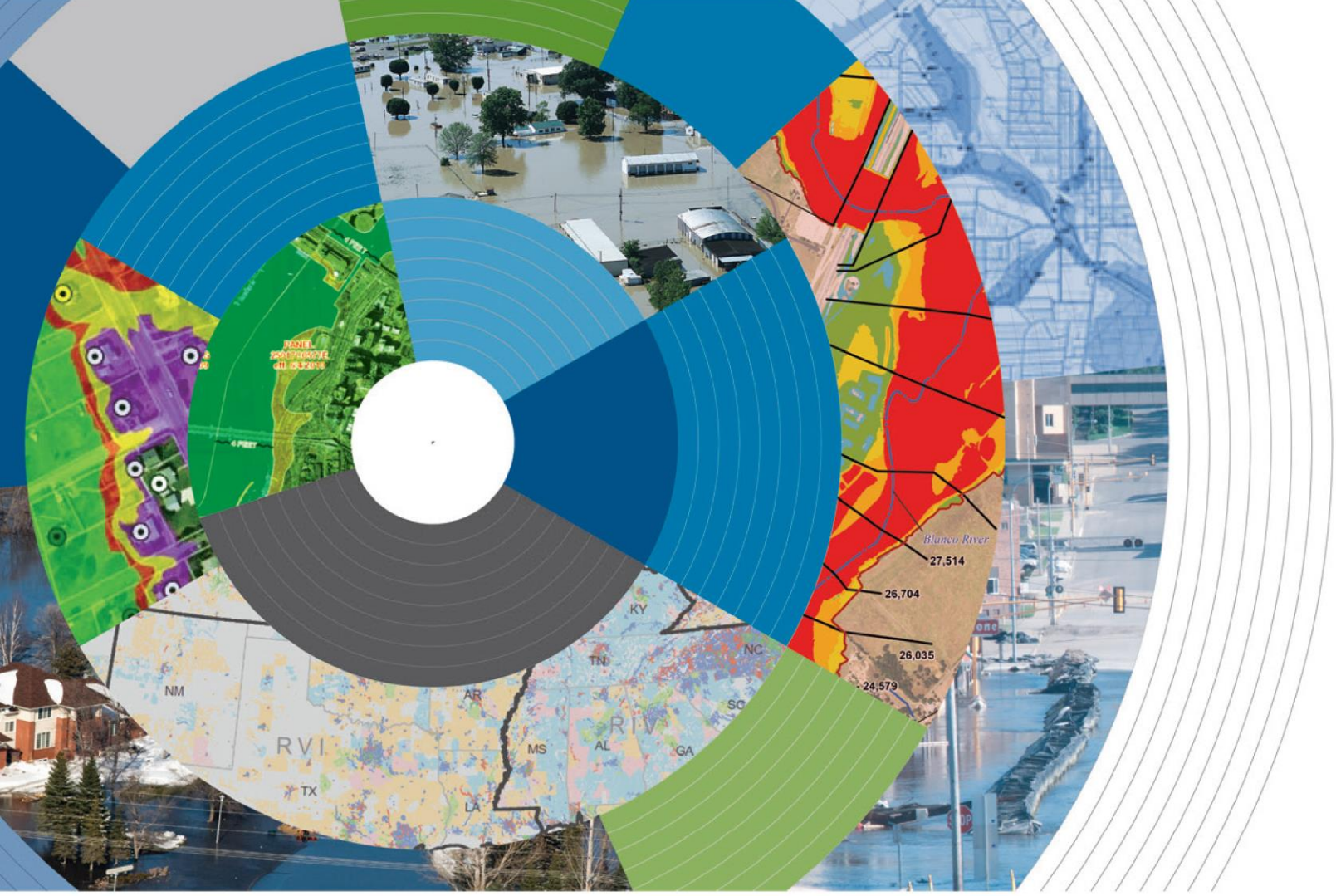

Flood Risk Report

Lower Red-Lake Iatt Watershed

HUC-8 11140207

FEMA CASE NUMBER: 21-06-0008S

July 2023

FEMA

Project Area Community List in Scope

Community Name
Grant Parish (Unincorporated Areas)
Natchitoches Parish (Unincorporated Areas)
Rapides Parish (Unincorporated Areas)
Sabine Parish (Unincorporated Areas)
Vernon Parish (Unincorporated Areas)
Winn Parish (Unincorporated Areas)
City of Alexandria
Village of Atlanta
Town of Boyce
Village of Clarence
Town of Colfax
Village of Creola
Town of Montgomery
Village of Natchez
City of Natchitoches
City of Pineville
Village of Provencal

Flood Risk Report History

Version Number	Version Date	Summary
v1.0	7/10/2023	Discovery and Flood Risk Report

Preface

The Department of Homeland Security, Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states and local communities with flood risk information, datasets, risk assessments, and tools that they can use to increase their resilience to flooding and better protect their residents. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP transforms the traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

The Flood Risk Report (FRR) is one of the tools created through the Risk MAP program. A FRR provides non-regulatory information to help local officials, floodplain managers, planners, emergency managers, and others. Local, federal, and state officials can use the information in the FRR to establish a better understanding of their flood risk, take steps to mitigate those risks, and communicate those risks to residents and local businesses.

The FRR serves as a guide when communities update local hazard mitigation plans, community comprehensive plans, and emergency operations and response plans. It is meant to communicate risk to officials and inform them of the modification of development standards, as well as assist in identifying necessary or potential mitigation projects. The FRR extends beyond community limits to provide flood risk data for the Lower Red-Lake Iatt watershed.

Flood risk is always changing, and studies, reports, or other sources may be available that provide more comprehensive information. This report is not intended to be the regulatory nor the final authoritative source of all flood risk data in the watershed. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

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Executive Summary

The Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides communities with flood information to help them understand their current flood risk and make informed decisions about taking action to become stronger and more resilient in the face of future risk. The Risk MAP process provides communities with new or improved information about their flood risk based on watershed models that use information from local, regional, state, and federal sources. Communities can use the resulting tools and data to enhance mitigation plans and better protect their residents.

This report is one such tool for communities impacted by an updated flood hazard analysis of the Lower Red-Lake Iatt Hydrologic Unit Code 8 (HUC-8) watershed. The FRR has two goals: (1) **inform communities of their risks** related to certain natural hazards, and (2) **enable communities to act** to reduce their risk. It is intended to assist federal, state, and local officials with the following:

- Updating local Hazard Mitigation Plans (HMPs) and community comprehensive plans
- Updating emergency operations and response plans
- Communicating risks
- Informing the modification of development standards
- Identifying mitigation projects.

Most important, during this phase of the process, communities are encouraged to review the flood hazard changes closely and provide feedback to FEMA Region 6 based on their local knowledge and any additional data available.

About the FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program

Flood risk is continually changing over time due to factors such as new building and development and weather patterns. The goal of FEMA's Risk MAP program is to work with federal, state, tribal, and local partners to identify and reduce flood risk across communities. These projects are conducted using watershed boundaries and bring together multiple communities to identify broader mitigation actions and create consistency across the watershed. The program provides resources and support that are tailored to each community to help mitigate their risk and work towards a reduction in risk and future loss.

Through coordination and data sharing, the communities in the watershed work as partners in the mapping process. In addition to providing data, the communities can also provide insight into flooding issues and flood prevention within their areas. To prepare for a future study and assist in mitigation, FEMA provides several data sources, including information from the community, such as the following:

- Areas of repeated flooding and insurance claims
- Future development plans
- Areas of low water crossings
- High water marks from recent flooding events
- Areas of evacuation during high water
- Master drainage plans, flood risk reduction projects, and large areas of fill placement
- Local flood studies
- Other flood risk information

For more information about ways communities can act or take advantage of available resources, please review the attached appendices.

FEMA provides communities with Base Level Engineering (BLE) data for select watersheds during the Risk MAP process. BLE is a form of automated hydrologic and hydraulic modeling which, when completed, can provide modeled flood hazard data for all flooding sources within the HUC-8 watershed. Knowing the extent of flooding during the 1-percent-annual-chance flooding event supports both risk reduction efforts and more resilient community planning. Completed BLE data is provided to watershed communities for planning, risk communication, floodplain management, and permitting activities, and to inform future flood study needs. BLE is large scale watershed-based modeling that lacks the detail of Zone AE modeling such as road crossings and the effects of routing storage. BLE does not replace Zone AE data and should be used for comparison purposes only in these areas.

For the Lower Red-Lake Iatt watershed BLE datasets and products, see Mapping Information Platform (MIP) case number 20-06-0049S, or visit the Interagency Flood Risk Management (InFRM) estimated Base Flood Elevation (BFE) Viewer. For a review of these BLE products, see Appendix III.

About the Lower Red-Lake Iatt Watershed

The Louisiana Department of Transportation and Development (LADOTD) became a FEMA Cooperating Technical Partner (CTP) in Fiscal Year 2015 (FY15). In FY20, LADOTD contracted with FEMA to provide Risk MAP Discovery for the Lower Red-Lake Iatt HUC-8 watershed located in Louisiana. The project area covers the portions of parishes included within the Lower Red-Lake Iatt (HUC-8) watershed: Grant, Natchitoches, Rapides, Sabine, Vernon, and Winn Parishes. Location maps covering the study area can be found in Appendix I.

The oldest effective FEMA flood hazard mapping for the parishes within the Lower Red-Lake Iatt watershed were released in the 1980s. Most of the parishes received modernized parish-wide Digital Flood Insurance Rate Maps (DFIRMs) as part of FEMA's Map Modernization (MAP MOD) program in the 2010s. However, Sabine and Rapides Parishes still have paper maps with flood hazard data developed during the 1980s and 1990s.

According to the 2019 National Land Cover Data, approximately 91 percent of the area in the Lower Red-Lake Iatt watershed is undeveloped; including shrub/scrub, herbaceous, cropland, pastures, woody wetlands, mixed forest, deciduous forest, and evergreen forest. Roughly six percent of the area is developed, and the remaining three percent is open water.

The Red River and the Lower Red-Lake Iatt watershed encompasses a diversity of landscapes and physical conditions, including dams (e.g., the Red River Lock and Dam 3 along the southern part of the Red River), levees (e.g., the Aloha-Rigolette Levee along the southeastern part of the Red River), and urbanized cities, towns, villages, and unincorporated areas. Over the past two decades, the study area has experienced many flash floods. In September of 2008, Hurricane Gustav caused heavy rain throughout the Lower Red-Lake Iatt watershed with a recorded rainfall of 20.5 inches only 7 miles from the City of Alexandria, which prompted over 200 water rescues. Over the past decade, the population overall has decreased slightly in the watershed. Additional background information for the watershed is depicted in Appendix I.

In 2020, FEMA authorized LADOTD to leverage the previously completed BLE data to perform Discovery in the Lower Red-Lake Iatt watershed. The goal of the Discovery project is to work closely with communities to better understand local flood risks, mitigation efforts, and other topics to spark watershed-wide discussions about increasing resilience to flooding.

Introduction

Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over a normally dry area. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the accumulation of unwanted debris. Severe flood losses can destroy buildings and crops and cause severe injuries or death.

Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Even if people know where a flood might occur, they may not know the level of flood risk in that area. The most common method for determining flood risk, also referred to as vulnerability, is to identify both the probability and the consequences of flooding:

> **Flood Risk** (or Vulnerability) **= Probability x Consequences**; where
>
> **Probability** = the likelihood of occurrence
>
> **Consequences** = the **estimated** impacts associated with the occurrence on life, property, and infrastructure

The probability of a flood is the likelihood that it will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. Factors affecting the probability that a flood will have an impact on an area range from changing weather patterns to the existence of mitigation projects. The ability to assess the probability of a flood, and the level of accuracy for that assessment, are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the body of water in question.

The consequences of a flood are the estimated impacts associated with its occurrence. Consequences relate to human activities within an area and how a flood affects the natural and built environment.

The FRR has two goals: (1) inform communities of their risks related to certain natural hazards, and (2) enable communities to act to reduce their risk. The information within this Risk Report is intended to assist federal, state and local officials to:

- **Communicate risks** – Local officials can use the information in this report to communicate with property owners, business owners, and other residents about risks and areas of mitigation interest.
- **Update local hazard mitigation plans and community comprehensive plans** – Planners can use risk information to develop and/or update hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes can be changed to provide for more appropriate land uses in high-hazard areas.
- **Update emergency operations and response plans** – Emergency managers can identify high-risk areas for potential evacuation and low-risk areas for sheltering. Risk assessment information may show vulnerable areas, facilities, and infrastructure for which continuity of operations plans, continuity of government plans, and emergency operations plans would be essential.

- **Inform the modification of development standards –** Planners and public works officials can use information in this report to support the adjustment of development standards for certain locations.
- **Identify mitigation projects –** Planners and emergency managers can use this risk assessment to determine specific mitigation projects of interest. For example, a floodplain manager may identify critical facilities that need to be elevated or removed from the floodplain.

This FRR focuses on the Risk MAP Discovery and BLE projects. It showcases risk assessments, which analyze how a flood hazard affects the built environment, population, and local economy to identify mitigation actions and develop mitigation strategies.

The information in this report should be used to identify areas for mitigation projects as well as for additional efforts to educate residents on the hazards that may affect them. The areas of greatest hazard impact are identified in the Areas of Mitigation Interest section of this report, which can serve as a starting point for identifying and prioritizing actions a community can take to reduce its risks.

Watershed Basics

Background

The Lower Red-Lake Iatt watershed is in central Louisiana and covers portions of Grant, Natchitoches, Rapides, Sabine, Vernon, and Winn Parishes. See Figure 1 for an overview map of the Lower Red-Lake Iatt watershed. The watershed impacts 17 communities which includes over 55,000 people. The total watershed size is approximately 1,426 square miles (sq. mi.) of which approximately 500 sq. mi. is mapped floodplain. See Appendix 1 for figures showing effective floodplain locations in the Lower Red-Lake Iatt watershed.

The Red River is the primary river in the watershed that flows from the Northwest of the Village of Clarence to the Southeast of the City of Alexandria. There are approximately 968 stream miles in the Lower Red-Lake Iatt watershed. All streams in the watershed are either direct or indirect tributaries to the Red River. These streams drain all the 42 HUC-12 watersheds within the study area. Flooding is highly dependent on rainfall and often follows tropical thunderstorm events hitting the watershed. There is an increase in rainfall from the Northern Parishes to the Southern Parishes, with an average rainfall of 56.8 inches in Natchitoches Parish to 59.4 inches in Rapides Parish, per USClimateData.com.

The Lower Red-Lake Iatt watershed is mainly in the South Central Plains ecoregion that consists the following ecoregions: Tertiary Uplands, Southern Tertiary Uplands, Lleistocene Fluvial Terraces, and Red River Bottomlands. For the South Central Plains ecoregion, deposits are mainly Eocene clays, silts, and sands. The soils of the area consist of moderately well drained Ultisols and Alfisols that have sandy and loamy surface textures. Commercial pine plantations can be found in many areas of the ecoregion and in turn have replaced much of the native shortleaf pine forests. Native trees in the South Central Plains ecoregion consist of variations of pine trees, oak trees, hickories, and sweetgums. The ecoregion's landscape is cut by several small streams and the flow is often intermittent in the summer and early fall. The land use is predominantly timber, but also has livestock grazing, poultry production, and oil and gas production.

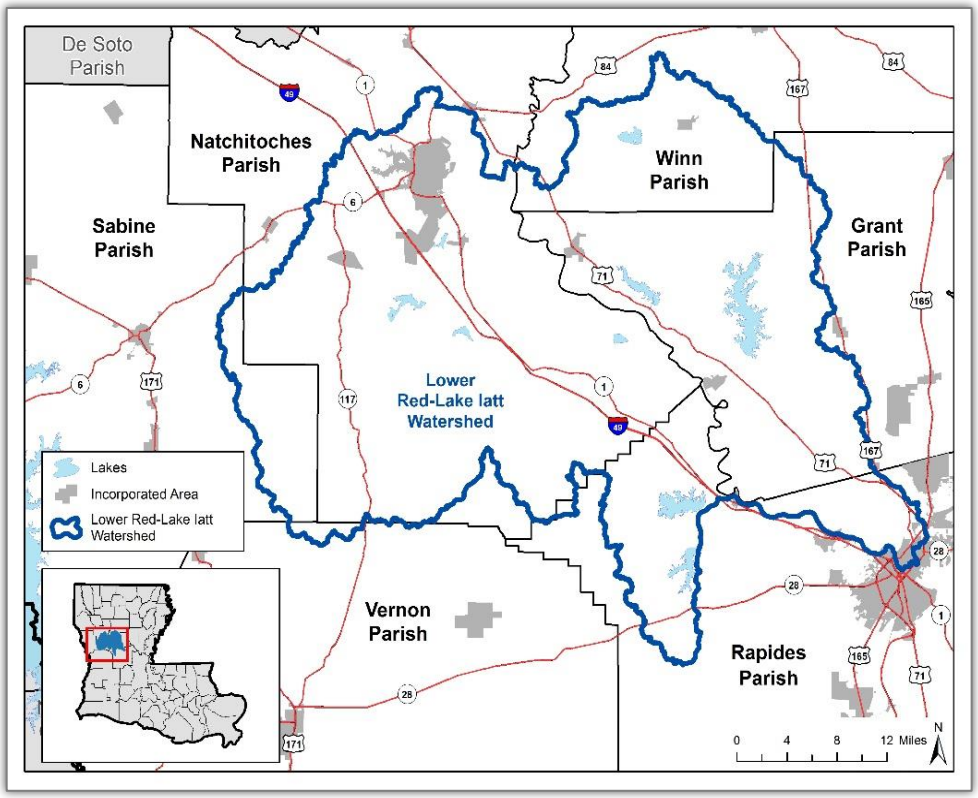

Figure 1: Overview map of the Lower Red-Lake Iatt watershed

Intense, localized thunderstorms and frontal-type storms in spring and summer cause most of the flooding issues in the Lower Red-Lake Iatt watershed. Flash flooding occurs despite the well-draining fine sandy and silt loam subsoils found throughout the watershed. The parishes within the Lower Red-Lake Iatt watershed have experienced up to 75 flash floods between 1996 and 2020. Figure 2 shows the number of flash floods per parish.

Most parishes that have recorded flood events within the Lower Red-Lake Iatt watershed have little to no flood damage. Most of the flooding is in the City of Natchitoches, the City of Alexandria, and the Town of Colfax. Between these three areas, there are approximately four years between successive damaging flood events. The City of Natchitoches, the City of Alexandria, and the Town of Colfax contain several streams in the study watershed that are near population centers and developed areas, increasing their risks during flood events.

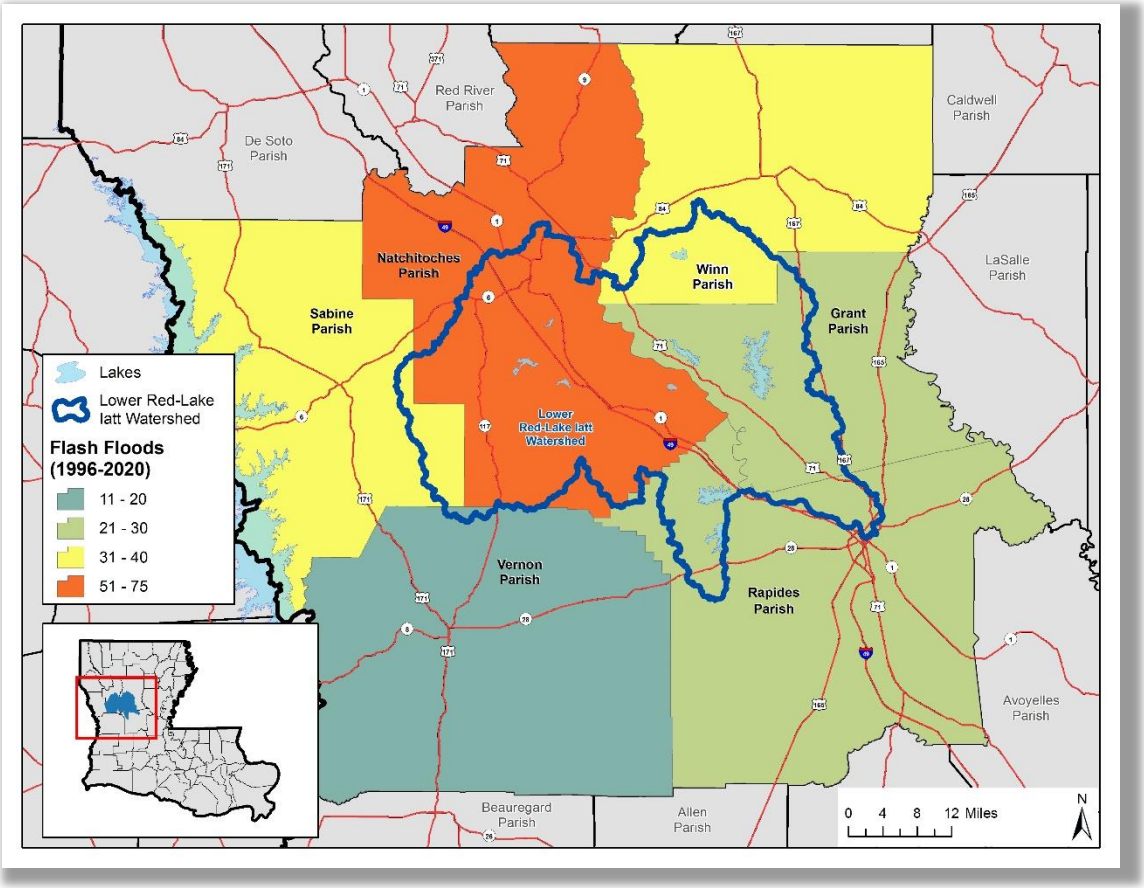

Figure 2: Flash Flood Incidents

Population

A review of land cover changes and population growth patterns in the watershed revealed that minimal development and a slight decrease in population occurred from 2010 to 2020 in most of the Lower Red-Lake Iatt watershed. According to the United States Census Bureau, almost every community decreased in population between 2010 and 2020. The study area's population dropped from 56,844 to 55,458, a difference of 2.4 percent. In comparison, the total population of Louisiana increased by 2.7 percent in the same timeframe.

Since 2010, three communities within the study watershed have experienced population growth: Grant Parish's population increased approximately one percent, Rapides Parish's population increased by approximately 2.6 percent, and the Village of Creola's population increased by approximately 12 percent. All other communities have declined in population since 2010, with Natchitoches Parish serving six percent fewer people, Sabine Parish and Winn Parish each serving approximately seven percent fewer people, and Vernon Parish serving approximately five percent fewer people. Assuming the average decrease rate experienced between 2010 and 2020, it is possible that the region population may decrease by another one percent between 2020 and 2025. See Figure 5 and Figure 7 in Appendix I for a watershed population density map and a population change map, respectively.

Watershed Land Use

The Lower Red-Lake Iatt watershed is predominately undeveloped, rural areas. The developed areas within this watershed are mainly in the northwest and southeast areas of the Lower Red-Lake Iatt watershed. The 17 communities range in population from 150 to over 18,000. On the northeast, southwest, and central portions of the study watershed, the land is mainly rural with land uses of agriculture, pastures, and evergreen forests. Excluding the combined areas of previously developed land and open water, roughly 1,296 sq. mi. of the Lower Red-Lake Iatt watershed still has the potential for new development. Table 1 shows both population and land use within the Lower Red-Lake Iatt watershed. See Figure 6 in Appendix I for a land cover map.

Table 1: Population and Area Characteristics [1]

Risk MAP Project	Total Population in Study Area (2020)	Average % Population Growth Yearly (2010-2020)	Predicted Population (by 2025)	Land Area (sq. mi.)	Developed Area (sq. mi.)	Open Water (sq. mi)
Lower Red-Lake Iatt (HUC-8 11140207)	55,458	-0.2%	54,905	1,426	88	42

*Total Land Area includes land and water.

National Flood Insurance Program (NFIP) Status and Regulations

To be a participant of the NFIP, all interested communities must adopt and submit floodplain management ordinances that meet or exceed the minimum NFIP regulations. These regulations can be found in the Code of Federal Regulations and most of the community ordinance requirements are in Title 44 parts 59 and 60. The level of regulation depends on the level of information available and the flood hazards in the area. The levels are as follows:

- A: The Federal Emergency Management Agency (FEMA) has not provided any maps or data – 60.3(a)
- B: Community has maps with approximate A Zones – 60.3(b)
- C: Community has a Flood Insurance Rate Map (FIRM) with Base Flood Elevations (BFE) – 60.3(c)
- D: Community has a FIRM with BFEs and floodways – 60.3(d)
- E: Community has a FIRM that shows coastal high hazard areas (V Zones) – 60.3(e)

To help mitigate the risk to areas where increased population and development are expected, communities can adopt (or exceed) the minimum standards of the NFIP. This is recommended as a proactive strategy to manage construction within the floodplain and avoid negative impacts to existing and future development. The Association of State Floodplain Managers (ASFPM) No Adverse Impact Floodplain Management is a good example.

To increase mitigation efforts and community flood awareness through potentially discounted premium rates, an NFIP community that has adopted more stringent ordinances or is actively completing mitigation and outreach activities is encouraged to consider joining the Community Rating System (CRS). The CRS is a voluntary incentive-based program that recognizes and encourages community floodplain management

[1] Data obtained from the U.S. Census Bureau; ESRI Demographic 5-year Projections; and National Land Cover Database

activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions.

Communities can review their current ordinances and reflect potential flood hazard changes by adopting updated ordinances early. This action can reduce future flood losses by affecting how substantial improvements or new construction are regulated. Figure 10 in Appendix I illustrates the NFIP flood losses within the project scope.

Hazard Mitigation Plan (HMP)

State and local governments must develop and adopt HMPs to be eligible for certain types of funding. To remain eligible, communities need to update and resubmit their plans every five years for FEMA approval. HMPs are created to increase education and awareness, identify strategies for risk reduction, and identify other ways to develop long-term strategies to reduce risk and protect people and property.

HMPs for Vernon Parish, Natchitoches Parish, Grant Parish, Winn Parish, the City of Natchitoches, the Town of Colfax, the Town of Montgomery, the Village of Clarence, the Village of Natchez, the Village of Provencal, the Village of Creola, and the Village of Atlanta have all expired, but new plans are in development. Rapides Parish, the City of Alexandria, the City of Pineville, and the Town of Boyce follow the Rapides Parish HMP, which is set to expire in November 2026. Sabine Parish participates in the Sabine Parish HMP, which is set to expire in February 2027.

HMPs effectively allow for FEMA to assess hazards identified through local, state, and federal partnerships and mitigation action items that communities have identified. These HMPs were used in the compilation and preparation of this report.

Community Rating System (CRS)

The CRS is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that communities undertake in addition to the minimum requirements they must meet when joining the NFIP. Individuals that carry flood insurance in a community that participates in the CRS program can receive a discount on their flood insurance premium. Discounts can range from 5 to 45 percent. As of March 2023, there are no CRS participating communities in the watershed. Table 2 depicts NFIP and CRS participation status and provides an overview of the effective flood data availability.

Table 2: NFIP and CRS Participation [2]

Risk MAP Project	Participating NFIP Communities/ Total Communities	Number of CRS Communities	CRS Rating Class Range	Average Years since FIRM Update	Level of Regulations (44 CFR 60.3)
Lower Red-Lake Iatt (HUC-8 11140207)	15/17	0	N/A	13	60.3(b) 60.3(c) 60.3(d)

[2] Data obtained from FEMA Community Information Systems.

Flood Insurance Rate Maps (FIRMs)

The average age of the oldest effective FIRMs within the study watershed is 18 years. The oldest effective map is in Rapides Parish; it is 42 years old and has an effective date of March 2, 1981. The newest effective maps in Winn Parish are three years old and have an effective date of August 19, 2020. As of 2023, all communities except for Rapides and Sabine Parishes in the watershed have modernized parish-wide effective digital FIRMs (DFIRMs).

Dams and Levees

As recorded by the United States Army Corps of Engineers (USACE) National Inventory of Dams (NID) datasets and the FEMA DFIRM databases, there are 21 dams within the study watershed. There are no dams in Sabine, Vernon, or Winn Parishes, seven dams in Grant Parish, 10 dams in Natchitoches Parish, and four dams in Rapides Parish. Several dams along numerous streams in the watershed are used to maintain water storage, control flooding, or divert flow. Figure 3 shows locations of dams and levees in the study watershed.

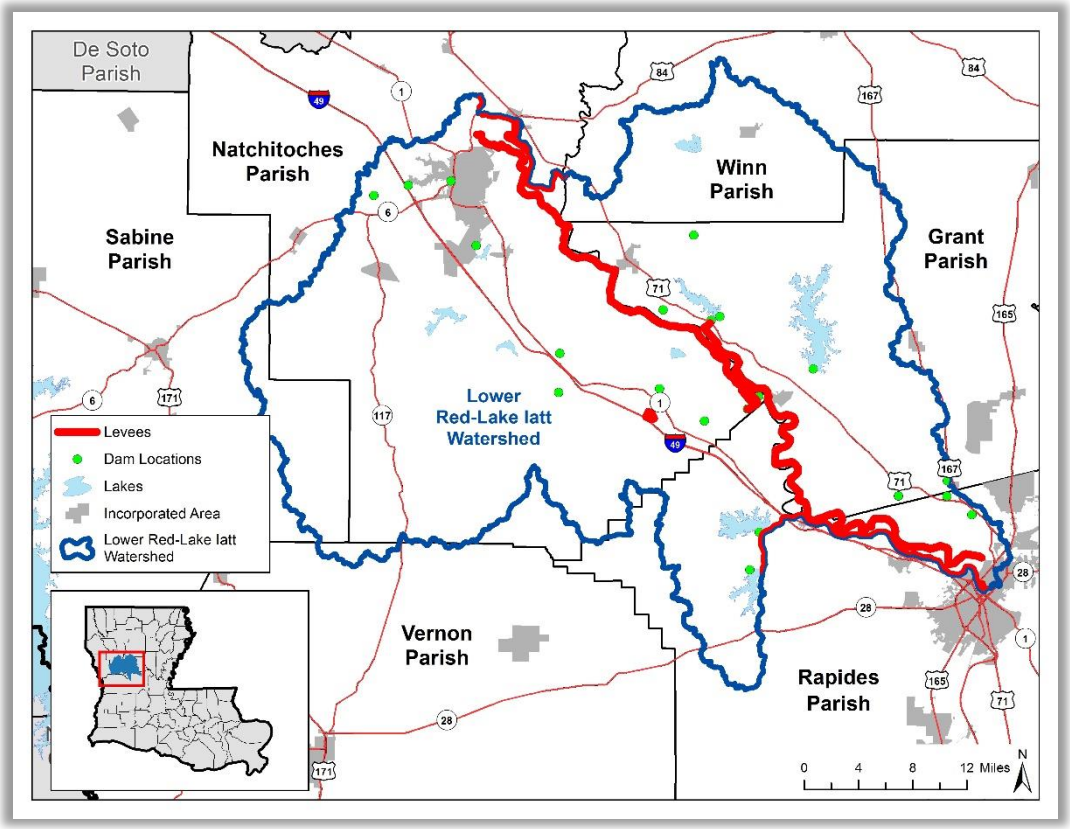

Figure 3: Dam and Levee Location Map for Lower Red-Lake Iatt watershed

The Lower Red-Lake Iatt watershed contains 21 dams that are used for various reasons, including recreation, flood control, irrigation, fire protection, water supply, and small fishponds. Most dams are privately owned, but several are owned by federal, state, and local government agencies and utility corporations, including the United States Army Corps of Engineers, the State of Louisiana, the Rapides Parish Police Jury, and CLECO. There are 15 dams in the watershed classified as low hazard, three are classified as high hazard, and three are classified as significant hazard. For high hazard dams, the owners and operators are required to develop and maintain Emergency Action Plans (EAPs) to reduce the risk of

loss of life and property if the dam fails. The Natural Resources Conservation Service (NRCS) has designed three dams in the study watershed. These NRCS dams are mainly used for flood control, to prevent erosion damage, to improve water supply and irrigation, and to create a habitat for wildlife. The largest dam in the watershed is the Iatt Lake Dam, which was completed in 1956 and stores a maximum of 167,000 acre-feet. Table 3 provides the characteristics of the dams identified in the entire HUC-8 watershed.

Table 3: Risk MAP Project Dam Characteristics[3]

Risk MAP Project	Total Number of Identified Dams	Number of Dams Requiring EAP	Percentage of Dams without EAP	Average Years since Inspection	Average Storage (acre-feet)
Lower Red-Lake Iatt (HUC-8 11140207)	21	8	5%	4	27,195

*Date of last inspection not provided for all records as of March 2023

There are four levees in the Lower Red-Lake Iatt watershed, of which three are FEMA accredited levees systems. These four levees provide flood protection to approximately 80 sq. mi. and protect over 18,000 people from Red River and Cane River flooding. There are four levees in Natchitoches Parish and one levee that crosses Rapides and Grant Parishes. The longest levee is the Aloha-Rigolette Levee, which covers approximately 42 miles along the Red River across Grant and Rapides Parishes.

[3] Data obtained from USACE National Inventory of Dams

Project Phases and Map Maintenance

Background

FEMA manages several risk analysis programs, including Flood Hazard Mapping, National Dam Safety, the Earthquake Safety Program, Multi-Hazard Mitigation Planning, and the Risk Assessment Program, all of which assess the impact of natural hazards and lead to effective strategies for reducing risk. These programs support the Department of Homeland Security's objective to "strengthen nationwide preparedness and mitigation against natural disasters."

FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing American communities for flood hazards. In the nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. A consistent risk-based assessment approach and a robust communication system are critical tools to ensure a community's ability to make informed risk management decisions and take mitigation actions. Flood hazard mapping is a basic and vital component for a prepared and resilient nation.

> *Flood-related damage between 1980 and 2013 totaled $260 billion [dollars], but the total impact to our Nation was far greater—more people lose their lives annually from flooding than any other natural hazard.*
>
> *FEMA, "Federal Flood Risk Management Standard (FFRMS)" (2015)*

In Fiscal Year 2009, FEMA's Risk MAP program began to synergize the efforts of federal, state, and local partners to create timely, viable, and credible information identifying natural hazard risks. The intent of the Risk MAP program is to share resources to identify the natural hazard risks a community faces and ascertain possible approaches to minimizing them. Risk MAP aims to provide technically sound flood hazard information to be used in the following ways:

- To update the regulatory flood hazard inventory depicted on FIRMs and the National Flood Hazard Layer
- To provide broad releases of data to expand the identification of flood risk (flood depth grids, water-surface elevation grids, etc.)
- To support sound local floodplain management decisions
- To identify opportunities to mitigate long-term risk across the nation's watersheds

How are FEMA's Flood Hazard Maps Maintained?

FEMA's flood hazard inventory is updated through several types of revisions.

Community-submitted Letters of Map Change (LOMCs)

First and foremost, FEMA relies heavily on the local communities that participate in the NFIP to carry out the program's minimum requirements. These requirements include the obligation for communities to notify FEMA of changing flood hazard information and to submit the technical supporting data needed to update the FIRMs.

Although revisions may be requested at any time to change information on a FIRM, FEMA generally will not revise an effective map unless the changes involve modifications to Special Flood Hazard Areas

(SFHAs). Be aware that the best floodplain management practices and proper assessments of risk result when the flood hazard maps present information that accurately reflects current conditions.

Under the current minimum NFIP regulations, a participating community commits to notifying FEMA if changes take place that will affect an effective FIRM no later than 6 months after project completion.

Section 65.3, Code of Federal Regulations

Letters of Map Amendment (LOMAs)

The scale of an effective FIRM does not always provide the information required for a site-specific analysis of a property's flood risk. FEMA's LOMA process provides homeowners with an official determination on the relation of their lot or structure to the SFHA. Requesting a LOMA may require a homeowner to work with a surveyor or engineering professional to collect site-specific information related to the structure's elevation; it may also require the determination of a site-specific BFE. Fees are associated with collecting the survey data and developing a site-specific BFE. Local surveying and engineering professionals usually provide an Elevation Certificate to the homeowner, who can use it to request a LOMA. A successful LOMA may remove the federal mandatory purchase requirement for flood insurance, but lending companies may still require flood insurance if they believe the structure is at risk.

FEMA-Initiated Flood Risk Project

Each year, FEMA initiates several Flood Risk Projects to create or revise flood hazard maps. Because of funding constraints, FEMA can study or restudy only a limited number of communities, parishes, or watersheds each year. As a result, FEMA prioritizes study needs based on a cost-benefit approach whereby the highest priority is given to studies of areas where development has increased, and the existing flood hazard data has been superseded by information based on newer technology or changes to the flooding extent. FEMA understands communities require products that reflect current flood hazard conditions to best communicate risk and implement effective floodplain management.

Flood Risk Projects may be delivered by FEMA or one of its Cooperating Technical Partners (CTPs). The CTP initiative is an innovative program created to foster partnerships between FEMA and participating NFIP communities, as well as regional and state agencies. Qualified partners collaborate in maintaining up-to-date flood maps. In FEMA Region 6, which includes the State of Louisiana, CTPs are generally statewide agencies that house the State Floodplain Administrator. However, some Region 6 CTPs are also large river authorities, flood control districts, regional planning agencies, or cities. They provide enhanced coordination with local, state, and federal entities, engage community officials and technical staff, and provide updated technical information that informs the national flood hazard inventory.

Risk MAP has modified FEMA's project investment strategy from a single investment by fiscal year to a multi-year phased investment, which allows FEMA to be more flexible and responsive to the findings of the project as it moves through the project lifecycle. Flood Risk Projects are funded and completed in phases.

General Flood Risk Project Phases

Each phase of the Flood Risk Project provides both FEMA and its partner communities with an opportunity to discuss the data that has been collected and to determine a path forward. Local engagement throughout each phase enhances the opportunities for partnership, furthers the discussion on current and future risk, and helps identify local projects and activities to reduce long-term natural hazard risk.

Flood Risk Projects may be funded for one or more of the following phases:

- Phase Zero – Investment
- Phase One – Discovery
- Phase Two – Risk Identification and Assessment
- Phase Three – Regulatory Product Update

Local input is critical throughout each phase of a Flood Risk Project. More details about the tasks and objectives of each phase are included below.

Phase Zero: Investment

Phase Zero of a Flood Risk Project initiates FEMA's review and assessment of the inventories of flood hazards and other natural hazards within a watershed area. During the Investment Phase, FEMA reviews the availability of information to assess the current floodplain inventory. FEMA maintains several data systems to perform watershed assessments and selects watersheds for a deeper review of available data and potential investment tasks based on the following factors:

Availability of High-Quality Ground Elevation Data

FEMA reviews readily available and recently acquired ground elevation data. This information helps identify development and earth-moving activities near streams and rivers. Where necessary, FEMA may partner with local, state, and other federal entities to collect necessary ground elevation information within a watershed.



If The National Map - Advanced Viewer can provide high-quality ground elevation data that is both available for a watershed area and compliant with FEMA's quality requirements, FEMA and its mapping partners may prepare engineering data to assess, revise, replace, or add to the current flood hazard inventory.

Mile Validation Status within Coordinated Needs Management Strategy (CNMS)

FEMA uses the CNMS database to track the validity of the flood hazard information prepared for the NFIP. The CNMS database reviews 17 criteria to determine whether the flood hazard information shown on the current FIRM is still valid.



Communities may also inform and request a review or update of the inventory through the CNMS website at https://msc.fema.gov/cnms/. The Coordinated Needs Management Strategy (CNMS) Technical Reference (fema.gov) provides an overview of the online tool. Requests should be directed to the appropriate FEMA Regional Offices for review.

Local Hazard Mitigation Plans

Reviewing current and historic hazard mitigation plans provides an understanding of a community's comprehension of its flood risk and other natural hazard risks. The mitigation strategies within a local

hazard mitigation plan provide a lens to local opportunities and underscore a potential for local adoption of higher standards related to development or other actions to reduce long-term risk.

Cooperating Technical Partner (CTP) State Business Plans
In some states, a CTP generates an annual state business plan that identifies future Flood Risk Project areas that are of interest to the state. The Louisiana Department of Transportation and Development (LADOTD) works to develop user-friendly data. In this project area, FEMA has worked closely with LADOTD to develop the project scope and determine the necessary project tasks.



Communities that have identified local issues are encouraged to indicate their data needs and revision requests to the State CTP so that they can be prioritized and included in the State Business Plans.

Possible Investment Tasks
After a review of the data available within a watershed, FEMA may choose to (1) purchase ground elevation data and/or (2) create some initial engineering modeling against which to compare the current inventory, also known as BLE modeling.

Phase One: Discovery

Phase One, the Discovery Phase, provides opportunities both internally (between the state and FEMA) and externally (with communities and other partners interested in flood potential) to discuss local issues with flooding and examine possibilities for mitigation action. This effort is made to determine where communities currently are with their examination of natural hazard risk throughout their community and to identify how state and federal support can assist communities in achieving their goals.



The Discovery process includes an opportunity for local communities to provide information about their concerns related to natural hazard risks. Communities may continue to inform the project identification effort by providing previously prepared survey data, as-built stream crossing information, and engineering information.

For a holistic community approach to risk identification and mapping, FEMA relies heavily on the information and data provided at the local level. Flood Risk Projects are focused on identifying (1) areas where the current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) areas of mitigation interest that may require more detailed engineering information than is currently available, and (3) community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on these evaluations of flood risk, data needs, availability of elevation data, regional knowledge of technical issues, identification of a community-supported mitigation project, and input from federal, state, and local partners.

Possible Discovery Tasks
Discovery may include a mix of interactive webinar sessions, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Data collection, interviews, and interaction with community staff and data-mining activities provide the basis for watershed-, community-, and stream-level reviews to determine potential projects that may benefit the communities. A range of analysis approaches are available to determine the extent of flood risk along streams of

concern. FEMA and its mapping partners will work closely with communities to determine the appropriate analysis approach, based on the data needs throughout the community.

These potential projects may include local training sessions, data development activities, outreach support to local communities wanting to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Two: Risk Identification and Assessment

Phase Two (Risk Identification and Assessment) continues the risk awareness discussion with communities through watershed analysis and assessment. Analyses are prepared to review the effects of physical and meteorological changes within the project watershed. The new or updated analysis provides an opportunity to identify how development has affected the amount of stormwater generated during a range of storm probabilities and shows how effectively stormwater is transported through communities in the watershed.



Coordination with a community's technical staff during engineering and model development allows FEMA and its mapping partners to include local knowledge, based on actual on-the-ground experience, when selecting modeling parameters.

The information prepared and released during Phase Two is intended to promote better local understanding of the existing flood risk by allowing community officials to review the variability of the risk throughout their community. As FEMA strives to support community-identified mitigation actions, it also looks to increase the effectiveness of community floodplain management and planning practices, including local hazard mitigation planning, participation in the NFIP, use of actions identified in the CRS Manual, risk reduction strategies for repetitive loss and severe repetitive loss properties, and the adoption of stricter standards and building codes.



FEMA is eager to work closely with communities and technical staff to determine the current flood risk in the watershed. During the Risk Identification and Assessment phase, FEMA would like to be alerted to any community concerns related to the floodplain mapping and analysis approaches being taken. During this phase, FEMA can engage with communities and review the analysis and results in depth.

Possible Risk Identification and Assessment Tasks

Phase Two may include a mixture of interactive webinars, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Flood Risk Project tasks may include hydrologic or hydraulic engineering analysis and modeling, floodplain mapping, risk assessments using Hazus-Multi Hazard software, and preparation of flood risk datasets (water-surface elevation, flood depth, or other analysis grids). Additionally, projects may include local training sessions, data development activities, outreach support to local communities that want to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Three: Regulatory Products Update

If the analysis prepared in the previous Flood Risk Project phases indicates that physical or meteorological changes in the watershed have significantly changed the flood risk since the last FIRM was printed, FEMA will initiate the update of the regulatory products that communities use for local floodplain management and NFIP activities.

Delivery of the preliminary FIRM and Flood Insurance Study (FIS) report begins another period of coordination between community officials and FEMA to discuss the required statutory and regulatory steps both parties will perform before the preliminary FIRM and FIS report can become effective. As in the previous phases, FEMA and its mapping partners will engage with communities through a variety of conference calls, webinars, and in-person meetings.

Once the preliminary FIRMs are prepared and released to communities, FEMA will initiate the statutory portions of the regulatory product update. FEMA will coordinate a Consultation Coordination Officer meeting and initiate a 90-day comment and appeal period. During this appeal period, local developers and residents may coordinate the submittal of their comments and appeals through their community officials to FEMA for review and consideration.

FEMA welcomes this information because additional proven scientific and technical information increases the accuracy of the mapping products and better reflects the community's flood hazards identified on the FIRMs.

Communities may host or hold Open House meetings for the public. The Open House layout allows attendees to move at their own pace through several stations, collecting information in their own time. This format allows residents to receive one-on-one assistance and ask questions pertinent to their situations or their interests in risk or flood insurance information.

All appeals and comments received during the statutory 90-day appeal period, including the community's written opinion, will be reviewed by FEMA to determine the validity of the appeal. Once FEMA issues the appeal resolution, the associated community and all appellants will receive an appeal resolution letter and FEMA will revise the preliminary FIRM, if warranted. A 30-day period is provided for review and comment on successful appeals. Once all appeals and comments are resolved, the flood map is ready to be finalized.

After the appeal period, FEMA will send community leaders a Letter of Final Determination stating that the preliminary FIRM will become effective in six months. The letter also discusses the actions each affected community participating in the NFIP must take to remain in good standing in the NFIP.

After the preceding steps are complete and the six-month compliance period ends, the FIRMs are considered effective maps and new building and flood insurance requirements become effective.

The following sections describe FEMA's Risk MAP investment in the Lower Red-Lake Iatt watershed to date.

Lower Red-Lake Iatt Watershed Risk MAP Project

Watershed Selection Factors

FEMA Risk MAP Project life cycles begins with Phase Zero (Investment) and Phase One (Discovery). The investment in these two phases in the Lower Red-Lake Iatt watershed paves the way for the local communities to move towards flooding resilience. FEMA selected and prioritized the watershed for BLE Investment and Discovery with the overall goal of assisting the local governments in identifying flood risks and strengthening their ability to make informed decisions about reducing these risks. Figure 4 shows communities within the Lower Red-Lake Iatt watershed.

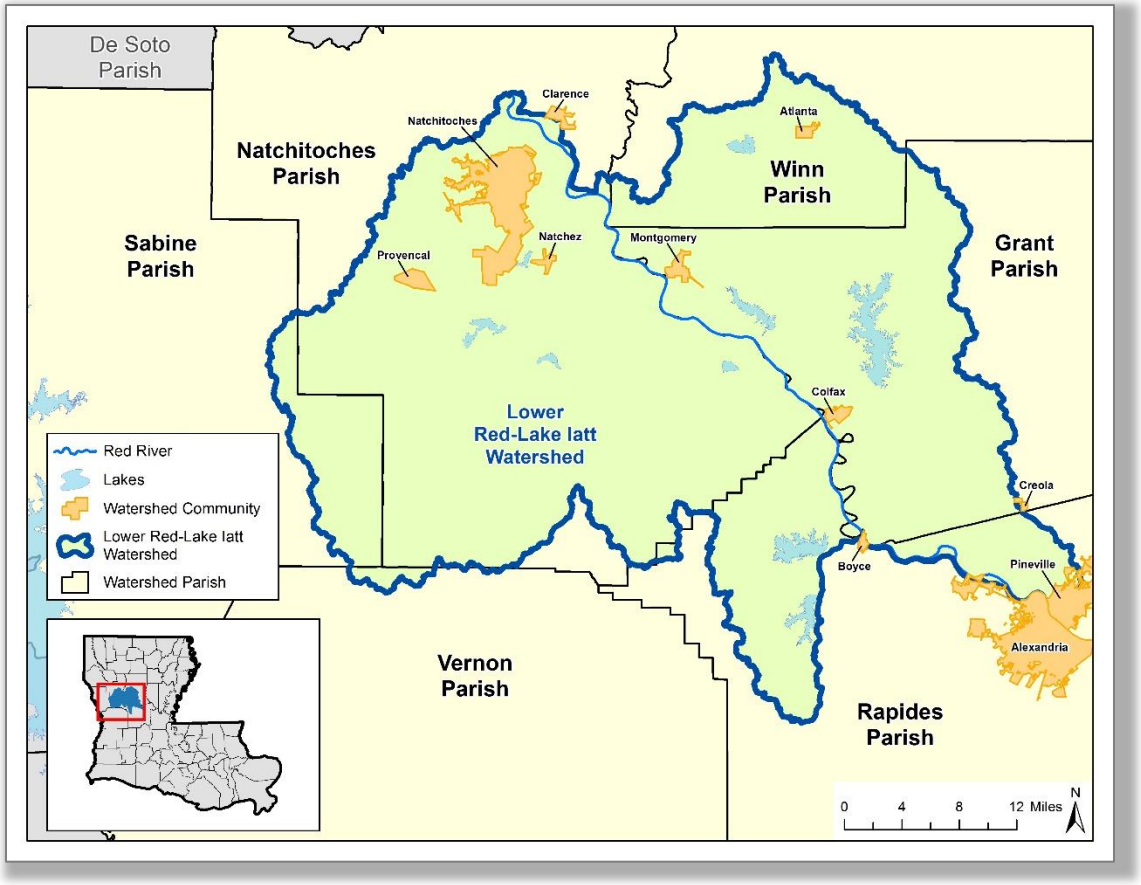

Figure 4: Overview of communities located within the Lower Red-Lake Iatt watershed

Many factors and criteria are reviewed for watershed selection: flood risk, the age of the current flood hazard data, population growth trends and potential for growth, recent flood claims, and disaster declaration history. The availability of local data and high-quality ground elevation data is reviewed for use in preparing flood hazard data. The CNMS database is reviewed to identify large areas of unknown or unverified data for streams. FEMA consults the State of Louisiana CTPs, the State NFIP Coordinator, and the State Hazard Mitigation Officer when watersheds are identified for study.

Flood Risk

Numerous flooding events are listed in the historical record. With a decrease in population over the next five years, the increase in urbanization is not likely and therefore the increase in the area's potential for flood damage may not rise.

In September 2016, several cities throughout the watershed experienced a slow-moving storm system which caused flash floods across the region requiring water rescues by The Louisiana National Guard. In August 2017, Hurricane Harvey produced flash floods and tornadoes causing damages to several properties. Road closures are common in Natchitoches Parish, where streams such as Old River and Cane River Lake overtop roadways.

Many additional flood related damages have been recorded in the various communities in the watershed. These flood events cause extensive damage to local infrastructure and illustrate the ongoing threat in the Lower Red-Lake Iatt watershed. Despite a population decline, most communities in the watershed have slightly increased their urban area footprint with more impermeable surfaces between 2011 and 2019.

Growth Potential

The Lower Red-Lake Iatt watershed is predominately rural except for the urbanized communities of the City of Natchitoches, the City of Alexandria, the Town of Provencal, the Town of Montgomery, and the Town of Colfax. Because of a steady decrease in population over the last decade, future development is likely to happen gradually over time.

Age of Current Flood Information

All parishes, except for Sabine Parish and Rapides Parish, in the Lower Red-Lake Iatt watershed have been updated to modernized parish-wide DFIRMs and FIS reports as part of FEMA's MAP MOD program that began in 2004. Some studies in Grant Parish, Vernon Parish, and Winn Parish went effective as recently as 2016, 2018, and 2020, respectively. However, many of the hydrology and hydraulic models supporting the mapping currently shown on the FIRMs in the parishes within the watershed have not been updated since the 1980s and 1990s. All mappings shown on these FIRMs were mixed between Zones X, AE, and A floodplains and did not always show readily available Base Flood Elevations (BFEs).

The combination of related severe floods, outdated flood information, and increasing development indicate that this watershed needs updated flood hazard information to support floodplain management activities, especially in Rapides and Sabine Parishes.

Availability of High-Quality Ground Elevation Data

FEMA's data availability review indicated that high-quality ground elevation data was available for all the Lower Red-Lake Iatt watershed in the form of Light Detection and Ranging (LiDAR) data. This data provides a great basis for preparing hydrologic and hydraulic modeling and help identify development and earth-moving activities near the streams and creeks. The available LiDAR data was collected by The United States Geological Survey (USGS) in 2007. The source and date of the LiDAR topographic data coverage used in the Discovery and BLE projects for in the Lower Red-Lake Iatt watershed is shown in Figure 5. See Figure 9 in Appendix I for topographic data sources for the whole watershed.

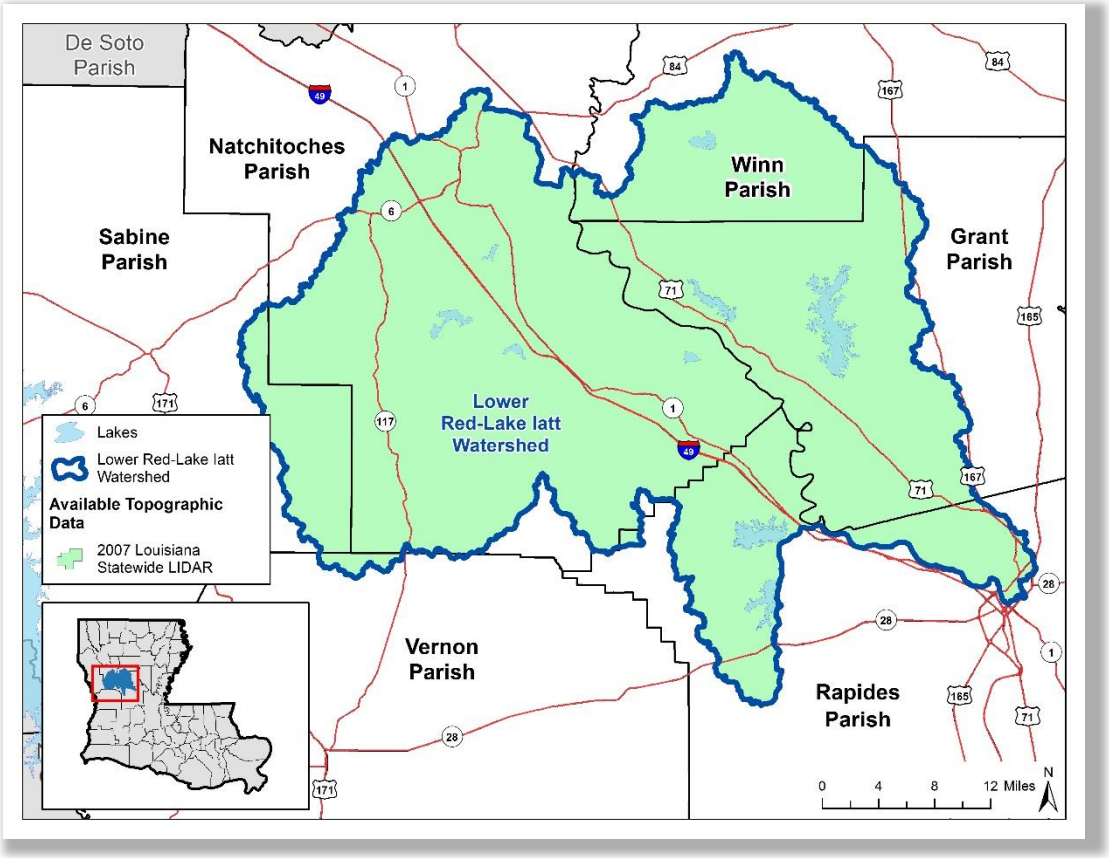

Figure 5: Availability of LiDAR data

Coordinated Needs Management Strategy (CNMS) Database Review

The CNMS database indicates the validity of FEMA's flood hazard inventory. CNMS reviews 17 criteria to determine whether flood hazard information shown on the current FIRMs is still valid. Streams that are indicated as ***Unverified*** or ***Unknown*** in the database indicate that the information used to map the floodplains currently shown on the FIRM is inaccessible or that a complete evaluation of the critical and secondary CNMS elements could not be performed. Figure 6 shows the CNMS-based attributed streams for the study watershed.

Unmapped Stream Coverage

FEMA also reviewed the current stream coverage and reviewed the areas against the National Hydrography Dataset (NHD). The NHD medium-resolution data inventoried by the USGS maps created at a 1:100,000 scale was used to review the watercourses within the Lower Red-Lake Iatt watershed. Population centers of 1,000 or more were reviewed for additional mileage against the high-resolution data inventoried by the USGS Quadrangle maps created at a 1:24,000 scale. CNMS was completed as part of the BLE project in October 2021 and was updated as part of the Discovery process. The intent of this review was to identify streams and watercourses and create a complete stream network for preparing BLE data.

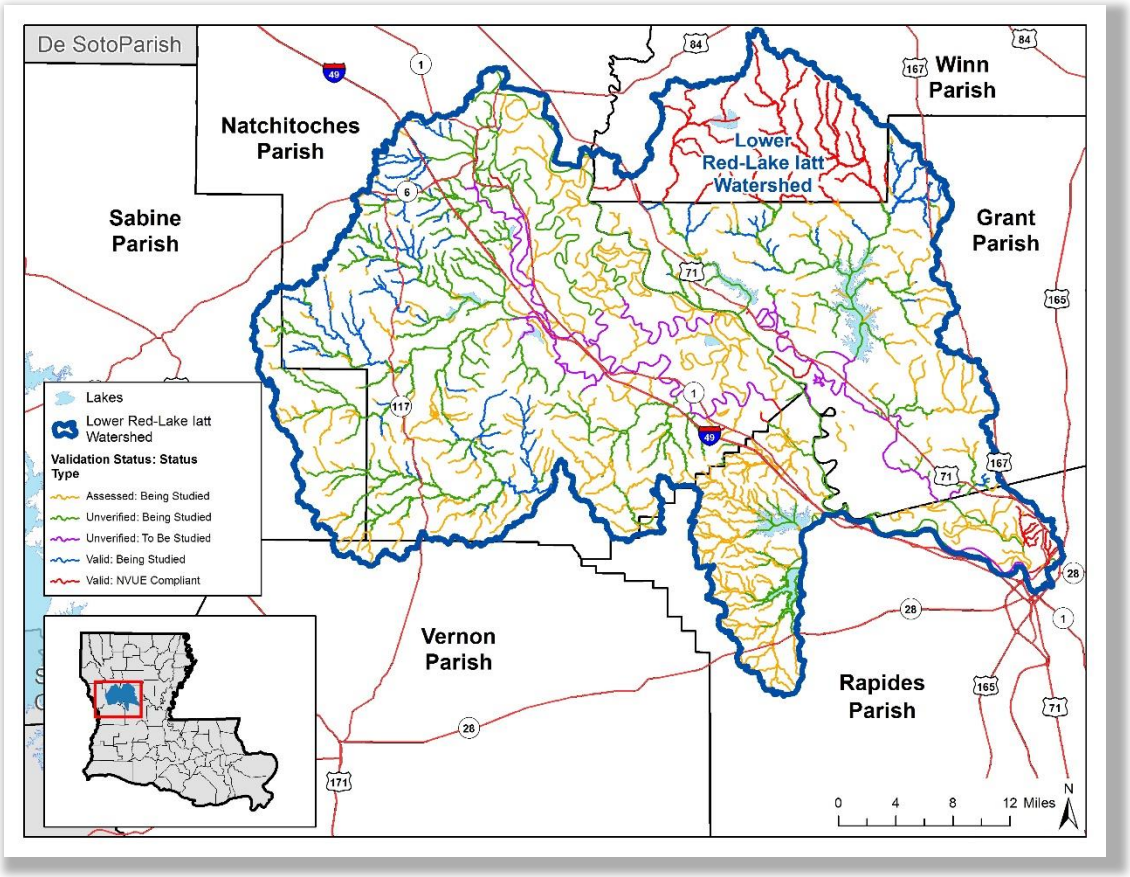

Figure 6: Overview of CNMS streams

Phase Zero – Base Level Engineering (BLE) – Lower Red-Lake Iatt Watershed (2020)

In 2020, FEMA began investing in BLE data development for the Lower Red-Lake Iatt watershed in Louisiana. This 2D approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area. BLE utilizes a gridded surface and precipitation model in conjunction with breaklines at significant hydraulic features and structures (streams, roads, dams, etc.) to develop a pluvial and fluvial flooding model that is calibrated to reflect data collected with USGS stream gages. The BLE project was published in October 2021 as MIP case numbers 20-06-0049S for the Lower Red-Lake Iatt watershed. The BLE report is included in Appendix III.

BLE provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter time. The data prepared through BLE provides planning-level data that is prepared to meet FEMA's Standards for Floodplain Mapping. BLE is scalable and can be updated for use as regulatory and non-regulatory products. Communities can choose to adopt the BLE as approximate, model-backed mapping in locations without model-backed Zone A mapping. Detailed studies can add structures to the BLE modeling for further refinement into Limited Detail studies or Detailed studies with or without floodway. Figure 7 shows the network of streams analyzed using the BLE approach. The results of this BLE study have been incorporated into the Discovery Process to support the engagement and communication activities that take place during the Discovery phase.

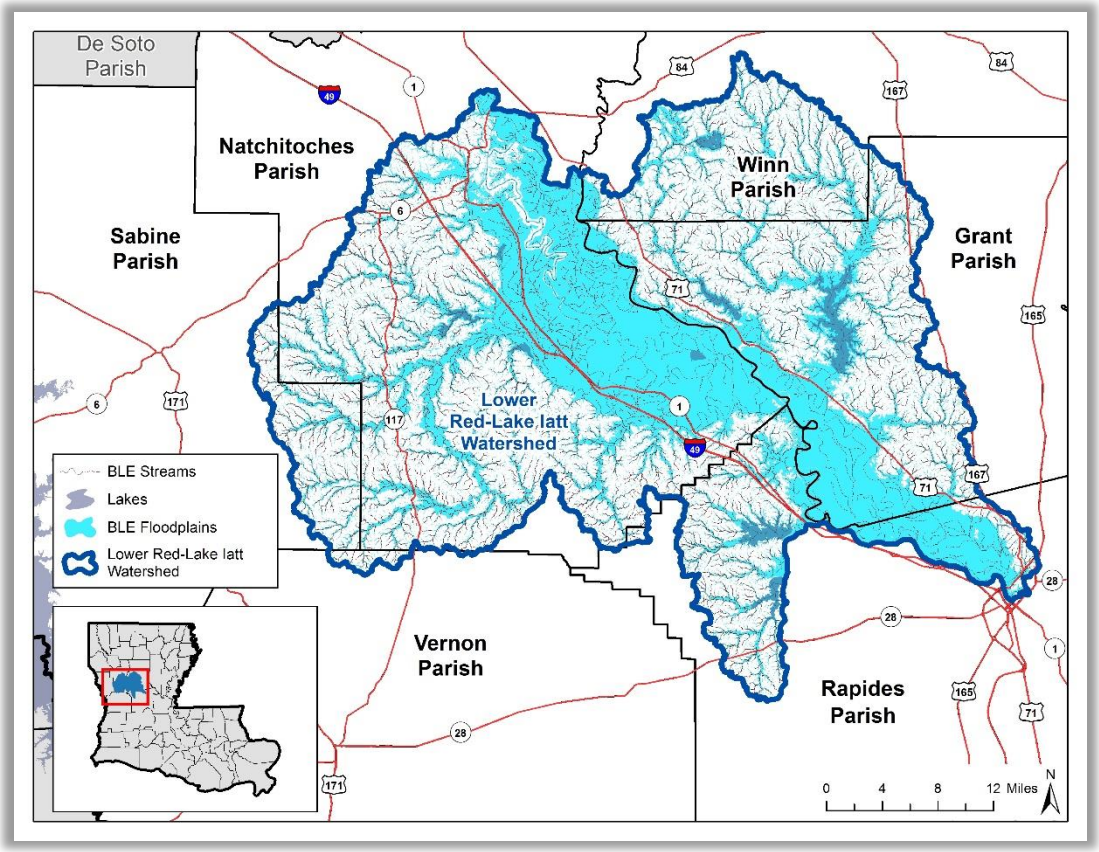

Figure 7: Overview of BLE streams and BLE floodplain

FEMA Base Level Engineering (BLE) Deliverables

The BLE provided the following items for use in the Lower Red-Lake Iatt watershed:

- Hydrologic modeling (regression) flow values for the 10%, 4%, 2%, 1%, 1%+ and 0.2%, and 1%- frequencies
- Hydraulic (HEC-RAS) modeling for all study streams (for the same frequencies listed above)
- 10-, 1-, and 0.2-percent-annual-chance floodplain boundaries
- 1- and 0.2-percent-annual-chance Water Surface Elevation Grids
- 1- and 0.2-percent-annual-chance Flood Depth Grids
- HAZUS flood analysis for the watershed
- Point file indicating the location of culverts and inline structures that may be informed by local as-built information
- Flood Risk Map (See Appendix I)

The BLE information is available on FEMA's Estimated BFE viewer for communities to use for planning, risk communication, floodplain management, and permitting activities.

CNMS Validation and Assessment

Per the Lower Red-Lake Iatt BLE report, "[as] described in Title 42 of the Code of Federal Regulations, Chapter III, Section 4101(e), once every five years, FEMA must evaluate whether the information of Flood Insurance Rate Maps (FIRMs) reflects the current risks in flood prone areas. FEMA makes this determination of flood hazard data validity by examining flood study attributes and change characteristics, as specified in the Validation Checklist of the Coordinated Needs Management Strategy (CNMS) Technical Reference. The CNMS Validation Checklist provides a series of critical and secondary checks to determine the validity of flood hazard areas studied by detailed methods (e.g., Zone AE, AH, or AO)."

The Regional CNMS database, National Flood Hazard Layer, and paper inventory were used as reference data to ensure extent of the BLE results represents appropriate flooding extent. The BLE CNMS database was revised for the study watershed during Discovery and the report tables are available in Appendix I.

Phase One – Discovery: Lower Red-Lake Iatt Watershed

The LADOTD-led Discovery project focused on the "Discovery" of flood hazards and risks throughout the Lower Red-Lake Iatt watershed. Through the Discovery process, flood risks are identified and local communities have an opportunity to collaborate with the State CTP to identify specific regions within the watershed that may benefit from future FEMA funded study and assessment. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand the interrelationships between upstream and downstream community flood risk throughout the watershed. At the conclusion of the Discovery process, the identified needs of the watershed will be considered for future investment in the Risk MAP process.

The Lower Red-Lake Iatt watershed Discovery project was completed through the following activities:

- Data Gathering
- Pre-Discovery Engagement Efforts
- Discovery Meeting
- Watershed Findings and Prioritizations

All possible efforts were made to ensure that stakeholders understood the Discovery and Risk MAP process through emails, phone calls, newsletters, and a developed website created for this Discovery project.

Data Gathering

Federal and state databases were downloaded and reviewed during the Pre-Discovery phase to highlight areas of concern where additional information from stakeholders would be most beneficial to fully understand the flood risk and damages in the area. Dams, levees, soils classification, recent developments, various population metrics, collections of high-water marks and low water crossings, historical flooding information, and more were reviewed to best prepare for in-depth conversations surrounding local action and impact. Additionally, the BLE water surface elevation rasters were compared to the effective flood extents and base flood elevations to check for any differences that might have been the result of changes in terrain or modeling considerations used in the non-regulatory model development. The final BLE Report is available in Appendix III. Table 4 summarizes the geospatial data collected.

Table 4: Geospatial Data Collection

Data Type	Data Source	Data Description
HUC Watershed Boundaries	USGS	HUC boundary for the Lower Red-Lake Iatt HUC-8. Also includes HUC-10 and HUC-12.
Roadways	US Census Bureau	2021 TIGER Line Roads
Jurisdictional Boundaries - Louisiana	LADOTD	Data includes city and parish boundaries
Current Effective Floodplain Information	FEMA DFIRMs	Data includes Floodplains, BFEs, and Cross Sections
Streamlines	FEMA DFIRMs	Stream Centerlines and Profile Baselines from DFIRM
BLE Floodplains and Stream	FEMA	Base Level Engineering Study for the Lower Red-Lake Iatt Watershed
Locations of Letters of Map Revision (LOMRs)	FEMA	LOMRs incorporated into Effective DFIRM databases and LOMRs filed after Effective DFIRM dates for watershed parishes
Coordinated Needs Management Strategy	FEMA	CNMS database dated December 31, 2021
Topography - Louisiana	LADOTD	2007 & 2008 Statewide LiDAR
HAZUS-based Loss Estimates	FEMA	HAZUS 5.0 (2021) building exposure and flood loss estimates per Census Tract
Location of Dams	National Inventory of Dams	Dam locations with Emergency Action Plan (EAP) status
Stream Gauges	USGS	Stream Gauge locations
Flood Claims	FEMA NFIP	Total number and value of claims by community for Louisiana
Land Cover	USGS	National Land Cover Dataset for 2011 and 2019
Land Use	USGS	Derived from National Land Cover Dataset 2019
Population	US Census Bureau	2020 U.S. Census
Population Growth	US Census Bureau	Calculated change between the 2010 and 2020 U.S. Census
U.S. Congressional Districts - Louisiana	LADOTD	Congressional District Boundaries
State House & Senate Districts - Louisiana	LADOTD	State House and Senate District Boundaries
National Risk Index	FEMA	NRI Rating data at the census tract level

The Discovery engagement process also included the development of a user-friendly website for data collection, verification, and coordination. The website was developed to become a repository to collect project information such as community background data; newsletters planned meeting dates, times, and locations; project data deliverables; and reports. Figure 8 and Figure 9 show the website splash screen and progress tracking page, respectively.

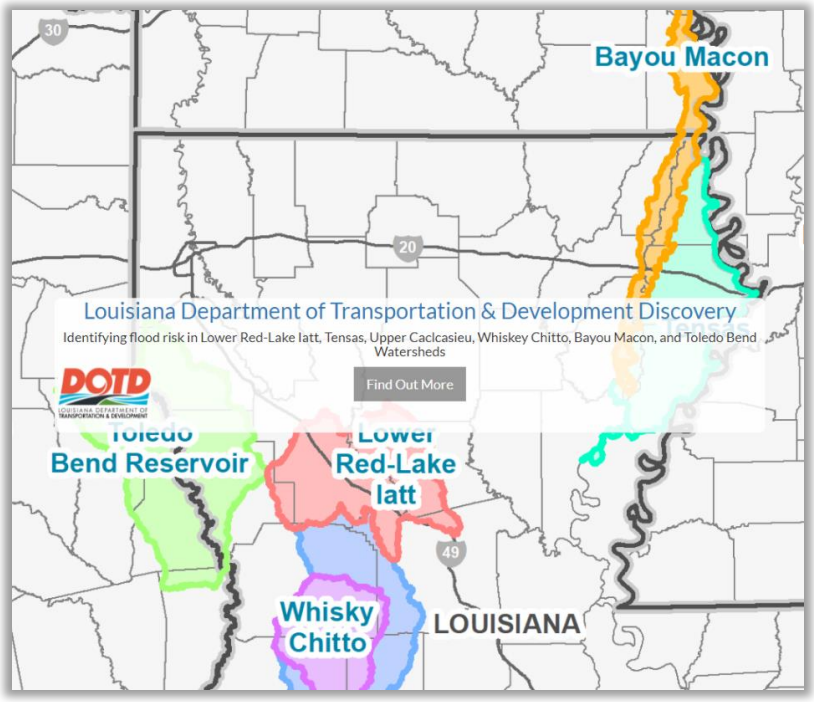

Figure 8: Website Splash Screen

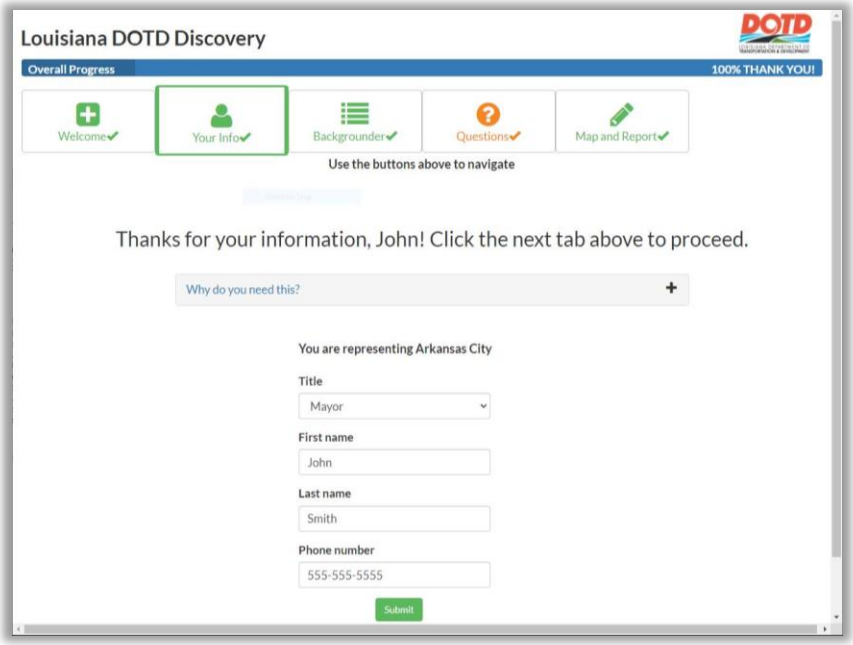

Figure 9: Website Progress Tracking Page

For the FEMA LADOTD Discovery project, the Discovery website allowed participating stakeholders to view basemap layers pertinent to the study area, including BLE rasters and polygons, effective FIRM layers, and satellite and street view imagery. Users were then able to update flood-related information about their community, including local flood risks, flood hazards, mitigation plans, mitigation activities, flooding history, development plans, and floodplain management activities. It also allowed stakeholders to input Areas of Mitigation Interest (AOMI) such as mitigation concerns, mapping needs, and requests on a web map. The website tracked community participation and helped accelerate the Discovery process by creating easy-to-use GIS shapefiles with attribute tables relevant to flood sources and community comments. Figure 10 shows the webmap interface.

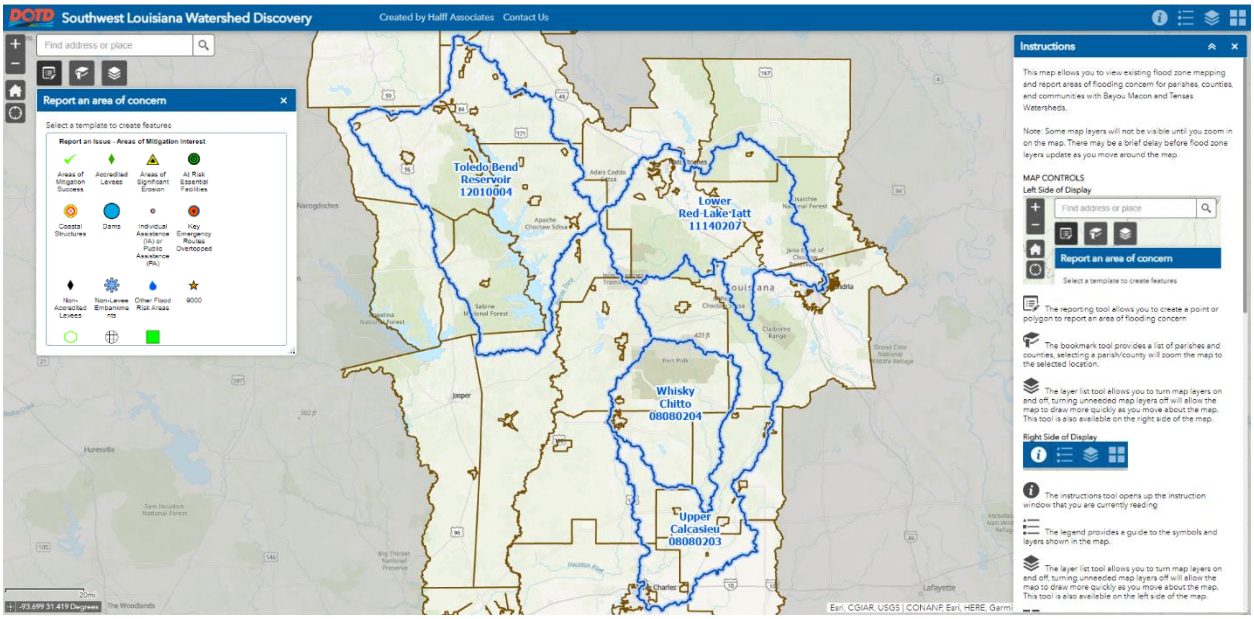

Figure 10: Webmap Interface

Pre-Discovery Engagement Efforts

A Discovery flyer was emailed out to the communities on file two weeks prior to the Pre-Discovery meeting. A Discovery newsletter was also developed and distributed to all stakeholders to gain public awareness of the Lower Red-Lake Iatt Discovery process. The newsletter contained information about FEMA's Risk MAP program, the Discovery process, details of the upcoming Pre-Discovery Meeting, the data collection process, and the Risk MAP process beyond Discovery. A copy of the flyer and the newsletter is included in Appendix I.

LADOTD held an informational Pre-Discovery Meeting on January 19, 2022, for stakeholders in the study watershed. A copy of the presentation is available in Appendix I. The Pre-Discovery informational meeting was held to increase awareness of the Discovery process prior to the Discovery Meeting so the stakeholders would be prepared to fully participate in the Discovery process. Seven stakeholders participated in the meeting. The goals of the Pre-Discovery Meeting were to:

- Explain the Discovery process
- Explain why the LADOTD was conducting Discovery in the Lower Red-Lake Iatt watershed
- Explain FEMA's Risk MAP program and benefits
- Introduce the website with a tutorial and open website enrollment
- Obtain information for Discovery in the watershed

Discovery Meeting

An in-person Discovery Meeting was held in the watershed with the goals of gathering additional flood risk data; discussing the communities' flooding history, development plans, flood mapping needs, and flood risk concerns; and discussing the vision for the watershed's future and the importance of mitigation planning and community outreach. The Discovery Meeting occurred on March 8, 2022 from 12:00 pm - 4:00 pm at the Natchitoches Parish Library in Natchitoches, Louisiana. In addition, an in-person Discovery Meeting was held in the Toledo Bend Reservoir watershed on March 9, 2022 at the Cypress Bend Golf Resort, Spa and Conference Center from 12:00 pm - 4:00 pm in Many, Louisiana, and an in-person Discovery Meeting was held for the Whisky Chitto and Upper Calcasieu watersheds on March 10th at the Beauregard Parish Library from 12:00 pm - 4:00 pm in DeRidder, Louisiana. Local stakeholders were invited to join for any of these meetings to offer flexibility in schedules and ideally collect more data.

Community stakeholders were able to participate in the meeting when most convenient to them. Discovery Ambassadors assisted stakeholder attendees through various stations in a "come and go" format. The stations included:

- *Laptops* – stakeholders were able to review, edit, or add information entered on the Discovery website.
- *Discovery Maps* – data collection process to capture information on identifying flood risk locations and problems, areas of growth or planned development, answering floodplain questions, and identifying map need locations.

Following the Discovery Meeting, stakeholders were contacted through email and phone calls to discuss their concerns and comments in detail. Often, in-person meetings were scheduled to offer a more in-depth webmap training and fuller conversations surrounding the identified areas of mitigation interest. Through these efforts, 100% community participation and representation were achieved via either phone/email coordination, in person meetings, or webmap usage.

The Lower Red-Lake Iatt Discovery project gathered 28 comments from the Discovery Meeting, from phone calls, and from the online web map. Of these 28 comments, no new mapping requests were made.

Watershed Findings and Prioritizations

Watershed Findings

Following the Discovery Meeting, the gathered community comments were placed into categories by comment type and summarized by parish, as shown in Table 5.

Table 5: Lower Red-Lake Iatt Comment Distribution by Parish

Parish Names	Stakeholder Comments						Total Number of Comments
	General Flood Note	Past Claim Hot Spot	Areas of Significant Erosion	Pumps/ Gravity Stations	Flooding Hot Spot	Other (As Reported)	
Grant	2				1		3
Natchitoches	3		2		4	1. At risk facilities: Town hall, police dept, fire department	10
Rapides	4	4		4	2		14
Sabine	No Comments Received						0
Vernon	No Comments Received						0
Winn						1. Non-Levee Embankments	1

*Some comments were general to watershed naming, do not provide flooding or pertinent information, or are conversations had and are not represented in this table.

Figure 11 shows a sample of the comments submitted by communities. There were nine general flood notes covering topics such as at-risk essential facilities, low-laying areas, and no current FIRM. Four past claims were reported as well as seven flooding hot spot areas. There were two reported areas of significant erosion. There were four comments about pumps or gravity stations. One non-levee embankment was also reported. All stakeholder comments were submitted to FEMA in the digital supplemental data deliverable associated with this project.

Figure 12 demonstrates the differences in numbers per comment type. Twenty-eight comments were submitted for flood related concerns, such as new development, flooding homes, and areas with insufficient pumps that flood with heavy rainfall. Mapping concerns include four comments related to needs for updated mapping, such as a detailed study not matching BLE study. No new or completed mitigation actions were reported.

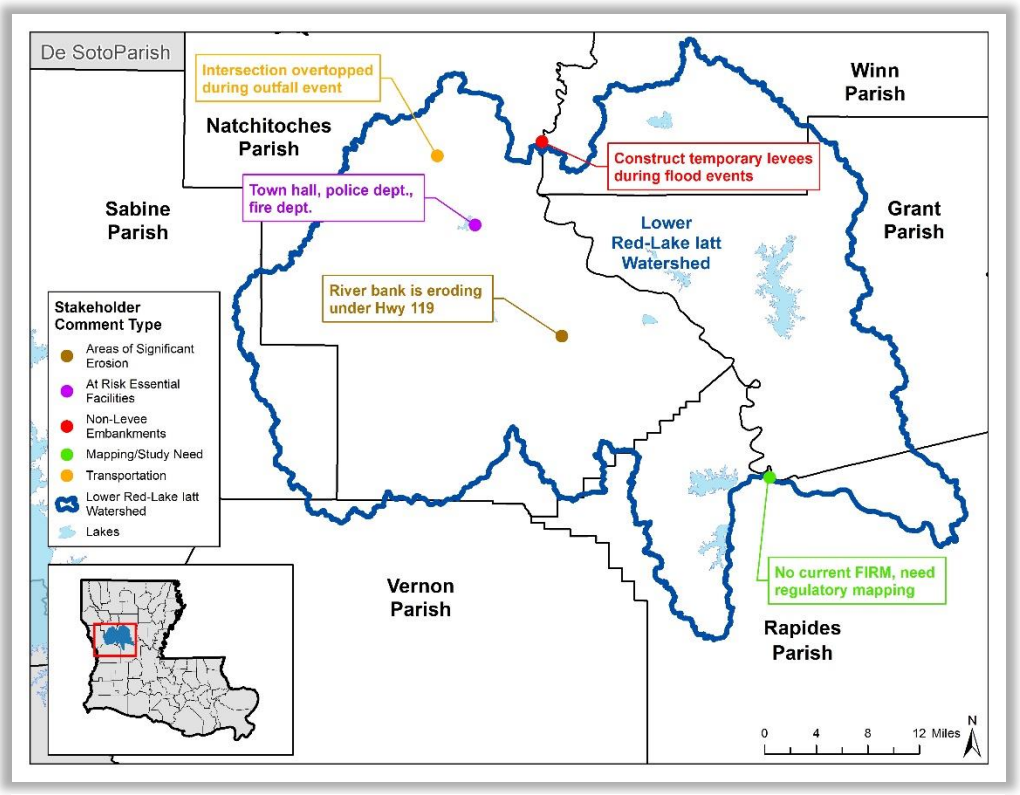

Figure 11: Stakeholder Comment Examples

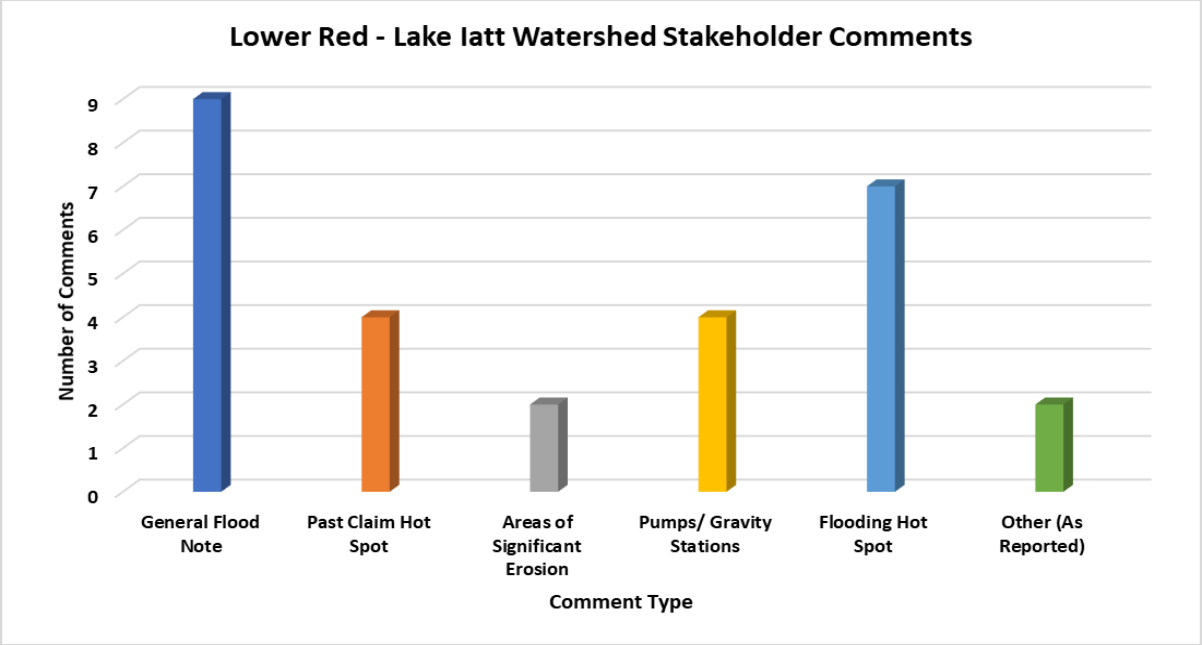

Figure 12: Stakeholder Comment Totals

Project Selection and Prioritization

Because of the presence of approximately 930 unverified CNMS stream miles in either Zone A or AE in the rural communities of this HUC-8 watershed, it is recommended that mapping updates be performed at a parish-wide level, rather than at the level of the individual flooding sources. This recommended approach to mapping updates would bring the number of modernized parishes from four to six (Rapides Parish and Sabine Parish are not yet modernized). Table 6 gives a more in-depth review of the parish CNMS data for all six parishes that intersect the Lower Red-Lake Iatt watershed.

Table 6: CNMS Data by Parish

CNMS Data by Parish							
Parish	Total Area (mi^2)	Oldest Effective FIRM Date	Total Stream Miles	Total Streams Unverified			A/AE Unverified of Total Mileage
				Zone	Segment Count	Miles	
Grant	664	6/16/2016	851	A	70	155	27%
				AE	17	76	
Natchitoches	1300	7/6/2015	2244	A	344	883	44%
				AE	16	105	
Rapides	1361	3/2/1981	2268	A	194	392	22%
				AE	24	102	
Sabine	996	8/5/1991	1260	A	200	709	58%
				AE	8	28	
Vernon	1318	11/26/2010	2678	A	90	404	16%
				AE	15	30	
Winn	956	8/19/2020	1127	A	10	10	1%
				AE	-	-	

Using the age of the oldest effective FIRM in the parish in conjunction with the percentage of unverified CNMS stream mileage, these needs for FIRM updates were prioritized from a low to moderate to high ranking with Rapides Parish rated as the highest priority. In addition to the CNMS data listed above, additional information such as partial update coverage and dates, DFIRM status, and stakeholder comments and requests were considered for this ranking. The outcome of this exercise can be seen in Table 7.

Table 7: Mapping Needs Prioritization by Parish

Mapping Needs Prioritization by Parish		
Parish	**Priority**	**Reason**
Rapides	Highest	More than 20% of the stream miles are unverified, and the oldest effective date exceeds the last 40 years. No DFIRM.
Sabine	High	More than 55% of the stream miles are unverified, and the oldest effective date exceeds the last 30 years. No DFIRM.
Natchitoches	High	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
Grant	Moderate	More than 25% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
Vernon	Low	Less than 20% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.
Winn	Low	Less than 5% of the stream miles are unverified, and the oldest effective date is within the last 5 years. DFIRM available.

Winn and Vernon Parishes receive a "Low" ranking due to relatively new FIRM data, DFIRM availability, and a lower percentage of unverified stream miles. Nearly half of the FIRM panels for Vernon Parish were updated in 2018. Grant Parish has FIRMs dating back to only 2016, but just over 25% of stream miles are unverified Zone A or AE streams which suggests this parish should be ranked as a "Moderate" need for this watershed. Although Natchitoches Parish is comparable to Grant Parish when considering age of oldest FIRM, this parish receives a "High" rank due to having nearly 1,000 unverified stream miles in the parish resulting in almost 45% of the stream miles being unverified Zone A or AE. Sabine Parish has also received a "High" ranking in the Lower Red–Lake Iatt watershed due to its 30+ year old FIRM dates and lack of modernized DFIRM availability. Additionally, this parish has more than 55% of its total stream miles as unverified Zone A or AE streams, suggesting that current understanding of flood risk has questionable accuracy. The lack of DFIRM availability, oldest FIRM dates in the watershed (dating back to 1981), over 20% of CNMS mileage being unverified Zone A or AE, and preliminary FIRMs from 2007 all support Rapides Parish in receiving the "Highest" ranking for CNMS needs prioritization. Stakeholder comments outlining concerns on flooding hot spots, past claims, and pump station capacity issues place this parish as the highest ranked for update needs. A heatmap outlining the parish's rank and unverified CNMS Zone A and AE streams can be seen in Figure 13.

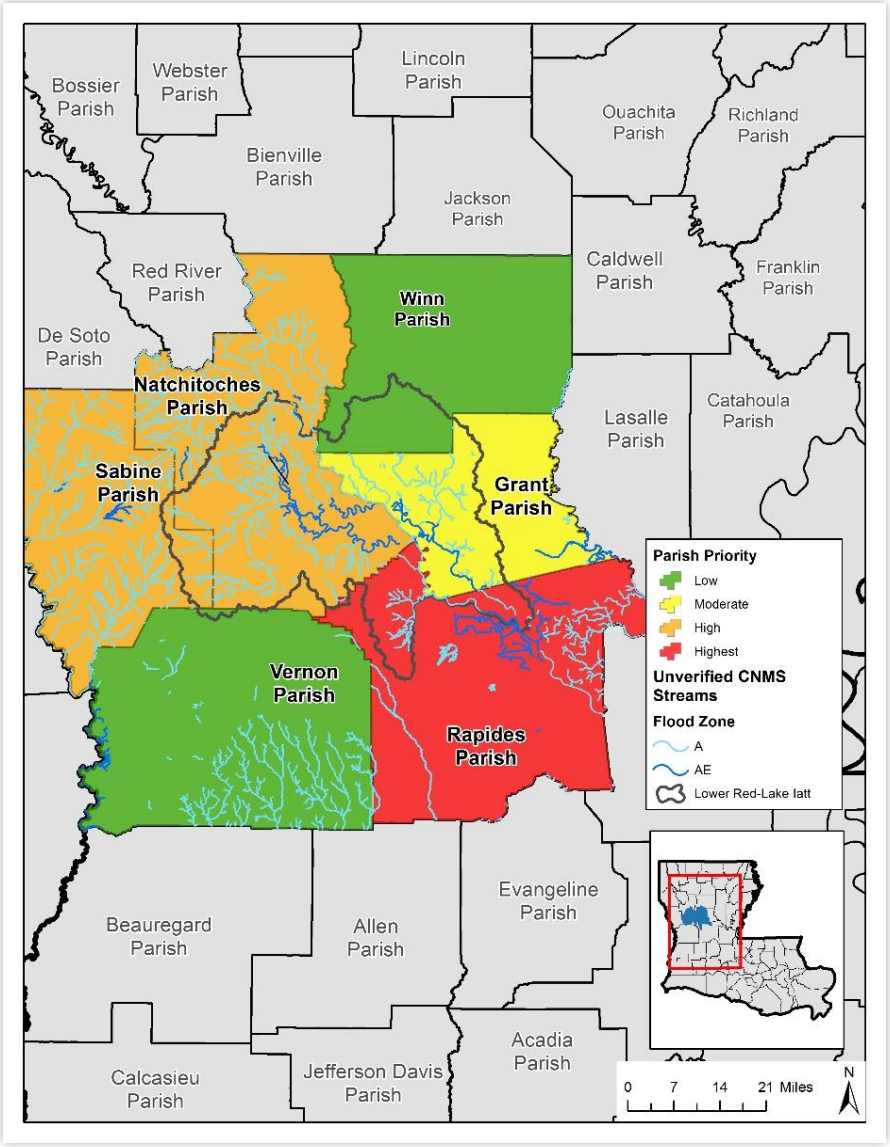

Figure 13: Parish Prioritization with Unverified CNMS Zone A and Zone AE Streams

When considering these projects, effort and cost associated with that effort must be weighed. The bulk of stream miles in need of update for all six of these parishes fall under Zone A. Given the BLE availability and recent practices of adopting BLE for FIRM map creation, it is expected that these miles will incur a reduced cost from previous Zone A modeling and mapping tasks. Every parish, aside from Winn Parish has unverified Zone AE streams as well. These will require enhancement of the BLE models with structure survey and further refinement before being used for any FIRM production. Additionally, the presence of a floodway in these streams would require a more advanced 2D modeling enhancement approach to produce accurate floodway coverage. The additional confidence in the BLE results after refinement and updated survey data in the AE flood zones will provide communities with better models for mitigation considerations such as channel widening or hardening, pump resizing, and other approaches that might be considered to address the concerns given through the Discovery process. This parish-wide mapping approach will maximize the value received from the improved models and mapping updates.

Data availability for enhancement and limiting factors, such as lack of levee accreditation, must also be weighed when considering parishes for updates and modernization. For parishes with non-accredited levee systems, further discussions on the status and schedule of accreditation should happen before investment in the enhancement of the BLE. Table 8 and Table 9 outline the data availability and limitations as described.

*Table 8: Parish Levee Accreditation Status**

Parish	Modernized	Levee Accreditation	
		Levee	Accreditation
Grant	Y	Aloha-Rigolette LA	Accredited
Natchitoches	Y	Campti-Clarence AR	Accredited
		Martco Levee	Accredited
		Natchitoches LA	Accredited
		Natchitoches West Bank Levee System	Non-Accredited
		Natchitoches-Red River West Bank Levee 2	Accredited
		Red River-Kraft System	Accredited
		State of Louisiana-Red River Levee	Accredited
		State of Louisiana-Red River Levee 2	Accredited
Rapides	N	Aloha-Rigolette LA	Accredited
		Philip Bayou Levee	Accredited
		Pineville LA	Accredited
		Red River-South Bank Systems	Accredited
		West of Atchafalya Basin	Accredited
Sabine	N	-	-
Vernon	Y	-	-
Winn	Y	-	-

*Includes all levees in the parishes affected by the watershed

Table 9: Parish BLE Status

Parish	Additional Intersecting BLE Models		
	Watershed Name	Status	Level of Study
Grant	Dugdemona	In Progress	-
	Little	Published	2D
Natchitoches	Bayou Pierre	Published	2D
	Black Lake Bayou	Published	2D
	Middle Red-Coushatta	Published	2D
	Saline Bayou	Published	2D
	Toledo Bend Reservoir	Published	1D
	Upper Calcasieu	Published	2D
Rapides	Bayou Teche	Published	2D
	Little	Published	2D
	Lower Red	Published	2D
	Upper Calcasieu	Published	2D
	Whisky Chitto	Published	2D
Sabine	Bayou Pierre	Published	2D
	Lower Sabine	Published	1D
	Toledo Bend Reservoir	Published	1D
Vernon	Lower Sabine	Published	1D
	Upper Calcasieu	Published	2D
	Whisky Chitto	Published	2D
Winn	Winn Parish (FOA)	Published	1D
	Castor	In Progress	-
	Dugdemona	In Progress	-
	Little	Published	2D
	Saline Bayou	Published	2D

Flood Risk Assessments Results

HAZUS is a risk assessment software program for analyzing potential losses in dollars from floods, hurricane winds, and earthquakes. The BLE flood data developed for this project was used as input data for the HAZUS-based flood risk assessment. The Lower Red-Lake Iatt watershed has an estimated $5.1 billion dollars worth of vulnerable assets, including residential, commercial, and other asset types. If a 100-year storm event were to occur throughout the watershed, HAZUS estimated two percent of the assets will be damaged, with losses estimated at over $750 million dollars to physical assets. There will also be economic losses, including lost wages, inventory losses, losses in production, and economic opportunity losses, valued at $495 million dollars. Figure 14 and Figure 15 show the capital stock inventory within the study watershed and the corresponding 100-year event losses. Figure 11 in Appendix I shows a more detailed potential loss risk map for the watershed.

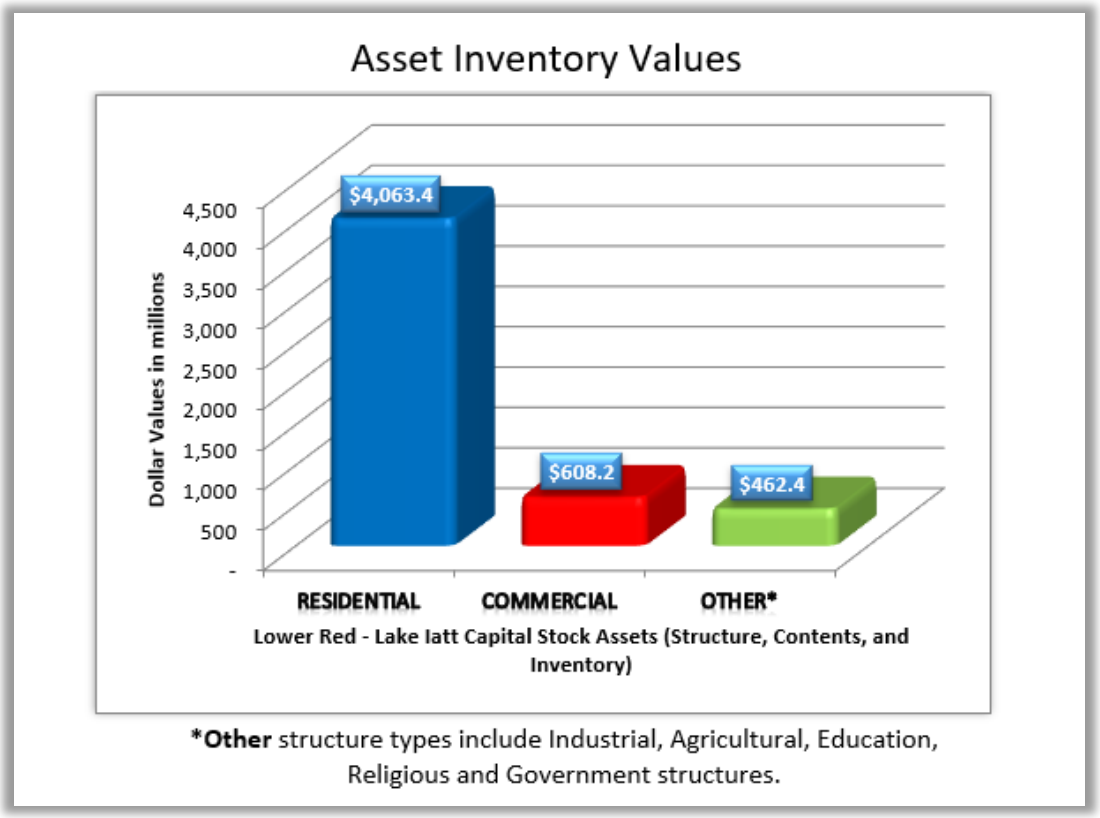

Figure 14: Asset Inventory Value Totals

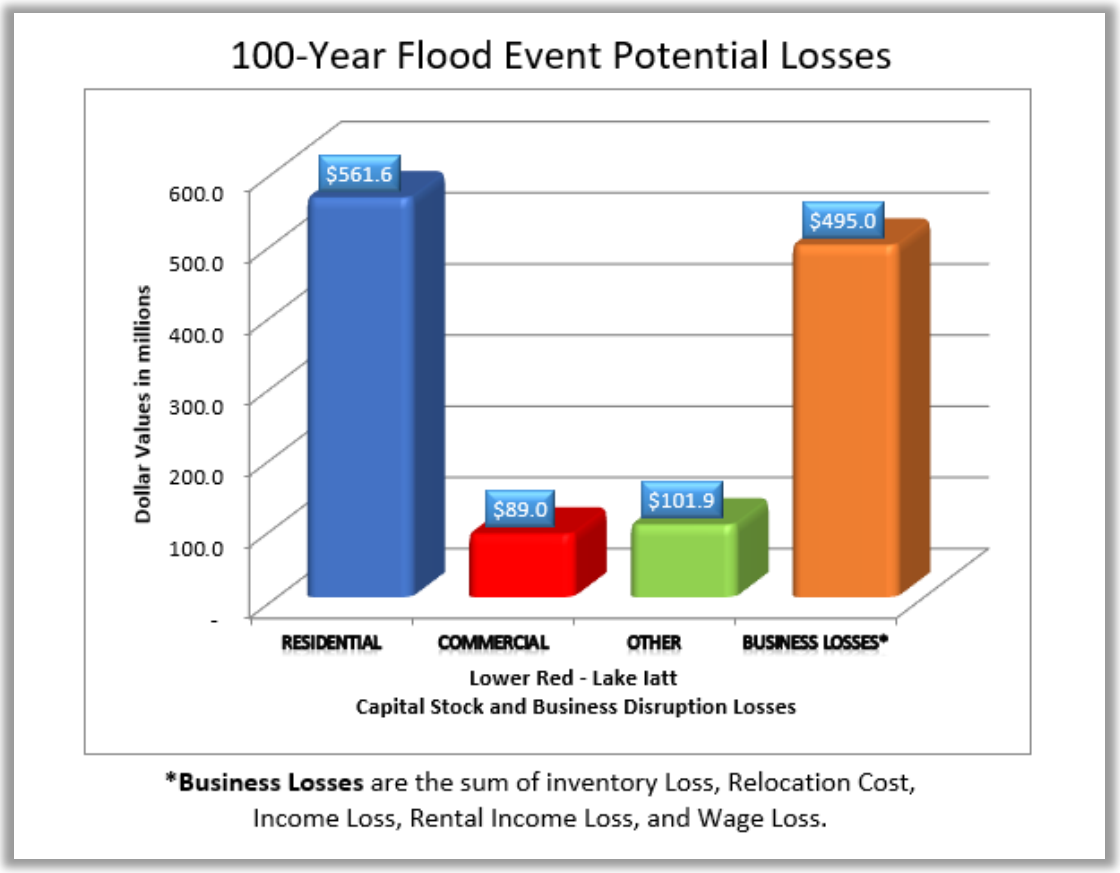

Figure 15: 100-Year Flood event Potential Loss Totals

Because the parishes in the Lower Red-Lake Iatt watershed have land in other watersheds, these HAZUS-based 100-year flood loss estimates are not indicative of their total potential loss estimates. Hence, the losses shown in this report do not necessarily represent community-wide totals.

Aggregating the HAZUS-based 100-year flood loss estimates to parishes provides another method to prioritize new studies and hazard mitigation projects in the watershed. Figure 16 ranks the HUC-12s by estimated flood losses. Most of the watershed is at risk for $1 million dollars to $253 million dollars in potential loss if there is a 100-year flood event. The southwest and northeast portions of the watershed risk up to $1 million dollars in potential losses based on the 100-year flood loss estimates.

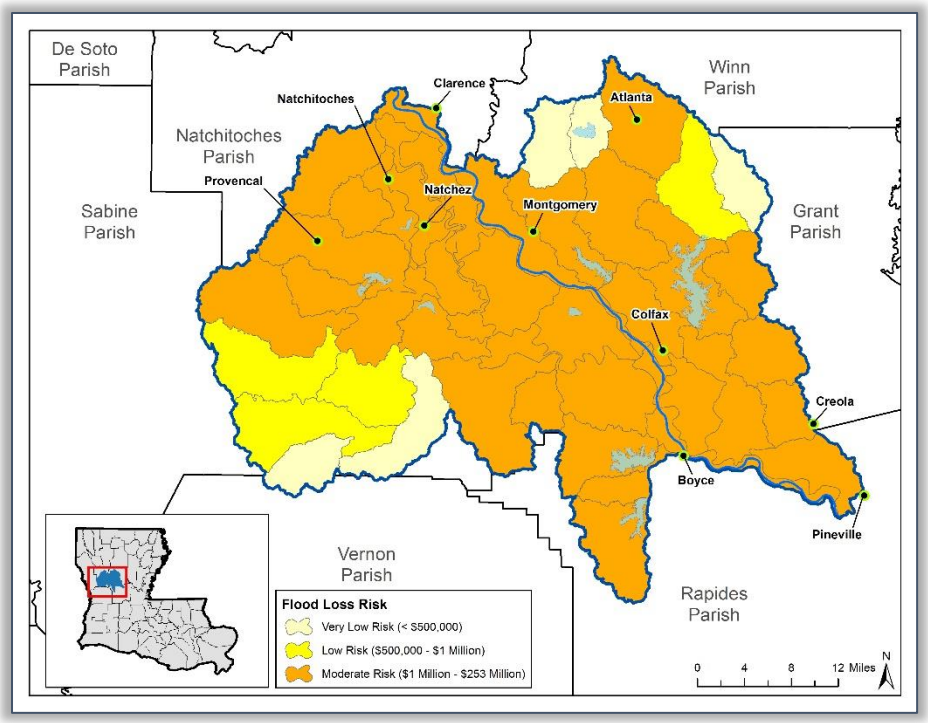

Figure 16: HAZUS-based 1% Annual Chance Loss Estimates by HUC-12s

Project Recommendation

Based on the needs of the communities, the availability of the data, and the current FEMA investment process, the proposed projects were prioritized for FEMA investment based on the following criteria. First, non-digital parishes with no levees are recommended as primary considerations for immediate investment. The projects would enhance the BLE data in areas with effective Zone AE streams and advance BLE data to FIRMs. The next tier is the non-digital parishes with Accredited levees. These projects would enhance and advance BLE while incorporating the results of the levee accreditation. The next tier is the non-digital parishes with non-accredited levees. These projects require additional coordination with the levee owners to determine accreditation status and schedule before BLE enhancement and advancement can occur. The readiness of the community to provide support can also be considered in the project prioritization.

From the outlined criteria for consideration and available data for reference, the following projects are recommended.

- **Sabine Parish BLE Enhancement and Regulatory Update** – Sabine Parish is non-digital with 720 miles of a combination of model-backed and non-model-backed effective Zone A and 34 miles of Zone AE streams. The study would leverage the Lower Red–Lake Iatt, Lower Sabine, Bayou Pierre, and Toledo Bend Reservoir BLE datasets for all Zone A streams and enhance the 34 miles through the effective Zone AE. The enhanced data would be combined with the BLE data to update the parish regulatory data. The Parish Social Vulnerability Index Score is 0.8396.
- **Rapides Parish BLE Enhancement and Regulatory Update** – Rapides Parish is non-digital with 804 miles of a combination of model-backed and non-model-backed effective Zone A and 207 miles of Zone AE streams. The study would leverage the six BLE datasets and enhance the 207 miles through

the effective Zone AE. The enhanced data would be combined with the BLE data to update the parish regulatory data. Prior to funding the study, the levee accreditation status of the five systems would be confirmed. If there are any proposed changes to the accreditation status, then the levee information would be confirmed prior to initiating the regulatory process. The Parish Social Vulnerability Index Score is 0.9198.

- **Vernon Parish BLE Enhancement and Regulatory Update** – Vernon Parish FIRMs are digital and were updated as recently as 2010, 2011, and 2018. There are 1,256 miles of a combination of model-backed and non-model-backed effective Zone A and 38 miles of Zone AE streams in the parish. The study would leverage the Whisky Chitto, Lower Red–Lake Iatt, Lower Sabine, and Upper Calcasieu BLE datasets and enhance the 38 miles through the effective Zone AE. The enhanced data would be combined with the BLE data to update the parish regulatory data. The Parish Social Vulnerability Index Score is 0.7801.
- **Grant Parish BLE Enhancement and Regulatory Update** – Grant Parish FIRMs are digital and were updated in 2016. There are 566 miles of a combination of model-backed and non-model-backed effective Zone A and 90 miles of Zone AE streams in the parish. The study would leverage the Dugdemona, Lower Red-Lake Iatt, and Little BLE datasets and enhance the 90 miles through the effective Zone AE. The enhanced data would be combined with the BLE data to update the parish regulatory data. Prior to funding the study, the levee accreditation status of the Aloha-Rigolette LA levee would be confirmed. If there are any proposed changes to the accreditation status, then the levee information would be confirmed prior to initiating the regulatory process. The Parish Social Vulnerability Index Score is 0.5563.
- **Natchitoches Parish BLE Enhancement and Regulatory Update** – Natchitoches Parish FIRMs are digital and were updated in 2015. There are 1,147 miles of a combination of model-backed and non-model-backed effective Zone A and 122 miles of Zone AE streams in the parish. The study would leverage the seven BLE datasets that cover the parish and enhance the 122 miles through the effective Zone AE. The enhanced data would be combined with the BLE data to update the parish regulatory data. Prior to funding the study, the levee accreditation status of the eight levees in the parish would be confirmed. If there are any proposed changes to the accreditation status, then the levee information would be confirmed prior to initiating the regulatory process. The Parish Social Vulnerability Index Score is 0.838.
- **Winn Parish BLE Outreach and 2D BLE Adoption** – Winn Parish FIRMs are digital and were updated in 2020 and 2023. There are 1,082 miles of a combination of model-backed and non-model-backed effective Zone A and 37 miles of Zone AE streams in the parish. The majority of these streams have been recently studied through a First Order Approximation (FOA) study conducted for the parish. 2D BLE models covering the parish can be adopted to cover all outstanding Zone A streams. Additionally, BLE outreach and utilization training will provide the parish with tools for future planning. The Parish Social Vulnerability Index Score is 0.7323.

Follow-Up On Phase Project Decisions

The BLE results and the effective DFIRM floodplains were compared to identify any areas of significant change. If the results show large areas of change (expansions and contractions of the floodplain, increases and decreases of the computed BFEs, and increases in expected flow values) FEMA will continue to coordinate with the communities to identify the streams that should be considered for FIRM updates. These updates could be Letter of Map Revisions for small project areas, or a Physical Map Revision for large areas with mapping changes.

To identify other streams for future refinement, community growth patterns and potential growth corridors should be discussed with FEMA. These areas of expected community growth and development may benefit from updated flood hazard information. BLE can be further refined to provide detailed study information for a Flood Risk Identification Study and a FIRM update.

Areas of communities that were developed prior to 1970 (pre-FIRM areas) may include repetitive and severe repetitive loss properties. They may also be areas where re-development is likely to occur. Having updated flood hazard information before re-development and reconstruction activities take place may benefit communities by providing guidance to mitigate future risk.



The Discovery process aims to identify a subset of the BLE stream studies to be updated and included on the FIRMs. Communities may wish to review these possible areas and provide feedback once the BLE data has been received. Local communities can also refine BLE information and submit it through the Letter of Map Revision (LOMR) process to revise the existing flood hazard information and maintain the FIRMs throughout their community.

Post-Discovery Findings Meeting

LADOTD held one virtual Post-Discovery Meeting on March 17, 2023, for stakeholders in the watershed. A copy of the presentation is available in Appendix I.

The Post-Discovery informational webinar was held to discuss the results of the Discovery process and findings, including a review of comments received, preliminary HAZUS results, and BLE data. The FEMA Estimated BFE viewer which can be used for reporting and downloading data, was presented and demonstrated to community stakeholders. The goals of the Post-Discovery Meeting were to:

- Recap FEMA's Risk MAP program's benefits and the Discovery process
- Discuss comments received by stakeholders
- Explain watershed prioritization and stream study requests
- Review HAZUS results
- Demonstrate the permanent FEMA BFE viewer
- Release a draft report to the communities prior to the release of the final report

Future Investments Decisions

FEMA will work closely with communities to identify additional areas for model refinement and FIRM panel updates. Communities will be provided information and training to support the use of BLE for planning, floodplain management, permitting, and risk communication activities. FEMA will work with communities to review, interpret, and incorporate the BLE information into their daily and future community management and planning activities.

Next Steps

Once the Discovery process is completed, FEMA will review project recommendations and determine if a project will move forward to update the regulatory products (FIS report, FIRM, and DFIRM database). A cursory review of the modeling results indicates that this study area has significant changes in floodplain width and depth.



FEMA will work with communities to collect any outstanding technical inquiries within the study area after delivering the hydrologic and hydraulic analysis and floodplain work maps. After coordinating with communities, FEMA will likely initiate the Phase Three effort to update the regulatory products.

Appendix I: Additional Data

Appendix Figures

Figure 01: Watershed (HUC-8) Location
Figure 02: U.S. Congressional Districts
Figure 03: Louisiana State House Districts
Figure 04: Louisiana State Senate Districts
Figure 05: Population Density
Figure 06: Land Cover
Figure 07: Population Change
Figure 08: Effective Floodplains
Figure 09: Topographic Data Source
Figure 10: NFIP Flood Losses
Figure 11: Flood Risk – Potential Losses
Figure 12: Social Vulnerability Index
Figure 13: Resilience Rating
Figure 14: Flood Risk Rating
Figure 15: Flood Risk Population Exposure
Figure 16: Community Rating System (CRS) Participating Communities

Figure 1:

Watershed (HUC-8) Location

LOWER RED-LAKE IATT WATERSHED

September 16, 2022

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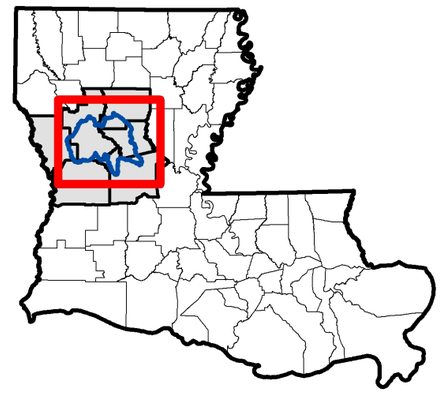
WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Clarence
Atlanta
Natchitoches
Natchez
Montgomery
Provencal
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Red River
Lake Iatt
Lake Rodemacher
Cotile Lake

Map Symbology

- Red River
- Other Streams
- Major Highways
- Lower Red-Lake Iatt
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Municipalities

- Alexandria
- Atlanta
- Boyce
- Clarence
- Colfax
- Creola
- Montgomery
- Natchez
- Natchitoches
- Pineville
- Provencal

0 6 12 Miles

N

Figure 2:

U.S. Congressional Districts

LOWER RED-LAKE IATT WATERSHED

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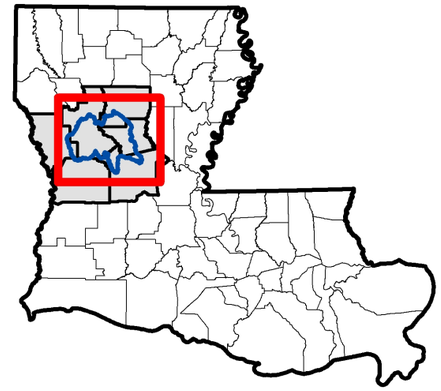
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish
Natchitoches
Colfax
Alexandria
District 5
District 4
Nantachie Lake
Lake Iatt
Lake Rodemacher
Cotile Lake
Red River

U.S. House of Representatives

District 4: Rep. Mike Johnson (R)
District 5: Rep. Julia Letlow (R)

U.S. Senators

Sen. Bill Cassidy (R)
Sen. John Kennedy (R)

Map Symbology

- Parish Seat
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Federal House Districts (2021)

- District 4
- District 5

0 6 12 Miles

N

Figure 3:

Louisiana State House Districts

LOWER RED-LAKE IATT WATERSHED

September 16, 2022

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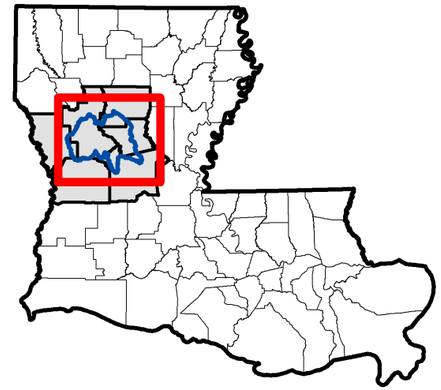

De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Natchitoches
Colfax
Alexandria

District 13
District 22
District 23
District 24
District 25
District 26
District 27

Nantachie Lake
Lake Iatt
Lake Rodemacher
Cotile Lake
Red River

Map Symbology

- Parish Seat
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

State House Districts (2020)

- House District 13
- House District 22
- House District 23
- House District 24
- House District 25
- House District 26
- House District 27

Louisiana State House Representatives

District 13: Rep. Jack McFarland (R)
District 22: Rep. Gabe Firment (R)
District 23: Rep. Kenny Cox (D)
District 24: Rep. Rodney Schamerhorn (R)
District 25: Rep. Lance Harris (R)
District 26: Rep. Ed Larvadain III (D)
District 27: Rep. Mike Johnson (R)

0 6 12 Miles

N

Figure 4:

Louisiana State Senate Districts

LOWER RED-LAKE IATT WATERSHED

September 16, 2022

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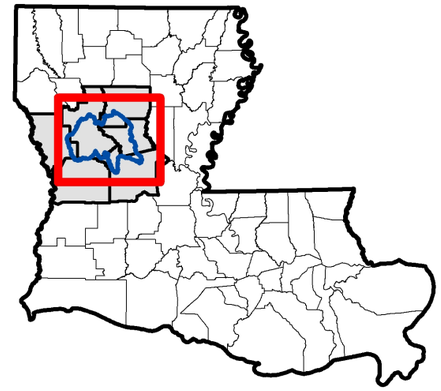
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Natchitoches
Colfax
Alexandria

District 31
District 29
District 35
District 30
District 26

Nantachie Lake
Lake Iatt
Lake Rodemacher
Cotile Lake
Red River

Map Symbology

- Parish Seat
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

State Senate Districts (2020)

- Senate District 29
- Senate District 30
- Senate District 31
- Senate District 35

Louisiana State Senators

District 29: Sen. Jay Luneau (D)
District 30: Sen. Mike Reese (R)
District 31: Sen. Louie Bernard (R)
District 35: Sen. Jay Morris (R)

0 6 12 Miles

N

Figure 5:

Population Density

LOWER RED-LAKE IATT WATERSHED

September 16, 2022

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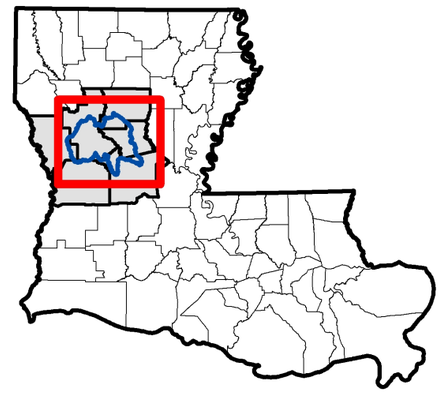
WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Clarence
Atlanta
Natchitoches
Natchez
Montgomery
Provencal
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Red River
Lake Iatt
Lake Rodemacher
Cotile Lake

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Population Density (2020*)

- Very Low
- Low
- Medium
- High

*Source: 2020 U.S. Census

0 6 12 Miles

N

Figure 6:

Land Cover

LOWER RED-LAKE IATT WATERSHED

September 16, 2022

FEMA

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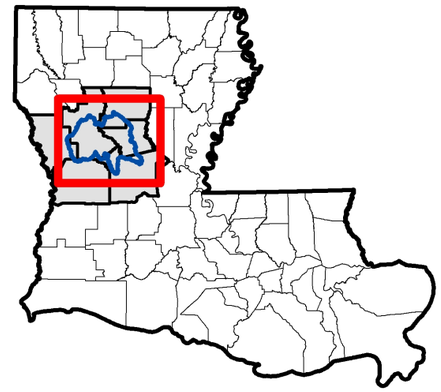
WATERSHED LOCATOR
STATE OF LOUISIANA



Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Land Cover (USDA 2021*)

- Farming
- Forestry
- Open Water
- Urban Development

*United States Department of Agriculture (USDA) Cropland Data Layer

0 6 12 Miles

N

De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Sabine Parish
Vernon Parish
Rapides Parish
Grant Parish
LaSalle Parish

Clarence
Natchitoches
Natchez
Provencal
Atlanta
Montgomery
Red River
Colfax
Boyce
Creola
Pineville
Alexandria

84 71 9 167 1 49 6 117 171 28 8 165

Figure 7:

Population Change

LOWER RED-LAKE IATT WATERSHED

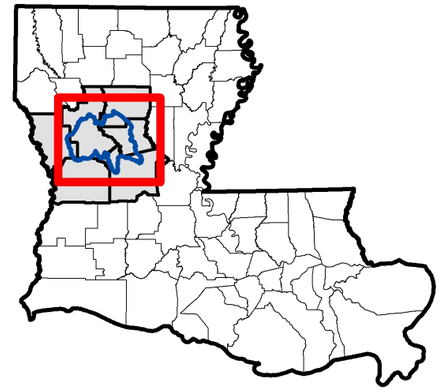
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Clarence
Atlanta
Natchitoches
Natchez
Montgomery
Provencal
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Red River
Lake Iatt
Lake Rodemacher
Cotile Lake

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Percent Population Change (2010-2020*)

- Greater than -20%
- -10% to -20%
- -5% to -10%
- 0% to -5%
- No Change
- 0% to 5%
- 5% to 10%
- Greater than 10%

*Source: 2010, 2020 U.S. Census

0 6 12 Miles

N

Figure 8:

Effective Floodplains

LOWER RED-LAKE IATT WATERSHED

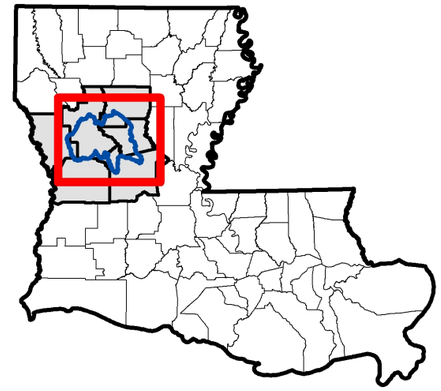
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Sabine Parish
Vernon Parish
Rapides Parish
Grant Parish
LaSalle Parish

Clarence
Atlanta
Natchitoches
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Montgomery
Provencal
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Red River
Lake Rodemacher
Cotile Lake

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Effective FEMA Floodplains (2021)

- Zone AE, Floodway (100-Year, Detailed)
- Zone AE, AO (100-Year,
- Zone A (100-Year,
- Zone X (500-Year, Detailed)
- Zone X (Reduced Flood Risk Due to Levee)

0 6 12 Miles

N

Figure 9:

Topographic Data Source

LOWER RED-LAKE IATT WATERSHED

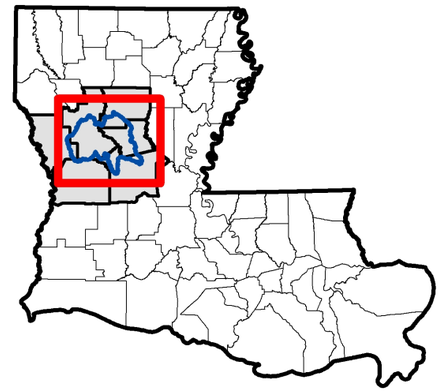
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
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Clarence
Natchitoches
Natchez
Provencal
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Montgomery
Colfax
Boyce
Creola
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Red River
Lake Rodemacher
Cotile Lake

84 71 9 167 49 1 6 117 171 28 8 165

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Available Topographic Data

- 2007 Louisiana Statewide LIDAR

0 6 12 Miles

N

Figure 10:

NFIP Flood Losses

LOWER RED-LAKE IATT WATERSHED

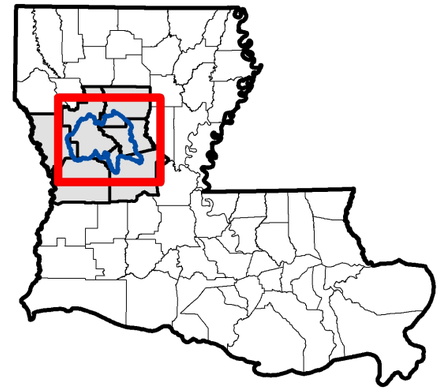
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



Map Symbology

- Red River
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Community Total NFIP Claims*

- No Data
- 0-40
- 41-200
- 201-400
- 400-1451

0 6 12 Miles

N

De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Clarence
Atlanta
Natchitoches
Natchez
Montgomery
Provencal
Nantachie Lake
Red River
Lake Iatt
Colfax
Creola
Boyce
Lake Rodemacher
Cotile Lake
Pineville
Alexandria

84 71 9 167 49 1 6 117 171 165 28 8

Figure 11:
Flood Risk -
Potential Losses

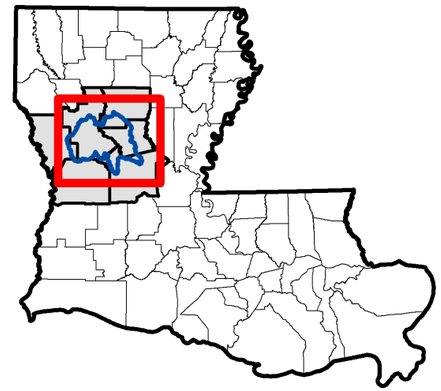
LOWER RED-LAKE IATT WATERSHED

September 16, 2022

FEMA

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
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Montgomery
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Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Red River
Lake Rodemacher
Cotile Lake

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Hazus 1%-Annual-Chance Loss Study*

- Very Low
- Low
- Medium
- High
- Very High

*Flood risk data obtained from the FEMA Base Level Engineering study

0 6 12 Miles

N

Figure 12:

Social Vulnerability Index

LOWER RED-LAKE IATT WATERSHED

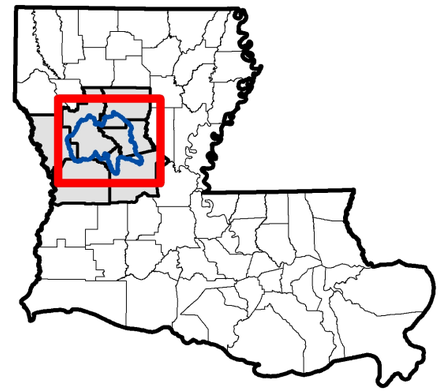
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
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Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Red River
Lake Rodemacher
Cotile Lake

Map Symbology

- Major Highways
- Watershed Boundary: HUC-8
- Red River
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Social Vulnerability Index (NRI 2021*)

- Very High
- Relatively High
- Relatively Moderate
- Relatively Low
- Very Low

*NRI is the National Risk Index, created by the Federal Emergeny Managament Agency

0 6 12 Miles

N

Figure 13:

Resiliance Rating

LOWER RED-LAKE IATT WATERSHED

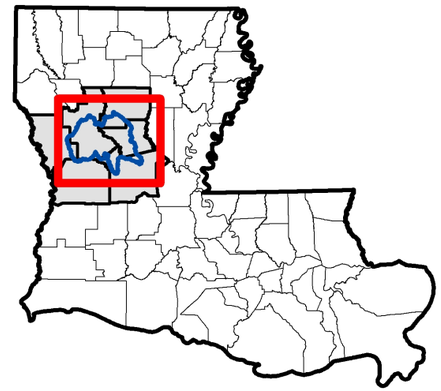
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



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Montgomery
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Red River
Lake Rodemacher
Cotile Lake

84 71 9 167 49 1 6 117 171 165 28 8

Map Symbology

- Major Highways
- Watershed Boundary: HUC-8
- Red River
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Resilience Rating (NRI 2021*)

- Very High
- Relatively High
- Relatively Moderate
- Relatively Low
- Very Low

*NRI is the National Risk Index, created by the Federal Emergeny Managament Agency

0 6 12 Miles

N

Figure 14:

Flood Risk Rating

LOWER RED-LAKE IATT WATERSHED

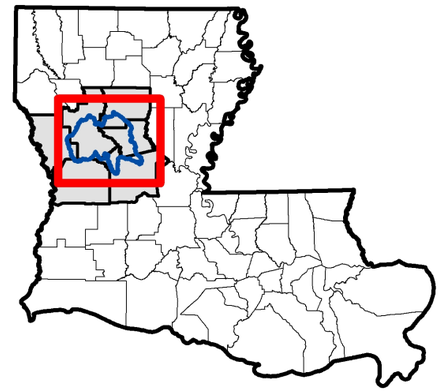
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



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Montgomery
Atlanta
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Lake Rodemacher
Cotile Lake
Red River

Map Symbology

- Major Highways
- Watershed Boundary: HUC-8
- Red River
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Riverine Flooding Risk Rating (NRI 2021*)

- Very High
- Relatively High
- Relatively Moderate
- Relatively Low
- Very Low

*NRI is the National Risk Index, created by the Federal Emergeny Managament Agency

0 6 12 Miles

N

Figure 15:

Flood Risk Population Exposure

LOWER RED-LAKE IATT WATERSHED

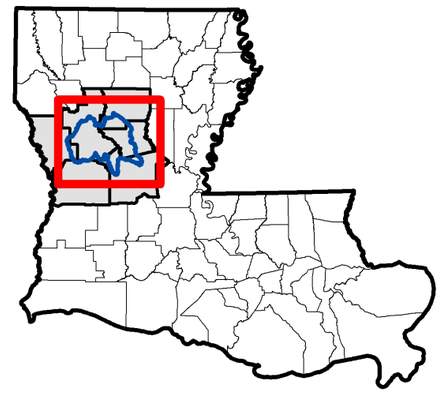
September 16, 2022

FEMA

DOTD

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



Map Symbology

- Major Highways
- Watershed Boundary: HUC-8
- Red River
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

Population Exposed to Flooding (NRI 2021*)

- 0 - 500
- 501-1000
- 1001-1500
- 1501-2000
- 2001-2755

*NRI is the National Risk Index, created by the Federal Emergeny Managament Agency

0 6 12 Miles

N

De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Sabine Parish
Vernon Parish
Rapides Parish
Grant Parish
LaSalle Parish
Clarence
Natchitoches
Atlanta
Natchez
Montgomery
Provencal
Nantachie Lake
Lake Iatt
Red River
Colfax
Creola
Lake Rodemacher
Boyce
Cotile Lake
Pineville
Alexandria

Figure 16:
Community Rating System (CRS) Participating Communities

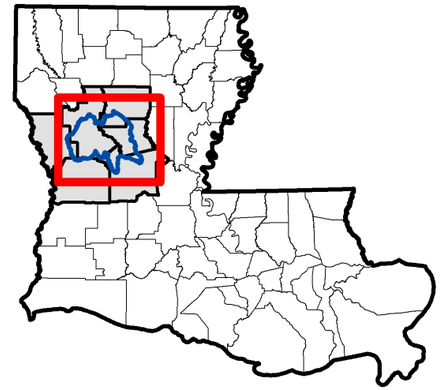
LOWER RED-LAKE IATT WATERSHED

September 16, 2022

FEMA

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

WATERSHED LOCATOR
STATE OF LOUISIANA



De Soto Parish
Red River Parish
Winn Parish
Natchitoches Parish
Grant Parish
LaSalle Parish
Sabine Parish
Vernon Parish
Rapides Parish

Clarence
Atlanta
Natchitoches
Natchez
Montgomery
Provencal
Colfax
Creola
Boyce
Pineville
Alexandria

Nantachie Lake
Lake Iatt
Lake Rodemacher
Cotile Lake
Red River

Map Symbology

- Cities
- Red River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- Discovery Parish Boundary
- Other Parish Boundary

CRS Class

- Not Participating

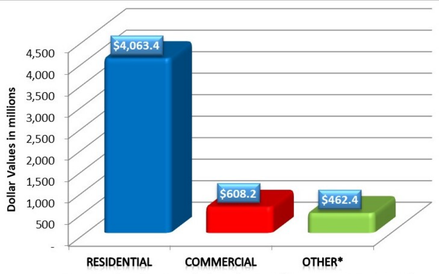
0 6 12 Miles

N

Flood Risk Map

Flood Risk Map: *Lower Red-Lake Iatt HUC 8 Watershed*

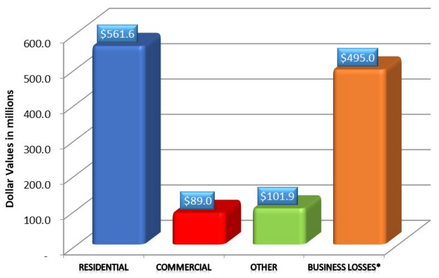
ASSET INVENTORY VALUES - LOWER RED-LAKE IATT WATERSHED HUC-8



Lower Red - Lake Iatt Capital Stock Assets (Structure, Contents, and Inventory)

***Other** structure types include Industrial, Agricultural, Education, Religious and Government structures.

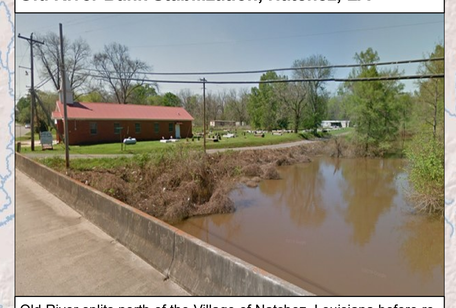
100-YEAR EVENT LOSSES - LOWER RED-LAKE IATT HUC-8



Lower Red - Lake Iatt
Capital Stock and Business Disruption Losses

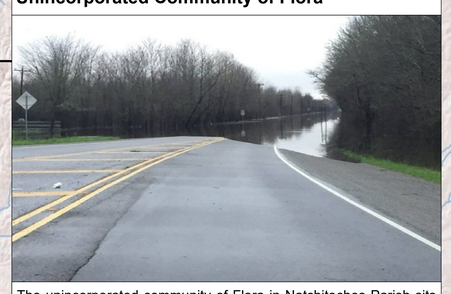
***Business Losses** are the sum of Inventory Loss, Relocation Cost, Income Loss, Rental Income Loss, Wage Loss and Direct Output Loss.

Old River Bank Stabilization, Natchez, LA



Old River splits north of the Village of Natchez, Louisiana before re-merging south of the village. Old River then flows into the Cane River further downstream, and eventually confluences with the Red River near the Town of Colfax. Both sections of Old River run perpendicular to Main Street in the Village of Natchez, and the eastern segment crosses Main Street between Morning Star Road and Lewis Street. Riverine erosion along the banks of Old River endangers these streets, including Morning Star Loop which encircles a small, established subdivision. To improve the current banks of Old River and prevent future erosion, bank stabilization efforts could be implemented on this portion of the drainage lateral.

Hwy 120 Elevation and Drainage Improvements, Unincorporated Community of Flora



The unincorporated community of Flora in Natchitoches Parish sits south of the City of Natchitoches and the Village of Provencal. The main corridors for the community are Hwy 120 and Hwy 478. Both routes are prone to flooding during heavy rainstorms, effectively trapping residents of the area. This is especially problematic on Hwy 120 eastbound towards Cypress. Some residents have expressed concerns over emergency vehicle accessibility during rain events, and obstructed passage to and from the larger communities. Elevating Hwy 120 between Flora and Cypress and increasing the stormwater capacity of the roadside ditches would aid in reducing the floodwaters on the roadway, providing a safe route for the community and emergency personnel.

Hwy 71 Culvert Replacement and Drainage Improvements, Colfax, LA



Hwy 71 runs through a swampy, low lying area crossing Bayou Rigolette to the south and Valentine Bayou to the north. While it appears that reasonably sized structures are placed at the crossings of these two bayous, Hwy 71 also traverses two small, unnamed channels which appear to utilize smaller culverts. These structures act as cross drains under Hwy 71 allowing hydraulic connection of these small channels. These pipes appear to be undersized, restricting the flow and causing the highway to flood. By replacing the culverts with larger structures, increased capacity can be expected and would help mitigate some of the flooding issues.

0 2 4
N
Miles

MAP SYMBOLOGY

Base Data
- Major Roads
- Levees
- Railroads
- State Boundary
- Watershed Boundary
- Waterbodies
- City Boundary
- County Boundary

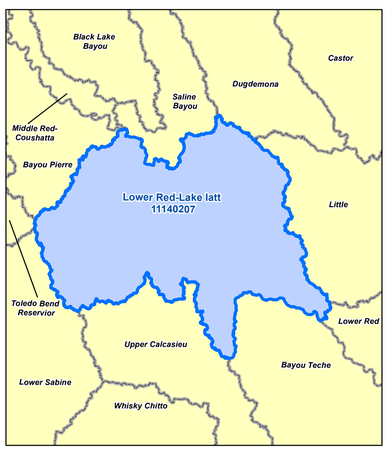
Flood Data
- Rivers and Streams
- New SFHA

Flood Risk*
- Very Low
- Low
- Medium
- High
- Very High

***Flood Risk Data Source**
Base Level Engineering (BLE) data and HAZUS Level 1 Analysis

Areas of Mitigation Interest
- Dams
- Past Claims Hot Spot
- At-Risk Essential Facilities
- Areas of Significant Riverine Erosion
- Other Flood Risk Areas
- Other

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FRM FLOOD RISK MAP

Lower Red-Lake Iatt Watershed

FEMA

HUC-8 Code
11140207

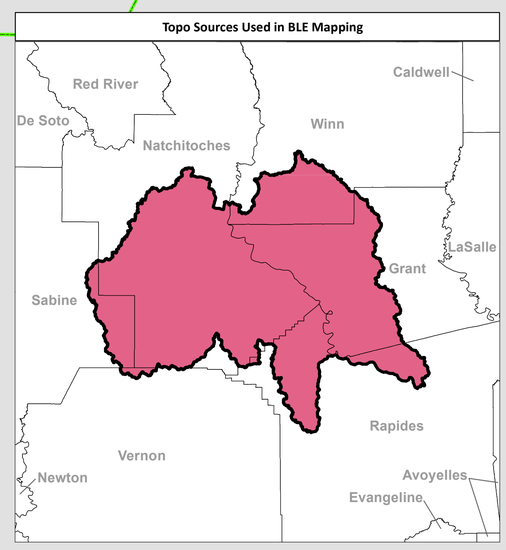
RELEASE DATE
03/29/2023

For more information of data used for this map, please consult the Lower Red-Lake Iatt Watershed Flood Risk Database and Flood Risk Report.

Pre-Discovery Map

Discovery Communities			
Community	CID	Total Flood Area Sq. Mi.	Percent of Community Floodplain within Lower Red-Lake Iatt Watershed
Grant Parish	220076	185.2	63.7%
Boyce	220147	0.0	100.0%
Colfax	220077	1.5	100.0%
Montgomery	220256	0.2	100.0%
Natchitoches Parish	220129	505.9	53.2%
Clarence	220130	1.6	15.3%
Natchez	220370	1.0	100.0%
Natchitoches	220131	9.0	100.0%
Provencal	220132	0.6	100.0%
Rapides Parish*	220145	448.9	13.9%
Alexandria*	220146	28.5	3.3%
Pineville*	220151	4.2	37.6%
Sabine Parish*	220368	263.4	2.7%
Winn Parish	220369	215.3	12.3%
Atlanta	220090	0.3	100.0%
*No Digital National Flood Hazard Layers Available. Floodplain in watershed taken from Q3.			

Red River
De Soto
Natchitoches
Winn
LaSalle
Grant
Sabine
Vernon
Rapides
Lower Red-Lake Iatt



Topo Sources Used in BLE Mapping

Elevation Data	*Location*
2007 Louisiana Statewide LIDAR	

N
0 2 4 8 12 Miles

Map Symbology

- USGS Gage
- LOMC
- High Water Mark
- Low Water Mark
- Dam
- Lake
- City Boundary
- County Boundary
- Watershed Boundary

SHIELD

- Interstate Highway
- US Highway
- State Highway
- Railroad

Effective FEMA Floodplains*

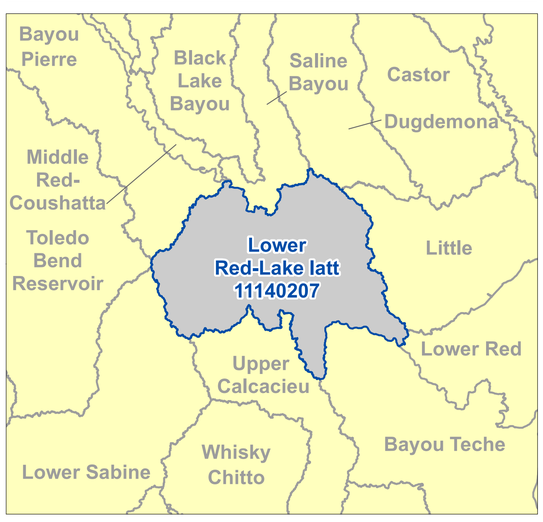
- Floodway
- Zone AE, VE, AO (100-Year, Detailed)
- Zone A (100-Year, Approximate)
- Zones AH, 100-Year Depth <1 Foot; X500 (500-Year, Detailed)
- Zone X, Reduced Flood Risk Due to Levee

Effective Streams Study Type*

- Zone AE (100-Year, Detailed)
- Zone A (100-Year, Approximate)
- Zone X (Unshaded X, Areas of Minimal Flood Risk)

***Data as of January 2022**

WATERSHEDS LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Pre-Discovery Map

LOWER RED-LAKE IATT WATERSHED, LOUISIANA

Stream Miles:	2,029
Zone AE Miles:	181
Zone A Miles:	1,132
Zone X Miles:	717
Population:	55,458

HUC-8 Codes
11140207

FEMA

Discovery Map

Parish	CID	Population [1]	Number of Policies	Total Coverage	Total Losses [2]	Total Payments [2]	Current FEMA DFIRM Status	Oldest Effective Date
Grant Parish	220076	18,751	144	$ 23,505,700.00	471	$ 5,091,714.00	Modernized	6/16/2016
Natchitoches Parish	220129	16,406	381	$ 82,470,700.00	429	$ 8,342,885.00	Modernized	7/6/2015
Rapides Parish	220145	60,547	1,455	$ 336,610,400.00	1,577	$ 24,295,616.00	Not Modernized	3/2/1981
Sabine Parish	220368	16,000	74	$ 16,943,800.00	16	$ 405,023.00	Modernized	8/5/1991
Vernon Parish	220221	37,503	232	$ 55,048,500.00	212	$ 7,271,803.00	Modernized	11/26/2010
Winn Parish	220369	8,501	40	$ 7,125,700.00	108	$ 1,834,540.00	Modernized	8/19/2020

[1] Total community population based on 2020 Decennial Census data

[2] Based on available NFIP claims data as of February 2022

Total Losses - All losses submitted regardless of the status.

Total Payments - Total amount paid on losses.

Discovery Communities			
Community	**CID**	**Total Flood Area Sq. Mi.**	**Percent of Community Floodplain within Lower Red-Lake latt Watershed**
Grant Parish	220076	185.2	63.7%
Boyce	220147	0.0	100.0%
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Winn Parish	220369	215.3	12.3%
Atlanta	220090	0.3	100.0%
*No Digital National Flood Hazard Layers Available. Floodplain in watershed taken from Q3.			

De Soto

Winn

Natchitoches

Clarence

Natchitoches

Atlanta

LaSalle

Grant

Montgomery

Provencal

Natchez

Lower Red-Lake latt

Colfax

Sabine

Boyce

Creola

Alexandria

Alexandria

Alexandria

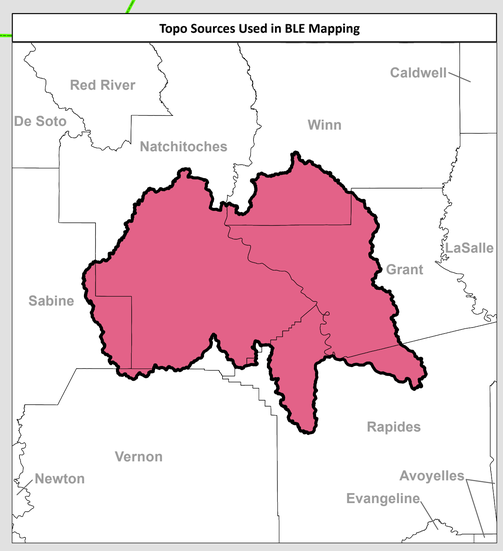
Pineville

Vernon

Rapides

Evangeline

Topo Sources Used in BLE Mapping



Topo Sources Used in BLE Mapping

Elevation Data	*Location*
2007 Louisiana Statewide LIDAR	

N

0 2 4 8 12 Miles

Map Symbology

- USGS Gage
- LOMC
- Dam
- Lake
- City Boundary
- County Boundary
- Watershed Boundary

Major Roads

- Interstate Highway
- US Highway
- State Highway
- Railroad

Effective FEMA Floodplains*

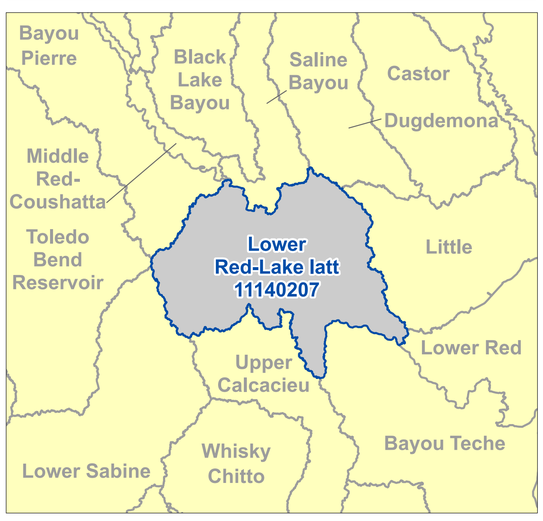
- Floodway
- Zone AE, VE, AO (100-Year, Detailed)
- Zone A (100-Year, Approximate)
- Zones AH, 100-Year Depth <1 Foot; X500 (500-Year, Detailed)
- Zone X, Reduced Flood Risk Due to Levee

Effective Streams Study Type*

- Zone AE (100-Year, Detailed)
- Zone A (100-Year, Approximate)
- Zone X (Unshaded X, Areas of Minimal Flood Risk)

***Data as of January 2022**

WATERSHEDS LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map

LOWER RED-LAKE IATT WATERSHED, LOUISIANA

Stream Miles:	2,029
Zone AE Miles:	181
Zone A Miles:	1,132
Zone X Miles:	717
Population:	55,458

HUC-8 Codes
11140207

FEMA

Post-Discovery Map

CNMS Validation Status Definitions	
Assessed	Unmapped Streams or streams not part of FEMA's SFHA inventory that have been investigated and considered for study in current and/or future Fiscal Years (FYs).
Unverified	Stream has not passed the Critical and Secondary Element checks (At least one critical or four or more secondary change conditions flagged) and may either be assigned resources for restudy in current and/or future FYs.
Valid	Streams considered New, Validated, or Updated Engineering (NVUE) compliant (zero critical and fewer than four secondary elements flagged).
To Be Studied	Mapped streams that need to be studied and are planned for a future FY or unmapped streams prioritized to be mapped with a SFHA.

Red River
De Soto
Natchitoches
Winn
LaSalle
Grant
Sabine
Lower Red-Lake Iatt
Vernon
Rapides
Evangeline

N
0 2 4 8 12 Miles

Map Symbology

- USGS Gage
- LOMC
- Dam
- Lake
- City Boundary
- County Boundary
- Watershed Boundary

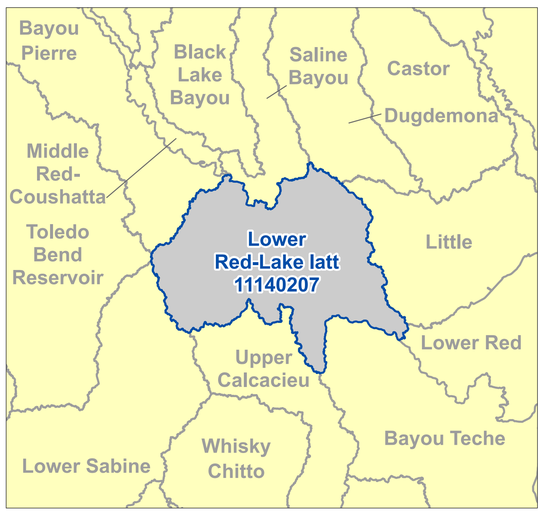
Transportation
- Interstate Highway
- US Highway
- State Highway
- Railroad

Effective FEMA Floodplains*
- Floodway
- Zone AE, VE, AO (100-Year, Detailed)
- Zone A (100-Year, Approximate)
- Zones AH, 100-Year Depth <1 Foot; X500 (500-Year, Detailed)
- Zone X, Reduced Flood Risk Due to Levee

VALIDATION STATUS, STATUS TYPE**
- Unverified, Being Studied
- Unverified, To Be Studied
- Assessed, Being Studied
- Valid, Being Studied
- Valid, NVUE Compliant

***Data as of January 2022**

WATERSHEDS LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Post-Discovery Map

LOWER RED-LAKE IATT WATERSHED, LOUISIANA

Stream Miles:	2,029
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HUC-8 Codes
11140207

FEMA

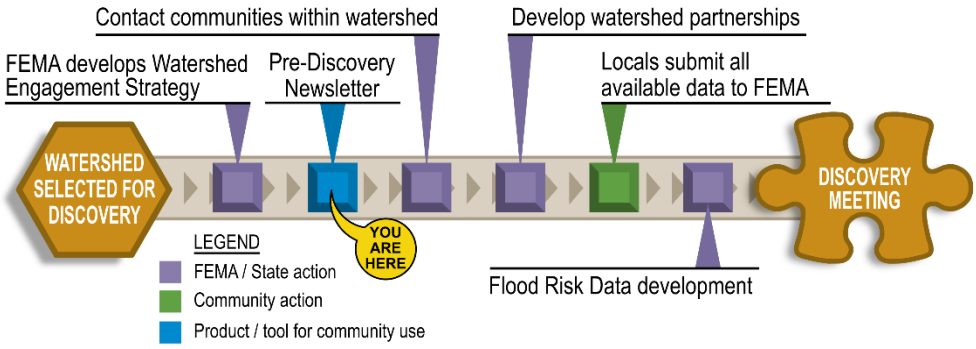
Pre-Discovery Newsletter

Pre-Discovery Newsletter
Toledo Bend Reservoir, Lower Red-Lake Iatt, Whisky Chitto & Upper Calcasieu Watersheds

"Capturing a More Complete Picture of Your Community and Your Watershed" *January 2022*

Risk MAP Process and Discovery

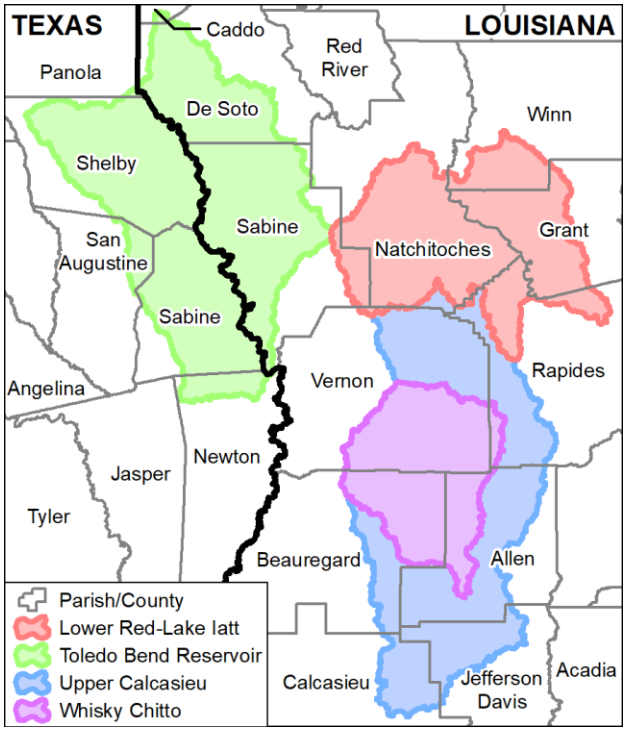
Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that assists communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Discovery is the first phase of an overall process to achieve mitigation actions for reducing risks. The Louisiana Department of Transportation & Development (DOTD) has been awarded a FEMA grant to conduct Discovery in the Toledo Bend Reservoir, Lower Red-Lake Iatt, Whisky Chitto & Upper Calcasieu Watersheds in 2022.



The Goal: To work closely with communities to better understand local flood risk, mitigation efforts, and other topics to spark watershed-wide discussions about increasing resilience to flooding.

Pre-Discovery Meeting
January 19th, 2022
10:00 AM

Online invitations for Webex Meeting to be sent out soon



Pre-Discovery Meeting

In preparation for the upcoming Discovery Meetings, DOTD will be hosting one Pre-Discovery meeting via Webex call. This meeting will introduce you to flood risk data being developed in the watershed, inform you about what to expect at the Discovery Meeting, describe who should attend, and communicate the data we need to collect from your community. Invitations to the meeting are currently being sent out. The meeting will be recorded and posted online should your community be unable to join the Webex call.

Requested Data from Communities

- Areas of recurring flooding
- Historical local flooding locations
- High water marks or flood photos documented from historical flood events
- Infrastructure information, especially for levees and new bridges, dams, culverts and road improvements
- Mitigation activities and grant projects (ongoing or planned)
- Local development and floodplain management plans
- Stormwater management activities
- Regional watershed plans
- Flood study needs

Customize Discovery:
After the meeting, enter your community's data at:
https://dotd.discovery.halff.com
Password: DOTD_FY20!

Discovery Data Collection

The section to the left lists some of the types of data requested from each community within the watershed. We would greatly appreciate your participation in providing mapping needs and flood risk data for your community.

DOTD requests communities share whatever data they have, to provide as complete a picture as possible.

The Louisiana Department of Transportation & Development is a FEMA Cooperating Technical Partner (CTP), which allows them to collaborate with FEMA to help maintain current flood hazard information. The results from Base Level Engineering (BLE) studies served as a reference for the Mapping Activity Statement (MAS) of the FEMA CTP grant. FEMA awarded a CTP grant to DOTD to perform Discovery in these watersheds. The current MAS is included in the Risk MAP program. **Please contact Susan Veillon (Susan.Veillon@la.gov) if you have questions about Discovery.**

Pre-Discovery Meeting Slides

FEMA

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Increasing Resilience Together

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LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

LOUISIANA DISCOVERY

"CAPTURING A MORE COMPLETE PICTURE OF YOUR WATERSHED"

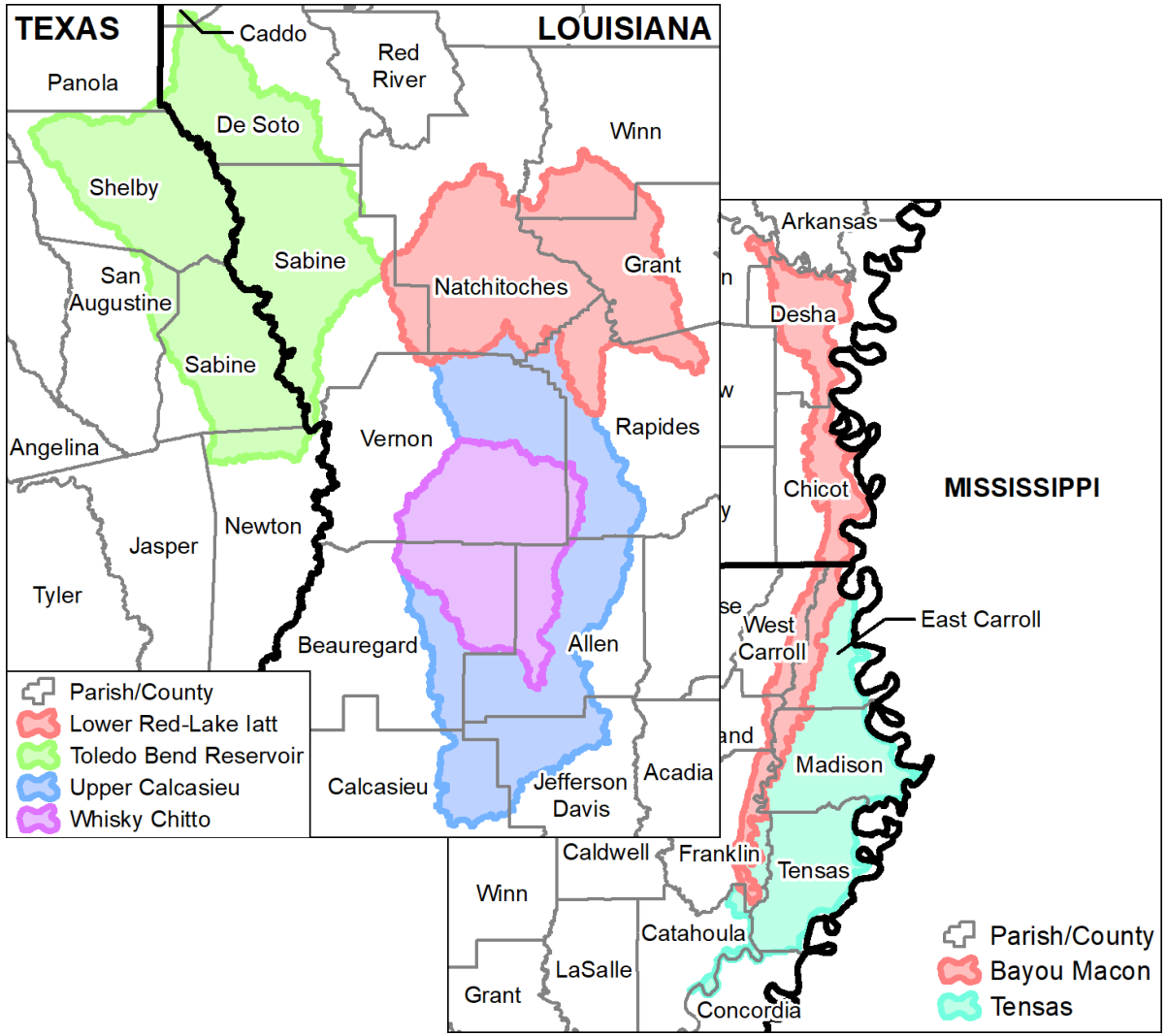
PRE-DISCOVERY MEETING

JANUARY 19, 2022

HALFF

AGENDA

- Overview of Risk MAP
- Discovery Overview
- LaDOTD Discovery Activities
  - Pre-Discovery Activities
  - Discovery Activities
  - Post-Discovery Activities
- 2022 LaDOTD Discovery Watersheds
  - Northeast Watersheds: Tensas & Bayou Macon
  - Southwest Watersheds: Toledo Bend Reservoir, Lower Red-Lake Iatt, Upper Calcasieu & Whisky Chitto
- Data Gathering Website and Walk-through



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DISCOVERY OVERVIEW

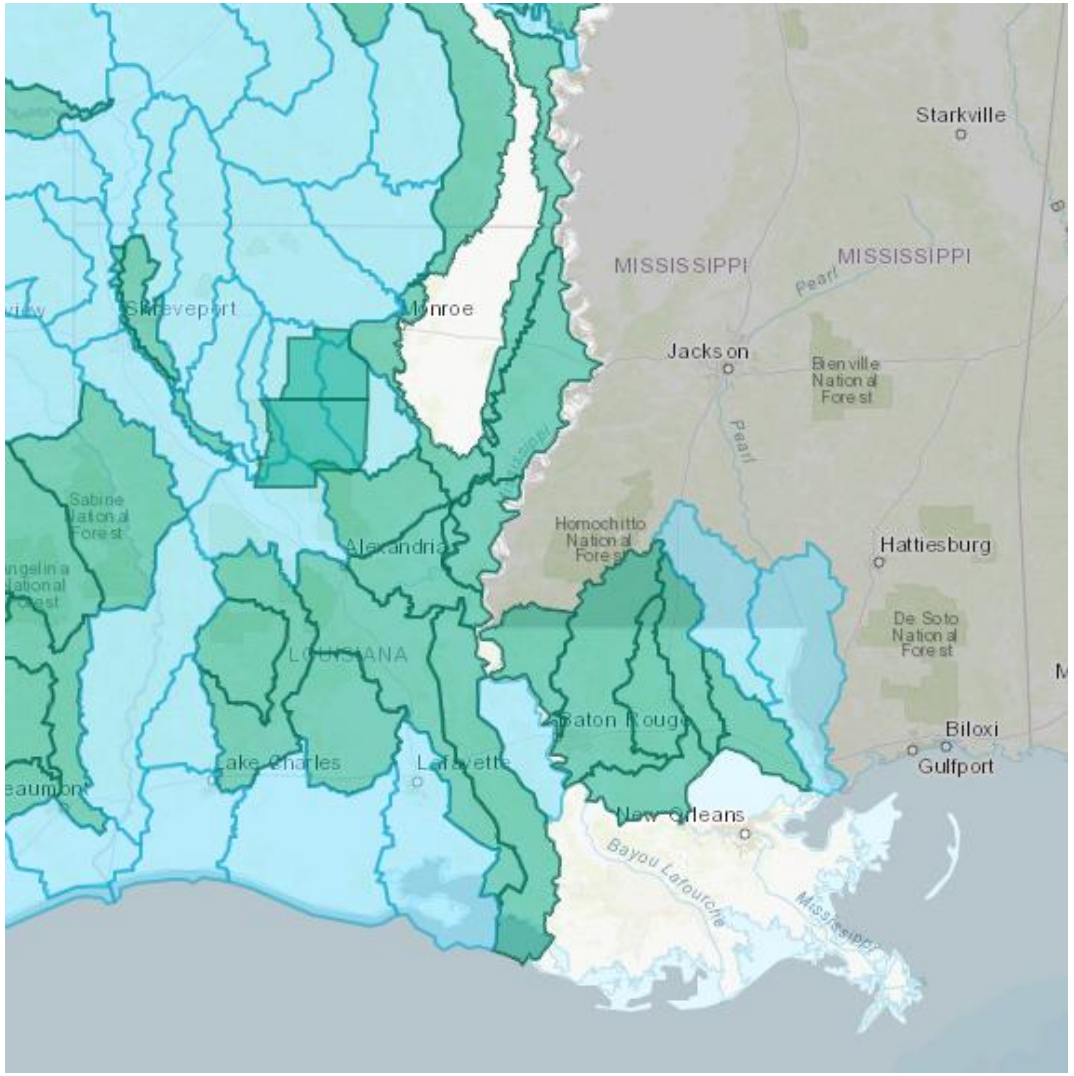
Discovery is FEMA's process for identifying and accessing flood risk to better prepare a list of needs and projects to address those needs within communities.

- Heighten community involvement and understanding
- Gather all flood-related information available
  - Knowledge of Flood Risks and Past Flooding in your community
  - Hazard Mitigation Projects – ongoing, planned or completed
  - Master Drainage Plans and floodplain studies – ongoing, planned or completed
  - Current flood risk communication process
  - GIS data

DISCOVERY OVERVIEW

- Request needs in the community
  - Questions and concerns for DFIRM maps
  - All questions and concerns for dams and levees
  - Study request in areas of repetitive loss
  - Areas of new development or other causes of concern for the future
  - Funding needs for identified flood risk projects

FEMA'S RISK MAP PROGRAM





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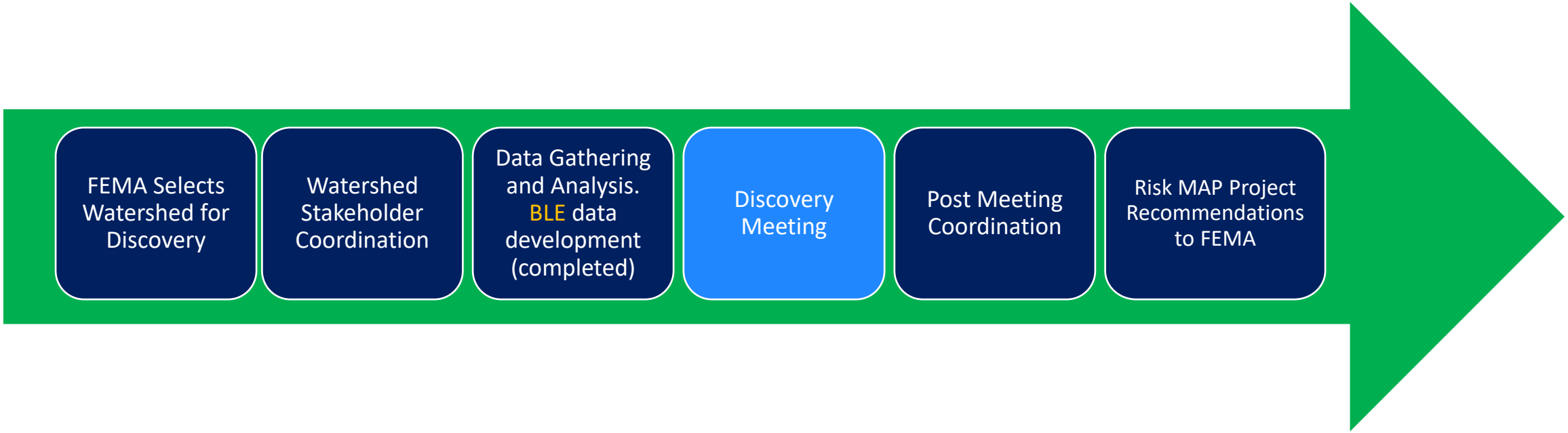
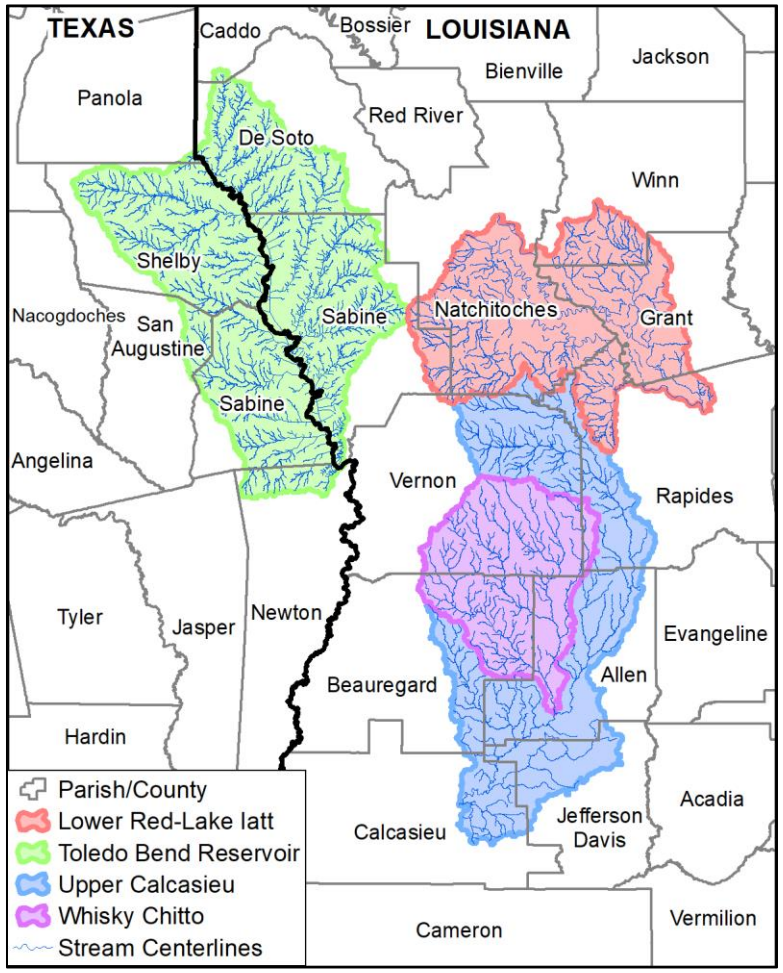
DISCOVERY STEPS

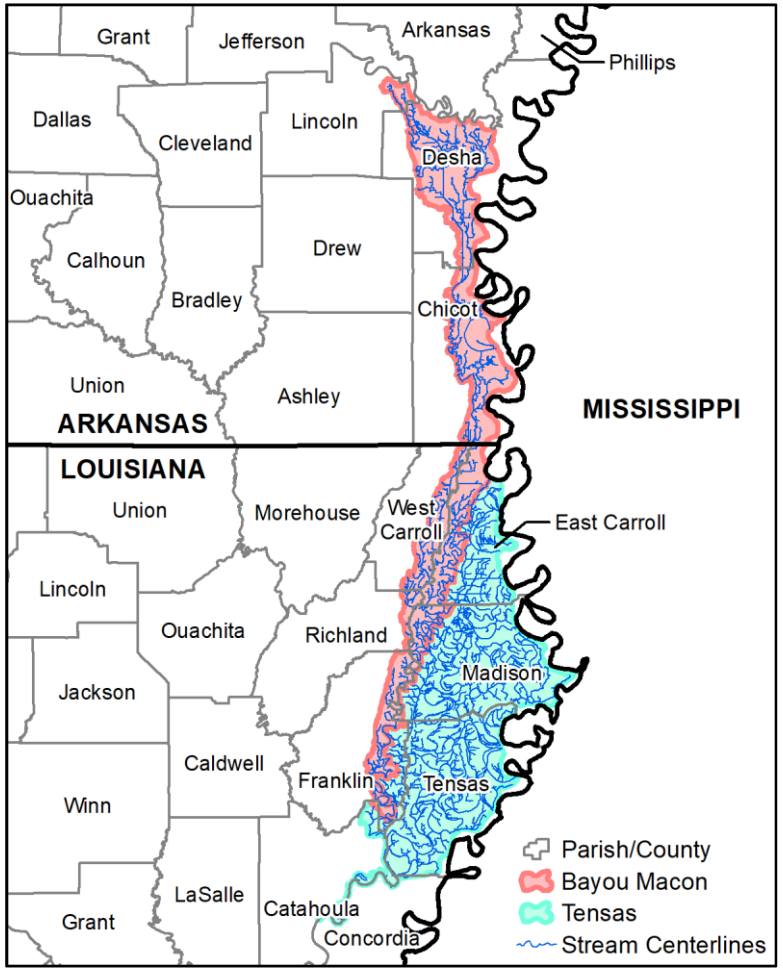
- ***Capture a more complete picture of your watershed by working closely with local communities…***



Louisiana Watersheds Discovery

- Goals
  - Inform Community of Present Flood Risk
  - Gather local data to supplement National, Regional and State data
  - Present FEMA with areas of highest concern and need for additional study





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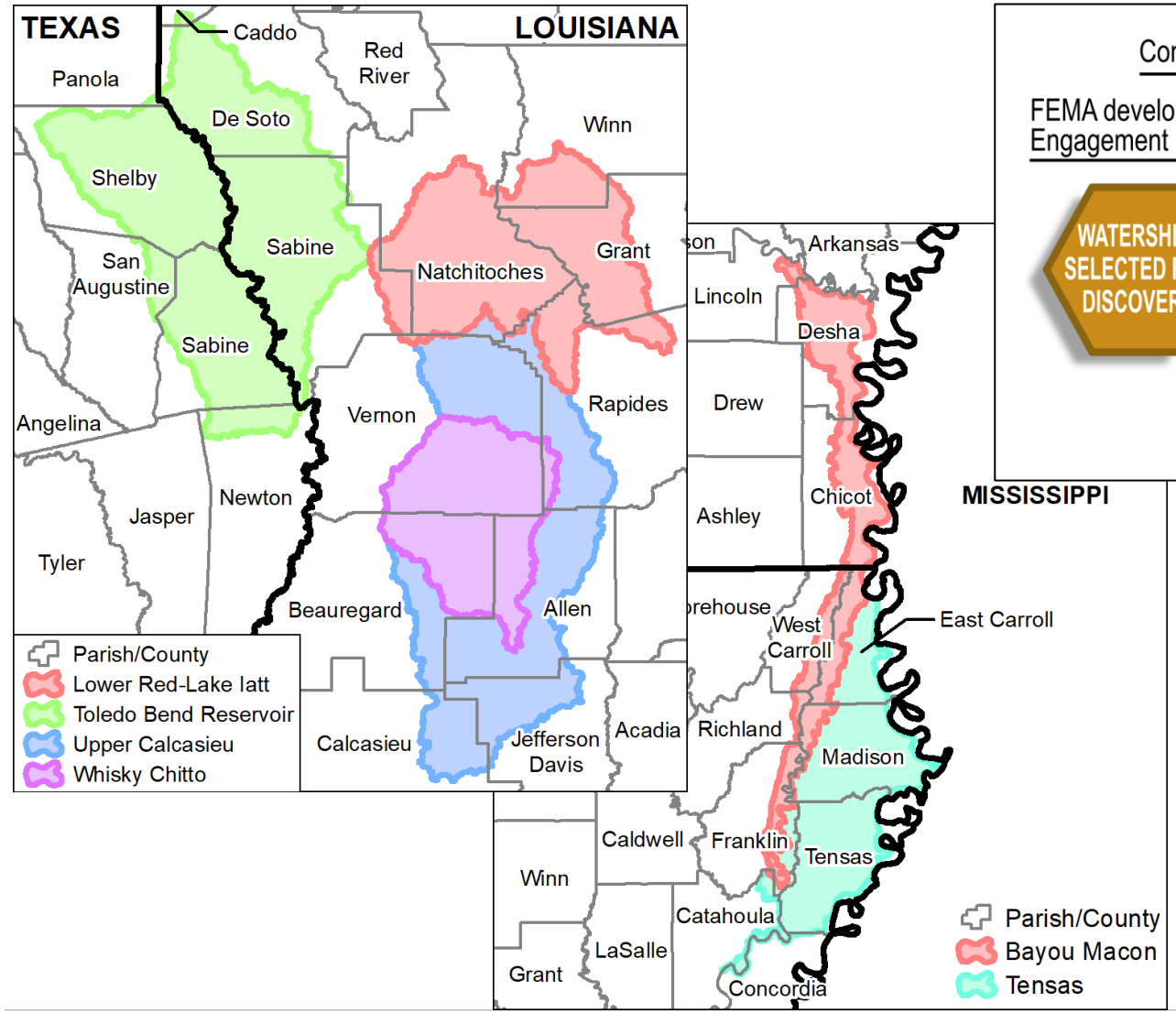
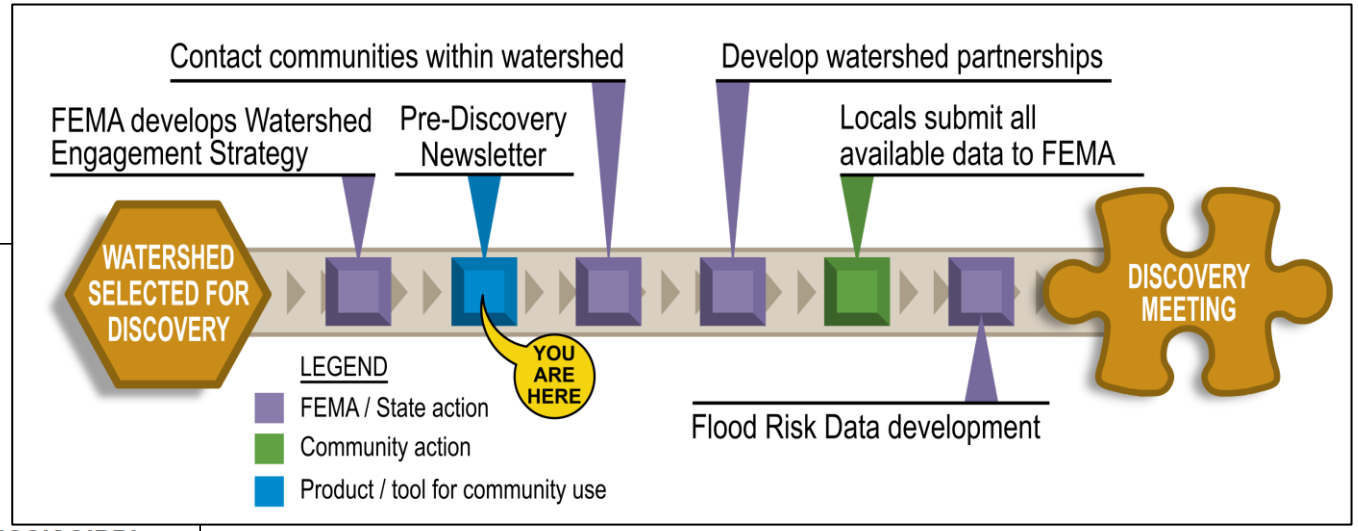
DISCOVERY NEWSLETTER





Pre-Discovery Meeting
January 19th, 2022
10:00 AM

Online invitations for Webex Meeting to be sent out soon

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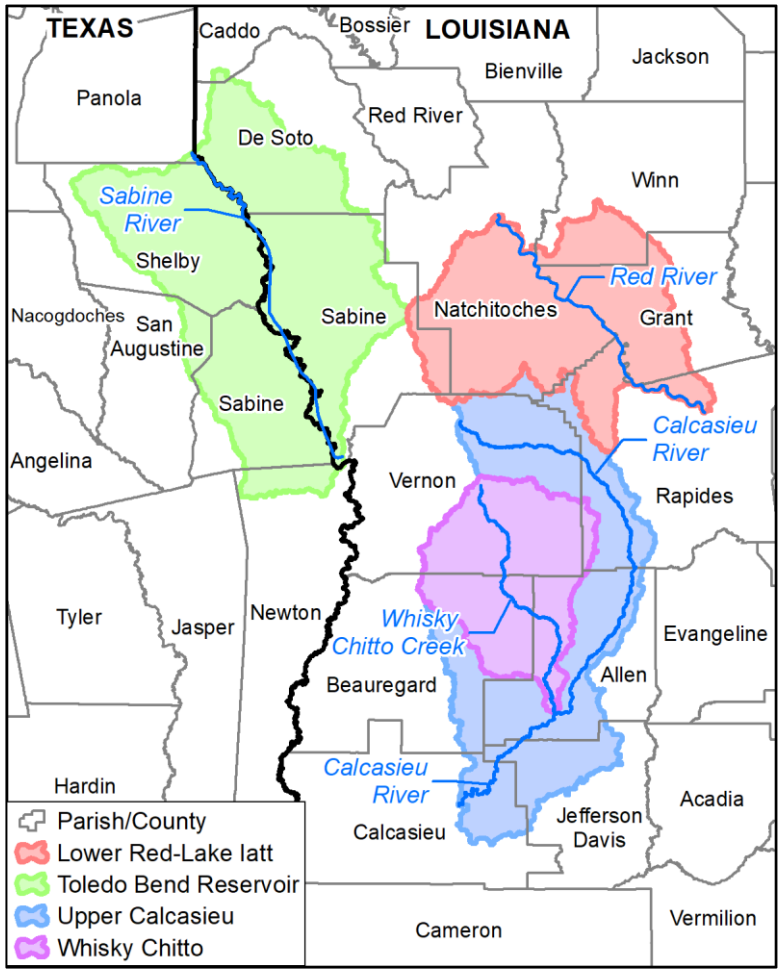
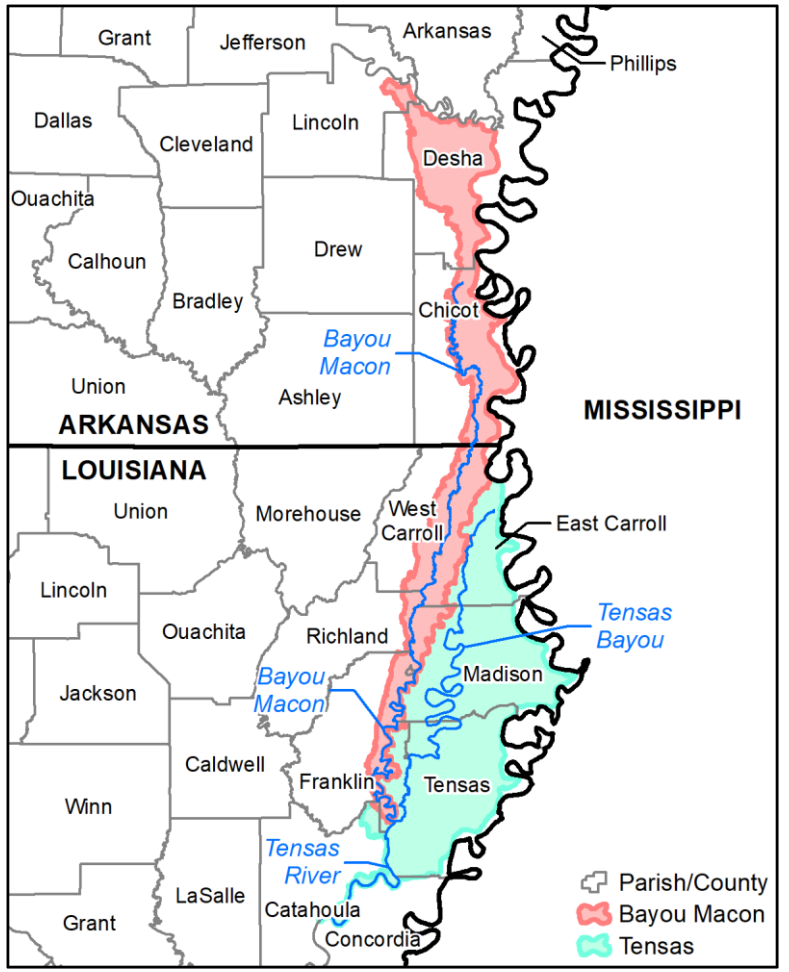
What information are we interested in?



BASE LEVEL ENGINEERING (BLE)

- BLE is developed at a larger scale (HUC8)
- LiDAR must be available
- Steps of Hydrology, Hydraulics & Terrain
- Model review and adjustments
- Gage review included in hydrology
- Used to assess flood risk





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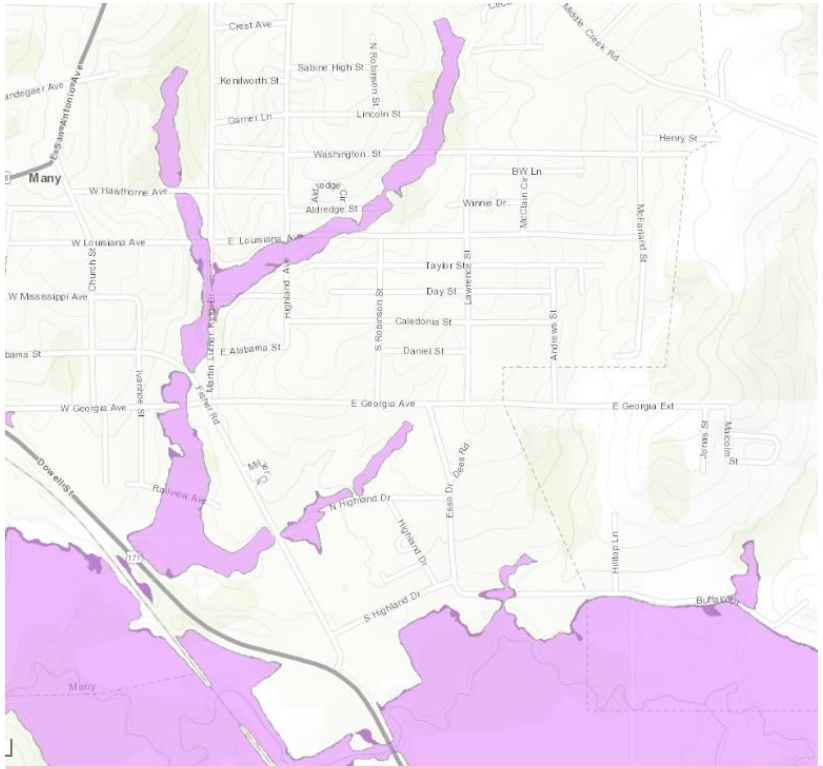
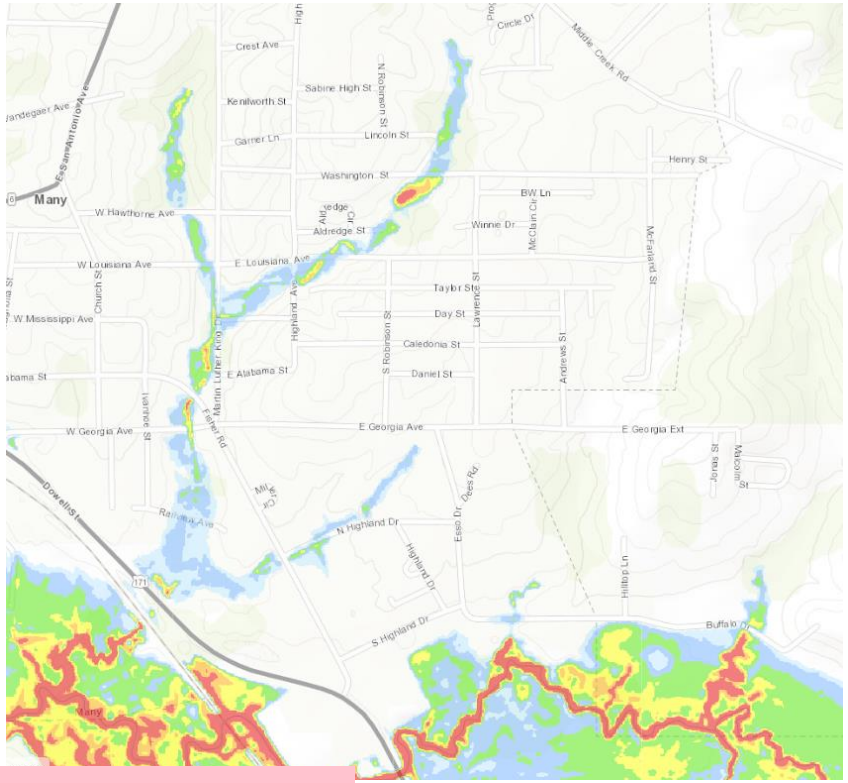
BASE LEVEL ENGINEERING (BLE)





High risk (1% flood zone)

Low to moderate risk (0.2% flood zone)

≤ 1 foot	> 3 to 4 feet
> 1 to 2 feet	> 4 to 5 feet
> 2 to 3 feet	> 5 feet

OUTPUTS

- Hydrology modeling (Regression) flows w/gage analysis
- Hydraulic modeling (HEC-RAS) for 10%, 4%, 2%, 1% and 0.2% storm events
- 10%, 1% and 0.2% floodplain boundaries

Non-Regulatory

- Areas of Expanded Flood Risk
- Depth and Analysis Grids
- Flood Risk Assessment

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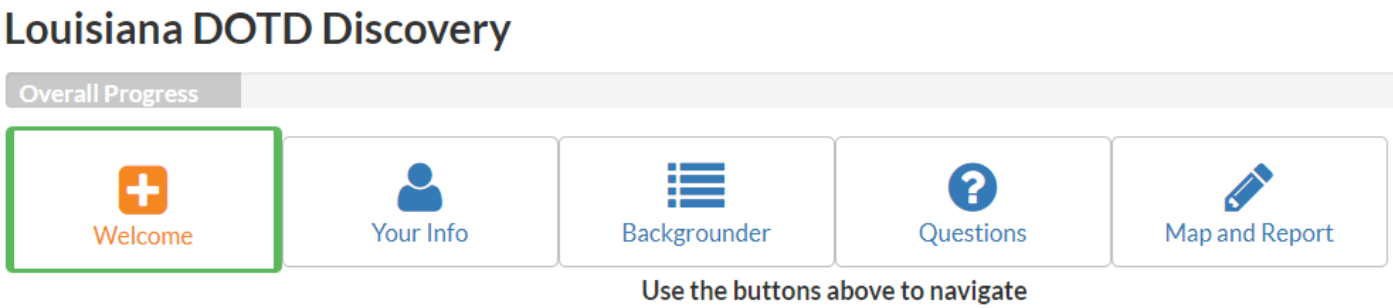
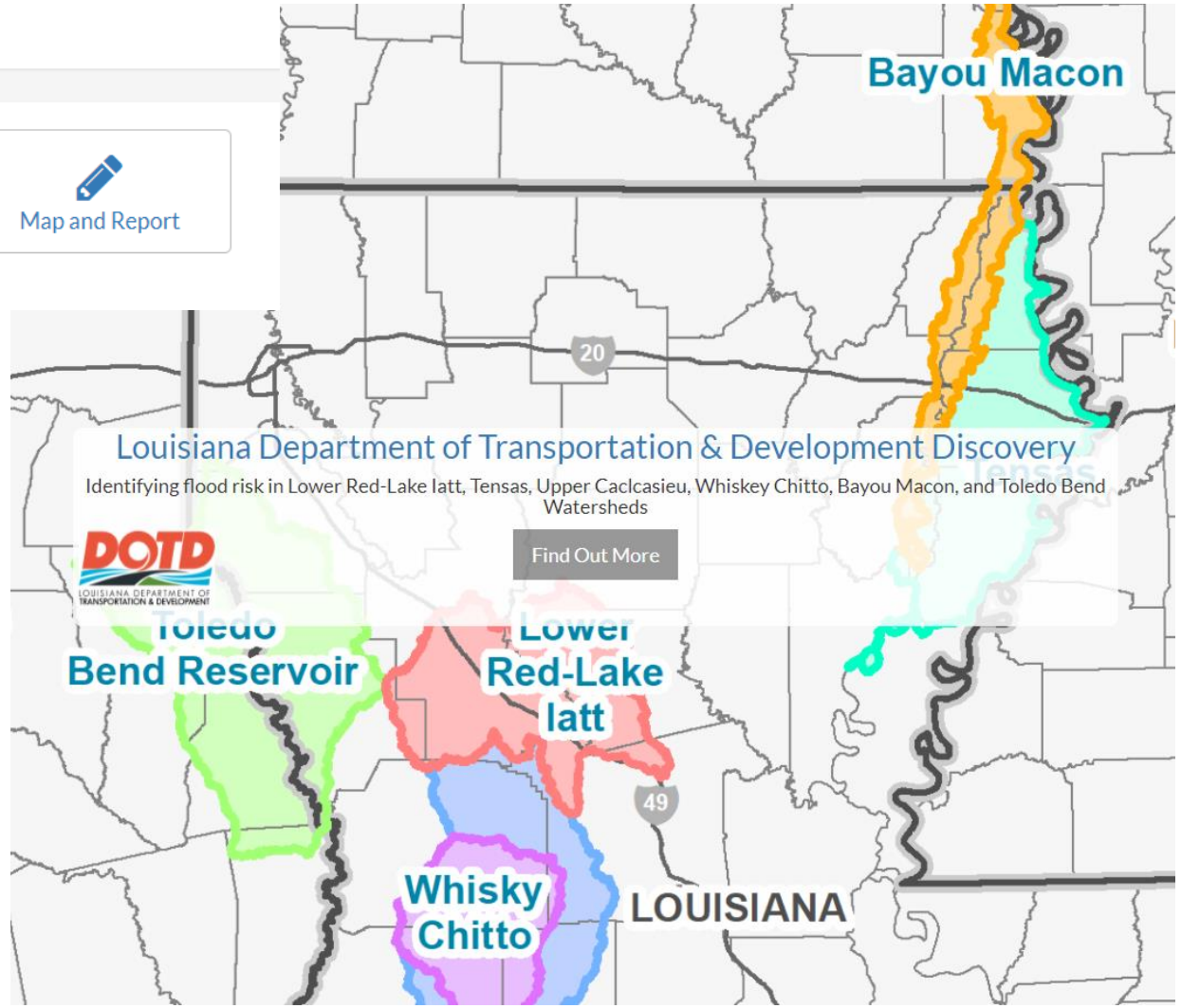
DISCOVERY MEETINGS – PREPARATION



- Enter your data online before the meeting
- Discovery meetings in March
- All community stakeholders are encouraged to attend



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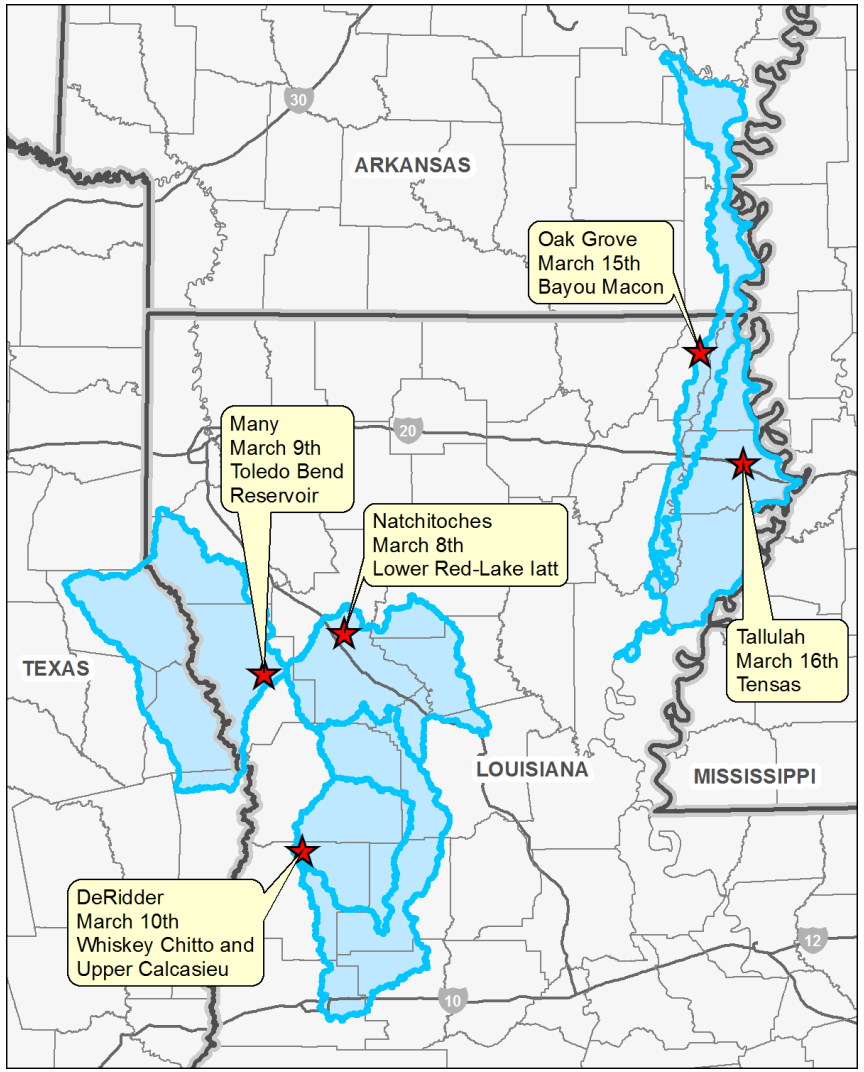
DISCOVERY MEETINGS – LOCATIONS

- Southwest Watersheds
  - March 8th – Natchitoches
  - March 9th – Many
  - March 10th – DeRidder
- Northeast Watersheds
  - March 15th – Oak Grove
  - March 16th – Tallulah



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DISCOVERY MEETINGS – WHAT TO EXPECT

- "Come and Go" format
- Open conversation
- Serves as additional meeting point beyond the webmap
- Groups present:
  - Federal, State, and Regional Agencies
  - Community Officials and other local stakeholders

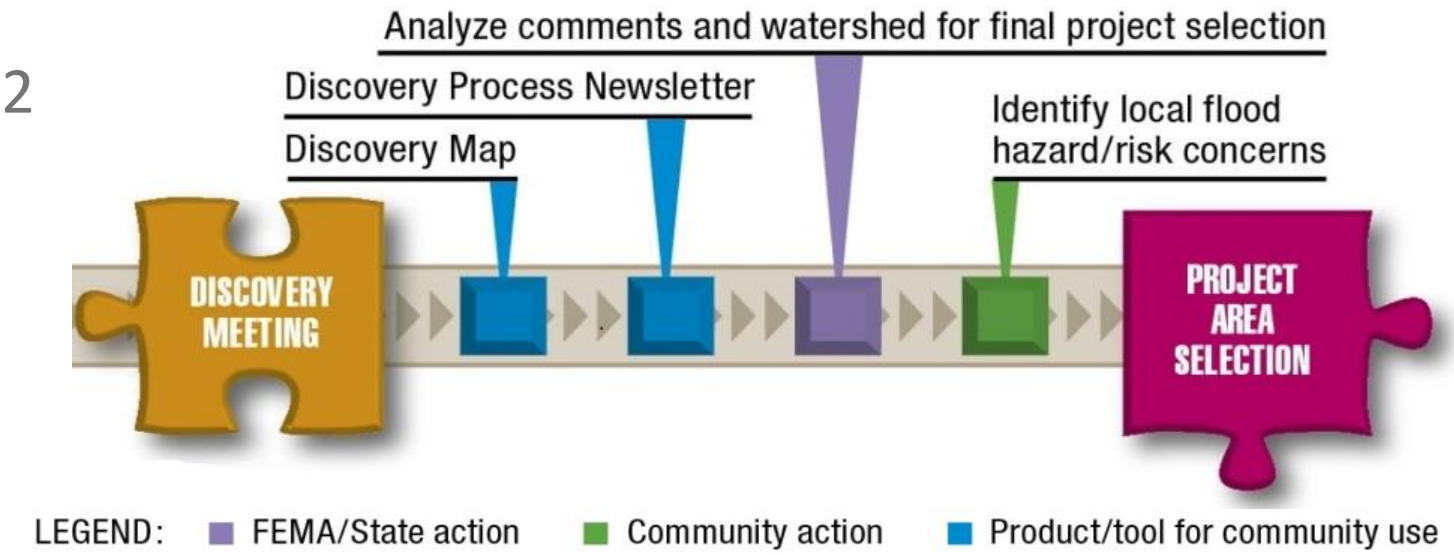


DISCOVERY MEETINGS – WHAT YOU SHOULD BRING

- Knowledge of Flood Risks and Past Flooding in your community
- Hazard Mitigation Projects – Identified, In Progress, or Complete?
- Master Drainage Plan(s), floodplain studies – completed or identified as needs
- Questions or Concerns regarding your current Digital Flood Insurance Rate Maps – Flood Study Needs
- Current Flood Risk Communication Process
- Dams and Levees – Questions or Concerns
- GIS data

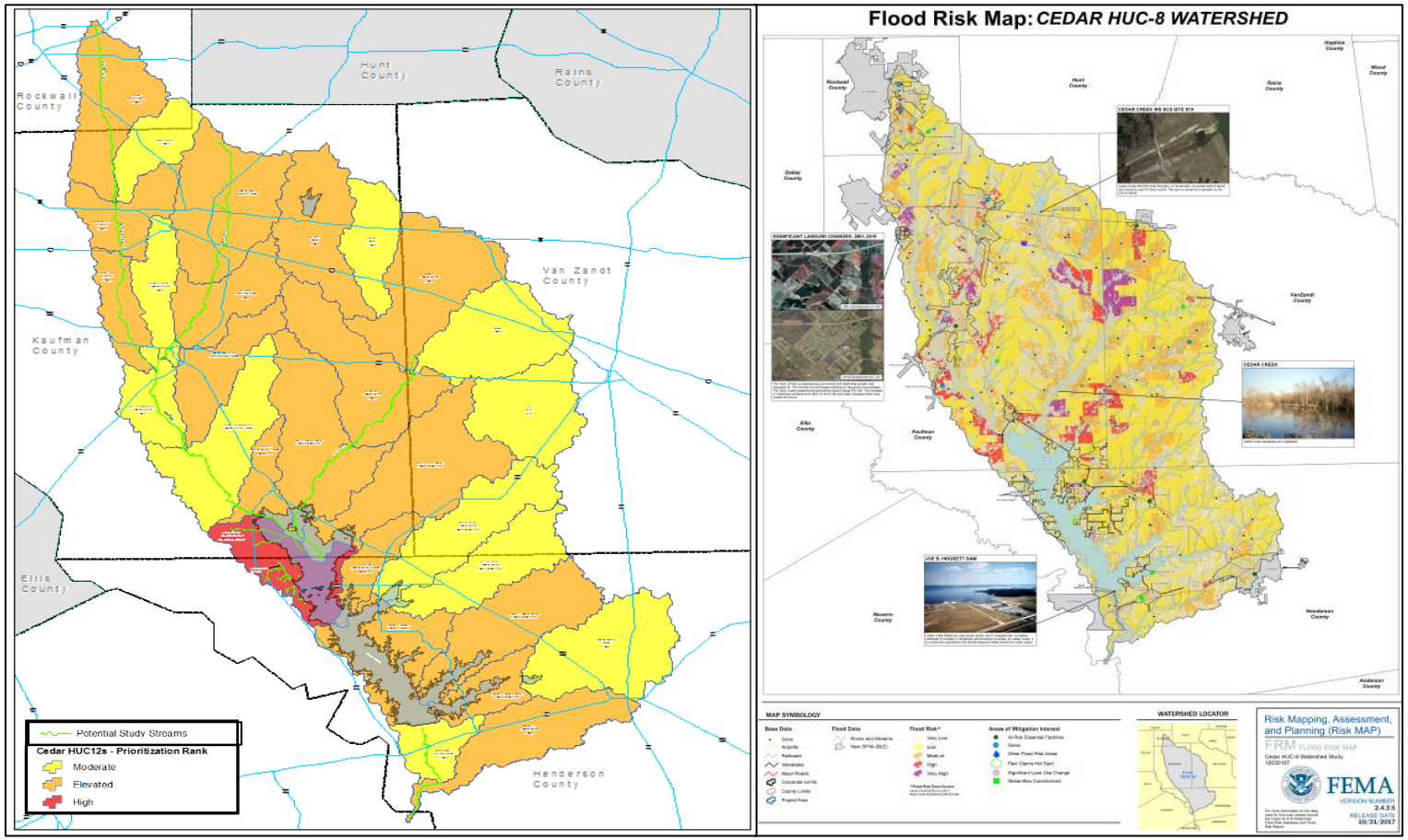
POST-DISCOVERY ACTIONS

- Post-Discovery Actions
  - -Analyze data collected
  - -Review findings with LaDOTD
  - -Preliminary project selections provided to communities
  - -Evaluate community input
  - -Discovery Report
- Findings Meetings – Fall 2022



POST-DISCOVERY RESULTS

- Population density and change
- Predicted population growth
- Historical flood events and claims
- Number of Letters of Map Change (LOMR/LOMA)
- Available current topography
- Age of technical data – hydrology and hydraulics
- Ability to leverage current studies
- Potential for local funding and "work in kind"
- Previous contribution to FEMA studies
- Stakeholder mapping requests



The primary result of Discovery is a list of projects to be considered for funding!

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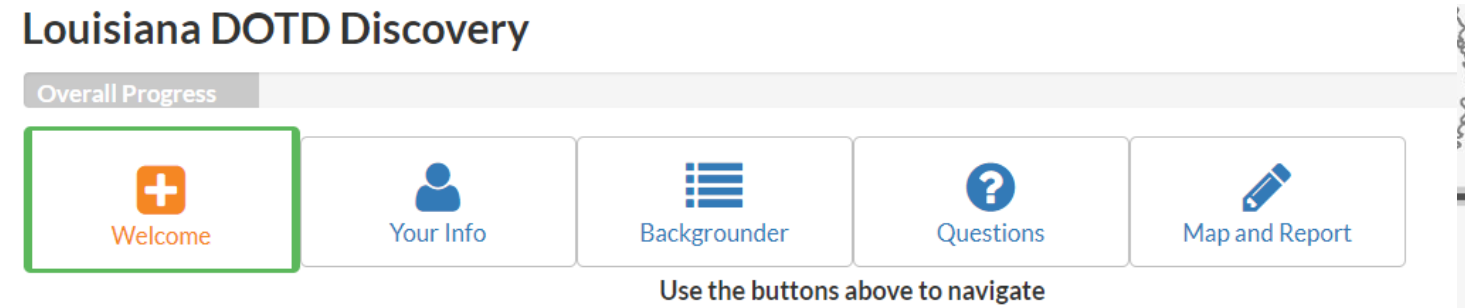
DISCOVERY SUMMARY

- Heighten community involvement and understanding
- Gather all flood-related information available
  - Knowledge of Flood Risks and Past Flooding in your community
  - Hazard Mitigation Projects – ongoing, planned or completed
  - Master Drainage Plans and floodplain studies – ongoing, planned or completed
  - Current flood risk communication process
  - GIS data
- Request needs in the community
  - Questions and concerns for DFIRM maps
  - All questions and concerns for dams and levees
  - Study request in areas of repetitive loss
  - Areas of new development or other causes of concern for the future
  - Funding needs for identified flood risk projects

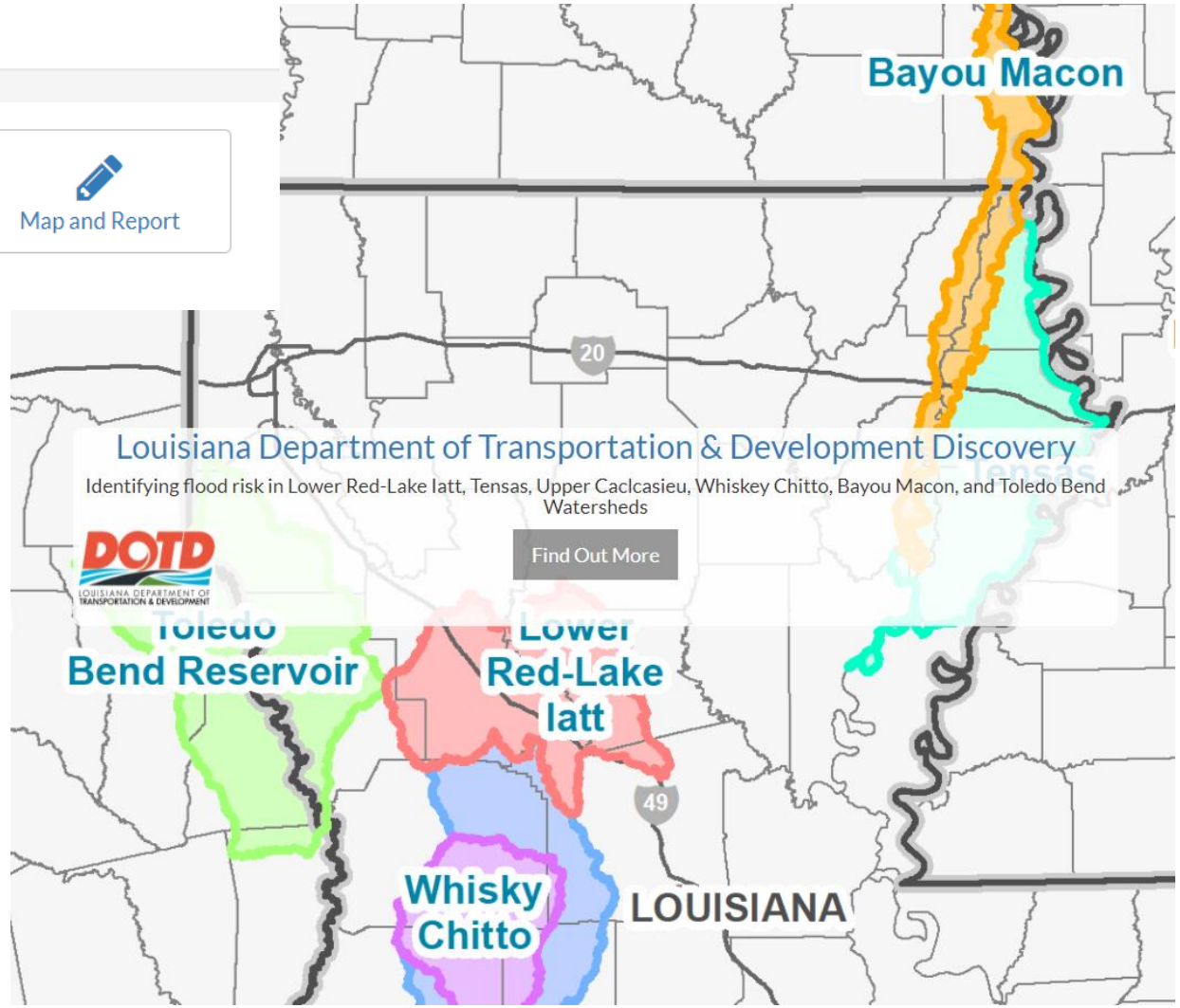
DISCOVERY SUMMARY

- Next steps
  - Involve other people in your office, team and community
  - Go to the website and add all information you gather
  - Call or email with questions
  - Join us in March for the Discovery meeting for any additional conversation
  - Get funding for your area!

PLEASE ENTER YOUR INFORMATION ON THE WEBSITE – LIVE AFTER THIS MEETING



Customize Discovery:
After the meeting, enter your community's data at:
https://dotd.discovery.halff.com
Password: DOTD_FY20!



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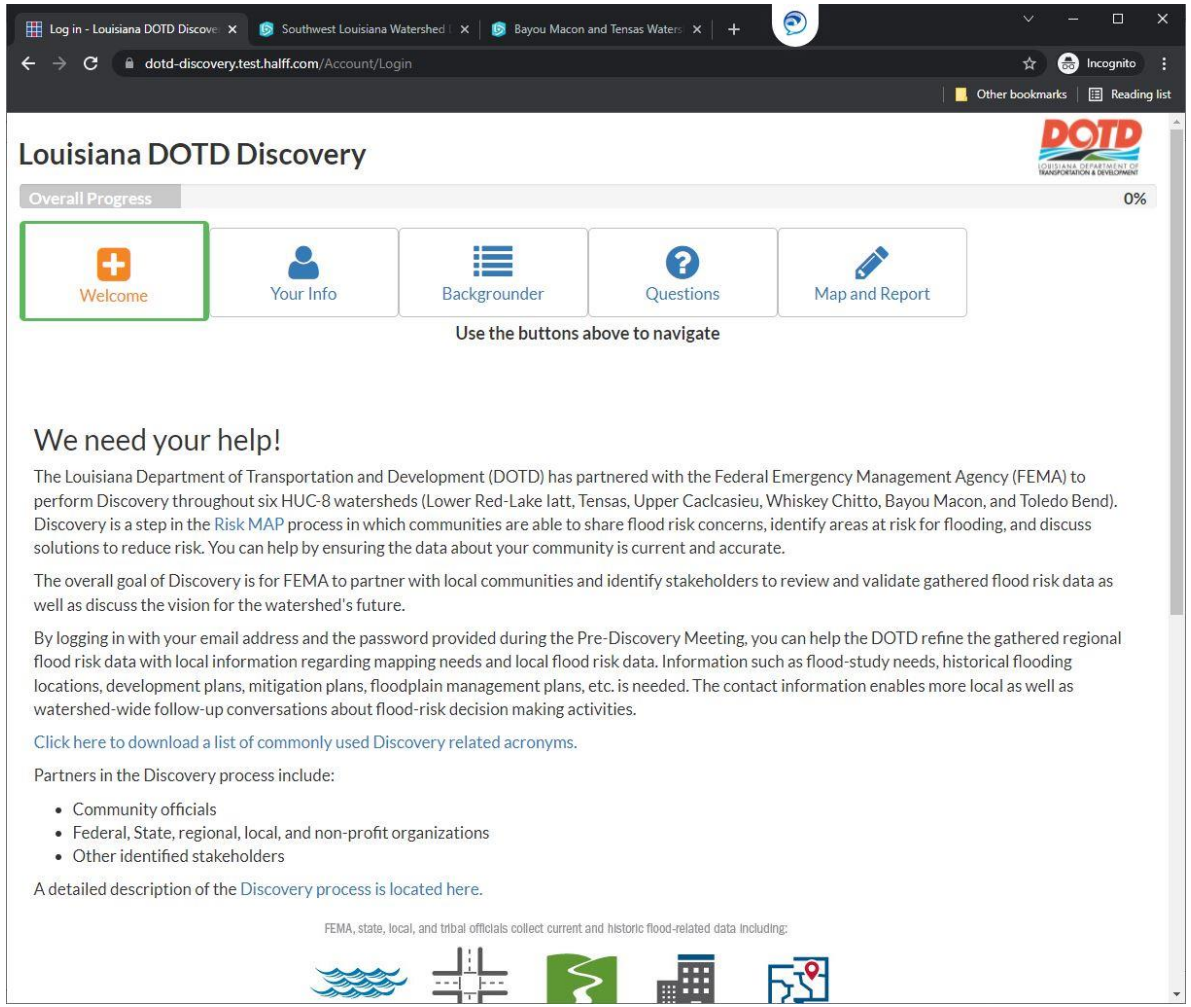
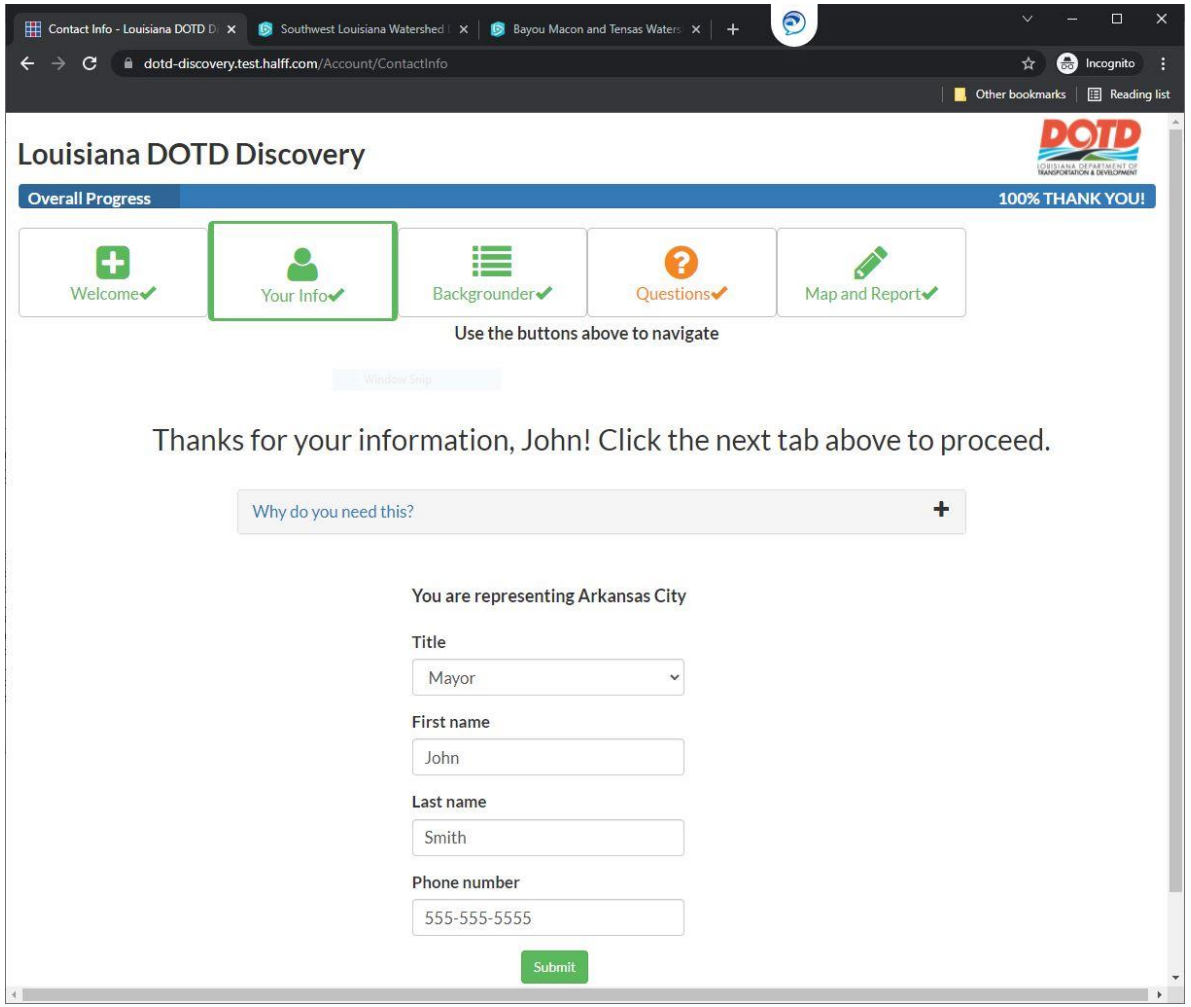
WEBSITE OVERVIEW





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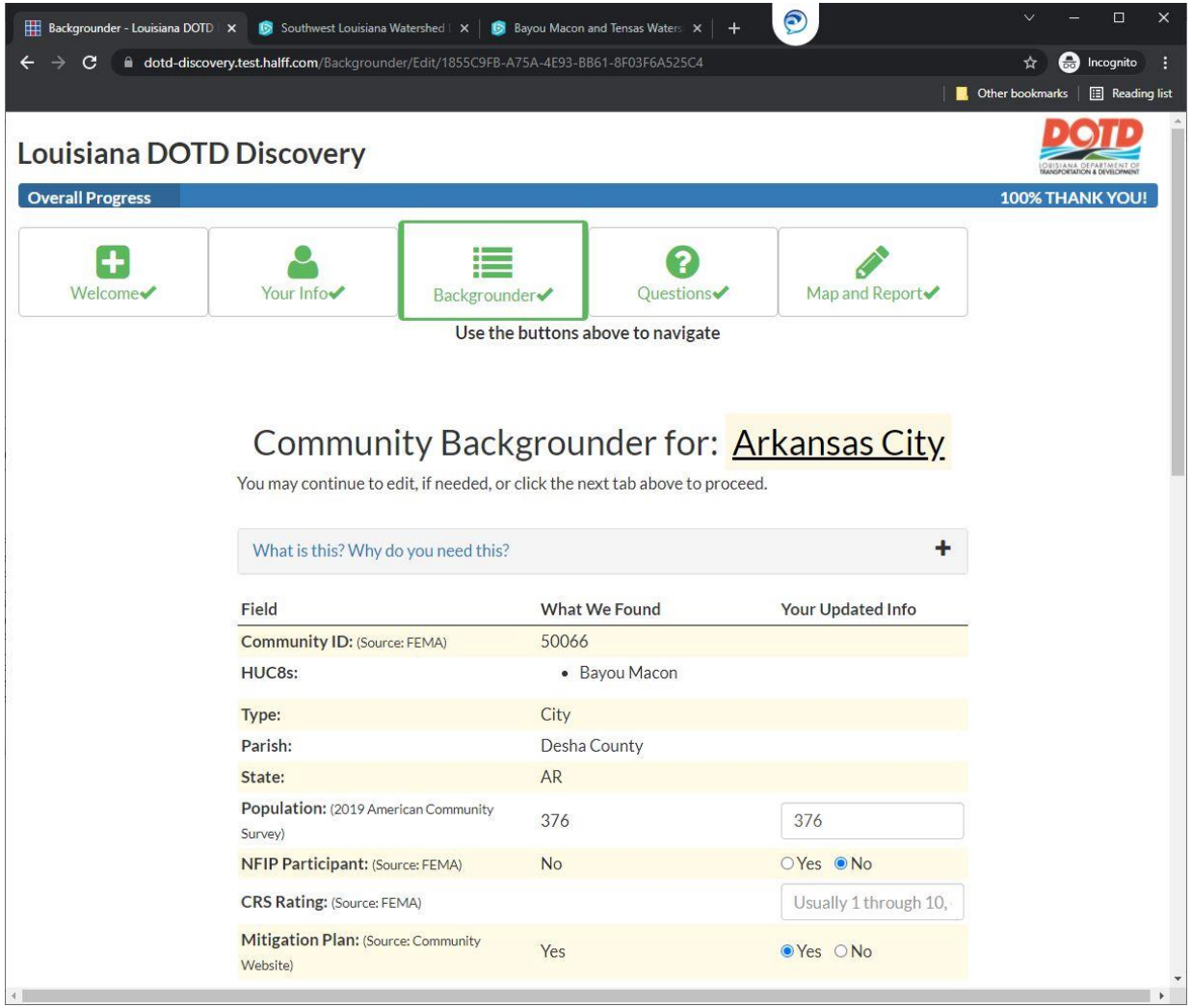
WEBSITE OVERVIEW

Community Backgrounder

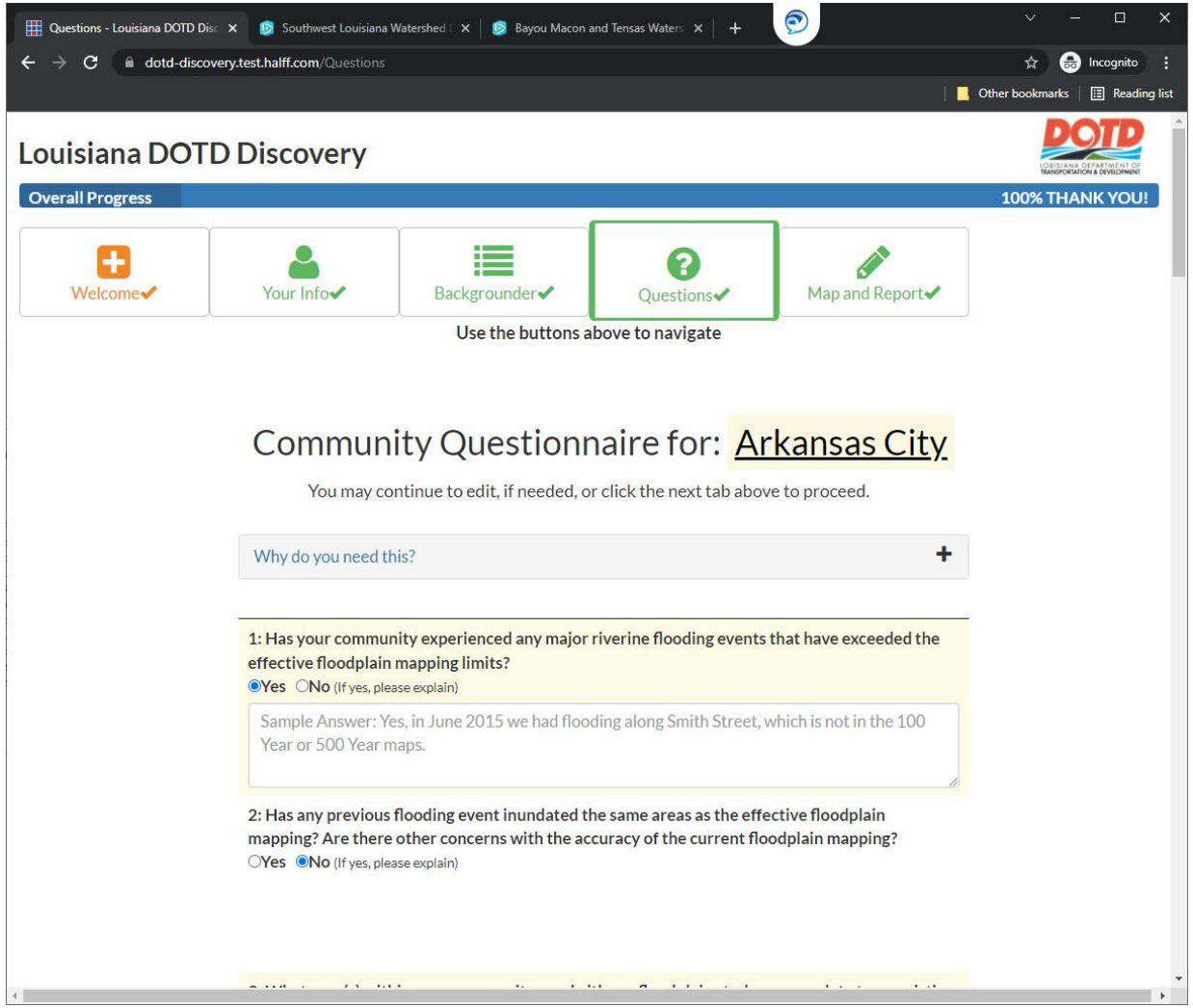
- Snapshot of existing data
- Open for review and verification
  - Key items for verification:
    - Number of NFIP claims
    - Financial cost of losses
    - Mitigation Plan standing (outdated, existing, proposed, etc.)
    - Number of high-water marks
    - Number of low-water crossings



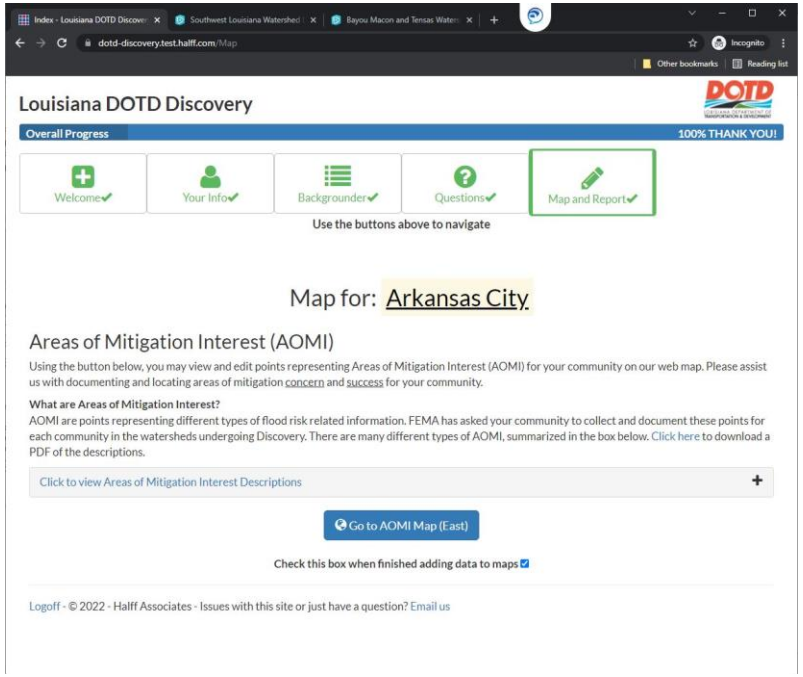
WEBSITE OVERVIEW

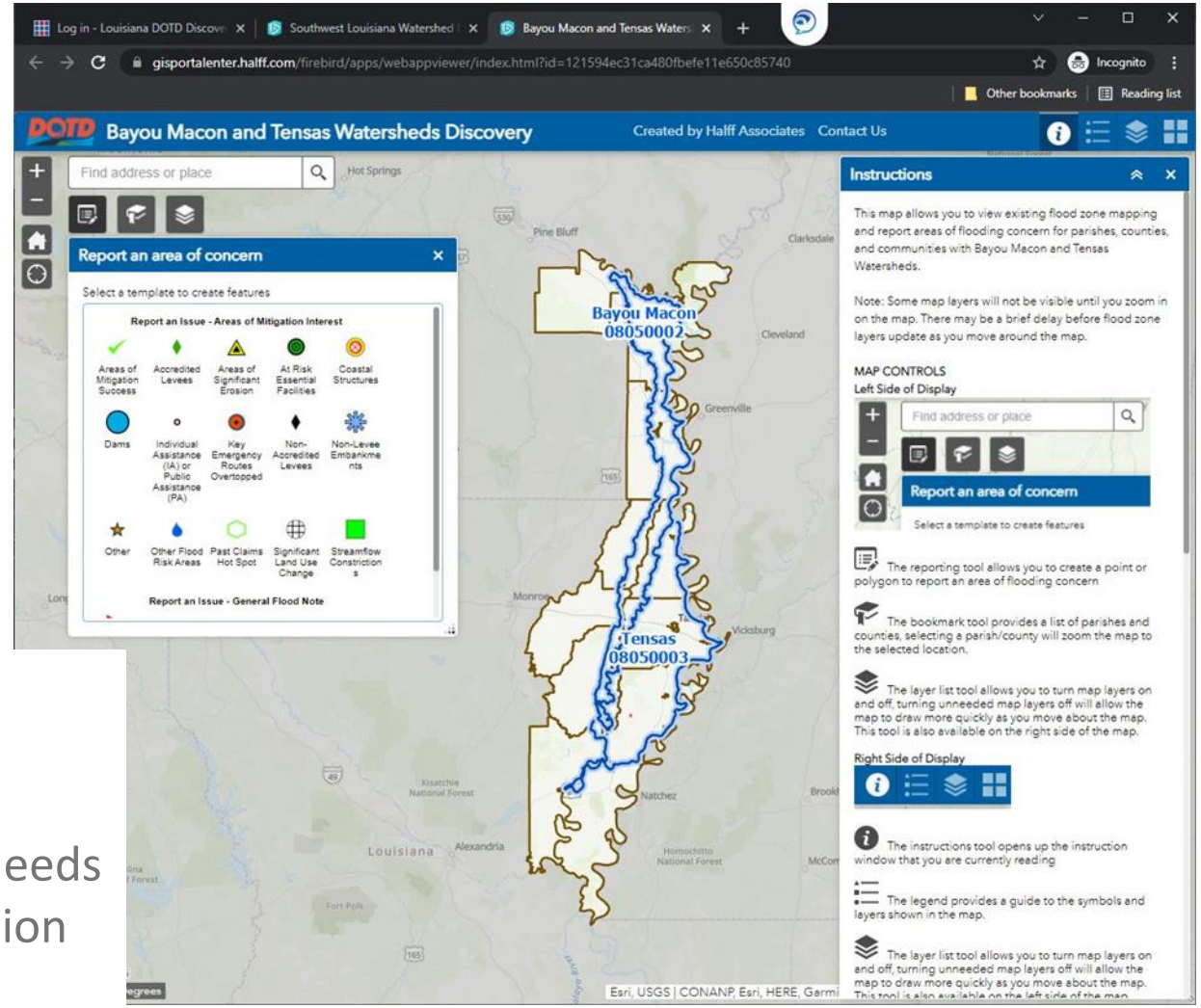
Community Questionnaire

- 26 questions to guide flood risk conversation and data gathering/mapping
- Sample responses provided



WEBSITE OVERVIEW





Interactive Webmap

- Areas of Mitigation Interest (AOMI)
- Gathering information on mitigation success and needs
- Place for all additional data and mapping risk location
- Tutorial available online

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QUESTIONS?



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QUESTIONS

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DOTD CTP Project Manager
(225) 379-3005
susan.veillon@la.gov

Cindy O'Neal
State NFIP Coordinator
(225) 379-3005
cindy.oneal@la.gov

Jack Young
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Discovery Findings Webinar Slides

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LOUISIANA DISCOVERY

"CAPTURING A MORE COMPLETE PICTURE OF YOUR WATERSHED"

POST-DISCOVERY MEETING

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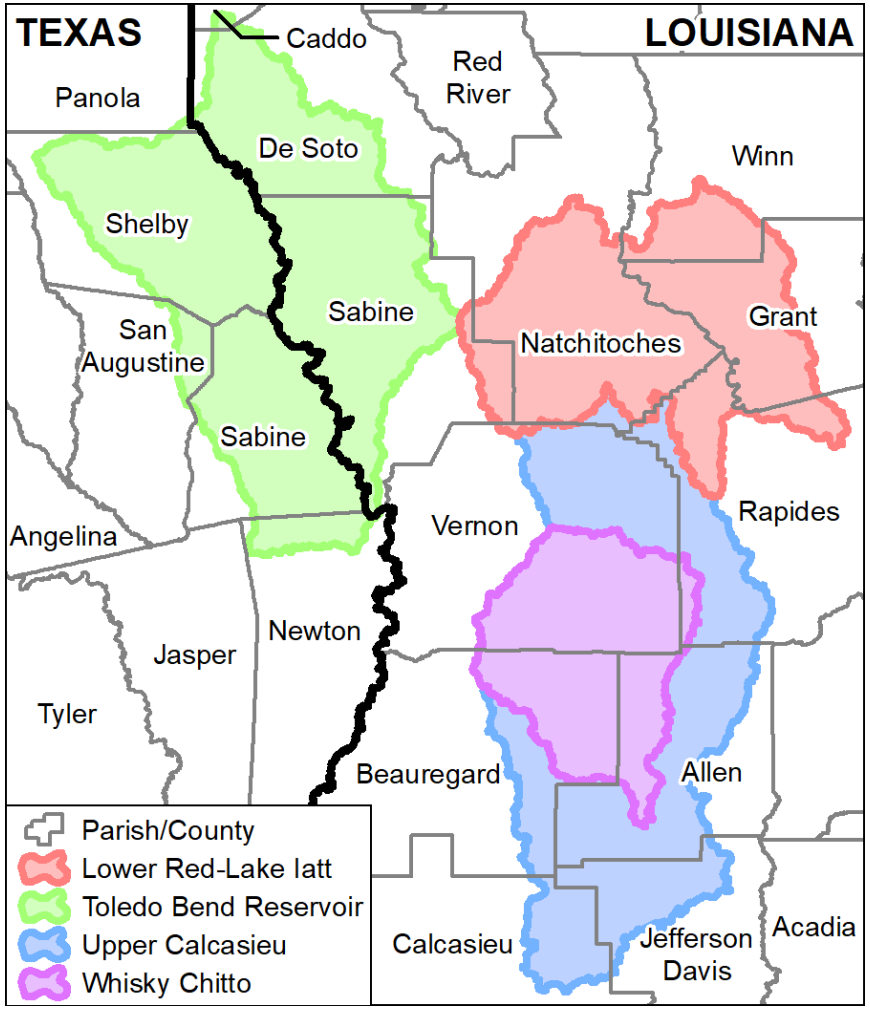
AGENDA

- Discovery Overview
- Overview of Risk MAP
- LaDOTD Discovery Activities
  - Pre-Discovery Activities
  - Discovery Activities
    - Data Gathering Website and Walk-through
  - Post-Discovery Activities
  - Post-Discovery Results
    - Base Level Engineering
    - HAZUS Results
- Post Meeting Coordination
- BFE Overview
- Project Recommendations to FEMA



DISCOVERY OVERVIEW

Discovery is FEMA's process for identifying and accessing flood risk to better prepare a list of needs and projects to address those needs within communities.

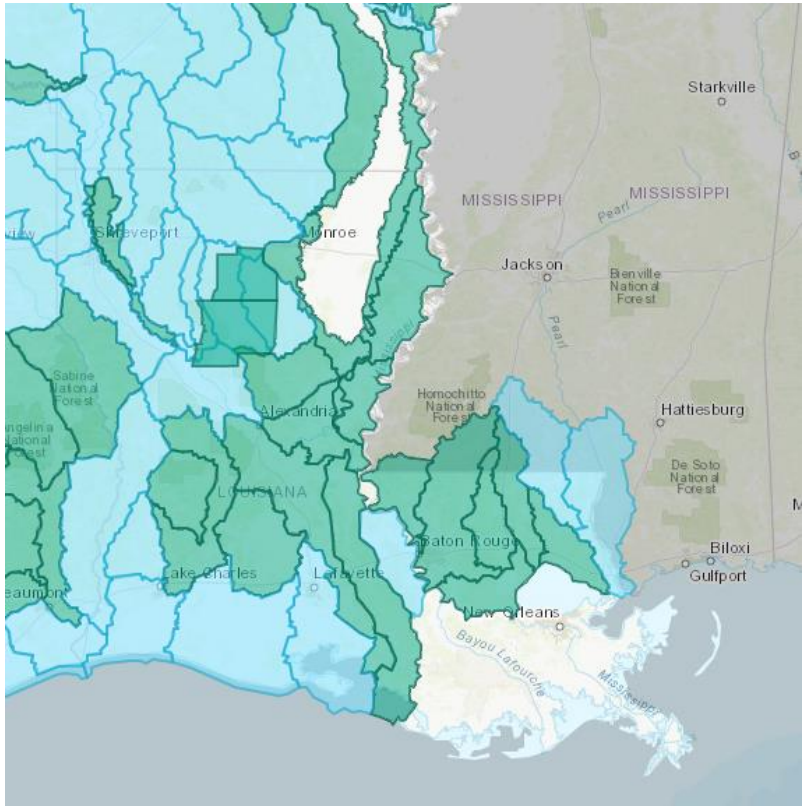
- Heighten community involvement and understanding
- Gather all flood-related information available
  - Knowledge of Flood Risks and Past Flooding in your community
  - Hazard Mitigation Projects – ongoing, planned or completed
  - Master Drainage Plans and floodplain studies – ongoing, planned or completed
  - Current flood risk communication process
  - GIS data

DISCOVERY OVERVIEW

- Request needs in the community
  - Questions and concerns for DFIRM maps
  - All questions and concerns for dams and levees
  - Study request in areas of repetitive loss
  - Areas of new development or other causes of concern for the future
  - Funding needs for identified flood risk projects

- Present Projects for Consideration
  - Modeling and Mapping needs
  - Structural improvements listed in the Flood Risk Map

FEMA'S RISK MAP PROGRAM



- Provide flood information and tools for better **protection**
- **Action-Driven** through local understanding and ownership of risk



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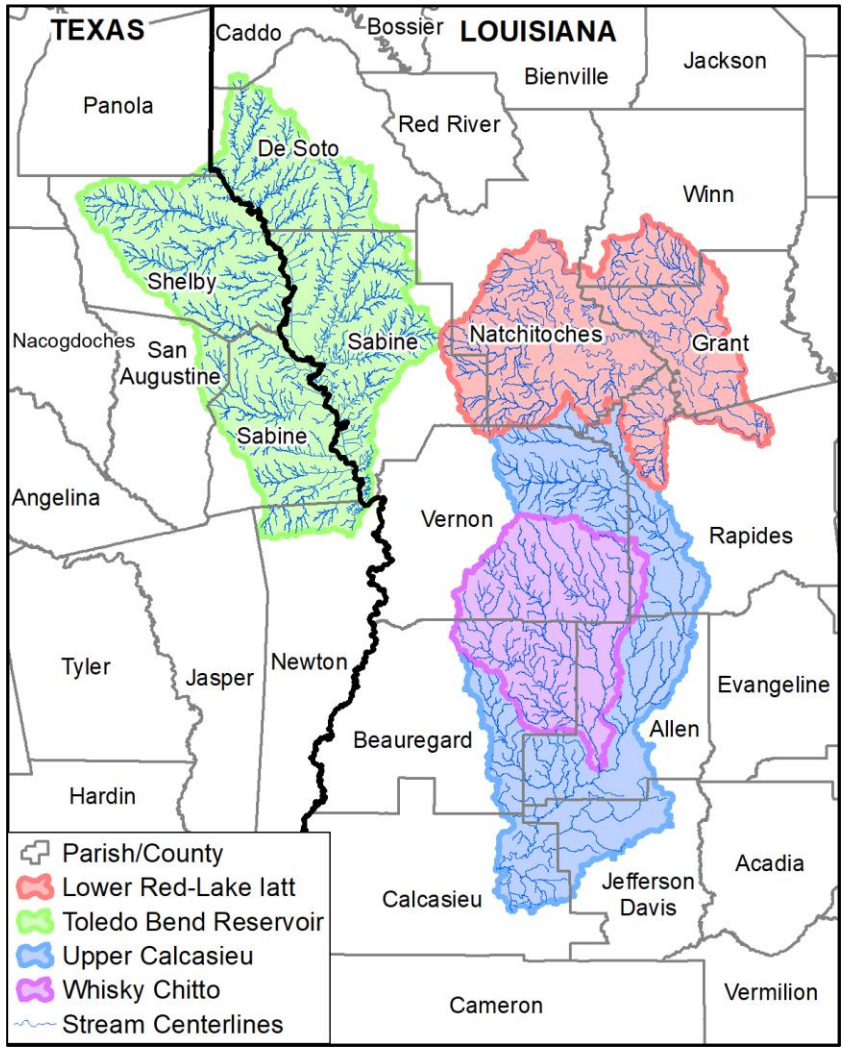
LOUISIANA DOTD DISCOVERY GOALS

Louisiana Watersheds Discovery

- Goals
  - Inform Community of Present Flood Risk
  - Gather local data to supplement National, Regional and State data
  - Present FEMA with areas of highest concern and need for additional study



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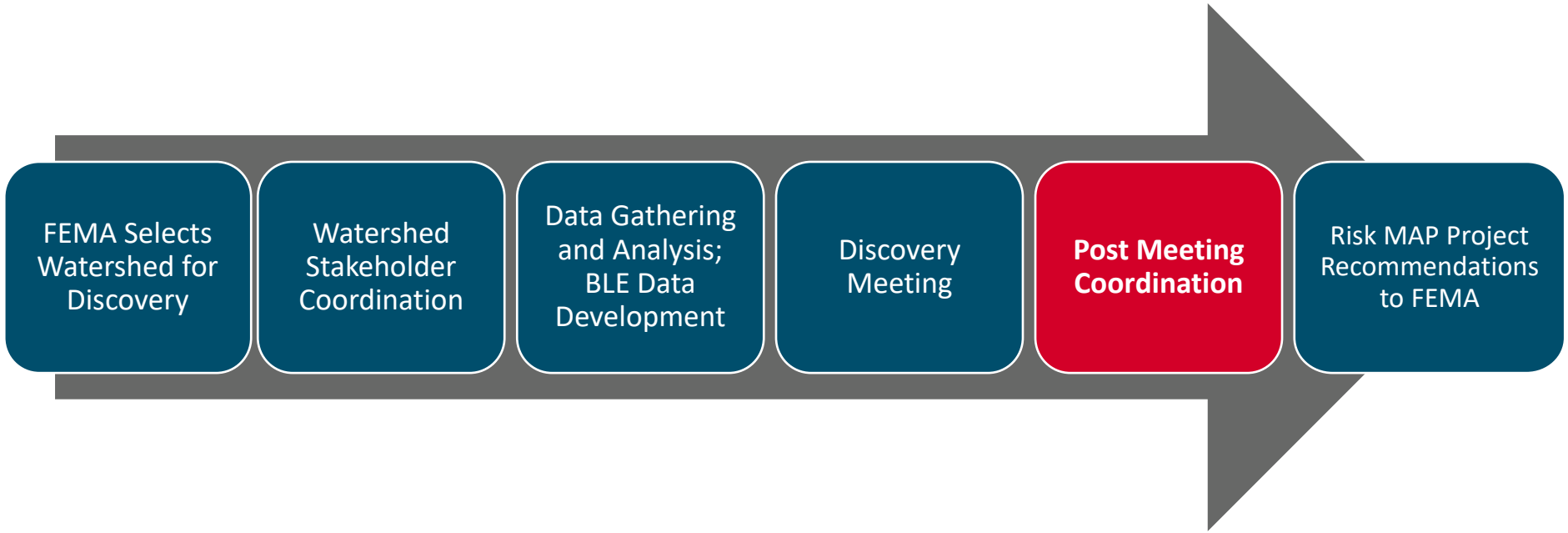
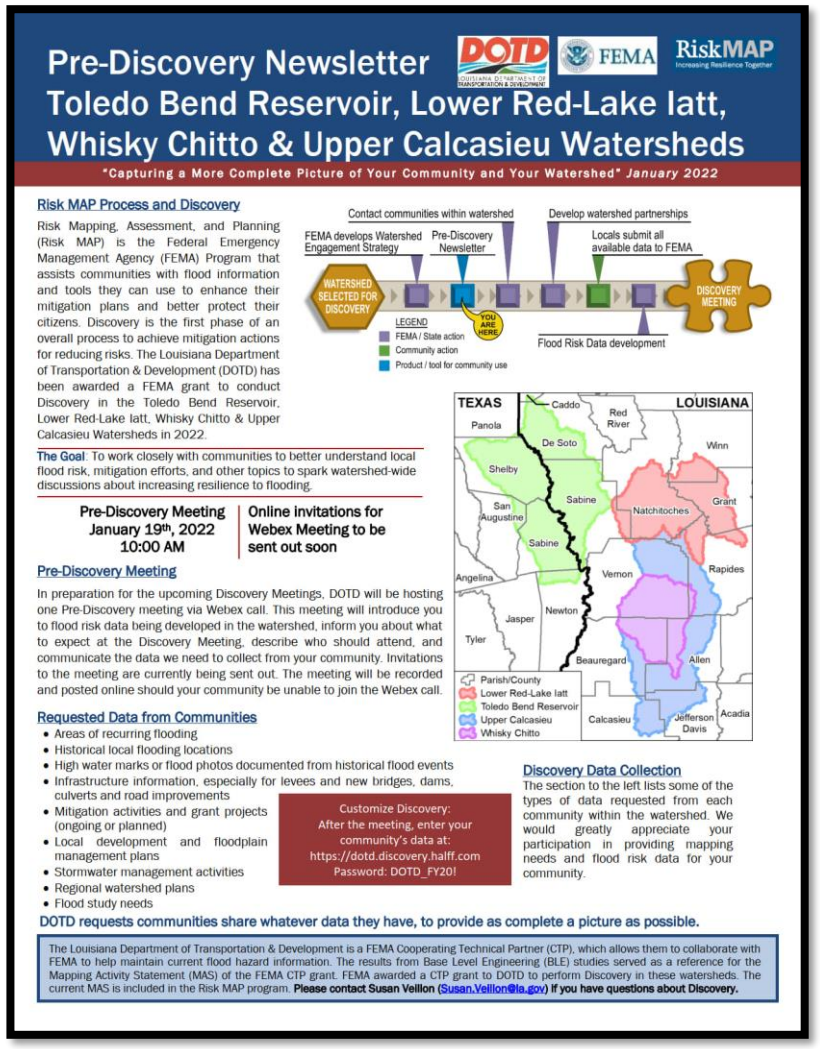
DISCOVERY STEPS

- ***Capture a more complete picture of your watershed by working closely with local communities…***



DISCOVERY NEWSLETTER



Pre-Discovery Newsletter
Toledo Bend Reservoir, Lower Red-Lake Iatt, Whisky Chitto & Upper Calcasieu Watersheds

Capturing a More Complete Picture of Your Community and Your Watershed January 2022

Risk MAP Process and Discovery

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that assists communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Discovery is the first phase of an overall process to achieve mitigation actions for reducing risks. The Louisiana Department of Transportation & Development (DOTD) has been awarded a FEMA grant to conduct Discovery in the Toledo Bend Reservoir, Lower Red-Lake Iatt, Whisky Chitto & Upper Calcasieu Watersheds in 2022.

Contact communities within watershed
Develop watershed partnerships
FEMA develops Watershed Engagement Strategy
Pre-Discovery Newsletter
Locals submit all available data to FEMA
WATERSHED SELECTED FOR DISCOVERY
DISCOVERY MEETING
LEGEND
FEMA / State action
Community action
Product / tool for community use
YOU ARE HERE
Flood Risk Data development

The Goal: To work closely with communities to better understand local flood risk, mitigation efforts, and other topics to spark watershed-wide discussions about increasing resilience to flooding.

Pre-Discovery Meeting
January 19th, 2022
10:00 AM

Online invitations for Webex Meeting to be sent out soon

Pre-Discovery Meeting

In preparation for the upcoming Discovery Meetings, DOTD will be hosting one Pre-Discovery meeting via Webex call. This meeting will introduce you to flood risk data being developed in the watershed, inform you about what to expect at the Discovery Meeting, describe who should attend, and communicate the data we need to collect from your community. Invitations to the meeting are currently being sent out. The meeting will be recorded and posted online should your community be unable to join the Webex call.

Requested Data from Communities

- Areas of recurring flooding
- Historical local flooding locations
- High water marks or flood photos documented from historical flood events
- Infrastructure information, especially for levees and new bridges, dams, culverts and road improvements
- Mitigation activities and grant projects (ongoing or planned)
- Local development and floodplain management plans
- Stormwater management activities
- Regional watershed plans
- Flood study needs

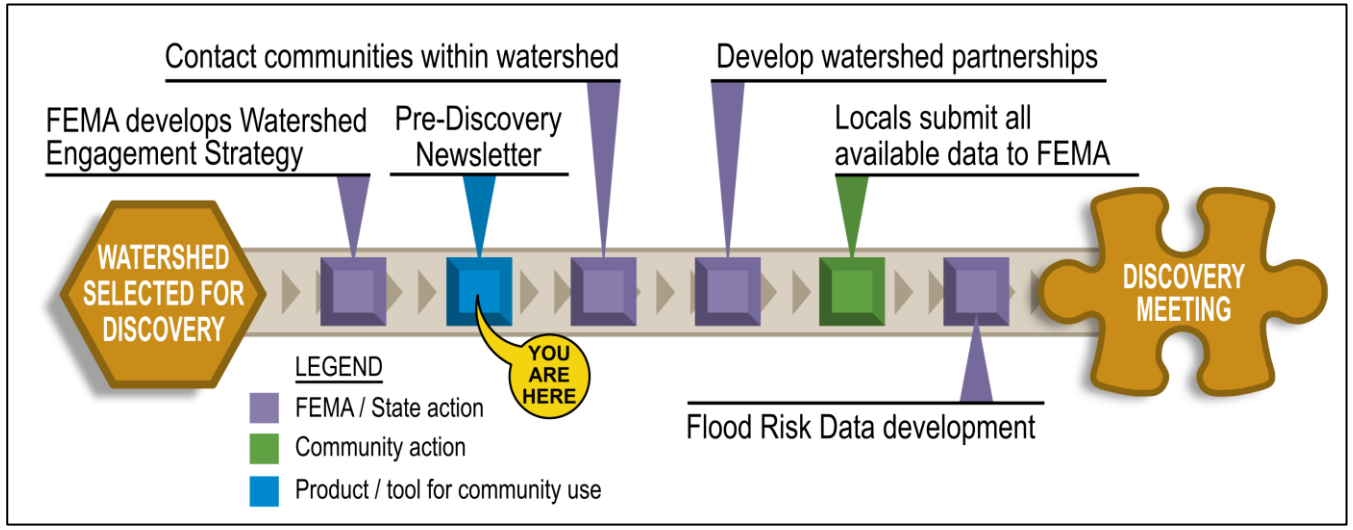
Customize Discovery:
After the meeting, enter your community's data at:
https://dotd.discovery.halff.com
Password: DOTD_FY20!

Discovery Data Collection

The section to the left lists some of the types of data requested from each community within the watershed. We would greatly appreciate your participation in providing mapping needs and flood risk data for your community.

DOTD requests communities share whatever data they have, to provide as complete a picture as possible.

The Louisiana Department of Transportation & Development is a FEMA Cooperating Technical Partner (CTP), which allows them to collaborate with FEMA to help maintain current flood hazard information. The results from Base Level Engineering (BLE) studies served as a reference for the Mapping Activity Statement (MAS) of the FEMA CTP grant. FEMA awarded a CTP grant to DOTD to perform Discovery in these watersheds. The current MAS is included in the Risk MAP program. **Please contact Susan Veillon (Susan.Veillon@la.gov) if you have questions about Discovery.**



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January 19th, 2022
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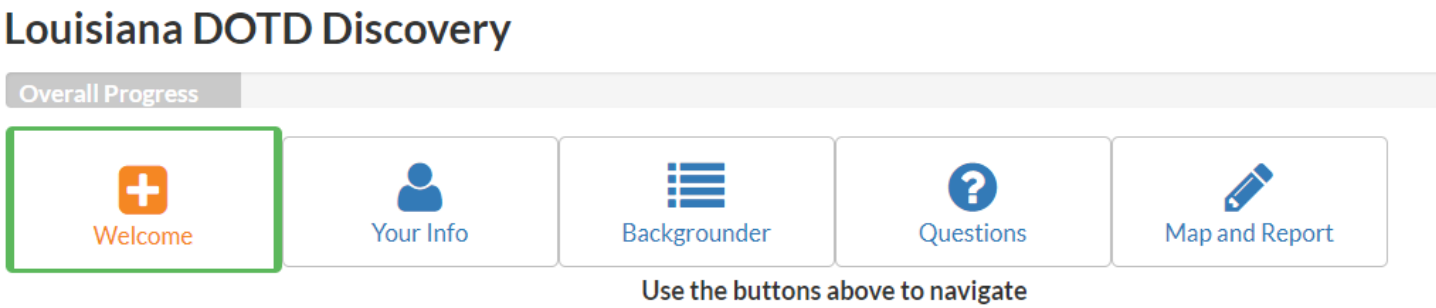
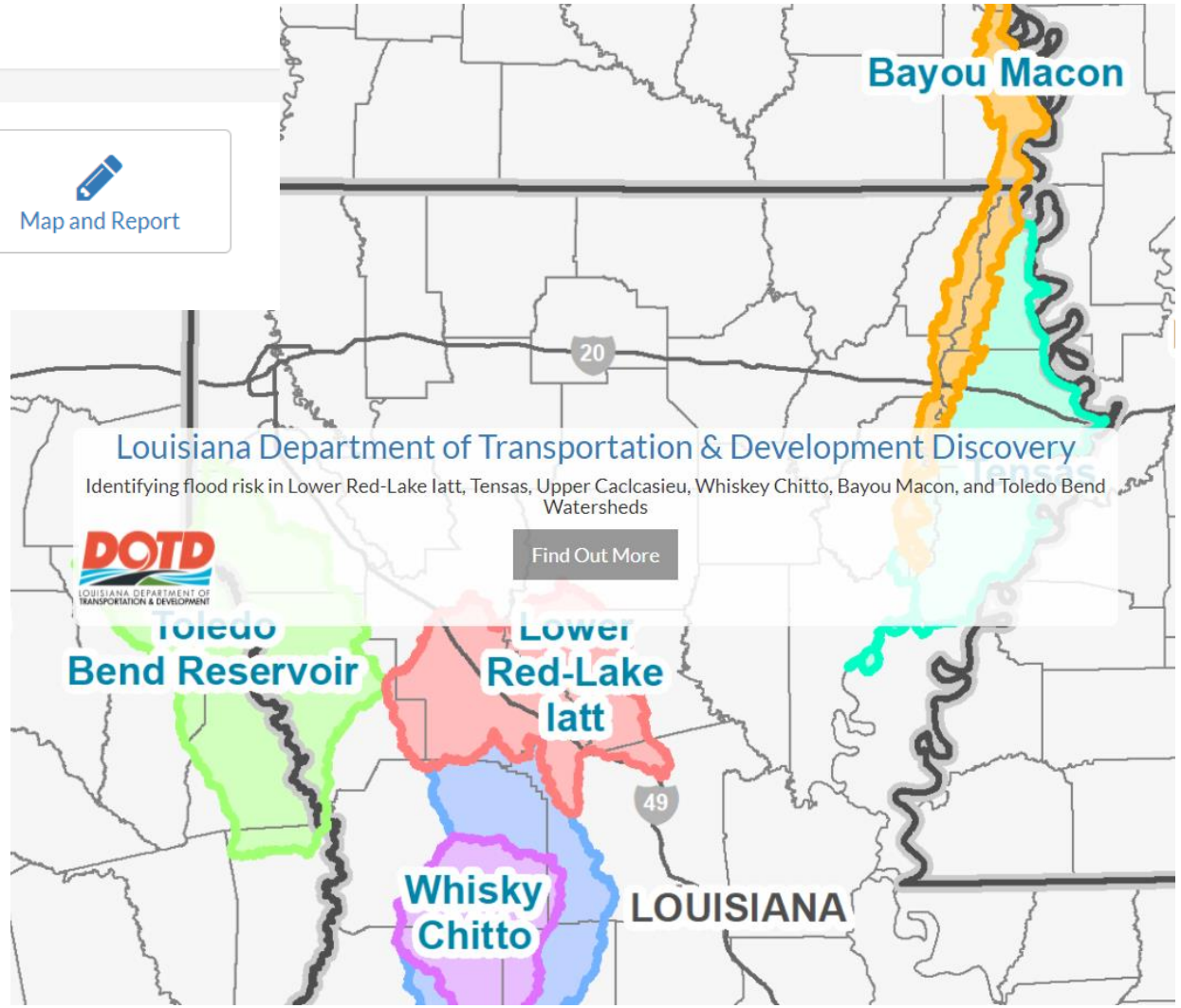
DISCOVERY MEETINGS – WEBSITE



- Enter your communities' data online
- Discovery meetings were conducted in March
- All community stakeholders were encouraged to attend



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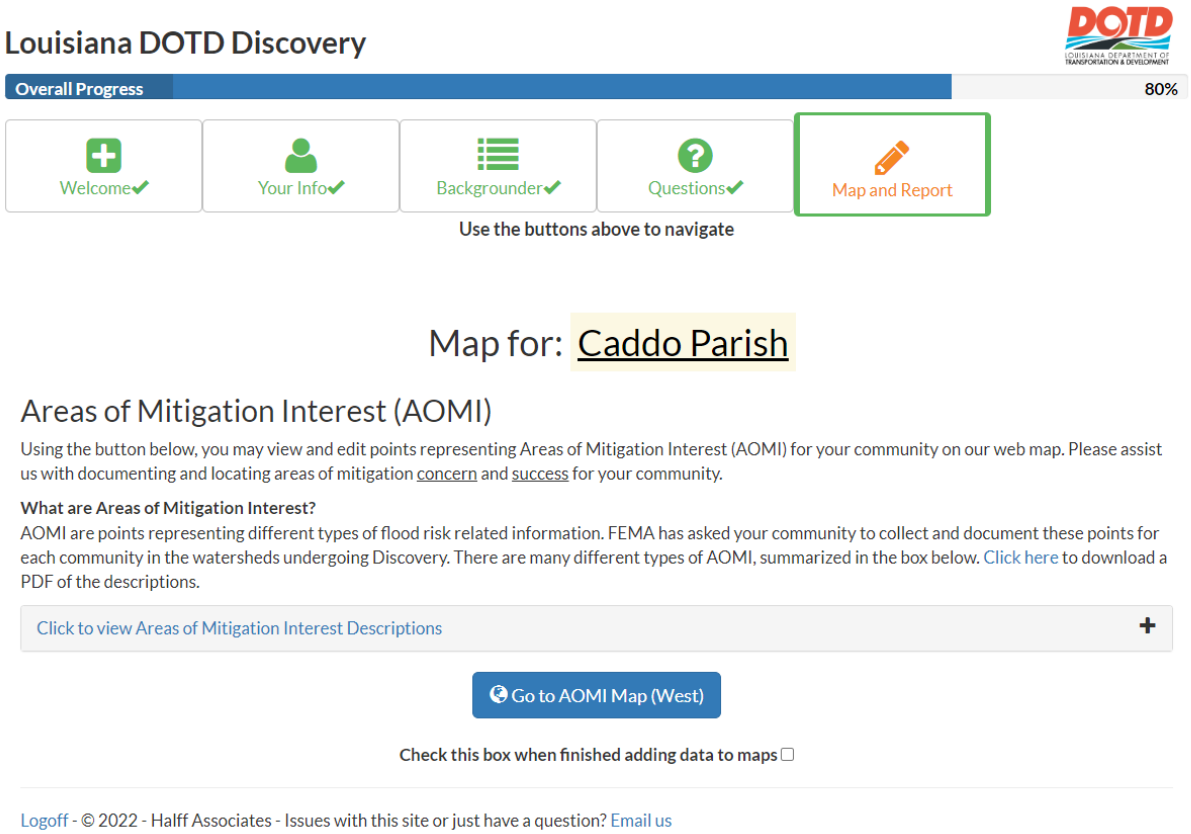
DISCOVERY ACTIVITIES - WEBSITE

Community Backgrounder

- Key items for verification:
  - Number of NFIP claims
  - Financial cost of losses
  - Mitigation Plan standing (outdated, existing, proposed, etc.)
  - Number of high-water marks
  - Number of low-water crossings
  - Significant Land Use Changes
  - Issues with Effective Mapping



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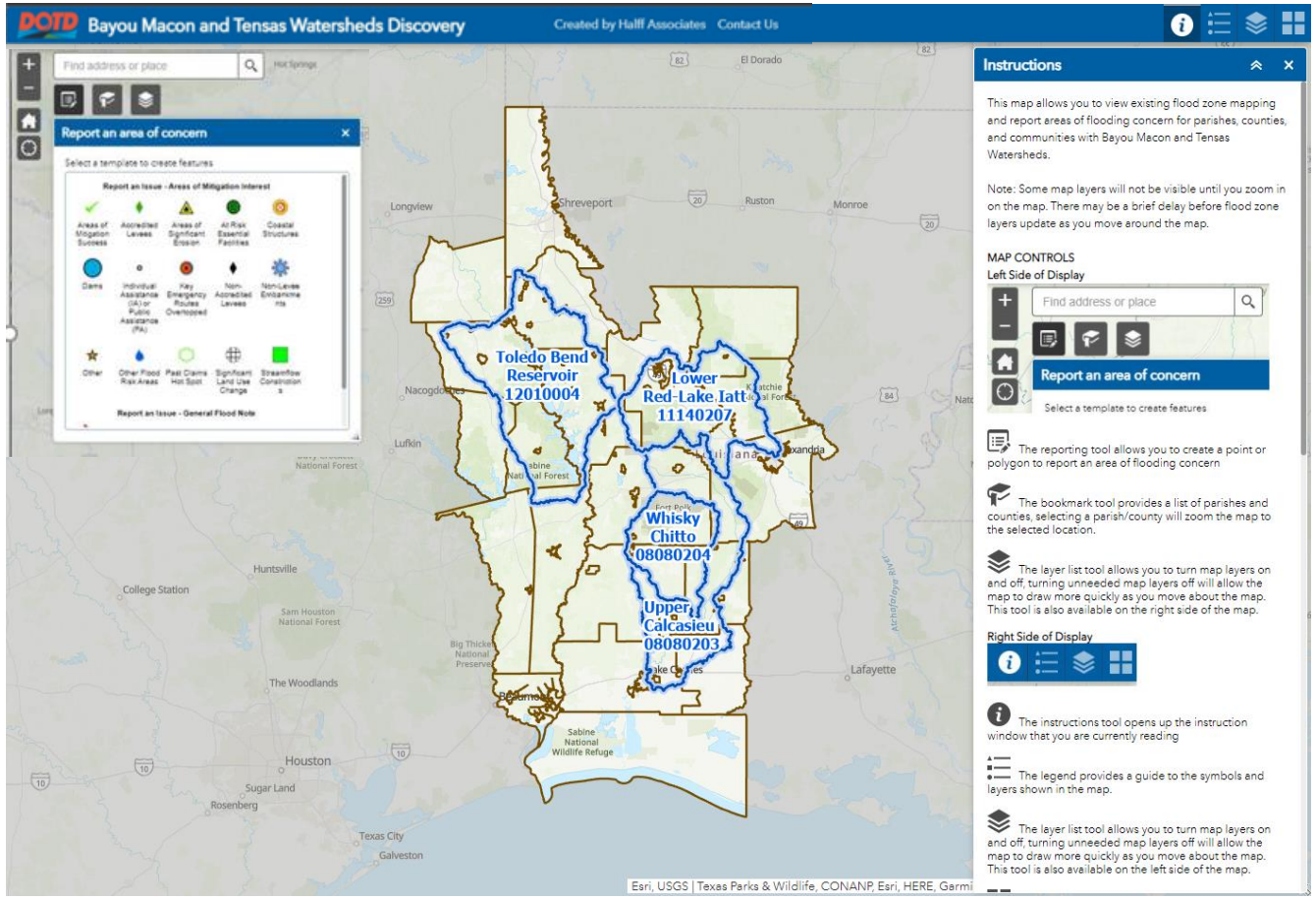
DISCOVERY ACTIVITIES - WEBSITE

Interactive Webmap

- Areas of Mitigation Interest (AOMI)
- Gathering information on at risk facilities, significant erosion areas, past claim hotspots, low water crossings, streamflow constrictions, and other flood risk areas
- Place for all additional data and mapping risk location



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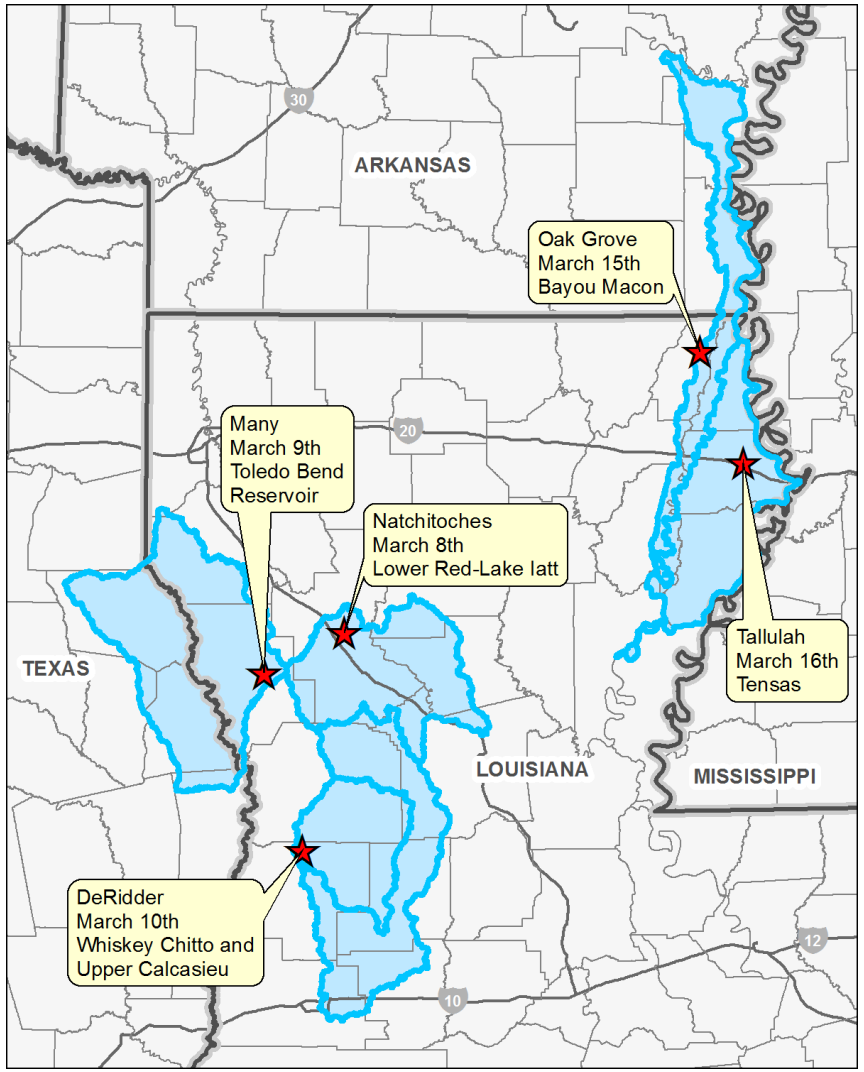
DISCOVERY ACTIVITIES – MEETINGS

- Southwest Watersheds
  - March 8th – Natchitoches
  - March 9th – Many
  - March 10th – DeRidder
- Northeast Watersheds
  - March 15th – Oak Grove
  - March 16th – Tallulah



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DISCOVERY MEETINGS – WHAT TO EXPECT

- "Come and Go" format
- Open conversation
- Served as additional meeting point beyond the webmap
- Facilitated discussion among stakeholders
- Received flooding issues
- Groups present:
  - Federal, State, and Regional Agencies
  - Community Officials and other local stakeholders









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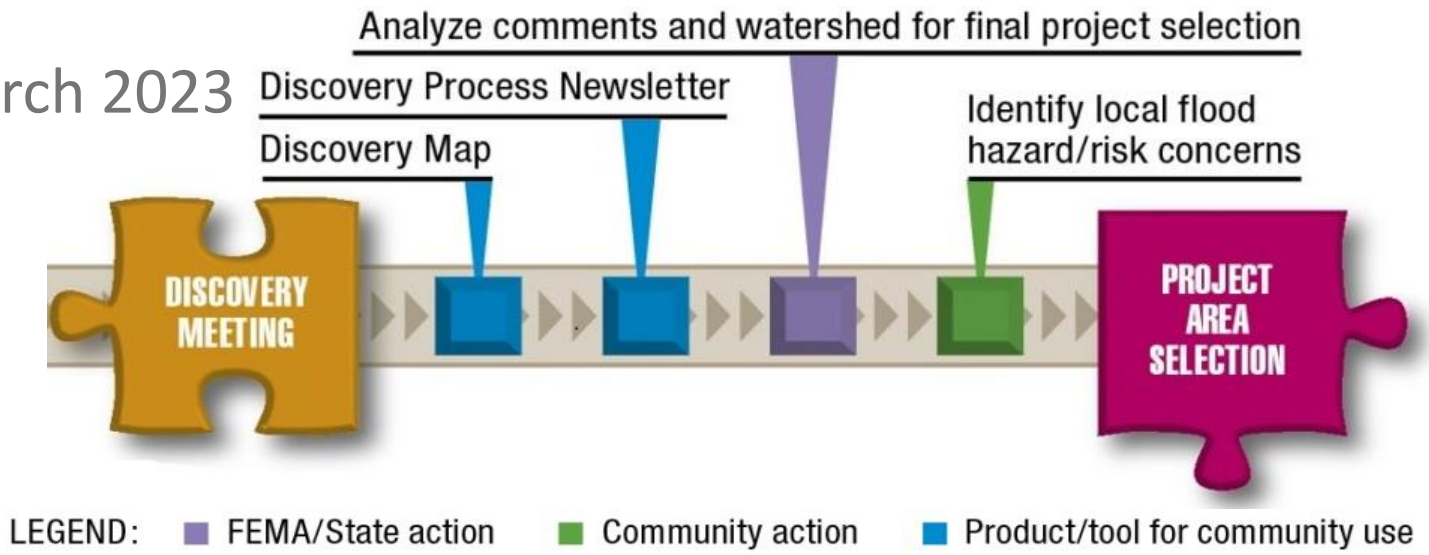
POST-DISCOVERY ACTIONS

- Post-Discovery Actions
  -Analyze data collected
  -Review findings with LaDOTD
  -Preliminary project selections provided to communities
  -Evaluate community input
  -Discovery Report
- Post Discovery Meeting – March 2023

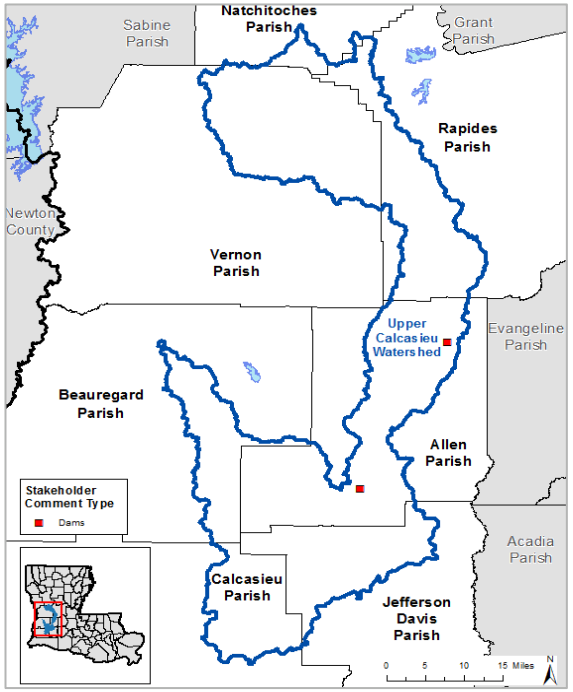


FINDINGS

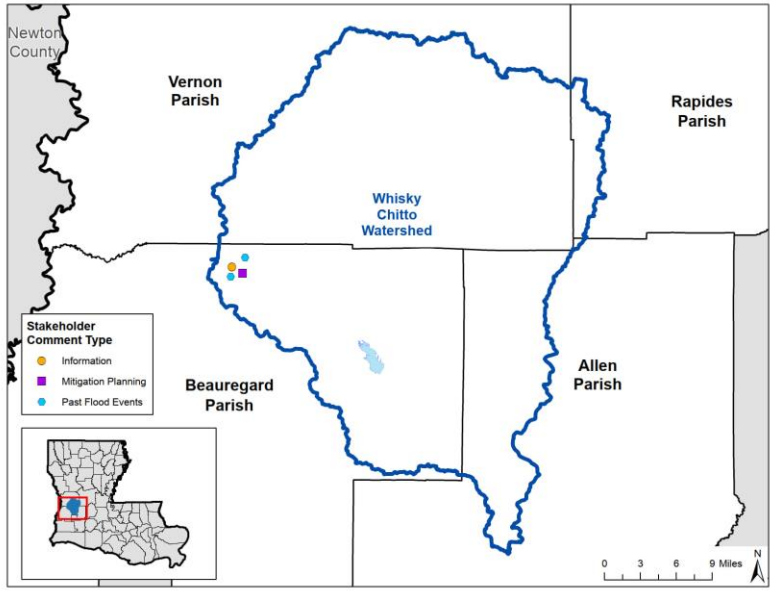
27 STAKEHOLDER MAP COMMENTS

Number of Comments	Community
5	Allen
6	Beauregard
6	Calcasieu
0	Jefferson Davis
0	Natchitoches
5	Rapides
5	Vernon

Upper Calcasieu Watershed



Whisky Chitto Watershed



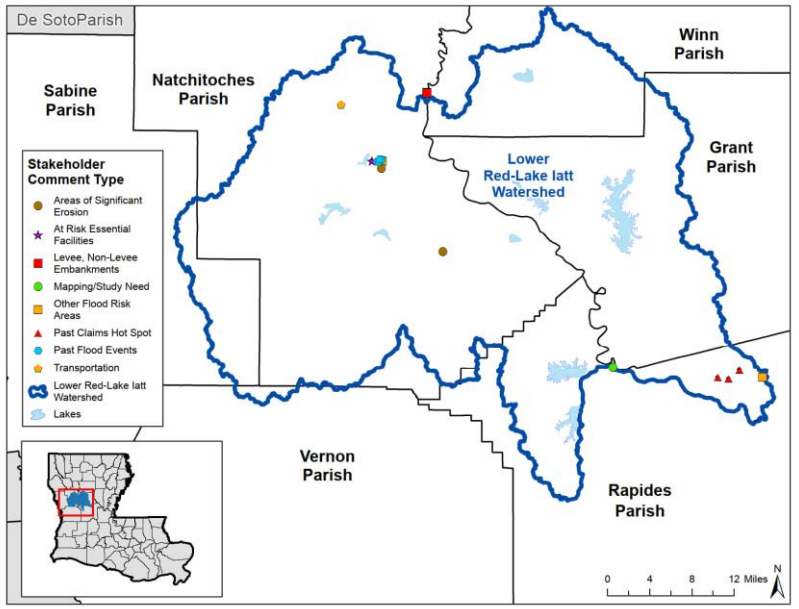
The primary result of Discovery is a list of projects to be considered for funding!

FINDINGS

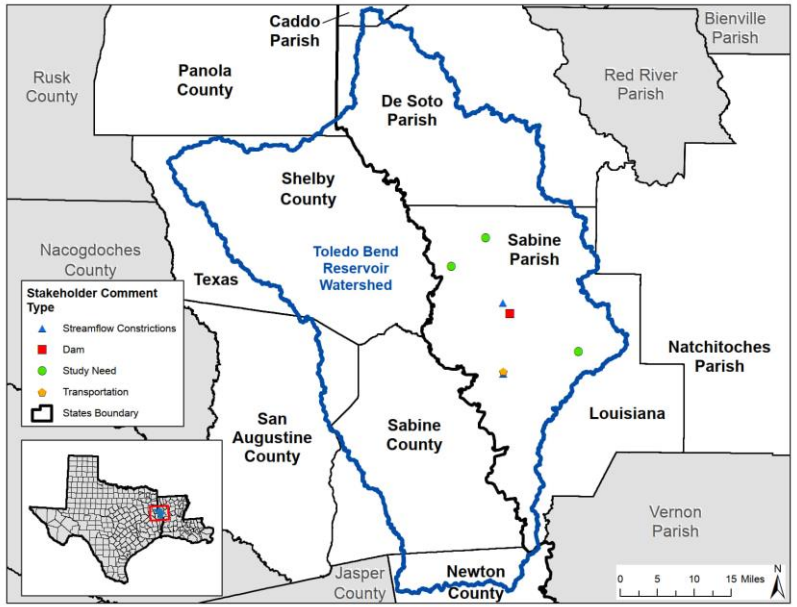
STAKEHOLDER MAP COMMENTS

Number of Comments	Community
0	Caddo
1	DeSoto
3	Grant
10	Natchitoches
14	Rapides
13	Sabine
0	Vernon
1	Winn

Lower Red – Lake Iatt Watershed



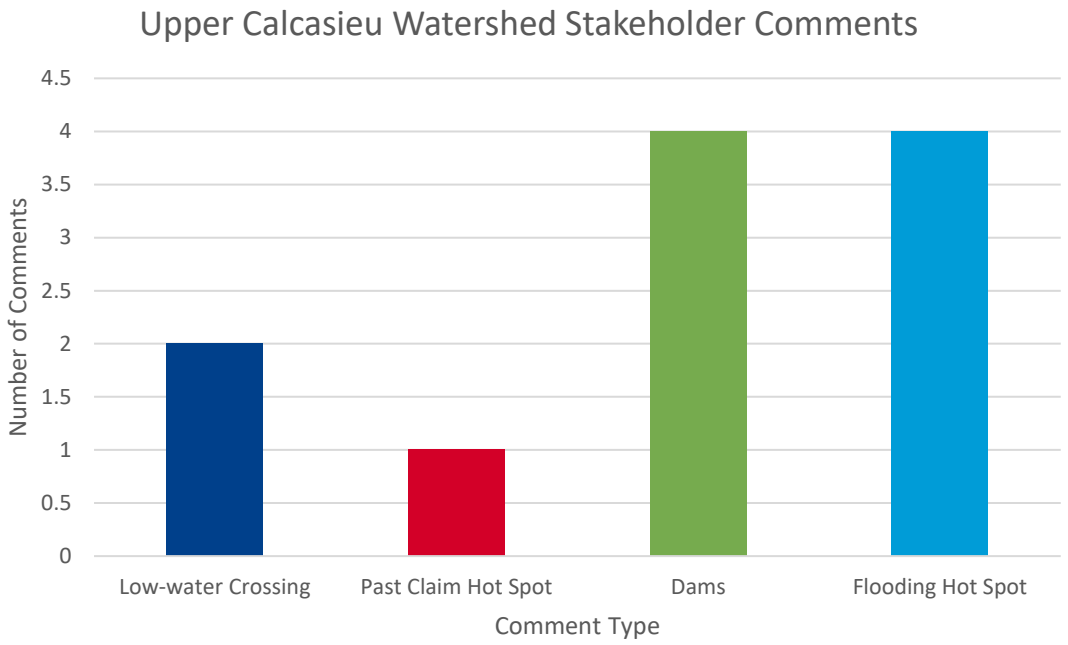
Toledo Bend Reservoir Watershed

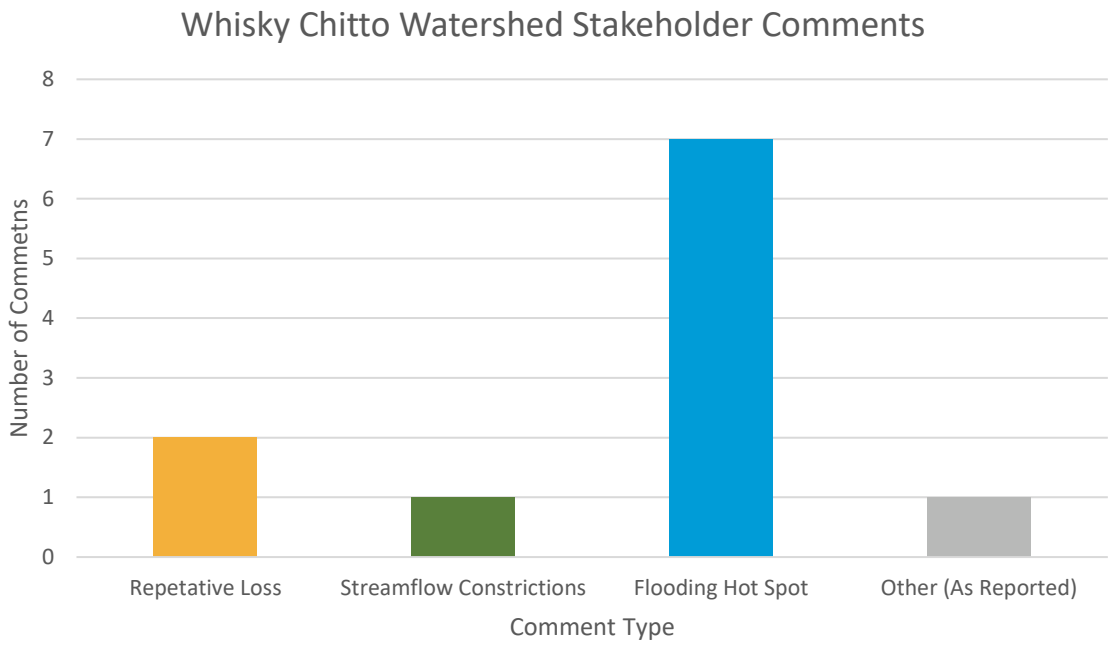


The primary result of Discovery is a list of projects to be considered for funding!

POST-DISCOVERY RESULTS

STAKEHOLDER COMMENTS BY TYPE





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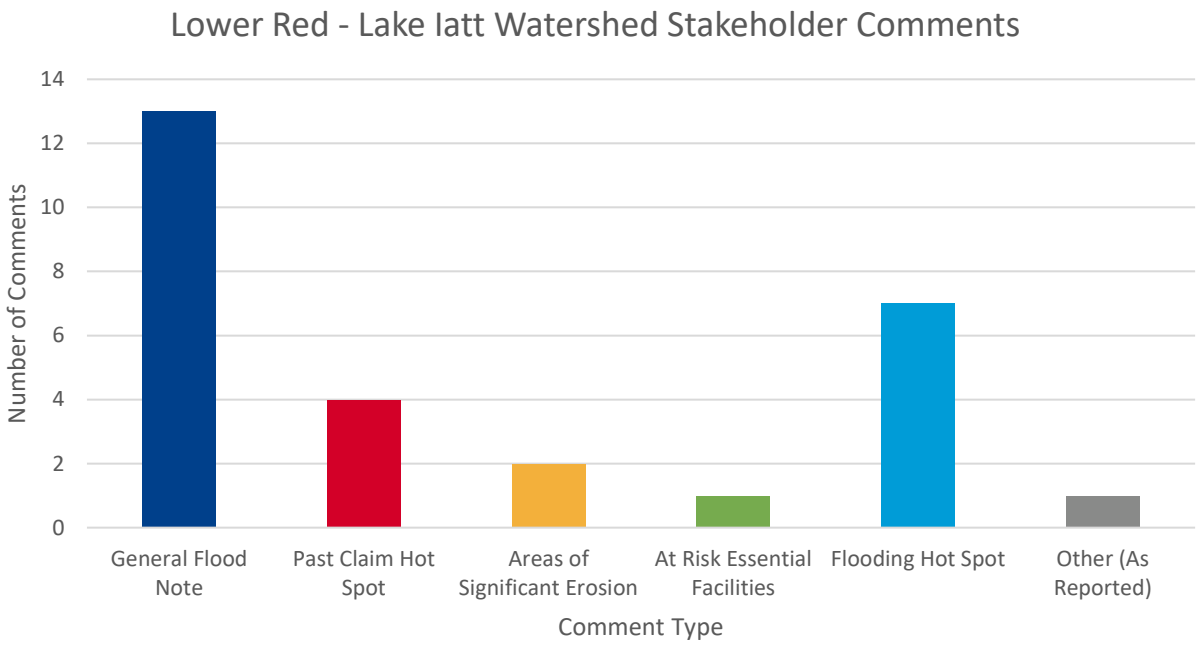
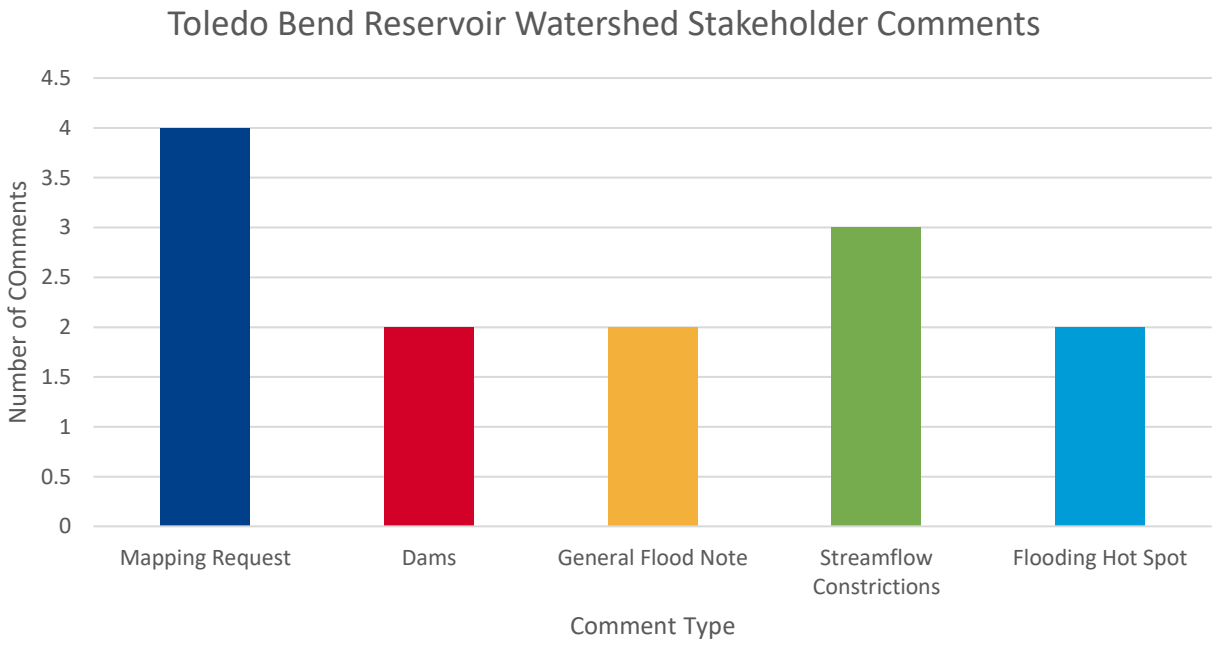
POST-DISCOVERY RESULTS

STAKEHOLDER COMMENTS BY TYPE





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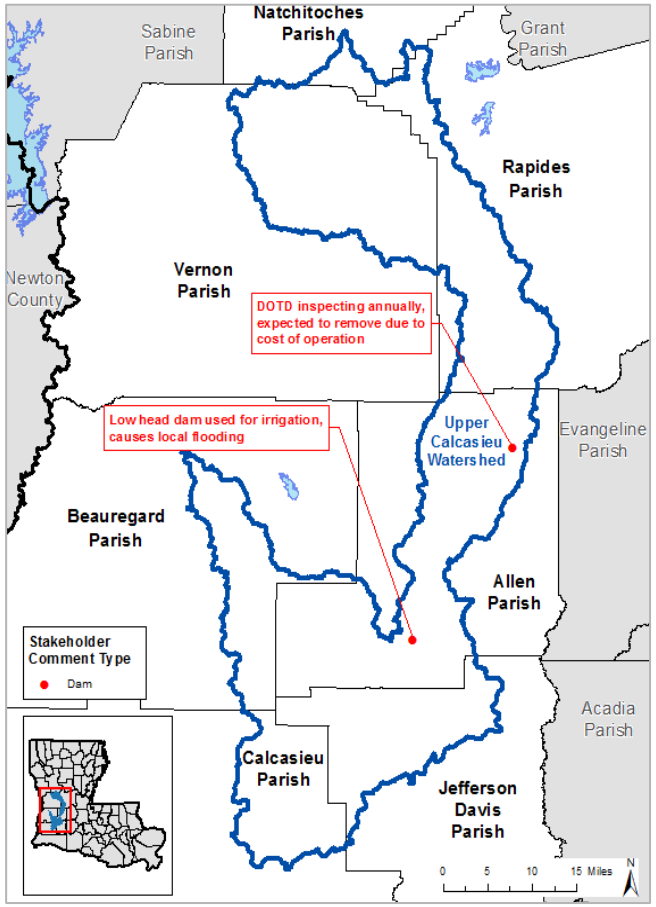
POST-DISCOVERY RESULTS

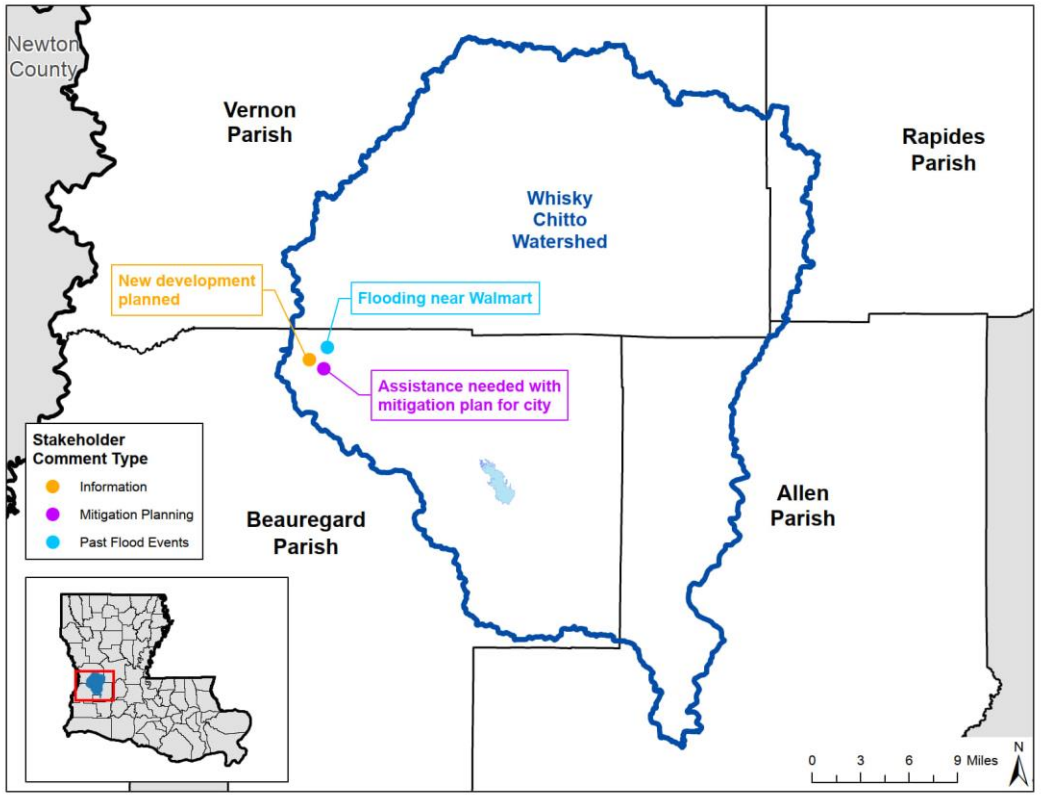
SAMPLE COMMENTS SUBMITTED

Upper Calcasieu Watershed



SAMPLE COMMENTS SUBMITTED

Whiskey Chitto Watershed



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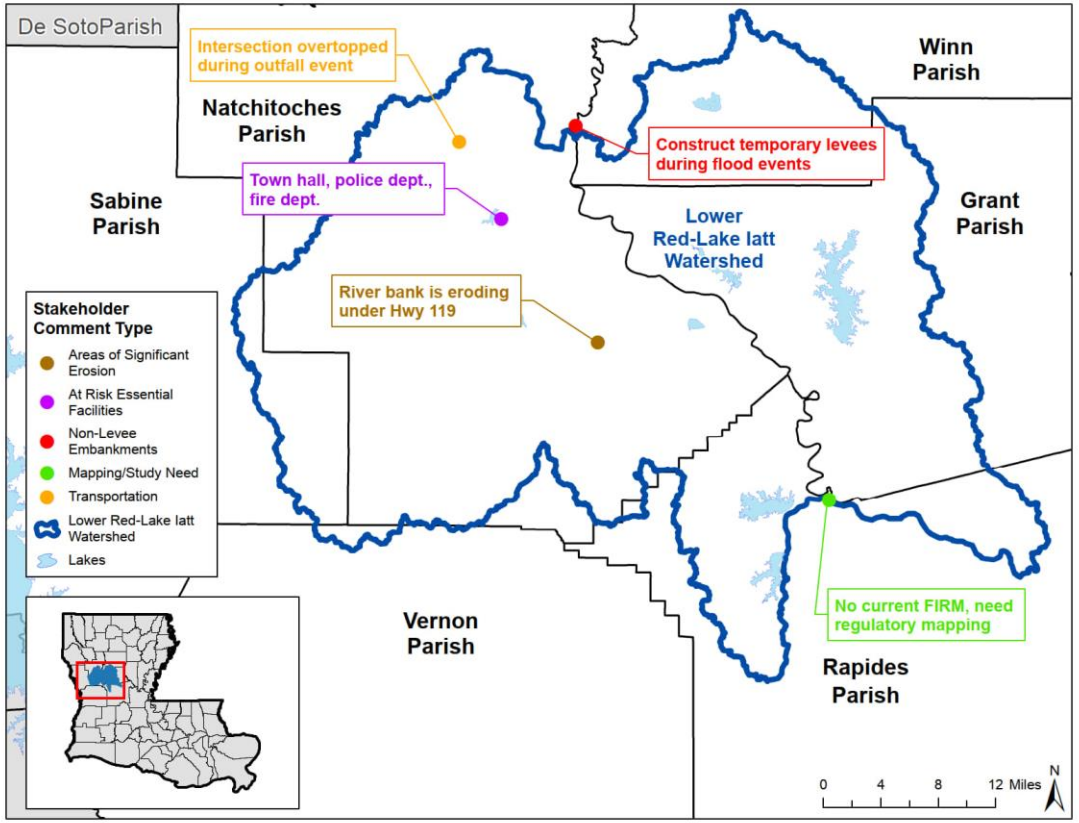
POST-DISCOVERY RESULTS

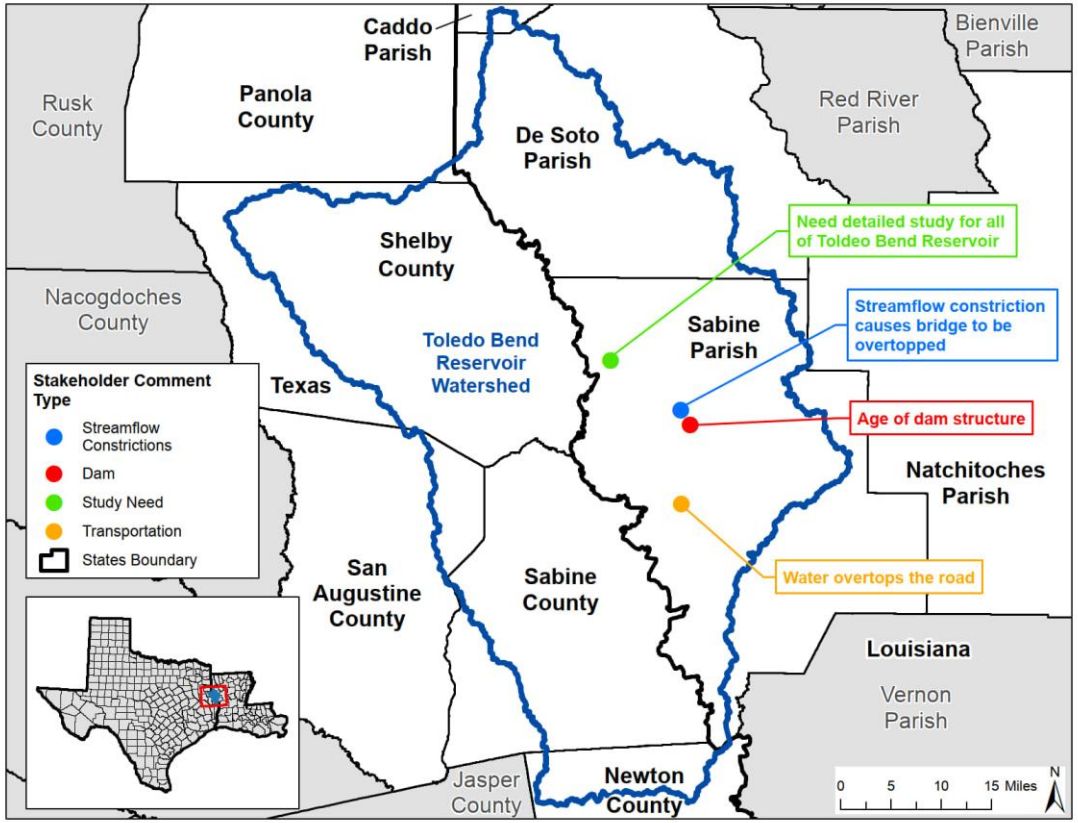
SAMPLE COMMENTS SUBMITTED

Lower Red – Lake Iatt Watershed



SAMPLE COMMENTS SUBMITTED

Toledo Bend Reservoir Watershed



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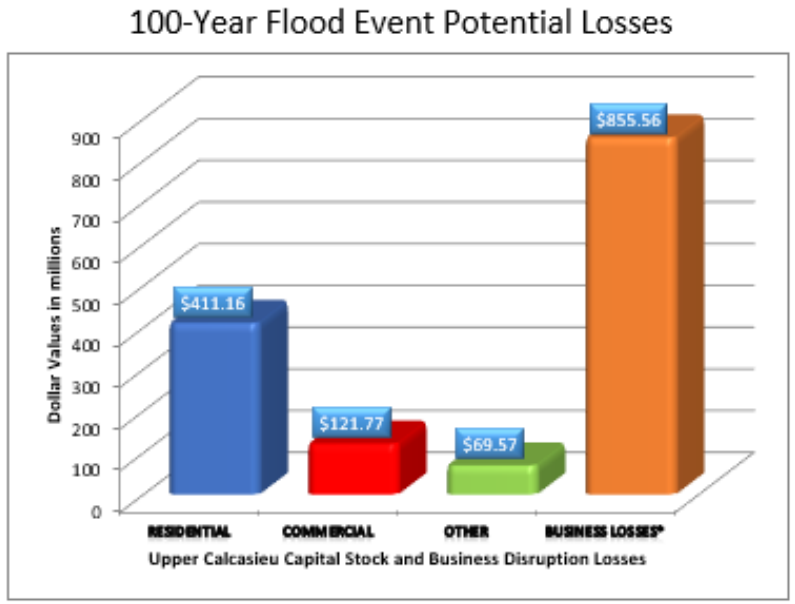
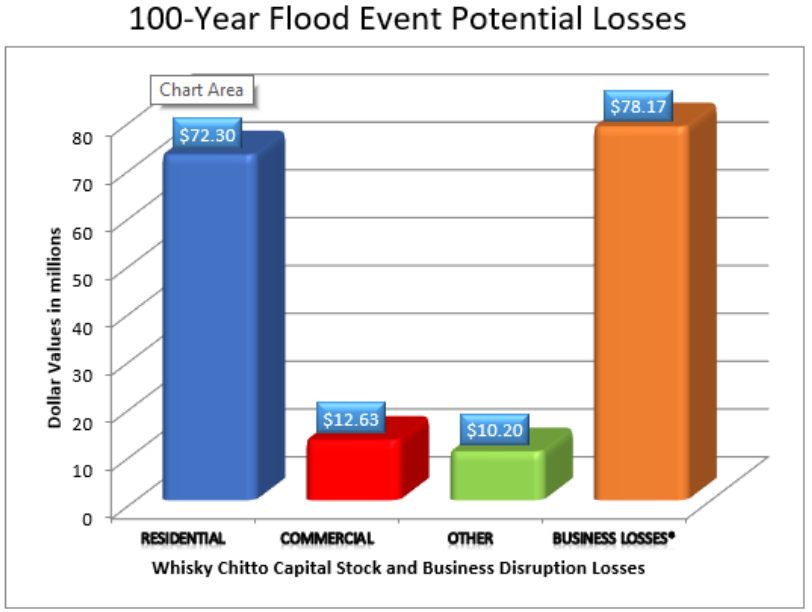
POST-DISCOVERY RESULTS

HAZUS-BASED 100-YEAR POTENTIAL LOSS ESTIMATES

- Identify flooding consequences in damages and other losses
- Based on 100 Year Depth Grids and at-risk assets
- Can be further refined



***Business Losses** are the sum of inventory Loss, Relocation Cost, Income Loss, Rental Income Loss, and Wage Loss.



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POST-DISCOVERY RESULTS

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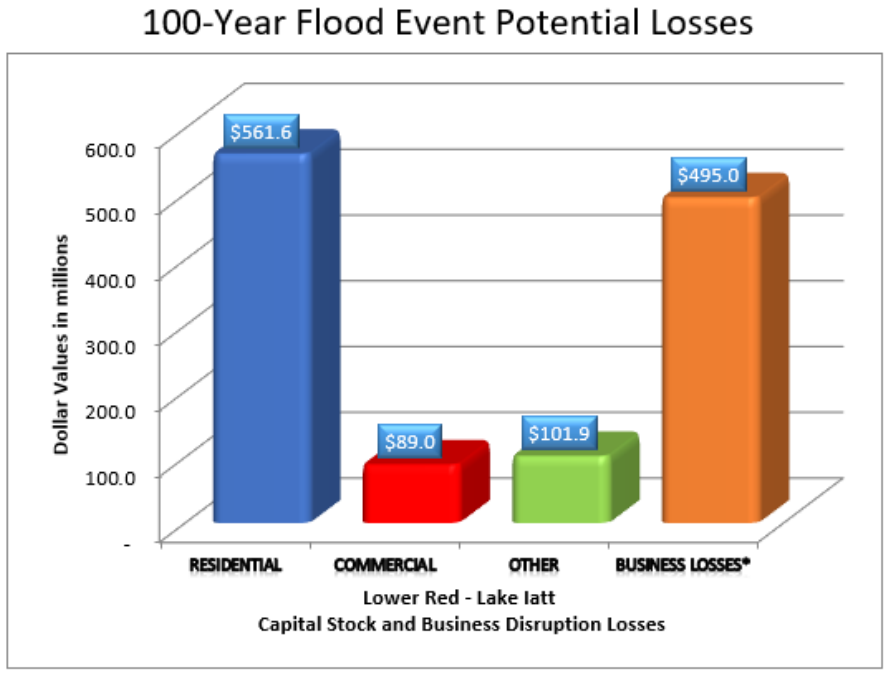

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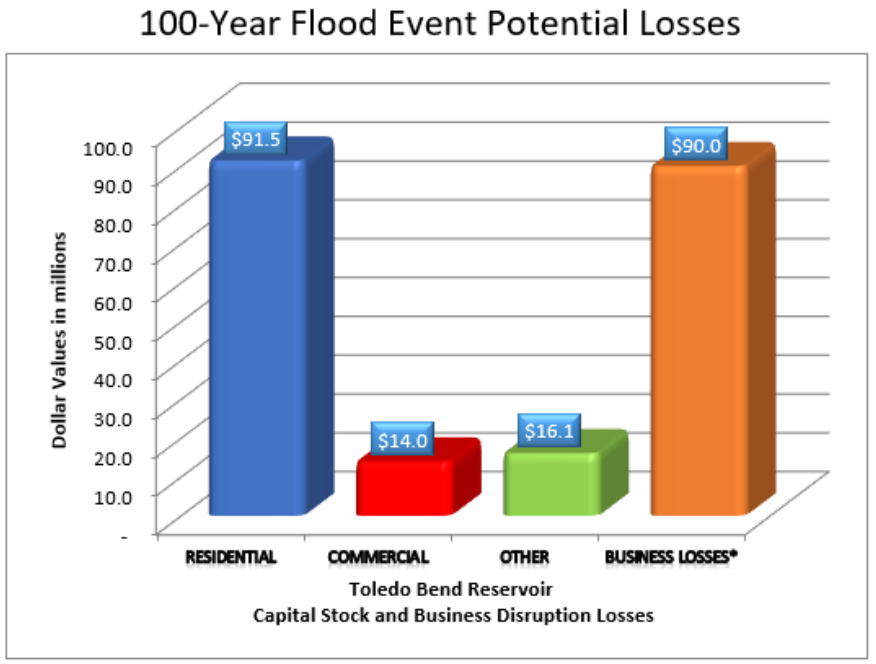

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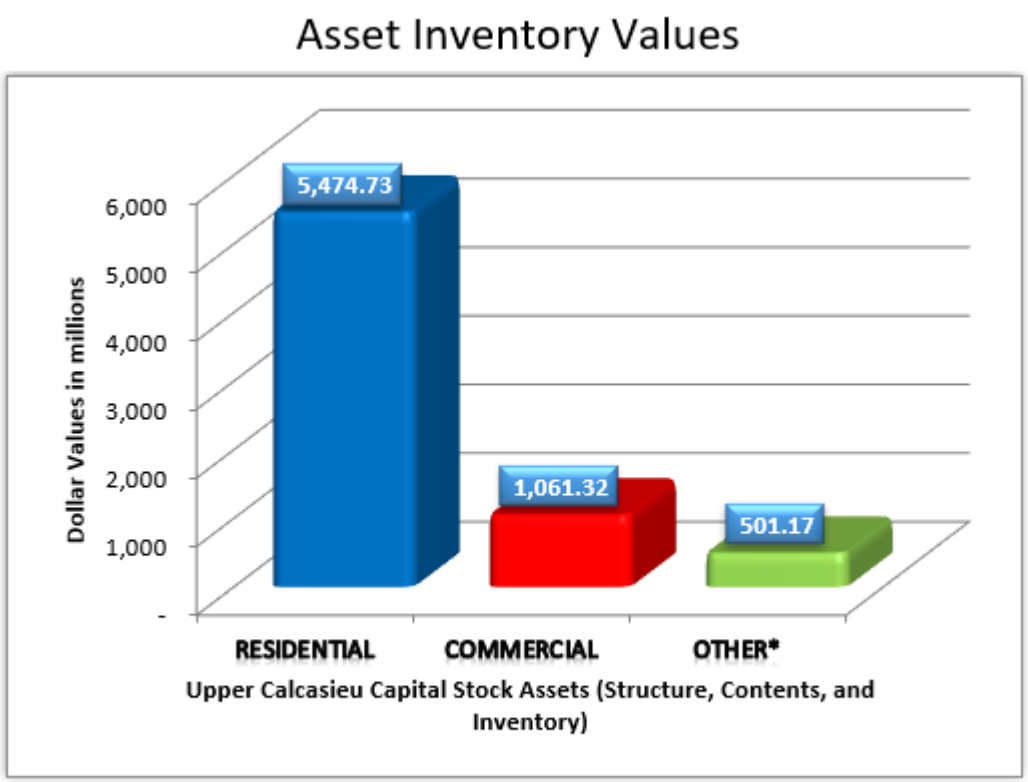
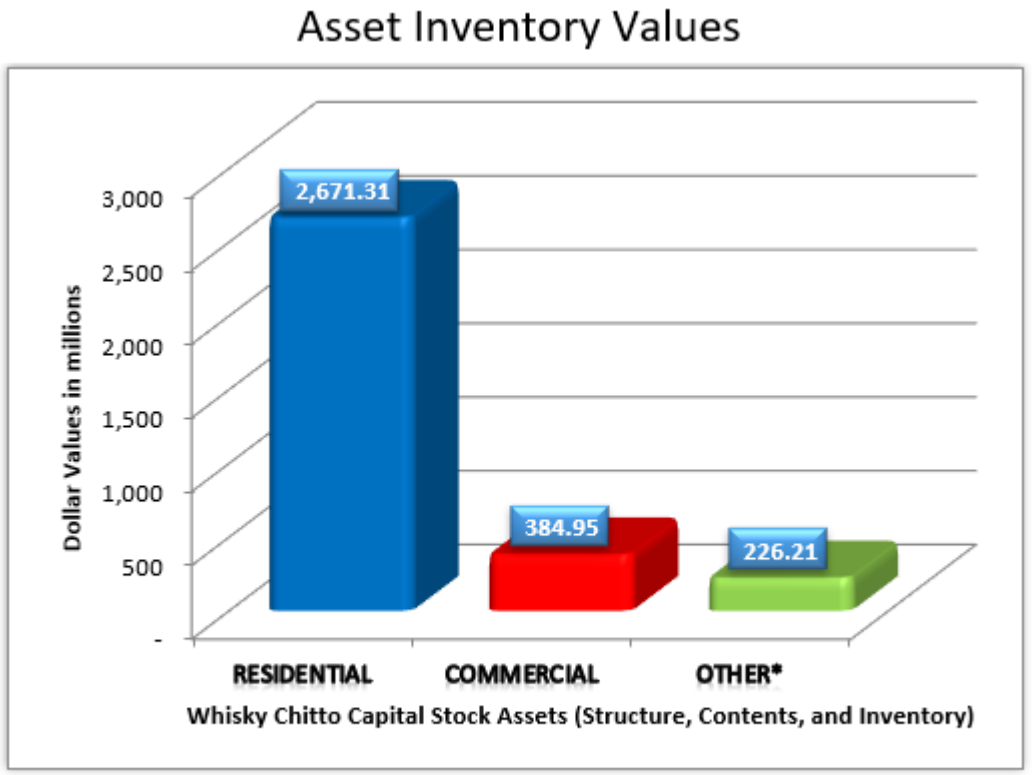
POST-DISCOVERY RESULTS

HAZUS-BASED ASSET INVENTORY VALUES



***Other** structure types include Industrial, Agricultural, Education, Religious and Government structures.



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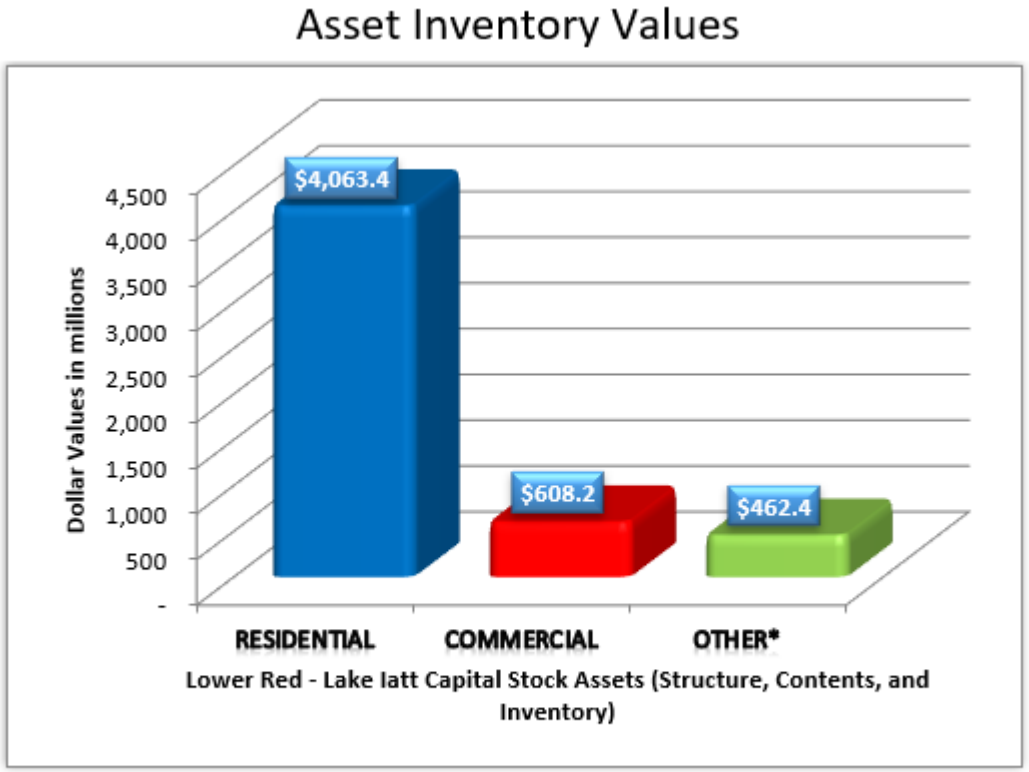
POST-DISCOVERY RESULTS

HAZUS-BASED ASSET INVENTORY VALUES



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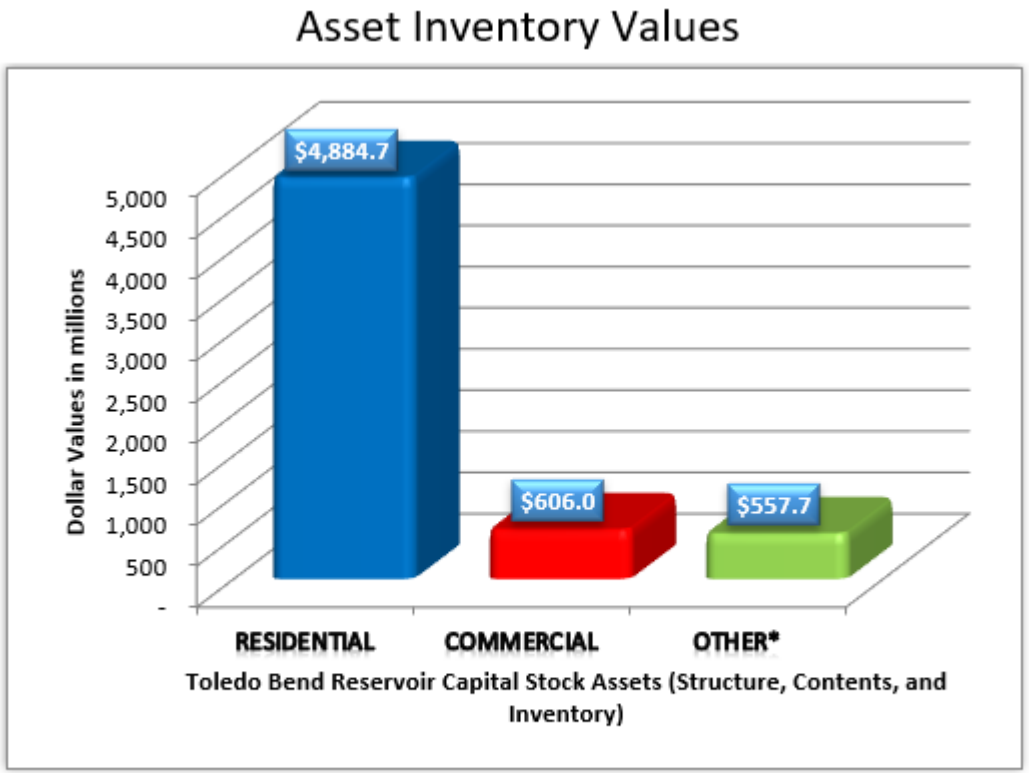

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POST-DISCOVERY RESULTS

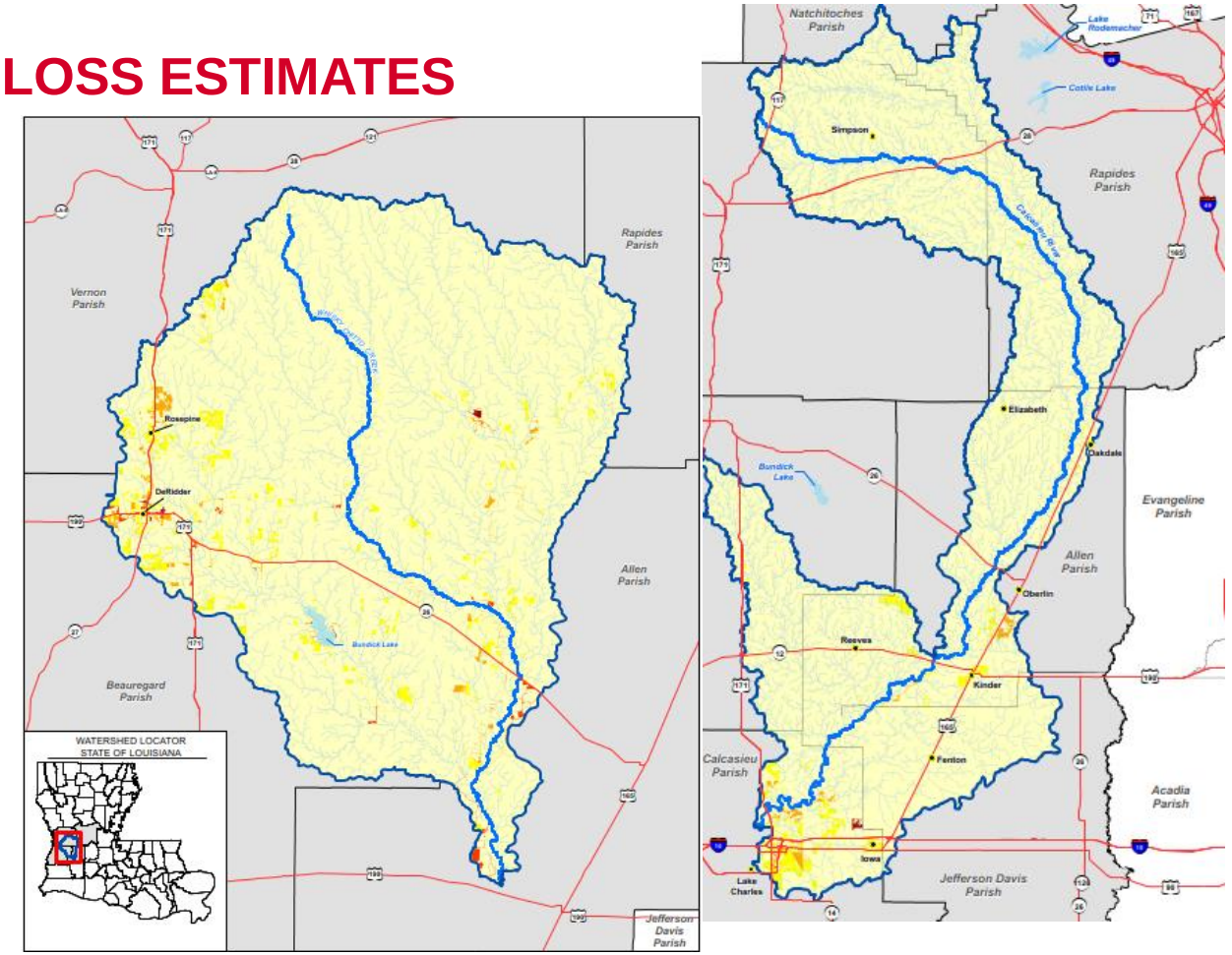
HAZUS-BASED 1% ANNUAL CHANCE LOSS ESTIMATES

Map Symbology

- Cities
- Tensas Bayou & Tensas River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- States Boundary
- Discovery Parish Boundary
- Other Parish/County Boundary

Hazus 1%-Annual-Chance Loss Study*

- Very Low
- Low
- Medium
- High
- Very High



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POST-DISCOVERY RESULTS

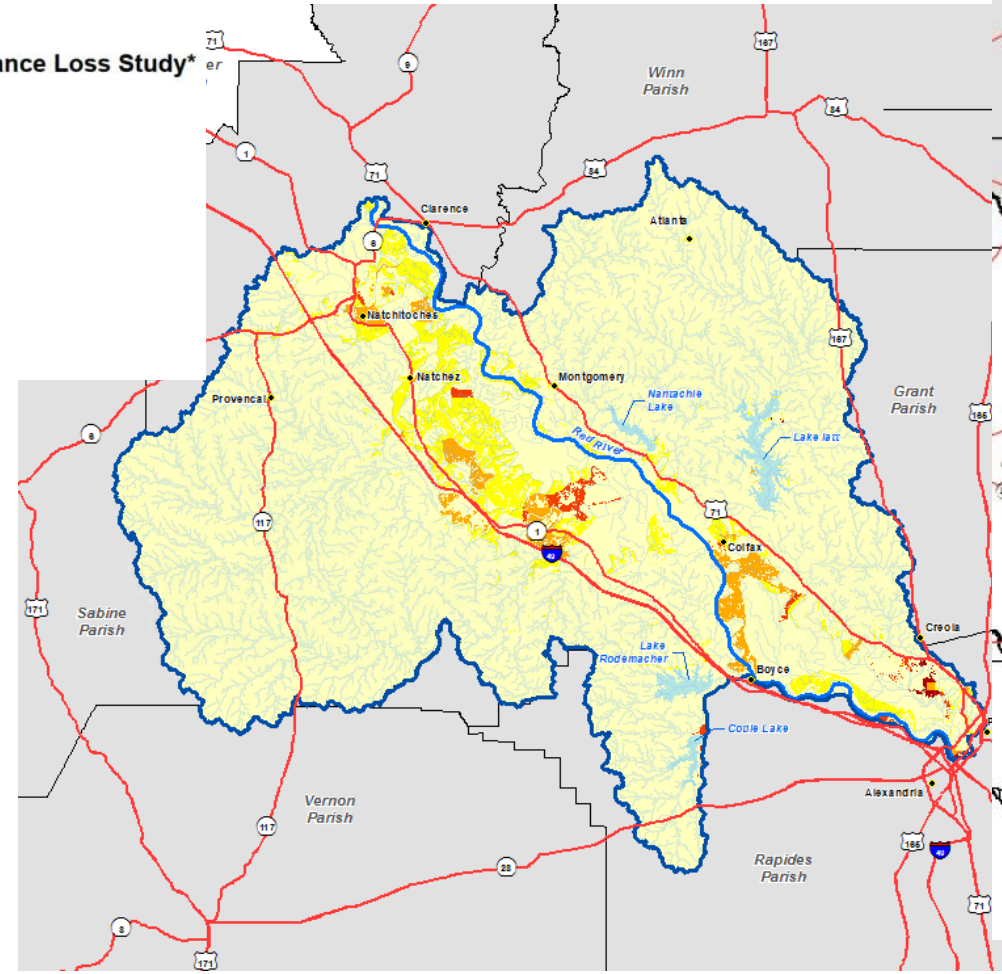
HAZUS-BASED 1% ANNUAL CHANCE LOSS ESTIMATES

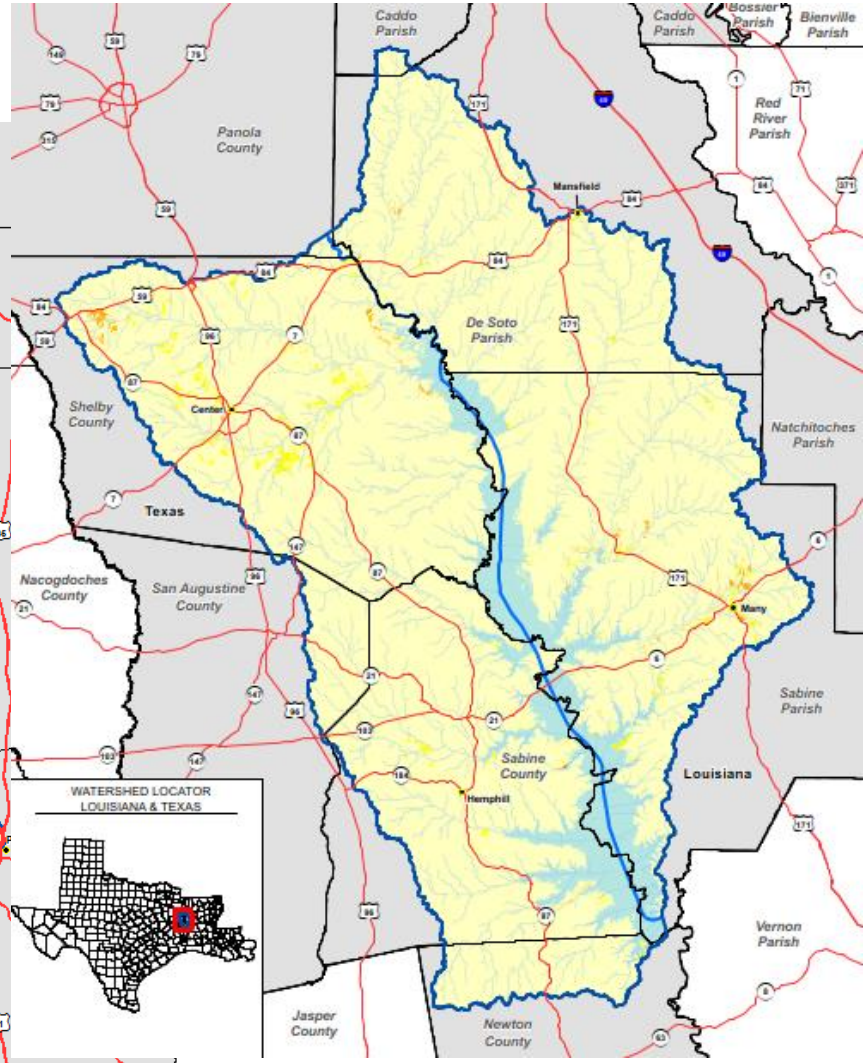
Map Symbology

- Cities
- Tensas Bayou & Tensas River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lake
- States Boundary
- Discovery Parish Boundary
- Other Parish/County Boundary

Hazus 1%-Annual-Chance Loss Study*

- Very Low
- Low
- Medium
- High
- Very High





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BASE LEVEL ENGINEERING (BLE)

- BLE is developed at a larger scale (HUC8)
- LiDAR must be available
- Steps of Hydrology, Hydraulics & Terrain
- Model review and adjustments
- Gage review included in hydrology
- Used to assess flood risk



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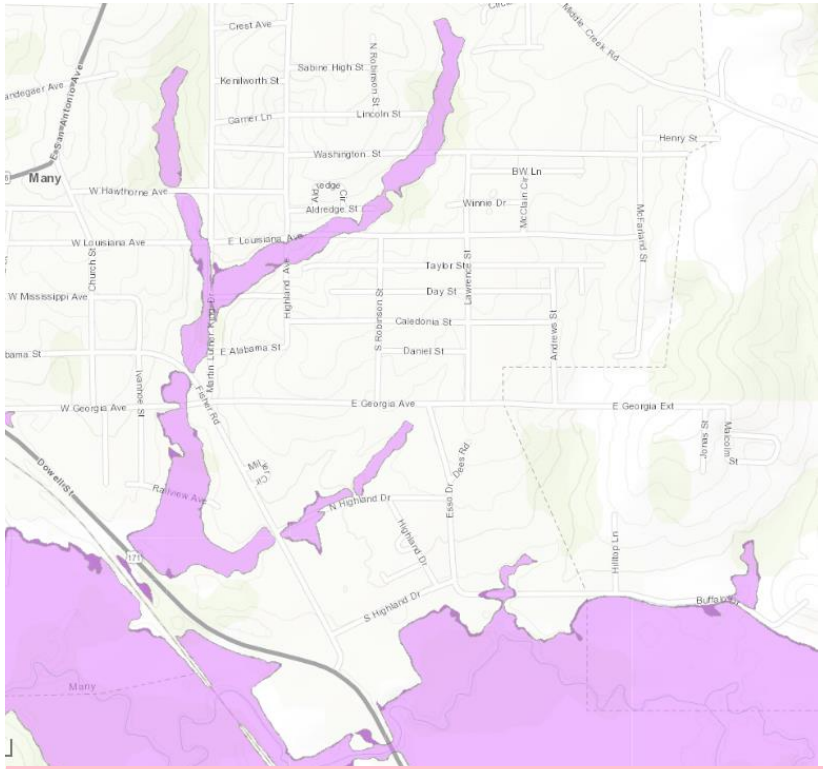
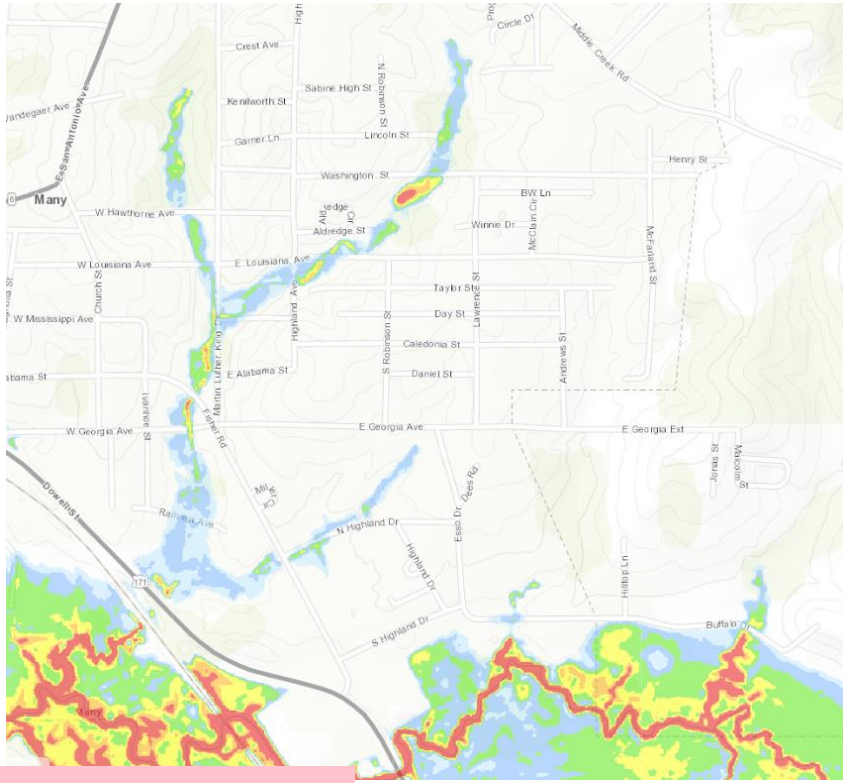
BASE LEVEL ENGINEERING (BLE)





- High risk (1% flood zone)
- Low to moderate risk (0.2% flood zone)

≤ 1 foot	> 3 to 4 feet
> 1 to 2 feet	> 4 to 5 feet
> 2 to 3 feet	> 5 feet

OUTPUTS

- Hydrology modeling (Regression) flows w/gage analysis
- Hydraulic modeling (HEC-RAS) for 10%, 4%, 2%, 1% and 0.2% storm events
- 10%, 1% and 0.2% floodplain boundaries

Non-Regulatory

- Areas of Expanded Flood Risk
- Depth and Analysis Grids
- Flood Risk Assessment

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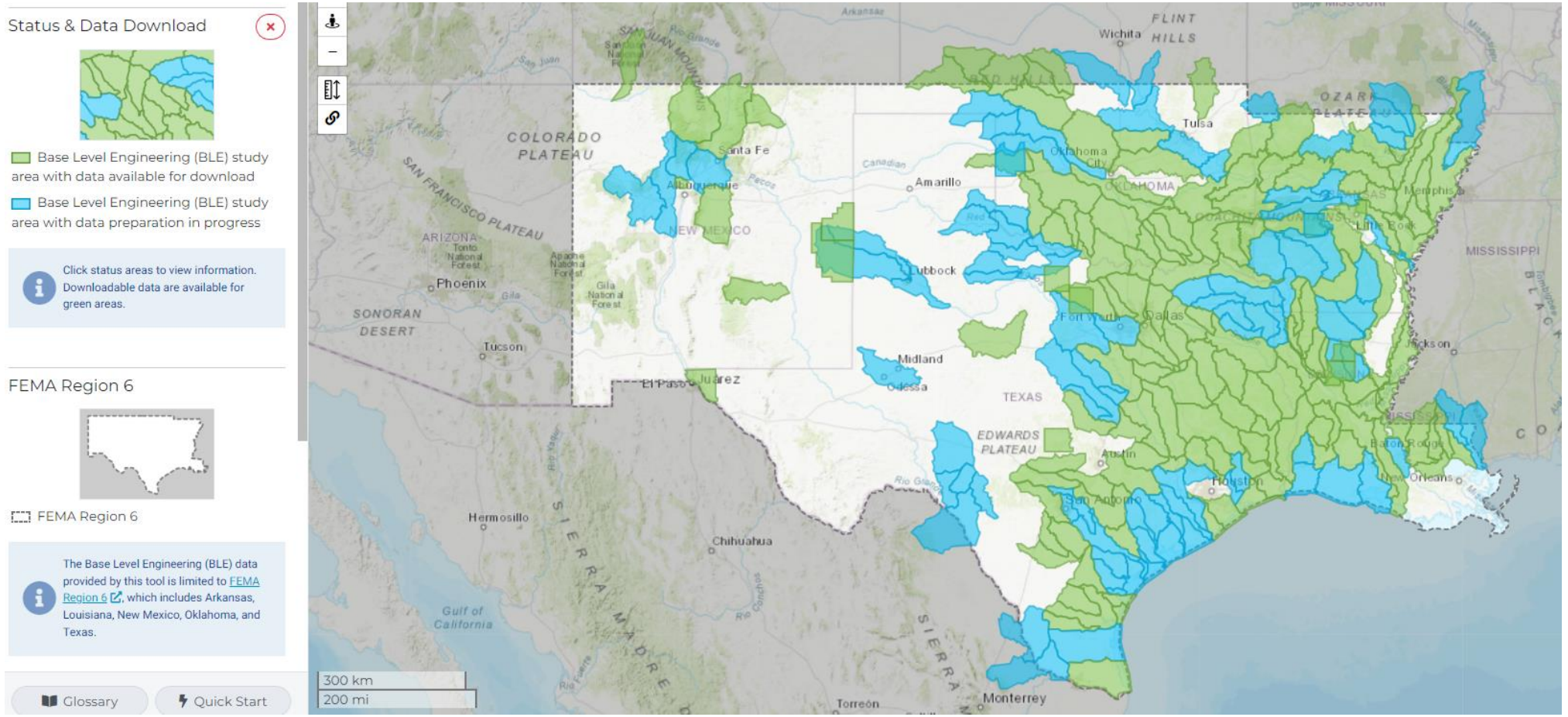
BASE LEVEL ENGINEERING (BLE)

- View and download completed BLE data
- Useful for determining BFEs for development

https://webapps.usgs.gov/infrm/estBFE/



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POST-DISCOVERY MEETING COORDINATION

FLOOD RISK REPORT

- Prioritization Results
- Summary of Discovery Activities
- Historical Flooding
- Figures and Maps
- Community Snapshots
- Stakeholder Comments

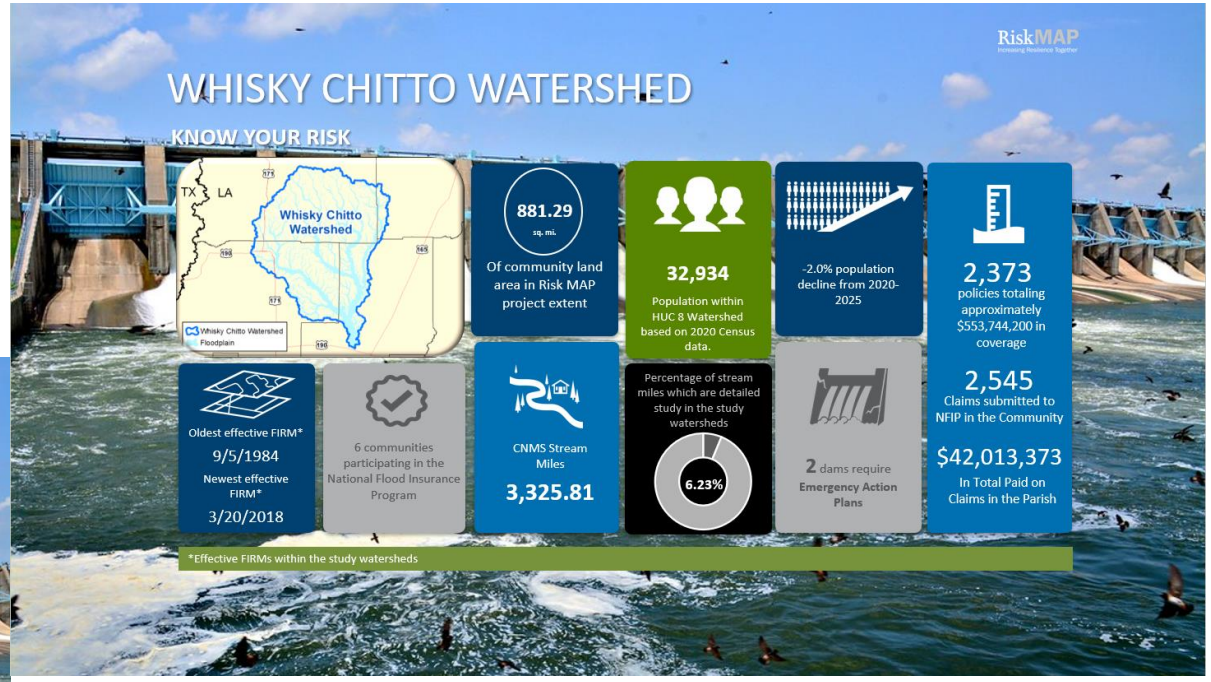


DISCOVERY | POST MEETING COORDINATION

FLOOD RISK REPORT

- Stakeholder Comments
- Community Snapshots
- BLE Report





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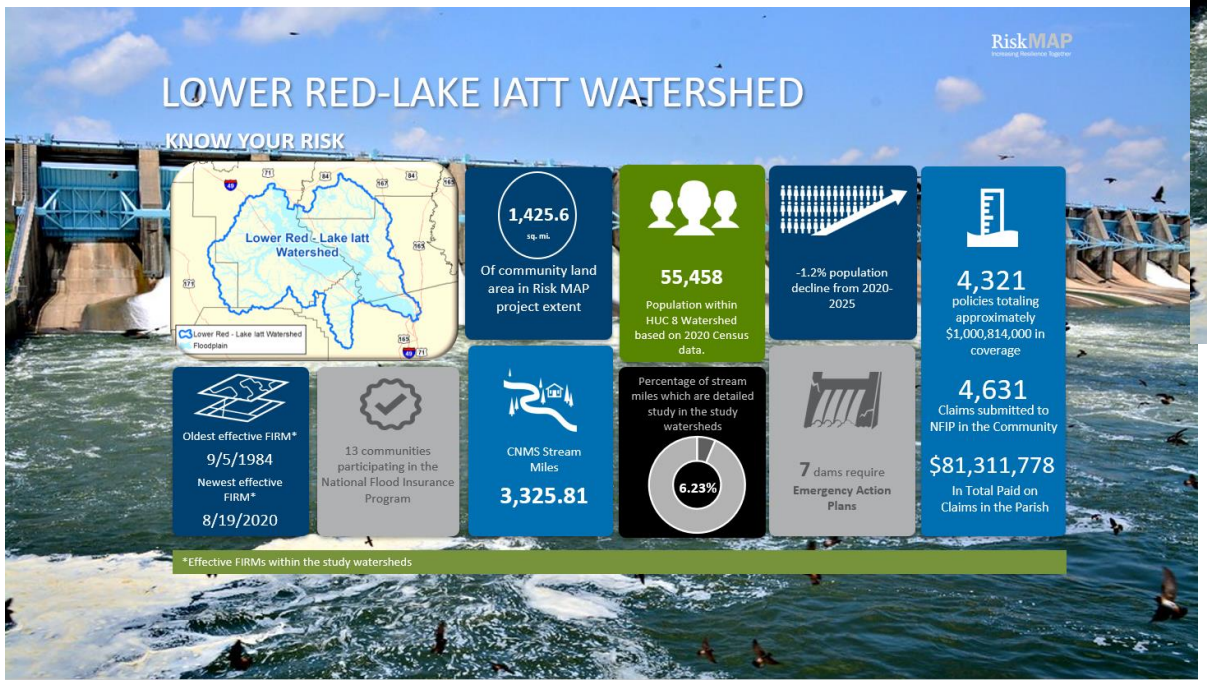
DISCOVERY | POST MEETING COORDINATION

FLOOD RISK REPORT

- Stakeholder Comments
- Community Snapshots
- BLE Report





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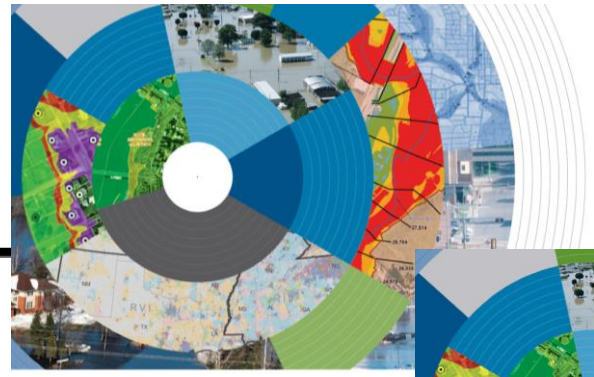
POST-DISCOVERY MEETING COORDINATION

BLE DATASET AND REVIEW



FLOOD RISK REPORT



Flood Risk Report

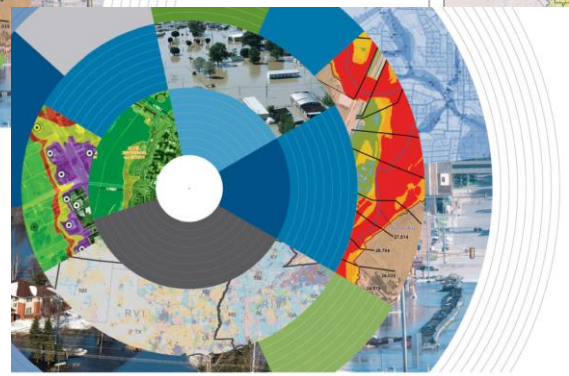
Whisky Chitto Watershed

HUC-8 08080204

FEMA CASE NUMBER: 22-06-0014S

March 2023

FEMA



Flood Risk Report

Upper Calcasieu Watershed

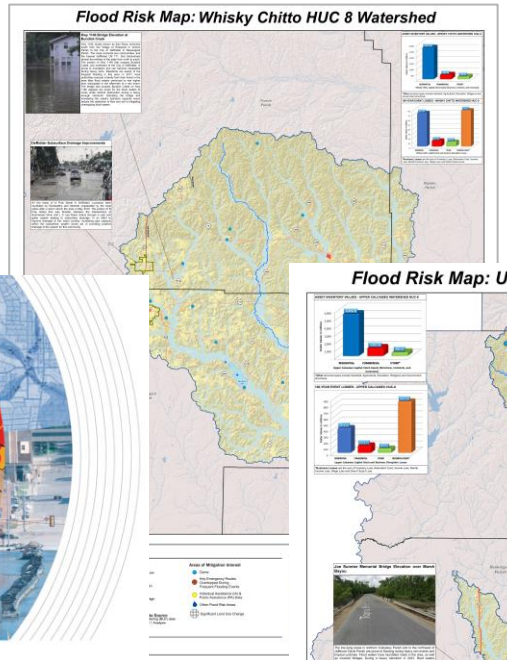
HUC-8 08080203

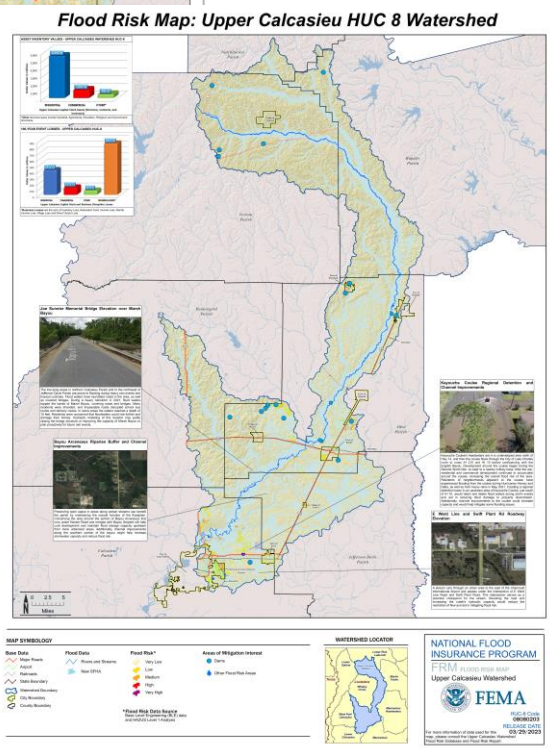
FEMA CASE NUMBER: 21-06-009S

March 2023

FEMA

FLOOD RISK MAP





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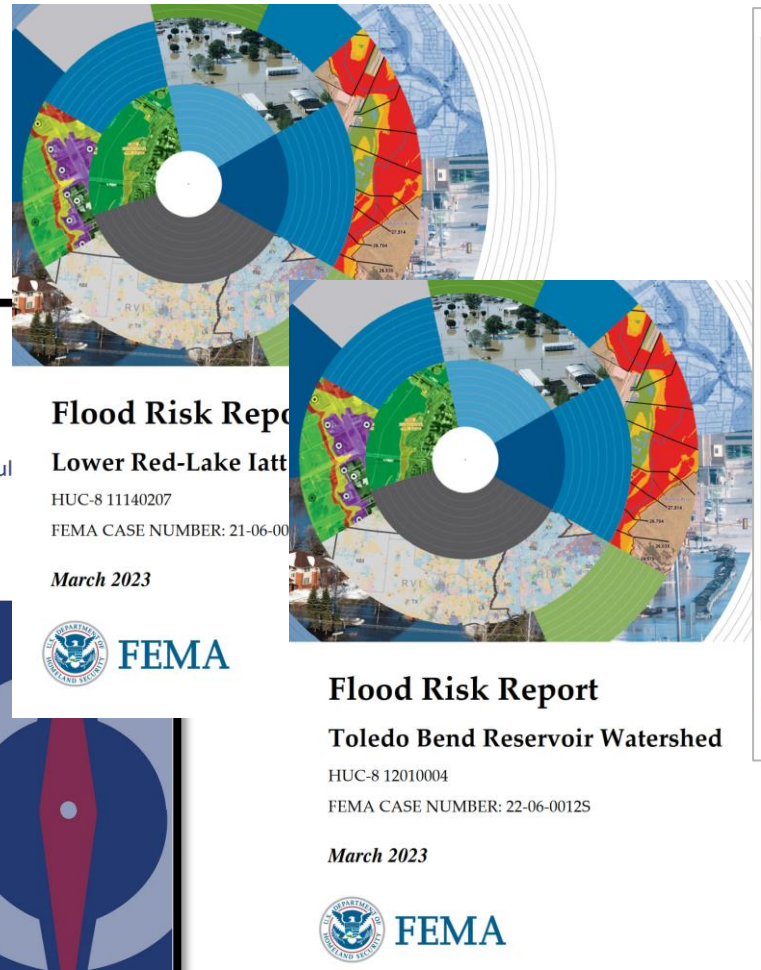
POST-DISCOVERY MEETING COORDINATION

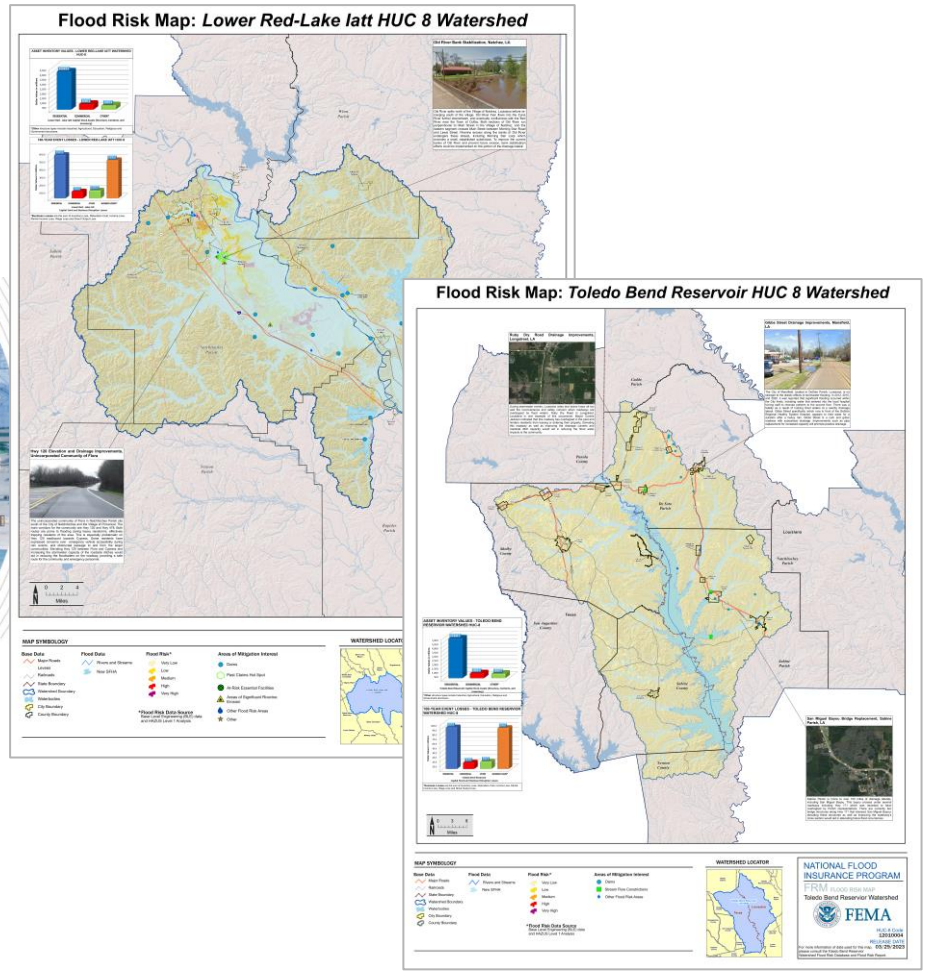
BLE DATASET AND REVIEW



FLOOD RISK REPORT



FLOOD RISK MAP



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POST-DISCOVERY RESULTS

MAPPING NEEDS PRIORITIZATION BY PARISH

Upper Calcasieu Watershed

Mapping Needs Prioritization by Parish		
Parish	**Priority**	**Reason**
Rapides	Highest	More than 20% of the stream miles are unverified, and the oldest effective date exceeds the last 35 years. No DFIRM.
Natchitoches	High	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
Beauregard	Moderate	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 15 years. DFIRM available.
Calcasieu	Moderate	More than 25% of the stream miles are unverified, but the oldest effective date is within the last 15 years. DFIRM available.
Allen	Low	Less than 15% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.
Vernon	Low	Less than 20% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.
Jefferson Davis	Low	Less than 5% of the stream miles are unverified, and the oldest effective date is within the last 5 years. DFIRM available.

Whisky Chitto Watershed

Mapping Needs Prioritization by Parish		
Parish	**Priority**	**Reason**
Rapides	Highest	More than 20% of the stream miles are unverified, and the oldest effective date exceeds the last 35 years. No DFIRM.
Beauregard	Moderate	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 15 years. DFIRM available.
Allen	Low	Less than 15% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.
Vernon	Low	Less than 20% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.

POST-DISCOVERY RESULTS

MAPPING NEEDS PRIORITIZATION BY PARISH

Lower Red – Lake Iatt Watershed

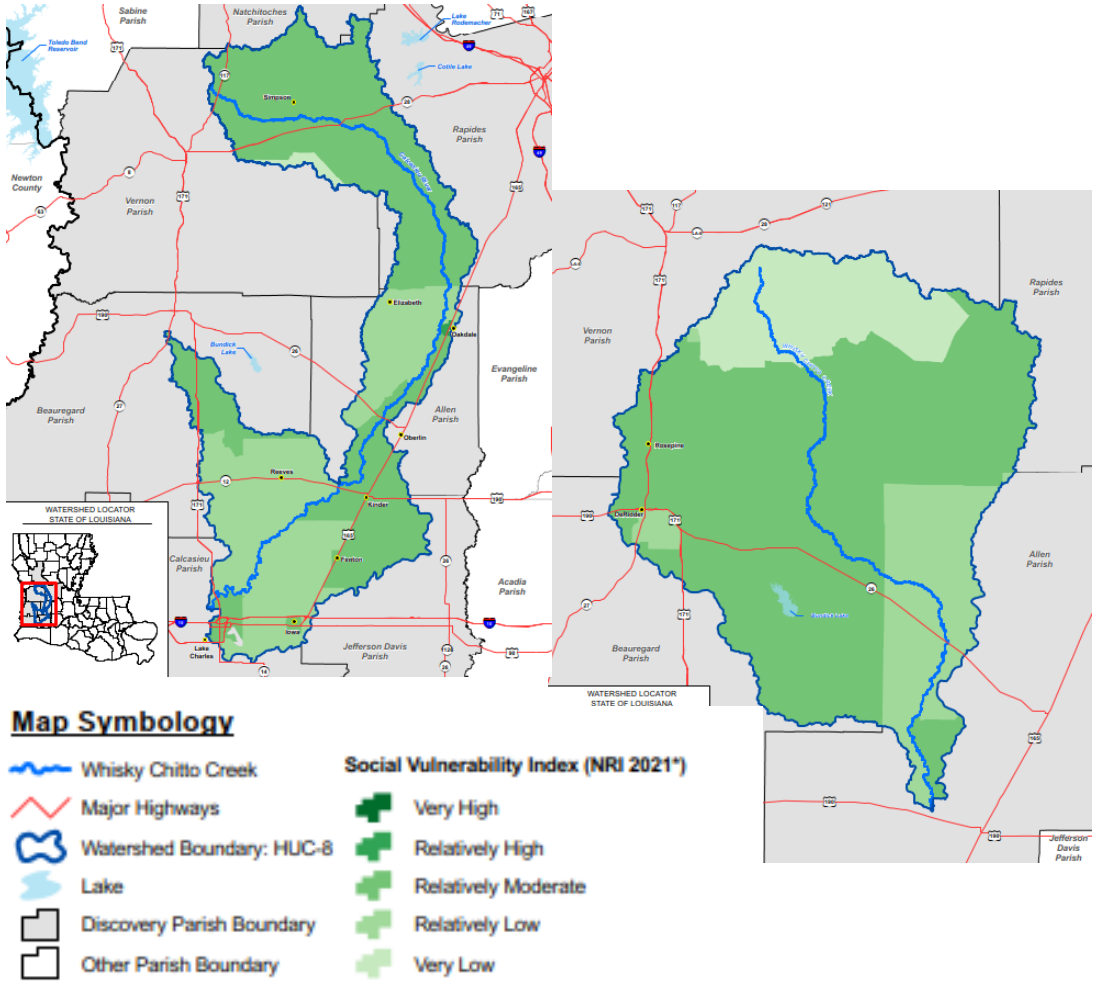
Mapping Needs Prioritization by Parish		
Parish	**Priority**	**Reason**
Rapides	Highest	More than 20% of the stream miles are unverified, and the oldest effective date exceeds the last 35 years. No DFIRM.
Sabine	High	More than 55% of the stream miles are unverified, and the oldest effective date exceeds the last 30 years. No DFIRM.
Natchitoches	High	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
Grant	Moderate	More than 25% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
Vernon	Low	Less than 20% of the stream miles are unverified, and the oldest effective date is within the last 15 years. DFIRM available.
Winn	Low	Less than 5% of the stream miles are unverified, and the oldest effective date is within the last 5 years. DFIRM available.

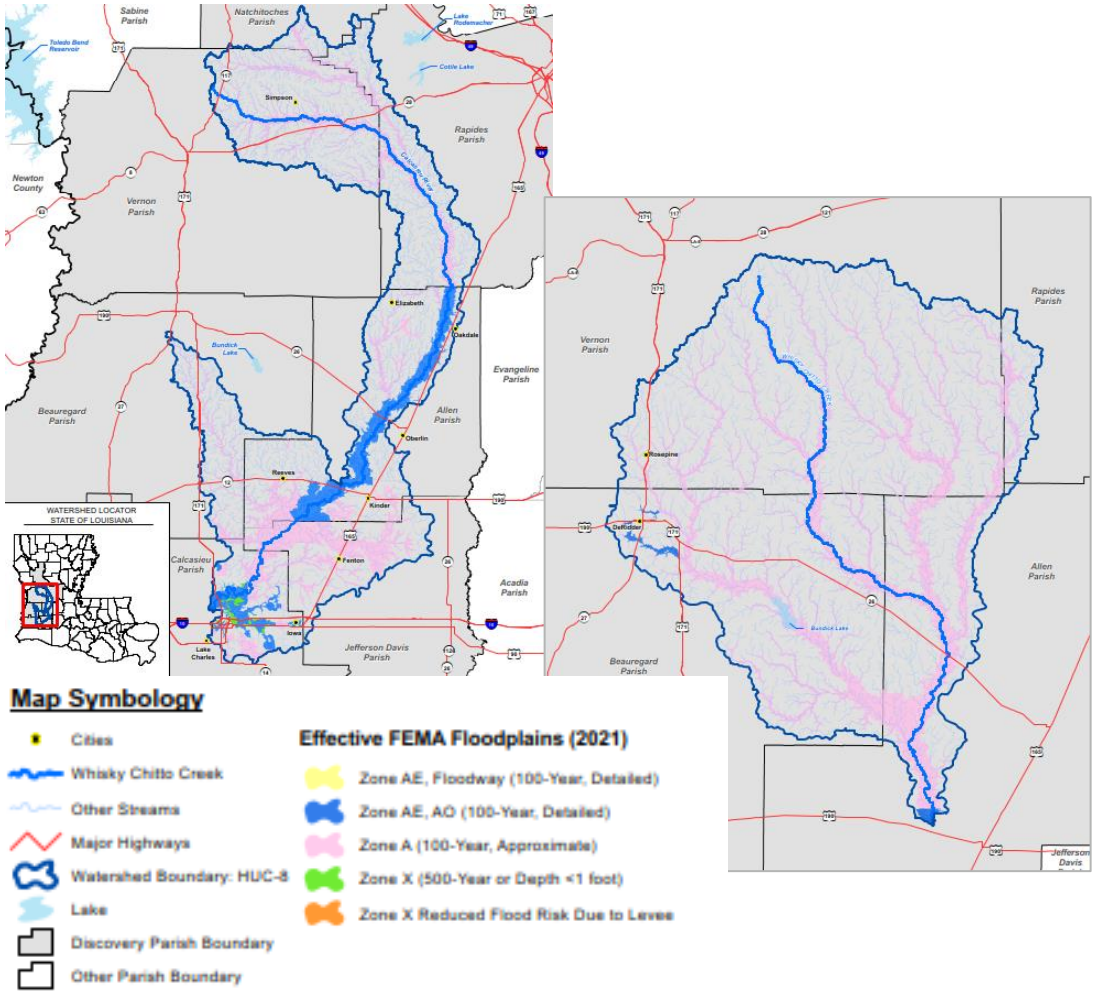
Toledo Bend Reservoir Watershed

Mapping Needs Prioritization by Parish		
Parish	**Priority**	**Reason**
Sabine	Highest	More than 55% of the stream miles are unverified, and the oldest effective date exceeds the last 30 years. No DFIRM.
Natchitoches	High	More than 40% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.
De Soto	Moderate	More than 70% of the stream miles are unverified, but the oldest effective date is within the last 20 years. DFIRM available.
Caddo	Moderate	More than 30% of the stream miles are unverified, but the oldest effective date is within the last 10 years. DFIRM available.

RISK MAP PROJECT RECOMMENDATIONS TO FEMA

OTHER CONSIDERATIONS FOR MAPPING UPDATES





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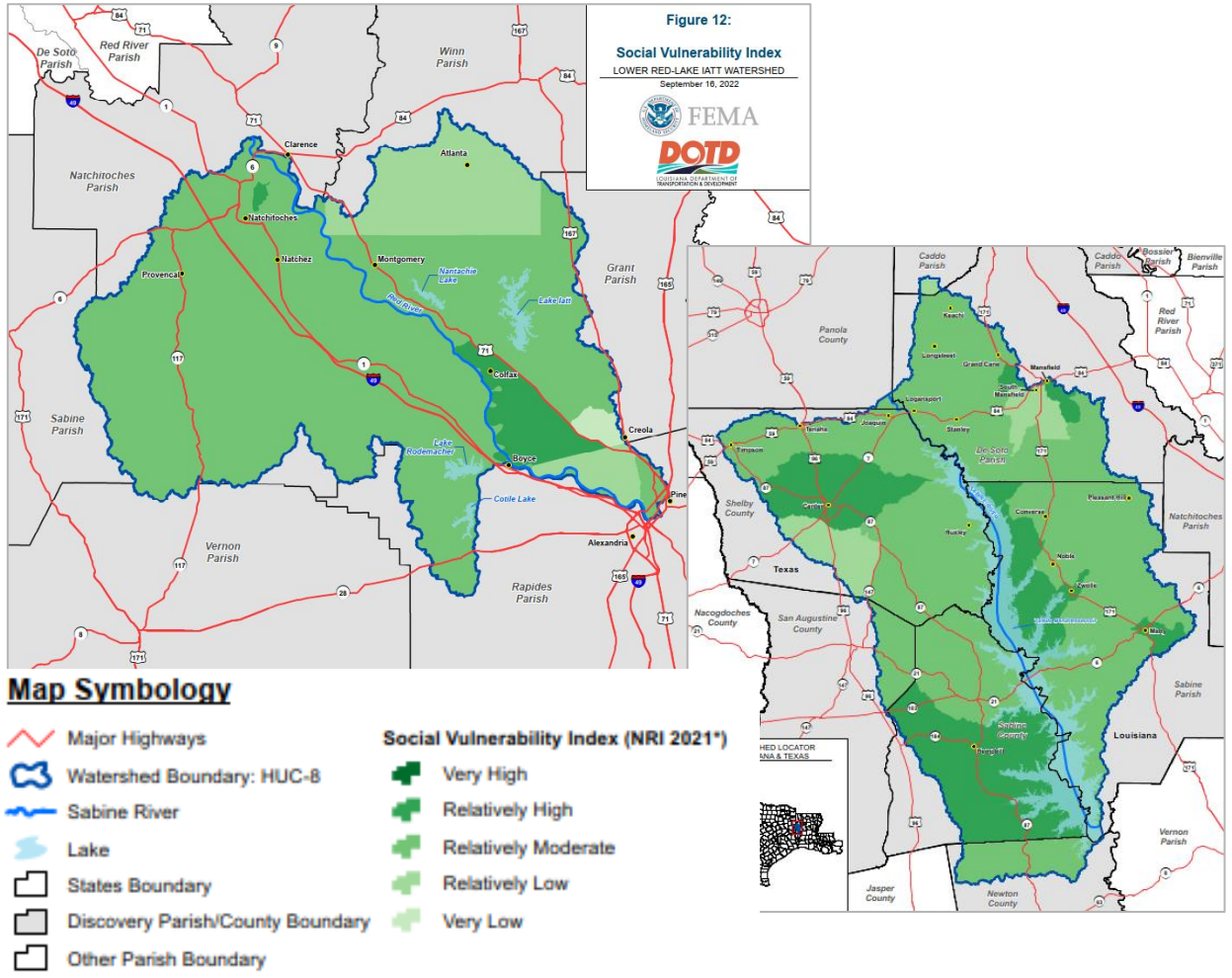
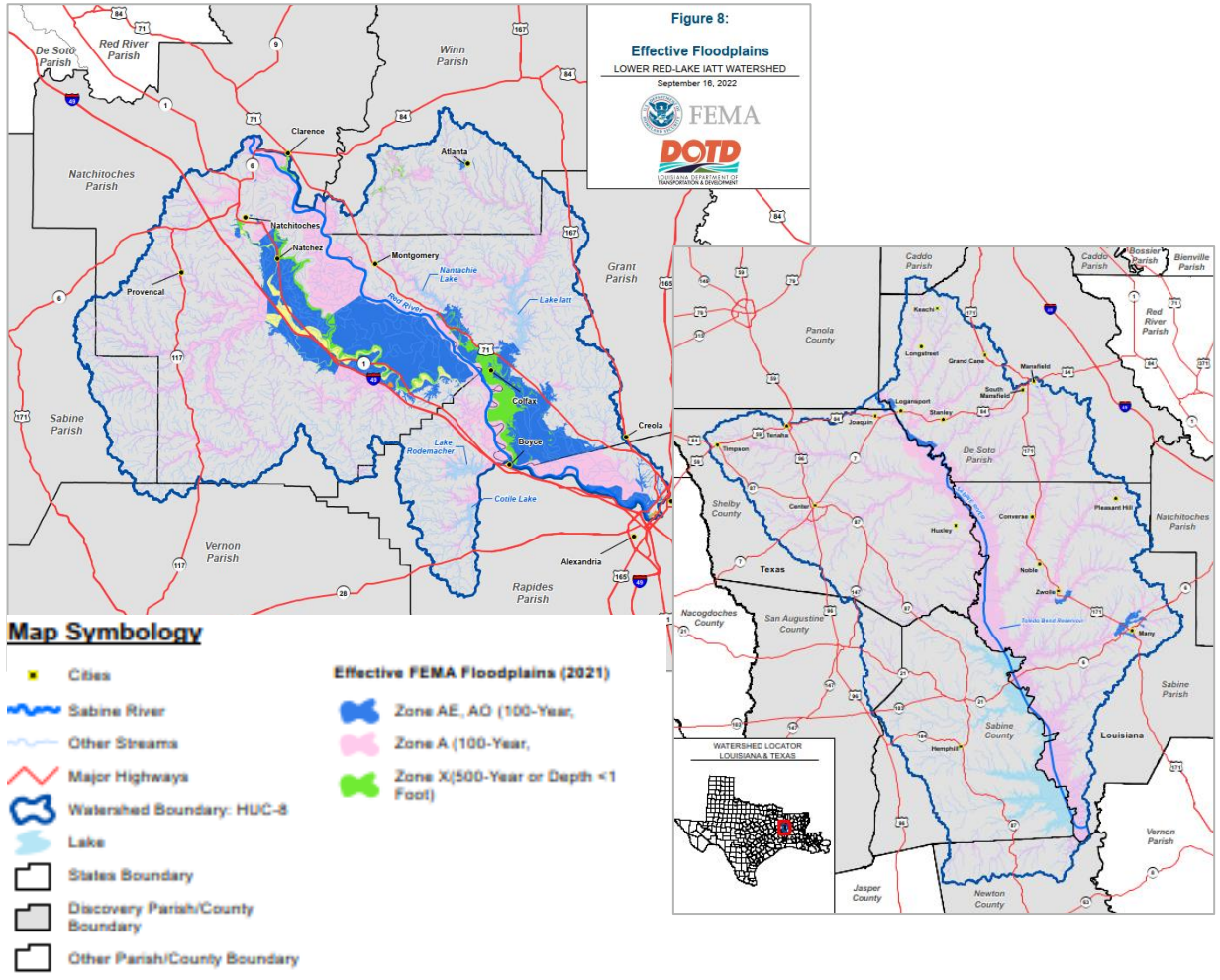
RISK MAP PROJECT RECOMMENDATIONS TO FEMA

OTHER CONSIDERATIONS FOR MAPPING UPDATES





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FEMA'S RISK MAPPING, ASSESSMENT, AND PLANNING (MAP) PROGRAM



QUESTIONS?



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THANK YOU!

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vbivens@Halff.com

Dennis Skultety
Discovery GIS Lead
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dskultety@Halff.com

Appendix II: Community-Specific Reports

Snapshots

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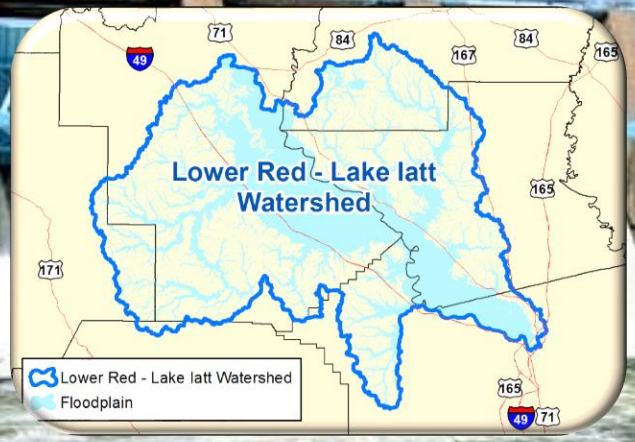
LOWER RED-LAKE IATT WATERSHED

KNOW YOUR RISK



1,425.6 sq. mi.
Of community land area in Risk MAP project extent

55,458
Population within HUC 8 Watershed based on 2020 Census data.

-1.2% population decline from 2020-2025

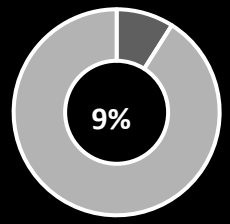
4,321
policies totaling approximately $1,000,814,000 in coverage

Oldest effective FIRM*
9/5/1984
Newest effective FIRM*
8/19/2020

13 communities participating in the National Flood Insurance Program

CNMS Stream Miles
2,030.83

Percentage of stream miles which are detailed study in the study watersheds



7 dams require **Emergency Action Plans**

4,631
Claims submitted to NFIP in the Community

$81,311,778
In Total Paid on Claims in the Parish

*Effective FIRMs within the study watersheds

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VERNON PARISH

KNOW YOUR RISK



6.79 sq. mi.

of the community's land area is in the study watershed

193

Population based on 2020 Decennial Census in the study watershed

-2.5% expected population growth predicted from 2020-2025 in the community

232
policies totaling approximately $55,048,500 in coverage

212
Claims submitted to NFIP in the Community

$7,271,803
In Total Paid on Claims in the Parish

0%

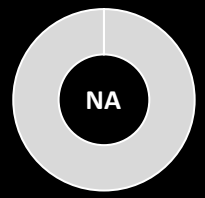
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

5.47

The are no detailed study stream miles in the study watershed



3

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

VERNON PARISH

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **October 2021.**

The hazard mitigation goals identified projects for:

- Limit development in flood plain areas
- Buy-out repetitive loss properties
- Expand and coordinate Early Warning Systems currently in use
- Provide public education materials to residents and private sector
- Increase participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and GOHSEP's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about FEMA's HMA grants[1] can be found on our website, as well as on the Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP)[2] website. The State Hazard Mitigation Officer may be contacted for additional information. Participation in FEMA's Community Rating System[3] (CRS) reduces insurance premiums up to 45%, and FEMA will provide free technical assistance in designing and implementing programs designed to reduce flood damage. The State Hazard Mitigation Officer may be contacted for additional information.

The Louisiana Watershed Initiative (LWI) provides funding for local governments for flood risk reduction projects and project development capacity building through CDBG-Mitigation dollars. These funds are distributed through three rounds of competitive funding opportunities focused on projects that result in demonstrable flood mitigation[4].

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. https://www.fema.gov/hazard-mitigation-assistance.
2. https://gohsep.la.gov/GRANTS/RECOVERY-GRANTS/Hazard-Mitigation-Assistance/Hazard-Mitigation-Overview
3. https://www.fema.gov/national-flood-insurance-program-community-rating-system
4. https://watershed.la.gov/local-regional-projects-programs

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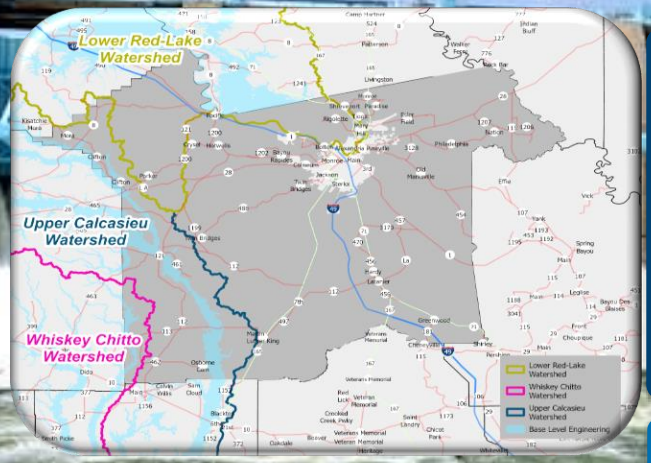
RAPIDES PARISH

KNOW YOUR RISK



168.24 sq. mi.

of the community's land area is in the study watershed

7,717

Population based on 2020 Decennial Census in the study watershed

1.3% expected population growth predicted from 2020-2025 in the community

1,455 policies totaling approximately $336,610,400 in coverage

1,577 Claims submitted to NFIP in the Community

$24,295,616 In Total Paid on Claims in the Parish

14%

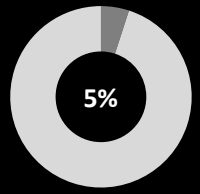
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

353.57

Percentage of stream miles which are detailed study in the study watersheds



12

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

RAPIDES PARISH

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **November 2026.**

The hazard mitigation goals identified projects for:

- Limit development in flood plain areas
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1. https://www.fema.gov/hazard-mitigation-assistance.
2. https://gohsep.la.gov/GRANTS/RECOVERY-GRANTS/Hazard-Mitigation-Assistance/Hazard-Mitigation-Overview
3. https://www.fema.gov/national-flood-insurance-program-community-rating-system
4. https://watershed.la.gov/local-regional-projects-programs

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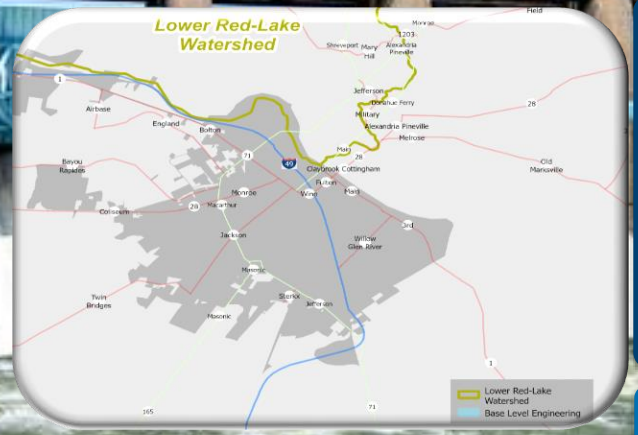
CITY OF ALEXANDRIA

KNOW YOUR RISK



0.95 sq. mi.

of the community's land area is in the study watershed

1,470

Population based on 2020 Decennial Census in the study watershed

-2.6% expected population growth predicted from 2020-2025 in the community

1,597
policies totaling approximately $393,025,500 in coverage

1,428
Claims submitted to NFIP in the Community

$27,465,416
In Total Paid on Claims in the Community

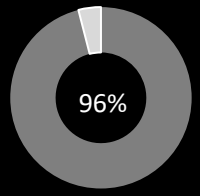
3%
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

3.22

Percentage of stream miles which are detailed study in the study watersheds



12

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

CITY OF ALEXANDRIA

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **November 2026.**

The hazard mitigation goals identified projects for:

- Limit development in flood plain areas
- Buy-out repetitive loss properties
- Expand and coordinate Early Warning Systems currently in use
- Provide public education materials to residents and private sector
- Increase participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)

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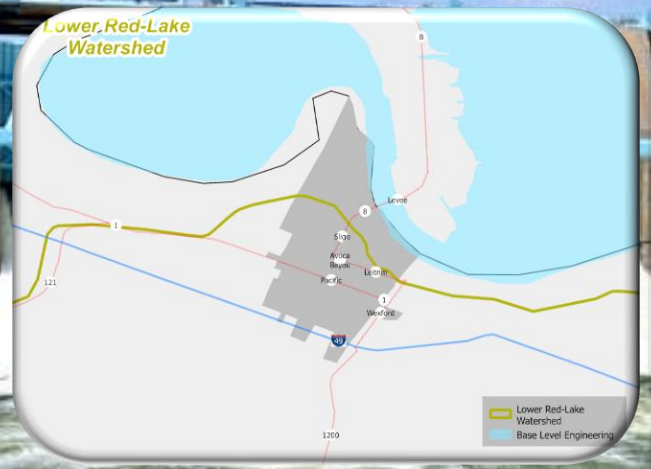
1. https://www.fema.gov/hazard-mitigation-assistance.
2. https://gohsep.la.gov/GRANTS/RECOVERY-GRANTS/Hazard-Mitigation-Assistance/Hazard-Mitigation-Overview
3. https://www.fema.gov/national-flood-insurance-program-community-rating-system
4. https://watershed.la.gov/local-regional-projects-programs

RiskMAP
Increasing Resilience Together

TOWN OF BOYCE

KNOW YOUR RISK



0.23 sq. mi.

of the community's land area is in the study watershed

335

Population based on 2020 Decennial Census in the study watershed

-5.9% expected population growth predicted from 2020-2025 in the community

5

policies totaling approximately $1,188,300 in coverage

5

Claims submitted to NFIP in the Community

100%

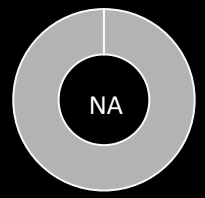
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

1.77

The are no detailed study stream miles in the study watershed



12

Flood-related presidential disaster declarations in your Discovery study parish

$245,909

In Total Paid on Claims in the Community

*National Flood Hazard Layer (NFHL)

TOWN OF BOYCE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **November 2026.**

The hazard mitigation goals identified projects for:

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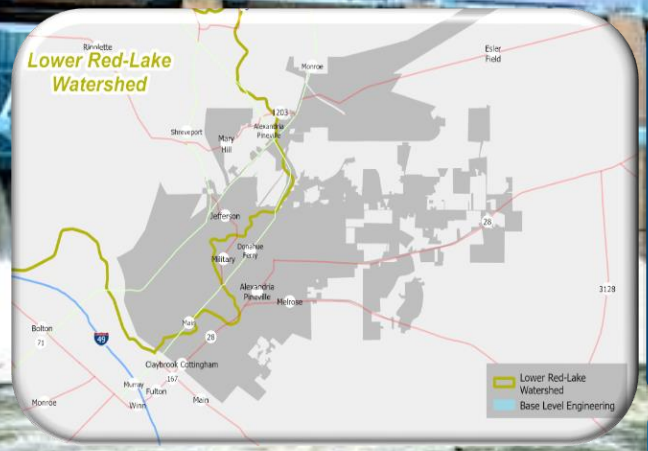
RiskMAP
Increasing Resilience Together

CITY OF PINEVILLE

KNOW YOUR RISK



3.48 sq. mi.

of the community's land area is in the study watershed

3,812

Population based on 2020 Decennial Census in the study watershed

-0.6% expected population growth predicted from 2020-2025 in the community

152

policies totaling approximately $31,447,800 in coverage

241

Claims submitted to NFIP in the Community

$4,582,923

In Total Paid on Claims in the Community

38%

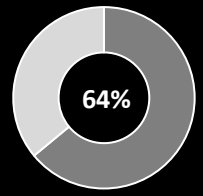
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

5.90

Percentage of stream miles which are detailed study in the study watersheds



12

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

CITY OF PINEVILLE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **November 2026.**

The hazard mitigation goals identified projects for:

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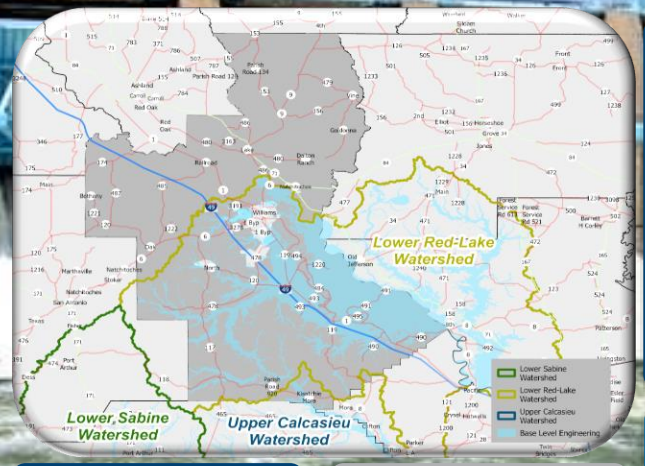
NATCHITOCHES PARISH

KNOW YOUR RISK



645.18 sq. mi.

of the community's land area is in the study watershed

8,337

Population based on 2020 Decennial Census in the study watershed

-3.1% expected population growth predicted from 2020-2025 in the community

381

policies totaling approximately $82,470,700 in coverage

429

Claims submitted to NFIP in the Community

$8,342,885

In Total Paid on Claims in the Parish

53%

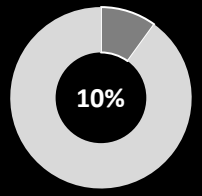
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

984.02

Percentage of stream miles which are detailed study in the study watersheds



7

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

NATCHITOCHES PARISH

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **February 22, 2021.**

The hazard mitigation goals identified projects for:

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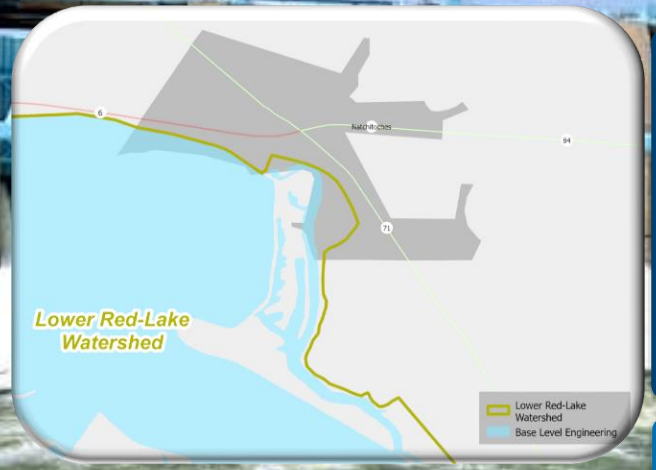
VILLAGE OF CLARENCE

KNOW YOUR RISK



0.24 sq. mi.

of the community's land area is in the study watershed

50

Population based on 2020 Decennial Census in the study watershed

-18.9% expected population growth predicted from 2017-2023 in the community

49

policies totaling approximately $3,398,800 in coverage

51

Claims submitted to NFIP in the Community

$367,433

In Total Paid on Claims in the Community

15%

Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

0.78

The are no detailed study stream miles in the study watershed

NA

7

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

VILLAGE OF CLARENCE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **February 22, 2021.**

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- Limit development in flood plain areas
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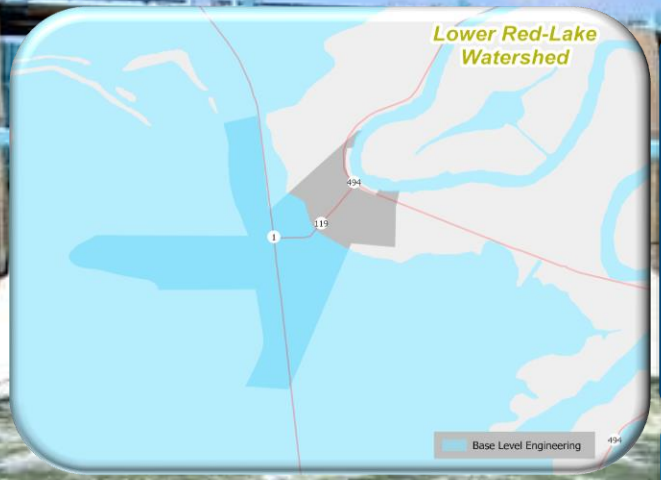
VILLAGE OF NATCHEZ

KNOW YOUR RISK



1.06 sq. mi.

of the community's land area is in the study watershed

489

Population based on 2020 Decennial Census in the study watershed

-9.5% expected population growth predicted from 2020-2025 in the community

10

policies totaling approximately $1,099,600 in coverage

11

Claims submitted to NFIP in the Community

$131,903

In Total Paid on Claims in the Community

100%

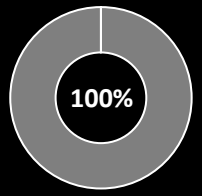
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

1.87

Percentage of stream miles which are detailed study in the study watersheds



7

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

VILLAGE OF NATCHEZ

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **February 22, 2021.**

The hazard mitigation goals identified projects for:

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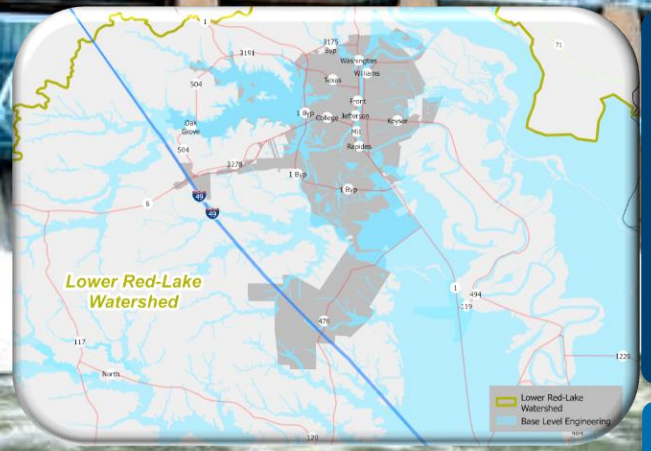
RiskMAP
Increasing Resilience Together

CITY OF NATCHITOCHES

KNOW YOUR RISK



26.42 sq. mi.

of the community's land area is in the study watershed

18,039

Population based on 2020 Decennial Census in the study watershed

-.08% expected population growth predicted from 2020-2025 in the community

144
policies totaling approximately $41,349,600 in coverage

62
Claims submitted to NFIP in the Community

$1,001,524
In Total Paid on Claims in the Community

100%

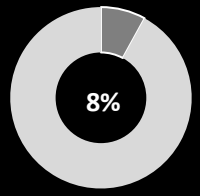
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

45.60

Percentage of stream miles which are detailed study in the study watersheds



7

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

CITY OF NATCHITOCHES

TAKE ACTION: Potential Next Step



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RiskMAP
Increasing Resilience Together

VILLAGE OF PROVENCAL

KNOW YOUR RISK



2.46 sq. mi.

of the community's land area is in the study watershed

528

Population based on 2020 Decennial Census in the study watershed

-7.0% expected population growth predicted from 2020-2025 in the community

0

policies totaling approximately $0 in coverage

0

Claims submitted to NFIP in the Community

0

In Total Paid on Claims in the Community

100%

Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

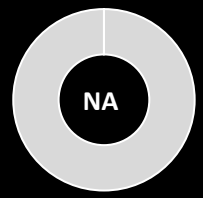
X

Not participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

5.16

The are no detailed study stream miles in the study watershed



7

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

VILLAGE OF PROVENCAL

TAKE ACTION: Potential Next Step



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RiskMAP
Increasing Resilience Together

SABINE PARISH

KNOW YOUR RISK



70.79 sq. mi.

of the community's land area is in the study watershed

1,136

Population based on 2020 Decennial Census in the study watershed

-3.9% expected population growth predicted from 2020-2025 in the community

74

policies totaling approximately $16,943,800 in coverage

16

Claims submitted to NFIP in the Community

$405,023

In Total Paid on Claims in the Parish

3%

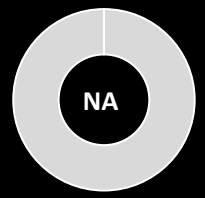
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

68.92

The are no detailed study stream miles in the study watershed



2

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

SABINE PARISH

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **February 2027.**

The hazard mitigation goals identified projects for:

- Limit development in flood plain areas
- Buy-out repetitive loss properties
- Expand and coordinate Early Warning Systems currently in use
- Provide public education materials to residents and private sector
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4. https://watershed.la.gov/local-regional-projects-programs

RiskMAP
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GRANT PARISH

KNOW YOUR RISK



343.10 sq. mi.

of the community's land area is in the study watershed

9,757

Population based on 2020 Decennial Census in the study watershed

0.5% expected population growth predicted from 2020-2025 in the community

144

policies totaling approximately $23,505,700 in coverage

471

Claims submitted to NFIP in the Community

$5,091,714

In Total Paid on Claims in the Parish

64%

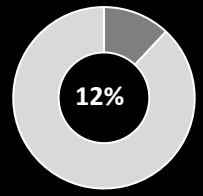
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

384.72

Percentage of stream miles which are detailed study in the study watersheds



8

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

GRANT PARISH

TAKE ACTION: Potential Next Step



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TOWN OF COLFAX

KNOW YOUR RISK



1.5 sq. mi.

of the community's land area is in the study watershed

1,428

Population based on 2020 Decennial Census in the study watershed

-4.3% expected population growth predicted from 2020-2025 in the community

38

policies totaling approximately $7,599,600 in coverage

20

Claims submitted to NFIP in the Community

$275,089

In Total Paid on Claims in the Community

100%

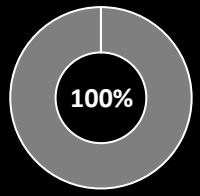
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

1.56

Percentage of stream miles which are detailed study in the study watersheds



8

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

TOWN OF COLFAX

TAKE ACTION: Potential Next Step



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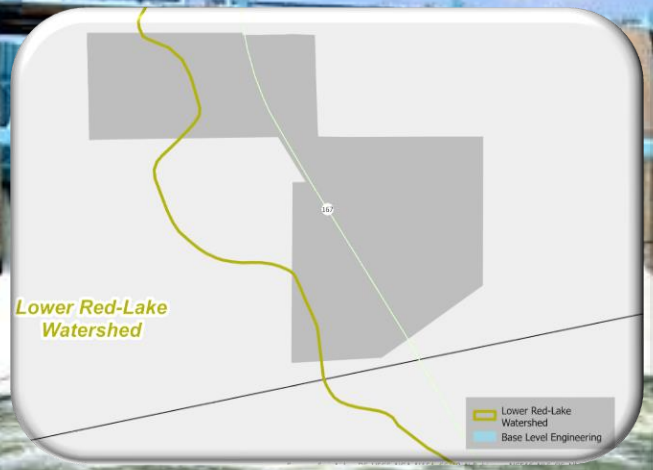
VILLAGE OF CREOLA

KNOW YOUR RISK



0.08 sq. mi.

of the community's land area is in the study watershed

46

Population based on 2020 Decennial Census in the study watershed

5.9% expected population growth predicted from 2020-2025 in the community

0

policies totaling approximately $0 in coverage

0

Claims submitted to NFIP in the Community

0

In Total Paid on Claims in the Community

0%

Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

X

Not participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

N/A

The are no detailed study stream miles in the study watershed

NA

8

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

VILLAGE OF CREOLA

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan expiration date is **February 22, 2021.**

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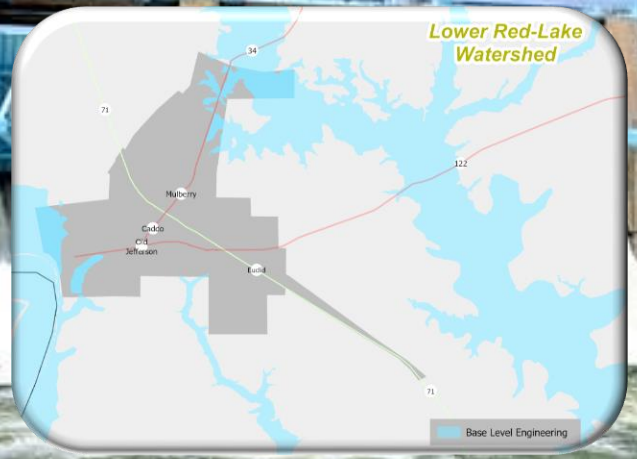
TOWN OF MONTGOMERY

KNOW YOUR RISK



2.07 sq. mi.

of the community's land area is in the study watershed

622

Population based on 2020 Decennial Census in the study watershed

-7.7% expected population growth predicted from 2020-2025 in the community

0

policies totaling approximately $0 in coverage

0

Claims submitted to NFIP in the Community

0

In Total Paid on Claims in the Parish

100%

Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

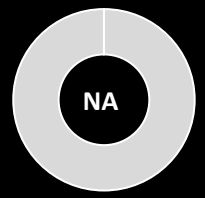
X

Not participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

0.49

The are no detailed study stream miles in the study watershed



8

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

TOWN OF MONTGOMERY

TAKE ACTION: Potential Next Step



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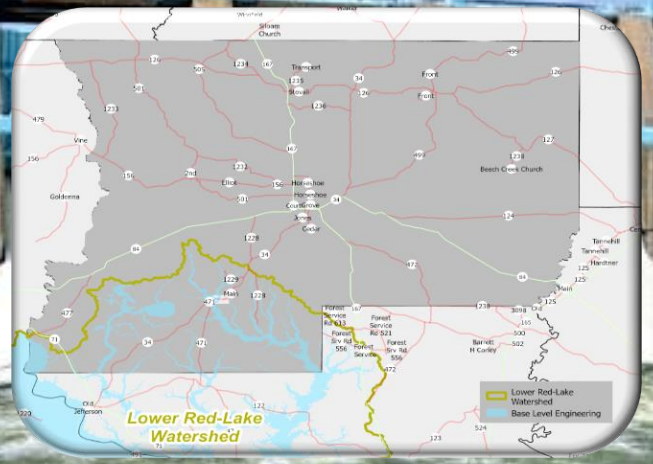
WINN PARISH

KNOW YOUR RISK



151.96 sq. mi.

of the community's land area is in the study watershed

1,350

Population based on 2020 Decennial Census in the study watershed

-4.8% expected population growth predicted from 2020-2025 in the community

40

policies totaling approximately $7,125,700 in coverage

108

Claims submitted to NFIP in the Community

$1,834,540

In Total Paid on Claims in the Parish

12%

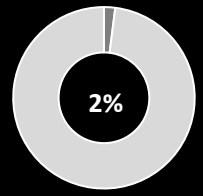
Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

Participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

165.65

Percentage of stream miles which are detailed study in the study watersheds



5

Flood-related presidential disaster declarations in your Discovery study parish

*National Flood Hazard Layer (NFHL)

WINN PARISH

TAKE ACTION: Potential Next Step



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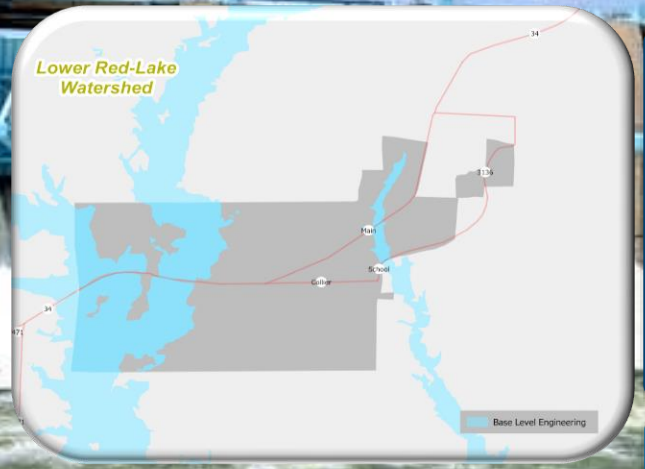
VILLAGE OF ATLANTA

KNOW YOUR RISK



1.08 sq. mi.

of the community's land area is in the study watershed

149

Population based on 2020 Decennial Census in the study watershed

-4.4% expected population growth predicted from 2020-2025 in the community

0

policies totaling approximately $0 in coverage

0

Claims submitted to NFIP in the Community

0

In Total Paid on Claims in the Parish

100%

Of the community's FEMA mapped* 1%-annual-chance storm flood extent areas are in the Lower Red-Lake Latt Watershed

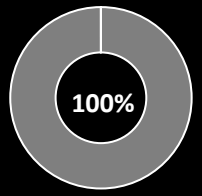
X

Not participating in the National Flood Insurance Program

CNMS Stream Miles in the study watershed

2.14

Percentage of stream miles which are detailed study in the study watersheds



5

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VILLAGE OF ATLANTA

TAKE ACTION: Potential Next Step



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Table 10: Lower Red-Lake Iatt Community Overview

CID	Community	*Total Community Population*[1]	Percent of Community in Study watershed	Total Community Land Area (sq. mi)	Percent of Land Area Study watershed	NFIP Participant
220076	**Grant Parish**	*18,751*	52.0%	658.9	23.2%	Y
220077	**Town of Colfax**	*1,428*	100.0%	1.5	0.1%	Y
220079	**Village of Creola**	*242*	19.1%	267.6	3.5%	N
220256	**Town of Montgomery**	*622*	100.0%	2.1	0.1%	Y
220129	**Natchitoches Parish**	*16,406*	50.8%	1,268.8	43.7%	Y
220130	**Village of Clarence**	*326*	15.3%	1.6	0.0%	Y
220370	**Village of Natchez**	*489*	100.0%	1.1	0.1%	Y
220131	**City of Natchitoches**	*18,039*	100.0%	26.4	1.8%	Y
220132	**Village of Provencal**	*528*	100.0%	2.5	0.2%	Y
220145	**Rapides Parish**	*60,547*	12.7%	1,319.1	11.4%	Y
220147	**Town of Boyce**	*888*	37.7%	0.6	0.0%	Y
220146	**City of Alexandria**	*4,527*	3.3%	29.2	0.1%	Y
220151	**City of Pineville**	*14,384*	26.5%	13.1	0.2%	Y
220368	**Sabine Parish**	*16,000*	7.1%	996.1	4.8%	Y
220221	**Vernon Parish**	*37,503*	0.5%	1,317.9	0.4%	Y
220369	**Winn Parish**	*8,501*	15.9%	956.4	10.3%	Y
220090	**Village of Atlanta**	*149*	100.0%	1.1	0.1%	N

[1]*2020 United States Census Bureau Population Estimate*

Appendix III: Base Level Engineering Report

Lower Red-Lake Iatt Watershed, Louisiana
2D Base Level Engineering Methods and Results

Contract# HSFE60-15-D-0003
Task Order 70FA6019F00000035
October 2021

Prepared for:

DHS/FEMA (Federal Emergency Management Agency)
FEMA Region VI
FRC 800 North Loop 288
Denton, TX 76209-3698

Submitted by:

Compass PTS JV
3101 Wilson Boulevard, Suite 900
Arlington, VA 22201

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3101 Wilson Boulevard, Suite 900
Arlington, VA 22201
T: 703.682.9100; F: 703.682.4901

DOCUMENT HISTORY

DOCUMENT LOCATION

J:/FY2020/20-06-0049S/HYDRAULICS - HYDRAULICS|LOWER RED-LAKE LATT LA|BLE 05/HYDRAULIC DATA CAPTURE - HYDRAULICS|LOWER RED-LAKE LATT LA|BLE - 01

REVISION HISTORY

Version Number	Version Date	Summary Changes	Team/Author
1.0	October 2021	Deliverable to FEMA Region VI	Compass PTS JV

APPROVALS

This document requires the approval of the following persons:

Role	Name	Phone	Title (CLIN/RMC)	Review Date	Approved Date
Project Manager	Jack Young	214-217-6676	Project Manager	10/21/2021	10/21/2021

CLIENT DISTRIBUTION

Name	Title/Organization	Location
FEMA's MIP	Region VI	See path above
Diane Howe	FEMA Region VI Risk MAP Lead	Denton, TX

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01 Introduction

Recent innovations and efficiencies in floodplain mapping have allowed the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) to develop a process formerly known as First Order Approximation (FOA), now labeled Base Level Engineering (BLE), which can be used to address current program challenges, including the validation of Zone A studies and the availability of flood risk data in the early stages of a Flood Risk Project. The BLE process involves using best available data and automated techniques to produce estimates of flood hazard boundaries for multiple recurrence intervals. The Lower Red – Lake Iatt Watershed BLE documented here was designed to use 2-dimensional (2D) modeling efforts with enhancements and calibration to develop products intended to be transitioned into regulatory data development workflows.

As described in Title 42 of the Code of Federal Regulations, Chapter III, Section 4101(e), once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks in flood prone areas. FEMA makes this determination of flood hazard data validity by examining flood study attributes and change characteristics, as specified in the Validation Checklist of the Coordinated Needs Management Strategy (CNMS) Technical Reference. The CNMS Validation Checklist provides a series of critical and secondary checks to determine the validity of flood hazard areas studied by detailed methods (e.g., Zone AE, AH, or AO). While the critical and secondary elements in CNMS provide a comprehensive method of evaluating the validity of Zone AE studies, a cost-effective approach for evaluating Zone A studies has been lacking.

In addition to the need for Zone A validation guidance, FEMA standards require flood risk data to be provided in the early stages of a Flood Risk Project. FEMA Program Standard Identification (SID) #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping which may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared, and results should be discussed with stakeholders.

An important goal of the BLE process is the scalability of the results. Scalability means that the results of a BLE should not only be used for CNMS evaluations of Zone A studies but can also be leveraged throughout the Risk MAP program. The large volume of data resulting from a BLE can be updated as needed and used for the eventual production of regulatory and non-regulatory products, outreach and risk communication, and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

In an effort to increase and enhance the flood risk products in Louisiana, FEMA Region VI contracted the Compass PTS JV to perform a BLE analysis for the Lower Red–Lake Iatt Watershed. This report documents the BLE process, products, and results for this watershed. Figure 1 depicts the Lower Red-Lake Iatt Watershed footprint.



Figure 1: Lower Red-Lake Iatt Watershed

02 2D BLE Modeling Inputs and Controls

Section 2 presents fundamental components required to execute a 2-dimensional (2D) hydraulic engineering analysis for the Lower Red – Lake Iatt Watershed. Inputs such as elevation data, hydrology from rain-on-grid and inflow hydrographs, and hydraulic analyses and variables are defined herein. HEC-RAS 5.0.7 rain-on-grid utility was applied in the production of these Louisiana 2D BLE products.

2.1 Topographic Data

A high-resolution Digital Elevation Model (DEM) is a fundamental component for two-dimensional engineering analyses by providing a detailed representation of the surface for hydraulic routing through the model area. As such, DEMs were developed for the Lower Red – Lake Iatt BLE project by leveraging available high-resolution gridded elevation data derived from Light Detection and Ranging (LiDAR) collections throughout the entire State of Louisiana. The 10-foot DEM developed to support the 2D BLE modeling and analysis, within the Lower Red – Lake Iatt Watershed, was executed using the following steps:

1. Available elevation data for the project area were inventoried and collected.
2. Leveraged elevation data were evaluated and prioritized based on source vertical accuracy, year of collection, and resolution.
3. Seamless DEMs were processed using GIS.
4. Quality was assured using quantitative and qualitative assessment.

Documentation regarding leveraged data including coverage, accuracy, acquisition dates, and source contact/agency are presented in the figures, tables and text within Section 2.1. All vertical accuracy specifications were obtained from the metadata or survey reports provided with the leverage datasets. All available metadata, survey reports, and other leverage documentation are included in the FEMA Data Capture Technical Reference compliant submittal content for the Lower Red-Lake Iatt Watershed.

2.1.1 Inventory

An inventory of existing topographic data was conducted for the Lower Red-Lake Iatt BLE project footprint. Figure 2 depicts the datasets identified for leveraged across the project area. FEMA, NOAA, USGS, and other State and Federal agencies were queried to build the inventory with the most current and available data sources.

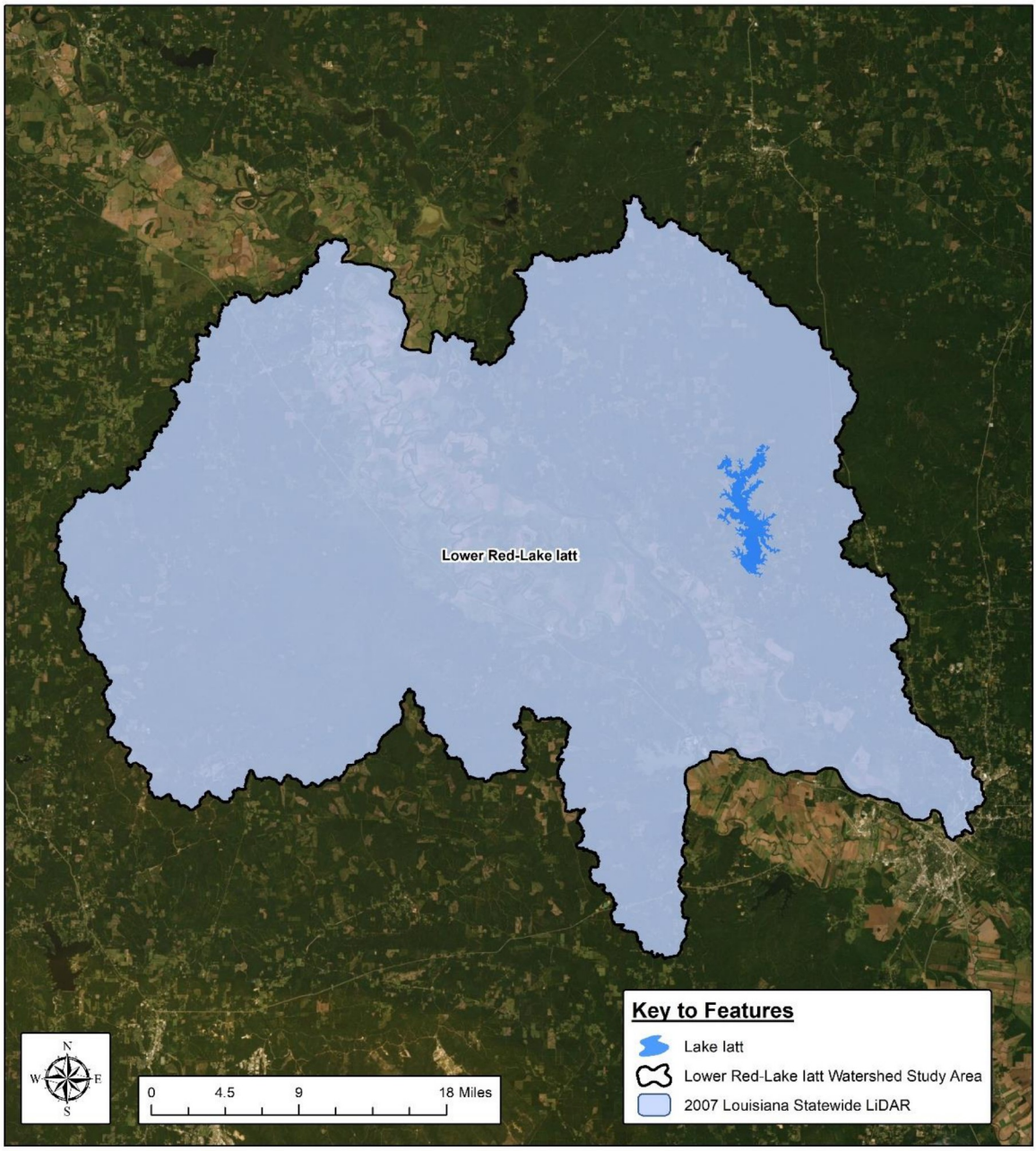

Figure 2: Lower Red-Lake Iatt Watershed BLE Source Terrain Data

2.1.2 Evaluation

A data coverage assessment was conducted to check for data gaps, extent, accuracy, and completeness. A review of related documentation, reports, indexes, and metadata associated with the leveraged datasets ensured each dataset meets FEMA accuracy requirements for topographic data. Decisions to leverage or exclude a dataset (or portion of it), were based generally on the following criteria coupled with engineering judgment:

- Data meet FEMA vertical accuracy standards (Table 1)
- Date of origination

- Data density and coverage

Table 1 depicts the Risk Map SID 43 vertical accuracy requirements based on flood risk and terrain slope within the floodplain being mapped.

Table 1: FEMA Vertical Accuracy Requirements for Leveraged Data

Level of Flood Risk	Typical Slopes	Specification Level	Vertical Accuracy*	LiDAR Nominal Pulse Spacing (NPS)
High (Deciles 1,2,3)	Flattest	Highest	24.5 cm / 36.3 cm	≤ 2 meters
High (Deciles 1,2,3)	Rolling or Hilly	High	49.0 cm / 72.6 cm	≤ 2 meters
High (Deciles 2,3,4,5)	Hilly	Medium	98.0 cm / 145 cm	≤ 3.5 meters
Medium (Deciles 3,4,5,6,7)	Flattest	High	49.0 cm / 72.6 cm	≤ 2 meters
Medium (Deciles 3,4,5,6,7)	Rolling	Medium	98.0 cm / 145 cm	≤ 3.5 meters
Medium (Deciles 3,4,5,6,7)	Hilly	Low	147 cm / 218 cm	≤ 5 meters
Low (Deciles 7,8,9,10)	All	Low	147 cm / 218 cm	≤ 5 meters

***Vertical Accuracy at 95% Confidence Level (FVA or NVA)/(CVA or VVA)**

Table 2 depicts the complete list of source elevation data and attributes leveraged for the Lower Red-Lake Iatt Watershed BLE project. All datasets used for hydraulic analyses and mapping meet the highest specification level defined in Table 1. Further explanation of the Table 2 datasets can be referenced in section 2.1.2.1.

Table 2: Source Topographic Data Available for the Lower Red-Lake Iatt Watershed

Year	Description	Data Type	RMSE	Source/Owner
2007	Louisiana Statewide LiDAR	Airborne LiDAR	15-30 cm	LSU/USGS

2.1.2.1 Lower Red-Lake Iatt Watershed Source Terrain Data

The source elevation data for the Lower Red-Lake Iatt Watershed are DEMs derived from the 2007 Louisiana Statewide/FEMA LiDAR. Only points classified as "ground" points (i.e., bare earth) were imported from the LiDAR and used for development of the project DEMs. Bare-earth LIDAR data are typically made by filtering non-ground returns (e.g. buildings, vegetation, etc.) from the raw laser returns. Figure 2 depicts the extent of the data defined in Table 2.

The 2007 Louisiana Statewide LiDAR was collected with a nominal pulse spacing of 3 to 4 meters. The RMSEz reported for the dataset was ranged from 15 cm to 30 cm at the 95% confidence level which meets project accuracy specifications of the National Standard for Spatial Data Accuracy (NSSDA).

2.1.3 Data Development Methodology

The source topographic data were processed for an area covering the Lower Red-Lake Iatt Watershed and contributing drainage areas for the Lower Red-Lake Iatt BLE modeling efforts. The topographic data for Lower Red-Lake Iatt Watershed was projected horizontally, as needed, to North American Datum of 1983 (NAD83), State Plane Coordinate System (SPCS) Louisiana North in feet (1701-SPC83). All topographic data were adjusted vertically, as needed, to NAVD88 in feet. Compass used a combination of ArcGIS and other software tools to apply any vertical datum shifts and\or any horizontal projection transformations to the topographic data.

2.1.4 DEM QA/QC

DEMs developed for use in the Lower Red-Lake Iatt Watershed BLE analysis were developed and independent assured to meet quality standards of the project. The data were developed using a controlled process, were evaluated and assured by a topographic data development team and were evaluated and assured by the engineering team. Quality assurance during the data development process includes, but is not limited to the following QC checks:

- Horizontal Projection Check
- Vertical Datum Check
- Resolution Check
- Format Check
- Seamless Data Check to ensure the DEM files are consistent and seamless along source data edges

The quality control after the development process by the DEM development team included visual observations using hillshade, contouring, color rendering, and/or other visual aids to review and identify potential impactful anomalies within the DEM surface. This QC step included, but were not limited to the following QC checks:

- Seamless Data Check to ensure no voids along the edges and between the prioritized datasets
- NoData Value Check to ensure no null values
- Manual Elevation Check using hillshade rasters to find erroneous elevation issues
- Unit Consistency Check
- Legacy Cell Value Anomalies

Quality assurance conducted after the seamless DEM development conducted by the engineering team included visual or automated assessments to identify potentially impactful anomalies or slope changes that may adversely impact hydraulic.

The final DEM data developed for the Lower Red-Lake Iatt Watershed are assured to meet FEMA standards and present a representative surface developed from leveraged elevation data for the purposes of this BLE project.

2.2 2D BLE Methods

The following sections describe the 2D computational mesh and program setting considerations, followed by discussion and tabulation of hydrologic and hydraulic engineering methods and model inputs.

2.2.1 2D Computational Mesh and Settings

The HEC-RAS 2D computational mesh defines the extents of the 2D flow and can affect the accuracy of the 2D calculations. A denser mesh may provide more accurate results, but it can dramatically increase computation times. The 2D mesh for the model was set as evenly spaced cells at 250 feet. The mesh was further refined by placing breaklines along roads, berms, ridges, and other high ground that can influence the flow.

To ensure the entire Lower Red-Lake Iatt Watershed was represented, a 1000-foot buffer was added to the HUC boundary. It also incorporated portions of Black Lake Bayou and a large portion of the Saline Bayou watershed in order to account for the interaction of the several confluences between the three watersheds.

The HEC-RAS 2D computational mesh was created for Lower Red-Lake Iatt watershed based on HUC boundaries using ArcGIS toolsets, such as smoothing and simplification routines; ultimately, significantly reducing the need for manual edits to mesh cells within HEC-RAS that happen to generate errors. The 2D mesh consists of 697,193 cells and a 250-foot nominal mesh cell size; there are factors that could result in either larger or smaller cell sizes including proximity to the edge of the 2D mesh or the presence of breaklines. A 1-minute time step was used in the HEC-RAS model, applying the Diffusion Wave (simplified Full Momentum) equations.

In order to analyze the complex system between Lower Red-Lake Iatt, Middle Red- Coushatta, Black Lake Bayou and Saline Bayou, Lower Red-Lake Iatt went through several iterations alongside these watersheds in order to create a seamless floodplain.

2.2.2 Model and Boundary Condition Setup

Using HEC-RAS rain-on-grid modeling requires establishing a 2D computational mesh boundary, and often requires defining inflow boundary conditions in addition to excess precipitation applied to the mesh. For the Lower Red-Lake Iatt basin, six (6) inflow hydrographs were used, along with excess precipitation applied to the mesh. Figure 3 shows the 2D computational mesh for the Lower Red-Lake Iatt basin, along with USGS peak streamflow gages pertinent to the study. Figure 4 shows the inflow boundary condition locations for the upstream basins.

The development of the inflow hydrographs, and excess precipitation hyetographs for the 2D mesh, are described in the following Section 2.2.3.

Outflow boundary conditions (from the computational 2D mesh) were utilized along basin boundaries along with inflow boundary hydrographs. Unique outflow boundaries were established for obvious riverine outflows, while the remaining boundaries were defined as continuous boundaries to allow drainage from adjacent basins to leave the model area freely. Normal depth was used for all non-unique outflow boundary conditions using approximate energy grade-line slopes estimated from the LiDAR terrain data.

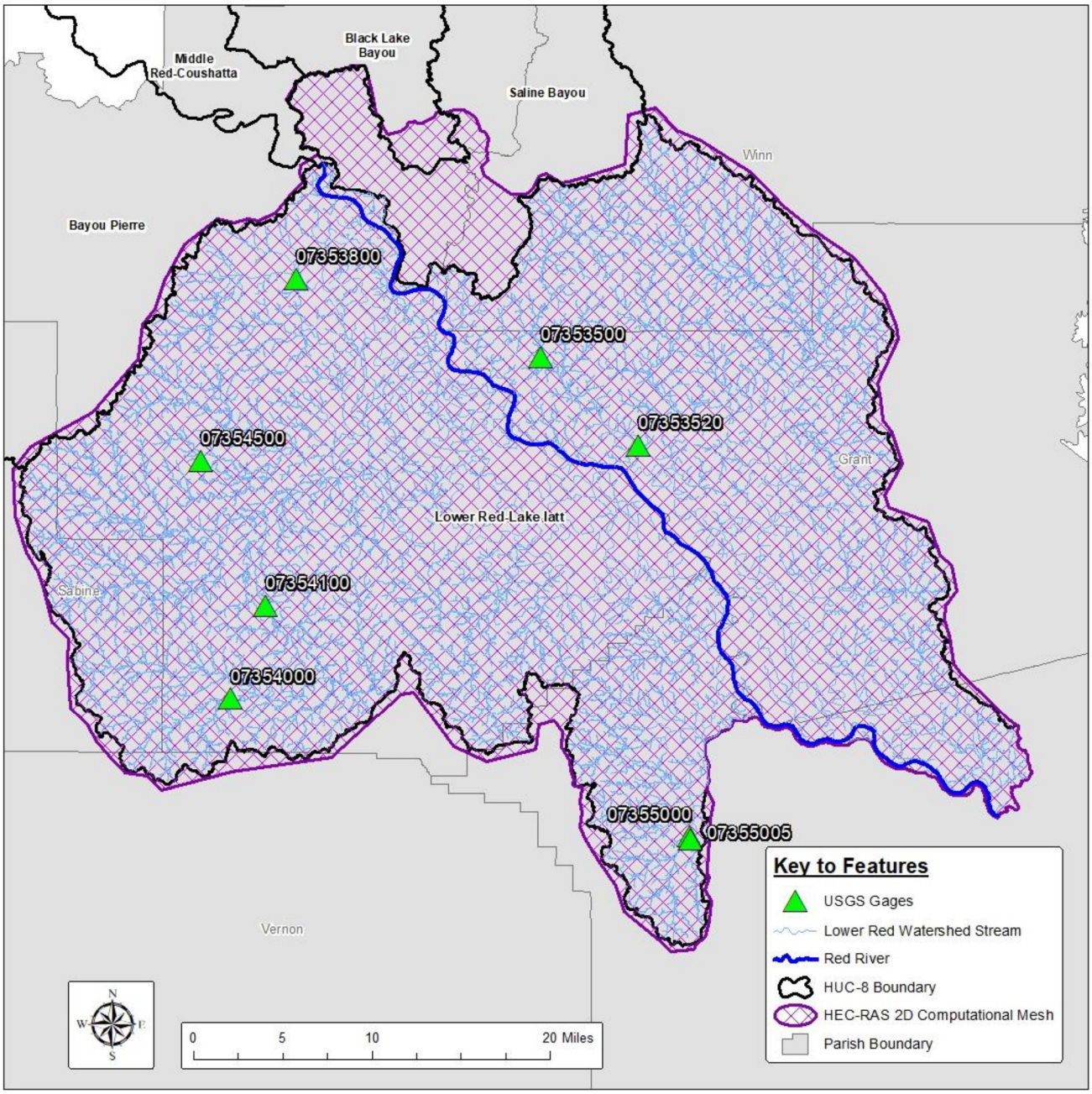

Figure 3: HEC-RAS 2D Computational Mesh and USGS Peak Streamflow Gages

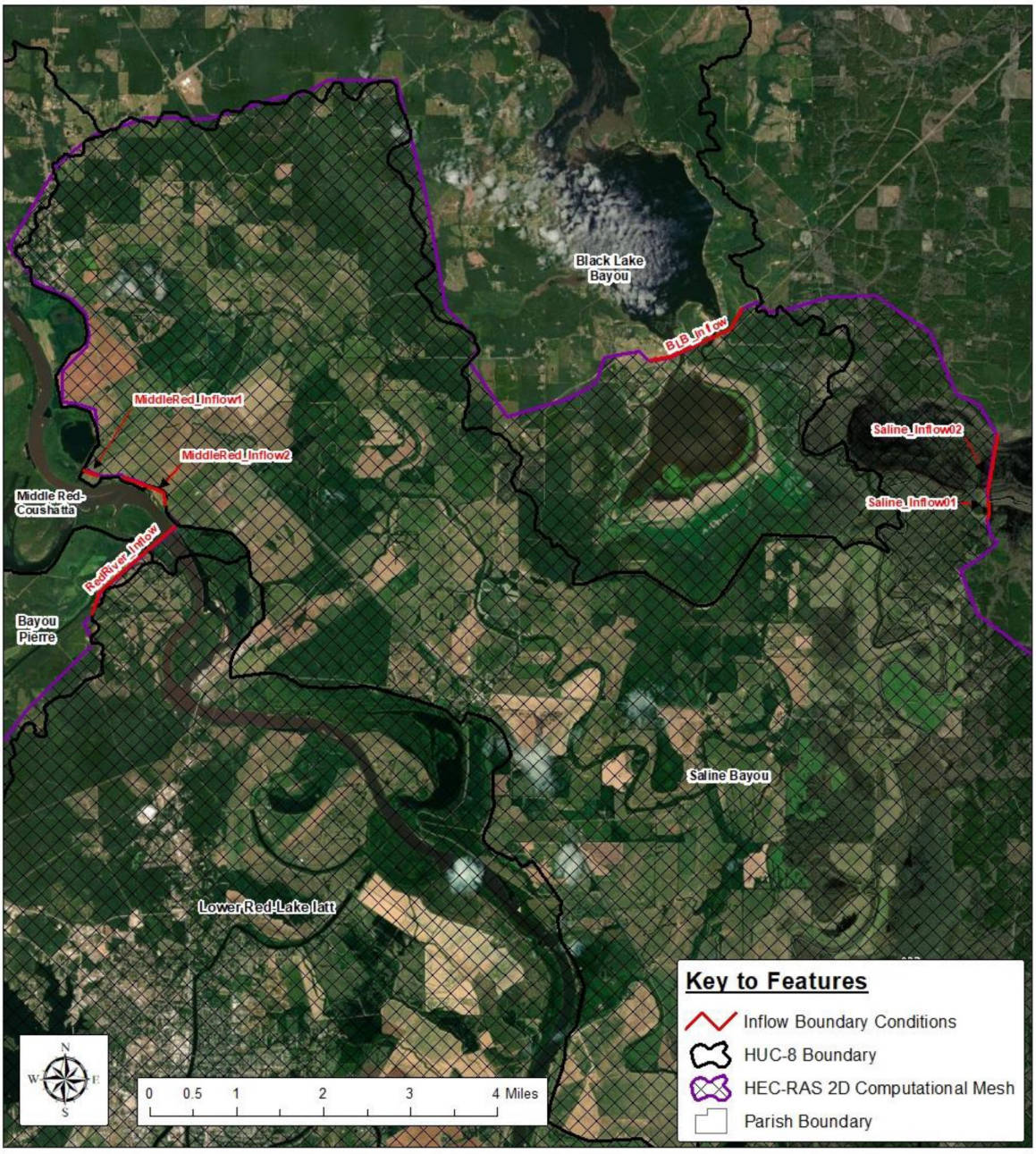

Figure 4: HEC-RAS 2D Computational Mesh and Inflow Boundary Conditions for Lower Red-Lake Iatt

2.2.3 Hydrology

Precipitation data for this study were referenced from NOAA's Precipitation Frequency Data Server, and appropriate values for all sub-basin elements were determined considering spatial variation and a representative total for each particular sub-basin. Excess precipitation for the 2D mesh was developed as described in Section 2.2.3.1. Inflow hydrograph boundary conditions to the 2D mesh were taken from the Middle Red-Coushatta, Saline Bayou, and Black Lake Bayou watersheds completed under the Compass FY20 RTO.

A total of eight (8) USGS gages are found within Lower Red-Lake Iatt Watershed. Seven (7) of the gages were excluded from the analysis due to insufficient data or the lack of a DATUM elevation, including: Hemphill Creek near Hot Wells, Dyer Creek near Hot Wells, Little Sandy Creek at Kisatchie, Horsepen Creek near Provencal, Nantachie Lake near Aloha, Nantachie Creek near Montgomery, and Youngs Bayou at Natchitoches.

Precipitation frequency data published in NOAA Atlas 14, Volume 9 Version 2.0 (NOAA, 2013) were used for this Study. These data were obtained from NOAA's Precipitation Frequency Data Server (PFDS) (http://hdsc.nws.noaa.gov/hdsc/pfds/index.html). The 10-, 4-, 2-, 1-, and 0.2-percent annual chance 24-hour precipitation depths for all sub-basin elements were determined by area-weighted intersection of gridded PFDS data with sub-basins. Excess precipitation for the 2D mesh was developed as described in Section 2.2.3.1. The gage utilized for this study is presented in Table 3.

Table 3: USGS Peak Streamflow Gages

Gage ID	Flooding Source and Location	Published Drainage Area (mi^2)	Period of Record
07354100	Kisatchie Bayou at Lotus, LA.	140	1939-2003

Annual chance peak flows were calculated at each gage using USGS Bulletin 17B methodology. The 84% confidence interval was used to determine the 1% plus and minus chance events. Calculated discharges for the 1%, 1% plus, and 1% minus events are presented in Table 4.

Table 4: USGS Peak Streamflow Gage Analysis Results

Gage ID	Flooding Source and Location	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
07354100	Kisatchie Bayou at Lotus, LA.	19,780	16,970	24,080

2.2.3.1 Excess Precipitation for 2D Computational Mesh

HEC-HMS version 4.2 was used to apply the SCS Curve Number method to calculate losses and define excess precipitation for each watershed. Temporal distributions of point rainfall totals were defined using 24-hour, SCS Type II storm distributions. The plus and minus standard error for the 1-percent annual chance precipitation depths were determined as the upper and lower 84% confidence limits on the nominal 1-percent depth, assuming a normal distribution of the logarithms for the precipitation depths.

In addition to recurrence interval precipitation estimates, NOAA Atlas 14 provides 90% confidence intervals of reported precipitation values. On a normal distribution curve, 90% confidence intervals (i.e. the upper and lower 95% confidence limits) correspond to +/- 1.645 standard deviations. The 1% plus and minus events are defined to be one standard deviation above and below the 1% event. It should be noted that the standard errors for the 1% rainfall depth were based on the depth used post-areal reduction.

Curve Numbers were computed by intersecting the National Land Cover Dataset (NLCD) 2016 coverage and NRCS soils data based on the matrix presented in Table 5.

Table 5: Land Use-Soils-CN Matrix for Computing Initial Curve Numbers

LU_GridCode	NLCD LU Description	Hydrologic Soil Group			
		A	B	C	D
11	Open Water	99	99	99	99
21	Developed Open Space	49	69	79	84
22	Developed Low Intensity	61	75	83	87
23	Developed Medium Intensity	81	88	91	93
24	Developed High Intensity	89	92	94	95
31	Barren Land	39	61	74	80
41	Deciduous Forest	30	55	70	77
42	Evergreen Forest	30	55	70	77
43	Mixed Forest	30	55	70	77
52	Shrub Scrub	30	48	65	73
71	Herbaceous	49	62	74	85
81	Hay Pasture	39	61	74	84
82	Cultivated Crops	51	67	76	80
90	Woody Wetlands	72	80	87	93
95	Emergent Herbaceous Wetlands	72	80	87	93

A Curve Number (CN) can be considered a parameter, exhibiting variability that follows some frequency distribution. While Antecedent Runoff Condition (ARC) II CNs were used for a 1% event, the range between ARC I and ARC III for the ARC II CN was assumed to correspond to an 80% confidence interval of the ARC II CN. The CN Loss method assumes a maximum potential retention parameter, S, is inversely related to a CN by S = 1000 / CN – 10; this relationship is based on a median value of S determined from plotting a large number of observations.

Chapter 5 of the NRCS NEH Part 630 provides an example of computing a CN for a watershed based on annual peak gage observations. The example involves computing a CN and corresponding S value for each event, then taking the logarithms of the S values. Further, the logarithm of S is assumed to vary normally, and the mean of the logarithms corresponds to the arithmetic median. Therefore, 10% (S10) and 90% (S90) extremes of log normally distributed S values can be assumed to correspond to ARC III and ARC I condition CN values, respectively. This range represents an 80% confidence interval, corresponding to +/- 1.282 standard deviations from the mean. The following procedure was used to estimate one standard deviation of a given CN (in fact, one standard deviation of the logarithm of S) for the purposes of modeling 1% plus and minus events. First, ARC I (corresponding to S10) and ARC III (corresponding to S90) CN values can be estimated from a 1% CN (ARC II) by:

$$\mathrm{CNI} = 4.2 * \mathrm{CNII} / (10 - 0.058 * \mathrm{CNII})$$
$$\mathrm{CNIII} = 23 * \mathrm{CNII} / (10 + 0.13 * \mathrm{CNII})$$

Next, S90 and S10 can be computed by:

$$S10 = 1000 / CNIII - 10$$
$$S90 = 1000 / CNI - 10$$

The following relationship can then be used to compute one standard deviation of the logarithm of S:

$$\log(S10) = \text{mean}(\log S) + 1.282\ \text{std. dev.}(\log S)$$
$$\log(S90) = \text{mean}(\log S) - 1.282\ \text{std. dev.}(\log S)$$
$$1\ \text{std. dev.}(\log S) = (\log S10 - \log S90) / (1.282 * 2)$$

Therefore, 1% plus and minus S values can be estimated by:

$$\log \text{SPlus} = \log S + [1\ \text{std. dev.}(\log S)]$$
$$\log \text{SMinus} = \log S - [1\ \text{std. dev.}(\log S)]$$

Finally, 1% plus and minus CNs can be computed by:

$$\text{CNPlus} = 1000 / (\text{SPlus} + 10)$$
$$\text{CNMinus} = 1000 / (\text{SMinus} + 10)$$

Since the 1% plus and minus events represent plus and minus one standard deviation of a 1% event, CNs used in a rainfall-runoff simulation for modeling 1% Plus and Minus events were developed, as described above.

Lag Times for sub-basins were determined using the SCS Lag Equation, as well as engineering judgement. Table 6 below shows the Curve Numbers and Lag Time values used in this study.

Table 6: Rainfall-Runoff Parameters (Curve Number, Lag Time)

Sub-basin Description	CN	CN 1% Minus	CN 1% Plus	Tlag (min)
Lower Red – Lake Iatt	75.3	61.1	85.5	2,384

NRCS rainfall-runoff methods were used to define excess precipitation applied to the 2D mesh, including Curve Numbers for defining rainfall losses and Lag Time for transforming the runoff temporally. No routing was considered in the rainfall-runoff modeling. NRCS Type II storm distributions were used for defining temporal distributions of point rainfall totals. An Area Reduction Factor (ARF) of 0.91 was used on all recurrence interval total precipitation depths in order to determine the effective precipitation for the sub-basin representing the 2D mesh. Table 7 provides the precipitation totals used for determining excess precipitation.

Table 7: Precipitation Totals for HEC-RAS 2D Computational Mesh (post ARF)

Sub-basin Description	Percent Annual Chance Precipitation Total (in)						
	10	4	2	1	0.2	1% Minus	1% Plus
Lower Red-Lake Iatt	6.87	8.69	10.29	12.04	16.77	9.85	14.23

Figure 5 shows the hyetographs applied to the 2D computational mesh.

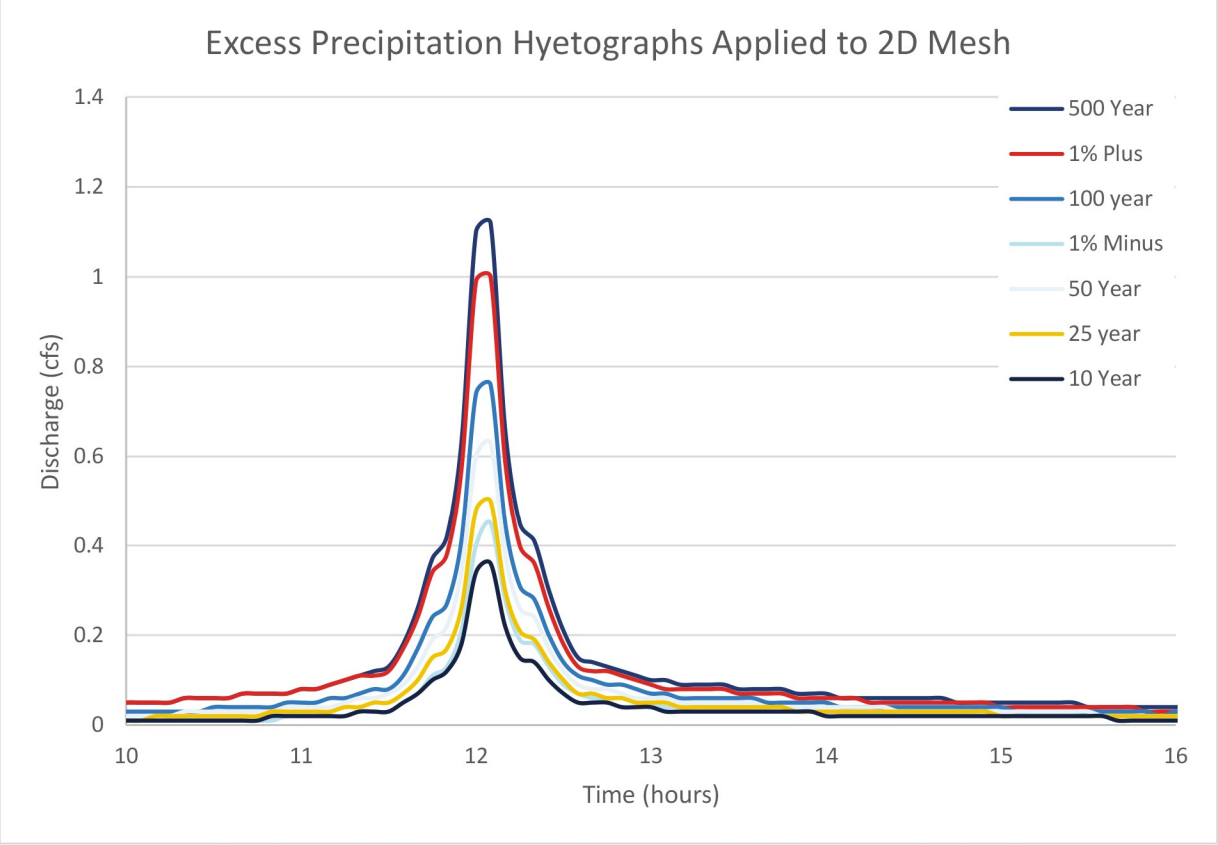

Figure 5: Precipitation Hyetographs (post ARF) applied to the Computational Mesh

2.2.3.2 Rainfall-Runoff Hydrograph Boundary Conditions

This section discusses the drainage areas for which inflow hydrographs, developed from rainfall-runoff modeling, were used as boundary conditions to the 2D computational mesh. The following figures show the inflow hydrographs for each contributing flooding source applied to the 2D computational mesh.

Figure 6 shows the Red River and Bayou Pierre drainage area contributing inflow hydrograph from the Middle Red-Coushatta FY20 RTO model. The USACE Red River model was leveraged for the Middle Red-Coushatta Watershed. The outfall of Middle Red-Coushatta established inflows to be used for the Lower Red-Lake Iatt model. The USACE model and Middle Red- Coushatta RAS model simulations ran for 38 days. Middle Red- Coushatta is peaking on day 35 of the simulation for 100-year storm event. A simulation time of 35 days was not enough for the Lower Red-Lake Iatt model, which at the downstream end of the watershed reaches its peak on day 42 for the 100-year storm event. Given that the inflow from Middle

Red-Coushatta had sufficient data and was past its peak, the falling limb of the inflow hydrograph was extrapolated to extend the run time of the Lower Red-Lake Iatt model to 50 days.

As discussed in Section 2.2.1, this watershed had many interactions with adjacent watersheds, which created spills from one watershed to another. Those areas of interaction were identified and added as inflow hydrographs to the Lower Red-Lake Iatt model. Figure 7 shows the inflow from the Black Lake Bayou Watershed. Saline Bayou and Middle Red-Coushatta had multiple points of interaction with Lower Red-Lake Iatt. Figure 8 and Figure 9 show the two inflows from the Saline Bayou Watershed. Middle Red-Coushatta had three points of interaction, one of which is along the Red River, and the other two are shown in Figure 10 and Figure 11.

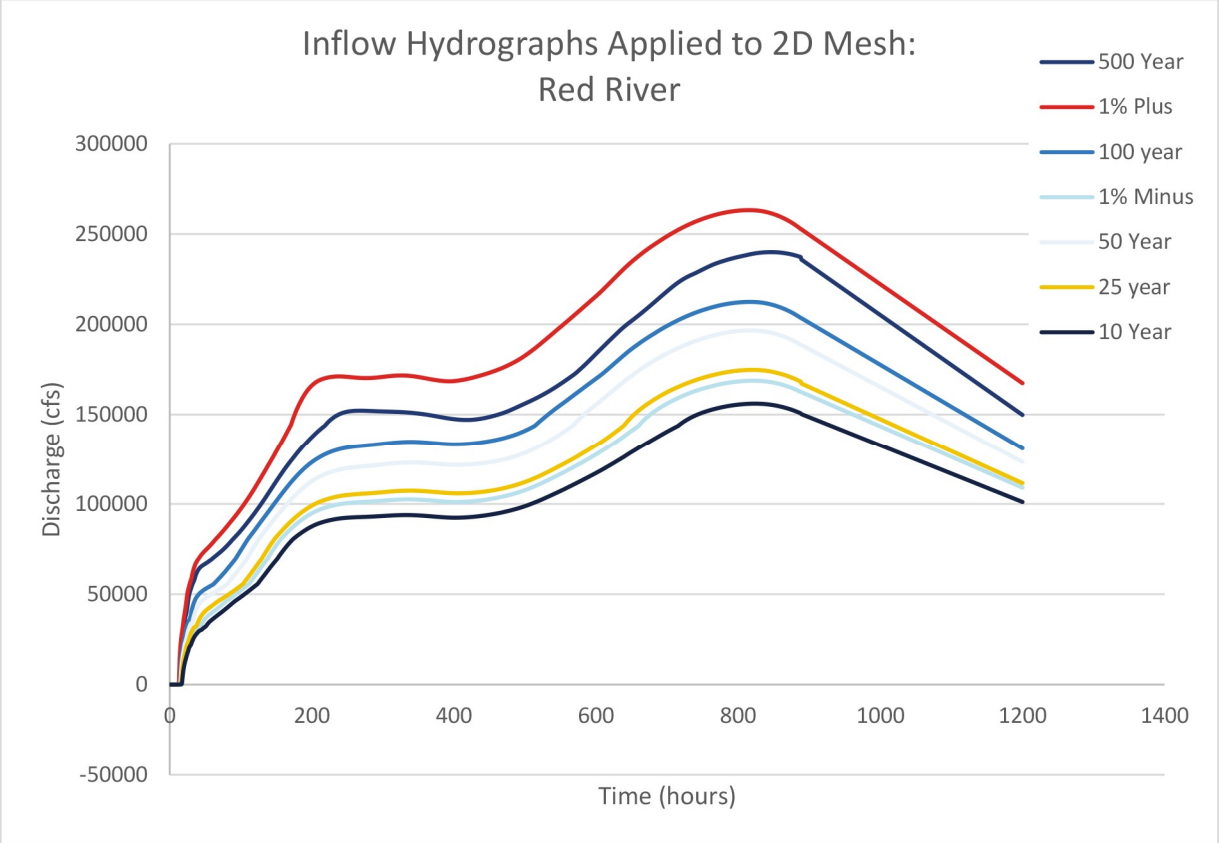

Figure 6: Red River (RedRiver_Inflow) Basins Contributing Drainage Area Inflow Hydrographs

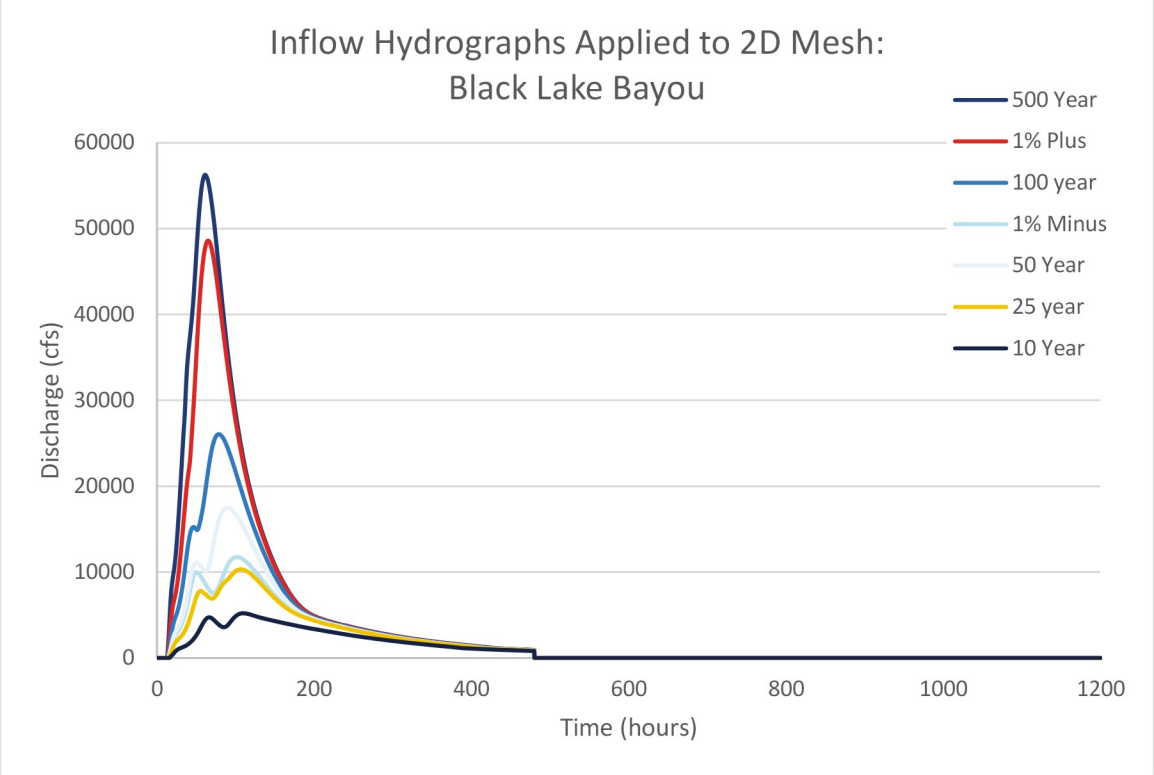

Figure 7: Black Lake Bayou (BLB_Inflow) Contributing Drainage Area Inflow Hydrographs

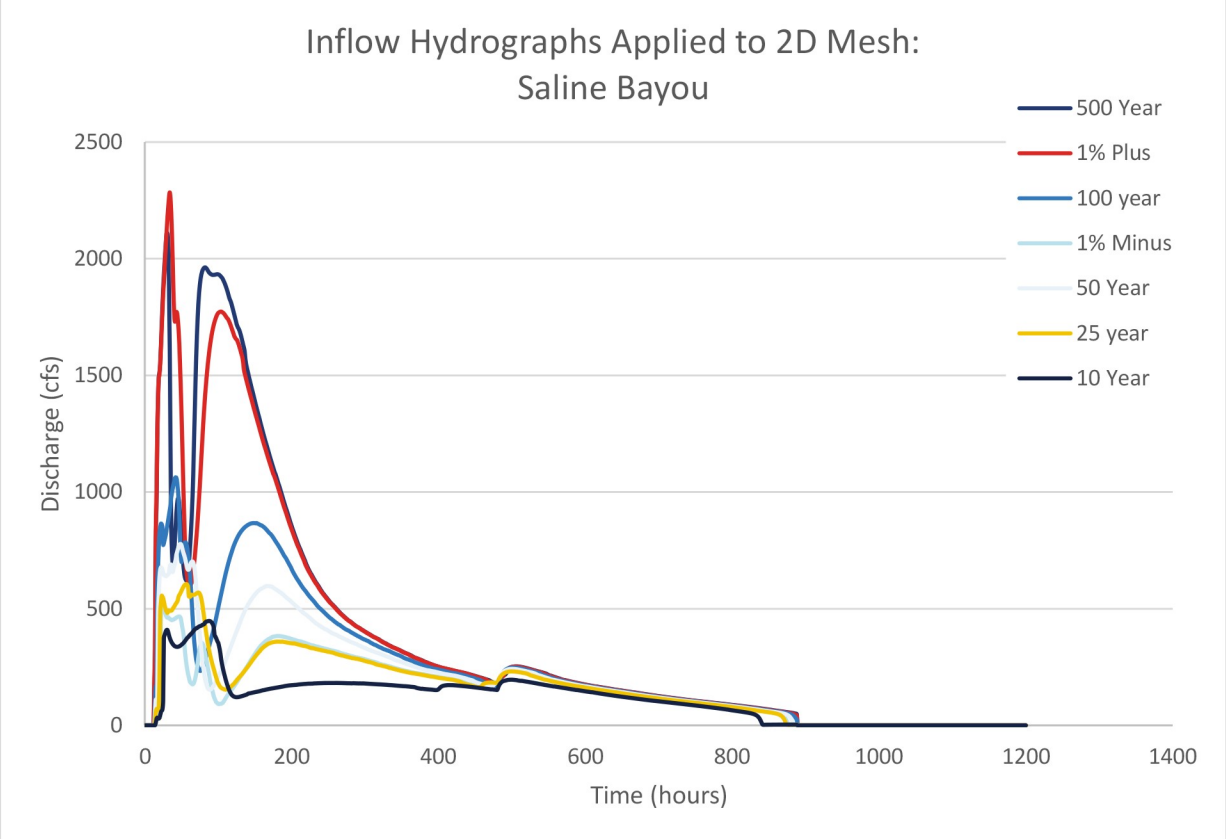

Figure 8: Saline Bayou (Saline_Inflow01) Basin Contributing Drainage Area Inflow Hydrographs

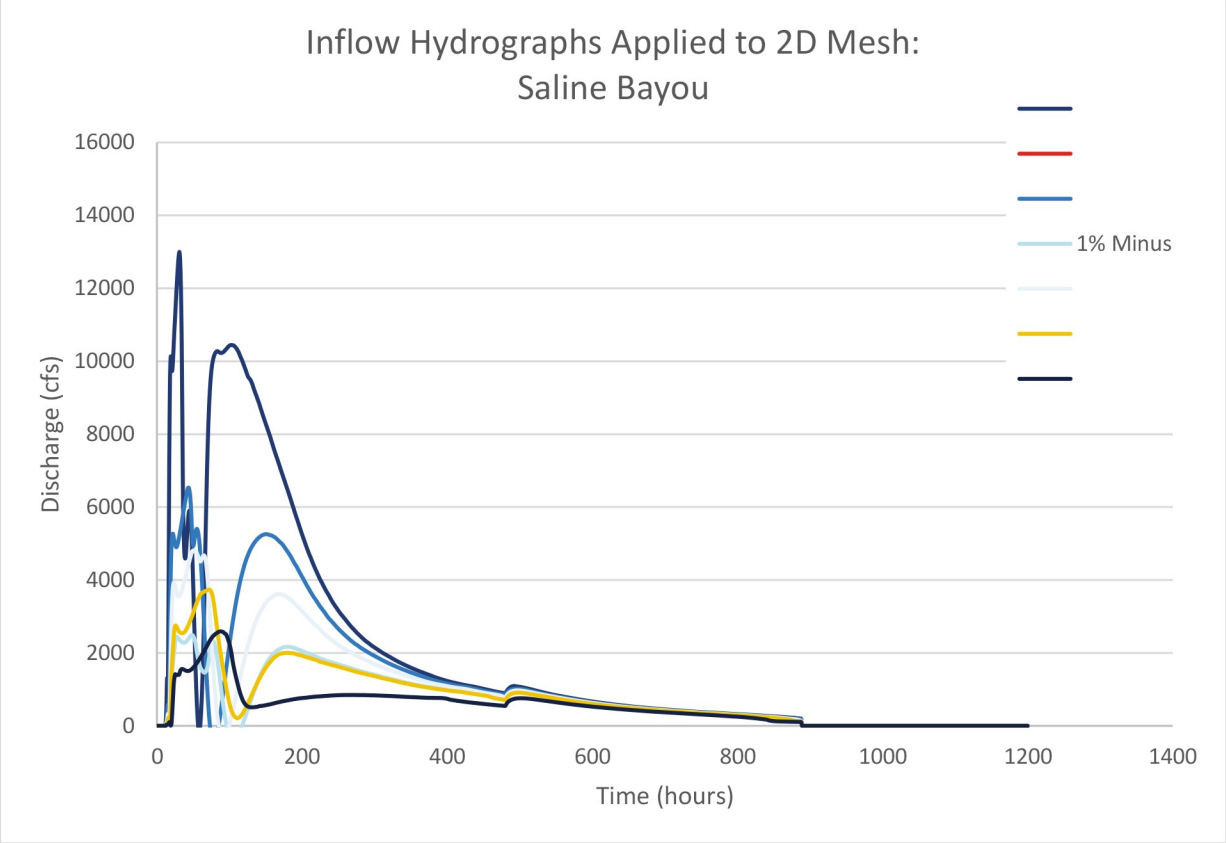

Figure 9: Saline Bayou (Saline_Inflow02) Basin Contributing Drainage Area Inflow Hydrographs

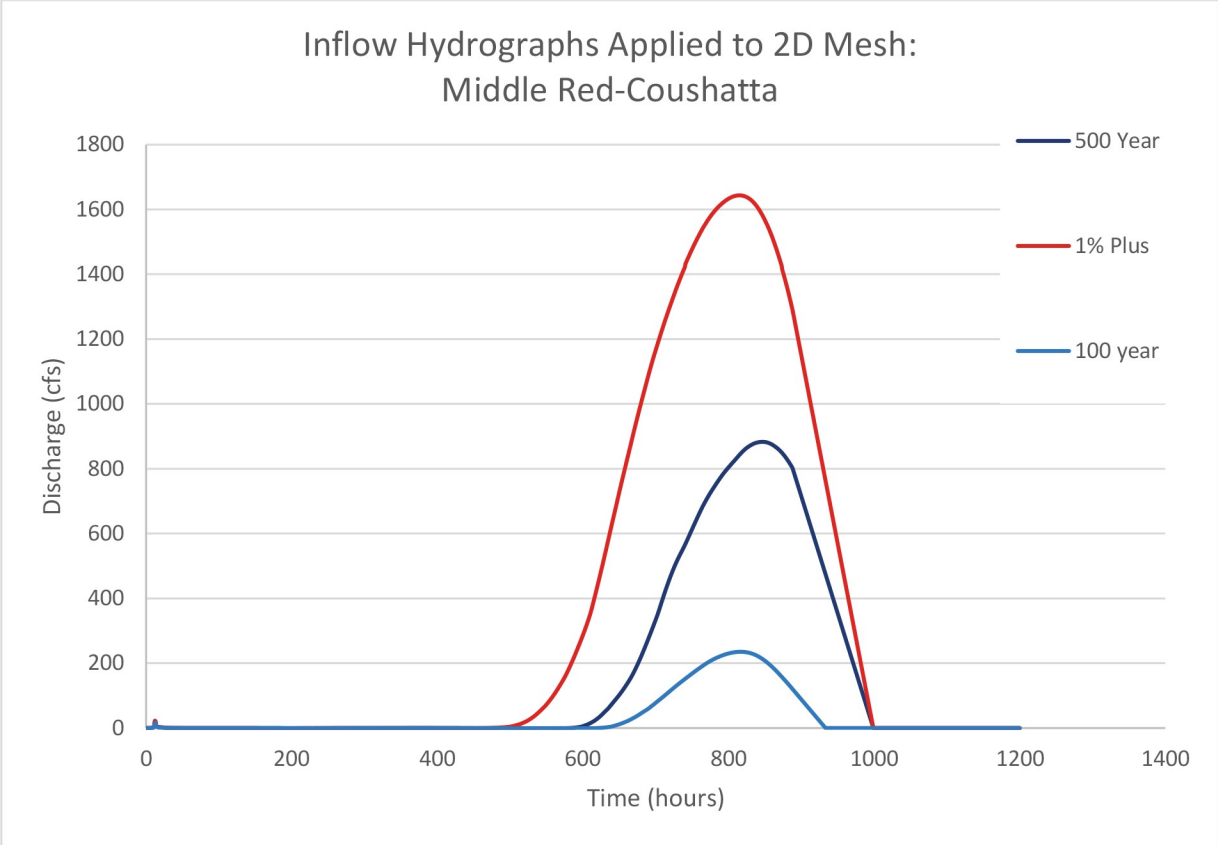

Figure 10: Middle Red-Coushatta (MiddleRed_Inflow1) Basin Contributing Drainage Area Inflow Hydrographs

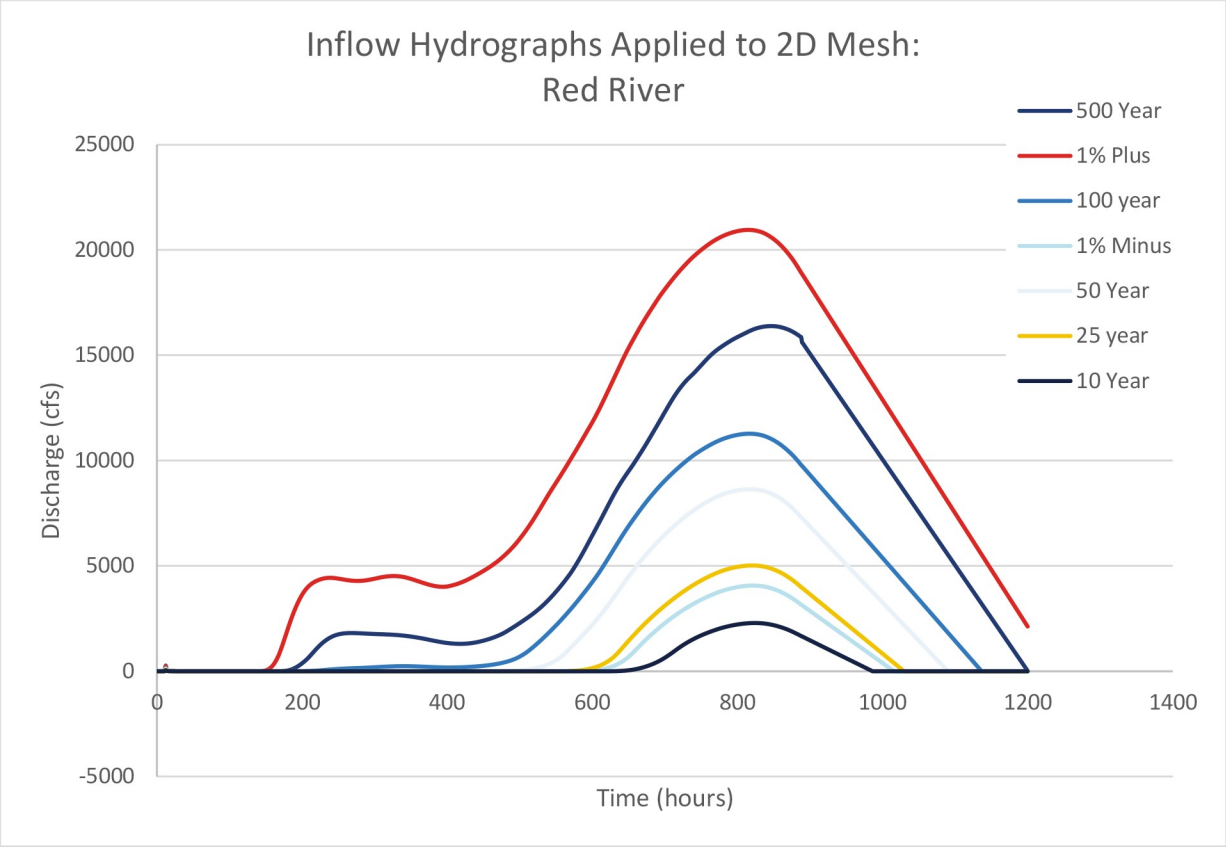

Figure 11: Middle Red-Coushatta (MiddleRed_Inflow2) Basin Contributing Drainage Area Inflow Hydrographs

2.2.4 Hydraulics

This section describes the remaining hydraulic modeling considerations, including implementation of Manning's roughness, breaklines, and hydraulic structures within the 2D computational mesh.

2.2.4.1 Roughness Coefficients

A Manning's n roughness coverage was developed for the 2D computational mesh using typical values for roughness for given NLCD land classifications. In several areas, the channel section land use indicated a Manning's n-value inappropriate for channel conveyance; for example, woody wetlands. The channel roughness zone was given a Manning's n value of 0.045 to ensure the channel 2D cells have appropriate conveyance with the value being taken from the HEC-RAS User's Manual.

A higher roughness coefficient was utilized for developed areas to account for buildings. Manning values were matched with USACE manning N values to provide closer results to the Middle Red-Coushatta model. The table below shows a typical land use-roughness matrix used in defining the roughness coverage for the study area.

Table 8: NLCD 2016-Manning's N Roughness Matrix

NLCD Classification	Manning's N	Minimum	Normal	Maximum	Source
Open Water	0.020	0.025	0.03	0.033	Chow 1959
Developed, Open Space	0.040	0.01	0.013	0.016	Calenda, et al. 2005
Developed, Low Intensity	0.060	0.038	0.05	0.063	Calenda, et al. 2005
Developed, Medium Intensity	0.070	0.056	0.075	0.094	Calenda, et al. 2005
Developed, High Intensity	0.070	0.075	0.1	0.125	Calenda, et al. 2005
Barren Land	0.035	0.025	0.03	0.035	Chow 1959
Deciduous Forest	0.150	0.1	0.12	0.16	Chow 1959
Evergreen Forest	0.150	0.1	0.12	0.16	Chow 1959
Mixed Forest	0.150	0.1	0.12	0.16	Chow 1959
Scrub/Shrub	0.100	0.035	0.05	0.07	Chow 1959
Grassland/Herbaceous	0.080	0.025	0.03	0.035	Chow 1959
Pasture/Hay	0.060	0.03	0.04	0.05	Chow 1959
Cultivated Crops	0.050	0.025	0.035	0.045	Chow 1959
Woody Wetlands	0.080	0.08	0.1	0.12	Chow 1959
Emergent Herbaceous Wetland	0.080	0.075	0.1	0.15	Chow 1959
Main Channel[1]	0.045				HEC-RAS User's Manual

[1] Clean, winding, some pools and shoals, some weeds and stones, lower stages, more ineffective slopes and sections

2.2.4.2 Breaklines

Breaklines align grid cell faces and were used within the 2D mesh area to define prominent features including, road embankments and hydraulic structures as well as stream centerlines. Road embankments were identified in ArcGIS and imported into HEC-RAS as breaklines to ensure that water was not routed past roads until it was deep enough to overtop the road. Similarly, bridge and culvert crossings that were not processed out of the terrain data were modeled by offsetting breaklines adjacent to the road embankment to align grid cells around the embankment and allow water to be routed across the embankment without creating artificial backwater. This approach was used for most hydraulic structures because it could be implemented in ArcGIS on a large scale with much less effort than alternative methods. An example of the offset breakline approach is shown below.

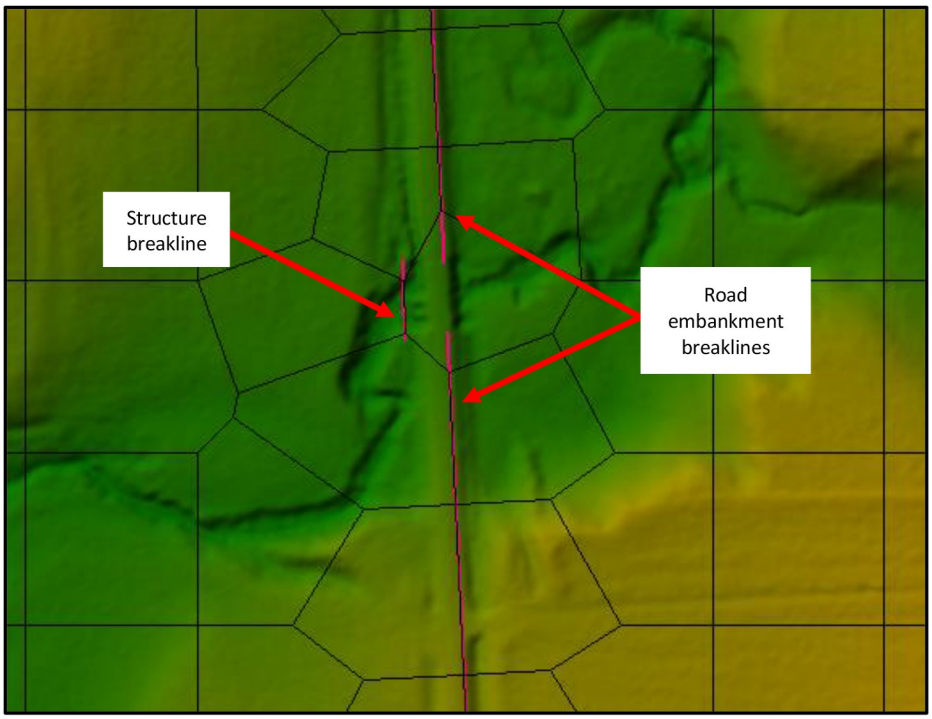

Figure 12: Offset Breakline Approach at Bridge Crossing

Parish, interstate, common name, state recognized, and U.S. roads were incorporated for road breaklines from the U.S. Census Bureau TIGER/Line road layer. The stream centerlines were input as breaklines to ensure cells lined up perpendicular to the stream and to capture stream conveyance. The study area included multiple accredited levee systems. In order to represent the prominent features, breaklines were utilized for the Red River Levee System sections within the HUC.

2.2.4.3 Initial Conditions

Initial conditions were not used in the Lower Red-Lake Iatt 2D BLE model.

2.3 Model Results

The 2D BLE results for the study produced an SFHA that compared reasonably well with the effective SFHA in most cases and provides additional estimated SFHA in areas that do not currently have an SFHA mapped. Table 9 shows a comparison of some the effective BFE data with the model results. While the results provide context for flood risk communication as part of the Discovery process, and are scalable, the results require further analysis to be used for regulatory purposes. The validity of the 2D BLE results should be verified through community work map meetings before being applied to a regulatory product.

Table 9: Effective and Model BFE Comparison

Stream	Comparison Point Effective Station*	Effective BFE (feet)	Model BFE (feet)	Difference (feet)
Lake Buhlow Tributary 3	-	120	120.7	0.7
Lake Buhlow Tributary 4	-	129	129.3	0.3
Lake Buhlow Tributary 4	-	101	100.8	-0.2

Stream	Comparison Point Effective Station*	Effective BFE (feet)	Model BFE (feet)	Difference (feet)
Cruie Creek	35,385	178.3	178.5	0.2
Marlin Branch	4,854	157.6	157.8	0.2
Iatt Creek	31218	123.4	123.4	0.1

[1] Effective stations that have been left blank were taken from BFE files and did not contain stationing information

2.3.1.1 Calibration & Sensitivity Analysis

Known USGS gages within the model area with more than 20-years of flow record were used for calibration and validation of the 1% annual chance event. Peak flows within the model were compared with a Bulletin 17B Analysis of the gage data using PeakFQ. Results of the 1% annual chance flow comparisons are presented in Table 10.

Table 10: 1% Annual Chance Reasonability Comparisons

Flooding Source	USGS Gage Used for Verification	HEC-RAS 5.0.7 (2D)		Reference	
		WSEL (ft)	Discharge (cfs)	WSEL (ft)	Discharge (cfs)
Kisatchie Bayou	07354100	142.1	9,040	141.7[2]	19,780

[1] Water surface elevation is approximate based on PeakFQ input data.
[2] Water surface elevation for the given discharge was assumed based on the PeakFQ input data.

To determine which factors were significantly impacting the model results, a sensitivity analysis was run to evaluate the impact of five parameters including Manning's roughness values, breaklines, hydrologic losses, initial conditions, and boundary conditions. The Manning's n-values greatly impacted the results and was determined that a channel n-value needed to be set for the watershed. Further discussion of the roughness coefficients can be found in Section 2.2.4.1. It was determined that enforced breaklines at major roads and centerlines were needed and are discussed further in Section 2.2.4.2. No changes were made to the precipitation. Table 11 summarizes the results of each run at the USGS gage.

Table 11: Sensitivity Analysis results at USGS Gage 07354100

Iteration	Manning's N Zones	Breaklines[1]	Hydrologic Losses	Initial Conditions	Boundary Conditions	Peak Flow (cfs)	Peak Elevations (cfs)	Volume[2] (ac-ft)
1	Recommended	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	39,157	137.7	56,252
2	Recommended	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	38,641	137.7	55,647
3	Recommended w/ Channel 0.045 (500 ft Buffer)	Major Roads w/ Centerlines	Excess Precipitation	Dry/5 min	Outfall & Potential Interaction Locations	66,960	138.5	55,685
4	Recommended w/ Evergreen Forest 0.10	Major Roads w/ Centerlines	Excess Precipitation	Dry/1 min	Outfall & Potential Interaction Locations	38,641	137.7	55,647
5	Recommended	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	8,425	139	15,948
6	Recommended	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	9,020	139.2	16,490
7	USACE N-values	Major Roads w/ Centerlines	Excess Precipitation	Dry/1 min	Outfall & Potential Interaction Locations	9,012	139.8	16,386
8	USACE N-values	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	7,120	140.1	16,400
9	USACE N-values	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	6,980	141.6	16,480
10	USACE N-values	Major Roads w/ Centerlines	Excess Precipitation	Dry/3 min	Outfall & Potential Interaction Locations	6,640	142.2	16,540
					Gage Analysis:	8,921	141.74	5,107

[1] All iterations included breaklines for roads, centerlines and levees.
[2] Sensitivity Runs were completed to pass the peak flow and elevations, and do not capture the full volume of the hydrograph.

2.4 Challenges

Major challenges included an abundance of USGS gage records causing a best method approach to modeling due to the Peak FQ results and HEC-RAS results conflicting throughout the HUC 8 area. Due to this and the lakes throughout the HUC, further study is recommended in specific areas to establish more confident results. Although, when comparing to the existing regulatory floodplains, the BLE results were comparable and provide further confidence in the results.

There were several areas where Middle Red- Coushatta, Lower Red-Lake Iatt and Saline Bayou spill in and out of Red River. Most of the spill areas from all three basins were identified and normal depth boundary conditions were adjusted to produce seamless results. Lower Red - Lake Iatt 2D flow area mesh was extended significantly into Saline Bayou and Black Lake Bayou to account for these spills. This resulted in similar water surface elevations at the boundary and a seamless floodplain for the area. Similarly, a flow hydrograph was extracted from Middle Red to add in Lower Red- Lake Iatt model. This confluence between all four watersheds is a complex system and multiple iterations were performed to be able to produce seamless results. A rating curve was also applied at the outfall of Middle Red- Coushatta to produce seamless results with Lower Red- Lake Iatt. The Lower Red – Lake Iatt hydraulics model was used to account for backwater and spill from the Red River into Saline Bayou and Black Lake Bayou watersheds.

Within the watershed, there are two distinct terrain types: high ground with distinct channels mainly in the northern half of the watershed and low, flat ground at the southern side. The difference in terrain caused the balance of the time step used to be a factor in model stability. It was determined that a smaller time step (30 second) would be needed to stabilize the model in the high ground portion. However, the results were not significantly different when using a larger time step, so it was decided a larger time step (1 minute) was appropriate.

Additional structure details and crossings need to be added to the BLE model due to evidence of structures continuing to hold water despite efforts to allow water to move through the structures, see Section 2.2.4.2 for additional details. Minor roads were not modeled and may skew the results in those areas. In these locations, the model may be overestimating the water surface elevation upstream of the road until the road is overtopped and underestimating the water surface elevation downstream of the road.

2.5 Recommendations

This study provides significant information useful for flood identification and communication among those affected. The study is highly scalable, and stakeholder input and further analysis would enhance the product and inform implementation of regulatory flood hazard areas. In addition, the validity of the 2D BLE results should be verified through community work map meetings before being applied as a regulatory product.

03 Floodplain Mapping and Effective Zone A Validation

The following sections provide a synopsis of how raw modeled depths were translated into SFHAs. In addition to developing a new SFHA, the BLE model data was leveraged to validate the effective zone A studies within the project footprint. The results of the validation effort can be found below in section 3.2.

3.1 Special Flood Hazard Area

3.1.1 Model Outputs

The floodplains are derived from the raw modeled depth grids using the maximum value. These depth grids are exported from HEC-RAS as TIFF format rasters with an interpolated rendering that slope values at the center and along the faces/edges of the computational mesh cells. Using GIS, the TIFF rasters are post processed into 1% SFHA and 0.2% shaded X polygons.

3.1.2 Methodology

The use of 2D modeling methods results in water surface elevation values at every cell in the model's computational mesh. In order to represent the desired model results and eliminate extraneous disconnected cells, post processing of the depth grids is required. For the purposes of the Lower Red-Lake Iatt BLE project, floodplain mapping delineation was completed using connected raster cells at the extent of the CNMS mapped and unmapped features in the project footprint with raster depths greater than 0.5 feet. Converting the raster data to polygon features enabled an intersection of modeled results to the CNMS and effective zones to create the SFHA and 0.2% shaded X features. Because the new mapping, based on gridded engineering, retains the blocky shape of a raster, a simplification process was applied using GIS to smooth the boundaries. These processes remove unnecessary points, bends, and angles while preserving the natural shape of the polygon. Furthermore, small voids, or "holes" inside of the floodplain were aggregated with the larger surrounding polygons to merge them and make the floodplain complete. Mapping polygons were cleaned against the criteria of being larger than 2 acres. For example, if flooding polygons were disconnected from a flooding source and less than two acres, the polygon was removed from the SFHA. Flood polygon less than 2 acres that intersected a flooding source were assessed individually. These edits adhere to traditional and approved floodplain mapping approaches.

In addition to the SFHA, all other flooding associated with the 1% and 0.2% raw results were retained as "on the shelf" data that may be leveraged for future needs and analysis.

3.1.3 Flood Hazard Area Layer

Special Flood Hazard Areas, as noted above, were developed to the extent of the CNMS features or up to 1 square mile drainage area and effective zone A study locations. The Regional CNMS database, National Flood Hazard Layer, and paper inventory were used as reference data to ensure extent of the BLE results represents appropriate flooding extent.

The 0.2% flood areas were produced using the same methods as the 1% SFHA. After both layers were developed, a union of the two products was performed to develop the deliverable format EBFE_FLD_HAZ_AR.

3.2 Validation of Effective Zone A SFHA

The following summarizes the results of the CNMS validation assessments for the effective Zone A studies in the Lower Red-Lake Iatt Watershed.

3.2.1 Initial Assessment A1 – Significant Topography Update Check

The significant topography update check determines whether a topographic data source is available that is significantly better than what was used for the effective Zone A modeling and mapping. For the study area in the Lower Red-Lake Iatt Watershed the effective Zone A topographic data source leveraged contours from USGS 24K map products. The topographic data source for the BLE was derived from LiDAR flown for the state of Louisiana from 2004 to 2008. This elevation data represents a significant improvement from the effective Zone A topographic source for reaches within Winn and Grant Parish, therefore, set to PASS this check. All other reaches were set to FAIL.

3.2.2 Initial Assessment A2 – Check for Significant Hydrology Changes

The significant hydrology changes check determines whether new regression equations have become available from the USGS since the date of the effective Zone A study. If newer regression equations exist for the area of interest, then an engineer must determine whether these regression equations would significantly affect the 1-percent-annual-chance flow. It is unknown if regression methods were used in the effective studies, therefore, this element was set to PASS for all reaches within the study area.

3.2.3 Initial Assessment A3 – Check for Significant Development

The significant development check, using the National Urban Change Indicator (NUCI) dataset, assesses increased urbanization in the watershed of the BLE. If the percentage of urban area within the HUC-12 watershed containing the effective Zone A study is 15 percent or more and has increased by 50 percent or more since the effective analysis, the study would fail this check. The check for significant development in the Lower Red-Lake Iatt Watershed was completed by evaluating percentage of urban change at the HUC-12 level.

Table presents the summarized results of checks A1 through A3.

Table 12: A1-A3 Validation Results

Assessment Checks	Pass / Fail	Notes
A1 – Topography	Fail/Pass	LiDAR significantly better than effective USGS topo source/Effective mapping leveraged LiDAR data.
A2 – Hydrology	Pass	Effective hydrology methods are unknown
A3- Development	Pass/Fail	Less than 15% of study area is under urban cover/>50% increase in urban area in an urban HUC-12

3.2.4 Validation Check A4 – Check of Studies Backed by Technical Data

Zone A studies that pass all initial assessment checks described above may be categorized as “Valid” in the CNMS Inventory only if the effective Zone A study is supported by modeling or sound engineering judgment and all regulatory products are in agreement. If the effective Zone A study passes all initial assessment checks, but is not supported by modeling, or if the original engineering method used is unsupported or undocumented, a comparison of the BLE results and effective Zone A’s is performed. Due to lack of documentation of the original engineering methods in the Lower Red-Lake Iatt watershed, check

A4 has been marked as FAIL for the majority of the reaches in the study area except for portions of the Red River and major tributaries, which utilized technical methods.

3.2.5 Validation Check A5 – Comparison of BLE and Effective Zone A

The effective Zone A comparison was performed at the full extent of the Lower Red-Lake Iatt Watershed. The validation of the effective Zone A boundaries using 2D flood hazard products differ from the standard 1D methods due to the lack of cross sections and their use with standard FBS methodology. For this 2D study, the effective A zone boundaries were compiled using the National Flood Hazard Layer and Core Logic effective digital uplift product. These data were dissolved to one continuous A-zone layer, which then had points placed along its perimeter every 500 feet.

For each test point, a 75-foot buffer was created. Using this buffer, the minimum and maximum values of the DEM were extracted, as a proxy for the effective base flood elevation. The minimum value of the 1% minus raster, and the maximum value of the 1% plus raster are also extracted. These 1% plus maximum and 1% minus minimum values are products of the new 2D BLE study and act as the vertical tolerance. The test point passes if the DEM maximum value is less than or equal to the 1% plus maximum value and the DEM minimum value is greater than or equal to the 1% minus minimum value. This can be visualized as a short 75-foot radius cylinder, with a height of 1% plus maximum – 1% minus minimum. This test verifies that at least one point from the ground surface (i.e. proxy BFE) falls both vertically and horizontally within this range.

3.2.6 Validation Results

All 968.2 total miles of available CNMS features representing the effective Zone A studies were categorized as VALID – BEING STUDIED or UNVERIFIED – BEING STUDIED. Total miles in each of these categories are summarized in Table and illustrated in Figure below. Table summarizes the validation results based on the individual HUC 12 watersheds within Lower Red-Lake Iatt Watershed.

Table 13: Aggregated Zone A Validation Results

Validation Status	Status Type	Total Miles
VALID	BEING STUDIED	116.8
UNVERIFIED	BEING STUDIED	851.4

Table 14: HUC 12 Zone A Validation Results

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>90%)	Priority Score
Watershed Name	Watershed Number						
Lower Red-Lake Iatt	All Streams	83,480	28,894	54,586	0.65	FAIL	
Coochie Break	111402070101	963	166	797	0.83	FAIL	4.3
Upper Nantachie Creek	111402070102	2,889	807	2,082	0.72	FAIL	7.0
Nantachie Lake-Lower Nantachie Creek	111402070103	3,179	941	2,238	0.7	FAIL	13.6
Little Sandy Creek	111402070201	894	219	675	0.76	FAIL	9.2

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>90%)	Priority Score
Watershed Name	Watershed Number						
Dry Creek-Kisatchie Bayou	111402070202	2,529	786	1,743	0.69	FAIL	17.0
Little Kisatchie Bayou-Bayou L'lurogne	111402070203	2,303	322	1,981	0.86	FAIL	3.5
Steep Hill Creek – Kisatchie Bayou	111402070204	1,865	319	1,546	0.83	FAIL	4.3
Middle Creek	111402070301	2,306	766	1,540	0.67	FAIL	16.8
Bayou Santabarb	111402070302	4,041	658	3,383	0.84	FAIL	7.9
McKims Creek	111402070303	1,367	349	1,018	0.74	FAIL	7.8
Sand Creek	111402070304	5,864	1,426	4,438	0.76	FAIL	16.3
Cunningham Brake-Kisatchie Bayou	111402070305	1,632	714	918	0.56	FAIL	18.4
Sibley Lake	111402070401	3,607	654	2,953	0.82	FAIL	12.5
Bayou Serpent	111402070402	2,283	605	1,678	0.73	FAIL	21.2
Bayou Boulet De Canon-Old River	111402070403	1,569	472	1,097	0.7	FAIL	26.7
Bayou Nachez	111402070404	886	189	697	0.79	FAIL	19.3
Bayou Poisson Canal	111402070405	2,529	851	1,678	0.66	FAIL	30.3
Cane River Lake	111402070406	2,368	803	1,565	0.66	FAIL	27.9
Bayou Derbonne	111402070501	869	503	366	0.42	FAIL	43.9
Bayou Barbue	111402070502	3,146	1,482	1,664	0.53	FAIL	22.6
Mill Bayou	111402070503	1,371	650	721	0.53	FAIL	12.4
Little River	111402070601	267	116	151	0.57	FAIL	42.9
Lake Cocodrie	111402070602	20	6	14	0.7	FAIL	24.0
Cane River Red Bayou Diversion Canal	111402070603	2,211	1,113	1,098	0.5	FAIL	39.2
Cotile Lake	111402070701	1,128	587	541	0.48	FAIL	24.8
Lake Rodemacher	111402070702	1,320	667	653	0.49	FAIL	45.5
Jacks Creek	111402070703	897	534	363	0.4	FAIL	52.0
Upper Iatt Creek	111402070801	4,451	513	3,938	0.88	FAIL	2.9
Saddle Bayou	111402070802	2,992	184	2,808	0.94	PASS	1.5
Middle Iatt Creek	111402070803	3,277	205	3,072	0.94	PASS	1.8
Dartigo Creek	111402070804	3,020	393	2,627	0.87	FAIL	7.8
Black Creek	111402070805	1,040	265	775	0.75	FAIL	6.4
Lower Iatt Creek-Lake Iatt	111402070806	3,162	1,815	1,347	0.43	FAIL	28.3
Sugarhouse Bayou	111402070807	619	395	224	0.36	FAIL	49.1
Bayou Darrow	111402070808	185	84	101	0.55	FAIL	36.3
Gray Creek	111402070901	580	366	214	0.37	FAIL	15.8
Bayou Rigollette-Walden Bayou	111402070902	512	428	84	0.16	FAIL	53.9
Hudson Creek	111402070903	836	322	514	0.61	FAIL	26.1
Bayou Rigollette-Lake Buhlow	111402070904	861	821	40	0.05	FAIL	83.2
Upper Red River	111402071001	4,972	4,250	722	0.15	FAIL	53.4

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>90%)	Priority Score
Watershed Name	Watershed Number						
Lower Red River	111402071002	2,670	2,148	522	0.2	FAIL	67.8

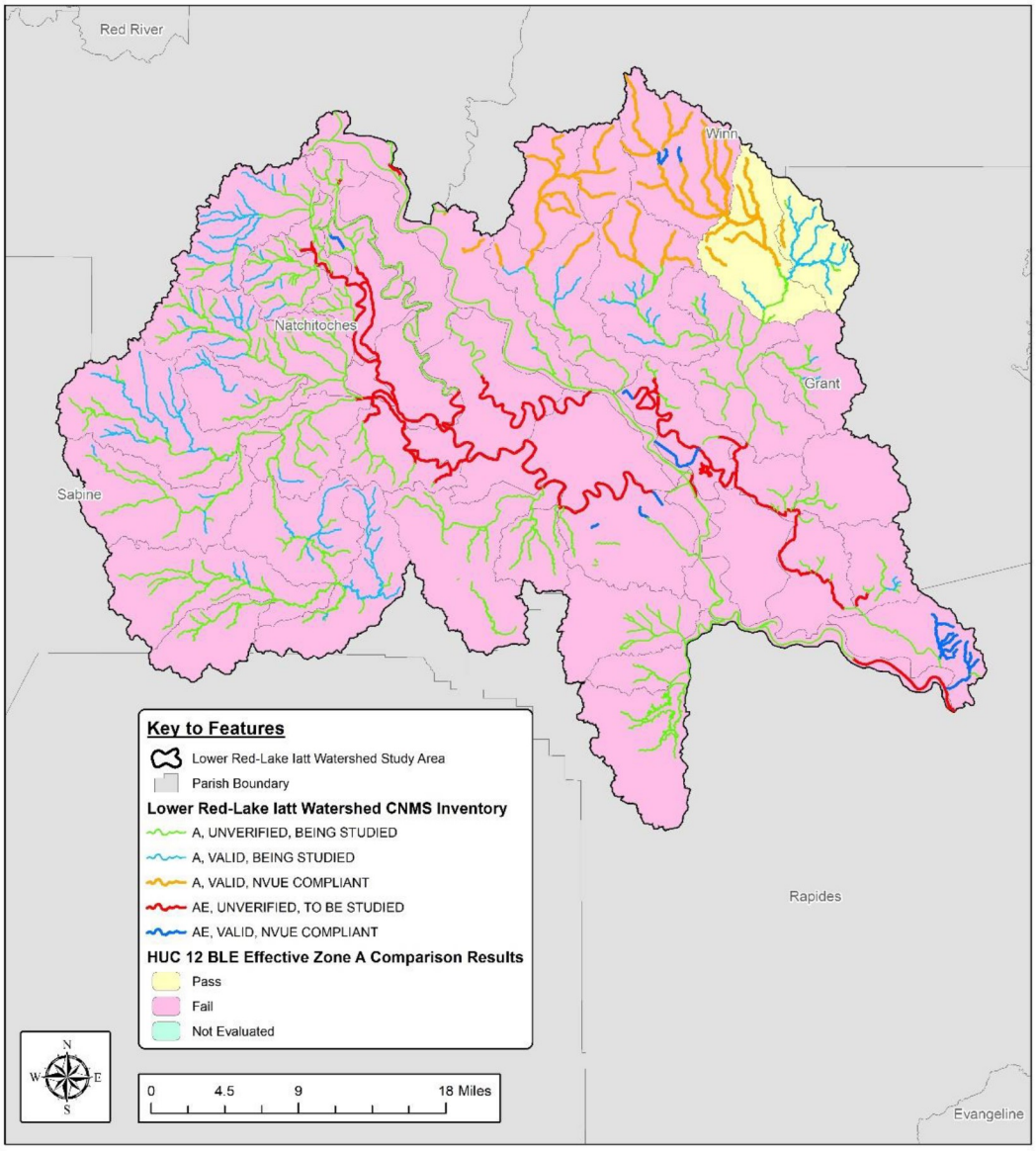

Figure 13: Lower Red-Lake Iatt Watershed CNMS Validation Results

An overall risk for each HUC-12 watershed was calculated using the National Flood Risk Percentages Dataset and its proportional area. The weighted risk was multiplied by the percentage of points in the watershed that failed the CNMS comparison to effective to determine the priority score. Figure below shows the range of the Lower Red-Lake Iatt HUC-12 priority scores which can be used to initiate discussions during the Discovery phase. Bayou Rigollette-Lake Buhlow HUC-12 was determined to have the highest priority score and the most need while Upper Iatt Creek HUC-12 has the lowest score.

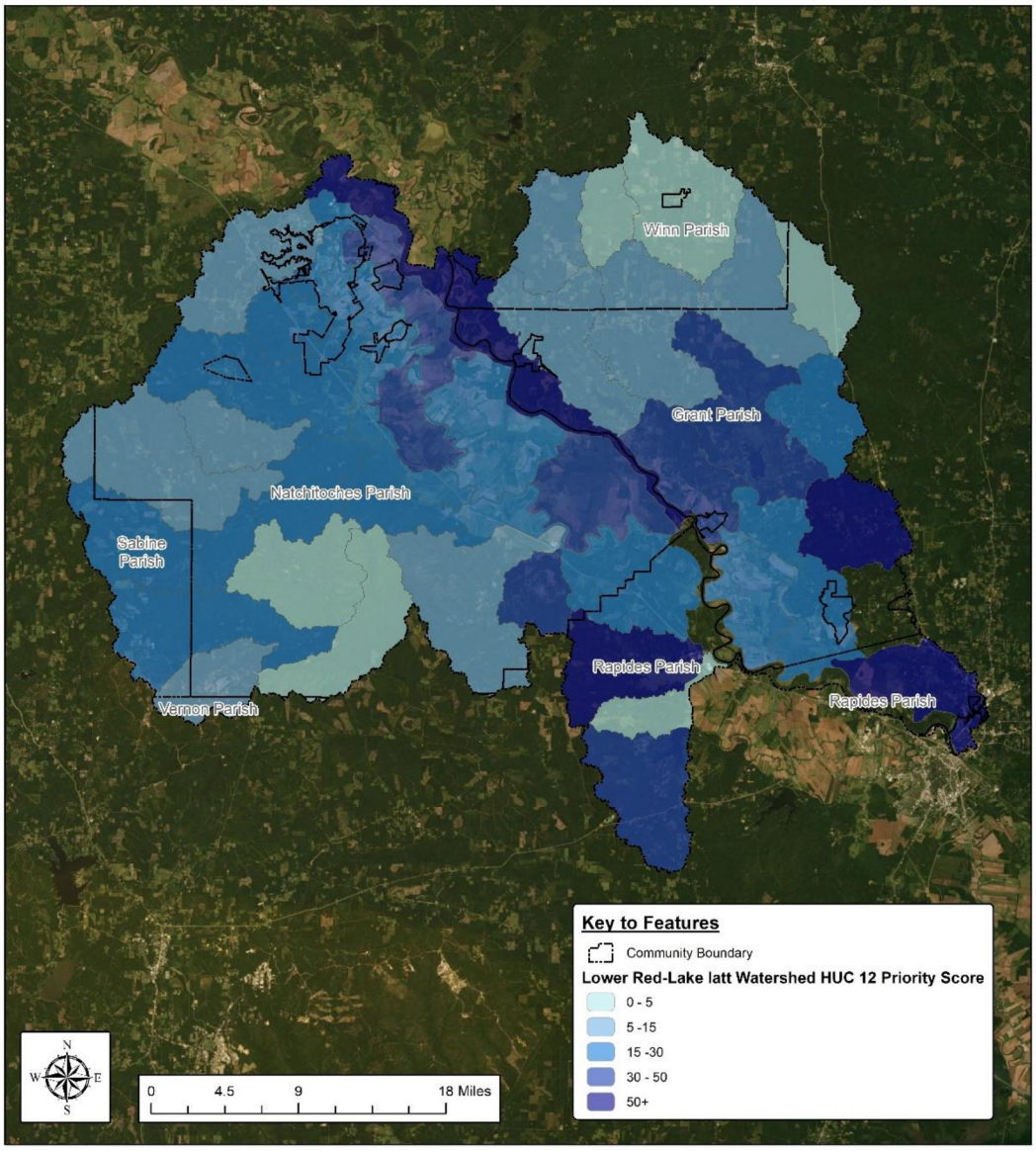

Figure 14: Ranking of Lower Red-Lake Iatt Watershed HUC-12s

3.3 Flood Risk Analysis

A flood risk analysis was performed for this project. The updated 1-percent annual chance depth grid was used to calculate the potential flood losses. The loss results are stored in the S_FRAC_AR spatial file within the FRD geodatabase. All results are reported in whole dollar values.

Hazus version 5.0 (SP02) was used for the basic and refined loss analysis.

The losses are reported via census blocks. It is important to note that Hazus version 5.0 (SP02) uses dasymetric census blocks. Dasymetric mapping removes undeveloped areas (such as areas covered by other bodies of water, wetlands, or forests) from the census blocks, changing their shape and reducing

their size in these areas. For more information on dasymetric data visit FEMA's Media Library for the Hazus-MH Data Inventories: Dasymetric vs. Homogenous, or Hazus 3.0 Dasymetric Data Overview.

Hazus analysis was performed by parish within the project watershed extends for each return period to ensure proper model processing. A summary of results per parish for the 100-year scenarios are shown in Table .

Table 15: Hazus 4.2 (SP02) Results for 1-percent-annual-chance (100-year) scenario for Lower Red-Lake Iatt Watershed, Louisiana

Parish	Full Replacement - Total Loss	Dollar Exposure (Replacement Value) - Buildings	Dollar Exposure (Replacement Value) - Contents
Grant	$385,033,000	$933,642,000	$540,923,000
Natchitoches	$573,524,000	$2,775,989,000	$1,767,227,000
Rapides	$310,882,000	$1,274,319,000	$825,321,000
Sabine	$395,000	$34,596,000	$19,030,000
Vernon	$0	$2,089,000	$1,069,000
Winn	$4,743,000	$113,331,000	$62,490,000
Total	$2,162,025,000	$5,133,966,000	$3,216,060,000

04 References

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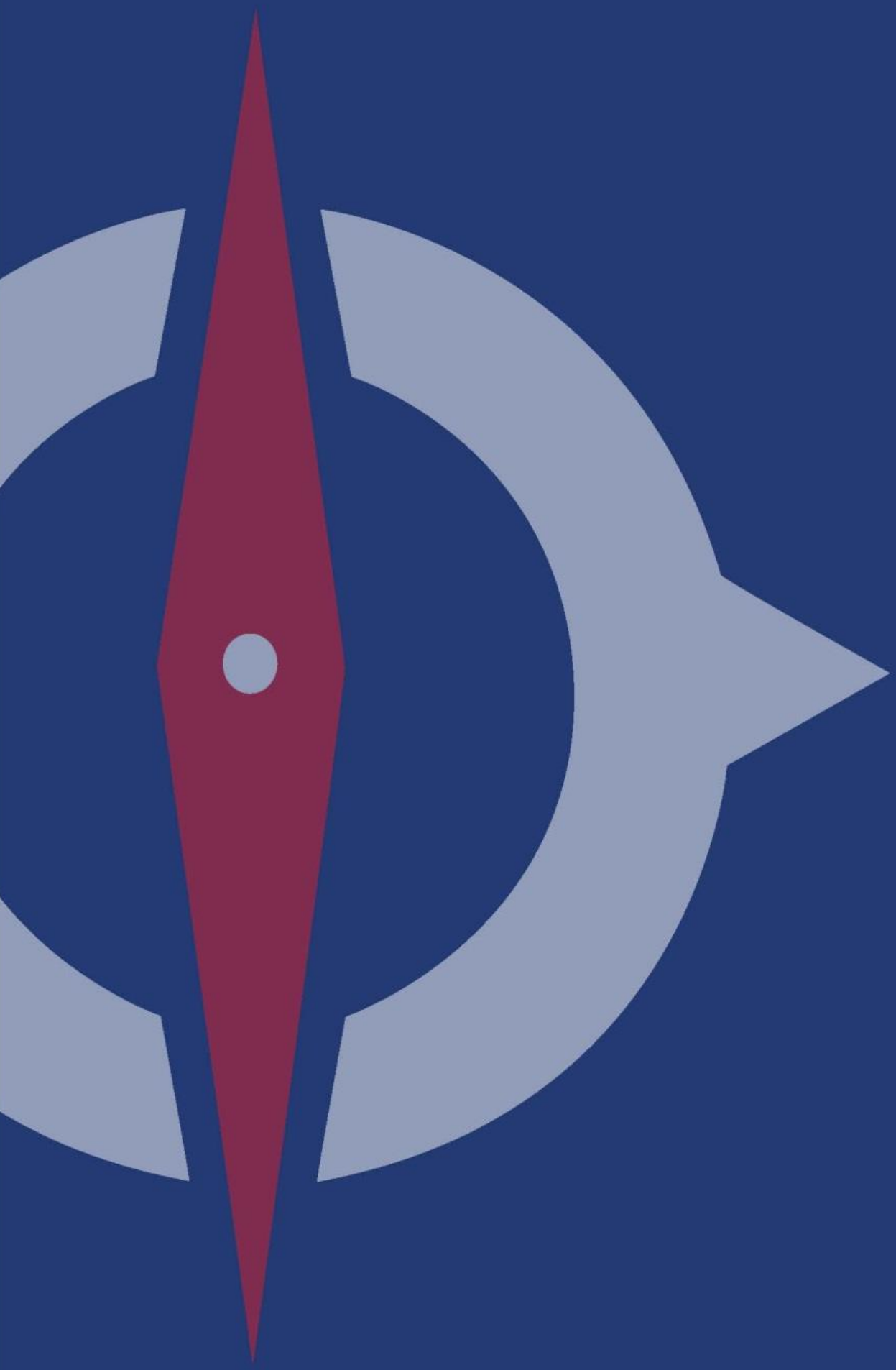


Appendix IV: Resources

FEMA Points of Contact

Subject/Topic of Interest	Name	Contact Information
FEMA Region 6 Risk MAP Lead *Project Outreach*	Diane Howe Risk Analysis Branch FEMA Region 6	Phone: (940) 898 5171 Email: diane.howe@fema.dhs.gov
FEMA Technical Monitor	Dustin Busse Risk Analysis Branch FEMA Region 6	Phone: (940) 383 7214 Email: dustin.busse@fema.dhs.gov
• How to find and read FIRMs • Letters of Map Change and Elevation Certificates • Flood zone disputes • Mandatory insurance purchase guidelines • Map Service Center (MSC) and National Food Hazard Layer	FEMA Map Information eXchange (FMIX)	Phone: 877-FEMA-MAP (336-2627) Email: FEMAMapSpecialist@Risk MAPcds.com Live Chat: https://www.floodmaps.fema.gov/fhm/fmx_main.html
FEMA Project Monitor Project Outreach	Diane Howe, CFM	Phone: (940) 898 5171 Email: diane.howe@fema.dhs.gov

State Partners

Organization/Title	Name	Partner Location	Contact Information
Louisiana Water Resources Development Program *Deputy Assistant Secretary, OPW*	Patrick J Landry, P.E. Edward M. Knight, P.E.	P.O. Box 94245 Baton Rouge, LA 70804-9245	Phone: (225) 379 3000 Email: patrick.landry@la.gov Email: Edward.knight@la.gov Web Page: Water Resources Program (la.gov)
Louisiana State NFIP Coordinator	Cindy O'Neal, CFM Susan Veillon, CFM	P.O. Box 94245 Baton Rouge, LA 70804-9245	Phone: (225) 379 3005 Email: cindy.oneal@la.gov Email: susan.veillon@la.gov Web Page: National Flood Insurance Program (NFIP) (la.gov)
DOTD CTP & CRS Program Manager	Pamela Lightfoot, CFM	P.O. Box 94245 Baton Rouge, LA 70804-9245	Phone: (225) 379 3005 Email: pam.lightfoot@la.gov Web Page: La DOTD - Floodplain Management Contacts
State Hazard Mitigation Officer	Jeffrey Giering	7667 Independence Blvd. Baton Rouge, Louisiana 70806	Phone: (225) 267 2516 Email: jeffrey.giering@la.gov Web Page: Governor's Office of Homeland Security & Emergency Preparedness

Organization/Title	Name	Partner Location	Contact Information
LADOTD *Statewide Flood Control Program Manager*	William J Williamson, P.E.	Public Works & Water Resources 1201 Capital Access Rd. Baton Rouge, LA 70802	Phone: (225) 379 3023 Email: billy.williamson@la.gov Web Page: Statewide Flood Control Program (la.gov)
Louisiana Department of Transportation and Development *Communications Director*	Rodney Mallett		Phone: (225) 379 1275 Email: rodney.mallett@la.gov Web Page: Administration Contacts (la.gov)

Governor's Office of Homeland Security and Emergency Preparedness

GOHSEP (la.gov)

Louisiana is a high-risk state for emergency events and disasters. The Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) is the agency responsible for coordinating the state's efforts throughout the emergency management cycle to prepare for, prevent where possible, respond to, recover from, and mitigate against hazards to lessen the effects of man-made or natural disasters that threaten the state. GOHSEP can save lives and reduce property damage by understanding risks and taking action to address those risks, as well as minimizing disaster impacts and increasing the resiliency in our communities, environment, and economy.

Louisiana Department of Transportation and Development (LADOTD)

Risk MAP / CTP (la.gov)

On March 11, 2015, the Louisiana Department of Transportation and Development (LADOTD) signed a partnership agreement with FEMA Region 6 to become a Cooperating Technical Partner (CTP) in FEMA's Risk MAP Program. Since becoming a CTP, LADOTD has been diligently planning and working toward the release of updated flood risk information for Louisiana. The hope is that in the future, other stakeholders will become involved in the program to make good and efficient use of the data for floodplain management decisions and mitigation actions.

Louisiana Floodplain Management Association (LFMA)

The Louisiana Floodplain Management Association serves as a forum for parish and municipal employees, state and federal officials, and the private sector to meet and share experiences, ideas, and solutions to common flooding problems. As a grassroots effort, we assist and support each other when confronted by flooding. Flood damage reduction can best be achieved through floodplain management, that is, a balanced combination of structural and nonstructural measures. Structural measures include levees, pumps, dams, channelization, diversions, and detention/retention ponds. Of equal importance are nonstructural measures, which encompass flood insurance, federal and state legislation, voluntary relocation, local codes, emergency preparedness, floodproofing, and mitigation plans and activities.

Organization	Contact Information	Website
Louisiana Floodplain Management Association (Chairman)	Phone: 504-736-6653	lfma.memberclicks.net

Certified Floodplain Manager (CFM) Certification

The Association of State Floodplain Managers (ASFPM) established a national program for certifying floodplain managers. This program recognizes continuing education and professional development that enhances the knowledge and performance of local, state, federal, and private-sector floodplain management professionals.

The role of the nation's floodplain managers is expanding due to increases in disaster losses, the emphasis on mitigation to alleviate the cycle of damage-rebuild-damage, and a recognized need for professionals to adequately address these issues. This certification program will lay the foundation for ensuring that highly qualified individuals are available to meet the challenge of breaking the damage cycle and stopping its negative drain on the nation's human, financial, and natural resources.

CFM® is a registered trademark and available only to individuals certified and in good standing under the ASFPM Certified Floodplain Manager Program.
For more information, you may want to review these available CFM Awareness Videos:

- What is the CFM Program?
- Becoming a CFM
- What are the Benefits of a CFM?

Study materials for those interested in applying for the CFM certification can be found on the ASFPM Website at: Getting Certified (floods.org)
Check the Training & Education | Association of State Floodplain Management (floods.org) for in-person training sessions near you.
For information on becoming a member and the exam application process in the State of Louisiana visit Getting Certified (floods.org)

Interactive Preliminary Data Viewer

Risk Mapping, Assessment and Planning (Risk MAP) | FEMA.gov

To support community review of the study information and promote risk communication efforts, FEMA launched an interactive web tool accessible on-line at ArcGIS - Mapping Information Platform Studies Tracker for the project areas.

For more information on the Interactive Preliminary Data Viewer in the Region 6 area:

Region 6 | FEMA.gov

FEMA's Flood Map Changes Viewer

Flood Map Changes Viewer (arcgis.com)

Estimated Base Flood Elevation (BFE) Viewer

As a part of the Risk MAP process, FEMA is completing **BLE** to provide a complete picture of flood hazard throughout a watershed. The BLE analysis uses high resolution ground elevation data, flood flow calculations, and fundamental engineering modeling techniques to define flood extents for streams.

To provide a look at BLE data availability and relative engineering analysis, FEMA developed the through the **Estimated BFE Viewer** for community officials, property owners, and land developers to identify the flood risk (high, moderate, low), expected flood elevation, and estimated flood depth near any property or structure within watersheds where BLE has been prepared.

Visit the Estimated BFE Viewer FEMA's Estimated Base Flood Elevation (BFE) Viewer (usgs.gov) application to learn the status of BLE in your area of interest or surrounding communities, to view the flood hazard data developed, or to utilize the tool's flood risk reporting features for a location where BLE has been made available.

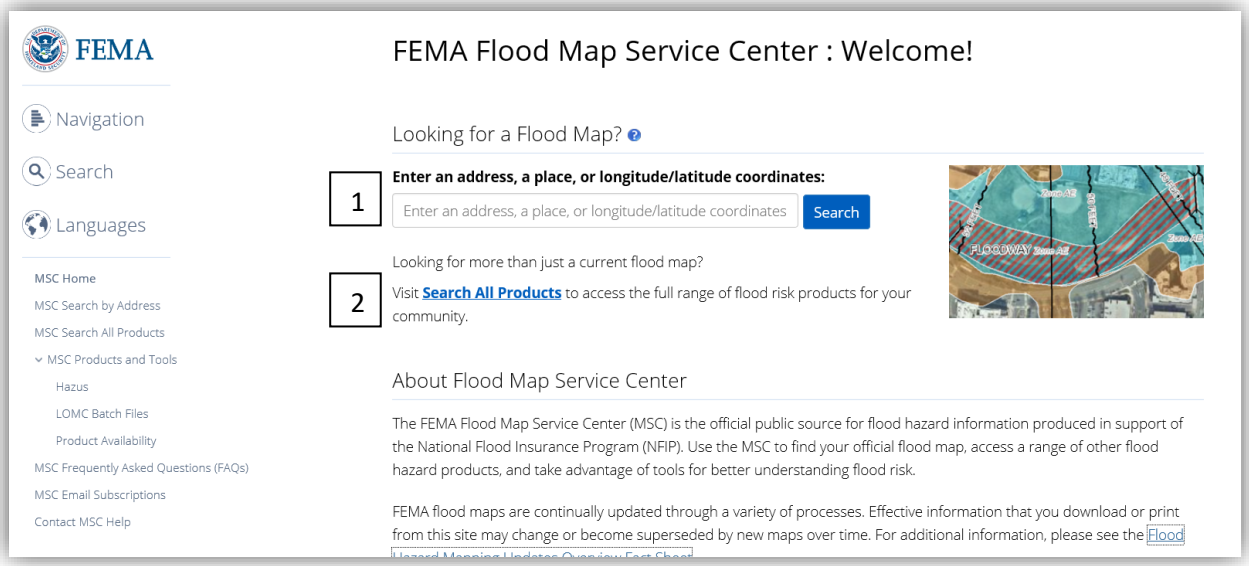
Map Service Center – Available Map Data

The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the NFIP. Use the MSC to find your official effective flood map, preliminary flood maps, and access a range of other flood hazard products.

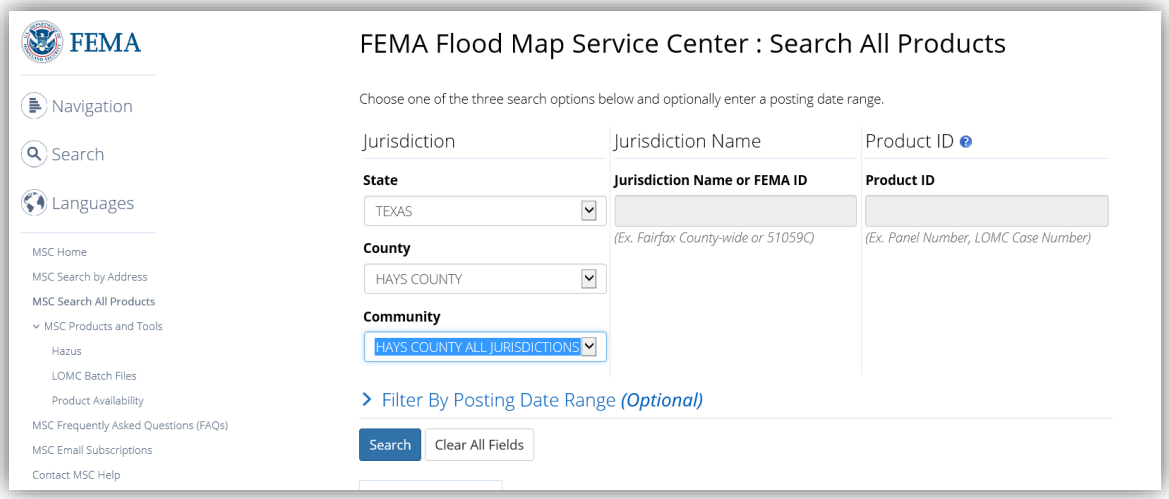
FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet.

At the MSC, there are two ways to locate flood maps in your vicinity.

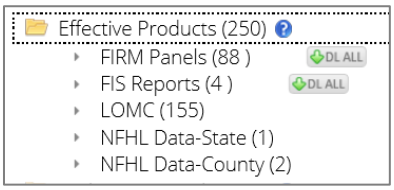
1. Enter an address, place name, or latitude/longitude coordinates and click search. This will provide the current effective FIRM panel where the location is shown.
2. Or Search All Products, which will provide access to the full range of flood risk information available.



By using the more advanced search option, "Search All Products," users may access current, preliminary, pending, and historic flood maps. Additionally, GIS data and flood risk products may be accessed through the site with these few steps.

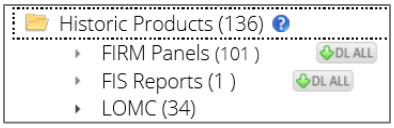


Using the pull down menus, select your state, county, and community of interest. For this example, we selected Hays County - All Jurisdictions. After the search button is selected, the MSC will return all items in the area. There are five types of data available.



Effective Products. The current effective FIS, FIRM, and DFIRM database (if available) is available through the MSC. If users click on the available effective products, they are presented a breakdown of the available products. FIRM panels, FIS reports, LOMRs, statewide National Flood Hazard Layer (NFHL) data, and parish-wide NFHL data may be available, as indicated in the breakdown on the right of the page.

Historic Products. A range of historic flood hazard maps, FIS texts, and LOMCs are available through the MSC.



Flood Risk Products. The Flood Risk Report, Flood Risk Map, and Flood Risk Database will be made available through the MSC once they have been compiled and completed. These products are made available after the flood study analysis and mapping have been reviewed and community comments incorporated.