CAPE COASTAL CONFERENCE

Linking Science with Local Solutions and Decision-Making

Tracking Natural Community Response to Sea Level Rise in Waquoit Bay

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Stewardship Coordinator, Waquoit Bay National Estuarine Research Reserve

December 2011 – May 2013

- Original design and purpose of the Waquoit Bay Salt Marsh Observatory
- Research questions presented by the SMO and opportunistic project expansion
- Current efforts to connecting abiotic measurements to biological response
- Future value and potential uses of local data sets

The National Estuarine Research Reserve System (NERRS) defines sentinel sites as areas in coastal and marine environments that have the operational capacity for intensive study and sustained observations to detect and understand changes in the ecosystems they represent.

1) Develop Sentinel Sites Program Plan
2) Identify Audiences and Management Issues
3) Establish Programmatic Capacity
4) Monitor Tidal Marsh, Mangrove,
   or submerged aquatic vegetation (SAV)
5) Measure Wetland Surface Elevation Change
6) Measure Water Level
7) Detect Elevation Changes
8) Water Quality Data
9) Meteorological Data
10) Synthesize and Translate Data

Local Water Level

- Tidal Inundation Frequency/Depth
- Storm Surge/Wind Events
- Local Tidal Datum
- Local Sea Level Rise

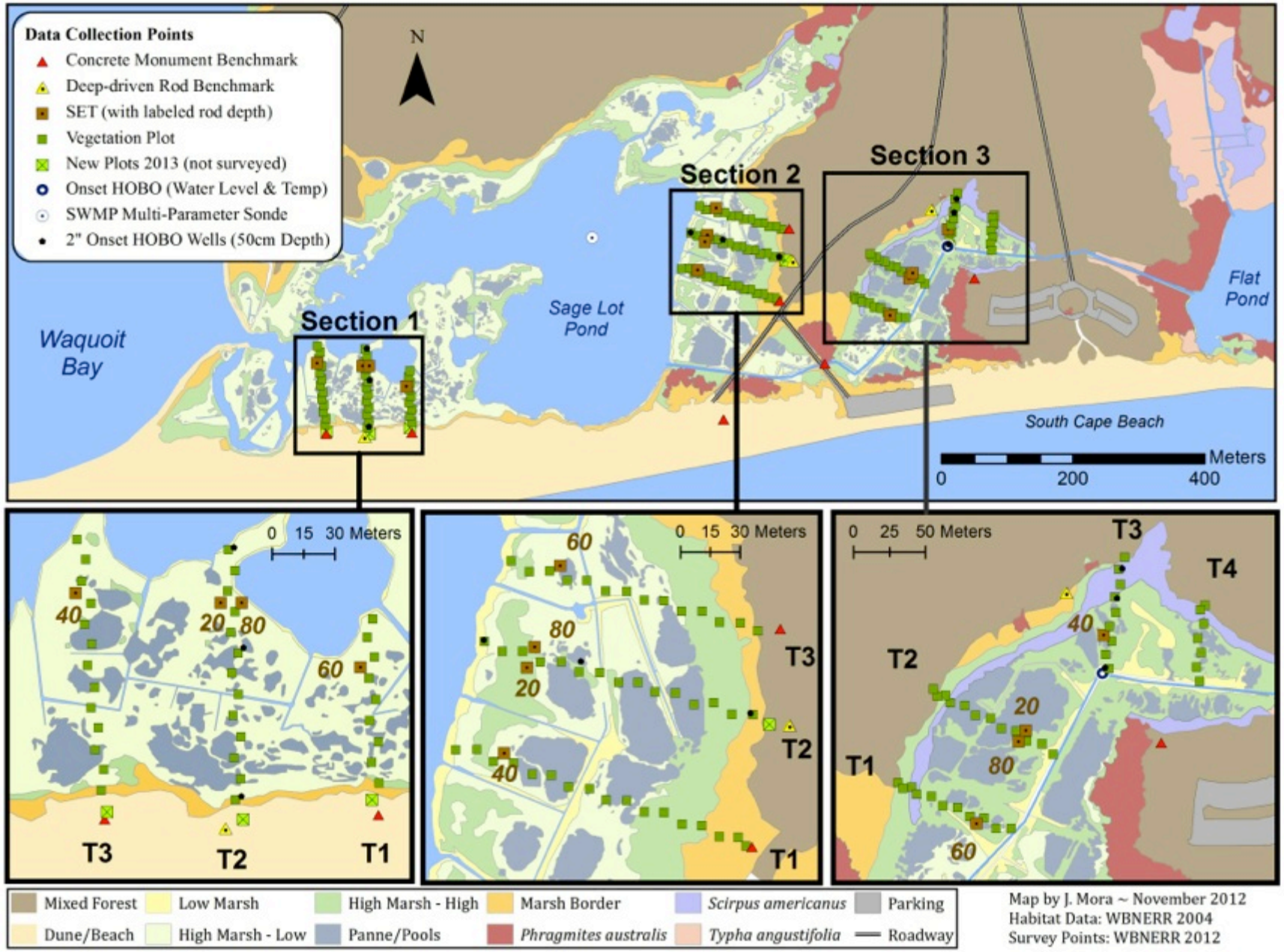
Surface Elevation Tables

- Deposition/accretion
- Subsidence/erosion
- Serves as a benchmark
- Correlated with vegetation and water level

Vegetation plots

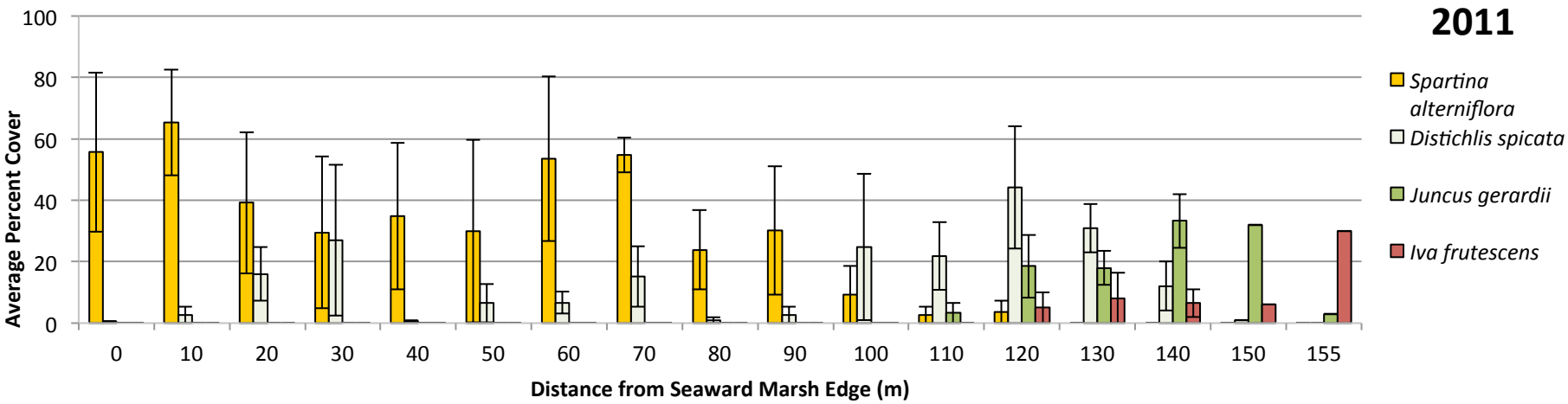
- Percent cover/stem counts/canopy heights
- Changes in Community structure
- Annual Variability
- Community migration

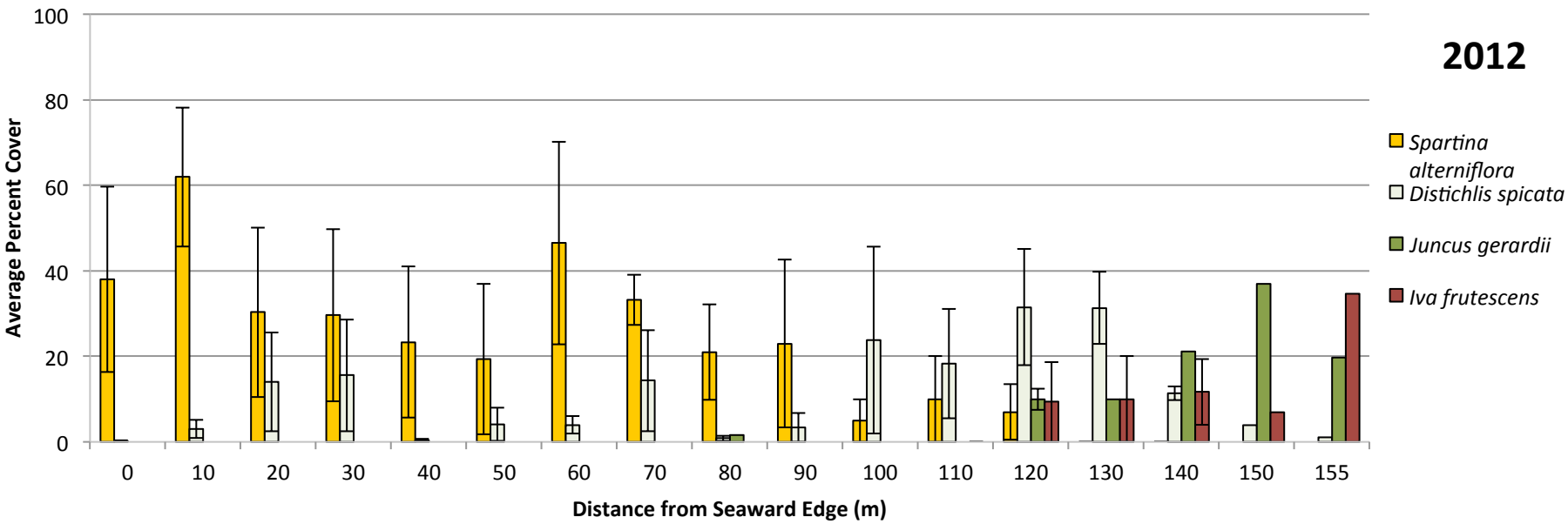
WBNERR Long-Term Salt Marsh Biomonitoring Project



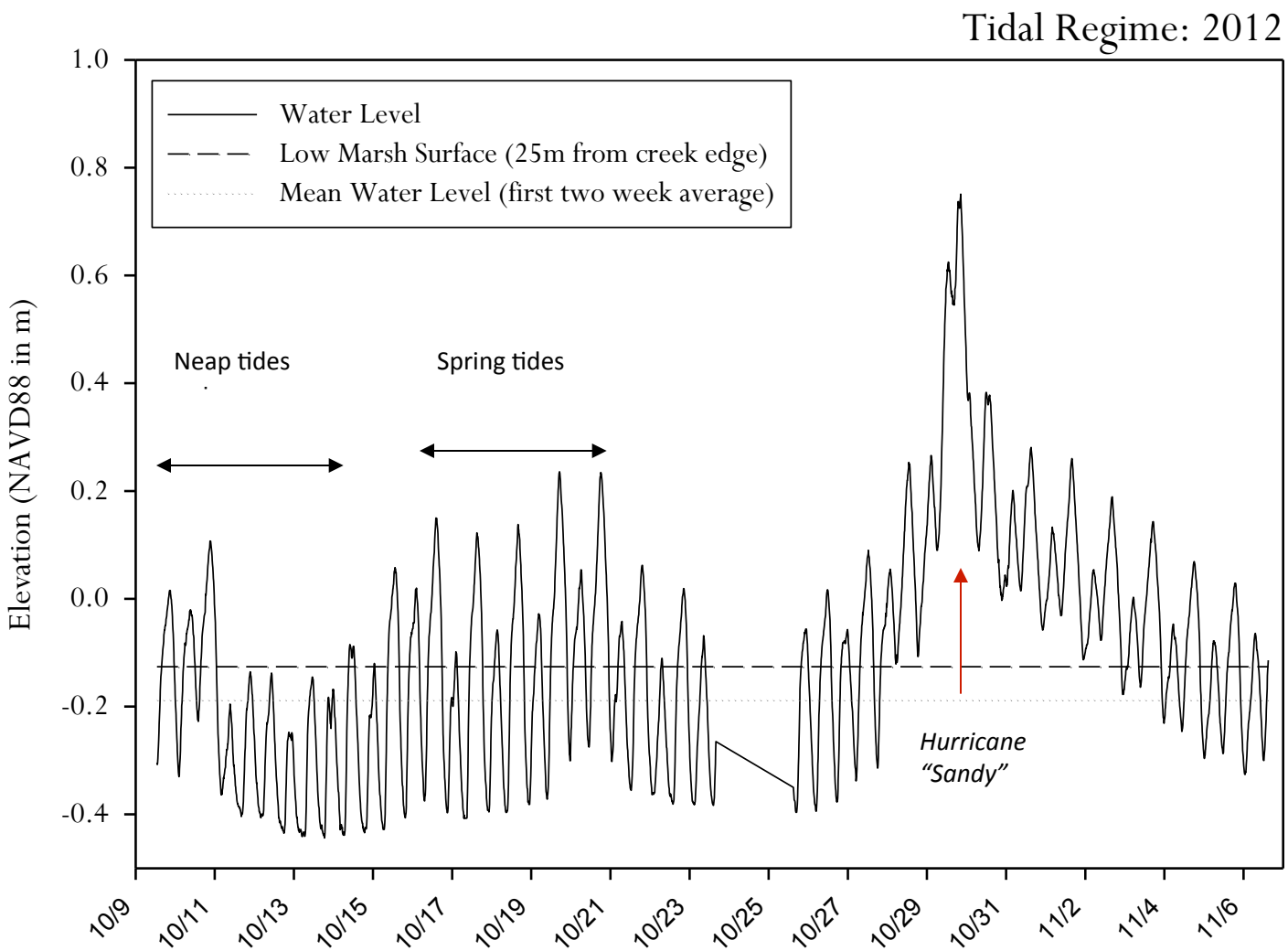
Map by J. Mora ~ November 2012
Habitat Data: WBNERR 2004
Survey Points: WBNERR 2012

Vegetation plot data





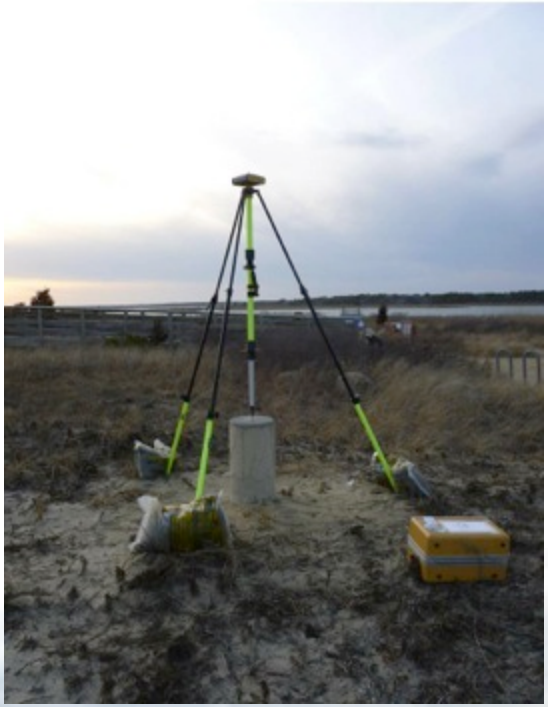
Local Water Level

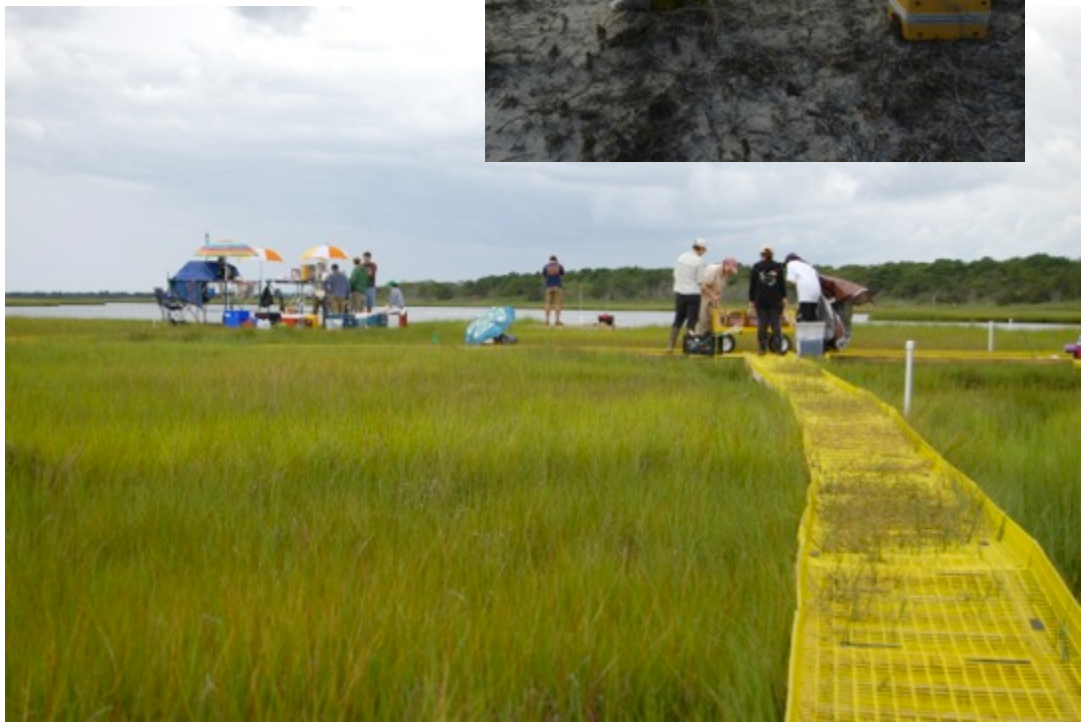


SMO Attracts New Research

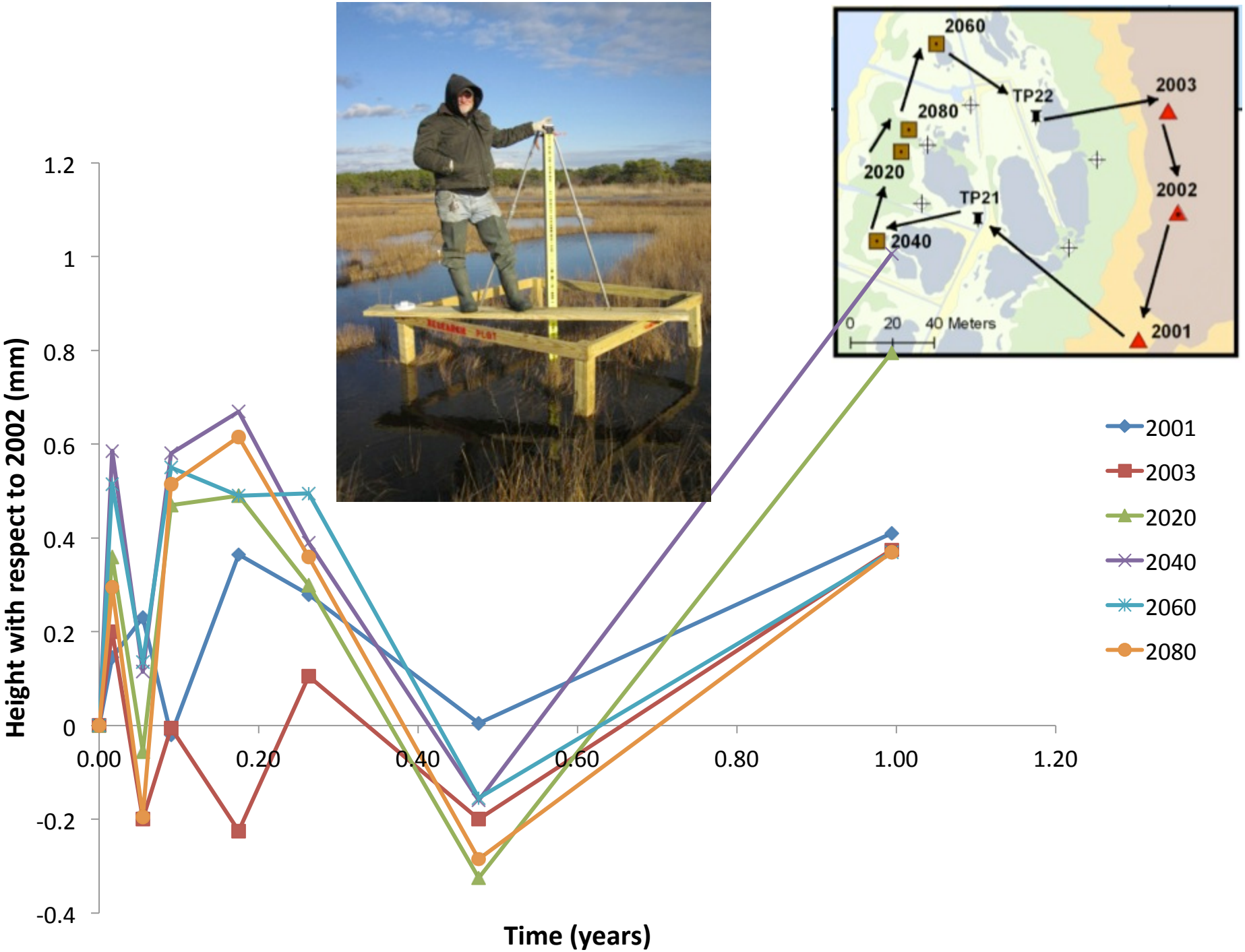
Mark Stability Study

Lidar / RTK Comparisons

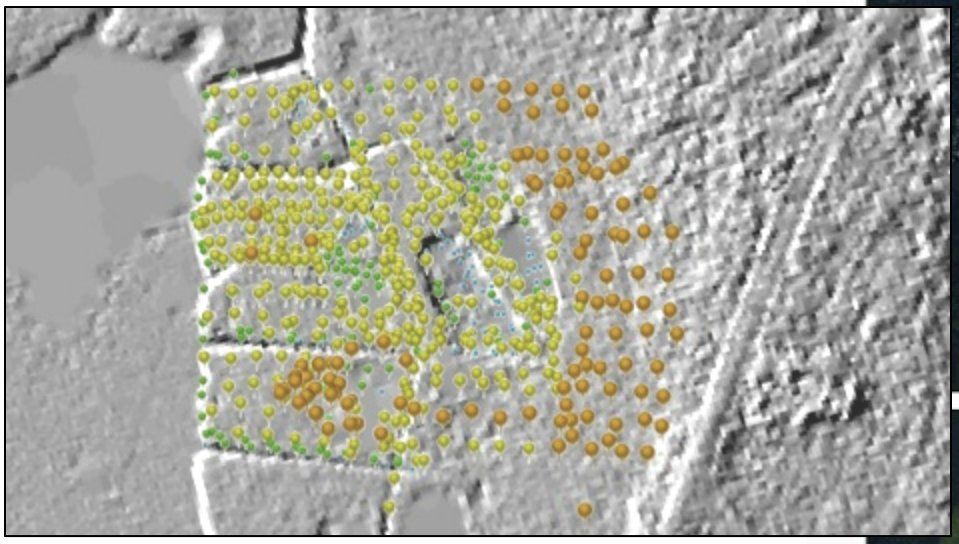


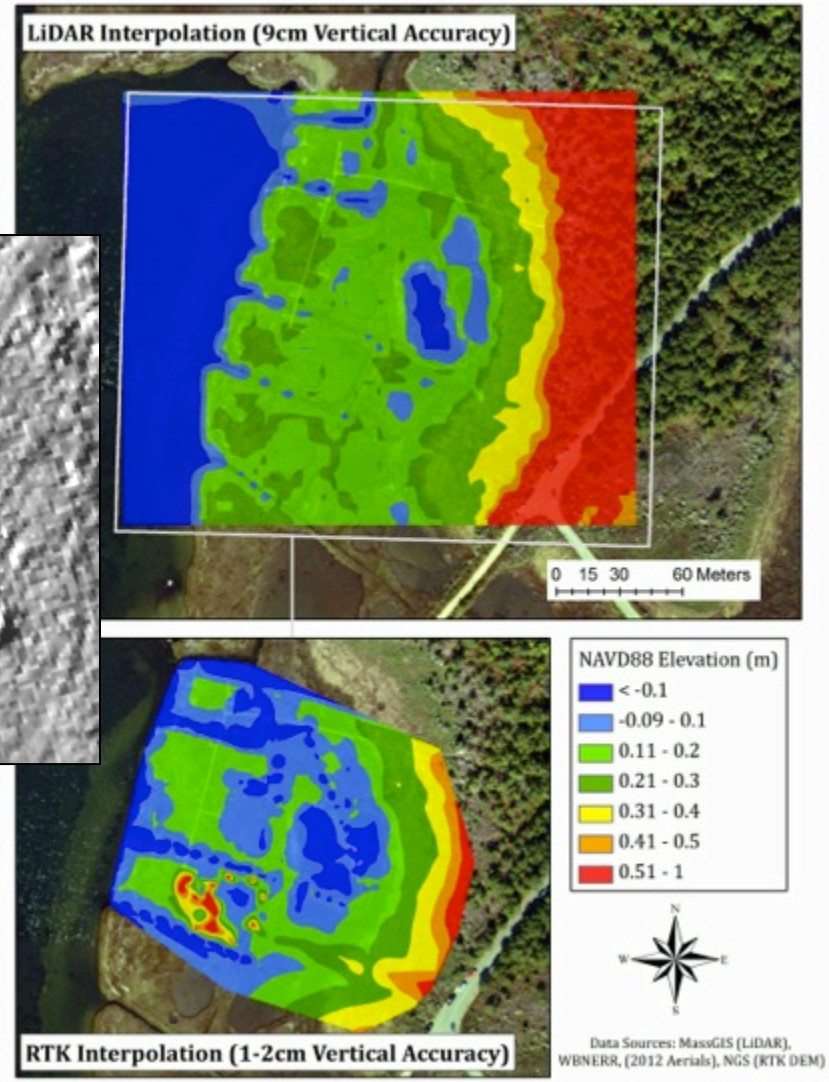


Blue Carbon Research

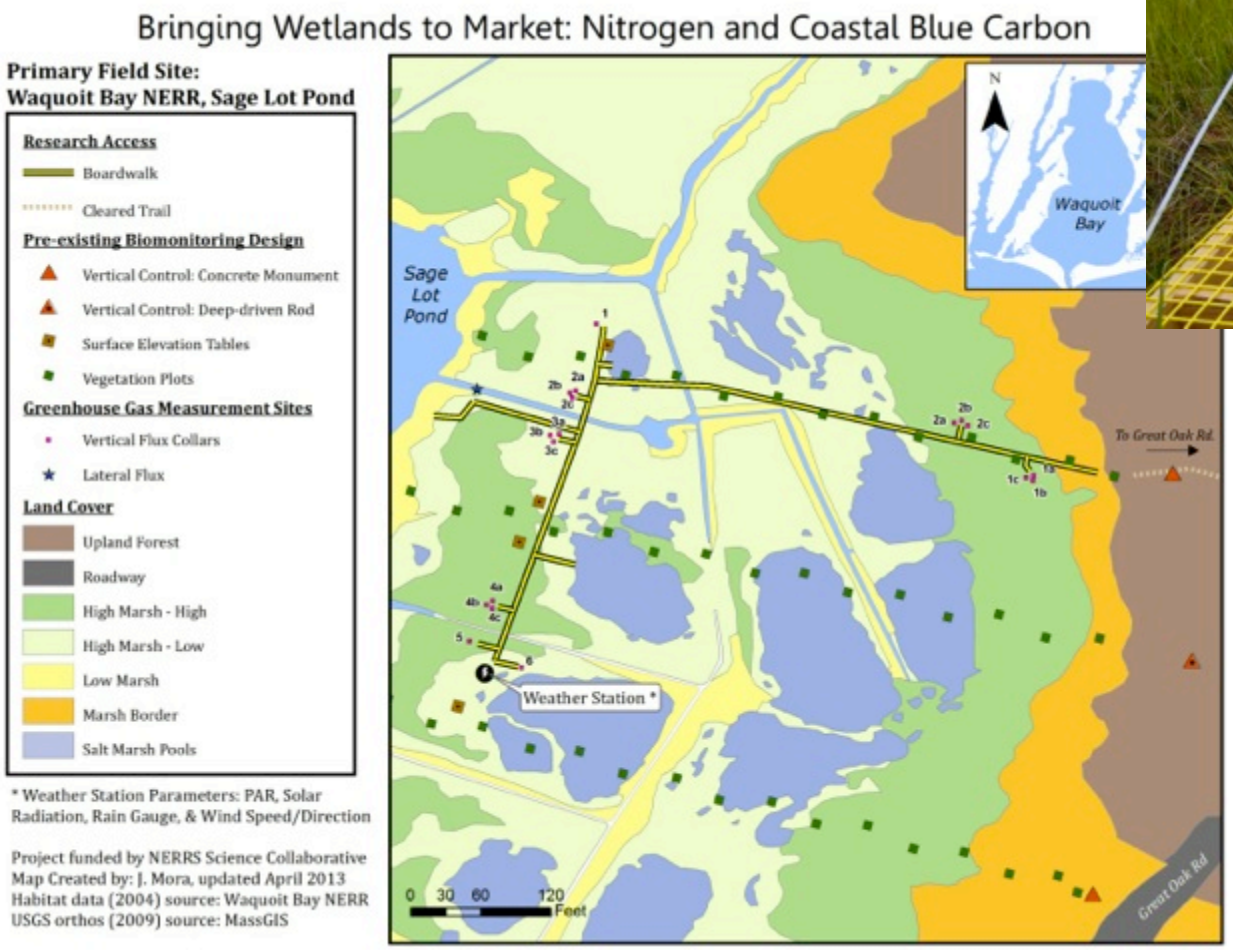

Height with respect to 2002 (mm)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Time (years)
2001
2003
2020
2040
2060
2080
2060
TP22
2003
2080
2020
2002
TP21
2040
2001
0
20
40 Meters

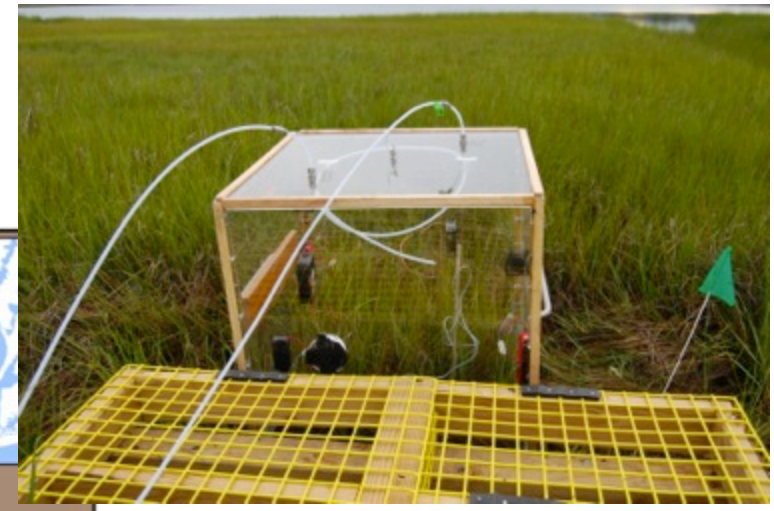
Lidar to DEM Comparisons





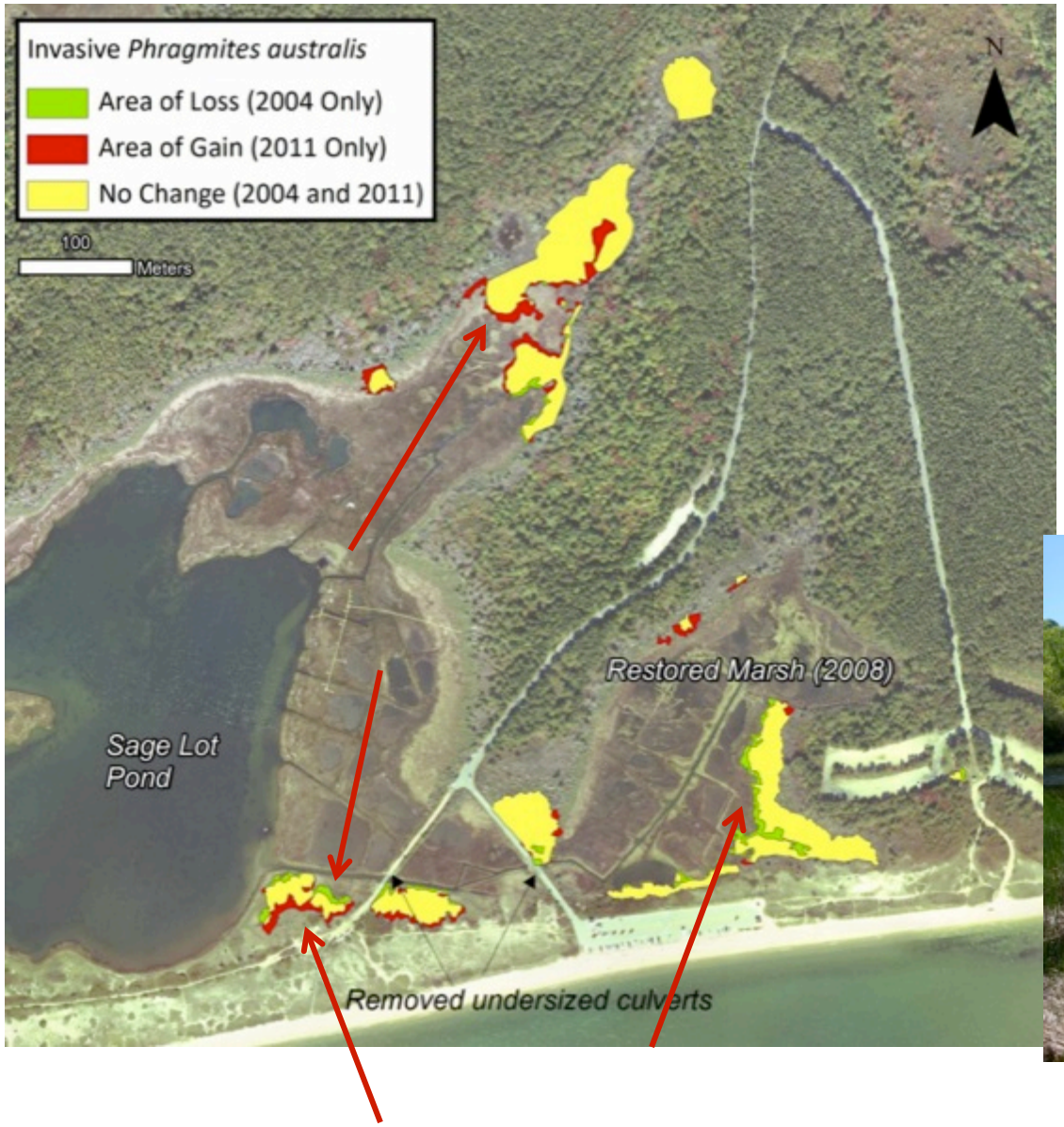
Bringing Wetlands to Market





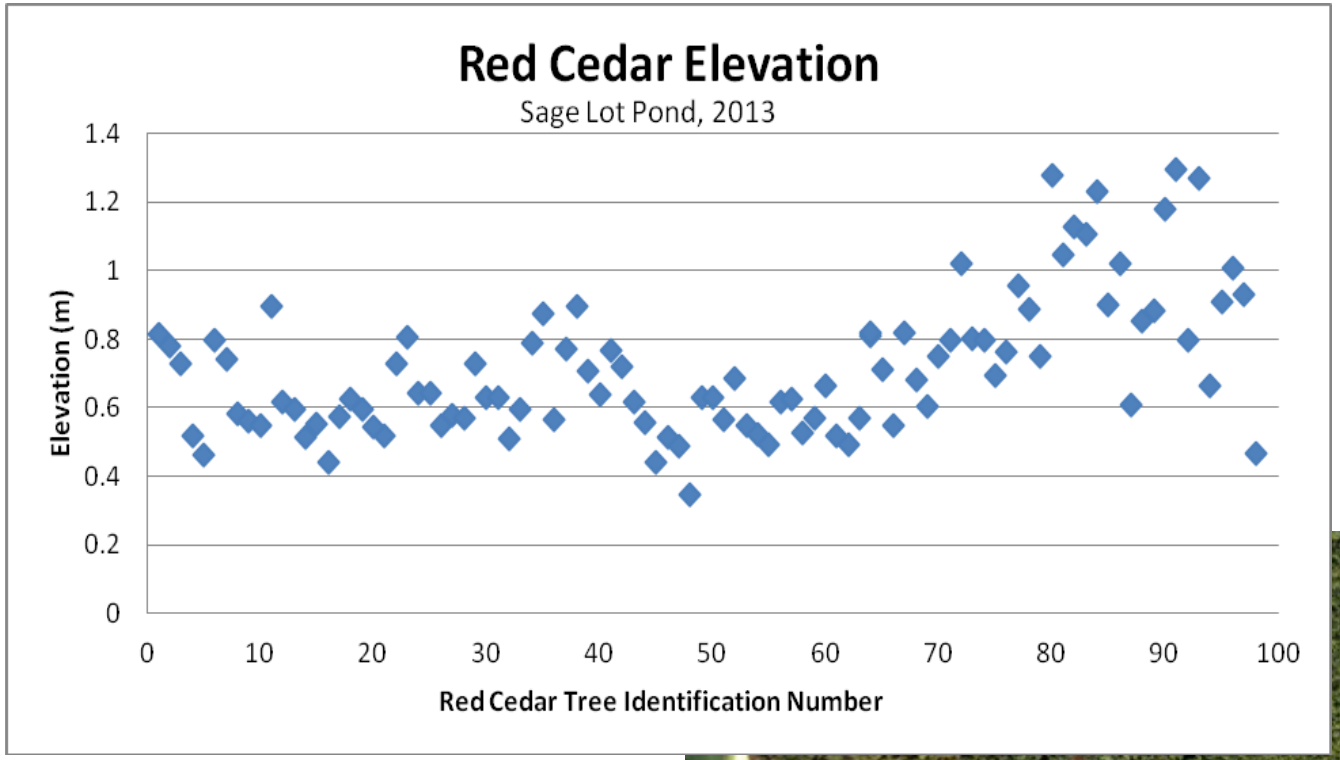
Change analysis –pools/pannes, phragmites, red cedar, coastal dunes

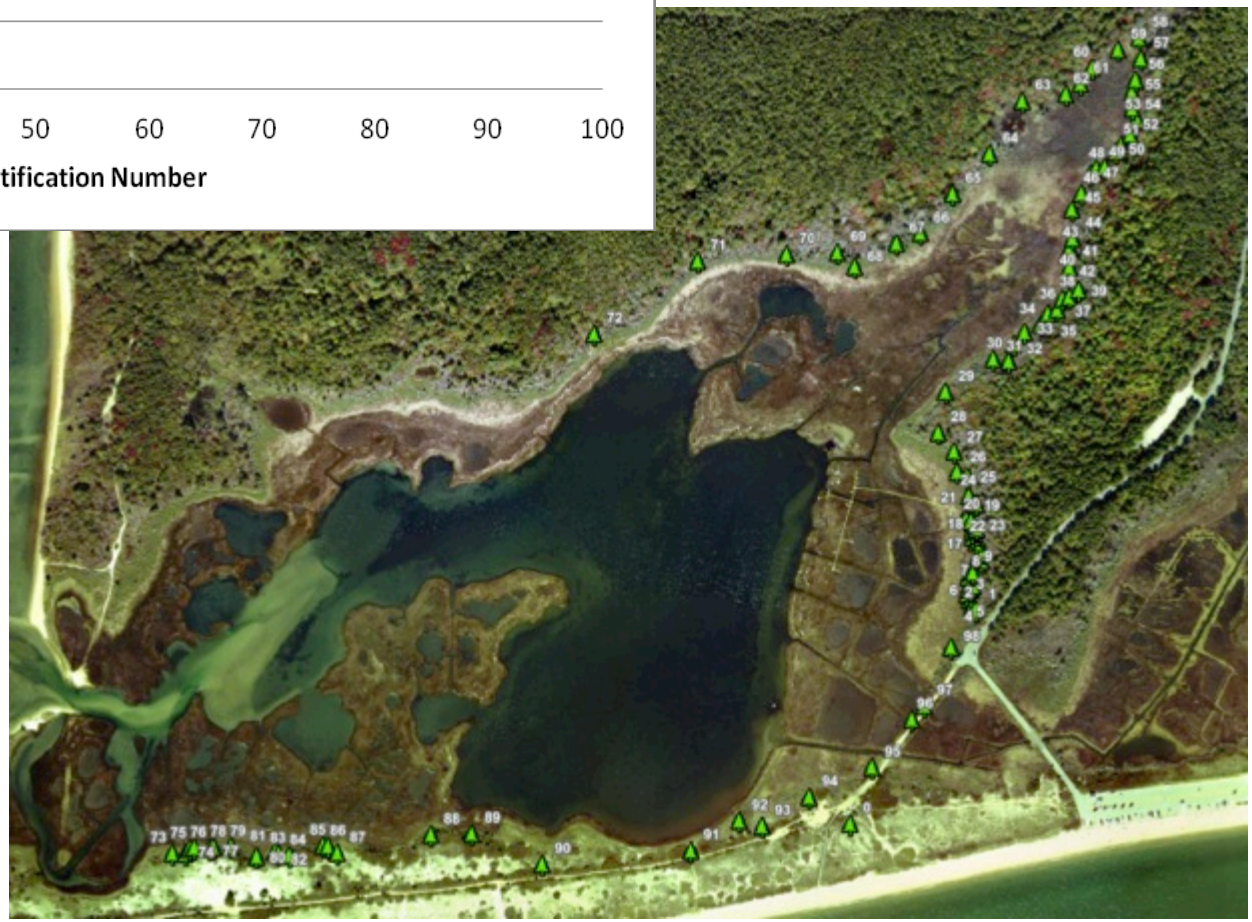
Phragmities Change



Study Area	2004 Stand Area			2011 Stand Area			Loss			Gain			Net Gain	% Change
	Sum (m^2)	Mean (m^2)	Count	Sum (m^2)	Mean (m^2)	Count	Sum (m^2)	Mean (m^2)	Count	Sum (m^2)	Mean (m^2)	Count	(m^2)	
Sage Lot Pond	13,338.3	2,223.0	6	15,380.0	1,398.2	11	687.6	137.5	5	2,729.4	545.9	5	2,041.76	15
Tidally Restored (Triangle & Dog Marsh)	11,460.7	1,910.1	6.0	11,013.4	847.2	13	1,463.7	292.7	5	1,016.4	145.2	7	-447.3	-4
Jehu Pond	45,141.4	1626.129121	28	50,602.4	992.2	51.0	3,964.6	174.2	25	9,435.3	393.1	24	5,470.69	12
Hamblin Pond	12,369.9	618.494268	20	12,914.9	290.0	42.0	1,260.5	104.9	19	1,820.4	79.1	23	559.9	4
Quashnet River	1,845.1	184.514899	10	2,520.3	140.0	18.0	762.4	95.3	8	1,437.6	159.7	9	675.2	37
Little River	2,312.5	462.509189	5	3,434.5	429.3	8.0	372.4	74.5	5	1,494.3	298.9	5	1,121.96	49
Tims Pond	410.3	205.166369	2	299.3	74.8	4.0	154.8	77.4	2	43.7	21.9	2	-111.0	-27
Eel Pond & Seapit River	2,019.1	504.782496	4	2,103.7	233.7	9.0	473.2	118.3	4	557.8	111.6	5	84.6	4
Eel River	12,061.6	753.84741	16	12,612.5	382.2	33.0	2,029.4	126.8	16	2,580.4	143.4	18	551.0	5
							"Loss" =2004 Only			"Gain" =2011 Only				
Waquoit Bay Total:	**100,958.9**			**110,881.2**			**11,168.6**			**21,115.4**			**9,946.8**	**10**

Red Cedar Condition and Elevation


Red Cedar Elevation
Sage Lot Pond, 2013
Elevation (m)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
10
20
30
40
50
60
70
80
90
100
Red Cedar Tree Identification Number

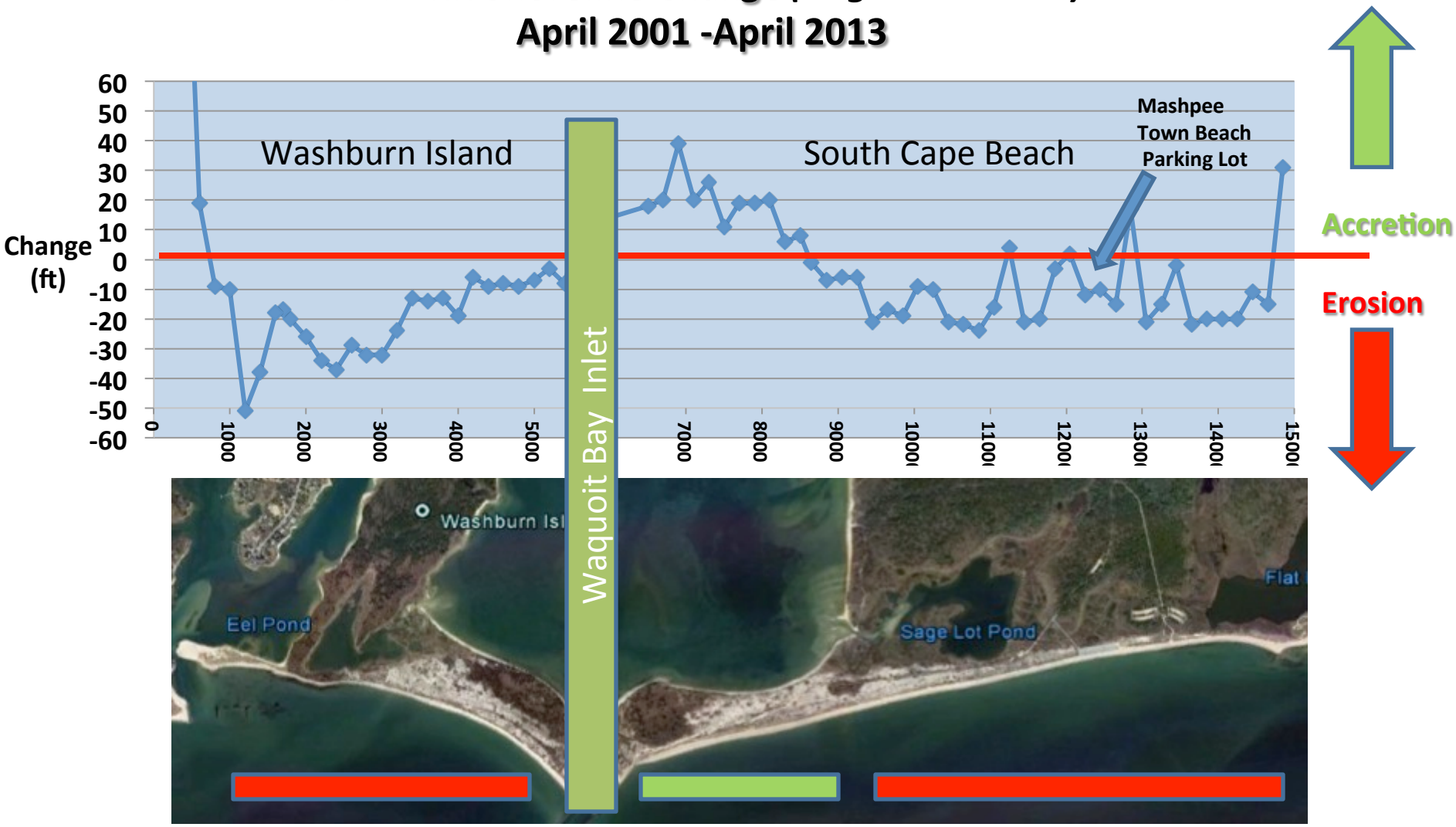



12/18/2001 5:51am

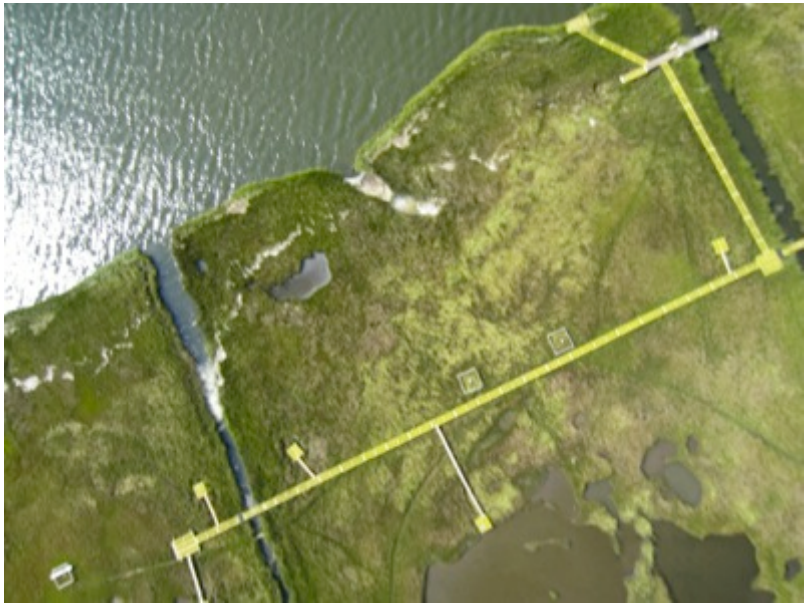
Shoreline Change

Coastwatchers Shoreline Change Monitoring Program (***77 stations ~every 200 ft***)

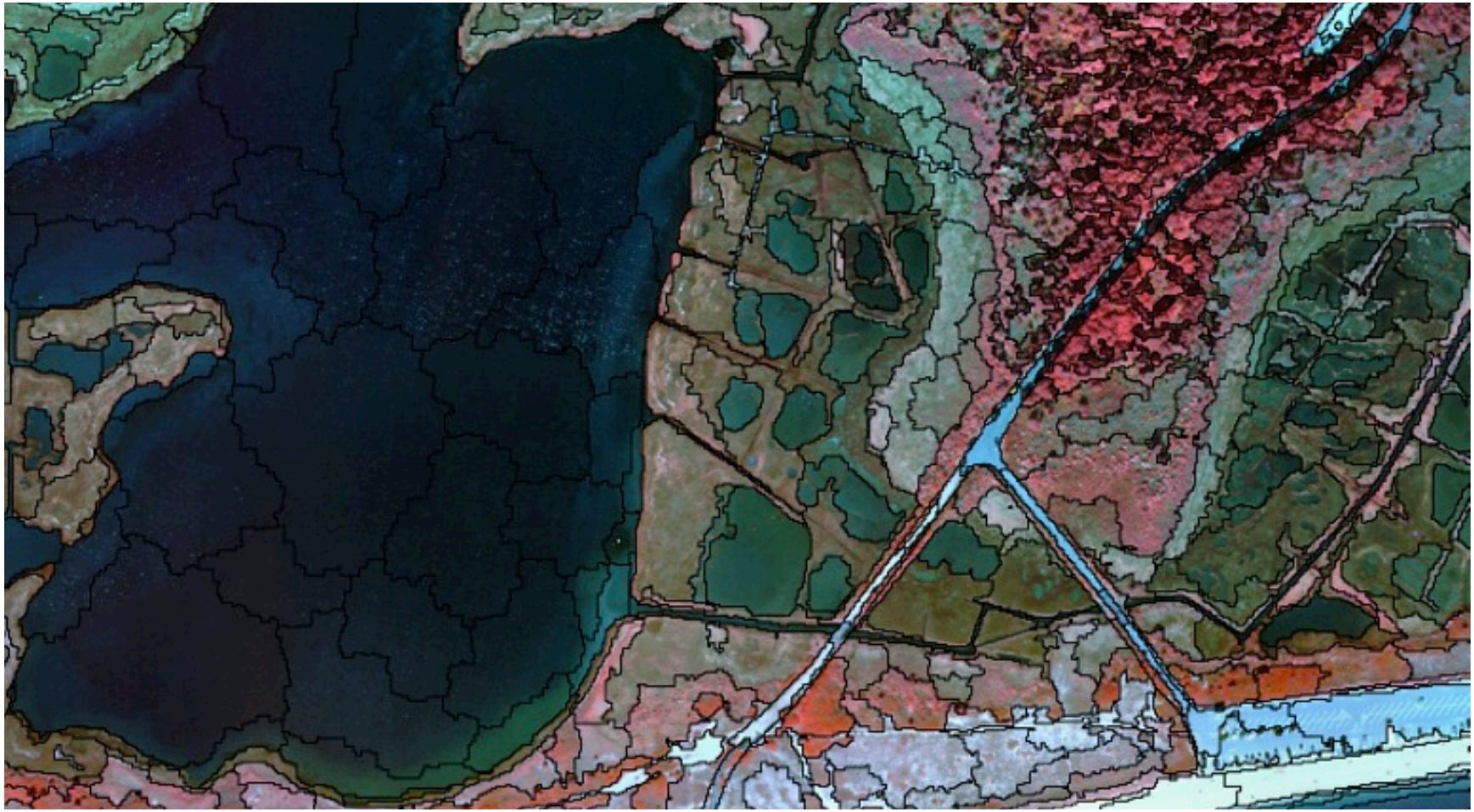
WBNERR Shoreline Change *(Vegetation Line)*
April 2001 -April 2013



2013 - Using remotely operated airframes



2013 - Using computer assisted mapping for change analysis



Values and Potential Applications of Findings

- Values – Local data, transparency, ability of stakeholders to provide input, sustained efforts, trust, translation
- MM - Conservation Commissions – Buffer Values
- MM - Planning – Spatial, Resilience
- SLR – Infrastructure Placement, Sizing, Repair
- HC – Zoning, Planning, Conservation
- Technologies – Mapping, Elevation, Remote Control Airframes
- CS – Planning, Zoning, Conservation Commissions, Ecosystem Services Valuation, Restoration

Local Vertical Control Network