Strategic Placement of Dredged Sediment to Support EWN Objectives

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Strategic Placement of Dredged Sediment

Definition

Placing dredged sediment in an environmentally acceptable manner at one location with the expectation that hydrodynamic and possibly aeolian forces will transport specified sediment classes to targeted receptor sites.

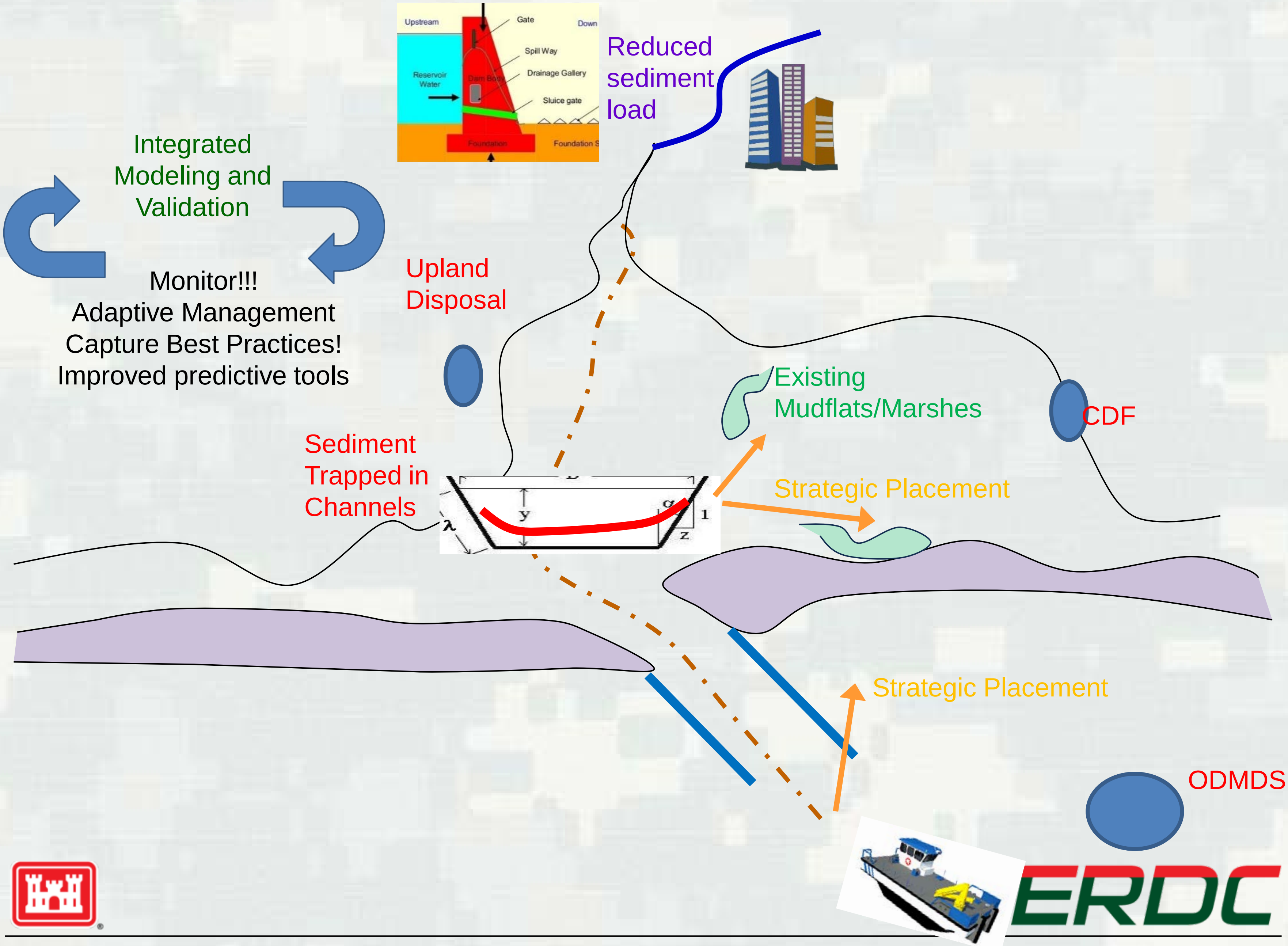
Strategic placement aligns with multiple ongoing/emerging USACE practices

- Engineering with Nature (EWN) – intentional alignment of natural and engineering processes – permit nature to do the "heavy lifting"
- Sustainable solution to dredged material management (LTMS)
- Beneficial use (BUDM)
- Regional Sediment Management (RSM)
- Natural and Nature-Based Features (NNBF)
- Resilience (resist and recover)

Strategic Placement of Dredged Sediment

Benefits

- Maintain sediment within the regional system
- Target resources experiencing sediment deficits
- Mimic natural processes which nourish resources over long time periods, often in pulses
- Generally less intrusive at the receptor site compared to direct placement
  - Natural winnowing of fines and sand
  - Rate of sediment introduction to targeted resource
  - No construction at targeted resource
- Sustainable – provides ongoing sediment source to receptor sites
- Sustainable – since the site is dispersive, capacity is renewed
- Potentially more cost-effective than direct placement
- Simultaneously support multiple USACE missions
- One component of an overall strategy to support coastal resilience


Upstream
Gate
Down
Spill Way
Reservoir Water
Dam Body
Drainage Gallery
Sluice gate
Foundation
Foundation S
Reduced sediment load
Integrated Modeling and Validation
Monitor!!!
Adaptive Management
Capture Best Practices!
Improved predictive tools
Upland Disposal
Existing Mudflats/Marshes
CDF
Sediment Trapped in Channels
Strategic Placement
Strategic Placement
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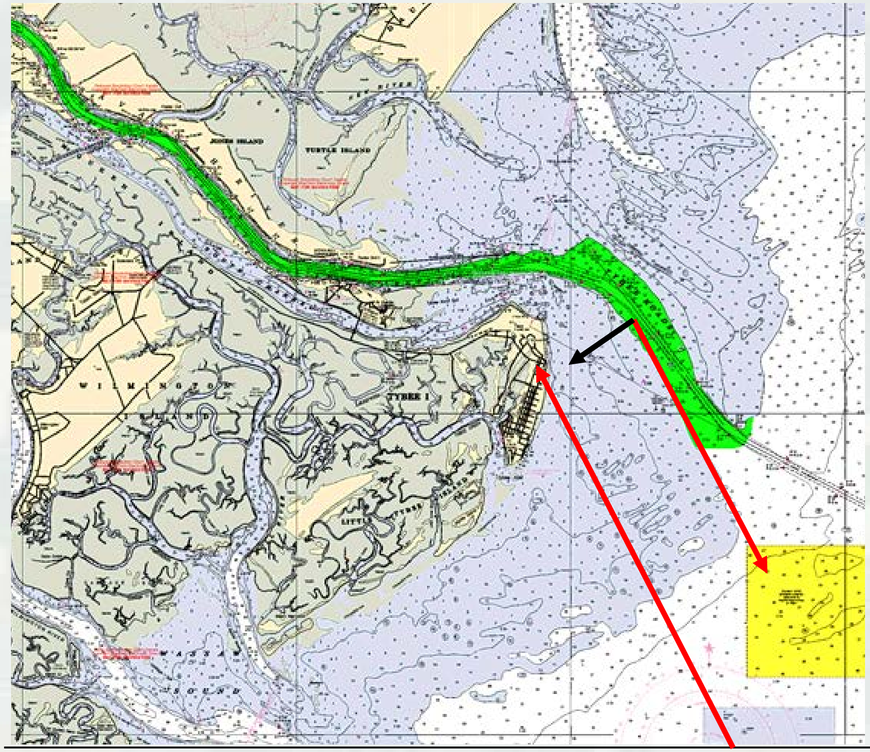
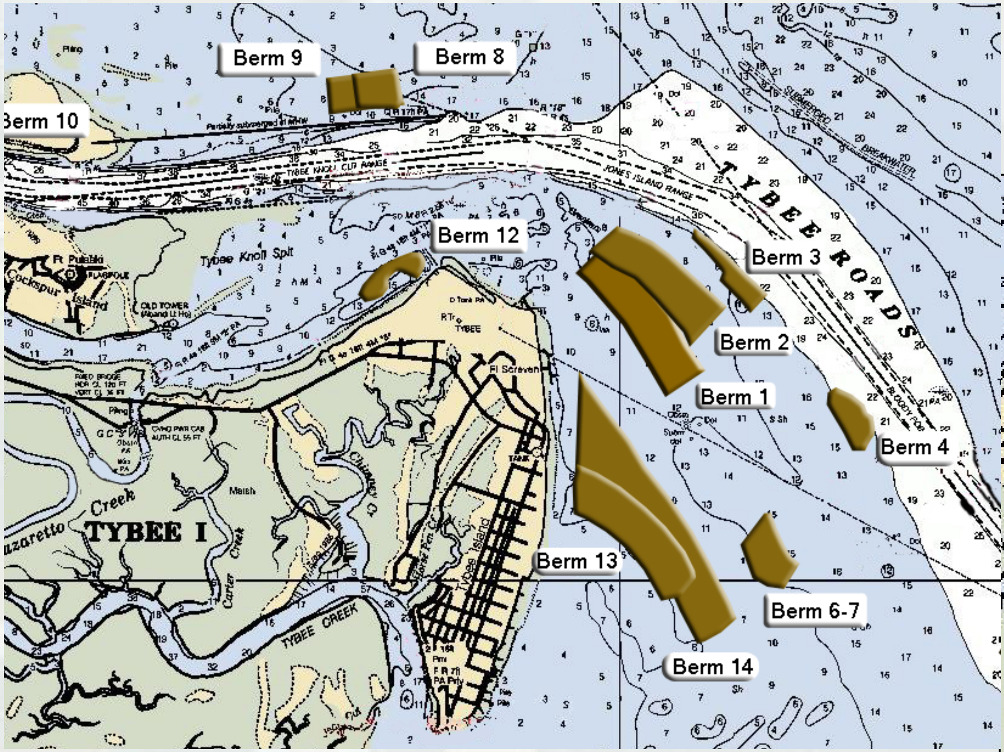
Tybee Island, Georgia

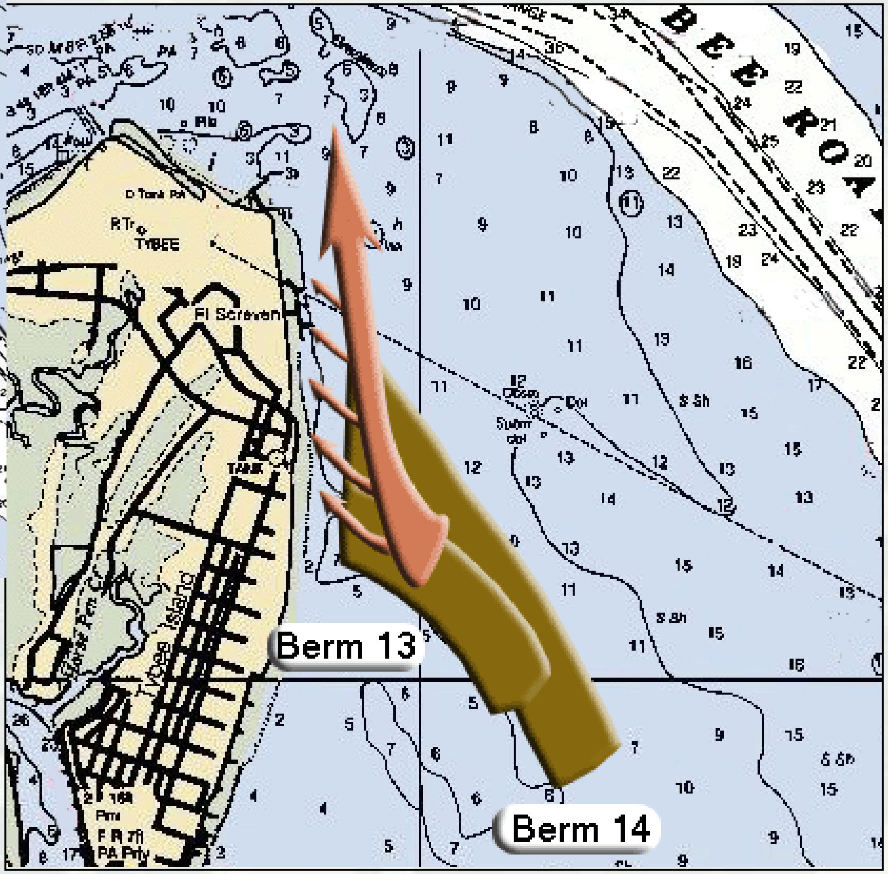
- Maintenance material 75-85% sand
- Not acceptable for beach nourishment
- Separate navigation and FRM (beach fill) projects



- Reduce cost by combining projects
- Demonstrate fate of sand and fines at adjacent inlet
- Guidance for placement at Savannah

Tybee Island, Georgia





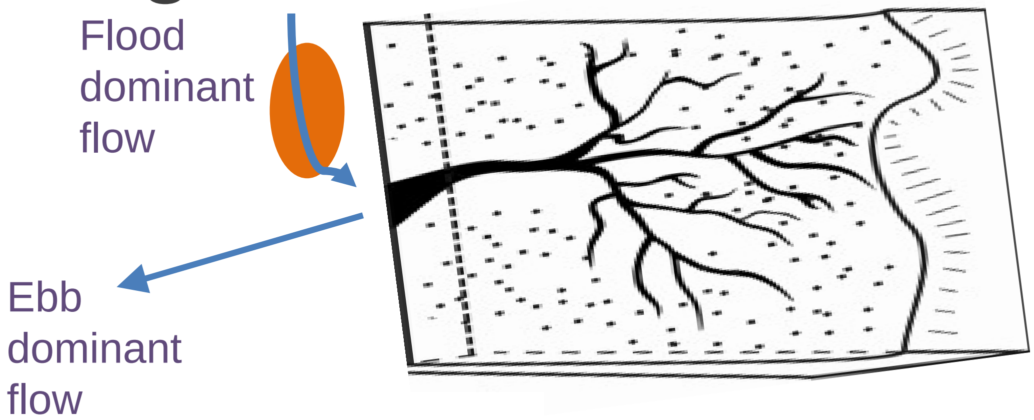
Delfland Sand Motor History

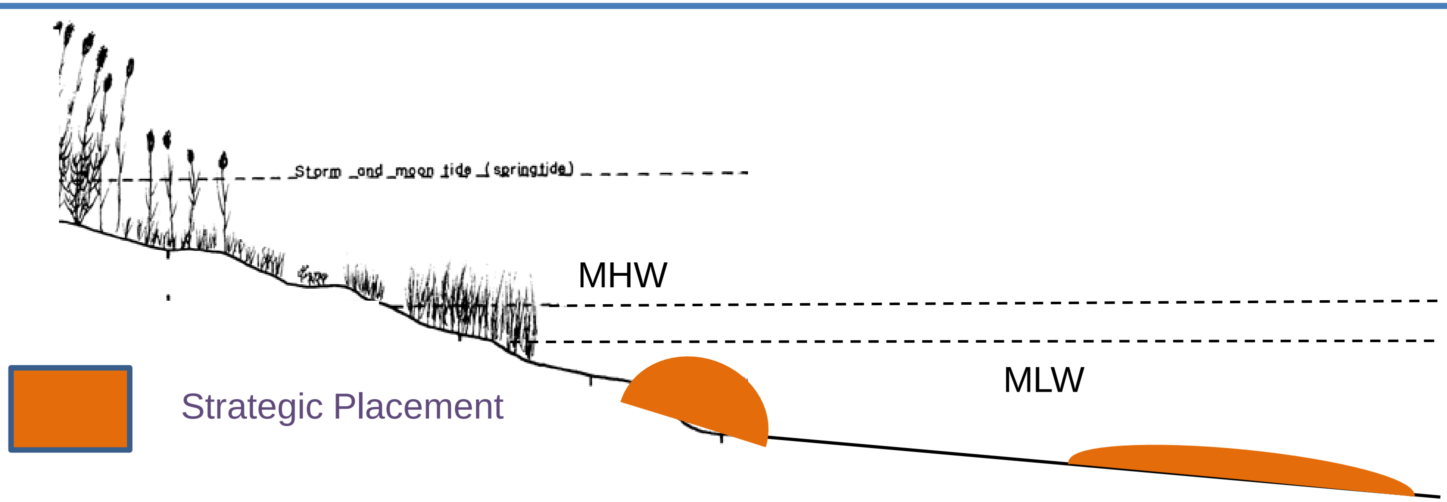
- Dutch coast is receding
- Dutch law: sustaining present coastline
- Addressed with standard beach nourishments every 3-5 years – use offshore borrow sites
- 2011: New strategic placement method tested
- 21.5 Mm^3 parabolic peninsula constructed
  - 2 km wide, protrudes 1 km into ocean
  - Reduce frequency of interruption to habitat caused by 3-5 year cycle of nourishment
- Evaluate risk and then monitor – compare to current practice

Delfland Sand Motor Objectives

- Feed 20 km adjacent beaches for 20 years
- Wind action, wave action and littoral current transport
- Foster natural dune growth
- Knowledge development
- Create habitat and leisure areas

Strategic Placement
Supporting resilient mudflat/marsh systems





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Strategic Placement
Supporting resilient mudflat/marsh systems

Do no harm –System is being harmed - how can we mitigate for anthropogenic disruption to the natural sediment transport system.

How can we use dredged sediment to support coastal ecosystems and system resilience

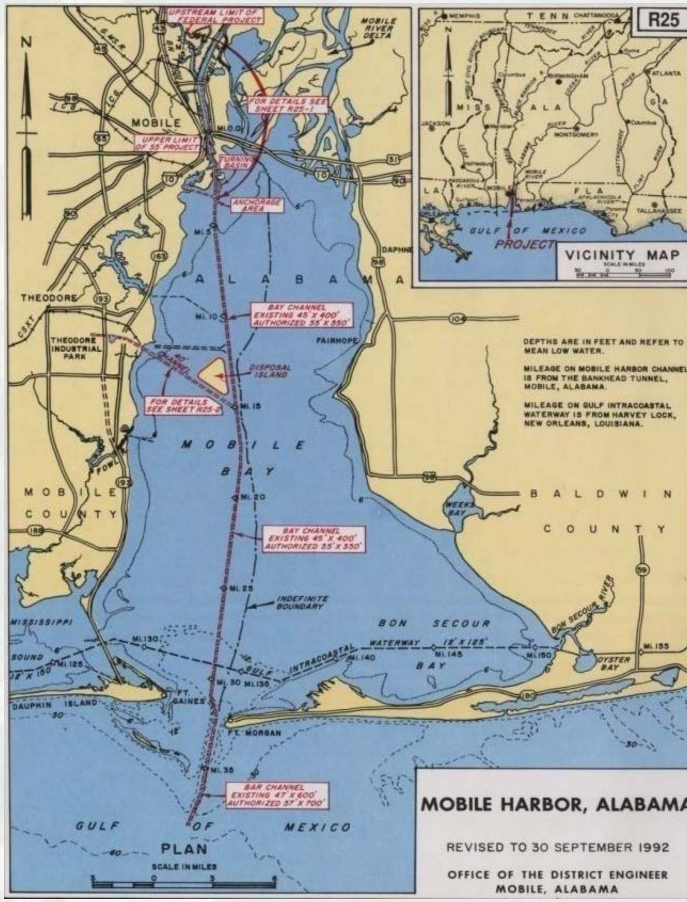
Expectations

- Must be managed - benefits provided more slowly compared to direct placement
- FGS are dispersive – only a fraction will deposit in wetland
- Risk can be bracketed and managed adaptively
- A cost-effective method practiced for decades
- Turbidity is natural and necessary – ex: storms
  - **TMDL, max TSS, WQ, etc. – what are the science-based risk to resources**
  - **Also must address minimum TSS, sedimentation, etc. which are required to sustain specific species and ecosystems**

Re-Evaluate "Success"
Present practice disrupts natural transport dynamics required for coastal resilience and ecosystems. New practices which reduce disruption will support resilience – even if benefits can only be quantified on decadal scale

Mobile Bay, Alabama

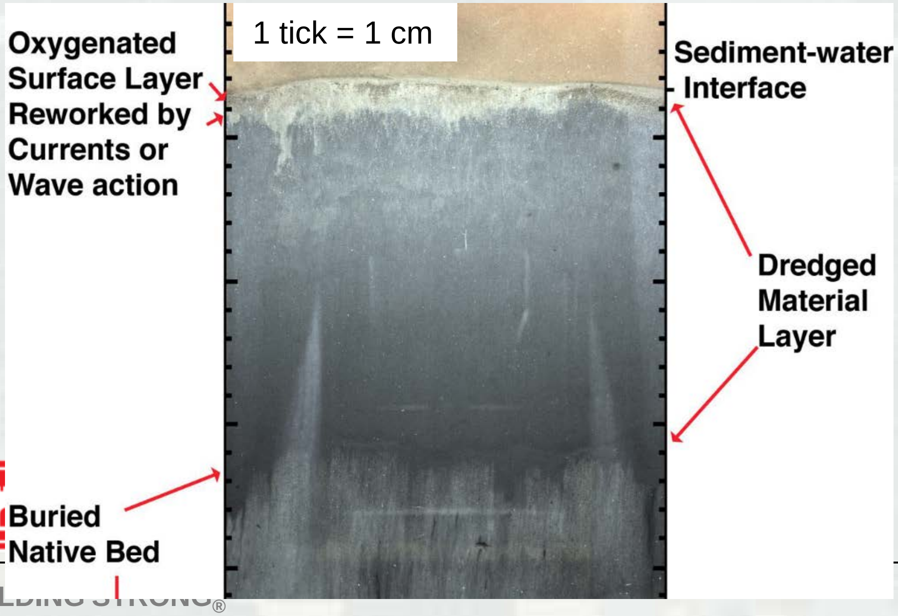
- Mobile-Tensaw system is 6th largest river system in US
- Majority of dredged sediment placed in Bay until WRDA 1986
- Post-WRDA, all sediment placed in Gulf to improve Bay "environmental quality"
- ~ 4 Mcy annually transported up to 40 miles to ODMDS
- It has been recognized that the Bay is losing sediment ~ 1.6 Mcy/year (Byrnes et al, 2013)



- 2012 permission for emergency in-bay thin-layer placement → monitor construction and recovery
- 2014 permission for long-term in-bay placement approved

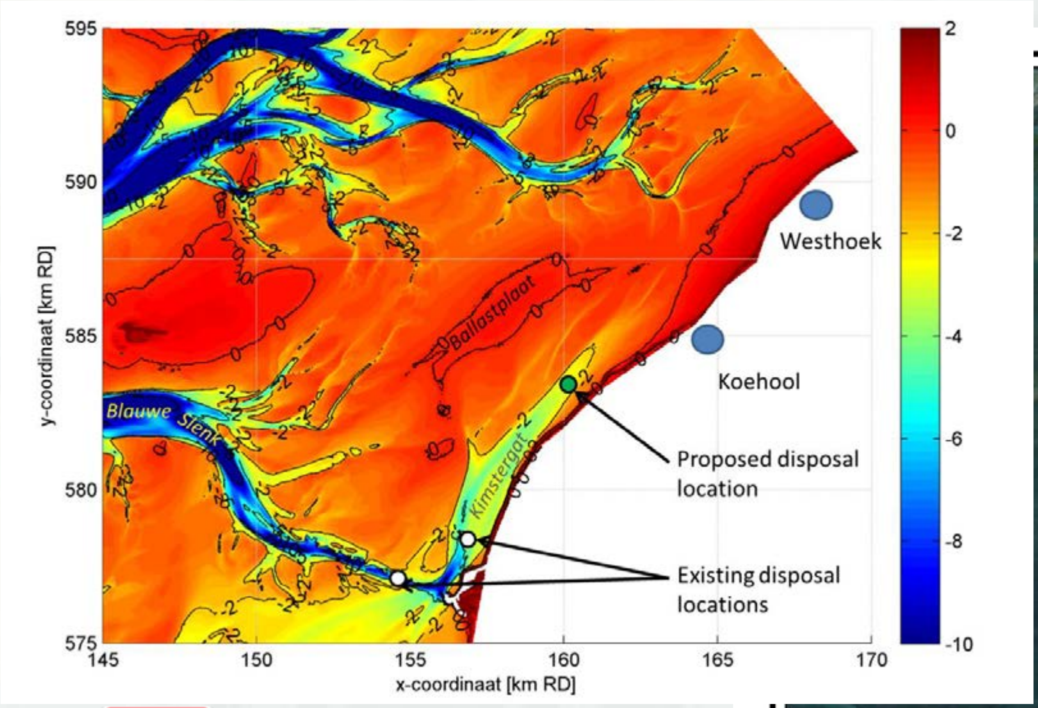
Mobile Bay, Alabama

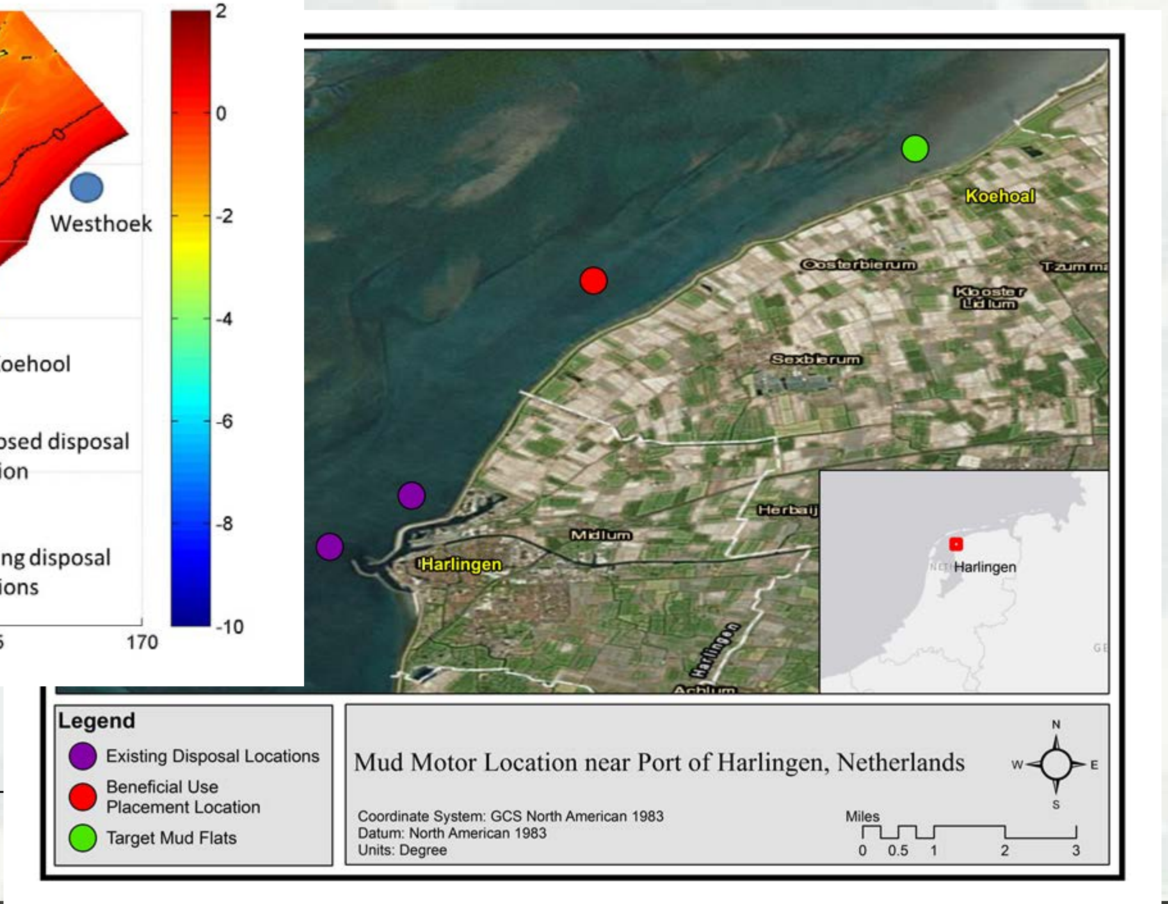
- Channel-Adjacent thin layer placement only in 2012
- <1 ft placement to permit re-establishment of benthic organisms
- Sediment placement, process and transport studies applied to evaluate placement options



Wadden Sea, The Netherlands

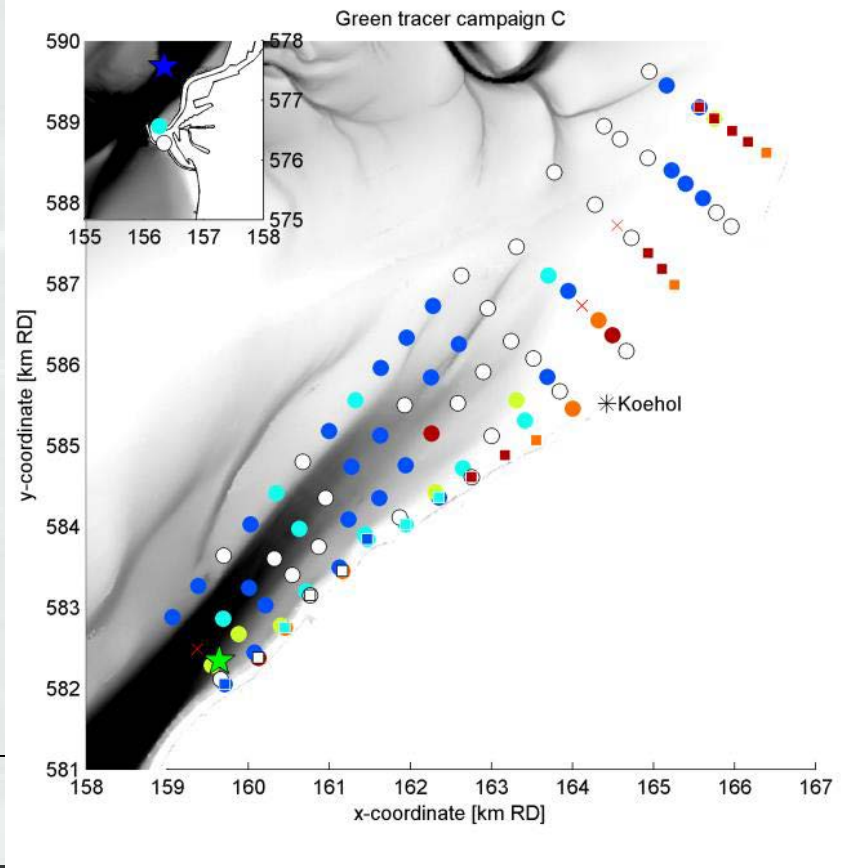
- Port of Harlingen – channel adjacent placement
- 2-year demonstration project: place dredged sediment midway between port and targeted wetlands
- 100,000 m^3/year for two years





Wadden Sea, The Netherlands

- Monitor hydrodynamic conditions, sediment fate (tracer), ecosystem response
- Sediment placed nearer wetland will increase TSS and sedimentation in the wetland but must accept that only a fraction deposits there
- Added Benefit: reduced channel infilling



Strategic Placement Summary

- Strategic placement supports broader USACE RSM/EWN goals
- Provides ongoing source of sediment to receptor site
- Supports FRM and Ecosystem Restoration missions
- One component in sustainable strategy for coastal resilience
- Placement design is critical to maximizing benefits while minimizing costs and risk
- Monitoring and modeling can support design and develop guidance (physical and ecology)