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

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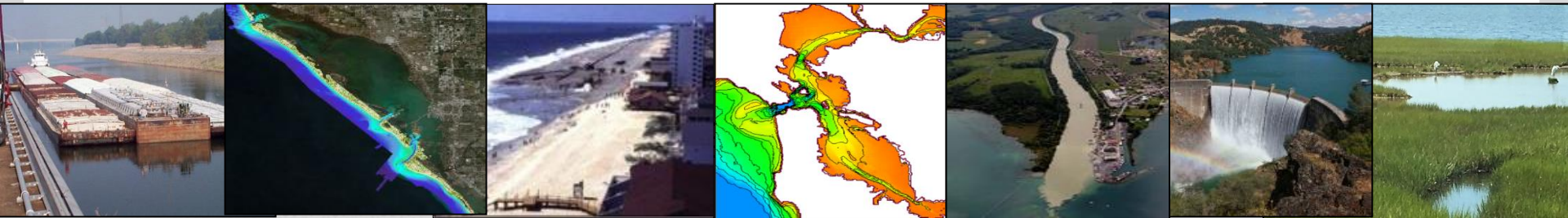
Regional Sediment Management

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."

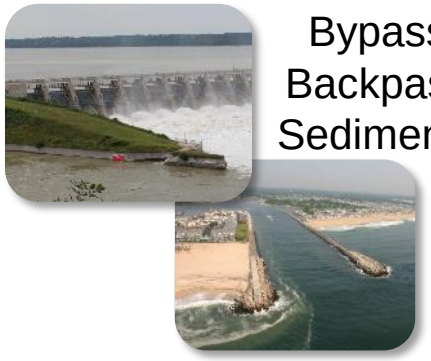
- **Recognizes sediment as a valuable *resource***
- ***Work across business lines, projects, and authorities*** **to create short and long-term economically viable & environmentally sustainable solutions**
- ***Improve*** **operational efficiencies and natural exchange of sediments**
- ***Consider*** **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

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**

Save Capacity

Stabilize Structures

Reduce Channel Shoaling

Reduce Runoff

Ecosystem Habitat Restoration

RSM Network of Experts
National RSM Program Participation (2000-2018)
>200 Projects

Collaboration

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

Tools & Technologies

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

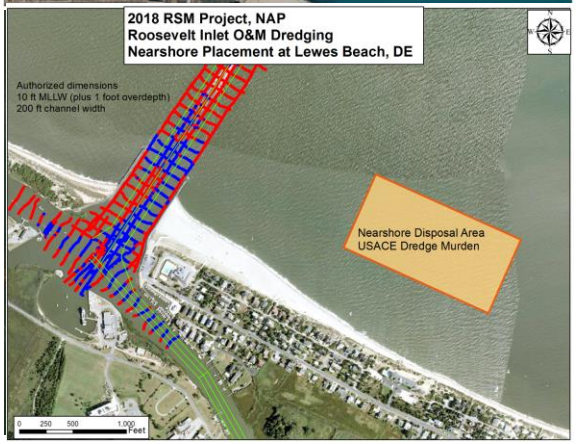
Post-Hurricane Sandy, federal channels in inlets and waterways required dredging

• **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

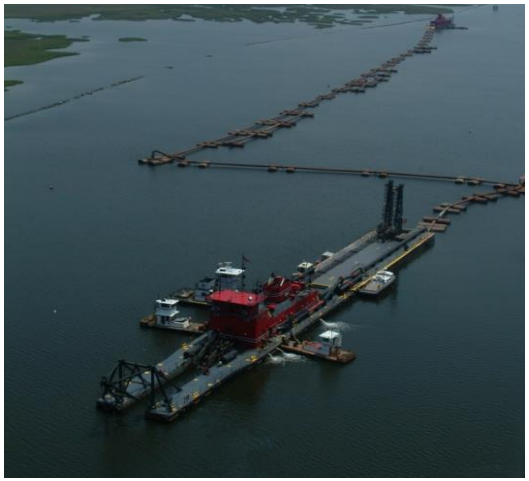
• **Technical Expertise**: Use of *Regional Sediment Management (RSM)* and *Engineering with Nature (EWN)* concepts to develop short-term (post-Sandy) and long-term dredging strategies

•**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



A Sediment Progression: From Confinement to In-Water Creation



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New Jersey Intracoastal Waterway (NJIWW) Channel Dredging with Innovative Placement

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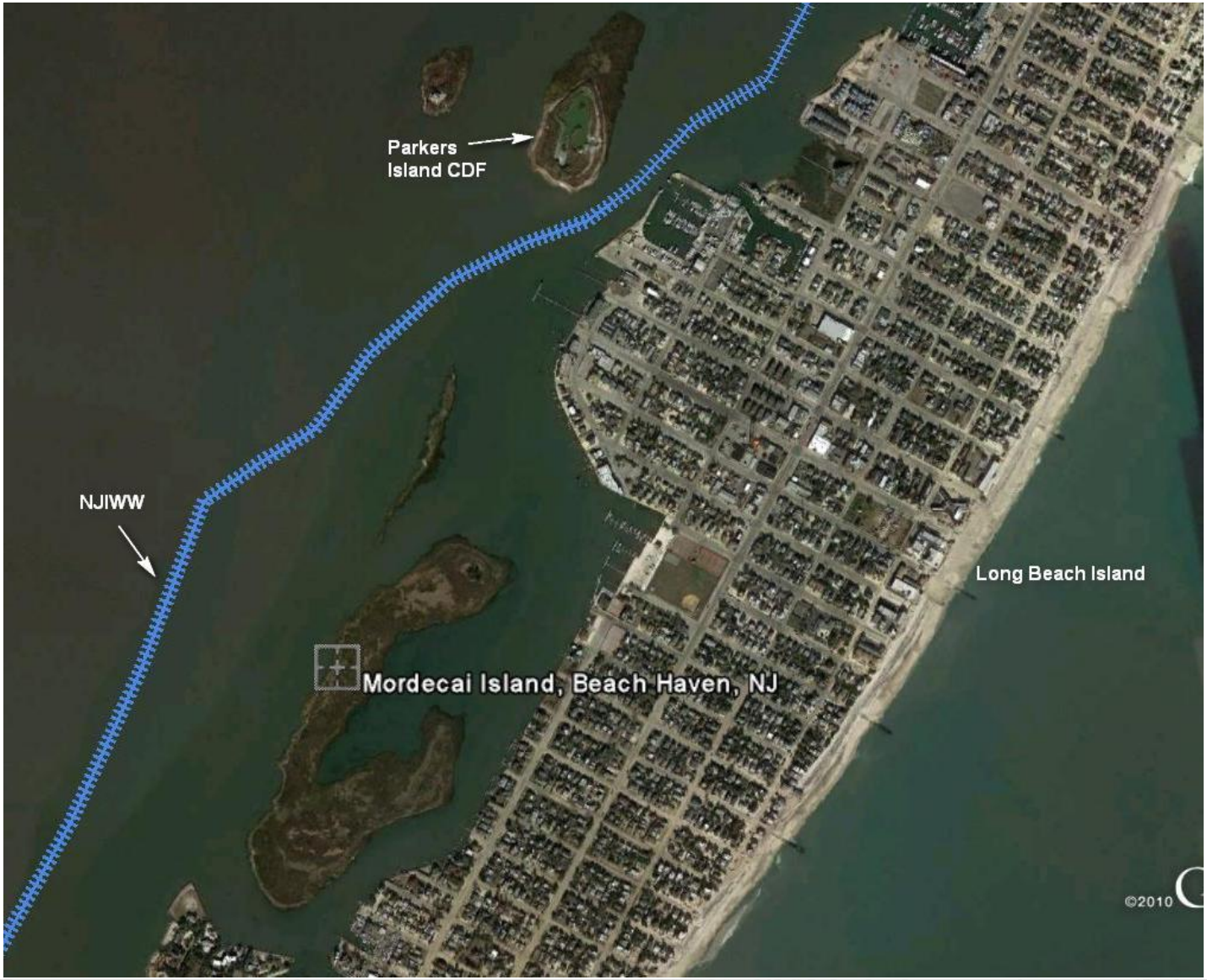
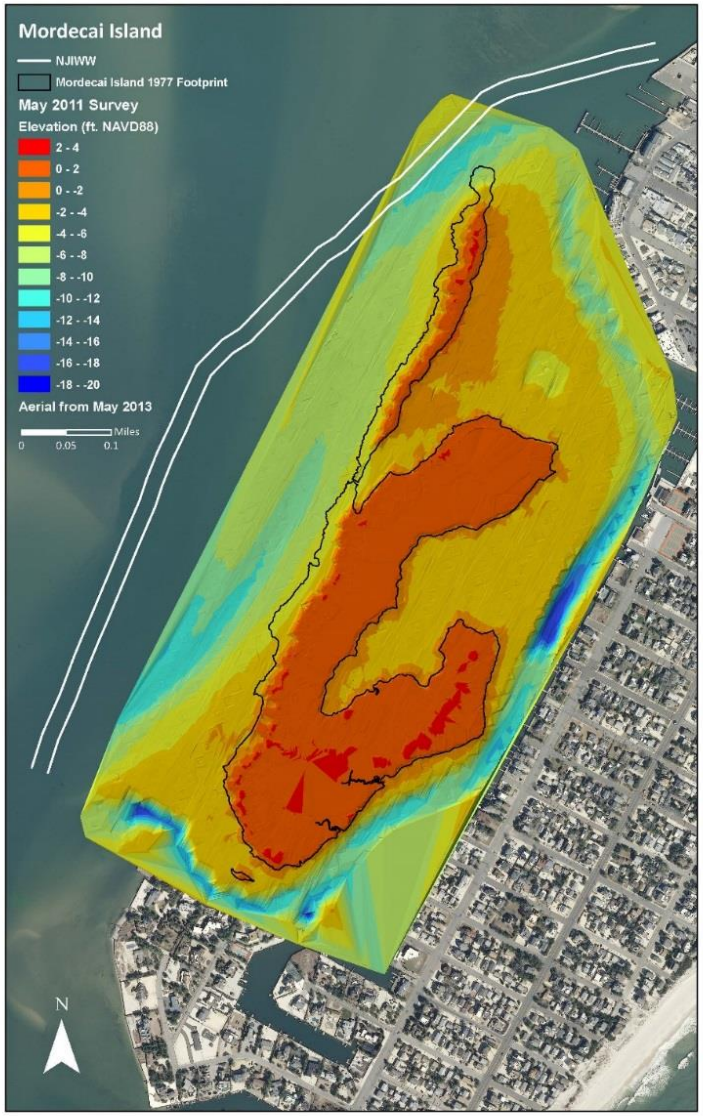
ACCELERATING PROGRESS WITH AN RSM/EWN SYSTEMS APPROACH: MORDECAI ISLAND NJ



MORDECAI ISLAND PLANNING STUDY: ECOSYSTEM RESTORATION CONTINUING AUTHORITIES PROGRAM (CAP)



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

POST-CONSTRUCTION MORDECAI ISLAND

Mordecai Island August 2017

AVIAN MONITORING AND ADAPTIVE MANAGEMENT

Raised Habitat in Dec 2017

Build it and they will come….

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.

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New Jersey Department of Environmental Protection

GreenVest One Step Ahead.

Princeton Hydro

Wetlands Institute

The Nature Conservancy Protecting nature. Preserving life.

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!!

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One Step Ahead.

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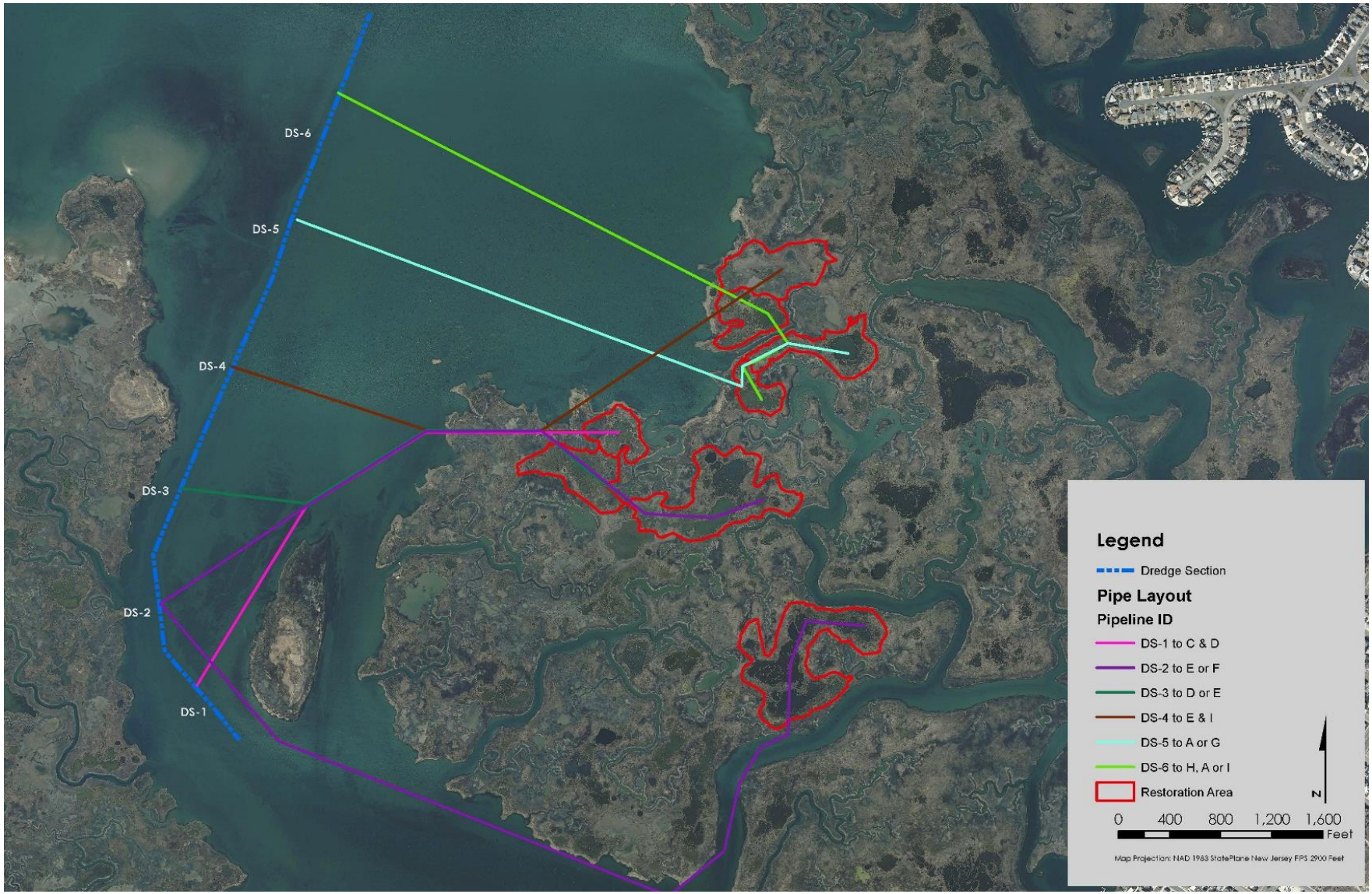
Wetlands Institute

NJIWW Dredging & Avalon Thin Layer Placement



Constructed Dec 2014 to Feb 2016

NJIWW 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

NJIWW 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

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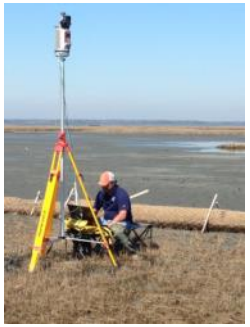
Avalon As An R&D Test Bed
To Advance Marsh Restoration Practices

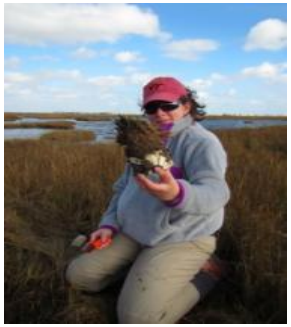
Bulking and consolidation of dredged material in marsh environments

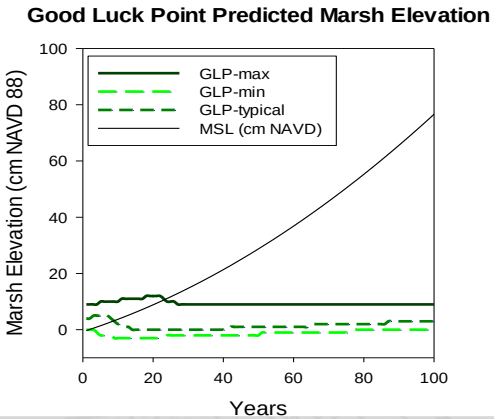
- If material is hydraulically placed, elevation changes over time.
- Elevation change can be modeled.
  - Maximum volume: at end of placement
  - Elevation subsides during primary settling and drainage of ponded water (SETTLE)
  - Long term: consolidation of dredged material and underlying foundation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

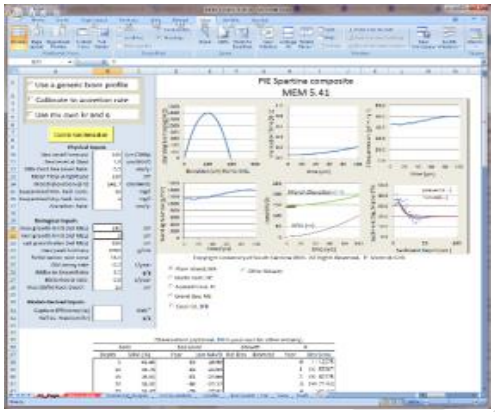
Long-term marsh elevation response to dredged material placement & sea level rise

- 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









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

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