CONSERVING HUDSON RIVER TIDAL WETLANDS IN AN AGE OF SEA LEVEL RISE

Nava Tabak
Director of Conservation Science
www.scenichudson.org

Our Mission

Scenic Hudson preserves land and farms and creates parks that connect people with the inspirational power of the Hudson River, while fighting threats to the river and natural resources that are the foundation of the valley's prosperity.

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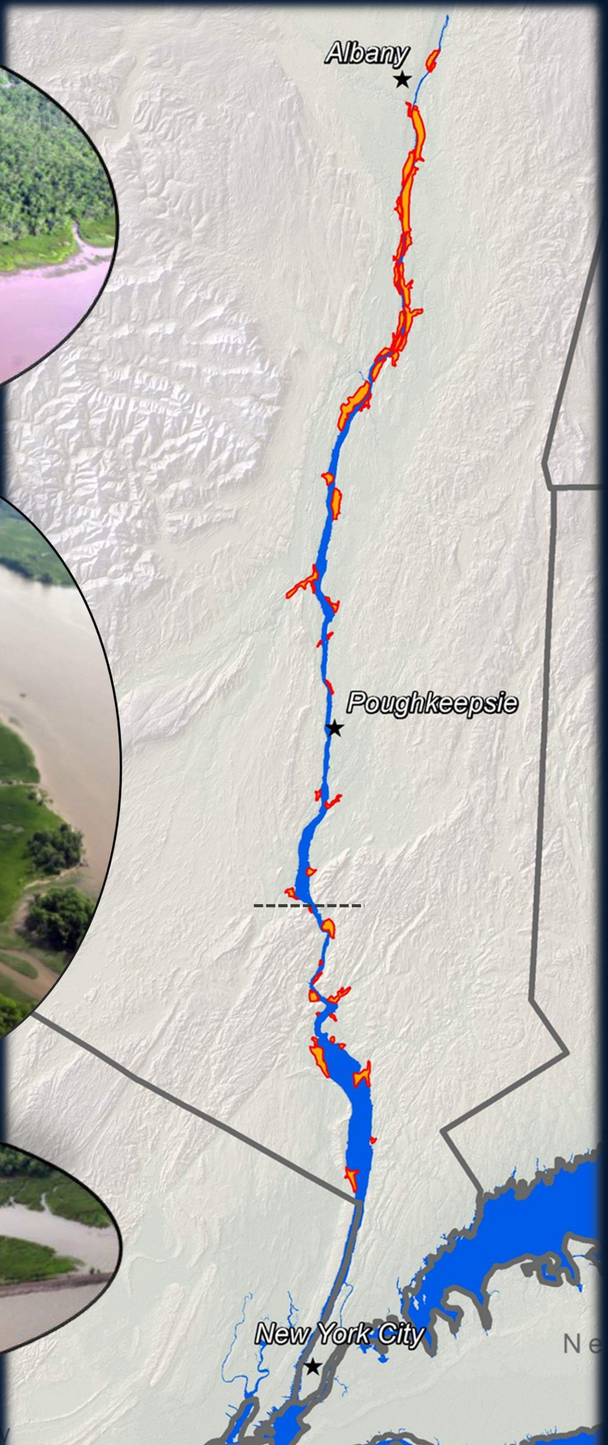
land ■ parks ■ advocacy

TIDAL WETLANDS OF THE HUDSON RIVER ESTUARY

- ~150 mile long estuary
- 7,000 ac of tidal wetland
- Brackish up to about mile 45
- ~80% of tidal wetland is freshwater
- Wetlands interspersed through the estuary (concentrated in nearly 50 wetland areas)



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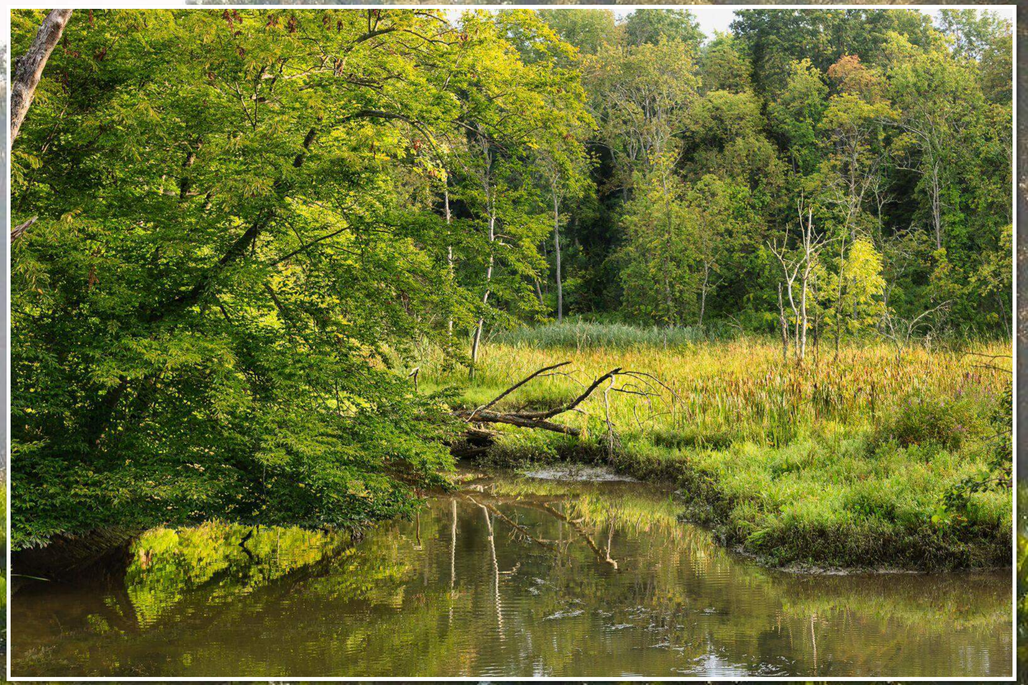
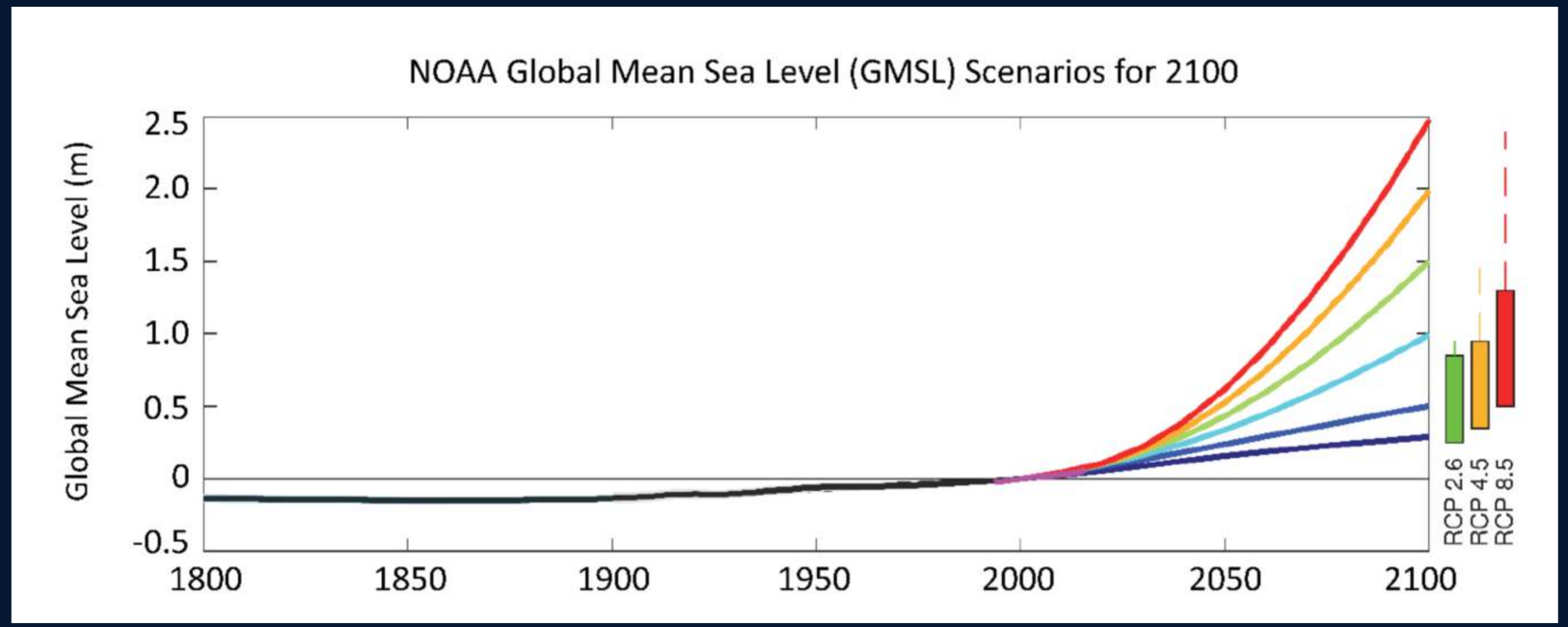
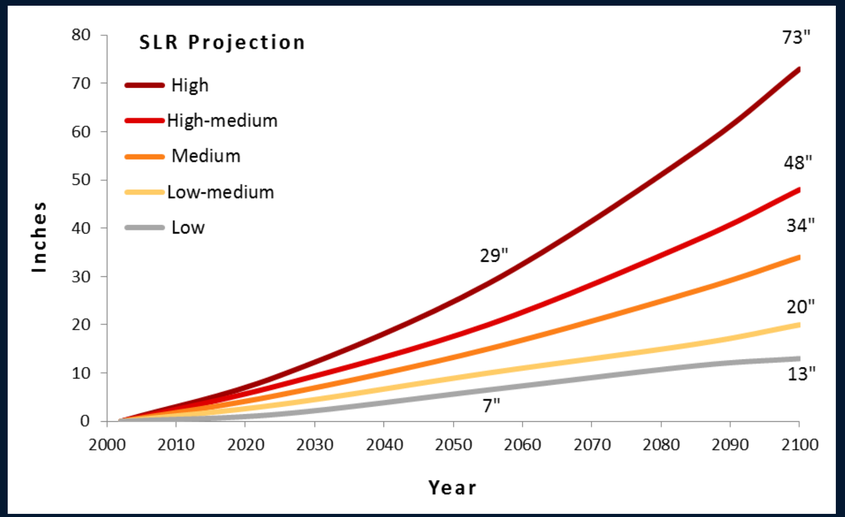
TIDAL WETLANDS: VALUES AND FUNCTIONS

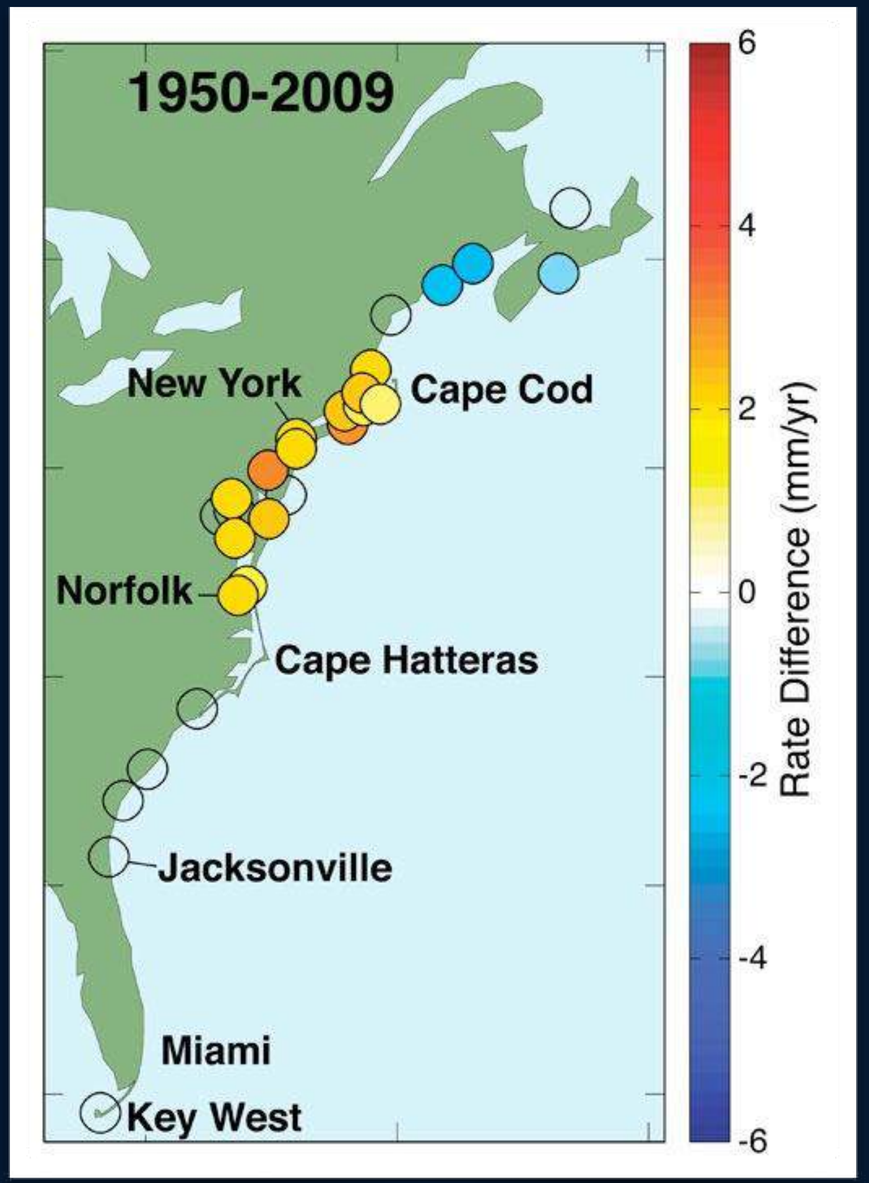
- Biologically diverse
- Fish and Wildlife habitat
- Highly productive
- Ecosystem services
- Recreational & economic resource



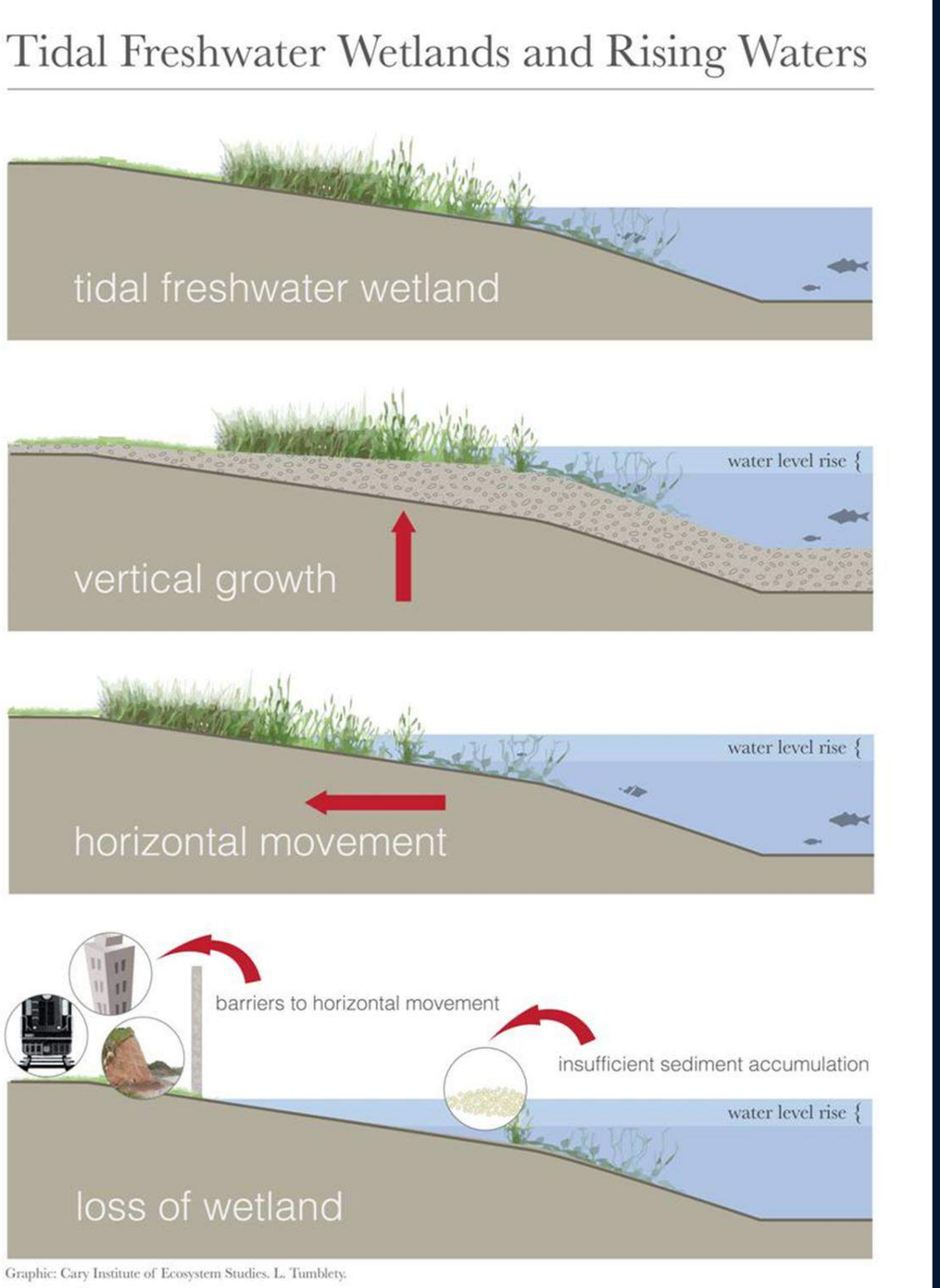
SEA LEVEL RISE PROJECTIONS: GLOBAL AND LOCAL







TIDAL WETLAND ADAPTATION TO SEA LEVEL RISE



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CONSERVING HUDSON RIVER TIDAL WETLANDS IN AN AGE OF SEA LEVEL RISE

- Will Hudson River tidal wetlands persist and/or change through the 21st century?
- Which are the most resilient wetland systems and habitats in the estuary?
- Where should land protection and restoration efforts be focused to ensure wetland resilience? What types of strategies will be most effective?

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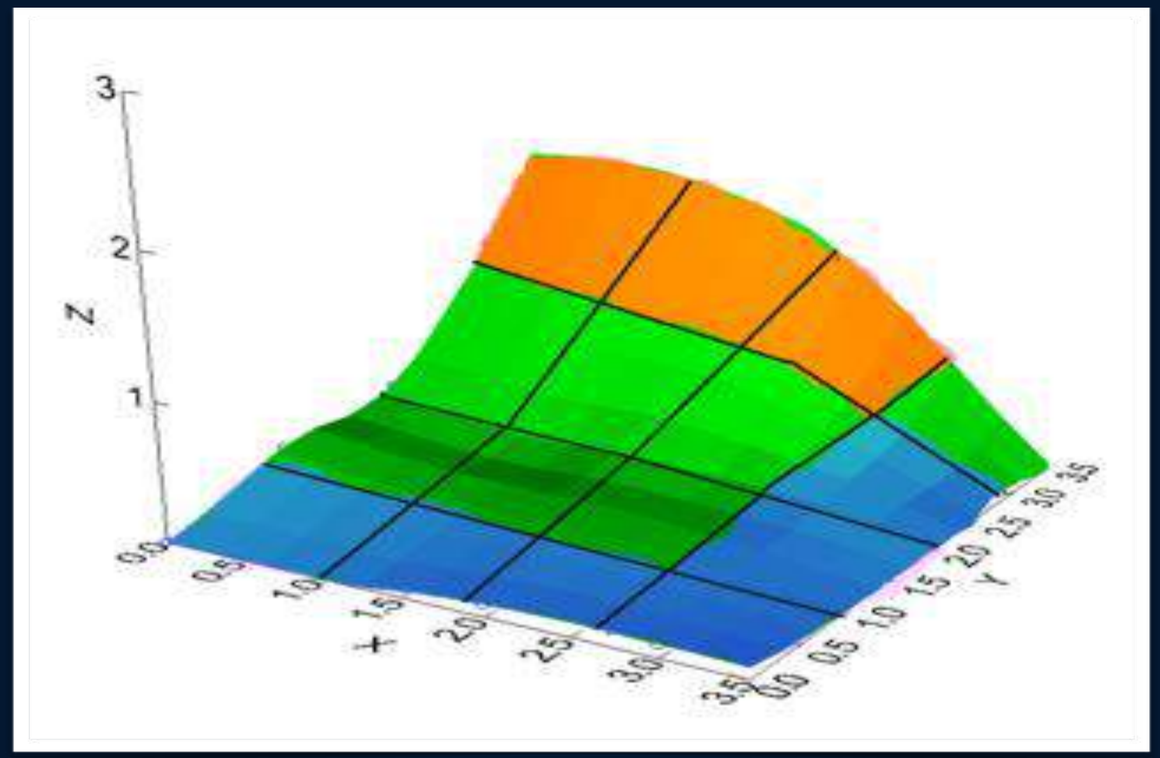
SEA LEVEL AFFECTING MARSHES MODEL (SLAMM)

- Integrates: sea level rise, accretion, elevation, tide range, erosion, and others factors.

- Uses a complex decision tree to project transitions among wetland classes.



warren pinnacle consulting, inc.

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SLAMM: KEY PARAMETERS

SEA LEVEL RISE | ACCRETION | ELEVATION | WETLANDS

UPPER HUDSON ESTUARY (Inches)

	Low	Low-Medium	Medium	High-Medium	High
2020s	1	3	5	7	9
2050s	5	9	14	19	27
2080s	10	14	25	36	54
2100	11	18	32	46	71

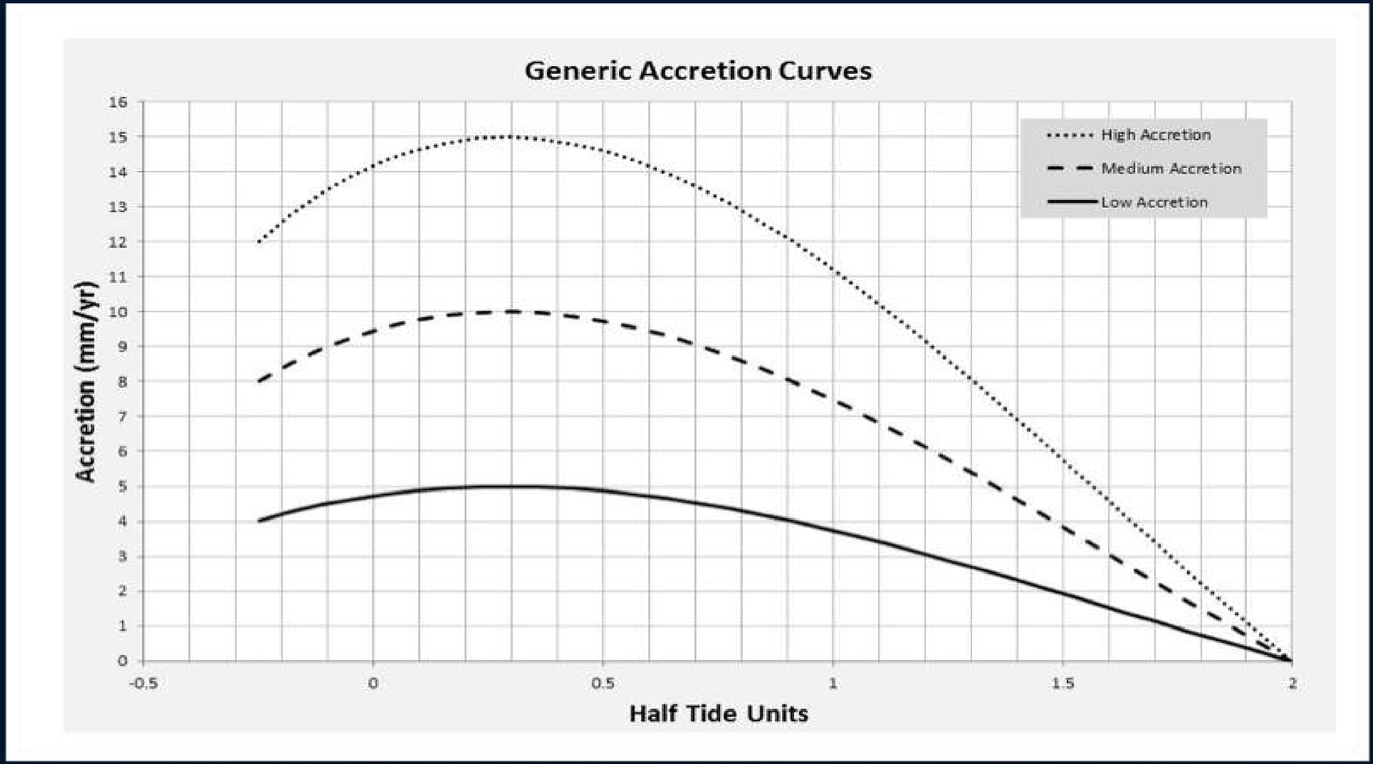
LOWER HUDSON ESTUARY (Inches)

	Low	Low-Medium	Medium	High-Medium	High
2020s	2	4	6	8	10
2050s	8	11	16	21	30
2080s	13	18	29	39	58
2100	15	22	36	50	75

SLAMM: KEY PARAMETERS

SEA LEVEL RISE | **ACCRETION** | ELEVATION | WETLANDS

- Generic curves incorporating elevation feedback
- Maximum levels based on empirical data from cores and SETs

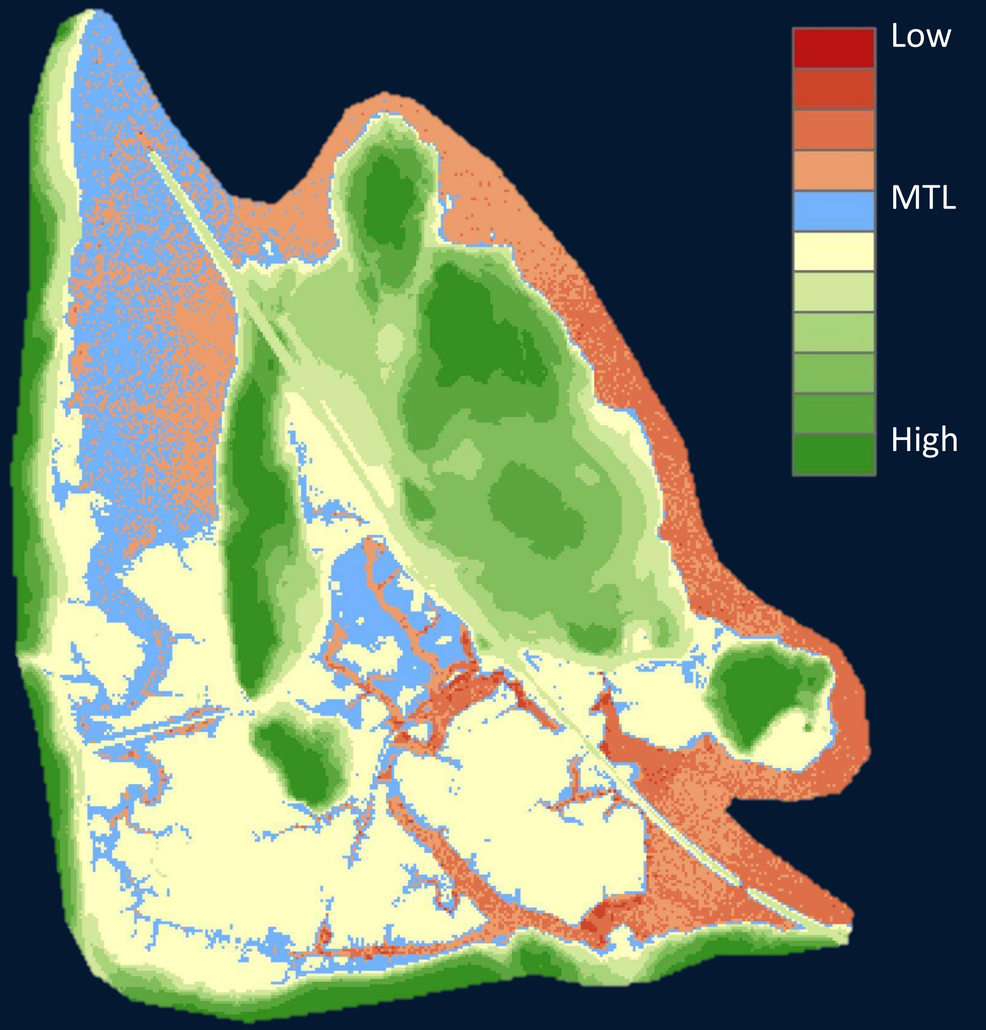


Accretion rates (mm/yr)* **		low	medium	high
Regularly flooded marsh	max	5	10	15
	min	3.05	6.1	9.3
Irregularly flooded marsh	max	4.3	8.6	13
	min	1.9	4	5.8
Tidal flat		2.5	5	7.5

SLAMM: KEY PARAMETERS

SEA LEVEL RISE | ACCRETION | **ELEVATION** | WETLANDS

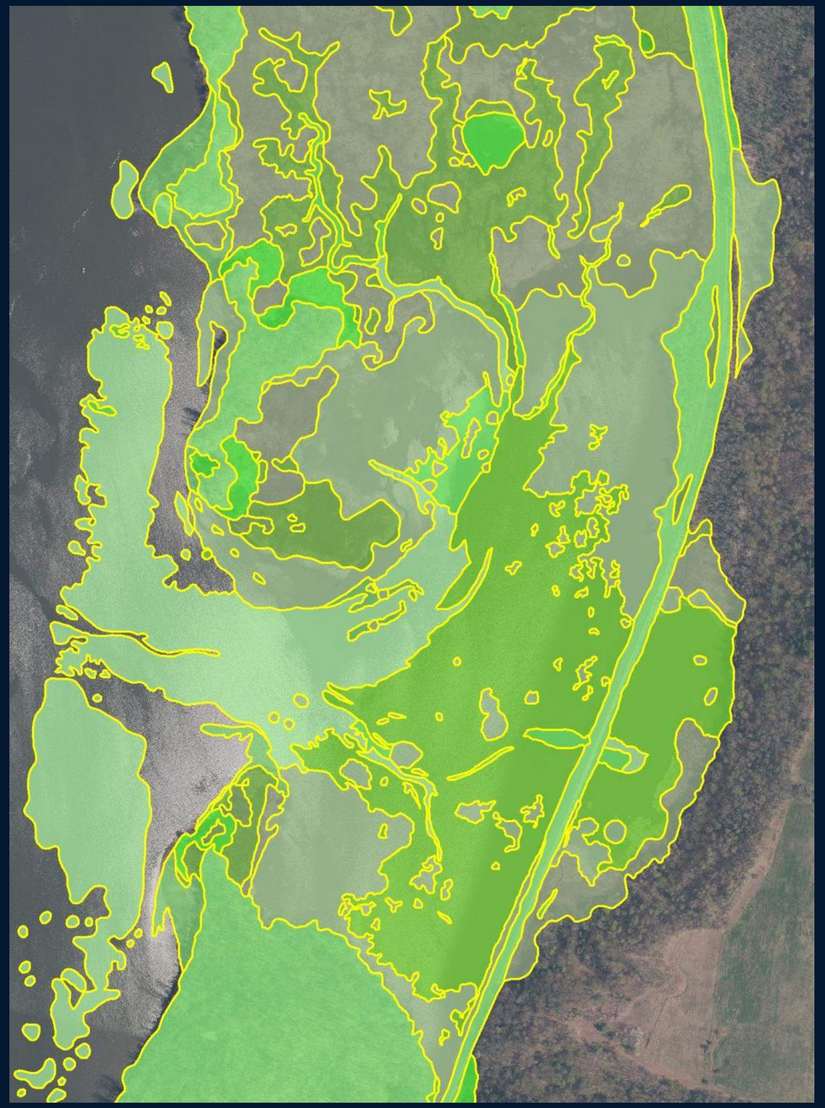
- LiDAR topography (2011, 1 m resolution, +/- 19 cm) used for DEM
- Adjusted to a tidal datum model from Stevens Institute of Technology (MTL = 0)
- Resampled to 5 m resolution
- Slope calculated from DEM



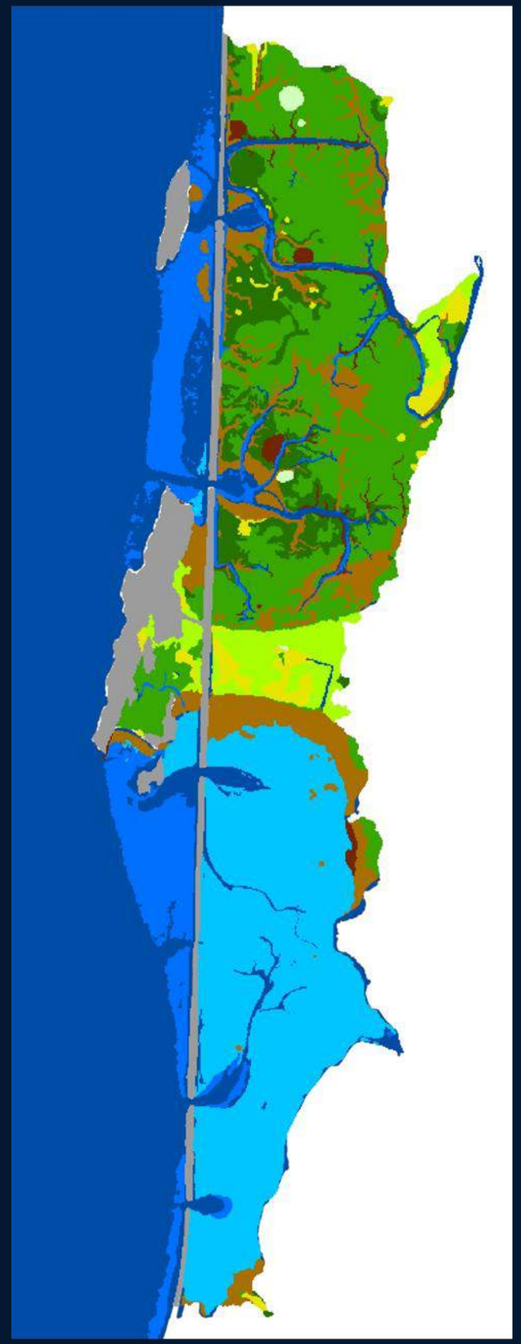
SLAMM: KEY PARAMETERS

SEA LEVEL RISE | ACCRETION | ELEVATION | WETLANDS

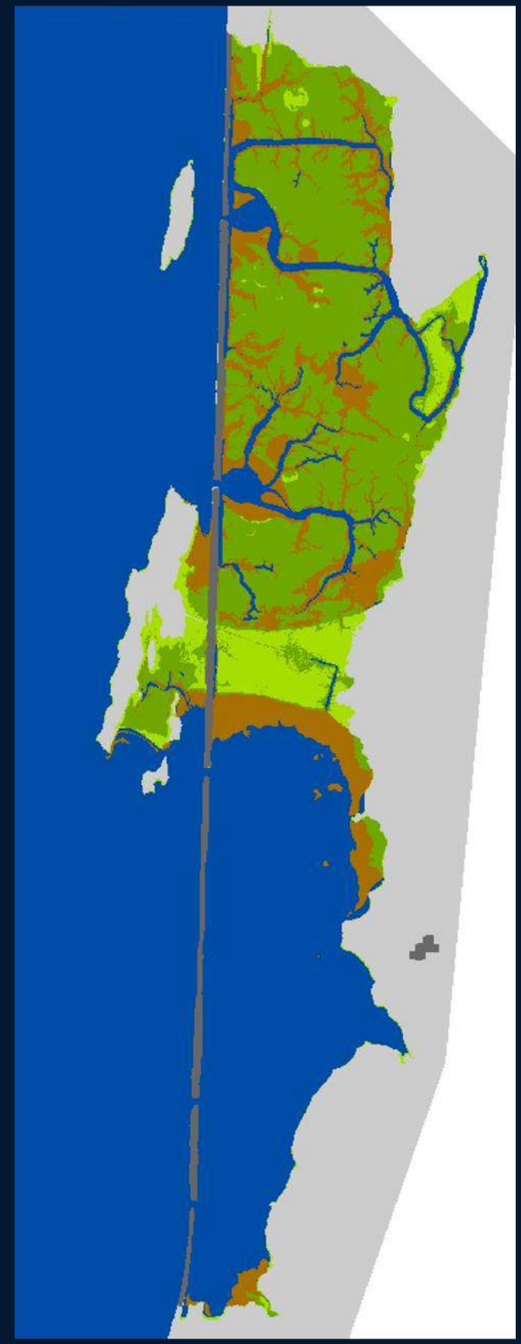
HRNERR tidal wetlands 2007



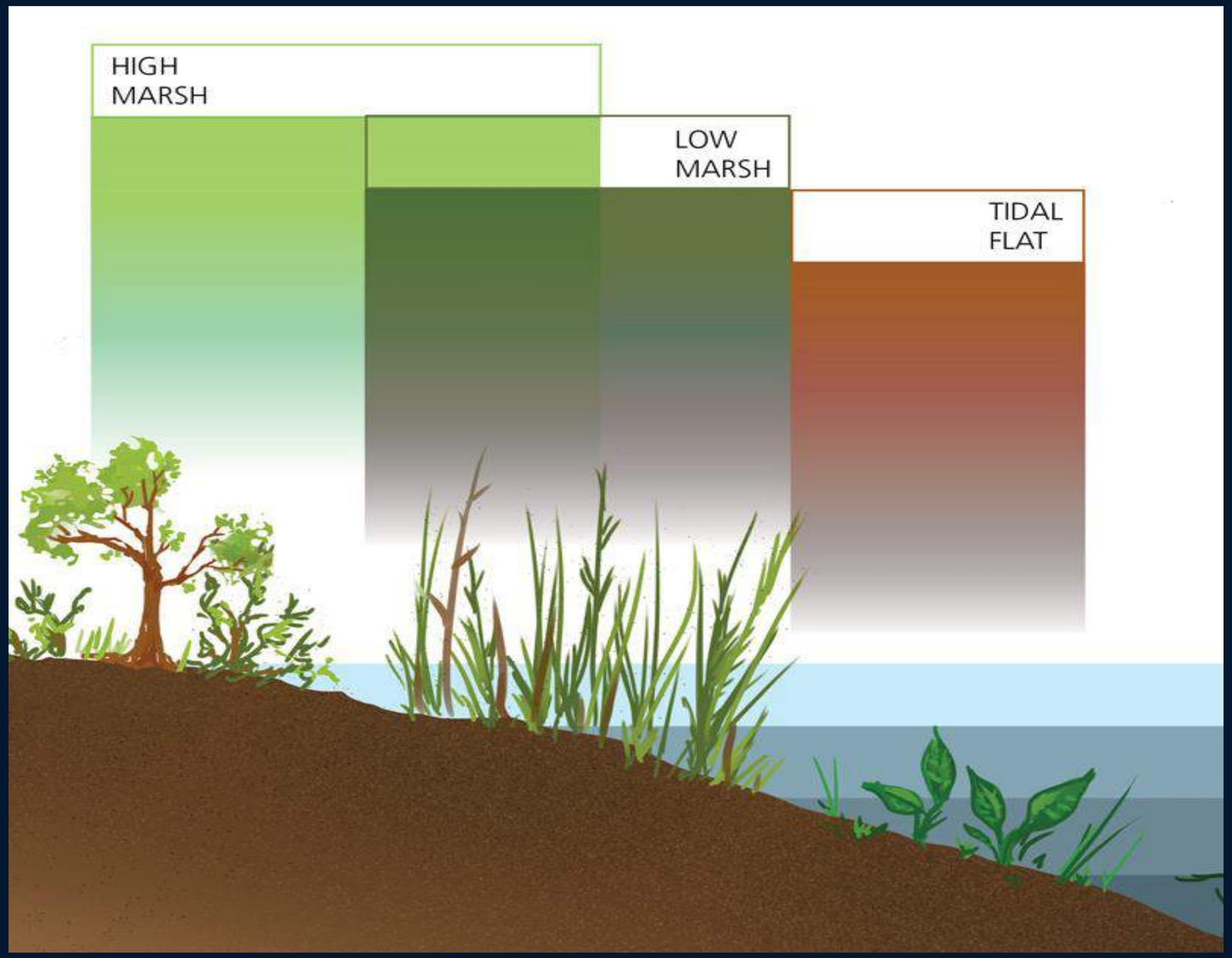
WETLAND CLASSIFICATION



- Wooded Swamp
- Scrub/Shrub
- Phragmites australis
- Typha angustifolia
- Upper Intertidal
- Lower Intertidal
- Unvegetated flat
- Trapa natans
- Submerged Aquatic Vegetation
- Open Water
- Upland



WETLAND CLASSIFICATION

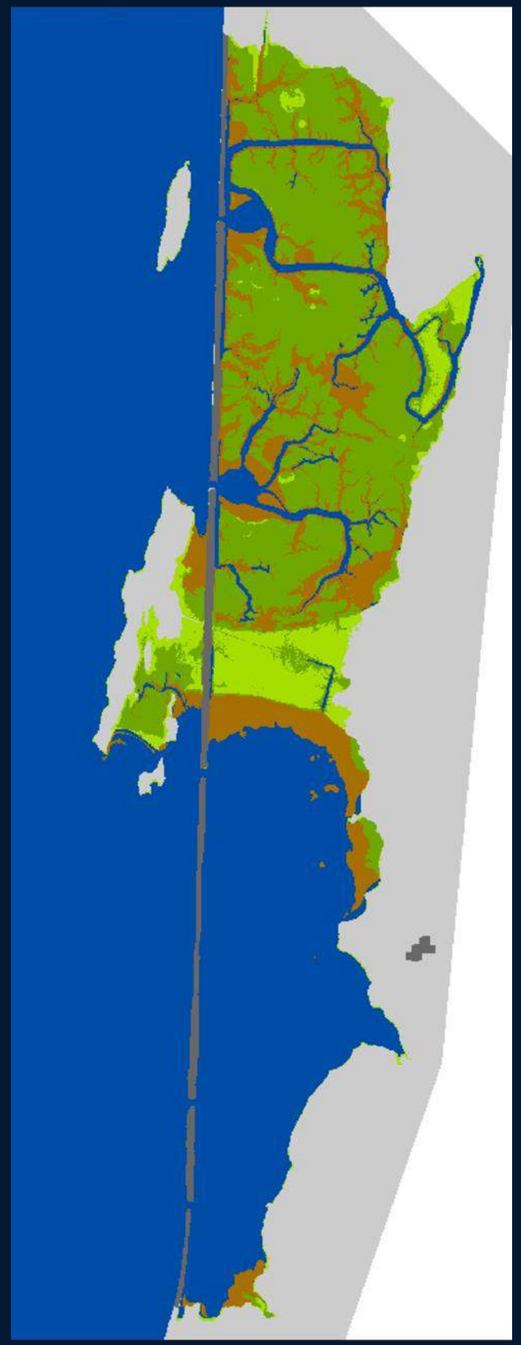


Tidal Extent

MHW

MTL

MLW



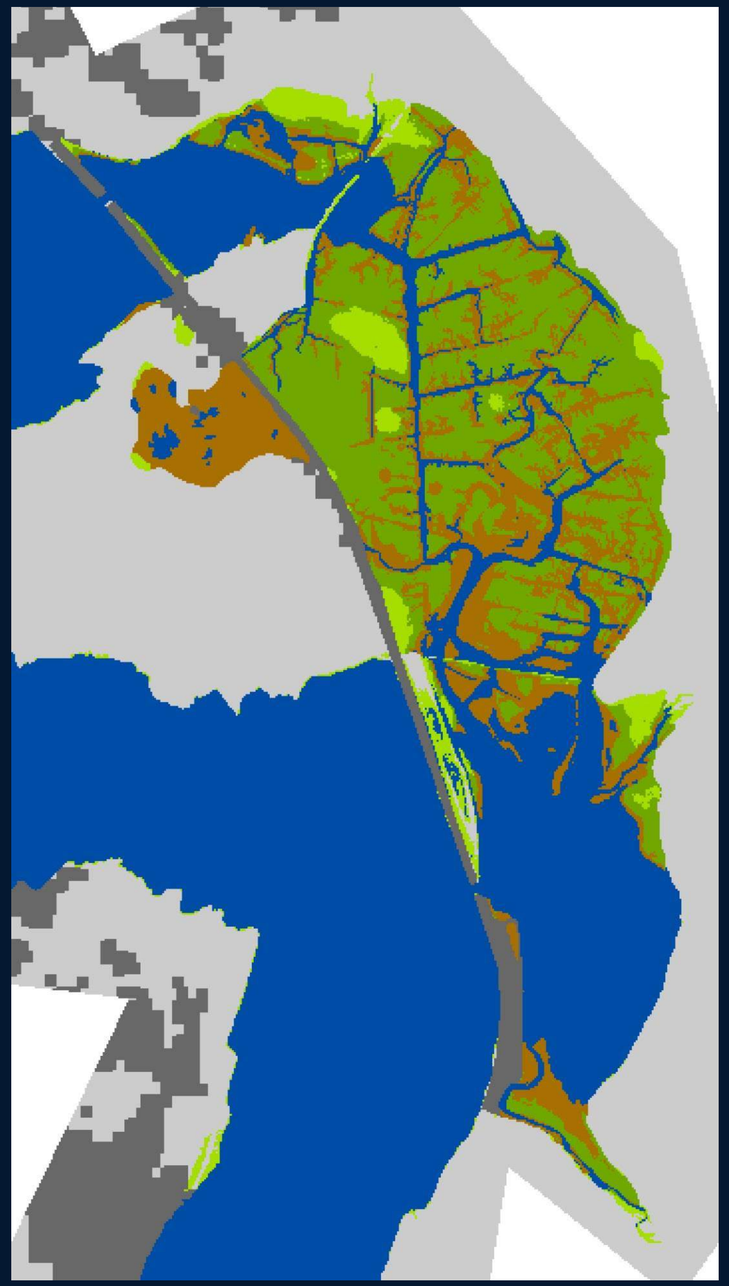
STUDY: SEA LEVEL AFFECTING MARSHES MODEL (SLAMM)

		Sea Level Rise		
		Low	Medium	High
Accretion	Low	Low SLR Low ACC	Med SLR Low ACC	High SLR Low ACC
	Medium	Low SLR Med ACC	Med SLR Med ACC	High SLR Med ACC
	High	Low SLR High ACC	Med SLR High ACC	High SLR High ACC

PROJECTIONS: CONSTITUTION MARSH

High Marsh
Low Marsh
Tidal Flat
Open Water

Current conditions



2100

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PROJECTIONS: BINNEN KILL

High Marsh
Low Marsh
Tidal Flat
Open Water

Current conditions

2100

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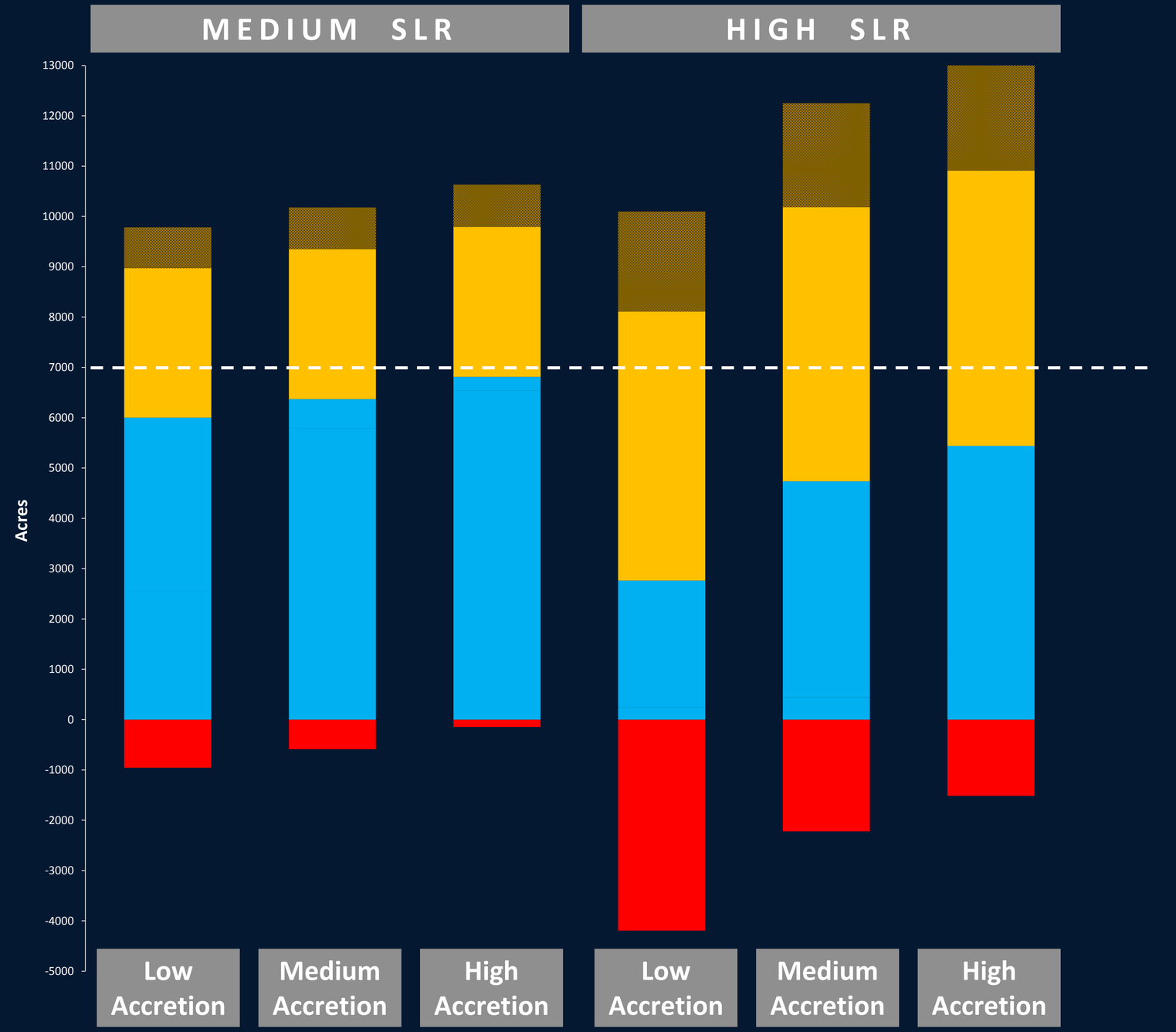
WETLAND RESILIENCE



New wetland is necessary for maintaining the current acreage of tidal wetland in all SLR and accretion scenarios

New wetlands in developed areas

New wetlands

Resilient wetlands

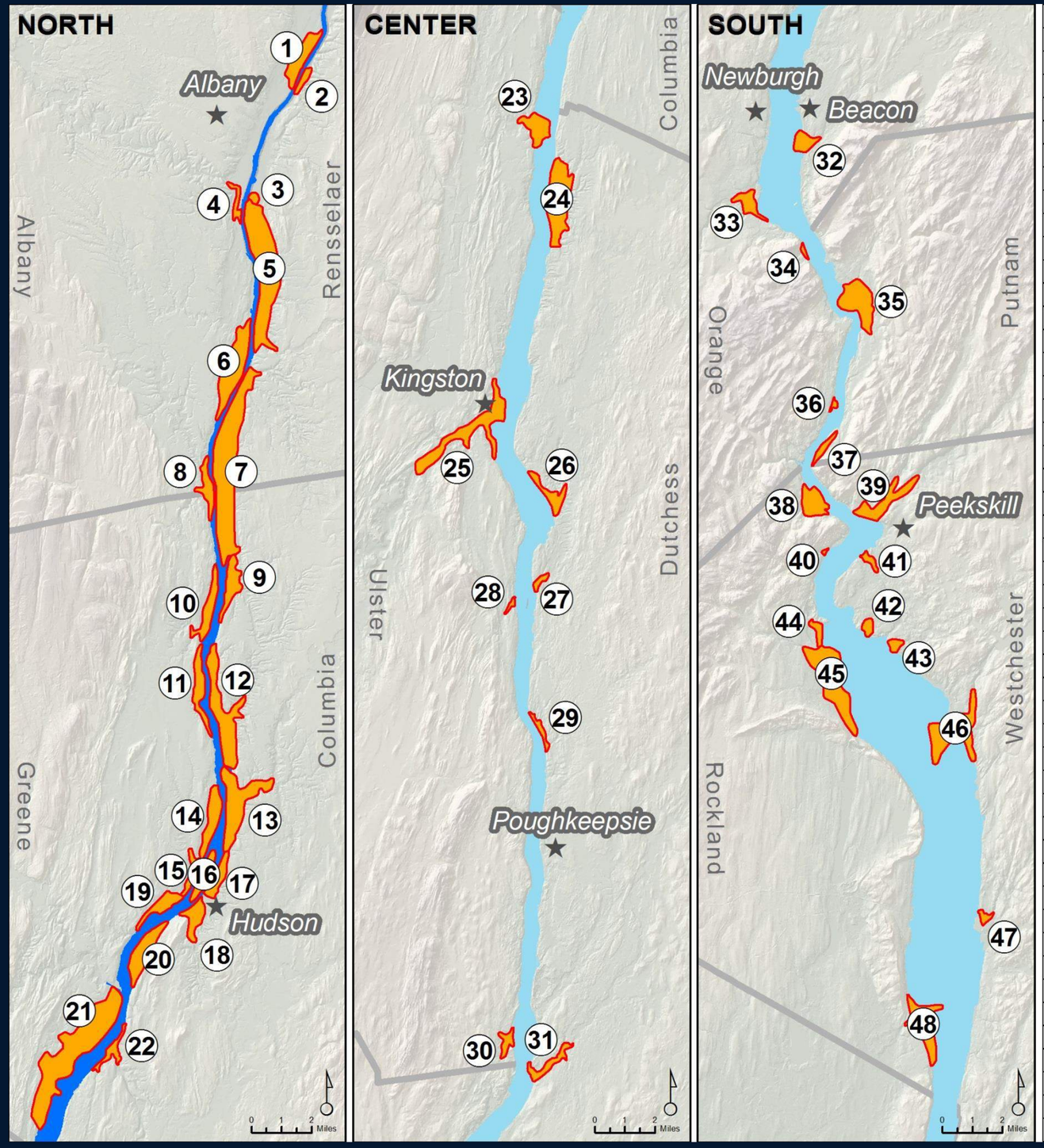
Estuary-wide Wetland Resilience

Lost wetlands

SLAMM STUDY RESULTS: WETLAND MIGRATION

GEOGRAPHY OF CHANGE:

Wetland Systems



ID	Name
1	Lower Patroon & Breaker Islands
2	Patroon Creek
3	Hudson Mat
4	Normans Kill Mouth
5	Papscanee & Campbell Islands
6	Binnen Kill
7	Schodack/Houghtaling
8	Hannacroix & Coeymans Creeks
9	Mill Creek
10	Coxsackie Creek & Bronck Island
11	Coxsackie Shore & Islands
12	Nutten Hook/Gays Point/Styvesant Marsh
13	Stockport Creek/Middle Ground
14	Vosburgh Swamp
15	Athens Shore
16	Middle Ground Flats
17	Hudson North Bay
18	Hudson South Bay
19	Brandow Point
20	Rogers Island
21	Ramshorn Marsh/Inbocht Bay
22	Roeliff Jansen Kill Mouth
23	Esopus Creek Mouth
24	Tivoli Bays
25	Rondout Creek Mouth
26	Vanderburgh Cove
27	Indian Kill Mouth
28	Black Creek Mouth
29	Maritje Kill/Crum Elbow
30	Cedar Cliff
31	Wappingers Creek Mouth
32	Fishkill Creek/Dennings Point
33	Moodna Creek Mouth
34	Storm King
35	Constitution Marsh
36	Con Hook
37	Manitou Marsh
38	Iona Island Marsh
39	Annsville Creek Mouth
40	Jones Point
41	Lents Cove
42	Georges Island
43	Furnace Brook/Oscawana Island
44	Stony Point
45	Minisceongo Creek Mouth
46	Croton
47	Pocantico River Mouth
48	Piermont Marsh

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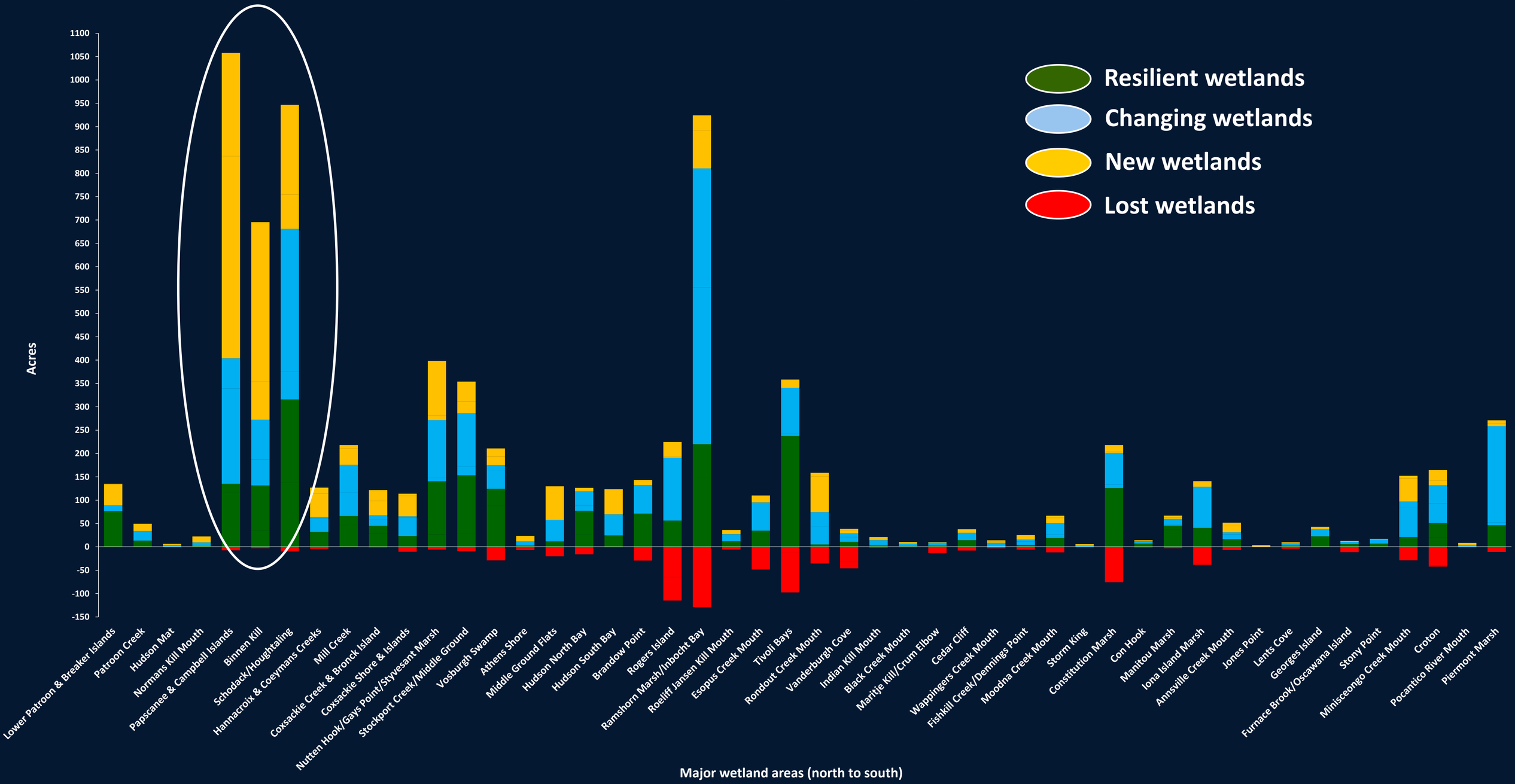
WETLAND RESILIENCE



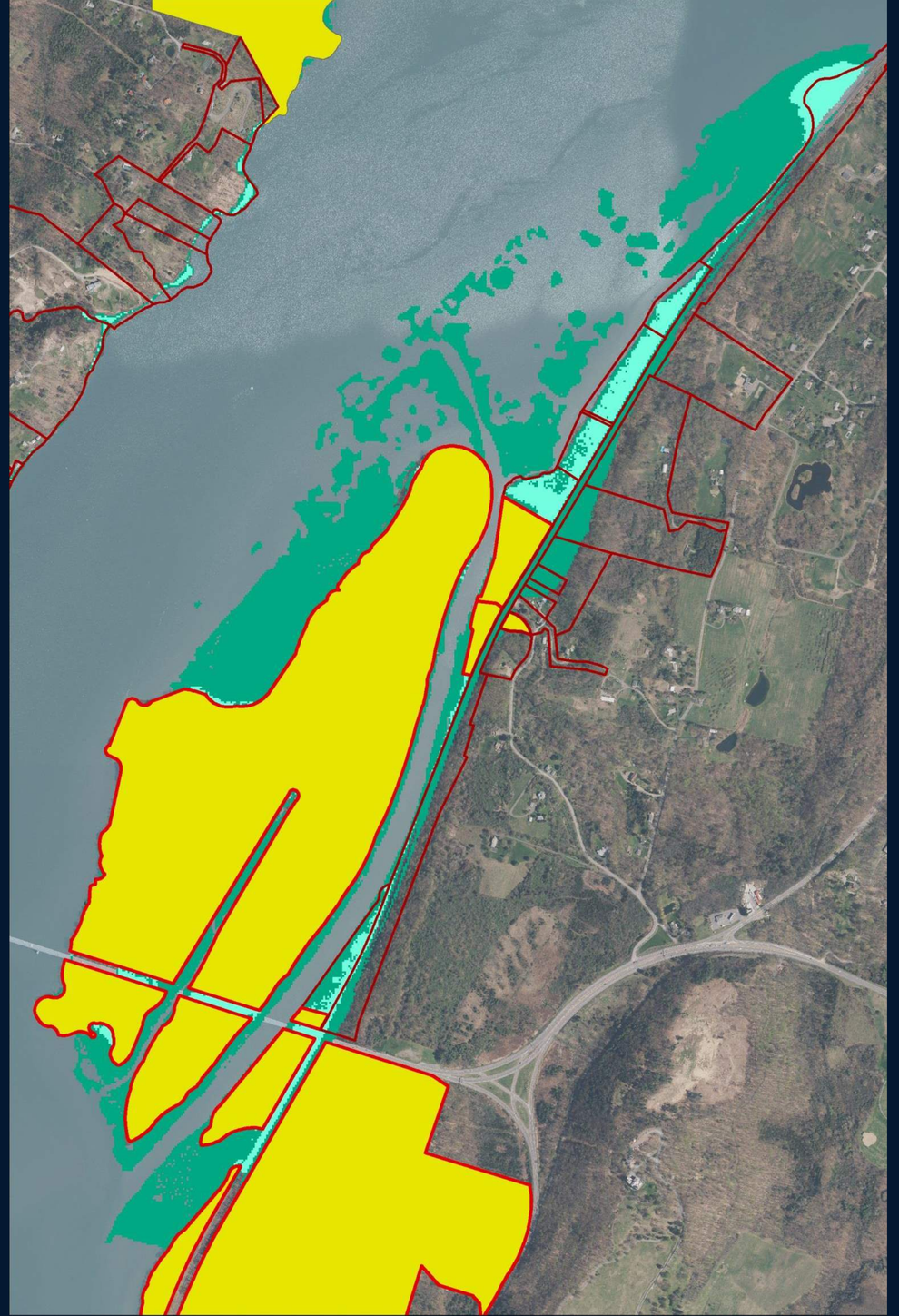
PROTECT THE PATHWAYS

Rogers Island

Any model
Six models

Wetland Pathway

Private
Conserved/public



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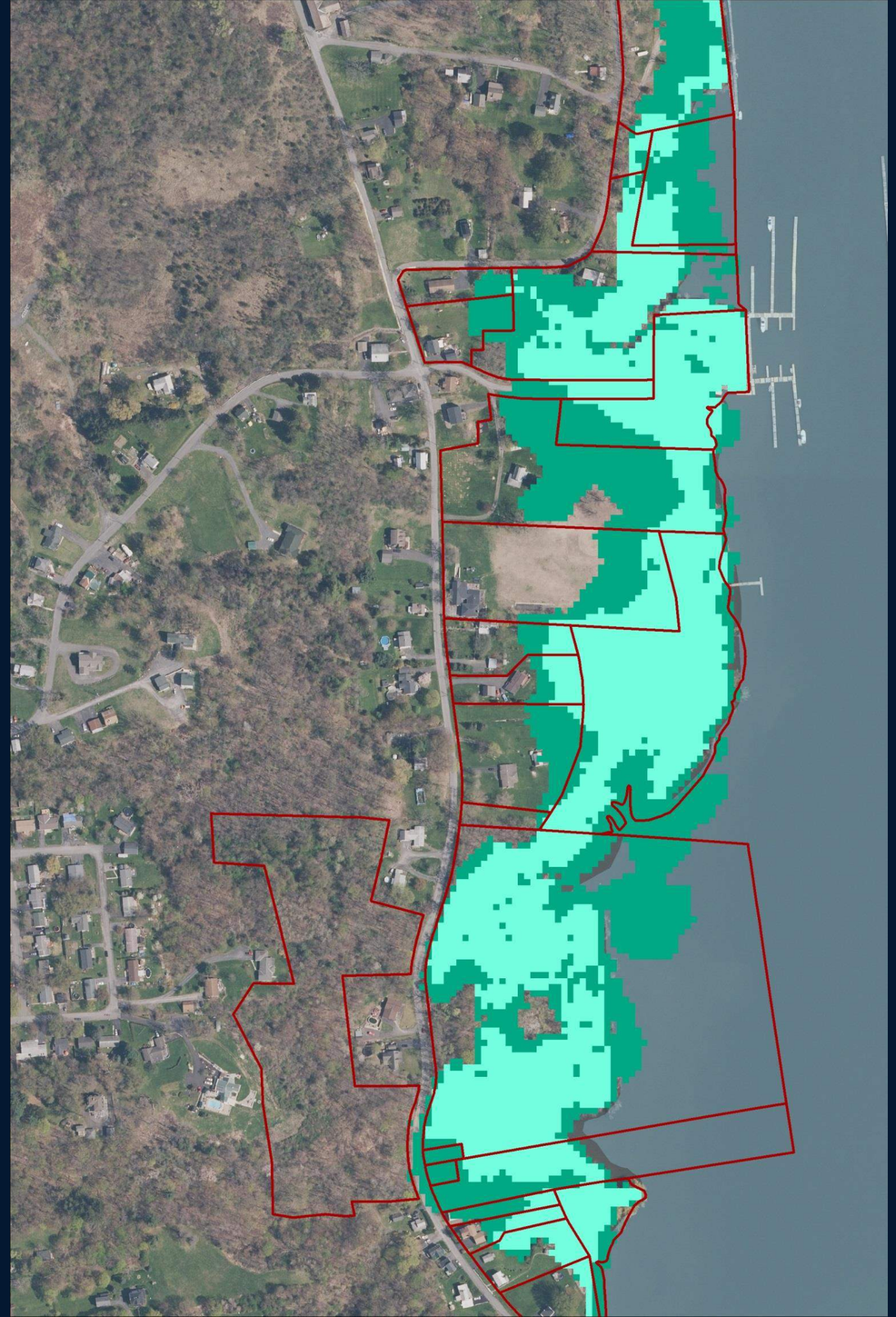
PROTECT THE PATHWAYS

Coxsackie Shore

Any model
Six models

Wetland Pathway

Private
Conserved/public



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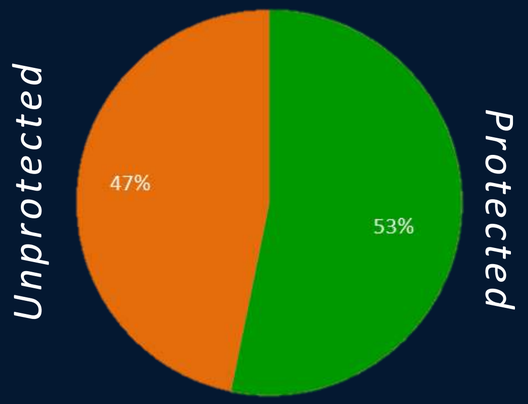
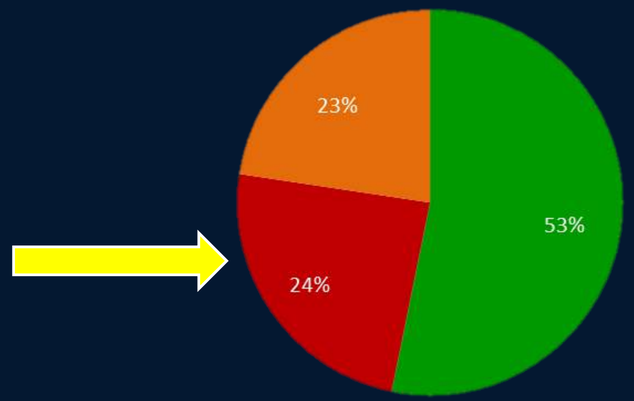
PROTECT THE PATHWAYS: PARCEL ANALYSIS



- Protected/publicly owned wetland pathway: 53%
- ~4,900 ac wetland pathway in 4,750 unprotected parcels
- 125 prioritized parcels encompass 2,520 ac of unprotected wetland pathway (52%)



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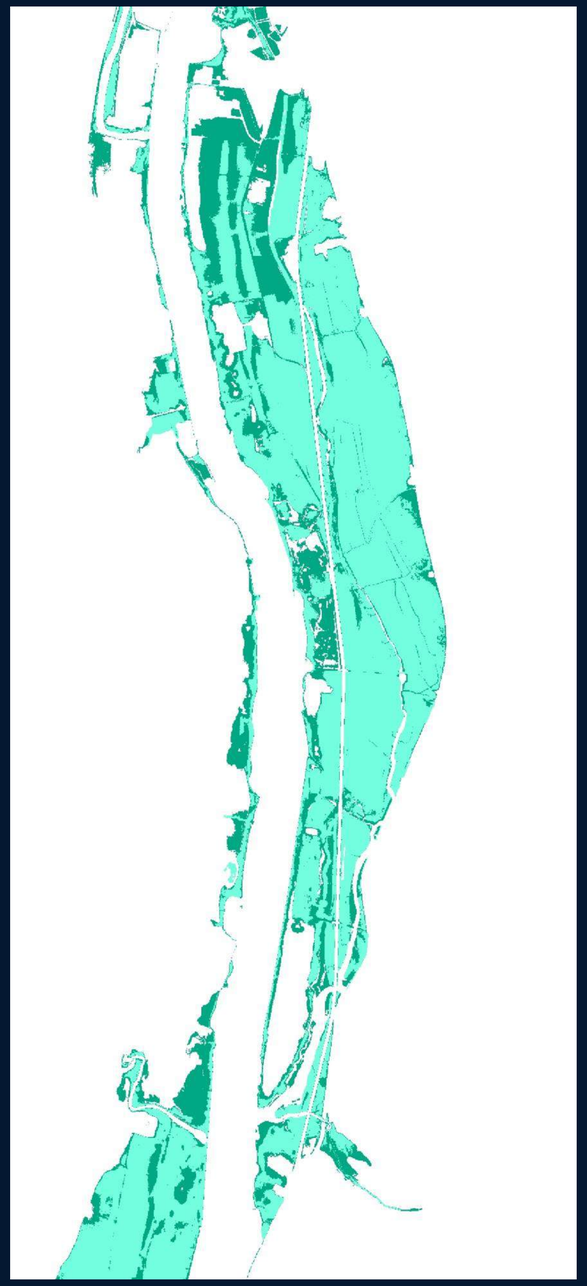
PROTECT THE PATHWAYS: PAPSCANEE & CAMPBELL ISLANDS



Highest Confidence Areas

Wetland Pathway

Protected Parcels

Priority Parcels

Current Wetland:	411 ac
Wetland Pathway:	1,329 ac
High Confidence:	1,001 ac
Priority Parcels:	
Number - 24 parcels	
Wetland Pathway - 646 ac	
Wetland/Dev Conflict:	13%

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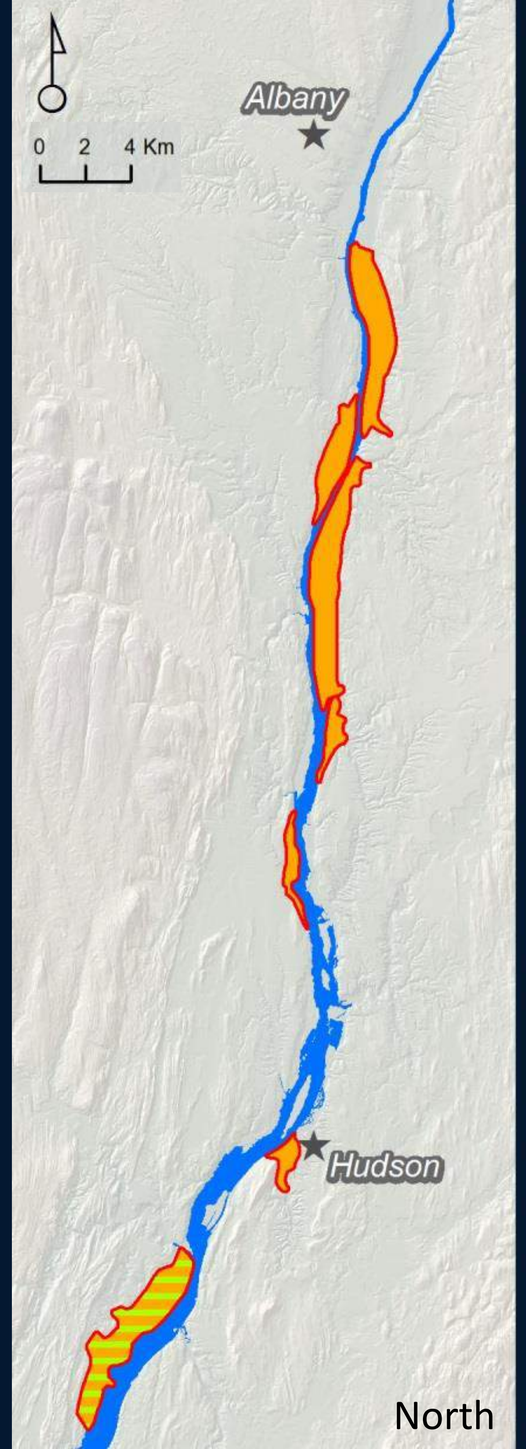
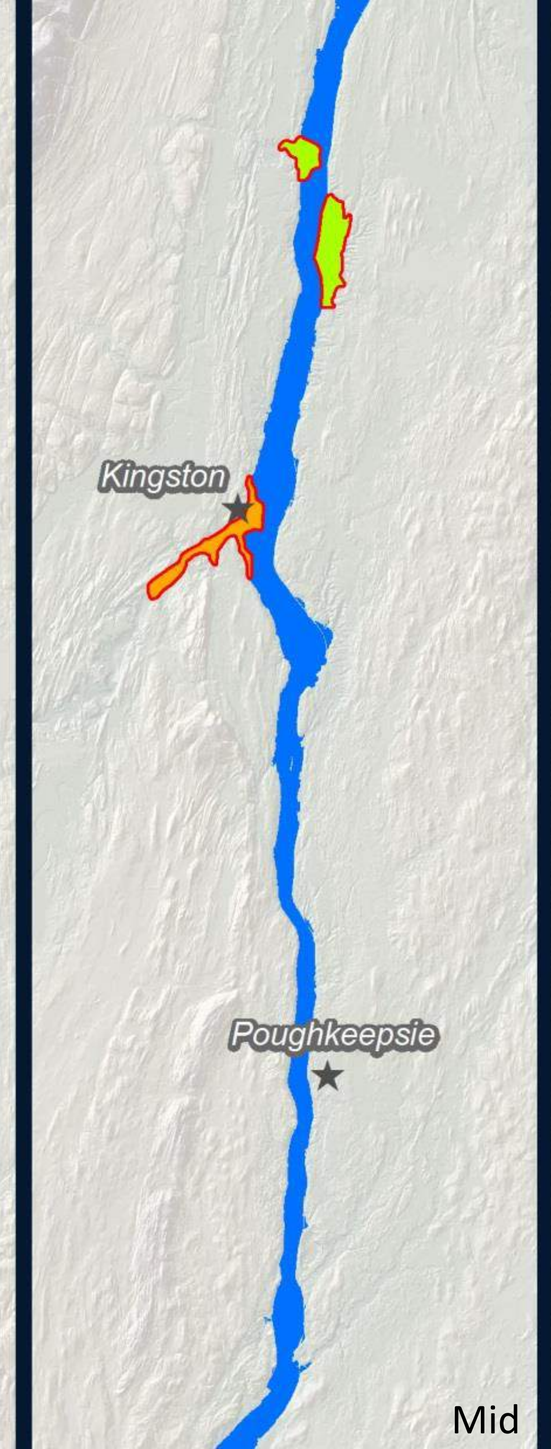
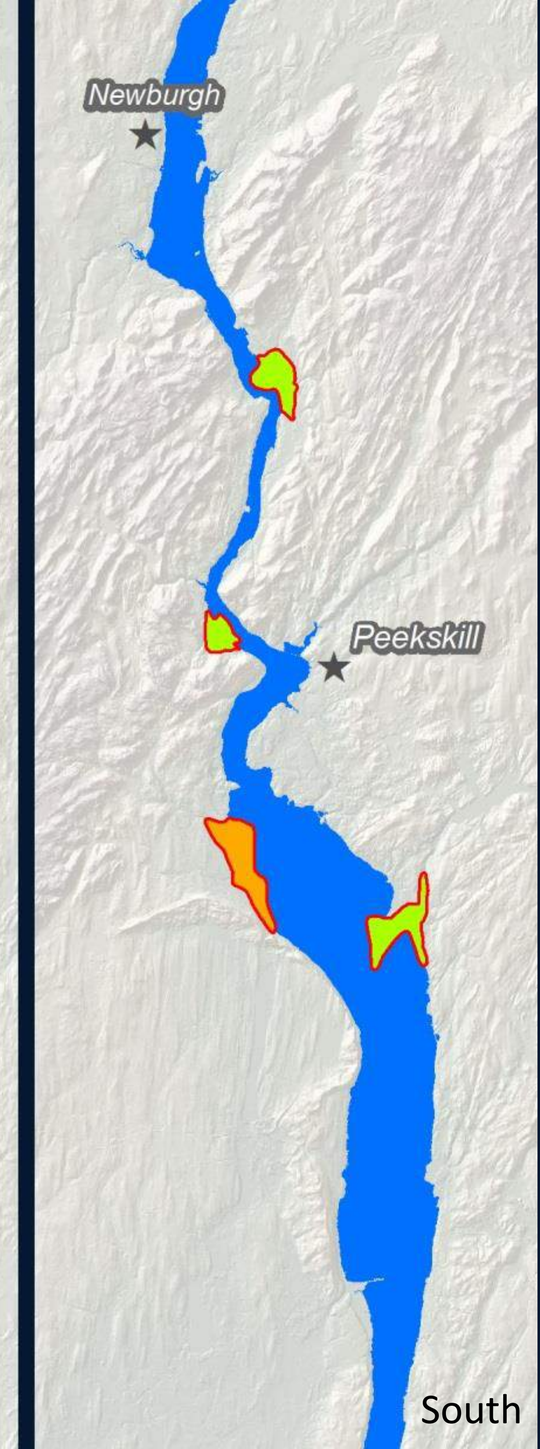
WETLAND SYSTEM CONSERVATION AND RESTORATION PRIORITIES

Conservation priorities

Management priorities







CONSERVING HUDSON RIVER TIDAL WETLANDS IN AN AGE OF SEA LEVEL RISE

- Hudson River tidal wetlands have high potential to adapt through the 21st century, but long term persistence is highly dependent on wetland migration.

- Strategies to enable wetland adaptation:
    - Conservation of the wetland pathway
    - Restoration and management of existing wetland systems
    - Strategic application of planning and policy

- Partnerships for implementation

CONSERVATION SUCCESS: RAMSHORN MARSH

PLANNING, POLICY, REGULATION

Community outreach: HR Estuary Program

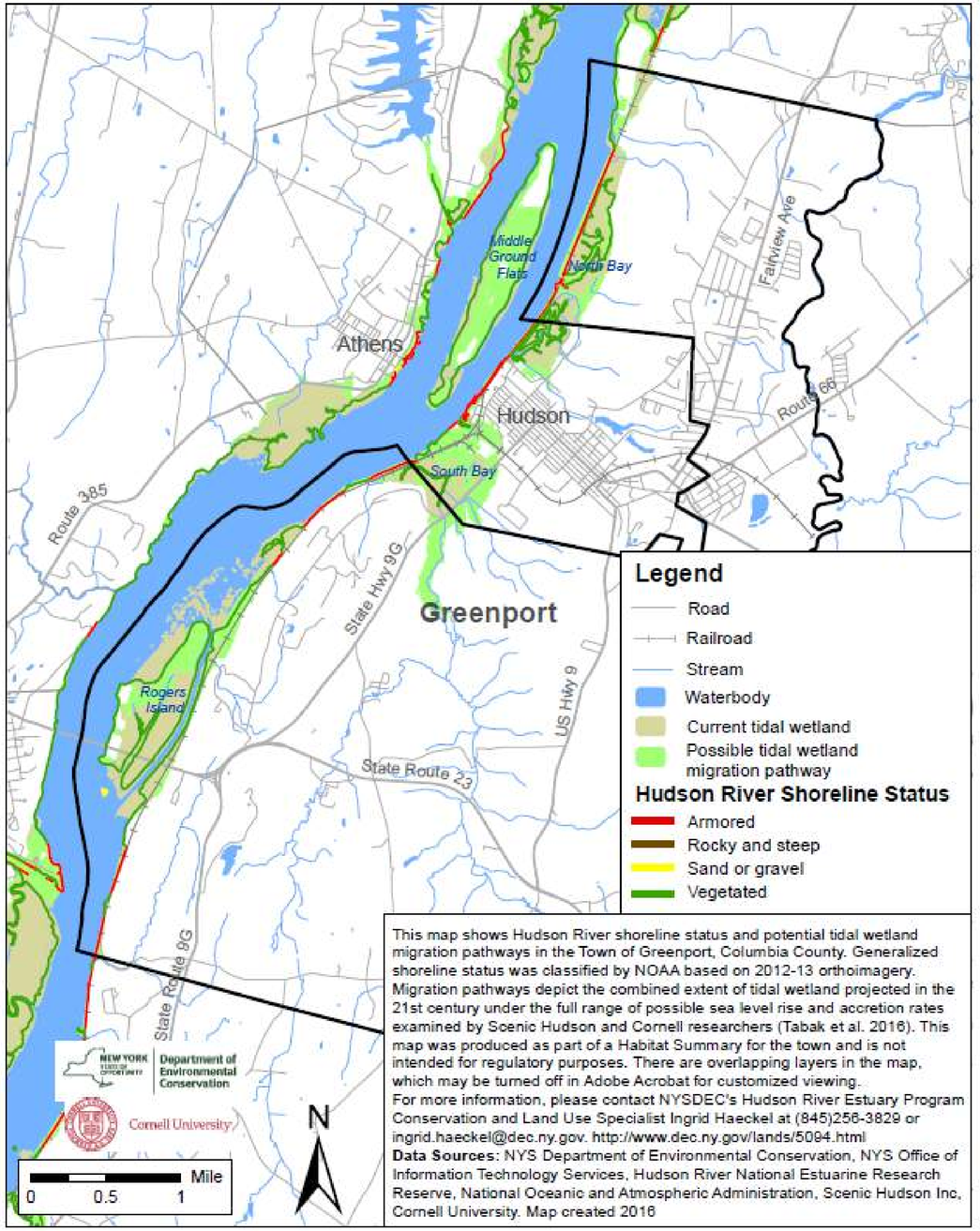
Natural Areas and Wildlife in your Community: A Habitat Summary Prepared for the Town of Greenport

Tidal Wetland Pathways

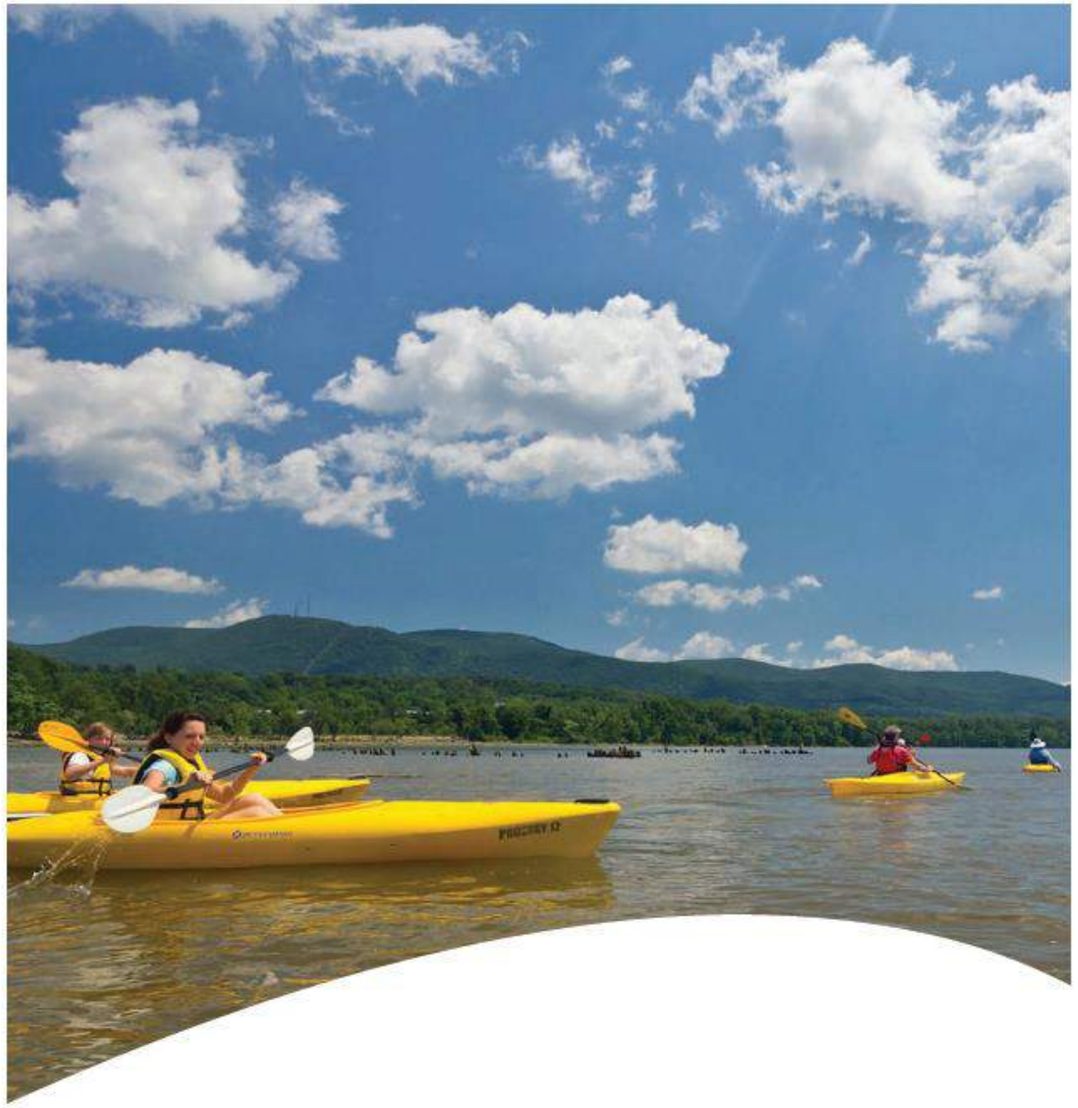
“Tidal wetlands along the Hudson River will disappear with SLR unless they can build up in place or move to higher ground. However, wetlands bordered by steep shorelines or existing development may have no place to go. Potential tidal wetland loss threatens the health of the entire estuary. “

“The most effective way for a municipality to conserve tidal wetlands in the face of these changes is to protect and manage the areas where wetlands may move. Minimizing future development in the pathways and designing public waterfronts to allow for these changes will ensure that tidal wetlands have room to adapt to rising sea levels. This strategy will also reduce risks to communities and property owners in the changing Hudson River flood zone. “

Figure 4: Hudson River Shoreline Status and Tidal Wetland Migration Pathways in the Town of Greenport, NY



HUDSON RIVER COMPREHENSIVE RESTORATION PLAN



Hudson River Comprehensive Restoration Plan

Recommendations for the New York–New Jersey Harbor & Estuary Program Action Agenda and the New York State Hudson River Estuary Action Agenda

AUGUST 2018

the HUDSON we SHARE

02 Hudson River Shorelines and Riparian Areas

Target Statement

By 2050, 700 acres of riparian areas are protected to accommodate future wetland expansion caused by sea level rise, and 20 miles of hardened Hudson River shorelines north of the Gov. Mario M. Cuomo Bridge are softened or otherwise restored to improve habitat values. The shorelines and riparian areas provide vital habitats as well as important resources along migration routes for birds and other wildlife. They improve climate resiliency and provide scenic and recreational opportunities for the public. By 2030, one major hard shoreline habitat restoration project has been completed, additional habitat protection opportunities have been prioritized, and 400 acres of riparian area suitable for wetland migration have been protected.

Summary

Riparian areas are located immediately inland and contiguous to shallow water and intertidal habitats, including tidal wetlands. Floodplains are a specific type of riparian area which are subject to inundation under flood conditions and, for regulatory purposes, are typically delineated by return frequencies (e.g., 100-year or 500-year floodplains). For the purposes of this report, riparian areas, including floodplains, of the Hudson River estuary are the same as the study area detailed under the Assessment of Current Conditions.

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Introduction

These materials are best viewed in full screen.

Welcome to ***Protecting the Pathways***, an initiative by Scenic Hudson and partners to study and help preserve the Hudson River's tidal wetlands in the face of sea level rise (SLR).

Here, you can learn about the Hudson's tidal wetlands, their fate under SLR (it's not all bad!) and what you can do to help.

Image credit: Jeff Anzevino, Scenic Hudson

The Hudson River Estuary

An estuary is the tidal mouth of a river. The Hudson River Estuary (HRE) stretches approximately 150 miles from The Battery in New York City to the Federal Dam north of Albany. The HRE is a region of rich biological resources.

Background image: Robert Rodriguez, Jr.

PROTECTING THE PATHWAYS: A CLIMATE CHANGE ADAPTATION FRAMEWORK FOR HUDSON RIVER ESTUARY TIDAL WETLANDS

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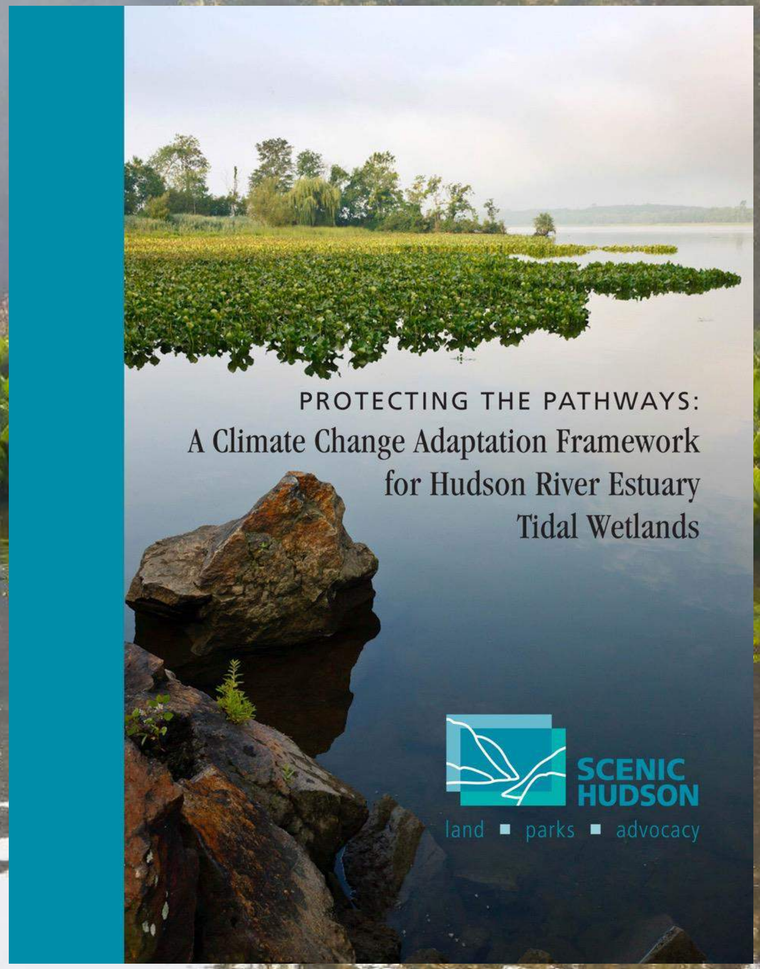
Products:

- Adaptation Framework and Story Map
  www.scenichudson.org
- Base GIS and Conservation Planning Data
  NYS GIS Clearinghouse
- Publication: Tabak et al. 2016, PLOS ONE
- Parcel Prioritization



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