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Natural Recolonization of a New England Salt Marsh: Build it and the Grasses Will Grow

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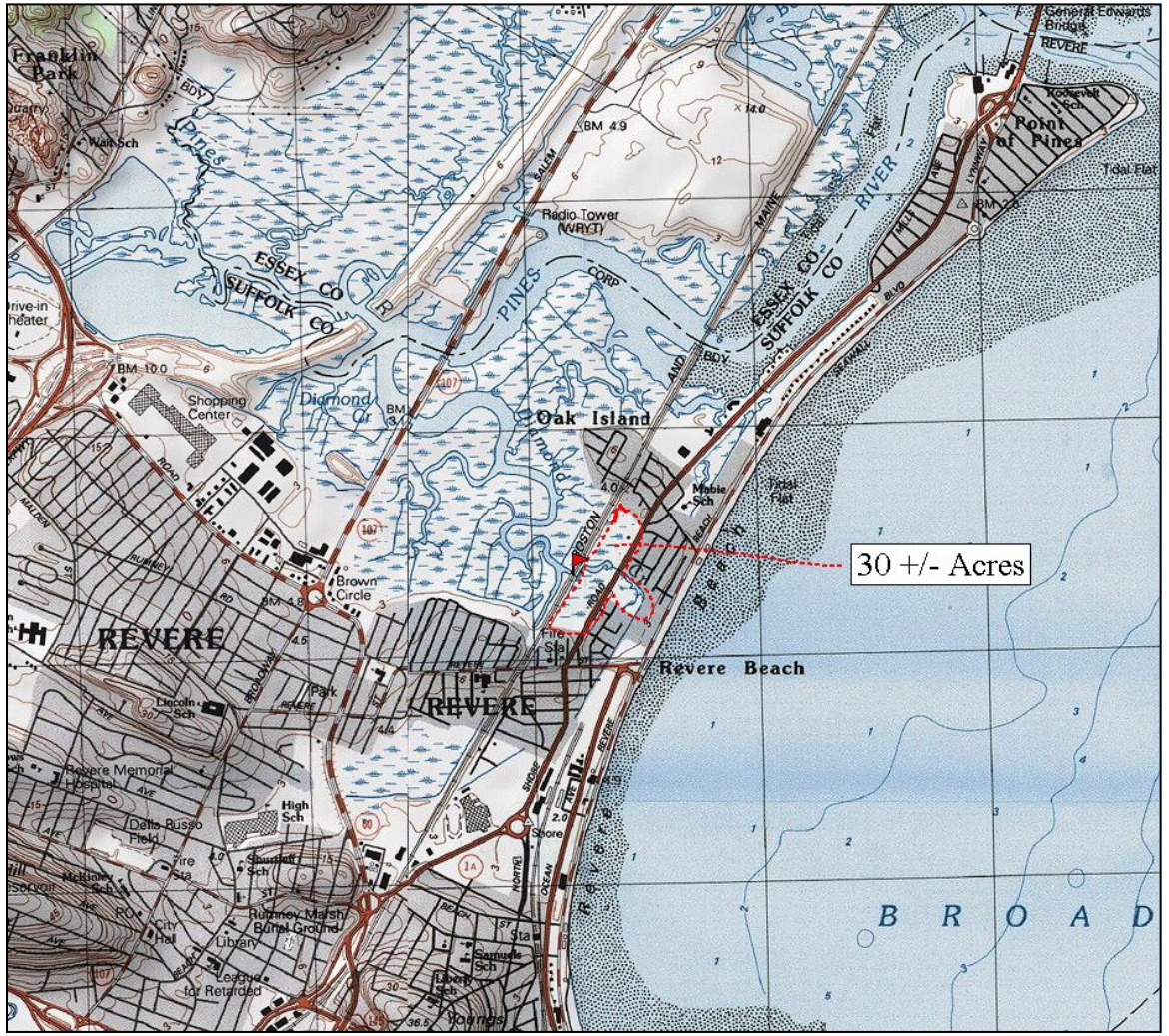
Presentation Overview

- Background information
- Oak Island setting
- Technical approach for natural recolonization
- Restoration results

Background: Why Restoration Was Needed

Oak Island Marsh

- 30-acre salt marsh
- Hydraulically connected to Rumney Marsh
- Saltwater flow to Oak Island is restricted by a tide gate
- Development activities and tide gate operations are critical drivers
- Marsh historically dominated by *Phragmites*



Local Concerns

- Flooding
- Mosquitos
- Fires

Tidal Inundation at 1.0 NGVD29

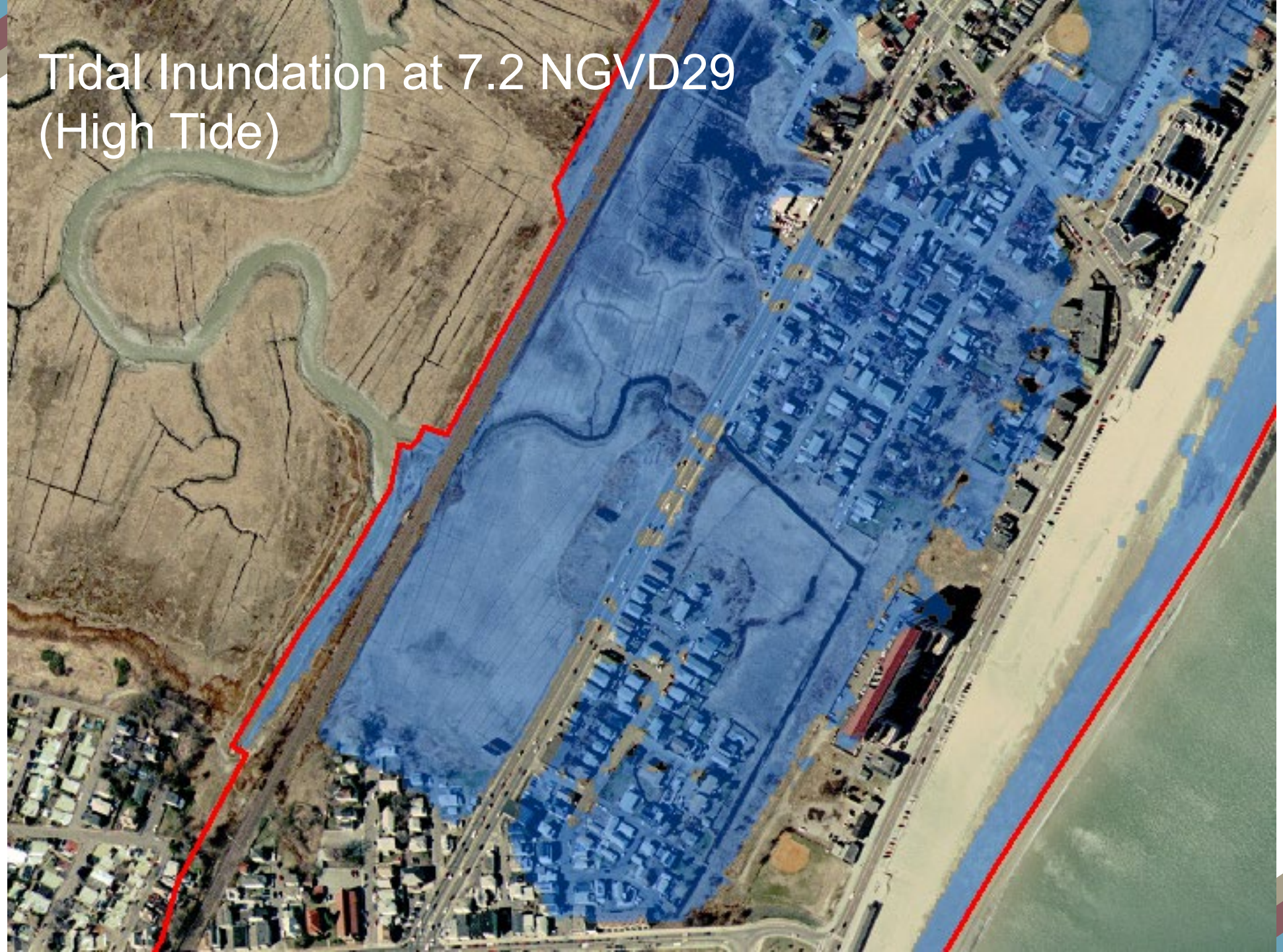
Tidal Inundation at 2.5 NGVD29

Tidal Inundation at 3.0 NGVD29

Tidal Inundation at 3.5 NGVD29

Tidal Inundation at 5.6 NGVD29

Tidal Inundation at 7.2 NGVD29 (High Tide)



Oak Island with Limited Saltwater Inundation

2003: Self-Regulating Tide Gate Installed

Self-Regulating Tide Gate, Channel and Island (2004)

~ 3.0 NGVD29

~ 1.0 NGVD29

Photo Credit: Eric Hutchins, NOAA

Postconstruction Conditions (2004–2011)

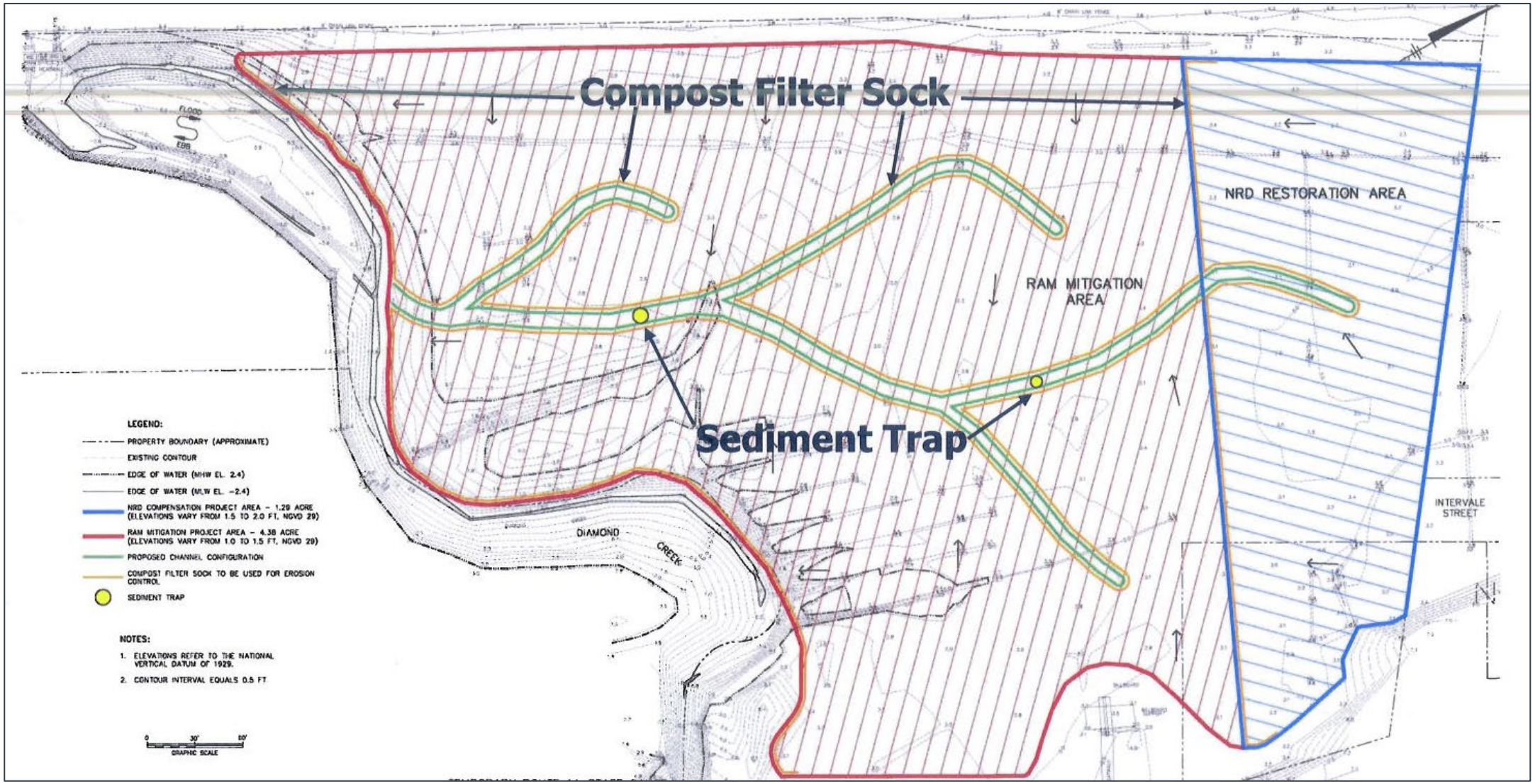
- Tide gate elevation set to 1.0 NGVD29
- Over 20 adjustments made to reach 2.5 NGVD29
- Limited restoration at 2.5 NGVD29
- Vandals steal tide gate parts in 2007
- Leakage only from 2007 to 2011

New Tide Gate and Marsh Restoration (2011–2014)

- New tide gate installed in 2011 as part of mitigation for the Island End River remediation project.
- Mitigation included removing marsh soil over a 4.38-acre area to elevations ranging from 1.0 to 1.5 NGVD29.
- Additional soil removed in 2014 over 1.2 acres by NOAA with funding from a Natural Resource Damage settlement.

Photo Credit: Eric Hutchins. NOAA

Restoration Design with Natural Recolonization of Native Wetland Vegetation



Establishing New Marsh-Bench Elevations in 2013

- Approximately 7,000 cubic yards of marsh soil removed
- Beneficial use of excavated marsh soil as cover material at a local landfill

Flow Channels Design

- Quickly inundate marsh bench areas to maximize duration of saltwater intrusion
- Allow for the development of secondary flow channels
- Provide sufficient surface water velocities to minimize in-channel sediment deposition

Monitoring Natural Recolonization

- Monitoring required for 5 years following construction
- Monitoring included
  - Tidal elevations (1 year)
  - Erosion and sediment stability
  - Invasive species
  - Recolonization at 20 fixed stations
  - Photos from fixed stations

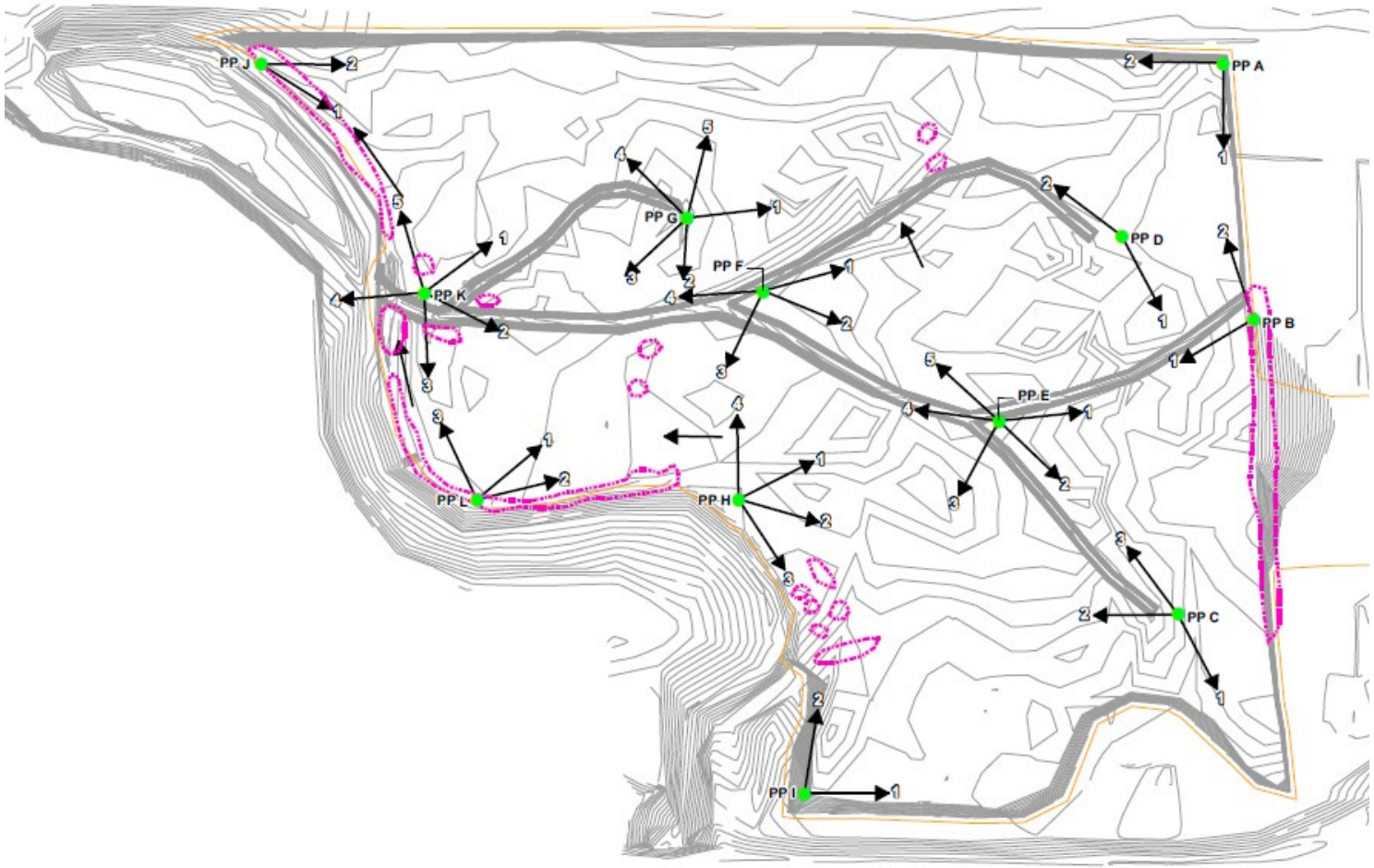
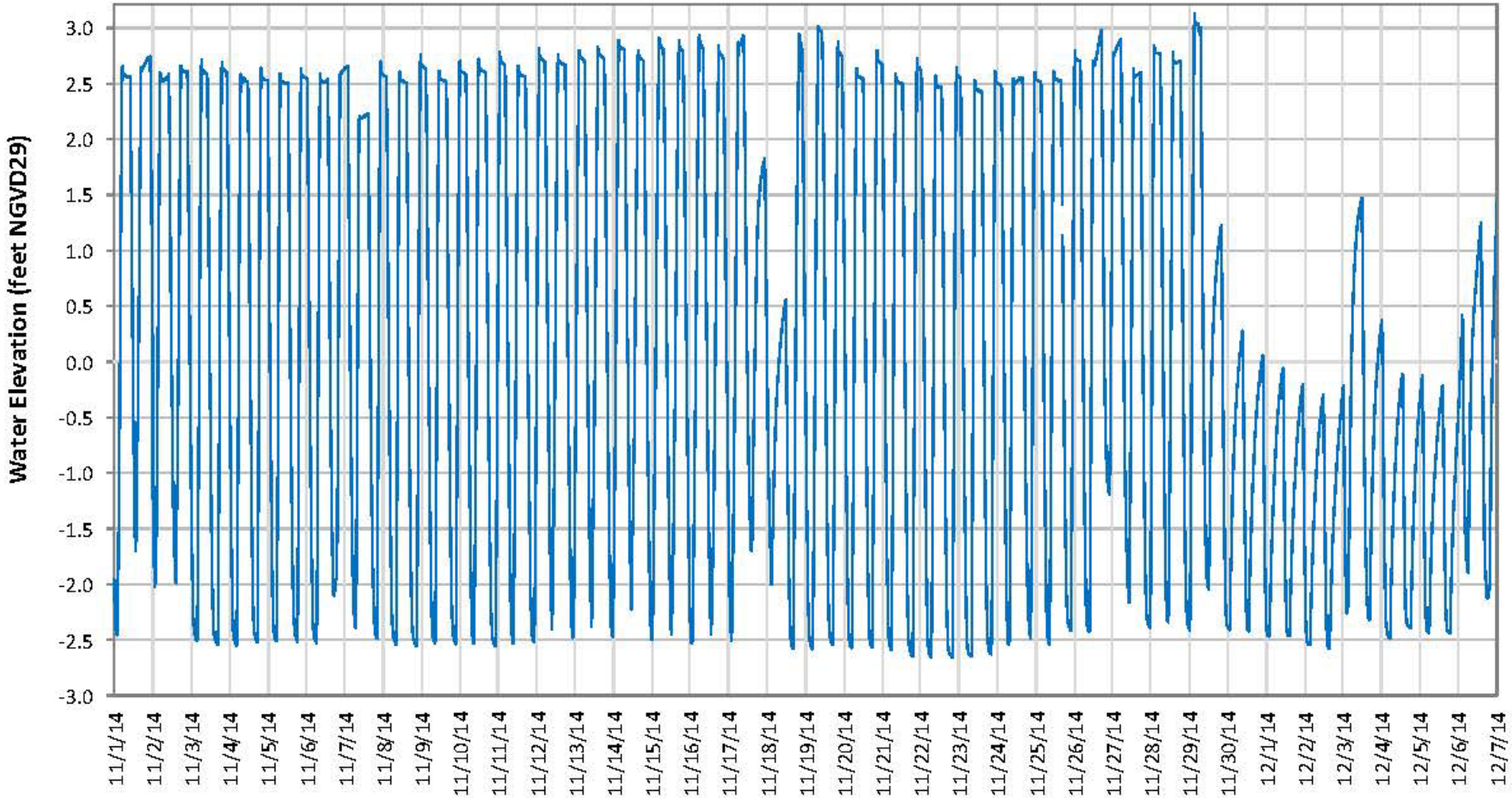


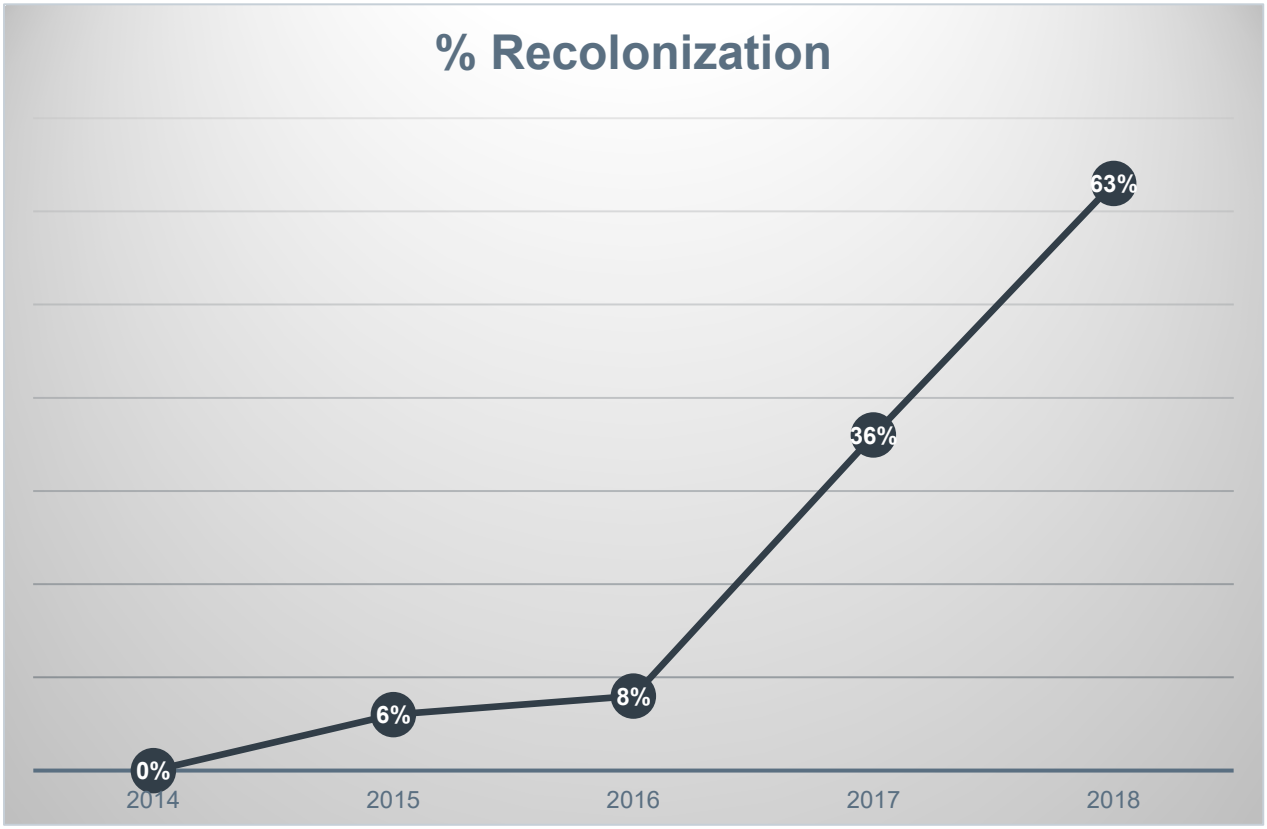
Image from Arcadis 2016

Surface Water Elevations in Late 2014



Monitoring Results After 5 Years

- Natural recolonization species:
  - Smooth Cordgrass (*Spartina alterniflora*)
  - American Glasswort (*Salicornia virginica*)
- Invasive species are limited
- Secondary flow channels are naturally developing
- Tide gate operation is mission critical



Station H-1 Looking Northeast

Photos from Arcadis 2016, 2017, and 2018

Take-Away Messages

- Natural recolonization can work, but it needs time.
- Interagency cooperation and a regulatory champion were key ingredients for success.
- For Oak Island, proper tide gate operation is mission critical.
- With sea level rise, we will be seeing more tide gates, and balancing impacts to habitat with flooding will be a key consideration.