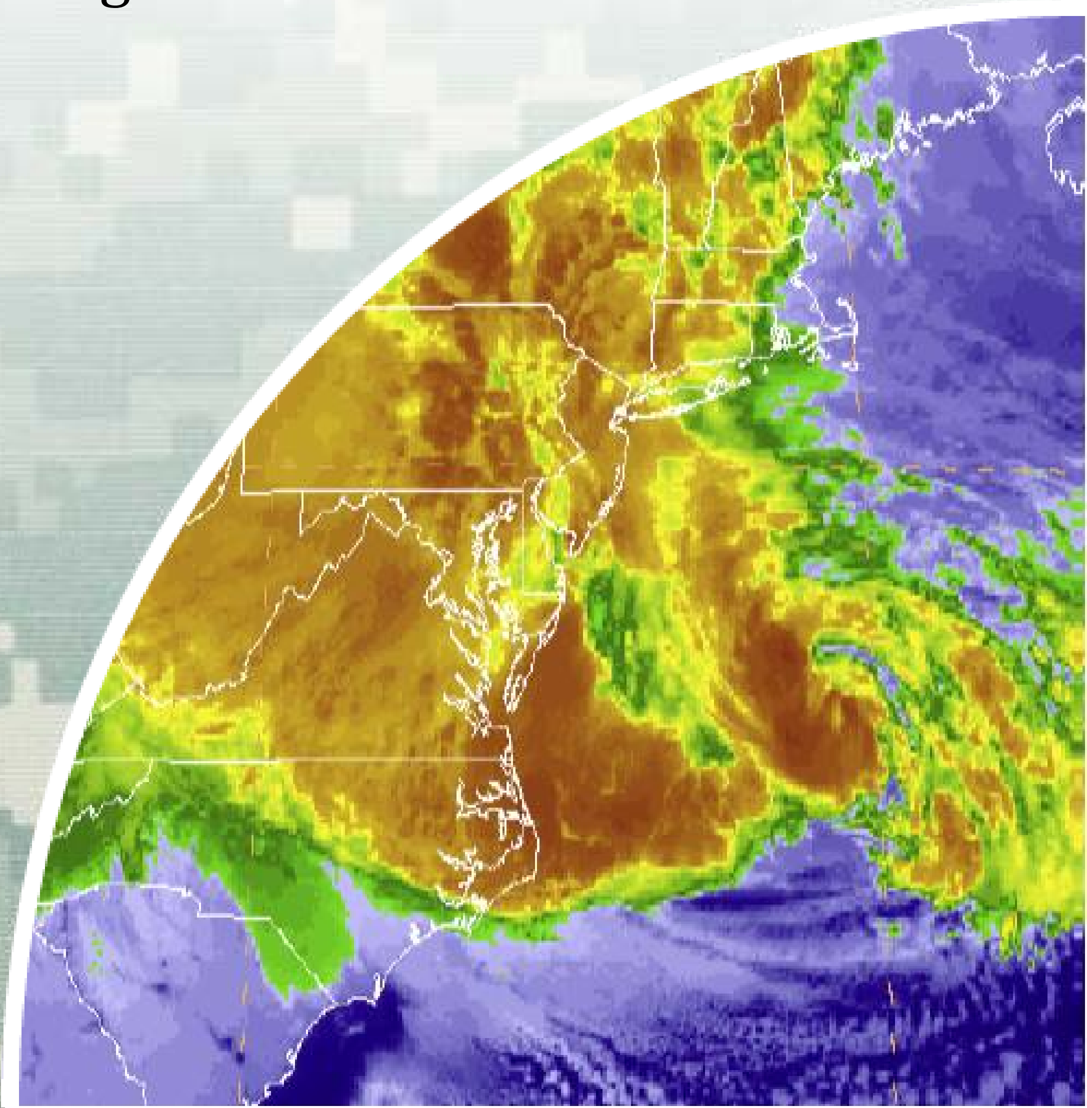
North Atlantic Coast Comprehensive Study

Resilient Adaptation to Increasing Risk

U.S. Army Corps of Engineers
National Planning Center for Coastal Storm Risk Management

24 June 2014



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Presenters

- Amy Guise
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  Chief, North Atlantic Coast Comprehensive Study (NACCS) Command Center
- Julie Rosati, Ph.D
  U.S. Army Engineer Research & Development Center (ERDC)
  Regional Sediment Management Team, NACCS
- Matthew Bates
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  NNBF Team, NACCS
- Monica Chasten
  Operations Division, Philadelphia District
  Regional Sediment Management Team, NACCS
- Dave Robbins
  Project Management, NACCS

NACCS Background

- Hurricane/Post-Tropical Cyclone Sandy moved to the U.S. Atlantic Ocean coastline 22-29 October 2012
- Affected entire U.S. east coast:

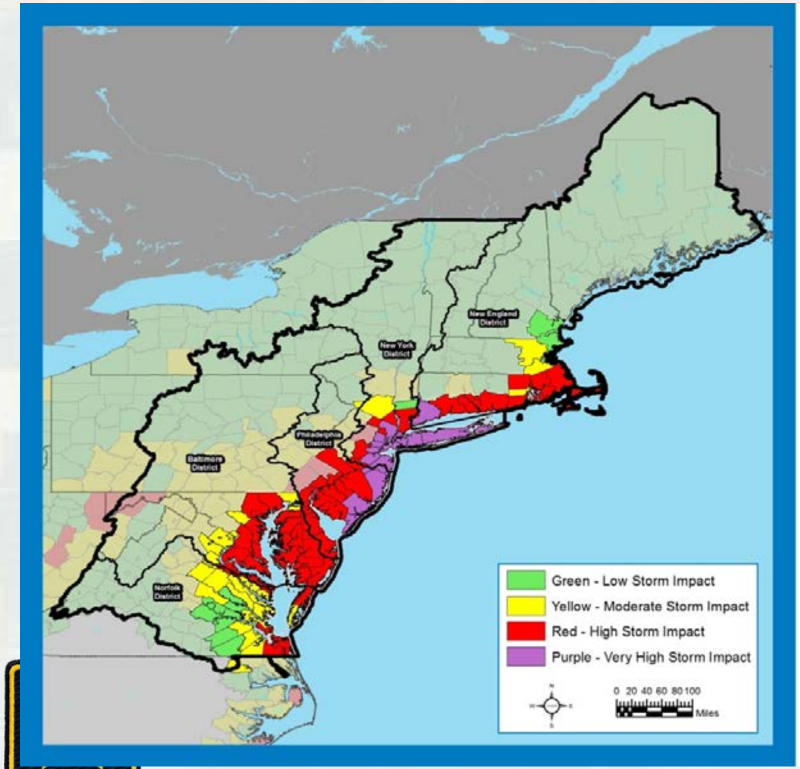
  24 States from Florida to Maine; New Jersey to Michigan and Wisconsin
- Areas of extensive damage from coastal flooding: New Jersey, New York, Connecticut
- Public Law 113-2 enacted

  29 January 2013

NACCS Background

"That using up to $20,000,000* of the funds provided herein, the Secretary shall conduct a **comprehensive study** to address the flood risks of **vulnerable coastal populations** in areas that were affected by Hurricane Sandy within the boundaries of the North Atlantic Division of the Corps…" (*$19M after sequestration)

- **Complete by January 2015**



Goals

- Provide a **Risk Reduction Framework** , consistent with USACE-NOAA Rebuilding Principles
- Support **Resilient Coastal Communities** and robust, sustainable coastal landscape systems, considering future sea level rise and climate change scenarios, to reduce risk to vulnerable population, property, ecosystems, and infrastructure

A Systems Approach:
Conceptual Regional Sediment Budget for the USACE North Atlantic Division

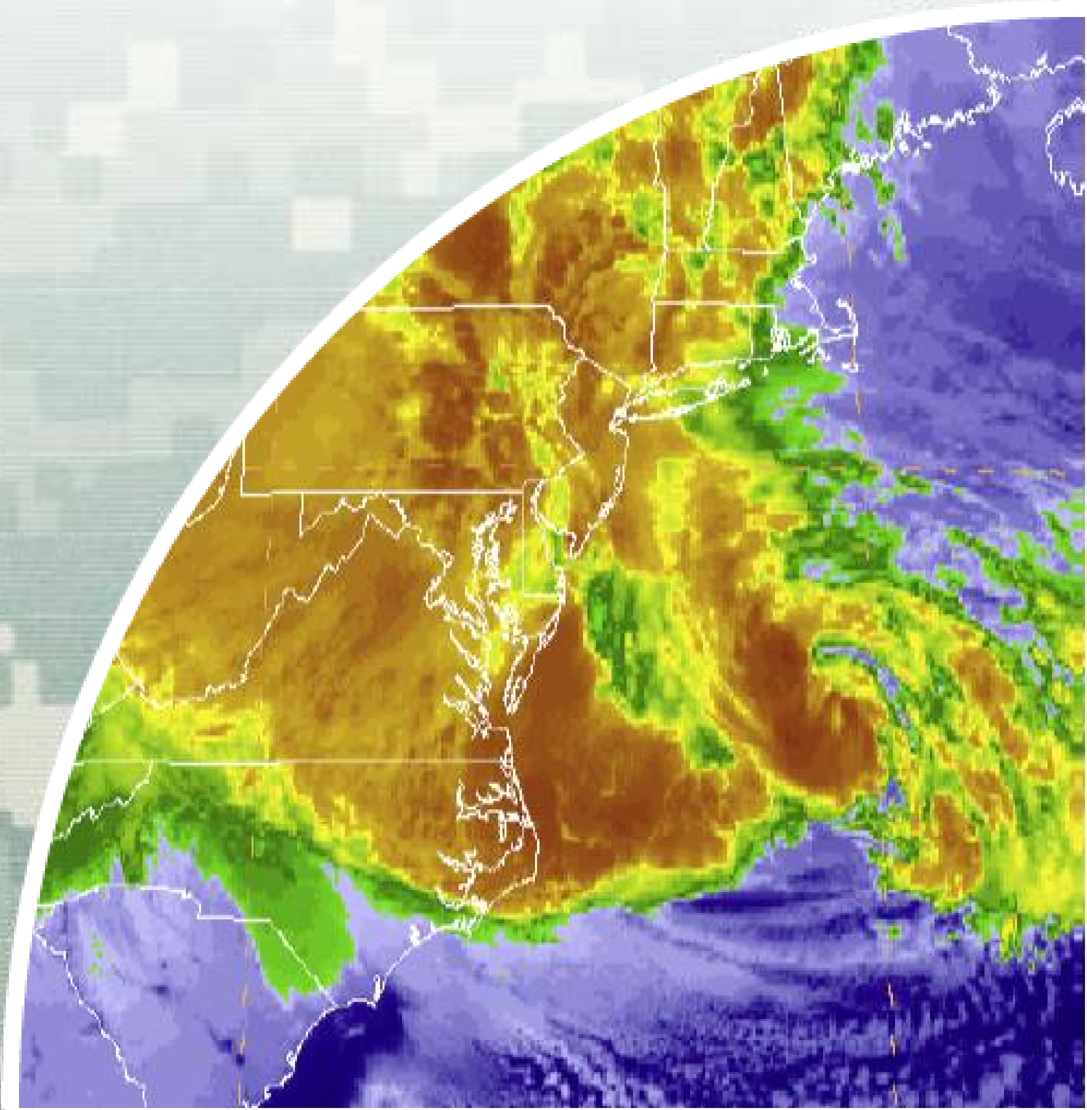
Julie Dean Rosati

Research Coastal Engineer

Coastal & Hydraulics Laboratory

Engineer Research & Development Center

U.S. Army Corps of Engineers



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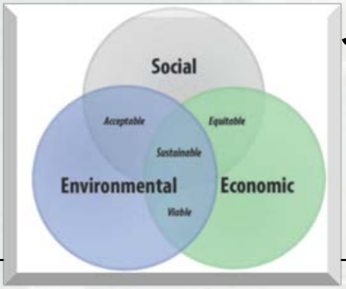
Why a Systems Approach?

- Coastal change occurs over large temporal and spatial scales, with complex interactions within:
  - Environment, Economic, Social
- Multiple, competing objectives between stakeholders



A Systems Approach:

→ *Takes broad view of interactions & objectives to develop potential solution sets*

→ *Intentionally aligns engineering and natural systems*

Restoration of Deer Island, MS Barrier Island and Marsh

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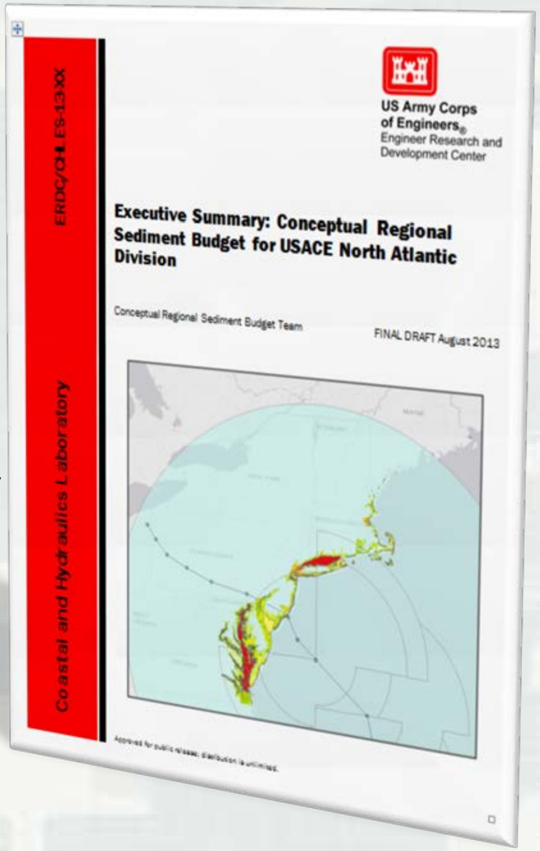
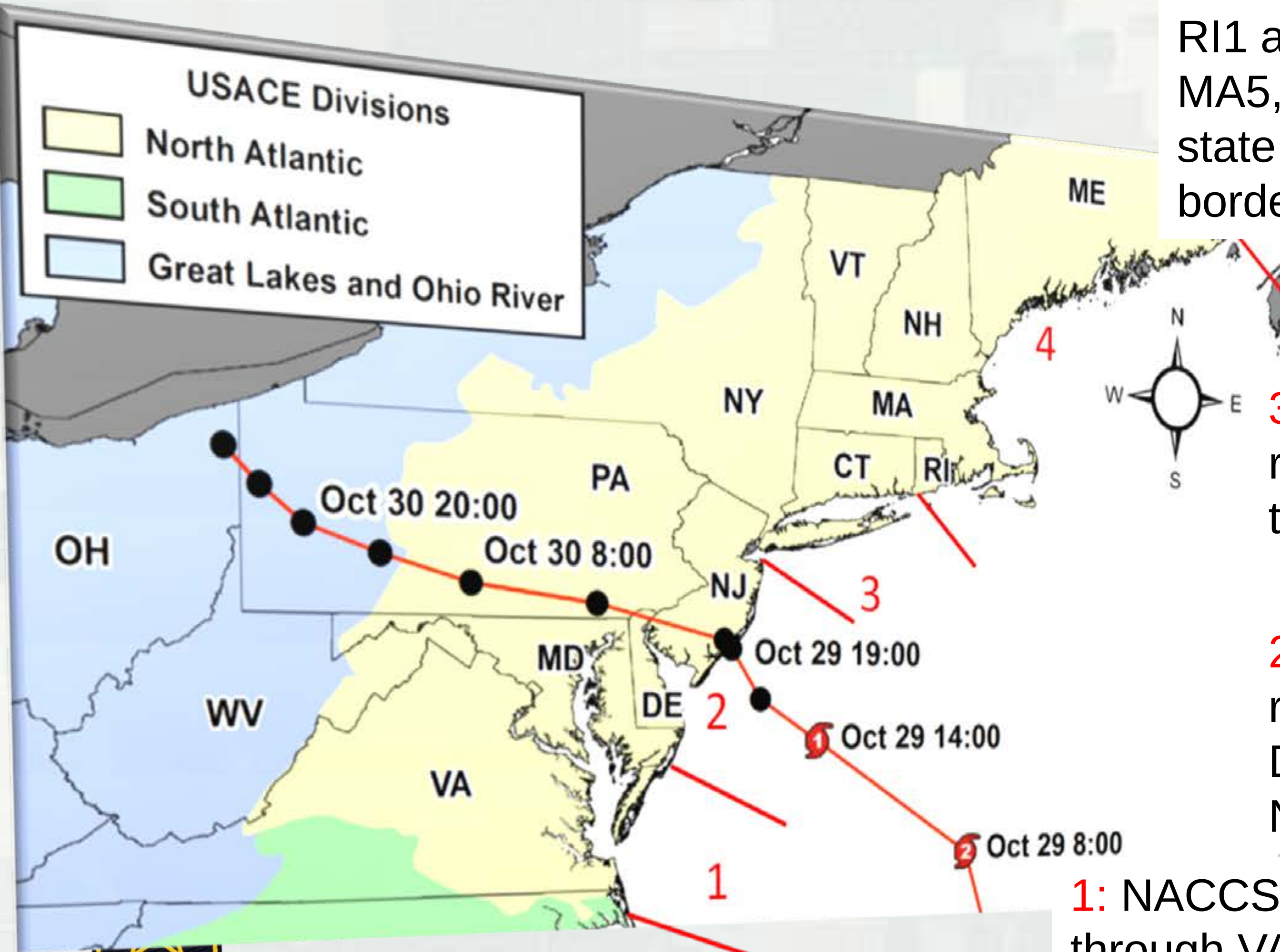
Conceptual Regional Sediment Budget (CRSB)

- Visualizes magnitude and direction of sediment transport
- Includes dredging from Dredging Information System (DIS) and placement (if available)
- Based on existing knowledge or morphology
- Extends from Virginia to Maine
- Visualized in SBAS Web Portal; overlain with Exposure/Risk/Vulnerability (ERV) database



CRSB Regions

4: NACCS planning regions RI1 and RI2, MA1 through MA5, and NH1 including the state of Maine to the Canadian border

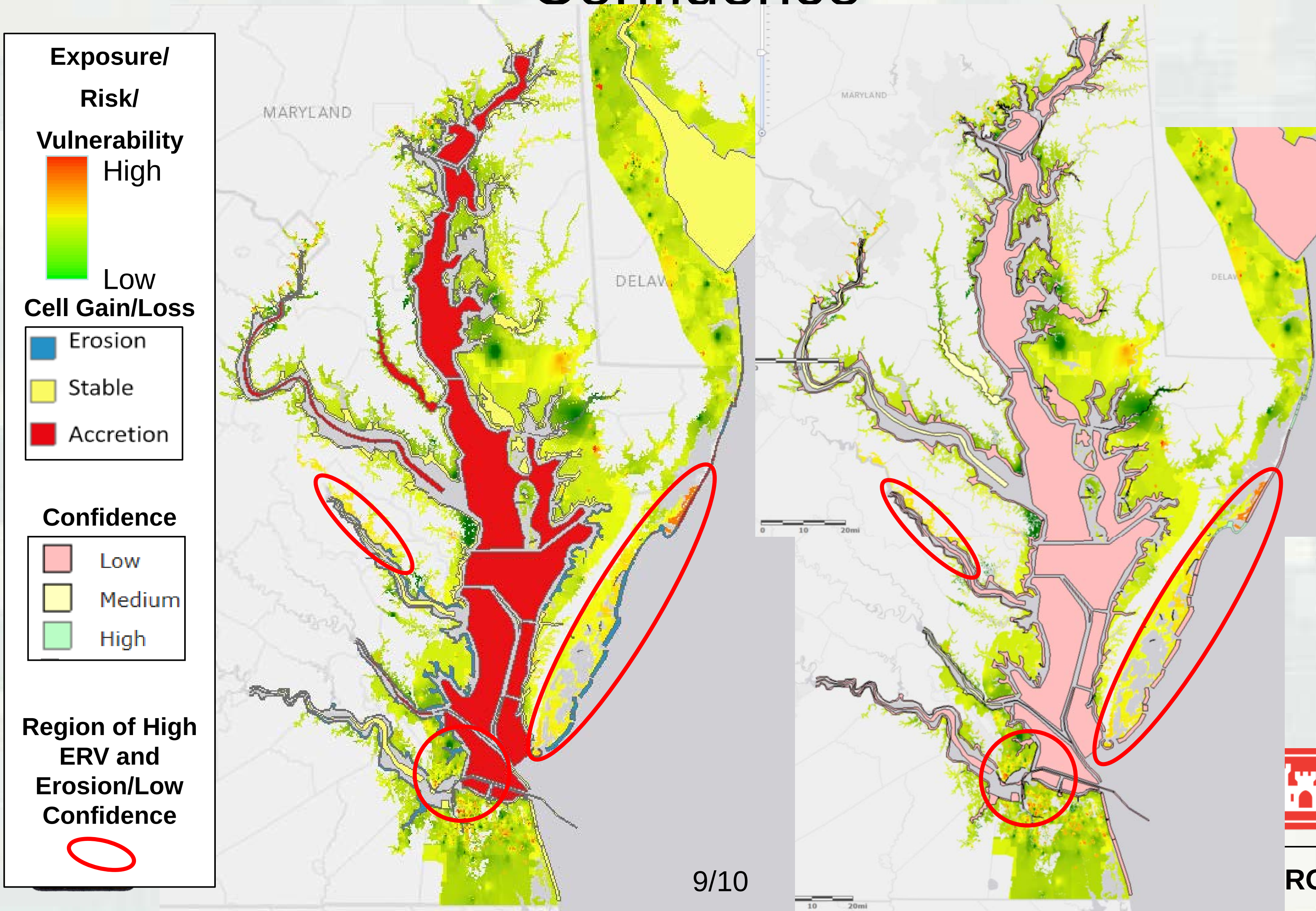


3: NACCS planning regions NJ1, NY-NJ1, NY1 through NY4, and CT1

2: NACCS planning regions MD1, DE1 through DE3, and NJ2 through NJ4

1: NACCS planning regions VA1 through VA6 and MD2 through MD5

Region 1: High Total ERV and Erosion/Low Confidence



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Region 2: High Total ERV <u>and</u> Erosion/Low Confidence

Exposure/ Risk/ Vulnerability

High

Low

Cell Gain/Loss

Erosion

Stable

Accretion

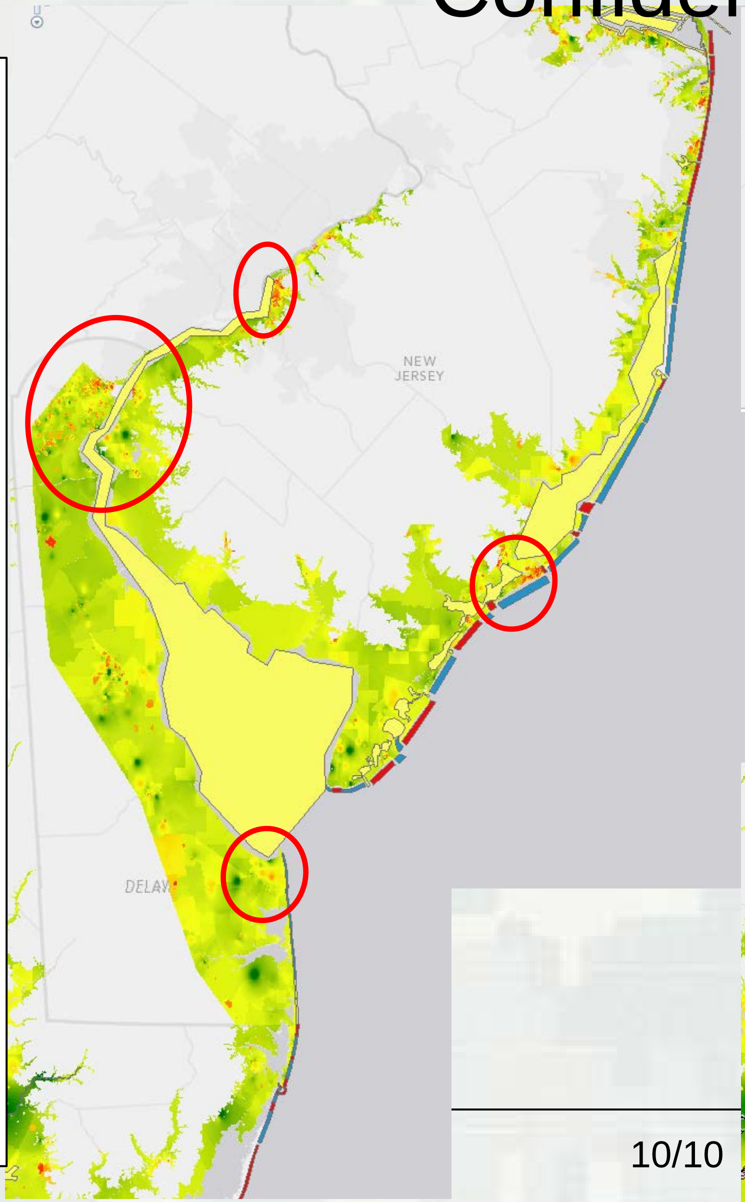
Confidence

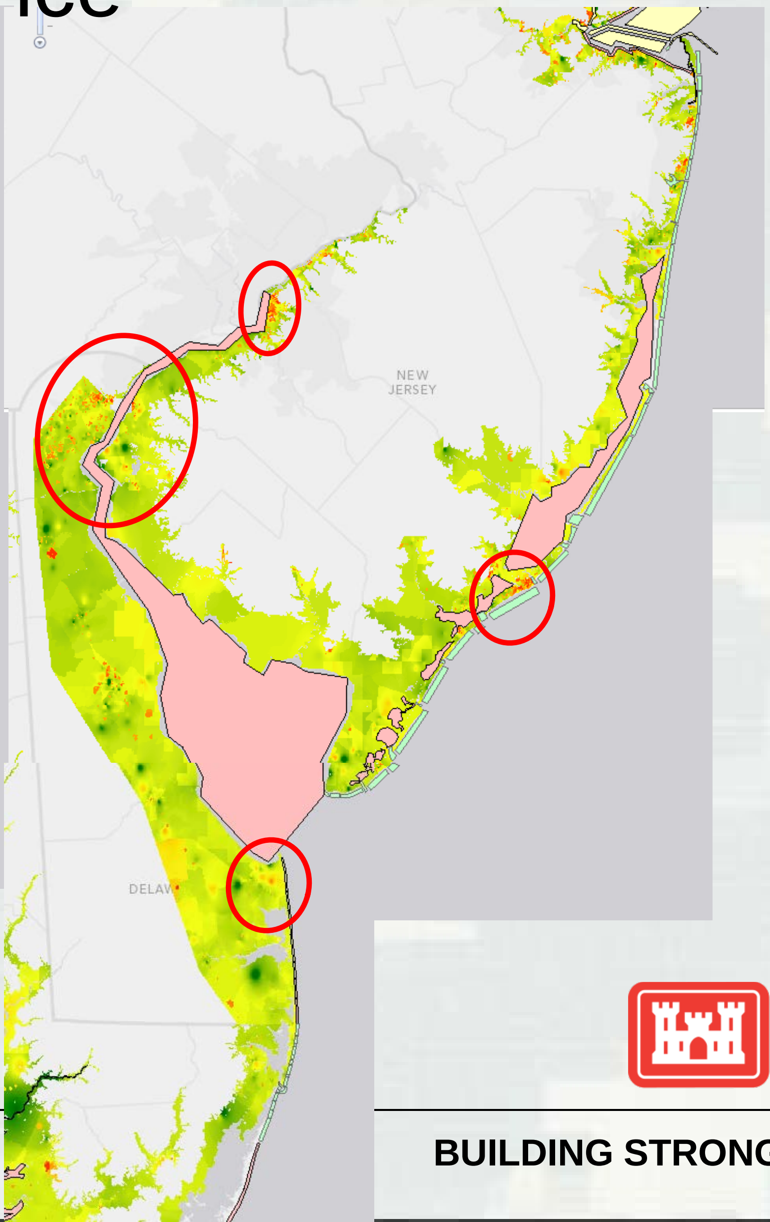
Low

Medium

High

Region of High ERV and Erosion/Low Confidence





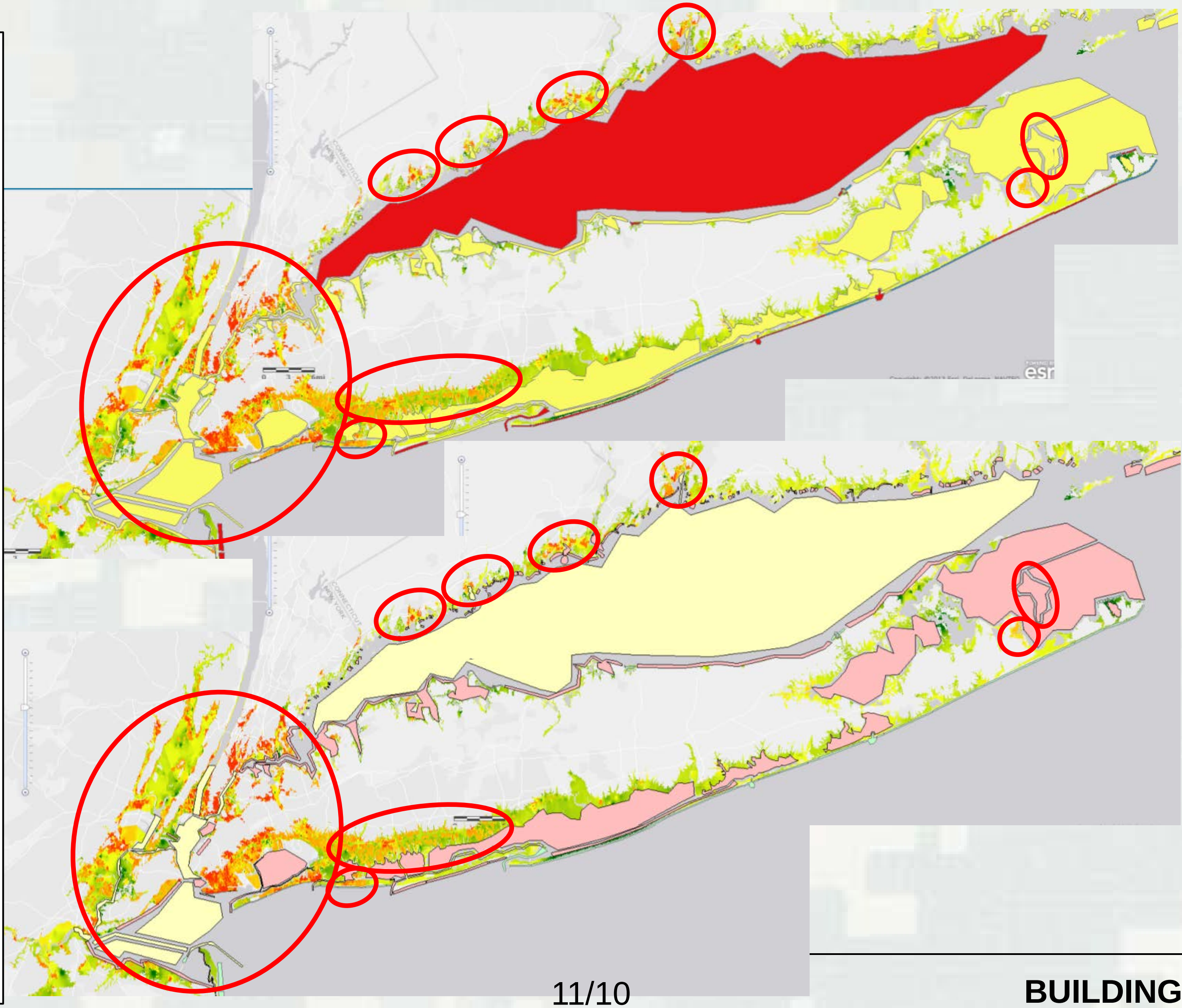
Region 3: High Total ERV and Erosion/Low Confidence

Exposure/ Risk/ Vulnerability
High
Low

Cell Gain/Loss
- Erosion
- Stable
- Accretion

Confidence
- Low
- Medium
- High

Region of High ERV and Erosion/Low Confidence



Region 4: High Total ERV and Erosion/Low Confidence

Exposure/ Risk/ Vulnerability

High

Low

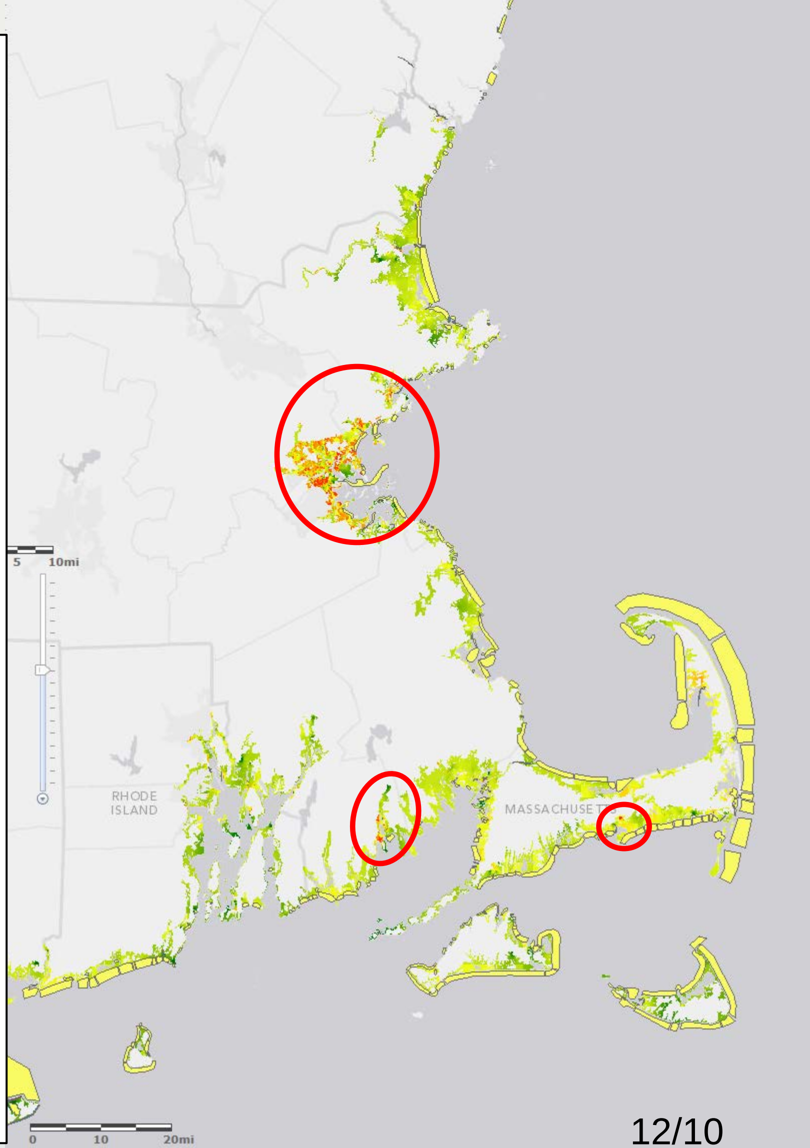
Cell Gain/Loss

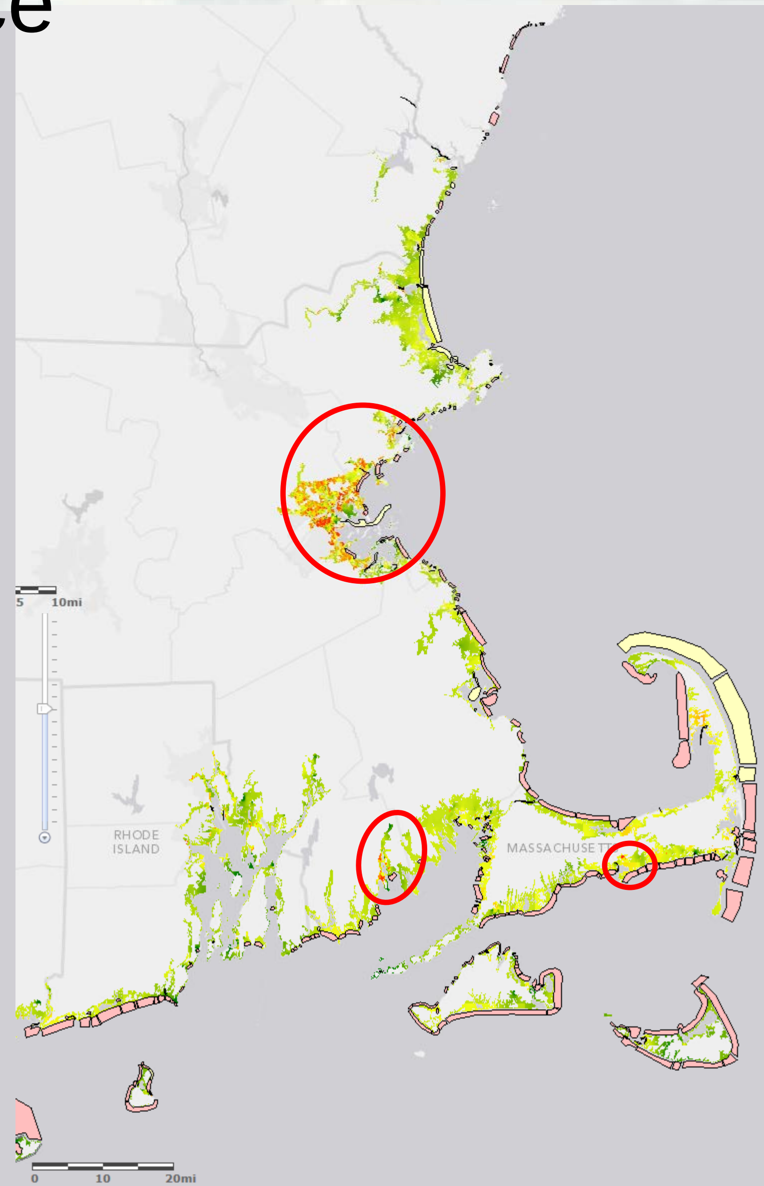
- Erosion
- Stable
- Accretion

Confidence

- Low
- Medium
- High

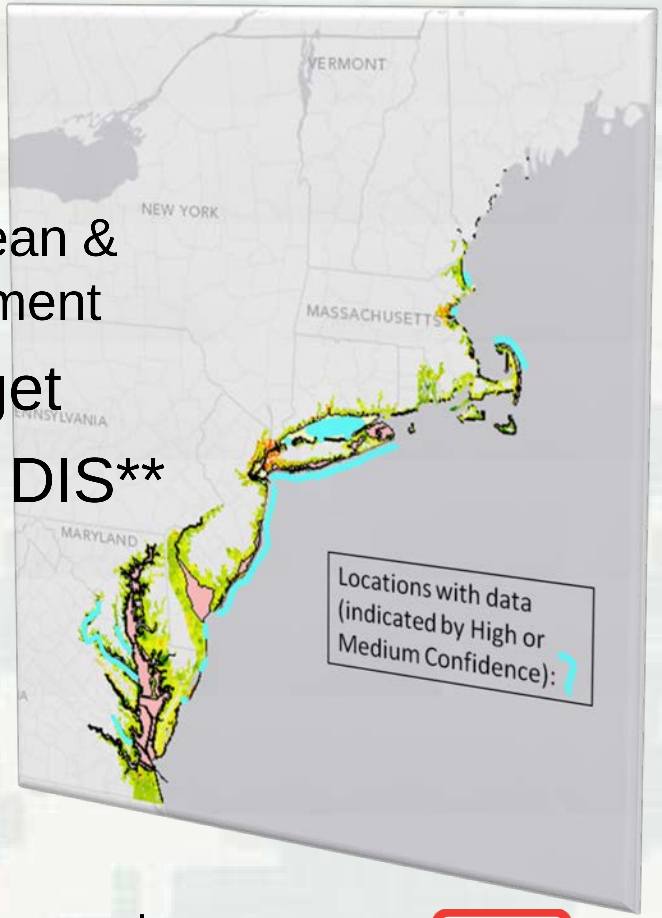
Region of High ERV and Erosion/Low Confidence





CRSB Summary & Findings

- 990 cells in CRSB; 67% no data
- Most estuaries/bays did not have data*
  - Damage from Sandy occurred from both ocean & bay; great potential to improve bay management
- Most placement data missing from budget
- Total of 18.7 Mill cu yd/year dredging in DIS**
  - Region 1: 6.3 Mill cu yd/year
  - Region 2: 7.3 Mill cu yd/year
  - Region 3: 4.9 Mill cu yd/year
  - Region 4: 0.2 Mill cu yd/year



* Chesapeake Bay and Long Island Sound only exceptions

**3 records or more; 1990 to present

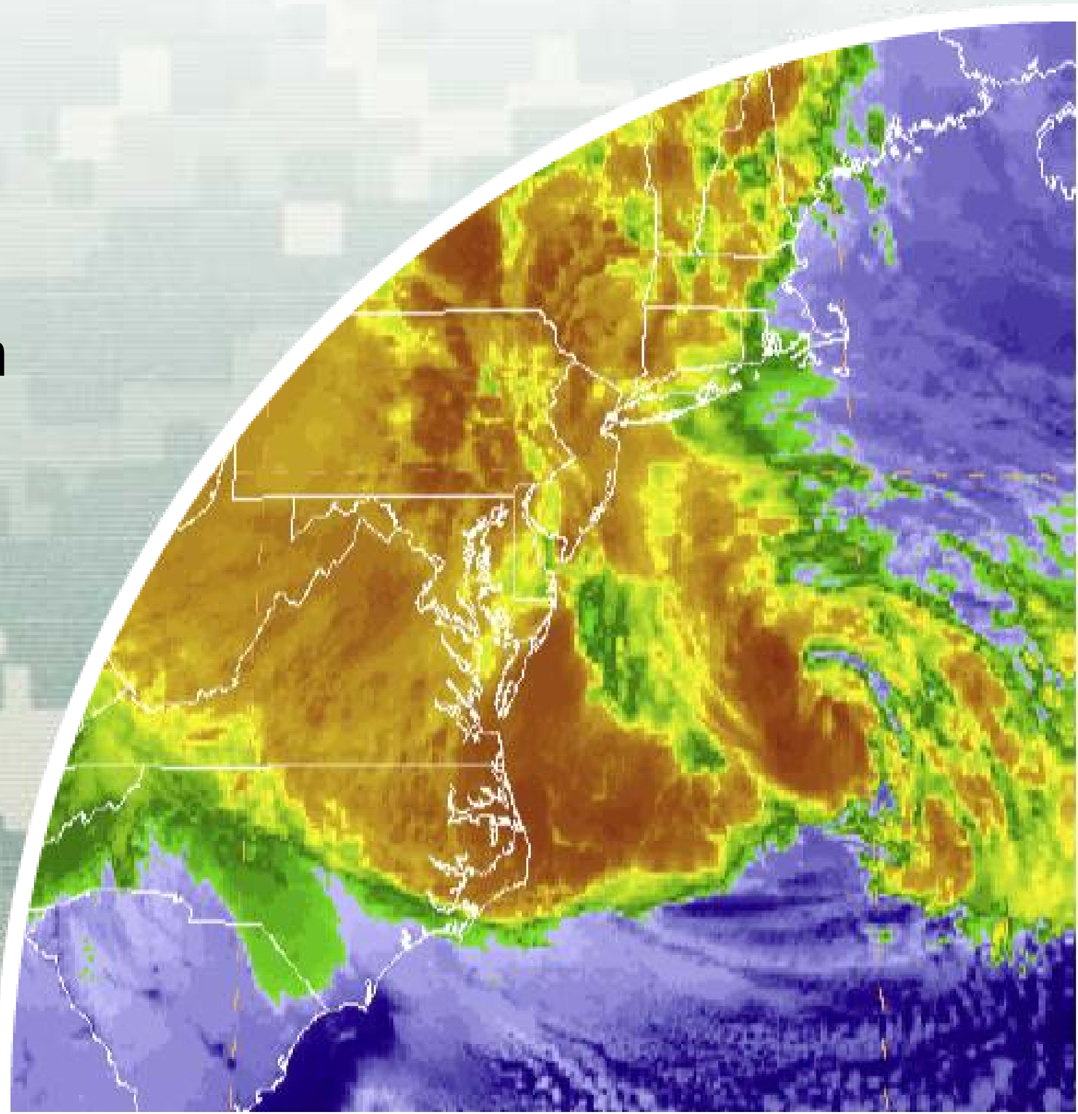
CRSB Recommendations

- Document dredged sediment type for best placement options and regional management
  - Coarser sand = building beaches and dunes
  - Finer silt and clay = providing estuarine habitat and wetland features
  - Rock = constructing artificial reef and fish habitat
- Quantify sediment transport in the estuaries & bays

Systems Approach to Enhancing and Protecting New Jersey NNBF

Presenters: Candice Piercy and Monica Chasten

Chapter Co-authors: Julie Rosati, Todd Bridges, Jason Engle, and Dave Robbins



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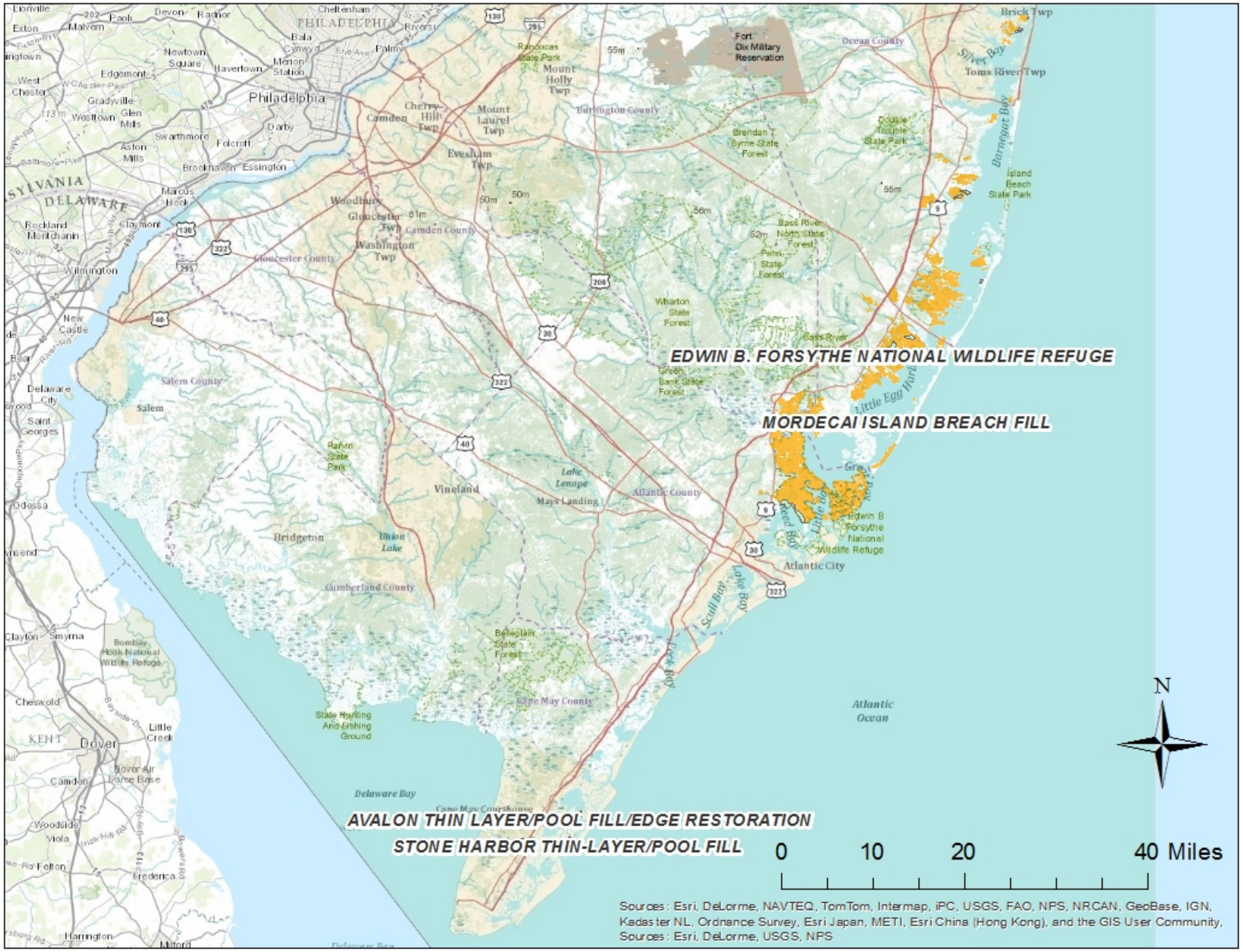
Background

- ERDC is partnering with NAP and Forsythe NWR to guide site selection and design on NNBF using dredged material
- Projects designed to increase resilience of NJ coast
- Enhance or restore existing NNBF – primarily wetlands

New Jersey Project Sites



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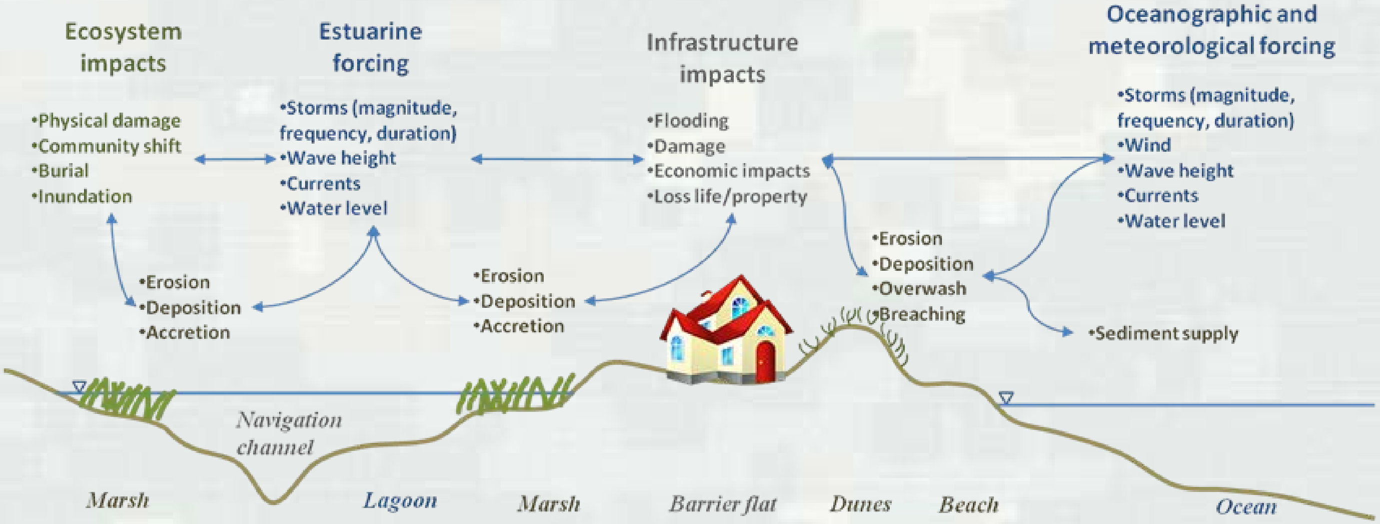
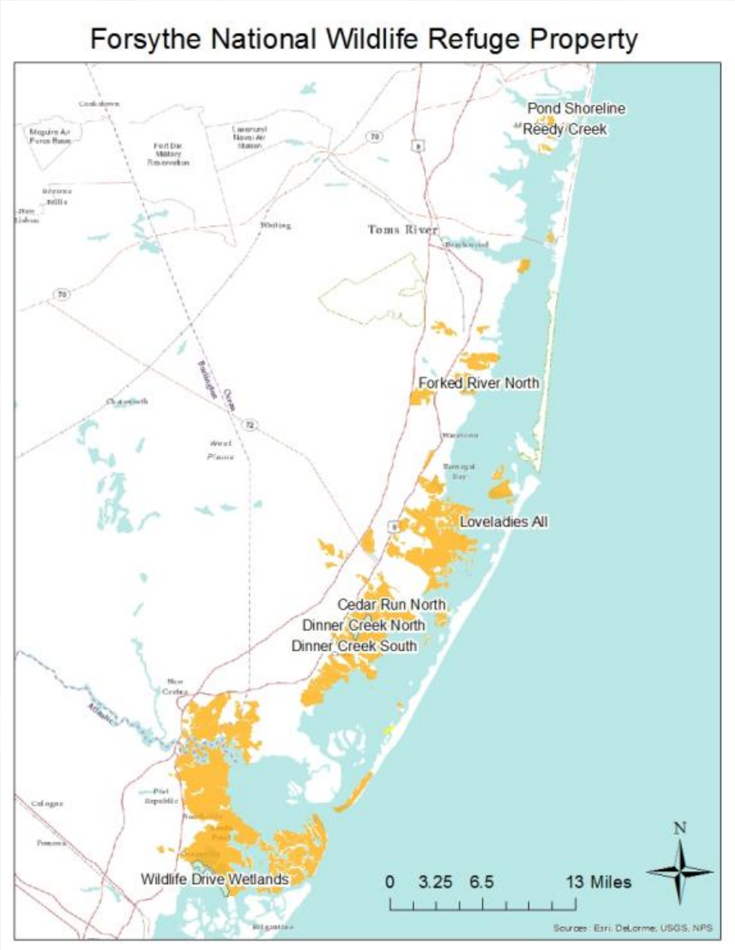
Viewing projects in a systems context



Forsythe NWR: sediment as a resource to improve habitat resilience

- ERDC serving as technical consultants
- Variety of projects
  - Thin-layer placement on subsiding marsh
  - Filling ditches
  - Restoration of tidal flow
- Monitoring and adaptive management



Forsythe NWR: critical project sites

Cedar Run

Dinner Creek

Wrangle Creek

- Impoundment sites
- Restoration goals
  - Tidal exchange
  - Sediment transport
  - Conversion to salt marsh species (currently brackish-fresh)
- Flooding concerns in adjacent neighborhoods

Forsythe NWR: critical project sites

Loveladies

- Filling illegally dredged channels
- Thin-layer subsiding marsh

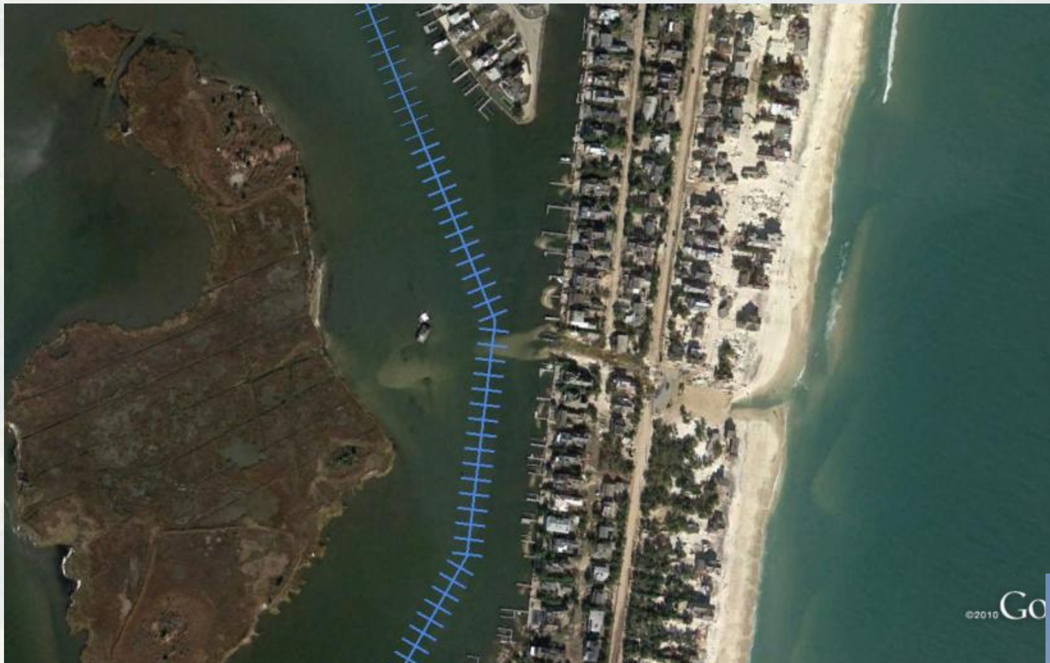
Forsythe NWR: critical project sites


Reedy Creek

- Thin-layer placement
- Wetland deterioration
  - Subsidence
  - Increase in salt pools

Wildlife Drive salt marsh

TAKING ACTION
Mantoloking - Lyman Street Breach
NJIWW Dredging and Beach Placement

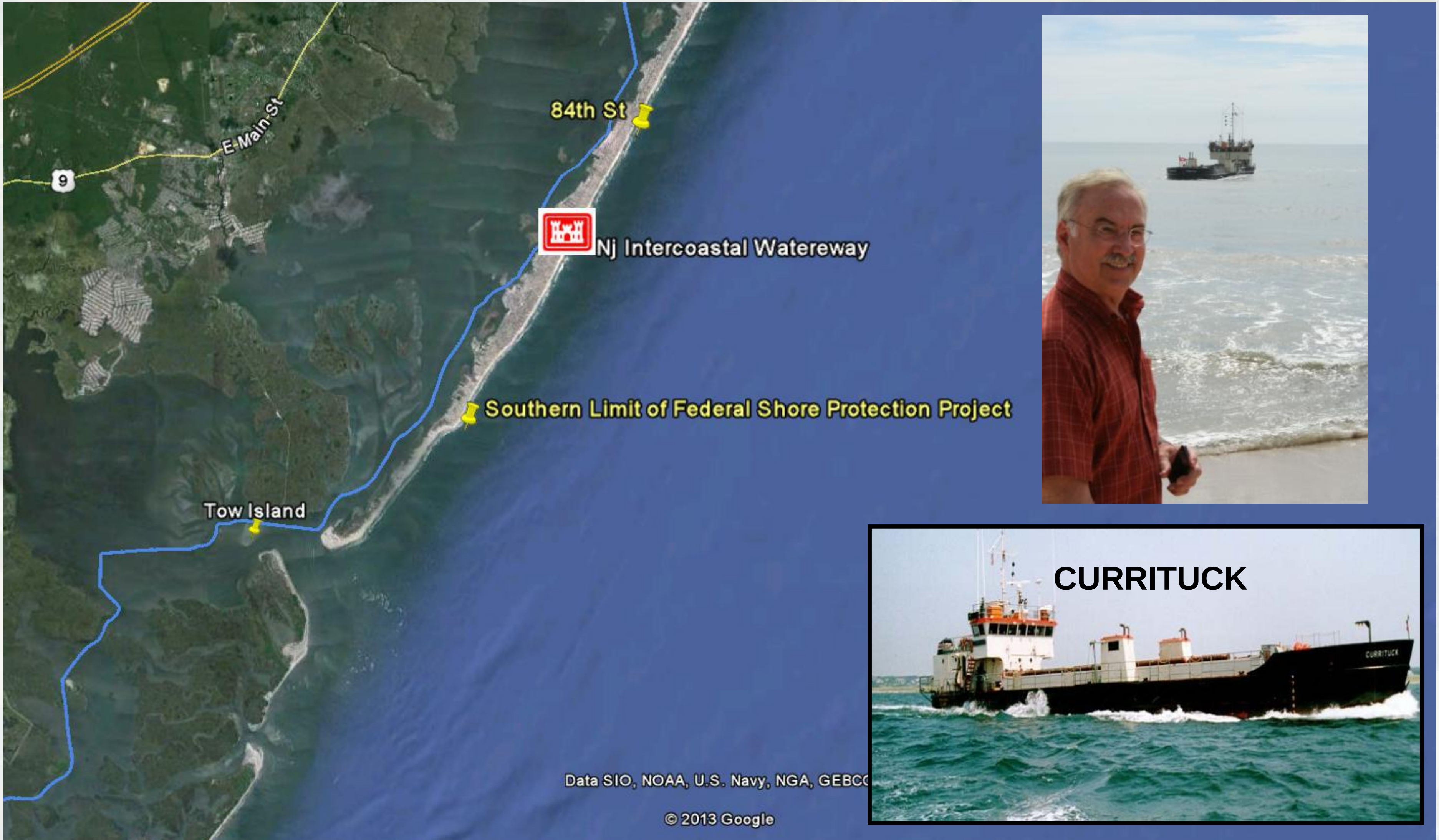


•Superstorm Sandy caused breach in Oct 2012 moving sand & debris into NJIWW

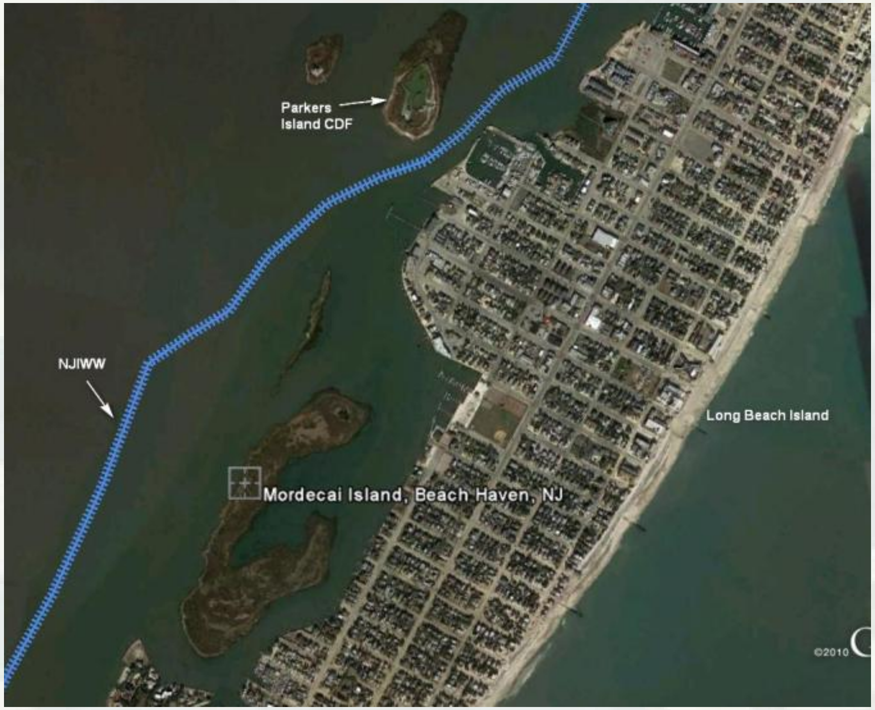
•Govt Plant SNELL responded in Dec 2012

•Coordination of emergency work with NJDEP & Borough were critical

NJIWW Dredging at Tow Island w/ Placement on Long Beach Island Beachfill Template: August 2013



NAP Internal Collaboration: Mordecai Island

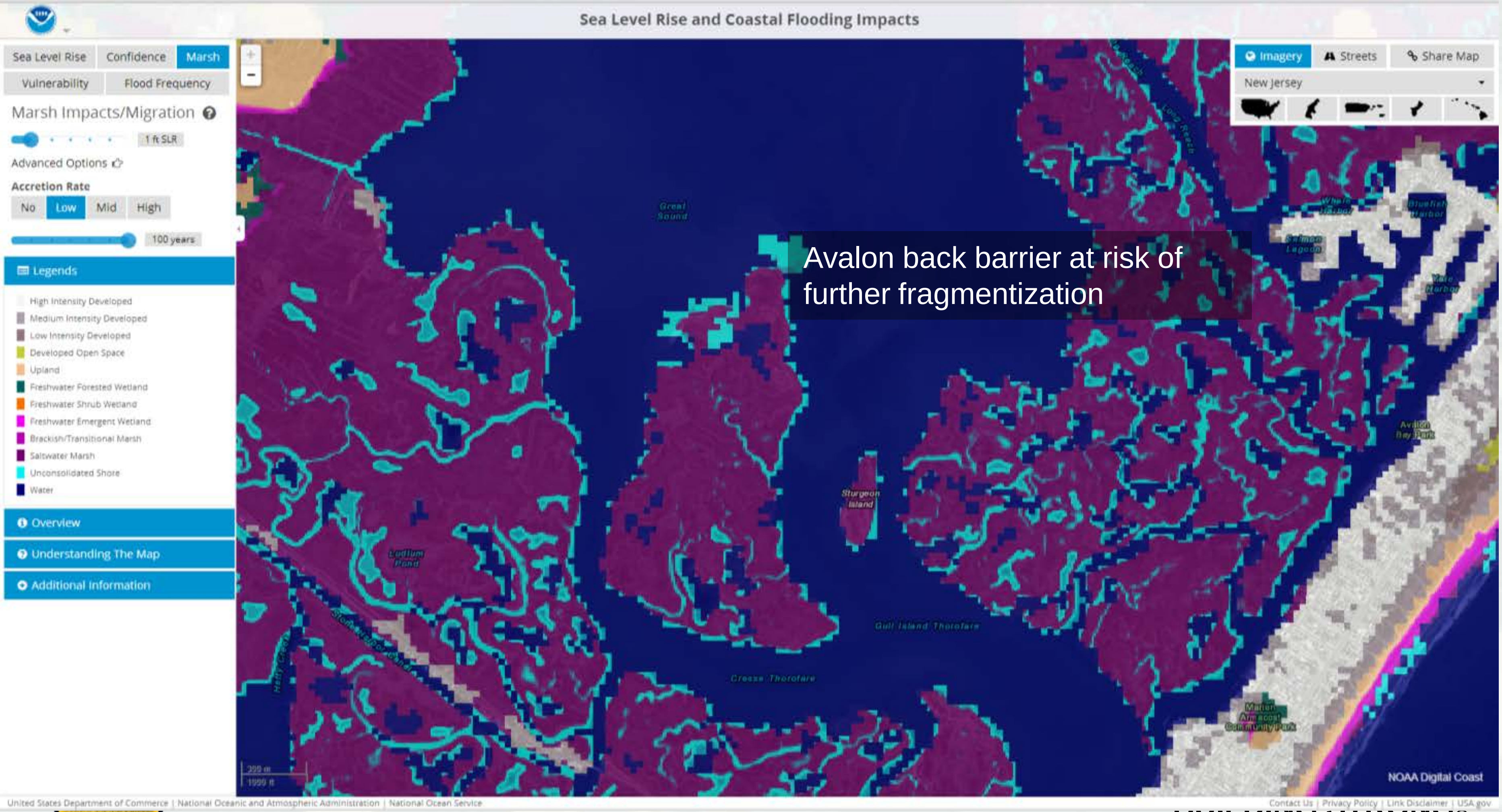


- Mordecai Island planning project ongoing
- NJIWW maintenance dredging and channel realignment adjacent to island
- DM placement will allay ongoing erosion until project constructed

Federal-State-NGO collaboration: Avalon and Stone Harbor demo

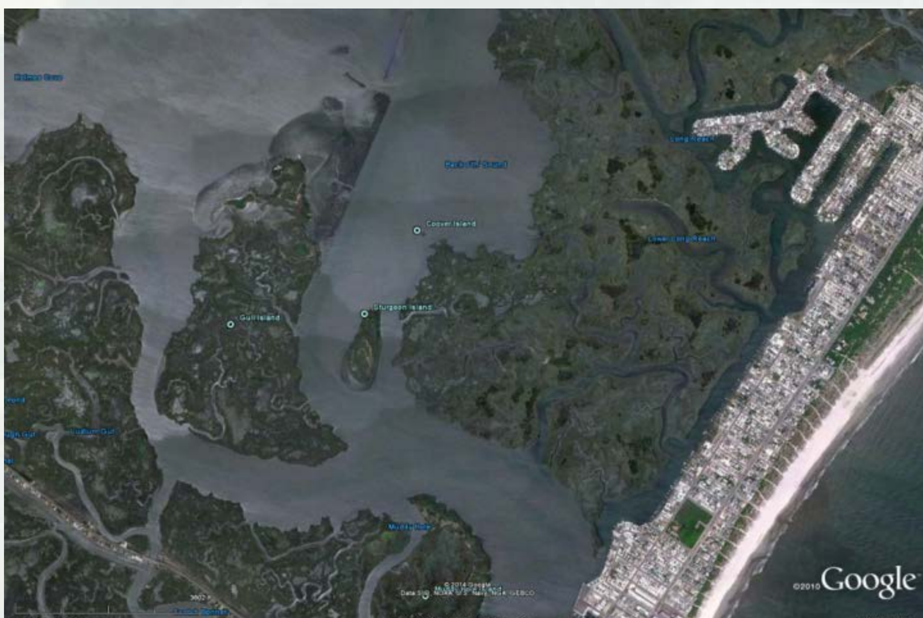
- NJIWW maintenance dredging
  - Stone Harbor: 7000 CY
  - Avalon: 75,000 CY
- TNC and NJ F&W received NFWF grant for marsh restoration demonstration

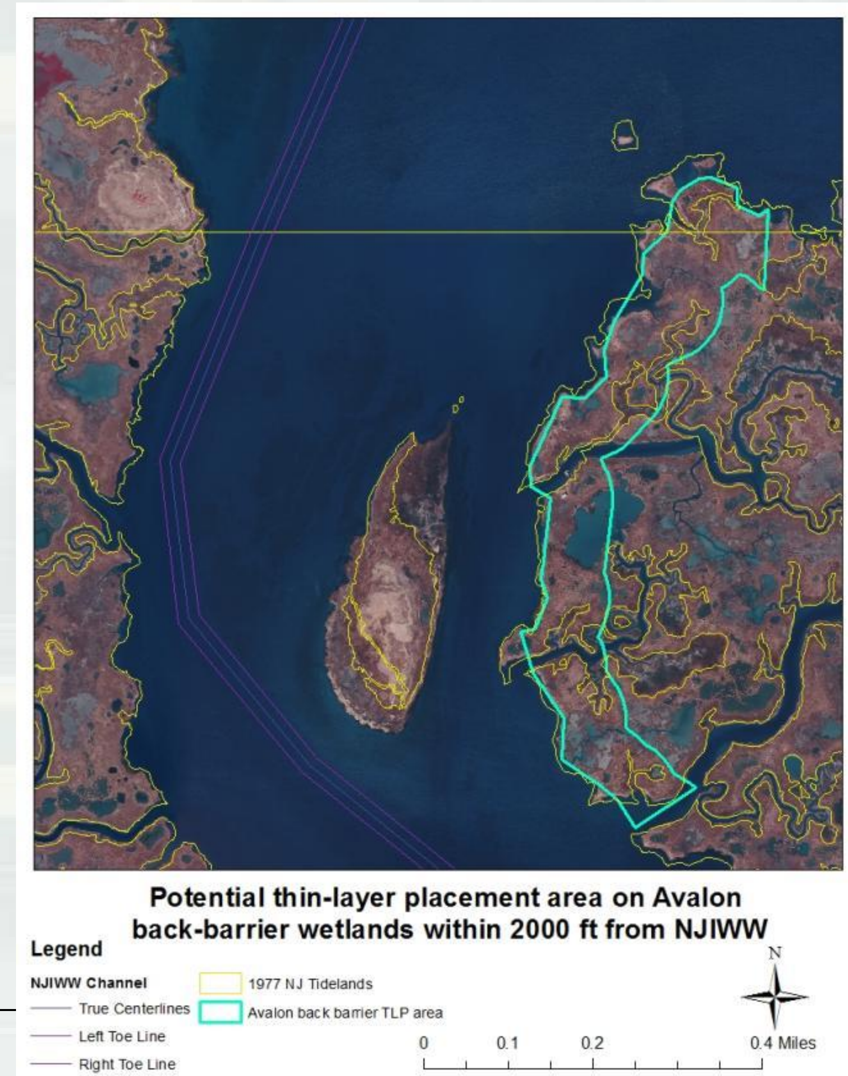
NOAA marsh map under 1 ft of SLR with low accretion rates at Avalon



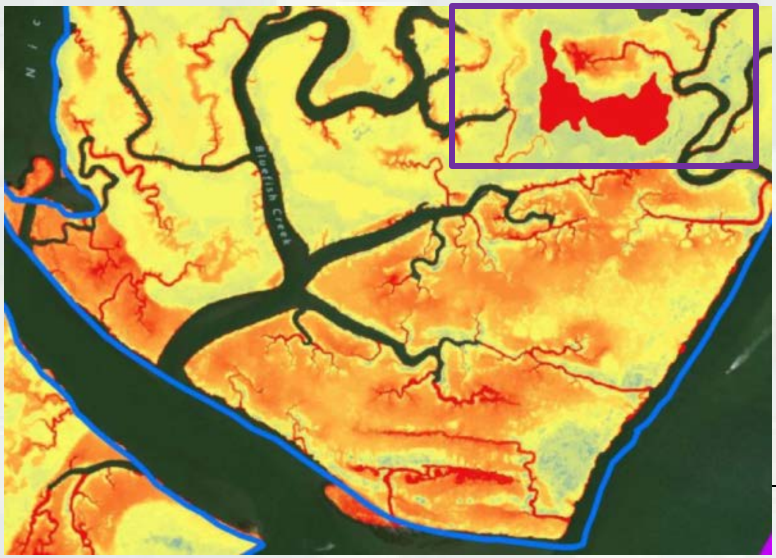
Proposed Avalon back barrier thin layer/marsh edge restoration

- Assuming 300 ft extent from shore
- Only considering shoreline within 2000 ft from channel
- Within 1977 NJ Tidelands





Proposed Stone Harbor thin-layer/pool fill demo



- Relatively small thin layer placement (or marsh nourishment) demonstration
- Fill salt pool near marsh edge

Summary

- Work is ongoing
- Collaboration is key
- Challenges
  - Constructability
  - Timing
- MONITOR
- Tell the Good News!
- Small actions hopefully lead to large shift within NJ and future O&M funding

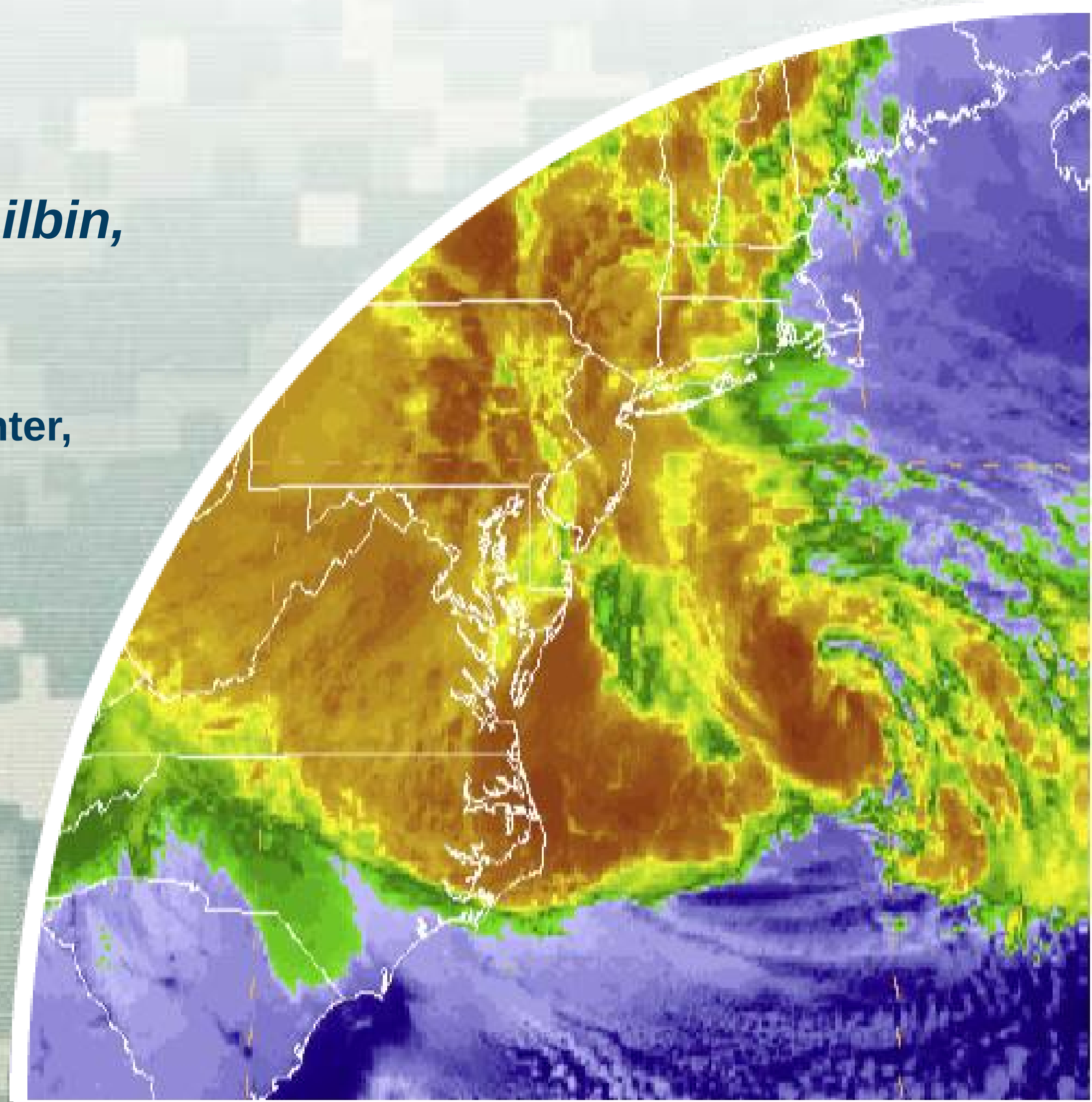
D2M2: A Systems Approach to Optimizing Regional Dredging

Application to Long Island Sound, NY/CT

Matthew E. Bates*, Kelley A. Philbin, Igor Linkov, Todd S. Bridges

Risk and Decision Science Team,
Engineer Research & Development Center,
US Army Corps of Engineers

A NAACS presentation
June 24, 2014
Matthew.E.Bates@usace.army.mil



Engineer Research and Development Center

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Background

- The US Army Corps of Engineers spends nearly $1 billion annually dredging public waterways.
- This secures access for over 2.2 billion tones of commercial shipping + national security and recreation.
- Strategic placement of dredged material is complex, involving many objectives, interactions, & constraints.

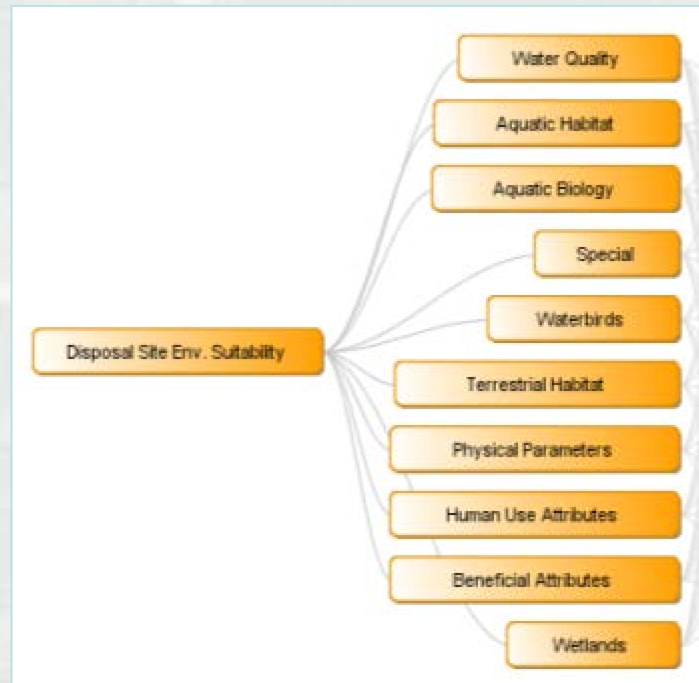
Background

- Optimization helps w/ multifaceted systems problems:
  - Multiple stakeholders with opposing interests.
  - Public concern over environmental effects.
  - High complexity in number of site variables.
  - Desire to use material beneficially for limited cost.

D2M2: Dredged Material Management Decisions

What is the most efficient way to connect potential dredging and placement sites?

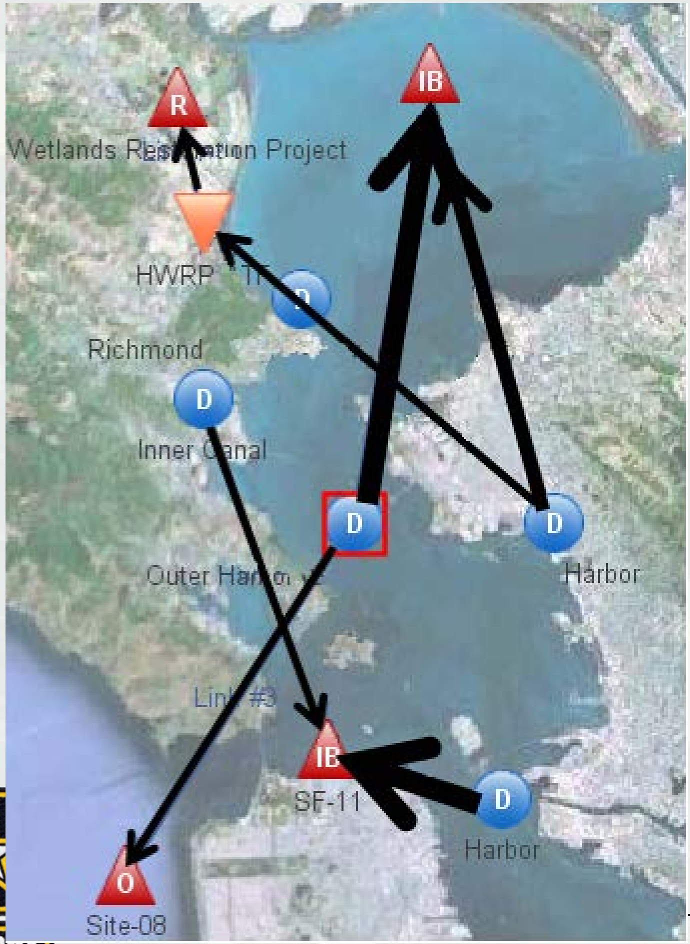
How do we maximize efficiency when tradeoffs need to be evaluated across multiple criteria or types of impact?



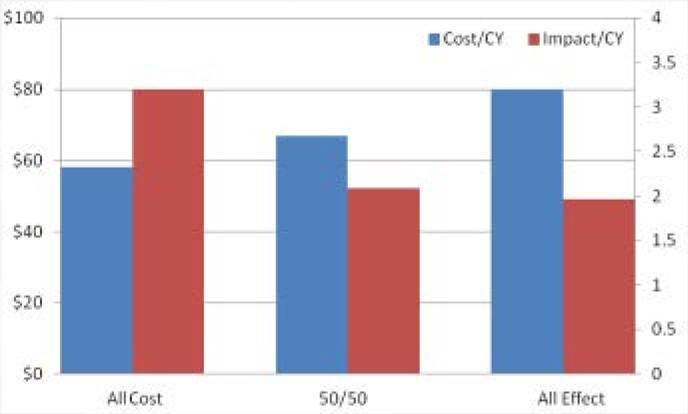
…How does this change when we consider temporal, regulatory, capacity, material-type, equipment, and other constraints?

D2M2: Dredged Material Management Decisions

D2M2 uses computer optimization to balance all dredging needs and system constraints with respect to multiple criteria and objectives. The results outline the most efficient DM strategies over time.



This can be helpful in identifying tradeoffs surrounding identifying the 'federal standard' – least cost, environmentally acceptable solution.



…or with different scenarios (e.g., "what if different sites were available?", "what if the costs or impacts were different?") .

D2M2: Dredged Material Management Decisions

- *Optimize system* of dredging, transfer and sediment-placement sites.
- Address multiple *competing objectives* (e.g., environmental, cost).
- Integrate decision maker & *stakeholder value* with *technical data*.

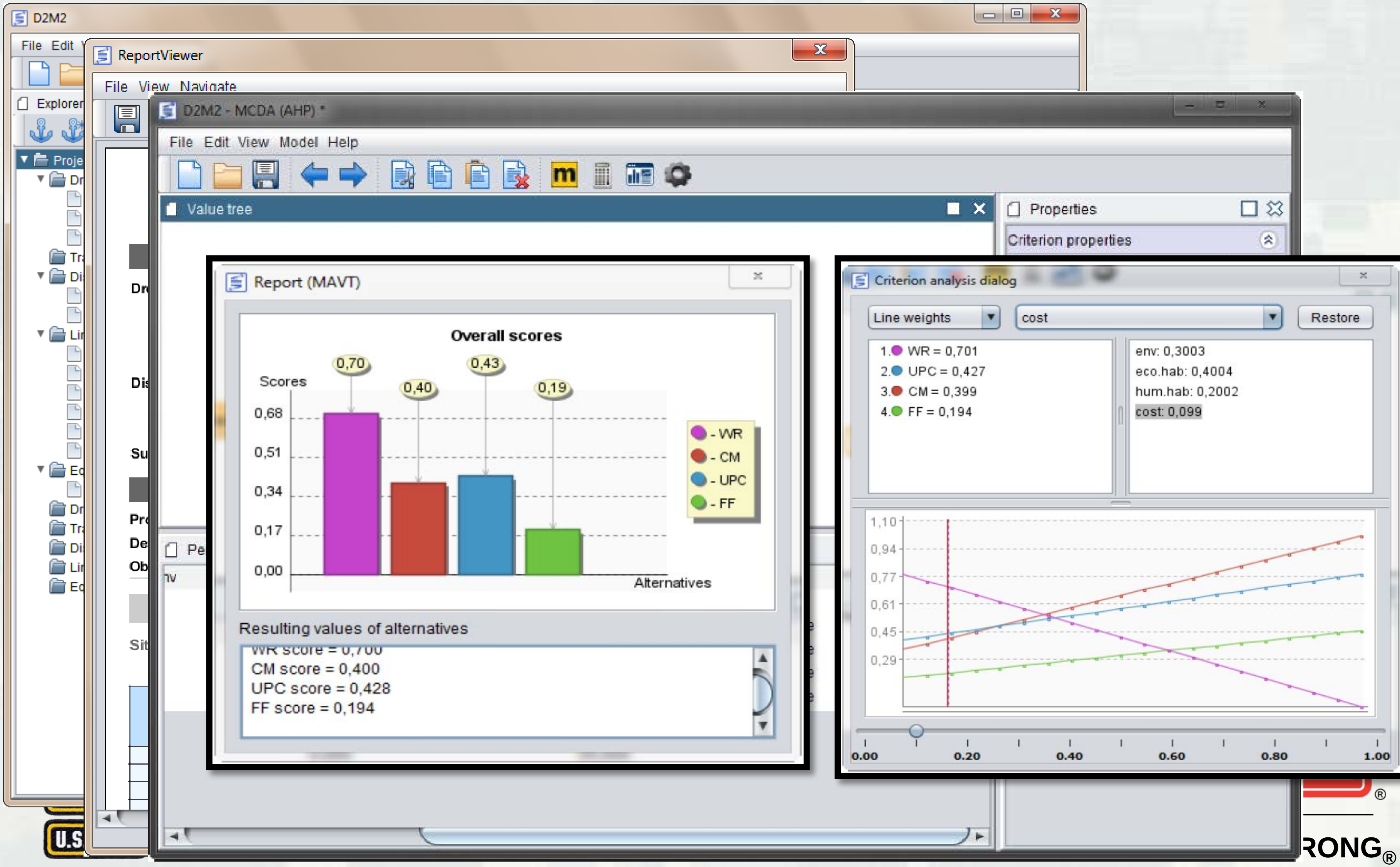
D2M2 Modules:

▪**Optimization:** Add dredging & placement site, route, and link data, optimization criteria, and tradeoff weights to calculate optimal and alternative solutions.

▪**Decision Support:** Conduct multi-criteria decision analysis to screen or rank potential sites or material management plans based on other factors.

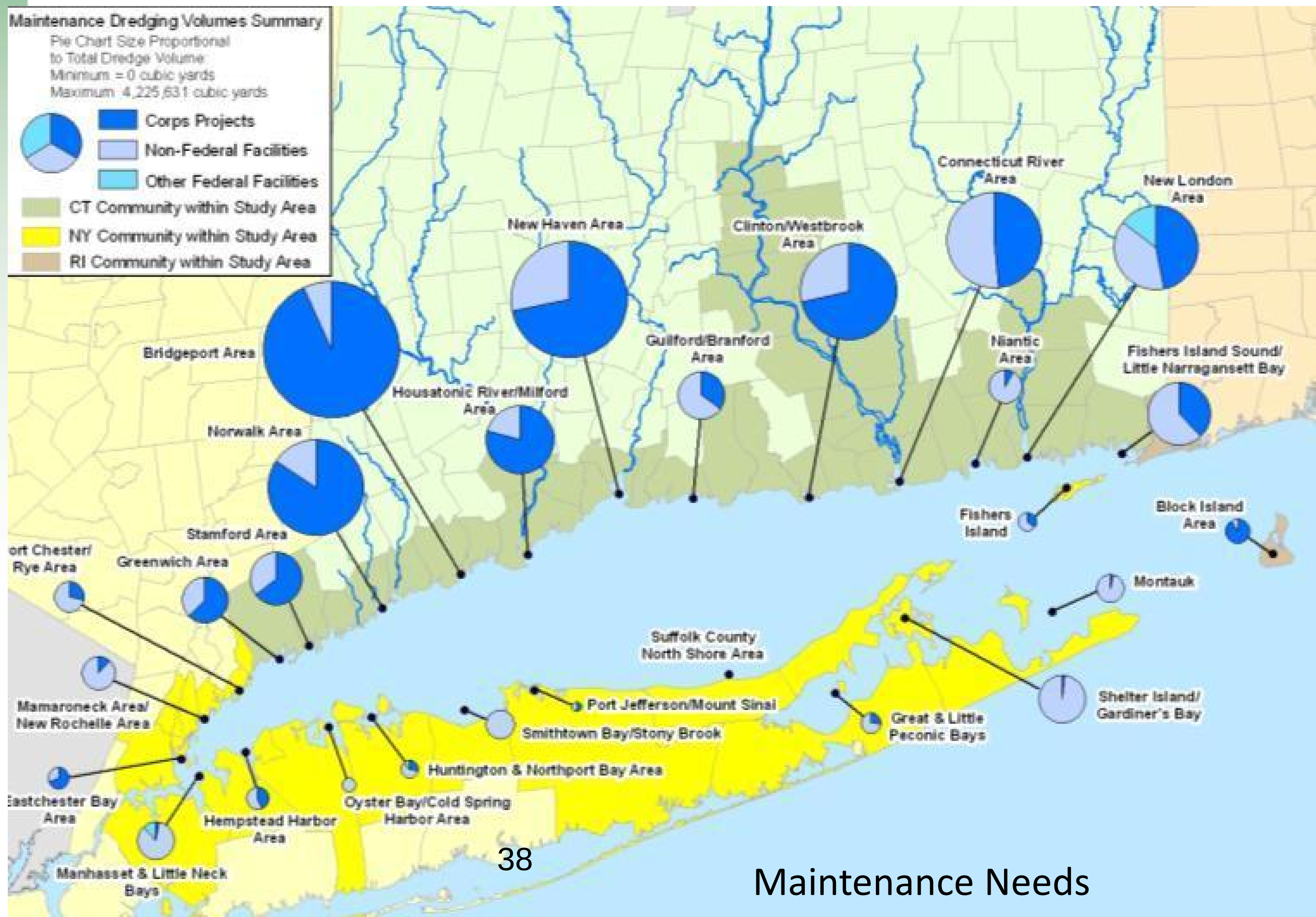
▪**GIS:** Input regional dredging sites, generate routes between them. (Or upload from Excel template.)

D2M2 Screenshots



Long Island Sound: D2M2 Case Study

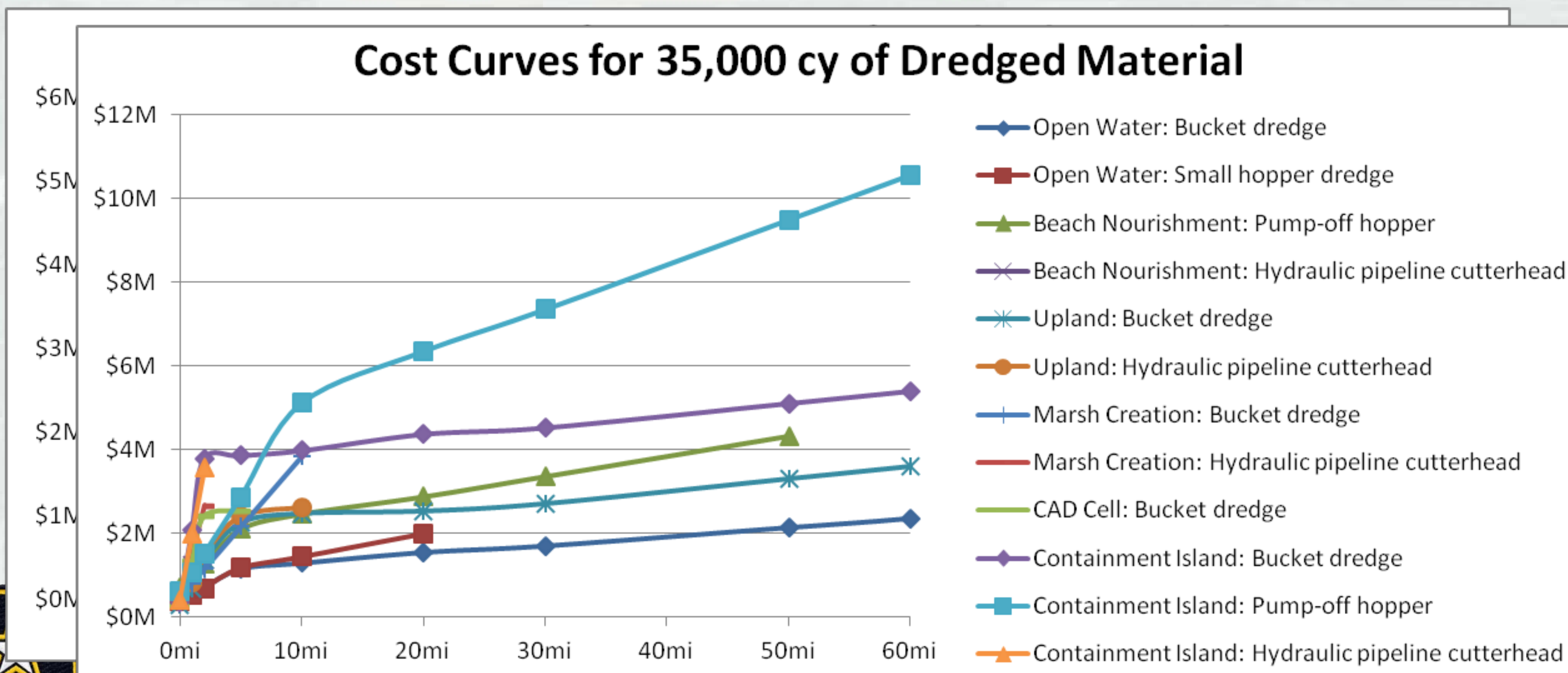
- **38.5 million cubic yards of dredged material produced in 30 years**
- **Majority of combined needs from CT:**
- **New Haven**
- **~8.7 million cy**
- **Bridgeport**
- **~4.6 million cy**
- **New London**
- **~2.5 million cy**
- **Connecticut River**
- **~2.4 million cy**
- **Clinton/Westbrook**
- **~2.4 million cy**
- **Norwalk**
- **~2.2 million cy**



Maintenance Needs

LIS Case Study Data

- Cost estimates from USACE New England engineering data:
  - Relative comparison for LIS region based on placement type.
  - Costs defined in terms of an initial cost and per unit (cy*mi) costs.
  - 50 cost curves generated for each type of equipment, volume, & distance.



LIS Case Study Data

- Effect (impact/benefit) data from LIS reports & SME judgment:

Criteria	Sub-Criteria
Cultural Effects	Shipwrecks, Historic Districts, Archaeological Sites
Environmental Effects	Wetlands, Federal and State Listed Species, Shellfish, Federally Managed Species, Submerged Aquatic Vegetation (SAV), Marine Protected Areas, Birds, Marine Mammals, Terrestrial Wildlife
Infrastructure Effects	Mooring Areas, Navigation Channels and Shipping, Ports, Coastal Structure, Cable/Power/Utility Crossings, Recreational Areas, Commercial and Industrial Facilities, Aquaculture, Dredged Materials Disposal Sites
Physical Effects	Sediments, Littoral Drift, Currents, Waves

LIS Case Study Data

- Effect (impact/benefit) data from LIS reports & SME judgment:

			Cultural Effects				Environmental Effects										Infrastructure Effects										Physical Effects					
Case Study Placement Site	**Site Type**	**Description**	Shipwrecks	Historic Districts	Archaeological Sites	**Total**	Wetlands	Federal and State Listed Species	Shellfish	Federally Managed Species	SAV	Marine Protected Areas	Birds	Marine Mammals	Terrestrial Wildlife	**Total**	Mooring Areas	Navigation Channels and Shipping	Ports	Coastal Structure	Cable/Power/Utility Crossings	Recreational Areas	Commercial and Industrial Facilities	Aquaculture	Dredged Material Disposal Sites	**Total**	Sediments	Littoral Drift	Currents	Waves	**Total**	***Total Effects Score***
Blydenburgh Road Landfill Complex	Landfill - Upland	create new landfill site				**0**		1		1			1		1	**4**										**0**					**0**	***4***
Town of Brookhaven Landfill	Landfill - Upland	create new landfill site				**0**		1		1			1		1	**4**										**0**					**0**	***4***
Southold Municipal Beaches	Beach Nourishment	create new beach nourishment site				**0**	-1	1	1	1			-1	1		**2**				-1		-1				**-2**		1		1	**2**	***2***
Manchester Landfill	Landfill - Upland	create new landfill site				**0**		1		1			1		1	**4**										**0**					**0**	***4***
Jacobs Beach	Beach Nourishment	create new beach nourishment site				**0**		1	1	1		1	-1	1		**4**				-1		-1				**-2**				1	**1**	***3***
Madison Municipal Beaches	Beach Nourishment	create new beach nourishment site				**0**		1	1	1		1	-1	1		**4**				-1		-1				**-2**				1	**1**	***3***
Westerly Municipal Beaches	Beach Nourishment	create new beach nourishment site	1			**1**		1	1	1			-1	1		**3**				-1	1	-1				**-1**		1		1	**2**	***5***
Norton Basin/Little Bay borrow pits	Marsh Creation	create new habitat restoration site				**0**	-1	1	-1	1		1	-1	-1		**-1**				1						**1**	1				**1**	***1***
Plum Island	Redevelopment - Upland	create new redevelopment site	1			**1**		1	-1	1	1	1	-1	-1		**1**				1				-1		**0**	1	1			**2**	***4***
Western Long Island Sound	Open Water	create new open water site				**0**		1	1	1				1		**4**		1								**1**	1				**1**	***6***
Central Long Island Sound	CAD Cell	create new CAD Cell site				**0**		1	1	1				1		**4**		1								**1**					**0**	***5***
Cornfield Shoals	Open Water	create new open water site				**0**		1	1	1				1		**4**		1								**1**	1				**1**	***6***
New London	Open Water	create new open water site				**0**		1	1	1				1		**4**		1								**1**	1				**1**	***6***
Bush Terminal Piers	Brownfield - Upland	create new open water site				**0**		1		1			-1		-1	**0**						-1				**-1**					**0**	***-1***
Flushing Airport	Redevelopment - Upland	create new redevelopment site	1			**1**	-1	1		1			-1			**0**						-1	-1			**-2**	1				**1**	***0***

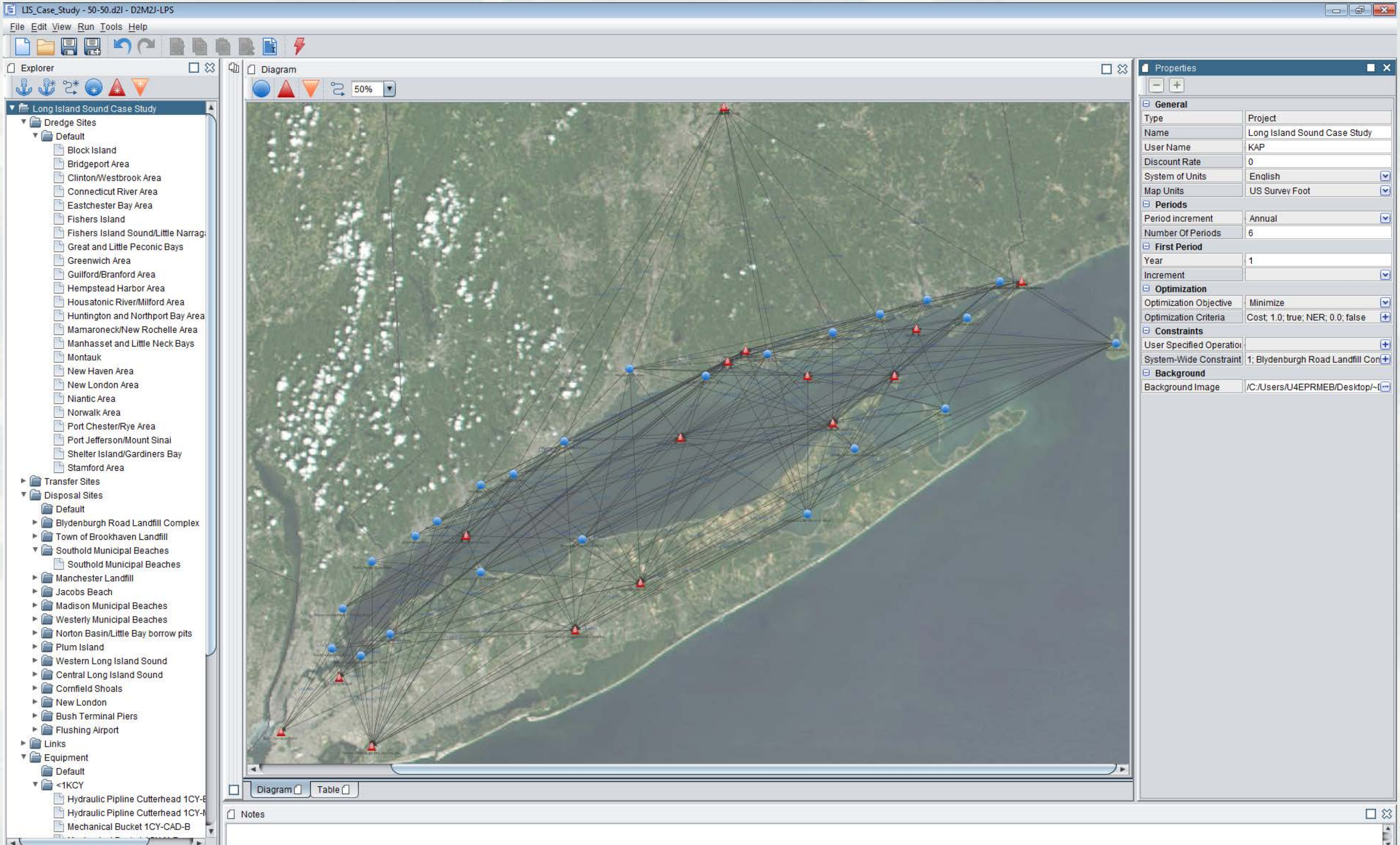
**Note: Positive values represent impacts, negative values represent benefits.
This case study demonstrates these values derived from expert judgment informed by LIS report details. For operational use, these values could come more detailed studies.*

LIS Case Study Data

The D2M2 model represents relevant intricacies of the LIS system:

- Strategically connect each dredging site with a subset of relevant placement sites to represent system topology.
- Add constraints about which placement sites will and will not be available at what volumes in each of six five-year time periods.
- Add constraints for links or types of sites by year and volume.
- Include details about placement site acquisition time and cost, lease end dates and potential renegotiation costs, O&M management costs, potential for beneficial reuse, etc.
- Include details about material bulking factors, transfer sites, site-specific costs and effects, equipment use, etc.

LIS Case Study System Network

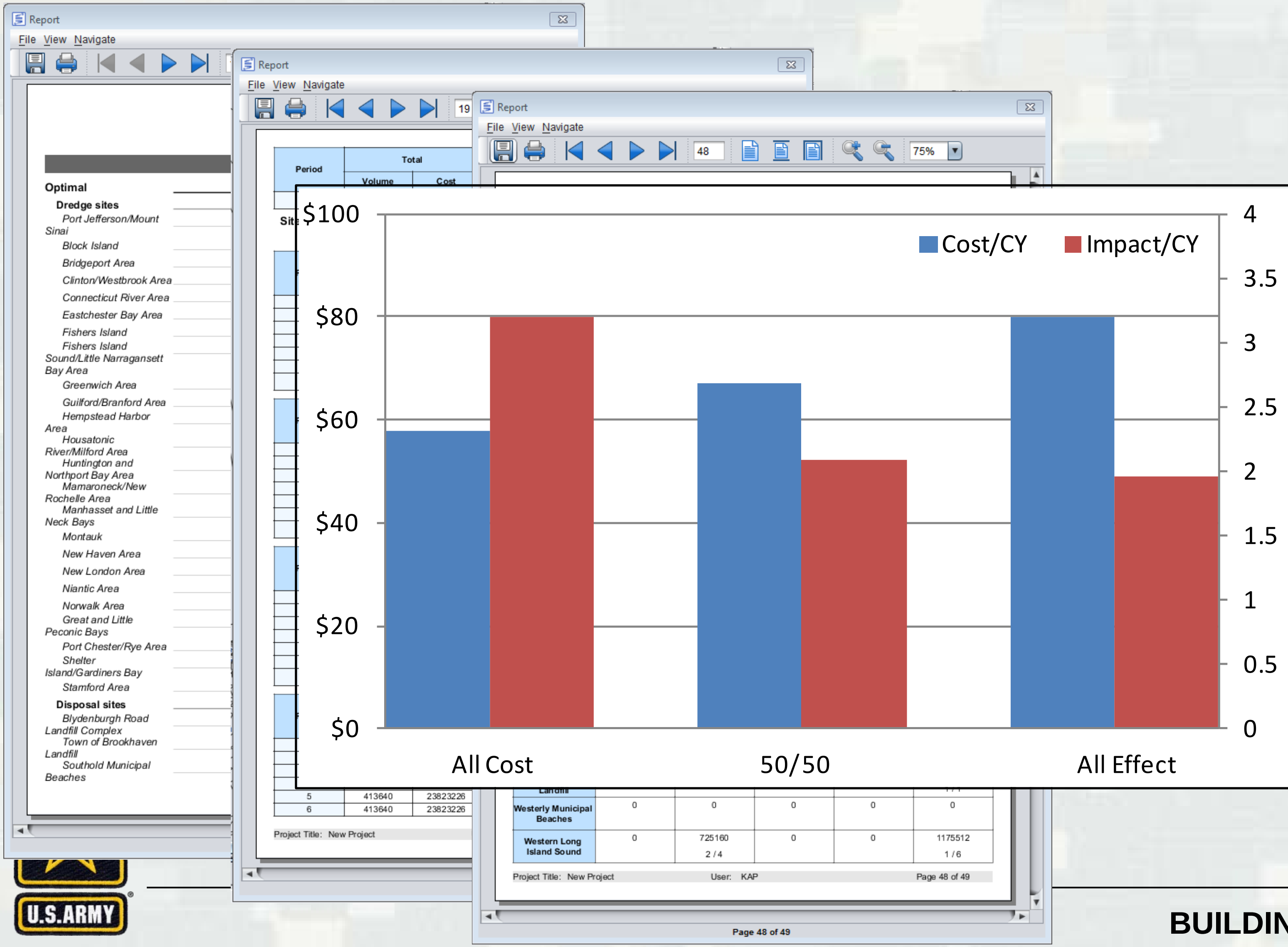


**Note: Straight line indicate logical connection between site pairs, nonlinear transit distance can be used in the calculations.*

Case Study Results

- Compare optimal recommended dredging plan under three scenarios: 100% cost, 100% effects (split evenly), & 50/50.
- Results show:
  - Cost-centric scenario favors open water disposal, with minimal other (e.g., beneficial) uses.
  - Effects-centric scenario favors beneficial uses, with minimal open water or landfill placement.
  - 50/50 scenario uses a mix of open water, landfill, and beneficial uses for placement, depending on how the location, costs, and effect implications play out for each potential pair of sites.

Case Study Results



Case Study Results

100% weight on operational cost

Placement Site / Dredge Site	Blydenburgh Road Landfill Complex	Town of Brookhaven Landfill	Southold Municipal Beaches	Manchester Landfill	Jacobs Beach	Madison Municipal Beaches	Westerly Municipal Beaches	Norton Basin/Little Bay borrow pits	Plum Island	Western Long Island Sound	Central Long Island Sound	Cornfield Shoals	New London	Bush Terminal Piers	Flushing Airport	Total CY
Manhasset and Little Neck Bays										10,000 (2028-2037)						10,000
Hempstead Harbor Area										50,000 (2008-2012, 2018-						50,000
Huntington and Northport Bay Area											30,000 (2028-2037)					30,000
Port Jefferson/Mount Sinai											10,000 (2028-2037)					10,000
Great and Little Peconic Bays											24,000 (2013-2017, 2028-					24,000
Shelter Island/Gardiners Bay											10,000 (2028-2037)					10,000
Montauk											5,000 (2013-2017)					5,000
Block Island											60,000 (2018-2027)		60,000 (2008-2017)			120,000
Fishers Island											25,000 (2028-2037)					25,000
Fishers Island Sound/Little							41,700 (2018-2022)				649,900 (2018-2037)					691,600
New London Area											770,046 (2028-2037)					770,046
Niantic Area											20,000 (2028-2037)					20,000
Connecticut River Area									342,772 (2018-2037)			281,740 (2008-2012)	382,440 (2008-2012)			1,006,952
Clinton/ Westbrook Area			1,385,826 (2018-2037)										140,000 (2008-2012)			1,525,826
Guilford/ Branford Area											176,554 (2018-2037)					176,554
New Haven Area			5,568,885 (2013-2027)							725,160 (2013-2027)	250,000 (2028-2037)	169,044 (2013-2017)				6,713,089
Housatonic River/Milford Area		50,000 (2008-2012)	737946 (2028-2037)							50,000 (2013-2022)						837,946
Bridgeport Area			3,937,882 (2008-2012, 2028-													3,937,882
Norwalk Area		258,280 (2008-2012)						343,488 (2028-2037)		1,175,512 (2008-2012, 2018-						1,777,280
Stamford Area											406,140 (2028-2037)					406,140
Greenwich Area										299,648 (2028-2037)						299,648
Port Chester/Rye Area										60,000 (2008-2017)						60,000
Mamaroneck/ New Rochelle Area											30,000 (2028-2037)					30,000
Eastchester Bay Area										70,000 (2008-2012, 2018-						700,000
TOTAL Dredged Material Transferred		308,280	11,630,539				41,700	343,488	342,772	2,440,320	2,456,640	450,784	582,440			18,596,963

Case Study Results

50/50% between operational costs & effects

Placement Site / Dredge Site	Blydenburgh Road Landfill Complex	Town of Brookhaven Landfill	Southold Municipal Beaches	Manchester Landfill	Jacobs Beach	Madison Municipal Beaches	Westerly Municipal Beaches	Norton Basin/Little Bay borrow pits	Plum Island	Western Long Island Sound	Central Long Island Sound	Cornfield Shoals	New London	Bush Terminal Piers	Flushing Airport	Total
Manhasset and Little Neck Bays										10,000 (2028-2037)						10,000
Hempstead Harbor Area	30,000 (2013-2017)									20,000 (2028-2037)						50,000
Huntington and Northport Bay Area											20,000 (2028-2037)					20,000
Port Jefferson/Mount Sinai											10,000 (2028-2037)					10,000
Great and Little Peconic Bays											24,000 (2013-2017, 2028-					24,000
Shelter Island/Gardiners Bay											10,000 (2028-2037)					10,000
Montauk											5,000 (2013-2017)					5,000
Block Island									60,000 (2018-2027)				60,000 (2008-2017)			120,000
Fishers Island											25,000 (2028-2037)					25,000
Fishers Island Sound/Little			691,600 (2018-2037)													691,600
New London Area			770,046 (2028-2037)													770,046
Niantic Area											20,000 (2028-2037)					20,000
Connecticut River Area			1,006,952 (2008-2012,													1,006,952
Clinton/ Westbrook Area			1,525,826 (2008-2012,													1,525,826
Guilford/ Branford Area			176,554 (2018-2037)													176,554
New Haven Area			6,713,089 (2013-2037)													6,713,089
Housatonic River/Milford Area			837,946 (2008-2012, 2018-													837,946
Bridgeport Area			3,937,882 (2008-2012,													3,937,882
Norwalk Area		457,280 (2008-2012, 2018-						1,000,000 (2008-2012, 2028-							320,000 (2008-2012)	1,777,280
Stamford Area			406,140 (2028-2037)													406,140
Greenwich Area										299,648 (2028-2037)						299,648
Port Chester/Rye Area										30,000 (2013-2017)					30,000 (2008-2012)	60,000
Mamaroneck/ New Rochelle Area											30,000 (2028-2037)					30,000
Eastchester Bay Area										60,000 (2008-2012, 2018-				10,000 (2008-2012)		70,000
TOTAL Dredged Material Transferred	30,000	457,280	16,066,035					1,000,000	60,000	419,648	144,000		60,000	10,000	350,000	18,596,963

Case Study Results

100% weight on effects (split evenly)

Placement Site / Dredge Site	Blydenburgh Road Landfill Complex	Town of Brookhaven Landfill	Southold Municipal Beaches	Manchester Landfill	Jacobs Beach	Madison Municipal Beaches	Westerly Municipal Beaches	Norton Basin/Little Bay borrow pits	Plum Island	Western Long Island Sound	Central Long Island Sound	Cornfield Shoals	New London	Bush Terminal Piers	Flushing Airport	Total CY
Manhasset and Little Neck Bays			10,000 (2028-2037)													10,000
Hempstead Harbor Area			50,000 (2013-2017, 2028-													50,000
Huntington and Northport Bay Area			20,000 (2028-2037)													20,000
Port Jefferson/Mount Sinai			10,000 (2028-2037)													10,000
Great and Little Peconic Bays			24,000 (2013-2017, 2028-													24,000
Shelter Island/Gardiners Bay			10,000 (2028-2037)													10,000
Montauk			5,000 (2013-2017)													5,000
Block Island			120,000 (2008-2027)													120,000
Fishers Island			25,000 (2028-2037)													25,000
Fishers Island Sound/Little			691,600 (2018-2037)													691,600
New London Area			770,046 (2028-2037)													770,046
Niantic Area			20,000 (2028-2037)													20,000
Connecticut River Area			1006952 (2008-2012,													1,006,952
Clinton/ Westbrook Area			1,525,826 (2008-2012,													1,525,826
Guilford/ Branford Area			176,554 (2018-2037)													176,554
New Haven Area			6,713,089 (2013-2037)													6,713,089
Housatonic River/Milford Area			837,946 (2008-2012, 2018-													837,946
Bridgeport Area			3,937,882 (2008-2012,													3,937,882
Norwalk Area	48,640 (2008-2012)	422,520 (2008-2012, 2018-			4,840 (2023-2027, 2033-	6,280 (2018-2022, 2028-		945,000 (20008-2012, 2028-							350,000 (2008-2012)	1,777,280
Stamford Area			406,140 (2028-2037)													406,140
Greenwich Area			299,648 (2028-2037)													299,648
Port Chester/Rye Area	30,000 (2013-2017)							30,000 (2008-2012)								60,000
Mamaroneck/ New Rochelle Area			30,000 (2028-2037)													30,000
Eastchester Bay Area		35,000 (2018-2027)						25,000 (2008-2012)						10,000 (2008-2012)		70,000
TOTAL Dredged Material Transferred	**78,640**	**457,520**	**16,689,683**		**4,840**	**6,280**		**1,000,000**						**10,000**	**350,000**	**18,596,963**

Conclusions

D2M2 is a multi-objective optimization tool that helps solve complex & multifaceted dredging planning/ops problems:

- Automatically explores thousands of potential solutions.
- Enables explicit consideration of multiple objectives (e.g., economic, environmental, social, etc.).
- Shows opportunity cost/benefit of beneficial use, etc.
- Adds transparency, replicability, & flexibility to analyses.
- Enables easy scenario and “what if” analysis.
- Helpful in discussing tradeoffs around “federal standard”.
- Useful for adopting a systems perspective.

Thank You!

Any Questions?

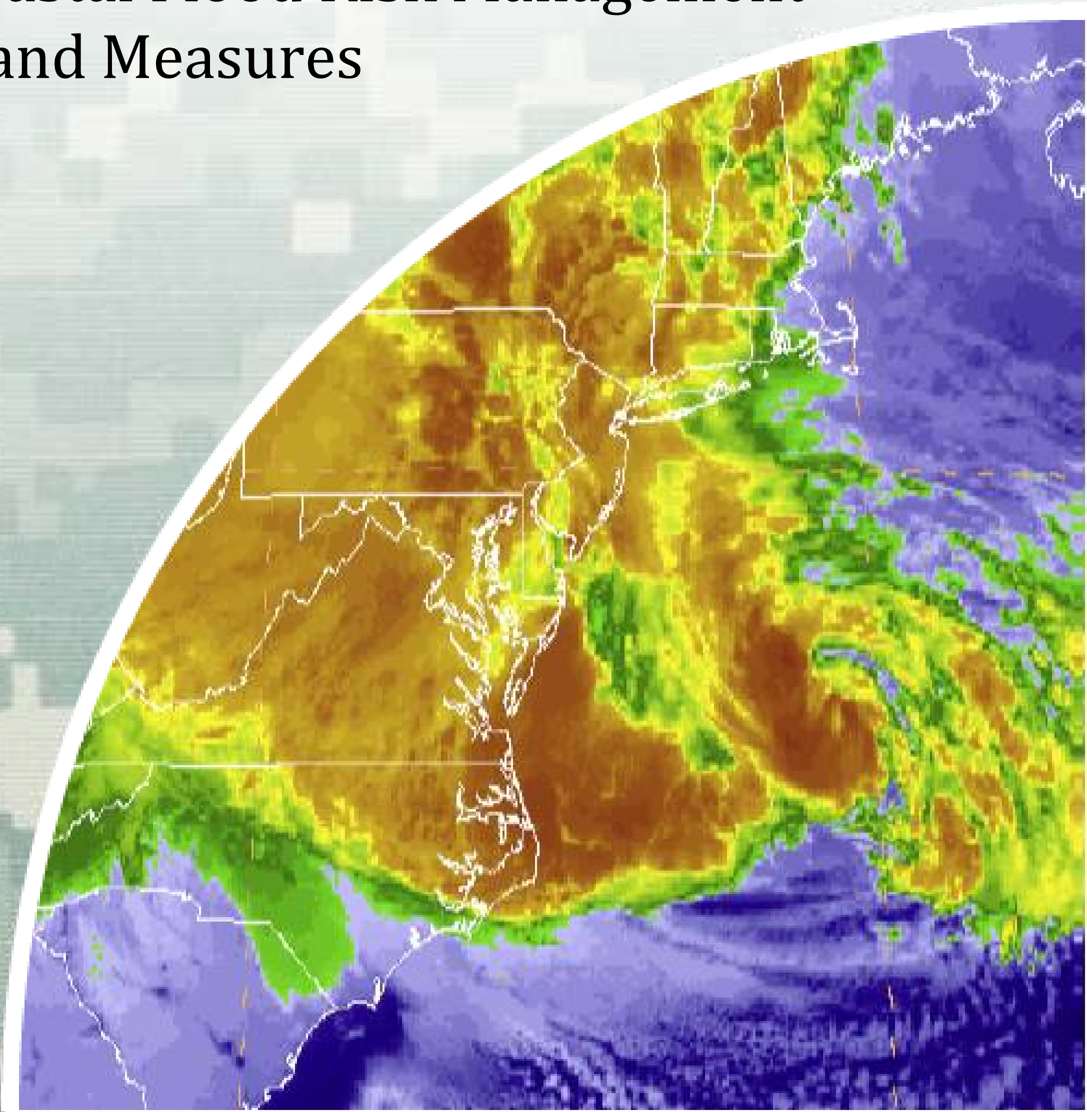
Email: *Matthew.E.Bates@usace.army.mil*

Download: *http://el.erdc.usace.army.mil/dots/models.html*

North Atlantic Coast Comprehensive Study

Draft Analyses Webinar: Coastal Flood Risk Management Strategies and Measures

U.S. Army Corps of Engineers
National Planning Center for Coastal Storm Risk Management



U.S.ARMY®

US Army Corps of Engineers
BUILDING STRONG®

Public-Private Partnerships

- **NACCS Findings, Outcomes, and Opportunities**
  - Public-Private Partnerships should be explored to strengthen the resilience of coastal communities and their supporting economies, environments, and infrastructure
- **Leveraging Limited Resources**
  - Hurricane Sandy Rebuilding Task Force – Hurricane Sandy Rebuilding Strategy
  - Cooperation and collaboration as opposed to competition for limited resources
- **Innovative Solutions to Complex Problems**
  - Multiple stakeholders with mutual interest in a resilient and sustainable coastal landscape
- **Not Solely Financial Assistance**
  - Information-sharing and collaboration
  - Technical services, training, other support
  - Materials