

# Engineering With Nature



**Cynthia J. Banks**  
Research Biologist/Program Manager  
Engineer Research and Development Center

MG Richard Stevens Visit  
10 September 2015

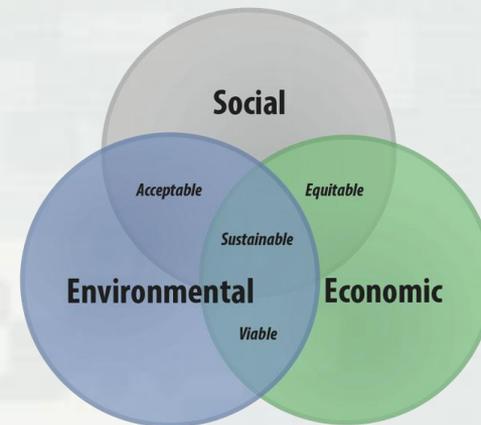


# Engineering With Nature...

*...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.*

## Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



# EWN Status

- *Engineering With Nature* initiative started within USACE Civil Works program in 2010. Over that period, we have:
  - ▶ Engaged across USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
    - Workshops (>20), dialogue sessions, project development teams, etc.
  - ▶ Implementing strategic plan
  - ▶ Focused research projects on EWN
  - ▶ Field demonstration projects
  - ▶ Communication plan
  - ▶ District EWN Proving Grounds established
  - ▶ Awards
    - 2013 Chief of Engineers Environmental Award in Natural Resources Conservation
    - 2014 USACE National Award-Green Innovation



# Evia Island, Galveston Bay, TX

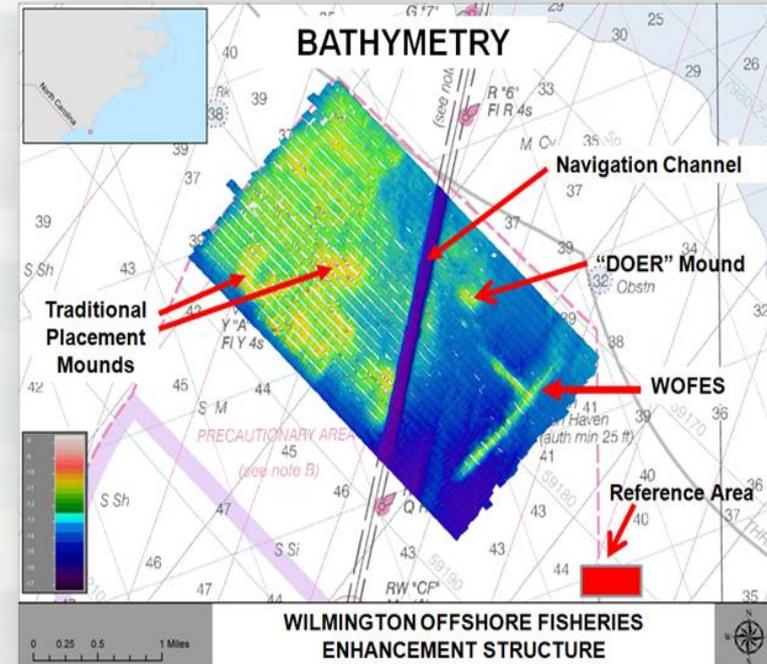
- 6-acre island was constructed using sediment dredged during the deepening of the Houston Ship Channel in 1998
- Island provides substantial bird and other habitat
- Producing significant environmental benefits





# WOFES, Wilmington, NC

- Created in 1994-1997 from 764,600 cubic meters of limestone dredged as part of the Wilmington channel deepening
- Located three nautical miles off of the mouth of the Cape Fear River in North Carolina
- The location and design of the reef involved extensive participation by stakeholders, and the North Carolina Department of Environment and Natural Resources supported the project as a local sponsor.
- Produced significant social benefits as a popular destination for fishing



# Horseshoe Bend, Atchafalaya River

- Options for managing dredged material via shore-based wetland creation were exhausted
- Strategic placement of sediment (0.5-1.8 mcy/1-3 yrs) was used to create a ~35 ha island
- Producing significant environmental and engineering benefits
- Project won WEDA's 2015 Award for Environmental Excellence



# Coastal NJ, Philadelphia District



December 2014



Stone Harbor

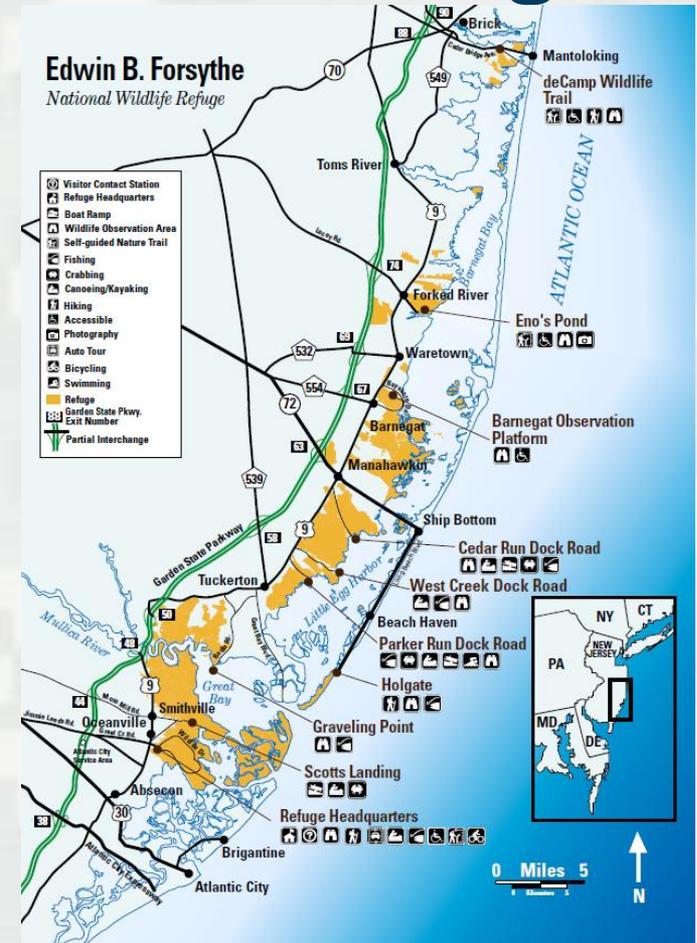


Avalon



# US Fish and Wildlife Service Forsythe National Wildlife Refuge

- Forsythe NWR: >40,000 acres of wetlands and other habitat in coastal NJ
- Collaboration objective: Enhance ecosystem resilience through engineering and restoration
- Means: Smart use of sediment resources and EWN principles and practices



# Thin-Layer Placement Website

Coming soon to  
[www.engineeringwithnature.org](http://www.engineeringwithnature.org)

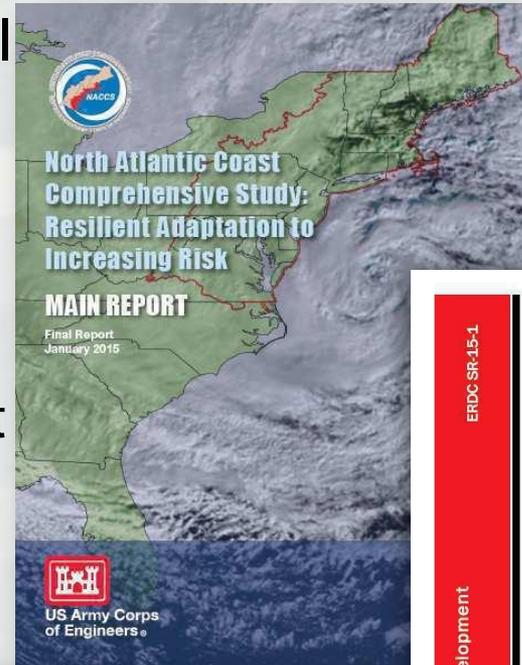
The screenshot shows the homepage of the Thin-Layer Placement website. At the top, there is a circular logo with 'TLP' and 'THIN LAYER PLACEMENT' text. Below the logo is a navigation bar with links: 'Welcome', 'What Is Thin Layer Placement?', 'Resources', 'Case Studies', 'Points of Contact', and 'Photo Gallery'. The main content area features a large photo of two people in a field, one holding a surveying instrument. Below this is a section titled 'Thin-Layer Placement' with three sub-sections: 'A Living Resource', 'Searchable Resources', and 'What's New'. At the bottom, there is a 'Welcome' section with introductory text and a footer with copyright information.

This screenshot displays the 'What Is Thin Layer Placement?' page. It features a large blue box with the title 'Thin Layer Placement' and a brief description. Below this, there are several small thumbnail images showing various construction and environmental scenes. At the bottom, there is a large photo of a green field with a fence, and a small text box at the bottom of the photo that reads 'used the erosion solution of the site.'

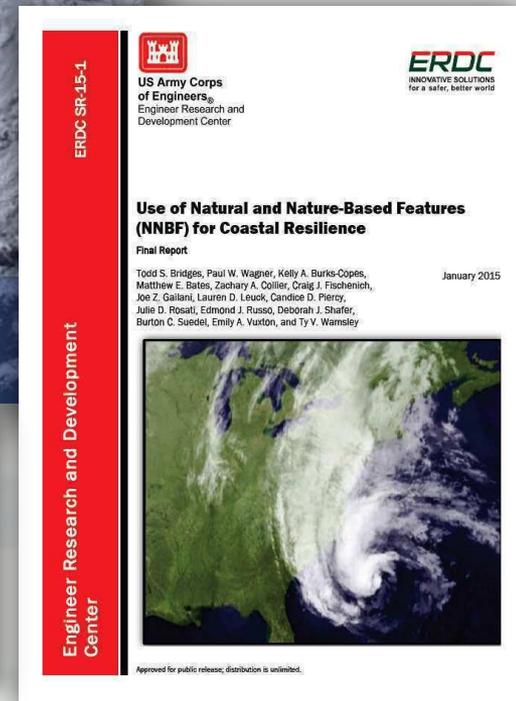
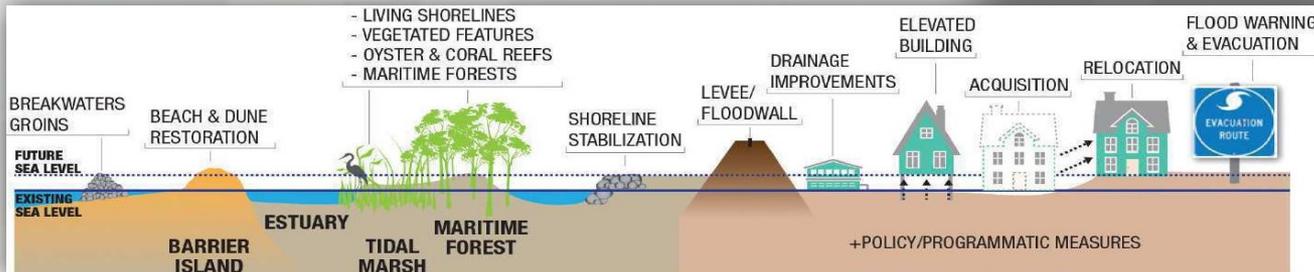
The screenshot shows the 'Case Studies' page. It includes a list of case study links on the left, such as 'Baltimore National Wildlife Refuge Restoration' and 'Anacostia River Fringe Wetland Creation'. On the right, there is a detailed description of the 'Anacostia River Fringe Wetland Creation' project, including a placeholder for a short project description and a large photo of the wetland area. The ERDC logo is visible in the bottom right corner.

# Natural and Nature-Based Features: North Atlantic Coast Comprehensive Study

- Opportunities to integrate Natural and Nature-Based Features (NNBF) with structural and non-structural measures to provide multiple lines of defense against storms and sea level rise, generating a full array of relevant economic, environmental and social ecosystem goods and services.



**Congrats to the  
USACE 2015  
Project Delivery  
Team of the Year  
for  
Honor!!!**



See Bridges et. al., 2015

<http://www.nad.usace.army.mil/CompStudy>



# R&D Example:

## Engineering Performance of NNBF

- What are the engineering benefits of wetlands with respect to waves?
- Flume studies being performed in the 10 ft flume
  - Complemented by examination of sediment processes and field studies
- Wave attenuation was found to:
  - increase with stem density
  - increase with submergence ratio
  - slight increase with incident wave height
- Results used to update STWAVE



# Coastal Resilience: The Environment, Infrastructure, and Human Systems

- USACE was the primary sponsor and host (USEPA and USDOE were co-sponsors)
  - ▶ Dr. Todd Bridges, Conference Chair
  - ▶ Ms. Cynthia Banks, Conference Organizer
- 85 participants from 8 countries (Barbados, Fiji, Mexico, The Netherlands, South Africa, South Korea, United Kingdom, and United States)
  - ▶ Diversity of organizational perspectives:
    - USACE, NOAA, USEPA, USFWS, OMB, CEQ, DOE, US Navy, Treasury Department, State Department, TNC, AAPA, Water Institute of the Gulf, National Wildlife Federation, Great Lakes Dredge & Dock Company, Environ Corp., Dewberry, several universities, and many other organizations
- Conference consisted of a series of plenary presentations and panel discussions
  - ▶ Share information about science and engineering relevant to coastal resilience



The audio and visuals for each presentation are at:  
<http://el.erd.c.usace.army.mil/ewn/workshop.cfm?List=14MayCR>

**ERDC**

# USACE Galveston and Buffalo Districts: EWN “Proving Grounds”



## EWN Proving Ground Kick-Off Workshops

- ▶ October (SWG) and December (LRB) 2014
- ▶ ~70 participants
- ▶ SWG, SWD, LRB, ERDC, IWR and HQ

Identified opportunities to implement EWN within current and future programs and projects

Emphasis on solution co-development



# EWN Action Demonstration Projects, 1

- Sediment Retention Engineering to Facilitate Wetland Development (San Francisco Bay, CA)
- Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande (Albuquerque, NM)
- Atchafalaya River Island and Wetlands Creation Through Strategic Sediment Placement (Morgan City, LA)
- Portfolio Framework to Quantify Beneficial Use of Dredged Material (New Orleans and New England)
- Engineering Tern Habitat into the Ashtabula Breakwater (Ashtabula, OH)
- Living Shoreline Creation Through Beneficial Use of Dredged Material (Duluth, MN)
- A Sustainable Design Manual for Engineering With Nature Using Native Plant Communities



# EWN Action Demonstration Projects, 2

- Landscape Evolution of the Oil Spill Mitigation Sand Berm in the Chandeleur Islands, Louisiana
- Guidelines for Planning, Design, Placement and Maintenance of Large Wood in Rivers: Restoring Process and Function (Collaboration with BoR)
- The Use and Value of Levee Setbacks in Support of Flood Risk Management, Navigation and Environmental Services (a strategy document)
- Strategic Placement of Sediment for Engineering and Environmental Benefit (an initial guide to opportunities and practices)



**ERDC**

# High Points

- Focus energy to motivate and facilitate innovation in both technical and business processes
- Important to elevate communication about advancing practice within and external to USACE
  - ▶ Creating project value
- Accelerate progress through co-development of solutions!
  - ▶ Districts with ERDC
  - ▶ USACE with others

