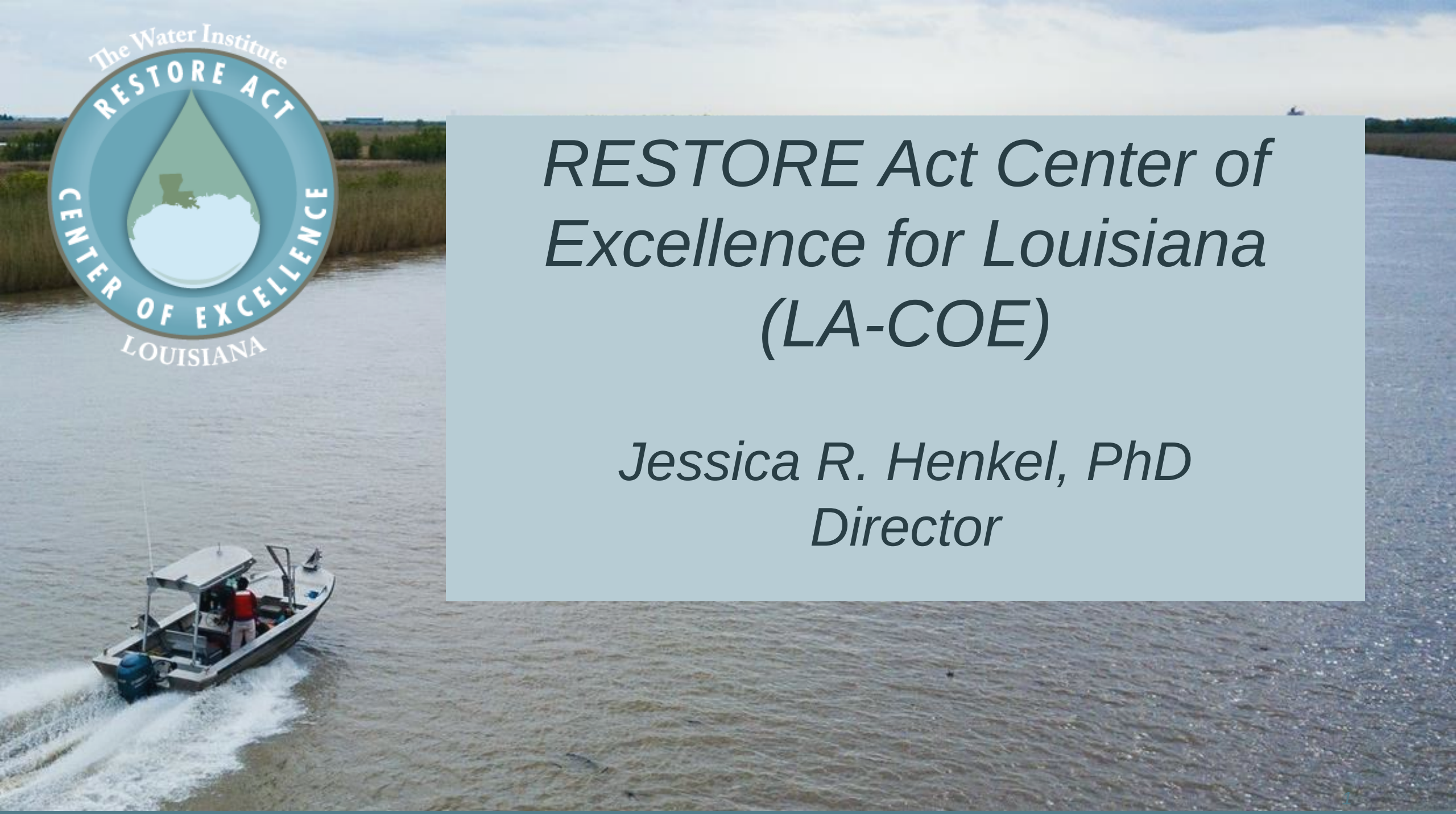
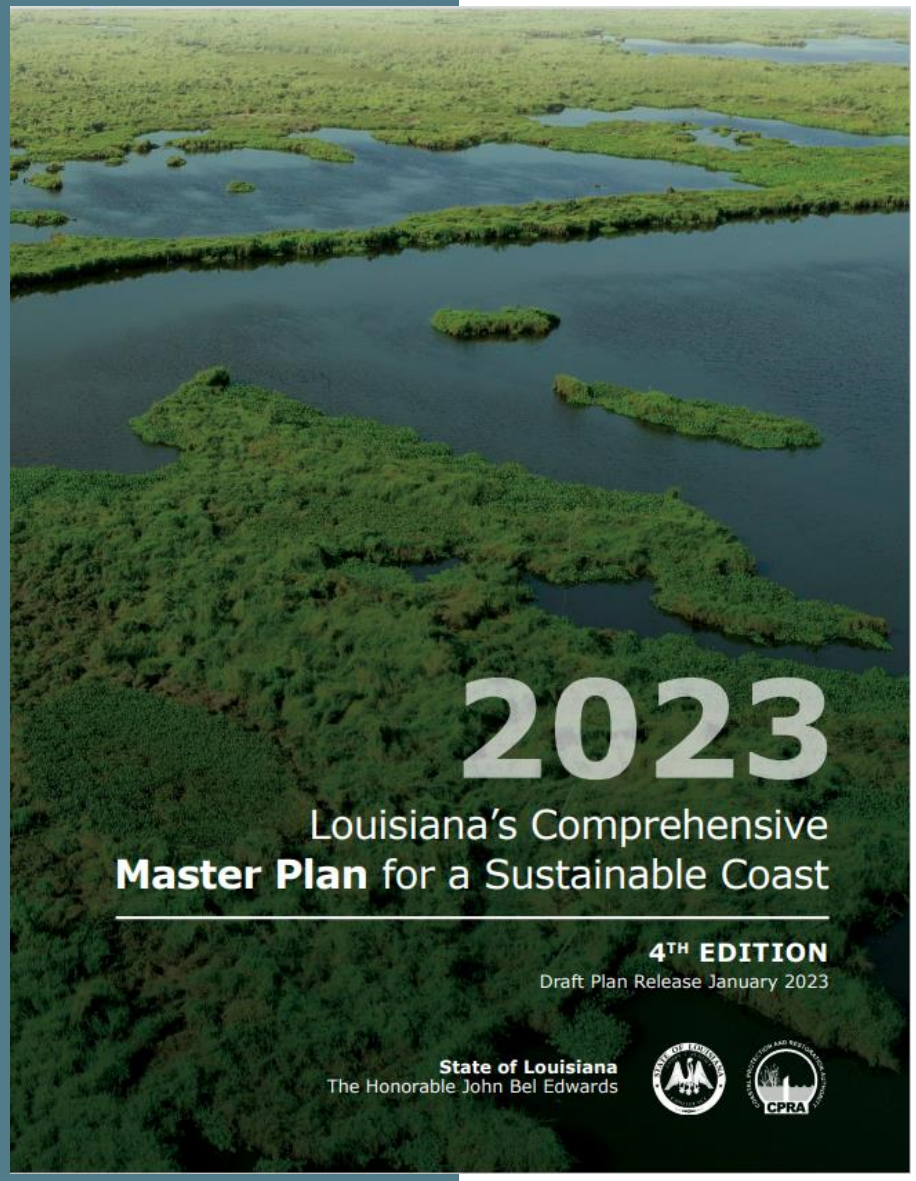


RESTORE Act Center of Excellence for Louisiana (LA-COE)

Jessica R. Henkel, PhD
Director

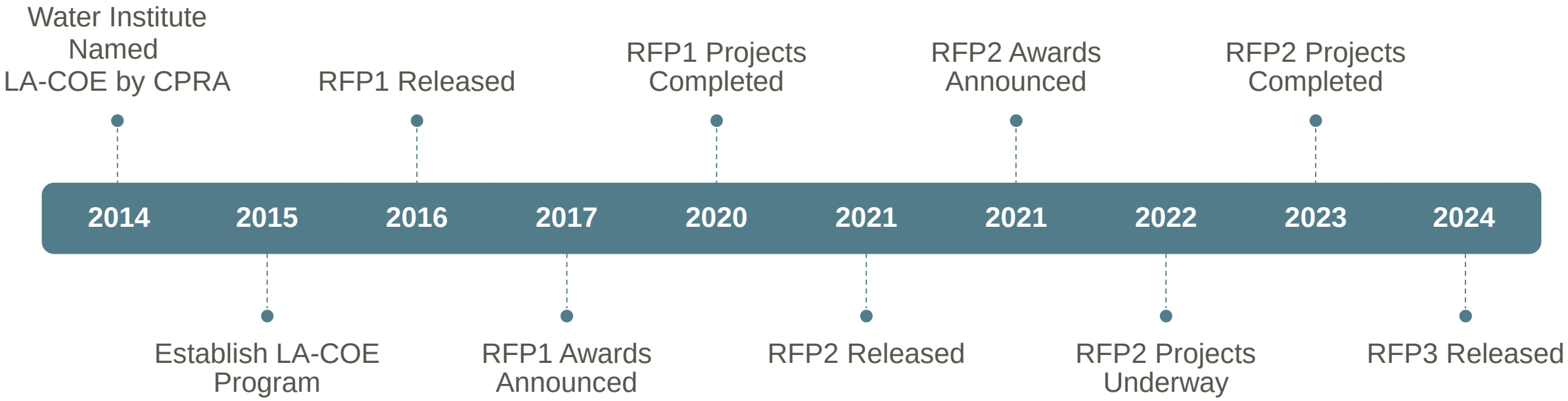


LA-COE PROGRAM

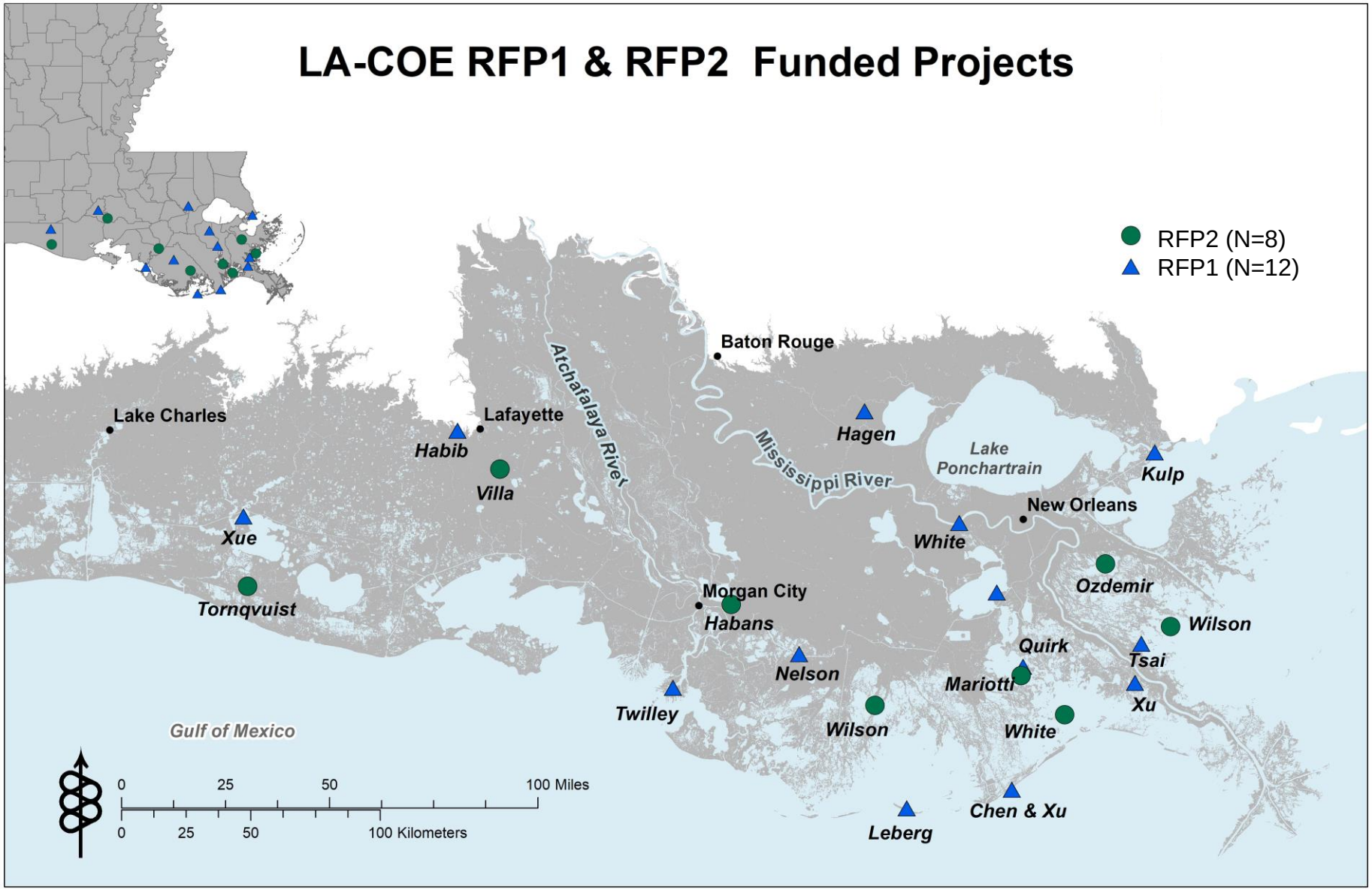
Mission: To support research directly relevant to implementation of Louisiana's Coastal Master Plan by administering a competitive grants program and providing the appropriate coordination and oversight to ensure that success metrics are tracked and achieved.

coastal.la.gov

LA-COE TIMELINE



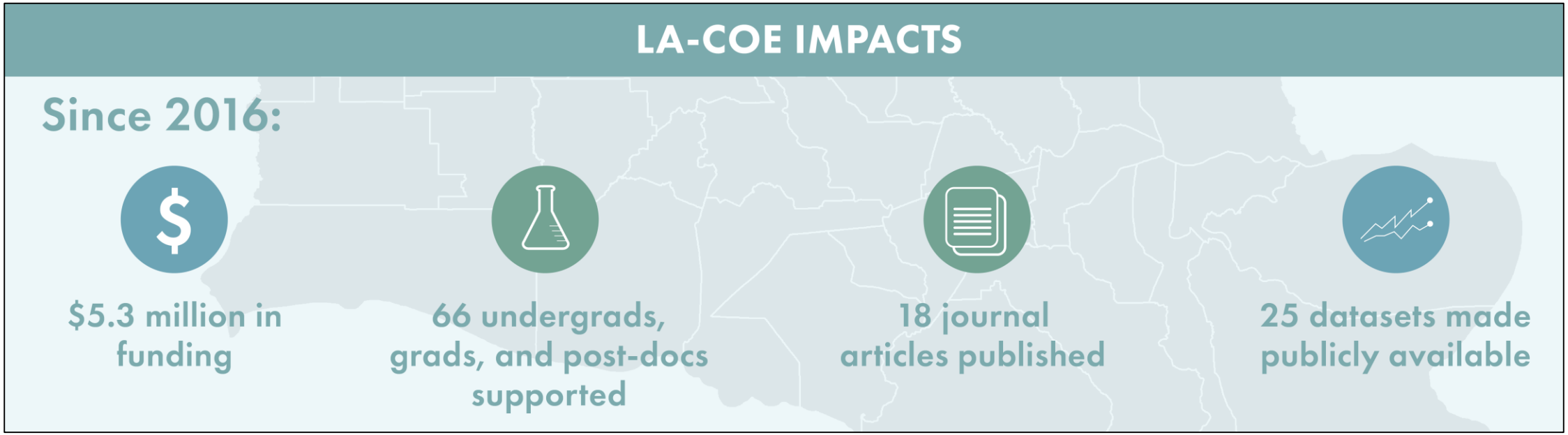
FUNDED PROJECTS



RFP1 - $3 million for 12 projects
(all completed by October 31, 2020)

RFP2 - $2.3 million for 8 projects
(August 1, 2021 – present)

TRACKING OUR IMPACTS

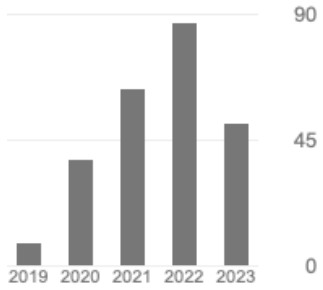


LA-COE Google Scholar to track publications

RESTORE Act Center of Excellence for Louisiana

The Water Institute of the Gulf
Verified email at thewaterinstitute.org - Homepage
Provide research directly re…

Cited by	All
Citations	248
h-index	10
i10-index	10



https://scholar.google.com/citations?hl=en&user=0j3dGmQAAAAJ

RFP1 AND RFP 2 RESEARCH TOPICS

- Sediment Dynamics
- Hydrodynamic Modeling
- Physical Climatic Processes
- Geotechnical Engineering
- Deltaic Modeling
- Geomorphology
- Coastal Restoration
- Nutrients, Vegetation, Soil
- Terrestrial and Aquatic Fauna
- Sea Level Rise
- Flood Risk Modeling
- Migration Modeling

2023 COASTAL MASTER PLAN
COMMITTED TO OUR COAST

Utilization of research in the implementation of the Louisiana Coastal Master Plan

SUMMER LANGLOIS

September 14, 2023

LOUISIANA CENTER OF EXCELLENCE MISSION

COASTAL MASTER PLAN - DEVELOPMENT

- Guiding document for comprehensive coastal restoration and storm surge flood risk reduction
- Built on world class science and engineering
- More than just projects – affiliated programs and initiatives

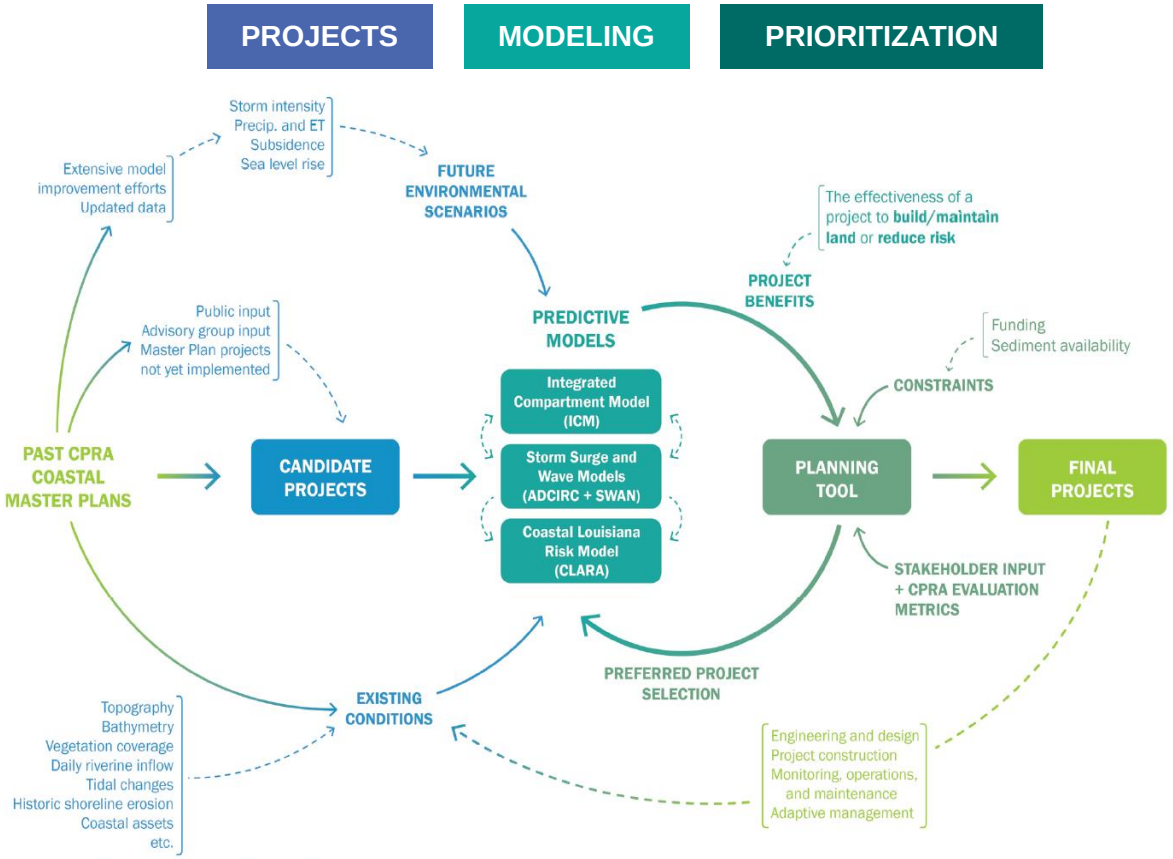
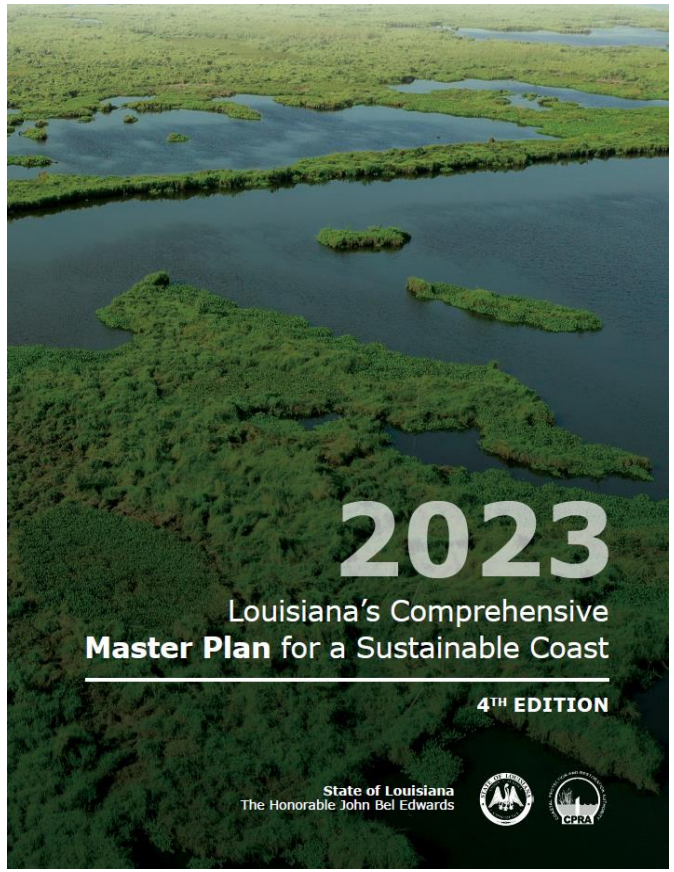


Figure 1.1: The 2023 Coastal Master Plan development process.



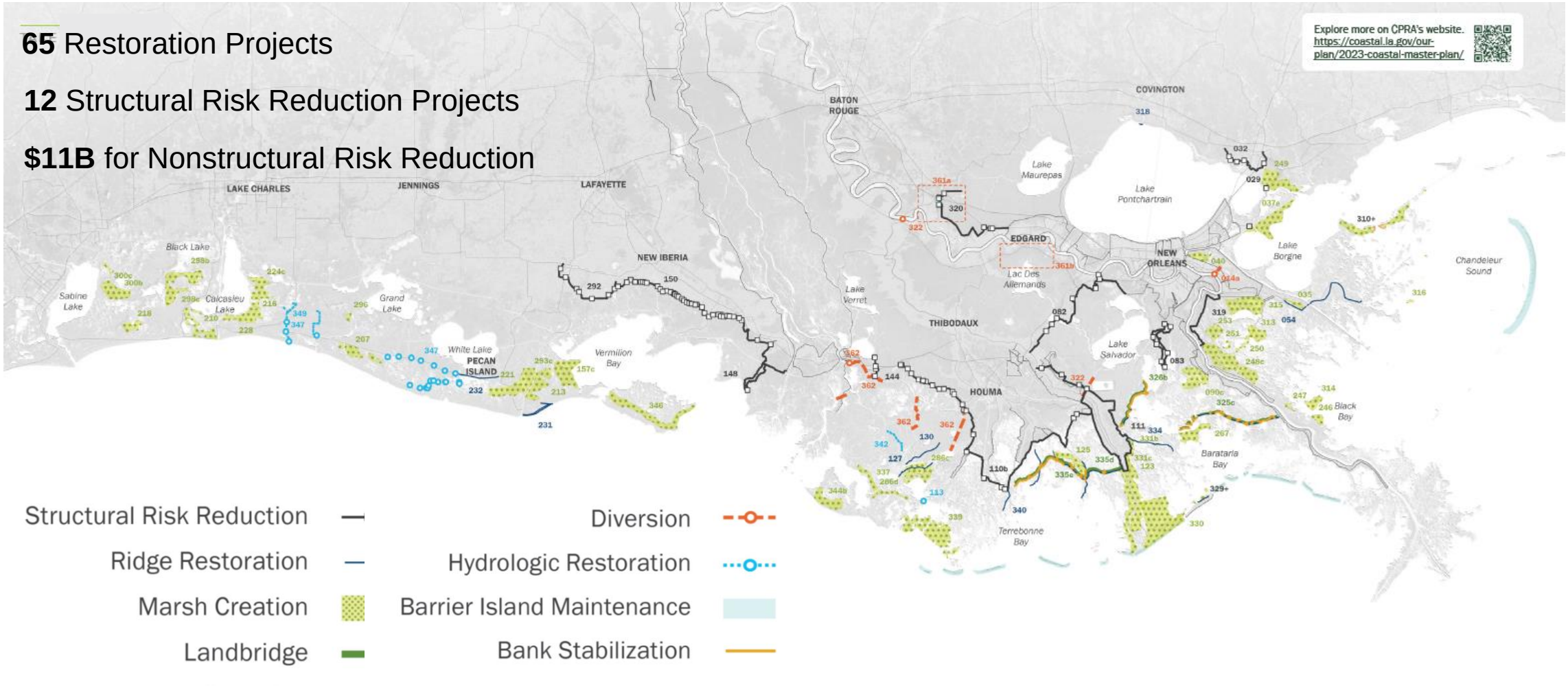
More info: coastal.la.gov/our-plan/2023-coastal-master-plan/

COASTAL MASTER PLAN - PROJECTS

65 Restoration Projects

12 Structural Risk Reduction Projects

$11B for Nonstructural Risk Reduction

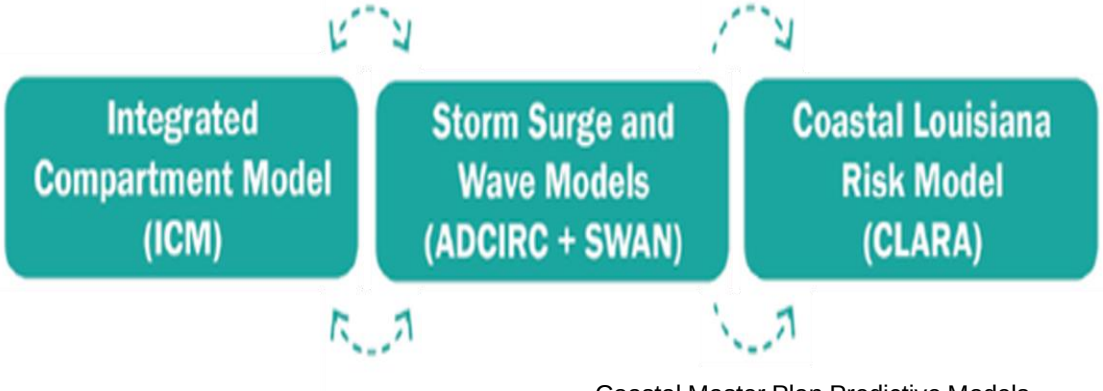


COASTAL MASTER PLAN - IMPLEMENTATION

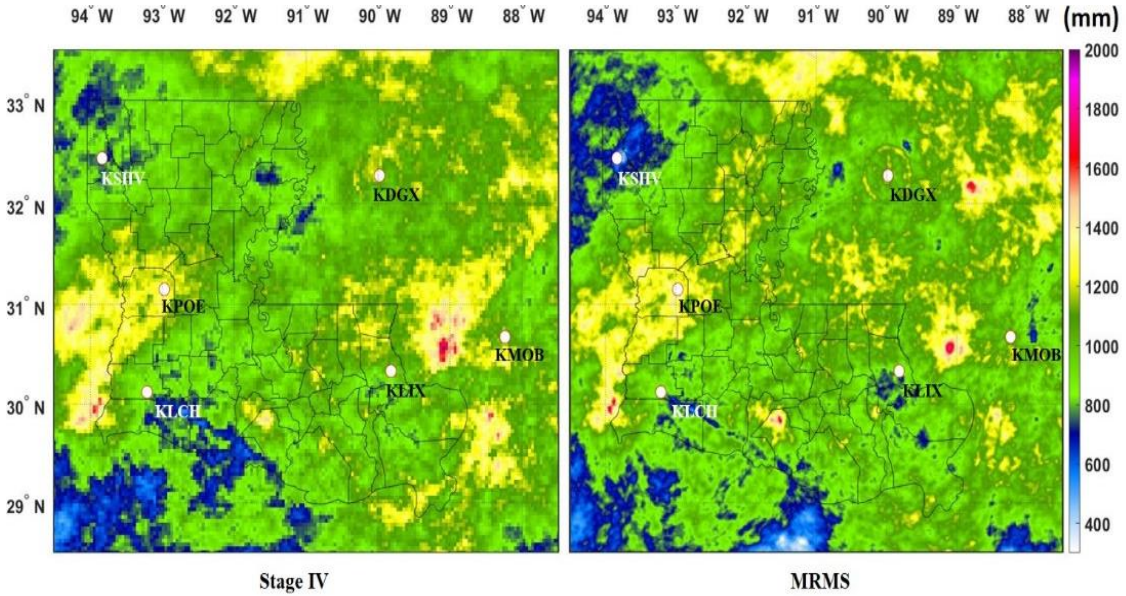
- Adaptive Management Cycle
- Research informs all phases
  - Address uncertainties and knowledge gaps
  - Develop new tools and techniques
  - Improve understanding of systems and project effects
  - Improve program effectiveness
- Examples of LA-COE Research usage in process….
  - First funding cycle (RFP1) – complete 2020
  - Second funding cycle (RFP2) – complete late 2023

MODEL IMPROVEMENT

- Many models, esp. in *Planning* and *Feasibility*
- Continually improved using research
  - Processes being simulated
  - Better datasets to drive models
  - Data to calibrate and validate models



Coastal Master Plan Predictive Models



Rainfall accumulation maps (in millimeters) for two datasets for January to August 2018.
From: Habib and ElSaadani (2020).

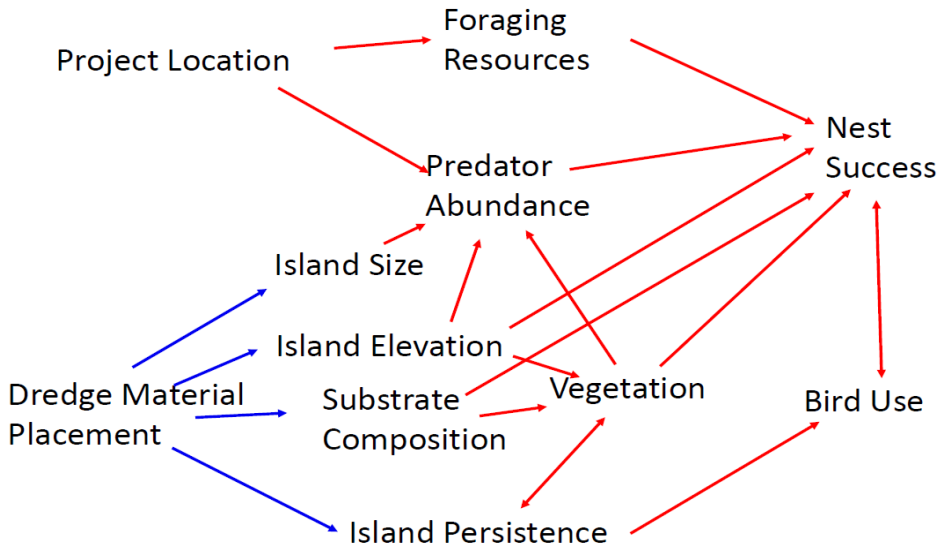
RFP1 Research: *Evaluation of Radar-based Precipitation Datasets for Applications in the Coastal Master Plan*

(PI) Dr. Emad Habib – University of Louisiana at Lafayette

- Evaluated quality of high resolution radar-based datasets as replacement for rain gage datasets
- Datasets useful, esp. for longer time-period estimates
- Used to drive ICM and project-specific models

HABITAT CREATION

- Restoration projects also create habitat
- Research informs *Engineering & Design* to improve capacity to support native flora and fauna
- What factors control habitat utilization?



Variables affecting pelican nesting success. From: Leberg et al. (2019)

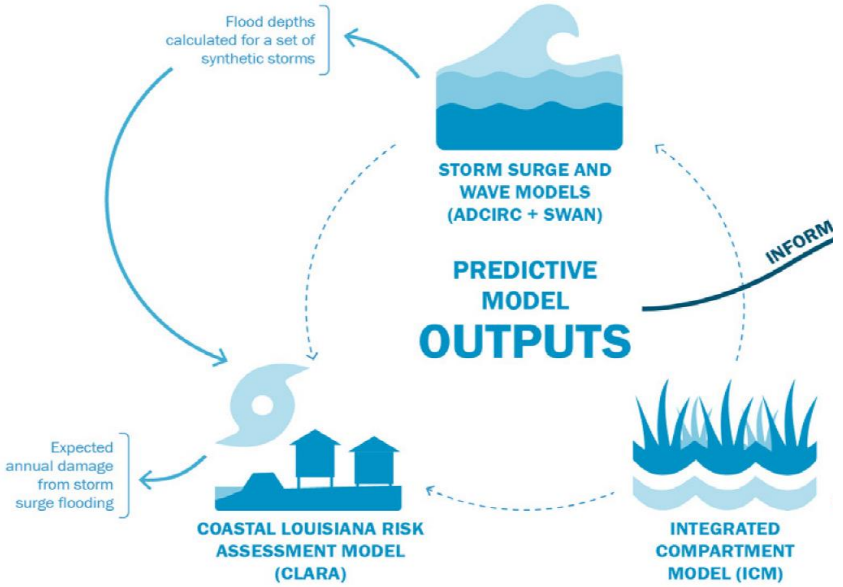
RFP1 Research: *Assessment of Coastal Island Restoration Practices for the Creation of Brown Pelican Nesting Habitat*

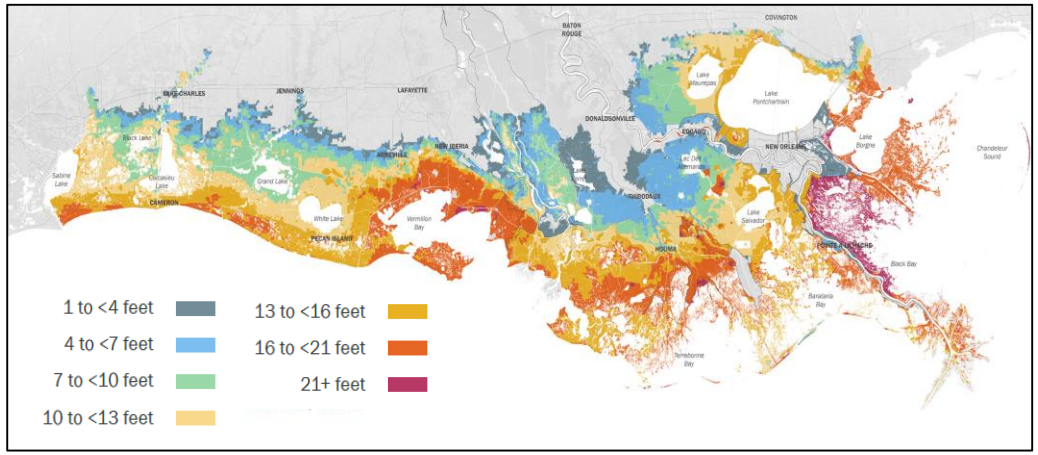
(PI) Dr. Paul Leberg – University of Louisiana at Lafayette

- Quantified effect of restored island characteristics on nesting success
- Extensive use of restored islands; predators a factor on larger, higher elevation islands near “mainland”
- Information useful for design of restored island nesting habitat

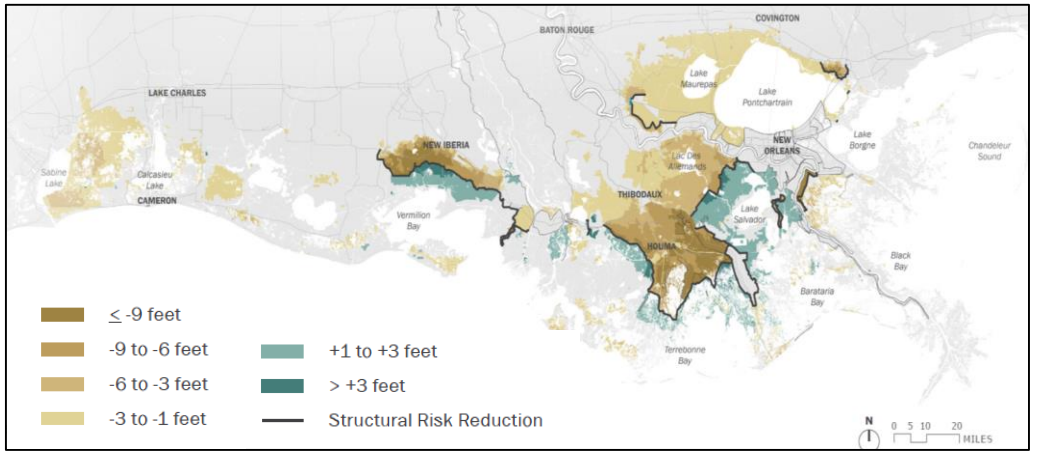
COASTAL FLOOD RISK

- ADCIRC + SWAN: Predicts water levels from storms
- CLARA: Estimates flood depths and economic damages
- Evaluated range of future environmental scenarios
- Projects assessed based on reductions to:
  - Storm surge-based flooding
  - Expected annual damages in dollars and to structures





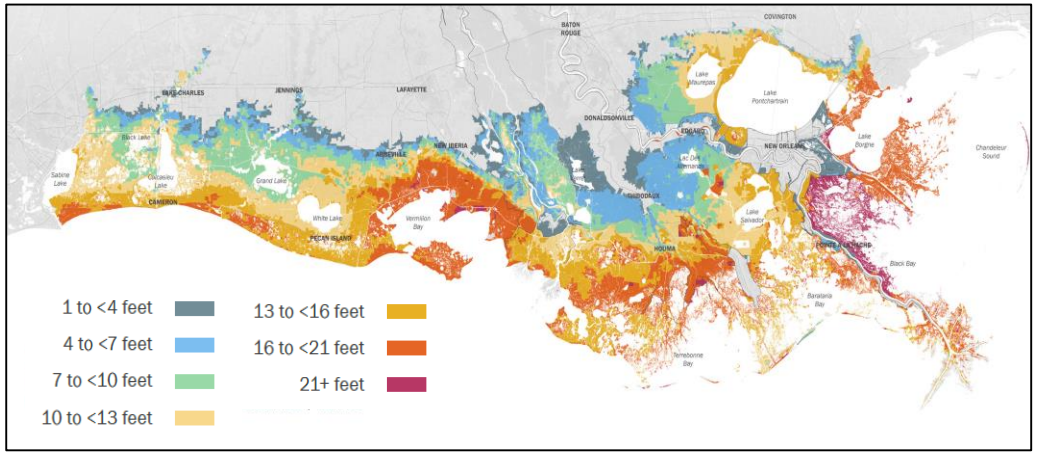
Flood Depths, Future Without Action
1% Annual Exceedance Probability, Lower Scenario, Year 50



Difference in Flood Depths: Future With Action minus Future Without Action
1% Annual Exceedance Probability, Lower Scenario, Year 50

COASTAL FLOOD RISK – FUNDED RESEARCH

- Research used to….
- Understand coastal flooding and effects now and in future
- Understand how populations, assets, economies respond to increasing flood risk
- Help evaluate and prioritize risk reduction projects



The Water Institute RESTORE ACT CENTER OF EXCELLENCE LOUISIANA

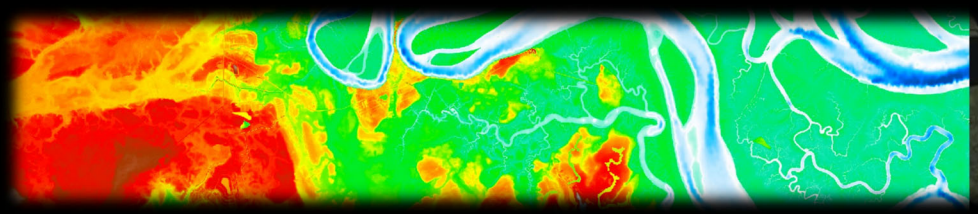
RFP1 Research: *Enhancing Flood Hazard Assessments in Coastal Louisiana through Coupled Hydrologic and Surge Processes*

Dr. Matthew Bilskie – University of Georgia

RFP2 Research: *Migration and flooding in coastal Louisiana*

Dr. Robert Habans – The Data Center


THANK YOU



Enhancing Flood Hazard Assessments in Coastal Louisiana Through Coupled Hydrologic and Surge Processes

Matthew V. Bilskie[1], Haihong Zhao [2], Don Resio [3], John Atkinson [2], Zachary Cobell[4], & Scott C. Hagen

mbilskie@uga.edu

[1] University of Georgia
[2] Arcadis International
[3] University of North Florida
[4] The Water Institute

RESTORE Act Center of Excellence Webinar Series
Understanding and Mitigating Flood Risk in Louisiana's Coastal Zone
Thursday, September 14, 2023

M.V. Bilskie, H. Zhao, D. Resio, J. Atkinson, Z. Cobell, S.C. Hagen (2021) "Enhancing Flood Hazard Assessments in Coastal Louisiana through Coupled Hydrologic and Surge Processes," *Frontiers in Water*, doi: 10.3389/frwa.2021.609231

UNIVERSITY OF GEORGIA
Coastal Ocean Analysis and Simulation Team

ARCADIS

LSU

UNF

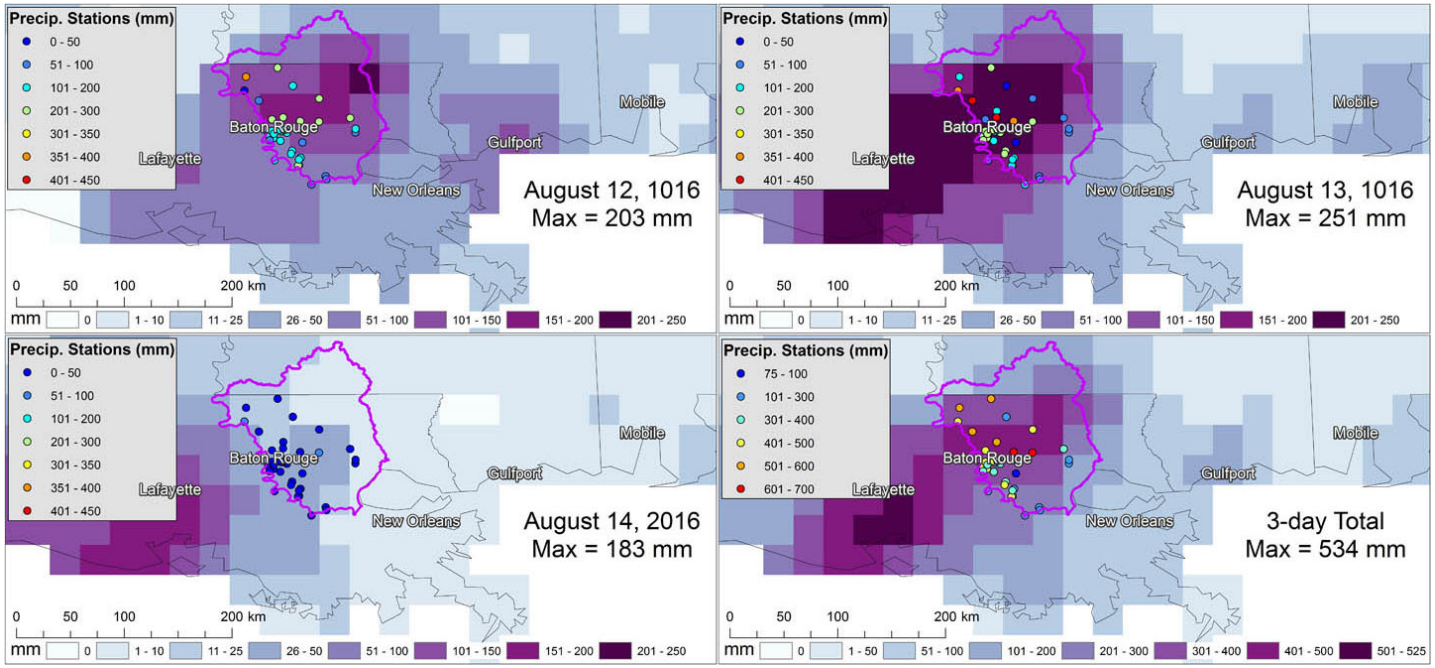
THE WATER INSTITUTE

Outline

- Study Motivation / Conception
- Hypothesis
- Study Area
- Methods
- Results
- Concluding Remarks

Motivation: 2016 Louisiana Rainfall Event

- August 5, 2016 – “Unnamed” sub-synoptic-scale low pressure system developed along the Florida/Alabama state line.
- August 12-14 – Intense precipitation across southeastern Louisiana.



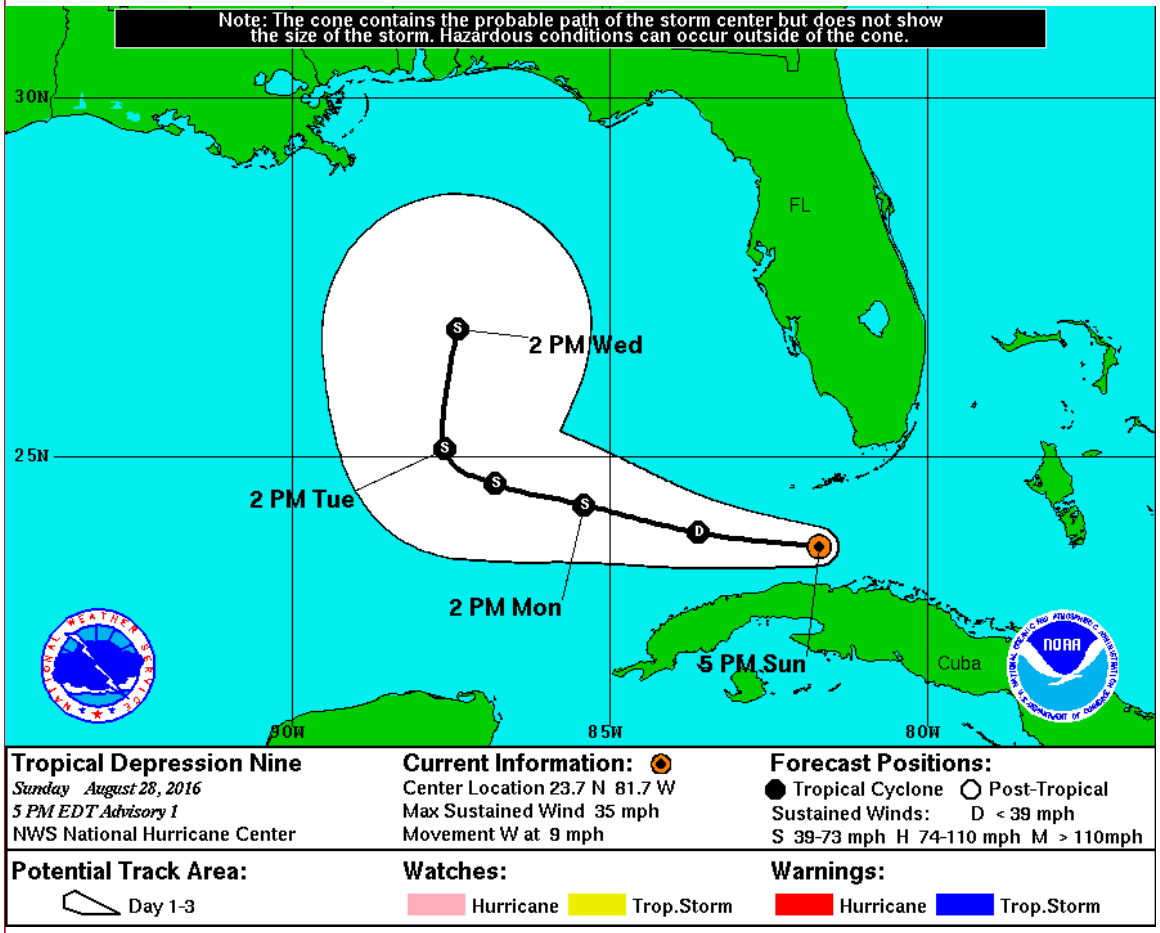
Maximums in inches
August 12: 8.0
August 13: 9.9
August 14: 7.2

3-day Total: 25.1 inches

NOAA Climate Prediction Center gridded (0.25° x 0.25 °) daily precipitation.

Bilskie, M.V. & S.C. Hagen (2018), “Defining Flood Zone Transitions in Low-Gradient Coastal Regions.” *Geophysical Research Letters*, Vol. 45(6), pp. 2761-2770. https://doi.org/10.1002/2018GL077524

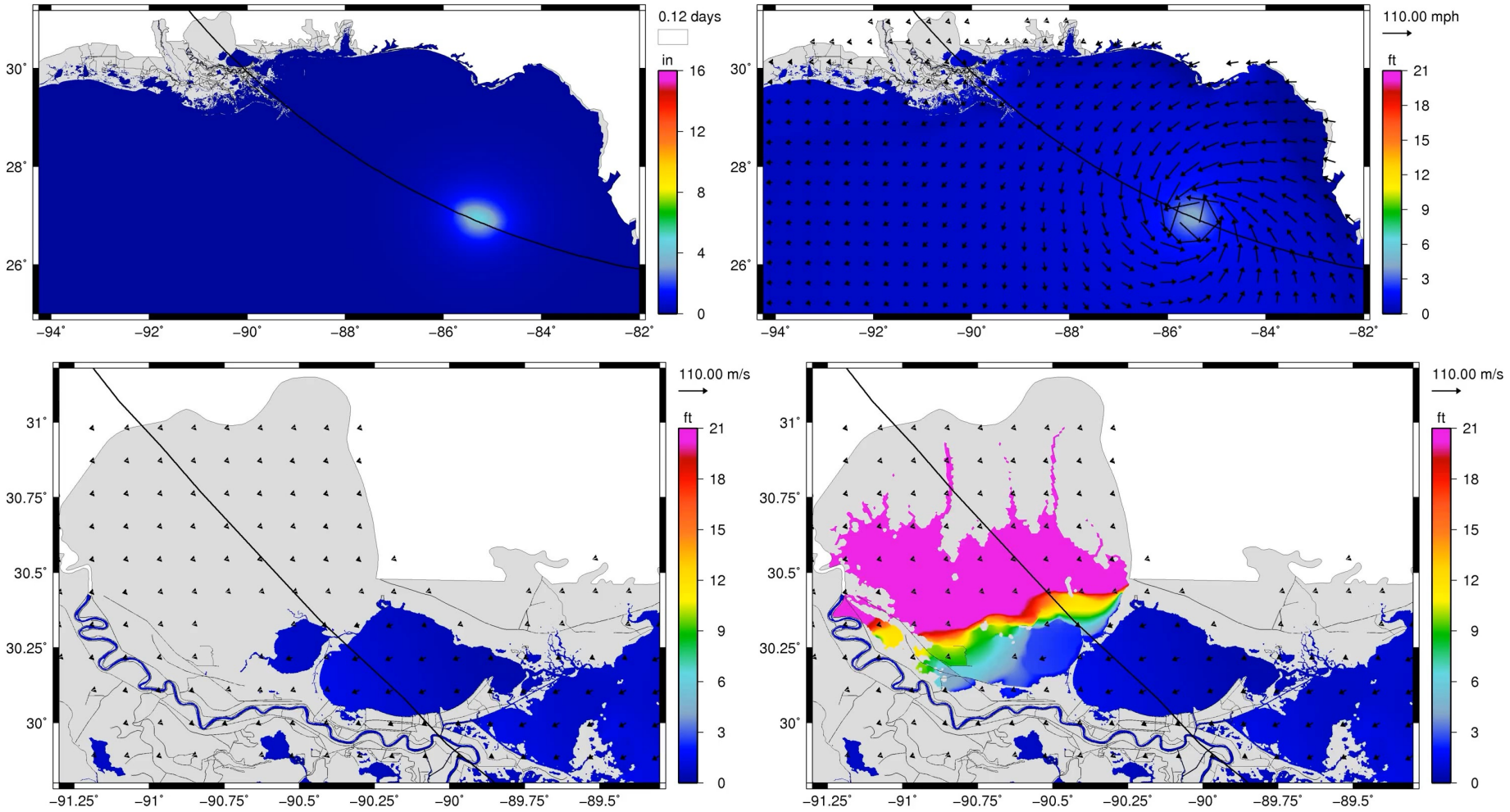
Local and State Officials – "What If?"



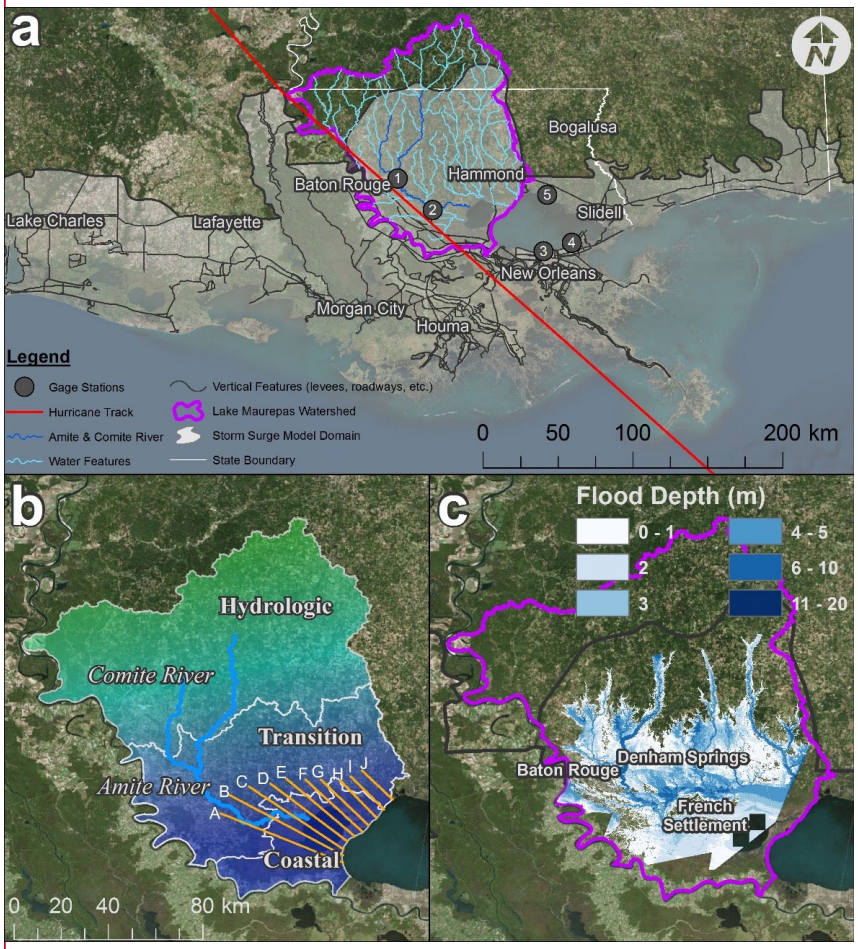
What impacts would a tropical system making landfall in the Louisiana / Mississippi region have on the saturated soil and ponded floodwaters?

Aerial photo of flooded homes near Denham Springs, Louisiana. (NOAA)

Example Result

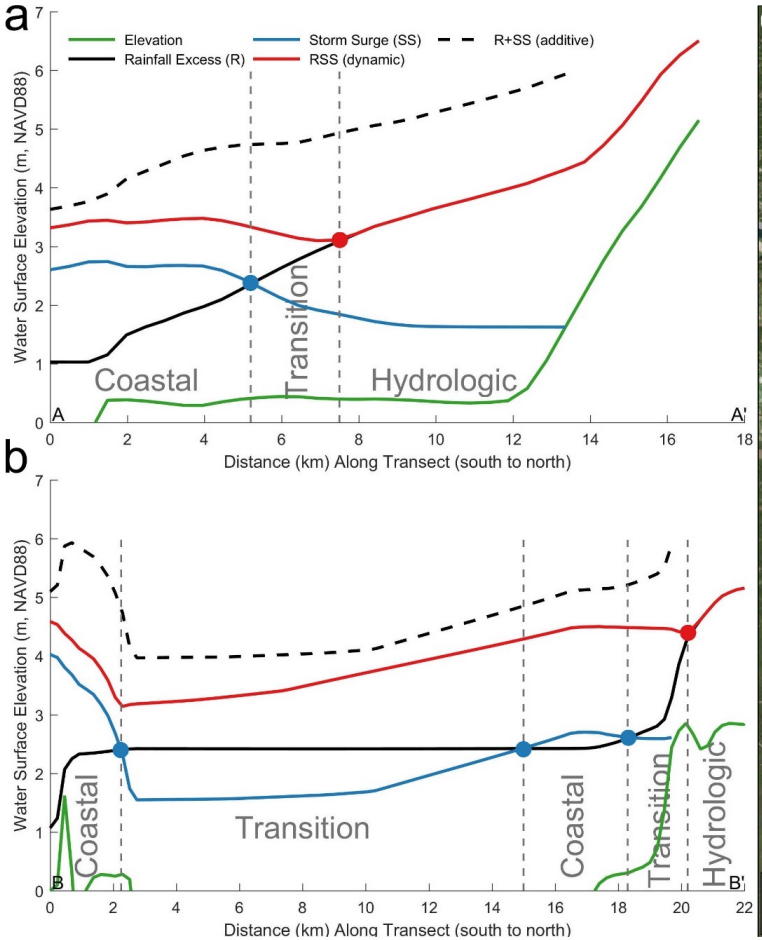


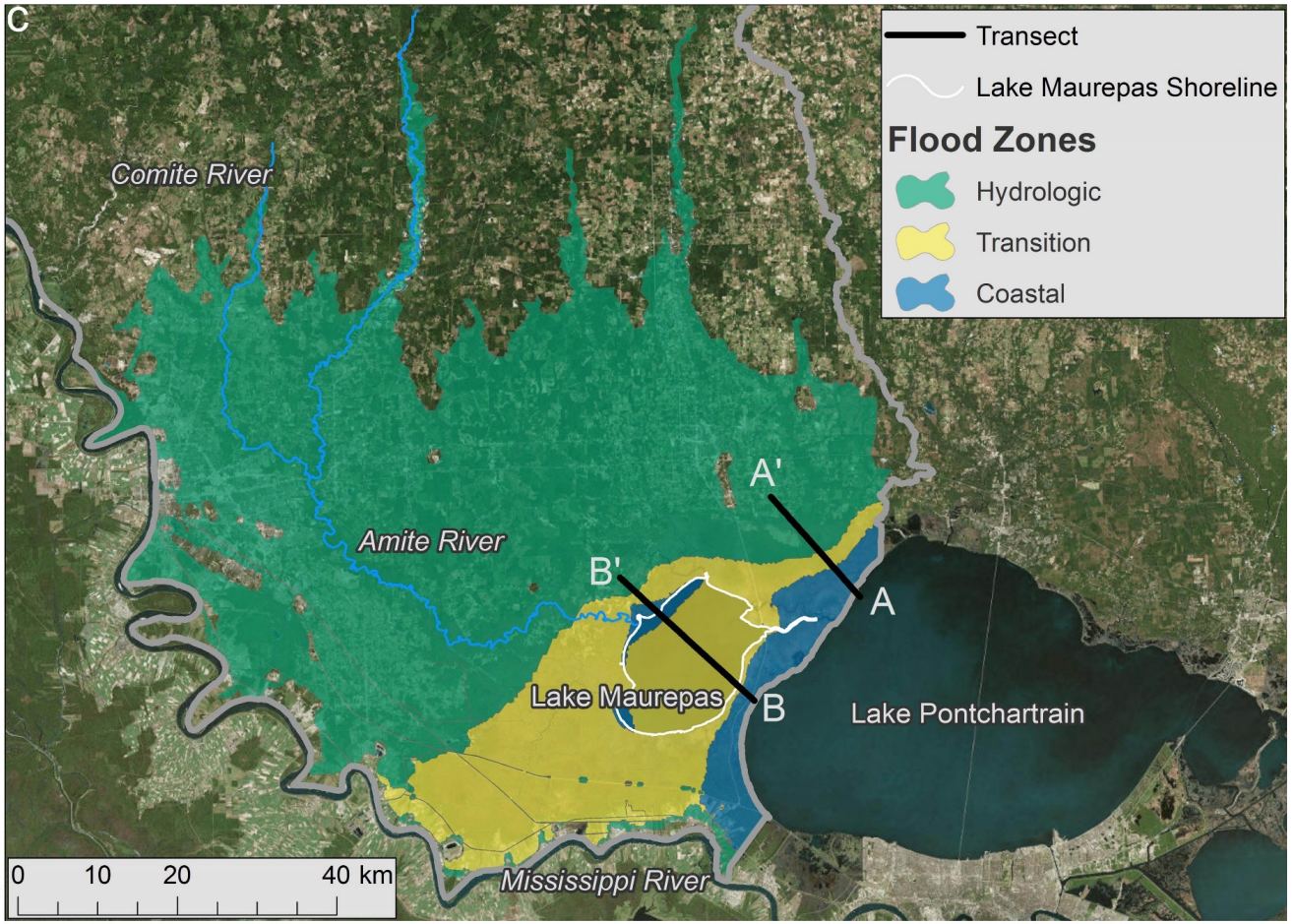
Hypothesis & Preliminary Efforts



- Hypothesis: There exist three distinct flood zones: hydrologic, coastal and transition (Bilskie & Hagen, 2018).
- These types of compound flood events are not unusual and may become more common and intense (van der Wiel et al., 2017).
- Developed a synthetic coupled rainfall runoff and storm surge scenario.

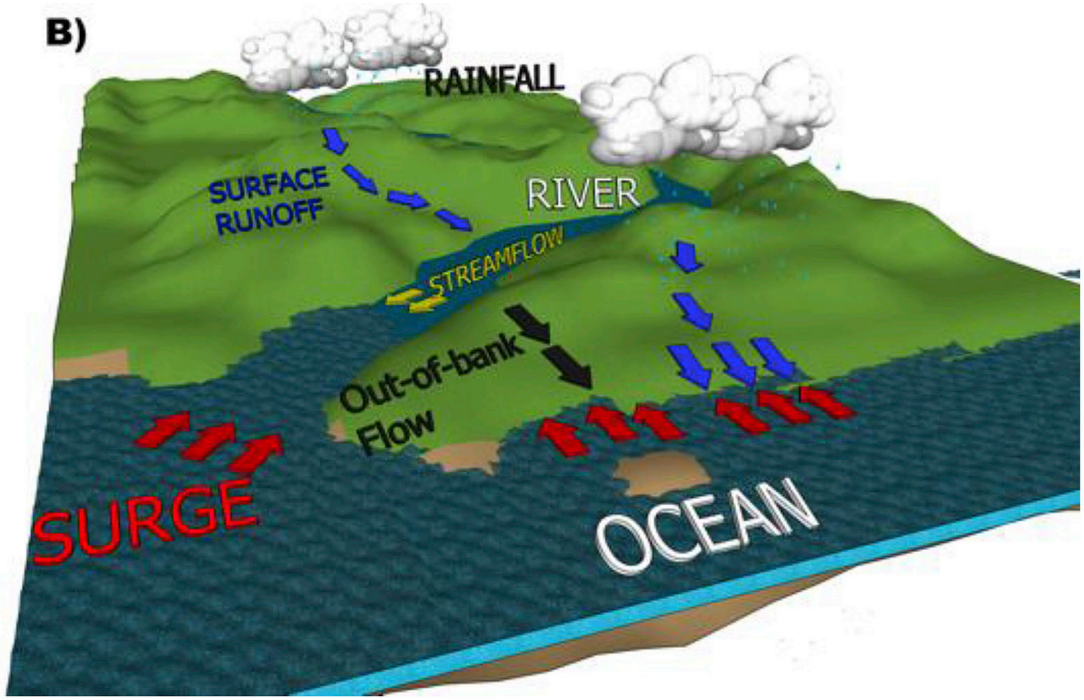
Coastal Flood Transition Zone





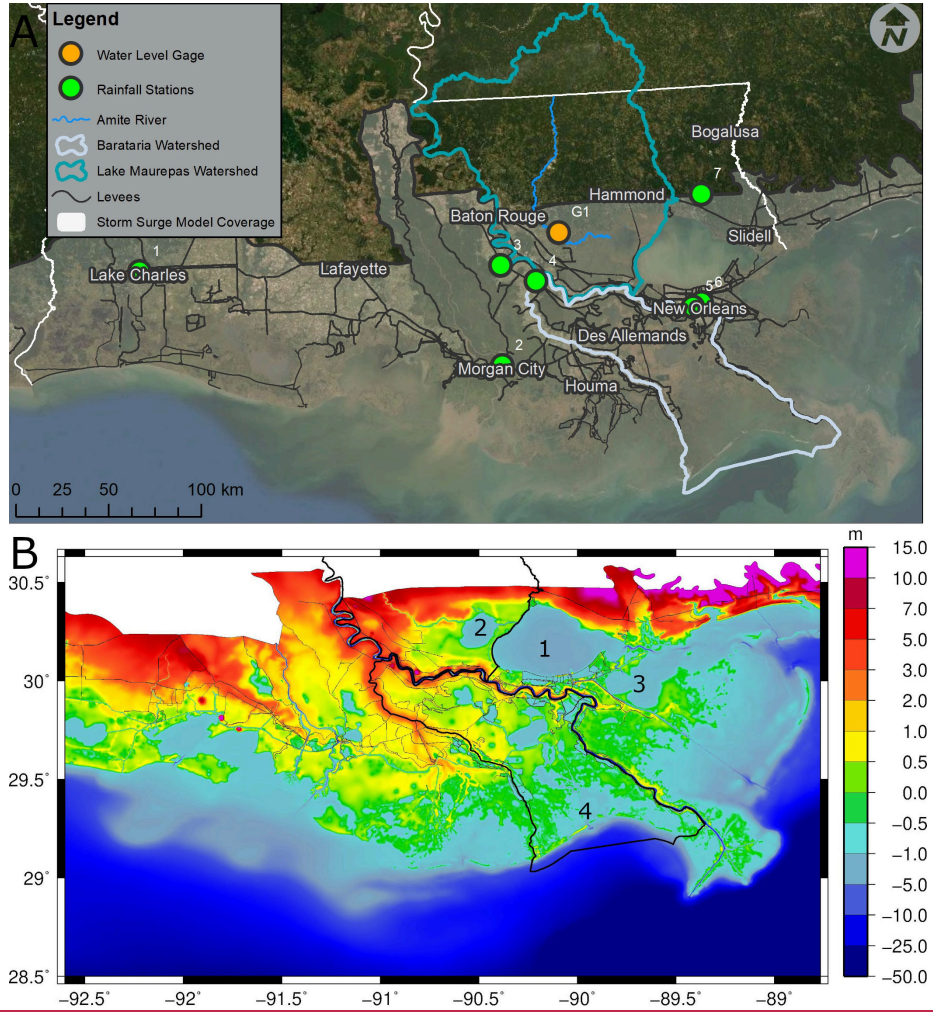
Bilskie, M.V. & S.C. Hagen (2018), "Defining Flood Zone Transitions in Low-Gradient Coastal Regions." *Geophysical Research Letters*, Vol. 45(6), pp. 2761-2770. https://doi.org/10.1002/2018GL077524

Coupling Rainfall & Runoff with Coastal Flooding



F.L. Santiago-Collazo, M.V. Bilskie, S.C. Hagen (2019). "A comprehensive review of compound inundation models." *Environmental Modelling & Software*. 119, pp. 166-181. https://doi.org/10.1016

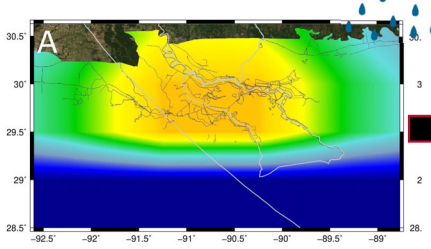
Study Area – Two Distinct Coastal LA Watersheds



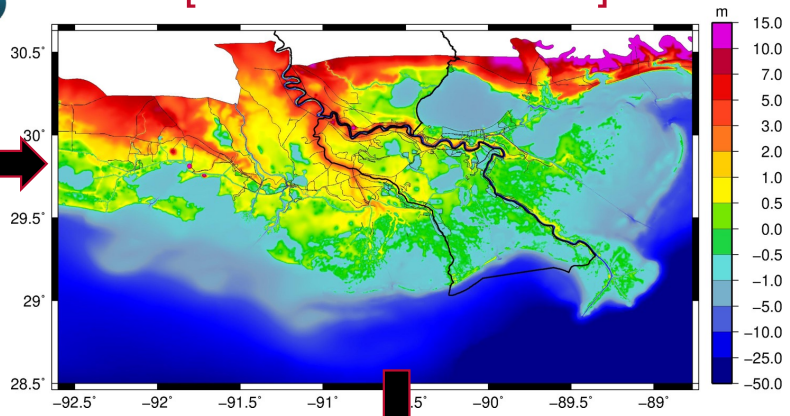
- Lake Maurepas Watershed
  - Focus south of I-12
  - Area = 3,360 km^2
  - 50% wetland and 15% developed
  - Major drainage basin of Baton Rouge
- Barataria Watershed
  - Area = 7,000 km^2
  - 38% open water and 44% wetland
  - Wetland loss due to lack of sediment, nutrients, etc.

Research Methods

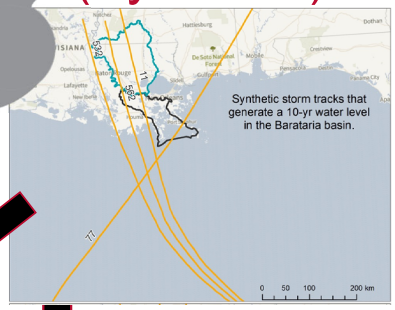
Antecedent Rainfall Conditions

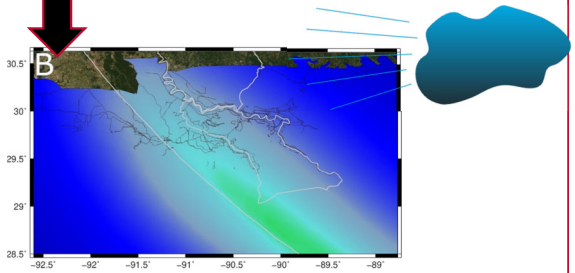


Louisiana Landscapes
[ADCIRC Framework]



Storm Tracks (Synthetic)

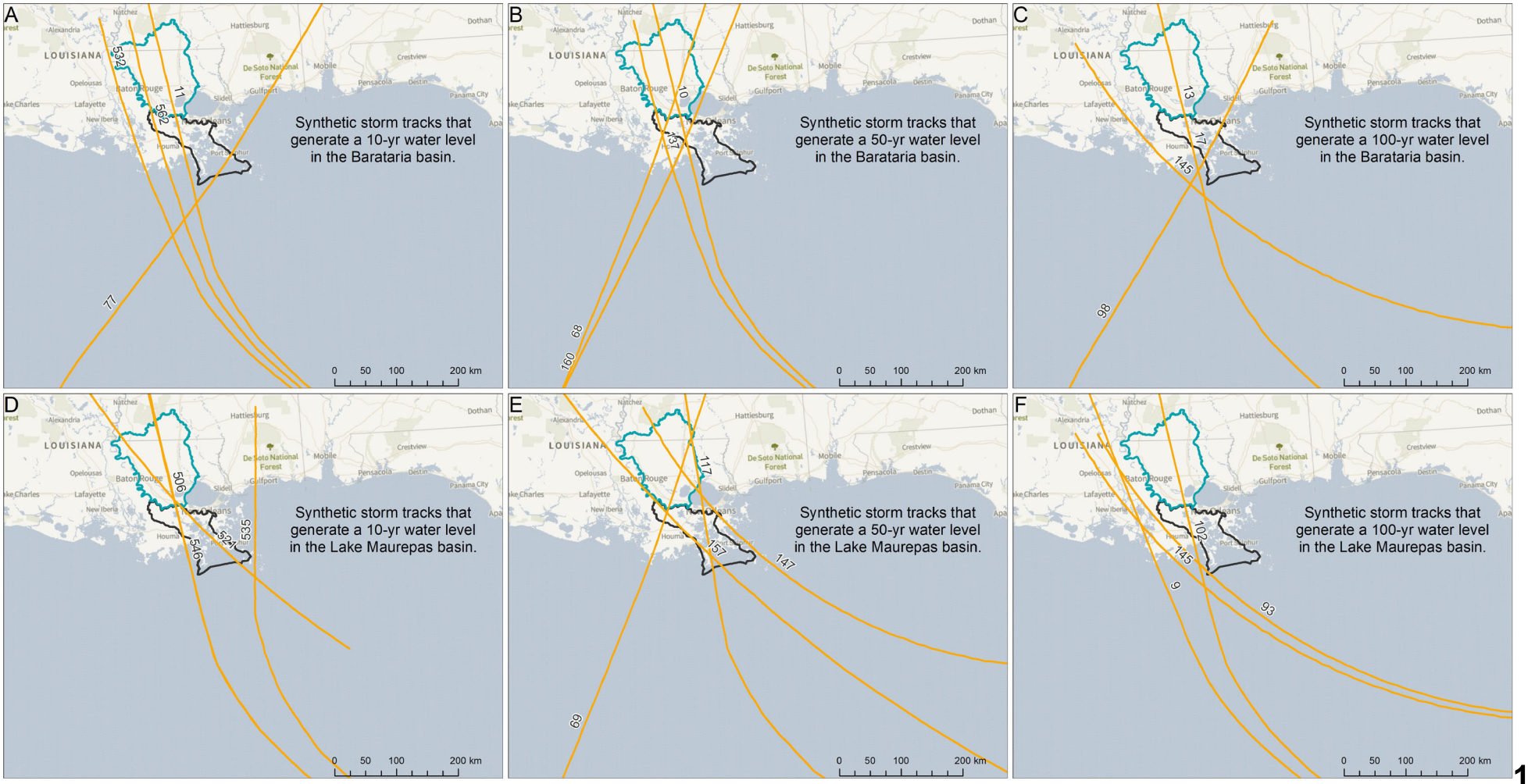




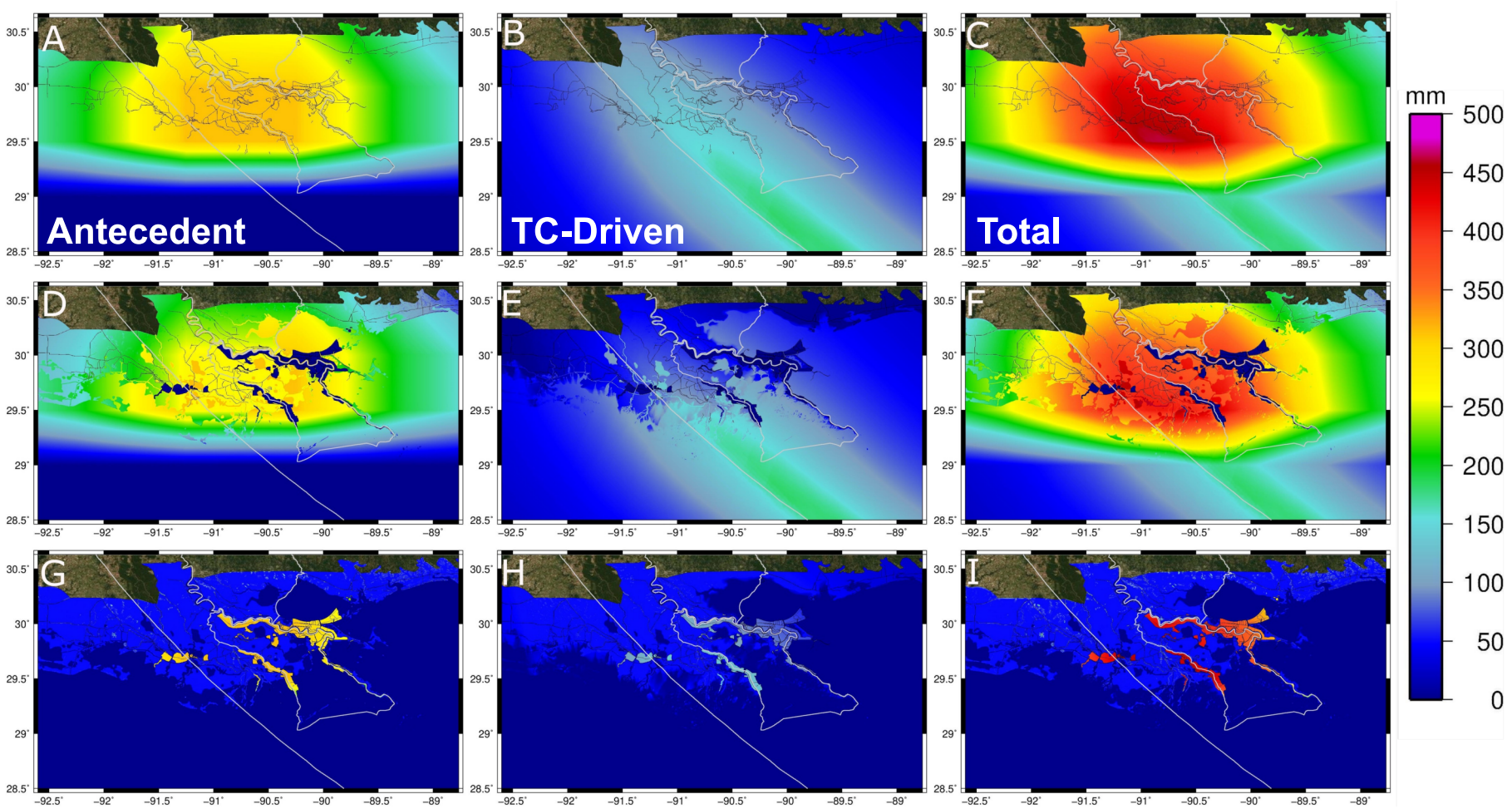
TC-Driven Rain

Water surface elevation, flood depth, and flood extent from surge and rainfall

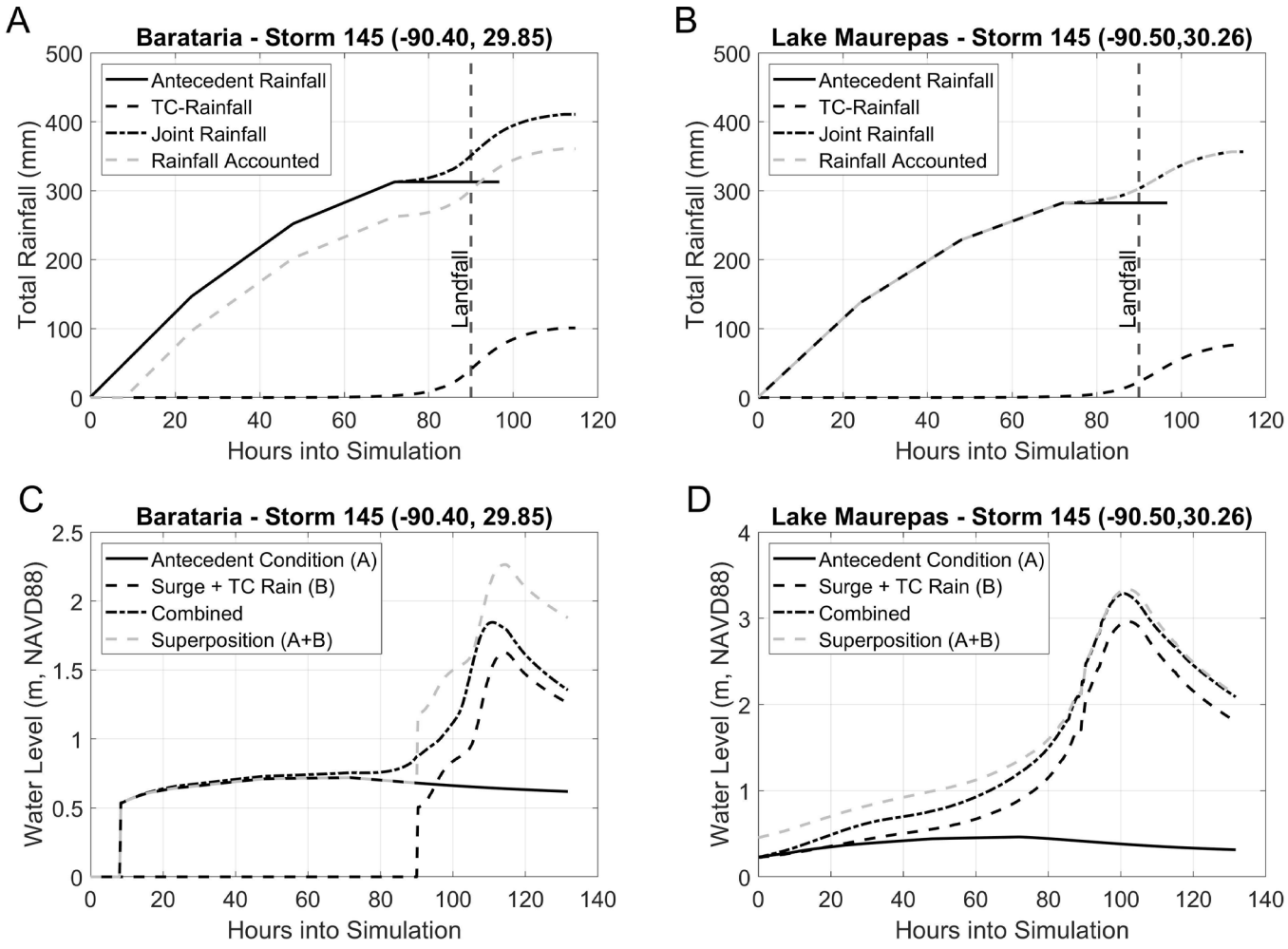
Synthetic Storm Selection



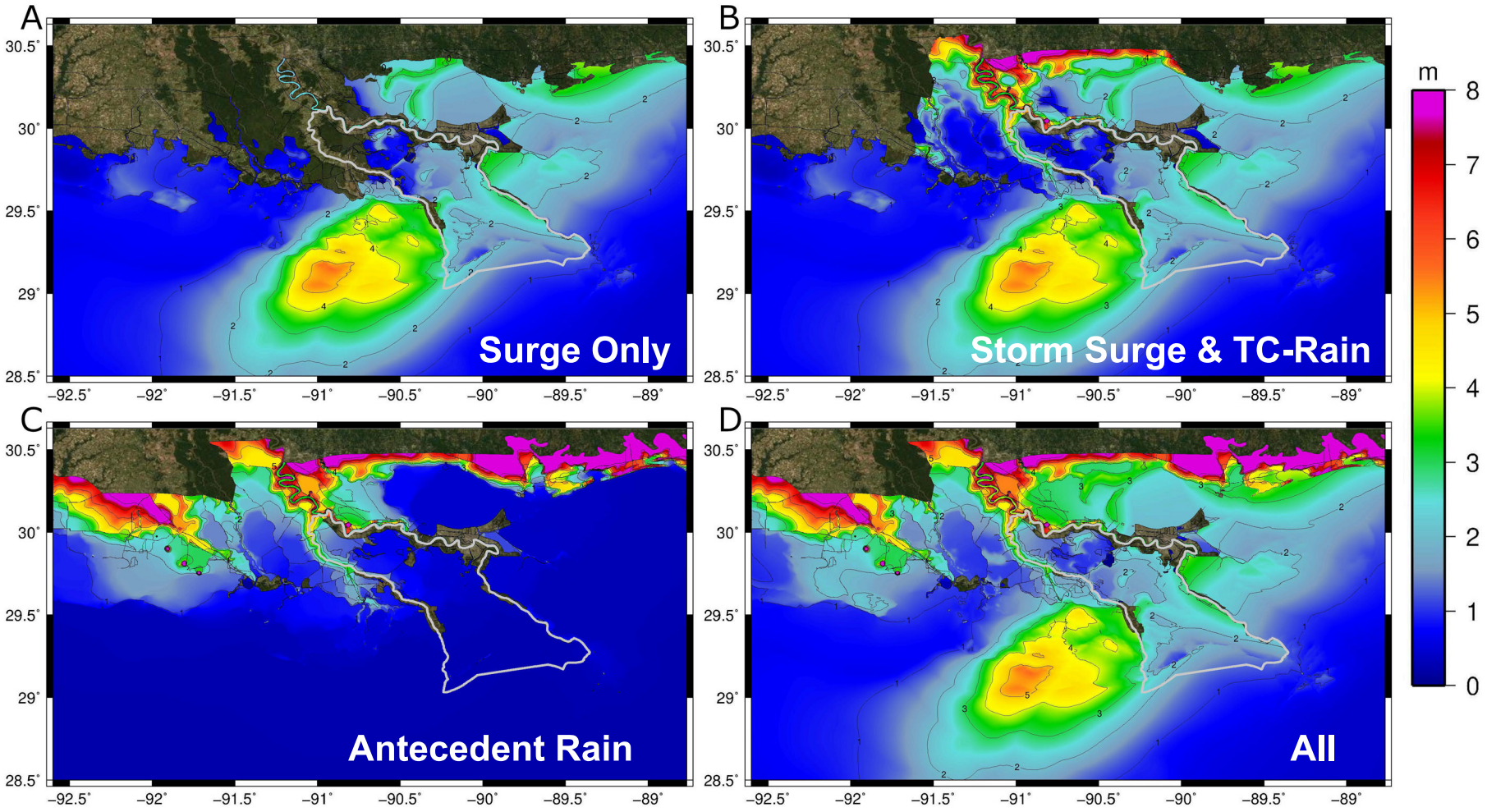
Rainfall Applied to the Model (Storm 145)



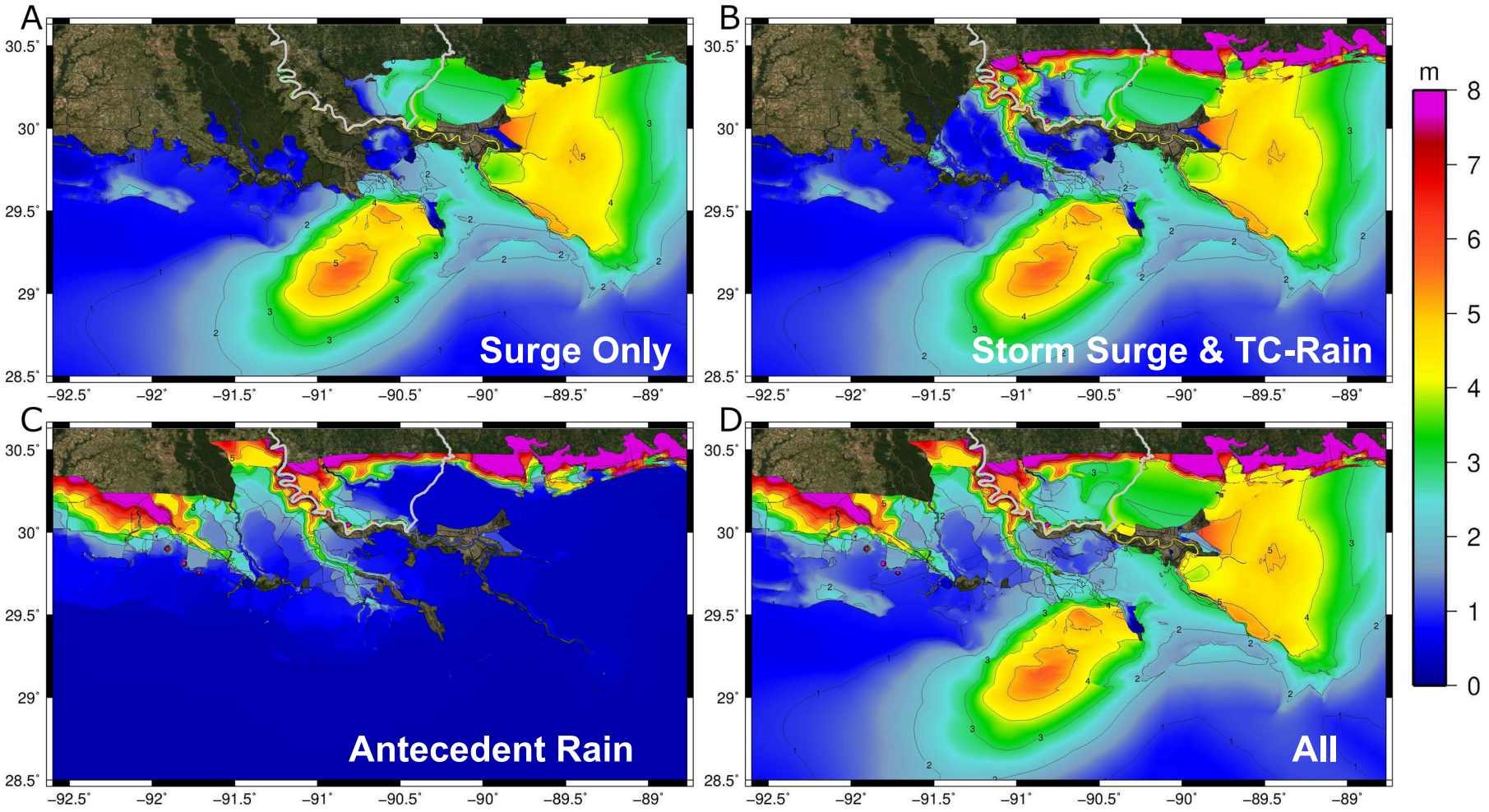
Model Rainfall and Simulated Water Levels



Barataria Watershed – Result (~50-yr Return Period)



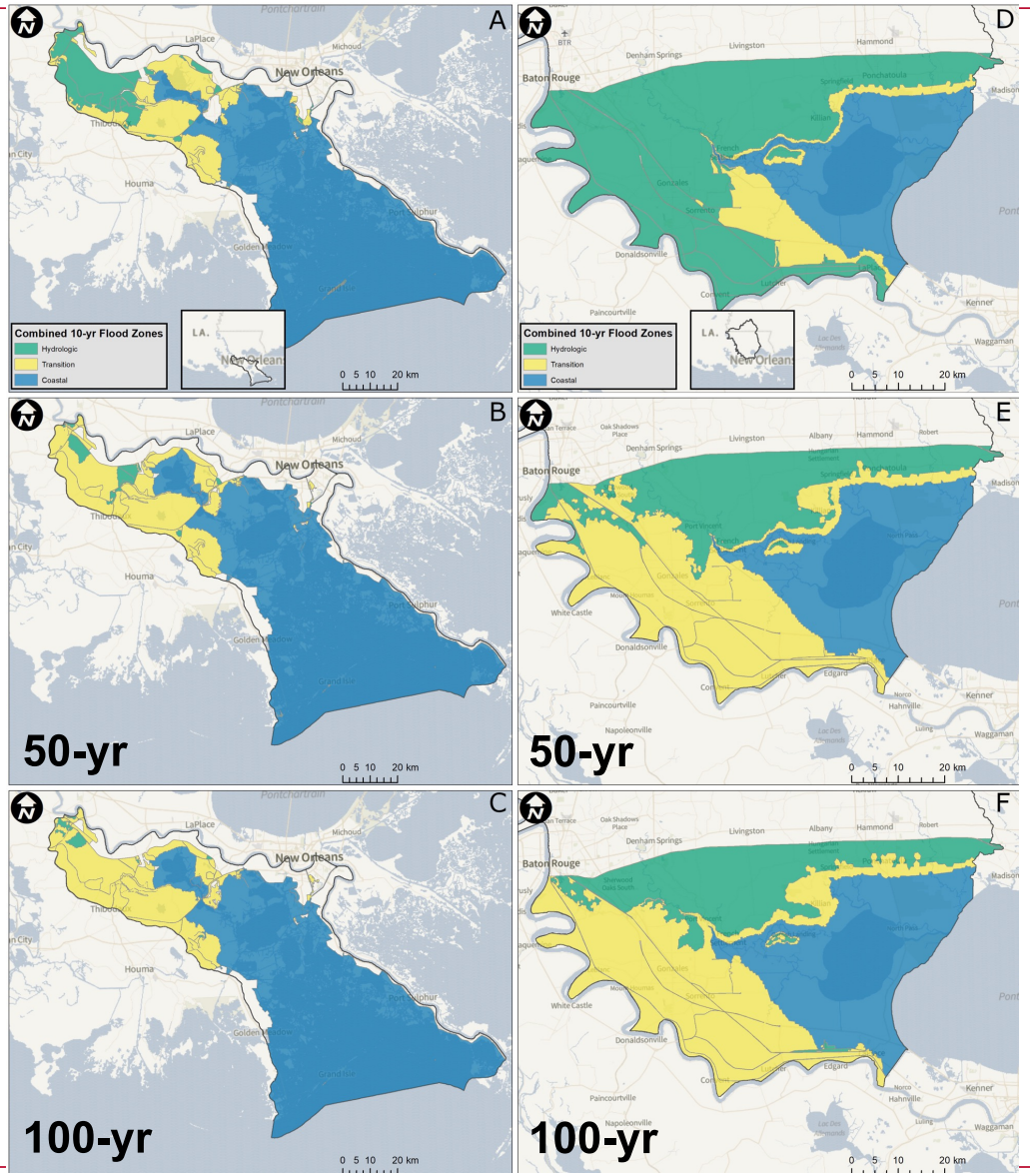
Maurepas Watershed – Result (~50-yr Return Period)



Final Results

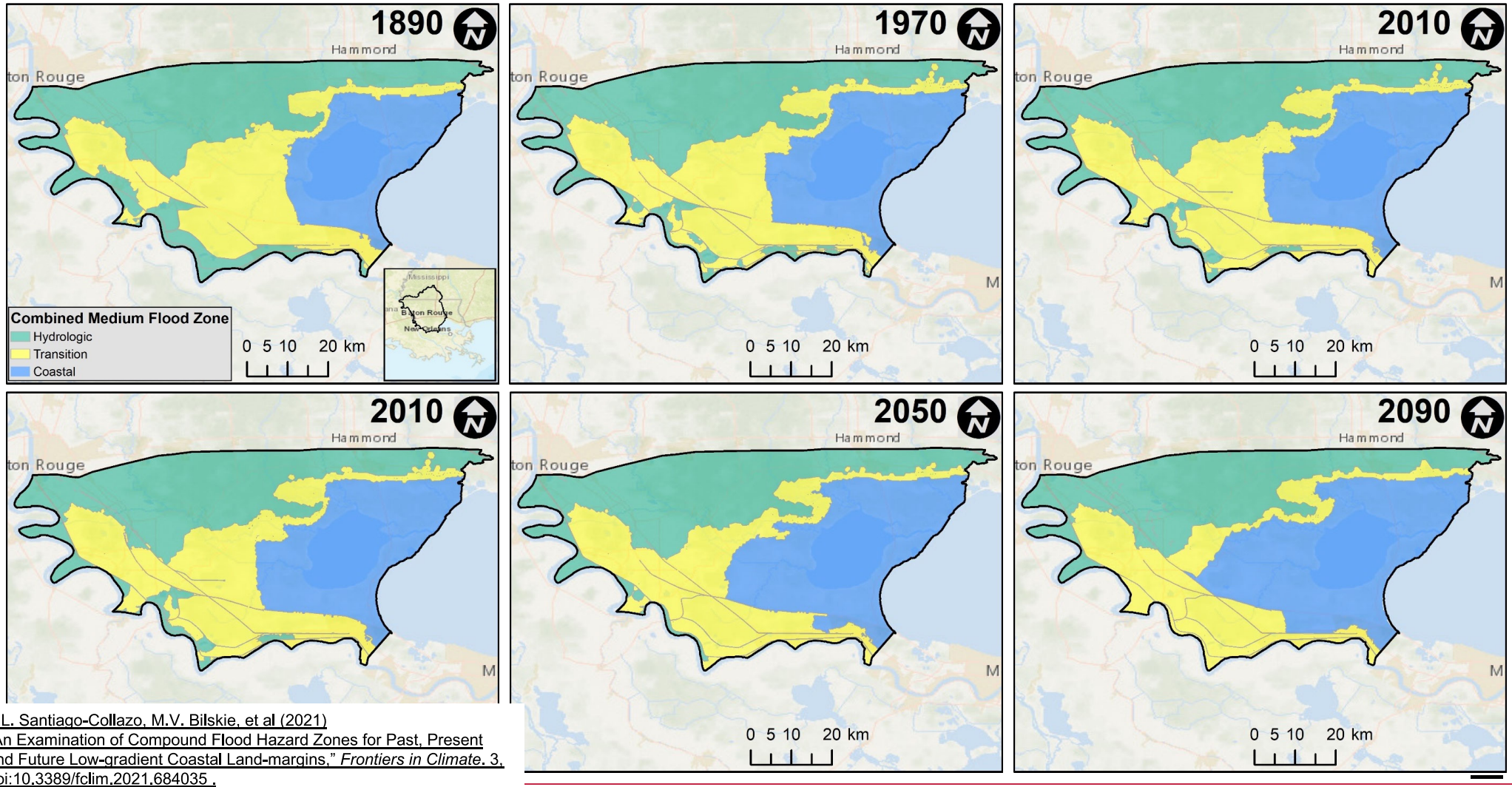
Basin	Return period	Percent of watershed		
		Coastal	Transition	Hydrologic
Barataria	10	66%	13%	8%
	50	68%	18%	2%
	100	69%	18%	1%
Lake Maurepas	10	28%	11%	61%
	50	31%	40%	29%
	100	34%	40%	26%

The percentage for the Lake Maurepas watershed is based on a total watershed area south of Interstate 10 (3,364 km^2).



Contact:
E-Mail: mbilskie@uga.edu
https://coastl.engr.uga.edu
@DrMattVBilskie
@COAST_UGA

Past & Future Projections



F.L. Santiago-Collazo, M.V. Bilskie, et al (2021)
"An Examination of Compound Flood Hazard Zones for Past, Present and Future Low-gradient Coastal Land-margins," *Frontiers in Climate*. 3, doi:10.3389/fclim.2021.684035 .

Concluding Remarks

- Established the basis for defining a flood transition zone.
- Developed a means to express the flood transition zone in a probabilistic framework (e.g., return period or annual exceedance probabilities)
- Examined how the flooding mechanisms differ in two distinct watersheds
- Combining total water levels from individual model simulations (e.g., ADCIRC and HEC-RAS) are not sufficient for flood risk studies.

M.V. Bilskie, H. Zhao, D. Resio, J. Atkinson, Z. Cobell, S.C. Hagen (2021) "Enhancing Flood Hazard Assessments in Coastal Louisiana through Coupled Hydrologic and Surge Processes," *Frontiers in Water,* doi: 10.3389/frwa.2021.609231