NSF Water Sustainability and Climate: A surface water management framework to counterbalance groundwater withdrawals in wetter regions of the U.S.

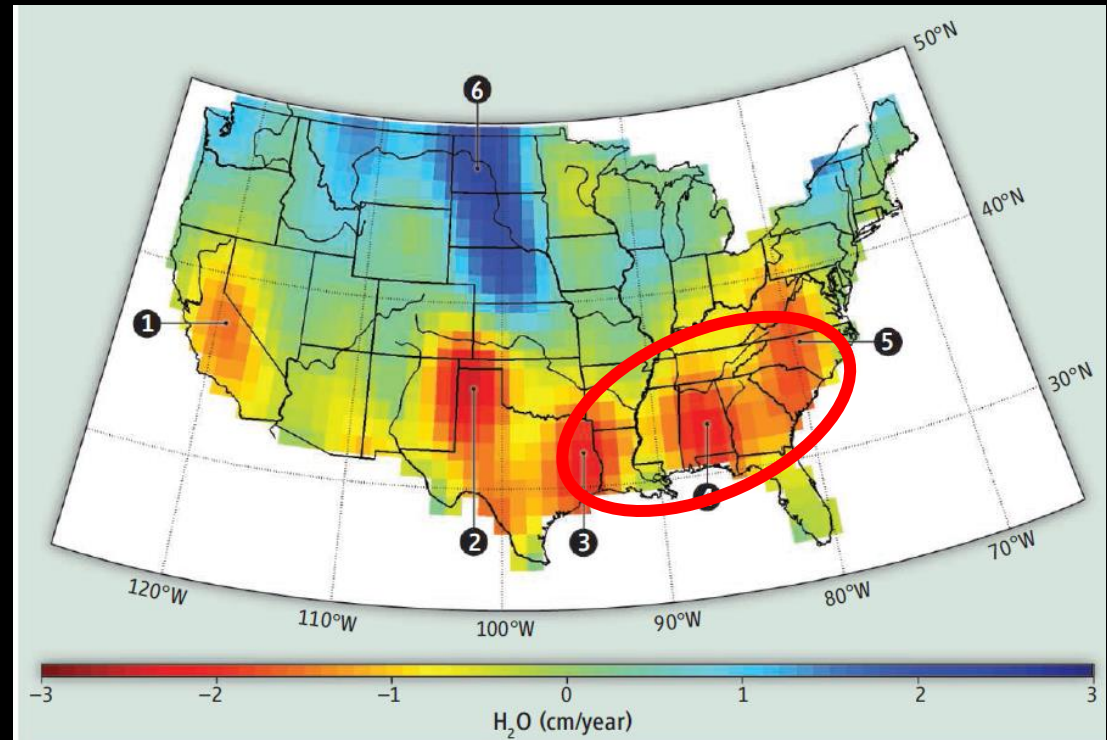Presented by
David Borrok

Investigators:

Emad Habib

Whitney Broussard

JoAnne DeRouen

Durga Poudel

Kari Smith

Jian Chen

Brian Schubert

Jenneke Visser

Ning Zhang

Motivation

- Despite relatively abundant rainfall and surface water, groundwater is being overused across the Southeastern United States and SWLA.

GRACE satellite investigation showing the change in groundwater and soil moisture across the US over the last decade. Red, orange, and yellow areas have the most water loss (Famiglietti and Rodell, 2013, Science).
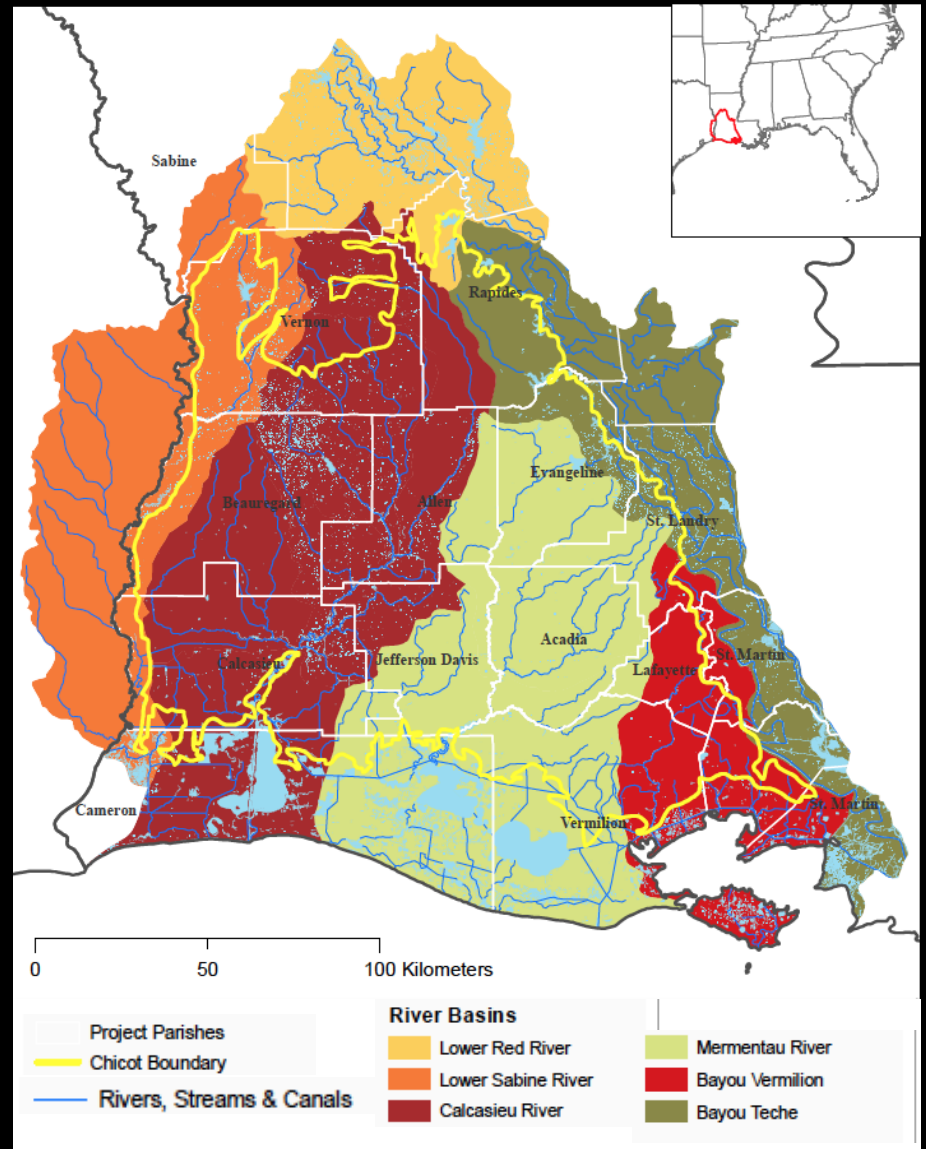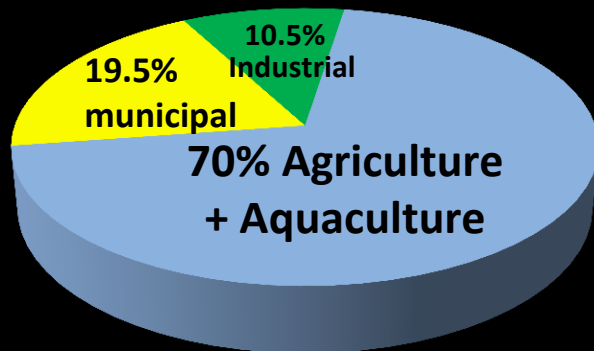
Opportunity

- Unlike other areas of the country, higher rainfall rates lead to abundant surface water supplies.
- We can re-visit the way we manage and use our surface water resources to potentially offset groundwater withdrawals and create a more sustainable water system.
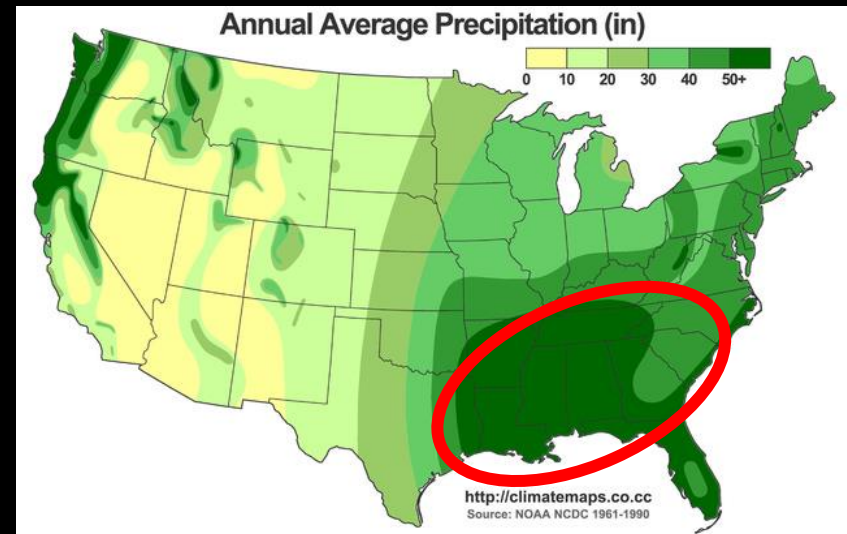
Annual precipitation averaged over 30 years (NOAA).

Chicot Aquifer Study Area

- 9,000 square miles
- Most used aquifer in Louisiana
- Overdraft of ~350 million gallons per day (MGD)
- Projected overdraft of 420 MGD by 2030.
- Saltwater intrusion near the coast

10.5% Industrial
19.5% municipal
70% Agriculture + Aquaculture

0   50   100 Kilometers

Project Parishes
Chicot Boundary
Rivers, Streams & Canals

River Basins
Lower Red River
Lower Sabine River
Calcasieu River
Mermentau River
Bayou Vermilion
Bayou Teche

Goal of the Study

Our plan is to create a geospatial modeling tool that integrates surface water availability, quality, and the needs of water users to evaluate different management scenarios

We will start in smaller watersheds within the Chicot Aquifer area and work toward larger scales
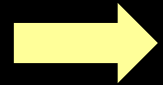
Components

✓ Social assessment to understand the needs and attitudes of key water users.
✓ Integrated surface water quality database.
✓ A rainfall runoff model (supplemented with flow/transport models).
✓ Expanded historical climate record and new climate projections (i.e., future water supply).
✓ A GIS platform for integrating data (e.g., land cover, ag census data, wells, water quality, soils, water supply, water demand, etc.)

Example

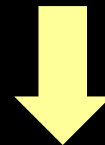Rainfall runoff, ecosystem services, climate projections ➡ Available Surface Water

⬇

Water quality

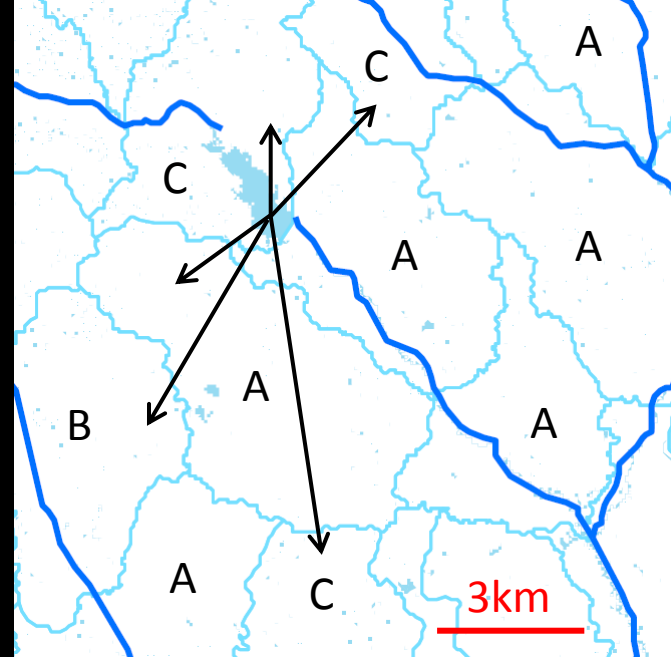| User Needs	Salinity			Sediment load			Nutrients		
	Low	med.	high	Low	med.	high	Low	med.	high
A	y	y	y	y	y	y	y	y	n
B	y	n	n	y	y	y	y	y	n
C	y	y	n	y	n	n	y	y	n

⬇

Useful Surface Water

Example

Geospatial Component

The idea is to match available water with nearby users and to optimize the geographic distribution of water in the system

Different scenarios of water availability and management can be evaluated

Implications

- We hope our work can help to inform current and future water initiatives in Louisiana. We want to draw attention to the need to look closely at management tools, technologies, and policies that can expand the efficient use of surface water to preserve our joint surface-groundwater resources.

Getting Started

- The project began in August, 2014. So far we've been pulling together data and visiting with stakeholders to better understand challenges and needs.
- Let us know if you have important data or information we can use for this project.

Thanks for your time!

Contact Information

David M. Borrok
School of Geosciences
University of Louisiana at Lafayette
Lafayette, LA 70504
E-mail: dborrok@louisiana.edu

Investigators

Emad Habib

Whitney Broussard

JoAnne DeRouen

Durga Poudel

Kari Smith

Jian Chen

Brian Schubert

Jenneke Visser

Ning Zhang