

# Trinity County Multi-Hazard Mitigation Plan

2019

"Under the Federal Disaster Mitigation Act of 2000 (DMA 2000 or "the Act"), Trinity County (County) is required to have a Federal Emergency Management Agency ("FEMA") - approved Local Hazard Mitigation Plan ("the Plan") in order to be eligible for certain pre- and post-disaster mitigation funds. Adoption of this Plan by the County and approval by FEMA will serve the dual objectives of providing direction and guidance on implementing hazard mitigation in the County, and qualify the County to obtain federal assistance for hazard mitigation. Solely to help achieve these objectives, the Plan attempts to systematically identify and address hazards that can affect the County. Nothing in this Plan is intended to be an admission, either expressed or implied, by or on behalf of the County, of any County obligation, responsibility, duty, fault or liability for any particular hazard or hazardous condition, and no such County obligation, responsibility, duty, fault or liability should be inferred or implied from the Plan, except where expressly stated."

## Table of Contents

Table of Contents .....	i
List of Figures .....	i
List of Tables.....	i
1. Introduction and Background.....	1
1) Participating Jurisdictions.....	1
2) Hazard Mitigation Plan History.....	1
Omission Statements.....	2
2. Planning Process.....	3
1) Existing Plans, Reports, Ordinances, and Technical Information Sources .....	6
2) Project Meetings .....	8
3) Public Input .....	8
4) Plan Maintenance.....	9
5) Plan Monitoring.....	10
6) Plan Evaluation .....	10
7) Plan Update.....	11
3. Determining Risk.....	13
1) Risk Assessment .....	13
2) Distribution of Property by Parcel Count and Potential Damage Values.....	13
3) Distribution of Vulnerable Populations .....	13
A) Age and Income.....	14
B) Vulnerability Maps.....	14
C) Low Income / Subsidized / Affordable Housing.....	24
City of Groveton .....	24
City of Trinity .....	24
Trinity County .....	24
D) Housing.....	24
Manufactured / Mobile Homes and Recreational Vehicles .....	24
Homes in Substandard Condition .....	25
4. Floods .....	26
1) Flood History .....	26

A)	National Flood Insurance Program .....	27
2)	Likelihood of Future Occurrence .....	28
3)	Extent .....	29
4)	Location and Impact .....	29
A)	Location – FEMA Special Flood Hazard Areas .....	29
B)	Impact .....	36
5)	Vulnerability .....	37
A)	Population .....	37
B)	Critical Facilities .....	37
C)	Infrastructure – US Highway 287 .....	38
D)	Vulnerable Parcels .....	38
5.	Hurricanes / Tropical Storms .....	40
1)	Hurricanes / Tropical Storms History .....	40
2)	Likelihood of Future Occurrence .....	41
3)	Extent .....	41
4)	Location and Impact .....	42
A)	Location .....	42
B)	Impact .....	42
5)	Vulnerability .....	42
A)	Population .....	42
B)	Infrastructure – US Highway 287 .....	43
C)	Critical Facilities .....	43
D)	Vulnerable Parcels .....	46
6.	Wildfire .....	47
1)	Wildfire History .....	47
2)	Likelihood of Future Occurrence .....	48
3)	Extent .....	48
4)	Location and Impact .....	49
A)	Location .....	49
B)	Impact .....	56
5)	Vulnerability .....	56
A)	Population .....	56

B)	Critical Facilities .....	57
C)	Vulnerable Parcels .....	57
7.	Tornado .....	59
1)	Tornado History .....	59
2)	Likelihood of Future Occurrence .....	60
3)	Extent .....	60
4)	Location and Impact .....	61
A)	Location .....	61
B)	Impact .....	61
5)	Vulnerability .....	61
A)	Population .....	61
B)	Critical Facilities .....	62
C)	Vulnerable Parcels .....	64
8.	Drought .....	65
1)	Drought History .....	67
2)	Likelihood of Future Occurrence .....	68
3)	Extent .....	68
4)	Location and Impact .....	71
A)	Location .....	71
B)	Impact .....	71
5)	Vulnerability .....	72
A)	Population .....	72
B)	Critical Facilities .....	72
C)	Vulnerable Parcels and Infrastructure .....	74
I.	Water and Wastewater Systems .....	74
II.	Road and Railroad Networks .....	74
III.	Agricultural Production .....	75
9.	Dam / Levee Failure .....	76
1)	Dam / Levee Failure History .....	76
2)	Likelihood of Future Occurrence .....	76
3)	Extent .....	76
4)	Location and Impact .....	79

A)	Location .....	79
B)	Impact .....	80
10.	Extreme Heat .....	81
1)	Extreme Heat History .....	81
2)	Likelihood of Future Occurrence .....	82
3)	Extent .....	82
4)	Location and Impact .....	84
A)	Location – All Jurisdictions.....	84
B)	Impact – All Jurisdictions .....	85
5)	Vulnerability .....	85
A)	Population .....	85
B)	Critical Facilities .....	85
11.	Hailstorm .....	86
1)	Hailstorm History.....	86
2)	Likelihood of Future Occurrence .....	87
3)	Extent .....	87
4)	Location and Impact .....	88
A)	Location .....	88
B)	Impact .....	88
5)	Vulnerability .....	89
A)	Population .....	89
B)	Critical Facilities .....	89
C)	Vulnerable Structures.....	90
12.	Severe Winter Storm .....	91
1)	Severe Winter Storm History .....	92
2)	Likelihood of Future Occurrence .....	93
3)	Extent .....	93
4)	Location and Impact .....	95
A)	Location – All Jurisdictions.....	95
B)	Impact – All Jurisdictions .....	95
1)	Vulnerability .....	96
A)	Infrastructure .....	96

B)	Population .....	96
C)	Critical Facilities .....	97
13.	Windstorm .....	99
1)	Windstorm History .....	99
2)	Likelihood of Future Occurrence .....	100
3)	Extent .....	100
4)	Location and Impact .....	102
A)	Location .....	102
B)	Impact .....	102
5)	Vulnerability .....	102
A)	Population .....	102
B)	Critical Facilities .....	103
A)	Vulnerable Parcels .....	105
14.	Lightning .....	106
1)	Lightning History .....	106
2)	Likelihood of Future Occurrence .....	107
3)	Extent .....	107
4)	Location and Impact .....	108
A)	Location .....	108
B)	Impact .....	108
5)	Vulnerability .....	108
A)	Critical Facilities .....	108
B)	Vulnerable Parcels .....	109
15.	Mitigation Strategy .....	110
1)	Capability Assessment .....	110
2)	Goals and Objectives Overview .....	112
3)	Long-term vision .....	112
4)	Goals .....	112
A)	Goal 1: To reduce loss of life and injury to persons .....	112
B)	Goal 2: To reduce disruptions to essential public services and infrastructure .....	113
C)	Goal 3: To reduce economic impacts to individuals, businesses, and area institutions .....	113
D)	Goal 4: To reduce losses to civic, cultural, and environmental resources .....	113

5)	Mitigation Action Plan .....	114
	Mitigation Action Prioritization .....	114
	Incorporation and Integration of Existing Capabilities and Hazard Mitigation .....	115
6)	Mitigation Actions by Jurisdiction and by Hazard .....	117
A)	Trinity County .....	118
	Multi-Hazard Actions .....	118
	Single Hazard Actions .....	121
B)	City of Groveton .....	124
	Multi-Hazard Actions .....	124
	Single Hazard Actions .....	127
C)	City of Trinity .....	128
	Multi-Hazard Actions .....	128
	Single Hazard Actions .....	130

## List of Figures

Figure 1: Trinity County Age Distribution by Census Block, Under 18 .....	15
Figure 2: Trinity County Age Distribution by Census Block, 65+ .....	16
Figure 3: Trinity County Income Distribution by Census Blockgroup, Under 25K.....	17
Figure 4: City of Groveton Age Distribution by Census Blockgroup, Under 17 .....	18
Figure 5: City of Groveton Age Distribution by Census Block Group, 65+ .....	19
Figure 6: City of Groveton Income Distribution by Census Blockgroup.....	20
Figure 7: City of Trinity Age Distribution by Census Block, Under 18 .....	21
Figure 8: City of Trinity Age Distribution by Census Block, 65+ .....	22
Figure 9: City of Trinity Income Distribution by Census Blockgroup, Under 25K.....	23
Figure 10: Trinity County FEMA Special Flood Hazard Areas .....	31
Figure 11: FEMA Special Flood Hazard Areas, City of Groveton .....	32
Figure 12: FEMA Special Flood Hazard Areas Land Use, City of Groveton .....	33
Figure 13: FEMA Special Flood Hazard Areas, City of Trinity .....	34
Figure 14: FEMA Special Flood Hazard Areas Land Use, City of Trinity .....	35
Figure 15: Trinity County Wildland Urban Interface.....	50
Figure 16: Trinity County Land Use Types in Wildland Urban Interface .....	51
Figure 17: City of Groveton Wildland Urban Interface .....	52
Figure 18: City of Groveton Land Use Types in Wildland Urban Interface .....	53
Figure 19: City of Trinity Wildland Urban Interface .....	54
Figure 20: City of Trinity Land Use Types in Wildland Urban Interface .....	55
Figure 21: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types.....	66
Figure 22: Trinity County Drought Conditions 2000 - Present.....	67
Figure 23: Trinity County Dam Locations.....	79
Figure 24: Maximum Recorded Daily Temperature 2000-2018 .....	81
Figure 25: NOAA's NWS Heat Index Chart .....	83
Figure 26: Minimum Recorded Daily Temperature, 2000-2017.....	92
Figure 27: NWS Wind Chill Index.....	95



## List of Tables

Table 1: Plan Schedule .....	5
Table 2: Plan Data Sources – In Alphabetical Order .....	6
Table 3: Local Stakeholders Contacted .....	7
Table 4: Maintenance Responsibility .....	9
Table 5: Estimated Values by Location .....	13
Table 6: Vulnerable Populations by Jurisdiction .....	14
Table 7: Trinity County Flood History .....	26
Table 8: City of Groveton Flood History .....	26
Table 9: City of Trinity Flood History .....	26
Table 10: NFIP Policy Statistics (As of July 31, 2018) .....	27
Table 11: NFIP Policy Loss Statistics (As of July 31, 2018) .....	28
Table 12: Vulnerable Parcels by Flood Zone in the City of Groveton .....	38
Table 13: Vulnerable Parcels by Flood Zone in the City of Trinity .....	38
Table 14: Historical Hurricanes & Tropical Storms that affected Trinity County and the Participating Jurisdictions.....	40
Table 15: Saffir-Simpson Scale .....	41
Table 16: Trinity County Critical Facilities Vulnerable to Hurricanes and Tropical Storms.....	44
Table 17: Estimated Potential Damage Values by Jurisdiction .....	46
Table 18: Trinity County Wildfire History .....	47
Table 19: Characteristic Fire Intensity Scale .....	48
Table 20: National Wildfire Coordinating Group Size Class of Fire.....	48
Table 21: Trinity County Critical Facilities Vulnerable to Wildfire .....	57
Table 22: Trinity County Parcels Vulnerable to Wildfire.....	57
Table 23: City of Groveton Parcels Vulnerable to Wildfire .....	58
Table 24: City of Trinity Parcels Vulnerable to Wildfire.....	58
Table 25: Trinity County Tornado History .....	59
Table 26: City of Groveton Tornado History .....	59
Table 27: City of Trinity Tornado History .....	59
Table 28: Enhanced Fujita Scale.....	60
Table 29: Trinity County Critical Facilities Vulnerable to Tornadoes .....	63
Table 30: Parcels Vulnerable to Tornadoes .....	64
Table 31: Drought Classifications.....	65
Table 32: Trinity County 2013 CHAMPS Report and NCEI Drought Data .....	68
Table 33: Palmer Drought Index .....	70
Table 34: Palmer Drought Category Descriptions.....	70
Table 35: Trinity County Critical Facilities Vulnerable to Drought.....	73
Table 36: Estimated Potential Damage Values in Trinity County .....	74
Table 37: Dam Failure Extent Classification.....	76
Table 38: National Inventory of Dams in Trinity County.....	77

Table 39: Heat Intensity .....	83
Table 40: Trinity County Hailstorm History.....	86
Table 41: City of Groveton Hailstorm History .....	86
Table 42: City of Trinity Hailstorm History .....	86
Table 43: Hailstorm Intensity' .....	87
Table 44: Trinity County Critical Facilities Vulnerable to Hailstorms.....	89
Table 45: All Parcels Vulnerable to Hailstorms .....	90
Table 46: Commercial Parcels Vulnerable to Hailstorms.....	90
Table 47: Winter Weather Extent Scale.....	93
Table 48: Critical Facilities Vulnerable to Winter Storms .....	97
Table 49: Trinity County Windstorm History .....	99
Table 50: City of Groveton Windstorm History .....	99
Table 51: City of Trinity Windstorm History .....	100
Table 52: Beaufort Wind Scale.....	100
Table 53: Critical Facilities Vulnerable to Windstorms and Potential Impacts.....	104
Table 54: Parcels Vulnerable to Windstorms.....	105
Table 55: Trinity County Lightning History.....	106
Table 56: Lightning Activity Levels .....	107
Table 57: Trinity County Critical Facilities .....	108
Table 58: Parcels Vulnerable to Lightning.....	109
Table 59: Capability Assessment by Jurisdiction.....	110
Table 60: Plan Integration.....	115
Table 61: Integration Process .....	116

# 1. Introduction and Background

## 1) Participating Jurisdictions

The Trinity County Multi-Hazard Mitigation plan includes three participating jurisdictions: Trinity County, the City of Groveton, and the City of Trinity.

## 2) Hazard Mitigation Plan History

Trinity County, the City of Groveton, and the City of Trinity have never participated in a Hazard Mitigation Plan before.

The mitigation planning regulation of the Disaster Mitigation Act<sup>1</sup> requires that mitigation plans be reviewed and updated every five years to maintain eligibility for mitigation grant funding. As part of this plan, Trinity County will develop a schedule to ensure that its hazard mitigation plan isn't allowed to lapse in the future.

Hazard	Jurisdiction		
	Trinity County	City of Groveton	City of Trinity
Flood	x	x	x
Hurricanes / Tropical Storms	x	x	x
Wildfire	x		
Tornados	x	x	x
Drought	x		x
Riverine Erosion			
Dam Failure	x		
Earthquakes			
Expansive Soils			
Extreme heat	x		
Hailstorms	x		
Land Subsidence			
Severe Winter Storms	x		

---

<sup>1</sup> 44 CFR §201.6(d)(3)

Windstorms	x	x	x
Lightning	x		

*Omission Statements*

Trinity County determined that any damages associated with Riverine Erosion, Earthquakes, Expansive Soils, and Land Subsidence are likely to be negligible and therefore aren't addressing those hazards.

The City of Groveton determined that any damages associated with Wildfire, Drought, Riverine Erosion, Dam Failure, Earthquakes, Expansive Soils, Extreme Heat, Hailstorms, Land Subsidence, Severe Winter Storms, and Lightning are likely to be negligible and therefore aren't addressing those hazards.

The City of Trinity determined that any damages associated with Wildfire, Riverine Erosion, Dam Failure, Earthquakes, Expansive Soils, Extreme Heat, Hailstorms, Land Subsidence, Severe Winter Storms, and Lightning are likely to be negligible and therefore aren't addressing those hazards.

## 2. Planning Process

The Trinity County Hazard Mitigation Plan is a multi-jurisdiction plan. Representatives to the local planning team were selected by each jurisdiction. Planning team members represented the following offices and departments:

Title	Agency or Department
County Judge	County
County Commissioner	County
County Auditor	County
Mayor	City of Groveton
Police Chief/Acting City Manager	City of Trinity

Once the planning team was established, members developed a schedule with specific goals and proposed meeting dates over the planning period.

Hazard mitigation planning team (HMPT) members contributed to the following activities throughout the planning process:

1. Providing technical assistance and necessary data to the HMPT.
2. Scheduling, coordinating, and facilitating community meetings.
3. Providing necessary materials for public planning meetings.
4. Collecting and analyzing data.
5. Developing mitigation goals and implementation strategies.
6. Preparing the first draft of the plan and providing technical writing assistance for review, editing, and formatting.

Each member of the HMPT participated in the following activities associated with development of the plan:

1. Identifying, contacting, coordinating, and implementing input from stakeholders.
2. Attending, conferencing in, or providing meeting support and information for regular HMPT meetings.
3. Identifying hazards and estimating potential losses from future hazard events.
4. Developing and prioritizing mitigation actions to address identified risks.
5. Coordinating public meetings to develop the plan.
6. Identifying community resources available to support planning effort.

7. Submitting proposed plan to all appropriate departments for review and comment, and working with the city to incorporate the resulting comments into the proposed plan.

Table 1: Plan Schedule

Timeline														
Planning Tasks	April	May	June	July	August	September	October	November	December	January	February	March	April	Completion
Organize Resources and Identify Planning Team														
Create Outreach Strategy														
Review Community Capabilities														
Conduct Risk Assessment														
Identify Mitigation Goals and Actions														
Develop Action Plan for Implementation														
Identify Plan Maintenance Procedures														
Review Final Draft														
Submit Plan to State and FEMA														
Adopt Plan														

Meetings	April	May	June	July	August	September	October	November	December	January	February	March	April	Completion
Planning Team														4/9/2018 9/26/2018 12/4/2018
Public Outreach														4/9/2018 9/26/2018 12/4/2018
Stakeholder Outreach														August 2018 – November 2018

## 1) Existing Plans, Reports, Ordinances, and Technical Information Sources

Each planning team member worked to collect and provide the input and information necessary to develop the hazard mitigation strategy. Research was coordinated and conducted by local planning team members. The local planning team reviewed the following documents during the planning process:

Table 2: Plan Data Sources – In Alphabetical Order

Data Source	Data Incorporation	Purpose
City of Groveton Building Code Adoption Ordinance	Building code requirements	Identifying building code requirements and opportunities to increase ordinance enforcement to reduce hazard impacts.
City of Groveton Dilapidated or Unsafe Building Abatement Ordinance	Building maintenance requirements	Identifying building condition requirements and opportunities to increase ordinance enforcement to reduce hazard impacts.
City of Groveton Flood Damage Prevention Ordinance	Flood damage prevention building requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Groveton Junked, Wrecked, and Dismantled Vehicles Ordinance	Nuisance abatement capabilities as they relate to junked and abandoned vehicles	Identify opportunities to increase abatement enforcement to reduce hazard threats
City of Groveton Subdivision Ordinance	Subdivision requirements and restrictions	Identifying development restrictions to limit future hazard exposure
City of Groveton Water Conservation Plan Ordinance	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact.
City of Groveton Weed Ordinance	Weed and stagnant water abatement capabilities	Identify opportunities to reduce floodborne pollutants or debris; and clearing debris that could contribute to wildfires.
City of Trinity Building Code Adoption Ordinance	Building code requirements	Identifying building code requirements and opportunities to increase ordinance enforcement to reduce hazard impacts.
City of Trinity Comprehensive Plan	City of Trinity plan for future growth and development	Identifying locations of expected growth, future development types, and land use changes
City of Trinity Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact.
City of Trinity Flood Damage Prevention Ordinance	Flood damage prevention building requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Trinity Mobile Homes and Manufactured Homes Ordinance	Mobile and manufactured housing requirements	Identify opportunities to reduce hazard risks for manufactured homes
City of Trinity NIMS Adoption Ordinance	Incident response capabilities	Identify opportunities for incident management
City of Trinity RV, Trailer, Motorhomes, and other Mobile Structures Ordinance	RV, Trailer, Motor Homes, and other mobile structures requirements	Identify opportunities to reduce hazard risks for mobile structures
Trinity County Junkyard Ordinance	Nuisance abatement capabilities as they relate to junkyards	Identify opportunities to increase abatement enforcement to reduce hazard threats



Trinity County Subdivision Ordinance	Subdivision requirements and restrictions	Identifying development restrictions to limit future hazard exposure
Federal Emergency Management Agency (FEMA) DFIRM Flood Zones	Flood zone maps	GIS mapping of flood zones
International Building Code	Building standards and best practices	Identifying opportunities to improve structural resiliency by updating current building codes.
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences, damage dollars, and mapping for all hazards
National Dam Inventory	Dam information	High-hazard dam list
National Flood Insurance Program	NFIP Policy and Loss Data	Identifying NFIP policies in force, paid losses, and repetitive and severe repetitive loss property data.
State of Texas Hazard Mitigation Plan 2013 Update	Hazard Descriptions	Official descriptions of hazards and their potential impacts
Texas Forest Service-Texas Wildfire Risk Assessment Summary Report	Wildfire Threat and Urban Interface	Mapping and wildfire vulnerability data
Texas State Data Center	Population and demographics	Population counts, parcel data, and land use data
Trinity County 2013 CHAMPS Report	Natural hazard data	Review previously compiled natural hazard histories.
Trinity County Appraisal Data	Population and demographics	Population counts, parcel data, and land use data

Additional information sources included: USDA Census of Agriculture, United States Geological Survey, Vaisala, and specific details about previous natural hazard events from planning team participants, the Emergency Management Coordinator in particular. Sources are noted throughout the document. Report titles and links to the most recently accessed websites hosting the related information are also noted, where appropriate.

Area stakeholders contacted to participate in the planning process included the following offices and departments within the participating jurisdictions and neighboring jurisdictions:

**Table 3: Local Stakeholders Contacted**

Stakeholder	Title	Participated
Houston County	Emergency Management Coordinator	Y
Polk County	Emergency Management Coordinator	Y
Angelina County	Emergency Management Coordinator	Y
Walker County	Emergency Management Coordinator	N

Area stakeholders were contacted by phone and email. The planning team collected valuable information relevant to the planning process from three of the stakeholders it contacted. That information was especially helpful in terms of identifying specific mitigation actions for each of the hazards the plan addresses.

## 2) Project Meetings

The planning team met on three separate occasions. Additional communication was regularly carried out via email and over the phone.

The first planning team meeting was held on April 9, 2018. During this meeting, the planning team decided which hazards needed to be addressed in the mitigation plan and which were not relevant. To make these decisions, a hazard handout was produced to show previous occurrences of each hazard, associated deaths and injuries, and total dollar damages.

The team agreed to use the collected hazard data, as the foundation for its hazard risk assessment and ongoing research into hazard extent, impact, and vulnerability.

At the end of the meeting, planning team members were tasked with reviewing the location of dams within the county and proposed critical facilities. Planning team members also agreed to compile relevant data, including city ordinances, and begin identifying critical facilities.

The second planning team meeting was held on September 26, 2018. Prior to the meeting, planning team members were provided with additional information about the meeting's scope based on the information the team had gathered between meetings.

To stay on schedule, the planning team needed to meet five objectives: Collect outstanding ordinances and other plan data sources, review and approve the critical facilities list, review and approve the area stakeholders list, and create a plan to identify mitigation actions for each of the hazards.

The planning team met its objectives.

The final planning team meeting was held on December 4, 2018. The team's primary goal was to identify specific mitigation actions for each jurisdiction's set of hazards. The planning team also reviewed the plan draft, discussed final changes and reviewed the plan submission process in preparation of submitting the plan for official review on April 12th, 2019 (TBD).

## 3) Public Input

Members of the public were invited to attend three public hearings to provide input and feedback during the planning process. The first two public hearings were advertised in the primary local paper, the *Groveton News*, at least 72 hours in advance, and the public hearing information was posted on Trinity County's official website for the final planning team meeting.

In an effort to provide an open process and collect any missing information related to hazard history, vulnerability, and impact, members of the public were given the opportunity to review an in-progress draft of the plan at the second meeting. The public was also given an opportunity

to review and comment on the final draft at the third public hearing before it was submitted for the formal review process on April 12th, 2019 (TBD).

One person attended the public hearing on September 26<sup>th</sup>, 2018. He was a former dentist looking for an Emergency Management position or project. He contributed valuable public input for the plan. No other persons attended the public hearings.

#### 4) Plan Maintenance

The hazard mitigation plan is not a static document. As conditions change and mitigation actions are implemented, the plan will need to be updated to reflect new and changing conditions in each jurisdiction.

The planning team has identified specific departments to oversee action implementation in each jurisdiction. The planning team has also identified potential funding sources and an implementation timeframe for each mitigation action. The expected timeframes will be an important component in determining whether or not actions are implemented efficiently. The departments or persons identified for each jurisdiction include but are not limited to:

Table 4: Maintenance Responsibility

Title	Agency or Department
County Judge	County
County Commissioner	County
County Auditor	County
Mayor	City of Groveton
Police Chief/Acting City Manager	City of Trinity

Within one year of adoption of this plan, each department or agency will review and, as appropriate, integrate implementation of their respective mitigation actions with their existing internal plans and policies relating to capital improvements, land use, design and construction, and emergency management.

On a biannual basis, representatives from each jurisdiction serving as the planning team will evaluate progress on implementing the plan's mitigation actions. The planning team will review departmental / agency findings, public input, and future development plans to evaluate the effectiveness and appropriateness of the plan.

In light of changing funding sources, hazard vulnerability, and local mitigation priorities, the planning team will identify changes to plan goals and priorities for their respective jurisdictions,

and they will report their findings to the rest of the planning team. It will be the planning team's responsibility to identify relevant reasons for delay or obstacles to completing the plan's mitigation actions, along with recommended strategies to overcome any deficiencies.

Any significant change to the plan, including but not limited to changing mitigation actions, abandoning mitigation actions, or pursuing new mitigation actions, will require the County and participating jurisdictions to provide opportunities for the public to make its views and concerns known. Trinity County and the participating jurisdictions will provide notice to the public through announcements in the local paper, fliers posted at city hall, and on the city's website.

## **5) Plan Monitoring**

The County Judge, in his role as Emergency Management Director (EMD), will be responsible for the overall continued coordination and monitoring of the mitigation plan and the actions assigned for each hazard. The agency or department identified above in Table 4 shall serve as the responsible party for each respective jurisdiction. The plan monitoring worksheet outlined below will serve as the basis for revision of the plan.

At a minimum, the mitigation plan will be reviewed by the EMD and planning team representatives from each jurisdiction quarterly, during budget workshops, and as other plans are being developed or revised including: comprehensive plans, capital improvement project plans, and emergency plans.

To execute the monitoring requirement, the EMD will produce a plan monitoring worksheet to be completed by each jurisdiction's representative. The worksheet will identify and track the following for each mitigation action: the expected implementation schedule, setbacks or delays, changes to the local risk assessment, changes in jurisdictional capabilities, and current and future opportunities for integration with other local plans.

Regularly monitoring the plan implementation process in each participating jurisdiction will ensure that every component of the plan gets reviewed for potential amendments.

After adoption of this plan, it will be posted to each participating jurisdiction's website or Facebook page, and a printed copy will be available for review in the Office of Emergency Management and/or County Judge's office. The goal is to create the opportunity for constant and continued feedback from local officials, stakeholders, and the general public.

## **6) Plan Evaluation**

Proper evaluation will measure the progress and effectiveness of the mitigation actions identified in the plan. On a bi-annual basis the Emergency Management Coordinator or County Judge along with the planning team representatives from each jurisdiction will use the following criteria, along with additional metrics as necessary, to assess the effectiveness of the plan:

- Do the specified goals and objectives still address current and expected conditions?
- Has the nature, magnitude, and/or risk of any hazard changed?
- Have there been changes in land development that the plan needs to address?
- Are available resources suitable for implementing the plan?
- Is funding budgeted or available to successfully implement prioritized mitigation actions?
- Are there opportunities in the local budgeting process or local, state, and national grant funding cycles to increase funding to implement mitigation actions?

Other steps will include site visits to completed mitigation projects in each jurisdiction to measure and ensure their success. In the event that a mitigation project fails to meet its goal, the planning team will evaluate the causes of the shortcoming. The planning team will use their assessment to amend the project and related projects in other jurisdictions, allocate additional resources to achieve the desired outcome for the project and related projects in other jurisdictions, or replace the project and similar projects in other jurisdictions with better projects.

The planning team members will also work to implement any additional revisions required to ensure that the plan and their respective jurisdiction is in full compliance with federal regulations and state statutes.

## 7) Plan Update

The plan is designed to address a five-year period. In accordance with 44CFR Section 201.6, it will be updated every five years to maintain compliance with State and Federal regulations. However, at least every two years from the date of approval, and quarterly on the fifth and final year of the plan, the planning team representatives from each participating jurisdiction will thoroughly review any significant changes in their respective jurisdictions that might impact the plan update.

During the update process, planning team representatives will do the following for their respective jurisdictions: collect data on recent occurrences of each natural hazard identified in the plan, record how each natural hazard impacted their jurisdiction during the preceding years, determine whether or not implemented mitigation actions produced the desired outcomes in their jurisdiction, and determine whether or not to modify their jurisdiction's list of hazards to be addressed in the update.

Additional considerations to address on a jurisdictional level include but are not limited to: changes in local development, changes in exposure to natural hazards, the development of new mitigation capabilities or techniques, and revisions to state or federal legislation.

The update process will provide continued opportunity for the public and elected officials to determine which actions succeeded, failed, or are no longer relevant. It is also an opportunity for each jurisdiction to identify recent losses due to natural hazards and to consider whether or not any of those losses could have been avoided.

### 3. Determining Risk

Risk is often portrayed as a function of probability/frequency and consequences/impacts.

#### 1) Risk Assessment

Throughout the plan, each hazard addressed will be considered in light of its history, likelihood of future occurrence, extent, jurisdictional vulnerability, location and impact.

**Likelihood of Future Occurrence** is measured based on a hazard’s expected frequency of occurrence in light of its previous frequency. Each hazard’s likelihood of occurrence will be considered using the following standardized parameters:

- **Highly likely** – event probable in the next year
- **Likely** – event probable in the next three years
- **Occasional** – event possible in the next five years
- **Unlikely** – event possible in the next 10 years

Given this plan’s five-year duration, hazards likely to occur during that period will be given priority when selecting and prioritizing mitigation actions.

#### 2) Distribution of Property by Parcel Count and Potential Damage Values

Table 5: Estimated Values by Location

Category	Trinity County	Groveton	Trinity
Total Housing Units <sup>2</sup>	8,753	597	1,401
Housing Unit Density (per sq. mile)	12	230	368
Median Housing Value <sup>3</sup>	\$78,000	\$74,000	\$55,300
Estimated Value of Housing Units <sup>4</sup>	\$682,734,000	\$44,178,000	\$77,475,300

#### 3) Distribution of Vulnerable Populations

The planning team identified a set of indicators it could use to identify each jurisdiction’s vulnerable population. The indicators include demographic data like age and income, as well as

<sup>2</sup> Table B25001 2012-2016 ACS Housing unit information for Trinity County includes totals for cities and unincorporated areas.

<sup>3</sup> Table B25077 2012-2016 ACS

<sup>4</sup> Total value of housing units derived from median value multiplied by number of units

geographic data including the location of low income or subsidized housing units, concentrations of manufactured and mobile homes, and concentrations of homes in substandard condition.

*A) Age and Income*

Trinity County’s population was broken down into three categories: young residents, elderly residents, and low-income residents. Residents falling into these categories were deemed most likely to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

Table 6: Vulnerable Populations by Jurisdiction

Jurisdiction	Estimated Vulnerable Population Totals		
	Young <sup>5</sup>	Elderly <sup>6</sup>	Extremely Low Income (≤ \$25,000 Annually) <sup>7</sup>
Trinity County	3,145	3,382	5,029
City of Groveton	327	225	537
City of Trinity	833	471	1,455

*B) Vulnerability Maps*

<sup>5</sup> Table S1401, 2011-2015 ACS, nursery school through high school totals.

<sup>6</sup> Table DP-1, 2010 Census, used to estimate current 65+ population

<sup>7</sup> <https://www.huduser.gov/portal/datasets/il/il2018/2018summary.odn>- Family of 4 income ≤ \$25,100 – For clarity and approximate alignment with ACS data rounded to nearest \$1,000. Household size selected as best approximation of average household size throughout Trinity County. Income Earned for Households per jurisdiction from Table B19001, 2012-2016 ACS. Average household size from Table B25010, 2012-2016 ACS – Trinity Co. 2.61, City of Groveton 3.12, City of Trinity 2.67.



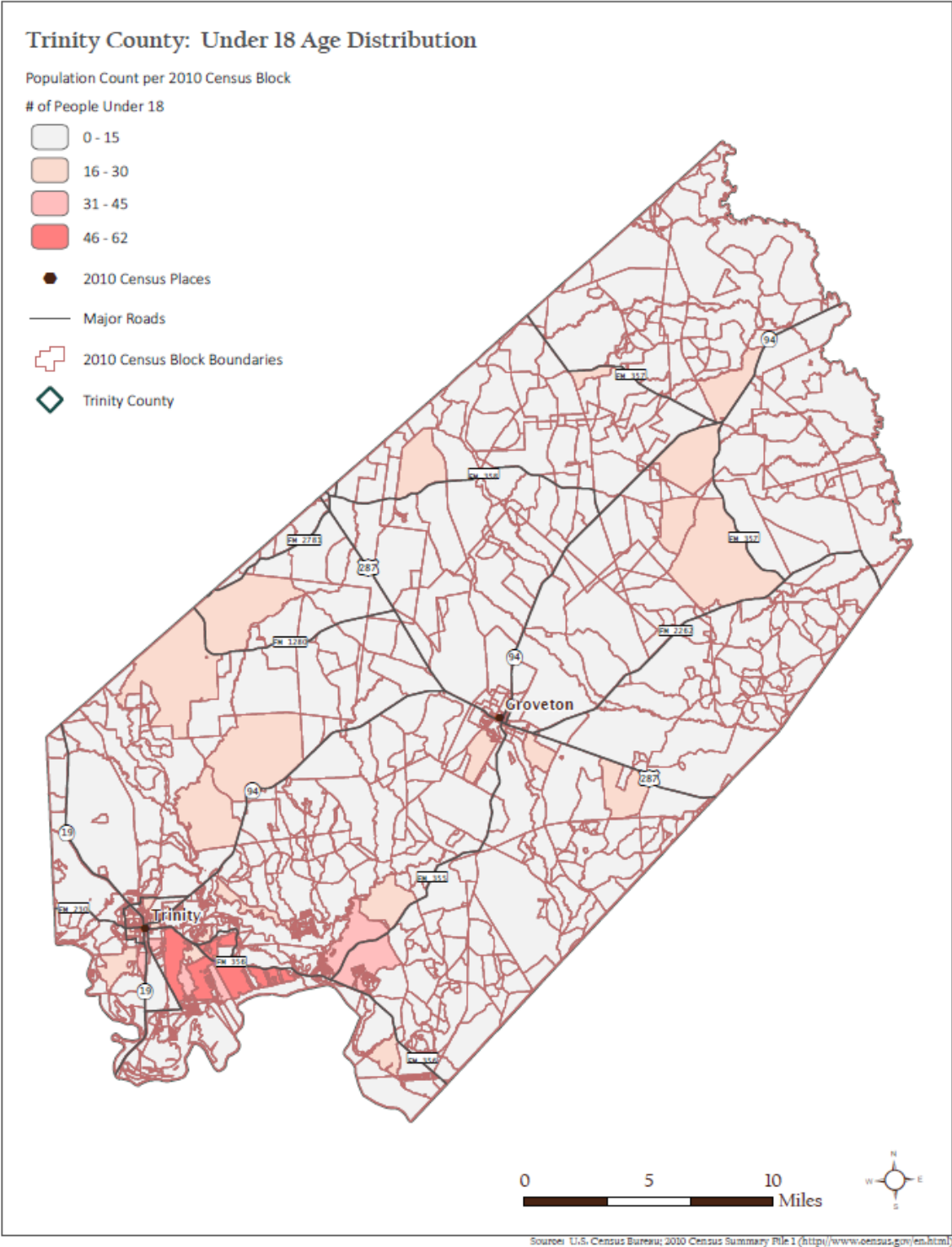
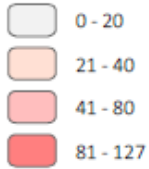


Figure 1: Trinity County Age Distribution by Census Block, Under 18

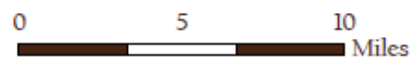
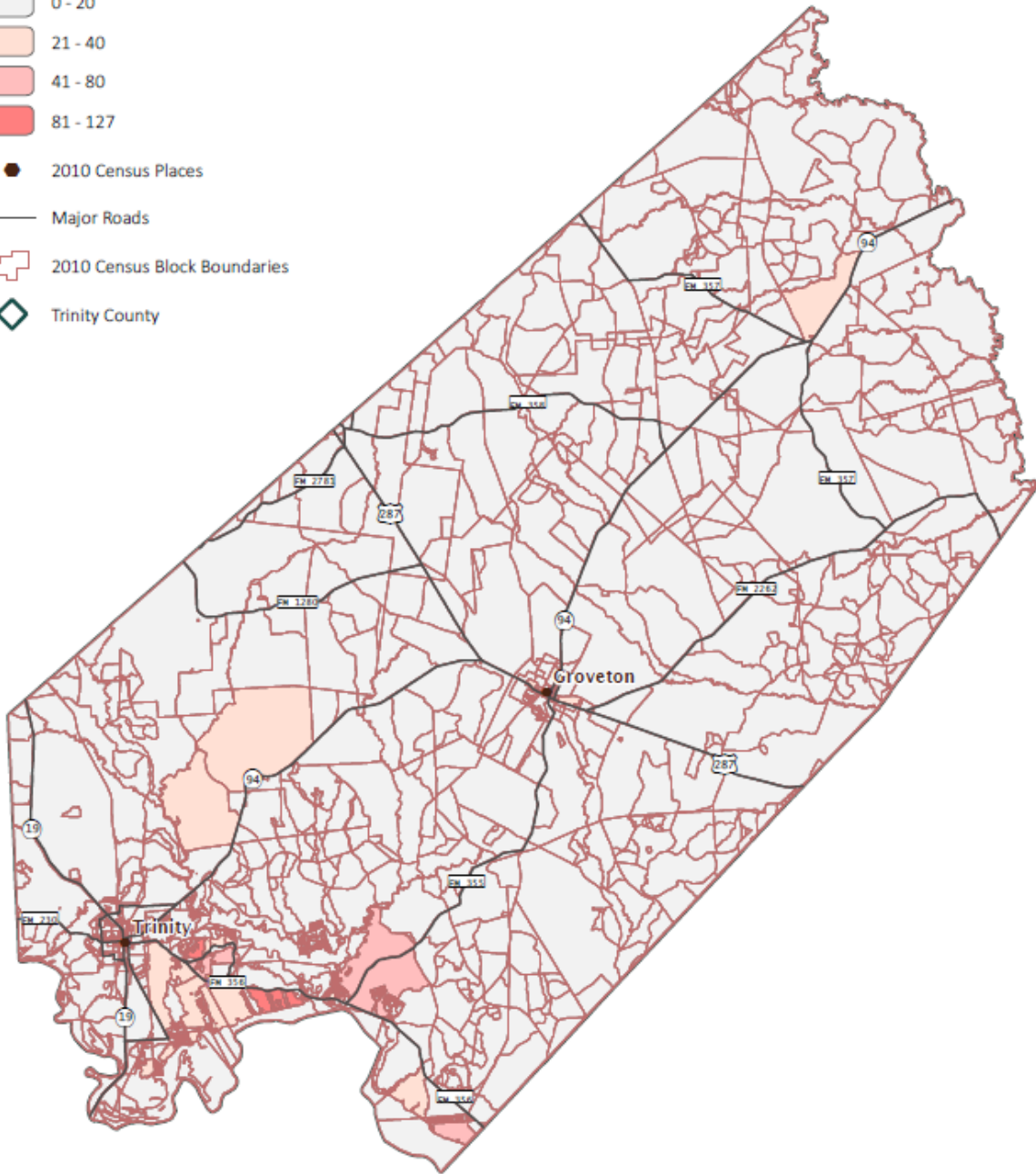
## Trinity County: 65 and Over Age Distribution

Population Count per 2010 Census Block

# of People 65 and Over



- 2010 Census Places
- Major Roads
- ⊕ 2010 Census Block Boundaries
- ◇ Trinity County



Sources: U.S. Census Bureau; 2010 Census Summary File 1 (<http://www.census.gov/en.html>)

Figure 2: Trinity County Age Distribution by Census Block, 65+

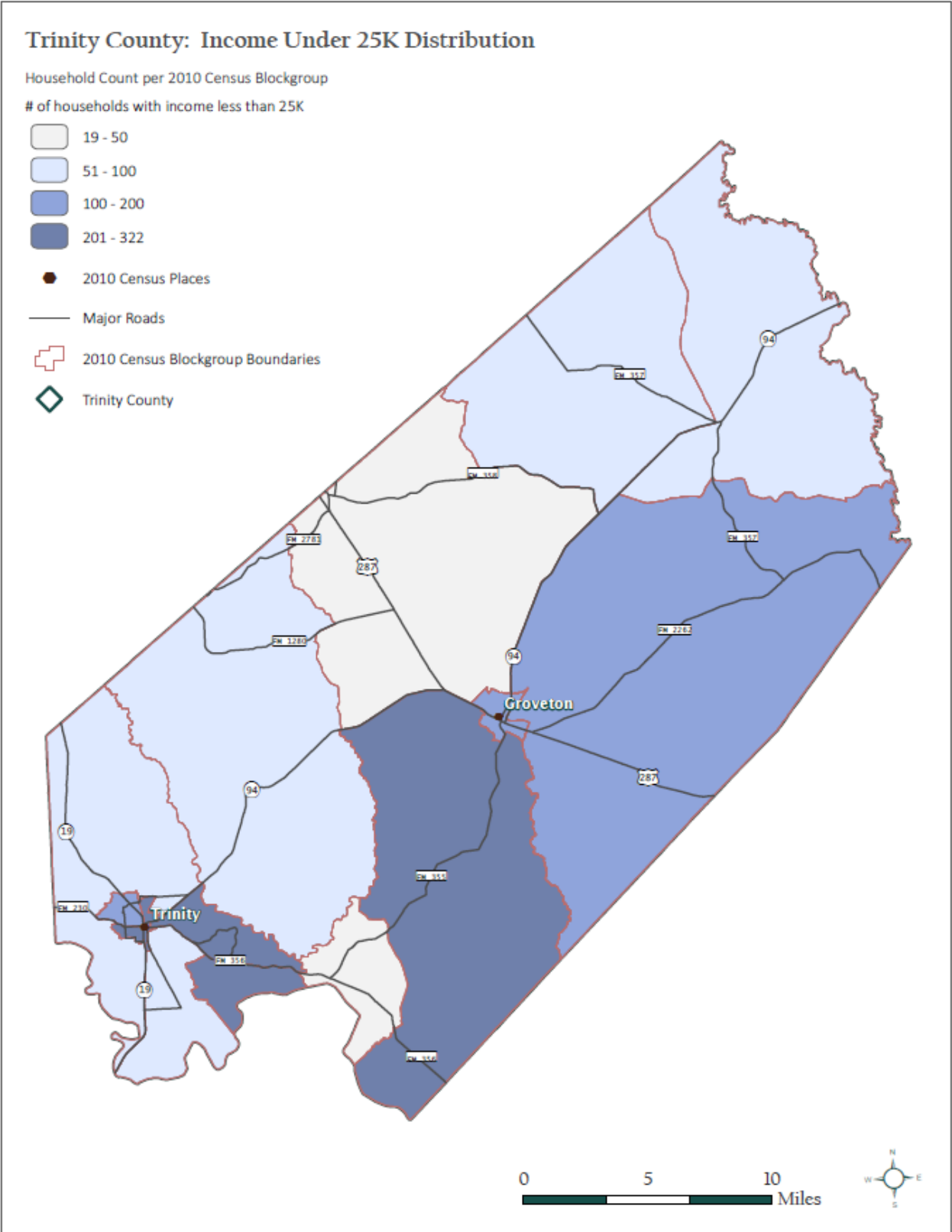


Figure 3: Trinity County Income Distribution by Census Blockgroup, Under 25K

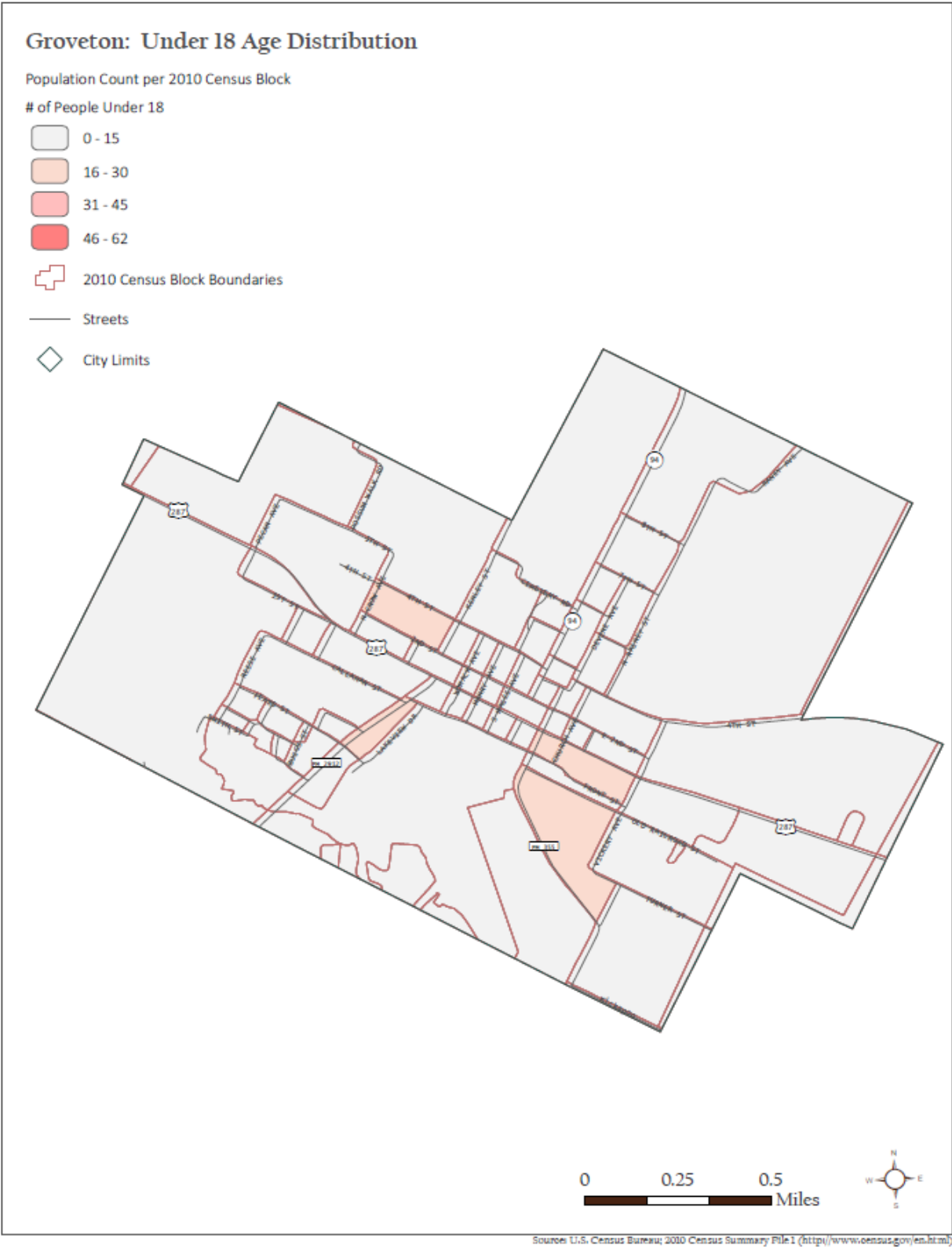


Figure 4: City of Groveton Age Distribution by Census Blockgroup, Under 17

### Groveton: 65 and Over Age Distribution

Population Count per 2010 Census Block

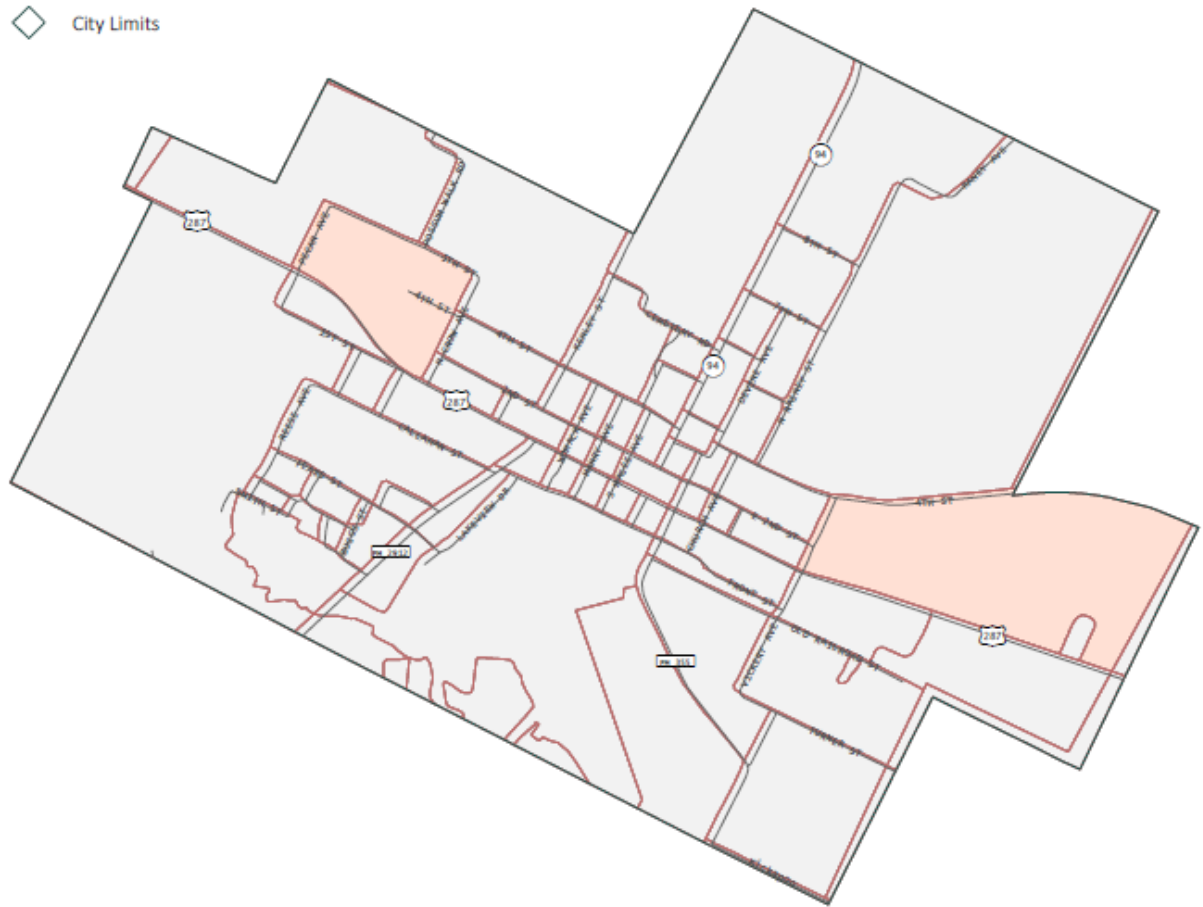
# of People 65 and Over

- 0 - 20
- 21 - 40
- 41 - 80
- 81 - 127

2010 Census Block Boundaries

Streets

City Limits



Source: U.S. Census Bureau; 2010 Census Summary File 1 (<http://www.census.gov/en.html>)

Figure 5: City of Groveton Age Distribution by Census Block Group, 65+

### Groveton: Income Under 25K Distribution

Household Count per 2010 Census Blockgroup

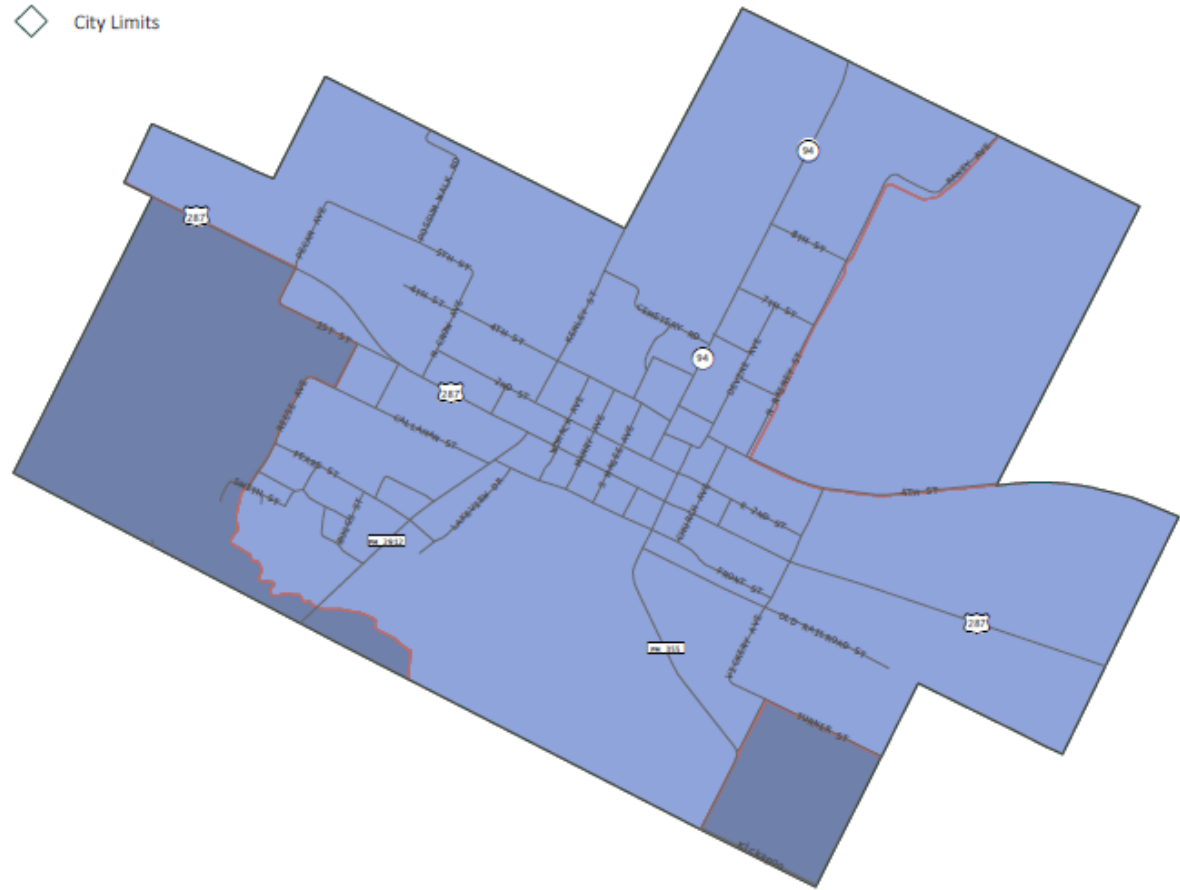
# of Households with Income Less than 25K

- 19 - 50
- 51 - 100
- 100 - 200
- 201 - 322

2010 Census Blockgroup Boundaries

Streets

City Limits



Sources: American Fact Finder; Table B19001 Household Income in the Past 12 Months, 2016 American Community Survey 5-Year Estimates (<https://factfinder.census.gov/faqs/nav/sf/pages/index.html>)

Figure 6: City of Groveton Income Distribution by Census Blockgroup

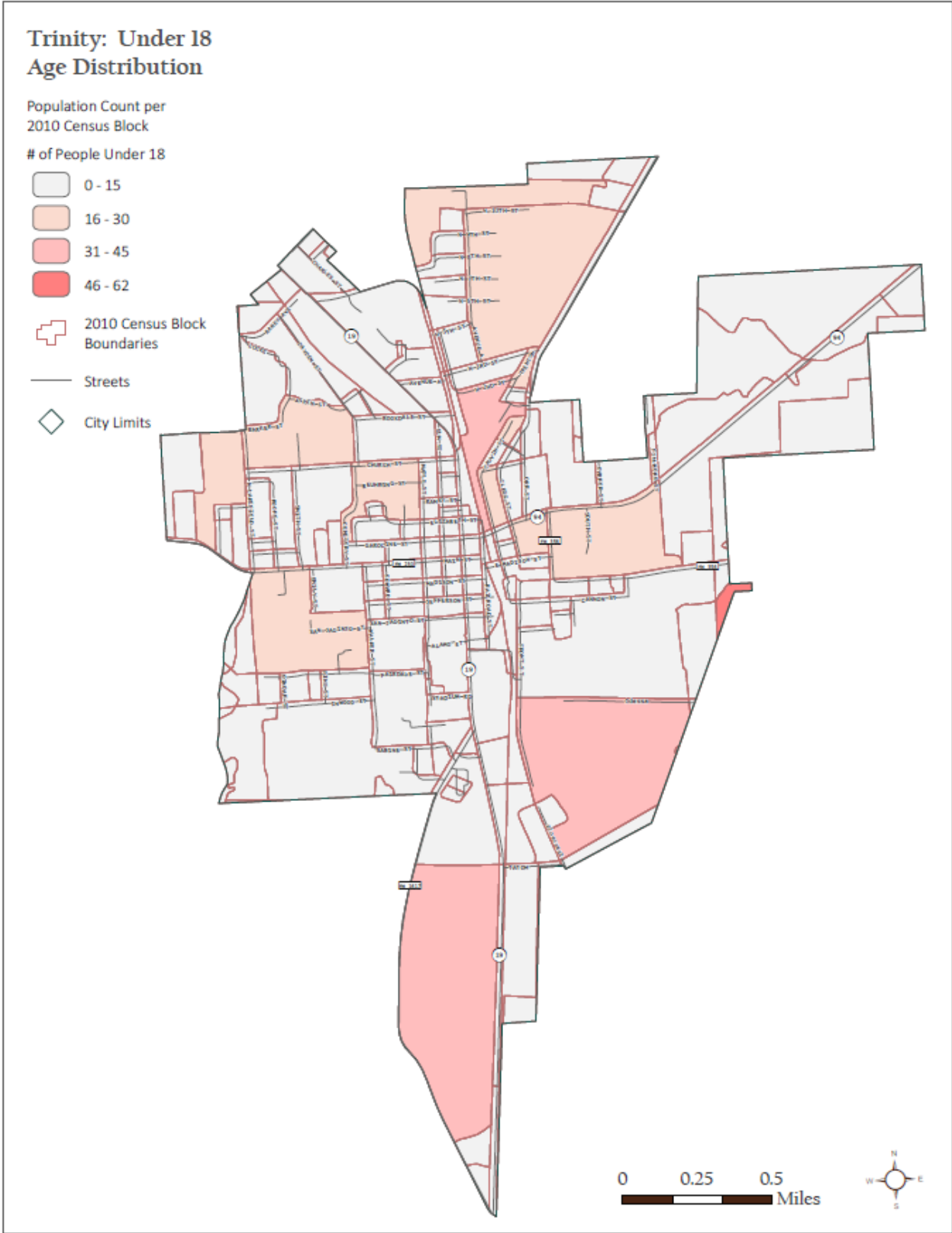


Figure 7: City of Trinity Age Distribution by Census Block, Under 18

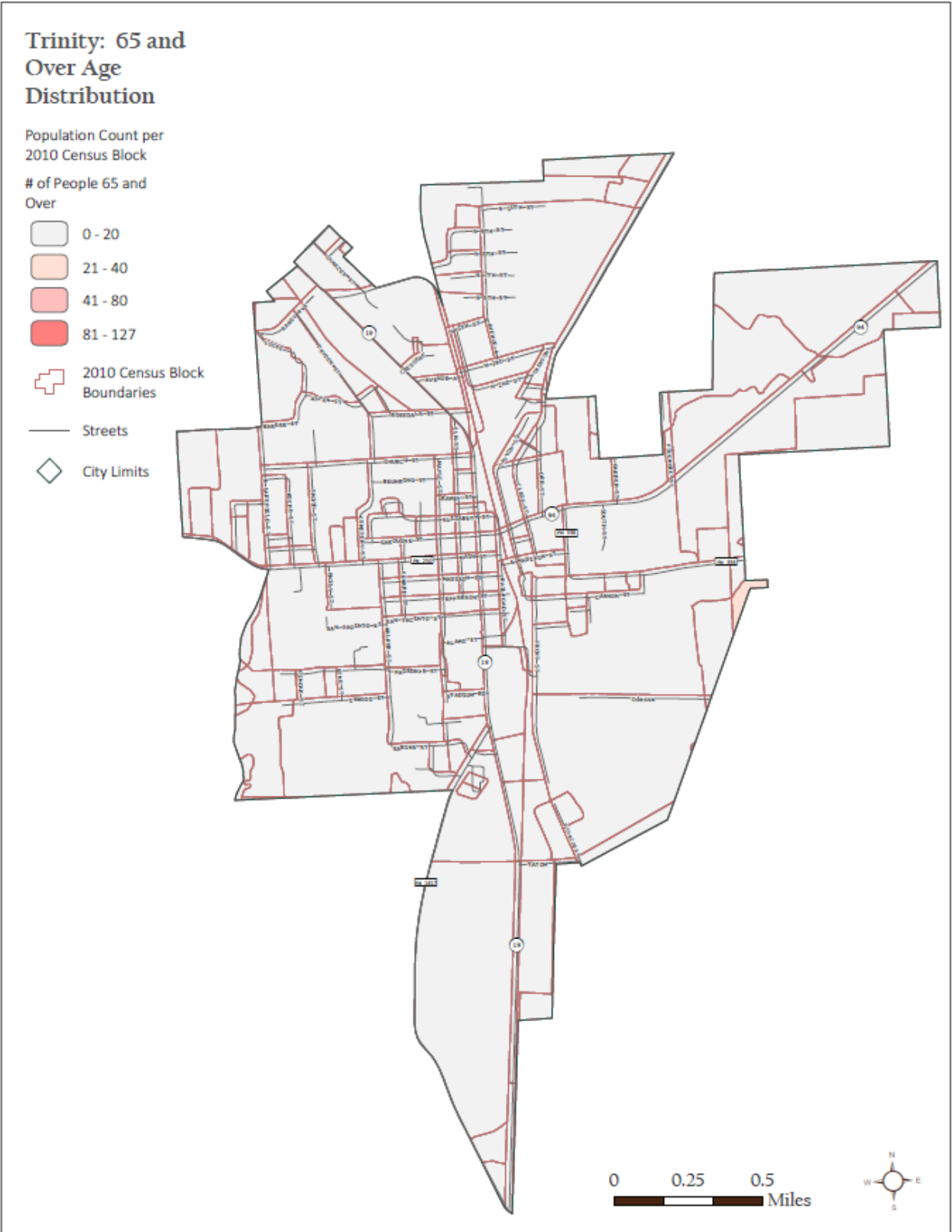
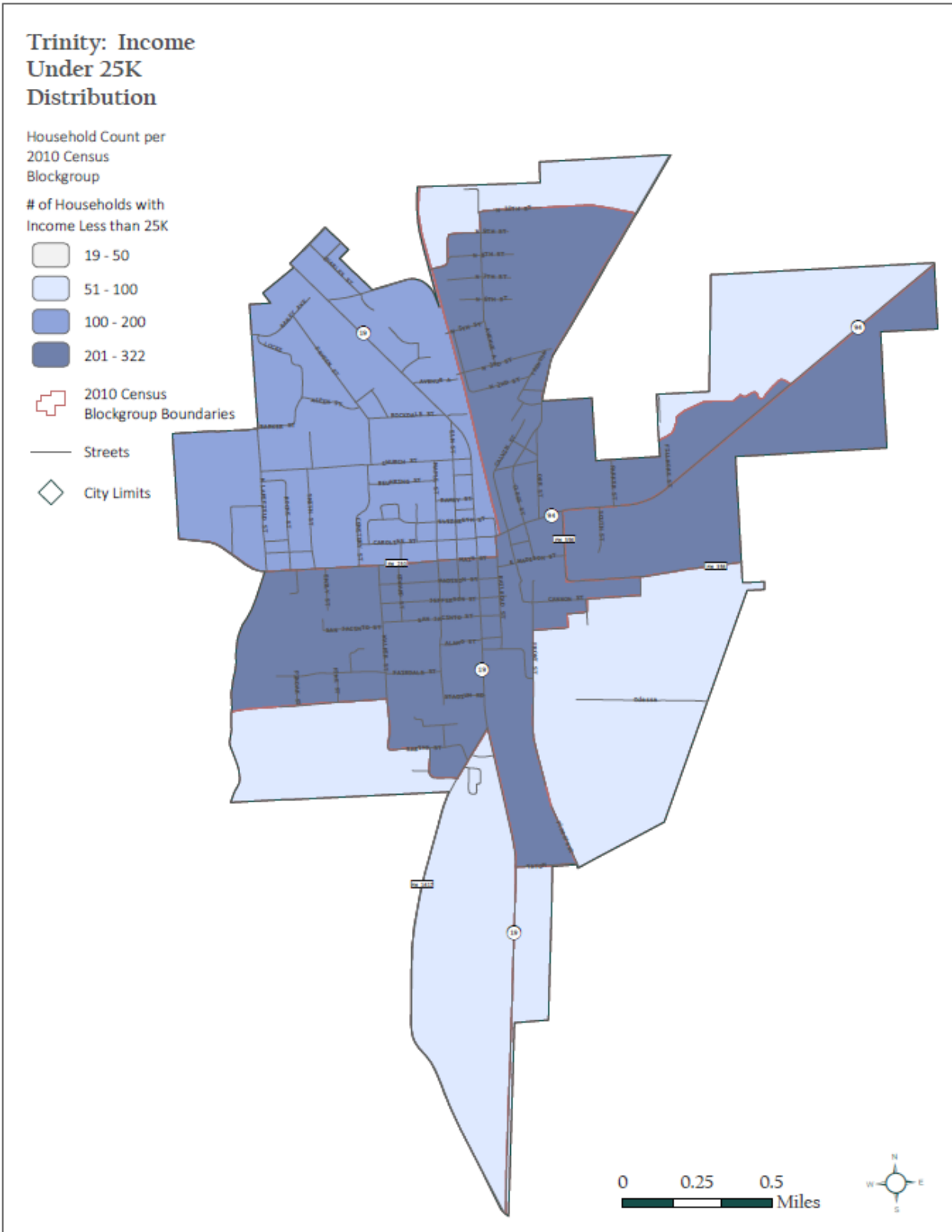


Figure 8: City of Trinity Age Distribution by Census Block, 65+





Source: American Fact Finder, Table B19001 Household Income in the Past 12 Months, 2016 American Community Survey 5-Year Estimates (<https://factfinder.census.gov/aces/nav/jsp/pages/index.xhtml>)

Figure 9: City of Trinity Income Distribution by Census Blockgroup, Under 25K

In addition to identifying vulnerable population categories, the planning team worked to identify specific locations that are likely home to high concentrations of vulnerable residents.

### *C) Low Income / Subsidized / Affordable Housing*

#### **City of Groveton**

The City of Groveton has a housing authority. There are two low-income apartment complexes in the City of Groveton. These complexes contain 76 affordable apartments.<sup>8</sup> These apartments are not subsidized but are considered affordable housing for low income families. There are no Project-Based Section 8 apartments.

#### **City of Trinity**

The City of Trinity does not have a housing authority. There is one low-income apartment complex that contains 40 affordable apartments in the City of Trinity.

#### **Trinity County**

The Deep East Texas Regional Housing Authority maintains a Housing Choice Voucher Program for the Deep East Texas Council of Governments (DETCOG) area, which Trinity County and the participating jurisdictions are members of. The housing authority has participants in 11 single family units in greater Trinity County, two single-family units in the City of Groveton, and seven single-family units in the City of Trinity.

Residents of low-income housing and/or subsidized housing facilities are expected to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

### *D) Housing*

The participating jurisdictions have used housing type and housing conditions to identify additional vulnerable areas and concentrations of vulnerable residents.

#### **Manufactured / Mobile Homes and Recreational Vehicles**

In particular, the jurisdictions have identified areas with large numbers of mobile/manufactured housing and RVs as being disproportionately vulnerable to certain hazards including but not limited to: hurricanes and tropical storms, tornados, droughts, and windstorms.

Mobile and manufactured homes can be found throughout Trinity County and the participating jurisdictions.

---

<sup>8</sup> <https://affordablehousingonline.com/housing-search/Texas/Groveton>

There is one mobile home park in Trinity County: South Oaks Mobile Home Park, located in the City of Trinity.

In addition to the mobile / manufactured home communities, Trinity County is also home to a number of RV parks, mostly located in the City of Trinity area. These parks' populations fluctuate on a seasonal basis. Due to the express portability of RVs, the majority of these structures are expected to evacuate ahead of hazard events with significant warning times like hurricanes and tropical storms. However, RVs probably won't have time to evacuate ahead of less predictable hazard events like tornados.

### **Homes in Substandard Condition**

The jurisdictions have determined that homes in sub-standard condition may indicate that residents are low-income or otherwise means-limited and thus more vulnerable to certain hazards.

To be considered standard condition, a home must show few or no minor visible exterior defects such as:

- cracked, peeling, or missing paint
- cracked, sagging, rotting, or missing siding, steps, porch planks, or other wooden surfaces
- cracked or broken window panes
- cracked masonry, brick, or mortar surfaces
- missing or damaged roof shingles
- small rust spots on mobile homes

The home must generally meet building codes, and there can't be any detriment to health and safety present.

Structures in sub-standard condition may provide less protection to residents during certain hazard events like tropical storms, tornados, or hurricanes. Furthermore, because they're already in a state of disrepair, additional damages due to hazard events may compound existing ones and potentially make these homes uninhabitable.

## 4. Floods

Floods are defined as the accumulation of water within a water body and the overflow of excess water into adjacent floodplain lands. Floods are capable of causing severe damage in a short period of time and can ultimately lead to evacuation and loss. Depending on weather conditions, floods can be classified as the following:

### 1) Flood History

According to data from NOAA’s National Weather Service Weather Forecast Office in Corpus Christi, data from the National Centers for Environmental Information, and data from the Trinity County 2013 Community Hazard Assessment Mitigation Planning System (CHAMPS) Report, the following tables outline the history of recorded flood events in Trinity County and the participating jurisdictions between the earliest reported floods in 1991 through the most recently reported floods in 2015.

Table 7: Trinity County Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage \$2018	Local Crop Damage \$2018
Trinity County	12/19/1991 - 7/17/2014	25	Flash Flood	0	0	\$4,395,618	\$181,640

Table 8: City of Groveton Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage \$2018	Local Crop Damage \$2018
City of Groveton	11/5/1997 - 8/4/2005	3	Flash Flood	0	0	\$30,940	\$0

Table 9: City of Trinity Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage \$2018	Local Crop Damage \$2018
City of Trinity	7/7/1997 - 6/18/2015	9	Flash Flood	0	0	\$61,130	\$0

### *A) National Flood Insurance Program*

The National Flood Insurance Program (NFIP) is administered by FEMA to provide flood insurance coverage to the nation.

Trinity County does not have countywide floodplain mapping. Both the City of Groveton and the City of Trinity have a FEMA Flood Insurance Rate Map (FIRM) map. The City of Groveton’s FIRM map is dated June 19, 1985, and the City of Trinity’s FIRM map is dated March 1, 1987. The City of Trinity’s FIRM map had a Letter of Map Change (LOMC) on February 8, 2007. Both FIRM maps are considered out of date, incomplete, and unreliable.

Trinity County does not have a flood damage prevention ordinance. The City of Groveton and the City of Trinity have adopted and enforce flood damage prevention ordinances.

In the City of Groveton, the Mayor is the designated Floodplain Administrator. In the City of Trinity, the City Manager is the designated Floodplain Administrator.

The City of Groveton and the City of Trinity require the lowest level of new structures in the floodplain to meet or exceed the base flood elevation in their respective flood damage prevention ordinances.

Floodplain management ordinances and any future updates will guide each jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction. Each jurisdiction will continue to encourage residents to purchase flood insurance to reduce their flood risk.

As of July 31, 2018, a total of 27 NFIP policies have been purchased in Trinity County and the participating jurisdictions. The NFIP policy statistics summary can be found in Table 10 below.

**Table 10: NFIP Policy Statistics (As of July 31, 2018)**

<b>Community Name</b>	<b>NFIP Policies In-force</b>
Trinity County	0
City of Groveton	0
City of Trinity	27

Reviewing the total NFIP loss statistics in Trinity County from January 1, 1978 to August 26, 2017, a total of \$703,352.00 has been paid to 42 closed losses.

Table 11: NFIP Policy Loss Statistics (As of July 31, 2018)

Community Name	Total Losses	Closed Losses	Open Losses	Losses Closed Without Payment	Total Payments
Trinity County	2	2	0	0	\$18,722.00
City of Groveton	No Data	No Data	No Data	No Data	No Data
City of Trinity	40	38	0	2	\$684,630.00

### *Repetitive Loss Properties*

A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978. There are six (6) RL properties in Trinity County, all located within the City of Trinity. City of Trinity RL properties have claimed 14 losses.

According to the NFIP data, all six of the RL properties in Trinity are classified as single family. Total payments on all RL properties in Trinity reached \$223,726.98 as of 7/31/2018.

### *Severe Repetitive Loss Properties*

A severe repetitive loss property is: “a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000 and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

There are four (4) SRL properties in Trinity County, all located within the City of Trinity. City of Trinity SRL properties have claimed 21 losses.

According to the NFIP data, all four of the SRL properties in Trinity are classified as single family. Total payments on all SRL properties in Trinity reached \$413,213.92 as of 7/31/2018.

## **2) Likelihood of Future Occurrence**

In the case of the FEMA 100-year floodplain, there’s a 1% annual chance, and in the 500-year floodplain it’s a 0.02% annual chance. The probability of a 100-year flood event is therefore occasional. The probability of a 500-year flood event is therefore unlikely.

However, based on the frequency of previous flood events, it is probable that Trinity County and the participating jurisdictions will see some type of flooding in the next three years, meaning a flood event that may or may not meet the definition of a 100-year or 500-year event is likely.

### 3) Extent

Throughout Trinity County and the participating jurisdictions, the worst flood events have been associated with riverine flooding. These events have inflicted as high as \$1,732,667 in property damages and \$173,266 in crop damages, both adjusted for inflation<sup>9</sup>.

There have been no injuries or fatalities reported as a result of flooding.

Flood extent is often measured by depth in feet. The worst flooding throughout the participating jurisdictions has been estimated at 4' deep or deeper<sup>10</sup>.

The worst flood incidents have flooded the Trinity River Authority Water Plant, caused the sewer plant to overflow, and left the Sportsman Oaks subdivision underwater for over a month<sup>11</sup>.

Future flood events in both participating jurisdictions may be as deep as 4' and meet previous worst-case floods in terms of damages inflicted, injuries, and even fatalities.

### 4) Location and Impact

The only Special Flood Hazard Areas in Trinity County are in the City of Groveton and the City of Trinity.

FEMA Special Flood Hazard Areas cover 1,667.98 acres in the City of Groveton. Of the City's 1,659.99-acre jurisdictional area, nearly 100% is located in a floodplain.

FEMA Special Flood Hazard Areas cover 1,577.67 acres in the City of Trinity. Of the City's 2,438.08-acre jurisdictional area, roughly 64.71% is located in a floodplain.

#### A) Location – FEMA Special Flood Hazard Areas

According to FEMA, Zone A covers areas that are subject to inundation by the 1-percent-annual-chance (100-year) flood event generally determined using approximate methodologies.

Mandatory flood insurance purchase requirements and floodplain management standards apply in Zone A<sup>12</sup>.

---

<sup>9</sup> Incident date: 12/19/1991. Trinity Count 2013 CHAMPS Report. Adjusted for inflation to \$2018.

<sup>10</sup> <http://www.ktre.com/story/29356922/trinity-county-flooding-continues-leaving-neighborhood-under-water-for-month/>

<sup>11</sup> <http://www.ktre.com/story/29356922/trinity-county-flooding-continues-leaving-neighborhood-under-water-for-month/>

<sup>12</sup> <https://www.fema.gov/zone>

Within Trinity County, 235.15 floodplain acres out of 3,245.64 are classified as Zone A.

Within the City of Groveton, 129.33 floodplain acres out of 1,667.98 are classified as Zone A.

Within the City of Trinity, 105.82 floodplain acres out of 1,577.67 are classified as Zone A.

There are 3,010.49 acres in the FEMA 500-year floodplain. All 500-year floodplain acres are located in the City of Groveton and the City of Trinity.

Every acre within the 500-year floodplain in Trinity County is designated Zone X. However, Zone X is divided into two categories, and the only way to distinguish the two is by their visual representation on a Flood Insurance Rate Map (FIRM). When Zone X represents areas within the 500-year floodplain on a FIRM, it has a dot matrix fill. When Zone X represents areas determined to be outside the 0.2% annual chance floodplain on a FIRM, there is no fill.



# Trinity County FEMA Special Flood Hazard Areas

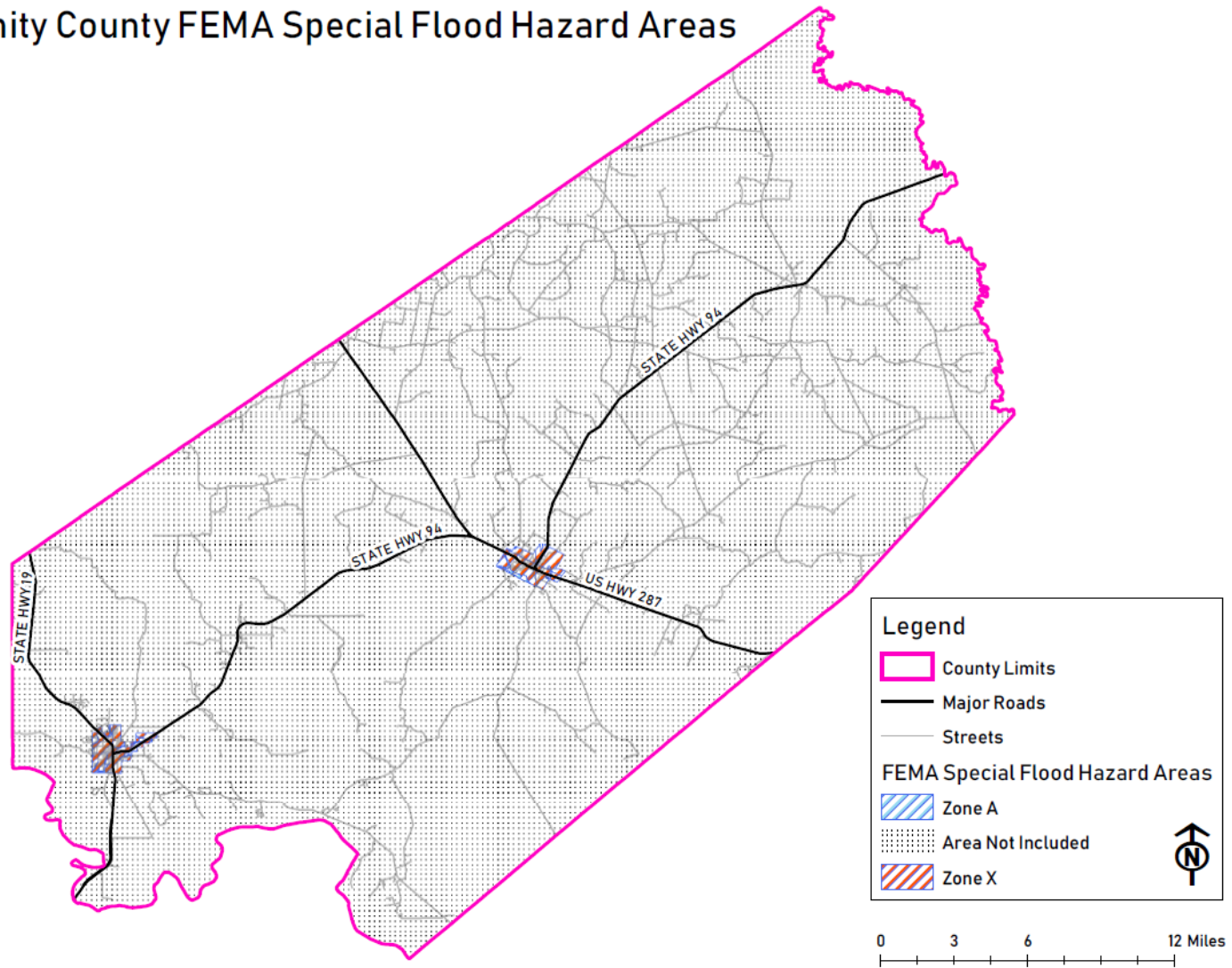


Figure 10: Trinity County FEMA Special Flood Hazard Areas

# City of Groveton FEMA Special Flood Hazard Areas

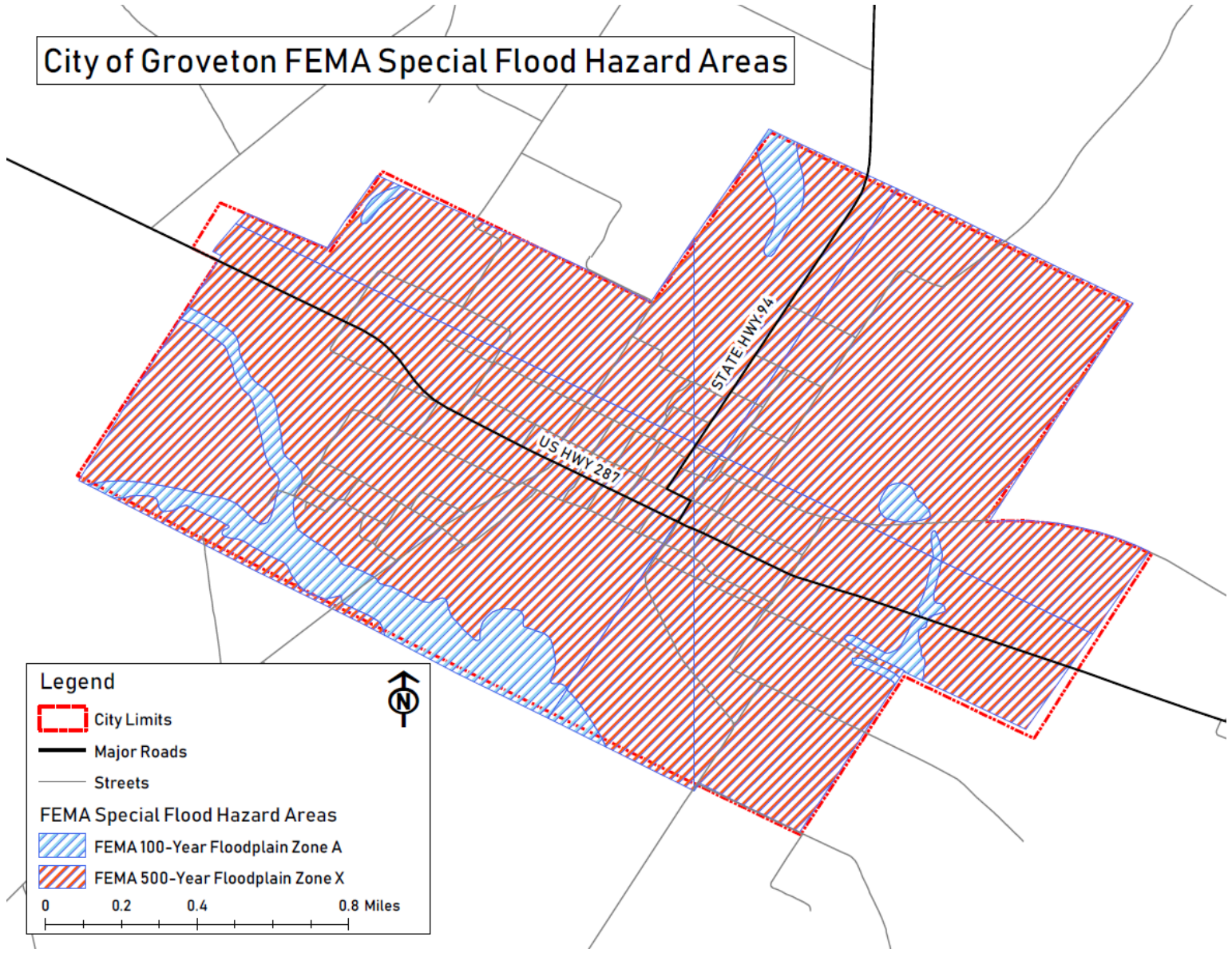


Figure 11: FEMA Special Flood Hazard Areas, City of Groveton

**City of Groveton FEMA Special Flood Hazard Area Land Use**

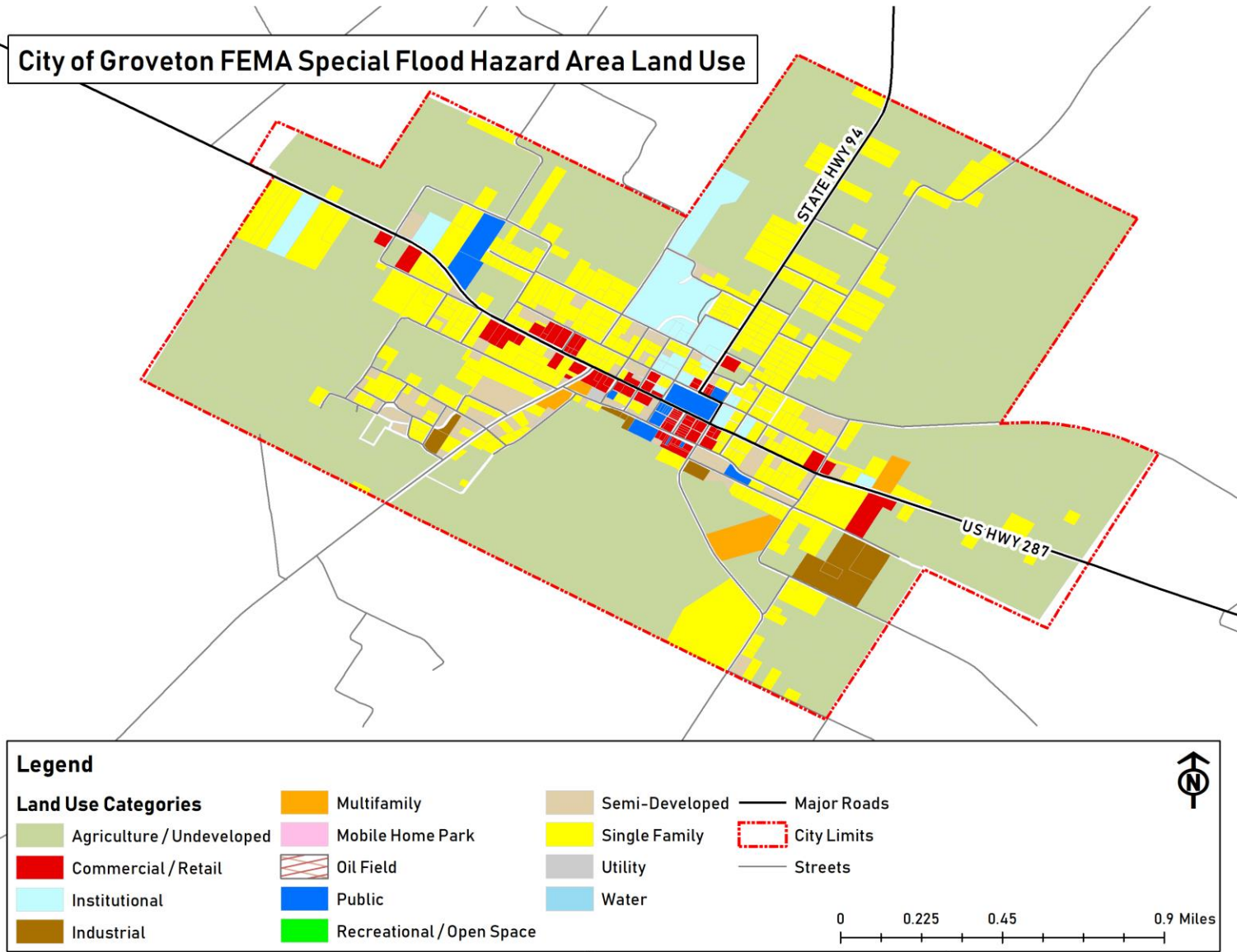


Figure 12: FEMA Special Flood Hazard Areas Land Use, City of Groveton

# City of Trinity FEMA Special Flood Hazard Areas

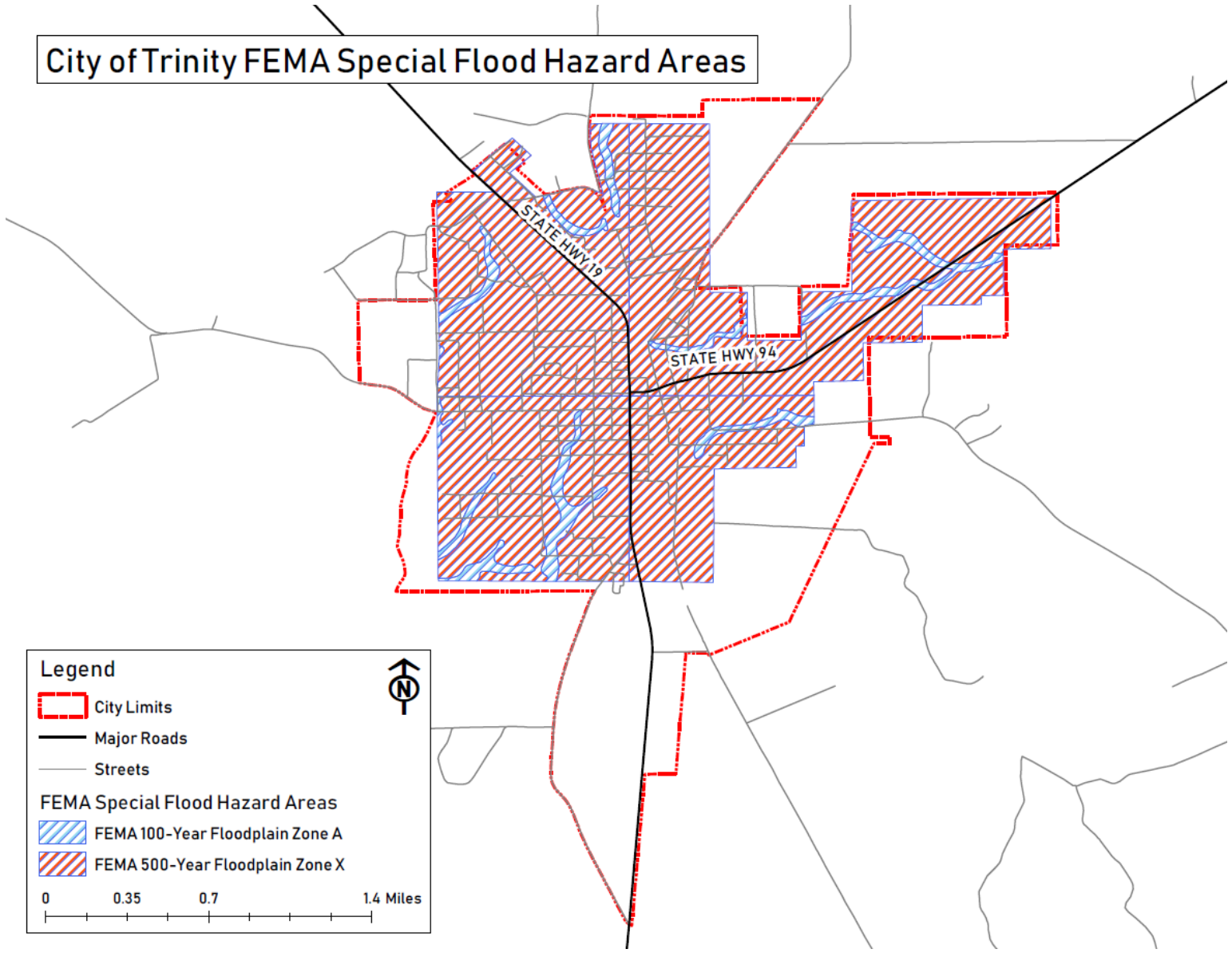


Figure 13: FEMA Special Flood Hazard Areas, City of Trinity

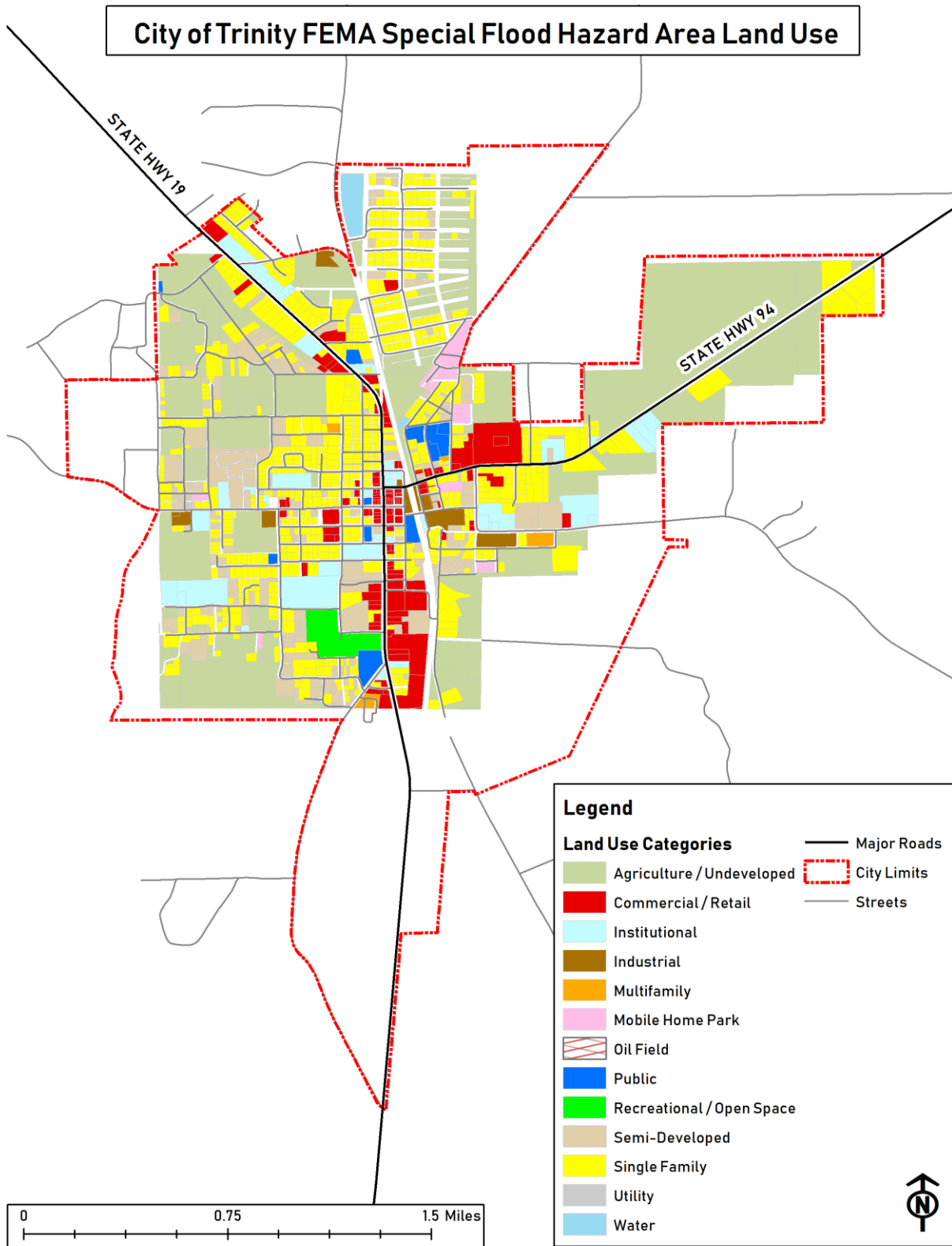


Figure 14: FEMA Special Flood Hazard Areas Land Use, City of Trinity

### *B) Impact*

Flooding's impact will vary depending on the specific location, size of the affected area, and number of structures affected. Parts of the participating jurisdictions may temporarily lose power due to downed power lines. Motorists and residents may be left stranded and needing rescue. Affected structures may be flooded, damaged by floodborne contaminants, damaged by debris flow, or even completely washed away. Crops may be damaged or destroyed. Estimated damage totals to vulnerable structures and total structures affected during a flood event may meet the totals outlined above. In the worst cases, flooding may cause injuries and fatalities.

In addition to flooding's direct effects, the participating jurisdictions may be subject to indirect effects. These may include but aren't limited to loss of power, limited travel due to flooded and/or washed out roads, and limited access to nearby emergency care centers.

## 5) Vulnerability

### A) Population

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a hurricane or tropical storm.

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a hurricane, and depending on tie-down methods, may also be unsafe during strong tropical storms.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tropical storm or hurricane, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a hurricane or tropical storm than structures in standard condition. Existing structural weaknesses may mean increased damages, injuries, or loss of life.

### B) Critical Facilities

Damage to critical facilities brings increased negative impact to the community beyond the importance of the critical facility itself. The planning team identified 26 critical facilities spread across Trinity County and the participating jurisdictions. Only 14 were located in a known FEMA Special Flood Hazard Area.

Critical Facilities
Blanche K. Werner Public Library
Dorcas Wills Memorial Baptist Church
Friday Volunteer Fire Department
Groveton City Hall
Groveton EMS
Groveton Police Department
Groveton VFD
Trinity City Hall
Trinity Community Center

Trinity County Courthouse
Trinity County Courthouse Annex
Trinity County Sheriff's Department
Trinity Police Department
Trinity VFD

**C) Infrastructure – US Highway 287**

US Highway 287 is a TxDOT-designated major hurricane evacuation route for the Groveton area. The distance between the southernmost and northernmost points of US 287 that serves as a designated evacuation route in Trinity County is roughly 20 miles. The highway passes through the City of Groveton. It meets SH 94 in central Groveton.

Flooding on either of these routes during a hurricane evacuation could strand motorists trying to escape the storm. These drivers may need to be rescued, and could be injured or killed.

**D) Vulnerable Parcels**

The planning team developed a parcel inventory to identify estimated damage values during a flood event. Parcels vulnerable to flooding have been identified by their complete or partial location within the FEMA 100-year floodplain and the FEMA 500-year floodplain.

Actual damages will vary based on the location and extent of flooding.

Table 12: Vulnerable Parcels by Flood Zone in the City of Groveton

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
City of Groveton	41	\$13,349,939
<u>FEMA 500-Year Flood Zone</u>		
City of Groveton	691	\$54,058,774

Table 13: Vulnerable Parcels by Flood Zone in the City of Trinity

Jurisdiction	Total Parcels	Estimated Potential Damage Value
--------------	---------------	----------------------------------



<u>FEMA 100-Year Flood Zone A</u>		
City of Trinity	135	\$7,585,098
<u>FEMA 500-Year Flood Zone</u>		
City of Trinity	1,318	\$76,424,760

## 5. Hurricanes /Tropical Storms

Once a tropical depression has intensified to the point where its maximum sustained winds are between 35-64 knots (39 – 73 mph), it becomes a tropical storm. At these wind speeds the storm becomes more organized and begins to become more circular in shape – resembling a hurricane. The rotation of a tropical storm is more recognizable than for a tropical depression. Tropical storms can cause many problems without becoming a hurricane. However, most of the problems a tropical storm causes stem from heavy rainfall and high winds.

According to the National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher. Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest.

### 1) Hurricanes /Tropical Storms History

Using data from the NOAA’s National Weather Service Weather Forecast Office in Corpus Christi, Trinity County’s 2013 CHAMPS Report, local news reports, and data from the National Centers for Environmental Information, the planning team created the following table to illustrate Trinity County’s and the participating jurisdictions’ hurricane and tropical storm history:

Table 14: Historical Hurricanes & Tropical Storms that affected Trinity County and the Participating Jurisdictions

Location	Date Range	Number of Hurricane & Tropical Storm Events	Hurricane & Tropical Storm Category Range	Maximum Wind Speed Range	Local Fatalities	Local Injuries	Local Property Damage \$2018	Local Crop Damage \$2018
Trinity County	9/8/1961 - 8/17/2017	7	TS - 5	60 - 180	1	5	\$51,616,782	\$4,107,893

Tropical storm and hurricane data aren’t broken down beyond the county level. However, while the County is not a Tier I or Tier II County, hurricanes and tropical storms will affect the entire County, including the City of Groveton and the City of Trinity.

No hurricane or tropical storm has affected any of the participating jurisdictions since 2017.

## 2) Likelihood of Future Occurrence

Hurricanes occur in seasonal patterns between June 1 and November 30. Based on the historical frequency of hurricane events in Trinity County and the participating jurisdictions outlined above, the likelihood of a future event affecting any of the participating jurisdictions is unlikely, that is a hurricane is possible in the next ten years.

## 3) Extent

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Wind, pressure, and surge are combined to estimate potential damage. Categories 3, 4 and 5 are classified as “major” hurricanes. Major hurricanes comprise only 20 percent of total tropical cyclone landfalls, but account for over 70 percent of the damage in the United States. Damage from hurricanes can result from spawned tornados, coastal flooding from storm surge, and inland flooding from heavy rainfall.

Table 15: Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74-95	Greater than 980	3-5
2	96-110	979-965	6-8
3	111-130	964-945	9-12
4	131-155	944-920	13-18
5	155+	Less than 920	19+

The worst hurricanes known to have affected Trinity County and the participating jurisdictions have been as intense as Category 5 with sustained wind gusts exceeding 155 MPH. Previous hurricanes and tropical storms have inflicted the inflation adjusted equivalent of over \$566 million in property damages and over \$4 million in crop damages, and they’ve injured up to 4 people in a single event.

In the recent past, Hurricanes Ike and Rita caused these impacts to Trinity County and the participating jurisdictions: there were water issues; generators were needed for the sewers; there was no power available for two weeks; and both US Highway 287 and SH 19 were used for evacuation through the county, leading to congestion.

Future hurricanes affecting the participating jurisdictions may meet previous worst-case Category 5 storms.

## 4) Location and Impact

### A) Location

Location is often referred to in terms of Tier I and II, designated by the Texas State Office of Risk Management<sup>13</sup> for property insurance purposes, to represent differing levels of loss exposure to coastal counties and adjacent counties. Tier I counties are those adjacent to the Gulf of Mexico and Tier II counties are those typically adjacent to Tier I counties.

Trinity County is not a Tier I or Tier II county. However, the County and all participating jurisdictions are located within 200 miles of the Gulf coast. Although tropical storm and hurricane effects begin to diminish as they move inland, the winds alone from Hurricane Harvey reached as far as 140 miles from the eye of the storm. The County and all participating jurisdictions are considered especially susceptible to indirect impacts from hurricanes and tropical storms including high winds and flooding.

Tropical storms and hurricanes vary tremendously in terms of size, location, intensity and duration. According to the Trinity County 2013 CHAMPS Report, Trinity County's proximity to the coast places it among the middle 20% of all Texas counties in terms of recorded hurricane and tropical storm events.

### B) Impact

Impacts from a tropical Storm or hurricane in Trinity County and the participating jurisdictions may include but are not limited to: loss of power due to downed lines caused by flying debris or fallen trees, flooding, flooding due to damaged or destroyed roofs, damaged or broken windows, damage due to flying debris, wind damage, escaped livestock and pets, injured or killed livestock and pets, crop damage or destruction. In the worst storms, residents may be injured or even killed.

## 5) Vulnerability

### A) Population

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a hurricane or tropical storm.

---

<sup>13</sup> <https://www.sorm.state.tx.us/insurance-services/statewide-property-insurance-program>

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a hurricane, and depending on tie-down methods, may also be unsafe during strong tropical storms.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tropical storm or hurricane, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a hurricane or tropical storm than structures in standard condition. Existing structural weaknesses may mean increased damages, injuries, or loss of life.

#### *B) Infrastructure – US Highway 287*

US Highway 287 is a TxDOT-designated major hurricane evacuation route for the Groveton area. The distance between the southernmost and northernmost points of US 287 that serves as a designated evacuation route in Trinity County is roughly 20 miles. The highway passes through the City of Groveton. It meets SH 94 in central Groveton.

Flooding on this route during a hurricane evacuation could strand motorists trying to escape the storm. These drivers may need to be rescued, and could be injured or killed.

#### *C) Critical Facilities*

The planning team identified 26 critical facilities spread across Trinity County and participating jurisdictions. The following critical facilities and infrastructure in each jurisdiction are expected to play particularly important roles in a hurricane or tropical storm recovery process.

Table 16: Trinity County Critical Facilities Vulnerable to Hurricanes and Tropical Storms

Trinity County	Potential Hurricane / Tropical Storm Impacts									
	Loss of Power	Flying Debris	Uprooted Trees	Flooding	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
356 VFD	x	x	x						x	x
Apple Springs VFD	x	x	x						x	x
Blanche K. Werner Public Library	x	x	x	x	x				x	x
Dorcas Wills Memorial Baptist Church	x	x		x	x	x	x	x	x	x
Friday Volunteer Fire Department	x	x	x						x	x
Groveton City Hall	x	x	x	x	x	x	x		x	x
Groveton EMS	x	x	x	x	x		x	x	x	x
Groveton Police Department	x	x	x	x	x		x	x	x	x
Groveton VFD	x	x		x	x				x	x
Groveton Wastewater Treatment Plant	x	x	x	x	x				x	x
Pennington VFD	x	x							x	x
Trinity City Hall	x	x		x	x				x	x
Trinity Community Center	x	x	x	x	x	x	x	x	x	x
Trinity County Airport	x	x	x			x		x	x	x
Trinity County Courthouse	x	x	x	x	x	x	x	x	x	x
Trinity County Courthouse Annex	x	x		x	x	x	x	x	x	x
Trinity County Sheriff's Department	x	x		x	x	x	x	x	x	x
Trinity Police Department	x	x		x	x				x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x	x	x			x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x		x	x				x	x
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x	x	x			x	x	x	x	x
Trinity VFD	x	x		x	x				x	x
Trinity Wastewater Treatment Plant	x	x	x			x	x		x	x

Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x	x	x	x	x	x			x	x
Ventura EMS	x	x	x						x	x
VFW Post #6899	x	x	x						x	x

#### *D) Vulnerable Parcels*

Central Appraisal District data was used to estimate potential damage values for each participating jurisdiction. Given the broad nature of vulnerability, damage values were calculated on the jurisdictional level.

Table 17: Estimated Potential Damage Values by Jurisdiction<sup>14</sup>

Jurisdiction	Parcel Count	Estimated Potential Damage Value
County	25,897	\$2,057,525,996.00
City of Groveton	721	\$43,895,823.00
City of Trinity	1,797	\$110,775,785.00

---

<sup>14</sup> Estimated using Trinity County CAD Data.



## 6. Wildfire

Wildfire is defined as a sweeping and destructive conflagration and can be further categorized as wildland, interface, or intermix fires.

Wildland fires are fueled almost exclusively by natural vegetation. Wildland/urban interface (WUI) fires include both vegetation and the built-environment. WUI fires occur in the zone of transition between unoccupied land and human development.

### 1) Wildfire History

The Texas A&M Forest Service Wildfire Risk Assessment Portal (TxWRAP) provides wildfire data on fires that occurred between 2005 – 2015. During that time, there were 253 wildfire ignitions in Trinity County and the participating jurisdictions.

**The City of Groveton determined that any damages associated with wildfires are likely to be negligible and therefore isn't addressing the hazard.**

**The City of Trinity determined that any damages associated with wildfires are likely to be negligible and therefore isn't addressing the hazard.**

Table 18: Trinity County Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	3/12/2005 - 9/23/2015	253	0 - 1,369	6,704	-	-	-	-

Previous wildfires have cumulatively burned 6,704 acres in Trinity County and the participating jurisdictions. The largest reported fire burned 1,369 acres.

No damage dollars, neither structural nor agricultural, were reported for any of the wildfire events for either jurisdiction.

The planning team didn't locate recorded data for wildfires in any participating jurisdiction after 2015. However, based on planning team members' expertise, the planning team determined that wildfires have continued to occur since then at a similar rate as occurred between 2005-2014.

## 2) Likelihood of Future Occurrence

According to the data, Trinity County and the participating jurisdictions experience over 20 wildfires per year. Given prior frequency of wildfire events, the likelihood of a wildfire event in Trinity County is highly likely, meaning an event is probable within the next year.

## 3) Extent

The Texas A&M Forest Service’s Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. The FIS is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. According to Texas A&M Forest Service data, Trinity County and the participating jurisdictions are rated between Class 1 and Class 4.

Table 19: Characteristic Fire Intensity Scale<sup>15</sup>

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

The National Wildfire Coordinating Group (NWCG) provides an additional way to measure extent by accounting for fire size. Based on Texas A&M Forest Service data, the average fire in Trinity County and the participating jurisdictions is a Class C event.

Table 20: National Wildfire Coordinating Group Size Class of Fire<sup>16</sup>

<sup>15</sup> <https://www.texaswildfirerisk.com>

<sup>16</sup> <http://www.nwcg.gov/term/glossary/size-class-of-fire>

Class A	¼ acre or less
Class B	More than ¼ acre, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

Previous wildfires in Trinity County and the participating jurisdictions have ranged between Class 1 and Class 4 on the Characteristic Fire Intensity Scale, with flame lengths up to over 30’ in length, and between Class A and Class F on the National Wildfire Coordinating Group Size Class of Fire scale (NWCGSCF). Most fires have been small and were contained quickly. However, the worst reported fire in Trinity County burned 1,369 acres.

Future fire events in Trinity County and the participating jurisdictions may meet previous worst-case Class G (NWCGSCF scale) and Class 4 (FIS) wildfires.

#### 4) Location and Impact

##### A) Location

Due to wildfire’s ability to inflict damages to both structures and landscapes, wildfire location has been assessed by parcel. Parcels have been identified by land use type, and have been determined to be either partially or completely vulnerable to wildfire based on TxWRAP’s Wildland Urban Interface boundaries. Certain parcels may contain various land uses; however, parcels have been identified based on the primary land use type.

Because wildfires are dynamically unpredictable, the following maps and tables may not be representative of every location and parcel at risk of wildfire.

I. Trinity County Location

## Trinity County Wildland Urban Interface

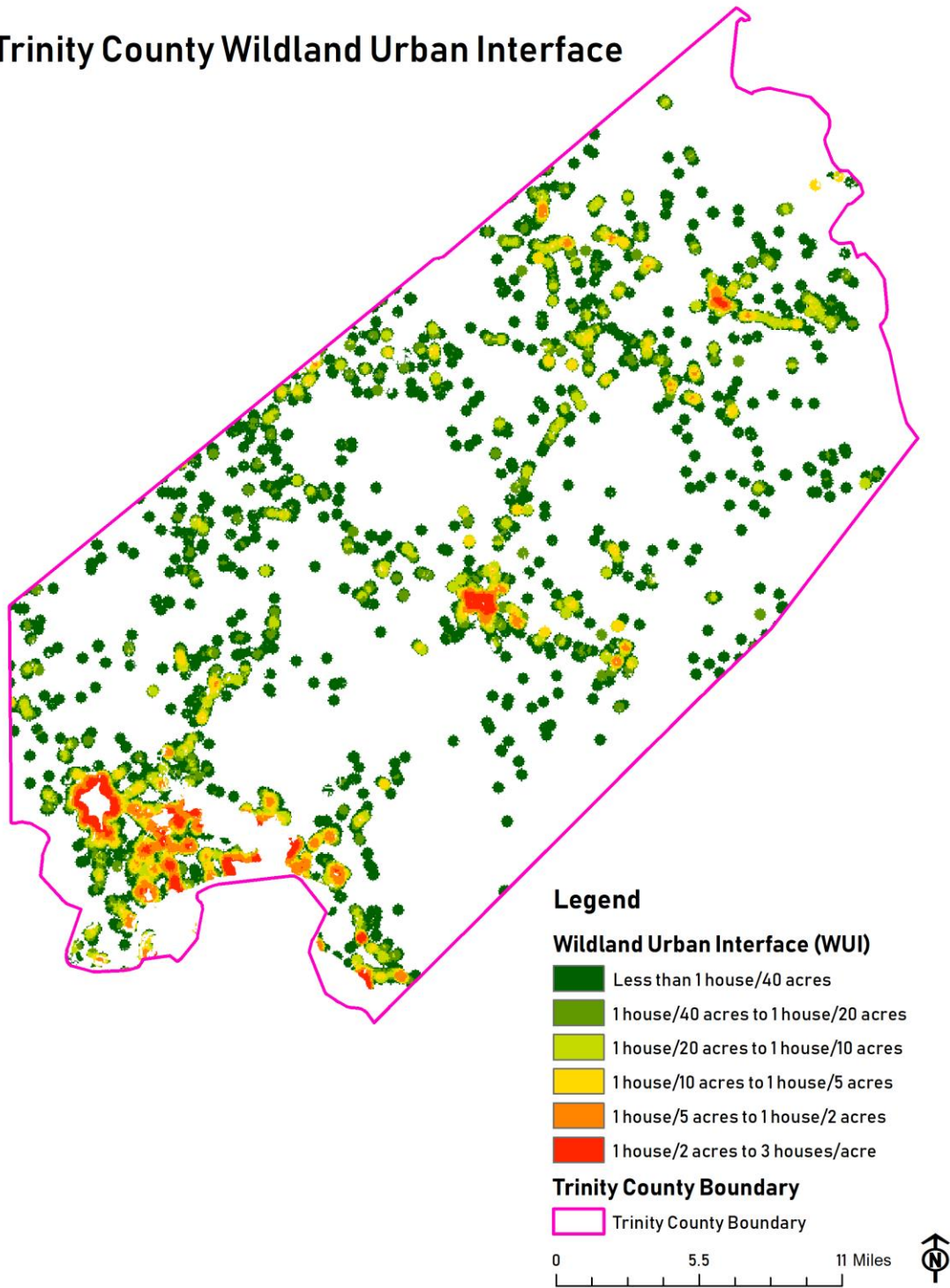


Figure 15: Trinity County Wildland Urban Interface

# Trinity County Wildland Urban Interface Land Use

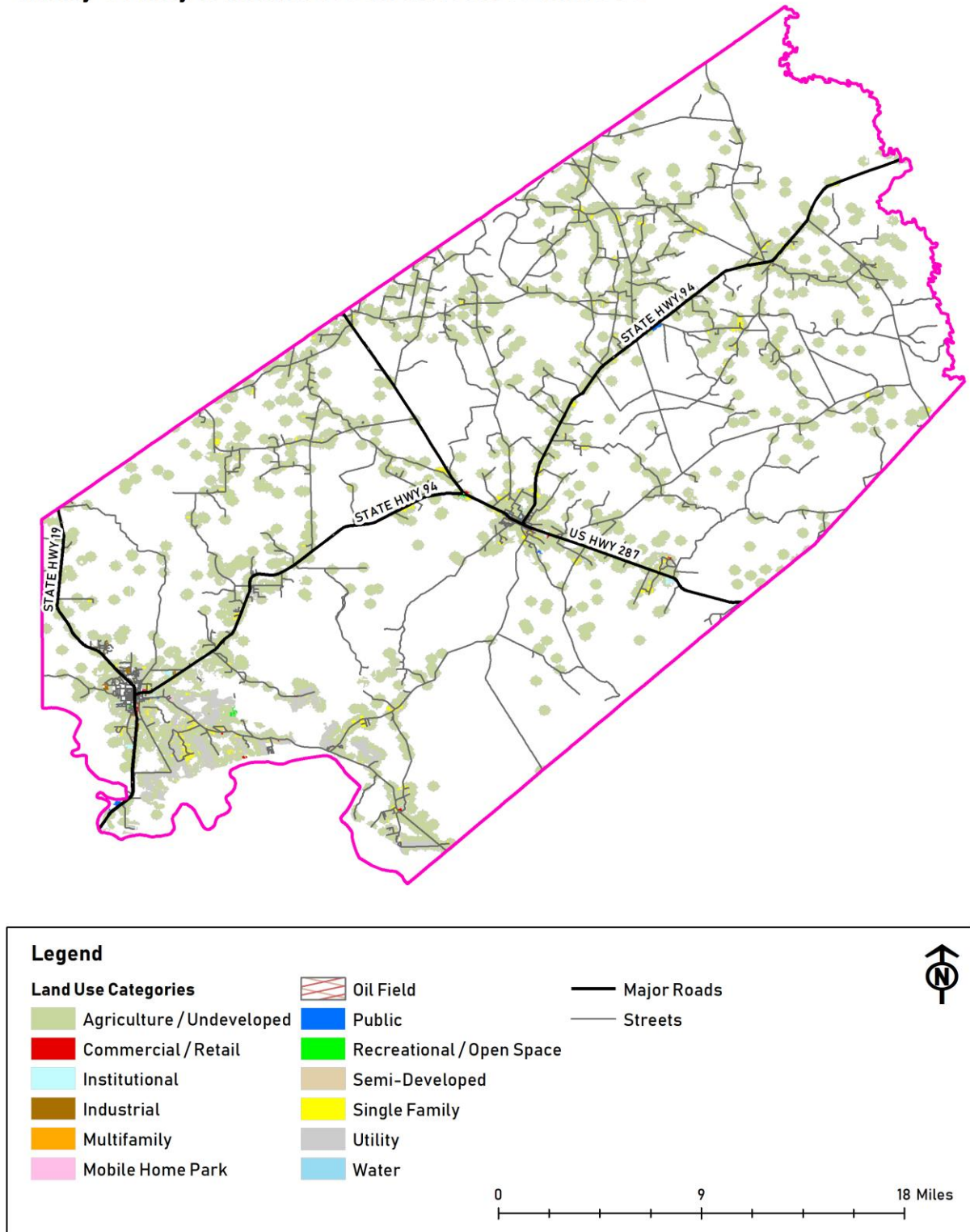


Figure 16: Trinity County Land Use Types in Wildland Urban Interface

II. City of Groveton Location

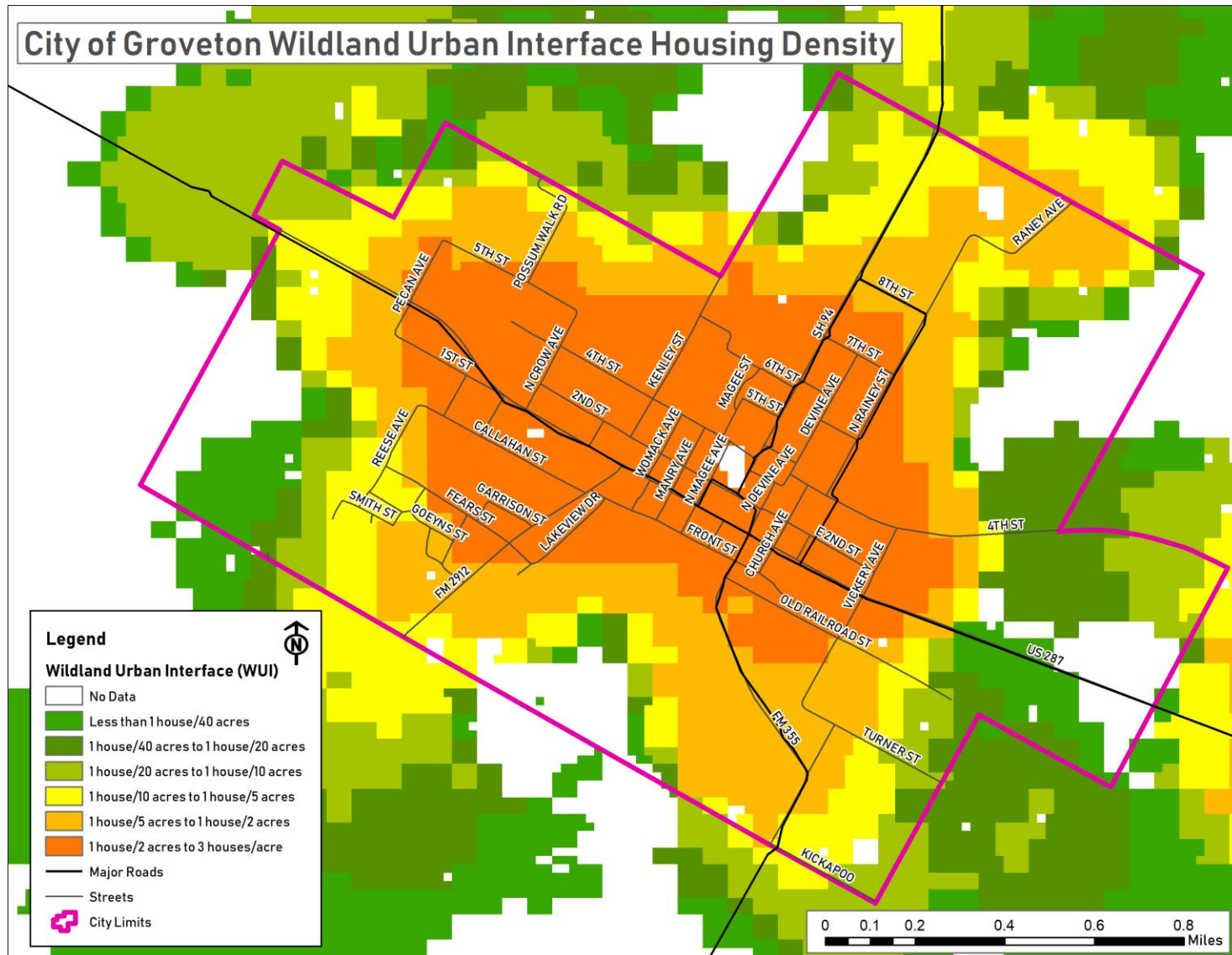


Figure 17: City of Groveton Wildland Urban Interface

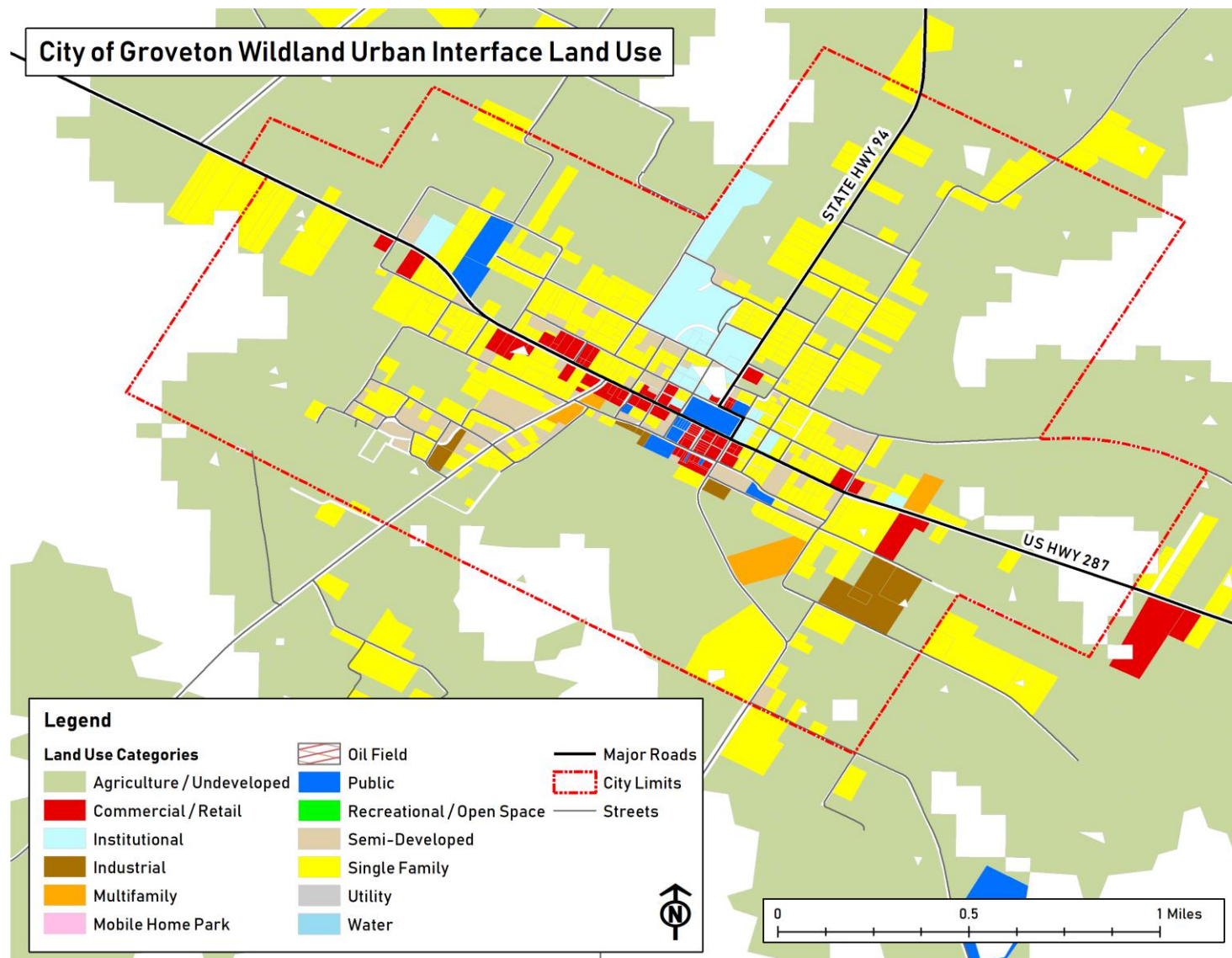


Figure 18: City of Groveton Land Use Types in Wildland Urban Interface

III. City of Trinity Location

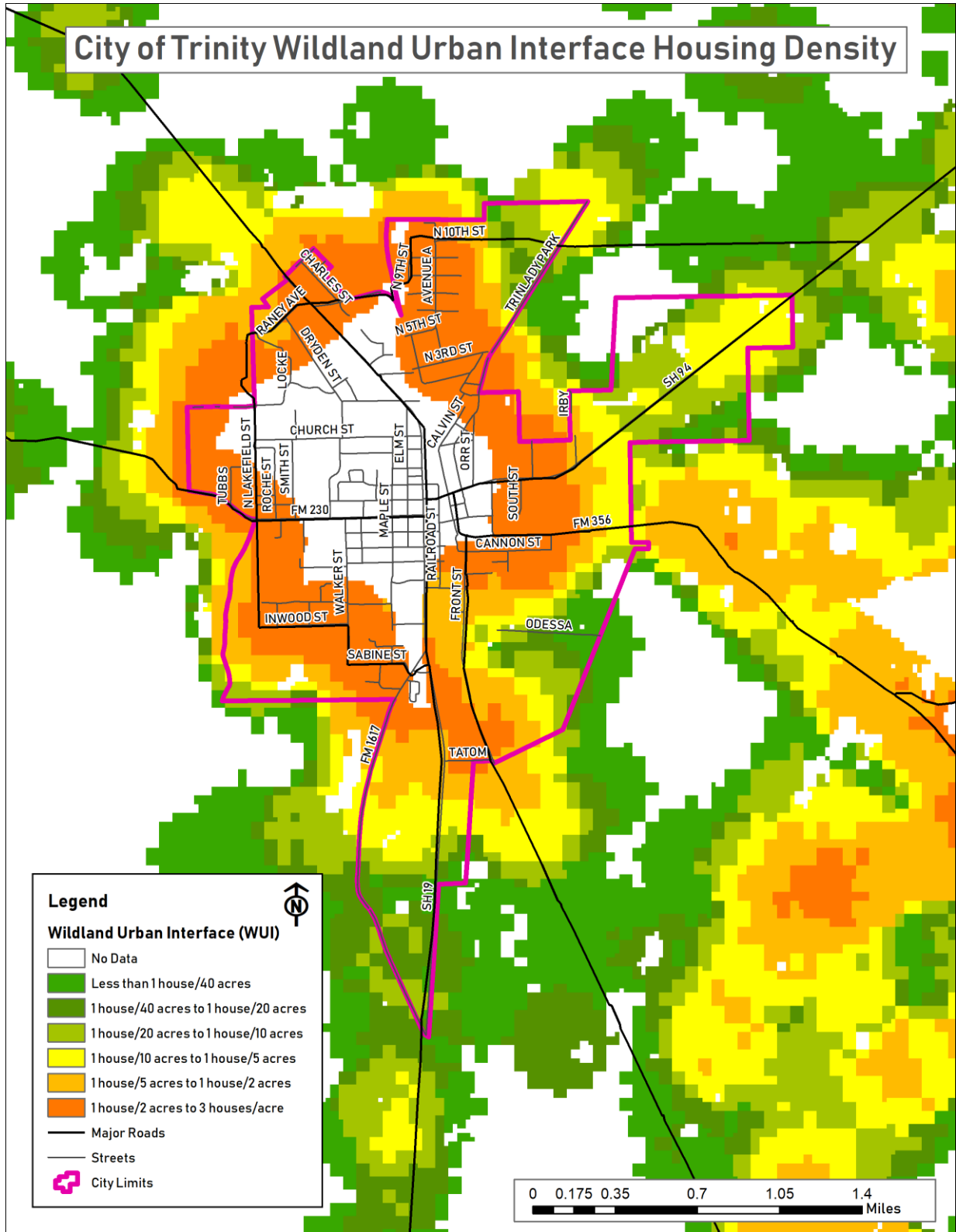


Figure 19: City of Trinity Wildland Urban Interface



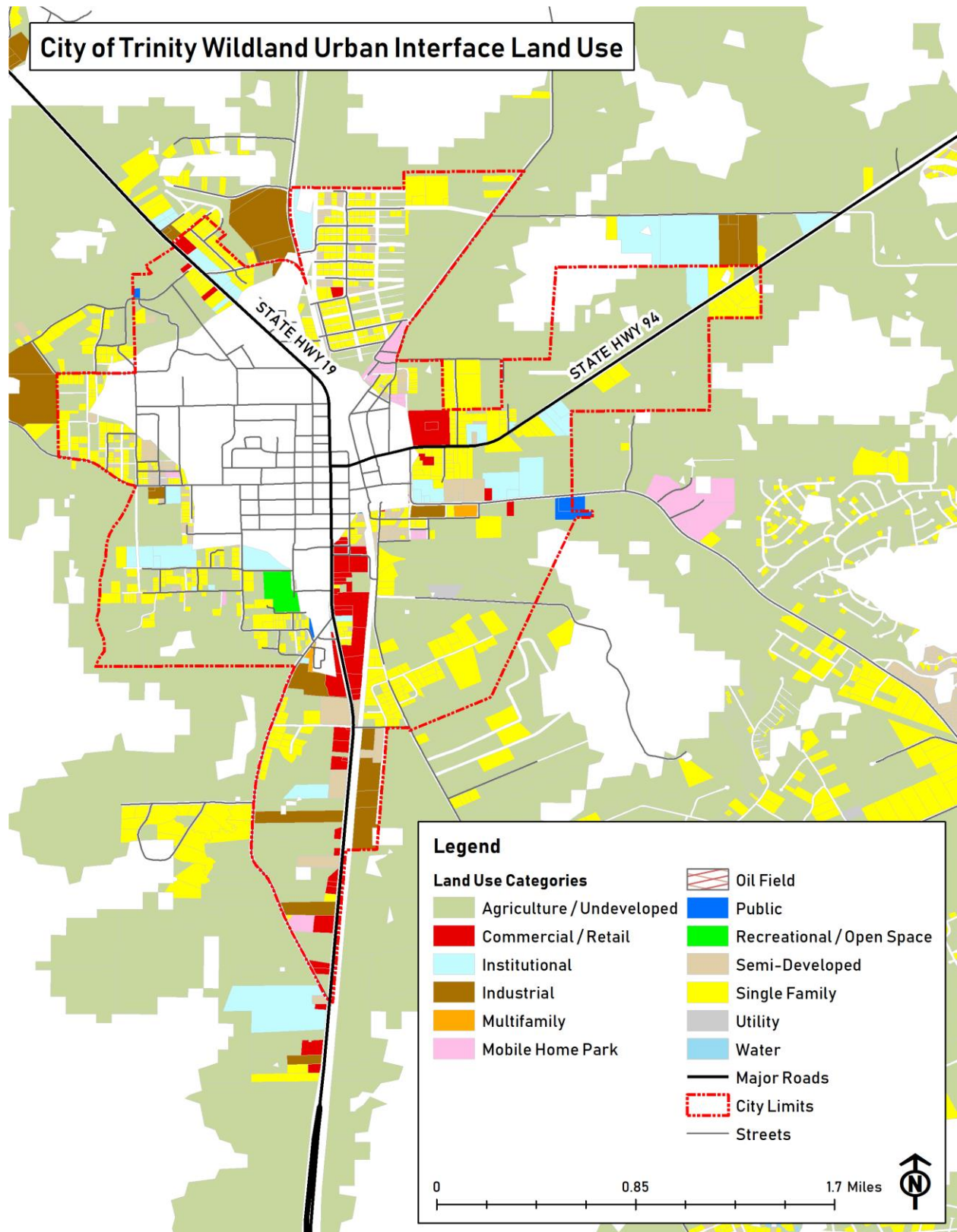


Figure 20: City of Trinity Land Use Types in Wildland Urban Interface

## *B) Impact*

Impacts from a wildfire in Trinity County and the participating jurisdictions may include but are not limited to: crop damage or destruction, damaged or destroyed agricultural, residential, commercial, and industrial buildings, escaped, lost, injured or killed livestock and pets. In the worst cases, residents may be injured or killed.

## **5) Vulnerability**

### *A) Population*

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a wildfire.

Residents of mobile homes, specifically those built before HUD's Manufactured Housing and Standards requirements were introduced in 1976, are of particular concern<sup>17</sup>. These structures are more prone to fire and have a higher incidence of occupant death than modern manufactured homes.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a wildfire, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a wildfire than structures in standard condition. Exterior damages may make the homes more prone to fire by more readily exposing flammable materials to flame. Missing windows and other exterior gaps may leave residents and structures prone to smoke inhalation and smoke damage.

All of these issues may increase damages and lead to injuries or loss of life.

---

<sup>17</sup> <https://www.usfa.fema.gov/downloads/pdf/statistics/rural.pdf>

### B) Critical Facilities

Eighteen critical facilities are located in the wildland urban interface (WUI), as defined by the Texas A&M Forest Service. Because of their location in the WUI, the density of development, and proximity to wildland areas, these facilities are believed to be particularly susceptible to future wildfire threats.

Table 21: Trinity County Critical Facilities Vulnerable to Wildfire

Critical Facilities	Potential Wildfire Impacts				
	Destruction	Partial Destruction	Heat Damage	Smoke Damage	Water Damage
356 VFD	x	x	x	x	x
Apple Springs VFD	x	x	x	x	x
Friday Volunteer Fire Department	x	x	x	x	x
Groveton City Hall	x	x	x	x	x
Groveton EMS	x	x	x	x	x
Groveton Police Department	x	x	x	x	x
Groveton Wastewater Treatment Plant	x	x	x	x	x
Pennington VFD	x	x	x	x	x
Trinity Community Center	x	x	x	x	x
Trinity County Courthouse	x	x	x	x	x
Trinity County Courthouse Annex	x	x	x	x	x
Trinity County Sheriff's Department	x	x	x	x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x	x	x	x
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x	x	x	x	x
Trinity Wastewater Treatment Plant	x	x	x	x	x
Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x	x	x	x	x
Ventura EMS	x	x	x	x	x

### C) Vulnerable Parcels

Table 22: Trinity County Parcels Vulnerable to Wildfire

Jurisdiction	Total	Estimated Potential Damage Value
Trinity County	21,1234	\$1,393,333,696

Table 23: City of Groveton Parcels Vulnerable to Wildfire

Jurisdiction	Total	Estimated Potential Damage Value
City of Groveton	717	\$41,312,654

Table 24: City of Trinity Parcels Vulnerable to Wildfire

Jurisdiction	Total	Estimated Potential Damage Value
City of Trinity	1,116	\$45,920,359

## 7. Tornado

A tornado is defined as a rapidly rotating vortex or funnel of air extending ground-ward from a cumulonimbus cloud. Most of the time, vortices remain suspended in the atmosphere and are visible as a funnel cloud. However, when the lower tip of a vortex touches the ground, the tornado becomes a force of destruction. Tornado strength is currently measured using the Enhanced Fujita (EF) Scale. Like the previously used Fujita scale, the EF Scale uses damage to estimate tornado wind speeds and assign a number between 0 and 5. A rating of EF0 represents minor to no damage whereas a rating of EF5 represents total destruction of buildings.

### 1) Tornado History

According to data from NOAA's National Weather Service Weather Forecast Office in Corpus Christi, Trinity County's 2013 Community Hazard Assessment Mitigation Planning System (CHAMPS) Report, local news reports, and data from the National Centers for Environmental Information, the following tornados affected Trinity County and the participating jurisdictions:

Table 25: Trinity County Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	12/31/1952 - 4/25/2011	24	F0 - F3, EF1	0	33	\$19,128,860	\$4,108,783

Table 26: City of Groveton Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Groveton	5/9/1994 - 1/1/1999	3	F0	0	0	\$67,538	\$0

Table 27: City of Trinity Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity	11/30/1996 - 10/13/2001	3	F0 - F2	0	2	\$1,174,649	\$0

No tornados have been recorded in Trinity County or either participating jurisdiction since 2011.

## 2) Likelihood of Future Occurrence

Based on the frequency of previous tornados in Trinity County and the participating jurisdictions, a future event that may impact any or all of them is likely, meaning one is probable in the next three years.

## 3) Extent

The Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornados via the damage they cause. Six categories from zero to five represent increasing degrees of damage. The scale considers how most structures are designed, and is thought to be an accurate representation of the surface wind speeds in the most violent tornados.

Table 28: Enhanced Fujita Scale<sup>18</sup>

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	Wind Speed (MPH)	Potential Damage
EF0	65-85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	200+	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Previous tornados in Trinity County and the participating jurisdictions have ranged in strength from F0 to F3 on the Fujita Scale. Since the switch to the updated scale, only EF1 tornados have been recorded.

<sup>18</sup> Texas State Hazard Mitigation Plan, 2013 Update

The worst tornado recorded caused, adjusted for inflation, over \$1.7 million in property damages and over \$170,000 in crop damages.<sup>19</sup> No injuries or fatalities have been reported in conjunction with tornado events.

The impact of future tornados in all three jurisdictions may meet those previous worst-case F3 (or EF1) tornados in terms of total damage dollars inflicted, the number residents injured, and may even be fatal.

#### **4) Location and Impact**

##### *A) Location*

Tornados are not constrained by any distinct geographic boundary. Tornados can occur across all participating jurisdictions, and may freely cross from one jurisdiction into another.

##### *B) Impact*

Impacts from a tornado may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Pets and livestock may be injured or killed by tornados or flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, tornados may cause injuries and/or be deadly.

#### **5) Vulnerability**

Tornados have the potential to impact the entire planning area. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population of the participating jurisdictions are considered vulnerable to this hazard.

##### *A) Population*

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a tornado.

---

<sup>19</sup> Incident date: 12/19/1991. Trinity County 2013 CHAMPS Report.

Residents of mobile / manufactured homes are of particular concern. These structures are never considered safe during a tornado.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tornado, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a tornado than structures in standard condition.

Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

### *B) Critical Facilities*

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to tornados. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible.

The selected critical facilities are built from a variety of materials with varying levels of resistance to tornadic damages. Additionally, their varying ages mean they weren't constructed to uniform building standards.

Given tornados' violent nature, the facilities identified below may experience increased levels of vulnerability to the hazard. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a tornado if that damage affects the facility's ability to reopen and resume normal business right away. Additionally, any loss of culturally important facilities may have negative effects in the community beyond the simple loss of the facility itself.



Table 29: Trinity County Critical Facilities Vulnerable to Tornadoes

Trinity County	Potential Tornado Impacts								
	Loss of Power	Flying Debris	Uprooted Trees	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
356 VFD	x	x	x					x	x
Apple Springs VFD	x	x	x					x	x
Blanche K. Werner Public Library	x	x	x	x				x	x
Dorcas Wills Memorial Baptist Church	x	x		x	x	x	x	x	x
Friday Volunteer Fire Department	x	x	x					x	x
Groveton City Hall	x	x	x	x	x	x		x	x
Groveton EMS	x	x	x	x		x	x	x	x
Groveton Police Department	x	x	x	x		x	x	x	x
Groveton VFD	x	x		x				x	x
Groveton Wastewater Treatment Plant	x	x	x	x				x	x
Pennington VFD	x	x						x	x
Trinity City Hall	x	x		x				x	x
Trinity Community Center	x	x	x	x	x	x	x	x	x
Trinity County Airport	x	x	x		x		x	x	x
Trinity County Courthouse	x	x	x	x	x	x	x	x	x
Trinity County Courthouse Annex	x	x		x	x	x	x	x	x
Trinity County Sheriff's Department	x	x		x	x	x	x	x	x
Trinity Police Department	x	x		x				x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x	x			x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x		x				x	x
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x	x	x		x	x	x	x	x
Trinity VFD	x	x		x				x	x
Trinity Wastewater Treatment Plant	x	x	x		x	x		x	x

Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x	x	x	x	x			x	x
Ventura EMS	x	x	x					x	x

*C) Vulnerable Parcels*

Table 30: Parcels Vulnerable to Tornados

Jurisdiction	Parcel Count	Estimated Potential Damage Value
County	25,897	\$2,057,525,996.00
City of Groveton	721	\$43,895,823.00
City of Trinity	1,797	\$110,775,785.00

## 8. Drought

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length.

Droughts are one of the most complex natural hazards to identify because it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants and even in severe cases, trees.

Table 31: Drought Classifications

<b>Meteorological Drought</b>	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
<b>Hydrologic Drought</b>	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
<b>Agricultural Drought</b>	Soil moisture deficiencies relative to water demands of plant life, usually crops.
<b>Socioeconomic Drought</b>	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

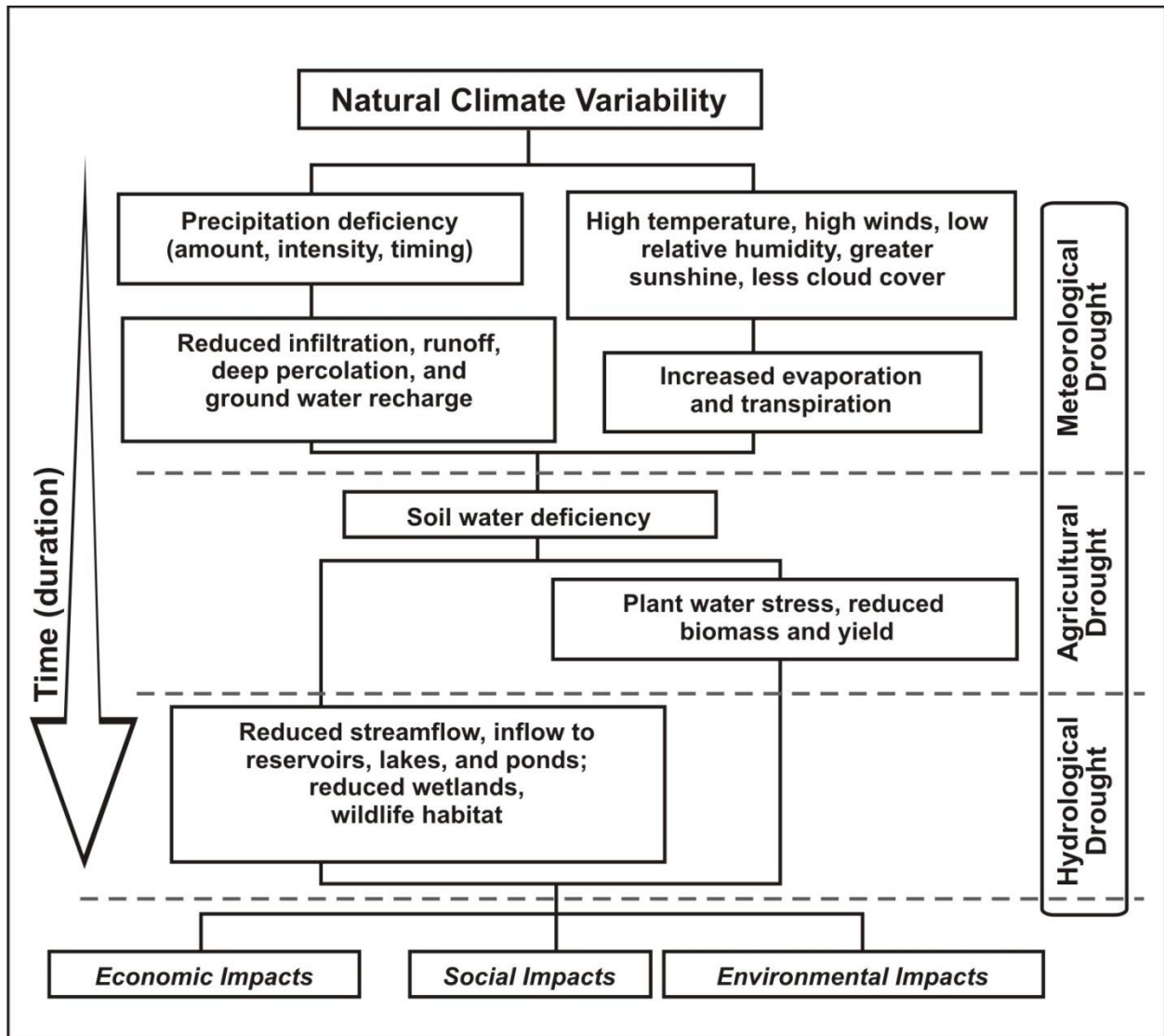


Figure 21: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types<sup>20</sup>

<sup>20</sup> Source: National Drought Mitigation Center, University of Nebraska-Lincoln, <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>

1) Drought History

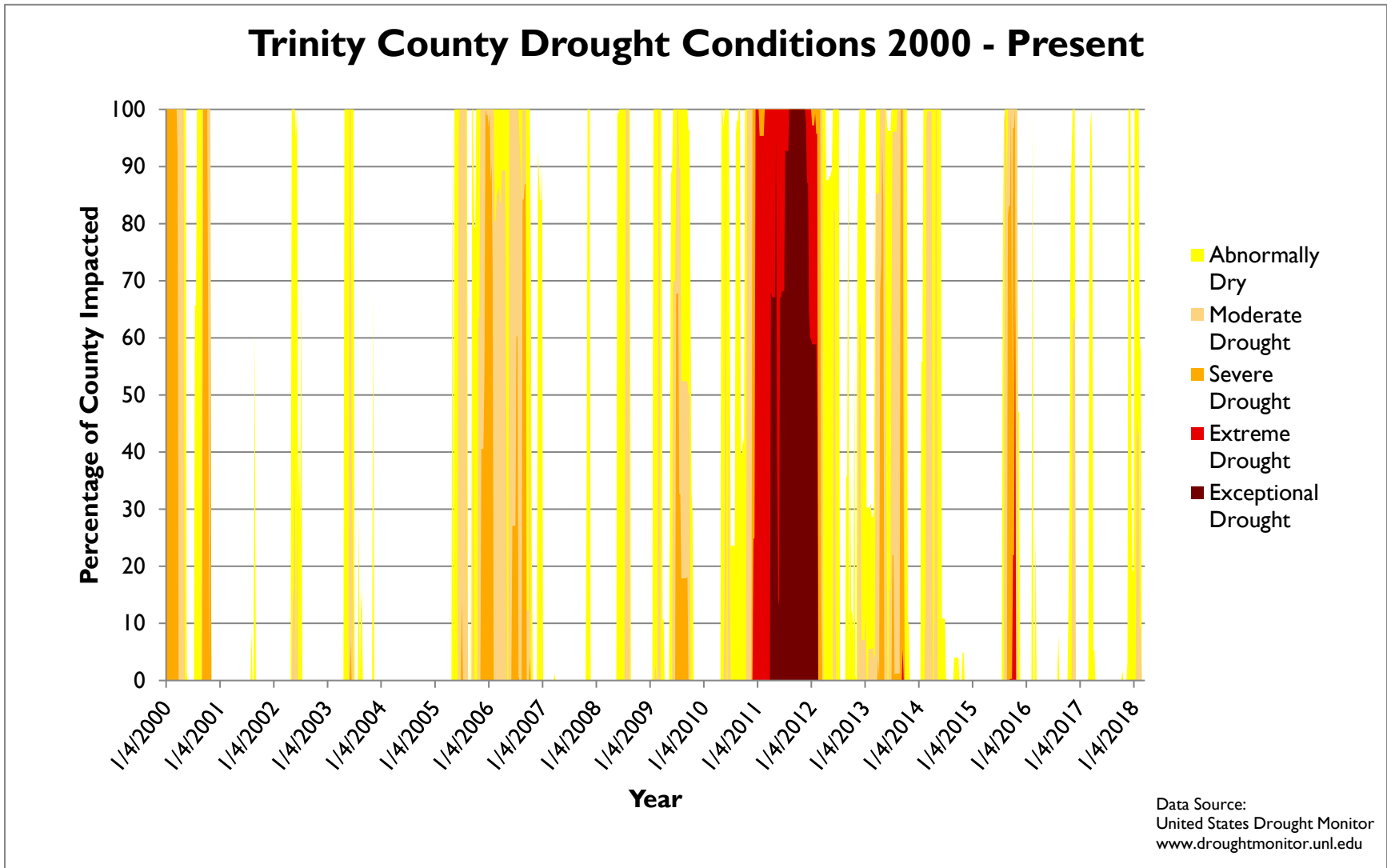


Figure 22: Trinity County Drought Conditions 2000 - Present

Drought history is recorded at the county level. However, the data is measured by the percentage of the county affected by drought. Although no specific data regarding drought’s occurrences in the City of Groveton or the City of Trinity is reported, it’s possible to use the data in Figure 22 to infer when both jurisdictions previously experienced drought conditions due to the fact that the conditions impacted 100% of the county.

According to the data, all participating jurisdictions have experienced drought conditions on a nearly annual basis during the last 10 years.

The planning team collected additional drought history from the Trinity County 2013 CHAMPS Report and the National Centers for Environmental Information. It included the following information:

**Table 32: Trinity County 2013 CHAMPS Report and NCEI Drought Data**

Location	Date Range	Number of Drought Events	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	4/1/1996 - 8/1/2009	11	0	0	\$2,912,111	\$27,876,626

There are no recorded injuries or deaths due to drought in Trinity County or the participating jurisdictions.

**The City of Groveton determined that any damages associated with droughts are likely to be negligible and therefore isn’t addressing the hazard.**

### 2) Likelihood of Future Occurrence

Based on historical drought in Texas and Trinity County, the likelihood of future drought affecting Trinity County and the City of Trinity is likely, with an event probable in the next three years, and a major drought every 20 years.

### 3) Extent

Over the last 10 years, Trinity County has regularly experienced county-wide droughts classified as periods ranging from abnormal dryness to exceptional drought. At multiple times, the entire County, including the City of Groveton and the City of Trinity, has been in exceptional drought, the most severe drought category.

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current

weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop.

Table 33: Palmer Drought Index

Drought Index	Drought Conditions Classifications						
	Extreme	Severe	Moderate	Normal	Mostly Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above

Table 34: Palmer Drought Category Descriptions<sup>21</sup>

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.	-5.0 or less

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

<sup>21</sup> www.droughtmonitor.unl.edu



Based on the historical occurrences of drought, Trinity County and all participating jurisdictions should anticipate experiencing droughts ranging from abnormally dry to exceptional drought or D0 to D4 based on the Palmer Drought Category. Given varying conditions, droughts may start on the low end of the Palmer Drought Category, but will intensify with duration and an ongoing lack of precipitation.

Trinity County and the participating jurisdictions experienced an extended period of drought between 2010 and 2012. Throughout that time, drought conditions ranged from abnormally dry to exceptional drought, and the worst period lasted from April 2011 through February 2012. In October 2012, 100% of the County was in exceptional drought, D4.

Since 1996, the worst droughts in Trinity County and the participating jurisdictions have inflicted up to \$1,527,552<sup>22</sup> in property damages and \$11,151,131<sup>23</sup> in crop damages. Droughts have been as intense as D4, exceptional drought, on the Palmer Drought Category scale.

Future drought events may meet previous D4 droughts in terms of intensity, duration, and total damage dollars inflicted.

#### 4) Location and Impact

##### A) Location

Drought has no distinct geographic boundary. Drought can occur across all participating jurisdictions.

##### B) Impact

Infrastructural impacts may include damage to the foundations of agricultural, residential, commercial, and industrial buildings. Road networks that pass through the County and participating jurisdictions may be damaged to the point of failure as the ground shifts and shrinks. The participating jurisdictions' water and wastewater systems may fail due to cracks and breaks in underground tanks and pipe networks.

Economic impacts may include: increased prices for food, unemployment for farm workers and ranch hands, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall.

The City of Groveton adopted its current Water Conservation and Drought Contingency Plan in August 2007. The plan describes three stages of water restrictions ranging from voluntary conservation to a prohibition of activities. Each stage is triggered by changes in the level of water

---

<sup>22</sup> Event date: 8/1/1998, damage dollars adjusted to \$2018

<sup>23</sup> Event date: 8/1/1998, damage dollars adjusted to \$2018

demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

The City of Trinity has also adopted a drought contingency plan. The plan describes three stages of water restrictions ranging from voluntary conservation to a prohibition of activities. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

## 5) Vulnerability

Because drought has the potential to impact every jurisdiction equally, all improved property and the entire population is exposed to this hazard. Foundations of all buildings are vulnerable; however, older structures or those built under less stringent foundation code requirements are most vulnerable. Critical infrastructure like water and wastewater lines and roads are also vulnerable.

### A) Population

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a drought.

Lower income populations who may not have the resources to buy large quantities of bottled water in the event of a shortage may be more vulnerable than other populations.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a drought may be more likely to suffer additional damages, including irreparable damage to building foundations as soils shift and shrink. Depending on their financial means, these residents may require additional assistance recovering from drought-caused damages.

### B) Critical Facilities

In addition to triggering various components of participating jurisdictions' Drought Contingency plans, drought conditions may affect local critical facilities. Area fire departments may see increased demand for controlling wildland fire due to dry conditions. Drought is likely to require increased output from the local power companies in order to keep up with electrical demand. Depending on factors like time of year, temperature, and duration, increased electrical demand may cause brownouts that would impact critical facilities like the local community centers, senior

center, and local nursing homes. Structural damage to all critical facilities, based on the rarity of previous instances of structural damage, is expected to be limited. However, in the worst cases such damage is possible, and may include cracked building foundations, damages to water and wastewater lines that serve the facilities, and in certain cases, these physical damages may create economic damages for the broader community.

Table 35: Trinity County Critical Facilities Vulnerable to Drought

Trinity County	Potential Drought Impacts			
	Structural Damage	Water / Wastewater Line Damages	Increased Demand for Services	Economic Damages
356 VFD	x	x	x	
Apple Springs VFD	x	x	x	
Blanche K. Werner Public Library	x	x	x	
Dorcas Wills Memorial Baptist Church	x	x	x	
Friday Volunteer Fire Department	x	x	x	
Groveton City Hall	x	x	x	
Groveton EMS	x	x	x	
Groveton Police Department	x	x	x	
Groveton VFD	x	x	x	
Groveton Wastewater Treatment Plant	x	x	x	x
Pennington VFD	x	x	x	
Trinity City Hall	x	x	x	
Trinity Community Center	x	x	x	
Trinity County Airport	x	x	x	x
Trinity County Courthouse	x	x	x	
Trinity County Courthouse Annex	x	x	x	
Trinity County Sheriff's Department	x	x	x	
Trinity Police Department	x	x	x	
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x	x	
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x	x	x	x
Trinity VFD	x	x	x	
Trinity Wastewater Treatment Plant	x	x	x	x
Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x	x	x	x
Ventura EMS	x	x	x	

### C) Vulnerable Parcels and Infrastructure

Given drought’s geographic reach, all parcels within the participating jurisdictions are equally vulnerable to the hazard. However, given the limited structural damage inflicted by previous droughts, future structural damages are expected to be similarly limited.

Table 36: Estimated Potential Damage Values in Trinity County<sup>24</sup>

Jurisdiction	Parcel Count	Estimated Potential Damage Value
County	25,897	\$2,057,525,996.00
City of Groveton	721	\$43,895,823.00
City of Trinity	1,797	\$110,775,785.00

#### I. Water and Wastewater Systems

Water and wastewater systems rely on underground pipe networks to function properly. During extreme droughts, as the ground shifts and shrinks, these pipes become vulnerable to cracks and breaks.

Damage to water and wastewater systems, especially during a drought, may be severe enough exceed a jurisdiction’s ability to immediately fund repairs without outside assistance.

Homes that rely on septic tanks or other onsite sewage facilities (OSSF) may become uninhabitable if the lines connecting them become damaged and cannot be repaired quickly.

Delays returning water and wastewater systems to normal functionality may require the participating jurisdictions to provide emergency alternatives.

#### II. Road and Railroad Networks

Drought conditions may damage road and railroad networks in various ways. Depending on usage and temperature, as soil shifts and shrinks, roadbeds and railroad beds may subside. In the case of railroads, subsidence may lead to failure. A combination of shifting ground, high temperatures, and heavy usage may cause asphalt roads to become rutted.

The Union Pacific railroad in Trinity County runs through the far western portion of the County and passes through the City of Trinity. A small portion of the Texas South-Eastern Railroad (TSE) passes through the northeastern corner of Trinity County, but doesn’t enter any incorporated

---

<sup>24</sup> Property values based on Trinity County 2013 CHAMPS Report.

areas within the County. Damages to either rail line, especially in the City of Trinity, could be catastrophic if they were to cause a derailment.

Although surface streets may be most vulnerable to drought's effects due to variations in street construction requirements throughout the county and participating jurisdictions, damages to US 287, which runs through the City of Groveton, would create the greatest impact in Trinity County and the participating jurisdictions because it also functions as a hurricane evacuation route.

### **III. Agricultural Production**

According to the USDA 2012 Census of Agriculture<sup>25</sup>, the total market value of agricultural products sold, including direct sales, in Trinity County was \$7,050,000. Between 1995 and 2017<sup>26</sup>, \$187,259 in indemnities was paid to farmers in Trinity County. That is roughly \$320,454 per year. Although the proportion of indemnities paid to cover losses due to drought isn't identifiable, given Trinity County's recent drought history, it is likely that at least some of the dollars paid were related to drought-caused damages.

Given agriculture's role in the County, drought-caused losses will have impacts beyond any individual and may lead to contraction in the wider economy. However, because the data is recorded at the county level, there is no specific information regarding agricultural losses due to drought for the City of Groveton or the City of Trinity.

---

<sup>25</sup>[https://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_County\\_Level/Texas/st48\\_2\\_002\\_002.pdf](https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/st48_2_002_002.pdf)

<sup>26</sup> <https://farm.ewg.org/cropinsurance.php?fips=48455&summpage=SUMMARY>

## 9. Dam/Levee Failure

Dam failure is defined as a systematic failure of the dam structure resulting in the uncontrolled release of water, often resulting in floods that could exceed the 100-year flood plain boundaries. Dam failure can cause mass fatalities, mass structural damage and/or a cascading potential if a populated area is located below the dam structure.

### 1) Dam/Levee Failure History

According to the best information available, there is no history of dam failure in Trinity County or either participating jurisdiction. The County elected to address this hazard because of the possibility that dam and / or levee failure may become a local issue within the current planning period.

The City of Groveton determined that any damages associated with dam failures are likely to be negligible and therefore isn't addressing the hazard.

The City of Trinity determined that any damages associated with dam failures are likely to be negligible and therefore isn't addressing the hazard.

### 2) Likelihood of Future Occurrence

Given the lack of a prior dam or levee failure in the participating jurisdictions, dam / levee failure is considered unlikely, meaning that one is possible in the next 10 years.

### 3) Extent

A way to consider the hazard extent is to use the storage capacity behind the dam to estimate the ground surface that would be covered with a foot of water.

An acre-foot is 325,851 gallons and would cover one acre of land with a foot of water. A 1,000-acre-foot body of water could cover 40 acres with an average depth of 25 feet, and the volume of 1,000 acre-feet is approximately 326 million gallons of water.

Hazard potential is also measured by the likelihood of dam / levee failure or negligent management to cause loss of human life. There are three levels of classification: High Hazard, Significant Hazard, and Low Hazard.

Table 37: Dam Failure Extent Classification

Hazard Potential Classification	Loss of Human Life	Dam Storage Capacity
Low	None Expected	Less than 10,000 acre-feet

Significant	Probable (1-6)	Between 10,000 – 100,000 acre-feet
High	Loss of Life Expected (7 or more)	100,000 acre-feet or more

There are 23 dams in Trinity County. There are no levee systems in the County.

Table 38: National Inventory of Dams in Trinity County

Dam	Owner Type	Storage Capacity in Acre/Feet	Location	
			Latitude	Longitude
CAMP BRANCH ACRES DAM	Federal	130	30.8521	-95.2061
ADAMS LAKE DAM	Private	240	31.0083	-95.3054
HARALSON LAKE DAM	Private	130	30.9274	-95.3819
HAYNES LAKE DAM	Private	560	30.9301	-95.1519
HORSESHOE LAKE DAM	Private	145	30.9329	-95.3311
HUNTLY MILLAR LAKE DAM	Private	120	30.9976	-95.2856
LAKE DAWSON DAM	Private	145	31.0037	-95.2888
LAKE JENNIFER	Private	480	30.9804	-95.4024
LAKE PENNINGTON DAM	Private	550	31.1742	-95.1855
LOWER LAKE AVERY DAM	Private	550	31.044	-95.1323
MILL POND DAM	Private	372	30.9655	-95.3787
PRICE LAKE DAM	Private	106	31.0752	-95.0136
RICE LAKE DAM	Private	184	31.0299	-95.1208
SARON LAKE NO 1 DAM	Private	1,040	31.0083	-95.2625
SARON LAKE NO 2 DAM	Private	68	31.0143	-95.2649
SARON LAKE NO 3 DAM	Private	140	31.0182	-95.2681
SARON LAKE NO 4 DAM	Private	58	31.0236	-95.27
SARON LAKE NO 6 DAM	Private	80	31.0287	-95.2795
SARON LAKE NO 7 DAM	Private	102	31.0323	-95.2781
SENTELL LAKE DAM	Private	224	30.9588	-95.4001

THORNTON LAKE DAM	Private	295	30.9341	-95.407
UPPER LAKE AVERY DAM	Private	690	31.0466	-95.1334
WESTWOOD LAKE DAM	Private	680	30.9447	-95.3344

There are 23 dams in Trinity County and the participating jurisdictions, and almost all are privately owned.

It is each dam owner’s responsibility to ensure that their dam is in compliance with the Texas Commission on Environmental Quality’s<sup>27</sup> (TCEQ) regulations regarding emergency action plans. Additionally, each dam owner required to have an emergency action plan must know and be prepared to take the actions outlined in their emergency action plan, should their dam begin to fail.

Dam owners are not required to share or publicize their emergency action plans with anyone other than TCEQ. Trinity County and the participating jurisdictions are not aware of an emergency action plan for any dam.

The dams in Trinity County pose an unknown threat. All dams in Trinity County are considered low hazard. They hold less than 10,000 acre-feet of water, and no loss of life is expected should any fail. However, given the right set of circumstances, dam failure in Trinity County has the potential to be damaging. At this time, Trinity County and the participating jurisdictions must claim a data deficiency at this time because they don’t have access to data showing expected inundation areas or peak discharge rates for any of the dams in the County.

---

<sup>27</sup> <https://www.tceq.texas.gov/compliance/investigation/damsafetyprog.html>  
For the most up-to-date information, contact TCEQ directly.



#### 4) Location and Impact

##### A) Location

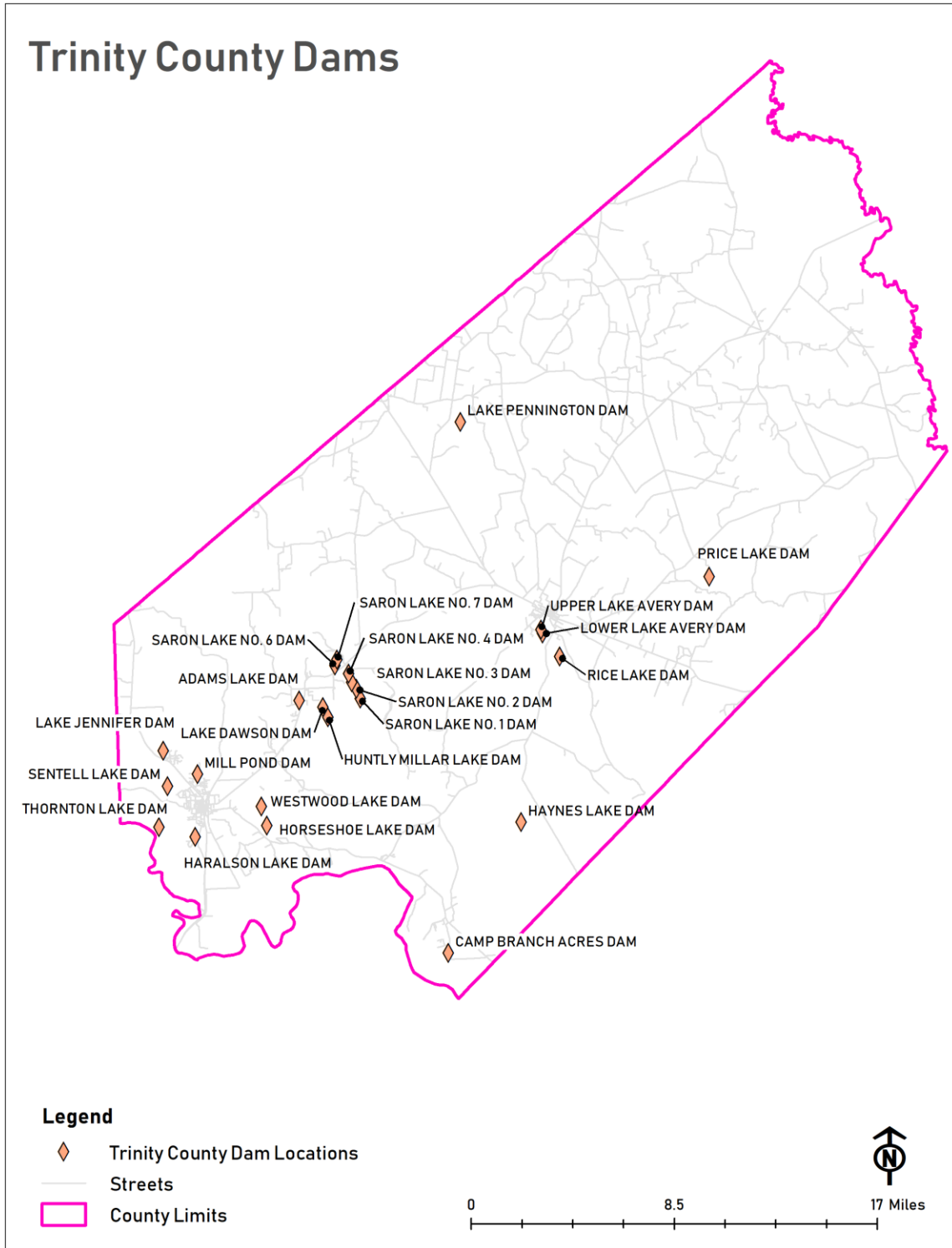


Figure 23: Trinity County Dam Locations

Given the low hazard status of both dams and levees, to determine potential downstream flooding, all census blocks within a one-mile radius of each dam were considered to be at risk of inundation during a dam or levee failure.

*B) Impact*

Structures at risk of dam failure may be flooded, damaged by floodborne contaminants, damaged by debris flow, or even completely washed away. Although no loss of life to dam failure is expected in Trinity County, under the right conditions injury or loss of life are possible.

## 10. Extreme Heat

Extreme heat is defined as summertime temperatures that are substantially hotter and/or more humid than average for a given location at that time of year. Humid conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens. The major human risks associated with severe summer heat include: heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirm, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their wellbeing.

Severe summer heat is an invisible killer. Although a heat wave does not happen with the spectacle of other hazards such as tornados and floods, the National Center for Environmental Health reports that extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010<sup>28</sup>. Extreme heat kills more people than hurricanes, floods, tornados and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

### 1) Extreme Heat History

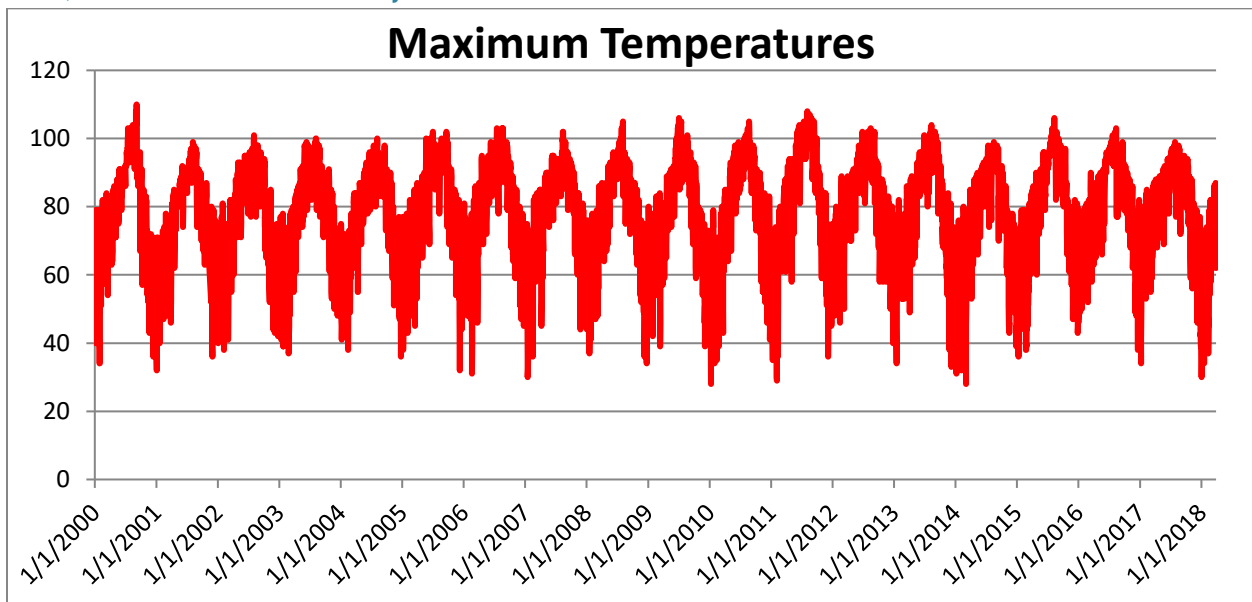


Figure 24: Maximum Recorded Daily Temperature 2000-2018<sup>29</sup>

<sup>28</sup> [http://www.bt.cdc.gov/disasters/extremeheat/heat\\_guide.asp](http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp)

<sup>29</sup> Source: National Climatic Data Center, <https://www.NCEI.noaa.gov/cdo-web/datasets>

Between January 2000 and January 2018, Trinity County and the participating jurisdictions experienced 250 days with a maximum temperature of 100°F or hotter and nearly 1,200 days where the combination of humidity and moderate-to-high temperatures warranted a heat advisory, if not an excessive heat warning.

Extreme heat data is recorded at the county level. However, given the nature of extreme heat, all participating jurisdictions experienced the same extreme heat events. No damage dollars for any extreme heat event have been recorded in either participating jurisdiction in over 15 years.

**The City of Groveton determined that any damages associated with extreme heat are likely to be negligible and therefore isn't addressing the hazard.**

**The City of Trinity determined that any damages associated with extreme heat are likely to be negligible and therefore isn't addressing the hazard.**

## **2) Likelihood of Future Occurrence**

Based on historic weather data, the likelihood of extreme heat in Trinity County and the participating jurisdictions is highly likely, meaning an event affecting any or all jurisdictions is probable in the next year.

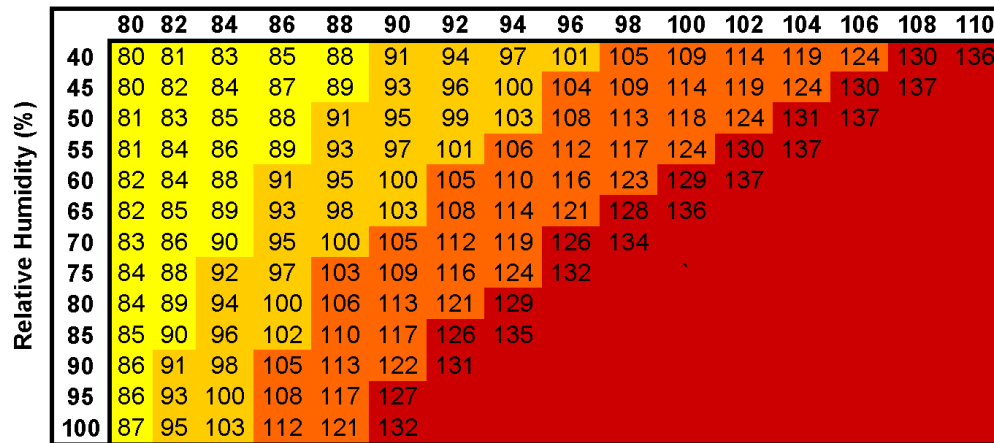
## **3) Extent**

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the "Heat Index," and is depicted in Figure 25. This index measures how hot it feels outside when humidity is combined with high temperatures.

## NOAA's National Weather Service

### Heat Index

Temperature (°F)



**Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity**

Caution     
  Extreme Caution     
  Danger     
  Extreme Danger

*Figure 25: NOAA's NWS Heat Index Chart<sup>30</sup>*

The extent scale in Figure 25 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is below 90°F, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. “Caution” is the first level of intensity where fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps or heat exhaustion are possible, whereas a “Danger” level means that these symptoms are likely. “Extreme Danger” indicates that heat stroke is likely.

The National Weather Service (NWS) initiates alerts based on the Heat Index as shown in Table 39.

**Table 39: Heat Intensity**

Intensity	Description
Heat Advisory	Extreme heat index making it feel hot, typically between 105°F to 110°F for 3 hours

<sup>30</sup> <http://www.nws.noaa.gov/om/heat/ht-images/heatindexchart.png>

	or more during the day and at or above 75°F at night.
Excessive Heat Warning	Extreme heat index making it feel very hot, typically above 105°F for 3 hours or more during the day and at or above 80°F at night.

Given an estimated daily average relative humidity level of 76%<sup>31</sup>, highs as low as 89°F can produce a heat index temperature of 106°F. The combination of high humidity and moderate temperatures creates an environment that reaches the Danger Zone on NOAA’s Heat Index Chart, and may trigger an NWS Heat Advisory.

Between 2000 and 2018, Trinity County and the participating jurisdictions experienced 449 days with highs of 89°F or hotter and overnight lows of 75°F or hotter. Based on the NWS descriptions in Table 39 above, and the average daily humidity level, these days likely warranted a heat advisory.

The hottest temperature recorded in Trinity County in the recent past, 110°F, was reached on September 5, 2000. Based on the NWS descriptions in Table 39 above, at least 107 of the 1,189 heat advisory days warranted an excessive heat warning based on daytime highs, the average daily humidity level, and overnight lows not falling below 80°F.

There has been no property damage, crop damage, fatalities, or injuries reported due to extreme heat in Trinity County or any of the jurisdictions.

Future extreme heat events may meet or exceed the heat index requirements for issuing an Excessive Heat Warning as described in the Heat Intensity scale in Table 39 above. The hottest temperatures in the participating jurisdictions may meet the current record temperature of 110°F. Future extreme heat events may be more intense, last longer, and cause more casualties and fatalities than previous ones.

#### 4) Location and Impact

##### A) Location – All Jurisdictions

Extreme heat has no distinct geographic boundary. Extreme heat can occur across the entire planning area and uniformly affect both participating jurisdictions.

---

<sup>31</sup> <https://www.currentresults.com/Weather/Texas/humidity-annual.php>

### *B) Impact – All Jurisdictions*

The potential impact of excessive summer heat is normally minor, resulting in few, if any, injuries. Although no deaths related to extreme heat have been reported in the participating jurisdictions, in the worst cases, the hazard has the potential to be deadly.

Extreme heat will likely cause only minor property damage and minimal disruption to the quality of life in the participating jurisdictions. Any shutdown of facilities due to extreme heat is expected to be temporary.

## **5) Vulnerability**

### *A) Population*

Vulnerable populations may feel greater impacts from extreme heat due to these populations' limited ability to properly address the hazard due to deficiencies including but not limited to: lack of air conditioning in their homes or vehicles, lack of access to air-conditioned public spaces during the hottest part of the day, insufficient numbers of box or ceiling fans, or lack of access to other means of cooling. The consequences for these populations' exposure to extreme heat can include but are not limited to: heat cramps, sunburn, dehydration, fatigue, heat exhaustion, heat stroke, or death.

### *B) Critical Facilities*

While all of the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to damages significant enough to interrupt or stop normal operations. Therefore, any estimated property losses associated with the hazard are anticipated to be minimal across the area.

## 11. Hailstorm

Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice. The size<sup>32</sup> of hailstones is a direct result of the size and severity of the storm.

High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a byproduct of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

Texas officials estimate that up to 40 percent of all homeowners' insurance claims in the state result from hail damage.

### 1) Hailstorm History

Table 40: Trinity County Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	3/30/1985 - 4/27/2015	32	0.75 - 1.75	0	0	\$394,785	\$0

Table 41: City of Groveton Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Groveton	1/26/1994 - 4/3/2012	9	0.75 - 1.75	0	0	\$52,537	\$1,107

Table 42: City of Trinity Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity	3/7/1998 - 8/23/2009	8	0.75 - 1.75	0	0	\$77,574	\$0

<sup>32</sup> As of January 5, 2010, the national minimum size for severe hail increased from ¾" to 1".



There haven't been any recorded hailstorms in Trinity County since 2015 or either participating jurisdiction since 2012.

The City of Groveton determined that any damages associated with hailstorms are likely to be negligible and therefore isn't addressing the hazard.

The City of Trinity determined that any damages associated with hailstorms are likely to be negligible and therefore isn't addressing the hazard.

### 2) Likelihood of Future Occurrence

Based on the participating jurisdictions' hailstorm history, as well as the knowledge that both hailstorms and hailstorm damages have likely been underreported, the planning team has determined that future hailstorm events are highly likely, meaning that an event is probable in every jurisdiction within the next year.

### 3) Extent

The severity of hail events ranges based on the size of the hail, wind speed, and the number and types of structures in the path of the hail storm. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding.

When hail breaks windows, water damage from accompanying rains can also be significant. A major hailstorm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over \$1 billion in property and crop damages per year. The scale showing intensity categories in Table 43 was developed by combining data from National Centers for Environmental Information (NCEI) and the Tornado and Storm Research Organization (TORRO). Damaging hail in Trinity County and the participating jurisdictions has ranged in size from H2 to H7.

Table 43: Hailstorm Intensity<sup>33,34</sup>

Size Code	Intensity Category	Size (Diameter in inches)	Descriptive Term	Typical Damage
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-.060	Mothball	Slight damage to plants and crops
H2	Significant	.060-.080	Penny	Significant damage to fruit, crops, and vegetation

<sup>33</sup> <http://www1.NCEI.noaa.gov/pub/data/cmb/extremes/scec/reports/SCEC-Hail-Guide.pdf>

<sup>34</sup> <http://www.torro.org.uk/hscale.php>

H3	Severe <sup>35</sup>	0.80-1.20	Nickel – Half dollar	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half dollar – Ping pong ball	Widespread glass damage and vehicle bodywork damage
H5	Destructive	1.6-2.0	Ping pong ball – hen egg	Wholesale destruction of glass, damage to tiled roofs, and significant risk of injuries
H6	Destructive	2.0-2.4	Hen egg – tennis ball	Bodywork of grounded aircraft dented and brick walls pitted
H7	Destructive	2.4-3.0	Tennis ball – Baseball	Severe roof damage and risk of serious injuries
H8	Destructive	3.0-3.5	Hockey puck	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Softball	Extensive structural damage could cause fatal injuries
H10	Super Hailstorms	4.0+	Greater than softball-sized	Extensive structural damage could cause fatal injuries

According to NCEI data and Trinity County’s 2013 CHAMPS Report, the worst hailstorms in Trinity County and the participating jurisdictions have produced hail up to 1 ¾” in diameter, H5 on the Hailstorm Intensity Scale. Adjusted for inflation, the worst individual hailstorms have inflicted the equivalent of \$82,406 in reported property damages and \$1,107 in crop damages.

Future hailstorms in the participating jurisdictions may meet or exceed previous worst-case H5 storms in terms of hailstone size, damage dollars inflicted, and the number of residents injured or worse.

**4) Location and Impact**

*A) Location*

Hailstorms vary in terms of size, location, intensity and duration but are considered frequent occurrences in the planning area. Each jurisdiction is uniformly exposed to hail events just as each is uniformly exposed to the thunderstorms that typically produce the hail events.

*B) Impact*

The severity of a hailstorm’s impact is considered to be limited since they generally result in injuries treatable with first aid, shut down critical facilities and services for 24 hours or less, and less than ten percent of affected properties are destroyed or suffer major damage. All existing

---

<sup>35</sup> Hail must be 1” or larger to be classified as severe

and future buildings, facilities, and populations in the participating jurisdictions are considered to be exposed to this hazard and could potentially be impacted.

## 5) Vulnerability

### A) Population

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

Since hailstorms arise with little to no warning, the participating jurisdictions recognize that vulnerable populations may primarily need additional help recovering from a hailstorm.

Residents of sub-standard structures are of particular concern. Structures in sub-standard condition ahead of a hailstorm, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may sustain more damages than structures in standard condition.

Existing weaknesses, especially those related to the condition of a structure's roof, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

### B) Critical Facilities

Because hailstorms don't recognize geographic boundaries, all critical facilities, no matter their jurisdictional location, are equally vulnerable to hailstorms.

However, due to their flat roofs and the increased vulnerability a flat roof creates the following critical facilities were determined to be especially vulnerable to hailstorms:

Table 44: Trinity County Critical Facilities Vulnerable to Hailstorms

Trinity County	Potential Hailstorm Impacts		
	Damaged or Destroyed Roof	Damaged Windows	Water damage due to Physical Damages
Dorcas Wills Memorial Baptist Church	x	x	x
Groveton Police Department	x	x	x
Trinity County Airport	x	x	x
Trinity County Courthouse	x	x	x
Trinity County Courthouse Annex	x	x	x
Trinity County Sheriff's Department	x	x	x

Trinity Police Department	x	x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x

### C) Vulnerable Structures

Although every structure is vulnerable to damage from hail, due to often having flat roofs and the increased exposure that flat roofs create, the County’s estimated 432 commercial buildings, most significantly concentrated in the City of Trinity, but spread throughout all participating jurisdictions, are expected to sustain more damages than other infrastructure.

Table 45: All Parcels Vulnerable to Hailstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Trinity County	28,826	\$2,185,670,363
City of Groveton	770	\$56,800,118
City of Trinity	1,719	\$77,044,671

Table 46: Commercial Parcels Vulnerable to Hailstorms

Jurisdiction	Estimated Potential Damage Value
Trinity County	\$51,298,443
City of Groveton	\$4,483,705
City of Trinity	\$18,638,680

## 12. Severe Winter Storm

A severe winter storm is defined by extreme cold and heavy concentrations of snowfall or ice. Texas is disrupted more severely by severe winter storms than are regions that experience severe winter weather more frequently.

The types of severe winter storms which Texans are most familiar with are snowstorms, blizzards, cold waves and ice storms.

Snowfall with an accumulation of four or more inches in a 12-hour period is considered a heavy snowfall. Snowfall of any amount is rare south of a line from Del Rio to Port Arthur, and it is this rarity of event, coupled with a lack of preparedness for such an event, that creates a severe weather condition.

Blizzards are the most perilous of all winter storms, characterized by low temperatures and strong winds in excess of 35 mph, bearing large amounts of blowing or drifting snow. Blizzards take a terrible toll on livestock and people caught in the open. In Texas, blizzards are most likely to occur in the Panhandle and South Plains Regions.

The passage of a winter cold front with a drastic drop in temperature heralds the arrival of a cold wave, usually referred to as a "blue north'er."

An ice storm occurs when rain falls out of the warm and moist upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. If a half inch of rain freezes on trees and utility wires, damage can occur, especially if accompanied by high winds, thus half an inch is used as the criteria before an icing event is categorized as an "ice storm."

1) Severe Winter Storm History<sup>36</sup>

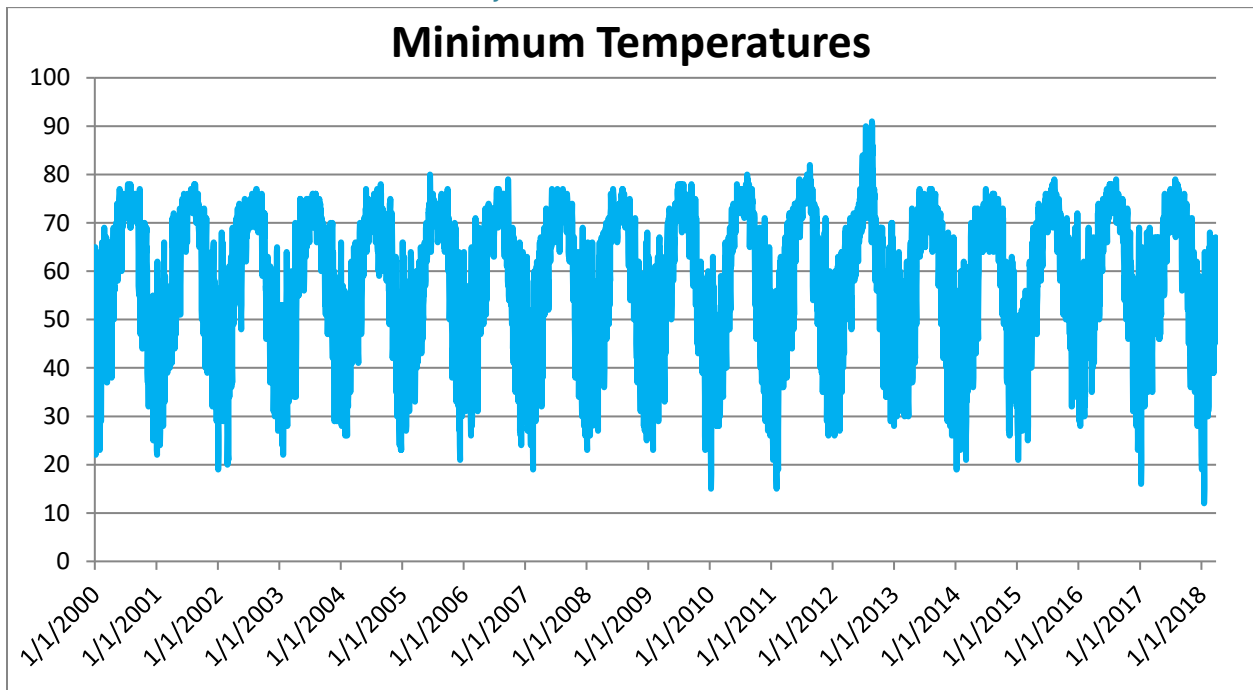


Figure 26: Minimum Recorded Daily Temperature, 2000-2017<sup>37</sup>

Location	Date Range	Number of Severe Winter Storms	Winter Storm Types	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	1/9/1962 - 12/7/2017	11	Ice Storm, Heavy Snow, Winter Storm	0	0	\$498,315	\$1,359,656

Between 2010 and 2018, Trinity County experienced 396 days with a minimum temperature of 32°F or colder. At least 13 of those days had a maximum temperature of 32°F or below.

During the same timeframe, the coldest temperature recorded was 12°F on January 17, 2018.

Severe winter weather data is recorded at the county level. However, given the nature of severe winter weather and the proximity of all jurisdictions to each other, the jurisdictions addressing the hazard experienced the same severe winter weather events.

<sup>36</sup> Comprehensive temperature data for Trinity County isn't available. Instead, the planning team used data from neighboring Houston County to estimate Trinity County's severe winter storm history.

<sup>37</sup> Source: National Centers for Environmental Information, <https://www.ncdc.noaa.gov/cdo-web/datasets>

The City of Groveton determined that any damages associated with severe winter storms are likely to be negligible and therefore isn't addressing the hazard.

The City of Trinity determined that any damages associated with severe winter storms are likely to be negligible and therefore isn't addressing the hazard.

## 2) Likelihood of Future Occurrence

The likelihood of future winter storms occurring in Trinity County and the participating jurisdictions is occasional, meaning an event affecting any or all of the participating jurisdictions is possible in the next five years.

## 3) Extent

Table 47 below displays the magnitude of severe winter storms. The wind-chill factor is further described in Figure 32. The wind chill index was developed by the National Weather Service. It neither addresses temperatures above 40°F nor wind speeds below 5 mph.

**Table 47: Winter Weather Extent Scale<sup>38</sup>**

<b>Frost Advisory*</b>	Issued when nighttime minimum temperatures are expected to range from 33°F to 36°F in the growing season.
<b>Freeze Warning*</b>	Issued when nighttime minimum temperatures are expected to reach 32°F or lower in the growing season. They are usually issued to highlight the first few freezes of the fall, or unusually late freezes in the spring. <i>A Freeze Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>
<b>Snow Advisory</b>	Issued when accumulating snow of 2 to 4 inches is expected. An advisory may still be warranted if lesser accumulations will produce travel difficulties, especially early in the winter season.
<b>Blowing Snow Advisory</b>	Issued when blowing snow is expected to occasionally reduce visibilities to 1/4 mile or less with winds generally 25 to 34 mph. The event should last at least 3 hours.
<b>Snow and Blowing Snow Advisory</b>	Issued when winds of 25 to 34 mph are expected to be accompanied by falling snow and blowing snow, occasionally reducing the visibility to 1/4 mile or less. The event should last at least 3 hours
<b>Freezing Rain / Drizzle Advisory</b>	Issued for freezing rain when ice accumulations are expected to cause travel problems, but not exceed 1/4".
<b>Sleet Advisory</b>	Issued for accumulating sleet of 1/4" to 1". Because sleet usually occurs with other precipitation types, a winter weather advisory will almost always be used in such cases.
<b>Winter Weather Advisory</b>	Issued for a winter weather event in which there is more than one hazard present, but all precipitation is expected to remain below

<sup>38</sup> Source: National Weather Service Weather Forecast Office; Norman, Oklahoma.  
<http://www.srh.noaa.gov/oun/?n=spotter-wwa-definitions>

	warning criteria. For example, it would be issued if 2 inches of snow were expected with a small amount of sleet mixing in at times.
<b>Wind Chill Advisory</b> <sup>39</sup>	Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.
<b>Wind Chill Warning</b> <sup>40</sup>	Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
<b>Ice Storm Warning</b>	Issued when a period of freezing rain is expected to produce ice accumulations of 1/4" or greater, or cause significant disruptions to travel or utilities.
<b>Heavy Sleet Warning</b>	Issued when a period of sleet is expected to produce ice accumulations of 1" or greater, or cause significant disruptions to travel or utilities.
<b>Heavy Snow Warning</b>	Issued when snow is expected to accumulate 4 inches or more in 12 hours, or 6 inches or more in 24 hours.
<b>Winter Storm Warning</b>	Issued for a winter weather event in which there is more than one hazard present, and one of the warning criteria listed above is expected to be met. For example, it would be issued if 5 inches of snow were expected in 12 hours, with some sleet mixing in at times. It is commonly issued for heavy snow with strong winds of 25-34 mph that will cause blowing and drifting of the snow. <i>A Winter Storm Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>
<b>Blizzard Warning</b>	Issued for sustained wind or frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. <i>A Blizzard Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>

\* - Non-precipitation watch / warning / advisory

<sup>39</sup> [https://www.osha.gov/dts/weather/winter\\_weather/windchill.html](https://www.osha.gov/dts/weather/winter_weather/windchill.html)

<sup>40</sup> [https://www.osha.gov/dts/weather/winter\\_weather/windchill.html](https://www.osha.gov/dts/weather/winter_weather/windchill.html)





# Wind Chill Chart

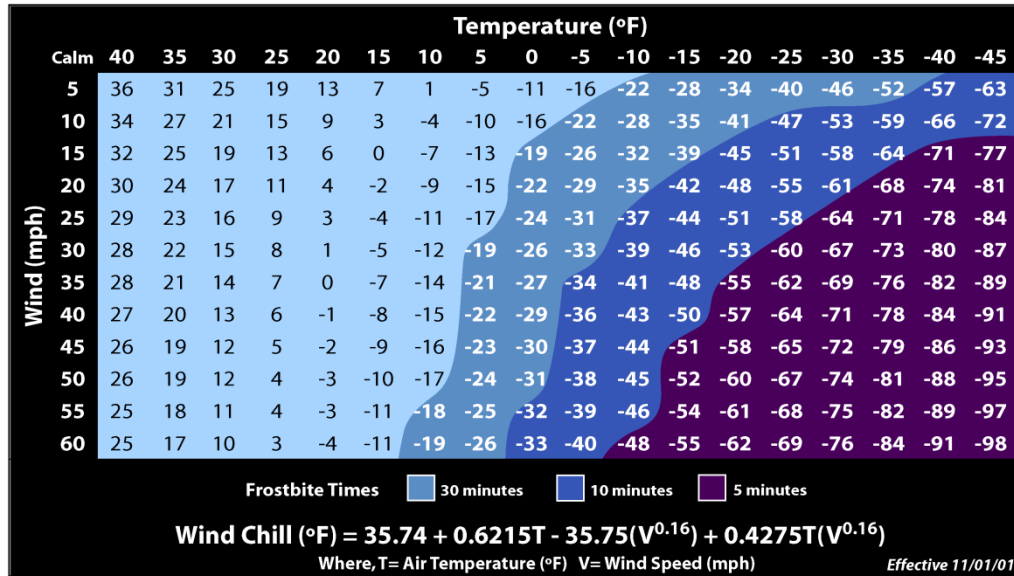


Figure 27: NWS Wind Chill Index

Based on previous winter storm events, future storms in Trinity County and the participating jurisdictions may see temperatures drop as low as the lowest recently recorded temperature, 12°F, see snow accumulation of up to 2” and see ice accumulation of up to 1”<sup>41</sup>.

#### 4) Location and Impact

##### A) Location – All Jurisdictions

Severe winter weather has no distinct geographic boundary. Severe winter weather can occur across the entire planning area and uniformly affect all participating jurisdictions.

##### B) Impact – All Jurisdictions

The potential impact of a severe winter storm is normally minor, resulting in few, if any, injuries. Because of the rarity of winter storm events in Trinity County and the participating jurisdictions, drivers, especially those unfamiliar with or unable to drive in icy conditions, may be at the highest risk of crashing their vehicle and sustaining injuries.

Beyond accidents caused by icy conditions, severe winter weather has the potential to cause widespread power outages. Trees and other vegetation that grow along or near power lines and utility lines can become overburdened by ice and snow accumulation. Falling limbs or trees can

<sup>41</sup> [https://www.weather.gov/hgx/severe\\_events\\_december](https://www.weather.gov/hgx/severe_events_december)

easily take down power and utility lines. Neglected vegetation is especially at risk of failure due to increased weight loads. Power outages can create a cascading effect depending on residents' ability to heat their homes without electricity, especially for those young, elderly, and low-income residents as identified in Section 3 of Chapter 3 above. Although no deaths related to severe winter storms have been reported in the participating jurisdictions, in the worst cases, the hazard has the potential to be deadly.

Severe winter storms will likely cause only minor property damage and minimal disruption to the quality of life in the participating jurisdictions.

Depending on when the event happens, a severe winter storm may damage or destroy crops.

## **1) Vulnerability**

### ***A) Infrastructure***

While all of the participating jurisdictions are exposed to extreme temperatures, existing buildings and infrastructure are not considered vulnerable to significant damage directly caused by severe winter storm events. This determination was made based on the expectation that most roofs can support 20 lbs. / square foot of snow<sup>42</sup>. The worst snow storm in any participating jurisdiction dropped 2". Although it's not impossible<sup>43</sup> for that much snow to cause structural damage, given that the snow weight is well below the threshold where damage is likely, structural damages are not expected. Additionally, 1" of ice is roughly equivalent in weight per square foot to 10" of snow. Considering the worst ice storms in the participating jurisdictions cause ice accumulations of 1", it's unlikely, but not impossible, that an ice storm causing structural ice accumulations of less than 4" will cause significant structural damages.

However, significant damages may be incurred indirectly. Examples include, but are not limited to, trees and limbs that fall after being overburdened with snow or ice, building strikes due to vehicles losing traction on snow or ice-covered roads, and power outages that affect building temperature regulation and allow pipes to freeze and burst.

### ***B) Population***

As described in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Areas with concentrations of young, elderly, and low-income residents may feel greater impacts from severe winter weather due to those populations' limited ability to properly address the hazard. Deficiencies may include but aren't limited to: lack of heating in their homes or vehicles, lack of access to heated public spaces

---

<sup>42</sup> <https://disastersafety.org/freezing-weather/prevent-roof-collapse-homes/>

<sup>43</sup> [https://www.fema.gov/media-library-data/7d8c55d1c4f815edf3d7e7d1c120383f/FEMA957\\_Snowload\\_508.pdf](https://www.fema.gov/media-library-data/7d8c55d1c4f815edf3d7e7d1c120383f/FEMA957_Snowload_508.pdf) - The weight of a foot a snow can vary widely based on how wet the snow is, between 3 and 21 lbs. per square foot. However, wet snow primarily affects the East Coast, Pacific Northwest, and southwestern Alaska.

during the coldest part of the day or night, and frozen pipes that may jeopardize access to drinking water, and in the worst cases, lead to severe structural damage that can render a home unlivable. The consequences for these populations' exposure to severe winter weather can include but are not limited to: complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

**C) Critical Facilities**

Any shutdown of critical facilities due to severe winter weather is expected to be temporary. However, based on the proximity of trees and powerlines on their properties, the following 26 critical facilities may be at a higher risk of losing power due to falling limbs.

**Table 48: Critical Facilities Vulnerable to Winter Storms**

Critical Facilities	Potential Severe Winter Storm Impacts
	Falling Tree Limbs
356 VFD	x
Apple Springs VFD	x
Blanche K. Werner Public Library	x
Dorcas Wills Memorial Baptist Church	x
Friday Volunteer Fire Department	x
Groveton City Hall	x
Groveton EMS	x
Groveton Police Department	x
Groveton VFD	x
Groveton Wastewater Treatment Plant	x
Pennington VFD	x
Trinity City Hall	x
Trinity Community Center	x
Trinity County Airport	x
Trinity County Courthouse	x
Trinity County Courthouse Annex	x
Trinity County Sheriff's Department	x
Trinity Police Department	x
Trinity River Authority (TRA) Water Treatment Plant	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x
Trinity VFD	x
Trinity Wastewater Treatment Plant	x

Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x
Ventura EMS	x
VFW Post #6899	x

### 13. Windstorm

A windstorm<sup>44</sup> is classified as any wind that is strong enough to cause at least light damage to trees and buildings, and may or may not be accompanied by precipitation. Wind speeds during a windstorm typically exceed 41 knots. Damage can be attributed to gusts or longer periods of sustained winds.

Windstorms may last for just a few minutes when caused by downbursts from thunderstorms, or they may last for hours (and even several days) when they result from large-scale weather systems. A windstorm that travels in a straight line and is caused by the gust front (the boundary between descending cold air and warm air at the surface) of an approaching thunderstorm is called a derecho. Derechos are capable of causing widespread damage and landscape devastation.

#### 1) Windstorm History

According to National Centers for Environmental Information (NCEI) data, between 1981 – 2017 Trinity County and the participating jurisdictions experienced damaging high winds with windspeeds up to 69 mph on 107 separate occasions not related to a Hurricane or Tropical Storm event. Windstorms have caused damage in the greater county, in the City of Groveton, and in the City of Trinity. No windstorms have been recorded in any participating jurisdiction since 2017.

Table 49: Trinity County Windstorm History

Location	Date Range	Windstorm Events	Windspeed Range Knots	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	2/10/1981 - 3/24/2017	61	Up to 69	5	5	\$2,877,360	\$137,773

Table 50: City of Groveton Windstorm History

Location	Date Range	Windstorm Events	Windspeed Range Knots	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Groveton	5/13/1994 - 4/27/2015	23	Up to 55	0	0	\$532,925	\$0

<sup>44</sup> <https://www.britannica.com/science/windstorm>

Table 51: City of Trinity Windstorm History

Location	Date Range	Windstorm Events	Windspeed Range Knots	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity	3/7/1995 - 3/24/2017	23	Up to 67	0	2	\$328,473	\$2,214

## 2) Likelihood of Future Occurrence

Given the frequency of windstorm events in Trinity County and the City of Groveton, the likelihood of a damaging windstorm in the future is likely, meaning that an event affecting either jurisdiction is probable in the next three years. In the City of Trinity, the likelihood of a damaging windstorm in the future is unlikely, meaning that one is possible in the next 10 years.

## 3) Extent

The generally accepted extent scale for wind events is the Beaufort Wind Scale. The following table lists categories, measurement, classification, and appearance descriptions.

Table 52: Beaufort Wind Scale<sup>45</sup>

Beaufort Wind Scale				
Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 feet becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 feet taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 feet, whitecaps common, more spray	Larger tree branches moving, whistling in wires

<sup>45</sup> Source: [www.spc.noaa.gov/faq/tornado/beaufort.html](http://www.spc.noaa.gov/faq/tornado/beaufort.html)

7	28-33	Near Gale	Sea heaps up, waves 13-20 feet, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 feet) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 feet), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 feet) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, visibility greatly reduced	

The worst windstorms in Trinity County and the participating jurisdictions have ranged from 1 to 12 on the Beaufort Wind Scale.

With winds up to 69 Knots, or a 12 on the Beaufort Wind Scale, the strongest windstorms in Trinity County and the participating jurisdictions have reached hurricane-level speeds.

The single most devastating wind event inflicted a little over \$1,000,000 in property damages on September 3, 2000. Adjusted for inflation to \$2018, that's nearly \$1,500,000 in property damages. On February 10, 1981, a windstorm inflicted the \$2018 equivalent of \$135,562 in crop damages. Neither storm's history includes a measurement of the wind speed.

Future windstorms may meet or exceed previous worst-case storms measuring a 12 on the Beaufort Scale in terms of wind speed and damage dollars inflicted.

#### 4) Location and Impact

##### A) Location

Windstorms are not constrained by any distinct geographic boundary. Windstorms can occur across all participating jurisdictions.

##### B) Impact

Impacts from a windstorm may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Pets and livestock may be injured or killed by flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, windstorms may cause injuries and/or be deadly.

#### 5) Vulnerability

Windstorms have the potential to impact all participating jurisdictions. Therefore, each jurisdiction is equally exposed to the hazard. Improved property, critical facilities, critical infrastructure, and the entire population are considered vulnerable to windstorms.

Based on windstorm data collected for the participating jurisdictions, windstorms primarily damage physical structures. However, there is no uniformity with respect to the type of structures that have been damaged by windstorms in any of the participating jurisdictions. Windstorm damages can be directly caused by the wind itself, flying debris, and falling trees, or indirectly by damages like power outages.

##### A) Population

As described in the narrative, as well as Tables 5 - 6 and Figures 1-9, in Section 3 of Chapter 3 above, Trinity County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a windstorm.

Residents of mobile / manufactured homes are of particular concern. These structures may not be safe during a windstorm.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a windstorm, whether due to structural damages, missing windows or doors,



holes in exterior walls or the roof, may be less safe during a windstorm than structures in standard condition.

Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

### *B) Critical Facilities*

Similar to hurricanes and tornados, certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to windstorms. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected critical facilities are built from a variety of materials with varying levels of resistance to wind damages. Additionally, their varying ages mean they weren't constructed to uniform building standards. Given wind's potentially violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a windstorm if that damage affects the facility's ability to reopen and resume normal business right away.

Table 53: Critical Facilities Vulnerable to Windstorms and Potential Impacts

Trinity County	Potential Windstorm Impacts								
	Loss of Power	Flying Debris	Uprooted Trees	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
356 VFD	x	x	x					x	x
Apple Springs VFD	x	x	x					x	x
Blanche K. Werner Public Library	x	x	x	x				x	x
Dorcas Wills Memorial Baptist Church	x	x		x	x	x	x	x	x
Friday Volunteer Fire Department	x	x	x					x	x
Groveton City Hall	x	x	x	x	x	x		x	x
Groveton EMS	x	x	x	x		x	x	x	x
Groveton Police Department	x	x	x	x		x	x	x	x
Groveton VFD	x	x		x				x	x
Groveton Wastewater Treatment Plant	x	x	x	x				x	x
Pennington VFD	x	x						x	x
Trinity City Hall	x	x		x				x	x
Trinity Community Center	x	x	x	x	x	x	x	x	x
Trinity County Airport	x	x	x		x		x	x	x
Trinity County Courthouse	x	x	x	x	x	x	x	x	x
Trinity County Courthouse Annex	x	x		x	x	x	x	x	x
Trinity County Sheriff's Department	x	x		x	x	x	x	x	x
Trinity Police Department	x	x		x				x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x	x			x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x		x				x	x
Trinity Rural Water Supply Corporation (TRWSC) Water Plant	x	x	x		x	x	x	x	x
Trinity VFD	x	x		x				x	x
Trinity Wastewater Treatment Plant	x	x	x		x	x		x	x

Westwood Shores Municipal Utility District Office and Wastewater Treatment Plant	x	x	x	x	x			x	x
Ventura EMS	x	x	x					x	x

*A) Vulnerable Parcels*

Table 54: Parcels Vulnerable to Windstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
County	25,897	\$2,057,525,996.00
City of Groveton	721	\$43,895,823.00
City of Trinity	1,797	\$110,775,785.00

## 14. Lightning

Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface.

Lightning damage can result in electrocution of humans and animals; vaporization of materials along the path of the strike; fire caused by the high temperature produced by the strike; and sudden power surges that can damage electrical and electronic equipment. Millions of dollars of direct and indirect damages result from lightning strikes on electric utility substations and distribution lines. While property damage is the major hazard associated with lightning, it should be noted that lightning strikes kill nearly 50 people<sup>46</sup> each year in the United States.

### 1) Lightning History

Trinity County and the participating jurisdictions used data from the National Centers for Environmental Information (NCEI) and the Trinity County 2013 CHAMPS Report to create a local lightning history.

Table 55: Trinity County Lightning History

Location	Date Range	Number of Lightning Events	Fatalities	Injuries	Property Damage \$2018	Crop Damage \$2018
Trinity County	6/6/1981 - 8/20/1996	2	1	1	\$0	\$0

In addition to the NCEI data and the CHAMPS report, the planning team reviewed wildfire ignition types, as identified in TxWRAP data, and determined that between June 2005 and March 2014, at least 43 wildfire events' origins were traceable to lightning. These wildfires burned up to 502 acres, but no damages of any kind were reported for any of the 43 events.

No lightning-inflicted property or crop damage dollars have been recorded in Trinity County or the participating jurisdictions since 1996.

**The City of Groveton determined that any damages associated with lightning are likely to be negligible and therefore isn't addressing the hazard.**

**The City of Trinity determined that any damages associated with lightning are likely to be negligible and therefore isn't addressing the hazard.**

---

<sup>46</sup> <http://www.lightningsafety.noaa.gov/victims.shtml>

## 2) Likelihood of Future Occurrence

Lightning is especially associated with thunderstorms. Despite the lack of reported instances of lightning-caused damages, a lightning event is highly likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next year. According to information from VAISALA<sup>47</sup>, a weather measurement company, all of Trinity County, including the City of Trinity and City of Groveton, can expect between 12 and 28 lightning flashes per square mile per year.

## 3) Extent

The extent for lightning can be expressed in terms of the number of strikes within an interval. Given the lack of lightning history data, it is expected that Trinity County and all participating jurisdictions may experience lightning events between LAL 1 and LAL 5. Dry thunderstorms, LAL 6, are not expected.

Table 56: Lightning Activity Levels<sup>48</sup>

Lightning Activity Level (LAL)		
Activity levels are valuable guidance tools to aid in the preparation for possible fire initiation from cloud-to-ground lightning.		
LAL	Cloud and Storm Development	Lightning Strikes per 15 Minutes
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	25+
6	Similar to LAL 3 except thunderstorms are dry.	

<sup>47</sup> [http://www.vaisala.com/VaisalaImages/Lightning/avg\\_fd\\_2005-2014\\_CONUS\\_2mi\\_grid.png](http://www.vaisala.com/VaisalaImages/Lightning/avg_fd_2005-2014_CONUS_2mi_grid.png)

<sup>48</sup> Source: <http://www.prh.noaa.gov/hnl/pages/LAL.php>

There have been no property or crop damages reported due to lightning events in Trinity County.

Future events may meet previous worst-case LAL 5 events in terms intensity levels, damage dollars inflicted, including damages to crops and livestock, and the number of residents injured or worse.

#### 4) Location and Impact

##### A) Location

Lightning strikes have no distinct geographic boundary. Lightning can occur across each participating jurisdiction.

##### B) Impact

Impacts from lightning in all jurisdictions may include but are not limited to loss of power due to electrical surges, damaged or destroyed personal property including computers and other electronics, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Livestock may be injured or killed by lightning. In the worst cases, lightning may cause injuries or even loss of life.

#### 5) Vulnerability

According to the Lightning Protection Institute, it is a myth<sup>49</sup> that lightning always strikes the tallest objects. Given lightning’s indiscriminate nature, it is impossible to identify buildings that are at an increased risk of being struck by lightning. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population are exposed to this hazard. However, structures without adequate lightning protection and those with large concentrations of electronic equipment like computers, servers, and printers, are most vulnerable, as are locations that may have outside crowds during a lightning event.

##### A) Critical Facilities

Table 57: Trinity County Critical Facilities

Trinity County	Potential Lightning Impacts			
	Physical Damage	Electrical Damage	Data Damage or Loss	Fire
356 VFD				
Apple Springs VFD	x	x	x	x
Blanche K. Werner Public Library	x	x	x	x
Dorcas Wills Memorial Baptist Church	x	x	x	x
Friday Volunteer Fire Department	x	x	x	x
Groveton City Hall	x	x	x	x
Groveton EMS	x	x	x	x

<sup>49</sup> [http://lightning.org/wp-content/uploads/2015/06/LPI\\_lightning\\_infographic\\_2015.jpg](http://lightning.org/wp-content/uploads/2015/06/LPI_lightning_infographic_2015.jpg)

Groveton Police Department	x	x	x	x
Groveton VFD	x	x	x	x
Groveton Wastewater Treatment Plant	x	x	x	x
Pennington VFD	x	x	x	x
Trinity City Hall	x	x	x	x
Trinity Community Center	x	x	x	x
Trinity County Airport	x	x	x	x
Trinity County Courthouse	x	x	x	x
Trinity County Courthouse Annex	x	x	x	x
Trinity County Sheriff's Department	x	x	x	x
Trinity Police Department	x	x	x	x
Trinity River Authority (TRA) Water Treatment Plant	x	x	x	x
Trinity Rural Water Supply Corporation (TRWSC) Office	x	x	x	x
Trinity Rural Water Supply Corporation	x	x	x	x
(TRWSC) Water Plant	x	x	x	x
Trinity VFD	x	x	x	x
Trinity Wastewater Treatment Plant	x	x	x	x
Westwood Shores Municipal Utility District	x	x	x	x

***B) Vulnerable Parcels***

Table 58: Parcels Vulnerable to Lightning

Jurisdiction	Parcel Count	Estimated Potential Damage Value
County	25,897	\$2,057,525,996.00
City of Groveton	721	\$43,895,823.00
City of Trinity	1,797	\$110,775,785.00

## 15. Mitigation Strategy

### 1) Capability Assessment

Trinity County and the participating jurisdictions have shown themselves to be highly capable, especially in terms of implementing hazard mitigation actions.

In addition to reviewing previous actions and the steps taken to implement them, the planning team reviewed existing regulatory capabilities and opportunities for establishing new capabilities and enhancing existing ones. All jurisdictions can improve their capabilities by: budgeting for mitigation actions and support, passing policies and procedures to implement mitigation actions, adopting and implementing stricter building regulations, approving the hiring and training of staff for mitigation activities, and approving mitigation action updates and additions to existing plans as new needs are recognized.

Table 59: Capability Assessment by Jurisdiction

Trinity County Administrative, Financial, Regulatory, and Technical Abilities
Subdivision
Emergency Management
Nuisance Abatement
Economic Development
Road and Bridge Management
Tax Collection
Grant Writing
General Budgeting
Capital Improvement Program (CIP) Funding
Community Development Block Grant (CDBG) Funding
State and Federal Grant Funding

City of Groveton Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Subdivision
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement



Drought Contingency Planning
Economic Development
Tax Collection
Grant Writing
General Budgeting
Capital Improvement Program (CIP) Funding
Community Development Block Grant (CDBG) Funding
State and Federal Grant Funding

<b>City of Trinity</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Floodplain Management
Emergency Management
Subdivision
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Drought Contingency Planning
Comprehensive Planning
Economic Development
Tax Collection
Grant Writing
General Budgeting
Capital Improvement Program (CIP) Funding
Community Development Block Grant (CDBG) Funding
State and Federal Grant Funding

## 2) Goals and Objectives Overview

The hazard analysis has shown that Trinity County and the participating jurisdictions are at risk of multiple natural hazards. The following goals and objectives take a broad approach to improving outcomes before, during, and after these anticipated natural hazard events.

The mitigation actions the County and participating jurisdictions have selected are designed to address specific hazard-related issues in support of achieving the desired goals and objectives.

## 3) Long-term vision

The hazard mitigation plan must strike a balance between identifying long-term goals and objectives and prioritized mitigation actions that may be addressed sooner, depending on funding availability and local priorities. The result is that certain goals and objectives don't have a corresponding mitigation action. Instead, by taking the long view, the local planning team has created a framework that can be developed as the plan is updated over time.

## 4) Goals

### A) Goal 1: To reduce loss of life and injury to persons

#### *Objective 1.1*

Improve the delivery and effectiveness of warning messages

#### *Objective 1.2*

Preserve public and private emergency response capability (9-1-1, law enforcement, fire services, emergency medical services, hospitals).

#### *Objective 1.3*

Utilize available mitigation measures to prevent or reduce life-threatening impacts of natural hazards.

#### *Objective 1.4*

Reduce obstacles to timely and safe evacuation of flood hazard areas.

#### *Objective 1.5*

Reduce vulnerability of individuals living in mobile homes / manufactured housing.

#### *Objective 1.6*

Reduce life or health threatening impacts on individuals with special physical care requirements.

#### *Objective 1.7*

Reduce secondary impacts to health and safety from cascading effects.

*B) Goal 2: To reduce disruptions to essential public services and infrastructure*

*Objective 2.1*

Minimize disruption to and enhance rapid restoration of utilities.

*Objective 2.2*

Minimize disruption to and enhance rapid restoration of essential transportation infrastructure.

*Objective 2.3*

Minimize disruption to governmental, educational, and other institutions providing services to the public.

*C) Goal 3: To reduce economic impacts to individuals, businesses, and area institutions*

*Objective 3.1*

Increase home and business owner investment in available mitigation measures for private property.

*Objective 3.2*

Increase home and business owner participation in appropriate insurance programs.

*Objective 3.3*

Increase public and private sector development and use of operations continuity strategies.

*Objective 3.4*

Utilize available mitigation measures to prevent or reduce economic losses from natural hazards.

*Objective 3.5*

Reduce vulnerability of existing development by encouraging property owners to participate in buy-out or flood-proofing opportunities.

*Objective 3.6*

Reduce vulnerability of future development by utilizing available planning and structural standards.

*D) Goal 4: To reduce losses to civic, cultural, and environmental resources*

*Objective 4.1*

Protect public investment in community-owned facilities and infrastructure through appropriate structural, non-structural, and financial methods.

*Objective 4.2*

Reduce future losses to the non-profit sector through participation in available mitigation opportunities.

### *Objective 4.3*

Reduce vulnerability of historically or culturally significant structures.

### *Objective 4.4*

Minimize environmental impacts from cascading effects.

## **5) Mitigation Action Plan**

### *Mitigation Action Prioritization*

The planning team members have identified at least two mitigation actions per natural hazard. Action items were identified and prioritized in consideration of the following criteria:

- 1) Life safety and property protection improvements
- 2) Cost effectiveness – do the action’s future benefits exceed its implementation costs?
- 3) Technical feasibility – is the action reasonable given its technical requirements?
- 4) Political acceptability
- 5) Administrative capabilities and legal authorities for implementation
- 6) Funding availability
- 7) The action’s environmental impacts
- 8) The action’s social acceptability
- 9) The action’s ability to reduce risk to more than one hazard
- 10) The ease of implementation
- 11) The availability of a local champion
- 12) The action’s relationship to other community objectives

In addition to considering an action’s cost effectiveness as described above, the planning team considered the Texas Department of Emergency Management’s (TDEM) Cost-Effectiveness, Environmental Soundness and Technical Feasibility requirements as they relate to construction projects. Mitigation actions relating to physical infrastructure will meet the State’s standards as outlined below:

- A) Any state government construction project, regardless of potential funding source, has to be cost effective, technically feasible and meet all of the appropriate federal, state, and local environmental laws and regulations before it is started.
- B) State government projects funded by Federal Mitigation Grant Programs administered by TDEM have to meet specific criteria related to cost effectiveness, environmental soundness and technical feasibility. These are outlined in the applicable FEMA grant program guidance for that particular funding program.

### *Incorporation and Integration of Existing Capabilities and Hazard Mitigation*

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. The planning team will ensure that each jurisdiction’s various departments continue to integrate hazard mitigation actions into their day-to-day processes.

**Table 60: Plan Integration**

<b>Department</b>	All Departments	Commissioners' Court, Road and Bridge, County Judge's Office, Mayor's Office, Council, Public Works, Economic Development, Zoning, Groveton Board of Trustees, Physical Plant	Planning, Zoning, Economic Development, Public Works, Mayor's Office, Floodplain Manager, Groveton Board of Trustees, Physical Plant	Office of Emergency Management, Mayor's Office, City of Trinity, City of Groveton News and Media Center	Office of Emergency Management, Mayor's Office, Chief of Fire Department Groveton/Trinity, Physical Plant	Office of Emergency Management, Mayor's Office Groveton/Trinity	Office of Emergency Management, Floodplain Manager, Mayor's Office, Physical Plant
<b>Activity</b>	Annual Budget	Capital Improvement Projects (CIPs)	Comprehensive Master Plan	Public Involvement	Emergency Operations	Grant Application	Floodplain Management
<b>Time Frame</b>	Quarterly/ Annual workshops	Bi-annually	Every 10 Years	As Needed	Annually	Annual Funding Cycles	Annually
<b>Integration Process</b>	Discuss integration of medium and high priority actions with Commissioners' Court, Council, or Schoolboard (as appropriate) concerning feasibility, potential funding sources, and a preliminary cost benefit review.	Discuss inclusion of mitigation actions with CIPs. Ensure CIPs are consistent with mitigation actions, NFIP compliance, and any new land use development.	Review existing floodplain and land use controls to ensure that long term goals are consistent with actions in the HMAP.	Utilize jurisdictional web sites, social media, and other forms of advertising to make announcements of any periodic review activities concerning potential amendments or updating of the HMAP	Review prevention and protection projects for continued relevance. Ensure appropriate actions and information are included in the Emergency Operation Plan.	Review and update mitigation actions as necessary based on funding opportunities available through FEMA PDM, FEMA HMGP, and other grant funding sources.	Update and maintain floodplain information including but not limited to: maps, construction practices, permitting, and NFIP compliance.

Each mitigation action below outlines the following requirements: the identified responsible department head or delegate will research all relevant information to confirm the action’s feasibility and prioritization, will formulate a plan of action, and will confirm funding sources and identify any fiscal liabilities associated with the mitigation action.

As part of each jurisdiction’s commitment to transparency, all relevant information, including but not limited to that described above and in each action’s description, will be presented to the public before the action is formally adopted for implementation. After public notification, the integration process will resemble the one outlined in Table 61 below.

Table 61: Integration Process

Jurisdiction	Integration Process
Trinity County	<p>After considering integrating mitigation actions with the activities outlined in Table 60 above, mitigation actions will be presented, considered, and formally adopted by the County Commissioners' Court and County Judge.</p> <p>Trinity County will also use the Trinity County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Groveton	<p>After considering integrating mitigation actions with the activities outlined in Table 60 above, mitigation actions will be presented, considered, and formally adopted by the City Council and Mayor.</p> <p>The City of Groveton will also use the Trinity County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Trinity	<p>After considering integrating mitigation actions with the activities outlined in Table 60 above, mitigation actions will be presented, considered, and formally adopted by the City Council and Mayor.</p> <p>The City of Trinity will also use the Trinity County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>

## **6) Mitigation Actions by Jurisdiction and by Hazard**

Each jurisdiction has selected actions that were identified as high or medium priority and that are in line with TDEM's recommended mitigation actions. However, many of the mitigation actions below are dependent upon outside grant funding for implementation. For all actions likely to require grant funding, potential sources have been identified. However, grant funding is awarded on a competitive basis, so applying for funding doesn't guarantee that funds will be received. Trinity County and the participating jurisdictions have a successful history of applying for and receiving grant funding to implement physical infrastructure actions. Budget constraints will remain the determining factor for how and when each action is implemented.

*A) Trinity County*

Trinity County has identified the following mitigation actions to address its natural hazard vulnerabilities. The County plans to implement the actions as funding becomes available.

**Multi-Hazard Actions**

Mitigation Action	Upgrade Contact Information for First Responders, Volunteers, and Special Needs Populations
Objective	This action will ensure that crucial information is kept up to date so that there is no delay in emergency response trying to find First Responders, Volunteers, and Special Needs Populations during emergencies.
Hazard	Flood, Hurricanes/Tropical Storms, Wildfire, Tornadoes, Dam/Levee Failure, Extreme Heat, Hailstorms, Severe Winter Storms, Windstorms, Lightning
Priority	Medium
Estimated Cost	\$5,000
Potential Funding Source (s)	County, FEMA HMGP <sup>50</sup> , FEMA PDM <sup>51</sup> , FEMA FMA <sup>52</sup>
Responsible Department	Trinity County
Implementation Schedule	6 months – 1 Year
Target	Existing and future population and infrastructure

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for multiple hazards, including but not limited to Wildfire Fuels Reduction, FireWise Construction Methods, Reducing Water Consumption, etc....
Hazard	Flood, Hurricane / Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Severe Winter Storm, Windstorm, Lightning
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	County, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department(s)	Trinity County
Implementation Schedule	1 - 5 Years

<sup>50</sup> Hazard Mitigation Grant Program

<sup>51</sup> Pre-Disaster Mitigation Program

<sup>52</sup> Flood Mitigation Assistance



Target	Existing and future population
--------	--------------------------------

Mitigation Action	Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Flood, Hurricanes/Tropical Storms, Wildfire, Tornadoes, Dam/Levee Failure, Extreme Heat, Hailstorms, Severe Winter Storms, Windstorms, Lightning
Priority	High
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	County, FEMA PDM, FEMA FMA, FEMA HMGP
Responsible Department	Trinity County
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Improve Public Warning/Notification System
Objective	Trinity County will implement, upgrade, expand, and integrate digital methods for storm notification to include all methods of communication including: cell phones, text messages, land-lines, internet networking sites, television, and radio. The County will also install warning sirens at strategic locations as needed and coordinate periodically with National Weather Service to maintain information channels.
Hazard	Wildfire, Tornadoes, Extreme Heat
Priority	High
Estimated Cost	\$1,000 - \$10,000 per device
Potential Funding Source (s)	County, FEMA HMGP
Responsible Department	Trinity County
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Upgrade Stormwater Conveyance Capacity
Objective	This action will upgrade stormwater conveyance capacity through drainage improvement projects which can include but are not limited to: installing/improving culverts and headwalls; and expanding stormwater ditches and canals.
Hazard	Flood, Hurricanes/Tropical Storms, Dam / Levee Failure
Priority	Medium
Estimated Cost	\$50,000 - \$500,000
Potential Funding Source (s)	County, FEMA PDM, FEMA HMGP
Responsible Department	Trinity County
Implementation Schedule	1 – 5 Years
Target	Existing and future infrastructure

Mitigation Action	Minimize Damage to Existing Structures and Infrastructure from Falling Trees and Limbs
Objective	Trinity County will minimize damage to existing structures and infrastructure from falling trees and limbs through actions that can include but are not limited to working with homeowners for voluntary removal or trimming of hazardous trees or limbs on private property; encouraging homeowner maintenance of rights-of-way adjacent to their property; coordination between the County and utility companies to maintain a tree removal/trimming program; and coordination between debris removal companies and the County for disaster response and recovery.
Hazard	Tornado, Hailstorms, Windstorms, Lightning
Priority	High
Estimated Cost	\$10,000 - \$50,000
Potential Funding Source (s)	County, Utility Companies
Responsible Department	Trinity County
Implementation Schedule	6 months – 1 Year
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	Trinity County will develop an ordinance with water conservation guidelines that define allowable uses during severe drought and extended periods of extreme heat.
Hazard	Drought, Extreme Heat
Priority	Medium
Estimated Cost	\$5,000
Potential Funding Source (s)	County
Responsible Department	Trinity County
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Set up Cooling/Warming Centers in Existing Facilities
Objective	This action will retrofit and equip existing facilities to act as cooling centers during extreme heat events, and warming centers during severe winter storms.
Hazard	Extreme Heat, Severe Winter Storms
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	County, FEMA PDM, FEMA HMGP
Responsible Department	Trinity County
Implementation Schedule	1 - 5 Years
Target	Existing and future population

### Single Hazard Actions

Mitigation Action	Create a Buyout Program for Repetitive Loss Properties
Objective	This action will develop and implement a program to buyout repetitive loss properties and convert to open space, parks, boating access, trails, and/or as a general community asset.
Hazard	Flood
Priority	High
Estimated Cost	Less than \$10,000 to establish program. Buyout costs will vary by structure.

Potential Funding Source (s)	County, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department	Trinity County
Implementation Schedule	Short Term - 1-5 Years
Target	Existing infrastructure

Mitigation Action	Upgrade Infrastructure Prone to Flooding
Objective	This action may include general roadway elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.
Hazard	Flood
Priority	Medium
Estimated Cost	\$500,000 - \$5,000,000
Potential Funding Source (s)	County, FEMA PDM, FEMA FMA, FEMA HMGP
Responsible Department	Trinity County, TXDOT
Implementation Schedule	1-5 Years
Target	Existing Infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	The County will re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan.
Hazard	Drought
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	Trinity County, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB <sup>53</sup>
Responsible Department(s)	Trinity County Judge's Office
Implementation Schedule	1-5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement SOP for Data Collection/Sharing for Dam/Levee Failure
Objective	Trinity County will develop and implement standard operating procedures for collecting and sharing data to provide extent of dam/levee failure, which will include compiling and reviewing existing

<sup>53</sup> Texas Water Development Board

	and future dam/levee failure studies and incorporating those findings into future hazard mitigation plans.
Hazard	Dam / Levee Failure
Priority	Medium
Estimated Cost	\$10,000 - \$30,000
Potential Funding Source (s)	County, FEMA HMGP, FEMA PDM, FEMA FMA
Responsible Department	Trinity County
Implementation Schedule	1 Year
Target	Existing and future population and infrastructure

**B) City of Groveton**

City of Groveton has identified the following mitigation actions to address its natural hazard vulnerabilities. The City plans to implement the actions as funding becomes available.

**Multi-Hazard Actions**

Mitigation Action	Upgrade Contact Information for First Responders, Volunteers, and Special Needs Populations
Objective	This action will ensure that crucial information is kept up to date so that there is no delay in emergency response trying to find First Responders, Volunteers, and Special Needs Populations during emergencies.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	Medium
Estimated Cost	\$5,000
Potential Funding Source (s)	City of Groveton, FEMA HMGP <sup>54</sup> , FEMA PDM <sup>55</sup> , FEMA FMA <sup>56</sup>
Responsible Department	City of Groveton
Implementation Schedule	6 months – 1 Year
Target	Existing and future population and infrastructure

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for multiple hazards, including but not limited to Flood Safety, Tornado Saferooms, Structural Hardening, etc...
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City of Groveton, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department(s)	City of Groveton
Implementation Schedule	1 - 5 Years
Target	Existing and future population

<sup>54</sup> Hazard Mitigation Grant Program

<sup>55</sup> Pre-Disaster Mitigation Program

<sup>56</sup> Flood Mitigation Assistance

Mitigation Action	Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	High
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City of Groveton, FEMA PDM, FEMA FMA, FEMA HMGP
Responsible Department	City of Groveton
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Improve Public Warning/Notification System
Objective	The City of Groveton will implement, upgrade, expand, and integrate digital methods for storm notification to include all methods of communication including: cell phones, text messages, land-lines, internet networking sites, television, and radio. The City will also install warning sirens at strategic locations as needed and coordinate periodically with National Weather Service to maintain information channels.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	High
Estimated Cost	\$1,000 - \$10,000 per device
Potential Funding Source (s)	City of Groveton, FEMA HMGP
Responsible Department	City of Groveton
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Minimize Damage to Existing Structures and Infrastructure from Falling Trees and Limbs
Objective	The City of Groveton will minimize damage to existing structures and infrastructure from falling trees and limbs through actions that can include but are not limited to working with homeowners for voluntary removal or trimming of hazardous trees or limbs on private property; encouraging homeowner maintenance of rights-of-way adjacent to their property; coordination between the City and utility companies to maintain a tree removal/trimming program; and coordination between debris removal companies and the City for disaster response and recovery.
Hazard	Hurricanes/Tropical Storms, Tornado, Windstorms
Priority	High
Estimated Cost	\$10,000 - \$50,000
Potential Funding Source (s)	City of Groveton, Utility Companies, FEMA PDM, FEMA HMGP
Responsible Department	City of Groveton
Implementation Schedule	6 months – 1 Year
Target	Existing infrastructure

Mitigation Action	Upgrade Stormwater Conveyance Capacity
Objective	This action will upgrade stormwater conveyance capacity through drainage improvement projects which can include but are not limited to: installing/improving culverts and headwalls; and expanding stormwater ditches and canals.
Hazard	Flood, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	\$50,000 - \$500,000
Potential Funding Source (s)	City of Groveton, FEMA PDM, FEMA HMGP
Responsible Department	City of Groveton
Implementation Schedule	1 – 5 Years
Target	Existing and future infrastructure



Mitigation Action	Construct Community Safe Rooms
Objective	The action's goal is to minimize local population vulnerability to hurricanes / tropical storms and tornados.
Hazard	Hurricanes / Tropical Storms, Tornados
Priority	Medium
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City of Groveton, FEMA PDM, FEMA HMGP
Responsible Department	City of Groveton
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

#### Single Hazard Actions

Mitigation Action	Create a Buyout Program for Repetitive Loss Properties
Objective	This action will develop and implement a program to buyout repetitive loss properties and convert to open space, parks, boating access, trails, and/or as a general community asset.
Hazard	Flood
Priority	High
Estimated Cost	Less than \$10,000 to establish program. Buyout costs will vary by structure.
Potential Funding Source (s)	City of Groveton, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department	City of Groveton
Implementation Schedule	Short Term - 1-5 Years
Target	Existing infrastructure

### C) City of Trinity

The City of Trinity has identified the following mitigation actions to address its natural hazard vulnerabilities. The City plans to implement the actions as funding becomes available.

#### Multi-Hazard Actions

Mitigation Action	Upgrade Contact Information for First Responders, Volunteers, and Special Needs Populations
Objective	This action will ensure that crucial information is kept up to date so that there is no delay in emergency response trying to find First Responders, Volunteers, and Special Needs Populations during emergencies.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	Medium
Estimated Cost	\$5,000
Potential Funding Source (s)	City of Trinity, FEMA HMGP <sup>57</sup> , FEMA PDM <sup>58</sup> , FEMA FMA <sup>59</sup>
Responsible Department	City of Trinity
Implementation Schedule	6 months – 1 Year
Target	Existing and future population and infrastructure

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for multiple hazards, including but not limited to Flood Safety, Tornado Saferooms, Structural Hardening, etc...
Hazard	Flood, Hurricanes/Tropical Storms, Drought, Tornadoes, Windstorms
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City of Trinity, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department(s)	City of Trinity
Implementation Schedule	1 - 5 Years
Target	Existing and future population

<sup>57</sup> Hazard Mitigation Grant Program

<sup>58</sup> Pre-Disaster Mitigation Program

<sup>59</sup> Flood Mitigation Assistance

Mitigation Action	Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	High
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City of Trinity, FEMA PDM, FEMA FMA, FEMA HMGP
Responsible Department	City of Trinity
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Improve Public Warning/Notification System
Objective	The City of Trinity will implement, upgrade, expand, and integrate digital methods for storm notification to include all methods of communication including: cell phones, text messages, land-lines, internet networking sites, television, and radio. The City will also install warning sirens at strategic locations as needed and coordinate periodically with National Weather Service to maintain information channels.
Hazard	Flood, Hurricanes/Tropical Storms, Tornadoes, Windstorms
Priority	High
Estimated Cost	\$1,000 - \$10,000 per device
Potential Funding Source (s)	City of Trinity, FEMA HMGP
Responsible Department	City of Trinity
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Minimize Damage to Existing Structures and Infrastructure from Falling Trees and Limbs
Objective	The City of Trinity will minimize damage to existing structures and infrastructure from falling trees and limbs through actions that can include but are not limited to working with homeowners for voluntary removal or trimming of hazardous trees or limbs on private property; encouraging homeowner maintenance of rights-of-way adjacent to their property; coordination between the City and utility companies to maintain a tree removal/trimming program; and coordination between debris removal companies and the City for disaster response and recovery.
Hazard	Hurricanes/Tropical Storms, Tornado, Windstorms
Priority	High
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source (s)	City of Trinity, Utility Companies, FEMA PDM, FEMA HMGP
Responsible Department	City of Trinity
Implementation Schedule	6 months – 1 Year
Target	Existing infrastructure

**Single Hazard Actions**

Mitigation Action	Harden Facilities
Objective	This action proposes hardening/upgrading critical facilities to withstand flooding. Hardening will include but is not limited to reinforcing building foundations, elevating low-lying structures, upgrading systems, and building protective walls.
Hazard	Flood
Priority	High
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA PDM, FEMA HMGP
Responsible Department	City of Trinity, Trinity River Authority, Trinity Rural Water Supply Corporation

Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Construct Storm Drainage Infrastructure
Objective	This action proposes constructing new storm drainage infrastructure and / or improving existing infrastructure to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	High
Estimated Cost	Greater than \$1,000,000
Potential Funding Source (s)	City of Trinity, FEMA FMA, FEMA PDM, FEMA HMGP
Responsible Department	City of Trinity, Trinity River Authority, Trinity Rural Water Supply Corporation
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Implement Drainage Projects to Upgrade Existing Drainage Infrastructure
Objective	This action proposes upgrading existing storm drainage infrastructure to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	High
Estimated Cost	More than \$100,000
Potential Funding Source(s)	City of Trinity, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department(s)	City of Trinity, Trinity River Authority, Trinity Rural Water Supply Corporation
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Purchase Portable Pumps
Objective	This action proposes purchasing portable pumps that can be deployed as needed to mitigate the potential impacts of future flood events.

Hazard	Flood
Priority	High
Estimated Cost	\$250,000
Potential Funding Source (s)	City of Trinity, FEMA PDM, FEMA HMGP, FEMA FMA
Responsible Department	City of Trinity, Trinity River Authority, Trinity Rural Water Supply Corporation
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan.
Hazard	Drought
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	City of Trinity, FEMA PDM, FEMA HMGP
Responsible Department(s)	City of Trinity
Implementation Schedule	1-5 Years
Target	Existing and future population and infrastructure