An Evaluation of the Increased Red River Flooding in the Caddo Parish Region of Northwest Louisiana

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Agenda

- Introduction
- Case Studies
- Red River Overview
- Technical Overview
- Public Opinion Survey
- Empirical Field Work
- Recommendations
- Conclusion

Statement of the Problem

- Caddo Parish faces reoccurring issues and problems due to the repeated flooding of the Red River.

- The purpose of this study is to help identify key problems and suggest and evaluate possible solutions.

Urban Flooding

- Urban flooding: “repetitive, costly and systematic impacts on communities, regardless of whether or not these communities are located within a formally designated floodplain or near any body of water.”

- Causes
  - Excessive rainfall
  - Increased urbanization
  - Inadequate infrastructure

Urban Flooding Impacts

- Economic
- Social
- Environmental

Case Studies

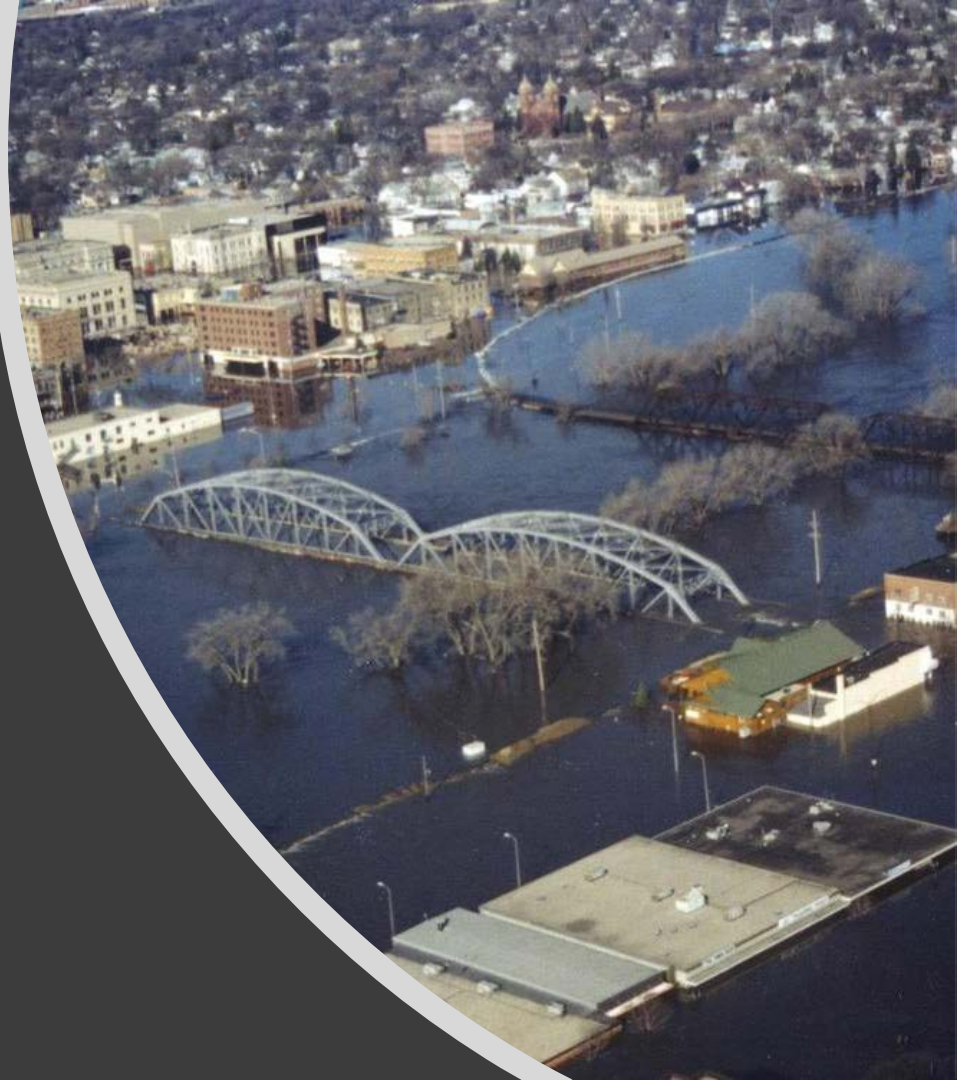
Red River of the North, Grand Forks, North Dakota

Napa River in Napa County, California

Flood of the Red River of the North

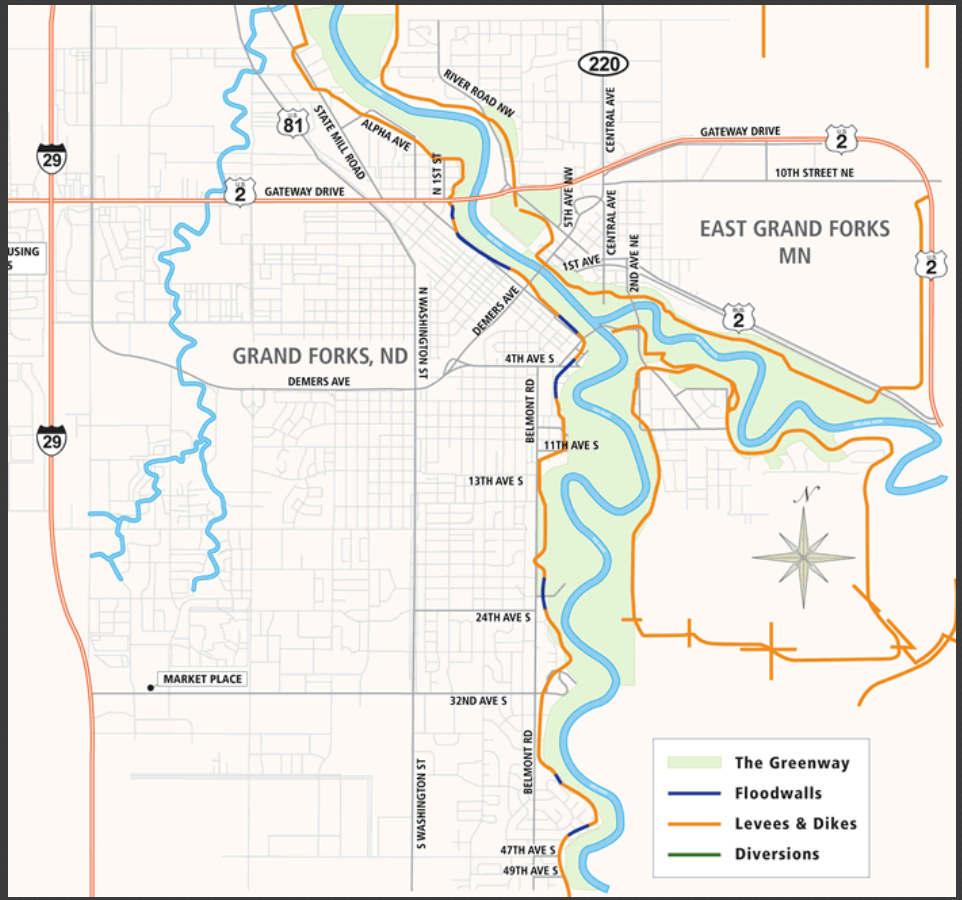
Grand Forks, North Dakota

- Grand Forks, ND, and East Grand Forks, MN, flooded during the Spring of 1997.
- This case is cited by American Rivers as an example of how communities can protect themselves by working together.
- Grand Forks, North Dakota's 3rd largest city, is located on the state line with Minnesota.
- Grand Forks is home to:
    - University of North Dakota
    - Grand Forks Air Force Base



Causes of the Flood of the Red River of the North

- Red River's natural characteristics:
  - The river's flat terrain keeps the water in place until it overflows.
  - As the river flows northward to Canada, the waters encounter frozen streams and tributaries leaving the water to accumulate.
- Late blizzard.



Impacts of the Flood of the Red River of the North

- Housing: 75,000 residents were evacuated and the damages are estimated at around to $2 billion.
- Economy: 86% of the businesses had to shut down and an important labor shortage followed the flood as residents were repairing their homes.
- Public Health: anxiety and depression issues.

The Actors Involved

- Cities of Grand Forks, ND, and East Grand Forks, MN
  - Local law enforcement agencies
- States of North Dakota and Minnesota
- Federal Government
  - Federal Emergency Management Agency (FEMA)
  - U.S. Army Corps of Engineers (USACE)
  - U.S. Congress
- Other stakeholders
  - Greenway Alliance

The East Grand Forks-Grand Forks Flood Damage Reduction and Recreation Project

- Partnership between Grand Forks, ND, East Grand Forks, MN, and the U.S. Army Corps of Engineers.
    - Restricting construction on the floodplains
    - Building dikes and walls on both sides of the River
    - Creation of a greenway along the River
    - Modifications to the sewer system in both cities
    - Pumping stations accompanied by back-up generators

Lessons Learned from the Red River of the North Flood

1

Cooperation between states allowed all the projects to be bundled as one larger project.

2

Early stakeholder involvement and cooperation were instrumental in getting all the projects bundled as one larger project and quickly approved.

3

Include mitigation strategies such as: potential land use regulations; infrastructure asset repair, upgrading and expansion.

Napa River in Napa County, California

- Napa River is 50 miles long. Starting from Mount St. Helena and ends at the San Pablo Bay
- Over 27 serious floods in Napa County since 1862
- 1986 Flood - most significant and damaging flood in the region
- Impact of Napa River Floods
  - Since the 1970s, floods have caused an excess of over $542 million in property damage
  - 1986 Flood: $140 million in damages, 7,000 residents evacuated, and 3 deaths
  - 1995 Flood: $100 million in damages and 220 properties destroyed
  - $6 million in annual costs for repairs and cleaning

Napa River Floods

Causes of the Floods

- Heavy upstream rainfall
- Increased sedimentation

Actors Involved

- Napa County Government
- Napa County Flood Protection and Watershed Improvement Authority
- Napa County Flood Control & Water Conservation District
- U.S. Army Corps of Engineers
- Community Coalition for Napa Flood Management

Napa River- Napa Creek Flood Protection Project

- Formed in 1998
- Created a technical advisory panel, a financial oversight committee, the Napa Flood Protection and Watershed Improvement Expenditure Plan, and introduced a half-cent sales tax increase
- Purpose:
  - Defend against 100-year floods
  - Provide environmental restoration and economic development
  - Enhance riparian environments
  - Establish floodplains terracing by river-widening
  - Avoid environmentally damaging techniques

Lessons Learned from the Napa River Floods

Community support is vital for the success of any watershed management

Stakeholder engagement and collaboration facilitated the creation of the Napa River - Napa Creek Flood Protection Project

Lessons Learned From the Case Studies

Early stakeholder engagement is critical to the success of the projects.

Collaboration between the various government agencies is essential.

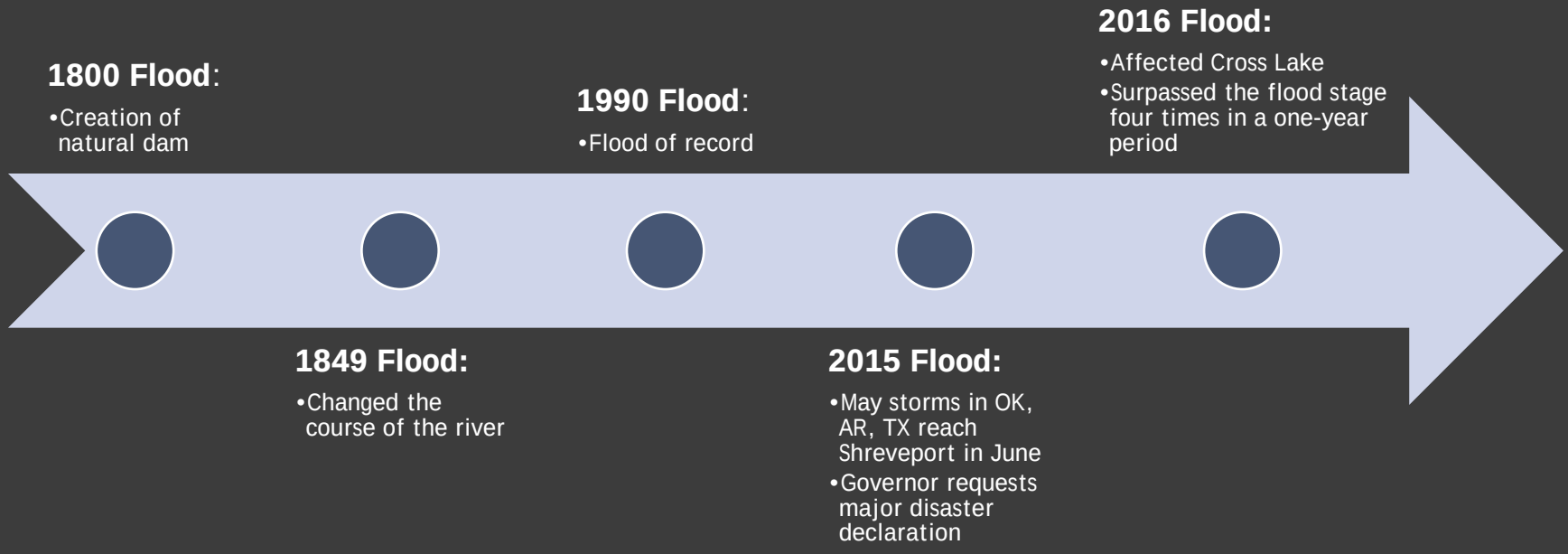
Collaboration between neighboring states, cities, and counties can greatly facilitate the realization of projects.

Red River Overview

Geography of Red River

- 4th longest river in U.S.
- Drainage basin covers 89,970 square miles, beginning in Texas and flowing east between Texas and Oklahoma through Arkansas into Louisiana
- 1,000 navigable miles
- Width of the river in Shreveport is 1,360 ft when full, with 183 miles of riverfront
- Transports large amounts of sediment downriver
- Natural levees and floodplains are created by the river

History of Red River Flooding



Technical Overview

Flood Causes

- Large rainstorms or stalled hurricanes around the Texas-Oklahoma border or over Northern Louisiana
- Key characteristics of Red River related to flooding for Caddo Parish
  - Loose sediment buildup around Shreveport
  - Constantly changing floodplains
  - Formation of new water features, such as oxbow lakes

Status of Federal Activities

- Congress
  - Budget cuts and lack of necessary funds
- FEMA
  - Postponed updates to flood maps
- USACE
  - Levee System
  - Postponed study of the Red River
  - Flood Control Reservoir system throughout Red River
  - Dredging

Engineering Mitigation Approaches

Soft Engineering Approaches

- Floodplain zoning
- Afforestation
- Wetland restoration
- River restoration

Hard Engineering Approaches

- Dams
- Artificial levees
- Wing dykes
- Dredging

Levee System Around Caddo Parish

All Caddo Levee District operated levees are either classified as minimally acceptable or unacceptable by USACE standards.

A minimally acceptable levee contains one or more unacceptable inspection items that **would not prevent** the segment/system from performing as intended during the next flood event.

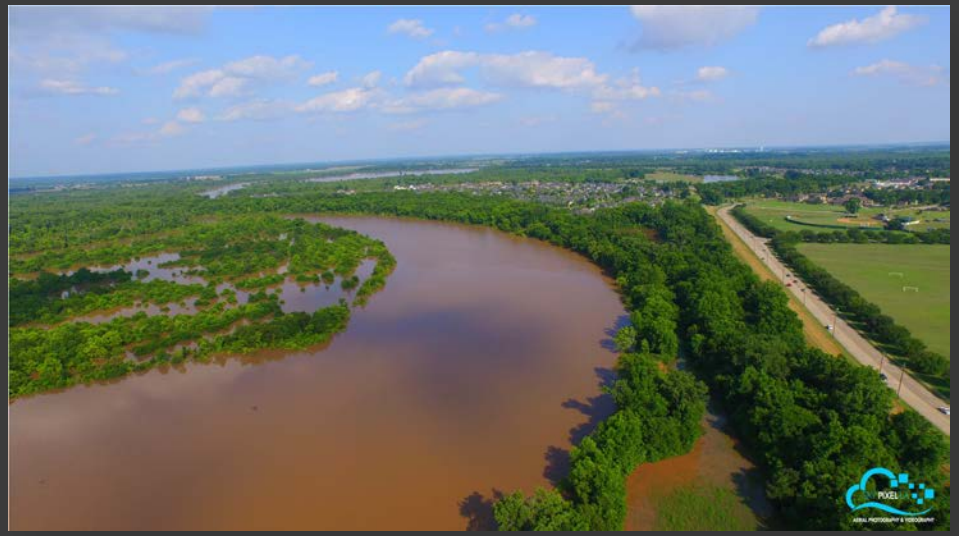
An unacceptable levee contains one or more a deficiency that **would prevent** the segment/system from performing as intended, or one with a serious deficiency noted in past inspections, but not corrected within two years of inspection

Dredging

- Current standards require the channel to stay at least 9 feet deep.
- Standards translate to the action of spot dredging the channel, with a large focus on dredging between Shreveport and the Atchafalaya River.
- Sediment deposits north of Shreveport are critical to dredge to prevent floods.
- Dredging is not done for flood control.

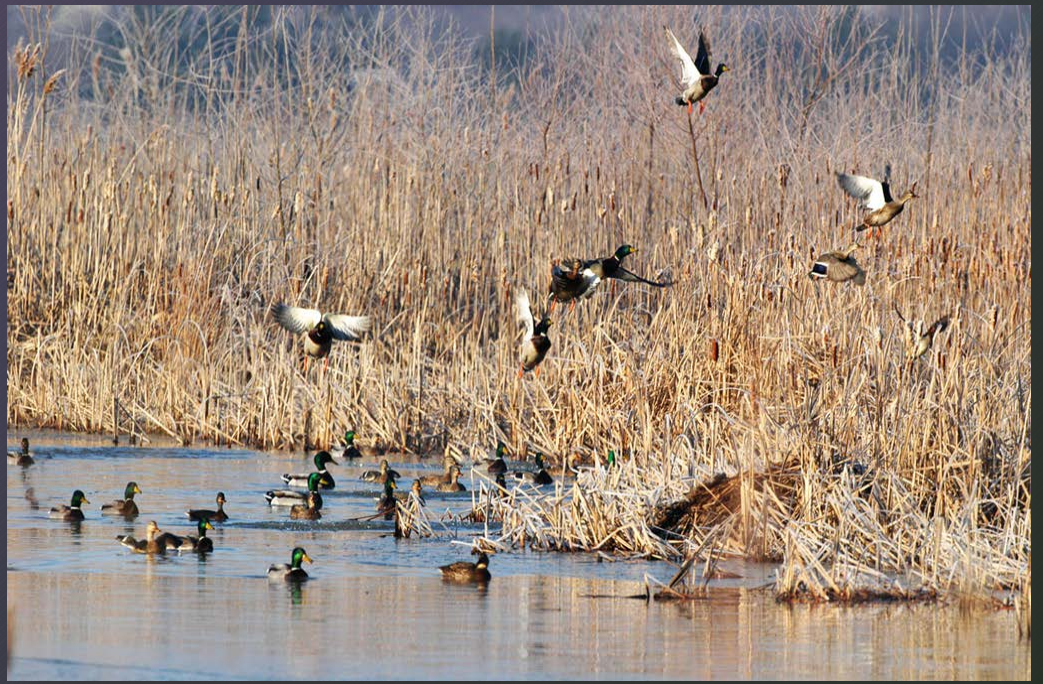
Ecosystem Management

- Approaches
  - Streambank Stabilization
  - Channel Re-profiling
  - Buffer Zones/Stream Margin Replanting
  - Wetland Restoration



Ecosystem Management

- Advantages
  - Improve Resiliency
    - Mitigate future flood risks
    - Increase water-holding capacity
  - Cost Effective
  - Science-Based Strategy from a different approach
  - Ecosystem Services
    - Cultural
    - Provisioning



Public Opinion Survey

The Community Resilience Study

- Louisiana State University Manship School of Mass Communications - Reilly Center of Media & Public Affairs
- Collected data from randomly selected sample of adult residents through telephone interviews
- January 8th - February 6th, 2017
- 1,079 respondents

Regional Disparities

- Parishes were split into two regions were formed - North and South
  - Northwestern region was created as a subset of the Northern region

Table 1. Percent of “Yes” Response by Region

Survey Questions	Louisiana	South	North	Northwest
“Was your residence flooded during any of these severe storms during 2016?”	19.2%	20.5%	13.7%	11.2%
“Did anyone stay with you who had to leave their homes because of flooding in 2016?”	18.2%	20.2%	10.6%	8.1%
“Was your work disrupted due to any flooding in 2016?”	30.9%	33.3%	20.1%	15%
“Did this affect your income?”	57.7%	58.4%	52.3%	66.7%
“Did your home lose power or any other utilities during the flooding in Louisiana last year?”	27.9%	27.2%	29.7%	25.5%
“Did you or anyone in your household apply for any financial or monetary assistance from the federal government, including FEMA, following the Louisiana floods of 2016?”	19.5%	21.5%	10%	5.1%
“Do you think news was a credible source of information regarding recovery resources during and after the Louisiana floods of 2016?”	64.9%	64.3%	66.7%	67.2%

Source: Community Resilience Study (2017)

Table 2. Percent of Agreeing Respondent by Region				
Survey Questions	**Louisiana**	**South**	**North**	**Northwest**
“I was able to successfully deal with the threats posed by the flooding”	82.4%	81.8%	87.2%	83.7%
“I was able to draw on the support of family and friends to help me get back on my feet after the flooding”	61.5%	63.5%	47.6%	43.2%
“I was able to get early warning information needed to prepare for the flooding”	57.3%	55.8%	64.3%	62.1%
Source: Community Resilience Study (2017)				

Table 3. “How prepared do you feel if your community were to flood in the next 12 months?”					
Region	**Not Prepared**	**Somewhat Unprepared**	**Neither**	**Somewhat Prepared**	**Very Prepared**
Louisiana	15.8%	12.5%	5.1%	40%	24.8%
North Region	16%	12.8%	5%	39.7%	25.1%
South Region	15.7%	12.4%	5.1%	40%	24.7%
Northwest Region	21.4%	13.3%	6%	37.7%	21.4%
Source: Community Resilience Study (2017)					

Table 4. Percent of Respondents Who Indicated Negative Flood Impacts by Race		
Survey Questions	**Race**	
	White	**Black**
“Was your residence flooded during any of these severe storms during 2016?”	17%	25%
“Was your work disrupted due to any flooding in 2016?”	30%	33%
“Did this affect your income?”	54%	66%
“Did your home lose power or any other utilities during the flooding in Louisiana last year?”	25%	37%
Source: Community Resilience Study (2017)		

Table 5. Percent of Respondents Who Indicated Negative Flood Impacts by Education

	Education		
Survey Questions	**Low**	**Medium**	**High**
"Was your residence flooded during any of these severe storms during 2016?"	32%	21%	13%
"Was your work disrupted due to any flooding in 2016?"	29%	32%	30%
"Did this affect your income?"	74%	66%	40%
"Did your home lose power or any other utilities during the flooding in Louisiana last year?"	32%	30%	27%

Source: Community Resilience Study (2017)

Low education is less than a high school diploma
Medium education is a high school diploma to an associates degree
High education is a bachelors degree or greater

Table 6. Percent of Respondents Who Indicated Negative Flood Impacts by Income

	Income		
Survey Questions	**Low**	**Medium**	**High**
"Was your residence flooded during any of these severe storms during 2016?"	26%	16%	17%
"Was your work disrupted due to any flooding in 2016?"	27%	34%	33%
"Did this affect your income?"	76%	54%	46%
"Did your home lose power or any other utilities during the flooding in Louisiana last year?"	35%	28%	28%

Source: Community Resilience Study (2017)

Low income is <$35,000 annually
Medium income is $35,000-$75,000
High income is >$75,000

Table 7. Percent Of Respondents Who Indicated Negative Flood Impacts By Housing Status			
	Housing Status		
Survey Questions	**Own**	**Rent**	**Other**
“Was your residence flooded during any of these severe storms during 2016?”	16%	24%	29%
“Was your work disrupted due to any flooding in 2016?”	29%	37%	34%
“Did this affect your income?”	55%	64%	63%
“Did your home lose power or any other utilities during the flooding in Louisiana last year?”	26%	37%	35%
Source: Community Resilience Study (2017)			

Summary of Findings

- Statewide, the flood had significant impact on the incomes of residents
- Work disruption caused by the floods varied by region
- Loss of power and utilities occurred statewide
- Not enough residents reported receiving early warning information
- Research on federal assistance is necessary

Summary of Findings

- Flooding occurred for all types of individuals in Louisiana
- Small differences in flooding between the following:
  - Low income individuals and high income individuals
  - Black and white individuals
  - Owners of homes compared to renters

Empirical Field Work

Stakeholder Interview Methodology

In-depth stakeholder phone interviews from January-March 2018

Stakeholders include:

- Engineering
- Business
- Governments
- Communications
- Nonprofits

Stakeholder Interviews Analysis

Post-Flood

- 2015 worst flood residents experienced
- Good communication from city
- Recovery efforts from private and public entities rated as good
- Majority of interviewees did not have flood insurance
- Changes in river led to inaccurate predictions

Cause of Flooding

- Urban development
- Sediment deposition
- Excessive rainfall in Shreveport
- Heavy rains upstream and release of water from Lake Texoma

Stakeholder Interviews Analysis

Solutions

- Fix outdated flood maps
- Continue with USACE Sediment and Hydrological Survey
- Government buyout flood-prone land
- Establish mandatory based flood elevation
- Restore wetlands

Moving Forward

- Need for coordinated efforts among all levels of government
- Concern about future flooding

Recommendations

Recommendations

Resiliency

- Flood Education Outreach
- Training and Exercises
- Partnerships and Collaborations

Sustainability

- Green Infrastructure
- Ecosystem Management
- Budgetary Considerations

Technical

- Updating Floodplain Maps
- Land Use Planning and Building Codes
- Dredging

Conclusion

Thank you! Questions?