



# Hudson River Research Reserve Habitat Mapping and Resilience

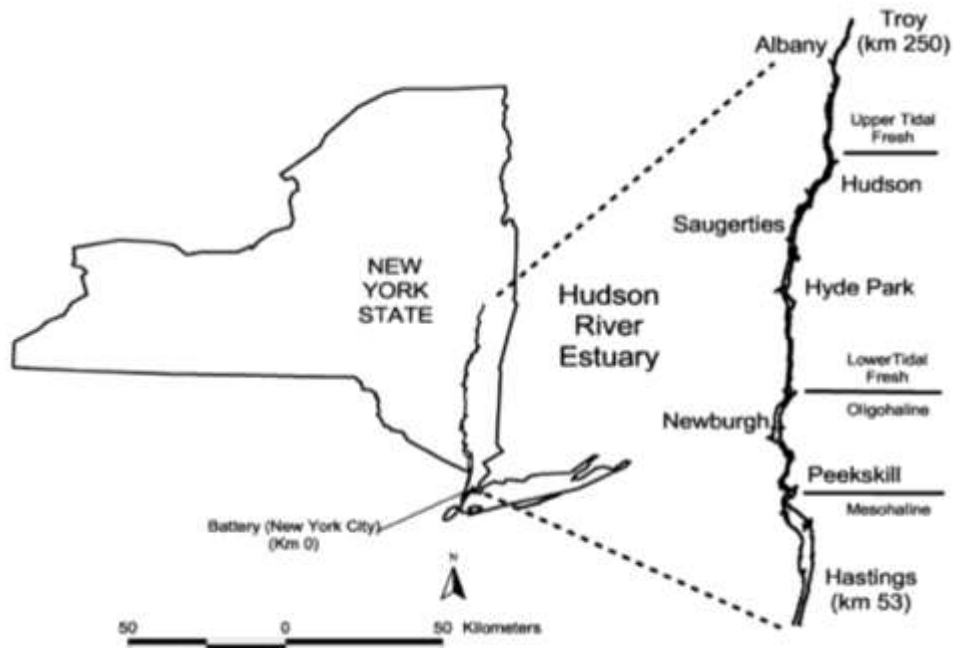
Sarah H. Fernald, Research Coordinator

March 11, 2020



# Hudson River Estuary Habitat Maps

## Hastings - Troy Aerial Photo Inventory



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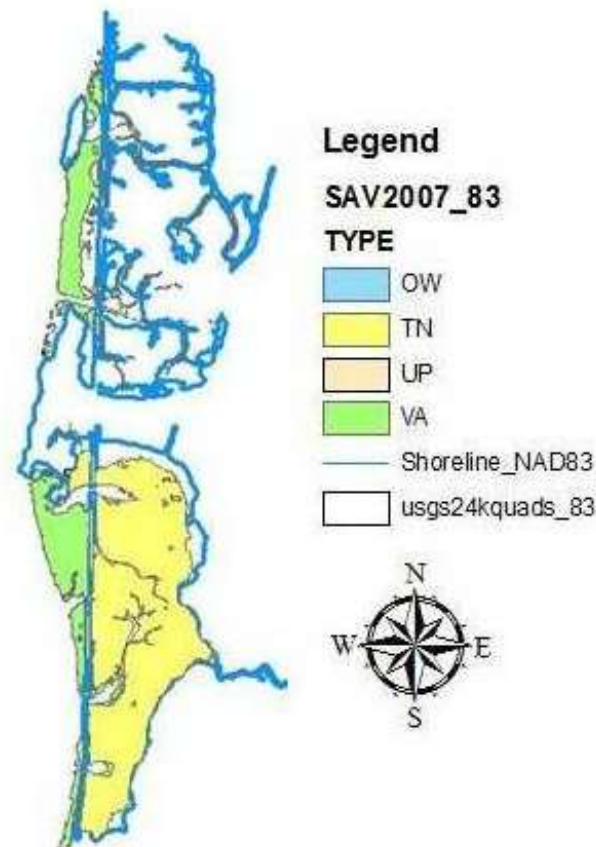


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# Submerged Aquatic Vegetation Mapping Products:

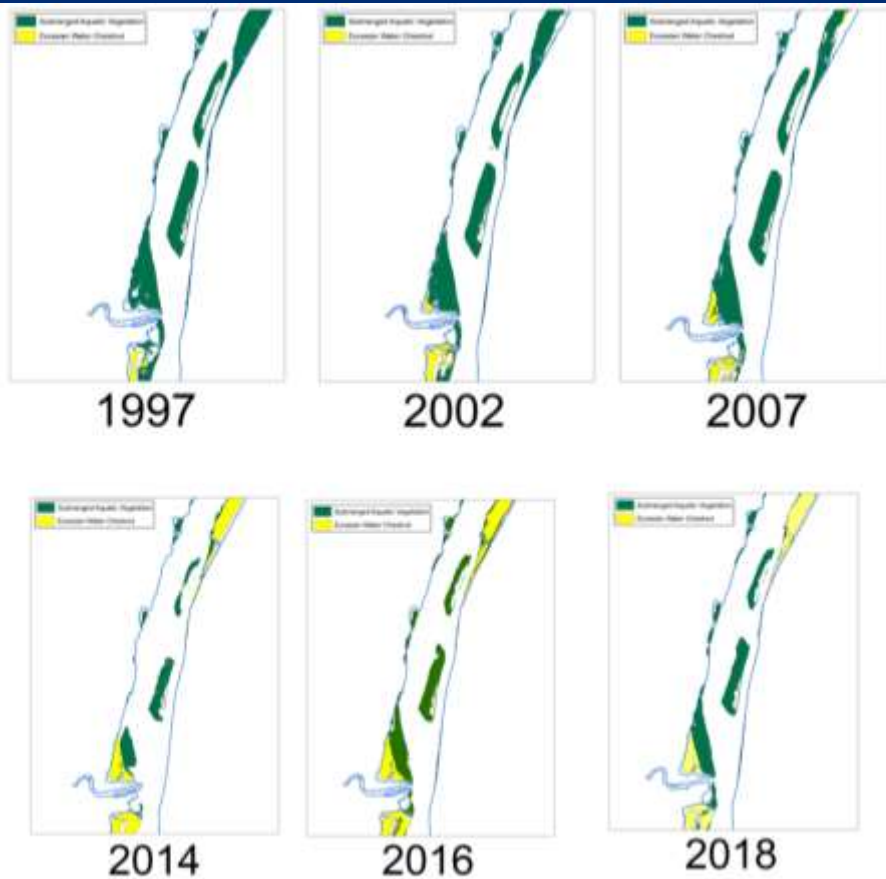
- 1) SAV 1997
- 2) SAV 2002
- 3) SAV 2007
- 4) SAV 2014
- 5) SAV 2016
- 6) SAV 2018 < new!
- 7) Documented SAV  
(1997 2002 2007 2014 2016 2018)



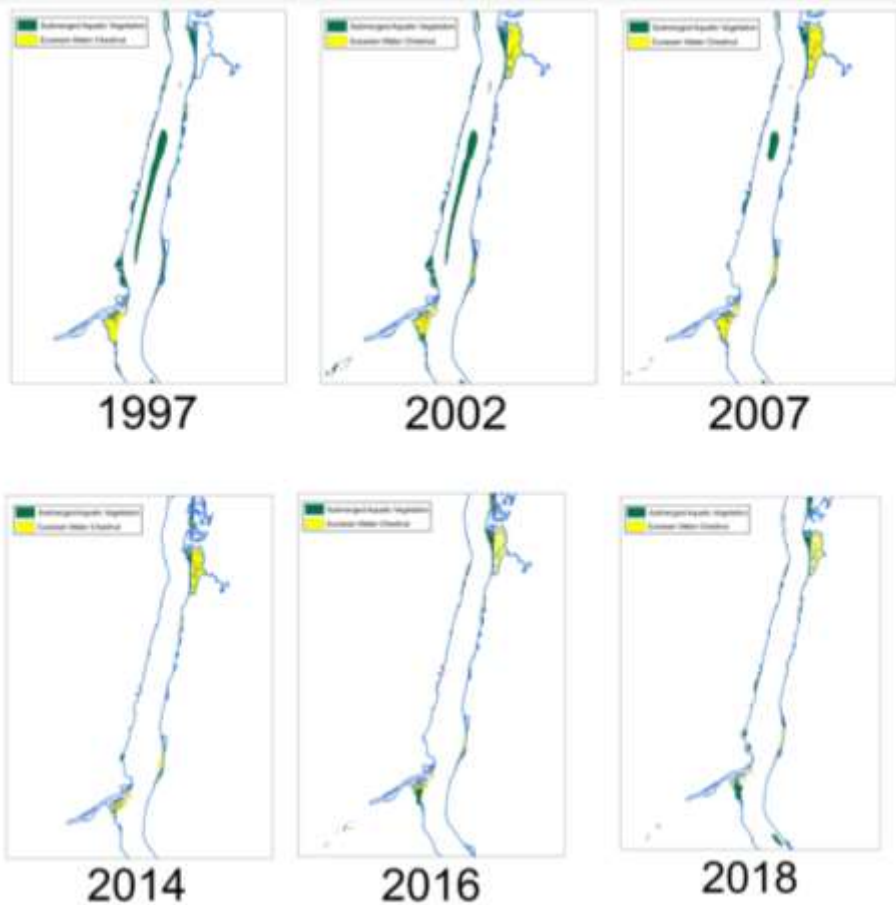
<b>Map Year</b>	<b>Hectares of SAV</b>	<b>Acres of SAV</b>	<b>Comparison years</b>	<b>SAV Change (HA)</b>	<b>Percent Change SAV</b>
<b>1997</b>	1802.0	4452.7	-----	-----	-----
<b>2002</b>	1760.1	4349.9	1997 - 2002	-41.8	-2.3%
<b>2007</b>	1342.1	3316.5	2002 - 2007	-418.0	-23.8%
<b>2014</b>	482.7	1192.0	2007 - 2014	-859.9	-64.0%
<b>2016</b>	1091.5	2697.2	2014 - 2016	608.8	126.1%
<b>2018</b>	1059.2	2617.3	2016-2018	-32.2	-3.0%

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**There are 1,800 acres less SAV today than there was 20 years ago.**



Saugerties SAV bed change comparison 1997-2018.



Kingston-Rhinecliff Bridge SAV bed change comparison 1997-2018.



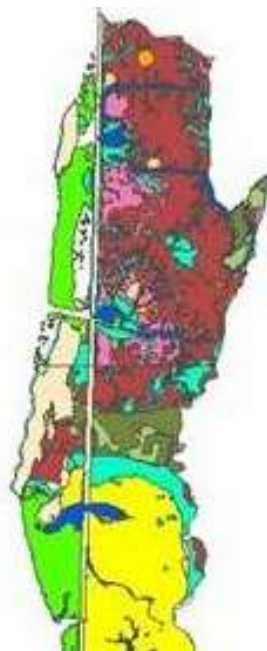


# Hudson River Estuary 2007 Tidal Wetland Maps

## Hastings - Troy Aerial Photo Inventory



River Section at Tivoli Bays



### Legend

- LOWER INTERTIDAL MIX
- OPEN WATER
- PHRAGMITES AUSTRALIS
- SALT MEADOW
- SCRUB / SHRUB
- SPARTINA ALTERNIFLORA
- SUBMERGED AQUATIC VEGETATION
- TRAPA NATANS
- TYPHA ANGUSTIFOLIA
- UNVEGETATED FLATS
- UPLAND
- UPPER INTERTIDAL MIX
- WOODED SWAMP

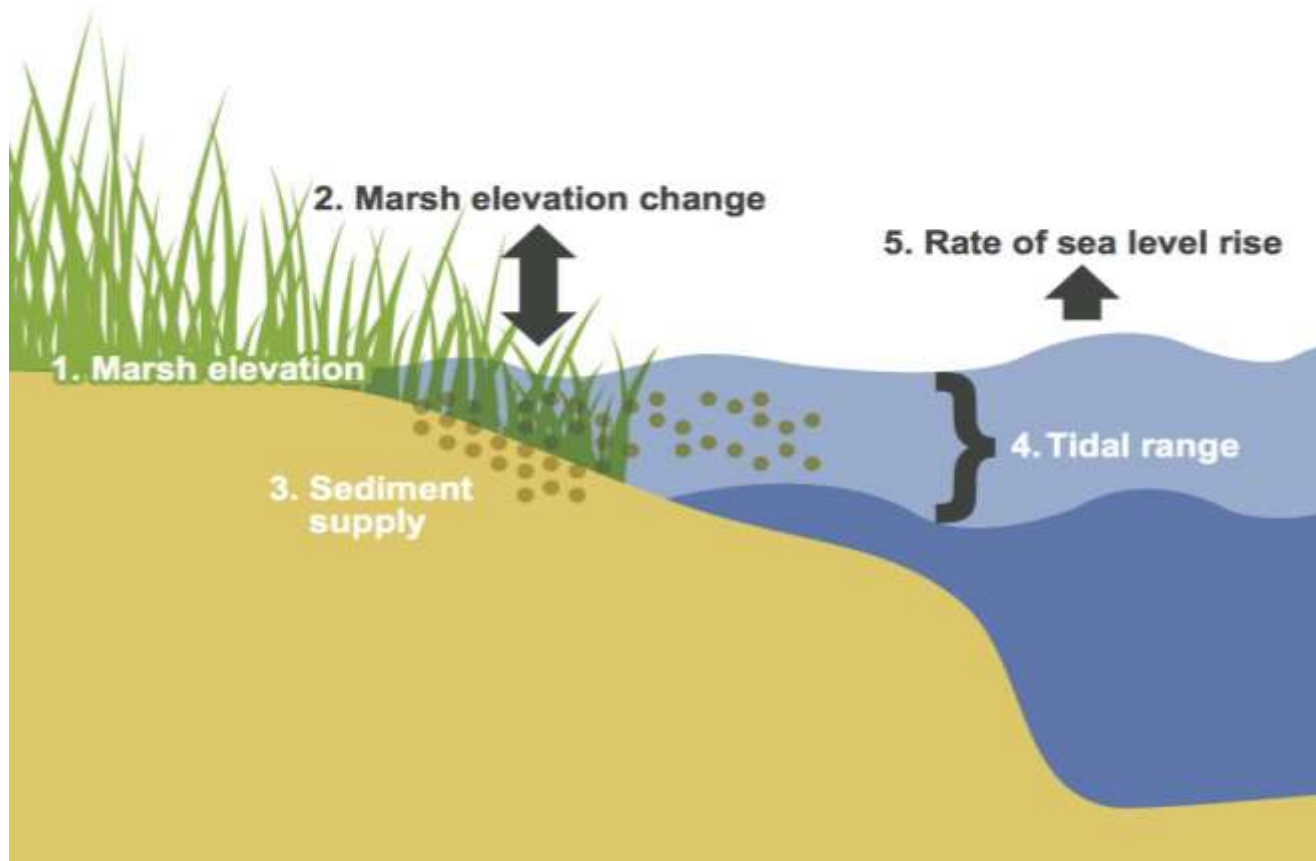
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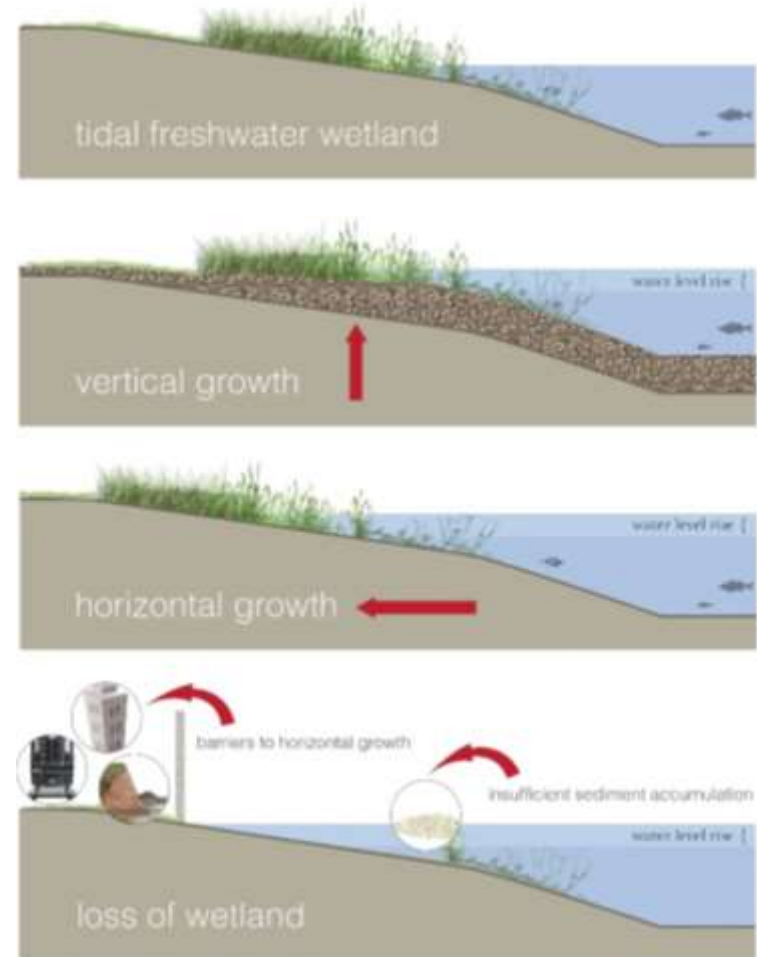
## 5 Indicators of Marsh Resilience to Sea Level Rise





# Tidal Wetlands and Rising Waters

- Vegetation in the intertidal zone
- Tides deposit sediment (vertical growth)
- Pathways for inland marsh migration (horizontal growth)
- Barriers to horizontal growth and insufficient sediment accumulation lead to loss of wetlands with sea level rise



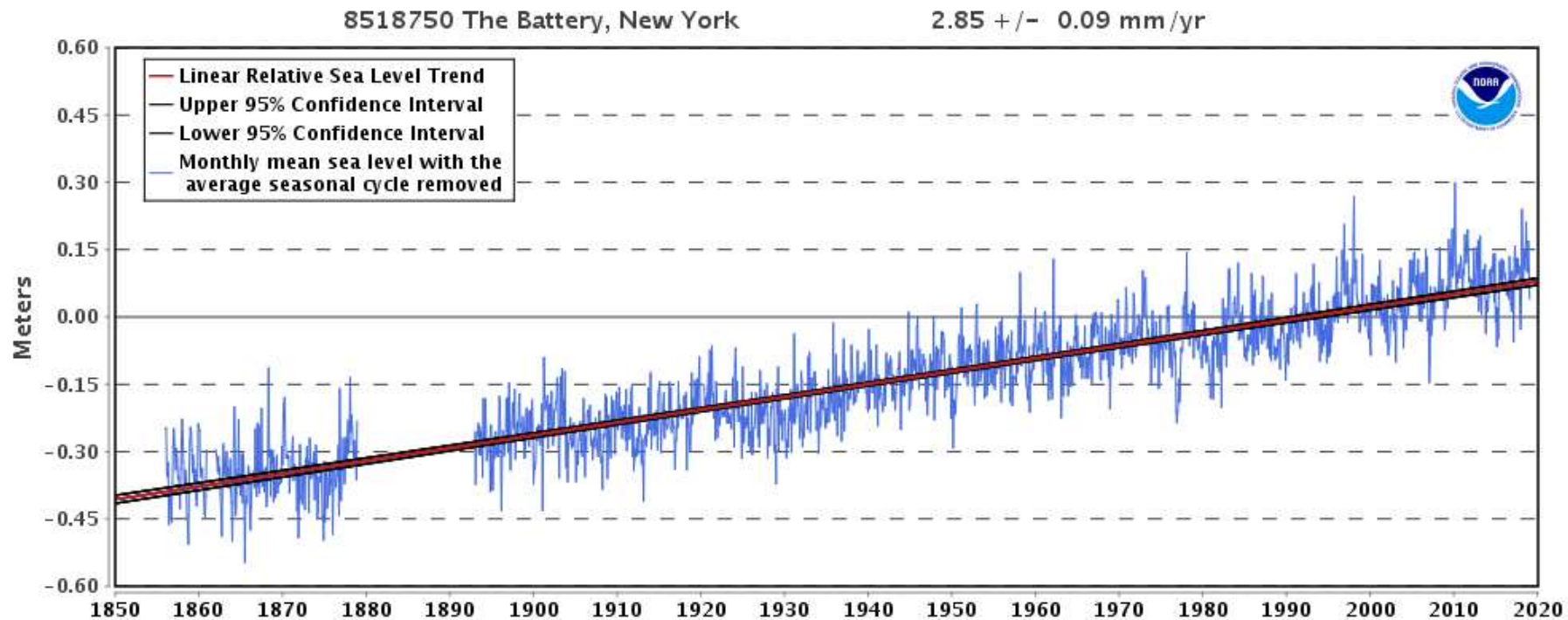


**The Battery Tide Station**

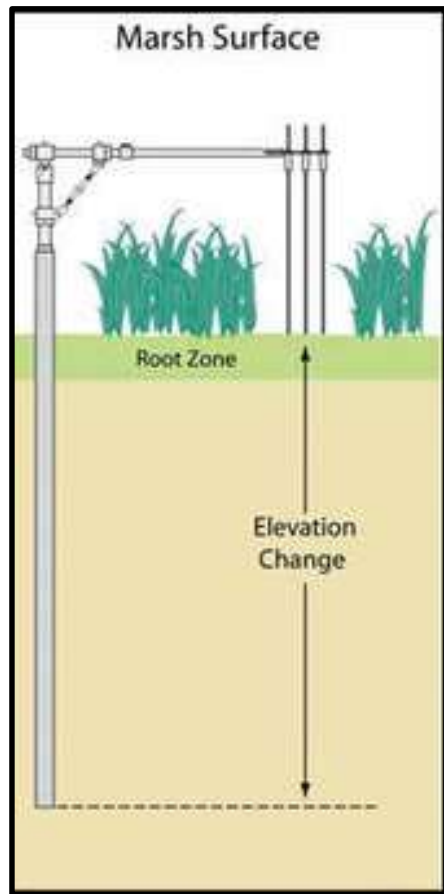


**The Turkey Point Tide Station**

Funded by:  **NEW YORK STATE** | Department of Environmental Conservation | Hudson River Estuary Program



# Surface Elevation Table (SET)



USGS



Photo: Narragansett Bay National Estuarine Research Reserve





Photo: HRNERR Tivoli Bays



Tivoli Bays Surface Elevation  
Table (SET) Data 2019

Site Code	(mm/year)	Ave Pin $R^2$
OTN-A	19.9	0.7669
OTN-B	5.7	0.4563
OTN-C	6.1	0.4803
<b>AVE</b>	<b>10.6</b>	<b>0.5678</b>
ITN-A	7.0	0.3922
ITN-B	8.1	0.5224
ITN-C	2.5	0.2516
<b>AVE</b>	<b>5.9</b>	<b>0.3887</b>
TSB-A	9.6	0.6636
TSB-B	10.1	0.7246
TSB-C	17.5	0.7206
<b>AVE</b>	<b>12.4</b>	<b>0.7029</b>

## SETs in the Tivoli Bays



**Vegetation Transects**



# **NERRS System-Wide Monitoring Program: Sentinel Sites**

**Water Level Station**



**Surface Elevation Tables**



**Vertical Control**

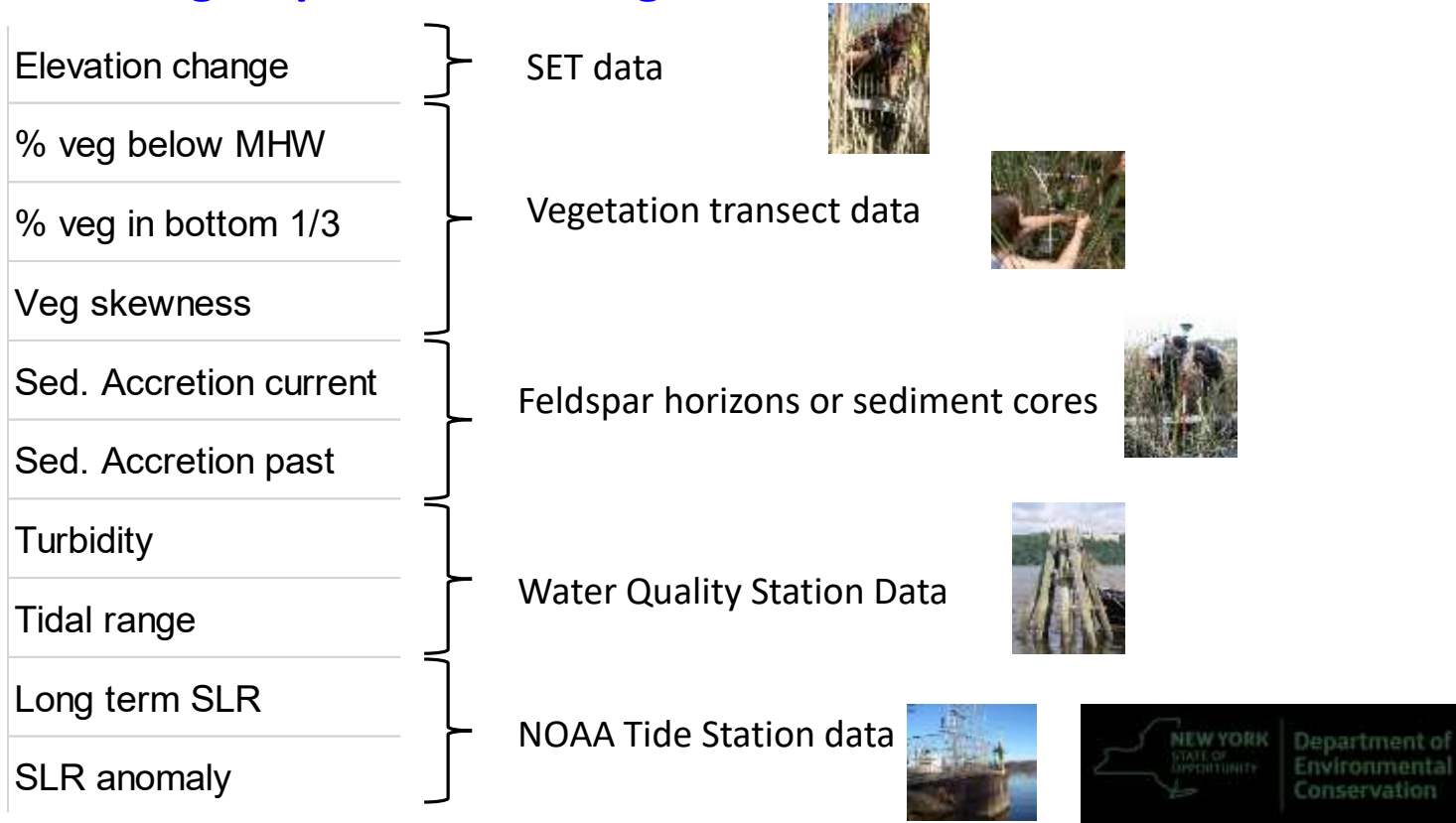


**Water Quality Stations**



# Marsh Resilience to Sea-level Rise (MARS) Index

- 10 metrics grouped into 5 categories





	<b>Northeast</b>			
	<b>NH</b>	<b>MA</b>	<b>RI</b>	<b>NY</b>
	Great Bay	Waquoit Bay	Narragansett Bay	Hudson River
Elevation change	4.30	1.70	1.90	10.0
% veg below MHW	42.46	62.00	61.01	71
% veg in bottom 1/3	8.88	14.00	5.57	46
Veg skewness	-1.56	1.45	-0.13	0.09
Sed. Accretion current	2.68	no data	no data	16.9
Sed. Accretion past	no data	no data	2.70	6.0
Turbidity	34.40	1.76	4.49	23.04
Tidal range	2.70	0.55	0.53	1.44
Long term SLR	1.76	2.83	2.74	2.84
SLR anomaly	no data	23.16	18.33	28.48

The range of values for all reserves were ranked from best (green) to worst (red).

	<b>NH</b>	<b>MA</b>	<b>RI</b>	<b>NY</b>
<b>RISKY METRICS</b>	1	7	7	3





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# Thank You Questions?



## Funding provided by:

NERRS Monitoring



HREP Mapping and Tide Station



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Commission

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