Beneficial Reuse of Dredge Material to Rebuild Spartina alterniflora Wetlands along Pepper Creek

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DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DELAWARE CENTER FOR THE INLAND BAYS
Research. Educate. Restore.

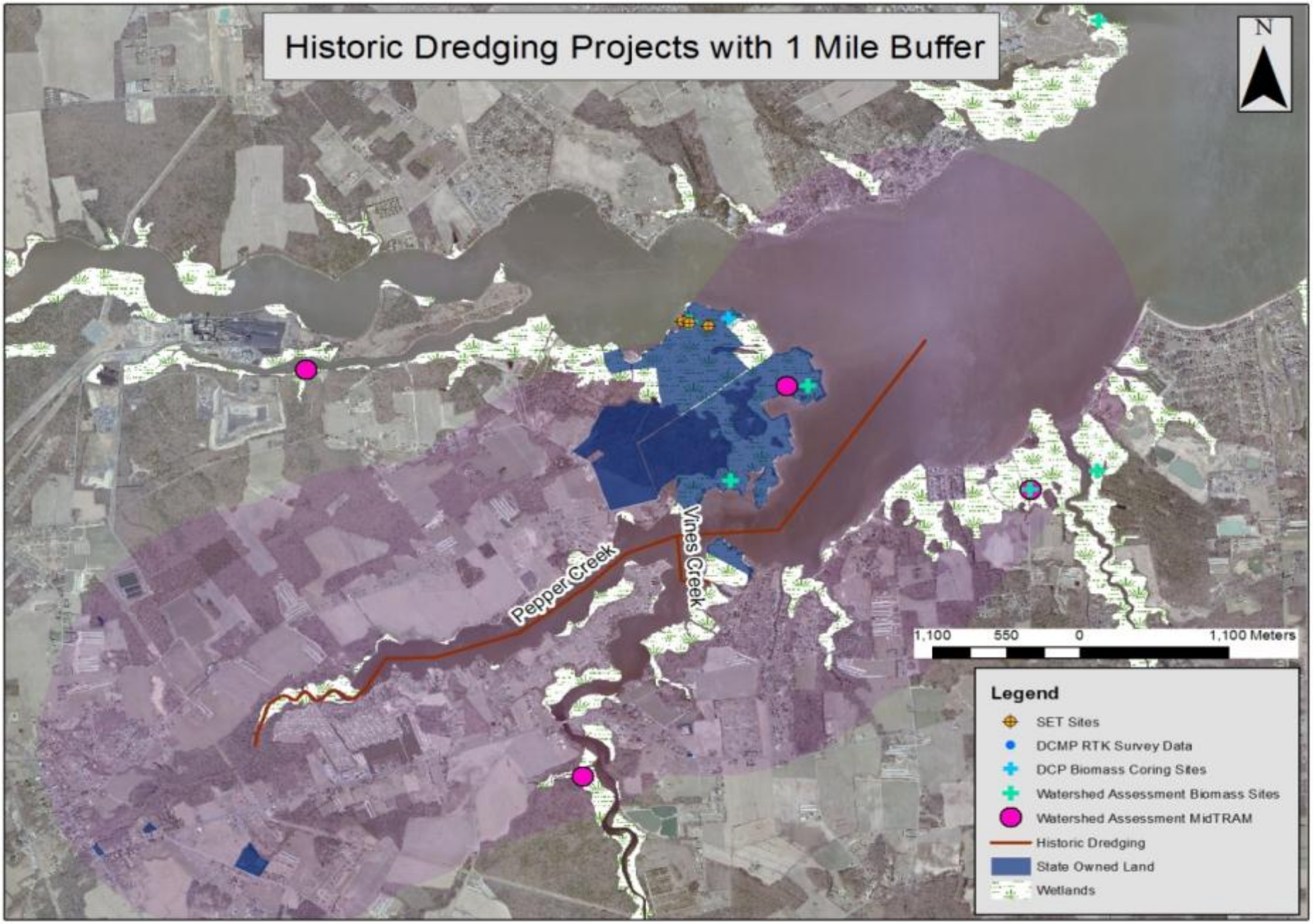
Thin-Layer Restoration Guide Book

- Site selection
- Establishing need
- Pre-application monitoring
- Site preparation
- Equipment
- Dredge and spray
- Post-application monitoring

- The Future of Thin-Layer Restoration: Lessons Learned

Fringe Wetland Workgroup Members

- DNREC:
  - Shoreline and Waterway Management
  - Wetland Monitoring and Assessment
  - Wetlands and Subaqueous Lands
  - Coastal Management
  - Fish and Wildlife
- Center for the Inland Bays


Historic Dredging Projects with 1 Mile Buffer
N
Pepper Creek
Vines Creek
1,100 550 0 1,100 Meters
Legend
SET Sites
DCMP RTK Survey Data
DCP Biomass Coring Sites
Watershed Assessment Biomass Sites
Watershed Assessment MidTRAM
Historic Dredging
State Owned Land
Wetlands

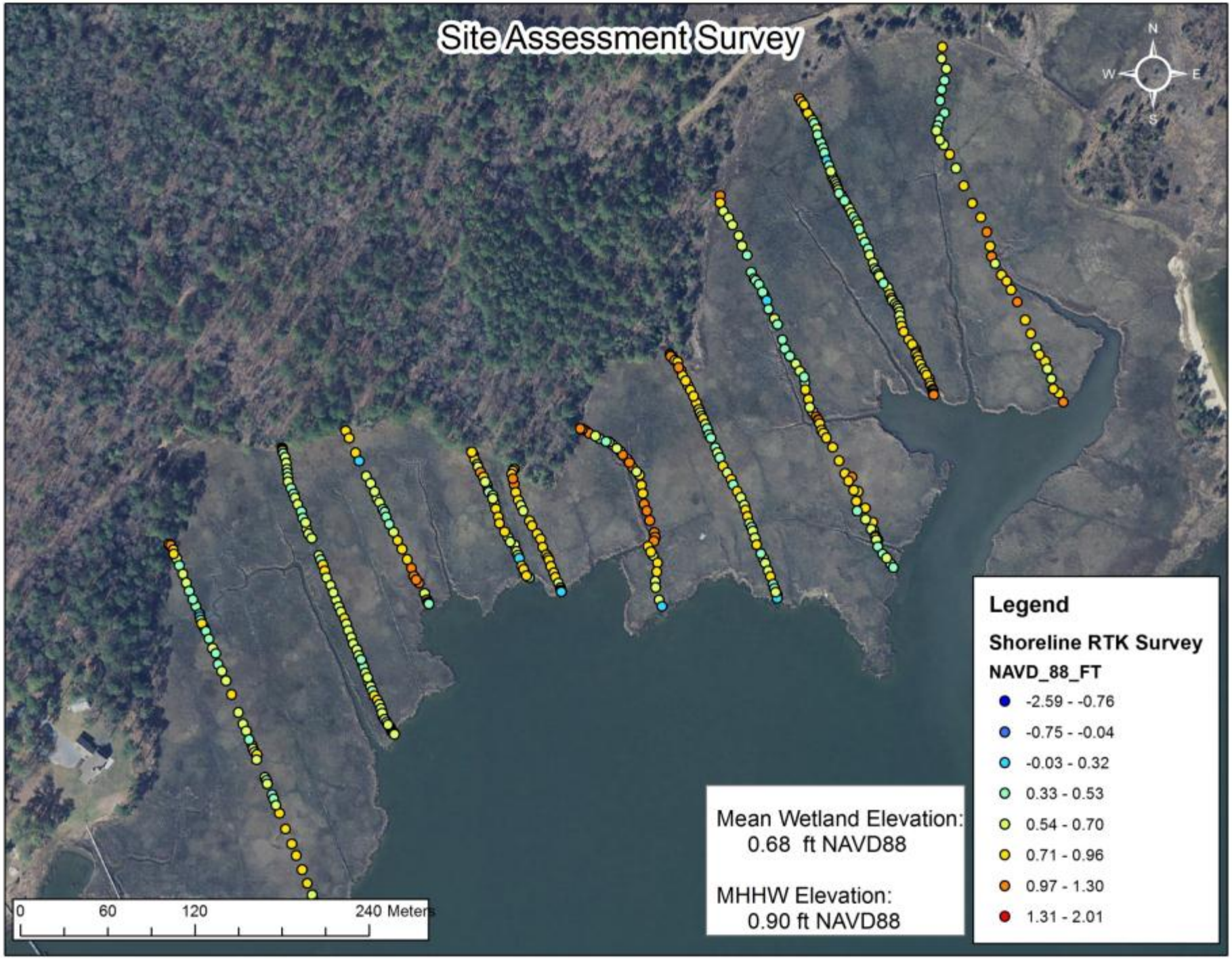
Site Selection

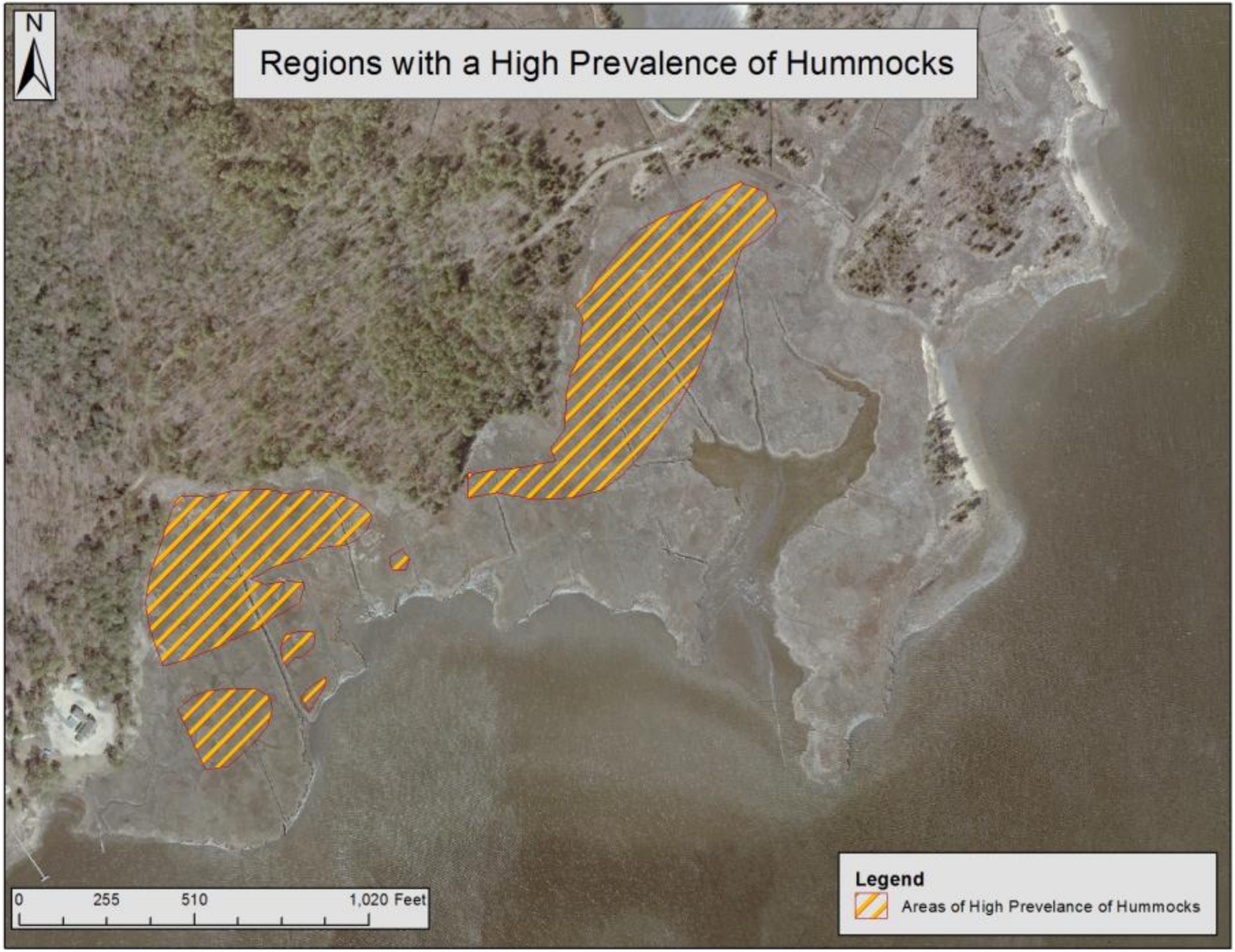
Property ownership- State of Delaware

Proximity to channel deepening- adjacent

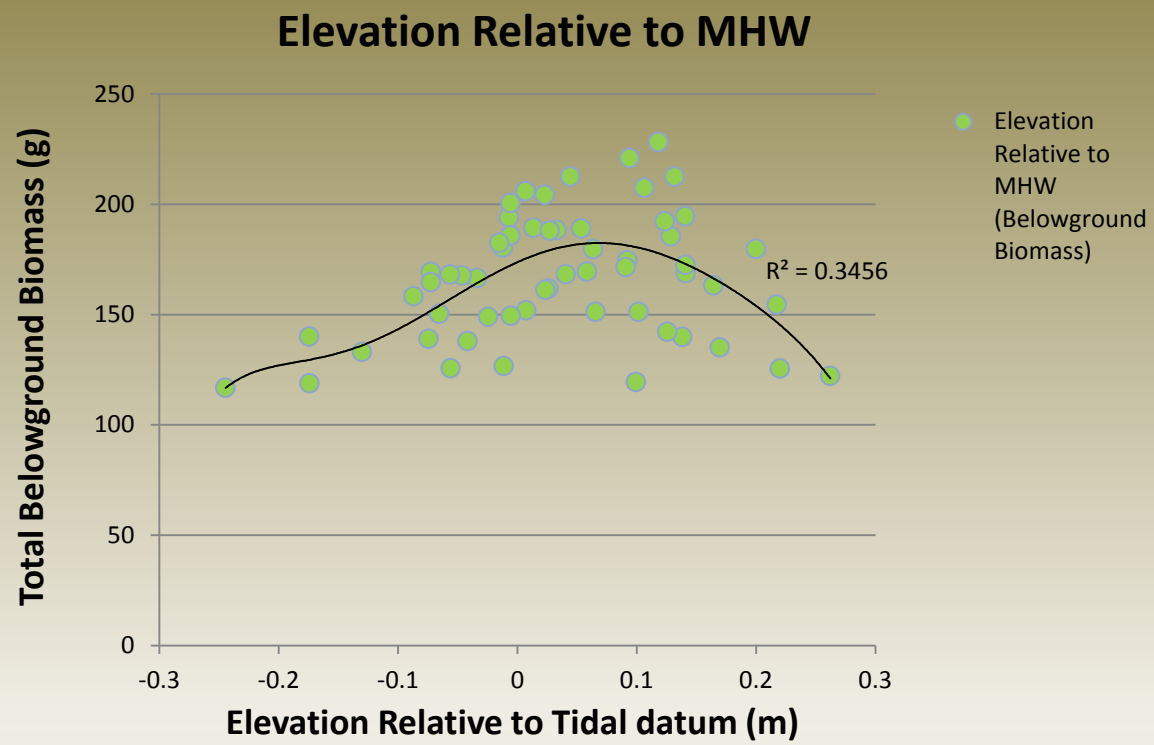
Site history- interior breaking up

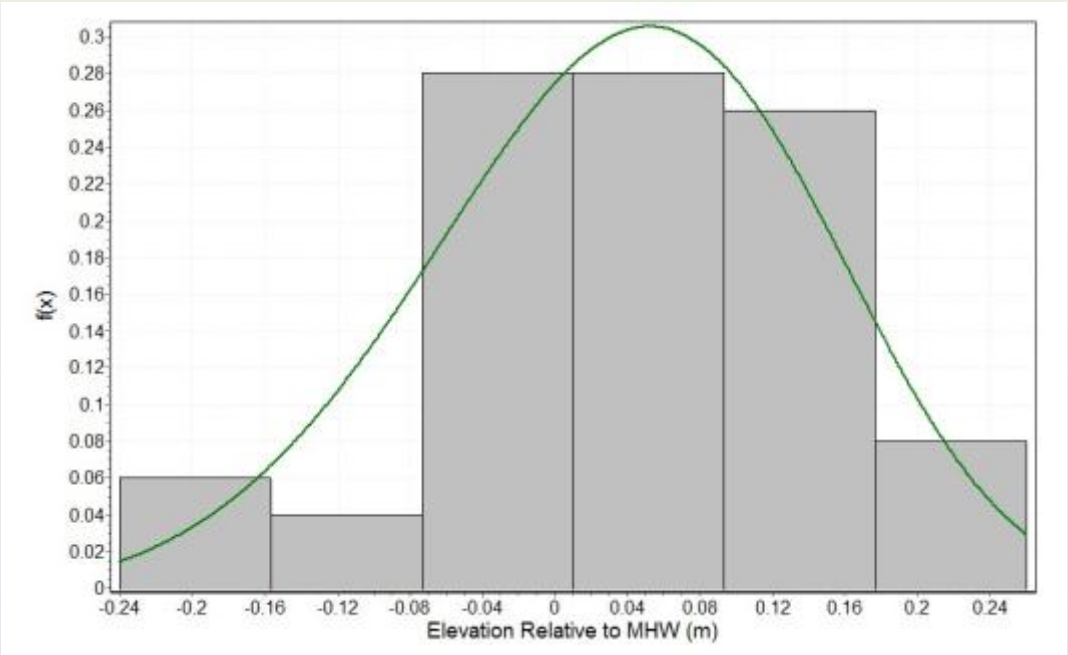
Need for replenishment- below average elevation


Site Assessment Survey
N
W
E
S
Legend
Shoreline RTK Survey
NAVD_88_FT
-2.59 - -0.76
-0.75 - -0.04
-0.03 - 0.32
0.33 - 0.53
0.54 - 0.70
0.71 - 0.96
0.97 - 1.30
1.31 - 2.01
Mean Wetland Elevation:
0.68 ft NAVD88
MHHW Elevation:
0.90 ft NAVD88
0
60
120
240 Meters


N
Regions with a High Prevalence of Hummocks
0
255
510
1,020 Feet
Legend
Areas of High Prevelance of Hummocks

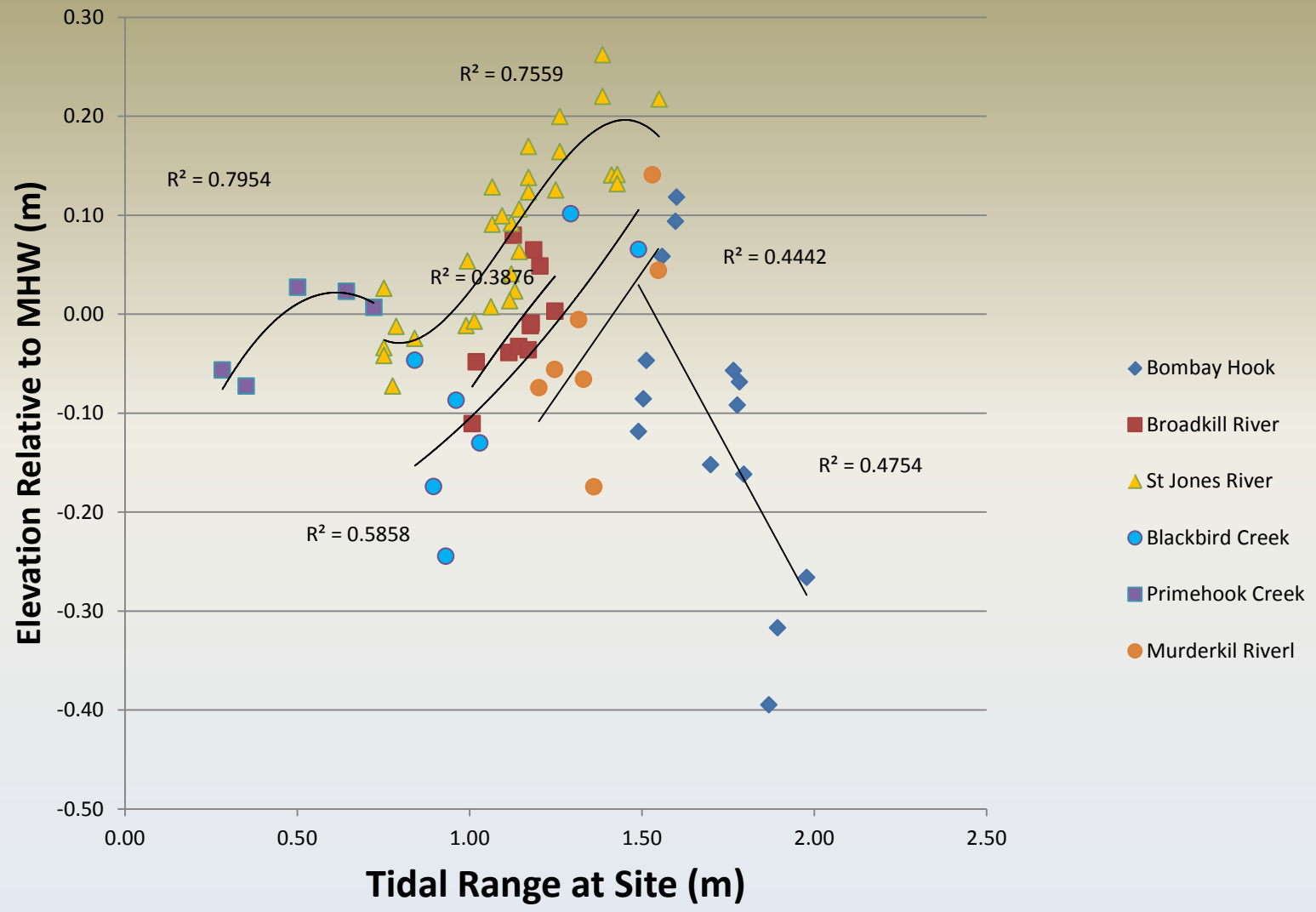
Evaluating the potential sites need for thin-layer application.

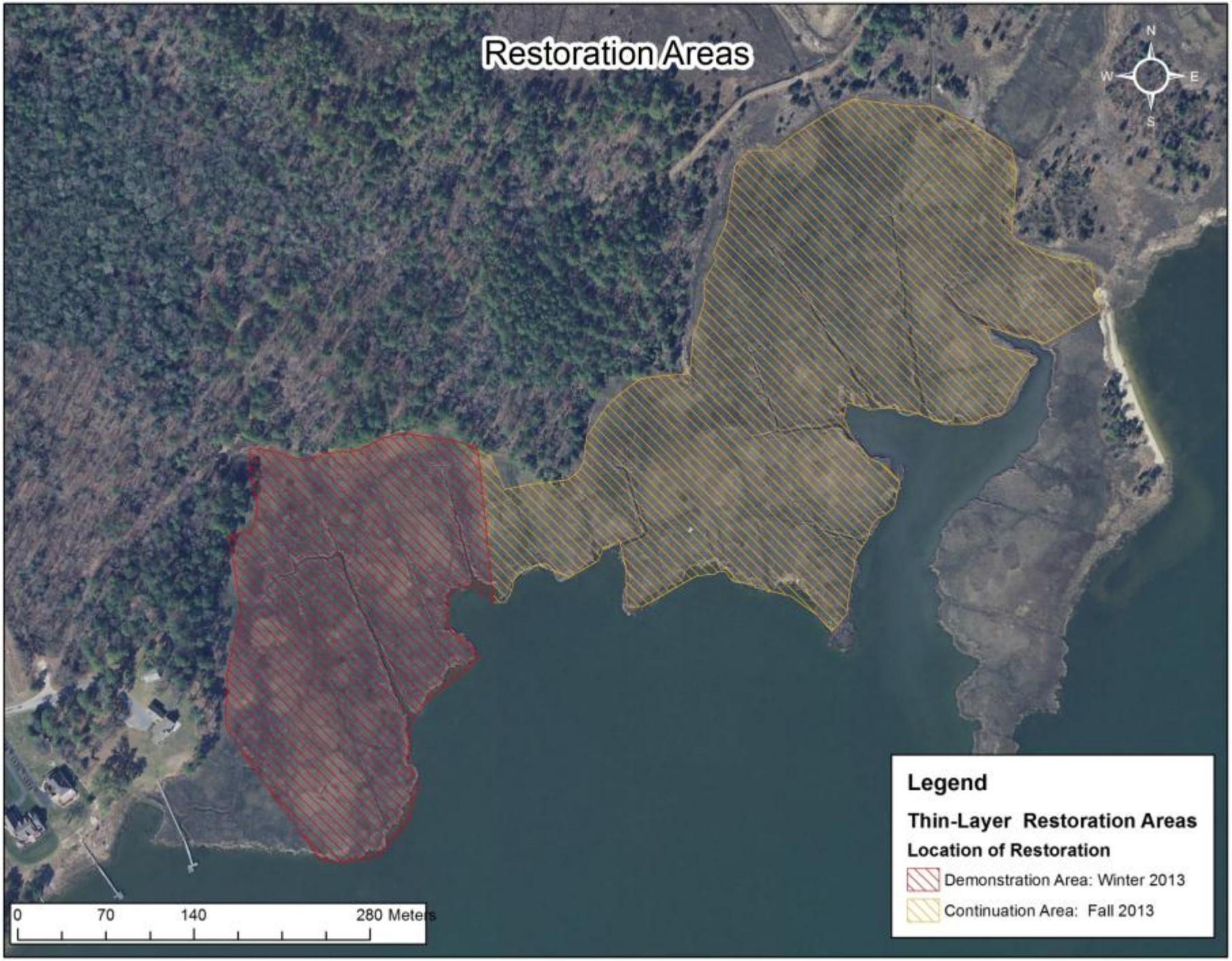


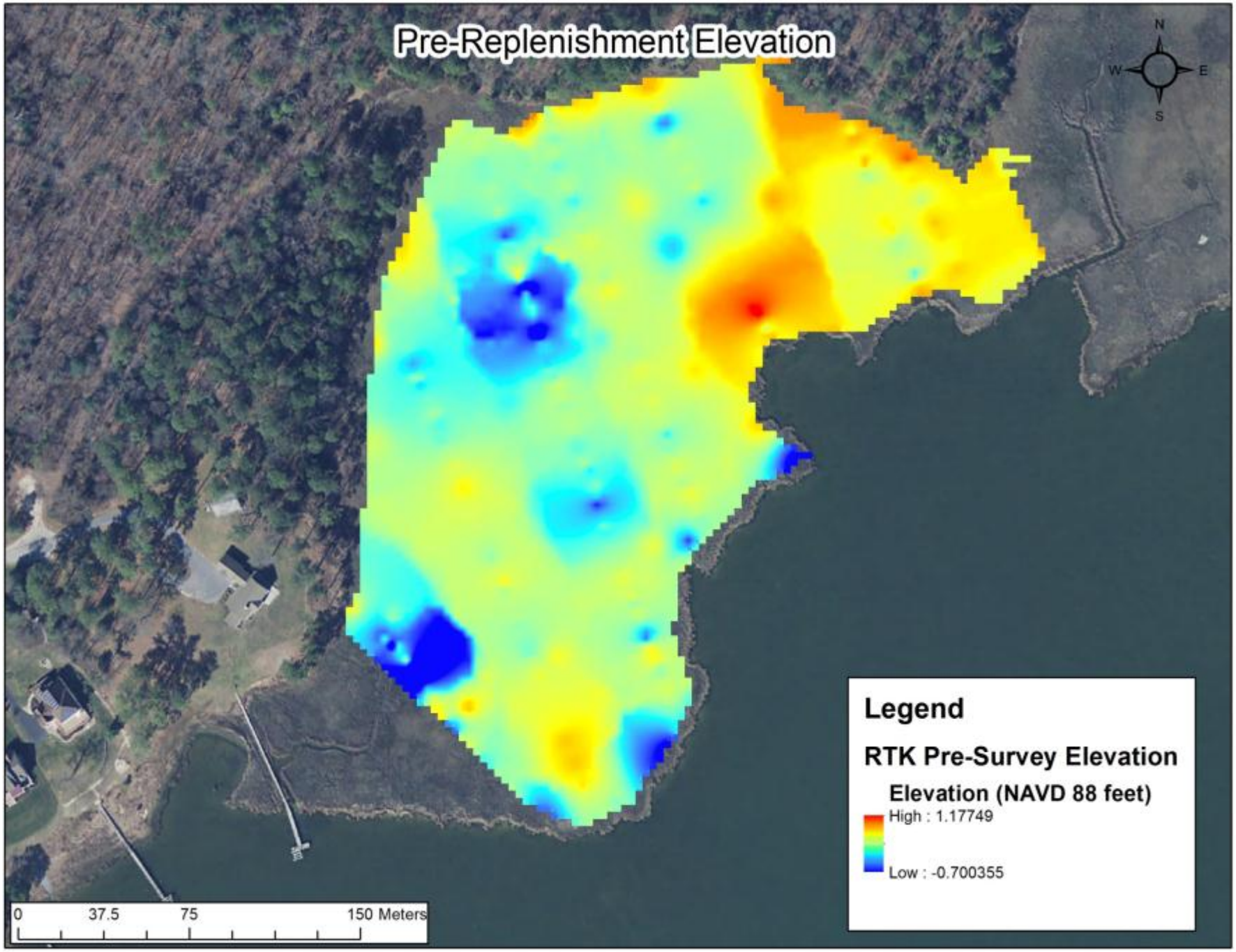


Wilson et al (In Review) . Developing the Goldilocks Elevation for Spartina alterniflora: Implications in Evaluating Sustainability and Restoration Potential of Wetlands

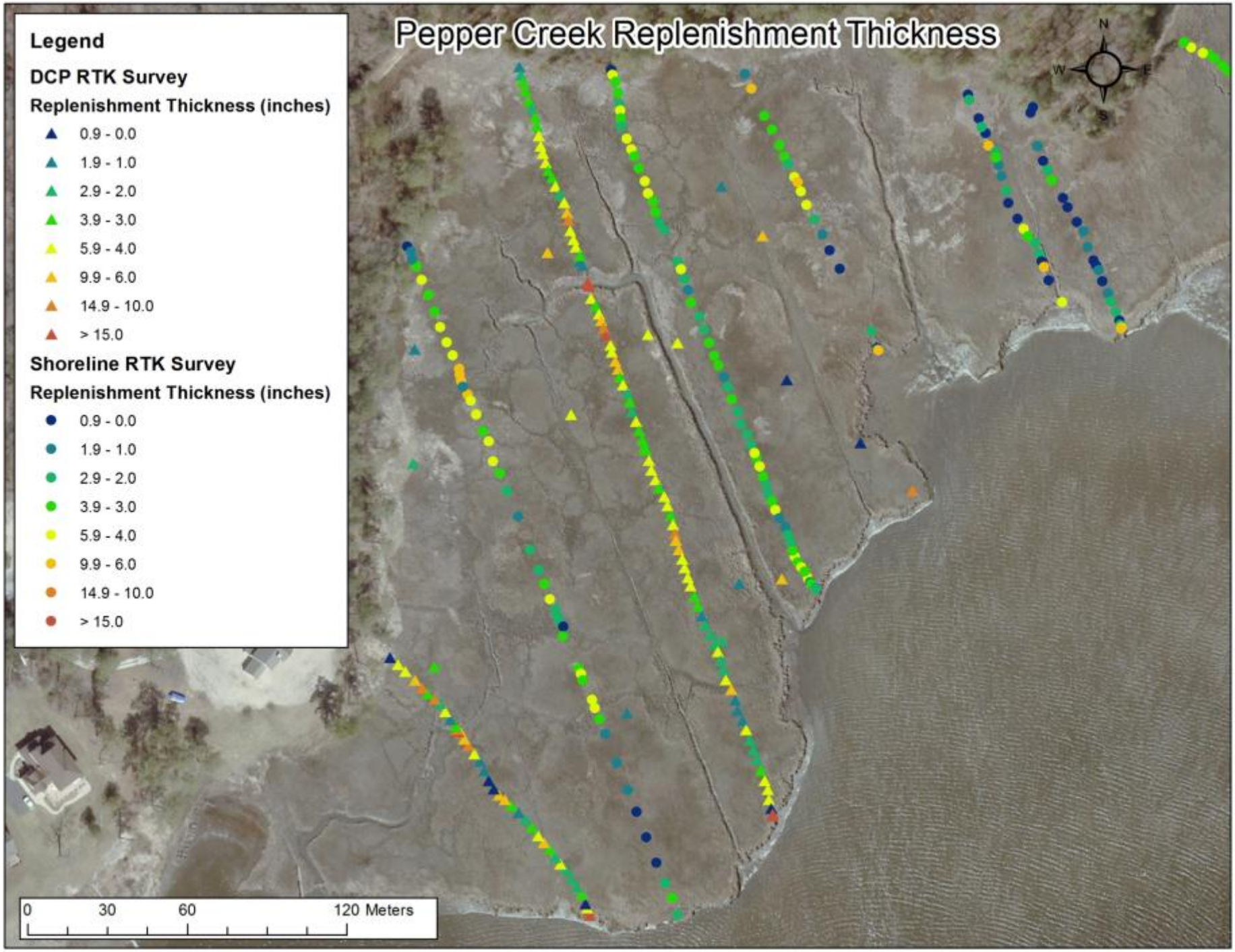
Marsh Elevation Relative to MHW vs Tidal Range

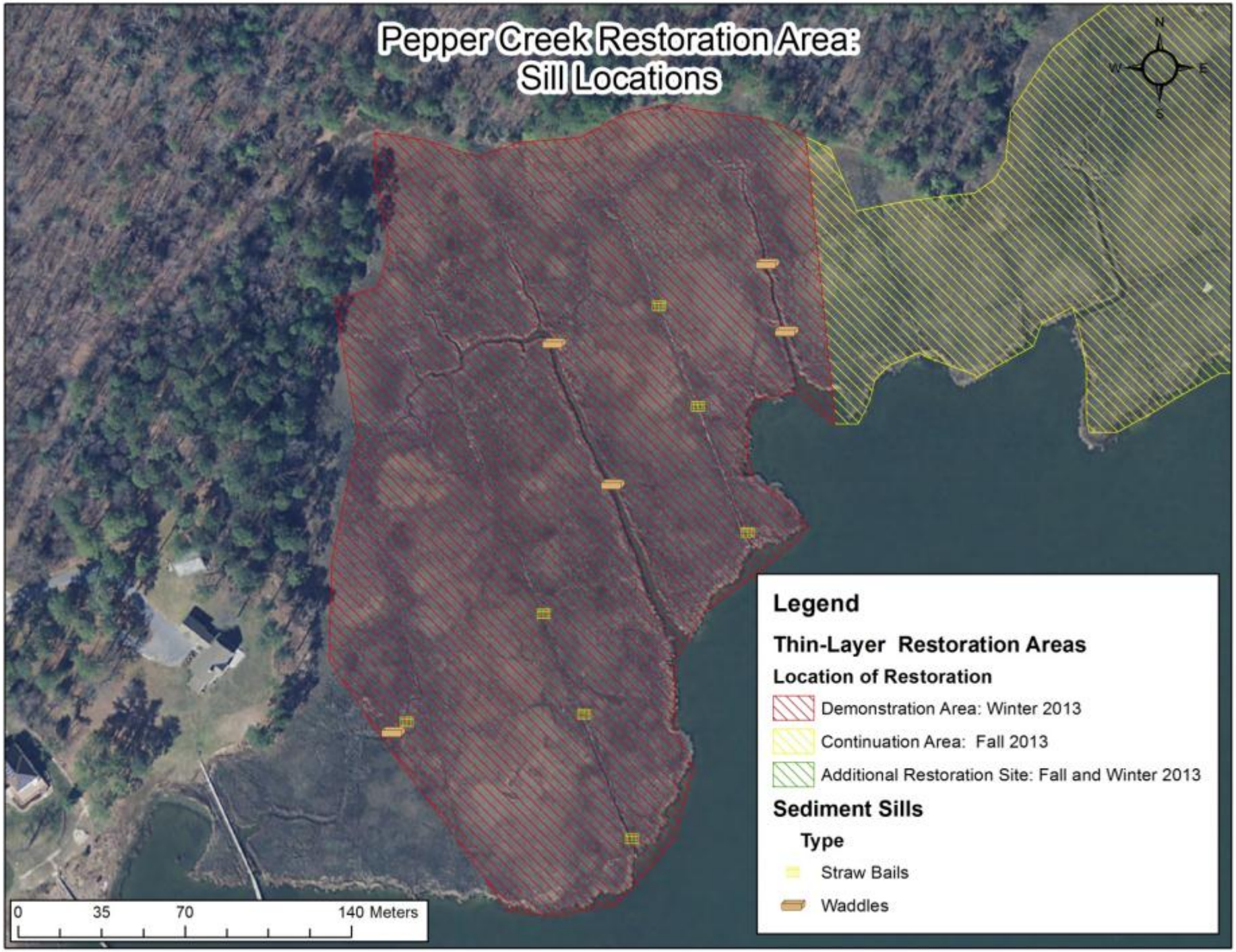


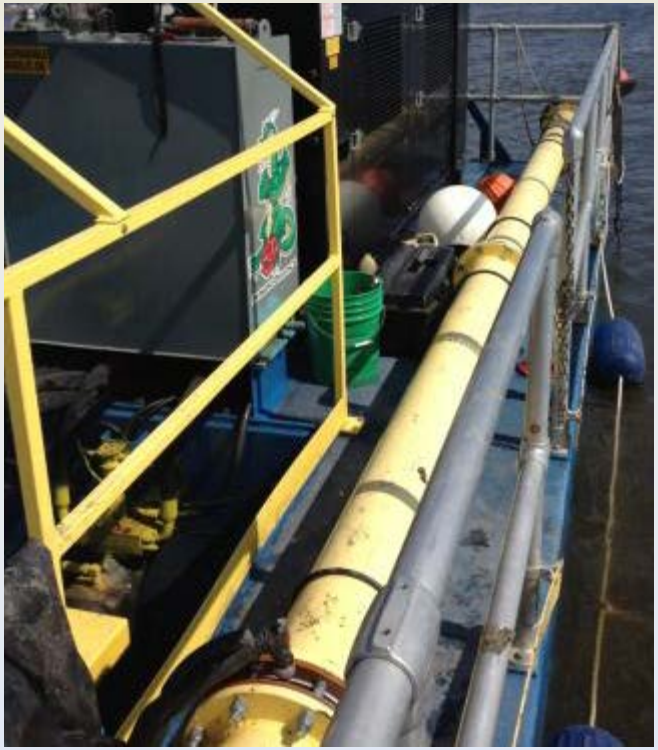

Restoration Areas
N
W
E
S
Legend
Thin-Layer Restoration Areas
Location of Restoration
Demonstration Area: Winter 2013
Continuation Area: Fall 2013
0
70
140
280 Meters


Pre-Replenishment Elevation
N
W
E
S
Legend
RTK Pre-Survey Elevation
Elevation (NAVD 88 feet)
High : 1.17749
Low : -0.700355
0
37.5
75
150 Meters

Demonstration Area
N
W
E
S
Pepper Creek Dredge Channel
Vines Creek
Legend
Navigational Channel Dredging
Demonstration Area: Winter 2013
0
75
150
300 Meters

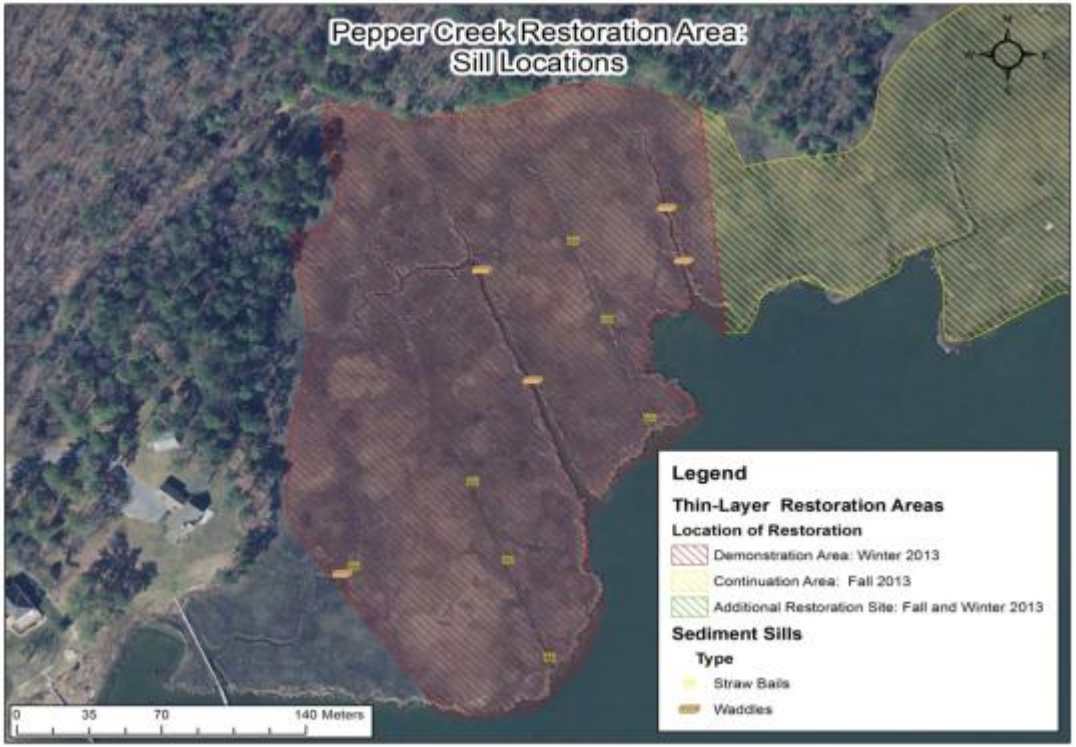

Pepper Creek Replenishment Thickness
Legend
DCP RTK Survey
Replenishment Thickness (inches)
0.9 - 0.0
1.9 - 1.0
2.9 - 2.0
3.9 - 3.0
5.9 - 4.0
9.9 - 6.0
14.9 - 10.0
> 15.0
Shoreline RTK Survey
Replenishment Thickness (inches)
0.9 - 0.0
1.9 - 1.0
2.9 - 2.0
3.9 - 3.0
5.9 - 4.0
9.9 - 6.0
14.9 - 10.0
> 15.0
N
W
E
S
0
30
60
120 Meters

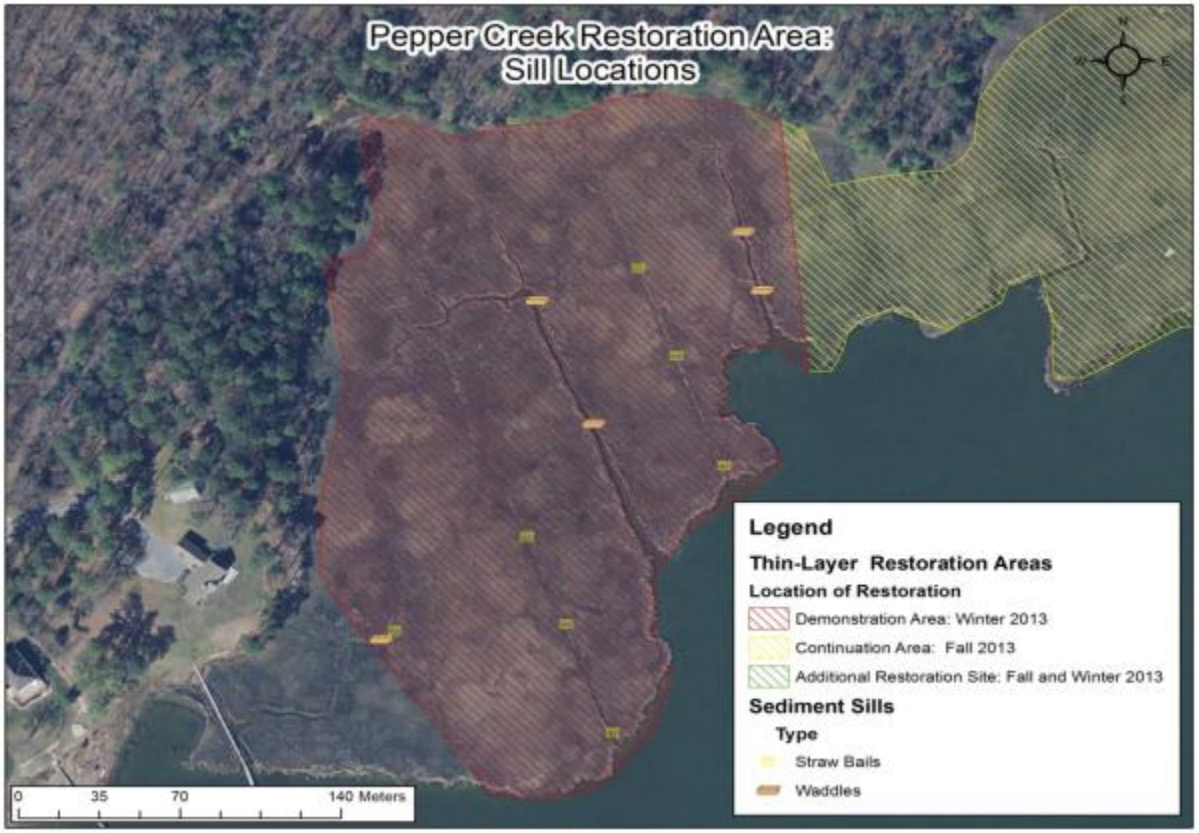

Pepper Creek Restoration Area:
Sill Locations
N
W
E
S
Legend
Thin-Layer Restoration Areas
Location of Restoration
Demonstration Area: Winter 2013
Continuation Area: Fall 2013
Additional Restoration Site: Fall and Winter 2013
Sediment Sills
Type
Straw Bails
Waddles
0
35
70
140 Meters



Dredge and spray

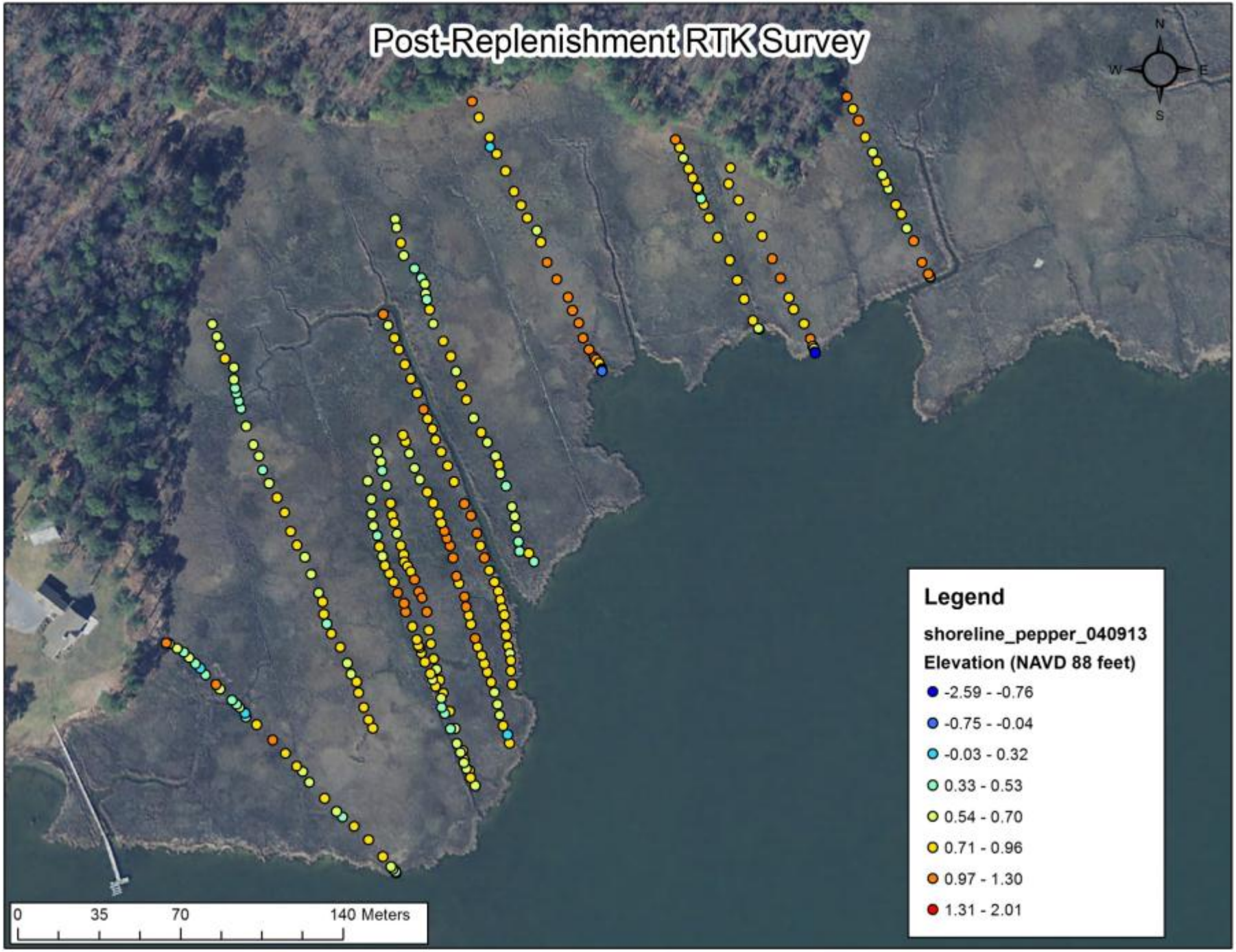
Pepper Creek Restoration Area:
Extent of Demonstration Area
Legend
Spray Barge Position
Area of Dredge Material Coverage
Sediment Sills
Type
Straw Bails
Waddles
0
35
70
140 Meters

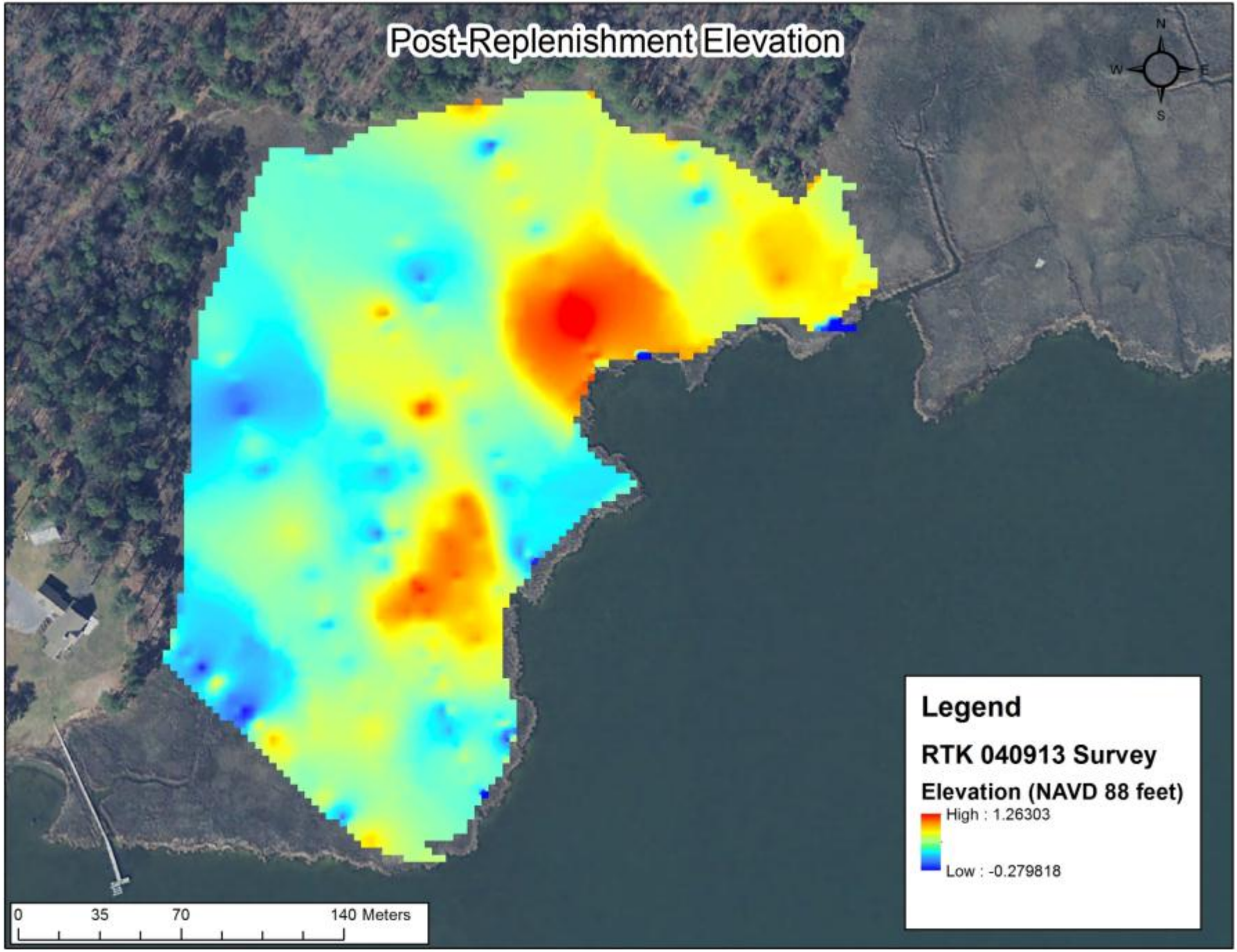

Pepper Creek Restoration Area:
Sill Locations
Legend
Thin-Layer Restoration Areas
Location of Restoration
Demonstration Area: Winter 2013
Continuation Area: Fall 2013
Additional Restoration Site: Fall and Winter 2013
Sediment Sills
Type
Straw Bails
Waddles
0
35
70
140 Meters

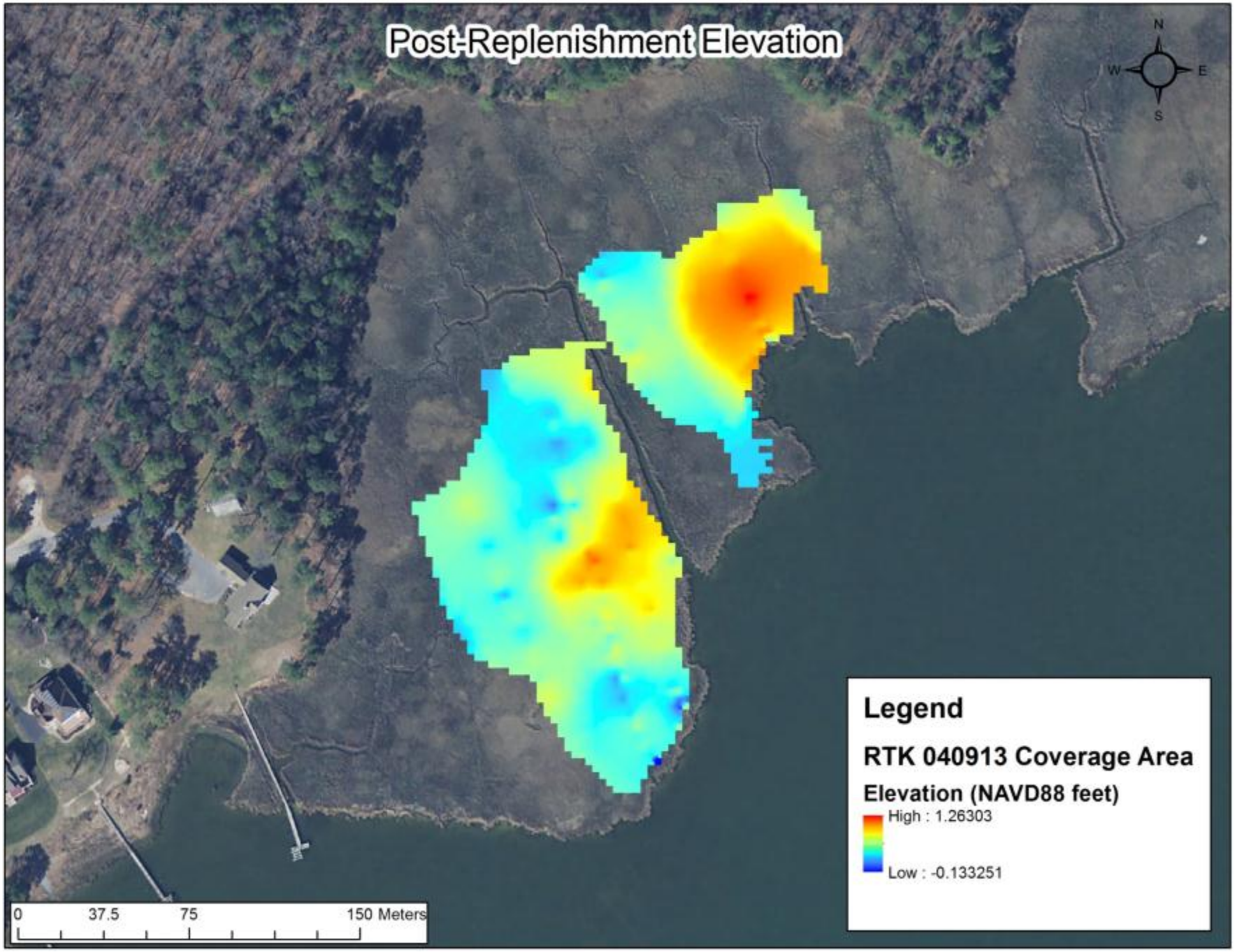

Pepper Creek Restoration Area:
Sill Locations
N
W
E
S
Legend
Thin-Layer Restoration Areas
Location of Restoration
Demonstration Area: Winter 2013
Continuation Area: Fall 2013
Additional Restoration Site: Fall and Winter 2013
Sediment Sills
Type
Straw Bails
Waddles
0
35
70
140 Meters

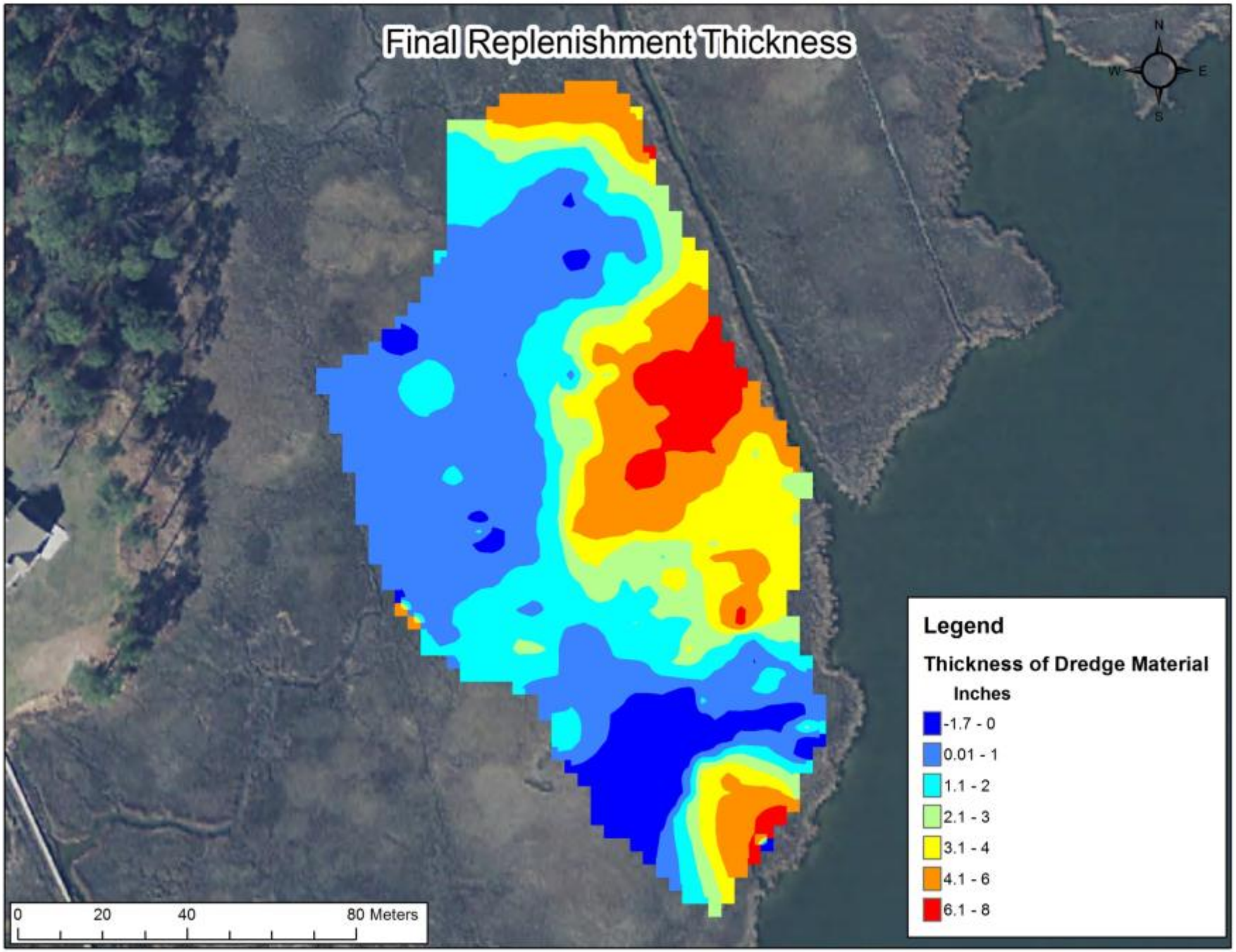
Pepper Creek Restoration Area:
Extent of Demonstration Area
N
W
E
S
Legend
Reach Dredged for Demonstartion Project
Spray Barge Position
Navigational Channel Dredging
Area of Dredge Material Coverage
0
60
120
240 Meters
Pepper Creek Dredge Channel
Vines Creek

Pepper Creek Restoration Area:
Area of Coverage
N
W
E
S
Legend
Spray Barge Position
Directions of Overland Flow
Area of Dredge Material Coverage
Sediment Sills
Type
Straw Bails
Waddles
0
30
60
120 Meters


Post-Replenishment RTK Survey
N
W
E
S
Legend
shoreline_pepper_040913
Elevation (NAVD 88 feet)
-2.59 - -0.76
-0.75 - -0.04
-0.03 - 0.32
0.33 - 0.53
0.54 - 0.70
0.71 - 0.96
0.97 - 1.30
1.31 - 2.01
0
35
70
140 Meters


Post-Replenishment Elevation
N
W
E
S
Legend
RTK 040913 Survey
Elevation (NAVD 88 feet)
High : 1.26303
Low : -0.279818
0
35
70
140 Meters


Post-Replenishment Elevation
N
W
E
S
Legend
RTK 040913 Coverage Area
Elevation (NAVD88 feet)
High : 1.26303
Low : -0.133251
0
37.5
75
150 Meters


Final Replenishment Thickness
N
W
E
S
Legend
Thickness of Dredge Material
Inches
-1.7 - 0
0.01 - 1
1.1 - 2
2.1 - 3
3.1 - 4
4.1 - 6
6.1 - 8
0
20
40
80 Meters

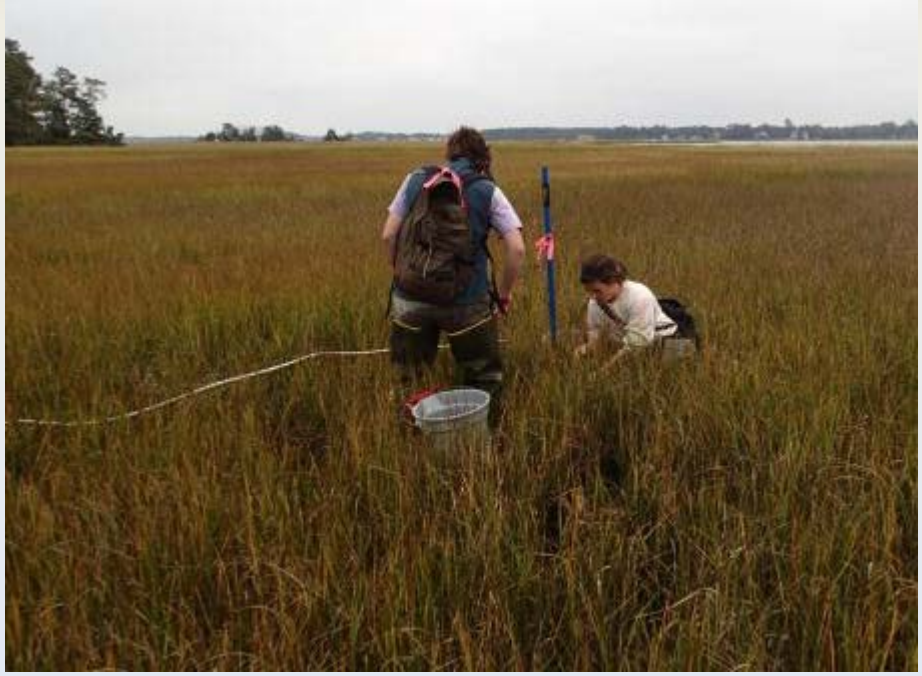
February 25

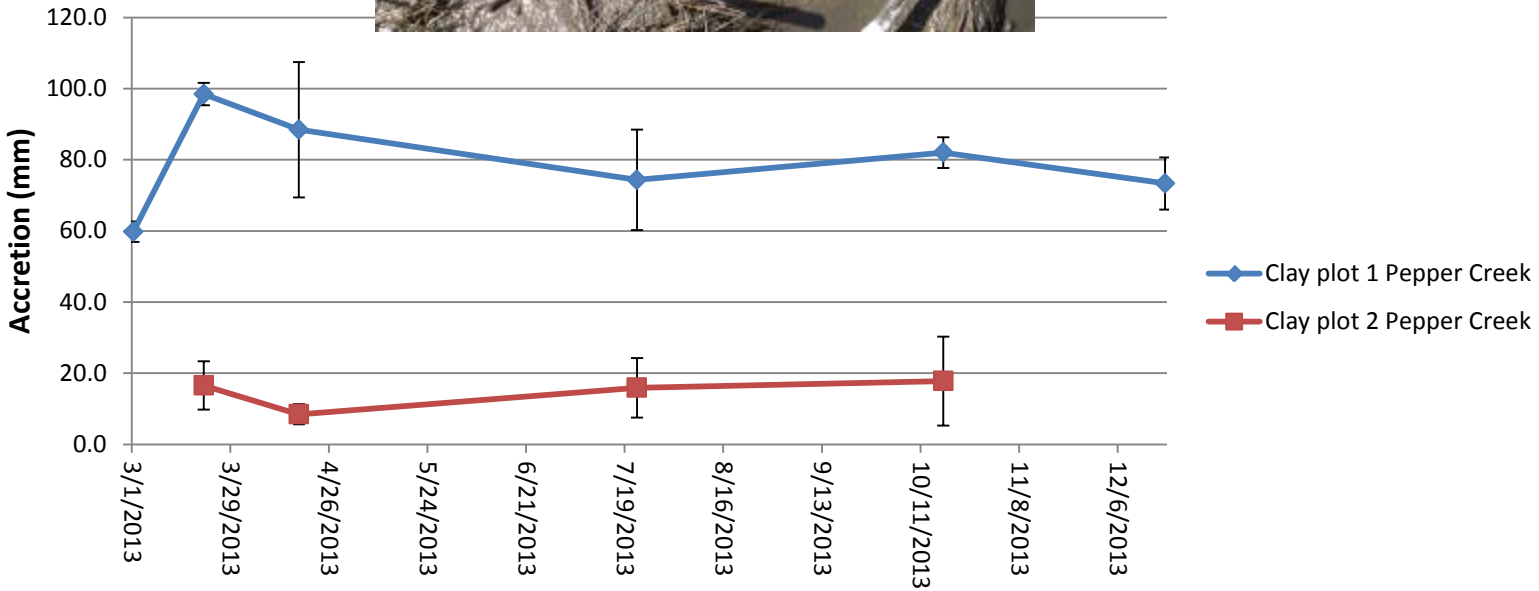
March 21

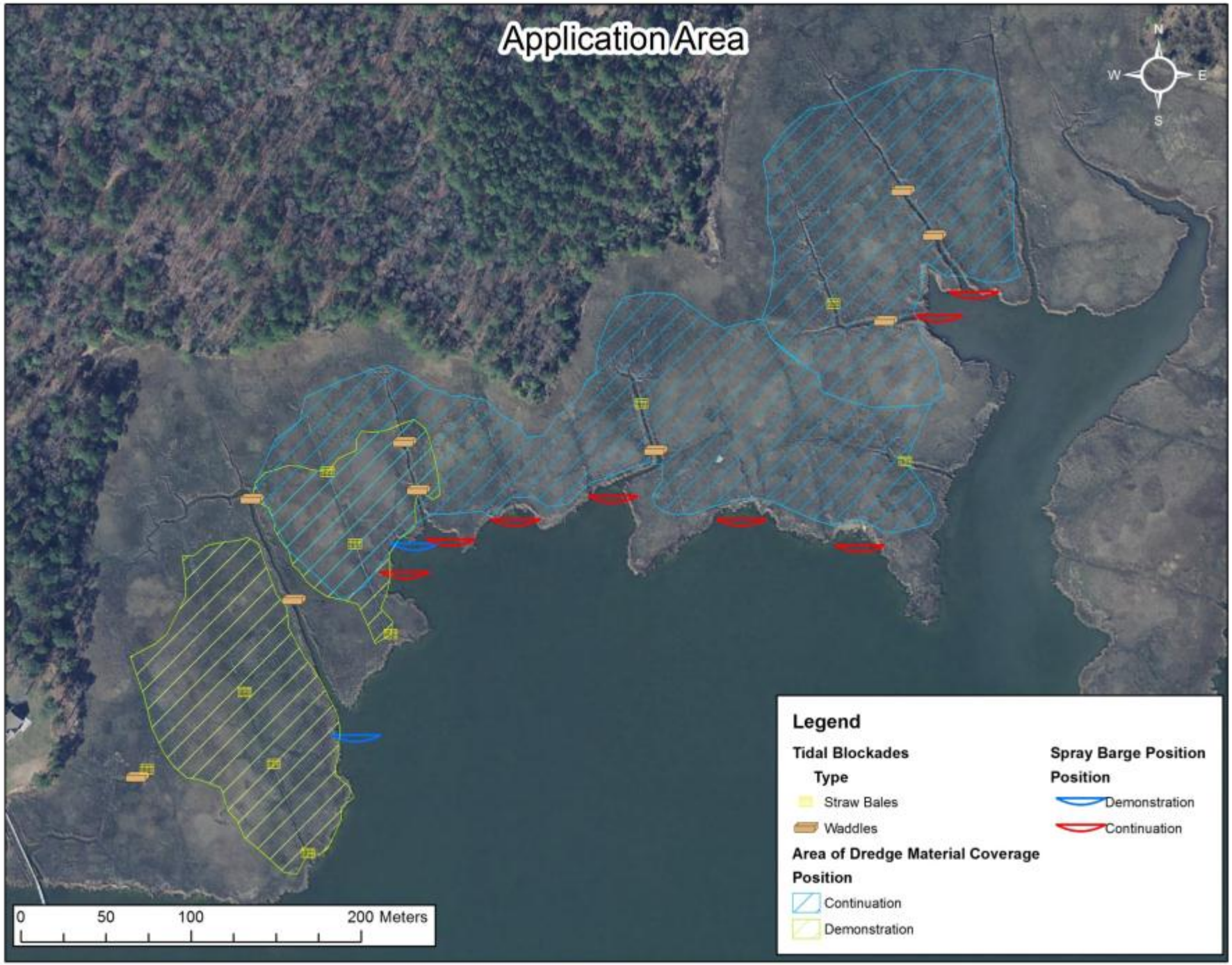
April 17

May 30

Monitoring and Assessment




Accretion (mm)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
3/1/2013
3/29/2013
4/26/2013
5/24/2013
6/21/2013
7/19/2013
8/16/2013
9/13/2013
10/11/2013
11/8/2013
12/6/2013
Clay plot 1 Pepper Creek
Clay plot 2 Pepper Creek


Application Area
N
W
E
S
Legend
Tidal Blockades
Type
Straw Bales
Waddles
Area of Dredge Material Coverage
Position
Continuation
Demonstration
Spray Barge Position
Position
Demonstration
Continuation
0
50
100
200 Meters

What is the Future of Thin-Layer Restoration?

- Permitting Issues?
- Institutionalizion within Navigational Dredging
  - State and Federal
  - Private Partnerships
- Monitoring is Key
  - Separation of Monitoring from Application