EWN to Support Islands

Joseph Gailani

U.S. Army Engineer Research and Development Center (ERDC)
Vicksburg, MS

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joe.z.gailani@usace.army.mil

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Elements Involved in Applying EWN

Producing Efficiencies: Using science and engineering to produce operational efficiencies

Natural Processes: Using natural processes to maximize benefit

Broadening Benefits: Increasing the value provided by projects to include social, environmental, and economic benefits

Promoting Collaboration: Using collaborative processes to organize, engage, and focus interests, stakeholders, and partners

EWN to Support Island Features

- Islands provide critical FRM, environmental, economic and social benefits
- Typically comprised of multiple inter-dependent features:
  - Beach/dune
  - Wetland
  - Upland plant community
  - Bird nesting/migration habitat
  - Reef, SAV, other shallow water habitat
  - Diverse back-bay habitat
- Disruptions to sediment transport patterns, SLR, and subsidence are degrading island benefits
- Recognize that many island features evolve naturally
- What can we do to restore/sustain islands?

EWN to Support Island Features

Bijagos Archipelago, West Africa

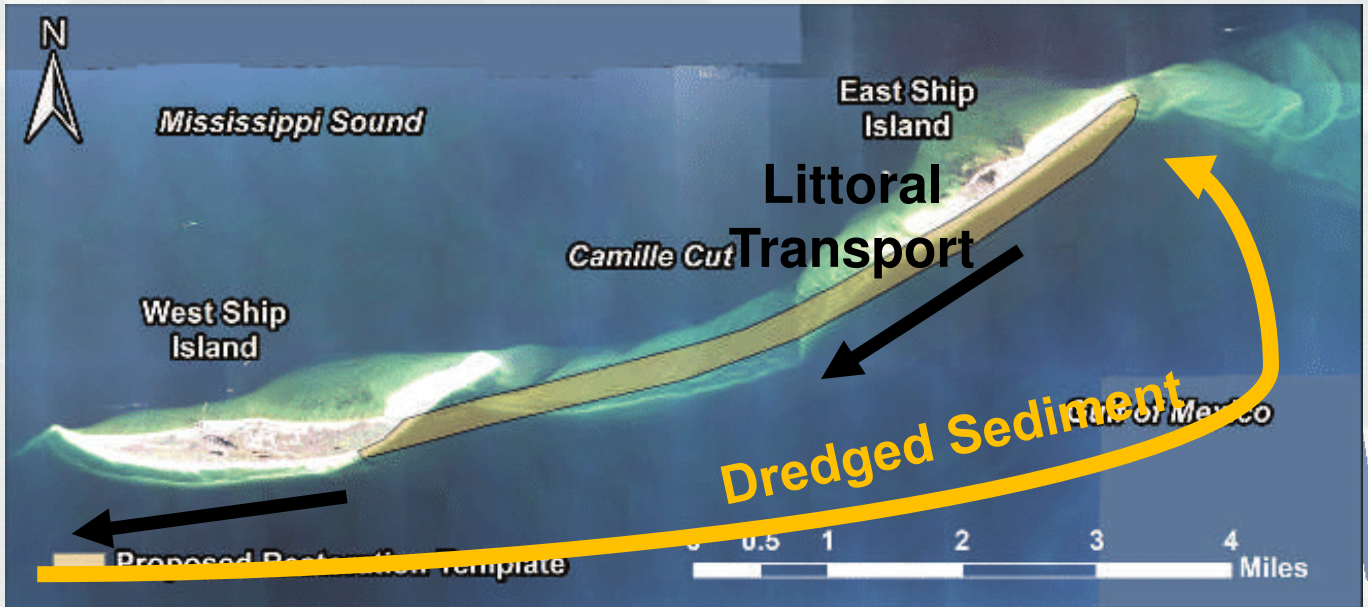
Swan Island in Chesapeake Bay prior to restoration

- Island types
  - Barrier
  - Deltaic
  - Other (in-bay, in-lake)
- In general, we cannot restore conditions which once maintained these islands
- Methods to restore or build islands
  - Reconstruct with intermittent renourishment
  - Create new island features which are supported by present conditions
  - Dredged sediment to increase sediment supply
  - Green/gray solutions
  - Adaptive management for sustainability

EWN, RSM, and Dredging

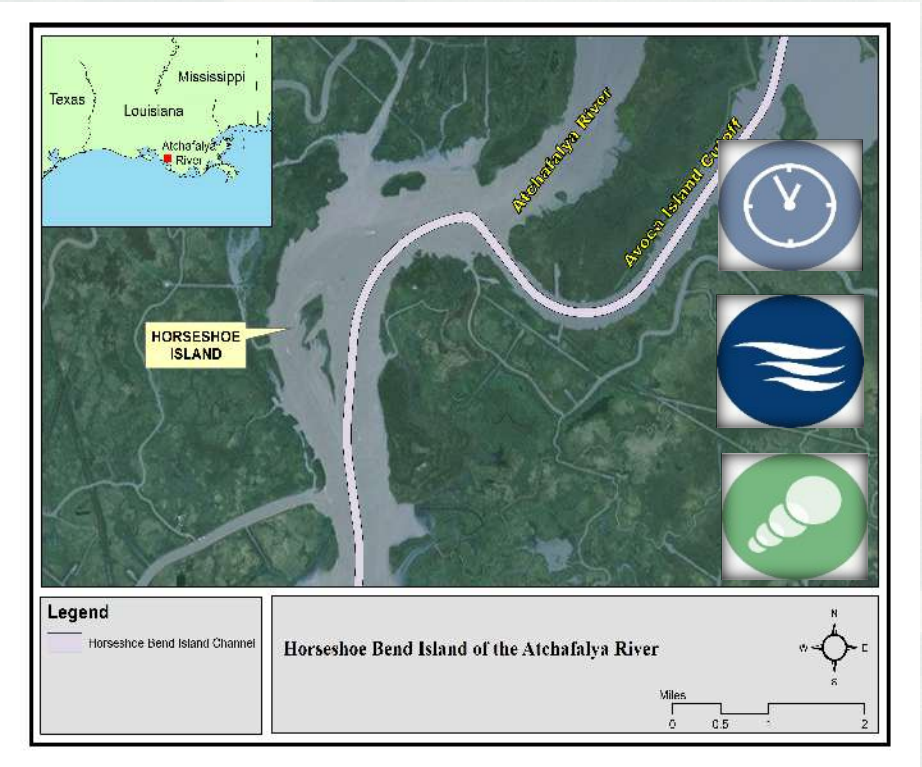
- Key components of EWN and RSM include understanding:
  - Original circulation/transport patterns and sediment fate
  - How and why islands are degrading
  - How we can manage/engineer system dynamics to support islands
- USACE dredges 200M+ CY yearly
  - These are the sediments that once nourished estuarine/coastal features
  - Dredged sediments may provide a cost-effective, ongoing source of sediments
  - Operational and cost efficiencies by maximizing benefit of dredged sediments

Using dredged sediment to maintain Ship Island, post-restoration



EWN Solution for DMM at Atchafalaya

- Existing sites filled
- Alternatives
  - Offshore placement
  - Wetland → upland
  - In-river placement
- A naturally occurring bar was forming next to navigation channel
- The concept:
  - Place dredged sediment adjacent to the channel upstream of the bar
  - Natural forces move sediment toward bar, forming/sustaining an island



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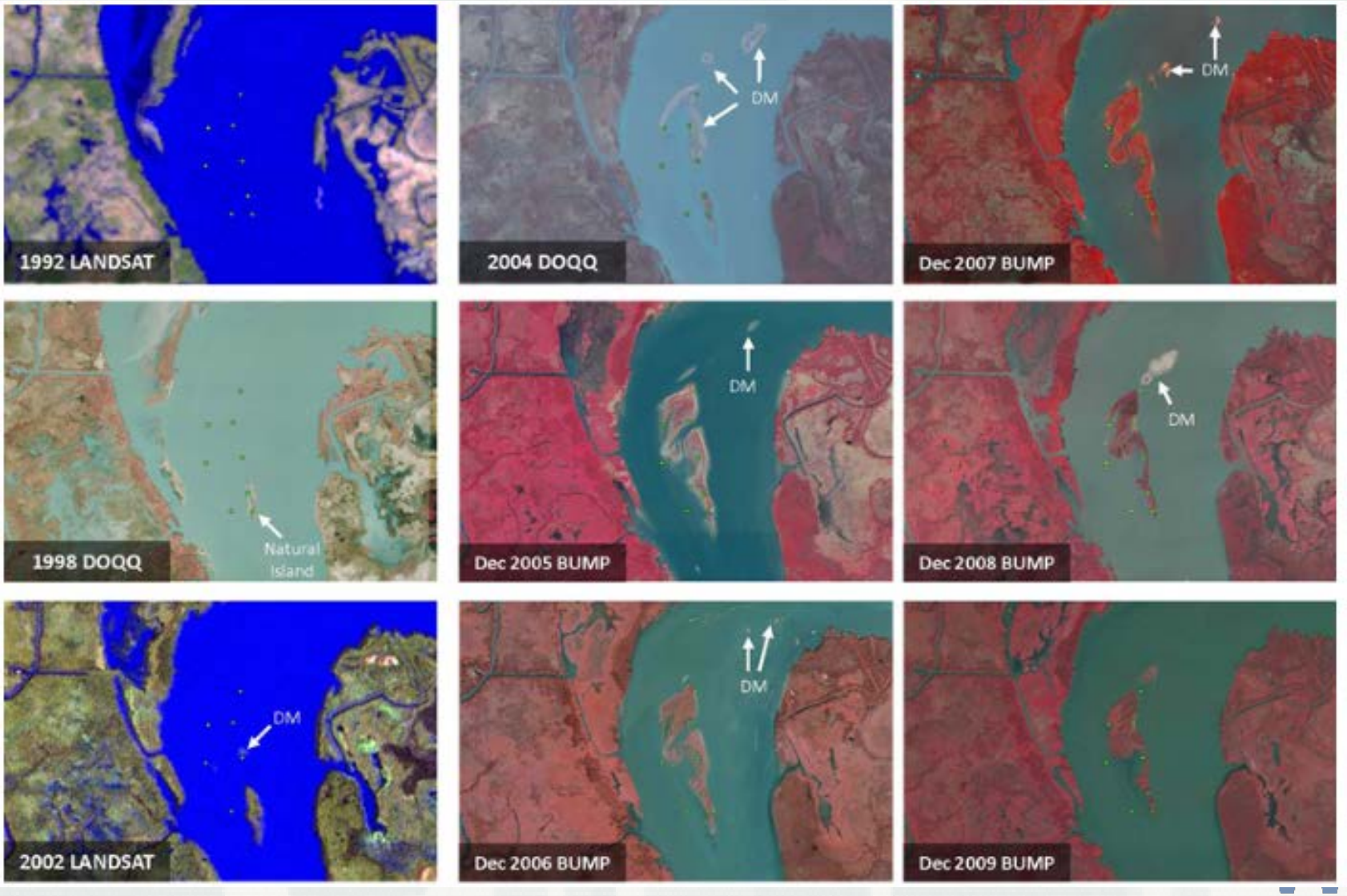
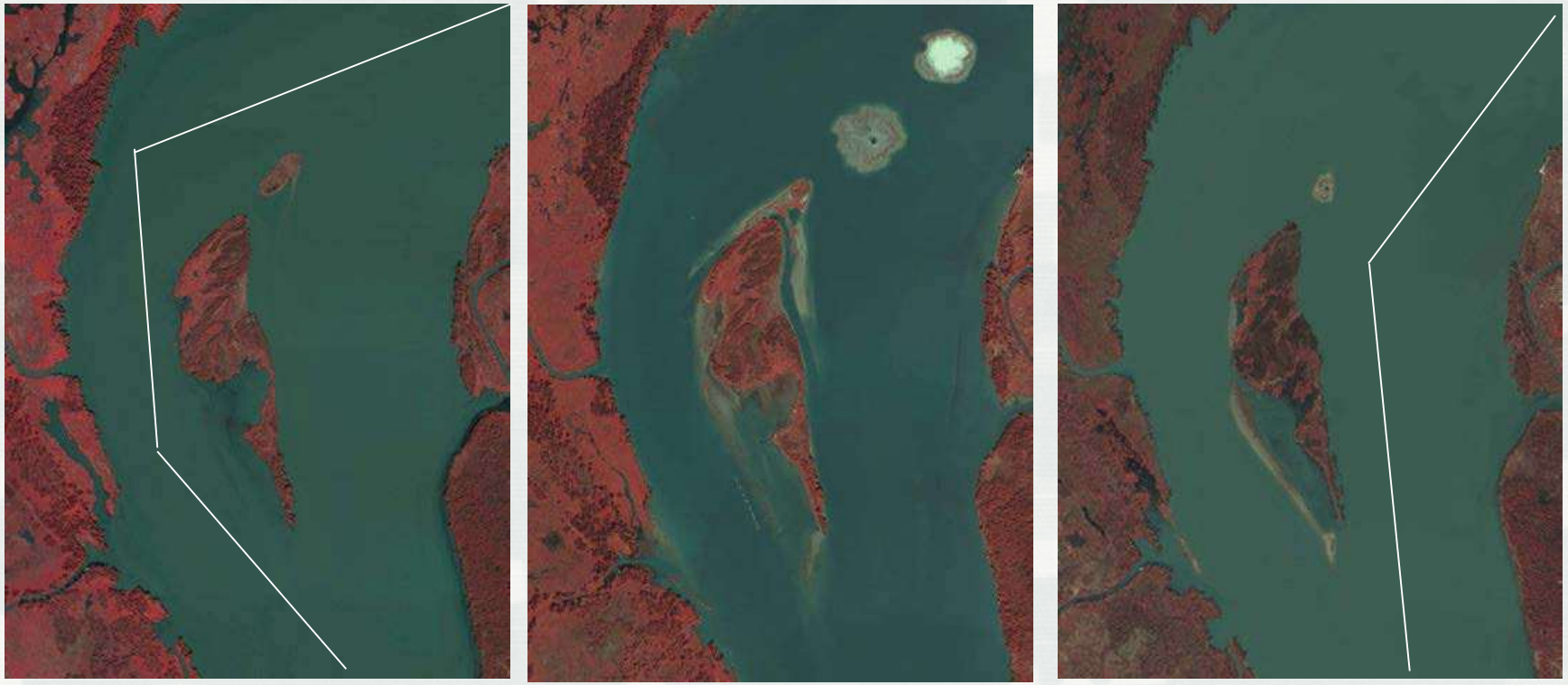


EWN Solution for DMM at Atchafalaya



Suedel et al, 2015

- Triple win: navigation, ecosystem, FRM
- Island both grows and recedes, depending on channel hydrodynamics
- Improved channel flow patterns permit efficient navigation
- Reduced dredging volumes/costs

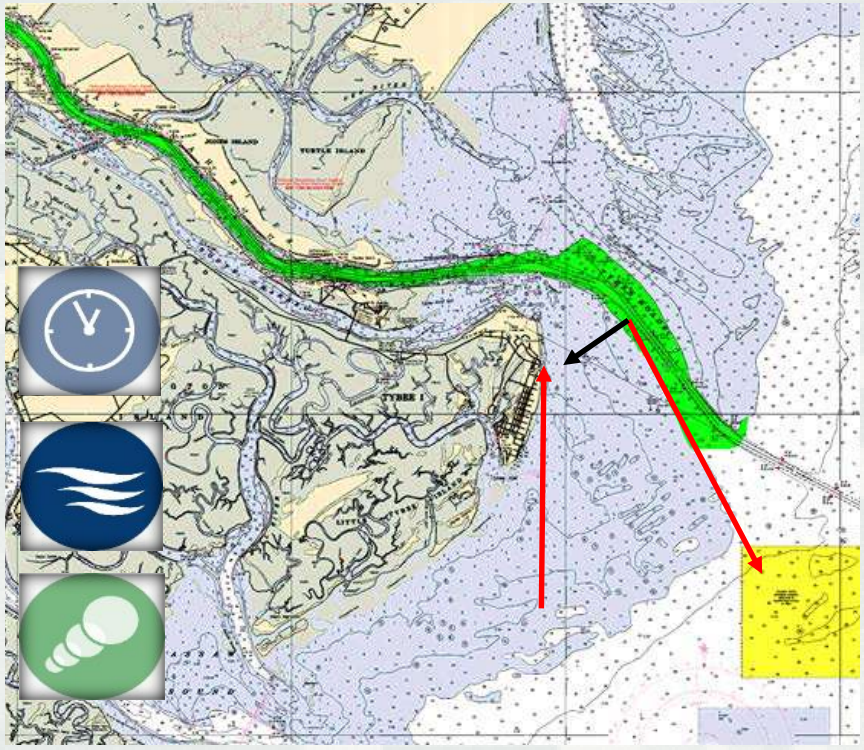
Horseshoe Bend Benefits

- EWN Benefits
  - 35 hectares of habitat
  - Increased navigation safety/reduced travel time
  - Sustainable dredged sediment management – EWM/RSM
  - Reduced dredging volumes and costs
  - Carbon Footprint (carbon sequestration, fuel consumption)
- Evaluate how/why the island evolved to inform future projects
  - Hydrology of the river (modeling)
  - Island geomorphology
  - Sediment transport patterns
  - Soil and biogeochemical activity
  - Floral and fauna composition
  - Suedel et al 2015 Terra et Aqua (140) Sept 2015

Suedel et al, 2015

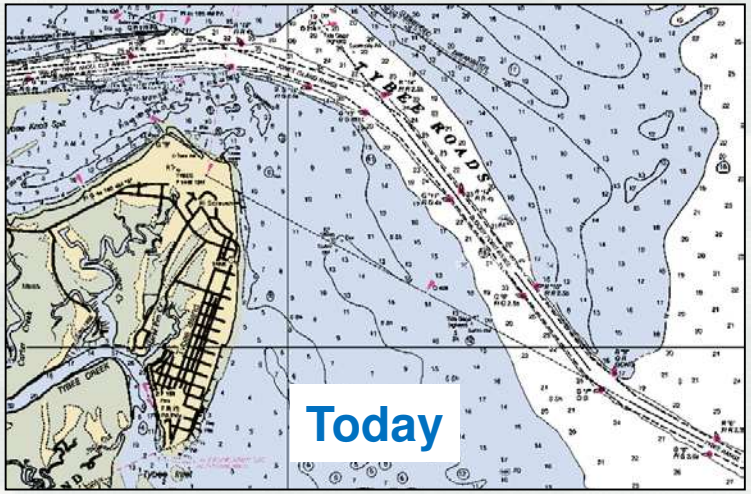
Tybee Island/Savannah Entrance Channel

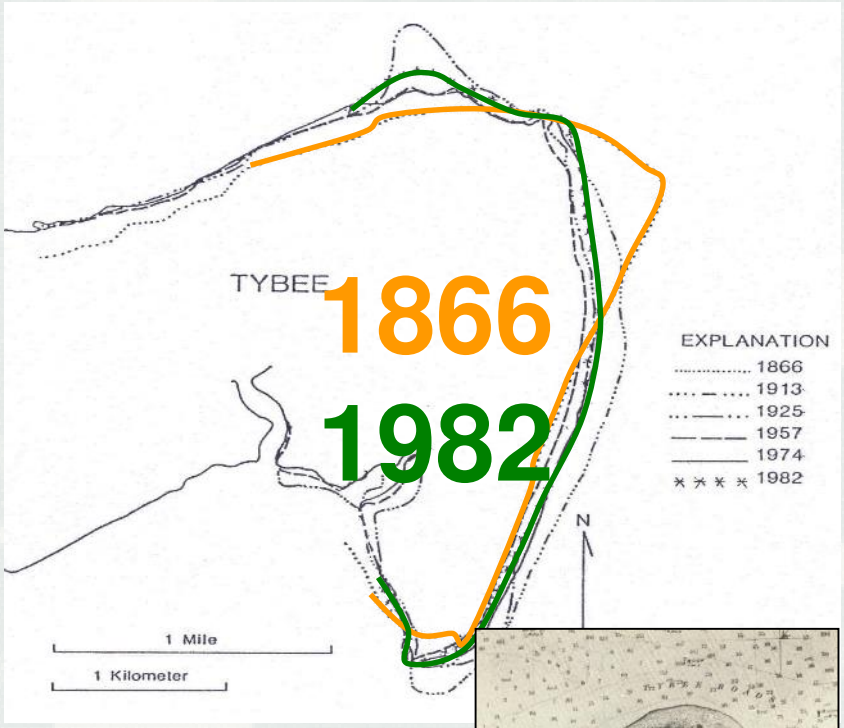
- Maintenance material 75-85% sand
- Not acceptable for beach nourishment
- Separate navigation and FRM (beach fill) projects



- Reduce cost by combining projects
- Demonstrate fate of sand and fines at inlet and nearshore
- Guidance for placement near Tybee and other inlets

Savannah River Entrance/Tybee Island Situation is a Familiar Picture



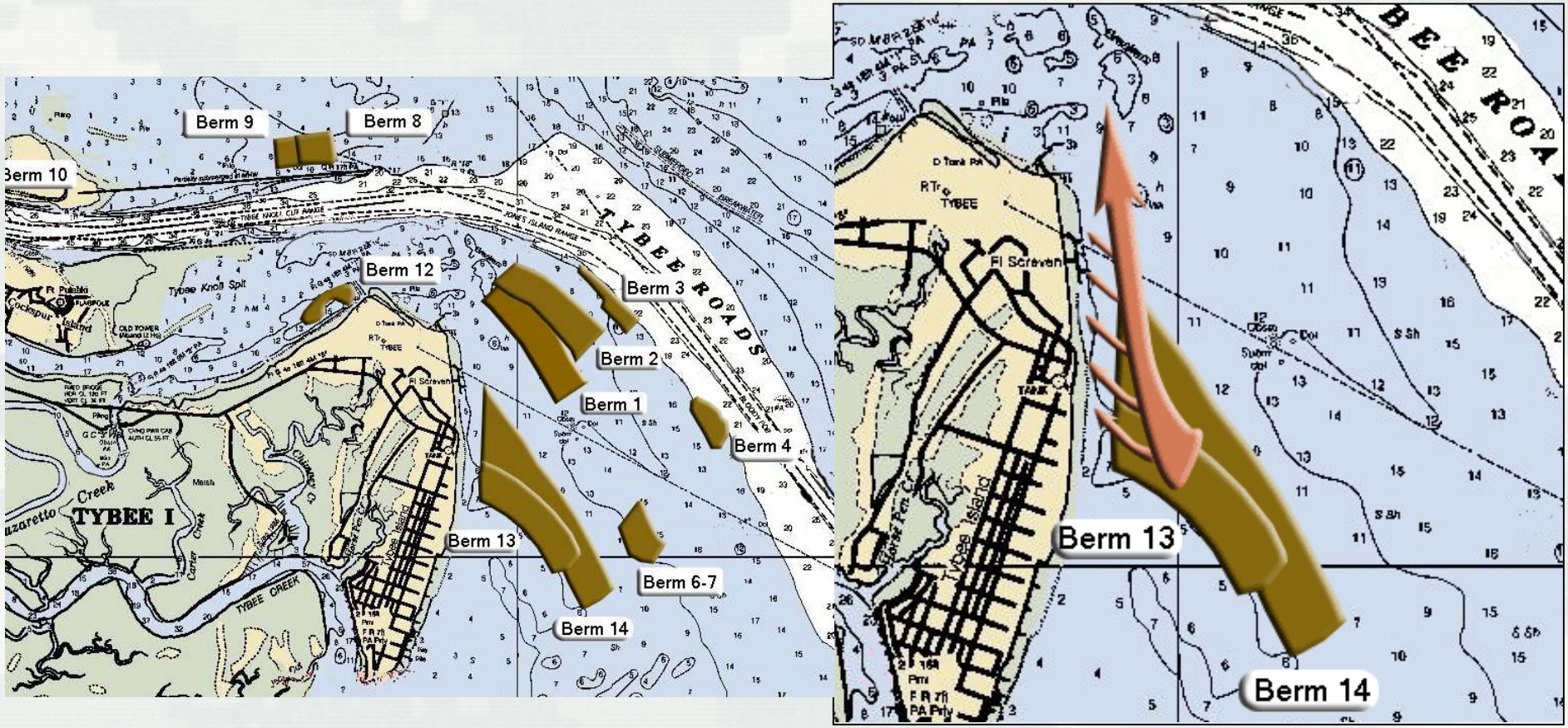


- Federal navigation project (jetties and channel deepening)
- Ebb shoal attachment bar migrates south
- North part of Tybee experiences shoreline recession and central part of the island experiences accretion
- Federal shore protection project constructed to address shoreline recession
- Continued high sand loss rate –nearshore currents are flood dominant

Tybee Island/Savannah Entrance Channel

- Maintenance material 75-85% sand
- Not acceptable for beach nourishment
- Separate navigation and FRM (beach fill) projects is expensive
- Operational and cost savings by combining projects
- Nourish littoral zone instead of beach – permit natural winnowing of fines
- Extensive wave, circulation, sediment transport, and morphology modeling to develop solution
- Nourishment can be performed as needed during navigation dredging cycles
- Sustainable solution supporting navigation, FRM and ecosystem

BU of new maintenance material Savannah Entrance Channel, Georgia



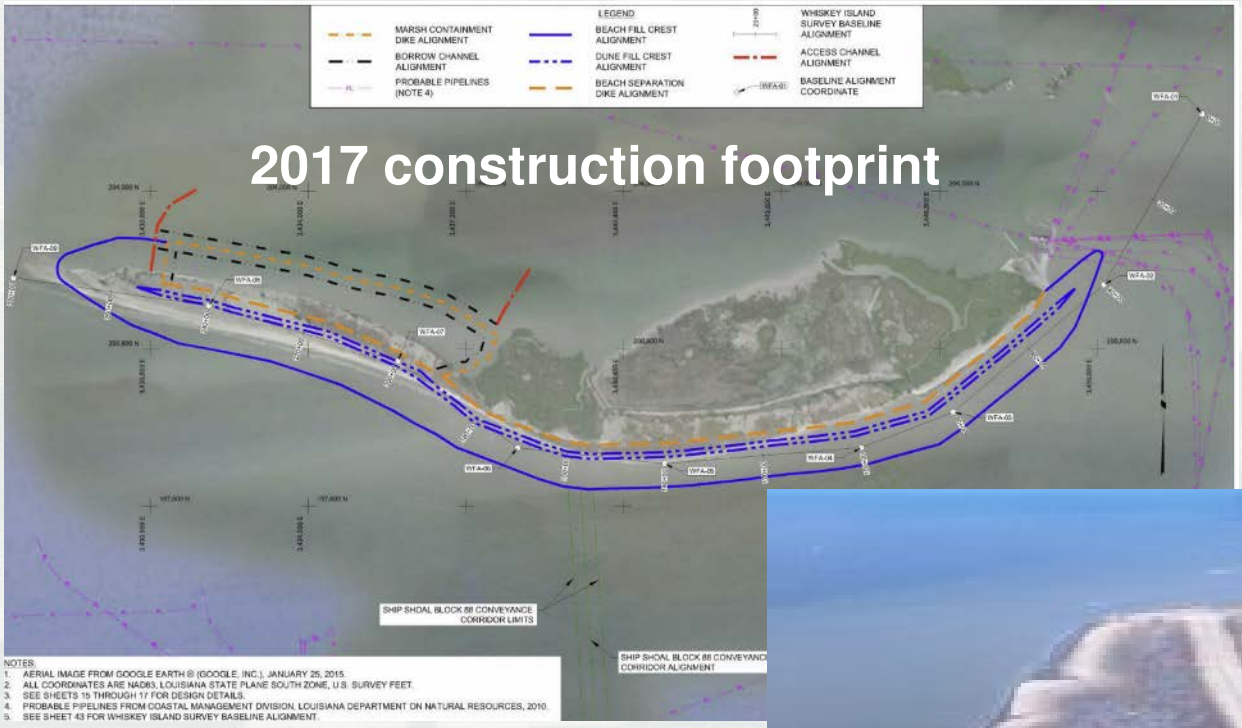
Whiskey Island, Louisiana

- Severe loss of coastal Louisiana
- Cannot maintain all features
- Objective: Optimize benefits w/ avail resources
- Identify priority barrier islands for restoration
- Optimize FRM performance

Whiskey Island, Louisiana

- Design acknowledges need for renourishment
- Construction of beach/ dune and wetland
- Maximize FRM benefits
- Natural recruitment and planting in wetlands
- Wetlands critical to minimize sediment loss
- Katrina demonstrated need for additional beach and wetland

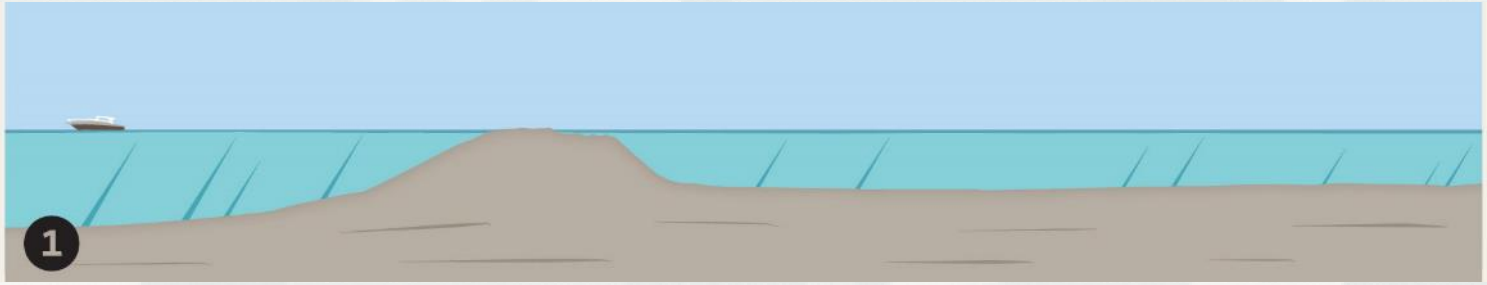
Whiskey Island, Louisiana



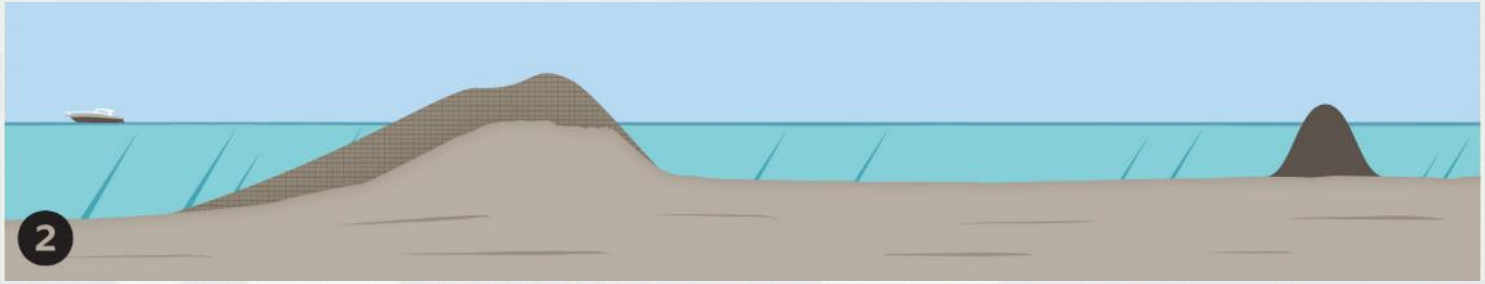
- Sand loss during non-storm periods
- Adaptive Mgm't: Sand fencing and additional planting to reduce loss rate

- Wetland and vegetated dune critical to keeping sand in island footprint
- Adaptive Management: larger wetland system to permit rollover

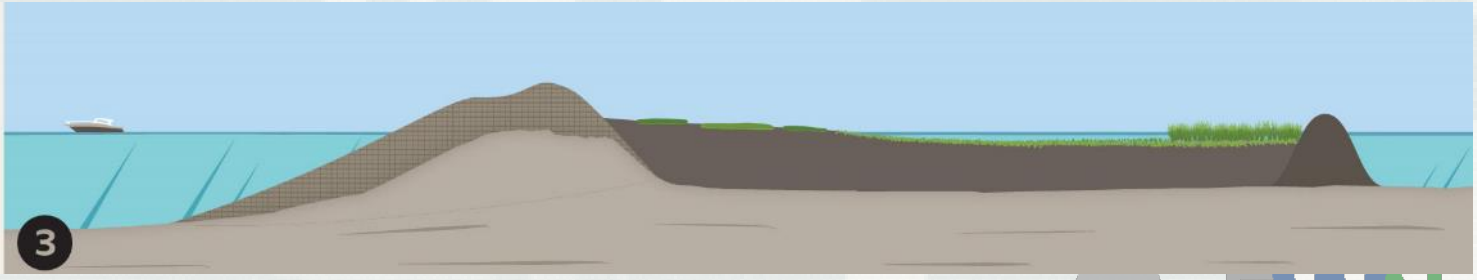
Barrier Island Design



Eroded barrier island – may be reduced to sand bar with little vegetation – dispersive during storms



Sand is pumped to restore beach/dune. Temporary dike built to contain the marsh. Dune planting may be required



Muddy sediment pumped to create the back marsh. Wetland vegetation planted. Dike may be removed or naturally degrade

BU maintenance material
Green Bay, Wisconsin

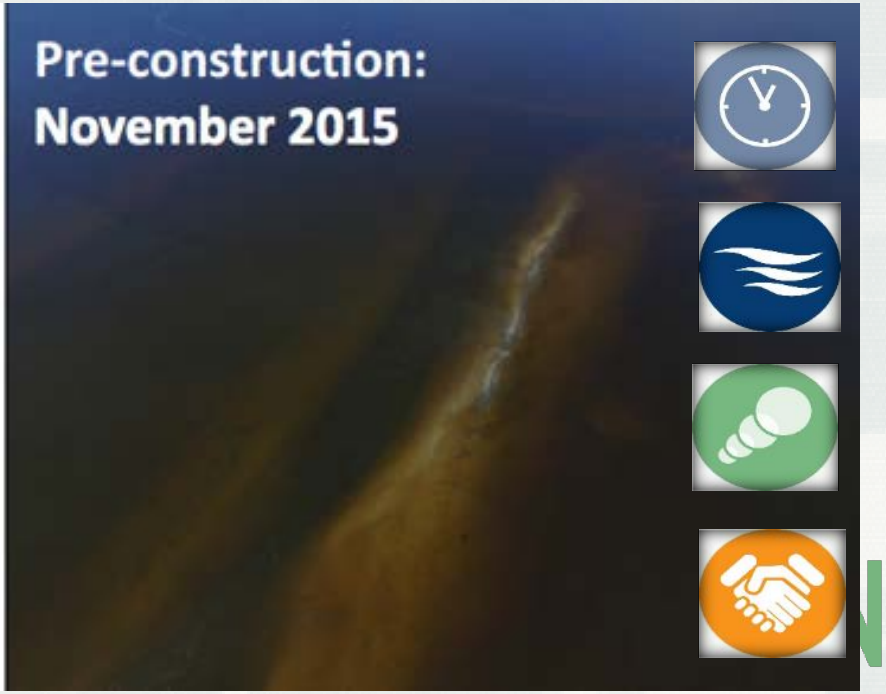
- Island/wetland near mouth of Fox River eroded
- Open-water placement not permitted
- Objective: use DM to re-construct island chain that has been eroding
- Federal, State, Local gov't, Port of Green Bay, Stakeholders

BU maintenance material
Green Bay, Wisconsin

- Construct Wave Barrier – temporary “gray” part of the solution
- Place dredged material behind barrier
- 20 years to construct(capacity ~ 2M CY)
- 110 ha of island and wetland habitat

BU maintenance material
Round Island, Mississippi

- Part of the Gulf Coast barrier Island
- Partially state-owned nature preserve
- 230 acres to 25 acres from 1884 to 2005
- Hurricane Katrina: direct hit, overtopping



BU maintenance material
Round Island, Mississippi

- 2 phases
  - ▶ Construct berm with sandy dredged sediment
  - ▶ Construct wetland with mixed dredged sediment
- Create ~200 acres of beach and wetland habitat
- 2 M m^3 from Pascagoula Channel maintenance
- NGO partner: National Fish & Wildlife Federation