

Marion County Multi-Hazard Mitigation Plan

2024

"Under the Federal Disaster Mitigation Act of 2000 (DMA 2000 or "the Act"), Marion 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."

Contents

List of Figures	6
List of Tables.....	7
1. Introduction and Background.....	9
1) Participating Jurisdictions	9
2) Hazards to be Addressed	9
2. Planning Process.....	12
1) Existing Plans, Reports, Ordinances, and Technical Information Sources	16
2) Project Meetings	18
3) Public Input.....	18
4) Plan Maintenance.....	22
5) Plan Monitoring.....	24
6) Plan Evaluation	24
7) Plan Update	25
3. Determining Risk	26
1) Risk Assessment.....	26
2) Distribution of Property by Housing Density and Potential Damage Values	27
3) Distribution of Vulnerable Populations	27
4. Floods	35
1) Flood History.....	35
2) Likelihood of Future Events	36
3) Extent.....	37
4) Location and Impact	37
5) Vulnerability.....	40
6) Climate Change.....	42
5. Wildfire.....	43
1) Wildfire History.....	43
2) Likelihood of Future Events	43
3) Extent.....	44
4) Location and Impact	45

5)	Vulnerability.....	48
6)	Climate Change.....	51
6.	Tornado	52
1)	Tornado History	52
2)	Likelihood of Future Events	52
3)	Extent.....	52
4)	Location and Impact	54
5)	Vulnerability.....	55
6)	Climate Change.....	59
7.	Drought	60
1)	Drought History	62
2)	Likelihood of Future Events	63
3)	Extent.....	63
4)	Location and Impact	65
5)	Vulnerability.....	65
6)	Climate Change.....	68
8.	Extreme Cold	70
1)	Extreme Cold History	70
2)	Likelihood of Future Occurrence	71
3)	Extent.....	71
4)	Location and Impact	72
5)	Vulnerability.....	72
6)	Climate Change.....	73
9.	Extreme Heat.....	74
1)	Extreme Heat History	74
2)	Likelihood of Future Events	75
3)	Extent.....	75
4)	Location and Impact	78
5)	Vulnerability.....	78

6)	Climate Change.....	78
10.	Hailstorm.....	80
1)	Hailstorm History.....	80
2)	Likelihood of Future Events.....	81
3)	Extent.....	81
4)	Location and Impact.....	82
5)	Vulnerability.....	82
6)	Climate Change.....	85
11.	Winter Weather.....	86
1)	Severe Winter Storm History.....	86
2)	Likelihood of Future Events.....	87
3)	Extent.....	87
4)	Location and Impact.....	88
5)	Vulnerability.....	89
6)	Climate Change.....	92
12.	Windstorms.....	93
1)	Windstorms History.....	93
2)	Likelihood of Future Events.....	94
3)	Extent.....	94
4)	Location and Impact.....	97
5)	Vulnerability.....	97
6)	Climate Change.....	102
13.	Lightning.....	103
1)	Lightning History.....	103
2)	Likelihood of Future Events.....	103
3)	Extent.....	103
4)	Location and Impact.....	104
5)	Vulnerability.....	104
6)	Climate Change.....	107

14. Mitigation Strategy.....	108
1) Capability Assessment	108
2) Goals and Objectives Overview	110
3) Long-Term Vision	110
4) Goals	110
5) Mitigation Action Plan	112

List of Figures

<i>Figure 1: Survey Responses for Question 1</i>	19
<i>Figure 2: Survey Responses for Question 2</i>	20
<i>Figure 3: Survey Response for Question 3</i>	20
<i>Figure 4: Survey Choices for Question 7</i>	21
<i>Figure 5: Response Breakdown for Question 7</i>	22
Figure 6: Marion County Social Vulnerability Index	30
<i>Figure 7: City of Jefferson Social Vulnerability Index</i>	31
<i>Figure 8: Mobile and Manufacturing Clusters in Marion County and the Participating Jurisdictions</i>	33
Figure 9: Marion County Potential Inundation Areas	38
Figure 10: City of Jefferson Potential Inundation Areas	39
Figure 11: Marion County Wildland Urban Interface	46
Figure 12: City of Jefferson Wildland Urban Interface	47
Figure 13: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types	61
<i>Figure 14: Marion County Drought History</i>	62
Figure 15: Minimum Recorded Daily Temperature 2000-2022	70
Figure 16: NOAA's NWS Wind Chill Index	71
Figure 17: Maximum Recorded Daily Temperature 2000-2022	74
Figure 18: NOAA's NWS Heat Index Chart	76
Figure 31: NWS Wind Chill Index	88

List of Tables

Table 1: List of Hazards Addressed	10
Table 2: Local Planning Team Representatives	12
Table 3: Plan Schedule	14
Table 4: Planning Team Data Sources.....	16
Table 5: Local Stakeholders Contacted	17
Table 6: Maintenance Responsibility.....	23
Table 7: Estimated Values by Location	27
Table 8: Age, Disability, and Poverty Level Percentages by Jurisdiction	28
Table 9: Marion County Critical Facilities Vulnerable to Flooding	41
Table 10: Marion County Wildfire History	43
Table 11: Characteristic Fire Intensity Scale	44
Table 12: National Wildfire Coordinating Group Size Class of Fire	44
Table 13: Critical Facilities Vulnerable to Wildfire and Potential Impacts	49
Table 14: All Parcels Vulnerable to Wildfire	50
Table 15: Marion County Tornado History	52
Table 16: Fujita Scale	53
Table 17: Enhanced Fujita Scale.....	53
Table 18: Critical Facilities Vulnerable to Tornadoes and Potential Impacts	56
Table 19: Parcels Vulnerable to Tornadoes	59
Table 20: Drought Classifications.....	60
Table 21: Marion County Drought History.....	63
Table 22: Palmer Drought Index	64
Table 23: Palmer Drought Category Descriptions	64
Table 24: Critical Facilities Vulnerable to Drought and Potential Impacts.....	67
Table 25: Parcels Vulnerable to Drought.....	68
Table 26: Heat Intensity	77
Table 27: Marion County Hailstorm History	80
Table 28: Hailstorm Intensity'	81
Table 29: Critical Facilities Vulnerable to Hailstorms and Potential Impacts.....	83
Table 30: All Parcels Vulnerable to Hailstorms.....	85
Table 31: Marion County Severe Winter Storm History	87
Table 32: Winter Weather Extent Scale.....	87
Table 33: Critical Facilities Vulnerable to Winter Storms	90
Table 34: All Parcels Vulnerable to Winter Weather	92
Table 35: Marion County Windstorm History.....	93
Table 36: City of Jefferson Windstorm History.....	93
Table 37: Beaufort Wind Scale.....	95

Table 38: Critical Facilities Vulnerable to Windstorm and Potential Impacts	99
Table 39: Parcels Vulnerable to Windstorm	102
Table 40: Lightning Activity Levels.....	103
Table 41: Critical Facilities Vulnerable to Lightning and Potential Impacts	105
Table 42: Parcels Vulnerable to Lightning	107
Table 43: Capability Assessment by Jurisdiction	108
Table 44: Building Codes Per Jurisdiction	109
Table 45: Previous Mitigation Actions – All Jurisdictions	114
Table 46: Plan Integration.....	126
Table 47: Integration Process	127

1. Introduction and Background

1) Participating Jurisdictions

The 2024 Marion County Multi-Hazard Mitigation Plan is an update of the County's most recent plan that expired in April 2024. The 2024 Plan update includes two participating jurisdictions: Marion County and the City of Jefferson.

2) Hazards to be Addressed

Previously, the expired 2018 plan identified 10 hazards facing the County: wildfire, flood, dam/levee failure, drought, tornado, severe winter storm, wind storm, hail storm, lightning, and extreme heat.

The mitigation planning regulation of the Disaster Mitigation Act¹ requires that mitigation plans be reviewed and updated every five years to maintain eligibility for mitigation grant funding. As part of this plan, Marion County will develop a schedule to ensure that its hazard mitigation plan is regularly updated.

The 2024 Marion County Multi-Hazard Mitigation Plan update will address the following natural hazards identified in the State of Texas' 2018 Hazard Mitigation Plan as threats throughout the state. The participating jurisdictions will address the following natural hazards listed below in Table 1.

¹ 44 CFR §201.6(d)(3)

Table 1: List of Hazards Addressed

Hazard	Jurisdiction	
	Marion County	City of Jefferson
Drought	X	X
Hailstorm	X	X
Flooding	X	X
Tornados	X	X
Windstorm	X	X
Wildfire	X	X
Winter Weather	X	X
Lightning	X	X
Extreme Cold	X	X
Extreme Heat	X	X
Additional Optional Hazards		
Coastal Erosion		
Inland Erosion		
Land Subsidence / Sinkhole		
Earthquakes		
Expansive Soils		
Dam / Levee Failure		

Omission Statements

Marion County and the participating jurisdictions will not be addressing the following hazards: Coastal/Inland Erosion, Land Subsidence, Earthquakes, Expansive Soils, and Dam/Levee Failure. Although the previous plan profiled Dam/ Levee Failure, the previous plan noted no history, minimal risk, and potential impacts only in uninhabited areas. The history of impacts for all the omitted hazards have been negligible (or non-existent), therefore the County and participating jurisdictions expects that future impacts will be negligible as well, nor do the County and participating jurisdictions anticipate applying for grant funding to address any of them.

2. Planning Process

The Marion County Multi-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:

Table 2: Local Planning Team Representatives

Title	Jurisdiction
County Judge	Marion County
Emergency Management Coordinator	
County Auditor	
Agenda Clerk	
Mayor	City of Jefferson
City Secretary	

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 County to incorporate the resulting comments into the proposed plan.

Table 3: Plan Schedule

Community Outreach Planning Timeline																											
Planning Tasks	2023											2024															
	Feb	Ma	Apr	Ma y	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Ma	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov					
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 Plan Draft																											

Submit Plan to State and FEMA																						
Adopt Plan																						
MEETINGS																						
Planning Team			4/24/23		6/13/23																	
Public Outreach – Online Surveys																						
Stakeholder Outreach																						

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 4: Planning Team Data Sources

Data Source	Data Incorporation	Purpose
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences, damage dollars, and mapping for all hazards
National Oceanic and Atmospheric Administration (NOAA)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
National Severe Storms Laboratory (NSSL)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all severe storms
National Weather Service (NWS), Shreveport, LA Office	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
Marion County 2018 CHAMPS Report	Natural hazard data	Review previously compiled natural hazard histories.
Marion County Appraisal District Data	Property values and parcel counts	Population counts, parcel data, and land use data
Marion County Hazard Mitigation Plan, 2018-2024	Previous planning approach, hazards addressed, and mitigation actions	Previous planning team representatives, plan maintenance, hazard histories, and mitigation actions
State of Texas Hazard Mitigation Plan 2018 Update	Hazard Descriptions	Official descriptions of hazards and their potential impacts
Estimated Base Flood Elevation – Federal Emergency Management (FEMA)	Flood Zones maps	GIS mapping of flood zones and potential flooding risk areas
City of Jefferson Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain

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. 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 neighboring jurisdictions and non-profit organizations. In many cases of non-participation, the title listed is reflective of the office the planning team tried to contact.

Table 5: Local Stakeholders Contacted

Stakeholder	Title	Participated
Cass County	Emergency Management Coordinator	Y
Cass County	Sheriff	Y
Morris County	Emergency Management Coordinator	N
Upshur County	Emergency Management Coordinator	Y
Harrison County	Emergency Management Coordinator	N
Texas A&M University	County AgriLife Extension Agent	Y
Marion County Farm Bureau	Agency Manager	N
Blessings of Grace Marion County Food Pantry	Chairperson	Y
American Homeless Families Foundation – Marion County	CEO	N
Marion County Chamber of Commerce	President	N
East Texas Council of Governments	Director of Public Safety	N
East Texas Council of Governments	Director of Workforce and Economic Development	N
St. Vincent DePaul Disaster Relief	Conference President	Y

Area stakeholders were contacted by phone and email. Each stakeholder was contacted at least twice in an effort to increase participation. Local academia, businesses, community based- and/or non-profit organizations were contacted in order to reach a diverse group of stakeholders. Those organizations included the Texas A&M AgriLife Extension, Blessings of Grace Marion County Food Pantry, American Homeless Families Foundation – Marion County, St. Vincent DePaul Disaster Relief, Marion County Farm Bureau, Marion County Chamber of Commerce, and East Texas Council of Governments. These organizations focus on multiple community needs such as education, food, health and safety, and financial stability. Area stakeholders who chose to participate provided important supplemental input and information that helped shape mitigation strategies for each hazard, by making the planning team aware of actions neighboring communities were successful in implementing, and what actions they think should take priority.

2) Project Meetings

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

The first planning team meeting was held virtually on April 24, 2024. 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 compiling relevant data, including city ordinances; court orders and regulations; identifying critical facilities; and providing a status update on previous mitigation actions.

The second planning team meeting was held virtually on June 13, 2024. To stay on schedule, the planning team needed to meet the following objectives: Finalize the hazards list, collect relevant ordinances and plans, review and refine the critical facilities list, and identify area stakeholders, as well as review possible mitigation actions and potential eligible projects for each participant. The planning team discussed and identified new mitigation actions, discussed changes to the plan drafts, and agreed to work on completing all deliverables for the plan. Additional work was done over email in preparation for submitting the plan for official review in September 2024.

3) Public Input

Members of the public were invited to participate in two public comment periods to provide input and feedback during the planning process. The public comment periods were held virtually. The first public comment period took place in June 2024. A Microsoft Forms survey was posted to the County website for a period of two weeks for members of the public to fill out. A newspaper ad was placed to announce to the public for the opportunity to provide input via online survey. The County and participating jurisdictions actively announced the online survey on their own websites and social medias. The planning team appreciated receiving responses to the survey which helped inform them when identifying and prioritizing new mitigation actions for this plan update. The survey received 41 anonymous responses.

The survey asked nine questions:

1. Where do you live?
2. Do you own or rent?

3. Marion County is looking at addressing the following hazards. Which hazards do you believe impact the County and/or participating cities the most? Please select all that apply (multiple choice answer).
4. Which of the above hazards have affected you directly within the past five years? Please select all that apply (multiple choice answer).
5. How have you been affected by the hazards selected above? (Open-ended question)
6. Have you taken any actions to reduce your risk to these hazards? If so, what actions have you taken? (Open-ended question)
7. What is the best means of communication for you? Please select all that apply (multiple choice answer).
8. Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply (multiple choice answer).
9. Do you have any other thoughts or concerns relating to the Hazard Mitigation Plan? (Open-ended question).

1. Where do you live? Please include the name of your town/city/community, if applicable.

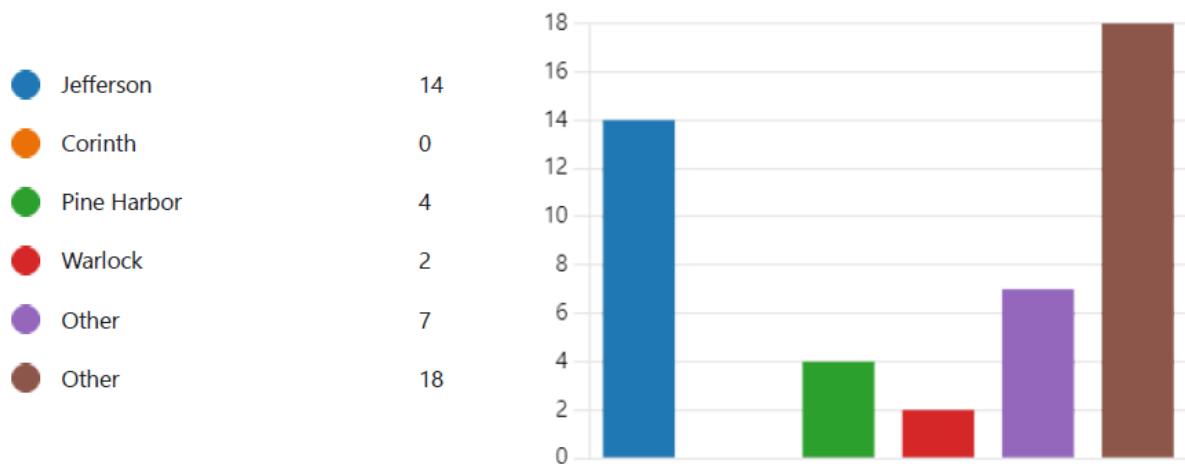


Figure 1: Survey Responses for Question 1

2. Do you own your home/ property?

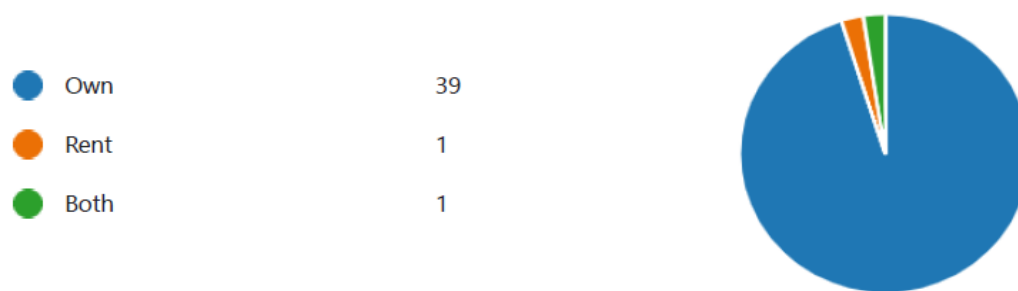


Figure 2: Survey Responses for Question 2

As Figure 1 above shows, majority of the respondents live in the City of Jefferson and other parts of the County. About 95.1% of respondents own their home as shown in Figure 2.

3. Marion County is looking at addressing the following hazards. Which hazards do you believe impact the County and/or participating cities the most? Please select all that apply.

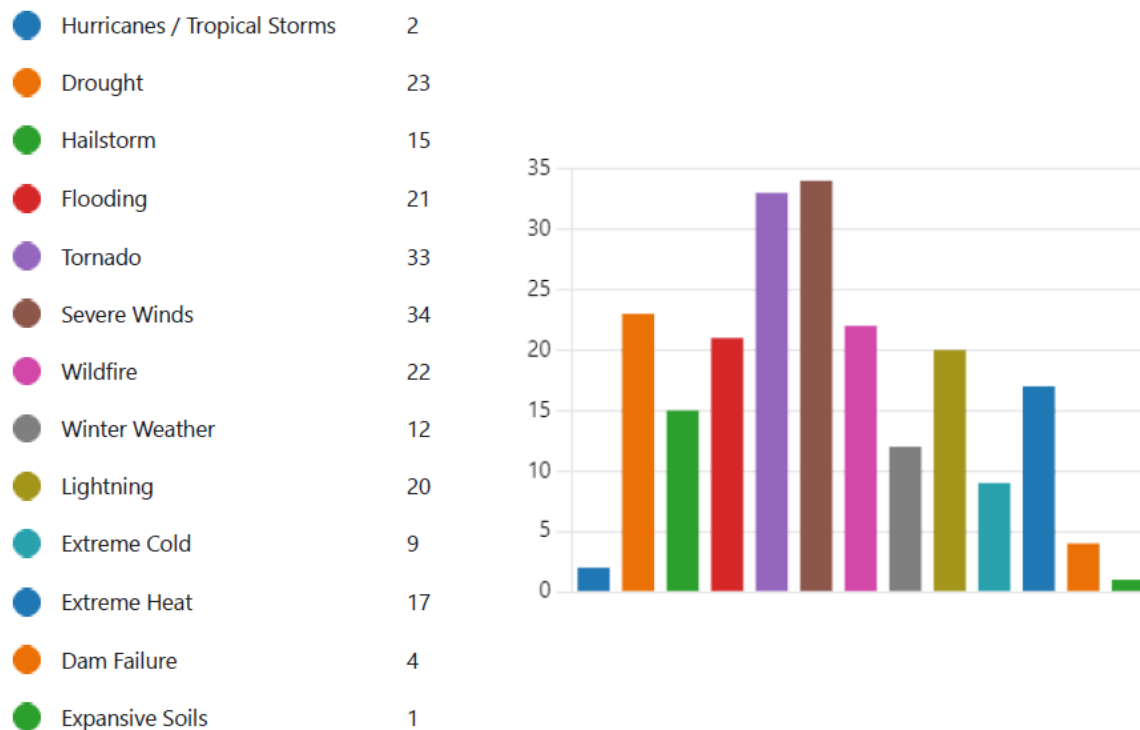


Figure 3: Survey Response for Question 3

The chart in Figure 3 above shows the breakdown of responses for survey question three. The answer choices were Hurricanes/ Tropical Storms, Drought, Hailstorm, Flooding, Tornadoes, Windstorm, Wildfire, Winter Weather, Lightning, Extreme Cold, Extreme Heat, Dam/Levee Failure, and Expansive Soils. Windstorm, Tornadoes, Drought, and Wildfire ranked the highest out of all the hazards addressed in the plan, with each choice being selected by more than 50% of the respondents.

Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply.

- ☐ Provide better information about hazard risk and high-hazard areas
- ☐ Reinforce essential facilities such as police, fire, emergency medical services, hospitals, schools, etc
- ☐ Educate property owners on ways they can reduce risk and mitigate damage to their properties
- ☐ Replace or improve inadequate or vulnerable bridges and causeways
- ☐ Reinforce or improve infrastructure, such as elevating roadways and improving drainage systems
- ☐ Work on mitigating risk to utilities (electricity, communications, water/wastewater facilities, etc)
- ☐ Install or improve protective structures, such as floodwalls or levees
- ☐ Buyout flood-prone properties and maintain as open space
- ☐ Strengthen codes, ordinances, and plans to require higher hazard risk management strategies
- ☐ Assist vulnerable property owners with securing funding to mitigate impacts to their property(ies)
- ☐ Work with schools, churches, local community groups to educate and reduce hazard risks
- ☐ Other...

Figure 4: Survey Choices for Question 7

Figure 4 shows the choices for Question 7: Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply. Respondents could choose from 11 answers such as “Provide better information about hazard risk and high-hazard areas,” “Reinforce or improve infrastructure, such as elevating roadways and improving drainage

systems,” “Install or improve protective structures, such as floodwalls or levees,” or input their own answer.

7. Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply.

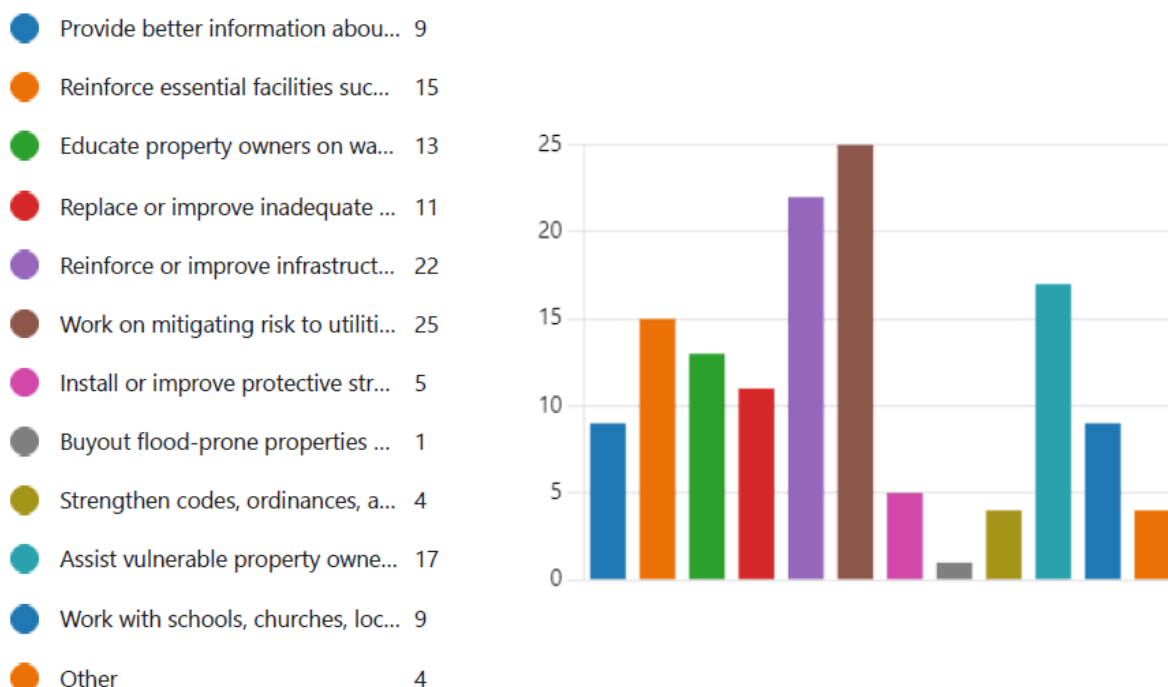


Figure 5: Response Breakdown for Question 7

Figure 5 shows the breakdown of responses to Question 7. The most popular answer was “Work on mitigating risk to utilities (electricity, communications, water/wastewater facilities, etc.),” with 61% of respondents selecting it.

The second public comment period took place in September 2024. A copy of the in-progress plan draft was posted to the County website for two weeks for the public to review and comment or provide suggestions. This public comment period was advertised in the newspaper and shared on social media. **No responses were received.**

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 actions are implemented efficiently. The departments or persons identified for each jurisdiction include but are not limited to:

Table 6: Maintenance Responsibility

Title	Jurisdiction	Agency or Department
County Judge	Marion County	County Judge
County Auditor	Marion County	County Judge
Emergency Management Coordinator	Marion County	Office of Emergency Management
Mayor	City of Jefferson	Mayor
City Secretary	City of Jefferson	City Administration

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.

Considering 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 will require the County and participating jurisdictions to provide opportunities for the public to make its views and concerns known. Marion County and the participating jurisdictions will provide notice to the public through announcements in the local paper, fliers posted at City and County offices, and on the County's website and/or social media accounts.

5) Plan Monitoring

The Marion County Emergency Management Coordinator (EMC) will be responsible for the overall continued coordination and monitoring of the mitigation plan in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions assigned for each hazard. The agency or department identified above in Table 6 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 EMC 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.

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. The goal is to create the opportunity for constant and continued feedback from local officials, stakeholders, and the 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 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 in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions:

- 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. The planning team will evaluate the causes of the shortcoming in the event that a mitigation project fails to meet its goal. 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 EMC and 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.

The approved plan will be hosted on the County website to allow the public to view and provide feedback during the 5-year lifespan of the plan.

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 EMC and 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 any of those losses could have been avoided.

3. Determining Risk

1) Risk Assessment

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

Likelihood of Future Events is measured based on a hazard's expected frequency of occurrence in terms of previous frequency. Each hazard's likelihood of future events 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.

Over the last five years population in Marion County and the City of Jefferson has decreased mainly due to deaths among elderly residents. Housing and development has remained relatively stagnant during this period as well. Similarly, business development has also remained consistent with previous trends. The effects of climate change have increased the frequency and intensity of hazard events. Since January 2018, Marion County has experienced multiple ice storms and tornados, with the largest tornado reaching an EF2 on the Enhanced Fujita Scale. Climate change is expected to exacerbate hazard events in the future. Climate change may also affect population migration and land use development in the future. As climate change exacerbates hazards, habitability of certain areas may be impacted. It is unclear how these effects will intersect with population migration patterns and land use changes. In the case of Marion County, the severity and frequency of wind events and tornados, as well as the increase in extreme heat and winter weather events may necessitate construction of appropriate infrastructure to address these threats as well as related land use changes. Additionally, population may consider relocation if appropriate measures are not taken.

The population of the City of Jefferson has stayed relatively the same over the last five years, however new development and climate change continue to increase vulnerability to natural hazards in the jurisdictions.

Major Disaster Declarations

The following table outlines all major disaster declarations that have occurred in Marion County since the 2018 HMAP.

Marion County Major Disaster Declarations		
Disaster	Incident Period	Declaration Date
DR-4485 Texas Covid-19 Pandemic	January 20, 2020 – May 11, 2024	March 25, 2020
DR-3540 Texas Tropical Storms Marco and Laura	August 23, 2020 – August 27, 2020	August 24, 2020
DR-4586 Texas Severe Winter Storms	February 11, 2021 – February 21, 2021	February 19, 2021

2) Distribution of Property by Housing Density and Potential Damage Values

Table 7: Estimated Values by Location²

Category	Marion County	City of Jefferson
Total Housing Units ³	5,629	1,143
Housing Unit Density (per square mile)	13 units/sq. mi	255 units/sq. mi
Median Housing Value ⁴	\$98,200	\$153,800
Estimated Value of Housing Units ⁵	\$552.8 million	\$175.8 million

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 geographic data including the location of low income or subsidized housing units,

² Source: U.S. Census 2020 American Community Survey 5-Year Estimates.

³ Table [B25001](#) 2020 ACS Housing Unit information for Marion County includes totals for cities and unincorporated areas.

⁴ Table [B25077](#) 2021 ACS Median Value information for Marion County includes totals for cities and unincorporated areas.

⁵ Total value of housing units derived from median value multiplied by number of units

concentrations of manufactured and mobile homes, and concentrations of homes in substandard condition.

Age, Disability, and Income

The populations of each jurisdiction were broken down into four categories: young residents, elderly residents, disabled 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 8: Age, Disability, and Poverty Level Percentages by Jurisdiction⁶

Demographic Category	Marion County	City of Jefferson	Texas	U.S.
Population Under Age 5 ⁷	5%	7.3%	7%	6%
Population Over Age 65	35.4%	23%	12.5%	16%
Disability Status ⁸	22.2%	17.2%	12.1%	13%
Individuals Below Poverty Level ⁹	18.3%	24.7%	14.2%	12.8%

⁶ Source: U.S. Census 2020 American Community Survey 5-Year Estimates

⁷ [Table S0101](#), Age and Sex, 2020 ACS 5-Year Estimates

⁸ [Table S1810](#), Disability Characteristics. The U.S. Census defines a person as having a work disability if one or more of the following conditions are met:

1. Persons with a health problem or disability which prevents them from working or which limits the kind or amount of work they can do
2. Persons who have retired or left a job for health reasons
3. Persons currently not in the labor force because of a disability.
4. Persons who did not work at all in the previous year because of illness or disability
5. Under 65 years old and covered by Medicare in previous year.
6. Under 65 years old and received Supplemental Security Income (SSI) in previous year.
7. Received VA disability income in previous year.

⁹ [Table DP03](#), Selected Economic Characteristics, 2016-2019 5-Year Estimates

Distribution of Vulnerable Populations

The following vulnerable populations map is based on a social vulnerability index created specifically for the planning area. The index considers six relevant Census Block Group-level factors: poverty rate, population of residents 65 years old and older, population of residents younger than 18, the population of residents without a high school diploma or GED, the population of residents with a low English proficiency, and the number of homes constructed before 1980.

To create the index, each factor is re-scaled by assigning the largest population in each category a score of 1. The remaining population counts for each category are then given a score based on the ratio of the relevant population to the largest population. Once each factor has a re-scaled score, the scores for each factor are totaled to create an overall index number for each Census Block Group. The vulnerable populations map is representative of each Census Block Group's overall vulnerability, based on the six factors outlined above, relative to the other Census Block Groups in the planning area.

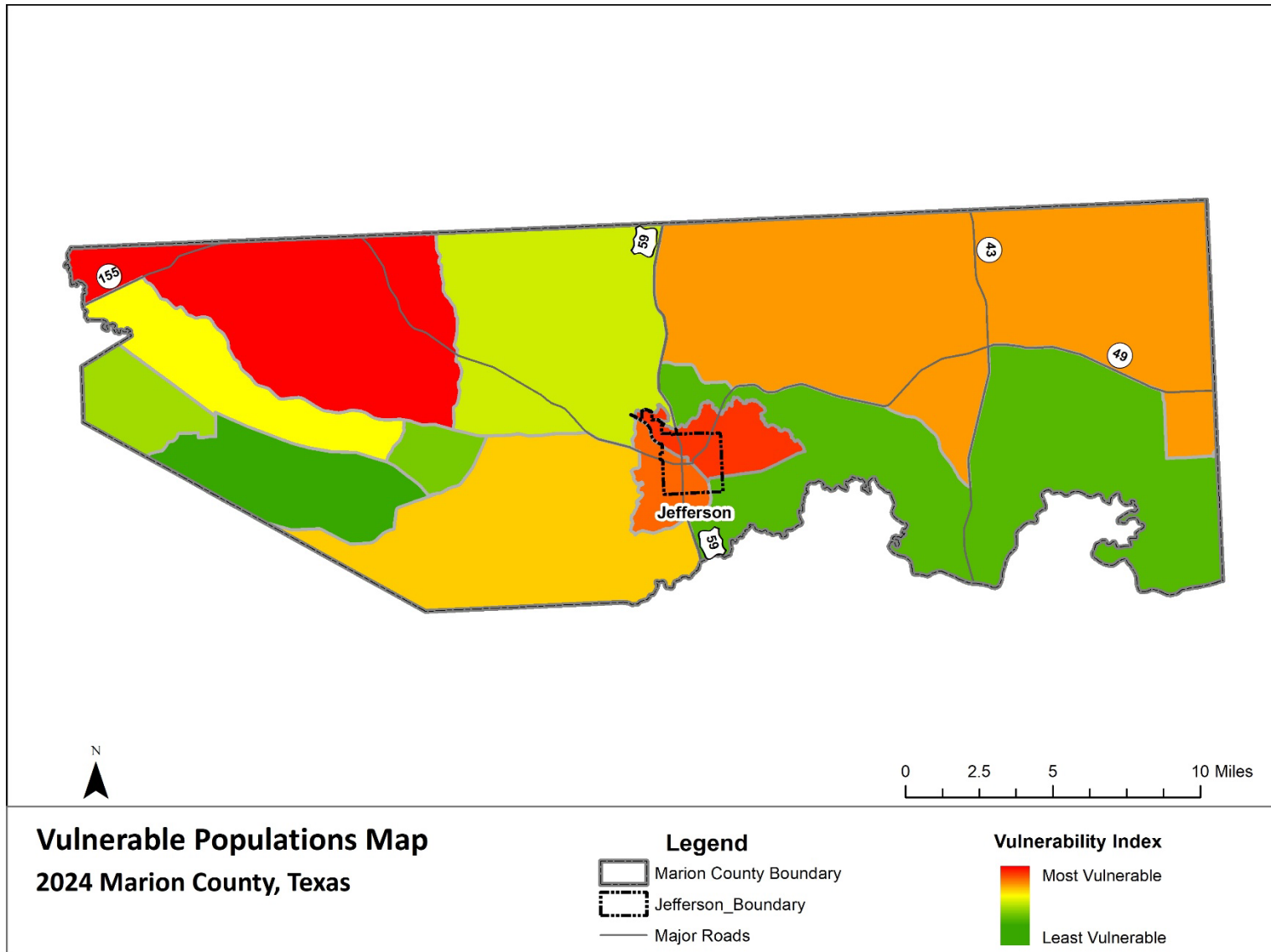


Figure 6: Marion County Social Vulnerability Index

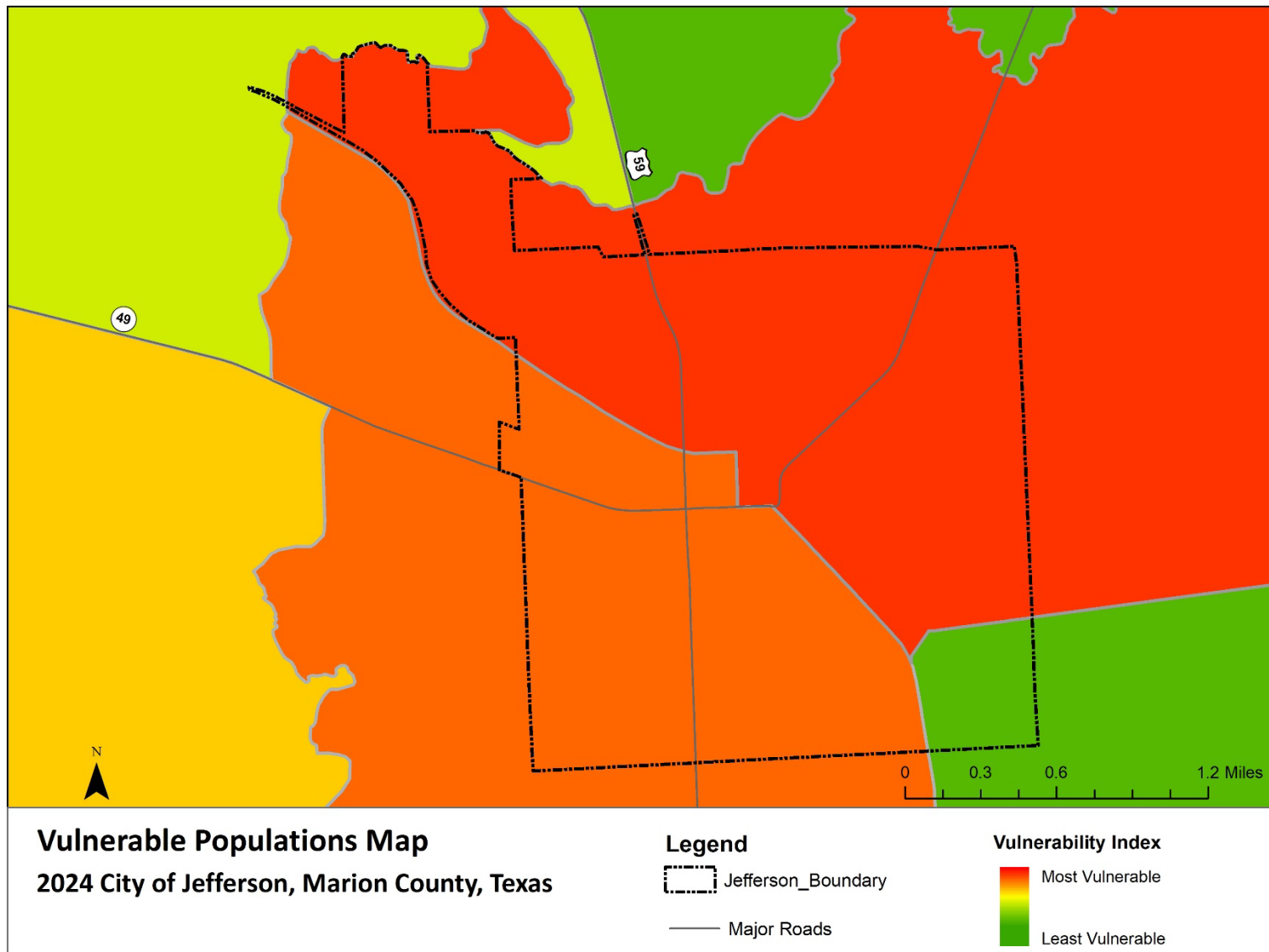


Figure 7: City of Jefferson Social Vulnerability Index

Low Income and Subsidized Housing

Low-income residents in Marion County are primarily served through rental assistance programs and low-income housing. The Housing Authority of Jefferson is the primary operator of low-income housing in the County¹⁰. There are two affordable apartment communities offering 48 apartments in Marion County, all located in the City of Jefferson. Furthermore, there are 32 low-income apartments that do not offer direct rental assistance but are still considered affordable for low-income families¹¹.

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.

Housing Type and Condition

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

I. Manufactured / Mobile Homes

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

Mobile and manufactured homes can be found throughout Marion County, including several RV parks. These parks' populations fluctuate on a seasonal basis. Due to the express portability of RVs, most of these structures are expected to evacuate ahead of hazard events with significant warning times. However, RVs may not have enough time to evacuate ahead of less predictable hazard events like tornados.

Locations with clusters of three or more mobile / manufactured homes, including named mobile home parks, are shown in Figure 8 below.

¹⁰ Affordable Housing Online, 2022. <https://affordablehousingonline.com/housing-authorities/Texas>

¹¹ Affordable Housing Online, 2021. <https://affordablehousingonline.com/housing-search/Texas/Jefferson>

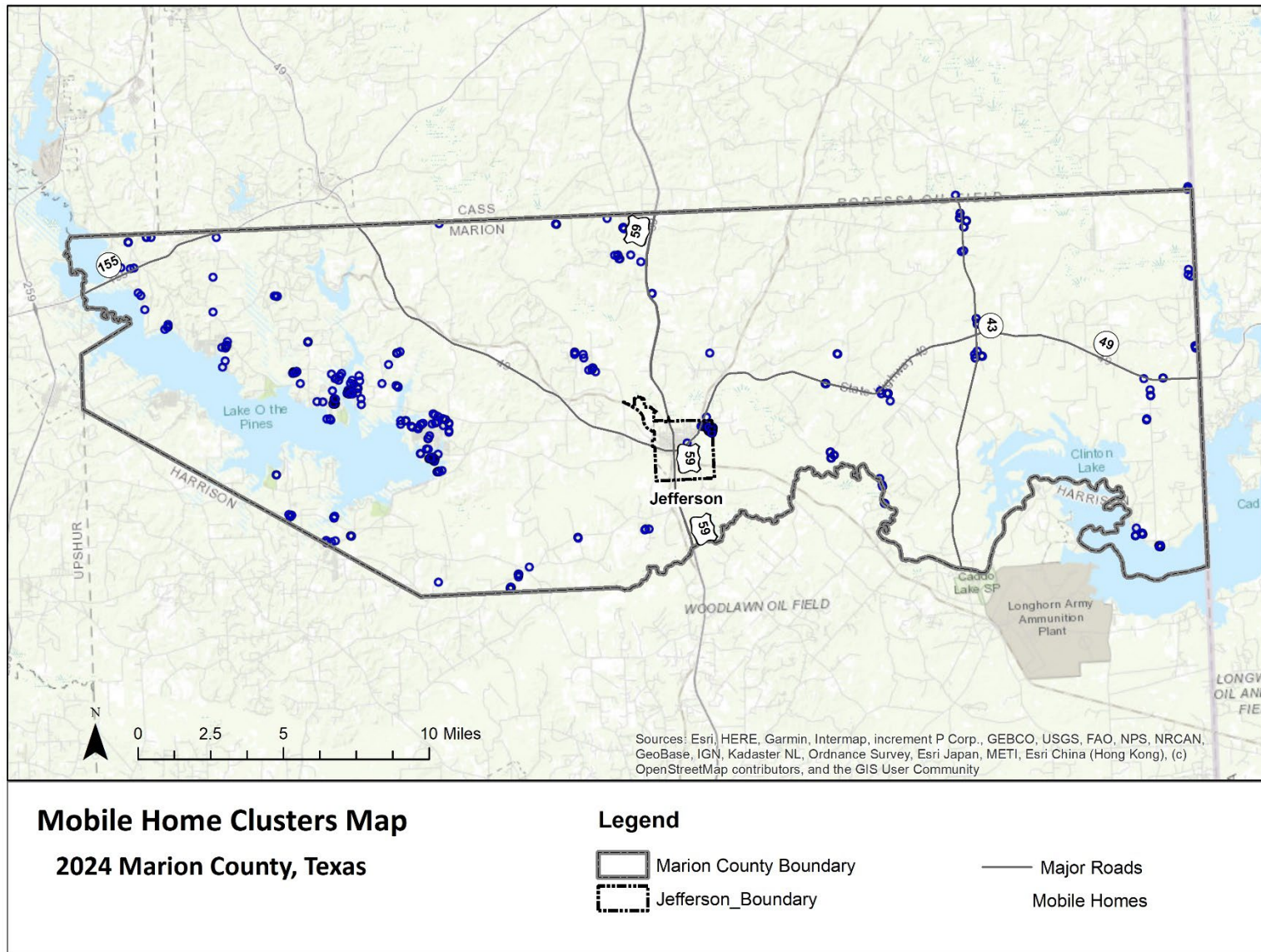


Figure 8: Mobile and Manufacturing Clusters in Marion County and the Participating Jurisdictions

II. Homes in Substandard Condition

The jurisdictions have determined that homes in sub-standard condition, regardless of structure type, 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 windowpanes
- cracked masonry, brick, or mortar surfaces
- missing or damaged roof shingles
- small rust spots on mobile homes

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

According to the National Oceanic and Atmospheric Administration, flood is defined as an overflow of water onto normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of the water at or near the point where the rain fell. Flooding is a longer-term event than flash flooding: it may last days or weeks.

Flash flood is defined as a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam.¹²

1) Flood History

The planning team relied on data from the National Centers for Environmental Information (NCEI) to develop a flood history for the County and each participating jurisdiction.

According to Marion County's 2018 HMAP plan, the County and jurisdictions addressing the hazard recorded 8 flood events between 1997 and 2016. The 2018 plan recorded about \$1,111,000 in property damages during that time, adjusted to \$2024. The 2018 plan found that the frequency flood occurrences is likely.

There have been no recorded events since the 2018 HMAP.

A) National Flood Insurance Program

The National Flood Insurance Program (NFIP) is administered by FEMA to provide flood insurance coverage to the nation. Marion County does not participate in NFIP because they have not deemed it necessary until this point, but they will consider participation in the future; however, the remaining jurisdictions are listed as participating NFIP communities in the FEMA Community Status Book Report.

The City of Jefferson has adopted and enforced a flood damage prevention ordinance in their jurisdiction. The City of Jefferson's Flood Damage Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Though there are no current NFIP maps available for the City of Jefferson, updating NFIP maps is a

¹² https://www.weather.gov/mrx/flood_and_flash

mitigation action listed in Chapter 14 below. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage.

The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

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. According to the best information available, there are 12 RL properties in Marion County. All 12 properties are located in the City of Paris and are single-family residences.

A severe repetitive loss (SRL) 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. According to the best information available, there are 3 SRL properties in Marion County. All 3 properties are located in the City of Paris and are single-family residences.

2) Likelihood of Future Events

In the case of the FEMA 100-year floodplain there is a 1% annual chance, while in the 500-year floodplain there is a 0.02% annual chance. Thus, the likelihood of a 100-year flood event is occasional and the likelihood of a 500-year flood event is unlikely. However, based on the frequency of previous flood events, every jurisdiction can expect to experience some type of

flooding that may or may not meet the definition of a 100-year or 500-year event on a more regular basis.

The local planning team determined it is probable that Marion County and the participating jurisdictions will experience a flood event in the next three years, meaning an event is likely.

3) Extent

Flood magnitude is generally measured by depth of flood waters in feet or inches. Throughout Marion County and the participating jurisdictions, the worst flood events have been associated with flooding due to combinations of heavy rainfall, flash flooding, and riverine flooding.

Throughout Marion County and the participating jurisdictions, the worst flood events have resulted in up to 2' of water and inflicted over \$500,000 in damages.¹³

Future worst-case flood events in Marion County and the participating jurisdictions may meet or exceed previous worst-case 2' flood depths.

4) Location and Impact

Rains County and the City of Jefferson do not currently participate in the NFIP, as noted above. As such, flood zone mapping is unavailable and base flood elevations are unavailable. The maps below are based on potential flood areas along rivers and water bodies within the county and participating jurisdictions.

¹³ 2017 Marion County Hazard Mitigation Plan

A) Location

I. Marion County

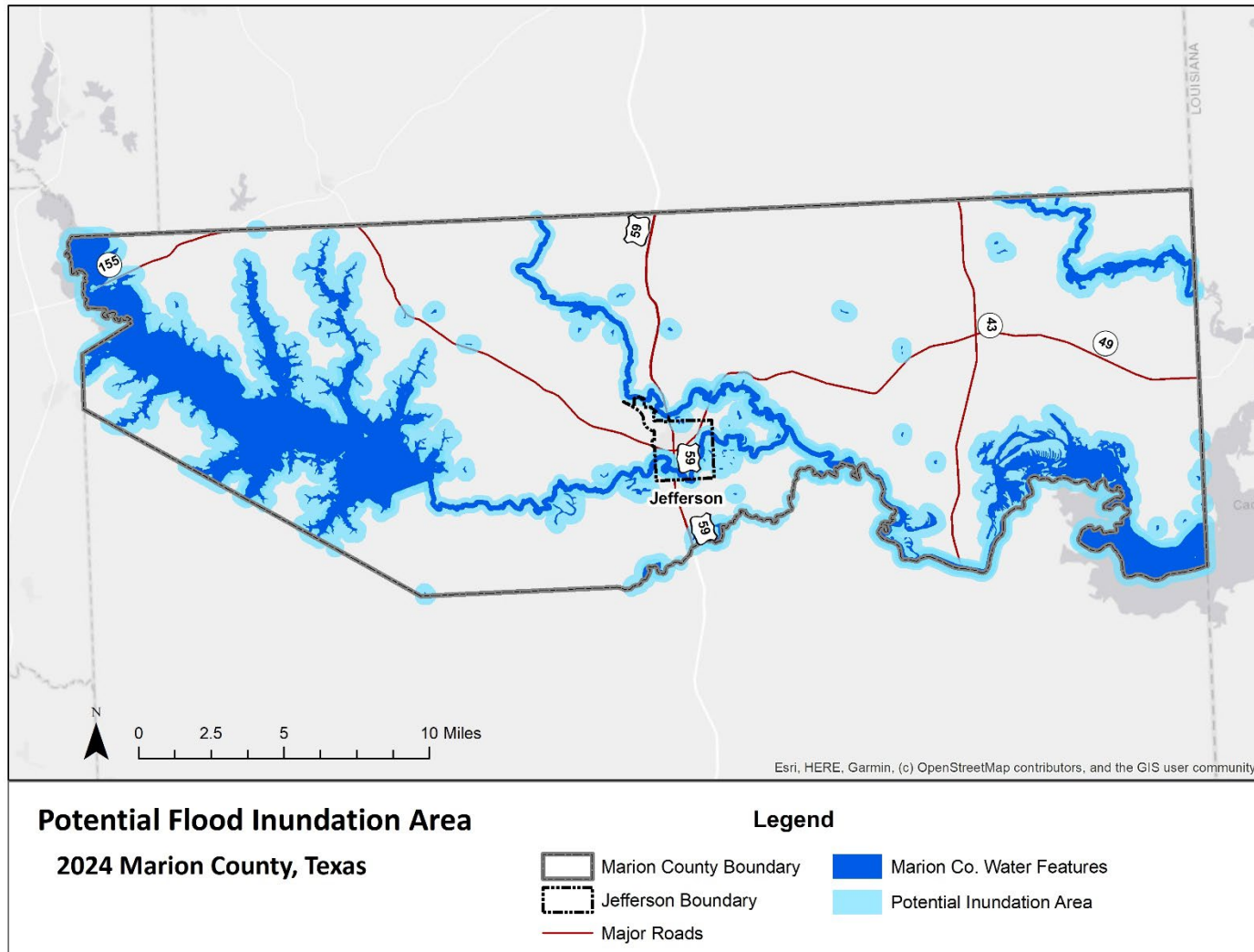


Figure 9: Marion County Potential Inundation Areas

II. City of Jefferson

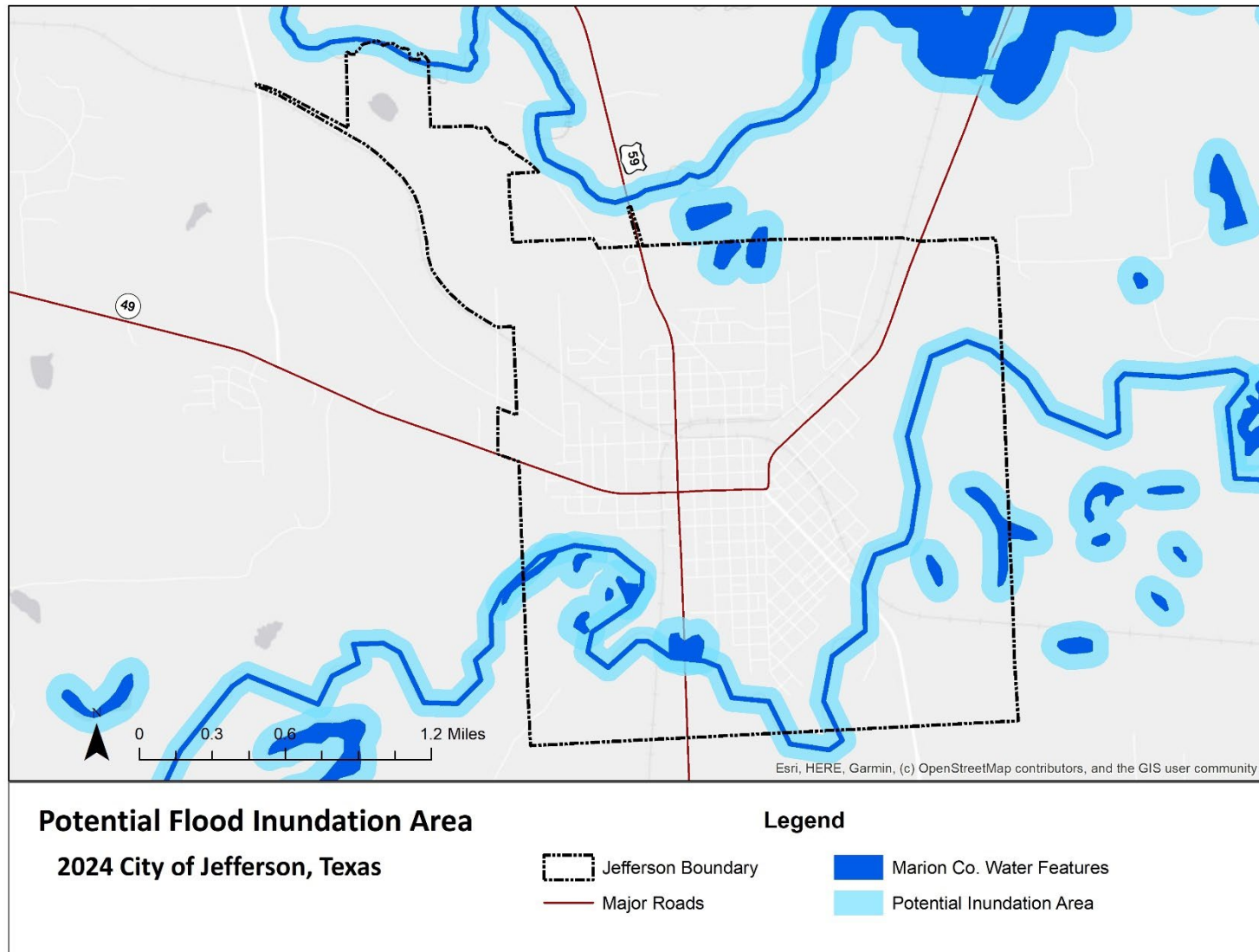


Figure 10: City of Jefferson Potential Inundation Areas

B) Impact

Flood impact in Marion County and the participating jurisdictions will vary depending on the location, size of the affected area, and number of structures affected. Marion County does not currently participate in the NFIP, and as such, accurate flood mapping is unavailable. However, it is possible to infer potential flood areas based on the location of waterways and adjacent topography.

Parts of the County 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 flood borne contaminants, damaged by debris flow, or even completely washed away; crops may be damaged or destroyed.

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 Section 3 of Chapter 3 above, Marion 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 flood.

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a flood, and depending on tie-down methods, may threaten surrounding structures.

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

B) Critical Facilities

The planning team identified 78 critical facilities spread across the County and participating jurisdictions. All are located in some variation of a flood zone.

Table 9: Marion County Critical Facilities Vulnerable to Flooding

Marion County Critical Facilities
Marion County Sheriff Office
Marion County Jail
Marion County Court House
Kellyville Community Center
Dump Pct 1
Dump Pct 2 (Lodi)
Dump Pct. 3 (Smithland)
Dump Pct. 4
Grey VFD
Smithland VFD
Jackson VFD
Mims VFD and Ambulance
Shady Shores VFD
Mims Water Supply Corporation
EMC Water Supply Corporation
Cypress Bend Elementary School
Jefferson Christian Academy
Country Day School
Dollar General
CRESTWOOD ONE STOP Gas station
Trico Lumber Co.
Bradley Veterinary Clinic
Radio Tower East
Radio Tower West
Radio Tower North
Marion County Airport
City of Jefferson Critical Facilities
Jefferson Police Department
Jefferson City Hall
Jefferson VFD
Champion EMS Jefferson
Jefferson Life Center
Thigpen Kent DDS
City Drug Co
Cypress Place
Magnolia Place Wellness and Rehabilitation
Jefferson High School
Jefferson Junior High School
Jefferson Elementary School
Jefferson Primary School
Jefferson Tourism and Visitor Center
Happy Hippo Daycare
Brookshire's

Family Dollar
Dollar General
Cefco
Valero
Exxon
V Mart
City Pump Station
City Sewer Plant
Houston St. Water Tower
Alley St. Water Tower
Burton Funeral Home
Lewis and Walker Funeral Home
Haggard Funeral Home

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Climate change may cause river floods to become larger or more frequent than they used to be in some places yet become smaller and less frequent in other places. As warmer temperatures cause more water to evaporate from the land and oceans, changes in the size and frequency of heavy precipitation events may in turn affect the size and frequency of river flooding.”¹⁴

¹⁴ <https://www.epa.gov/climate-indicators/climate-change-indicators-river-flooding>

5. 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. The wildfire disaster cycle begins when homes are built adjacent to wildland areas. When what would have been rural wildfires occur, they advance through all available fuels, which can include homes and structures.¹⁵

1) Wildfire History

The Texas A&M Forest Service Wildfire Risk Assessment Portal provides wildfire data on fires that occurred as recently as 2021. Additional data came from local planning team members.

In the 2018 plan, the County and participating jurisdictions looked at Texas A&M Forest Service Wildfire Risk Assessment Portal data to determine wildfire risk across Marion County. The 2017 plan reported 1 wildfire in 2011.

The following table represents all events recorded in the Texas A&M Forest Service database between 2018 – 2021. No data is available after 2021. There is no data available in the National Centers for Environmental Information (NCEI) database for Marion County between 2018-2024. Wildfire events are only recorded at the county level, therefore there are no recorded events for the City of Jefferson. For planning purposes, we can assume that events recorded for the County may have also impacted the City of Jefferson.

Table 10: Marion County Wildfire History

Location	Date Range	Wildfire Events	Acres Burned
Countywide	1/1/2018 – 12/31/2021	266	945

2) Likelihood of Future Events

Although the County and participating jurisdictions haven't recorded a wildfire since the 2017 HMAP, some wildfires may have gone unreported. A wildfire event in any of the jurisdictions addressing the hazard is occasional, meaning an event is probable within the next five years.

¹⁵ 2018 State of Texas Hazard Mitigation Plan

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, Marion County and the participating jurisdictions are rated between Class 1 and Class 4.

Table 11: Characteristic Fire Intensity Scale¹⁶

Class 1 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.
Class 2 Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
Class 3 Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
Class 4 High	Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
Class 5 Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

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 Marion County and the participating jurisdictions is a Class C event.

Table 12: National Wildfire Coordinating Group Size Class of Fire¹⁷

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

¹⁶ <https://www.texaswildfirerisk.com>

¹⁷ <http://www.nwcg.gov/term/glossary/size-class-of-fire>

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

Future fire events in Marion County and the participating jurisdictions may meet previous worst-case Class C (NWCGSCF) and Class 4 (FIS) wildfires in terms of intensity, acreage burned, and inflicted damage.

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, rather than by structure. Parcels have been determined to be either partially or completely vulnerable to wildfire based on TxWRAP's Wildland Urban Interface boundaries.

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

I. Marion County Location

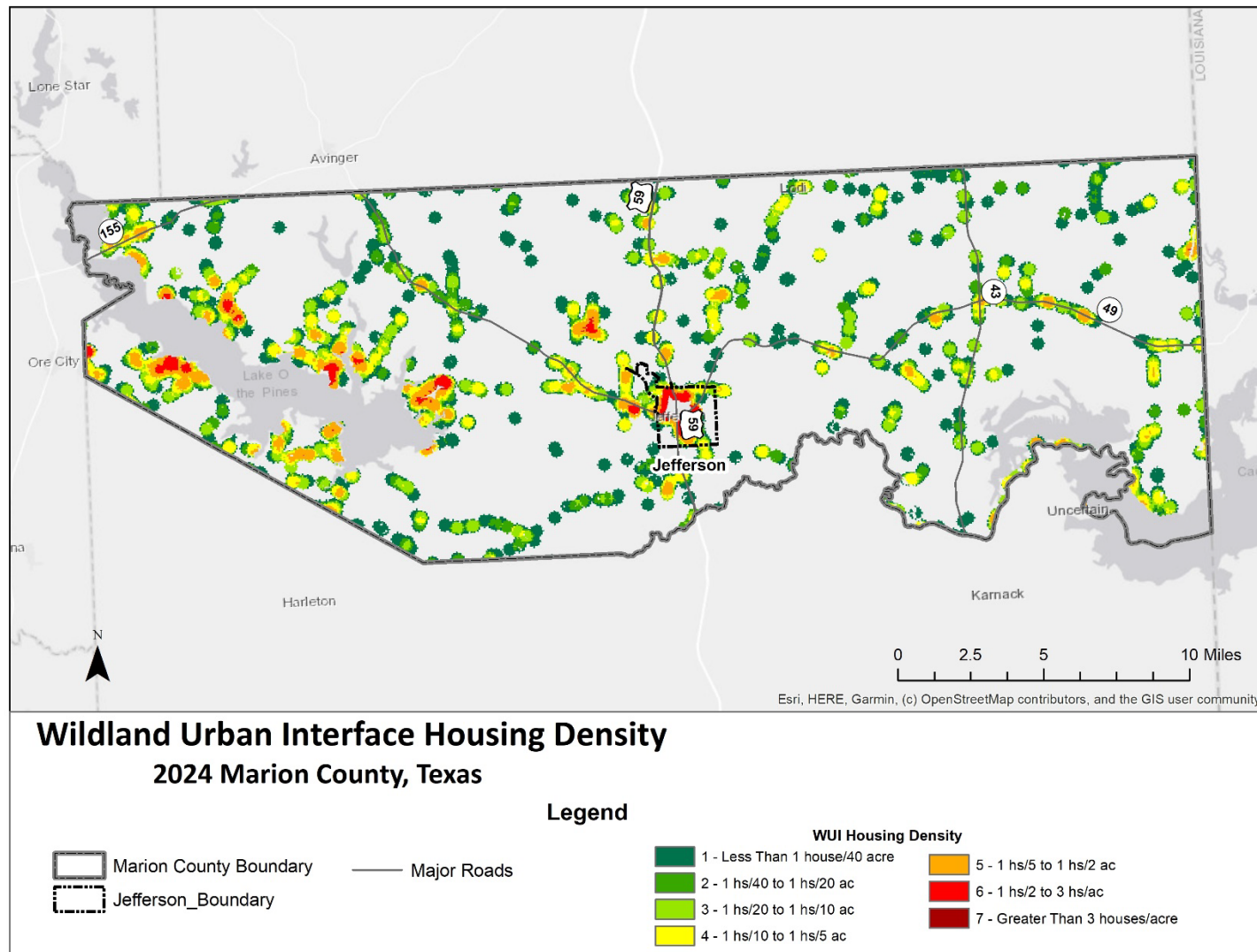


Figure 11: Marion County Wildland Urban Interface

II. City of Jefferson Location

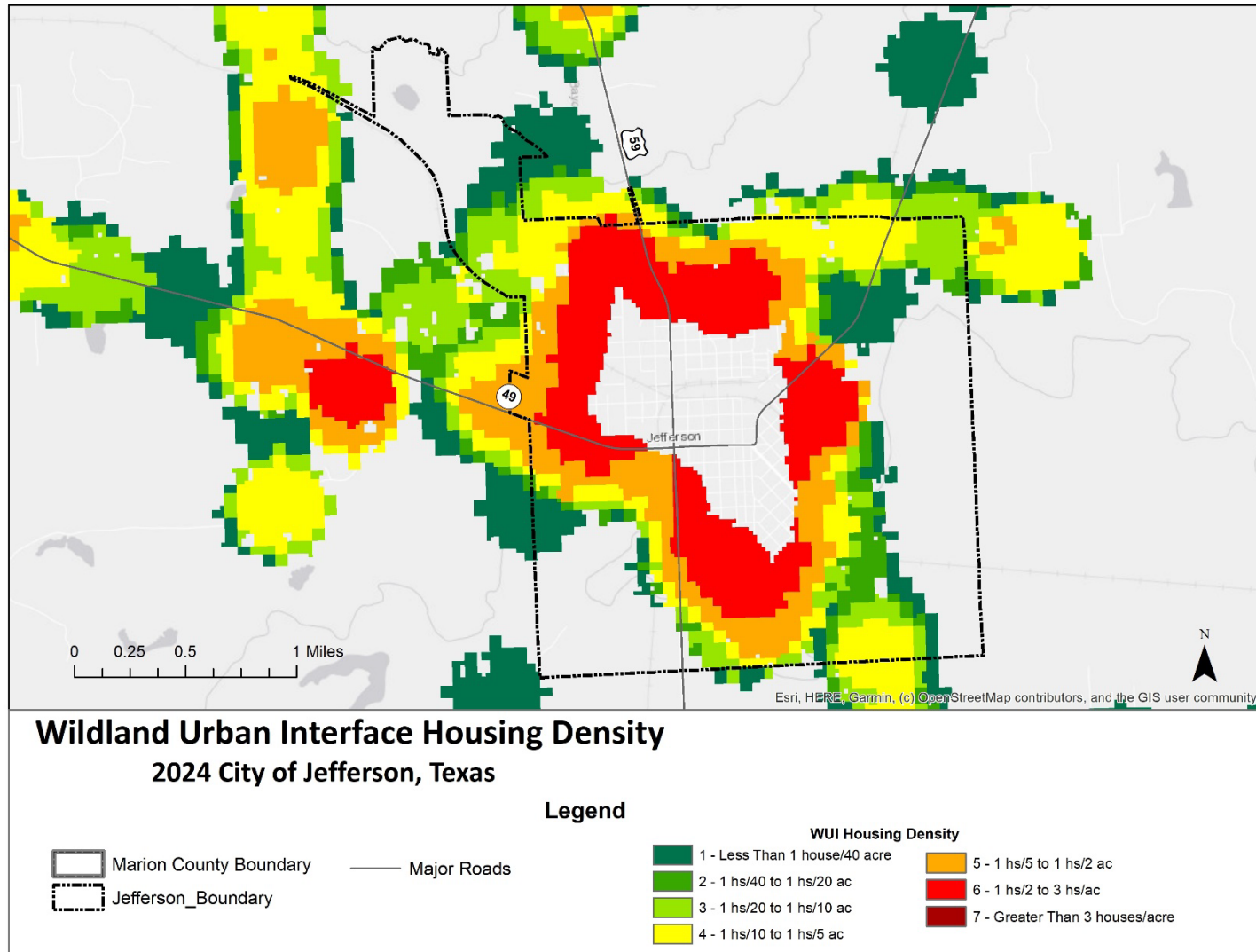


Figure 12: City of Jefferson Wildland Urban Interface

B) Impact

Impacts from a wildfire in Marion 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 Section 3 of Chapter 3 above, Marion 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 concern¹⁸. 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.

¹⁸ <https://www.usfa.fema.gov/downloads/pdf/statistics/rural.pdf>

B) Critical Facilities

There are 78 critical facilities located throughout the County and participating jurisdictions. 69 of the 78 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 13: Critical Facilities Vulnerable to Wildfire and Potential Impacts

Jurisdiction	Critical Facilities	Potential Wildfire Impacts			
		Destruction	Partial Destruction	Heat Damage	Smoke Damage
Marion County	Marion County Sheriff Office	x	x	x	x
	Marion County Jail	x	x	x	x
	Marion County Court House	x	x	x	x
	Kellyville Community Center	x	x	x	x
	Dump Pct 1	x	x	x	x
	Dump Pct 2 (Lodi)	x	x	x	x
	Dump Pct. 3 (Smithland)	x	x	x	x
	Dump Pct. 4	x	x	x	x
	Grey VFD	x	x	x	x
	Smithland VFD	x	x	x	x
	Jackson VFD	x	x	x	x
	Mims VFD and Ambulance	x	x	x	x
	Shady Shores VFD	x	x	x	x
	Mims Water Supply Corporation	x	x	x	x
	EMC Water Supply Corporation	x	x	x	x
	Cypress Bend Elementary School	x	x	x	x
	Jefferson Christian Academy	x	x	x	x
	Country Day School	x	x	x	x
	Dollar General	x	x	x	x
	CRESTWOOD ONE STOP Gas station	x	x	x	x
	Trico Lumber Co.	x	x	x	x
	Bradley Veterinary Clinic	x	x	x	x
	Radio Tower East	x	x	x	x
	Radio Tower West	x	x	x	x
		x	x	x	x
City of Jefferson	Jefferson Police Department	x	x	x	x
	Jefferson City Hall	x	x	x	x
	Jefferson VFD	x	x	x	x
	Champion EMS Jefferson	x	x	x	x
	Jefferson Life Center	x	x	x	x

	Thigpen Kent DDS	x	x	x	x
	City Drug Co	x	x	x	x
	Cypress Place	x	x	x	x
	Magnolia Place Wellness and Rehabilitation	x	x	x	x
	Jefferson High School	x	x	x	x
	Jefferson Junior High School	x	x	x	x
	Jefferson Elementary School	x	x	x	x
	Jefferson Primary School	x	x	x	x
	Jefferson Tourism and Visitor Center	x	x	x	x
	Happy Hippo Daycare	x	x	x	x
	Brookshire's	x	x	x	x
	Family Dollar	x	x	x	x
	Dollar General	x	x	x	x
	Cefco	x	x	x	x
	Valero	x	x	x	x
	Exxon	x	x	x	x
	V Mart				
	City Pump Station	x	x	x	x
	City Sewer Plant	x	x	x	x
	Houston St. Water Tower	x	x	x	x
	Alley St. Water Tower	x	x	x	x
	Burton Funeral Home	x	x	x	x
	Lewis and Walker Funeral Home	x	x	x	x
	Haggard Funeral Home	x	x	x	x

C) Vulnerable Parcels

Table 14: All Parcels Vulnerable to Wildfire

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	8655	\$306,067,640
City of Jefferson	1995	\$276,997,880

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons. Increases in temperatures and the thirst of the atmosphere due to climate change have increased aridity of forest fuels during the fire season. These drivers were found to be responsible for over half the observed decrease in the moisture content of fuels in western U.S. forests from 1979 to 2015, and the doubling of forest fire burned area over the period 1984 to 2015. For much of the U.S. West, projections show that an average annual 1 degree C temperature increase would increase the median burned area per year by as much as 600%.”¹⁹

¹⁹ <https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection#:~:text=Research%20shows%20that%20changes%20in,fuels%20during%20the%20fire%20season.https://www.c2es.org/content/wildfires-and-climate-change/#:~:text=For%20much%20of%20the%20U.S.,in%20some%20types%20of%20forests.>

6. 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 destruction of buildings.

1) Tornado History

The 2018 Marion County plan reported 18 tornados between 1950 – 2016 for the County and jurisdictions. The table below represents all tornado occurrences since the 2018 HMAP.

Table 15: Marion County Tornado History

Location	Date Range	Number of Tornados	F/EF Magnitude Range	Facilities	Injuries	Local Property Damage \$2024	Local Crop Damage \$2024
Countywide	1/01/2018 – 6/30/2024	2	EF1 – EF2	0	1	\$393,099.47	\$0

2) Likelihood of Future Events

The likelihood of future tornados will be determined in consideration of all tornados in Marion County. Tornado events in Marion County are considered a likely hazard given the frequency of previous tornados in the County and participating jurisdictions, meaning one is possible in the next three years.

3) Extent

Before 2007, the Fujita Scale was used for rating tornado strength. The Fujita Scale is based on damage intensity instead of wind speed, with estimated wind speed ranges based on the extent of observed damage.

Table 16: Fujita Scale

Fujita Scale			
Enhanced Fujita Category	Wind Speed (MPH)	Character	Potential Damage
Zero (F0)	40-72	Weak	Light Damage. Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged.
One (F1)	73-112	Weak	Moderate damage. Roof surfaces peeled off; mobile homes pushed foundations or overturned; moving autos pushed off road.
Two (F2)	113-157	Strong	Considerable damage. Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles.
Three (F3)	158-206	Strong	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.
Four (F4)	207-260	Violent	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
Five (F5)	260-318	Violent	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.

Adopted after 2007, the Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornadoes 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 tornadoes.

Table 17: Enhanced Fujita Scale²⁰

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.

²⁰ Texas State Hazard Mitigation Plan, 2018 Update.

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.

The most recent tornados in Marion County and the participating jurisdictions have been classified as EF1s on the Enhanced Fujita Scale. Marion County sits within Zone IV (250 mph winds) of the IBC's wind speed map²¹. Future tornados in Marion County and the participating jurisdictions may meet up to EF5 on the Enhanced Fujita Category.

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 to Marion County and the participating jurisdictions may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings, and loss of power. 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.

²¹ <https://iibec.org/giving-tornadoes-their-due/>

5) Vulnerability

Tornadoes 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 Section 3 of Chapter 3 above, Marion 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. 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 and Infrastructure

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, 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 tornado if that damage affects the facility's ability to reopen and resume normal business right away.

Table 18: Critical Facilities Vulnerable to Tornadoes and Potential Impacts

Jurisdiction	Critical Facilities	Potential Tornado 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
Marion County	Marion County Sheriff Office	x	x	x	x	x	x	x	x	x	x
	Marion County Jail	x	x	x	x	x	x	x	x	x	x
	Marion County Court House	x	x	x	x	x	x	x	x	x	x
	Kellyville Community Center	x	x	x	x	x	x	x	x	x	x
	Dump Pct 1	x	x	x	x	x	x	x	x	x	x
	Dump Pct 2 (Lodi)	x	x	x	x	x	x	x	x	x	x
	Dump Pct. 3 (Smithland)	x	x	x	x	x	x	x	x	x	x
	Dump Pct. 4	x	x	x	x	x	x	x	x	x	x
	Grey VFD	x	x	x	x	x	x	x	x	x	x
	Smithland VFD	x	x	x	x	x	x	x	x	x	x
	Jackson VFD	x	x	x	x	x	x	x	x	x	x
	Mims VFD and Ambulance	x	x	x	x	x	x	x	x	x	x
	Shady Shores VFD	x	x	x	x	x	x	x	x	x	x
	Mims Water Supply Corporation	x	x	x	x	x	x	x	x	x	x
	EMC Water Supply Corporation	x	x	x	x	x	x	x	x	x	x
	Cypress Bend Elementary School	x	x	x	x	x	x	x	x	x	x
	Jefferson Christian Academy	x	x	x	x	x	x	x	x	x	x
	Country Day School	x	x	x	x	x	x	x	x	x	x
	Dollar General	x	x	x	x	x	x	x	x	x	x
	CRESTWOOD ONE STOP Gas station	x	x	x	x	x	x	x	x	x	x
	Trico Lumber Co.	x	x	x	x	x	x	x	x	x	x
	Bradley Veterinary Clinic	x	x	x	x	x	x	x	x	x	x
	Radio Tower East	x	x	x	x	x	x	x	x	x	x
	Radio Tower West	x	x	x	x	x	x	x	x	x	x
	Radio Tower North	x	x	x	x	x	x	x	x	x	x

	Marion County Airport	x	x	x	x	x	x	x	x	x	x
City of Jefferson	Jefferson Police Department	x	x	x	x	x	x	x	x	x	x
	Jefferson City Hall	x	x	x	x	x	x	x	x	x	x
	Jefferson VFD	x	x	x	x	x	x	x	x	x	x
	Champion EMS Jefferson	x	x	x	x	x	x	x	x	x	x
	Jefferson Life Center	x	x	x	x	x	x	x	x	x	x
	Thigpen Kent DDS	x	x	x	x	x	x	x	x	x	x
	City Drug Co	x	x	x	x	x	x	x	x	x	x
	Cypress Place	x	x	x	x	x	x	x	x	x	x
	Magnolia Place Wellness and Rehabilitation	x	x	x	x	x	x	x	x	x	x
	Jefferson High School	x	x	x	x	x	x	x	x	x	x
	Jefferson Junior High School	x	x	x	x	x	x	x	x	x	x
	Jefferson Elementary School	x	x	x	x	x	x	x	x	x	x
	Jefferson Primary School	x	x	x	x	x			x		
	Jefferson Tourism and Visitor Center	x	x	x	x	x	x	x	x	x	x
	Happy Hippo Daycare	x	x	x	x	x	x	x	x		
	Brookshire's	x	x	x	x	x	x	x	x	x	x
	Family Dollar	x	x	x	x	x	x	x	x	x	x
	Dollar General	x	x	x	x	x	x	x	x	x	x
	Cefco	x	x	x	x	x	x	x	x		
	Valero	x	x	x	x	x	x	x	x	x	x
	Exxon	x	x	x	x	x	x	x	x	x	x
	V Mart	x	x	x	x	x	x	x	x	x	x
	City Pump Station	x	x	x	x	x	x	x	x	x	x
	City Sewer Plant	x	x	x	x	x	x	x	x		
	Houston St. Water Tower	x	x	x	x	x			x		
	Alley St. Water Tower	x	x	x	x	x			x		
	Burton Funeral Home	x			x	x					

	Lewis and Walker Funeral Home	x	x	x	x	x	x	x	x		
	Haggard Funeral Home	x	x	x	x	x	x	x	x		

C) Vulnerable Parcels

Table 19: Parcels Vulnerable to Tornadoes

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	18,590	\$1,602,489,740
City of Jefferson	1,995	\$276,997,880

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Scientists must attempt to predict how climate change might affect the individual weather ‘ingredients’ that support the development of supercell thunderstorms (the type that produce tornadoes). These weather ingredients are:

- warm, moist air;
- an unstable atmosphere; and
- wind at different levels moving in different directions at different speeds, a phenomenon known as wind shear.

Some studies predict that climate change could provide the opportunity for more severe thunderstorms to form. However, this does not necessarily mean that more tornadoes will occur, especially in light of the fact that only about 20 percent of supercell thunderstorms produce tornadoes.”²²

²² <https://education.nationalgeographic.org/resource/tornadoes-and-climate-change/>

7. Drought

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period, usually a season or more in length.²³

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. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 20: Drought Classifications

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

²³ 2018 State of Texas Hazard Mitigation Plan

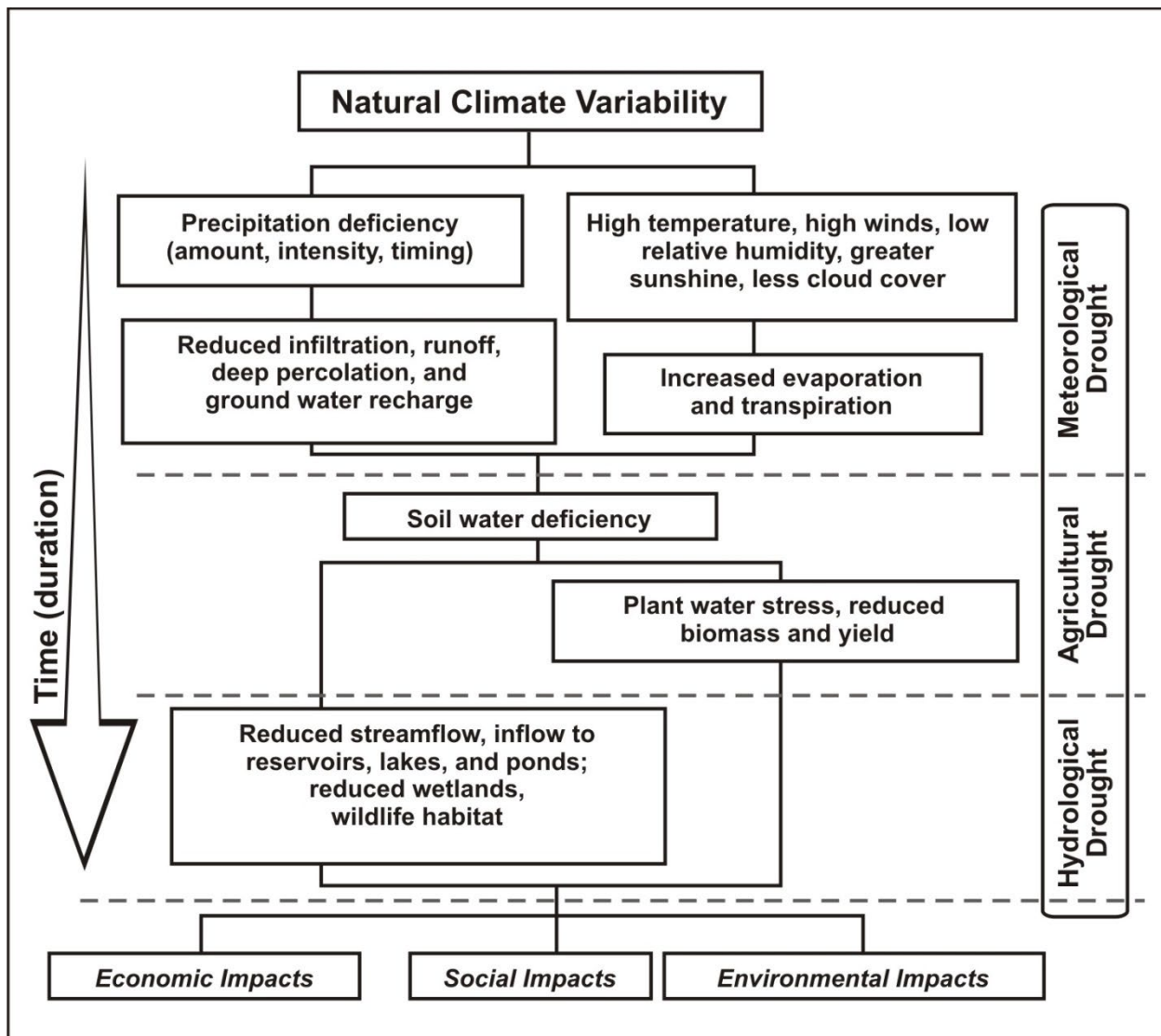


Figure 13: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types²⁴

²⁴ Source: National Drought Mitigation Center, University of Nebraska-Lincoln, <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>

1) Drought History²⁵

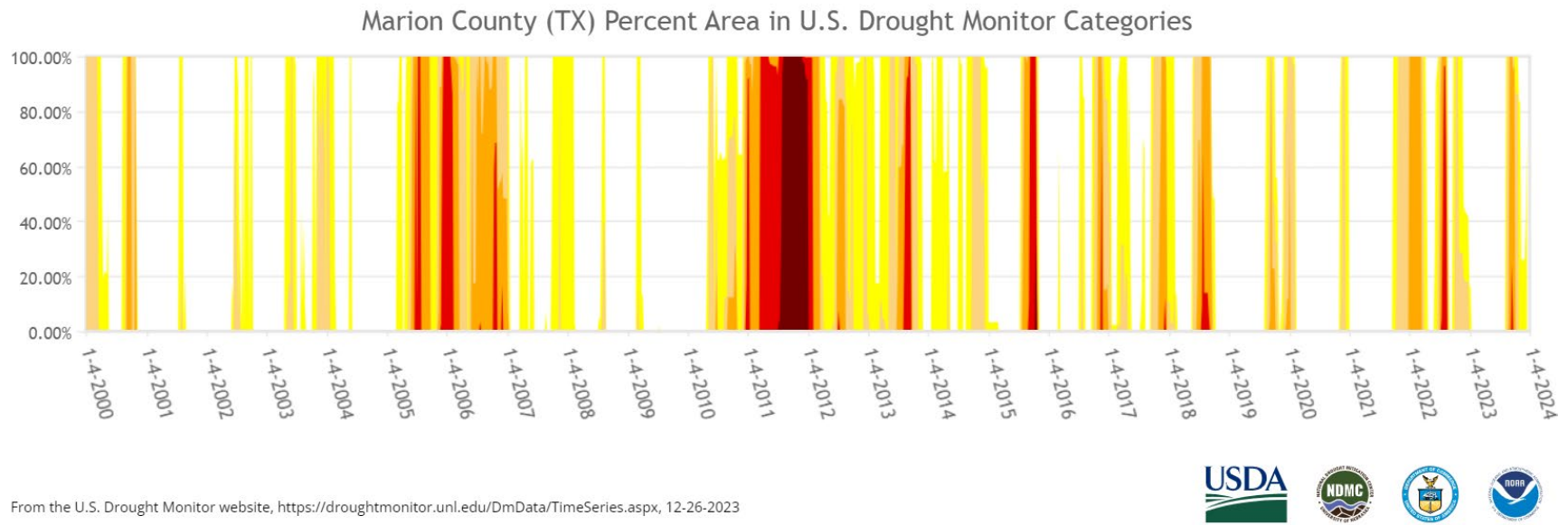


Figure 14: Marion County Drought History

²⁵ Source: United States Drought Monitor <https://droughtmonitor.unl.edu/Data.aspx>

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 individual cities is available, it's possible to use the data in Figure 14 to infer when the participating jurisdictions addressing the hazard previously experienced drought conditions due to the fact that the conditions impacted 100% of the county. According to the data, Marion County and the participating jurisdictions have regularly experienced drought conditions since 2000.

Table 21: Marion County Drought History

Location	Date Range	Number of Drought Events	Fatalities	Injuries	Property Damage \$2024	Crop Damage \$2024
Countywide	1/1/2018 – 6/30/2024	10	0	0	\$0	\$0

2) Likelihood of Future Events

Based on historical drought in Texas and Marion County, it is highly likely that a future drought will affect Marion County and the participating jurisdictions, meaning an event affecting any or all the participating jurisdictions is probable in the next year, and a major drought every 20 years.

3) Extent

According to the best information available, there were 10 recorded drought events between 1950 and 2017, the year that the previous HMAP was created, with droughts noted in 1996, 1998, 2005, 2010, 2011, 2012, 2013, and 2015 in the 2018 HMAP. The 2018 Marion County HMAP noted that Marion County experiences drought less than once per year, noting that over the 20 year period prior to the 2018 HMAP, Marion County experienced drought approximately 9% of the time. During the time period covered by the previous HMAP, the most significant drought occurred between December of 2010 through March of 2012. Additionally, according to the 2018 HMAP, The City of Jefferson is affected by a significant drought less than once per year. Since the 2018 HMAP, Marion County experienced 10 drought events.

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 22: 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 23: Palmer Drought Category Descriptions²⁶

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.

Based on the historical occurrences of drought, Marion 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 Index but will intensify with duration and ongoing lack of precipitation. Future drought events may reach the intensity of D4 on the Palmer Drought Index.

²⁶ www.droughtmonitor.unl.edu

4) Location and Impact

A) Location

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

B) Impact

General impacts to Marion County and the participating jurisdictions may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat. Economic impacts may include increased prices for food, unemployment for farm workers and ranch hands, livestock mortality from limited grazing availability, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall, along with other supply shortages.

5) Vulnerability

Because drought has the potential to impact every jurisdiction equally, all improved property and the entire population is exposed to this hazard. General impacts may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat.

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

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.

A) Population

As described in Section 3 of Chapter 3 above, Marion 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.

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 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.

Table 24: Critical Facilities Vulnerable to Drought and Potential Impacts

Jurisdiction	Critical Facilities	Potential Drought Impacts	
		Increased Demand for Services	Economic Damages
Marion County	Marion County Sheriff Office	x	x
	Marion County Jail		x
	Marion County Court House		x
	KellyVille Community Center	x	x
	Dump Pct 1		x
	Dump Pct 2 (Lodi)		x
	Dump Pct. 3 (Smithland)		x
	Dump Pct. 4		x
	Grey VFD	x	x
	Smithland VFD	x	x
	Jackson VFD	x	x
	Mims VFD and Ambulance	x	x
	Shady Shores VFD	x	x
	Mims Water Supply Corporation	x	x
	EMC Water Supply Corporation	x	x
	Cypress Bend Elementary School	x	x
	Jefferson Christian Academy	x	x
	Country Day School	x	x
	Dollar General	x	x
	CRESTWOOD ONE STOP Gas station	x	x
	Trico Lumber Co.	x	x
	Bradley Veterinary Clinic	x	x
	Radio Tower East		x
	Radio Tower West		x
	Radio Tower North		x
	Marion County Airport	x	x
City of Jefferson	Jefferson Police Department	x	x
	Jefferson City Hall	x	x
	Jefferson VFD	x	x
	Champion EMS Jefferson	x	x
	Jefferson Life Center	x	x
	Thigpen Kent DDS		x
	City Drug Co	x	x
	Cypress Place	x	x
	Magnolia Place Wellness and Rehabilitation		x

	Jefferson High School	x	x
	Jefferson Junior High School	x	x
	Jefferson Elementary School	x	x
	Jefferson Primary School	x	x
	Jefferson Tourism and Visitor Center	x	x
	Happy Hippo Daycare	x	x
	Brookshire's	x	x
	Family Dollar	x	x
	Dollar General	x	x
	Cefco	x	x
	Valero	x	x
	Exxon	x	x
	V Mart	x	x
	City Pump Station	x	x
	City Sewer Plant	x	x
	Houston St. Water Tower	x	x
	Alley St. Water Tower	x	x
	Burton Funeral Home	x	x
	Lewis and Walker Funeral Home	x	x
	Haggard Funeral Home	x	x

C) Vulnerable Parcels

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

Table 25: Parcels Vulnerable to Drought

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	18,590	\$1,602,489,740
City of Jefferson	1,995	\$276,997,880

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events

will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“As average temperatures have risen because of climate change, the Earth’s water cycle has sped up through an increase in the rate of evaporation from soil and transpiration from plants. An increase in evapotranspiration makes more water available in the air for precipitation, but contributes to drying over some land areas, leaving less moisture in the soil. As the climate continues to change, many historically wet areas are likely to experience increased precipitation and increased risk of flooding, while historically dry areas are likely to experience less precipitation and increased risk of drought.”²⁷

²⁷ <https://www.epa.gov/climate-indicators/climate-change-indicators-drought>

8. Extreme Cold

Extreme cold can happen anywhere in the state, although its levels can range extensively. In the panhandle extreme cold means days below zero Fahrenheit while in the Rio Grande Valley it means reaching temperatures below freezing.²⁸ Extreme cold is an issue any time winter temperatures drop significantly below normal and make staying warm and safe a challenge.

Extreme cold can accompany winter weather, but it can also be independent of those storms. For that reason, the impacts of extreme cold are presented here separately from the impacts of winter weather.

1) Extreme Cold History

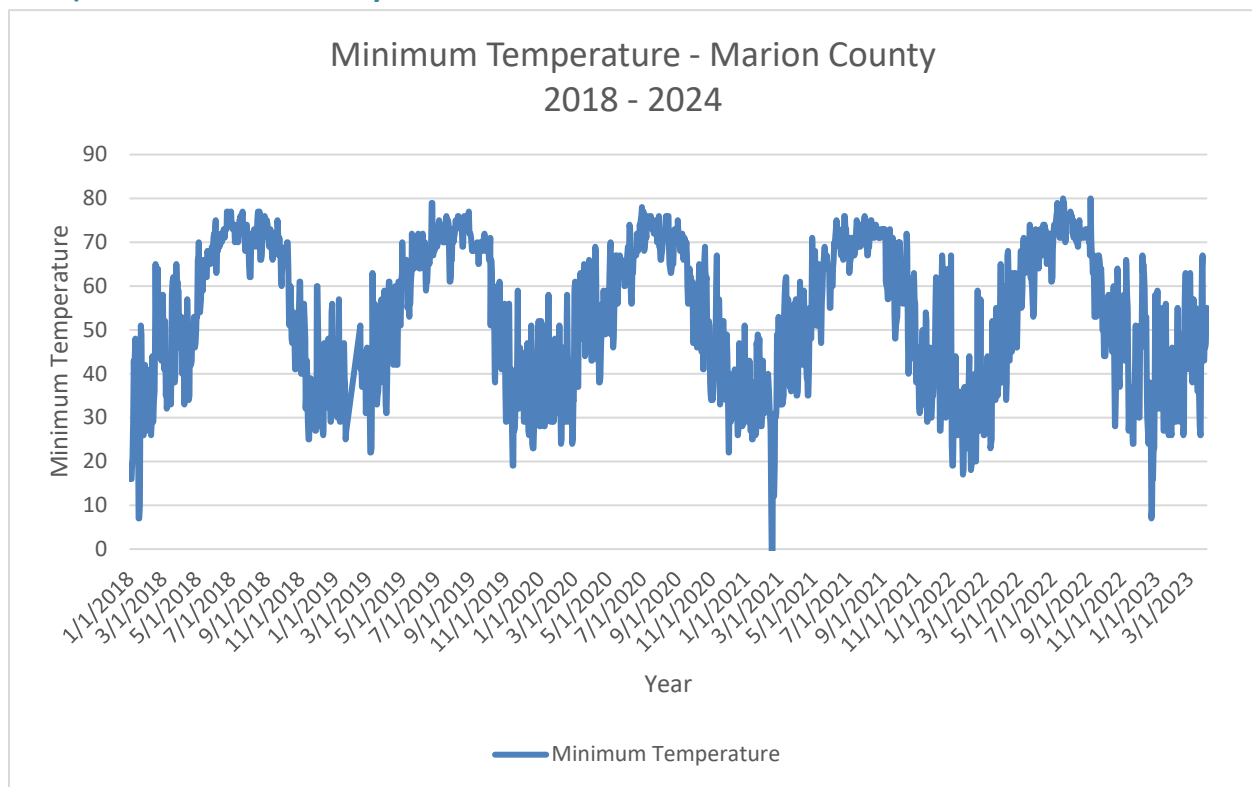


Figure 15: Minimum Recorded Daily Temperature 2000-2022²⁹

Marion County and the jurisdictions addressing the hazard have not previously included extreme cold in their mitigation plan as a standalone hazard. Prior to the 2018 update to the State of Texas mitigation plan, extreme cold was considered part of the winter weather hazard.

²⁸ 2018 State of Texas Hazard Mitigation Plan

²⁹ Source: National Centers for Environmental Information, <https://www.ncdc.noaa.gov/cdo-web/datasets>

Between 2018 to 2024, Marion County experienced 261 days with a minimum temperature of 32°F or colder. At least 9 of those days had a maximum temperature of 32°F or below. During the same timeframe, the coldest temperature recorded was -4°F on February 16, 2021.

Temperature data is recorded at the county level. However, given the nature of extreme cold and the proximity of all jurisdictions to each other, the jurisdictions addressing the hazard experienced the same extreme cold events. The following table are the only events recorded in the NCEI database from 2000 – 2022, however it is likely that more events have gone unreported. The NCEI Storm Events database has 0 recorded events, however climate data reported above from NOAA NCEI Climate data, reported above, shows more accurate data in terms of temperature data experience in Marion County since the 2018 HMAP.

2) Likelihood of Future Occurrence

Based on historic weather data, extreme cold in Marion County and the participating jurisdictions is likely, meaning an event affecting any or all the participating jurisdictions is probable in the next three years.

3) Extent

The magnitude or intensity of an extreme cold event is measured according to temperature in relation to wind speed. The relationship is referred to as the “Wind Chill,” and is depicted in Figure 16.

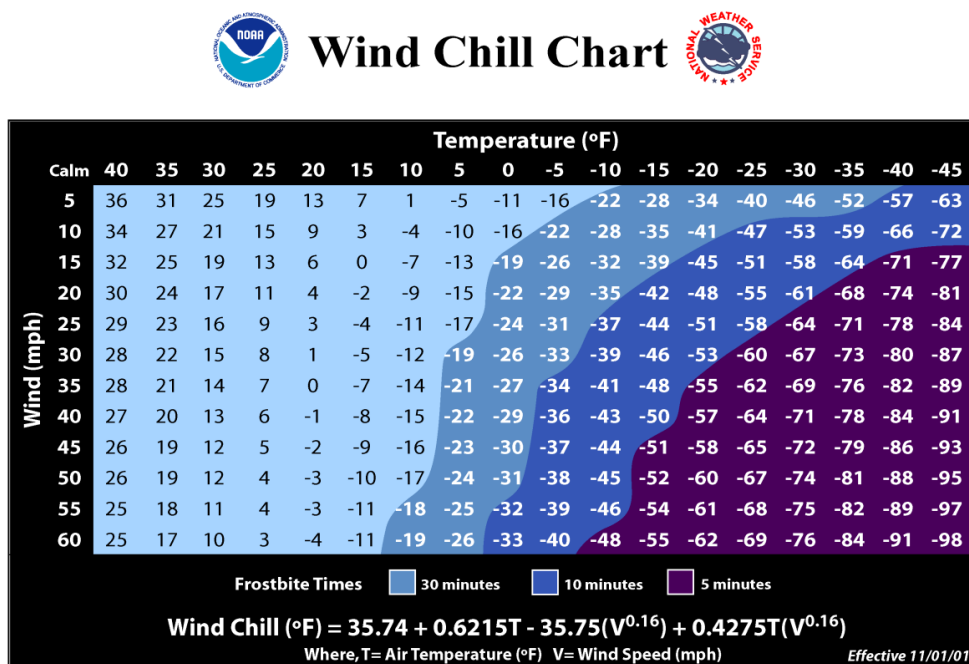


Figure 16: NOAA's NWS Wind Chill Index

As displayed in Figure 16, the wind chill temperature is a measurement of how cold the wind makes the air feel to the human body. Since wind can dramatically accelerate heat loss from the body, a 20° day could feel just as cold as a calm day with 0° temperatures. The Wind Chill Chart factors the wind chill; it is not applicable in calm winds or when the temperature is over 50°.

The coldest temperatures in Marion County and the participating jurisdictions may meet or exceed the current record temperature of -4°F. Future extreme cold events may be as intense, long-lasting, and dangerous as previous ones.

4) Location and Impact

A) Location

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

B) Impact

The potential impact to Marion County and the participating jurisdictions is normally minor, resulting in few, if any, injuries. No deaths related to extreme cold have ever been reported in the participating jurisdictions. However, based on the hazard's potential, in the worst cases, especially if combined with winter weather, the hazard may inflict property or crop damages, and it can even be deadly. Any shutdown of facilities due to extreme cold is expected to be temporary.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Marion 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 extreme cold 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 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 extreme cold may include but are not limited to complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

B) Critical Facilities

While all the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities were historically not considered vulnerable to damages significant enough to interrupt or stop normal operations. However, damages to existing buildings and infrastructure as a result of winter weather and extreme cold in recent years has shown exceptions to long held assumptions about the threat of extreme winter weather. Therefore, all facilities are potentially vulnerable to the impacts noted in section 4b.

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Stretching of the Arctic polar vortex—a strong band of winds in the stratosphere surrounding the North Pole— has increased with Arctic amplification and is linked with extreme cold across parts of Asia and North America. Climate change is favorable for increasing Arctic polar vortex stretching events.³⁰ When the Arctic polar vortex is strong and stable, the polar air remains in place over the North Pole; when the polar vortex weakens or stretches, extremely cold air can dip south. Results show that stronger Arctic polar vortex conditions are decreasing in frequency, while weaker Arctic polar vortex conditions and stretching disruptions are increasing in frequency for October through February.”³¹

³⁰ <https://cpo.noaa.gov/Divisions-Programs/Earth-System-Science-and-Modeling/MAPP>

³¹ <https://cpo.noaa.gov/Divisions-Programs/Communication-Education-and-Engagement/CEE-News/ArtMID/8293/ArticleID/2369/Research-Links-Extreme-Cold-Weather-in-the-United-States-to-Arctic-Warming>

9. Extreme Heat

Extreme heat is defined as a combination of very high temperatures and, usually, exceptionally humid conditions.³² 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 tornadoes 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 2010³³. Extreme heat kills more people than hurricanes, floods, tornadoes, and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

1) Extreme Heat History

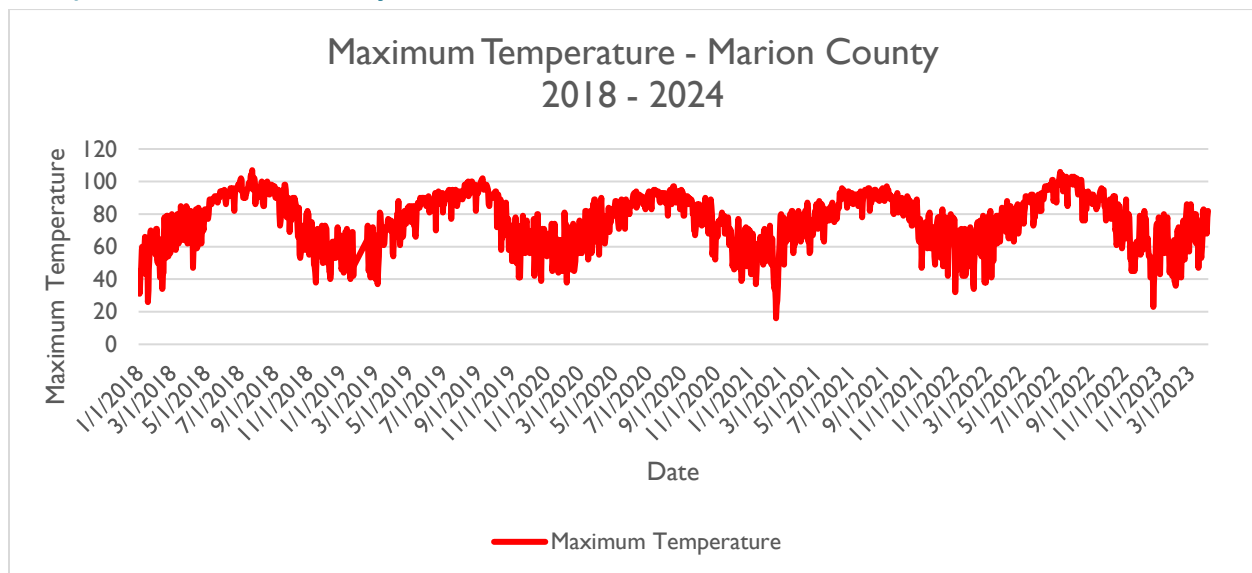


Figure 17: Maximum Recorded Daily Temperature 2000-2022³⁴

³² 2018 State of Texas Hazard Mitigation Plan

³³ http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp

³⁴ Source: National Centers for Environmental Information, <https://www.ncdc.noaa.gov/cdo-web/datasets>

In the 2018 HMAP, Marion County and the participating jurisdictions reported 7 excessive heat events from 2011 - 2017, although many occurrences may have gone unreported. The 2018 HMAP also reported that it is highly likely Marion County, and its jurisdictions, will experience extreme heat with urban areas possibly being at greater risk than within rural areas.

Between 2018 to 2024, Marion County and the participating jurisdictions experienced 72 days with a maximum temperature of 100°F or hotter and 117 days where the combination of humidity and moderate-to-high temperatures warranted a heat advisory, if not an extreme heat warning.

Extreme heat data is recorded at the county level. However, given the nature of extreme heat and the proximity of all jurisdictions to each other, every jurisdiction experienced the same extreme heat events. The NCEI Storm Events database has 0 recorded events, however climate data reported above from NOAA NCEI Climate data, reported above, shows more accurate data in terms of temperature data experience in Marion County since the 2018 HMAP.

2) Likelihood of Future Events

Based on historic weather data, extreme heat in Marion County and the participating jurisdictions is highly likely, meaning an event affecting any or all of the participating 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 18. This index measures how hot it feels outside when humidity is combined with high temperatures.

NOAA's National Weather Service

Heat Index

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

 Caution
 Extreme Caution
 Danger
 Extreme Danger

Figure 18: NOAA's NWS Heat Index Chart³⁵

The extent scale in Figure 18 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.

³⁵ <http://www.nws.noaa.gov/om/heat/ht-images/heatindexchart.png>

The National Weather Service (NWS) initiates alerts based on the Heat Index as shown in Figure 18.

Table 26: Heat Intensity

Intensity	Description
Heat Advisory	Extreme heat index making it feel hot, typically between 105°F to 110°F for 3 hours 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 75%³⁶, 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 2018 and 2024 Marion County and the participating jurisdictions experienced 117 days with highs of 89°F or hotter and overnight lows of 75°F or hotter. Based on the NWS descriptions in Table 26 above, and the average daily humidity level, these days likely warranted a heat advisory.

The hottest temperature recorded in Marion County in the recent past, 108°F, was reached on August 27, 2024. Based on the NWS descriptions in Table 26 above, at least 3 of the 117 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.

Future extreme heat events may meet the heat index requirements for issuing an Excessive Heat Warning as described in the Heat Intensity scale in Table 26 above. The hottest temperatures in Marion County and the participating jurisdictions may meet the current record temperature of 108°F. Future extreme heat events may be as intense, long-lasting, and dangerous as previous ones.

³⁶ Used Houston Average, closest to County - <https://www.currentresults.com/Weather/Texas/humidity-annual.php>

4) Location and Impact

A) Location

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

B) Impact

The potential impact to Marion County and the participating jurisdictions is normally minor, resulting in few, if any, injuries. No property or crop damage specifically tied to extreme heat events has been recorded in any of the participating jurisdictions. No deaths related to extreme heat have ever been reported in the participating jurisdictions. However, based on the hazard's potential, in the worst cases, especially if combined with drought conditions, the hazard may inflict property or crop damages, and it can even be deadly. Any shutdown of facilities due to extreme heat is expected to be temporary.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Marion County and the participating jurisdictions are home to many vulnerable residents. 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 were historically not considered vulnerable to damages significant enough to interrupt or stop normal operations. However, damages to existing building and infrastructure as a result of extended periods of extreme heat and record high temperatures in recent years has shown exceptions to long held assumptions about the threat of extreme heat. Therefore, all critical facilities are potentially vulnerable to the impacts noted in section 4b.

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time.

Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Record-setting daily temperatures, heat waves, and cold spells are a natural part of day-to-day variation in weather. As the Earth’s climate warms overall, however, heat waves are expected to become more frequent and more intense. Higher heat index values (which combine temperature and humidity to describe perceived temperature) are expected to increase discomfort and aggravate health issues.”³⁷

³⁷ <https://www.epa.gov/climate-indicators/climate-change-indicators-high-and-low-temperatures>
<https://science2017.globalchange.gov/>

10. Hailstorm

Hail is a form of solid precipitation. It consists of balls or irregular lumps of ice, each of which is called a hailstone. Hailstones usually measure between 5 millimeters (0.2 in) and 15 centimeters (6 in) in diameter. Hail is possible within most thunderstorms as it is produced by cumulonimbus clouds. Hail formation requires environments of strong, upward motion of air, similar to tornadoes, and lowered heights of the freezing level. In the mid-latitudes, hail forms near the interiors of continents, while in the tropics, it tends to be confined to high elevations. Any thunderstorm which produces hail that reaches the ground is known as a hailstorm. Hailstorms can happen anywhere in the state of Texas.

Hailstones form by colliding with super cooled water drops. Super cooled water will freeze on contact with ice crystals, frozen raindrops, dust or some other nuclei. The storm's updraft blows the forming hailstones up the cloud. As the hailstone ascends it passes into areas of the cloud where the concentration of humidity and super cooled water droplets varies. When the hailstone moves into an area with a high concentration of water droplets, it captures the latter and acquires a translucent layer. Should the hailstone move into an area where mostly water vapor is available, it acquires a layer of opaque white ice.

The hailstone will keep rising in the thunderstorm until its mass can no longer be supported by the updraft. It then falls toward the ground while continuing to grow, based on the same processes, until it leaves the cloud. It will later begin to melt as it passes into air that is above freezing temperature.³⁸

1) Hailstorm History

The 2018 plan reported that Marion County and the participating jurisdictions experienced 89 hail events between 1970 and 2017. The 2018 HMAP also reported 26 hail events between 1970 and 2017 for the City of Jefferson. Historically, the County reported high probability of hailstorms, particularly in association with seasonal patterns during the spring and early fall.

The following tables identify the most comprehensive list available of hailstorm events and associated damages in Marion County and the participating jurisdictions from 2018 to present. No participating jurisdiction has recorded a hailstorm more recently than what is listed below.

Table 27: Marion County Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2024	Crop Damage \$2024
Marion County	1/01/2018 – 6/30/2024	7	1 – 1.75	0	0	\$28,972	\$0

³⁸ 2018 State of Texas Hazard Mitigation Plan

There were no recorded events for the City of Jefferson since 2018, however, it is likely that the events recorded for the County also impacted the City of Jefferson.

2) Likelihood of Future Events

Based on the history of hailstorms, a hailstorm in Marion County and the City of Jefferson is likely, meaning that an event is probable within the next three years.

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 hailstorm. 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 28 was developed by combining data from National Climatic Data Center (NCDC) and the Tornado and Storm Research Organization (TORRO).

Table 28: Hailstorm Intensity^{39,40}

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
H3	Severe ⁴¹	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

³⁹ <http://www1.ncdc.noaa.gov/pub/data/cmb/extremes/scec/reports/SCEC-Hail-Guide.pdf>

⁴⁰ <http://www.torro.org.uk/hyscale.php>

⁴¹ Hail must be 1" or larger to be classified as severe

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, the worst hailstorms in Marion County and the participating jurisdictions have produced hail up to 4.5” in diameter, H10 on the Hailstorm Intensity Scale.

Future hailstorms may meet previous worst-case H10 storms in terms of strength, intensity, hailstone size, damage dollars inflicted, and the number of residents injured or killed.

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

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Marion 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, 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

The presence of older structures that have not been hardened against hailstorms, and / or the presence of metal buildings that may be more susceptible to hail. Thus, the following critical facilities were determined to be especially vulnerable to hailstorms due to the presence of structures with flat roofs and its increased vulnerability.

Table 29: Critical Facilities Vulnerable to Hailstorms and Potential Impacts

Jurisdiction	Critical Facilities	Potential Hailstorm Impacts		
		Damaged or Destroyed Roof	Damaged Windows	Water damage due to Physical Damages
Marion County	Marion County Sheriff Office	x	x	x
	Marion County Jail	x	x	x
	Marion County Court House	x	x	x
	Kellyville Community Center	x	x	x
	Dump Pct 1	x	x	x
	Dump Pct 2 (Lodi)	x	x	x
	Dump Pct. 3 (Smithland)	x	x	x
	Dump Pct. 4	x	x	x
	Grey VFD	x	x	x
	Smithland VFD	x	x	x
	Jackson VFD	x	x	x
	Mims VFD and Ambulance	x	x	x
	Shady Shores VFD	x	x	x
	Mims Water Supply Corporation	x	x	x
	EMC Water Supply Corporation	x	x	x
	Cypress Bend Elementary School	x	x	x
	Jefferson Christian Academy	x	x	x
	Country Day School	x	x	x
	Dollar General	x	x	x
	CRESTWOOD ONE STOP Gas station	x	x	x
	Trico Lumber Co.	x	x	x
	Bradley Veterinary Clinic	x	x	x
	Radio Tower East	x	x	x
	Radio Tower West	x		x
	Radio Tower North	x		x
	Marion County Airport	x	x	x

City of Jefferson	Jefferson Police Department	x	x	x
	Jefferson City Hall	x	x	x
	Jefferson VFD	x	x	x
	Champion EMS Jefferson	x	x	x
	Jefferson Life Center	x	x	x
	Thigpen Kent DDS	x	x	x
	City Drug Co	x	x	x
	Cypress Place	x	x	x
	Magnolia Place Wellness and Rehabilitation	x	x	x
	Jefferson High School	x	x	x
	Jefferson Junior High School	x	x	x
	Jefferson Elementary School	x	x	x
	Jefferson Primary School			x
	Jefferson Tourism and Visitor Center	x	x	x
	Happy Hippo Daycare	x	x	x
	Brookshire's	x	x	x
	Family Dollar	x	x	x
	Dollar General	x	x	x
	Cefco	x	x	x
	Valero	x	x	x
	Exxon	x	x	x
	V Mart	x	x	x
	City Pump Station	x	x	x
	City Sewer Plant	x	x	x
	Houston St. Water Tower	x		x
	Alley St. Water Tower	x		x
	Burton Funeral Home	x	x	x
	Lewis and Walker Funeral Home	x	x	x
	Haggard Funeral Home	x	x	x

C) Vulnerable Parcels

Table 30: All Parcels Vulnerable to Hailstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	104,674	\$12,781,441,507
City of Jefferson	2,598	\$168,792,900

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“As a result of anthropogenic warming, it is generally anticipated that low-level moisture and convective instability will increase, raising hailstorm likelihood and enabling the formation of larger hailstones; the melting height will rise, enhancing hail melt and increasing the average size of surviving hailstones.”⁴²

⁴² <https://www.nature.com/articles/s43017-020-00133-9>

11. Winter Weather

Winter Storms includes heavy snow and blizzards, sleet, ice storms (or freezing rain), frost/freeze or a mix of these. Winter storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries. The effect of winter storms on Texas is quite disruptive compared to other regions that normally experience winter storms.

A heavy snowfall for the State is an accumulation of four or more inches of snow in a 12-hour period. This amount of snow accumulation usually occurs in the northern half of the state and in the higher elevations of West Texas. South of the line from Del Rio to Port Arthur snow is rare.

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.

An ice storm occurs when rain falls out of the warm 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. Damage can occur with half an inch of rain freezing on trees and utility wires; the damage increases if there are high winds. Based on this, an icing event is categorized an ice storm at half an inch.⁴³

1) Severe Winter Storm History

In the 2018 HMAP, Marion County and the participating jurisdictions reported 22 winter weather events between 1997-2017. The 2018 plan found that the frequency of occurrences of severe winter storms was likely.

NCEI data shows that the participating jurisdictions experienced 4 winter storm events between January 2018 and July 2022. None are reported to have caused any injuries or fatalities nor significant property or crop damages. One of the most significant winter storms in recent history was Winter Storm Uri in February 2021, during which, Marion County received up to 6" of snow accumulation.

⁴³ 2018 State of Texas Hazard Mitigation Plan

Table 31: Marion County Severe Winter Storm History

Location	Date Range	Number of Severe Winter Storms	Winter Storm Types	Fatalities	Injuries	Property Damage \$2024	Crop Damage \$2024
Countywide	1/01/2018 – 6/30/2024	4	Winter Storm	0	0	\$0	\$0

2) Likelihood of Future Events

Future winter storms in Marion County and the participating jurisdictions are considered likely due to the significant impacts of the historic winter weather, meaning an event affecting any or all of the participating jurisdictions is probable in the next three years.

3) Extent

Table 48 below displays the magnitude of severe winter storms.

Table 32: Winter Weather Extent Scale⁴⁴

Frost Advisory*	Issued when nighttime minimum temperatures are expected to range from 33°F to 36°F in the growing season.
Freeze Warning*	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>
Snow Advisory	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.
Blowing Snow Advisory	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.
Snow and Blowing Snow Advisory	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
Freezing Rain / Drizzle Advisory	Issued for freezing rain when ice accumulations are expected to cause travel problems, but not exceed 1/4".
Sleet Advisory	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.

⁴⁴ Source: National Weather Service Weather Forecast Office; Norman, Oklahoma.
<http://www.srh.noaa.gov/oun/?n=spotter-wwa-definitions>

Winter Weather Advisory	Issued for a winter weather event in which there is more than one hazard present, but all precipitation is expected to remain below 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.
Wind Chill Advisory⁴⁵	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.
Wind Chill Warning⁴⁶	Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
Ice Storm Warning	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.
Heavy Sleet Warning	Issued when a period of sleet is expected to produce ice accumulations of 1" or greater, or cause significant disruptions to travel or utilities.
Heavy Snow Warning	Issued when snow is expected to accumulate 4 inches or more in 12 hours, or 6 inches or more in 24 hours.
Winter Storm Warning	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>
Blizzard Warning	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

Based on previous winter storm events, future storms in Marion County and the participating jurisdictions may see snow accumulation of up to 6" and see ice accumulation of up to 1".

4) Location and Impact

A) Location

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

⁴⁵ https://www.osha.gov/dts/weather/winter_weather/windchill.html

⁴⁶ https://www.osha.gov/dts/weather/winter_weather/windchill.html

B) Impact

The potential impact to Marion County and the participating jurisdictions is normally minor, resulting in few, if any, injuries. 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 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.

5) Vulnerability

A) Infrastructure

While all of the participating jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by severe winter storm events. This determination was made based on the expectation that most roofs can support 20 lbs. / square foot of snow⁴⁷. The worst snowstorm in any participating jurisdiction dropped 6". Although it's not impossible⁴⁸ 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 1" 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

⁴⁷ <https://disastersafety.org/freezing-weather/prevent-roof-collapse-homes/>

⁴⁸ 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.

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, Marion 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 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 critical facilities may be at a higher risk of losing power due to falling limbs.

Table 33: Critical Facilities Vulnerable to Winter Storms

Jurisdiction	Critical Facilities	Potential Severe Winter Storm Impacts
		Falling Tree Limbs
Marion County	Marion County Sheriff Office	x
	Marion County Jail	x
	Marion County Court House	x
	KellyVille Community Center	x
	Dump Pct 1	x
	Dump Pct 2 (Lodi)	x
	Dump Pct. 3 (Smithland)	x
	Dump Pct. 4	x
	Grey VFD	x
	Smithland VFD	x
	Jackson VFD	x
	Mims VFD and Ambulance	x
	Shady Shores VFD	x
	Mims Water Supply Corporation	x
	EMC Water Supply Corporation	x
	Cypress Bend Elementary School	x

	Jefferson Christian Academy	x
	Country Day School	x
	Dollar General	x
	CRESTWOOD ONE STOP Gas station	x
	Trico Lumber Co.	x
	Bradley Veterinary Clinic	x
	Radio Tower East	x
	Radio Tower West	x
	Radio Tower North	x
	Marion County Airport	x
City of Jefferson	Jefferson Police Department	x
	Jefferson City Hall	x
	Jefferson VFD	x
	Champion EMS Jefferson	x
	Jefferson Life Center	x
	Thigpen Kent DDS	x
	City Drug Co	x
	Cypress Place	x
	Magnolia Place Wellness and Rehabilitation	x
	Jefferson High School	x
	Jefferson Junior High School	x
	Jefferson Elementary School	x
	Jefferson Primary School	x
	Jefferson Tourism and Visitor Center	x
	Happy Hippo Daycare	x
	Brookshire's	x
	Family Dollar	x
	Dollar General	x
	Cefco	x
	Valero	x
	Exxon	x
	V Mart	x
	City Pump Station	x
	City Sewer Plant	x
	Houston St. Water Tower	x
	Alley St. Water Tower	x
	Burton Funeral Home	
	Lewis and Walker Funeral Home	x
	Haggard Funeral Home	x

D) Vulnerable Parcels

Table 34: All Parcels Vulnerable to Winter Weather

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	104,674	\$12,781,441,507
City of Jefferson	2,598	\$168,792,900

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“Warmer temperatures cause more water to evaporate from the land and oceans, which leads to more precipitation, larger storms, and more variation in precipitation in some areas. In general, a warmer climate causes more of this precipitation to fall in the form of rain instead of snow. Some places, however, could see more snowfall if temperatures rise but still remain below the freezing point, or if storm tracks change. Areas near large lakes might also experience more snowfall as lakes remain unfrozen for longer periods, allowing more water to evaporate. In contrast, other areas might experience less snowfall as a result of wintertime droughts.”⁴⁹

⁴⁹ <https://www.epa.gov/climate-indicators/climate-change-indicators-snowfall>

12. Windstorms

Windstorms are classified as any wind that is strong enough to cause at least light damage to trees and buildings, which 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. Although tornados and tropical cyclones also produce wind damage, they are usually classified separately.

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.⁵⁰

1) Windstorms History

In the 2018 HMAP, Marion County reported 123 windstorm events between 1964 and 2016, with wind speeds of up to 78 knots recorded. Windstorms average to between 2 and 3 events annually in Marion County, with almost half of reported incidents occurring within the City of Jefferson. The 2018 plan found that the frequency of occurrences of windstorms was highly likely.

The following tables identify the most comprehensive list available of windstorm events and associated damages in Marion County and the City of Jefferson from 2018 to present.

Table 35: Marion County Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2024	Crop Damage \$2024
Marion	1/1/2018 – 12/31/2024	18	52 - 78	0	0	\$366,836.85	\$0

Table 36: City of Jefferson Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2024	Crop Damage \$2024
Jefferson	1/1/2018 – 12/31/2024	12	52 - 65	0	0	\$0	\$0

⁵⁰ <https://www.britannica.com/science/windstorm>

2) Likelihood of Future Events

Given the frequency of past events in all jurisdictions, a damaging Windstorm event in the future is highly likely, meaning that an event is probable in the next year.

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 37: Beaufort Wind Scale⁵¹

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
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"

⁵¹ Source: www.spc.noaa.gov/faq/tornado/beaufort.html

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 windstorm events in Marion County and the participating jurisdictions have ranged up to a 12 on the Beaufort Wind Scale. A windstorm on 3/10/2018 in Marion County resulted in \$366,836.85 of property damage. No other recent Windstorm events in any of the participating jurisdictions have caused any injuries, deaths, or crop damages. Future Windstorm events may meet previous worst-case Force 12 events in terms of strength and intensity of wind speed.

4) Location and Impact

A) Location

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

B) Impact

Impacts to Marion County and the participating jurisdictions 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, Windstorm may cause injuries and/or be deadly.

5) Vulnerability

Windstorm 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 Windstorm.

Based on Windstorm data collected for the participating jurisdictions, winds primarily damage physical structures. However, there is no uniformity with respect to the type of structures that have been damaged by Windstorm 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 Section 3 of Chapter 3 above, Marion 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

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to windstorms, similar to hurricane and tornado events. 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 damage. 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 38: Critical Facilities Vulnerable to Windstorm and Potential Impacts

Jurisdiction	Critical Facilities	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
Marion County	Marion County Sheriff Office	x	x	x	x	x	x	x	x	x
	Marion County Jail	x	x	x	x	x	x	x	x	x
	Marion County Court House	x	x	x	x	x	x	x	x	x
	KellyVille Community Center	x	x	x	x	x	x	x	x	x
	Dump Pct 1	x	x	x	x	x	x	x	x	x
	Dump Pct 2 (Lodi)	x	x	x	x	x	x	x	x	x
	Dump Pct. 3 (Smithland)	x	x	x	x	x	x	x	x	x
	Dump Pct. 4	x	x	x	x	x	x	x	x	x
	Grey VFD	x	x	x	x	x	x	x	x	x
	Smithland VFD	x	x	x	x	x	x	x	x	x
	Jackson VFD	x	x	x	x	x	x	x	x	x
	Mims VFD and Ambulance	x	x	x	x	x	x	x	x	x
	Shady Shores VFD	x	x	x	x	x	x	x	x	x
	Mims Water Supply Corporation	x	x	x	x	x	x	x	x	x
	EMC Water Supply Corporation	x	x	x	x	x	x	x	x	x
	Cypress Bend Elementary School	x	x	x	x	x	x	x	x	x
	Jefferson Christian Academy	x	x	x	x	x	x	x	x	x
	Country Day School	x	x	x	x	x	x	x	x	x
	Dollar General	x	x	x	x	x	x	x	x	x
	CRESTWOOD ONE STOP Gas station	x	x	x	x	x	x	x	x	x
	Trico Lumber Co.	x	x	x	x	x	x	x	x	x
	Bradley Veterinary Clinic	x	x	x	x	x	x	x	x	x
	Radio Tower East	x	x	x	x	x	x	x	x	x
	Radio Tower West	x	x	x	x	x	x	x	x	x

	Radio Tower North	x	x	x	x	x	x	x	x	x
	Marion County Airport	x	x	x	x	x	x	x	x	x
City of Jefferson	Jefferson Police Department	x	x	x	x	x	x	x	x	x
	Jefferson City Hall	x	x	x	x	x	x	x	x	x
	Jefferson VFD	x	x	x	x	x	x	x	x	x
	Champion EMS Jefferson	x	x	x	x	x	x	x	x	x
	Jefferson Life Center	x	x	x	x	x	x	x	x	x
	Thigpen Kent DDS	x	x	x	x	x	x	x	x	x
	City Drug Co	x	x	x	x	x	x	x	x	x
	Cypress Place	x	x	x	x	x	x	x	x	x
	Magnolia Place Wellness and Rehabilitation	x	x	x	x	x	x	x	x	x
	Jefferson High School	x	x	x	x	x	x	x	x	x
	Jefferson Junior High School	x	x	x	x	x	x	x	x	x
	Jefferson Elementary School	x	x	x	x	x	x	x	x	x
	Jefferson Primary School	x	x	x	x	x	x	x		
	Jefferson Tourism and Visitor Center	x	x	x	x	x	x	x	x	x
	Happy Hippo Daycare	x	x	x	x	x	x	x	x	x
	Brookshire's	x	x	x	x	x	x	x	x	x
	Family Dollar	x	x	x	x	x	x	x	x	x
	Dollar General	x	x	x	x	x	x	x	x	x
	Cefco	x	x	x	x	x	x	x	x	x
	Valero	x	x	x	x	x	x	x	x	x
	Exxon	x	x	x	x	x	x	x	x	x
	V Mart	x	x	x	x	x	x	x	x	x
	City Pump Station	x	x	x	x	x	x	x	x	x
	City Sewer Plant	x	x	x	x	x	x	x	x	x
	Houston St. Water Tower	x	x	x	x	x	x	x		
	Alley St. Water Tower	x	x	x	x	x	x	x		
	Burton Funeral Home				x					
	Lewis and Walker Funeral Home	x	x	x	x	x	x	x	x	x

	Haggard Funeral Home	x	x	x	x	x	x	x	x	x
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C) Vulnerable Parcels

Table 39: Parcels Vulnerable to Windstorm

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	104,674	\$12,781,441,507
City of Jefferson	2,598	\$168,792,900

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“The Arctic has warmed more than lower latitudes, and as a result the temperature difference between the mid-latitudes and the polar regions has become reduced, which has changed the path of the northern hemisphere jet stream so that it now moves north and south over a greater range of latitudes. As the atmosphere continues to warm, we expect to see much deeper north-south waves, which will cause a slowing down, or even blocking, of the jet stream. This could result in weather systems that persist for much longer than would be considered normal over any particular region.”⁵²

“Another recent study found that there will be regional and seasonal variability in winds in the United States as carbon dioxide levels increase: by 2100, wind speeds will decrease over most of the western U.S. and the East Coast, but the central U.S. will see an increase.”⁵³

⁵² <https://ugc.berkeley.edu/background-content/wind/#:~:text=The%20global%20atmospheric%20circulation%20pattern,by%20transporting%20heat%20and%20water.>

⁵³ <https://e360.yale.edu/features/global-stilling-is-climate-change-slowing-the-worlds-wind#:~:text=Another%20recent%20study%20found%20that,U.S.%20will%20see%20an%20increase.>

13. Lightning

Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface.⁵⁴

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 49 people⁵⁵ each year in the United States.

1) Lightning History

The 2017 HMAP recorded 2 lightning events that caused damage between 2006 to 2008. According to the NCEI database, there have been no recorded events since the 2017 HMAP; however, the planning team determined that lightning events occur multiple times annually.

2) Likelihood of Future Events

Lightning is especially associated with thunderstorms. Despite the lack of officially 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 VAISALA⁵⁶, most of Marion County can expect about 10 to 12 lightning flashes per square miles 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 Marion County and all participating jurisdictions may experience lightning events up to LAL 3. Dry thunderstorms, LAL 6, are not expected.

Table 40: Lightning Activity Levels⁵⁷

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.	-

⁵⁴ 2018 State of Texas Hazard Mitigation Plan

⁵⁵ <https://www.weather.gov/safety/lightning-victims>

⁵⁶ <https://indd.adobe.com/view/ddf9619e-36e0-46b4-981d-3458b2532b98>

⁵⁷ Source: <http://www.prh.noaa.gov/hnl/pages/LAL.php>

2	Cumulus clouds are common but only a few reaches 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.	

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 Marion County and the participating 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 myth⁵⁸ 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.

⁵⁸ http://lightning.org/wp-content/uploads/2015/06/LPI_lightning_infographic_2015.jpg

A) Critical Facilities

Table 41: Critical Facilities Vulnerable to Lightning and Potential Impacts

Jurisdiction	Critical Facilities	Potential Lightning Impacts			
		Physical Damage	Electrical Damage	Data Damage or Loss	Fire
Marion County	Marion County Sheriff Office	x	x	x	x
	Marion County Jail	x	x	x	x
	Marion County Court House	x	x	x	x
	Kellyville Community Center	x	x	x	x
	Dump Pct 1	x	x	x	x
	Dump Pct 2 (Lodi)	x	x	x	x
	Dump Pct. 3 (Smithland)	x	x	x	x
	Dump Pct. 4	x	x	x	x
	Grey VFD	x	x	x	x
	Smithland VFD	x	x	x	x
	Jackson VFD	x	x	x	x
	Mims VFD and Ambulance	x	x	x	x
	Shady Shores VFD	x	x	x	x
	Mims Water Supply Corporation	x	x	x	x
	EMC Water Supply Corporation	x	x	x	x
	Cypress Bend Elementary School	x	x	x	x
	Jefferson Christian Academy	x	x	x	x
	Country Day School	x	x	x	x
	Dollar General	x	x	x	x
	CRESTWOOD ONE STOP Gas station	x	x	x	x
	Trico Lumber Co.	x	x	x	x
	Bradley Veterinary Clinic	x	x	x	x
	Radio Tower East	x	x	x	x
	Radio Tower West	x	x	x	x
	Radio Tower North	x	x	x	x
	Marion County Airport	x	x	x	x
City of Jefferson	Jefferson Police Department	x	x	x	x
	Jefferson City Hall	x	x	x	x
	Jefferson VFD	x	x	x	x
	Champion EMS Jefferson	x	x	x	x
	Jefferson Life Center	x	x	x	x
	Thigpen Kent DDS	x	x	x	x
	City Drug Co	x	x	x	x
	Cypress Place	x	x	x	x
	Magnolia Place Wellness and Rehabilitation	x	x	x	x
	Jefferson High School	x	x	x	x

	Jefferson Junior High School	x	x	x	x
	Jefferson Elementary School	x	x	x	x
	Jefferson Primary School	x	x	x	x
	Jefferson Tourism and Visitor Center	x	x	x	x
	Happy Hippo Daycare	x	x	x	x
	Brookshire's	x	x	x	x
	Family Dollar	x	x	x	x
	Dollar General	x	x	x	x
	Cefco	x	x	x	x
	Valero	x	x	x	x
	Exxon	x	x	x	x
	V Mart	x	x	x	x
	City Pump Station	x	x	x	x
	City Sewer Plant	x	x	x	x
	Houston St. Water Tower	x	x	x	x
	Alley St. Water Tower	x	x	x	x
	Burton Funeral Home	x	x	x	x
	Lewis and Walker Funeral Home	x	x	x	x
	Haggard Funeral Home	x	x	x	x

B) Vulnerable Parcels

Table 42: Parcels Vulnerable to Lightning

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Marion County	104,674	\$12,781,441,507
City of Jefferson	2,598	\$168,792,900

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

“New research from the University of California, Berkeley, found warming conditions would result in 50% more lightning strikes by the end of the century. The scientists found lightning strikes would increase by about 12% for every 1C of warming.”⁵⁹

⁵⁹ <https://romps.berkeley.edu/papers/pubdata/2014/lightning/guardian.pdf>

14. Mitigation Strategy

1) Capability Assessment

Marion County and the participating jurisdictions have shown themselves to be highly capable, especially in terms of implementing hazard mitigation actions. All six jurisdictions participated in the 2018 plan.

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. At this time, all jurisdictions could improve their hazard mitigation capabilities through the following efforts: budgeting for mitigation actions and support, passing policies and procedures to implement mitigation actions, adopting, and implementing stricter mitigation regulations, approving the hiring, and training of staff for mitigation activities, and approving mitigation updates and additions to existing plans as new needs are recognized. The participating cities could further improve their capabilities by creating and adopting regularly updated comprehensive plans.

Table 43: Capability Assessment by Jurisdiction

Marion County Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Drought Contingency Planning
Subdivision
Zoning
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Road and Bridge Management
Comprehensive Planning
Economic Development
Grant Writing
General Budgeting

CIP Funding
CDBG Funding
State and Federal Grant Funding

City of Jefferson Administrative, Financial, Regulatory, and Technical Abilities
Drought Contingency Planning
Zoning
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Comprehensive Planning
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

Building Codes

Table 44: Building Codes Per Jurisdiction

Jurisdiction	Codes	Description
Marion County	ICC – International Building Codes	The County defers to the State of Texas, which recommends the International Building Codes. The County has no enforcement in place.
Jefferson	ICC – International Building Codes	The City of Jefferson has adopted the 2000 International Building Codes.

2) Goals and Objectives Overview

The hazard analysis has shown that Marion 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 goals and objectives in this plan reflect the overarching priorities identified by the communities and are similar to the goals listed in the 2017 plan. They have been expanded to include public services, public infrastructure, economic impacts, civic resources, and cultural resources as priorities in addition to reducing loss of life, injury, property damage, and preservation of natural resources. 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

A) Mitigation Action Prioritization

The planning team members have identified at least two mitigation actions per natural hazard. The previous plan had three prioritization criteria: 1) cost rank; 2) citizens potentially saved; and 3) number of hazards mitigated by the action. The priorities for this plan were expanded due to community changes in priorities. For this update, 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 TDEM’s 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.

B) Incorporation and Integration of Existing Capabilities and Hazard Mitigation

As previously outlined, the planning team reviewed a range of codes, ordinances, and planning studies that have been adopted by the participating jurisdictions. The planning team's goal was to understand how these existing capabilities might affect mitigation actions in terms of implementation and enforcement.

Mitigation Action Status – 2018 Plan

In addition to reviewing existing codes, ordinances, and planning studies, the planning team also examined the status of each mitigation action identified in the 2018 plan.

Mitigation actions marked as abandoned are no longer considered relevant as written to the participating jurisdictions. Deferred and in progress actions are indicated with an asterisk (*) in the new actions tables in Chapter 14, Part C.

Table 45: Previous Mitigation Actions – All Jurisdictions

Marion County Mitigation Actions Status		
Hazards Addressed	Mitigation Actions	Status
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Maintain a current list of all local media: television, radio, cable; including telephone numbers, fax numbers, e-mail addresses and names of media contacts for PSA distribution. Provide this list to all EMCs and PIOs within the county; update list as needed, and share updates with other jurisdictions. Develop a relationship with all local media, to encourage rapid sharing and distribution to the public of information about imminent or developing natural hazards.	<i>Completed</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Coordinate with local jurisdictions' information technology departments to place warnings on local websites when appropriate. If possible, give EMC authority and access to post such warnings on website directly, from any location.	<i>Completed</i>
Flood, dam / levee failure, wildfire, tornado, severe winter storm, wind storm, hail storm	Incorporate the use of the automated emergency calling system, Code Red, into local emergency management procedures; determine cost of use, and train the EMC and local officials in how and when to use this resource.	<i>Completed</i>
Flood, dam / levee failure, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Inventory equipment and supplies owned by the jurisdiction which could be useful during a natural hazard event. Consider search for and rescue of stranded citizens; transportation of injured or special needs individuals; debris removal; infrastructure repair; communications during an emergency; location, size and condition of shelter facilities; first aid supplies, water, food, paper products, cots, blankets, pillows and other necessary items.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Maintain a current list of personnel trained and ready to respond in an emergency. Record training of each, and collect file copies of training certificates as appropriate. Consider scheduling local classes in first aid, CPR, NIMS, etc. Include local HAM radio clubs or individual operators for possible assistance with emergency communications; consult local industry for possible volunteers trained in useful skills; contact local hospitals, clinics and other medical personnel to determine surge capacity.	<i>In Progress*</i>

Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Maintain a current list of local and regional resources, including grocery stores, department stores, discount stores, sporting goods stores, rental outlets, farm supply stores, distribution centers, warehouses, gasoline stations, transportation companies, restaurants, caterers, churches and fraternal or benevolent organizations which might be able to assist in an emergency. Contact the managers, owners, directors, presidents or other organizational leaders to discuss possible partnerships.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Schedule public meetings to discuss hazard mitigation topics; invite community leaders, emergency responders and members of the public to suggest ways to improve local emergency response.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Develop public and private partnerships with businesses, service organizations, and other community groups to work together on local mitigation projects, planning, and cooperative mitigation actions.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Develop, enhance and implement education programs to increase awareness of natural hazards and encourage the use of mitigation actions to reduce risk to citizens, public infrastructure, private property owners, businesses and schools. Public officials will include hazard mitigation messages in their newsletters, web pages, and speeches, as appropriate. The EMC will accept opportunities to speak to service clubs and school groups about hazard mitigation, and will encourage other emergency management professionals to do the same.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Increase training opportunities for citizens, to encourage their involvement in mitigation efforts. Partner with ETCOG, TDEM, TFS, TEEX, FEMA, and others, to bring free and low- cost mitigation training to the people of our city, county, and region.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Sponsor a booth at local festivals, offering brochures and training information to the public.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe	Include information on the jurisdiction's website about free training available by internet or in local or regional classes.	<i>In Progress*</i>

winter storm, wind storm, hail storm, lightning, extreme heat		
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Send PSAs to media contacts to publicize any training opportunities.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Appoint appropriate personnel to attend regular meetings of the County and City Hazard Mitigation Planning Committee, to review the Plan and suggest any needed revisions.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Instruct and train the local EMC in the jurisdiction's chosen Mitigation Action Items, including record-keeping and the need to report results to the Planning Committee.	<i>In Progress*</i>
(Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Maintain records of property values, including the regular addition of any new development data, and information about any losses due to natural hazards. Provide this information to the County Hazard Mitigation Planning Committee, to be used when revising the Plan.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Watch for new ideas in mitigation; attend training whenever possible; search the internet regularly for "best practices" information, including ideas from other states. Share any new information with others in the local jurisdictions, on the Planning Committee, and throughout the region.	<i>In Progress*</i>
Flood, dam / levee failure, drought, wildfire, tornado, severe winter storm, wind storm, hail storm, lightning, extreme heat	Apply for NOAA's Storm Ready Communities designation (for more information, visit: http://www.stormready.noaa.gov/howto.htm).	<i>In Progress*</i>
Flood	Ensure that critical facilities owned by the jurisdiction are protected from flood. Inspect all critical facilities and consider the flood risk of each. Consult FEMA publications, and ask an expert for additional suggestions in floodproofing, if needed. Consider cost and potential benefits, and make an appropriate recommendation to governing body.	<i>In Progress*</i>
Flood	Improve the long-range management and use of flood-prone areas by the adoption and enforcement of local ordinances to regulate	<i>In Progress*</i>

	new development within the floodplain. Review and revise ordinances, when needed.	
Flood	Encourage retrofitting of existing structures that are at risk. Consider offering a local tax incentive, providing surplus materials or labor assistance, or developing a matching fund for use by property owners who make improvements to a building that is at risk.	<i>In Progress*</i>
Flood	Obtain educational materials for distribution at public libraries, in schools, and at public offices, detailing flood dangers, the NFIP, and mitigation strategies.	<i>In Progress*</i>
Flood	Place links on local websites offering free FEMA training for independent study via the internet, such as IS-271 "Anticipating Hazardous Weather and Community Risk," or IS-279 "Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures."	<i>In Progress*</i>
Flood	Seek state and FEMA sponsored training in flood mitigation for key personnel.	<i>In Progress*</i>
Flood	Encourage and assist all jurisdictions to participate in NFIP.	<i>In Progress*</i>
Flood	Increase drainage capacity in sites that are prone to flooding.	<i>In Progress*</i>
Flood	Construct retention ponds to minimize flash flooding.	<i>In Progress*</i>
Flood	Install low water crossing barriers, similar to railroad crossing barriers.	<i>In Progress*</i>
Flood	Work with state and federal agencies to maintain current flood maps.	<i>In Progress*</i>
Flood	Promote the "Turn Around Don't Drown" campaign, in partnership with DPS.	<i>In Progress*</i>
Dam / Levee Failure	Improve existing public-owned dams and / or levees to reduce threats posed by potential failure. Consult with TCEQ to arrange for inspection of any public-owned dams or levees; if risk is	<i>In Progress*</i>

	apparent, seek professional guidance, consider cost and potential benefits, and make an appropriate recommendation to governing body.	
Dam / Levee Failure	Encourage or require improvement of privately-owned dams or levees that are at risk. Consider offering a local tax incentive, or developing a matching fund for use by landowners who voluntarily make improvements to a dam or levee that is at risk.	<i>In Progress*</i>
Dam / Levee Failure	Promote FEMA-recommended construction methods for any new dam or levee development. Provide educational materials in public offices, such as the floodplain manager's office, the local EMC's office, the local tax office, inspector's office, permit office, etc.; and offer links to FEMA publications on the local website.	<i>In Progress*</i>
Dam / Levee Failure	Develop or improve emergency procedures to efficiently respond and avoid unnecessary risk to human life, should a nearby dam or levee fail.	<i>In Progress*</i>
Drought	Issue burn bans during drought conditions; publicize burn bans and enforce compliance.	<i>Completed</i>
Drought	Assign one person to monitor drought conditions, including the soil moisture index; this person should coordinate with other local jurisdictions, be aware of all burn bans in effect in nearby locations, and advise decision-makers appropriately, if a burn ban is needed in this jurisdiction.	<i>Completed</i>
Drought	Communicate with local law enforcement and judiciary about the importance of enforcing local burn bans, and procedures to follow if violations are observed.	<i>Completed</i>
Drought	Make sure that any current burn bans are posted on the jurisdiction's website, and communicated to all local media by PSA distribution.	<i>Completed</i>
Drought	Notify the public of the local soil moisture index, especially when it is low, and take steps to conserve public water supplies, before the situation becomes critical. Include the current soil moisture index and information about water conservation practices on the jurisdiction's website, and in PSAs sent to all local media, as appropriate.	<i>In Progress*</i>
Drought	Increase public awareness of ways to conserve water, prevent loss of valuable topsoil, and reduce the effects of drought. Coordinate this effort with local agriculture agents; local Farm Bureau staff	<i>In Progress*</i>

	members; agricultural science, earth science, and natural science teachers at local schools, and other interested parties.	
Drought	Obtain educational materials about water conservation and drought mitigation; distribute these at local libraries, schools, public offices, and at a booth at public gatherings.	<i>In Progress*</i>
Drought	Apply for Drought Ready Communities designation (for more information, visit: http://drought.unl.edu/portals/0/docs/DRC_Guide.pdf).	<i>In Progress*</i>
Drought	Adopt and enforce drought tolerant practices and regulations.	<i>In Progress*</i>
Wildfire	Issue, publicize and enforce total, county-wide burn bans when drought and/or wind conditions increase the danger that wildfire may occur.	<i>Completed</i>
Wildfire	Enhance emergency services to increase the efficiency of wildfire response and recovery activities.	<i>In Progress*</i>
Wildfire	Assist local VFDs in applying for grant funding to purchase needed equipment; assist them in qualifying for grants and writing applications, if needed.	<i>In Progress*</i>
Wildfire	Seek out grant opportunities, and publicize them to all possible grantees.	<i>In Progress*</i>
Wildfire	Seek training opportunities, and publicize them to all emergency responders.	<i>In Progress*</i>
Wildfire	Develop and use mutual aid agreements with adjoining jurisdictions, to improve response capabilities.	<i>In Progress*</i>
Wildfire	Implement all available measures to reduce the potential magnitude of a wildfire event on public-owned property. Schedule regular mowing of grass, trimming of trees and shrubs; consider plowing a firebreak in hazard areas.	<i>Completed</i>
Wildfire	Develop public information programs to create a greater awareness of the risk of wildfire, and to encourage individuals to implement mitigation strategies on their own property.	<i>In Progress*</i>
Wildfire	Coordinate with the Texas Forest Service to schedule educational events and obtain literature for public distribution.	<i>In Progress*</i>

Wildfire	Provide literature about wildfire prevention and loss mitigation to the public library, to all local school libraries, and to all public offices for free distribution.	<i>In Progress*</i>
Wildfire	Sponsor a booth at local events, to hand out free literature about the dangers of wildfire and what people can do to reduce the risk of fire damage to their homes and businesses.	<i>In Progress*</i>
Wildfire	Place links on public websites to free FEMA training in wildfire mitigation, and to other informational sites, such as Texas Forest Service.	<i>In Progress*</i>
Wildfire	Work with Texas Forest Service to develop a Community Wildfire Protection Plan. (This is a county-wide project, in which the city can participate.)	<i>In Progress*</i>
Tornado	Improve the ability to notify citizens of tornado watches and warnings, through use of any or all of the following: local radio, television, and cable providers; website announcements and e-mail blasts; Code Red automated emergency calling system; emergency warning sirens; and any other available method.	<i>Completed</i>
Tornado	Maintain list of all local media: television, radio, cable; including telephone numbers, fax numbers, e-mail addresses and names of media contacts for PSA distribution. Provide this list to all EMCs and PIOs within the county, including every participating city; update list as needed, and share updates with other jurisdictions. Contact via phone, fax or e-mail to discuss each station's policy regarding public service announcements about tornado watches and warnings, and other weather hazards. Share information as appropriate.	<i>Completed</i>
Tornado	Assign one person the task of monitoring local media during tornado watch or warning times; this person should have the contact list and know the personnel to contact at each media location. If watch or warning information is not being displayed appropriately, the designated person should contact media to request on-air updates for public safety.	<i>Completed</i>
Tornado	Coordinate with the IT Department to place tornado warnings and watches on local websites when appropriate. If possible, give the EMC authority and access to post such warnings on the website directly, from any location.	<i>Completed</i>

Tornado	Incorporate the use of the automated emergency calling system, Code Red, into local emergency management procedures; determine cost of use, and train the EMC and local officials in how and when to use this resource.	<i>Completed</i>
Tornado	Harden public structures to protect the building and its contents, and to provide a safe place for humans during a storm.	<i>In Progress*</i>
Tornado	Build community storm shelters, as funds permit.	<i>In Progress*</i>
Tornado	Seek grant funding to build needed storm shelters.	<i>In Progress*</i>
Tornado	Educate the public about the dangers of tornadoes and the mitigation actions each family can take.	<i>In Progress*</i>
Tornado	Sponsor a booth at local events, to hand out free literature about the danger of tornadoes and what people can do to reduce the risk of damage to their homes and businesses.	<i>In Progress*</i>
Tornado	Place links on public websites to important sites, such as the National Weather Service (http://www.srh.noaa.gov), and to other informational sites, such as the tornado project online (http://www.tornadopproject.com/).	<i>In Progress*</i>
Tornado	Watch for new ideas in tornado mitigation; attend training whenever possible; search the internet regularly for "best practices" information, including ideas from other states. Share any new information with others in the local jurisdiction, on the Planning Committee, and throughout the region.	<i>In Progress*</i>
Tornado	Consider requiring RV parks and mobile home parks to provide safe rooms; consider offering tax incentives to those who do so.	<i>In Progress*</i>
Severe Winter Storm	Develop or improve and use the ability of public warning systems to warn of imminent or expected severe winter storms.	<i>In Progress*</i>
Severe Winter Storm	Maintain list of all local media: television, radio, cable; including telephone numbers, fax numbers, e-mail addresses and names of media contacts for PSA distribution. Share list with all EMCs and PIOs within the county, including every participating city; update list as needed, and share updates with other jurisdictions. Contact via phone, fax or e-mail to discuss each station's policy regarding	<i>Completed</i>

	public service announcements about weather hazards. Share information as appropriate.	
Severe Winter Storm	Ensure that the jurisdiction's website has an active link to the local NOAA weather forecast, and that any severe weather alerts are prominently displayed on the local jurisdiction's home page.	<i>In Progress*</i>
Severe Winter Storm	Assign one person to publicize any traffic advisories issued due to severe weather; make sure that all local media receive the information promptly.	<i>Completed</i>
Severe Winter Storm	Plan for public response to severe storms and prolonged icy conditions; develop procedures to de-ice roads, sidewalks and public access points to critical facilities.	<i>In Progress*</i>
Severe Winter Storm	Stock up on sand, salt, cat litter, and other common, inexpensive ice mitigation aids, prior to the start of the winter season. Make sure employees know when, where, and how to deploy these items for maximum effectiveness.	<i>In Progress*</i>
Severe Winter Storm	Increase public awareness of the dangers of walking and driving on icy sidewalks and roads; educate the public in ways to avoid injury and accidents in icy weather.	<i>In Progress*</i>
Severe Winter Storm	Develop PSAs about safety while walking and driving in icy conditions; distribute to local media.	<i>In Progress*</i>
Severe Winter Storm	Work with local utility companies to coordinate efforts to trim tree branches that are close to power lines, and to promptly respond to notice of power outages due to trees falling on lines during icy weather. Include a public education campaign to publicize the telephone number to call to report power outages and trees blocking roads.	<i>In Progress*</i>
Severe Winter Storm	Train public works employees to respond safely and appropriately to trees across roadways, including proper safety precautions to take when power lines are down.	<i>In Progress*</i>
Wind Storm	Develop or improve and use public warning systems to warn of imminent or expected wind storms.	<i>Completed</i>
Wind Storm	Maintain list of all local media: television, radio, cable; including telephone numbers, fax numbers, e-mail addresses and names of media contacts for PSA distribution. Provide this list to all EMCs and PIOs within the county, including every participating city; update list as needed, and share updates with other jurisdictions.	<i>Completed</i>

	Contact via phone, fax or e-mail to discuss each station's policy regarding public service announcements about weather hazards. Share information as appropriate.	
Wind Storm	Assign one person the task of monitoring local media during times when severe weather is expected; this person should have the contact list and know the personnel to contact at each media location. If severe weather information is not being displayed appropriately, the designated person should contact media to request on-air updates for public safety.	<i>Completed</i>
Wind Storm	Coordinate with the IT Department to place severe weather warnings on local websites when appropriate. If possible, give EMC authority and access to post such warnings on website directly, from any location.	<i>Completed</i>
Wind Storm	Incorporate the use of the automated emergency calling system, Code Red, into local emergency management procedures; determine cost of use, and train the EMC and local officials in how and when to use this resource.	<i>Completed</i>
Wind Storm	Provide community outreach and education to individuals and businesses concerning recommended mitigation actions for homes and businesses to take in preparation for Wind Storms.	<i>In Progress*</i>
Wind Storm	Consider requiring RV parks and mobile home parks to provide safe rooms for residents to use during Wind Storms; consider offering tax incentives to those who do so.	<i>In Progress*</i>
Hail Storm	Develop or improve and use public warning systems to warn of imminent or expected Hail Storms.	<i>Completed</i>
Hail Storm	Maintain list of all local media: television, radio, cable; including telephone numbers, fax numbers, e-mail addresses and names of media contacts for PSA distribution. Provide this list to all EMCs and PIOs within the county, including every participating city; update list as needed, and share updates with other jurisdictions. Contact via phone, fax or e-mail to discuss each station's policy regarding public service announcements about weather hazards. Share information as appropriate.	<i>Completed</i>
Hail Storm	Assign one person the task of monitoring local media during times when severe weather is expected; this person should have the contact list and know the personnel to contact at each media location. If severe weather information is not being displayed	<i>Completed</i>

	appropriately, the designated person should contact media to request on-air updates for public safety.	
Hail Storm	Coordinate with the IT Department to place severe weather warnings on local websites when appropriate. If possible, give the EMC authority and access to post such warnings on website directly, from any location.	<i>Completed</i>
Hail Storm	Incorporate the use of the county's automated emergency calling system, Code Red, into local emergency management procedures; determine cost of use, and train the EMC and local officials in how and when to use this resource.	<i>Completed</i>
Hail Storm	Improve the ability to notify citizens of tornado watches and warnings, through use of any or all of the following: local radio, television, and cable providers; website announcements and e-mail blasts; Code Red automated emergency calling system; emergency warning sirens; and any other available method.	<i>Completed</i>
Hail Storm	Provide shelter for supplies and equipment at critical facilities.	<i>In Progress*</i>
Hail Storm	Provide community outreach and education to individuals and businesses concerning recommended mitigation actions for homes and businesses to take in preparation for Hail Storms.	<i>In Progress*</i>
Hail Storm	Promote the use of roofing materials that better resist hail damage.	<i>In Progress*</i>
Lightning	Provide community outreach and education to promote awareness of lightning dangers, teach safety precautions, and show the value of lightning rods and lightning arrestors.	<i>In Progress*</i>
Lightning	Assign one person the task of contacting all local electric companies and insurance companies, to discuss lightning damage and the benefits of lightning rods and lightning arrestors; plan a cooperative program to encourage residents to install these where needed.	<i>In Progress*</i>
Lightning	Place lightning safety information on the jurisdiction's website.	<i>In Progress*</i>
Lightning	Purchase lightning rods or lightning arrestors and install on public buildings such as the Courthouse and City Hall.	<i>Completed</i>

Extreme Heat	Conduct public information campaign to remind citizens to hydrate and avoid direct exposure to the sun between the peak UV hours of 1 p.m. to 4 p.m., to prevent heat stroke.	<i>In Progress*</i>
Extreme Heat	Encourage utilities to defer high power bills during extreme high temperatures.	<i>In Progress*</i>
Extreme Heat	Provide free or low-cost cooling equipment to needy individuals.	<i>In Progress*</i>
Extreme Heat	Notify the homeless of available shelters, fans, free water sources, and other resources to help them “beat the heat.”	<i>In Progress*</i>

City of Jefferson Mitigation Actions Status		
Hazards Addressed	Mitigation Actions	Status
Tornado	Check the location and condition of warning sirens; if repairs are needed, determine cost and make an appropriate recommendation to governing body.	<i>Completed</i>
Wind Storm	Check the location and condition of warning sirens; if repairs are needed, determine cost and make an appropriate recommendation to governing body.	<i>In Progress*</i>
Hail Storm	Check the location and condition of warning sirens; if repairs are needed, determine cost and make an appropriate recommendation to governing body.	<i>In Progress*</i>

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. The 2017 HMAP was integrated into various annexes of the Marion County Emergency Operations Plan, to streamline goals and focus on high importance actions. No other integration is known to have taken place from the County or remaining jurisdictions. Moving forward, the planning team will ensure that each jurisdiction’s various departments continue to integrate hazard mitigation actions into their day-to-day processes.

Table 46: Plan Integration

Department	All Departments	Commissioners' Court, Road and Bridge, Mayor's Office/Council, Public Works, Economic Development	Planning, Zoning, Economic Development, Public Works, Mayor's Office, Floodplain Manager	Office of Emergency Management, Mayor's Office, Mayor and Council, Commissioners' Court	Office of Emergency Management, Mayor's Office, Chief of Fire Department	Office of Emergency Management, Mayor's Office, Administrative Office	Floodplain Manager, Mayor's Office
Activity	Annual Budget	Capital Improvement Projects	Comprehensive Master Plan	Public Involvement	Emergency Operations	Grant Application	Floodplain Management
Time Frame	Quarterly/ Annual workshops	Bi-annually	Every 10 Years	As Needed	Annually	Annual Funding Cycles	Annually
Integration Process	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 FMA, 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.
Jurisdiction							
Marion County	X	X		X	X	X	
City of Jefferson	X	X	X	X		X	X

Each new 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 47 below.

Table 47: Integration Process

Jurisdiction	Integration Process
Marion County	<p>After considering integrating mitigation actions with the activities outlined in Table 46 above, mitigation actions will be presented, considered, and formally adopted by the County Commissioners’ Court and County Judge.</p> <p>Marion County will also use the Marion 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 Jefferson	<p>After considering integrating mitigation actions with the activities outlined in Table 46 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p> <p>The City of Jefferson will also use the Marion County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. Currently, integration of the previous 2013 plan into other planning mechanisms within the County is unknown. Therefore, new tracking measures may be implemented to ensure future staff are aware of plan integration moving forward. The planning team will ensure that each jurisdiction's various departments continue to integrate hazard mitigation actions into their day-to-day processes.

C) 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. Budget constraints will remain the determining factor for how and when each action is implemented.

i. Marion County

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Windstorm, Lightning
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Set up Cooling and Heating Centers in Existing Facilities
Objective	The action's goal is to increase extreme heat resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather

Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	County Commissioners' Court
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Install 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	Extreme Heat, Hailstorm, Lightning
Priority	Medium
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 BRIC, FEMA HMGP
Responsible Department	County Commissioners' Court
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs
Objective	The jurisdiction will re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Tornado, Windstorms
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, CDBG-MIT
Responsible Department	Commissioners' Court
Implementation Schedule	1 – 2 Years

Target	Existing and future population and infrastructure
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Single Hazard Actions

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection and/or grounding systems at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	County Commissioners' Court, OEM
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	Jurisdiction will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Low
Estimated Cost	Less than \$100,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Obtain NFIP Compliance
Objective	Marion County is not a participant in NFIP. Marion County will work with FEMA to move towards participation in the NFIP, develop associated flood mapping, and develop and adopt a new flood damage prevention ordinance and appoint a flood plain administrator.
Hazard	Flood
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	Rains County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Commissioners' Court
Implementation Schedule	1 Years
Target	Existing and future population and infrastructure

ii. City of Jefferson

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Windstorm, Lightning
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works, Emergency Management, City Admin
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Set up Cooling and Heating Centers in Existing Facilities
Objective	The action's goal is to increase extreme heat resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP

Responsible Department	Public Works, Emergency Management, City Admin
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Install 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	Extreme Heat, Hailstorm, Lightning
Priority	Medium
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, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, Emergency Management, City Admin
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs
Objective	The jurisdiction will re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Tornado, Windstorms
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, CDBG-MIT
Responsible Department	City Admin
Implementation Schedule	1 – 2 Years
Target	Existing and future population and infrastructure

Single Hazard Actions

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, Emergency Management, City Admin
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	Jurisdiction will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Low
Estimated Cost	Less than \$100,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Obtain NFIP Compliance
Objective	The City of Jefferson a participant in NFIP. The City of Jefferson will work with FEMA to move towards participation in the NFIP, develop associated flood mapping, and develop and adopt a new flood damage prevention ordinance and appoint a flood plain administrator.
Hazard	Flood
Priority	High

Estimated Cost	Less than \$10,000
Potential Funding Source(s)	Rains County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Commissioners' Court
Implementation Schedule	1 Years
Target	Existing and future population and infrastructure