



U.S.ARMY

The Natural Infrastructure Opportunities Tool

Safra Altman
Environmental Laboratory
US Army Engineer Research and Development Center

Rose Dopsovic
US Army Corps of Engineers, Mobile District






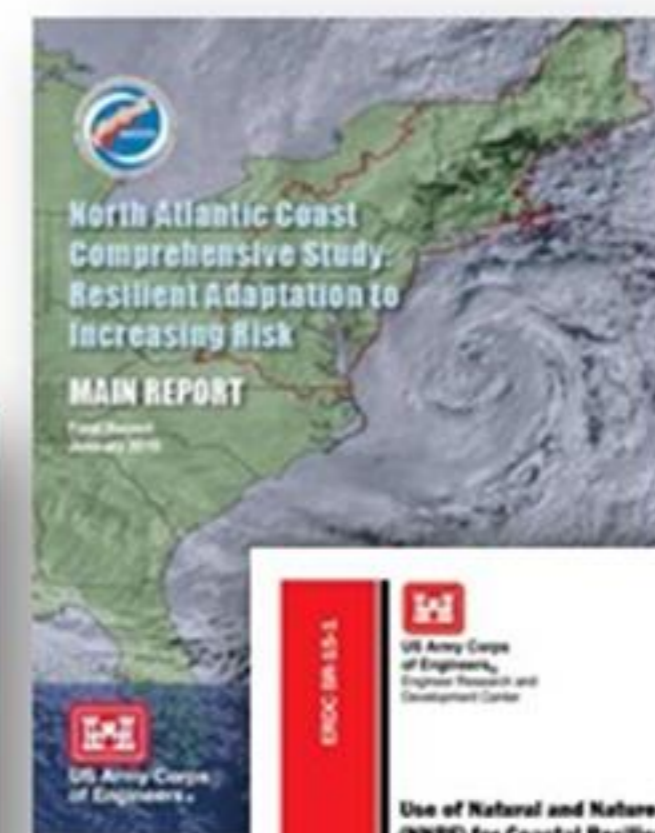
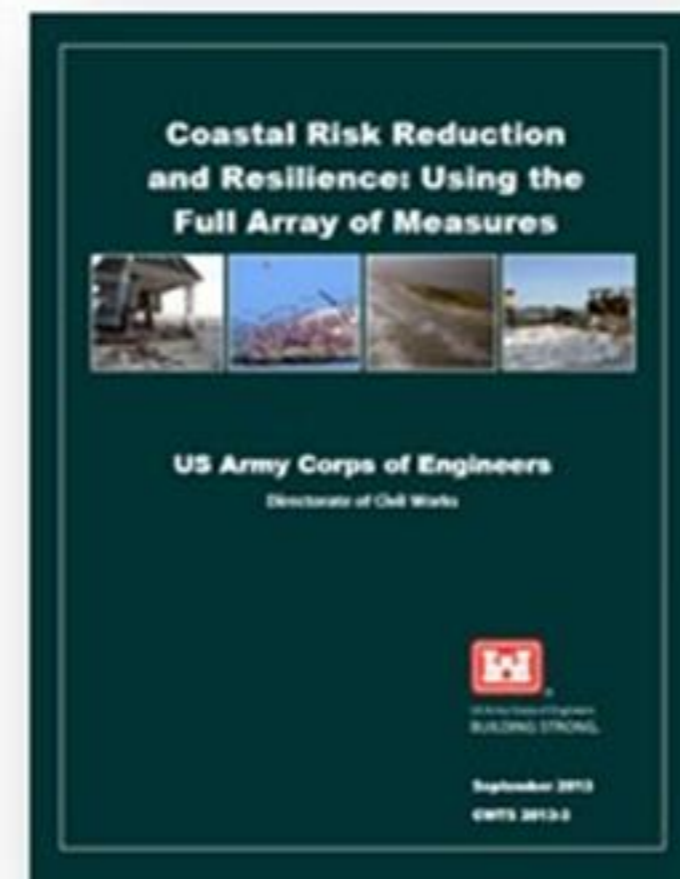
Natural and Nature-Based Features

NNBF are **landscape features** that are developed to provide **engineering functions** relevant to **flood risk** management while producing additional **economic, environmental** and **social benefits**.

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

				
<p>Dunes and Beaches</p> <p>Benefits/Processes Break offshore waves Attenuate wave energy Slow inland water transfer</p> <p>Performance Factors Berm height and width Beach Slope Sediment grain size and supply Dune height, crest, width Presence of vegetation</p>	<p>Vegetated Features: Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)</p> <p>Benefits/Processes Break offshore waves Attenuate wave energy Slow inland water transfer Increase infiltration</p> <p>Performance Factors Marsh, wetland, or SAV elevation and continuity Vegetation type and density</p>	<p>Oyster and Coral Reefs</p> <p>Benefits/Processes Break offshore waves Attenuate wave energy Slow inland water transfer</p> <p>Performance Factors Reef width, elevation and roughness</p>	<p>Barrier Islands</p> <p>Benefits/Processes Wave attenuation and/or dissipation Sediment stabilization</p> <p>Performance Factors Island elevation, length, and width Land cover Breach susceptibility Proximity to mainland shore</p>	<p>Maritime Forests/Shrub Communities</p> <p>Benefits/Processes Wave attenuation and/or dissipation Shoreline erosion stabilization Soil retention</p> <p>Performance Factors Vegetation height and density Forest dimension Sediment composition Platform elevation</p>



CALM BEFORE THE STORM

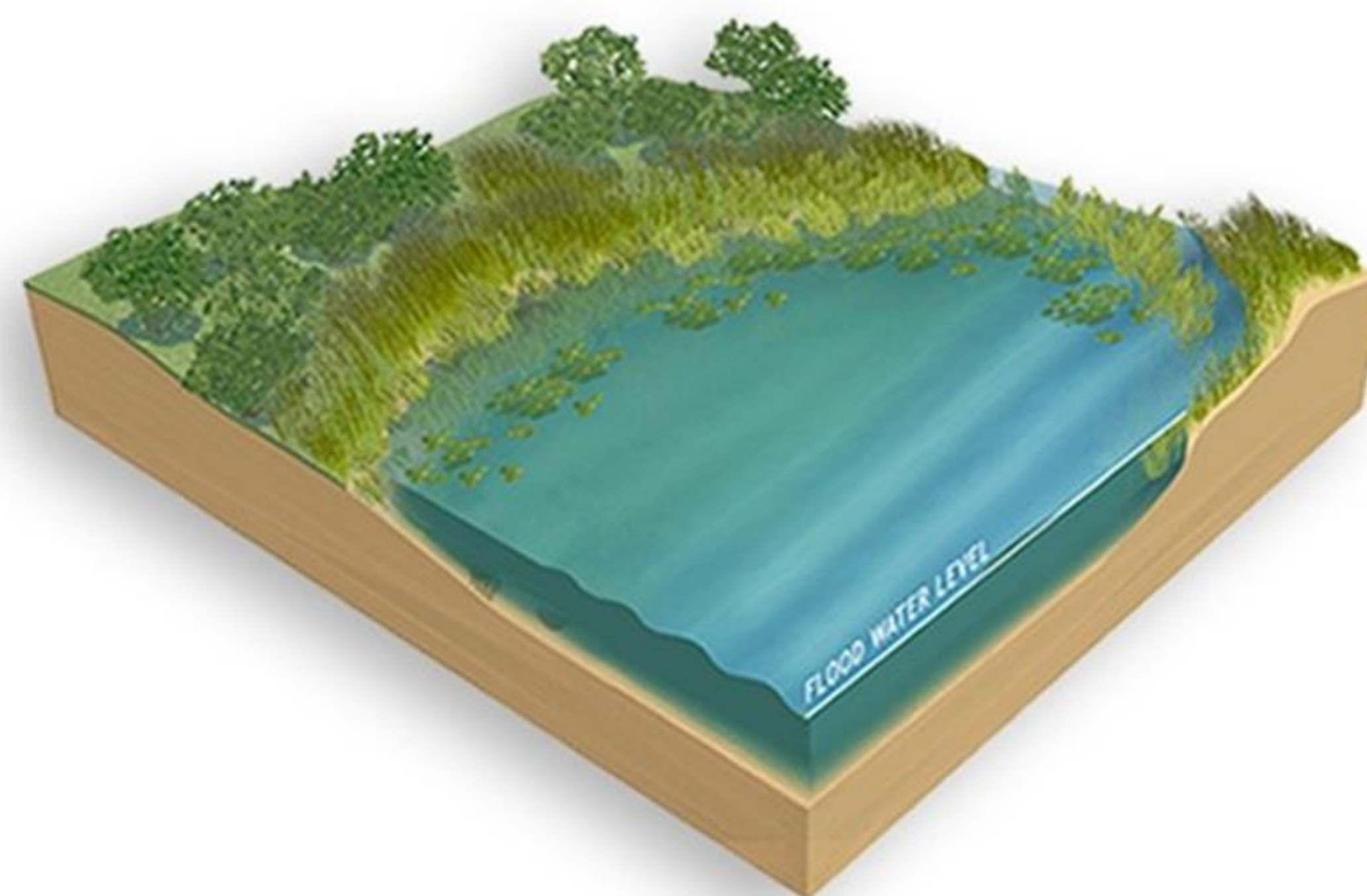
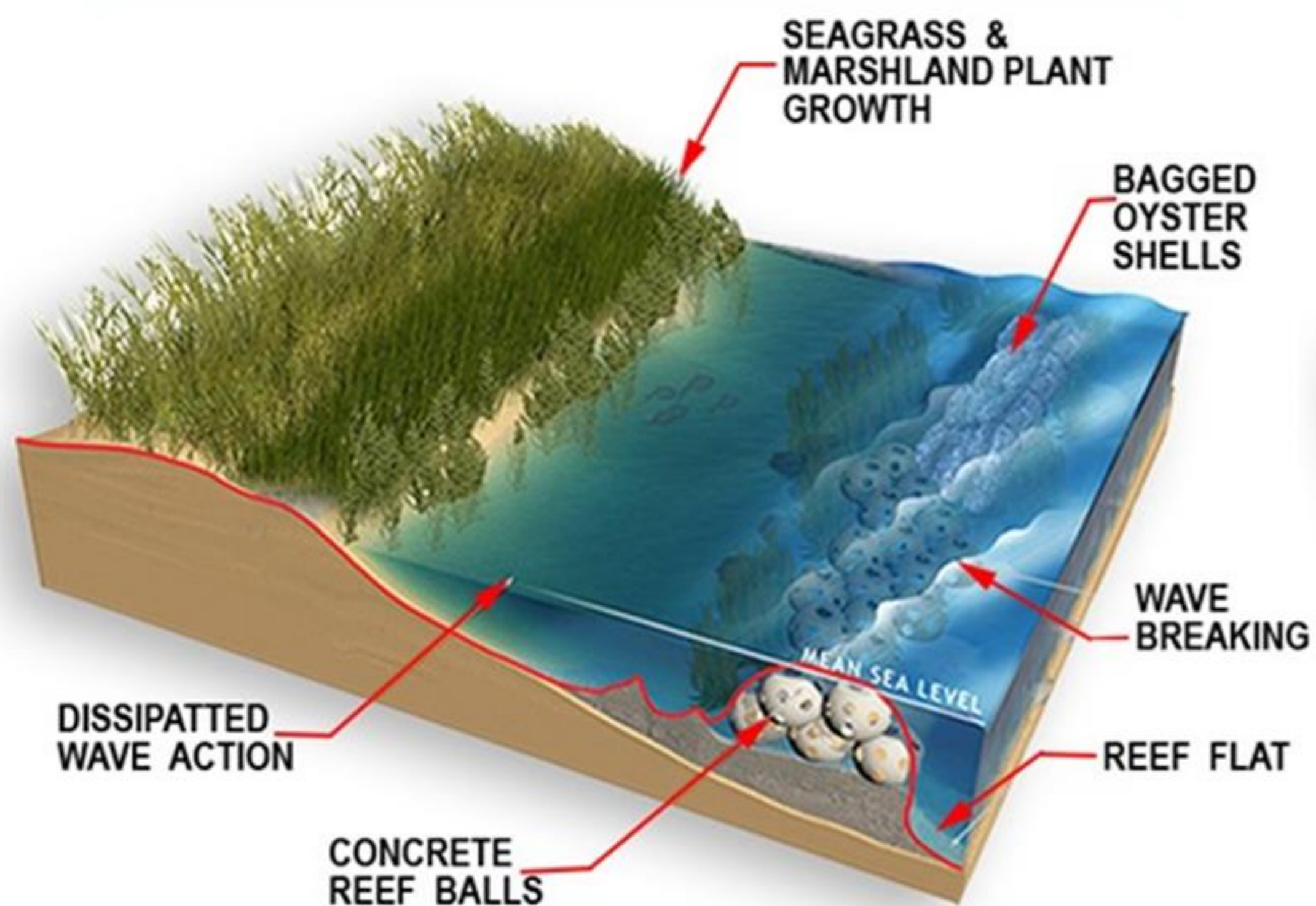
PREPARE • RESIST

combine nonstructural and structural measures to deliver full array of ecosystem goods and services

THE STORM

RECOVER • ADAPT

NNBF features can help attenuate waves offering improved flood protection during storms

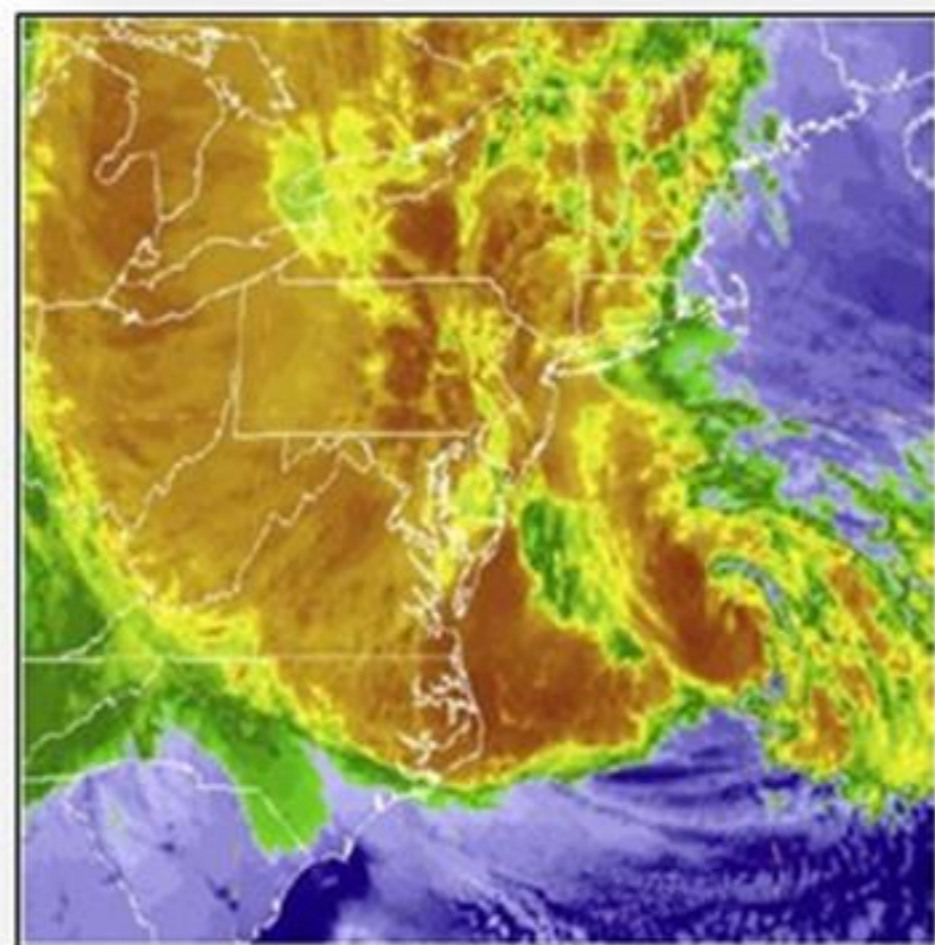


<https://ewn.el.erdc.dren.mil/nbnf.html>

Leveraging nature for engineering value

Following Hurricane Sandy:

- Risk industry-based tools used to quantify the economic benefits of coastal wetlands
 - Temperate coastal wetlands saved more than \$625 million in flood damages.
 - In Ocean County, New Jersey, salt marsh conservation can significantly reduce average annual flood losses by more than 20%.



COASTAL WETLANDS AND FLOOD DAMAGE REDUCTION

Using Risk Industry-based Models
to Assess Natural Defenses in the Northeastern USA

October 2016



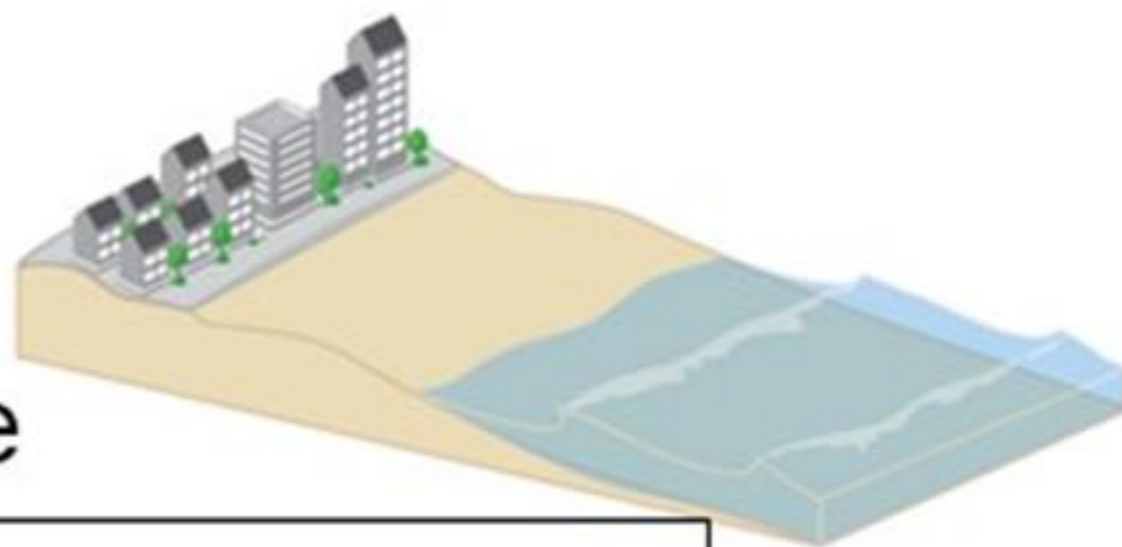
The Nature
Conservancy



LLOYDS
TERCENTENARY
RESEARCH
FOUNDATION

Importance of Natural Infrastructure

Minimal
Defense



salt marsh
oyster beds
barrier island



of sea wall
salt marsh
oyster beds
previous location of sea wall



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Review

Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems

Ariana E. Sutton-Grier^{a,b,*}, Kateryna Wouk^{a,c}, Holly Bamford^{a,b}

^a National Oceanic and Atmospheric Administration (NOAA), Silver Spring, MD 20910, United States
^b University of Maryland, Center for Environmental and Estuarine Science, Earth System Science Center and National Ocean Service, NOAA, Silver Spring, MD 20910, United States
^c Covallack, Silver Spring, MD 20910, United States

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Storm surge
Community resilience

ABSTRACT

There is substantial evidence that natural infrastructure combinations of natural and built infrastructure ("hybrid") can enhance coastal resilience by providing important storm and coastal flooding protection benefits. There is growing interest in the US and other coastal nations to help coastal communities build and reduce the risk of coastal flooding. Here we highlight coastal protection benefits provided by built infrastructure and innovative opportunities to combine the two into hybrid approaches. We also examine some case studies where hybrid approaches improve coastal resilience as well as some of the potential limitations of these approaches. The case studies include the US but also include a couple of international cases. We conclude that coastal communities and other decision makers should consider ecosystem protection and restoration efforts. As additional projects are developed, it is important to learn more about the cost of natural and hybrid infrastructure and the value of the storm and erosion protection benefits provided by healthy coastal ecosystems. We highlight the importance of natural and hybrid approaches and the need for adoption of these approaches in planning and decision making for coastal resilience.

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* Corresponding author at: National Oceanic and Atmospheric Administration (NOAA), 1305 East-West Highway, Silver Spring, MD 20910, United States. Tel.: +1 301/713/3174.

E-mail addresses: ariana.sutton@noaa.gov (A.E. Sutton-Grier), holly.bamford@noaa.gov (H. Bamford), kateryna.wouk@noaa.gov (K. Wouk).
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Finding the ways that work

Performance of Natural Infrastructure and Nature-based Measures as Coastal Risk Reduction Features

Authors

Shannon Cunniff¹
and
Aaron Schwartz²

REVIEWS REVIEWS REVIEWS

Marine urbanization: an ecological framework for designing multifunctional artificial structures

Katherine A Dafforn^a, Tim M Glasby^b, Laura Airolidi^{a,c}, Natalie K Riveiro^d, Mariana Mayer-Pinto^e, and Emma L Johnston^f

Underwater cities have long been the subject of science fiction novels and movies, but the "urban sprawl" of artificial structures being developed in marine environments has widespread ecological consequences. The combining of ecological principles with the planning, design, and operation of marine artificial structures is gaining in popularity, and examples of successful engineering applications are accumulating. Here we explore marine ecological engineering in practice, and introduce a conceptual framework for designing artificial structures with multiple functions. The rate of marine urbanization will almost certainly accelerate as "aquatourism" drives the development of underwater accommodations. We show that current marine developments could be designed to reduce negative ecological impacts while promoting ecosystem services.

2015, 113(2): 82–90, doi:10.1016/j.joem.2015.04.005 (published online 8 Jun 2015)

Artificial structures are expanding into marine environments and the construction of artificial structures. In the US, Australia, and Asia, more than 1000 km² of artificial structures are now in place. This infrastructure is now modified by hard engineering structures such as piers and breakwaters (man-made structures along the shore or offshore that protect against erosion and wave action, and provide a mooring for boats and other activities). Offshore aquaculture facilities and artificial reefs for oil and gas exploration is also increasing (e.g., Airolidi et al., 2011). Despite habitat loss and degradation associated with urban sprawl (Airolidi and Bertoni, 2011), artificial structures will continue and most likely escalate in the future, given the need for improved defenses around ports, harbors, and coastal cities as protection from both natural and human-induced hazards.



Journal of Environmental Economics and Management

Volume 85, September 2017, Pages 62–80

Benefits and ancillary costs of natural infrastructure: Evidence from the New Jersey coast ☆

Steven J. Dundas^a

[Show more](#)

<https://doi.org/10.1016/j.joem.2017.04.008>

Get rights and content

Abstract

Collaboration with the Private Sector

- Caterpillar Inc.
 - ▶ Restoring Natural Infrastructure Summit; November 4th 2015; New York City
 - ▶ Natural Infrastructure Initiative – USACE Collaboration Work Streams
 1. NI Opportunity Evaluation Tool.
Capitalizing on enterprise-level capability:
CE Dredge Decision Support Tool
 2. Evaluation and Decision Making
 3. Field Application and Demonstration
- Western Dredging Association (WEDA)
 - ▶ Collaborative technical workshop on engineering and construction techniques for Engineering With Nature



<http://www.caterpillar.com/en/company/sustainability/natural-infrastructure.html>

Natural Infrastructure Initiative



Natural Infrastructure Initiative is an informal grouping of companies and organizations working to promote the use of natural infrastructure

High level objectives:

- Accelerate investment in water based natural infrastructure projects as part of a solution set for infrastructure needs
- Embed natural infrastructure as part of ongoing discussions about improving investment in water-based infrastructure. Promote the use of natural infrastructure in general

Vision:

The widespread acceptance of, and increased investment, in natural infrastructure projects as a means to advance the economic vitality, environmental health and security of our nation.

Natural **AND** Built Infrastructure, not **OR**



The Nature Conservancy



INTREXON

AECOM



Brown & Root



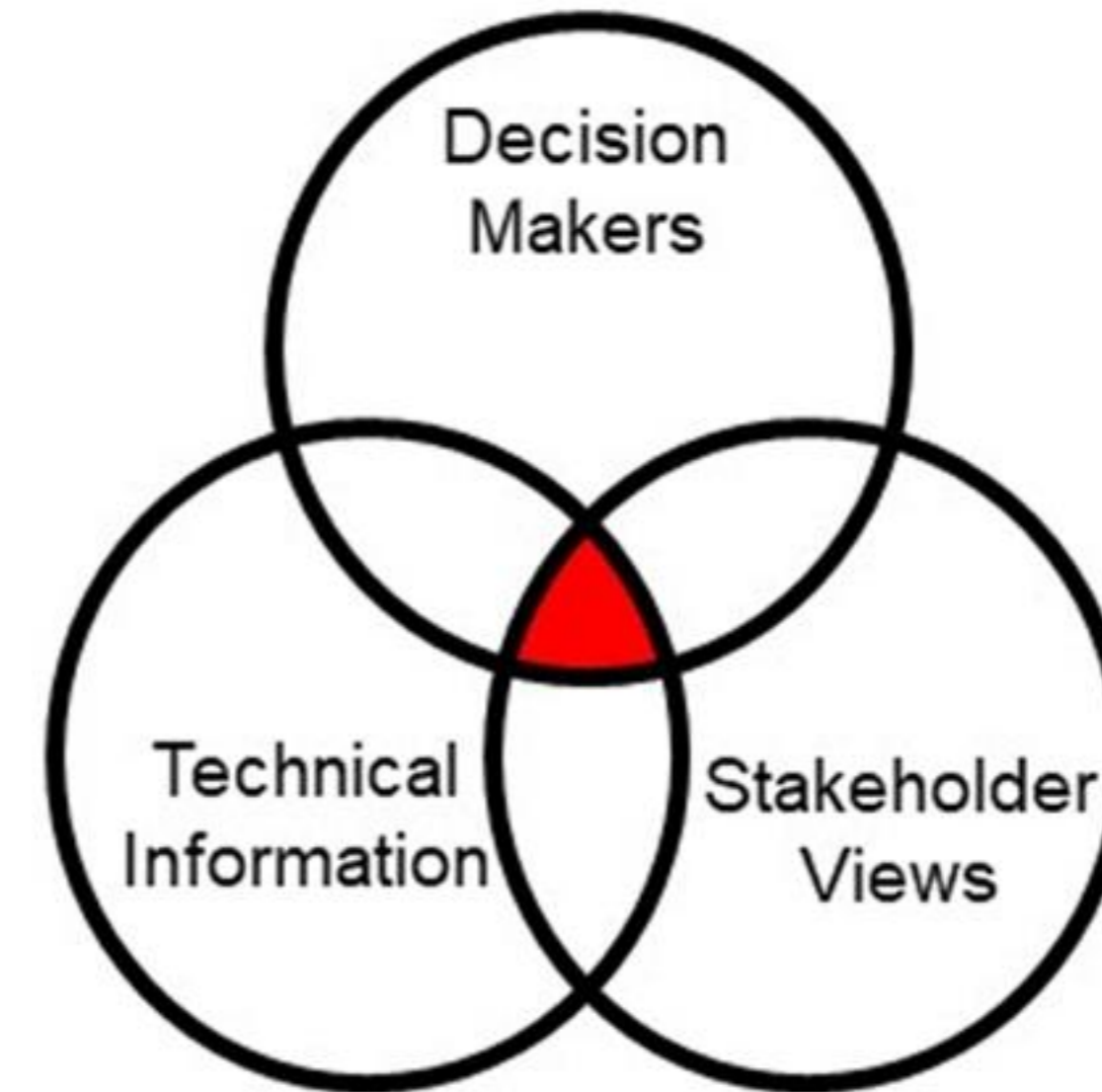
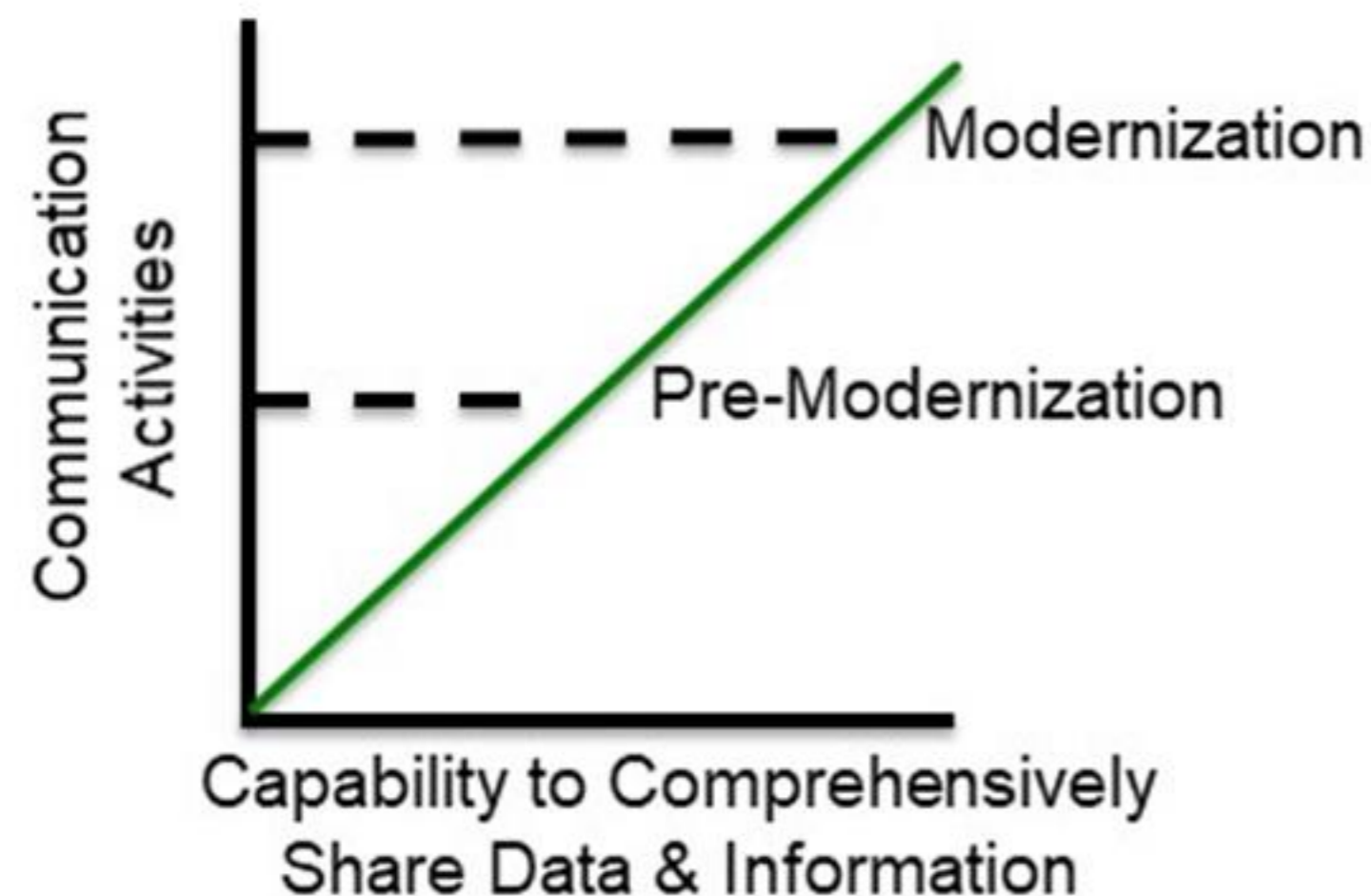
DUCKS UNLIMITED



US Army Corps of Engineers • Engineer Research and Development Center

Increase integration of information through a connected data network

- Consistent access to authoritative data
- Simplified & expedited dredging analyses
- Multi-objective systems optimization
- Dynamic visualization
- Enhances communications
 - Within USACE
 - With non federal sponsors and partners
 - With environmental agencies



**Improved Communication,
Shared Visioning, and
Alignment of Mutual Objectives**

Tool Development: Natural Infrastructure Opportunities Tool

- The public facing *N/OT* web-viewer, developed in collaboration with the Natural Infrastructure Initiative, focuses on identifying beneficial use an natural infrastructure opportunities.
- The initial version of viewer developed to address a number of questions identified by NII group including:

Where are the sediment sources?

Where are the current placement areas?

Where are the restoration, shore protection, and nearshore placement projects?

What volume of material was (or is planned to be) placed?

Where are potential placement sites?

What capacity is available?

What are the upcoming dredging/navigation needs?

What are the opportunities for new beneficial use?

Are there opportunities to link multiple projects?



What is the Natural Infrastructure Opportunities Tool?

By using map based visualizations of environmental, geomorphic and sediment conditions, as well as upcoming USACE projects, and an interface for users to add their resource needs and resource availability, this portal will help discover natural infrastructure connections and inspire innovative opportunities.

Natural Infrastructure & Opportunities - Connecting Resources to Needs

1 About NIO

Welcome to the Natural Infrastructure & Opportunities (NIO) Tool where we connect your natural resources and needs!

Sponsored by the National Infrastructure Opportunities for Utilizing Dredge Material Initiative Group program, this portal will help discover the movement and content of sediment dredged material through placement area capacities, dredging plans, and sediment characteristic descriptions and help to identify beneficial use and infrastructure opportunities.

How the NIO Tool Works

Each tab-numbered tab across the top holds a category of data. In any map, zoom to your area of interest. As you browse throughout the tabs, different data layers will appear, allowing you to gather important about the sediment at your site.

Become a Contributor

This map is powered by our contributors! Do you have or need sediment?

Step 1: Click the respective button below to make a registry in the Natural Infrastructure Opportunities database. Once a registry is made, it is visible on the Sediment Baseline Conditions, Sediment Needs, and Sediment Connections tabs.

- I HAVE Sediment
- I NEED Sediment

2 Local Conditions

3 Explore Subsidence

NIO - Resource BACK

Please fill out the form below to register your resource in the Natural Infrastructure and Opportunity (NIO) database.

Location of Resource*
Where is the resource located?

Map interface showing a location pin on a world map.

En: PAC NOAA
Lat: 1.40611 Lon: 0

Submission Date*
9/14/18

Resource Status*
Is this a planned, under contract, or...

NIO - Need BACK

Please fill out the form below to register your resource in the Natural Infrastructure and Opportunity (NIO) database.

Submission Date*
9/14/18

Location of Need*
Where is the need located?

Map interface showing a location pin on a world map.

En: PAC NOAA
Lat: 1.40611 Lon: 0

Area of Interest Buffer*
Enter, in feet, the appropriate width of the area of interest.

How the NIOT Works

- The NIOT brings together datasets from multiple sources all in one place using an open, online Arc Story Maps platform
- Data is organized in a map. The map will change based on what links are clicked – either the category number or any hyperlinks in the category description
- There are 11 tabs. Each tab holds a subset of data organized for that category. Interested in seeing all data together? Tab 10 provides access to all data layers in the NIO tool.

Interested in finding contacts who are also exploring natural infrastructure opportunities? Tab 11 provides contact offices for users of the NIOT.

- ▶ 1 About NIO
- ▶ 2 Local Conditions
- ▶ 3 Explore Subsidence
- ▶ 4 Shoreline Rate Change
- ▶ 5 Sediment Baseline Conditions
- ▶ 6 Resource Needs
- ▶ 7 Resource Connections
- ▶ 8 Environmental Considerations
- ▶ 9 Environmental Impact
- ▶ 10 All Data
- ▶ 11 Connections & Contacts

Open, Online Application

Natural Infrastructure Opportunities Tool - Connecting Resources to Needs

A decision support tool



▶ 1 About NIOT

Welcome to the Natural Infrastructure Opportunities Tool (NIOT) where we connect your natural resources and natural infrastructure needs!

This portal will help discover available resources for natural infrastructure projects including the movement and content of dredged material through placement area capacities, dredging plans, and sediment characteristic descriptions and help to identify beneficial use and infrastructure opportunities.

How the NIOT Works

Each numbered tab down the left holds a category of data. In any map, zoom to your area of interest. As you browse throughout the tabs, different data layers will appear, allowing you to gather important information about your site of interest.

Become a Contributor

This map is powered by our contributors! Do you have or need resources for natural infrastructure (e.g., sediment, equipment, etc.)?

Step 1: Click the respective button below to make a registry in the Natural Infrastructure Opportunities database. Once a registry is made, it is visible on the Sediment Baseline Conditions, Resource Needs, and Resource Connections tabs.

-  I HAVE Resources
-  I NEED Resources

▶ 2 Local Conditions



Supported by Arc Story Maps

Local Conditions

Natural Infrastructure & Opportunities - Connecting Resources to Needs

A decision support tool



1 About NIO

2 Local Conditions

How to use this map:

- The National Wetlands Inventory area provides by FWS. This data set represents the extent, approximate location and type of wetlands and deepwater habitats in the United States and its Territories. These data delineate the areal extent of wetlands and surface waters as defined by Cowardin et al. (1979).

3 Explore Subsidence

4 Shoreline Rate Change

5 Sediment Baseline Conditions

6 Resource Needs

7 Resource Connections

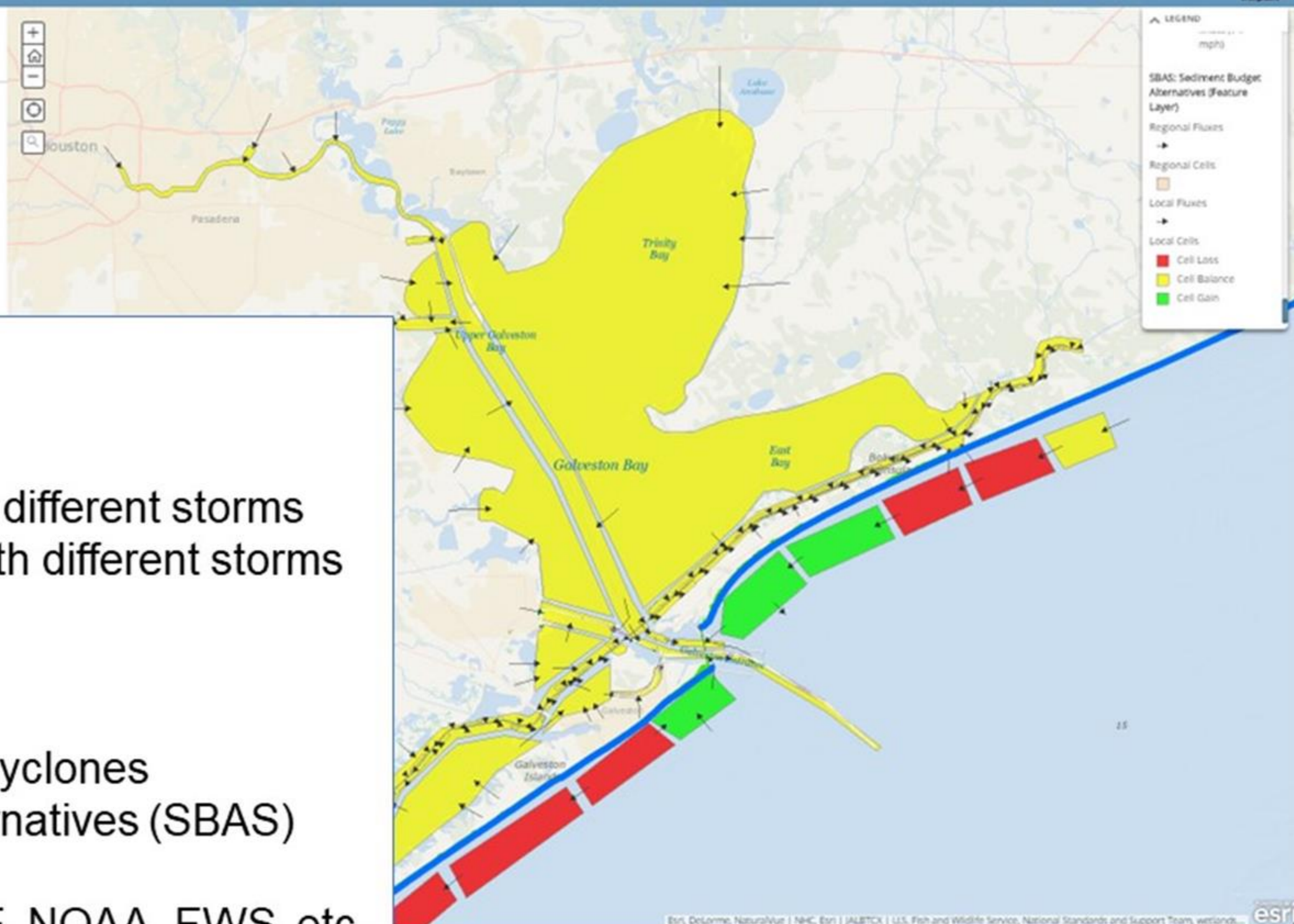
8 Environmental Considerations

9 Environmental Impact

10 All Data

Data Layers:
 Wetlands
 Shoaling Rate
 Volume change – with different storms
 Shoreline change – with different storms
 Elevation change
 Geomorphic features
 Dune Features
 Tropical Storms and Cyclones
 Sediment Budget Alternatives (SBAS)

Data Sources: USACE, NOAA, FWS, etc.



Subsidence

Natural Infrastructure & Opportunities - Connecting Resources to Needs

A decision support tool



- ▶ 1 About NIO
- ▶ 2 Local Conditions
- ▶ 3 Explore Subsidence

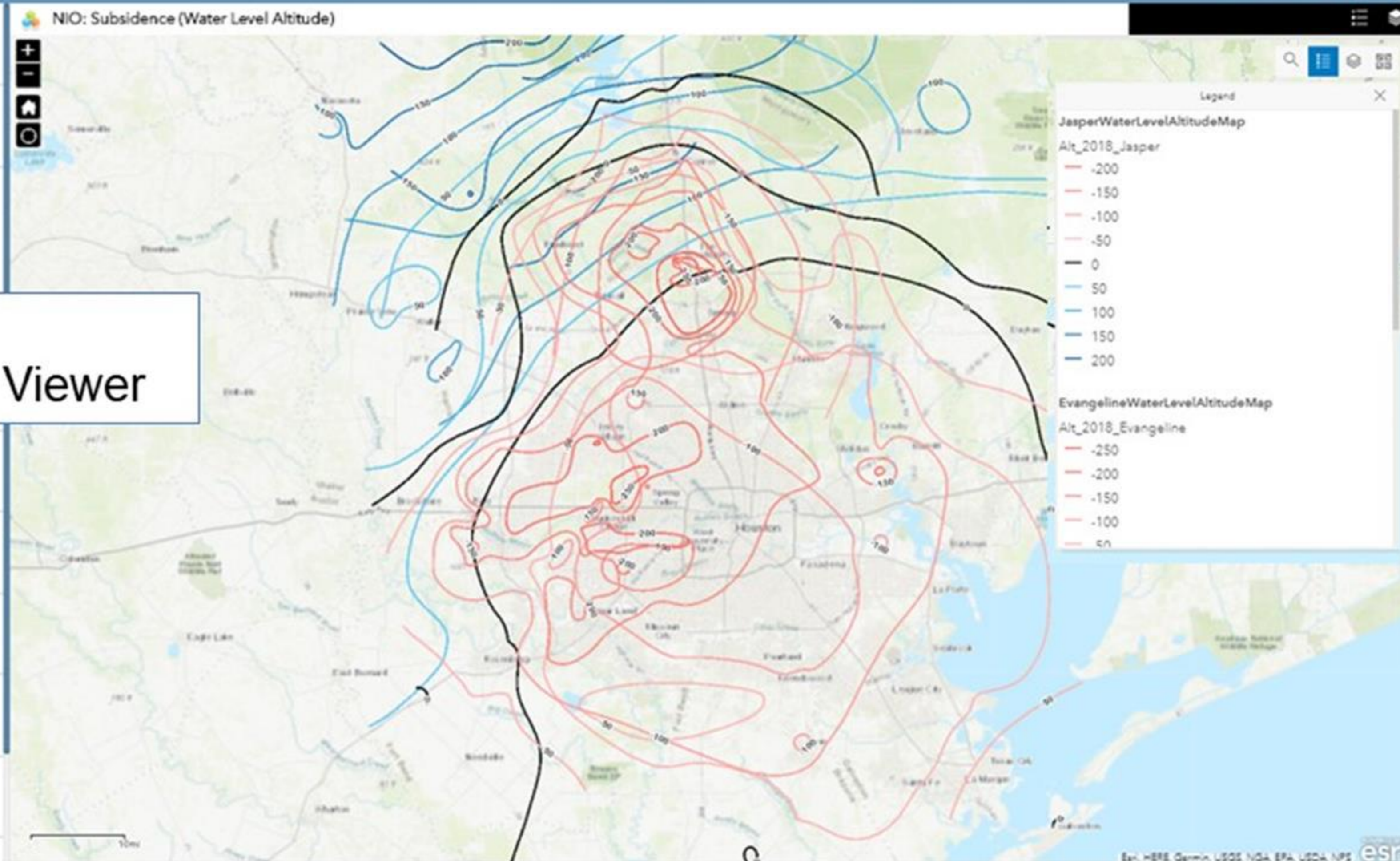
Explore Groundwater-Level and Compaction Data in the Chicot, Evangeline and Jasper Aquifers

- The map to your right shows the 2018 water levels for the Chicot, Evangeline and Jasper aquifers.
- [Open USGS's Subsidence Viewer](#)

USGS measures over groundwater levels in over 700 wells in an 11-county area. The cumulative compaction in the county area. Water-level altitude contours, wells, and compaction data have been derived from 1977 through the present, water level changes over

Data Layers:
USGS Subsidence Viewer

- ▶ 4 Shoreline Rate Change
- ▶ 5 Sediment Baseline Conditions
- ▶ 6 Resource Needs
- ▶ 7 Resource Connections
- ▶ 8 Environmental Considerations



Shoreline Change

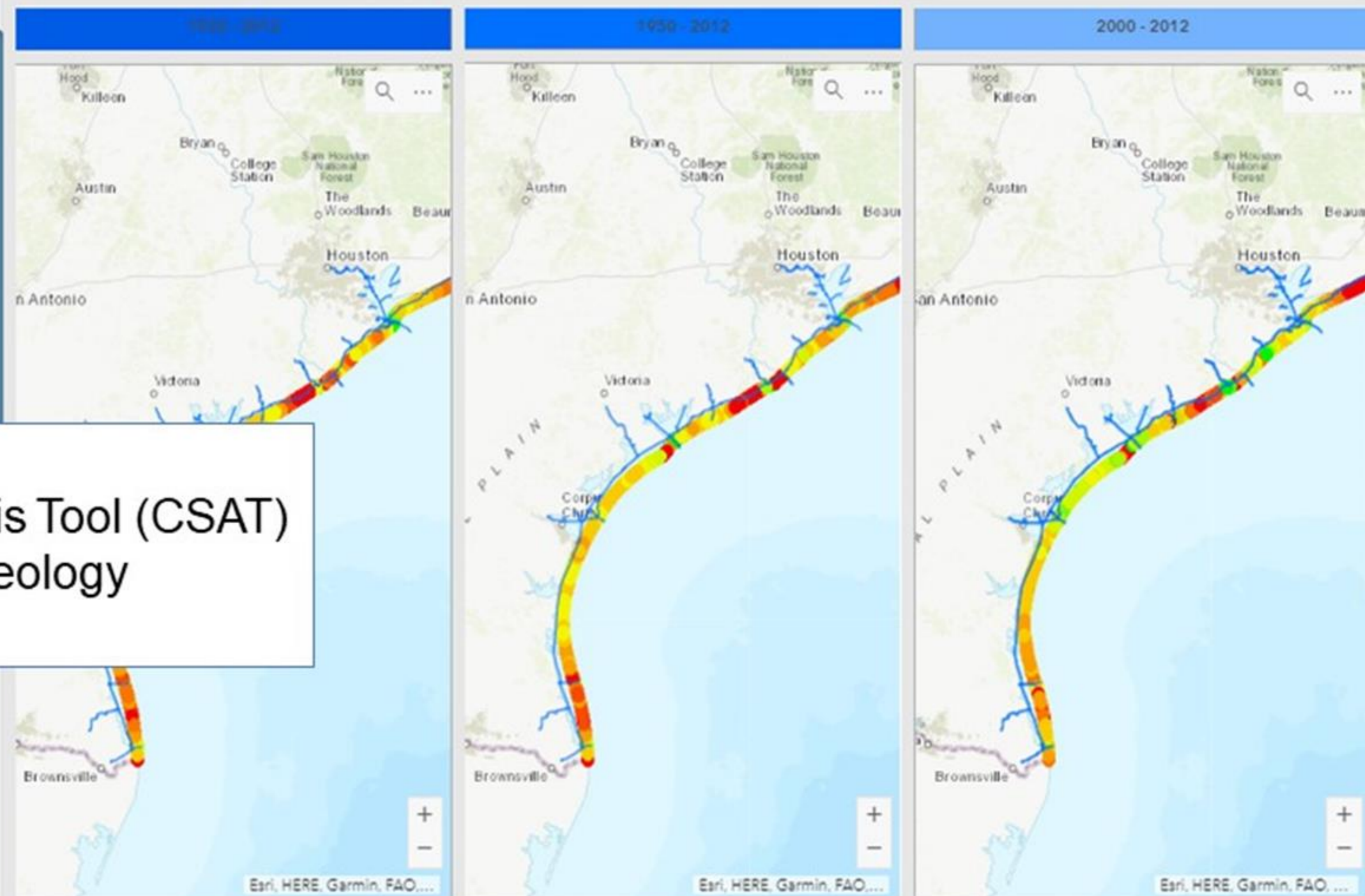
Natural Infrastructure & Opportunities - Connecting Resources to Needs

A decision support tool



- ▶ 1 About NIO
- ▶ 2 Local Conditions
- ▶ 3 Explore Subsidence
- ▶ 4 Shoreline Rate Change

Shoreline Rate Change: 1930 - 2012



How to use this map:

- Click to show Corps Shoaling Analysis Tool (CSAT)
- Click to show change rate (Bureau of Economic Geology)
- Click to show change rate (Bureau of Economic Geology)
- Click to show change rate (Bureau of Economic Geology)

Other options to explore:

- Bureau of Economic Geology
- CSAT mapping application
- CSAT data sources

Note:

Data for this change rate (1930s - 2012) application are taken from Paine, Caudle, and Andrews (2014), where the methods, data sources, and results are discussed. The individual data points (shoreline movement rates at 11,497 points along the 2012 Texas Gulf coast shoreline) can be downloaded from the Bureau's coastal studies download page. Project sponsored by the General Land Office of Texas under CEPR contract no. 09-074-000.

Sponsoring and Participating Organizations

Data Layers:
 Corps Shoaling Analysis Tool (CSAT)
 Bureau of Economic Geology
 Shoreline Change

Baseline Conditions

Natural Infrastructure Opportunities Tool - Connecting Resources to Needs

A decision support tool



4 Shoreline Rate Change

5 Sediment Baseline Conditions

How to use this map:

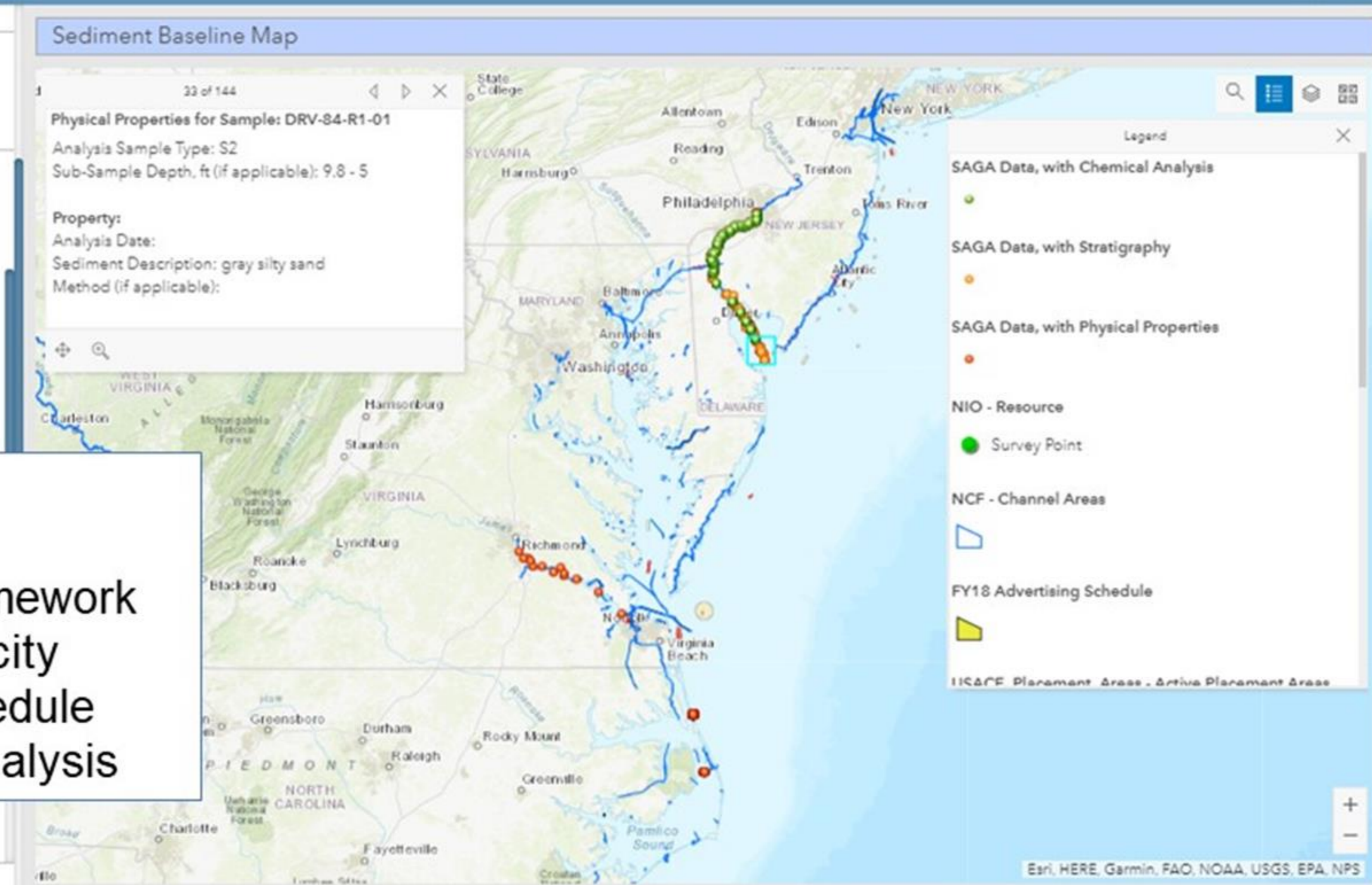
- This map shows sediment RESOURCES known in the US Army Corps of Engineers through sediment sampling activities and analyses, based on FY 18 [Dredging Advertising Schedule](#).
 - You can see if a location have Physical, Chemical, or Biologic analyses available.
 - You can view Placement Area Capacity
- This map also shows channel areas.
- Click on features in the map to view details.
- Available Map Layers:
 - NIO - Resource
 - Placement area Capacity
 - FY19 Advertising Schedule
 - Available Sediment Analysis

Become a Contributor

This map is powered by our community.

Step 1: Click the button below to get started.

- I HAVE Resources



Data layers:
 NIO – Resource
 National Channel Framework
 Placement area Capacity
 FY19 Advertising Schedule
 Available Sediment Analysis

NI Resource Need

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6 Resource Needs

How to use this map:

- This map also shows contribution from our *NIO User Community* identifying resource NEEDS.
- Click on features in the map to uncover additional attribution per each site or polygon

- NIO Resource Needs
- Regional Sediment Management (RSM) Projects, FY17
- Pre-Construction Engineering and Design (CSRM)
- Partial Construction Funds Received (CSRM)
- Awaiting Initial Construction (CSRM)
- National Channel Framework

Become a Contributor

This map is powered by our contributors! D

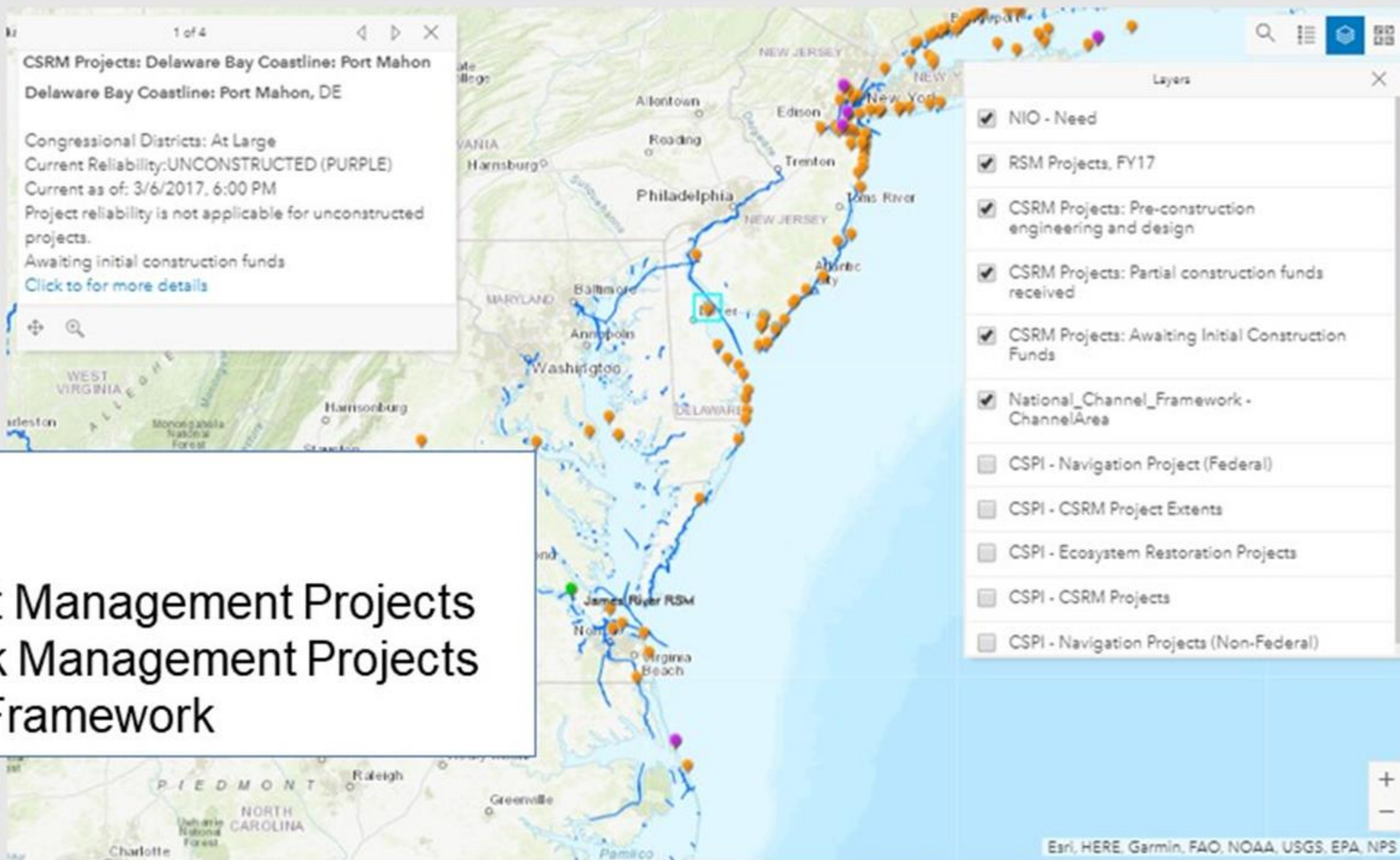
Step 1: Click the NEED button below to mak

- I NEED Resources

7 Resource Connections

Data Layers:
 NIO – Need
 Regional Sediment Management Projects
 Coastal Storm Risk Management Projects
 National Channel Framework

Resource Needs Map



NIO Contributors

- The mapping tools allows the community of users to submit “announcements” of resources or needs.
- Tabs 1, 5, and 6 have links to create a mapped “announcement” of Available Resources or Resource Needs.
- Click the respective link to open the online entry form
 - Users supply location and basic descriptions of resources that they need or have.

▶ 1 About NIO

▶ 2 Local Conditions

▶ 3 Explore Subsidence


▶ 4 Shoreline Rate Change

▶ 5 Sediment Baseline Conditions

▶ 6 Resource Needs

▶ 7 Resource Connections

Step 1: Click the respective button below to make a registry in the Natural Infrastructure Opportunities database. Once a registry is made, it is visible on the Sediment Baseline Conditions, Resource Needs, and Resource Connections tabs.

•  I HAVE Resources

•  I NEED Resources

NIO Contributors | Forms

NIO - Resource

Please fill out the form below to register your resource in the Natural Infrastructure and Opportunity (NIO) database.

Submission Date*

Location of Resource*
Where is the resource located?

Esri, FAO, NOAA Powered by Esri

Lat: 1.40611 Lon: 0

Resource Status*
Is this a planned, under contract, or current availability?

Planned

Under Contract

Currently Available

NIO - Need

Please fill out the form below to register your resource in the Natural Infrastructure and Opportunity (NIO) database.

Submission Date*

Location of Need*
Where is the need located?

Esri, FAO, NOAA Powered by Esri

Lat: 1.40611 Lon: 0

Area of Interest Buffer*
Enter, in feet, the approximate width of the area of interest.

Need Description*

NIO Resource Connections

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A decision support tool



7 Resource Connections

How to use this map:

- This map only shows contributions from our *NIO User Community* and Regional Sediment Management (RSM) Projects for the current fiscal year.
- Click on the Legend and Layers buttons at the bottom of the map to discover what data is available.
- Click on features in the map to uncover additional attribution per each site or polygon.

Legend

- USACE Projects
- NIO Resource
- NIO Need

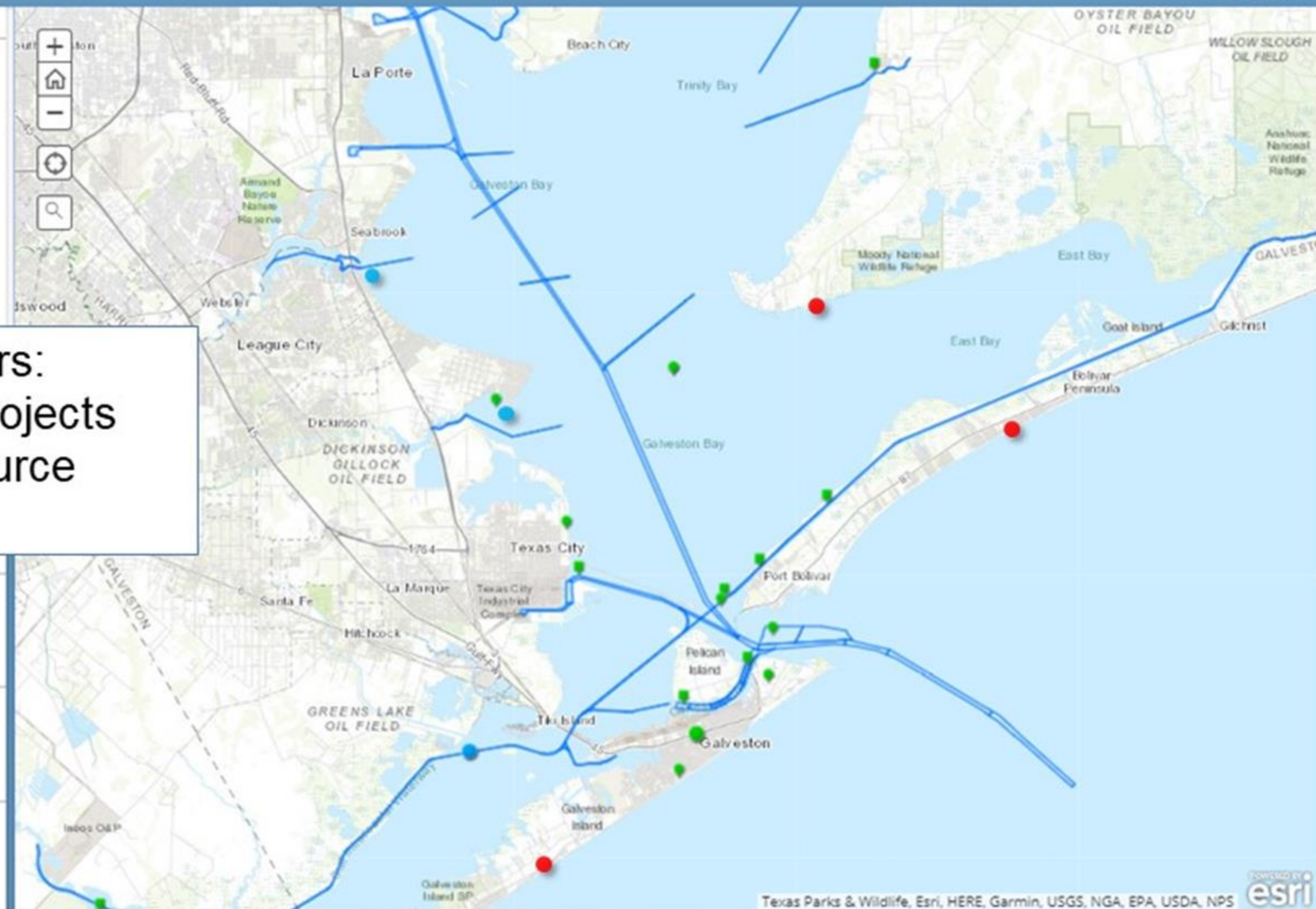
Sources: NIO, RSM

Data Layers:
USACE Projects
NIO Resource
NIO Need

8 Environmental Considerations

9 Environmental Impact

10 All Data



Texas Parks & Wildlife, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS



Environmental

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A decision support tool



▶ 5 Sediment Baseline Conditions

▶ 6 Resource Needs

▶ 7 Resource Connections

▶ 8 Environmental Considerations

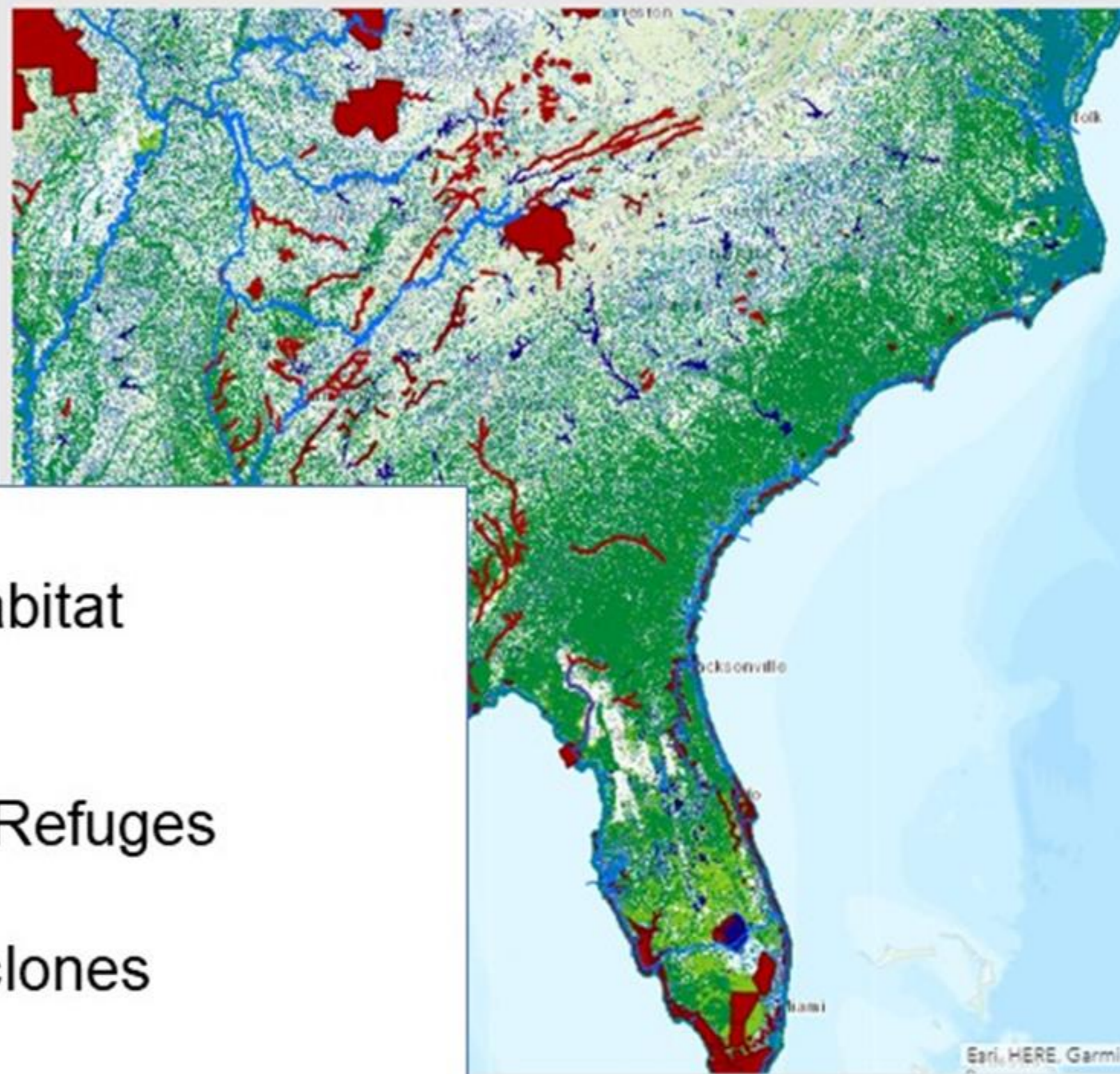
▶ 9 Environmental Impact

How to use this map:

- View the [NIO Environmental Impact Map](#)
 - Zoom to your area of interest and display environmental considerations.
 - Click on the Legend button in the upper right corner when available.
 - Click on features in the map to uncover more information.
 - Use the map tools in the upper right corner.
 - Available Map Layers:
 - National Wildlife Refuge

Data Layers:
 Essential Fish Habitat
 Oyster Beds
 Seagrasses
 National Wildlife Refuges
 Wetlands
 Major Global Cyclones
 Hurricanes
 NCF-Channel area

Environmental Impact Map



Research and Development Center

Contacts and Connections

Natural Infrastructure Opportunities Tool - Connecting Resources to Needs

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▶ 8 Environmental Considerations

▶ 9 Environmental Impact

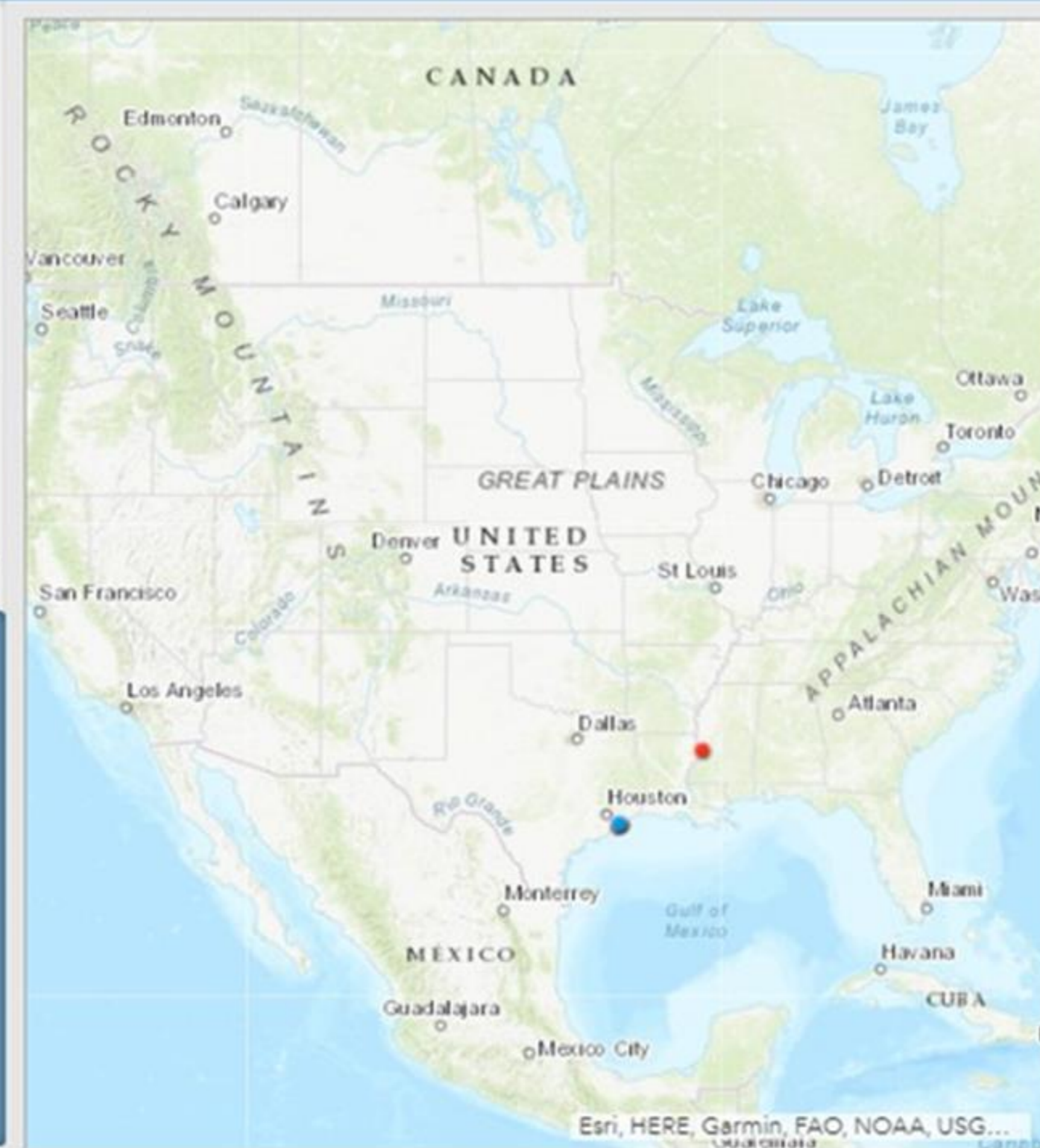
▶ 10 All Data

▶ 11 Connections & Contacts

The Natural Infrastructure Initiative membership includes: Caterpillar, AECOM, Great Lakes Dredge & Dock, The Nature Conservancy, Ducks Unlimited, University of Georgia - Institute for Resilient Infrastructure Systems, Brown & Root, and Dawson & Associates.

The NIOT was developed in collaboration with the Natural Infrastructure Initiative, US Army Corps of Engineers Engineer Research and Development Center (ERDC), and US Army Corps of Engineers Mobile District.

Use the lists on the right to view each of the Have/Need Resources submitted by



Need Resources

Vicksburg, MS
Wetlands and Coastal Ecology
ERDC TEST
<https://www.erd.usace.army.mil/Locations/EL/Demo>

Name of Need Here
USACE
ERDC-RDE-EL-MS
www.usace.army.mil
A description of your resource need goes here

Name of Need Here
Organization name Here
Office Name Here
yourwebsite.com
I need sandy material

Last update: 2 hours ago

Have Resources

Title of Resource Here
Your Agency Name Here
Your Office Name Here
Your Website Here
Amount of Resource:
10000 cy

Last update: 2 hours ago

Integrating Natural Infrastructure

Increasing infrastructure resilience with Nature-based Solutions (NbS)

Stakeholder engagement

Adaptive planning & management

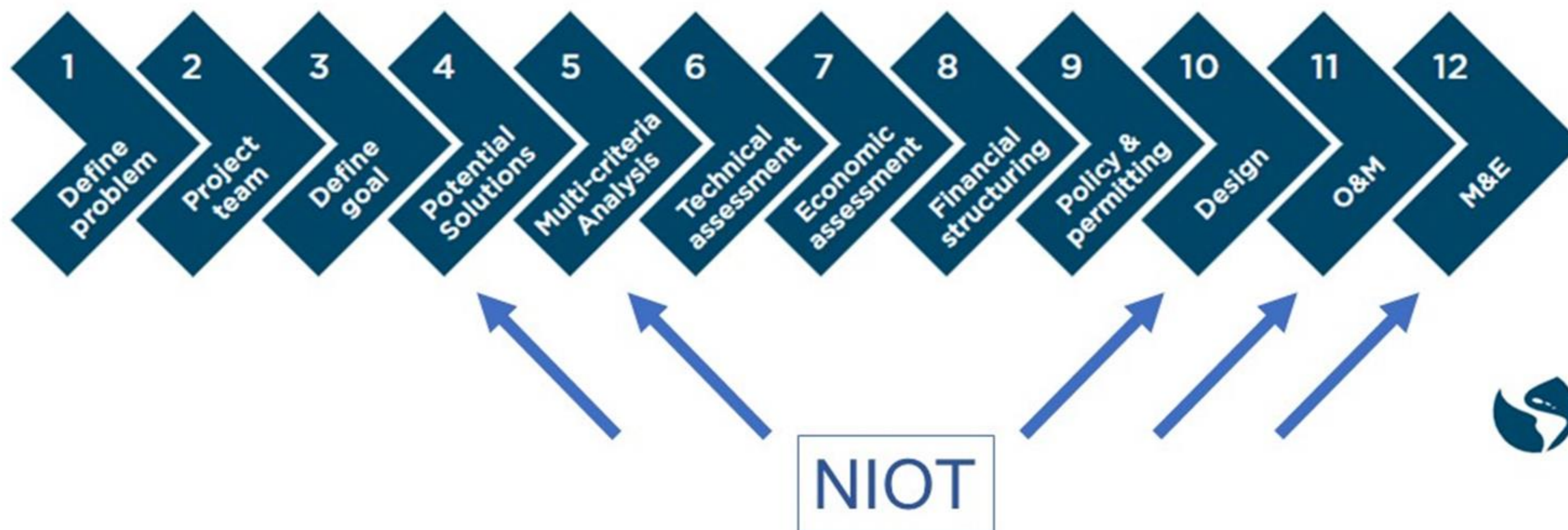


Integrating Natural Infrastructure

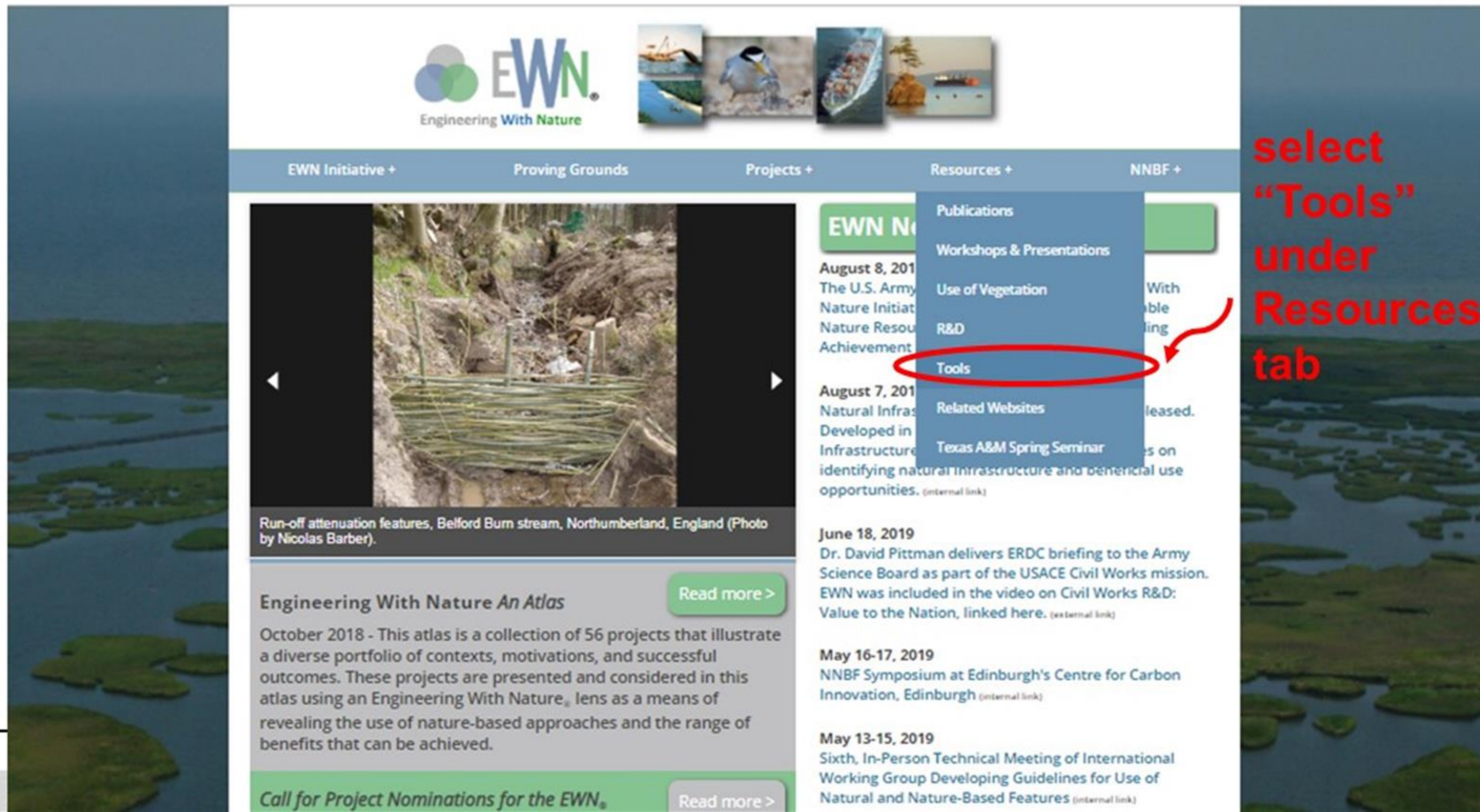
Increasing infrastructure resilience with Nature-based Solutions (NbS)

Stakeholder engagement

Adaptive planning & management



Where to find NIOT: <https://ewn.el.erdc.dren.mil/> <http://engineeringwithnature.org>



The screenshot shows the EWN website interface. At the top, there is a navigation bar with tabs: "EWN Initiative +", "Proving Grounds", "Projects +", "Resources +", and "NNBF +". The "Resources +" tab is active, and a dropdown menu is open, listing several categories: "Publications", "Workshops & Presentations", "Use of Vegetation", "R&D", "Tools", "Related Websites", and "Texas A&M Spring Seminar". The "Tools" option is circled in red, and a red arrow points to it from the right side of the page. Below the navigation bar, there is a main content area with a large image of a stream with run-off attenuation features. To the right of the main content, there is a list of news items with dates and titles, including "August 8, 2019: The U.S. Army Nature Initiative Nature Resource Achievement", "August 7, 2019: Natural Infrastructure Developed in Infrastructure", "June 18, 2019: Dr. David Pittman delivers ERDC briefing to the Army Science Board as part of the USACE Civil Works mission.", "May 16-17, 2019: NNBF Symposium at Edinburgh's Centre for Carbon Innovation, Edinburgh", and "May 13-15, 2019: Sixth, In-Person Technical Meeting of International Working Group Developing Guidelines for Use of Natural and Nature-Based Features".

select "Tools" under Resources tab

<https://ewn.el.erdc.dren.mil/tools.html>


[EWN Initiative +](#)
[Proving Grounds](#)
[Projects +](#)
[Resources +](#)
[NNBF +](#)

Tools

Natural Infrastructure Opportunities Tool

The public facing *Natural Infrastructure Opportunities Tool (NIOT)*, developed in collaboration with the Natural Infrastructure Initiative, focuses on identifying natural infrastructure and beneficial use opportunities. Through map-based visualizations of environmental, geomorphic, and sediment conditions, as well as upcoming USACE projects, and an interface for users to add their resource needs and resource availability, this portal will help discover natural infrastructure connections and inspire innovative opportunities.

The aim of the viewer is to provide a data informed perspective for multiple stakeholders with the goal of finding mutually beneficial strategies to improve and increase investment in the use and creation of natural infrastructure. The viewer is intended to be used in collaboration, as a platform to generate new ideas about natural infrastructure projects during the planning stages.

The NIOT viewer was developed through iterative collaboration with representatives from Caterpillar Inc., The Nature Conservancy, Great Lakes Dredge and Dock, AECOM, USACE ERDC and USACE Mobile District. The viewer brings together datasets from multiple sources in one place and also allows users to identify current infrastructure projects, and directly add resource or project needs. Resource connections, as well as points of contact, are integrated into supporting databases and appear on the viewer map. The viewer includes national and regional datasets, and also provides users the option to request the addition of user-identified geospatial data layers, allowing NIOT to be adapted for regional use and fine tuned for local application.

Type: Web application

User: Public and USACE

POC: Safra.Altman@usace.army.mil

[NIOT Tool User Guide \(PDF\)](#)

[Visit Natural Infrastructure Opportunities Tool web application](#)

Engineering With Nature Project Mapper (ProMap)

ProMap is a geography-based data viewer for projects that fit within the EWN context. The aim of the mapper is to allow users to explore information that can be helpful in developing EWN ideas during the planning of their own projects. Projects can be viewed based upon infrastructure type (e.g., dredging project, breakwater, lock & dam) or by their intended environmental or social benefits. (see [User's Guide](#))

Type: Web Application

User: Public and USACE

[ProMap Platform Presentation \(PDF\)](#)

[ProMap Poster Presentation \(PDF\)](#)

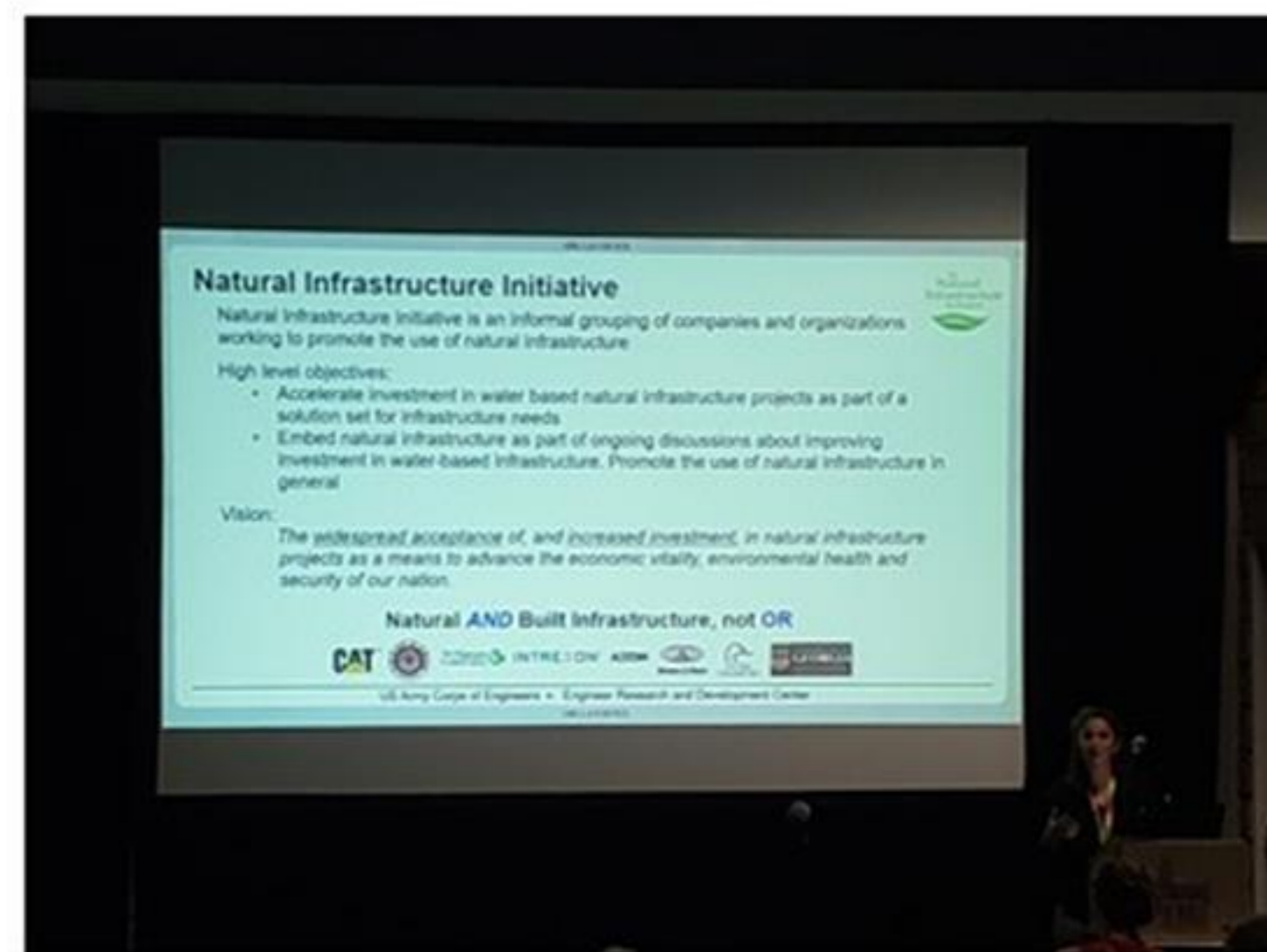
[ProMap ERDC Technical Note](#)

Concluding Thoughts

- USACE ERDC, Mobile and Galveston Districts have developed an extensible framework that uses available Corps enterprise databases and integrates data collection and analysis tools.
- Database capabilities, tools, and methods are extendable to other projects, USACE Districts, and infrastructure opportunities.
- In collaboration with the Natural Infrastructure Initiative the public facing *NIOT* web-viewer focuses on identifying beneficial use and infrastructure opportunities.

Future Directions

- Getting user feedback and adding additional data (Virtual Workshop)
- Developing contacts, documenting use, connections and collaboration
- Developing case studies
- Phase II – Developing tool capability
 - Overlay tools to identify NI project types for a given region
 - Overlay tools for spatial prioritization



We need feedback and data! Check out the viewer!

<http://engineeringwithnature.org>