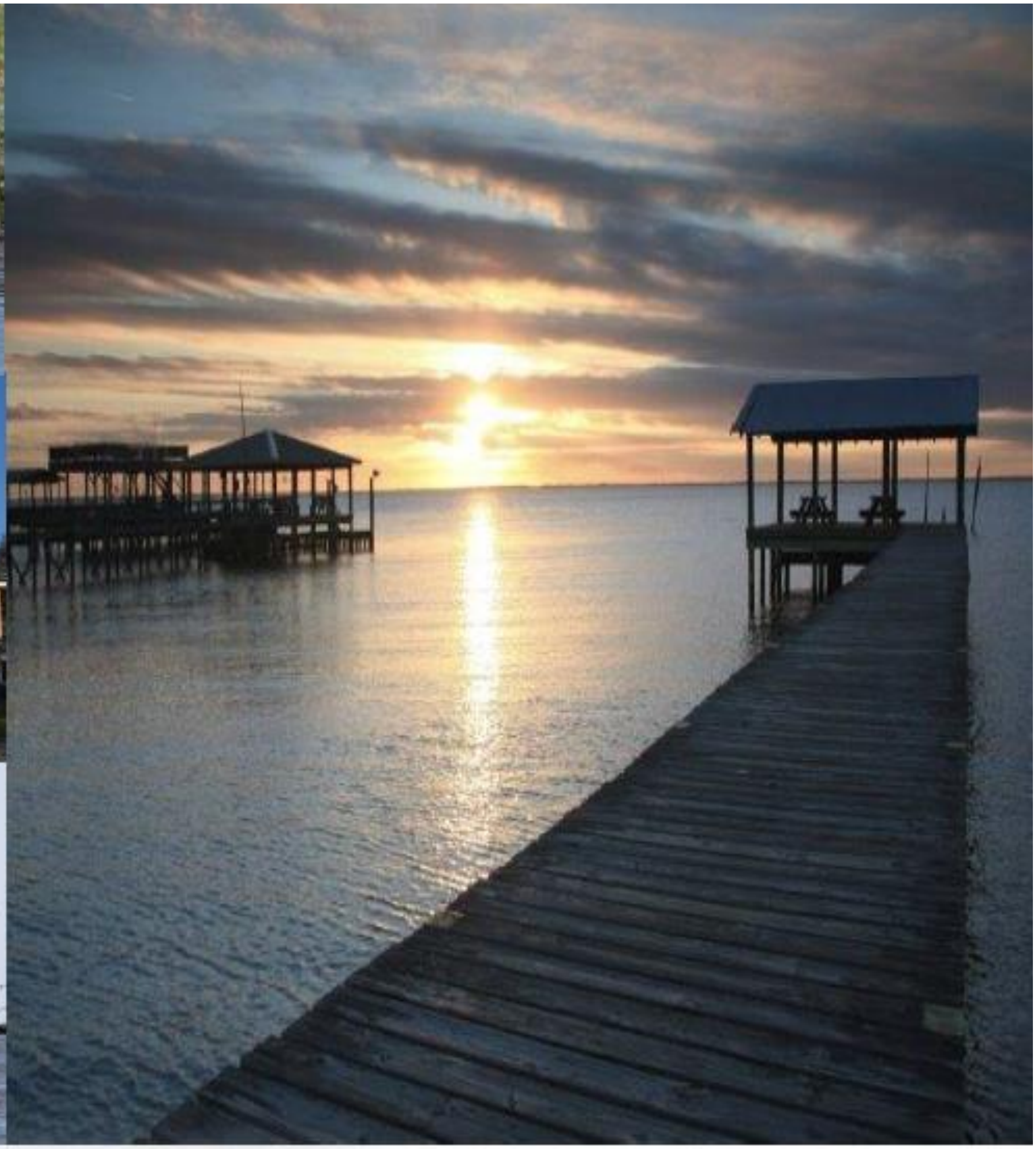

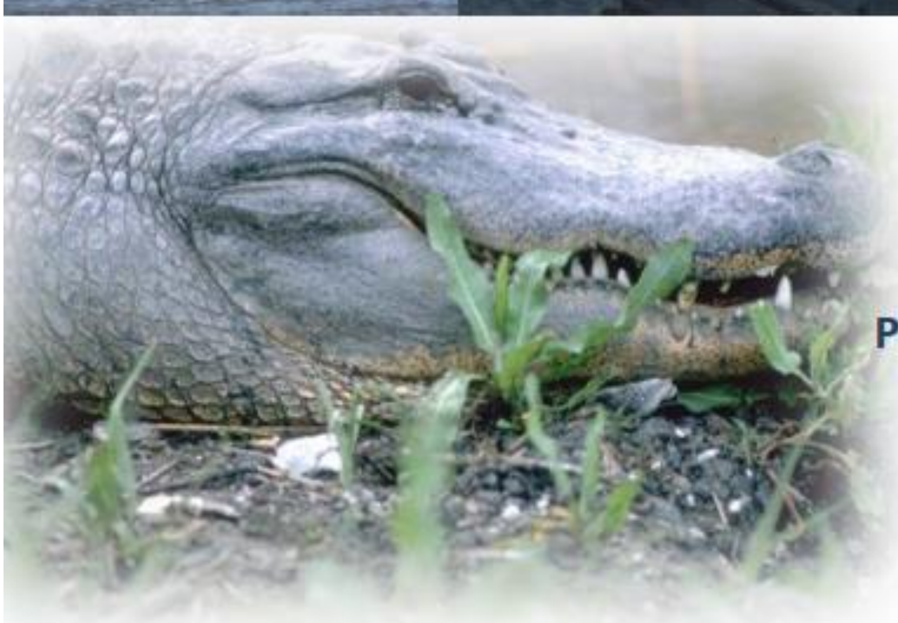

CAMERON

PARISH HAZARD MITIGATION PLAN
UPDATE - 2015

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CAMERON HAZARD MITIGATION PLAN UPDATE

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Cameron Parish

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ACKNOWLEDGMENTS

This 2015 Cameron Parish Hazard Mitigation Plan Update was coordinated by the Cameron Parish Hazard Mitigation Plan Update Steering Committee, in collaboration with community stakeholders and the general public.

Special thanks is directed to all of those who assisted in contributing feedback and expertise on this document, especially the Cameron Parish Office of Homeland Security and Emergency Management. These combined efforts have made this project possible. The Parish Steering Committee consists of the following individuals, who are credited in the creation of this document:

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The 2015 Cameron Parish Hazard Mitigation Plan Update was written by the Stephenson Disaster Management Institute, Louisiana State University. Further comments should be directed to the Cameron Parish Office of Homeland Security and Emergency Preparedness: P.O. Box 2, Cameron, LA 70631 (337)775-7382, cppjjury@camtel.net

Contents

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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 Cameron Parish Hazard Mitigation Plan Update (HMPU) process; (b) identifies natural hazards and risks within the parish; and (c) identifies the parish's hazard mitigation strategy to make Cameron Parish less vulnerable and more disaster resistant. It also includes mitigation project scoping to further identify scopes 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 Cameron Parish Hazard Mitigation Plan is a single jurisdictional plan that covers the unincorporated communities of Cameron, Creole, Grand Chenier, Hackberry, Holly Beach, Johnson Bayou, Sweet Lake, and Grand Lake. Multi-Jurisdictional requirements are not required nor addressed in this plan update.

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 Cameron 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 the Federal Emergency Management Agency (FEMA), "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event.

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 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.

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 (CRS), 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 CRS credit and provides the Parish and its communities with a blueprint for reducing the impacts of these natural hazards on people and property.

Location, Demography and Economy

Cameron Parish, originally called Leesburg, is a land of abundance, unique in formation, with miles of beautiful beaches, abundant wildlife and fisheries, and a vast unspoiled wilderness just waiting to be enjoyed. Located in the southwest corner of Louisiana, Cameron Parish has a land area of about 1,313 square miles representing 840,343 acres and a water area of approximately 619 square miles representing 395,986 acres with an average elevation of 5 feet above sea level. Cameron Parish, Louisiana's largest parish is almost entirely gulf marshland with approximately 32% of the parish covered by water. The coastal town of Cameron has been the nation's leading commercial fishing port. The unincorporated communities of Creole, Grand Chenier, Grand Lake, Hackberry, Holly Beach, Johnson Bayou, and Sweet Lake comprise the rest of the parish.

Figure 1-1: Cameron Parish
(Source: Cameron Parish Office of Tourism)

Cameron Parish is bound by Calcasieu Parish to the north, the Gulf of Mexico to the south, Jefferson Davis and Vermilion Parishes to the east, and the Sabine River/Newton and Orange County, Texas to the west. Cameron Parish lives up to the term of "Sportsman's Paradise" with its 26 miles of easily accessible public beaches, many miles of waterways, four wildlife refuges comprising of approximately 284,000 acres of both fresh and saltwater marshes and a bird sanctuary. Activities such as fishing, hunting, crabbing, swimming, shelling, photography, and bird watching are beyond compare.

POPULATION

The population of Cameron Parish is estimated at 6,679 (2014 estimate) with a population percent change from April 1, 2010 – July 1, 2014 of -2.6%.

Table 1-1: Cameron Parish Population - Source US Census

	2010 Census	2013 Census	(Current Year) Estimate	Percent Change 2010 - 2014
Total Population	6,839	6,679	6,679	-2.60%
Population Density (Pop/Sq Mi)	5.3	___	___	___
Total Households	3,822	3,593	3,593	5.90%

Table 1-2: Cameron Parish Business Patterns
(Source: enstats.census.gov

Business Description	Number of Employees	Number of Establishments	Payroll ($1,000)
Retail trade	20-99	17	2,233
Manufacturing	20-99	2	---
Health care, social assistance	20-99	2	---
Mining	100-209	14	---
Transportation / warehousing	359	30	25,730
Construction	20-99	14	---
Administration, support, waste management, remediation services	0-19	3	---
Real estate, rental, leasing	65	8	3,013
Wholesale trade	173	20	8,389
Other services, except public administration	20-99	11	482
Accommodation, food services	20-99	5	---
Financial and insurance	0-19	7	869
Professional, scientific, technical services	72	10	5,162
Utilities	27	5	1,958
Arts, entertainment, recreation	53	6	1,157

NATIONAL WILDLIFE REFUGES

Three National Wildlife Refuges – Sabine, Cameron Prairie, and Lacassine; and one State Refuge – Rockefeller – are located in Cameron Parish. The National Wildlife Refuges (NWRs) are managed by the U.S. Fish and Wildlife Service and the state refuge is owned by the state and managed by the L.A. Department of Wildlife and Fisheries.

The Sabine National Wildlife Refuge was established in 1937 and consists of 124,511 acres, 39,844 acres of open water, and 84,667 acres of grassland/herbaceous/marsh. The refuge is located eight miles south of Hackberry on State Highway 27, the Creole Nature Trail All- American Road, in Cameron Parish, LA. The refuge occupies the marshes between Calcasieu and Sabine lakes in southwest Louisiana, containing large concentrations of ducks, geese, alligators, muskrats, nutrias, raptors, wading birds, shorebirds, blue crabs, and shrimp in addition to olivaceous cormorant, snowy egret, and common egret rookeries being present.

The objectives of the refuge are to provide a habitat for migratory waterfowl and other birds, preserve and enhance coastal marshes for fish and wildlife, and provide outdoor recreation and environmental education for the public. Refuge visitors contribute to the local economy through the purchase of gasoline, food items, and fishing/hunting license sales. Gas and oil exploration activities generate financial returns to the local economy during oil well drilling and seismic exploration activities, and in the form of federally mandated excise tax revenues to local governments from oil extraction active.

The Cameron Prairie NWR was established in 1988 and consists of 9,621 acres. The refuge is located in Cameron Parish, 25 miles southeast of Lake Charles, Louisiana on the LA Highway 27, the Creole Nature Trail All-American Road. Abundant migratory birds and fresh marsh are the dominant features of the area. Old rice fields have been converted to moist soil management areas, utilizing existing levees and pump system. Over 45,000 ducks and 10,000 geese are present in peak populations during the winter months. The refuge provides excellent habitat for native wildlife including alligators, furbearers, white-tailed deer, as well as numerous migratory birds throughout the year. The refuge is crucial to meeting goals set by the North American Waterfowl Management Plan, an international agreement to restore lost wetland habitats.

The Lacassine NWR was established on December 30, 1937 and consists of 34,886 acres in Cameron and Evangeline Parishes. The refuge is located at 209 Nature Road, at the end of Highway 3056, eleven miles southwest of Lake Arthur, Louisiana off Hwy. 14. The Lacassine NWR is responsible for managing a 3,345 acre wilderness area and an 8,000 acre private lands mini-refuge program for migrating waterfowl in six parishes. Wintering populations of ducks and geese are among the largest in the National Wildlife Refuge System. The refuge management is responsible for negotiating with oil and gas industries for mineral exploration/extraction, establishing prairie restoration programs, exotic Chinese tallow tree control programs, and wetland easements in Jefferson Davis Parish.

Rockefeller Wildlife Refuge, located in eastern Cameron and western Vermilion Parishes, is owned and maintained by the State of Louisiana. When deeded to the state this refuge encompassed approximately 86,000 acres, but beach erosion has taken a heavy toll and the most recent surveys indicate only 76,042 acres remaining. This area borders the Gulf of Mexico for 26.5 miles and extends inland toward the Grand Chenier ridge, a stranded beach ridge, and six miles from the Gulf. The Rockefeller Refuge is a flat, treeless area with highly organic soils which are capable of producing immense quantities of waterfowl foods in the form of annual emergent and submerged aquatics. Since 1954, Rockefeller Refuge has been a test site for various marsh management strategies, including levees, weirs, and several types of water control structures utilized to enhance marsh health and waterfowl food production. Rockefeller Wildlife Refuge is one of the most biologically diverse wildlife areas in the nation. Located at the terminus of the vast Mississippi Flyway, south Louisiana winters about four million waterfowl annually. Historically, Rockefeller wintered as many as 400,000-plus waterfowl annually, but severe declines in the continental duck population due to drought and poor habitat quality on the breeding grounds have altered Louisiana's wintering population. More recent surveys indicate a wintering waterfowl population on Rockefeller Wildlife Refuge reaching 160,000. In addition to ducks, geese, and coots, numerous shorebirds and wading birds either migrate through or over winter in Louisiana's coastal marshes. Neo-tropical migrant passerines also use the shrubs and trees on levees and other "upland" areas of the refuge as a rest stop on their trans-Gulf journeys to and from Central and South America. Although Canada geese no longer migrate to the refuge from breeding areas in the north as they once did, a resident flock of giant Canada geese was established in the early 1960s. Recreational shrimping, crabbing, fishing, and bird-watching are common on the refuge accounting for an annual visitation rate of nearly 80,000 people.

The Steering Committee, in communication with parish civic and government leaders, does not expect any significant changes in land use for the next five years. Timber and Agribusiness will continue to play a significant role in the allocation and use of the parish's land. There are no significant commercial and/or residential developments in the update.

This plan will discuss hazards affecting Cameron 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 Cameron 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 in advance of 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 1-1 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.

Figure 1-2: The Four Phases of Emergency Management and Their Relation to Future Hazard Mitigation (Source: Louisiana State Hazard Mitigation Plan 2014)

As Figure 1-1 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.

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 it's 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 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 communities 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 2015 Cameron Parish Hazard Mitigation Plan (HMP) maintains much of the information from the 2006 and 2010 plan versions, but it now reflects the order and methodologies of the 2014 Louisiana State Hazard Mitigation Plan. The sections in the 2010 Cameron HMP were as follows:

- Section One Introduction
- Section Two Hazard Mitigation Plan Update
- Section Three Developing the Plan Update
- Section Four Cameron Parish
- Section Five Hazard Identification, Frequency and Severity
- Section Six Assets and Vulnerable Populations
- Section Seven Repetitive Loss Properties
- Section 8 Potential Losses and Hazard Rankings
- Section 9 Mitigation Strategy
- Section 10 Plan Maintenance
- Section 11 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 Cameron 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.

2015 Plan Update

This 2015 plan update proceeds with the ten previous goals of the Cameron Parish hazard mitigation plan. One goal was added by the Steering Committee. The current goals are as follows:

1. Reduce the loss of life or property

2. Protect critical public facilities and thoroughfares

3. Ensure post-disaster operability of strategic facilities and thoroughfares

4. Develop incentive and community outreach/education programs that assist homeowners in protecting residential properties

5. Provide a long term mitigation solution in locations which experience repetitive hazard damage

6. Provide a cooperative, inter-jurisdictional / inter-agency solution to a problem

7. Show development and implementation of comprehensive programs, standards, and regulations that reduce future hazard damage

8. Avoid inappropriate future development in areas that are vulnerable to hazard damage

9. Reduce the level of hazard vulnerability in existing structures and developed property

10. Restore or protect natural resources, recreational areas, open space, or other environmental values

This plan update makes a number of textual changes throughout, with the most obvious changes being data related and structural. 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 HMP update has five sections and five appendices. The most significant changes are the newly developed hazard profiles and risk assessments, the removal of much repetition between sections from the previous plan updates. The 2015 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 Strategies
- Appendix A Planning Process
- Appendix B Plan Maintenance
- Appendix C Essential Facilities
- Appendix D Plan Adoption
- Appendix E State Required Worksheets

Table 1-3: 2015 Plan Update Crosswalk

2010 Plan	Revised Plan (2015)
Section 2: Hazard Mitigation Plan Update	Appendix A: Planning Process
Section 3: Developing the Plan Update	Appendix A: Planning Process
Section 4: Cameron Parish	Section 1: Introduction
Section 5: Hazard Identification, Frequency, and Severity	Section 2: Hazard Identification and Parish wide Risk Assessment
Section 6: Assets and Vulnerable Populations	Section 2: Hazard Identification and Parish wide Risk Assessment; Appendix E: State Required Worksheets
Section 7: Repetitive Loss Properties	Section 2: Hazard Identification and Parish wide Risk Assessment
Section 8: Potential Losses and Hazard Rankings	Section 2: Hazard Identification and Parish wide Risk Assessment
Section 9: Mitigation Strategy	Section 4: Mitigation Strategy
Section 10: Plan Maintenance	Appendix B: Plan Maintenance
Section 11: Appendices	Appendix A: Planning Process, Appendix B: Plan Maintenance, Appendix C: Critical Facilities, Appendix D: Plan Adoption, Appendix E: State Required Worksheets

Despite numerous 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 Cameron Parish and its communities. The extent of this risk is dictated primarily by its geographic location. Most significantly, Cameron 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 communities, 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. While Cameron is a single jurisdiction plan, they do have multiple communities that are partners in mitigation strategy efforts. 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.

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2 Hazard Identification and Parish wide Risk Assessment

This section assesses the various hazard risks Cameron 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 provided an overview of the hazards that had been previously profiled in the Cameron Parish Hazard Mitigation plan published in 2009, 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 2015 Update
Coastal Land Loss	X	X	X
Drought	X		X
Earthquakes			
Expansive Soils			
Fog			
Floods	X		X
Excessive Heat	X		X
Sinkhole		X	X
Subsidence			
Termites			
Thunderstorms (Hail, Lightning & Wind)	X	X	X
Tornado	X		X
Tropical Cyclones	X	X	X
Wildfires	X		X
Winter Storm			

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.

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

a) Flooding (backwater, storm surge, riverine, localized stormwater event)
b) Tropical Cyclones (flooding and high winds)
c) Land Change – Coastal Erosion
d) Tornadoes
e) Thunderstorms (hail, lightning, and wind)
f) Drought
g) Excessive Heat
h) Wildfires
i) Sinkholes

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

- Flooding from rivers and waterways, rain storms, tropical storms, and hurricanes in the following forms:
    a) Riverine
    b) Stormwater
    c) Surge
    d) Back water flooding (as the result of river flooding and surge)
- High wind damage most commonly resulting from hurricanes, thunderstorms and tornadoes
- Land loss as a result of land subsiding and coastal erosion which have been combined into a single hazard since they both result in increased potential for flooding.

The issues of coastal land loss and thunderstorm winds were determined to be the most frequent hazards in Cameron Parish. Because Cameron Parish is a parish with significant coastline along the Gulf of Mexico it is susceptible to land loss through coastal erosion and land subsidence. High wind from thunderstorms is also a fairly common occurrence in Cameron Parish. Damage from high winds can include roof damage, destruction of homes and commercial buildings, downed trees and power lines, and disruption of services. While there have been no Presidential Declarations for coastal land loss and thunderstorm winds alone, they both still present risks that must be acknowledged and discussed to further mitigate their effects on a community.

The potential destructive power of Tropical Cyclones was determined to be one the most prevalent hazards to the parish. Eleven of the fifteen presidential declarations Cameron Parish has received resulted from tropical cyclones which validates this as one of the most significant hazards. 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 potential destructive potential, the risk assessment will also asses non-storm surge flooding as well.

Previous Occurrences

Table 2-2 summarizes federal disaster declarations for Cameron Parish since 1972. Information includes names, dates and types of disaster.

Table 2-2: Cameron Parish Major Disaster Declarations

Disaster Declaration Number	Date	Type of Disaster
374	4/27/1973	Severe Storm, Flood
675	1/11/1983	Severe Storm, Flood
752	11/1/1985	Tropical Cyclone – Hurricane Juan
902	5/3/1991	Severe Storm, Flood
956	8/26/1992	Tropical Cyclone – Hurricane Andrew
1169	3/18/1997	Winter Storm, Ice
1246	9/23/1998	Tropical Cyclone – TS Frances and Hurricane Georges
1380	6/11/2001	Tropical Cyclone – Tropical Storm Allison
1435	9/27/2002	Tropical Cyclone – Tropical Storm Isidore
1437	10/3/2002	Tropical Cyclone – Hurricane Lili
1603	8/29/2005	Tropical Cyclone – Hurricane Katrina
1607	9/24/2005	Tropical Cyclone – Hurricane Rita
1786	9/2/2008	Tropical Cyclone – Hurricane Gustav
1792	9/13/2008	Tropical Cyclone – Hurricane Ike
3347	8/27/2012	Tropical Cyclone – Tropical Storm Isaac

Probability of Future Hazard Events

The probability of a hazard event occurring in Cameron Parish is estimated below. 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 (1989 – 2014) in order to determine future probability of a hazard occurring. While the twenty five year record used by the State was adopted for the purpose of determining the overall probability, to assist with determining estimated losses, unless otherwise stated the full 54 year record was used when HAZUS-HM 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 to inflation 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 as it contains specific data for cities, whereas SHELDUS is limited to parishes.

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

Table 2-3: Probability of Future Hazard Reoccurrence

	Probability
Hazard	**Cameron Parish**
Coastal Land Loss	100%
Drought	8%
Excessive Heat	4%
Floods	36%
Sinkholes	< 1%
Thunderstorm - Hail	8%
Thunderstorm - Lightning	32%
Thunderstorm - Winds	100%
Tornado	32%
Tropical Cyclones	50%
Wildfires	2%

As shown in *Table 2-3*, coastal land loss and thunderstorm winds have the highest chance of occurrence in the parish (100%) followed by tropical cyclones (50%) and floods (36%). Tornadoes and lightning both have a 36% annual chance of occurrence within Cameron Parish. The remaining hazards of drought, excessive heat, sinkholes, hail, and wildfires all have less than a 10% chance of occurring annually.

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 on critical infrastructure from a previous hazard mitigation project.

Within the entire planning area there are an estimated value of $1,482,884,000 in structures throughout the parish. The table on the following page provides the total estimated value for each structure by occupancy.

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

Occupancy	Cameron Parish
Agricultural	$5,168,000
Commercial	$233,824,000
Government	$16,874,000
Industrial	$149,134,000
Religion	$39,558,000
Residential	$61,031,334,000
Education	$6,992,000
Total	$1,482,884,000

Essential Facilities of the Parish

On the following pages are maps showing the locations and names of the essential facilities within the parish.

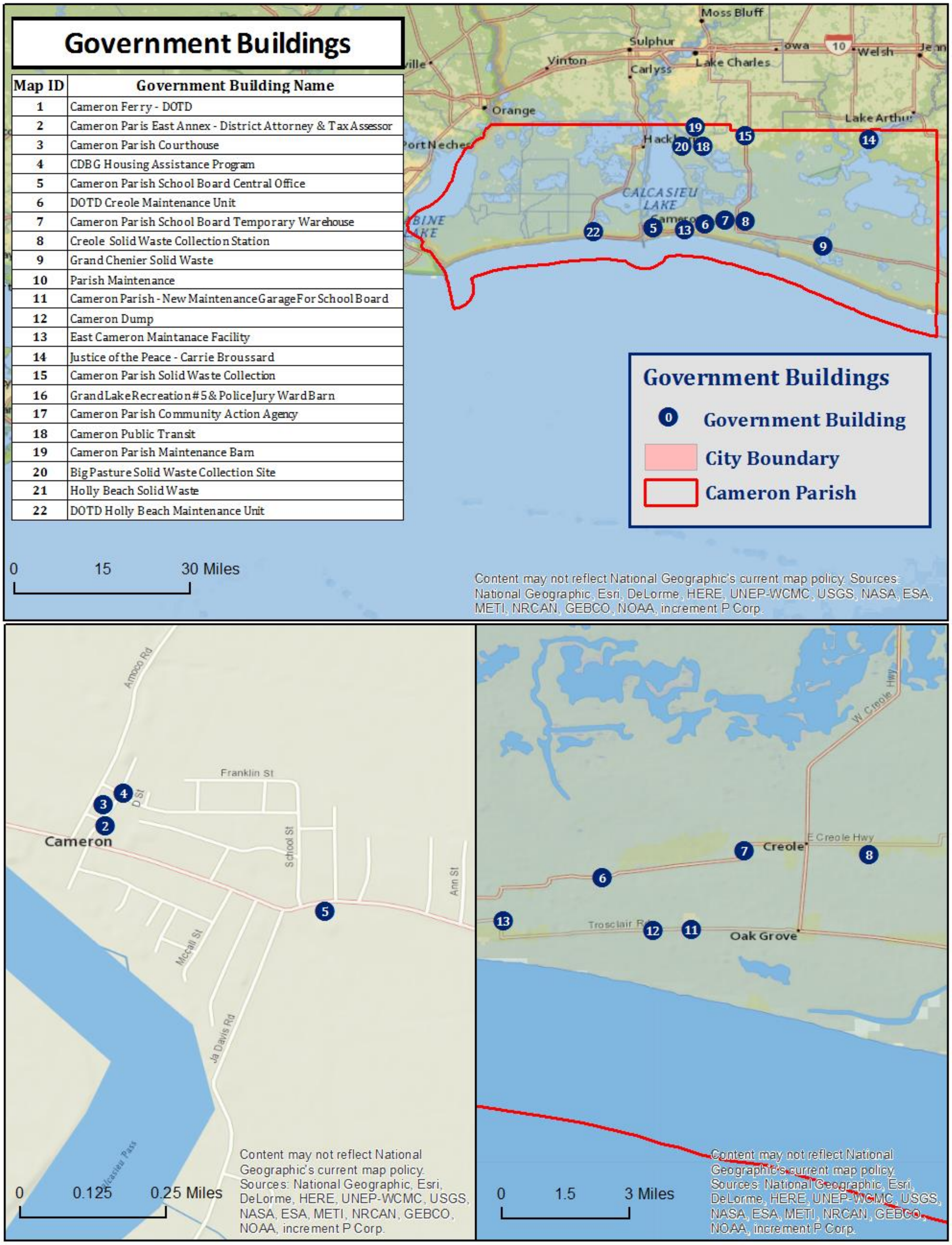

Figure 2-1: Government Buildings throughout Cameron Parish

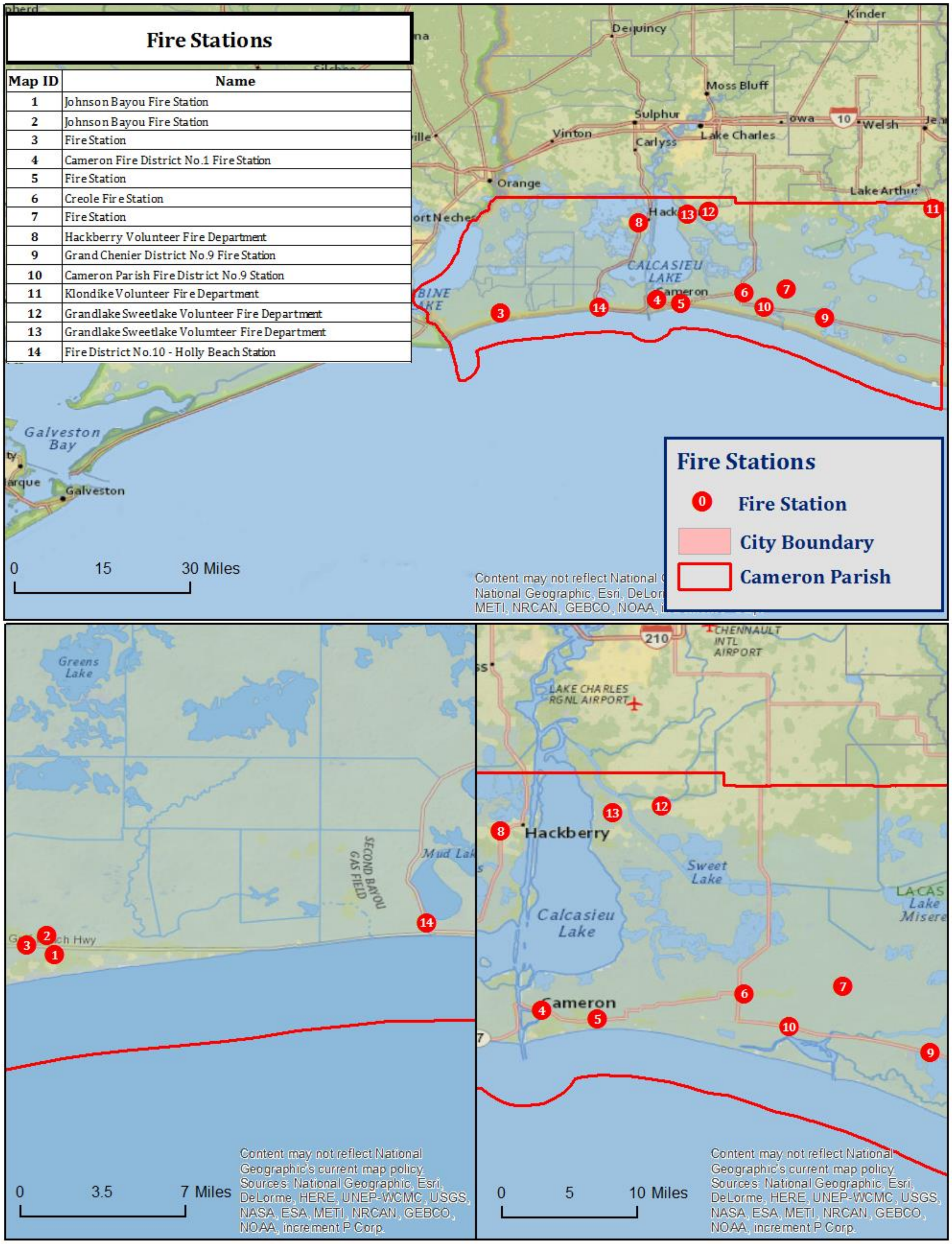

Figure 2-2: Fire Stations throughout Cameron Parish

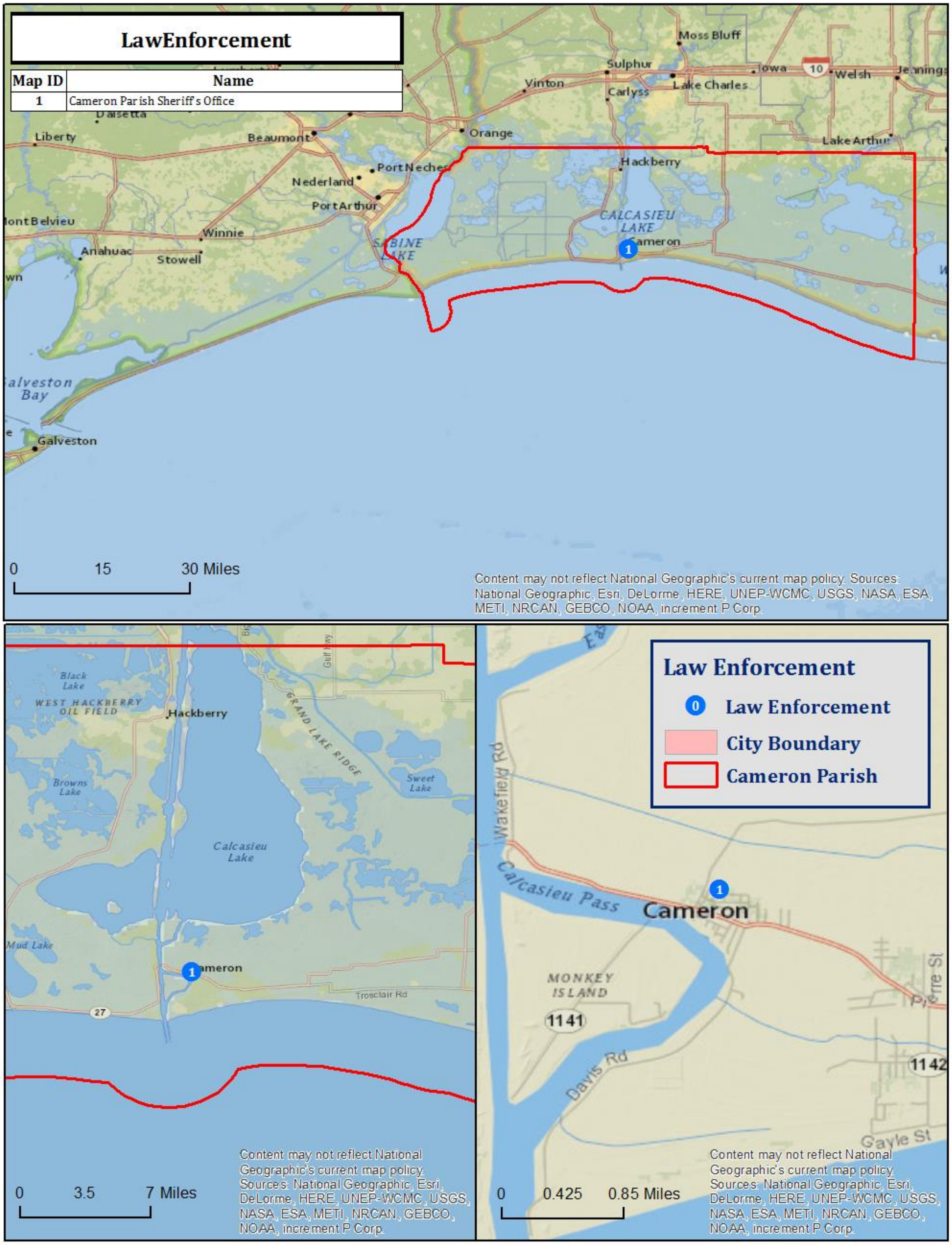

Figure 2-3: Law Enforcement Facilities in Cameron Parish

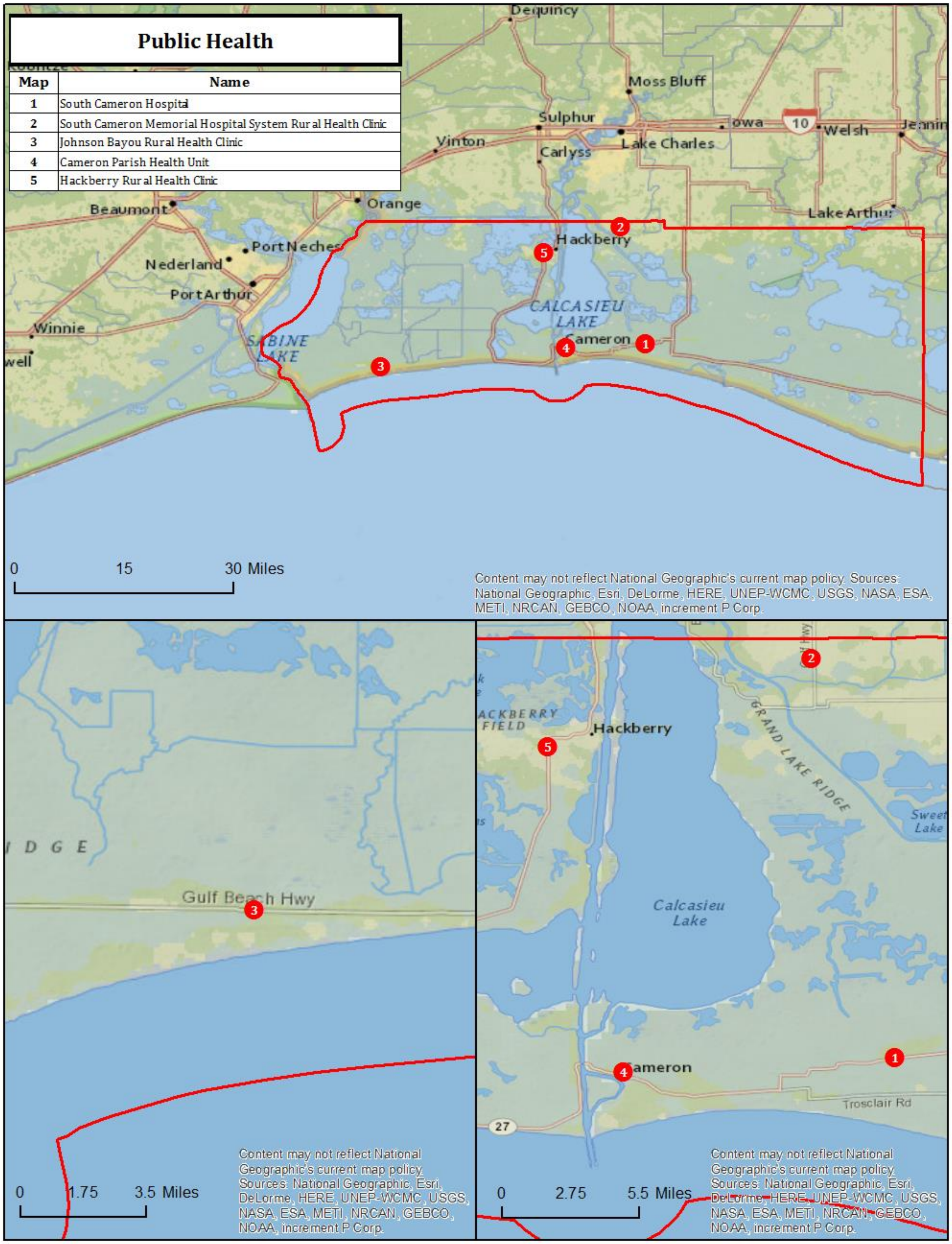

Figure 2-4: Public Health Facilities in Cameron Parish

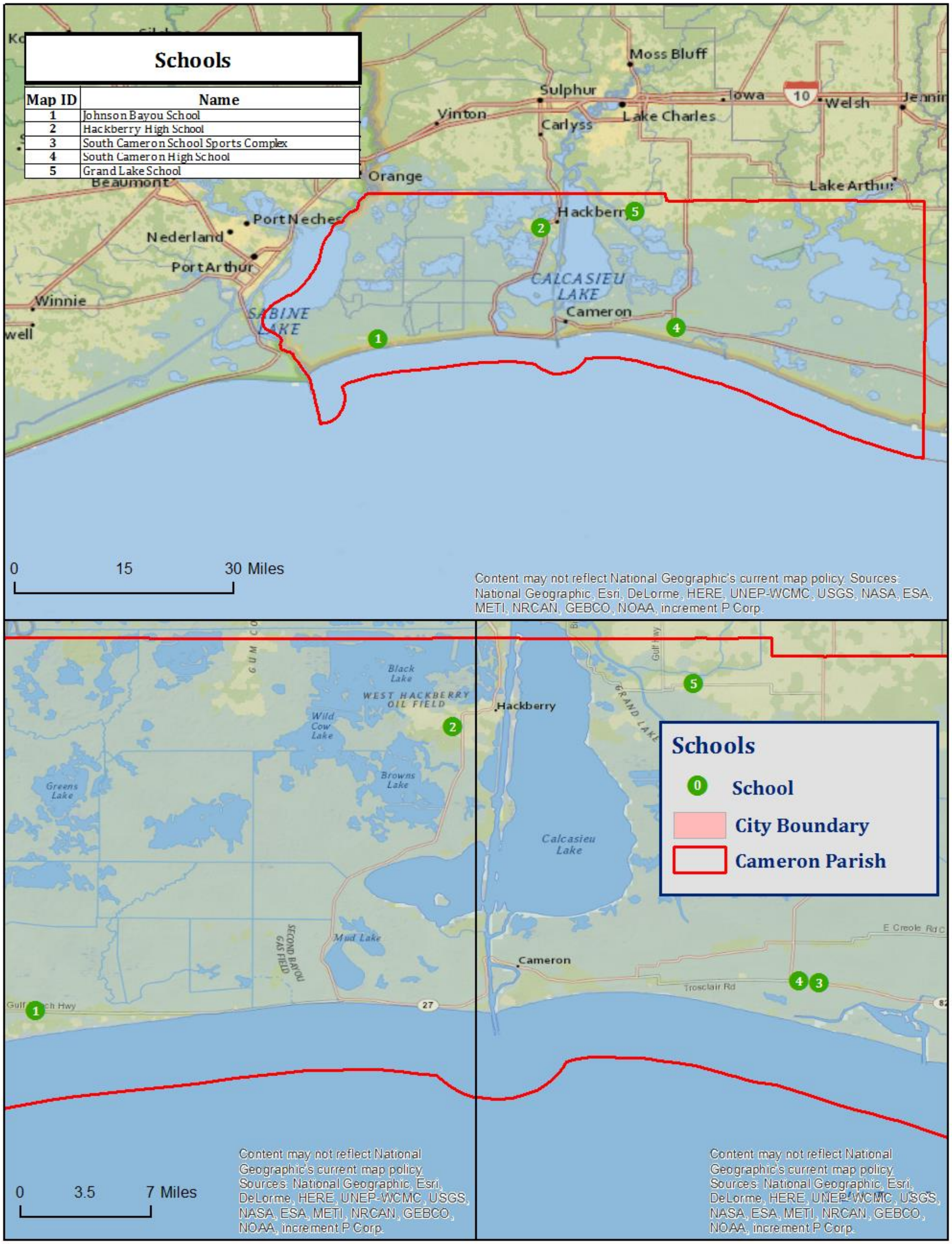

Figure 2-5: Educational Facilities in Cameron Parish

Future Development Trends

Cameron Parish has experienced two significant hurricane events that drastically shaped both population and housing numbers during the 2000's. Hurricane Rita in 2005 destroyed most of the buildings in Cameron Parish, and Hurricane Ike in 2008 flooded nearly every square inch of the parish. Because of these events, Cameron Parish has experienced a significant decline in both population and housing numbers from 2000 to 2013. The parish's population has decreased by over 30% between the years of 2000 and 2010 going from a population of 9,991 to 6,839. The annual growth rate for this time period was -3.15%. From 2010 to 2013, the annual growth rate slowed to -0.24%. The future population and number of buildings can be estimated using U.S. Census Bureau housing and population data. The tables below show population and housing unit estimates from 2000 to 2013.

Table 2-5: Population Growth Rate for Cameron Parish

Total Population	Cameron Parish
1-Apr-00	9,991
1-Apr-10	6,839
1-Jul-13	6,789
Population Growth between 2000 – 2010	-31.55%
Average Annual Growth Rate between 2000 – 2010	-3.15%
Population Growth between 2010 – 2013	-0.73%
Average Annual Growth Rate between 2010 – 2013	-0.24%

Table 2-6: Housing Growth Rate for Cameron Parish

Total Housing Units	Cameron Parish
1-Apr-00	5,336
1-Apr-10	3,593
1-Jul-13	3,593
Housing Growth between 2000 – 2010	-32.66%
Average Annual Growth Rate between 2000 – 2010	-3.27%
Housing Growth between 2010 – 2013	0%

Total Housing Units	Cameron Parish
Average Annual Growth Rate between 2010 – 2013	0%

As shown in Table 2-5 and Table 2-6 Cameron Parish population and housing has been in a sharp decline during the 13 year period and has just recently started to stabilize.

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, there is nothing to indicate substantial change in growth rates 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%.

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	3,530	3,354	3,354	3,354
Value of Structures	$1,552,277,251	$1,474,663,388	$1,474,663,388	$1,835,546,419
# of People	6,789	6,450	6,450	6,450
Tropical Cyclone				
Structures	3,530	3,530	3,530	3,530
Values of Structures	$1,552,277,251	$1,552,277,251	$1,740,301,831	$1,951,101,494
# of People	6,789	6,789	6,789	6,789

Land Use

The Cameron Parish Land Use table is provided below. Residential, commercial and industrial areas account for only 1% of the parish's land use. Wetlands at 656,089 acres is by far the largest category accounting for 53% of parish land. The parish also consists of water areas (39%) and agricultural land (7%).

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

Land Use	Acres	Percentage
Agricultural Land, Cropland, and Pasture	82,329	7%
Wetlands	656,089	53%
Forest land (not including forested wetlands)	4,472	0%
Urban/Development	16,723	1%
Water	476,107	39%

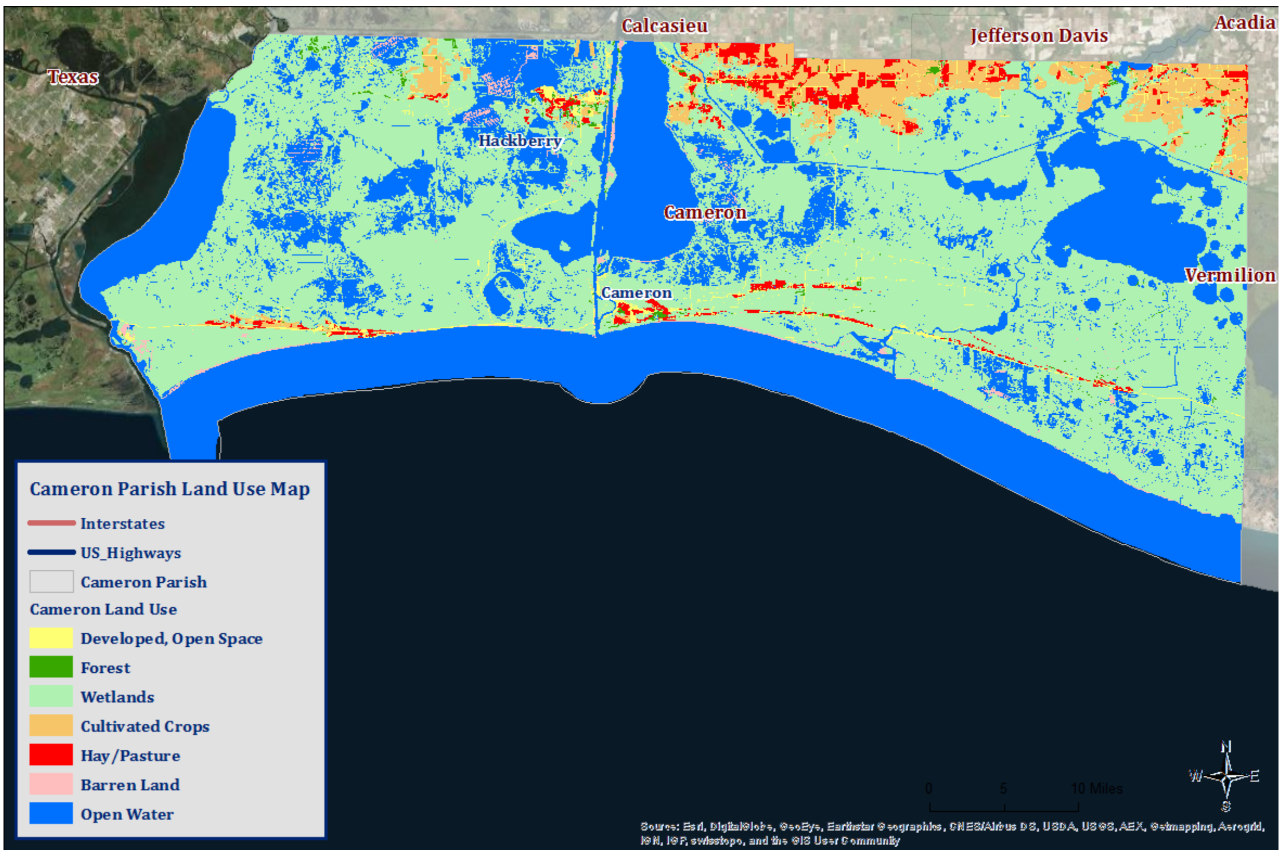

Figure 2-6: Cameron Parish Land Use Map.
(Source: USGS Land Us Map)

Hazard Identification

Coastal Land Loss

Coastal land loss is the loss of land (especially beach, shoreline, or dune material) by natural and/or human influences. Coastal land loss occurs through various means, including erosion, subsidence (the sinking of land over time as a result of natural and/or human-caused actions), saltwater intrusion, coastal storms, littoral drift, changing currents, manmade canals, rates of accretion, and sea level rise. The effects of these processes are difficult to differentiate because of their complexity and because they often occur simultaneously, with one influencing each of the others.

Some of the worst recent contributors to coastal land loss in the state are the tropical cyclones of the past decade. Two storms that stand out in this regard are Hurricanes Katrina and Rita. These powerful cyclones completely covered large tracts of land in a very brief period, permanently altering the landscape. The disastrous legacy of these storms concentrated already ongoing efforts to combat coastal land loss. Consistent with the 2014 State Hazard Mitigation Plan Update, coastal land loss is considered in terms of two of the most dominant factors: sea level rise and subsidence.

Sea level rise and subsidence impact Louisiana in a similar manner—again making it difficult to separate impacts. Together, rising sea level and subsidence—known together as relative sea level rise—can accelerate coastal erosion and wetland loss, exacerbate flooding, and increase the extent and frequency of storm impacts. According to NOAA, global sea level rise refers to the upward trend currently observed in the average global sea level. Local sea level rise is the level that the sea rises relative to a specific location (or, benchmark) at the coastline. The most prominent causes of sea level rise are thermal expansion, tectonic actions (such as sea floor spreading), and the melting of the Earth's glacial ice caps.

The current U.S. Environmental Protection Agency (EPA) estimate of global sea level rise is 10–12 in. per century, while future sea level rise could be within the range of 1–4 ft. by 2100. According to the U.S. Geological Survey (USGS), the Mississippi Delta plain is subject to the highest rate of relative sea level rise of any region in the nation largely due to rapid geologic subsidence.

Subsidence results from a number of factors including:

- Compaction/consolidation of shallow strata caused by the weight of sediment deposits, soil oxidation, and aquifer draw-down (shallow component)
- Gas/oil/resource extraction (shallow & intermediate component)
- Consolidation of deeper strata (intermediate components)
- Tectonic effects (deep component)

For the most part, subsidence is a slow-acting process with effects that are not as evident as hazards associated with discrete events. Although the impacts of subsidence can be readily seen in coastal parishes over the course of decades, subsidence is a "creeping" hazard. The highest rate of subsidence is occurring at the Mississippi River Delta (estimated at greater than 3.5 ft./century). Subsidence rates tend to decrease inland, and they also vary across the coast.

Overall, subsidence creates three distinct problems in Louisiana:

- By lowering elevations in coastal Louisiana, subsidence accelerates the effects of saltwater intrusion and other factors that contribute to land loss.

- By lowering elevations, subsidence may make structures more vulnerable to flooding.
- By destabilizing elevations, subsidence undermines the accuracy of surveying benchmarks (including those affecting levee heights, coastal restoration programs, surge modeling, BFEs, and other engineering inputs), which can contribute to additional flooding problems if construction occurs at lower elevations than anticipated or planned.

Location

Historic areas of coastal land loss and gain (Figure 2-7) and subsidence rates (Figure 2-8) have been quantified for Cameron Parish using data from the U.S. Geologic Survey and Louisiana Coastal Protection and Restoration Authority (CPRA). Since 1932, the average annual land loss in Louisiana is 35 mi^2, while the average annual land gain has been 3 mi^2 for a net loss of 32 mi^2 per year. Land loss is primarily currently occurring on the eastern and western shores of Calcasieu Lake as well as the southeastern portion of the coastline along the Gulf of Mexico in Cameron Parish (Figure 2-7). Subsidence is occurring in the majority of the parish.

Previous Occurrences / Extent

Coastal land loss is an ongoing process, including discrete (hurricanes) and continuous (subsidence, sea level rise) processes. While historic flood loss data undoubtedly include the effects of coastal land loss, specific previous occurrences have not been identified as a source of direct disaster damage in Louisiana. Rather, the effects of the underlying flood or hurricane storm surge hazard are recorded. Land loss is a significant hazard, however, and assessment of the added flood impacts caused by land loss is quantified in the following sections.

Frequency / Probability

Subsidence, sea level rise, and coastal land loss are ongoing hazards. Based on historical subsidence rates and land loss/gain trends, the probability of future land loss in Louisiana is 100% certain, but actual rates of subsidence and land loss/gain vary along the coast based on various meteorological, geological, and human-influenced dynamics (e.g., water/resource extraction, canal dredging, saltwater intrusion, marsh restoration projects, etc.).

Table 2-9: Annual Probability of Coastal Land Loss in Cameron Parish

Coastal Land Loss Probability Cameron Parish
100%

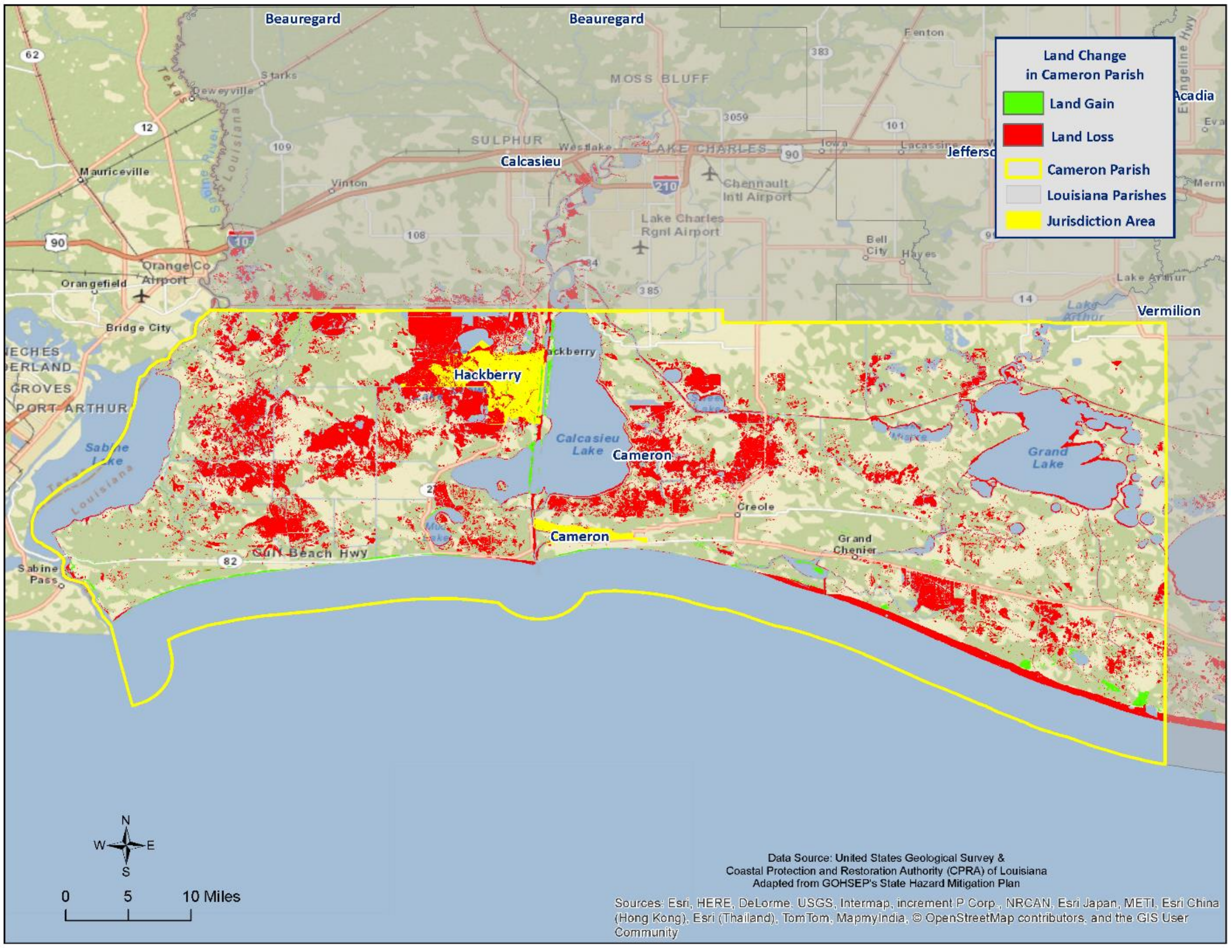

Figure 2-7: Historical Areas of Land Loss and Gain between 1932 and 2010
(Source: State of Louisiana Hazard Mitigation Plan)

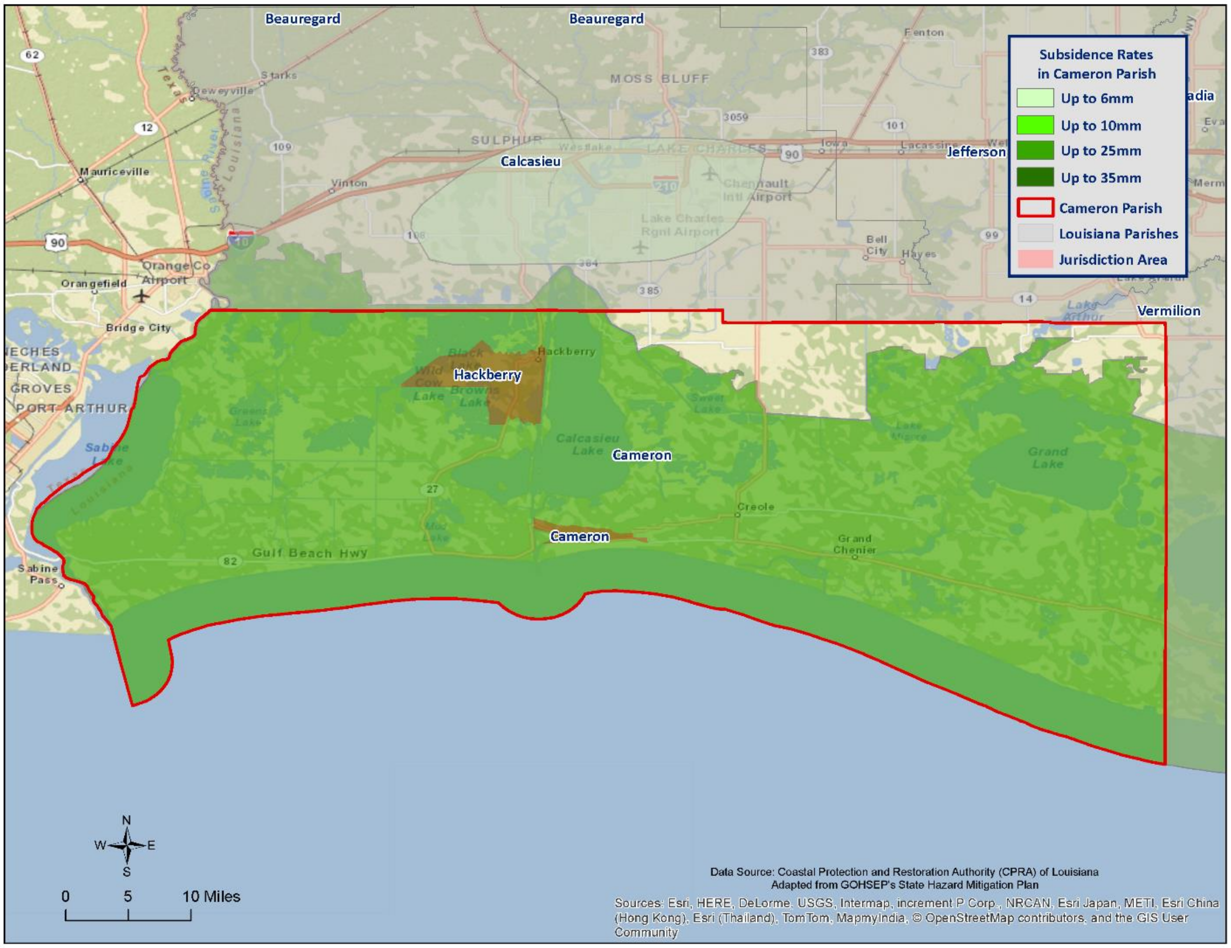

Figure 2-8: Maximum Annual Subsidence Rates based on Subsidence Zones in Coastal Louisiana (Source: State of Louisiana Hazard Mitigation Plan)

Estimated Potential Losses

To determine the estimated potential losses, the methodology implemented in the 2014 Louisiana State Plan Update was used. In the state plan, two parameters were considered to estimate the projected increase in coastal flood losses from storm surge scenarios – global sea level rise and subsidence. A timeframe of 10 years was used for evaluation of future effects of sea level rise and subsidence for comparison with current conditions. The NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model was used to estimate the maximum of maximum (MOM) storm surge elevations for a Category 1 hurricane at mean tide along the coast of Louisiana. The MOM scenario is not designed to describe the storm surge that would result from a particular event, but rather evaluates the impacts of multiple hurricane scenarios with varying forward speeds and storm track trajectories to create the maximum storm surge elevation surface that would occur given the simultaneous occurrence of all hurricane events for a given category.

There are many global sea level rise scenarios from which to select; however, within a 10-year timeframe, methods that predict accelerating sea level rise rates do not deviate significantly from straight line methods. Therefore, a linear sea level rise projection for the sea level rise occurring in 10 years (SLR2024) using a linear global sea level rise rate of 3.1 mm/year was used (IPCC, 2007), which is also in accordance with the CPRA Coastal Master Plan. This resulted in an increase of 0. 1 feet, which was applied to the NOAA MOM storm surge elevation results over the model output domain.

$$SLR_{2024} = 0.0031 \frac{m}{year} x\ 10\ years$$

$$SLR_{2024} = 0.031\ meters = 0.10\ ft\ in\ 2024$$

To estimate the effects of subsidence, the elevation profile for southern Louisiana was separated into sections based on subsidence zones. The 20th percentile values for subsidence were used, in accordance with the CPRA Master Plan, and subtracted from the digital elevation model (DEM) for each zone and re-joined to create a final subsided ground elevation layer.

To perform the economic loss assessment, depth grids were created for current conditions (SLOSH MOM Results – Current Land Elevation) and for projected 2024 conditions ([SLOSH MOM Results + 0.1 ft sea level rise] – [Current Land Elevation – Subsidence]). Hazus-MH was used to calculate economic loss for the current and future depth grids.

Figure 2-9 shows the projected increase in total flood loss resulting from a SLOSH Category 1 MOM in the year 2014, with many areas expecting increase in losses. Some areas that would be currently unaffected by a SLOSH Category 1 MOM would be impacted in ten years based on subsidence and sea level rise projections (Figure 2-10).

To determine annual potential loss estimates for coastal land loss, increased exposure estimates over the next 10 years calculated using Hazus-MH were annualized at the parish level (Figure 2-11). To provide an annual estimated potential loss per jurisdiction, the total loss for the census block groups within each jurisdiction were calculated. Based on hazard exposure, Table 2-10 provides an estimate of annual potential losses for Cameron Parish.

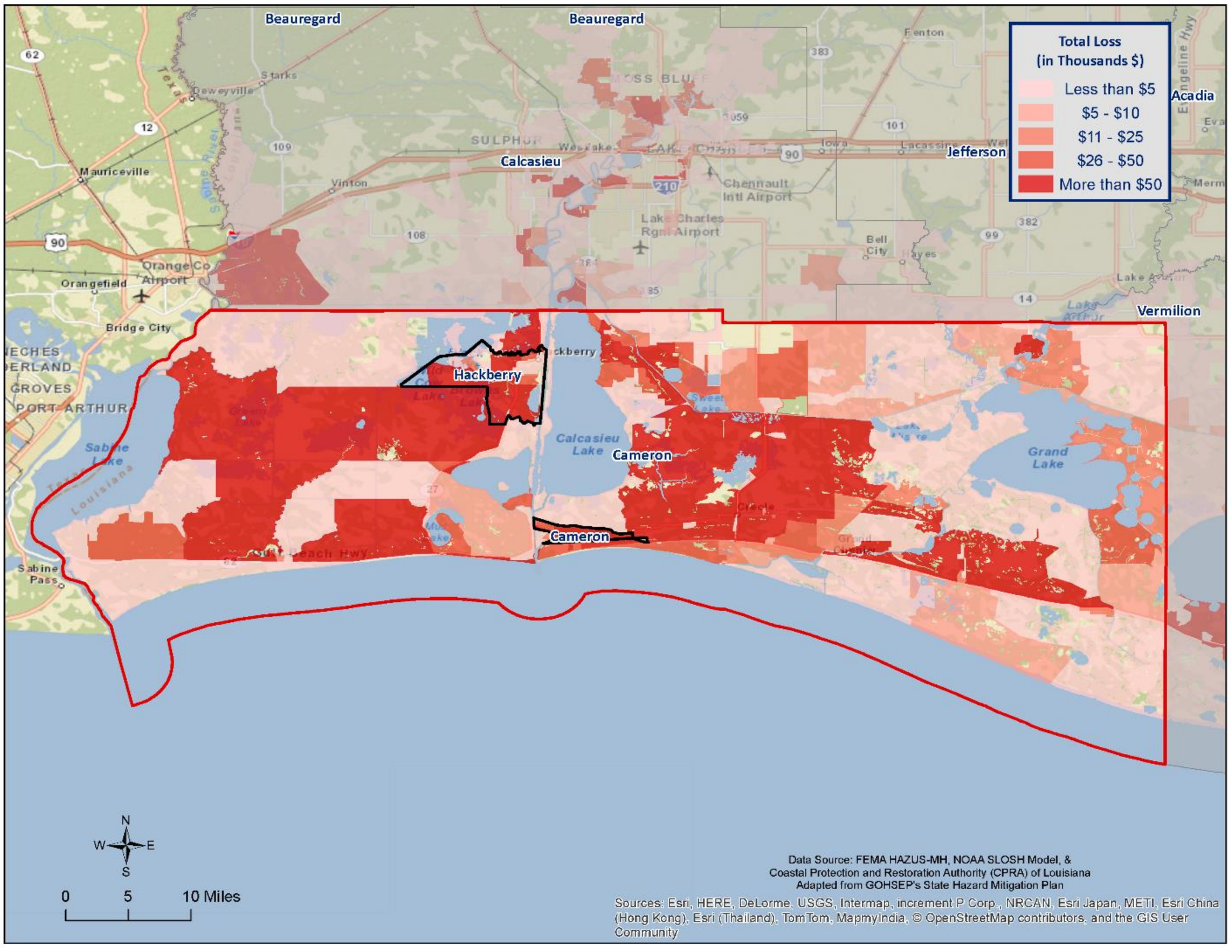

Figure 2-9: Increase in Total Loss Estimates in 2024 by Census Block Group based on the Hazus-MH Flood Model and NOAA SLOSH Model
(Source: State of Louisiana Hazard Mitigation Plan)

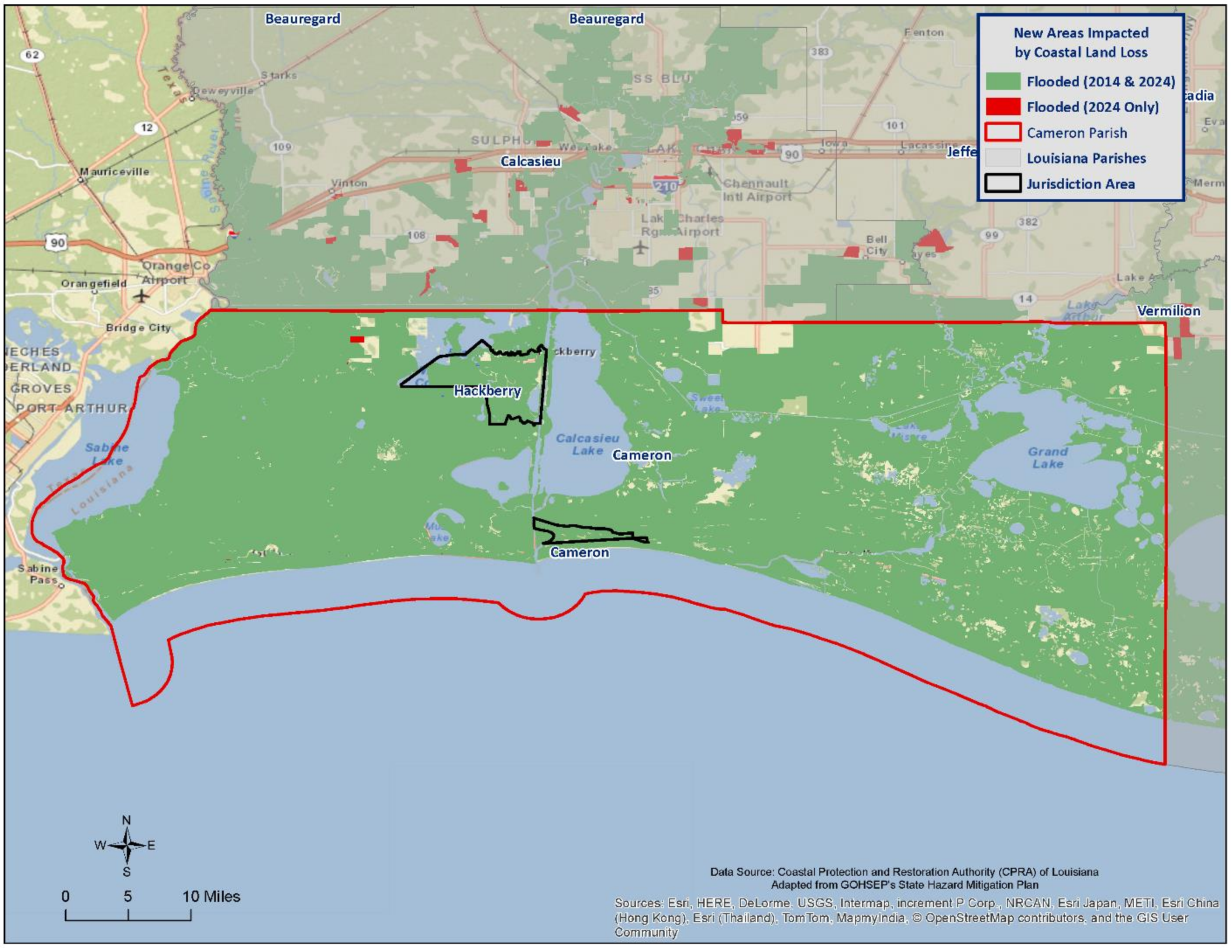

Figure 2-10: Census Block Groups not Currently Impacted by Category 1 Hurricane Storm Surge but Expected to be impacted in 2024 are Shown in Red
(Source: State of Louisiana Hazard Mitigation Plan)

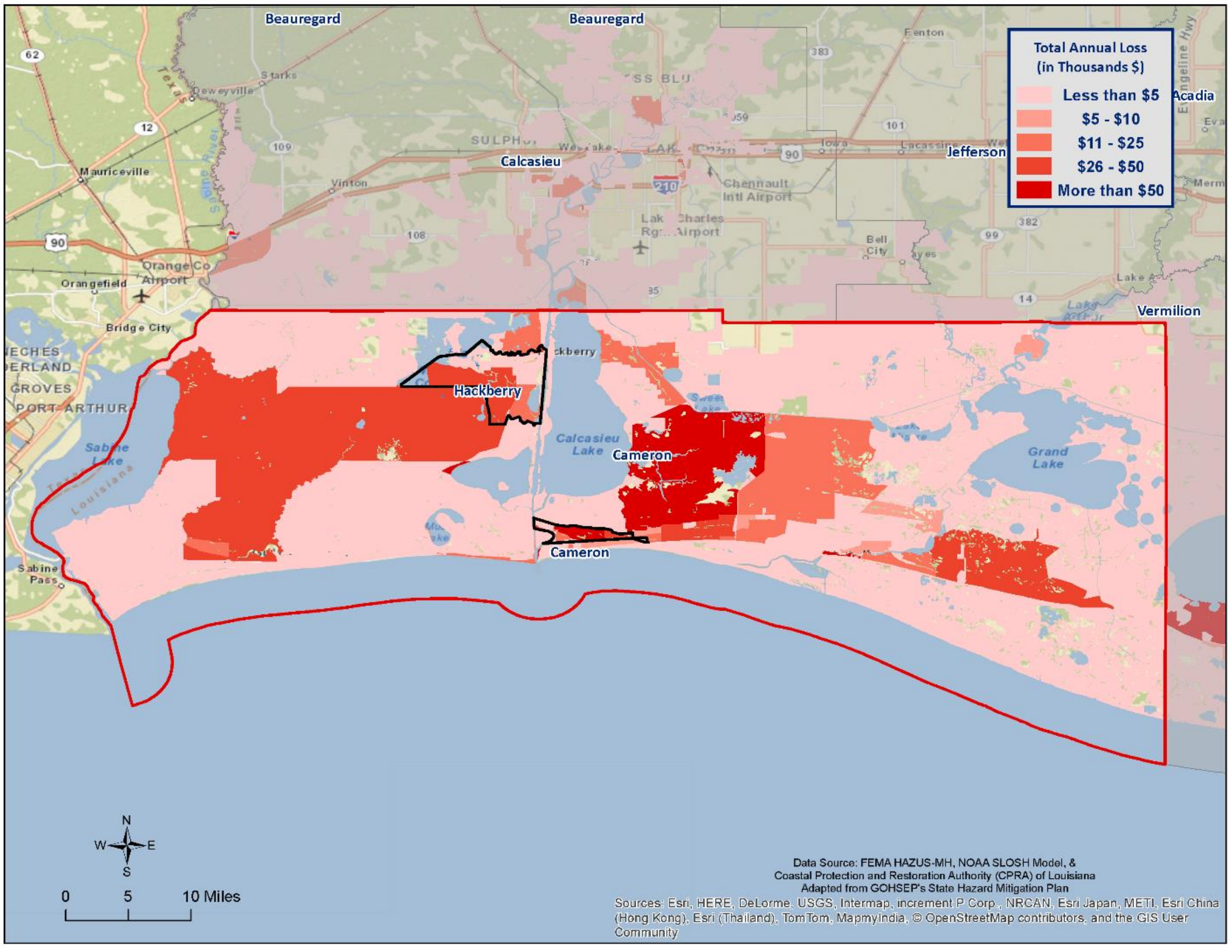

Figure 2-11: Estimated Annual Losses for Coastal Land Loss by Census Block Group

Table 2-10: Estimated annual losses for coastal land loss in Cameron Parish (Source: HAZUS-MH)

Coastal Land Loss Estimated Annual Potential Losses for Cameron Parish
$1,363,000

Threat to People

Coastal land loss can impact all demographics and age groups. Buildings located within highly vulnerable coastal land loss areas could be eventually permanently shut down and forced to re-locate. Long-term sheltering and permanent relocation could be a concern for communities that are at the highest risk for future coastal land loss. The total population within the parish that is susceptible to the effects of coastal land loss are shown in

The HAZUS-MH hurricane model was used to identify populations vulnerable to coastal land loss throughout the jurisdictions in the tables below:

Table 2-11 Population Vulnerable by Jurisdiction in Cameron Parish

Number of People Exposed to Flood Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
Cameron Parish	**6,839**	**5,097**	**75%**

Table 2-12: Population Vulnerable to Coastal Land Loss in Cameron Parish (Source: HAZUS-MH)

Cameron Parish		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	5,097	75%
Persons Under 5 years	280	5.5%
Persons Under 18 years	1,223	24%
Persons 65 Years and Over	729	14.3%
White	4,898	96.1%
Minority	199	3.9%

Vulnerability

See Appendix C for parish vulnerability to coastal land loss hazard.

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. And 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 tend to be associated with other hazards such as wildfires and/or heat waves as well. 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 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 2-13* displays the range and Palmer classifications of the PDSI index. *Figure 2-12* displays the current drought monitor for the state of Louisiana and its parishes.

Table 2-13: 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 plus the effects of cumulative patterns of previous months—or longer. Although weather patterns can change almost literally 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 Cameron Parish at the time this plan went to publication (*Figure 2-12*).

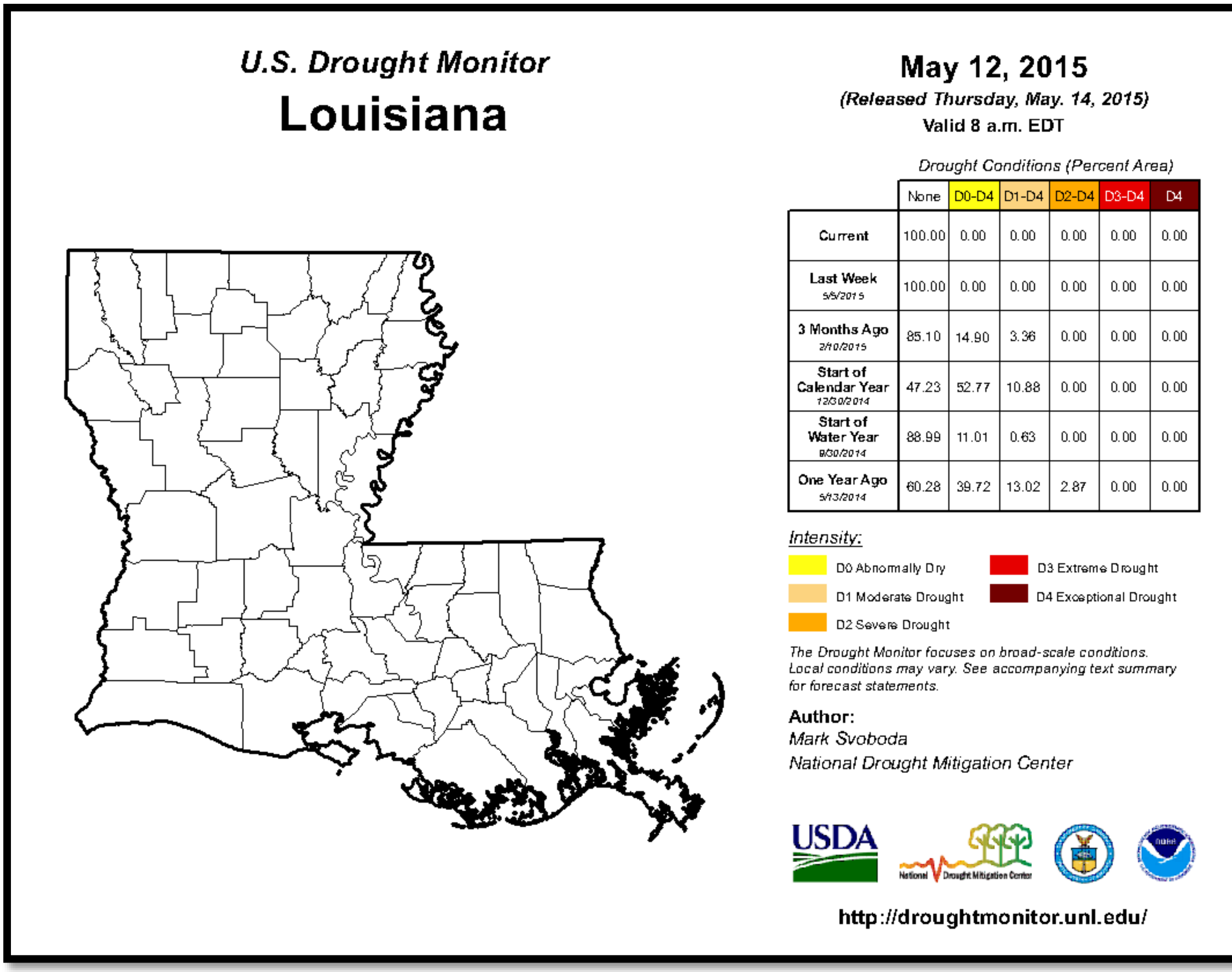

Figure 2-12 : United States Drought Monitor for the State of Louisiana and its Parishes (Source: The National Drought Mitigation Center)

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 Cameron Parish is on the agricultural community.

Previous Occurrences / Extents

The SHELDUS database reports a total of 2 drought events occurring within the boundaries of Cameron Parish between the years of 1989 – 2014. Table 2-14 identifies the date of occurrence, estimated crop damage, and severity of droughts that have occurred in Cameron Parish. Based on previous occurrences, the worst case scenarios for droughts in Cameron Parish would be a Severe Drought based on the Palmer Classification.

Table 2-14: Drought events with crop damage totals for Cameron Parish (Source: SHELDUS)

Date	Crop Damage	Palmer Classification
May 1996	$92,797	Moderate Drought
December 2000	$14,339,978	Severe Drought

Frequency / Probability

Based on previous occurrences of 2 droughts in 25 years, the probability of drought occurrence in the planning area in any given year is 8%.

Estimated Potential Losses

According to the SHELDUS database, there have been 2 droughts that have caused some level of crop damage. The total agricultural damage from these events is $14,432,775 with an average cost of $7,216,387 per drought event. When annualizing the total cost over the 25 year record, total annual losses based on drought is estimated to be $573,599. Table 2-15 presents an analysis of agricultural exposure that is susceptible to droughts by major crop type for Cameron Parish.

Table 2-15 : Agricultural Exposure by Crop Type for Droughts in Cameron Parish. (Source: LSU Ag Center 2013 Parish Totals)

Agricultural Exposure by Type for Drought				
Forestry	Rice	Soybeans	Hay	Total
$45,717	$13,131,047	$1,521,807	$1,276,695	$15,975,266

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

Vulnerability

See Appendix C for parish vulnerability to drought.

Excessive 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 in *Table 2-16* and *Table 2-17* 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, and that strong winds of hot, dry air can be extremely hazardous.

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 considering 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. Excessive 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, excessive heat is the leading weather-related cause of deaths 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 because they are unexpected. 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 2-16: Heat Index Advisor based on Air Temperature (°F) and Relative Humidity (Source: National Weather Service)

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Table 2-17: 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

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

Previous Occurrences / Extents

The SHELDUS database reports a total of 2 significant excessive heat events occurring within the boundaries of Cameron Parish between the years of 1960 - 2014. Table 2-18 provides an overview of excessive heat events that have impacted the Cameron Parish planning area since 1960. Based on historical data, the worst case scenario for Cameron Parish involving excessive heat would be a high risk level event on the HI scale with temperatures ranging from 103°F to 115°F.

Table 2-18: Previous Occurrences of Excessive Heat in Cameron Parish (Source: SHELDUS)

Date	Crop Damage	Risk Level
May 1963	$594,764	Moderate
July 1980	$22,087	High

Frequency / Probability

The probability was determined based on the geographical location of the state of Louisiana and Cameron Parish. However, excessive heat events that meet the definition that is used by SHELDUS that actually results in damages to property or crops and injury or death to people is a less likely event. Based on a review of significant excessive heat data that has caused damages in the last 54 years, in which Cameron Parish has had two recorded events, the probability of occurrence is estimated at approximately 4%.

Estimated Potential Losses

According to the SHELDUS database, crop damage due to excessive heat in Cameron Parish have totaled approximately $616,851 since 1960. A list of the crop damages by event can be found in Table 2-18. To estimate the potential losses of an excessive heat event on an annual basis, the total damages recorded for an extreme event was divided by the total number of years of available excessive heat data in SHELDUS (1960 – 2014). This provides an annual estimated potential loss of $11,423. Based on the 2010 Census data, the following table provides an estimate of potential crop losses for Cameron Parish:

Table 2-19 : Estimated Annual Crop Losses in Cameron Parish for Excessive Heat.

Estimated Annual Potential Losses from Excessive Heat for Cameron Parish
$11,423

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

Vulnerability

See Appendix C for parish vulnerability to excessive heat.

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 (e.g., 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 10 in. 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, and low-lying, poorly drained areas are particularly prone to flooding during these months.

In Louisiana, six specific types of floods 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 and the shape and land cover of its drainage basin. The smaller the river, the faster 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, 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, tsunami, and gradual sea level rise.

In Cameron parish, all six types of flooding have historically been observed. 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 floods:

- **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 hydro meteorological 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-yr 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-yr flood event is larger in magnitude, but it has a smaller chance of recurrence (1%). A 500-yr flood is significantly larger than both a 100-yr event and a 10-yr 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-yr flood event does not mean an event of that magnitude occurs only once in x years. Instead, it just 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 lay 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-yr flood event has having a 25% chance of occurring over the life of a 30-yr mortgage.

It is essential to understand that the magnitude of an x-yr 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-yr flood events can have very different impacts. The 100-yr flood events in two separate locations have the same likelihood to occur, but they do not necessarily have the same magnitude. For example, a 100-yr event for the Mississippi River means something completely different in terms of discharge values (ft^3/s) than, for example, for the Amite River. Not only are the magnitudes of 100-yr events different between rivers, they can be different along any given river. A 100-yr event upstream is different from one downstream since river characteristics (volume, discharge, and topography) change. As a result, the definition of what constitutes a 100-yr flood event is specific to each location, river, and time, since floodplain and river characteristics change over time. 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-yr 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 (NFIP) Rate Maps. The NFIP and FEMA suggest insurance rates based on special flood hazard areas (SFHAs), as diagrammed in *Figure 2-13*.

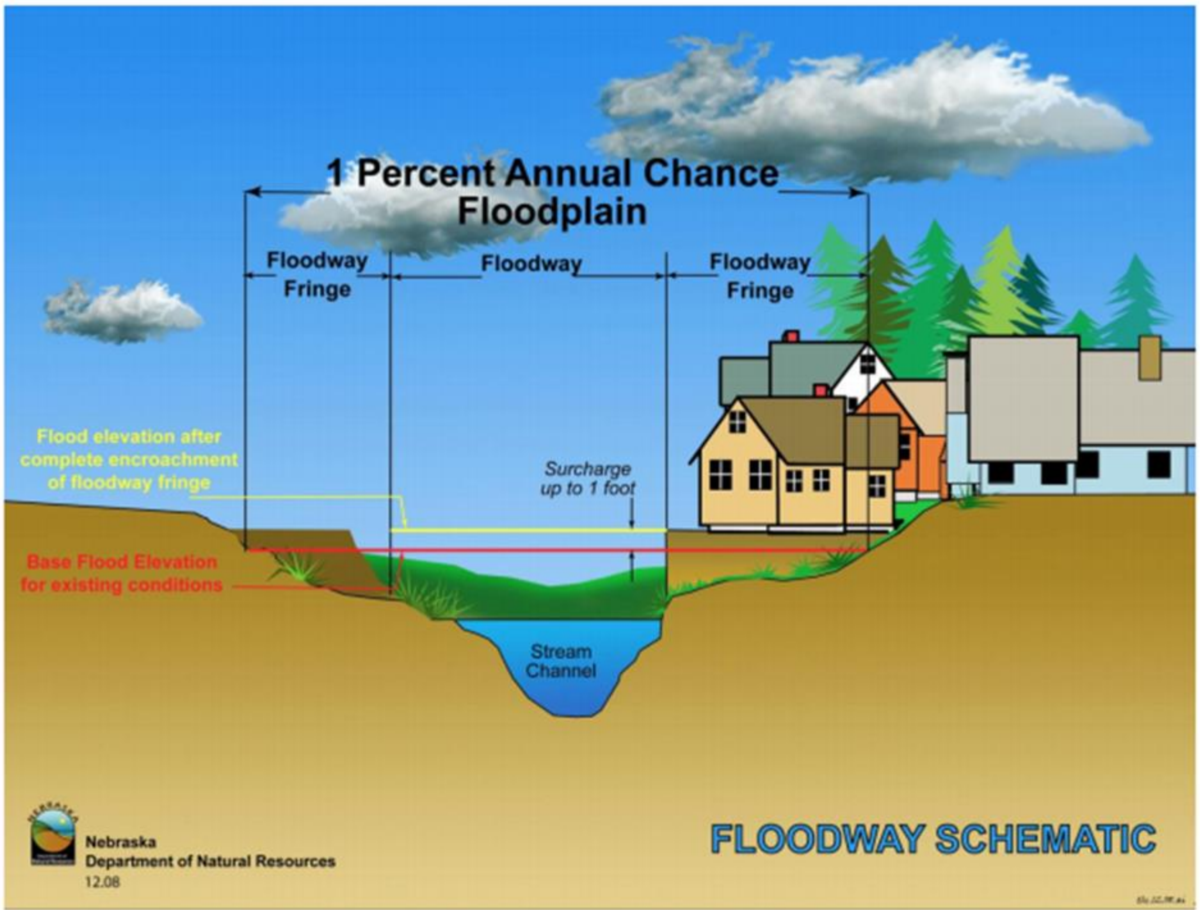

Figure 2-13: Schematic of 100 year Floodplain. The special hazard area (SFHA) extends to the end of the floodway fringe
(Source: Nebraska Department of Natural Resources)

A SFHA is the land area covered by the floodwaters of the base flood (red line in *Figure 2-13*), 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 a few situations, deep and fast moving waters will 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 to quickly, will crack, split, or warp. Plywood can come apart and gypsum wallboard has the potential to fall apart 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 usually are 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 is 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. Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the 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. Is covered under a contract for flood insurance made available under the NFIP; and
b. Has incurred flood related damage –
    1) For which 4 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 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Repetitive loss properties for Cameron Parish are provided below:

Table 2-20 : Repetitive Loss Structures for Cameron Parish

Jurisdiction	Number of Structures	Residential	Commercial	Government	Total Claims	Total Claims Paid	Average Claim Paid
Cameron Parish	442	411	25	6	957	$64,313,620	$67,203

Of the 442 repetitive loss structures, 434 were able to be geocoded to provide an overview of where the repetitive loss structures were located throughout the parish. *Figure 2-14* shows the approximate location of the 434 structures, while *Figure 2-15* shows where the highest concentration of repetitive loss structures are located. Through the density map, it is clear that the primary concentrated area of repetitive loss structures are focused around the unincorporated area of Hackberry along the western shoreline of Calcasieu Lake and along the southern coast line near unincorporated area of the town of Cameron in close proximity to the Gulf of Mexico.

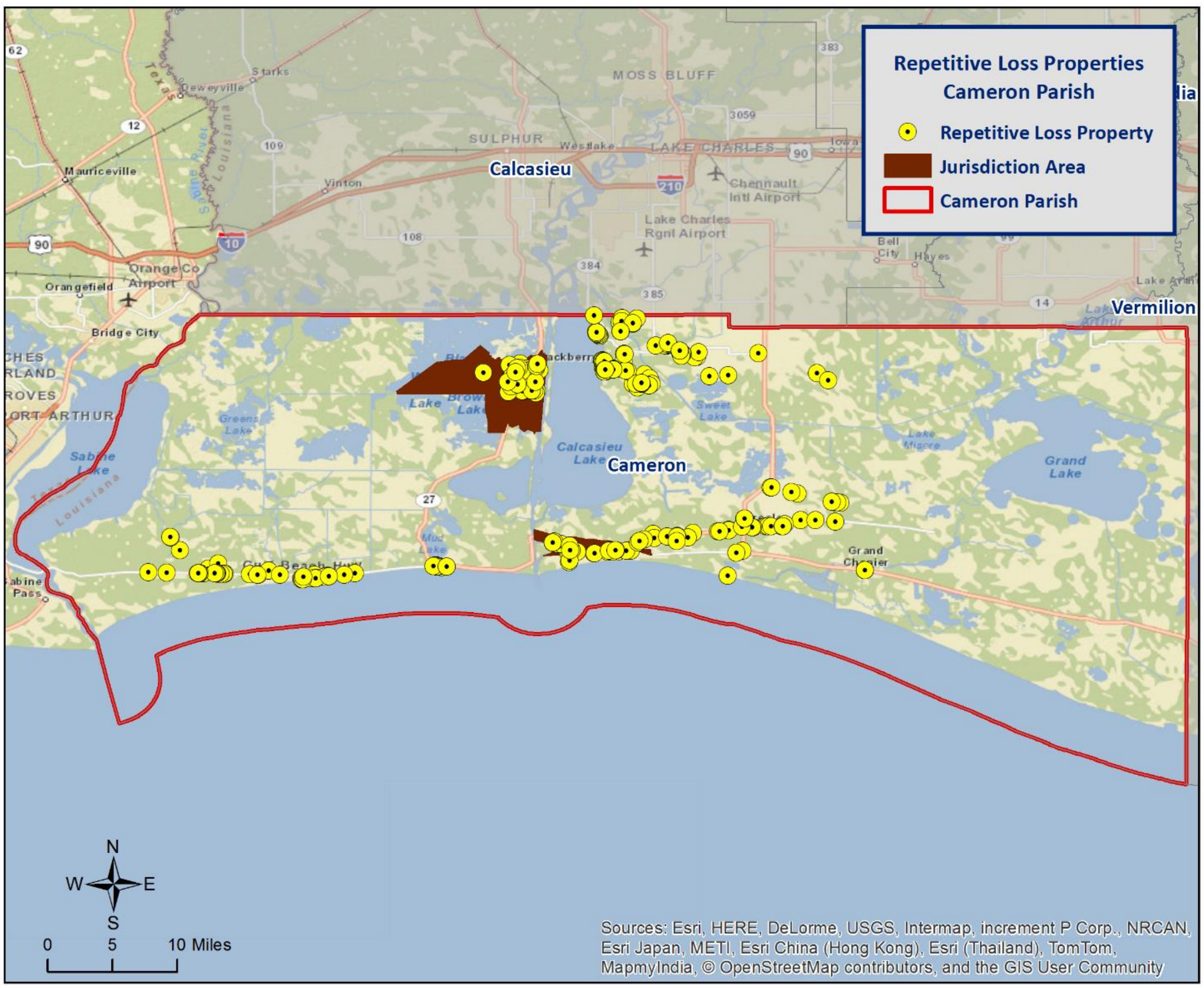

Figure 2-14: Repetitive Loss Properties in Cameron Parish

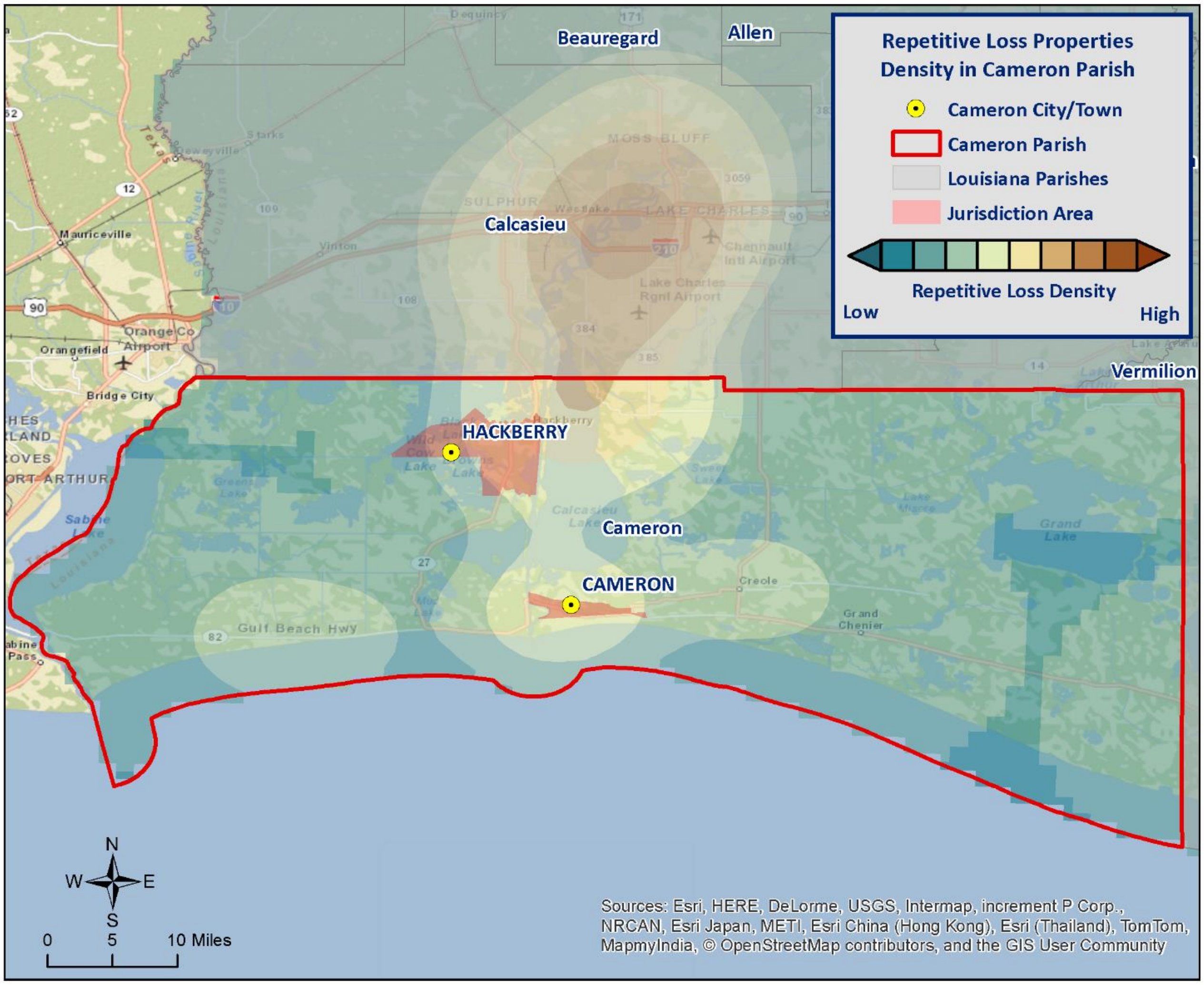

Figure 2-15: Repetitive Loss Property Densities in Cameron Parish

National Flood Insurance Program

Flood insurance statistics indicate that Cameron Parish has 1,753 flood insurance policies with the NFIP with total annual premiums of approximately $2 million. Flood insurance statistics and additional NFIP participation details for Cameron Parish is provided in the tables to follow.

Table 2-21: Summary of NFIP Policies for Cameron Parish

Location	No. of Insured Structures	Total Insurance Coverage Value	Annual Premiums Paid	No. of Insurance Claims Filed Since 1978	Total Loss Payments
Cameron Parish	1,753	$378,227,200	$1,950,343	3,065	$173,750,115

Table 2-22: Summary of Community Flood Maps for Cameron Parish

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Date Joined the NFIP	Tribal
225194	Cameron Parish	9/1/1970	9/4/1970	11/16/2012	9/4/1970	No

According to the Community Rating System (CRS) list of eligible communities dated June 1, 2014, Cameron Parish does not participate in the Community Rating System (CRS).

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 the passengers within the vehicle. Victims of floods have often put themselves in perilous situations by entering flood waters they believe are safe or by ignoring travel advisories.

Major health concerns are also associated with floods. Floodwaters 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. Floodwaters 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 Cameron Parish

By definition, flooding is caused by more water than the drainage system can convey. Flooding is dependent on three factors: precipitation, conditions in the watershed, and conditions in the drainage channel.

Precipitation: Cameron Parish receives an average of 58 inches of rain each year. The rain comes from tropical storms, convective thunderstorms, and storms caused by the interaction of warm moist air with colder air from the north. The amount of rain that falls varies from storm to storm and varies over an area. Where this rain goes depends on the watershed.

The watershed: A "watershed" is an area of land that drains into a lake, stream or other body of water. The runoff from rain is collected by ditches and sewers which send the water to small streams (tributaries), which send the water to larger channels and eventually to the lowest body of water in the watershed (Cameron Bay, the Gulf, or White Lake). When one of these conveyance channels receives too much water, the excess flows over its banks and into the adjacent area – causing a flood.

There are several watershed conditions that affect flooding. The first is the size of the watershed. Smaller watersheds will flood more quickly. The second watershed factor that affects flooding is the slope of the land. More rain will run off the land and into the streams if the terrain is steep. Because much of Cameron Parish is so flat, water tends to pond where it falls and run off slowly. This results in localized flooding conditions, before the water reaches the local drainage system.

A third factor is what development has done to the watershed and drainage system. Given the flat topography of the parish, the natural drainage ways that drain runoff can be hard to discern and are often disrupted or even built on during construction. In areas that have been developed, farm fields and forests have been converted to pavements and rooftops. As a result, the amount of storm water that runs off increases. The original natural drainage system cannot handle the increased loads and localized flooding occurs. These watershed conditions mean that Cameron Parish is faced with two types of flooding: longer-lasting, overbank flooding from the larger rivers and quick or “flash” storm water flooding in areas where the runoff overloads the local drainage system. The former may be caused by rain falling upstream in the watershed while the latter is caused by rain falling on the affected area. Because overbank flooding takes longer to occur, there may be advance warning time, but there is very little warning of local storm water flooding.

The channel: Flooding can be aggravated by obstructions in the drainage system. There are two kinds: channel obstructions, such as small bridge or culvert openings or log jams, and floodplain obstructions, such as road embankments, fill and buildings. Channel obstructions will aggravate smaller, more frequent floods, while floodplain obstructions impact the larger, less frequent floods where most of the flow is overbank, outside the channel. Channel obstructions can be natural (e.g., log jams or growth) or manmade (e.g., broken culverts or debris). Channel obstructions can be cleared out by work crews or washed away during larger floods. Floodplain obstructions tend to be more permanent.

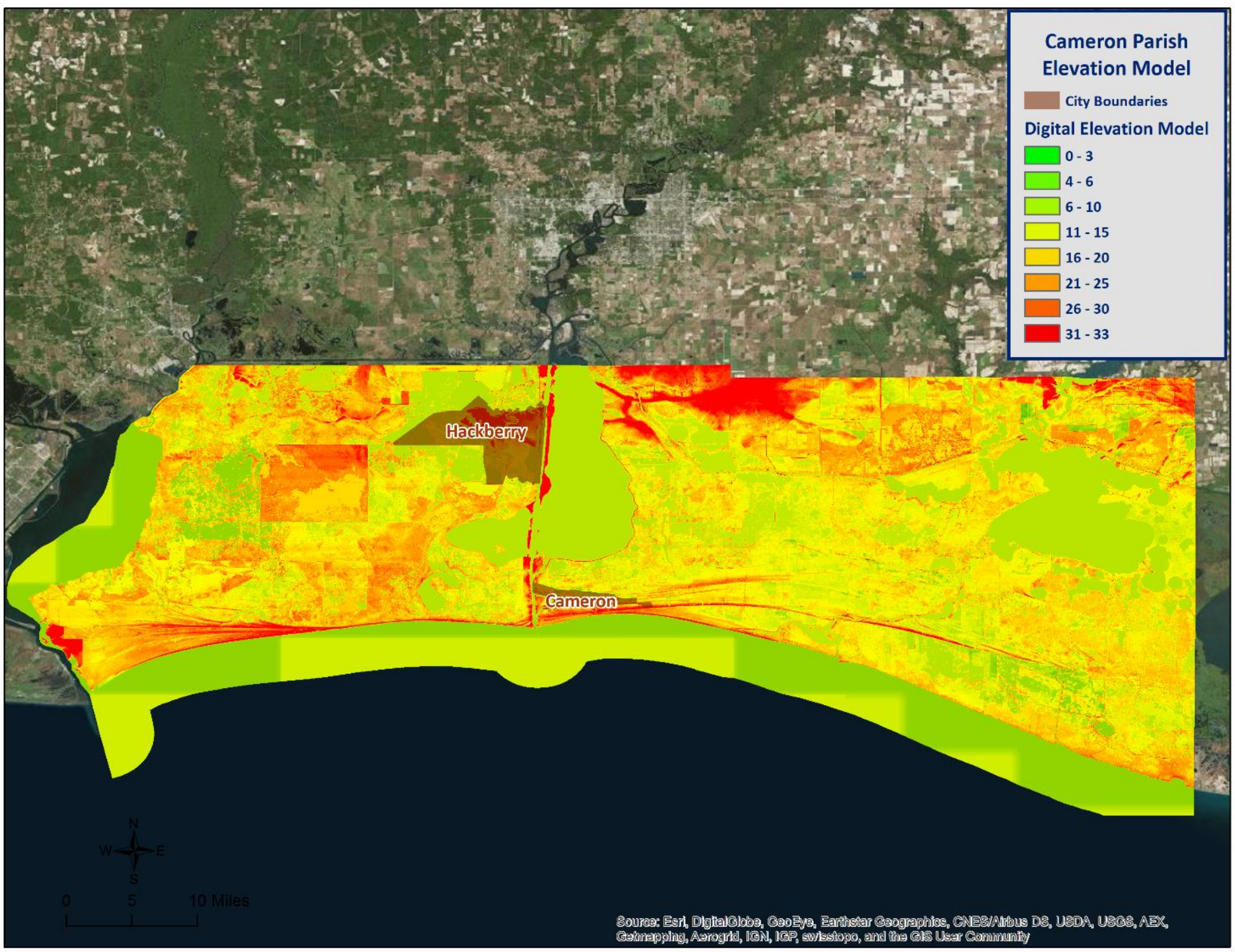

Figure 2-16: Elevation throughout Cameron Parish

Looking at the digital elevation model (DEM) in Figure 2-16 for Cameron Parish is instructive in visualizing where the low lying and risk areas are for the parish. Elevations in Cameron Parish are extremely lower than those of the surrounding parishes such as Vermilion Parish. The highest elevations in the parish are approximately 30 to 33 feet. These higher elevations are sporadically located throughout the parish with the majority of these areas located in the northern portion of the parish.

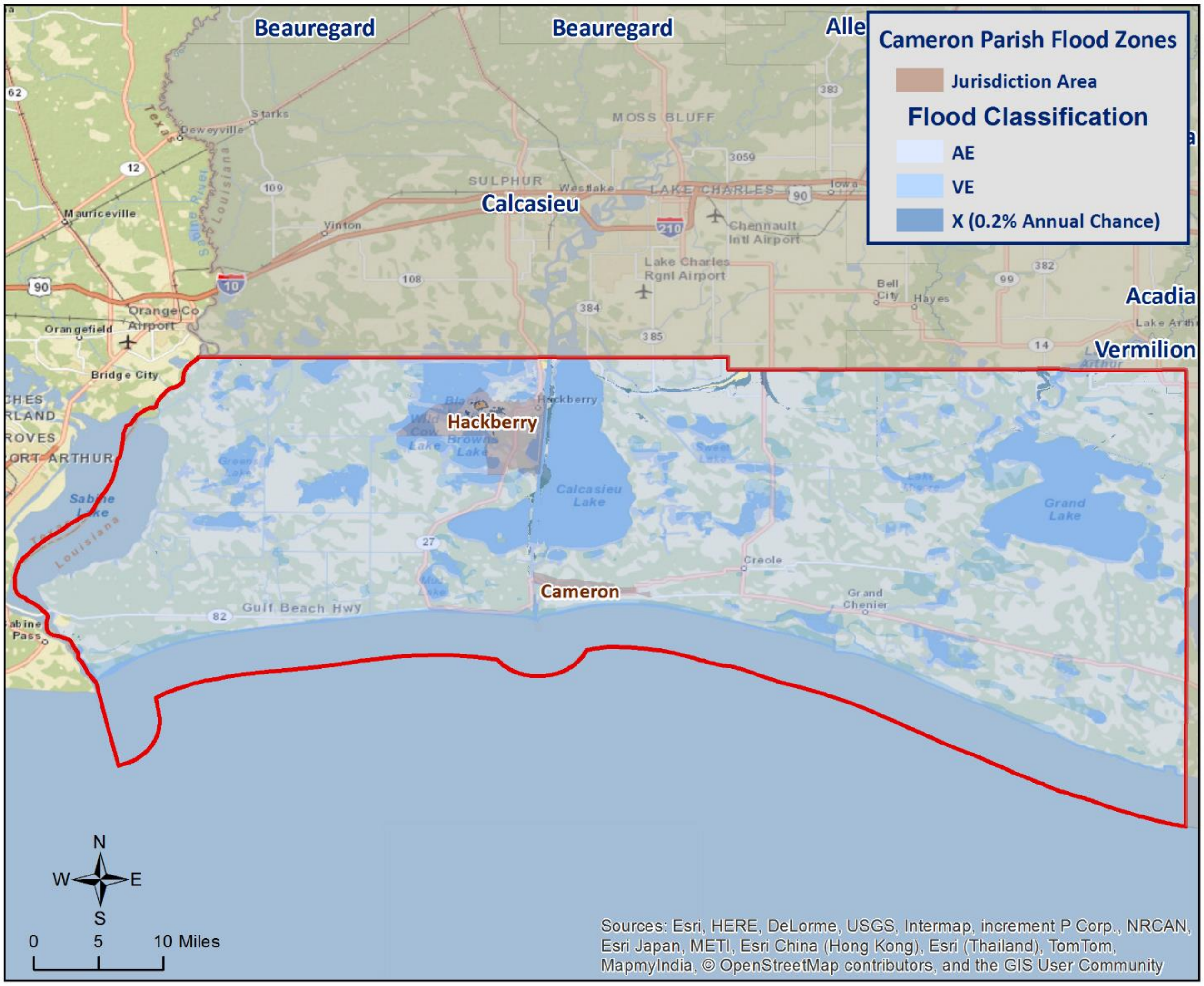

Figure 2-17: The 100 Year Floodplain for Cameron Parish

Location

Cameron parish has experienced significant flooding in its history and can expect more in the future. Cameron Parish is located along the eastern portion of the Sabine River Basin which make the parish susceptible to riverine flooding. The Sabine River is formed by three tributaries which begin in Collin County and Hunt County in northeast Texas, and becomes the boundary between Texas and Louisiana near Logansport, Louisiana. Cameron Parish is also susceptible to storm surge in the southern areas of the parish from the Gulf of Mexico. Low lying coastal areas of the parish including are vulnerable to storm surge.

Previous Occurrences and Extents

Historically, there have been 9 flood events that have created significant flooding in Cameron parish between 1989 and 2014. Below is a brief synopsis of the 9 flooding events over the last 25 years, including each flooding event that has occurred since the parish's last planning update.

Table 2-23: Historical Floods in Cameron Parish with Locations from 1989 - 2014

Date	Extents	Type of Flooding	Estimated Damages	Location
10/5/1996	Coastal flooding occurred along Highway 82 between Holly Beach and Johnson Bayou causing minor damage to the north side of the highway.	Coastal Flood	$20,000	Holly Beach
11/16/1996	Three beach camps and 30 feet of shoreline were washed away by wave action caused by south winds in excess of 55 mph.	Coastal Flood	$100,000	Holly Beach
10/11/1997	Minor coastal flooding occurred due to strong southeast winds. Highway 82 was covered in debris and a few beach homes received minor damage.	Coastal Flood	$25,000	Holly Beach
9/11/1998	Four to six inches of rain caused flooding of over 20 homes in the Grand Lake area. Over a foot of water covered several streets.	Flash Flood	$100,000	Grand Lake
10/29/2002	Over 5 inches of rain fell in less than three hours, resulting in widespread street flooding and some flooded homes.	Flash Flood	$50,000	Cameron Parish
11/5/2002	Several homes were flooded near Creole, Little Chenier, and Chenier Pardue due to three inches of rain on already saturated grounds.	Flash Flood	$25,000	Creole
3/20/2012	Strong persistent south winds pushed water into low coastal areas. Main street in downtown Cameron experienced minor flood.	Coastal Flood	$0	Cameron Parish

Date	Extents	Type of Flooding	Estimated Damages	Location
1/9/2013	Heavy rain fell on saturated ground in Northeast Cameron Parish causing portions of Highway 384 to become inundated. 8.75 inches of rain fell in a 24 hour period at the Rockefeller Wildlife Refuge.	Flash Flood	$1,000	Sweet Lake
1/10/2013	Flood waters from rainfall slowly drained across the Mermentau Basin and into the coastal marsh lands causing three homes to flood.	Flood	$650,000	Grand Chenier

Based on previous flood events, the worst-case scenarios are based on several different types of flooding events. Storm water excesses affects primarily the low lying areas of the parish and flood depths of up to 3 feet can be expected in the northern areas of the parish. The southern areas of Cameron parish are susceptible to coastal flooding. Based on historical records the worst case scenario would be flooding levels of approximately 3 to 5 feet.

Frequency / Probability

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

Table 2-24: Flood Annual probabilities for Cameron Parish

Jurisdiction	Annual Probability	Return Frequency
Cameron Parish	36%	2 - 3 Years

Based on historical record, the overall probability for the entire Cameron Parish Planning area is 36% with 9 events occurring over a 25 year period.

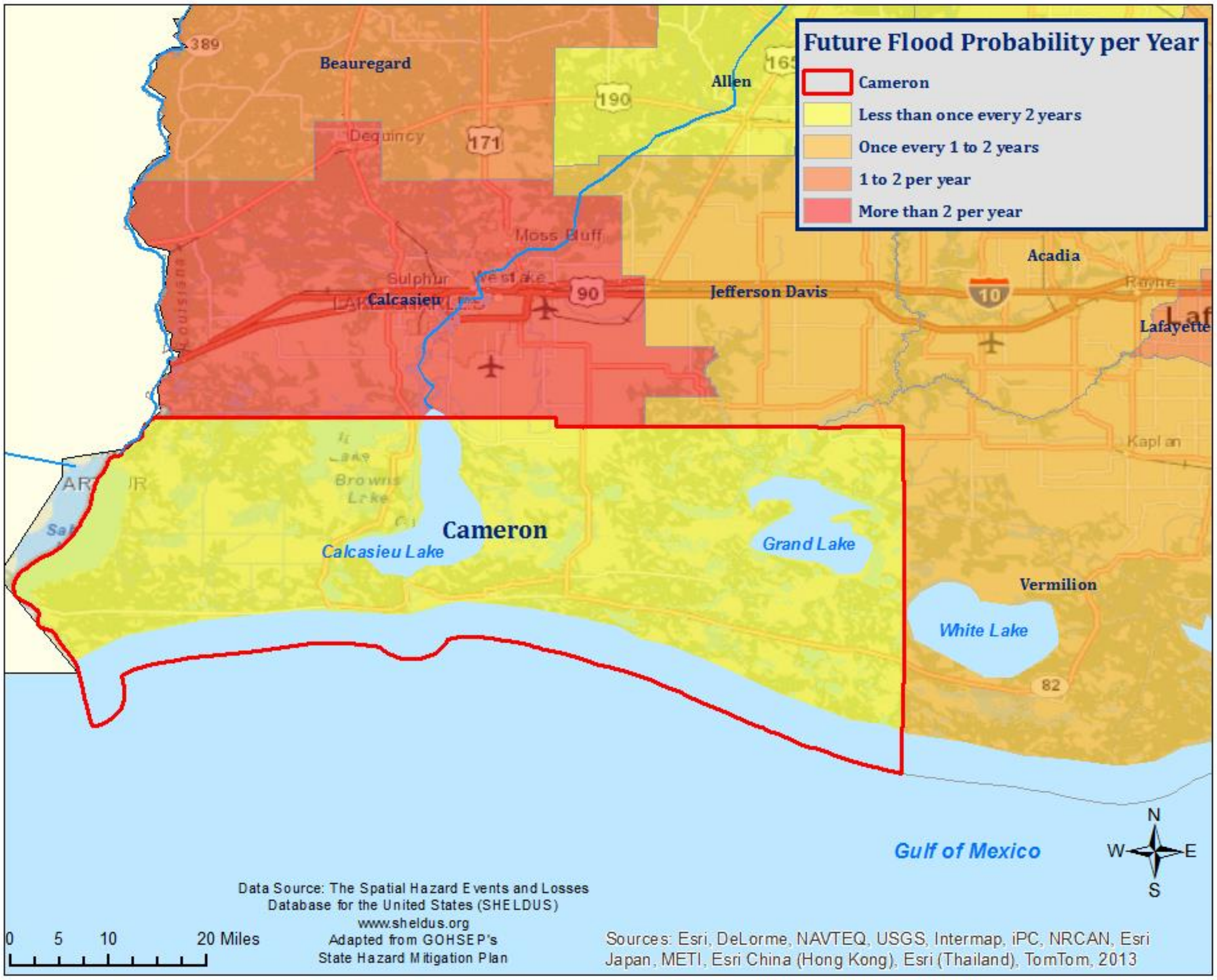

Figure 2-18: Flood Probability for Cameron Parish

Estimated Potential Losses

Using Hazus-MH Flood Model the 100 year flood scenario, along with the Parish DFIRM, was analyzed to determine losses from this worst-case scenario. Table 2-25 shows the total economic losses that would result from this occurrence.

Table 2-25: Estimated Losses in Cameron Parish from a 100 year Flood Event

Jurisdiction	Estimated total Losses from 100 Year Flood Event
Cameron Parish	$897,175,000

The Hazus-MH Flood model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish.

Table 2-26: Estimated 100 year Flood Losses for Cameron Parish by Sector (Source: HAZUS-MH)

Cameron Parish	Estimated total Losses from 100 Year Flood Event
Agricultural	$4,206,000
Commercial	$173,824,000
Government	$16,680,000
Industrial	$104,500,000
Religious / Non-Profit	$34,502,000
Residential	$5556,648,000
Schools	$6,815,000
Totals	$897,175,000

Threat to People

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

Table 2-27: Vulnerable Populations Susceptible to a 100 year Flood Event (Source: HAZUS-MH)

Number of People Exposed to Flood Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
Cameron Parish	**6,839**	**6,495**	**95%**

The HAZUS-MH flood model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions in the tables below:

Table 2-28: Vulnerable Populations Susceptible to a 100 year Flood Event in Cameron Parish (Source: HAZUS-MH)

Cameron Parish		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	6,495	95%
Persons Under 5 years	357	5.5%
Persons Under 18 years	1,559	24%
Persons 65 Years and Over	929	14.3%
White	6,242	96.1%
Minority	253	3.9%

Vulnerability

See Appendix C-1 to C-2 for parish and municipality buildings that are susceptible to flooding due to proximity within the 100 year flood plain.

Sinkholes

Sinkholes are areas of ground—varying in size from a few square feet to hundreds of acres, and reaching in depth from 1 to more than 100 ft.—with no natural external surface drainage. 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, encounters water-soluble bedrock, and then begins to dissolve it, sinkholes start to form. The karst rock dissolves along cracks; as the fissures grow, soil and other particles fill the gaps, loosening the soil above the bedrock. Figure 1 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 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 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 land in the United States 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.

Location

Currently, there are fourteen identifiable salt dome locations in Cameron Parish. Figure 2-19 displays the locations of these salt domes within Cameron Parish. As depicted in Figure 2-19, the sinkholes are dispersed throughout Cameron Parish. Five of the sinkholes are located off the shores of Cameron Parish and are completely discounted. Of the nine inland salt domes, four of them have a two mile buffer that does not contain any people, homes or essential infrastructure sites. While the majority of sinkholes are located in uninhabited parts of the parish, there are five salt domes that are located near populated areas. These five locations were analyzed to determine potential loss exposure if a sinkhole were to occur.

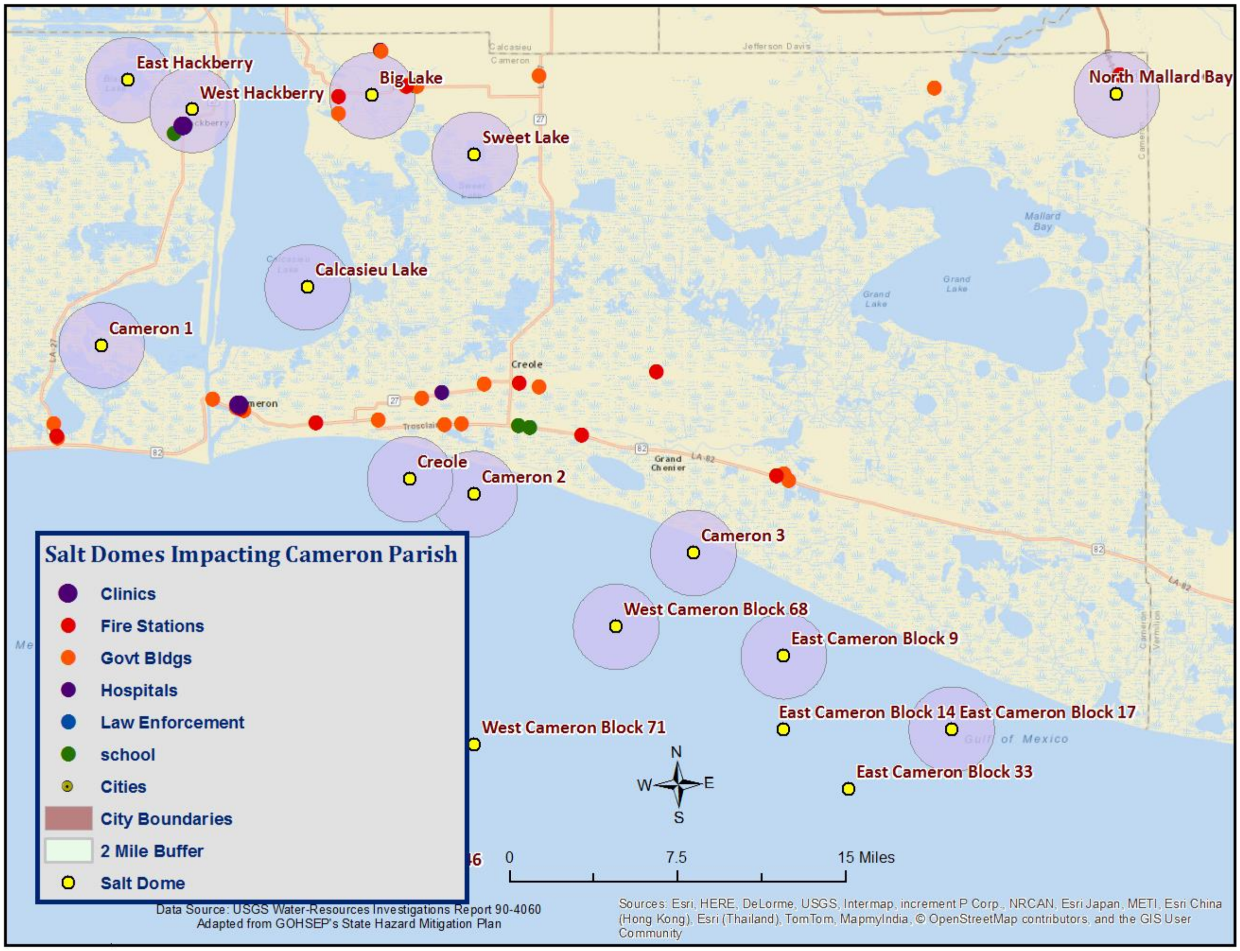

Figure 2-19: Salt dome locations in Cameron Parish relative to infrastructure

Previous Occurrences / Extent

There have been no recorded incidents of sinkholes or salt dome collapses in Cameron Parish to date.

Estimated Potential Losses

Each of the five salt domes that influence Cameron parish were analyzed to determine the number of people and essential facilities 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 were located within two miles of each salt dome. Parish critical infrastructure was also evaluated to determine if it is located within any of the two mile buffers. Total losses for each two mile buffer zone were determined by analyzing the total values in HAZUS-MH of all structures within the buffer zone.

The salt dome that poses the greatest risk to Cameron Parish is the West Hackberry Salt Dome, which encompasses the unincorporated jurisdiction Hackberry. There is a total population of 979 people who would potentially be exposed to a sinkhole formation, along with 4 critical infrastructures.

Table 2-29: Estimated Potential Losses from a Sinkhole formation

Salt Dome Name	Total Building Exposure	Critical Infrastructure Exposure	Number of People Exposed
East Hackberry	$2,484,000	0	103
West Hackberry	$194,220,000	4	979
Big Lake	$144,176,000	5	1,071
North Mallard Bay	$5,134,000	1	82
Sweet Lake	$26,168,000	0	177

Due to isolated locations of the sinkholes there is little to no risk to people with the exception being the residents within two miles of the Big Lake and West Hackberry Salt Domes. The East Hackberry, North Mallard Bay and Sweet Lake Salt Domes also pose some risk but not nearly to the same degree as West Hackberry and Big Lake.

Vulnerability

See Appendix C for parish 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 and therefore 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, multicell, 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 multicell 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, and warming 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) have the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued 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 counties (parishes).

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

- Hail of 1 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 develops in the upper atmosphere initially as ice crystals that are bounced about by high-velocity updraft winds. The ice crystals grow through deposition of water vapor onto their surface, fall partially to a level in the cloud where the temperature exceeds the freezing point, melt partially, get caught in another updraft whereupon re-freezing and deposition grows another concentric layer of ice, and fall after developing enough weight, sometimes after several trips up and down the cloud. The size of hailstones varies depending on the severity and size of the thunderstorm. Higher surface temperatures generally mean stronger updrafts, which allows more massive hailstones to be supported by updrafts, leaving them suspended longer. This longer time means larger hailstone sizes. Table 2-30 displays a spectrum of hailstone diameters and their everyday equivalents.

Table 2-30: 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”	Nickel
1” (severe)	Quarter
1 1/4”	Half Dollar
1 1/2”	Ping Pong Ball / Walnut
1 3/4”	Golf Ball

Spectrum of Hailstone Diameters	
Hail Diameter Size	Description
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 homes and other 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 Table 2-31.

Table 2-31: 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

High Winds Categories			
High Wind Type	Description	Relative Frequency in Louisiana	Relative Maximum Duration in Louisiana
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 mountainous 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.

Table 2-32 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 2-32: 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

Beaufort Wind Scale			
Force	Wind (MPH)	WMO Classification	Appearance of Wind Effects on Land
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	
12	74+	Hurricane	

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.

Hazard Profile

Hailstorms

Location

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

Previous Occurrences / Extents

The SHELDUS database reports a total of 2 significant hailstorms occurring within the boundaries of Cameron Parish between the years of 1989-2014. The hailstorm diameters experienced in Cameron Parish have ranged from 0.75 inches to 1.75 inches according to the National Climatic Data Center over the 25 year period. The most frequently recorded hail size has been 1 inch diameters. *Figure 2-20* displays the density of hailstorms in Cameron parish and adjacent parishes. *Table 2-33* provides an overview of hail storms that have impacted the Cameron Parish Planning area since 2009 based on the National Climatic Data Center dataset. Cameron Parish can expect to experience hail up to 1.75 inches for future events.

Table 2-33: Previous Occurrences of Hailstorms in Cameron Parish
(Source: NCDC)

Date	Recorded Hail Size	Location
1-Feb-09	1.75 in	Creole
12-Apr-09	0.75 in	Grand Lake
6-Jun-11	1.00 in	Grand Lake
6-Jun-11	1.75 in	Grand Lake
6-Jun-11	1.00 in	Grand Lake
6-Jun-11	1.00 in	Grand Lake
22-May-12	1.00 in	Grand Chenier
22-May-12	1.00 in	Creole

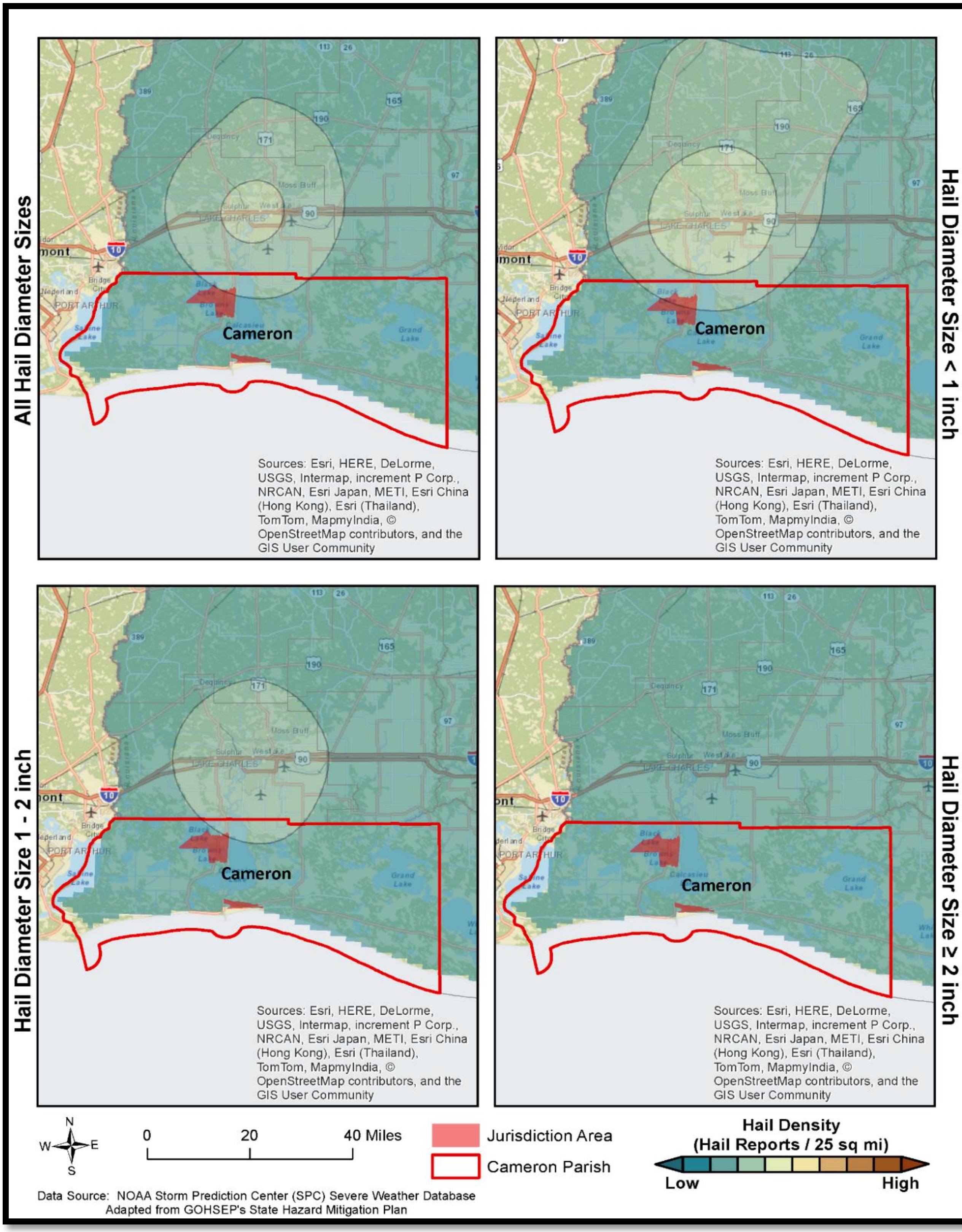

Figure 2-20 : Density of Hailstorms by Diameter from 1950-1964
(Source: State of Louisiana Hazard Mitigation Plan 2014)

Frequency

The State of Louisiana Hazard Mitigation plan estimated the probability of occurrence at approximately 8%, with a return frequency of less than once every 8 years. The probability was determined based on a review of significant hail data that has caused damages in the last twenty five years, in which Cameron parish has had two recorded events (Figure 2-21).

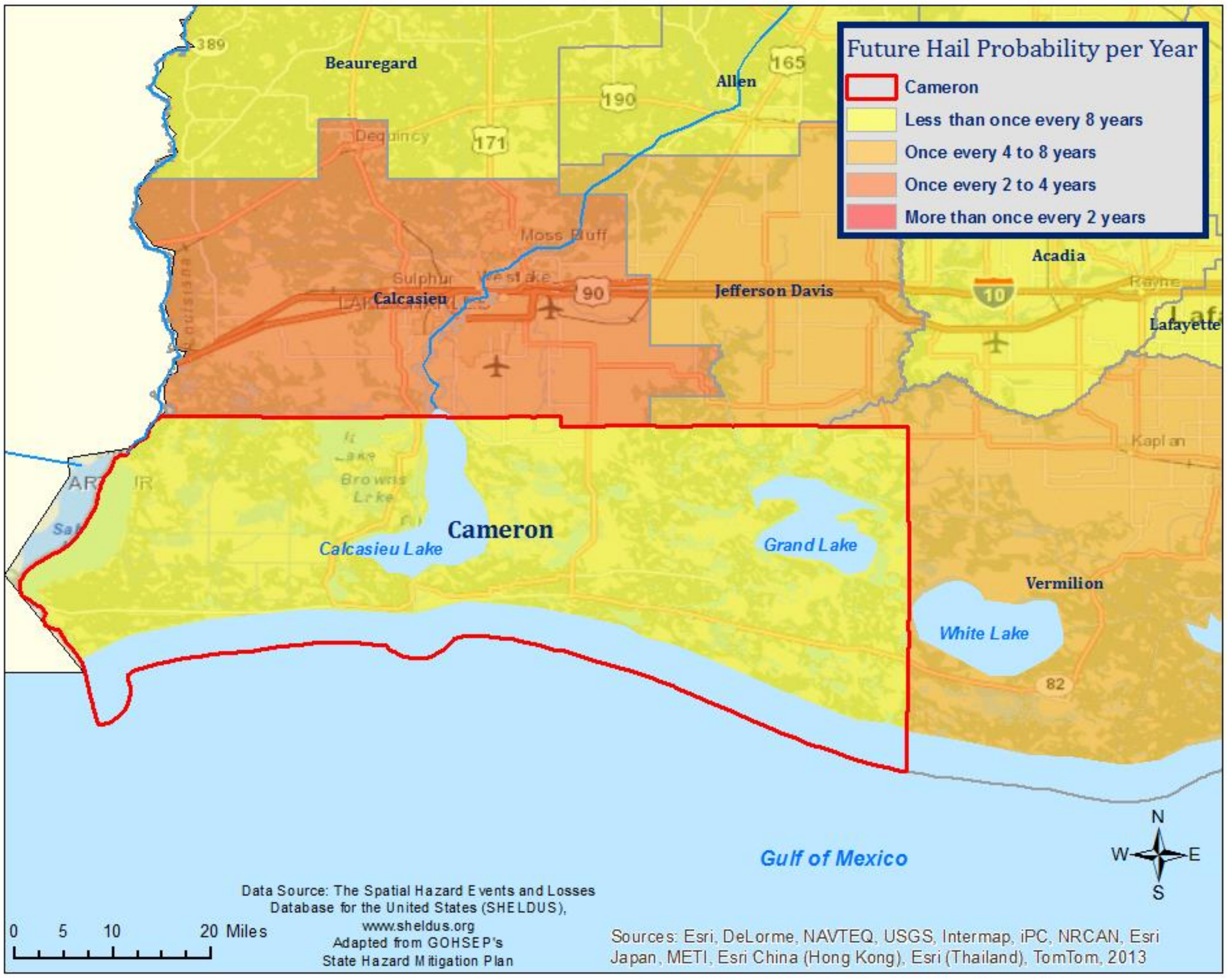

Figure 2-21: Probability of Hailstorm Events in Cameron Parish from 1987-2012 (Source: State of Louisiana Hazard Mitigation Plan 2014)

Estimated Potential Losses

According to the SHELDUS database, property damage due to hailstorms in Cameron Parish have totaled approximately $13,904 since 1960. A list of total damages by event can be found in *Table 2-34*. To estimate the potential losses of a severe weather event on an annual basis, the total damages recorded for hailstorms was divided by the total number of years of available hailstorm data in SHELDUS (1960 – 2014). This provides an annual estimated potential loss of $257. The following table provides an estimate of potential property losses for Cameron Parish:

Table 2-34: Property Damage Caused by Hailstorms in Cameron Parish.
(Source: SHELDUS)

Date	Property Damage
Apr-62	$3,013
Jul-63	$1,983
Apr-64	$14,677
Jun-67	$1,816
Jul-67	$1,362
May-68	$17
Jun-70	$1,501
Jul-70	$834
Mar-71	$11,234
Nov-72	$1,089
May-75	$11,276
May-78	$17,515
Jun-81	$214
May-85	$1,546

Table 2-35: Estimated Annual Property Losses in Cameron Parish from Hailstorms.

Estimated Annual Potential Losses from Hailstorms for Cameron Parish
$257

The Parish has suffered no deaths or injuries due to hailstorms from 1989 – 2014.

Vulnerability

See Appendix C-1 to C-2 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 Cameron Parish is equally at risk for high winds.

Previous Occurrences / Extents

The SHELDUS database reports a total of 60 thunderstorm wind events occurring within the boundaries of Cameron Parish between the years of 1989-2014. The significant thunderstorm wind events experienced in Cameron Parish have ranged from a wind speed of 58 mph to 81 mph. Cameron Parish can expect to receive winds up to 81 mph for future high wind events.

Table 2-36: Previous Occurrences for Thunderstorm High Wind Events

Location	Date	Recorded Wind Speeds	Property Damage	Crop Damage
Grand Lake	25-Mar-09	70 mph	$25,000	$0
Grand Lake	25-Mar-09	60 mph	$0	$0
Sweet Lake	8-Jul-09	60 mph	$1,000	$0
Hackberry	24-Dec-09	70 mph	$75,000	$0
Grand Chenier	24-Dec-09	60 mph	$2,000	$0
Sweet Lake	1-Feb-11	59 mph	$3,000	$0
Grand Lake	6-Jun-11	58 mph	$5,000	$0
Grand Lake	6-Jun-11	58 mph	$10,000	$0
Cameron	18-Feb-12	63 mph	$0	$0
Grand Lake	11-Mar-12	58 mph	$20,000	$0
Creole	22-May-12	58 mph	$5,000	$0
Grand Chenier	20-Jul-12	58 mph	$1,000	$0
Calcasieu Lake North	21-Jul-12	58 mph	$0	$0
Calcasieu Lake South	21-Jul-12	60 mph	$0	$0
Johnson Bayou	25-Dec-12	60 mph	$0	$0
Grand Lake	10-May-13	70 mph	$80,000	$0
Sweet Lake	10-Aug-13	58 mph	$1,000	$0

Frequency

High winds are a fairly common occurrence within Cameron Parish with an annual chance of occurrence calculated at 100%. According to the State Hazard Mitigation Plan, Cameron parish has a future probability of experiencing 2 to 4 wind events annually as seen in *Figure 2-22*.

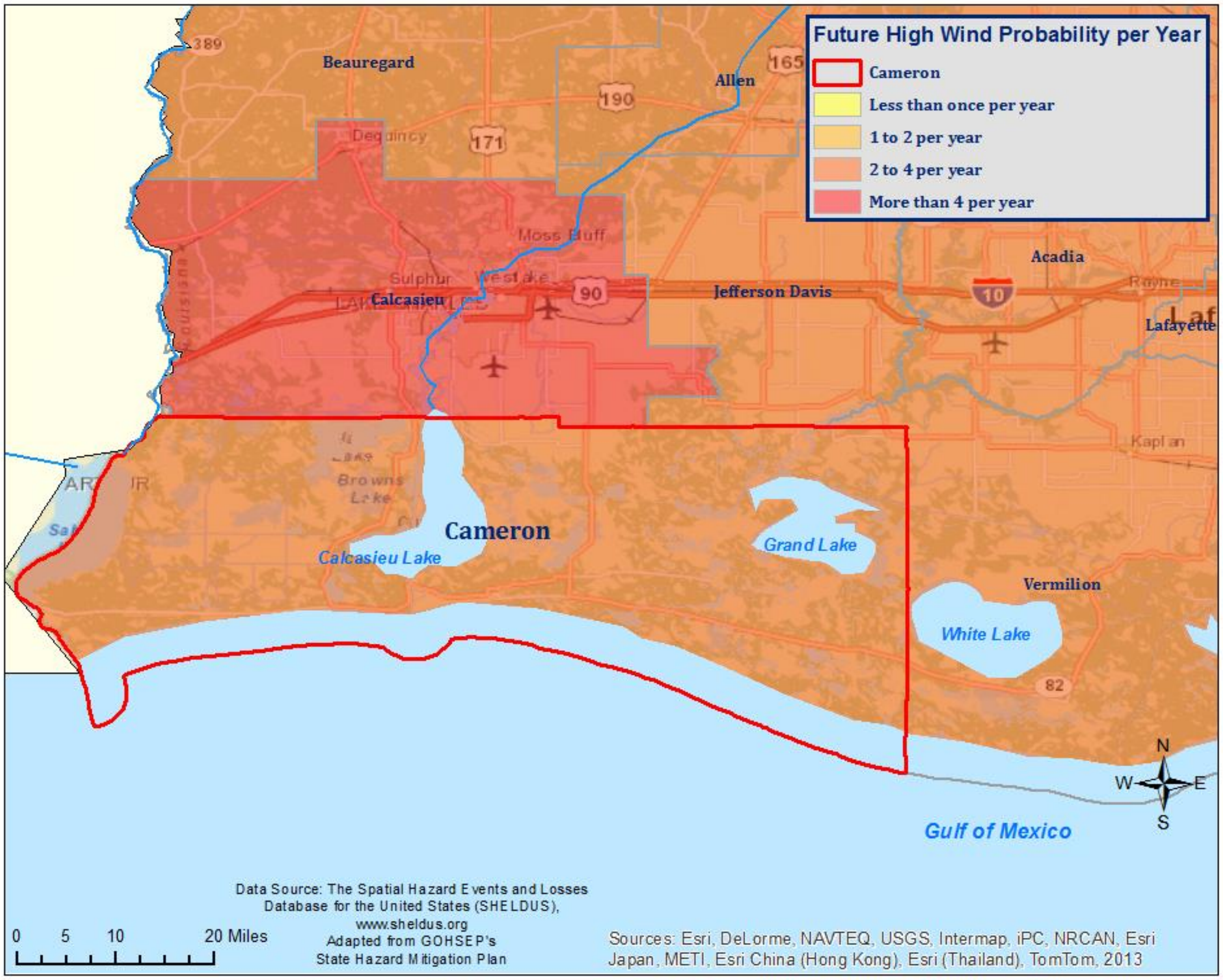

Figure 2-22: Probability of High Wind Events in Cameron and Adjacent Parishes (Source: State of Louisiana 2014 Hazard Mitigation Plan)

Estimated Potential Losses

Since 1989, there have been 60 significant wind events that have resulted in property damages according to the SHELDUS database. The total property damages associated with those storms have totaled $1,343,948. 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 (1989 – 2014). This provides an annual estimated potential loss of $53,758. The following table provides an estimate of potential property losses for Cameron Parish:

Table 2-37: Estimated annual property losses in Cameron parish resulting from wind damage

Estimated Annual Potential Losses from Thunderstorm Winds for Cameron Parish
$53,758

There have been 2 reported injuries as a result of a wind event over the 25 year record.

Vulnerability

See appendix C-1 to C-2 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 Cameron Parish.

Previous Occurrences / Extent

The SHELDUS database reports a total of 8 lightning events occurring within the boundaries of Cameron Parish between the years of 1989-2014. 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 Cameron Parish which occur on a nearly monthly basis. The table below provides an overview of significant lightning strikes over the last five years.

Table 2-38: Previous Occurrences of Significant Lightning Strikes in Cameron Parish from 2009 – 2014 (Source: NCDC and SHELDUS)

Location	Date	Summary	Property Damage
Hackberry	15-Jul-09	Lightning ignited a fire in the Sabine National Wildlife Refuge which burned over 4,000 acres of marshland.	$0
Holly Beach	18-Jul-09	Lightning started a fire just south of the Wetland Walkway and adjacent to Highway 27 in the far southeast portion of the Sabine National Refuge.	$0
Grand Chenier	23-Aug-10	Lightning struck marsh land in the Rockefeller National Wildlife Refuge and created a large marsh fire.	$0
Hackberry	7-Aug-12	Lightning started a fire in north central sections of the Sabine National Wildlife Refuge burning over 2,300 acres.	$1,015
Grand Lake	10-May-13	Lightning struck two men in a fishing boat attempting to outrun the storm.	$0

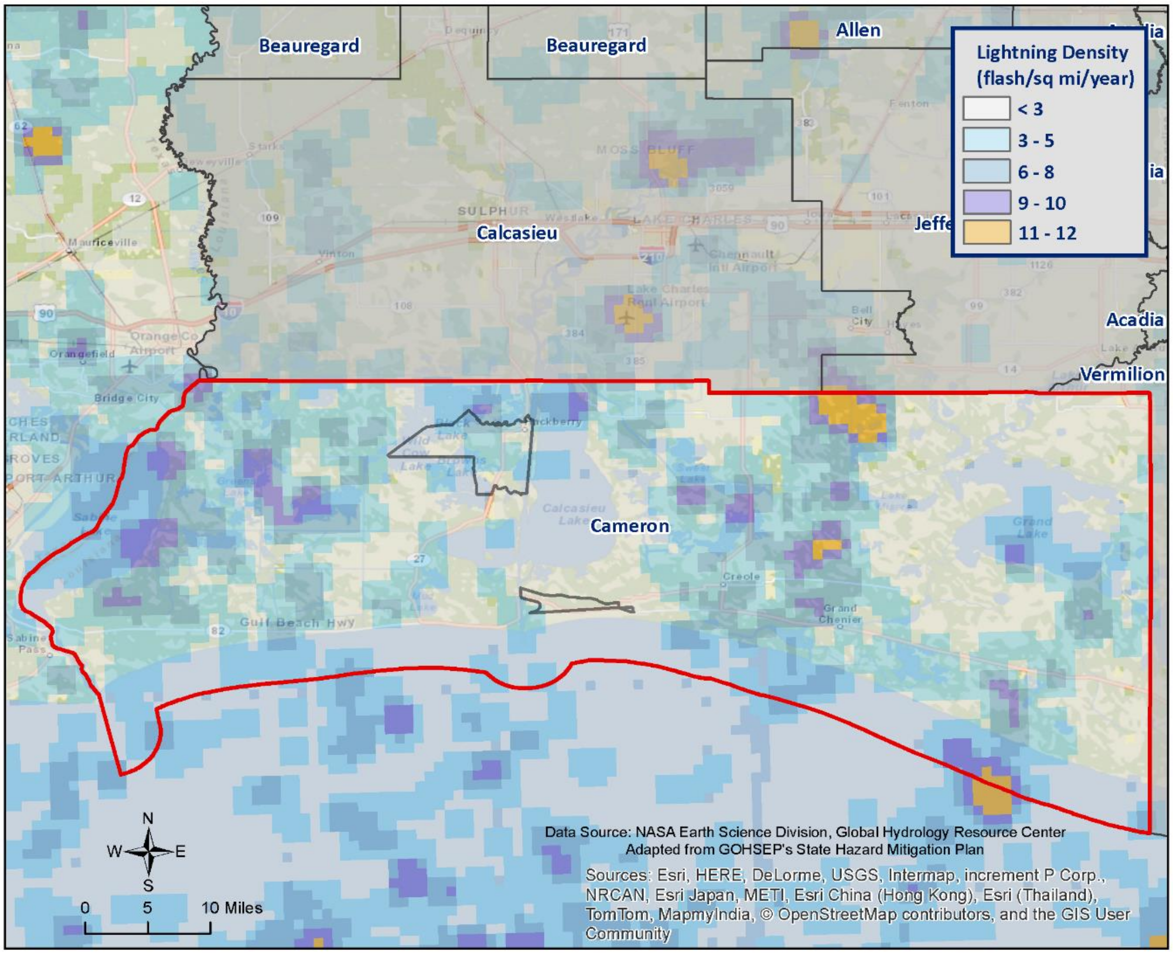

Figure 2-23: Lightning Density Reports for Cameron Parish

Frequency

Lightning can strike anywhere and is produced by every thunderstorm, so the chance of lightning occurring in Cameron 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 to people is a less likely event. According to the State Hazard Mitigation Plan, a major lightning strike in Cameron parish is likely to occur every 1 to 4 years as depicted in *Figure 2-24*. This is consistent with SHELDUS, which has 8 lightning events that have caused property damages or injuries over the last 25 years, establishing an annual probability of 32%.

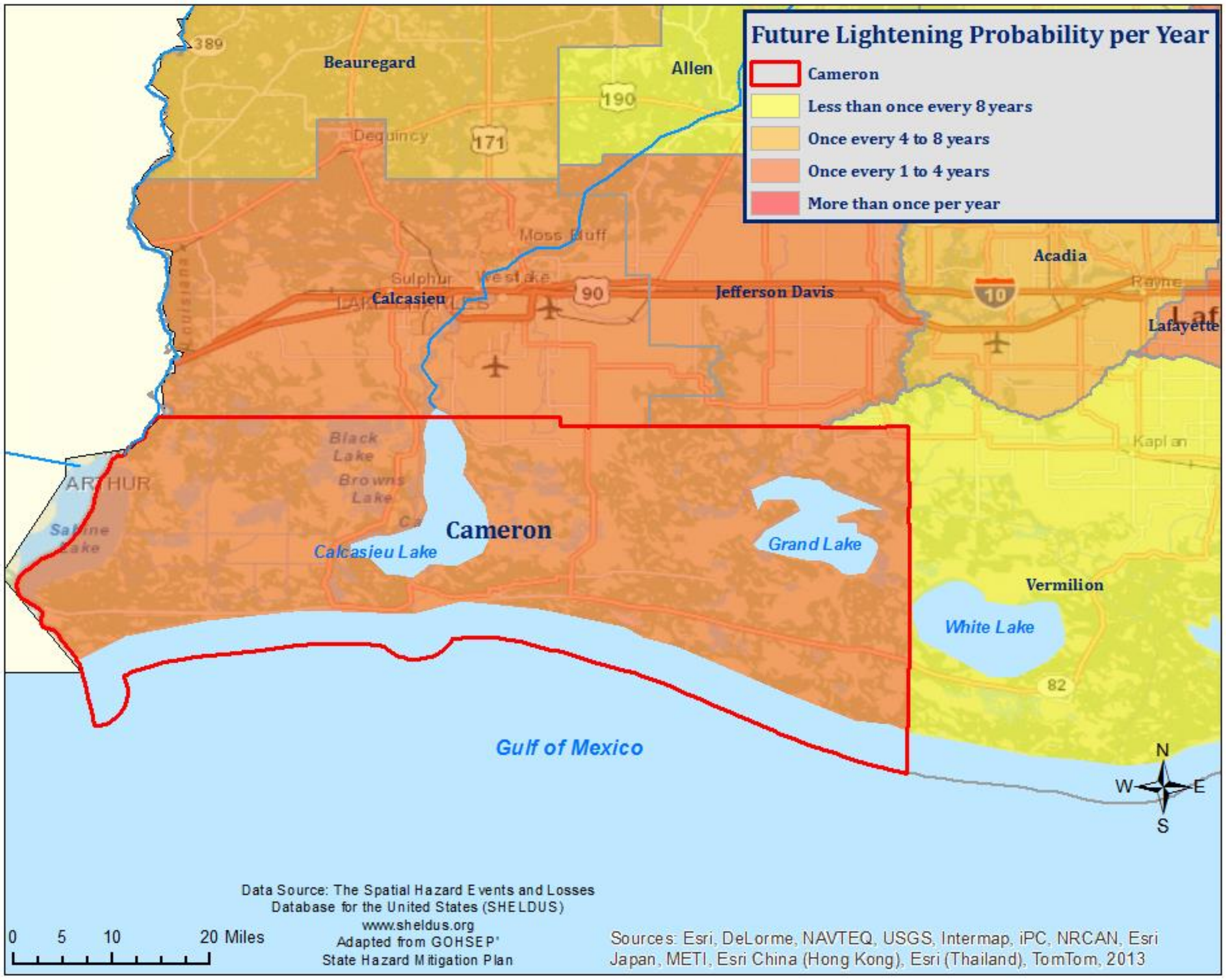

Figure 2-24: Probability of Lightning Events in Cameron and Adjacent Parishes. (Source: State of Louisiana Hazard Mitigation Plan 2014)

Estimated Potential Losses

Since 1989, there have been 8 significant lightning strikes with 1 of those strikes resulting in property damages according to the SHELDUS database. The total property damages associated with this event totaled $1,015. 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 (1989 – 2014). This provides an annual estimated potential loss of $41. The following table provides an estimate of potential property losses for Cameron Parish:

Table 2-39: Estimated annual property losses in Cameron Parish from lightning

Estimated Annual Potential Losses from Thunderstorm Winds for Cameron Parish
$41

There have been 4 reported injuries and 3 fatalities in Cameron Parish as a result of a lightning strikes over the 25 year record.

Vulnerability

See Appendix C-1 to C-2 for parish and municipality building exposure to lightning hazards.

Tornadoes

Tornadoes (also called twisters and 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, which usually occurs in a counterclockwise direction 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 2-37 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. Adjustment between scales can be made using Table 2-74.

Table 2-40: Comparison of the Enhanced Fujita (EF) Scale to the Fujita (F) Scale

	Enhanced Fujita Scale					
Wind speed (mph)	**EF0**	**EF1**	**EF2**	**EF3**	**EF4**	**EF5**
	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

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 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 Doppler 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 on 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 missiles 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

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

Previous Occurrences / Extent

Cameron Parish has not experienced any federally declared disasters due to a tornado alone. SHELDUS reports a total of 8 tornadoes or waterspouts occurring within the boundaries of Cameron Parish between the years of 1989-2014. The tornadoes experienced in Cameron Parish have been EF0's on the EF scale and ranged from F0 to F1 on the F scale. The worst case scenario Cameron Parish can expect in the future is an EF0 tornado.

The tornado that caused the most damage to property occurred in October 1979 causing approximately $1,604,387. The tornado that resulted in the most injuries and fatalities occurred in August of 1962 causing 30 injuries and claiming 2 lives.

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

Date	Impacts	Property Damage	Location	Magnitude
June 27, 1989	1.5 mile path with a width of 40 yards. Destroyed four homes and heavily damaged 12 others.	$93,934	Hackberry	F1
December 15, 1996	1.5 mile path with a width of 100 yards. Minor roof damage and broken windshield.	$44,542	Creole	F0

Date	Impacts	Property Damage	Location	Magnitude
March 13, 1999	0.5 mile path with a width of 10 yards. One mobile home destroyed and injured a man and his two daughters.	$69,915	Johnson Bayou	F1
April 2, 2000	15 mile path with a width of 20 yards. Severely damaged a home and three mobile homes. Destroyed several barns and garages.	$405,848	Hackberry	F1
August 8, 2008	0.16 mile path with a width of 20 yards. Damaged several cars in a school parking lot and caused roof damage to the school.	$54,100	Johnson Bayou	EF0
January 25, 2012	0.12 mile path with a width of 10 yards. Minor roof and carport damage to a home.	$10,146	Grand Chenier	EF0
February 18, 2012	1.32 mile path with a width of 20 yards. Roof of a barn destroyed and several telephone poles and trees snapped.	$20,293	Grand Lake	EF0
May 10, 2013	0.89 mile path with a width of 75 yards. Minor damage to several homes.	$25,000	Sweet Lake	EF0

Since 2009, the year the last update to this hazard mitigation plan was written, Cameron parish has had 4 tornado touch downs. The following is a brief synopsis of these events:

January 25, 2012 – EF0 Tornado in Grand Chenier

A slow moving cold front and low surface pressures moved across the area producing a several tornadoes throughout the state of Louisiana. A tornado touch downed near Grand Chenier near Highway 82. The tornado destroyed a carport and a part of roof blowing the debris into the marsh behind the home.

February 18, 2012 – EF0 Tornado in Grand Lake

A slow moving cold front produced severe weather including tornadoes throughout southern Louisiana. A weak tornado touched down along Highway 14 and 717 near Klondike ripping part of a metal roof off a barn, and snapping several telephone poles and trees.

May 10, 2013 – EF0 Tornado in Sweet Lake

Multiple rounds of severe weather were produced from sporadic weather patterns throughout the region. A tornado touched down just north of Highway 384 near Lucy Lane snapping numerous branches and downing several small trees. Minor damage occurred to the roof of one home along Highway 384 and to several homes along Clydes and Clyde Olivers Lanes. The tornado dissipated just north of T. Johns Road and east of Tans road.

Frequency / Probability

Tornadoes are a sporadic occurrence within Cameron Parish with an annual chance of occurrence calculated at 32% based on the records for the past 25 years (1989-2014). Figure 2-25 displays the density of tornado touchdowns in Cameron Parish and neighboring parishes. Based on the State Hazard Mitigation Plan, the overall probability of a tornado touching down in Cameron Parish is once every 2 to 4 years.

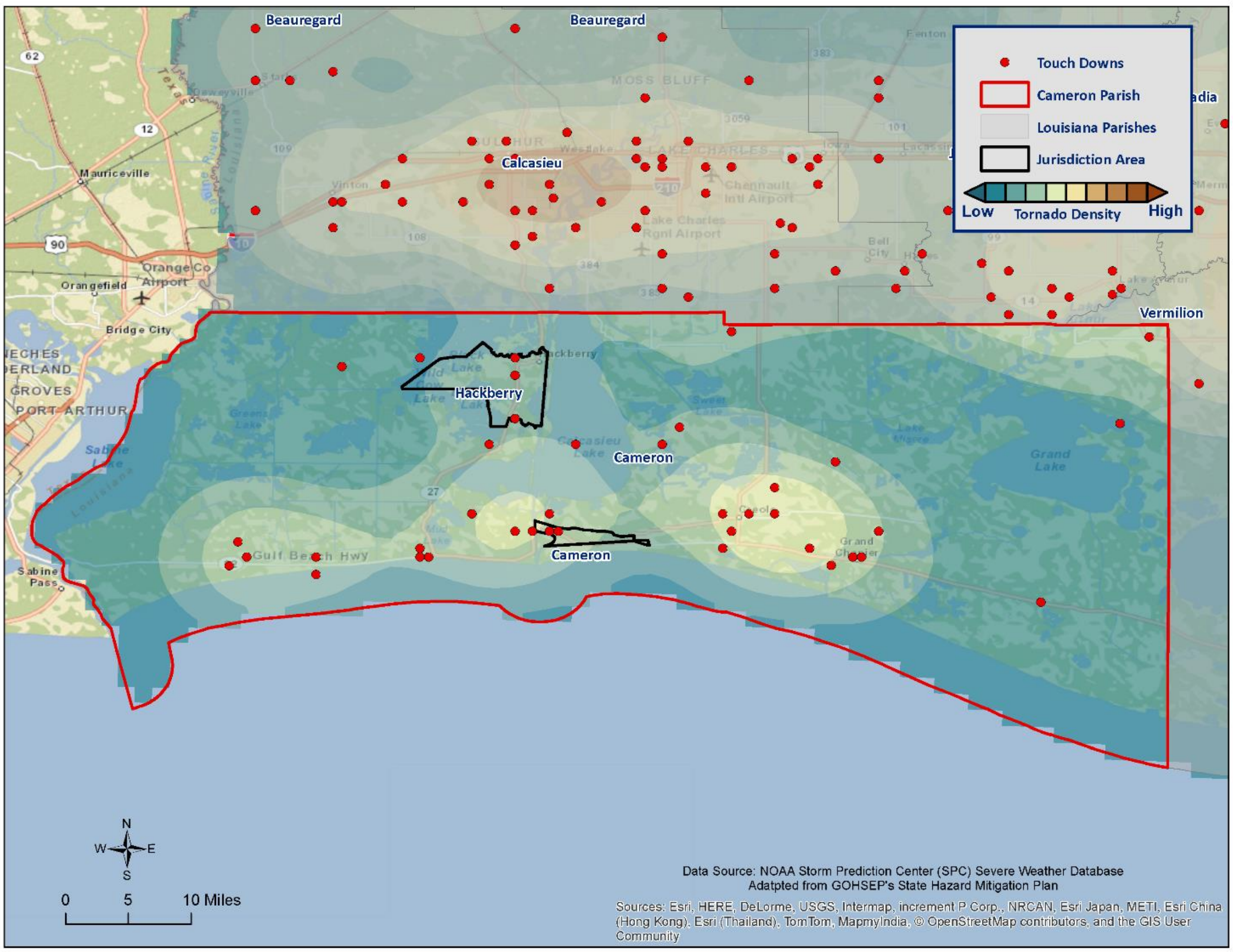

Figure 2-25: Location and Density of Tornadoes to Touchdown in Cameron Parish (Source: NOAA/SPC Severe Weather Database)

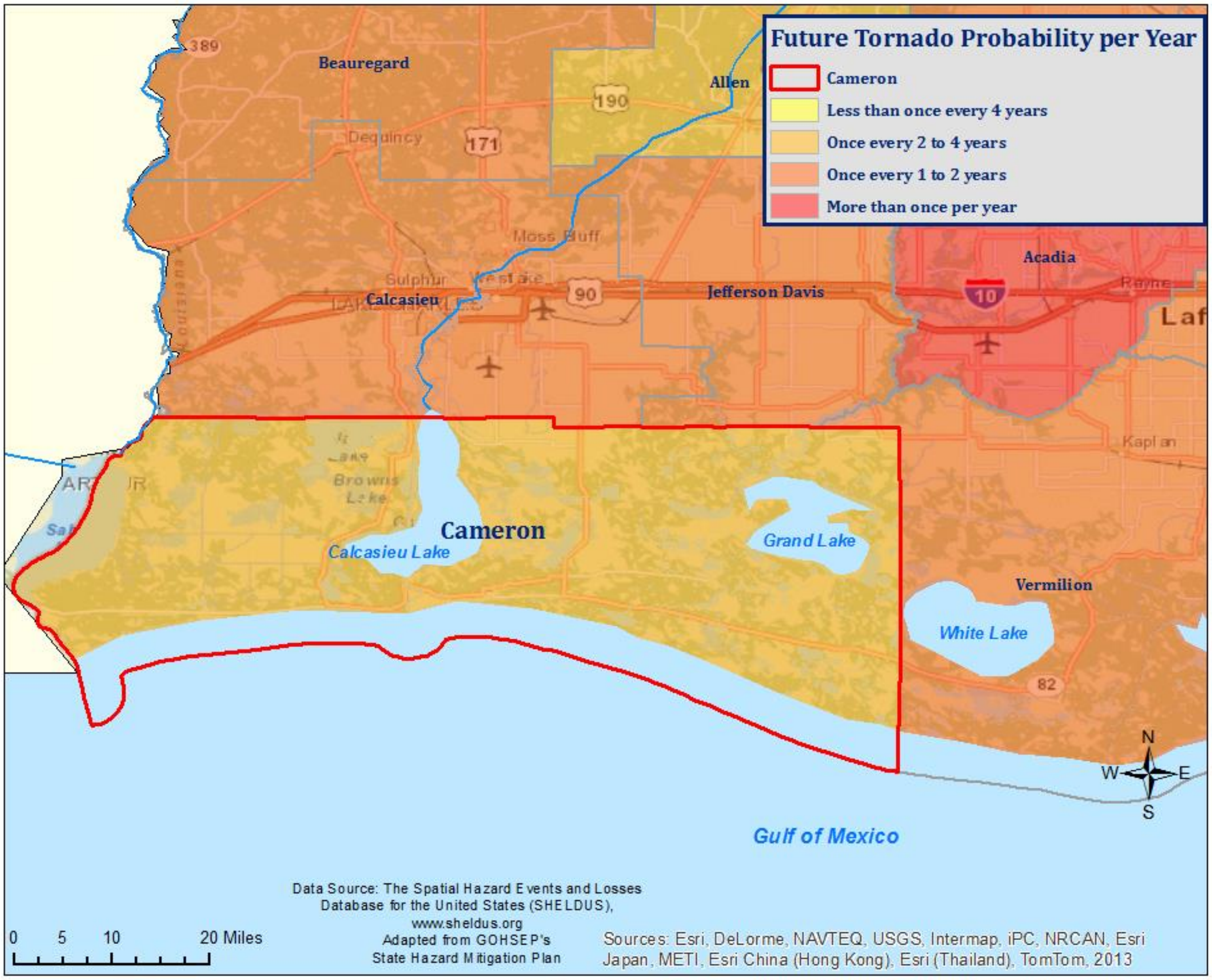

Figure 2-26: Probability of Tornado Events in Cameron and Adjacent Parishes Based on Data from 1987-2012
(Source: State of Louisiana Hazard Mitigation Plan)

Estimated Potential Loses

According to the SHELDUS database, there have been 8 tornadoes that have caused some level of property damage. The total damage from the actual claims for property is $723,779 with an average cost of $90,472 per tornado strike. When annualizing the total cost over the 25 year record, total annual loses based on tornadoes are estimated to be $30,951. Table 2-42 provides an annual estimate of potential losses for Cameron parish.

Table 2-42: Estimated Annual Losses for Tornadoes in Cameron Parish.

Cameron Parish
$30,951

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

Table 2-43: Building Exposure by General Occupancy Type for Tornadoes in Cameron 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 (%)
1,031,334	233,824	149,134	5,168	39,558	16,874	6,992	30.8%

The Parish has suffered through a total of 3 days in which tornadoes or waterspouts have accounted for 7 injuries and no fatalities during this 25 year period (Table 2-44). The average injury per event for Cameron parish is 0.88 per tornado with an average of 0.28 per year for the 25 year period.

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

Date	Magnitude	Deaths	Injuries
June 27, 1989	F1	0	2
March 13, 1999	F1	0	3
April 2, 2000	F1	0	2

In accessing the overall risk to population, the most vulnerable population throughout the parish are those residing in manufacturing housing. Approximately 30.8% of all housing in Cameron parish consists of manufactured housing. Based on location data collected in a previous hazard mitigation project, there are 4 known locations where manufactured housing is concentrated. Those 4 locations have an overall number of manufactured houses ranging from 1 to 63. The location and density of manufactured houses can be seen in Figure 2-27.

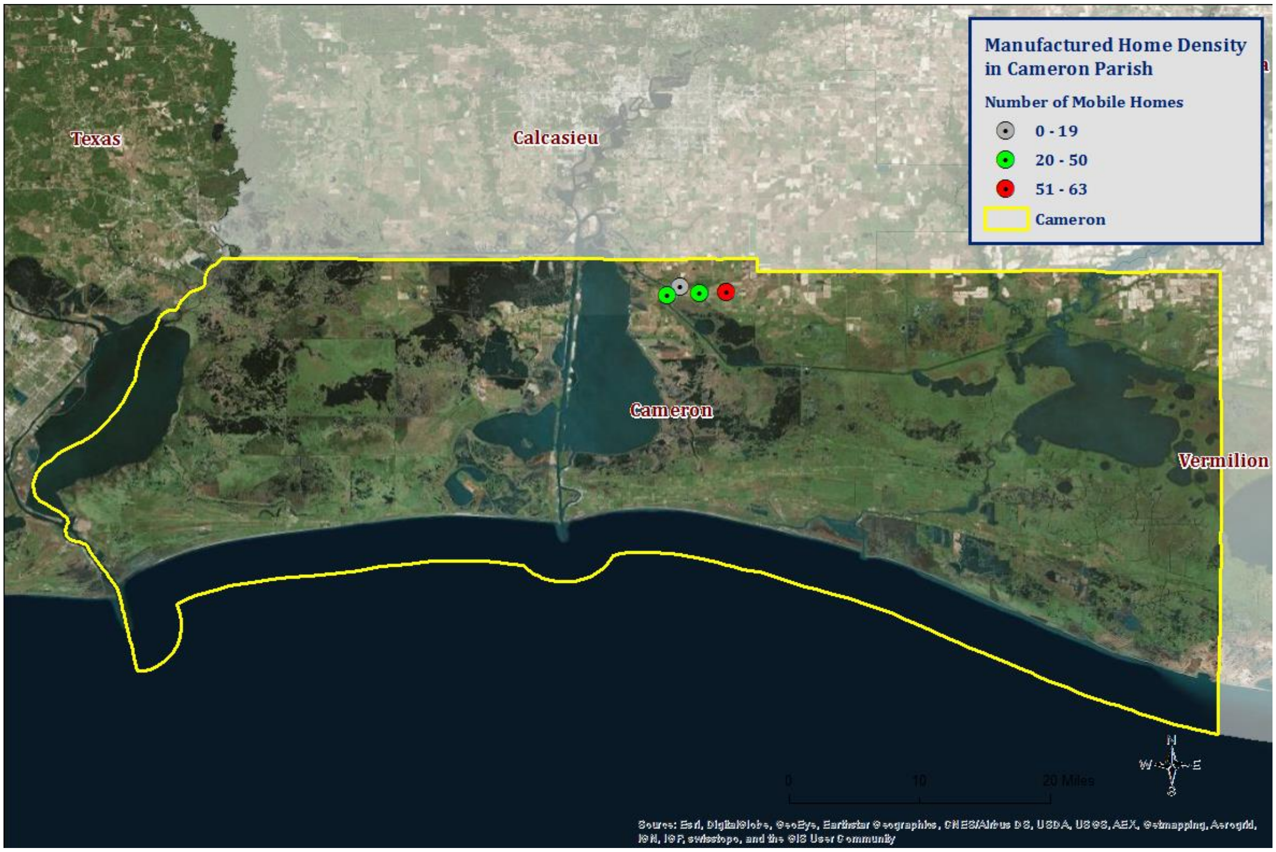

Figure 2-27: Location and Approximate Number of Units in Manufactured Housing Locations Throughout Cameron Parish

Vulnerability

See Appendix C-1 to C-2 for parish and municipality building exposure to tornado hazards.

Tropical Cyclones

Tropical cyclones are among the worst hazards 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, forming a tropical depression (defined when the maximum sustained surface wind speed is 38 mph or less), then a tropical storm (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). 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	
Tropical Storm	39-73 mph	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 likely will 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 will 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 rain, 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 5 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 as 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 10 m in some places that can inflict high numbers 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 in St. Bernard Paris, near Alluvial City.

Property can be damaged by the various forces that accompany a tropical storm. 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 pressures 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). Buildings needing maintenance and mobile homes are most subject to wind damage. High winds mean bigger waves. Extended pounding by waves can demolish any structure not properly designed. The waves also erode sand beaches, roads, and foundations. When foundations are undermined, 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 south Louisiana. With any single hurricane having the potential to devastate multiple parishes during a single event, the risk of a tropical cyclone has the probability of impacting anywhere within the planning area for Cameron parish.

Previous Occurrences / Extent

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 7 tropical cyclone events occurring within the boundaries of Cameron Parish between the years 2002-2014 (Table 2-46). The tropical cyclone events experienced in Cameron Parish include depressions, storms, and hurricanes. As a worst case scenario, Cameron Parish can expect to experience hurricanes at the category 3 level in the future.

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

Date	Name	Storm Type While Impacting Parish Name Parish
September 25, 2002	Isidore	Tropical Storm
October 3, 2002	Lili	Hurricane – Cat 1
September 23, 2005	Rita	Hurricane – Cat 3
September 13, 2007	Humberto	Hurricane – Cat 1
August 5, 2008	Edouard	Tropical Storm
September 1, 2008	Gustav	Tropical Storm
September 12, 2008	Ike	Hurricane Cat 2

There have been no significant tropical cyclone events that have impacted Cameron Parish since the plan was last updated in 2010.

Hurricane Audrey (1957)

Hurricane Audrey made landfall on June 27, 1957 near the Texas/Louisiana border causing a disastrous storm surge. The highest storm surge measured was 12.4 feet west of Cameron. Waves associated with the storm were monstrous. In the Gulf of Mexico, seas of 45 to 50 feet were reported. Waves at Cameron reached as high as 20 feet above mean sea level. Approximately 526 people died, most of whom were residents of Cameron Parish. Damages in Louisiana totaled approximately $120 million.

Tropical Storm Allison (2001)

In June 2001, Tropical Storm Allison made landfall in the state of Texas and moved across Louisiana causing extensive flood damage. Up to 30 inches of rain fell in some areas of the state. Allison's flooding occurred primarily in the southern portion of Cameron Parish. The town of Cameron experienced a storm surge of 2.5 feet due to Tropical Storm Allison which resulted in the flooding of several sections of Louisiana Highway 82.

Tropical Storm Isidore (2002)

Tropical Storm Isidore made landfall in Grand Isle, Louisiana on September 27, 2002. Tropical Storm Isidore had a large circulation with high force winds extending several hundreds of miles from its center. This caused significant storm surge over a large area specifically on Lake Pontchartrain where storm surges of 4 to 5 feet above normal were measured. Low lying areas, roadways, and some non-elevated structures on the lake were flooded.

In Cameron Parish, tides ran approximately 2 feet above normal resulting in minor beach erosion between Johnson Bayou and Holly Beach. Minor street flooding occurred in downtown Cameron when water was unable to drain into the Gulf of Mexico. Wind speeds were estimated to be in between 40 and 60 mph which contributed to the damage of the sugarcane stalks within Cameron Parish.

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 affect 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 5 to 7 feet above normal overtopped or breached local drainage levees inundating many small communities. Newspaper accounts indicated 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 with some homes and businesses flooded from Slidell to Mandeville and Madisonville. Approximately 1500 structures were reported 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, although the flooding was much more limited in area coverage than during Hurricane Katrina.

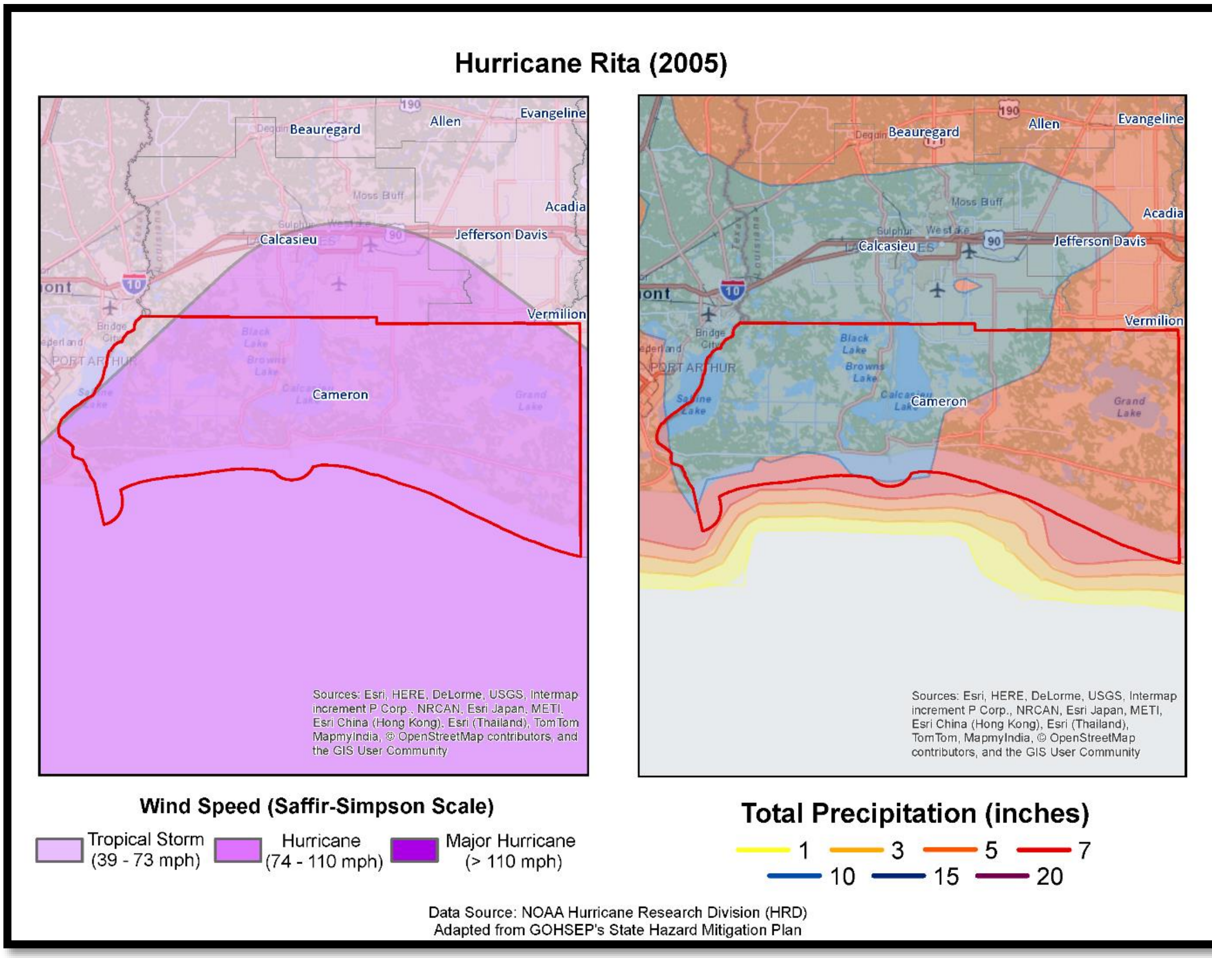

Figure 2-28: Wind Speed and Precipitation Totals for Hurricane Rita in Cameron Parish

Cameron Parish was hit the hardest by Hurricane Rita. Hurricane Rita made landfall in Cameron Parish around 230 AM in September 24th near Johnson Bayou as a Category 3 hurricane with sustained winds of 120 mph. Wind gusts over 110 mph were recorded in Cameron and Calcasieu Parishes. This resulted in numerous trees and power lines downed. Only one direct fatality was reported as a result of Hurricane Rita which occurred when a man drowned near a sunken shrimping vessel near Calcasieu ship channel. 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 and at approximately 12 feet in the town of Cameron.

Hurricane Humberto

Hurricane Humberto brought tropical storm force winds to western sections of Cameron Parish, including Johnson Bayou area. Minor wind damage such as trees and power lines downed, and minor roof damage occurred. Hurricane Humberto made landfall in southeast Texas and moved into southwest Louisiana the morning of September 13. Humberto was weakening to a tropical storm as it moved northeast across southwest Louisiana. Rain totals of 5 to 7 inches were recorded in parts of Beauregard and Vernon parishes, with amounts of 3 to 5 inches recorded in Cameron parish.

Hurricane Gustav (2008)

Hurricane Gustav emerged into the southeast Gulf of Mexico as a major category 3 hurricane on August 31st 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 102 knots or 117 mph at a USGS site at the Houma Navigational Canal and at the Pilot Station East C-MAN at 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 4 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 across the inland areas through the Baton Rouge area and surrounding parishes. A peak wind gust of 91 mph was recorded at the Baton Rouge (Ryan Field) Airport at 112 PM CST. This was only one mph less than the highest wind gust recorded during Hurricane Betsy in 1965. The electric utility serving most of southeast Louisiana reported 75 to 100 percent of utility customers were without power after the storm from Lafourche and Terrebonne Parishes northwest through the Baton Rouge area to southwest Mississippi and central Louisiana. 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. 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.

Cameron Parish suffered minor damage from Hurricane Gustav including wind stripped trees, wind damaged buildings, and a short-lived blackout that affected the majority of the populace in Cameron Parish.

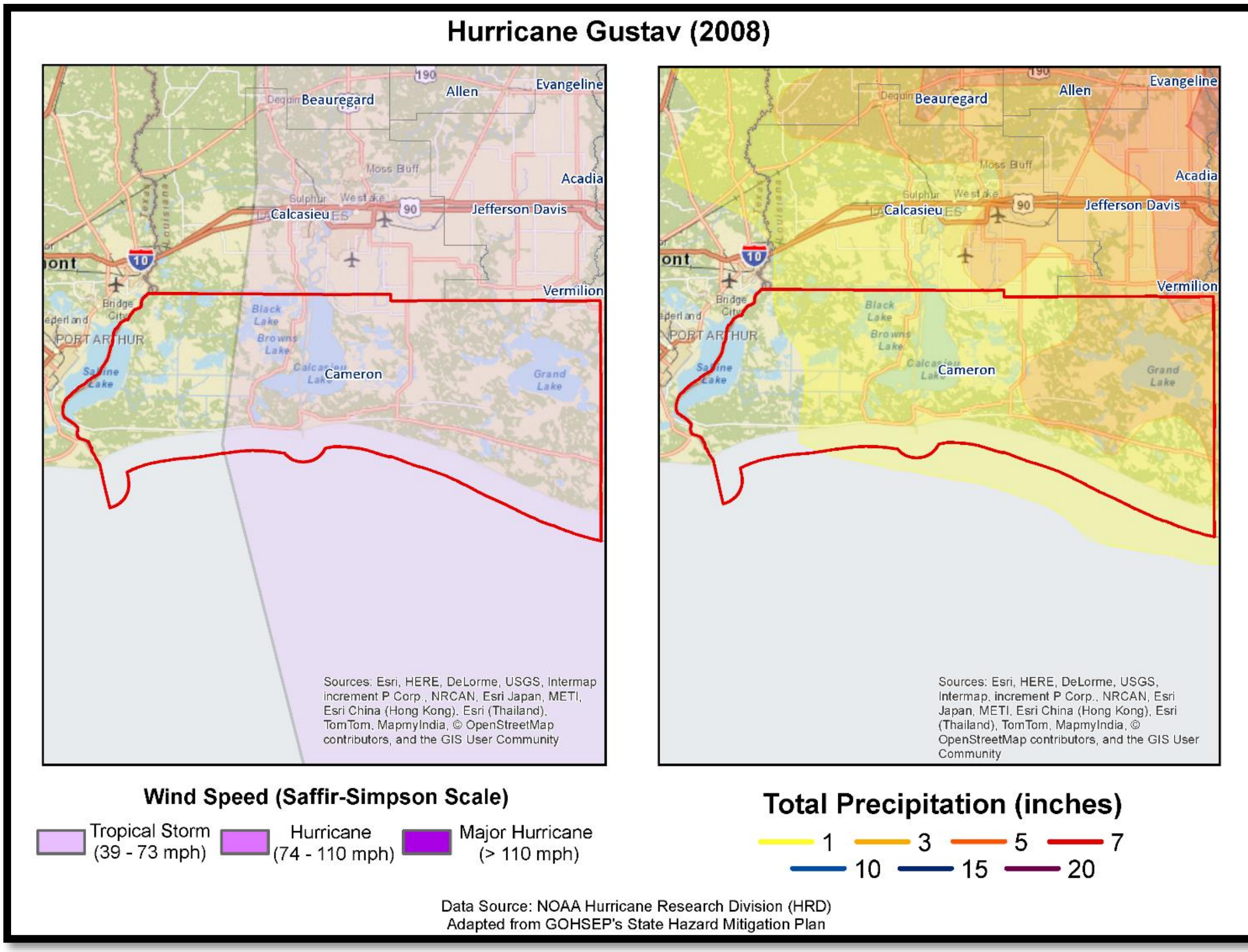

Figure 2-29: Wind Speed and Precipitation Totals for Hurricane Gustav in Cameron Parish

Hurricane Ike (2008)

Hurricane Ike caused tropical storm wind gusts of 50 to 60 mph, resulting in minor wind damage across Acadia Parish. Hurricane Ike caused wind damage, storm surge flooding, and tornadoes across southwest Louisiana. Ike made landfall near Galveston, TX early in the morning on September 13th as a strong category 2 hurricane. Sustained hurricane force winds were confined to extreme western Cameron Parish. The highest recorded winds in southwest Louisiana were at Lake Charles Regional Airport with sustained winds of 46 kts. (53 mph) and gusts of 67 kts. (77 mph). The lowest pressure reading occurred at Southland Field near Sulphur, LA, with a low of 994.6 mb. Several tornadoes were reported across southwest Louisiana. The most significant one was near Mamou, where a home lost its roof, and another 10-15 homes were damaged. Storm surge was a significant event. Water levels ranged from 14 ft. in western Cameron Parish, to 8 ft. in St. Mary Parish. This resulted in widespread flooding of the same areas that flooded in Hurricane Rita in 2005. Most of Cameron Parish was under water. Over 3000 homes were flooded. This extended north into Calcasieu Parish, where another 1000 homes flooded in Lake Charles, Westlake, and Sulphur. In Vermilion Parish, at least 1000 homes flooded in Pecan Island, Forked Island, Intracoastal City, and Henry. This extended east into Iberia Parish, where another 1000 homes flooded south of Highway 14 and Highway 90. In St. Mary Parish, some of the worst flooding occurred in Franklin, where a man-made levee failed, flooding over 450 homes. Maximum storm total rainfall ranged from 6 to

8 inches across Cameron, Calcasieu, and Beauregard Parishes. No fatalities were reported in southwest Louisiana. Total property damages, however, were high. Losses are estimated to be almost $420 million dollars across southwest Louisiana. Agricultural losses were over 225 million dollars.

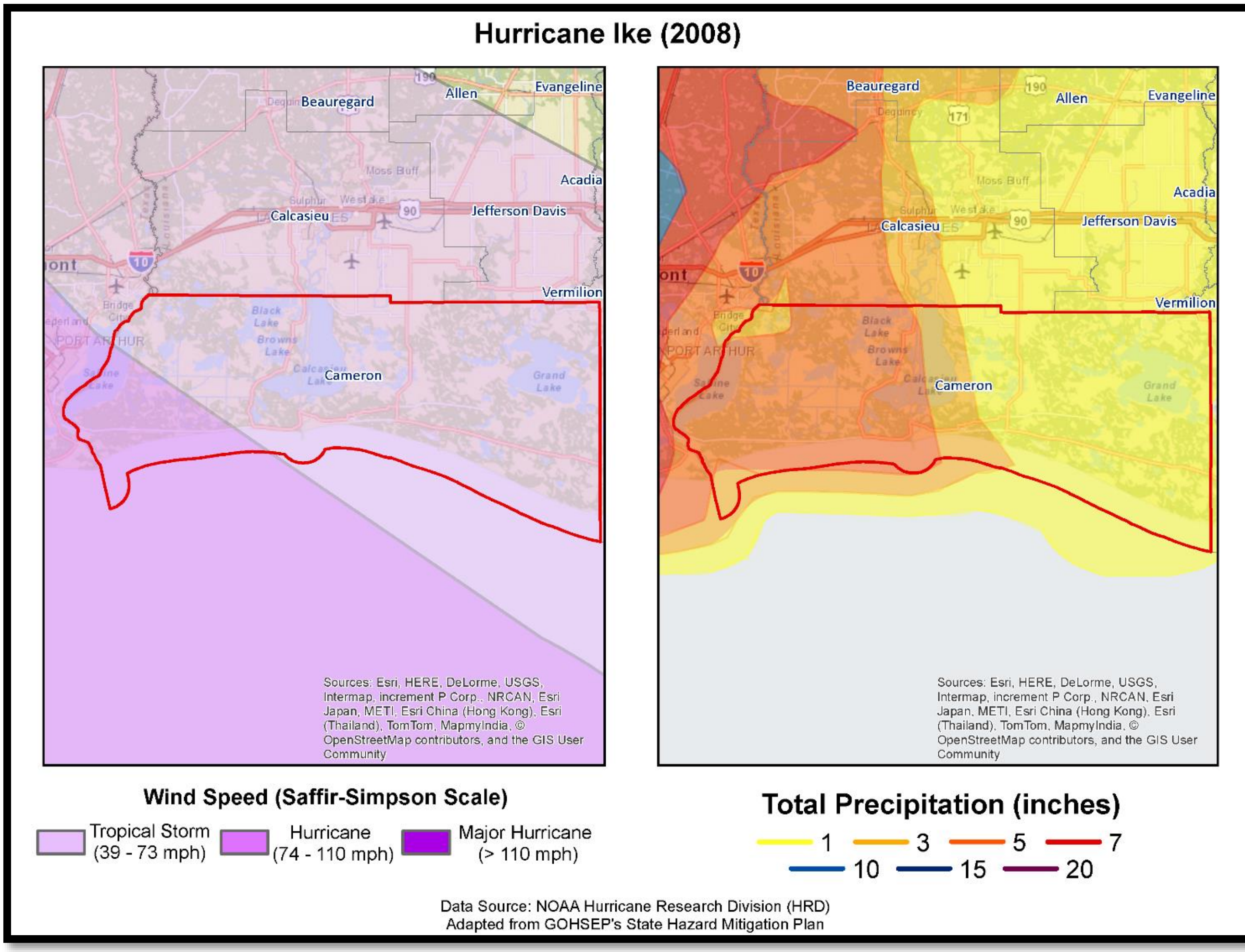

Figure 2-30: Wind Speed and Precipitation Totals for Hurricane Ike

Figure 2-31 displays the wind zones that affect Cameron Parish in relation to critical facilities throughout the Parish.

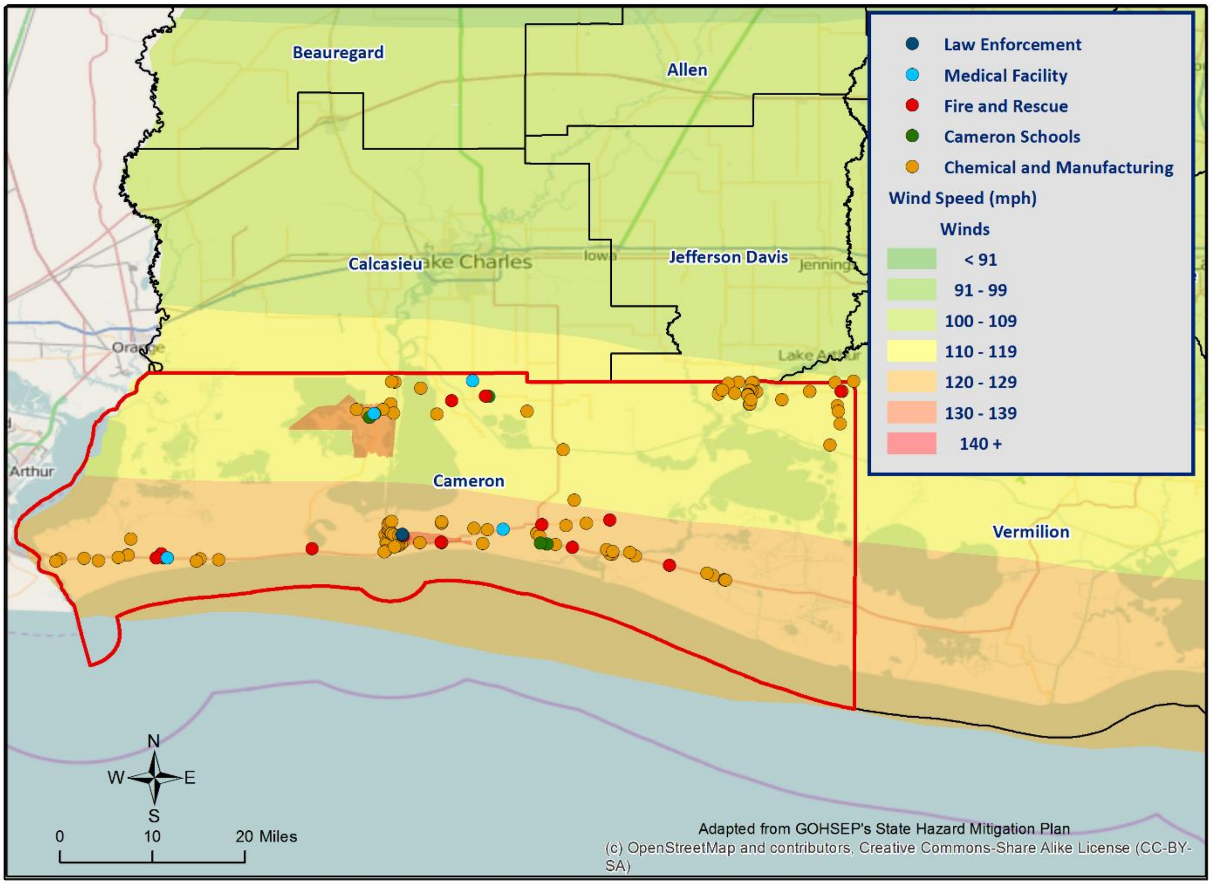

Figure 2-31: Winds Zones for Cameron Parish in Relation to Critical Facilities

Frequency / Probability

Tropical cyclones are large natural hazard events that occur regularly within Cameron Parish. The annual chance of occurrence for a tropical cyclone occurrence is estimated at 50% for Cameron parish and its municipalities.

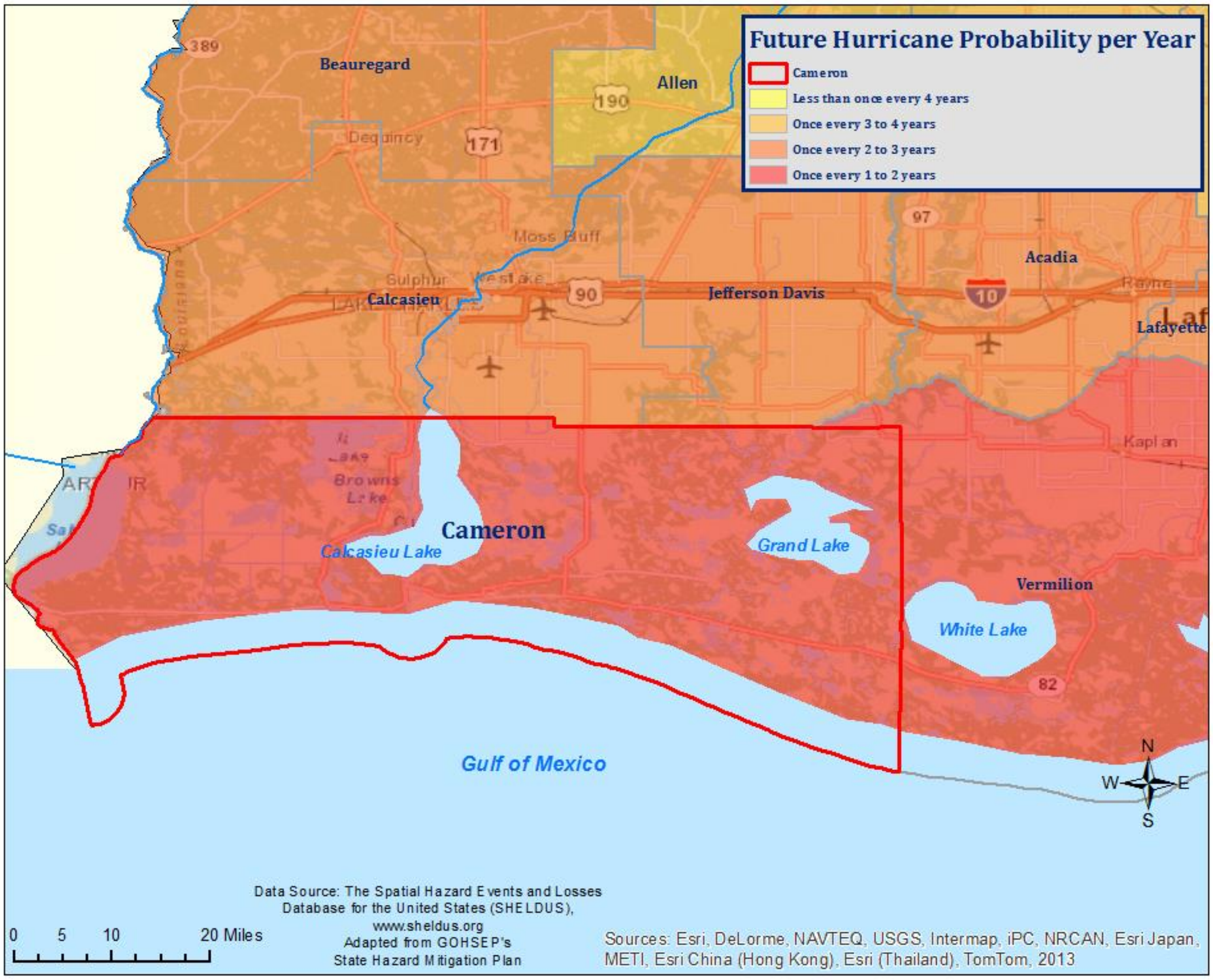

Figure 2-32: Probability of Tropical Cyclones impacting Cameron Parish (Source: State of Louisiana Hazard Mitigation Plan)

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. Based on geographical location alone, Cameron Parish is highly vulnerable to tropical cyclones. This area has experienced several tropical cyclone events in the past and can expect more in the future. Based on historical record, illustrated in Figure 2-32, the probability of future occurrence of tropical cyclones in Cameron Parish is approximately one event every 1 to 2 years.

Estimated Potential Losses

Using Hazus-MH 100 year hurricane model, the 100 year hurricane scenario was analyzed to determine losses from this worst-case scenario. Table 2-47 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)

Jurisdiction	Estimated total Losses from 100 Year Hurricane Event
Cameron Parish	$85,610,638

The Hazus-MH hurricane model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish.

Table 2-48: Estimated Losses in Cameron Parish for a 100 year hurricane event.
(Source: Hazus)

Cameron Parish	Estimated Total Losses from 100 Year Hurricane Event
Agricultural	$239,681
Commercial	$6,291,490
Government	$452,524
Industrial	$1,822,570
Religious / Non-Profit	$674,670
Residential	$76,129,703
Schools	$0
Totals	$85,610,638

Threat to People

The total population within the parish that is susceptible to a hurricane hazard are shown in the table below.
Table 2-49. The HAZUS-MH hurricane model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions in the tables below:

Table 2-49: Vulnerable populations in Cameron Parish for a 100 year hurricane.
(Source: Hazus)

Cameron Parish		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	6,839	100%
Persons Under 5 years	376	5.5%
Persons Under 18 years	1,641	24%
Persons 65 Years and Over	978	14.3%
White	6,572	96.1%
Minority	267	3.9%

Vulnerability

See Appendix C-1 to C-2 for parish and municipality buildings that are susceptible to hurricanes.

Wildfire

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. **Error! Reference ource not found.** displays the areas of wildland-urban interaction in Cameron Parish.

Location

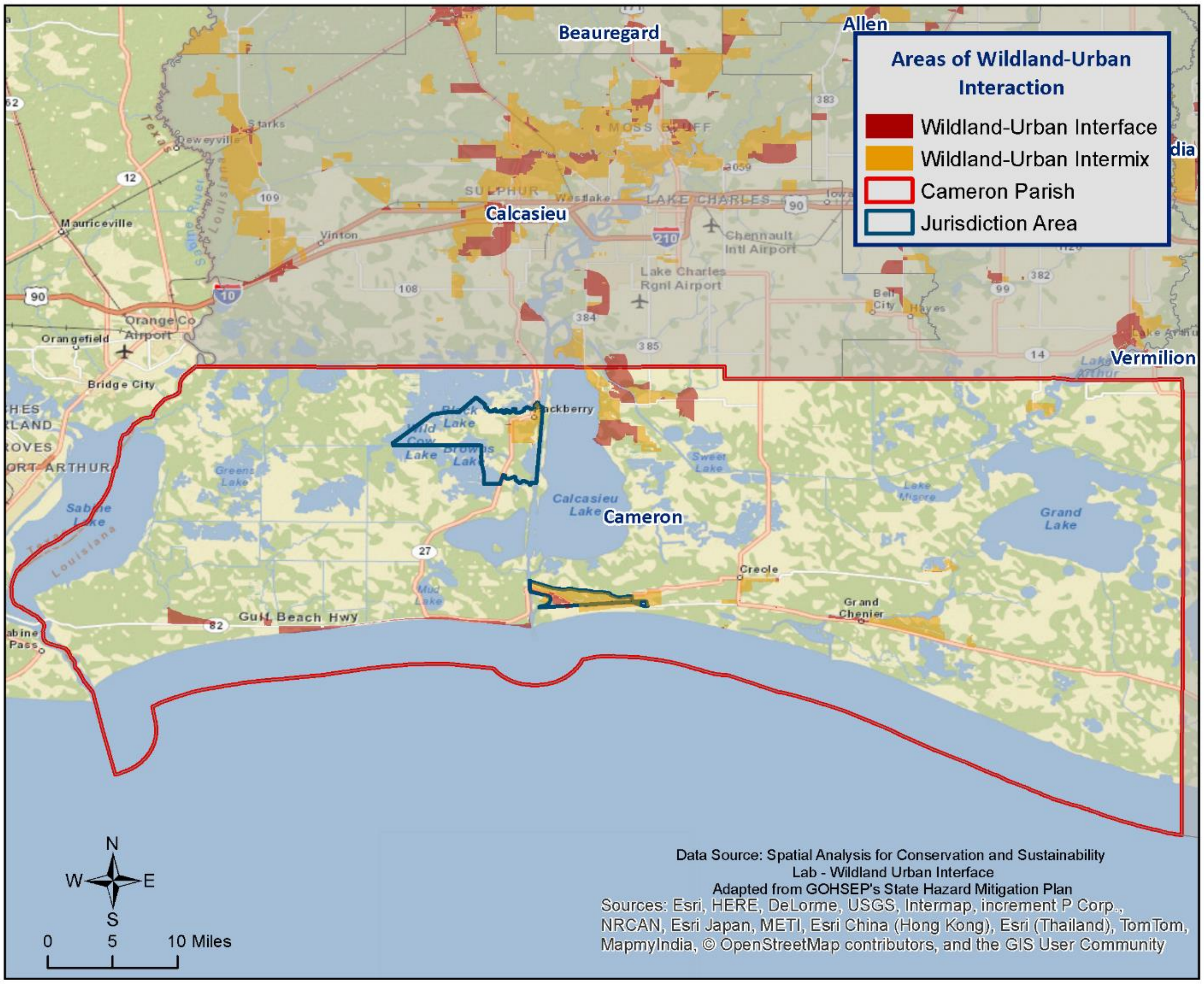

Figure 2-33: Wildland-Urban Interaction in Cameron Parish

Previous Occurrences / Extents

The SHELDUS database reports no wildfire events occurring within the boundaries of Cameron Parish between the years of 1960 – 2014. NCDC has one wildfire occurrence during the same time frame that occurred on August 19, 2003. A brief synopsis of that fire is below. Based on the Southern Group of State Foresters Risk Assessment Portal, Cameron Parish is considered to be in a High Risk Intensity area. Based on the definition of a High Risk Intensity Area, residents can expect large flames up to 30 feet in length.

October 19, 2003 – Sabine National Wildlife Refuge

A lightning strike caused five fires within the boundaries of the Sabine National Wildlife Refuge. Approximately 12,000 acres burned during this wildfire event. No injuries or damage to structures were reported.

Frequency / Probability

With only one recorded event in 54 years, wildfire events within the boundaries of Cameron Parish have an annual chance of occurrence calculated at 2% based on the NCDC data. There has been no reported event in the SHELDUS database that has caused damage to property, crops, or life.

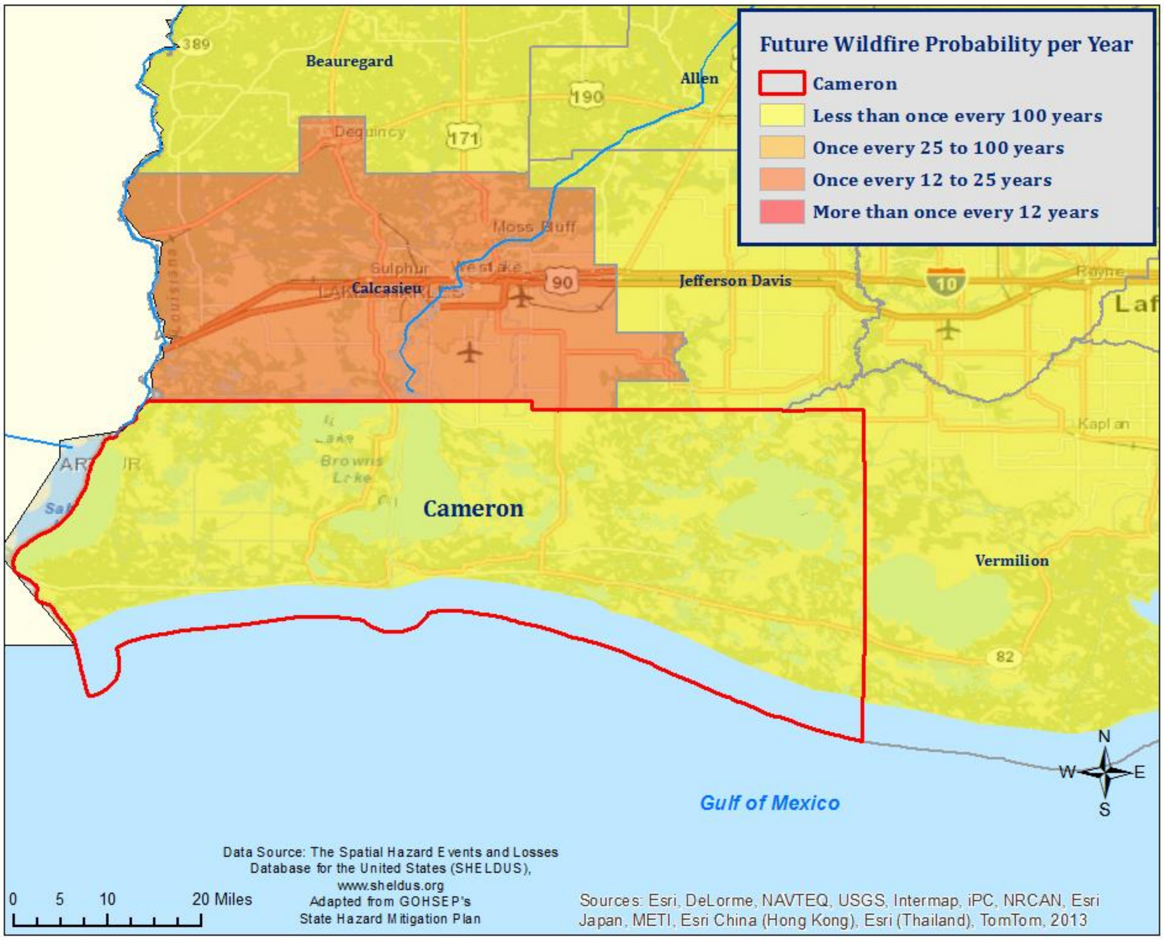

Figure 2-34: Probability of Wildfire Events in Cameron and Adjacent Parishes Based on Data from 1987-2012
(Source: State of Louisiana Hazard Mitigation Plan)

Estimated Potential Losses

According to the SHELDUS database, there have been no wildfire events that have caused property damage, crop damage, injuries, or fatalities in Cameron Parish. In accessing the overall risk to population, the most vulnerable population throughout the parish consists of those residing in areas of wildland-urban interaction (Figure 2-33).

Table 2-50: Estimated Potential Losses from a Wildfire.

Location	Total Building Exposure	Number of People Exposed
Cameron Parish	$4,854,985	986

Vulnerability

See Appendix C-1 to C-2 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.

3 Capability Assessment

This section summarizes the results of Cameron Parish 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, Cameron Parish was to identify strengths that could be used to reduce losses and reduce risk throughout the communities. 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

Cameron 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, and take an integrated and strategic look holistically at hazard mitigation in Cameron Parish to continually propose ways to 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 Cameron Parish include the following:

Table 3-1: Planning and Regulatory Capabilities

Planning and Regulatory	Cameron Unincorporated
Plans	Yes / No
Comprehensive / Master Plan	N
Capital Improvements Plan	N
Economic Development Plan	N
Local Emergency Operations Plan	Y
Continuity of Operations Plan	Y
Transportation Plan	N
Stormwater Management Plan	N
Community Wildfire Protection Plan	N
Other plans (redevelopment, recovery, coastal zone management)	N
Building Code, Permitting and Inspections	Yes / No
Building Code	Y
Building Code Effectiveness Grading Schedule (BCEGS) Score	N
Fire Department ISO/PIAL rating	5
Site plan review requirements	N
Land Use Planning and Ordinances	Yes / No
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

Building Codes, Permitting, Land Use Planning and Ordinances

As of the 2015 Update Cameron Parish ensures that all building codes adopted are enforced and in compliance relating to the construction of any within the boundaries of the parish. The Cameron Parish Planning and Development Office is responsible for all Building Code, Permitting, Land Use Planning and Ordinances. Cameron Parish follows the National Electrical Code, Louisiana State Plumbing Code, International Residential Code, International Building Code (for commercial work), International Mechanical Code, and the International Fuel Gas Code, and will require all building, mechanical, gas, electrical, and plumbing work to comply with these codes. The Parish also has a Flood Damage Prevention Ordinance, Coastal Use Permits, and a Coastal Zone Program that are followed. Permitting and inspections capabilities are in place within the Parish. Some examples of leveraging these capabilities within the parish are seen above in Table 3-1.

While local capabilities for mitigation can vary from community to community, Cameron Parish as a whole has a system in place to coordinate and share these capabilities through the OHSEP 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, Cameron 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 following are examples of resources in place in Cameron Parish:

Table 3-2: Administration and Technical Capabilities

Administration and Technical	Cameron Unincorporated
Administration	**Yes / No**
Planning Commission	N
Mitigation Planning Committee	N
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y
Staff	
Chief Building Official	Y
Floodplain Administrator	Y
Emergency Manager	Y
Community Planner	N
Civil Engineer	N
GIS Coordinator	Y
Grant Writer	Y
Technical	
Warning Systems / Service (Reverse 911, outdoor warning signals)	Y
Hazard Data & Information	N
Grant Writing	N
Hazus Analysis	N

Financial capabilities are the resources that Cameron Parish has access to or are eligible to use in order to fund mitigation actions. Costs associated with implementing the actions identified by the parish may vary from little to no cost actions, such as outreach efforts, or substantial action costs such acquisition of flood prone properties.

The following financial resources are available to fund mitigation actions in Cameron Parish:

Table 3-3: Financial Capabilities

Financial	Cameron Unincorporated
Funding Resource	**Yes / No**
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

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 communities and the Parish as a whole to maximize opportunities for implementation of activities through greater acceptance and consensus of the community.

Cameron Parish has existing education and outreach programs to implement mitigation activities as well as communicate risk and hazard related information to its communities. Specifically focusing on advising repetitive loss property owners of ways they can reduce their exposure to damage by repetitive flooding remains a priority for the entire parish. The existing programs are as follows:

Table 3-4: Education and Outreach Capabilities

Education and Outreach	Cameron Unincorporated
Program / Organization	Yes / No
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	Y
Natural Disaster or safety related school	N
Storm Ready certification	N
Firewise Communities certification	N
Public/Private partnership initiatives addressing disaster-related issues	N
Other	N

The communities within Cameron Parish rely on Cameron OHSEP and/or Cameron Parish Government Agencies for the above listed planning and regulatory, Administrative and Technical, Financial, and Education and Outreach Capabilities.

As reflected with above existing regulatory mechanisms, programs and resources within the parish, Cameron remains committed to expanding and improving on the existing capabilities within the parish. Communities, along with Cameron Parish will work together 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 parish will all enhance and expand risk reduction for all of Cameron.

Flood Insurance and Community Rating System

Cameron Parish is not a current participant in the Community Rating System (CRS). However, becoming a participant in the CRS was recognized as a high priority by the Hazard Mitigation Steering Committee. The parish is currently working on obtaining CRS certification in 2015. Participation in the CRS strengthens local capabilities by lowering flood insurance premiums for jurisdictions that exceed NFIP minimum requirements.

The Federal Emergency Management Agency's National Flood Insurance Program (NFIP) administers the Community Rating System (CRS). 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.

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)

During the last update, thirty-eight Louisiana communities participated in the CRS. As of the 2015 update, Jefferson Parish, East Baton Rouge and Terrebonne all lead the state with best classifications, Class 6.

As of May 2012, 310 communities in the State of Louisiana participate in the Federal Emergency Management Agency's National Flood Insurance Program (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. Once the Parish has obtained a CRS rating and is a participant, 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 1 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 (CRS) 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 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

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

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 the 2013 Manual will impact their community and when.

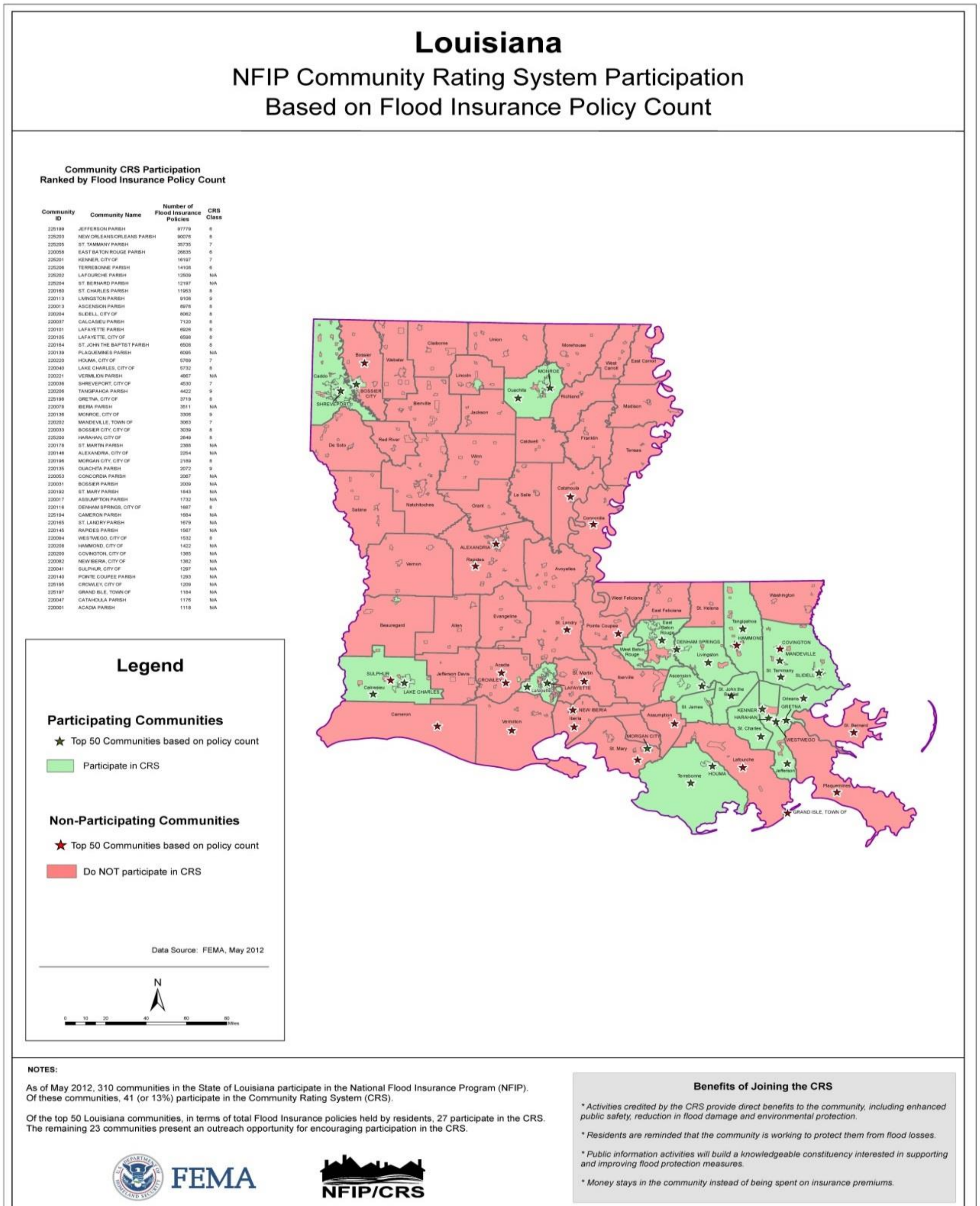

Figure 3-2: Louisiana CRS Participation[2]

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

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

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; and
– 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 program 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 NFIP worksheets can be found in Appendix E: State Required Worksheets

4 Mitigation Strategy

Introduction

Cameron Parish's Hazard Mitigation Strategy has a common guiding principle and is the demonstration of the Parishes 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.

Cameron 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 2015 HMP update are a product of analysis and review of the Cameron Parish Hazard Mitigation Plan Steering Committee under the coordination of the Cameron Parish Office of Homeland Security and Emergency Preparedness. The Committee was presented a list of projects and actions, new and from the 2009 plan, for review From December 2014 – March 2015.

An online public opinion survey was conducted of Cameron Parish residents between December 2014 and April 2015. The survey was designed to capture public perceptions and opinions regarding natural hazards in Cameron 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.

During the public meeting in April, the committee provided a status of the projects from 2009 and the proposed actions for the 2015 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.

This activity confirms that the goals and action items developed by the Cameron Parish Hazard Mitigation Plan Steering Committee are representative of the outlook of the community at large. Full survey results can be found here: https://www.surveymonkey.com/r/CameronParish

Goals

The goals represent the guidelines 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 Cameron 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, Cameron Parish 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 Cameron Parish Hazard Mitigation Plan Update steering committee represent long-term commitments by the parish. After assessing these goals, the committee decided that the current remain valid.

The goals are as follows:

1. Reduce the loss of life or property

2. Protect critical public facilities and thoroughfares

3. Ensure post-disaster operability of strategic facilities and thoroughfares

4. Develop incentive and community outreach/education programs that assist homeowners in protecting residential properties

5. Provide a long term mitigation solution in locations which experience repetitive hazard damage

6. Provide a cooperative, inter-jurisdictional / inter-agency solution to a problem

7. Show development and implementation of comprehensive programs, standards, and regulations that reduce future hazard damage

8. Avoid inappropriate future development in areas that are vulnerable to hazard damage

9. Reduce the level of hazard vulnerability in existing structures and developed property

10. Restore or protect natural resources, recreational areas, open space, or other environmental values

The Mitigation Action Plan focuses on actions to be taken by Cameron Parish. All of the activities in the Mitigation Action Plan will be focused on helping the parish and its communities 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 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.

2015 Mitigation Actions and Update on Previous Plan Actions

The Cameron Parish Hazard Mitigation Plan Steering Committee identified actions that would reduce and/or prevent future damage within Cameron Parish and their respective communities. In that effort, the parish focused on a comprehensive range of specific mitigation actions. These actions were identified in thorough fashion by the consultant team and the committee 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 actions relative to the parish-wide goals are below. Additionally, action updates from the previous plan updates can be found below the new actions.

Cameron Parish Mitigation Actions

Table 4-1: Cameron Parish Unincorporated

Mitigation Actions for Cameron Parish							
Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
Action 1 - Building Retrofits	Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA	1-5 years	Public Works	Hail, High Wind, tornado, Tropical Cyclone	1,2,3,5,6,9	New
Action 2 - Drainage Improvements	Ensure usability of roads and buildings that serve a public purpose such as government, healthcare, and school districts by retrofitting and improving drainage structures to reduce flood risk	FEMA, Local	1-10 years	Public Works	Tropical Cyclone, Flooding, Coastal Land Loss	1,2,3,5,6,9, 10	New
Action 3 - Acquisitions	Continue to mitigate flood damage by acquiring properties in the parish	FEMA, Local	1-5 years	Cameron Parish OHSEP	Tropical Cyclone, flooding, coastal land loss	1,5,6,7,8,9	New
Action 4 - Elevation of Severe Repetitive Loss Properties	Mitigate parish flood damage by elevating homes and buildings throughout the parish.	FEMA. Local	1-5 years	Cameron Parish OHSEP/Public Works	Tropical Cyclone, Flooding, Coastal Land Loss	1,2,4,5,6,9	New

Mitigation Actions for Cameron Parish							
Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
Action 5 - Safe Room Project	Construction of a safe room for first responders located in Cameron Parish.	FEMA	1-10 years	Cameron Parish OHSEP/Public Works	Tornado, High Wind, Hail	1,2,3,6,9	New
Action 6 - Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for flooding, coastal hazards tropical cyclone, sinkholes, wind, lightning, hail, and tornadoes 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	1-5 years	Cameron Parish OHSEP	Tropical Cyclone, high wind, hail, lightning, flooding, tornado, coastal land loss, sinkhole, excessive heat, wildfire, drought	1,4,5,6,7	New
Action 7 - Properties at Risk Study	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizen of magnitude potential and provide mitigation suggestions.	FEMA, Local, Corps of Engineers	1-5 years	Cameron Parish OHSEP	Tropical Cyclone, wind, hail, lightning, flooding, tornado, coastal land loss, sinkhole, wildfire	1,4,5,6,7,9	New
Action 8 - Continuity of Operations for Parish (Generators, Cooperative Agreements, Communications Equipment)	Purchase of generators and communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents.	FEMA, Local	1-5 years	Cameron Parish OHSEP/Public Works	Tropical Cyclone, high wind, tornado, sinkhole, wildfire	1,2,3,6	New

Mitigation Actions for Cameron Parish							
Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
Action 9 - Water Rationing Program Implementation	Implement water rationing program for times of drought	FEMA, Local	1-5 years	Cameron Parish OHSEP, Local agencies	Drought	1,6,10	New
Action 10 - Development of Drought Emergency Operations Plan	Development of a long-term emergency plan for drought and implementation of measures contained in the plan	FEMA, Local, NOAA	1-5 years	Cameron Parish OHSEP	Drought	1,2,3	New
Action 11 - Reduction of Future Development	Reduce future development in floodplains and correct in appropriate development already in floodplains. This may include modification of codes, new zoning and ordinances.	FEMA, Police Jury	1-5 years	Cameron Parish OHSEP, Local Agencies, Public Works	Tropical Cyclone, flooding, coastal land loss	1,5,6,7,8,9, 10	New
Action 12 – Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities	FEMA	1-5 years	Cameron Parish OHSEP	Lightning	1,2,3,9	New
Action 13 - Extreme Temperature Shelters	Set up of community shelters for excessive heat throughout the parish.	FEMA	1-5 Years	Cameron Parish OHSEP	Excessive Heat	1,6	New
Action 14 – Wildfire Management Strategy	Identify and implement wildfire vegetation management strategies	FEMA	1-5 years	Cameron Parish OHSEP	Wildfire	1,2,5,7,9	New
Acton 15 - Capital Improvement Projects for Sabine River	Carry out long-range capital improvement projects to support implementation of projects recommended by the US Army Corps of Engineers related to the Sabine River	FEMA, USARCOE, Local	1-5 years	Cameron Parish OHSEP, Public Works	Flooding, Tropical Cyclone	1,2,3,5,6,9, 10	New

Mitigation Actions for Cameron Parish							
Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
	in relation to drainage improvements						
Action 16 - Emergency Warning Systems and Communications Equipment	Improve communication within the parish by purchasing, installing and implementing warning systems and communications equipment.	FEMA, Local	1-5 years	Cameron Parish OHSEP, Public Works	High wind, hail, lightning, flooding, tornado, sinkhole	1,3,6	New

Cameron Parish Mitigation Action Update

Table 4-2: Cameron Parish Unincorporated - Completed Actions

Completed Mitigation Actions for Cameron Parish							
Action	**Action Description**	**Funding Source**	**Target Completion Date**	**Responsible Party, Agency, or Department**	**Hazard**	**Goal**	**Status**
Acquisitions	Completed LLT Properties, 127 properties acquired.	FEMA	1-5 years	Public Works	Tropical Cyclone, Flooding, Coastal Hazards	1,5,6,7,8,9	Completed
Elevation of properties	Mitigate parish flood damage by elevating homes and buildings throughout the parish.	FEMA, Local	1-10 years	Public Works	Tropical Cyclone, Flooding, Coastal Hazards	1,2,4,5,6,9	Completed
Reduce future development	Reduce future development in floodplains and correct in appropriate development already in floodplains. This may include modification of	FEMA, Local	1-5 years	Cameron Parish OHSEP	Tropical Cyclone, Flooding, Coastal Hazards	1,5,6,7,8,9, 10	Completed

Completed Mitigation Actions for Cameron Parish							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
	codes, new zoning and ordinances.						

Action Prioritization

During the prioritization process, 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; therefore, many projects were prioritized with these factors in mind.

In all cases, the Committee 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 prioritized the possible activities that could be pursued. Steering Committee members consulted appropriate agencies in order to assist with the prioritizations. The results were items that address the major hazards, are appropriate for those hazards, are cost-effective, and are affordable. The Steering Committee met internally for mitigation action meetings to review and approve Cameron mitigation actions.

Cameron Parish 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

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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 Cameron Parish Hazard Mitigation Plan Update

The Cameron Parish Hazard Mitigation Plan Update process began in December 2014 with a series of meetings and collaborations between the contractor (SDMI) and the participating agencies. Update activities were intended to give each participating agency 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. The below table details the meeting schedule and purpose for the planning process:

Date	Meeting or Outreach	Location	Public Invited	Purpose
	Coordination Conference Call	Telephone	No	Discuss with Parish HM coordinator and any Steering Committee members expectations and requirements of the project.
12/3/2014	Kick-Off Meeting	Cameron OHSEP, Cameron, LA	No	Discuss with the plan Steering Committee expectations and requirements of the project. Assign plan worksheets to Parish.
3/24/2015	Risk Assessment overview	Cameron OHSEP, Cameron, LA	No	Discuss and review the Risk Assessment with the Steering Committee. Discuss and review expectations for Public Meeting.
3/24/2015	Public Meeting	Cameron OHSEP, Cameron, 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 Cameron Parish communities were provide for the meeting attendees to identify specific areas where localized hazards occur.
Internal Meeting	Mitigation Strategy Meeting	Cameron OHSEP, Cameron, LA	No	Parish discussed, reviewed and prioritized new mitigation actions and reviewed action statuses from previous plan update.
Ongoing	Public Survey Tool	Online	Yes	This survey asked participants about public perceptions and opinions regarding natural hazards in Cameron Parish. In addition, questions covered the methods and techniques preferred for reducing the risks and losses associated with these hazards. Survey Results: https://www.surveymonkey.com/r/CameronParish

2 week period	Public Plan Review (Digital)		Yes	Parish Website or other locations determined by Steering Committee

Planning

The plan update process consisted of several phases:

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
Plan revision								
Data collection								
Risk assessment								
Public input								
Mitigation strategy and actions								
Plan review by GOHSEP and FEMA								
Plan adoption								
Plan approval								

Coordination

The Cameron Parish Office of Homeland Security and Emergency Preparedness (OHSEP) oversaw the coordination of the 2015 Hazard Mitigation Plan Update Steering Committee during the update process. The Parish OHSEP was 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. SDMI assisted the Parish Director with press releases 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 Steering Committee encouraged participation from a broad range of parish 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
- Action item development
- Plan document draft review
- Formal adoption of the Hazard Mitigation Plan document following provisional approval by the State of Louisiana and FEMA

The 2015 Hazard Mitigation Plan Update Steering Committee consisted of representatives from the following parish, municipal or community stakeholders:

- Cameron Parish Government
- Cameron Office of Homeland Security and Emergency Preparedness
- Cameron Parish Sheriff's Department
- Cameron Parish Fire Department
- Cameron Police Department
- Cameron Parish Police Jury

The Cameron Parish OHSEP staff attended the Kickoff meeting for Calcasieu Parish in an effort to coordinate mitigation efforts where possible as neighboring communities. The Cameron Parish OHSEP also included the US Army Corps of Engineers in Mitigation Action development planning and will continue to partner with the USARCE on ensuring mitigation actions in the future are a collaborative effort.

The Parish of Calcasieu OHSEP staff was invited to participate in an effort to collaborate with neighboring communities. SDMI assisted Cameron with encouraging Calcasieu OHSEP collaboration via email by extending an invitation to the Cameron Public Meeting. The participation of the GOHSEP Region 5 Coordinator during the process also contributed to neighboring community representation.

As part of the coordination and planning process, the parish was provided the State Required Hazard Mitigation Plan Update Worksheet. The completed worksheets can be found in Appendix E – State Required Plan Update Worksheets.

Below is a detailed list of the 2015 HMPU Steering Committee:

Member/Title	Jurisdiction/Entity	Phone/Email
Danny Lavergne OHSEP Director	Cameron OHSEP	Cameron_oep@camtel.net (337)775-7048
Cassandra Duhon OHSEP Asst. Director	Cameron Parish OHSEP	Roe05@camtel.net (337)775-7048
Ryan Bourriaque Parish Administration	Cameron Parish Government	ryanb@camtel.net (337)775-5718
Kara Bonsall Permit Secretary	Cameron Parish Government	Kb_cppj@camtel.net (337)775-5718
Mark LaBoeuf Fire District #9	Cameron Parish	ogfd@camtel.net (337)274-8291
Toby Landry Fire District #4	Cameron Parish	Toby.landry@dnow.com (337)912-0045
Ronnie Doucet Johnson Bayou Fire Department	Cameron Parish	rwdoucett@gmail.com (337)526-7171
Paul Sellers Cameron Fire Department	Cameron, LA	posellers@hotmail.com (337)661-8780
Michael Welsh Hackberry Fire Department	Hackberry, LA	mlwhvfd@camtel.net (337)274-2717
Lee Faulk Road Superintendent	Cameron Parish	Lf_cppj@camtel.net (337)775-5718
Charles Adkins Superintendent of Schools	Cameron Parish	Charles_adkins@camsch.org (337)775-5784
Chris Savoie Chief Deputy Police	Cameron Parish	chris@cameronso.org (337) 775-511
Ron Johnson Sheriff	Cameron Parish	sheriffjohnson@gmail.com (337)775-5111
Clair Hebert Planning and Economic Development	Cameron Parish	clairh@camtel.net (337)775-5718
Mona Kelley Tax Assessor	Cameron Parish	cpao@camtel.net (337)775-5416
Dinah Landry Council on Aging	Cameron Parish	dblandry@aol.com (337)598-5158
Cyndi Sellers Cameron Pilot/American Press	Cameron Parish	cyndisell@hotmail.com (337)764-3352

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 Cameron Parish programs and planning.

A measure of integration and coordination is achieved through the HMPU participation of Steering Committee members and community stakeholders who administer programs such as: floodplain management under the National Flood Insurance Program (NFIP), coastal protection and restoration, 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 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 any 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 Cameron Parish Hazard Mitigation Steering Committee will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their communities 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 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 data and plans used in the planning process include those listed below.

- Louisiana Coastal Master Plan
- Parish Emergency Operations Plan
- State of Louisiana Hazard Mitigation Plan
- Parish Continuity of Operations Plan.

Further information on the plans can be found in the Capabilities Assessment, Section 3.

Meeting Documentation and Public Outreach Activities

The following pages contain documentation of the meetings and public outreach activities conducted during this hazard mitigation plan update for Cameron parish.

Meeting #1: Coordination Conference Call

Date: August 1, 2014
Location: Teleconference
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 an initial project timeline.
Public Initiation: No
MEETING INVITEES:

Cameron Parish OHSEP Director, Deputy Director
SDMI Staff

Meeting #2: Hazard Mitigation Plan Update Kick-Off

Date: December 3, 2014
Location: Cameron, Louisiana
Purpose: Discuss the expectations and requirements of the hazard mitigation plan update process and establish an initial project timeline with the Parish's Hazard Mitigation Plan Steering Committee. Assign each individual the parish data collection for the plan update.
Public Initiation: No
MEETING INVITEES:

Hazard Mitigation Plan Update Steering Committee

Member/Title	Jurisdiction/Entity	Phone/Email
Danny Lavergne OHSEP Director	Cameron OHSEP	Cameron_oep@camtel.net (337)775-7048
Cassandra Duhon OHSEP Asst. Director	Cameron Parish OHSEP	Roe05@camtel.net (337)775-7048
Ryan Bourriaque Parish Administration	Cameron Parish Government	ryanb@camtel.net (337)775-5718
Kara Bonsall Permit Secretary	Cameron Parish Government	Kb_cppj@camtel.net (337)775-5718
Mark LaBoeuf Fire District #9	Cameron Parish	ogfd@camtel.net (337)274-8291
Toby Landry Fire District #4	Cameron Parish	Toby.landry@dnow.com (337)912-0045
Ronnie Doucet Johnson Bayou Fire Department	Cameron Parish	rwdoucett@gmail.com (337)526-7171
Paul Sellers Cameron Fire Department	Cameron, LA	posellers@hotmail.com (337)661-8780
Michael Welsh Hackberry Fire Department	Hackberry, LA	mlwhvfd@camtel.net (337)274-2717
Lee Faulk Road Superintendent	Cameron Parish	Lf_cppj@camtel.net (337)775-5718
Charles Adkins Superintendent of Schools	Cameron Parish	Charles_adkins@camsch.org (337)775-5784
Chris Savoie Chief Deputy Police	Cameron Parish	chris@cameronso.org (337) 775-511
Ron Johnson Sheriff	Cameron Parish	sheriffjohnson@gmail.com (337)775-5111
Clair Hebert Planning and Economic Development	Cameron Parish	clairh@camtel.net (337)775-5718
Mona Kelley Tax Assessor	Cameron Parish	cpao@camtel.net (337)775-5416
Dinah Landry Council on Aging	Cameron Parish	dblandry@aol.com (337)598-5158
Cyndi Sellers Cameron Pilot/American Press	Cameron Parish	cyndisell@hotmail.com (337)764-3352

Meeting #3 Risk Assessment Overview

Date: March 24, 2015

Location: Cameron, LA, Louisiana

Purpose: Members of the Cameron Parish Hazard Mitigation Plan update Steering Committee were presented the results of the Risk Assessment and an overview of the Public Meeting presentation during this overview. The Assessment was conducted based on hazards identified during previous plans and on any newly identified risks.

Public Initiation: No

MEETING INVITEES:

Hazard Mitigation Plan Update Steering Committee

Member/Title	Jurisdiction/Entity	Phone/Email
Danny Lavergne OHSEP Director	Cameron OHSEP	Cameron_oep@camtel.net (337)775-7048
Cassandra Duhon OHSEP Asst. Director	Cameron Parish OHSEP	Roe05@camtel.net (337)775-7048
Ryan Bourriaque Parish Administration	Cameron Parish Government	ryanb@camtel.net (337)775-5718
Kara Bonsall Permit Secretary	Cameron Parish Government	Kb_cppj@camtel.net (337)775-5718
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Toby Landry Fire District #4	Cameron Parish	Toby.landry@dnow.com (337)912-0045
Ronnie Doucet Johnson Bayou Fire Department	Cameron Parish	rwdoucett@gmail.com (337)526-7171
Paul Sellers Cameron Fire Department	Cameron, LA	posellers@hotmail.com (337)661-8780
Michael Welsh Hackberry Fire Department	Hackberry, LA	mlwhvfd@camtel.net (337)274-2717
Lee Faulk Road Superintendent	Cameron Parish	Lf_cppj@camtel.net (337)775-5718
Charles Adkins Superintendent of Schools	Cameron Parish	Charles_adkins@camsch.org (337)775-5784
Chris Savoie Chief Deputy Police	Cameron Parish	chris@cameronso.org (337) 775-511
Ron Johnson Sheriff	Cameron Parish	sheriffjohnson@gmail.com (337)775-5111
Clair Hebert Planning and Economic Development	Cameron Parish	clairh@camtel.net (337)775-5718
Mona Kelley Tax Assessor	Cameron Parish	cpao@camtel.net (337)775-5416
Dinah Landry Council on Aging	Cameron Parish	dblandry@aol.com (337)598-5158
Cyndi Sellers Cameron Pilot/American Press	Cameron Parish	cyndisell@hotmail.com (337)764-3352

Meeting #4: Public Meeting

Date: March 24, 2015 **Location:** Cameron, 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 Cameron Parish communities were provided for the meeting attendees to identify specific areas where localized hazards occur.

Public Initiation: Yes

MEETING INVITEES:

Hazard Mitigation Plan Update Steering Committee

Member/Title	Jurisdiction/Entity	Phone/Email
Danny Lavergne OHSEP Director	Cameron OHSEP	Cameron_oep@camtel. net (337)775-7048
Cassandra Duhon OHSEP Asst. Director	Cameron Parish OHSEP	Roe05@camtel.net (337)775-7048
Ryan Bourriaque Parish Administration	Cameron Parish Government	ryanb@camtel.net (337)775-5718
Kara Bonsall Permit Secretary	Cameron Parish Government	Kb_cppj@camtel.net (337)775-5718
Mark LaBoeuf Fire District #9	Cameron Parish	ogfd@camtel.net (337)274-8291
Toby Landry Fire District #4	Cameron Parish	Toby.landry@dnow.com (337)912-0045
Ronnie Doucet Johnson Bayou Fire Department	Cameron Parish	rwdoucett@gmail.com (337)526-7171
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Michael Welsh Hackberry Fire Department	Hackberry, LA	mlwhvfd@camtel.net (337)274-2717
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Cyndi Sellers Cameron Pilot/American Press	Cameron Parish	cyndisell@hotmail.com (337)764-3352

Hazard Mitigation meeting to be held March 24th

Cameron Parish Hazard Mitigation Plan Update public meetings will be held on Tuesday, Mar. 24 at 3 p.m. at the Cameron Parish Police Jury meeting room at 148 Smith Circle.

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 creat a more sustainable and disaster-resilient community.

A hazard mitigation plan describes an area's vulnerability to the various 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.

Cameron Parish is in the beginning stages of updating its hazard mitigation plan. Two public meetings will be held on Mar. 24, at Cameron Police Jury West Annex Building for all citizens interested in learning about and participating in discussions concerning the Cameron Parish Hazard Mitigation Plan.

Residents of Cameron 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/Cameron Parish.

AT&T 72% 11:08 AM

Cameron Parish Oep

Cameron Parish Oep
Mar 19 at 2:12pm

SDMI STEPHENSON Disaster Management Institute LSU

FOR IMMEDIATE RELEASE
Thursday, March 12, 2015

Cameron Parish to hold Public Meetings for Hazard Mitigation Plan Update

Cameron Parish Hazard Mitigation Plan Update public meetings will be held on Tuesday, March 24, at 3 p.m. at the Cameron Parish Police Jury meeting room at 148 Smit Circle, Cameron.

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.

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Stephenson Disaster Management Institute
Louisiana State University • 3000 Business Education Complex • Baton Rouge, Louisiana 70803

3 likes

Like Comment Share

Outreach Activity #1: Public Opinion Survey

Date: Ongoing throughout planning process
Location: Web survey
Public Initiation: Yes

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 parish and community specific 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 division 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.

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 Cameron Parish Hazard Mitigation Plan Update must be reviewed and re-submitted for approval every five years. However, it is anticipated that the plan will need revisiting prior to the five year period. To determine the need to update the plan, the plan administrator, currently the Director of the Cameron Parish OHSEP, will be responsible for monitoring and evaluating the plan.

On a quarterly basis, the plan administrator will monitor the plan to assess if significant changes have occurred in the premises upon which the plan was updated. The plan administrator will look at items such as:

- Changes in data used to determine vulnerabilities and loss estimates, in terms of quality and availability
- Changes in Federal or state plans that could affect the continued implementation of any mitigation actions
- The identification of new hazards requiring new mitigation actions
- Changes in the parish residents' perceptions relative to specific hazards.

The administering agency for each mitigation action is responsible for providing a quarterly status report to the plan administrator detailing the progress of the mitigation action, difficulties encountered, success of coordination efforts, and any suggested revisions. The plan administrator will consolidate this information for the active mitigation action and will produce a status report for the plan as a whole.

The plan's status reports will be published in public places and communicated within the community through service, religious, professional, and social organizations.

On an annual basis, the plan administrator will reconvene the Cameron Parish HMP Steering Committee including additional stakeholders to:

- Review the progress and goals of the mitigation actions to determine their relevance to changing situations in the parish, as well as changes in state or Federal policy, and to ensure they are addressing current and expected conditions

- Review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data
- Review the list of critical facilities and modify as needed
- Any items that may have changed the level of risk to the parish and parish residents.

Additionally, the public will be canvassed to solicit public input to continue Cameron 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.

For all revisions, prior to the required five-year update and for the five-year update, the plan administrator will assign plan update responsibilities to the Steering Committee members and other available resources as applicable. The plan administrator will manage the update process through to the completion of the next revision of the plan. The plan administrator will be responsible for having the revision reviewed and approved.

The review in the fourth year of the plan will become the basis for the five-year update revision. The plan administrator will have six months to make appropriate changes to the plan and obtain approval from the Cameron Parish Police Jury before submitting the updated plan to the State of Louisiana Hazard Mitigation Officer and FEMA for acceptance and re-approval. In order to provide the sufficient time for an iterative review and approval process, the plan should be submitted six months prior to the five-year deadline.

The plan administrator will notify all interested parties when changes have been made to the parish plan.

2015 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 2015 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 the responsibility of the Cameron Parish Hazard Mitigation Plan Steering Committee to determine additional implementation procedures when appropriate. This may include integrating the requirements of the Cameron Parish Hazard Mitigation Plan into other local planning documents, processes, or mechanisms as follows:

- Ordinances, Resolutions, Regulations
- Comprehensive Economic Development Strategy
- Parish Emergency Operations Plans
- Parish Continuity of Operations Plan
- State of Louisiana Hazard Mitigation Plan

Opportunities to integrate the requirements of this Plan into other local planning mechanisms will continue to be identified through future meetings of the Cameron 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 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 remain charged with ensuring that the goals and strategies of new and updated local planning documents for their agencies are consistent with the goals and actions of the Cameron 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, such as a Risk Assessment, Comprehensive Plan, Capital Improvements Plan, or Emergency Management Plan, the Parish 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 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.

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 may include:

- 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.

Appendix C: Essential Facilities

Cameron Parish

Cameron Parish Essential Facilities													
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
Fire and Rescue	Cameron Fire District No.1 Fire Station	X			X	X	X	X		X	X	X
	Cameron Parish Fire District No.9 Station	X			X	X	X	X		X	X	
	Creole Fire Station	X			X	X	X	X		X	X	X
	Fire District No.10 - Holly Beach Station	X			X	X	X	X		X	X	
	Fire Station	X			X	X	X	X		X	X	X
	Fire Station	X			X	X	X	X		X	X	
	Fire Station	X			X	X	X	X		X	X	
	Grand Chenier District No.9 Fire Station	X			X	X	X	X		X	X	
	Grandlake Sweetlake Volunteer	X			X	X	X	X		X	X	

Cameron Parish Essential Facilities												
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
	Fire Department											
	Grandlake Sweetlake Volunteer Fire Department	X			X	X	X	X		X	X	
	Hackberry Volunteer Fire Department	X			X	X	X	X	X	X	X	X
	Johnson Bayou Fire Station	X			X	X	X	X		X	X	
	Johnson Bayou Fire Station	X			X	X	X	X		X	X	
	Klondike Volunteer Fire Department				X	X	X	X		X	X	
Government	Big Pasture Solid Waste Collection Site	X			X	X	X	X		X	X	X
	Cameron Dump	X			X	X	X	X		X	X	
	Cameron Ferry - DOTD	X			X	X	X	X		X	X	

Cameron Parish Essential Facilities												
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
	Cameron Paris East Annex - District Attorney & Tax Assessor	X			X	X	X	X		X	X	
	Cameron Parish - New Maintenance Garage For School Board	X			X	X	X	X		X	X	
	Cameron Parish Community Action Agency	X			X	X	X	X		X	X	
	Cameron Parish Courthouse	X			X	X	X	X		X	X	
	Cameron Parish Maintenance Barn	X			X	X	X	X		X	X	X
	Cameron Parish School Board Central Office	X			X	X	X	X		X	X	X

Cameron Parish Essential Facilities												
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
	Cameron Parish School Board Temporary Warehouse	X			X	X	X	X		X	X	
	Cameron Parish Solid Waste Collection				X	X	X	X		X	X	
	Cameron Public Transit	X			X	X	X	X		X	X	X
	CDBG Housing Assistance Program	X			X	X	X	X		X	X	
	Creole Solid Waste Collection Station	X			X	X	X	X		X	X	X
	DOTD Creole Maintenance Unit	X			X	X	X	X		X	X	
	DOTD Holly Beach Maintenance Unit	X			X	X	X	X		X	X	
	East Cameron	X			X	X	X	X		X	X	X

Cameron Parish Essential Facilities												
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
	Maintenance Facility											
	Grand Chenier Solid Waste	X			X	X	X	X		X	X	
	Grand Lake Recreation #5 & Police Jury Ward Barn	X			X	X	X	X		X	X	
	Holly Beach Solid Waste	X			X	X	X	X		X	X	
	Justice of the Peace - Carrie Broussard				X	X	X	X		X	X	
	Parish Maintenance	X			X	X	X	X		X	X	
Law Enforcement	Cameron Parish Sheriff's Office	X			X	X	X	X		X	X	X
Public Health	Cameron Parish Health Unit	X			X	X	X	X		X	X	X
	Hackberry Rural Health Clinic	X			X	X	X	X	X	X	X	X

Cameron Parish Essential Facilities												
Type	Name	Coastal Land Loss	Drought	Excessive Heat	Flooding	Hail	Lightning	Wind	Sinkhole	Tornado	Tropical Cyclone	Wildfire
	Johnson Bayou Rural Health Clinic	X			X	X	X	X		X	X	
	South Cameron Hospital	X			X	X	X	X		X	X	
	South Cameron Memorial Hospital System Rural Health Clinic	X			X	X	X	X		X	X	
Schools	Grand Lake School				X	X	X	X		X	X	
	Hackberry High School	X			X	X	X	X	X	X	X	X
	Johnson Bayou School	X			X	X	X	X		X	X	
	South Cameron High School	X			X	X	X	X		X	X	X
	South Cameron School Sports Complex	X			X	X	X	X		X	X	

Appendix D: Plan Adoption

KIRK QUINN
PRESIDENT
CURTIS FOUNTAIN
VICE PRESIDENT
RYAN BOURRIAQUE
ADMINISTRATOR
DARRELL WILLIAMS
SECRETARY-TREASURER

POLICE JURY
PARISH OF CAMERON
P.O. BOX 1280
CAMERON, LOUISIANA 70631
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DISTRICT 1 CURTIS FOUNTAIN
DISTRICT 2 ANTHONY HICKS
DISTRICT 3 KIRK QUINN
DISTRICT 4 TERRY BEARD
DISTRICT 5 KIRK BURLEIGH
DISTRICT 6 JOE DUPONT
DISTRICT 7 DARRYL FARQUE

RESOLUTION

RESOLUTION NO. 1021

STATE OF LOUISIANA
PARISH OF CAMERON

A RESOLUTION OF THE CAMERON PARISH POLICE JURY IN THE STATE OF LOUISIANA FORMALLY ADOPTING THE CAMERON PARISH HAZARD MITIGATION PLAN

WHEREAS, Cameron Parish has submitted a Hazard Mitigation Plan Update, HMGP #4080-0005, to the Governor's Office of Homeland Security (GOHSEP), and;

WHEREAS, after review of the plan by GOHSEP, Cameron Parish Hazard Mitigation Plan Update has been granted an Approvable Pending Adoption status and thusly requires formal adoption of the plan by Cameron Parish before final approval by FEMA;

BE IT RESOLVED, by the Cameron Parish Police Jury, by unanimous vote of the board, hereby formally adopts the Cameron Parish Hazard Mitigation Plan as approved by GOHSEP.

ADOPTED AND APPROVED this 4th day of August, 2015.

APPROVED:

KIRK QUINN, PRESIDENT

ATTEST:

DARRELL WILLIAMS, SECRETARY

BOBBY JINDAL
GOVERNOR

State of Louisiana
Governor's Office of Homeland Security
and
Emergency Preparedness

KEVIN DAVIS
DIRECTOR

July 21, 2015

GOHSEP-AFO-BR

The Honorable Kirk Quinn
Parish President
Cameron Parish
P.O. Box 1280
Cameron, LA 70631

SUBJECT: Hazard Mitigation Plan Update Approvable Pending Adoption
Cameron Parish - Hazard Mitigation Plan Update
HMGP # 4080-0005

Dear Mr. Quinn:

I am pleased to inform you the Cameron Parish Hazard Mitigation Plan was reviewed by the Governor's Office of Homeland Security (GOHSEP) and the Federal Emergency Management Agency (FEMA). Per this review, the Cameron Parish Hazard Mitigation Plan has been granted an Approvable Pending Adoption (APA) status. Before the Cameron Parish plan can receive Final Approval from FEMA, the Parish must formally adopt the plan by resolution.

After official adoption of the current version of the plan, an electronic copy (CD) of the plan in single digital format, which includes the signed resolution for Cameron Parish, must be submitted to GOHSEP within **30 days** of this letter. Funding for projects inside Cameron Parish is dependent on the Final Approval of this plan.

Thank you for your interest in mitigation and your prompt delivery of this plan. If you have any questions, please contact your Project Officer, Nicolette English at 225.267.2607 or at nicolette.english@la.gov.

Sincerely,

Jeffrey Giering

Jeffrey Giering
State Hazard Mitigation Officer

JG: nbe

Enclosures: 1) FEMA APA Letter Dated July 13, 2015
2) Cameron Parish - APA Plan Review Tool

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. The worksheets were presented at the Kickoff Meeting by SDMI as tools for assisting in the update of the Hazard Mitigation Plan, but also as a State Requirement (Element E) for the update. 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 state required worksheets.

Mitigation Planning Team

Hazard Mitigation Plan Update Steering Committee

Member/Title	Jurisdiction/Entity	Phone/Email
Danny Lavergne OHSEP Director	Cameron OHSEP	Cameron_oep@camtel.net (337)775-7048
Cassandra Duhon OHSEP Asst. Director	Cameron Parish OHSEP	Roe05@camtel.net (337)775-7048
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Cyndi Sellers Cameron Pilot/American Press	Cameron Parish	cyndisell@hotmail.com (337)764-3352

Capability Assessment

Planning and Regulatory		
Plans	Yes / No	How often is the plan updated?
Comprehensive / Master Plan	NO	Parish has a Coastal Restoration Committee
Capital Improvements Plan	NO	
Economic Development Plan	NO	Comprehensive Economic Development Strategy
Local Emergency Operations Plan	YES	Yearly
Continuity of Operations Plan	YES	
Transportation Plan	NO	Evacuation Planning
Stormwater Management Plan	NO	
Community Wildfire Protection Plan	NO	
Other plans (redevelopment, recovery, coastal zone	NO	
Building Code, Permitting and Inspections	Yes / No	Are the codes adequately enforced?
Building Code	YES	I CODES 2012
Building Code Effectiveness Grading Schedule (BCEGS) Score	NO	
Fire Department ISO rating	5	
Site plan review requirements	NO	
Land Use Planning and Ordinances	Yes / No	Is the ordinance adequately administered and enforced?
Zoning Ordinance	NO	
Subdivision Ordinance	YES	
Floodplain Ordinance	YES	
Natural Hazard Specific Ordinance (stormwater, steep	NO	
Flood Insurance Rate Maps	YES	
Acquisition of land for open space and public recreation uses	NO	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Increased participation in funding opportunities and mitigation programs will enhance and expand risk reduction measures		

Administration and Technical		
Administration	Yes / No	Comments
Planning Commission	NO	
Mitigation Planning Committee	NO	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	YES	
Mutual Aid Agreements	YES	
Staff	Yes / No	Percentage of time spent on hazard mitigation
Chief Building Official	YES	
Floodplain Administrator	YES	
Emergency Manager	YES	
Community Planner	NO	
Civil Engineer	NO	
GIS Coordinator	YES	
Grant Writer	YES	
Other	NO	
Technical	Yes / No	Describe capability
Warning Systems / Service	YES	
Hazard Data & Information	NO	
Grant Writing	NO	
Hazus Analysis	NO	
Other	NO	
How can these capabilities be expanded and improved to reduce risk?		
Increased participation in funding opportunities and mitigation programs will enhance and expand risk reduction measures		

Financial

Funding Resource	Yes / No	Could the resource be used to fund future mitigation actions?
Capital Improvements project funding	YES	
Authority to levy taxes for specific purposes	YES	
Fees for water, sewer, gas, or electric services	YES	
Impact fees for new development	NO	
Stormwater Utility Fee	NO	
Community Development Block Grant (CDBG)	YES	
Other Funding Programs	YES	
How can these capabilities be expanded and improved to reduce risk?		
Increased participation in funding opportunities and mitigation programs will enhance and expand risk reduction measures		

Education and Outreach

Program / Organization	Yes / No	Comments
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	YES	Cameron Community Action Agency also assists with getting information to Head Starts and low income families
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	YES	
Natural Disaster or safety related school program	No	
Storm Ready certification	No	
Firewise Communities certification	No	
Public/Private partnership initiatives addressing disaster-related issues	No	
Other	No	
How can these capabilities be expanded and improved to reduce risk?		
Increased participation in funding opportunities and mitigation programs will enhance and expand risk reduction measures		

Building Inventory

Building Inventory

List of Parish/City Owned Buildings

Name of Building	Purpose of Building	Address	City	Date Built	Construction Type	Assessed Value
Cameron Multi Purpose	Recreational	122 Recreation Center Lane	Cameron	8/20/2012	Metal	257,625
Co-op Extension Office	office	180 Henry Street	Cameron	12/5/2012	Reinforced Masonry	90,300
Sheriff Investigator Office	office	122A Recreation Center Lane	Cameron		Select One	90,000
East Annex Building	office	110 Smith Circle	Cameron	1/8/2010	Reinforced Masonry	435,300
West Annex Building	office	148 Smith Circle	Cameron	8/14/2012	Reinforced Masonry	713,250
Health Unit	Medical Office	107 Recreation Center	Cameron	3/2/2009	Reinforced Masonry	90,000
Court House and Jail	office	119 Smith Circle	Cameron		Reinforced Masonry	648,000
Old D.A. Office	vacant	124 Smith Circle	Cameron		Reinforced Masonry	60,000
Grand Lake Conference Center	office	10098 Gulf Hwy	Grand Lake	2/4/2013	Metal	7,914
Hackberry Maint Barn	maintenance Building	105 Parish Road	Hackberry		Metal	51,000
East Cameron Maintenance Faclity	maintenance Building	153 LeBlanc Road	Creole	5/20/2009	Metal	305,379
Johnson Bayou Maint. Barn	maintenance Building	881 Smith Ridge	Johnson Bayou	9/14/2007	Metal	34,904
Grand Chenier Maint. Barn	maintenance Building	205 Recreation	Grand Chenier		Metal	25,313
Klondike Barn	maintenance Building	440 Veterans Memorial Dr.	Gueydan	11/20/2014	Metal	25,220
Pole Barn	maintenance Building	6103 Holly Beach	Johnson Bayou		Metal	6,450
Hackberry Waterworks	office	1190 Main Street	Hackberry	11/1/2007	Metal	52,136
Grand Lake Waterworks	office	111 Dennis Lane	Bell City	8/1/1999	Metal	21,547
Cameron Waterworks	office	126 Ann Street	Cameron	9/7/2006	Metal	41,038
Pavilion - Open Sides	canopy	799C Davis Road	Cameron		Metal	225,000
Rest Rooms	rest rooms	799A Davis Road	Cameron	6/1/2009	Reinforced Masonry	225,000
Guard Building	office	799A Davis Road	Cameron	6/3/2009	Metal	225,000
Grand Chenier Recreation	recreationial	113 Recreation Lane	Grand Chenier	10/22/2010	Metal	100,000
Grand Lake Recreation	Recreationial	108 Recreation Lane	Grand Lake		Metal	100,000
Hackberry Recreation	Recreationial	1250 Recreation Lane	Hackberry		Metal	100,000
Johnson Bayou Recreation Center	Recreationial	135 Berwick Road	Johnson Bayou	5/22/2013	Metal	200,000
Hackberry Multi Purpose Building	Recreationial	986 Main Street	Hackberry		Metal	75,000
Multi Purpose Faclity	Recreationial	434 Veterans Memorial Drive	Lake Arthur		Metal	11,340
Johnson Bayou Multi Purpose Building	Recreationial	5556 Gulf Beach Hwy	Johnson Bayou	7/10/2008	Metal	210,000
Grand Lake Library	Library	10200 Gulf Hwy	Grand Lake	8/16/2012	Metal	22,553
Johnson Bayou Library	Library	4586 Gulf Beach Hwy	Johnson Bayou	11/3/2010	Reinforced Masonry	98,700
Grand Chenier Library	Library	2863 Grand Chenier Hwy	Grand Chenier	12/11/2012	Metal	90,375
Hackberry Library	Library	983 Main Street	Hackberry		Reinforced Masonry	7,500
Lowry Library	Library	460 Lowry Hwy	Lake Arthur		Select One	25,090
Cameron Fire Station	Fire Station	449 Marshall Street	Cameron	12/16/2009	Reinforced Masonry	210,000
Cameron Fire Sub Station	Fire Station	122 Ridgecrest	Cameron	12/30/2008	Select One	10,715
Muria Fire Station	Fire Station	129 Muria Road	Creole	8/13/2012	Reinforced Masonry	243,958
Grand Chenier Water and Fire Station	Fire Station	4011 Grand Chenier	Grand Chener	5/30/2008	Reinforced Masonry	210,000
Grand Chenier Fire Station	Fire Station	1523 Oak Grove Hwy	Grand Chener		Metal	32,250
Hackberry Fire Station	Fire Station	1025 Main Street	Hackberry		Metal	559,125
Hackberry Fire Station	Fire Station	110 Volunteer Lane	Hackberry		Metal	35,100
Johnson Bayou Waterworks and Fire Station	Fire Station	6246 Gulf Beach Hwy	Johnson Bayou	10/8/2012	Metal	157,358

Building Inventory

List of Parish/City Owned Buildings

Name of Building	Purpose of Building	Address	City	Date Built	Construction Type	Assessed Value
Johnson Bayou Fire Garage Station	Fire Station	6246 Gulf Beach Hwy	Johnson Bayou		Metal	same as above same loca.
Holly Beach Fire Station	Fire Station	6051 Holly Beach Fire	Johnson Bayou	11/4/2011	Metal	208,500
Grand Lake Fire Station	Fire Station	160 Big Pasture Road	Big Lake		Metal	14,100
Grand Lake Fire Station	Fire Station	957 Hwy 384B	Grand Lake		Metal	18,900
Grand Lake Fire Station (Grangerville)	Fire Station	142 Mhires Lane	Bell City		Metal	14,100
Grand Lake Fire Station (Granger)	Fire Station	140 Granger Lane	Grand Lake		Metal	3,750
Lowry Fire Station	Fire Station	460 Lowry Hwy	Lake Arthur		Metal	18,000
Klondike Fire Station	Fire Station	430 Veteran's Drive	Klondike		Metal	42,000
Creole Community Center & Fire Station	Fire Station	184 E Creole Hwy B	Creole	11/21/2011	Metal	15,120
Creole Fire Garage Staion	Fire Station	184 E Creole Hwy B	Creole		Metal	20,000
Creole Fire Station	Fire Station	135 Camille Lane	Creole		Metal	30,000
Grand Lake Fireman Center	Recreationial	963 Hwy 384B	Grand Lake		Metal	13,500

Critical Facilities and Vulnerable Populations

Critical Facilities and Vulnerable Population Worksheet					
Name	**Street**	**City**	**Zip Code**	**Latitude**	**Longitude**
Critical Facilities					
Sheriff's Office	119 Smith Circle	Cameron	70631		
Cameron Water Tower	125 Carter St	Cameron	70631		
Hackberry Water Tank	338 Old Town Rd	Hackberry	70645		
Hackberry Water Tank and Tower	988 Main St	Hackberry	70645		
Creole Water Tower	157 LeBlanc Rd	Creole	70632		
Creole Water Tank	4790 West Creole Hwy	Cameron	70631		
Grand Lake Water Tower	160 Hwy 1144	Grand Lake	70607		
Grand Lake Water Tower	963 Hwy 384	Grand Lake	70607		
Grand Lake Water Tank	980 West Lincoln Rd	Lake Charles	70607		
Grand Lake Water Tank	111 Dennis Ln	Sweetlake	70630		
Johnson Bayou Water Tower	159 Berwick Rd	Johnson Bayo	70631		
Johnson Bayou Water Tower and Tanks	6051 Holly Beach Hwy	Johnson Bayo	70631		
Johnson Bayou Water Tanks	201 Middle Ridge	Johnson Bayo	70631		
Johnson Bayou Water Tanks	235 Main St	Hackberry	70645		
Johnson Bayou Water Tanks	1192 Main St	Hackberry	70645		
Grand Chenier Water Well	125 Muria Rd	Creole	70632		
Grand Chenier Water Well	see coordinates			29.49217665	92.5958409
Grand Chenier Water Well	see coordinates			29.50333133	93.0026023
Grand Chenier Water Well	see coordinates			29.50538293	93.02201177
Grand Chenier Water Tower	1531 Oak Grove Hwy	Grand chenie	70643		
Grand Chenier Water Tower	5035 Grand Chenier Hwy	Grand Chenie	70643		
Grand Chenier Water Tower	125 Muria Rd	Creole	70643		
Klondike Fire Station	430 Veteran's Dr	Gueydan	70542		
Cameron Fire Station	449 Marshall St	Cameron	70631		
Grand Chenier Fire Station	4011 B Grand Chenier Hwy	Grand Chenie	70643		
Johnson Bayou Fire Station	155 Berwick Rd	Johnson Bayo	70631		
Johnson Bayou Fire Station	6246 Gulf Beach hwy	Johnson Bayo	70631		
Holly Beach Fire Station	6501 Holly Beach hwy	Holly Beach	70631		
Grand Lake Fire Station	957 A Hwy 384	Grand Lake	70607		
Big Lake Fire Station	160 Big Pasture Rd	Grand Lake	70607		
Grand Lake Fire Station	140 Granger Ln	Grand Lake	70607		
Sweetlake Fire Station	140 Mhires Ln	Sweetlake	70630		
Lowry Fire Station	460 Lowry Hwy	Lake Arthur	70549		
Oak Grove Fire Station	1523 Oak Grove Hwy	Grand Chenie	70643		
Hackberry Fire Station	1025 Main St	Hackberry	70645		
Creole Fire Station	184 East Creole Hwy	Creole	70632		

Critical Facilities and Vulnerable Population Worksheet

Name	Street	City	Zip Code	Latitude	Longitude
Shelters					
None					
Hospitals					
South Cameron Memorial Hospital	5360 West Creole Hwy	Cameron	70631		
Schools					
South Cameron High School	753 Oak Grove hwy	Creole	70632		
Grand Lake High School	1039 Hwy 384	Grand Lake	70607		
Hackberry High School	1390 School St	Hackberry	70645		
Johnson Bayou High School	6304 Gulf Beach Hwy	Johnson Bayo	70631		
Daycares					
Mobile Home Parks					
Long Acre Trailer Park	100 Long Acre Dr	Grand Lake	70607		
Hebert Trailer Park	207 Hebert Trailer Park Rd	Grand Lake	70607		
Shandy Acres	1471 Hwy 384	Grand Lake	70607		
Twin Oaks Trailer Park	111 Twin Oaks Rd	Grand Lake	70607		
Bridges/Dams					
Kelso Bayou Bridge	101 Main St	Hackberry	70645		
Grand Lake Pontoon Bridge	200 Hwy 384	Grand Lake	70607		
Conway LeBlue Bridge (Gibbstown)		Creole	70632		
Cameron Ferry	121 Wakefield Rd	Cameron	70631		
Mermentau River Bridge	2275 Oak Grove Hwy	Grand Chenie	70643		
Superior Bridge	8820 Grand Chenier Hwy	Grand Chenie	70643		

NFIP

Work Sheet 4.3

National Flood Insurance Program (NFIP)

Instructions: Use this worksheet to collect information on your community's participation in and the continued compliance with the NFIP, as well as identify areas for improvement that could be potential mitigation actions. Indicate the source of information, if different from the one included.

NFIP Topic	Source of Information	Comments
Insurance Summary		
How many NFIP polices are in the community? What is the total premium and coverage?	State NFIP Coordinator or FEMA NFIP Specialist	total policies in community 1,747, coverage $373,212,400, total premium annually $1,949,812
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?	FEMA NFIP or Insurance Specialist	3,065 claims paid since 1978, total claim paid $173,759,448, Substantial damage paid losses 1,368.
How many structures are exposed to flood risk with in the community?	Community Floodplain Administrator (FPA)	311
Describe any areas of flood risk with limited NFIP policy coverage.	Community FPA and FEMA Insurance Specialist	
Staff Resources		
Is the Community FPA or NFIP Coordinator certified?	Community FPA	Cameron Parish has 2 Certified FPA
Is flood plain management an auxiliary function?	Community FPA	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Community FPA	Permit review inspections, town hall meetings, GIS, flood maps
What are the barriers to running an effective NFIP program in the community, if any?	Community FPA	None
Compliance History		
Is the community in good standing with the NFIP?	STate NFIP Coordinatorr, FEMA NFIP Specialist, community records	Yes
Are there any outstanding compliance issues(i.e., current violations)?		Yes, Parish is working towards closing out state CAV
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact(CAC)?	State CAV	Oct-13
Is a CAV or CAC scheduled or needed? If so when?		No
Regulation		
When did the community enter the NFIP?	NFIP	3-Apr-84
Are the FIRMs digital or paper?	Adopted November 16, 2012	Digital and Paper
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so,		Yes
Community Rating System (CRS)		
Does the community participate in CRS?		Cameron Parish currently working towards implementing
What is the community's CRS Class Ranking?		
Does the plan include CRS planning requirements?		