NATIONAL REGIONAL SEDIMENT MANAGEMENT PROGRAM

Katherine E. Brutsché, PhD
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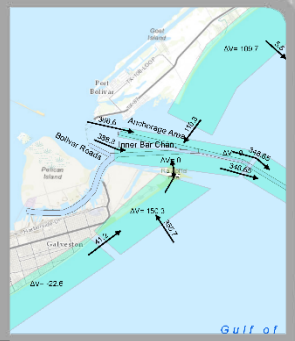
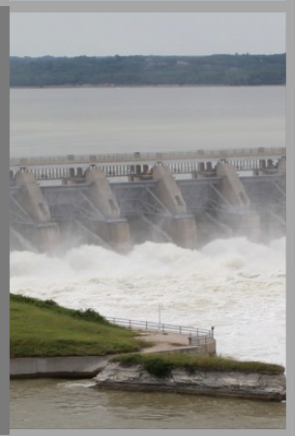
National Regional Sediment Management Program

Linda S. Lillycrop
Program Manager
National Regional Sediment Management Program

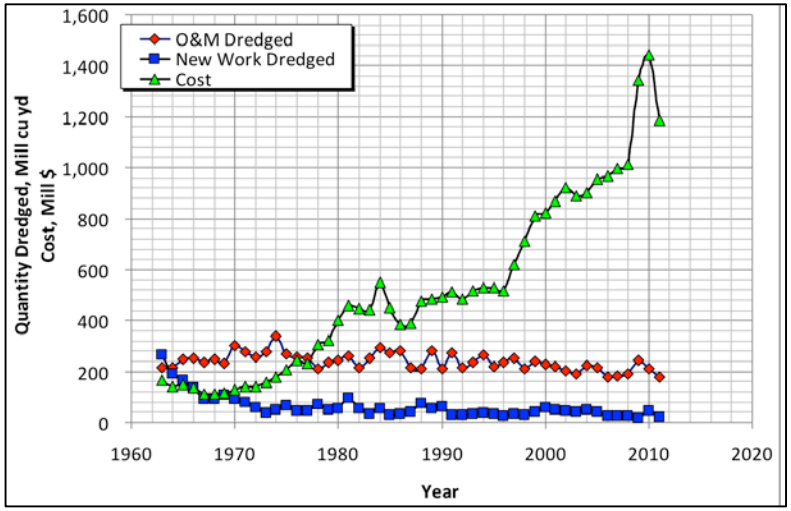





ERDC Engineer Research and Development Center
Innovative solutions for a safer, better world
US Army Corps of Engineers®
U.S.ARMY

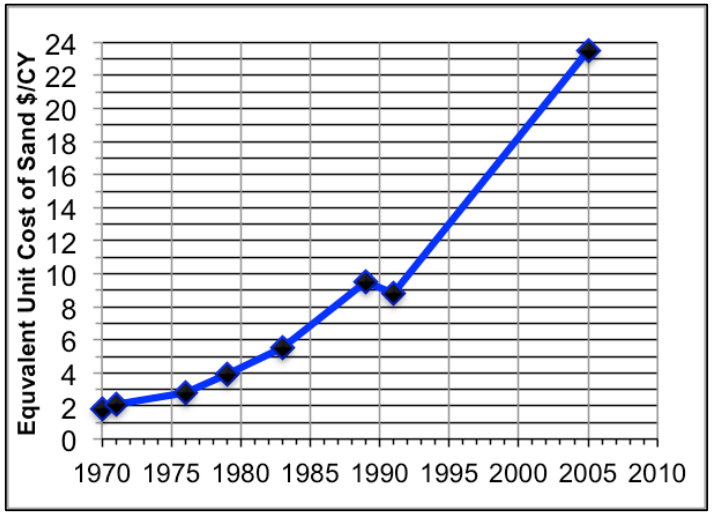
…..The Corps moves 200 Million cu yds of sediment annually

…At a cost of more than $1 Billion per year



US Navigation Channels

O&M & New Work Volumes and Cost

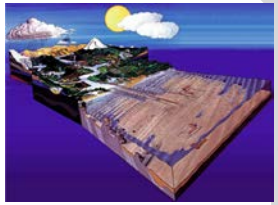


Broward Co Shore Protection Project

Cost of Sand

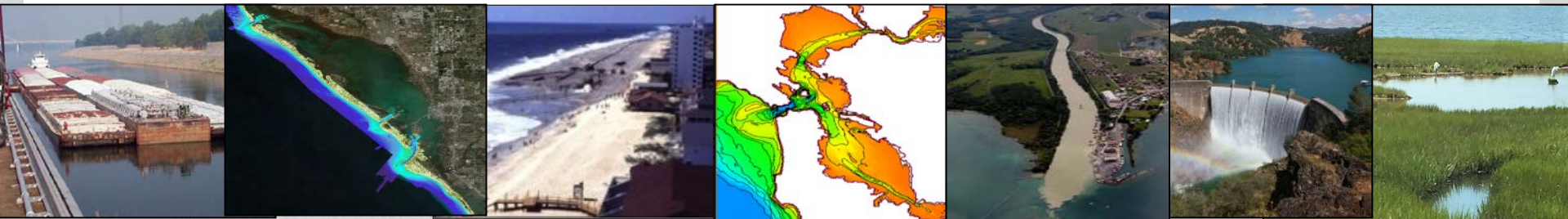
Regional Sediment Management

Established 1999, CERB Charge



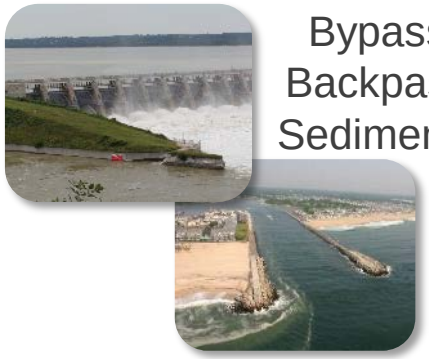
"A systems approach using best management practices for more efficient and effective use of sediments in coastal, estuarine, and inland environments for healthier and more resilient systems."

- **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

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

Stabilize Structures

Save Capacity

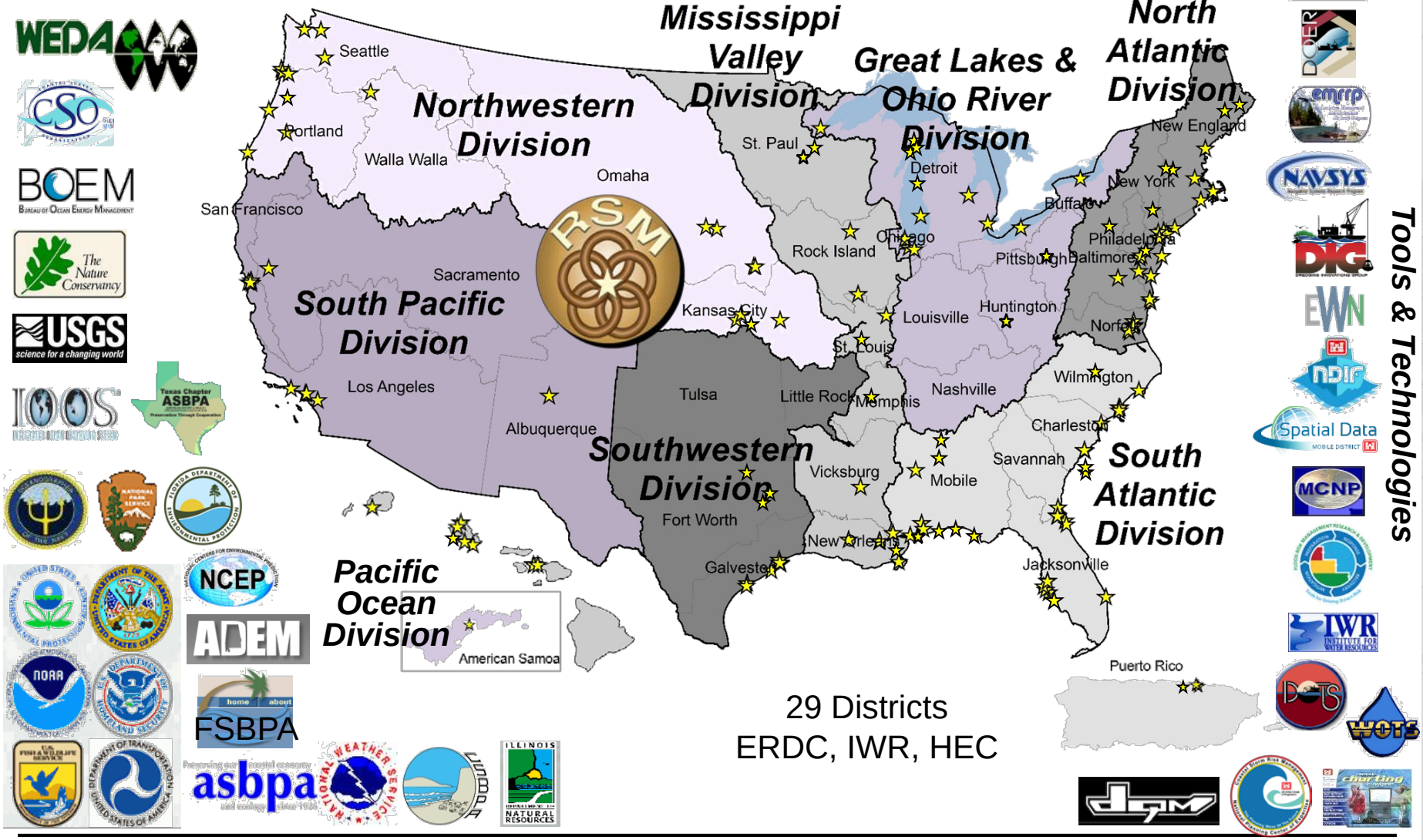
Reduce Channel Shoaling

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

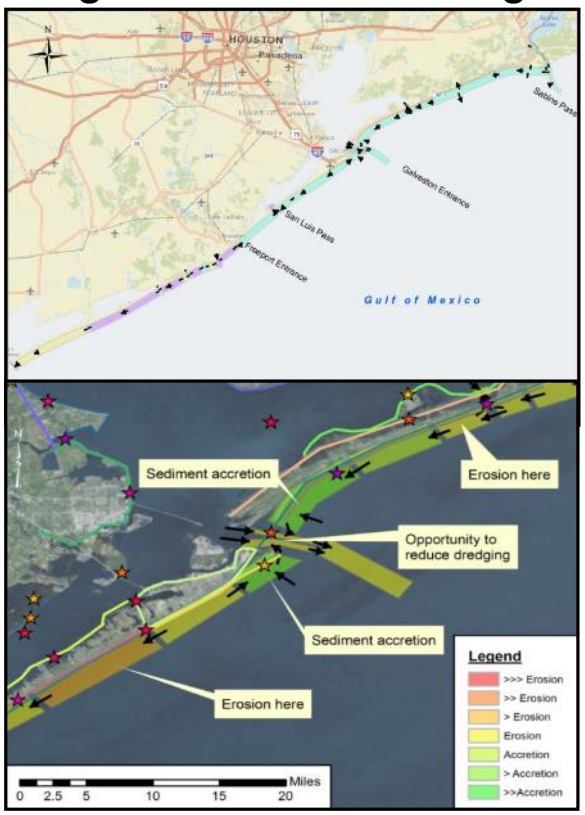
RSM Process


4. TAKE ACTION
-Change practices, construct, monitor & adaptively manage
-Capture benefits & lessons learned
-Incorporate into standard practice
1. UNDERSTAND REGION
-Sediment sources, project needs, processes, gaps, engineering actions, ecological considerations
-Resources, challenges & requirements
RSM
3. REGIONAL RSM STRATEGY
-Integrate projects into Regional Strategy
-ID authorities, funding, permit requirements, leveraging opportunities
-Prioritize: need, benefits, timelines
2. EVALUATE RSM STRATEGIES (PROJECT SCALE)
-Efficient & effective use of sediments
-Project-level analysis (tools, models, technologies)
-RSM pilot projects
Communication, Collaboration, Innovation, Decision Making
Interagency, Stakeholders, Partners, Resource Agencies

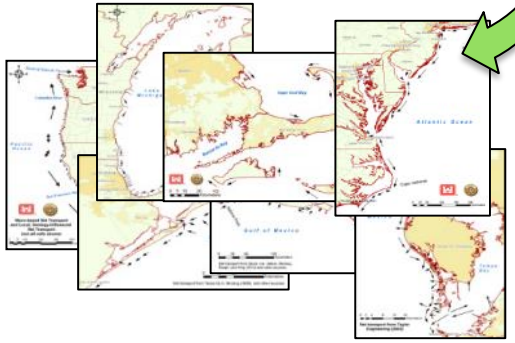
Sediment Budgets

- Sediment Budget Analysis System (SBAS)
- Sediment Impact Analysis Methods (SIAM)

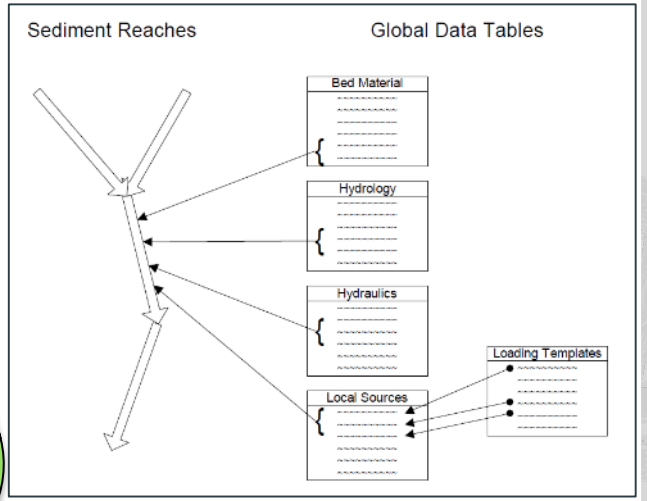
Regional Sediment Budget



Sediment Budget Portal



Sediment Budget Database

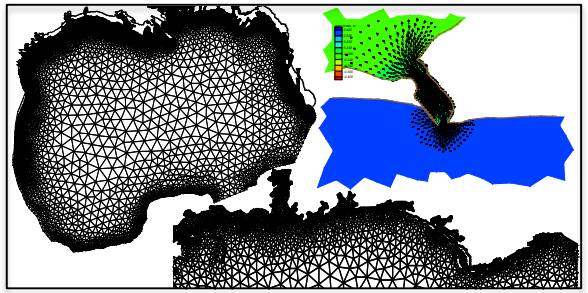


Anna Jalowska, UNC-CH

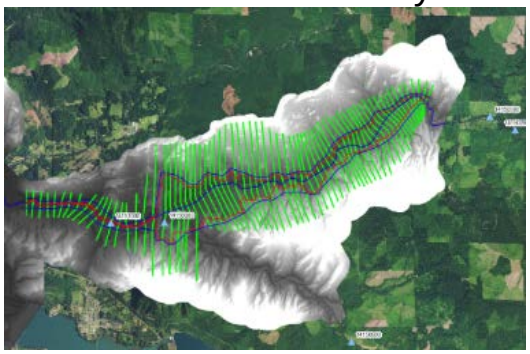
Models for RSM

- Sediment sources and sinks
- Regional processes and trends
- Multiple interacting projects
- Connect beaches & inlets
- Connect rivers & reservoirs
- Navigation channel maintenance
- Evaluate local/regional RSM strategies

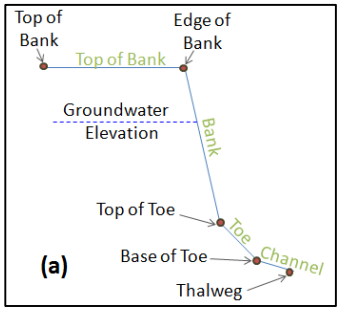
ADCIRC: Storm Surge & Circulation



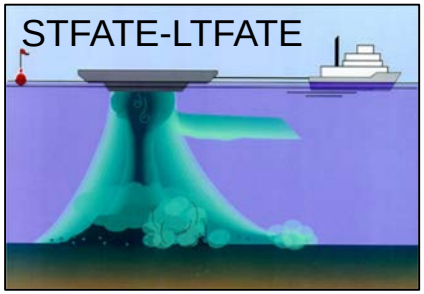
HEC-RAS: River Analysis



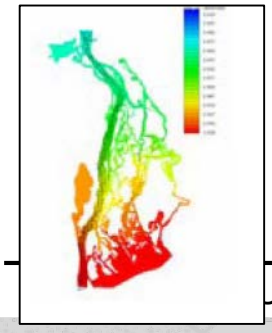
Bank Stabilization

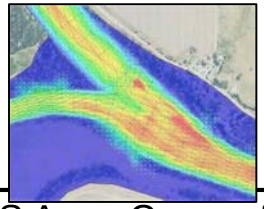


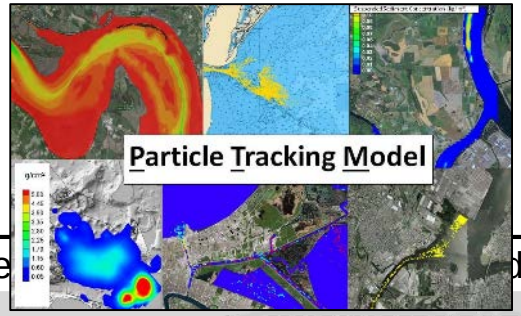
Dredge Material Placement



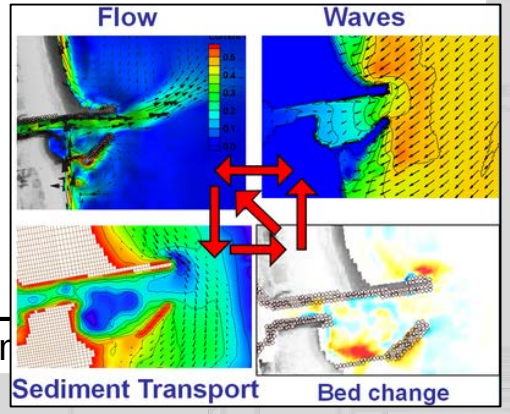
ADH: Watershed Analysis







CMS

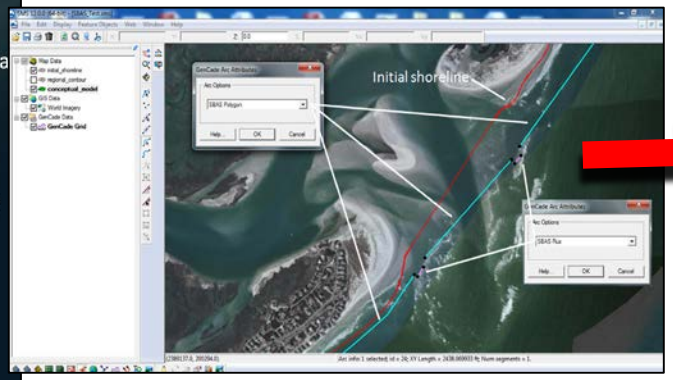


GenCade & SBAS Integration

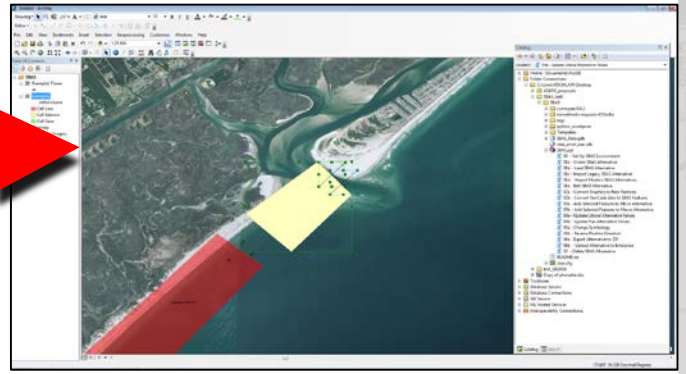
GenCade

- Regional shoreline change, sand transport, inlet-sand sharing model
- Connects multiple beaches & inlets
- Multiple sources & sinks
- Regional trends
- Evaluate regional strategies

GenCade



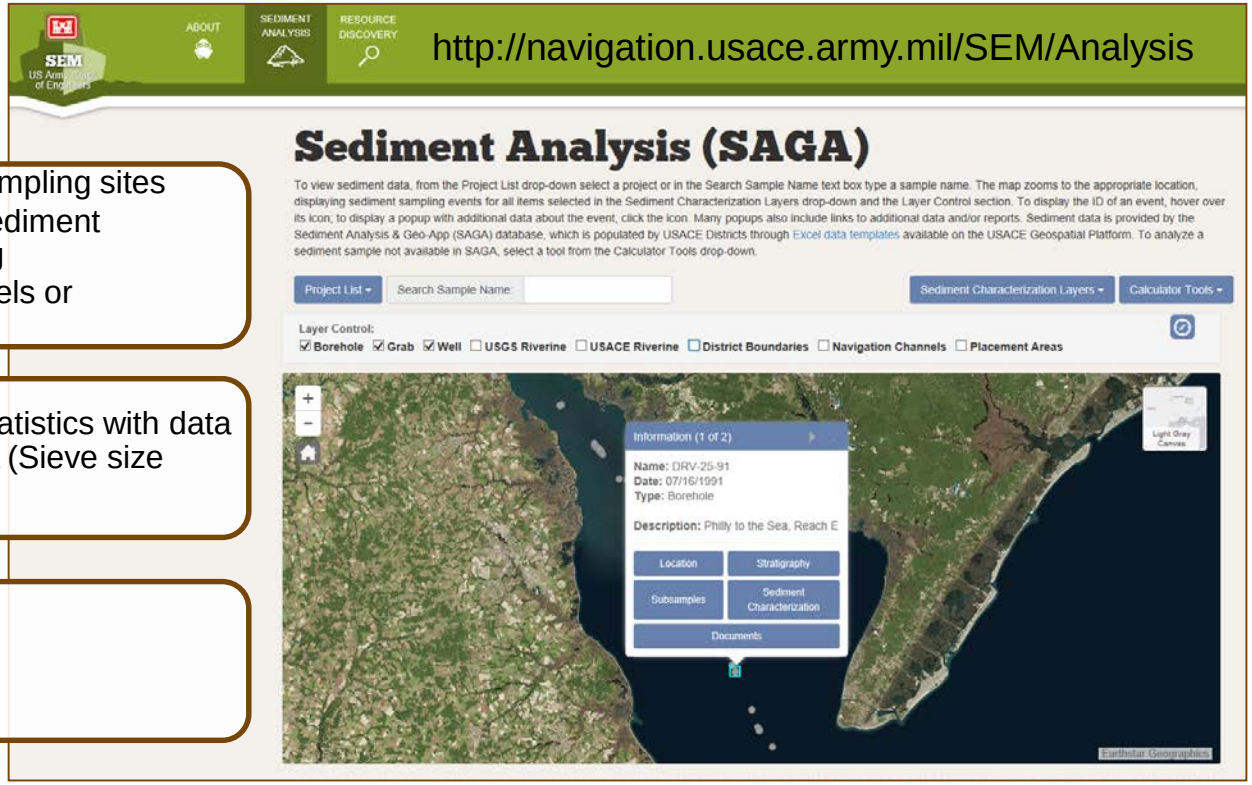
SBAS



Automate Output to SBAS

- ➢Volume change
- ➢Transport rates
- ➢Dredging and beach fill volumes
- ➢Cells and fluxes

Sediment Analysis and GeoApp (SAGA)



Mapped Sites

- Show distribution of sampling sites
- Filter sites based on sediment characterization testing
- View navigation channels or placements areas

Tools

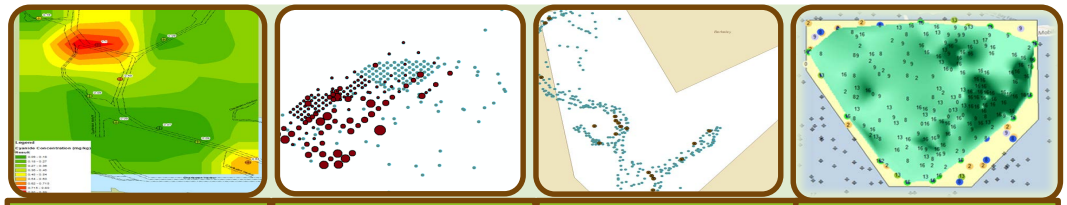
- Compute Grain Size statistics with data not yet stored in SAGA (Sieve size distribution testing)

Site Details

- Retrieve testing results
- View documents
- Access stratigraphy

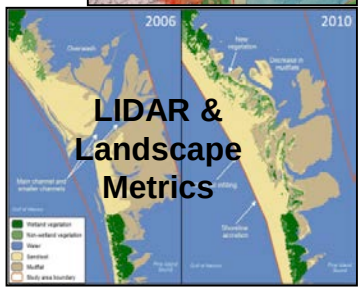
FRF

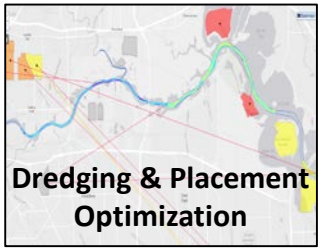
SAC, SPN MVD

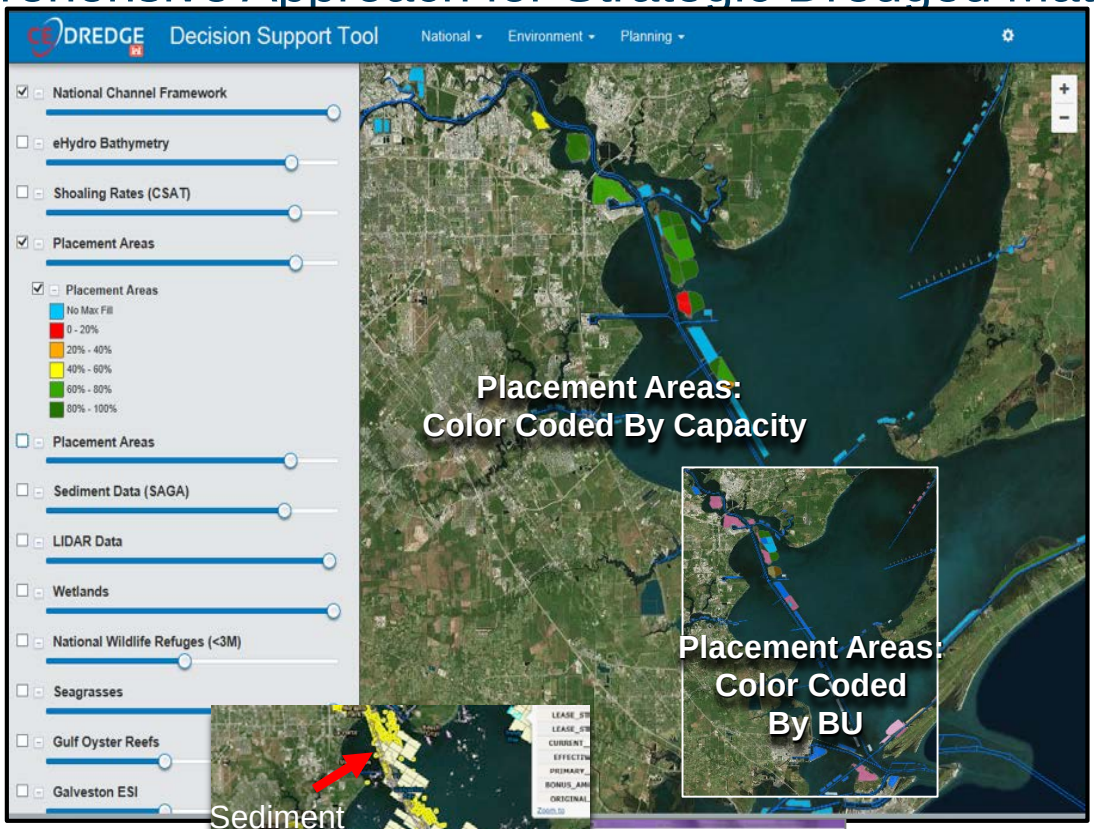


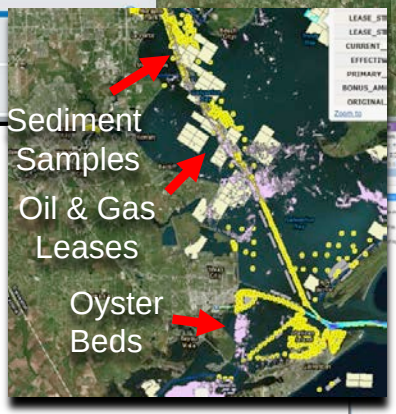
Visualize distribution of detected chemicals	Symbolize sites based on average grain size	Isolate sites based on attributes	Determine volume of material at specified depths

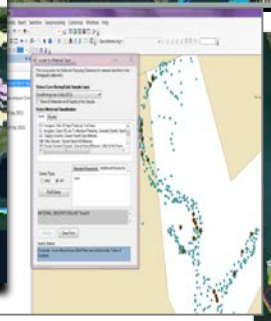
CE-Dredge Decision Support Tool
Integrated, Comprehensive Approach for Strategic Dredged Mat'l Mgmt





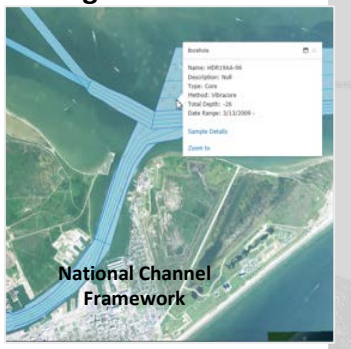


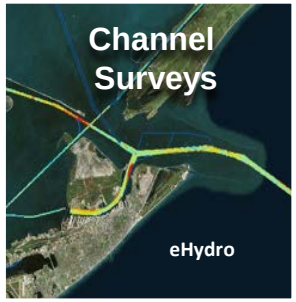


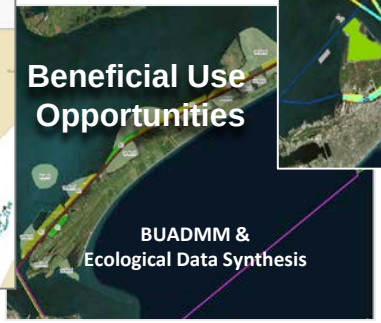


Sediment Data & Tools

Navigation Channels

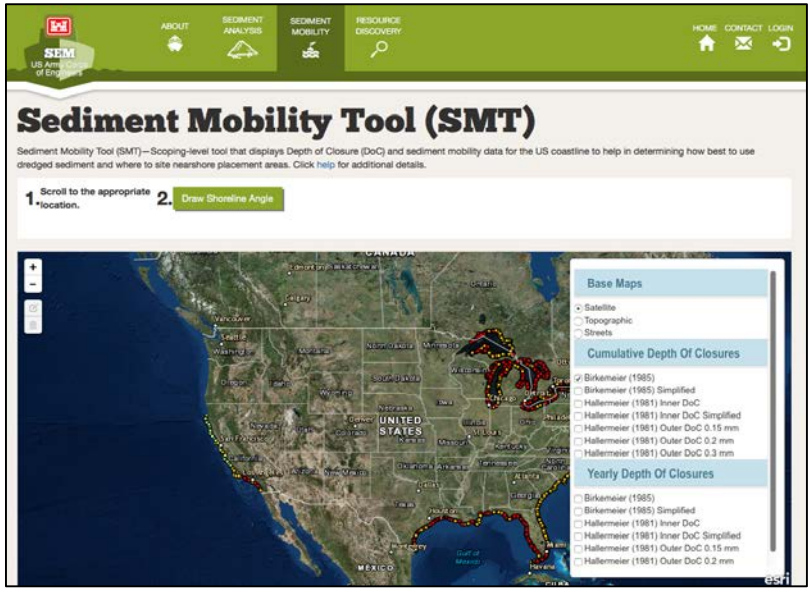






Nearshore Berm Research, Guidance, and Tools

http://navigation.usace.army.mil/SEM/SedimentMobility



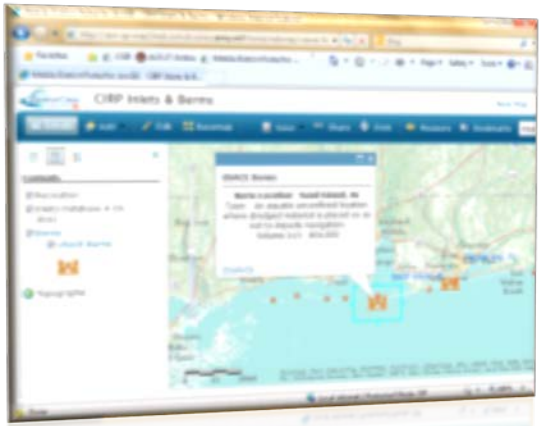
d_{50} (mm)	Frequency of Mobilization	Predicted Sediment Migration
0.1	16 – 38%	83% Offshore
0.2	14 – 30%	60% Onshore
0.3	12 – 26%	84% Onshore

SMT

Preliminary tool: educated decisions w/limited data

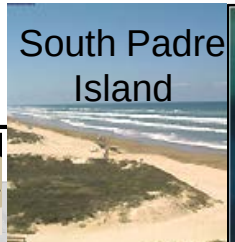
Estimates

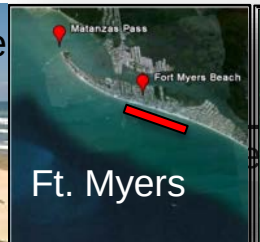
- Frequency of sediment mobility
- On/Offshore migration direction
- Dominant axis of wave direction to estimate alongshore migration



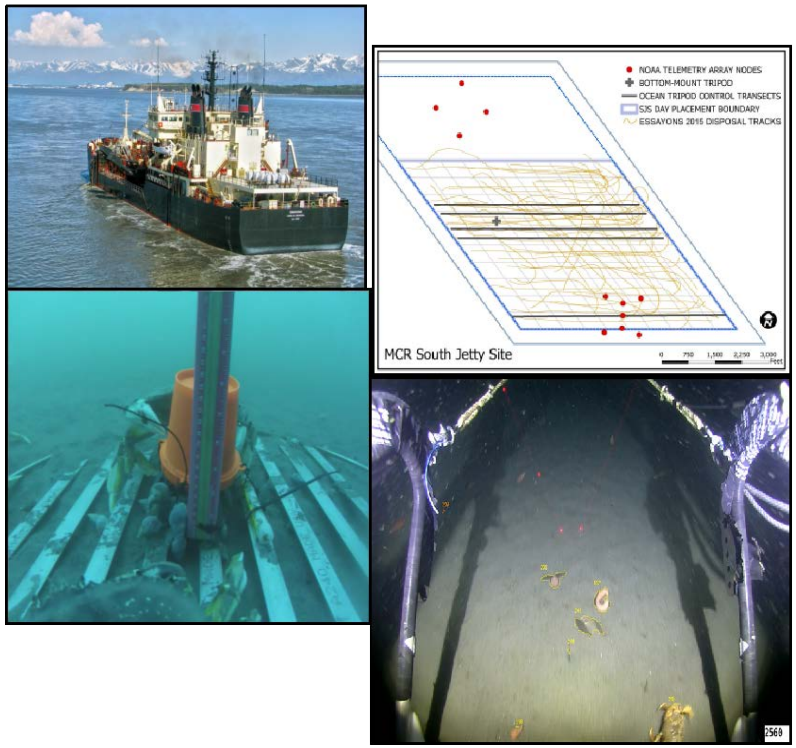
Berm Database

Assateague Island, MD

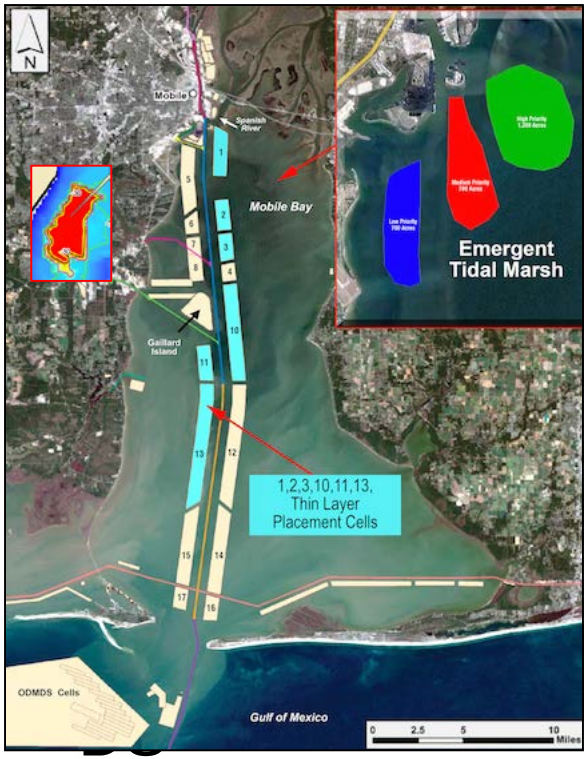




Thin Layer Placement of Dredged Sediments
Open Water Placement



Mouth of the Columbia River
(Lower Columbia River Solutions Group)

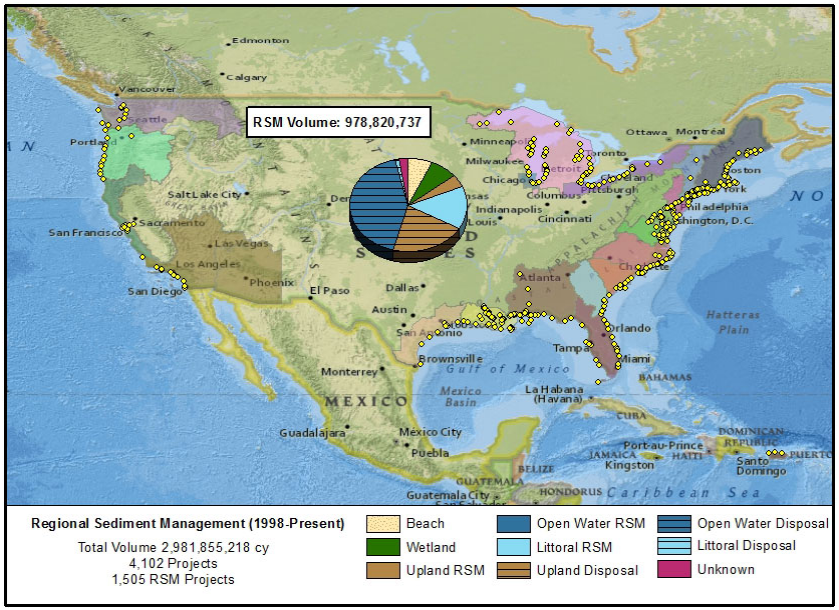


Mobile Bay
(Interagency Working Group)

Understand Behavior - Mobilization, Transport, Consolidation
Benthic Habitat - Reduce Impacts & Enhance
Shallow Emergent Tidal Marsh Habitat
Dredge Hole filling - Recover Hypoxic & Anoxic Zones

Historical Navigation Sediment Utilization:

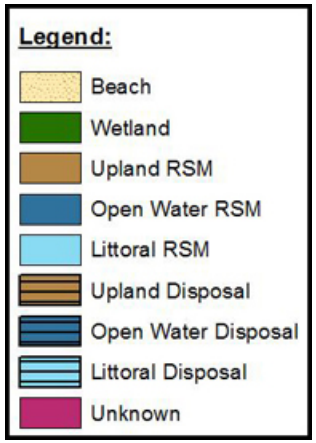
Where, when, volume of sediments placed beneficially? Where can we improve?

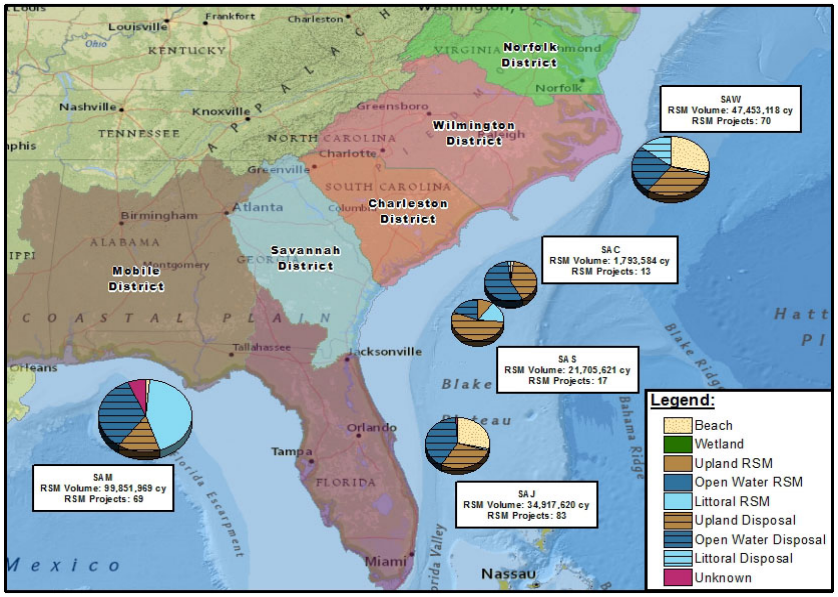


District Data 1998-2017

Coastal Navigation Projects

- 3 Bcy
- 36% placed beneficially
- 9 Mcy/yr placed on beaches
- 5 Mcy/yr Unknown





Regional Sediment Management (RSM) Studies

SWG selected for RSM studies FY12-19 (green = implementing)

- **FY12: Matagorda Bay RSM Study**
- **FY13: GIWW RSM (West Galveston Bay)**
- **FY14: Galveston Entrance Channel RSM**
- **FY15: Lower Matagorda Bay RSM**
- **FY16: GIWW-CCSC Intersection Shoaling**
- **FY17: GIWW-Bolivar Flare Shoaling**
- **FY18: Utilization and Design Considerations for Channel to Victoria (CTV) BU Sites**
- **FY19 (upcoming study): GIWW Caney Creek RSM**

*from Trisha Campbell, SWG

Galveston Entrance Channel RSM

Tricia Campbell, Ashley Frey, Andy Morang

Challenge

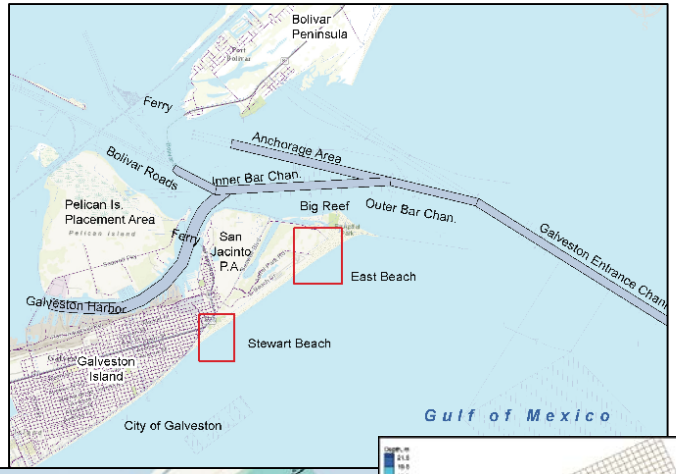
- Funding challenge to maintain Galveston Entrance Channel and upland PAs
- Dredge 1.5-2MCY every 18-24 months, $6-8M

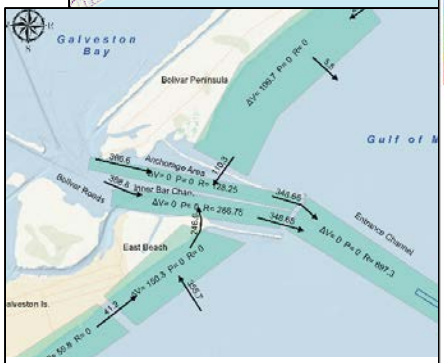
Objectives

- Solutions to reduce channel sedimentation & dredging requirements
- Allow more flexibility to manage overall project
- Coordinate w/PAS Galveston Park Board of Trustees Galveston Island study 50 yr mgmt plan

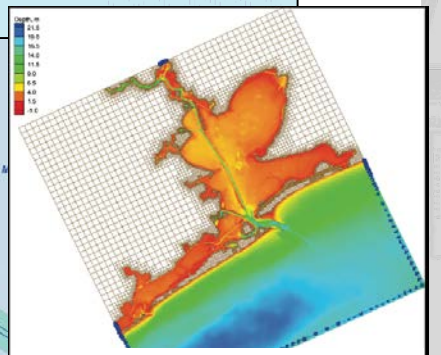
Maximum Sediment Saved by Implementing Each Alternative Individually

- Sand-tighten jetties: 113,000 CY/YR
- Prevention of wind-blown sand: 21,000 CY/YR
- Back-passing plant with spur dikes 150,000 CY/YR
- Close boat cut in North Jetty: 160,000 CY/YR
- Place PA A material on beach: 300,000 CY/YR

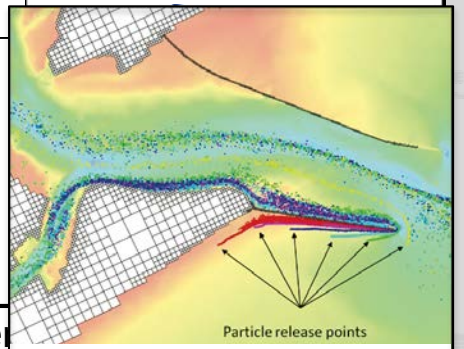




Sediment Budget Analysis System



Coastal Modeling System



Particle Tracking Model

MAXIMUM POSSIBLE SAVINGS OF ALL ALTERNATIVES:
690,000 CY/YR* ~ $2.8M/YR (based on $4/CY)

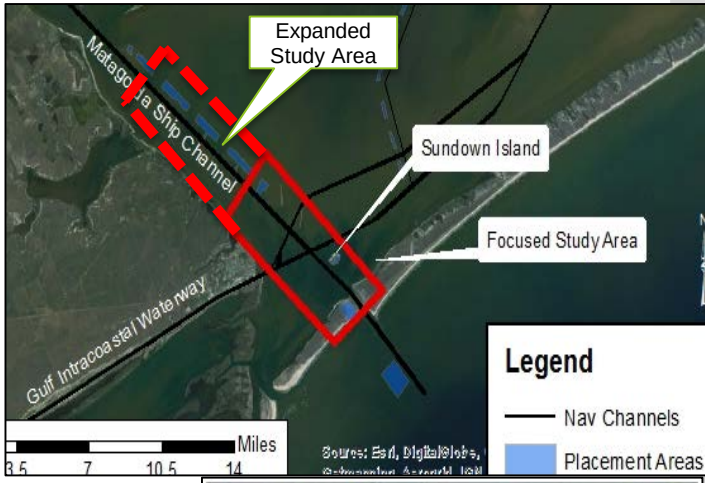
Park Board Adopted Sand Management Plan 2015

Lower Matagorda RSM

Tricia Campbell

Challenge

- Issues maintaining Lower Matagorda Ship Channel to authorized depth with available funding
- Draft restrictions requiring annual dredging
- Impacts MSC and GIWW projects

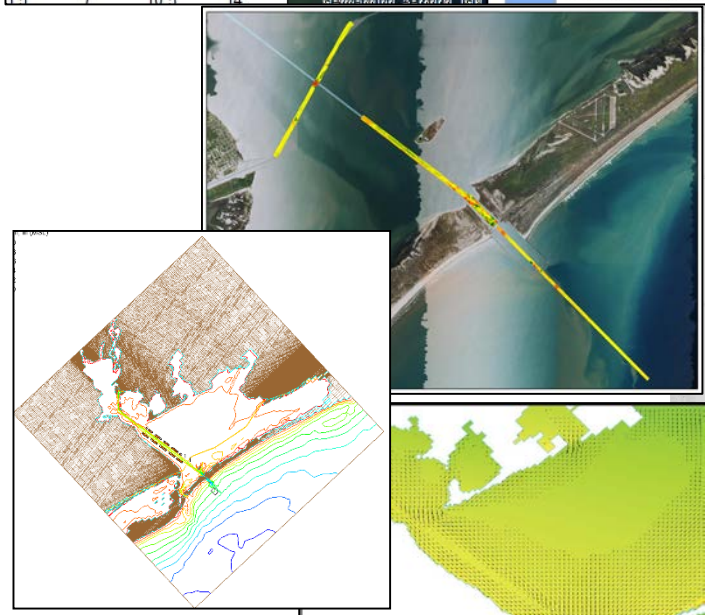


Approach

- Stakeholders, Pilots feedback on issues & solutions
- Analysis of physical conditions & alternative dredging practices to develop solutions
- Model solutions to quantify any reduction in shoaling
- Utilize Enterprise Systems (SBAS, eHydro, CSAT, DMMP tools, ArcGIS to display data)

Potential Solutions

- Relocate PAs 6-10 to west side of channel
- Semi-confine PAs 6-10
- Place Sediment in Sundown Island in lieu of PA6
- Place material “elsewhere” besides PAs 6-10



SWG – Channel to Victoria BU Utilization Investigation
POC: Steve Howard

BLUF: Development of an alternative approach to managing dredged material in the GIWW, Channel to Victoria (CTV) by assessing impacts of utilizing BU sites adjacent to the channel.

Challenges

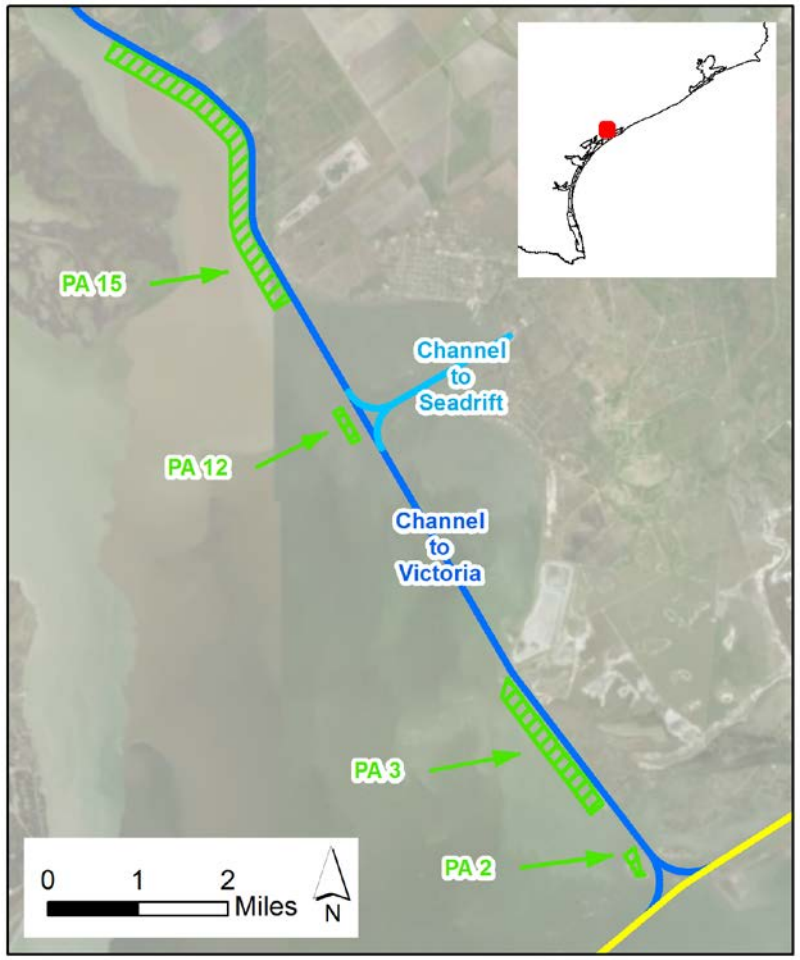
- Quantify benefits
- Balance missions of difference agencies

Objective

- Leverage historic or previously identified BU sites.
- Determine potential impact on channel shoaling rates and design components.
- Reducing the cost of dredging while creating/enhancing habitat

Approach

- Task 1: Gather data
- Task 2: Review coastal processes and develop potential living shorelines
- Task 3: Analyze impacts of BU sites/living shoreline to channel
- Task 4: Cost analysis



SWG, GIWW CCSC Intersection Shoaling Reduction
POC: Tricia Campbell

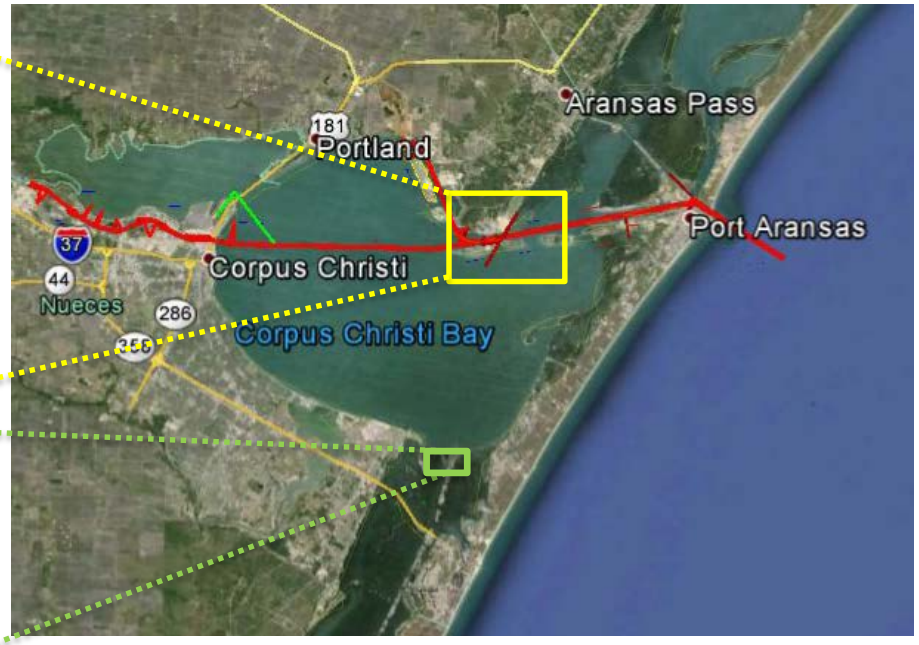
BLUF: Shoaling in the Gulf Intracoastal Waterway (GIWW) adjacent to the Corpus Christi Ship Channel (CCSC) has impacted navigation over past several years. Analysis of physical conditions and alternative dredging and/or placement practices could help to increase channel availability.

Description/Challenges

- Address two key shoaling areas and impacts to navigation
  - "Hole in the Wall" GIWW near intersection of CCSC
  - "The Spit" in South Corpus Christi Bay

Objectives

- Develop alternative approaches to managing sediment in the GIWW to better maintain navigation
- Provide general understanding of sediment movement along GIWW in Corpus Christi Bay



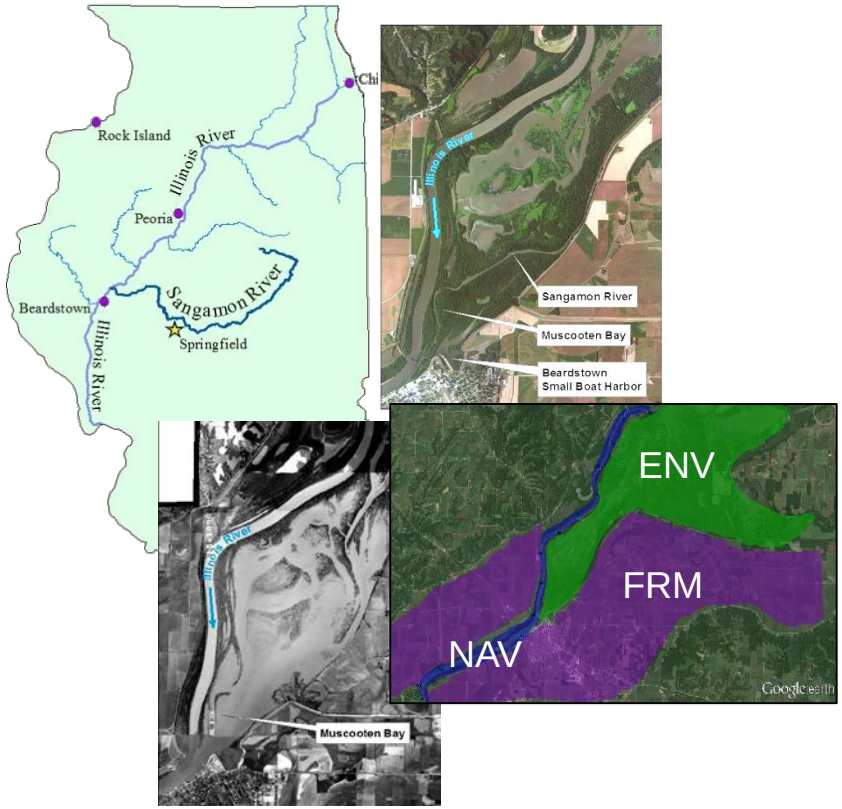
FY19 GIWW Caney Creek RSM

Recent increase in shoaling rate at GIWW intersection with Caney Creek has resulted in frequent navigation restrictions and bi-annual dredging

*from Trisha Campbell, SWG

Riverine and Reservoir RSM

Sedimentation Impacts at the Confluence of the Sangamon and Illinois Rivers

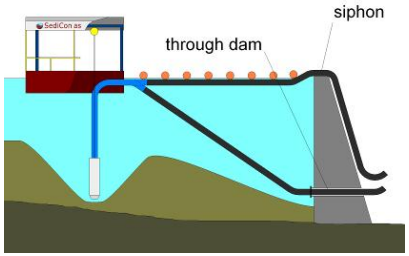


Reduce Sedimentation
Beneficial Use
Shoreline Restoration
Environmental Restoration
Consequences of Channelization
Land Use Impacts
Stakeholder Collaboration

Fall Creek, Cherry Creek, Spencer Dam Reservoir Flushing

- Monitoring and Model Enhancements
- Impacts & Benefits Increased Sediments Below Reservoirs

Innovative Reservoir Sediment Bypassing Techniques



What is the value of RSM?

- Relationship building
  - Across USACE
  - Stakeholder/Resource Agency Communication and Participation
- More Efficient Systems
  - 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
- Recovery operations
  - Teams and relationships established
  - RSM strategies for managing sediments
  - Data, tools, models available

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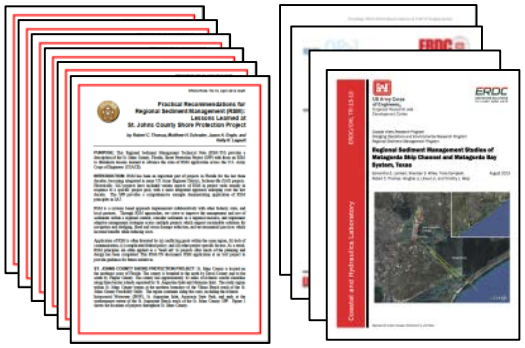
RSM Technical Notes, Reports Manuals, Conference Papers



USACE Bi-Monthly Call/Webinars

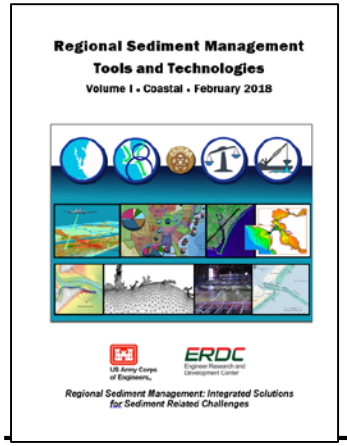
District Stakeholder Workshops

Technical Webinars with Districts

*R&D Programs

DOTS

WOTS



Regional Sediment Management = Resilient Healthy Systems

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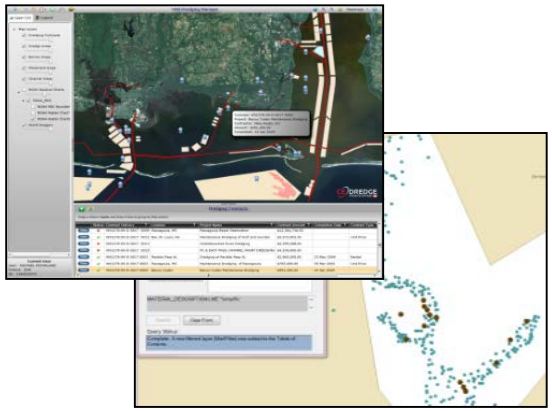
Regional Sediment Budgets
Local Actions=Regional Benefits

ODMDS
Regional Strategies

Riverine &
Reservoir Mgmt



Data Management and Access

Improved Relationships
Outreach & Training

Ecosystem/Aquatic
Habitat