



U.S. ARMY

WEST COAST REGIONAL SEDIMENT MANAGEMENT

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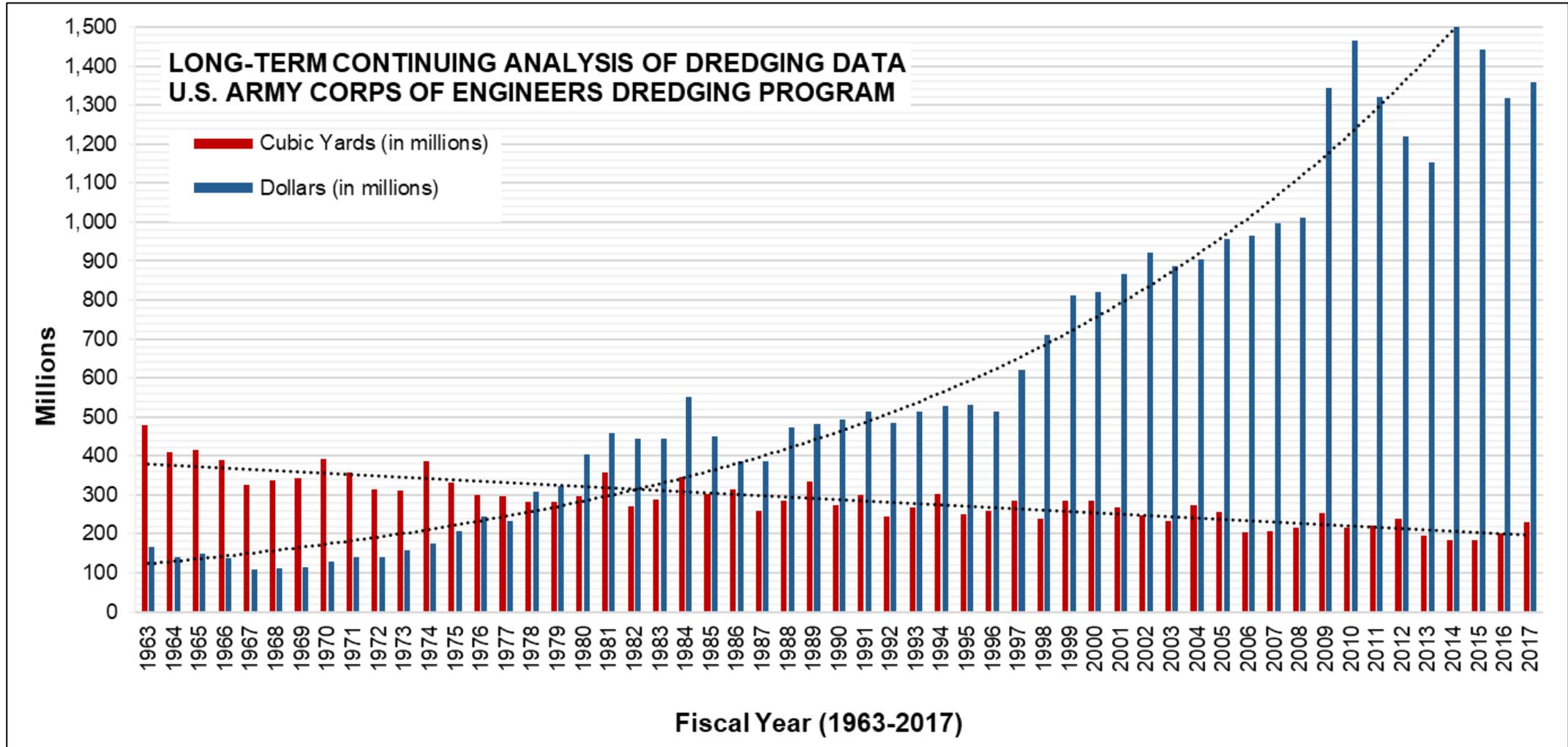
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US Army Corps of Engineers



The Corps moves 200 million cu yds of sediment annually...



...at a cost of more than \$1 billion per year

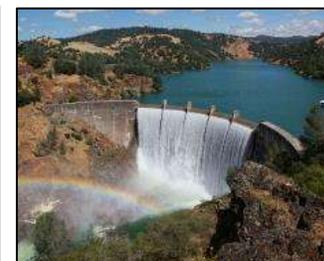
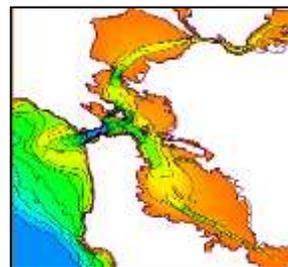
Regional Sediment Management

Established 1999, CERB Charge



“A systems approach using best management practices for more efficient and effective use of sediments in coastal, estuarine, and inland environments for healthier and more resilient systems.”

- Recognizes sediment as a valuable resource
- Work across business lines, projects, and authorities to create short and long-term economically viable and environmentally sustainable solutions
- Improve operational efficiencies and natural exchange of sediments
- Consider regional implications of project scale actions and benefits
- Apply/Enhance tools and technologies for regional approaches
- Share lessons learned, information, data, tools, and technologies
- Communicate and collaborate



RSM Goals and Strategies



Reduce Upland/CDF Disposal



Bypass Backpass Sediments



Reduce Erosion



Save Capacity



- **Keep sediments in the system**
- **Mimic natural sediment processes**
- **Reduce unwanted sedimentation**
- **Environmental enhancement**
- **Maintain & protect infrastructure**



Stabilize Structures

Reduce Channel Shoaling



Reduce Runoff



Ecosystem Habitat Restoration



National RSM Program Participation (2000-2019)

>230 Projects

Collaboration



29 Districts
ERDC, IWR, HEC

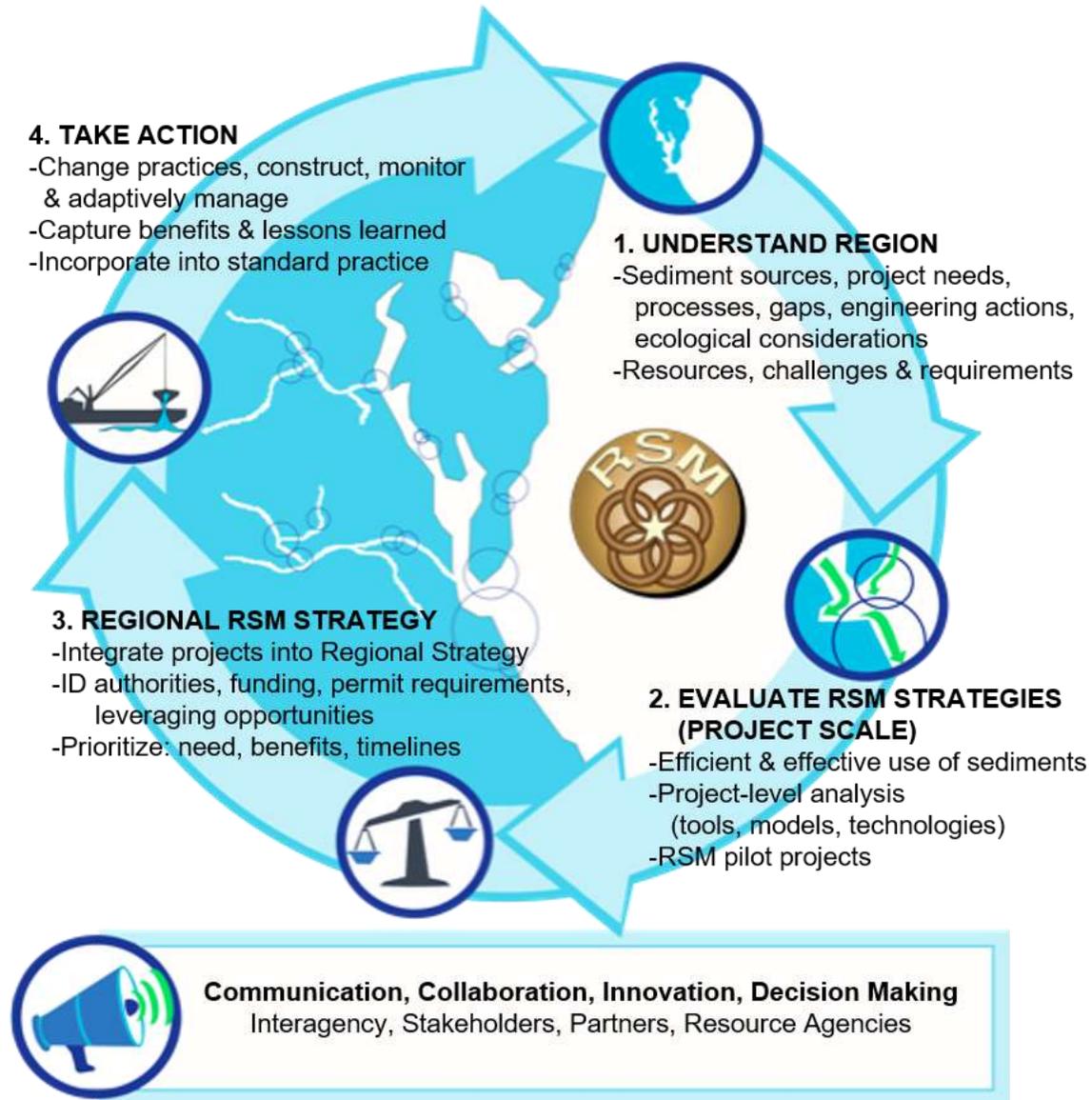


Tools & Technologies

RSM Collaboration: National and Regional Teams



RSM Process



Commonly Used Tools for RSM



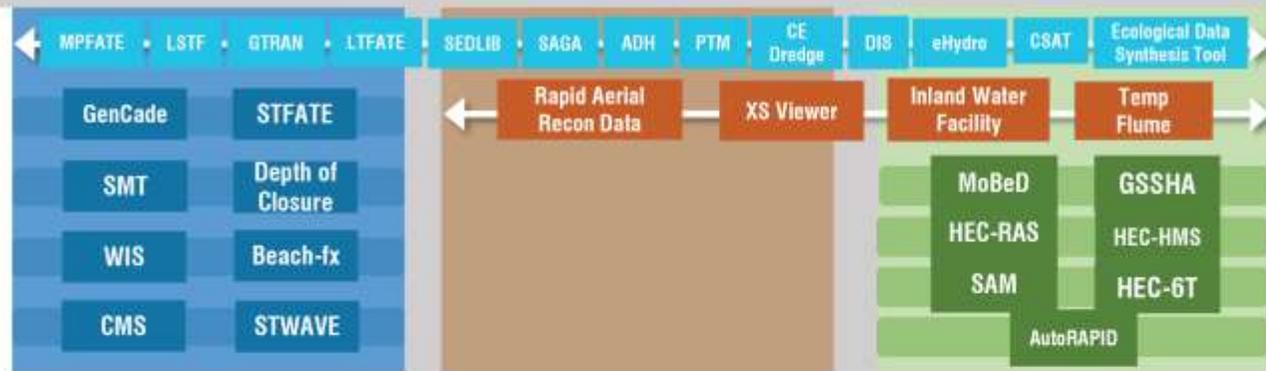
Understand Region

- Sediment Budgets
- Hydrodynamic, Hydraulic, and Sediment Transport Modeling
- Data and Information
- Surveys and Environmental Mapping
- Communication and Collaboration



Project-level Strategies

- Keep Sediments Within the Littoral and Inland systems
- Reduce Undesirable Sedimentation
- Mimic Natural Sediment Processes
- Environmental Enhancement
- Protect and Maintain Infrastructure
- Communication and Collaboration

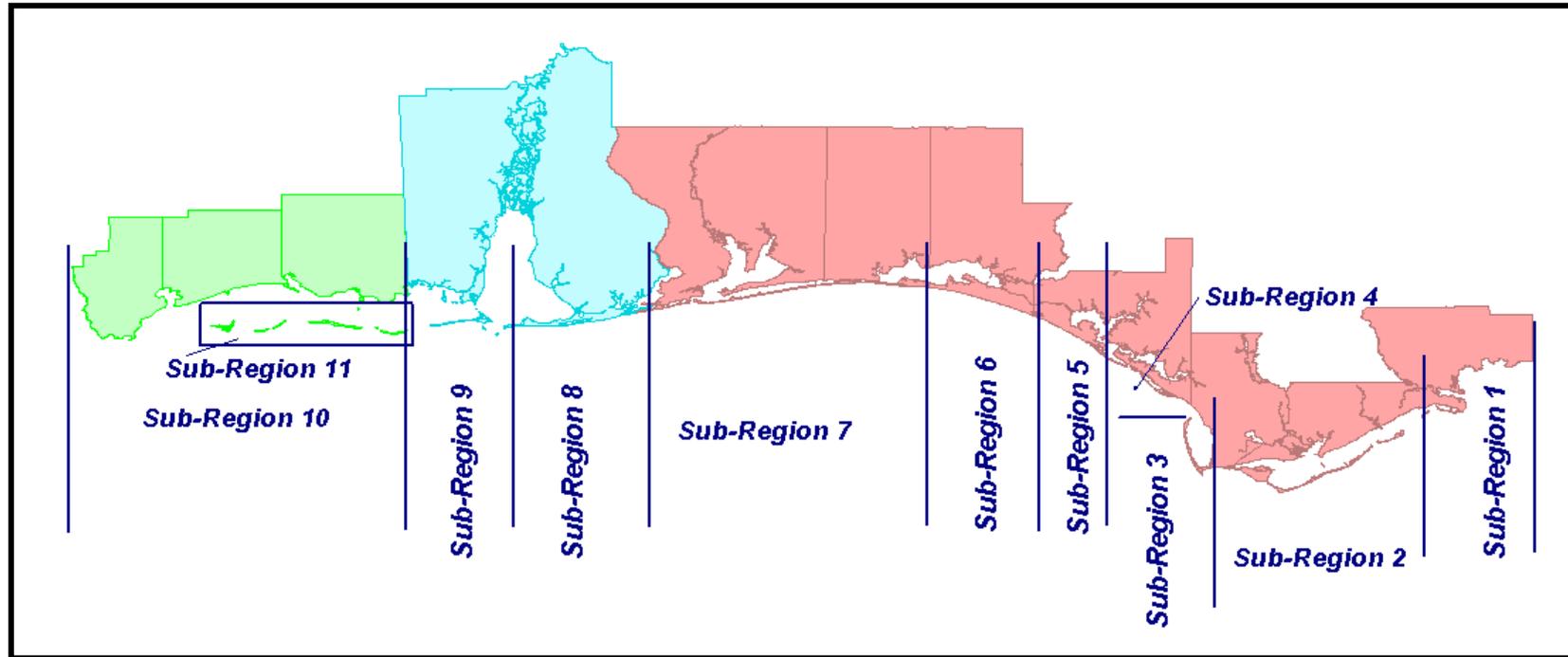


Regional Strategies and Optimization

- Optimize Value and Benefits
- Coordinate, Prioritize, Policy, Authorities, Permits, Funding, etc



Mobile District RSM Domain



375-miles of Shoreline
21 Federal Projects
8 State Parks
7 Military Installations

Gulf Islands National Seashore
Harrison County Beach Fill
Panama City Beach Fill
Local Projects

WRDA86:

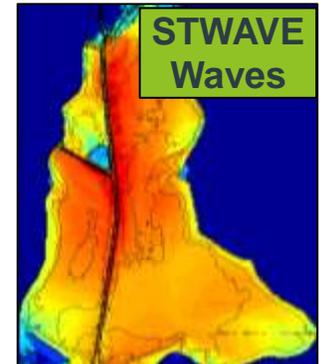
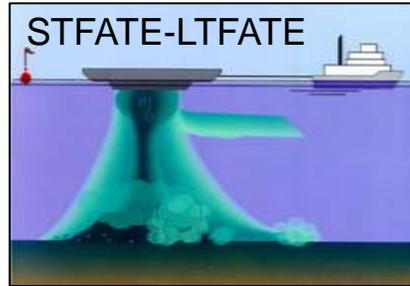
Place all dredged sediments in ODMDS
- 4.0 Mcy/yr, Hopper Dredge, 20-Miles
- Tripled maintenance costs
2014 Decision reversed
- ERDC Tools and Technologies
- RSM Interagency Work Group

Evaluating RSM Strategies

Mobile Bay O&M Dredged Material BU Alternatives



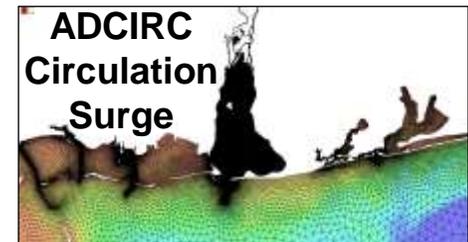
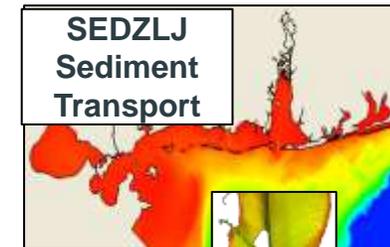
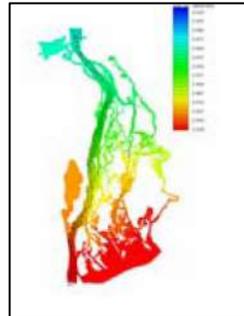
- Upper-bay
 - In-bay placement
 - Thin layer placement
- Lower Bay
 - ODMDS
- Various ERDC tools and technologies used to evaluate each alternative



HEC-RAS: River Analysis

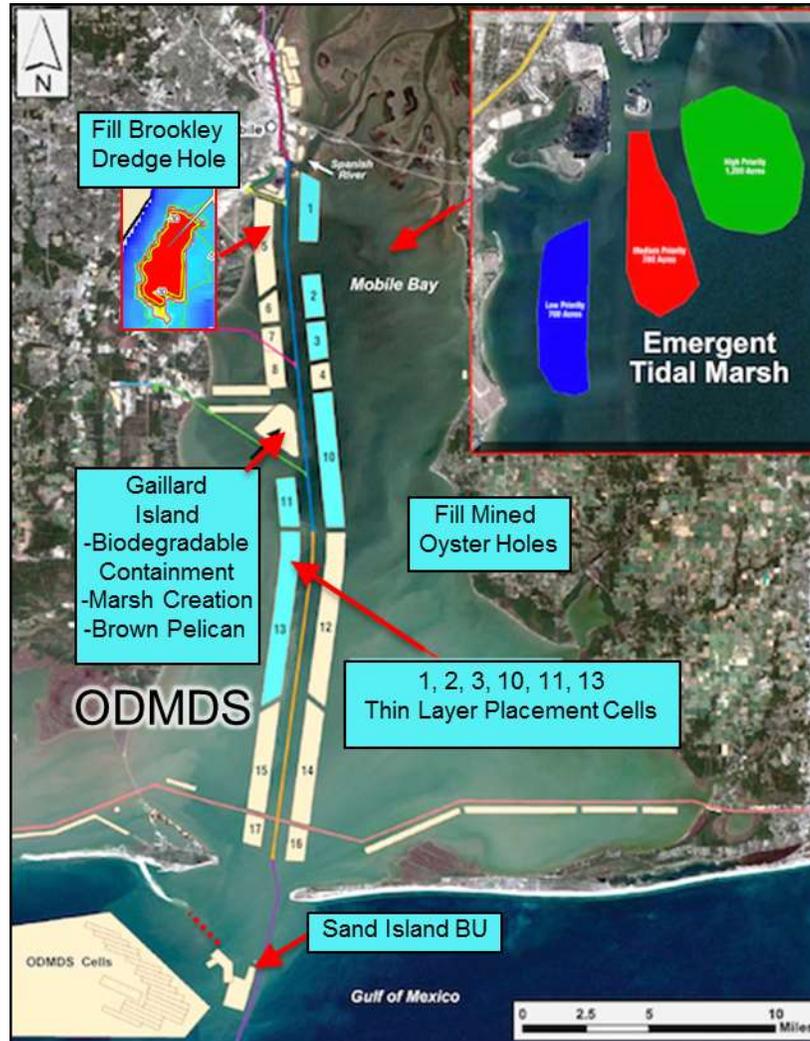


ADH: Watershed Analysis



Regional RSM Strategy and Construction

Mobile Bay RSM Strategy



\$6 Million in Annual Value

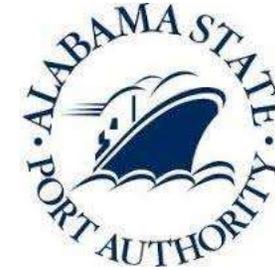
- Fill Brookley Dredge Hole
- Gaillard Island
 - Marsh creation
 - Biodegradable containment of sediment
- In-bay thin layer placement
- Fill mined Oyster Holes
- Sand Island Beneficial Use
 - No ODMDS Placement
 - Dredged material from upper end used to help reduce erosion along the island

Communicate and Collaborate

Mobile District Interagency RSM Team



- Alabama Department of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division
- Alabama Department of Environmental Management (ADEM)
- Alabama State Port Authority
- U.S. Fish and Wildlife Service
- NOAA, National Marine Fisheries Service
- Alabama/Mississippi Sea Grant
- Mobile Bay National Estuarine Program
- Mobile District
- ERDC



NOAA FISHERIES
National Oceanic and Atmospheric Administration



ADEM
Alabama Department of Environmental Management



ERDC



US Army Corps of Engineers
Mobile District

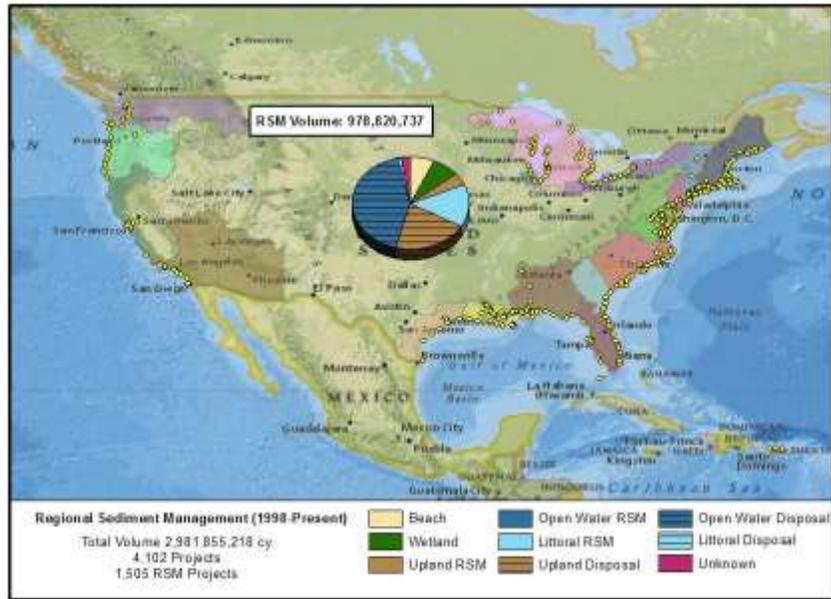


RSM Program Project Types

- **Research and Development**
 - Tool Enhancement/Development
 - New RSM Strategy Demos
 - Evaluating BU Hurdles
 - Quantification of BU in the USACE
- **RSM Implementation Projects**
 - Sediment Budgets
 - Evaluating Innovative RSM Alternatives (Project Specific)
 - Creating Regional RSM Strategies
 - Optimization
 - Stakeholder and Resource Agency Workshops
- **RSM University**
- **Others**
 - Great Lakes Coastal Resiliency Study Scope
 - WRDA 2016 Section 1122 Pilot Projects

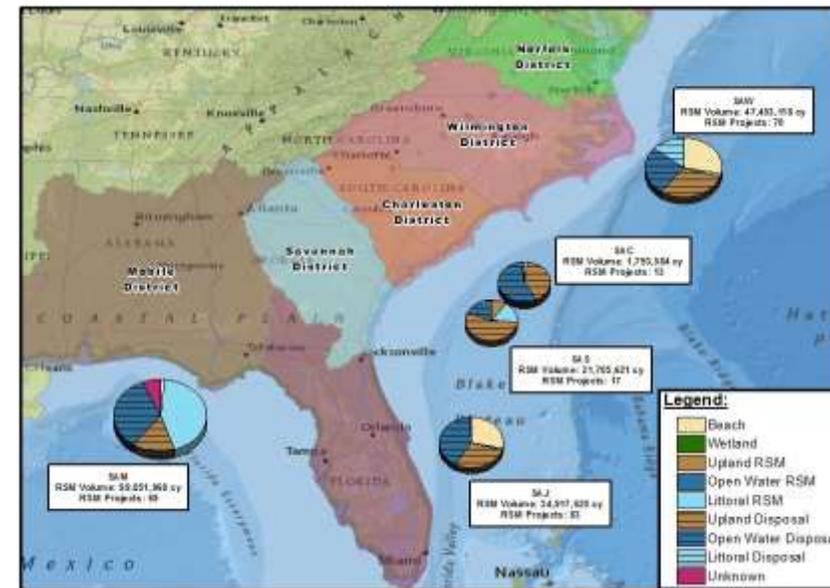
Historical Navigation Sediment Utilization:

Where, when, volume of sediments placed beneficially? Where can we improve?



District Data 1998-2018 Coastal/Inland Navigation Projects

- 210 Mcy/yr Total
- 38% placed beneficially
- 10 Mcy/yr placed on beaches
- 2.5 Mcy/yr Unknown



Sediment Sorting during the Dredging and Placement Process



BLUF: The objective of this study is to quantify sediment sorting and the corresponding changes in sediment characteristics during dredging and placement operations. These objectives are motivated by a desire to better inform sediment compatibility analyses and subsequent management of sediment resources.

Challenge/Objectives

- Perform extensive literature review of previous studies
- Determine best practice for the dredging process
- Quantify changes in sediment characteristics during the dredging process

Approach

- Complete conceptual review on sediment sorting through the dredging process
- Laboratory testing of weir sampling methods
- Field study on dredge to identify loss points and quantify sediment sorting

87% of fines removed

• 70% - overflow

• 30% - beach outwash



Mouth of the Columbia River

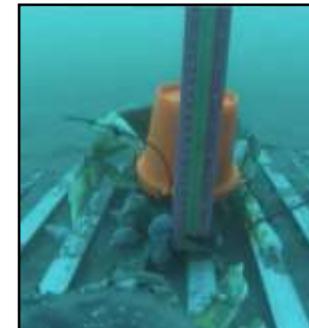
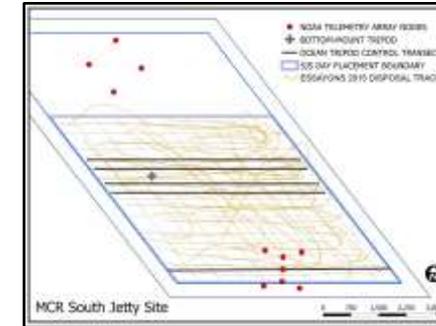
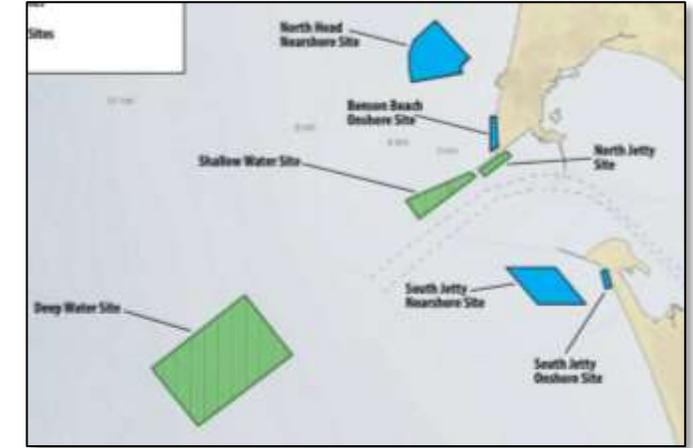
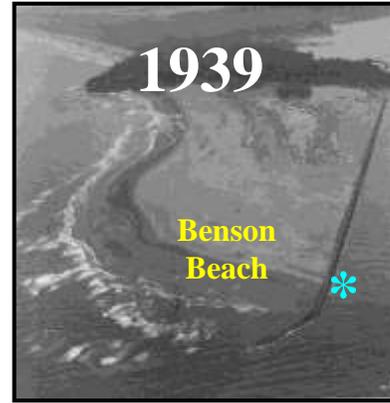
POC Jarod Norton
Challenge

- Prevent “wasting” sediment to the DWS
- Protecting public investment (Jetty)
- Shoreline erosion
- Protect benthic habitat

Goals

Implement NWP RSM Strategy

- Keep sediment in the littoral cell (BU)
- Obtain/place new nearshore sites
- Protect South Jetty Root
- Dune Building: Sand Fencing
- Lower Maintenance Dredging Costs/Cycle Time
- Increased Habitat Opportunities for Benthics
- Stakeholder collaboration
- \$110,000 cost savings/season South Jetty Site
- Additional Cost Savings/Environmental Benefits TBD



Seattle District, Ediz Hook Post-dam removal shoreline change analysis

POC: David R. Michalsen, P.E.



BLUF: Two dams on the Elwha River were removed in late 2011, sending a large pulse of sediment into the Elwha River Littoral Cell (ERLC). Ediz Hook located at the downdrift end of the ERLC began a beach nourishment program in 1978 to mitigate for loss of sediment supply from the delta and shoreline armoring. Now that sediment from the ER delta has been restored, we are investigating how this large sediment pulse will affect O&M of Ediz Hook over the next 50-year life cycle

Problem Statement/Issue

- Ediz Hook protects the only deep-draft NAV channel on the Strait of Juan de Fuca
- USCG has a strategic air station on Ediz Hook for S&R
- O&M program partners with City of Port Angeles to renourish Ediz Hook with cobble ~5-10 years. O&M funding and cost-share \$\$ are not routinely available (deferred maintenance)
- Loss of nearshore habitat due to beach coarsening

Approach to Address Problem

- Determine if O&M demands will decrease & if so when will this occur?
- Can sand/gravel vs. cobble be utilized in future nourishment(s) to increase habitat value?
 - Develop sediment budget over ERLC
 - Perform shoreline change modeling to help guide future management decisions



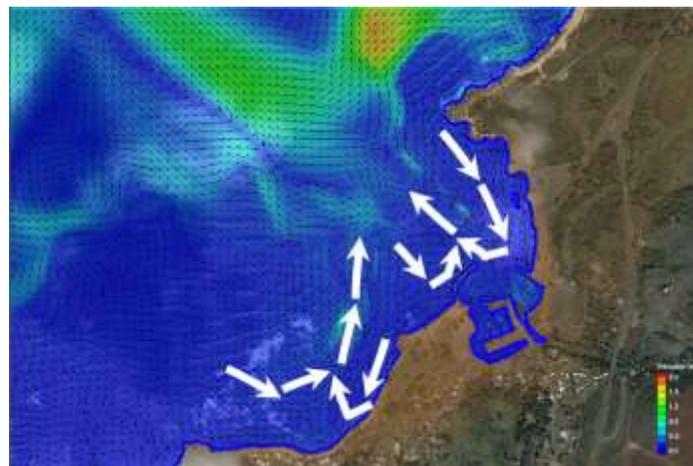
POH: Regional Sediment Budgets for the Haleiwa Region Oahu, Hawaii

Objectives

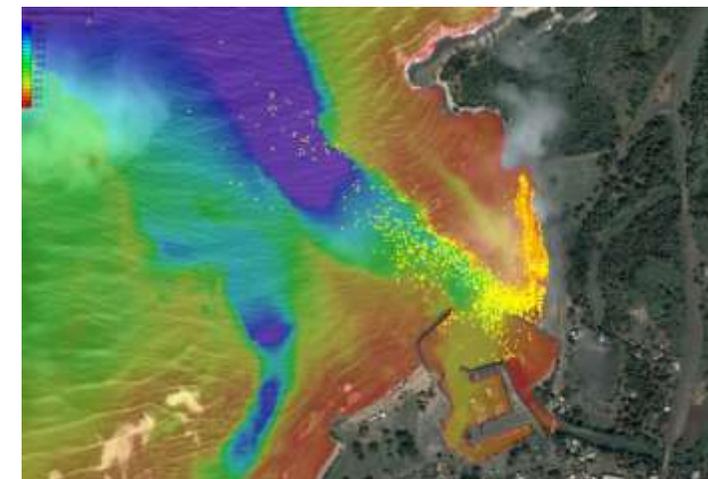
- Analyze existing shoreline change data, field observations, modeling results to develop better informed decisions for future RSM strategies in the area
- Results of this project were used to create the pre- and post-Haleiwa Harbor sediment budgets for the Haleiwa Region

Approach

- Conduct shoreline analysis using USGS data
- Run CMS-Wave and Flow in steering module to determine wave transformation and water circulation in the area for both prevailing (trade winds) and predominant (northwest swell) conditions
- Run PTM with CMS hydrodynamics to identify sediment transport pathways
- Use modeling results and field data analysis to create a sediment budget pre- and post- harbor construction to determine best RSM practices



Pre-Project Sediment Pathways



Post-Project Sediment Pathways





Future Program Goals

- **Continue District support to determine best RSM alternatives for projects**
- **Ongoing effort to quantify BU in USACE**
 - **Connect Dredging Information System directly to database**
- **Quantify cost savings/value due to RSM**
 - **Quantification of benefits not necessarily related to money (i.e. what is the value of a wetland?)**
- **R&D on innovative RSM solutions**
 - **Thin layer placements**
 - **CDF sediment usage**
 - **Adding more science to regulations (e.g. allowable percentage of fine sediment)**
- **Make RSM SOP in District and Division project planning**



What is the value of RSM?

- **More Efficient Project Execution**
 - Reduced lifecycle costs
 - More project execution (low use)
- **Utilizing Sediment Resources for Healthy Systems**
 - More sustainable and resilient coastal and riverine shorelines, ecosystem and aquatic habitats
- **Build Institutional Knowledge**
 - Improved post-storm recovery
 - Better data, tools, models available
- **Relationship Building**
 - Across USACE
 - Nationwide engagements across business lines and communities of practice
 - Stakeholder/Resource Agency Communication and Participation



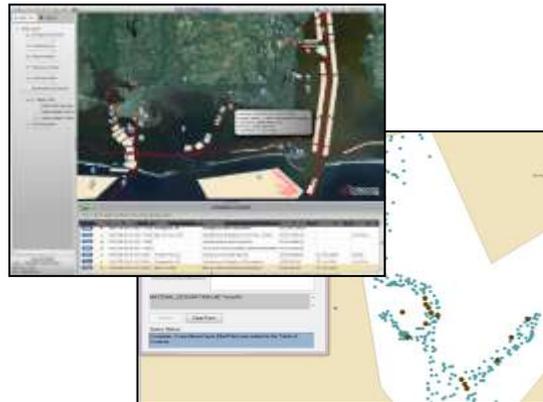
Regional Sediment Management = Resilient Healthy Systems

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Regional Sediment Budgets
Local Actions=Regional Benefits



Data Management and Access



ODMDS
Regional Strategies



Improved Relationships
Outreach & Training



Riverine & Reservoir Mgmt



Ecosystem/Aquatic Habitat