TENSAS

PARISH HAZARD MITIGATION UPDATE - 2019

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TENSAS PARISH

HAZARD MITIGATION PLAN UPDATE

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Tensas Parish

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Unincorporated Tensas Parish
Town of Newellton
Town of St. Joseph
Town of Waterproof

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1. Introduction

Hazard Mitigation is defined as sustained actions taken to reduce or eliminate long-term risk from hazards and their effects. Hazard Mitigation Planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented.

In that regard, this plan (a) documents the Tensas Parish Hazard Mitigation Plan Update process; (b) identifies natural hazards and risks within the parish; and (c) identifies the parish's hazard mitigation strategy to make Tensas Parish less vulnerable and more disaster resistant. It also includes mitigation project scoping to further identify the extent of work, estimated costs, and implementation timing requirements of proposed selected mitigation projects. Information in the plan will be used to help guide and coordinate mitigation activities and local policy decisions affecting future land use.

The Tensas Parish Hazard Mitigation Plan is a multi-jurisdictional plan that includes the following jurisdictions which participated in the planning process:

- Unincorporated Tensas Parish
- Town of Newellton
- Town of St. Joseph
- Town of Waterproof

The Federal Emergency Management Agency (FEMA), now under the Department of Homeland Security, has made reducing losses from natural disasters one of its primary goals. The Hazard Mitigation Plan (HMP) and subsequent implementation of recommended projects, measures, and policies is the primary means to achieving these goals. Mitigation planning and project implementation has become even more significant in a post-Katrina and Rita environment in south Louisiana.

This Hazard Mitigation Plan is a comprehensive plan for disaster resiliency in Tensas Parish. The parish is subject to natural hazards that threaten life and health and have caused extensive property damage. To better understand these hazards and their impacts on people and property, and to identify ways to reduce those impacts, the parish's Office of Homeland Security and Emergency Preparedness undertook this Natural Hazards Mitigation Plan.

"Hazard mitigation" does not mean that all hazards are stopped or prevented. It does not suggest complete elimination of the damage or disruption caused by such incidents. Natural forces are powerful and most natural hazards are well beyond our ability to control. Mitigation does not mean quick fixes. It is a long term approach to reduce hazard vulnerability. As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event.

Why this plan? Every community faces different hazards and every community has different resources and interests to bring to bear on its problems. Because there are many ways to deal with natural hazards and many agencies that can help, there is no one solution or cookbook for managing or mitigating their effects.

Planning is one of the best ways to correct these shortcomings and produce a program of activities that will best mitigate the impact of local hazards and meet other local needs. A well-prepared plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and

with other goals and programs, preventing conflicts and reducing the costs of implementing each individual activity.

Mitigation activities need funding. Under the Disaster Mitigation Act of 2000 (42 USC 5165), a mitigation plan is a requirement for federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from FEMA. FEMA also recognizes plans through its Community Rating System, a program that reduces flood insurance premiums in participating communities. This program is described at the end of this chapter.

This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by natural hazards. It fulfills the federal mitigation planning requirements, qualifies for Community Rating System credit, and provides the parish and its municipalities with a blueprint for reducing the impacts of these natural hazards on people and property.

Location, Demography, and Economy

Location

Tensas Parish is located in the northeast portion of the State of Louisiana, along the west bank of the Mississippi River. To the north are Madison Parish and Warren County, Mississippi; to the south are Catahoula Parish, Concordia Parish, and Adams County, Mississippi; to the east are Claiborne and Jefferson Counties, Mississippi; to the west is Franklin Parish.

Since it is in the meander belt of the Mississippi River, water dominates the geography of Tensas Parish. Dozens of lakes, bayous, and sloughs are crowded between the two rivers that form its eastern and west boundaries. In Tensas Parish, water drains away from the Mississippi levees in a southwesterly direction. From the Tensas River, on the other hand, water drains to the east. Water accumulates in the center of the parish but is taken back into the Tensas River by the larger bayous.

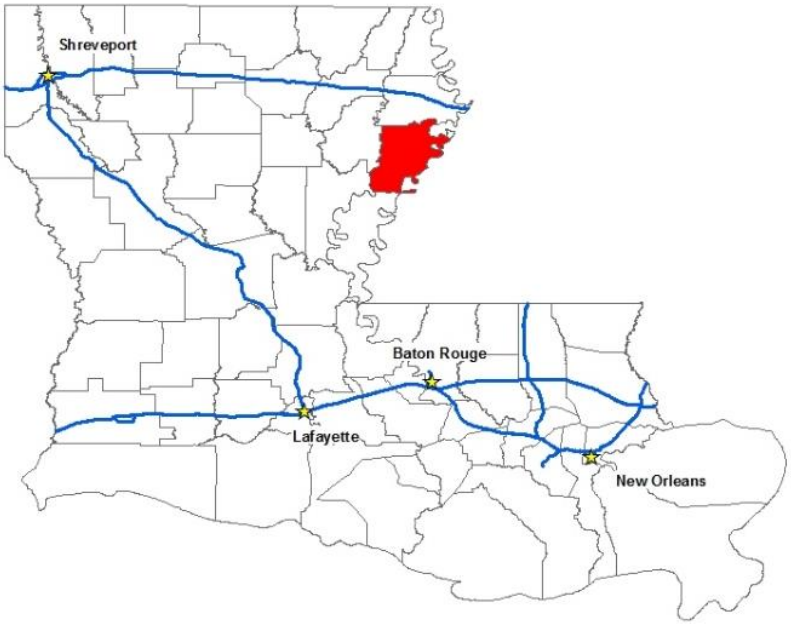

Figure 1-1: Location of Tensas Parish within the State of Louisiana

There are three incorporated communities in the parish: Newellton, St. Joseph, and Waterproof. All three communities are linked by U.S. Highway 65, which passes just to the west of each town. Major highways within the parish include the aforementioned U.S. Highway 65, as well as Louisiana Highway 4.

Tensas Parish is located in Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) Region 8.

As noted above, Tensas Parish is located in the northeast region of Louisiana.

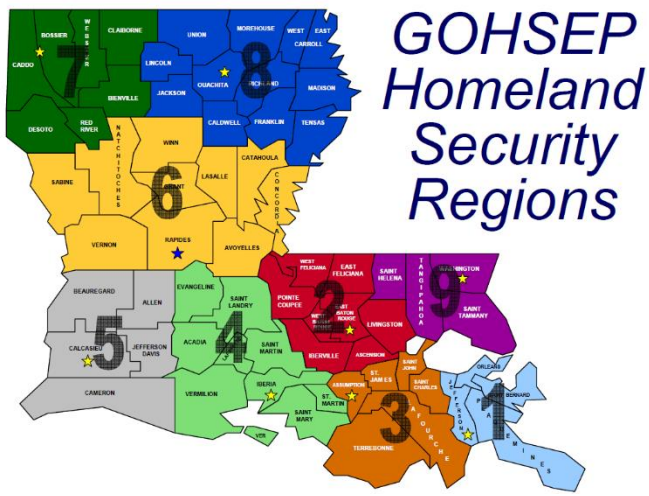

Figure 1-2: Louisiana Homeland Security Regions

Table 1-1: Tensas Parish Population
(Source: U.S. Census Bureau)

	2010 Census	2013 Census	(Current Yr) Estimate	Percent Change 2010 -2013	Percent Change 2010 -(Current Year)
Total Population	5,252	4,907	4,830	-6.60%	-8.00%
Population Density (Pop/Sq Mi)	8.7	____	____	____	____
Total Households	2,049	2,049	____	____	____

Economy

The State of Louisiana is the nation's third leading manufacturer of pulp wood and softwood plywood, and Tensas Parish is one of the largest producers of timber in the state. The parish has forests of pine, oak, gum, cypress, mixed oak-pine, oak-hickory, and elm-ash-cottonwood trees. With these vast natural resources, Tensas Parish and wood chip plants, saw mills, and a particleboard plant located within its boundaries.

Agricultural crops are produced on 181,000 acres, with the primary crops being cotton, corn, soybeans, grain sorghum and rice. Other major employment industries within Tensas Parish include retail/wholesale trade, healthcare, and the parish government.

Industry data for business patterns in Tensas Parish can be found in the table below:

Table 1-2: Business Patterns in Tensas Parish
(Source: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl)

Business Description	Number of Employees	Number of Establishments	Annual Payroll ($1,000)
Retail Trade	79	14	1,667
Manufacturing	20-99	3	___
Health Care and Social Assistance	74	9	2,291
Mining, Quarrying, Oil and Gas Extraction	0-19	2	___
Transportation and Warehousing	20-99	5	___
Construction	0-19	6	915
Administration and Support and Waste Management and Remediation Services	0-19	5	___
Real Estate and Rental and Leasing	0-19	2	___
Wholesale Trade	20-99	8	___
Other Services (except Public Administration)	15	5	118
Accommodation and Food Services	25	6	198
Financial and Insurance	20-99	5	___
Professional, Scientific, and Technical Services	0-19	2	___
Information	0-19	1	___
Educational Services	20-99	1	___
Arts, Entertainment, and Recreation	0-19	5	217
Agriculture, Forestry, Fishing and Hunting	0-19	4	1,163
Utilities	0-19	2	___

While nature has presented the parish with a variety of hazards, the parish has the human resources that can face those hazards and manage the impact they have on people and property. This plan will discuss hazards affecting Tensas Parish. Hazard Profiles (see Section Two) contain detailed information on the likelihood of occurrence, possible magnitude or intensity, areas of the parish that could be affected, and conditions that could influence the manifestation of the hazard.

Hazard Mitigation

To fully understand hazard mitigation efforts in Tensas Parish and throughout Louisiana, it is first crucial to understand how hazard mitigation relates to the broader concept of emergency management. In the early 1980s, the newly-created Federal Emergency Management Agency (FEMA) was charged with developing a structure for how the federal, state, and local governments would respond to disasters. FEMA developed the *four phases of emergency management*, an approach which can be applied to all disasters. The four phases are as follows:

- **Hazard Mitigation**—described by FEMA and the Disaster Mitigation Act of 2000 (DMA 2000) as "any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event." The goal of mitigation is to save lives and reduce property damage. Besides significantly aiding in the obviously desirous goal of saving human lives, mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities and minimize community disruption, helping communities return to usual daily living in the aftermath of disaster. Examples of mitigation involve a range of activities and

actions including the following: land-use planning, adoption and enforcement of building codes, and construction projects (e.g., flood proofing homes through elevation, or acquisition or relocation away from floodplains).

- **Emergency Preparedness**—includes plans and preparations made to save lives and property and to facilitate response operations before a disaster event.
- **Disaster Response**—includes actions taken to provide emergency assistance, save lives, minimize property damage, and speed recovery immediately following a disaster.
- **Disaster Recovery**—includes actions taken to return to a normal or improved operating condition following a disaster.

Figure 1-3 illustrates the basic relationship between these phases of emergency management. While hazard mitigation may occur both before and after a disaster event, it is significantly more effective when implemented before an event occurs. This is one of the key elements of this plan and its overall strategy: reduce risk before disaster strikes in order to minimize the need for post-disaster response and recovery.

As *Figure 1-3* demonstrates, mitigation relies on updating in the wake of disaster. This can give the appearance that mitigation is only reactive rather than proactive. In reality, however, post-disaster revision is a vital component of improving mitigation. Each hazardous event affords an opportunity to reduce the consequences of future occurrences.

Figure 1-3: The Four Phases of Emergency Management and their Relation to Future Hazard Mitigation
(Source: Louisiana State Hazard Mitigation Plan 2014)

Unfortunately, this cycle can be painful for a community. For instance, the risks of disasters that could create catastrophic incidents in Louisiana were thought to be relatively well-understood prior to 2005. However, the impact of the 2005 hurricane season on the Gulf Coast region of the United States prompted a new level of planning and engagement related to disaster response, recovery, and hazard mitigation. Hurricanes Katrina and Rita hit three weeks apart and together caused astonishing damage to human life and to property. The two storms highlighted a hurricane season that spawned 28 storms—unparalleled in American history. The 2005 hurricane season confirmed Louisiana's extreme exposure to natural disasters and both the positive effects and the concerns resulting from engineered flood-protection solutions.

The catastrophic events of 2005 had profound impacts on emergency management and hazard mitigation throughout Louisiana. As detailed later in this document, significant funding has been made available to the State of Louisiana and its parishes for the purpose of hazard mitigation planning. The storms also raised awareness of the importance of hazard mitigation among decision-makers and the general population, which has been particularly important since natural hazards will likely be increasing in frequency, magnitude, and impact in the coming years due to climate change.

General Strategy

During the last update to the Louisiana State Hazard Mitigation Plan, the State Hazard Mitigation Team (SHMT) began a long-term effort to better integrate key components of all plans with hazard mitigation implications in Louisiana to ensure that the programs, policies, recommendations, and implementation strategies are internally consistent. As each of these documents has been adopted by various agencies within the state, the SHMT has worked to incorporate this information into the decision process.

Part of the ongoing integration process is that GOHSEP encourages the parishes and the local municipalities with independent hazard mitigation plans to utilize the same plan format and methodologies as the State Hazard Mitigation Plan in order to create continuity of information from local to state mitigation plans and programs.

The 2016 Tensas Parish Hazard Mitigation Plan maintains much of the information from the 2006 and 2011 plan versions, but it now reflects the order and methodologies of the 2011 Louisiana State Hazard Mitigation Plan. The sections in the 2011 Tensas Hazard Mitigation Plan were as follows:

- Section One Table of Contents
- Section Two Executive Summary
- Section Three Context
- Section Four Adoption and Approval
- Section Five Planning Process
- Section Six Hazard Identification, Profiling, and Ranking
- Section Seven Risk Assessment
- Section Eight Capability Assessment
- Section Nine Mitigation Action Plan
- Section Ten Plan Monitoring and Maintenance
- Appendices

This plan update now also coheres with the Plain Writing Act of 2010, which requires federal agencies to use clear communication that is accessible, consistent, understandable, and useful to the public. While the state of Louisiana and its political subdivisions are not required to meet such standards, the Act aligns with best practices in hazard mitigation. Since successful hazard mitigation relies on full implementation and cooperation at all levels of government and community, a successful hazard mitigation plan must also be easily used at all of these levels. Nevertheless, the Tensas Parish Hazard Mitigation Steering Committee was not ignorant or dismissive of the successful analysis and mitigation planning executed in previous plan updates. This plan update remains coherent with those documents, retaining language and content when needed, deleting it when appropriate, and augmenting it when constructive.

2016 Plan Update

This 2016 plan update proceeds with the previous goals of the Tensas Parish Hazard Mitigation Plan. The current goals are as follows:

- Improve education and outreach efforts regarding potential impacts of hazards and the identification of specific measures that can be taken to reduce their impact
- Improve data collection, use, and sharing to reduce the impact of hazards
- Improve capabilities, coordination, and opportunities at municipal and parish level to plan and implement hazard mitigation projects, programs, and activities
- Pursue opportunities to mitigate repetitive and severe repetitive loss properties and other appropriate hazard mitigation projects, programs, and activities

This plan update makes a number of textual changes throughout, but the most obvious changes are data related and structural edits. First, the Spatial Hazard Events and Losses Database for the United States (SHELDUS) was used as a data source for hazard identification because it incorporates all storm event data from the National Climatic Data Center (NCDC) Storm Events Database used in previous plans, as well as storm event data from other sources including the NOAA Storm Prediction Center, National Hurricane Center, and U.S. Fire Administration. Furthermore, all of the sections were updated to reflect the most current information and the most current vision of the plan update. Second, instead of eleven, separate sections for numerous tables, maps, and appendices, the present plan update has four sections and five appendices. The most significant changes are the newly developed hazard profiles and risk assessments, as well as the removal of repetition between sections from the previous plan updates. The 2016 plan update is organized generally as follows:

- Section One Introduction
- Section Two Hazard Identification and Parish-Wide Risk Assessment
- Section Three Capability Assessment
- Section Four Mitigation Strategy
- Appendix A Planning Process
- Appendix B Plan Maintenance
- Appendix C Essential Facilities
- Appendix D Plan Adoption
- Appendix E State Required Worksheets

Table 1-4: Plan Crosswalk

2011 Plan	Revised Plan (2016)
Section 1: Table of Contents	Section 1: Introduction
Section 2: Executive Summary	Section 1: Introduction
Section 3: Context	Section 1: Introduction
Section 4: Adoption and Approval	Appendix D: Plan Adoption
Section 5: Planning Process	Appendix A: Planning Process
Section 6: Hazard Identification, Profiling and Ranking	Section 2: Risk Assessment
Section 7: Risk Assessment	Section 2: Risk Assessment
Section 8: Capability Assessment	Section 3: Capability Assessment
Section 9: Mitigation Action Plan	Section 4: Mitigation Strategy
Section 10: Plan Monitoring and Maintenance	Appendix B: Plan Maintenance
Appendices	Appendices

Despite changes in this plan update, the plan remains consistent in its emphasis on the few types of hazards that pose the most risk to loss of life, injury, and property in Tensas Parish and its municipalities. The extent of this risk is dictated primarily by its geographic location. Most significantly, Tensas Parish remains at high risk of water inundation from various sources, including flooding, tornadoes, and tropical cyclone activity. All of the parish is also at high risk of damages from high winds and wind-borne debris caused by various meteorological phenomena. Other hazards threaten the parish and/or its municipalities, although not to such great degrees and not in such widespread ways. In all cases, the relative social vulnerability of areas threatened and affected plays a significant role in how governmental agencies and their partners (local, parish, state, and federal) prepare for and respond to disasters.

Mitigation efforts related to particular hazards are highly individualized by jurisdiction. Flexibility in response and planning is essential. The most important step forward to improve hazard management capability is to improve coordination and information sharing between the various levels of government regarding hazards.

2. Hazard Identification and Parish-Wide Risk Assessment

This section assesses the various hazard risks that Tensas Parish faces in order to identify a strategy for mitigation. Having identified the categories of hazards, emergencies, disasters, and catastrophes, this section details the major climatological and natural/human-influenced hazards by (1) defining them, (2) explaining how they are measured, (3) describing their geographic extent, (4) surveying their previous occurrences, and (5) evaluating their future likelihood of occurrences.

The table below provides an overview of the hazards that had been previously profiled in the Tensas Parish Hazard Mitigation Plan published in 2011, as well as the hazards that were identified in the state's 2014 Hazard Mitigation Plan that were considered to be of high or medium risk for the parish by the state. Those hazards identified as high or medium risk by the state or previously identified as a risk by the parish, have been determined to provide a risk to the parish and will be profiled in this section.

Table 2-1: Hazard Profile Summary

Hazard	Profiled in Last Plan	Considered Medium or High Risk in the State's HM Plan	Profiled in the 2016 Update
Subsidence/Coastal Land Loss			
Drought	X		X
Earthquakes	X		*
Expansive Soils			
Fog			
Flooding	X	X	X
Extreme Heat	X		X
Sinkholes	X	X	X
Thunderstorms (Hail, Lightning, & Wind)	X	X	X
Tornadoes	X	X	X
Tropical Cyclones	X	X	X
Tsunamis			
Wildfires	X		X
Winter Storms	X		X
Levee Failure	X		X

* Hazard was profiled but discounted

Prevalent Hazards to the Community

While many of the hazards identified in *Table 2-1* occur in the parish, their occurrence was not merited for further study by the planning committee. The determination was made to focus attention and resources on the most prevalent hazards, which include the hazards previously profiled, along with sinkholes. Earthquakes were discounted due to having no impact on the planning area.

The following hazards have been selected to be included in this risk assessment:

a) Drought
b) Earthquakes
c) Extreme Heat
d) Flooding (backwater, riverine, localized stormwater event)
e) Sinkholes
f) Thunderstorms (hail, lightning, wind)
g) Tornadoes
h) Tropical Cyclones (flooding and high winds)
i) Wildfires
j) Winter Storms
k) Levee Failure

For analysis purposes, the impact of the critical and prevalent hazards is summarized as follows:

- Flooding from rivers and waterways, rain storms, tropical cyclones, and hurricanes in the following forms:
  a) Riverine
  b) Stormwater
  c) Surge
  d) Backwater flooding (as the result of river flooding and surge)
- High wind damage most commonly resulting from hurricanes, thunderstorms, and tornadoes
- Property and crop damage resulting from drought, extreme heat, and wildfires

The potential destructive power of tropical cyclones and flooding were determined to be the most prevalent hazards to the parish. All nine Presidential Declarations that Tensas Parish has received resulted from either tropical cyclones (4 declarations) or flooding (5 declarations), which validates these as the most significant hazards. Therefore, the issues of hurricanes and floods will both serve as the main focus during the mitigation planning process. Hurricanes present risks from the potential for flooding, primarily resulting from storm surge, and high wind speeds. While storm surge is considered the hazard with the most destructive potential, the risk assessment will also asses non-storm surge flooding as well. Flooding can also occur from non-hurricane events, as flash floods are a common occurrence due to heavy rainfall.

Hurricanes, tropical storms, and heavy storms are fairly common occurrences, and resultant wind damage is of utmost concern. Damage from high winds can include roof damage, destruction of homes and commercial buildings, downed trees and power lines, and damage and disruption to services caused by heavy debris. A wind map for Tensas Parish is included in the hurricane risk assessment.

Tensas Parish is also susceptible to tornadoes. Tornadoes can spawn from tropical cyclones or severe weather systems that pass through Tensas Parish. High winds produced by tornadoes have the potential to destroy residential and commercial buildings, as well as create wind-borne objects from the debris produced by the destruction of the natural and human environment, such as building materials and trees.

Previous Occurrences

Table 2-2 summarizes federal disaster declarations for Tensas Parish since 1965. Information includes names, dates, and types of disaster.

Table 2-2: Tensas Parish Major Disaster Declarations

Disaster Declaration Number	Date	Type of Disaster
374	4/27/1973	Severe Storms and Flooding
904	5/3/1991	Severe Storms, Tornadoes, and Flooding
1603	8/29/2005	Tropical Cyclone – Hurricane Katrina
1607	9/24/2005	Tropical Cyclone – Hurricane Rita
1668	11/2/2006	Severe Storms and Flooding
1786	9/2/2008	Tropical Cyclone – Hurricane Gustav
3322	5/6/2011	Flooding
4015	8/18/2011	Flooding
4080	8/29/2012	Tropical Cyclone – Hurricane Isaac

Probability of Future Hazard Events

The probability of a hazard event occurring in Tensas Parish is estimated in the table on the following page. The percent chance of an event happening during any given year was calculated by posting past events and dividing by the time period. Unless otherwise indicated, the time period used to access probability followed the method used in the State of Louisiana's most current Hazard Mitigation Plan. The primary source for historical data used throughout the plan is the Spatial Hazards Events and Losses Database (SHELDUS), which provides historical hazard data from 1960 to 2014. In staying consistent with the state plan, the SHELDUS database was evaluated for the last twenty five years (1990 – 2015) in order to determine future probability of a hazard occurring. While the 25-year record used by the State was adopted for the purpose of determining the overall probability, in order to assist with determining estimated losses, unless otherwise stated, the full 54-year record was used when HAZUS-Multi-Hazard (MH) wasn't available to determine losses. This full record was used to provide a more extensive record to determine losses. All assessed damages were adjusted for inflation in order to reflect the equivalent amount of damages with the value of the U.S. dollar today. In addition, the National Climatic Data Center (NCDC) was also used to help identify hazard data specific to the municipalities. This was used due to it containing specific data for cities, whereas the data within SHELDUS is limited to parishes.

The following table shows the annual probability for each hazard occurring across the parish and in separate jurisdictions:

Table 2-3: Probability of Future Hazard Reoccurrence

Hazard	Probability			
	Tensas Parish (Unincorporated)	Newellton	St. Joseph	Waterproof
Drought	24%	24%	24%	24%
Earthquake	<1%	< 1%	< 1%	<1%
Extreme Heat	4%	4%	4%	4%
Flooding	64	36%	36%	28%
Sinkholes	<1%	<1%	<1%	<1%
Thunderstorms (Hail)	36%	36%	36%	36%
Thunderstorms (Lightning)	4%	4%	4%	4%
Thunderstorms (Wind)	100%	100%	100%	100%
Tornadoes	48%	48%	48%	48%
Tropical Cyclones	16%	16%	16%	16%
Wildfires	<1%	< 1%	< 1%	<1%
Winter Storms	36%	36%	36%	36%

As shown in *Table 2-3*, thunderstorm winds for the entire planning area, have the highest annual chance of occurrence in the parish (100%). Flooding for the unincorporated area of Tensas Parish an annual chance of occurrence of 64%, followed by tornadoes at 48%, and winter storms at 36%. Flood events in the incorporated areas have a slightly lower chance of occurring annually. Thunderstorm hails has a 36% annual chance of reoccurrence, followed by tropical cyclones (16%), drought (24%), and both lightning and extreme heat (4%). Wildfires and sinkholes have the lowest chance of occurrence at less than 1% annually. Earthquakes were discounted since the annual chance of occurrence was calculated at less than 1% and the hazard has no impact on the parish.

Inventory of Assets for the Entire Parish

As part of the Risk Assessment, the planning team identified essential facilities throughout the parish. Several methods were used to assist in identifying all essential facilities, including field data collected by the Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) on critical infrastructure from a previous hazard mitigation project.

Within the entire planning area, there is an estimated value of $1,001,091,000 in structures throughout the parish. The table below provide the total estimated value for each type of structure by occupancy.

Table 2-4: Estimated Total of Potential Losses throughout Tensas Parish

Occupancy	Tensas Parish	Unincorporated Tensas	Newellton	St. Joseph	Waterproof
Agricultural	$40,870,000	$13,792,000	$8,092,000	$476,000	$18,510,000
Commercial	$121,630,000	$75,500,000	$22,617,000	$12,911,000	$10,602,000
Government	$13,433,000	$5,966,000	$1,248,000	$5,117,000	$1,102,000
Industrial	$28,752,000	$3,488,000	$20,883,000	$764,000	$3,617,000
Religion	$36,750,000	$16,744,000	$9,858,000	$3,624,000	$6,524,000
Residential	$746,228,000	$420,258,000	$118,070,000	$132,074,000	$75,826,000
Education	$13,428,000	$1,860,000	$8,440,000	$3,128,000	$0
Total	$1,001,091,000	$537,608,000	$189,208,000	$158,094,000	$116,181,000

Essential Facilities of the Parish

The following figures show the locations and names of the essential facilities within the parish:

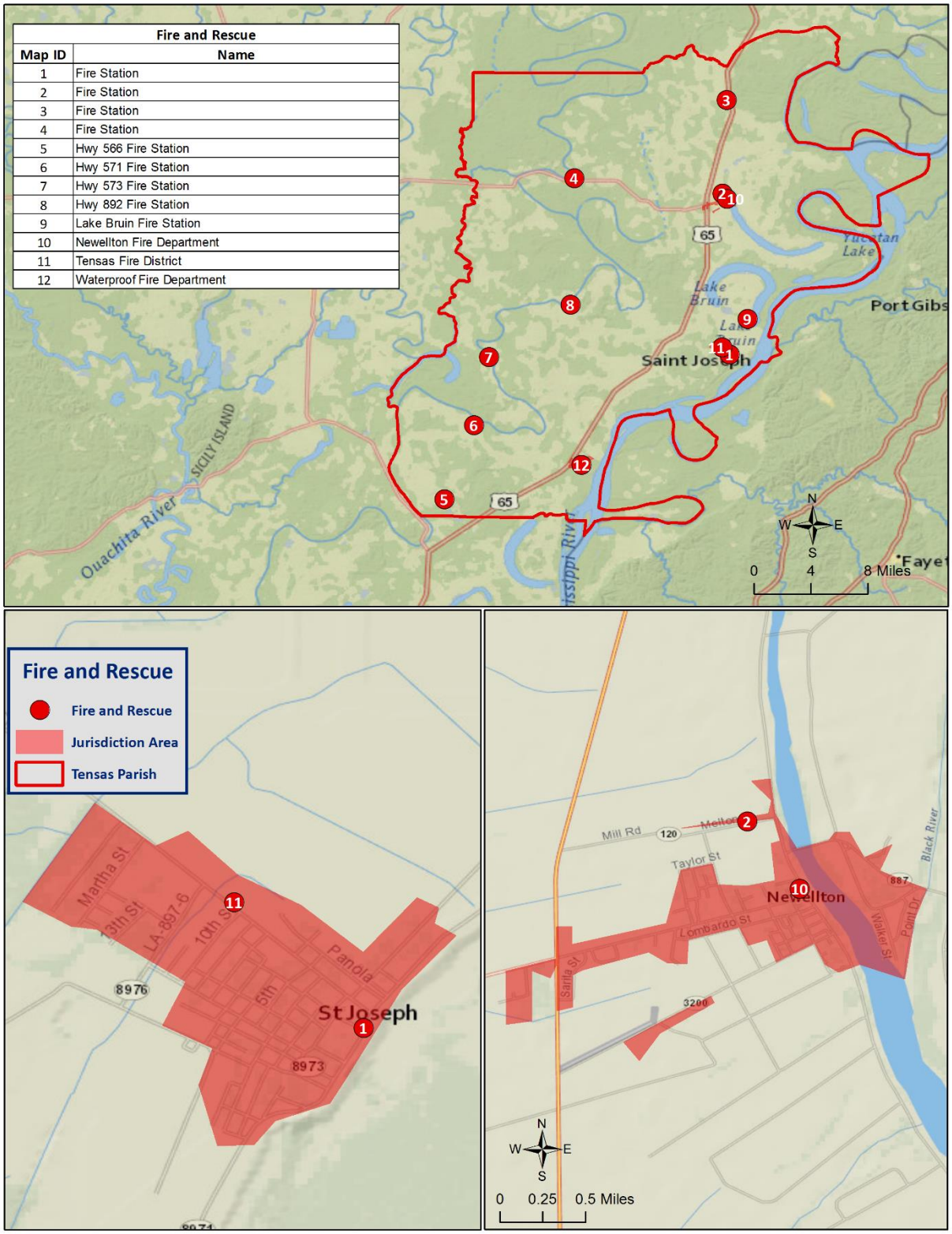

Figure 2-1: Fire and Rescue Buildings in Tensas Parish

Government Facility	
Map ID	Name
1	District Attorney's Office
2	Housing Authority of the Town of Newellton
3	LA Sectretary of State's Office
4	Newellton Chamber of Commerce
5	6th District Court Judge
6	St. Joseph Animal Rescue
7	St. Joseph City Hall
8	Tensas Community Development Center
9	Tensas Community Center
10	Tensas Council on Aging
11	Tensas Council on Aging
12	Tensas Courthouse
13	Tensas Department of Health and Hospitals
14	Tensas Department of Motor Vehicles
15	Tensas Department of Social Services
16	Tensas Educational Materials Center
17	Tensas Maintenance Unit
18	Tensas Office of Voter Registration
19	Tensas School Board
20	Tensas School Board Special Services Center
21	Town of St. Joseph Mayor's Office
22	Unknown
23	Unknown Maintenance Facility
24	USDA Service Center
25	Waterproof Town Hall

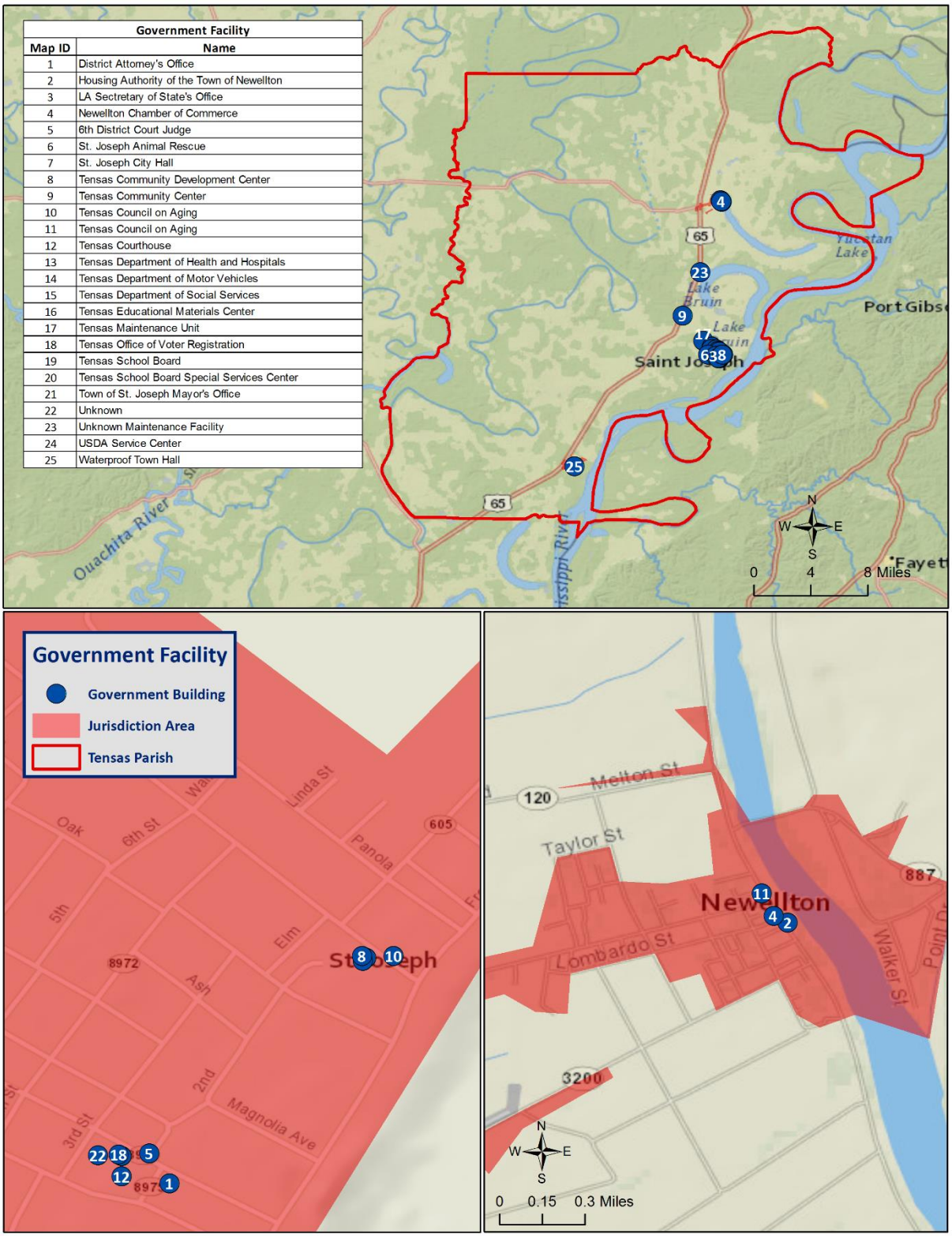

Figure 2-2: Government Buildings in Tensas Parish

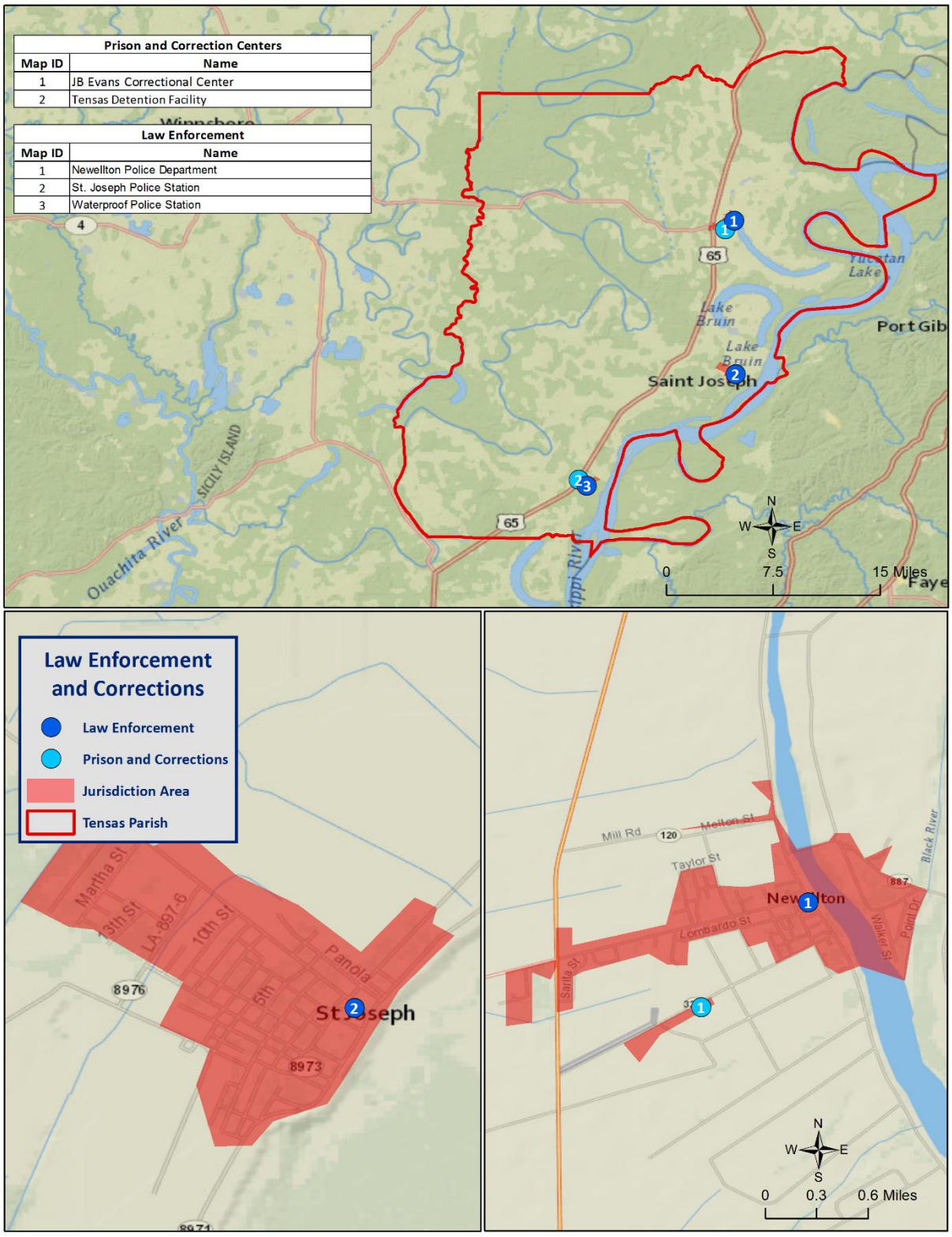

Figure 2-3: Law Enforcement and Corrections in Tensas Parish

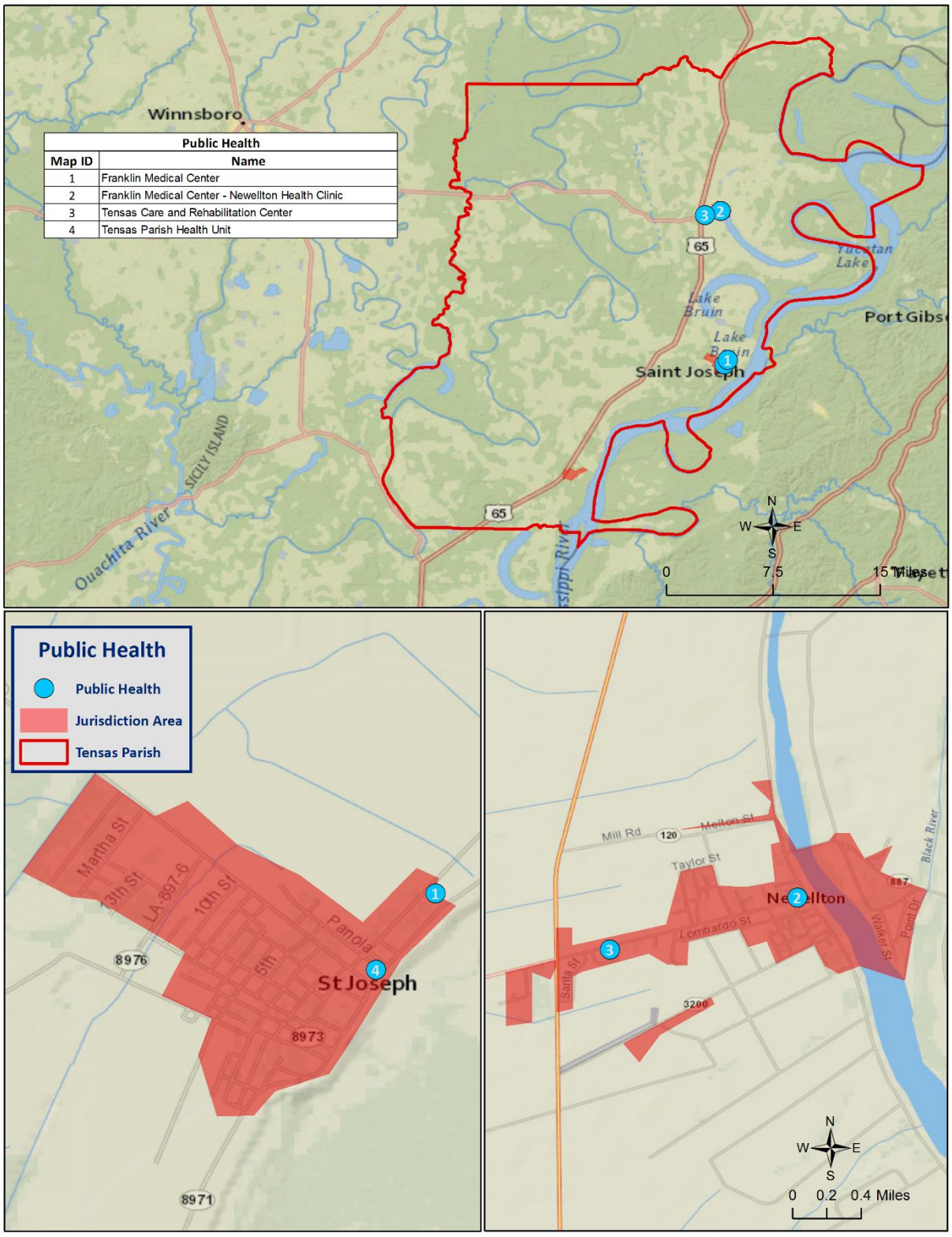

Figure 2-4: Public Health Buildings in Tensas Parish

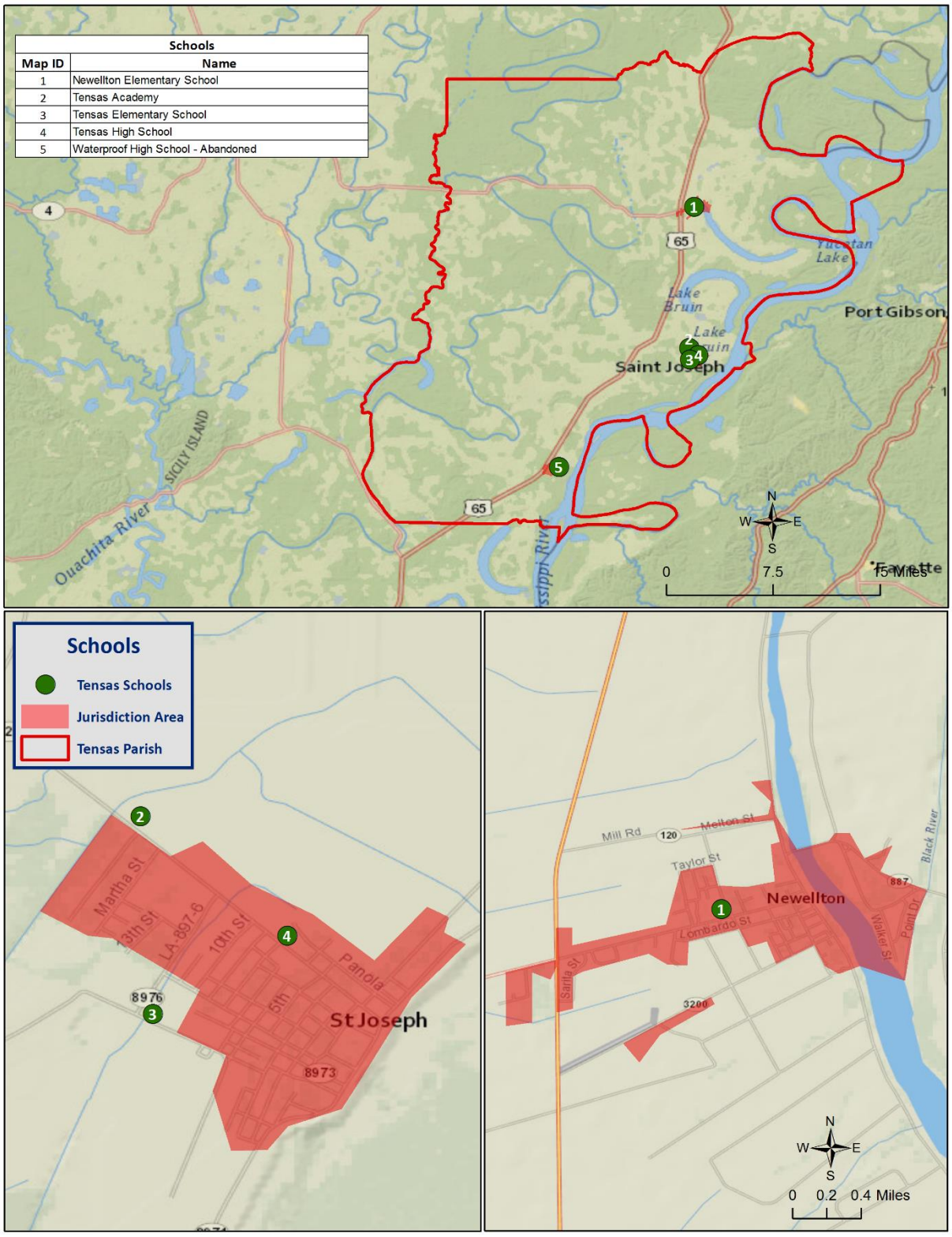

Figure 2-5: School Facilities in Tensas Parish

Future Development Trends

Tensas Parish experienced a decline in population and slight increase in housing between the years of 2000 and 2014, with population falling from 6,535 in 2000 to 4,830 in 2014. Housing increased by one unit during the same time period going from 3,359 units in 2000 to 3,360 units in 2014. Population decline was largely in the incorporated area of Newellton and Waterproof from 2000 to 2014. The future population and number of buildings can be estimated using U.S. Census Bureau housing and population data. The following tables show population and housing unit estimates from 2000 to 2014:

Table 2-5: Population Growth Rate for Tensas Parish

Total Population	Tensas Parish	Tensas (Unincorporated)	Newellton	St. Joseph	Waterproof
1-Apr-00	6,535	2,523	1,853	1,335	824
1-Apr-10	5,231	2,192	1,182	1,172	685
1-Jul-14	4,830	2,037	1,095	1,076	622
Population Growth between 2000 – 2010	-20.0%	-13.1%	-36.2%	-12.2%	-16.9%
Average Annual Growth Rate between 2000 – 2010	-2.0%	-1.3%	-3.6%	-1.2%	-1.7%
Population Growth between 2010 – 2014	-7.7%	-7.1%	-7.4%	-8.2%	-9.2%
Average Annual Growth Rate between 2010 – 2014	-1.92%	-1.77%	-1.84%	-2.05%	-2.30%

Table 2-6: Housing Growth Rate for Tensas Parish

Total Housing Units	Tensas Parish	Tensas (Unincorporated)	Newellton	St. Joseph	Waterproof
1-Apr-00	3,359	1,730	595	607	427
1-Apr-10	3,357	1,814	563	562	418
1-Jul-14	3,360	1,859	583	532	386
Housing Growth between 2000 – 2010	-0.1%	4.9%	-5.4%	-7.4%	-2.1%
Average Annual Growth Rate between 2000 – 2010	0.0%	0.5%	-0.5%	-0.7%	-0.2%
Housing Growth between 2010 – 2014	0.1%	2.5%	3.6%	-5.3%	-7.7%
Average Annual Growth Rate between 2010 – 2014	0.0%	0.6%	0.9%	-1.3%	-1.9%

As shown in the previous tables, Tensas Parish has experienced a decline in population and minimal growth in housing units. Housing growth rates fell at less than 0.1% annual from 200 to 2010, and grew at less than 0.1% annually from 2010 to 2014. Population growth rates for the parish fell at -2% annually from 2000 to 2010, and -1.92% annually from 2010 to 2014. From 2000 to 2014, the incorporated areas of Newellton and Waterproof had the largest decrease in population.

The unincorporated area of Tensas Parish is the only area in the parish to experience an increase in housing units from 2000 to 2010 at 4.9% overall. All of the incorporated areas of the parish experienced a decline in housing units during this time period. From 2010 to 2014, the incorporated area of Newellton experienced the largest increase in housing units at 0.9% annually, followed by the unincorporated area of Tensas Parish at 0.6% annually.

Future Hazard Impacts

Hazard impacts were estimated for five years and ten years in the future (2019 and 2024). Yearly population and housing growth rates were applied to parish inventory assets for composite flood and tropical cyclones. Based on a review of available information, it is assumed that population and housing units will grow slightly within Tensas Parish from the present until 2024. A summary of estimated future impacts is shown in the table below. Dollar values are expressed in future costs and assume an annual rate of inflation of 1.02%. No changes in development have impacted the community's vulnerability since the plans last update.

Table 2-7: Estimated Future Impacts, 2019-2024
(Source: Hazus, US Census Bureau)

Hazard / Impact	Total in Parish (2014)	Hazard Area (2014)	Hazard Area (2019)	Hazard Area (2024)
Flood Damage				
Structures	3,360	456	456	457
Value of Structures	$1,001,091,000	$135,715,307	$142,938,999	$150,547,185
# of People	4,830	655	594	540
Tropical Cyclone				
Structures	3,360	3,360	3,364	3,368
Value of Structures	$1,001,091,000	$1,001,091,000	$1,054,375,875	$1,110,496,935
# of People	4,830	4,830	4,385	3,980

Land Use

The Tensas Parish Land Use table is provided on the following page. Residential, commercial, and industrial areas account for only 4% of the parish's land use. Agricultural land is the largest category at 230,386 acres, accounting for 56% of parish land. At 131,211 acres, wetlands account for 32% of parish lands, while 21,899 acres of open water account for 5% of parish lands. The parish also consists of 10,783 acres of forested areas, accounting for 3% of all parish lands.

Table 2-8: Tensas Parish Land Use
(Source: USGS Land Use Map)

Land Use	Acres	Percentage
Agricultural Land, Cropland, and Pasture	230,386	56%
Wetlands	131,211	32%
Forest Land (not including forested wetlands)	10,783	3%
Urban/Development	16,262	4%
Water	21,899	5%

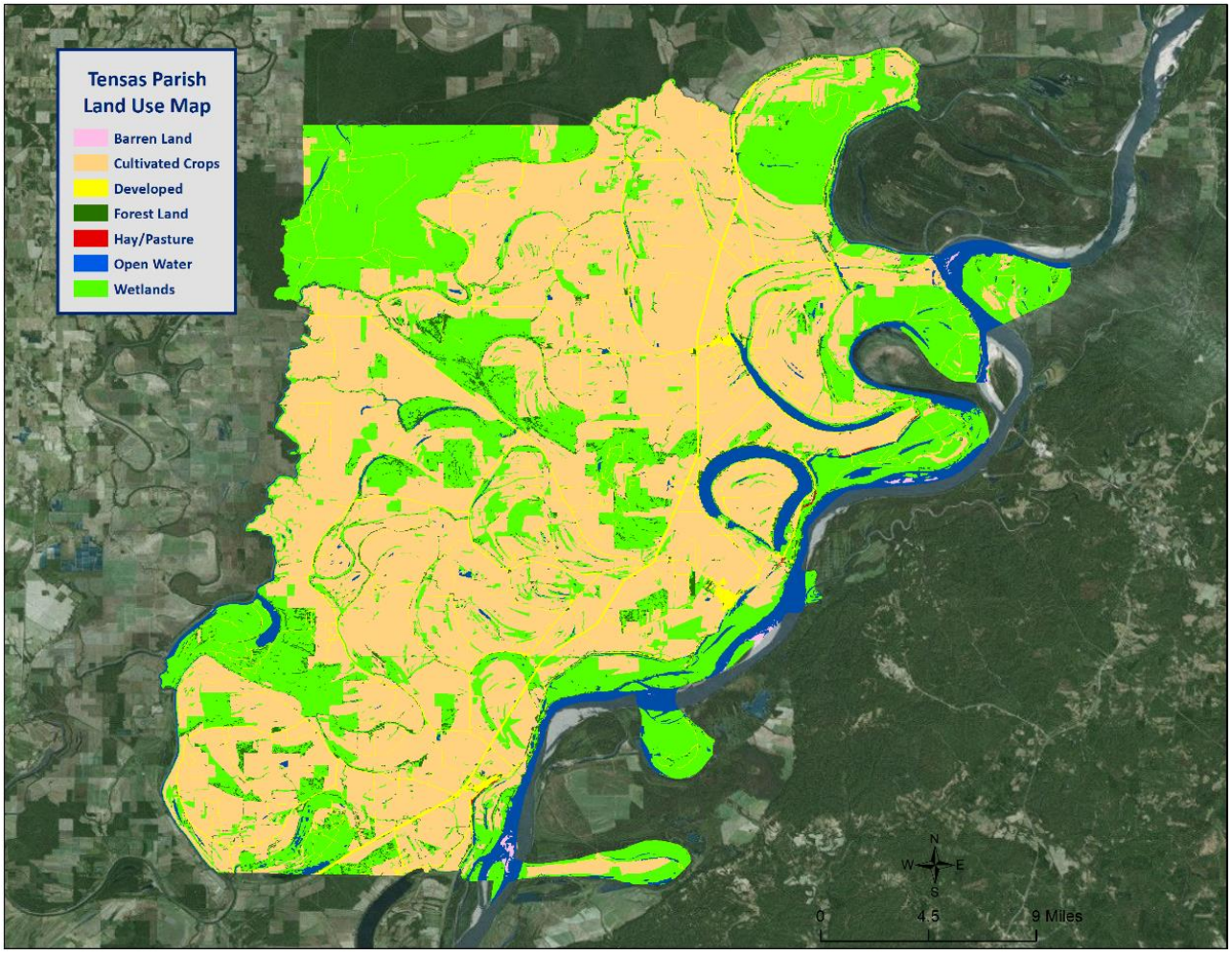

Figure 2-6: Tensas Parish Land Use Map
(Source: USGS Land Use Map)

Hazard Identification

Drought

A drought is a deficiency in water availability over an extended period of time, caused by precipitation totals and soil water storages that do not satisfy the environmental demand for water, either by evaporation or transpiration through plant leaves. It is important to note that the lack of precipitation alone does not constitute drought; the season during which the precipitation is lacking has a major impact on whether drought occurs. For example, a week of no precipitation in July, when the solar energy to evaporate water and vegetation's need for water to carry on photosynthesis are both high, may trigger a drought, while a week of no precipitation in January may not initiate a drought.

Drought is a unique and insidious hazard. Unlike other natural hazards, no specific threshold of "dryness" exists for declaring a drought. In addition, the definition of drought depends on stakeholder needs. For instance, the onset (and demise) of agricultural drought is quick, as crops need water every few days; once they get rainfall, they improve. But hydrologic drought sets in (and is alleviated) only over longer time periods. A few dry days will not drain a reservoir, but a few rain showers cannot replenish it either. Moreover, different geographical regions define drought differently based on the deviation from local, normal precipitation. Drought can occur anywhere, triggered by changes in the local-to-regional-scale atmospheric circulation over an area, or by broader-scale circulation variations such as the expansion of semi-permanent oceanic high-pressure systems or the stalling of an upper-level atmospheric ridge in place over a region. The severity of a drought depends upon the degree and duration of moisture deficiency, as well as the size of the affected area. Periods of drought also tend to be associated with other hazards, such as wildfires and/or heat waves. Lastly, drought is a slow onset event, causing less direct—but tremendous indirect—damage. Depletion of aquifers, crop loss, and livestock and wildlife mortality rates are examples of direct impacts. Since the groundwater found in aquifers is the source of about 38% of all county and city water supplied to households (and comprises 97% of the water for all rural populations that are not already supplied by cities and counties), droughts can potentially have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts causes drought to affect people and economies well beyond the area physically experiencing the drought.

This hazard is often measured using the Palmer Drought Severity Index (PDSI, also known operationally as the Palmer Drought Index). The PDSI, first developed by Wayne Palmer in a 1965 paper for the U.S. Weather Bureau, measures drought through recent precipitation and temperature data with regard to a basic supply-and-demand model of soil moisture. It is most effective in long-term calculations. Three other indices used to measure drought are the Palmer Hydrologic Drought Index (PHDI), the Crop Moisture Index (CMI), which is derived from the PDSI, and the Keetch-Byram Drought Index (KBDI), created by John Keetch and George Byram in 1968 for the U.S. Forest Service. The KBDI is used mainly for predicting the likelihood of wildfire outbreaks. As a compromise, the PDSI is used most often for droughts since it is a medium-response drought indicator. The objective of the PDSI is to provide measurements of moisture conditions that are standardized so that comparisons using the index can be made between locations and between months. *Table 2-9* displays the range and Palmer classifications of the PDSI index. *Figure 2-7* displays the current drought monitor for the state of Louisiana and its parishes.

Table 2-9: Palmer Drought Severity Index Classification and Range

Range	Palmer Classifications
4.0 or more	Extremely Wet
3.0 to 3.9	Very Wet
2.0 to 2.9	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

The PDSI best measures the duration and intensity of drought-inducing circulation patterns at a somewhat long-term time scale, although not as long-term as the PHDI. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns in addition to the effects of cumulative patterns of previous months. Although weather patterns can change almost overnight from a long-term drought pattern to a long-term wet pattern, as a medium-response indicator, the PDSI responds relatively rapidly. Data compiled by the National Drought Mitigation Center indicates normal conditions exist in Tensas Parish at the time this plan went to publication (*Figure 2-7*).

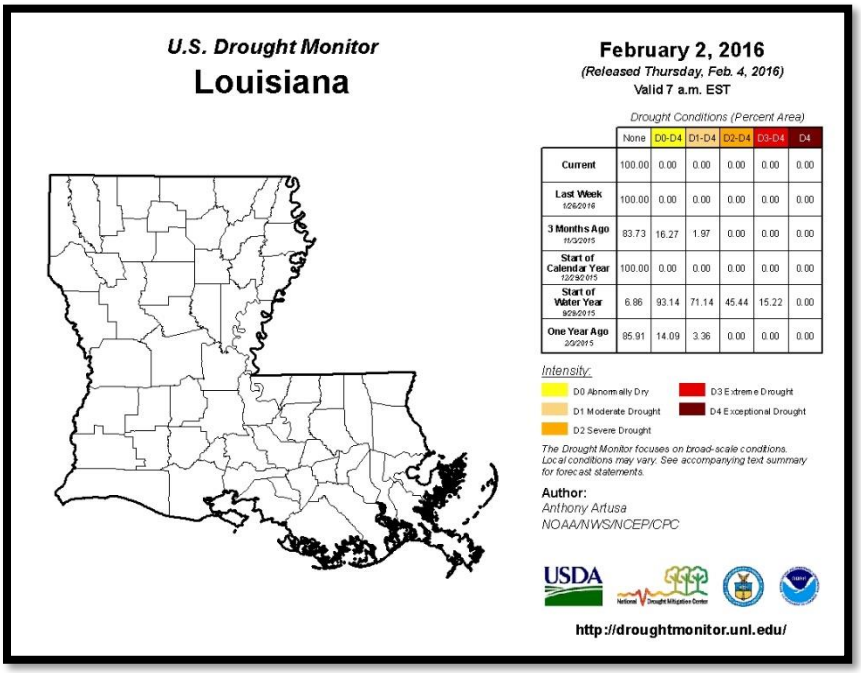

Figure 2-7: United States Drought Monitor for the State of Louisiana and its Parishes (Source: The National Drought Mitigation Center)

Location

Drought typically impacts a region and not one specific parish or jurisdiction. While the entire planning area can experience drought, the major impact of a drought event in Tensas Parish is on the agricultural community.

Previous Occurrences / Extents

The SHELDUS database reports a total of six drought events occurring within the boundaries of Tensas Parish between the years of 1990 to 2015. *Table 2-10* identifies the date of occurrence, estimated crop damage, and severity of the events that have occurred in Tensas Parish. Based on previous occurrences, and in accordance with the Palmer Drought Index, the worst case scenario for drought in Tensas Parish would be a severe drought event.

Table 2-10: Drought Events with Crop Damage Totals for Tensas Parish (Source: SHELDUS)

Date	Crop Damage	Palmer Classification
October 2006	$965,524	Severe Drought
June 2010	$108,567	Moderate Drought
July 2010	$759,966	Severe Drought
August 2010	$542,833	Severe Drought
September 2010	$542,833	Severe Drought
October 2010	$542,833	Severe Drought

Frequency / Probability

Based on previous occurrences of six drought events in 25 years, the probability of drought occurrence in the planning area in any given year is 24%.

Estimated Potential Losses

According to the SHELDUS database, there have been six drought events that have caused some level of crop damage. The total agricultural damage from these events is $3,462,556, with an average cost of $577,093 per drought event. When annualizing the total cost over the 25-year record, total annual losses based on drought is estimated to be $138,502. *Table 2-11* presents an analysis of agricultural exposure that is susceptible to drought by major crop type for Tensas Parish.

Table 2-11: Agricultural Exposure by Crop Type for Droughts in Tensas Parish (Source: LSU Ag Center 2014 Parish Totals)

Agricultural Exposure by Type for Drought in Tensas Parish						
Soybeans	Cotton	Feed Grains	Wheat	Forestry	Rice	Total
$58,371,019	$40,870,562	$26,399,695	$6,843,827	$3,927,441	$3,742,376	$140,154,920

There have been no reported injuries or deaths as a direct result to drought in Tensas Parish.

Earthquakes

An earthquake is a sudden motion or trembling of the Earth caused by an abrupt release of stored energy in the rocks beneath the Earth's surface. The energy released results in vibrations which are known as seismic waves. Ground motion from seismic waves is expressed as peak ground acceleration (PGA), the fastest measured change in speed for a particle at ground level that is moving because of an earthquake. PGA is commonly measured as a percentage of acceleration due to Earth's gravity (%g). This measurement is relied upon to determine seismic load engineering design and construction requirements. Earthquakes are typically described in terms of magnitude and intensity. Magnitude is the measure of the amplitude of the seismic wave and is often expressed by the Richter scale, and intensity is a measure of how strong the shock was felt at a particular location, indexed by the Modified Mercalli Intensity (MMI) scale. The Richter scale is a logarithmic measurement whereby an increase in the scale by one whole number represents a tenfold increase in measured ground motion of the earthquake (and an increase in energy released of more than 30 times). An increase by two whole numbers represents a 102 (or 100-fold) increase in ground motion, and thus more than 302 (or 900) times the energy released. *Table 2-12* shows the rough correlation between the Richter scale, PGA, and the MMI. The relationship between these is approximate and depends upon such specifics as the depth of the focus (the location of the actual rock movement) and distance from the epicenter (the location on the Earth's surface above the earthquake focus) of the earthquake.

Table 2-12: Comparison of Earthquake Magnitudes for PGA, Richter, and MMI (Source: USGS Earthquake Hazards Program)

COMPARISON OF EARTHQUAKE METRICS			
PGA (%g)	**Magnitude (Richter)**	**Intensity (MMI)**	**Description (MMI)**
<0.17	1.0 - 3.0	I	**I**. Not felt except by a very few under especially favorable conditions.
0.17 - 1.4	3.0 - 3.9	II - III	**II**. Felt only by a few persons at rest, especially on upper floors of buildings. **III**. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
1.4 - 9.2	4.0 - 4.9	IV - V	**IV**. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rock noticeably. **V**. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
9.2 - 34	5.0 - 5.9	VI - VII	**VI**. Felt by all. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII**. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.

COMPARISON OF EARTHQUAKE METRICS			
PGA (%g)	**Magnitude (Richter)**	**Intensity (MMI)**	**Description (MMI)**
34 - 124	6.0 - 6.9	VII - IX	**VIII**. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. **IX**. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
>124	7.0 and higher	**VIII** or higher	**X**. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. **XI**. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. **XII**. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

The system of subsidence faults in southern Louisiana developed due to accelerated land subsidence and rapid sediment deposition from the Mississippi River. The system stretches across the southern portion of the state from Beauregard Parish in the west to West Baton Rouge Parish in the east and it includes every parish south of this line. This system is thought to be responsible for many of the recorded earthquakes from 1843 to the present. All of the earthquakes that occurred over this period of time were of low magnitude, resulting mostly in limited property damage (such as broken windows, damaged chimneys, and cracked plaster). While faults throughout the northwestern parishes are thought to be inactive, the New Madrid seismic zone lies just to the north of Louisiana and originates in the region of New Madrid, Missouri. The magnitude of historic earthquakes originating in the New Madrid seismic zone is far greater than that generated by the subsidence fault system in coastal Louisiana. A significant seismic event from the New Madrid seismic zone is more likely to have a greater impact on Louisiana than a seismic event from the subsidence fault system.

Location

An earthquake event is a geological hazard that occurs along fault lines. Tensas Parish has no fault lines within its boundaries (*Figure 2-8*). However, effects of an earthquake in neighboring parishes may be felt throughout the parish.

Previous Occurrences / Extents

Both the SHELDUS and National Climatic Data Center report no earthquake events occurring within the boundaries of Tensas Parish between the years of 1990 – 2015. The National Oceanic and Atmospheric Administration's National Geophysical Data Center reports no earthquake events occurring within the boundaries of Tensas Parish between the years 1811 – 2014. *Figure 2-8* displays the location and intensity of each earthquake event in surrounding parishes. Based on the previous earthquake events in the neighboring parishes, an earthquake with an intensity level of MMI 3 could occur in neighboring parishes. This intensity of an earthquake would only be felt people indoors, but most would not recognize it as an earthquake event.

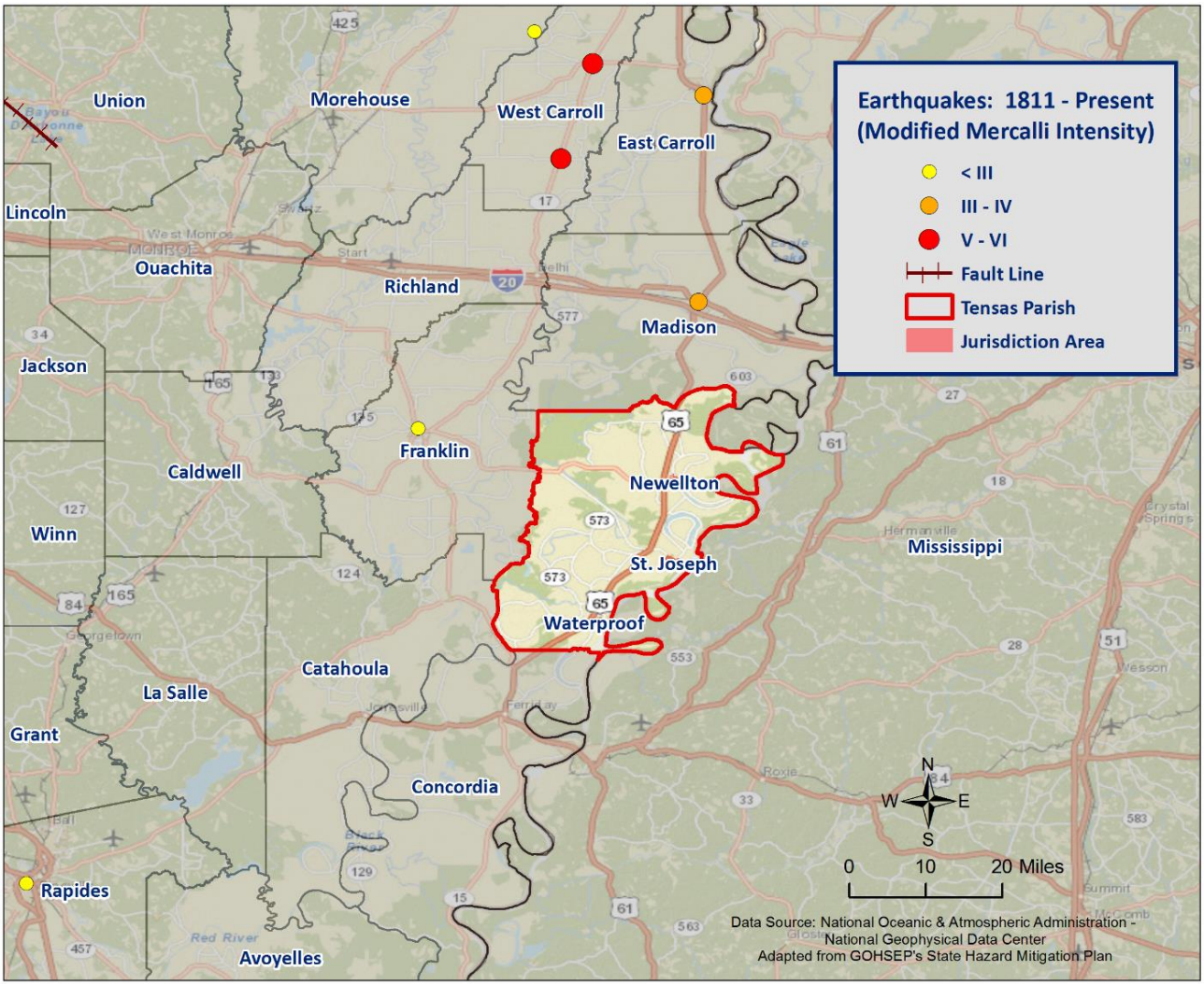

Figure 2-8: Location and Intensity (MMI) of Earthquakes in Tensas Parish

Frequency / Probability

Earthquakes are an extremely rare occurrence in the State of Louisiana and Tensas Parish, with no earthquake events occurring within the boundaries of the parish from the years 1811 – 2014. Based on this historical record and Louisiana's State Hazard Mitigation Plan, it is determined that an earthquake event has less than a 1% annual chance of occurrence in the Tensas Parish planning area. Since earthquakes have no impact on Tensas parish, earthquakes are not carried forward into risk assessment and are discounted.

Extreme Heat

There is no operational definition for defining heat or a heat wave. Heat waves are the consequence of the same weather pattern as drought, and therefore both hazards often occur concurrently. A heat wave is an extended period of oppressive and above normal temperatures over a given period of time. The World Meteorological Organization recommends the declaration of a heat wave when the daily maximum temperature exceeds the average maximum temperatures by 9 °F and lasts for a period of at least five days.

However, temperature alone is insufficient to describe the stress placed on humans (as well as flora and fauna) in hot weather. It is crucial to consider the effect of relative humidity since it is essential to the body's ability to perspire and cool. Once air temperature reaches 95 °F, perspiration becomes a very significant biophysical mechanism to ensure heat loss. Perspiration is ineffective as a cooling mechanism if the water cannot evaporate (i.e., sweating in high relative humidity is reduced as compared to during dry conditions). To communicate this relationship between temperature and humidity, the National Weather Service (NWS) developed the Heat Index (HI), which provides a warning system based on a combination of air temperature and relative humidity. The HI is presented *Table 2-13*, and *Table 2-14* summarizes the HI risk levels and protective measures. The NWS devised the index for shady, light wind conditions, and thus advises that the HI value can be increased by as much as 15 °F if a person is in direct sunlight with strong, hot winds present.

Most heat disorders (e.g., sunburn, heat cramps, heat exhaustion, and heat stroke) occur because the victim has been overexposed to heat, or has over-exercised in relation to their age and physical condition. Other circumstances that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Seniors and children are most at risk from adverse heat effects. Extreme heat can also damage roads, bridges, pipelines, utilities, and railroads. High temperatures can be partially responsible for deflection of rails and related railroad accidents.

According to NOAA, extreme heat is the leading weather-related cause of death in the United States. And while heat-related deaths in Louisiana are not common, due in part to the consistency and predictability of high seasonal temperatures, they do occur and are still very intense and dangerous. Such deaths happen in a variety of circumstances, often in ways that are not easily categorized due to their unexpectedness. For instance, although exposure to heat is higher at the beach than usual, NOAA does not track heat-related deaths there because such deaths happen infrequently.

Table 2-13: Heat Index Advisor based on Air Temperature (°F) and Relative Humidity (Source: National Weather Service)

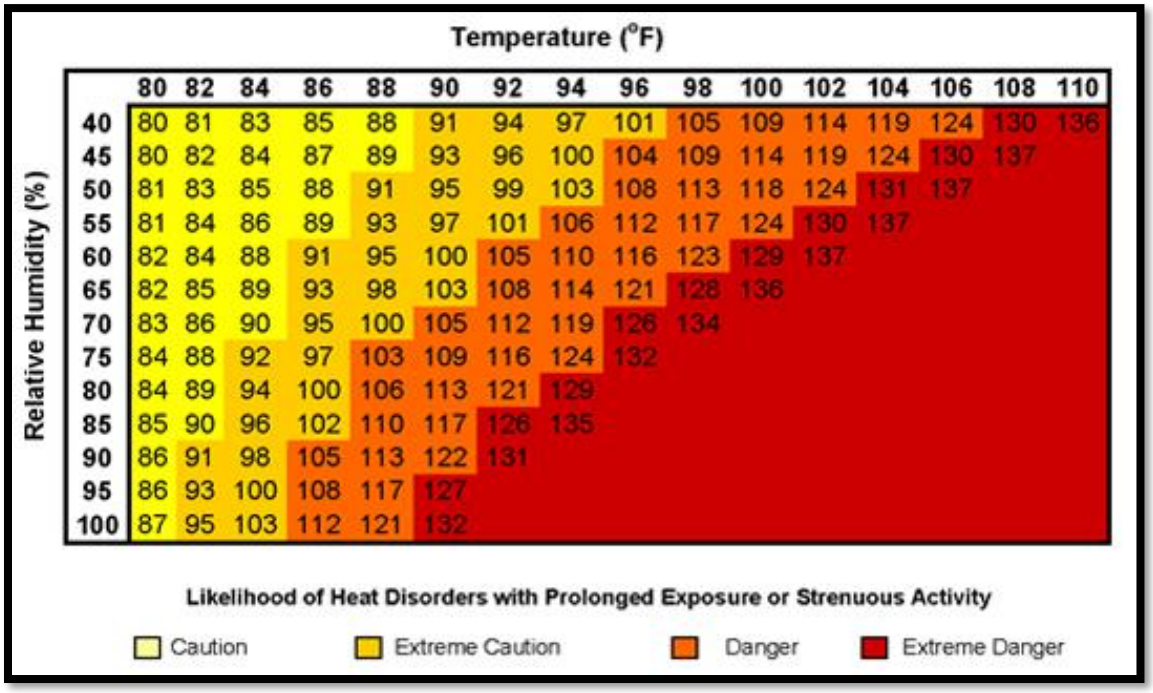

Table 2-14: Summary of Heat Index Risk Levels with Protective Measures (Source: National Weather Service)

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning.
91°F to 103°F	Moderate	Implement precautions and heighten awareness.
103°F to 115°F	High	Additional precautions to protect workers.
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures.

Location

Extreme heat typically impacts a region and not one specific parish or jurisdiction. Because extreme heat is a climatological based hazard and has the same probability of occurring in Tensas Parish as all of the adjacent parishes, the entire planning area for Tensas Parish is equally at risk for extreme heat.

Previous Occurrences / Extents

The SHELDUS database reports a total of two significant extreme heat events occurring within the boundaries of Tensas Parish between the years of 1960 to 2015 that have caused significant damage to crops or property and injuries or death. *Table 2-15* provides an overview of extreme heat events that have impacted the Tensas Parish planning area since 2010. Based on historical data, the worst case scenario for Tensas Parish involving extreme heat would be a high risk level event on the HI scale with temperatures ranging from 103 °F to 115 °F.

Table 2-15: Previous Occurrences of Extreme Heat in Tensas Parish (Source: NOAA)

Date	Temperature (°F)
August 3, 2010	103
August 9, 2015	103
August 11, 2015	103

Frequency / Probability

Based on the geographical location of the State of Louisiana, and Tensas Parish in particular, extreme heat events occur frequently. The probability of occurrence is estimated at approximately 4%.

Estimated Potential Losses

According to the SHELDUS database, crop damage due to extreme heat in Tensas Parish has totaled approximately $626,856 since 1960. To estimate the potential losses of an extreme heat event on an annual basis, the total damages recorded for an extreme event is divided by the total number of years of available extreme heat data in SHELDUS (1960 – 2014). This provides an annual estimated potential loss of $11,397. The following table, based on the 2010 Census data, provides an estimate of potential crop losses for Tensas Parish:

Table 2-16: Estimated Annual Crop Losses in Tensas Parish for Extreme Heat

Estimated Annual Potential Losses from Extreme Heat for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	Newellton (22.6% of Population)	St. Joseph (22.4% of Population)	Waterproof (13.1% of Population)
$4,776	$2,576	$2,552	$1,493

There have been no reported injuries or deaths as a direct result of extreme heat in Tensas Parish.

Vulnerability

See Appendix C for parish and municipality agricultural exposure to extreme heat hazards.

Flooding

A flood is the overflow of water onto land that is usually not inundated. The National Flood Insurance Program defines a flood as:

> A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waves, unusual and rapid accumulation or runoff of surface waters from any source, mudflow, or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Factors influencing the type and severity of flooding include natural variables such as precipitation, topography, vegetation, soil texture, and seasonality, as well as anthropogenic factors such as urbanization (extent of impervious surfaces), land use (agricultural and forestry tend to remove native vegetation and accelerate soil erosion), and the presence of flood-control structures such as levees and dams.

Excess precipitation, produced from thunderstorms or hurricanes, is often the major initiating condition for flooding, and Louisiana can have high rainfall totals at any time of day or year. During the cooler months, slow-moving frontal weather systems produce heavy rainfalls, while the summer and autumn seasons produce major precipitation in isolated thunderstorm events (often on warm afternoons) that may lead to localized flooding. During these warmer seasons, floods are overwhelmingly of the flash flood variety, as opposed to the slower-developing river floods caused by heavy stream flow during the cooler months.

In cooler months, particularly in the spring, Louisiana is in peak season for severe thunderstorms. The fronts that cause these thunderstorms often stall while passing over the state, occasionally producing rainfall totals exceeding ten inches within a period of a few days. Since soil tends to be nearly saturated at this time (due to relatively low overall evaporation rates), spring typically becomes the period of maximum stream flow across the state. Together, these characteristics increase the potential for high water, with low-lying, poorly drained areas being particularly susceptible to flooding during these months.

In Louisiana, six specific types of flooding are of main concern: riverine, flash, ponding, backwater, urban, and coastal.

- **Riverine flooding** occurs along a river or smaller stream. It is the result of runoff from heavy rainfall or intensive snow or ice melt. The speed with which riverine flood levels rise and fall depends not only on the amount of rainfall, but even more on the capacity of the river itself, as well as the shape and land cover of its drainage basin. The smaller the river, the faster that water levels rise and fall. Thus, the Mississippi River levels rise and fall slowly due to its large capacity. Generally, elongated and intensely-developed drainage basins will reach faster peak discharges and faster falls than circular-shaped and forested basins of the same area.
- **Flash flooding** occurs when locally intense precipitation inundates an area in a short amount of time, resulting in local stream flow and drainage capacity being overwhelmed.
- **Ponding** occurs when concave areas (e.g., parking lots, roads, and clay-lined natural low areas) collect water and are unable to drain.
- **Backwater flooding** occurs when water slowly rises from a normally unexpected direction where protection has not been provided. A model example is the flooding that occurred in LaPlace during Hurricane Isaac in 2012. Although the town was protected by a levee on the side facing the

Mississippi River, floodwaters from Lake Maurepas and Lake Pontchartrain crept into the community on the side of town opposite the Mississippi River.

- **Urban flooding** is similar to flash flooding but is specific to urbanized areas. It takes place when storm water drainage systems cannot keep pace with heavy precipitation, and water accumulates on the surface. Most urban flooding is caused by slow-moving thunderstorms or torrential rainfall.
- **Coastal flooding** can appear similar to any of the other flood types, depending on its cause. It occurs when normally dry coastal land is flooded by seawater, but may be caused by direct inundation (when the sea level exceeds the elevation of the land), overtopping of a natural or artificial barrier, or the breaching of a natural or artificial barrier (i.e., when the barrier is broken down by the sea water). Coastal flooding is typically caused by storm surge, tsunamis, or gradual sea level rise.

For purposes of this assessment, ponding, flash flood, and urban flooding are considered to be flooding as a result of storm water from heavy precipitation thunderstorms

Based on stream gauge levels and precipitation forecasts, the National Weather Service (NWS) posts flood statements, watches, and warnings. The NWS issues the following weather statements with regard to flooding:

- **Flood Categories**
  - Minor Flooding: Minimal or no property damage, but possibly some public threat.
  - Moderate Flooding: Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.
  - Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
  - Record Flooding: Flooding which equals or exceeds the highest stage or discharge at a given site during the period of record keeping.
- **Flood Warning**
  - Issued along larger streams when there is a serious threat to life or property.
- **Flood Watch**
  - Issued when current and developing hydrometeorological conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.

Floods are measured mainly by probability of occurrence. A 10-year flood event, for example, is an event of small magnitude (in terms of stream flow or precipitation) but with a relatively high annual probability of recurrence (10%). A 100-year flood event is larger in magnitude, but it has a smaller chance of recurrence (1%). A 500-year flood is significantly larger than both a 100-year event and a 10-year event, but it has a lower probability than both to occur in any given year (0.2%). It is important to understand that an X-year flood event does not mean an event of that magnitude occurs only once in X years. Instead, it means that on average, we can expect a flood event of that magnitude to occur once every X years. Given that such statistical probability terms are inherently difficult for the general population to understand, the Association of State Floodplain Managers (ASFPM) promotes the use of more tangible expressions of flood probability. As such, the ASFPM also expresses the 100-year flood event as having a 25% chance of occurring over the life of a 30-year mortgage.

It is essential to understand that the magnitude of an X-year flood event for a particular area depends on the source of flooding and the area's location. The size of a specific flood event is defined through historic data of precipitation, flow, and discharge rates. Consequently, different 100-year flood events can have very

different impacts. The 100-year flood event in two separate locations have the same likelihood to occur, but they do not necessarily have the same magnitude. For example, a 100-year event for the Mississippi River means something completely different in terms of discharge values (ft^3/s) than for the Amite River. Not only are the magnitudes of 100-year events different between rivers, they can be different along any given river. A 100-year event upstream is different from one downstream due to the variation of river characteristics (volume, discharge, and topography). As a result, the definition of what constitutes a 100-year flood event is specific to each location, river, and time, since floodplain and river characteristics temporally fluctuate. Finally, it is important to note that each flood event is unique. Two hypothetical events at the same location, given the same magnitude of stream flow, may still produce substantially different impacts if there were different antecedent moisture characteristics, different times of day of occurrence (which indicates the population's probable activities at the flood's onset), or other characteristic differences.

The 100-year flood event is of particular significance since it is the regulatory standard that determines the obligation (or lack thereof) to purchase flood insurance. Flood insurance premiums are set depending on the flood zone, as modeled by National Flood Insurance Program (NFIP) Rate Maps. The NFIP and FEMA suggest insurance rates based on Special Flood Hazard Areas (SFHAs), as diagrammed in *Figure 2-9*.

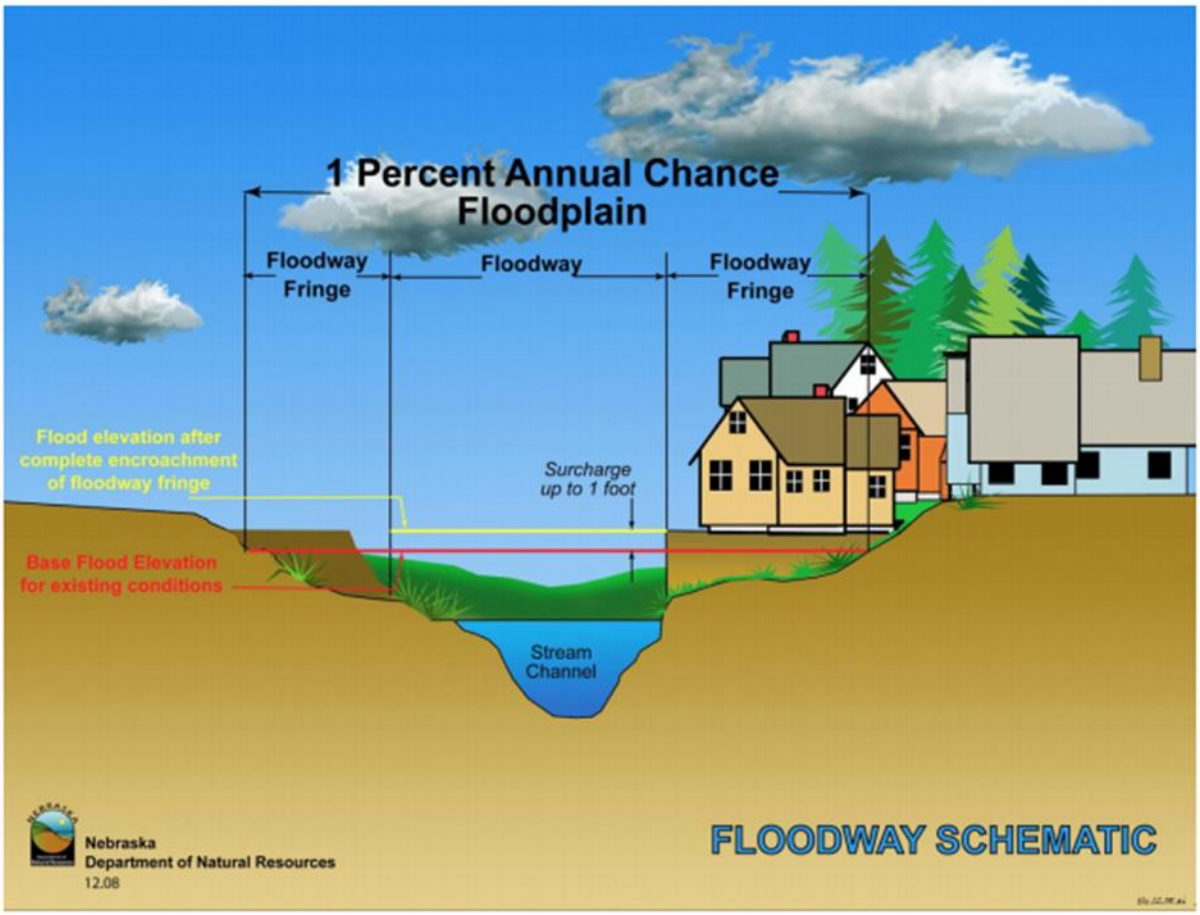

Figure 2-9: Schematic of 100-Year Floodplain. The Special Flood Hazard Area (SFHA) extends to the end of the floodway fringe.
(Source: Nebraska Department of Natural Resources)

A SFHA is the land area covered by the floodwaters of the base flood (red line in *Figure 2-9*), where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

Property Damage

The depth and velocity of flood waters are the major variables in determining property damage. Flood velocity is important because the faster water moves, the more pressure it puts on a structure and the more it will erode stream banks and scour the earth around a building's foundation. In some situations, deep and fast moving waters can push a building off its foundation. Structural damage can also be caused by the weight of standing water (hydrostatic pressure).

Another threat to property from a flood is called "soaking". When soaked, many materials change their composition or shape. Wet wood will swell, and if dried too quickly, will crack, split, or warp. Plywood can come apart and gypsum wallboard can deteriorate if it is bumped before it has time to completely dry. The longer these materials are saturated, the more moisture, sediment, and pollutants they absorb.

Soaking can also cause extensive damage to household goods. Wooden furniture may become warped, making it unusable, while other furnishings such as books, carpeting, mattresses, and upholstery are usually not salvageable. Electrical appliances and gasoline engines will flood, making them worthless until they are professionally dried and cleaned.

Many buildings that have succumbed to flood waters may look sound and unharmed after a flood, but water has the potential to cause severe property damage. Any structure that experiences a flood should be stripped, cleaned, and allowed to dry before being reconstructed. This can be an extremely expensive and time consuming effort.

Repetitive Loss Properties

Repetitive loss structures are structures covered by a contract for flood insurance made available under the NFIP that:

a. Have incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and
b. At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe repetitive loss (SRL) is defined by the Flood Insurance Reform Act of 2004 and updated in the Biggert-Waters Flood Insurance Reform Act of 2012. For a property to be designated SRL, the following criteria must be met:

a. It is covered under a contract for flood insurance made available under the NFIP; and
b. It has incurred flood related damage –
    1) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or
    2) For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Figures regarding repetitive loss structures for Tensas Parish are provided in the table below:

Table 2-17: Repetitive Loss Structures for Tensas Parish

Jurisdiction	Number of Structures	Residential	Commercial	Government	Total Claims	Total Claims Paid	Average Claim Paid
Tensas Parish (Unincorporated)	36	35	1	0	125	1,427,146	$11,417
Newellton	0	0	0	0	0	$0	$0
St. Joseph	1	1	0	0	2	$3,364	$1,682
Waterproof	0	0	0	0	0	$0	$0
Total	37	36	1	0	127	$1,430,510	$11,264

Of the 37 repetitive loss structures, 5 were able to be geocoded in order to provide an overview of where the repetitive loss structures were located throughout the parish. *Figure 2-10* shows the approximate location of the 5 structures, while *Figure 2-11* shows where the highest concentration of repetitive loss structures are located. Through the repetitive loss map, it is clear that the primary concentrated area of repetitive loss structures is focused in the unincorporated areas of Tensas Parish.

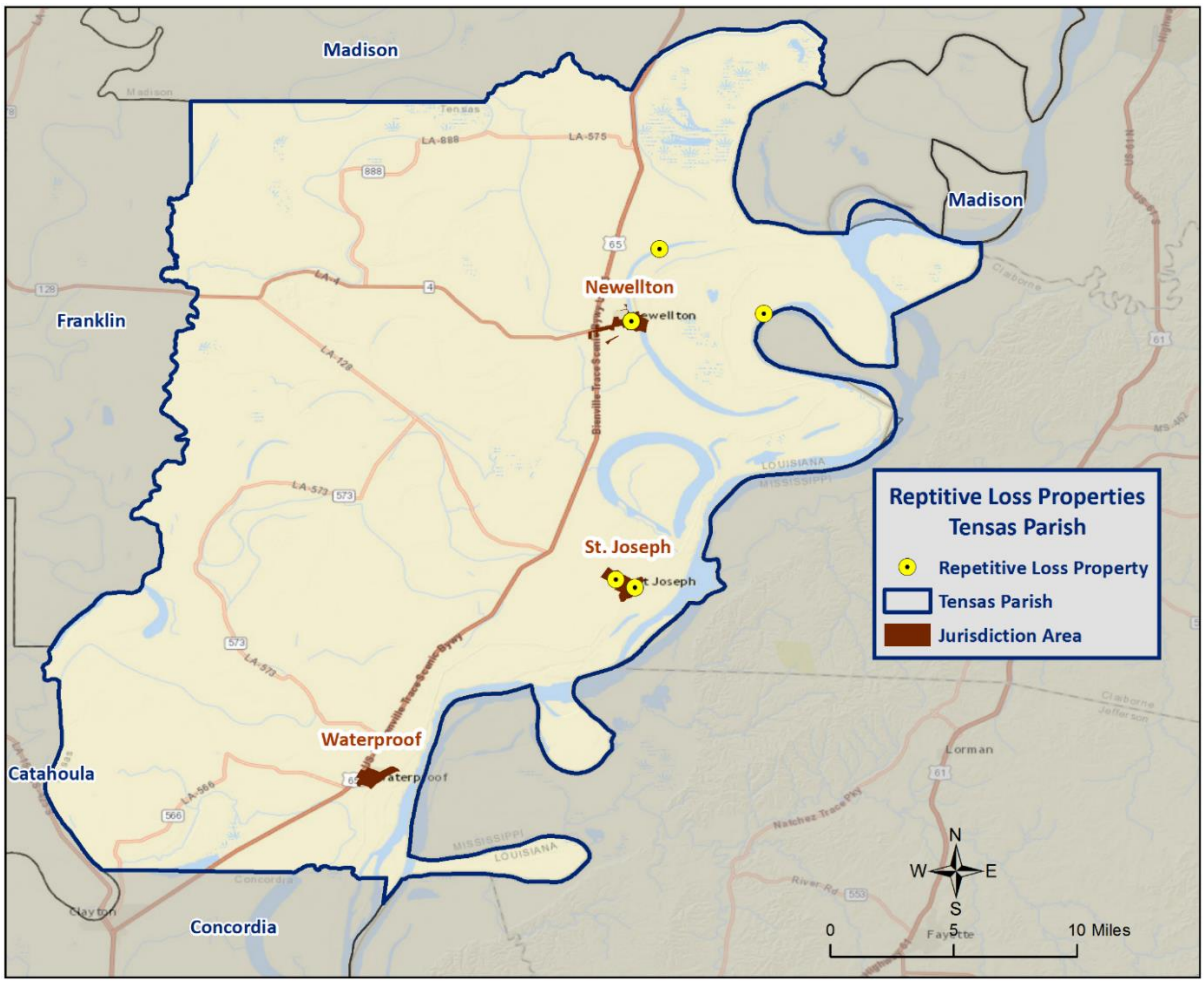

Figure 2-10: Repetitive Loss Properties in Tensas Parish

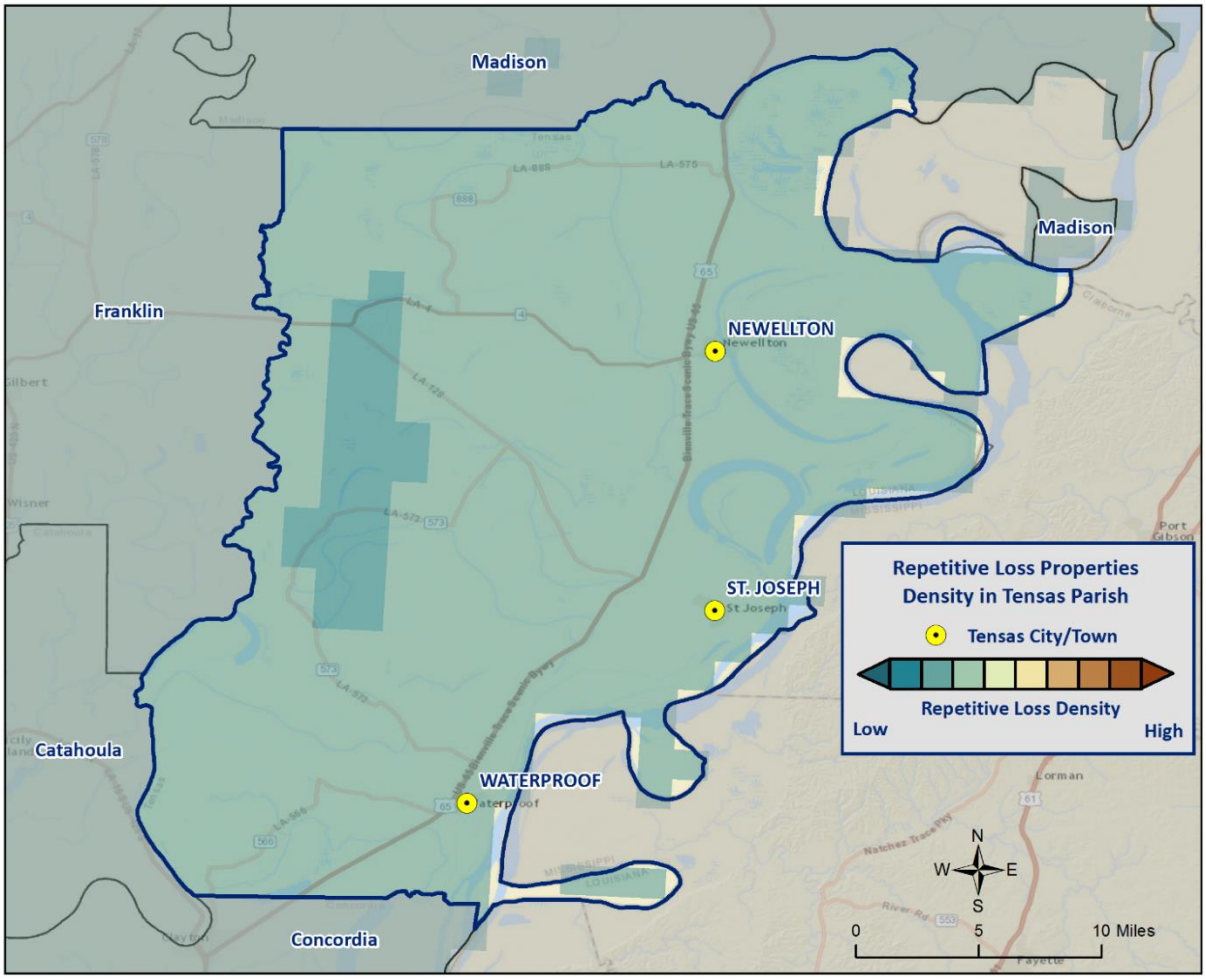

Figure 2-11: Repetitive Loss Property Densities in Tensas Parish

National Flood Insurance Program

Flood insurance statistics indicate that Tensas Parish has 375 flood insurance policies with the NFIP, with total annual premiums of $178,175. Tensas Parish and the incorporated areas of Newellton, St. Joseph, and Waterproof are all participants in the NFIP. Tensas Parish and each of the incorporated jurisdictions will continue to adopt and enforce floodplain management requirements, including regulating new construction Special Flood Hazard Areas, and will continue to monitor activities including local requests for new map updates. Flood insurance statistics and additional NFIP participation details for Tensas Parish are provided in the tables on the following page.

Tensas Parish and the communities listed above will continue their active participation in the NFIP through various education and outreach activities. These activities will include community outreach on the availability of flood insurance within the parish and incorporated municipalities, as well as flood safe building initiatives throughout the parish. The Parish Floodplain Manager will continue to work in coordination with each community to ensure floodplain management regulations are adopted and enforced. The Parish Floodplain Manager will continue to seek and attend floodplain management and NFIP continuing education.

Table 2-18: Summary of NFIP Policies for Tensas parish

Location	No. of Insured Structures	Total Insurance Coverage Value	Annual Premiums Paid	No. of Insurance Claims Filed Since 1978	Total Loss Payments
Tensas Parish (Unincorporated)	311	$77,398,000	$152,709	245	$3,113,896
Newellton	28	$5,642,000	$10,914	25	$397,136
St. Joseph	28	$7,162,000	$11,507	12	$56,277
Waterproof	8	$1,421,000	$3,045	1	$608
Total	375	$91,623,000	$178,175	283	$3,567,917

Table 2-19: Summary of Community Flood Maps for Tensas Parish

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Date Joined the NFIP	Tribal
220215#	Tensas Parish (Unincorporated)	9/6/1974	4/3/1978	4/3/1978	4/3/1978	No
220216#	Newellton	6/14/1974	3/16/1982	3/16/82 (M)	3/16/1982	No
220217	St. Joseph	4/9/1976	-	(NSFHA)	8/26/1977	No
220218	Waterproof	5/24/1974	6/21/1977	11/27/79 (M)	6/21/1977	No

According to the Community Rating System (CRS) list of eligible communities dated June 1, 2014, Tensas Parish and the incorporated areas of Newellton, St. Joseph, and Waterproof do not participate.

Threat to People

Just as with property damage, depth and velocity are major factors in determining the threat posed to people by flooding. It takes very little depth or velocity for flood waters to become dangerous. A car will float in less than two feet of moving water, and can be swept downstream into deeper waters, trapping passengers within the vehicle. Victims of flooding have often put themselves in perilous situations by entering flood waters that they believe to be safe, or by ignoring travel advisories.

Major health concerns are also associated with floods. Flood waters can transport materials such as dirt, oil, animal waste, and chemicals (e.g., farm, lawn, and industrial) that may cause illnesses of various degrees when coming in contact with humans. Flood waters can also infiltrate sewer lines and inundate wastewater treatment plants, causing sewage to backup and creating a breeding ground for dangerous bacteria. This infiltration may also cause water supplies to become contaminated and undrinkable.

Flooding in Tensas Parish

By definition, flooding is caused when an area receives more water than the drainage system can convey. The following is a synopsis of the types of flooding that Tensas Parish experiences.

Flash Flooding: Flash flooding is characterized by a rapid rise in water level, high velocity, and large amounts of debris. It is capable of uprooting trees, undermining buildings and bridges, and scouring new channels.

Major factors in flash flooding are the high intensity and short duration of rainfall, as well as the steepness of watershed and stream gradients.

Local Drainage or High Groundwater Levels: Locally heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable drainage channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems.

Backwater Flooding: Backwater flooding is normally associated with riverine flooding and connotes minimal velocity. All low lying areas are at risk. A heavy rainfall event coupled with a swollen river, canal, bayou, or marsh hinders drainage outflow, causing backwater flooding to the same areas susceptible to storm surge.

Riverine Flooding: Riverine flooding is, by definition, river-based. Most of the riverine flooding problems occur when the Mississippi River crests at flood stage levels, causing extensive flooding in low-lying areas.

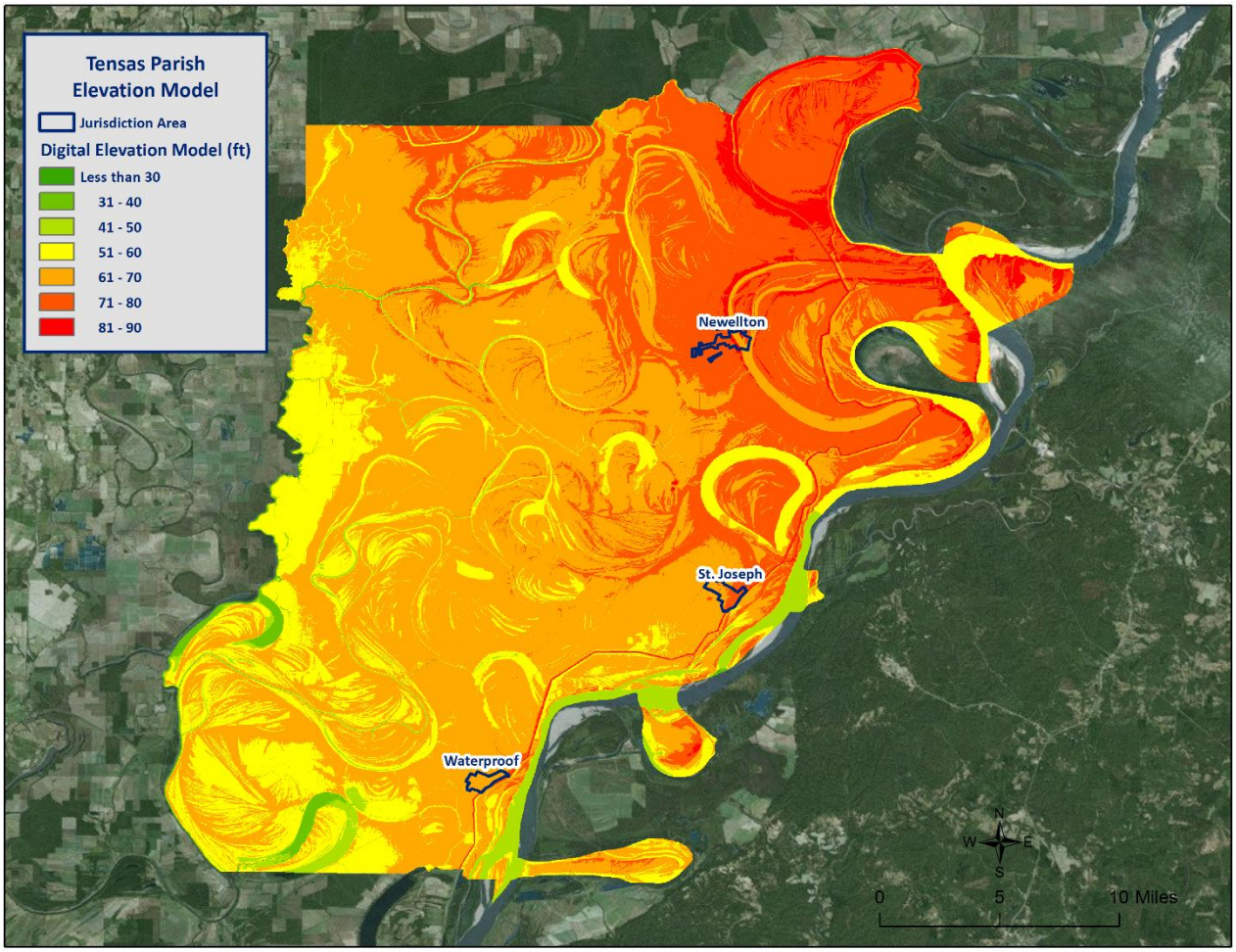

Figure 2-12: Elevation throughout Tensas Parish

Looking at the digital elevation model (DEM) for Tensas Parish in the figure on the previous page is instructive in visualizing where the low lying and high risk areas are for the parish. Elevations in the parish range from less than 30 feet to approximately 90 feet. The highest elevations in the parish are approximately 90 feet, located in the unincorporated areas of the parish. The incorporated areas of Tensas Parish range in elevation from 69 to 79 feet, with the Waterproof averaging 69 feet, St. Joseph averaging 75 feet, and Newellton averaging 79 feet.

Location

Tensas Parish has experienced significant flooding in its history and can expect more in the future. Tensas Parish is bordered to the east by the Mississippi River, which runs along the entire eastern part of the parish. The majority of the flood issues for Tensas Parish are associated with the Mississippi River; however, there are some specific areas of concern within the parish. These areas of concern are the Point Drive area in Newellton, the western drainages of Clarks Bayou, the Lake Bruin area on the western leg of Highway 606, the northwestern boundary of St. Joseph, the Tensas Academy area, and the residential areas in central Waterproof.

The following are enlarged maps of the incorporated areas showing the areas within each jurisdiction that are at risk of flooding:

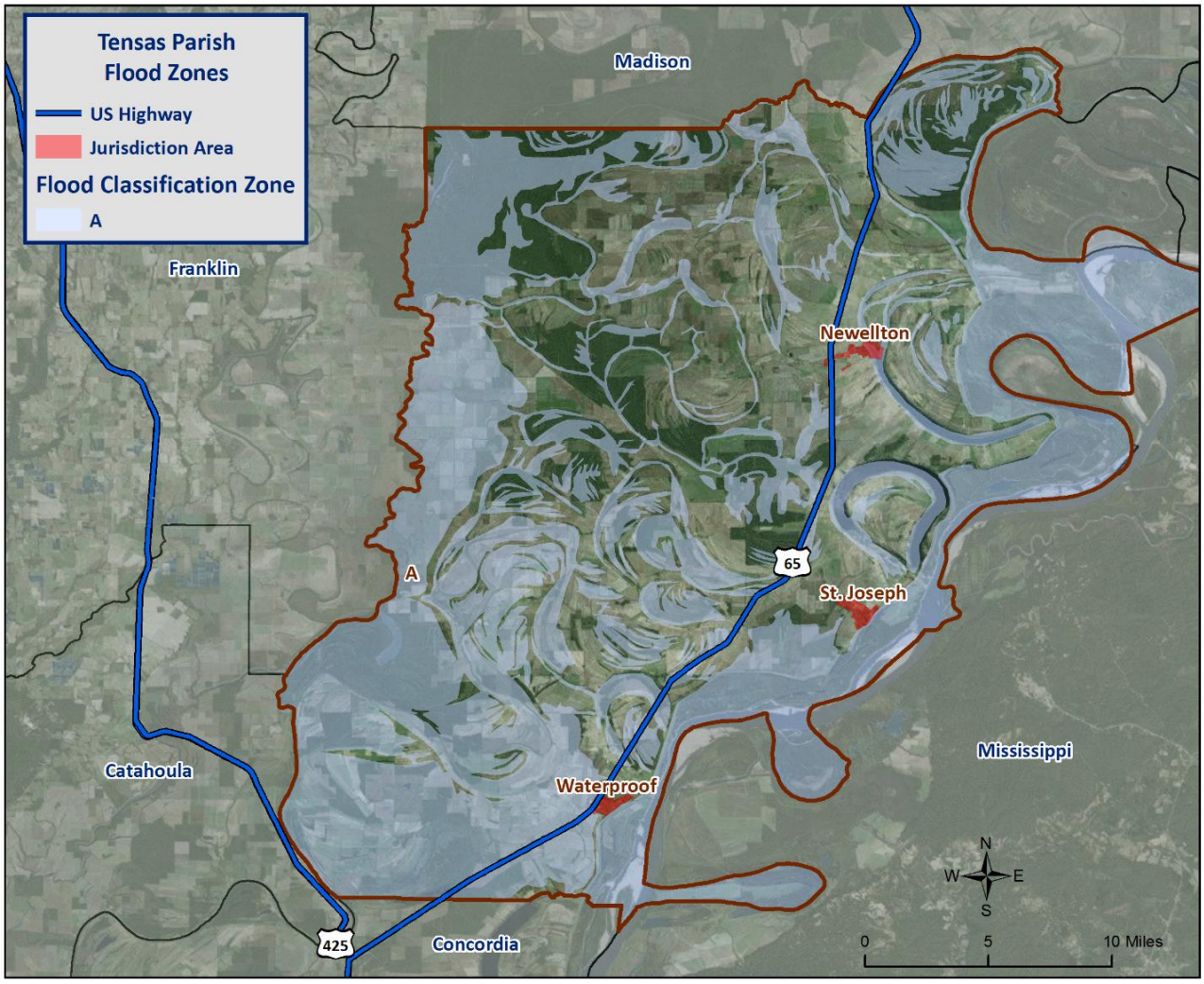

Figure 2-13: Tensas Parish Areas within the Flood Zones

Figure 2-14: Town of Newellton Areas within the Flood Zones

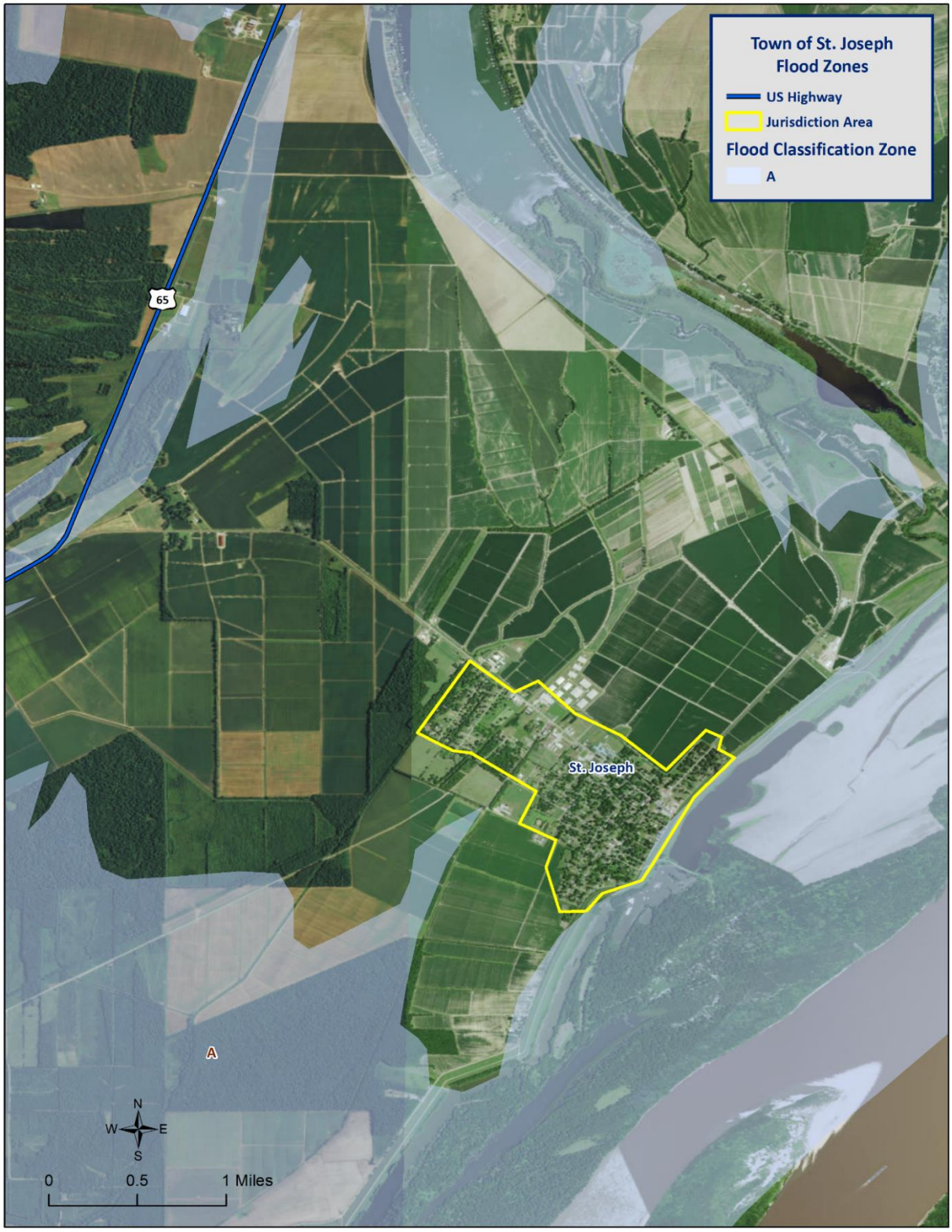

Figure 2-15: Town of St. Joseph Areas within the Flood Zones

Figure 2-16: Town of Waterproof Areas within the Flood Zones

Previous Occurrences / Extents

Historically, there have been 26 flooding events that have created significant flooding in Tensas Parish between 1990 and 2015. Below is a brief synopsis of the eight flooding events that have occurred since 2010, including flooding events that have occurred since the parish's last planning update. Since 2010, there have been no significant flood events in the incorporated area of Waterproof.

Table 2-20: Historical Floods in Tensas Parish with Locations from 2010 - 2015

Date	Extents	Type of Flooding	Estimated Damages	Location
January 20, 2010	Numerous severe storms produced damaging winds, large hail, and flooding. Flooding was reported on Highway 4 near Newellton.	Flash Flood	$5,000	NEWELLTON ARPT
March 9, 2011	A potent storm system combined with abundant moisture brought nearly 24 hours of showers and thunderstorms. A couple streets were under water and closed for a period of time.	Flash Flood	$2,000	ST. JOSEPH
March 29, 2011	Heavy rain caused a few roads to flood, and the flooding caused water to flow out of the banks of a few ditches. Approximately 4.5 inches fell around Newellton.	Flash Flood	$20,000	FRANKLIN
May 8, 2011	Flooding along the Mississippi River caused extensive flooding of low lying farmland around the river. All of the flood waters were within the mainline levee. A Grainery was damaged due to the flood waters, and approximately 70 camps and homes were damaged or destroyed. Damage also occurred to industrial structures and levees along the river.	Flood	$5,000,000	BALMORAL
June 1, 2011	Flooding along the Mississippi River caused extensive flooding of low lying farmland around the river. All of the flood waters were within the mainline levee. The flood waters continued to recede during the first two weeks of June, with significant flooding ending on June 14th.	Flood	$200,000	BALMORAL
February 18, 2012	Heavy rains combined with saturated soil conditions caused flooding of several roads in eastern portions of Tensas Parish. Water was reported across several roads in eastern portions of the Parish.	Flash Flood	$3,000	ST JOSEPH

Date	Extents	Type of Flooding	Estimated Damages	Location
January 10, 2013	A strong disturbance crossing over ArkLaTex initiated several storms west of Interstate 55. Several roads were flooded across the parish.	Flash Flood	$20,000	ST JOSEPH
June 29, 2015	Daytime heating, instability, and good gulf moisture combined together to form a few strong storms across northeast Louisiana. Water covered Highway 573 near the intersection of Highway 892.	Flash Flood	$5,000	DELTA BRIDGE

The worst-case scenarios are based on several different types of flooding events. Storm water excesses and riverine flooding primarily affect the low-lying areas of the parish, and flood depths of up to six feet can be expected in the unincorporated areas of the parish. The incorporated areas of Newellton, St. Joseph, and Waterproof can expect flood depths from three to five feet.

Frequency / Probability

While other parts of this plan, along with the State's Hazard Mitigation Plan, have relied on the SHELDUS database to provide the annual probability, due to Tensas Parish having multiple jurisdictions, it was necessary to assess the historical data found in the National Climatic Data Center for Tensas Parish and its jurisdictions to properly determine probability for future flood events. The table below shows the probability and return frequency for each jurisdiction.

Table 2-21: Annual Flood Probabilities for Tensas Parish

Jurisdiction	Annual Probability	Return Frequency
Tensas Parish (Unincorporated)	64%	1 – 2 years
Newellton	36%	2 – 3 years
St. Joseph	36%	2 – 3 years
Waterproof	28%	3 – 4 years

Based on historical record, the overall flooding probability for the entire Tensas Parish planning area is 100%, with 26 events occurring over a 25-year period.

Estimated Potential Losses

Using the Hazus 2.2 Flood Model, along with the Parish DFIRM, the 100-year flood scenario was analyzed to determine losses from this worst-case scenario. *Table 2-22* shows the total economic losses that would result from this occurrence.

Table 2-22: Estimated Losses in Tensas Parish from a 100-Year Flood Event (Source: Hazus 2.2)

Jurisdiction	Estimated Total Losses from 100-Year Flood Event
Tensas Parish (Unincorporated)	$6,093,000
Newellton	$0
St. Joseph	$0
Waterproof	$0
Total	$6,093,000

The Hazus 2.2 Flood Model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. The losses for each affected jurisdiction by sector are listed in the following tables:

Table 2-23: Estimated 100-Year Flood Losses for Unincorporated Tensas Parish by Sector (Source: Hazus 2.2)

Tensas Parish (Unincorporated)	Estimated Total Losses from 100-Year Flood Event
Agricultural	$49,000
Commercial	$176,000
Government	$28,000
Industrial	$11,000
Religious / Non-Profit	$378,000
Residential	$5,440,000
Schools	$11,000
Total	$6,093,000

Threat to People

The total population within the parish that is susceptible to a flood hazard is shown in the table below:

Table 2-24: Vulnerable Populations Susceptible to a 100-Year Flood Event (Source: Hazus 2.2)

Number of People Exposed to Flood Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
Tensas Parish (Unincorporated)	**2,201**	**712**	**32.3%**
Newellton	**1,187**	**0**	**0%**
St. Joseph	**1,176**	**0**	**0%**
Waterproof	**688**	**0**	**0%**
Total	**5,252**	**712**	**13.6%**

The Hazus 2.2 Flood Model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions in the following tables:

Table 2-25: Vulnerable Populations Susceptible to a 100-Year Flood Event in Unincorporated Tensas Parish (Source: Hazus 2.2)

Tensas Parish (Unincorporated)		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	712	32.3%
Persons Under 5 Years	50	7.0%
Persons Under 18 Years	180	25.3%
Persons 65 Years and Over	123	17.3%
White	311	43.7%
Minority	401	56.3%

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to flooding due to proximity within the 100-year floodplain.

Sinkholes

Sinkholes are areas of ground with no natural external surface drainage. They can vary in size from a few square feet to hundreds of acres, and can reach depths of more than 100 feet. Sinkholes are usually found in karst terrain—that is, areas where limestone, carbonate rock, salt beds, and other water-soluble rocks lie below the Earth's surface. Karst terrain is marked by the presence of other uncommon geologic features, such as springs, caves, and dry streambeds that lose water into the ground. In general, sinkholes form gradually (in the case of cover-subsidence sinkholes), but they can also occur suddenly (in the case of cover-collapse sinkholes).

Sinkhole formation is a very simple process. Whenever water is absorbed through soil, it encounters water-soluble bedrock. The water then begins to dissolve the bedrock, forming sinkholes. The karst rock dissolves along cracks; as the fissures grow, soil and other particles fill the gaps, loosening the soil above the bedrock. *Figure 2-17* illustrates the development of a cover subsidence sinkhole. As the soil sinks from the surface a depression forms, which draws in more water, funneling it down to the water-soluble rock. The increase of water and soil in the rock pushes open the cracks, again drawing more soil and water into it. This positive feedback loop continues, unless clay plugs into the cracks in the bedrock, at which time a pond may form. A sudden cover-collapse sinkhole occurs when the top soil above dissolving bedrock does not sink, but forms a bridge over the soil that is sinking beneath it. As *Figure 2-18* demonstrates, underground soil continues to fill the bedrock fissures, until finally the soil bridge collapses and fills the void beneath it.

Both kinds of sinkholes can occur naturally or through human influence. While sinkholes tend to form naturally in karst areas, sinkholes can form in other geological areas that have been altered by humans, by processes such as mining, sewers, hydraulic fracture drilling, groundwater pumping, irrigation, or storage ponds. In all of these cases, and others, the cause for the sinkhole is that support for surface soil has been weakened or substantially removed.

In the United States, 20% of the land is susceptible to sinkholes. Most of this area lies in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. In Louisiana, most of the sinkholes are precipitated by the human-influenced collapse of salt dome caverns. The collapse of a salt dome is usually a slow process; however, it may occur suddenly and without any advance warning.

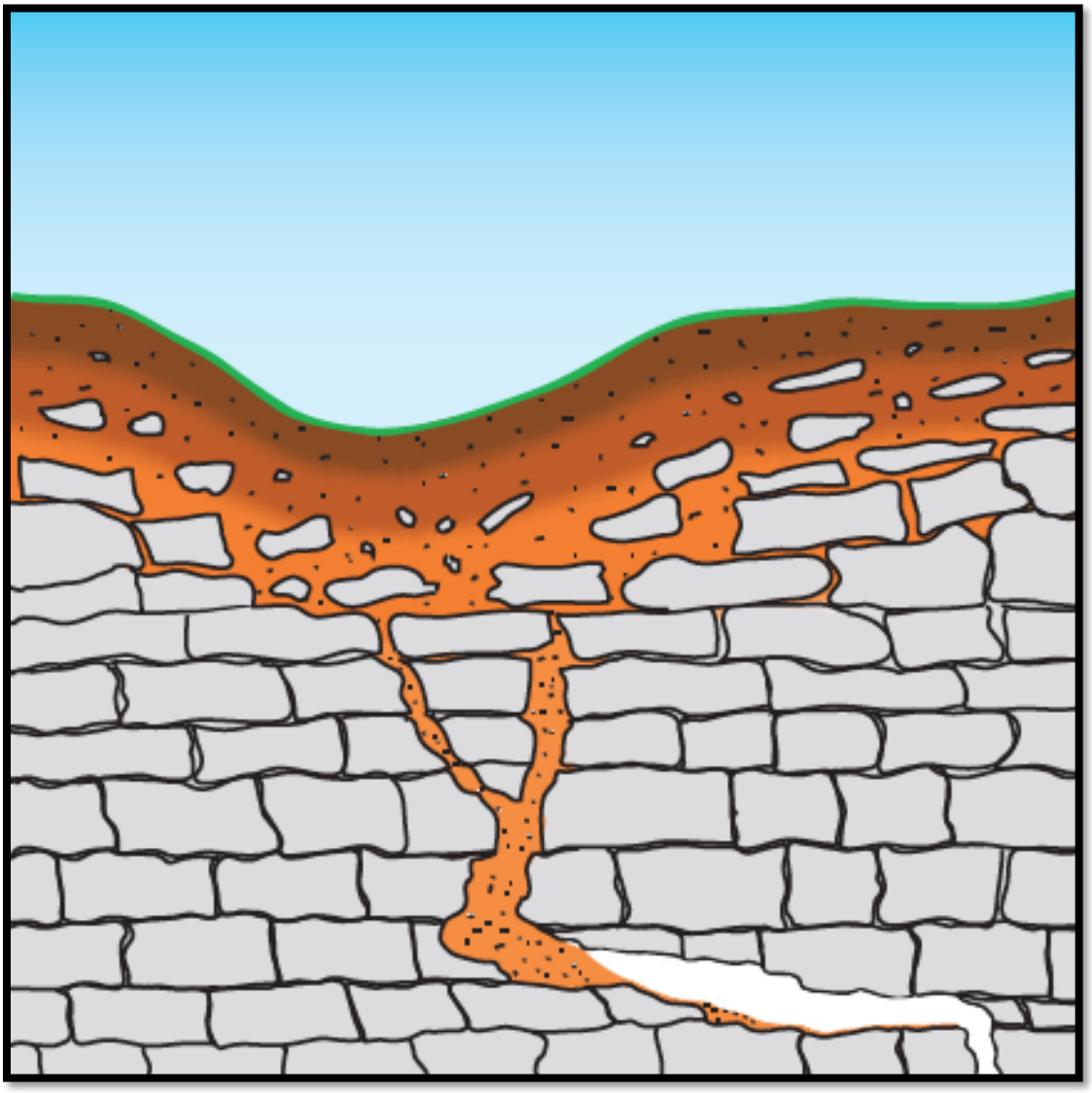

Figure 2-17: Cover-subsidencence Sinkole Formation from the Breaking Apart of Karst Bedrock by Soil Deposit
(Courtesy of USGS Sinkholes Fact Sheet)

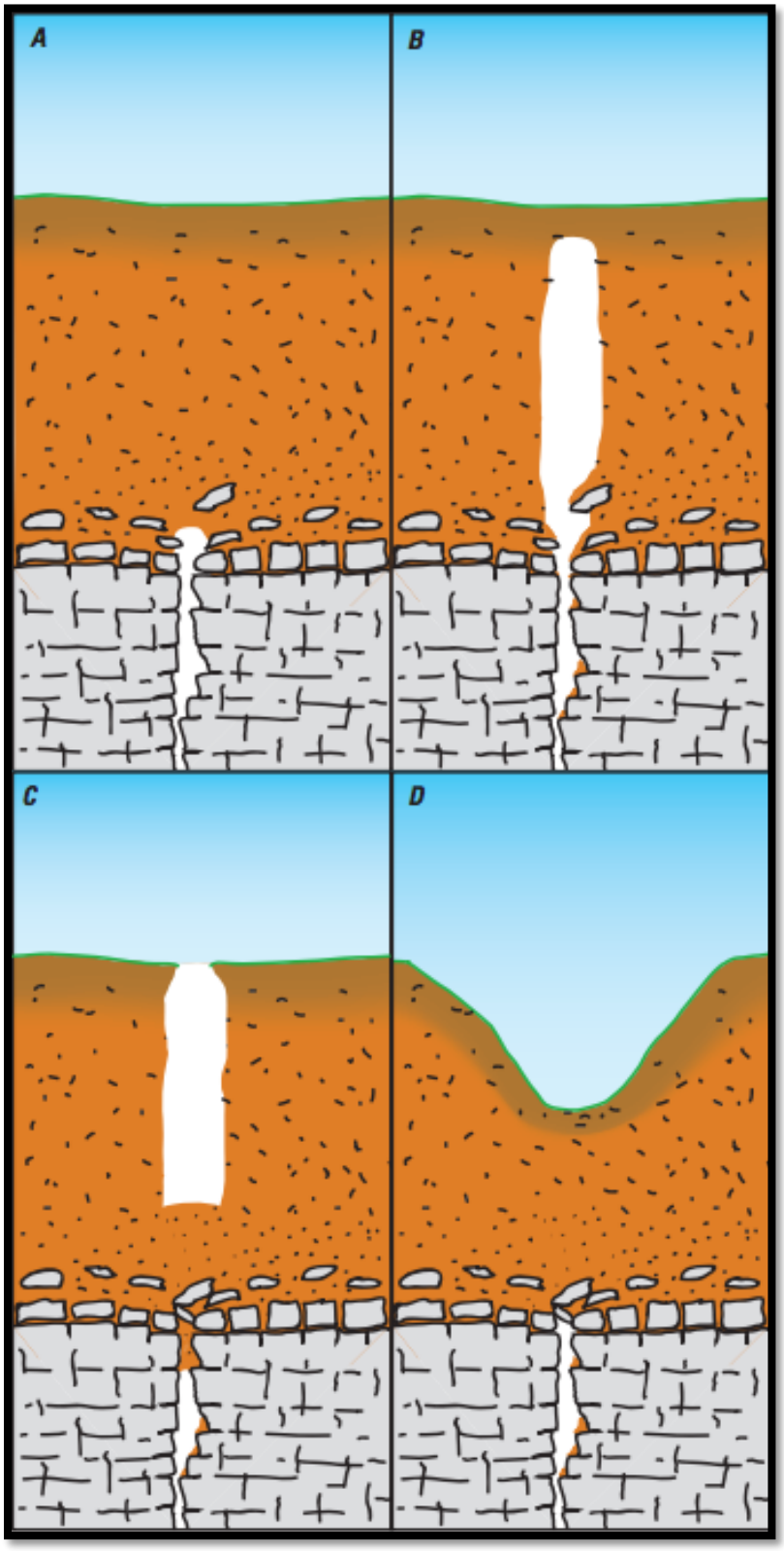

Figure 2-18: Formation of Cover-collapse Sinkhole after a Soil Bridge forms above Dissolving Bedrock (Courtesy of USGS Sinkhole Fact Sheet)

Location

Currently, there are three identifiable salt dome locations in Tensas Parish. In addition, there are three salt domes in which their two mile buffer extends into Tensas Parish. *Figure 2-19* displays the locations of these salt domes with their relative location to the nearest jurisdiction. As depicted in *Figure 2-19*, the sinkholes are dispersed throughout Tensas Parish. While the majority of sinkholes are located in unincorporated areas of the parish, a two mile buffer around Newellton salt dome encompass parts of the incorporated area of Newellton. At this time, there are no sinkholes in or near the incorporated areas of Waterproof and St. Joseph, but the salt domes will continue to be monitored.

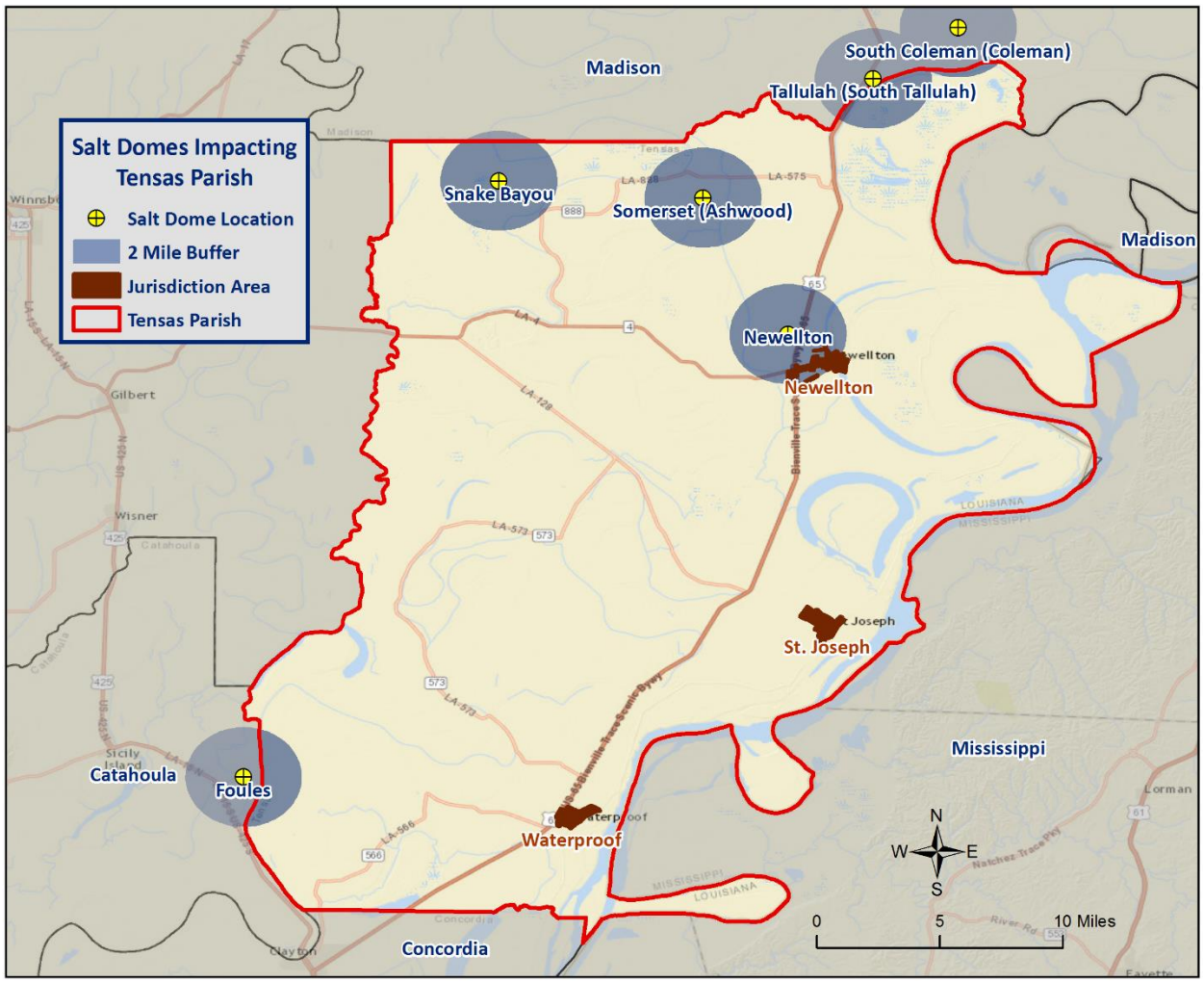

Figure 2-19: Salt Dome Locations in Tensas Parish Relative to Jurisdictions

Previous Occurrences / Extents

There have been no recorded incidents of sinkholes or salt dome collapses in Tensas Parish to date. Based on the State of Louisiana Hazard Mitigation Plan, sinkholes in the planning area would be anticipated to reach up to two square miles in size. At this time, there are no sinkholes in or near the incorporated areas of Waterproof and St. Joseph, but the salt domes will continue to be monitored.

Frequency / Probability

Since there have been no recorded incidents of sinkhole or salt dome collapse in Tensas Parish, the annual chance of occurrence is calculated at less than 1%.

Estimated Potential Losses

All six salt domes were analyzed to determine the number of people and houses that are potentially susceptible to losses from a sinkhole materializing from one of the salt domes. The following table is based on conducting a two mile buffer around the center of the salt dome. The values were determined by querying the 2010 U.S. Census block data to determine the number of houses and people located within two miles of each salt dome. Critical facilities were also analyzed to determine if they fell within the two mile buffer of a salt dome. Total value for all occupancy groups from Hazus 2.2 was used to estimate a total loss of all facilities that were within two miles of a salt dome.

The salt dome that poses the greatest risk to Tensas Parish is the Newellton Salt Dome. The Newellton Salt Dome contains a total of 536 homes and 1,183 people within its two mile buffer. Currently, there are no salt domes or sinkholes located in or near the incorporated areas of St. Joseph and Waterproof.

Table 2-26: Estimated Potential Losses from a Sinkhole Formation
(Source: U.S. 2010 Census Data and Hazus 2.2)

Salt Dome Name	Total Building Exposure	Critical Infrastructure Exposure	Number of People Exposed	Number of Houses Exposed
Foules	$256,000	0	124	63
Newellton	$179,863,000	9	1,183	536
Snake Bayou	$7,305,000	0	6	11
Somerset (Ashwood)	$11,441,000	0	91	89
South Coleman (Coleman)	$189,000	0	6	3
Tallulah (South Tallulah)	$189,000	0	23	43

Vulnerability

See Appendix C for parish and municipality building exposure to a sinkhole hazard.

Thunderstorms

The term "thunderstorm" is usually used as a catch-all term for several kinds of storms. Here, "thunderstorm" is defined to include any precipitation event in which thunder is heard or lightning is seen. Thunderstorms are often accompanied by heavy rain and strong winds, and depending on conditions, occasionally by hail or snow. Thunderstorms form when humid air masses are heated, which causes them to become convectively unstable. Consequently, the air masses rise. Upon rising, the air masses' water vapor condenses into liquid water and/or deposits directly into ice when they rise sufficiently to cool to the dew-point temperature.

Thunderstorms are classified into four main types (single-cell, multi-cell, squall line, and supercell), depending on the degree of atmospheric instability, the change in wind speed with height (called wind shear), and the degree to which the storm's internal dynamics are coordinated with those of adjacent storms. There is no such interaction for single-cell thunderstorms, but there is significant interaction with clusters of adjacent thunderstorms in multi-cell thunderstorms, and with a linear "chain" of adjacent storms in squall line thunderstorms. Though supercell storms have no significant interactions with other storms, they have very well-organized and self-sustaining internal dynamics, which allows them to be the longest-lived and most severe of all thunderstorms.

The life of a thunderstorm proceeds through three stages: the developing (or cumulus) stage, the mature stage, and the dissipation stage. During the developing stage, the unstable air mass is lifted as an updraft into the atmosphere. This sudden lift rapidly cools the moisture in the air mass, releasing latent heat as condensation and/or deposition occurs, which warms the surrounding environment, thus making it less dense than the surrounding air. This process intensifies the updraft and creates a localized lateral rush of air from all directions into the area beneath the thunderstorm to feed continued updrafts. At the mature stage, the rising air is accompanied by downdrafts caused by the shear of falling rain (if melted completely), or hail, freezing rain, sleet, or snow (if not melted completely). The dissipation stage is characterized by the dominating presence of the downdraft as the hot surface that gave the updrafts their buoyancy is cooled by precipitation. During the dissipation stage, the moisture in the air mass largely empties out.

The Storm Prediction Center, in conjunction with the National Weather Service (NWS), has the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued, along with definitions of each:

- *Severe Thunderstorm Watch*: Issued to alert people to the possibility of a severe thunderstorm developing in the area. Expected time frame for these storms is three to six hours.

- *Severe Thunderstorm Warning*: Issued when severe thunderstorms are imminent. This warning is highly localized and covers parts of one to several parishes (counties).

A variety of hazards might be produced by thunderstorms, including lightning, hail, tornadoes or waterspouts, flash flooding, and high-speed winds called downbursts. Nevertheless, given the criteria, the National Oceanic and Atmospheric Administration (NOAA) characterizes a thunderstorm as severe when it produces one or more of the following:

- Hail of one inch in diameter or larger
- Wind gusts to 58 mph or greater
- One or more tornadoes

Tornadoes and flooding hazards have been profiled within this report; therefore, for the purpose of thunderstorms, the sub-hazards of hail, high winds, and lightning will be profiled.

Thunderstorms occur throughout Louisiana at all times of the year, although the types and severity of those storms vary greatly depending on a wide variety of atmospheric conditions. Thunderstorms generally occur more frequently during the late spring and early summer when extreme variations exist between ground surface temperatures and upper atmospheric temperatures.

Hazard Description

Hailstorms

Hailstorms are severe thunderstorms in which balls or chunks of ice fall along with rain. Hail initially develops in the upper atmosphere as ice crystals that are bounced about by high-velocity updraft winds. The ice crystals grow through deposition of water vapor onto their surface. They then fall partially to a level in the cloud where the temperature exceeds the freezing point, melt partially, and then get caught in another updraft whereupon re-freezing and deposition grows another concentric layer of ice. After several trips up and down the cloud, they develop enough weight to fall. The size of hailstones varies depending on the severity and size of the thunderstorm. Higher surface temperatures generally mean stronger updrafts, which allow more massive hailstones to be supported by updrafts, leaving them suspended longer. This longer suspension time results in larger hailstone sizes. The tables on the following page display the TORRO Hailstorm Intensity Scale, along with a spectrum of hailstone diameters and their everyday equivalents.

Table 2-27: TORRO Hailstorm Intensity Scale

Intensity Category		Hail Diameter (mm)	Probable Kinetic Energy	Typical Damage Impacts
H0	Hard Hail	5	0 - 20	No damage
H1	Potentially Damaging	5 - 15	>20	Slight general damage to plant, crops
H2	Significant	10 - 20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20 - 30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25 - 40	>500	Widespread glass damage, vehicle body work
H5	Destructive	30 - 50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40 - 60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50 - 75		Severe roof damage, risk of serious injuries
H8	Destructive	60 - 90		Severe damage to aircraft bodywork
H9	Super Hailstorms	75 - 100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Table 2-28: Spectrum of Hailstone Diameters and their Everyday Description (Source: National Weather Service)

Spectrum of Hailstone Diameters	
Hail Diameter Size	**Description**
1/4”	Pea
1/2”	Plain M&M
3/4”	Penny
7/8”	Nickle
1” (severe)	Quarter
1 1/4”	Half Dollar
1 1/2”	Ping Pong Ball / Walnut
1 3/4”	Golf Ball
2”	Hen Egg / Lime
2 1/2"	Tennis Ball
2 3/4"	Baseball
3”	Teacup / Large Apple
4”	Softball
4 1/2"	Grapefruit
4 3/4” – 5”	Computer CD-DVD

Hailstorms can cause widespread damage to structures, automobiles, and crops. While the damage to individual structures or vehicles is often minor, the cumulative cost to communities, especially across large metropolitan areas, can be quite significant. Hailstorms can also be devastating to crops. Thus, the severity of hailstorms depends on the size of the hailstones, the length of time the storm lasts, and where it occurs.

Hail rarely causes loss of life, although large hailstones can cause bodily injury.

High Winds

In general, high winds can occur in a number of different ways, within and without thunderstorms. The Federal Emergency Management Agency (FEMA) distinguishes these as shown in the following table.

Table 2-29: High Winds Categorized by Source, Frequency, and Duration (Source: Making Critical Facilities Safe from High Wind, FEMA)

High Winds Categories			
High Wind Type	**Description**	**Relative Frequency in Louisiana**	**Relative Maximum Duration in Louisiana**
Straight-line Winds	Wind blowing in straight line; usually associated with intense low-pressure area	High	Few minutes – 1 day
Downslope Winds	Wind blowing down the slope of a mountain; associated with temperature and pressure gradients	N/A	N/A
Thunderstorm Winds	Wind blowing due to thunderstorms, and thus associated with temperature and pressure gradients	High (especially in the spring and summer	Few minutes – several hours
Downbursts	Sudden wind blowing down due to downdraft in a thunderstorm; spreads out horizontally at the ground, possibly forming horizontal vortex rings around the downdraft	Medium-to-High(~5% of all thunderstorms)	~15 – 20 minutes
Northeaster (nor'easter) Winds	Wind blowing due to cyclonic storm off the east coast of North America; associated with temperature and pressure gradients between the Atlantic and land	N/A	N/A
Hurricane Winds	Wind blowing in spirals, converging with increasing speed toward eye; associated with temperature and pressure gradients between the Atlantic and Gulf and land	Low-to-Medium	Several days
Tornado Winds	Violently rotating column of air from base of a thunderstorm to the ground with rapidly decreasing winds at greater distances from center; associated with extreme temperature gradient	Low-to-Medium	Few minutes – few hours

The only high winds of present concern are thunderstorm winds and downbursts. Straight-line winds are common but are a relatively insignificant hazard (on land) compared to other high winds. Downslope winds are common but relatively insignificant in the hilly areas of Louisiana where they occur. Nor'easters are cyclonic events that have at most a peripheral effect on Louisiana, and none associated with high winds. Winds associated with hurricanes and tornadoes will be considered in their respective sections.

The following table presents the Beaufort Wind Scale, first developed in 1805 by Sir Francis Beaufort, which aids in determining relative force and wind speed based on the appearance of wind effects.

Table 2-30: Beaufort Wind Scale
(Source: NOAA's SPC)

Beaufort Wind Scale			
Force	**Wind (MPH)**	**WMO Classification**	**Appearance of Wind Effects on Land**
			Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Twigs breaking off trees, generally impedes progress
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	54-73	Violent Storm	N/A
12	74+	Hurricane	N/A

Major damage directly caused by thunderstorm winds is relatively rare, while minor damage is common and pervasive, and most noticeable when it contributes to power outages. These power outages can have major negative impacts such as increased tendency for traffic accidents, loss of revenue for businesses, increased vulnerability to fire, food spoilage, and other losses that might be sustained by a loss of power. Power outages may pose a health risk for those requiring electric medical equipment and/or air conditioning.

Lightning

Lightning is a natural electrical discharge in the atmosphere that is a by-product of thunderstorms. Every thunderstorm produces lightning. There are three primary types of lightning: intra-cloud, cloud-to-ground, and cloud-to-cloud. Cloud-to-ground lightning has the potential to cause the most damage to property and crops, while also posing as a health risk to the populace in the area of the strike.

Damage caused by lightning is usually to homes or businesses. These strikes have the ability to damage electrical equipment inside the home or business, and can also ignite a fire that could destroy homes or crops.

Lightning continues to be one of the top three storm-related killers in the United States per FEMA, but it also has the ability to cause negative long-term health effects to the individual that is struck. The following table outlines the lightning activity level that is a measurement of lightning activity.

Table 2-31: Lightning Activity Level (LAL) Grids

LAL	Cloud and Storm Development	Lightning Strikes/15 Min
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation. 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.	>25
6	Similar to LAL 3 except thunderstorms are dry	

Hazard Profile

Hailstorms

Location

Because hailstorms are a climatological based hazard, the entire planning area for Tensas Parish is equally at risk for hailstorms.

Previous Occurrences / Extents

The SHELDUS database reports nine significant hailstorm events occurring within the boundaries of Tensas Parish between the years of 1990-2015. According to the National Climatic Data Center, hailstorm diameters experienced in Tensas Parish have ranged from 0.75 inches to 2.75 inches since 1990. The most frequently recorded hail size has been 1.75 inch diameters. Based on the National Climatic Data Center dataset, *Table 2-32* provides an overview of hailstorms that have impacted the Tensas Parish planning area since 2010. *Figure 2-20* displays the density of hailstorms in Tensas Parish and adjacent parishes. Tensas Parish can expect to experience hail up to 2.75 inches in diameter for future events. Since 2010, there have been no significant hailstorm events in Newellton, St. Joseph, and Waterproof.

Table 2-32: Previous Occurrences of Hailstorms in Tensas Parish (Source: NCDC)

Date	Recorded Hail Size (inches)	Location
March 29, 2011	2	NEW LIGHT

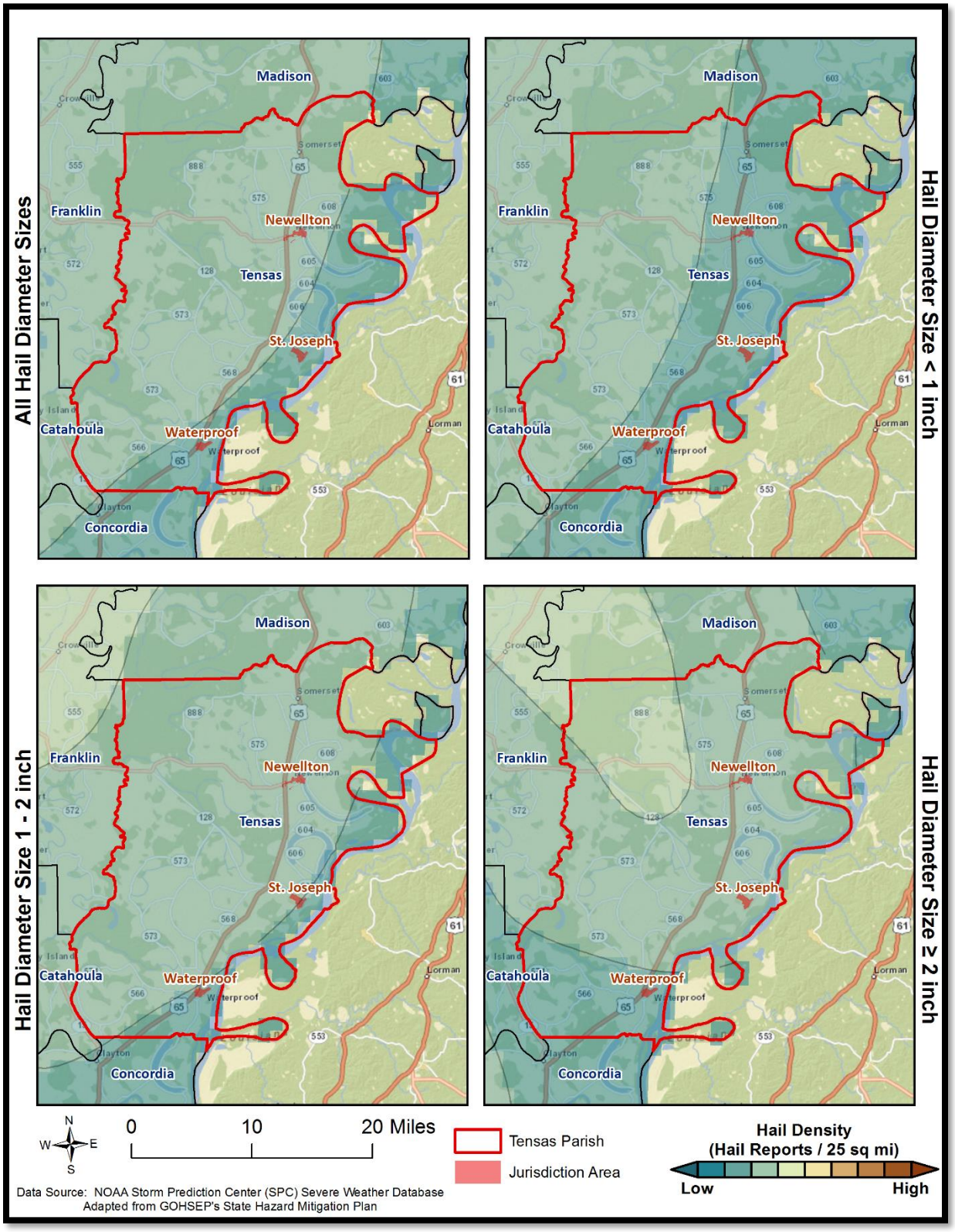

Figure 2-20: Density of Hailstorms by Diameter from 1950-2012
(Source: State of Louisiana Hazard Mitigation Plan 2014)

Frequency

Based on historical data from SHELDUS for the past 25 years, it is estimated the probability of occurrence for a significant hailstorm event is approximately 36%. The probability was determined based on a review of significant hail data that has caused damages in the last 25 years, in which Tensas Parish has had nine recorded events.

Estimated Potential Losses

According to the SHELDUS database, property damage due to hailstorms in Tensas Parish have totaled approximately $1,024,179 since 1990. A list of total damages by event can be found in *Table 2-33*. To estimate the potential losses of a hail event on an annual basis, the total damages recorded for wind events was divided by the total number of years of available wind data in SHELDUS (1990 – 2015). This provides an annual estimated potential loss of $40,967. *Table 2-34* provides an estimate of potential property losses for Tensas Parish.

Table 2-33: Property Damage Caused by Hailstorms in Tensas Parish (Source: SHELDUS)

Date	Property Damage
January 1999	$7,105
March 2003	$2,573
February 2006	$704,571
May 2006	$94,943
June 2008	$5,498
March 2011	$210,489

Table 2-34: Estimated Annual Property Losses in Tensas Parish from Hailstorms

Estimated Annual Potential Losses from Hailstorms for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	Newellton (22.6% of Population)	St. Joseph (22.4% of Population)	Waterproof (13.1% of Population)
$17,168	$9,259	$9,173	$5,367

There have been no deaths or injuries due to hailstorms from 1990 – 2015 in Tensas Parish.

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to hailstorms.

High Winds

Location

Because high winds are a climatological based hazard, the entire planning area for Tensas Parish is equally at risk for high winds.

Previous Occurrences / Extents

The SHELDUS database reports a total of 81 thunderstorm wind events occurring within the boundaries of Tensas Parish between the years of 1990 to 2015. The significant thunderstorm wind events experienced in Tensas Parish have ranged in wind speed from 58 mph to 98 mph. Tensas Parish can expect to receive thunderstorm winds up to 98 mph for future high wind events. The table below provides an overview of significant high wind events over the last five years:

Table 2-35: Previous Occurrences for Thunderstorm High Wind Events

Location	Date	Recorded Wind Speed (mph)	Property Damage	Crop Damage
ST JOSEPH LAKE	November 29, 2010	58	$0	$0
SOMERSET	December 31, 2010	60	$0	$0
NEWELLTON	April 15, 2011	69	$31,611	$0
NEWELLTON	April 27, 2011	61	$5,268	$0
ST JOSEPH LAKE	June 3, 2011	58	$10,537	$0
BALMORAL	July 13, 2011	58	$3,161	$0
WATERPROOF	April 2, 2012	58	$10,323	$0
TENSAS BLUFF	May 20, 2012	58	$8,259	$0
HELENA	May 31, 2012	58	$25,808	$0
NEWELLTON	June 11, 2012	63	$7,226	$0
NEW LIGHT	June 12, 2012	58	$4,129	$0
ST JOSEPH LAKE	August 9, 2012	63	$8,259	$0
NEW LIGHT	August 9, 2012	63	$8,259	$0
LAKE BRUIN LAKE	December 20, 2012	58	$15,485	$0
ST JOSEPH LAKE	January 30, 2013	75	$101,743	$0
AZUCENA	February 12, 2013	63	$25,436	$0
ST JOSEPH	March 31, 2013	58	$15,261	$0
ST JOSEPH	June 28, 2013	63	$10,174	$0
LAKE BRUIN	July 14, 2013	58	$10,174	$0
WILSONIA	March 28, 2014	66	$15,018	$0
ST JOSEPH	March 28, 2014	60	$15,018	$0
NEWELLTON	April 8, 2014	63	$6,007	$0
NEWELLTON	April 28, 2014	58	$0	$0
NEWELLTON	June 9, 2014	61	$6,007	$0
ST JOSEPH	June 9, 2014	69	$300,356	$0
WATERPROOF	May 29, 2015	60	$20,000	$0

Frequency

High winds are a fairly common occurrence within Tensas Parish, with an annual chance of occurrence calculated at 100%.

Estimated Potential Losses

Since 1990, there have been 81 significant wind events that have resulted in property damages according to the SHELDUS database. The total property damages associated with those storms have totaled $1,465,976. To estimate the potential losses of a wind event on an annual basis, the total damages recorded for wind events was divided by the total number of years of available wind data in SHELDUS (1990 – 2015). This provides an annual estimated potential loss of $58,639. The following table provides an estimate of potential property losses for Tensas Parish:

Table 2-36: Estimated Annual Property Losses in Tensas Parish Resulting from High Winds

Estimated Annual Potential Losses from Thunderstorm Winds for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	Newellton (22.6% of Population)	St. Joseph (22.4% of Population)	Waterproof (13.1% of Population)
$24,574	$13,253	$13,130	$7,682

There has been one reported injury and no fatalities as a result of a thunderstorm wind event over the 25-year record.

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to high winds.

Lightning

Location

Like hail and high winds, lightning is a climatological based hazard and has the same probability of occurring throughout the entire planning area for Tensas Parish.

Previous Occurrences / Extents

The SHELDUS database reports a total of one lightning event occurring within the boundaries of Tensas Parish between the years of 1990-2015. The SHELDUS database only records lightning events that cause death, injuries, crop damage, and/or property damage, so these numbers do not accurately reflect the number of lightning events in Tensas Parish, which occur on a nearly monthly basis. The planning area can expect to have a lightning density of 11-12 flashes per sq. mile per year. The table on the next page provides an overview of significant lightning strikes over the last five years.

Table 2-37: Previous Occurrences of Significant Lightning Strikes in Tensas Parish from 2010 – 2015 (Source: NCDC and SHELDUS)

Location	Date	Summary	Property Damage
LAKE BRUIN	June 28, 2011	A home was struck by lightning along Lake Bruin resulting in a fire. The house sustained only minor damage.	$21,049

Since 2010, there have been no lightning events that have caused property damage or loss of life in the incorporated areas of Newellton, St. Joseph, and Waterproof.

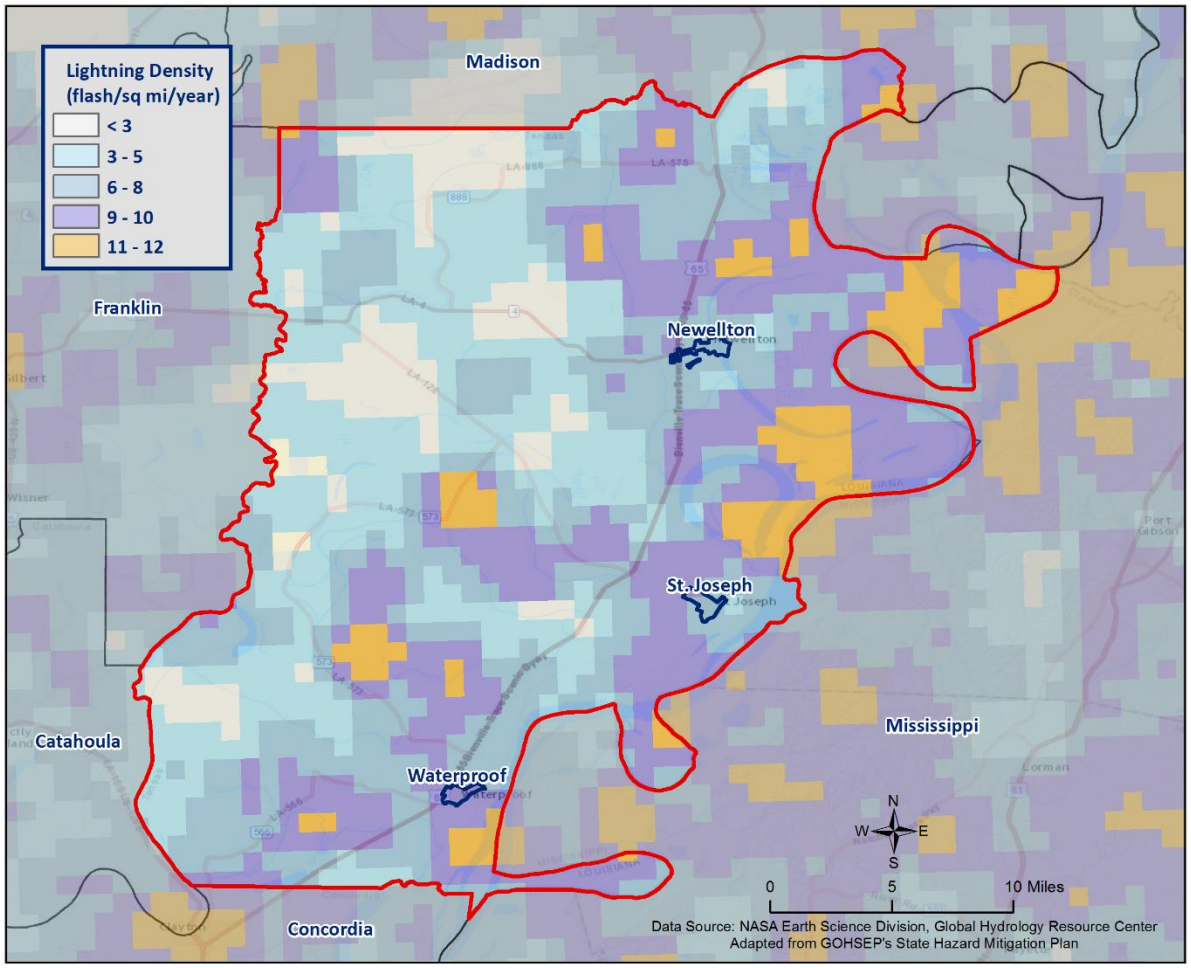

Figure 2-21: Lightning Density Reports for Tensas Parish

Frequency

Lightning can strike anywhere and is produced by every thunderstorm, so the chance of lightning occurring in Tensas Parish is high. However, lightning that meets the definition that is used by SHELDUS and the NCDC that actually results in damages to property and injury or death is a less likely event. According to SHELDUS, there has been one lightning event that has caused property damages or injuries over the last 25 years, establishing an annual probability of 4%.

Estimated Potential Losses

Since 1990, there has been one significant lightning event that has resulted in property damages according to the SHELDUS database. The total property damages associated with lightning events totaled $21,049. To estimate the potential losses of a lightning event on an annual basis, the total damages recorded for lightning events was divided by the total number of years of available major lightning strike data in SHELDUS (1990 – 2015). This provides an annual estimated potential loss of $842. The following table provides an estimate of potential property losses for Tensas Parish:

Table 2-38: Estimated Annual Property Losses in Tensas Parish from Lightning

Estimated Annual Potential Losses from Lightning for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	**Newellton (22.6% of Population)**	**St. Joseph (22.4% of Population)**	**Waterproof (13.1% of Population)**
$353	$190	$189	$110

There have been no reported injuries or fatalities in Tensas Parish as a result of a lightning strikes over the 25-year record.

Vulnerability

See Appendix C for parish and municipality building exposure to lightning hazards.

Tornadoes

Tornadoes (also called twisters or cyclones) are rapidly rotating funnels of wind extending between storm clouds and the ground. For their size, tornadoes are the most severe storms, and 70% of the world's reported tornadoes occur within the continental United States, making them one of the most significant hazards Americans face. Tornadoes and waterspouts form during severe weather events, such as thunderstorms and hurricanes, when cold air overrides a layer of warm air, causing the warm air to rise rapidly. This usually results in a counterclockwise rotation in the northern hemisphere. The updraft of air in tornadoes always rotates because of wind shear (differing speeds of moving air at various heights), and it can rotate in either a clockwise or counterclockwise direction; clockwise rotations (in the northern hemisphere) will sustain the system, at least until other forces cause it to die seconds to minutes later.

Since February 1, 2007, the Enhanced Fujita (EF) Scale has been used to classify tornado intensity. The EF Scale classifies tornadoes based on their damage pattern rather than wind speed; wind speed is then derived and estimated. This contrasts with the Saffir-Simpson scale used for hurricane classification, which is based on measured wind speed. *Table 2-39* shows the EF scale in comparison with the old Fujita (F) Scale, which was used prior to February 1, 2007. When discussing past tornadoes, the scale used at the time of the hazard is used. Damage and adjustment between scales can be made using the following tables.

Table 2-39: Comparison of the Enhanced Fujita (EF) Scale to the Fujita (F) Scale

	Enhanced Fujita Scale					
	EF0	**EF1**	**EF2**	**EF3**	**EF4**	**EF5**
Wind Speed (mph)	65-85	86-110	111-135	136-165	166-200	>200
	Fujita Scale					
	F0	**F1**	**F2**	**F3**	**F4**	**F5**
	<73	73-112	113-157	158-206	207-260	>261

Table 2-40: Fujita and Enhanced Fujita Tornado Damage Scale

Scale	Typical Damage
F0/EF0	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1/EF1	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2/EF2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; light-object missiles generated; cars lifted off ground.
F3/EF3	Severe damage. Roofs and some walls torn of well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4/EF4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5/EF5	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

The National Weather Service (NWS) has the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued, along with definitions of each:

- *Tornado Watch*: Issued to alert people to the possibility of a tornado developing in the area. A tornado has not been spotted but the conditions are favorable for tornadoes to occur.

- *Tornado Warning*: Issued when a tornado has been spotted or when radar identifies a distinctive "hook-shaped" area within a thunderstorm line.

Structures within the direct path of a tornado vortex are often reduced to rubble. Structures adjacent to the tornado's path are often severely damaged by high winds flowing into the tornado vortex, known as inflow winds. It is here, adjacent to the tornado's path, that the building type and construction techniques are critical to the structure's survival. Although tornadoes strike at random, making all buildings vulnerable, mobile homes, homes with crawlspaces, and buildings with large spans are more likely to suffer damage.

The major health hazard from tornadoes is physical injury from flying debris, or being in a collapsed building or mobile home. Within a building, flying debris or projectiles are generally stopped by interior walls. However, if a building has no partitions, any glass, brick, or other debris blown into the interior is life threatening. Following a tornado, damaged buildings are a potential health hazard due to instability, electrical system damage, and gas leaks. Sewage and water lines may also be damaged.

Peak tornado activity in Louisiana occurs during the spring, as it does in the rest of the United States. Nearly one-third of observed tornadoes in the United States occur during April. About half of those in Louisiana, including many of the strongest, occur between March and June. Fall and winter tornadoes are less frequent, but the distribution of tornadoes throughout the year is more uniform in Louisiana than in locations farther north.

Location

While there is a significant tornado record in Tensas Parish with actual locations, tornadoes in general are a climatological based hazard and have the same approximate probability of occurring in Tensas Parish as all of its jurisdictions. Because a tornado has a similar probability of striking anywhere within the planning area for Tensas Parish, all jurisdictions are equally at risk for tornadoes.

Previous Occurrences / Extents

SHELDUS reports a total of 12 tornadoes or waterspouts occurring within the boundaries of Tensas Parish between the years of 1990-2015. The tornadoes experienced in Tensas Parish have from ranged EF0 to EF3 on the EF scale, and ranged from F0 to F3 on the F scale. The worst case scenario Tensas Parish can expect in the future is an EF2 tornado.

The tornado that caused the most damage to property occurred on April 4, 2011. The tornado first touched down along Highway 573 just south of Cooter Point. The tornado tracked northeast across Lake Bruin and traveled north before crossing the southern end of Lake St. Joseph. The tornado ended in Claiborne County, Mississippi. Numerous homes, farms, and outbuildings were significantly damaged by the tornado. Much of the damage to the homes was to the roofs with many being blown off. A water treatment plant received major damage and an antebellum home also received significant damage. A grain silo received a huge dent

from the tornado and an 18 wheeler was flipped over. Hundreds of trees were snapped and uprooted along the path and numerous power poles were snapped. One injury was noted northwest of St. Joseph. Maximum winds were around 125 mph.

Table 2-41: Historical Tornadoes in Tensas Parish with Locations from 1989-2014

Date	Impacts	Property Damage	Location	Magnitude
December 21, 1990	1 mile path with a width of 75 yards. Caused considerable timber damage and destroyed a small number of hunting camps near Newellton.	$906	UNINCORPORATED AREA	F1
December 21, 1990	18 mile path with a width of 300 yards. A significant amount of timber was destroyed along with several hunting camps.	$9,056	UNINCORPORATED AREA	F3
November 21, 1992	38 mile path with a width of 200 yards. Destroyed a mobile home, partially destroyed eight homes, and injured six people.	$332,358	UNINCORPORATED AREA	F3
November 21, 1992	16 mile path with a width of 100 yards. Blew down many trees, destroyed three barns, and heavily damaged four buildings. Heavily damaged five homes and destroyed several outbuildings.	$33,236	UNINCORPORATED AREA	F2
March 7, 1995	1 mile path with a width of 40 yards. Destroyed four houses and damaged seventeen others. A woman suffered a broken hip and arm. Schools were closed in Newellton due to no electricity.	$0	NEWELLTON	F2
January 21, 1999	14 mile path with a width of 440 yards. A combined fifty house trailers and houses were completely destroyed. Hundreds of trees were downed or snapped off. A metal fishing boat was wrapped around a tree. Many cotton hoppers were flipped over several times. Vehicles were thrown 250 to 300 feet, one of which was left suspended in a tree.	$710,492	NEW LIGHT	F3
November 8, 2000	16 mile path with a width of 600 yards. Completely destroyed a mobile home. Four houses were heavily damaged, including a brick home. Several people in the brick home received minor injuries. Several deer camps were heavily damaged or destroyed. Several farm buildings sustained damage.	$206,216	COOTER POINT	F2

Date	Impacts	Property Damage	Location	Magnitude
December 12, 2001	0.2 mile path with a width of 30 yards. No damage to structures was reported, but a few trees and powerlines were knocked down.	$1,337	NEWELLTON	F0
September 24, 2005	11 mile path with a width of 100 yards. Destroyed a church by blowing it off its pillars and depositing it into a tree across the highway. Also hit the “Thunderbird House” where it wrapped a john boat in a tree like tin foil and destroyed a large barn in the back yard. The house had its second story torn off and was moved four feet with two of the side walls being torn off.	$1,212,166	WATERPROOF	F3
May 10, 2006	2 mile path with a width of 50 yards. Caused minor damage to three buildings and uprooted or damaged several trees.	$70,457	NEWELLTON	F0
October 15, 2009	0.75 mile path with a width of 75 yards. An EF0 tornado caused a mobile home to roll over. The south and west sides of a metal commercial building were blown out along with some roof tiles. A back door was blown out of another building.	$66,208	OSCEOLA	EF0
April 4, 2011	26.23 mile path with a width of 880 yards. Numerous homes, farms, and outbuildings were significantly damaged. A water treatment plant received major damage and an antebellum home also received significant damage. A grail silo received a huge dent and an 18 wheeler was flipped over. One injury was noted.	$4,209,781	COOTER POINT	EF2

The incorporated areas of Newellton, St. Joseph, and Waterproof have not experienced a tornado event from 2010 to the present. Since 2010, the year in which the last update to this hazard mitigation plan was written, Tensas Parish has had one tornado touch down in the unincorporated areas of the parish. The following is a brief synopsis of this event:

April 4, 2011 – EF2 Tornado in Cooter Point

The tornado first touched down along Highway 573 just south of Cooter Point. The tornado tracked northeast across Lake Bruin and traveled north before crossing the southern end of Lake St. Joseph. The tornado ended in Claiborne County, Mississippi. Numerous homes, farms, and outbuildings were significantly damaged by the tornado. Much of the damage to the homes was to the roofs with many being blown off. A water treatment plant received major damage and an antebellum home also received significant damage. A grain silo received a huge dent from the tornado and an 18 wheeler was flipped over. Hundreds of trees were snapped and uprooted along the path and numerous power poles were snapped. One injury was noted northwest of St. Joseph. Maximum winds were around 125 mph.

Frequency / Probability

Tornadoes are a sporadic occurrence within Tensas Parish, with an annual chance of occurrence calculated at 48% based on the records for the past 25 years (1990-2015). The figure on the next page displays the density of tornado touch downs in Tensas Parish and neighboring parishes.

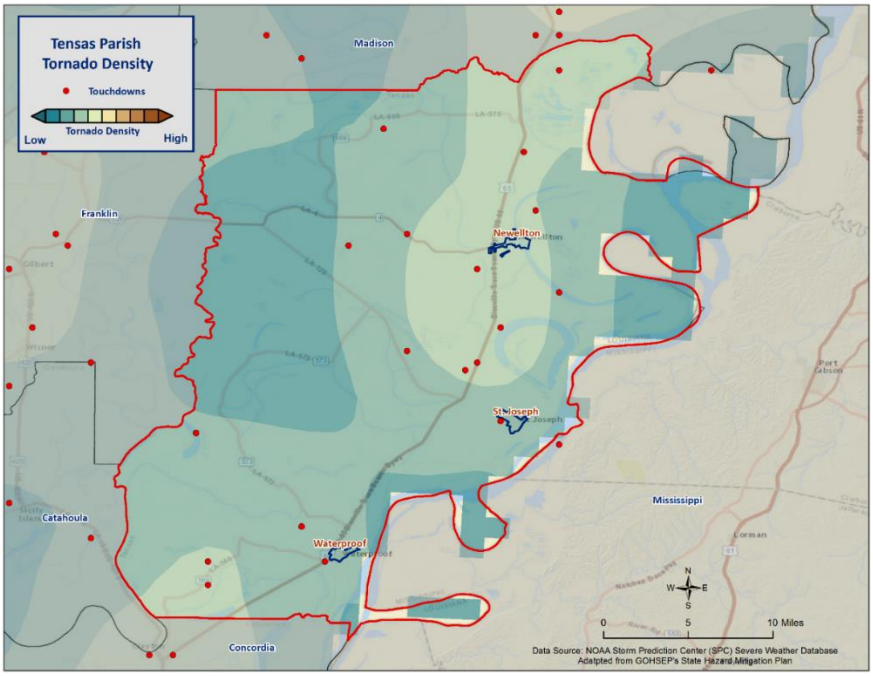

Figure 2-22: Location and Density of Tornadoes to Touchdown in Tensas Parish (Source: NOAA/SPC Severe Weather Database)

Estimated Potential Losses

According to the SHELDUS database, there have been 12 tornadoes that have caused some level of property damage. The total damage from the actual claims for property is $6,852,214, with an average cost of $571,018 per tornado strike. When annualizing the total cost over the 25-year record, total annual loses based on tornadoes are estimated to be $274,089. To provide an estimated annual estimated potential loss per jurisdiction, the 2010 Census population was used to assign the estimated potential losses proportionally

across the jurisdictions. Based on the 2010 Census data, the following table provides an annual estimate of potential losses for Tensas Parish.

Table 2-42: Estimated Annual Losses from Tornadoes in Tensas Parish

Estimated Annual Potential Losses from Tornadoes for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	Newellton (22.6% of Population)	St. Joseph (22.4% of Population)	Waterproof (13.1% of Population)
$114,865	$61,947	$61,372	$34,905

Table 2-43 presents an analysis of building exposure that is susceptible to tornadoes by general occupancy type for Tensas Parish, along with the percentage of building stock that are mobile homes.

Table 2-43: Building Exposure by General Occupancy Type for Tornadoes in Tensas Parish (Source: FEMA's Hazus 2.2)

Building Exposure by General Occupancy Type for Tornadoes Exposure Types ($1,000)							
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Mobile Homes (%)
746,228	121,630	28,752	40,870	36,750	13,433	13,428	16.4%

The parish has suffered through a total of four days in which tornadoes or waterspouts have accounted for ten injuries and no fatalities during this 25-year period (*Table 2-44*). The average number of injuries per event for Tensas Parish is 0.83 per tornado, with an average of 0.40 per year for the 25-year period.

Table 2-44: Tornadoes in Tensas Parish by Magnitude that Caused Injuries or Deaths

Date	Magnitude	Deaths	Injuries
November 11, 1992	F3	0	6
March 7, 1995	F2	0	1
September 24, 2005	F3	0	2
April 4, 2011	EF2	0	1

In assessing the overall risk to population, the most vulnerable population throughout the parish are those residing in manufacturing housing. Approximately 16.4% of all housing in Tensas Parish consists of manufactured housing. Based on location data collected in a previous hazard mitigation project, there no identifiable locations of mobile home parks in Tensas Parish. Manufactured housing is more likely to sustain damage from a tornado than any other residential structure. However, this does not influence the risk associated with a tornado event since they strike at random, making all structures and population within the planning area equally vulnerable.

Vulnerability

See Appendix C for parish and municipality building exposure to tornado hazards.

Tropical Cyclones

Tropical cyclones are among the worst hazards that Louisiana faces. These spinning, low-pressure air masses draw surface air into their centers and attain strength ranging from weak tropical waves to the most intense hurricanes. Usually, these storms begin as clusters of oceanic thunderstorms off the western coast of Africa, moving westward in the trade wind flow. The spinning of these thunderstorm clusters begins because of the formation of low pressure in a perturbation in the westerly motion of the storms associated with differential impacts of the Earth's rotation. The west-moving, counterclockwise-spinning collection of storms, now called a tropical disturbance, may then gather strength as it draws humid air toward its low-pressure center. This results in the formation of a tropical depression (defined when the maximum sustained surface wind speed is 38 mph or less), then a Tropical Cyclone (when the maximum sustained surface wind ranges from 39 mph to 73 mph), and finally a hurricane (when the maximum sustained surface wind speeds exceed 73 mph). On the next page, *Table 2-45* presents the Saffir-Simpson Hurricane Wind Scale, which categorizes tropical cyclones based on sustained winds.

Table 2-45: Saffir-Simpson Hurricane Wind Scale

Saffir-Simpson Hurricane Wind Scale			
Category	**Sustained Winds**	**Pressure**	**Types of Damage Due to Winds**
Tropical Depression	<39 mph	N/A	N/A
Tropical Cyclone	39-73 mph	N/A	N/A
1	74-95 mph	>14.2 psi	Very dangerous winds will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallow-rooted trees may be toppled, especially after the soil becomes waterlogged. Extensive damage to power lines and poles will likely result in power outages that could last several days.
2	96-110 mph	14-14.2 psi	Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallow-rooted trees will be snapped or uprooted, especially after the soil becomes waterlogged, and block numerous roads. Near total power loss is expected, with outages that could last from several days to weeks.
3	111-129 mph	13.7 -14 psi	Devastating damage will occur. Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, especially after the soil becomes waterlogged, blocking numerous roads. Electricity and water may be unavailable for several days to weeks after the storm passes.
4	130-156 mph	13.3-13.7 psi	Catastrophic damage will occur. Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, especially after the soil becomes waterlogged, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 mph or higher	<13.7 psi	Catastrophic damage will occur. A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks to months.

Many associated hazards can occur during a hurricane, including heavy rains, flooding, high winds, and tornadoes. A general rule of thumb in coastal Louisiana is that the number of inches of rainfall to be expected from a tropical cyclone is approximately 100 divided by the forward velocity of the storm in mph; so a fast-moving storm (20 mph) might be expected to drop five inches of rain while a slow-moving (5 mph) storm could produce totals of around 20 inches. However, no two storms are alike, and such generalizations have limited utility for planning purposes. Hurricane Beulah, which struck Texas in 1967, spawned 115 confirmed tornadoes. In recent years, extensive coastal development has increased the storm surge resulting from these storms so much that this has become the greatest natural hazard threat to property and loss of life in the state. Storm surge is a temporary rise in sea level generally caused by reduced air pressure and strong onshore winds associated with a storm system near the coast. Although storm surge can technically occur at any time of the year in Louisiana, surges caused by hurricanes can be particularly deadly and destructive. Such storm surge events are often accompanied by large, destructive waves (exceeding ten meters in some places) that can inflict a high number of fatalities and economic losses. In 2005, Hurricane Katrina clearly demonstrated the destructive potential of this hazard, as it produced the highest modern-day storm surge levels in the State of Louisiana, reaching up to 18.7 feet near Alluvial City in St. Bernard Parish.

Property can be damaged by the various forces that accompany a tropical cyclone. High winds can directly impact structures in three ways: wind forces, flying debris, and pressure. By itself, the force of the wind can knock over trees, break tree limbs, and destroy loose items, such as television antennas and power lines. Many things can be moved by high winds. As winds increase, so does the pressure against stationary objects. Pressure against a wall rises with the square of the wind speed. For some structures, this force is enough to cause failure. The potential for damage to structures is increased when debris breaks the building “envelope” and allows the wind pressure to impact all surfaces (the building envelope includes all surfaces that make up the barrier between the indoors and the outdoors, such as the walls, foundation, doors, windows, and roof). Mobile homes and buildings in need of maintenance are most subject to wind damage. High winds mean bigger waves. Extended pounding by waves can demolish any poorly or improperly designed structures. The waves also erode sand beaches, roads, and foundations. When foundations are compromised, the building will collapse.

Nine out of ten deaths during hurricanes are caused by storm surge flooding. Falling tree limbs and flying debris caused by high winds have the ability to cause injury or death. Downed trees and damaged buildings are a potential health hazard due to instability, electrical system damage, broken pipelines, chemical releases, and gas leaks. Sewage and water lines may also be damaged. Salt water and fresh water intrusions from storm surge send animals, such as snakes, into areas occupied by humans.

Location

Hurricanes are the single biggest threat to all of Louisiana. With any single hurricane having the potential to devastate multiple parishes at once, the risk of a tropical cyclone has the probability of impacting anywhere within the planning area for Tensas Parish. As such, all jurisdictions are equally at risk for tropical cyclones.

Previous Occurrences / Extents

The central Gulf of Mexico coastline is among the most hurricane-prone locations in the United States, and hurricanes can affect every part of the state. The SHELDUS database reports a total of four tropical cyclone events occurring within the boundaries of Tensas Parish between the years 2002 and 2015 (*Table 2-46*). The tropical cyclone events experienced in Tensas Parish include depressions, storms, and hurricanes. As a worst case scenario, Tensas Parish can expect to experience hurricanes at the Category 1 level in the future.

Table 2-46: Historical Tropical Cyclone Events in Tensas Parish from 2002- 2014 (Source: SHELDUS)

Date	Name	Storm Type At Time of Impact
August 29, 2005	Katrina	Hurricane – Category 1
September 24, 2005	Rita	Tropical Storm
September 1, 2008	Gustav	Tropical Storm
August 29, 2012	Isaac	Tropical Storm

Hurricane Katrina (2005)

Hurricane Katrina was one of the strongest and most destructive hurricanes on record to impact the coast of the United States. The National Hurricane Center ranked Katrina as the costliest storm (both before and after adjusting for inflation) and the third deadliest in the U.S. since 1851. The hurricane initially made landfall in Plaquemines Parish on August 29, 2005, as a Category 3 storm and continued on a north-northeast track, with a second landfall occurring near the Louisiana- Mississippi border. Hurricane Katrina caused widespread devastation along the central Gulf Coast states. Following the passage of Katrina, the flooding of New Orleans was catastrophic, resulting in the displacement of more than 250,000 people.

In Tensas Parish, total damage was minimal compared to the devastation found in coastal Louisiana and Mississippi. Katrina's eastward track and weakening over land reduced peak wind speeds to 55 mph in neighboring Madison Parish.

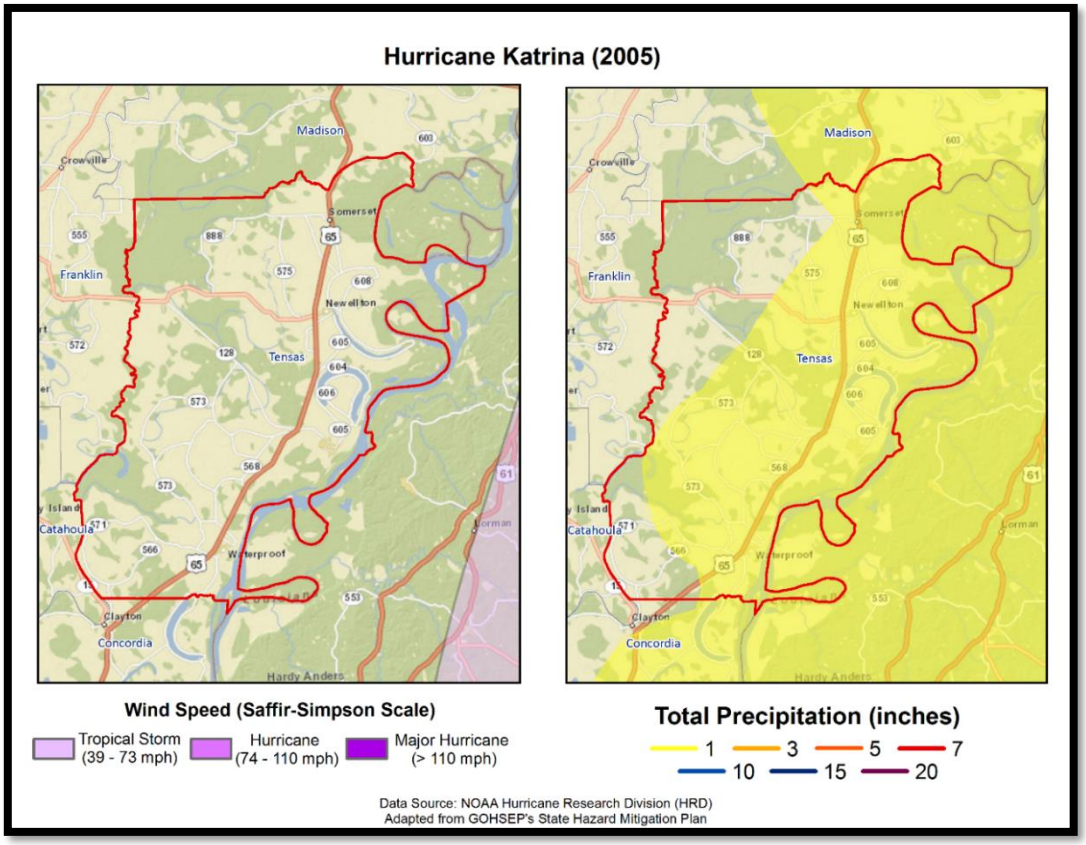

Figure 2-23: Wind Speed and Precipitation Totals in Tensas Parish for Hurricane Katrina

Hurricane Rita (2005)

While Hurricane Katrina and resulting levee failures captured headlines worldwide, lesser known (but just as destructive) Hurricane Rita wreaked havoc on southwestern Louisiana less than a month later. The storm made landfall as a Category 3 hurricane in Cameron Parish. Across southeast Louisiana, the main effect from Hurricane Rita was the substantial storm surge flooding that occurred in low lying communities across coastal areas of southern Terrebonne, southern Lafourche, and southern Jefferson Parishes, where numerous homes and businesses were flooded. Some of the most substantial damage occurred in southern Terrebonne Parish, where storm surge of five to seven feet above normal overtopped or breached local drainage levees, inundating many small communities. Newspaper accounts indicated that approximately 10,000 structures were flooded in Terrebonne Parish. Lafitte and other communities in lower Jefferson Parish also suffered extensive storm surge flooding. Storm surge flooding also occurred in areas adjacent to Lake Pontchartrain and Lake Maurepas, affecting homes and businesses from Slidell to Mandeville and Madisonville. Approximately 1,500 structures were reported as flooded in Livingston Parish near Lake Maurepas. Repaired levees damaged by Hurricane Katrina in late August were overtopped or breached along the Industrial Canal in New Orleans, resulting in renewed flooding in adjacent portions of New Orleans and St. Bernard Parish. However, the flooding was much more limited in scope than during Hurricane Katrina.

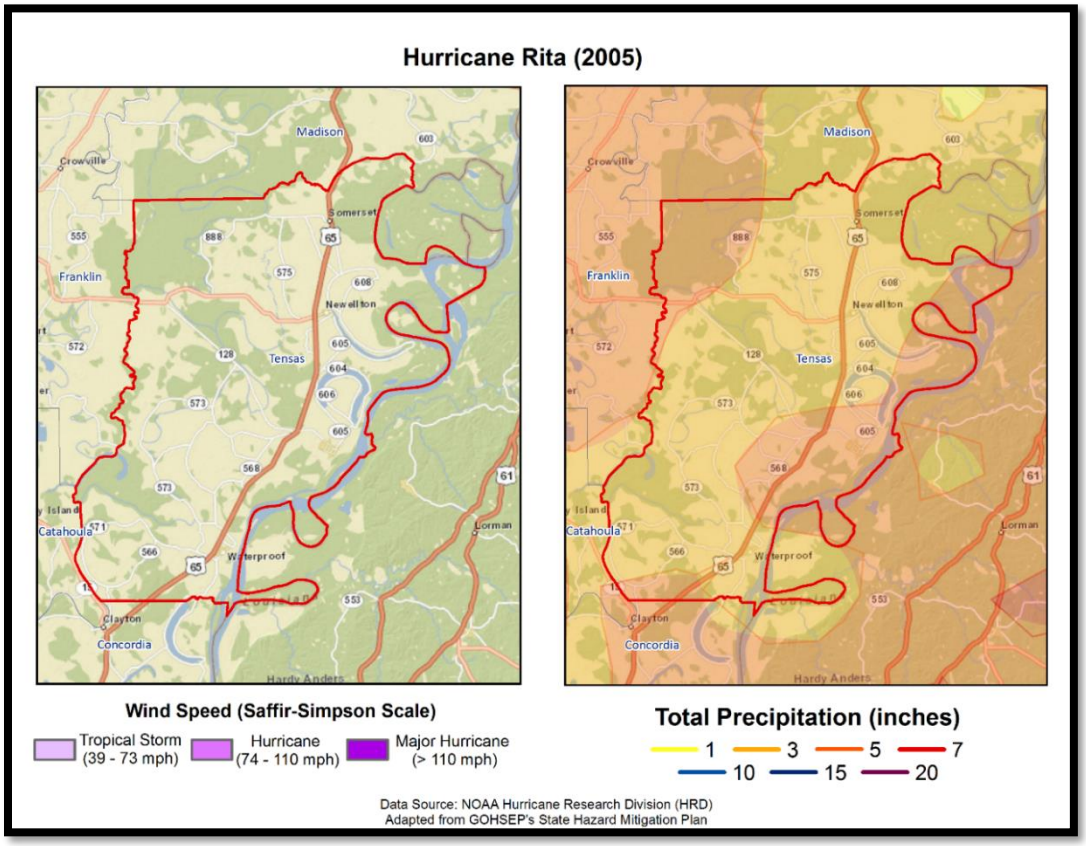

Figure 2-24: Wind Speed and Precipitation Totals in Tensas Parish for Hurricane Rita

Hurricane Rita was the most powerful hurricane to impact southwestern Louisiana since Hurricane Audrey in 1957. Estimated damages in southwest Louisiana totaled near $4 billion, with the majority of those losses occurring in Cameron and Calcasieu Parishes. Entire towns were destroyed in Cameron Parish, including downtown Cameron, Creole, Holly Beach, and Grand Chenier. An estimated 90 to 95 percent of the homes

in the parish were severely damaged or destroyed. Storm surge values were estimated around 15 feet in parts of Cameron Parish.

In Tensas Parish, Hurricane Rita produced maximum sustained winds of 35 mph with gusts up to 42 mph. However, rainfall totals reached or exceeded seven inches in places across the parish. St. Joseph Research Station recorded a total of 6.90 inches alone. One F3 tornado spawned in Tensas Parish as a result of Hurricane Rita.

Hurricane Gustav (2008)

Hurricane Gustav entered the southeast Gulf of Mexico as a major Category 3 hurricane on August 31, 2008, after developing in the Caribbean Sea and moving across western Cuba. Gustav tracked northwestward across the Gulf toward Louisiana and made landfall as a Category 2 hurricane near Cocodrie, Louisiana, during the morning of September 1st. Gustav continued to move northwest across south Louisiana and weakened to a Category 1 storm over south central Louisiana later that day. The storm diminished to a tropical depression over northwestern Louisiana on September 2nd.

The highest wind gust recorded was 117 mph (102 kts) at a USGS site at the Houma Navigational Canal and at the Pilot Station East C-MAN near the Southwest Pass of the Mississippi River. The highest sustained wind of 91 mph was recorded at the Pilot's Station East C-MAN site. However, due to the failure of equipment at some observation sites during the storm, higher winds may have occurred. The minimum sea level pressure measured was 951.6 millibars at a USGS site at Caillou Lake, southwest of Dulac, and 954.5 millibars at the LUMCON facility near Dulac. Rainfall varied considerably across southeast Louisiana, ranging from around four inches to just over 11 inches.

Gustav produced widespread wind damage across southeast Louisiana, especially in the area from Houma and Thibodaux through the greater Baton Rouge area. Hurricane force wind gusts occurred also across the inland areas, including the Baton Rouge area and surrounding parishes. A peak wind gust of 91 mph was recorded at the Baton Rouge (Ryan Field) Airport at 1:12 PM CST. This was only one mph less than the highest wind gust recorded during Hurricane Betsy in 1965. After the storm, the electric utility serving most of southeast Louisiana reported 75 to 100 percent of utility customers were without power, in areas ranging from Lafourche and Terrebonne Parishes northwest through the Baton Rouge area to central Louisiana and southwest Mississippi. Considerable damage occurred to many houses and structures as large tree limbs and trees were toppled by the hurricane force winds. Preliminary estimates from the American Red Cross indicated that around 13,000 single family dwellings were damaged by the hurricane in southeast Louisiana, and several thousand more apartments and mobile homes were also damaged. Early estimates from Louisiana Economic Development indicated that Gustav caused at least $4.5 billion in property damage in Louisiana, including insured and uninsured losses.

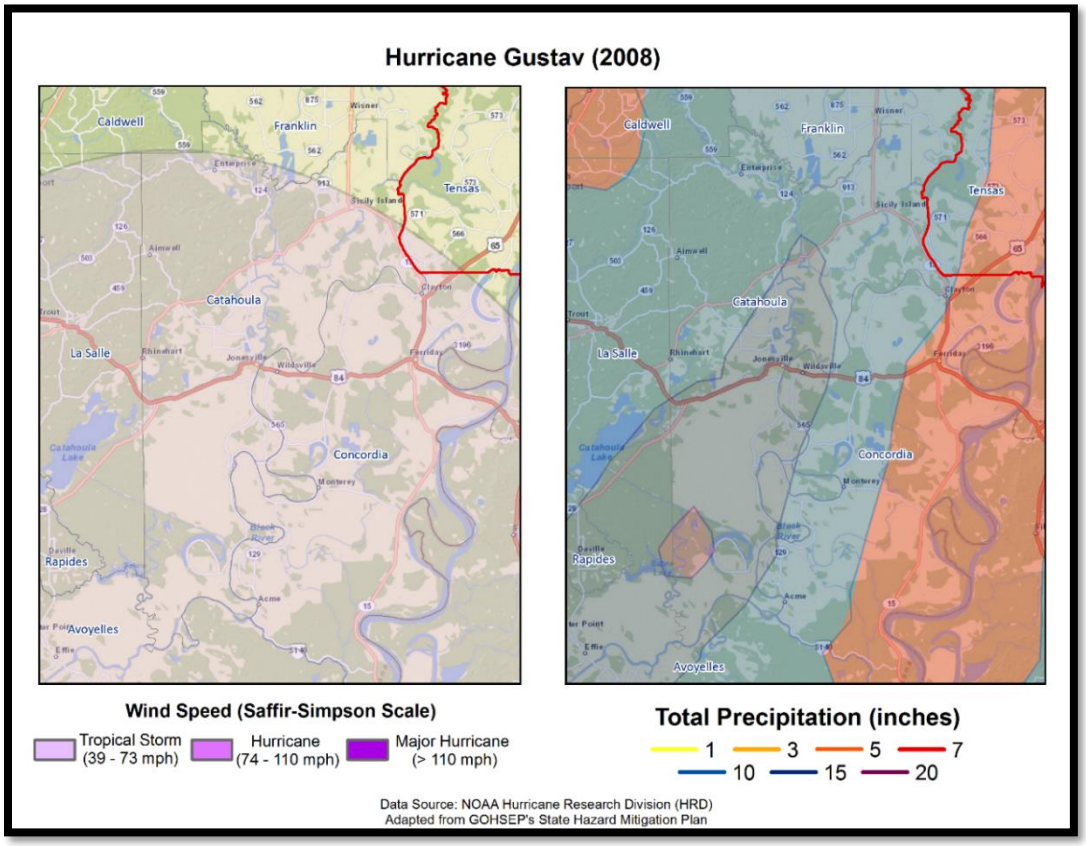

Figure 2-25: Wind Speed and Precipitation Totals in Tensas Parish for Hurricane Gustav

Tropical storm force winds occurred across Tensas Parish as the outer edges of Hurricane Gustav moved across southern and central Louisiana. Numerous trees and power lines were blown down. Tree damage was widespread across the parish as wind gusts peaked between 50 and 60 mph for several hours. Many roads were blocked by downed trees and the power outages were extensive. Sustained winds were around 40 mph.

Hurricane Isaac (2012)

Tropical Depression Nine formed in the Atlantic, east of the Lesser Antilles, on the morning of August 21, 2012. Twelve hours later, Tropical Depression Nine had strengthened into Tropical Storm Isaac. Isaac continued to track through the eastern Caribbean Sea and Florida Straits while maintaining high end tropical storm strength. Just before noon central time on the 28th, Isaac was located about 75 miles south-southeast of the mouth of the Mississippi River(or about 160 miles southeast of New Orleans) and was found to have reached hurricane strength with winds of 75 mph. An outer rain band from Isaac brought some showers to portions of the ArkLaMiss during the afternoon of the 28th, while the center of Isaac was still churning in the Gulf of Mexico. At 6:45pm on August 28th, Hurricane Isaac made a brief landfall along the coast of Southeast Louisiana in Plaquemines Parish. Maximum sustained winds were 80mph at this landfall. Isaac did not remain over land for long as he was back over water again by 9:00pm that same evening. Isaac made his second landfall along the coast of southeast Louisiana, just to the west of Port Fourchon, around 2:15am August 29th, again with maximum sustained winds of 80 mph.

Isaac moved very slowly to the north and northwest over the course of August 29th, which made for prolonged impacts. Forward motion of about 5 mph led to tremendous flooding issues for both Louisiana and portions of Mississippi south of I-20. Around noon on August 29th, Isaac was downgraded to a Tropical

Storm, but this was not much relief to the many residents who were being inundated with rain and wind. Storm total rainfall across portions of Marion County indicated at least 10 to 15 inches fell. Numerous homes and buildings were flooded and some water rescues occurred in Lamar, Marion and Clarke counties. Further to the north, flooding issues were not quite as bad with about 5 to 7 inches of rain falling from the I-20 corridor and north. Tropical storm force wind gusts were noted as far north as Bolivar County, with the Golden Triangle region not seeing winds reach more than tropical depression strength. The worst of the wind was felt generally along and south of an axis from Marion County to Adams County. Numerous trees were down in Adams County, leaving many without power for several days. Eighty percent of the roads were blocked in Franklin County due to downed trees.

With all of the rain that fell, some of the area rivers filled quickly. Minor flooding was recorded on the lower Pearl River at Rockport and Monticello, as well as on Bouie Creek at Hattiesburg and Tallahala Creek at Laurel. The biggest river impact in the Jackson Hydrologic Service Area was on Black Creek at Brooklyn. Black Creek entered moderate flooding and finally crested at 26.71 feet on August 31st at 5pm. This will go down as the second highest crest in history for this particular river and forecast point. This river flooding caused damage to 15 homes both upstream and downstream of the river gage. The winds and flooding were not all Isaac brought as a couple of tornadoes touched down in eastern Mississippi. Two tornadoes, one in Clarke County and one in Lauderdale County, occurred during the morning of August 30th. Both were rated EF-1 with winds around 100 mph. The tornado in Clarke County, near Crandall, resulted in 3 injuries to residents of a mobile home. One death attributed to Isaac occurred in Holmes County when a 64 year old woman was killed by a tree falling on her car. Isaac finally moved out of the region by the afternoon of the 30th, and was downgraded to a tropical depression by late afternoon on the 30th as it continued to track to the northwest into Missouri and the Ohio Valley.

In Tensas Parish, minimal damage was reported as the parish was located west of the eyewall. Multiple trees and power lines were blown down across the parish between the afternoon of the 29th and midday on the 30th. Tensas Parish residents did not qualify for disaster relief as the parish was not designated for individual assistance by the Federal Emergency Management Association.

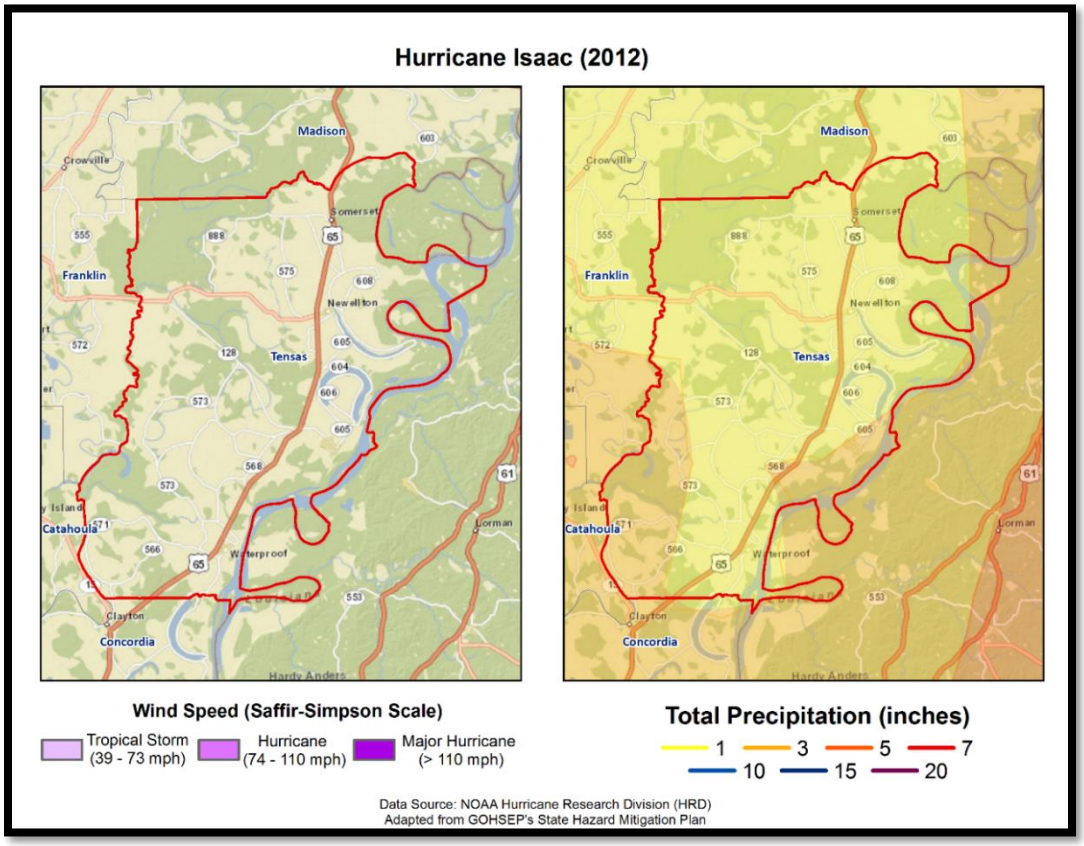

Figure 2-26: Wind Speed and Precipitation Totals in Tensas Parish for Hurricane Isaac

The figure on the next page displays the wind zones that affect Tensas Parish in relation to critical facilities throughout the parish.

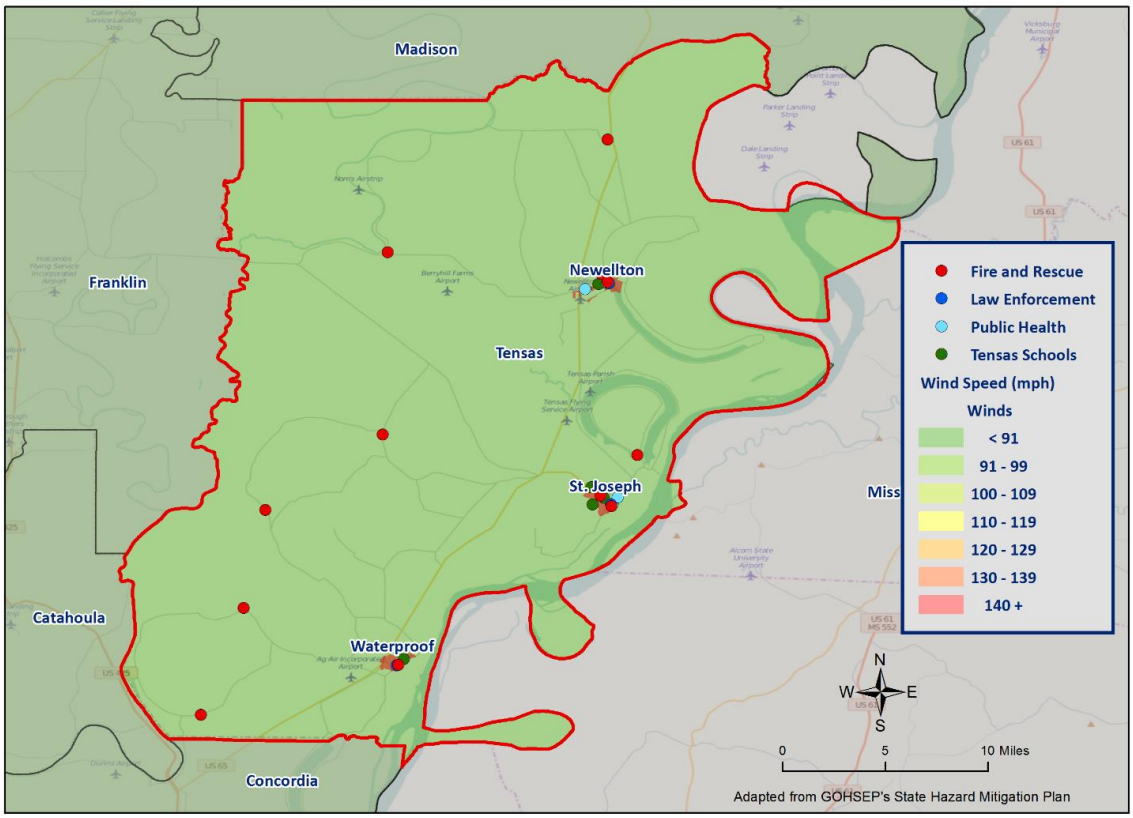

Figure 2-27: Winds Zones for Tensas Parish in Relation to Critical Facilities

Frequency / Probability

Tropical cyclones are large natural hazard events that regularly impact Tensas Parish. The annual chance of occurrence for a tropical cyclone is estimated at 16% for Tensas Parish and its municipalities, with four events occurring within 25 years. The tropical cyclone season for the Atlantic Basin is from June 1st through November 30th, with most of the major hurricanes (Saffir-Simpson Categories 3, 4, & 5) occurring between the months of August and October.

Estimated Potential Losses

Using Hazus 2.2 100-Year Hurricane Model, the 100-year hurricane scenario was analyzed to determine losses from this worst-case scenario. The table below shows the total economic losses that would result from this occurrence.

Table 2-47: Total Estimated Losses for a 100-Year Hurricane Event (Source: Hazus 2.2)

Jurisdiction	Estimated Total Losses from 100-Year Hurricane Event
Tensas Parish (Unincorporated)	$374,169
Newellton	$201,789
St. Joseph	$199,919
Waterproof	$116,960
Total	$892,838

Total losses from a 100-year hurricane event for each jurisdiction were compared with the total value of assets to determine the ratio of potential damage to total inventory in the table below.

Table 2-48: Ratio of Total Losses to Total Estimated Value of Assets for each Jurisdiction in Tensas Parish (Source: Hazus 2.2)

Jurisdiction	Estimated Total Losses from 100-Year Hurricane Event	Total Estimated Value of Assets	Ratio of Estimated Losses to Total Value
Unincorporated	$374,169	$537,608,000	0.1%
Newellton	$201,789	$189,208,000	0.1%
St. Joseph	$199,919	$158,094,000	0.1%
Waterproof	$116,960	$116,181,000	0.1%

Based on the Hazus 2.2 Hurricane Model, estimated total losses are 0.1% of the total estimated value of all assets for the unincorporated area of Tensas Parish, and the incorporated areas of Newellton, St. Joseph, and Waterproof.

The Hazus 2.2 Hurricane Model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. The losses for each jurisdiction by sector are listed in the following tables.

Table 2-49: Estimated Losses in Unincorporated Tensas Parish for a 100-Year Hurricane Event (Source: Hazus 2.2)

Tensas Parish (Unincorporated)	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	$816
Commercial	$2,131
Government	$178
Industrial	$740
Religious / Non-Profit	$785
Residential	$369,185
Schools	$335
Total	$374,169

Table 2-50: Estimated Losses in Newellton for a 100-Year Hurricane Event (Source: Hazus 2.2)

Newellton	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	$440
Commercial	$1,149
Government	$96
Industrial	$399
Religious / Non-Profit	$423
Residential	$199,102
Schools	$180
Total	$201,789

Table 2-51: Estimated Losses in St. Joseph for a 100-Year Hurricane Event (Source: Hazus 2.2)

St. Joseph	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	$436
Commercial	$1,139
Government	$95
Industrial	$395
Religious / Non-Profit	$419
Residential	$197,257
Schools	$179
Total	$199,919

Table 2-52: Estimated Losses in Waterproof for a 100-Year Hurricane Event (Source: Hazus 2.2)

Waterproof	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	$255
Commercial	$666
Government	$56
Industrial	$231
Religious / Non-Profit	$245
Residential	$115,402
Schools	$105
Total	$116,960

Threat to People

The total population within the parish that is susceptible to a hurricane hazard is shown in the table below:

Table 2-53: Number of People Susceptible to a 100-Year Hurricane Event in Tensas Parish (Source: Hazus 2.2)

Number of People Exposed to Hurricane Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
Parish (Unincorporated)	**2,201**	**2,201**	**100.0%**
Newellton	**1,187**	**1,187**	**100.0%**
St. Joseph	**1,176**	**1,176**	**100.0%**
Waterproof	**688**	**688**	**100.0%**
Total	**5,252**	**5,252**	**100.0%**

The HAZUS-MH Hurricane Model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions. These populations are illustrated in the following tables:

Table 2-54: Vulnerable Populations in Unincorporated Tensas Parish for a 100-Year Hurricane Event (Source: Hazus 2.2)

Tensas Parish (Unincorporated)		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	2,201	100.0%
Persons Under 5 Years	154	7.0%
Persons Under 18 Years	557	25.3%
Persons 65 Years and Over	381	17.3%
White	962	43.7%
Minority	1,239	56.3%

Table 2-55: Vulnerable Populations in Newellton for a 100-Year Hurricane Event (Source: Hazus 2.2)

Newellton		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	1,187	100.0%
Persons Under 5 Years	96	8.1%
Persons Under 18 Years	326	27.5%
Persons 65 Years and Over	197	16.6%
White	338	28.5%
Minority	849	71.5%

Table 2-56: Vulnerable Populations in St. Joseph for a 100-Year Hurricane Event (Source: Hazus 2.2)

St. Joseph		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	1,176	100.0%
Persons Under 5 Years	100	8.5%
Persons Under 18 Years	345	29.3%
Persons 65 Years and Over	134	11.4%
White	246	20.9%
Minority	930	79.1%

Table 2-57: Vulnerable Populations in Waterproof for a 100-Year Hurricane Event (Source: Hazus 2.2)

Waterproof		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	688	100.0%
Persons Under 5 Years	43	6.3%
Persons Under 18 Years	195	28.3%
Persons 65 Years and Over	113	16.4%
White	56	8.1%
Minority	632	91.9%

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to tropical cyclones.

Wildfires

A wildfire is combustion in a natural setting, marked by flames or intense heat. Most frequently, wildfires are ignited by lightning or unintentionally by humans. Fires set purposefully (but lawfully) are referred to as controlled fires or burns. There are three different types of wildfires: (1) **Ground fires** burn primarily in the thick layers of organic matter directly on the forest floor and even within the soil. Ground fires destroy root networks, peat, and compact litter. These fires spread extremely slowly and can smolder for months. (2) **Surface fires** burn litter and vegetative matter in the underbrush of a forest. (3) **Crown fires** spread rapidly by wind and move quickly by jumping along the tops of trees. There are two types of crown fires: (a) *passive (or dependent)* crown fires rely on heat transfer from surface fire, whereas (b) *active (or independent)* crown fires do not require any heat transfer from below. Active crown fires tend to occur with greater tree density and drier conditions. A firestorm is a mass, crown fire (also called a running crown fire, area fire, or conflagration). They are large, continuous, intense fires that lead to violent convection. They are characterized by destructively violent surface in-drafts near and beyond their perimeter. Crown fires are the most damaging and most difficult to contain. The intensity of crown fires enables the fire to produce its own wind gusts. These so-called *fire whirls* can move embers ahead of the fire front and ignite new fires. Fire whirls are spinning vortex columns of ascending hot air and gases rising from the fire. Large fire whirls have the intensity of a small tornado.

The conditions conducive to the occurrence of wildfires are not distributed equally across the United States. Wildfires have a much greater likelihood of occurring in the western part of the country. Although less frequent than in other areas, wildfires do occur in Louisiana. Wildfire danger can vary greatly season to season, and is exacerbated by dry weather conditions. Factors that increase susceptibility to wildfires are the availability of fuel (e.g., litter and debris), topography (i.e., slope and elevation affect various factors like precipitation, fuel amount, and wind exposure), and specific meteorological conditions (e.g., low rainfall, high temperatures, low relative humidity, and winds). The potential for wildfire is often measured by the Keetch–Byram Drought Index (KBDI), which represents the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in the soil. The KBDI tries to measure the amount of precipitation needed to return soil to its full field capacity, with KBDI values ranging from 0 (moist soil) to 800 (severe drought).

According to the State of Louisiana Forestry Division, most forest fires in Louisiana are caused by intentional acts (arson) or carelessness and negligence committed by people, exacerbated by human confrontation with nature. The wildland–urban interface is the area in which development meets wildland vegetation, where both vegetation and the built environment provide fuel for fires. As development near wildland settings continues, more people and property are exposed to wildfire danger. *Figure 2-28* displays the areas of wildland-urban interaction in Tensas Parish.

The Southern Group of State Foresters developed the Southern Wildfire Risk Assessment Portal to create awareness among the public and government sectors about the threat of wildfires in their areas. The Southern Wildfire Assessment Portal allows users to identify areas that are most prone to wildfires. The table on the next page summarizes the intensity levels assigned to areas in the Southern Wildfire Assessment Portal.

Table 2-58: Southern Group of State Foresters Wildfire Risk Assessment Fire Intensity Scale (Source: Southern Wildfire Assessment Portal)

Fire Intensity Scale	
Level	**Definition**
1	Lowest Intensity: Minimal direct wildfire impacts. Location has a minimal chance of being directly impacted by a wildfire.
2	Low Intensity: Small flames usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress.
3	Moderate Intensity: Flames up to eight feet in length; short-range spotting is possible.
4	High Intensity: Large flames up to 30 feet in length; short-range spotting common; medium range spotting possible.
5	Highest Intensity: Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire induced winds.

Location

Wildfires impact areas that are populated with forests and grasslands. The following figure displays the areas of wildland-urban interface and intermix in Tensas Parish and its jurisdictions.

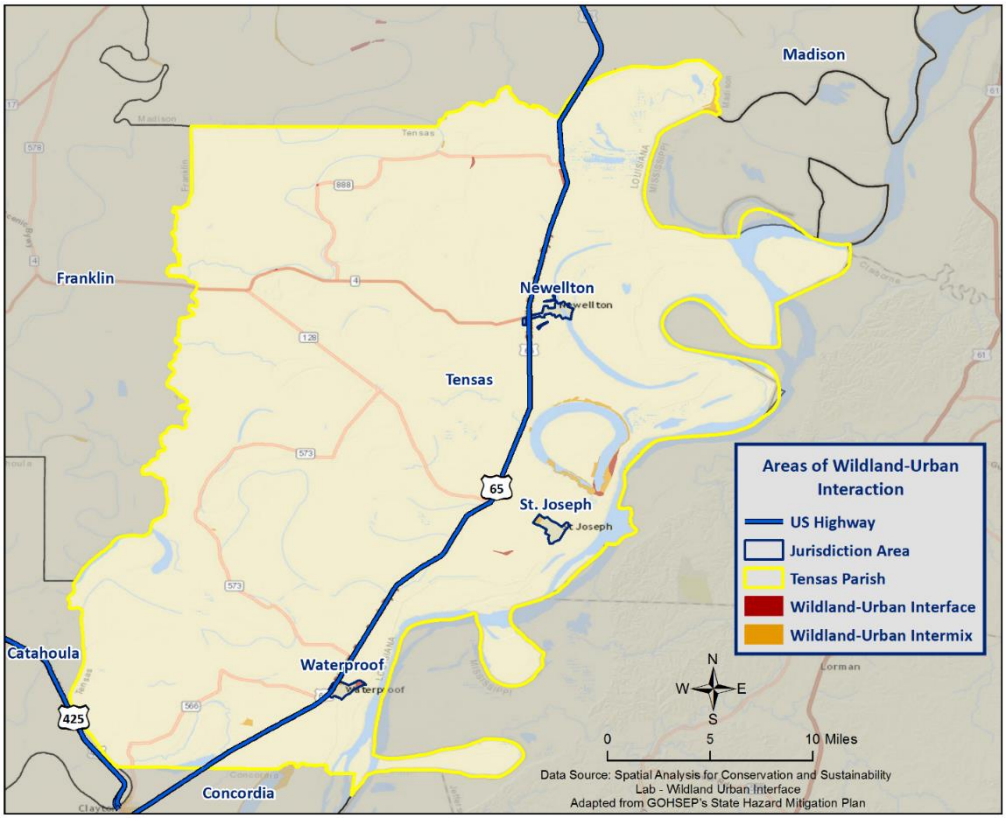

Figure 2-28: Wildland-Urban Interaction in Tensas Parish

Figure 2-29: Wildland-Urban Interaction in the Incorporated Area of Newellton

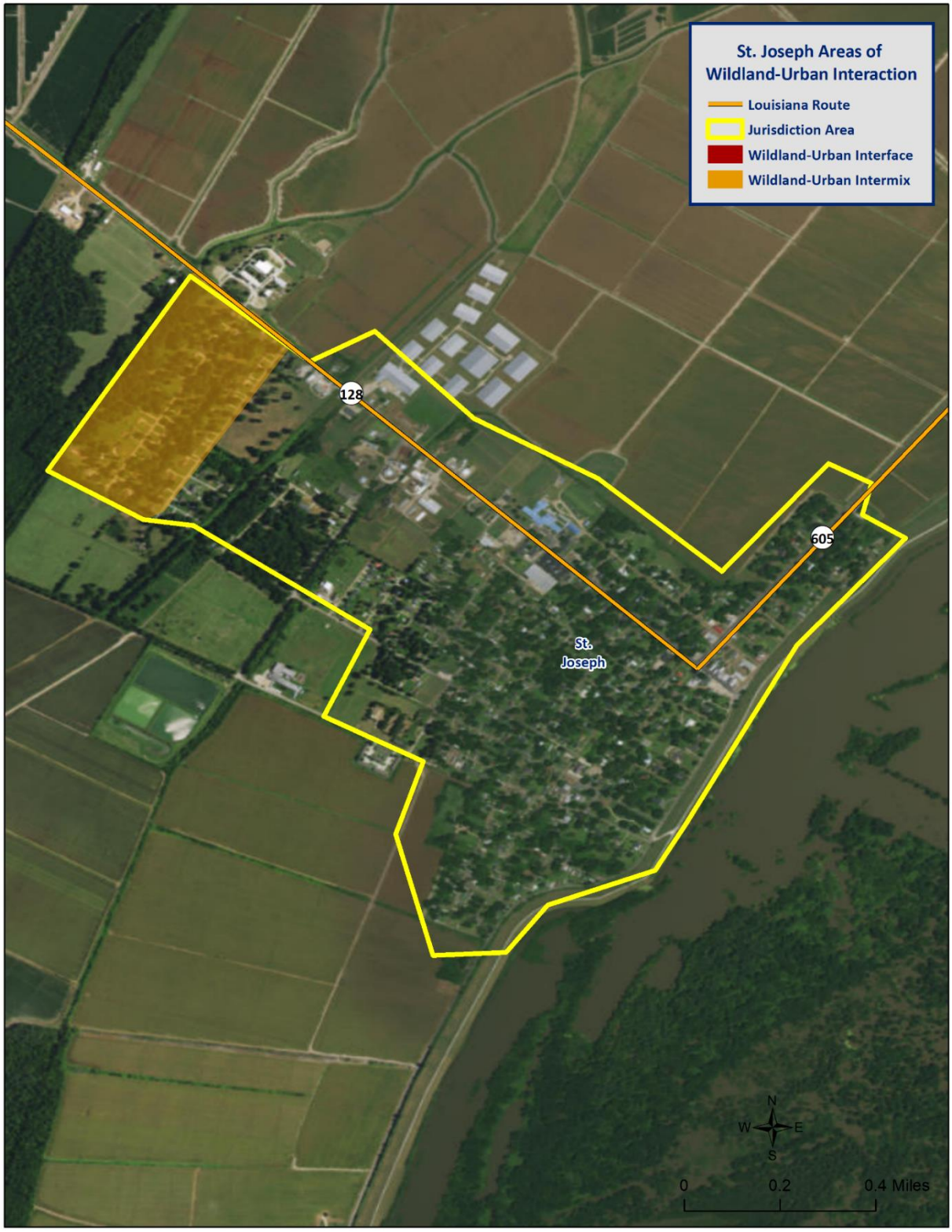

Figure 2-30: Wildland-Urban Interaction in the Incorporated Area of St. Joseph

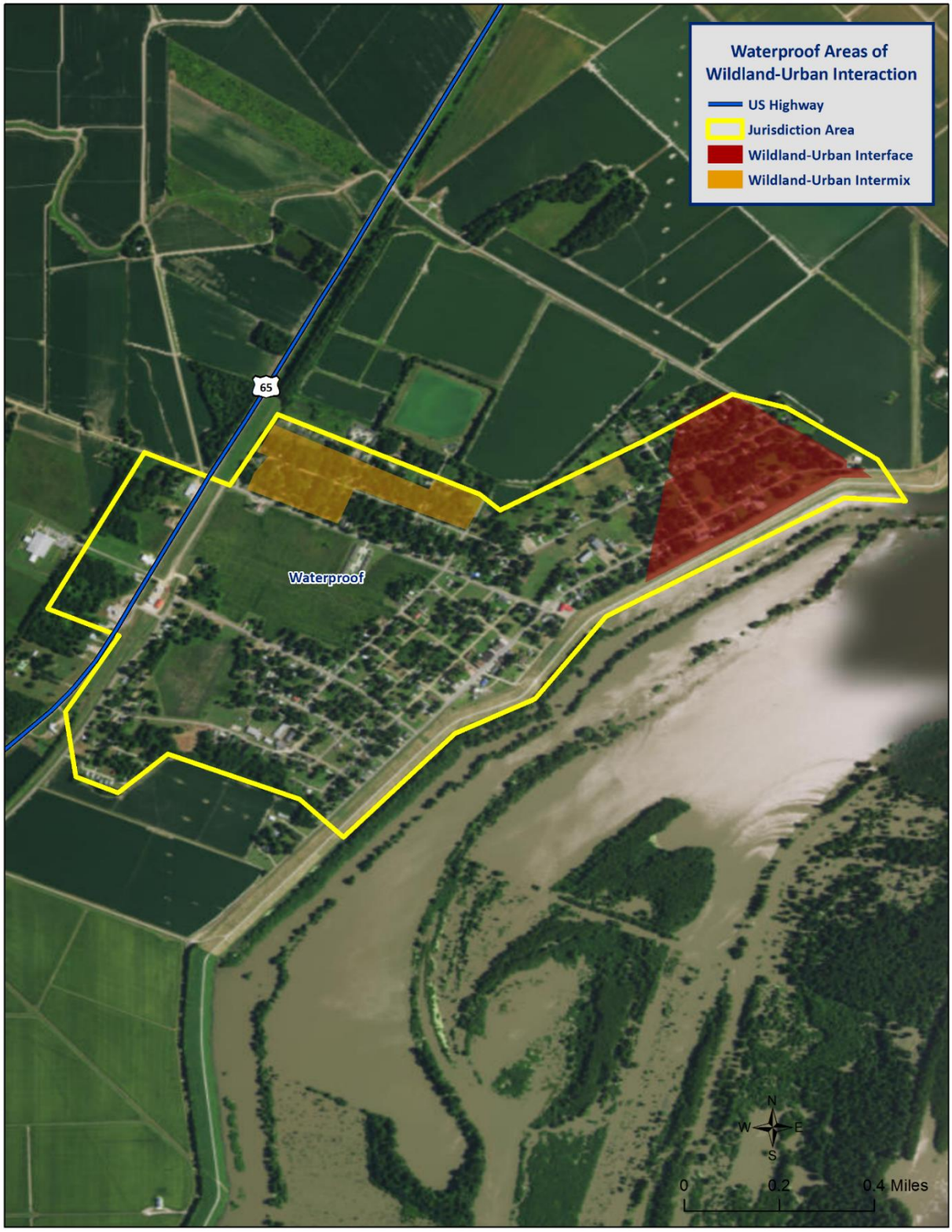

Figure 2-31: Wildland-Urban Interaction in the Incorporated Area of Waterproof

Previous Occurrences / Extents

There have been no reported wildfire events that have occurred within the boundaries of Tensas Parish between the years of 1990 and 2015. Since 2010, there have been no reported wildfire events in the incorporated areas of Newellton, St. Joseph, and Waterproof.

Based on the Southern Group of State Foresters Risk Assessment Portal, the following table outlines the intensity that each jurisdictional area within Tensas Parish could potential experience due to a wildfire event.

Table 2-59: Potential Wildfire Intensity Levels for Tensas Parish
(Source: Southern Wildfire Assessment Portal)

Potential Wildfire Intensity	
Tensas (Unincorporated)	Highest Intensity Level 5
Newellton	Moderate Intensity Level 3
St. Joseph	Moderate Intensity Level 3
Waterproof	Moderate Intensity Level 3

Frequency / Probability

With no recorded events in 25 years, wildfire events within the boundaries of Tensas Parish have an annual chance of occurrence calculated at less than 1%.

Estimated Potential Losses

There have been no wildfire events that have caused property damage, crop damage, injuries, or fatalities in Tensas Parish. In assessing the overall risk to population, the most vulnerable population throughout the parish consists of those residing in areas of wildland-urban interaction. *Figure 2-28* displays the areas of wildland-urban interaction in Tensas Parish.

Using Hazus 2.2, along with wildland-urban interaction areas, the following table presents an analysis of total building exposure that is located within the wildland-urban interaction areas.

Table 2-60: Total Building Exposure by Wildland-Urban Interaction Areas
(Source: Hazus 2.2)

Jurisdiction	Estimated Total Building Exposure
Tensas (Unincorporated)	$204,845,000
Newellton	$25,606,000
St. Joseph	$20,855,000
Waterproof	$61,526,000
Total	$312,832,000

Hazus 2.2 also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. Utilizing this information with the wildland-urban interaction areas allows for identifying the total exposure by jurisdiction. The total exposure for each jurisdiction by sector is listed in the tables on the next page.

Table 2-61: Estimated Exposure for Unincorporated Tensas Parish by Sector (Source: Hazus 2.2)

Tensas Parish (Unincorporated)	Estimated Total Building Exposure by Sector
Agricultural	$3,592,000
Commercial	$1,212,000
Government	$0
Industrial	$0
Religious / Non-Profit	$1,504,000
Residential	$198,537,000
Schools	$0
Total	$204,845,000

Table 2-62: Estimated Exposure for Newellton by Sector (Source: Hazus 2.2)

Newellton	Estimated Total Building Exposure by Sector
Agricultural	$136,000
Commercial	$1,848,000
Government	$0
Industrial	$0
Religious / Non-Profit	$3,562,000
Residential	$20,060,000
Schools	$0
Total	$25,606,000

Table 2-63: Estimated Exposure for St. Joseph by Sector (Source: Hazus 2.2)

St. Joseph	Estimated Total Building Exposure by Sector
Agricultural	$476,000
Commercial	$1,084,000
Government	$0
Industrial	$0
Religious / Non-Profit	$0
Residential	$19,295,000
Schools	$0
Total	$20,855,000

Table 2-64: Estimated Exposure for Waterproof by Sector
(Source: Hazus 2.2)

Waterproof	Estimated Total Building Exposure by Sector
Agricultural	$18,510,000
Commercial	$9,338,000
Government	$1,102,000
Industrial	$0
Religious / Non-Profit	$3,040,000
Residential	$29,536,000
Schools	$0
Total	$61,526,000

Threat to People

The total population within the parish that is located within a wildland-urban interaction area is shown in the table below:

Table 2-65: Populations Located within a Wildland-Urban Interaction Area
(Source: 2010 U.S. Census Data)

Number of People Located in Wildland-Urban Interaction Areas			
Location	**# in Community**	**# in Area**	**% in Area**
Tensas (Unincorporated)	**2,201**	**75**	**3.4%**
Newellton	**1,187**	**31**	**2.6%**
St. Joseph	**1,176**	**162**	**13.8%**
Waterproof	**688**	**185**	**26.9%**
Total	**5,252**	**453**	**8.6%**

The 2010 U.S. Census data was also extrapolated to provide an overview of populations located within wildland-urban interaction areas throughout the jurisdictions. That data is illustrated in the following tables:

Table 2-66: Population in Unincorporated Tensas Parish Located within a Wildland-Urban Interaction Area
(Source: 2010 U.S. Census Data)

Tensas Parish (Unincorporated)		
Category	**Total Numbers**	**Percentage of People in Wildland-Urban Interaction Area**
Number in Hazard Area	75	3.4%
Persons Under 5 Years	5	7.0%
Persons Under 18 Years	19	25.3%
Persons 65 Years and Over	13	17.3%
White	33	43.7%
Minority	42	56.3%

Table 2-67: Population in Newellton Located within a Wildland-Urban Interaction Area (Source: 2010 U.S. Census Data)

Newellton		
Category	**Total Numbers**	**Percentage of People in Wildland-Urban Interaction Area**
Number in Hazard Area	31	2.6%
Persons Under 5 Years	3	8.1%
Persons Under 18 Years	6	19.4%
Persons 65 Years and Over	5	16.6%
White	9	28.5%
Minority	22	71.5%

Table 2-68: Population in St. Joseph Located within a Wildland-Urban Interaction Area (Source: 2010 U.S. Census Data)

St. Joseph		
Category	**Total Numbers**	**Percentage of People in Wildland-Urban Interaction Area**
Number in Hazard Area	162	13.8%
Persons Under 5 Years	14	8.5%
Persons Under 18 Years	34	20.8%
Persons 65 Years and Over	18	11.4%
White	34	20.9%
Minority	128	79.1%

Table 2-69: Population in Waterproof Located within a Wildland-Urban Interaction Area (Source: 2010 U.S. Census Data)

Waterproof		
Category	**Total Numbers**	**Percentage of People in Wildland-Urban Interaction Area**
Number in Hazard Area	185	26.9%
Persons Under 5 Years	12	6.3%
Persons Under 18 Years	41	22.1%
Persons 65 Years and Over	30	16.4%
White	15	8.1%
Minority	170	91.9%

Vulnerability

See Appendix C for parish and municipality facilities that could potentially be exposed to a wildfire hazard. Buildings were determined based on whether or not they fall within the wildfire-urban interface and/or intermix.

Winter Storms

For Louisiana and other parts of the southeastern United States, a severe winter storm occurs when humid air from the Gulf of Mexico meets a cold air mass from the north. Once the cold air mass crosses Louisiana, and the temperature drops, precipitation may fall in the form of snow or sleet. If the ground temperature is cold enough but air temperature is above freezing, rain can freeze instantly on contact with the surface, causing massive ice storms.

The winter storm events that affect the state of Louisiana are ice storms, freezes, and snow events. Of the winter storm types listed above, ice storms are the most dangerous. Ice storms occur during a precipitation event when warm air aloft exceeds 32 °F, while the surface remains below the freezing point. Ice will form on all surfaces when precipitation originating as rain or drizzle contacts physical structures. These ice storms are usually accompanied by freezing temperatures and occasionally snow.

Winter storms can be accompanied by strong winds, creating blizzard conditions with blinding, wind driven snow, severe drifting, and dangerous wind chill. These types of conditions are very rare in Louisiana, even in north Louisiana, but ice storms are more common. The climatic line between snow and rain often stalls over north Louisiana, creating ideal conditions for ice accumulation.

In a typical winter storm event, homes and buildings are damaged by ice accumulation, either directly by the weight of the ice on the roofs or by trees and/or limbs falling on buildings. While it is not very prevalent, this type of damage can occur in Louisiana, particularly in north Louisiana. Effects of winter weather more likely to occur in Louisiana, especially southern Louisiana, include extreme temperatures which can cause waterlines to freeze and sewer lines to rupture. This is especially true with elevated or mobile homes, since cold air is able to access more of the building's infrastructure. Winter storms can also have a devastating effect on agriculture, particularly on crops (like citrus) that are dependent on warm weather. Long exposures to low temperatures can kill many kinds of crops, and ice storms can weigh down branches and fruit.

Winter storms are not only a direct threat to human health through conditions like frostbite and hypothermia, but they are also an indirect threat to human health due to vehicle accidents and loss of power and heat, which can be disrupted for days. However, these impacts are rarely seen in Louisiana. As people use space heaters and fireplaces to stay warm, the risk of household fires and carbon monoxide poisoning increases.

Winter storm events occur throughout Louisiana usually during the colder calendar months of December, January, and February. Severe weather events do not occur with the same frequency across all parts of Louisiana. The northern quarter of Louisiana has historically experienced the most severe winter events between 1987 and 2012. The central, and to an even greater extent the southern parts of the state, such as Ascension Parish, have experienced the fewest severe winter events. The table on the next page shows the Sperry-Piltz Ice Accumulation Index which is utilized to predict the potential damage to overhead utility systems from freezing rain and ice storms.

Table 2-70: Sperry-Piltz Ice Accumulation Index

Ice Damage Index	Damage and Impact Descriptions
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structure. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Location

Because a winter storm is a climatological based hazard and has the same probability of occurring in Tensas Parish as all of the adjacent parishes, the entire planning area for Tensas Parish is equally at risk for winter storms.

Previous Occurrences / Extents

There have been nine reported winter storm events that have occurred within the boundaries of Tensas Parish between the years of 1990 and 2015. The table below provides a brief synopsis of each event. Based on historic data, Tensas Parish can expect an ice damage index of 2 on the Sperry-Piltz Ice Accumulation Index.

Table 2-71: Previous Occurrences for Winter Storm Events

Date	Synopsis	Property Damage	Crop Damage
March 12, 1993	A widespread, damaging freeze occurred. Temperatures fell into the upper teens across the northern parishes and into the 20s elsewhere. Due to the relatively mild winter, many crops were in early bloom.	$0	$227,818
February 1, 1996	Freezing rain fell in Tensas Parish. Widespread damage was done to trees and power lines. Accumulations of up to one inch were common over the area. Most roads and bridges were impassable. Many thousand customers were without power.	$150,883	$0

Date	Synopsis	Property Damage	Crop Damage
December 22, 1998	A shallow dome of arctic air spread across northern Louisiana while low pressure formed in the norther Gulf of Mexico pulling warm moist air northward over the top of the cold air. Ice accumulated mainly across exposed surfaces such as trees and power lines as well as bridges and overpasses. Over a quarter million people were without power, some for over a week. Numerous minor injuries were reported from vehicle accidents caused by slippery roads.	$850,673	$0
January 1, 2010	A prolonged cold snap, caused by a couple of strong arctic air masses, affected the ArkLaMiss region during the first two weeks of January. There were reports of frozen water valves at many residential homes around the parish.	$108,567	$0
February 11, 2010	Heavy snow affected a large portion of the region. Light precipitation overspread the region before becoming heavy. Due to the heavy wet nature of the snow, many large branches and some trees took down power lines. Power outages were common after the event and widespread. Around 6 inches of snow was reported across Tensas Parish, with 6.5 inches reported in Saint Joseph.	$325,700	$0
February 3, 2011	An ice storm developed across the area and impacted travel. Thousands of accidents occurred from slick roads. Some snow did occur, but those were just across select areas and the accumulation was mainly one inch or less. A quarter inch to four tenths of ice and sleet accumulated across the parish. Bridges and overpasses were iced over and roadways were slick.	$210,489	$0
January 28, 2014	A large upper trough dove was diving southeast, bringing an arctic front to ArkLaMiss. Due to a warm layer in the mid-levels of the atmosphere, mixed precipitation occurred from south of a line near Natchez to south of Meridian. Two to three inches of snow mixed with some sleet fell across the far southeastern portion of Tensas Parish.	$0	$0
February 11, 2014	A series of complex weather systems affected ArkLaMiss. As temperatures fell, the first upper disturbance began to moisten the atmosphere to bring potential for freezing precipitation. Over a half inch of ice accumulated on trees and power lines in central and western Tensas Parish. All of the parish saw ice accumulations of at least one quarter inch.	$0	$0
March 5, 2015	A cold front quickly moved southeast, filtering in colder air. Moisture also lingered behind the front. This setup was very favorable for a transition from rain to freezing rain to sleet. Around one half inch of heavy sleet accumulated at Newlight.	$0	$0

Based on previous winter storm events, the worst-case scenario for Tensas Parish and the incorporated areas of Newellton, St. Joseph, and Waterproof is approximately six to eight inches of snow accumulation and approximately one half to three quarters of an inch of ice accumulation.

Frequency / Probability

With nine recorded events in 25 years, winter storm events within the boundaries of Tensas Parish have an annual chance of occurrence calculated at 36% based on the SHELDUS dataset.

Estimated Potential Losses

Since 1990, there have been nine reported winter weather events that have resulted in property and/or crop damages according to the SHELDUS database. The total property damages associated with these storms have totaled $1,646,312. To estimate the potential losses of a winter weather event on an annual basis, the total damage recorded for winter weather events was divided by the total number of years of available winter weather data in SHELDUS (1990 – 2015). This provides an annual estimated potential loss of $65,852. To assess potential losses to the participating jurisdictions, the 2010 Census population was used to assign the estimated potential losses proportionally across the jurisdictions. The following table provides an estimate of potential property losses for Tensas Parish based on the 2010 Census data:

Table 2-72: Estimated Annual Losses for Winter Weather Events in Tensas Parish

Estimated Annual Potential Losses from Winter Weather for Tensas Parish			
Unincorporated Tensas Parish (41.9% of Population)	**Newellton (22.6% of Population)**	**St. Joseph (22.4% of Population)**	**Waterproof (13.1% of Population)**
$51,883	$1,944	$1,800	$43,254

From 1990 - 2015, there have been no injuries or fatalities as a result of winter weather in Tensas Parish.

Vulnerability

See Appendix C for parish and municipality building exposure to winter weather hazards.

Levee Failure

Levees and floodwalls are flood control barriers constructed of earth, concrete, or other materials. For the purposes of this plan, levees are distinguished from smaller flood barriers (such as berms) by their size and extent. Berms are barriers that only protect a small number of structures, or at times only a single structure. Levees and floodwalls are barriers that protect significant areas of residential, commercial, or industrial development; at a minimum, they protect a neighborhood or small community. Levee failure involves the overtopping, breach, or collapse of the levee. Levee failure is especially destructive to nearby development during flood and hurricane events.

The northern half of Louisiana is protected by levees on the Ouachita River, under the authority of the Vicksburg District of the United States Army Corp of Engineers (USACE). The Vicksburg District encompasses 68,000 mi^2 in the states of Arkansas, Mississippi and Louisiana. They manage seven drainage basins, including the Yazoo, Pearl, Big Black, Red, Ouachita, and Mississippi Rivers; 12 locks and dams on the Pearl, Red, and Ouachita Rivers; 1,808 miles of levees, including 468 miles along the Mississippi River; and multiple lakes with 1,709 miles of shoreline.

Coastal and southern Louisiana are protected by an extensive levee system under the authority of the New Orleans District of the USACE. This system includes 30,000 mi^2 of Louisiana south of Alexandria, including 961 miles of river levees in the Mississippi River and Tributaries Project, 449 miles of river levees in the Atchafalaya Basin, and 340 miles of hurricane-protection levees. Other levees have been built along stretches of rivers throughout Louisiana by local levee districts and private citizens. The data regarding these non-federal levees are managed by the individual entity responsible for construction and subsequent maintenance and are not kept in a consistent format for comprehensive hazard analysis.

The effects of a levee failure on property is similar to that of a flood, as discussed in the flooding section. One major difference is that the velocity of the water is increased in the area of the breach, so the potential for property damage is higher in these areas.

A levee failure occurs during high water events, so the populace is normally alerted to the potential danger. Levees are normally monitored during these events and the population in danger is alerted to a possible levee failure. However, if people consider themselves safe once a levee has been breached and do not evacuate, the results could be deadly.

Location

The primary Mississippi River Levee extends along the entire eastern border of Tensas Parish.

Previous Occurrences / Extents

There have been no reported levee failures in Tensas Parish from 1990 to 2015. Levee information including the extent of a levee failure has been requested from the U.S. Army Corps of Engineers. Tensas Parish is awaiting a response from the USACE, and will continue to update this information as new data is received.

Frequency / Probability

Based on the 25-year record, it is determined that a levee failure has less than a 1% annual chance of occurrence in the Tensas Parish planning area. Tensas Parish is awaiting a response from the USACE, and will continue to work to update this information as new data is received.

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3. Capability Assessment

This section summarizes the results of the Tensas Parish jurisdictions and other agency efforts to develop policies, programs, and activities that directly or indirectly support hazard mitigation. It also provides information on resources and gaps in the parish's infrastructure, as well as relevant changes in its law since the last plan update, in order to suggest a mitigation strategy.

Through this assessment, Tensas Parish and the participating jurisdictions are able to identify strengths that could be used to reduce losses and reduce risk throughout the community. It also identifies areas where mitigation actions might be used to supplement current capabilities and create a more resilient community before, during, and after a hazard event.

Policies, Plans, and Programs

Tensas Parish capabilities are unique to the parish, including planning, regulatory, administrative, technical, financial, and education and outreach resources. There are a number of mitigation-specific acts, plans, executive orders, and policies that lay out specific goals, objectives, and policy statements which already support or could support pre- and post-disaster hazard mitigation. Many of the ongoing plans and policies hold significant promise for hazard mitigation. They take an integrated and strategic look holistically at hazard mitigation in Tensas Parish to propose ways to continually improve it. These tools are valuable instruments in pre- and post-disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework. Examples of existing documents in Tensas Parish and its jurisdictions are shown in the table on the following page.

Table 3-1: Tensas Parish Planning and Regulatory Capabilities

Planning and Regulatory					
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.					
	Tensas Parish	Newellton	St. Joseph	Waterproof	
Plans	Yes / No				
Comprehensive / Master Plan	Y	N	N	N	
Capital Improvements Plan	Y	N	N	N	
Economic Development Plan	Y	N	N	N	
Local Emergency Operations Plan	Y	N	N	N	
Continuity of Operations Plan	Y	N	N	N	
Transportation Plan	Y	N	N	N	
Stormwater Management Plan	N	N	N	N	
Community Wildfire Protection Plan	N	N	N	N	
Other plans (redevelopment, recovery, coastal zone management)	N	N	N	N	
Building Code, Permitting and Inspections	Yes / No				
Building Code	Y	N	Y	Y	
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	N	N/A	N	
Fire Department ISO/PIAL rating	7	5	5	5	
Site plan review requirements	N	N	Y	Y	
Land Use Planning and Ordinances	Yes / No				
Zoning Ordinance	N	N	Y	Y	
Subdivision Ordinance	Y	N	Y	Y	
Floodplain Ordinance	Y	Y	Y	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	N	N	Y	N	
Flood Insurance Rate Maps	Y	Y	Y	Y	
Acquisition of land for open space and public recreation uses	N	N	N	N	
Other	N	N	N	N	

Building Codes, Permitting, Land Use Planning and Ordinances

The Tensas Parish Government provides oversight for building permits and codes for the unincorporated areas of the parish, as well as the Towns of St. Joseph and Waterproof. The Tensas Parish Government also oversees land use planning for the Towns of St. Joseph and Waterproof, and all other parish ordinances where applicable.

As of the 2016 update, Tensas Parish and its jurisdictions ensure that all adopted building codes are enforced (where applicable) and in compliance relating to the construction of any structure within the boundaries of the parish. Building permits are required prior to beginning any type of construction or renovation projects, installation of electrical wiring, plumbing or gas piping, moving manufactured/modular or portable buildings, and reroofing or demolitions.

The Tensas Parish Government is also responsible for enforcing the parish ordinances relating to health and safety, property maintenance standards, and condemnation of unsafe structures. The governing bodies for the jurisdictions of St. Joseph and Waterproof are responsible for enforcing and oversight of zoning compliance in St Joseph and Waterproof respectively.

The Tensas Government Agencies, to include the Sheriff's Office, Assessor's Office and OHSEP meets regularly to consider any proposed ordinance changes, and to take final actions on proposed changes.

While local capabilities for mitigation can vary from community to community, Tensas Parish as a whole has a system in place to coordinate and share these capabilities through Tensas Parish Government and through this Parish Hazard Mitigation Plan.

Some programs and policies, such as the above described, might use complementary tools to achieve a common end, but fail to coordinate with or support each other. Thus, coordination among local mitigation policies and programs is essential to hazard mitigation.

Administration, Technical, and Financial

As a community, Tensas Parish has administrative and technical capabilities in place that may be utilized in reducing hazard impacts or implementing hazard mitigation activities. Such capabilities include staff, skillset, and tools available in the community that may be accessed to implement mitigation activities and to effectively coordinate resources. The ability to access and coordinate these resources is also important. The table below shows examples of resources in place in Tensas Parish and its jurisdictions.

Table 3-2: Tensas Parish Administrative and Technical Capabilities

Administration and Technical					
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.					
	Tensas Parish	Newellton	St. Joseph	Waterproof	
Administration	Yes / No				
Planning Commission	N	N	N	N	
Mitigation Planning Committee	Y	Y	Y	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	Y	Y	Y	
Mutual Aid Agreements					
Staff	Yes / No; FT/PT; % Hazard Mitigation				
Chief Building Official	Y	N	N	N	
Floodplain Administrator	Y	N	N	N	
Emergency Manager	Y	N	N	N	
Community Planner	N	N	N	N	
Civil Engineer	Y	N	N	Y	
GIS Coordinator	N	N	N	N	
Grant Writer	N	N	N	N	
Other	N	N	N	N	
Technical	Yes / No				
Warning Systems / Service (Reverse 911, outdoor warning signals)	Y	Y	Y	N	
Hazard Data & Information	Y	N	N	N	
Grant Writing	N	N	N	N	
Hazus Analysis	N	N	N	N	
Other	N	N	N	N	

Financial capabilities are the resources that Tensas Parish and its incorporated jurisdictions have access to or are eligible to use in order to fund mitigation actions. Costs associated with implementing the actions identified by the jurisdictions may vary from little/no cost actions, such as outreach efforts, to substantial action costs such acquisition of flood prone properties. The following resources are available to fund mitigation actions in Tensas Parish and its jurisdictions:

Table 3-3: Tensas Parish Financial Capabilities

Financial					
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.					
	Tensas Parish	Newellton	St. Joseph	Waterproof	
Funding Resource	Yes / No				
Capital Improvements project funding	Y	N	Y	Y	
Authority to levy taxes for specific purposes	Y	Y	y	Y	
Fees for water, sewer, gas, or electric services	Y	Y	Y	Y	
Impact fees for new development	N	N	N	N	
Stormwater Utility Fee	N	N	N	N	
Community Development Block Grant (CDBG)	Y	N	Y	Y	
Other Funding Programs	Y	N	N	N	

Education and Outreach

A key element in hazard mitigation is promoting a safer, more disaster resilient community through education and outreach activities and/or programs. Successful outreach programs provide data and information that improves overall quality and accuracy of important information for citizens to feel better prepared and educated with mitigation activities. These programs enable the individual jurisdictions and parish as a whole to maximize opportunities for implementation of activities through greater acceptance and consensus of the community.

Tensas Parish and its jurisdictions have existing education and outreach programs to implement mitigation activities, as well as to communicate risk and hazard related information to its communities. The existing programs are outlined in the table on the next page.

Table 3-4: Tensas Parish Education and Outreach Capabilities

Education and Outreach					
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.					
Program / Organization	Tensas Parish	Newellton	St. Joseph	Waterproof	Yes / No
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	N	Y	N	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	N	Y	N	
Natural Disaster or safety related school program	Y	Y	Y	N	
Storm Ready certification	N	N	N	N	
Firewise Communities certification	N	N	N	N	
Public/Private partnership initiatives addressing disaster-related issues	N	N	Y	N	
Other	N	N	N	N	

In some cases, the jurisdictions rely on Tensas Parish OHSEP and/or Tensas Parish Government Agencies for the above listed planning and regulatory, administrative and technical, financial, and education and outreach capabilities. Comments regarding the jurisdictions utilization or intentions to utilize and leverage the capabilities of the parish government can be found in Appendix E in the jurisdictional specific worksheets.

As reflected in the aforementioned existing regulatory mechanisms, programs, and resources within each jurisdiction, Tensas Parish and its jurisdiction remains committed to expanding and improving on the existing capabilities within the parish. All participating jurisdictions will work toward increased participation in funding opportunities and available mitigation programs. Should funding become available, the hiring of additional personnel to dedicate to hazard mitigation initiatives and programs, as well as increasing ordinances within the jurisdictions, will help to enhance and expand risk reduction measures within the parish.

With the sharing of these capabilities, the following municipalities and entities are recognized by the Parish of Tensas under the Hazard Mitigation Plan, allowing them to apply for available hazard mitigation funding for as long as these municipalities and entities notify the parish of their intentions and the parish concurs:

- Unincorporated Tensas Parish
- Town of Newellton
- Town of St. Joseph
- Town of Waterproof

Flood Insurance and Community Rating System

Tensas Parish is not a participant in the Community Rating System (CRS), nor are any of its jurisdictions. Obtaining the CRS rating for the parish and participating jurisdictions is recognized as an eventual goal by the Hazard Mitigation Steering Committee. Participation in the CRS strengthens local capabilities by lowering flood insurance premiums for jurisdictions that exceed NFIP minimum requirements.

Under the Federal Emergency Management Agency (FEMA), the National Flood Insurance Program (NFIP) administers the Community Rating System. Under the CRS, flood insurance premiums for properties in participating communities are reduced to reflect the flood protection activities that are being implemented. This program can have a major influence on the design and implementation of flood mitigation activities, so a brief summary is provided here.

A community receives a CRS classification based upon the credit points it receives for its activities. It can undertake any mix of activities that reduce flood losses through better mapping, regulations, public information, flood damage reduction and/or flood warning and preparedness programs.

There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction (see *Figure 3-1*). A community that does not apply for the CRS or that does not obtain the minimum number of credit points is a class 10 community.

During the last update, 38 Louisiana communities participated. Mandeville, Shreveport, and Jefferson and East Baton Rouge Parishes had the best classifications in the state, class 7. As of the 2016 update, Jefferson, East Baton Rouge, and Terrebonne Parishes all lead the state with best classifications, class 6.

CLASS	DISCOUNT	CLASS	DISCOUNT
1	45%	6	20%
2	40%	7	15%
3	35%	8	10%
4	30%	9	5%
5	25%	10	–
SFHA (Zones A, AE, A1–A30, V, V1–V30, AO, and AH): Discount varies depending on class.			
SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1–A30, AR/AH, and AR/AO): 10% discount for Classes 1–6; 5% discount for Classes 7–9.*			
Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1–6; 5% discount for Classes 7–9.			

* In determining CRS Premium Discounts, all AR and A99 Zones are treated as non-SFHAs.

Figure 3-1: CRS Discounts by Class (Source: FEMA)

As of May 2012, 310 communities in the State of Louisiana participate in the Federal Emergency Management Agency's NFIP. Of these communities, 41 (or 13%) participate in the Community Rating System (CRS). Of the top fifty Louisiana communities, in terms of total flood insurance policies held by residents, 27 participate in the CRS. The remaining 23 communities present an outreach opportunity for encouraging participation in the CRS.

The CRS provides an incentive not just to start new mitigation programs, but to keep them going. There are two requirements that "encourage" a community to implement flood mitigation activities.

First, the parish will receive CRS credit for this plan when it is adopted. To retain that credit, though, the parish must submit an evaluation report on progress toward implementing this plan to FEMA by October 1st of each year. That report must be made available to the media and the public.

Second, the parish must annually recertify to FEMA that it is continuing to implement its CRS credited activities. Failure to maintain the same level of involvement in flood protection can result in a loss of CRS credit points and a resulting increase in flood insurance rates to residents.

In 2011[1], the National Flood Insurance Program (NFIP) completed a comprehensive review of the Community Rating System that will result in the release of a new CRS Coordinator's Manual.

The changes to the 2013 CRS Coordinator's Manual are the result of a multi-year program evaluation that included input from a broad group of contributors in order to evaluate the CRS and refine the program to meet its stated goals.

The upcoming changes will drive new achievements in the following six core flood loss reduction areas important to the NFIP: (1) reduce liabilities to the NFIP Fund; (2) improve disaster resiliency and sustainability of communities; (3) integrate a whole community approach to addressing emergency management; (4) promote natural and beneficial functions of floodplains; (5) increase understanding of risk, and; (6) strengthen adoption and enforcement of disaster-resistant building codes.

The 2013 CRS Coordinator's Manual changes will impact each CRS community differently. Some communities will see an increase in the points they receive since points for certain activities have increased (e.g., Activity 420 Open Space Preservation). Other communities will receive fewer points for certain activities (e.g., Activity 320 Map Information Service). It is likely that some communities with marginal CRS class 9 programs will have to identify new CRS credits in order to remain in the CRS.
Typically, CRS communities do not request credit for all the activities they are currently implementing unless it would earn enough credit to advance the community to a higher CRS class. A community that finds itself losing CRS credit with the 2013 manual could likely identify activities deserving credit they had not previously received.

Due to the changes in both activities and CRS points, community CRS coordinators should speak with their ISO/CRS Specialist to understand how and when the 2013 manual will impact their community.

[1] https://www.fema.gov/national-flood-insurance-program-community-rating-system

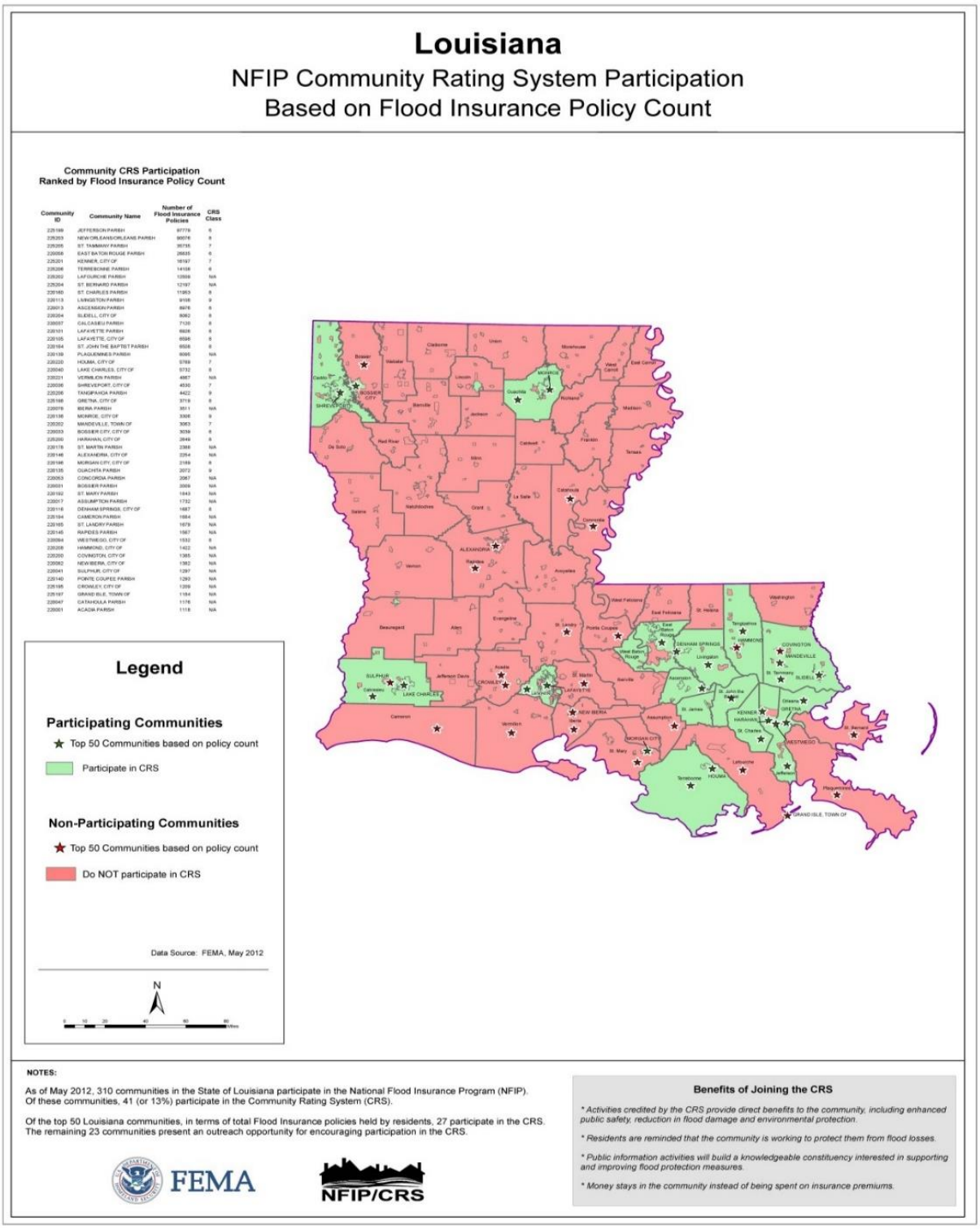

Figure 3-2: Louisiana CRS NFIP Participation
(Source: FEMA[2])

[2] http://www.fema.gov/media-library-data/20130726-2128-31471-9581/ks_ky_la_crs_may_2012_508.zip

In addition to the direct financial reward for participating in the Community Rating System, there are many other reasons to participate in the CRS. As FEMA staff often say, "If you are only interested in saving premium dollars, you're in the CRS for the wrong reason." The other benefits that are more difficult to measure in dollars include:

1. The activities credited by the CRS provide direct benefits to residents, including:
   – Enhanced public safety
   – A reduction in damage to property and public infrastructure
   – Avoidance of economic disruption and losses
   – Reduction of human suffering
   – Protection of the environment

2. A community's flood programs will be better organized and more formal. Ad hoc activities, such as responding to drainage complaints rather than an inspection program, will be conducted on a sounder, more equitable basis.

3. A community can evaluate the effectiveness of its flood programs against a nationally recognized benchmark.

4. Technical assistance in designing and implementing a number of activities is available at no charge from the Insurance Services Office.

5. The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

6. A community would have an added incentive to maintain its flood programs over the years. The fact that its CRS status could be affected by the elimination of a flood related activity or a weakening of the regulatory requirements for new developments would be taken into account by the governing board when considering such actions.

7. Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.

More information on the Community Rating System can be found at www.fema.gov/nfip/crs.shtm

NFIP Worksheets

Parish and participating jurisdiction NFIP worksheets can be found in Appendix E: State Required Worksheets

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4. Mitigation Strategy

Introduction

Tensas Parish's Hazard Mitigation Strategy has a common guiding principle and is the demonstration of the parish's and participating jurisdictions' commitment to reduce risks from hazards. The strategy also serves as a guide for parish and local decision makers as they commit resources to reducing the effects of hazards.

Tensas Parish confirmed the goals, objectives, actions, and projects over the period of the Hazard Mitigation Plan Update process. The mitigation actions and projects in this 2016 update are a product of analysis and review of the Tensas Parish Hazard Mitigation Plan Steering Committee, under the coordination of the Tensas Parish Office of Homeland Security and Emergency Preparedness. The committee was presented a list of projects and actions, new and from the 2011 plan, for review from December 2015 – June 2016.

An online public opinion survey was conducted of Tensas Parish residents between December 2015 and June 2016. The survey was designed to capture public perceptions and opinions regarding natural hazards in Tensas Parish. In addition, the survey collected information regarding the methods and techniques preferred by the respondents for reducing the risks and losses associated with local hazards. The residents of Tensas Parish did not provide any feedback to be included into this update.

During the public meeting in June, the committee provided a status of the projects from 2011 and the proposed actions for the 2016 update. Committee members then agreed on the submission of each project based on feasibility for funding, ease of completion and other community specific factors. The actions were later prioritized.

Goals

The goals represent the guidelines that the parish and its communities want to achieve with this plan update. To help implement the strategy and adhere to the mission of the Hazard Mitigation Plan, the preceding section of the plan update was focused on identifying and quantifying the risks faced by the residents and property owners in Tensas Parish from natural and manmade hazards. By articulating goals and objectives based on the previous plans, the risk assessment results, and intending to address those results, this section sets the stage for identifying, evaluating, and prioritizing feasible, cost effective, and environmentally sound actions to be promoted at the parish and municipal level – and to be undertaken by the state for its own property and assets. By doing so, Tensas Parish and its jurisdictions can make progress toward reducing identified risks.

For the purposes of this plan update, goals and action items are defined as follows:

- **Goals** are general guidelines that explain what the parish wants to achieve. Goals are expressed as broad policy statements representing desired long-term results.
- **Action Items** are the specific steps (projects, policies, and programs) that advance a given goal. They are highly focused, specific, and measurable.

The current goals of the Tensas Parish Hazard Mitigation Plan Update Steering Committee represent long-term commitments by the parish and its jurisdictions. After assessing these goals, the committee decided that the current four goals remain valid.

The goals are as follows:

- Improve education and outreach efforts regarding potential impacts of hazards and the identification of specific measures that can be taken to reduce their impact
- Improve data collection, use, and sharing to reduce the impact of hazards
- Improve capabilities, coordination, and opportunities at municipal and parish level to plan and implement hazard mitigation projects, programs, and activities
- Pursue opportunities to mitigate repetitive and severe repetitive loss properties and other appropriate hazard mitigation projects, programs, and activities

The Mitigation Action Plan focuses on actions to be taken by Tensas Parish and its jurisdictions. All of the activities in the Mitigation Action Plan will be focused on helping the parish and its municipalities in developing and funding projects that are not only cost effective, but also meet the other DMA 2000 criteria of environmental compatibility and technical feasibility.

The Hazard Mitigation Plan Steering Committee and each jurisdiction reviewed and evaluated the potential action and project lists in which consideration was given to a variety of factors. Such factors include determining a project's eligibility for federal mitigation grants, as well as its ability to be funded. This process required evaluation of each project's engineering feasibility, cost effectiveness, and environmental and cultural factors.

2016 Mitigation Actions and Update on Previous Plan Actions

The Tensas Parish Hazard Mitigation Plan Steering Committee and participating jurisdictions each identified actions that would reduce and/or prevent future damage within Tensas Parish and their respective communities. In that effort, each jurisdiction focused on a comprehensive range of specific mitigation actions. These actions were identified in thorough fashion by the consultant team, the committee, and the individual jurisdictions by way of frequent and open communications and meetings held throughout the planning process.

As outlined in the Local Mitigation Planning Handbook, the following are eligible types of mitigation actions:

- **Local Plans and Regulations –** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Projects –** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area, and also includes projects to construct manmade structures to reduce the impact of hazards.
- **Natural System Protection –** These actions minimize the damage and losses and also preserve or restore the functions of natural systems.
- **Education and Awareness Programs –** These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.

The established and agreed upon parish and jurisdiction actions relative to the parish-wide goals are below. Additionally, action updates from the previous plan updates can be found in the first table below.

Tensas Parish 2011 Hazard Mitigation Action Update

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T1: Flood Education	Continue and expand efforts to educate the public regarding floods, including direct mail, technical assistance, and development / implementation of general advertising campaign.	Tensas Parish Office of Homeland Security and Emergency Preparedness	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T2: Business Mitigation	Work with location businesses to identify hazards to their business and mitigation actions that can be taken to protect Parish's economy.	Tensas Parish Office of Homeland Security and Emergency Preparedness	All Hazards	Ongoing
T3: Employee Hazard Mitigation	Work with parish and municipal employees to identify potential ways to mitigate the impact of hazards upon employees, assets and infrastructure	Tensas Parish Office of Homeland Security and Emergency Preparedness	All Hazards	Ongoing
T4: Terrorism Education Program	Develop disaster education program to inform citizens about the terrorism hazard	Tensas Parish Office of Homeland Security and Emergency Preparedness	Terrorism	Deleted
T5: Flooding Education Programs	Develop education programs and support the LA 5th Levee District funding initiatives with disaster education.	Tensas Parish Office of Homeland Security and Emergency Preparedness	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T6: Tornado Education Programs	Develop disaster education programs and warning system implementation procedure for tornadoes	Tensas Parish Office of Homeland Security and Emergency Preparedness	Tornadoes	Ongoing

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T7: Hailproofing Education Programs	Develop disaster education programs and hail proof public buildings	Tensas Parish Office of Homeland Security and Emergency Preparedness	Severe Thunderstorms	Ongoing
T8: Winter Storm Education Programs	Develop disaster education programs for winter storms	Tensas Parish Office of Homeland Security and Emergency Preparedness	Winter Storms	Ongoing
T9: Hurricane Education Programs	Develop disaster education programs for tropical systems / hurricanes	Tensas Parish Office of Homeland Security and Emergency Preparedness	Tropical Systems / Hurricanes	Ongoing
T10: Drought Education Programs	Develop disaster education programs for drought	Tensas Parish Office of Homeland Security and Emergency Preparedness	Droughts	Ongoing
T11: Mosquito Born Disease Education Programs	Develop disaster education programs for mosquito borne disease and implement / maintain new and existing mosquito abatement programs	Tensas Parish Office of Homeland Security and Emergency Preparedness	Mosquito Born Diseases	Ongoing
T12: Wildfire Education Programs	Develop disaster education programs for wildfire	Tensas Parish Office of Homeland Security and Emergency Preparedness	Wildfires	Ongoing
T13: Insurance Partnerships	Develop partnerships with insurance companies to promote building codes	Tensas Parish Office of Homeland Security and Emergency Preparedness	All Hazards	Deleted
T14: FIRM Updating	Work with FEMA to update FIRMs	Tensas Parish Office of Homeland Security and Emergency Preparedness	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Deleted
T15: Update Floodplain Regulations	Continue to update and implement mitigation requirements in floodplain development regulations	Tensas Parish Office of Homeland Security and Emergency Preparedness; Municipal Enforcement Officials	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T16: Transportation Chemical Commodity Flow Study	Develop transportation chemical commodity flow study	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Hazardous Materials Incidents (Fixed Site and Transport)	Deleted
T17: Server Prioritization	Prioritize servers to ensure that critical data remains available.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Deleted
T18: Resource Examination	Examine current resources and potential reservoir sites	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Droughts	Deleted
T19: Vegetation Mitigation Programs	Identify and implement vegetation mitigation programs and methods.	Tensas Parish Office of Homeland Security and Emergency Preparedness	Wildfires	Ongoing
T20: Auxiliary Power Sources	Identify and prioritize auxiliary power sources for critical infrastructure	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Ongoing
T21: Update Development Regulations	Update and implement floodplain development regulations, which limit the opportunity for new homes and businesses to be constructed in the floodplain	Tensas Parish Office of Homeland Security and Emergency Preparedness	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T22: First Responders	First Responders (EMS Personnel) in hazardous materials incidents	Tensas Parish Office of Homeland Security and Emergency Preparedness	All Hazards	Deleted
T23: COOP/COG Exercise	Conduct a COOP/COG exercise to identify challenges to operations from working from an alternate site	Tensas Parish Office of Homeland Security and Emergency Preparedness	All Hazards	Ongoing
T24: Terrorism Exercise	Develop disaster education programs and conduct parish--wide terrorism exercise and critical infrastructure review.	Tensas Parish Office of Homeland Security and Emergency Preparedness	Terrorism	Deleted

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T25: Critical Infrastructure Review	Conduct town-wide terrorism critical infrastructure review.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Terrorism	Deleted
T26: Mitigation Coordination	Coordination of all preparedness and mitigation efforts; hosting disaster response drills; regular attendance at networking, and coordination meetings.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Ongoing
T27: Emergency Personnel Training	Work to provide training to emergency personnel Parish-wide in NIMS and ICS.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Ongoing
T28: Emergency Monitoring Enhancement	Work to enhance emergency monitoring and communications systems to improve ability to predict and prepare for flood events	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T29: Disaster Response Drills and Meetings	Coordination with Local Cities and Towns on all matters of disaster preparedness and mitigation. The Parish will host disaster response drills and attend regular networking and coordination meetings	Tensas Parish Office of Homeland Security and Emergency Preparedness; Tensas Parish Public Works	All Hazards	Ongoing
T30: Flood Emergency Resources	Water Programs Emergency Resource Maintenance-- maintain the resources needed to respond to emergency flood situations.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Tensas Parish Public Works	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T31: International Building Codes	Implement and enforce International Building Codes	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Ongoing
T32: Insurance Partnerships for Mitigation	Develop partnerships with insurance companies to promote mitigation.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Deleted

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T33: Insurance Partnerships for NFIP	Partner with insurance agents to increase awareness and policyholders in the NFIP	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Deleted
T34: Generators for Courthouse, EOC, and Water Wells	Install generator at Tensas Parish Courthouse, Parish EOC, and two water wells (portable)	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Completed
T35: Public Warning System	Upgrade / implement public warning system	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Completed
T36: Mosquito Abatement Programs	Implement/maintain new and existing mosquito abatement programs	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Communicable Diseases	Deleted
T37: Clear Drainage Ditch Debris	Clear debris from dedicated drainage ditches to prevent standing water and related vector control issues	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Communicable Diseases	Deleted
T38: Culvert Resizing	Resize culverts and replace catch basins throughout Parish	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed
T39: Reduce Flooding on Sanderson Road	Reduce/eliminate flooding on Sanderson Road Culvert Crossing	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed
T40: Relocation Incentives	Offer relocation incentives to current flood hazard area residents and businesses (32); develop a community program to acquire repetitive loss structures identified by FEMA	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed

Tensas Parish - Unincorporated				
Jurisdiction-Specific Action	**Action Description**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
T41: Generators for Critical Facilities	Ensure that all critical facilities have generators.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	All Hazards	Completed
T42: Pump Removal Hoists and Emergency Generator Receptacles	Install pump removal hoists and emergency generator receptacles with disconnect boxes at all sewer pump stations	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Ongoing
T43: Mobile Generator for Sewer Pump Stations	Mobile generator to be shared by sewer pump stations	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Tornado / Hurricane and Tropical System	Completed
T44: Generator for Lake Bruin	Generator for Lake Bruin Water System and Intake	Tensas Parish Office of Homeland Security and Emergency Preparedness; Town Mayor's Offices	Tornado / Hurricane and Tropical System	Completed
T45: Preventative Maintenance	Preventative Maintenance for Flood Control Infrastructure to ensure proper function during flood events	Tensas Parish Office of Homeland Security and Emergency Preparedness; Tensas Parish Public Works	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed
T46: New Flood Control Facilities	Flood Control Infrastructure - design and construct new facilities to enhance flood protection during storm and high-water events such as levees and upsized culverts.	Tensas Parish Office of Homeland Security and Emergency Preparedness; Tensas Parish Public Works	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed
T47: Relocation Incentives	Repetitive Loss Properties- offer relocation incentives to current flood hazard area residents and businesses to reduce repeated property damage, contamination hazards, and personal safety risks associated with their current activities	Tensas Parish Office of Homeland Security and Emergency Preparedness; Tensas Parish Public Works	Flooding (Flash and Riverine), Flooding (Dam / Levee Failure)	Completed

Unincorporated Tensas New Mitigation Actions

Tensas Unincorporated - New Mitigation Actions							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
T1: Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Wind, Tropical Cyclone, Tornado	3,4	New
T2: Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Flooding, Tropical Cyclone	3,4	New
T3: Mitigation of repetitive loss and severe repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss or flooding or other hazard prone properties.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Flooding, tropical cyclone, Levee Failure	1,3,4	New
T4: Safe Room Projects	Construction of a safe room for first responders located in Tensas Parish. Other locations will be identified based on funding availability.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Tornado, wind, tropical cyclone, wildfire	1,3,4	New

Tensas Unincorporated - New Mitigation Actions							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
T5: Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for flooding, tropical cyclones, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), drought, sinkholes, levee failure and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), winter storms, drought, sinkholes, levee failure	1,2,3,4	New
T6: Generators for Continuity of Operations and Government	Procurement and Installation of generators at public facilities to ensure continued operations during and after events.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Tornados, winter storms, tropical cyclone, thunderstorms (lightning, high wind, hail) , extreme heat	3,4	New
T7: Lightning Mitigation	Procurement and Installation of Lightning rods and surge protectors for public buildings to preserve life and property	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Lightning	3,4	New
T8: Warning Systems	Update/upgrade public warning system components throughout Tensas Parish as necessary. Install audible and/or reverse 911 warning system(s)	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Winter storm, tornados, tropical cyclone, sinkhole, levee failure	1,3,4	New
T9: Potable Water	Create redundancy of potable water supply to critical facilities, especially hospitals in Parish, and provide protection of potable water supply by acquisition/installation of backflow preventers at appropriate critical locations.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Tropical Cyclone, thunderstorms (lightning, high wind, hail), tornados	3,4	New
T10: Relocation Incentives	Offer relocation incentives to current flood hazard area residents and businesses to reduce repeated property damage and safety risks.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Flooding, Tropical Cyclone, Levee Failure, sinkholes	1,2,3,4	New

Tensas Unincorporated - New Mitigation Actions							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
T11: Levee Failure Working Group / Grant Funding Opportunities	Create a working group to assess the extent and determine the possible effects of levee failure. Seek and apply for future funding.	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Flooding, tropical cyclone, Levee Failure	1,2,3,4	New
T12: Promote Flood Insurance	Promote the purchase of flood insurance. Advertise the availability, cost, and coverage of flood insurance through the National Flood Insurance Program (NFIP).	FEMA HMPG, Local	1-5 years	Tensas Parish OHSEP Director	Tropical Cyclone, Flooding, Levee failure	1,2,3,4	New
T13: Water Conservation Measures	Adopt ordinances requiring water-saving measures in time of drought	FEMA HMGP, Local	1-5 years	Tensas Parish OHSEP Director	Drought	1,2	New
T14: Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinances	FEMA HGMP, Local	1-5 years	Tensas Parish OHSEP Director	Wildfire	1,2	New
T15: Cooling Shelter Construction	Construct or enhance a cooling facility for the residents of Tensas Parish to utilize during times of extreme heat in the parish	FEMA HMGP, Local	1-5 Years	Tensas Parish OHSEP Director	Extreme Heat	1,3,4	New

Town of Newellton - New Mitigation Actions

Town of Newellton							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
N1: Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Wind, Tropical Cyclone, Tornado	3,4	New
N2: Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Flooding, Tropical Cyclone	3,4	New
N3: Mitigation of repetitive loss and severe repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss or flooding or other hazard prone properties.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,3,4	New
N4: Safe Room Projects	Construction of a safe room for first responders located in Newellton. Other locations will be identified based on funding availability.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Tornado, wind, tropical cyclone, wildfire	1,3,4	New

Town of Newellton							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
N5: Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), drought, sinkholes, levee failure and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), winter storms, drought, sinkholes, levee failure	1,2,3,4	New
N6: Generators for Continuity of Operations and Government	Procurement and Installation of generators at public facilities to ensure continued operations during and after events.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Tornados, winter storms, tropical cyclone, thunderstorms (lightning, high wind, hail) , extreme heat	3,4	New
N7: Lightning Mitigation	Procurement and Installation of Lightning rods and surge protectors for public buildings to preserve life and property	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Lightning	3,4	New
N8: Warning Systems	Update/upgrade public warning system components throughout Newellton as necessary. Install audible and/or reverse 911 warning system(s)	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Winter storm, tornados, tropical cyclone, sinkhole, levee failure	1,3,4	New
N9: Potable Water	Create redundancy of potable water supply to critical facilities, especially hospitals in Parish, and provide protection of potable water supply by acquisition/installation of backflow preventers at appropriate critical locations.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Tropical Cyclone, thunderstorms (lightning, high wind, hail), tornados,	3,4	New

Town of Newellton							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
N10: Relocation Incentives	Offer relocation incentives to current flood hazard area residents and businesses to reduce repeated property damage and safety risks.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Flooding, Tropical Cyclone, Levee Failure, sinkholes	1,2,3,4	New
N11: Levee Failure Working Group / Grant Funding Opportunities	Participate in working group to assess the extent and determine the possible effects of levee failure. Seek and apply for future funding.	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,2,3,4	New
N12: Promote Flood Insurance	Promote the purchase of flood insurance. Advertise the availability, cost, and coverage of flood insurance through the National Flood Insurance Program (NFIP).	FEMA HMPG, Local	1-5 years	Mayor, Town of Newellton/ Tensas Parish OHSEP	Tropical Cyclone, Flooding, levee failure	1,2,3,4	New
N13: Water Conservation Measures	Adopt ordinances requiring water-saving measures in time of drought	FEMA HMGP, Local	1-5 years	Tensas Parish OHSEP Director	Drought	1,2	New
N14: Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinances	FEMA HGMP, Local	1-5 years	Tensas Parish OHSEP Director	Wildfire	1,2	New
N15: Cooling Shelter Construction	Construct or enhance a cooling facility for the residents of Tensas Parish to utilize during times of extreme heat in the parish	FEMA HMGP, Local	1-5 Years	Tensas Parish OHSEP Director	Extreme Heat	1,3,4	New

Town of St Joseph – New Mitigation Actions

Town of St. Joseph							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
S1: Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Wind, Tropical Cyclone, Tornado	3,4	New
S2: Drainage Improvements	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Flooding, Tropical Cyclone	3,4	New
S3: Mitigation of repetitive loss and severe repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss or flooding or other hazard prone properties.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,3,4	New
S4: Safe Room Projects	Construction of a safe room for first responders located in St. Joseph. Other locations will be identified based on funding availability.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Tornado, wind, tropical cyclone, wildfire	1,3,4	New

Town of St. Joseph							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
S5: Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), drought, levee failure and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), winter storms, drought, levee failure	1,2,3,4	New
S6: Generators for Continuity of Operations and Government	Procurement and Installation of generators at public facilities to ensure continued operations during and after events.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Tornados, winter storms, tropical cyclone, thunderstorms (lightning, high wind, hail) , extreme heat	3,4	New
S7: Lightning Mitigation	Procurement and Installation of Lightning rods and surge protectors for public buildings to preserve life and property	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Lightning	3,4	New
S8: Warning Systems	Update/upgrade public warning system components throughout St. Joseph as necessary. Install audible and/or reverse 911 warning system(s)	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Winter storm, tornados, tropical cyclone, levee failure	1,3,4	New
S9: Potable Water	Create redundancy of potable water supply to critical facilities, especially hospitals in Parish, and provide protection of potable water supply by acquisition/installation of backflow preventers at appropriate critical locations.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Tropical Cyclone, thunderstorms (lightning, high wind, hail), tornados,	3,4	New

Town of St. Joseph							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
S10: Relocation Incentives	Offer relocation incentives to current flood hazard area residents and businesses to reduce repeated property damage and safety risks.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Flooding, Tropical Cyclone, Levee Failure	1,2,3,4	New
S11: Levee Failure Working Group / Grant Funding Opportunities	Participate in parish working group to assess the extent and determine the possible effects of levee failure. Seek and apply for future funding.	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,2,3,4	New
S12: Promote Flood Insurance	Promote the purchase of flood insurance. Advertise the availability, cost, and coverage of flood insurance through the National Flood Insurance Program (NFIP).	FEMA HMPG, Local	1-5 years	Mayor, Town of St. Joseph/Tensas Parish OHSEP	Tropical Cyclone, Flooding, levee failure	1,2,3,4	New
S13: Water Conservation Measures	Adopt ordinances requiring water-saving measures in time of drought	FEMA HMGP, Local	1-5 years	Tensas Parish OHSEP Director	Drought	1,2	New
S14: Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinances	FEMA HGMP, Local	1-5 years	Tensas Parish OHSEP Director	Wildfire	1,2	New
S15: Cooling Shelter Construction	Construct or enhance a cooling facility for the residents of Tensas Parish to utilize during times of extreme heat in the parish	FEMA HMGP, Local	1-5 Years	Tensas Parish OHSEP Director	Extreme Heat	1,3,4	New

Town of Waterproof – New Mitigation Actions

Town of Waterproof							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
W1: Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Wind, Tropical Cyclone, Tornado	3,4	New
W2: Drainage Improvements	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Flooding, Tropical Cyclone	3,4	New
W3: Mitigation of repetitive loss and severe repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss or flooding or other hazard prone properties.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,3,4	New
W4 Safe Room Projects	Construction of a safe room for first responders located in Waterproof. Other locations will be identified based on funding availability.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Tornado, wind, tropical cyclone, wildfire	1,3,4	New

Town of Waterproof							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
W5: Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), drought, levee failure and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, extreme heat, thunderstorms (lightning, high wind, hail), winter storms, drought, levee failure	1,2,3,4	New
W6: Generators for Continuity of Operations and Government	Procurement and Installation of generators at public facilities to ensure continued operations during and after events.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Tornados, winter storms, tropical cyclone, thunderstorms (lightning, high wind, hail) , extreme heat	3,4	New
W7: Lightning Mitigation	Procurement and Installation of Lightning rods and surge protectors for public buildings to preserve life and property	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Lightning	3,4	New
W8: Warning Systems	Update/upgrade public warning system components throughout Waterproof as necessary. Install audible and/or reverse 911 warning system(s)	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Winter storm, tornados, tropical cyclone, levee failure	1,3,4	New

Town of Waterproof							
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
W9: Potable Water	Create redundancy of potable water supply to critical facilities, especially hospitals in Parish, and provide protection of potable water supply by acquisition/installation of backflow preventers at appropriate critical locations.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Tropical Cyclone, thunderstorms (lightning, high wind, hail), tornados,	3,4	New
W10: Relocation Incentives	Offer relocation incentives to current flood hazard area residents and businesses to reduce repeated property damage and safety risks.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Flooding, Tropical Cyclone, Levee Failure	1,2,3,4	New
W11: Levee Failure Working Group / Grant Funding Opportunities	Participate in parish working group to assess the extent and determine the possible effects of levee failure. Seek and apply for future funding.	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Flooding, tropical cyclone, Levee Failure	1,2,3,4	New
W12: Promote Flood Insurance	Promote the purchase of flood insurance. Advertise the availability, cost, and coverage of flood insurance through the National Flood Insurance Program (NFIP).	FEMA HMPG, Local	1-5 years	Mayor, Town of Waterproof/Tensas Parish OHSEP	Tropical Cyclone, Flooding, levee failure	1,2,3,4	New
W13: Water Conservation Measures	Adopt ordinances requiring water-saving measures in time of drought	FEMA HMGP, Local	1-5 years	Tensas Parish OHSEP Director	Drought	1,2	New
W14: Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinances	FEMA HGMP, Local	1-5 years	Tensas Parish OHSEP Director	Wildfire	1,2	New
W15: Cooling Shelter Construction	Construct or enhance a cooling facility for the residents of Tensas Parish to utilize during times of extreme heat in the parish	FEMA HMGP, Local	1-5 Years	Tensas Parish OHSEP Director	Extreme Heat	1,3,4	New

Action Prioritization

During the prioritization process, each jurisdiction and the steering committee considered the costs and relative benefits of each new action. Costs can usually be listed in terms of dollars, although at times it involves staff time rather than the purchase of equipment or services that can be readily measured in dollars. In most cases, benefits, such as lives saved or future damage prevented, are hard to measure in dollars, many projects were prioritized with these factors in mind.

In all cases, the jurisdictions concluded that the benefits (in terms of reduced property damage, lives saved, health problems averted and/or economic harm prevented) outweighed the costs for the recommended action items.

The steering committee met internally for mitigation action meetings to review and approve Tensas Parish and the jurisdiction's mitigation actions. On-going actions, as well as actions which can be undertaken by existing parish or local staff without need for additional funding, were given high priority. The actions with high benefit and low cost, political support, and public support but require additional funding from parish or external sources were given medium priority. The actions that require substantial funding from external sources with relatively longer completion time were given low priority. There have been no changes in financial, legal and political priorities within the past 5 years, with the methodology and prioritization process remaining the same.

Tensas Parish and the participating jurisdictions will implement and administer the identified actions based off of the proposed timeframes and priorities for each reflected in the portions of this section where actions are summarized. The inclusion of any specific action item in this document does not commit the parish to implementation. Each action item will be subject to availability of staff and funding. Certain items may require regulatory changes or other decisions that must be implemented through standard processes, such as changing regulations. This plan is intended to offer priorities based on an examination of hazards.

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Appendix A: Planning Process

Purpose

The Hazard Mitigation Plan Update process prompts local jurisdictions to keep their hazard mitigation plan current and moving toward a more resilient community. The plan update builds on the research and planning efforts of previous plans while reviewing recent trends. The steering committee followed FEMA's hazard mitigation planning process per the FEMA Local Mitigation Planning Handbook. This planning process assured public involvement and the participation of interested agencies and private organizations. Documentation of the planning process for the updated plan is addressed in this section.

The Tensas Parish Hazard Mitigation Plan Update

The Tensas Parish Hazard Mitigation Plan Update process began in October 2015 with a series of meetings and collaborations between the contractor (SDMI) and the participating jurisdictions. Update activities were intended to give each jurisdiction the opportunity to shape the plan to best fit their community's goals. Community stakeholders and the general public were invited to attend and contribute information to the planning process during specific time periods or meetings.

Tensas Parish includes the unincorporated areas of the parish, as well as three incorporated municipalities that participated in the plan update process – the Town of Newellton, Town of St. Joseph, and Town of Waterproof. Tensas Parish Office of Homeland Security and Emergency Preparedness (OHSEP) invited communities' representatives to meetings, where they supplied critical infrastructure data and reviewed work-in-progress for the plan update.

Similar to the development of the original Hazard Mitigation Plan, the role of the steering committee members during the plan update was to attend the planning meetings and provide valuable information on the parish, develop parts of the plan update, and review the results of research conducted by SDMI. Tasks completed by the steering committee include:

- Reviewing and revising the list of potential hazards included in the plan update
- Assembling a list of critical facilities, such as hospitals, police stations, and shelters
- Updating mitigation goals and objectives
- Determining prudent mitigation measures
- Prioritization of identified mitigation measures

The table below details the meeting schedule and purpose for the planning process:

Date	Meeting or Outreach	Location	Public Invited	Purpose
10/27/2015	Initial Coordination	Telephone/ Email	No	Discuss with Parish HM coordinator and any Steering Committee members expectations and requirements of the project.
12/17/2015	Kick-Off Meeting	St. Joseph, LA	No	Discuss with the plan steering committee expectations and requirements of the project. Assign plan worksheets to jurisdictions.
6/16/2016	Risk Assessment Overview	St. Joseph, LA	No	Discuss and review the risk assessment with the steering committee discuss and review expectations for public meeting.
6/16/2016	Public Meeting	St. Joseph, LA	Yes	The public meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the Assumption Parish communities were provide for the meeting attendees to identify specific areas where localized hazards occur.
Ongoing	Public Survey Tool	Online	Yes	This survey asked participants about public perceptions and opinions regarding natural hazards in Assumption Parish. In addition, we asked about the methods and techniques preferred for reducing the risks and losses associated with these hazards.
2 Week Period	Public Plan Review		Yes	Tensas Parish OHSEP Office

Planning

The plan update process consisted of several phases:

Phase	Month 1-2	Month 3-4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10
Plan Revision								
Data Collection								
Risk Assessment								
Public Input								
Mitigation Strategy and Actions								
Plan Review by GOHSEP and FEMA								
Plan Adoption								
Plan Approval								

Coordination

The Tensas Parish OHSEP oversaw the coordination of the 2016 Hazard Mitigation Plan Update Steering Committee during the update process. The Tensas Parish OHSEP and participating jurisdictions were responsible for identifying members for the committee.

The Parish Director and SDMI were jointly responsible for inviting the Steering Committees and key stakeholders to planned meetings and activities by email invitations, phone calls and calendar invites. SDMI assisted the Parish Director with meeting notices, website and social media statements for notification to the media and general public for public meetings and public outreach activities.

SDMI was responsible for facilitating meetings and outreach efforts during the update process.

Neighboring Community, Local and Regional Planning Process Involvement

From the outset of the planning process, the Hazard Mitigation Team encouraged participation from a broad range of jurisdictional entities. The involvement of representatives from the city, state, and regional agencies provided diverse perspectives and mitigation ideas.

Formal participation in this plan includes but is not limited to the following activities:

- Participation in Hazard Mitigation Team meetings at the local and parish level
- Sharing local data and information
- Local action item development

- Plan document draft review
- Formal adoption of the Hazard Mitigation Plan document by each jurisdiction following provisional approval by The State of Louisiana and FEMA

The 2016 Hazard Mitigation Plan Update Steering Committee consisted of representatives from the following parish, municipal or community stakeholders:

- Tensas Parish Government
- Tensas Office of Homeland Security and Emergency Preparedness
- Tensas Fire Department
- Town of St Joseph
- Town of Newellton
- Town of Waterproof
- GOHSEP Regional Coordinator

The Parish of Concordia was invited by the Tensas Parish OHSEP via email and phone calls to participate in all meetings and activities as well in an effort to collaborate with neighboring communities. In addition, the participation of the GOHSEP Region 8 Coordinator during the process also contributed to neighboring community representation.

As part of the coordination and planning process, each jurisdiction was provided the State Required Hazard Mitigation Plan Update Worksheet. Jurisdictions with the capability to complete and return these worksheets returned them to assist with the 2016 update. The completed worksheets can be found in Appendix E – State Required Plan Update Worksheets.

Below is a detailed list of the 2016 Hazard Mitigation Plan Update Steering Committee:

Name	Title	Agency	Email/Phone	Address
Rick Foster	Director	Tensas OHSEP	tpoep@bellsouth.net	212 Hancock street. St Joseph. La.
Caldwell A. Flood, Jr.	Mayor	Town of Waterproof	(318) 749-5233	311 Main St, Waterproof, LA 71375
Edward L. Brown, Sr.	Mayor	Town of St. Joseph	(318) 766-3713	125 Plank Rd, St Joseph, LA 71366
Timothy Turner	Mayor	Town of Newellton	(318) 467-5051	110 N Main St, Newellton, LA 71357
Payne Scott	Director	Concordia OHSEP	oep@conppj.org	Vidalia, LA
Joe Stewart	Regional Coordinator	GOHSEP	joe.stewart@la.gov	7667 Independence Blvd, Baton Rouge, LA
Ricky Jones	Fire Chief	Tensas Fire Department	rjones@tensasfire.org	St. Joseph, LA

Program Integration

Local governments are required to describe how their mitigation planning process is integrated with other ongoing local and area planning efforts. This subsection describes Tensas Parish programs and planning.

A measure of integration and coordination is achieved through the Hazard Mitigation Plan participation of steering committee members and community stakeholders, who administer programs such as floodplain management under the National Flood Insurance Program (NFIP) and parish planning and zoning and building code enforcement.

Opportunities to integrate the requirements of this Hazard Mitigation Plan into other local planning mechanisms will continue to be identified through future meetings of the parish and jurisdictions, and through the five-year review process described in the Plan Maintenance section. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each jurisdiction's individual city/town plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.).

The members of the Tensas Parish Hazard Mitigation Steering Committee will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in the parish. Existing plans, studies, and technical information were incorporated in the planning process. Examples include flood data from FEMA, the U.S. Army Corps of Engineers (USACE or Corps), and the U.S. Geological Survey. Much of this data was incorporated into the risk assessment component of the plan relative to plotting historical events and the magnitude of damages that occurred. The parish's 2005 Hazard Mitigation Plan was also used in the planning process. Other existing parish and jurisdiction data and plans reviewed and/or incorporated into the planning process include those listed below:

- Emergency Operations Plans
- Flood Insurance Rate Maps

Further information on other plans and capabilities reviewed can be found in the Capabilities Assessment, Section 3.

Meeting Documentation and Public Outreach Activities

The following pages contain information from the meetings and public outreach activities conducted during this Hazard Mitigation Plan Update for Tensas Parish.

Meeting #1: Coordination Discussion

Date: October 27, 2015
Location: Email
Purpose: Discuss with the Hazard Mitigation Lead for the parish (OHSEP Director) the expectations and requirements of the Hazard Mitigation Plan Update process and to establish and initial project timeline.
Public Initiation: No
Invitees Included: Tensas Parish OHSEP, SDMI Staff

Meeting #2: Hazard Mitigation Plan Update Kick-Off

Date: December 17, 2015
Location: St. Joseph, Louisiana
Purpose: Discuss the expectations and requirements of the Hazard Mitigation Plan Update process and to establish and initial project timeline with the parish's Hazard Mitigation Plan Steering Committee. Assign each individual jurisdiction and the parish data collection for the plan update.
Public Initiation: No
Invitees Included:

Name	Title	Agency
Rick Foster	Director	Tensas OHSEP
Caldwell A. Flood, Jr.	Mayor	Town of Waterproof
Edward L. Brown, Sr.	Mayor	Town of St. Joseph
Timothy Turner	Mayor	Town of Newellton
Payne Scott	Director	Concordia OHSEP – Neighboring Community
Joe Stewart	Regional Coordinator	GOHSEP
Ricky Jones	Fire Chief	Tensas Fire Department

Meeting #3: Risk Assessment Overview

Date: June 16, 2016

Location: St. Joseph, LA

Purpose: Members of the Hazard Mitigation Plan Update Steering Committee were invited and were presented the results of the most recent risk assessment and an overview of the public meeting presentation during this overview. The assessment was conducted based on hazards identified during previous plans.

Public Initiation: No

Invitees Included:

Name	Title	Agency
Rick Foster	Director	Tensas OHSEP
Caldwell A. Flood, Jr.	Mayor	Town of Waterproof
Edward L. Brown, Sr.	Mayor	Town of St. Joseph
Timothy Turner	Mayor	Town of Newellton
Payne Scott	Director	Concordia OHSEP – Neighboring Community
Joe Stewart	Regional Coordinator	GOHSEP
Ricky Jones	Fire Chief	Tensas Fire Department

Meeting #4: Public Meeting

Date: June 16, 2016

Location: St. Joseph, LA

Purpose: The public meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the Tensas Parish communities were provided for the meeting attendees to identify specific areas where localized hazards occur.

Public Initiation: Yes

Invitees Included:

Name	Title	Agency
Rick Foster	Director	Tensas OHSEP
Caldwell A. Flood, Jr.	Mayor	Town of Waterproof
Edward L. Brown, Sr.	Mayor	Town of St. Joseph
Timothy Turner	Mayor	Town of Newellton
Payne Scott	Director	Concordia OHSEP – Neighboring Community
Joe Stewart	Regional Coordinator	GOHSEP
Ricky Jones	Fire Chief	Tensas Fire Department

Subject Matter Experts from parish government were present to answer specific questions about proposed projects from any citizens

Meeting Public Notice

STEPHENSON DISASTER MANAGEMENT INSTITUTE

TENSAS OFFICE OF HOMELAND SECURITY & EMERGENCY PREPAREDNESS

MEETING NOTICE – June 16, 2016

Tensas Parish to hold Public Meetings for Hazard Mitigation Plan Update

St. Joseph, LA – Tensas Parish Office of Homeland Security & Emergency Preparedness is in the process of updating the Tensas Parish Hazard Mitigation Plan and are required to hold public meetings on the plan update. The Public meeting will be held on June 16, 2016 in the Tensas Emergency Operations Center from 11:30AM to 12:30PM.

Natural hazards have the potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. While an important aspect of emergency management deals with disaster recovery (the actions that a community takes to repair damages), an equally important aspect of emergency management involves hazard mitigation - sustained actions taken to reduce long-term risk to life and property. They are things we do today to be more protected in the future. For example, elevating buildings in flood hazard areas, installing hurricane clips and storm shutters, relocating critical facilities out of hazard areas, using fire-resistant construction materials in wildfire hazard areas, etc. Hazard mitigation actions are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, they can be long-term, cost-effective means of reducing risk and helping to create a more sustainable and disaster-resilient community.

A hazard mitigation plan describes an area's vulnerability to the various natural hazards that are typically present, along with an array of actions and projects for reducing key risks. While natural disasters cannot be prevented from occurring, the continued implementation of mitigation strategies identified in the plan will gradually, but steadily, make our communities more sustainable and disaster-resilient.

The Disaster Mitigation Act of 2000 (DMA 2000) requires all states and local governments to have a hazard mitigation plan in order to be eligible to apply for certain types of federal hazard mitigation project grants. Hazard mitigation plans must be: (a) implemented on an ongoing basis, and (b) updated every five years to ensure that they remain applicable representations of local risk and locally-preferred risk reduction strategies.

Tensas Parish is in the beginning stages of updating its hazard mitigation plan. Public meeting will be held on June 16th for all citizens interested in learning about and participating in discussions concerning the Tensas Parish Hazard Mitigation Plan.

Residents of Tensas Parish are asked to participate in a survey about public perceptions and opinions regarding natural hazards in the parish. The survey results will be used in the development of the plan. This short web-based survey can be found at https://www.surveymonkey.com/r/TENSAS

For more information, please contact: Rick Foster, OHSEP Director

Outreach Activity #1: Public Opinion Survey

Date: Ongoing throughout planning process
Location: Web Survey
Public Initiation: Yes
*No responses were collected during this activity

Outreach Activity #2: Incident Questionnaire

Date: Public Meeting Activity
Location: Public Meeting
Public Initiation: Yes

Outreach Activity #3: Mapping Activities

Public meeting attendees were asked to identify areas on jurisdictional maps provided that were "problem areas". They were also asked to indicate any areas of new development. This activity gave the public an opportunity to interact with SDMI's GIS Mapping section, as well as provide valuable input on areas that may flood repeatedly during rain events that may not get reported to local emergency managers as significant events.

Public Plan Review Documentation

The Tensas Parish Hazard Mitigation Draft Plan was placed in the Tensas Parish OHSEP Office (printed copy) to collect comments and feedback from the public. This outreach provided the public an opportunity to comment on the plan during the drafting stage and prior to plan approval. No feedback or public comment was received during this time.

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Appendix B: Plan Maintenance

Purpose

The section of the Code of Federal Regulations (CFR) pertaining to Local Mitigation Plans lists five required components for each plan: a description of the planning process; risk assessments; mitigation strategies; a method and system for plan maintenance; and documentation of plan adoption. This section details the method and system for plan maintenance, following the CFR's guidelines that the Plan Update must include (1) "a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle," (2) "a process by which local governments incorporated the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans", and (3) "discussion on how the community will continue public participation in the plan maintenance process."

Monitoring, Evaluating, and Updating the Plan

The Tensas Parish Planning Committee will be responsible for monitoring, evaluating, and documenting the plan's progress throughout the year. Part of the plan maintenance process should include a system by which local governing bodies incorporate the HMP into the parish's comprehensive or capital improvement plans. This process provides for continued public participation through the diverse resources of the parish to help in achieving the goals and objectives of the plan. Public participation will be achieved through availability of copies of HMP in parish public library and parish website. This section describes the whole update process which includes the following:

- Responsible parties
- Methods to be used
- Evaluation criteria to be applied
- Scheduling for monitoring and evaluating the plan

Responsible Parties

Tensas Parish has developed a method to ensure that a regular review and update of the Hazard Mitigation Plan occurs. This will be the responsibility of the steering committee, which consists of representatives from governmental organizations, local businesses, and private citizens, who will be involved in the process of monitoring, evaluating and updating the plan. All committee members in this plan will remain active in the steering committee.

Although the people filling the positions may change from year to year, the parish and its stakeholders will have representatives on the Steering Committee. The future Steering Committee will continue to be comprised of the same job functions as currently evident in the Steering Committee. However, the decision of specific job duties will be left to the Parish OHSEP Director to be assigned as deemed appropriate.

Methods for Monitoring and Evaluating the Plan and Plan Evaluation Criteria

Tensas Parish has developed a method to ensure monitoring, evaluating, and updating of the HMP occurs during the five-year cycle of the plan. The planning committee will become a permanent body and will be responsible for monitoring, evaluating, and updating of the plan. The planning committee meeting will be held annually in order to monitor, evaluate, and update the plan. The Tensas Parish OHSEP Director will be responsible for conducting the annual planning committee meetings.

The lead person of the agency responsible for the implementation of a specific mitigation action will submit a progress report to the Director at least thirty days prior to the planning committee meeting. The progress report will provide project status monitoring to include the following: whether the project has started; if not started, reason for not starting; if started, status of the project; if the project is completed, whether it has eliminated the problem; and any changes recommended to improve the implementation of the project etc. In addition, the progress report will provide status monitoring on the plan evaluation, changes to the hazard profile, changes to the risk assessment, and public input on the Hazard Mitigation Plan updates and reviews.

Progress on the mitigation action items and projects will be reviewed during the annual planning committee meeting. The criteria that would be utilized in the project review will include the following:

1) Whether the action was implemented and reasons, if the action was not implemented

2) What were the results of the implemented action

3) Were the outcomes as expected, and reasons if the outcomes were not as expected

4) Did the results achieve the stated goals and objectives

5) Was the action cost-effective

6) What were the losses avoided after completion of the project

7) In case of a structural project, did it change the hazard profile

In addition to monitoring and evaluating the progress of the mitigation plan actions and projects, the mitigation plan is required to be maintained and monitored annually, and updated every five years. The annual maintenance, monitoring and evaluation of the plan will be conducted in the annual planning committee meeting. The planning committee will review each goal and objective to determine their relevance to changing situations in the parish, as well as changes to state or federal policy, and to ensure that they are addressing current and expected conditions. The planning committee will evaluate if any change in hazard profile and risk in the parish occurred during the past year. In addition, the evaluation will include the following criteria in respect of plan implementation:

1) Any local staffing changes that would warrant inviting different members to the planning committee

2) Any new organizations that would be valuable in the planning process or project implementation need to be included in the planning committee

3) Are there any procedures that can be done more efficiently

4) Are there more ways to gain more diverse and widespread cooperation

5) Are there any different or additional funding sources available for mitigation planning and implementation

The HMP will be updated every five years to remain eligible for continued HMGP funding. The planning committee will be responsible for updating the HMP. The OHSEP Director will be the lead person for the HMP update. The HMP update process will commence at least one year prior to the expiration of the plan. The HMP will be updated after a major disaster if an annual evaluation of the plan indicates a substantial change in hazard profile and risk assessment in the parish.

Additionally, the public will be canvassed to solicit public input to continue Tensas Parish's dedication to involving the public directly in review and updates of the Hazard Mitigation Plan. Meetings will be scheduled as needed by the plan administrator to provide a forum for which the public can express their concerns, opinions, and/or ideas about the plan. The plan administrator will be responsible for using parish resources to publicize the annual public meetings and maintain public involvement through the newspapers, radio, and public access television channels. Copies of the plan will be catalogued and kept at all appropriate agencies in the city government, as well as at the Public Library.

The review by the steering committee and input from the public will determine whether a plan update is needed prior to the required five-year update.

Annual Reports on the progress of actions, plan maintenance, monitoring, evaluation, incorporation into existing planning programs, and continued public involvement will be documented at each annual meeting of the committee and kept by the Parish OHSEP Director. The Steering Committee will work together as a team, with each member sharing responsibility for completing the monitoring, evaluation and updates. It is the responsibility of the Parish OHSEP Director for contacting committee members, organizing the meeting and providing public noticing for the meeting to solicit public input.

2016 Plan Version Plan Method and Schedule Evaluation

For the current plan update, the previously approved plan's method and schedule were evaluated to determine if the elements and processes involved in the required 2016 update. Based on this analysis, the method and schedule were deemed to be acceptable, and nothing was changed for this update.

Incorporation into Existing Planning Programs

It is and has been the responsibility of the Tensas Parish Hazard Mitigation Plan Steering Committee and participating jurisdictions to determine additional implementation procedures when appropriate. This may include integrating the requirements of the Tensas Parish Hazard Mitigation Plan into each jurisdiction's planning documents, processes, or mechanisms as follows:

- Ordinances, Resolutions, Regulations
- Floodplain Ordinances (Parish and Jurisdictions)
- Emergency Operations Plan (Parish)
- Stormwater Management Plan (Parish)
- Continuity of Operations Plan (Parish)

Opportunities to integrate the requirements of this plan into other local planning mechanisms will continue to be identified through future meetings of the Tensas Parish Hazard Mitigation Steering Committee and through the five-year review process described herein. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update and implementation of each jurisdiction's individual plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.). The members of the steering committee will meet with Department Heads to discuss what should be included in the changes that are necessary before the changes are introduced to the city council or police jury meetings. Steering committee members will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Tensas Parish Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability within the parish.

During the planning process for new and updated local planning documents at the parish and jurisdiction level, such as a risk assessment, comprehensive plan, capital improvements plan, or emergency operations plan, the jurisdictions will provide a copy of the Parish Hazard Mitigation Plan to the appropriate parties and recommend that all goals and strategies of new and updated local planning documents are consistent with and support the goals of the Parish Hazard Mitigation Plan and will not contribute to increased hazards.

Although it is recognized that there are many possible benefits to integrating components of this plan into other parish and jurisdiction planning mechanisms, the development and maintenance of this stand-alone Hazard Mitigation Plan is deemed by the steering committee to be the most effective and appropriate method to ensure implementation of parish and local hazard mitigation actions.

On behalf of the jurisdictions of Unincorporated Tensas Parish, Town of Newellton, Town of St. Joseph, and Town of Waterproof, Tensas Parish has the authority to incorporate the contents of the Hazard Mitigation Plan into the parish's existing regulatory mechanisms. Agreements are currently in place with jurisdictions to allow for the parish incorporation mechanisms to take place.

The following parish and local plans incorporate requirements of this HMP Update as follows through steering committee member and jurisdiction representation throughout the planning process as described above:

Unincorporated Tensas Parish
Comprehensive Master Plan/Updated as needed/Tensas Parish Government
Capital Improvement Plan/Updated Annually/Tensas Parish Government
Local Emergency Operations Plan/Updated as needed/Tensas Parish OHSEP
Continuity of Operations Plan/Updated as needed/Tensas Parish OHSEP
Economic Development Plan/Updated as needed/Tensas Parish Government
Transportation Plan/Updated as needed/Tensas Parish Government

Town of Newellton
There are no additional plans within this jurisdiction for the Hazard Mitigation Plan to be integrated.

Town of St. Joseph
There are no additional plans within this jurisdiction for the Hazard Mitigation Plan to be integrated.

Town of Waterproof
There are no additional plans within this jurisdiction for the Hazard Mitigation Plan to be integrated.

Continued Public Participation

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan evolves over time. Significant changes or amendments to the plan require a public hearing prior to any adoption procedures. Other efforts to involve the public in the maintenance, evaluation, and revision process will be made as necessary. These efforts will include at least one of the following:

- Advertising meetings of the Mitigation Committee in the local newspaper, public bulletin boards, and/or city and county office buildings
- Designating willing and voluntary citizens and private sector representatives as official members of the Mitigation Committee
- Utilizing local media to update the public of any maintenance and/or periodic review activities taking place
- Utilizing city and parish web sites to advertise any maintenance and/or periodic review activities taking place
- Keeping copies of the plan in appropriate public locations

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Appendix C: Essential Facilities

Tensas Parish Essential Facilities – All Jurisdictions

Tensas Parish Unincorporated Essential Facilities												
Type	**Name**	**Drought***	**Extreme Heat***	**Flooding**	**Sinkholes**	**Hail**	**Lightning**	**Wind**	**Tornado**	**Tropical Cyclone**	**Wildfire***	**Winter Storms***
Fire and Rescue	Fire Station			X		X	X	X	X	X		
	Fire Station				X	X	X	X	X	X		
	Fire Station					X	X	X	X	X		
	Hwy 566 Fire Station			X		X	X	X	X	X		
	Hwy 571 Fire Station			X		X	X	X	X	X		
	Hwy 573 Fire Station			X		X	X	X	X	X		
	Hwy 892 Fire Station			X		X	X	X	X	X		
	Lake Bruin Fire Station					X	X	X	X	X		
Government	Maintenance Facility					X	X	X	X	X		
	St. Joseph Animal Rescue					X	X	X	X	X		
	Tensas Parish Community Center			X		X	X	X	X	X		
	Tensas Parish Maintenance Unit					X	X	X	X	X		
Public Health	Franklin Medical Center					X	X	X	X	X		

Tensas Parish Unincorporated Essential Facilities												
Type	Name	Drought*	Extreme Heat*	Flooding	Sinkholes	Hail	Lightning	Wind	Tornado	Tropical Cyclone	Wildfire*	Winter Storms*
Schools	Tensas Academy					X	X	X	X	X		
	Tensas Elementary School					X	X	X	X	X		

Newellton Essential Facilities												
Type	**Name**	**Drought***	**Extreme Heat***	**Flooding**	**Sinkholes**	**Hail**	**Lightning**	**Wind**	**Tornado**	**Tropical Cyclone**	**Wildfire***	**Winter Storms***
Fire and Rescue	Newellton Fire Department			X	X	X	X	X	X	X		
Government	Housing Authority of Newellton			X	X	X	X	X	X	X		
	Newellton Chamber of Commerce			X	X	X	X	X	X	X		
	Tensas Parish Council on Aging			X	X	X	X	X	X	X		
Law Enforcement	Newellton Police Department			X	X	X	X	X	X	X		
Corrections	JB Evans Correctional Center				X	X	X	X	X	X		
Public Health	Franklin medical Center - Newellton				X	X	X	X	X	X		
	Tensas Care and Rehab Center				X	X	X	X	X	X		
Schools	Newellton Elementary School				X	X	X	X	X	X		

St. Joseph Essential Facilities												
Type	**Name**	**Drought***	**Extreme Heat***	**Flooding**	**Sinkholes**	**Hail**	**Lightning**	**Wind**	**Tornado**	**Tropical Cyclone**	**Wildfire***	**Winter Storms***
Fire and Rescue	Fire Station					X	X	X	X	X		
	Tensas Fire District					X	X	X	X	X		
Government	District Attorney's Office					X	X	X	X	X		
	LA Secretary of State's Office					X	X	X	X	X		
	Sixth District Court Judge					X	X	X	X	X		
	St. Joseph City Hall					X	X	X	X	X		
	Tensas Community Development Center					X	X	X	X	X		
	Tensas Parish Council on Aging					X	X	X	X	X		
	Tensas Parish Courthouse					X	X	X	X	X		
	Tensas Department of Health and Hospitals					X	X	X	X	X		
	Tensas Department of Motor Vehicles					X	X	X	X	X		
	Tensas Department of Social Services					X	X	X	X	X		

St. Joseph Essential Facilities												
Type	**Name**	**Drought***	**Extreme Heat***	**Flooding**	**Sinkholes**	**Hail**	**Lightning**	**Wind**	**Tornado**	**Tropical Cyclone**	**Wildfire***	**Winter Storms***
	Tensas Educational Materials Center					X	X	X	X	X		
	Tensas Office of Voter Registration					X	X	X	X	X		
	Tensas Parish School Board					X	X	X	X	X		
	Tensas parish School Board Special Services Center					X	X	X	X	X		
	Town of St. Joseph Mayor's Office					X	X	X	X	X		
	Unknown					X	X	X	X	X		
	USDA Service Center					X	X	X	X	X		
Law Enforcement	St. Joseph Police Station					X	X	X	X	X		
Public Health	Tensas Parish Health Unit					X	X	X	X	X		
Schools	Tensas High School					X	X	X	X	X		

Waterproof Essential Facilities												
Type	**Name**	**Drought***	**Extreme Heat***	**Flooding**	**Sinkholes**	**Hail**	**Lightning**	**Wind**	**Tornado**	**Tropical Cyclone**	**Wildfire***	**Winter Storms***
Fire and Rescue						X	X	X	X	X		
Law Enforcement	Waterproof Police Station					X	X	X	X	X		
Corrections	Tensas Detention Facility			X		X	X	X	X	X		
Government	Waterproof Town Hall					X	X	X	X	X		
Schools	Waterproof High School - Abandoned					X	X	X	X	X		

*No critical facilities are vulnerable to the hazard

Appendix D: Plan Adoption

VILLAGE OF WATERPROOF
503 MAIN ST. P.O. BOX 248
WATERPROOF, LA 71375
PHONE: (318) 749-5233
FAX: (318) 749-3131
"THIS IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER"

A RESOLUTION OF THE VILLAGE OF WATERPROOF ADOPTING THE TENSAS PARISH HAZARD MITIGATION PLAN -UPDATED 2016

WHEREAS, the Village of Waterproof recognizes the threat that natural hazards pose to people and property within Tensas Parish; and

WHEREAS, the Parish of Tensas has prepared a multi-hazard mitigation plan, hereby known as THE TENSAS PARISH HAZARD MITIGATION PLAN UPDATE 2016, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, THE PARISH OF TENSAS HAZARD MITIGATION PLAN - UPDATE 2016, identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Tensas Parish from the impacts of future hazards and disasters; and

WHEREAS, adoption by the Village of Waterproof demonstrates their commitment to the hazard mitigation and achieving the goals outlined in THE TENSAS PARISH HAZARD MITIGATION PLAN-2016 UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE VILLAE OF WATERPROOF COUNCIL THAT:

Section 1. The Village of Waterproof adopts THE TENSAS PARISH HAZARD MITIGATION PLAN- UPDATE 2016.

I hereby certify that I am the duly acting and qualified Mayor of the Village of Waterproof and that the above and foregoing constitutes a true and correct copy of the Resolution duly adopted at a meeting of the Council held on June 11, 2018, at which meeting a quorum was present and voted in favor of said Resolution.

Caldwell A. Flood, Mayor

This resolution shall pass effective June11, 2018.

THUS DONE AND PASSED BY VOTE INDICATED BELOW:

	NAYS	YAYS	ABSENT	SIGNATURE
Veronica Stacker	____	____	X	_____
Henry Jenkins	____	X	____	_____
Robert Clark	____	X	____	_____

Caldwell Flood, Jr.
Mayor

Erica Crump
Clerk

TOWN OF NEWELLTON
REGULAR MEETING
JUNE 13, 2018

CALL TO ORDER: The Mayor and Board of Alderman met in regular session, on June 13, 2018 at 5:30 p.m. in the Newellton conference room. Those present were Mayor Timothy Turner, Edwin Britt, Ben Britton, Richard Dunmore. Lavone Garner and Mattie Sampson were absent. Also present was Patricia Washington, Roy Sikes, Kelvin McCaskill and Chief Johnny Gales.
PRAYER: There being a quorum present Ben Britton opened the meeting with a prayer.
MINUTES: On a motion by Edwin Britt seconded by Richard Dunmore and unanimously carried the minutes were approved as appeared in the Tensas Gazette.
BILLS: On a motion by Ben Britton seconded Richard Dunmore and unanimously carried the bills were approved for payment as funds become available.
PUBLIC COMMENTS:
BUDGET: The council members were presented with a copy of the 2018/2019 budget for their review last month. On a motion by Edwin Britt seconded by Richard Dunmore the budget was adopted.
DOLLAR GENERAL ALCOHOL PERMIT: On a motion by Ben Britton seconded by Richard Dunmore and unanimously carried the Town of Newellton granted approval for Alcohol Permit to Dollar General.
LCDBG ACCOUNT RESOLUTION: On a motion by Ben Britton seconded by Edwin Britt and unanimously carried a resolution was adopted authorizing Mayor Timothy Turner, Patricia Washington and Edwin Britt to sign checks and conduct business for the town.
STATE BOND COMMISSION RESOLUTION: On a motion by Ben Britton seconded by Richard Dunmore and unanimously carried a resolution was adopted making application to the State Bond Commission for consent and authority for the Town of Newellton.
TENSAS PARISH HAZARD MITIGATION PLAN ADOPTION RESOLUTION: On a motion by Ben Britton seconded by Edwin Britt and unanimously carried a resolution was adopted on the Tensas Hazard Mitigation Plan.
EXECUTIVE SESSION: On a motion by Ben Britton seconded by Richard Dunmore at 6:05 p.m. the council went out of regular session into executive session. At 6:56 p.m. on a motion by Edwin Britt seconded by Richard Dunmore the board went back into regular session.
ACTION TAKEN: On a motion by Ben Britton seconded by Richard Dunmore and unanimously upon recommendation of Mr. Roy Sikes, Derrick Jackson was hired as a plant worker. He will be under a 6-month probationary period and a starting pay rate of $7.25 per hour.
ADJOURN: On a motion by Ben Britton seconded by Edwin Britt the meeting was adjourned

Patricia Washington

Timothy Turner, Mayor

TENSAS PARISH POLICE JURY

212 HANCOCK STREET
ST. JOSEPH, LOUISIANA 71366
TELEPHONE (318) 766-3542
FAX (318) 766-4580
email: cathydarden@bellsouth.net

STATE OF LOUISIANA
PARISH OF TENSAS

A RESOLUTION OF THE PARISH OF TENSAS ADOPTING THE TENSAS PARISH HAZARD MITIGATION PLAN - UPDATE2016

WHEREAS, the Parish of Tensas recognizes the threat that natural hazards pose to people and property within Tensas Parish; and

WHEREAS, the Parish of Tensas has prepared a multi-hazard mitigation plan, hereby known as THE TENSAS PARISH HAZARD MITIGATION PLAN UPDATE 2016, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, THE PARISH OF TENSAS HAZARD MITIGATION PLAN - UPDATE 2016, identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Tensas Parish from the impacts of future hazards and disasters; and

WHEREAS, adoption by the Tensas Parish Police Jury demonstrates their commitment to the hazard mitigation and achieving the goals outlined in THE TENSAS PARISH HAZARD MITIGATION PLAN - 2016 UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE TENSAS PARISH POLICE JURY THAT:

Section 1. The Tensas Parish Police Jury adopts THE TENSAS PARISH HAZARD MITIGATION PLAN- UPDATE 2016.

I hereby certify that I am the duly acting and qualified Secretary/Treasurer of the Tensas Parish Police Jury and that the above and foregoing constitutes a true and correct copy of the Resolution duly adopted at a meeting of the Jury held on April 10, 2018, at which meeting a quorum was present and voted in favor of said Resolution.

Cathy Darden

Cathy Darden, Secretary/Treasurer

TOWN OF SAINT JOSEPH
125 Plank Road
Saint Joseph, Louisiana 71366

RESOLUTION
BY BOARD OF ALDERMEN
OF THE TOWN OF SAINT JOSEPH
STATE OF LOUISIANA, PARISH OF TENSAS

RESOLUTION 18-006

A RESOLUTION ADOPTING THE TENSAS PARISH HAZARD MITIGATION PLAN 2016

At the May 14, 2018 regular meeting of the Mayor and Board of Aldermen of the Town of Saint Joseph, held at City Hall in the Town of Saint Joseph, Louisiana, Parish of Tensas, at which a quorum of the Aldermen was present, the following business was conducted:

WHEREAS, The **SAINT JOSEPH** Mayor and Board of Aldermen recognize the threat that natural hazards pose to people and property within Saint Joseph; and

WHEREAS, TENSAS Parish Government has prepared a multi-hazard mitigation plan, hereby known as TENSAS Parish Hazard Mitigation Plan 2016 in accordance with the Disaster Mitigation Act of 2000, and

WHEREAS adoption by the **SAINT JOSEPH** Board of Aldermen demonstrates their commitment to the hazard mitigation and achieving the goals outlined in the **TENSAS** Parish Hazard Mitigation Plan 2016.

NOW THEREFORE, BE IT RESOLVED that the **SAINT JOSEPH** Board of Alderman hereby adopt the **TENSAS** Parish Hazard Mitigation Plan 2016.

BE IT FURTHER RESOLVED that the foregoing resolution was read in full, the roll was called on the adoption thereof, and the resolution was adopted by the following votes

	YES	NAYS	ABSTAINED	ABSENT
Lewis	X			
Jackson	X			
Newman	X			
Shields	X			
Olds	X			

CERTIFICATE

I, Maude H. Scott, Clerk of the Town of Saint Joseph, do hereby certify that the above and foregoing is a true and correct copy of a resolution passed and adopted by the Mayor and Board of Aldermen of the Town of Saint Joseph at a regular meeting held in Saint Joseph, Louisiana on the 14th day of May 2018, at which meeting a quorum of said Board was present and participating, and said

Witness my hand officially at Saint Joseph, Louisiana, this 14th day of May 2018.

Maude H. Scott
Maude H. Scott, Municipal Clerk

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Appendix E: State Required Worksheets

During the planning process (Appendix A) the Hazard Mitigation Plan Update Steering Committee was provided state-required plan update process worksheets to be filled out by each jurisdiction. The worksheets were presented at the Kickoff Meeting by the contractor as tools for assisting in the update of the Hazard Mitigation Plan. The plan update worksheets allowed for collection of information such as planning team members, community capabilities, critical infrastructure and vulnerable populations and NFIP information. The following pages contain documentation of the worksheets.

Mitigation Planning Team

Name	Title	Agency	Email/Phone	Address
Rick Foster	Director	Tensas OHSEP	tpoep@bellsouth.net	212 Hancock street. St Joseph. La.
Caldwell A. Flood, Jr.	Mayor	Town of Waterproof	(318) 749-5233	311 Main St, Waterproof, LA 71375
Edward L. Brown, Sr.	Mayor	Town of St. Joseph	(318) 766-3713	125 Plank Rd, St Joseph, LA 71366
Timothy Turner	Mayor	Town of Newellton	(318) 467-5051	110 N Main St, Newellton, LA 71357
Payne Scott	Director	Concordia OHSEP	oep@conppj.org	Vidalia, LA
Joe Stewart	Regional Coordinator	GOHSEP	joe.stewart@la.gov	7667 Independence Blvd, Baton Rouge, LA
Ricky Jones	Fire Chief	Tensas Fire Department	rjones@tensasfire.org	St. Joseph, LA

Capability Assessment

Tensas Unincorporated

Worksheet 4.1: Capability Assessment Worksheet		
Local mitigation capabilities are existing authorities, polices and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
Tensas Parish Unincorporated		
Plans	Yes/No	Comments
Comprehensive / Master Plan	Y	
Capital Improvements Plan	Y	
Economic Development Plan	Y	
Local Emergency Operations Plan	Y	
Continuity of Operations Plan	Y	
Transportation Plan	Y	
Stormwater Management Plan	N	
Community Wildfire Protection Plan	N	
Other plans (redevelopment, recovery, coastal zone management)	N	
Building Code, Permitting and Inspections		
Building Code	Y	
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	
Fire Department ISO/PIAL rating	7	
Site plan review requirements	N	
Land Use Planning and Ordinances		
Zoning Ordinance	N	

Subdivision Ordinance	Y	
Floodplain Ordinance	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	N	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	N	
Other	N	
Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	**Yes/No**	**Comments**
Planning Commission	N	
Mitigation Planning Committee	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Staff		
Chief Building Official	Y	On Contract
Floodplain Administrator	Y	On contact
Emergency Manager	Y	
Community Planner	N	
Civil Engineer	Y	
GIS Coordinator	N	
Grant Writer	N	
Other	N	
Technical		

Warning Systems / Service (Reverse 911, outdoor warning signals)	Y	
Hazard Data & Information	Y	
Grant Writing	N	
Hazus Analysis	N	
Other	N	
Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes/No	Comments
Capital Improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	Y	
Other Funding Programs	Y	Delta Recovery Authority
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes/No	Comments
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	
Natural Disaster or safety related school program	Y	

Storm Ready certification	N	
Firewise Communities certification	N	
Public/Private partnership initiatives addressing disaster-related issues	N	
Other	N	

Town of Newellton

Worksheet 4.1: Capability Assessment Worksheet		
Local mitigation capabilities are existing authorities, polices and resources that reduce hazard impacts or that could be used to		
implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
Newellton		
Plans	Yes/No	Comments
Comprehensive / Master Plan	N	RELY ON PARISH
Capital Improvements Plan	N	RELY ON PARISH
Economic Development Plan	N	RELY ON PARISH
Local Emergency Operations Plan	N	RELY ON PARISH
Continuity of Operations Plan	N	RELY ON PARISH
Transportation Plan	N	RELY ON PARISH
Stormwater Management Plan	N	RELY ON PARISH
Community Wildfire Protection Plan	N	RELY ON PARISH
Other plans (redevelopment, recovery, coastal zone management)	N	
Building Code, Permitting and Inspections		
Building Code	N	Police Jury Bldg Inspect

Building Code Effectiveness Grading Schedule (BCEGS) Score	N	
Fire Department ISO/PIAL rating	5	
Site plan review requirements	N	
Land Use Planning and Ordinances		
Zoning Ordinance	N	
Subdivision Ordinance	N	
Floodplain Ordinance	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	N	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	N	
Other	N	
Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes/No	Comments
Planning Commission	N	
Mitigation Planning Committee	Y	Parish
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Staff		
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	

Civil Engineer	N	
GIS Coordinator	N	
Grant Writer	N	
Other	N	
Technical		
Warning Systems / Service (Reverse 911, outdoor warning signals)	Y	
Hazard Data & Information	N	
Grant Writing	N	
Hazus Analysis	N	
Other	N	
Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes/No	Comments
Capital Improvements project funding	N	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	N	
Other Funding Programs	N	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes/No	Comments

Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	N	
Natural Disaster or safety related school program	Y	
Storm Ready certification	N	
Firewise Communities certification	N	
Public/Private partnership initiatives addressing disaster-related issues	N	
Other	N	

Town of St Joseph

Worksheet 4.1: Capability Assessment Worksheet		
Local mitigation capabilities are existing authorities, polices and resources that reduce hazard impacts or that could be used to		
implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
St. Joseph		
Plans	Yes/No	Comments
Comprehensive / Master Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	RELY ON PARISH

Local Emergency Operations Plan	N	RELY ON PARISH
Continuity of Operations Plan	N	RELY ON PARISH
Transportation Plan	N	RELY ON PARISH
Stormwater Management Plan	N	
Community Wildfire Protection Plan	N	
Other plans (redevelopment, recovery, coastal zone management)	N	
Building Code, Permitting and Inspections		
Building Code	Y	Parish Building Codes
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	
Fire Department ISO/PIAL rating	5	
Site plan review requirements	Y	
Land Use Planning and Ordinances		
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
Floodplain Ordinance	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Y	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	N	
Other	N	
Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without		
local staff resources, if there are public resources at the next higher level government that can provide technical assistance,		
indicate so in your comments.		
Administration	Yes/No	Comments

Planning Commission	N	
Mitigation Planning Committee	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Staff		
Chief Building Official	N	Parish Official
Floodplain Administrator	N	Parish Contract
Emergency Manager	N	
Community Planner	N	
Civil Engineer	N	
GIS Coordinator	N	
Grant Writer	N	
Other	N	
Technical		
Warning Systems / Service (Reverse 911, outdoor warning signals)	Y	Parish System
Hazard Data & Information	N	Parish System
Grant Writing	N	
Hazus Analysis	N	
Other	N	
Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes/No	Comments
Capital Improvements project funding	Y	
Authority to levy taxes for specific purposes	y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	Y	

Other Funding Programs	N	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	**Yes/No**	**Comments**
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	
Natural Disaster or safety related school program	Y	
Storm Ready certification	N	
Firewise Communities certification	N	
Public/Private partnership initiatives addressing disaster-related issues	Y	
Other	N	

Town of Waterproof

Worksheet 4.1: Capability Assessment Worksheet		
Local mitigation capabilities are existing authorities, polices and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
Waterproof		
Plans	Yes/No	Comments
Comprehensive / Master Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	N	RELY ON PARISH
Continuity of Operations Plan	N	RELY ON PARISH
Transportation Plan	N	RELY ON PARISH
Stormwater Management Plan	N	
Community Wildfire Protection Plan	N	
Other plans (redevelopment, recovery, coastal zone management)	N	
Building Code, Permitting and Inspections		
Building Code	Y	
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	
Fire Department ISO/PIAL rating	5	
Site plan review requirements	Y	
Land Use Planning and Ordinances		
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
Floodplain Ordinance	Y	

Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	N	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	N	
Other	N	
Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes/No	Comments
Planning Commission	N	
Mitigation Planning Committee	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Staff		
Chief Building Official	N	
Floodplain Administrator	N	Contract with Parish
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y	Pan American
GIS Coordinator	N	
Grant Writer	N	
Other	N	
Technical		
Warning Systems / Service (Reverse 911, outdoor warning signals)	N	
Hazard Data & Information	N	

Grant Writing	N	
Hazus Analysis	N	
Other	N	
Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes/No	Comments
Capital Improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	Y	
Other Funding Programs	N	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes/No	Comments
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	N	
Natural Disaster or safety related school program	N	
Storm Ready certification	N	
Firewise Communities certification	N	

Public/Private partnership initiatives addressing disaster-related issues	N	
Other	N	

Building Inventory

Critical Facility (If Yes, Mark X)	Name of Building	Purpose of Building	Address	City	Latitude	Longitude	Assessed Value	Date Built	Construction Type
Tensas Parish									
X	Tensas Community Center	Education	107 Arts Dr	Saint Joseph	31.9490384	-91.2252306	$400,000	2005	concrete
X	Tensas Academy	Education	418 Louisiana 128	Saint Joseph	31.92994357	-91.24690325	$350,000	1973	metal
X	Tensas High School	Education	720 Plank Road	Saint Joseph	31.92264293	-91.23794599	$568,215.00	1940	concrete
X	Tensas Elementary School	Education	192 Highway 897-6	Saint Joseph	31.91786837	-91.24615812	$473,985.00	1960	concrete
X	Tensas Parish EMS Station	Emergency Medical Services	1233 Plank Road	Saint Joseph	31.95944732	-91.27132393	$65,000	2005	metal
X	Tensas Parish Communication District	Emergency Operations Center	Nearby: 3rd Street	Saint Joseph	31.91545708	-91.23732296	$450,000	2005	concrete
X	Tensas Parish Maintenance Unit	Civil Government	Nearby: Louisiana 128	Saint Joseph	31.93201998	-91.25248907	$20,000	1960	metal
x	USDA Service Center	Civil Government	1000 Asu Drive #539	Saint Joseph	31.92594016	-91.24386801	Unknown	1991	concrete
X	Tensas Parish Department of	Civil Government	Nearby: LA 897-6	Saint Joseph	31.92348204	-91.24410773	Unknown	2004	concrete

	Health and Hospitals								
X	Tensas Parish School Board Special Services Center	Civil Government	720 Plank Road	Saint Joseph	31.92332823	-91.23912936	Unknown	1962	concrete
X	Tensas Parish Educational Materials Center	Civil Government	512 Plank Road	Saint Joseph	31.92186629	-91.23731784	Unknown	1962	concrete
X	Tensas Parish School Board	Civil Government	720 Plank Road	Saint Joseph	31.92097998	-91.23633242	$80,000	1962	concrete
X	Tensas Parish Courthouse	Civil Government	124 Hancock Street	Saint Joseph	31.91426542	-91.23695532	$72,495.00	1905	concrete
X	District Attorney's Office	Civil Government	124 Hancock Street	Saint Joseph	31.91414875	-91.23617631	28,620.00	1940	
X	Sixth District Court Judge John D. Crigler	Civil Government	Nearby: 2nd Street	Saint Joseph	31.91463538	-91.23650916	$24,435.00	1940	
X	Tensas Parish Department of Motor Vehicles Office	Civil Government	Nearby: 200-298 Hancock Street	Saint Joseph	31.91459326	-91.23695519	$30,000	1950	concrete
X	Tensas Parish Office of Voter Registration	Civil Government	Nearby: 200-298 Hancock Street	Saint Joseph	31.91461705	-91.23700753	Unknown	1950	concrete
X	Tensas Community Development Center	Civil Government	107 Arts Dr	Saint Joseph	31.9178495	-91.23304363	$400,000	2000	metal
X	Tensas Parish Health Unit	Hospital or Medical Center	1115 Levee Street	Saint Joseph	31.91830333	-91.23185966	$76,000	2002	concrete

X	Tensas Detention Facility	Prisons and Correctional Facilities	8606 U.S. 65	Waterproof	31.81043401	-91.39239989	$175,000	1995	concrete
X	Tensas Fire District	Fire Search and Rescue	1104 Plank Road	Saint Joseph	31.92410575	-91.24036659	$23,700.00	1999	metal
X	Newellton Fire Department	Fire Search and Rescue	Nearby: 101-126 Melton Street	Newellton	32.08065213	-91.23979314	$60,000	2012	Metal
X	Fire Station	Fire Search and Rescue	Nearby: Louisiana 575	Newellton	32.17546318	-91.23553493	$35,000	2001	Metal
X	Fire Station	Fire Search and Rescue	Nearby: Louisiana 888	Newellton	32.09607144	-91.39069092	$35,000	2001	Metal
X	St Joseph Fire Department	Fire Search and Rescue	1104 Plank Road	Saint Joseph	31.80451204	-91.38346859	$23,700.00	2001	metal
X	Hwy 573 Fire Station	Fire Search and Rescue	State Route 573	Saint Joseph	31.91417026	-91.47722779	$35,000.00	2001	metal
X	Hwy 892 Fire Station	Fire Search and Rescue	Louisiana 892	Saint Joseph	31.96721224	-91.39426852	$45,000	2001	metal
X	Hwy 571 Fire Station	Fire Search and Rescue	Louisiana 571	Waterproof	31.84476011	-91.49257837	$25,000	2002	metal
X	Hwy 566 Fire Station	Fire Search and Rescue	Louisiana 566	Waterproof	31.76932936	-91.52253159	$30,000	2002	metal
X	Lake Bruin Fire Station	Fire Search and Rescue	Hwy 606	Saint Joseph	31.9528112	-91.2144218	$12,150.00	2001	metal
	Tensas Parish Council on Aging	Civil Government	114 Plank Road	Saint Joseph	31.917848	-91.23253619	Unknown	1940	concrete
X	Newellton Elementary School	Education	400 Verona Street	Newellton	32.07334998	-91.24196216	$387,045.00	1959	Metal
	Tensas Parish Council on Aging	Civil Government	Nearby: 1822 Louisiana 605	Newellton	32.07472848	-91.23501423	$30,000	1940	concrete
Newellton									
X	Newellton Police Department	Law Enforcement	628 Verona Street	Newellton	32.07394465	-91.23463125	$60,000	1960	Metal

	Housing Authority of the Town of Newellton	Civil Government	Nearby: 1822 Louisiana 605	Newellton	32.07324743	-91.23370567	Unknown	1998	
	Newellton Chamber of Commerce	Civil Government	Nearby: 1822 Louisiana 605	Newellton	32.07359446	-91.23441054	$50,000	1945	concrete
	Exodus Behavioral Health Center	Hospital or Medical Center	605 South Main Street	Newellton	32.07368133	-91.23444023	Unknown	2000	
	Franklin Medical Center - Newellton Health Clinic	Hospital or Medical Center	Nearby: 100-118 Verona Street	Newellton	32.07434003	-91.23557124	$50,000	1980	Metal
St. Joseph									
X	St. Joseph Police Station	Law Enforcement	127 Plank Road	Saint Joseph	31.9177877	-91.23301293	$65,000	1950	concrete
X	St. Joseph City Hall	Civil Government	125 Plank Road	Saint Joseph	31.91781791	-91.23298053	$50,000	1940	concrete
X	Town of St. Joseph Mayor's Office	Civil Government	125 Plank Road	Saint Joseph	31.91783219	-91.23303407	$40,000	1940	concrete
X	Franklin Medical Center	Hospital or Medical Center	Nearby: 435-441 Newton Road	Saint Joseph	31.92286968	-91.22828285	$80,000	1980	concrete
Waterproof									
X	Waterproof Police Station	Law Enforcement	342 Main Street	Waterproof	31.80442977	-91.38446269	$28,000	1960	concrete
X	Waterproof Town Hall	Civil Government	311 Main Street	Waterproof	31.80449884	-91.38347991	$80,000	1960	concrete

Vulnerable Populations

Vulnerable Populations Worksheet					
Tensas Parish					
Name	**Street**	**City**	**Zip Code**	**Latitude**	**Longitude**
All Hospitals (Private or Public)					
Exodus Behavioral Health Center	605 South Main Street	Newellton	71357	32.07368133	-91.23444023
Franklin Medical Center - Newellton Health Clinic	Nearby: 100-118 Verona Street	Newellton	71357	32.07434003	-91.23557124
Tensas Parish Health Unit	1115 Levee Street	Saint Joseph	71366	31.91830333	-91.23185966
Franklin Medical Center	Nearby: 435-441 Newton Road	Saint Joseph	71366	31.92286968	-91.22828285
Nursing Homes (Private or Public)					
****No Nursing Homes in Tensas Parish or Jurisdictions****					
Mobile Home Parks					
****No Mobile Home Parks in Tensas Parish or Jurisdictions****					

National Flood Insurance Program (NFIP)

Tensas Parish

ELEMENT F: STATE REQUIREMENT				
National Flood Insurance Program (NFIP)				
Jurisdiction: Tensas Unincorporated				
	Tensas Parish	**Newellton**	**St. Joseph**	**Waterproof**
Insurance Summary				
How many NFIP polices are in the community? What is the total premium and coverage?	311; $77,398,000; $152,709	28; $5,642,000;$10,914	28; $7,162,000;$11,507	8; $1,421,000;$3,045
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	245 filed claims;$3,113,896 claims paid	25 filed claims; $397,136 paid	12 filed claims; $56,277 paid	1 filed claim; $608 paid
How many structures are exposed to flood risk with in the community?	212	22	429	362
Describe any areas of flood risk with limited NFIP policy coverage.	None known	none	None	None
Staff Resources				
Is the Community FPA or NFIP Coordinator certified?	Yes	Yes	Yes	Yes

Is flood plain management an auxiliary function?	Yes	Yes	Yes	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	permit review, planning requirements, building minimums	permit review, planning requirements, building minimums	permit review, planning requirements, building minimums	permit review, planning requirements, building minimums
What are the barriers to running an effective NFIP program in the community, if any?	Staffing, funding	staffing/manpower, demographics	staffing/manpower, demographics	staffing/manpower, demographics
Compliance History				
Is the community in good standing with the NFIP?	Yes	yes	Yes	Yes
Are there any outstanding compliance issues(i.e., current violations)?	No	none	No	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact(CAC)?	Unknown	Unknown	Unknown	Unknown
Is a CAV or CAC scheduled or needed? If so when?	No	No	no	No
Regulation				
When did the community enter the NFIP?	78	78	78	78
Are the FIRMs digital or paper?	Both	both	both	both
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet minimum	meet minimum requirements	Meet minimum requirements	meet minimum requirements
Community Rating System (CRS)				
Does the community participate in CRS?	No	No	No	N
What is the community's CRS Class Ranking?	No	No	No	N
Does the plan include CRS planning requirements?	Yes	Yes	Yes	Yes