North Atlantic Coast Comprehensive Study Natural and Nature-Based Approaches to Support Coastal Resilience and Risk Reduction

Dr. Todd S. Bridges
U.S. Army Engineer Research and Development Center (ERDC)
Vicksburg, MS

Dr. Paul F. Wagner
U.S. Army Corps of Engineers Institute for Water Resources (IWR)
Alexandria, VA

21- 22 November 2013

US Army Corps of Engineers
BUILDING STRONG®

Post-Sandy

- PL 113-2: "conduct a comprehensive study to address the flood risks of vulnerable coastal populations in areas that were affected by Hurricane Sandy within the boundaries of the North Atlantic Division of the Corps... in coordination with other Federal agencies, and State, local and Tribal officials to ensure consistency with other plans to be developed."

- NACCS: develop a strategy to reduce risk and increase resiliency to communities affected by Hurricane Sandy and those areas vulnerable to tidally-influenced flooding and storm surge in areas within the boundaries of the USACE North Atlantic Division.

Why we are here

- Convene experts in natural and nature-based features (NNBF) to share technical information and perspectives on natural and nature-based features that have been developed for the North Atlantic Coast Comprehensive Study

- Take the next steps toward collaborative development of natural and nature-based approaches

- Review/share existing sources of information about natural and nature-based measures

- Identify technical gaps and opportunities for assessing effectiveness in risk reduction and building resilience
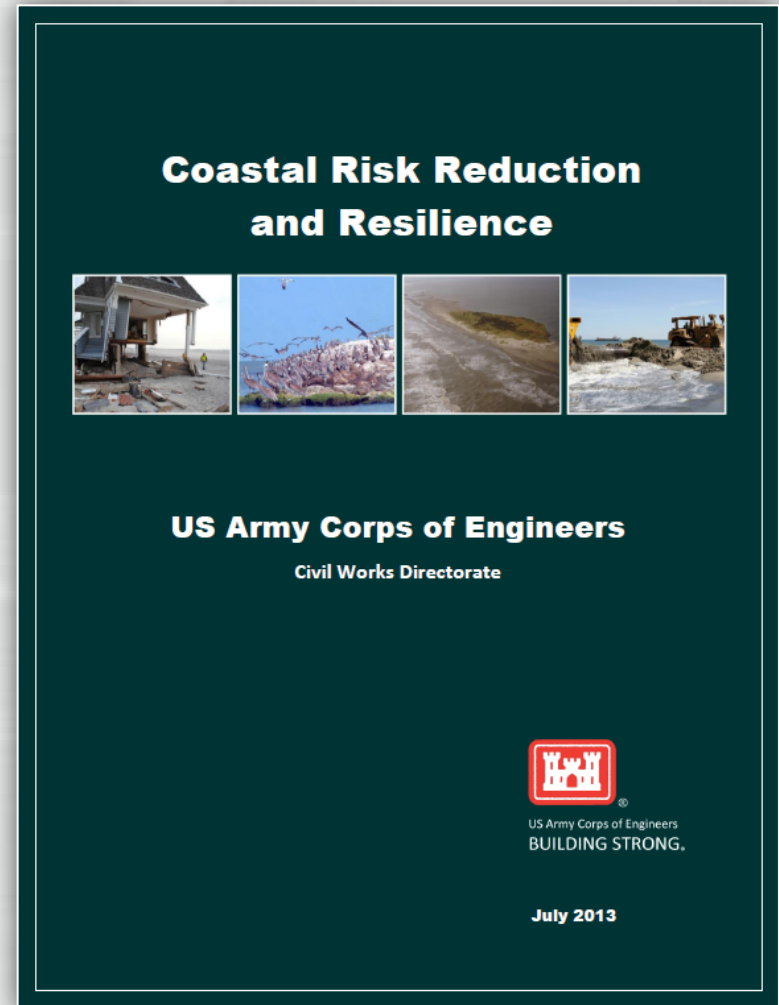
Coastal Risk Reduction and Resilience

The USACE planning approach supports an **integrated approach** *to reducing coastal risks and increasing human and ecosystem community resilience through a combination of* **natural, nature-based, non-structural and structural measures**.

This approach considers the engineering attributes of the component features and the dependencies and interactions among these features over both the short- and long-term.

It also considers the **full range of environmental and social benefits** *produced by the component features.*

Coastal Risk Reduction and Resilience

US Army Corps of Engineers

Civil Works Directorate

US Army Corps of Engineers
BUILDING STRONG.

July 2013

Background

- Hurricane Sandy impacted the Atlantic coastline in October 2012

- Affected entire east coast – Florida to Maine

- Greatest areas of impact: NJ, NY, CT

- Public Law 113-2

Study Area

Why we are here

Bring Federal agencies together to generate critical discussion and conversation on policies which support or hinder the development of comprehensive implementation green and nature-based infrastructure and possible solutions to increase the implementation of this type of infrastructure in areas affected by Hurricane Sandy.

- Share federal experiences regarding nature-based and green coastal features,

- Gain an understanding of the policy options and potential barriers associated with using these features, and

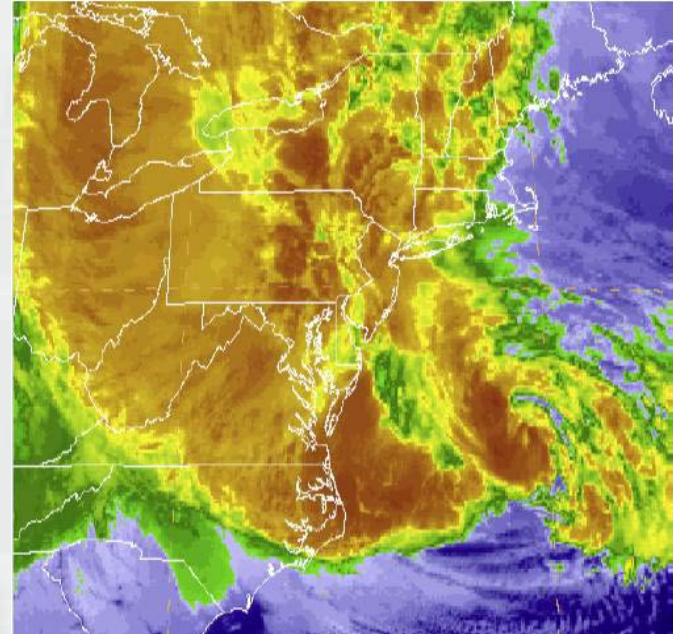- Identify possible solutions to overcome the policy and institutional barriers.

Our Multi-Disciplinary Team

Project leaders:

- **Paul Wagner (IWR)**
- **Todd Bridges (EL)**

Task leaders:

- Kelly Burks-Copes (EL)
- Craig Fischenich (EL)
- Edmond Russo (EL)
- Deborah Shafer (EL)
- Ty Wamsley (CHL)

Study team members:

|		
Scott Bourne (EL)	Burton Suedel (EL)	Jane Smith (CHL)
Pam Bailey (EL)	Lauren Dunkin (CHL)	Jennifer Wozencraft (CHL)
Kate Brodie (EL)	Ashley Frey (CHL)	Jae Chung (IWR)
Zach Collier (EL)	Mark Gravens (CHL)	Michael Deegan (IWR)
Sarah Miller (EL)	Linda Lillycrop (CHL)	Michelle Haynes (IWR)
Patrick O'Brien (EL)	Jeff Melby (CHL)	Lauren Leuck (IWR)
Candice Piercy (EL)	Andy Morang (CHL)	David Raff (IWR)
Bruce Pruitt (EL)	Cheryl Pollock (CHL)	Emily Vuxton (IWR)

Key Definitions

Natural and Nature-Based Features

Natural features are created and evolve over time through the actions of physical, biological, geologic, and chemical processes operating in nature. Nature-based features are those that may mimic characteristics of natural features but are created by human design, engineering, and construction to provide specific services such as coastal risk reduction.

The built components of the system include nature-based and other structures that support a range of objectives, including erosion control and storm risk reduction (i.e., seawalls, levees), as well as infrastructure providing economic and social functions (i.e., navigation channels, ports, harbors, residential housing). Natural coastal features take a variety of forms, including reefs (e.g., coral and oyster), barrier islands, dunes, beaches, wetlands, and maritime forests. The relationships and interactions among the natural and built features comprising the coastal system are important variables determining coastal vulnerability, reliability, risk, and resilience.
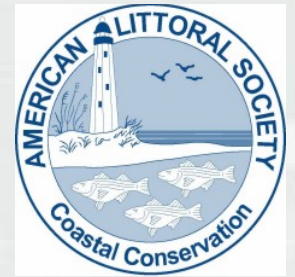
Natural and Nature-Based Infrastructure at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM INTENSITY, TRACK, AND FORWARD SPEED, AND SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY

Dunes and Beaches

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Berm height and width

Beach Slope

Sediment grain size and supply

Dune height, crest, width

Presence of vegetation

Vegetated Features:

Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Increase infiltration

Performance Factors

Marsh, wetland, or SAV elevation and continuity

Vegetation type and density

Oyster and Coral Reefs

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Reef width, elevation and roughness

Barrier Islands

Benefits/Processes

Wave attenuation and/or dissipation

Sediment stabilization

Performance Factors

Island elevation, length, and width

Land cover

Breach susceptibility

Proximity to mainland shore

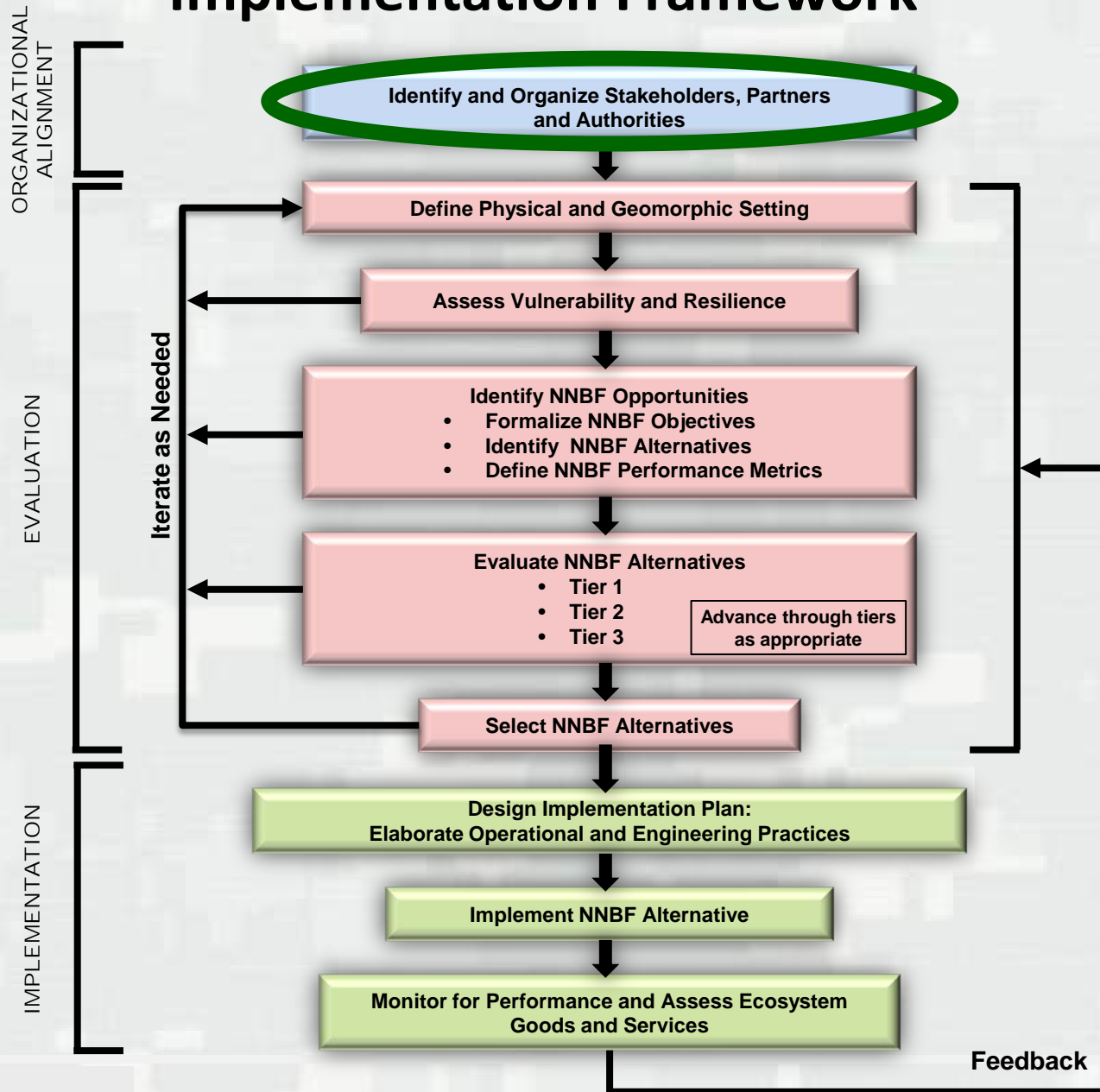### Maritime Forests/Shrub Communities

Benefits/Processes

Wave attenuation and/or dissipation

Shoreline erosion stabilization

Soil retention

Performance Factors

Vegetation height and density

Forest dimension

Sediment composition

Platform elevation

Natural and Nature-Based Features Evaluation and Implementation Framework

Goals

1. ## _Provide Risk Reduction Strategies_

   Reduce risk to which vulnerable coastal populations are subject.

2. ## _Promote Coastal Resilient Communities_

   Ensure a sustainable and robust coastal landscape system, considering future sea level rise and climate change scenarios, to reduce risk to vulnerable population, property, ecosystems, and infrastructure.

*Consistent with NOAA-USACE Rebuilding Principles and Sandy Assessment proposal

Natural and Nature-Based Features Evaluation and Implementation Framework
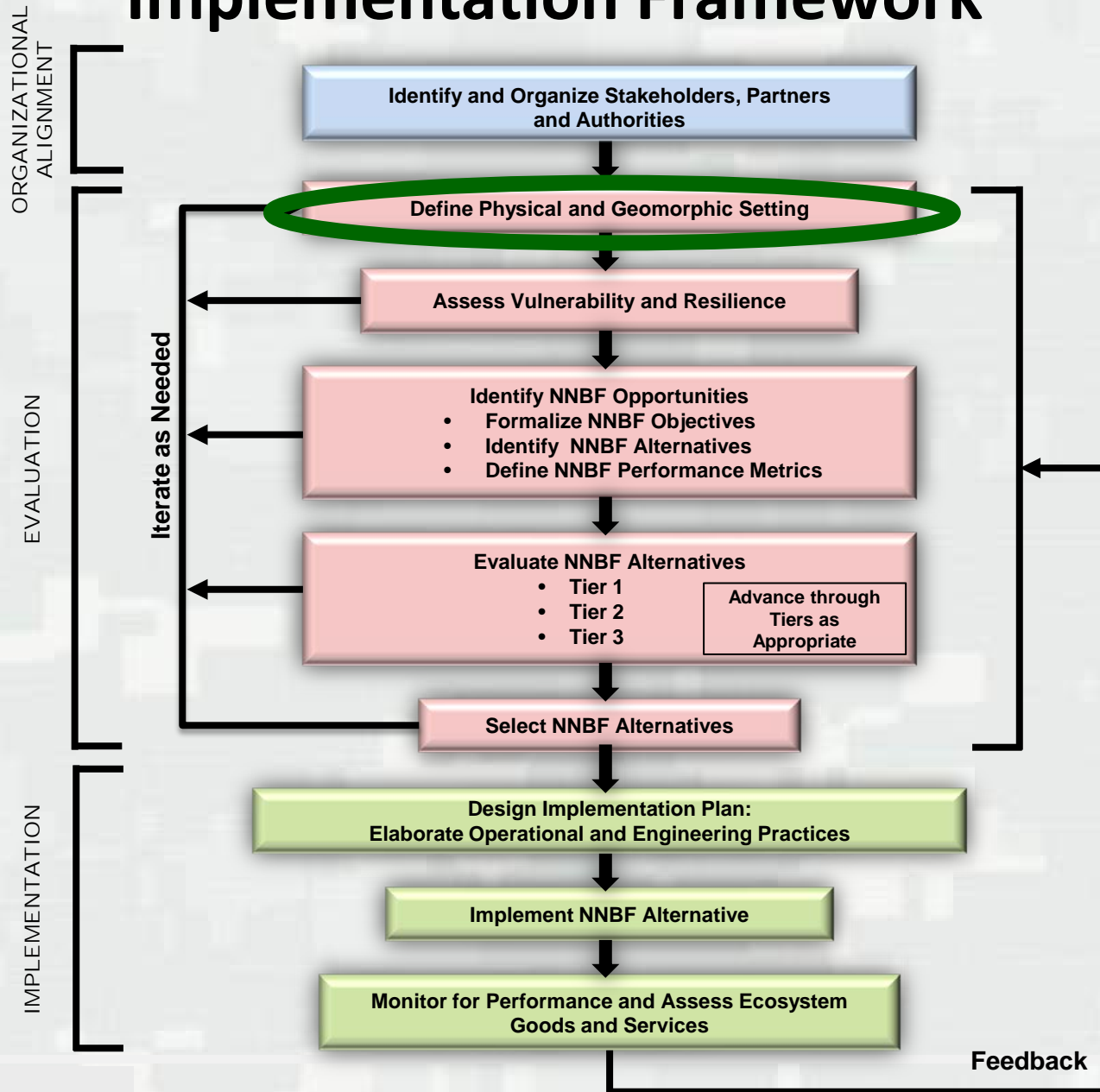
Authority

- Up to $20M for Comprehensive Study by Jan. 2015; unused funds available for future USACE studies (*ie*, Section 729)

- "Address flood risks of vulnerable populations affected by Hurricane Sandy within NAD..."
  - Coastline + tidally influenced areas
  - Affected by erosion, precipitation, winds, surge, etc.

- Develop interim reports

- Ensure study is consistent with interagency efforts

- Identify activities warranting additional analysis by USACE