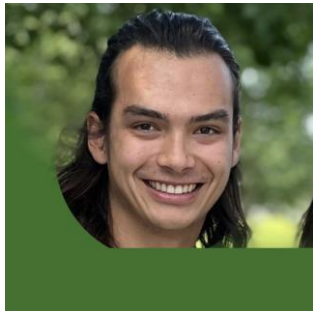
TULANE UNIVERSITY
SCHOOL of SCIENCE & ENGINEERING

Co-Development of a Forecasting Support Tool for Management and Planning – FaST MaP

RESTORE SCIENCE PROGRAM

Thank you to the RCSE modeling research group



Mikey Sison

Emma House

Nazmul Beg

Laura Manuel

Kelin Hu

Sherif Ahmed

Sophie Ohtake

Eric White

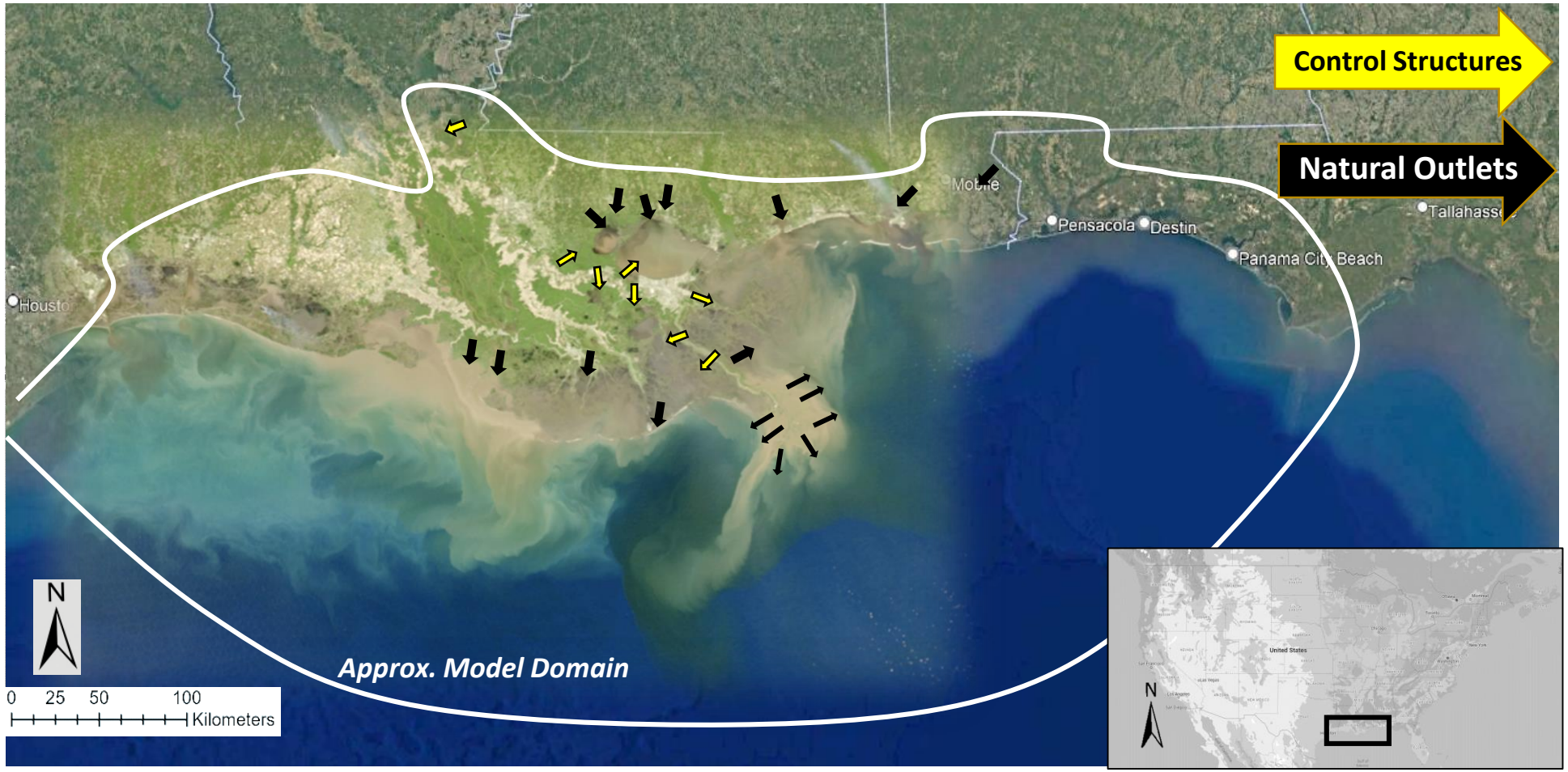
Katelyn Keller

Ahmed Khalifa

Kiley Marandino

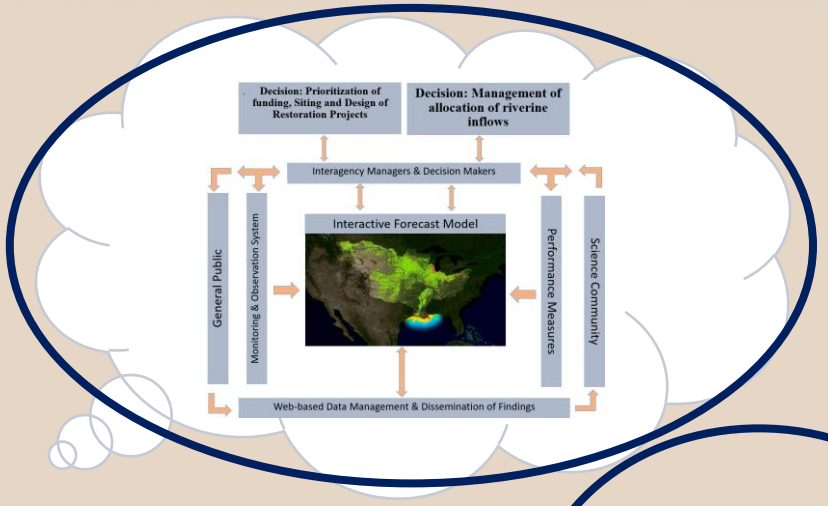
Ali Abdelrahim

Lea Goldstein


Control Structures
Natural Outlets
Mobile
Pensacola
Destin
Panama City Beach
Houston
N
Approx. Model Domain
0 25 50 100
Kilometers
United States
N

Key Partners

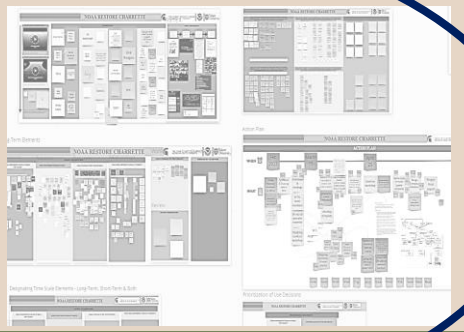
Co-Production Effort



Design Kickoff

Toolbox Dialogue Initiative

Design Charrette



Team Additions

Design Process Timeline

Conceptual Design

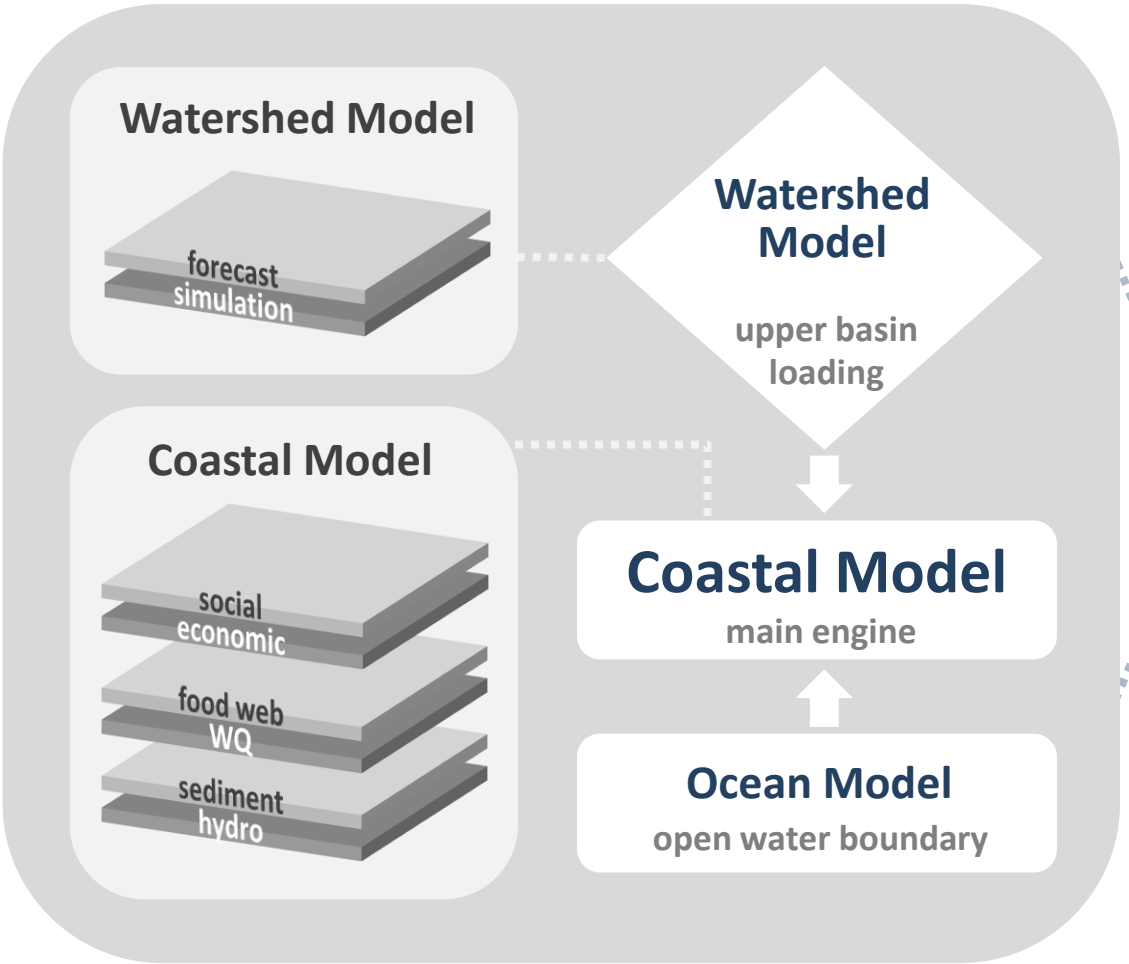
Knowledge Sharing

Focus Groups

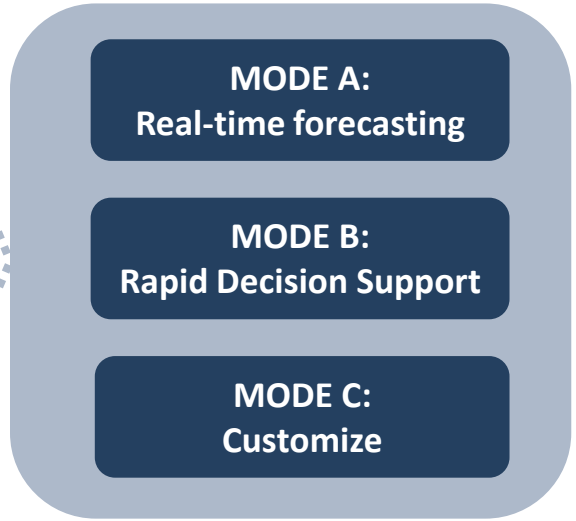
Working Sessions

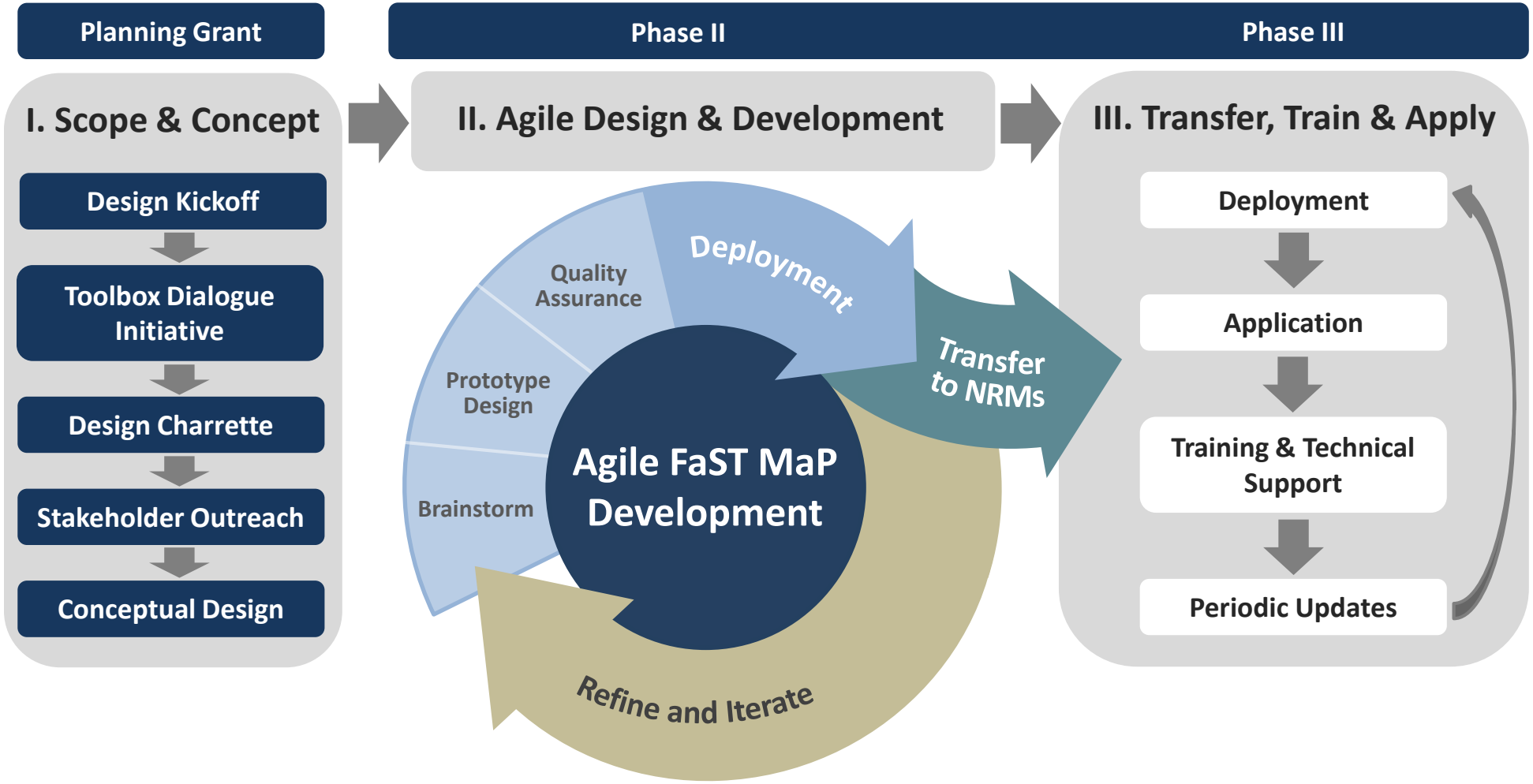
Design Enhancements

BUILT MODEL FRAMEWORK



USER INTERFACE



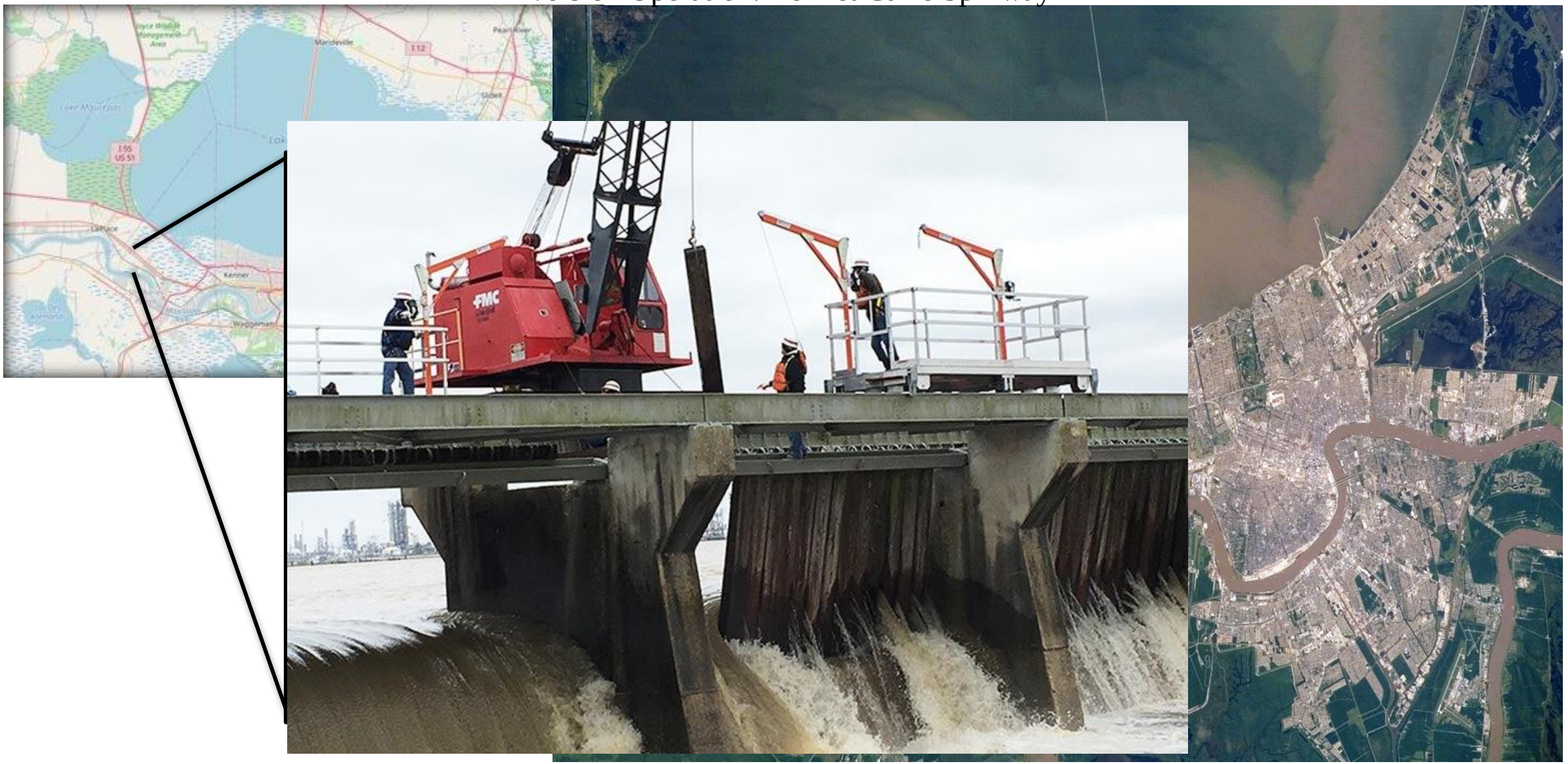

Planning Grant
Phase II
Phase III
I. Scope & Concept
Design Kickoff
Toolbox Dialogue Initiative
Design Charrette
Stakeholder Outreach
Conceptual Design
II. Agile Design & Development
Brainstorm
Prototype Design
Quality Assurance
Deployment
Agile FaST MaP Development
Refine and Iterate
Transfer to NRMs
III. Transfer, Train & Apply
Deployment
Application
Training & Technical Support
Periodic Updates

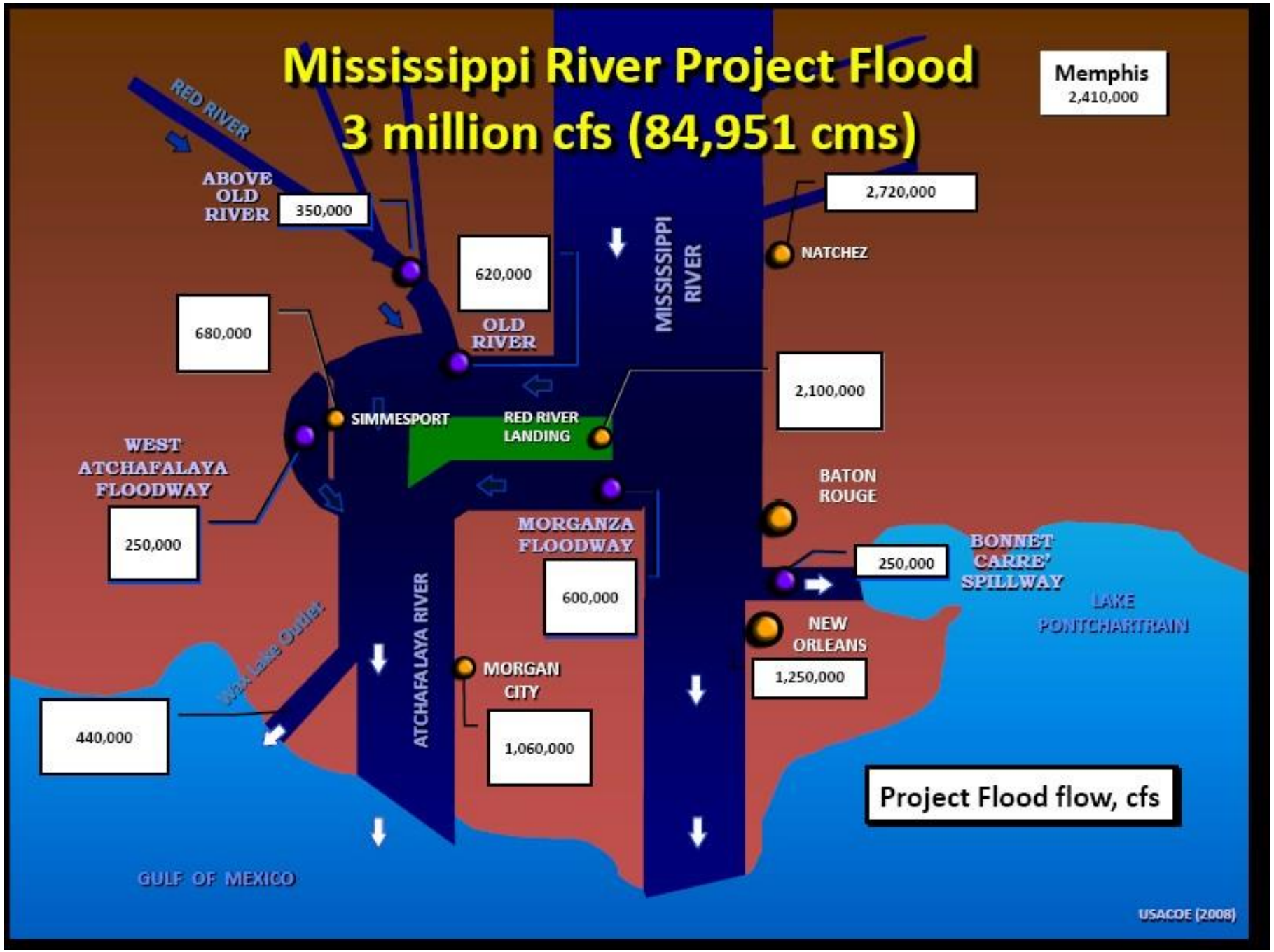
Preliminary Analysis

Mode A: Real Time Forecasting

Hydro – Sediment - WQ

Diversion Operation: Bonnet Carre Spillway

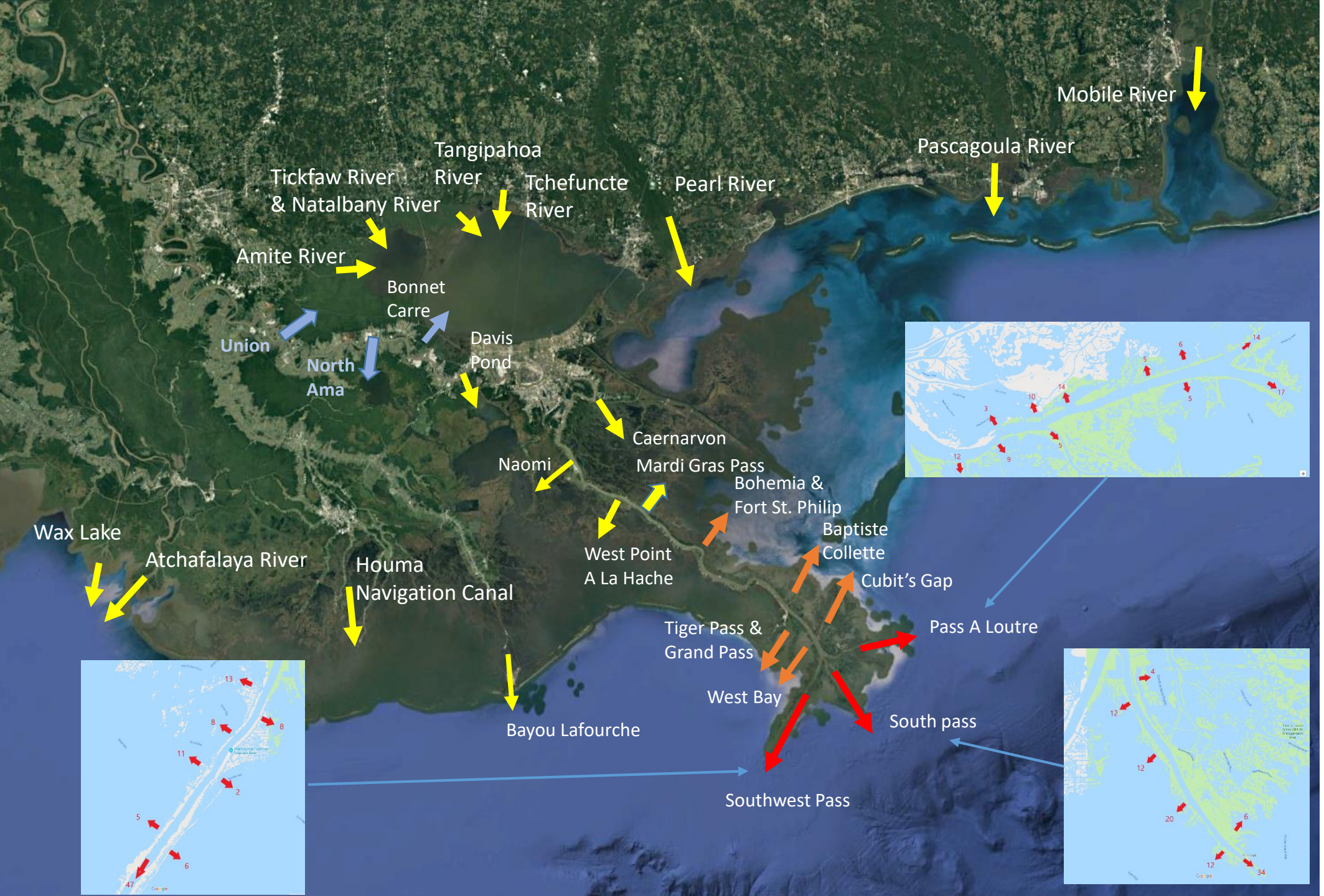



Mississippi River Project Flood
3 million cfs (84,951 cms)
Memphis
2,410,000
RED RIVER
ABOVE OLD RIVER
350,000
620,000
OLD RIVER
MISSISSIPPI RIVER
2,720,000
NATCHEZ
680,000
2,100,000
SIMMESPORT
RED RIVER LANDING
WEST ATCHAFALAYA FLOODWAY
250,000
BATON ROUGE
MORGANZA FLOODWAY
600,000
250,000
BONNET CARRE' SPILLWAY
LAKE PONTCHARTRAIN
NEW ORLEANS
1,250,000
ATCHAFALAYA RIVER
MORGAN CITY
1,060,000
440,000
GULF OF MEXICO
Project Flood flow, cfs
USACOE (2008)

Bonnet Carré Spillway Operation Record

Year	Duration	Max bays opened	Maximum discharge (cfs)
1937	01/28 – 03/16	285	211,000
1945	03/23 – 05/18	350	318,000
1950	02/10 – 03/19	350	228,000
1973	04/08 – 06/21	350	207,000
1975	04/14 – 04/26	225	110,000
1979	04/17 – 05/31	350	228,000
1983	05/20 – 06/23	350	268,000
1994	05/16 – 05/26	30	14,000
1997	03/17 – 04/18	298	243,000
2008	04/11 – 05/08	160	160,000
2011	05/09 – 06/20	330	316,000
2016	01/10 – 02/01	210	203,000
2018	03/08 – 03/30	186	196,000
2019	02/27 – 04/11	206	213,000
2019	05/10 – 07/27	168	161,000
2020	04/03 – 05/01	90	90,000

Discharge Sources

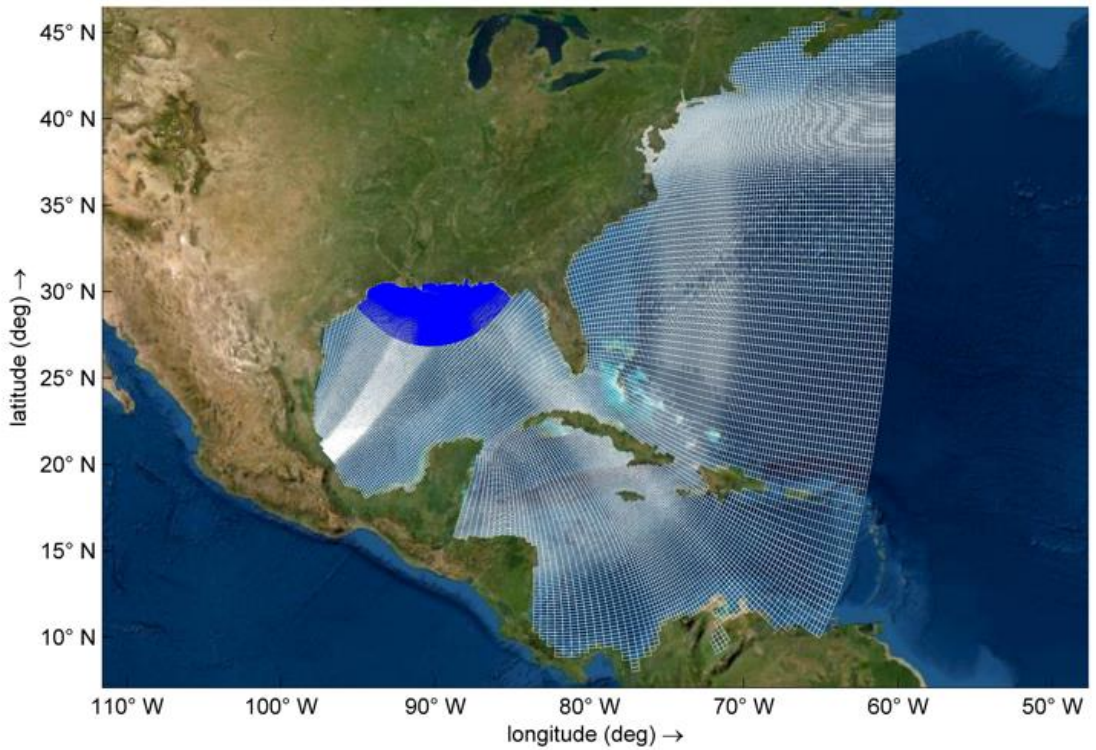


Gulf-Atlantic Model

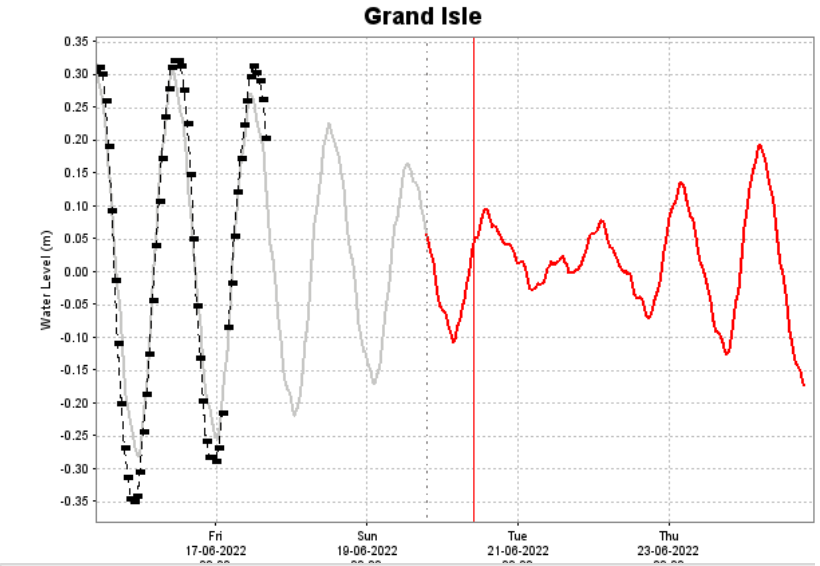
- Size 253 x 238
- Resolution 6 - 40 km
- Time step 6 min

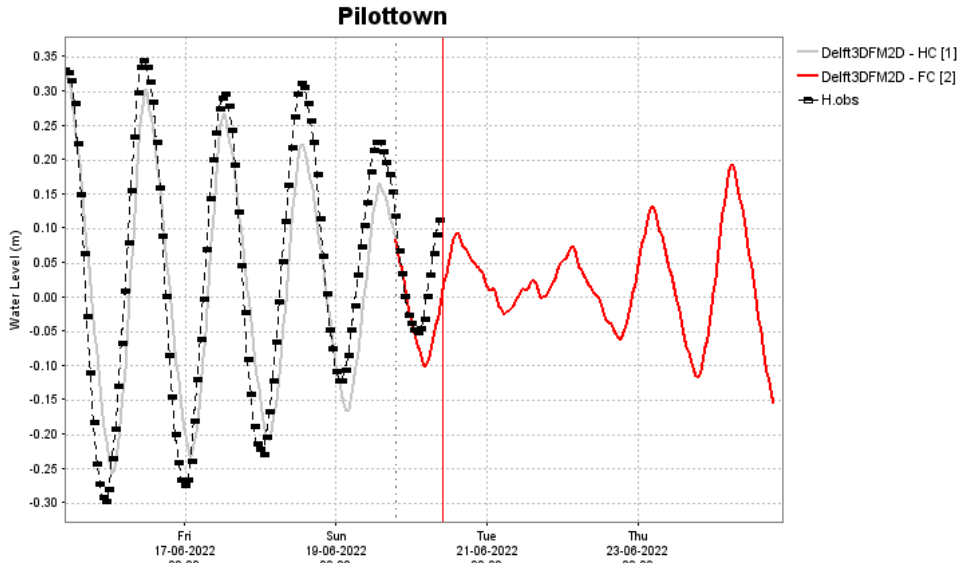
- 3D simulation with 7 vertical sigma layers, [5, 10, 20, 30, 20, 10 and 5]% of total depth.

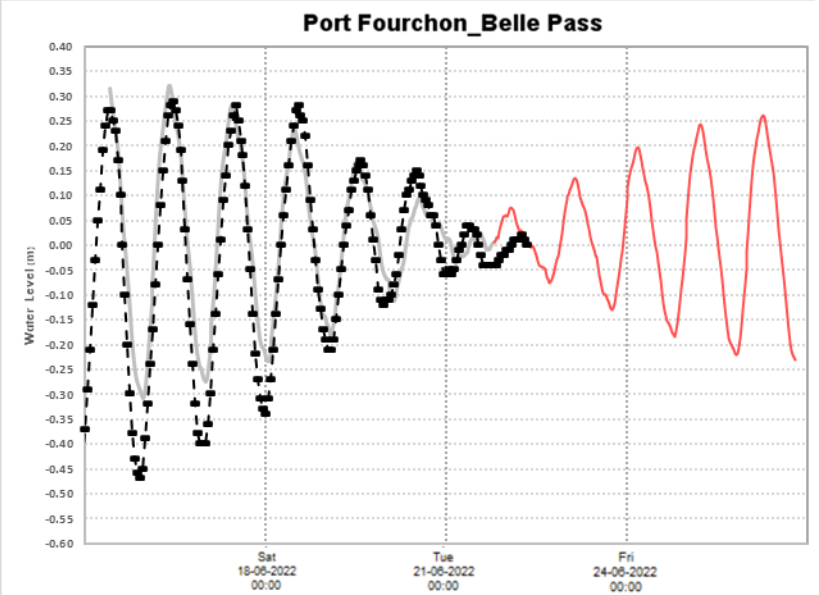
- Run time: 2 hours (10 processors) for a one-year simulation

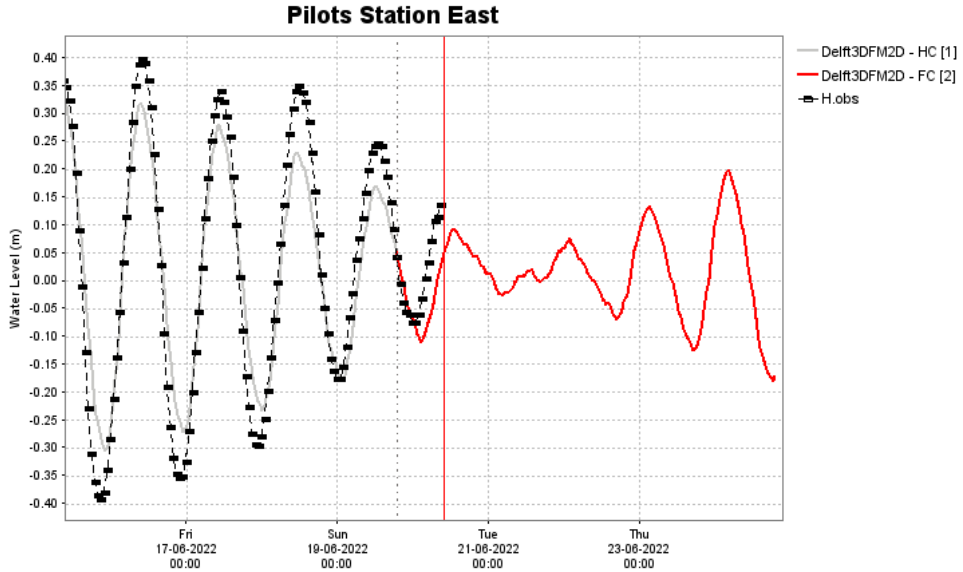


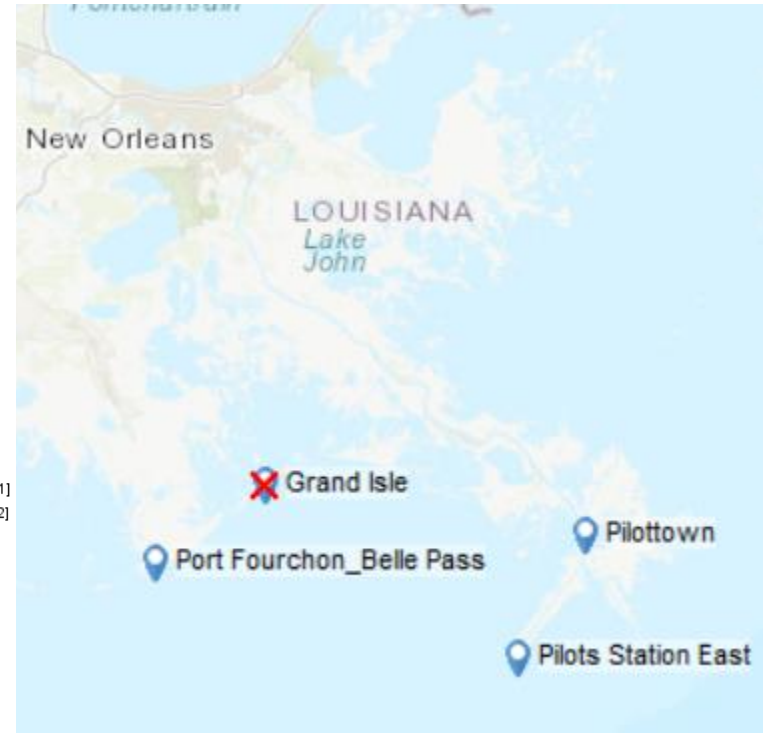
Sample Output at Select Locations of Interest







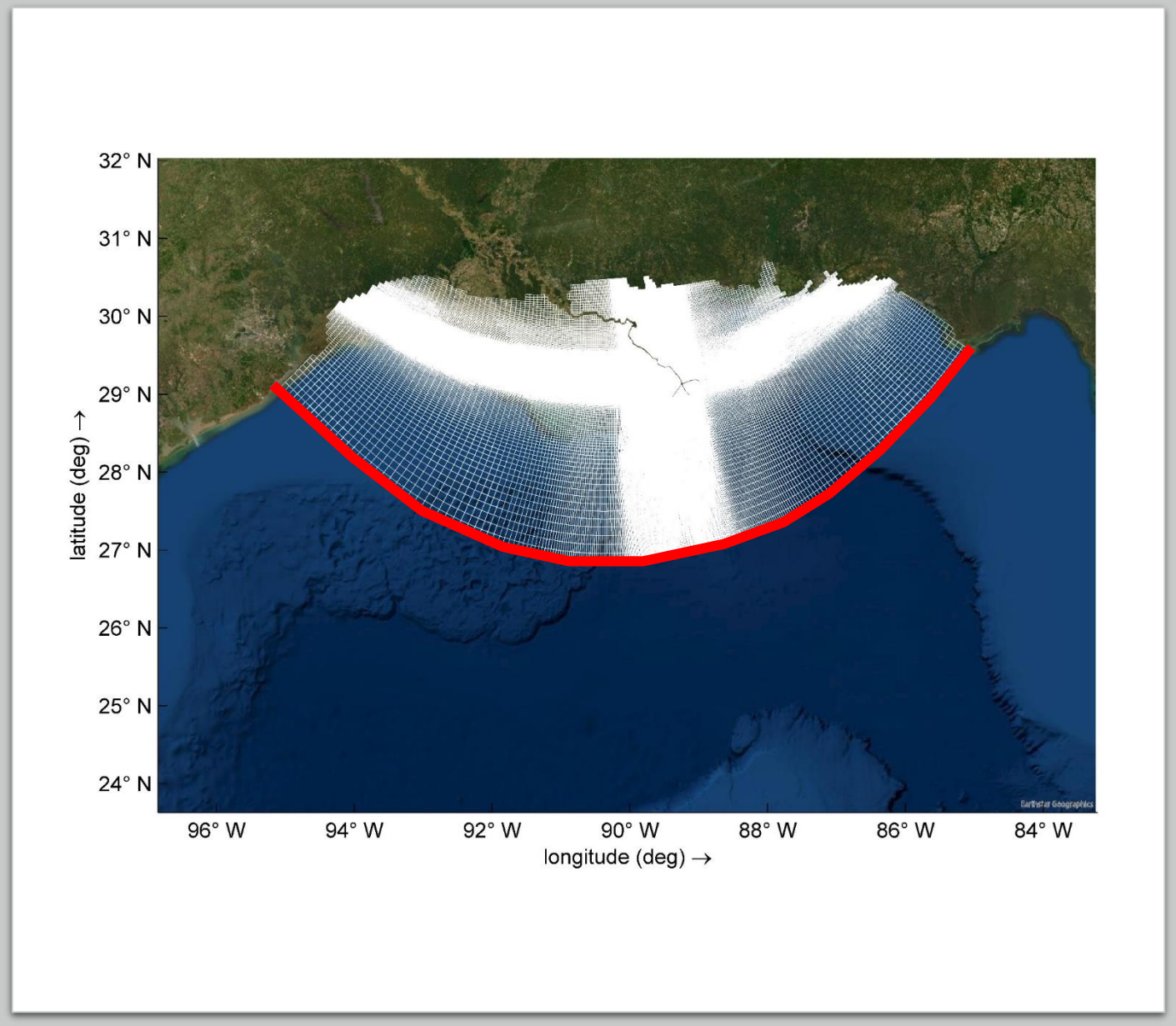




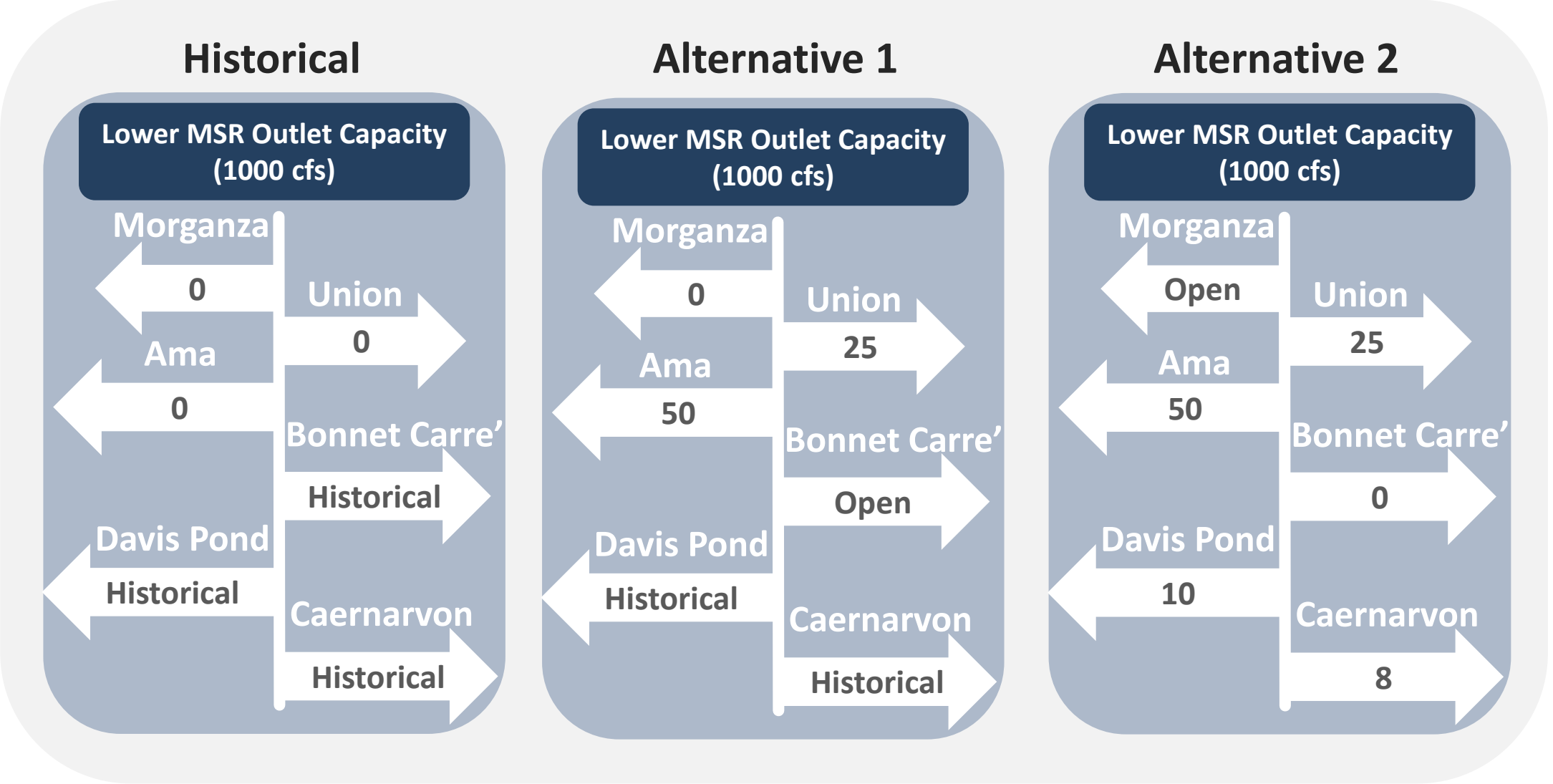
Regional Model

- Regional domain

- Size 553 x 403
- Resolution 280m – 7km
- Time step 0.6 min
- Run time 2.3 hrs – 10 day run

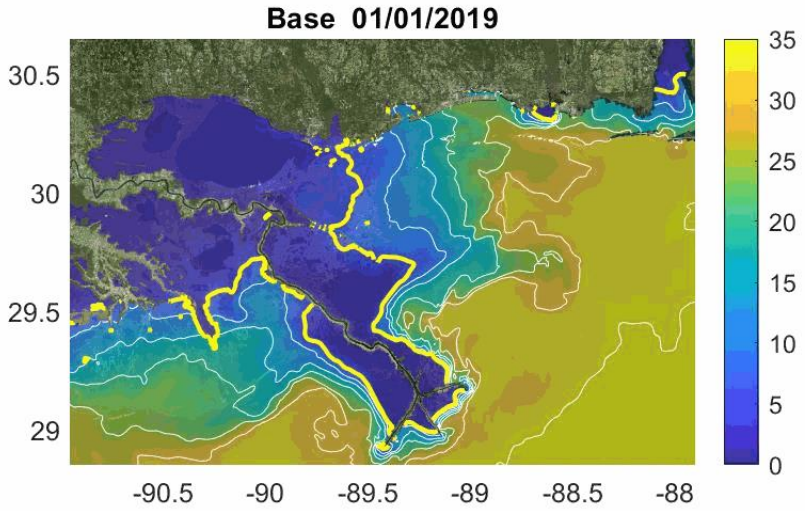


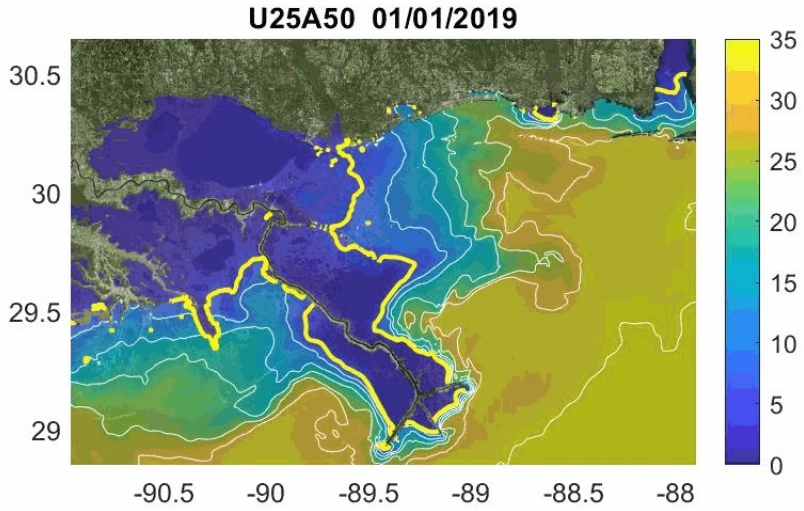
Flood Risk Management Scenarios



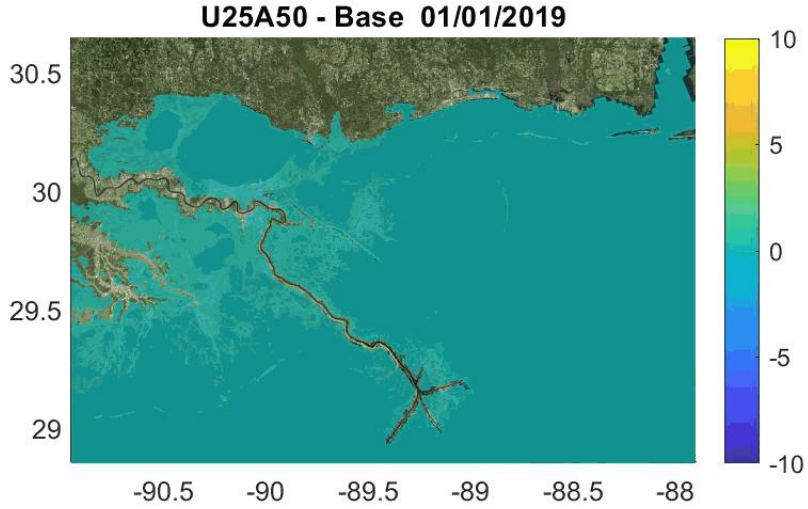
Historical Versus Alternative #1

Salinity (ppt, thick yellow line: 5-ppt contour)



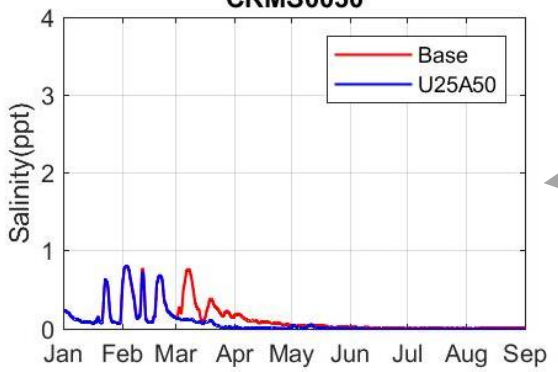


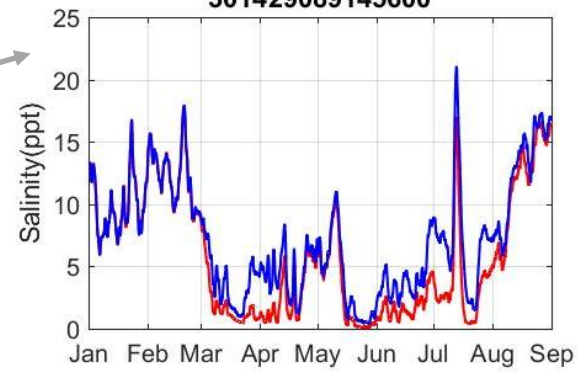
Salinity difference (ppt)

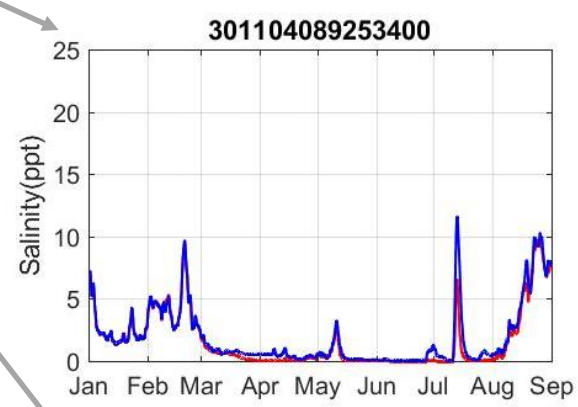


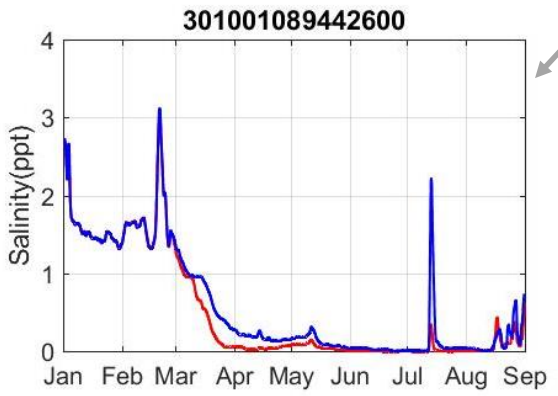
Salinity (ppt)

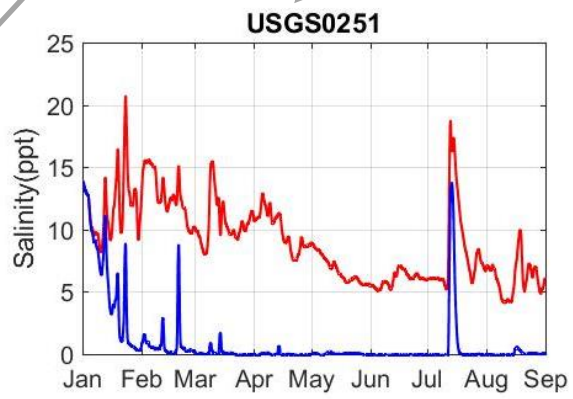
Historical Versus Alternative #1

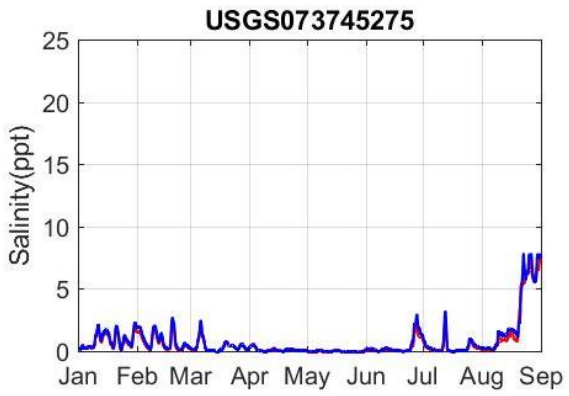


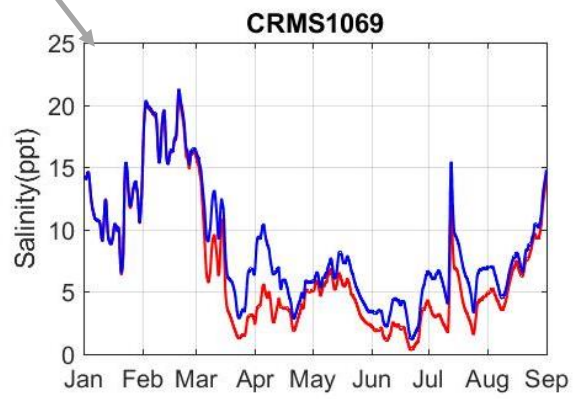






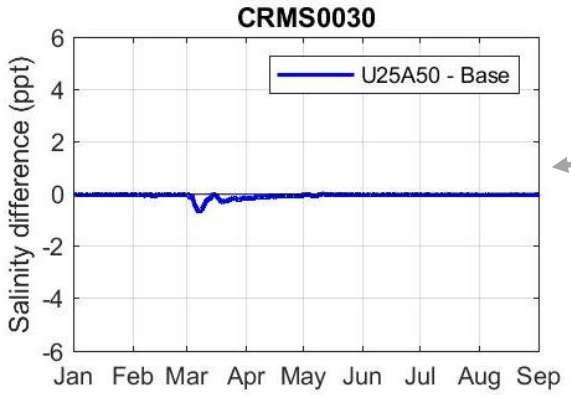


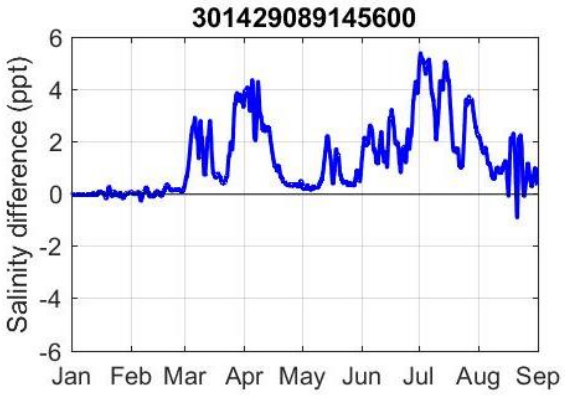


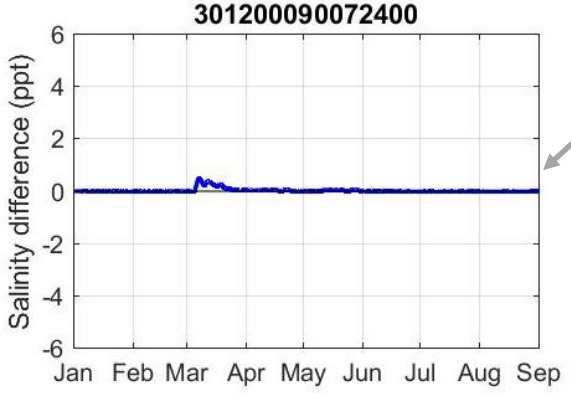


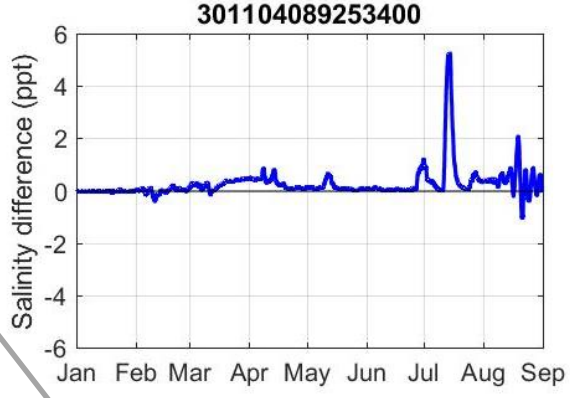
Salinity difference (ppt)

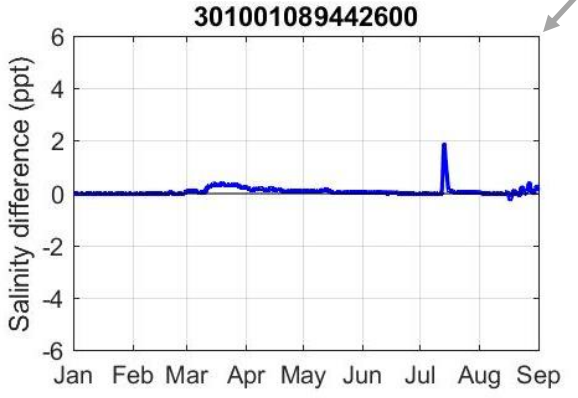
Historical Versus Alternative #1

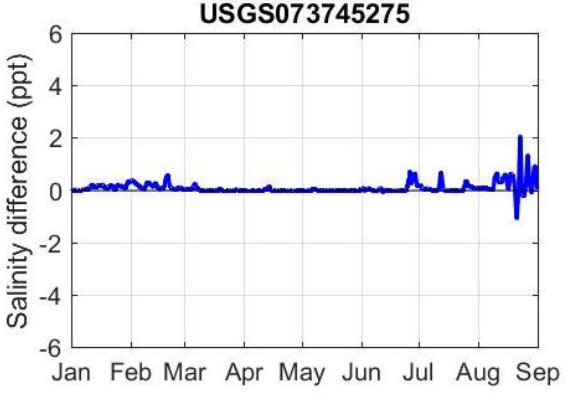


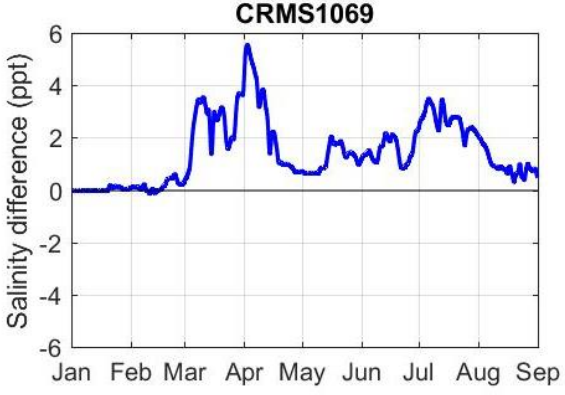




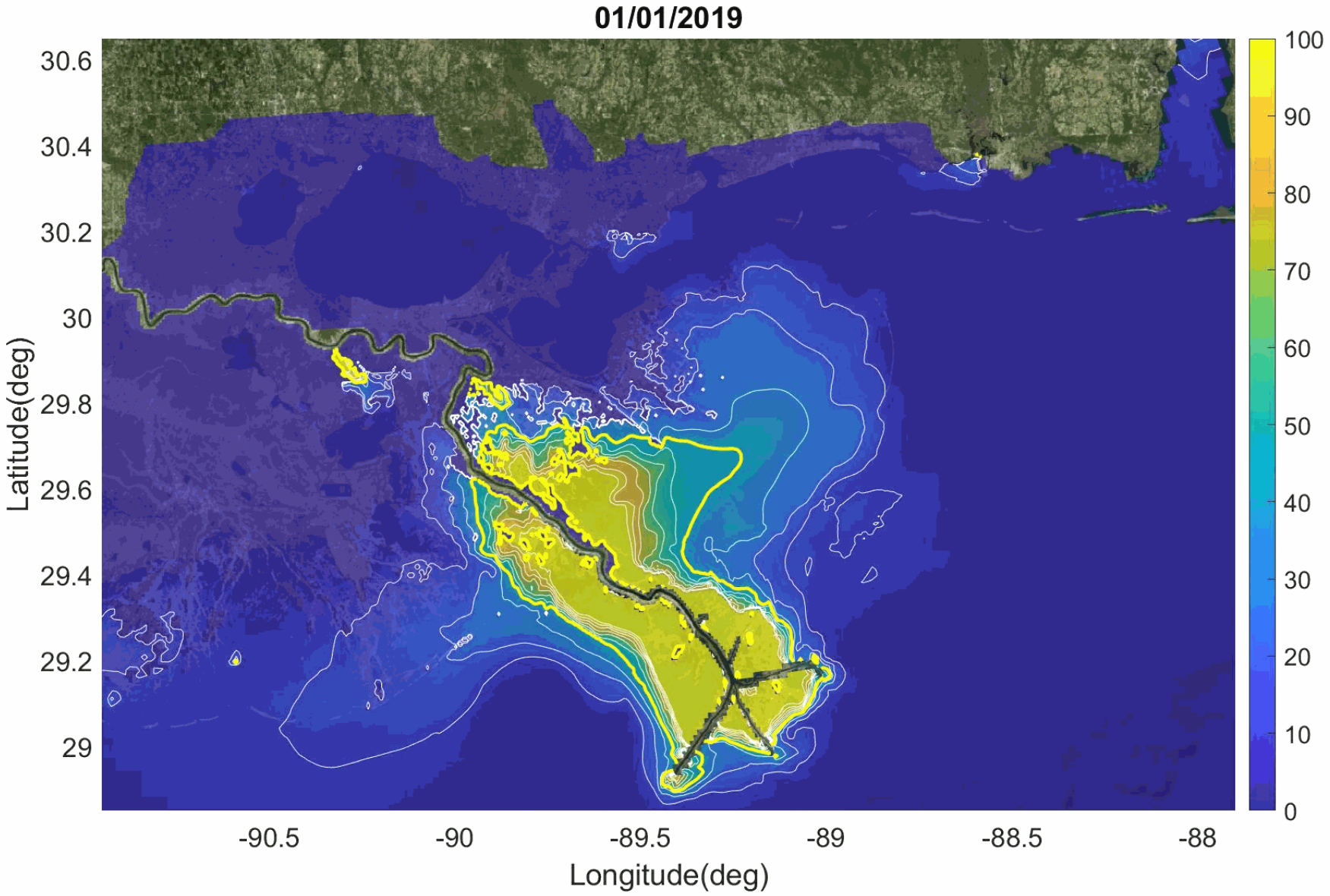




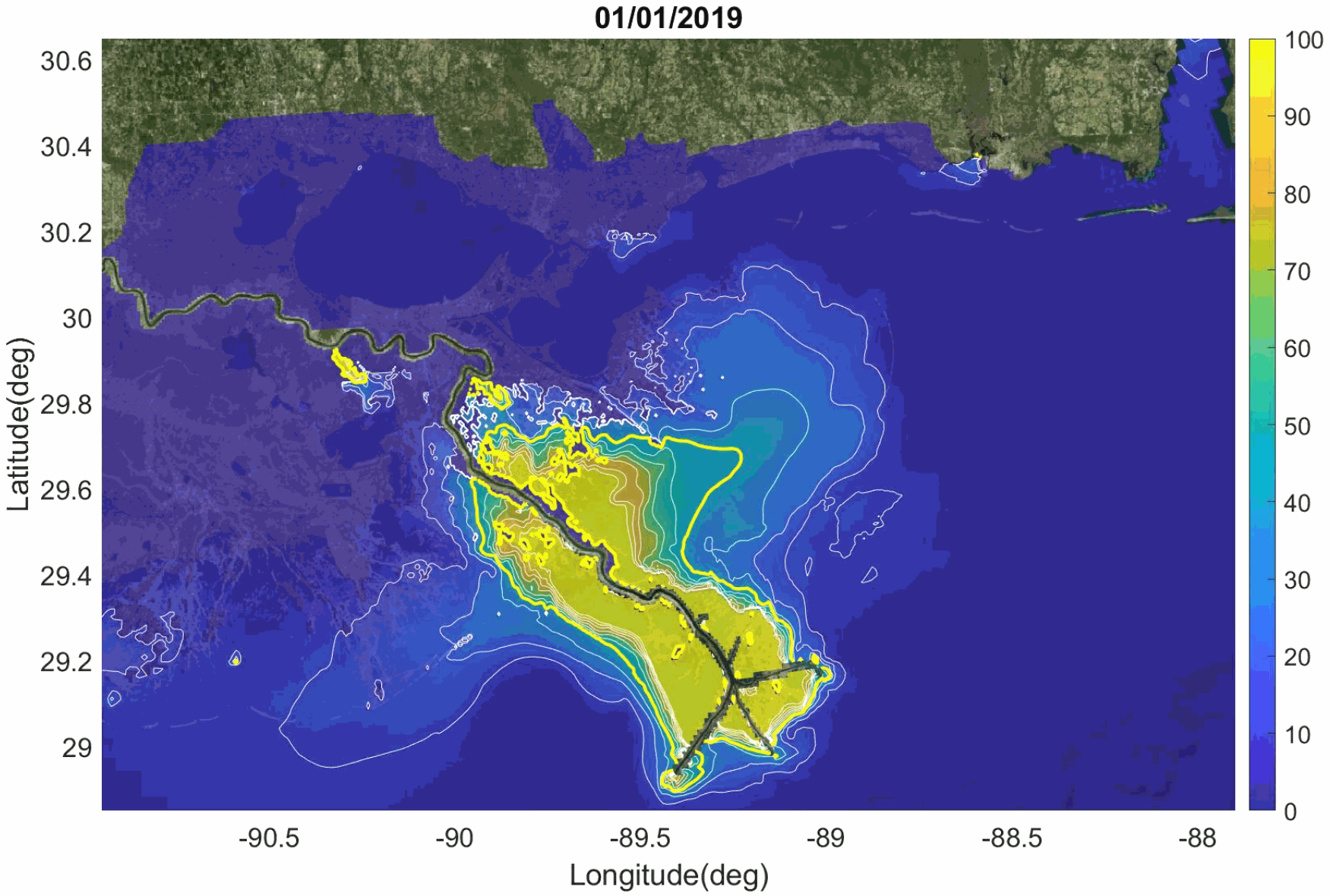




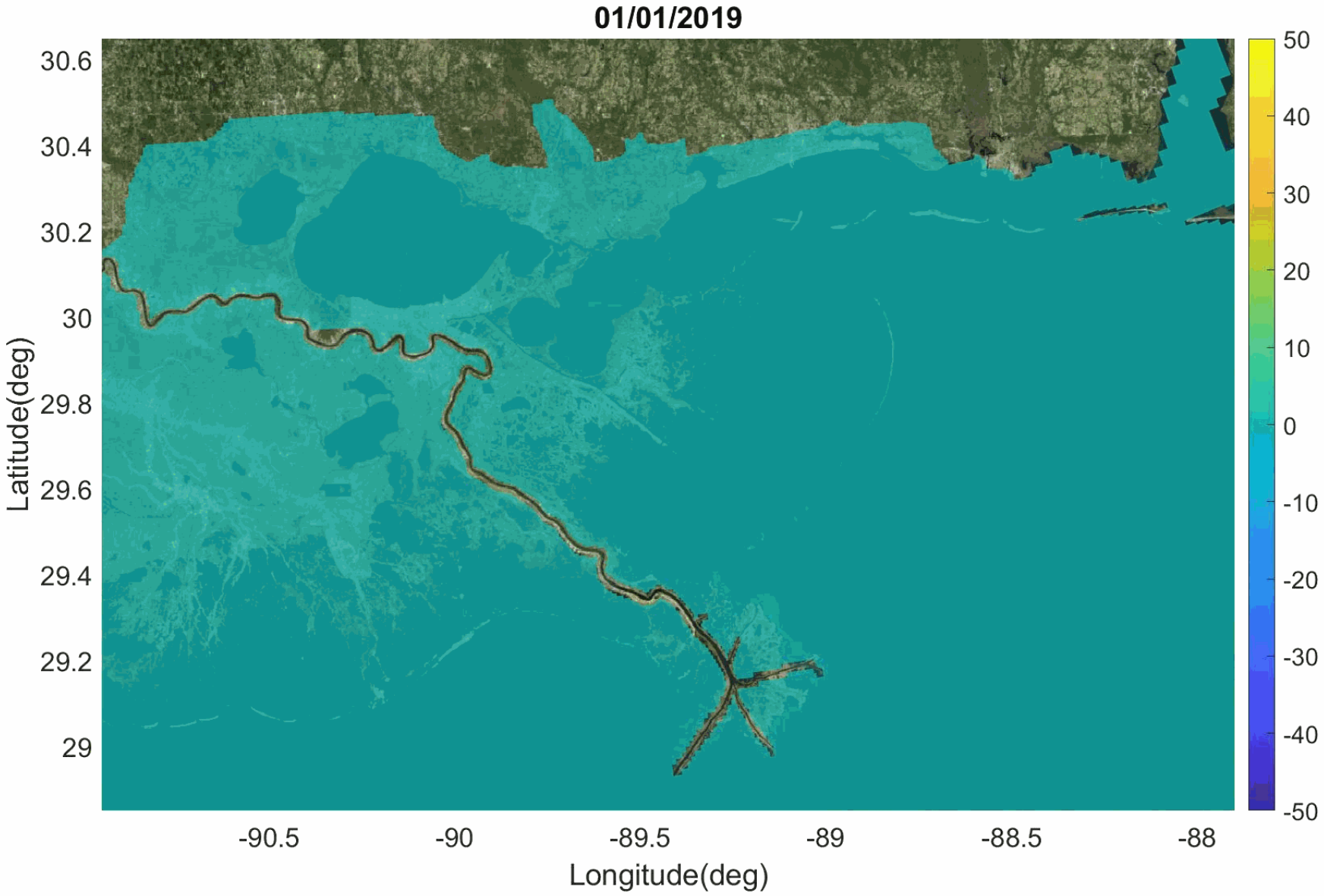
2019 Historical SST (mg/l, thick yellow line: 40-mg/l contour)



2019 Alternative #1 SST (mg/l)

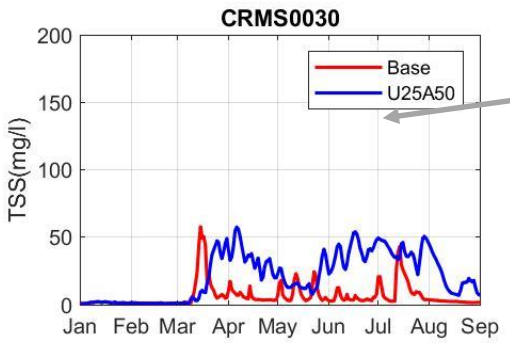


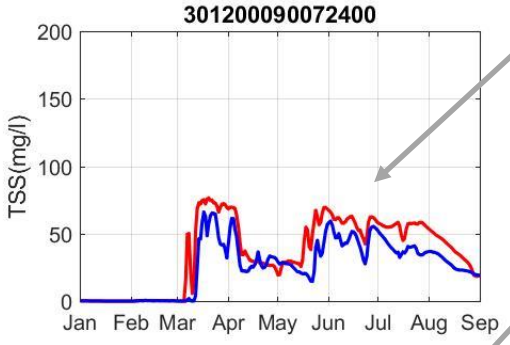
2019 Alternative #1 SST (mg/l) – Historical SST (mg/l)

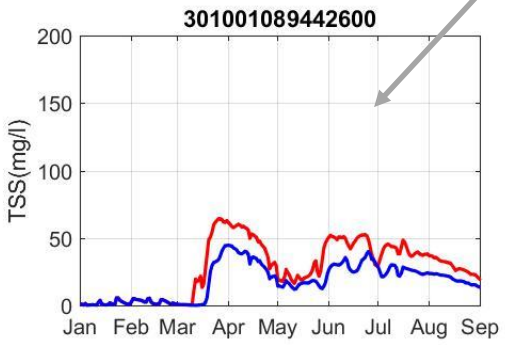


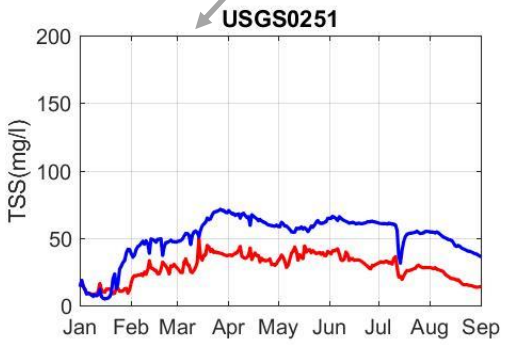
TSS (mg/l)

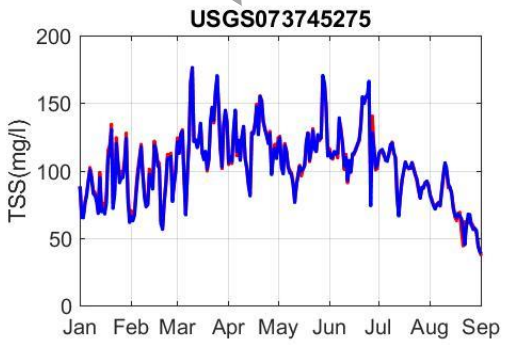
Historical Versus Alternative #1

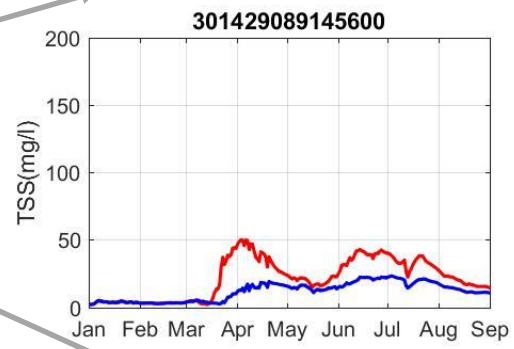


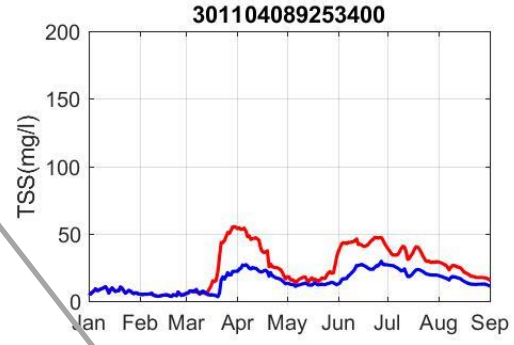


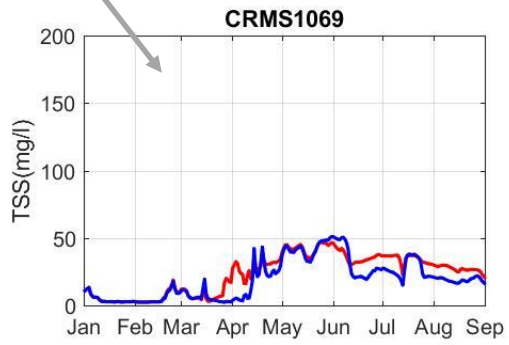




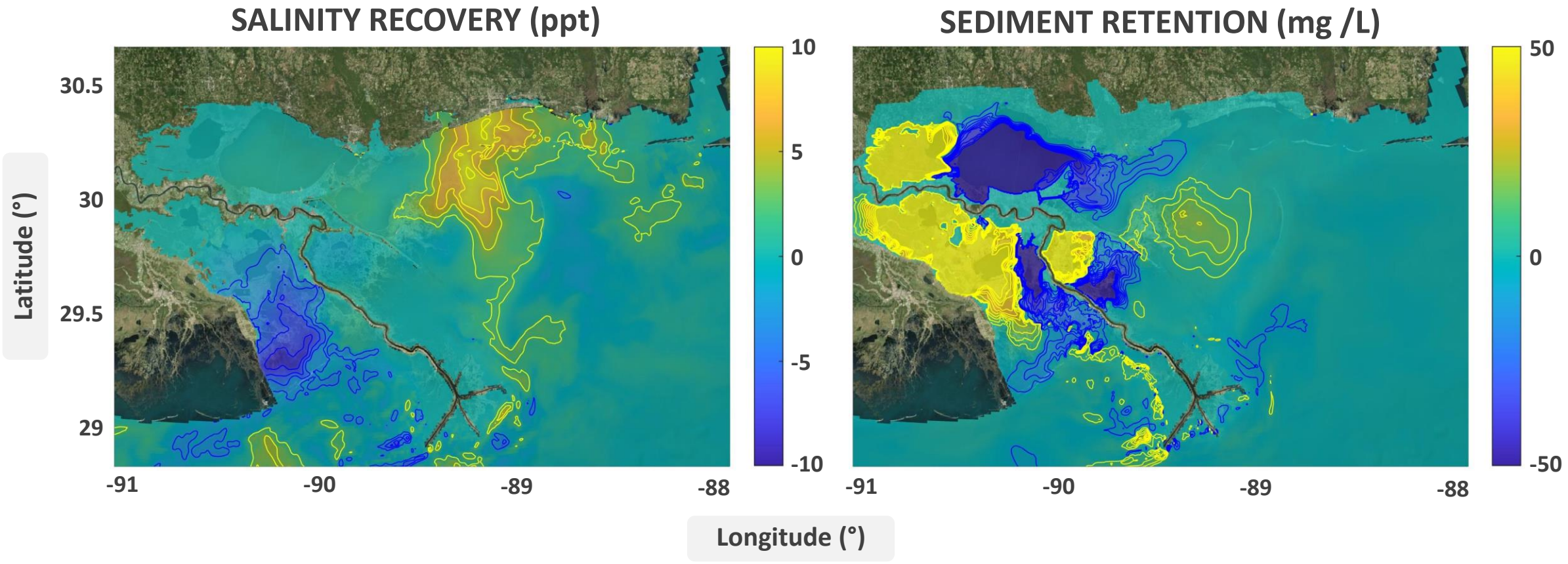








Historical Versus Alternative #2



Closing Remarks

- Coproducing the system with Natural Resources Managers ensures their needs and priorities are integrated into the design
- Decision-making uncertainties is challenging but a high priority
- Forecasted parameters must be translated to attributes and outcomes readily usable by managers and stakeholder