REGIONAL SEDIMENT MANAGEMENT: INNOVATIVE APPROACHES AND PROGRESS IN THE PHILADELPHIA DISTRICT

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Regional Sediment Management
Established 1999, Coastal Engineering Research Board 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 & 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*

USACE Program Managers: Ms. Linda Lillycrop and Dr. Katie Brutsche
**RSM Goals and Strategies**

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

- Reduce Upland/CDF Disposal
- Bypass Sediments
- Backpass Reduction

- Save Capacity
- Reduce Channel Shoaling
- Reduce Runoff

- Ecosystem Habitat Restoration
- Stabilize Structures

US Army Corps of Engineers • Engineer Research and Development Center
RSM Network of Experts
National RSM Program Participation (2000-2018)
>200 Projects

Northwestern Division
Great Lakes & Ohio River Division
Mississippi Valley Division
North Atlantic Division

South Pacific Division
South Atlantic Division
Pacific Ocean Division

29 Districts
20 Coastal
9 Inland
6 Coastal/Inland
ERDC, IWR, HEC

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Engineering With Nature®

…the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural processes to maximize benefits
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners

USACE Program Managers: Dr. Todd Bridges and Dr. Jeff King
A “PERSISTENT” APPROACH

Post-Hurricane Sandy, federal channels in inlets and waterways required dredging

- **Navigation and Nature**: District took action to restore navigation, but also looked for opportunities to assist with shoreline & ecosystem recovery and build coastal system resilience

- **Technical Expertise**: Use of *Regional Sediment Management (RSM)* and *Engineering with Nature (EWN)* concepts to develop short-term (post-Sandy) and long-term dredging strategies

- **Team Approach**: Actions were aided by support from USACE North Atlantic Division and other districts, ERDC, NJDEP and other partners
Navigation Channels With Nearshore Placement Of Sand

Use of SAW Government Dredge Fleet
A Sediment Progression: From Confinement to In-Water Creation
New Jersey Intracoastal Waterway (NJIWW) Channel Dredging with Innovative Placement
ACCELERATING PROGRESS WITH AN RSM/EWN SYSTEMS APPROACH: MORDECAI ISLAND NJ
Continued erosion of Mordecai Island threatens a diversity of natural wildlife habitats including open marsh, salt ponds, exposed mud flats, shrub-dominated areas and shallow water eelgrass beds.

Previous work and partnerships were and are incredibly valuable!! Included NMFS & USFWS, Bureau of Coastal Engineering, Mordecai Land Trust, NOAA
MORDECAI ISLAND CONSTRUCTED!
NOVEMBER 2015

Contractors: Barnegat Bay Dredging Company, Fish Tec Inc. and GreenVest LLC
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POST-CONSTRUCTION MORDECAI ISLAND

3 months

10 Months

2 years

Mordecai Island August 2017
Build it and they will come….

Raised Habitat in Dec 2017
NJIWW Channel Dredging And Placement Demonstration Projects:
Ring Island And Avalon NJ

Land Owned By New Jersey Division Of Fish & Wildlife (NJDFW)

Constructed With Emergency Supplemental Operation & Maintenance Funds

And

A National Fish And Wildlife Foundation Grant TO NJDFW, The Nature Conservancy And Green Trust Alliance

Contractor: Barnegat Bay Dredging Co.
Ring Island, NJ: Black Skimmer Habitat And Thin-layer Placement with NJIWW Sand

- Constructed August 2014
- Placed on land owned by NJDFW instead of Confined Disposal Facility
- Habitat creation
  - Shorebird usage
  - Also used by horseshoe crabs & terrapins
- Small thin layer placement demo with >96% sand, 500 cubic yards
- Raised elevation of habitat in March 2018, Adaptive Management!!
NJWW Avalon Pilot Project: Dredging “The Football Field” And Thin-layer Placement

- Constructed in December 2014
- Thin Layer Placement demo with fine-grained material
- Filled pools and pannes to restore marsh (5,000 cubic yards & 6 acres)
- Minimal containment
- Documented lessons learned and informed NJ permits for construction of larger thin layer placement project
NJIIWW Avalon Pilot Project:
Dredging “The Football Field” And Thin-layer Placement

- Larger project continued from Nov 15 to Feb 2016 (45,000 cy & 35 acres)
- USACE funded dredging, NFWF grant funded placement design, construction oversight
- Costs and lessons learned under development
- Monitoring to continue for several years
MONITORING, LESSONS LEARNED & FUTURE OPPORTUNITIES
Avalon As An R&D Test Bed
To Advance Marsh Restoration Practices

Bulking and consolidation of dredged material in marsh environments

- If material is hydraulically placed, elevation changes over time.
- Elevation change can be modeled.
  - Maximum volume: at end of placement
  - Elevation subsides during primary settling and drainage of ponded water (SETTLE)

Long-term marsh elevation response to dredged material placement & sea level rise

- Marsh Equilibrium Model (MEM) projects future conditions based on known interactions between biomass and accretion
- Developed at University of South Carolina by Dr. James Morris
- Goal: use MEM to predict the response of marshes to thin-layer and other episodic sediment deposition events

![Graph showing predicted marsh elevation changes over time.](image)
Sharing Lessons Learned
Summary

- USACE navigation mission is succeeding on limited funds by collaborating with shore protection and ecosystem restoration efforts - partnering is critical. *More opportunities exist!!*

- Using sediment as a resource, keep it in the system; *SMALL SUCCESSES LEAD TO LARGER ACTIONS*

- Site and Project Specific remains key, *Risk* level is important

- Momentum in NJ for more innovative placement such as TLP, but these techniques aren’t always easy; they take *time, $$$ and commitment/persistence*

- *Sediment Testing and Constructability Up front!* Talk to Regulators and Dredging Industry

- *Monitoring/Lessons Learned;* more R&D needed to improve methods and make sediment placement more cost-effective solution