POLK COUNTY
MULTI-JURISDICTION
HAZARD MITIGATION PLAN

VERSION 3.2

Polk County Texas & Cities of Livingston, Corrigan, Goodrich, Onalaska, & Seven Oaks

Developed in accordance with PUBLIC LAW 106–390—OCT. 30, 2000 (Disaster Mitigation Act of 2000), et al. by the Polk County Hazard Mitigation Team with assistance from MPTX Associates.

ACKNOWLEDGEMENTS

Preparation of this multi-jurisdiction hazard mitigation action plan involved collaboration among public, private and non-profit organizations including: Polk County and the Cities of Livingston, Corrigan, Goodrich, Onalaska, and Seven Oaks, Deep East Texas Council of Governments, Trinity River Authority, Texas Forest Service, representatives of private industry, the Texas Division of Emergency Management, among numerous others.

The work of the Polk County Hazard Mitigation Taskforce (HMT) has made this project possible, led by the Polk County Office of Emergency Management. Numerous elected officials and city, county, regional and state personnel participated in the planning process and contributed greatly to this plan's development. Sincere thanks goes out to all HMT participants and their staff for their work, information sharing, and ideas. A complete listing of the Hazard Mitigation Taskforce is provided in Section 2.1.

The Polk County Judge's Office, Commissioner's Court, and participating community administration and staff deserve special recognition for their exceptional contributions to this project.

Specific thanks goes out to Polk County Office of Emergency Management (Polk County OEM). Polk County EMC Courtney Comstock is recognized for her excellent work throughout this project and on previous version of this Hazard Mitigation Plan, Larry Pitts for his exceptional guidance and leadership on this project, and Linda Hicks for her assistance, mapping and data contributions to this plan and previous version.

Finally, thanks to the staff of MPTX Associates for their work to facilitate the planning process, collect and compile data, and prepare this document.

Polk County OEM

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CHAPTER 1. INTRODUCTION

1.1 EXECUTIVE SUMMARY

Texans are at risk of experiencing a variety of natural hazards that can cause damage to property and infrastructure, or even loss of life. Although we cannot prevent destructive forces of nature, we must find ways to protect life and property through various measures of preparedness, response, and recovery. Hazard mitigation is a method used to prepare for natural hazards. Hazard mitigation is defined by the Federal Emergency Management Agency (FEMA) as any sustained action taken to reduce long-term risk to human life and property from natural hazards.

The purpose of this plan is to expose the vulnerability and potential risks within Polk County in order to reduce the effects of natural hazards on life and property. The Polk County Hazard Mitigation Taskforce (HMT) and the public will work together to develop both short-term and long-term mitigation actions that will reduce vulnerability to hazards, reduce exposure to hazards, or reduce the effects of hazards. These actions will reduce the adverse impact and costs of future disasters.

Polk County public officials and first responders want to ensure that residents, visitors, and businesses in Polk County, Texas are safe from natural hazards by reducing their risk of exposure through hazard mitigation and public outreach and education. Throughout the development of this mitigation plan, we will identify and assess risks and develop projects that will reduce loss from natural disasters. The following data points will be analyzed and addressed in this Plan:

Hazard Mitigation is any sustained action taken to reduce or eliminate the long-term risk and effects that can result from a specific hazard.

Hazard Mitigation Planning is the act or process of making or carrying out plans; specifically the establishment of goals, policies and procedures for a social or economic unit.

- Hazards which could occur
- Frequency of occurrence
- Impact and severity of hazards
- Vulnerability to each hazard
- Hazards with greatest risk
- Prioritized mitigation actions

This document is a FEMA sanctioned multi-jurisdiction natural hazard mitigation action plan for the unincorporated areas of Polk County and the incorporated cities of Livingston, Onalaska, Corrigan, Goodrich, and Seven Oaks. The Polk County Multi-Jurisdiction Hazard Mitigation Plan will be referred to throughout this document as the “Plan”.

1.2 AUTHORITIES

Federal Authorities

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), is the primary authority for providing federal disaster recovery and hazard mitigation financial assistance to state and local governments. The Stafford Act was last amended on October 10, 2000 by Public Law (PL) 106-390 also known as the (Disaster Mitigation Act of 2000) which incorporated the hazard mitigation-related program requirements included in 44 CFR, Parts 78, 201 and 206.

The intent of the Disaster Mitigation Act of 2000 is best summarized by the following Congressional findings and declarations:

§ 5121. CONGRESSIONAL FINDINGS AND DECLARATIONS {Sec. 101}

a) The Congress hereby finds and declares that--

1. because disasters often cause loss of life, human suffering, loss of income, and property loss and damage; and
2. because disasters often disrupt the normal functioning of governments and communities, and adversely affect individuals and families with great severity; special measures, designed to assist the efforts of the affected States in expediting the rendering of aid, assistance, and emergency services, and the reconstruction and rehabilitation of devastated areas, are necessary.

b) It is the intent of the Congress, by this Act, to provide an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from such disasters by—

1. revising and broadening the scope of existing disaster relief programs;
2. encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the States and by local governments;
3. achieving greater coordination and responsiveness of disaster preparedness and relief programs;
4. encouraging individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance;
5. encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and
6. providing Federal assistance programs for both public and private losses sustained in disasters [.]

Source: (Pub. L. 93-288, title I, § 101, May 22, 1974, 88 Stat. 143; Pub. L. 100-707, title I, § 103(a), Nov. 23, 1988, 102 Stat. 4689.)

State Authorities

The Texas Disaster Act of 1975, V.T.C.A., Government Code, Chapter 418, and the Executive Order of the Governor pertaining to Emergency Management are the primary authorizing statutes for mitigation planning at the state level. State regulatory authority for hazard mitigation planning resides with the Texas Department of Public Safety, Division of Emergency Management (TDEM), Mitigation Section based in Austin.

Local Authorities

Local authority for hazard mitigation resides with the Polk County Judge, who reserves the right to appoint a Hazard Mitigation Officer to direct and oversee activities under the purview of this Plan, in coordination with the Office of Emergency Management. The County Judge and local HMT Officer appoints by invitation HMT members, and maintains direct oversight of mitigation activities.

1.3 DOCUMENT STRUCTURE

This document is structured to match the mandated elements for hazard mitigation plans under federal and state requirements. It consists of four chapters and various appendices, each organized to satisfy requirements as described in the *Local Multi-Hazard Mitigation Planning Guidance* published by FEMA in July of 2008. Code of Federal Regulations (CFR) requirements pertaining to each respective plan section is included directly following each corresponding heading. The document is organized into chapters (1.), sections (1.1), and subsections (1.1.1). Tables and figures are numbered in order of appearance within each chapter.

Chapter 1 includes prerequisites for hazard mitigation plans and describes the purpose, authorities, process of local adoption, etc., and provides general profiles of the participating jurisdictions. Chapter 2 describes the process through which this Plan was developed, via planning team and public meetings, and the input of citizens and local officials. Chapter 3 includes the risk and vulnerability assessments for the county and participating jurisdictions, describing the hazards that occur in the southeast Texas region, and an inventory of local assets and critical facilities that represent varying degrees of vulnerability to hazard impacts. Chapter 4 describes the mitigation strategy for the participating jurisdiction's, representing this Plan's primary function moving forward. It outlines the Plan's overarching goals, intended activities, and projects that the jurisdictions intend to implement. Chapter 5 describes the approach to Plan maintenance, which includes processes for local adoption, monitoring and evaluation criteria, strategy for incorporation with other planning mechanisms, and review and update schedules.

1.4 2017 UPDATE-VERSION 3.0

This Plan is an update of the existing hazard mitigation plan for Polk County and the participating cities that was updated in 2012. The original hazard mitigation plan for Polk County was developed in 2006, making this the third version of the document. Information about the planning area and recent hazard events has been updated and incorporated into this current document.

Updated Prerequisites (Chapter 1)

Profiles for the county and cities were updated and expanded. Specifically, an updated history of disaster declarations and non-declared hazard events was included in Section 1.5.2. Also, a comprehensive recap of storm, flood, and hazard data as reported by NOAA was included in Section 1.5.3 covering 2012-2017.

Updated Planning Process (Chapter 2)

County Emergency Management Coordinator and Deputy Coordinator were vital participants in the mitigation planning process. The HMT for this update included participants in previous mitigation plan processes, as well as new members. In general, Plan update meetings involved re-evaluation of goals, risk assessment, and Plan maintenance process from the previous plan, and recommended changes were incorporated into this updated document. The Plan update process also included a progress report on the previous plan's mitigation activities (reported in Appendix C),and was guided by reviewing information from various agencies and technical documents noted in Section 3.1.2.

The Plan maintenance is discussed in Section 2.9. The process for Plan maintenance remained largely unchanged from the previous version of this Plan. However, new emphasis for incorporation of this Plan into existing and future planning mechanisms was developed, and the Office of Emergency Management has a process for maintaining a file of notes from annual review meetings. A paper form for tracking mitigation project implementation is included on page 150.

Updated Risk Assessment (Chapter 3)

Information about the planning area and recent hazard events was updated and incorporated into the current document. This updated information includes descriptions of disaster events that occurred since publication of the previous plan.

Updated Mitigation Strategy (Chapter 4)

The HMT conducted a thorough review of mitigation activities proposed in the previous version of the Plan, with findings summarized in Appendix C. (Previous Action Item Status Report). Implementation successes and barriers were noted and these findings guided the development of the updated mitigation strategy. New action items prioritized by the HMT were incorporated into the updated document and are reported in the Mitigation Strategy (Chapter 4). Mitigation activities proposed in other hazard mitigation action plans from the region were reviewed during the planning process, along with valuable input from TDEM. Lessons learned in the development of FEMA mitigation grant applications during the previous planning cycle also guided the process for updating the mitigation strategy for Polk County.

Updated Appendices

Appendices were updated to include current adoption documents, previous action item review, and valuable information from the previous version of the Plan.

1.5 PARTICIPATING JURISDICTIONS

The planning area is defined by the boundaries of the following governmental entities. Each of these independent jurisdictions participated in development of the original version of this hazard mitigation plan, participated in the process to update this Plan, and has adopted this Plan by formal resolution.

- Polk County
- City of Livingston
- City of Corrigan
- City of Goodrich
- City of Onalaska
- City of Seven Oaks

1.5.1 County Profile

Geography

Polk County is located in central eastern Texas approximately 70 miles north of the Gulf of Mexico. Uplands consist of pine forest and mixed hardwoods along drainages, riparian areas are hardwood and dense brush, and floodplains are grassland and marshy areas. Polk County is approximately 60 miles north of Houston, 30 miles south of Lufkin, and 80 miles east of College Station.

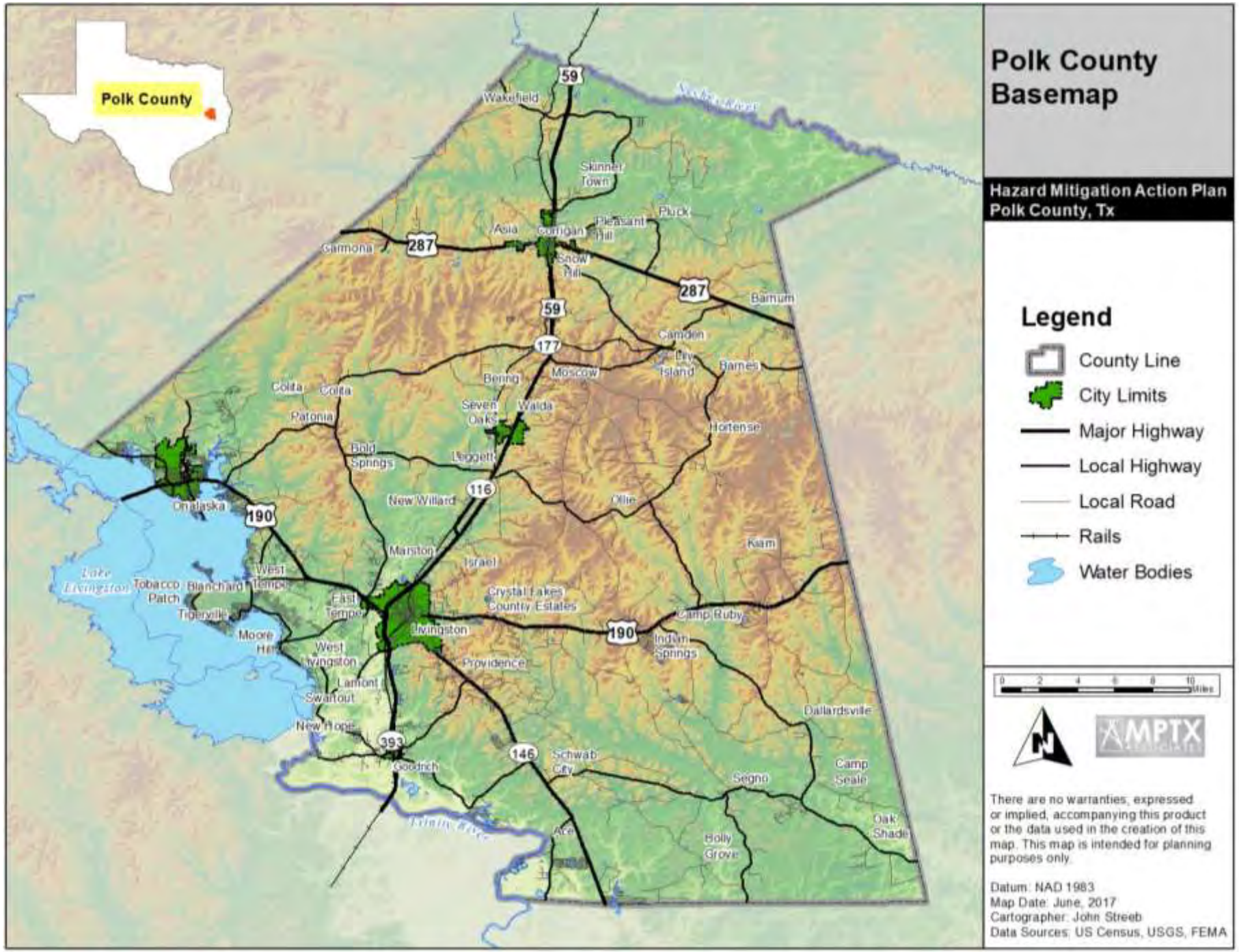
Polk County's elevation ranges from 40 feet above sea level to over 485 feet above sea level in the northeastern part of the county. The largest body of water is the Lake Livingston Reservoir which is approximately 90,000 acres. Lake Livingston is fed by the Trinity River which borders the county on the south and west and serves as the boundary line between San Jacinto, Trinity and Liberty Counties. The major waterways in the county are Long King Creek, Kickapoo Creek, Rocky Creek, Big Sandy Creek, Choates Creek and Menard Creek.

Higher elevation uplands stretch east-west across the central county, with lowlands in the northern and southern portions of the county. The Neches River forms the northern county boundary, Lake Livingston and the Trinity River form the southern portion of the western boundary.

Predominant soils are sandy to loamy surface soils and deep, reddish loam or clay subsoil. Polk County is primarily covered by pine and hardwood forests.

Average annual precipitation for the county has increased in recent decades from 48 inches per year to 51.5 inches (7.3 percent increase, based on data available through 2014). Rainfall totals from 2015 through 2017 continued this upward trend in precipitation.

The map on the following page shows the relative geography, terrain, major water bodies, transportation corridors, and city and community locations of Polk County.


Polk County
Polk County Basemap
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
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Local Road
Rails
Water Bodies
Wakefield
Skinner Town
Asia
Corrigan
Pleasant Hill
Pluck
Camden
Dry Island
Barnes
Barnum
Moscow
Benng
Colita
Patonia
Seven Oaks
Walda
Hortense
Bold Springs
Leggett
New Willard
Ollie
Onalaska
Marston
Israel
Kam
Lake Livingston
Tobacco Patch
Blanchard
Tigerville
West Tempe
East Tempe
Crystal Lakes Country Estates
Camp Ruby
Livingston
Indian Springs
Moore Hill
West Livingston
Providence
Lamont
Swartout
New Hope
Goodrich
Schwab City
Dallardsville
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Holly Grove
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Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

Population, Demographics

Polk County covers 1,057 square miles in eastern central (Deep East) Texas and is the 71st most populous county in Texas. According to the 2016 US Census estimate, there are 47,916 people living in the county, including incorporated cities. There are 23,624 housing units for an average household size of 2.02 people.

The following data is reported by the U.S. Census for Polk County as of 2016:

Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Polk County	47,916	$39,662	17.2%	79.7%	$81,500	23,624	4,316

Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Polk+County%2C+TX&search.x=0&search.y=0

According to an alternative source, the nationwide multiple listing service, the median home value in Polk County is $131,500. Polk County home values have gone up 4.0% over the past year. The median list price per square foot in Polk County is $118, which is similar to the Texas average of $120. The median price of homes currently listed in Polk County is $186,900 (February 2018).

With the influx of the vastly growing Houston Metropolitan area, Polk County is expected to grow in the future, though this growth has slowed over the last five years. The HMT considers these trends in development neutral in the short term relating to hazard vulnerability. The table below shows relative trends in population change for the unincorporated county and incorporated cities.

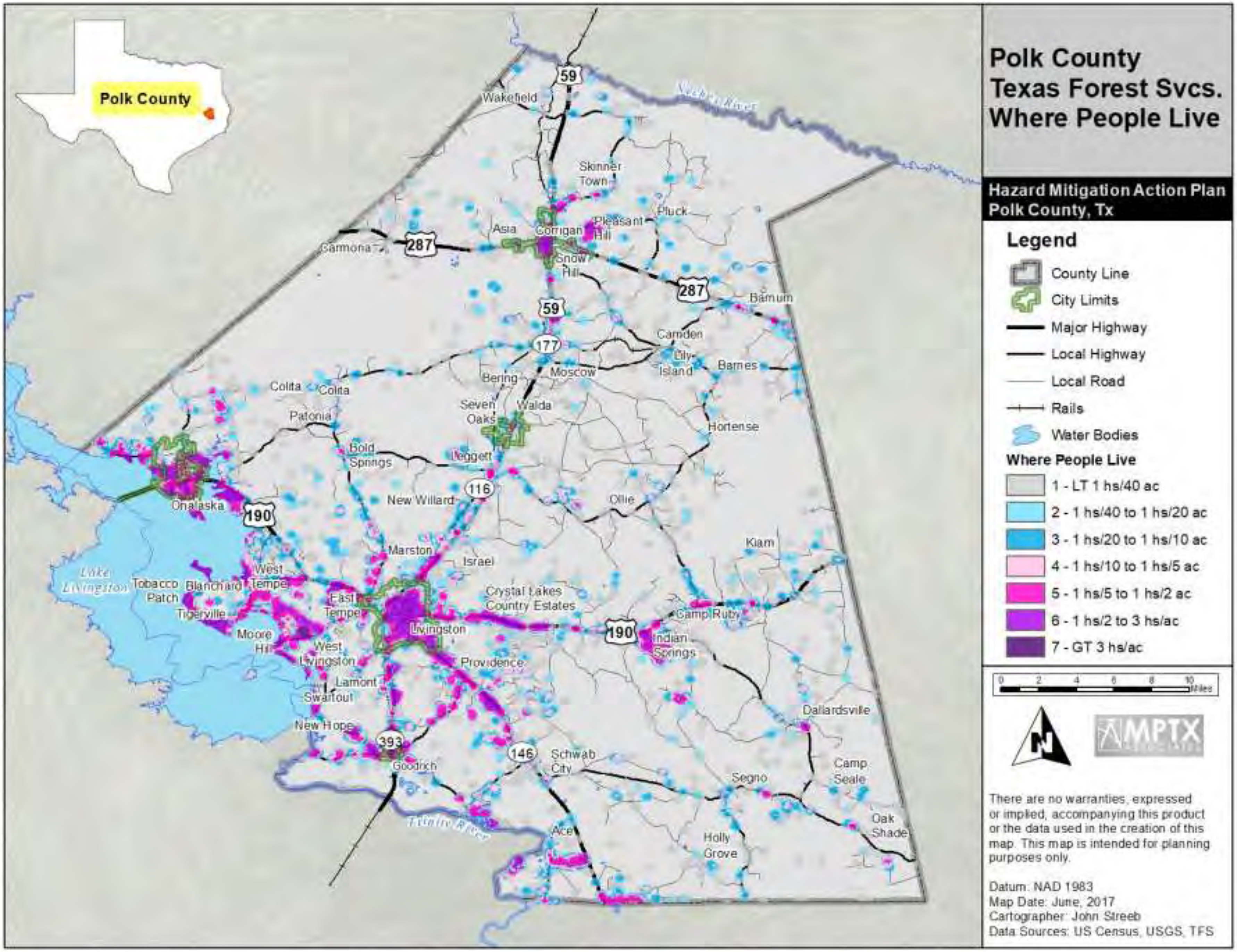
Population Change in Polk County: 2010 – 2015

Jurisdiction	2010 Census	2015 Census	Percentage of Growth (%)
Polk County	45,413	46,113	1.60
City of Livingston	5,335	5,219	-2.2
City of Corrigan	1,595	1,742	9.2
City of Onalaska	1,764	2,523	43.0
City of Goodrich	271	260	-4.1
City of Seven Oaks	111	119	7.2

Source: U.S. Census Bureau, 2010, 2015 American Community Survey (ACS)

According to the Texas Department of State Health Services, the projected overall population of Polk County including all jurisdictions in the year 2020 is 51,908 which represents a 14.3 percent increase over the 2010 Census population.

The map on the following page shows patterns of population distribution across Polk County.


Polk County
Texas Forest Svcs.
Where People Live
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Local Highway
Local Road
Rails
Water Bodies
Where People Live
1 - LT 1 hs/40 ac
2 - 1 hs/40 to 1 hs/20 ac
3 - 1 hs/20 to 1 hs/10 ac
4 - 1 hs/10 to 1 hs/5 ac
5 - 1 hs/5 to 1 hs/2 ac
6 - 1 hs/2 to 3 hs/ac
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Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, TFS
Polk County
Wakefield
Skinner Town
Asia
Corrigan
Pleasant Hill
Pluck
Carmona
Snow Hill
Barnum
Camden
Lily Island
Barnes
Bering
Moscow
Colita
Patonia
Seven Oaks
Walda
Hortense
Bold Springs
Leggett
Onalaska
New Willard
Ollie
Kiam
Marston
Israel
Lake Livingston
Tobacco Patch
Blanchard
West Tempe
East Tempe
Tigerville
Crystal Lakes Country Estates
Camp Ruby
Livingston
Indian Springs
Moore Hill
West Livingston
Providence
Lamont
Swartout
New Hope
Dallardsville
Goodrich
Schwab City
Camp Seale
Segno
Oak Shade
Ace
Holly Grove
Trinity River
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1.5.2 Disaster Declaration History

General

The President of the United States approves major disaster declaration requests, with input from FEMA. FEMA establishes requirements and criteria for evaluating a request for a major disaster declaration. Individual Assistance (IA) and Public Assistance (PA) have different evaluation criteria.

Public Assistance: (PA)

According to the State of Texas Emergency Management Executive Guide for FY 2017 (published May 1, 2017), in order to be eligible to receive PA, two requirements must be met.

1. The State of Texas must meet a damage threshold of $35,958,152.
2. Polk County must meet a damage threshold of $163,941.

Categories of Eligible Public Assistance

- Category A: Debris removal
- Category B: Emergency Protective Services
- Category C: Roads and Bridges
- Category D: Water Control Facilities
- Category E: Public Buildings and Equipment
- Category F: Utilities
- Category G: Parks, Recreational Facilities and Other Facilities

Individual Assistance (IA)

In order to be eligible to receive IA, there are several factors that are considered:

Concentration of damages, trauma, special populations, voluntary agency assistance, insurance, and number of homes affected. In Texas, the average number of uninsured or underinsured homes that must either be destroyed or suffer major damage is 801.

Polk County Residential (Major) Disaster Declarations

Among many natural disaster occurrences in the region's history, since 1973 there have been 13 federal disaster declarations that included Polk County. Four (4) of the 13 federal disaster declarations resulted from hurricanes and tropical storms. Seven (7) of the 13 declarations were related to general flooding. One (1) disaster declaration was related to severe wildfire threat, and one was related to severe thunderstorms. Table 1-2 outlines the history of federal disaster declarations for Polk County.

Table 1-1 Federal Disaster Declarations, Polk County

Declaration Number	Date	Disaster Description	Regional Damage Estimate
4332	8/28/2017	Hurricane Harvey	**$180,000,000,000
4272	6/11/2016	Severe Storms and Flooding	*$562,998
4223	5/29/2015	Severe Storms and Flooding	*$245,664
1791	9/13/2008	Hurricane Ike	**$29,000,000,000
1624	1/11/2006	Severe Wildfire Threat	$46,966,613
1606	9/24/2005	Hurricane Rita	**$12,000,000,000
1257	10/21/1998	TX-Flooding	$184,673,340
1239	8/26/1998	Tropical Storm Charley	$37,955,276
1041	10/18/1994	Severe Thunderstorms & Flooding	$233,891,675
930	12/26/1991	Severe Thunderstorms	$38,168,436
863	5/2/1990	Severe Storms, Tornados, & Flooding	$38,918,221
828	5/19/1989	Severe Storms, Tornados & Flooding	$53,836,626
398	7/11/1973	Severe Storms & Flooding	$8,861,371

Source: FEMA

Note: Regional damage estimates include impacts across multiple counties/states. **Statewide damage estimates for Hurricane Harvey, Ike, and Rita. * Preliminary Public Assistance (PA) for Polk County only.

1.5.3 Hazard Events, Polk County: 2012-2017

The following table shows hazard events recorded by the National Weather Service in Polk County since 2012.

Table 1-2 Natural Hazard Events, Polk County 2012-April 2017

Location	Date	Type	Magnitude	Injuries	Damage Total
POLK COUNTY-REGIONAL	8/28/2017	Hurricane/Flood			
ONALASKA	8/26/2017	Flash Flood			
EAST TEMPE	7/15/2017	Tornado	EF0		$40,000
CORRIGAN	4/26/2017	Hail	1.25 in.		
CORRIGAN	3/24/2017	Wind	55 kts.		$10,000
GOODRICH	5/27/2016	Flash Flood			$500,000
BLANCHARD	5/1/2016	Hail	0.88 in.		
CORRIGAN, BLANCHARD	4/30/2016	Flash Flood			
INDIAN VLG	4/27/2016	Wind	55 kts.		
LEGGETT	1/8/2016	Hail	1.75 in.		$5,000
KICKAPOO	5/27/2015	Flash Flood			
ONALASKA	5/11/2015	Wind/Hail	51 kts / 0.75 in		$3,000
SEVEN OAKS	4/27/2015	Wind	53 kts.		$7,000
LIVINGSTON	4/18/2015	Wind	52 kts.		
ALABAMA/COUSHATTA	4/16/2015	Hail	1.00 in.		
ALABAMA/COUSHATTA	10/12/2014	Wind	59 kts.		
CORRIGAN	6/22/2014	Wind	53 kts.		$6,000
LIVINGSTON	3/28/2014	Hail	1.00 in.		
POLK (ZONE)	1/28/2014	Winter Storm			
POLK (ZONE)	1/23/2014	Winter Storm			
BARNES	10/31/2013	Flash Flood			$10,000
MOSCOW	9/29/2013	Flash Flood			
CORRIGAN	6/6/2013	Hail	65 kts / 0.75 in		$8,000
LIVINGSTON, CARMONA	6/6/2013	Wind	60 kts.		$8,000
CORRIGAN	5/21/2013	Hail	1.00 in.		
LIVINGSTON DAM, CORRIGAN	3/10/2013	Wind	67 kts.		$5,000
GOODRICH	2/21/2013	Wind	60 kts.		$14,000
SODA	2/10/2013	Tornado	EF0	1	$50,000
LIVINGSTON	2/10/2013	Wind	52 kts.		$3,000
POLK (ZONE)	7/21/2012	Wind	52 kts.		
PROVIDENCE CAMP	4/4/2012	Hail	1.00 in.		$3,000

Source: NOAA Storm Events Database; https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=48%2CTEXAS

Note: Damage totals reported in table above does not include all impacts including roads, bridges, private homes, business impacts, debris removal, cost of emergency services, etc.

1.5.4 City Profiles

CITY OF CORRIGAN

The City of Corrigan covers 2.3 square miles in northern Polk County. According to the 2016 US Census estimate, Corrigan has 1,587 residents, and 814 housing units.

The following data is reported by the U.S. Census for Corrigan as of 2016:

Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Corrigan	1,587	$29,385	23.1%	71.4%	$71,200	814	62

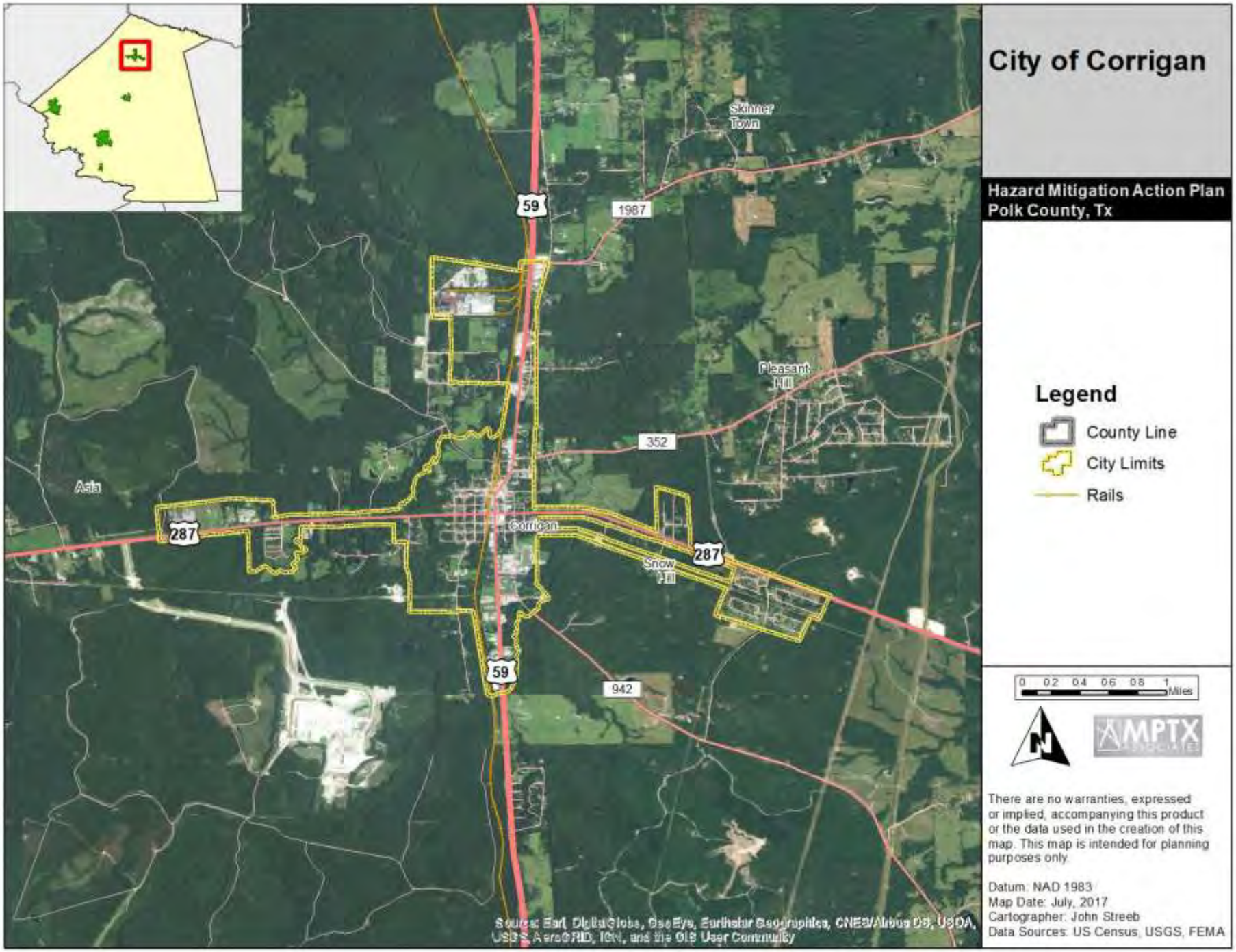
Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Corrigan%2C+TX&search.x=0&search.y=0

Corrigan was first incorporated in 1938. The town is located in the Texas forest country, 22 miles north of Livingston on U.S. Highway 59 and U.S. Highway 287 and about 100 miles north of Houston. The town boasts that it has natural resources, excellent local fishing and hunting opportunities, hiking and water sports. Corrigan's population has decreased approximately 11 percent since 2010.

Although small sawmills and farms had been established in the area, completion of the Houston East & West Texas Railway in 1881 brought with it real community settlement. The town incorporated in 1938 and was named after Pat Corrigan, conductor of the first train to pass through the area upon completion of the line. The Trinity and Sabine Railway came though the next year in 1882. These rail connections attracted new businesses and residents, and by the end of 1882 there were seventeen sawmills in the area. But Corrigan also developed other aspects of its economy, and this economic diversification helped the town when the lumber industry hit periodic rough spots. There are only two remaining large lumber mills and several small lumber mills.

With regard to land use and development trends, as a result of new industry, Corrigan has the potential to increase population with the new economic opportunities in the area. RoyOMartin, Martco L.L.C., in 2015 chose Corrigan as the new location of its soon-to-open state of the art strand board (OSB) manufacturing facility. The facility will be the newest and most technologically advanced plant of its kind in the United States. Scheduled for completion in early 2018, the new facility expects to employ 165 and is currently hiring. The site was selected outside the floodplain and with adequate defensible space from wildfire impacts.

Additionally, Georgia Pacific Forest Products owns and operates lumber mills in both Corrigan and Camden employing 1,200. It is anticipated that these development trends will be positive in the long term with regarding to hazard vulnerability.


City of Corrigan
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Datum: NAD 1983
Map Date: July, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

CITY OF GOODRICH

The City of Goodrich covers 0.7 square miles in southwestern Polk County. Goodrich is located 8 miles south of Livingston on Loop 393 just off of U.S. Highway 59 with its southern border 1.8 miles north of the Trinity River. According to the 2016 US Census estimate, Goodrich has 293 residents, and 145 housing units.

The following data is reported by the U.S. Census for Goodrich as of 2016:

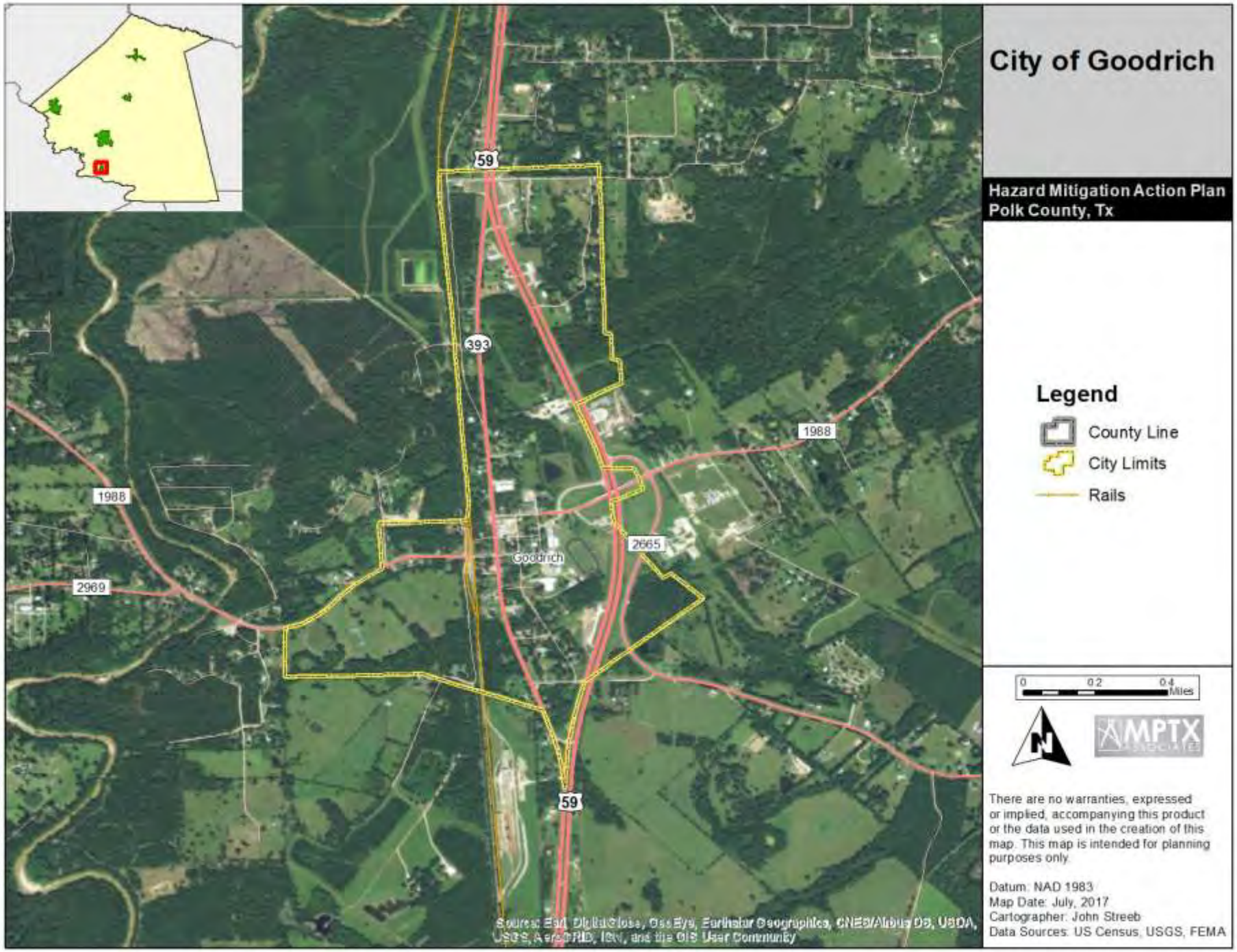
Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Goodrich	293	$44,444	13.5%	79.7%	$48,800	106	17

Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Goodrich%2C+TX&search.x=0&search.y=0

Goodrich was first incorporated in 1974. According to the Chamber of Commerce, the Goodrich area is largely a residential community, which hosts tourists on weekends, holidays and during the summer months. It is located on U.S. Highway 59, with connecting roads to Lake Livingston. The community includes rural areas, small lake subdivisions, farms, ranches and gas/oil compression plants. The low-key environment continues to attract retirees seeking escape from major cities of Texas and young families wishing to live in a small town.

Goodrich has an excellent public school system. Goodrich ISD, with a small student teacher ratio of 11:1, appeals to families in this area. The high school received the Texas Education Agency's highest ranking of Exemplary for the 2000, 2001, 2002, 2003 and 2004 school years.

The population of Goodrich has increased by 8.1% since 2010. It has the highest ratio of household income to housing value in Polk County, statistically indicating good housing affordability. Manufacturing includes a railcar refurbishing facility. New residential and commercial construction activity in the area has been limited during the last five year planning cycle, with most new housing residential-rural in nature. It is anticipated that these development trends will be positive in the long term with regarding to hazard vulnerability.


City of Goodrich
Hazard Mitigation Action Plan
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There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: July, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

CITY OF LIVINGSTON

Livingston covers 8.5 square miles in central Polk County and is the county seat. According to the 2016 US Census estimate, Livingston has 5,130 residents, & 2,504 housing units.

The following data is reported by the U.S. Census for Livingston as of 2016:

Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Livingston	5,130	$38,659	21.1%	83.2%	$87,000	2,504	281

Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Livingston%2C+TX&search.x=0&search.y=0

Livingston is located at the intersections of U.S. Highway 59, U.S. Highway 190, and State Highway 146, approximately 75 miles north of Houston. The top ten employers include Livingston Independent School District, Wal-Mart, CHI St. Luke's Health – Memorial Livingston, County of Polk, IAH Detention Center, Sam Houston Electric Coop, The Bradford at Brookside, Lowe's Home Improvement, Pine Ridge Nursing Center, and First National Bank of Livingston.

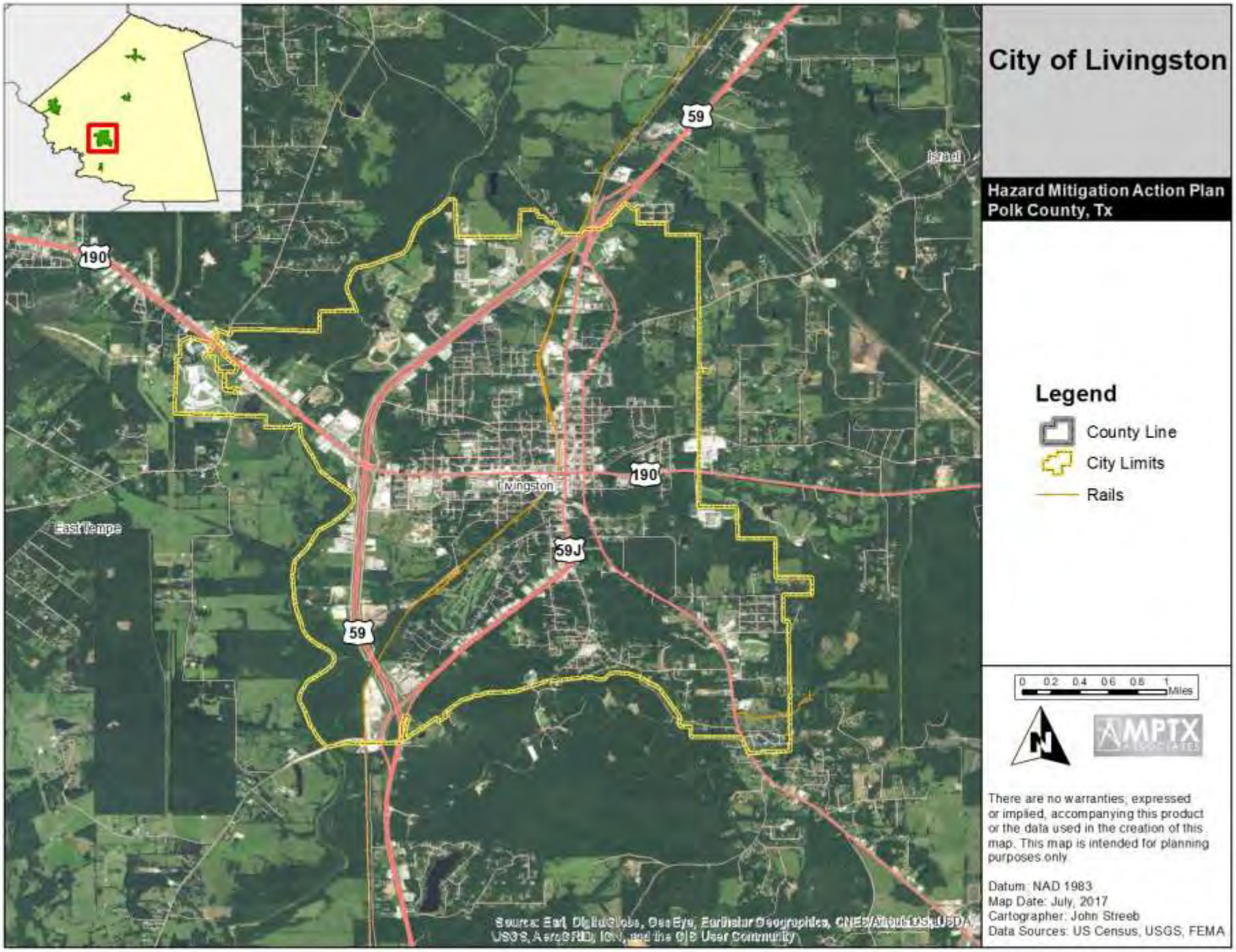
Livingston staffs and operates a monthly Trade Days event at scenic Pedigo Park that opened in 1999 as part of an initiative to promote tourism to the area. Trade Days welcomes families, day-trippers and outdoor enthusiasts. Local motels and restaurants report a significant increase in business on Trade Days weekends, and increased tourism has resulted in a renewed interest in the remodeling and renovation of buildings in the downtown business district. As a result, several antique malls and specialty shops have opened in the area.

Livingston has experienced a diversification of its economic base with the construction of two maximum-security prisons located approximately five miles outside Livingston. The Texas Department of Criminal Justice operates a 2,850-bed unit that employs approximately 835 people, and the IAH Detention Center, which opened in 2006, is a 1061-bed unit that employs approximately 250 people.

Livingston has also benefited from a tremendous growth in the health-care services industry in the past few years. In July 2000, Memorial Medical Center-Livingston opened its $25 million state-of-the-art facility, located on the U.S. Highway 59 bypass. In 2014 Memorial transferred ownership to Catholic Health Initiatives, becoming part of CHI St. Luke's Health Memorial Hospital. In 2017, the Hospital opened its new state-of-the-art Emergency Room facility, at an estimated cost of $10.2 million. The new facility has 16 exam rooms, 3 trauma bays, and adjacent radiology, ultrasound & CT rooms. The Emergency Room also has designated areas for disaster response and decontamination.

To accommodate the ever-increasing number of students moving into the area, the Livingston Independent School District (LISD) constructed a new $17 million junior high school campus for grades 7 thru 9 and remodeled and expanded both an existing elementary school campus and an intermediate school. In 2011 LISD completed construction of a $57 million high school. Additional new development includes the Angelina College-Satellite Campus in Livingston, which is adjacent to the Polk County Commerce Center.

The continuing financial success of the community is tangible. At the Livingston Town Center, work has begun on the 10-acre site located on US 190 West for infrastructure for a commercial development project, and the Discount Tire Center is now open for business. Construction of new water, sewer lines and lift station that will tie into the city's utilities has also been under construction indicating positive growth in the city. The Best Gas Convenience gas station, Huddle House restaurant and store (a 6,000 square foot facility) located on US 190 east of Second Street opened in 2018. The new Polk County Senior Citizen opened on East Church Street at Abbey Street in 2018, and the First Baptist Church opened its new building on the FBC campus at SH 146 and US 59. Chicken Express opened a restaurant on US Hwy 190 W in 2016, and a new Hartz Chicken Buffet on W Church St opened its doors in May 2018. It is anticipated that these development trends will be positive in the long term with regarding to hazard vulnerability.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Datum: NAD 1983
Map Date: July, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

CITY OF ONALASKA

The City of Onalaska covers 4.3 square miles in western Polk County on the shore of Lake Livingston. According to the 2016 US Census estimate, Onalaska has 2,523 residents, and 1,198 housing units.

The following data is reported by the U.S. Census for Onalaska as of 2016:

Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Onalaska	2,523	$32,250	21.3%	74.8%	$53,500	1,198	201

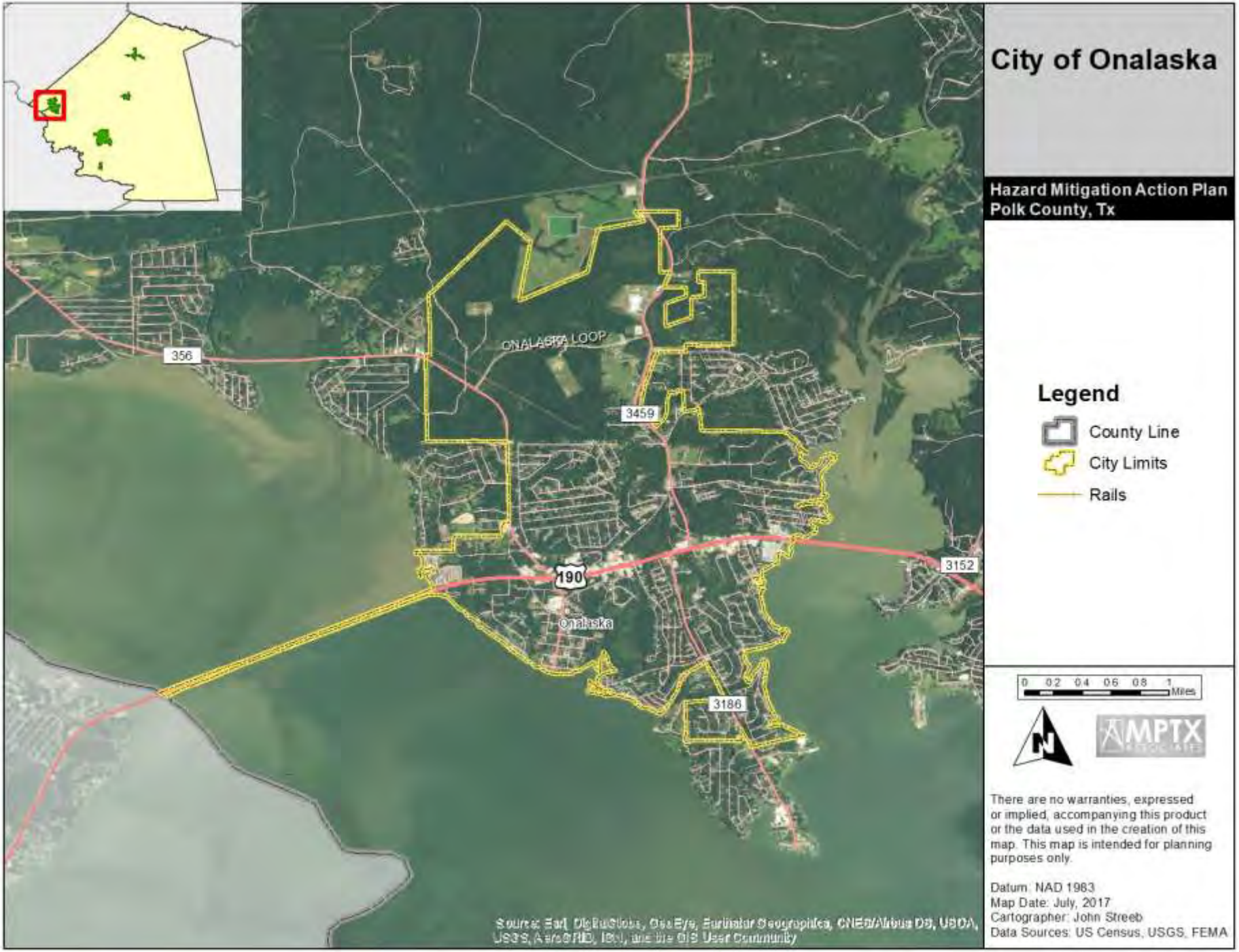
Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Onalaska%2C+TX&search.x=0&search.y=0

The population of Onalaska has increased 43 percent increase since the 2010 Census, making it the fastest growing city in Polk County based on percentage of growth and more than doubled it's population from the 2000 Census. The city is located on a peninsula extending into Lake Livingston, and both residents and tourists alike are attracted to this picturesque area surrounded by Lake Livingston and the Piney Woods in all directions. Onalaska is located 13 miles west of Livingston and 28 miles east of Huntsville on US Highway 190, and 80 miles north of Houston.

Lake Livingston is a Trinity River Authority project completed in 1971 as a result of a contract between TRA and the city of Houston. The lake is the largest single purpose reservoir in Texas with 83,000 surface acres. The lake is stocked with striped and Florida bass, and supplies water to four surrounding counties. With the coming of the water, new life sprang into the little town of Onalaska. Originally settled in 1840 as a farming community, the town experienced its first growth boon in 1904 when the Carlisle Lumber Company Sawmill opened. With the depletion of available timber, the town decreased in size until the late 1960s, and the creation of Lake Livingston. Now considered to be a recreation destination, the town continues to thrive. After an intense period of growth between 2000 and 2010, the population has dropped slightly in the last five years.

However, with weekend visitors, the population numbers often increase to between 10,000 to 15,000 or more. The Onalaska area has become a popular vacation and retirement community, and it retains a village quality and country atmosphere that offers wilderness and recreational activities for all ages. Visitors and residents will find a great selection of campgrounds, RV parks, motels, marinas, and golf courses. The mild winter climate caters to Winter Texans.

It is anticipated that these development trends will be positive in the long term with regarding to hazard vulnerability.


City of Onalaska
Hazard Mitigation Action Plan
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Datum: NAD 1983
Map Date: July, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

CITY OF SEVEN OAKS

The City of Seven Oaks covers 1.4 square miles or 846 acres, and is located in central Polk County, 12 miles north of Livingston on U.S. Highway 59 north of Leggett. According to the 2016 US Census estimates, Seven Oaks has 119 residents and 77 housing units.

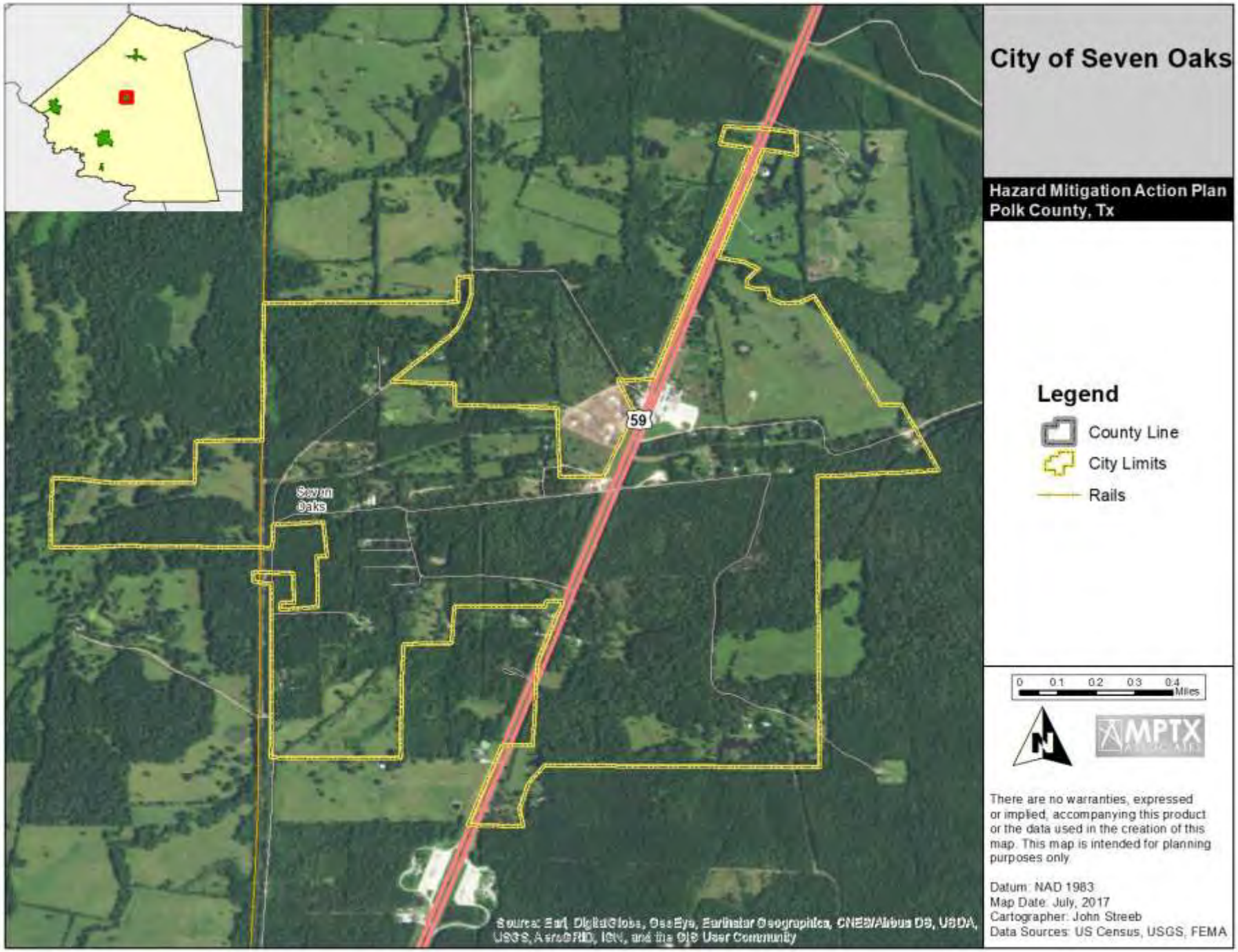
The following data is reported by the U.S. Census for Seven Oaks as of 2016:

Jurisdiction	2016 Population	Median Household Income	% Below Poverty Level	% High School Graduate or Higher	Median Housing Value	Total Housing Units	# Military Veterans
Seven Oaks	119	$55,625	16.2%	78.7%	$64,000	77	12

Source: US Census; https://www.census.gov/search-results.html?page=1&stateGeo=none&searchtype=web&cssp=Typeahead&q=Onalaska%2C+TX&search.x=0&search.y=0

The City of Seven Oaks incorporated in 1969. According to 2015 U.S. Census data Seven Oaks has the highest median household income in Polk County, and 10 percent of its population are military veterans.

Seven Oaks spans across both the eastern and western sides of US Highway 59. Housing density is broadly distributed across the city's boundaries. Much of the city is forested, and interspersed with areas of open pastureland as indicated on the following map. It is anticipated that these development trends will be neutral in the long term with regarding to hazard vulnerability.


City of Seven Oaks
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There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: July, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA

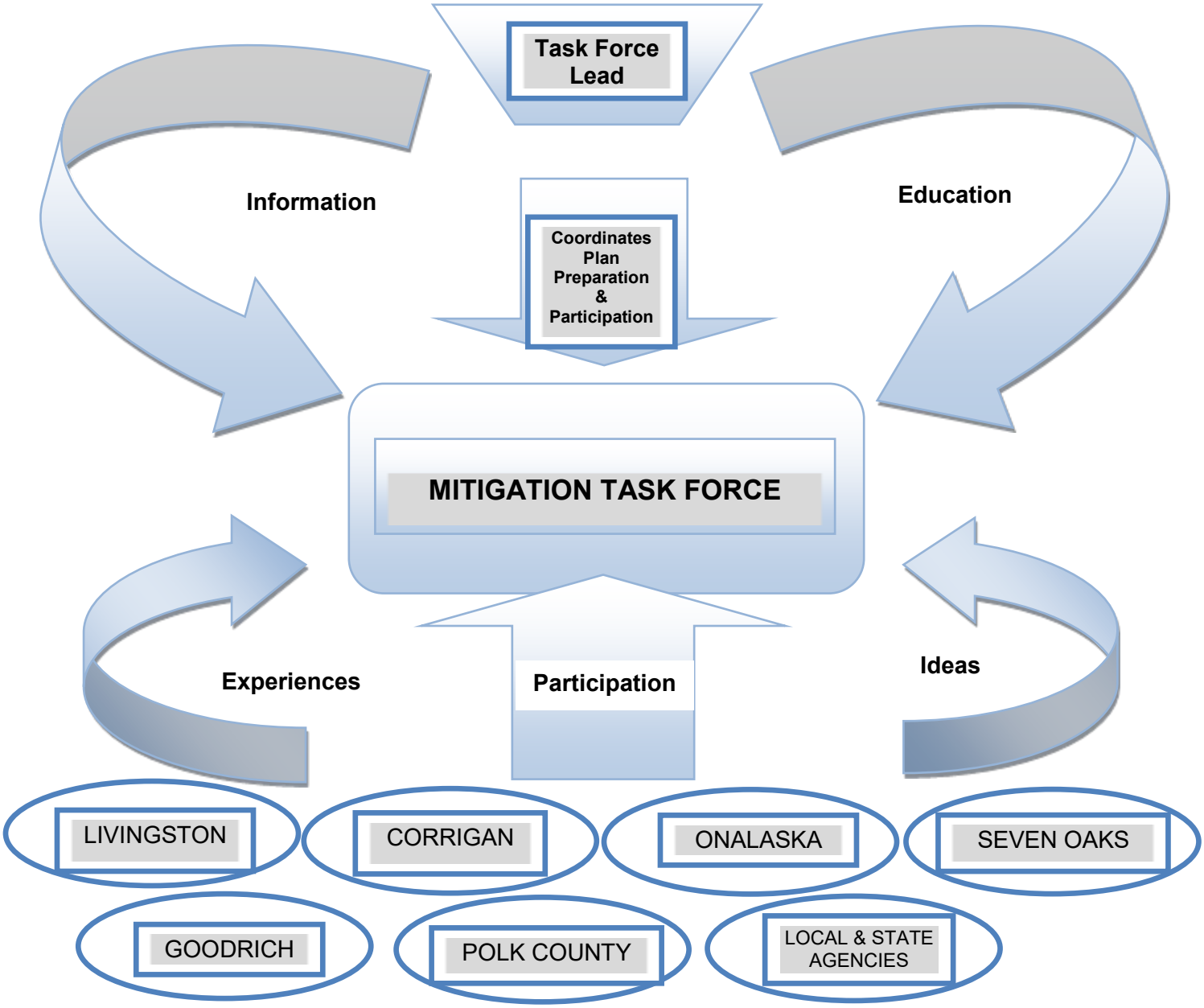
CHAPTER 2. PLANNING PROCESS

44 CFR Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process;
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
Requirement §201.6(c) (1): *[The plan* ***shall*** *document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Polk County played the lead role in initiating the update of this Plan, supported by representatives of each incorporated city as formal participants in this Plan. Federal funding for the Plan update was secured through a grant from the Hazard Mitigation Grant Program developed in coordination with Texas Division of Emergency Management (TDEM).

2.1 HAZARD MITIGATION TASKFORCE

PLANNING PROCESS ORGANIZATIONAL MODEL



HMT membership for this Plan update included participants in previous mitigation plan processes, as well as new members. The Polk County Emergency Management Coordinator served as the HMT leader and presided over the Plan update project from start to finish.

The HMT is comprised of a core multijurisdictional team and city/county teams. The core team is comprised of representatives from each participating jurisdiction and select stakeholders and individual teams at the county and cities. The county team and individual city teams are comprised of staff personnel and other subject matter experts' familiar with the specific history and circumstances of their respective jurisdiction. Professional fields represented by the HMT include:

- City and County Administration and Elected Officials
- Emergency Response and Management
- Law Enforcement
- Public Works/Engineering
- Floodplain Management
- School Administration
- Climatology and Geographic Information Systems
- Land Use Planning and Community Development
- Local Media
- General Public and Interested Stakeholders

Hazard Mitigation Taskforce Membership

The table below lists the Polk County HMT membership for the Plan's development. HMT membership included representatives from every participating jurisdiction as well as stakeholders such as Deep East Texas Council of Governments (DETCOG), Texas A&M Forest Service (TFS), Alabama-Coushatta Indian Nation, and local energy companies. Each participating jurisdiction likewise formed a planning team composed of staff and stakeholders familiar with jurisdiction operations and the information required to update the Plan.

Table 2-1 Polk County Hazard Mitigation Taskforce

Name	Jurisdiction	Agency/Department	Title
Courtney Comstock	Polk County	Emergency Management	Coordinator
Larry Pitts	Polk County	Emergency Management	Coordinator (ret.)
Linda Hicks	Polk County	Emergency Management	GIS/Rural Addressing
Chad Holton	Trinity River Authority	Emergency Management	EMC/Assistant Project
Darrian Hudman	Corrigan	City Hall	City Manager
Carol Loving	Corrigan	Public Works	Road & Bridge
Gary Bates	Goodrich	School District	Superintendent
Craig Davis	Livingston	School District	Chief Operations Officer
Dennis Clifton	Livingston	Police Department	Chief
Matt Parrish	Livingston	Police Department	Lieutenant
Lee Parrish	Onalaska	Fire Department	Fire Marshal
Roy Newport	Onalaska	Mayor's Office	Mayor, EMC, Floodplain Mgr
Centa Evans	Seven Oaks	Mayor's Office	City Hall
Gloria English	Seven Oaks	City Administration	City Secretary
Tommy Overstreet	Polk County	Precinct 4	Commissioner
Ronnie Vincent	Polk County	Precinct 2	Commissioner
Lisa Ellis, CFM	Polk County	Floodplain Office	Administrator
Jay Burks	Polk County	Maintenance Department	Maintenance Supervisor
Chad Hill	Polk County	Appraisal District	Chief Appraiser
Stephanie Dale	Polk County	Auditors Office	Auditor
Tatum White	Polk County	Tax Office	Chief Deputy
Leslie Burks	Polk County	Tax Office	Tax Assessor
Ricky Harrell	Polk County	Sam Houston Electric	Communications Officer
Jan Shandley	Polk County	Co Judge Office	Office Manager
Corylee Thomas	United States	USDA-NRCS	District Conservationist
Willo Sylestine	Alabama Coushatta Tribe	Emergency Management	EMC
Jason Calvet	Texas	Tx A&M Forest Service	District Representative
Jarad Karns	Texas	Tx A&M Forest Service	Fire Coordinator
Weldon Dent	Texas	Tx A&M Forest Service	WUI Specialist
Ricky Holbrook	Texas	Tx A&M Forest Service	RFC
Virgil Miller	Texas	TDCJ Livingston	Captain
Mark Duff	Texas	TDCJ Livingston	Chief-Facilities
Karisa Simpson	Texas	TDCJ Livingston	Risk Manager
Tracey Brodeur	Private Industry	Entergy Electric	Customer Svc Manager
Ricky Taylor	Private Industry	Americare EMS	EMT-I Public Relations
Justin Cude	Private Industry	Americare EMS	Director of Operations
John McDowell	Texas Region 14	DETCOG	Homeland Security Director

Table 2-2 Polk County Planning Team

Name	Jurisdiction	Agency/Department	Title
Courtney Comstock	Polk County	Emergency Management	Coordinator
Larry Pitts	Polk County	Emergency Management	Coordinator (ret.)
Linda Hicks	Polk County	Emergency Management	GIS/Rural Addressing
Kenneth Hambrick	Polk County	Precinct 1	Foreman
Ronnie Vincent	Polk County	Precinct 2	Commissioner
Kathy Crowhurst	Polk County	Precinct 2	Office Manager
Carol Loving	Polk County	Precinct 3	Office Manager
Tommy Overstreet	Polk County	Precinct 4	Commissioner
Kayla Pitts	Polk County	Precinct 4	Office Manager
Lisa Ellis, CFM	Polk County	Floodplain Office	Administrator
Chad Hill	Polk County	Appraisal District	Chief Appraiser
Margie Ainsworth	Polk County	Auditors Office	Auditor
Stephanie Dale	Polk County	Auditors Office	Assistant Auditor
Tatum White	Polk County	Tax Office	Chief Deputy
Leslie Burks	Polk County	Tax Office	Tax Assessor
Sydney Murphy	Polk County	Judge's Office	County Judge
Jan Shandley	Polk County	Judge's Office	Office Manager
Marcia Cook	Polk County	Judge's Office	Assistant to County Judge
Chad Holton	Trinity River Authority	Emergency Management	Coordinator
Mark Waters	Trinity River Authority	Operations	Project Manager
John McDowell	Texas	DETCOG	HS Director
Ricky Holbrook	Texas	Tx A&M Forest Service	Regional Fire Coordinator
Ricky Taylor	Private Industry	Americare EMS	EMT-I Public Relations
Justin Cude	Private Industry	Americare EMS	Director of Operations
Keith Stapleton	Private Industry	SHECO	Chief Communications Officer
Tracy Brodeur	Private Industry	Entergy	Customer Svc Representative

Table 2-3 Corrigan Planning Team

Name	Jurisdiction	Agency/Department	Title
Johnna Lowe Gibson	Corrigan	City Administration	Mayor
Darrell Gibson	Corrigan	Police Department	Chief of Police
Mike Cody	Corrigan	Public Works	Director
Carrie Casper	Corrigan	City Administration	City Secretary
Paloma Martinez	Corrigan	City Administration	Admin Assistant

Table 2-4 Goodrich Planning Team

Name	*Jurisdiction*	*Agency/Department*	*Title*
Kelly Nelson	Goodrich	Administration	Mayor Pro Tem
Kenneth Hambrick	Goodrich	VFD	Chief
Sally Yingling	Goodrich	Administration	City Secretary
Bobby Wright	Goodrich	Administration	City Council Member
Louis Hill	Goodrich	Administration	City Council Member

Table 2-5 Livingston Planning Team

Name	Jurisdiction	Agency/Department	Title
Bill Wiggins	Livingston	Administration	City Manager
Dennis Clifton	Livingston	Police Department	Chief of Police
Matt Parrish	Livingston	Police Department	Lieutenant
Paul Baker	Livingston	Public Works	Assistant Director
Dewayne Oates	Livingston	Electric Department	Superintendent
Jim Wright	Livingston	Administration	City Attorney
Ellie Monteaux	Livingston	Administration	City Secretary
Ben Buchanan	Livingston	Administration	Community Development
Hec Long	Livingston	Public Works	Director

Table 2-6 Onalaska Planning Team

Name	Jurisdiction	Agency/Department	Title
Roy Newport	Onalaska	City Administration	Mayor
Lee Parrish	Onalaska	City Administration	Fire Marshal
Lynn Redden	Onalaska	Onalaska ISD	Superintendent
Ronald Gilbert	Onalaska	Police Department	Chief
Angela Stutts	Onalaska	City Administration	City Secretary
Jay Stutts	Onalaska	Onalaska VFD	Fire Chief

Table 2-7 Seven Oaks Planning Team

Name	Jurisdiction	Agency/Department	Title
Centa Evans	Seven Oaks	City Administration	Mayor
Gloria English	Seven Oaks	City Administration	City Secretary

2.2 MULTI-JURISDICTION PARTICIPATION

The planning area for this Plan is the entirety of Polk County and the incorporated communities named above. This geographic scope of the Plan also corresponds with the reach of the Polk County Emergency Operations Plan.

Polk County and the Cities of Livingston, Corrigan, Goodrich, Onalaska, and Seven Oaks are the formal participants in this Plan. As such, each entity provided information relevant to its jurisdiction and developed its own mitigation action item list. Formal participation in this Plan includes but is not limited to the following activities:

- Participation in HMT meetings
- Providing hazard profile information
- Building community asset listings
- Identifying community vulnerabilities
- Local action item development
- Status of actions from previous plan
- Provided process for amending other plans and policies for their jurisdiction
- Approval of draft document
- Formal adoption of the Plan document following provisional approval by the State of Texas and FEMA

Regional stakeholders were invited to participate in the process in order to bring additional levels of expertise and other perspectives into the process, and so they might also benefit from the process with the intent of reducing risk across the entire region. Stakeholders are public or private entities that are not formal jurisdictions of the County but have an interest in the county either geographically or by way of a business interest in the county that may be affected by the Plan. Table 2-8 lists the stakeholders that were invited to participate in the planning process.

Table 2-8 Stakeholder Invite List

Title of Representative Invited	Agency	Method of Invite
Manager of Member Services	SHECO	Email
District Conservationist for Polk & San Jacinto Counties	USDA-NRCS	Email
Fire Chief/Emergency Management Coordinator	Alabama-Coushatta Tribe	Email
Jason Clavet – District Representative Weldon Dent - Wildland Urban Interface Specialist Ricky Holbrook - Regional Fire Coordinator	Texas A&M Forest Service	Email
Virgil Miller- Captain Mark Duff - Chief of Classification Karissa Simpson - Risk Manager	Texas Department of Criminal Justice	Email
Customer Service Manager	Entergy Electric	Phone and Email
Justin Cude - Director of Operations Ricky Taylor - EMT-I, Public Relations	Allegiance Mobile Health	Email
Homeland Security Director	DETCOG	Email
Assistant Project Officer, Operations	TRA	Email

2.3 TEAM MEETINGS

The planning process began with an executive meeting on January 10, 2017 to discuss the overarching goals and timelines for the Plan development process, and to create a list of invitees to serve on the HMT. Invitation letters were sent to representatives of various agencies and jurisdictions outlined at the beginning of this chapter. The Office of Emergency Management Coordinator and Deputy Coordinator chose to execute a very aggressive planning schedule by having five HMT meetings in the first four months of the process, with the city teams meeting in between and after these meetings to discuss, compile and submit required data to the appropriate repository, conduct city and county risk analysis, and establish city and county mitigation strategies.

The update process centered around a series of meetings of the HMT. These meetings were structured the same throughout the process. A review of the federal requirements was followed by discussion of planning-area-specific information concerning the requirements and concluded with distribution of tools to assist in capturing information.

Taskforce meetings and work sessions were held at the Polk County Chamber of Commerce conference room. Meetings in both the planning and public comment stages were advertised as open to the public in local publications.

The first meeting was held January 12, 2017. Main points covered in the meeting were:

- Overview of the task and purpose of the team
- Time-Keeping, project participation, “in-kind contributions”
- Overview of planning process
- Federal prequirements
- Data collection discussion
- Hazard Identification

The second meeting was held on February 16, 2017. Main points and work conducted included the following:

- Building city/county planning teams
- Identify and review existing planning mechanisms
- National Flood Insurance Program (NFIP) participation
- Confirm critical asset list

Hazard Profile Federal Requirements

- Previous occurrences
- Location
- Extent – Strength or magnitude?
- Impact – What did it damage?
- Probability of future occurrence
- Overall vulnerability

Previous Impact Discussion

- Photos, FEMA Project Worksheets (PW’s)
- Public buildings
- Roads & bridges
- Homes & Neighborhoods
- Utility systems

The third meeting was on March 16, 2017. The public was invited via announcement in local newspapers and county website. Main agenda points and work conducted included the following:

- Building city/county planning teams (form emailed)
- Identify and review existing planning mechanisms
- National Flood Insurance Program (NFIP) participation (emailed)
- Update critical asset inventory (Old list & form emailed)
- Previous plan action item status
- Mitigation Action Requirements (FEMA Standards)
  - Action
  - Hazard
  - Priority
  - Possible funding
  - Responsible department
  - Coordinating agencies
  - Timeframe for completion
- Mitigation Action Discussion
  - Flooding
  - Wildfire
  - High winds/tornado
  - Hurricane

The fourth meeting was on April 12, 2017. The public was invited to this meeting. The main topic of discussion for this meeting was mitigation project prioritization. The agenda for this meeting was as follows:

- In-Kind Documentation
- FEMA Grants Overview
- Mitigation Project Prioritization

Participating City Planning Meetings

The participating jurisdictions had individual planning meetings as well to gather and discuss city or county specific data and information. These meetings were attended by the city and county team members listed in Tables 2-2 through 2-7 above. There were also field trips to gather pictures and geographic specifics about vulnerable assets to include in hazard profiles. Polk County Emergency Management personnel and consultants attended these meetings to answer questions and concerns and to guide the direction of the meetings.

Mar 1……Livingston
Mar 20…….Livingston
Mar 29…….Corrigan
Mar 30…….Goodrich
Mar 31…….Onalaska
Apr 4……Polk Co Planning team (just the county folks)
Apr 12…….Seven Oaks
Apr 25……Seven Oaks (tour and pictures of flooding areas)
Apr 25……Corrigan (tour and pictures of flooding areas)
May 10……Goodrich (tour and pictures of flooding areas)
May 10……Onalaska (tour and pictures of flooding areas)

2.4 PUBLIC INVOLVEMENT AND PARTICIPATION

Public Comment and Involvement

Participation of the general public in this Plan update was an important element which was implemented by means of invitation to the HMT planning meetings; a public survey relating to hazard mitigation opinions, priorities, and attitudes; and also opportunity to comment on the draft Plan update.

The public was invited to the April 12, 2017 meeting to allow for public input during the action prioritization exercise of the planning process. Unfortunately, no representatives of the general public attended this meeting.

Page 6A POLK COUNTY ENTERPRISE Sunday, April 9, 2017

Community Calendar

Hazard mitigation team meeting

The public is invited to attend a meeting of the Polk County Hazard Mitigation Team at 10 a.m. Wednesday, April 12, at the Livingston-Polk County Chamber of Commerce, 1001 U.S. 59 Loop N. in Livingston. The purpose of the meeting is to prioritize hazard mitigation activities for the next five years. To RSVP or for information, contact Greg Wobbe at 318-238-6811 or Larry Pitts at 936-327-6826.

Source: Polk County Enterprise; Sunday Edition, 4-9-2017

A second opportunity for public involvement pertained to a public survey on hazard mitigation. The survey was distributed online and consisted of the following questions:

1. From the following list, please check what you think are the most serious potential natural hazards for your community:

- [ ] Flood
- [ ] Wildfire
- [ ] Severe Winter Storm
- [ ] High Winds
- [ ] Drought
- [ ] River Bank Erosion
- [ ] Lightning
- [ ] Hurricane
- [ ] Earthquake
- [ ] Tornado
- [ ] Extreme Heat

Other (natural hazard)

2. Have you ever experienced or been impacted by a hazard occurrence? If yes, please describe.

- Yes
- No

Description

3. Have you taken any actions to make your home or neighborhood more resistant to hazards? If yes, please describe.

- Yes
- No

Description

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

5. Please rate on a 1-5 scale the importance of activity types listed below.

	1 - Less Important	2	3	4	5 - More Important
Rules that guide the way land is used and how buildings are built.					
Hardening buildings to make them wind and fire resistant.					
Road elevation, flood, drainage improvement.					
Warning systems and protection for critical facilities.					
Public education on hazard preparedness and prevention.					
Natural resource protection and management.					

Thank you for completing this survey!

OK

Community response to the hazard mitigation survey was excellent, including detailed and useful data, encouraging comments, and ideas for improvement. This community feedback was taken into consideration in development and prioritization of mitigation strategy and actions, and also provided data supporting this Plan's risk assessment. Results of the public involvement survey are as follows:

Question #1 (Most Serious Hazards). Analysis: 8 out of 9 responses noted hurricane as among the most serious hazard affecting the planning area. Flood was noted with the next highest frequency of notation with 7 out of 9 responses. Tornado was noted in 5 out of 9 responses. Also, drought was noted in 4 responses, followed by wildfire, high winds, and extreme heat in 3 responses. Finally, both lightning and river bank erosion were noted in 2 responses and mosquitos were noted in 1 response.

Question #2 (Personal Hazard Experience). Analysis: 6 out of 8 or 75% of respondents answered affirmatively to whether they have experienced or been impacted by a hazard or disaster. Again, affirmative responses to this question would likely increase if the survey were conducted after Hurricane Harvey. Examples of responses included the following:

"Hurricanes Rita & Ike, flooding, extreme drought, tornado". "Wildfires, extreme drought conditions, 3+ hurricanes, trees falling across our house and barn". "Lots of debris from neighbors, old buckets of oil and motor fuel coming onto our property". "8 Hurricanes, 2 out of control 'Controlled Burns', 1 train derailment, 4 toxic spills related to bulk carriers on Highway 59" "Tornado, Straight Line winds and Hurricanes. Roof torn partly off, trees on house and trees down in yard and across power lines". "Erosion from Hurricane Harvey".

Question #3 (Personal Mitigation Action). Analysis: 7 out of 9 respondents answered affirmatively to whether they have personally taken action to make their home or neighborhood more hazard resilient. The majority of personal mitigation activities related to structure hardening, tree and vegetation removal, drainage improvements. Responses included the following examples:

"Improved drainage around house, applied Hardie Plank siding to out-buildings, replaced roof with higher wind rated shingles". "Cleared vegetation around home (wildfires)". "Cut trees, and opened up our ditches more". "Removed trees nearest the residence after 2005. More serious preparations for Hurricane Season". "Removing anything that might be caught up in winds". "I bring in dirt to help with erosion on my property, however my neighbors do not. Their lack of concern effects my property value".

Question #4 (Mitigation Ideas for Local Government). Analysis: 6 out of 8 or 75% of respondents provided ideas and feedback for mitigation activities to be implemented by local government. Many were specific, and some responses emphasized the importance of faith and cooperation. Other responses complimented the work of Polk County Emergency Management and the great job they are doing. Responses included the following examples:

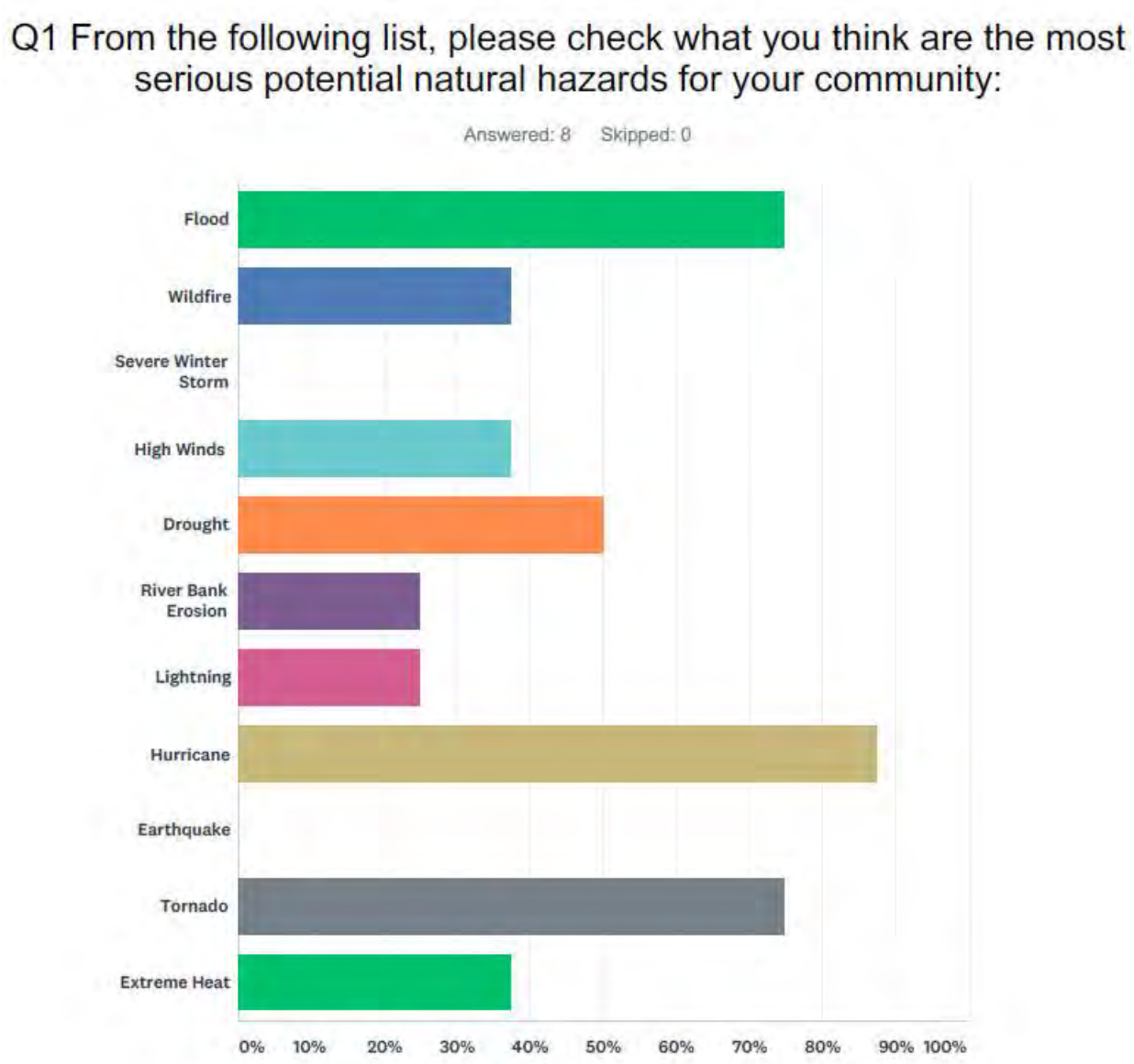
"Polk County prepares better than most for response & recovery." "Make people keep their yard's cleaner and not have so much trash and junk to wash away and scatter onto other people's yard. And stop the burning it smells so bad." "OEM already does good job of keeping people updated on dangerous weather conditions." "Actively track the "high water benchmarks" on county maintained roads. There should be a plan in place to monitor and record rainfall and corresponding hazards to travel on county roads." "Patrol areas more. Put up a complaint area on your website."

Question #5 (Mitigation Project Types: Relative Importance). Analysis: Road and drainage improvement, and natural resource protection and management received the highest scores from the public survey. Other project types scored slightly lower but each project type received high scores from at least 3 respondents. The table below summarizes raw data and average scores for each project type.

Mitigation Project Type	1	2	3	4	5	6	7	8	9	Raw Total	Avg. Score
Road elevation, flood, drainage improvement.	5	4	5	5	5	5	4	5	5	43	4.8
Natural resource protection and management.	5	4	5	5	5	4	5	5	5	43	4.8
Public education on hazard preparedness and prevention.	4	5	4	5	5	5	4	5	1	38	4.2
Warning systems and protection for critical facilities.	5	5	3	5	3	4	5	5	1	36	4.0
Hardening buildings to make them wind and fire resistant.	5	3	4	5	2	2	5	5	3	34	3.8
Rules that guide the way land is used and how buildings are built.	5	3	5	5	1	2	4	5	3	33	3.7

Source: Community responses, Hazard Mitigation Public Involvement Survey; Polk County OEM

GRAPHIC: Survey Results, Relative Hazard Significance



Source: Community responses, Hazard Mitigation Public Involvement Survey; Polk County OEM

A third method for involving the public came in the form of an opportunity to review and comment on the Plan update as it was being drafted. The document was posted on the Office of Emergency Management website inviting comments from the general public. A feedback form was solicited and comments received guided modifications to the final document.

2.5 ADOPTION

44 CFR Requirement §201.6(c) (5):
*[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

44 CFR Requirement §201.6(c) (5):
*For multi-Jurisdiction plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Upon provisional approval of this Plan by TDEM and FEMA, the governing bodies for Polk County and the participating municipalities will formally adopt this Plan in public session. Following local adoption, copies of each participating jurisdiction's local adoption instrument will be included in Appendix A of this document.

2.6 IMPLEMENTATION, MONITORING, EVALUATION, AND UPDATE

Requirement §201.6(c) (4) (i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

The Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the local agencies and organizations participating in Plan evaluation. The Emergency Management Coordinator will be responsible for contacting the HMT members and organizing the annual meeting. HMT members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. The HMT will review the goals and action items to determine their relevance to changing situations in the county, as well as changes in state or federal policy, and to ensure they are addressing current and expected conditions.

The HMT will review the entire plan and planning process to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised. HMT members should report back on the progress made on the integration of mitigation planning elements into county planning documents and procedures. The designated HMT members will have three months to make appropriate changes to the Plan before submitting it to the Plan jurisdictions for approval. The HMT will notify all holders of the county Plan when changes have been made. In accordance with 44 CFR, Section 201.6, every five years the updated Plan will be submitted to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review and approval.

2.7 INCORPORATION INTO EXISTING AND FUTURE PLANNING DOCUMENTS

Requirement §201.6(c) (4) (ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Mitigation is most successful when it is codified and incorporated into the functions and priorities of government, planning and future development. Incorporating mitigation strategies into other planning documents is an effective way to leverage the support of affiliated agencies and departments while ensuring mutually supportive goals and policies.

Accordingly, the goals and mitigation strategies of this Hazard Mitigation Action Plan will be incorporated into other planning documents within the purview of participating jurisdictions as they are updated or are developed. Examples of local planning mechanisms are the County Emergency Operations Plan, Subdivision Ordinances, Floodplain Ordinances, County Community Wildfire Protection Plan, and local municipal building codes, etc.

Development of future plans or update of existing plans will include a review of this Hazard Mitigation Action Plan for consideration and incorporation of pertinent elements. To ensure the incorporation of goals and actionable items of this plan, Hazard Mitigation Team members will be invited to sit on future plan development or existing plan update committees, and this Hazard Mitigation Plan will be cited as a technical reference and data source for these planning processes.

2.7.1 Integration of Studies and Existing Planning Mechanisms

An integral component of the update of this document is the incorporation of this plan's objectives as well as information and data collected during the planning process into existing and future planning mechanisms (capabilities).

An integral component of the mitigation strategy is the incorporation of this plan's objectives into existing and future planning mechanisms of all participating jurisdictions. The Hazard Mitigation Team is comprised of personnel with oversight into the development, update, and day-to-day implementation of these planning mechanisms, and will help to ensure the incorporation of this plan into updates of existing plans and ordinances and ones that are developed and adopted in the future. A detailed discussion of the process for incorporating this hazard mitigation plan into other planning mechanisms is presented in Section 2.7.

Polk County adopts higher standards for freeboard: 1' above BFE

On September 3, 2010, Polk County adopted new floodplain maps through FEMA's Map Modernization Program. The updated NFIP maps with the improved technologies for identifying flood hazards are more closely aligned with actual risk. Polk County's flood insurance rate is Zone A; therefore, with no elevations or bench marks, obtaining a base-flood elevation certificate from a surveyor is very difficult.

The County Judge and County Commissioners continue to look for ways to reduce losses from flooding through comprehensive planning, the regulation of flood-prone land, and by promoting the purchase of Floodplain Insurance. Polk County will continue to enforce a rigid floodplain management program.

Polk County has had a comprehensive mitigation program for the past twelve years. For example, the county has improved large culverts and bridges by installing bulkheads to protect culverts and prevent erosion to road beds. The Commissioners have also fortified bridge approaches by improving head walls, adding bulkheads and rip rap to help protect the bridges from washing out and erosion.

Polk County has been participating in the NFIP since the original Floodplain Ordinance was adopted on August 13, 1990. On May 13, 2008, the county adopted a more stringent Order to include the freeboard of one foot. With the new map modification program from FEMA our County adopted the latest Floodplain Order on September 3, 2010 to include new floodplain maps. Other jurisdictions in Polk County participating in the NFIP are Onalaska, Goodrich, Corrigan, and Livingston. Seven Oaks is the only jurisdiction that elects not to participate in the NFIP due to limitations of available resources. Each jurisdiction that participates in the NFIP makes an effort to educate it's residents on the benefits of the program.

For the purpose of regulating development in the floodplain, Polk County requires permits for all development in the county. The Electric Companies, Sam Houston Electric Coop and Entergy help by requiring a county permit number before electricity can be installed on any property.

The following is a comprehensive listing of existing planning mechanisms available for incorporation and their process for integration of this document. Items are included for each participating jurisdiction (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks). By definition, items which are not referenced below can be assumed not to exist, but conceivably may be developed in the future.

Table 2-9 Existing Plans and Regulations, Polk County and Participating Municipalities

Code/Policy/ordinance/Plan	Jurisdictions	Date of adoption	Integration Process – Opportunities to Expand
International Building code	Corrigan Livingston Onalaska		Consider increasing wind damage resilience standards (Corrigan, Livingston, Onalaska).
2003 NFPA 101 Life Safety Code	State Fire Marshall (pertains to all jurisdictions)	October 22, 2009	**By statute, NFPA 101 (Life and Safety Code) applies to all participating jurisdictions (see Texas Administrative Code note below) . Consider expanding capacity and inspection resources for State Fire Marshall.
Floodplain Management Ordinance / Flood Damage Prevention Order	Polk County Livingston Corrigan Goodrich Onalaska	03/01/1991 07/14/2009 04/20/1982 06/19/1985 11/06/1996	Update FEMA Flood Insurance Rate maps to improve accuracy and detail (Goodrich Polk County, Livingston, Corrigan, Onalaska).
Comprehensive Land Use Plan	Livingston		Create section addressing natural hazards (Livingston)
Capital Improvement Plan	Livingston		Consider review of hazard mitigation actions during update (Livingston).
Community Wildfire Protection Plan	Polk County	05/24/2011	Expand detail for wildfire mitigation projects (Polk County).
Emergency Management Plan	Covers all participating jurisdictions		Data gathered on HAZMAT sights will be added to Annex Q (all).
Subdivision Regulation	Polk County	04/01/2012	Consider adding No Adverse Impact (NAI) standard. (Polk County)
Lower Trinity Groundwater Conservation District Groundwater Management Plan	Lower Trinity Groundwater Conservation District	09/12/2014	Review opportunities to integrate stormwater management projects with groundwater recharge areas (LTGCD).
Fire plan	Livingston		Data/actions from planning process and mitigation strategy added to city fire plan
City Council Bylaws	Seven Oaks	July 5, 1969	Consider participation in the National Flood Insurance Program (Seven Oaks).

Note: Excerpted from **Texas Administrative Code
TITLE 28 : INSURANCE
PART 1 TEXAS DEPARTMENT OF INSURANCE

CHAPTER 34 STATE FIRE MARSHAL
SUBCHAPTER C STANDARDS FOR STATE FIRE MARSHAL INSPECTIONS
RULE §34.303 Adopted Standards

"The Commissioner adopts by reference: NFPA Life Safety Code 101-2009. These copyrighted standards and recommendations are adopted, except to the extent they are in conflict with sections of this chapter or any Texas statutes or federal law. The standards are published by and are available from the National Fire Protection Association, Quincy, Massachusetts."

Source Note:

The provisions of this §34.303 adopted to be effective February 27, 1996, 21 TexReg 1286; transferred effective September 1, 1997, as published in the Texas Register November 14, 1997, 22 TexReg 11091; amended to be effective July 19, 2000, 25 TexReg 6724; amended to be effective September 17, 2003, 28 TexReg 7994; amended to be effective October 5, 2006, 31 TexReg 8238; amended to be effective October 22, 2009, 34 TexReg 7204

Scope of NFPA Life Safety Code 101-2009:

1.1* Scope. 1.1.1 Title. NFPA 101, Life Safety Code, shall be known as the Life Safety Code®, is cited as such, and shall be referred to herein as "this Code" or "the Code."

1.1.2 Danger to Life from Fire. The Code addresses those construction, protection, and occupancy features necessary to minimize danger to life from the effects of fire, including smoke, heat, and toxic gases created during a fire.

1.1.3 Egress Facilities. The Code establishes minimum criteria for the design of egress facilities so as to allow prompt escape of occupants from buildings or, where desirable, into safe areas within buildings.

1.1.4 Other Fire-Related Considerations. The Code addresses other considerations that are essential to life safety in recognition of the fact that life safety is more than a matter of egress. The Code also addresses protective features and systems, building services, operating features, maintenance activities, and other provisions in recognition of the fact that achieving an acceptable degree of life safety depends on additional safeguards to provide adequate egress time or protection for people exposed to fire.

1.1.5* Considerations Not Related to Fire. The Code also addresses other considerations that, while important in fire conditions, provide an ongoing benefit in other conditions of use, including non-fire emergencies.

2.7.2 Technical Data Sources and Data Limitations

Requirement §201.6(c) (4) *the Plan shall describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))*

How Data Sources Were Incorporated

Since the original hazard mitigation plan for Polk County was developed (2005-2006), there have been significant advances in the availability of data. In addition to review of the original version of hazard mitigation plan, a number of technical documents / studies were reviewed and reported in this hazard mitigation plan update.

Review of these information sources was integral to planning meetings, work sessions, site tours, and discussions regarding risk assessment and provided guidance to development of the mitigation strategy and prioritization of action items.

Notably, much information contained in the Hazard Profiles and Risk Assessment sections came from the following agencies, plans, technical documents and data sources:

Agency Sources:

- Federal Emergency Management Agency (FEMA)
- Texas Division of Emergency Management (TDEM)
- National Flood Insurance Program (NFIP)
- National Weather Service-Houston (NWS)
- National Oceanic and Atmospheric Administration (NOAA)
- National Center for Environmental Information (NCEI)
- National Climatic Data Center (NCDC)
- National Severe Storms Laboratory (NSSL)
- National Inventory of Dams (NID)

- U.S. Geological Survey (USGS)
- National Hurricane Center
- Local and regional media and jurisdictions (current and historical)

Technical Documents and Plans:

- Federal Emergency Management Agency (FEMA). Publication 386-2, *Understanding Your Risks: Identifying Hazards and Estimating Losses*
- *FEMA Flood Insurance Study*: Polk County Texas and Incorporated Communities (Effective September 29. 2010)
- *State of Texas Hazard Mitigation Plan* (2013 Edition)
- *National Flood Insurance Program: Flood Insurance Claim Report; (1-31-2018)*
- *National Hurricane Center Tropical Cyclone Report* (AL092017) HURRICANE HARVEY, Eric S. Blake and David A. Zelinsky; (January 23, 2018)

Software and GIS Shapefiles and Analysis Tools:

- FEMA 'D-FIRM' Flood Insurance Rate Map Shapefile
- Texas Forest Service (TxWRAP) Wildfire Mapping Data
- ArcMap Geographic Information System (GIS) Software, Spatial Analyst

Data Limitations

Quality and availability of source data improved markedly since the original hazard mitigation plan was development though many limitations remain. Over time it is expected that hazard related information will continue to improve and will be included in future updates.

Notably, the Polk County Hazard Mitigation Team and local officials find limitations in the accuracy and level of detail available on Flood Insurance Rate Maps (FIRMs) for the planning area.

Also, National Climatic Data Center information is used extensively as a reporting mechanism for hazard events of various types. It should be noted however that damage descriptions and totals provided by this source is not necessarily a full accounting of local impacts, and further, damage totals for certain hazard events may cover multi-county regions and may or may not accurately reflect direct impacts in the planning area.

2.8 CONTINUED PUBLIC INVOLVEMENT

Requirement §201.6(c) (4) (iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

Throughout current and future planning cycles, city and county residents will be canvassed to solicit local information, continuing Polk County's dedication to involving the public directly in annual review and cyclical updates of this Plan. In addition to the annual monitoring and evaluation meetings of the HMT, meetings will be scheduled as deemed necessary by the Polk County Office of Emergency Management to provide a forum for which the public can express its concerns, opinions, or ideas about the Plan and/or its implementation. The HMT will publicize meetings under standard public notice procedures and through local media outlets.

Attendance at the HMT meetings is just the first level of public involvement planned for the local planning process. Members of the HMT were encouraged to not only invite members of the public and local experts to future meetings, but also to carry on a dialogue outside of the formal meetings to develop a more comprehensive picture of the needs and concerns of county residents related to natural hazards and mitigation planning.

Copies of this Plan will be catalogued and kept at all appropriate agencies and will be accessible on the Polk County Emergency Management website. There are also several mitigation action items that have been designed with involvement from the public in mind.

Many of the effects of natural hazards can be lessened by simply educating members of the public on actions they can take to minimize danger to themselves and their possessions. It is anticipated that these strategies will help develop ownership by the public in the Plan, and that future iterations of the Plan will include strategies that are developed via high levels of public participation.

Polk County is dedicated to involving the public directly in review and updates of the Mitigation Plan. The HMT members are responsible for the annual review and update of the Plan. The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all of the appropriate agencies in the County. The existence and location of these copies will be publicized in the Polk County Enterprise.

The Plan also includes the address and the phone number of the Polk County Office of Emergency Management responsible for keeping track of public comments on the Plan. In addition, copies of the Plan and any proposed changes will be posted on the Polk County Emergency Management website. A public meeting will also be held after each annual evaluation or when deemed necessary by the HMT. The meetings will provide the public a forum for which they can express their concerns, opinions, or ideas about the Plan. The Polk County Office of Emergency Management will be responsible for using county resources to publicize the annual public meetings and maintain public involvement through the Polk County Emergency Management website, and newspapers.

CHAPTER 3. RISK ASSESSMENT

44 CFR Requirement §201.6(c) (2)
[The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The purpose of the risk assessment is to identify and describe the hazards that affect the planning area and to inventory and analyze potential losses for human life and material assets. Through a better understanding of potential hazards and the degree of risk they pose to the participating jurisdictions, more successful mitigation strategies can be developed and implemented.

This risk assessment follows the four-step process described in the FEMA publication 386-2, *Understanding Your Risks: Identifying Hazards and Estimating Losses* (2002), listed as follows:

- Identify Hazards
- Profile Hazard Events
- Inventory Assets
- Estimate Losses

This chapter is organized into three (3) sections that address the risk assessment process.

Section 3.1 Identifying Hazards lists the hazards that were considered and ultimately profiled in the Plan and the methods, definitions and data sources used for the hazard identification and profile process.

Section 3.2 Multi-Jurisdiction Risk Assessment – Exposure outlines primary hazard risk vulnerability factors for each of the cities participating in this plan as differentiated from the county overall in addition to a countywide overview of risk exposure. It includes potentially vulnerable assets in the planning area. Other subsections of the vulnerability assessment include inventories of repetitive loss properties; National Flood Insurance Program flood insurance claims; potential dollar loss estimates; land use and development trends; and vulnerable structures.

Section 3.3 Hazard Profiles presents a detailed outline for each identified hazard. Each hazard profile is addressed as a Plan subsection and includes a general description; the affected geographic area; discussion of previous occurrences; probability of future occurrence; magnitude and severity; assessment of overall vulnerability to each hazard.

3.1 IDENTIFYING HAZARDS

44 CFR Requirement §201.6(c) (2) (i)
[The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

Natural hazards do not affect all portions of Polk County equally. The planning teams of each participating jurisdiction analyzed past occurrences and the potential for future occurrences of natural hazards to determine which hazards will be included in this Plan. The chart that follows displays the results of this analysis and displays the hazards that each participant will address in this Plan.

Hazard Type	Polk County	Corrigan	Goodrich	Livingston	Onalaska	Seven Oaks
Wildfire	X	X	X	X	X	X
Flood	X	X	X	X	X	X
Thunderstorm Wind	X	X	X	X	X	X
Tornado	X	X	X	X	X	X
Hurricane	X	X	X	X	X	X
Lightning	X	X	X	X	X	X
Winter Storm	X	X	X	X	X	X
Hail	X	X	X	X	X	X
Drought	X	X	X	X	X	X
Extreme Heat	X	X	X	X	X	X
Earthquake	X	X	X	X	X	X

Source: Hazard Mitigation Taskforce

- Land subsidence is not addressed in this document due to a lack of history of impacts to buildings, public safety, or infrastructure.
- Coastal erosion is not addressed due to geographic location.
- Dam failure is not discussed as a separate category from flooding, but rather regarded as a related component of a flood event.
- Riverine Erosion is discussed as a component of flooding.
- Historically no critical assets impacted by hailstorm in Onalaska, and therefore risk is considered negligible but not non-existent.

3.1.1 Methods and Definitions

44 CFR Requirement §201.6(c) (2) (i):
[The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Hazard profiles in Section 3.2 were developed from information provided by the State of Texas Hazard Mitigation Plan, FEMA, the National Weather Service, the previous version of the Plan, and other referenced sources. Geographic information is provided for each hazard based on information on the impact areas of previous occurrences. For many hazards including drought, excessive heat, hurricane, thunderstorm, etc., geographic location of impacts is potentially any location in the county and is noted accordingly.

A common set of definitions/classifications was established for the probability of future hazard occurrences and the magnitude and severity of impacts for the purpose of describing the identified hazards in a quantitative and qualitative way (to the extent that data allows). Every effort is made to use these definitions strictly and consistently but note that some degree of overlap and generalizations may be present.

Classifications used to categorize probability of future occurrence were based on statistical assessments of previous occurrences (or recurrence interval) and equated to a percent probability of occurrence in a given year whenever possible. Probability of future occurrence classifications used for this Plan are listed below and summarized in Section 3.3, Table 3-2.

Figure 3-1 Probability of Future Occurrence Classifications

- **High -** Greater than 50 percent probability of occurrence in a given year
- **Medium -** 10 to 50 percent probability of occurrence in a given year
- **Low –** Less than 10 percent probability of occurrence in a given year

Potential magnitude and severity for each hazard is classified based on a scenario where the most extreme documented event occurs in modern times. It is acknowledged here that the categories established may involve some degree of overlap and therefore classification of hazards in this manner is inherently subjective. The magnitude and severity classifications used in the hazard profiles for this Plan are listed below and summarized in Section 3.3, Table 3-2.

Figure 3-2 Magnitude and Severity and Extent Classifications

- **Level 4-Catastrophic**—Severe property damage on a regional or metropolitan scale; shutdown of critical facilities, utilities & infrastructure for extended periods, and/or multiple injuries/fatalities
- **Level 3-Critical**—Severe property damage on a neighborhood scale; temporary shutdown of critical facilities, utilities and infrastructure, and/or injuries or fatalities
- **Level 2-Limited**—Isolated occurrences of moderate to severe property damage; brief shutdown of critical facilities, utilities and infrastructure, and/or potential injuries
- **Level 1-Negligible**— Isolated occurrences of minor property damage; minor disruption of critical facilities, utilities and infrastructure, and/or potential minor injuries

Definitions for overall vulnerability are subjective and based primarily on future probability and severity, with additional considerations for potential impacts to special needs populations and the location of buildings, critical facilities and infrastructure. Note: vulnerability classification criteria are general and may involve some degree of overlap. Definitions for overall vulnerability classifications used in this plan are listed below and summarized in Section 3.3, Table 3-1.

Figure 3-3 Overall Vulnerability Classifications

- **High Vulnerability**—High probability of occurrence and Level-3 or Level-4 potential severity.
- **Moderate Vulnerability**— Moderate/high probability and Level-1 or Level-2 potential severity
- **Low Vulnerability**— Low probability and Level-1 or Level-2 potential severity

3.1.2 Data Sources and Data Limitations

Data Sources

Since the original hazard mitigation plan for Polk County was developed (2005-2006), there have been significant advances in the availability of data relevant to risk and vulnerability assessment. In addition to information reported in the original version of hazard mitigation plan, the majority of information contained in the Hazard Profiles and Vulnerability Assessment sections came from the following agencies, plans, technical documents and data sources:

Agency Sources:

- Federal Emergency Management Agency (FEMA)
- Texas Division of Emergency Management (TDEM)
- National Flood Insurance Program (NFIP)
- National Weather Service-Houston (NWS)
- National Oceanic and Atmospheric Administration (NOAA)
- National Center for Environmental Information (NCEI)
- National Climatic Data Center (NCDC)
- National Severe Storms Laboratory (NSSL)
- National Inventory of Dams (NID)
- U.S. Geological Survey (USGS)
- National Hurricane Center
- Local and regional media (current and historical)
- Participating jurisdictions

Technical Documents and Plans:

- Federal Emergency Management Agency (FEMA). Publication 386-2, *Understanding Your Risks: Identifying Hazards and Estimating Losses*
- FEMA Flood Insurance Study: Polk County Texas and Incorporated Communities (Effective September 29, 2010)
- State of Texas Hazard Mitigation Plan (2013 Edition)

Software and Analysis Tools:

- FEMA 'D-FIRM' Flood Insurance Rate Map Shapefile
- ArcMap Geographic Information System (GIS) Software, Spatial Analyst

Data Limitations

Quality and availability of source data improved markedly since the original hazard mitigation plan was developed though many limitations remain. Over time it is expected that hazard related information will continue to improve and will be included in future updates.

Notably, the use of FEMA's HAZUS Loss Estimation software involved analysis of data derived from the U.S. Census Bureau at the Census Block level, and potential flooding impacts were derived from hydrologic analysis at an approximate scale.

The resulting maps and information may represent potential impacts that vary significantly from previous disaster occurrences.

Also, National Climatic Data Center information is used extensively as a reporting mechanism for hazard events of various types. It should be noted however that damage descriptions and totals provided by this source is not necessarily a full accounting of local impacts, and further, damage totals for certain hazard events may cover multi-county regions and may or may not accurately reflect direct impacts in the planning area.

3.2 RISK ASSESSMENT - EXPOSURE

44 CFR Requirement §201.6(c) (2) (ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c) (2) (i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Overall vulnerability to each hazard was based on assessments of previous and potential occurrences regarding the scale of geographic area affected, future probability, and severity of impact considering a worst-case scenario. Factors including risk exposure of special needs populations, medical special-needs populations, the location of critical facilities, and key infrastructure were also considered.

Relative to many geographic regions of the U.S., overall vulnerability to natural hazard impacts is substantial for the region of East Texas that includes the planning area. For Polk County, vulnerability by hazard type varies widely.

Based on these factors and the definitions established in Subsection 3.1.1 (listed below in the table notes), Table 3-1 below shows the Hazard Mitigation Team's assessment of overall vulnerability to each of the identified hazards and categories of primary impacts (classified as human, property, infrastructure, economy, and/or environment).

Table 3-1 Overall Vulnerability and Impact by Hazard Type

HAZARD TYPE	VULNERABILITY	PRIMARY IMPACT CATEGORIES
Flood	High	Property, Infrastructure, Public Safety
Hurricane	High	Public Safety, Property, Infrastructure
Tornado	High	Public Safety, Property, Infrastructure
Thunderstorm Winds	High	Public Safety, Property, Infrastructure
Wildfire	High	Public Safety, Property, Infrastructure, Economy
Winter Storm	Moderate	Property, Infrastructure
Lightning	Moderate	Property, Public Safety, Infrastructure
Drought	Moderate	Public Safety, Property, Infrastructure, Economy
Earthquake	Low	Public Safety, Economy, Infrastructure
Hail	Low	Property
Extreme Heat	Low	Public Safety, Property, Infrastructure

Source: Polk County Hazard Mitigation Team

Notes: Overall vulnerability classifications are defined as follows:
High— Moderate/high probability of future occurrence and potentially critical severity.
Moderate— Moderate/high probability of future occurrence and limited potential severity.
Low— Low/moderate probability of future occurrence and negligible/limited potential severity

Table 3-2 on page 49 summarizes the probability of occurrence and magnitude and severity assessments from the individual hazard profiles detailed in Subsections 3.2.1 through 3.2.11.

3.2.1 Risk Assessment Per Jurisdiction

44 CFR Requirement §201.6(c) (2) (ii) (B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c) (2) (ii) (A) of this section and a description of the methodology used to prepare the estimate ….*

An important component of the county's hazard mitigation strategy is to estimate potential damage as a way of targeting high priority mitigation projects. In this analysis, estimates of potential economic losses are expressed in dollar terms and based on the best available data.

Due to the location of the planning area within a region of the U.S. that experiences relatively frequent hazard events with catastrophic magnitude and geographic scale, all structures in Polk County can be considered vulnerable to disaster impacts. A subset of the complete inventory of structures in the planning area are those with unique propensity to damage from hazard events, either due to architectural design, building material type, location, or combination of factors.

Potential damages are estimated using a 'probable worst-case scenario' for each hazard type. This subjective approach estimates losses resulting from the most severe occurrence within roughly a 0 to 99 percent probability parameter (less than 1 percent of major occurrences would exceed estimated severity). This definition excludes extraordinary events such as super-volcanos or asteroid impact, but includes the vast majority of realistic potential major event scenarios.

Table 3-2 gives an approximation of total structures vulnerable to hazard impact by type. These estimates reflect a combination of vulnerability based on location as well as structural vulnerability. Similar to potential dollar loss, these vulnerable structure estimates are premised on a 'most likely worst-case scenario', a subjective approach that estimates losses resulting from the most severe event occurrence possible within roughly a 0-99 percent probability parameter. This definition was developed to exclude farfetched, though theoretically possible, estimates that exceed rational analysis for mitigation purposes.

Differentiation of damages for residential, commercial, industrial development types was not developed. For some hazards such as winter storm, all structures in the geographic region are affected to some extent, but a relatively small percentage could be expected to sustain actual damage. For other hazards such as hail, drought, and extreme heat, structures are not impacted to a measurable degree. Other hazards such as hurricanes and earthquakes affect broad regions when they occur, and others such as flooding have more clearly defined areas of potential impact.

Table 3-2 Potential Structure Impacts and Potential Vulnerability per Hazard Type: Maximum Credible Scenario

Polk County							
Hazard	**Total Improved Parcels (#)**	**Median Parcel Improvement Value ($)**	**Maximum Structures Potentially Impacted (%)**	**Structures Potentially Impacted (#)**	**Max-Avg Damage Factor (%)**	**Estimated Potential Structure Damage ($)**	**Estimated Population Impacted**
Hurricane	23,994	$50,443	40.0%	9,598	50.0%	$242,065,868	19,196
Tornado	23,994	$50,443	10.0%	2,399	80.0%	$96,826,347	4,798
Flood	23,994	$50,443	15.0%	3,599	50.0%	$90,774,701	7,198
T-Storm Wind	23,994	$50,443	10.0%	2,399	30.0%	$36,309,880	4,798
Earthquake	23,994	$50,443	10.0%	2,399	20.0%	$24,206,587	4,798
Wildfire	23,994	$50,443	2.0%	480	80.0%	$19,365,269	960
Winter Storm	23,994	$50,443	10.0%	2,399	5.0%	$6,051,647	4,798
Lightning	23,994	$50,443	0.1%	24	10.0%	$121,033	48
Drought	23,994	$50,443	0.0%	0	0.0%	$0	23,994
Extreme Heat	23,994	$50,443	0.0%	0	0.0%	$0	23,994
Hail	23,994	$50,443	0.0%	0	0.0%	$0	48

Sources: PCAD (data); HMT (analysis). Notes: Total improved parcels includes semi-developed and non-residential, resulting in a higher total of improved parcels than total housing units (23,400), and median parcel improvement value somewhat lower than median housing unit value of $81,200 countywide. Total value of structure improvement (total, all jurisdictions) = $2,011,513,639. Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to county total population at any given time.

Corrigan							
Hazard	Total Improved Parcels (#)	Median Parcel Improvement Value ($)	Maximum Structures Potentially Impacted (%)	Structures Potentially Impacted (#)	Max-Avg Damage Factor (%)	Estimated Potential Structure Damage ($)	Estimated Population Impacted
Tornado	1,018	$51,279	50.0%	509	80.0%	$20,880,809	1,018
Wildfire	1,018	$51,279	20.0%	204	80.0%	$8,352,324	408
Hurricane	1,018	$51,279	30.0%	305	50.0%	$7,830,303	610
Flood	1,018	$51,279	10.0%	102	50.0%	$2,610,101	204
T-Storm Wind	1,018	$51,279	10.0%	102	30.0%	$1,566,061	204
Earthquake	1,018	$51,279	10.0%	102	20.0%	$1,044,040	204
Winter Storm	1,018	$51,279	10.0%	102	5.0%	$261,010	204
Lightning	1,018	$51,279	0.5%	5	10.0%	$26,101	10
Drought	1,018	$51,279	0.0%	0	0.0%	$0	1,018
Extreme Heat	1,018	$51,279	0.0%	0	0.0%	$0	1,018
Hail	1,018	$51,279	0.0%	0	0.0%	$0	10

Sources: PCAD (data); HMT (analysis). Note: Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to city's total population at any given time.

Goodrich							
Hazard	Total Improved Parcels (#)	Median Parcel Improvement Value ($)	Maximum Structures Potentially Impacted (%)	Structures Potentially Impacted (#)	Max-Avg Damage Factor (%)	Estimated Potential Structure Damage ($)	Estimated Population Impacted
Tornado	307	$45,182	50.0%	154	80.0%	$5,548,350	308
Hurricane	307	$45,182	45.0%	138	50.0%	$3,120,947	276
Flood	307	$45,182	20.0%	61	50.0%	$1,387,087	122
T-Storm Wind	307	$45,182	20.0%	61	30.0%	$832,252	122
Wildfire	307	$45,182	5.0%	15	80.0%	$554,835	30
Earthquake	307	$45,182	10.0%	31	20.0%	$277,417	62
Winter Storm	307	$45,182	10.0%	31	5.0%	$69,354	62
Lightning	307	$45,182	0.5%	2	10.0%	$6,935	4
Drought	307	$45,182	0.0%	0	0.0%	$0	307
Extreme Heat	307	$45,182	0.0%	0	0.0%	$0	307
Hail	307	$45,182	0.0%	0	0.0%	$0	4

Sources: PCAD (data); HMT (analysis). Note: Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to city's total population at any given time.

Onalaska							
Hazard	Total Improved Parcels (#)	Median Parcel Improvement Value ($)	Maximum Structures Potentially Impacted (%)	Structures Potentially Impacted (#)	Max-Avg Damage Factor (%)	Estimated Potential Structure Damage ($)	Estimated Population Impacted
Hurricane	1,669	$65,587	50.0%	835	50.0%	$27,366,176	1,670
Tornado	1,669	$65,587	15.0%	250	80.0%	$13,135,764	500
Wildfire	1,669	$65,587	15.0%	250	80.0%	$13,135,764	500
T-Storm Wind	1,669	$65,587	20.0%	334	30.0%	$6,567,882	668
Flood	1,669	$65,587	10.0%	167	50.0%	$5,473,235	334
Earthquake	1,669	$65,587	10.0%	167	20.0%	$2,189,294	334
Winter Storm	1,669	$65,587	10.0%	167	5.0%	$547,324	334
Lightning	1,669	$65,587	0.5%	8	10.0%	$54,732	16
Drought	1,669	$65,587	0.0%	0	0.0%	$0	1,669
Extreme Heat	1,669	$65,587	0.0%	0	0.0%	$0	1,669
Hail	1,669	$65,587	0.0%	0	0.0%	$0	16

Sources: PCAD (data); HMT (analysis). Note: Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to city's total population at any given time.

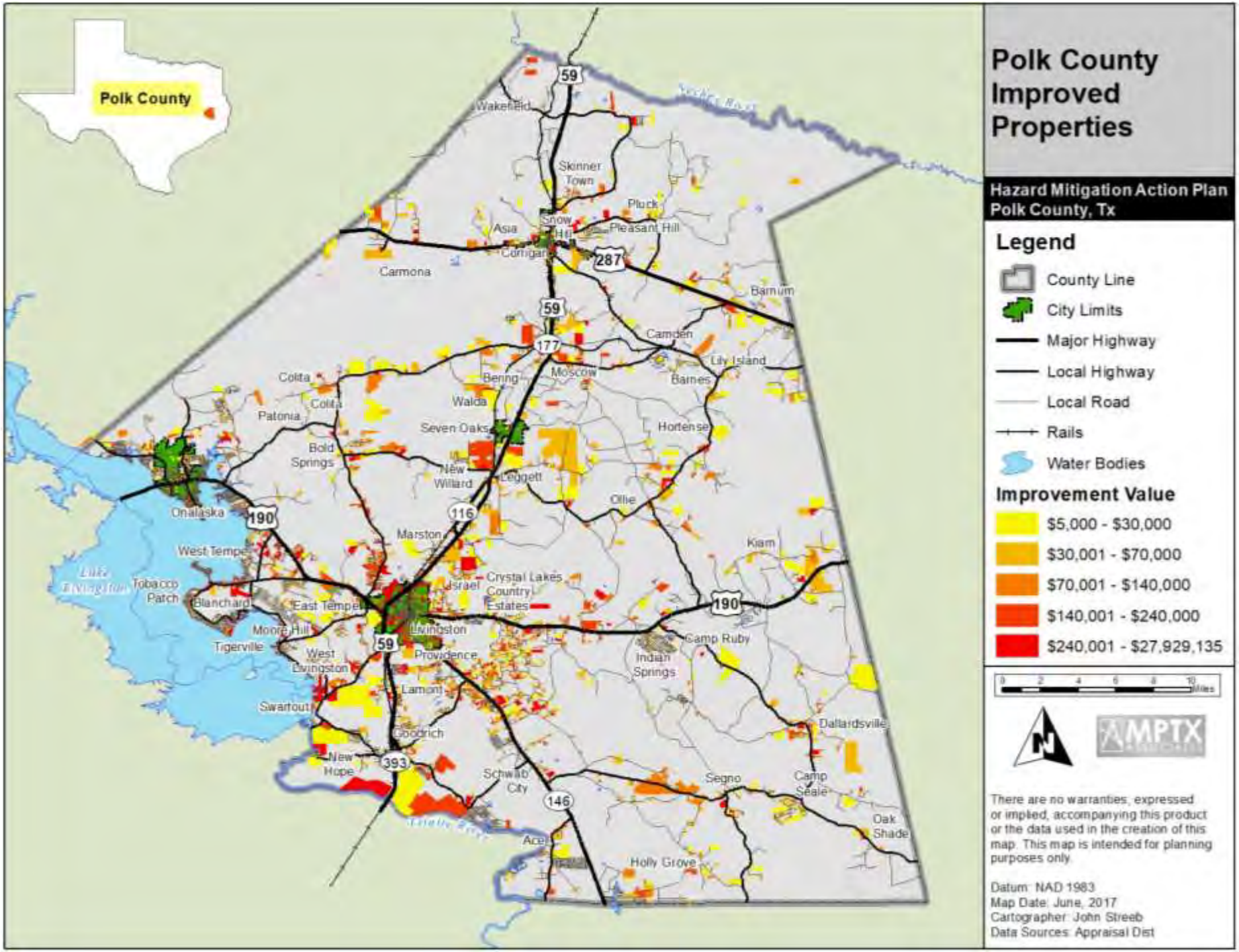
Livingston							
Hazard	**Total Improved Parcels (#)**	**Median Parcel Improvement Value ($)**	**Maximum Structures Potentially Impacted (%)**	**Structures Potentially Impacted (#)**	**Max-Avg Damage Factor (%)**	**Estimated Potential Structure Damage ($)**	**Estimated Population Impacted**
Hurricane	3,509	$103,137	50.0%	1,755	50.0%	$90,476,933	3,510
Tornado	3,509	$103,137	15.0%	526	80.0%	$43,428,928	1,052
Flood	3,509	$103,137	15.0%	526	50.0%	$27,143,080	1,052
T-Storm Wind	3,509	$103,137	20.0%	702	30.0%	$21,714,464	1,404
Wildfire	3,509	$103,137	5.0%	175	80.0%	$14,476,309	350
Earthquake	3,509	$103,137	10.0%	351	20.0%	$7,238,155	702
Winter Storm	3,509	$103,137	10.0%	351	5.0%	$1,809,539	702
Lightning	3,509	$103,137	0.5%	18	10.0%	$180,954	36
Drought	3,509	$103,137	0.0%	0	0.0%	$0	3,509
Extreme Heat	3,509	$103,137	0.0%	0	0.0%	$0	3.509
Hail	3,509	$103,137	0.0%	0	0.0%	$0	36

Sources: PCAD (data); HMT (analysis). Note: Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to city's total population at any given time.

Seven Oaks							
Hazard	**Total Improved Parcels (#)**	**Median Parcel Improvement Value ($)**	**Maximum Structures Potentially Impacted (%)**	**Structures Potentially Impacted (#)**	**Max-Avg Damage Factor (%)**	**Estimated Potential Structure Damage ($)**	**Estimated Population Impacted**
Tornado	179	$60,700	35.0%	63	80.0%	$3,042,284	126
Wildfire	179	$60,700	35.0%	63	80.0%	$3,042,284	126
Hurricane	179	$60,700	40.0%	72	50.0%	$2,173,060	144
Flood	179	$60,700	15.0%	27	50.0%	$814,898	54
T-Storm Wind	179	$60,700	20.0%	36	30.0%	$651,918	72
Earthquake	179	$60,700	10.0%	18	20.0%	$217,306	36
Winter Storm	179	$60,700	10.0%	18	5.0%	$54,327	36
Lightning	179	$60,700	0.5%	1	10.0%	$5,433	2
Drought	179	$60,700	0.0%	0	0.0%	$0	179
Extreme Heat	179	$60,700	0.0%	0	0.0%	$0	179
Hail	179	$60,700	0.0%	0	0.0%	$0	2

Sources: PCAD, US Census (data); HMT (analysis). Note: Defining potential impact as potential to influence, population potentially impacted by all listed hazard types is equal to city's total population at any given time.

The map on the following page shows all property parcels with improvement values greater than $5,000. This threshold was chosen to represent properties with improvement assets most at risk from hazard impacts.


Polk County
Polk County Improved Properties
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
Improvement Value
$5,000 - $30,000
$30,001 - $70,000
$70,001 - $140,000
$140,001 - $240,000
$240,001 - $27,929,135
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: Appraisal Dist
Wakefield
Skinner Town
Pluck
Snow Hill
Asia
Pleasant Hill
Corrigan
Carmona
Barnum
Camden
Lily Island
Moscow
Barnes
Colita
Benng
Walda
Patonia
Seven Oaks
Hortense
Bold Springs
New Willard
Leggett
Ollie
Onalaska
Marston
West Tempe
Kiam
Crystal Lakes Country Estates
Israel
Tobacco Patch
Blanchard
East Tempe
Livingston
Moore Hill
Tigerville
West Livingston
Providence
Camp Ruby
Indian Springs
Lamont
Swartout
Goodrich
Dallardsville
New Hope
Schwab City
Segno
Camp Seale
Oak Shade
Ace
Holly Grove
59
287
177
190
116
393
146

Regarding hazard impacts to infrastructure, the following table presents an outline of estimated impacts per jurisdiction.

Table 3-2A Potential Infrastructure Impacts per Hazard Type: Maximum Credible Scenario

Hazard Type	Polk County % Infrastructure Impact	Corrigan % Infrastructure Impact	Goodrich % Infrastructure Impact	Livingston % Infrastructure Impact	Onalaska % Infrastructure Impact	Seven Oaks % Infrastructure Impact	Notes
Hurricane	40.0%	30.0%	40.0%	40.0%	40.0%	40.0%	Power, roads
Tornado	20.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Power, roads
Flood	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	Roads, water, waste-water
T-Storm Wind	60.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Power, roads
Earthquake	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	Power, roads, water, waste-water
Wildfire	2.0%	10.0%	10.0%	10.0%	10.0%	10.0%	Power, roads
Winter Storm	60.0%	80.0%	80.0%	80.0%	80.0%	80.0%	Power, water, roads
Lightning	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	Power
Drought	10.0%	80.0%	80.0%	40.0%	80.0%	80.0%	Water
Extreme Heat	2.0%	5.0%	5.0%	5.0%	5.0%	5.0%	Power, roads, buildings (minor)
Hail	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	Minor infrastructure impact

Source: HMT estimates.

Table 3-2B Potential Environment Impacts per Hazard Type: Maximum Credible Scenario

Hazard Type	Polk County % Environment Impact	Corrigan % Environment Impact	Goodrich % Environment Impact	Livingston % Environment Impact	Onalaska % Environment Impact	Seven Oaks % Environment Impact	Notes
Hurricane	10.0%	20.0%	30.0%	30.0%	30.0%	30.0%	Trees
Tornado	1.0%	20.0%	20.0%	20.0%	20.0%	20.0%	Trees
Flood	25.0%	20.0%	20.0%	20.0%	20.0%	20.0%	Water quality, trees, erosion
T-Storm Wind	10.0%	30.0%	30.0%	30.0%	30.0%	30.0%	Trees
Earthquake	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	Minor
Wildfire	50.0%	80.0%	80.0%	80.0%	80.0%	80.0%	Smoke, trees, wildlife
Winter Storm	10.0%	15.0%	15.0%	15.0%	15.0%	15.0%	Trees, wildlife
Lightning	0.1%	1.0%	1.0%	1.0%	1.0%	1.0%	Minor
Drought	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	Trees, wildlife
Extreme Heat	5.0%	10.0%	10.0%	10.0%	10.0%	10.0%	Trees, wildlife
Hail	0.1%	1.0%	1.0%	1.0%	1.0%	1.0%	Minor

Source: HMT estimates.

Table 3-2C Overall Potential Relative Vulnerability per Hazard Type: Maximum Credible Scenario

Hazard Type	Polk County Overall Relative Vulnerability	Corrigan Overall Relative Vulnerability	Goodrich Overall Relative Vulnerability	Livingston Overall Relative Vulnerability	Onalaska Overall Relative Vulnerability	Seven Oaks Overall Relative Vulnerability
Hurricane	High	High	High	High	High	High
Tornado	High	High	High	High	High	High
Flood	High	High	High	High	High	High
T-Storm Wind	High	High	High	High	High	High
Wildfire	High	High	High	High	High	High
Winter Storm	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Lightning	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Drought	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Extreme Heat	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Earthquake	Low	Low	Low	Low	Low	Low
Hail	Low	Low	Low	Low	Low	Low

Source: HMT estimates. Note: see also data presented in Section 3.3 Hazard Profiles.

Table 3-2D Vulnerability Analysis by Population

Jurisdiction	Total Population	Under 5 (#)	Percent Under Age 5	Over 85 (#)	Percent Over Age 85
Polk County	46,583	2,520	5.4%	723	1.6%
Corrigan	1,762	134	7.6%	14	0.8%
Goodrich	294	4	1.4%	0	0.0%
Livingston	5,144	225	4.4%	147	2.9%
Onalaska	2,755	149	5.4%	29	1.1%
Seven Oaks	124	9	7.3%	0	0.0%

Source: American Community Survey 2016

3.2.2 Repetitive Loss Properties – NFIP Flood Insurance Claims

44 CFR Requirement §201.6(c) (2) (ii): *[The risk assessment]* ***must*** *also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.*

National Repetitive Loss Strategy

The National Flood Insurance Program (NFIP) has developed a strategy to mitigate future losses related to repetitive loss properties. The primary objective of the Repetitive Loss Properties Strategy is to eliminate or reduce the damage to property and the disruption of life caused by repeated flooding of the same properties. A specific target group of repetitive loss properties is identified and serviced separately from other NFIP policies by the Special Direct Facility (SDF). The target group includes every NFIP-insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced:

- Four or more paid flood losses of more than $1,000 each; or
- Two paid flood losses within a 10-year period that, in the aggregate, equal or exceed the current value of the insured property; or
- Three or more paid losses that, in the aggregate, equal or exceed the current value of the insured property.

Loss history is determined by counting all flood claims paid on an insured property, regardless of any change(s) of ownership, since the building's construction. Target group policies are afforded coverage, whether new or renewal, only through the SDF. Property owners affected by the repetitive loss strategy are notified at least 90 days before the policy renewal date. Affected property owners and their flood insurance agents are sent notice stating that the policy is ineligible for renewal and offering renewal in the SDF.

If a property owner agrees to undertake appropriate mitigation measures, the property will be removed from the target group at the next renewal, and the policy then will be transferred from the SDF to the insurance company that previously serviced the policy. Depending on individual circumstances, appropriate mitigation measures commonly include elevating buildings above the level of the base flood, demolishing buildings, and removing buildings from the Special Flood Hazard Area (SFHA).

National and State Repetitive Loss Information

As noted in the flooding hazard profile, the planning area has experienced major flood events numerous times, threatening public safety, damaging property and infrastructure, and slowing the economy for extended periods. One of the larger concerns from a mitigation standpoint is repetitive loss properties. As defined above, a property is considered a repetitive loss property when there are 2 or more insured losses (flood insurance claims) reported which were paid more than $1,000 for each loss. The 2 losses must be within 10 years of each other and be at least 10 days apart. A property is considered a Severe Repetitive Loss (SRL) property either when there are at least 4 losses each exceeding $5,000, or when there are 2 or more losses where the payouts exceed the property value.

According to the Government Accounting Office, as of 2004, repetitive loss properties receive over 38 percent of claims dollars paid (approximately $200 million annually) but represent only 1 percent of all NFIP-insured properties. FEMA reports that as of 2007, approximately 9,000 properties in the U.S. meet the definition of severe repetitive loss properties. Out of the national total of severe repetitive loss properties, 1,500 (17 percent) are located in Texas, the second highest statewide total in the nation.

Polk County Repetitive Loss Information

Based on information reported through December 2016, 28 individual properties in Polk County have flood insurance claim histories that meet one or both definitions for repetitive losses or severe repetitive losses. 14 of these properties are located in the unincorporated Polk County, 12 are located in the City of Livingston, and 2 are located in the City of Corrigan. The available data indicates all of these properties are residential type. These 28 properties with repetitive loss history have made a total of 48 flood insurance claims (2.6 claims average).

Table 3-3 summarizes repetitive loss data for Polk County and amounts paid in insurance claims by category. All are residential type structures.

Table 3-3 Summary of Repetitive & Severe Repetitive Loss Claims, Polk County

# of RL/SRL Properties	# of Losses	Total Payments	Average Payment Per Loss	Average Total Payments Per Property
18	48	$974,251	$20,296	$54,125

Source: NFIP claim data, through December 2016

POLK COUNTY FLOOD INSURANCE CLAIM DATA

NOTE: City or community listed on the flood insurance claim may be located in a city zip code service area for addressing purposes only and may or may not indicate if that property is within the respective city limits (some city addresses may in fact be located in the unincorporated county). With that noted, the following table shows the number of claims per listed community address.

Table 3-4 Flood Insurance Claims per Community Address

Community	# of Flood Claims
Livingston address	70
Goodrich address	34
Onalaska address	18
Corrigan address	4
Ace address	2
Unincorporated address	2
Blanchard address	1
Taylor address	1

Source: NFIP claim data, through December 2016

A key method for capturing flood occurrence data is analysis of flood insurance claim records from National Flood Insurance Program (NFIP) reports on claim activity. Figure 3-5 on the following pages show general locations and dates of flood claims in Polk County for the period 1991-2016. NOTE: claims related to Hurricane Harvey Aug-Sept 2017 are not included in these totals.

Table 3-5 Polk County, Flood Insurance Claims Exceeding $2,000 (1991-2016)

Community Name	Record Type	City	St Cd	Zip Code	Dt of Loss	Total Paid
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	06/02/2016	41,636
POLK COUNTY*	CLM	GOODRICH	TX	77335	06/01/2016	2,593
POLK COUNTY*	CLM	GOODRICH	TX	77335	05/28/2016	59,199
POLK COUNTY*	CLM	CORRIGAN	TX	75939	05/27/2016	10,297
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/27/2016	2,166
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/27/2016	16,175
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/26/2016	10,649
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/02/2016	9,657
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/02/2016	36,227
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/01/2016	45,378
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/01/2016	41,727
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/30/2016	4,775
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/18/2016	2,615
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	12/18/2015	48,496

Community Name	Record Type	City	St Cd	Zip Code	Dt of Loss	Total Paid
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	11/03/2015	15,301
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/28/2015	29,030
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/27/2015	132,759
POLK COUNTY*	CLM	GOODRICH	TX	77335	05/23/2015	32,334
POLK COUNTY*	CLM	ONALASKA	TX	77360	05/12/2015	39,492
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/31/2013	15,670
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/30/2013	15,270
POLK COUNTY*	CLM	CORRIGAN	TX	75939	03/11/2012	61,485
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	02/03/2012	41,706
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	02/03/2012	3,194
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/29/2009	19,980
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/29/2009	3,403
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/22/2009	4,585
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/17/2009	12,693
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	09/13/2008	10,300
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	09/13/2008	25,429
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	09/13/2008	20,219
POLK COUNTY*	CLM	ONALASKA	TX	77360	09/13/2008	4,099
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/16/2006	8,787
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/16/2006	14,145
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/16/2006	59,967
POLK COUNTY*	CLM	CORRIGAN	TX	75939	11/17/2004	18,891
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	11/17/2004	75,000
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	07/01/2004	3,532
POLK COUNTY*	CLM	CORRIGAN	TX	75939	06/28/2004	6,796
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/01/2004	14,566
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/01/2004	19,949
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	05/01/2004	16,100
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	11/04/2002	12,873
POLK COUNTY*	CLM	GOODRICH	TX	77335	06/09/2001	11,271
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	06/09/2001	88,275
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	03/03/2001	6,290
POLK COUNTY*	CLM	ACE	TX	77326	03/01/2001	11,693
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/05/1999	49,621
POLK COUNTY*	CLM	GOODRICH	TX	77335	04/03/1999	34,352
POLK COUNTY*	CLM	GOODRICH	TX	77335	04/03/1999	34,684
POLK COUNTY*	CLM	HOLIDAY LAKE	TX	77590	04/03/1999	5,152
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/03/1999	12,471
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	04/03/1999	13,600
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	11/15/1998	15,934
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	11/14/1998	18,125
POLK COUNTY*	CLM	ONALASKA	TX	77360	11/13/1998	9,268
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	01/07/1998	11,756
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	03/18/1997	2,577
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	09/26/1996	12,600
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	12/18/1995	10,634
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/19/1994	22,800
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/18/1994	30,528
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/18/1994	7,729
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/18/1994	12,200
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/18/1994	2,102
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/18/1994	2,154
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	10/18/1994	66,121
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/18/1994	29,815
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/17/1994	28,475
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/17/1994	14,465
POLK COUNTY*	CLM	GOODRICH	TX	77355	10/17/1994	49,000
POLK COUNTY*	CLM	GOODRICH	TX	77834	10/17/1994	42,822
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/17/1994	11,300

Community Name	Record Type	City	St Cd	Zip Code	Dt of Loss	Total Paid
POLK COUNTY*	CLM	GOODRICH	TX	77335	10/17/1994	10,700
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/17/1994	50,873
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/17/1994	10,400
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/16/1994	12,276
POLK COUNTY*	CLM	ONALASKA	TX	77360	10/16/1994	19,468
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	06/27/1993	8,778
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	03/04/1992	9,474
POLK COUNTY*	CLM	GOODRICH	TX	77335	01/02/1992	8,061
POLK COUNTY*	CLM	GOODRICH	TX	77335	01/02/1992	9,336
POLK COUNTY*	CLM	GOODRICH	TX	77335	12/31/1991	12,908
POLK COUNTY*	CLM	LIVINGSTON	TX	77351	12/26/1991	20,161
				TOTAL (133 flood insurance claims)		**$1,921,020**

Source: NFIP claim data, through December 2016. Note: flood claims less than $2,000 are included in totals.

3.2.3 Critical Facilities and Infrastructure

44 CFR Requirement §201.6(c)(2)(ii)(A): *The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area*

During the planning process, the following critical facilities were identified as priorities for hardening and mitigation:

- **City of Livingston, Marsh Road, Water Treatment Plant: Road accessing water treatment plant for City of Livingston in need of shoring and reconstruction to assure access during hazard events.**
- **Polk County EOC: Storm Hardening.**
- **City Hall for Onalaska, Corrigan, Goodrich, Seven Oaks: Storm Hardening**
- **Various stretches of US Highway 59: Elevate**
- **Various county roads with frequent flooding impacts: Elevate**

Road Flooding

During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Road systems in Polk County are maintained by multiple jurisdictions. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Roads were hard hit during the Memorial Day Floods of 2015. The following chart summarizes damage from DR-4223.

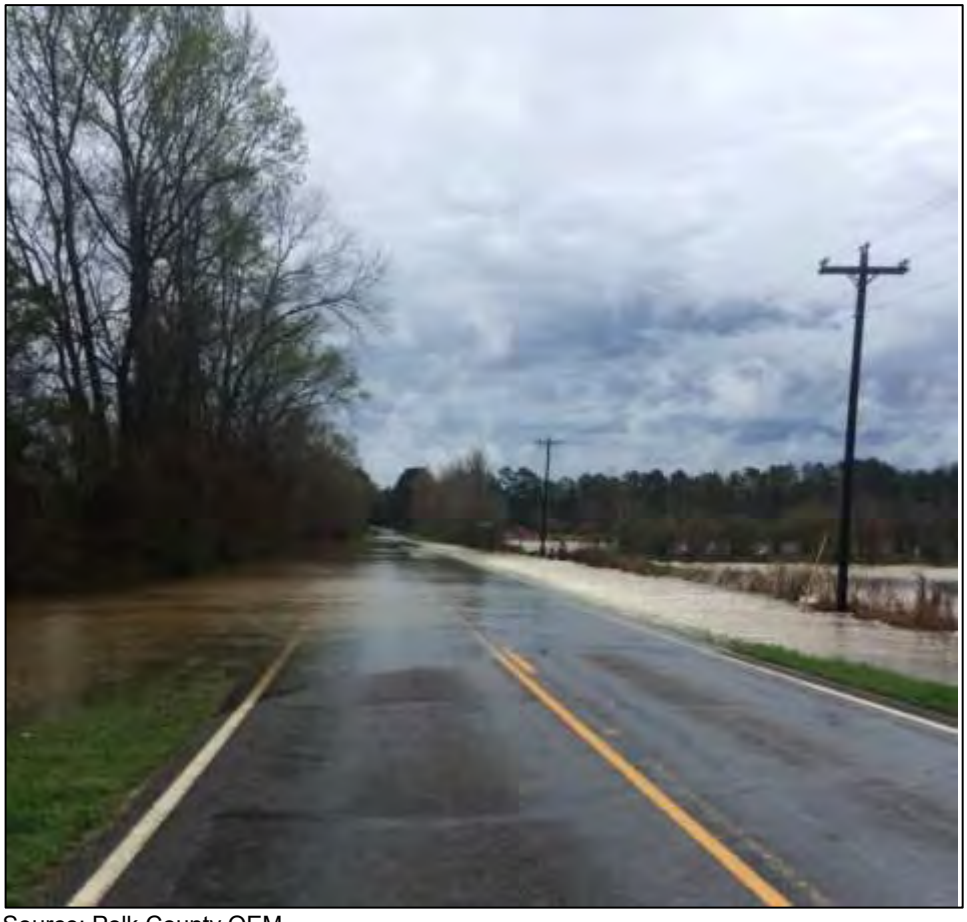
PRECINCT	CULVERT WASHED OUT	ROAD WASHED OUT	RETAINING WALL WASHED OUT		REPAIR COST
1	1	6			$56,286.23
2	2		1		$78,900.95
3	1	4			$59,454.27
4	5	25			$51,022.96
				Total road damage from DR-4223	$254,664.41

Source: FEMA Public Assistance, Project Worksheets (DR-4223)

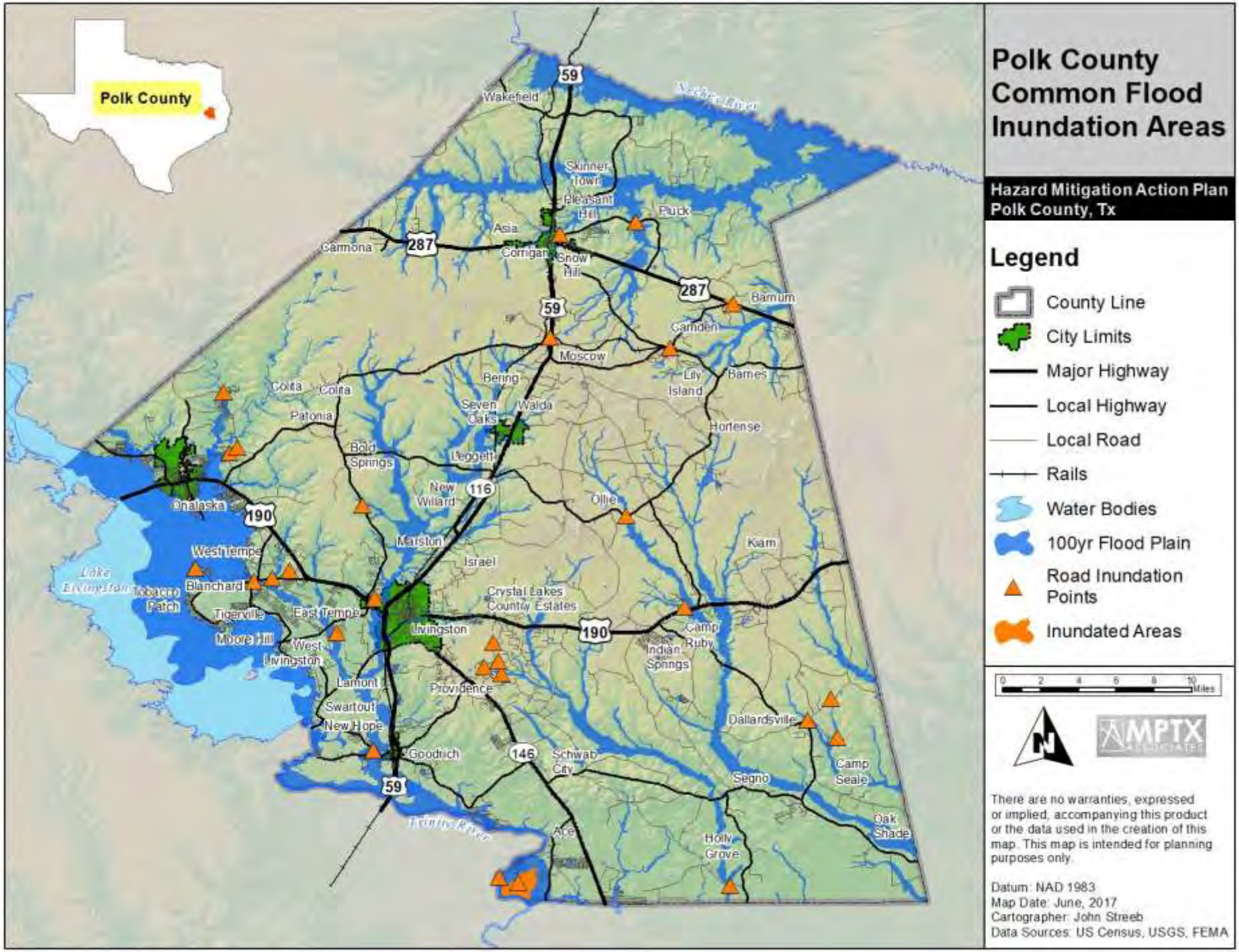
Source: Polk County OEM

Major flooding events occurred in May 2015, May 2016, and August 2017 following a number of relatively dry years from 2010-2014. The photos below shows water overtopping roadways in Polk County, followed by a map of frequently flooded roads countywide.

Source: Polk County OEM



Source: Polk County OEM

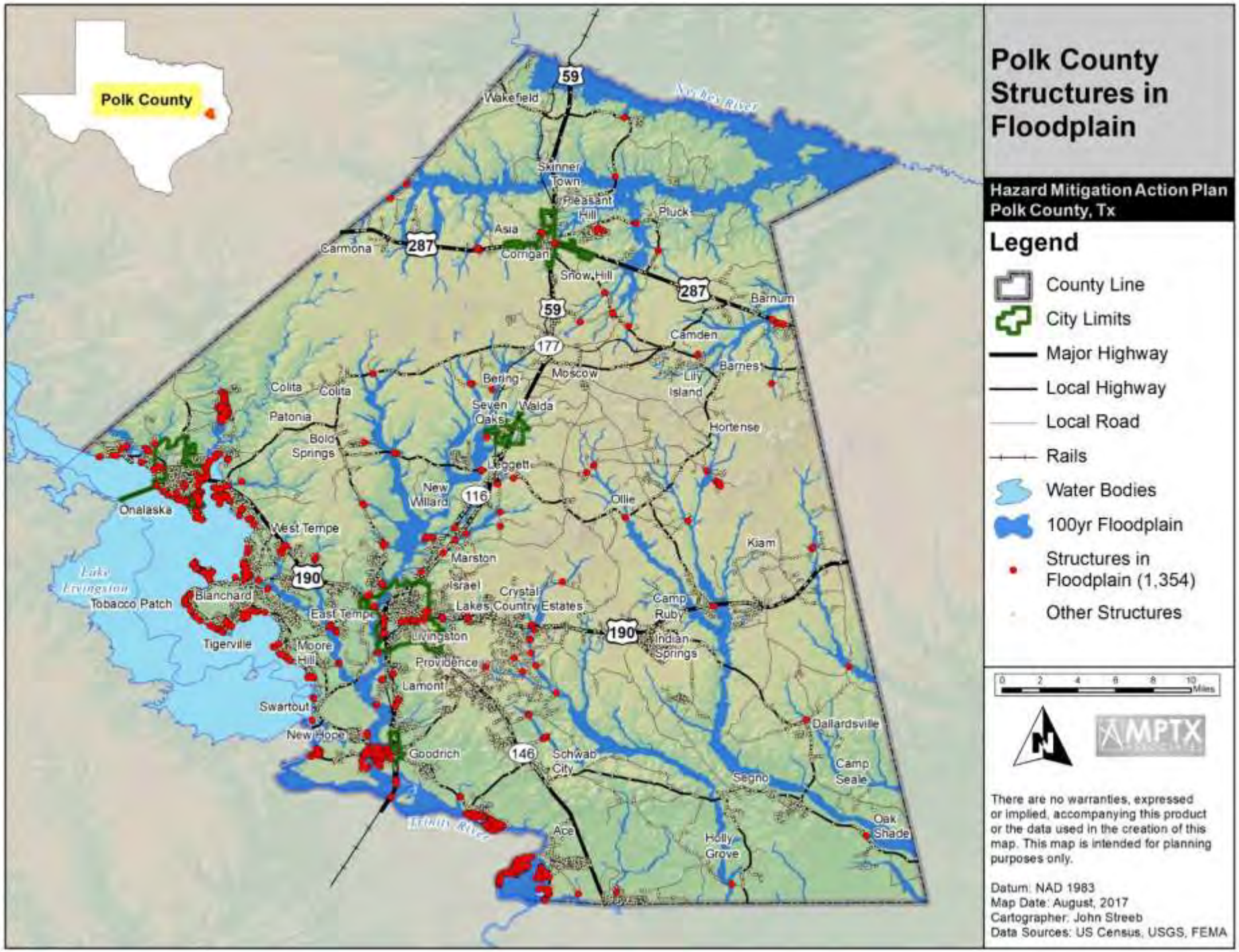

Polk County
Polk County Common Flood Inundation Areas
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
100yr Flood Plain
Road Inundation Points
Inundated Areas
0 2 4 6 8 10 Miles
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA
Wakefield
Skinner Town
Pleasant Hill
Asia
Corrigan
Snow Hill
Prock
Barnum
Camden
Moscow
Lily Island
Barnes
Hortense
Bering
Seven Oaks
Walda
Colita
Patonia
Bold Springs
Leggett
New Willard
Onalaska
West Tempe
Blanchard
Tobacco Patch
Tigerville
East Tempe
Moore Hill
West Livingston
Livingston
Marston
Israel
Crystal Lakes Country Estates
Ollie
Kiam
Camp Ruby
Indian Springs
Lamont
Providence
Swartout
New Hope
Goodrich
Schwab City
Dallardsville
Camp Seale
Segno
Oak Shade
Holly Grove
Ace
Lake Livingston
Trinity River
59
287
190
116
146

Vulnerable Structures (Floodplain)

The map on the following page shows location of address points in relation to the Flood Insurance Rate Maps (FIRMs) defined floodplain. Number of address points in the floodplain is calculated at 1,211, representing approximately 3.7 percent of total structures in the county. The following table is a detailed breakdown of structures in relation to floodplain areas. These totals vary slightly from those mapped on the following page due to slight variation in classification method and vintage of appraisal district data.

Location Category	Structures	Percent of Total
In floodway	138	0.4%
In 1-percent annual flood probability	1,211	3.7%
In 0.2-percent annual flood probability	87	0.3%
Total in all floodplain areas	1,298	4.0%
Outside floodplain	31,409	96.0%
Total	32,707	100.0%

Source: FEMA (floodplain); Polk Central Appraisal District (address points)


Polk County
Polk County Structures in Floodplain
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
100yr Floodplain
Structures in Floodplain (1,354)
Other Structures
0 2 4 6 8 10 Miles
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: August, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA
Wakefield
Skinner Town
Pleasant Hill
Pluck
Asia
Carmona
Corrigan
Snow Hill
Barnum
Camden
Moscow
Lily Island
Barnes
Bering
Colita
Patonia
Bold Springs
Seven Oaks
Walda
Hortense
Leggett
New Willard
Ollie
Onalaska
West Tempe
Marston
Kiam
Lake Livingston
Tobacco Patch
Blanchard
Israel
Crystal Lakes
Country Estates
Camp Ruby
East Tempe
Livingston
Indian Springs
Tigerville
Moore Hill
Providence
Lamont
Swartout
New Hope
Goodrich
Schwab City
Dallardsville
Camp Seale
Segno
Oak Shade
Ace
Holly Grove
Trinity River
59
287
177
116
190
146

3.2.4 Land Use and Development Trends

44 CFR Requirement §201.6(c) (2) (ii) (C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Polk County Permit Office records indicate there have been eight (8) new commercial structures and 117 new residential structures built in the floodplain since 2012.

This new development brings the overall county total of structures in the floodplain to 1,575, representing approximately 6 to 7 percent of the total housing units in the planning area.

The table below shows an overall development profile for Polk County.

Development Profile, Polk County: Value Range per Structure Type (2017)

Improvement Values	Number	Typical
More than $1,000,000	83	Commercial, Institutional (large)
$500,000 - $1,000,000	159	Commercial, Institutional (medium)
$300,000 - $500,000	492	Commercial, high-end residential
$200,000 - $300,000	1,050	High-end residential
$100,000 - $200,000	4,331	Medium-High residential
$60,000 - $100,000	4,528	Medium residential
$30,000 - $60,000	4,497	Medium-low residential
$10,000 - $30,000	4,165	Low range residential
$2,000 - $10,000	2,959	Barns, work shops
$0 - $2,000	1,730	Small outbuildings

Sources: PCAD (raw data); MPTX (analysis)
Notes: Improvement values indicate appraised value of structure only. Overall market value including land approximately 1.25 multiple of improvement value (typical).

Additional notes relating to development specific to individual cities is found in the Section 1.5.4 (City Profiles).

3.3 HAZARD PROFILES

44 CFR Requirement §201.6(c) (2) (ii):
[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazard described in paragraph (c) (2) (i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Each profile includes a general description of the hazard, the geographic area affected, information regarding previous occurrences, and assessments of probability of future occurrence, magnitude and severity, and overall vulnerability to each hazard identified as relevant to the planning area. Hazard profiles are organized by general order of significance.

3.3.1 Flood

HAZARD DESCRIPTION

A flood is defined as the inundation of land by the rise and overflow of a body of water. Floods typically occur as a result of heavy rainfall causing a river system or stream to exceed normal carrying capacity. It is one of the most pervasive natural hazard threats in Texas, with public safety, housing, property, and infrastructure all potentially impacted. Floods are also one of the most common and costly hazards for the nation overall. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states.

Flooding may develop slowly over a period of days, or flash floods can develop quickly. Flash floods often have a dangerous wall of water that carries mud, trees, and other debris and has the potential to sweep away most things in its path. Flooding can also occur when a dam breaks, producing effects similar to flash floods.

Floods become a hazard when people compete for the use of floodplains. The natural function of a floodplain is to carry away excess water in time of flood. Failure to recognize this function has led to rapid and haphazard development in floodplains and consequent increases in flood hazards.

There are two types of flooding that can impact Polk County: riverine flooding and flash floods. Riverine flooding is a natural occurrence where a waterway exceeds its 'bank full' capacity and inundates the adjacent floodplain. According to common usage, a floodplain is that area that is inundated by the 100-year flood (a flood that has a 1 percent chance in any given year of being equaled or exceeded). Riverine flooding is affected by the intensity and distribution of rainfall, soil moisture, seasonal variation in vegetation, and water-resistance of the surface areas caused by urbanization.

Flash flooding is a localized flood that results from a short duration of intense rainfall across a limited geographic area. During extended periods of intense rainfall, storm water conveyance systems can be overwhelmed and flooding of surrounding neighborhoods can result. The following are summaries of these two flooding types.

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Faster moving floodwaters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris.

Riverine erosion and landslide damage related to soil saturation can be a major cause of damage from flood events. Most flood damage is caused by water saturating materials susceptible to loss (e.g., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances).

GEOGRAPHIC LOCATION

Continuing development and growth in the planning area has increased the threat of flooding in areas that have never before flooded. Consequently, flooding vulnerability no longer occurs

exclusively in the floodplain, and it is important to note that flooding is not limited to areas identified on FIRMs derived by FEMA. However, FIRMs do serve as a general guide to areas with significant flooding potential.

The maps in following sections were derived with FEMA FIRM data, representing the 100-year floodplain (Flood Zone A), and defined as Special Flood Hazard Area (SFHA) on FIRM legends. By FEMA's definition the SFHA is intended to represent the area with a 1% annual chance of flooding to a depth of at least 1 foot. This probability of inundation relates to at least a 26% chance of flooding over the life of a 30-year mortgage.

Because detailed analyses have not yet been performed for the participating jurisdictions of this Plan; no depths or Base Flood Elevations are defined by FEMA. Riverine erosion occurrence related to flooding is most prevalent in southwestern unincorporated Polk County in proximity of the Trinity River.

Unincorporated Polk County Floodplain Locations (Southern Polk County)

FEMA defined Special Flood Hazard Area (SFHA, Zone A) of the Trinity River intersects Polk County on its eastern bank downstream from Lake Livingston Dam. The communities of Taylor Lake Estates and Holiday Lake Estates are representative of larger subdivisions with numerous structures built in Zone A (aka, floodplain).

The Long King Creek watershed comprises a large floodplain network sourced by a number of tributary creeks west of Highway 59 and near communities of Bering, Seven Oaks, Leggett, New Willard, Marston, and Livingston.

The Tempe Creek floodplain (East and West) lies between Onalaska and Livingston running southward to its confluence with Long King Creek in southwestern Polk County near Lake Livingston.

Menard Creek floodplain originates east of Livingston running southward and east of Crystal Lakes Country Estates, Providence, Schwab City and Holly Grove.

The Big Sandy Creek floodplain is comprised of a number of tributary creeks in southeastern Polk County. The confluence of these source creeks is west of the Alabama-Coushatta Indian Reservation near Camp Ruby and south of Hwy 190, from where it runs southward then east into adjoining Tyler County.

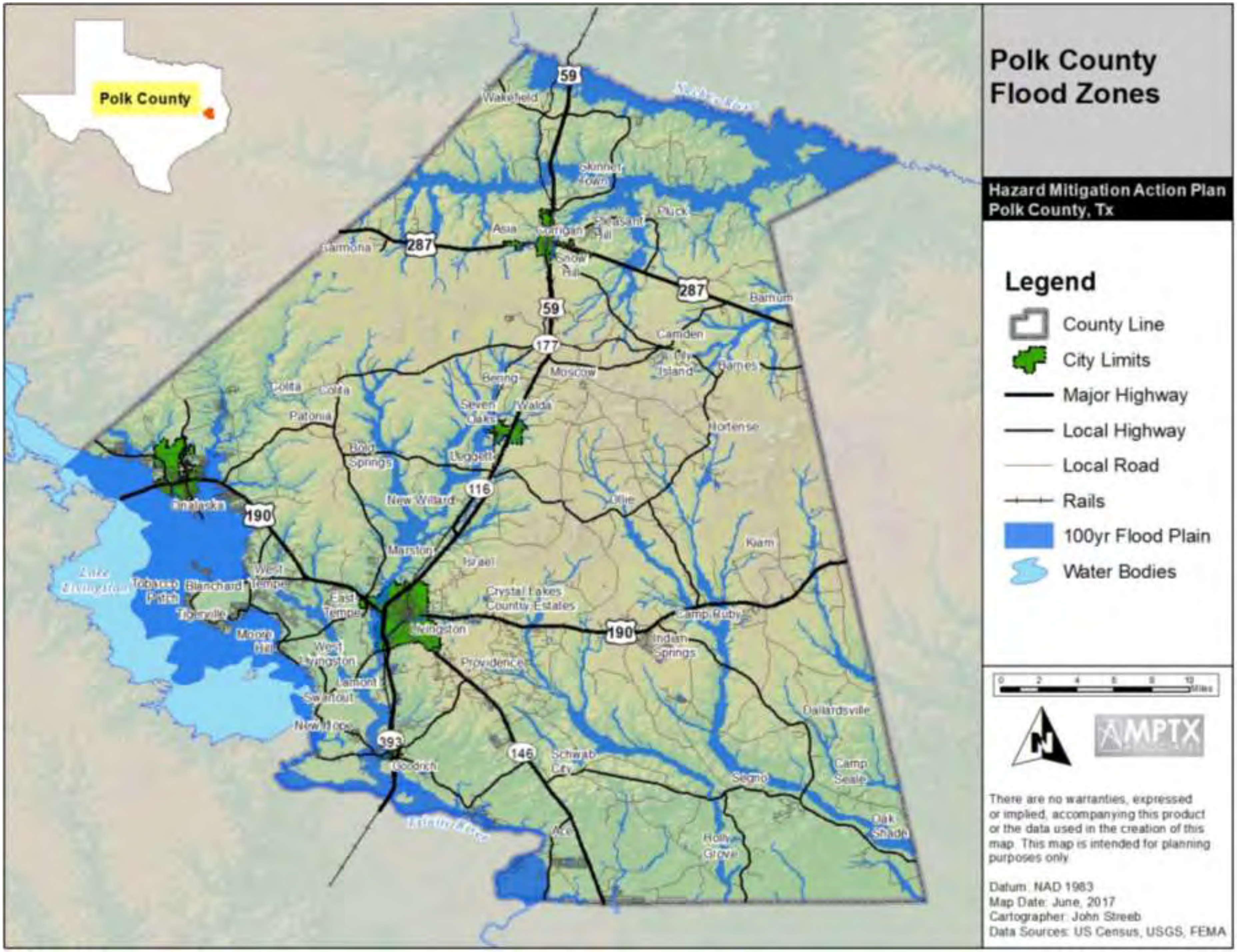
Unincorporated Polk County Floodplain Locations (Northern Polk County)

The Neches River floodplain runs west-southeast along the northern boundary with Angelina County. It is largely uninhabited.

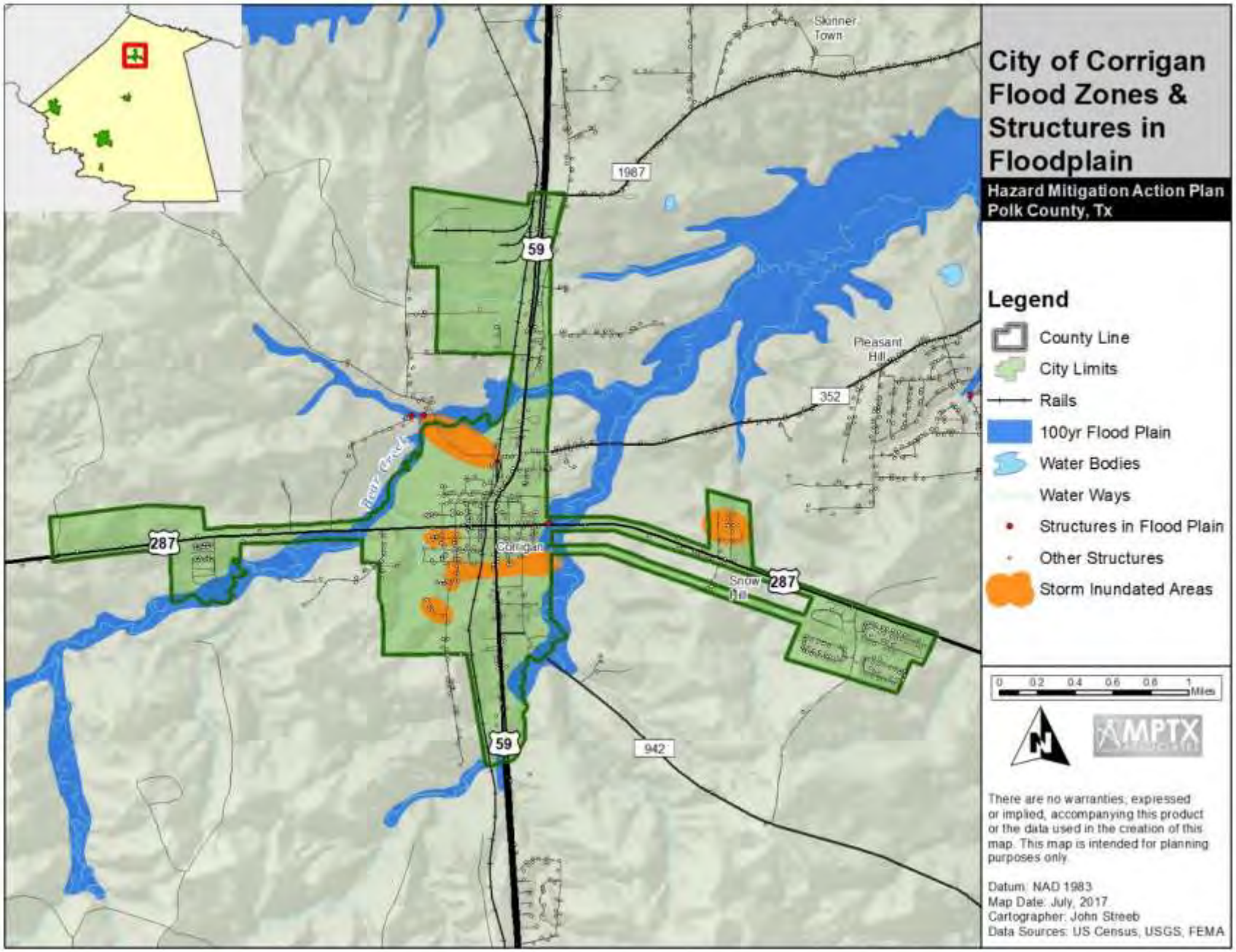
Piney Creek floodplain runs west-east in the northern portion of the county north of Hwy 287 to its confluence with the Neches River in northeastern Polk County. East of Corrigan, Piney Creek is joined by Bear Creek and McManus Creek floodplains near communities of Skinner Town and Pluck.

Caney Creek floodplain lies in northeastern Polk County near the community of Barnum.

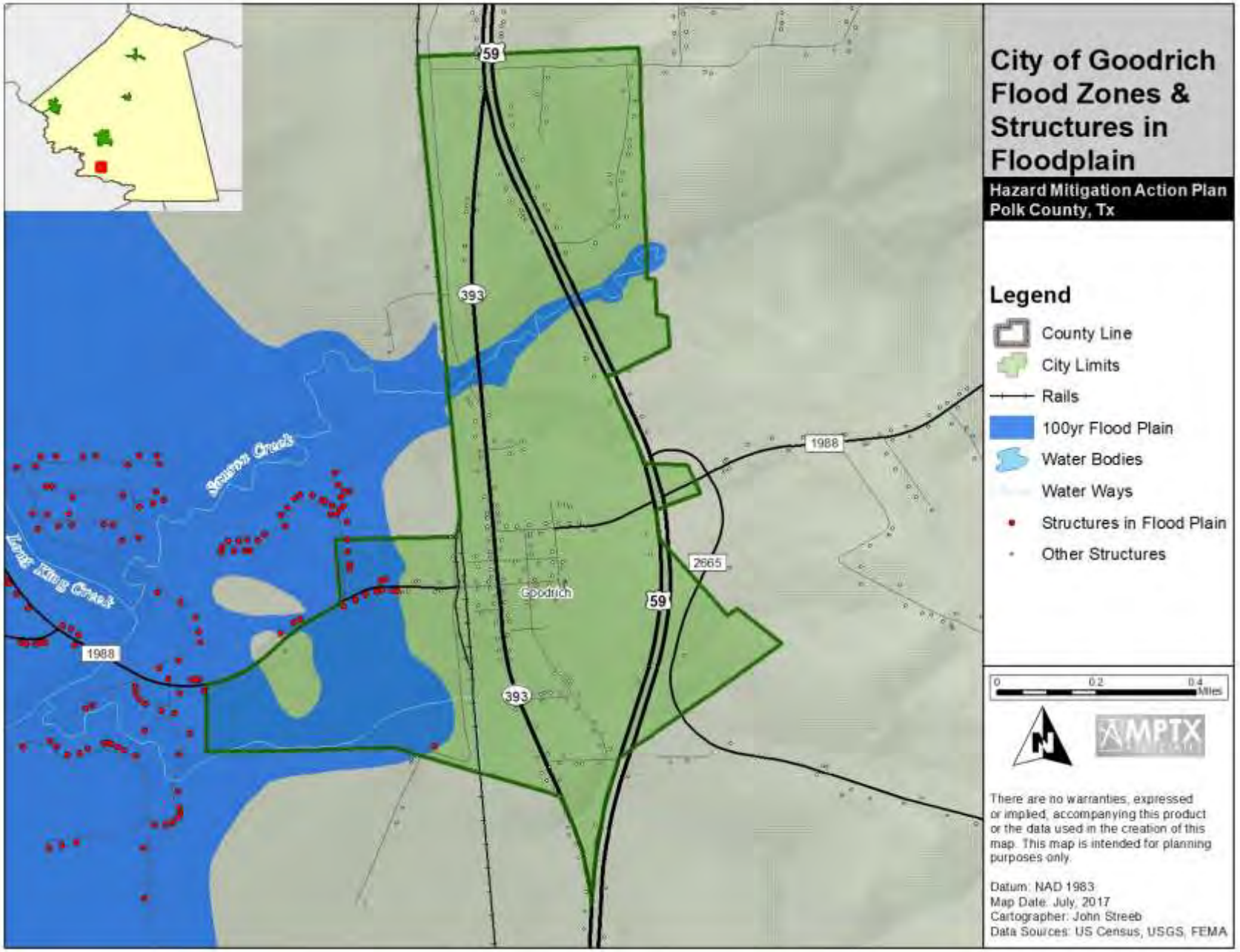
Additional detail for individual cities and their immediate surroundings is shown on the maps and pages that follow.


Polk County
Flood Zones
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
100yr Flood Plain
Water Bodies
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA
Polk County
59
287
190
177
116
146
393
Wakefield
Skinner Town
Pluck
Asia
Corrigan
Pleasant Hill
Carmona
Snow Hill
Barnum
Camden
Moscow
Barnes
Colita
Patonia
Seven Oaks
Walda
Hortense
Bold Springs
Leggett
New Willard
Onalaska
Ollie
Marston
Israel
Kiam
West Tempe
Tobacco Patch
Blanchard
East Tempe
Crystal Lakes Country Estates
Camp Ruby
Livingston
Indian Springs
Moore Hill
West Livingston
Providence
Lamont
Swartout
New Hope
Dallardsville
Goodrich
Schwab City
Segno
Camp Seale
Ace
Holly Grove
Oak Shade

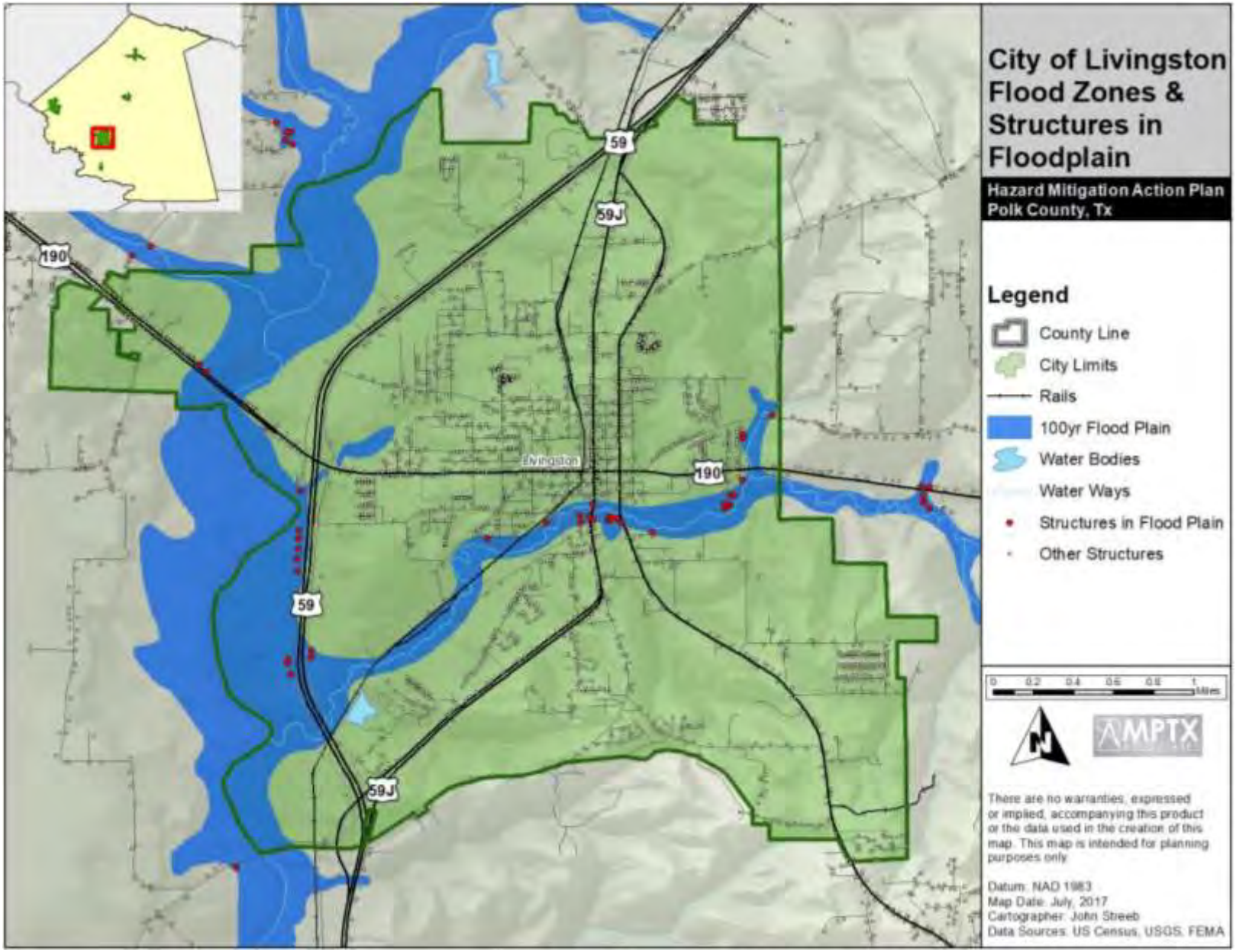
Corrigan is positioned between the east and west forks of Bear Creek, a tributary of Piney Creek which drains in a northeasterly direction into the Neches River. Relatively few houses are situated in Special Flood Hazard Areas as defined by FEMA, but street flooding does occur as indicated by orange shaded areas in the map below. Flooding has occurred approximately 2-4 times in last 5 years depending on location.



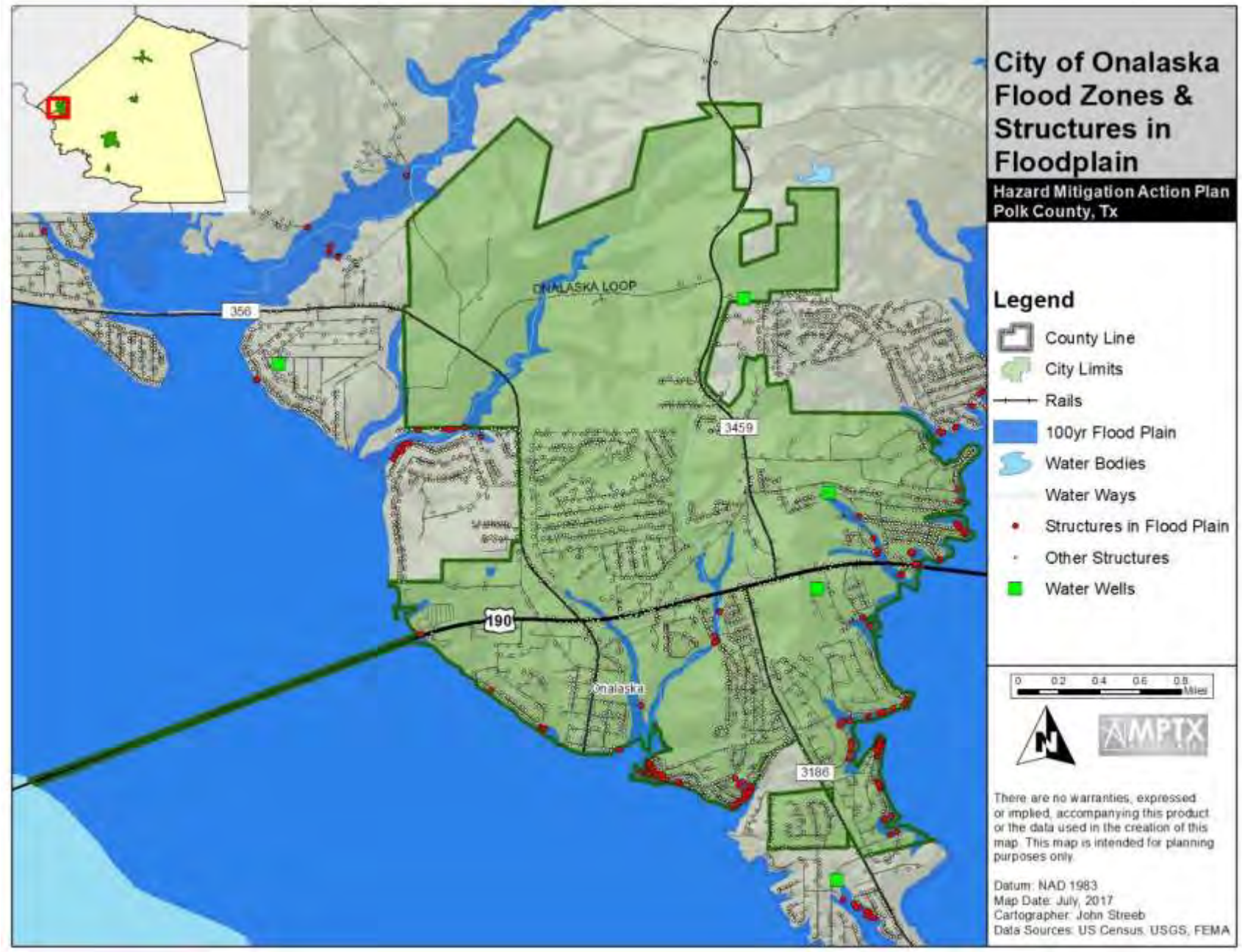
Goodrich has broad areas to the west of the city defined as Special Flood Hazard Areas at the confluence of Sanson Creek and Long King Creek. A small number of homes in western Goodrich are located in SFHA's, but many more are located further west in unincorporated outskirts of the city. Flooding has occurred approximately 2-4 times in last 5 years depending on location.



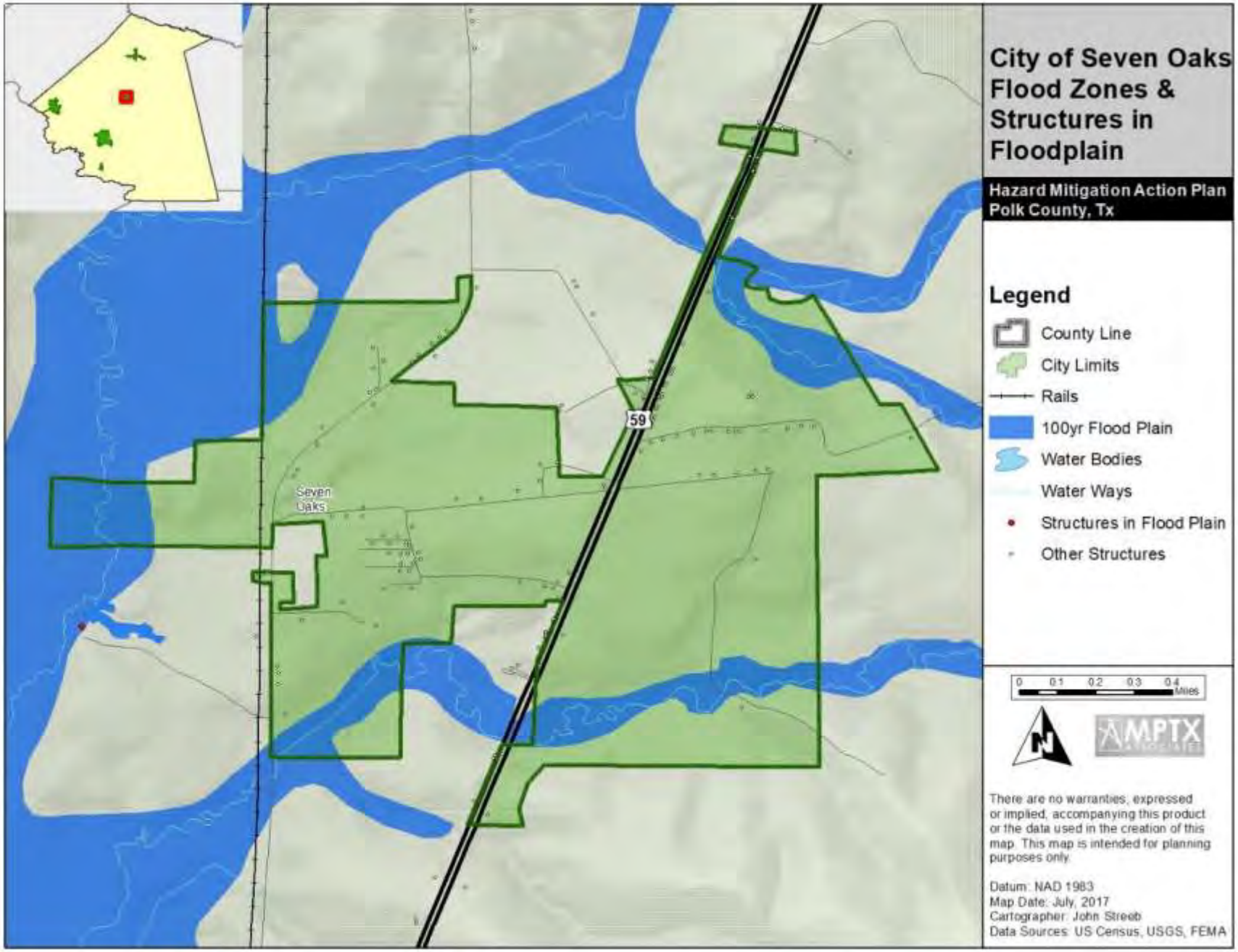
Livingston is bordered on the west side by Long King Creek, and Choates Creek which runs through the heart of the city. During severe thunderstorms, these creeks quickly reach flood stage, thus cutting Livingston in half. Floodwaters cover and cut off US Highway 190 east of Livingston (E Church St. within the city limits), Texas State Highway 146 (S Houston Ave within the city limits) and US Highway 59 south of the city, and US Highway 190 west of the city (W Church St. within the city). Flooding can last several days as waters slowly drain into the Trinity River. Clear cutting forestry lands in the water shed, debris and land erosion all contribute to the flooding problems along both creeks.



Onalaska has a number of homes situated in SFHAs associated with Lake Livingston which are unlikely to flood due to lake level control. A smaller number of structures are located in SFHAs associated with unnamed creeks and inlets which drain into Lake Livingston. Flooding has occurred approximately 2-4 times in last 5 years depending on location.



Seven Oaks has no structures situated in SFHAs but is intersected by floodplains of Willis Creek on the northern portion of city and Mud Creek in the southern portion of city. Each of these waterways drain westward to join Long King Creek which runs southward toward Livingston. Flooding has occurred approximately 2-4 times in last 5 years depending on location.



PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of flooding impacts. Historically floods have caused approximately 90% of the disaster related damage in the planning area and participating jurisdictions, and flooding continues to be one of the most destructive and costly natural hazards.

The following sequence of flood narratives presents a partial history of flooding in Polk County dating back to 1989. Events resulting in Federal Disaster Declaration denoted by asterisk (*)

May 3 - June 15, 1989: Heavy rains caused severe flash flooding throughout Polk County.

***May 10 - June 12, 1990**: Lake Livingston Dam recorded record releases when heavy rains in the Dallas area caused severe flooding all along the Lower Trinity River Basin. Several hundred homes and businesses were flooded. This flood occurred while a drought declaration was in effect for the County, and was caused solely by heavy flooding in the extreme northern area of the Trinity River. No local rainfall contributed to this flood.

***December 18 - 31, 1991**: Heavy local rains coupled with severe riverine flooding caused heavy flooding along the Lower Trinity River Basin. Homes and businesses located within the 100-year floodplain flooded causing thousands of dollars in damages. Several roads, bridges and culverts were washed out and had to be replaced or repaired. Several Culverts were mitigated by enlarging the size of some and by installing bulkheads to help protect the culvert and roadway. This mitigation project was through the US Department of Agriculture Emergency Water Shed Program.

***October 15 - 19, 1994**: Heavy local rains caused severe flash and riverine flooding all along the watershed of Kickapoo, Rocky, Sandy, Long King, and Menard Creeks. This flooding produced record releases at the Lake Livingston Dam Site, and affected hundreds of homes throughout Polk County. Nine (9) bridges were washed out along with roads and culverts. Two (2) Fatalities were reported in the County.

March 13 - 14, 1997: Heavy local rains caused severe flooding along Menard, Choates, Mill and Long King Creeks that washed out culverts and roadbeds throughout the eastern half of the County. Menard Creek reached flood stage, washing out the temporary culvert and roadway crossing at Mill Creek in Big Thicket Lake Estates (BTLE) subdivision. Washouts have occurred on numerous occasions and both Liberty County and Polk County must repair the damage quickly because 300 to 400 residents are stranded on the east side of Mill Creek with no other means of ingress or egress. On the morning of March 13, 1997, the roadway was completely destroyed by heavy rains. As the county was preparing to send equipment to repair the road, an oil drilling company was in the process of slant drilling across Mill Creek at the entrance of BTLE. Oil Companies were laying a high-pressure pipeline, and a miscalculation caused the driller to sever a 36” high-pressure propane line adjacent to where they were drilling. Thousands of gallons of propane were released, forcing emergency crews to evacuate all residents in BTLE. Residents were out of their homes for two (2) days. Although the road was repaired, County officials quickly realized that someone could have been killed or seriously injured. A permanent solution was needed to mitigate this problem.

***November 13 - 16, 1998**: A number of homes and businesses were flooded when heavy local rains coupled with severe riverine flooding caused major flooding along the Lower Trinity River

Basin. County roads and bridges were seriously damaged, and numerous bridges and culverts were washed out. Several culverts and bridges were mitigated by enlarging their size, or by installing bulkheads and replacing bridge abutments to help protect the culvert and roadway. This mitigation project was through the US Department of Agriculture Emergency Water Shed Program.

April 3 - 4, 1999: Easter Sunday, April 3, 1999, heavy rains led to what was, at the time, record flooding along Choates, Long King and Menard Creeks which led to severe damage in Livingston and countywide. Approximately 50 businesses were seriously damaged or destroyed and several hundred homes were flooded. Approximately 30 homes were completely destroyed. Tons of debris littered the landscape and had to be removed. Some good did come from this flood, however, because many dilapidated houses were damaged so severely they had to be torn down. Unfortunately, there was not enough damage to warrant a Presidential declaration, and the cost of this flood fell on the city and its residents.

***June 4, 2001**: Tropical Storm Allison caused severe flooding in several counties throughout southeast Texas, and was especially severe in Harris, Liberty, Montgomery, and other counties surrounding Polk County. This storm caused some of the most costly flood damages in Texas history. Locally, four bridges were destroyed and several roads were severely damaged.

October 16, 2006: A state of disaster was declared by Polk County Judge John P. Thompson when heavy rains resulted in severe flooding throughout Polk County. Rainfall of 12 – 15 inches caused road closings in parts of the County.

October 28, 2009: Rainfall of 6 – 9 inches was recorded throughout Polk County causing Sandy Creek to rise nine inches and Kickapoo Creek to rise five inches. Houses along Sandy Creek and Kickapoo Creek were flooded.

October 31, 2013: Flooded roads were reported across western Polk County (Barnes) and in and around the Livingston area. $10,000 in damage was reported.

May 27, 2015: Several roads were closed due to heavy rainfall, including Twin Harbor Road.

April 30, 2016: High rainfall created countywide flooding. Sections of FM 350, FM 1988, FM 352, and FM 1276 between Livingston and Corrigan were flooded. Roads were inundated with water around the cities of Onalaska and west Livingston. Water also covered FM 3126 between FM 2457 and Cedar Valley Road.

May 27, 2016: Five structures damaged in the Goodrich area. Roads damaged near Corrigan and over eastern part of county.

August 27, 2017: Slow moving Hurricane Harvey produced very heavy rainfall and flooding over portions of Polk County. Major lowland flooding occurred near the Trinity River and areas upstream of Lake Livingston. There was high floodwater on roads FM 3126 and FM 356 along the eastern shore of Lake Livingston. The lowest homes and businesses in Onalaska within close vicinity of the lake, Trinity River and Long King Creek flooded. Roads along the southern end of Lake Livingston such as FM 3278 were inaccessible, FM 3126 and W FM 1988 near Long King Creek were flooded. Major lowland flooding occurred on the Trinity River near Goodrich. A local state of disaster was declared by Polk County Judge Sydney Murphy prior to landfall in anticipation of Polk County needing state resources and assistance.

Table 3-7 Historical /Flood Events (1994-2016)

Location	Date	Description	Reported Damages
Goodrich	5/27/2016	Flash Flood	$500,000
Corrigan	4/30/2016	Flash Flood	data unavailable
Kickapoo	5/27/2015	Flash Flood	data unavailable
Barnes	10/31/2013	Flash Flood	$10,000
Moscow	9/29/2013	Flash Flood	data unavailable
Goodrich	2/3/2012	Flash Flood	$60,000
Countywide	10/29/2009	Flash Flood	$55,000
Countywide	9/13/2008	Flash Flood	$61,000
Countywide	10/16/2006	Flash Flood	$562,000
Countywide	5/1/2004	Flash Flood	$746,000
Countywide	11/4/2002	Flash Flood	$20,000
Countywide	6/9/2001	Flash Flood	$123,000
Countywide	11/6/2000	Flash Flood	$25,000
Countywide	6/25/1999	Flash Flood	$25,000
Countywide	6/25/1999	Flash Flood	$25,000
Countywide	4/3/1999	Flash Flood	$175,000
Countywide	3/13/1999	Flash Flood	$100,000
Countywide	11/13/1998	Flash Flood	$18,000
Countywide	11/12/1998	Flash Flood	$3,000
Countywide	1/6/1998	Flash Flood	$25,000
Corrigan	7/6/1997	Flash Flood	$5,000
Countywide	2/20/1997	Flash Flood	$5,000
Countywide	9/27/1996	Flash Flood	$50,000
Livingston	12/17/1995	Flash Flood	$5,000
Countywide	5/28/1995	Flash Flood	$20,000
Countywide	5/28/1995	Flash Flood	$20,000
Countywide	1/26/1995	Flash Flood	$20,000
Countywide	12/16/1994	Flash Flood	$500,000
Countywide	10/16/1994	Flash Flood	$5,000,000

Source: NCEI

Note: Flooding impacts from Hurricane Harvey (August-September 2017 are still being calculated and are not included in the above table.

Flood Risk from Dam Failure

Loss of life and damage to structures, roads, utilities and crops may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects would certainly accompany the failure of one of the major dams in Polk County. In addition to the Lake Livingston Dam maintained by the Trinity River Authority, there are a total of 37 smaller dams in Polk County holding millions of gallons of water in reservoirs. Because dam failure can have severe consequences, FEMA requires that all dam owners develop Emergency Action Plans for warning, evacuation, and post-flood actions. Although there may be coordination with county officials in the development of the Emergency Action Plans, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner.

Dam failures are usually considered technological hazards; however, since most dam failures result from prolonged periods of rainfall, they are often cited as secondary, or cascading, effects of natural flooding disasters and are not named as the primary hazard that causes disaster declarations. For example, Lake Livingston Dam, a 2.5 mile earthen embankment with 12 flood gates for releasing water was heavily damaged in 2005 by Hurricane Rita when it made landfall on the Texas coast bringing 117 mile per hour winds to Lake Livingston. The high winds and significant wave action eroded some of the rip rap on the lake side of the dam, exposing part of the earthen embankment. Following the state-approved emergency action plan, the Trinity River Authority began releasing water from Lake Livingston to lower the water level to 127 feet above sea level to avoid any further erosion of the rip rap or the soil on the dam from wave action during the hurricane event. The release of 79,200 cubic feet per second caused flooding in low-lying areas downstream from the dam.

Each dam in the *National Inventory of Dams* is assigned a downstream hazard classification based on the potential for loss of life and damage to property should the dam fail. The classification is not a determination on the condition or structure of the dam or a judgment as to the likelihood of failure. The hazard classifications are as follows:

Hazard Classification 1: High Hazard: dam failure would probably result in loss of life and major damage to property.

Hazard Classification 2: Significant Hazard: dam failure could possibly cause some loss of life and property damage.

Hazard Classification 3: Low Hazard: dam failure would be unlikely to cause loss of life or property damage

Polk County has 37 dams which are depicted on the following map. Six dams are classified as Hazard Classification 1:

- Wild Indian Lake Dam,
- Lakeside Village Dam,
- Chesswood Lake Dam,
- Lake Downs Dam,
- Lake Londa Lynn Dam, and
- Pine Pond Dam.

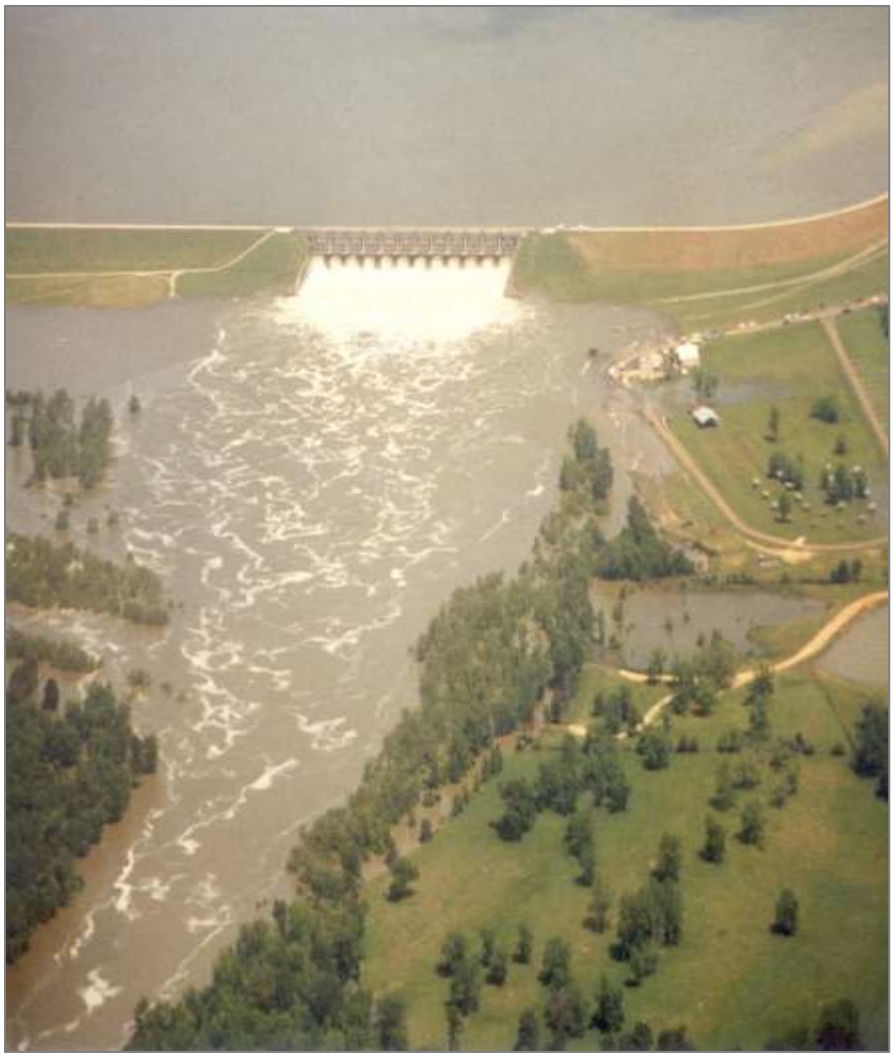
Of these, only two have storage capacities over 500 acre/feet; Lake Londa Lynn Dam (905 acre/feet storage) and Lakeside Village Dam (537 acre/feet storage).

Potential inundation from Chesswood Lake Dam is projected to flow west across Highway 59 in a failure scenario at depth of 0.5 – 3.0 feet depending on location and severity of breach.

Potential inundation from Pine Pond Dam is projected to flow north across an industrial facility in a failure scenario at depth of 0.5 – 4.0 feet depending on location and severity of breach.

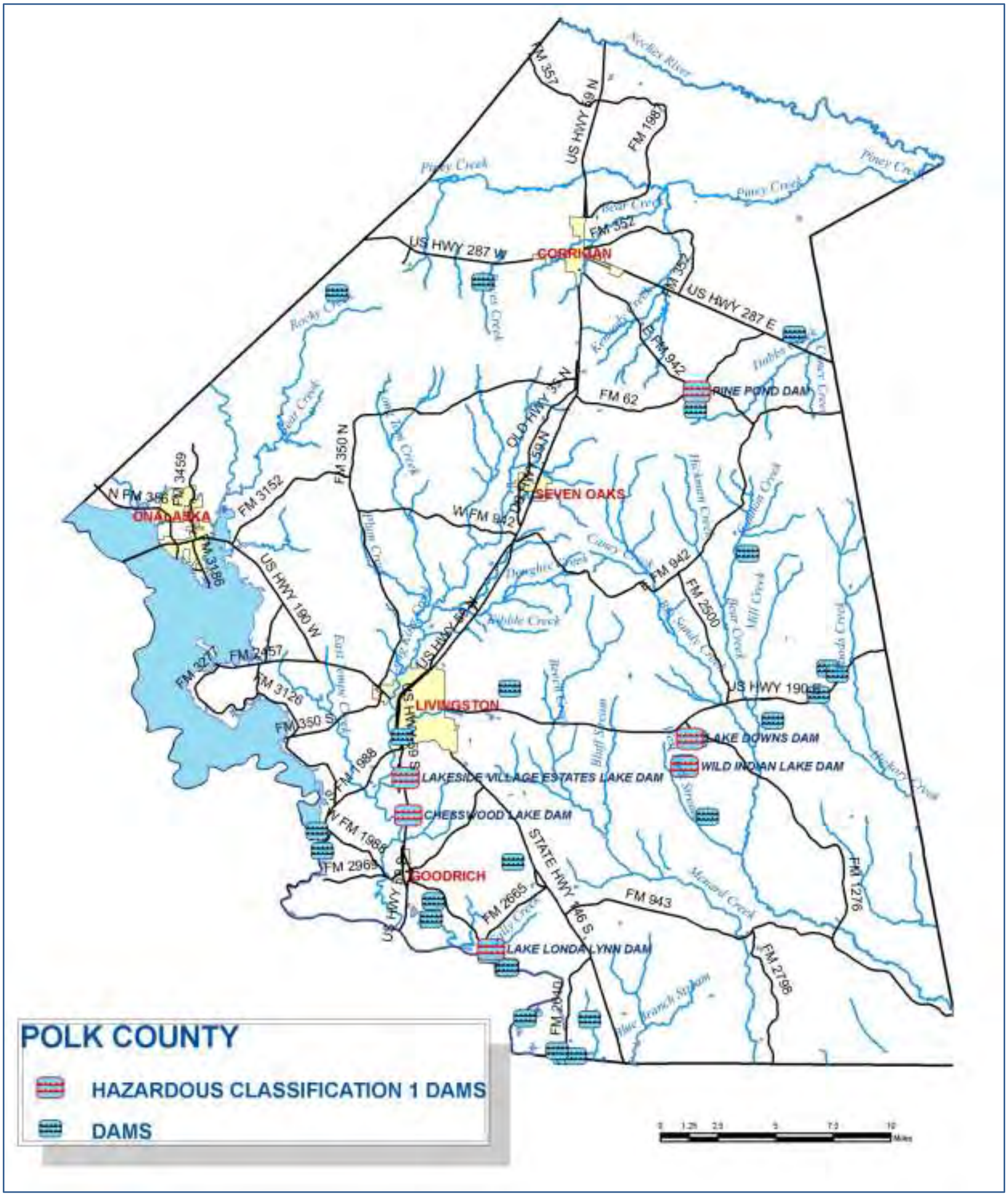
Lake Connie Jean Dam was rated by the TCEQ as having spillway damage, with a notation that the lake level was lowered through an outfall pipe to prevent additional damage. Since that report, the dam has failed, depriving the Wild Country Lake Estates Subdivision and the surrounding areas access to a viable water source for fighting fires.

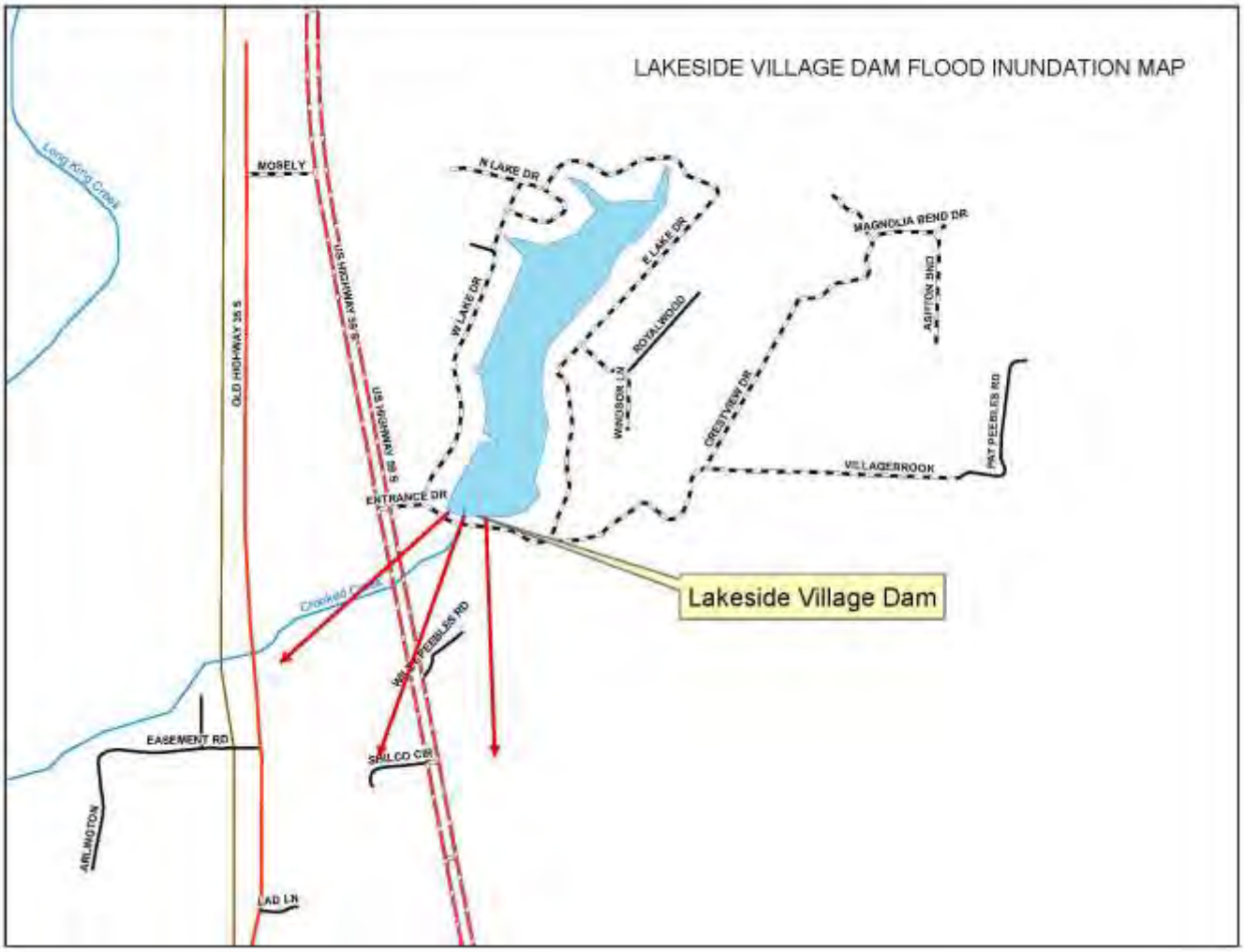
Polk County is considered Zone A, and a detailed study of flood inundation caused by the breech of dams has not been done. Polk County and the incorporated cities within have a data deficiency, and hopefully, in the future, a study may be undertaken to obtain more detailed information to include in the next update of this Plan. An action item has been created to address this issue.



On multiple occasions in the past, severe rains in the upper Trinity River Watershed produced major floods in Polk County with major road closures and severe damage to homes. These floods in turn produced massive water releases through Lake Livingston Dam (as shown in photo at left).

Probability of dam failure is considered **Low** according to terms and definitions outlined in Section 3.1.1.

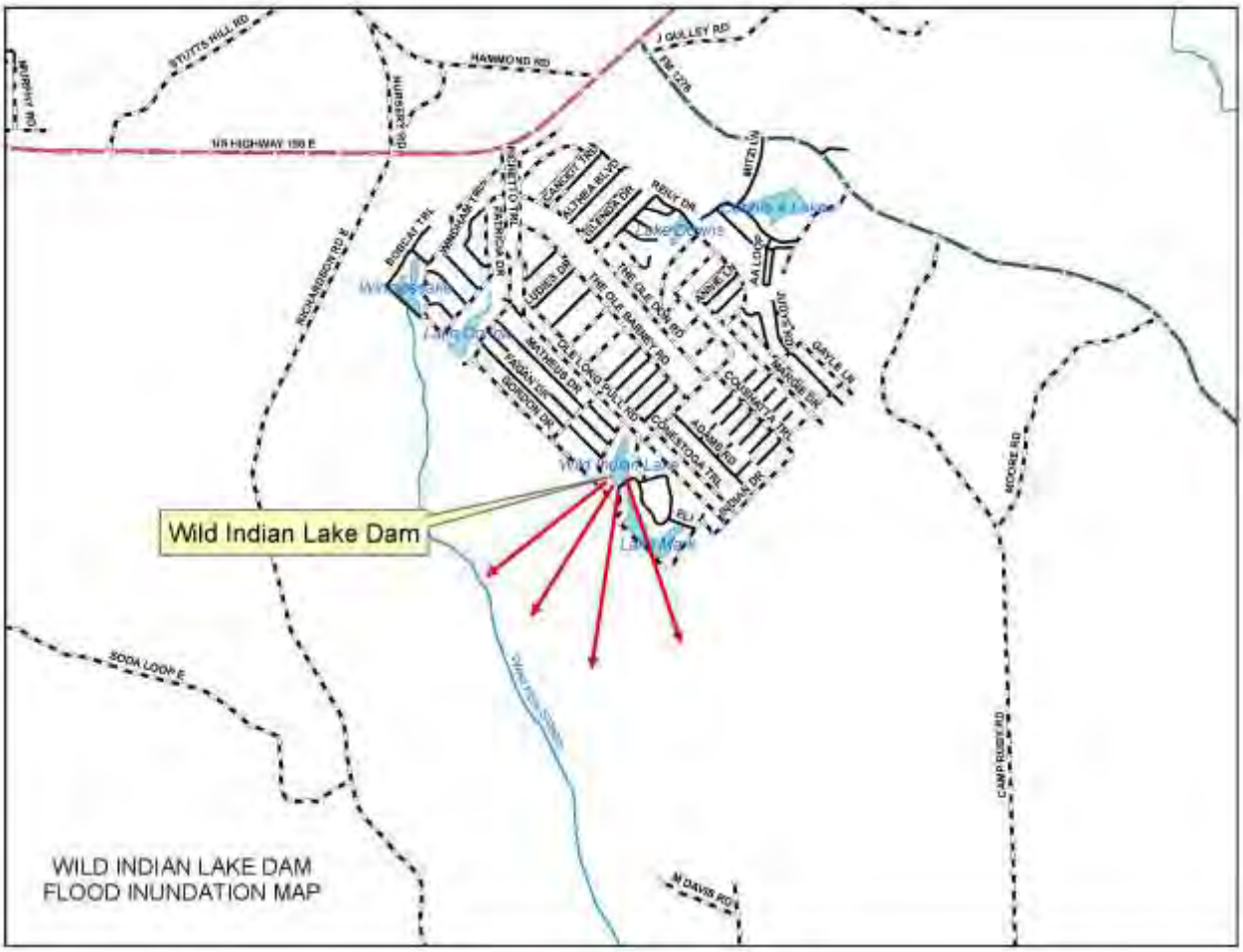

POLK COUNTY
HAZARDOUS CLASSIFICATION 1 DAMS
DAMS
CORRIGAN
ONALASKA
SEVEN OAKS
LIVINGSTON
GOODRICH
PINE POND DAM
LAKE DOWNS DAM
WILD INDIAN LAKE DAM
LAKESIDE VILLAGE ESTATES LAKE DAM
CHESSWOOD LAKE DAM
LAKE LONDA LYNN DAM
US HWY 287 W
US HWY 287 E
US HWY 59 N
US HWY 190 W
FM 62
FM 942
FM 943
FM 1276
FM 2500
FM 3152
FM 350 N
FM 350 S
FM 3186
FM 1988
FM 2665
FM 2798
STATE HWY 146 S
Neches River
Piney Creek



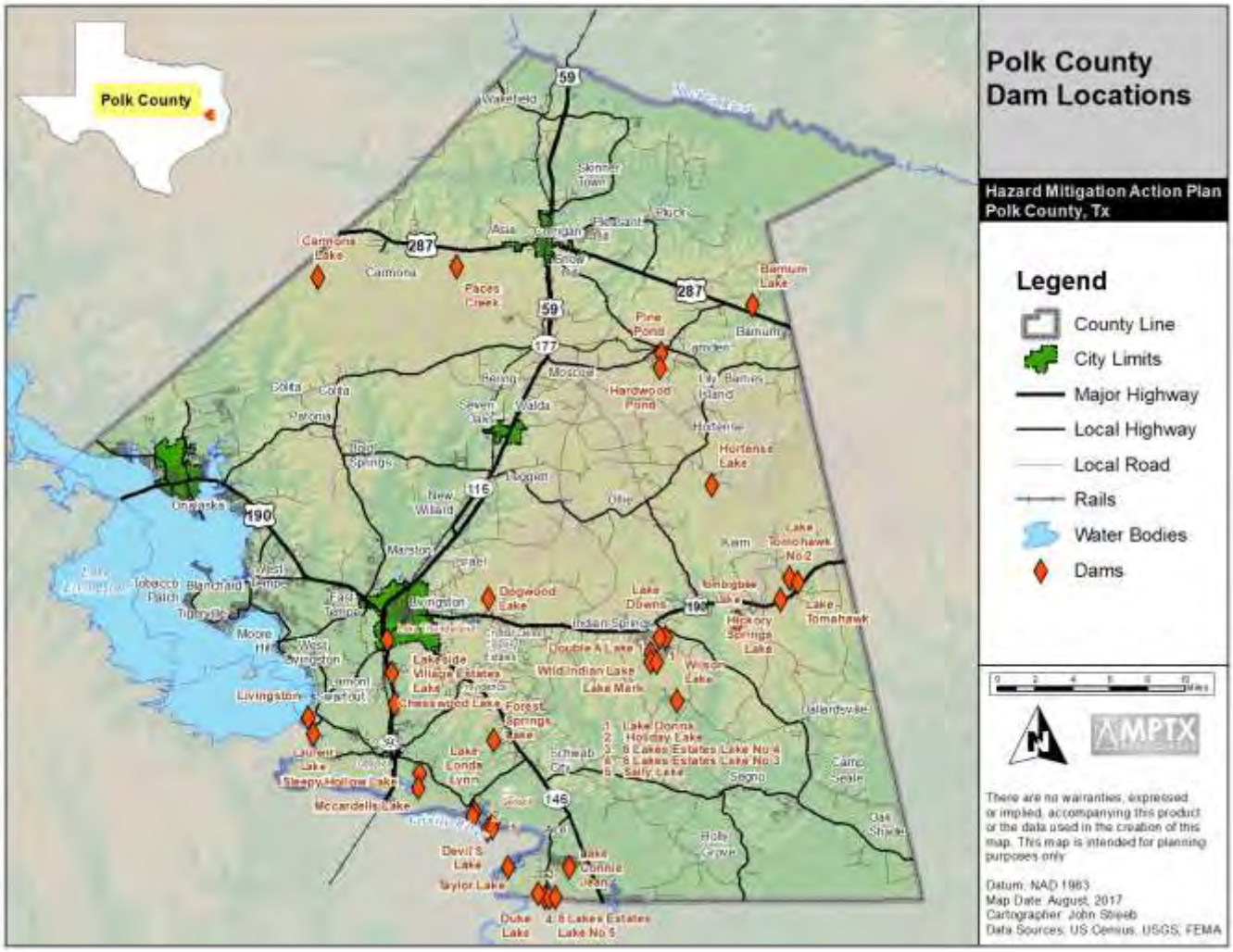
This dam is located in the Lakeside Village Subdivision in Polk County. Water surface elevation of the lake at normal stage is 148 feet above sea level. Projected inundation depths downstream as indicated by the arrows are 10 feet within 400 yards of the dam and across U.S. Hwy 59. A nearby RV park and other proximate structures are situated at elevations greater than 150 above sea level and would not likely be inundated.

This dam is located in southwestern Polk County approximately 1 mile from the Trinity River. Water surface elevation of the lake at normal stage is 148 feet above sea level. Projected inundation depths downstream as indicated by the arrows are 10 feet within 1000 yards of the dam. The downstream area is undeveloped and no nearby structures are likely to be inundated.

This dam is located in the Indian Springs Subdivision in Polk County off FM 1276 south of US Hwy 190. Estimated water surface elevation of the lake at normal stage is 318 feet above sealevel. Projected inundation depths downstream as indicated by the arrows are 4 feet within 200 yards of the dam, gradually dissapating to 2 feet within 500 yards downstream of the dam. One structure is situated within 160 yards downstream of the dam and could experience water depths of 3-4 feet over the ground surface, though the first floor elevation/height above grade for this structure is not known. Approximately 6-8 additional residential structures are located in the projected inundation area on Juan Falcon Road and Mitzi Lane and could see inundation depths of approximately 2 feet. Property owners who own property downstream of Lake Downs Dam were sent certified letters from the Polk County Office of Emergency Management Permitting Department in Dec 2010 notifying them that the TCEQ had recently inspected the dam upstream of their property and considered it to be in poor maintenance condition, meaning, should the dam fail, it could cause possible loss of life and property. A copy of the notification letter is linked to the address, and in the event a new property owner or renter requests address verification they are provided a copy of the notification letter.



This dam is located at the southernmost point of Indian Springs Subdivision in Polk County off FM 1276 south of Hwy 190. Water surface elevation of lake at normal stage is 300 feet above sea level. Projected inundation depths downstream as indicated by the arrows are 4 feet within 200 yards of the dam following a defined creek channel. According to available data, the downstream area is undeveloped and no nearby structures are likely to be inundated. Twenty-seven (27) property owners in Indian Spring Lake Estates Subdivision who own property downstream of Wild Indian Lake Dam were sent certified letters in December 2010 notifying them that the TCEQ had recently inspected the dam upstream of their property and considered it to be in poor maintenance condition, meaning, should the dam fail, it could cause possible loss of life and property. A copy of the notification letter is linked to the address, and in the event a new property owner or renter requests address verification they are provided a copy of the notification letter.


Polk County
Polk County Dam Locations
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
Dams
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only
Datum: NAD 1983
Map Date: August, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA
Camrona Lake
Paces Creek
Barnum Lake
Pine Pond
Hardwood Pond
Hortense Lake
Dogwood Lake
Lake Downs
Lake Tomahawk No 2
Lake Tomahawk
Hickory Springs Lake
Double A Lake
Wild Indian Lake
Lake Mark
Wilson Lake
Lakeside Village Estates Lake
Chesswood Lake
Forest Springs Lake
Lake Donna
Holiday Lake
5 Lakes Estates Lake No 4
5 Lakes Estates Lake No 3
Sally Lake
Lake Londa Lynn
Sleepy Hollow Lake
Mccardells Lake
Devil S Lake
Taylor Lake
Lake Connie
Duke Lake
4 5 Lakes Estates Lake No 5

PROBABILITY OF FUTURE FLOODING OCCURRENCE

According to information provided by the NOAA National Climatic Data Center (NCDC) Severe Storm Event database, there were 40 flood events reported in Polk County between 1996 and 2017 (22-year period). This calculates to approximately (2) flood events per year over this time frame, and a 6-month return interval for Polk County overall. This probability assessment equates with a **High** probability of future occurrence classification as defined in Section 3.1.1 Methods and Definitions. This High probability classification applies to all participating jurisdictions including Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks.

MAGNITUDE/SEVERITY/EXTENT

According to the NFIP flood claims database, over the past 22 years floods have resulted in nearly $2 million in flood insurance claims, not counting Hurricane Harvey. Actual losses are likely much higher when factoring for unreported damages, infrastructure loss of function, and economic impacts. In terms of magnitude and severity of flooding events throughout Polk County, a worst-case scenario such as a 500-year flood occurrence could be considered **Level- 4 Catastrophic** based on the definitions set forth in Section 3.1.1 Methods and Definitions, with impacts on a regional scale, extended loss of use of facilities and infrastructure, and potential injuries or fatalities

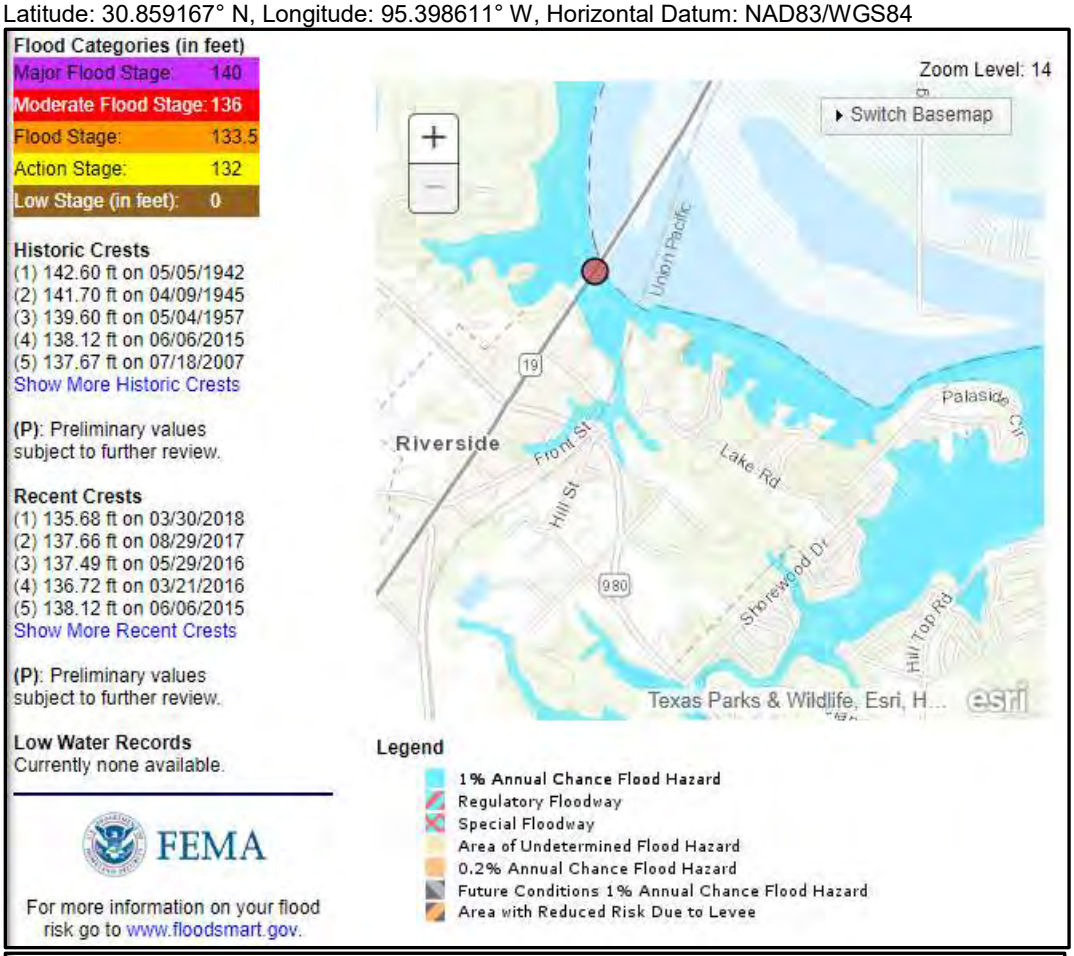
With regard to flood extent reporting and forecasting, there are 4 gauges relevant to Polk County, as profiled on the following pages. The National Weather Service Houston/Galveston Forecast Office monitors and reports data from these sites, in coordination with the USGS.

- The northernmost flood gauge is the Trinity River Gauge at Riverside, north Lake Livingston. This gauge is outside Polk County but indicates upstream flooding conditions. (RVRT2)
- A second flood gauge is at Long King Creek Gauge west of Livingston. (LIVT2)
- A third is the Trinity River Gauge near Goodrich (GRIT2)
- A fourth flood gauge is Menard Creek near Rye. (RYET2)

Each gauge records historic flood heights, recent crests, and calibrates these to correspond with typical impacts per flood height as shown on the following pages.

TRINITY RIVER GAUGE AT RIVERSIDE

Latitude: 30.859167° N, Longitude: 95.398611° W, Horizontal Datum: NAD83/WGS84

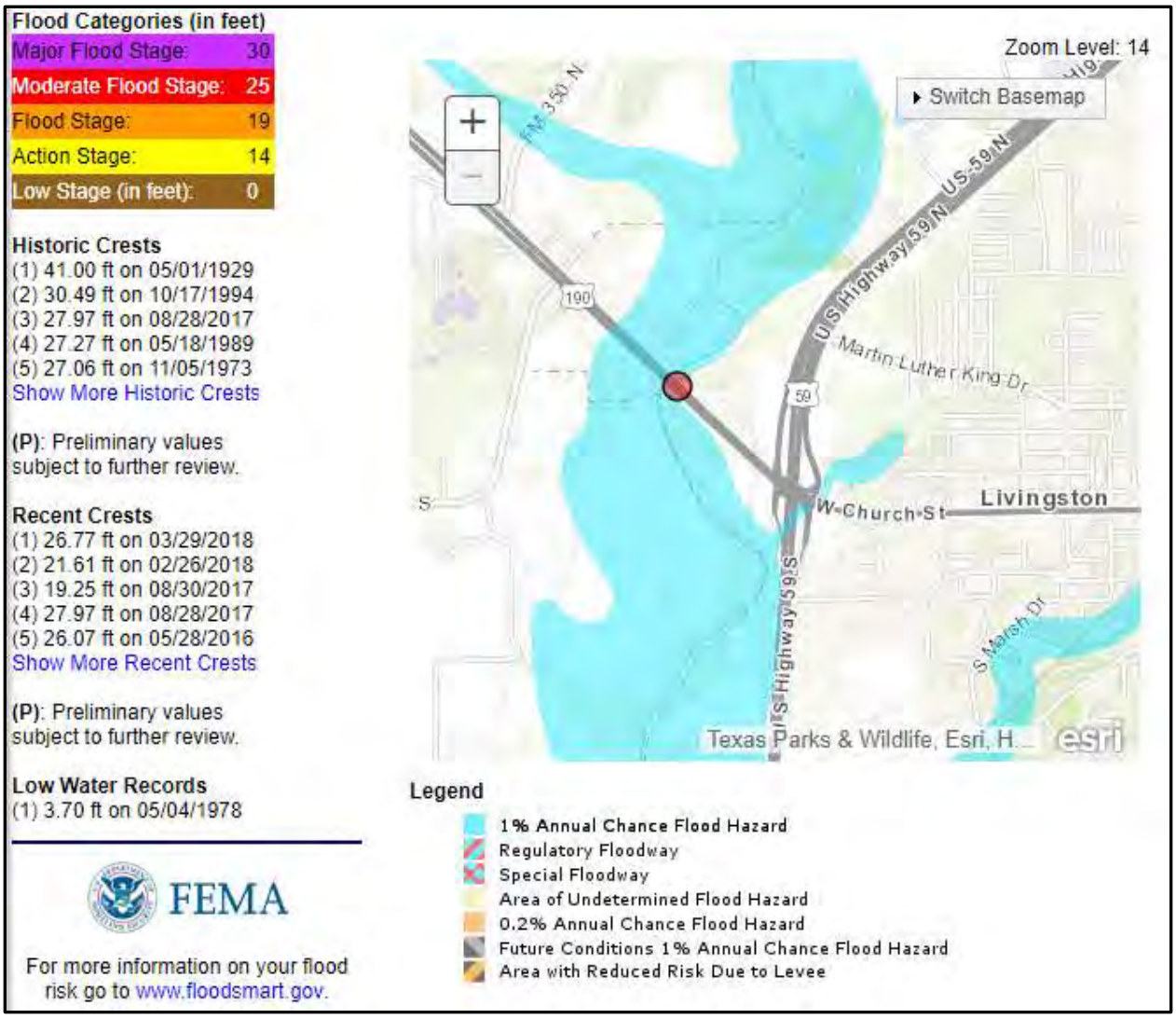


140	Major lowland flooding begins with widespread flooding in Trinity and Walker Counties. Water is in several homes in the Deep River Plantation and Green Rich Shores subdivisions. Roads into several subdivisions in Walker and Trinity Counties and secondary roads along the river are inundated.
138	Moderate lowland flooding continues with water 3 to 4 feet below the State Highway 19 Bridge and Plantation Drive near FM 230 is inundated. FM 2978 is flooded and impassable. Up to one foot of water is flowing over Thomas Lake Road which remains impassable. Several roads into the Green Rich Shores and Deep River Plantation subdivisions are covered with up to one foot of water and homes in Deep River Plantation are threatened.
137	Moderate lowland flooding continues as several homes in the Green Rich Shores Subdivision in Walker County flood and water covers Thomas Lake Road. The lowest buildings off FM 980 northwest of Riverside flood.
136.8	Moderate lowland flooding continues as the approaches to the FM 3478 bridge upstream of the gage are inundated and impassable. The lowest homes in the Green Rich Shores Subdivision are flooded with up to one half foot of water. Thomas Lake Road remains flooded and the lowest roads into properties off FM 980 northwest of Riverside are inundated and impassable.
136	Moderate lowland flooding begins in the vicinity of the gage. The lowest homes in the Green Rich Shores Subdivision are flooded and Thomas Lake Road is inundated and impassable. Low roads in the Deep River Plantation Subdivision are inundated. The lowest roads into properties off FM 980 northwest of Riverside are inundated and the lowest buildings are threatened.
135	Minor lowland flooding continues as significant backwater up Thomas Lake floods the lowest areas in the Green Rich Shore Subdivision in Walker County with the boat ramp completely inundated. The lowest lying areas in the Deep River Plantation Subdivision and FM 980 northwest of Riverside are threatened.
134	Minor lowland flooding continues with the boat ramp in the Deep River Plantation Subdivision in Walker County inundated. Backwater flooding up Thomas Lake in Walker County floods the boat ramp in the Green Rich Shores Subdivision in Walker County.
133.5	Minor lowland flooding begins in the vicinity of the gage with water in the Green Rich Shores subdivision. Backwater flooding up Wright's Creek impacts Plantation Drive in the Deep River Plantation subdivision.
132	Bankfull stage. Water begins to overflow the main channel in the vicinity of the gage.

Source: National Weather Service, Houston/Galveston Forecast Office; https://water.weather.gov/ahps2/hydrograph.php?wfo=hgx&gage=rvrt2

LONG KING CREEK GAUGE AT LIVINGSTON

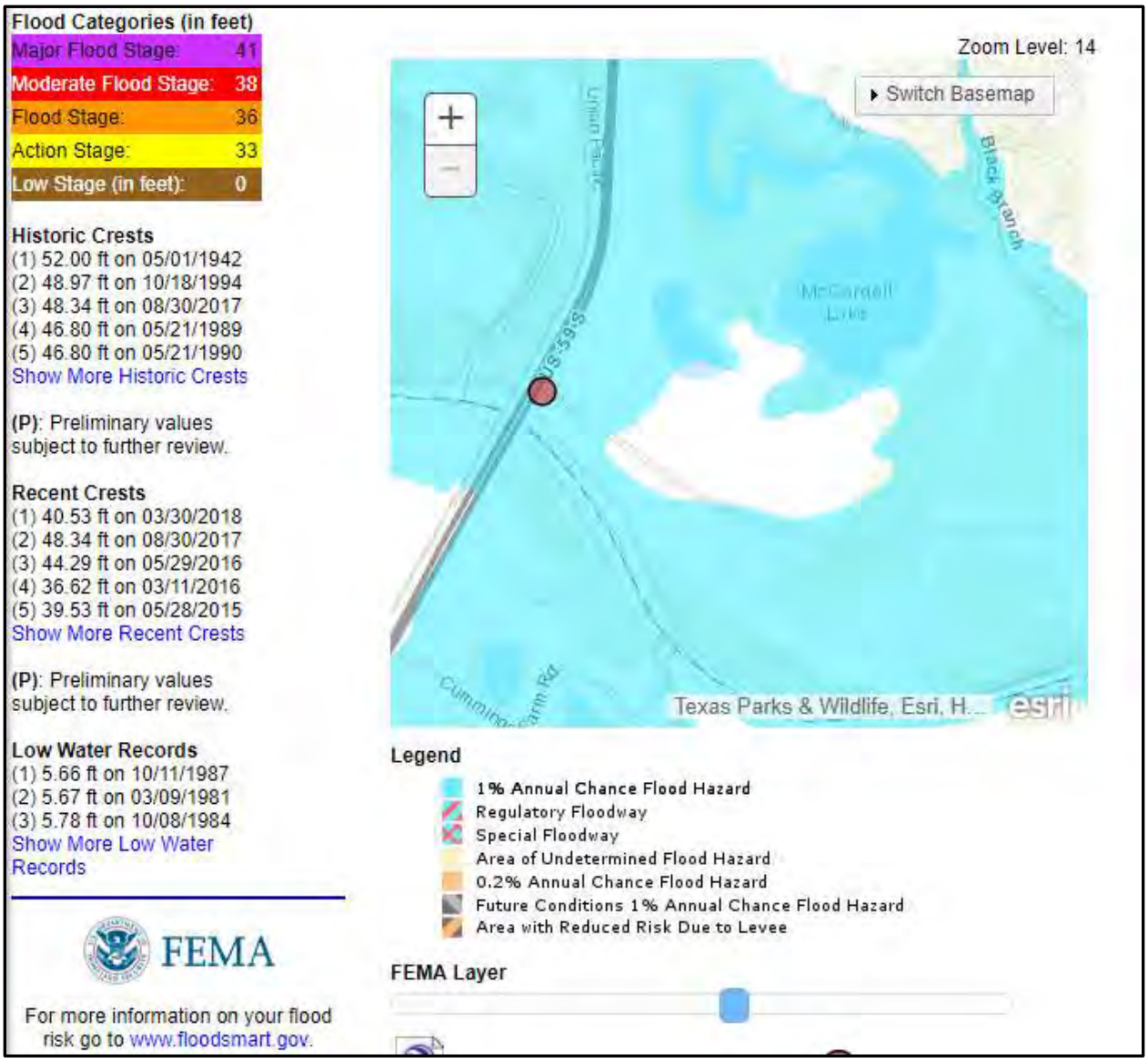
Latitude: 30.716111° N, Longitude: 94.958611° W, Horizontal Datum: NAD83/WGS84



38	At levels above 38 feet water coveres U.S. Highway 190 in the vicinity of the gage with several businesses along the highway flooded.
30	At levels above 30 feet major lowland flooding begins with several businesses along U.S. Highway 190 in the vicinity of the gage threatened.
25	At levels above 25 feet moderate lowland flooding begins as low lying areas along the creek become innundated.
19	At levels above 19 feet minor lowland flooding begins as water escapes the main channel of the creek.

Source: National Weather Service, Houston/Galveston Forecast Office;
https://water.weather.gov/ahps2/hydrograph.php?wfo=hgx&gage=livt2

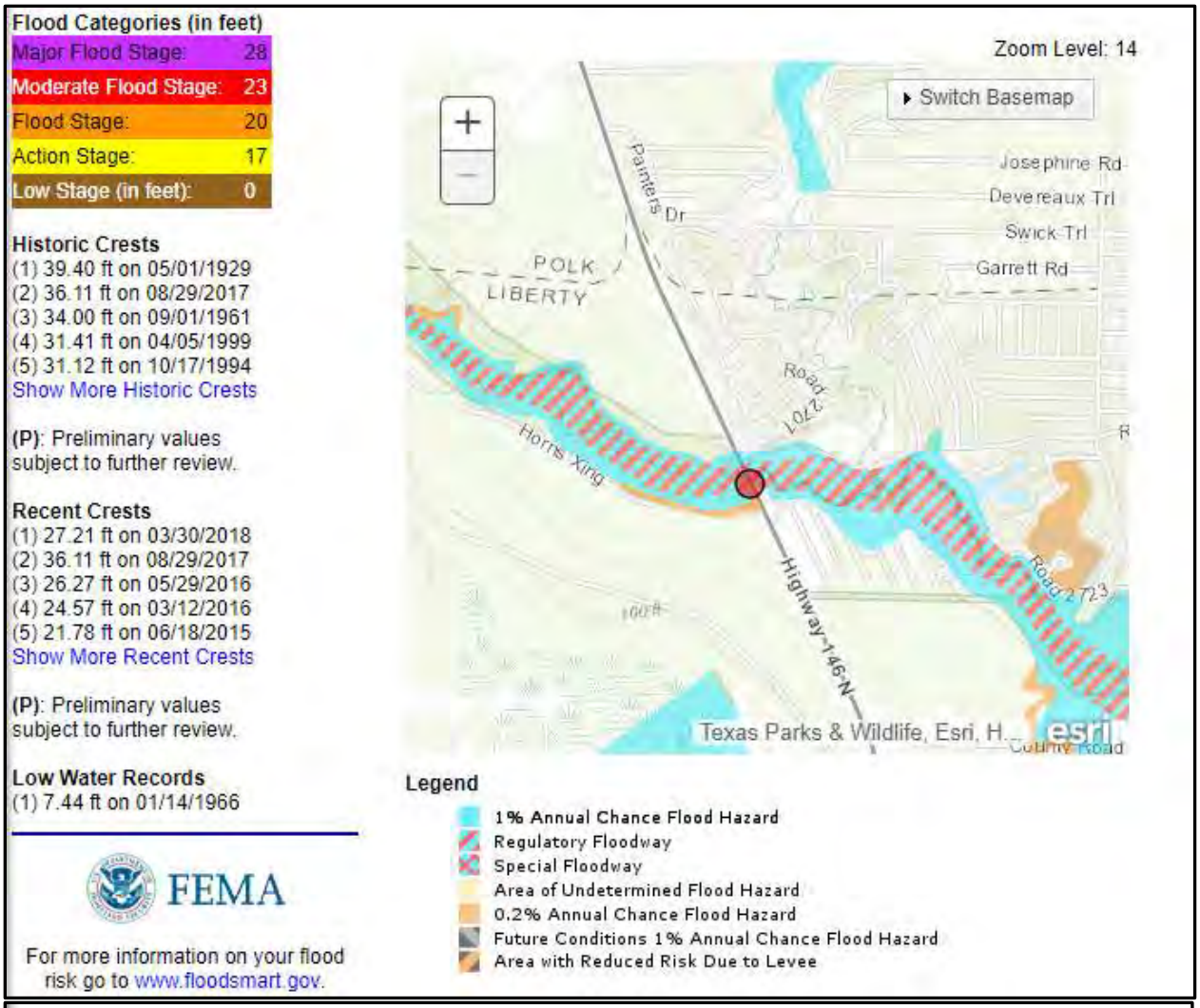
TRINITY RIVER GAUGE NEAR GOODRICH
Latitude: 30.571944° N, Longitude: 94.948611° W, Horizontal Datum: NAD83/WGS84



46.8	In past flood at levels above 46.8 feet many homes below Lake Livingston were flooded...some with water midway up their windows.
41	Major lowland flooding begins as the slab elevation of homes on the right bank just below Lake Livingston is reached.
38	Moderate lowland flooding begins.
36	Minor lowland flooding begins as water spreads out over fields and threatens buildings in the immediate vicinity of the gage.

Source: National Weather Service, Houston/Galveston Forecast Office; https://water.weather.gov/ahps2/hydrograph.php?wfo=hgx&gage=grit2

MENARD CREEK GAUGE NEAR RYE
Latitude: 30.481100° N, Longitude: 94.779400° W, Horizontal Datum: NAD83/WGS84



45	Water is over State Highway 146 in the vicinity of the gage.
28	Major lowland flooding begins with widespread inundation of the flood plain in the vicinity of the gage.
23	Moderate lowland flooding begins as low lying areas along the creek are inundated.
20	Minor lowland flooding begins as water escapes the main channel in the vicinity of the gage..

Source: National Weather Service, Houston/Galveston Forecast Office;
https://water.weather.gov/ahps2/hydrograph.php?wfo=hgx&gage=ryet2

Flood inundation depths inside homes typically are less than 4 feet, but many homes fall into this category of vulnerability. Water velocity is relatively high during flooding events due to terrain characteristics of Polk County. This extent classification applies to all participating jurisdictions including Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks.

OVERALL FLOOD VULNERABILITY AND IMPACTS

Overall vulnerability to flooding for each participating jurisdiction is considered high. The following table summarizes this floodplain information, noting changes by comparing 2011 data to 2017.

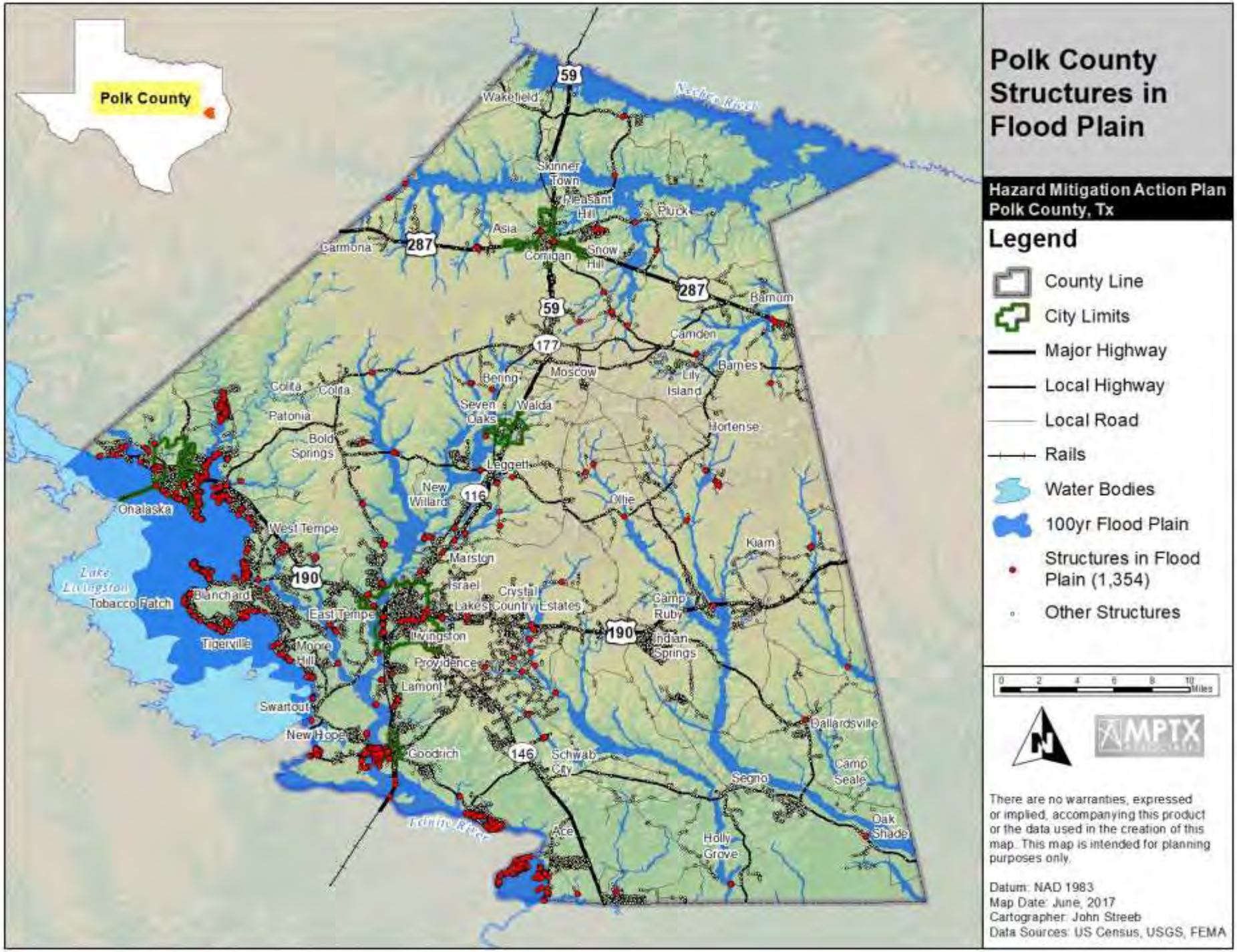
Among other data notes the table describes number of acres and the value of property within Polk County's 100-year floodplain.

Table 3-8 Floodplain Vulnerability Data, Polk County, All Jurisdictions

Acres in Zone A (100-year floodplain, SFHA, 2011 – 2017 unchanged)	126,649
Miles of Roadway located within Zone A (2011 – 2017 unchanged)	80
Structures Located within Zone A (2011)	1,450
Structurers Located within Zone A (2017)	1,354
Total Value of Structures located within Zone A (2011)	$53,664,004
Total Value of Structures located within Zone A (2017)	$60,000,000
Flood Insurance policies active in Polk County (2011)	555
Flood Insurance policies active in Polk County in (2017)	501
Total Flood Insurance In Force (2017)	$118,163,108

Source: Polk County OEM, PCAD, NFIP

The map on the following page shows structures located in the FEMA defined Special Flood Hazard Area (SFHA). These point locations are indicted as red dots. There are 1,354 structures located in the SFHA across all jurisdictions in Polk County. Structures not located within SFHAs are shown as grey dots.


Polk County
Polk County Structures in Flood Plain
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
100yr Flood Plain
Structures in Flood Plain (1,354)
Other Structures
0 2 4 6 8 10 Miles
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, FEMA
Wakefield
Skinner Town
Pleasant Hill
Pluck
Asia
Camona
Corrigan
Snow Hill
Barnum
Camden
Lily Island
Barnes
Moscow
Berry
Colita
Patonia
Bold Springs
Seven Oaks
Walda
Hortense
Leggett
New Willard
Ohlie
Onalaska
West Tempe
Marston
Kiam
Lake Livingston
Tobacco Patch
Blanchard
Israel
Crystal Lakes
Country Estates
Camp Ruby
East Tempe
Livingston
Indian Springs
Tigerville
Moore Hill
Providence
Lamont
Swartout
New Hope
Goodrich
Schwab City
Dallardsville
Camp Seale
Segno
Oak Shade
Ace
Holly Grove
59
287
177
190
116
146

Flood Hazard Vulnerability Assessment, Subdivision Scale Analysis

Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events. The data used to develop these models is based on hydrological analysis of landscape features. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that can be expected from a flood event. Using GIS technology and flow-velocity models, it is possible to map the damage that can be expected from flood events over time. It is also possible to pinpoint the effects of certain flood events on individual properties. At the time of publication of this Plan, data was insufficient to conduct a risk analysis for flood events in Polk County. However, the current mapping projects being led by the County GIS Mapping Department will result in better data that will assist in understanding risk. This Plan includes recommendations for building partnerships that will support the development of a flood-risk analysis in Polk County.

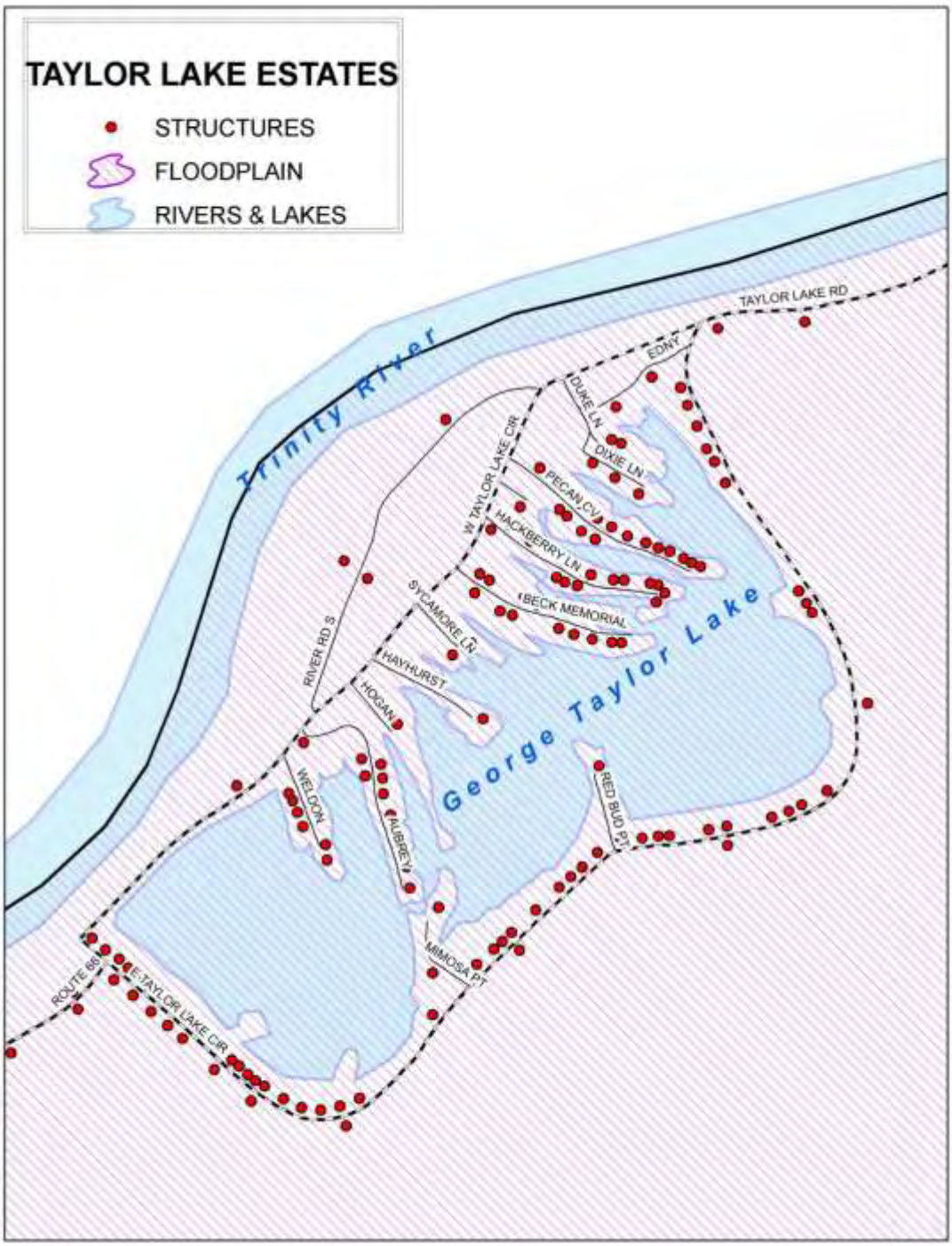
The following table reports subdivision specific data for concentrated areas of developed and potentially developed parcels located within or in direct proximity to FEMA defined Special Flood Hazard Areas.

Table 3-9 Subdivision Specific Data in Proximity to SFHAs

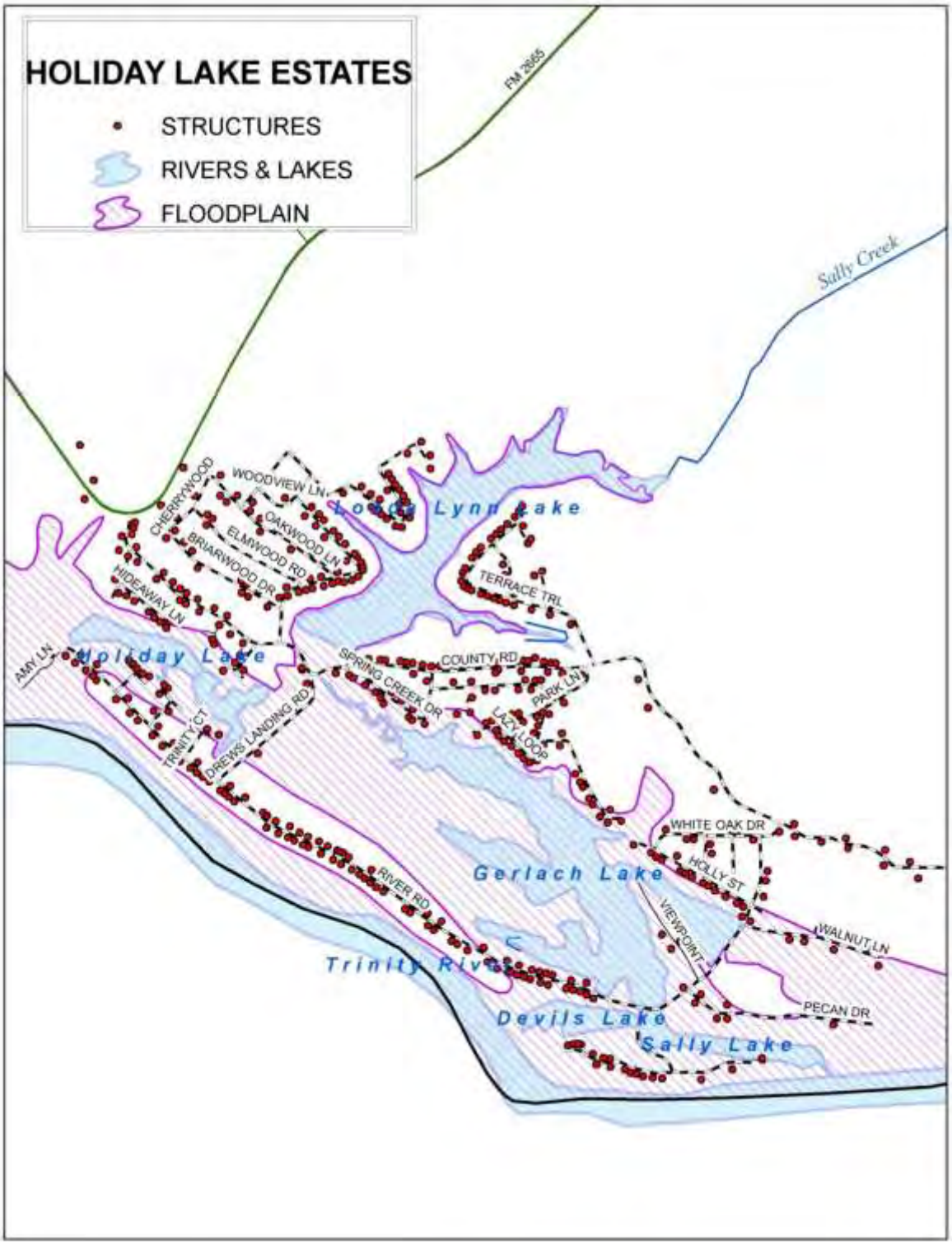
Name	Developed Parcels	Undeveloped Parcels	Total Parcels	Improvement Total	Maximum Value
Holiday Lake Estates	220	240	460	$16,546,115	$297,722
Taylor Lake Estatess	150	177	327	$12,314,419	$176,819
Livingston Industrial East side Hwy 59	8	12	20	$7,892,176	$3,682,621
Wells Landing-Sportsmans Retreat	70	257	327	$3,264,465	$153,704
Livingston Commercial	6	0	6	$3,109,805	$1,091,447
Sleepy Hollow	55	40	95	$2,924,695	$136,030
Livingston Commercial-Indust	3	2	5	$1,927,423	$1,150,546
Siesta Hollow	40	155	195	$1,821,796	$255,685
Crystal Lakes - East Livingston	28	30	58	$1,277,633	$97,646
South Central Livingston-1	18	5	23	$1,000,002	$312,032
Stones Throw Oak - Choate Survey	6	4	10	$866,006	$175,502
Sugar Street - North Livingston	8	10	18	$771,373	$164,005
East Corrigan - Reilly Village	15	180	195	$518,342	$79,790
South Central Livingston-2	8	9	17	$412,049	$150,080
First Street - East Livingston	8	3	11	$316,904	$87,559
Seven Oaks	8	3	11	$301,218	$72,084
NW Polk Co - Hwy 287	3	3	6	$266,341	$130,121
Second Street - East Livingston	5	3	8	$222,436	$96,109
Moye Road - East Polk County	5	4	9	$158,952	$41,191
Midway Loop - East Polk County	2	2	4	$102,256	$70,650
Oats Rd - North Livingston	3	10	13	$90,960	$49,291
Corrigan Residential	1	0	1	$67,771	$67,771
Menard Creek Estates	1	5	6	$38,675	$38,675
Theriot Road	4	12	16	$35,478	$20,709
	675	1,166	1,841	$56,247,290	n/a

Source: Polk CAD (parcel values, location); FEMA FIRM (flood zones); MPTX (analysis)

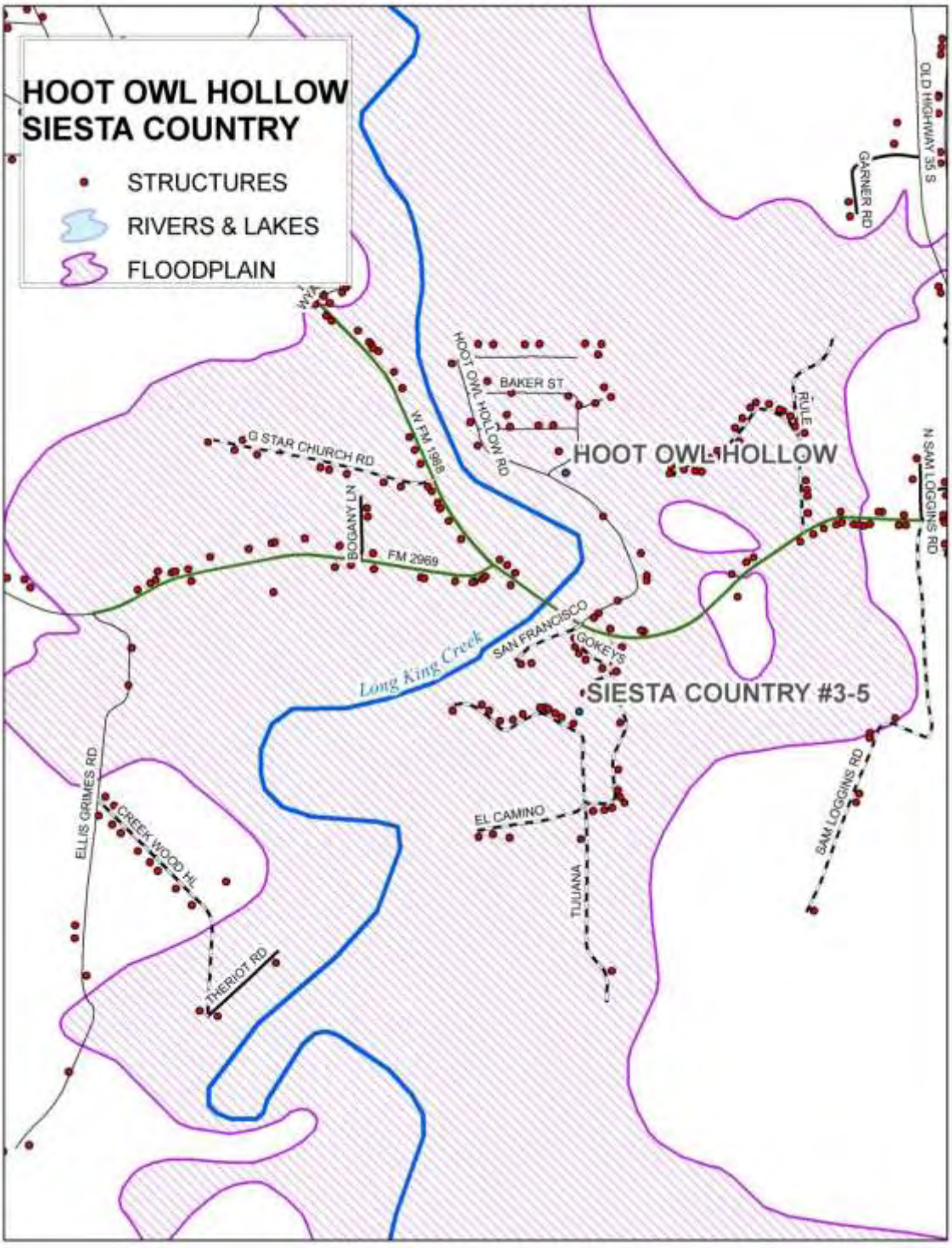
The following maps are examples of a few of the many subdivisions and areas along rivers and creeks in Polk County that are in the floodplain and are, therefore, at risk of flooding.



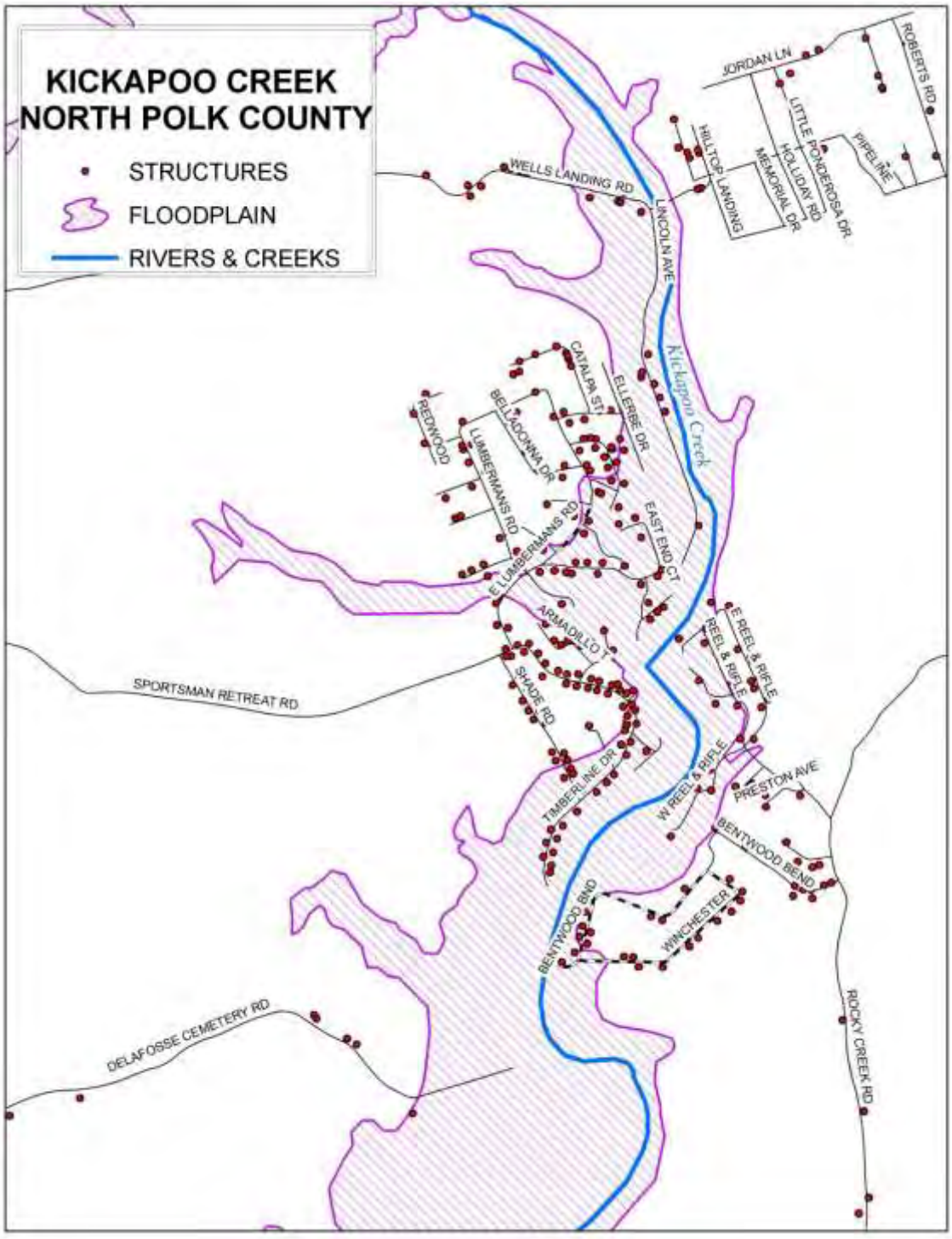
Taylor Lake Estates is located in south Polk County with approximately 150 homes and 8 businesses located in the floodplain surrounding both George Taylor Lake and the Trinity River.



Holiday Lake Estates is located in south Polk County with approximately 107 homes located in the floodplain impacted by the Trinity River, Devils, Sally, Gerlach and Holiday Lakes.



Hoot Owl Hollow and Siesta Country are located in southwest Polk County, west of the City of Goodrich. Approximately 215 homes and 17 businesses are impacted by flooding along Long King Creek.



Several subdivisions in north Polk County are situated along Kickapoo Creek. Approximately 86 homes are impacted by flooding in this area.

Flood Hazard Vulnerability Assessment, Development Type Analysis

Site Built Homes

Homes in frequently flooded areas can suffer damage to septic systems and drain fields. Homes in rural floodplain areas often depend on private sewage treatment systems, and inundation of these systems may result in leakage of wastewater into surrounding areas. In many cases, flood damage to homes renders them unlivable. The federal government provides disaster funding for people who cannot, or should not, live in their homes because of damage or other disaster-related reasons.

Manufactured Homes

Many manufactured homes are located in floodplain areas. Manufactured homes have a lower level of structural stability than stick-built homes, and therefore must be anchored to provide additional structural stability during flood events. Because of confusion in the late 1980s resulting from multiple changes in NFIP regulations, there are some communities that do not actively enforce anchoring requirements. Lack of enforcement of manufactured home construction standards in floodplains can contribute to severe damages from flood events.

Business/Industry

Flood events impact businesses by damaging property and by interrupting business operations. Flood events can cut off customer access to a business as well as close a business for repairs. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

Public Infrastructure

Publicly-owned facilities are a key component of daily life for all citizens of the county. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices can hinder the ability of the government to deliver services. Government can take action to reduce risk to public infrastructure from flood events, as well as craft public policy that reduces risk to private property from flood events.

There are a variety of drinking water, surface water, and wastewater service providers throughout the county. During flooding events, the infrastructure that supports the water service providers in the county can be damaged and sometimes destroyed. For example, the City of Livingston lost power to its water pumping station during the October 1994 flood, and water had to be pumped through it by a fire truck to keep the facility running.

Based on the frequency and severity of previous occurrences, the overall assessment flooding is considered **High Vulnerability**, according to subjective assessments and the classifications defined in Section 3.1.1.

3.3.2 Hurricane

HAZARD DESCRIPTION

Hurricanes and tropical storms are types of cyclones. The basic difference between a hurricane and tropical storm is the intensity of the storm, measured by maximum sustained wind speed. A hurricane has surface winds in excess of 74 miles per hour (64 knots).

A tropical storm has less intense winds than hurricanes, but greater than 39 miles per hour (34 knots). For locations in the Northern Hemisphere, hurricanes and tropical storms are accompanied by a counterclockwise wind circulation near the earth's surface.

Wind speeds are occasionally reported in knots rather than miles per hour. The conversion method to translate knots to miles per hour is to multiply knots by 1.15. Therefore, an 80-knot wind speed would equal 92 mph, a 100-knot wind speed would equal 115 mph, etc.

A hurricane and tropical storm can be characterized by storm surges along a coast, high waves, severe winds, coastal erosion, extreme rainfall, thunderstorms, lightning, inland flooding, and the spawning of tornados and microbursts. Hurricanes and tropical storms typically lose strength over land, though extensive damage can occur several hundred miles inland.

Hurricanes are classified into five categories based on wind speed, central pressure, and damage potential. The classification system for hurricanes is referred to as the Saffir-Simpson Hurricane Scale shown in Table 3-10 below.

Table 3-10 Saffir-Simpson Hurricane Scale

Category	Wind Speed (mph)	Expected Damage
Category 1	74-95	**Minimal:** Damage is primarily limited to shrubbery and trees, unanchored mobile homes and signs damaged, some signs, no real damage to structures.
Category 2	96-110	**Moderate:** Some trees toppled, some roof coverings damaged, and major damage to mobile homes.
Category 3	111-130	**Extensive:** Large trees toppled, some structural damage to roofs, mobile homes are destroyed, and structural damage is done to small homes and utility buildings.
Category 4	131-155	**Extreme:** Extensive damage to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.
Category 5	> 155	**Catastrophic:** Roof damage is considerable and widespread, window and door damage severe, extensive glass failures and entire buildings could fail.

Source: Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA. 2001.

The official season for hurricanes and tropical storms is from June 1 to November 30. Peak storm activity often occurs in late August - early September. Typical hurricanes are about 300 miles wide although they can vary considerably in size.

The eye at a hurricane's center is a relatively calm, clear area approximately 20-40 miles across. The eyewall surrounding the eye is composed of dense clouds that contain the highest winds in the storm. The storm's outer rain-bands (often with hurricane or tropical storm-force winds) are made up of dense bands of thunderstorms ranging from a few miles to tens of miles wide and 50 to 300 miles long.

Hurricane-force winds can extend outward to about 25 miles in a small hurricane and to more than 150 miles for a large one. Tropical storm-force winds can stretch out as far as 300 miles from the center of a large hurricane. A typical hurricane brings at least 6 to 12 inches of rainfall to the area it crosses.

The right side of a hurricane is the frequently referred to as "dirty side" of the storm. It is the most dangerous in terms of storm surge and winds. Hurricane forward speed averages 15-20 mph, but can also stall, causing devastating rainfall, or in rare cases accelerate to 60+ mph. Tropical storms display the same general characteristics of hurricanes but with lesser intensity.

GEOGRAPHIC LOCATION

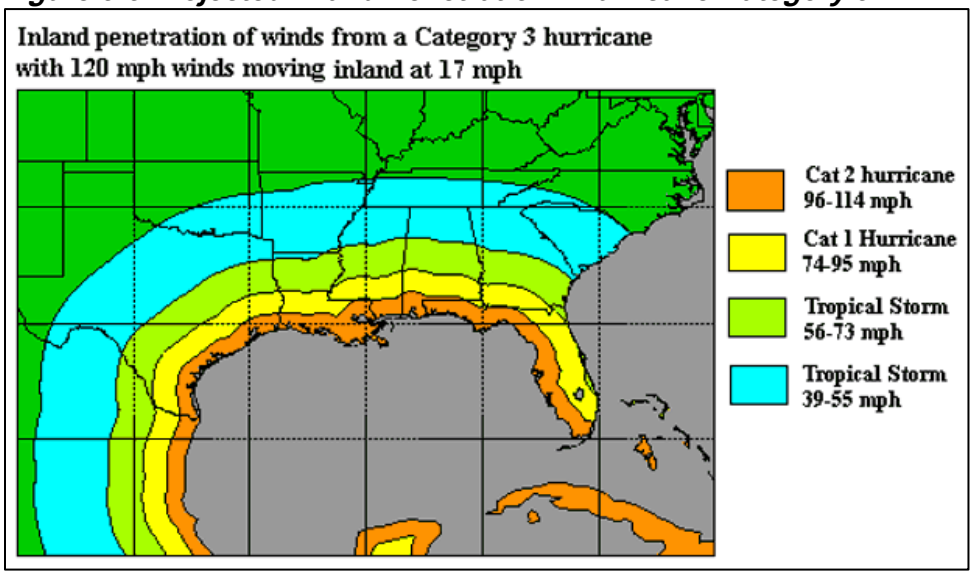
The entire planning area has the potential for hurricane impacts including all jurisdictions. The southern border of Polk County is approximately 65 miles inland from the Gulf of Mexico, and numerous hurricanes and tropical storms have tracked across Polk County in records dating back to 1851. Figure 3-4 shows the location of Polk County in relation to all hurricanes from 1851 to 2008, indicating the planning area is situated along the northern fringe of storm tracks moving northward from the Gulf. The yellow square depicts the approximate location of Polk County.

Figure 3-4 Atlantic Basin Hurricane Tracks 1851 – 2008

Source: NWS, National Hurricane Center

Also notable for inland counties is hurricane "wind decay" models. These wind forecasting tools model standard wind speeds for various categories of hurricanes ranging from Category 1 to 5. The following map produced by NOAA shows projected 'inland penetration of wind' from a hurricane making landfall as Category 3 with forward motion of 17 knots per hour. The result shows the Polk County planning area is located on the outer fringe of orange or inner fringe of yellow, indicating winds approximately 90 to 100 mph for this example hurricane event.

Figure 3-5 Projected Inland Penetration - Hurricane Category 3



Source: NOAA

PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of hurricane impacts. Three (3) major hurricanes have impacted Polk County during the 13-year period since 2005. The following narratives describe each of these storm events.

HURRICANE HARVEY – 2017

The definitive report published to date for Hurricane Harvey was released January 28, 2018 by the National Oceanic and Atmospheric Administration (NOAA), National Weather Service / National Hurricane Center. The report is titled TROPICAL CYCLONE REPORT, HURRICANE HARVEY (AL092017, Blake, Zelinsky).

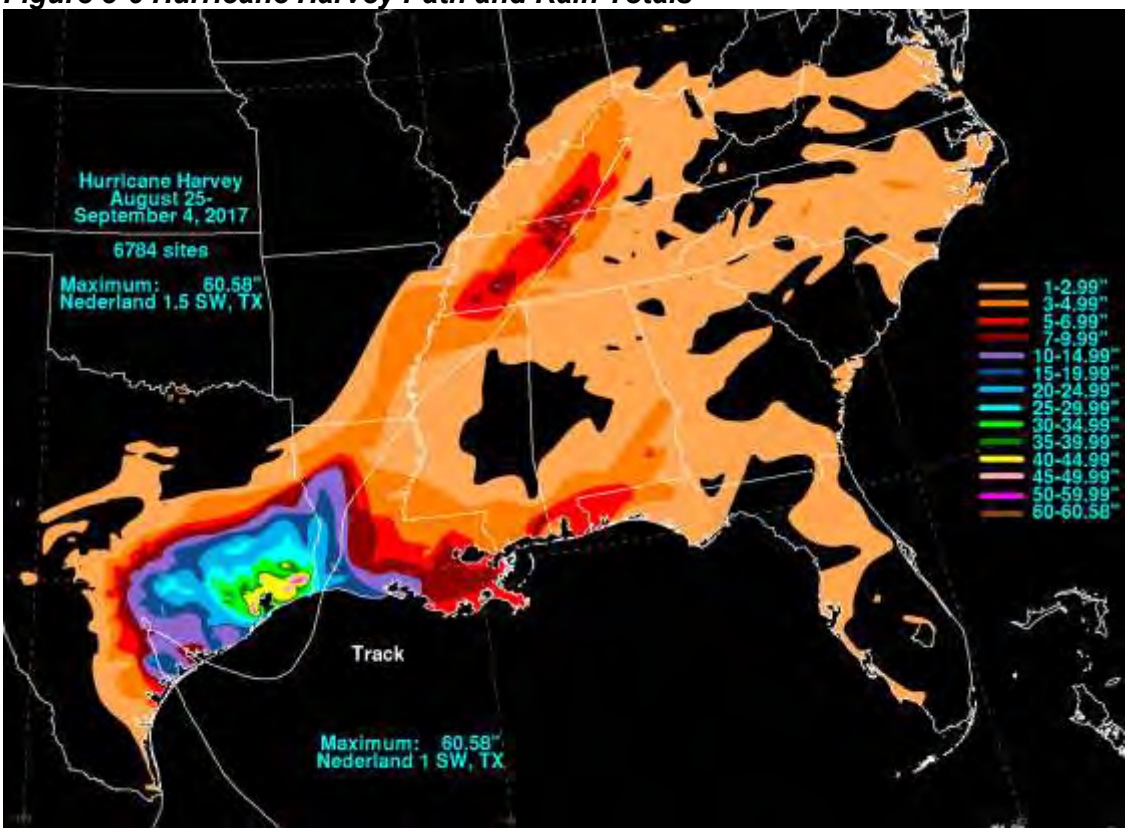
According to this report, Hurricane Harvey started as a weak August tropical storm that ultimately intensified into a Category 4 hurricane which made landfall along the middle Texas coast carrying 130-mph sustained winds. During the following 4-5 day period the storm dropped 50-60 inches of rain across a vast area of southeastern Texas (all-time record).

Catastrophic flooding resulted, making Hurricane Harvey the 2nd most costly hurricane in U.S. history, behind only Katrina (2005). At least 68 people died from the direct effects of the storm in Texas, the largest number of fatalities from a tropical cyclone in Texas since 1919.

The latest NOAA damage estimate from Hurricane Harvey is $125 billion, with the 90% confidence interval ranging from $90 to $160 billion. Over 300,000 structures and approximately 500,000 cars across the region were flooded. About 336,000 customers lost power during the hurricane. An estimated 40,000 flood victims were evacuated or took refuge in shelters. FEMA reported that about 30,000 water rescues were conducted during Hurricane Harvey.

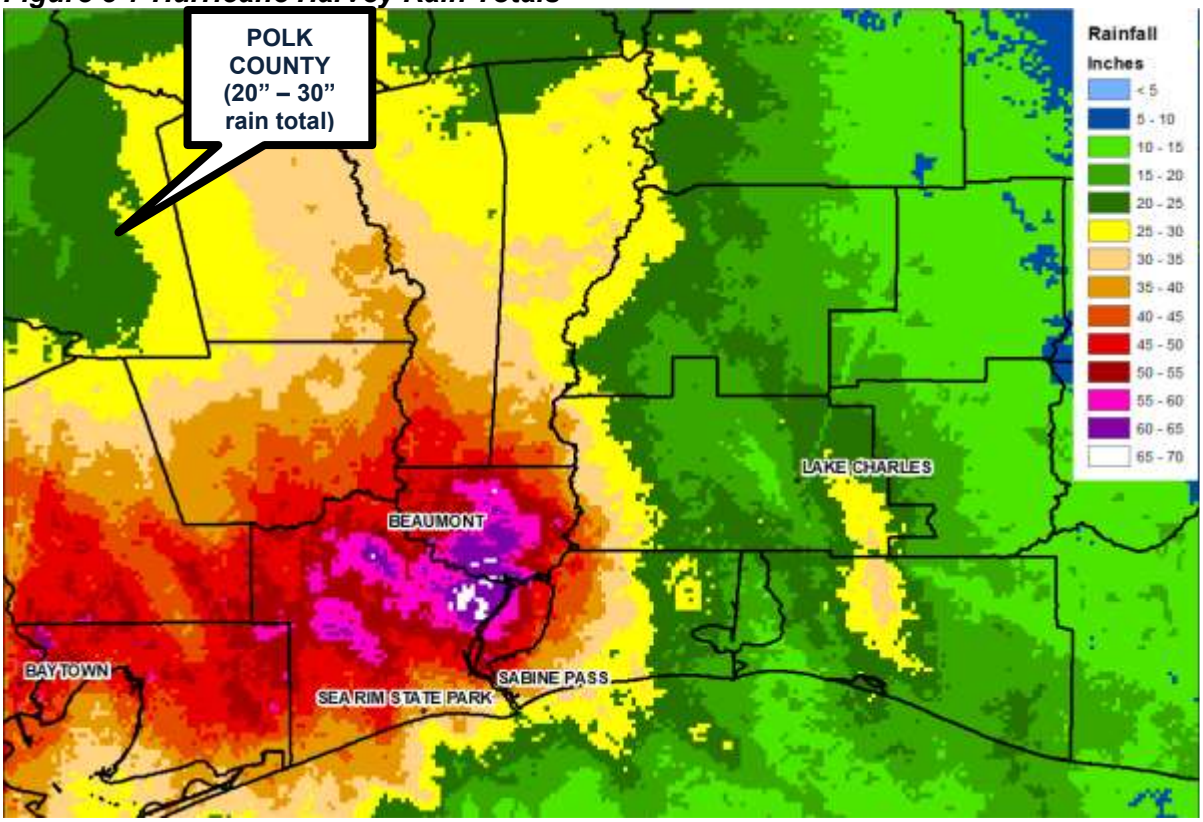
Major lowland flooding occurred on the Trinity River near Goodrich with damage and debris noted near the boat ramp and channel in proximity to the river gauge. Major flooding occurred upstream near Lake Livingston, with roads and many homes south of the lake being inundated. About 3,300 homes were damaged in Polk and surrounding counties.

Figure 3-6 Hurricane Harvey Path and Rain Totals



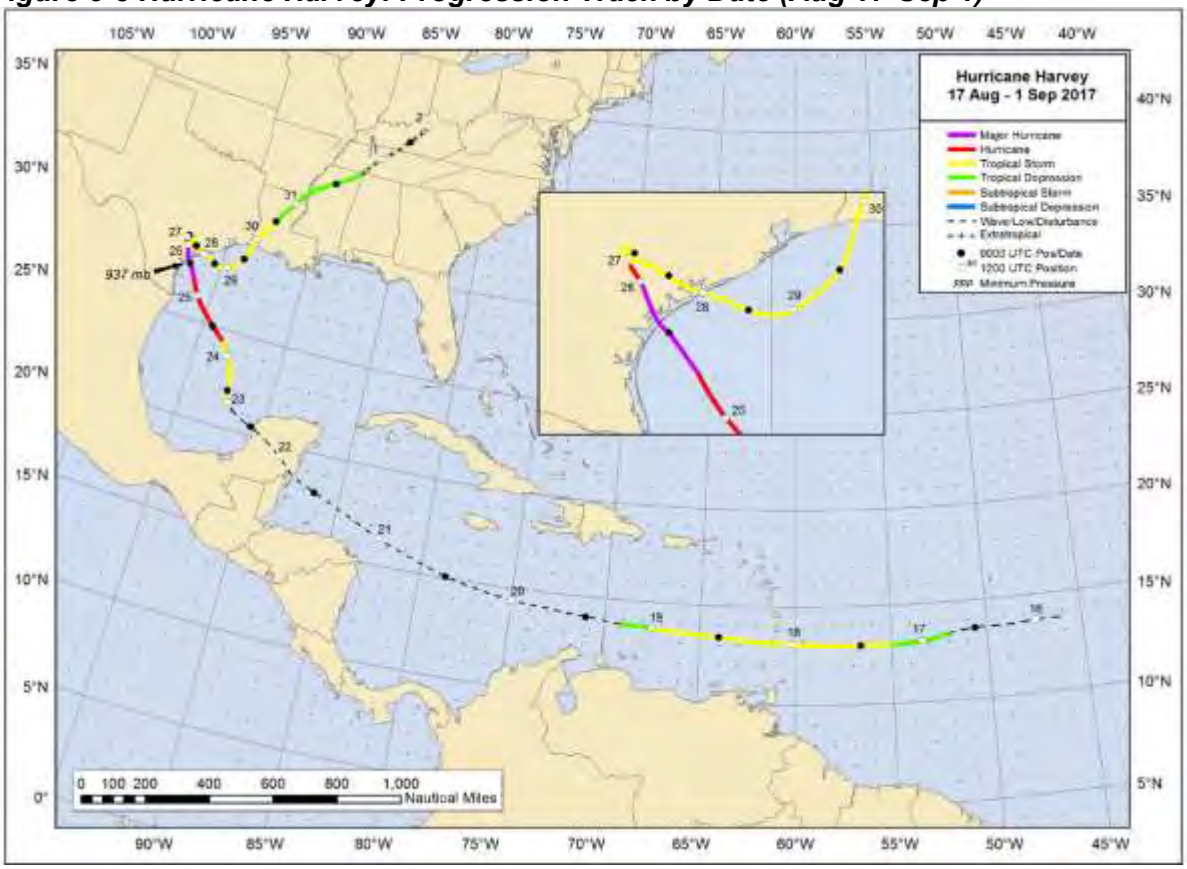
Source: NOAA, National Hurricane Center, Tropical Cyclone Report, Hurricane Harvey (AL092017)

Figure 3-7 Hurricane Harvey Rain Totals



Source: NOAA, National Hurricane Center, Tropical Cyclone Report, Hurricane Harvey (AL092017)

Figure 3-8 Hurricane Harvey: Progression Track by Date (Aug 17-Sep 1)



Source: NOAA, National Hurricane Center, Tropical Cyclone Report, Hurricane Harvey (AL092017)

HURRICANE IKE - 2008

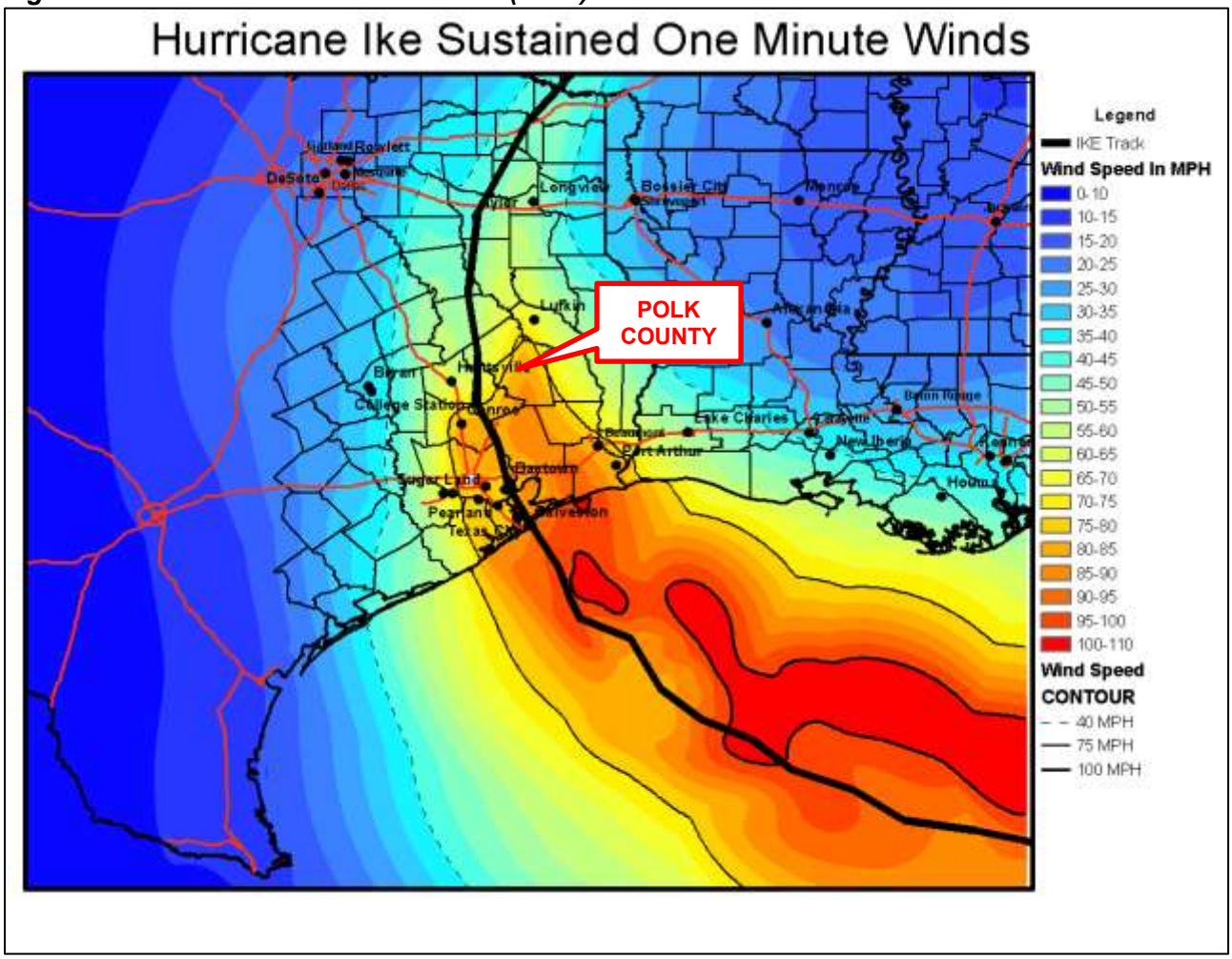
The primary source of summary data for Hurricane Ike is presented in the Tropical Cyclone Report Hurricane Ike 1-14 September 2008 National Hurricane Center (1/23/2009,), updated 2/4/2009, 3/18/2009 and 5/3/2010.

Polk County was declared a disaster area in 2008 when Hurricane Ike, cut a path of devastation through Polk County, which had not yet fully recovered from Hurricane Rita.

Polk County's population surges dramatically each time coastal areas evacuate north to safety. This places an enormous strain on the county's f resources and infrastructure.

The map below shows sustained winds from Hurricane Ike, which exceeded 85 mph in the southern portion of Polk County, and 80 mph across the rest of the county.

Figure 3-9 Storm Track: Hurricane Ike (2008)



Source: National Weather Service

The primary source of summary data for Hurricane Ike is presented in the Tropical Cyclone Report, Hurricane Rita 18-26 September 2005, updated August 2006, the National Hurricane Center; and the National Climatic Data Center, FEMA Disaster Summaries, and National Hurricane Center.

Hurricane Ike Storm Photos




Photos courtesy of Polk County Today

The volunteer fire departments served as vital Points of Distribution ("POD") sites for hundreds of residents in the aftermath of Hurricanes Rita (2005) and Ike (2008). Because of its remote location and abundance of fallen trees, Big Thicket Lake Estates was one of the last areas in the county to regain essential services. Therefore, the firefighters manned the fire station 24/7 and lived in small tents set up in the front yard of the station for over a month in 2005 (Rita) and for over two weeks in 2008 (Ike). In 2005 essential services were out and temperatures topped 105 degrees. The need for water and ice became a matter of life and death. The VFD cleared miles of country roads blocked by fallen trees so they could reach their stranded residents. People trapped in remote areas and those who could not reach their own VFDs because of impassible roads came to this fire station for assistance. The firefighters passed out food, ice and water, and made daily runs through the neighborhoods reaching out to elderly residents, shut-ins and those who could not make it to the station to pick up supplies.

Indian Springs VFD was a Point of Distribution during Hurricane Rita in 2005 and Hurricane Ike in 2008. The heavily wooded rural community was without power and essential services for 14 days after Rita and 11 days after Ike. Seventeen VFD personnel manned the station 24/7, sleeping on cots and in sleeping bags placed on the floor among the fire trucks. They passed out

water, ice and food 11 hours a day, 7 days a week, cleared fallen trees from 32 miles of subdivision roads and delivered food to the elderly and shut-ins. In 2005 they were without showers; however, in 2008 the firemen were able to use a shower trailer. In the face of almost unimaginable adversity the volunteers of this department found a useable building and sheltered and fed 15 elderly residents who evacuated from their mobile homes.

Segno VFD was a Point of Distribution during Hurricanes Rita and Ike. The community was without essential services for 14 days following Rita and 9 days following Ike. Firefighters cleared roads and distributed MREs, ice and water to its own residents, but their location along a route used by many to evacuate placed them in the position of ensuring the safety and wellbeing of hundreds of motorists evacuating coastal areas who found themselves stranded along the road with no gasoline, food or water. The station served the community 12 hours each day, but a lack of working toilets, showers, and kitchen facilities forced the station to close down each night at dusk.

Scenic Loop VFD suffered damage from Hurricane Rita in 2005 when a tree fell on the station. The fire station was a Point of Distribution in the aftermaths of Hurricanes Rita and Ike. Following Rita in 2005 they served a community 24/7 that was without power for 10 days and following Hurricane Ike in 2008 they served again for 12 days. The firefighters slept on cots in a cramped meeting room. They cleared trees from neighborhood roads, handed out MREs, ice and water and delivered food to shut-ins and those who had no way to reach the station for supplies. They had no showers, no cooked meals and toilets that overflowed onto floors.

South Polk County VFD served as a Point of Distribution during Hurricanes Rita and Ike, but the lack of essential facilities mandated that it shut its door each night at dusk. This fire station played a vital role during the last two disasters. They not only handed out and delivered food, water, and ice, they also brought in portable showers for stranded motorists and residents and used their generators to allow citizens to take their life-saving breathing treatments.

The upper Gulf Coast has enjoyed an unprecedented population explosion, with growth exceeding better than 57% over the past ten years. Because the Upper Gulf Coast has been impacted by several major hurricanes in recent history, residents have begun to heed evacuation warnings. Projected traffic density along evacuation routes can create a condition that may preclude a safe evacuation, as many Southeast Texans experienced during Hurricanes Rita and Ike. Thousands of Texans that evacuated from the Golden Triangle found themselves stranded for hours on end in dense traffic

Three evacuation routes cross into Polk County, US Highway 59 that runs north from the Houston area, State Highway 146 that runs north from the Galveston area, and US Highway 287 that runs west from Corrigan to Groveton. (See following 2010 Inland Evacuation Map provided by the Texas Department of Transportation. All of these routes come together in Livingston causing a serious traffic bottleneck. There is cause for concern if the Galveston – Houston area evacuates at the same time as the Golden Triangle (Beaumont, Orange and Port Arthur) areas. Because both districts evacuated at the same time during Hurricane Rita, it caused a traffic ***"Nightmare"*** for Polk County. This was a worst-case scenario. However, following the aftermaths of Hurricanes Rita and Ike, the Texas Department of Transportation along with other state agencies and officials revised the Inland Evacuation Map in 2010 to address evacuation concerns.

The State of Texas Hazard Mitigation Plan (2010) notes somewhat higher statewide damage totals and impacts, with 135 fatalities attributed to Hurricane Ike and over $29 billion in losses.

Figure 3-10 Hurricane Ike Event Details, Texas

Hurricane Ike (2008)
EVENT NARRATIVE: A wind gust of 69 mph was measured at the Lufkin, Texas ASOS before the sensor went out due to a power failure. Stronger winds sustained near 74 mph with higher gusts likely effected portions of Polk County however the wind equipment at the Lufkin airport was inoperable at the time.

EPISODE NARRATIVE: Hurricane Ike came onshore across extreme southeast Texas during the late night hours of September 12th and the pre-dawn hours of September 13th. The storm made good progress northward during the day of September 13th and brought Tropical Storm force winds to much of northeast Texas and northwest Louisiana and extreme southwest Arkansas.

The storm produced widespread downed trees and power lines along with structural damage either from the winds or from downed trees which fell on top of structures. Power outages were widespread across a three state area of northeast Texas, northwest Louisiana and southwest Arkansas. Southwest Electric Power Company (SWEPCO) which provides electricity to a good portion of northeast Texas, northwest Louisiana and southwest Arkansas said that the number of outages peaked at 187,000 customers.

Additional power companies were called in from far away as Indiana and Michigan to deal with the numerous power outages. This was the second most number of outages at one time reported in SWEPCO's 96 year history. The most number of outages was 234,000 during the ice storm of December 13th, 2000. The number of power outages in association with Hurricane Ike topped the September 2005 recovery from Hurricane Rita by nearly 1000 customers. The storm also produced tornadoes across portions of north central Louisiana as well as south central Arkansas and east central Texas.

Summary
Hurricane Ike was a long-lived Cape Verde hurricane that caused extensive damage and many deaths across portion of the Caribbean and along the coasts of Texas and Louisiana. It reached its peak intensity as a Category 4 hurricane over the open waters of the central Atlantic, directly impacting the Turks and Caicos Islands and Great Inagua Island in the southeastern Bahamas before affecting much of the island of Cuba. Ike, with its associated storm surge, then caused extensive damage across part of the northwestern Gulf Coast, when it made landfall along the upper Texas coast as a strong Category 2 hurricane.

Landfall Location
The center of the hurricane made landfall along the north end of Galveston Island, Texas. The hurricane's center continued up through Galveston Bay, just east of Houston, the northward across east Texas.

Wind Speeds Measured
The estimated Texas intensity of 95 knots (109 mph) is based on flight level winds of 105 knots (120 mph), Stepped Frequency Microwave Radiometer (SFMR) winds up to 90 knots (103 mph) and Doppler radar velocities from the Houston radar, which showed 114 knots (131 mph) at 6500 feet. The highest 1-minute sustained wind recorded by surface instruments was 83 knots (95 mph) from a WeatherFlow anemometer located at Crab Lake on the Bolivar Peninsula. A 1-minute sustained wind of 34 knots (39 mph) was recorded in Lufkin. A gust of 60 knots (69 mph) was also recorded in Lufkin.

Rain Events Measured
Ike produced a large amount of rainfall 3 inches or greater over much of southern Texas and extreme southwestern Louisiana. Measured rainfall in Polk County included 2.59 inches in Lufkin.

Initial Damage Estimates
The Property Claims Services of the Insurance Services Office estimates that the insured damage (not including inland flooding or storm surge) from Ike in Texas, Louisiana and Arkansas is about $10 billion. The National Flood Insurance Program estimates that insured losses from inland flooding and storm surge is approximately $2.5 billion in the same three states. Because there is a $250,000 cap on each claim for inland flooding and storm surge, the actual dollar number is considerably higher. Total damage is estimated at about $24.9 billion.

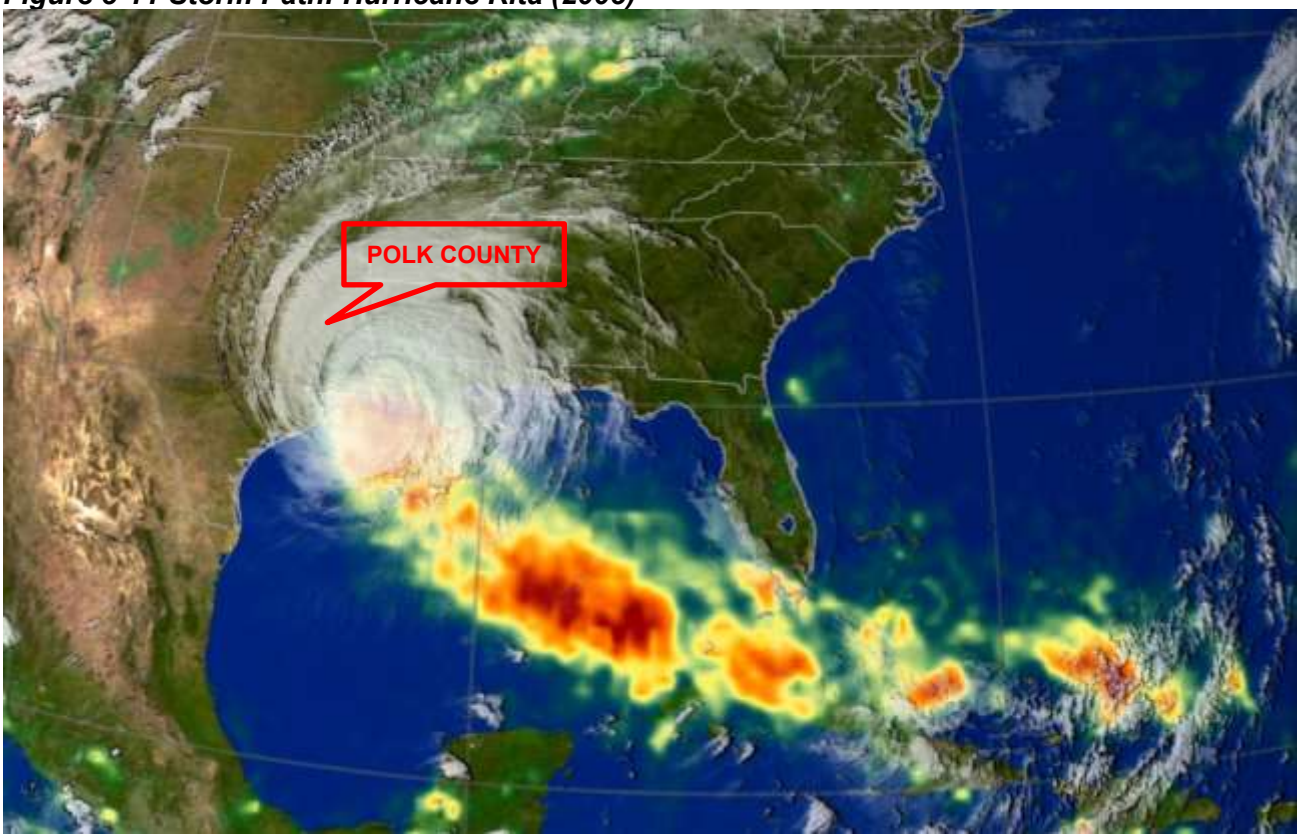
Source: Tropical Cyclone Report Hurricane Ike 1-14 September 2008 National Hurricane Center (1/23/2009,), updated 2/4/2009, 3/18/2009 and 5/3/2010.

HURRICANE RITA – 2005

The primary source of summary data for Hurricane Ike is presented in the Tropical Cyclone Report, Hurricane Rita 18-26 September 2005, updated August 2006, the National Hurricane Center; and the National Climatic Data Center, FEMA Disaster Summaries, and National Hurricane Center.

Polk County was declared a hurricane disaster area in 2005 after Hurricane Rita downed trees and flying debris blocked roadways, destroyed homes, and caused power outages that persisted for over a month in rural areas. The area was inundated by an influx of over 15,000 evacuees from the coastal areas, which caused a near nonexistence of fuel. Lake Livingston Dam, a 2.5 mile earthen embankment with 12 flood gates for releasing water was heavily damaged by Hurricane Rita when it made landfall on the Texas coast bringing 117 mile per hour winds to Lake Livingston. The high winds and significant wave action eroded some of the rip rap on the lake side of the dam, exposing part of the earthen embankment. Following the state-approved emergency action plan, the Trinity River Authority began releasing water from Lake Livingston to lower the water level to 127 feet above sea level to avoid any further erosion of the dam foundation from wave action during a hurricane. The release of 79,200 cubic feet per second caused flooding in low-lying areas downstream from the dam.

Figure 3-11 Storm Path: Hurricane Rita (2005)



Source: NASA

To understand the extent of damage Hurricane Rita caused, the Texas Department of State Health Services prepared a report entitled “Rapid Public Health Assessment, East Texas, Hurricane Rita, 2005, by David Zane, M.S. The report focused on Indian Springs subdivision located near Livingston, Texas. An estimated 459 households were counted, and 153 were selected for the sample. Since the storm, 27% of homes were deemed unsafe, 41% had a tree fall on the house, 15% had a tree fall on a vehicle, and 52% of residents needed assistance removing trees. Further 4% of residents suffered injury due to the hurricane. In the aftermath of the hurricane, 23% have suffered illness, 38% experienced sadness/depression, and 26% required medical care. Only 37% of the residents studied had homeowners insurance.

According to the Insurance Council of Texas in 2010 dollars, state-wide property damage sustained from Hurricane Rita totaled $3.19 billion. State-wide property damage from Hurricane Ike totaled $12.3 billion. Profile of the two hurricane events in Polk County are provided below in Figures 3-20a. The information sources for hurricane profiles are the Hurricane Rita Rapid Response, Coastal and Riverine High Water Mark Collection Final Report to FEMA (2006).

Figure 3-12 Hurricane Profile for Hurricane Rita (2005) Polk County

Hurricane Rita moved onshore the Southeast Texas/Southwest Louisiana coast during the early morning hours of September 24, 2005 and moved northward into portions of East Central Texas during the predawn hours. The hurricane remained a category two storm as it moved northward into extreme eastern Polk County, extreme southeast Nacogdoches County, San Augustine County and Sabine County Texas. A NWS Storm Survey was conducted of the hardest hit areas of East Central Texas and this region experienced widespread damage consistent of winds with a category two hurricane. A few hundred homes experienced damage that varied from shingles off roofs to collapsed carports or awnings to damage caused by downed trees on top of homes, businesses and automobiles. Particularly hard hit areas were those surveyed near and east of the Sam Rayburn Reservoir of East Central Texas. This region experienced winds adjacent to the northern and eastern eyewall of Hurricane Rita and extensive damage was observed to many rural homes and communities along the storms path. Much of this region was without power during the height of the storm. There was one direct fatality resulting from the storm when a downed tree fell across a man outside his residence. There was one indirect fatality from the storm when a young woman touched a downed powerline. A monetary amount was not available at the time of this report.

Summary

Hurricane Rita was an intense hurricane that reached Category 5 strength over the central Gulf of Mexico, where it had the fourth-lowest central pressure on record in the Atlantic basin. Although it weakened prior to making landfall as a Category 3 hurricane near the Texas/Louisiana Border, Rita produced significant storm surge that devastated coastal communities in southwestern Louisiana, and its winds, rain and tornadoes caused fatalities and a wide swath of damage from eastern Texas to Alabama. Additionally, Rita caused floods due to storm surge in portion of the Florida Keys.

Landfall Location

The landfall of Hurricane Rita was just east of the Texas-Louisiana border. It landed between Johnson's Bayou and Sabine Pass. This places the upper Texas coast in the left front hurricane quadrant. In this section of the counterclockwise circulation of the storm winds, the forward speed of the storm does not add to the magnitude of the maximum wind speeds. This explains the lower coastal storm surge in Texas compared to Louisiana.

Wind Speeds Measured

The strongest sustained wind reported from an official surface observing site was 71 knots (81 mph) as Sabine River, Texas near the Louisiana border. Sustained hurricane-force winds were also reported at the Southeast Texas Regional Airport in Beaumont, Texas at 70 knots (80 mph). A variety of temporary instrumental towers in extreme southeastern Texas also measured sustained hurricane-force winds, as strong as 82 knots (94 mph) with peak 3-second gusts up to 100 knots (115 mph). The maximum 2-minute sustained wind in Lufkin was 33 mph with a peak gust of 50 mph before equipment failure.

Rain Events Measured

Estimates between 5-6 inches fell in Lufkin, with three day estimates between 7-11 inches.

Initial Damage Estimates

Single family dwellings destroyed 35. Single family dwellings with major damage 330. Single family dwellings with minor damage 585. Mobile homes destroyed 35. Mobile homes with major damage 403. Mobile homes with minor damage 512. Apartments with major damage 25, minor damage 73.

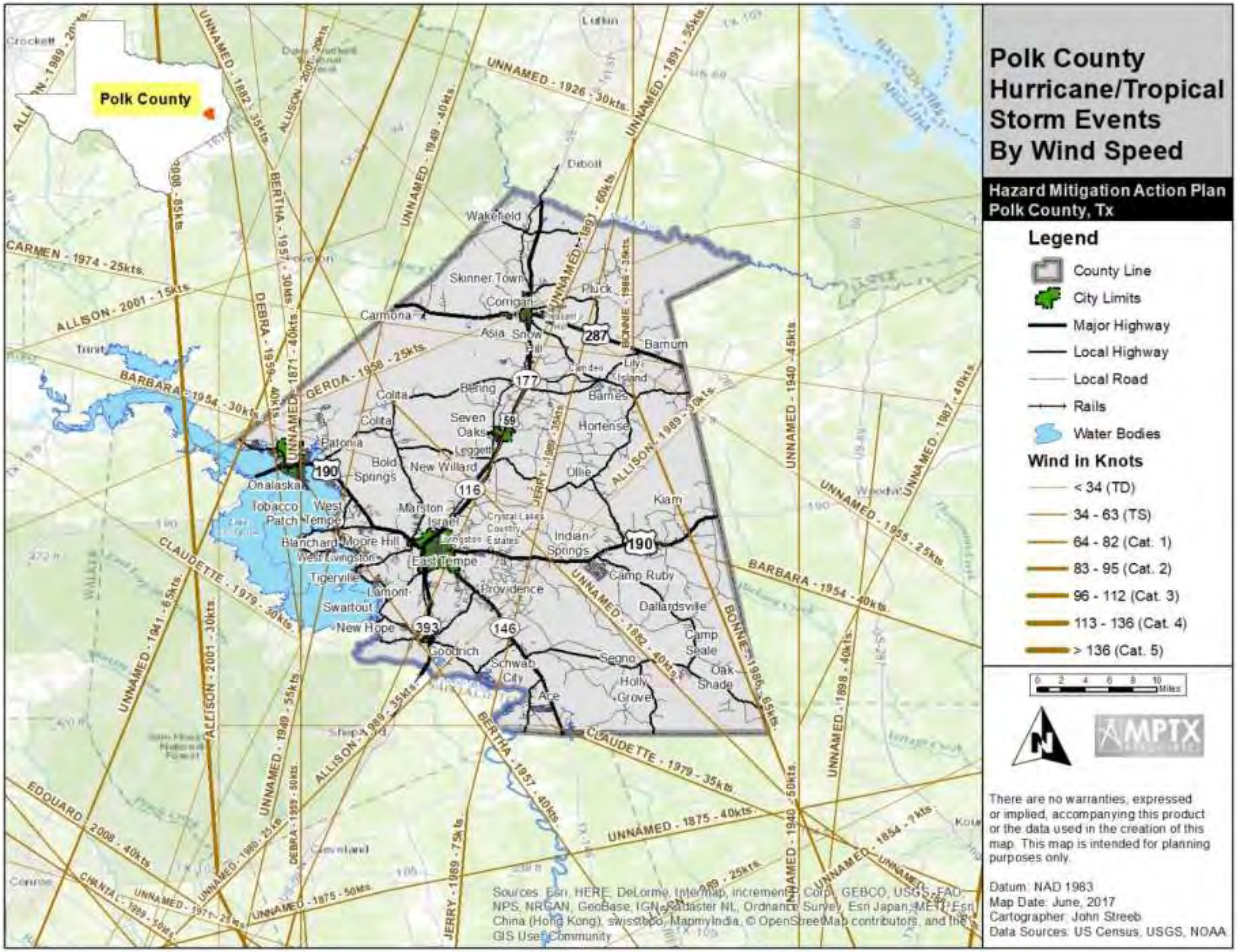
Source: National Weather Service, National Hurricane Center

Hurricane Jerry - 1989

Hurricane Jerry was a minimum category one hurricane that devastated the southern and eastern parts of Polk County. About half of the residents in these areas were without electricity for 5 to 10 days. Trees were downed everywhere blocking roads and destroying houses. Hurricanes do not have to strike Southeast Texas to impact Polk County, storms as far away as Corpus Christi can spawn tornados and produce torrential rains of 8 – 10 inches or more.

To summarize previous occurrences, hurricanes have impacted Polk County, Livingston, Goodrich, Seven Oaks, Onalaska, and Corrigan three times in the last 13 years.

Based on detailed data from the NOAA, the map on the following page shows actual hurricane and tropical storm eyewall tracks across Polk County and nearby vicinity, for the period 1891-2008.

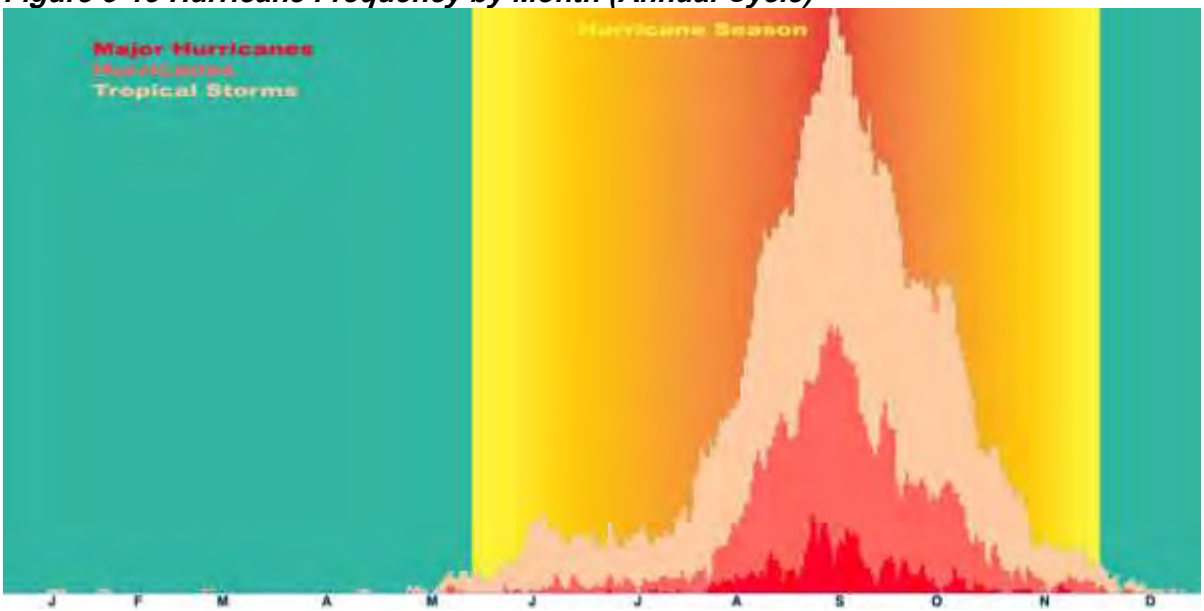

Polk County
Hurricane/Tropical
Storm Events
By Wind Speed
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
Wind in Knots
< 34 (TD)
34 - 63 (TS)
64 - 82 (Cat. 1)
83 - 95 (Cat. 2)
96 - 112 (Cat. 3)
113 - 136 (Cat. 4)
> 136 (Cat. 5)
Miles
AMPTX
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, NOAA
Polk County
Onalaska
Livingston
Corrigan
Goodrich
Seven Oaks
CARMEN - 1974 - 25kts.
ALLISON - 2001 - 15kts.
BARBARA - 1954 - 30kts.
GERDA - 1958 - 25kts.
CLAUDETTE - 1979 - 30kts.
CLAUDETTE - 1979 - 35kts.
UNNAMED - 1926 - 30kts.
UNNAMED - 1875 - 40kts.
UNNAMED - 1955 - 25kts.
BARBARA - 1954 - 40kts.
EDOUARD - 2008 - 40kts.
BERTHA - 1957 - 40kts.
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

PROBABILITY OF FUTURE OCCURRENCE

Based on National Climatic Data Center records, during the 18-year period from 2000 to 2017, three hurricane events that impacted Polk County. This frequency equates to a 6-year return interval, 16.7 percent chance of occurrence in a given year, and equaling a **Medium** probability of future occurrence according to the definitions set forth in Figure 3-1 in Section 3.1.1. This probability analysis applies to Polk County and each of the participating cities of this plan.

Considering probability based on time of year, patterns of previous occurrences show probability of hurricane occurrence is highest in the month of September, as indicated by Figure 3-13. This data is remarkable because the actual major hurricane occurrence affecting the Polk County planning area over the last 20 years follows this pattern closely. All three hurricanes since 2005 have occurred in late August and early September as the hurricane frequency by month would predict.

Figure 3-13 Hurricane Frequency by Month (Annual Cycle)



Source: Atlantic Oceanographic and Meteorological Laboratory (AOML)

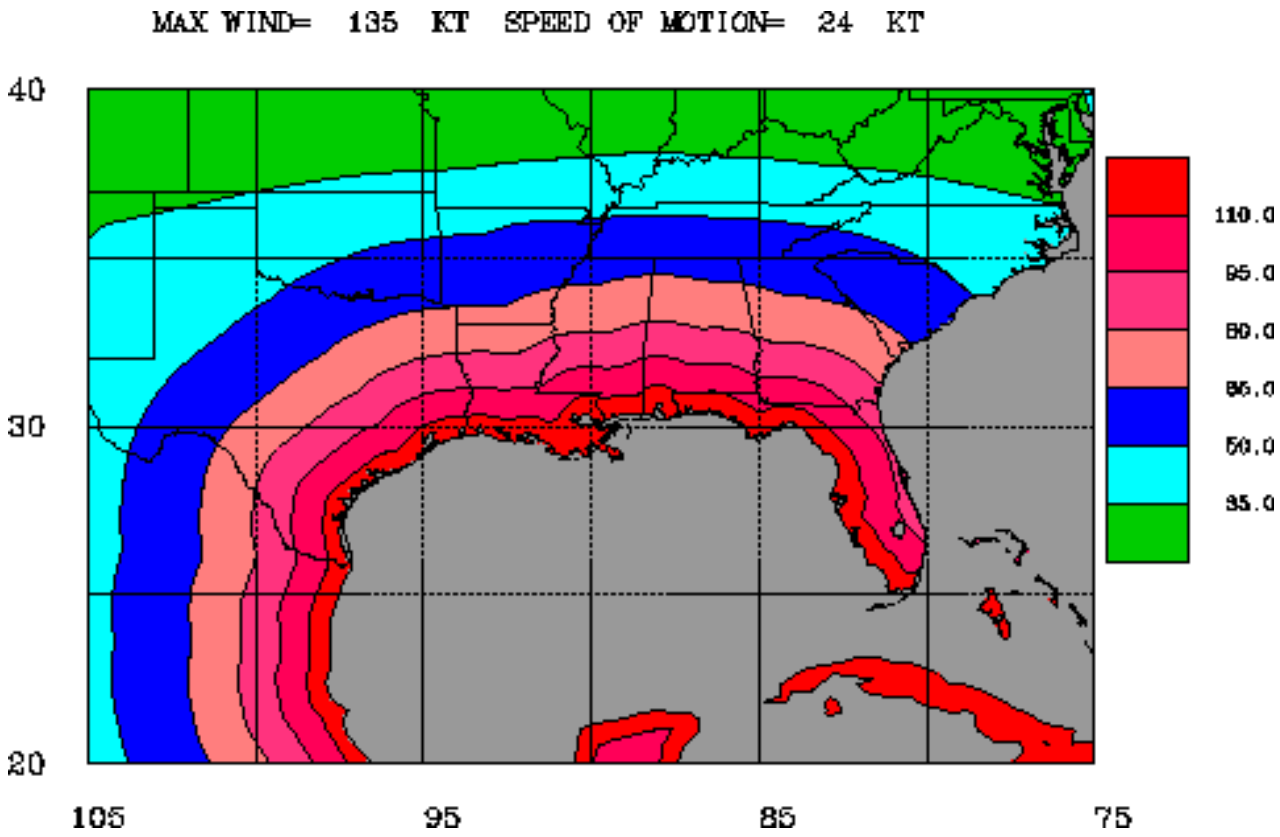
MAGNITUDE/SEVERITY/EXTENT

The worst case scenario hurricane to impact Polk County would be a Category 5 hurricane with forward motion of 24 knots per hour.

The following map produced by NOAA shows forecast wind speeds for the planning area of a Category 5 hurricane with forward track speed of 24 knots. According to this standard model, it indicates the planning area is within the dark pink band of wind speed ranging from 95 to 110 knots. As noted previously, the conversion method to translate knots to miles per hour is multiply by 1.15.

Therefore wind speed extent in the southern portion of the planning area is projected to be 126 mph for a Category 5 hurricane traveling due north at 24 knots per hour. In the northern portion of the planning area including north Polk County, Seven Oaks and Corrigan the wind speed would be slightly lower at approximately 120 mph for the same storm.

Figure 3-14 Wind Speeds of Category 5 Hurricane



Source: NOAA

According to definitions established in Section 3.1.1, the magnitude and severity of hurricanes/tropical storms across the planning area are considered **Level 4- Catastrophic**, particularly especially in the southern reaches of the county. This assessment is predicated on structural damage on a regional scale; loss of service for critical facilities, infrastructure and utilities for multiple weeks; and the potential for multiple injuries and fatalities.

Hurricane Overall Vulnerability

Overall vulnerability to hurricane for each participating jurisdiction is considered high. Based on the probability and potential intensity of a strong hurricane impacting Polk County, the overall vulnerability is considered **High Vulnerability**, according to subjective assessments and the classifications defined in Figure 3-3 in Section 3.1.1.. In general, neighborhoods in southern portions of the planning area have the highest vulnerability to hurricanes and tropical storms. Winds can exceed 80 mph, enough to seriously damage non-hardened structures, knock down powerlines and disrupt service for days.

3.3.3 Tornado

Hazard Description

The National Weather Service defines a tornado as a "violently rotating column of air extending from a thunderstorm to the ground." Tornados are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 mph, and damage paths can be more than one mile wide and 50 miles long. In an average year, more than 900 tornados are reported in the United States, resulting in approximately 80 deaths and more than 1,500 injuries.

Although tornados are documented on every continent, they occur most frequently in the central U.S. east of the continental divide. Atmospheric and topographic conditions cause warm and cold air masses to meet in the center of the country, creating unstable, fast moving air at high pressure that can cause a tornado to form. Tornados occur most frequently from April to June. While most tornados occur between 3:00 and 9:00 p.m., a tornado can occur at any time of day. Prior to 2007, tornado intensity was measured by the Fujita (F) scale shown below.

Table 3-11 Fujita Scale

Fujita Scale	Wind Estimate (Mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center,

An updated and revised version of the Fujita scale is the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators and associated degrees of damage, allowing for more detailed analysis and thus better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. The Enhanced Fujita Scale is presented in Table 3-12.

Table 3-12 Enhanced Fujita Scale (EF)

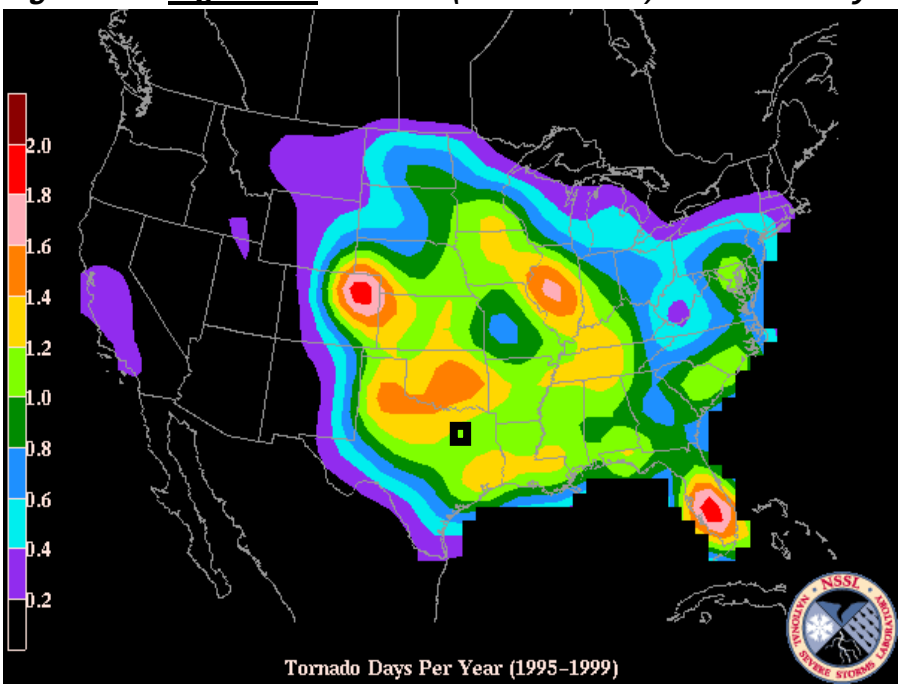
Enhanced Fujita Scale (EF)	EF Wind Estimate (MPH)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Geographic Location

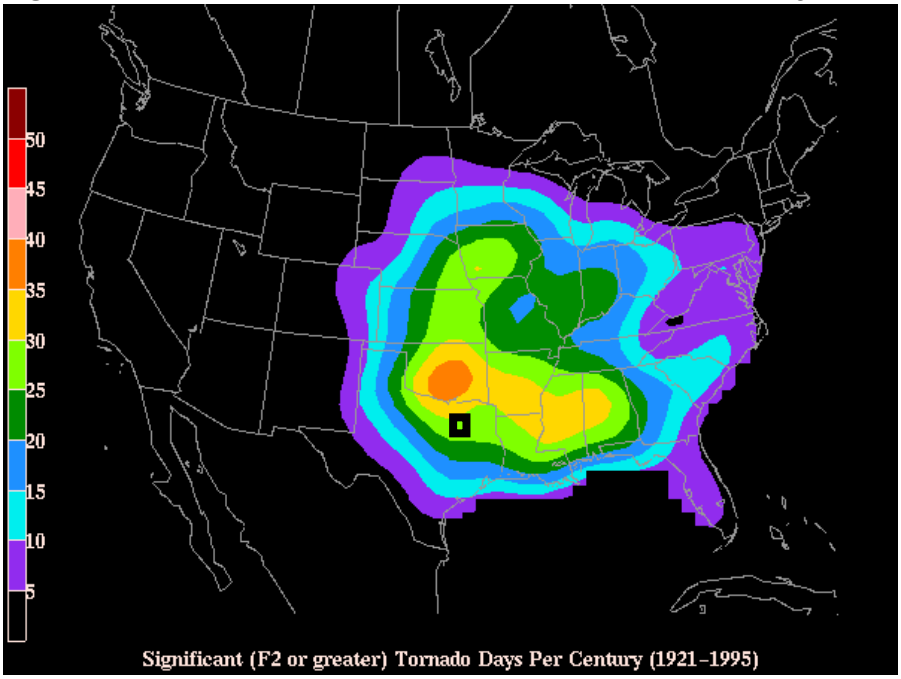
As a weather-based phenomenon, tornados can occur and impact any portion of the planning area. Based on analysis by the National Severe Storms Laboratory, Polk County is located in a region of the U.S. that experiences a moderate to high frequency of tornado occurrences. The nationwide maps that follow show the location and frequency of 'significant' tornados and 'severe' tornados, and the map on the following page shows tornado tracks across the planning area from 1953-2008.

Figure 3-15 Significant Tornado (F0 or Greater) Occurrence by Location, 1995-1999

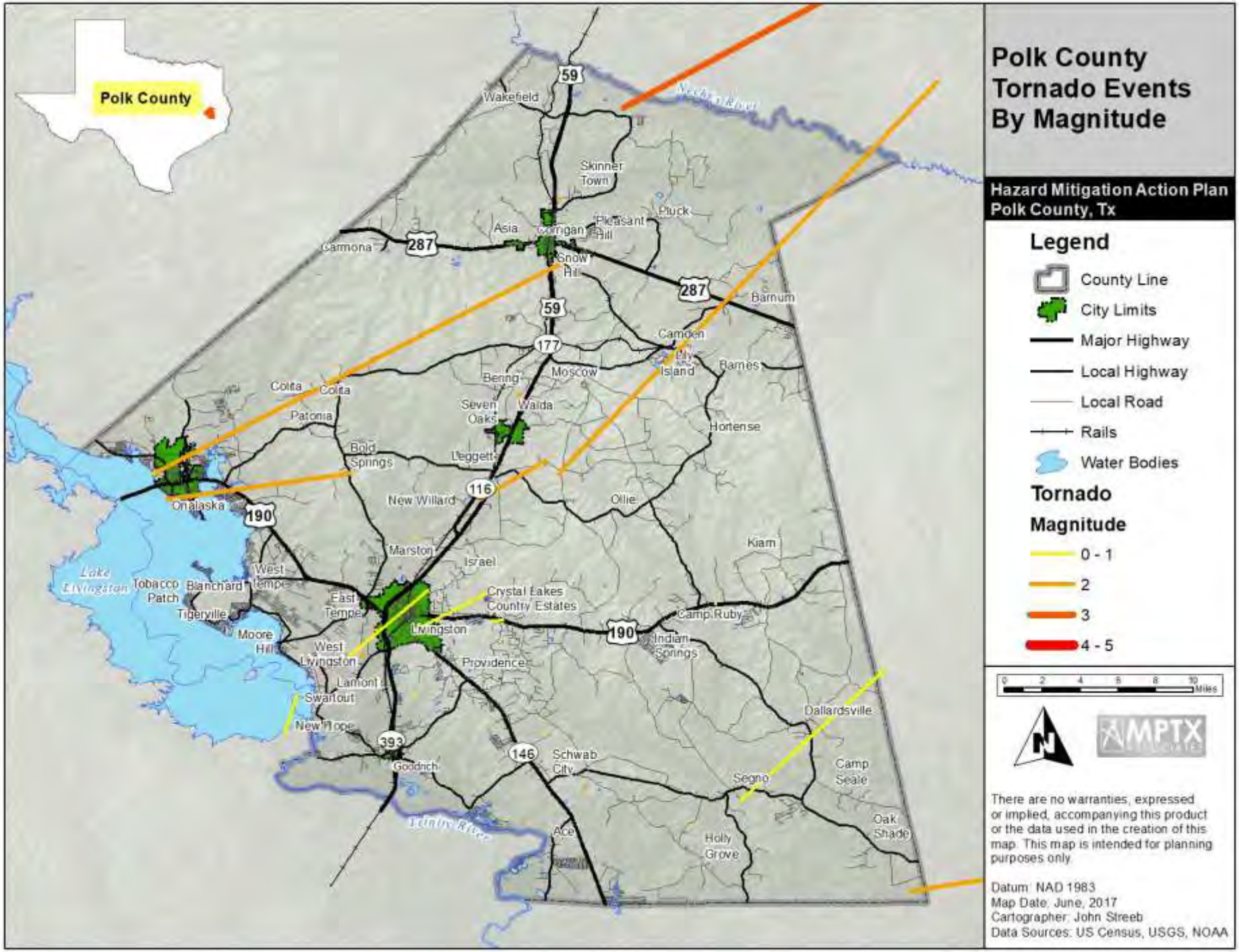


Source: National Oceanic and Atmospheric Administration (NOAA), National Severe Storm Laboratory (NSSL)
Note: Black rectangle indicates approximate location of Polk County.

Figure 3-16 Severe Tornado (F2 or Greater) Occurrence by Location, 1921-1995



Source: National Oceanic and Atmospheric Administration (NOAA), National Severe Storm Laboratory (NSSL)
Note: Black rectangle indicates approximate location of Polk County.


Polk County
Polk County Tornado Events By Magnitude
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
Tornado
Magnitude
0 - 1
2
3
4 - 5
Miles
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only
Datum: NAD 1983
Map Date: June, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, NOAA
Wakefield
Skinner Town
Asia
Corrigan
Pleasant Hill
Pluck
Carmona
Snow Hill
Barnum
Camden
Bay Island
Barnes
Moscow
Benning
Colita
Patonia
Seven Oaks
Walda
Hortense
Bold Springs
Leggett
New Willard
Ollie
Onalaska
Marston
Israel
Kiam
Lake Livingston
Tobacco Patch
Blanchard
West Tempe
East Tempe
Tigerville
Crystal Lakes Country Estates
Camp Ruby
Livingston
Moore Hill
West Livingston
Indian Springs
Providence
Lamont
Swartout
New Hope
Dallardsville
Goodrich
Schwab City
Camp Seale
Segno
Oak Shade
Ace
Holly Grove
Trinity River
59
287
177
116
190
393
146

PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of tornado impacts, which at a minimum involve tornado warnings issued by the National Weather Service. A listing of historical tornado events with recorded property or crop damage from March 1959 through 2017 is presented in Table 3-16 below. 29 tornadoes were reported over this period, resulting in 5 injuries. Property damage is estimated at $6.2 million attributable to these tornados, though it is assumed many other unreported tornados and impacts affected Polk County and participating jurisdictions during the period measured.

Table 3-13 Polk County Tornado Reports 1959-2017

Location	Date	Time	Mag	Dth	Inj	Property Damage
EAST TEMPE	7/15/2017	14:27	EF0	0	0	40.00K
SODA	2/10/2013	9:15	EF0	0	1	50.00K
ONALASKA	4/25/2011	23:30	EF0	0	0	1.00K
LIVINGSTON	5/3/2007	15:50	EF0	0	0	0.00K
ALABAMA/COUSHATTA RES	4/25/2007	19:20	EF0	0	0	0.00K
SEGNO	4/29/2006	6:26	F0	0	0	200.00K
LAKE LIVINGSTON DAM	11/23/2004	13:49	F0	0	0	5.00K
LIVINGSTON	6/12/2003	12:56	F0	0	0	0.00K
LIVINGSTON	6/12/2003	12:56	F0	0	0	0.00K
CORRIGAN	3/30/2002	18:50	F0	0	0	20.00K
ONALASKA	10/13/2001	1:45	F1	0	0	25.00K
SEGNO	10/23/1997	17:35	F0	0	0	10.00K
LIVINGSTON	5/28/1997	14:59	F0	0	0	0.00K
POLK CO.	5/13/1994	14:30	F0	0	0	0.00K
POLK CO.	11/16/1993	11:47	F0	0	0	0.50K
POLK CO.	11/21/1992	16:12	F2	0	0	25.00K
POLK CO.	10/16/1989	1:50	F0	0	0	25.00K
POLK CO.	5/17/1989	17:28	F2	0	0	0.00K
POLK CO.	12/6/1987	14:30	F2	0	0	250.00K
POLK CO.	12/6/1987	15:00	F2	0	0	2.500M
POLK CO.	11/7/1986	14:52	F0	0	0	0.00K
POLK CO.	9/14/1982	15:00	F0	0	0	250.00K
POLK CO.	4/25/1980	6:45	F1	0	0	25.00K
POLK CO.	3/30/1976	13:00	F2	0	1	2.500M
POLK CO.	3/30/1976	13:20	F2	0	0	250.00K
POLK CO.	7/15/1972	13:30	F1	0	0	0.00K
POLK CO.	5/1/1967	14:00	F2	0	2	25.00K
POLK CO.	4/8/1961	22:50	F2	0	1	25.00K
POLK CO.	3/5/1959	2:00		0	0	0.03K
			TOTALS	0	5	$6,227,000

Source: National Climatic Data Center (NCDC)

To summarize previous tornado occurrences, the NCDC lists 2 events for Onalaska, 4 events for Livingston, 1 event in Corrigan, 1 event 2 miles north of Seven Oaks, 1 event 4 miles north of Goodrich, and multiple events for Polk County.

The following photos show actual tornado events in Polk County during the most recent 5-year planning cycle. The first shows a tornado in the background of an office building near the hospital. The second photo shows damage to a structure in Polk County.

Source: Polk County Today

Source: Polk County Today

PROBABILITY OF FUTURE OCCURRENCE

The NCDC reports a total of 28 tornado events in the last 58 years in Polk County. This equals a 2-year recurrence interval and equates to approximately a 50-percent change that a tornado will occur in Polk County within a given year, and a **High** probability of future occurrence according to the definitions set forth in Figure 3-1 in Section 3.1.1.

The Probability for tornado occurrence in each city in a given year is proportionately lower because their areas are smaller.

MAGNITUDE/SEVERITY/EXTENT

Several EF3 or F3 tornados have impacted Polk County. When considering a potential future worst-case scenario, tornados may produce impacts with **Level 3- Critical** magnitude and severity with Enhanced Fujita ratings up to EF5. Property damage can occur on a neighborhood or community-wide scale. A temporary shutdown of utilities and critical facilities can occur, and injuries and fatalities can result.

TORNADO OVERALL VULNERABILITY

Overall vulnerability to tornado for each participating jurisdiction is considered high. Based on assessments of the severity of previous occurrences, large area of potential occurrence, and the probability of future occurrence, overall vulnerability of tornado impact is **High.**

3.3.4 Thunderstorm Winds

Hazard Description

Thunderstorms are defined as violent atmospheric disturbances accompanied by high winds, lightning, thunder, hail and heavy rain. There are three types of thunderstorms: air mass, dry, and severe. Air mass thunderstorms, also known as scattered thunderstorms, typically develop in summer and are generally less severe than other types of thunderstorms. They are capable of producing downbursts, brief heavy rain, and (in extreme cases) hail over 3/4 inch in diameter. Dry thunderstorms occur at higher elevations of the atmosphere and involve lightning. Most precipitation evaporates before reaching the ground.

Severe thunderstorms form in areas with a strong vertical wind shear that forces the updraft into the mature stage, which is the most intense stage of the thunderstorm. Wind speed is generally measured in knots. The conversation of knots to miles per hour is 1 knot = 1.15 mph. Therefore a 50-knot wind is 57.5 miles per hour and a 100-knot wind is 115 miles per hour. Table 3-12 below shows an Appended Beaufort Wind Scale and the relationship of wind speed in knots, miles per hour, and typical wind effects on land.

Table 3-14 Appended Beaufort Wind Scale

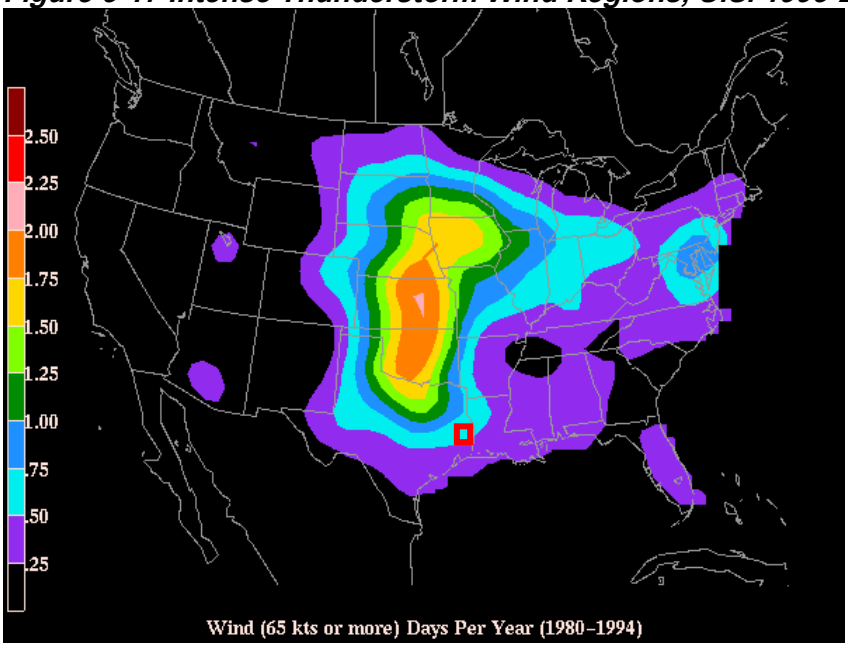
Wind Speed (Knots)	Wind Speed (MPH)	Typical Wind Effects on Land
Less than 1	Less than 1.15	Calm, smoke rises vertically
1 to 4	1.15 to 4	Smoke drift indicates wind direction, still wind vanes
4 to 7	4 to 8	Wind felt on face, leaves rustle, vanes begin to move
7 to 11	8 to 13	Leaves and small twigs constantly moving, light flags extended
11 to 17	13 to 20	Dust, leaves, and loose paper lifted, small tree branches move
17 to 22	20 to 25	Small trees in leaf begin to sway
22 to 28	25 to 32	Larger tree branches moving, whistling in wires
28 to 34	32 to 39	Whole trees moving, resistance felt walking against wind
34 to 41	39 to 47	Whole trees in motion, resistance felt walking against wind
41 to 48	47 to 55	Slight structural damage occurs, slate blows off roofs
48 to 56	55 to 64	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
56 to 64	64 to 74	Substantial structural damage
64+	74+	Major structural damage potential

Source: NOAA

GEOGRAPHIC LOCATION

High winds associated with thunderstorms occur across a broad region of the U.S. that includes all areas of Polk County. As shown in Figure 3-17 below, the planning area is located along a band of the southern U.S. that experiences winds ≥ 65 knots on roughly a semi-annual basis.

Figure 3-17 Intense Thunderstorm Wind Regions, U.S. 1993-2009



Source: National Severe Storms Laboratory (NSSL), http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
Note: Red rectangle indicates approximate location of Polk County.

Location of previous occurrences of thunderstorm winds is also represented in the following table.

PREVIOUS OCCURRENCES - IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of thunderstorm wind impacts. The table below lists high wind events reported in Polk County since 2012, courtesy of the National Weather Service/National Environmental Information Center (NEIC). The highest winds recorded over this timeframe occurred in March 2013 with a 67 knot recording (77 mph), reported at both Lake Livingston Dam and Corrigan. According to the appended Beaufort Wind Scale, such winds involve major structural damage potential.

Table 3-15 High Wind Events, Polk County (2012-2017)

Location	Date	Type	Magnitude	Injuries	Damage Total
CORRIGAN	3/24/2017	Wind	55 kts.	0	$10,000
INDIAN VLG	4/27/2016	Wind	55 kts.	0	data unavailable
ONALASKA	5/11/2015	Wind	51 kts.	0	$3,000
SEVEN OAKS	4/27/2015	Wind	53 kts.	0	$7,000
LIVINGSTON	4/18/2015	Wind	52 kts.	0	data unavailable
ALABAMA/COUSHATTA	10/12/2014	Wind	59 kts.	0	data unavailable
CORRIGAN	6/22/2014	Wind	53 kts.	0	$6,000
CORRIGAN	6/6/2013	Wind	65 kts.	0	$8,000
CARMONA	6/6/2013	Wind	60 kts.	0	$3,000
LIVINGSTON	6/6/2013	Wind	60 kts.	0	$5,000
LAKE LIVINGSTON DAM	3/10/2013	Wind	67 kts.	0	data unavailable
CORRIGAN	3/10/2013	Wind	67 kts.	0	$5,000
GOODRICH	2/21/2013	Wind	60 kts.	0	$14,000
LIVINGSTON	2/10/2013	Wind	52 kts.	0	$3,000
POLK (ZONE)	7/21/2012	Wind	52 kts.	0	data unavailable

Source: National Environmental Information Center (NEIC)

To summarize previous occurrences of thunderstorm winds as reported by the NCDC, 4 events have occurred in Corrigan, 2 events occurred in Livingston, 1 event occurred in Seven Oaks, 1 event occurred in Goodrich, and multiple events occurred in Polk County, which possibly may have impacted Onalaska as well.

The following narrative is representative of impacts related to thunderstorm wind activity.

February 10, 1998: Straight-line wind damage across the entire county from west to east. Lake Livingston Dam measured 134 mph wind gusts before the storm damaged their equipment. The hardest hit area was from the Tobacco Patch community to the west of the Livingston area, though major damage occurred across the majority of the county.

Numerous trees/power poles down, 18 homes completely destroyed, 172 with major damage, 180 with moderate to minor damage. Timber losses due to downed trees were extensive.


APARTMENT DAMAGED DURING TORNADOES IN CORRIGAN, 1998

Within an area of several blocks in West Corrigan, numerous homes were damaged and five were destroyed. An apartment complex located about a mile east of Corrigan was seriously damaged. The Champions International Mill suffered about $2.5 million in damages to the roof. Wonder Chemical suffered about $1.6 million in damages to their plant.

Several hundred homes in the Scenic Loop area had roof damage; several trailer houses were completely destroyed. At US Hwy 146 and FM 943 tornados caused heavy losses to trees and homes, one business was completely destroyed. It was estimated that as many as four (4) tornados were the cause of the damage, however that number was not confirmed.

Polk County has a history of violent thunderstorms, high winds and tornados; however there have not been any recorded injuries or loss of life. NOAA weather radio tower and transmitter facility have been installed. Sam Houston Electric Cooperative erected a 400-foot communications tower on FM 3459, about three (3) miles northeast of Onalaska. A NOAA Weather Radio Transmitter was installed and became operational in 2000. This station covers a four-county area around Lake Livingston.

Probability of Future Occurrence

Based on the frequency of previous occurrences of 15 thunderstorm wind events reported in Polk County from March 2012 through March 2017; the frequency of previous occurrence is equal to at least 3 high-wind events per year, a 4-month recurrence interval, and approximately a 99 percent statistical probability in a given year. Therefore, there is a **High** probability of future occurrence according to the definitions set forth in Figure 3-1 in Section 3.1.1.

Magnitude/Severity/Extent

When considering a potential future worst-case scenario, thunderstorm winds may produce up to 140+ mph winds and impacts with **Level 3- Critical** magnitude and severity including isolated occurrences of infrastructure and property damage and public safety impacts. The maximum recorded wind extent in Polk County is 134+ mph (1998), which according to Appended Beaufort Wind Scale (Table 3-14) is more than double the velocity necessary to cause major damage.

Thunderstorm Overall Vulnerability

Overall vulnerability to thunderstorm winds for each participating jurisdiction is considered high. Based on assessments of the magnitude of previous occurrences, the disruptions of utilities infrastructure, and a high future probability, the overall vulnerability to thunderstorm impacts is considered **High Vulnerability,** according to Figure 3-3, Section 3.1.1.

3.3.5 Wildfire

HAZARD DESCRIPTION

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that fills the area for miles around. Wildfires are caused by human acts such as arson or careless accidents, or by natural occurrences such as lightning. Wildfire danger is exacerbated by dry weather conditions and excessive heat. The majority of forest fires in Texas are caused by arson and other careless acts by people.

The urban-wildland interface is an area in which development meets wildland vegetation. Both vegetation and the built environment provide fuel for fires. Table 3-16 below lists fire danger rating classifications as defined by the U.S. Forest Service.

Table 3-16 U.S. Forest Service, Fire Danger Adjective Class Rating

Danger Rating	Basic Description	Detailed Description
Low	fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open grassland may burn freely a few hours after rain, but wood fires spread slowly by smoldering and burn in irregular fingers. Low danger of spotting.
Moderate	fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Forest fires will spread at slow to moderate speed. The average fire is of moderate intensity, although heavy concentrations of fuel may burn hot. Short-distance spotting may occur. Fires are not likely to become serious and control is relatively easy.
High	fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
Very High	fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
Extreme	fire situation is explosive and can result in extensive property damage	Fires start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

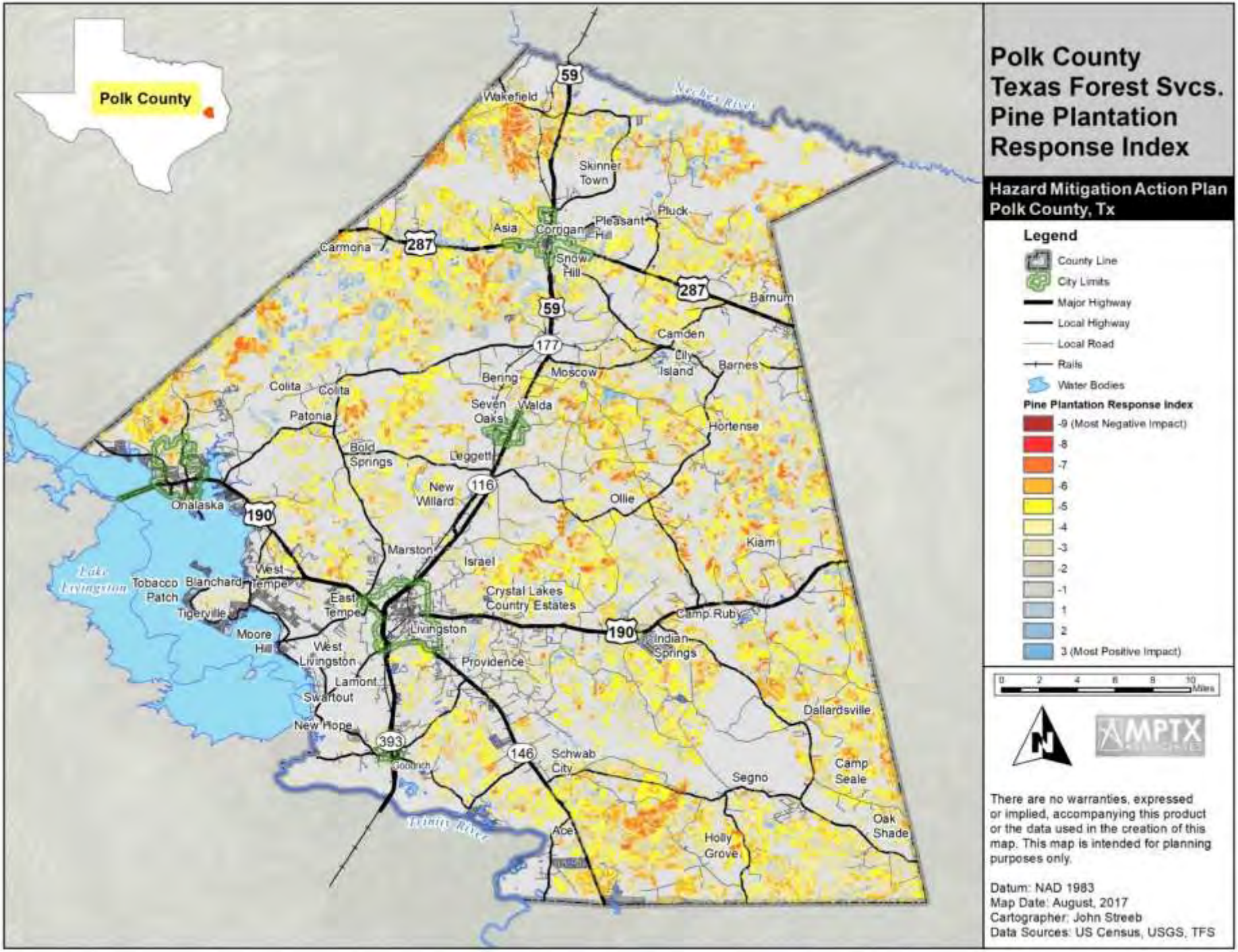
Source: U.S. Forest Service, Wildland Fire Assessment System

GEOGRAPHIC LOCATION

Wildfire is defined as fire that occurs in forests, grasslands, brush, or otherwise undeveloped terrain. It can be sparked by either natural or human causes and is often problematic to contain due to lack of water and/or accessibility of firefighting resources. Wildfires oftentimes go unnoticed, until they fill the air with dense smoke. Spreading quickly through vegetative fuels, a wildfire can pose an immediate threat to public safety, housing and infrastructure.

The risk of wildfire is not confined to a particular geographic region of the county, though, the risk of wildfire and damage from wildfire is highest in the urban-wildland interface. The urban-wildland interface is generally described as an area where development meets dense forest. Fires burning in this fuel type under drought conditions are extremely hard to contain, require concentrated firefighting resources, and threaten all homes and facilities in its vicinity.

The map on the following page shows the pine-plantation response index, which is a key indicator of wildfire location and risk. It shows areas in north Polk County near Wakefield have the largest area of high index scores, and the Livingston – Onalaska areas have relatively lower response-risk scores.


Polk County
Polk County
Texas Forest Svcs.
Pine Plantation
Response Index
Hazard Mitigation Action Plan
Polk County, Tx
Legend
County Line
City Limits
Major Highway
Local Highway
Local Road
Rails
Water Bodies
Pine Plantation Response Index
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1
1
2
3 (Most Positive Impact)
0 2 4 6 8 10 Miles
There are no warranties, expressed or implied, accompanying this product or the data used in the creation of this map. This map is intended for planning purposes only.
Datum: NAD 1983
Map Date: August, 2017
Cartographer: John Streeb
Data Sources: US Census, USGS, TFS
Wakefield
Skinner Town
Pluck
Asia
Corrigan
Pleasant Hill
Carmona
Snow Hill
Barnum
Camden
City Island
Barnes
Moscow
Bering
Colita
Patonia
Seven Oaks
Walda
Hortense
Bold Springs
Leggett
New Willard
Onalaska
Ollie
Kiam
Marston
Israel
West Tempe
Tobacco Patch
Blanchard
East Tempe
Tigerville
Crystal Lakes Country Estates
Camp Ruby
Livingston
Moore Hill
West Livingston
Indian Springs
Providence
Lamont
Swartout
New Hope
Dallardsville
Schwab City
Camp Seale
Segno
Oak Shade
Holly Grove
Ace
Lake Livingston
Trinity River
59
287
177
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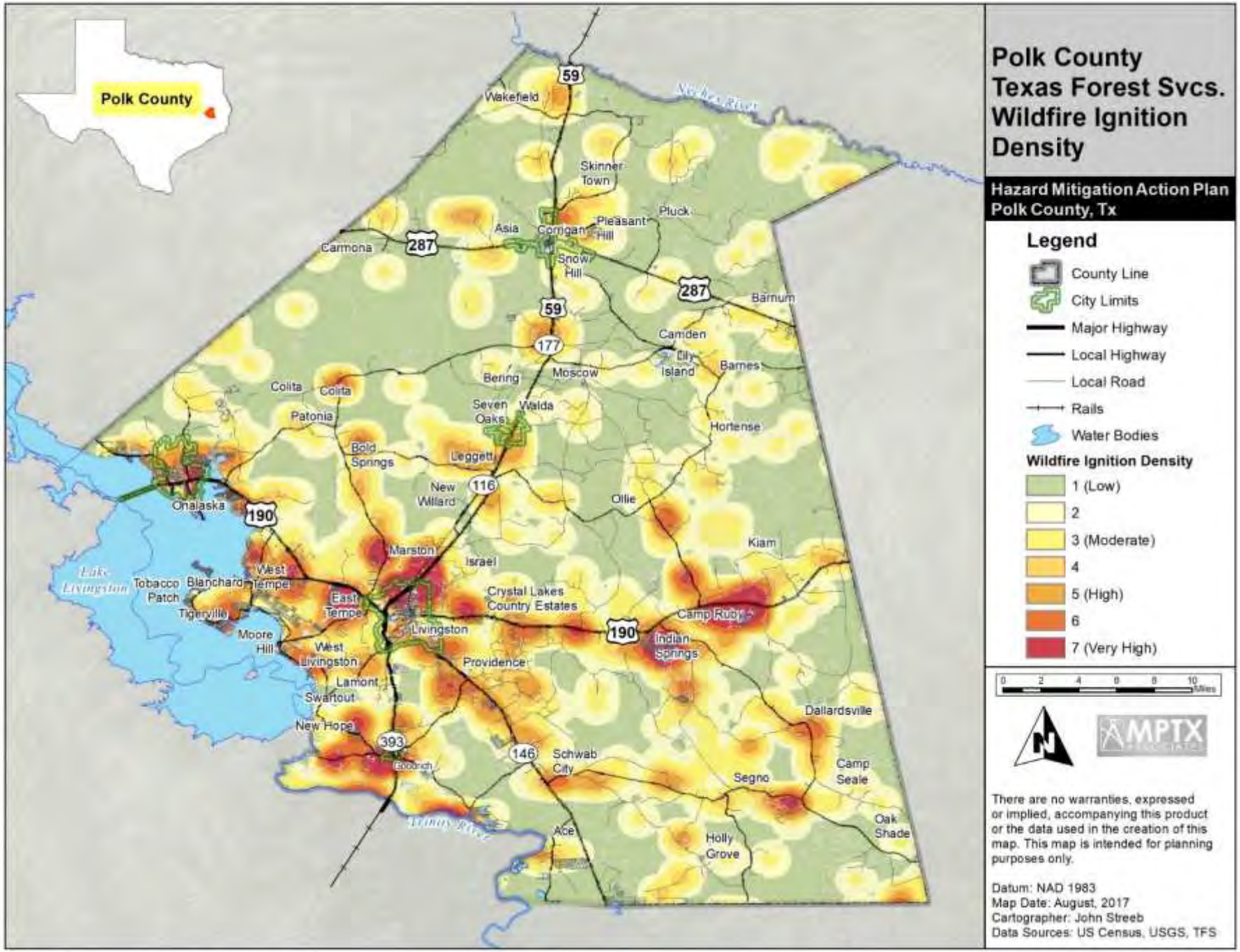
393
146

The following map shows history of wildfire occurrences for Corrigan, Seven Oaks, Livingston, Onalaska, Goodrich, and Polk County.



The southern region of the U.S. records the most human caused fires in the nation, averaging over 33,000 fires per year for the period 2002-2008. A breakdown of numbers of fires and acreage burned is shown in Table 3-17 below.

According to the Texas Forest Service's *2007 Economic Impact of the Texas Forest Sector*, Texas has more than 60 million acres of forestland of which 12.1 million acres in East Texas alone. Of the 60 million acres, timberland accounts for 24.3 percent, or about 14.6 million acres, and the majority – around 82-percent – is located in East Texas. The economic influence of the forest sector is relevant in East Texas. About 37.8 percent of direction industrial output ($7.3 billion) and employed 33.8 percent of total workers (26,431) in the sector, mainly from the primary solid wood products manufacturing firms and logging industries in the region. Over two-thirds of all forestry and logging industries and the great majority of primary forest product manufacturing industries are in East Texas. The forest sector of East Texas had a total economic impact of $12.7 billion in total industry output, $6.1 billion in value-added and 56,031 jobs to the state economy.

The southern region of the U.S. records the most human caused fires in the nation, averaging over 33,000 fires per year for the period 2002-2008. A breakdown of numbers of fires and acreage burned is shown in the following table.

Table 3-17 Human Caused Fires: Number and Acreage by U.S. Region

Human Caused Fires (Number)

Year	AK	North-west	Northern CA	Southern CA	Northern Rockies	Eastern Great Basin	Western Great Basin	South-west	Rocky Mtns	Eastern Area	Southern Area	Total
2008	265	1,365	3,407	5,208	1,971	826	224	2,013	1,616	11,152	**42,043**	70,093
2007	247	2,346	3,093	5,140	2,005	1,048	425	1,730	1,876	12,453	**43,083**	73,446
2006	254	2,666	3,676	3,166	2,303	943	331	2,511	2,968	14,227	**47,175**	80,220
2005	296	1,924	3,010	3,781	1,183	813	262	3,287	1,940	13,014	**28,920**	58,430
2004	426	1,901	3,613	3,845	1,883	526	173	1,491	704	11,781	**27,758**	54,101
2003	379	2,370	3,795	3,929	1,970	944	227	1,657	4,214	14,851	**16,479**	50,815
2002	378	2,148	3,789	4,060	1,665	730	215	2,668	2,118	12,857	**31,394**	62,022

Human Caused Fires (Acreage Burned)

Year	AK	North-west	Northern CA	Southern CA	Northern Rockies	Eastern Great Basin	Western Great Basin	South-west	Rocky Mtns	Eastern Area	Southern Area	Total
2008	1,857	99,706	91,022	454,249	105,634	120,391	17,769	339,201	117,554	69,396	**2,013,212**	3,429,991
2007	59,007	244,335	153,154	855,978	237,835	288,627	46,057	90,660	85,442	230,750	**1,157,515**	3,449,360
2006	147,292	112,098	146,999	342,864	126,078	278,288	46,947	392,892	209,693	115,171	**2,486,522**	4,404,844
2005	8,184	219,012	37,658	61,728	53,616	187,248	43,811	267,043	48,356	85,589	**509,082**	1,521,327
2004	17,789	58,178	146,720	84,075	23,585	13,636	13,864	63,062	35,346	101,089	**407,456**	964,800
2003	22,093	126,381	96,415	653,016	137,309	182,916	5,161	127,332	87,823	235,391	**248,412**	1,922,249
2002	427,321	105,544	39,560	412,447	65,891	101,986	29,288	772,299	661,679	104,900	**356,204**	3,077,119

Source: National Interagency Coordination Center

Polk County has over 400,000 acres of prime timber land and is extremely vulnerable to wildfire. Each year thousands of acres are destroyed by careless campers, residents burning household trash, and by farmers and ranchers using controlled burns to clear hay fields and pasture land.

The following photo was taken during the 1996 fire-storm at the Liberty Hill Fire in Segno, which consumed approximately 4,500 acres. The fire was started by a farmer burning a hayfield. A county-wide burn ban was in effect at the time of this fire.

Establishing burn bans, banning the use of certain fireworks, training and early preparations have helped to prevent large forest fires. An extensive education program aimed at the local residents, weekend campers, and fishermen have helped curb fires caused by burning debris and trash. Polk County will remain exposed to fire hazards, but education, training and planning helps the county stay one step ahead in preventing forest fires.

A large percent of the population of Polk County is located in rural areas; therefore, vulnerability to wildfires is relatively high. The main concerns for people, homes, structures and natural resources in rural areas include response time, access to a means of fire suppression and water sources.

The following series of maps depict the Wildland Urban Interface for each of the jurisdictions.

PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of wildfire impacts, which at a minimum involve smoke associated with wildfires in the area. While the most recent planning cycle 2012-2017 was relatively wet and stormy, with multiple disaster declarations pertaining to flooding, storms, and a hurricane, Polk County continues to face major fire exposure

each year similar to other counties throughout the State of Texas. This problem is compounded by the fact that more building is occurring within what was once forests and plantation forestlands maintained by large timber companies. Many residents seek out a woodland setting, never realizing they are exposing their homes and families to the threat of wildfires.

The major causes of wildfires in Polk County are debris burning and controlled burns conducted by property owners who are either ill-equipped or lack training. As forestlands disappear and are developed into residential areas, the chances for greater numbers of wildfires increase. On April 1, 1996 (during a burn ban) a property owner burning a hay field lost control of the fire resulting in one of the largest wildfires in the history of Polk County.

From 2010-2011, a series of destructive wildfires occurred in Texas. Statewide statistics on the fires from November 15, 2010 through October 16, 2011 recorded approximately 26,516 fires which burned 3,853,475 acres, 2,870 homes, and over 4,900 other structures. In the United States in 2011, 46% of all the acreage burned occurred in Texas. The fires were particularly severe due to drought which covered the state, and convergence of strong winds, unseasonably warm temperatures, and low humidity. In 2011, Texas endured its most severe single-year drought since the 1950s, received the lowest single-year rainfall since 1895, and experienced the hottest June-August period of any U.S. state at any point in time on record—exceeding that of even the Dust Bowl of the 1930s.

In June 2011, the Bearing Fire occurred in Polk County when a trailer being pulled along US 287 in western Polk County was taken off the road. An overheated wheel bearing came in contact with dry grass igniting a fire that burned over 18,000 acres in both Trinity and Polk counties and became the largest wildfire in East Texas history. This wildfire was followed by the Bastrop County Complex Fire, which burned east of the City of Bastrop from September 4 through September 30, 2011. The Bastrop wildfire consumed 34,068 acres, destroyed 1,669 residential and 40 commercial structures, killed two people and inflicted an estimated $250 million of insured property damage, becoming the single most destructive wildfire in Texas history.

In Polk County over the five-year period of 1991 - 1995, an average of 1,178 fires a year burned an average of 17,022 acres with the average fire size being 14 acres. In 1996, 2,622 fires burned 76,581 acres with an average fire size of 29 acres. That same year a record number of Texas fires, in terms of acreage lost, occurred during a four-month period. A total of 113 homes and 170,000 acres were lost due to fire in what was, at that time, the worst siege of fire in the history of Texas. Over three hundred (300) trained fire fighters were brought in from across the nation to assist Texas Forest Service personnel in controlling these fires.

Texas Forest Service's online, voluntary reporting site documents that from 2006 to 2010 approximately 30 fires a year occurred in Polk County. One hundred forty-five (145) separate forest fires burned a total of 1,504 acres, with the average fire consuming 10 acres. The following is a break down of major causes of fires in Polk County commercial forest regions:

1) Debris burning 51.0%
2) Arson 12.0%
3) Miscellaneous 24.0%
4) Equipment/railroads 5.5%
5) Lightning 3.5%
6) Smoking 2.5%
7) Campfires 1.5%

PROBABILITY OF FUTURE OCCURRENCE

According to data obtained from the Texas Forest Service for the years 2006 to 2010, there was an average of 29 wildfires a year in Polk County. This historic frequency constitutes a **HIGH** probability of future occurrence according to definitions set forth in Figure 3-1, Section 3.1.1.

In reference to statistical gathering methods, there are several on-line sites to report emergency response incidents, all of which are voluntary. Therefore, the current fire occurrence and response statistics referred to above do not accurately reflect the actual number of wildfires that occurred in Polk County. Underreporting oftentimes results from a lack of knowledge that these systems exist or that certain tools are in place to help report these incidents. Another barrier is the existence of several clearinghouses that have different needs and different formats for reporting the same information. Voluntary information requested by outside sources in combination with local reporting requirements to cities and counties can create an enormous amount of paperwork for fire departments staffed with volunteers who also hold down fulltime jobs. The Texas Forest Service's online reporting site recognizes that most wildland fires in Texas go unreported at the state and national levels, resulting in missed opportunities for significant federal funding. Therefore, in July 2009, the county began a campaign to encourage VFDs to report all incidents to the Texas Forest Service's on-line site so they can receive the benefits that on-line reporting affords them.

The benefits of reporting incidents on-line to the Texas Forest Service are as follows:

- Reported wildfire causes can be used to develop prevention programs
- FEMA recognizes documented costs per reported fire
- Maps, data lists and fire statistics are easily obtained through the on-line site

According to long-term historical data, the county has, in fact, experienced approximately 200 wildfires a year. It is estimated that this number of average annual events will continue into the future in lieu of successful mitigation measures.

Magnitude/Severity/Extent

When considering a worst-case scenario, a wildfire is capable of producing impacts of **Level 3-Critical** magnitude and severity. Isolated occurrences of damage to infrastructure and property are typical, with limited impacts to public safety. According to the US Forest Service Adjective Rating Chart, fire danger in Polk County can be Extreme (highest level), and represent fire situations which are explosive and result in extensive property damage

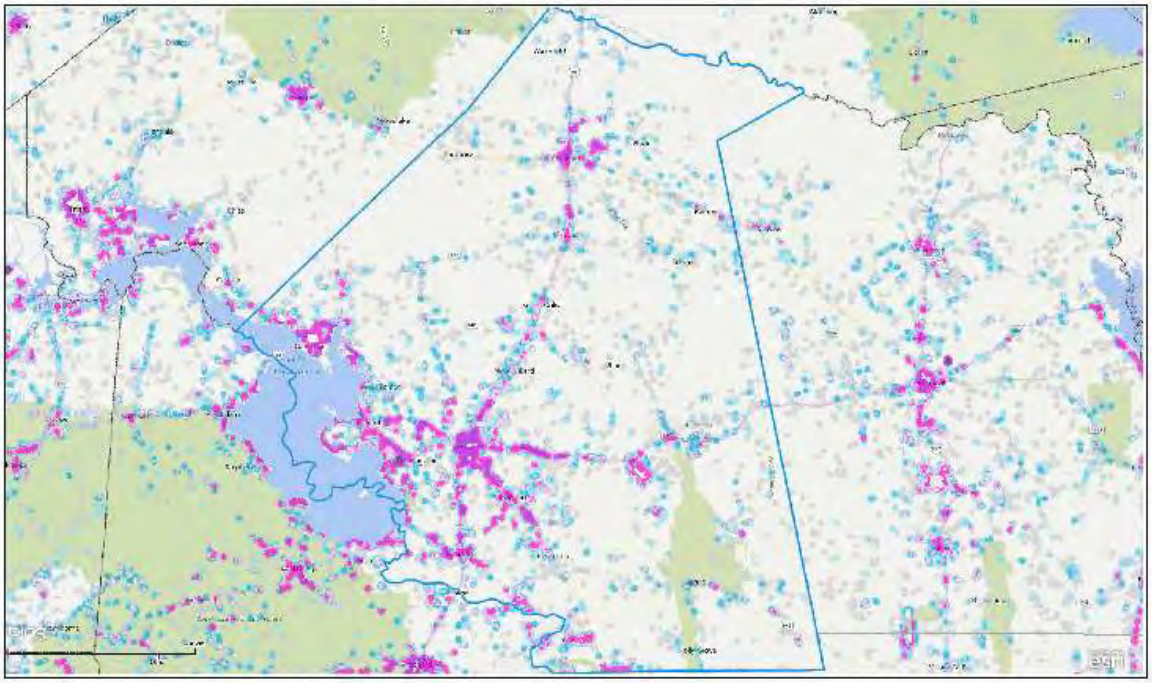
Wildfire Overall Vulnerability

Overall vulnerability to wildfire for each participating jurisdiction is considered high. Based on assessments of the magnitude of previous occurrences, and overall distribution of structures and infrastructure in wildfire risk areas, the overall vulnerability to wildfire is considered **High Vulnerability**, according to Figure 3-1 in Section 3.1.1.

The following series of maps represent wildfire vulnerability for Polk County.

Polk County Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels



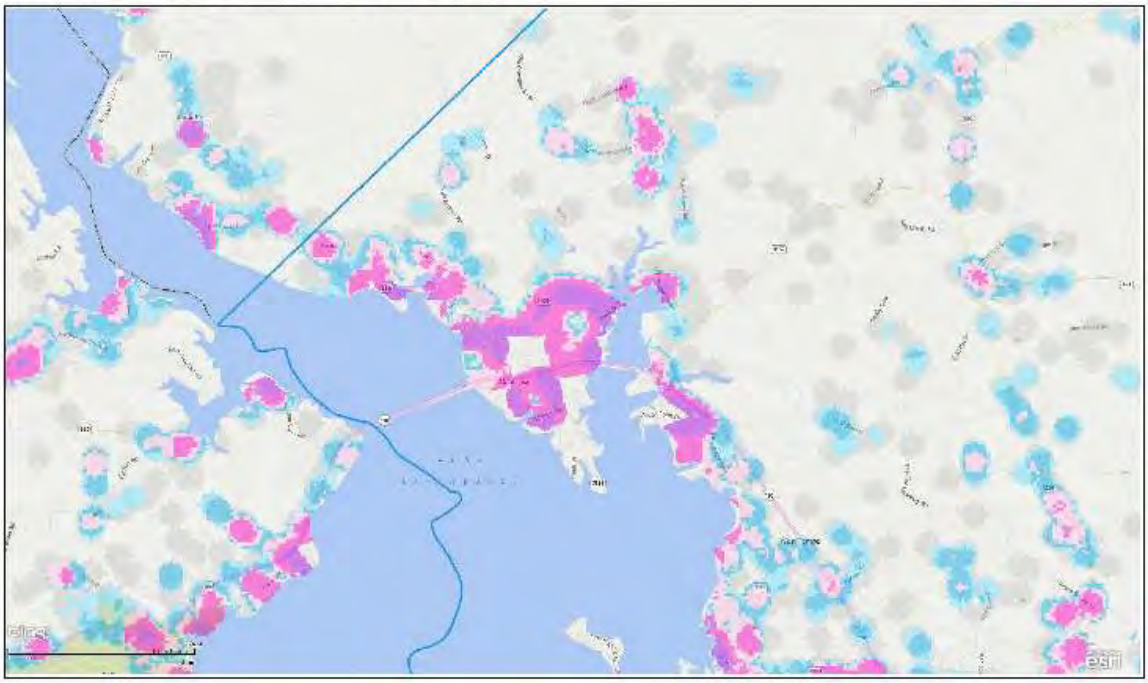
Report Created:
03/21/2017 4:33 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

Onalaska Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels



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03/21/2017 4:35 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

Seven Oaks Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels

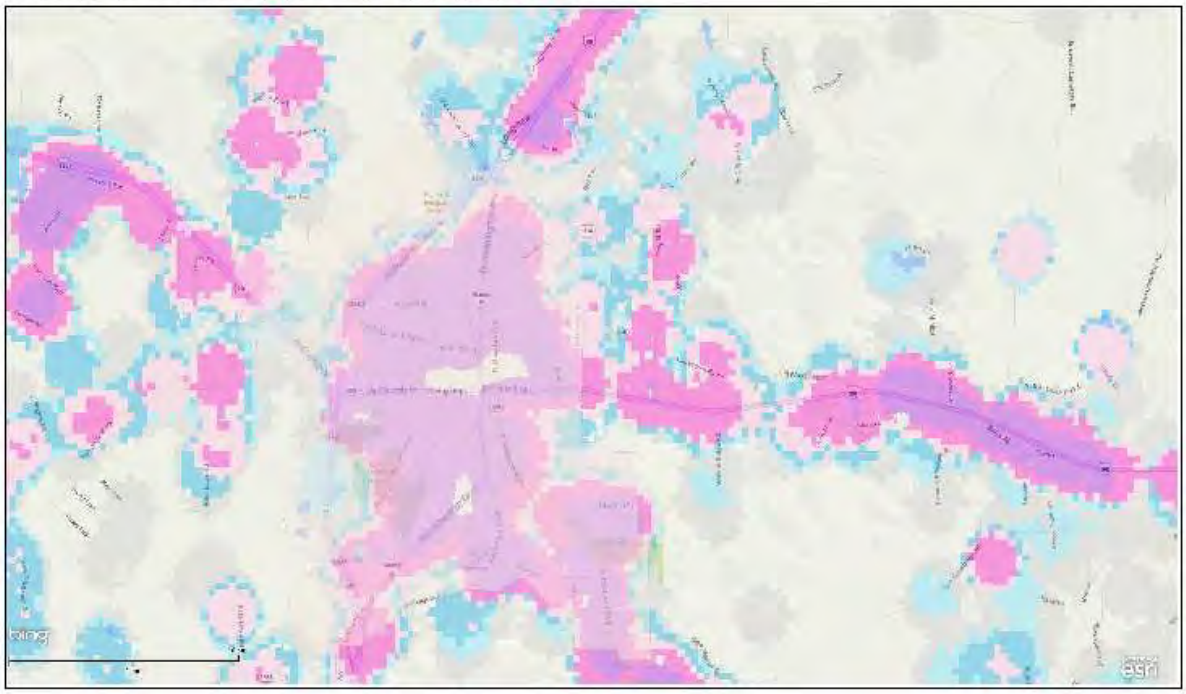
Report Created:
04/06/2017 2:15 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

Livingston Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels



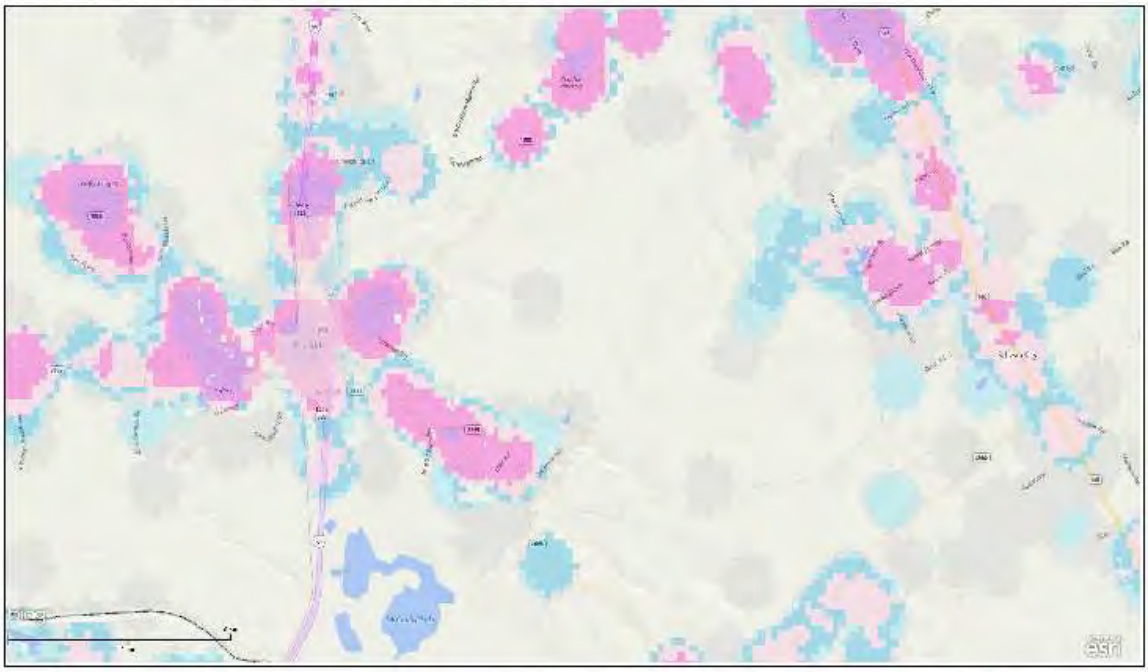
Report Created:
04/06/2017 2:02 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

Goodrich Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels



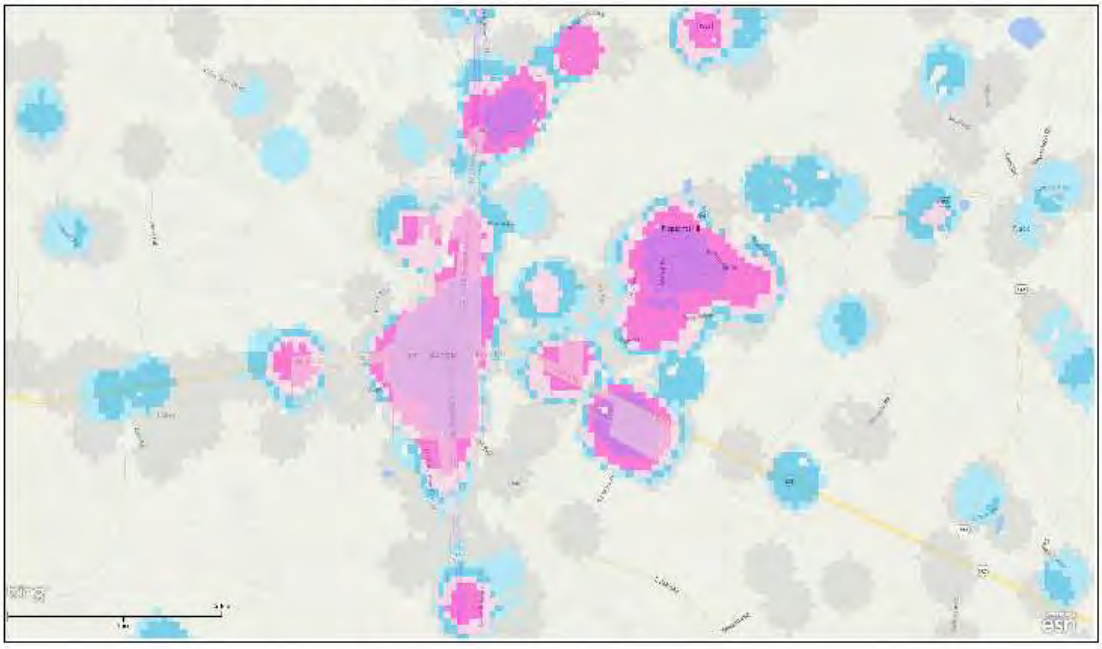
Report Created:
04/06/2017 2:14 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

Corrigan Wildland Urban Interface (WUI)

Depicts where humans and their structures meet or intermix with wildland fuels



Report Created:
04/06/2017 2:01 PM

Texas Wildfire Risk Assessment 2010
www.texaswildfirerisk.com

TEXAS A&M FOREST SERVICE

3.2.6 Winter Storm

HAZARD DESCRIPTION

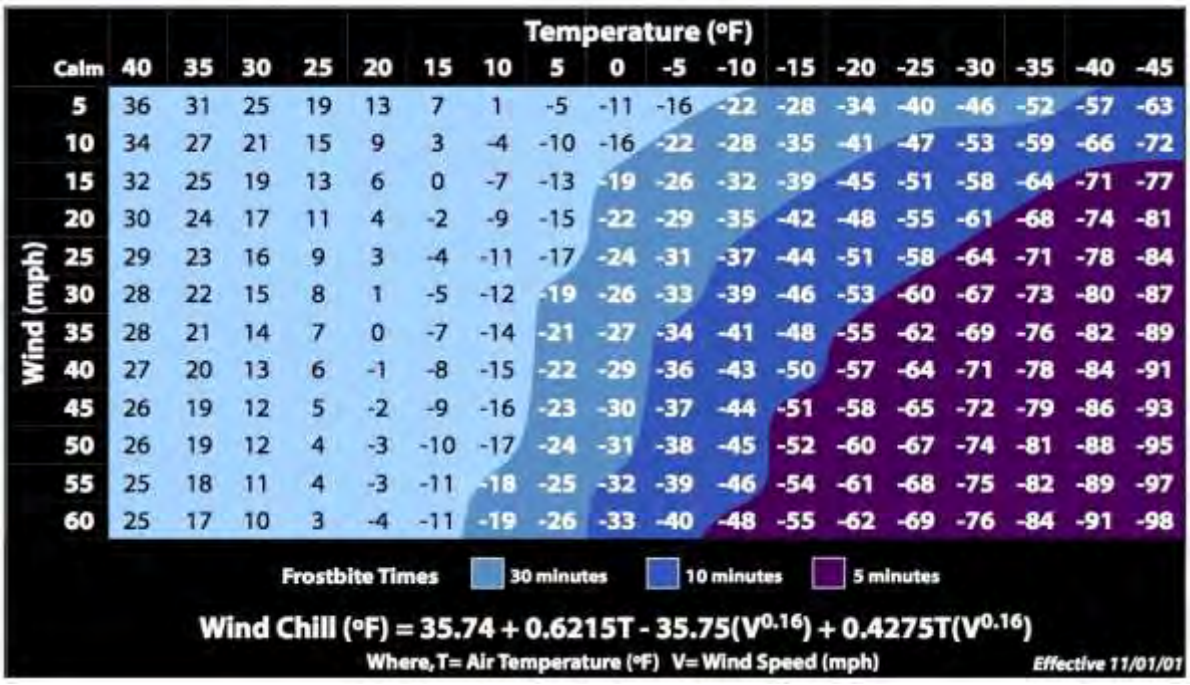
Winter storms originate as mid-latitude depressions or cyclonic weather systems, sometimes following the path of a jet stream. A winter storm or blizzard involves heavy snowfall, high winds, extreme cold and ice storms. Many winter depressions create heavy rain and widespread flooding. Conditions can worsen if the precipitation falls in the form of snow. The winter storm season varies widely, depending on latitude, altitude and proximity to moderating influences. Winter storms affect the entire planning area equally. Cold snaps in which temperatures fall below the freezing point of 32° F happen on an annual basis in the planning area and can lead to issues with infrastructure, especially frozen roads and bridges.

Severe winter storms may be categorized as sleet, freezing rain, heavy snowfall, ice storms and blizzards. Characteristics of severe winter storms are determined by the amount and extent of snow or ice, air temperature, wind speed, and event duration. Severe winter storms in the southeast Texas region are relatively rare, and typically create disruption of regional systems such as public utilities, telecommunications, and transportation routes. Because severe winter weather is relatively rare in southeast Texas, compared to northern states where winter events are expected and states tend to be better equipped to handle them, occurrences tend to be very disruptive to transportation and commerce. Trees, cars, roads, and other surfaces can develop a coating of ice. Even small accumulations of ice can be extremely hazardous.

Ice storms are occasions when damaging accumulations of ice occur during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice affect transportation routes making walking and driving extremely dangerous. Ice accumulations of ¼" or greater are considered significant. Extreme cold often accompanies a winter storm. This impact is less common in the southern states. Exposure to extreme cold can lead to life-threatening frostbite, hypothermia or illness. It can cause pipes to freeze and/or burst in buildings that are poorly insulated or without heat, which can lead to water damage and disruption of water supply.

The National Weather Service Wind Chill Temperature index is shown below. The chart describes relative discomfort/danger that can result from the combination of wind and cold temperatures.

Figure 3-19 National Weather Service Wind Chill Chart



Source: National Weather Service, www.nws.noaa.gov/om/windchill/index.shtml

GEOGRAPHIC LOCATION

Polk County is in a region of the country known for mild winter temperatures, but the county does experience severe winter weather. Risks associated with a winter storm are county wide and not confined to a particular area.

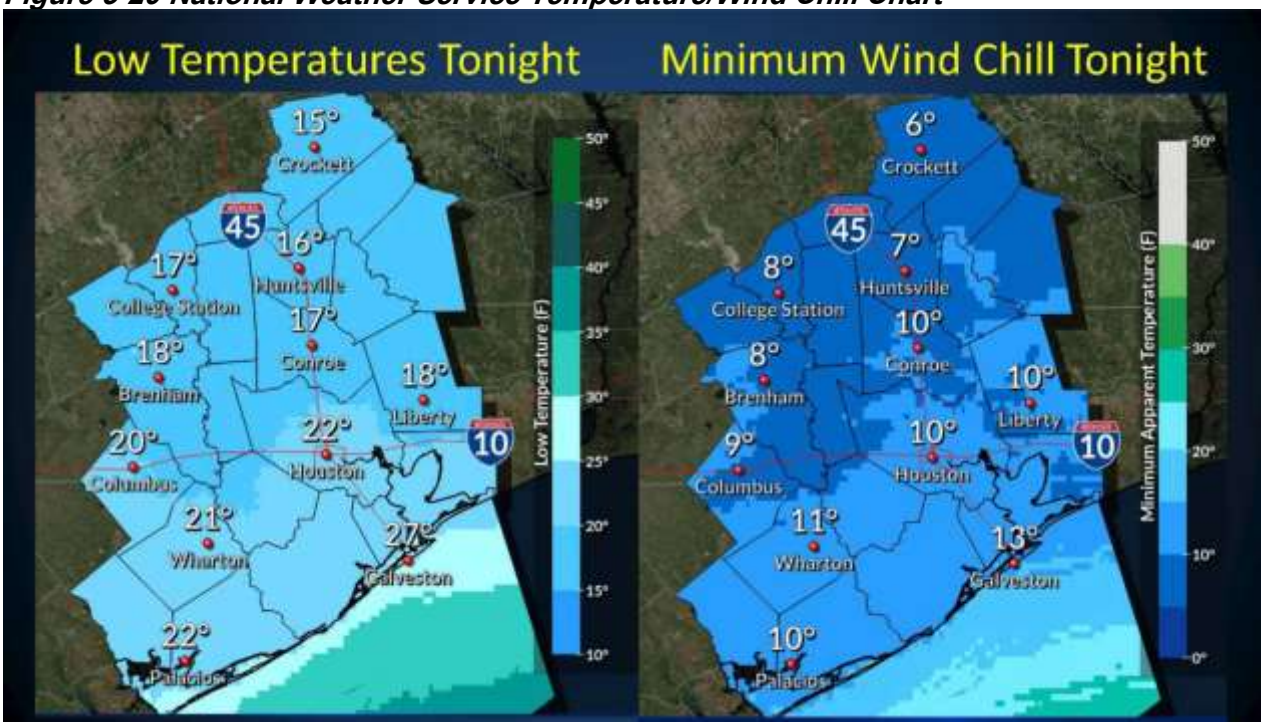
PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of winter storm impacts. Figure 3-19 below illustrates recent winter storm events that have impacted Polk County and the region. The most prevalent impacts of winter storms are vehicle accidents; fallen trees, broken limbs from heavy ice and snow; downed electrical and telephone lines, and broken plumbing pipes. The following summaries provided by National Weather Service summarize winter storm impacts for Polk County including all participating jurisdictions.

Region (January 2018)

A severe cold-snap impacted the south-central United States which included Polk County in late January 2018. Polk County received sleet and snow during this storm system, and overnight wind-chills of 10 degrees, as shown in the following graphics (Polk County located in northeastern portion of map).

Figure 3-20 National Weather Service Temperature/Wind Chill Chart



Source: National Weather Service, Polk County Emergency Management

Region (January 2014)

Snow totals between 1 and 4 inches and freezing rain occurred during a storm system that moved across the area overnight and into the morning hours. Freezing rain produced significant ice accumulations on bridges and overpasses and caused road closures. Between 2 and 4 inches of snow fell across the county, especially along a Livingston to Onalaska line. A second winter weather event followed four days later in southeast Texas as an upper-level disturbance moved across the area with near-freezing temperatures. Although some light icing was observed across the area, there was little accumulation.

Region (February 2011)

A cold arctic airmass moved across four states the night of February 3rd as a strong upper level storm system moved out of the southern Great Basin and into the West Texas Hill Country. Precipitation, mostly in the form of snow, fell across Central Texas during the late night hours of February 3rd and moved quickly northeast into Northeast Texas, Southeast Oklahoma and Southwest Arkansas during the early morning hours of February 4th. Accumulating snow was the result across much of the area with a mixture of sleet and freezing rain across portions of East Central Texas and Central Louisiana. East Texas counties saw mostly freezing rain with a brief mixture of sleet and an ice depth 0.25 inches in Polk County.

Region (February 2010)
Snow began accumulating during the morning hours of February 11th and did not end until the afternoon hours of February 12th. Snowfall totals across the county ranged from 1 to 2 inches with 2 inches being reported near Lufkin, Texas.

Region (February 2006)
Much of the region was entrenched in an arctic airmass during the weekend of the 18th through the 20th of February. A weak storm system moved into the southern plains and into the lower Mississippi valley with light freezing rain and freezing drizzle falling across much of the region. Ice accumulations were less than one quarter of an inch across most places. While road surfaces remained wet from ground warmth, most elevated bridges and overpasses saw some ice accumulation which resulted in numerous traffic accidents. Many elevated bridges and overpasses had to be closed due to the ice accumulation.

Region (December 1998)
A shallow artic air mass spread across northeast and east Texas while low pressure formed in the Gulf of Mexico. This allowed warm moist air to move over the cold dome producing widespread freezing rain and sleet. Overall ice accumulations were less than one inch. The ice accumulated mainly across exposed surfaces such as trees and powerlines as well as bridges and overpasses. A few automobile accidents, downed trees, and downed powerlines resulted from the storm.

Region (January 1997)
Freezing rain and sleet accumulated with depths of 1/4 to 1/2 inch across the region. Several highways were closed and numerous traffic accidents occurred. Isolated power outages from fallen power lines also occurred.

Region (February 1994)
An arctic cold front moved into Northern Texas during the afternoon of the 8th, causing temperatures to drop 60 degrees within 48 hours in many locations. Up to 4 inches of ice and sleet accumulated, making this the most significant ice storm across East Texas in two years. Numerous highways, businesses, and schools were closed. Over 30,000 homes experienced power outages. Damage to homes and businesses from falling trees was widespread. Two indirect fatalities occurred as icy roads caused traffic accidents.

Source: National Weather Service with regional edits

PROBABILITY OF FUTURE OCCURRENCE

Based on the storm events listed by the National Climatic Data Center, Polk County has experienced 8 winter storm events during the last 14 years. The associated recurrence interval is approximately 1.75 years, representing a 57 percent probability of occurrence in a given year. This probability equates to a **High** probability of future occurrence according to the Figure 3-1 in Section 3.1.1.

Magnitude/Severity/Extent

The magnitude and severity of winter storms impact broad geographical areas. The duration of winter storm events is typically one or two days. Due to the far southern location of the planning

area and mild winter temperatures, the magnitude and severity of the winter storms are limited. Roads may become icy causing some traffic accidents. Based on the public safety risk and the scale of potential damage to infrastructure and economic loss, this hazard merits a severity rating of **Level 2- Limited.** Wind-chill levels approaching zero degrees Fahrenheit have recently been recorded, and radial ice accumulation of 0.5 – 1.0 inch is considered possible for the planning area.

Winter Storm Overall Vulnerability

Overall vulnerability to winter storm for each participating jurisdiction is considered **Moderate**. This assessment is based on the recurrence interval for winter and the severity of the impacts to infrastructure and threat to human life posed by this hazard.

3.3.7 Lightning

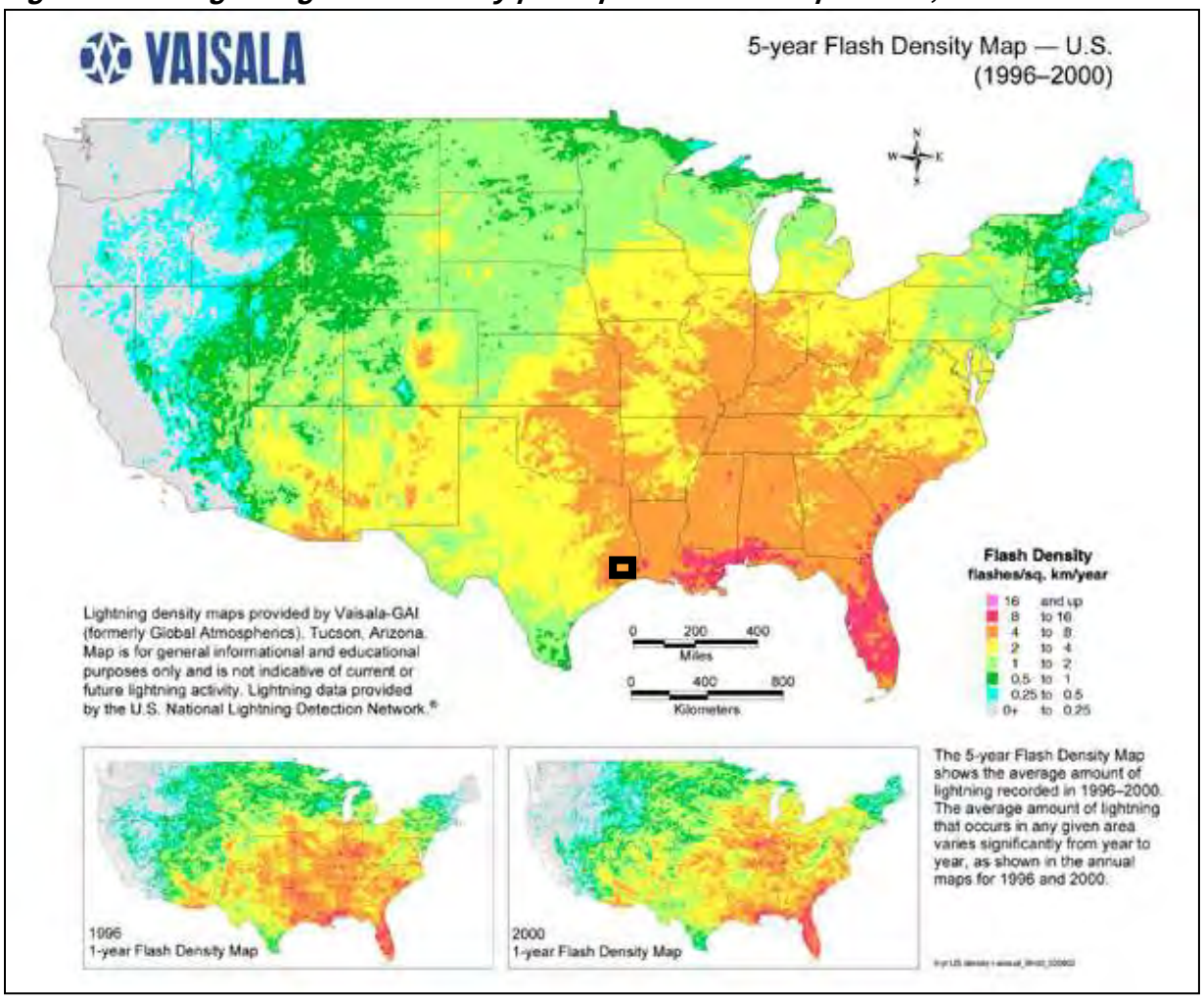
HAZARD DESCRIPTION

Lightning typically occurs as a by-product of a thunderstorm. The action of rising and descending air in the thunderstorm separates positive and negative charges. Lightning is the result of the buildup and discharge of energy between positive and negative charge areas. The hazard posed by lightning is underrated. According to NOAA, an average of 20 million cloud-to-ground lighting flashes is detected every year in the continental United States. About half of all flashes have more than one ground strike point, so at least 30 million points on the ground area are struck in an average year. Lightning is the most dangerous and frequently encountered weather hazard that most people in the United States experience annually. Lightning is the second most frequent killer in the U.S., behind floods and flash flood events, causing approximately 100 deaths and 500 injuries annually.

GEOGRAPHIC LOCATION

Lightning is also known to impact all regions of the planning area. The map below shows southeastern Texas has a relatively high frequency of lightning, averaging 4 to 8 flash occurrences per square kilometer per year.

Figure 3-20A Lightning Flash Density per Square Kilometer per Year; Continental U.S.



Note: Approximate location of Polk County indicated by black rectangle

PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of lightning impacts. Lightning occurs frequently in Polk County but it frequently goes unreported to federal, state, and local authorities. According to NOAA, an average of 20 million cloud-to-ground lighting flashes are detected every year in the continental United States. About half of all flashes have more than one ground strike point, so at least 30 million points on the ground area are struck in an average year.

Specifically regarding impact, there were two reported lighting strikes of interest by the NCDC; a boy was struck within his home and suffered minor burns in 1997. Please be aware that lightning strikes are rarely reported to the NCDC except for those that have caused injury. Other impacts which have gone unreported to federal authorities include power outages and electrical component malfunction, and the occasional wildfire caused by lightning strikes. See also Section 3.2.1 Risk Assessment per Jurisdiction for analysis of potential lightning impacts to structures, environment, and infrastructure.

PROBABILITY OF FUTURE OCCURRENCE

Lightning is the most frequently encountered weather hazard that most people in the United States experience annually. Based on the lack of recorded information on previous occurrences, approximations must be used to judge future probability for the planning area. According to anecdotal evidence of lightning occurrence, future probability is considered **HIGH**, according to Figure 3-1 in Section 3.1.1.

MAGNITUDE/SEVERITY/EXTENT

The magnitude and severity of lightning can impact broad geographical areas. The duration of lightning events is typically one to two hours. Based on the public safety risk and the scale of potential damage to infrastructure and economic loss, this hazard merits a severity rating of **Level 3- Critical.** Based on the chart below for lightning magnitude, maximum lightning CAPE index levels for the planning area are estimated to be 2000 to 3500.

Lightning magnitude and probability can be determined using “convective available potential energy” measurements (CAPE index), as shown in the following table:

Table 3-18 CAPE INDEX: Lightning Risk / Magnitude Scale

CAPE Index	Lightning Risk
< 1000	Slight
1000 – 2500	Moderate
2500-3500	Very
> 3500	Extremely

Source: The Weather Window; http://weather.mailasail.com/Franks-Weather/Cape

LIGHTNING OVERALL VULNERABILITY

For each of the participating jurisdictions, overall vulnerability to lightning is considered **Moderate**, based on Figure 3-2 in Section 3.1.1. This assessment is based on the frequency of occurrence at any given point, and is weighted against potential damage, and considered equal for all participating jurisdictions.

3.3.8 Drought

HAZARD DESCRIPTION

Drought can be defined as a water shortage caused by the natural reduction in the amount of precipitation expected over an extended period of time. It can be aggravated by other factors such as high temperatures, high winds, and low relative humidity. Texas experiences a cycle of extended wet and drought conditions that can extend over a period of months or even years. Extended periods of drought can have an enormous impact on an area by affecting the abundance of water supply, the agriculture economy, and foundations of structures. When drought occurs, the entire planning area experiences drought conditions; however, jurisdictions are not always impacted in the same way depending on differences in water supply and agricultural activity.

Table 3-19 Drought Monitor: Drought Severity Classification

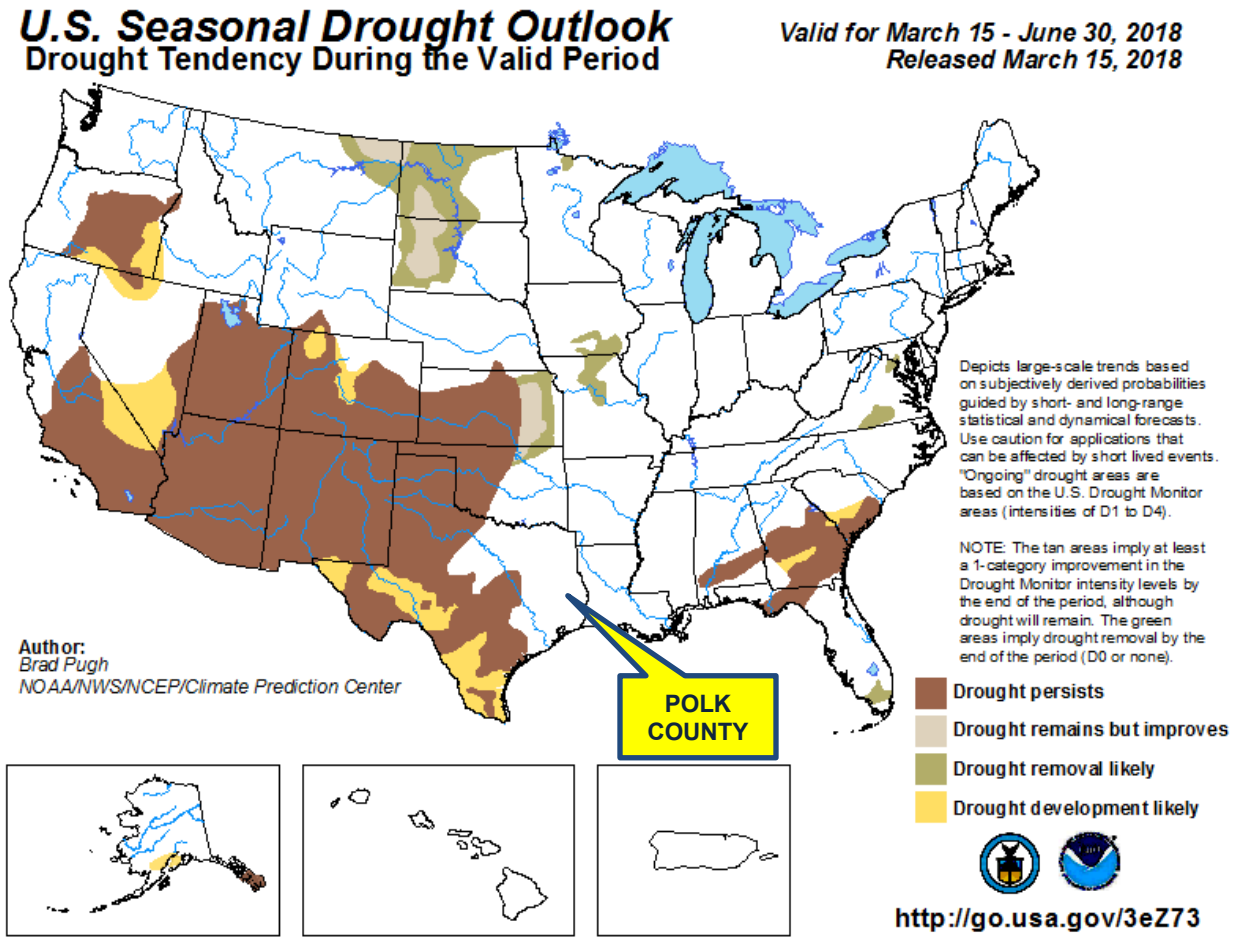
Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Satellite Vegetation Health Index
Abnormally Dry	Going into drought, short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	36-45
Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	26-35
Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	16-25
Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	6-15
Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams and wells, creating water emergencies.	-5.0 or less	0-2	0-2	-2.0 or less	1-5

Source: Drought Monitor http://drought.unl.edu

GEOGRAPHIC LOCATION

While Polk County is located in a portion of East Texas with above average rainfall compared to the state overall, it is not immune from the occurrence or effects of drought. Agricultural irrigators and municipal water supplies are primarily dependent on groundwater resources. As severe droughts may affect the groundwater table, the risks associated with drought are county wide and not confined to any particular community or discreet geographic region of the county. As of March 2018, Polk County and each of the participating jurisdictions is situated in an area with no drought conditions reported or forecast.

Figure 3-21 U.S. Seasonal Drought Outlook, March15 – June 30, 2018



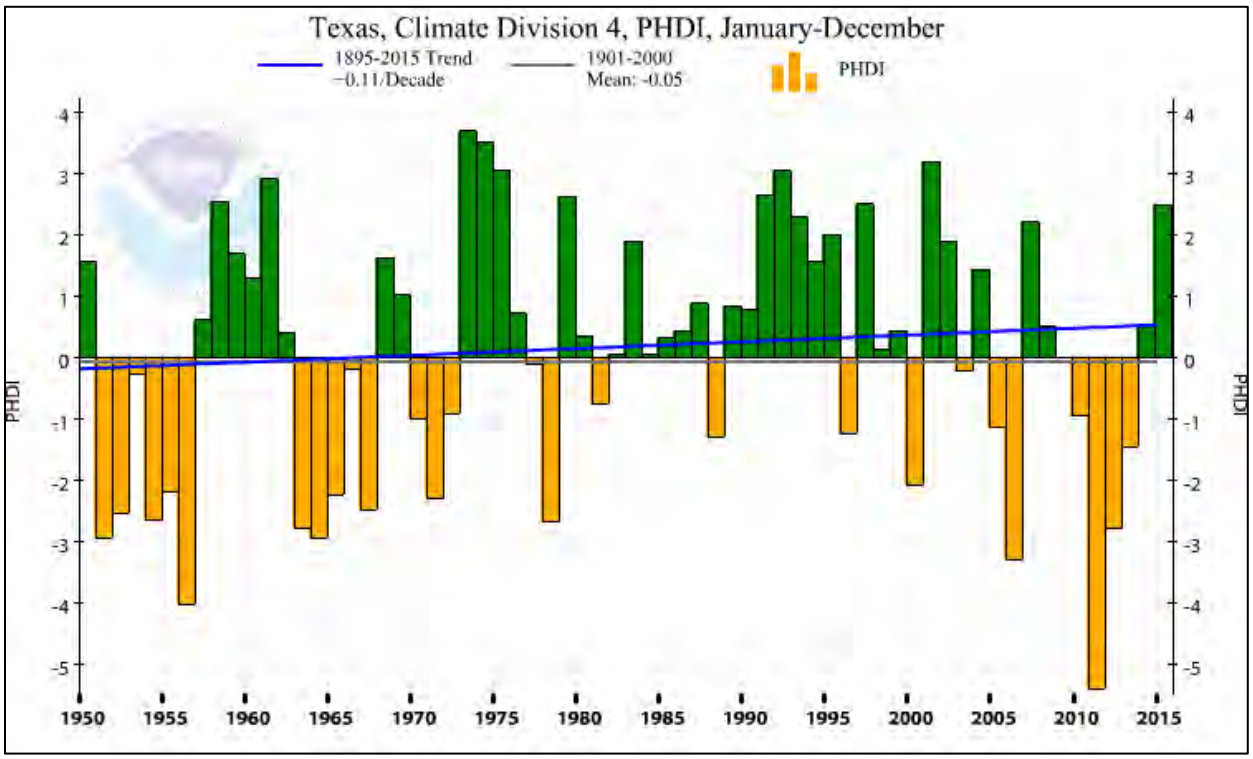
PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of drought impacts. Historically, Texas has experienced occasional severe drought conditions. Western counties especially have experienced agricultural droughts, leading to severe soil-moisture decreases with serious consequences for crop production. Historical review indicates that a highly significant relationship exists between precipitation in Texas and the establishment of La Niña weather patterns. La Niña, characterized by unusually cold ocean temperatures in the Pacific, can bring abnormally warm and dry weather conditions to Texas. For example, during the 1998 to 2000 period, the state shifted to a drier weather pattern. The year 2000 was the driest winter in over 100 years. During roughly 80 percent of past significant La Niña occurrences, winter and spring rainfall has been below normal.

The Palmer Drought Severity Index (PDSI) is a commonly used measure for moisture depletion or abundance on a regional scale. Figure 3-22 below indicates that the East Texas Region, of which Polk County is a part, experienced 26 years of drought conditions since 1950. The chart

indicates that these periods of drought ranged from Abnormally Dry to an Exceptional Drought rating on the Palmer Drought Index.

Figure 3-22 Palmer Historical Drought Index (PHDI), East Texas Region (1950-2015)



Source: National Oceanic and Atmospheric Administration (NOAA)

The most notable droughts for the planning area are detailed in Figure 3-7 below.

Figure 3-23 Notable Droughts, Polk County and East Texas (1998-2017)

08/01/1998: Drought conditions continue from July. After months of extremely dry and hot weather across SE Texas, relief came late in the month with welcomed rainfall and slightly cooler temperatures. Over 20 people across the region lost their lives due to the extreme heat and property and crop damage averaged $8.3 million per county since May. Locations across the region were finally catching up with rainfall toward the end of the month as the drought was coming to an end. NOTE: CROP AND PROPERTY DAMAGE LISTED HERE IS FOR THE PERIOD MAY-AUGUST 1998.

08/01/2000: Severe drought across southeast Texas through the month of August. Rainfall for the month of August averaged on 30 to 50 percent of normal across southeast Texas. Several cities were placed under water rationing with large crop losses were noted across the area. Wildfires became increasingly common, especially toward the end of the month. Drought losses in dollars will be computed at the end of the summer growing season.

09/01/2000: Severe drought continued across southeast Texas through September 2000. The combination of excessive heat and dryness caused many wildfires to burn during the first week of the month including a 4500 acre fire in Liberty County on the 4th and a 1,965 acre fire in Polk County on the 2nd. Water rationing continued during the first half of the month in several small communities and was briefly instigated in the city of Houston. Water line breaks and small grass fires were a common problem across southeast Texas, especially at the beginning of the month. By the end of September, damage estimates for the season to cotton, wheat, and forage crops and increased irrigation reached $102.3 million for southeast Texas.

December 2005 – The month was a continuation of the devastating drought that impacted much of the eastern half of the state through 2005. Many lakes and reservoirs remained near or set all time record levels and a series of dry cold fronts that blew through the region during the month

did not help the already dry conditions. Several small fires broke out across the region during the month but the resulting damage was minimal. Burn bans continue for many counties across Texas as most of the region experienced rainfall deficits of some 15 to 20 inches in a year.

December 2010 – While much of Northeast Texas was downgraded to D1 Moderate Drought category during the month of November, a very dry December resulted in much of Northeast Texas being upgraded to D2 Severe Drought and D3 Extreme Drought categories during the month of December. Once again, many counties saw burn bans throughout the month as the fire danger was very high across the region. Lufkin monthly rainfall was 0.86. The departure from normal was -3.58. The yearly rainfall through December was 30.01. The yearly departure from normal through December was -16.61.

January - September 2011 - After a very dry December of 2010, portions of Northeast Texas saw surplus rainfall for the first month of 2011. While the surplus rainfall was something this region had not seen in a while, it still did very little to quench the drought that was ongoing across the region when the year began. Much of the region remained in D2 Severe Drought and D3 Extreme Drought categories through the end of January. Once again, many counties saw burn bans throughout the month as the fire danger was very high across the region. Lufkin monthly rainfall was 7.14. The departure from normal was 2.69.

The month of March, 2011 remained on the dry side across all of East Texas. While the month did see some appreciable rainfall, it was not enough to stifle the ongoing drought conditions across the northeast half of the state. In fact, by the end of the month...all of Northeast Texas was classified as being under D3 Extreme Drought conditions. Burn bans began going up across a few counties in Northeast Texas during the month of March. Lufkin March rainfall was 0.75. The departure from normal was -2.78. Lufkin yearly rainfall was 8.65. The departure from normal was -2.50.

As of July 2011, Polk County rainfall year-to-date shortfall from normal was minus 6-10”, or 50-75% normal.

By September 2011 this historic Texas drought had led to a record $5.2 billion in agricultural losses, making it the most costly drought on record, according to Texas AgriLife Extension Service economists. The $5.2 billion in losses exceeds the previous record of $4.1 billion during the 2006 drought. The losses also represent 27.7% of the average value of agricultural production over the last four years. The 2011 drought losses have reached record levels in large part due to Texas farmers failing to cash in crops during times of high commodity prices. The state’s cattle producers continue to cull herds at historic levels and spend money on expensive supplemental feed. Livestock losses include the increased cost of feeding due to lack of pastures and ranges and market losses. Market losses include the impact of fewer pounds sold per calf and the impact of lower market prices due to the large number of cattle sold in a very short time period. The drought, coupled with prolonged high winds and record temperatures, were enormously destructive to Texas agriculture and natural resources. The summer rains caused grass growth, which provided fuel for an unprecedented fire season, with more than 3.3 million acres of Texas ravaged by wildfire.

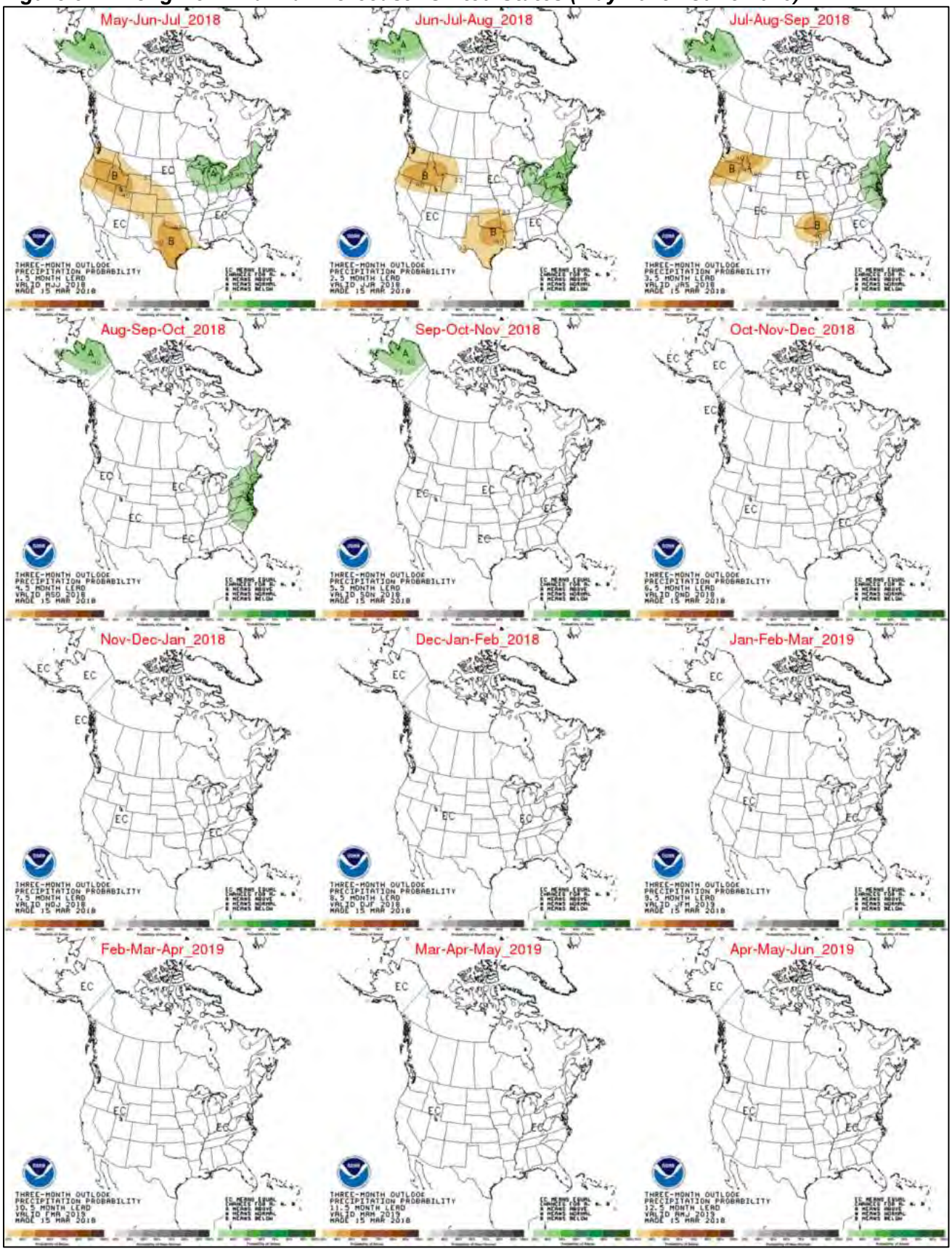
Source: National Climatic Data Center; Advanced Hydrologic Prediction Center

PROBABILITY OF FUTURE OCCURRENCE

Probability of future drought occurrence is proportionately equal for each of the participating jurisdictions. Based on historical information from the National Climatic Data Center, the planning area can expect to experience about 26 years of drought conditions (occurring with varying durations and severity) within the next 65 years, or approximately a 40 percent chance that any year will involve a drought period. This constitutes a Medium probability of future occurrence based on Figure 3-1 in Section 3.1.1.

With regard to longer-term drought forecasting, the map on the following page developed by NOAA shows that the State of Texas, including Polk County, is expected to see below-average rainfall during the months of May 2018 through October 2018, and then shift to more typical rainfall patterns through June 2019.

Figure 3-24 Long-Term Rainfall Forecast –United States (May 2018 - June 2019)



Source: NOAA

MAGNITUDE/EXTENT

Droughts can be expected to be similar in extent to those of the last 65 years. All jurisdictions in the planning area can expect to experience droughts ranging from "Abnormally Dry" to "Exceptional Drought" on the Palmer Hydrologic Drought Index.

DROUGHT OVERALL VULNERABILITY

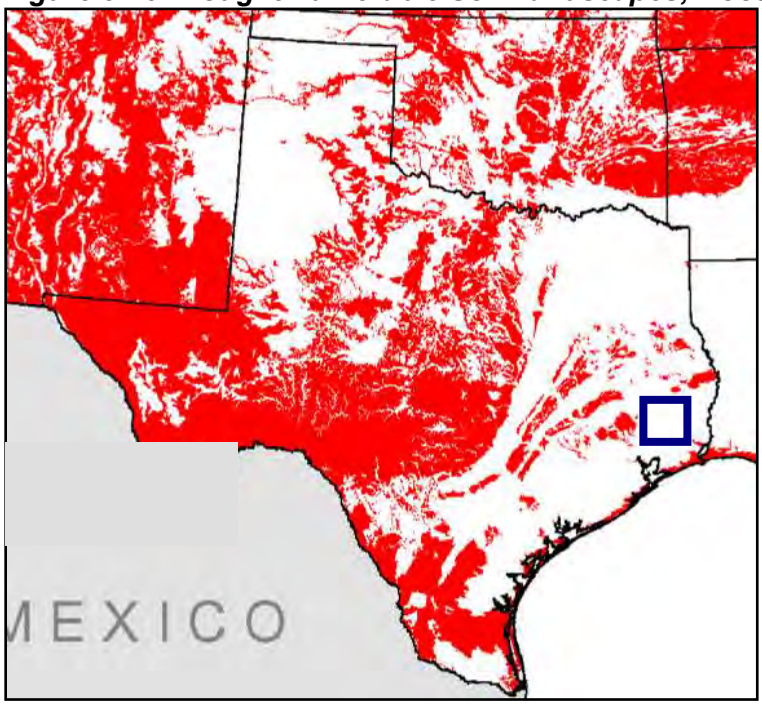
Overall vulnerability to drought for each participating jurisdiction is considered moderate. Vulnerability to loss or damage due to drought would be considered relatively low to buildings, infrastructure and public safety. However, the droughts that affected Polk County in 1998, and again in 2011 reflect the vulnerability of industries to this hazard.

Impact was greatest on cattle ranchers, farmers and the timber industry. The hay crop was seriously affected, with drought reducing the normal three hay cuttings to just one in 2011. The resulting hay shortage created a greater cost in feeding livestock during the winter months.

Additionally, great care had to be taken by the timber industry to prevent the dry conditions from contributing to the spread of wildfires. The normal process of controlled burning of undergrowth had to be completely stopped. Outdoor burning of household waste was banned because of the drought and the extreme fire danger that accompanied it. Developers and builders complained that banning outdoor burning had an economic impact on them. Major forest fires were likely averted because of the early preparation by the Texas Forest Service, preparation and training by local volunteer fire departments, enforcing burn-ban restrictions, restricting use of fireworks and educating the public on the dangers of forest fires.

The following are more detailed descriptions of the impact of drought on Polk County and the surrounding region. The map below shows Polk County within a region of east Texas that contains some soil landscapes considered vulnerable to drought impacts.

Figure 3-25 Drought Vulnerable Soil Landscapes; Root Zone AWC ≤ 6"



Source: USDA-NRCS; http://soils.usda.gov/use/thematic/dv_soilmap_high.html

With regard to future drought vulnerability, all jurisdictions are approximately equal and share a **Moderate Drought Vulnerability** assessment. In general, smaller unincorporated communities in the County, and smaller cities in the planning area may have slightly higher vulnerability than larger cities due to comparatively less water production and conveyance infrastructure than average.

3.3.9 Earthquake

HAZARD DESCRIPTION

Earthquake is a sudden motion or trembling caused by an abrupt release of accumulated strain on the tectonic plates that comprise the Earth's crust. The ensuring seismic activity and ground motion provoke secondary hazards: surface faulting, ground failure, and tsunamis. The vibration or shaking of the ground during an earthquake is referred to as ground motion. In general, the severity of ground motion increases with the amount of energy released and decreases with distance from the causative fault or epicenter. When a fault ruptures, seismic waves are propagated in all directions, causing the ground to vibrate at frequencies ranging from 0.1 to 30 Hz.

There is no history of earthquakes occurring within Polk County; however, there have been earthquakes measuring up to 3.7 on the Richter scale in nearby counties.

Earthquakes are typically described in terms of magnitude and intensity. The traditional measurement of amplitude of the seismic wave through the assignment of a single number to quantify the amount of seismic energy released by an earthquake is the Richter scale. The intensity of how strong the shock was felt at a particular location is the Modified Mercalli Intensity (MMI) scale. The scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature and man-made structures. Table 3-4 below is a combined earthquake magnitude and intensity comparison from the United States Geological Survey.

Table 3-20 Earthquake Magnitude / Intensity Comparison

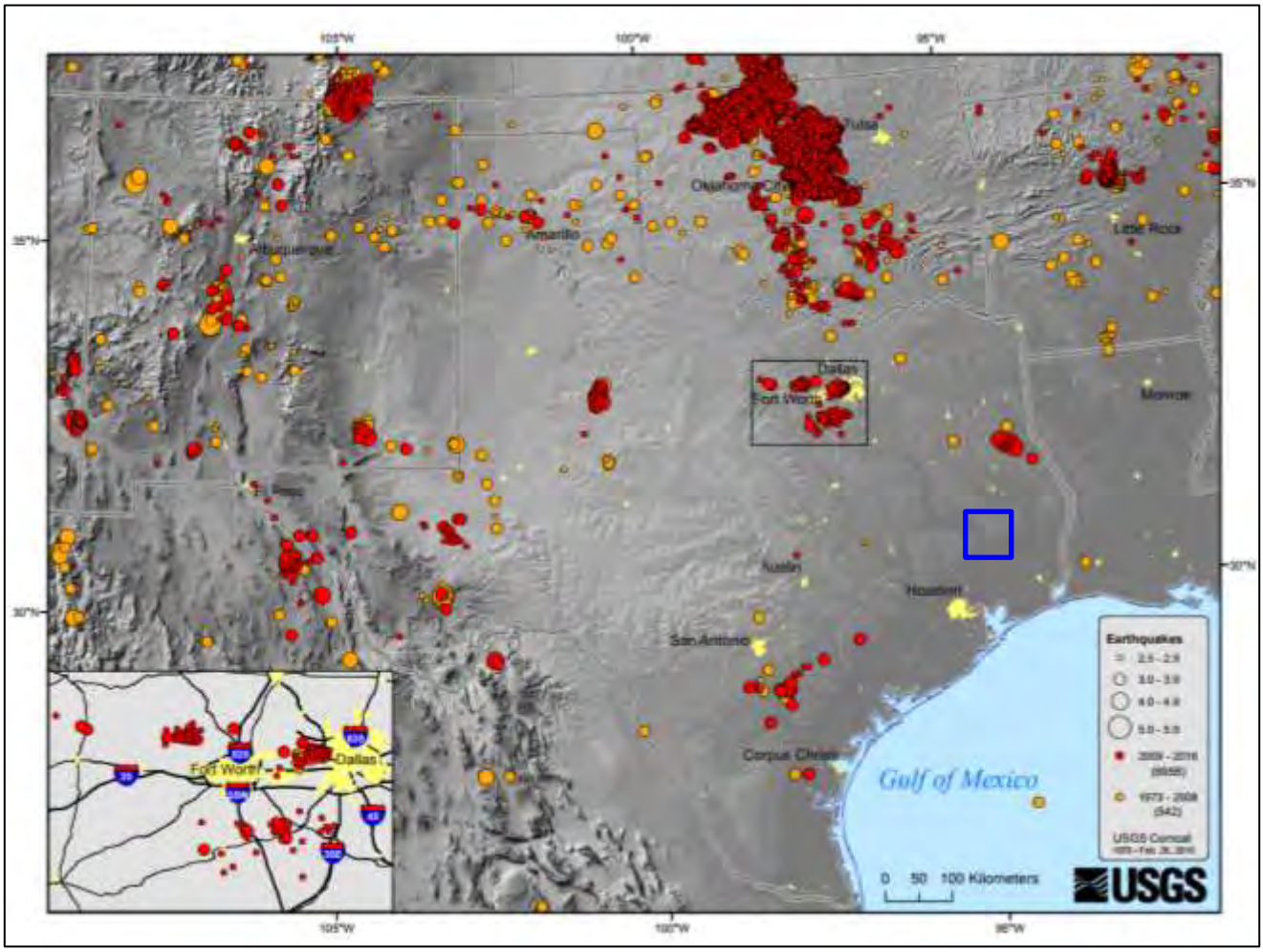
PGA (% g)	Magnitude (Richter)	Intensity (MMI) & Label	MMI Description
< 0.17	1.0 – 3.0	I. Instrumental	**I.** Not felt by many people unless in favorable conditions.
0.17 – 1.4	3.0 – 3.9	II. – III. Feeble/Slight	**II.** Felt only by a few persons at rest, especially on building upper floors. **III.** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck.
1.4 – 9.2	4.0 – 4.9	IV. – V. Moderate/Rather Strong	**IV.** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Parked cars rock noticeably. **V.** Felt by nearly everyone: many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
9.2 – 34	5.0 – 5.9	VI – VII Strong/Very Strong	**VI.** Felt by all. Some heavy furniture moved. Damage slight. **VII.** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built of badly designed structures; some chimneys broken.
34 – 124	6.0 – 6.9	VIII – IX Destructive/Ruinous	**VIII.** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Sensation like heavy truck striking building. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. **IX.** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
> 124	7.0 and higher	X, XI and XII Disastrous/Very Disastrous/ Catastrophic	**X.** Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. **XI.** Few if any (masonry) structures remain standing. Bridges destroyed. **XII.** Damage total. Line of sight & level distorted. Objects thrown in the air.

Source: USGS, Earthquake Hazards Program. http://earthquake.usgs.gov

GEOGRAPHIC LOCATION

The epicenter of an earthquake would not have to be directly under the planning area to be felt or to have an impact on the planning area. If an earthquake were to occur close enough to have a measurable impact, the entire planning area would be the geographic location.

Figure 3-26 Earthquake Occurrences, State of Texas (1973-2016)



Source: USGS, published August 2017. Note: Polk County area highlighted with blue square.

PREVIOUS OCCURRENCES / IMPACTS

There are no recorded earthquakes with epicenters in Polk County or recorded impacts for any of the participating jurisdictions, though each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has at least some potential for impact. See also Section 3.2.1 Risk Assessment per Jurisdiction for analysis of potential earthquake impacts to structures, environment, and infrastructure.

PROBABILITY OF FUTURE OCCURRENCE

According to the University of Texas at Austin, there are limited continuously recording seismograph stations in the state, which makes an accurate recording of both the number and intensity of earthquakes problematic.

Annual probability for earthquakes capable of structural damage in the planning area is considered low. USGS modeling of earthquake probability within 50 kilometers of Lufkin resulted in roughly a 2.5 percent probability for a 4.75 magnitude or larger quake over a 100 year time span, as shown in Figure 3-27 on the following page. The associated recurrence interval for this probability is 4,000 years. Based on these assessments, future probability for damaging earthquakes is assigned a **Low** classification according to Figure 3-1 in Section 3.1.1.

While no definitive research has been conducted, there is speculation that hydraulic fracturing methods for natural gas drilling is related to recent (minor) earthquake activity in north Texas. Any future findings relevant to earthquake probability relationships will be evaluated in future updates of this plan.

Based on USGS 2016 studies shown in the following maps, there is a 99% chance that an earthquake, if it were to occur in Polk County, would be less than 4.0 magnitude and less than 1% chance that it would cause damage.

Figure 3-27 Probable Earthquake Intensity from Natural and Induced Earthquakes (2016)

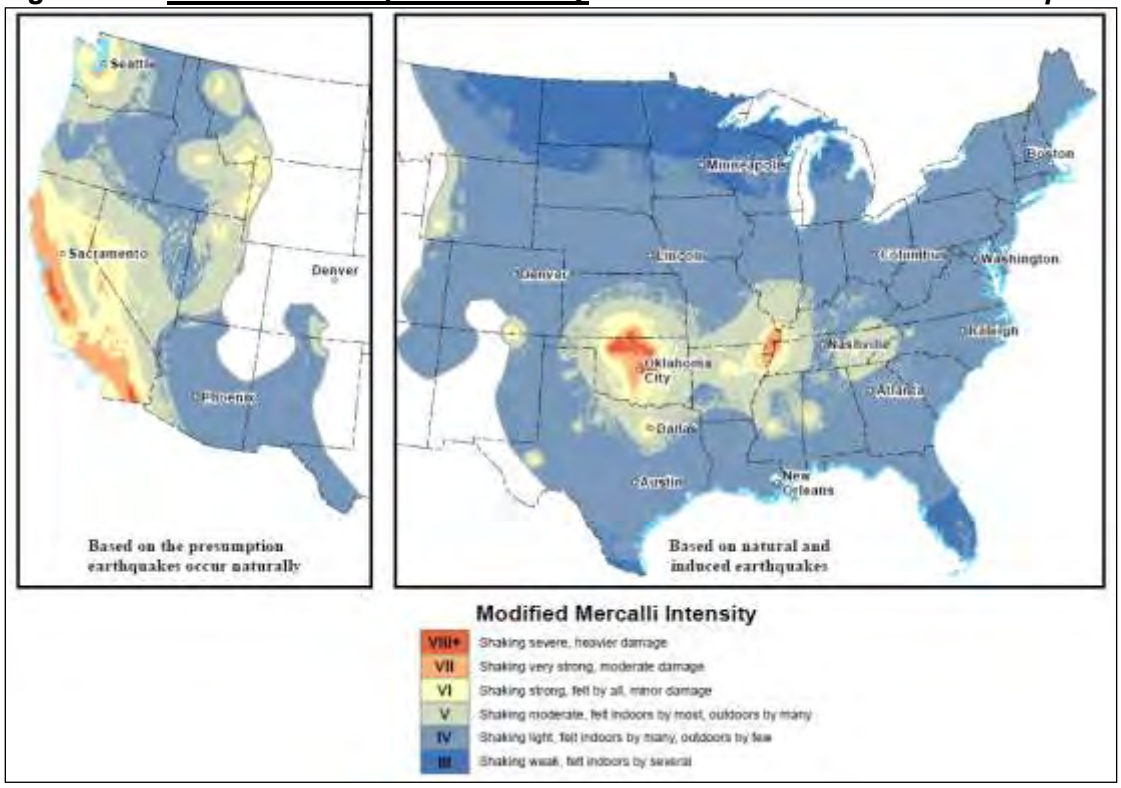
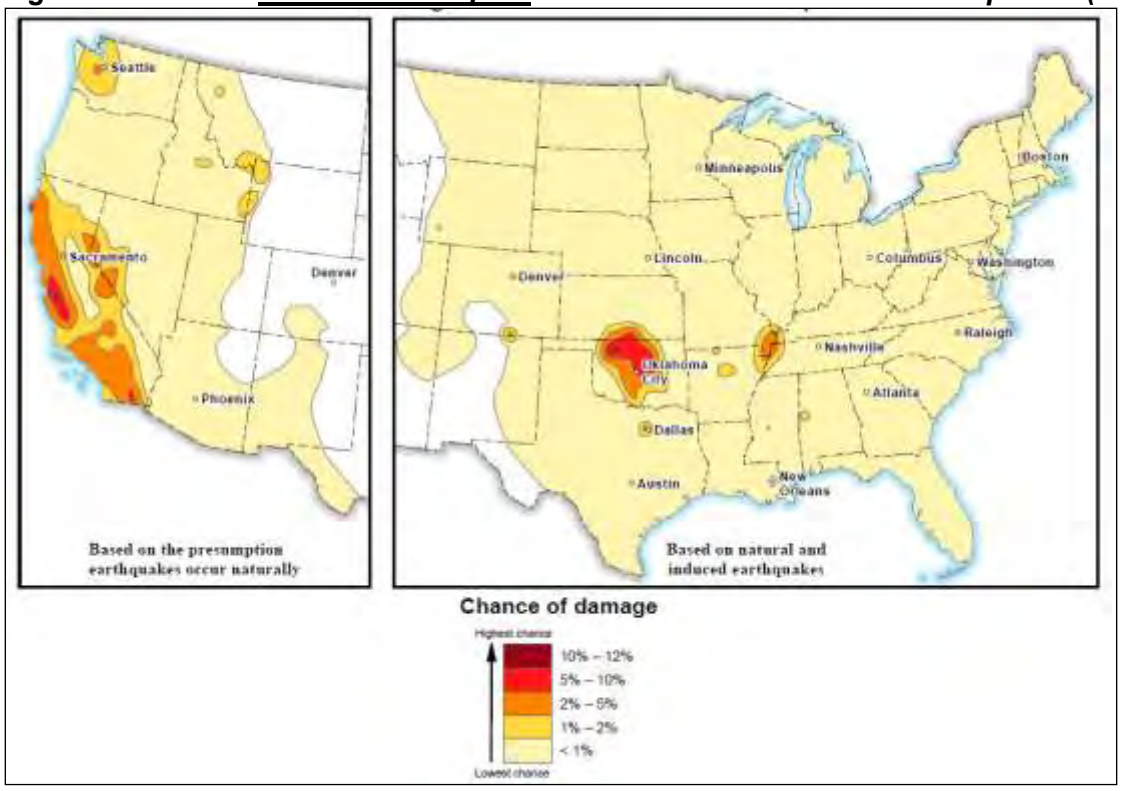


Figure 3-28 USGS Forecast for Impact from Natural and Induced Earthquakes (2016)



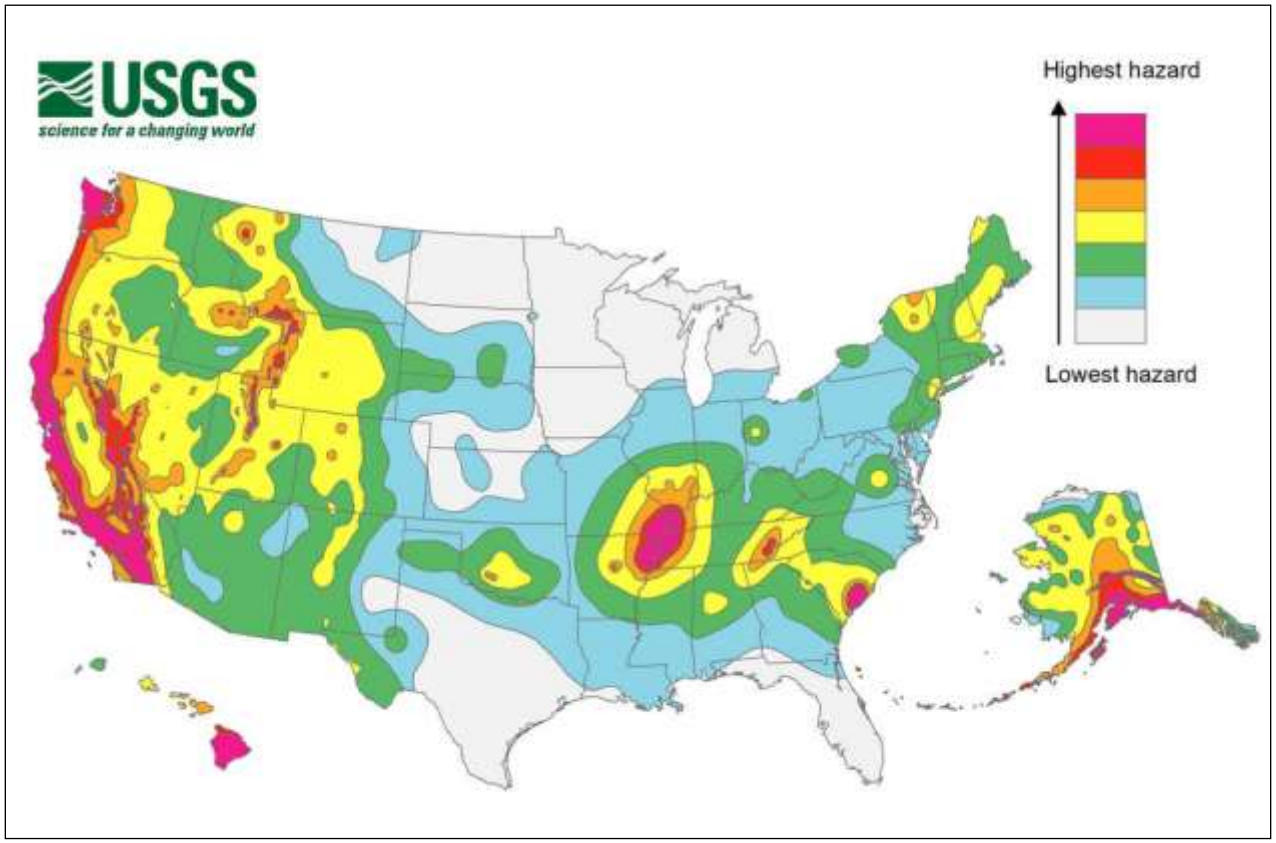
Source: USGS

MAGNITUDE/SEVERITY/EXTENT

As stated above in the earthquake hazard description, the magnitude of an earthquake is measured in the amplitude of the seismic wave and is expressed in the Richter scale; intensity is expressed as peak ground acceleration (PGA) relative the earth's gravity or "g", and is a measure of how strong the shock was felt at a particular location, expressed in Modified Mercalli Intensity (MMI) scale.

Figure 3-29 maps the ground shaking intensity (expressed relative to gravity, or "g") at various locations in the eastern U.S. at 2% probability in 50 years. East of the Rockies, the highest PGA is located at the New Madrid seismic zone at the junction of Missouri, Arkansas, Tennessee, Kentucky, and Illinois. To the southwest toward Texas, the PGA diminishes to a PGA value near zero. Eastern Texas including Polk County falls within the 0.01 g zone. This would correspond to an earthquake of approximately 1.0 to 3.0 on the Richter scale, (not felt by many people unless in favorable conditions). This assessment is equal for the entirety of the planning area.

Figure 3-29 Earthquake Hazard, Peak Ground Acceleration, 2% in 50 Years



Source: US Geological Survey;
http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpg

Based on these assessments the extent and severity of such as seismic event would be considered **Level 2- Limited** across the planning area including county and cities, with potential for noticeable shaking, but a low likelihood of extensive structural damage.

EARTHQUAKE OVERALL VULNERABILITY

Based on the probability of future occurrences and magnitude/severity the overall vulnerability rating for each of the participating jurisdictions would be **Low Earthquake Vulnerability**, according to Figure 3-3 in Section 3.1.1.

3.3.10 Hail

HAZARD DESCRIPTION

Hail is defined as ice precipitation with a diameter of 5 to 190 millimeters (0.2 inch to 7.4 inches). Hail develops in the upper atmosphere as ice crystals are bounced about by high-velocity updraft winds. The ice crystals accumulate frozen droplets and fall after developing enough weight.

Hailstorms are most common in the middle latitudes and are generally brief in duration. Large downdrafts in mature thunderstorm clouds provide the mechanism for hail formation. A hailstorm ordinarily occurs in mid to late afternoon during the passage of a cold front or during a thunderstorm.

The severity of hailstorms depends on the size of the hailstones, the length of time the storm lasts, and whether it occurs in developed areas. Hailstorms can cause widespread damage to homes and other structures, automobiles, and crops. While the damage to individual structures or vehicles is often minor, the cumulative costs to communities, especially across large metropolitan areas, can be significant.

Hail size and potential impact from hailstorms is outlined in the following scale provided by NOAA

Table 3-21 Combined NOAA/TORRO Hailstorm Intensity Scales

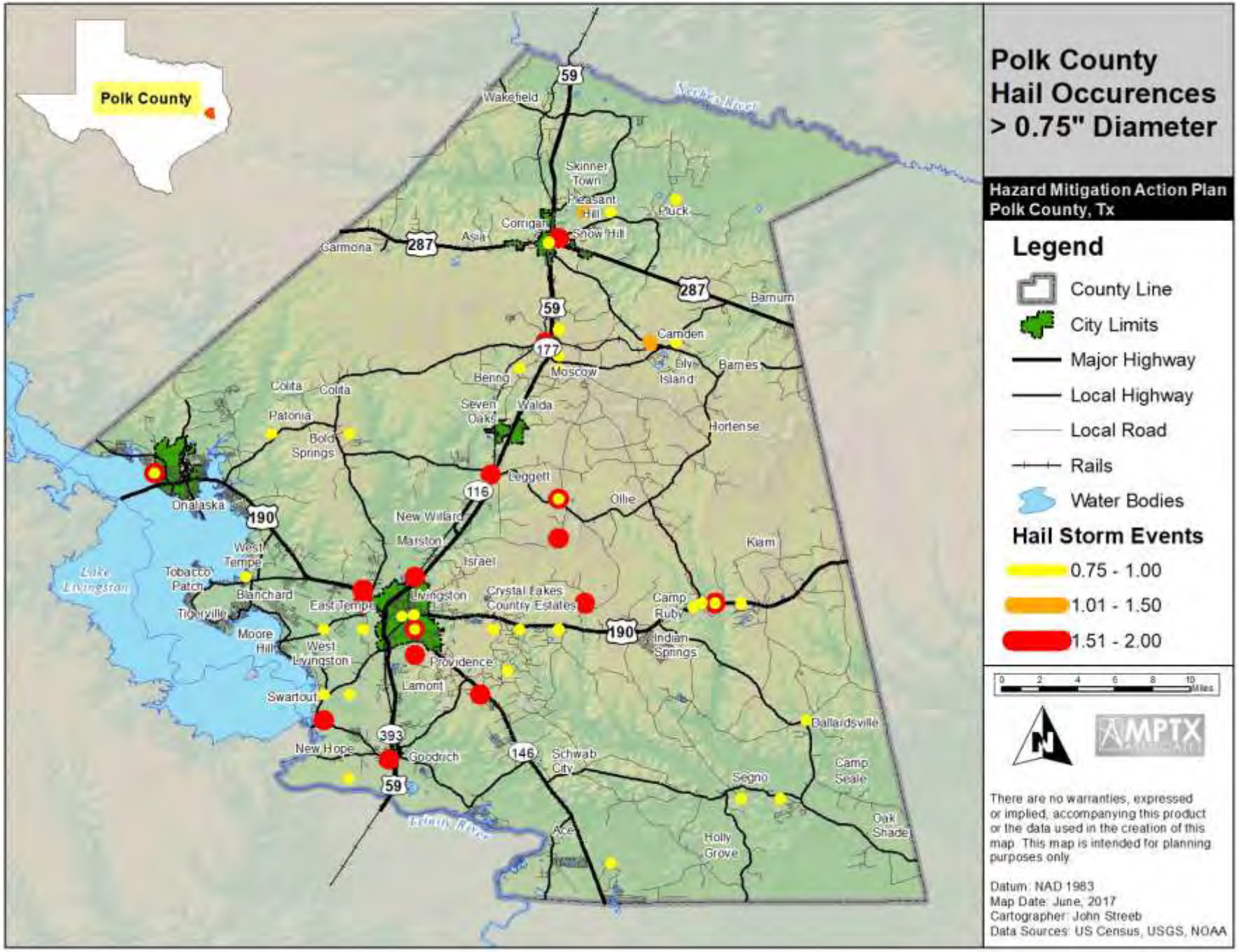
Size Code	Intensity Category	Hail Diameter	Comparative Size	Typical Impacts
H0	Hard Hail	up to 0.33"	Pea	No damage
H1	Potentially Damaging	0.33-0.60"	Marble or Mothball	Slight damage to plants, crops
H2	Potentially Damaging	0.60-0.80"	Dime or grape	Significant damage to fruit, crops, vegetation
H3	Severe	0.80-1.2"	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6"	Half Dollar to Silver Dollar	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.6-2.0"	Silver dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4"	Lime or Egg	Aircraft bodywork dented, brick walls pitted
H7	Very destructive	2.4-3.0"	Tennis ball	Severe roof damage, risk of serious injuries
H8	Very destructive	3.0-3.5"	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0"	Grapefruit	Extensive structural damage. Risk of severe/fatal injuries to persons caught in the open
H10	Super Hailstorms	4+"	Softball and larger	Extensive structural damage. Risk of severe/fatal injuries to persons caught in the open

Sources: National Oceanic and Atmospheric Administration (NOAA), Tornado and Storm Research Organization

GEOGRAPHIC LOCATION

Hail is known to occur across any portion of the planning area with nearly equal probability. The map on the following page shows locations of actual reports, with color and size of symbols indicating approximate magnitude for each event.

The following map shows history of hail occurrences for Corrigan, Seven Oaks, Livingston, Onalaska, Goodrich, and Polk County.



PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of hail impacts, though in most cases these have involved relatively minor or no damage reported. See also Section 3.2.1 Risk Assessment per Jurisdiction for analysis of potential hail impacts to structures, environment, and infrastructure. Based on NCDC records from 2007 through 2017, there were 20 hail events with hail measuring at least 0.75" in diameter; on at least 40 occasions hail 1.75" in diameter occurred. Regarding impacts of these hail events, reported property damage totaled $16,000.

Table 3.22 Hail Storm Reports, Polk County (2007-2017)

Location	Date	Time	Magnitude	Damage
CORRIGAN	4/26/2017	15:48	0.75 in.	$0
CORRIGAN	4/26/2017	15:56	1.25 in.	$0
BLANCHARD	5/1/2016	22:00	0.88 in.	$0
LEGGETT	1/8/2016	18:55	1.75 in.	$5,000
ONALASKA	5/11/2015	5:45	0.75 in.	$0
ALABAMA/COUSHATTA RES	4/16/2015	16:10	1.00 in.	$0
LIVINGSTON	3/28/2014	17:57	1.00 in.	$0
CORRIGAN	6/6/2013	11:30	0.75 in.	$0
CORRIGAN	5/21/2013	22:30	1.00 in.	$0
NEW HOPE	4/4/2012	1:52	1.00 in.	$1,000
PROVIDENCE CAMP	4/4/2012	2:10	1.00 in.	$2,000
PROVIDENCE CAMP	1/30/2011	18:25	1.75 in.	$0
CORRIGAN	8/25/2009	19:15	1.75 in.	$5,000
CORRIGAN	6/3/2009	15:20	0.75 in.	$0
MOSCOW	6/3/2009	15:24	0.88 in.	$0
LIVINGSTON	5/26/2009	13:55	1.00 in.	$1,000
LAKE LIVINGSTON DAM	5/3/2009	6:57	0.75 in.	$1,000
ALABAMA/COUSHATTA RES	10/22/2008	18:24	0.75 in.	$1,000
SEVEN OAKS	5/11/2008	1:56	0.75 in.	$0
LIVINGSTON	5/3/2007	15:38	1.75 in.	$0
			TOTALS (20 occurrences)	$16,000

Source: National Center for Environmental Information (NCEI), Storm Events Database

PROBABILITY OF FUTURE OCCURRENCE

Based on the storm events listed by the National Climatic Data Center, Polk County and the participating cities have experienced 20 hail events during the last 10 years. The associated recurrence interval for all jurisdictions in the planning area is approximately 6-months, or 2 hail events per year. For each jurisdiction this recurrence interval equates to a **High** probability of future occurrence according to the Figure 3-1 in Section 3.1.1.

MAGNITUDE/SEVERITY/EXTENT

The largest hail size recorded over the last 10 years was 1.75" (golf ball size), which occurred on four separate occasions. This equates to H5 in the NOAA/TORRO hail index, representing potentially destructive hail activity, primarily related to vehicle windshield damage or paint finish.

HAIL OVERALL VULNERABILITY

Overall vulnerability for each participating jurisdiction to hail is considered Low, based on the relatively minimal exposure of structures and damage to infrastructure. The most notable potential impact is cosmetic damage to vehicles. Public safety impacts could include cases where cover is not available to persons caught outside during a hailstorm.

3.3.11 Extreme Heat

HAZARD DESCRIPTION

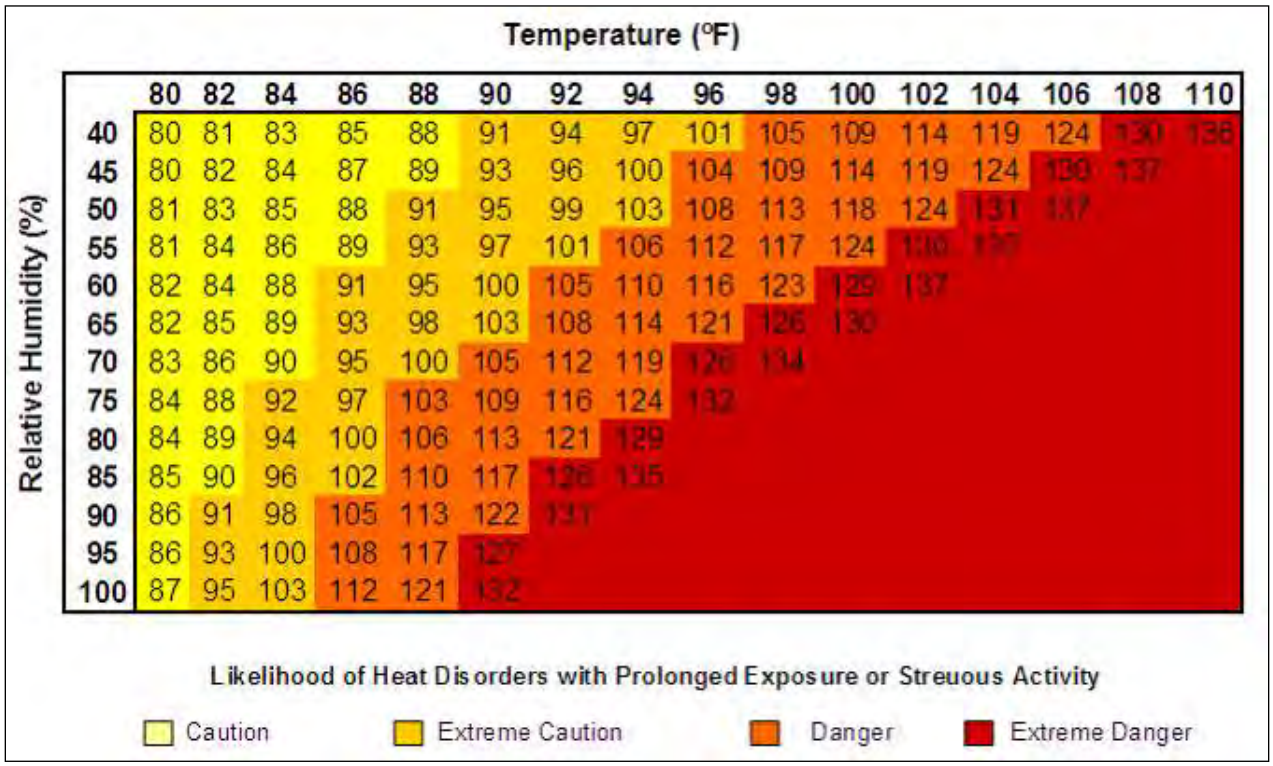
Extreme heat is a persistent period of high temperatures (significantly above normal) which is often accompanied by high humidity.

Extreme heat can cause heat stroke or heat exhaustion. Heat stroke is the most serious of the two heat-related illnesses. It occurs when the body becomes unable to control its temperature. The body's temperature rises rapidly and loses its ability to sweat, and is therefore unable to cool down. Body temperatures can rise to 106(°F) or higher within 10 to 15 minutes. Heat stroke can cause death or permanent disability if emergency treatment is not provided. Heat exhaustion is a milder form of heat-related illness that can develop after several days of exposure to high temperatures and inadequate or unbalanced replacement of fluids.

The "Heat Index" is a measure of the effect of the combined elements of heat and humidity on the human body. The Heat Index (HI) or the "Apparent Temperature" is an accurate measure of how hot it really feels when the Relative Humidity (RH) is added to the actual air temperature. An Excessive Heat Warning is issued within 12 hours of the onset of a heat index of at least 105°F for more than 3 hours per day for 2 consecutive days, or a heat index of more than 115°F for any period of time. An Excessive Heat Watch is issued by the National Weather Service when heat indices in excess of 105ºF (41ºC) during the day combined with nighttime low temperatures of 80ºF (27ºC) or higher are forecast to occur for two consecutive days.

The Heat Index Chart shown below (Figure 3-30) was provided by the National Weather Service and indicates the relationship of ambient air temperature and relative humidity to the likelihood of heat disorder and health risk.

Figure 3-30 Heat Index Chart



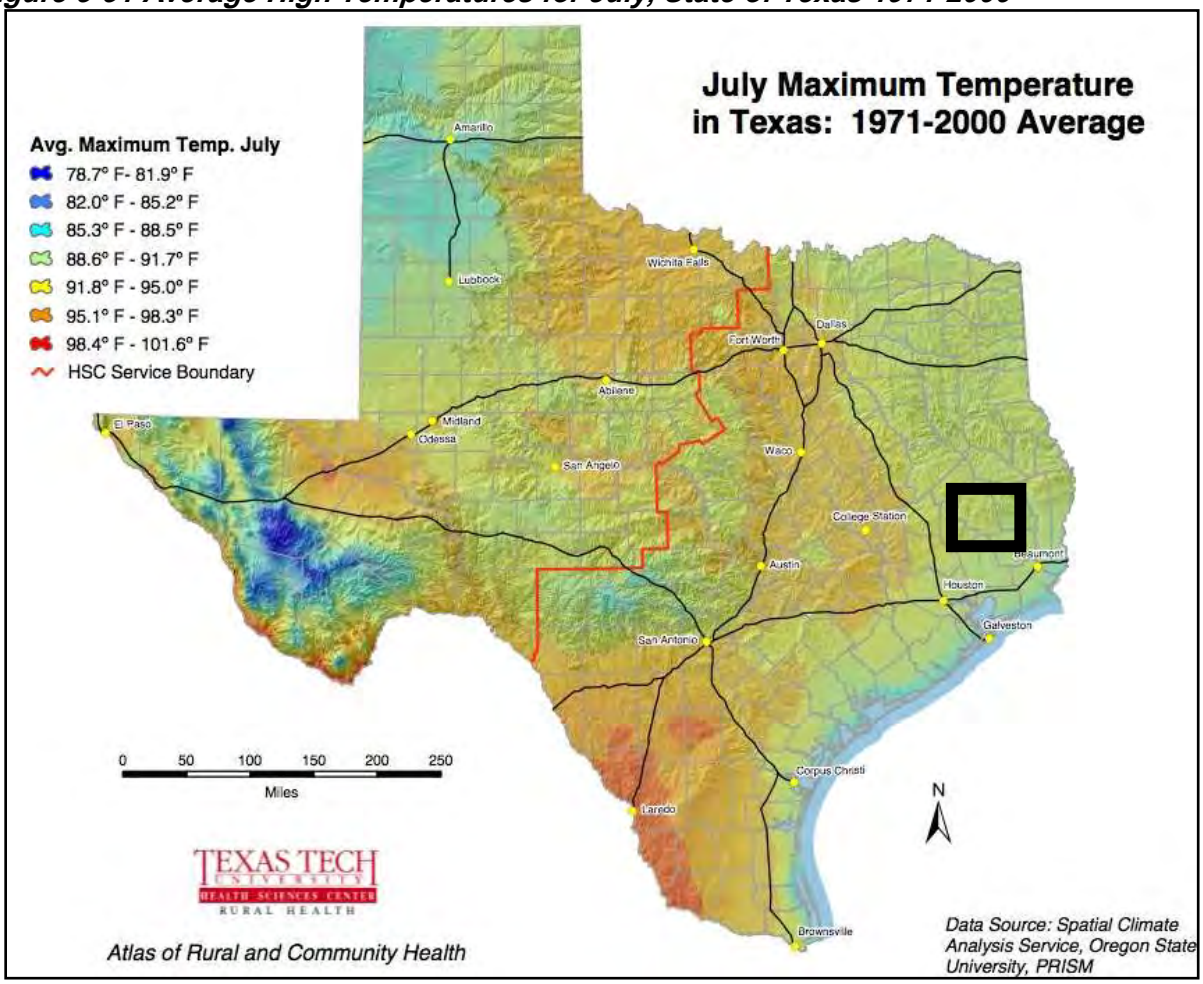
Source: National Weather Service

GEOGRAPHIC LOCATION

Extreme heat affects the entire planning area, though it may be noted that based on fatality statistics unshaded parking lots are the most likely location for tragic heat injury. More broadly, the eastern third of the State of Texas is classified climatologically as subtropical humid, and

known for hot summers. The relatively wet climate is largely due to the influence of weather patterns driven by proximity to the Gulf of Mexico.

Figure 3-31 Average High Temperatures for July, State of Texas 1971-2000



Source: Texas Tech Rural Health Sciences Center
Note: Black rectangle indicates location of Polk County

The map above shows Polk County in a zone of east Texas with an average high temperature for July ranging from 88.6° F to 91.7° F for the period 1971 to 2000. During this period, the east Texas region was cooler than areas along the strip running through central Texas from Laredo in the south to Wichita Falls in the north.

PREVIOUS OCCURRENCES / IMPACTS

Each participating jurisdiction including both county and cities (Polk County, Corrigan, Goodrich, Livingston, Onalaska, and Seven Oaks) has experienced at least some degree of extreme heat impacts. For the period 1990-2017, the years 2000, 2009, and 2011 are noted by the National Center for Environmental Information for reporting extreme heat impacting Polk County. A selection of these specific events are described below.

July-September 2000: Excessive heat impacted southeast Texas for much of the month of July. High temperatures ranged from 98 to 105 degrees on a daily basis over all but the immediate coast during a 2-week period. College Station recorded 12 consecutive days with temperatures of 100 degrees or higher. Highest temperatures for the month included 103 degrees at Houston Intercontinental Airport and 105 degrees at College Station. Only traces of rainfall were observed during this period. Of the 19 heat related deaths reported during this period, 17 were in Harris County and 2 were in Galveston County. Excessive heat continued to occur over southeast Texas

during the last 3 days of August. High temperatures reached well over 100 degrees over inland areas, with Galveston reaching 100 degrees on the 31st. The high temperature of 107 degrees at Houston Intercontinental on the 31st ties the all-time record high temperature observed in Houston up to that date. All 3 heat-related deaths were in Harris County. The record setting heat wave continued over southeast Texas through the first week of September 2000. The temperature at Houston Intercontinental soared to 109 degrees on the 4th and 108 degrees on the 5th, setting new records for the all-time highest temperatures recorded in Houston. The temperatures in College Station peaked at 112 degrees on the 4th and 111 degrees on the 5th, both the highest temperatures ever recorded in College Station. In Galveston, the all-time record high temperature of 101 degrees was tied on the 4th, then broken the next day when the temperature rose to 104 degrees. Temperatures over southeast Texas began to cool on the 6th. In all, Houston recorded 6 consecutive days with temperatures of 104 degrees or higher and College Station recorded 6 consecutive days of 107 degrees or higher. Galveston reached 100 degrees or higher for the first time since 1939, and for the first time on record had more than one day in a season with 100-degree temperatures. A heat wave with temperatures of this duration and magnitude is unprecedented for southeast Texas. All 5 heat-related deaths occurred in Harris County.

June 2009: Hot humid conditions led to heat indices above 105 degrees for several days in late June. An upper level ridge built over the area, corresponding to a period of hot and humid conditions. A number of indirect fatalities were attributed to the heat. 2009 was the hottest summer on record in, when there were 68 days of 100-degree heat.

June 2011: During 2011, Texas endured its most severe single-year drought since the 1950s, received the lowest single-year rainfall since 1895, and experienced the hottest June-August period of any U.S. state on record—exceeding that of even the Dust Bowl of the 1930s.

According to data provided by the National Weather Service, for the period 1979 to 1999, extreme heat exposure caused 8,015 deaths in the United States (annual mean: approximately 400 deaths). During this period, more people in this country died from extreme heat than from hurricanes, lightning, tornados, floods, and earthquakes combined.

From 1999 to 2003, a total of 3,442 deaths resulting from exposure to extreme heat were reported to the Center for Disease Control (annual mean: 688). For 2,239 (65 percent) of these deaths, the underlying cause of death was recorded as exposure to extreme heat. For the remaining 1,203 (35 percent), hyperthermia was recorded as a contributing factor. Deaths among males accounted for 66 percent of deaths and outnumbered deaths among females in all age groups. Of the 3,401 decedents for whom age information was available, 228 (7 percent) were aged under 15 years, 1,810 (53 percent) were aged 15--64 years, and 1,363 (40 percent) were aged 65 years.

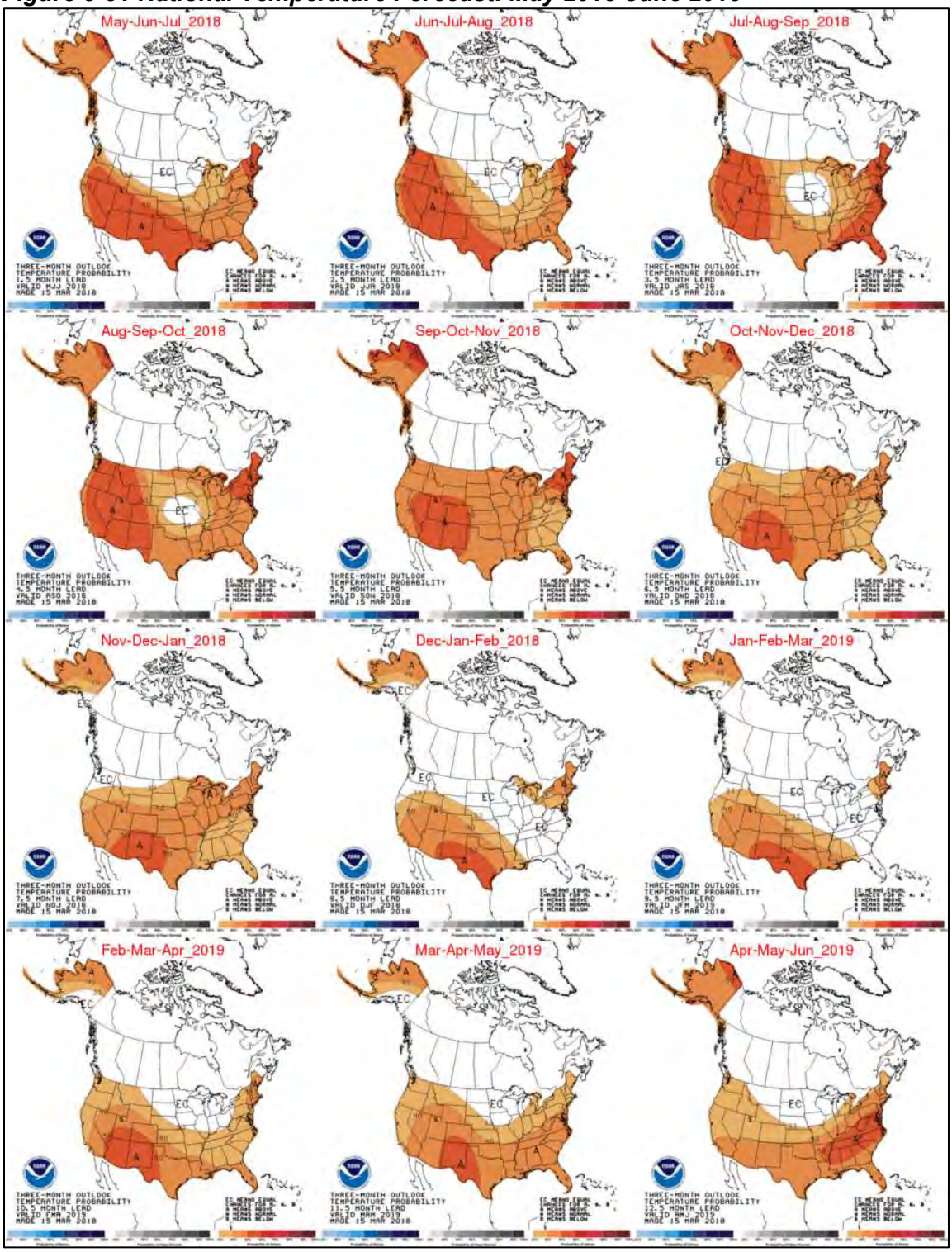
The National Oceanic and Atmospheric Administration (NOAA) states that more than 1,500 people in the United States die each year from excessive heat. The Texas Department of State Health Services analyzed death certificates for cause of death due to extreme temperatures from 1999-2004. Over the 5-year reporting period, there were 258 deaths due to exposure to heat as the underlying cause. During this reporting period, there was one reported death in Polk County. For geographical context, there was only one heat related death in the counties surrounding Polk County during the 5-year reporting period (Cherokee in 2000). More recently, there have been two additional heat related deaths in Polk County, both in August 2010.

Additional impacts from extreme heat are noted for roof structures and roadways. Roofing impacts occur more or less annually on the hottest weather days of the year, and often only become apparent when heavy rains test the continuity of seals for the roof structure. Heat impacts to roadways also occur on an annual basis and are amplified by heavy trucking during these weather patterns. This damage also becomes apparent during rainy weather when channels that form in the road trap water, increasing the chance of a vehicle hydroplaning and contributing to the development of potholes.

PROBABILITY OF FUTURE OCCURRENCE

Climate data is available through the National Weather Service for Polk County from the period 1906 to the present. In general, the summer months are consistently warm, with maximum temperatures at or above 90 degrees 89 days a year. The high heat coupled with the high summer time humidity associated with subtropical climates, makes for annual oppressive heat events resulting in a **High Probability** of future occurrence classification according to Figure 3-1 in Section 3.1.1. The following map shows temperature forecasts for Summer 2018 through June 2019. Above normal temperatures are forecast for the upcoming 12-month period.

Figure 3-31 National Temperature Forecast: May 2018-June 2019



Source: NOAA

MAGNITUDE/SEVERITY/EXTENT

Maximum magnitude of extreme heat is considered equal across each jurisdiction in the planning area. According to the NWS Heat Index chart and analysis of previous occurrences in the planning area, Heat Index values over 120°F are possible in Polk County. During the last 5-year planning cycle, heat index readings in the 105-108° range have occurred.

As an area known for high summer temperatures and humidity, significant health related impacts and/or economic impacts from extreme heat have likely been underreported. Extreme heat can be combated through the use of air conditioning. However, persistent heat also increases demand on energy infrastructure. Extreme heat increases the risk of wildfire and typically compounds the effects of drought. Based on these assessments, magnitude and severity is classified as **Level 3-Critical.**

EXTREME HEAT OVERALL VULNERABILITY

Overall vulnerability to extreme heat for each participating jurisdiction is considered moderate. Children, the elderly, persons without air conditioning, and the sick and disabled are at greatest risk of heat stroke, though anyone may be affected. Census statistics for these potentially vulnerable groups are provided in Section 1.5 (County Profile/Demographics) and Section 1.5.4 (City Profiles). In addition to human health impacts, extreme heat can stress agricultural crops and livestock thus reducing yields, and it may cause widespread power outages as a result of increased demand for electricity to power air-conditioning systems.

Additional factors that increase risk of impact include drinking alcohol, strenuous outdoor physical activity, and medications that impair the body's ability to regulate its temperature or inhibit perspiration.

Air-conditioning is the number one protective factor against heat-related illness and death. If a home is not air-conditioned, people can reduce their risk for heat-related illness by spending time in public facilities or private facilities that are air-conditioned. Suggestions for preventing a heat-related illness include frequently drinking water or non-alcoholic fluids, wearing lightweight, light-colored, loose-fitting clothing, and reducing or eliminating strenuous activities or doing them during cooler parts of the day. Periodically checking on neighbors who do not have air conditioning is also recommended.

Based on subjective assessments, including the possibility of life-threatening heat to vulnerable populations, Polk County is considered to be at **Moderate Vulnerability**, as defined in Figure 3-3 in Section 3.1.1.

CHAPTER 4. MITIGATION STRATEGY

44 CFR Requirement 201.6(c) (3):
The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The mitigation strategy creates a planning framework to reduce the impact of future hazard events. The structure of this mitigation strategy is intentionally straightforward:

- Establish a set of agreed upon goals and objectives.
- Identify vulnerabilities
- Analyze potential actions to reduce vulnerability
- Choose actions to implement.

4.1 LOCAL HAZARD MITIGATION GOALS AND OBJECTIVES

44 CFR Requirement §201.6(c) (3) (i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

The goals of the State of Texas Hazard Mitigation Plan were reviewed during the Plan update process. The 2013 State goals are as follows:

Figure 4-1 Hazard Mitigation Goals from the State of Texas Hazard Mitigation Plan

Goal 1: Reduce or eliminate hazardous conditions that may cause loss of life
Goal 2: Reduce or eliminate hazardous conditions that may inflict injuries
Goal 3: Reduce or eliminate hazardous conditions that can cause property damages
Goal 4: Reduce or eliminate hazardous conditions that degrade important natural resources
Goal 5: Reduce or eliminate repetitive losses due to frequent probability of occurrence
Goal 6: Lessen economic impact within communities when hazards occur.

Source: State of Texas Hazard Mitigation Plan (2013), Section 3, page 189

Also during Meeting 1 of the plan update process, the HMT had an opportunity to re-evaluate the goals from the 2012 Plan. Upon review, the team determined the goals from the prior version of the Mitigation Action Plan remain appropriate for the current cycle and that no changes in overarching mitigation priorities is needed at this time. These mitigation goals are intentionally straightforward and correspond to the state mitigation goals. The goals of this Plan are:

Figure 4-2 Polk County Multi-Jurisdiction Hazard Mitigation Goals

1) Reduce vulnerability to natural hazards that cause injury or loss of life;

2) Reduce vulnerability to natural hazards that cause property damage;

3) Reduce vulnerability to natural hazards that cause the degradation of natural resources

4) Reduce vulnerability to natural hazards of critical facilities and infrastructure.

Source: Polk County Multi-Jurisdiction Hazard Mitigation Task Force

4.1.1 Mitigation Objectives

The following list of objectives support the mitigation goals and provide specific ideas for successful achievement of the goals.

Property Protection:

- Reduce insurance losses and repetitive claims for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Focus resources on activities involving property owners and that assist in protecting homes, structures, or property from natural hazards.

Natural Systems:

- Evaluate and make recommendations for county guidelines and permitting processes in addressing natural hazard mitigation and development in vulnerable areas.
- Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities to protect vital habitat and water quality.
- Preserve and rehabilitate natural systems to serve natural hazard mitigation functions.

Public Awareness:

- Develop and implement education programs that will increase property owners' and developers' awareness of natural hazards.
- Develop and conduct outreach programs to increase the number of local, county, and regional activities implemented by public and private sector organizations.

Partnerships:

- Strengthen communication and coordinate participation in and between public agencies, citizens, non-profit organizations, business, and industry.
- Document the process and resources that will reduce the administrative burden on the requestors/recipients of grant funds.
- Provoke legislature attention by identifying mitigation priorities.

Emergency Services:

- Establish policy to encourage mitigation for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Implementation:

- Promote leadership within public agencies to implement natural hazard mitigation activities.
- Attain participation and funding to implement mitigation activities by creating a dynamic document, which is continually updated and revised.

Pursuant to the above stated goals and objectives, the Hazard Mitigation Task Force developed mitigation action items (measurable activities targeted at mitigating disaster events). Each hazard is assigned a 'Moderate' or 'High' overall vulnerability ranking. Mitigation action items, implementation strategies, and methods for identification and prioritization are described in the following sections, which begins with a monitoring tool in the form of a Hazard Mitigation Project Report shown on the following page.

Polk County
Hazard Mitigation Project Report

Date:	
Project Stage (circle one): - Planning - Grant Application - Implementation/Construction - Completed	**Comments:**
Project Description:	
Action Item Number and Page Number in Hazard Mitigation Plan (if applicable, 2017 Version):	
Summary Analysis:	
Prepared by:	
Return to: Polk County Office of Emergency Management 602 E. Church Street, Suite 165 Livingston, Texas 77351 Phone: 936-327-6826	**Method:** Fax: 936- 327-6890 Email : emergencymanagement@co.polk.tx.us

4.2 ACTION ITEM IDENTIFICATION AND PRIORITIZATION

44 CFR Requirement §201.6(c) (3) (ii)
The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

This Plan provides mitigation actions that will assist all jurisdictions within the county in reducing future losses. The remainder of this chapter describes the mitigation strategy developed by the HMT to implement action items in support of the above stated goals. It is expected that with sound and thorough implementation of these action items, significant reductions in future losses to county residents and assets will result.

4.2.1 Action Item Identification

During the meetings and discussions conducted during the development of the Plan, numerous suggestions were presented by the attendees. The Hazard Mitigation Teams considered this broad range of potential mitigation activities in relation to their particular area of interest or expertise. In general, the Hazard Mitigation Teams considered the cost effectiveness, technical feasibility, and environmental soundness of each action item when choosing which ones to implement.

The mitigation action items are reported below in Sections 4.3 and 4.4. The outline for each action item includes the following information:

- Hazard(s) addressed — hazard types mitigated by project
- Estimated cost — estimated expense to carry an action item through to completion
- Project timeframe — estimated period to complete action item
- Responsible department – The department with the primary responsibility to plan, secure funding and coordinate all required actions to execute the project
- Coordinating agencies — departments and agencies involved in action item implementation
- Potential funding sources for both Federal and local share: Hazard Mitigation Grant Program; Repetitive Flood Claims Program (RFC); Severe Repetitive Loss Program (SRL); Pre-Disaster Mitigation Program (PDM); Flood Mitigation Assistance Program (FMA); Cooperating Technical Partners Grant Program (CTPGP)

4.2.2 Action Item Prioritization Criteria and Process

Prioritization Process
In Meetings 2 & 3, the Hazard Mitigation Team was advised to emphasize the cost effectiveness, technical feasibility, and environmental soundness of each action item in order to determine its relative priority. Specifically, the HMT was encouraged to consider the predicted social impacts of mitigation project implementation, its technical feasibility, administrative barriers, political or legal considerations, economic impacts, and environmental soundness. These criteria, organized under the STAPLE-E acronym, are listed below, followed by the method for benefit-cost review:

STAPLE-E Criteria: Social Effects**, T**echnical Feasibility**, A**dministrative Barriers/Considerations**, P**olitical Considerations**, L**egal Ramifications**, E**conomic Impacts**, E**nvironmental Soundness

Cost-Effectiveness/Benefit-Cost Ratio
An overall evaluation of an action item's expected benefits versus costs was also considered during action item identification and prioritization.

During the fourth meeting of the HMT, a worksheet (shown on following page) was distributed to each attendee. The purpose was to prioritize mitigation actions in a quantifiable way, while also allowing for new ideas to emerge. The worksheet results were compiled and helped determine the prioritized action items for each jurisdiction.

POLK COUNTY HAZARD MITIGATION ACTION PLAN UPDATE (2018-2023)

Instructions: Please score the following list of project types based on your opinion of relative priority. For example, a Low Priority project would score a "1", a Medium Priority project would score a "5", and a High Priority project would score a "10".

If you have specific ideas for a project location or examples of where it is needed, note it on the right side.

If you have other ideas for hazard mitigation projects list them at the bottom.

Return completed forms to: Emergency Management at emergencymanagement@co.polk.tx.us

County/City Buildings & Facilities	Priority Score (circle one)										Specific Ideas, Examples
Safe Rooms (tornado, hurricane, etc.)	1	2	3	4	5	6	7	8	9	10	
Window Protection	1	2	3	4	5	6	7	8	9	10	
Roof upgrades	1	2	3	4	5	6	7	8	9	10	
Door upgrades (including roll-up doors)	1	2	3	4	5	6	7	8	9	10	
Generators	1	2	3	4	5	6	7	8	9	10	
Underground utilities	1	2	3	4	5	6	7	8	9	10	
Ignition resistant materials	1	2	3	4	5	6	7	8	9	10	

Roads	Priority Score (circle one)										Specific Ideas, Examples
Elevate low road sections	1	2	3	4	5	6	7	8	9	10	
Culvert install or upgrade	1	2	3	4	5	6	7	8	9	10	
Bridge install or upgrade	1	2	3	4	5	6	7	8	9	10	

Drainage	Priority Score (circle one)										Specific Ideas, Examples
Enlarge drainage channels	1	2	3	4	5	6	7	8	9	10	
Headwall reinforcement	1	2	3	4	5	6	7	8	9	10	
Install stormwater retention ponds	1	2	3	4	5	6	7	8	9	10	

Residential Homes	Priority Score (circle one)										Specific Ideas, Examples
Acquire flood prone properties	1	2	3	4	5	6	7	8	9	10	
Elevate flood prone structures	1	2	3	4	5	6	7	8	9	10	
Wildfire fuels removal near homes	1	2	3	4	5	6	7	8	9	10	
Safe room rebates for homeowners	1	2	3	4	5	6	7	8	9	10	

General	Priority Score (circle one)										Specific Ideas, Examples
Storm warning sirens	1	2	3	4	5	6	7	8	9	10	
Controlled burns to reduce wildfire fuels	1	2	3	4	5	6	7	8	9	10	
Burn ban notice and enforcement	1	2	3	4	5	6	7	8	9	10	
Public education	1	2	3	4	5	6	7	8	9	10	

Other Hazard Mitigation Project Ideas	Priority Score (circle one)										Specific Ideas, Examples
	1	2	3	4	5	6	7	8	9	10	
	1	2	3	4	5	6	7	8	9	10	
	1	2	3	4	5	6	7	8	9	10	

Contact Information (voluntary)	
Name	
Agency/Title/Affiliation	
Phone	
Email	

As a result of the prioritization process, a minimum of **three** action items were developed for each profiled hazard. Table 4-1 below shows the type of hazards each action item addresses.

Table 4-1 Matrix of Action Items by Hazards Addressed

AI #	Flood	Hurricane	Tornado	T-Storm Wind	Wildfire	Winter	Lightning	Drought	Earthquake	Hail	Heat
1	X	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X	X
4	X	X									
5	X	X									
6	X	X	X	X	X	X	X	X	X	X	X
7					X						
8									X		
9									X		
10											X
11								X			
12								X			
13						X					
14						X					
15				X							
16							X				
17					X						
18	X										
19	X										
20	X										
21		X	X	X							
22	X										
23					X						
24					X						
25	X										
26	X										
27	X										
28							X				
29			X								
30			X								
31		X	X	X							
32		X	X	X							
33		X	X	X							
34					X						
35	X										
36	X										
37	X										
38		X	X	X							
39	X										
40	X										
41					X						
42		X	X	X							
43											X
44					X						
45	X										
46	X										
47			X								
48					X						
49					X						
50	X										
51	X										
52							X				
53			X								
54			X								
55		X									
56	X										
57	X										

Source: Section 4.3 Mitigation Action Items

Table 4-2 Matrix of Action Items by Jurisdiction

AI #	Polk County	Corrigan	Goodrich	Livingston	Onalaska	Seven Oaks
1	X	X	X	X	X	X
2	X	X	X	X	X	X
4	X	X	X	X	X	X
5	X	X	X	X	X	X
6	X	X	X	X	X	X
7	X	X	X	X	X	X
8	X	X	X			
9	X	X	X			
10	X	X	X	X	X	X
11	X	X	X	X	X	X
12	X	X	X	X	X	X
13	X	X	X	X	X	X
14	X	X	X	X	X	X
15	X	X	X	X	X	X
16	X	X	X	X	X	X
17		X				
18		X				
19		X				
20		X				
21		X				
22	X					
23	X					
24	X					
25	X					
26	X					
27	X					
28	X					
29	X					
30	X					
31	X					
32	X					
33	X					
34			X			
35			X			
36			X			
37			X			
38			X			
39					X	
40					X	
41					X	
42					X	
43					X	
44						X
45						X
46						X
47						X
48				X		
49				X		
50				X		
51				X		
52				X		
53				X		
54				X		
55				X		
56				X		
57				X		

Source: Section 4.3 Mitigation Action Items

4.3 ACTION ITEMS

1. Initiate public education campaign to improve the community's understanding and access to information to guide and facilitate activities they can undertake which improve level of protection for their homes, their property and improve their safety and resiliency to natural hazards.

Hazards Addressed	Flood, Hurricane, Tornado, Thunderstorm Wind, Wildfire, Winter Storm, Lightning, Drought, Earthquake, Hail, Extreme Heat
Estimated Cost:	$250,000 – $300,000
Project timeline	6 months
Responsible Department	Polk County OEM, City Administrators
Coordinating Agency	FEMA, TDEM, NFIP, TFS, NWS
Potential Funding Sources	HMGP, PDM, CDBG
Jurisdictions	Polk County, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

2. Hazard Hardening Retrofit for county/city facilities. Activities may include but are not limited to: flood proofing, impact resistant windows, storm shutters, roof straps, structural bracing, low-flow plumbing fixtures, roll-up door reinforcement, grounding systems, surge-protection, data back-up systems, plumbing reinforcement and insulation, heat resilient roofing materials, foundation support and expansion joints, shade providing-drought resistant landscaping.

Hazards Addressed	Flood, Hurricane, Tornado, Thunderstorm Wind, Wildfire, Winter Storm, Lightning, Drought, Earthquake, Hail, Extreme Heat
Estimated Cost:	$25,000,000 – $30,000,000
Project timeline	3 years
Responsible Department	Polk County OEM, City Facilities Directors
Coordinating Agency	FEMA, TDEM, HUD, GLO
Potential Funding Sources	HMGP, PDM, CDBG
Jurisdictions	Polk County, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

4. Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.

Hazards Addressed	Flood, Hurricane, Dam Failure
Priority	**High**
Estimated Cost:	$1,000,000 – 5,000,000
Implementation Schedule	2 – 5 years
Coordinating Agency	Polk County, TDEM, FEMA, TXDOT
Potential Funding Sources	HMGP, PDM, TXDOT,
Impact	Existing Infrastructure
Jurisdictions	Polk County, City of Livingston, Goodrich, Onalaska, Seven Oaks, Corrigan

5. Work with FEMA to develop detailed FIRMs to more accurately map flooding risk from all sources.

Hazards Addressed	Flood, Hurricane; NFIP Compliance
Priority	**High**
Estimated Cost:	$1,000,000 – 2,000,000
Implementation Schedule	12 months
Coordinating Agency	Polk County, Floodplain Administration, NWS
Potential Funding Sources	NFIP, FEMA
Impact	Future Structures
Jurisdictions	Polk County, Seven Oaks, Corrigan, Livingston, Onalaska, Goodrich

6. Upgrade and expand implementation of natural hazard warning systems and methods. This may include but is not limited to: upgraded and modernized text-enabled warning systems, warning sirens and speakers, televised warnings, reverse 911, remote sensing devices with automated alerts.

Hazards Addressed	Flood, Hurricane, Tornado, Thunderstorm Wind, Wildfire, Winter Storm, Lightning, Drought, Earthquake, Hail, Extreme Heat
Estimated Cost:	$2,000,000 – $3,000,000
Project timeline	2 years
Responsible Department	Polk County OEM, City Administration
Coordinating Agency	FEMA, TDEM
Potential Funding Sources	HMGP, PDM, CDBG
Jurisdictions	Polk County, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

7. Wildfire fuel reduction projects.

Hazards Addressed	Wildfire
Estimated Cost:	$250,000 – $300,000
Project timeline	1 month
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Texas A&M Forest Service
Potential Funding Sources	HMGP, PDM, CDBG, budget
Jurisdictions	Polk County, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

Specific locations:
Polk County – Wooded areas surrounding hospital, nursing homes, and subdivisions in WUI.
Corrigan – Wooded area adjacent to High school

Goodrich, Onalaska, Seven Oaks – WUI around city limits

Livingston – Wooded area adjacent to Intermediate school and ISD Admin building and WUI between MLK Drive and HWY 190

8. Secure furniture to walls in city and county buildings.

Hazards Addressed	Earthquake
Estimated Cost:	5,000 per jurisdiction
Project timeline	1 month
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners
Potential Funding Sources	HMGP, PDM, CDBG, budget
Jurisdictions	Polk Co, Corrigan, Goodrich

9. Adopt building code requirements for county/city buildings to ensure all future construction will withstand a 4.2 earthquake.

Hazards Addressed	Earthquake
Estimated Cost:	5,000 per jurisdiction
Project timeline	1 month
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners, Tenant Dept.
Potential Funding Sources	HMGP, PDM, CDBG, budget
Jurisdictions	Polk Co, Corrigan, Goodrich

10. Establish cooling centers in public facilities.

Hazards Addressed	Extreme heat
Estimated Cost:	$10,000
Project timeline	6 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners, Tenant Dept.
Potential Funding Sources	HMGP, PDM, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

11. Adopt city policy and replace city/county landscaping with drought resistant plants.

Hazards Addressed	Drought
Estimated Cost:	$50,000-60,000
Project timeline	24 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners
Potential Funding Sources	HMGP, PDM, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

12. Educate the public in water saving techniques.

Hazards Addressed	Drought
Estimated Cost:	$5,000
Project timeline	24 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	City Council/County commissioners, Public Info Dept.
Potential Funding Sources	HMGP, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

13. Remove limbs from trees that overhang power lines.

Hazards Addressed	Winter Storm
Estimated Cost:	$50,000-60,000
Project timeline	24 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners, Tenant Dept.
Potential Funding Sources	HMGP, PDM, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

14. Install generators for all City/County critical facilities.

Hazards Addressed	Winter Storm
Estimated Cost:	$500,000
Project timeline	72 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners, Tenant Dept.
Potential Funding Sources	HMGP, CDBG, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

15. Install lightning warning systems for outdoor venues. Specific locations listed below.

Hazards Addressed	Lightning
Estimated Cost:	$150,000 – $200,000
Project timeline	2 months
Responsible Department	City Administrator/Polk County OEM
Coordinating Agency	Public Works, City Council/County commissioners
Potential Funding Sources	HMGP, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

Specific coverage:

Polk County – Escapees Club & State Park

Onalaska – RV resorts

Seven Oaks – Town center

16. Install lightning rods and grounding systems. Specific locations listed below.

Hazards Addressed	Lightning
Estimated Cost:	$50,000 – $60,000 per facility
Project timeline	6 months
Responsible Department	City Administrator, County EMC
Coordinating Agency	Public Works, City Council, User Department
Potential Funding Sources	HMGP, PDM, budget
Jurisdictions	Polk Co, Corrigan, Goodrich, Livingston, Onalaska, Seven Oaks

Specific facilities:

Polk County – Sheriff's office and Courthouse

Corrigan – Police station commo tower, water treatment plant and water tower

Goodrich – Fire dispatch tower, water tower, pumps at treatment plant

Livingston – Police/fire dispatch antenna,

Onalaska – Fire dispatch antenna and commo equipment

Seven Oaks – City hall

4.4 JURISDICTION SPECIFIC ACTIONS

Corrigan

17. Create wildfire defensible space around HUD housing complex.

Hazards Addressed	Wildfire
Estimated Cost:	$150,000 – $200,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Texas A&M Forest Service, Public Works, City Council, Housing Authority
Potential Funding Sources	HMGP, PDM, CDBG, budget

18. Increase capacity of drainage canal behind high school baseball field to prevent flooding school property.

Hazards Addressed	Flood
Estimated Cost:	$500,000 – $600,000
Project timeline	1 month
Responsible Department	ISD
Coordinating Agency	Public Works, City Council, City Administrator, land owner
Potential Funding Sources	HMGP, PDM, FMA, CDBG, budget

19. Install culvert on MLK south of Hulett street to prevent repeat of road washout.

Hazards Addressed	Flood
Estimated Cost:	$350,000 – $400,000
Project timeline	1 month
Responsible Department	Public Works
Coordinating Agency	City Administrator, City Council
Potential Funding Sources	HMGP, PDM, FMA, CDBG, budget

20. Enlarge culvert on MLK at Buckshot Ave.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Public Works
Coordinating Agency	City Administrator, City Council
Potential Funding Sources	HMGP, PDM, FMA, CDBG, budget

21. Adopt building code with more stringent requirements for wind resistant building techniques.

Hazards Addressed	Tornado, Hurricane, T-storm Wind
Estimated Cost:	$5,000
Project timeline	6 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

Polk County

22. Conduct road elevation and drainage improvements.

Hazards Addressed	Flood
Priority ranking	2
Estimated Cost:	$500,000 – $600,000
Project timeline	18 months
Responsible Department	Polk County OEM
Coordinating Agency	County Commissioners
Potential Funding Sources	HMGP, PDM, FMA, CDBG, budget

Specific drainage project locations:

- Increase flow capacity under CR 352 at Dry Creek and at McManus Creek on both sides of Rielly Village by increasing the span or elevate the bridge.
- Increase flow of West Tempe Creek under 2457 or elevate the bridge.
- Install culvert under Nelson road.
- Increase water flow of Turkey Creek under the bridges at Plantation Drive, Mill Gate Road and Tom Cummings Road.
- Install larger culvert where Johnsons Mill Creek runs under Johnson Branch Road.
- Increase flow of Menard Creek under Holly Grove Road.
- Drainage project to prevent Tempe Creek from flooding Tempe Timbers and Piney Path south of MF 350 S.
- Drainage project from Long King Creek to FM 350 North and east of W Church Street.
- Increase flow of Plum Creek under FM 350 North.
- Drainage project to prevent overtopping of bridge at FM 942 and FM 62.
- Increase flow of Big Sandy Creek under FM 942 East.
- Increase flow of Kimball Creek under County Line Road and Little Kimball Creek under County Line Road and Dillon Road.
- Drainage project to prevent Long King Creek from flooding FM 1988 near G Star Church Rd.
- Drainage project to prevent flooding under 59 South where RR tracks go under 59.
- Increase flow of Dry Creek under Stryker road.

23. Educate the public in methods to harden their property against fire**.**

Hazards Addressed	Wildfire
Estimated Cost:	$5000
Project timeline	36 months
Responsible Department	Polk County OEM
Coordinating Agency	Texas A&M Forest Service, Local VFD
Potential Funding Sources	HMGP, budget

24. Create defensible space around the hospital, the nursing homes and subdivision homes.

Hazards Addressed	Wildfire
Estimated Cost:	$500,000--$600,000
Project timeline	36 months
Responsible Department	Polk County OEM
Coordinating Agency	Texas A&M Forest Service, Local VFD
Potential Funding Sources	HMGP, CDBG, budget

25. Enlarge culvert under Route 66 past Taylor Lake Estates.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Precinct 1
Coordinating Agency	County Commissioner
Potential Funding Sources	HMGP, PDM, FMA, CDBG, budget

26. Acquire property on River Road in Holiday Lake Estates that consistently flood or are threatened by Trinity River bank erosion.

Hazards Addressed	River bank erosion
Estimated Cost:	$250,000
Project timeline	1 month
Responsible Department	Polk County OEM
Coordinating Agency	County Commissioners Court
Potential Funding Sources	HMGP, FMA, budget

27. Restore areas that have been washed away and stabilize riverbank in Taylor Lake Estates subdivision.

Hazards Addressed	River bank erosion
Estimated Cost:	$500,000 – $750,000
Project timeline	1 month
Responsible Department	Polk County OEM
Coordinating Agency	County Commissioner #1, County Commissioners Court
Potential Funding Sources	HMGP, FMA, budget, EWP grant funding

28. Educate the public about lightning warning applications for smart phones.

Hazards Addressed	Lightning
Estimated Cost:	$5,000
Project timeline	60 months
Responsible Department	Polk County OEM
Coordinating Agency	Polk County OEM
Potential Funding Sources (Federal & Local Share)	HMGP, FMA, budget

29. Replace Precinct 1 office and shop windows and doors to withstand higher strength winds.

Hazards Addressed	Tornado
Estimated Cost:	$50,000 – $60,000
Project timeline	6 months
Responsible Department	Precinct 1
Coordinating Agency	County Commissioner, Polk County OEM
Potential Funding Sources (Federal & Local Share)	HMGP, PDM, budget

30. Install roof tie down straps on Precinct 4 barn and outbuildings.

Hazards Addressed	Tornado, T-Storm Wind, Hurricane
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month

Responsible Department	Precinct 4
Coordinating Agency	County Commissioners, Polk County OEM
Potential Funding Sources (Federal & Local Share)	HMGP, PDM, budget

31. Retrofit Precinct 3 wood frame office and outbuildings to withstand higher strength wind.

Hazards Addressed	Tornado, T-Storm Wind, Hurricane
Estimated Cost:	$500,000 – $600,000
Project timeline	1 month
Responsible Department	Precinct 3
Coordinating Agency	County Commissioners, Polk County OEM
Potential Funding Sources (Federal & Local Share)	HMGP, PDM, budget

32. Replace windows in courthouse with glass that will withstand hurricane force winds.

Hazards Addressed	Tornado, T-Storm Wind, Hurricane
Estimated Cost:	$150,000 – $160,000
Project timeline	1 month
Responsible Department	Polk County OEM
Coordinating Agency	County Commissioners, County Maintenance Dept.
Potential Funding Sources (Federal & Local Share)	HMGP, PDM, budget

33. Install roof tiedown straps on tax office to withstand hurricane force winds.

Hazards Addressed	Tornado, T-Storm Wind, Hurricane
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Polk County OEM
Coordinating Agency	County Commissioners, County Maintenance Dept.
Potential Funding Sources (Federal & Local Share)	HMGP, PDM, budget

Goodrich

34. Defensible space projects around water tower.

Hazards Addressed	Wildfire
Estimated Cost:	$50,000 – $60,000
Project timeline	2 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

35. Install multiple culverts under Pennington Road.

Hazards Addressed	Flood
Estimated Cost:	$250,000 – $300,000
Project timeline	12 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, FMA, budget

36. Enlarge culvert on Sam Loggins Road.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

37. Elevate bridge on Old 35 S over Sampson Creek.

Hazards Addressed	Flood
Estimated Cost:	$400,000
Project timeline	6 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

38. Update and adopt building code with more stringent requirements for wind resistant building techniques.

Hazards Addressed	Tornado, T-Storm Wind, Hurricane
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

Onalaska

39. Acquire property at 395 Shawnee to prevent future flooding.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

40. Enlarge culvert and elevate roadbed on Hickory Hollow at Impala Drive.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

41. Defensible space project around timber plantation south of Onalaska Loop.

Hazards Addressed	Wildfire
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Texas A&M Forest Service, Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

42. Educate the public to mitigate wind damage to mobile homes.

Hazards Addressed	Tornado, Thunderstorm Winds, Hurricane
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Texas A&M Forest Service, Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

43. Provide generators and/or fans to citizens with medical needs that require electricity or cooling equipment.

Hazards Addressed	Extreme Heat
Estimated Cost:	$150,000 – $160,000
Project timeline	1 month
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	budget

Seven Oaks

44. Public education on wildfire defensible space.

Hazards Addressed	Wildfire
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Mayor
Coordinating Agency	Texas A&M Forest Service, Public Works, City Council,
Potential Funding Sources	HMGP, PDM, budget

45. Install multiple new culverts under Camp Road, Pickens Loop, and Franklin Road.

Hazards Addressed	Flood
Estimated Cost:	$300,000 – $400,000
Project timeline	18 months
Responsible Department	Mayor
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

46. Construct drainage ditched along city streets Camp Road, Pickens Loop, Franklin Road, Austin Street, and Hunt Street.

Hazards Addressed	Flood
Estimated Cost:	$500,000 – $600,000
Project timeline	24 months
Responsible Department	Mayor
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

47. Update and adopt building code with more stringent requirements for wind resistant building techniques.

Hazards Addressed	Tornado
Priority ranking	3
Estimated Cost:	$5,000
Project timeline	18 months
Responsible Department	Mayor
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

Livingston

48. Education program aimed at teaching citizens, public agencies, private property owners and business owners how to mitigate wildfire risk to their property.

Hazards Addressed	Wildfire
Estimated Cost:	$5,000
Project timeline	60 months
Responsible Department	City Administrator
Coordinating Agency	Texas A&M Forest Service, City Council, Public Information office
Potential Funding Sources	HMGP, budget

49. Defensible space projects around neighborhoods west of Livingston off 190.

Hazards Addressed	Wildfire
Estimated Cost:	$250,000 – $300,000
Project timeline	10 months
Responsible Department	City Administrator
Coordinating Agency	Texas A&M Forest Service, Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

50. Continuation of drainage plans and projects.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Public Works
Coordinating Agency	City Administrator, City Council, Public Information office
Potential Funding Sources	HMGP, PDM, FMA

51. Establish an educational program to teach citizens how to mitigate flood damage to their property.

Hazards Addressed	Flood
Estimated Cost:	$50,000 – $60,000
Project timeline	1 month
Responsible Department	Public Works
Coordinating Agency	City Administrator, City Council, Public Information office
Potential Funding Sources	HMGP, FMA

52. Educate the public on the risks of lightning and how they can mitigate damage/injury to themselves and their property.

Hazards Addressed	Lightning
Estimated Cost:	$50,000 – $60,000
Project timeline	60 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council, Public Information Office
Potential Funding Sources	HMGP, budget

53. Educate the public on actions they can take to mitigate tornado damage to their private property.

Hazards Addressed	Tornado
Estimated Cost:	$5,000
Project timeline	6 months
Responsible Department	City Administrator
Coordinating Agency	City Council, Public Information Office
Potential Funding Sources	HMGP, budget

54. Construct safe rooms in public buildings.

Hazards Addressed	Tornado
Estimated Cost:	$5,000,000
Project timeline	12 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

55. Install windows and doors in city buildings that will withstand hurricane force winds.

Hazards Addressed	Hurricane
Estimated Cost:	$250,000 – $300,000
Project timeline	12 months
Responsible Department	Public Works
Coordinating Agency	City Administrator, City Council
Potential Funding Sources	HMGP, PDM, budget

56. Stabilize slopes susceptible to erosion by planting vegetation and bank stabilization, sloping or grading techniques, terracing hillsides, or installing riprap boulders or geotextile fabric.

Hazards Addressed	Streambed erosion
Estimated Cost:	$250,000 – $300,000
Project timeline	18 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council
Potential Funding Sources	HMGP, PDM, budget

57. Educate the public on techniques to mitigate streambed erosion on privately owned property.

Hazards Addressed	Streambed erosion
Estimated Cost:	$5,000
Project timeline	12 months
Responsible Department	City Administrator
Coordinating Agency	Public Works, City Council, Public Information Office
Potential Funding Sources	HMGP, budget

4.5 NATIONAL FLOOD INSURANCE PROGRAM PARTICIPATION

CFR 44 Requirement: §201.6(c) (3) (ii):
[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Community Participation in the National Flood Insurance Program

Nearly 20,000 communities across the United States participate in the National Flood Insurance Program (NFIP) by adopting and enforcing floodplain management ordinances to reduce future floodplain damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, residents and business owners in these communities. The following includes a list of NFIP participating communities in Polk County. Each of these jurisdictions are committed to continued participation in the NFIP, and each has developed an action item supporting continued participation that is included in Chapter 4 (Mitigation Strategy) in their respective action item sections. Table 4-3 identifies the NFIP participation status for Polk County and municipalities.

Table 4-3 Community NFIP Participation Status

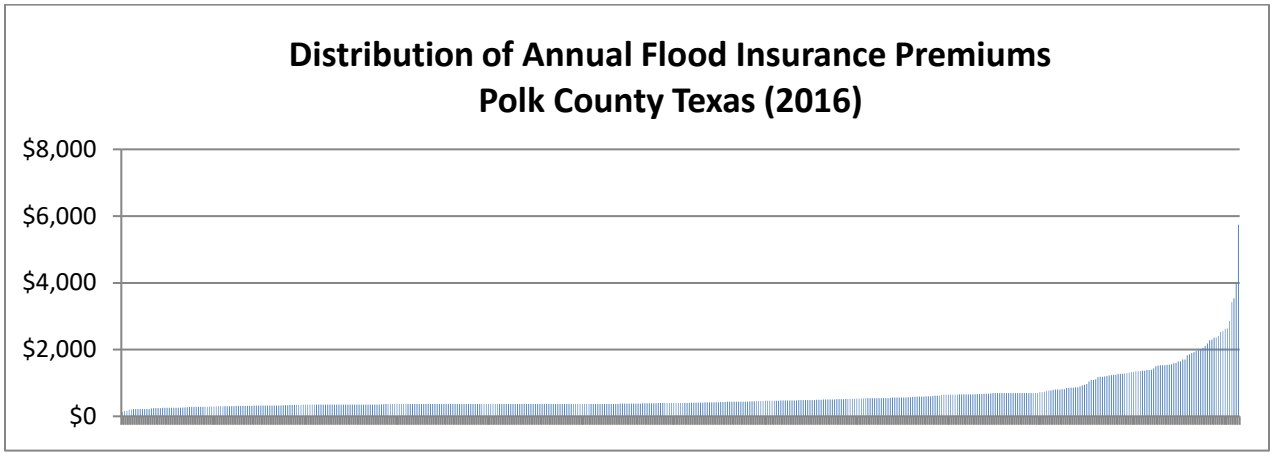
Community	Initial FIRM	Current Effective Map Date	Status
Polk County	07/01/98	09/29/10	Participating
City of Corrigan	5-24-1974	9-3-2010(M)	Participating
City of Goodrich	11-19-1976	12-3-2010	Participating
City of Livingston	3-1-1974	9-3-2010(M)	Participating
City of Onalaska	11-26-1976	9-3-2010(M)	Participating
City of Seven Oaks	9-3-2010(M)	9-3-2010	Sanctioned

Source: FEMA National Flood Insurance Program as of 8/18/2017, FEMA Community Status Report Book
Note: "M" on Current Effective Map Date refers to No Base Flood Elevations determined on Flood Insurance Rate Maps (FIRMs). Only Zones A, C, and X identified. Seven Oaks does not currently participate in the NFIP due to FEMA sanction September 3, 2011.

The HMT considers continued participation in the NFIP as integral to future flood mitigation efforts. Each of the participating jurisdictions is committed to involvement in the National Flood Insurance Program (NFIP). In addition to other benefits of participation, this allows for the availability of flood insurance policies for residents who are either required to maintain flood insurance by the mortgage lender, or those who choose to carry flood insurance voluntarily. Projects implemented during the previous planning cycle that support NFIP participation include: Flood-prone property acquisition and construction of storm water detention ponds.

Floodplain administration for Polk County is handled by the Office of Permits and Floodplain Development. This office also has a standing agreement to handle floodplain permitting for the cities of Corrigan and Seven Oaks. The cities of Livingston and Onalaska have dedicated floodplain and building permit officials who handle floodplain development for those municipalities. Floodplain development and administration for the City of Goodrich is handled by the City Secretary at City Hall.

As of Dec 31, 2016, there were 501 NFIP flood insurance policies in effect in Polk County. Total premiums for these policies was $312,917 in 2016. Lowest annual premium was $130, the highest $5,743, average $624, and median premium was $398 per year or $33 per month. Chart below shows the distribution of annual premiums. The vast majority are below $1,000 per year.



Source: NFIP Policy Summary, Polk County (2016)

APPENDICES

APPENDIX A. ADOPTION DOCUMENTS

The following are adoption resolutions for each participating jurisdiction.

Polk County, Texas

A COURT ORDER ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION ACTION PLAN

STATE OF TEXAS §

COUNTY OF POLK §

WHEREAS, Polk County has developed a Hazard Mitigation Action Plan to serve as a guiding document for local officials, Emergency Management, and the general public.

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan will be utilized by elected officials, county staff, and community members to ensure continuity of future mitigation programs and policies.

NOW, THEREFORE BE IT ORDAINED by the Commissioners' Court of Polk County, Texas that the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan is hereby adopted.

PASSED AND APPROVED by the Commissioners' Court of Polk County, Texas on this 21st day of December, 2018.

The Honorable Sydney Murphy
County Judge

Robert "Bob" Willis
Commissioner Pct. 1

Ronnie Vincent
Commissioner Pct. 2

Milton Purvis
Commissioner Pct. 3

Charles "Tommy" Overstreet
Commissioner Pct. 4

ATTEST:

I, Schelana Walker, County Clerk of Polk County, Texas do herby certify that the foregoing Order was duly passed and adopted by the Commissioners' Court of Polk County, Texas, at a regular meeting thereof assembled on December 21, 2018.

Schelana Hock, County Clerk
Polk County, Texas

COUNCIL RESOLUTION ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION ACTION PLAN

STATE OF TEXAS §

CITY OF CORRIGAN §

WHEREAS, the City of Corrigan, working in concert with Polk County and other local municipalities, has developed the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan to serve as a guiding document for local officials.

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan will be utilized by elected officials, city staff, and community members to ensure continuity of future mitigation programs and policies.

NOW, THEREFORE BE IT ORDAINED by the City Council of Corrigan, Texas that the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan is hereby adopted.

PASSED AND APPROVED on this 18th day of December, 2018

Mayor Johnna Lowe Gibson

ATTEST:

Paloma Carbajal, City Secretary
Corrigan, Texas

29

COUNCIL RESOLUTION ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION ACTION PLAN

STATE OF TEXAS §

CITY OF GOODRICH §

WHEREAS, the City of Goodrich, working in concert with Polk County and other local municipalities, has developed the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan to serve as a guiding document for local officials.

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan will be utilized by elected officials, city staff, and community members to ensure continuity of future mitigation programs and policies.

NOW, THEREFORE BE IT ORDAINED by the City Council of Goodrich, Texas that the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan is hereby adopted.

PASSED AND APPROVED on this 18th day of January 2019

Mayor Kelly Nelson

ATTEST:

Sally Yingling, City Clerk
Goodrich, Texas

RESOLUTION NO. 565

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LIVINGSTON, TEXAS, ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION PLAN

WHEREAS, the City of Livingston, Texas working in concert with Polk County and other local municipalities, has developed the Polk County Multi-Jurisdiction Hazard Mitigation Plan to serve as a guiding document for local officials; and

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Plan will be utilized by elected officials, city staff, and community members to ensure continuity of future mitigation programs and policies; and

WHEREAS, the City Council of the City of Livingston, Texas has reviewed the Polk County Multi-Jurisdiction Hazard Mitigation Plan and affirms that the plan will be reviewed and revised as appropriate;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LIVINGSTON, TEXAS, that the City of Livingston, Texas hereby officially adopts the Polk County Multi-Jurisdiction Hazard Mitigation Plan.

RESOLVED AND ADOPTED this the 8th day of January, 2019.

SIGNED:

Judy B. Cochran, Mayor

ATTEST:

Ellie Monteaux, TRMC, CMC
City Secretary/Assistant City Manager

STATE OF TEXAS §
§ **CERTIFICATE TO COPY OF PUBLIC RECORD**
COUNTY OF POLK §

I hereby certify, in the performance of the functions of my office, that the instrument to which this statement is appended, consisting of one (1) page, is a full, true and correct copy of Resolution No. 565, as the same appears of record in my office and that said document is an official record from the public office of the City Secretary of the City of Livingston, Polk County, State of Texas, and is kept in said office. I further certify that I am the City Secretary/Assistant City Manager of the City of Livingston, Texas, that I am a lawful possessor and keeper, and that I have legal custody of the records in said office.

In witness whereof I have hereunto set my hand and affixed the official seal of said office, this 9th day of January, 2019.

ELLIE MONTEAUX, TRMC, CMC
City Secretary/Assistant City Manager
City of Livingston, Polk County, Texas

City of Onalaska

P.O. Box 880 • Onalaska, Texas 77360

RESOLUTION 19-001

COUNCIL RESOLUTION ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION ACTION PLAN

STATE OF TEXAS §

CITY OF ONALASKA §

WHEREAS, the City of Onalaska, working in concert with Polk County and other local municipalities, has developed the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan to serve as a guiding document for local officials.

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan will be utilized by elected officials, city staff, and community members to ensure continuity of future mitigation programs and policies.

NOW, THEREFORE BE IT ORDAINED by the City Council of Onalaska, Texas that the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan is hereby adopted.

PASSED AND APPROVED on this 8th day of January, 2019.

B. Milton "Chip" Choate

Chip Choate, Mayor
City of Onalaska, Texas

ATTEST:

Angela Stutts, City Administrator/City Secretary
City of Onalaska, Texas

COUNCIL RESOLUTION ADOPTING THE POLK COUNTY MULTI-JURISDICTION HAZARD MITIGATION ACTION PLAN

STATE OF TEXAS §

CITY OF SEVEN OAKS

WHEREAS, the City of Seven Oaks, working in concert with Polk County and other local municipalities, has developed the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan to serve as a guiding document for local officials.

WHEREAS, the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan will be utilized by elected officials, city staff, and community members to ensure continuity of future mitigation programs and policies.

NOW, THEREFORE BE IT ORDAINED by the City Council of Seven Oaks, Texas that the Polk County Multi-Jurisdiction Hazard Mitigation Action Plan is hereby adopted.

PASSED AND APPROVED on this 8 th day of ~~December, 2018~~ January 2019.

Mayor: Centa Evans

ATTEST:

Gloria English, City Clerk
Seven Oaks, Texas

City Council Members:

Pro Tim: Dina Dickerson

Council Members:
Elain Hardy

Christine Hansen

CO Darrell Evans

APPENDIX B: STATE OF TEXAS STRATEGY GUIDELINES FOR HMGP PROJECTS

The following information is excerpted from Appendix 1 of Annex A of the State of Texas Hazard Mitigation Administrative Plan (2005). It includes a listing of State of Texas priorities for the funding of mitigation projects under the FEMA Hazard Mitigation Grant Program.

I. Priority I is Acquisition Projects: The highest priority mitigation project will be the voluntary evacuation/removal of people/structures from flood prone areas, with a resulting permanent land use change that includes a significant enhancement to the natural resource values and low-impact recreational opportunities for the public.

A. Acquisition funding may be given for those properties in flood-prone areas, along the following priority order guidelines:

1. Structures in the floodway
2. Structures in the floodplain with > 50% damage.
3. Structures with repetitive losses in the past ten years.
4. Structures in the floodplain with < 50% damage.
5. Other structures in the floodplain with > 50% damage.
6. Other structures in the floodplain with < 50% damage
7. Vacant lots in the floodway.
8. Vacant lots in the floodplain.

B. Additional priority ratings are applied to the structures in categories 1 through 7, section A, as follows:

1. Structure priority will be as follows:
   (a) Primary residences;
   (b) Secondary residences/rentals;
   (c) Non residential property.

2. Properties will be ranked for purchase, lowest to highest in cost.

3. In determining priorities for vacant lots, contiguity to structures acquired will be a contributing factor.

C. In acquisition projects, the State will not normally approve Non-URA (Uniform Relocation Assistance) payments to property owners seeking buy-outs.

D. Properties NOT INCLUDED IN THE ORIGINAL APPLICATION, OR SUBSTITUTED DURING THE ORIGINAL APPLICATION PERIOD, MAY NEVER be used as substitutions during an acquisition project's performance period.

II. Priority II is Residential Relocation projects: Projects will be prioritized according to Benefit Cost Analysis (BCA) scores, beginning with the highest BCA. Projects below the 1 to 1 Benefit Cost ratio are normally not considered.

III. Priority III is Elevation projects: Projects will be prioritized according to Benefit Cost Analysis (BCA) scores, beginning with the highest BCA. Projects below the 1 to 1 Benefit Cost ratio are normally not considered.

IV. Priority IV is Retrofitting (including safe rooms): Projects will be prioritized according to Benefit Cost Analysis (BCA) scores, beginning with the highest BCA. Projects below the 1 to 1 Benefit Cost ratio are normally not considered.

V. Priority V is Structural: Projects will be prioritized according to Benefit Cost Analysis (BCA) scores, beginning with the highest BCA. Projects below the 1 to 1 Benefit Cost ratio are normally not considered.

VI. Priority VI is Warning and Public Information: These projects are usually submitted as *initiative projects*, and as such do not have to achieve the normally required 1 to 1 Benefit-Cost ratio. A maximum of 5% (10% in the case of declared tornado disasters) of the available HMGP funds may go toward initiative type projects.

VII. Priority VII is Mitigation Action Plans (MAPs):
Congress has established than no more than 7% of the available HMGP funds, may go toward eligible planning grants that meet the State/FEMA criteria.

(Note: The final 25% of funding for all planning grants will be withheld by the State pending final plan approval within the project's performance period by FEMA.)

VIII. Priority VIII is Equipment: Items such as communication equipment, which do little to reduce damages in the next disaster, will normally not achieve an acceptable B/C, and are therefore requested under the 5% initiative category.
(Note: Emergency generators are no longer eligible as independent projects, nor may they be purchased under the initiative category. However, emergency generators may be included as an element in, or a part of, another eligible stand-alone mitigation project.)

APPENDIX C. PREVIOUS ACTION ITEM STATUS REPORT

The following is a status report for implementation progress regarding action items from previous version of plan.

Action Item	Complete or in Progress	Have not got to it yet	Keep	Discard	Comments
ST-WF #1	X	X	X		Part is obsolete Part will keep
ST-WF #2	X				
ST-WF #3				X	Add to CWPP
ST-WF #5				X	Add to CWPP
ST-WF #6	X				
LT-WF #1	X				
LT-WF #2		X	X		
LT-WF #3				X	Add to CWPP
LT-WF #4		X	X		
ST-FL #1			X		
ST-FL #2	X				
ST-FL #3	X				
ST-FL #4		X	X		
ST-FL #6					
LT-FL #1		X	X		
LT-FL #2		X	X		
LT-FL #3		X	X		
LT-FL #4		X	X		
LT-FL #5		X	X		
LT-FL #6			X		Change to riverbank erosion
LT-FL #7			X		Warning system
LT-FL #8			X		Add specifics
LT-FL #9			X		Study needed
ST-TH #1	X				
ST-TH #2				X	Have debris plan and contract
LT-TH #1	X				
LT-TH #2				X	Not viable
LT-TH #3	X				
ST-T #1	X				
ST-T #2	X				
LT-T #1	X				
LT-T #2	X				
LT-T #3	X				
LT-T #4			X		
ST-H #1	X				
ST-H #2	X				
ST-H #3	X				
LT-H #1			X		

Action Item	Complete or in Progress	Have not got to it yet	Keep	Discard	Comments
LT-H #2			X		
LT-H #4			X		
ST-SWS #1			X		
ST-SWS #2			X		
LT-SWS #1			X		
LT-SWS #2	X				
ST-D #1			X		
ST-D #2			X		
LT-D #1			X		
LT-D #2			X		
LT-D #3			X		
LT-EH #1			X		
LT-EH #2			X		

ACTION ITEM DETAILS (PREVIOUS PLAN)

Wildfire Mitigation Action Items

The wildfire mitigation action items provide direction on specific activities that organizations and residents in Polk County can undertake to reduce risk and prevent loss from wildfire events. Each action item is followed by ideas for implementation, which can be used by the Mitigation Taskforce and local decision makers in pursuing strategies for implementation.

ST= Short Term
LT= Long Term
WF= Wildfire

ST-WF#1: Enhance emergency services to increase the efficiency of wildfire response and recovery activities.

Implementation:

Install more fire reporting stations for better access and coverage;

Estimated Cost: $30,500

Update*: The modern use of cell phones has eliminated necessity due to the fact that broadband signal is now available throughout the county.*

Develop a county call list that includes all at-risk urban/wildland interface residents in the Polk County jurisdiction in order to contact them during evacuations;

Estimated Cost: $10,000

Update*: The county telephone system cannot handle more than 70 calls at a time; therefore, the county relies on the EAS system, the National Weather Service, local media and law enforcement personnel to give evacuations notice in case of wildfire.*

Inventory bridges on evacuation routes, assess the bridges for their ability to support fire apparatus ingress, and encourage replacement of unstable bridges.

Estimated Cost: $5,500

Update*: The county has an ongoing bridge program, and most bridges have been identified and mapped on the county GIS System.*

Coordinating Organization: Polk County Office of Emergency Management, Livingston Volunteer Fire Departments, Onalaska Volunteer Fire Department, Corrigan Volunteer Fire Department, Goodrich Volunteer Fire Department, Volunteer Fire Departments in the unincorporated areas of Polk County, Seven Oaks City Council

Timeline: 2 years
Plan Goals Addressed: Emergency Services
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-WF#2: Educate agency personnel on federal cost-share and grant programs, Fire Protection Agreements, and other related federal programs so the full array of assistance available to local agencies is understood.

Implementation:

Investigate potential funding opportunities for individual mitigation projects; and
Develop, approve, and promote Fire Protection Agreements and partnerships to clarify roles and responsibilities and to provide for fire mitigation activities and suppression preparedness.
Estimated Cost: $8,000
Coordinating Organization: Polk County Office of Emergency Management, County Fire Marshal's Office, Livingston City Council, Onalaska City Council, Corrigan City Council, Goodrich City Council, Seven Oaks City Council
Timeline: 1-2 years
Plan Goals Addressed: Protect Life and Property, Public Awareness
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-WF#3: Explore and develop alternative firefighting water sources and encourage the development of additional sources.

Implementation:

Advocate for water storage facilities with fire-resistant electrical pump systems in developments outside of fire protection districts that are not connected to a community water or hydrant system;
Estimated Cost: $25,000
Develop a protocol for fire jurisdictions and water districts to communicate all hydrant outages and water shortage information.
Estimated Cost: $9,500
Install additional dry fire hydrants
Estimated Cost: $87,500

Coordinating Organization: Polk County Office of Emergency Management, County Fire Marshal's Office, City of Livingston Fire Marshal's Office, City of Livingston Volunteer Fire Department, City of Onalaska Volunteer Fire Department, City of Goodrich Volunteer Fire Department, Seven Oaks City Council
Timeline: 1 year

Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

ST-WF#4: Install five fire hydrants in the city of seven oaks.
Implementation:
Install fire hydrants to provide adequate water sources to fight fires within the City of Seven Oaks.
Estimated Cost: $20,000
Coordinating Organization: Seven Oaks City Council
Timeline: 1 - 2 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Seven Oaks	1

ST-WF#5: Construct water reservoir at lake connie jean dam to allow fire trucks to draw water from dry hydrants
Implementation:
Lake Connie Jean Dam to once again provide a viable source of water for firefighters responding to Eagles Nest, Wild County Lake Estates, and Big Thicket Lake Estates Subdivisions and the surrounding areas
Install dry hydrants and electric pumps to fill fire trucks
Estimated Cost: $1,000,000
Coordinating Organization: Polk County Road & Bridge Precinct 1
Timeline: 2 years
Plan Goals Addressed: Public Safety
Possible Funding Sources: FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4

ST-WF#6: Construct road over lake connie jean dam to allow first response vehicles faster ingress and egress to wild country lake estates subdivision
Implementation:
Construct roadway over Lake Connie Jean Dam to provide ingress and egress for residents and emergency services
Estimated Cost: $500,000
Coordinating Organization: Polk County Road & Bridge Precinct 1
Timeline: 2 years
Plan Goals Addressed: Public Safety
Possible Funding Sources: FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2

ST-WF#7: Construct fire breaks and buffer zones in the city limits
Implementation:

Implement city-wide vegetation management and tree trimming and removal program to construct fire breaks to reduce the loss of property and facilitate emergency response.
Estimated Cost: $75,000

Coordinating Organization: Onalaska City Council, Onalaska City Engineer, Onalaska Volunteer Fire Department
Timeline: 1-2 years
Plan Goals Addressed: Protection of life and property
Possible Funding Sources: Operating Budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Onalaska	1

LT-WF#1: Develop maps relating to the fire hazard to educate and assist builders and homeowners in wildfire mitigation activities, and to guide emergency services during response.
Implementation:
Update wildland/urban interface maps using data derived from the Polk County satellite-mapping project
Conduct risk analysis incorporating data and the created hazard maps using GIS technology to identify risk sites and further assist in prioritizing mitigation activities
Estimated Cost: $10,500
Coordinating Organization: Polk County Geographic Information System, Polk County Office of Emergency Management Systems Department, City of Livingston Engineer, City of Onalaska Engineer, Goodrich City Council, Corrigan City Council, Seven Oaks City Council
Timeline: 1-3 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-WF#2: Improve outreach and implement education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to wildfire hazards.
Implementation:
Hire fire prevention and education personnel to oversee education programs
Visit urban interface neighborhoods and rural areas and conduct education and outreach activities
Estimated Cost: $5,500
Conduct specific community-based demonstration projects of fire prevention and mitigation in the urban interface;
Establish neighborhood “drive-through” activities that pinpoint site-specific mitigation activities. Fire crews can give property owners personal suggestions and assistance; and
Perform public outreach and information activities at Polk County fire stations by creating “Wildfire Awareness Week” activities. Fire stations can hold open houses and allow the public to visit, see the equipment, and discuss wildfire mitigation with the station crews.
Estimated Cost: $5,000
Coordinating Organization: Polk County Office of Emergency Management, Polk County Fire Marshal’s Office, Livingston Volunteer Fire Department, Onalaska Volunteer Fire Department, Goodrich Volunteer Fire Department, Corrigan Volunteer Fire Department, Volunteer Fire Departments in the unincorporated areas of Polk County, Seven Oaks City Council

Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-WF#3: Increase communication, coordination, and collaboration between wildland/urban interface property owners, local and county planners, and fire prevention crews and officials to address risks, existing mitigation measures, State and federal assistance programs.
Implementation:
Educate the community on the need for fire plans and to practice evacuation routes;
Educate the community on the need for fire inspections in residential homes by fire departments to increase awareness among homeowners and potential fire responders;
Require fire department notification of new business applications to ensure that appropriate fire plans have been developed;
Work with local planning, landowners, and/or developers who choose to build in the wildland/urban interface to identify and mitigate conditions that aggravate wildland/urban interface wildfire hazards, including:
Limited access for emergency equipment due to width and grade of roadways;
Inadequate water supplies and the spacing, consistency, and species of vegetation around structures;
Inadequate fuel breaks, or lack of defensible space;
Highly flammable construction materials;
Building lots and subdivisions that are not in compliance with state and local land use and fire protection regulations
Inadequate entry/escape routes.
Implement a community-wide campaign promoting the benefit of installing fire resistant roofs and residential sprinkler systems in all new homes and major remodels involving roofs or additions that are located in the interface.
Work with the public to evaluate access routes to rural homes for fire-fighting vehicles and to develop passable routes if they do not exist.
Estimated Cost: $45,500 Projected cost for inspections, literature, and creation of awareness program.
Coordinating Organization: Polk County Office of Emergency Management, Polk County Fire Marshal's Office, Livingston Volunteer Fire Department, Onalaska Volunteer Fire Department, Goodrich Volunteer Fire Department, Corrigan Volunteer Fire Department, Volunteer Fire Departments in the unincorporated areas of Polk County, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness, Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

LT-WF#4: Implement wildfire mitigation activities in a manner consistent with the goals of promoting sustainable ecological management and community stability.

Implementation:

Employ mechanical thinning and prescribed burning to abate the risk of catastrophic fire and restore the more natural regime of high frequency, low-intensity burns. Prescribed burning can provide benefit to ecosystems by thinning hazardous vegetation and restoring ecological diversity to areas homogenized by invasive plants; and

Clear trimmings, trees, brush, and other debris completely from sites when performing routine maintenance and landscaping to reduce fire risk.

Estimated Cost: $3,500 working with home owners, farmers, ranchers and loggers.

Update cost to $500,000 for mechanical thinning and abatement.

Coordinating Organization: Office of Emergency Management, County Fire Marshal's Office, Livingston Volunteer Fire Department, Onalaska Volunteer Fire Department, Goodrich Volunteer Fire Department, Corrigan Volunteer Fire Department, Volunteer Fire Departments in the unincorporated areas of Polk County, Seven Oaks City Council

Timeline: Ongoing

Plan Goals Addressed: Natural Systems, Emergency Services

Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4
Livingston	4
Onalaska	4
Corrigan	4
Goodrich	4
Seven Oaks	4

LT-WF#5: Assist local volunteer fire department in the RECRUITMENT, training and proper equipping of firefighters

Implementation:

Apply for grant funding to provide training and proper equipping of firefighters.

Estimated Cost: $10,000

Coordinating Organization: City of Corrigan, Corrigan Volunteer Fire Department

Timeline: 1-3 Years

Plan Goals Addressed: Increase Emergency Response Capabilities & Firefighting Techniques

Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Corrigan	1

Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in Polk County can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation. *Action Items marked (NFIP) are to insure continual National Flood Insurance Program (NFIP) compliance.*

ST=Short Term
LT=Long Term
FL=Flood

The mitigation actions that have ***no comment and remain unchanged are ongoing***. Polk County has been impacted by two major hurricanes since 2005 and is currently facing exceptional drought conditions. Therefore, the county has had limited human assets and budgetary funding to complete these projects.

ST-FL#1: Analyze each repetitive flood property within Polk County and identify feasible mitigation options.

Implementation:
Identify appropriate and feasible mitigation activities for identified repetitive flood properties. Funding may be available through FEMA's Hazard Mitigation Grant and Flood Mitigation Assistance Programs and the Pre-disaster Mitigation Program;
Contact repetitive loss property owners to discuss mitigation opportunities, and determine interest should future project opportunities arise; and
Explore options for incentives to encourage property owners to engage in mitigation.
Update: HMGP buyout of all structures located at 1076 River Rd, Lot 2 in Holiday Lake Estates, Polk County, Texas, located on River Road in Goodrich. The buyout has been completed. The cost of this project was $109,500. This project took approximately 2 years to complete.
Estimated Cost: $15,500
Coordinating Organization: Polk County Certified Floodplain Manager, City of Livingston Emergency Management Coordinator, City of Goodrich Emergency Management Coordinator, City of Onalaska Emergency Management Coordinator, Corrigan City Council, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-FL#2: Revise requirements for development within the floodplain, where appropriate.
Implementation:
Evaluate elevation requirements for new residential and nonresidential structures in the unincorporated floodplain area; (NFIP)
Task Completed: No action taken. All areas in the county are Zone A, no benchmarks available
Estimated Cost: $5,500
Explore raising the base elevation requirement for new residential construction to two or three feet above base flood elevation, or greater. An increased elevation standard is one activity the county can engage in to receive credit from the NFIP Community Rating System Program;
Task Completed*: It was determined one-foot freeboard is sufficient*.
Estimated Cost: $5,000

Identify opportunities to upgrade Federal Insurance Rate Map, and arrange for Cooperative Technical Partnership mapping upgrades for select areas;
***Task Completed**: On September 3, 2010, Polk County adopted new floodplain maps as a result of map changes through FEMA's Flood Map Modernization Program. Prior to the new maps, the County's floodplain maps were dated back to 1991. The new maps indicate more accurate floodplain data for the County.*
Identify alternatives to reduce development in the floodplain.
***Task Completed**: As of July 2010, Polk County has a Certified Floodplain Manager ("CFM) to educate the public on floodplain issues and programs. The CFM also reviews tax foreclosure properties in the county and "flags" floodplain properties in order to warn advise potential buyers of the floodplain regulations.*
Coordinating Organization: Office of Emergency Management, Permit Department, and Floodplain Management
Timeline: 1-2 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-FL#3: Develop better flood warning systems.
Implementation:
Coordinate with appropriate organizations to evaluate the need for more stream gauges (NFIP)
***Task Completed**: Installed flood gauge at Long King Creek in Livingston. Additional gauges may be installed at a later date, as needed.*
Estimated Cost: $100,000
Distribute information regarding flooding to the general public efficiently (NFIP)
***Task Completed**: Flood awareness calendars and general floodplain information are placed in various county offices annually.*
Estimated Cost: $50,000
Coordinating Organization: Office of Emergency Management, County Sheriff Department
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Emergency Services
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

ST-FL#4: Replace bridge on Kate Lowe rd (NFIP).
Implementation: (Project no longer viable)
Replace bridge on Kate Lowe Rd to provide ingress and egress during floods;
Estimated Cost: $2,000,000
Coordinating Organization: Polk County Road & Bridge Precinct 1
Timeline: 2 - 5 years
Plan Goals Addressed: Protect Life and Property

Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-FL#5: Elevate camp road in city of seven oaks (NFIP).
Implementation:
Elevate road to prevent washing out and to provide ingress and egress during floods;
Estimated Cost: $400,000
Coordinating Organization: Seven Oaks City Council
Timeline: 1 - 2 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Seven Oaks	1

ST-FL#6: Construct concrete embankments to improve water passage along creeks that frequently flood.
Project no longer viable due to financial cost.
Implementation:
Build a concrete embankment along Long King Creek throughout the Livingston City limits to allow rapid removal of flood waters. (NFIP)
Estimated Cost: $8.5 Million
Coordinating Organization: City of Livingston
Timeline: 1-2 years
Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-FL#7: Identify and analyze structures that are within the floodplain that are below the base flood elevation.
Implementation:
Work with a certified surveyor in determining the elevation of the base floor for structures within the floodplain.
Estimated Cost: $50,000
Coordinating Organization: Onalaska City Council
Timeline: 1 Year
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Onalaska	1

LT-FL#1: Improve data and mapping for floodplain information within the county, and identify and map flood-prone areas outside of designated floodplains (NFIP).
***Note**: FEMA Map Modernization is completed and adopted with more accurate floodplain information.*
Implementation:
Apply for FEMA's cooperative technical partnership using the 2-foot contour interval floodplain mapping data acquired by Polk County GIS; and
Encourage the development of floodplain maps for all local streams not currently mapped on Flood Insurance Rate Maps or county maps, with special attention focused on mapping rural and unincorporated areas. The maps should show the expected frequency of flooding, the level of flooding, and the areas subject to inundation. The maps can be used for planning, risk analysis, and emergency management.
Task Not Complete: A detailed study of the floodplain has not been performed in Polk County, County is rated Zone A.
Estimated Cost: $ Unknown
Coordinating Organization: Polk County Geographic Information Systems, Polk County Office of Emergency Management
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1

LT-FL#2: Develop acquisition and management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain.
Implementation:
Develop a comprehensive strategy for acquiring and managing floodplain open space in Polk County; (NFIP)
Explore funding for property acquisition from federal (e.g., FEMA Hazard Mitigation Grant Program), state, regional, and local governments, as well as private and non-profit organizations, trails programs, fish programs as well as options for special appropriations;
Estimated Cost: Unknown (Mitigation match on the 404 Grant is 25%)
Task Not Completed: Ongoing project
Develop a regional partnership between flood mitigation, fish habitat, and water quality enhancement organizations/programs to improve educational programs; (NFIP)
Estimated Cost: $10,500
Task Not Complete: Ongoing project
Identify sites where environmental restoration work can benefit flood mitigation, fish habitat, and water quality; (NFIP)
Work with landowners to develop flood management practices that provide healthy fish habitat; and
Identify existing watershed education programs and determine which programs would support a flood education component.
Estimated Cost: $5,500
Task Not Complete: Ongoing project
Coordinating Organization: Polk County Geographic Information Systems, Polk County Office of Emergency Management, Polk County Environmental Officer, Livingston City Council, Onalaska City Council, Corrigan City Council, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Natural Systems, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Seven Oaks	2

LT-FL#3: Identify surface water drainage obstructions for all parts of unincorporated Polk County.
Implementation:
Map culverts in unincorporated areas of the county;
Estimated Cost: $18,000
Prepare an inventory of culverts that historically create flooding problems and target them for retrofitting; and (NFIP)
Estimated Cost: $10,000
Prepare an inventory of major drainage problems, and identify causes and potential mitigation actions for drainage problem areas. (NFIP)
Estimated Cost: $25,500
Tasks Not Complete: Ongoing Projects
Coordinating Organization Polk County Geographic Information Systems, Polk County Office of Emergency Management, Polk County Environmental Officer
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3

LT-FL#4: Establish a framework to compile and coordinate surface water management plans and data throughout the county.
Implementation:
Develop surface water management plans for areas that are not currently within surface water management plan boundaries.
Estimated Cost: $15,000
Task Not Complete
Coordinating Organization: Polk County Geographic Information Systems, Polk County Office of Emergency Management, Polk County Environmental Officer, Livingston City Council, Onalaska City Council, Corrigan City Council, Seven Oaks City Council, Goodrich City Council
Timeline: 3-5 years
Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4
Livingston	4
Onalaska	4
Corrigan	4
Goodrich	4
Seven Oaks	4

LT-FL#5: Establish base flood elevations in the County.
Implementation:
Research and Apply for grants to fund Lidar or elevation tools/programs for base flood elevations for the county: (NFIP)
Estimated Cost: $300,000

Develop detailed floodplain study for the county; (NFIP)
Estimated Cost: Unknown
Coordinating Organization: Polk County Geographic Information Systems, Polk County Office of Emergency Management, Polk County Environmental Officer
Timeline: 5 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3

LT-FL#6: Mitigate or buyout subdivisions with structures in the floodplain and structures on River Road that are threatened by Trinity River bank erosion.
Implementation:
Research Grants for subdivisions in the floodplain and structures that consistently flood and for structures threatened by Trinity River erosion; (NFIP)
Estimated Cost; $15,000
Buyout properties and relocate residents in the floodplain and River Road**.** (NFIP)
Estimated Cost: $3,000,000
Coordinating Organization Polk County Geographic Information Systems, Polk County Office of Emergency Management, Polk County Environmental Officer
Timeline: 3-5 years
Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4

LT-FL#7: Establish and purchase a flood warning system for Holiday Lakes Estates and Taylor Lakes Subdivisions
Implementation:
Develop and research the cost of implementing flood warning systems in floodplain subdivisions using gauges; (NFIP)
Estimated Cost: $15,000
Implement the flood warning gauges to alert residents in floodplain subdivisions; (NFIP)
Estimated Cost: $400,000
Coordinating Organization Polk County Geographic Information Systems, Polk Office of Emergency Management, Polk County Environmental Officer
Timeline: 3-5 years
Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4

LT-FL#8: Assess and improve high hazard dams in the county.
Implementation:
Assess and develop a plan to improve the high hazard dams in the county; (NFIP)
Estimated Cost: $15,000
Improve High hazardous dams in Polk County; (NFIP)
Estimated Cost: Unknown
Coordinating Organization Polk County Geographic Information Systems, Polk Office of Emergency Management, Polk County Environmental Officer
Timeline: 3-5 years

Plan Goals Addressed: Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4

LT-FL#9: Conduct a detailed study of zone a floodplain within the unincorporated areas of polk County toassess dam inundation and development within the floodplain.
Implementation:
Apply for grant to study hydrologic and hydraulic methods in the floodplain for a detailed analysis to develop base flood elevations.
Estimated Cost: $800,000
Coordinating Organization: Polk Office of Emergency Management, Polk County Certified Floodplain Manager, Polk County Geographic Information Systems, Corp of Engineers
Timeline: 3-5 years
Plan Goals Addressed: Determine Base Flood Elevation, Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1

Thunderstorm Mitigation Action Items

The windstorm mitigation action items provide direction on specific activities that organizations and residents in Polk County can undertake to reduce risk and prevent loss from windstorm events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

ST=Short Term
LT= Long Term
TH=Thunderstorm

ST-TH#1: Develop and implement Early Warning Systems County Wide
Task Completed*: Polk County has partnered with the EAS system and has been designated as a Storm Ready county. The Skywarn system is in place within the county. Polk County also utilizes the Upper Lake Livingston Wireless Association to serve as weather warn advisors to the county. Polk County Sheriff Department has 24-hous access to monitor the internet network, telephone and weather stations for early public warning.*
Implementation:
Partner with responsible agencies and organizations to design and develop an early warning system for residents along the Trinity River and Lake Livingston.
Estimated Cost: $75,000
Develop partnerships between utility providers and county and local public works agencies to document known hazard areas; and
Encourage and train Law Enforcement, Fire, EMS and civilian Skywarn spotters.
Estimated Cost: $2,500
Coordinating Organization: Polk County Office of Emergency Management, Polk County Sheriff's Dept, Local Police, Fire and EMS
Timeline: Ongoing
Plan Goals Addressed: Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-TH#2: Improve strategies for debris management for thunderstorm events.
Implementation:
Develop coordinated management strategies for clearing roads of fallen trees, and clearing debris from public and private property.
Estimated Cost: $5,000
Coordinating Organization: Polk County Road and Bridge 1, 2, 3 & 4, City of Livingston Public Works, City of Corrigan Public Works, City of Goodrich Public Works, City of Onalaska Public Works, Seven Oaks City Council
Timeline: 2 years
Plan Goals Addressed: Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-TH#3: Apply for grant funding to purchase generators to power critical facilities.
Implementation:
Apply for grant funds to purchase two generators and install them at the city water well site to power the well and distribution pumps.
Estimated Cost: $150,000
Coordinating Organization: Onalaska City Council
Timeline: 1-2 Years
Plan Goals Addressed: Provide continuing water utility service to city residents during extended power outages.
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Onalaska	1

ST-TH#4: Develop an electronic roadside warning system
Implementation:
Apply for grant funds to purchase electronic signs and install them along primary traffic routes.
Estimated Cost: $60,000
Coordinating Organization: Onalaska City Council
Timeline: 1 Year
Plan Goals Addressed: To provide warnings and instructions to public to protect life and property.
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Onalaska	1

LT-TH#1: Map and publicize locations around the county that have the highest incidence of tornados or extreme windstorms.
Task Completed*: Critical structure identification completed and areas mapped using the County GIS system.*
Implementation:
Identify a responsible agency for central collection and reporting of storm data. Data collected should include:
Windstorm data (sustained speeds, gusts, storm durations) for localities throughout the county;
Maps of the locations within the county, which are most vulnerable to high winds; and
Injury and property damage estimates, including locations.
Identify a responsible agency to collect and transfer data to the National Climate Data Center, FEMA, or other agencies concerned with the incidence of storms, to help establish and maintain baseline and historic records of storm events; and
Identify public infrastructure and facilities subject to damage or closure during Tornado events.
Estimated Cost: $17,000
Coordinating Organization: Polk County Geographic Systems, Polk County Office of Emergency Management
Timeline: 5 years

Plan Goals Addressed: Public Awareness, Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-TH#2: Encourage electrical utilities to use underground construction methods where possible to reduce power outages from thunderstorms.
Project no longer viable due to financial cost and soil types in the County. The soil is too moist and line maintenance would exceed cost of in air location.
Implementation:
Increase the use of underground utilities where possible.
Coordinating Organization: LEPC
Timeline: 5 years
Plan Goals Addressed: Natural Systems, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-TH#3: Increase public awareness of thunderstorm mitigation activities.
Task Completed*: Utilized verbal presentations and speaker engagements*
Implementation:
Collect information on public education materials for protecting life, property, and the environment from thunderstorms; and
Distribute educational materials to Polk County residents and public and private sector organizations regarding preparedness for no power situations.
Estimated Cost: $ 7,500
Coordinating Organization: LEPC, Polk County Office of Emergency Management
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

Tornado Mitigation Action Items

The windstorm mitigation action items provide direction on specific activities that organizations and action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

ST= Short Term
LT = Long Term
T= Tornado

The mitigation actions that have ***no comment and remain unchanged are ongoing***. Polk County has been impacted by two major hurricanes since 2005 and is currently facing exceptional drought conditions. Therefore, the county has had limited human assets and budgetary funding to complete these projects.

ST-T#1: Develop and implement Early Warning Systems County wide.

Action Item Completed*: Polk County has partnered with the EAS system and has been designated as a Storm Ready county. The SKYWARN system is in place within the county. Polk County also utilizes the Upper Lake Livingston Wireless Association to serve as weather warn advisors to the county. Polk County Sheriff Department has 24-hour access to monitor the internet network, telephone and weather stations for early public warning. Polk County has a phone, email, and text emergency alert system called "AlertMePolkCounty" powered by Blackboard Connect.*

Implementation:

Partner with responsible agencies and organizations to design and develop an early warning system for residents along the Trinity River and Lake Livingston.

Estimated Cost: $75,000

Develop partnerships between utility providers and county and local public works agencies to document known hazard areas; and

Encourage and train Law Enforcement, Fire, EMS and civilian SKYWARN spotters.

Estimated Cost: $2,500

Coordinating Organization: Polk County Office of Emergency Management, Polk County Sheriff's Department, Local Police, Fire and EMS

Timeline: Ongoing

Plan Goals Addressed: Emergency Services, Partnerships and Implementation

Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-T#2: Improve strategies for debris management for tornado events.

Action Item Completed*: Continual ongoing clearing of fallen trees and debris removal by cities' work crews and county Road and Bridge crews. Pre-disaster vendor contracts in place for debris removal. Polk County has identified debris collection sites that are pre-approved by TCEQ.*

Implementation:

Develop coordinated strategies for clearing roads of fallen trees, and clearing debris from public and private property.

Estimated Cost: $5,000

Coordinating Organization: Polk County Road and Bridge, Cities Public Works

Timeline: 2 years

Plan Goals Addressed: Emergency Services, Partnerships and Implementation

Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-T#3: Modernize and expand the emergency siren warning system.
Implementation:
Design and develop additional siren warning system locations
Construct additional sirens
Educate and inform public of siren warning system

Estimated Cost: $65,000
Coordinating Organization: Livingston City Council, City of Livingston Staff, Livingston Police Department, Livingston Volunteer Fire Department
Timeline: 2 years
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Livingston	1

ST-T#4: Modernize the emergency siren warning system
Implementation:
Apply for grants to design and install a modern siren warning system
Educate and inform public of siren warning system

Estimated Cost: $6,000
Coordinating Organization: Corrigan City Council
Timeline: 1 year
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Corrigan	1

ST-T#5: Apply to Fema for grant to fund the purchase and installation of a storm warning system
Implementation:
Explore funding and grant opportunities for the system
Install System

Estimated Cost: $50,000
Coordinating Organization: Goodrich City Council, City of Goodrich Staff
Timeline: 1-3 year
Plan Goals Addressed: Public Awareness, Protect Life
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Goodrich	1

LT-T#1: Map and publicize locations around the county that have the highest incidence of tornados or extreme windstorms.

***Action Item Completed**: Critical structure identification completed and areas mapped using the County GIS system.*

Implementation:
College data to include:
Windstorm data (sustained speeds, gusts, storm durations) for localities throughout the county;
Maps of the locations within the county, which are most vulnerable to high winds; and
Injury and property damage estimates, including locations.
Identify a responsible agency to collect and transfer data to the National Climate Data Center, FEMA, or other agencies concerned with the incidence of storms, to help establish and maintain baseline and historic records of storm events; and
Identify public infrastructure and facilities subject to damage or closure during Tornado events.
Estimated Cost: $ 17,000
Coordinating Organization: Polk County Geographic Systems, Polk County Office of Emergency Management
Timeline: 5 years
Plan Goals Addressed: Public Awareness, Protect Life and Property, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-T#2: Encourage electrical utilities to use underground construction methods where possible to reduce power outages from Tornados or severe windstorms.
***Action Item Completed**: Project no longer viable due to financial cost and soil types in County. The soil is too moist and line maintenance would exceed cost of in air locations.*
Implementation:
Increase the use of underground utilities where possible.
Coordinating Organization: Hazard Mitigation Taskforce
Timeline: 5 years
Plan Goals Addressed: Natural Systems, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-T#3: Increase public awareness of tornado mitigation activities.
***Action Item Completed**: Verbal public presentations and speakers used.*
Implementation:
Collect information on public education materials for protecting life, property, and the environment from tornado events; and
Distribute educational materials to Polk County residents and public and private sector organizations regarding preparedness for no power situations.

Estimated Cost: $7,500
Purchase weather radios for indigent individuals that reside in mobile homes and travel trailers.
Estimated Cost: $50,000
Coordinating Organization: LEPC, Polk County Office of Emergency Management
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

LT-T#4: Develop and enforce wind-resistant construction codes.
Implementation:
Petition the Texas Legislature to develop building codes for efficiency in protecting structures from tornados and severe wind damage.
Coordinating Organization: Polk County Commissioners Court, Polk County Office of Emergency Management, Livingston City Council, Onalaska City Council, Corrigan City Council, Goodrich City Council, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4
Livingston	4
Onalaska	4
Corrigan	4
Goodrich	4
Seven Oaks	4

LT-T#5: Distribute emergency preparedness information related to tornados to the public
Implementation:
Partner with emergency response agencies to design and develop information for distribution to promote public awareness among citizens.
Coordinating Organization: Corrigan City Council, City of Corrigan Staff, Corrigan Volunteer Fire Department, Volunteers
Timeline: 1-2 Years
Plan Goals Addressed: Public education to protect life and property from tornado events
Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Corrigan	1

Hurricane Mitigation Action Items

ST=Short Term
LT= Long Term
H= Hurricane

ST-H#1: Develop and implement Early Warning Systems County-wide.
Task Completed: *Polk County has partnered with the EAS system and has been designated as a Storm Ready county. The SKYWARN system within the county is in place. Polk County also utilizes the Upper Lake Livingston Wireless Association to serve as weather warn advisors to the county. The Polk County Sheriff Department also has 24-hour access to the internet network, telephone and weather stations for early public weather warnings. Polk County has a phone, email, and text emergency alert system called "AlertMePolkCounty" powered by Blackboard Connect.*
Implementation:
Partner with responsible agencies and organizations to design and develop an early warning system for residents along the Trinity River and Lake Livingston.
Estimated Cost: $150,000
Develop partnerships between utility providers and county and local public works agencies to document known hazard areas.
Estimated Cost: $5,000
Coordinating Organization: Polk County Office of Emergency Management, Polk County Sheriff's Dept., Local Police, Fire and EMS
Timeline: Ongoing
Plan Goals Addressed: Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-H#2: Review and update the Traffic Management Plan for Region 2B and Sub-2B.
Task Complete*: Review and updates are completed annually by the Texas Department of Transportation and new routes information are handed out to law enforcement, TxDOT, and other agencies. If a disaster evacuation is imminent TxDOT and pass thru cities have set protocol for removal of road hazards and will utilize construction barriers to facilitate traffic control.*
Implementation:
Check evacuation routes annually
Develop coordinated strategies to man traffic control points throughout the county.
Estimated Cost: No Cost
Coordinating Organization: Polk County Sheriff Dept., City Police Depts.
Timeline: Ongoing
Plan Goals Addressed: Emergency Services
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-H#3: Enhance strategies for debris management for hurricane events.
***Task Complete**: City work crews as well as county Road and Bridge crews used for ongoing fallen tree and debris removal.*

Implementation:
Develop coordinated management strategies for clearing roads of fallen trees, and clearing debris from public and private property.
Estimated Cost: $10,000
Coordinating Organization: Polk County Road and Bridge, Cities' Public Works
Timeline: 2 - 3 years
Plan Goals Addressed: Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	3
Livingston	3
Onalaska	3
Corrigan	3
Goodrich	3
Seven Oaks	3

ST-H#4: Install generator at Seven Oaks City Hall.
Implementation:
Install a generator at Seven Oaks City Hall, which is the only shelter in the City, in order to provide a backup power source during power outages.
Estimated Cost: $25,000
Coordinating Organization: Seven Oaks City Council
Timeline: 1 - 2 years
Plan Goals Addressed: Public Safety, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Seven Oaks	1

ST-H#5: Restore well at goodrich isd.
Implementation:
Restore well at Goodrich ISD to provide emergency backup if City water system fails.
Estimated Cost: $30,000
Coordinating Organization: Goodrich ISD, Polk County Office of Emergency Management, Goodrich City Council
Timeline: 1 - 5 years
Plan Goals Addressed: Public Safety
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	4
Goodrich	1

LT-H#1: Increase public awareness of hurricane mitigation activities.
Implementation:
Collect information on public education materials for protecting life, property, and the environment from Hurricane events; and
Estimated Cost: $5,000
Distribute educational materials to Polk County residents and public and private sector organizations regarding preparedness for no-power situations.
Estimated Cost: $5,000
Coordinating Organization: Polk County Office of Emergency Management, Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council and Staff
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-H#2: Develop and enforce wind-resistant building siding and construction codes.
Implementation:
Petition the Texas Legislature to develop building codes for efficiency in protecting structures from hurricanes and severe wind damage.
Estimated Cost: $2,500
Coordinating Organization: Polk County Commissioners Court, Polk County Office of Emergency Management, Livingston City Council, Onalaska City Council, Corrigan City Council, Goodrich City Council, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-H#3: Develop EVACUATION ROutes OUT OF OLD TOWN ONALASKA
Implementation:
Extend East Beaumont Ave to Phillips Rd to provide adequate ingress and egress to residents and emergency services.
Estimated Cost: $500,000
Extend Gantry west to H Pickins Rd. to provide adequate ingress and egress to residents and emergency services

Estimated Cost: $100,000
Coordinating Organization: Onalaska City Council
Timeline: Ongoing
Plan Goals Addressed: Provide Evacuation Routes to Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Onalaska	1

LT-H#4: Replace bridge on Old Bold Springs Rd.
Implementation:
Restore road and replace bridge over creek to provide ingress and egress for emergency access for the hospital and school children;
Estimated Cost: $6,000,000
Coordinating Organization: Polk County Precinct #3 Road & Bridge Department
Timeline: 5 - 10 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1

Severe Winter Storm Mitigation Action Items

ST=Short Term
LT=Long Term
SWS=Severe Winter Storm

ST-SWS#1: Improve strategies for debris management for Severe Winter storms.
Implementation:
Develop coordinated management strategies for de-icing roads, plowing snow, clearing roads of fallen trees, and clearing debris from public and private property.
Estimated Cost: $25,000
Coordinating Organization: Polk County Road and Bridge Departments 1, 2, 3, & 4, Livingston Public Works Department, Onalaska Public Works Department, Corrigan Public Works Department, Goodrich Public Works Department, Seven Oaks City Council
Timeline: 2 years
Plan Goals Addressed: Partnerships and Implementation, Emergency Services
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-SWS#2: Implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
Implementation:
Partner with responsible agencies and organizations to implement programs that reduce risk to life, property, and utility systems; and
Work with utility providers and county and local public works agencies to document known hazard areas.

Estimated Cost: $5,000
Coordinating Organization: Polk County Office of Emergency Management, Livingston Public Works, Onalaska Public Works, Corrigan Public Works, Goodrich Public Works, Seven Oaks City Council
Timeline 2 years
Plan Goals Addressed: Emergency Services, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-SWS#3: Implement vegetation management by trimming hanging tree limbs and conducting tree removal to prevent damage to property and infrastructure within the city of seven oaks.
Implementation:
Trim hanging tree limbs to prevent damage to power lines, property and infrastructure within the City of Seven Oaks during ice and windstorms.
Remove dangerous trees near Seven Oaks City Hall which is the only shelter facility in the city.
Estimated Cost: $6,000
Coordinating Organization: Seven Oaks City Council
Timeline: 1 - 2 years
Plan Goals Addressed: Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Seven Oaks	1

LT-SWS#1: Increase public awareness of severe winter storm mitigation activities.
Implementation:
Collect information on public education materials for protecting life, property, and the environment from severe winter storm events;
Distribute educational materials to Polk County residents and public and private sector organizations regarding evacuation routes during road closures; and
Target the vulnerable populace for disseminating preparedness information.
Estimated Cost: $10,000
Coordinating Organization: Polk County Office of Emergency Management, City of Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-SWS#2: Enhance weather monitoring to attain earlier severe winter storm warnings, improve data gathering capabilities of County on impacts of severe winter storms.
***Task Complete**: Polk County has partnered with the EAS system and has been designated as a Storm Ready county. The Skywarn system is in place within the county. Polk County also utilizes the Upper Lake Livingston Wireless Association to serve as weather warn advisors to the county. Polk County Sheriff Department has 24-hour access to monitor the internet network, telephone and weather stations for early public warning.*

Implementation:
Coordinate with appropriate organizations to evaluate the need for more weather stations and/or weather instrumentation.
Estimated Cost: $25,000
Coordinating Organization: Hazard Mitigation Taskforce, Polk County Office of Emergency Management
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

Drought Mitigation Action Items

ST=Short Term
LT=Long Term
D=Drought

ST-D#1: Develop education programs aimed at mitigating drought hazards and reducing the exposure of citizens, public agencies, and private property owners.
Implementation:
Utilize the media and public service announcements to inform the public about drought management options and activities
Improve water-efficient land use and development practices through public awareness programs and other media.
Estimated Cost: $10,000
Coordinating Organization: Polk County Office of Emergency Management, Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

ST-D#2: Improve methods of gathering and delivering drought-related information to those who are vulnerable

***Update**: Current KBDI being used to monitor drought effects. County issuing burn bans throughout the county and using various forms of media to deliver notice to the public.*

Implementation:

Continue education efforts through the use of educational programs for drought public awareness.
Research into methods for improving drought monitoring, assessment, and mitigation.
Modernize the statewide environmental monitoring and forecasting system.

Estimated Cost: $50,000

Coordinating Organization: Polk County Office of Emergency Management, Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council

Timeline: Ongoing

Plan Goals Addressed: Protect Life and Property, Public Awareness

Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

ST-D#3: Educate the public on the drought contingency plan

Implementation:

Post the Drought Contingency Plan on the City's website
Add Drought Contingency Plan as a utility billing insert
Use social media and other public information outlets to increase public awareness

Estimated Cost: $2,000

Coordinating Organization: Livingston City Council and Staff

Timeline: Ongoing

Plan Goals Addressed: Public Awareness, Protect Life and Property

Possible Funding Sources: Operating budget, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Livingston	1

LT-D#1: Improve available data, communication, coordination, and collaboration between property owners, local and county planners, and officials to assess and address risks, existing mitigation measures, state and federal assistance programs

Implementation:

Provide educational emphasis to forest and land management practices for the minimizing of drought impacts.
Coordinate drought response activities, particularly water use restrictions, among neighboring water systems.

Estimated Cost: $18,500
Coordinating Organization: Polk County Commissioners Court, Polk County Office of Emergency Management, City of Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council
Timeline: 2 – 3 years
Plan Goals Addressed: Protect Life and Property, Public Awareness, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-D#2: Establish stronger economic and other incentives for private investments in water conservation.
Implementation:
Improve water-efficient land use and development practices.
Establish stronger economic and other incentives for private investments in water conservation.
Improve water conveyance infrastructure efficiencies in agricultural, municipal, and industrial uses.
Explore tax abatement for utility districts to develop new wells.
Estimated Cost: $20,000
Coordinating Organization: Polk County Commissioners Court, Polk County Office of Emergency Management, Livingston City Council, Onalaska City Council, Corrigan City Council, Goodrich City Council, Seven Oaks City Council
Timeline: 2 - 3 years
Plan Goals Addressed: Protect Life and Property, Public Awareness, Partnerships and Implementation
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-D#3: Find alternative water source for those communities who only have a primary water source.
Implementation:
Contact all communities to discover information on their primary source and encourage those communities to seek secondary water source.
Assist communities in establishing new wells and connecting to their existing piping system.
Estimated Cost: $500,000
Coordinating Organization: Polk County Office of Emergency Management, Livingston Public Works Department, Onalaska Public Works Department, Corrigan Public Works Department, Goodrich Public Works Department, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Public Health and Safety
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

Extreme Heat Mitigation Action Items

ST=Short Term
LT = Long Term
EH = Excessive Heat

LT- EH#1: Reduce the exposure of citizens to dangerous heat-related events.
Implementation:
Enhance outreach and education programs aimed at teaching citizens the health hazards associated with extreme heat. **Estimated Cost: $1,500 (materials)**
Target vulnerable communities, such as senior citizens, schools, etc.
Generate and/or distribute literature that outlines the safety measures one should take during a severe heat event
Establish emergency cooling centers (i.e.: school gyms) and to explore options to pay utility bills once costs amount has been determined.
Estimated Cost: $50,000
Coordinating Organization: Polk County Commissioners Court, Polk County Office of Emergency Management, Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Minimize threat to public safety
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	1
Livingston	1
Onalaska	1
Corrigan	1
Goodrich	1
Seven Oaks	1

LT-EH #2: Create data base of addresses and contact information of members of the community that are particularly vulnerable during extreme heat events; assimilate data on crop losses and other economic impacts of extreme heat.
Implementation:
Compile addresses and contact information of community members that are particularly vulnerable to extreme heat conditions (e.g. elderly populations).
Create method for assimilating data on crop losses and other economic impacts of extreme heat to improve future vulnerability assessment efforts.
Estimated Cost: $5,000
Coordinating Organization: Local Health Care Organizations and/or Consultants, Local Texas Department of State Health Services Office, Polk County Office of Emergency Management, Polk County

Extension Office, Livingston City Council and Staff, Onalaska City Council and Staff, Corrigan City Council and Staff, Goodrich City Council and Staff, Seven Oaks City Council
Timeline: Ongoing
Plan Goals Addressed: Rapid and organized response for community members in need of assistance during periods of extreme heat
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Polk County	2
Livingston	2
Onalaska	2
Corrigan	2
Goodrich	2
Seven Oaks	2

LT-EH #3: Establish cooling shelters within the city of Goodrich for extreme heat conditions.
Implementation:
Locate churches willing to setup as cooling shelters in extreme heat conditions
Secure funding for reimbursement of electric and food costs
Estimated Cost: $2,000
Coordinating Organization: Goodrich City Council, Polk County Office of Emergency Management
Timeline: Ongoing
Plan Goals Addressed: Protect Life, Create Partnerships with Local Churches
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Goodrich	1

LT-EH #4: Increase public awareness and disaster preparedness education to individuals and public and private organizations.
Implementation:
Increase public awareness and disaster preparedness education to individuals and public and private organizations.
Estimated Cost: $2,000
Coordinating Organization: Goodrich City Council and Staff
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property
Possible Funding Sources: Operating budget, general revenue, FEMA, PDM, HMGP

Jurisdiction	Priority Rank of this Mitigation Item
Goodrich	1

APPENDIX D: HOUSING AND POPULATIONS

Three vulnerable population groups within the County were identified that would be more susceptible to hazard events than the general population. These groups are:

1) the elderly, 65 years of age or older, that make up approximately 20% of the population;
2) the disabled or incapacitated, either by physical or mental injury, that make up approximately 20% of the population; and
3) the disadvantaged whose average income per capita is $16,435 (somewhat less than the average for the state), that make up approximately 22.6% of the population.

The percentage of persons living below poverty level is 5.5% higher than the State average. The diversity of Polk County makes it difficult to identify certain areas as economically depressed (i.e. in any area you will find expensive homes intermixed with intermediate to very low priced homes).

HEAVY POPULATION AREAS

The following table outlines Emergency Service Number (ESN) Zones throughout the County where People congregate.

ESN ZONE	Facility
Livingston Zones ESNs 359, 361 & 364	Polk County Courthouse Livingston City Hall Area Churches Pedigo Park American Legion Hall Veterans of Foreign Wars Hall (VFW) Senior Citizens Center Livingston ISD Campuses Matthews Street Park Polk County Fire Training Facility Area Community Centers (POA Halls) Livingston-Polk County Chamber of Commerce Leggett ISD Campus Escapees Community Center Camp Cho-Yeh
Onalaska Zones ESNs 360 & 363	Polk County Sub-Courthouse Onalaska City Hall Area Churches Area Marinas Senior Citizens Center Onalaska ISD Campuses Area Community Centers (POA Halls) Onalaska Volunteer Fire Dept.
Goodrich Zones ESNs 350 & 356	Area Churches Goodrich ISD Campuses Area Community Centers (POA Halls) Woody Hollow Community Center
South Polk County Zone ESN 354	South Polk County VFD Station Area Churches Area Community Centers (POA Halls) Ace Community Park Big Thicket POA Hall

ESN ZONE	Facility
Scenic Loop Zone ESN 357	Scenic Loop VFD Station Area Churches Area Marinas Area Community Centers (POA Halls)
Corrigan Zones ESNs 358 & 362	Polk County Sub-Courthouse Senior Citizens Center Corrigan City Hall Corrigan-Camden ISD Campuses Corrigan Community Center Area Community Centers (POA Halls) Veterans of Foreign Wars Hall (VFW) Area Churches
Alabama-Coushatta Indian Nation Zone ESN 351	Cultural Center Area Churches Alabama-Coushatta Gymnasium Alabama-Coushatta VFD Station Alabama-Coushatta Health Center
Holiday Lake Estates Zone ESN 403	Clubhouse, Pool, Boat Ramps Holiday Lake Estates VFD Station
Segno Zone ESN 352	Area Churches Area Schools Segno VFD Station Park
Indian Springs Zone ESN 353	Area Churches Indian Springs VFD Station Indian Springs Community Center
Chester Zone ESN 169	Area Churches

*Property Owners Association Halls (POA Halls)

PERSONS WITH FUNCTIONAL NEEDS - POPULATIONS

2010 Census calculates Polk County's population at 45,413. Of that number, 8,646 or 19% are over the age of 65. Although 2010 Census information on disability statistics is not available, the 2000 Census states 9,222 or 20% of people age 5+ have a disability. The majority of the senior population and the persons with disabilities live throughout the county; however, the county has several housing areas that cater to elderly seniors and people with disabilities.

Livingston Housing Authority:

- Pine Street Addition, housing for low income
- Hudman Street Addition, housing for very low income and Aging Housing
- Livingston Seniors Apartments

Corrigan Housing Authority:

- S. Mathews Community Ctr. Addition, housing for low income

Watson Enterprises: Low-Income Apartment Complexes

- Ridgecrest Apartments
- Livingston Plaza Apartments
- Timbers Apartments
- Garden Ridge Townhouses, housing for the elderly

Rood Woodhollow, LLC:

- Woodhollow Apartments, low-income apartments

The following table sets out the number of occupied and vacant housing units in Polk County and each of the incorporated cities.

Housing Units Location	No. Units	Occupied Housing	Vacant Housing (seasonal, recreational, occasional use)
Housing units, 2010 Polk County	22,683	16,503	6,180
Housing units, 2010 City of Livingston	2,281	1,958	323
Housing units, 2010 City of Corrigan	698	597	101
Housing units, 2010 City of Onalaska	1,207	755	452
Housing units, 2010 City of Goodrich	123	99	24
Housing units, 2010 City of Seven oaks	58	44	14
Median value of owner-occupied housing units, 2005-2009 Census Data: $64,600			

ADDITIONAL HOUSING STATISTICS

THE CENSUS 2013-2017 PERSONS PER HOUSEHOLD IN POLK COUNTY IS 2.46.

The Livingston Zone has an area of 220 square miles or 141,171 acres. This service area has a population of approximately 23,852 people. There are over 9,700 homes in 143 subdivisions located in this Zone. Below is a listing of the subdivisions which range in size from several hundred residents to as few as forty residents.

LIVINGSTON ZONE		
A A WELLS	GREEN ACRES	PEBBLE CREEK
ALEXANDER	GREENCLIFF ACRES	PINE VALLEY
ALEXANDER ACRES	GREEN-LIV	PINECREST
ALSTON	HARDWOOD HILLS	PINEHILL
BEACON BAY	HIDDEN VALLEY ESTATES	PUTNAMS LANDING
BEECHCREEK WOODS	HILL-DAVIDSON	RAINBOWS END
BEOLAND	HILLSIDE PINES	RAINTREE
BONNIE HILLS ESTATES	HOLLEMAN	REBEL
BRAIR BEND	HOLLEMAN JS	RED HORSE RIDGE
BRENTWOOD	HOLLY HILLS	RETREAT OF LIVINGSTON
BROCK	JONES - J H	ROB SUB 164
BULLFROG BASIN	JONES-LIV	ROLLINGWOODS
CAMPBELL-WOOD	JONES-MATHEWS	SCHWAB CITY ACRES
CANNON-NORWOOD	JONES-VIOLA	SHADY OAK
CHESSWOOD	KNOB HILL	SKYLINE
CHURCH PLACE 1300	L K WALKER	SNELL ADDN
COATS	LAKE LIVINGSTON ESTATES #2	SODA OAKS
COCHRAN-LIV	LAKE LIVINGSTON ESTATES #3	SOMERSET
COLEMAN	LAKE LIVINGSTON AIR PARK	SOUTH
COPELAND CREEK	LAKELAND HIDEAWAY	SOUTHLAND PLANTATION
COUNTRY CHARM	LAKESIDE	SPRING CREEK
COUNTRY LANE	LAKESIDE VILLAGE	SPRING CREEK BUSINESS PARK
COUNTRY OAKS	LAKEVIEW	SPRING HILL
COUNTRY PLACE	LEGGETT EST	SPRING WOODS
COUNTRY WOOD	LIVINGSTON BUSINESS PARK	STONES THROW
CREEKBEND ESTATES	LIVINGSTON EVERGREEN	SUGAR HILLS

LIVINGSTON ZONE		
CRYSTAL CREEK FOREST	LIVINGSTON FIELD OF DREAMS	SUMMER ESCAPE
CRYSTAL LAKES	LIVINGSTON-OT	SUNRISE EAST
CRYSTAL POINT	LONGHORN VALLEY ESTATES	SUNSET SHADOWS
DAVIS WOODS	MANGUM ESTATES	SUNSHINE
DICKENS OAKS WEST	MARSH	TEMPE TIMBERED TERRACE
DOGWOOD LAKE ESTATES	MARSTON HEIGHTS	THUNDER MOUNTAIN LAKES
DOVE ACRES	MATTHEWS	TOWNE FOREST
DREW-LIV	MEECE	TOWNE SOUTH
DUNBAR	MENARD CREEK ESTATES	TWO FORTY
EASTON OAKS	MILLS FOREST	WALKER
EASTWAY	MOFFETT ADDITION	WEAVERS COVE
ELLZEY	MORNINGSIDE	WEST
ENCHANTED FOREST	NEW SUNSET	WEST END
FEAGIN	NORTH	WEST LEGGETT
FIRST FOLLY EST	NORTH GLEN	WEST PROVIDENCE
FOREST SPRINGS	OAK FOREST	WESTPARK
FOREST SPRINGS	OAK HOLLOW	WESTWOOD
FOUR CORNERS ESTATES	OAK TERRACE EST	WIGGINS RIDGE
FOUR CORNERS EST-THE PARK	OAK TERRACE ESTATES	WIGGINS VILLAGE
FOX HILLS	OAKHILL	WINDHAM
GARDEN ACRES	OAKHURST	WOODWAY ACRES
GARDEN CITY	OATES 271	

The Onalaska Zone has an area of 132 square miles or 84,656 acres. This service area has a population of approximately 13,670 people with over 5557 homes in 73 subdivisions located within this Zone.

ONALASKA ZONE		
Alabama Point	Idlewilde	Plaza North
Allen Woods	Impala Woods	Ponderosa Ridge
Autumn Trails	Indian Hills	Sandy Creek
Beaver Bend	Kickapoo Estates	Sandy Ridge
Bentwood Bend	Kickapoo Forest	Sandy Shores
Branchwood	Kickapoo Forest New	Scenic Cove
Bridgeview	Kickapoo Village	Shady Ridge
Brushy Creek Campgrounds	Kickapoo Wildlife Club	Shady Shores
Bully Hill	Lake Forest	Sportsman Retreat
Canyon Park	Lake Livingston R&R Club	Stanford Shores
Carl Dickens A-44	Leisure Wood	Stowaway Bay
Cedar Point	Magnolia Ridge	Tanner Meadows
Country Boy Estates	Maxwell	Texas Acres
County Line	Nikki's Landing	The Channel at Cedar Pt
Creek Lake Cove	Oak Ridge	The Meadows
Creekside	Onalaska OT	The Point
Elbow Bend	Onalaska 360	Tree Farm Tracts
Emerald Bay	Onalaska East	Twin Creeks
Forest Hills	Onalaska North	Twin Harbors
Fountain Lake	Onalaska Woods	Twin Hills Cove
Garden Villas	Paradise Acres	Wells Landing

ONALASKA ZONE		
Harbor Light	Paradise Point	White
Harbors Edge	Pelican Point	Yaupon Cove
Hickory Valley West	Pine Harbor	
Hideaway Ridge	Pine Ridge	

The Goodrich Zone has an area of 54 square miles or 34,317 acres. This service area has a population of approximately 3355 people. There are over 1,1364 homes in 27 subdivisions located in this Zone.

GOODRICH ZONE		
Armitage Add	Goodrich OT	Schwab Oaks
Ballas 343	Holiday Lake Estates	Shawland
Beau Rivage	Holleyfield 100	Shiloh Ridge
Chesswood	Hoot Owl Hollow	Siesta Country 1 & 2, 4 & 5
Country Settlement	Jones	Sleepy Hollow
Country Sunrise	Lake Livingston Estates	Sunnyside
Creekwood	Magnolia Village	Sunset Shores
Goodrich Acres	Pennington	The Preserve at Sally Creek
Goodrich North	River Lake Estates	WM Pace A-60

The South Polk County Zone has an area of 45 square miles or 28,610 acres. This service area has a population of approximately 2593 people. There are over 1055 homes in 12 subdivisions located in this Zone:

SOUTH POLK COUNTY ZONE		
Ace Acres	Forest Bend	Plum Pudding
Big Thicket Lake Estates	Magnolia Springs Estates	Six Lakes
Cactus Jack	Nine Aces Estates	Taylor Lake Estates
Eagles Nest	Outlaw Bend	Wild Country Lake Estates

The Segno Zone covers 113 square miles or 72,546 acres and 1597 population. There are over 649 homes in 7 subdivisions located in this Zone:

SEGNO ZONE		
Bluewater #2	Davis	Segno Ranchettes
Carl Dickens	Ellis Woods	
Cochran 45	Magnolia Woods	

The Scenic Loop Zone has an area of 39 square miles or 24,973 acres. This service area has a population of approximately 9237 people. There are over 3755 homes in 45 subdivisions located in this Zone:

SCENIC LOOP ZONE		
Apache Terrace	Indian Hill Estates	Oak Creek Farms
Bayhaven	Indian Hill Harbor	Pats Point
Blanchard Heights	Indian Hill Heights	Pine Shadows
Blue XX	Indian Hills	Pinwah Pines
Cedar Ridge	Jennings Cove	Pinwah Pines Estates
Cherokee Forest	Kalita Point	Reiley's Landing
Commodore Cape	Lake Livingston Est 4 & 5	Resort Country

SCENIC LOOP ZONE		
Copper Cove	Lake Livingston Village	Scenic Woods
Cotton Hill Estates	Lakeland Hideaway	Shelter Cove
Cresent Shores	Lakeshore Estates	Sundance Forest
Deerfield	Lakewood	Sunset Shadows
Dickens Landing	Memorial Point	Texas Landing
Forresters Retreat	Memorial Point Townhouses	The Loop
Glen Cove	Natasha Heights	The Oaks
Hickey Ridge Estates	Nugents Cove	Timberland Cove

The Corrigan Zone has an area of 325 square miles or 208,490 acres. This service area has a population of over 6612 people. There are over 2,688 homes in 22 subdivisions located in this Zone:

CORRIGAN ZONE		
Asia	Eden Heights	Old Stag Ridge
Bulay 85	Hardins Hide Out	Pine Hollow
Carmona Estates	Hood 207	Rayburn Hills
Corrigan Heights	Hunters Paradise	Reilley's Village
Corrigan OT	Jones Moscow Acres	Reinhardt 60
Corrigan West	Laurelie Estates	Tanner 131
County Line Farms	Moscow Acres	
Damasus Woods	Moscow OT	

The Alabama-Coushatta Indian Nation has an area of 110 square miles or 70,336 acres. This service area has a population of over 1493 people. There are over 607 homes located in this Zone. There are no subdivisions located within this area. Much of the area belongs to the Alabama-Coushatta Indian Nation and the remainder is predominantly rural forest land east of the reservation to the Polk/Tyler County line.

The Indian Springs Zone has an area of 61 square miles or 38,758 acres. This service area has a population of approximately 2667 people. There are over 1084 homes located in 3 subdivisions in this Zone:

INDIAN SPRINGS ZONE		
Double A Lake Estates	Indian Springs	Wilson Lake Estates

The Holiday Lake Estates Zone has an area of 1.7 square miles or 1,090 acres. This service area has a population of approximately 1068 people. There are approximately 434 homes.

HOLIDAY LAKE ESTATES ZONE		
Holiday Lake Estates		

The Chester Zone has an area of 9.7 square miles or 6,218 acres. This service area has a population of approximately 418 people. There are over 170 homes in 3 subdivisions located in this Zone:

CHESTER ZONE		
Chester 100	Deer Country	Shoeshine Terrace

HOUSING SUMMARY BY ZONE 2019

Location	Number of Houses	Appraised Value
The Livingston Zone	9,696	$700,959,822
The Onalaska Zone	5,557	$373,737,172
The Goodrich Zone	1,364	$87,510,789
The South Polk County Zone	1,054	$43,296,676
The Segno Zone	649	$37,688,948
The Scenic Loop	3,755	$356,244,871
The Corrigan Zone	2,688	$130,481,909
The Alabama-Coushatta Indian Nation	607	$29,077,520
The Indian Springs Zone	1,084	$46,980,749
The Holiday Lake Estates Zone	434	$28,160,224
The Chester Zone	170	$4,807,182
Total Housing for County and Cities	**27,058**	**1,838,945,862**
The above statistics provided by Polk County Appraisal District & Rural Addressing		

Statistics from Census Bureau 2017 Quick Facts (http://quickfacts.census.gov)	
Housing units in Polk County 2017	25,675
Homeownership rate, 2013-2017	76.7%
Housing units in multi-unit structures, apartment buildings, percent, 2005-2009	4.3%
Median value of owner-occupied housing units, 2013-2017	$84,900

Note: The values of the houses listed above are an average estimate of property values in that area, actual figures may vary somewhat, however these figures are in line with the 2019 appraised values recorded at the Central Appraisal District.

APPENDIX E. HISTORICAL MARKERS AND COMMUNITY EVENTS

UNIQUE HISTORICAL BUILDINGS AND OTHER RESOURCES

Locations in each of the following categories have a historical marker listed with the Texas Historical Commission.

HISTORICAL CHURCHES

- ***Bethel Baptist Church***, Bold Springs – From Livingston, take FM 350 north about nine miles to Bold Springs, church is located just north of intersection with FM 942.
- ***Damascus Missionary Baptist Church*** – seven miles northeast of Corrigan on FM 1987.
- ***First Baptist Church, Moscow*** – on Loop 177 just north of FM 350, a quarter mile west of U.S. Hwy. 59 in Moscow.
- ***First United Methodist Church of Livingston*** – relocated to new church just west of Livingston on U.S. Hwy. 190.
- ***Sunflower Baptist Church*** – go 12 miles east of Livingston on U.S. Hwy. 190, then 1.4 miles south on FM 1276 to Camp Ruby Road, then 3.5 miles west to Sunflower Road and 5.5 miles to the church.
- ***Union Springs Baptist Church*** – across the street from Corrigan City hall is Union Springs Drive, go one mile to the church.

HISTORICAL CEMETERIES

- ***Feagin Cemetery*** – From Livingston, take U.S. Hwy. 59 north about nine miles to FM 942, go 12 miles east on FM 942 and 1.4 miles south on Clamon Country Road.
- **Old City Cemetery**, also known as Founders' Cemetery – 300 E. Church St. in Livingston.
- ***Midway Cemetery*** – From Livingston, go 18 miles east on U.S. Hwy. 190, then south on Midway Center Road to the cemetery.
- ***Nelson Henry Rice Cemetery*** – Go seven miles east of Leggett on FM 942, then a quarter mile south on cemetery road.
- ***Wheeler Cemetery*** – From Corrigan, go north on U.S. Hwy. 59 seven miles to FM 357, west 1.2 miles to Wheeler Road at the railroad tracks, go north two miles to cemetery.
- ***Nettles Cemetery*** – From Livingston, go east on US Hwy 190 3.5 miles, and turn left on Nettles Cemetery Rd, 2.8 miles at the end of the road.
- ***McCaghren Cemetery*** – from U.S. Hwy. 190 in Livingston, U.S. Hwy. 59 south to South Washington Ave. to Liberty Ave., left, right .8 miles to gate, right in pasture .3 miles, on left.
- ***West Tempe Cemetery*** – south on FM 3156 from U.S. Hwy. 190 west of Livingston, .6 miles to dirt road, left one mile.
- ***Forest Hill Cemetery*** – south from intersection of U.S. Hwy. 190 and U.S. Hwy. 59, 1.1 miles on South Washington Avenue.

SPECIFIC GRAVESITES

- ***Major Henry W. Augustine*** (fought in the Cherokee Indian War in Nacogdoches) – Magnolia Hill Cemetery, Segno Community, 21 miles southeast of Livingston.
- ***James Burch*** (fought in the Texas Revolution with Sam Houston in the Battle of San Jacinto), Moscow, grave marker on private property.
- ***John Wesley Hardin*** (famous outlaw) – near boyhood home in Moscow; in front of Holhausen-Darby Cemetery, four miles west of Moscow on FM 350.
- ***William Barnett Hardin*** (was in the Republic of Texas) – grave marker in Holhausen Cemetery in Moscow, four miles west of Moscow on FM 350.
- ***Roscoe D. Holliday*** (Texas Ranger) – in Peebles Cemetery on FM 1988 near Goodrich.
- ***Capt. Hardy B. Purvis*** (famous lawman) – in Peebles Cemetery on FM 1988, 2.5 miles northeast of Goodrich.
- ***Chief John Scott*** – Indian Reservation Cemetery at Alabama-Coushatta Indian Reservation 16 miles east of Livingston on U.S. Hwy. 190.

- ***Captain Isaac Newton Moreland Turner***, Confederate States of America – from Livingston, go 18.4 miles east on U.S. Hwy. 190 to Midway Center Rd., then two miles north to a dead end, go east to cemetery sign and follow it to Turner Cemetery.

HISTORICAL HOMES

- ***Augustus Darby Home*** (early pioneer family) – five miles west of Moscow on FM 350, private property.
- ***Magee-Love Log House*** – private property in Goodrich.
- ***E.C. Matthews Home*** – Loop 177 south of FM 350, a quarter mile west of U.S. Hwy. 59 in Moscow.
- ***P.B. Maxey*** – from Corrigan, take U.S. Hwy. 287 west one mile to Eden Street, then go south to Maxey Road, take a right and follow the road up, house is on the right.
- ***G.G. Nettles Home*** – 400 block of E. Young St. in Livingston.
- ***The Sawyer House*** – 110 Oak St. in Livingston.

MARKER ONLY

- ***Old Andress Inn*** site at 109 W. Mill St. in Livingston.
- ***Confederate Service of Alabama and Coushatta Indians*** – Alabama-Coushatta Indian Reservation, 16 miles east of Livingston on U.S. Hwy. 190.
- ***Early Indian Trails*** – on Murphy Memorial Library grounds at corner of West Church and Drew streets in Livingston.
- ***Birthplace of Margo Jones*** – 517 S. Washington Ave. in Livingston.
- ***Confederate States of America Polk County*** – Polk County Courthouse square.

HISTORICAL COMMUNITIES

- ***Village of Alabama and Coushatta Indians*** – 16 miles east of Livingston on U.S. Hwy. 190 at Indian Reservation entrance.
- ***Menard Chapel Church, School and Cemetery*** – from Livingston, go 10 miles south on S.H. 146, two miles east on FM 942 and two miles north on Menard Chapel Road.
- ***Moscow*** – on FM 350 about a quarter mile west of U.S. Hwy. 59.
- ***Site of Smithfield*** – 13.2 miles south of Livingston on S.H. 146, then four miles southwest on FM 2610 in Ace Community.
- ***Town of Swartout*** site – FM 1988 in front of a church.

OTHER

- ***Polk County Courthouse*** - located in the 100 block of West Church Street. It is listed on the National Register of Historic Places and is also designated as a State Archeological Landmark.
- ***Courthouse Annex***, formerly known as the Campbell-Foreman Building - located next to the Polk County Courthouse in the 100 block of West Church Street. It is listed on the National Register of Historic Places and is also designated as a State Archeological Landmark.
- ***First National Bank*** – 300 block of West Church Street in Livingston.
- ***First State Bank*** – 122 W. Polk St. in Livingston.
- ***Texas Statesman William Pettus Hobby picnic area*** on U.S. Hwy. 59 in Moscow.
- ***Livingston City Hall*** – corner of West Church and Jackson streets in Livingston.
- ***Livingston Telephone Company*** – 501 N. Houston Ave. in Livingston.
- ***Locomotive No. 5*** – in Heritage Park at West Church and Drew streets in Livingston.
- ***Moscow, Camden and San Augustine Railroad*** – at railroad depot at intersection of FM 62 and FM 942.
- ***Polk County Enterprise*** – at the intersection of Calhoun and Tyler streets.
- ***Early roads in Polk County*** – FM 1988 at Park Road 5, six miles southwest of Livingston.
- ***Trinity Lodge No. 14 AF & AM*** – 1105 West Church St. in Livingston.
- ***Paddle Wheels on the Trinity***.

CULTURAL CENTERS

Alabama-Coushatta Indian Nation
Cultural Center
571 St Park Road 56
Livingston, TX 77351
(936) 563-4391

TOURIST ATTRACTIONS

- **The Big Thicket Preserve** is located in the far southeast portion of Polk County. Two of the preserve's 12 units -- the Big Sandy Creek Unit and the Menard Creek Corridor -- lie within Polk County.
- **Livingston Golf Course**, an 9-hole, par 70 course, is located on Matthews St. in Livingston.
- **Alabama-Coushatta Indian Reservation** is located on about 4,600 acres approximately 16 miles east of Livingston on U.S. Hwy. 190
- **Polk County Memorial Museum** is located in The Webster House at 514 W. Mill in Livingston.
- **Lake Livingston State Park** is a 635.5-acre park on Lake Livingston.
- **Southland Park** is a 14-acre park along the Trinity River just under the Lake Livingston Dam.
- **Tigerville Park** is located on FM 3126.
- **Pedigo Park** is a 100-acre city park on the west side of the U.S. Hwy. 59 Bypass in Livingston.
- **Matthews Street Park** is a city park located on Matthews Street in Livingston.
- **Northshore RV Resort** is located at 168 Butler on Lake Livingston in Onalaska.
- **Lakeside RV Park** is located at 15152 US Hwy. 190 W. on Lake Livingston in Onalaska.
- **Heritage Park Complex** is located at West Church and Drew streets in Livingston that consists of three major attractions – a log cabin, an authentic old fashioned steam engine and a vintage Victorian home.
- **Livingston Rotary Club's Anniversary Park** is located on the corner of East Church Street and Tyler Avenue in Livingston.
- **Miss Effie's Cottage**, home of the Polk County Garden Club, is located on the corner of Jackson Avenue and Mill Street in Livingston.
- **Barney Wiggins Rodeo Arena** is located at S.H. 146 at Fair Street.
- **Livingston-Polk County Chamber of Commerce Office and Visitors Center** is located at the northern entrance road of Pedigo Park on the U.S. Hwy. 59 Bypass.
- **Trade Days**, City of Livingston's Third Monday at Pedigo Park.

TRADE DAYS

Livingston's 3rd Monday Trade Days is located in beautiful Pedigo Park on US Highway 59 in Livingston. Trade Days take place on over 200 acres in a park-type atmosphere with two covered pavilions and plans for over 800 vendor spaces. It's a great place to bring the entire family.

TOURIST ATTRACTIONS (SEASONAL/ANNUAL)

- Fourth of July in Onalaska
- Firemen's Fundraisers
- Trinity-Neches Livestock Show and Rodeo
- Multicultural Festival honoring Dr. Martin Luther King Jr.
- Polk County Youth Rodeo
- Alabama-Coushatta Indian Powwow
- Christmas Events

APPENDIX F. EXISTING WILDFIRE MITIGATION PROGRAMS

EXISTING MITIGATION ACTIVITIES

Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations. The Polk County Commissioners Court has gone to great lengths to assuring that local volunteer fire departments have adequate training and firefighting equipment. The county has implemented several programs to enhance training:

Built a comprehensive video library through the Fire Emergency Training Network (FETN) and set training guidelines for each firefighter to adhere to; and

Allowed each VFD an additional $1,000.00 per year for members to use for fire training activities.

HB2604 provided an opportunity for VFDs to purchase new equipment, including vehicles. The County requested that each VFD apply for a new Brush Truck through the Texas Forest Service (TFS) grant, valued at $60,000.00. The grant was a 90% TFS and 10% department match. The County agreed to pay the 10% match up to $6,000.00, thus each department received a new Brush Truck at no cost to the fire department. This fleet of trucks added to our fire-fighting capabilities and allowed smaller departments the opportunity to have new fire equipment.

Polk County residents are served by a variety of local volunteer fire departments. Although each department is responsible for fire-related issues in specific geographic areas, they work together to keep Polk County residents safe from fire and ensure availability of resources.

The fire departments provide essential public services in the communities they serve, and their duties far surpass extinguishing fires. In fact, many of the fire departments provide other services to their jurisdictions, including Emergency Medical Technicians (EMT) and paramedics who can begin treatment and stabilize sick and injured patients before an ambulance arrives (first responders). All of the volunteer fire departments in the county are dedicated to fire prevention, and use their resources to educate the public to reduce the threat of the fire hazard, especially in the wildland/urban interface. Fire prevention professionals throughout the county have taken the lead in providing many useful and educational services to Polk County residents, such as:

- Home fire safety inspection;
- Assistance developing home fire escape plans;
- Business inspections;
- Free smoke detectors to residents who qualify;
- Fire extinguisher operation classes;
- School, church, and civic group fire safety education presentations;
- Fire cause determination;
- Counseling for juvenile fire-setters;
- Teaching fire prevention in schools;
- Conducting CPR classes;
- Teaching proper use of fire extinguishers;
- Coordinating educational programs with other agencies, hospitals, and schools; and
- Answering citizens' questions regarding fire hazards.

Countywide Outdoor Burning Bans

Should any part of the State of Texas experience extended periods of fair, windy weather, the implementation of a countywide ban on outdoor burning may be advised as a wildfire prevention tool in that area. TFS recommends that local governments consider a KBDI of 500 and above for imposition of burn bans. The Cities of Livingston, Corrigan, and Onalaska have a city ordinance prohibiting all outdoor burning inside of the city limits.

Polk County policy for burn bans is as follows: KBDI of 500 or more, a recommendation from the TFS and recommendations from local fire departments. Once a ban is in place it is reviewed weekly to determine the status of the ban. At the fire departments' recommendation, the ban is lifted.

The Office of Emergency Management alerts residents and business when the National Weather Service issues a Fire Weather Warning by posting the warning on the Polk County Office of Emergency Management's website at www.polkcountyoem.com, the Polk County Emergency Management Facebook page at www.facebook.com/PolkCountyEmergencyManagement, and Polk CountyToday at www.polkcountytoday.com, and through Polk County's emergency alert system (AlertMePolkCounty).

The following is an Outdoor Burn Bans map made available on the Texas Forest Service website.

Burn bans are strictly enforced by the County Fire Marshal, Constables and the County Sheriff's Department. Normally on the first offense a warning is issued, second offense a ticket is issued; third offense could mean jail time and a fine. Penalty for violation of a burn-ban order is a $1,000 fine and/or up to six (6) months in jail or both.

THE MAIN GOAL OF THESE BURN BANS IS TO LIMIT OR RESTRICT OUTDOOR BURNING TO PREVENT WILDFIRES!

Polk County Community Wildfire Protection Plan

The Polk County Community Wildfire Protection Plan not only prioritizes long-term goals, it also outlines immediate steps homeowners and businesses can take to protect their homes and communities from wildfires. The Polk County Community Wildfire Protection Plan ("CWPP") was signed into effect by the Texas Forest Service on May 24, 2011. The following projects are addressed in the CWPP.

Media Program

- A comprehensive media program will be developed to systematically schedule and provide information to the public about the dangers of wildfires, how to prevent them and what to do if their home is threatened by one.

CWPP Projects

- Develop a countywide mapping system of emergency water locations to determine areas without water sources for volunteer fire departments.
- Provide water sources to areas identified as fire critical. This may consist of dry hydrants, fire hydrants on existing waterlines or storage tanks located in remote forested areas.
- Provide fire lanes for residential areas by mulching the areas between forests and subdivisions. This will be done by the pre-established ranking chart above.
- Provide GIS maps that identify narrow rural roads or roads with bridges that may not allow fire suppression apparatus to navigate.
- Install signs countywide to indicate locations of rural water supplies for mutual aid partners and identify roads inaccessible to fire suppression apparatus.

The Polk County Community Wildfire Protection Plan was collaboratively developed by interested parties, and federal land management agencies managing land in the vicinity of Corrigan, Leggett, Livingston, Onalaska and Goodrich have been consulted. The CWPP identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect the rural areas of Polk County and the incorporated cities of Corrigan, Leggett, Livingston, Onalaska and Goodrich. It also recommends measures to reduce the ignitability of structures throughout the area addressed by the CWPP.

APPENDIX G. HAZARD REPORTS, ARTICLES, AND DATA

Hazard Mitigation Project reports are to be prepared by or submitted to the local hazard mitigation officer at the start and completion of mitigation project implementation, or at various midpoints in the grant application, or implementation process. A template for this form is included on the following page.

Information collection during and after disaster occurrences is vital to mitigation planning and for coordination with state and federal emergency management officials. The following forms will be used to document damages following disasters are maintained on file by the local hazard mitigation officer and in this Appendix.

- Disaster Summary Outline (Form DEM-93 revised 4/2000), or updated equivalent form
- FEMA Disaster Housing Program: Preliminary Damage Assessment
- TDEM Public Property Site Assessment Worksheet