required
Campbell Lake Dam	TX07282	Significant	No Data	5/14/2009	Yes, 1/4/2011
Corlay Lake No. 1 Dam	TX07301	Significant	10 miles	6/24/2011	Yes, 9/8/2010
Corlay Lake No. 2 Dam	TX07302	Significant	10 miles	6/7/2016	Yes, 9/8/2010
Dogwood Lake Dam	TX07426	Significant	No Data	7/10/2013	Not Required
Mathews Lake Dam	TX02961	Significant	No Data	12/10/2009	No
Sunset Lake Dam	TX02955	Significant	25 miles	9/13/2017	Yes, 4/2/2010

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 has been 1 historical occurrence of dam failure within Walker County, as shown in the table below.[123]

Table 6.12.5: Historic Dam Failures, Walker County

Dam Name	Hazard Potential	Incident Date	Incident ID	Incident Description	Economic Damages ($)	People Evacuated	Structures Flooded
Spring Lake Dam	Significant	6/10/2010	TX00268-1231	The dam overtopped and failed. A public water supply line was affected	$0.00	0	0

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.[124] The risk of dam failure is monitored closely by TCEQ and local emergency management staff. The probability of a future dam/levee failure within Walker 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. Likely, 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.[125]

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. Areas of growth and future development within the county could be potentially impacted by this hazard, especially if they are downstream of dams rated as significant or high hazard. The county has experienced a steady increase in population, which is expected to reach 97,641 people by 2040, a 27.8% increase. Increases in population in dam failure inundation areas will result in increased risk to life and property from this hazard. Typically, flood inundation maps that are created by the USACE show how water might behave and how the dam might react in the event of a breech or failure. Areas on the map can show where water may go upstream and downstream of dams, including how far it may extend past the banks of a river or waterway and how deep it may be. These maps aid in identifying populations at risk (who and what could be damaged) within dam inundation zones and how much time there might be to give evacuation notice in an area that may flood. These maps are important for the development of emergency action plans, evacuation plans, and other emergency response activities. However, the USACE does not have dam inundation maps available for Walker County. This has been noted as a data deficiency for this hazard and is addressed within Section 7: Mitigation Action Plan as an action item for all plan participants.

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 6.12.6: 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: Hailstorm

6.13 Hailstorm

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."[126] 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.[127]

Table 6.13.1: 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.

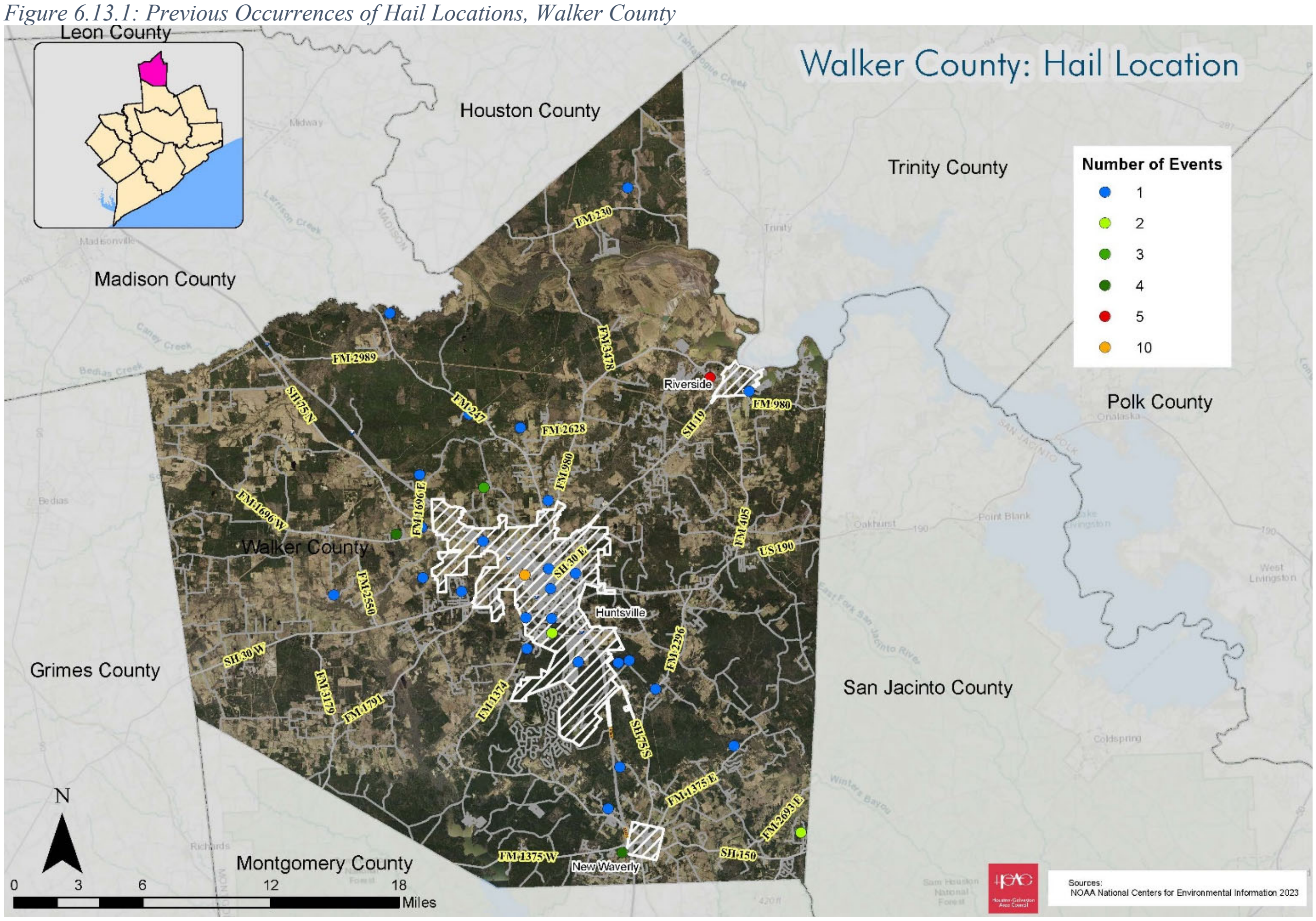
When forecasting for hail, forecasters look for deep moist convection, in addition to adequate updraft to keep the hailstone aloft for an appropriate amount of time, sufficient supercooled water near the hailstone to enable growth as it travels through an updraft, and a piece of ice, snow or dust for 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 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[128]

Location

Similar to the Severe Thunderstorms & Lightning (Section 6.10), and the Tornado (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. Walker County is in an area that can see anywhere from 63-72 thunderstorm days per year.[107] Figure 6.13.1 depicts the locations within the county where previous hail events have occurred.

Figure 6.13.1: Previous Occurrences of Hail Locations, Walker County



Extent

The NWS classifies a hailstorm as "severe" if there is hail 0.75 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).[129]

Table 6.13.2: Severe Hail Threat Levels and Descriptions

Severe Hail Threat Level	Map Color	Threat Level Descriptions
Extreme		**"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		**"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		**"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		**"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		**" 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		**" 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.

The TORRO scale measures hail intensity. 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.[130]

Table 6.13.3: 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

Scale	Intensity category	Typical hail diameter (in)	Size Comparison	Typical damage impacts
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

A worst-case scenario for this hazard would include a severe thunderstorm event that could produce straight-line winds, tornadoes, hail of H5 or above, and lightning which results in dangerous and life-threatening conditions. Walker County has seen more instances of larger hail, 1.75+ inches diameter or H5, since the last plan update. There were two instances where hail reached H7 and H9, golf ball and tennis ball size, in April 2020. Hail with an intensity of H5 and above are considered destructive and can pose the risk of structural damages to windows and roofs, vehicle damages, and injuries to residents.

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCEI storm events database. There have been 76 hail events recorded since 1950. The earliest record of hail within Walker County occurred in 1973. A condensed version of Walker County hail events since the last HMP update, 2018-2023, is provided in the table below.[38]

Table 6.13.4: Walker County Hail Events (2018-2023)

Date	Location	Event Type	Injuries	Fatalities	Property Damage	Crop Damage	Magnitude (in.)
3/18/2018	HUNTSVILLE ARPT	Hail	0	0	$-	$-	1.75
3/18/2018	DODGE	Hail	0	0	$-	$-	0.88
4/18/2020	NEW WAVERLY	Hail	0	0	$-	$-	1.25
4/18/2020	PHELPS	Hail	0	0	$-	$-	1.75
4/18/2020	PHELPS	Hail	0	0	$-	$10,000	3.5
4/18/2020	HUNTSVILLE	Hail	0	0	$-	$-	1.75
4/18/2020	PHELPS	Hail	0	0	$-	$40,000	2.75
4/18/2020	PHELPS	Hail	0	0	$-	$-	1.75
4/18/2020	RIVERSIDE	Hail	0	0	$-	$-	1.75
4/18/2020	COUNTRY CAMPUS	Hail	0	0	$-	$-	1.75
4/22/2020	KITTRELL	Hail	0	0	$-	$-	1
5/26/2020	RIVERSIDE	Hail	0	0	$-	$-	1.75
1/7/2023	HUNTSVILLE	Hail	0	0	$-	$-	1.5

$- No dollar amount ($0.00).

Presidential Disaster Declarations

There have been no disaster declarations in which hail was included within Walker County.[2]

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 Walker County, in which the Walker County since the last HMP for this hazard are listed in the table below.[39]

Table 6.13.5: 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 2.4 events per year over a 34-year period of record (1986-2021), with 82 events on record for this timeframe. [44]

Populations at Risk

Hail can occur during thunderstorms, but larger hail occurs more often during warmer months because the heat that builds the thunderstorms up higher in the air also strengthens these storms and can create sustained updrafts, as mentioned above. Populations most at risk for hail include outdoor workers, athletes, and pets/animals. Outdoor workers, such as farmers or landscapers have a higher chance of exposure to hail due to the nature of their work. Likewise, athletes can be caught in a hailstorm and are more exposed to this hazard when engaged in outdoor activities. Pets and animals are also at risk from hail due to their increased exposure to outdoor elements. To cause serious injury to humans and animals, hail would have to be relatively larger in size (1" or larger).

Any areas of growth or future development within the county could be impacted by these hazards because the entire county is vulnerable to hailstorms. As the population and development within the county increases, so does the vulnerability of residents and property to this hazard.

National Risk Index

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.[50]

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). The outcome, the risk index, represents the potential negative impacts of natural hazards on the county level or individually by census tracts. 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. [50]

EAL Exposure Values and EAL Values for Walker County can be found in the tables below.

Table 6.13.6: Expected Annual Loss Exposure Values, Hail

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)
Hail	$10,148,163,352	$885,068,400,000/ 76,299.00	$38,738,889	$895,255,302,241

Table 6.13.7: Expected Annual Loss Values, Hail

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Hail	$68,993	$74,803/ 0.01	$11,052

EAL for Walker County was derived by creating a report that used census tract information for all tracts within Walker County. These were census tracts 48471790500, 48471790103, 48471790302, 48471790800, 48471790401, 48471790101, 48471790200, 48471790600, 48471790301, 48471790700, 48471790402, and 48471790102. Risk Index Ratings according to the FEMA NRI for hail within these census tracts are listed as very moderate for 10 census tracts and relatively low for the remaining 2 census tracts.[47] EAL values, risk index ratings, risk index scores, social vulnerability, and community resilience for each census tract can be found in the figures below. Additionally, the FEMA NRI lists the HLR, a hazard- and county-specific estimate of the percentage of the exposed consequence type (building value, population, or agriculture value) expected to be lost due to a hazard occurrence. For hail within Walker County the HLR is relatively low.[44]

When looking at the figures below, the last 6 digits of the census tract are used on FEMA NRI maps and correlate with the last 6 figures listed for census tracts in comparison charts. For instance, census tract 48471790500 will be listed as 790500 on the figures below. All figures below are from the FEMA NRI online map.[48]

Figure 6.13.2: Risk Index, Walker County, Hail

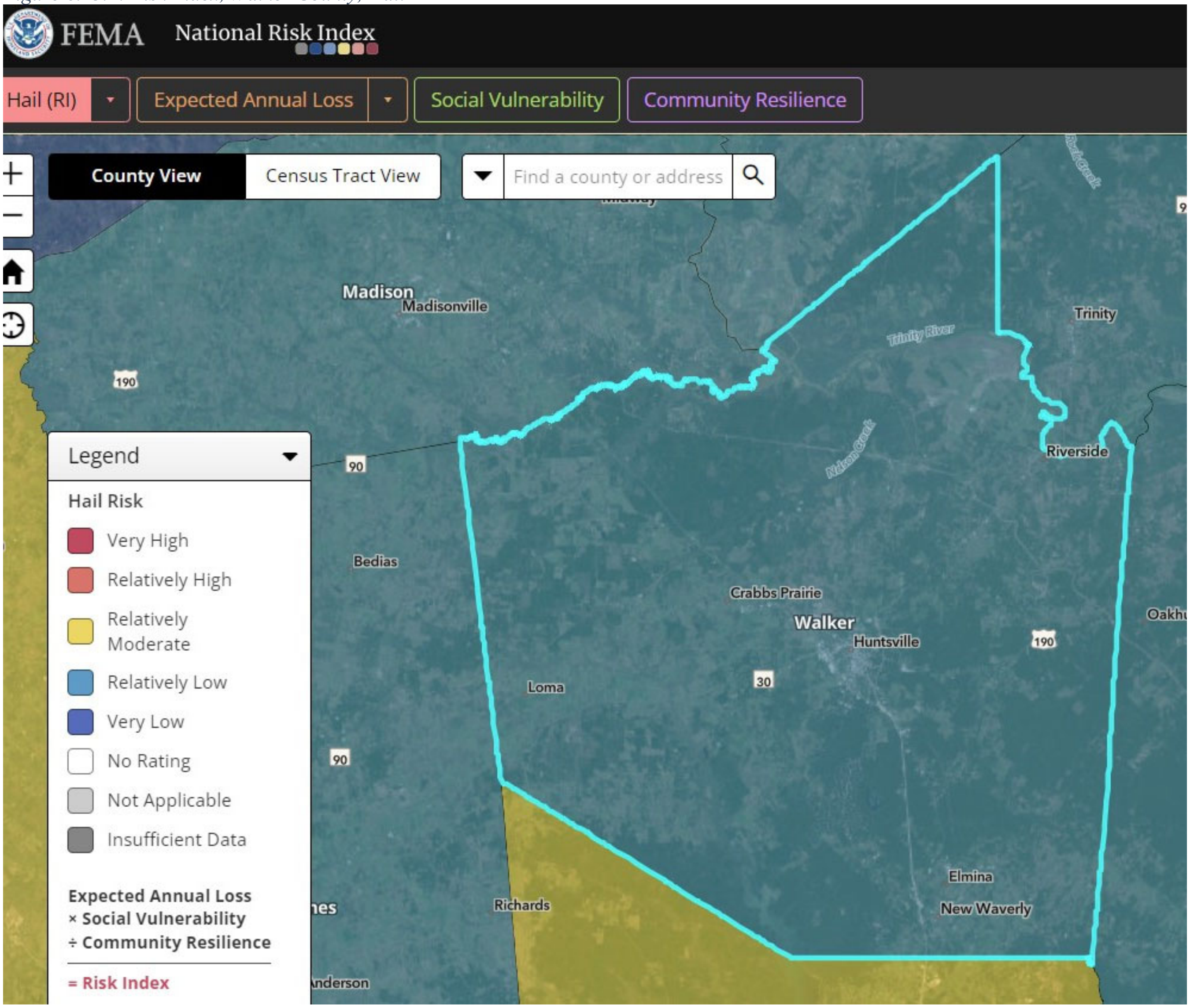


Figure 6.13.3: Risk Index by Census Tract, Walker County, Hail

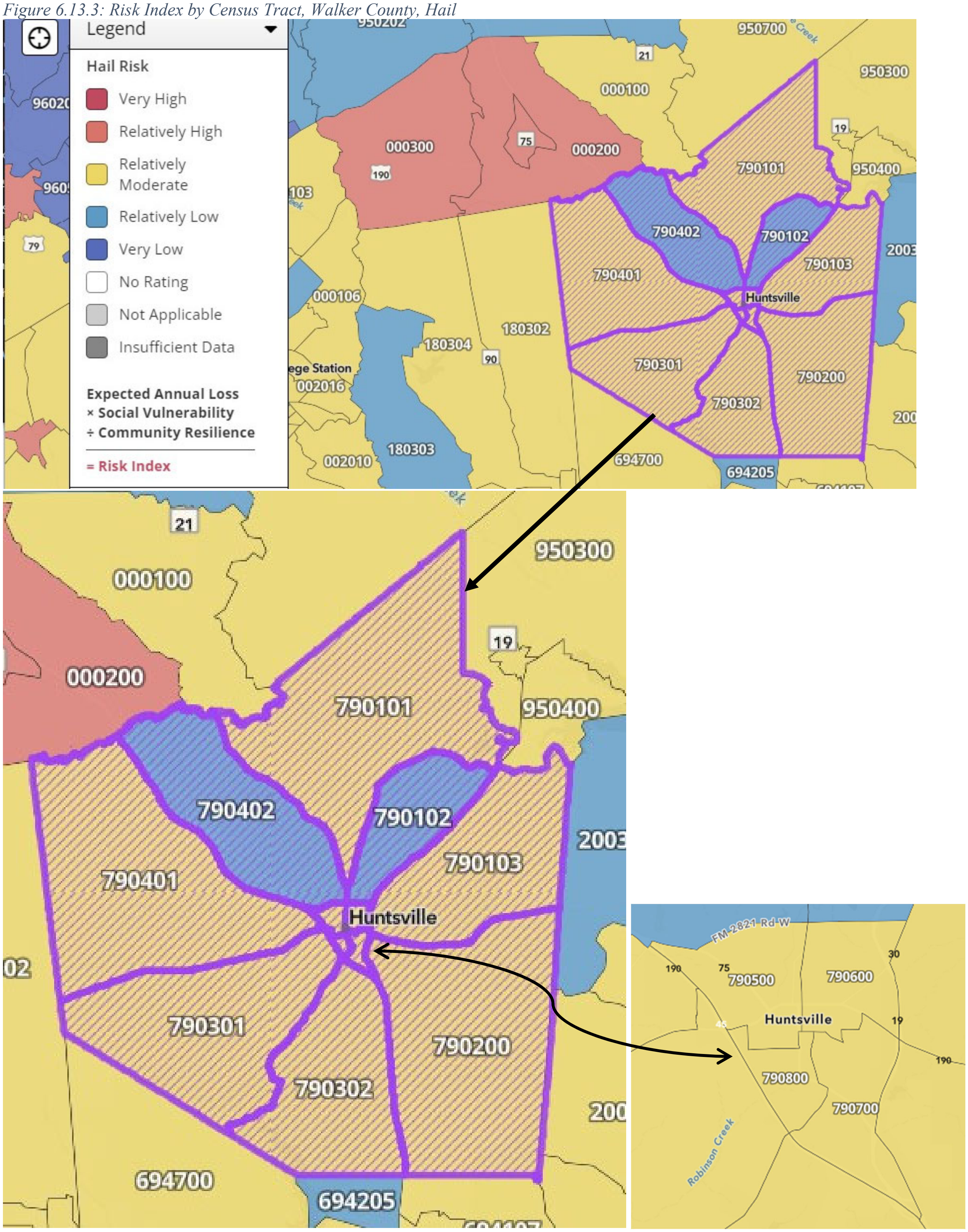


Figure 6.13.4: Social Vulnerability by Census Tract, Walker County

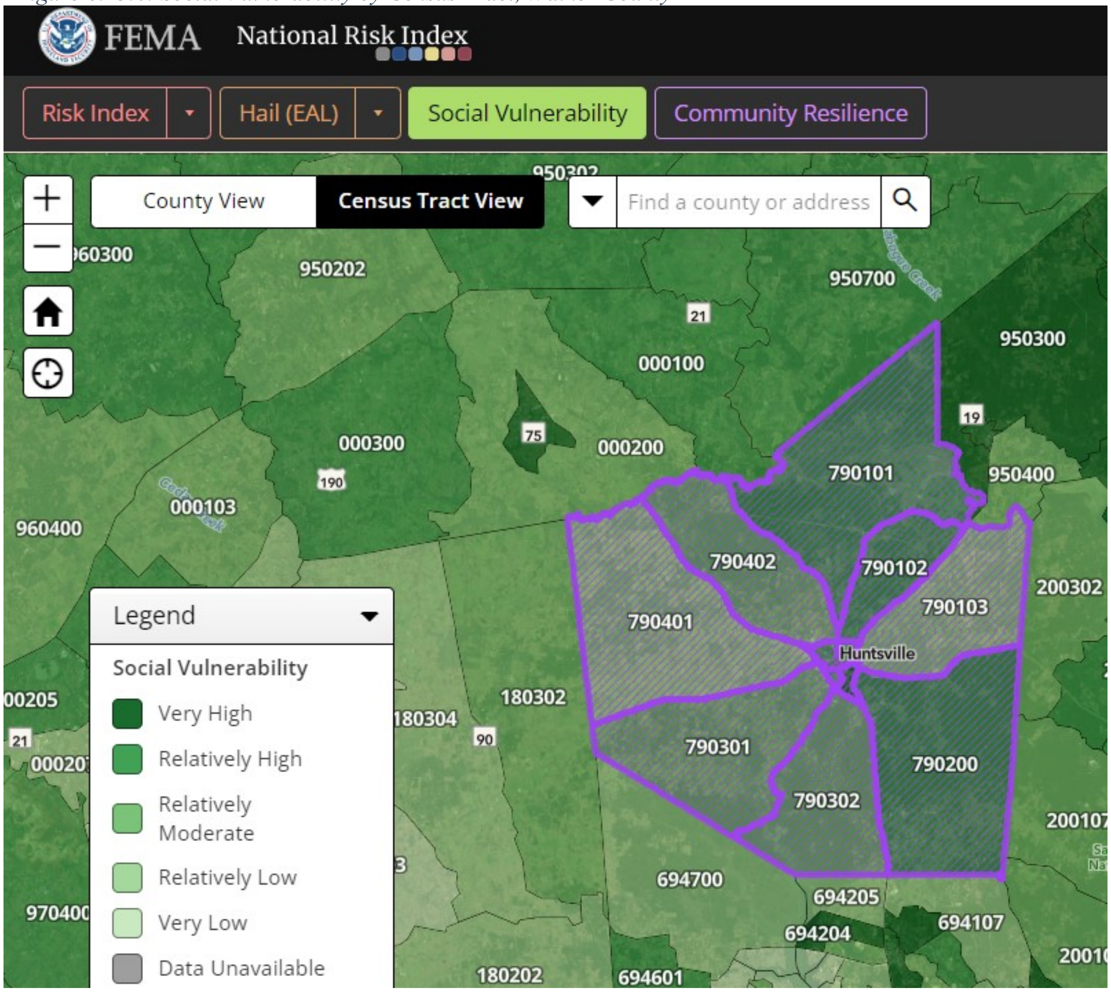


Figure 6.13.5: Social Vulnerability, Walker County

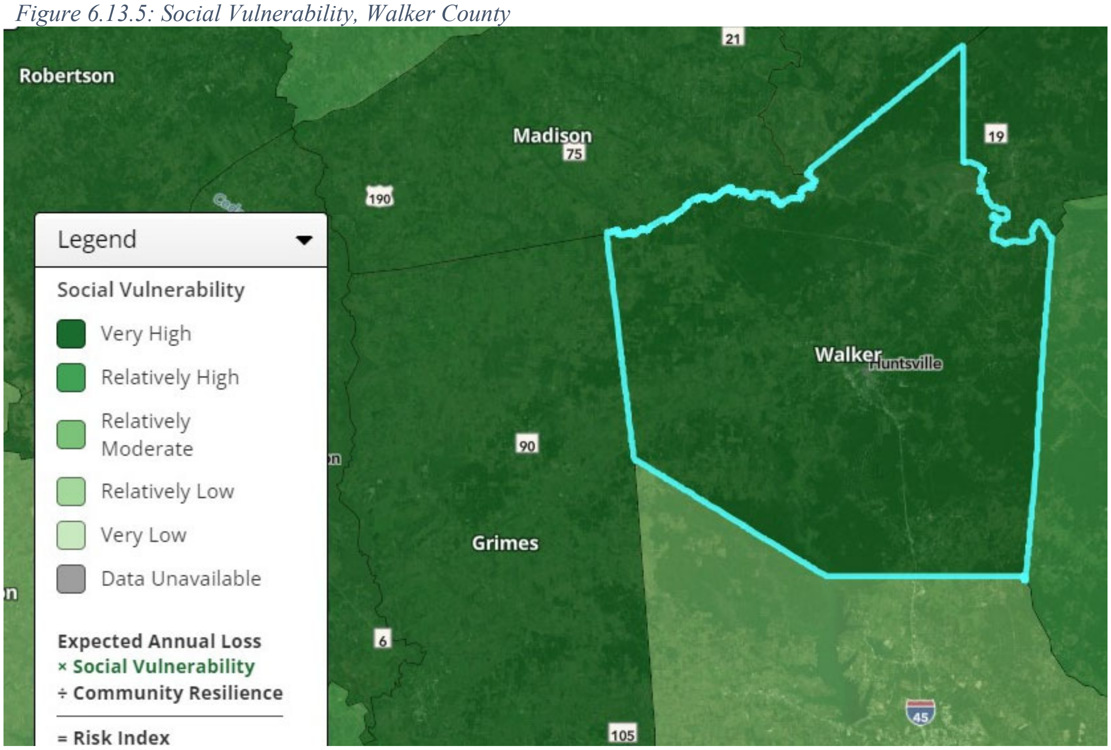


Figure 6.13.6: Community Resilience by Census Tract, Walker County

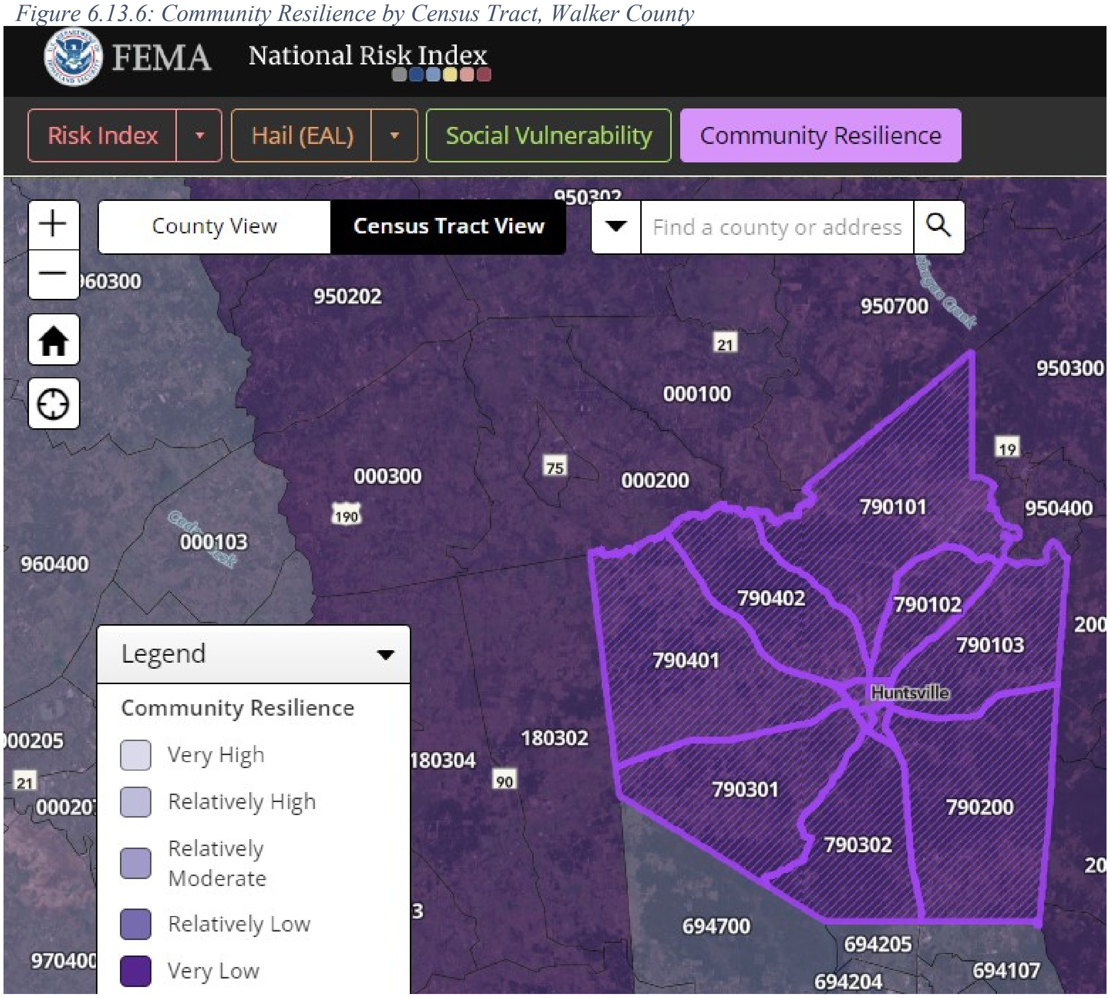


Figure 6.13.7: Community Resilience, Walker County

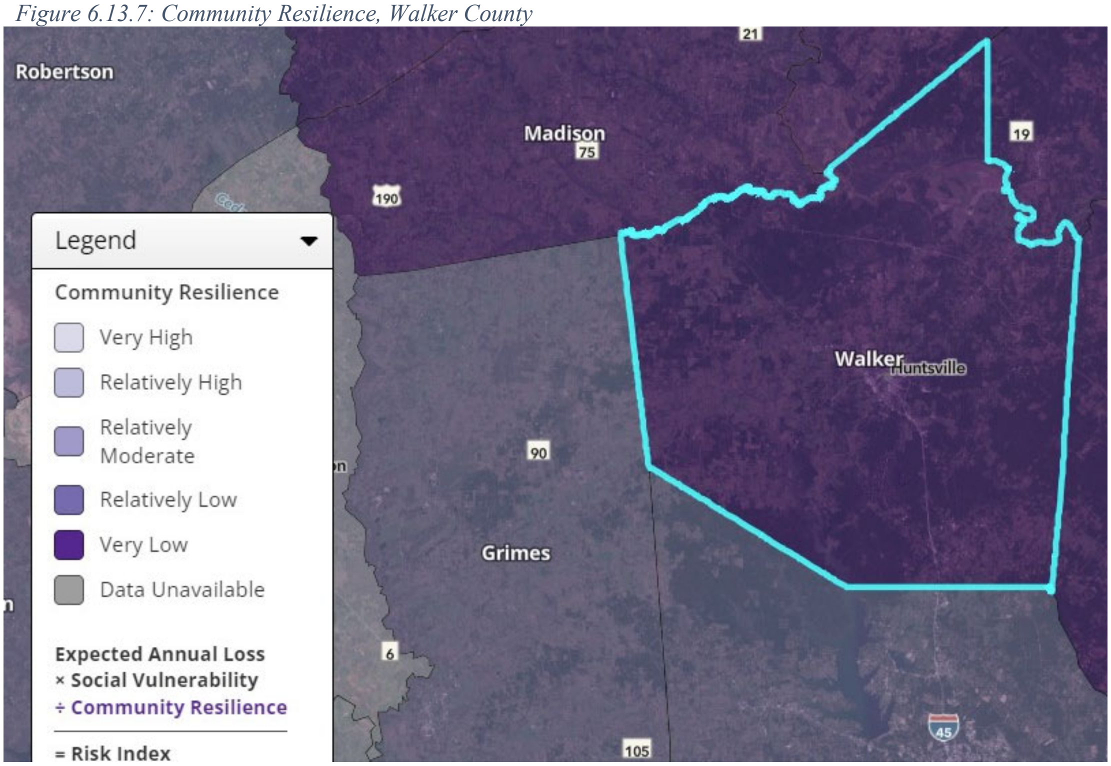


Figure 6.13.8: FEMA NRI Summary by Census Tract, Walker County, Hail

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48471790800	TX	Relatively Moderate	83.88	0 100
2	Census tract 48471790200	TX	Relatively Moderate	81.85	0 100
3	Census tract 48471790101	TX	Relatively Moderate	81.33	0 100
4	Census tract 48471790700	TX	Relatively Moderate	80.8	0 100
5	Census tract 48471790500	TX	Relatively Moderate	80.07	0 100
6	Census tract 48471790302	TX	Relatively Moderate	77.84	0 100
7	Census tract 48471790600	TX	Relatively Moderate	77.47	0 100
8	Census tract 48471790401	TX	Relatively Moderate	76.2	0 100
9	Census tract 48471790103	TX	Relatively Moderate	73.38	0 100
10	Census tract 48471790301	TX	Relatively Moderate	73.12	0 100
11	Census tract 48471790102	TX	Relatively Low	71.27	0 100
12	Census tract 48471790402	TX	Relatively Low	70.54	0 100

Figure 6.13.9: FEMA NRI EAL Summary by Census Tract, Walker County, Hail

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48471790800	TX	$21,188	Relatively High	Very Low	1.44	$30,466	83.88
2	Census tract 48471790200	TX	$16,519	Relatively High	Very Low	1.48	$24,521	81.85
3	Census tract 48471790101	TX	$17,220	Relatively High	Very Low	1.35	$23,183	81.33
4	Census tract 48471790700	TX	$13,816	Very High	Very Low	1.59	$21,944	80.8
5	Census tract 48471790500	TX	$13,662	Relatively High	Very Low	1.49	$20,389	80.07
6	Census tract 48471790302	TX	$14,100	Relatively Moderate	Very Low	1.16	$16,415	77.84
7	Census tract 48471790600	TX	$8,677	Very High	Very Low	1.82	$15,833	77.47
8	Census tract 48471790401	TX	$13,427	Relatively Low	Very Low	1.06	$14,179	76.2
9	Census tract 48471790103	TX	$11,409	Relatively Low	Very Low	0.98	$11,124	73.38
10	Census tract 48471790301	TX	$9,730	Relatively Moderate	Very Low	1.12	$10,917	73.12
11	Census tract 48471790102	TX	$6,973	Relatively High	Very Low	1.34	$9,312	71.27
12	Census tract 48471790402	TX	$8,127	Relatively Moderate	Very Low	1.07	$8,719	70.54

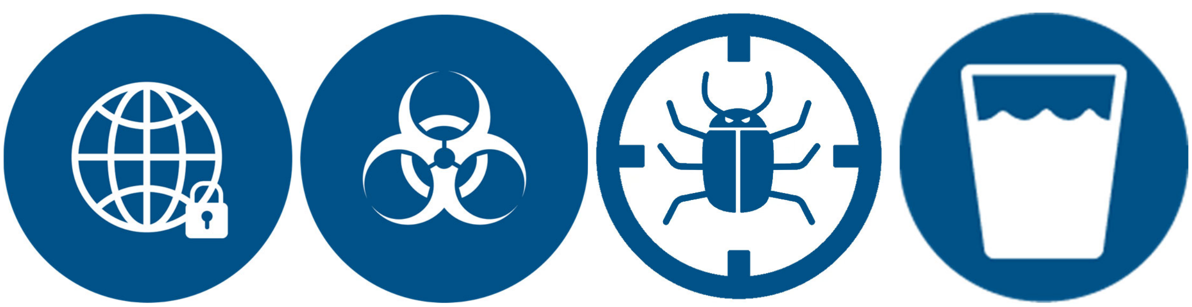
Climate Change Impacts

Since tornadoes, windstorms, and hail are heavily associated with severe thunderstorm development, this section will mirror that of Section 6.10, 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.[49]

Table 6.13.8: 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 6.14: Other Hazards of Concern



6.14 Other Hazards

This section includes hazards of concern for Walker County that were not fully profiled due to various reasons or combinations of reasons such as being a human-induced hazard, lack of data regarding the hazard, lack of historic occurrences or reporting of the hazard, unable to quantify the future probability of the hazard occurring, and unable to identify the extent or populations impacted. However, these hazards were identified as concerning and warranting attention with this HMP update by the HMC during the Risk Assessment.

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 cyberattacks that can have wide-ranging effects on individuals, organizations, the community, and the nation.[131] Cyberterrorism 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.[132] 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 unsecured 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."[133]

Historic Occurrences

There have been no historic occurrences or documented cyber-attacks within Walker County or participating jurisdictions. 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 and USDA Disaster Declarations

There have been no federally declared cyber-attack or cyber terrorism-related disaster declarations in Walker County or participating jurisdictions since 1950. Similarly, there are no USDA Disaster Declarations associated with this hazard.[2, 39]

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 and 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 backing up files in an encrypted file or encrypted file storage device, limiting any personal information shared online, changing privacy settings, and protecting home networks.[134]

Populations at Risk

Everyone is equally at risk for this hazard within Walker County and participating jurisdictions. As the US becomes increasingly reliant on technology, the vulnerability to cyber threats will increase. 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

Cybersecurity and Cyber Terrorism are human-caused hazards; thus no climate change impacts are associated with these hazards.

Hazardous Material Spill (Haz/Mat Spill)

The Occupational Safety and Health Administration (OSHA) defines hazardous materials as "any substance or chemical which is hazardous to people's health or is physically hazardous. This includes chemicals such as carcinogens, irritants, corrosives, toxic agents, sensitizers, agents that damage the lungs, skin, eyes, or mucous membranes; chemicals that can combust, explode, are flammable, oxidizers, pyrophoric, unstable-reactive or water-reactive. They also include chemicals that produce or release dust, gases, fumes, vapors, mists or smoke during normal handling, use, or storage."[135] These are a wide-ranging category of substances that can cause death or serious harm to people or may significantly damage human or environmental health. Hazardous materials pose a risk when they are released into the environment or an uncontrolled setting. Hazardous materials are widely used and in most cases are safe if used properly with the correct handling protocols.

Hazardous materials incidents can occur naturally and during the manufacture, transportation, storage, and use of hazardous materials. These incidents can occur as a result of human error, natural hazards, deliberate acts, or a breakdown in equipment or monitoring systems. The impact depends upon the quantity and physical properties of the hazardous material, environmental and weather factors at the point of release, the type of release, and its proximity to human and wildlife populations and valuable ecosystems. The duration of a hazardous materials incident can range from hours to days. Hazardous materials incidents include the unwanted, unplanned, or deliberate release or escape of explosive, flammable, combustible, corrosive, reactive, poisonous, toxic, or radioactive substances that may cause or create a potential risk to public health, safety, or the environment. For this HMP update, hazardous materials will refer to unusually harmful substances or large quantities of hazardous materials and will focus on releases from fixed sites. It does not address the potential of small-scale hazardous material releases of common supplies, such as cleaning supplies under a sink or a spare can of gasoline in a shed.

Location

The Toxics Release Inventory (TRI) is a publicly available database from the Federal Environmental Protection Agency (EPA) that contains information on toxic chemical releases and other waste management activities reported annually by certain industry groups and federal facilities.[136] This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 and expanded by the Pollution Prevention Act of 1990. Each year, facilities that meet certain activity thresholds must report their releases and other waste management activities for listed toxic chemicals to EPA and to their state or tribal entity.

Walker County contains 7 TRI facilities and various pipelines that transport these materials, as shown in the figures below.

Figure 6.14.1: Toxic Release Inventory Facilities, Walker County

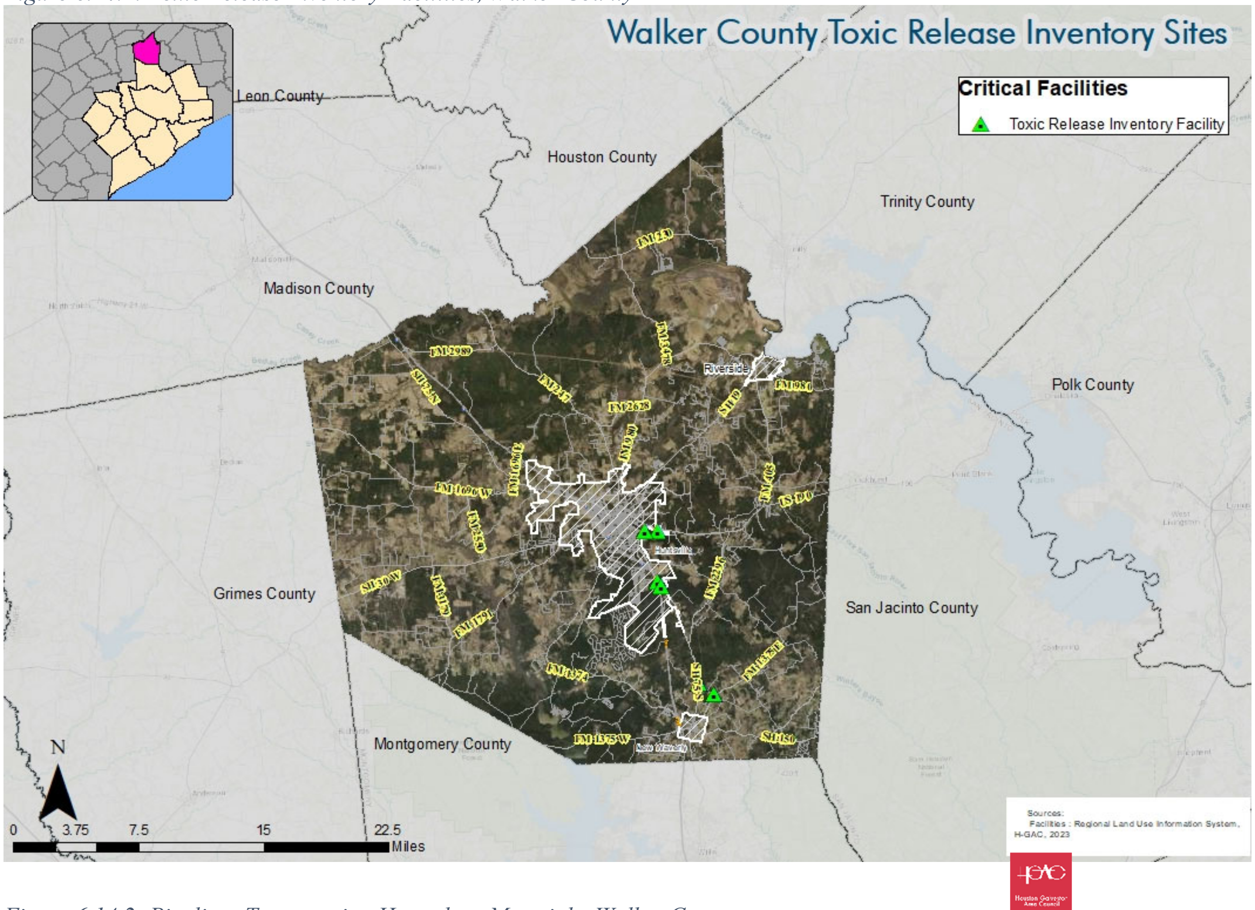
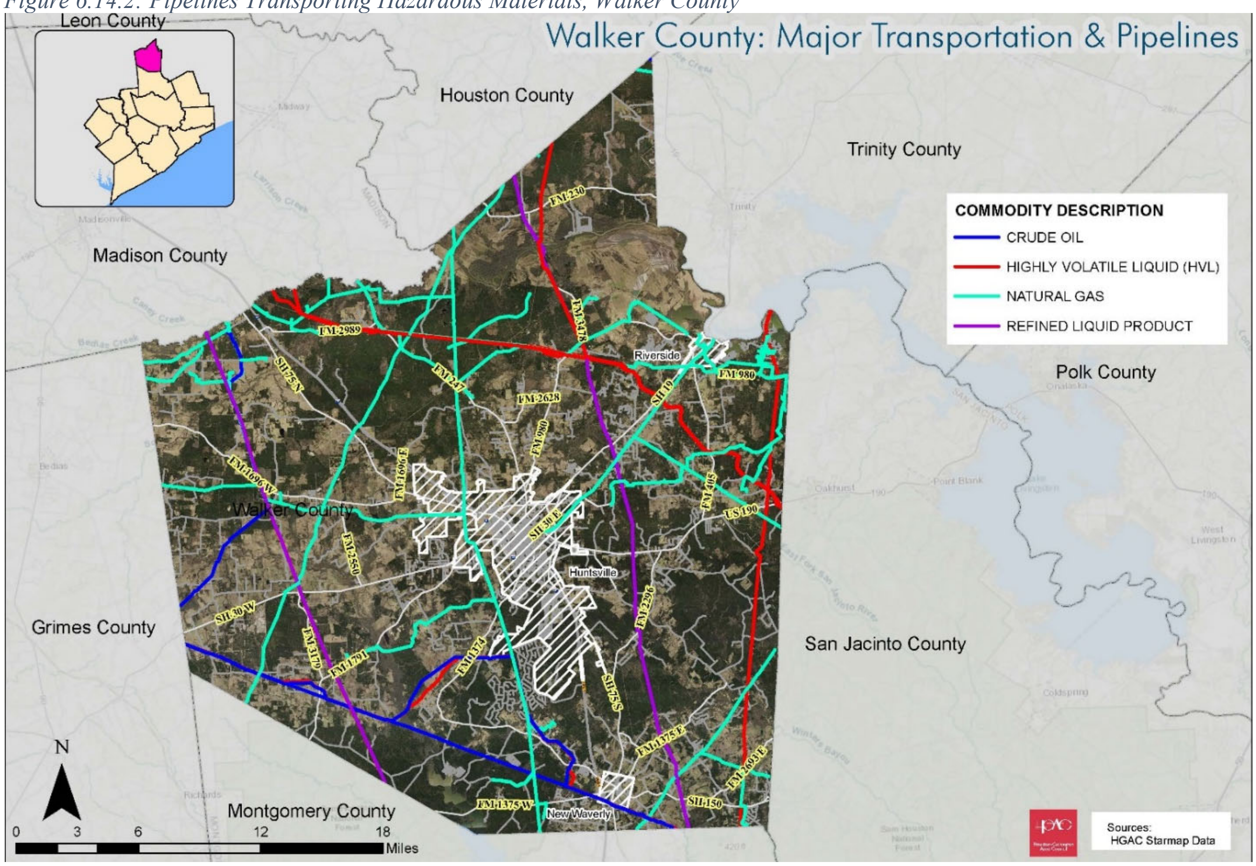


Figure 6.14.2: Pipelines Transporting Hazardous Materials, Walker County



Extent

The extent of a hazardous substance release will depend on whether it is from a fixed or in-transit (mobile) source, the volume of substance released, the duration of the release, the toxicity and properties of the substance, and the environmental conditions (for example, wind and precipitation, terrain, etc.). Hazardous substance releases can contaminate air, water, and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when the hazardous substance is transported by water and wind. While often accidental, releases can occur as a result of human negligence, intentional acts, or natural hazards.

When caused by natural hazards, these incidents are known as secondary events. These releases can affect nearby populations and contaminate critical or sensitive environmental areas. With a hazardous substance release, whether accidental or intentional, several potentially exacerbating or mitigating circumstances will affect its severity of impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact a release has on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place measures can help to protect people and property from the harmful effects of a hazardous substance release.

Historic Occurrences

Presidential and USDA Disaster Declarations

There have been no federally declared hazardous material-related disaster declarations in Walker County or participating jurisdictions since 1950. Similarly, there are no USDA Disaster Declarations associated with this hazard.[2, 39]

Probability of Future Occurrences

As development continues and populations increase, the risk for a hazardous material release and the potential impacts on the population, infrastructure, and environmental resources will increase. The number and types of hazardous chemicals stored in and transported through Walker County and Texas will likely continue to increase.

Populations at Risk

As the population grows, the number of people vulnerable to the impacts of hazardous materials spills and transportation incidents will increase. Populations living and/or working near facilities that produce, store, or transport hazardous substances are at higher exposure risk. Population and business growth along major transportation corridors increases the vulnerability to transportation-related hazardous material spills. Growth increasing commercial and residential density near fixed-site hazardous materials facilities will also increase vulnerability. Populations considered most vulnerable to this hazard include persons over the age of 65 (elderly individuals), children, pregnant women, and those with chronic health conditions or who are immunocompromised. Depending on the type of release and environmental conditions, people may be evacuated as a precaution or instructed to shelter in place. A hazardous substance release, whether fixed-site or in-transit can also negatively impact the natural environment. Depending on the nature and amount of the substance, the release may contaminate the air, water, or soil potentially causing concern for direct human and animal exposure, recreational usage, crop irrigation, and fish and wildlife consumption. Water contamination, whether surface water, groundwater, or marine, is an immediate concern from a hazardous materials release potentially impacting potable water supplies, wildlife, and recreational activities. Environmental damages can linger for decades and result in extensive remediation costs.[137]

Climate Change Impacts

Climate change-related events may affect the frequency and/or intensity of hazardous material releases. For example, extreme heat events can buckle railways, which can lead to train derailments and potentially cause hazardous material releases. Sites that store hazardous materials that are at risk from current flooding will become more vulnerable to climate change. Flooding during a storm event could cause the release of hazardous materials if they are not properly stored or contained. The release of these hazardous materials may in turn expose the nearby population, harm water quality, and negatively affect the overall environmental and economic health of the area.

Invasive Species

The official definition of invasive species as per Executive Order 13112:

(a) "Alien species" means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

(f) "Invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

(h) "Species" means a group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms. [138]

Invasive species are non-native to a specific location and can harm the environment, the economy, or human health. They may come from anywhere in the world and can contribute to habitat degradation, loss of native species, crop damage, and diseases in humans and livestock. Per the USDA, "invasive species can negatively impact human health by infecting humans with new diseases, serving as vectors for existing diseases, or causing wounds through bites, stings, allergens, or other toxin.[139] For instance, the Asian tiger mosquito (*Aedes albopictus*), often considered the most invasive mosquito in the world, serves as a vector for many diseases, including West Nile Virus and Dengue fever.[140]" The USDA also outlines the economic and social impacts of invasive species, which include both direct effects of a species on property values, agricultural productivity, public utility operations, native fisheries, tourism, and outdoor recreation, as well as costs associated with invasive species control efforts. A 2021 study estimated that invasive species have cost North America $2 billion per year in the early 1960s to over $26 billion per year since 2010.[141]

Using the Early Detection and Distribution Mapping System (EDDMapS), records of invasive species within counties can be viewed by the number of records reported for sightings within a given area. EDDMapS is a web-based mapping system for documenting invasive species and pest distribution that was launched in 2005 by the Center for Invasive Species and Ecosystem Health at the University of Georgia, it was originally designed as a tool for state Exotic Pest Plant Councils to develop more complete distribution data of invasive species. Since then, the program has expanded to include the entire US and Canada as well as to document certain native pest species.

For Walker County, the following species discussed below were identified as the most reported through EDDMapS, mentioned by the HMC, or identified through data gathered as current threats at the time of this plan update.[142] The list of invasives currently impacting Walker County includes:

- Chinese Tallowtree, *Triadica sebifera*
  - Chinese Tallowtree was one of the most reported invasive species within EDDMapS. This species invades wet areas such as stream banks and ditches but can also invade drier upland sites. *Triadica sebifera* is a serious threat because of its ability to invade high-quality, undisturbed forests. It can displace native vegetation as well as alter soil conditions due to the high number of tannins present in the leaf litter. Chinese Tallowtree

is a native of China and was introduced into South Carolina in 1776 for ornamental purposes and seed oil production.[143]

- Pig (feral), Wild Boar at large, *Sus scrofa (feral type)*
    - Feral hogs were listed as an item of concern in community surveys, public outreach/community engagement events, and within EDDMapS reporting. Feral swine, also known as wild pigs, wild boars, wild hogs, and razorbacks can look similar to domestic hogs but are generally thinner with coarse bristly hair, long tusks, and a flattened elongated snout. These invasive species can cause damage via extensive rooting or digging as they search for food in agricultural and recreational areas, wetlands, waterways, and historic sites. The U.S. feral swine population is rapidly expanding. Range expansion over the last few decades is due to a variety of factors including their adaptability to a variety of climates and conditions, translocation by humans, and a lack of natural predators.[144]
- Zebra Mussels, *Dreissena polymorpha*
    - Lake Conroe, which is in both Walker and Montgomery Counties, experiences issues with Zebra Mussels per the San Jacinto River Authority. Zebra mussels can block intake pipes for power generation and water treatment facilities, degrade water quality, destroy shorelines, severely damage boats, and impede recreation. Invasive Zebra Mussels have become a hazard of concern throughout the entire State of Texas.[145]

Location

The entire county could experience impacts from invasive species and is believed at risk for invasive species propagation. The ability of invasive species to propagate rapidly over a large geographic area, whether through accidental introduction or natural migration patterns is an area of concern. Similarly, in open freshwater and marine ecosystems, like that of Lake Conroe, invasive species can quickly spread once introduced. The damage rendered by invasive species is significant. Experts estimate that about 3 million acres within the U.S. are lost each year to invasive plant species alone.[146]

Extent

Once established, invasive species often continue to propagate and grow for years or decades, they often escape notice until they are widespread, and eradication is impractical. As a result, early and coordinated action between public and private landowners is critical to preventing widespread damage from invasive species. The National Strategy and Implementation Plan for Invasive Species Management (FS-805) was developed by the USDA Forest Service in October 2004 with the goal being to "reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of (non-native) invasive species across all landscapes and ownerships." This National Strategy is based on four elements: Prevention, Early Detection and Rapid Response, Control and Management, and Rehabilitation and Restoration.

Eradication involves both chemical and mechanical methods, combined with ongoing monitoring. Often, due to limited staffing and diminished municipal budgets, there are limited controls or programs for invasive species. Most invasives, when they are discovered, are considered more of a nuisance hazard and are not directly associated with any primary impacts of other weather-related hazards such as loss of life, limited evacuation, or property damages.

Historic Occurrences

Invasive species do not represent a singular event but rather an ongoing or emerging problem, so it is difficult to measure the frequency of occurrences.

Presidential and USDA Disaster Declarations

Between 1954 and 2022, there were 0 disaster declarations for invasive species-related events within Walker County. [2] Generally, these types of disasters cover a wide region of the State; therefore, they can impact many counties.

Probability of Future Occurrences

The USDA Animal and Plant Health Inspection Service (APHIS) manages the Plant Protection and Quarantine (PPQ) Program which safeguards U.S. agriculture and natural resources from the introduction, establishment, and spread of plant pests and noxious weeds. PPQ is the lead federal agency for plant health emergencies and works closely with federal, state, and local agencies; universities; industries; and private entities in developing and implementing science-based frameworks designed to protect against invasive pests and diseases.[147]

The presence of invasive species is ongoing, and it is difficult to quantify the future frequency of these occurrences. Increased rates of global trade and travel have created many new pathways for the dispersion of exotic species. As a result, the frequency with which these invasive species have been introduced has increased. Increased international trade in ornamental plants is particularly concerning because many of the invasive plant species in the U.S. were originally imported as ornamentals.

Populations at Risk

The entire population of Walker County is exposed to invasive species. However, those living in areas more impacted by invasive species may be more at risk. Some invasive plants have been shown to destabilize soil due to high densities and shallow root systems, negatively impacting nearby buildings and septic systems. Other invasive plant species have been known to clog culverts and streams which increases flooding risk. Species that cause eventual destabilization of soil, such as invasive insects that destroy plants or invasive plants that outcompete native vegetation but have less effective root systems, can increase runoff into waterbodies. Zebra Mussels negatively impact their aquatic environment by out-competing native organisms and by exerting toxic chemicals into an aquatic ecosystem.

Invasive species typically harm native species through predation, habitat degradation, and competition for shared resources. Negative consequences can be far-reaching, considering they can spread at astonishing rates and, as stated above, can affect property values, agricultural productivity, public utility operations, native fisheries, tourism, outdoor recreation, and the overall health of an ecosystem.

Climate Change Impacts

Climate change and invasive species are two of the top four drivers of global biodiversity loss, affecting production landscapes, reducing crop yields, and the provision of ecosystem services. Land use changes because of climate change create an empty niche for invasive species to occur. Together these drivers have a greater impact. Invasive Species, such as new species that become invasive, entering regions due to climate change can shift the species hierarchy in ecosystems leading to new dominants that may portray invasive behaviors. Climate-induced stress in the ecosystem can facilitate invasive ecosystems. Alternatively, invasive species and infestations can facilitate climate stress by increasing the ecosystem's susceptibility to climatic disturbance, through reducing the number of species and their functional types within an ecosystem.[148]

Future Mitigation Action Ideas-

1. **Develop an Invasive Species Management Plan**
   a. Contract a formal evaluation of invasive species affecting Walker County and develop a plan, with participating jurisdictions for how they will be managed.
   b. Map invasive species and their habitat/area of reach within the County
      i. Utilize Citizen Science and other groups (hikers, outdoor enthusiasts, campers, State Park visitors, etc.) to identify invasive species and where they were found through resources such as TexasInvasives.org to expand mapping.
   c. Plan Example: City of Austin Invasive Species Management Plan: https://services.austintexas.gov/watershed_protection/publications/document.cfm?id=196403

2. **Develop educational materials surrounding invasive species identification, habitat, and detriments to the environment, economy, and health of Walker County and its residents.**
   a. Map invasive species and their habitat/area of reach within the County
      i. Utilize Citizen Science and other groups (hikers, outdoor enthusiasts, campers, State Park visitors, etc.) to identify invasive species and where they were found through resources such as TexasInvasives.org to expand mapping.
   b. Collaborate with the participating jurisdictions to initiate short-term restoration techniques such as invasive removals.

Water Quality and Quantity

The Texas Water Development Board (TWDB) is the state's lead water planning and infrastructure financing agency and is statutorily responsible for administering the regional water planning process and preparing and adopting the state water plan every five years. Water planning in Texas starts at the regional level with 16 regional water planning groups, one for each of the 16 designated planning areas in the state. Each planning group consists of about 25 members who represent at least 12 interests, as required by Texas statute, including agriculture, industry, public, environment, municipalities, businesses, water districts, river authorities, water utilities, counties, power generation, and groundwater management areas. Development of the state water plan is central to the mission of the TWDB. The plan addresses the needs of all water user groups in the state: municipal, irrigation, manufacturing, livestock, mining, and steam-electric power. The regional and state water plans consider a 50-year planning horizon.[149]

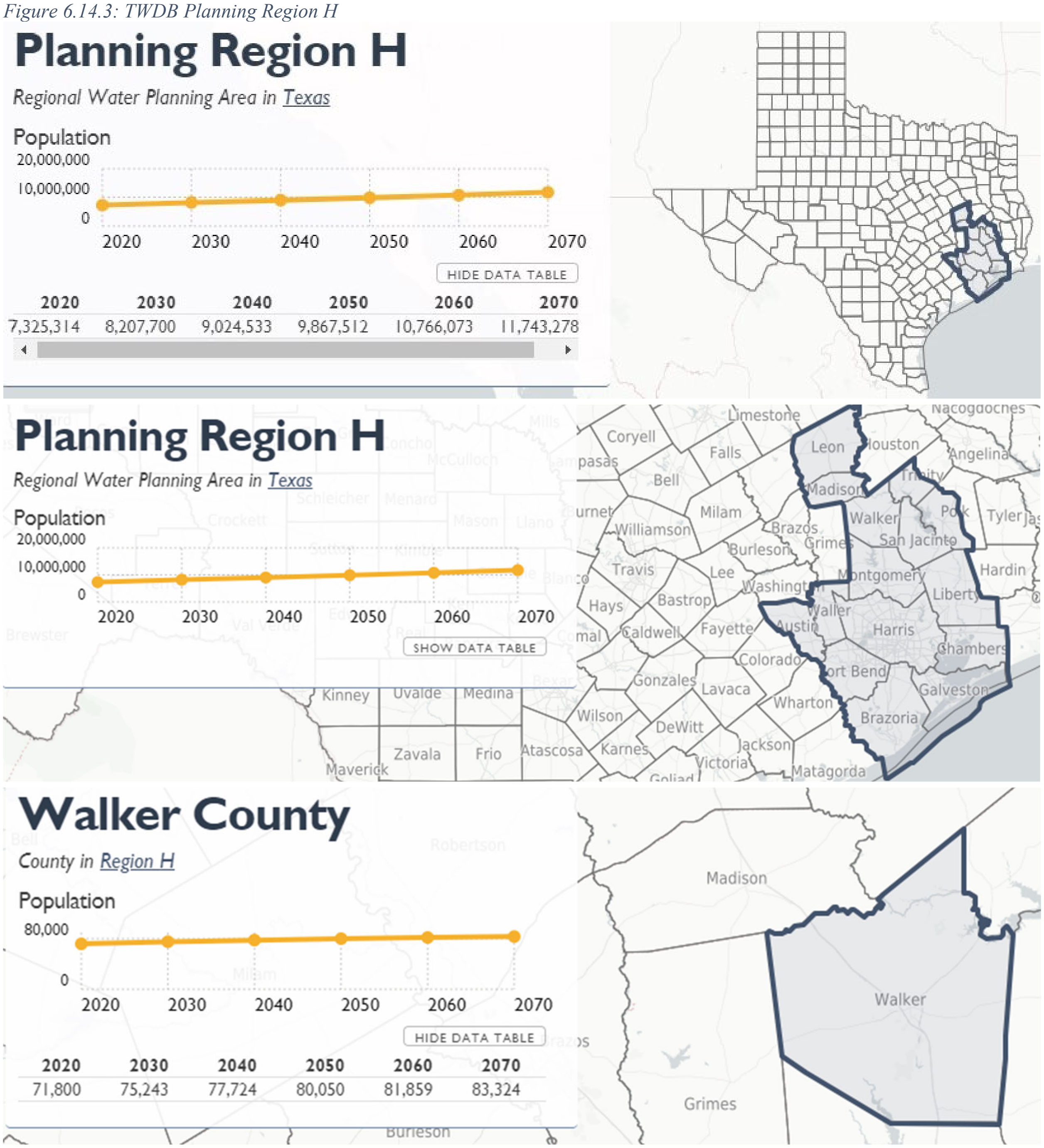
Within the Texas State Water Plan, developed by TWDB, one can find the projected water demands, existing water supplies, the relative severity, and projected water needs (potential shortages), and water management strategies recommended to address potential shortages (including recommended capital projects and their sponsors) can be viewed. The 2022 TWDB Texas State Water Plan includes data covering the next 50 years in geographical and tabular forms.

During each five-year planning cycle, planning groups evaluate population projections, water demand projections, and existing water supplies that would be available during times of drought. Planning groups identify water user groups that will not have enough water during times of drought and recommend strategies and projects that could be implemented to address shortages and estimate the costs of these strategies. TWDB then compiles all planning group's water plans into the state water plan, which serves as a guide to state water policy, with information from the regional water plans and policy recommendations to the Texas Legislature. Each step of the process is open to the public and provides numerous opportunities for public input.

Location

The location for this hazard of concern will follow the TWDB's Texas State Water Plan Planning Area. Walker County is included in Region H of the State Water Plan. The Region H Regional Water Planning Area is composed of all or parts of 15 counties and includes portions of the Trinity, San Jacinto, Brazos, Neches, and Colorado River basins. The Houston metropolitan area is located within this region.[150]

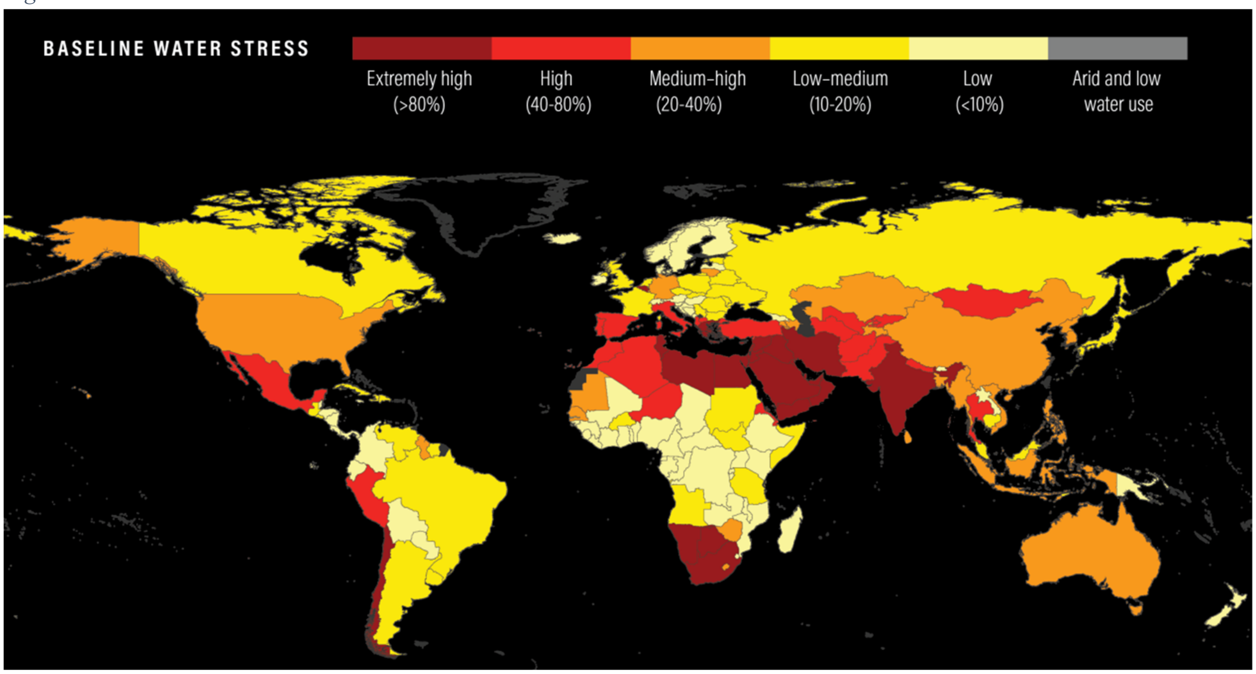
Figure 6.14.3: TWDB Planning Region H



Extent

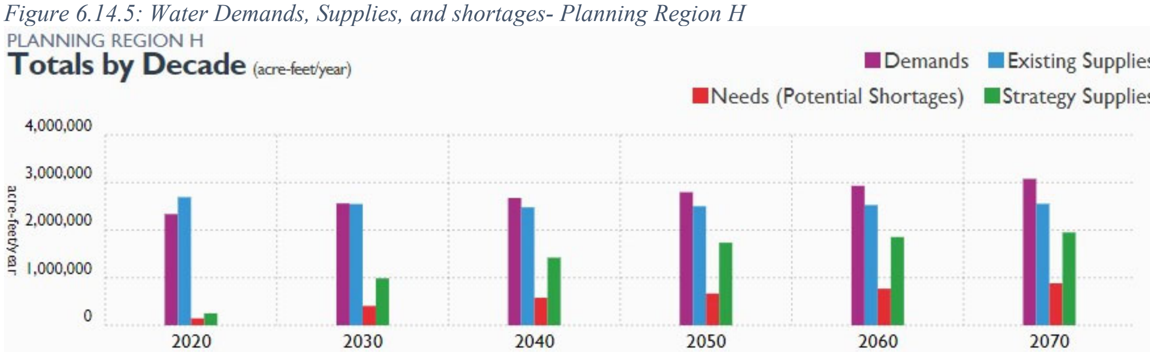
Water scarcity refers to the demand for water that may be exceeding supply, water infrastructure may be inadequate, or institutions may be failing to balance everyone's needs.[151] The World Resources Institute quantifies increasing demands in water supply as water stress. Water stress is the ratio of water demand to renewable supply, which measures the competition over local water resources. The smaller the gap between supply and demand, the more vulnerable a place is to water shortages. A country facing "extreme water stress" means it is using at least 80% of its available supply, "high water stress" means it is withdrawing 40% of its supply. The U.S. rates medium-high for water stress annually.

Figure 6.14.4: Annual Water Stress



Within the TWDB Planning Region H potential shortages within the entire planning region are expected to increase steadily, as seen in the figure below.

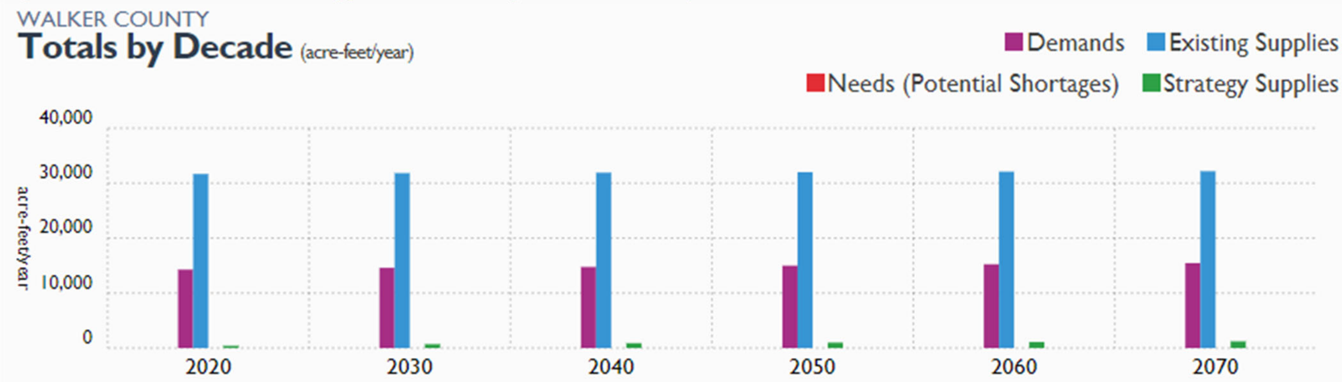
Figure 6.14.5: Water Demands, Supplies, and shortages- Planning Region H



	2020	2030	2040	2050	2060	2070
Demands	2,336,763	2,561,103	2,674,943	2,796,416	2,930,696	3,076,799
Existing Supplies	2,691,768	2,548,191	2,478,114	2,501,243	2,526,876	2,553,324
Needs (Potential Shortages)	145,122	405,443	578,314	667,117	769,125	883,136
Strategy Supplies	251,441	986,707	1,421,459	1,734,514	1,854,533	1,951,180

However, for Walker County alone, there are no projected water supply shortages through 2070.[152]

Figure 6.14.6: Water Demands, Supplies, and shortages- Walker County



	2020	2030	2040	2050	2060	2070
Demands	14,273	14,591	14,755	14,988	15,239	15,458
Existing Supplies	31,666	31,829	31,906	31,999	32,093	32,174
Needs (Potential Shortages)	0	0	0	0	0	0
Strategy Supplies	402	706	889	996	1,099	1,219

Historic Occurrences
There have been no historic occurrences of water quantity hazards within Walker County. Water quality is often affected by other hazards of concern within the planning area.

Presidential and USDA Disaster Declarations
Between 1954 and 2022, there were 0 disaster declarations for water quality or water quantity-related events within Walker County.[2]

Probability of Future Occurrences
The probability of future occurrences for Walker County is low based on Figure 6.14.4 above.

Populations at Risk
Ground and surface water quality can be impacted when water is not regularly replenished, and water may not be available for farming, manufacturing, or use in everyday activities like bathing, cooking, and washing dishes. Given the information provided by TWDB within the 2022 Texas State Water Plan above, this hazard is considered low risk for Walker County as there are no projected water shortages for any industry within Walker County through 2070.

Climate Change Impacts
In addition to water quality issues, low water levels resulting from drought have a significant impact on ecosystems. When water levels are low in lakes, rivers, and other water bodies, their ability to flush out contaminants diminishes, causing an increase in waterborne pollutants. Reduced plant growth, local species reduction or extinction, and landscape-level transitions, such as forest conversion to non-forested vegetation, which may in turn reduce water retention in soils, may occur. Additionally, freshwater ecosystems may change flow regimes, increase water temperature, and deteriorate water quality, which may result in fish kills, reduced opportunities for recreation, and decreased hydropower production.[153]

Section 7: Mitigation Strategy

This section covers the mitigation strategy, which provides the mitigation goals, objectives, and action items included in the Hazard Mitigation Action Plan in response to identified hazards.

Section 7: MITIGATION STRATEGY

The planning process, hazard analysis, and vulnerability assessment are foundations 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 hazard mitigation action plan (HMAP). 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 policies 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 natural hazards.
2) Develop publications and educational information on all hazards and make them easily accessible to all within Walker County and participating jurisdictions.
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 Walker County and participating jurisdictions 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 in recovery from hazard impacts.

Objectives

- Protect the lives and property of residents and business owners.
- Eliminate the number of vulnerable structures in areas susceptible to repetitive flooding.
- Increase public education and awareness of hazards that affect the County and participating jurisdictions.
- Provide alternative power sources for critical facilities and infrastructure.
- Upgrade deteriorating 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 city intends to fund these actions, and the estimated time for implementing these actions.

Walker County and participating jurisdictions submitted their mitigation actions based on the greatest vulnerabilities, goals, and needs. Each action was evaluated for feasibility using FEMA's Benefit-Cost Analysis (BCA) Toolkit or other means, such as a Benefit-Cost Ratio (BCR). The actions are separated by jurisdiction and include the BCA or BCR score for each. Mitigation actions below were given a priority rating of 1- high, 2- medium, or 3- low based on feasibility, potential funding, BCA or BCR score, and implementation timelines.

All Participating Jurisdictions

Table 7.1: 2018 HMP Action Items- All Participating Jurisdictions

Action Item #	Remove from HMP	Keep in HMP	What is the status of the Action Item? If the Action Item is being removed, note why.
15	X		No longer feasible for the County, participating jurisdictions, and partners
17	X		No longer feasible, there is not enough community backing/buy-in from citizens to support the project
20		X	
22	X		No longer feasible, No private buy-in from power companies
25	X		No longer feasible, there is not enough community backing/buy-in from citizens to support the project
27		X	
28	X		No longer feasible, there is not enough community backing/buy-in from citizens to support the project
33	X		There is not enough backing/buy-in from elected officials to support the project. No funding is available to support the project.
34	X		Completed
35		X	
36		X	
37	X		There is not enough backing/buy-in from elected officials to support the project. No funding is available to support the project.
38		X	

Jurisdiction:	All Participating Jurisdictions	**Action:**	20
Hazard(s) Addressed:	Wildfires Severe Thunderstorms & Lightning		
Project Title:	Lightning and Fire Protection		
Project Description:	Purchase lightning rods for communication towers within the county.		
Responsible Entity:	Walker County OEM		
Losses avoided:	Prevent the loss of communication because of lightning strikes on communication towers. Prevent the loss of life or property during a hazard event that could have been prevented if communication was continuous.		
Partners:	City of Huntsville		
Cost Estimate:	$150,000	Timeframe:	12-18 months
Potential Funding Sources:	HMGP, BRIC, CDBG, FP&S Grants	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating:	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All Participating Jurisdictions	Action:	23
Hazard(s) Addressed:	Dam Failure Erosion		
Project Title:	Data Deficiencies		
Project Description:	Address data deficiencies for erosion and dam failure hazards to identify the extent, vulnerability, and potential impacts. Conducti a risk assessment of all dams with significant and high hazard potentials within the county and to identify inundation areas.		
Responsible Entity:	Walker County OEM, Walker County Planning & Development, City of Huntsville, City of New Waverly, City of Riverside		
Losses avoided:	Prevent loss of life and property		
Partners:	USACE, USGS, USDA, NWS		
Cost Estimate:	$600,000	Timeframe:	12-36 months
Potential Funding Sources:	HMGP, USACE, USGS FIM, TWDB, TCEQ	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	All Participating Jurisdictions	Action:	27
Hazard(s) Addressed:	Flooding		
Project Title:	Structural Project		
Project Description:	Develop a community-wide drainage system in Southwood Forest Subdivision and Forgotten Forest Subdivision.		
Responsible Entity:	Walker County Commissioner- Precinct 4, Road and Bridge Dept.		
Losses avoided:	Prevent loss of life and property through improved drainage system in subdivisions that repeatedly flood.		
Partners:	None		
Cost Estimate:	$2,500,000	Timeframe:	12-24 months
Potential Funding Sources:	USACE Small Flood Control Projects, USDA NRCS Emergency Watershed Protection Agency, TWDB Clean Water State Revolving Fund, TWDB (Development Fund II)-Texas Water Development Fund, USDA NRCS Watershed Protection and Flood Prevention Program, EPA NPS Grant	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating:	3 = Lowest Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All Participating Jurisdictions		Action:	35
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Extreme Heat Severe Thunderstorms & Lightning			
Project Title:	Safe Room at KSAM, Structural Project			
Project Description:	Construct a safe room with a generator at KSAM radio station.			
Responsible Entity:	Emergency Management			
Losses avoided:	Prevent loss of radio communications during hazard events and prevent loss of life			
Partners:	City of Huntsville, KSAM Radio Station			
Cost Estimate:	$250,000	Timeframe:	24-36 months	
Potential Funding Sources:	PDM, HMGP, BRIC, CDBG	Benefit-Cost Analysis:	More than a 1:4 BCR	
Priority Rating:	3 = Lowest Priority Rating	Status:	Not started	
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No	

Jurisdiction:	All Participating Jurisdictions		Action:	36
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Emerging Infectious Diseases Windstorms Severe Thunderstorms & Lightning Erosion Dam & Levee Failure Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)			
Project Title:	Public Information and Awareness			
Project Description:	The county and participating jurisdictions will create and implement an education campaign to educate the public on hazards of concern within the HMP and mitigation techniques for all hazards.			
Responsible Entity:	Walker County OEM, City of Huntsville, City of Riverside, City of New Waverly			
Losses avoided:	Prevent and reduce the loss of life and property			
Partners:	Walker County OEM, City of Huntsville, City of Riverside, City of New Waverly			
Cost Estimate:	$2,500	Timeframe:	12 months	
Potential Funding Sources:	PDM, HMGP, BRIC	Benefit-Cost Analysis:	N/A	
Priority Rating	3 = Lowest Priority Rating	Status:	Not started	
Is this action related to a critical facility or lifeline?			No	
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No	

Jurisdiction:	All Participating Jurisdictions	Action:	38
Hazard(s) Addressed:	Extreme Heat Wildfires Drought & Expansive Soils		
Project Title:	Water Conversation Project		
Project Description:	The county and participating jurisdictions will install low-flow water systems into any new or renovated public buildings.		
Responsible Entity:	Walker County OEM, City of Huntsville, City of Riverside, City of New Waverly		
Losses avoided:	Reduction in water usage will help conserve water supplies during extreme heat events, wildfires, and droughts.		
Partners:	Walker County OEM, City of Huntsville, City of Riverside, City of New Waverly		
Cost Estimate:	$25,000	Timeframe:	12-24 months
Potential Funding Sources:	PDM, HMGP, BRIC	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Walker County

Table 7.2: 2018 HMP Action Items- Walker County

Action Item #	Removed from HMP	Keep in HMP	What is the status of the Action Item? If the Action Item is being removed, note why.
1		X	
3		X	
4	X		Replaced by Action Item 3
5		X	
6	X		Replaced by Action Item 3
7		X	
9	X		Completed. High- water boats were obtained by participating jurisdictions to be used during disaster events throughout the County.
10		X	
11		X	
13	X		Replaced by Action Item 3
14		X	
16	X		No longer feasible. The Walker County Storm Shelter houses 150 evacuees, and there are no plans for adding future storm shelters.
18	X		Completed, past drainage project on Town Creek that runs under the annex alleviated the flooding issue.
19		X	
21	X		Replaced by Action Item 3 which would include protection for generators
24		X	
26	X		No longer feasible, Not enough community support from citizens
31		X	
32			*NEW
33			*NEW
34			*NEW

Jurisdiction:	Walker County	Action:	1
Hazard(s) Addressed:	Flooding		
Project Title:	High water flood indicator for Bedias Creek crossing		
Project Description:	Purchase high water (flood) indicator for Bedias Creek Crossing.		
Responsible Entity:	Walker County OEM and Madison County OEM		
Losses avoided:	Prevent the loss of life and property with a better notification system. There is a Multijurisdictional benefit because it would belocated on the Madison County and Walker County border.		
Partners:	Madison County OEM		
Cost Estimate:	$100,000	Timeframe:	12-24 months
Potential Funding Sources:	PDM, HMGP, BRIC	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	3
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Severe Thunderstorms & Lightning		
Project Title:	Property Protection		
Project Description:	Install permanently mounted generator on a concrete pad at all critical facilities in Walker County, including within the City of Riverside and the City of New Waverly, to provide continuity of government,		
Responsible Entity:	Emergency management		
Losses avoided:	Prevent loss of life and property by providing emergency power at critical facilities during natural or man-made disasters.		
Partners:	City of New Waverly, City of Riverside		
Cost Estimate:	$1,500,000	Timeframe:	24-36 months
Potential Funding Sources:	PDM, HMGP	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	5
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Emerging Infectious Diseases Windstorms Severe Thunderstorms & Lightning Dam & Levee Failure Hailstorms		
Project Title:	Emergency Animal Shelter Construction		
Project Description:	Construct an emergency animal shelter that will house animals both large and small, including livestock, for use during events where human sheltering will be needed.		
Responsible Entity:	Emergency Management		
Losses avoided:	Prevent loss of animal life and reduce livestock economic losses during events.		
Partners:	Texas A&M AgriLife Extension Service		
Cost Estimate:	$6,000,000	Timeframe:	24-36 months
Potential Funding Sources:	HMGP, CDBG	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	7
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Dam & Levee Failure Hailstorms		
Project Title:	Harden Emergency Operations Center		
Project Description:	Retrofit and harden the Walker County Emergency Operations Center serving Walker County, including the City of Huntsville, City of Riverside and the City of New Waverly		
Responsible Entity:	Emergency Management		
Losses avoided:	Prevent loss of life		
Partners:	City of Huntsville, City of New Waverly, and City of Riverside		
Cost Estimate:	$4,000,000	Timeframe:	18-24 months
Potential Funding Sources:	HMGP, BRIC, FEMA Emergency Operations Center, Department of Justice-State Homeland Security Program, FEMA Emergency Management Planning Grant	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
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?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	10
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Property Protection		
Project Description:	Install a permanently mounted 60kw generator on a concrete pad at KSAM Radio Station to provide continuous broadcast services to citizens of Walker County.		
Responsible Entity:	Emergency Management		
Losses avoided:	Prevent the loss of life and property through improved communication systems during natural disasters.		
Partners:	KSAM		
Cost Estimate:	$100,000	Timeframe:	12-24 months
Potential Funding Sources:	HMGP	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
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?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	11
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Severe Thunderstorms & Lightning		
Project Title:	Public Information and Awareness		
Project Description:	Purchase high water (flood) indicators for low water crossings for county roads.		
Responsible Entity:	Walker County Planning and Development Dept.		
Losses avoided:	Prevent loss of life and property with better notification system.		
Partners:	Walker County OEM		
Cost Estimate:	$500,000	Timeframe:	12-48 months
Potential Funding Sources:	HMPG, FMA Program, PDM Program, HUD-Disaster Recovery Initiative Program, CDBG, USDA NRCS-Watershed Protection and Flood Prevention Program	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Walker County	Action:	14
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Dam & Levee Failure Hailstorms		
Project Title:	Prevention		
Project Description:	Purchase topographical maps and aerial photography for Walker County to identify flood hazards and wildfire hazard areas. Notify and educate public in these areas of risk, and work to develop mitigation actions to address vulnerable areas.		
Responsible Entity:	Walker County Planning & Development Department		
Losses avoided:	Prevent the losss of life and property		
Partners:	Walker County OEM		
Cost Estimate:	$500,000	Timeframe:	6- 12 months
Potential Funding Sources:	FEMA Map Modernization Program, FEMA Flood Hazard Mapping Program, Department of the Interior, USGS Mapping Standards Support, FEMA Flood Recovery Program	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	19
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Emerging Infectious Diseases Windstorms Severe Thunderstorms & Lightning Erosion Dam & Levee Failure Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Emergency Services		
Project Description:	Finish fiber optic communications project		
Responsible Entity:	Information Technology		
Losses avoided:	Prevent loss of life and property through improved communication system during natural disasters.		
Partners:	None		
Cost Estimate:	$250,000	Timeframe:	48-60 months
Potential Funding Sources:	PDM Program, HMGP, BRIC, FEMA-All Hazards Operational Planning, FEMA-Fire Management Assistance Program, FEMA Emergency Operation Center Funding	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	24
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Severe Thunderstorms & Lightning		
Project Title:	Structural Project		
Project Description:	Elevate and install culverts on Hostetter and Gourd Creek roadways to prevent flooding and/or flood damage on roadway.		
Responsible Entity:	Walker County Commissioner- Precinct 4		
Losses avoided:	Prevent loss of life and property during flood events		
Partners:	Walker County OEM		
Cost Estimate:	$2,500,000	Timeframe:	24-36 months
Potential Funding Sources:	USDA NRCS Emergency Watershed Protection Agency, TWBD Clean Water State Revolving Fund, Texas Water Development Fund, PDM, HMGP, 406 Public Assistance Program USDA NRCS	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Walker County	Action:	31
Hazard(s) Addressed:	Wildfires		
Project Title:	Property Protection		
Project Description:	Create defensible space per Walker County Wildfire Protection Plan around subdivisions in Walker County		
Responsible Entity:	Walker County OEM		
Losses avoided:	Prevent loss of life and property due to wildfires		
Partners:	Walker County Commissioners		
Cost Estimate:	$2,000,000	Timeframe:	36-60 months
Potential Funding Sources:	PDM Program, HMGP	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	32
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Severe Thunderstorms & Lightning		
Project Title:	Roy Webb Bridge Replacement		
Project Description:	Replace the Roy Webb bridge to increase pedestrian and vehicular safety.		
Responsible Entity:	Walker County Commissioner- Pct 3, Road and Bridge Department		
Losses avoided:	Prevent the loss of life and disruption of traffic flow		
Partners:	N/A		
Cost Estimate:	$1,250,000	Timeframe:	18 months
Potential Funding Sources:	HMGP, BRIC, DR4781, DR4798	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	33
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Severe Winter Weather Emerging Infectious Diseases Windstorms Severe Thunderstorms & Lightning Hailstorms		
Project Title:	Emergency Animal Shelter Construction		
Project Description:	Construct an emergency animal shelter (60’ x 150’ metal building with separate rooms and restrooms) that will house large and small pets and livestock during disasters.		
Responsible Entity:	Walker County Commissioner- Pct 4		
Losses avoided:	Prevent the loss of animal life and reduce livestock economic losses from disasters		
Partners:	New Waverly 4H		
Cost Estimate:	$250,000	Timeframe:	24 months
Potential Funding Sources:	HMGP, BRIC, DR4781, DR4798	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Walker County	Action:	34
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Severe Thunderstorms & Lightning		
Project Title:	Plum Creek Crossing- Stewart Road		
Project Description:	13 8’x4’ concrete boxes with 600’ low water crossing		
Responsible Entity:	Walker County Commissioner- Pct 4		
Losses avoided:	Prevent loss of life and disruption of traffic flow from continual road and culvert repairs that can lead to citizens trapped with no ingress/egress		
Partners:	N/A		
Cost Estimate:	$1,500,000	Timeframe:	24 months
Potential Funding Sources:	DR4781, DR4798	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started

Is this action related to a critical facility or lifeline?	No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?	No

City of Huntsville

Table 7.3: 2018HMP Action Items- City of Huntsville

1		X	Not started
2		X	Not started
3		X	Not started
4	X		Replacing with a new Action Item for 2024, #29
5		X	Not started
6		X	Not started
7		X	Not started
8		X	Not started
9		X	Not started
10		X	Not started
11		X	Not started
12		X	Not started
13		X	Not started
14		X	Not started
15		X	Not started
16		X	Not started
17		X	Not started
18	X		Near completion or completed
19		X	Not started
20		X	Not started
21		X	Not started
22		X	Not started
23		X	Not started
24	X		Replacing with a new Action Item for 2024, #29
25		X	Not started
26		X	Not started
27	X		No longer feasible
28		X	Not started

Jurisdiction:	City of Huntsville	**Action:**	14
Hazard(s) Addressed:	Flooding		
Project Title:	Construction of Channel Improvements for Tributary A		
Project Description:	Channel improvements made to Tributary A in order to correct drainage issues that result in flooding along 11th Street.		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Prevent the loss of life and property during natural disasters		
Partners:	None		
Cost Estimate:	$7,000,000-$10,000,000	Timeframe:	24 months
Potential Funding Sources:	FEMA Hazard Mitigation Assistance Grants, City Funds, Bonds	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	15
Hazard(s) Addressed:	Flooding		
Project Title:	Construction of McDonald Creek Flood Mitigation (action 2006-14, modified).		
Project Description:	Construction of enhancements to existing McDonald Drainage system to alleviate areas flooding		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Prevent the loss of life during natural disasters		
Partners:	None		
Cost Estimate:	$2,000,000	Timeframe:	24 months
Potential Funding Sources:	FEMA Hazard Mitigation Assistance Grants, City Funds, Bonds	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	26
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Emerging Infectious Diseases Windstorms Severe Thunderstorms & Lightning Erosion Dam & Levee Failure Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Purchase of Mobile Command Center (action 2011-11, modified)		
Project Description:	large-scale		
Responsible Entity:	City of Huntsville Office of Emergency Management		
Losses avoided:	This activity would provide incident commanders with a location for handling the response and recovery of large scale incidents within the City for all hazards.		
Partners:	None		
Cost Estimate:	$2,000,000	Timeframe:	36 months
Potential Funding Sources:	FEMA Operations Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	25
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Tornado Drought & Expansive Soils Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Erosion Hailstorms		
Project Title:	Installation of Hardened Communications Tower (action 2006-13, modified)		
Project Description:	Install hardened communications tower and necessary hardware and software for fire stations 1 and 4 to maintain continuity of critical services. This infrastructure project will be accomplished with the intent of ensuring resiliency against natural hazards that are associated with structural damage caused by high winds, lightning, hail, etc. Expansive soils can also be mitigated through the use of higher standards in soil compaction.		
Responsible Entity:	City of Huntsville Public Works		
Losses avoided:	Ensure continuous communications and prevent loss of life during hazard events.		
Partners:	None		
Cost Estimate:	$300,000/installation	Timeframe:	36 months
Potential Funding Sources:	HMGP, BRIC, FEMA-Emergency Operations Center, PDM program, City Funds, Other grant programs supporting fire departments	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	13
Hazard(s) Addressed:	Flooding Drought & Expansive Soils Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Phase 2 of City Drainage Master Plan		
Project Description:	This effort will enhance the phase 1 plan document through further analysis and more comprehensive analysis. This effort can also explore the effective use of surface water, once collected.		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:			
Partners:	None		
Cost Estimate:	$100,000	Timeframe:	18 months
Potential Funding Sources:	City Funds, Private Grant Sources	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	3
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado severe Winter Weather Windstorms Severe Thunderstorms & Lightning Hailstorms		
Project Title:	Phase 2 of Wildland vegetation reduction project to protect homes		
Project Description:	Second phase of wildland vegetation reduction in various high hazard areas within the City where undeveloped areas are intermingled with developed lots. This project will not only reduce hazardous fuel that is susceptible to ignition from lightning or that can lead to wildland fire, but also reduce the amount of debris resulting from hazards associated with high winds.		
Responsible Entity:	City of Huntsville		
Losses avoided:	Loss of life and property due to wildfire or flying debris generated by hazards.		
Partners:	None		
Cost Estimate:	$50,000	Timeframe:	9 months/ clearing
Potential Funding Sources:		Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	30
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Erosion Dam & Levee Failure Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Establish drone program		
Project Description:	Provide a drone equipped with thermal imaging capabilities to assist in wildfires, large structure fires, water rescue, search and rescue, surveying damage from hazards, and training.		
Responsible Entity:	City of Huntsville Office of Emergency Management		
Losses avoided:			
Partners:	None		
Cost Estimate:	$20,000	Timeframe:	6-12 months
Potential Funding Sources:		Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	29
Hazard(s) Addressed:	Hurricanes, Tropical Storms, & Depressions Tornado Windstorms Severe Thunderstorms & Lightning		
Project Title:	Lightening detection and alerting		
Project Description:	Provide lightning detection at Kate Barr Ross, MLK Park, Aquatic center		
Responsible Entity:	City of Huntsville Office of Emergency Management		
Losses avoided:	Loss of life from events that generate lightning.		
Partners:	None		
Cost Estimate:	$6,000	Timeframe:	12 months
Potential Funding Sources:		Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

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<tr><td>Jurisdiction:</td><td colspan="2">City of Huntsville</td><td>Action:</td><td>1</td></tr>
<tr><td>Hazard(s) Addressed:</td><td colspan="4">Flooding
Hurricanes, Tropical Storms, & Depressions
Wildfires
Tornado
Drought & Expansive Soils
Extreme Heat
Severe Winter Weather
Windstorms
Severe Thunderstorms & Lightning
Erosion
Dam & Levee Failure
Hailstorms
Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)</td></tr>
<tr><td>Project Title:</td><td colspan="4">Creation and implementation of the Mitigation Public Awareness Program</td></tr>
<tr><td>Project Description:</td><td colspan="4">Increase public education on mitigation techniques for all hazards. Distribute information regarding flood hazards, SFHA’s, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school-age children or “how to” classes in retrofitting by local merchants. Integrate “Disaster Resistance Education” into the public school curriculum. Provide public education on the importance of maintaining the ditches.</td></tr>
<tr><td>Responsible Entity:</td><td colspan="4">City of Huntsville Office of Emergency Management</td></tr>
<tr><td>Losses avoided:</td><td colspan="4"></td></tr>
<tr><td>Partners:</td><td colspan="4">None</td></tr>
<tr><td>Cost Estimate:</td><td>$15,000</td><td>Timeframe:</td><td colspan="2">9 months</td></tr>
<tr><td>Potential Funding Sources:</td><td>Local budget, staff time, in-kind services</td><td>Benefit-Cost Analysis:</td><td colspan="2">N/A</td></tr>
<tr><td>Priority Rating</td><td>1 = High Level Priority Rating</td><td>Status:</td><td colspan="2">Not started</td></tr>
<tr><td colspan="3">Is this action related to a critical facility or lifeline?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Does this action reduce the effects of hazards on existing buildings?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?</td><td colspan="2">No</td></tr>
</table>

Jurisdiction:	City of Huntsville	**Action:**	20
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Erosion Dam & Levee Failure Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Adoption of Higher Standards for New Publicly-Owned Structures		
Project Description:	Update existing development standards to require that new publicly-owned structures are structurally reinforced against natural hazards (when cost-effective) to include, low-flow water units for drought, energy efficient windows and doors for extreme heat, reinforced roofs for withstanding the forces of wind related to windstorms, tornadoes and hurricanes/tropical storms, ice, snow and hail, increased freeboard to build above the base flood elevation to mitigate flooding and flooding that could result from dam failure, lightning grounding systems, increased soil compaction for expansive soils and vegetation control and perimeter clearance for wildfires.		
Responsible Entity:	City of Huntsville City Council		
Losses avoided:			
Partners:	None		
Cost Estimate:		Timeframe:	12 months
Potential Funding Sources:	Local budget, staff time, in-kind services	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	City of Huntsville	**Action:**	10
Hazard(s) Addressed:	Flooding		
Project Title:	Construction of Drainage Solution for Kate Barr Ross Park		
Project Description:	Drainage project for Kate Barr Ross Park, which is designated as a staging area for National Guard and Utility companies during large-scale hazard events. The current drainage system is insufficient and results in flooding within the park.		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Potential loss of life and property due to flooding		
Partners:	None		
Cost Estimate:	$500,000-$1,000,000	Timeframe:	24-36 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	City of Huntsville	**Action:**	7
Hazard(s) Addressed:	Flooding		
Project Title:	Construction of Flood Mitigation Solutions for Elkins Lake		
Project Description:	Construction of drainage/channelization/ storage solutions that will alleviate flooding within the Elkins Lake community.		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Potential loss of life and property due to flooding		
Partners:	None		
Cost Estimate:	$50,000-$500,000 per action	Timeframe:	24 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	5
Hazard(s) Addressed:	Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Hailstorms Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Installation of generator and quick hook-up		
Project Description:	Installation of generators and hardware for connectivity for generators at Huntsville Memorial Hospital, wastewater lift stations, the City Service Center (to support water distribution alert system- SCADA) and City Hall during hazard events that can potentially cause power outages.		
Responsible Entity:	City of Huntsville Public Works		
Losses avoided:	Avoiding service disruptions, flooding, water contamination, and loss of city services during hazard events.		
Partners:	None		
Cost Estimate:	$300,000 each	Timeframe:	24 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville	**Action:**	2
Hazard(s) Addressed:	Wildfires Tornado Drought & Expansive Soils Extreme Heat Windstorms Severe Thunderstorms & Lightning		
Project Title:	Installation of Additional Fire Hydrants (action 2006-10, modified)		
Project Description:	Install fire hydrants needed for firefighting that are related to drought, lightning strike ignition and wildfires in various areas around the city.		
Responsible Entity:	City of Huntsville Public Works		
Losses avoided:	Potential loss of life		
Partners:	None		
Cost Estimate:	$3,000/hydrant	Timeframe:	24 months
Potential Funding Sources:	City funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	City of Huntsville		**Action:**	8
Hazard(s) Addressed:	Flooding			
Project Title:	Construction of Flood Mitigation Solutions for Forest Hill			
Project Description:	Construction of underground drainage structure storage solutions that will alleviate flooding along Eastham Drive within the Forest Hill Subdivision.			
Responsible Entity:	City of Huntsville Engineering			
Losses avoided:	Loss of property due to flood events			
Partners:	None			
Cost Estimate:	$1,500,000-$2,000,000	Timeframe:	24 months	
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:		
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started	
Is this action related to a critical facility or lifeline?			No	
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No	

Jurisdiction	City of Huntsville		**Action:**	9
Hazard(s) Addressed:	Flooding			
Project Title:	Construction of Flood Mitigation Solutions for River Oaks Drive			
Project Description:	Flood mitigation improvements along River Oaks Drive at Lake Crossing to alleviate inundation of homes and streets critical to ingress and egress			
Responsible Entity:	City of Huntsville Engineering			
Losses avoided:	Loss of property due to flood events			
Partners:	None			
Cost Estimate:	$1,000,000-$1,500,000	Timeframe:	24 months	
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:		
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started	
Is this action related to a critical facility or lifeline?			No	
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No	

Jurisdiction	City of Huntsville	**Action:**	11
Hazard(s) Addressed:	Flooding		
Project Title:	Construction of Flood Mitigation Solutions for Dawson Dam (action 2011-16, modified)		
Project Description:	Mitigation activities to mitigate overflow along spillways and embankments at the Dawson Dam.		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Loss of property due to flood events		
Partners:	None		
Cost Estimate:	$1,000,000	Timeframe:	24-36 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds, TWDB State Revolving Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	12
Hazard(s) Addressed:	Flooding Drought & Expansive Soils Erosion		
Project Title:	Construction of Erosion Control for Eastham Thomas Park		
Project Description:	Construction project to mitigate major erosion along the confluence of 2 creeks within Eastham Thomas Park between 7th and 10th streets		
Responsible Entity:	City of Huntsville Engineering		
Losses avoided:	Loss of property due to flood and erosion events		
Partners:	None		
Cost Estimate:	$1,000,000	Timeframe:	24-36 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds, TWDB State Revolving Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	6
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Installation of Debris Removal Grinder		
Project Description:	Installation of a debris removal grinder in support of mitigation activities. The equipment will reduce the impact of fallen branches on infrastructure during various hazard events. It will process debris from floodways in order to eliminate encroachments. Vegetative fuels will be cleared to reduce ignition from lightning and resulting wildfires.		
Responsible Entity:	City of Huntsville Public Works		
Losses avoided:	Providing an alternative for debris from debris generating events to avoid using the solid waste landfill, and clearing out floodways, fuel areas within the WUI, and debris sites quickly		
Partners:	None		
Cost Estimate:	$500,000	Timeframe:	24 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	31
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning Other Hazards (Cyber Threats, HazMat, Invasive Species, Water Quality/ Quantity)		
Project Title:	Communication on Wheels		
Project Description:	Provide communication capabilities to first responders and the public during cell tower outages or during large events that may overwhelm the current communication systems.		
Responsible Entity:	City of Huntsville Office of Emergency Management		
Losses avoided:	Potential loss of life and loss of communications during hazard events		
Partners:	None		
Cost Estimate:	$30,000	Timeframe:	12 months
Potential Funding Sources:	HMGP, BRIC	Benefit-Cost Analysis:	
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	17
Hazard(s) Addressed:	Flooding		
Project Title:	Creation and Implementation of Turn Around, Don’t Drown		
Project Description:	Incorporate Turn Around, Don’t Drown into Safe Sidewalks public outreach program.		
Responsible Entity:	City of Huntsville Neighborhood Services		
Losses avoided:	Potential loss of life		
Partners:	None		
Cost Estimate:		Timeframe:	6 months
Potential Funding Sources:	City funds, in-kind services	Benefit-Cost Analysis:	
Priority Rating	1 = High Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	21
Hazard(s) Addressed:	Flooding Hurricanes, Tropical Storms, & Depressions Wildfires Tornado Drought & Expansive Soils Extreme Heat Severe Winter Weather Windstorms Severe Thunderstorms & Lightning		
Project Title:	Enhancement of Subdivision Building Standards		
Project Description:	Modify building standards to regulate subdivision design to ensure adequate ingress/egress, road widths, road grade, lot size and street sign placement and materials to ensure ease of evacuation and firefighting. Also add factors to ensure that construction materials and utility placement reduces risk to fire.		
Responsible Entity:	City of Huntsville City Council		
Losses avoided:			
Partners:	None		
Cost Estimate:		Timeframe:	12 months
Potential Funding Sources:	City funds, in-kind services	Benefit-Cost Analysis:	N/A
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	23
Hazard(s) Addressed:	Hurricanes, Tropical Storms, & Depressions Tornado Windstorms Severe Thunderstorms & Lightning		
Project Title:	Retrofitting for Service Center for Safe Room (action 2011-7, modified)		
Project Description:	Retrofitting of a room within the newly constructed City Service Center to serve as a safe room to protect employees and center visitors from natural hazard events.		
Responsible Entity:	City of Huntsville Public Works		
Losses avoided:	Loss of life		
Partners:	None		
Cost Estimate:	$1,500,000	Timeframe:	36 months
Potential Funding Sources:	HMGP, BRIC, Other FEMA Hazard Mitigation Assistance Grants, City Funds	Benefit-Cost Analysis:	
Priority Rating	3 = Low Level Priority Rating	Status:	Not started
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?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	16
Hazard(s) Addressed:	Flooding		
Project Title:	Acquisition of Repetitive Loss Properties (action 2011-18, modified)		
Project Description:	Acquisition of 2 repetitive loss properties within the City of Huntsville.		
Responsible Entity:	City of Huntsville City Council		
Losses avoided:			
Partners:	None		
Cost Estimate:	$300,000	Timeframe:	36 months
Potential Funding Sources:	FEMA Hazard Mitigation Assistance Grants, City Funds, Bonds	Benefit-Cost Analysis:	
Priority Rating	3 = Low Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction	City of Huntsville	**Action:**	28
Hazard(s) Addressed:	Wildfires		
Project Title:	Funding of a Fuel Reduction Specialist/PIO (action 2011-12, modified)		
Project Description:	While not a qualifying mitigation action, the activity will assist with preparing for wildfire response and recovery. This action will be pursued with FEMA firefighting grant sources.		
Responsible Entity:	City of Huntsville Office of Emergency Management		
Losses avoided:			
Partners:	None		
Cost Estimate:	$125,000	Timeframe:	18 months
Potential Funding Sources:	City Funds, FEMA Fire and Operations Grants	Benefit-Cost Analysis:	
Priority Rating	3 = Low Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	19
Hazard(s) Addressed:	Flooding Drought & Expansive Soils		
Project Title:	Adoption of Sidewalk Standards that Mitigate for Expansive Soils		
Project Description:	Adopt sidewalk construction standards (within Huntsville Design Standards) to ensure that new sidewalk development utilizes methods that mitigate expansive soils and take into account the SFHA. Sidewalks should be constructed so that pedestrians are not exposed to dangerous flood areas and also ensure that they are not exacerbating existing flood issues.		
Responsible Entity:	City of Huntsville City Council, City of Huntsville Engineering		
Losses avoided:			
Partners:	None		
Cost Estimate:		Timeframe:	12 months
Potential Funding Sources:	City funds, in-kind services	Benefit-Cost Analysis:	
Priority Rating	3 = Low Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction	City of Huntsville	**Action:**	22
Hazard(s) Addressed:	Flooding Wildfires		
Project Title:	Adoption of Mitigation Techniques for Hike/Bike Trail System		
Project Description:	Adoption of mitigation risk assessment data to support selection of hike/bike trail locations in order to multi-purpose clearings as fire breaks and flood easements		
Responsible Entity:	City of Huntsville Parks Department		
Losses avoided:	Loss or life and property		
Partners:	None		
Cost Estimate:		Timeframe:	3 months
Potential Funding Sources:	HMGP, BRIC, City funds, In-kind Services	Benefit-Cost Analysis:	
Priority Rating	3 = Low Level Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

City of New Waverly

Table 7.3: 2018 HMP Action Items- City of New Waverly

Action Item #	Removed from HMP	Keep in HMP	What is the status of the Action Item? If the Action Item is being removed, note why.
2		X	
8	X		Replaced by Action Item 3
12		X	
23		X	Moved to all participating jurisdictions
30	X		Completed
32		X	

Jurisdiction:	City of New Waverly	**Action:**	12
Hazard(s) Addressed:	Flooding		
Project Title:	Public Information, Awareness, and Prevention		
Project Description:	Rewrite, improve, and implement new local floodplain regulations. Project to include a public information campaign on regulatory awareness.		
Responsible Entity:	City of New Waverly		
Losses avoided:	Prevent loss of life and property through education.		
Partners:	City of Riverside, Walker County OEM		
Cost Estimate:	$10,000	Timeframe:	36-48 Months
Potential Funding Sources:	PDM, HMGP, FMA, Local funds	Benefit-Cost Analysis:	N/A
Priority Rating	2 = Meedium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	City of New Waverly	**Action:**	32
Hazard(s) Addressed:	Flooding		
Project Title:	Public Information and Awareness		
Project Description:	Become a CRS community.		
Responsible Entity:	City of New Waverly		
Losses avoided:	Become a more resilient community through the CRS program, and mitigate the effects of flooding.		
Partners:	Walker County OEM, Walker County Planning & Development		
Cost Estimate:	$5,000	Timeframe:	12 months
Potential Funding Sources:	Local budge	Benefit-Cost Analysis:	N/A
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	City of New Waverly	Action:	2
Hazard(s) Addressed:	Flooding		
Project Title:	Property Protection, Structural Project		
Project Description:	Generate base flood elevation data for flood map revisions, use a floodplain study to identify future mitigation activities to improve water ways and flood carrying capacities for watersheds affecting the City's municipal areas, to include approximately 4 miles of floodway in New Waverly.		
Responsible Entity:	City of New Waverly		
Losses avoided:	Prevent future loss of life and property		
Partners:	Walker County Planning & Development, Walker County OEM		
Cost Estimate:	$2,500,000	Timeframe:	24-36 months
Potential Funding Sources:	PDM Program, HMGP, FMA	Benefit-Cost Analysis:	More than a 1:4 BCR
Priority Rating	1 = Highest Priority Rating	Status:	Not started
Is this action related to a critical facility or lifeline?			No
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

City of Riverside

Table 7.4: 2018 HMP Action Items- City of Riverside

Action Item #	Removed from HMP	Keep in HMP	What is the status of the Action Item? If the Action Item is being removed, note why.
12		X	
29	X		Completed
32		X	

Jurisdiction:	City of Riverside	**Action:**	12
Hazard(s) Addressed:	Flooding		
Project Title:	Public Information, Awareness, and Prevention		
Project Description:	Rewrite, improve, and implement new local floodplain regulations. Project to include a public information campaign on regulatory awareness.		
Responsible Entity:	City of New Waverly		
Losses avoided:	Prevent loss of life and property through education.		
Partners:	City of New Waverly, Walker County OEM		
Cost Estimate:	$10,000	Timeframe:	36-48 Months
Potential Funding Sources:	PDM, HMGP, FMA, Local funds	Benefit-Cost Analysis:	N/A
Priority Rating	2 = Medium Level Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	City of Riverside	**Action:**	32
Hazard(s) Addressed:	Flooding		
Project Title:	Public Information and Awareness		
Project Description:	Become a CRS community.		
Responsible Entity:	City of New Waverly		
Losses avoided:	Become a more resilient community through the CRS program, and mitigate the effects of flooding.		
Partners:	Walker County OEM, Walker County Planning & Development		
Cost Estimate:	$5,000	Timeframe:	12 months
Potential Funding Sources:	Local budget	Benefit-Cost Analysis:	N/A
Priority Rating	3 = Lowest Priority Rating	Status:	Not started
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 mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Section 8: Plan Maintenance

This section provides an overview of plan maintenance procedures which includes information on monitoring, evaluating, and updating the plan, and a description of how this plan will be incorporated into existing programs.

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 plan. To accomplish this, a Plan Maintenance Team (PMT) has been determined and is comprised of representatives from each of the County's participating jurisdictions.

Plan Maintenance Team	
Plan Maintenance Team Leader	Walker County Emergency Management Coordinator
Jurisdiction	**Responsible Entity**
Unincorporated Walker County	Walker County OEM and County Judge
City of Huntsville	Mayor or designee
City of New Waverly	Mayor or designee
City of Riverside	Mayor or designee

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 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 advertise all annual meetings in local newspapers, post invitations on the County's social media pages, and post 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, and 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 and public participants.

Procedures & Schedule

Procedures to monitor and evaluate the HMP were determined during the November 11th meeting. This ensures that the goals, objectives, and mitigation strategy are regularly examined for feasibility and that the HMP remains a relevant and adaptive tool. The PMT will meet as needed and hold its first meeting within one year after the plan's approval date. An additional mid-year meeting will be held 24 months prior to the plan's expiration to develop a timeline and strategy to update the HMP.

Table 8.1: 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	Plan Maintenance Team Leader

Method and Procedures	Schedule	Responsible Entity
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.	As needed	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.	As needed	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.	As needed	PMT member for each participating jurisdiction
Each participating jurisdiction will evaluate their progress implementing the mitigation strategy. 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 will seek comment from the public after each participating jurisdiction's presentation.	As needed	PMT, the responsible department identified in the mitigation action up for discussion, and the public.
The PMT will develop a timeline and strategy to update the plan 24 months before it expires. The update strategy will include: 1) Establish 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.	Every 5 years, To begin 24 months before expiration	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 Plan Maintenance team, each participating jurisdiction will follow the pre-determined actions:

Table 8.2: Hazard Mitigation Plan Adoption and Integration Procedures

Walker County	HMP will be presented to the Commissioner's Court by the Walker County Emergency Management Office. An agenda for the meeting will be posted 14 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 detailed in Table 8.3.
City of Huntsville EMC, City of New Waverly, and City of Riverside	The HMP will be presented to the mayor and alderpersons by the Walker County Office of Emergency Management. Upon review and approval by the mayor, approved actions, amendments, and revisions will be acted upon and/or integrated into existing planning mechanisms detailed in Table 8.3.

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.

- Propose a policy, strategy, or regulatory amendment to the proper governing body.
- 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.
- Provide the public, elected officials, and governing bodies the opportunity to discuss and comment upon proposed change(s).
- 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. Since the last plan approval the County, the City of New Waverly, and the City of Riverside have not integrated the 2018 HMP into current planning mechanisms. Many planning documents, like those seen in the table below, have not been updated in the timeframe since the last update. Hazard mitigation action items are considered when the annual budget is reviewed, but very few action items were completed from the 2018 HMP to this update. The City of Huntsville considers their 2018 HMP Update when one of the integration methods below is being updated. The City of Huntsville Comprehensive Plan was updated in 2021 and references the 2018 Hazard Mitigation Plan Update, including outlining risks and hazards of concern. The Emergency Management Department works closely with other departments to develop maps and collect data. The city is also in the process of updating their Development Code and Parks Master Plan for 2024. Other Plan Updates where the HMP has been integrated include the 2024 Strategic Plan which emphasizes public safety and resident education of hazards, and the 2023 Huntsville Master Drainage Study which incorporates action items from the 2018 HMP. 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 8.3: Integration of HMP and Planning Mechanisms

Planning Mechanism	Integration Method
Walker County	
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 updates to the disaster recovery plans are made.
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 Regulations	New Waverly and Riverside 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 strategies 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	Walker County and each participating jurisdiction will review their annual budget in July for opportunities to fund their highest priority mitigation actions.
Mutual Aid Agreements	Walker County and each participating jurisdiction was satisfied with their mutual aid agreements when the HMP was drafted. If any mutual aid agreements change and negatively impact a participating jurisdiction(s), Walker County and each participating jurisdiction will amend the HMP to include the new vulnerability and include a mitigation action to address it.
Floodplain Regulations	Walker 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 in the mitigation action strategy for flooding in Section 7 of this plan.
Transportation Plan	When the plan is updated or revised, the PMT will propose the adoption of codes that support mitigation strategy and mitigation activities.
Participating Jurisdictions	
City of Huntsville Emergency Management Program	Add processes to existing emergency management procedures to drive hazard-affected areas with local building officials to gather damage estimates (to structures). This activity will support future risk assessment activities. This integration can be achieved through the Emergency Management Coordinator changing existing procedures to include data collection during windshield damage assessments. With Fire Chief approval, the department can seek coordination with the Information Technology department in order to record the data with GIS.
City of Huntsville Drainage Master Plan	Include member of HMC in Drainage Master Plan committee whenever updates arise. Include HMP Action Items from Section 7- Mitigation Strategy when conducting data collection for the plan creation. Consider the addition of Hazard Mitigation Action Items that are related to drainage for incorporation into the plan. Once completed and approved, City Council will adopt the plan.
City of Huntsville Comprehensive Plan	Include a member of HMC in Comprehensive Plan Update committee whenever updates arise. This member will ensure that HMP goals and action items are considered for inclusion within the comprehensive plan update process. When planning and zoning is reviewed, the HMC member will be a source of reference for ensuring that the update committee is aware of hazard areas within the city that should be considered and/or avoided for certain types of development.
City of Huntsville Park Master Plan	Include a member of HMC in the Parks Master Plan Committee whenever updates arise.
City of Huntsville Strategic Plan	Include a member of HMC in Drainage Master Plan committee whenever updates arrive. Include HMP Action Items from Section 7- Mitigation Strategy when conducting data collection for the plan creation or updates. Consider addition of HMP Action Items that are related to drainage for incorporation into the plan. Once completed and approved, City Council will adopt the plan.
City of Huntsville Development Code	Include member of HMC in Development Code Committee whenever updates arise.
City of New Waverly Subdivision Ordinance	When the plan is updated or revised, include a member of HMC in the committee to support mitigation strategy and mitigation activities.
City of Riverside Subdivision Ordinance	When the plan is updated or revised, include a member of HMC in the committee to support mitigation strategy and mitigation activities.

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