

SEA LEVEL RISE RESILIENCY IN DELAWARE

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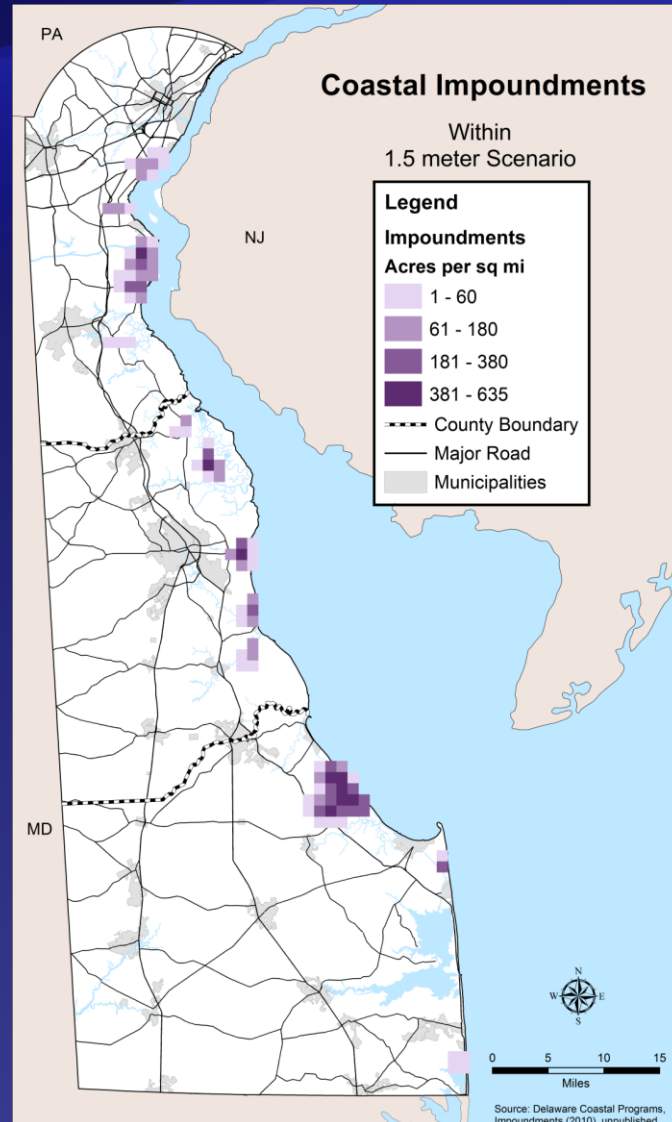
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SEA LEVEL RISE A PRIORITY IN DE:

- ◆ Sea Level Rise Vulnerability Assessment
- ◆ Executive Order 41
- ◆ Delaware Bayshore Initiative
- ◆ Adaptation/Restoration Projects:
 - ◆ Impoundment restoration and management
 - ◆ Marsh restoration
 - ◆ Beach restoration

Assess Climate Impacts and Vulnerabilities

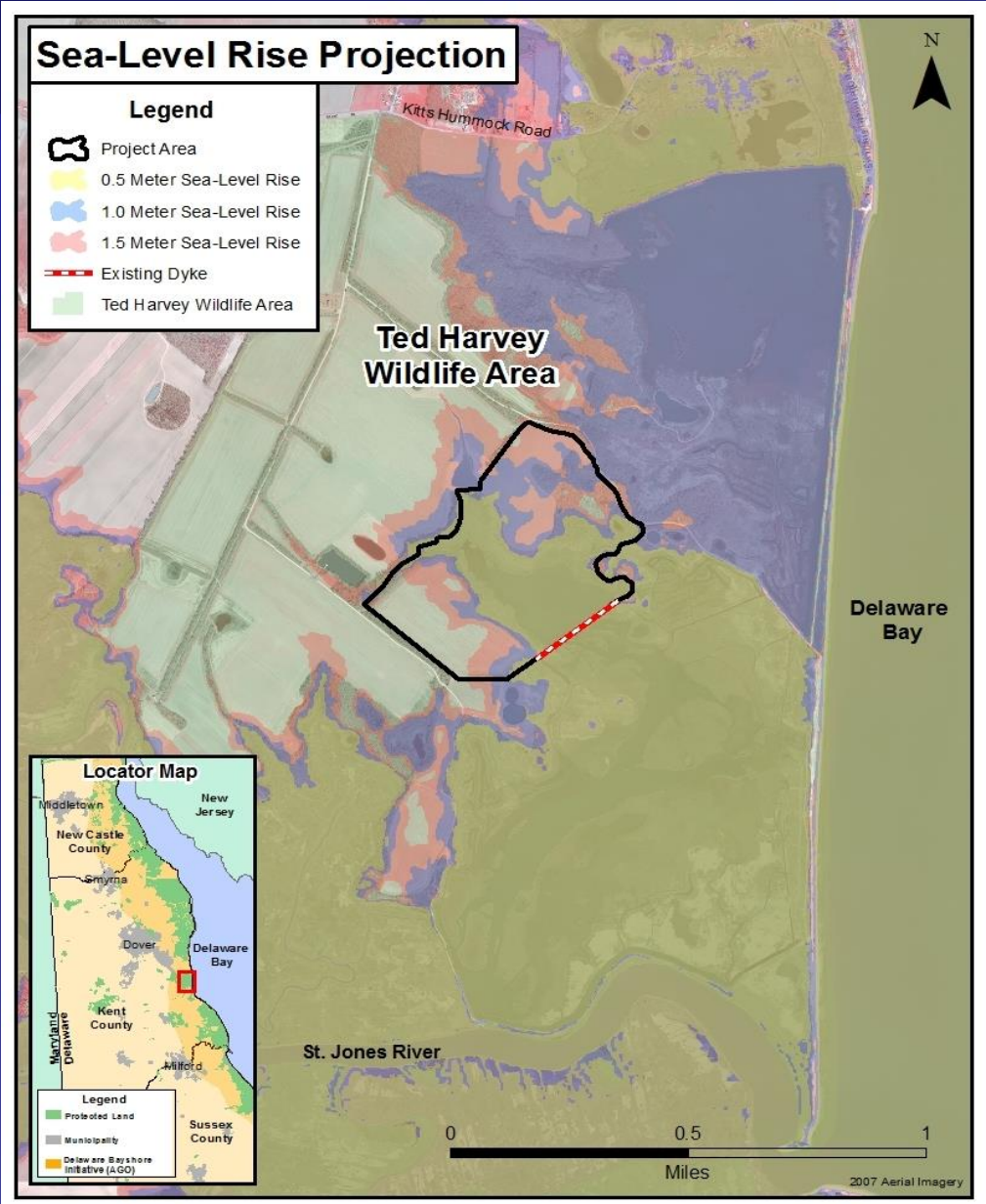
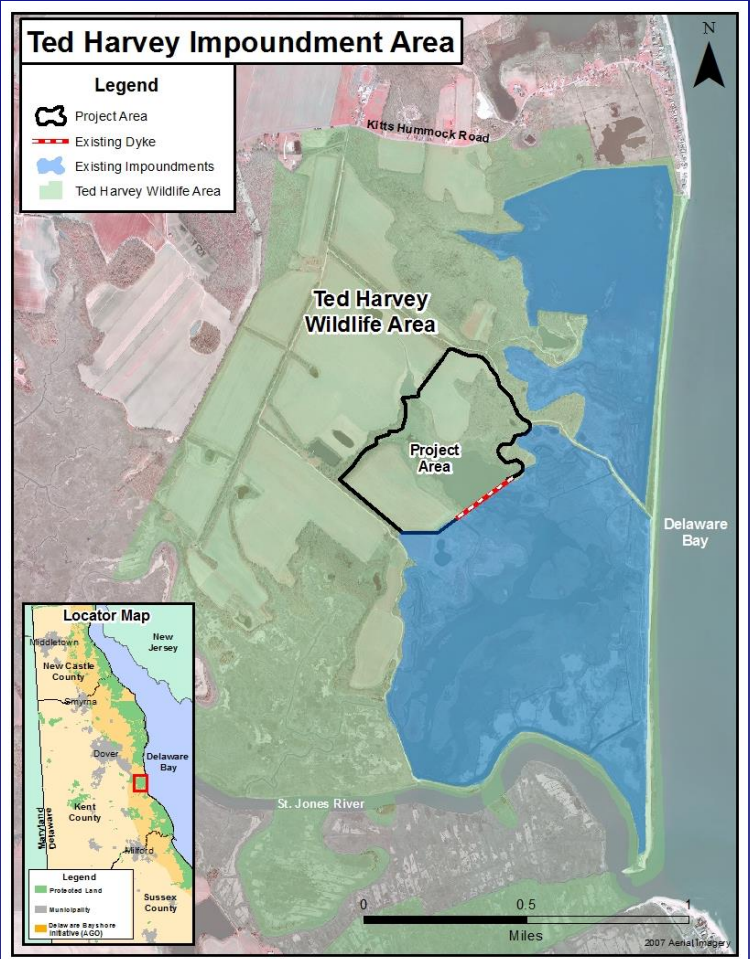


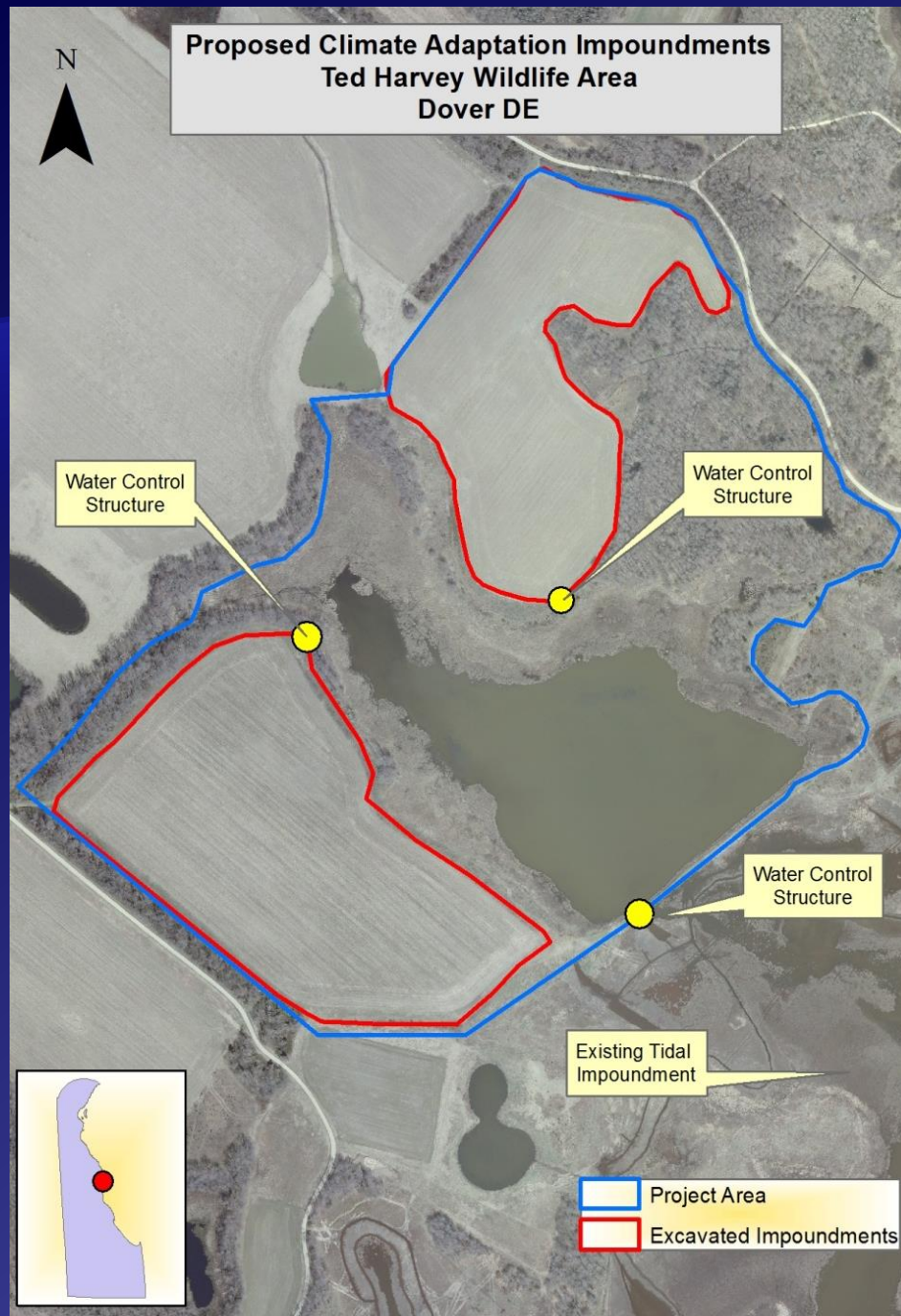
Identify Possible Adaptation Options

Goal: Maintain Impoundments for another 30 years

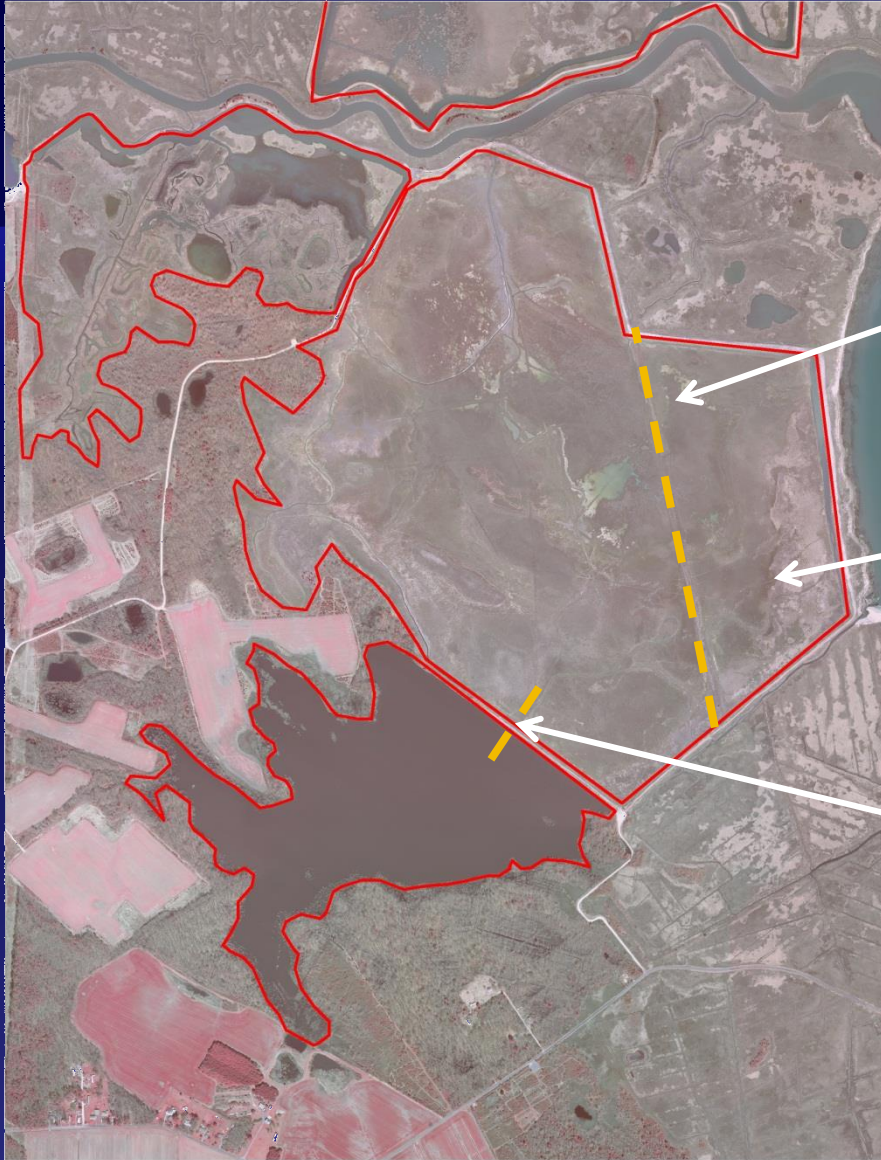
- ◆ Raise levees and water control structures
- ◆ Raise elevation with thin soil application
- ◆ Revert to tidal salt marsh
- ◆ Retreat inland/Abandon
- ◆ Etc...Site Specific

Facilitated Marsh Migration





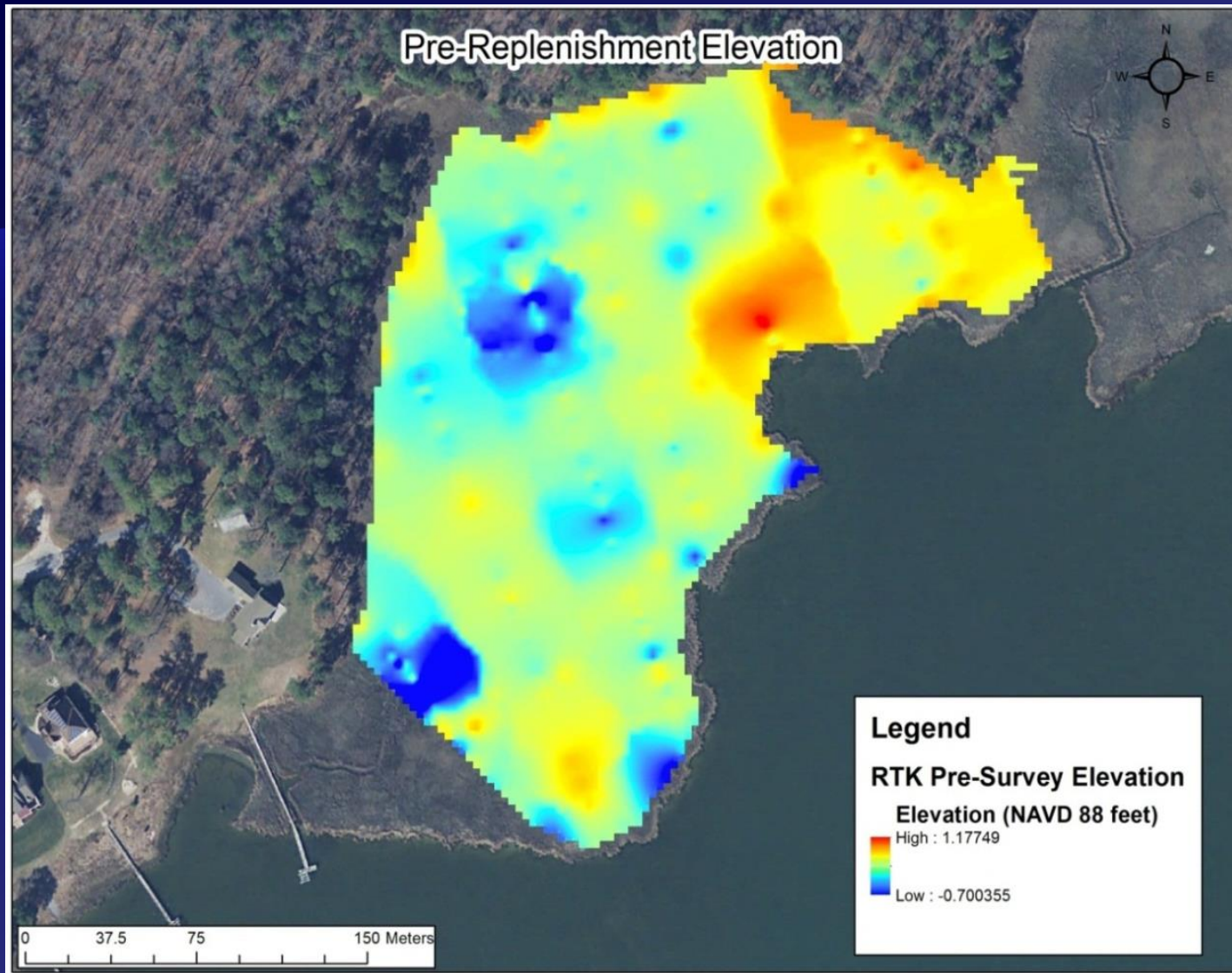
Thin Layer Deposition

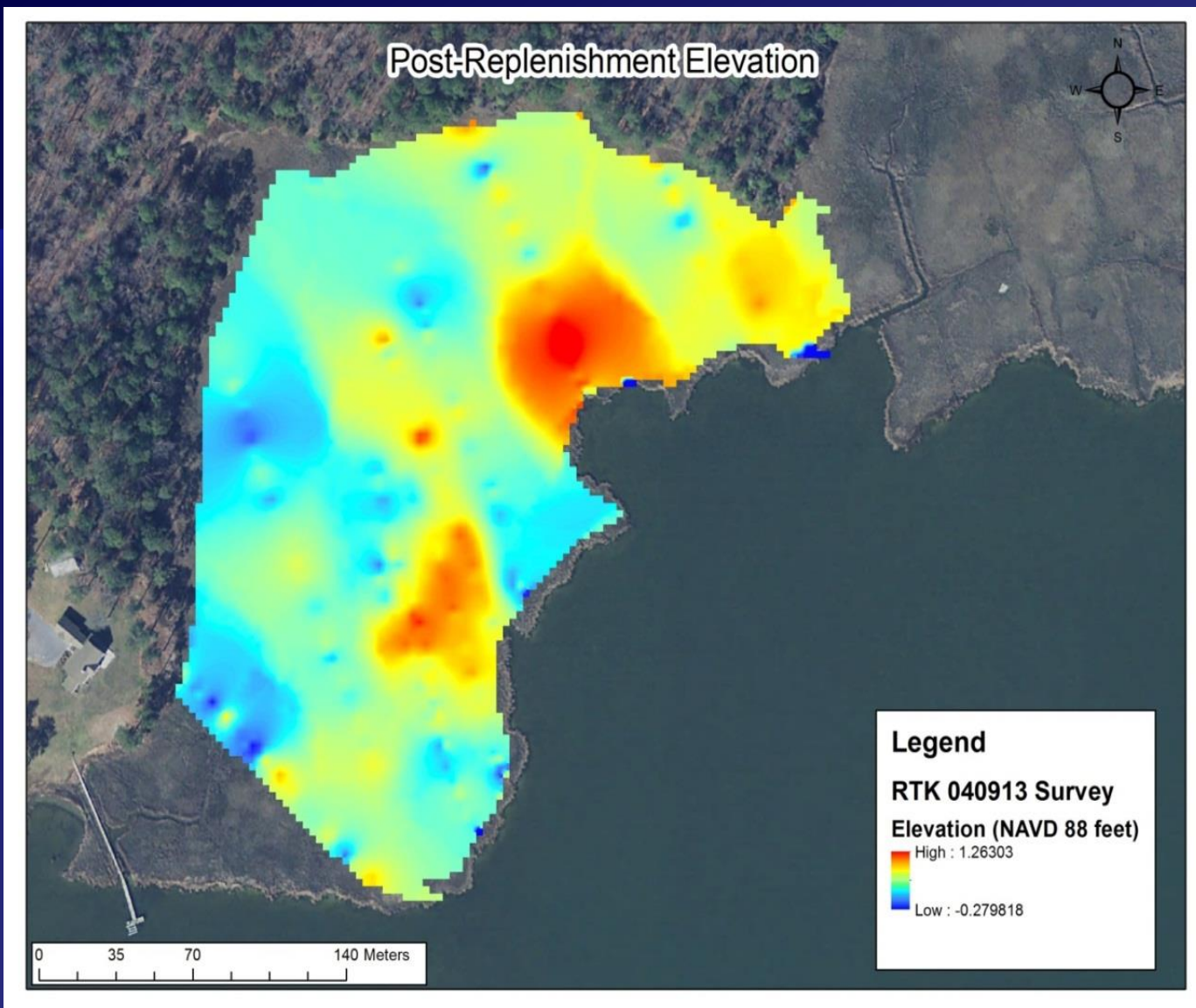


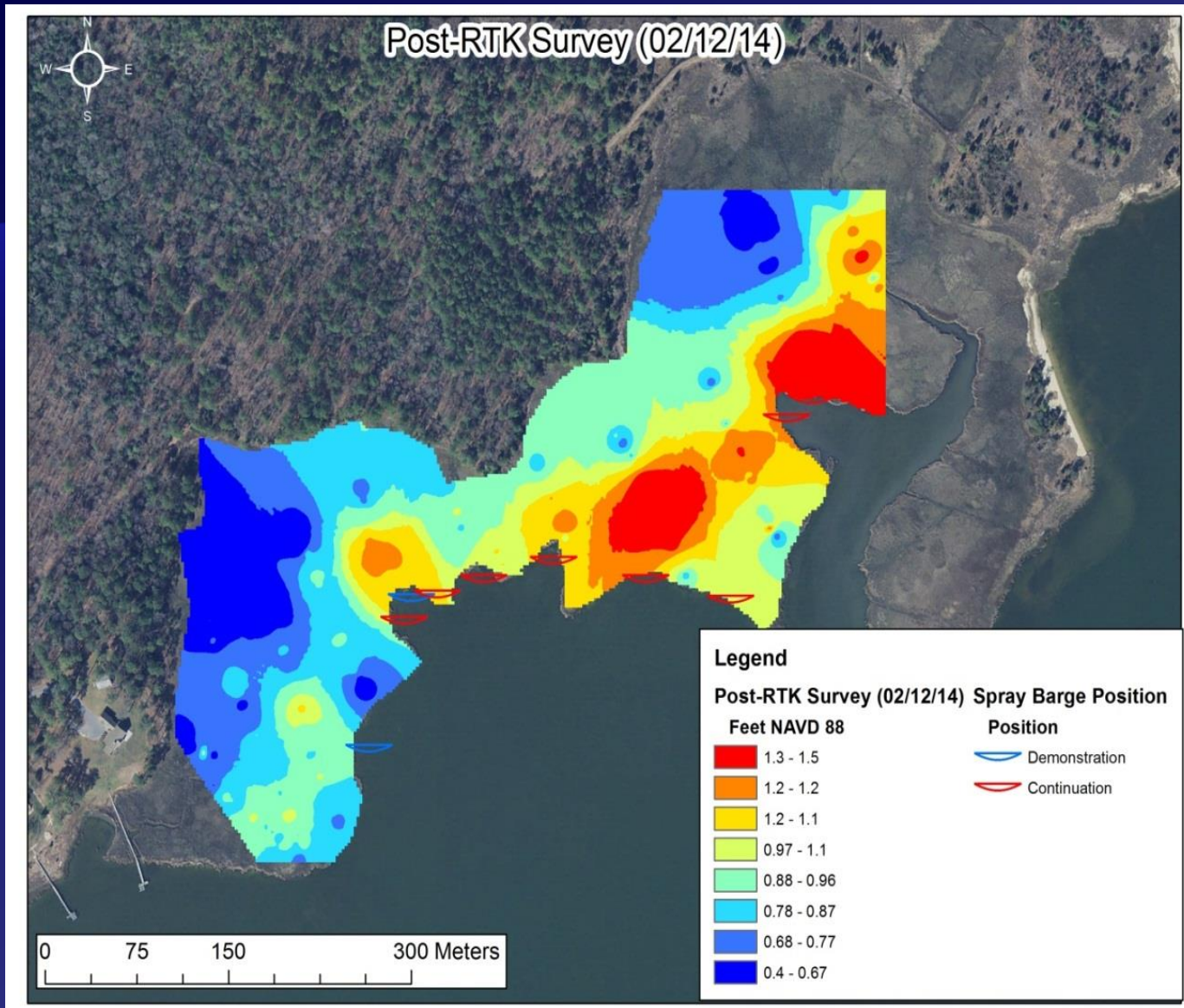
Repair old levee

**Restore tidal flow,
add thin-layer dredge
material**

**Repair water-control
structure**





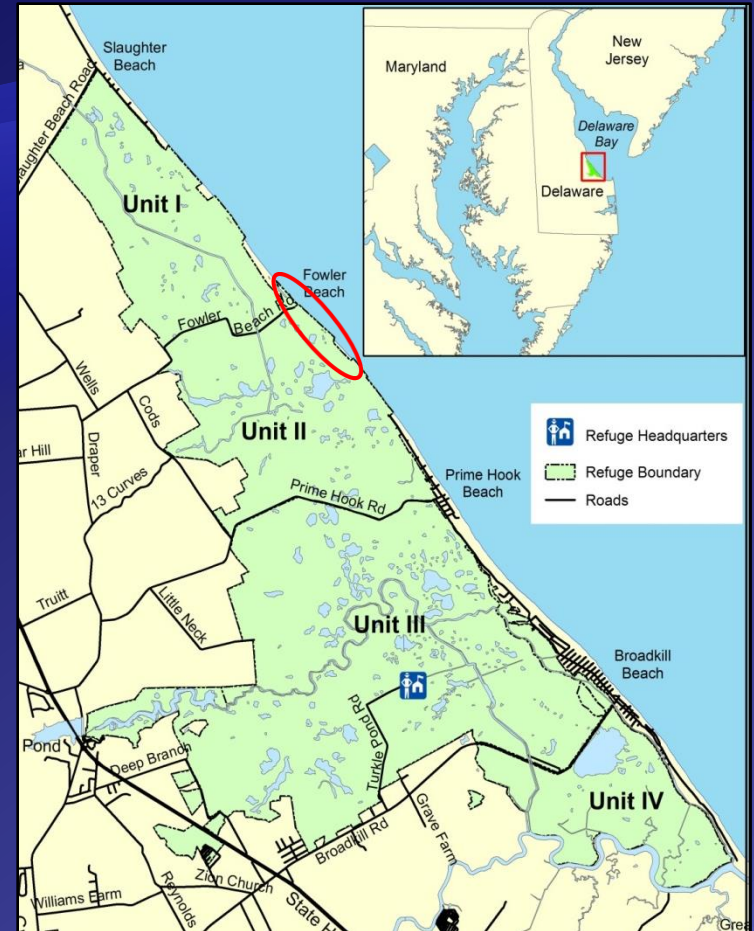




Tidal Marsh Restoration At Prime Hook National Wildlife Refuge In Delaware

Susan Guiteras – USFWS Coastal DE NWR Complex

- Refuge divided into management units: Unit I through Unit IV, north to south
- Historically, wetlands almost entirely salt marsh
- Numerous impacts and alterations ... Ditching, draining, mosquito management, grazing and haying, trapping, hunting
- **In the 1980's, the two central units – Unit II and Unit III – were converted to freshwater impoundments (totaling about 4000 acres)**
- Series of overwashes resulting from storms: 2006 (Unit I only), 2008 (minor, repaired), 2009 (two breaches in Unit II)... then SANDY!
- Rapid introduction of saltwater into the previously freshwater impoundments led to vegetation die-off, peat collapse, conversion to open water, and impacts in adjacent uplands in ~4000 acres

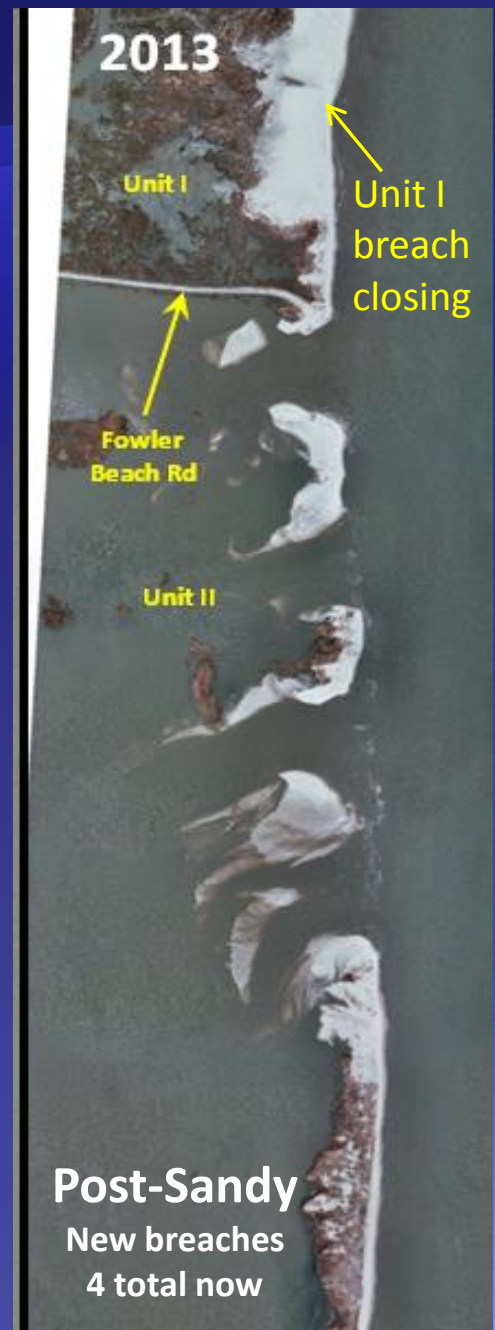




Breach formed in 2006 has since closed. Unit I serves as a Reference marsh for our restoration plans and monitoring



Because the back-barrier marsh had been converted to a freshwater impoundment 20+ years ago, Unit II could not tolerate rapid salt water introduction, and it could not handle the otherwise natural process of overwash and breaching



Tidal Marsh Restoration Design At Prime Hook National Wildlife Refuge In Delaware

- Complex 4000-acre ***Restoration of Hydrology***
 - With some ***Living Shoreline, Thin Layer Deposition, & Invasive Species Control***
- Restoration design guided by extensive Delft-3D modeling project that evaluated potential restoration scenarios
- Shoreline Recovery Project
 - Barrier beach (6000 ft of shoreline); Back-barrier marsh platform (60 acres)
 - Army Corps of Engineers Interagency Agreement
- Tidal Marsh Interior Resiliency Project
 - Dredging of over 20 miles of interior tidal channels (re)connecting all units
 - 20ft & 40ft wide, up to 3.5 ft deep, using historic channel network
 - Strategic disposal of dredged material on marsh surface
 - MATOC contract just awarded
- Comprehensive biotic & abiotic monitoring program
 - Sediments, hydrology, salinity, marsh elevation, vegetation, birds, fish
 - DNREC Coastal Program, University of Delaware, FWS MD Fisheries Resources

