ENGINEERING WITH NATURE TO SUPPORT NAVIGATION AND SYSTEM RESILIENCE:

EXAMPLES OF INNOVATIVE CHANNEL DREDGING AND PLACEMENT IN THE PHILADELPHIA DISTRICT

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ORGANIZATIONAL PERSPECTIVE FOR EWN
US ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT

- **Navigation Mission:** maintain federal channels in the Philadelphia District, largest is Delaware River
- **Flood Risk Management:** strong beach nourishment program in NJ & DE and 5 Reservoirs in PA
- **Ecosystem Restoration**
- **Regulatory Mission**

USACE GALVESTON, BUFFALO, PHILADELPHIA DISTRICTS: EWN "PROVING GROUNDS"

- Philadelphia District EWN Proving Ground initiated in June 2016
- Identify opportunities to implement EWN across current and future programs and projects; and with other agencies
- Emphasis on "triple-win" strategies and outcomes

EWN PLANTING WORKSHOP: APRIL 2018
USACE, CENTER FOR INLAND BAYS, DNREC

A "PERSISTENT" APPROACH
Past, Present & Future

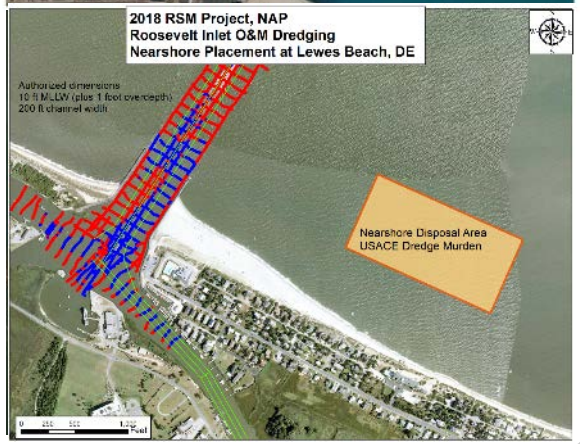
• **Navigation and Nature**: District took action to restore navigation after Sandy, but also looked for opportunities to assist with shoreline & ecosystem recovery and build coastal system resilience with *clean* dredged sediment

• **Technical Expertise**: Use *Regional Sediment Management (RSM)* and *Engineering with Nature (EWN)* concepts to develop short-term (post-Sandy) and long-term dredging strategies

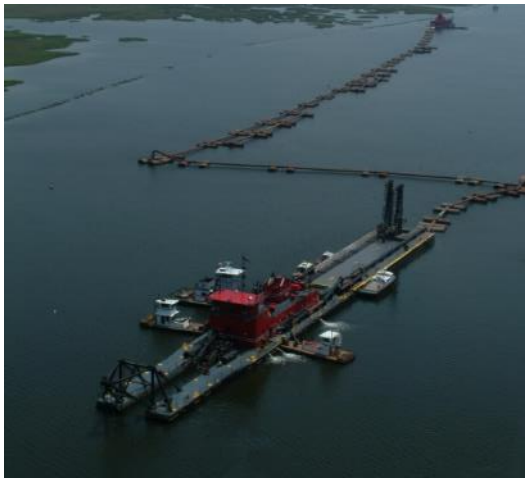
•**Team Approach**: Actions were aided by support from USACE North Atlantic Division and other districts including Galveston, Mobile & Baltimore, ERDC, NJDEP and other partners

Progression from caution and risk aversion to being proactive and innovative

NAVIGATION CHANNELS WITH NEARSHORE PLACEMENT OF SAND



A SEDIMENT PROGRESSION: FROM CONFINEMENT TO IN-WATER CREATION



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New Jersey Intracoastal Waterway (NJIWW) Channel Dredging with Innovative Placement

The NJIWW is a 117 mile long federal channel that runs through the NJ Back Bays from Manasquan to Cape May

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MORDECAI ISLAND RESTORATION
BEACH HAVEN, NJ
CASE STUDY

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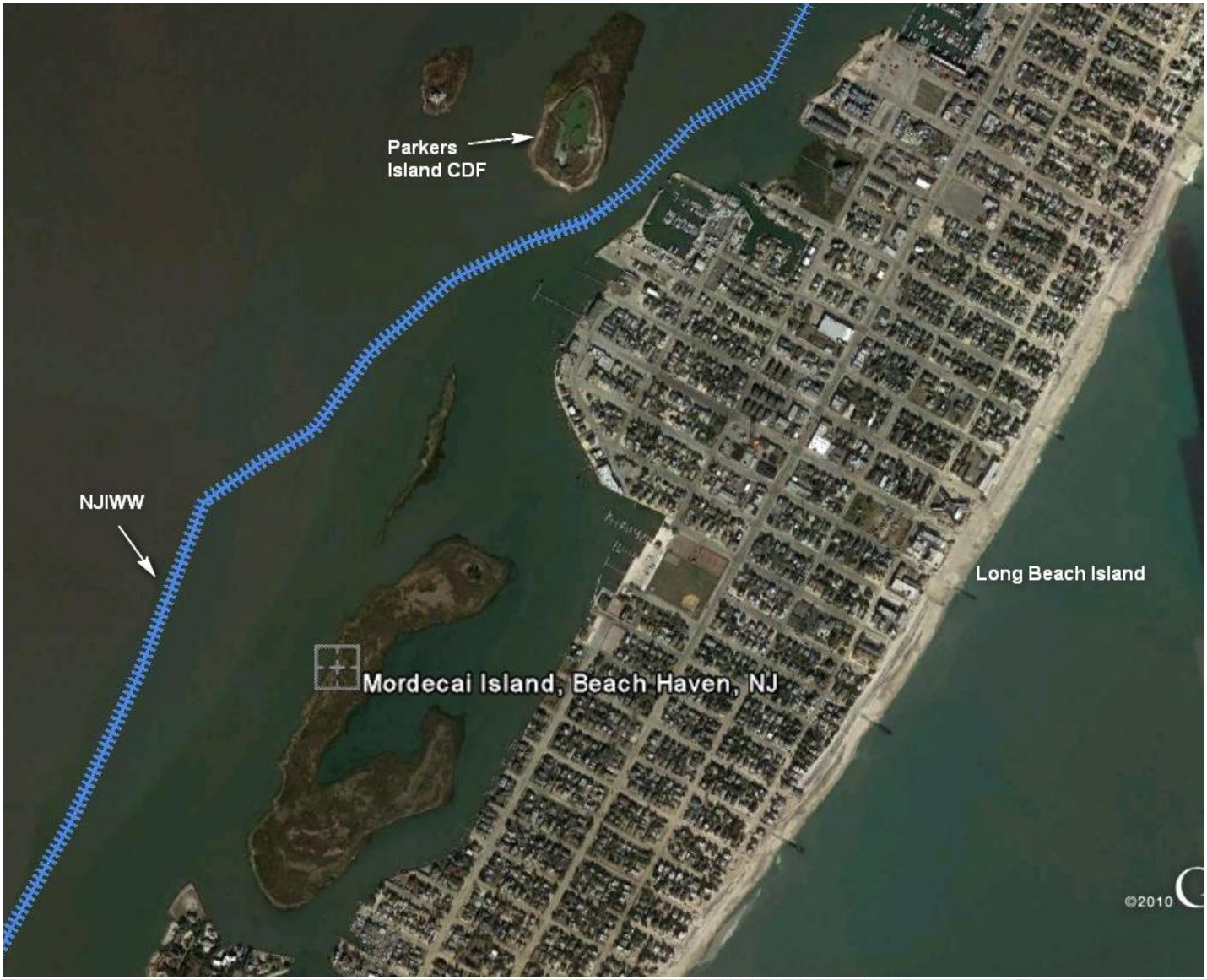
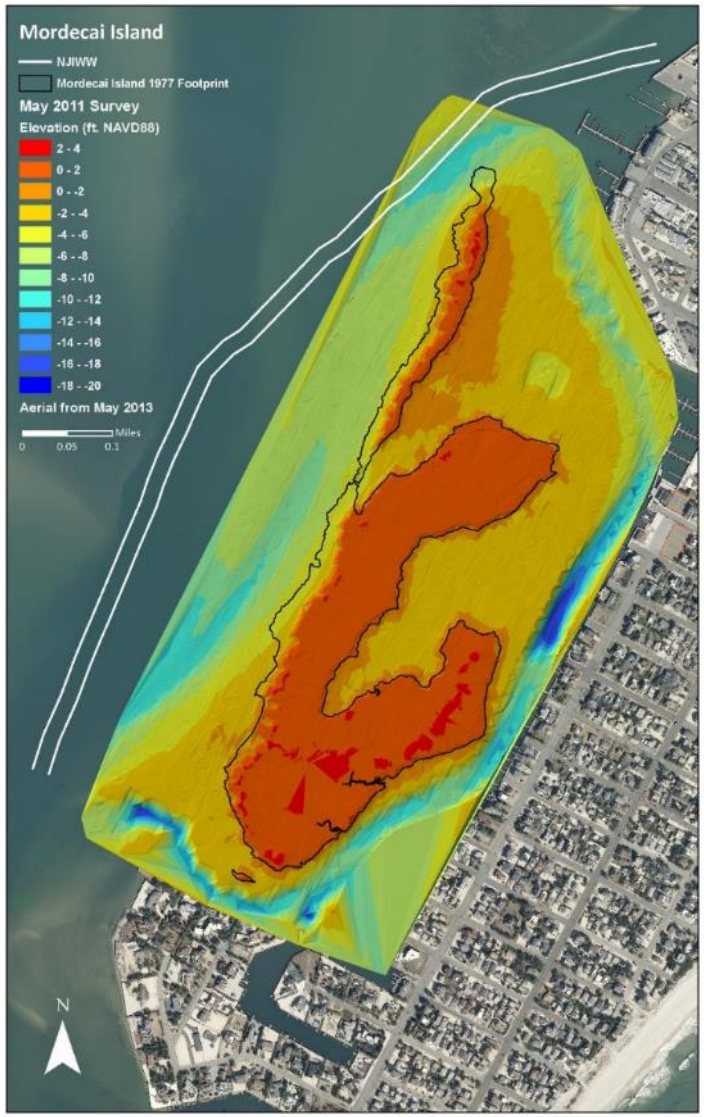
ACCELERATING PROGRESS WITH AN RSM/EWN SYSTEMS APPROACH: MORDECAI ISLAND NJ



MORDECAI ISLAND PLANNING STUDY: ECOSYSTEM RESTORATION CONTINUING AUTHORITIES PROGRAM (CAP)



Continued erosion of Mordecai Island threatens a diversity of natural wildlife habitats including open marsh, salt ponds, exposed mud flats, shrub-dominated areas and shallow water eelgrass beds.

Previous work and partnerships were and are incredibly valuable!! Included NMFS & USFWS, Bureau of Coastal Engineering, Mordecai Land Trust, NOAA

POST-CONSTRUCTION MORDECAI ISLAND

Mordecai Island August 2017

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AVIAN MONITORING AND ADAPTIVE MANAGEMENT: THINKING THROUGH THE PROJECT OBJECTIVES

Build it and they will come….

Raised Habitat in Dec 2017

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MORDECAI ISLAND CONSTRUCTION: DECEMBER 2017

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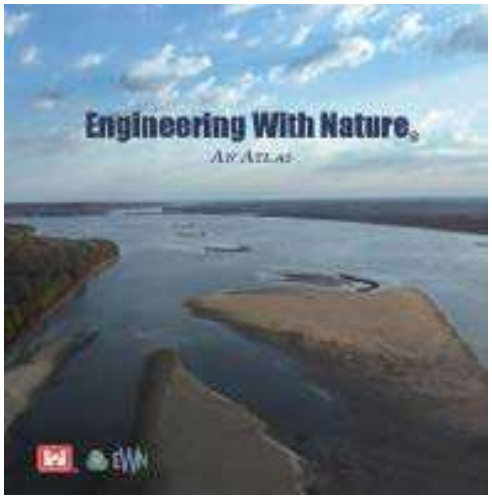
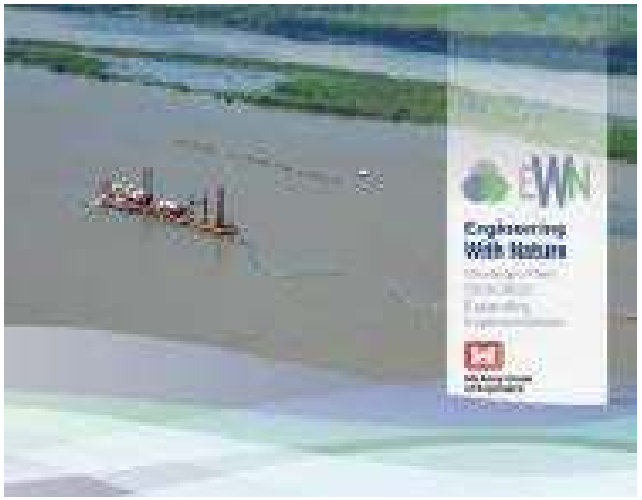
MORDECAI ISLAND: CONTINUING TO MONITOR & PARTNER

- NOAA NCCOS
- ReClam the Bay
- Mordecai Land Trust
- NJDEP
- Rutgers University
- USFWS
- USACE ERDC

EWN COMMUNICATION, OUTREACH AND EDUCATION





NJIWW Channel Dredging And Placement Projects: Ring Island and Avalon NJ

Land Owned By New Jersey Division Of Fish & Wildlife (NJDFW)

Constructed With Emergency Supplemental Operation & Maintenance Funds

And

A National Fish And Wildlife Foundation Grant TO NJDFW, The Nature Conservancy And Green Trust Alliance

Contractor: Barnegat Bay Dredging Co.

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

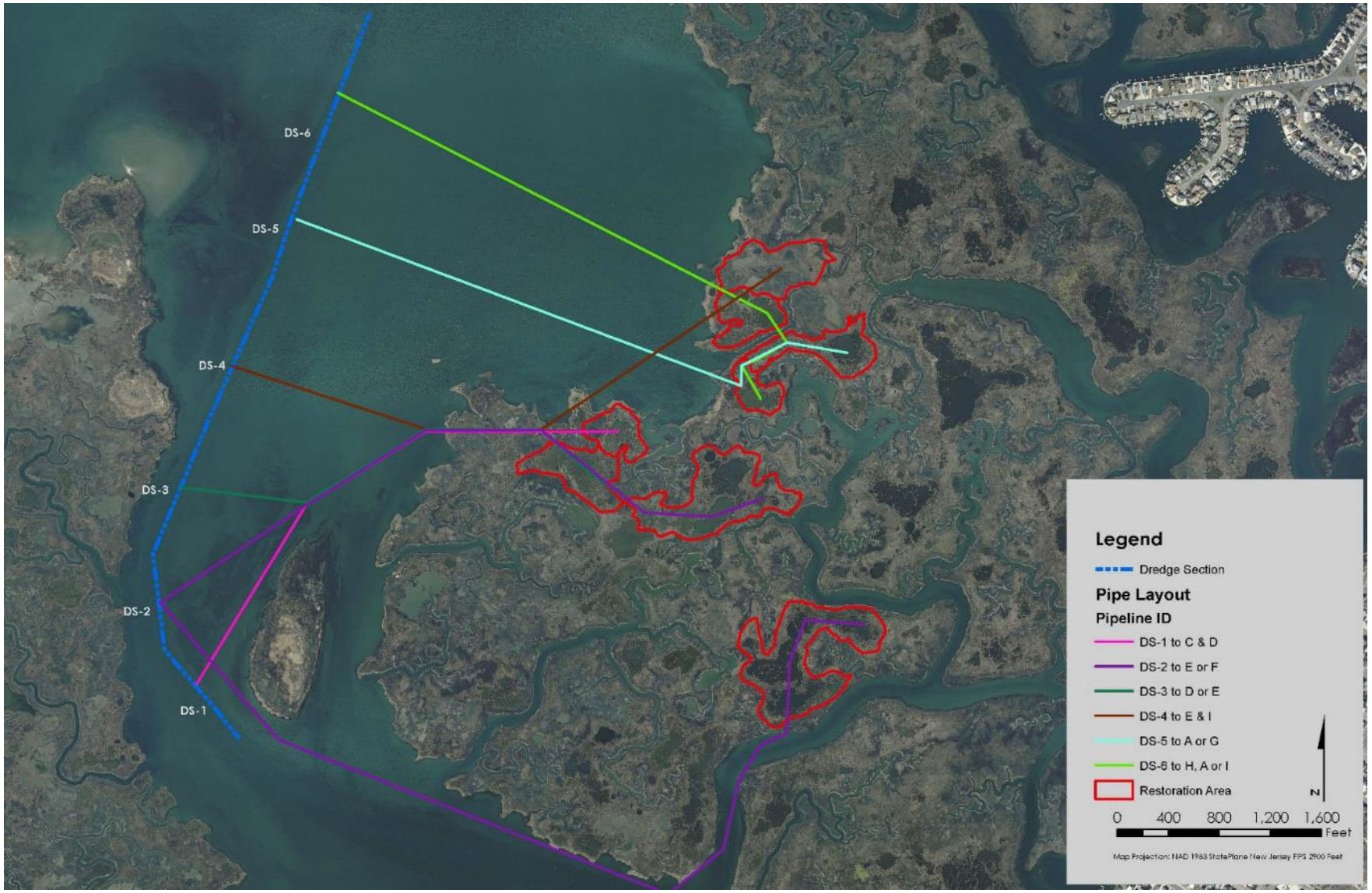
GreenVest One Step Ahead.

pH Princeton Hydro

Wetlands INSTITUTE

The Nature Conservancy Protecting nature. Preserving life.

NJIWW Dredging & Avalon Thin Layer Placement



Constructed Dec 2014 to Feb 2016

Ring Island, NJ: Black Skimmer Habitat And Thin-layer Placement with NJIWW Sand

- Constructed August 2014
- Placed on land owned by NJDFW instead of Confined Disposal Facility
- Habitat creation
  - Shorebird usage
  - Also used by horseshoe crabs & terrapins
- Small thin layer placement demo with >96% sand, 500 cubic yards
- Raised elevation of habitat in March 2018, Adaptive Management!!

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ERDC

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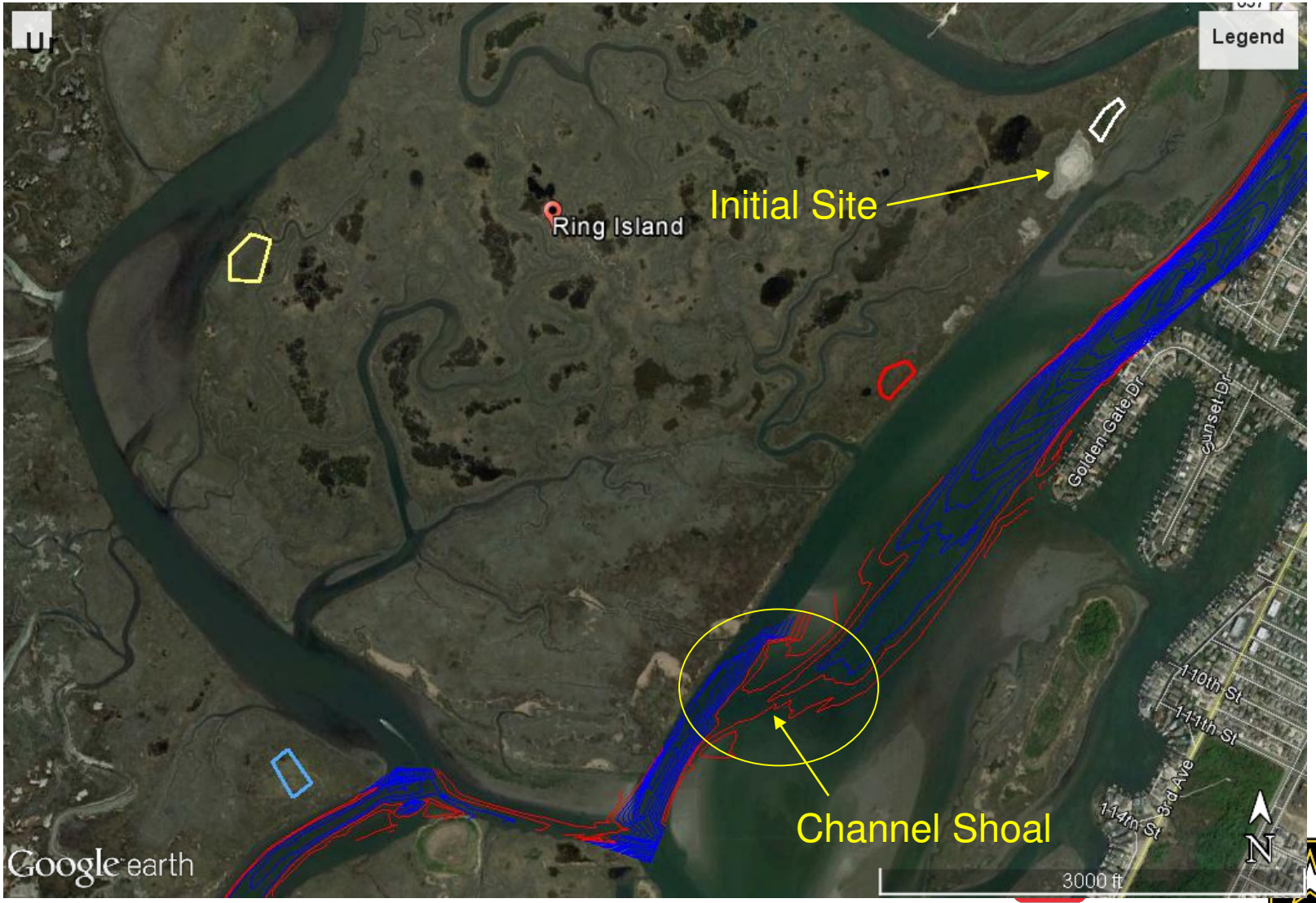
The Nature Conservancy
Protecting nature. Preserving life.

Wetlands Institute

ADAPTIVE MANAGEMENT AND SYSTEMS APPROACH
FROM PILOTS TO SOLUTIONS



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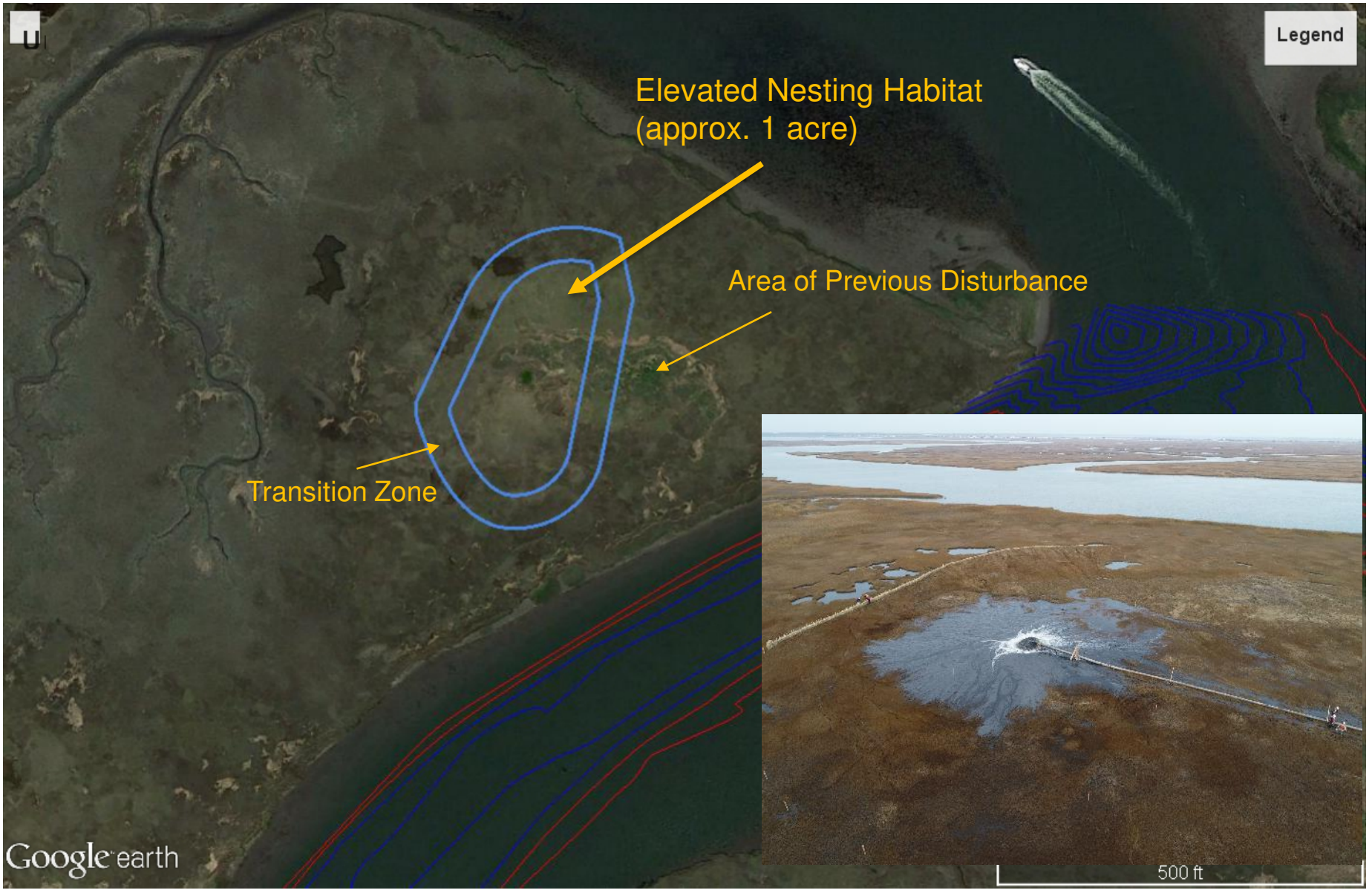
RING ISLAND SYSTEMS APPROACH: DECEMBER 2018



RING ISLAND SYSTEMS APPROACH: DECEMBER 2018

MOVING FORWARD

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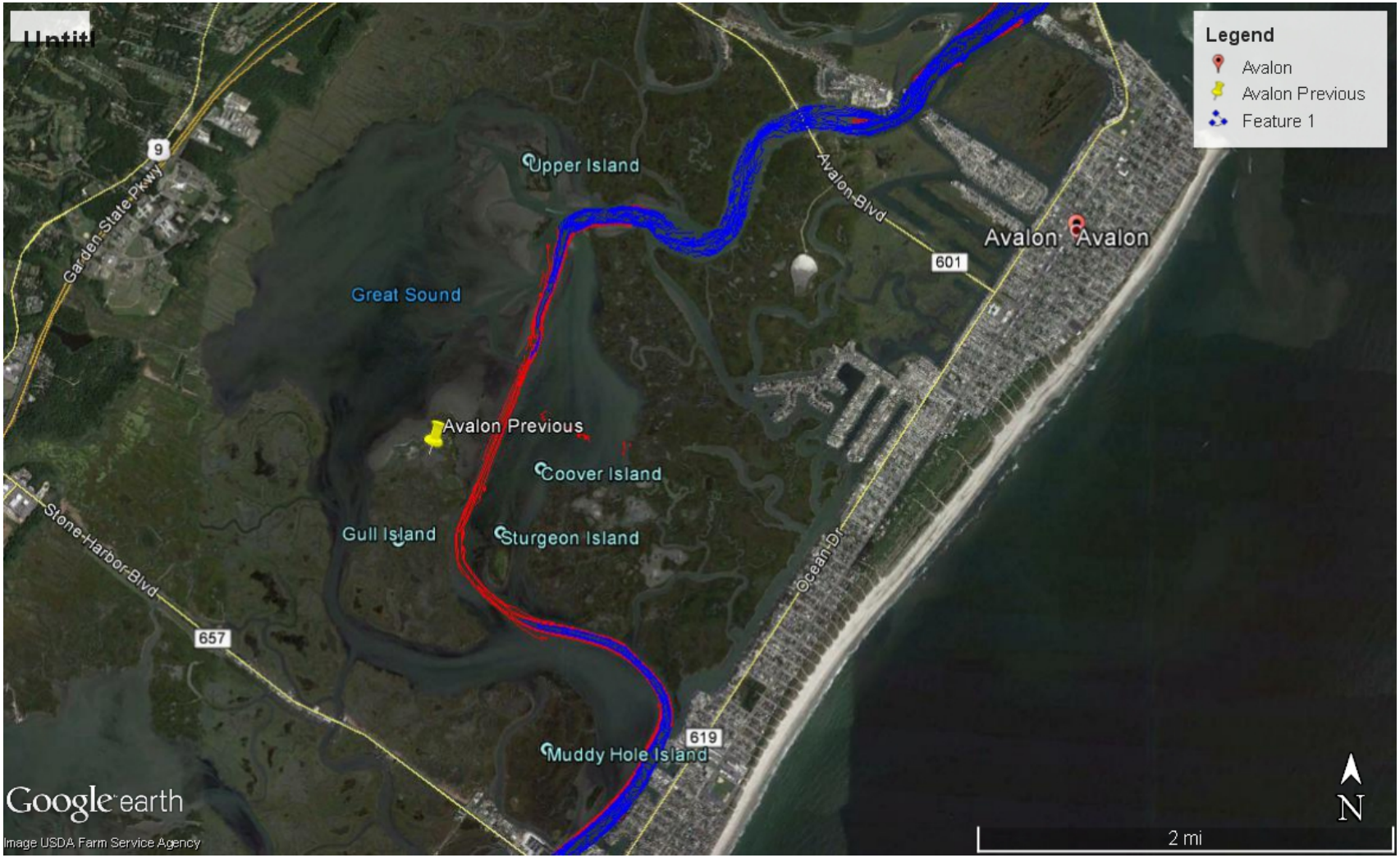
SEVEN MILE ISLAND "LIVING LABORATORY" APPROACH

PROVIDING ECOLOGICAL UPLIFT AND ENHANCED RESILIENCE FOR ECOSYSTEMS AND COASTAL COMMUNITIES



https://www.ecoshape.org/en/projects/living-lab-mud

Fine sediment: from waste to resource

Throughout the world, different coasts, shores, lakes and rivers have to deal with excess sediment or sediment shortages. The natural balance between the removal and deposition of sediment is disrupted by human interventions such as dams in a river or ports in an estuary. As a result, sediment doesn't reach places where it is needed and too much accumulates in other locations. Ecosystems are affected and life becomes difficult for plants and animals. People are also pressured, for example in terms of food supplies, ports and leisure activities.

Too much fine sediment

Too much fine sediment has an adverse effect on water quality, and biodiversity is reduced as a result. In

NJIWW Critical Shoals Placement Strategy (revisited)

Possible placement areas for NJIWW
Markers 386 to 397 west of Avalon/Stone Harbor

Notes
1. Volumes ~75K CY, mixed sediments
2. Need clarification on current shellfish areas

Date: 4/24/2013

SEVEN MILE ISLAND "LIVING LABORATORY" FOR COASTAL RESILIENCE

- Develop project objectives and EWN techniques that have role in addressing future system resilience, such as,
  - fine grained sediment transport & strategic placements
  - sea level rise & future trajectories of marsh
  - success of previous sites

- Supported by ERDC R&D and Living Lab Advisory Committee

- Implement Short and Long-term Actions and Strategies
  - Collect comprehensive data and establish baseline to add to existing data (start now)
  - Do not over-engineer, use nature as the lead and mimic processes
  - Construct Pilot (Fall 2019), continue to monitor
  - Develop adaptive management and long-term strategies
  - Additional placement Fall 2020

BARNEGAT INLET AND BAY, NJ
EWN OPPORTUNITIES & FUTURE LIVING LAB

Sharing Lessons Learned across USACE

San Francisco District Navigation Synchronization Meeting

March 2018

Adaptive Management Puts Controls on Known Risk,
LTC Rayfield, San Fran District
September 2018