U.S.ARMY

INFLUENCE OF WETLAND NOURISHMENT ON COASTAL INLET SYSTEMS

INLET GEOMORPHIC EVOLUTION

Doug Krafft, Richard Styles

Tanya Beck, Mary-Claire Allison, Loderay Bracero Marrero

District PDT Members

Monica Chasten, Corraggio Maglio, Elizabeth Godsey, Richard Allen, Rod Moritz

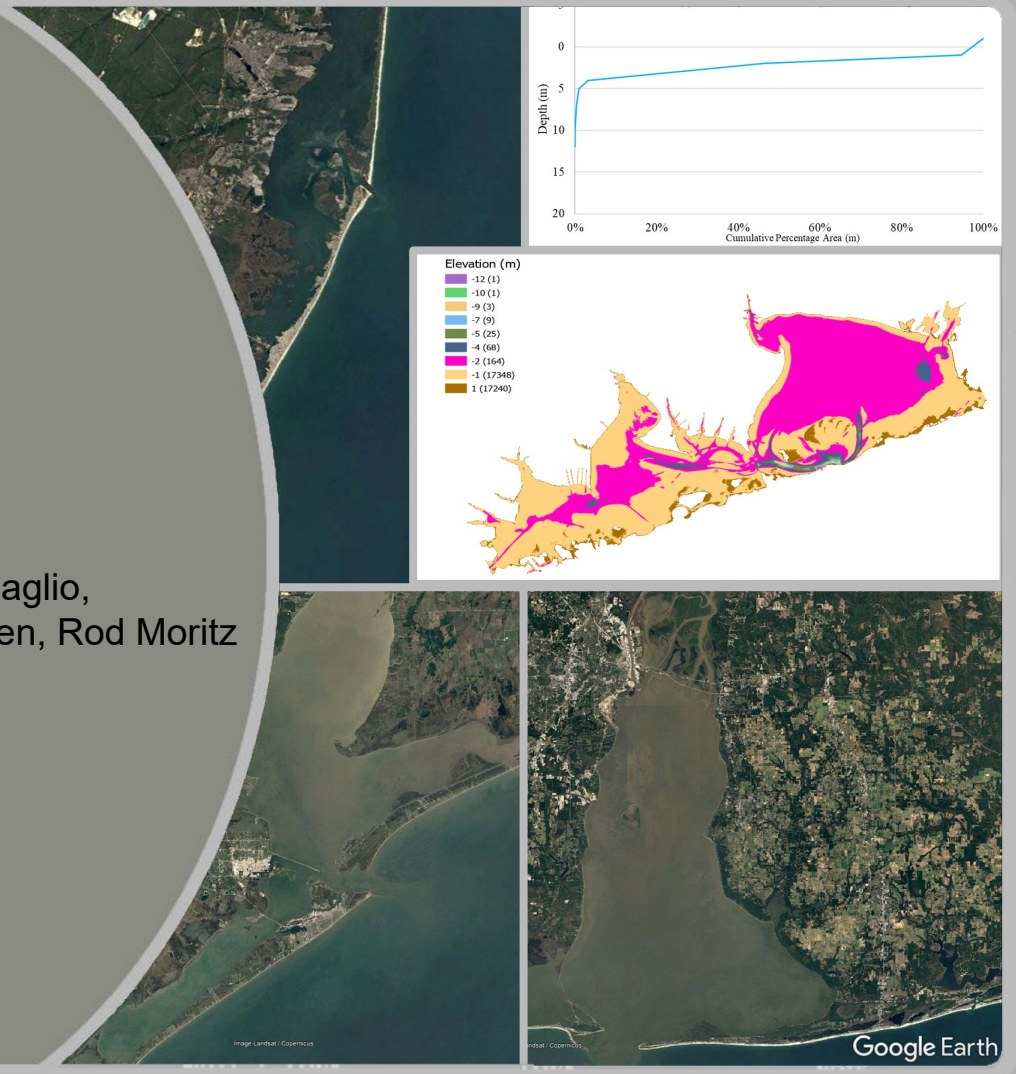
COASTAL INLETS RESEARCH PROGRAM

FY20 IN PROGRESS REVIEW

Mike Ott
HQ Navigation Business Line Manager

Eddie Wiggins
Technical Director

Katherine Brutsché
Associate Technical Director



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ERDC ENGINEER RESEARCH & DEVELOPMENT CENTER

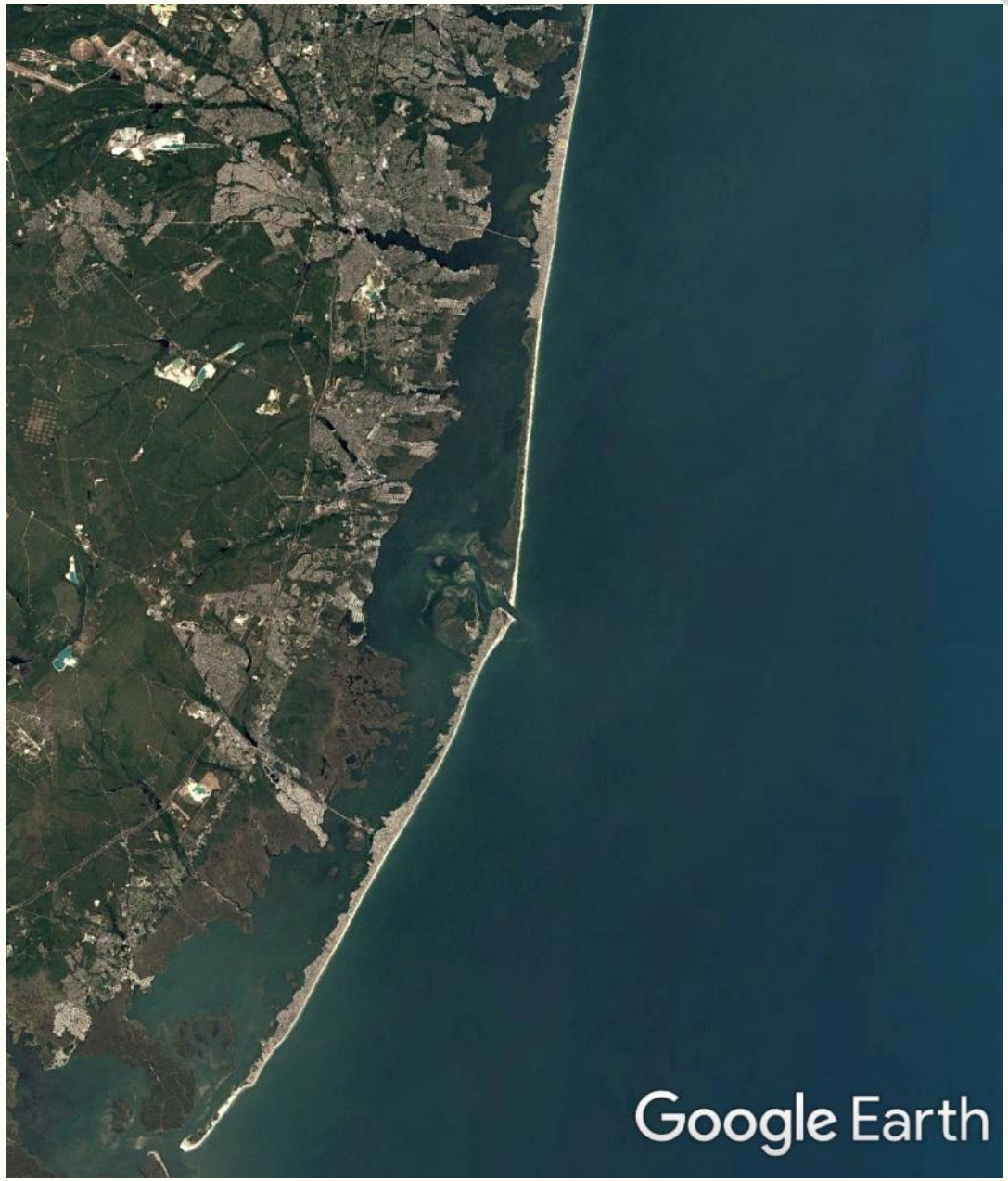
Background

- Wetland nourishments are becoming more and more common as sediment is increasingly retained within the system
- Many research projects have focused on various aspects of wetland nourishments, e.g.
  - New field data collection (physical, biological, chemical)
  - Empirical & Numerical model improvement of sediment transport and ecomorphology
  - Investigating stakeholder questions on Natural and Nature-based Features (NNBFs)
- These projects have not focused on the impact of repeated wetland nourishments on tidal inlet hydrodynamics and subsequent annual and decadal scale sediment transport changes and impacts to the O&M mission
- Could the continued increase in cyclical wetland nourishment have an impact on tidal inlet morphodynamics?

Motivation

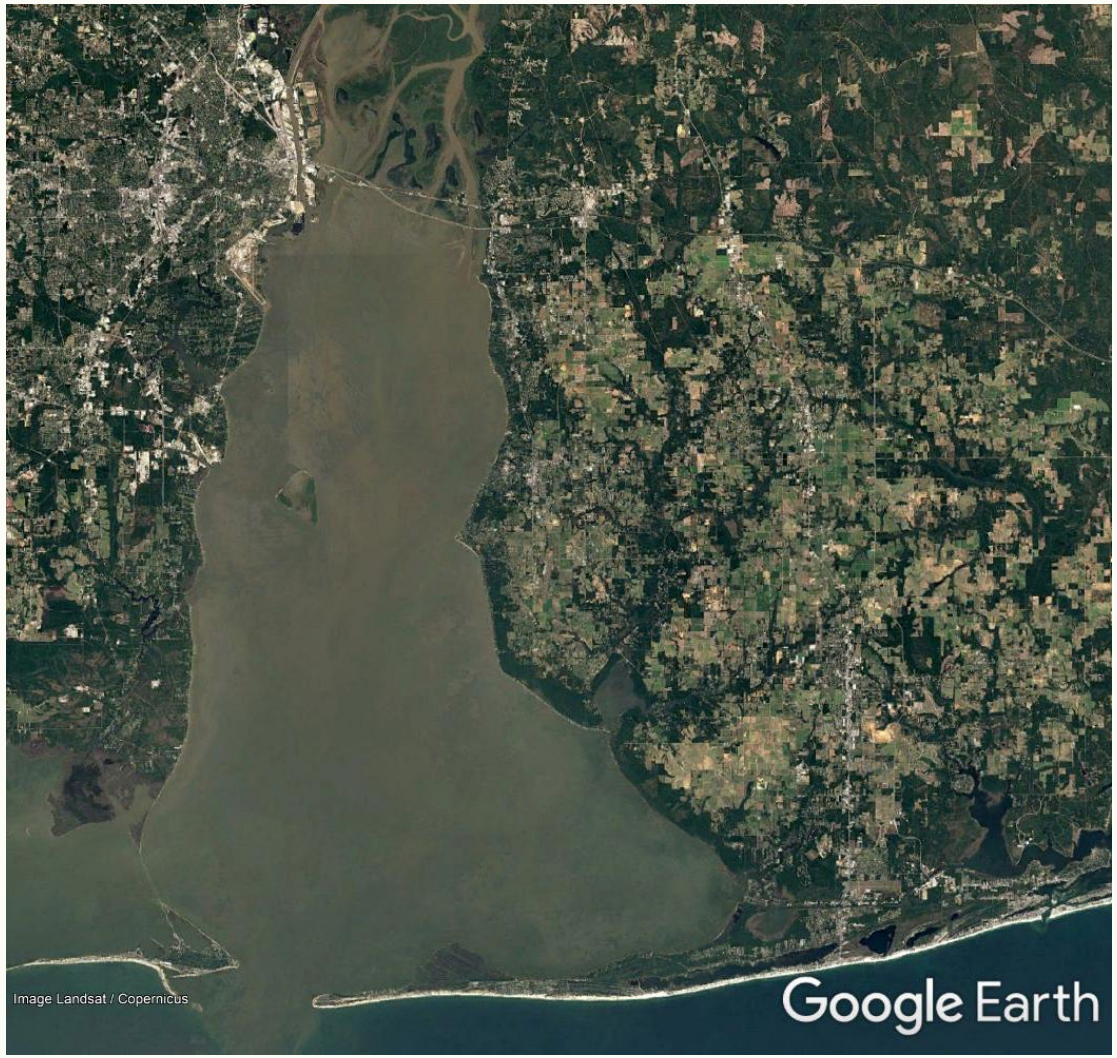
- Can we categorize leading factors contributing to risks of changes to tidal inlet systems (e.g. flow pattern change) with available data?

- How can we apply the insights from the long history of anthropogenic modifications to tidal inlet systems to diagnostics about potential changes expansive wetland nourishments could cause?



Problems to Address

- If the long-term application of wetland nourishment can impact channel sedimentation does a procedure to assess these impacts exist?
- Alternatives must be evaluated, but there is a large degree of uncertainty. Which processes are most relevant?
- Can we develop a standard diagnostic framework to compare impacts to inlet stability and O&M requirements?



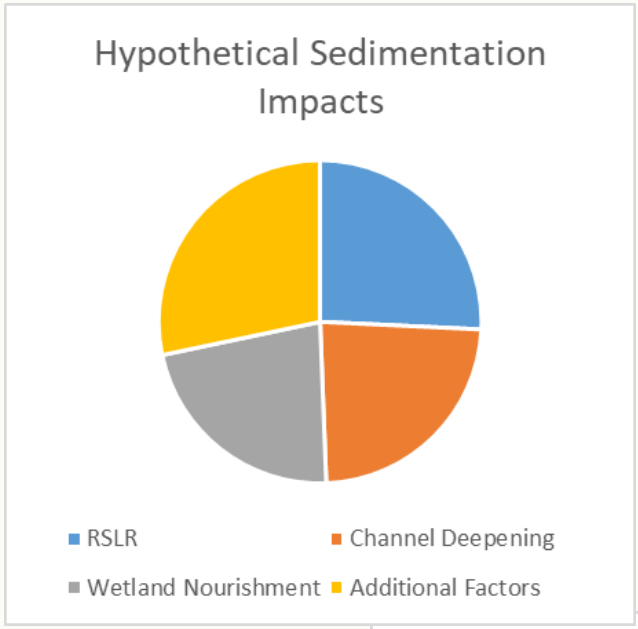
Statements of Need

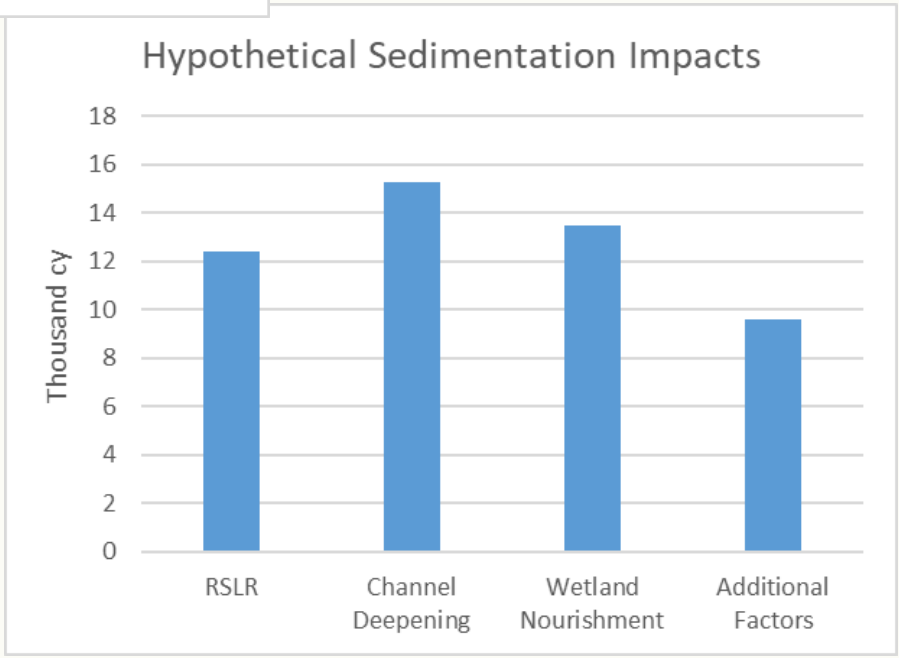
- FY19 1356 (Long-term Modeling of Barrier Island Tidal Inlets)
- **FY20 1411 (Sustainable Dredged Sediment Management Practices to Support Wetlands)**
- **FY20 1322 (Near-shore Placement for Wetland Nourishment)**
- FY19 1370 (Testing and Evaluation of USACE Coastal Numerical Models)

Goals

- **Determine primary factors associated with wetland nourishment that drive inlet stability and channel sedimentation**

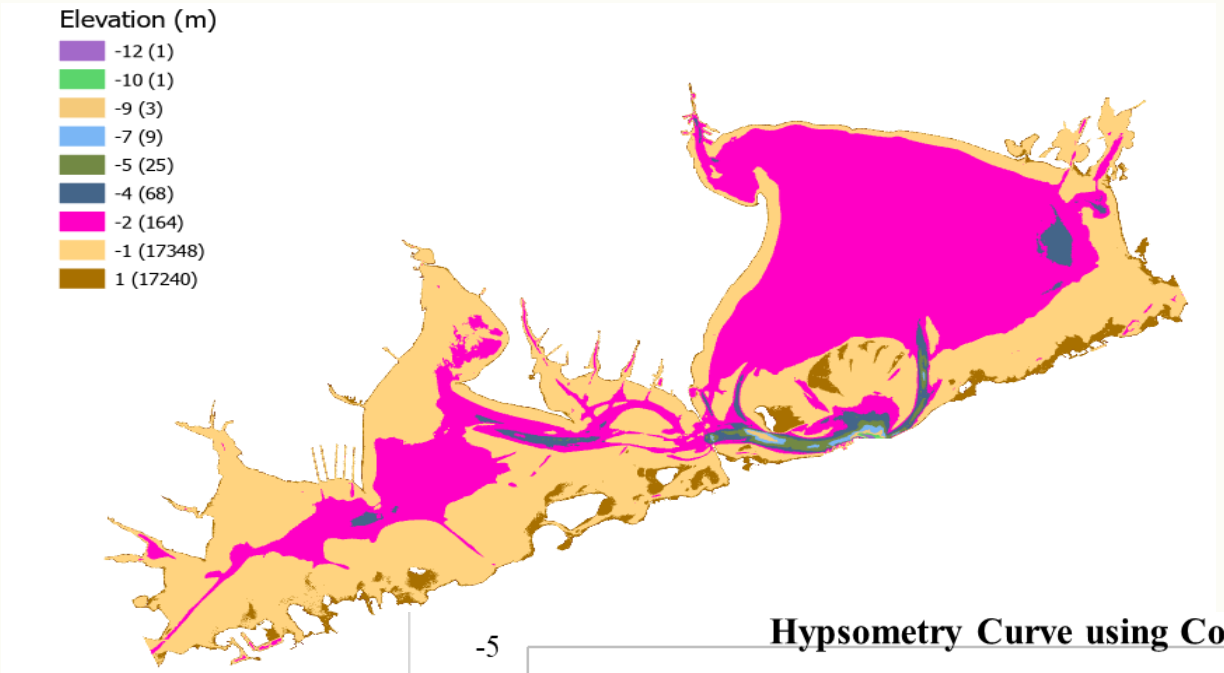
- **Develop a generalized approach to understand inlet morphological change in the context of wetland nourishment**

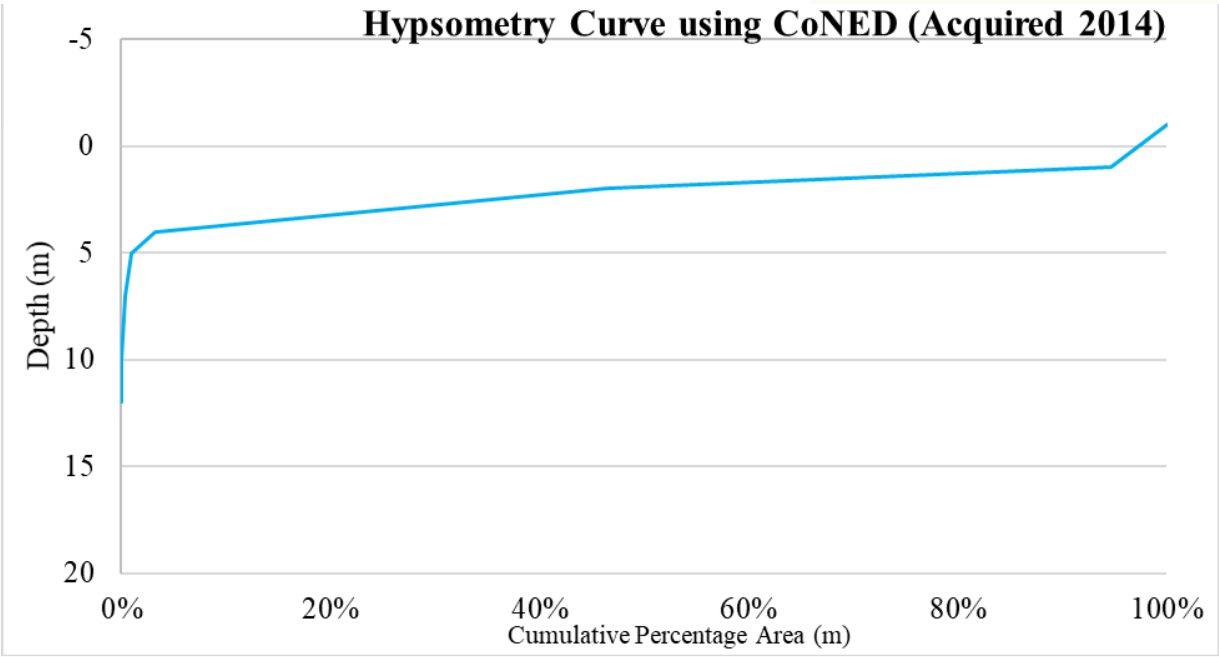




Approach

- Review existing information to help identify key processes controlling morphological change
- Develop generalized guidelines to anticipate inlet response to sea level rise and anthropogenic modifications.





Approach (cont.)

- **Develop a diagnostic check list for tidal inlet basin systems for natural and anthropogenic factors to evaluate long-term strategies for wetland nourishment at tidal inlets. Include tidal energy, wind- and vessel-wave generated energy, and other processes simplified over an aerial plot of an existing basin.**

- **Pick test case to do a rigorous analysis of basin hypsometry, relative sea level change, inlet hydrodynamics, inlet morphodynamic maturity, sediment characteristics, and historical anthropogenic activities. Model with/without historical modifications and future potential modifications.**

Test Cases in Consideration

Barnegat

- Extensive wetland nourishment strategy and moderately sized inlet
- Similarities to the Seven Mile Island Innovation Lab
- Leverage existing model work

Galveston

- Large volumes of sediment going into wetland nourishments
- Concurrent system modifications (surge barriers, spine, islands)
- High volume ship traffic through major deep-draft channel

Mobile

- Large volumes of sediment going into wetland nourishments
- Channel deepening; Major deep-draft channel
- Leverage existing model work

Path Forward

- Gather insight from interested District engineers and planners
- Collaborate with researchers in related efforts
- Develop PDT
- Refine project vision with PDT

Summary

FY20 Major Advances in Capability

- Literature review on the impacts of long-term anthropogenic modifications to inlet systems
- Hypsometry application refinement in GIS setting

FY20 Major Products & Collaborations

- PDT meeting (late FY20 / early FY21)

FY21 Products/Advances

- Continue expanding PDT and refining path forward
- Develop and apply emerging diagnostics about potential tidal inlet system changes expansive wetland nourishments could cause
- Test case analysis