



WORKING WITH LOCAL COMMUNITIES TO DEVELOP A NATURE-BASED DEFENSE ASSESSMENT AND SOLUTION TOOL

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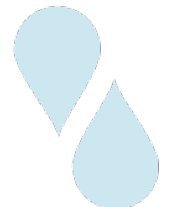
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*NCER 2018
New Orleans, LA*

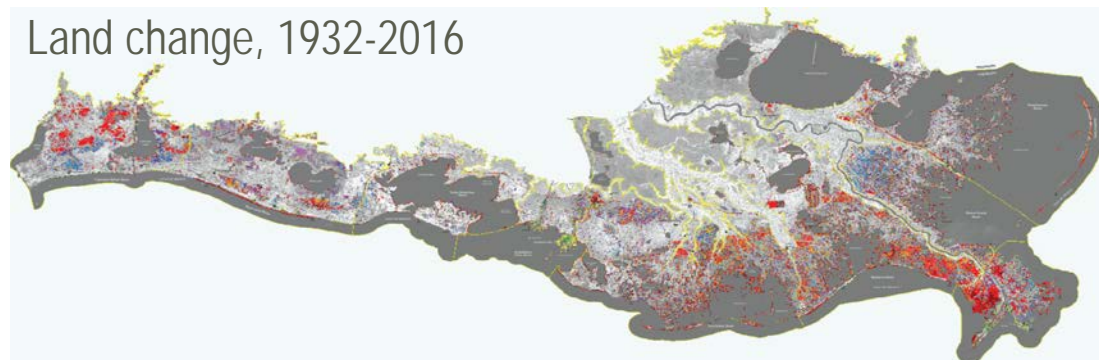
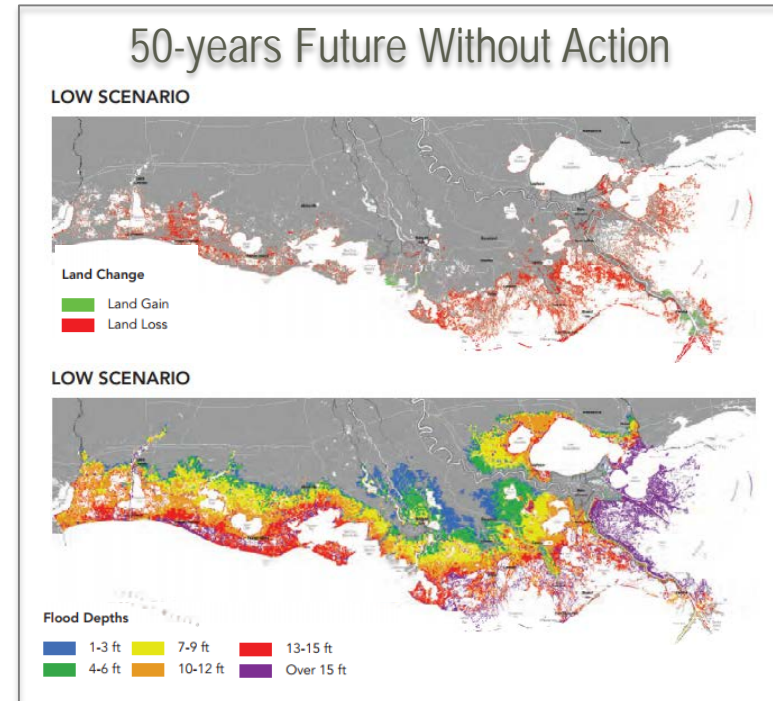


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COASTAL HAZARDS TO HUMANS

- Land Loss
 - From 1932 to 2016, decrease of about 25% of coastal land : ~5,000 km² (Couvillion et al., 2017)
 - Habitat loss
 - Fisheries loss
 - Reduced protection from flooding
- State of Louisiana hopes to invest and plans for ~\$50 billion on addressing land loss and reducing risk to storm hazards (2017 Coastal Master Plan)



SOLUTIONS

- Decisions to be made about solutions:
 - **Natural:** conserving existing habitats (e.g., salt marsh)
 - **Nature-based:** creating solutions by utilizing nature-type processes (e.g., created marsh)
 - **Engineered approaches:** bulkheads, seawalls, levees, and jetties
- Require community buy-in and local knowledge



Natural marshes near Breton Sound



NATURAL AND NATURE-BASED (NNB)

- NNB Solutions Support Ecosystem Processes:
 - Wave attenuation
 - Nutrient assimilation
 - Fisheries Habitat
 - Soil carbon storage



Marsh soil core



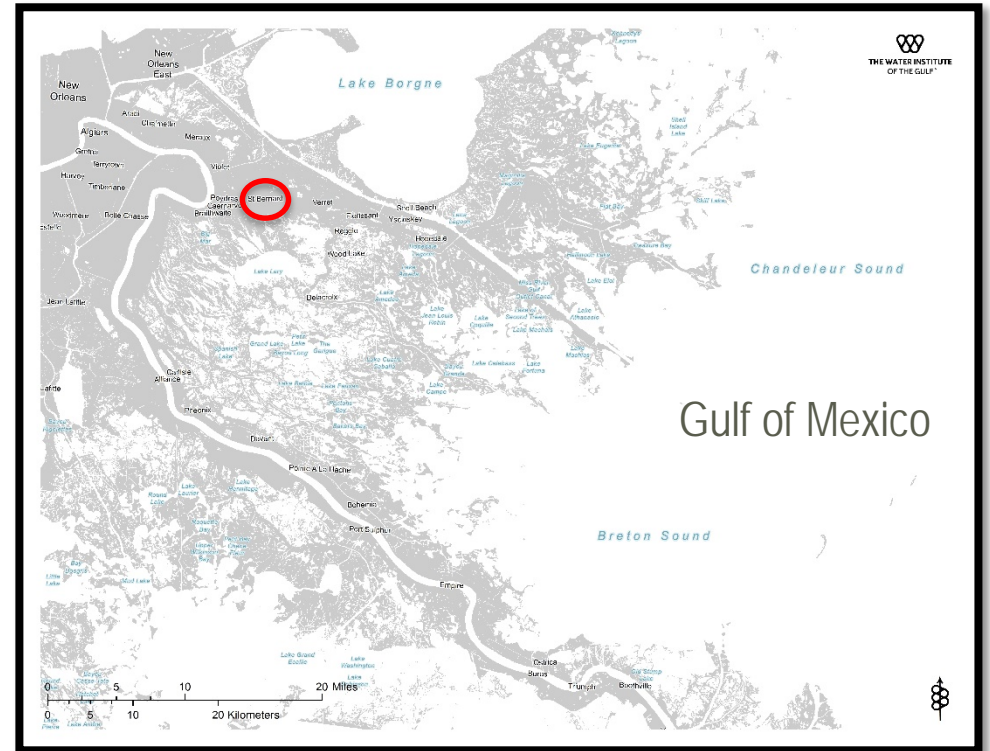
RESEARCH QUESTIONS

- Can collaborative approaches to modeling with communities produce innovative solutions or tools for reducing coastal risk?
- What is the contribution of natural and nature-based solutions to wave attenuation, nutrient assimilation, fish habitat, and soil carbon storage?



RESEARCH METHODS OVERVIEW

1. **Engage** with local communities to understand hazards and solutions.
2. Co-develop an ecosystem model
3. Run **scenarios** with natural and nature-based solutions



METHODS - ENGAGE

1. Engage: Competency Group

- Adapted from Landström et al. 2011
- Relies on controversy (restoration projects!) to prompt local residents to engage with science
- Bring scientists and concerned public together
- Attendees:
 - Commercial Fisherman
 - Marine owner
 - Charter fisherman
 - Land manager
 - Louisiana Sea Grant extension agent
 - Scientists
 - Engineers
- Host 5 meetings
- Facilitated by social scientists
- Ecosystem of interest: Breton Sound Estuary



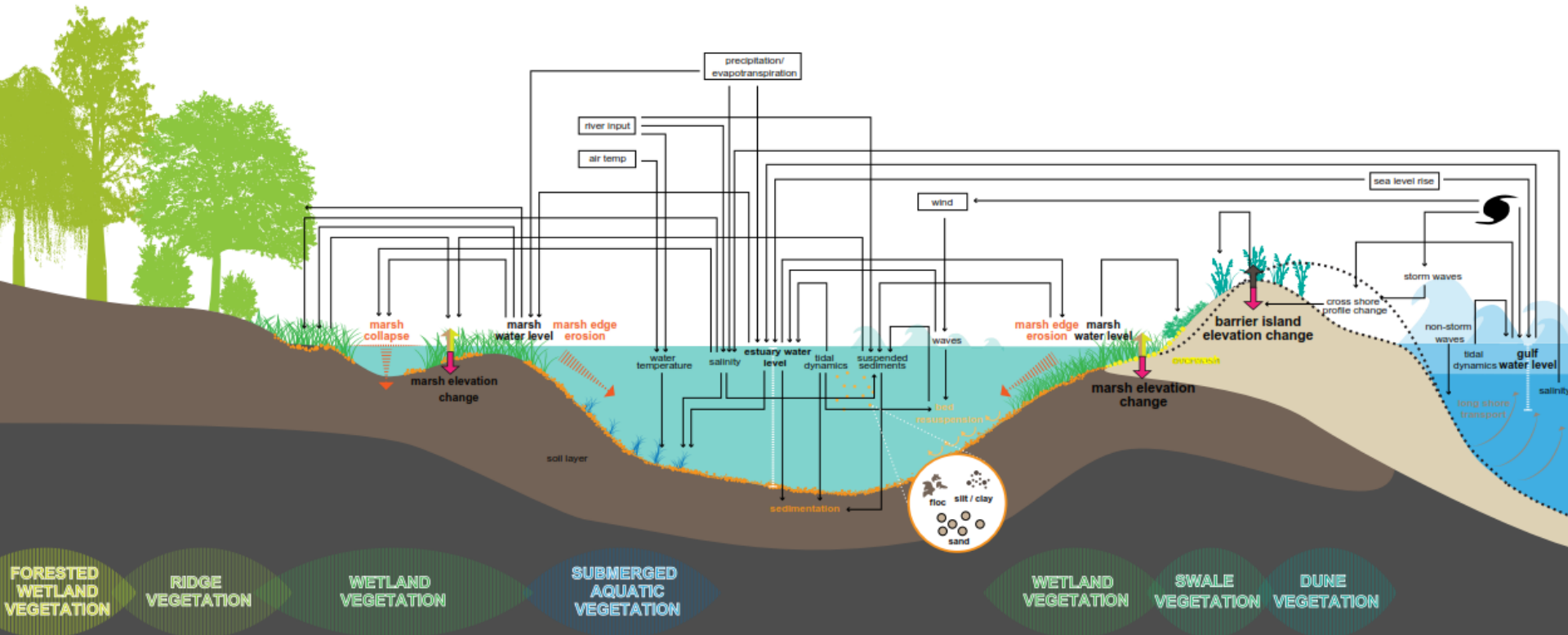
Meeting #3, May 29, 2018



METHODS - MODEL

2a. Planning-level Model - Participatory modeling

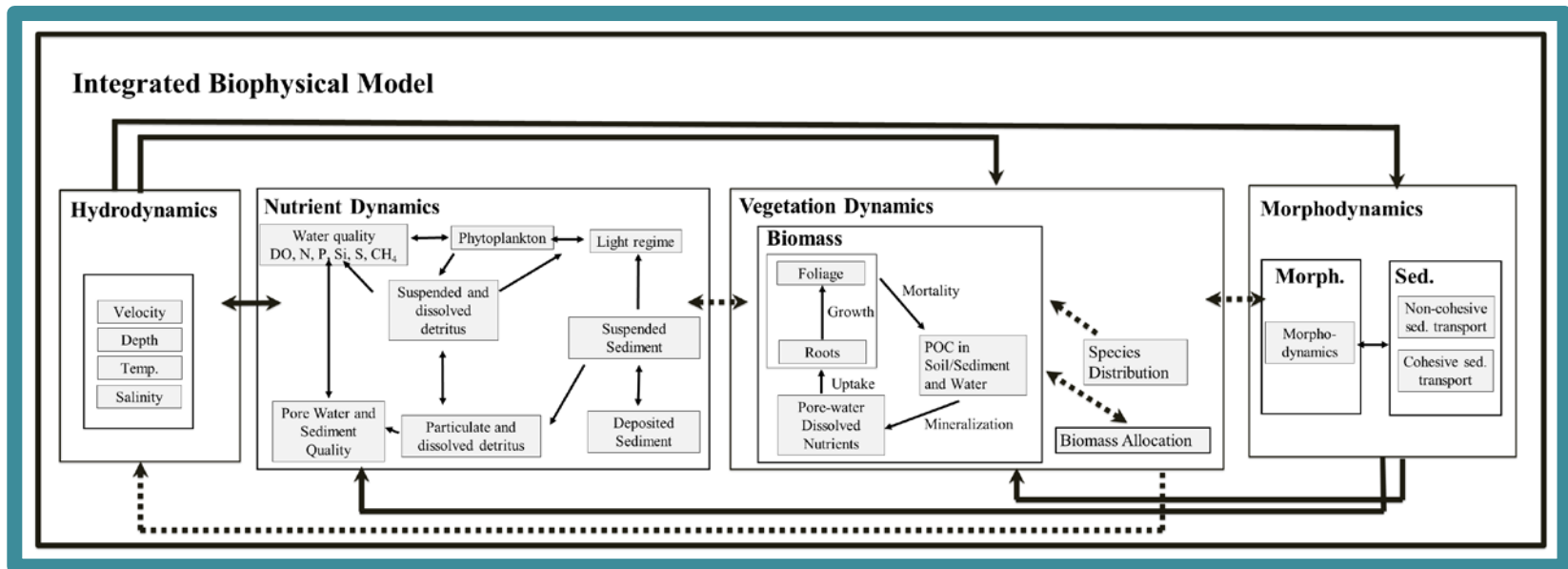
- Ecosystem: wetland and estuarine habitats
- Integrated Compartment Model (ICM) – used in 2017 Coastal Master Plan
- Efficiently test multiple scenarios across multi-decadal timescales



METHODS - MODEL

2b. Ecosystem Model - Participatory modeling

- Ecosystem: wetland and estuarine habitats
- Delft3D open source code
- Coupled 4 ecosystem components: Integrated Biophysical Model



Meselhe et al. 2015; Baustian et al. In Press.



METHODS - SCENARIOS

3. Run scenarios with solutions

- Provided maps and worksheets
- Scenarios included:
 - Projects or solutions
 - Future conditions
- Utilize ecosystem model to run scenarios with solutions - currently underway!



Meeting #4, June 25, 2018



RESULTS - ENGAGE

1. Engage - Overall concerns

- Wetland area for future generations
- Hydrological restoration
- Proposed sediment diversion operation
- Subsidence rates
- Water quality

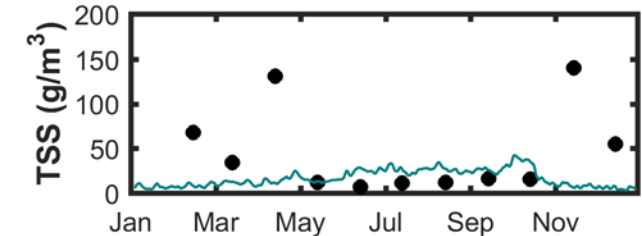
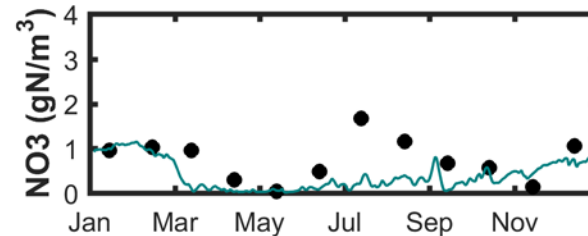
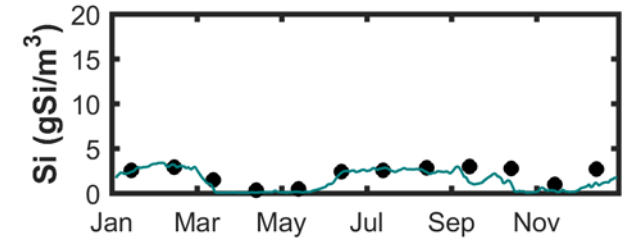
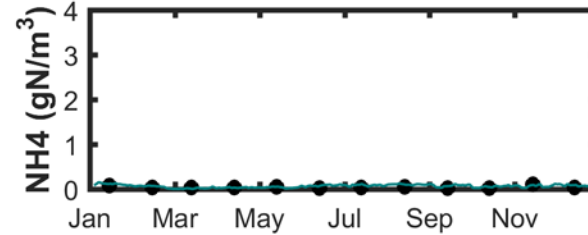
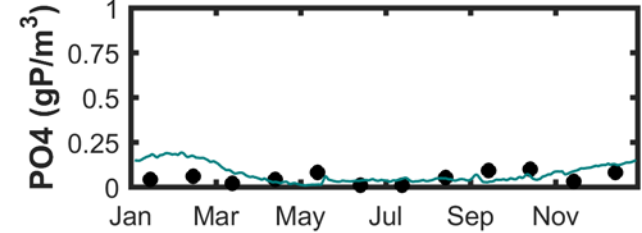
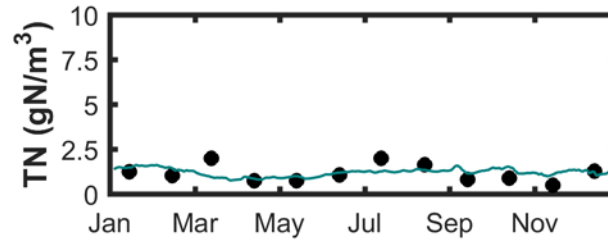
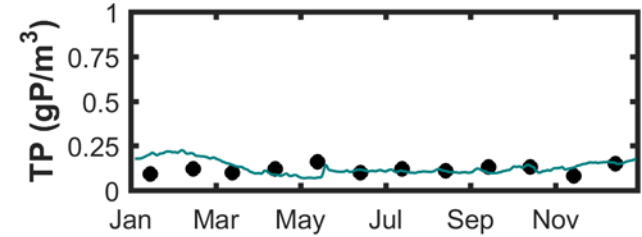
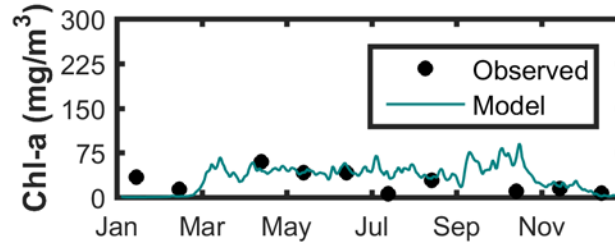


Meeting #3, May 29, 2018



RESULTS - MODEL

2. Model Output – Water Quality



Time (in 2009)

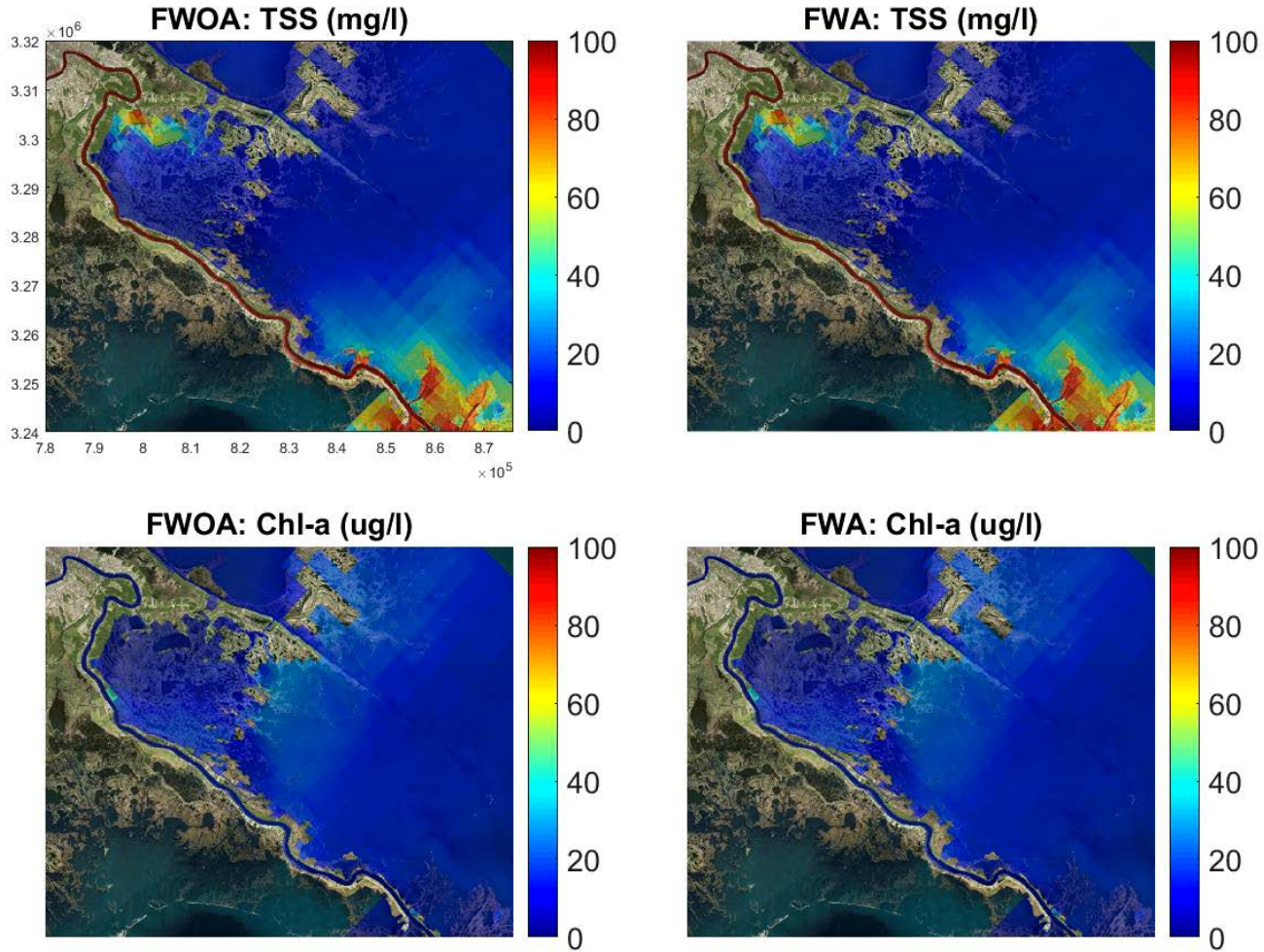
Time (in 2009)



RESULTS - MODEL

2. Model Output – Water Quality

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RESULTS - SCENARIOS

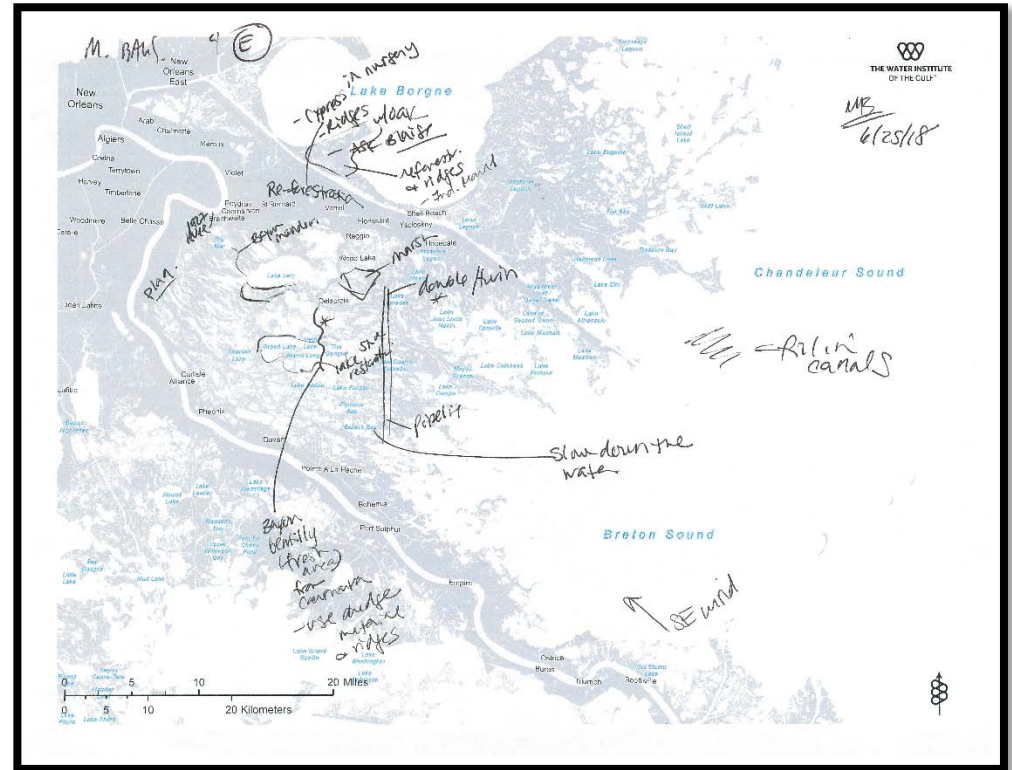
3. Scenarios-

– Projects (Nature-based):

- Marsh terracing
- Marsh creation
- Reforestation
- Ridge restoration
- Sand nourishment

– Future Conditions:

- TS/Hurricane conditions
- Sea level rise
- Allowing more sediment into freshwater diversions
- Alter weather patterns (rainfall and drought)



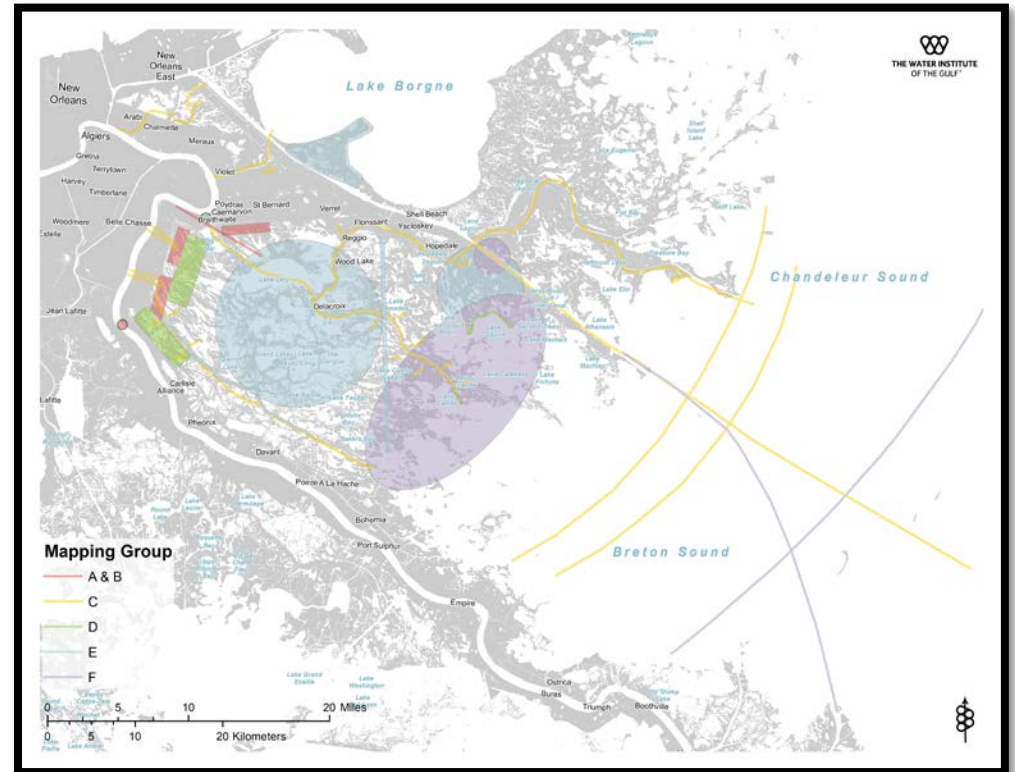
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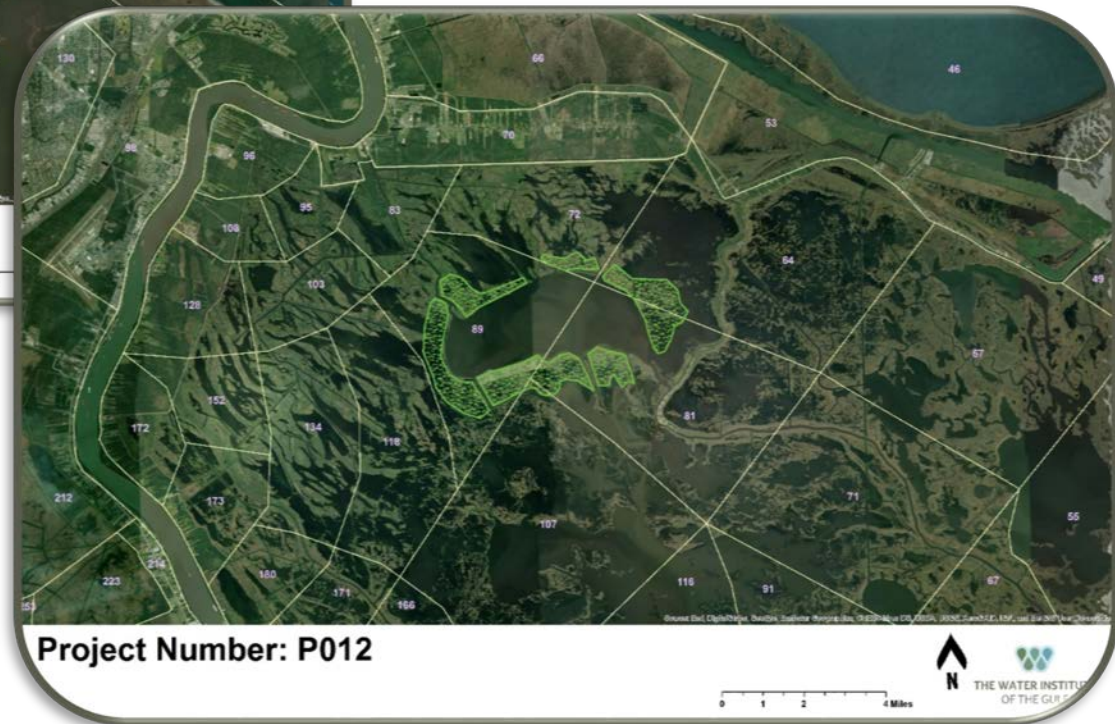
RESULTS - SCENARIOS

3. Scenarios-

- Summarized the hand-written notes from maps for all groups



RESULTS - SCENARIOS



ONGOING & NEXT STEPS

- Ecosystem model runs with projects+scenarios
- Discuss the model run output at the next competency group meeting
- Write manual about our methodology
- Write manuscripts about our results



Coastal Louisiana marsh



ACKNOWLEDGEMENTS

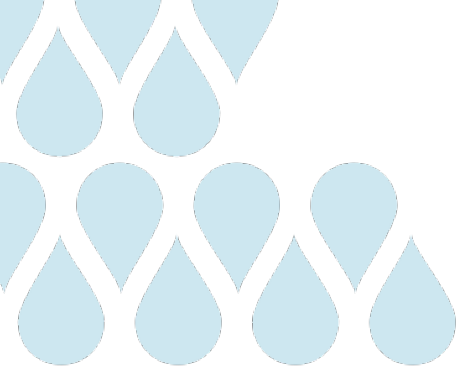
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THANK YOU

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