Sea Level Affecting Marshes Model (SLAMM) for NH

Goal: to guide conservation strategies that will protect coastal wetland areas that are likely to provide high quality wildlife habitat and persist for the longest duration.

Ecological Services

- Wildlife habitat
- Natural storm surge buffers
- Water filtration
- Wetland-dependent human activities

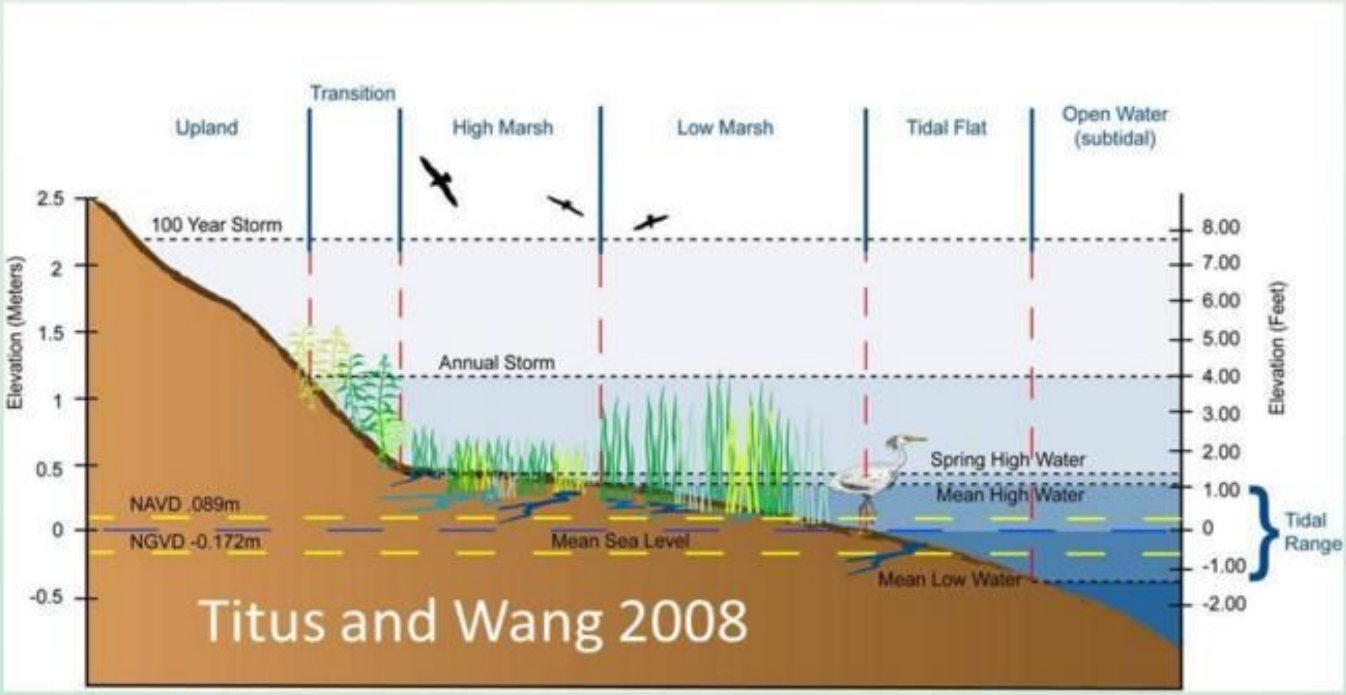
Sea Level Affecting Marshes Model (SLAMM) for NH

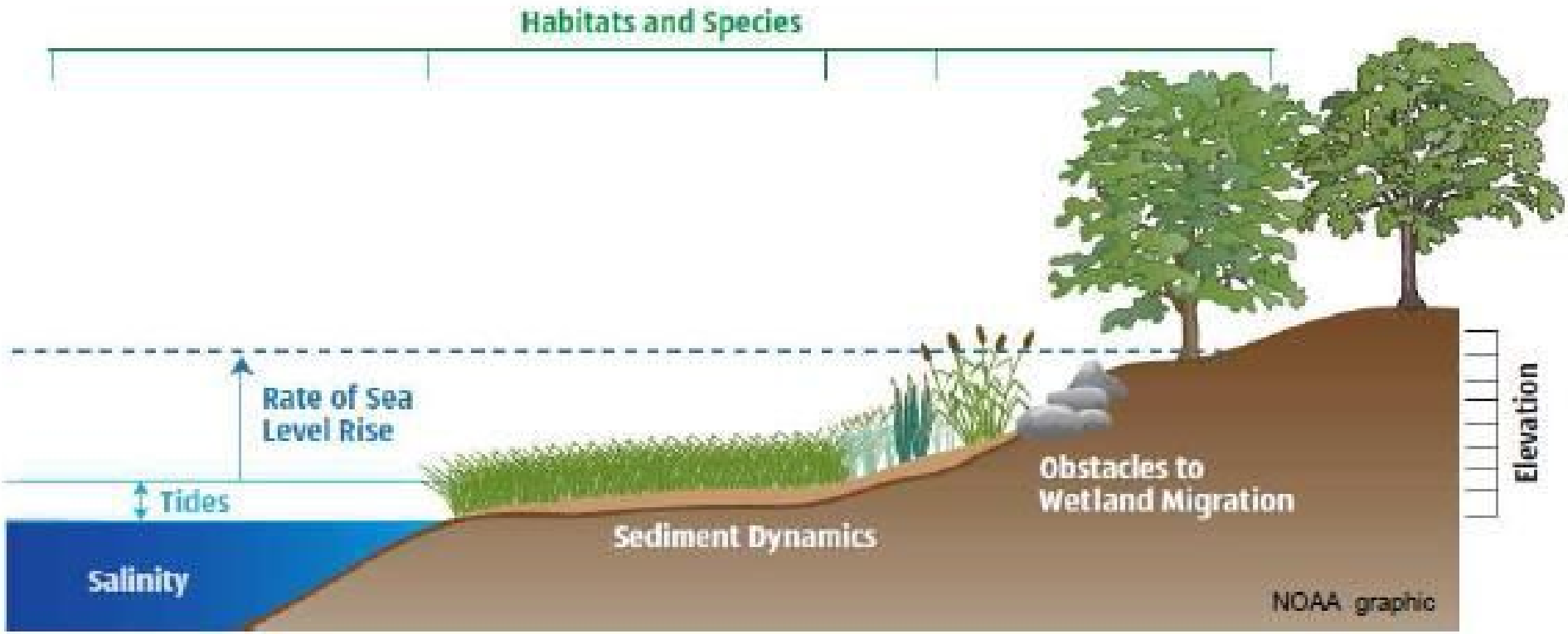
What is SLAMM?

Model Process Overview

- Simulates the dominant processes involved in wetland conversions under different scenarios of sea level rise

  inundation, erosion, accretion, soil saturation and barrier island overwash

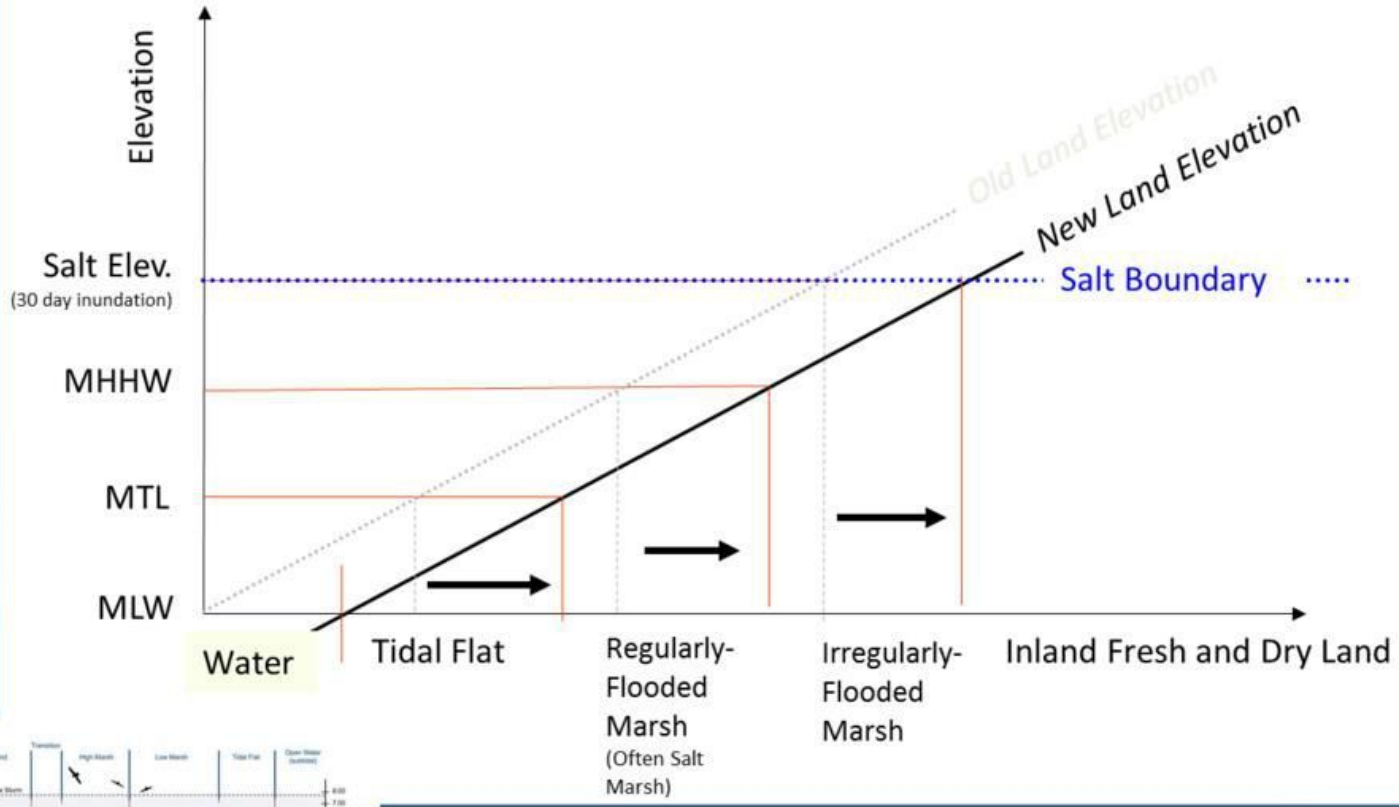


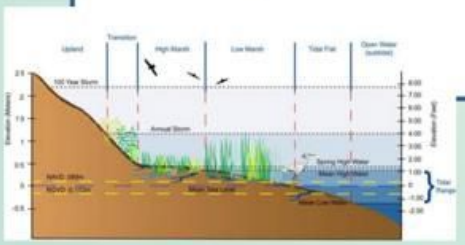


SLAMM tracks the rise of water levels and the salt boundary by reducing the elevation of each cell, as sea levels rise.

SLAMM Inundation Model

(Migration of Wetlands Boundaries due to Sea Level Rise)





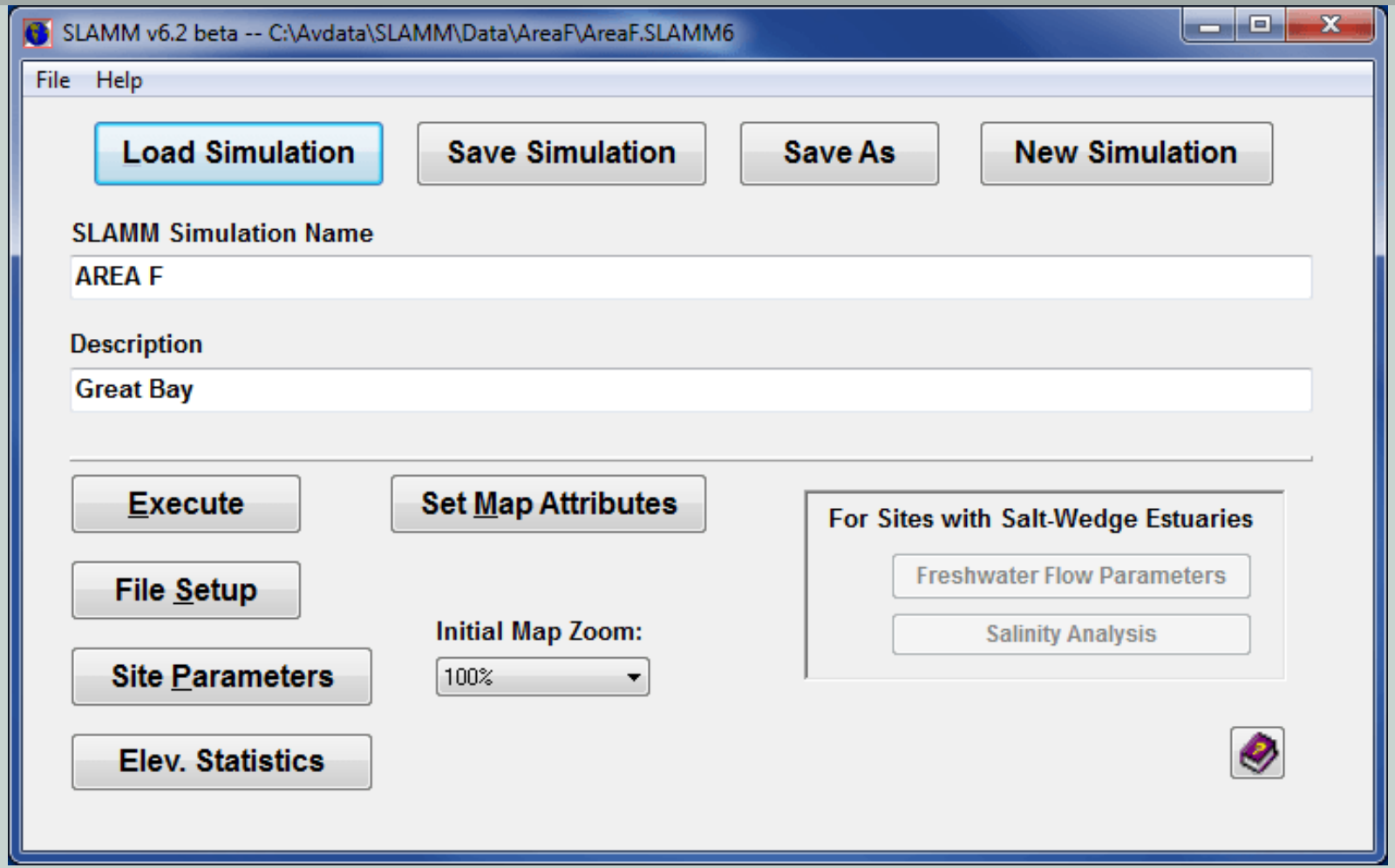
SLAMM Habitats

- 3 Swamp
- 5 Inland fresh marsh
- 6 Tidal fresh marsh
- 7 Scrub shrub
- 8 Reg flood marsh
- 10 Estuarine beach
- 11 Tidal flat
- 12 Ocean beach
- 15 Inland open water
- 17 Estuarine water
- 19 Open ocean
- 20 Irreg flood marsh
- 23 Tidal swamp

Fate of Wetland Cells

- Adjust cell elevation based on SLR, Accretion, Uplift / Subsidence
- Determine if cell has fallen below minimum elevation
- If cell is in defined estuary, determine type based on salinity
- If cell is exposed to water and meets maximum fetch, erode cell

SLAMM software interface



Spring 2013 SLAMM 6.2 released 64bit version

SLAMM Execution Options

SLR scenarios to Run

IPCC, 2001 or Fixed

Scenarios	Estimates	and/or Fixed Rise by 2100
☐ A1B	☐ Min	☐ 1 meter
☐ A1T	☐ Mean	☐ 1.5 meters
☐ A1F1	☐ Max	☐ 2 meters
☐ A2		
☐ B1		
☐ B2		

☑ Custom 1.2 m by 2100

Protection Scenarios to Run

- ☑ Don't Protect
- ☐ Protect Developed Dry Land
- ☐ Protect All Dry Land

☑ Run Model for NWI Photo Date (T0)

Time Step (years) 25

Last Year of Simulation 2100

☐ Run Model for Specific Years

2025,2050,2075,2100

e.g. 2050,2075,2100

Display Maps on screen

- ☑ Pause with Examination Tools
- ☐ Automatically Paste Maps to Word
- ☐ Save Maps to GIF Files
- ☐ Also Save Salinity, Accretion Maps
- ☐ Additional Simplified Category Maps

◉ No Maps (Quicker Execution)

Data to Save

- ○ Save Tabular Data Only
- ◉ Save Output for GIS — GIS File Options

- ☐ Include Dikes
- ☑ No-Data Elevs Loaded as Blanks
- ☑ Use Soil Saturation
- ☑ Use Connectivity Algorithm
- ☐ Use Bruun Rule for "Ocean Beach" Erosion

- ☐ Run Latin-Hypercube Analysis
- ☐ Run Sensitivity Analysis

Uncertainty / Sensitivity Setup

Save simulation

Return to Main Menu

Cancel

Execute

NH Planning Scenarios

New Hampshire Coastal Risks & Hazards Commission

Archive | Scientific Advisory Panel

The Scientific Advisory Panel will meet on March 17.

by **Cathy Coletti** on March 13, 2014 in **Meeting Announcements**, **Scientific Advisory Panel**

The Scientific Advisory Panel Meeting of the N.H. Coastal Risks and Hazards Commission will meet on March 17 from 10:30am-12:00pm at 320 Gregg Hall at the University of New Hampshire in Durham, N.H. View the agenda.

Continue Reading 0

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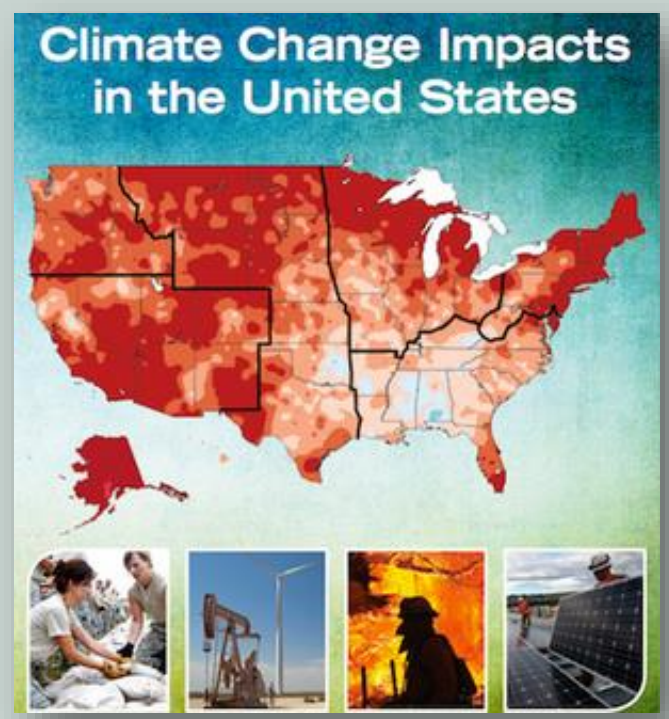
Topics

- Grant Proposal
- Meeting Announcements
- Scientific Advisory Panel
- Steering Committee
- Uncategorized
- Working Groups

NH Planning Scenarios

SLR at 2100

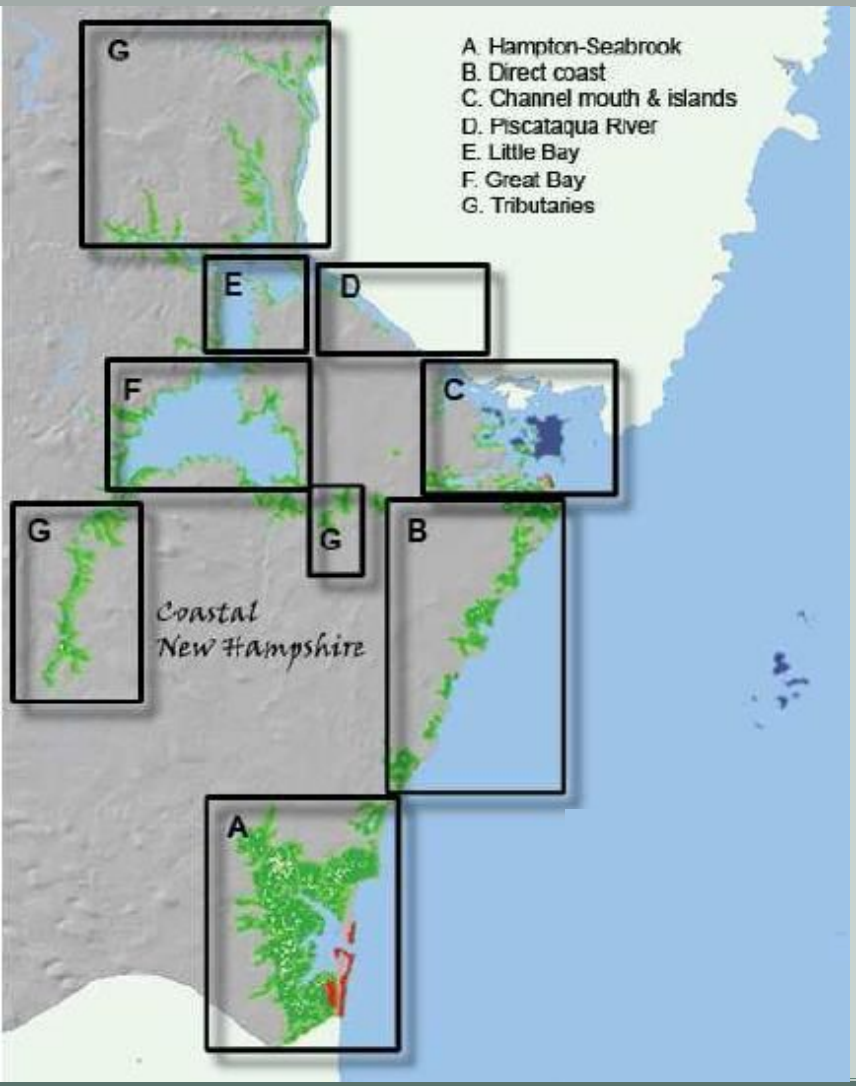


0.5m (1.7ft), 1.2m (3.9ft), 2m (6.3ft)

Temporal Scale

2025, 2050, 2075, 2100

Locally relevant input parameters



Parameter	Global
Description	GreatBay
NWI Photo Date (YYYY)	2001
DEM Date (YYYY)	2011
Direction Offshore [n,s,e,w]	East
Historic Trend (mm/yr)	1.76
MTL-NAVD88 (m)	0.067
GT Great Diurnal Tide Range (m)	2.3
Salt Elev. (m above MTL)	1.61
Marsh Erosion (horz. m /yr)	1.8
Swamp Erosion (horz. m /yr)	1
T.Flat Erosion (horz. m /yr)	0.5
Reg.-Flood Marsh Accr (mm/yr)	4.3
Irreg.-Flood Marsh Accr (mm/yr)	4.3
Tidal-Fresh Marsh Accr (mm/yr)	5.38
Inland-Fresh Marsh Accr (mm/yr)	0
Mangrove Accr (mm/yr)	7
Tidal Swamp Accr (mm/yr)	1.1
Swamp Accretion (mm/yr)	0.3
Beach Sed. Rate (mm/yr)	0.5
Freq. Overwash (years)	50
Use Elev Pre-processor [True,False]	FALSE

Currently the closest active tide station is located at Fort Point, with the next closest located within Wells NERR (Figure 2b). The station at Fort Point was established in 1976, with the present installation operating since 2003. It measures primary water level only. The station at Wells NERR was established in 1999. It measures primary and backup water level, barometric pressure, conductivity and wind, air and water temperature.

Figure 2a. Location of historic tide stations in the Great Bay region. (CO-OPS map)

Figure 2b. Location of current tide stations in New Hampshire and southern Maine. (CO-OPS map)

Center for Coastal and Ocean Mapping / NOAA-UNH Joint Hydrographic Center

A Tidal Study of Great Bay, New Hampshire

		Shankhassic, Great Bay,NH	Winnicut River, Great Bay,NH	Adam's Point, Great Bay,NH	Squamscott River, Great Bay,NH
Datum:	MHHW (m)	1.012	1.016	0.868	1.119
	MHW (m)	0.899	0.895	0.753	1.005
	MTL (m)	0.072	0.143	-0.083	0.134
	DTL (m)	0.047	0.096	-0.106	0.106
	MSL (m)	0.043	0.012	-0.112	0.071
	MLW (m)	-1.113	-0.987	-1.242	-1.080
	MLLW (m)	-1.176	-1.013	-1.311	-1.141
Range of Tide:	Gt (m)	2.300	2.066	2.212	2.304
	Mn (m)	2.083	1.889	2.012	2.094
	DHQ (m)	0.112	0.121	0.114	0.114
	DLQ (m)	0.063	0.026	0.070	0.062
Lunitidal Interval:	HWI (hrs)	5.85	5.87	5.79	5.90
	LWI (hrs)	12.15	12.55	12.03	12.34

SLAMM File Setup

DEM File (elevation): (required)
C:\Avdata\SLAMM\Data\AreaF\dem.asc *LiDAR 2m dem* Browse
NRows: 4500, NCols: 6000.

SLAMM Categories (NWI): (required)
C:\Avdata\SLAMM\Data\AreaF\nwi.asc *NWI with RPC Land Use (dev/undev)* Browse
NRows: 4500, NCols: 6000.

SLOPE File: (required)
C:\Avdata\SLAMM\Data\AreaF\slope.asc *slope (degrees) from LiDAR dem* Browse
NRows: 4500, NCols: 6000.

Dike File: (optional)
C:\Avdata\SLAMM\Data\AreaF\dike.asc *from NWI "h" modifier* Browse
NRows: 4500, NCols: 6000.

(•) Classic dike raster (protected areas) ( ) Dike location raster (dike locations and height)

Pct. Impervious File: (optional)
C:\Avdata\SLAMM\Data\AreaF\imperv.asc *image classification 2010 NHDOT 1ft photos (spring, leaf-off CIR)* Browse
NRows: 4500, NCols: 6000.

Raster Output Sites File: (optional) Browse
No Raster Output File Selected, outputs will not be summarized by raster coverage

VDATUM File: (optional) Browse
No VDATUM Correction File Selected, using MTL-NAVD corrections in site/subsite records.

Uplift, Subidence File: (optional) Browse
No Raster Uplift/Subsidence Map Selected, using Historic Trend to estimate land movement.

Salinity Raster File (base): (optional) Browse
No Salinity Raster File Selected. The initial condition file should be specified here.

Re-check Files' Validity

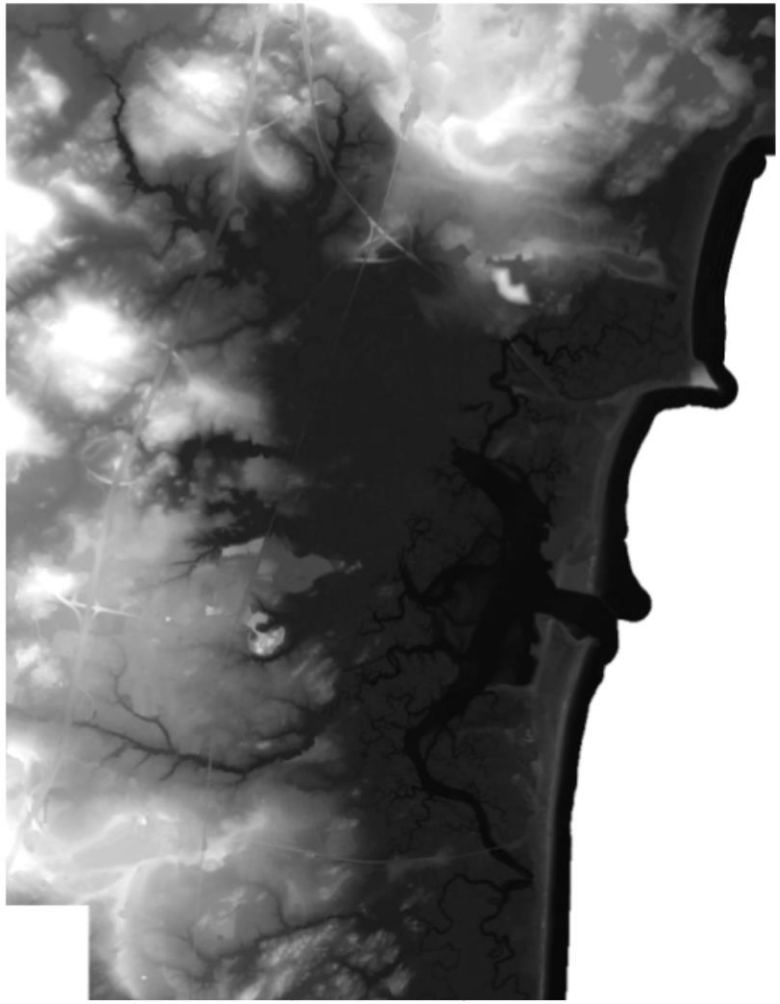
Base Output File Name: C:\Avdata\SLAMM\Data\AreaF\GreatBay.asc Browse

( ) Track All Cells
(•) Do not Track 'Blank'
( ) Do not Track High Elevations and Open Water

Cells to Track: 27,000,000 Count
Memory Utilization in GB: 2.3888424

Cancel OK

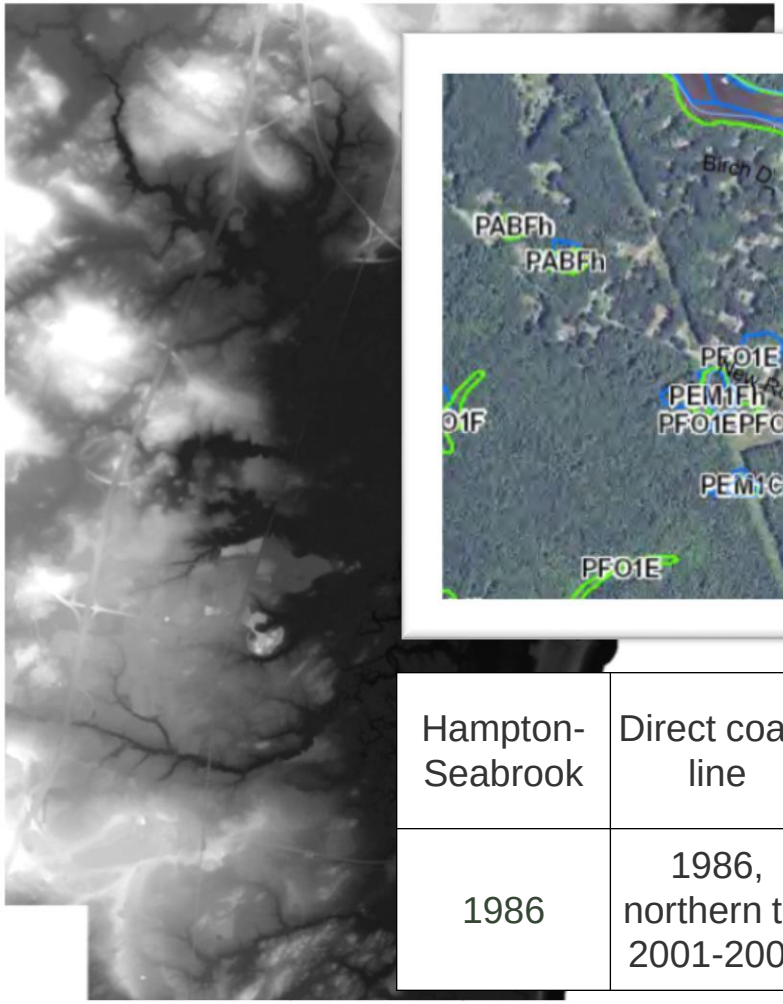
SLAMM Data inputs

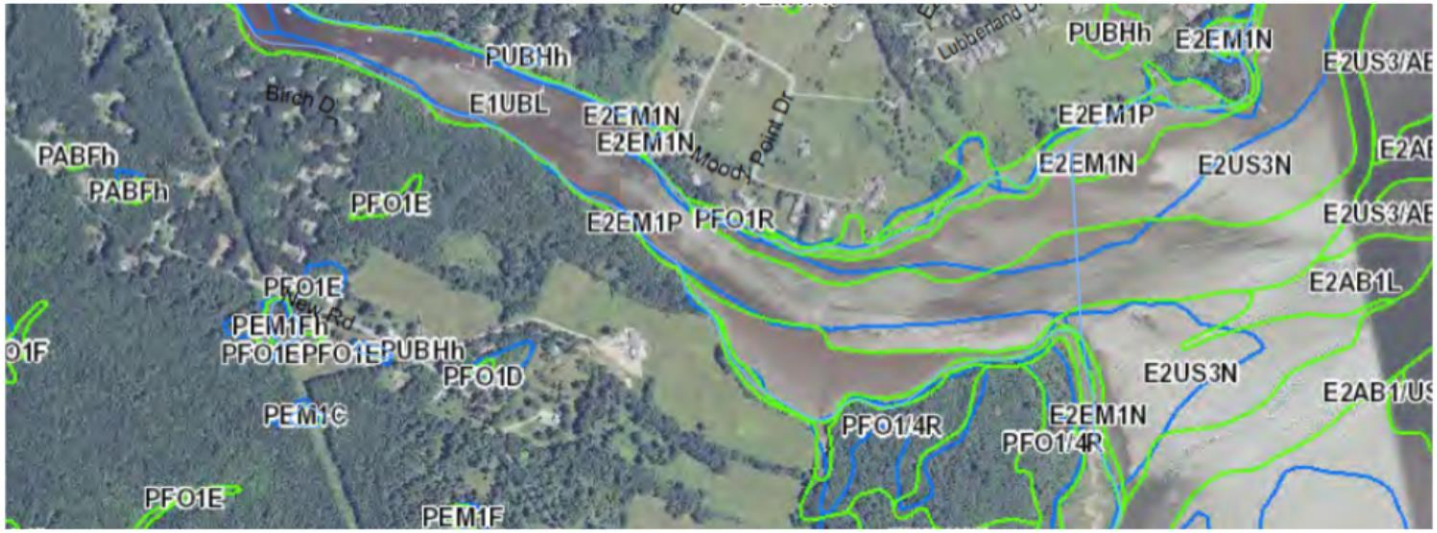


LiDAR based on 2011 data collection

2-meter digital elevation model (dem)

SLAMM Data inputs – National Wetlands Inventory (NWI)





Hampton-Seabrook	Direct coast line	Harbor entrance	Piscataqua River	Little Bay	Great Bay	Tributaries
1986	1986, northern tip 2001-2004	2001-2004	2001-2004	2001-2004	Half 2001-2004, half 1986	Both 1986 and 2001-2004

Results

Mapping products

2012

HS_restoration.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table Of Contents

- restoration_restriction present_2m
- restoration_restriction_removed_2r
- region
- MarshStudyUnits
- pbp
- consnh
- SLR05m_Tidal Restrictions Remain
- SLR05m_Tidal Restrictions Removec
- SLR1.2m_Tidal Restrictions Remain
- SLR1.2m_Tidal Restrictions Remove
- SLR2m_Tidal Restrictions Remain
- SLR2m_Tidal Restrictions Removed
- initial_condition
- NH_Southeast_LiDAR_HS
- NH_NED_2011_HS
- MarshStudyUnits
- 2003naip15_50.sid
- 2003naip15_48.sid
- 2003naip15_49.sid
- 2003naip15_57.sid
- 2003naip15_58.sid
- 2003naip17_48.sid
- 2003naip17_49.sid

Time Slider

1/1/2000 12:00:00 AM

1/1/2000 12:00:00 AM 1/1/2100 12:00:00 AM

1192366.086 147484.227 Feet

4:51 PM 12/1/2014

Mapping products

2050

HS_restoration.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table Of Contents

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- restoration_restriction_removed_2m
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- consnh
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- 2003naip15_49.sid
- 2003naip15_57.sid
- 2003naip15_58.sid
- 2003naip17_48.sid
- 2003naip17_49.sid

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1/1/2000 12:00:00 AM 1/1/2100 12:00:00 AM

4:52 PM
12/1/2014

Mapping products

2075

HS_restoration.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table Of Contents

- restoration_restriction present_2m
- restoration_restriction_removed_2m
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- MarshStudyUnits
- pbp
- consnh
- SLR05m_Tidal Restrictions Remain
- SLR05m_Tidal Restrictions Removed
- SLR1.2m_Tidal Restrictions Remain
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- SLR2m_Tidal Restrictions Remain
- SLR2m_Tidal Restrictions Removed
- initial_condition
- NH_Southeast_LiDAR_HS
- NH_NED_2011_HS
- MarshStudyUnits
- 2003naip15_50.sid
- 2003naip15_48.sid
- 2003naip15_49.sid
- 2003naip15_57.sid
- 2003naip15_58.sid
- 2003naip17_48.sid
- 2003naip17_49.sid

Time Slider

1/1/2075 12:00:00 AM

1/1/2000 12:00:00 AM 1/1/2100 12:00:00 AM

1200769.094 159665.566 Feet

4:53 PM 12/1/2014

Mapping products

2100

HS_restoration.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table Of Contents

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- restoration_restriction_removed_2r
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- MarshStudyUnits
- pbp
- consnh
- SLR05m_Tidal Restrictions Remain
- SLR05m_Tidal Restrictions Remove
- SLR1.2m_Tidal Restrictions Remain
- SLR1.2m_Tidal Restrictions Remove
- SLR2m_Tidal Restrictions Remain
- SLR2m_Tidal Restrictions Removed
- initial_condition
- NH_Southeast_LiDAR_HS
- NH_NED_2011_HS
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- 2003naip15_49.sid
- 2003naip15_57.sid
- 2003naip15_58.sid
- 2003naip17_48.sid
- 2003naip17_49.sid

Time Slider

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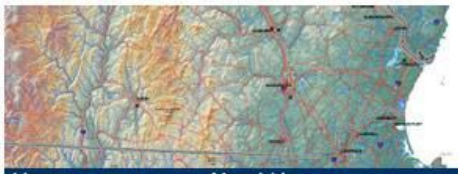
1/1/2000 12:00:00 AM 1/1/2100 12:00:00 AM

Drawing Arial 10

4:54 PM
12/1/2014

Results



WELCOME to NH GRANIT

NEW HAMPSHIRE'S STATEWIDE GIS CLEARINGHOUSE

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- Floodplain/DFIRM Resources
- Links to GIS Resources
- NH GIS Data & Metadata
- GRANITViewII
- GRANITViewLite
- NH Coastal Viewer
- LiDAR Data Distribution
- User Groups & Organizations

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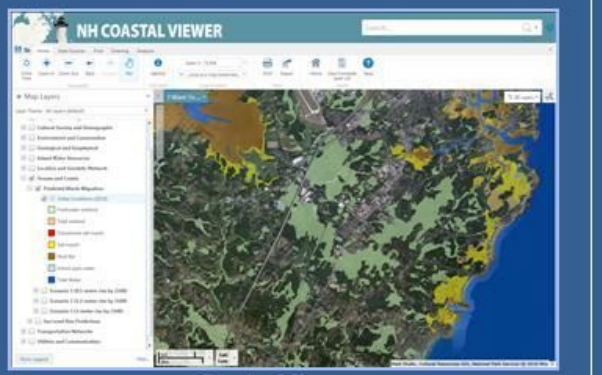
GIS Event Calendar

June						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

New Hampshire Coastal Viewer



Go to Viewer

Getting Started

About the Data

FAQs

Contact Us

The data presented in the Coastal Viewer are for informational purposes and may not have been prepared for or be suitable for legal, engineering or surveying purposes.

What is the Coastal Viewer?

The Coastal Viewer is an online mapping tool that brings coastal resources spatial data, hazards-related spatial data, and other spatial data sets within NH's 42 coastal watershed communities together in one place. Users can search for available data sets; display the data sets in multiple ways; and create, print, and share customized maps. Overall, the goals of the Coastal Viewer are to serve as a one-stop shop for all coastal resources and hazards-related spatial data in NH's coastal watershed; to improve access to new and existing spatial data sets; and to provide information about coastal resources, hazards, and opportunities to reduce risk from these hazards and increase coastal resiliency.

The Coastal Viewer was developed by NH GRANIT as part of the Resilient NH Coasts project, which was

GREAT BAY NATIONAL ESTUARINE RESEARCH RESERVE

NH COASTAL VIEWER

Search...

Home | Data Sources | Find | Drawing | Analysis

Home | Initial View | Zoom In | Zoom Out | Back | Forward | Pan | Identify | Scale: 1: 19,266 | Jump to a map bookmark... | Print | Export

Home | Navigation | Find Data | Scale & Extent | Tasks

Map Layers

Layer Theme: Basic (default)

- Inland Water Resources
- Location and Geodetic Network
- Oceans and Coasts
  - Predicted Marsh Migration
    - Initial Conditions (2014)
    - Scenario 1 (e.g. 0.5 m by 2100)
    - Scenario 2 (e.g. 1.2 m by 2100)
      - Predicted Marsh Migration 2100
      - Predicted Marsh Migration 2075
      - Predicted Marsh Migration 2050
      - Predicted Marsh Migration 2025
    - Scenario 3 (e.g. 2 m by 2100)

Show Legend | Filter...

Quick Tools ...

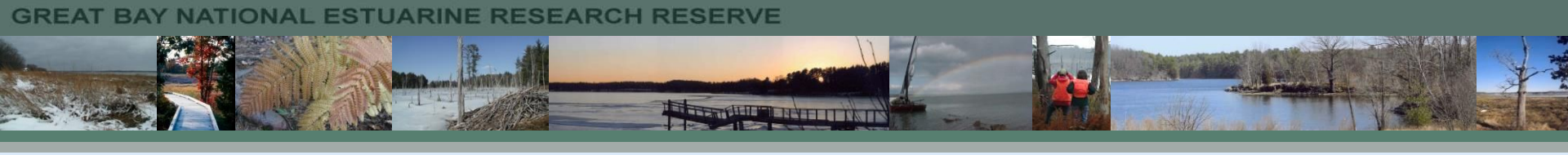
2000ft
500m

Lat:
Lon:

Dumbarton Oaks

Tuckers Trail

Depot Rd



NH COASTAL VIEWER

Search...

Home | Data Sources | Find | Drawing | Analysis

Home | Initial View | Zoom In | Zoom Out | Back | Forward | Pan | Identify | Scale: 1: 19,266 | Jump to a map bookmark... | Print | Export

Home | Navigation | Find Data | Scale & Extent | Tasks

Habitat Type

- Tidal water
- Mud flat
- Salt marsh
- Transitional salt marsh
- Tidal wetland
- Fresh water
- Freshwater wetland

Quick Tools ...

Show Layers

Filter...

2000ft
500m

Lat:
Lon:

Tuckers Trail

Depot Rd

Cons

Models don’t make decisions

NWI data (update)

Tidal connection

LiDAR in marshes wider accuracy interval than on upland

Pros

Simple to use & free

NH’s data resolution

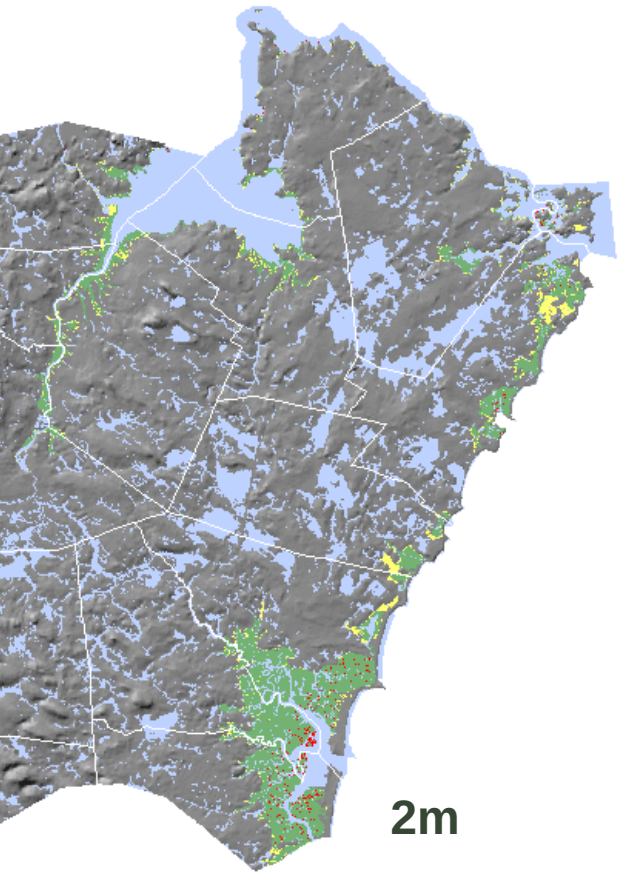
Vehicle for planning discussion

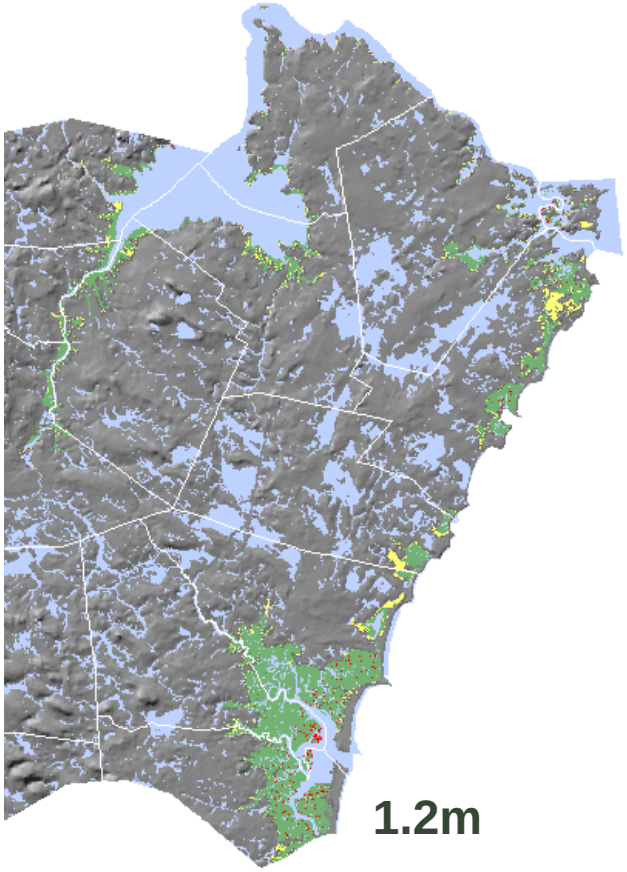
Next Steps

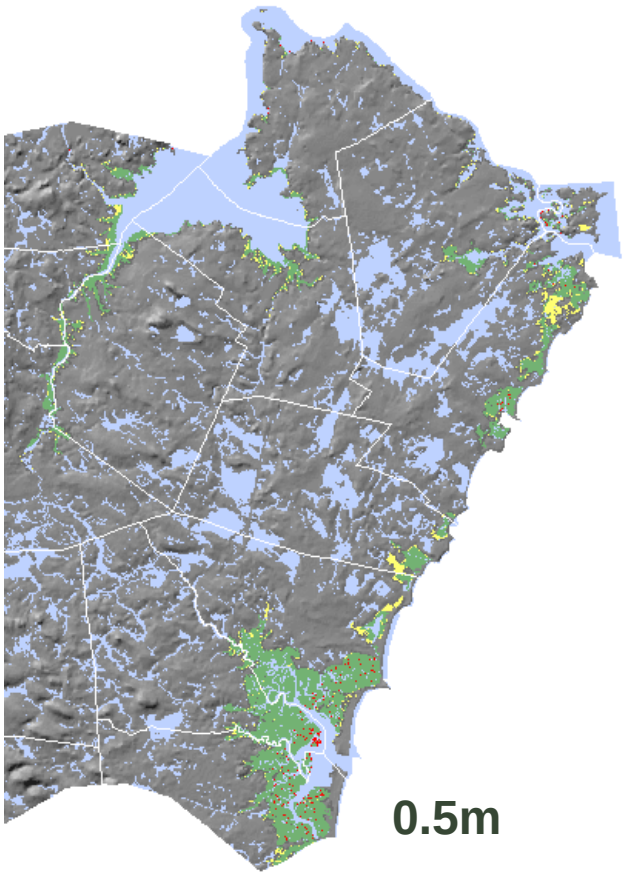
Current status

- ✓ Mapping products (quantitative to come)
  - ✓ Uncertainty Analysis (site specific)

2025

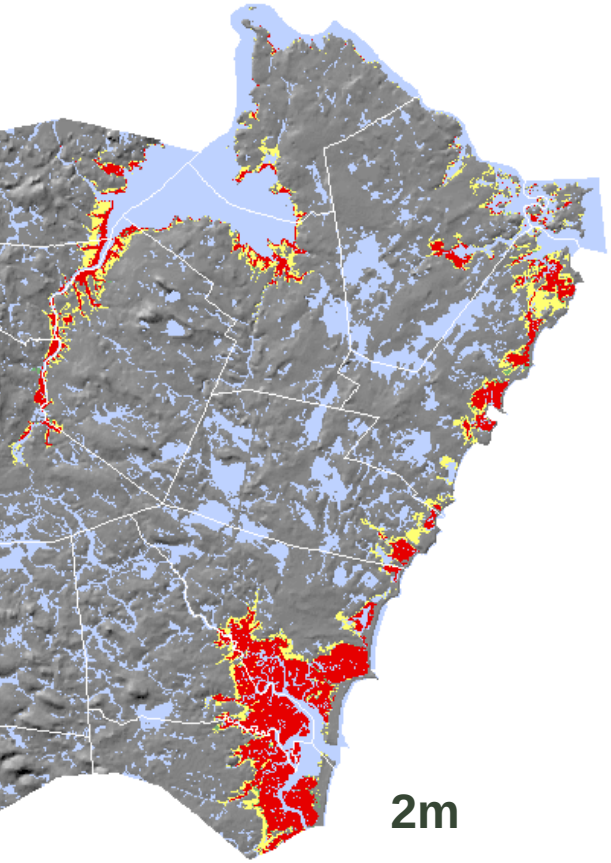


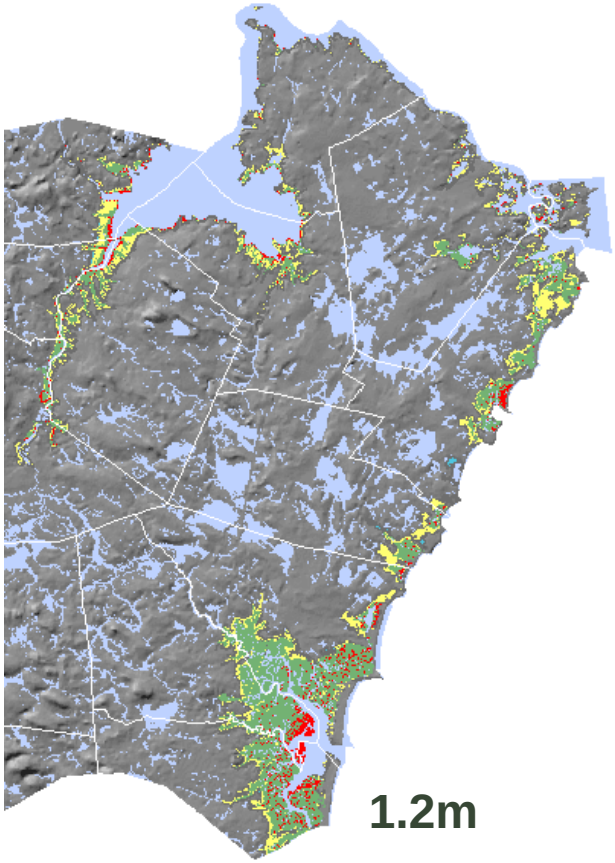


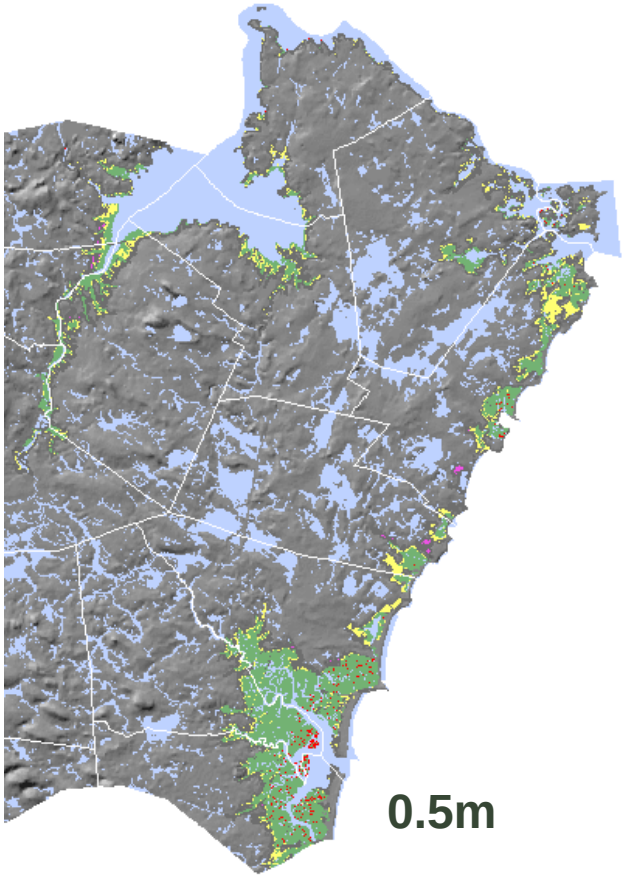


Salt marsh lost Salt marsh persistent Salt marsh potential

2100







Salt marsh lost

Salt marsh persistent

Salt marsh potential

Model prediction uncertainties

- SLAMM predictions are always affected by uncertainties

Inputs affected by uncertainty and data errors:

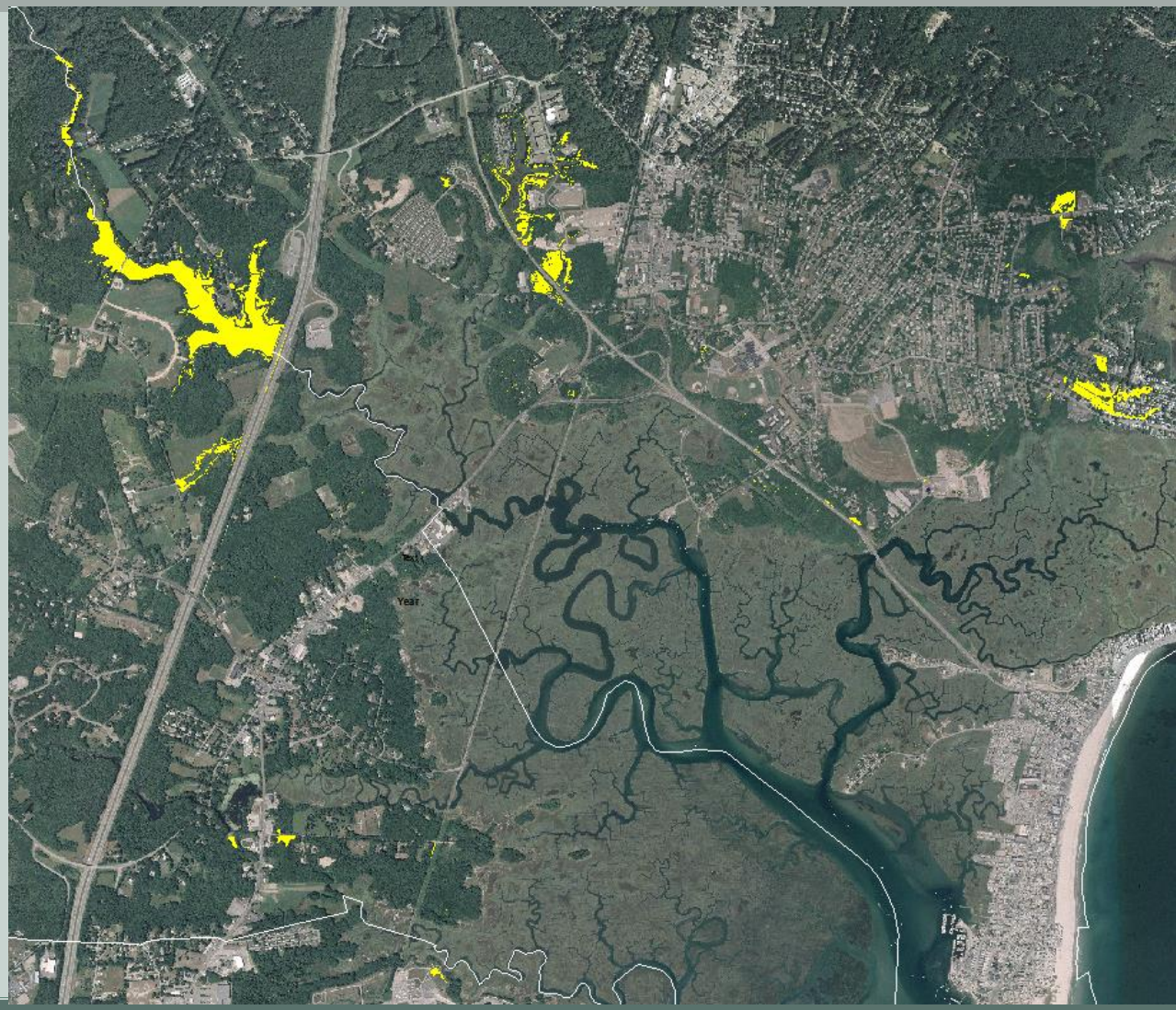
- Sea Level Rise
- Uplift / Subsidence
- Tide ranges
- Height of salt-water
- Overwash Parameters
- Elevations
  - LiDAR and NAVD88 Corr.
- Accretion Rates
  - Extent of Feedbacks
- Erosion Rates

- Therefore, there is not *one* prediction that is right, but rather *a distribution* of possible future wetland coverages

Current status

- ✓ Mapping products (quantitative to come)
  - ✓ Uncertainty Analysis (site specific)
- ✓ Restoration opportunities

Restoration Opportunities



(SLR 2m / 7ft)

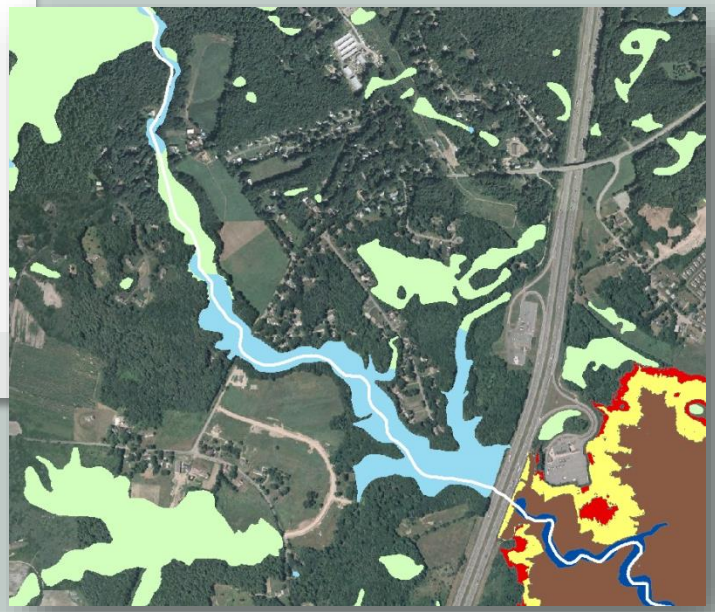
2100

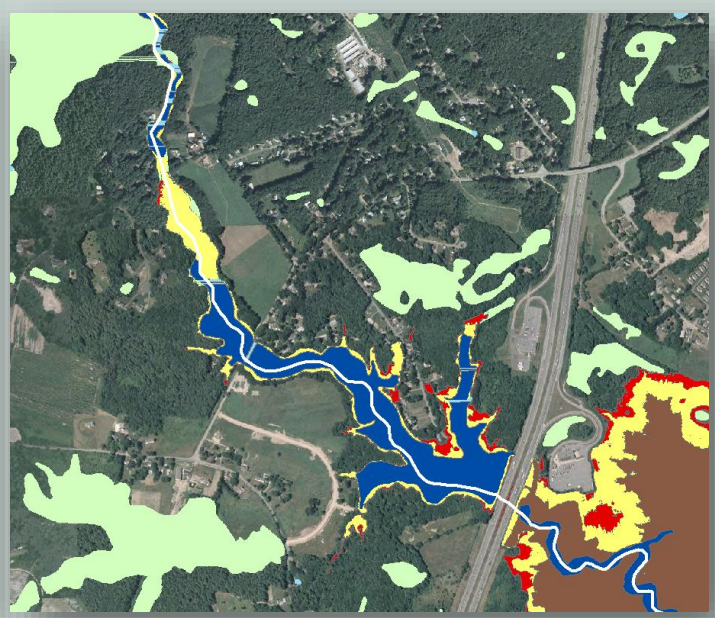
Restoration – Taylor River

Habitat Type

- Tidal water
- Mud flat
- Salt marsh
- Transitional salt marsh
- Tidal wetland
- Fresh water
- Freshwater wetland

SLR 2m / 7ft





2100

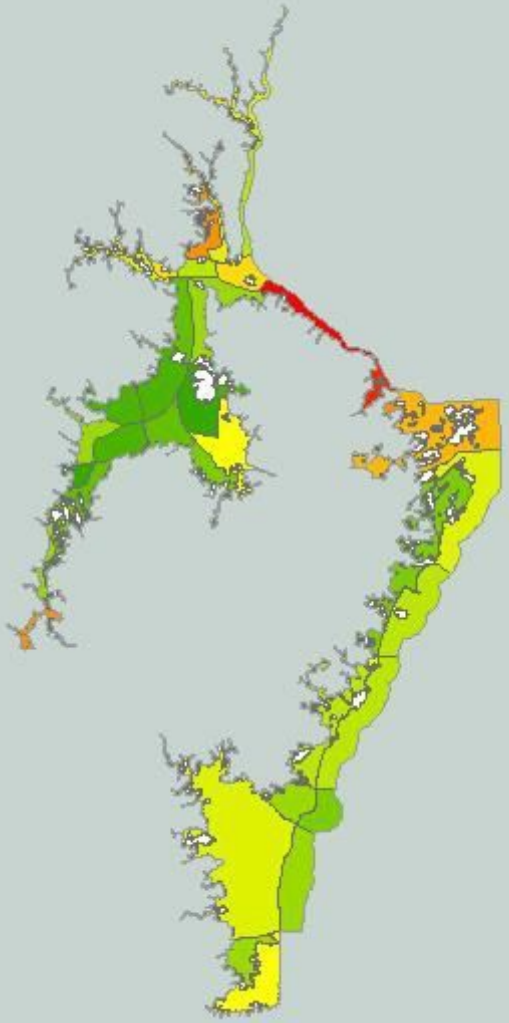
Tidal restriction in place

Tidal restriction removed

Current status

- ✓ Mapping products (quantitative to come)
  - ✓ Uncertainty Analysis (site specific)
- ✓ Restoration opportunities
- ✓ Habitat quality and adaptation potential

Habitat Condition and Adaptation Potential



- **Landscape scale components of SMI**
- **Natural Heritage data & bird species richness**
- **Potential to migrate inland (proximity to low lying undeveloped land)**

Current status

- ✓ **Mapping products (quantitative to come)**
  - ✓ **Uncertainty Analysis (site specific)**
- ✓ **Restoration opportunities**
- ✓ **Habitat quality and adaptation potential**
- ○ **Priority lands for conservation** (field verified)

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Project Spotlight

Great Bay NERR System-Wide Monitoring Program/Habitat Mapping & Characterization

High / low marsh boundary

Next Steps?

- Integrating local fine scale resolution data (e.g. NH Coastal Program's and GBNERR's salt marsh mapping data) into NWI format

- Explore opportunities to enhance knowledge of relative tide level relationships throughout the entire system

- Salt marsh conservation and restoration opportunities workshop

  July 30th 9:00-Noon

Contact:
Rachel Stevens, GBNERR Stewardship Coordinator and Wildlife Ecologist