Identifying Collaborative Opportunities for Natural Infrastructure and Nature Based Features

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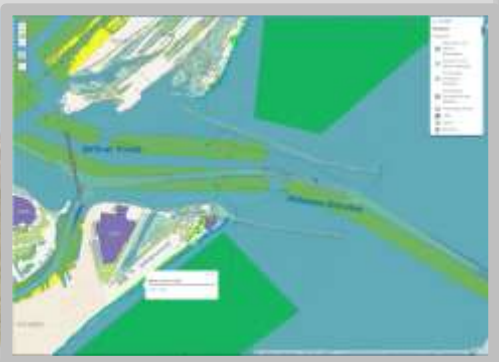


Importance of Natural Infrastructure

- Natural and hybrid approaches provide important coastal risk reduction.
- Now is the time to incorporate natural and hybrid approaches into coastal planning.
- These approaches are key to increasing coastal resilience to climate change.

Sutton-Grier et al 2015

Evaluation of Natural Infrastructure

- Environmental Defense Fund, 2015
- Summary of risk reduction performance and engineering guidance, costs, and factors relevant to climate change.
  - Risk Reduction Performance
  - Design/O&M Criteria
  - Costs
  - Other Factors

Table 1: Natural Infrastructure and Nature-based Measures: Summary of risk reduction performance and engineering guidance, costs, and factors relevant to climate change.

Key - = Low confidence, feature not likely to address + = High confidence, data available ~ = Limited confidence refinement needed Blank = need data			Risk Reduction Performance[1]					Design/O&M Criteria	Costs[2] per linear foot		Other Factors	
			Reduce coastal erosion/ Shoreline Stabilization	Nuisance floods (high tides with sea level rise)	Short wave (<2') attenu-ation (Stabilize Sediment)	Reduce force & height of med. waves (2-5')	Storm Surge (low frequency extreme events)	(for performance areas specific to feature)	Construction	Annual O&M[3]	Mitigates climate change (CO_2 sequest-ration)	Adaptability to sea level rise & changing community needs
Strategy	Structural	Groins	+[4]	-	+			+	$2-5k	$.1-.5k	No	
		Breakwaters	+[4]	-	+	+		+	$5-10k	>$.5k	No	Variable
		Seawall/ Revetments/ Bulkheads	+[4]	+		+	+	+	$5-10k $5-10k $2-5k	>$.5k $.1-.5k $.1-.5k	No	
		Surge Barriers	-			+	+	+	>$10k[5]		No	
	Existing Natural	Wetlands	+		+	~	~	N/A	N/A		Yes	Yes
		Mangroves/ coastal forest	+		+	+	+	N/A	N/A		Yes	Yes
		Vegetated Dunes	+		+	+	+	N/A	N/A		~	Yes
	Nature based	Beach Nourishment	+	+	+	+		+	$2k-5k[6]	$.1k-.5k		Yes
		Vegetated Dune creation	+	+	+	+	+	+	$.03k-.5k[6]	$.1k-.5k	~	Yes
		Barrier Island Restoration	+	+	+	+	+	+	$0.76k-$1.1k[7]			Yes
		Small scale edging and sills (living shorelines)	+	~	+				$1k-2k	<$.1k	Variable	Yes
		Restored Oyster/Shell-fish Reefs	+		+	~	~	Possible, akin to low breakwaters	$.23k - .24k[8]		Yes	Yes
		Restored/ Created Coral Reefs	+		+	~	~	Possible, akin to low breakwaters	$.2k – 508k[9]		~	
		Restored Maritime Forests (including Mangroves)	+	+	+	+	+		$.23k - 216k[10]/ha (mangroves)		Yes	Yes
		Restored Wetlands[11]	+	+	+	~		-	$0.81k-36.4k/ha[12]		Yes	Yes

Cunniff and Schwartz 2015

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

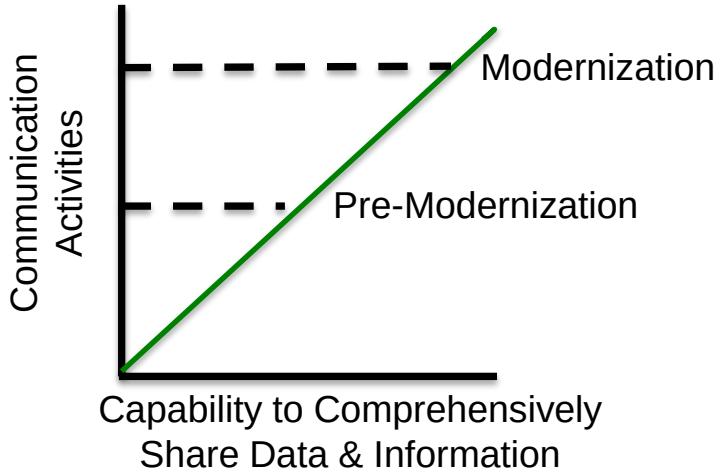
Vision:

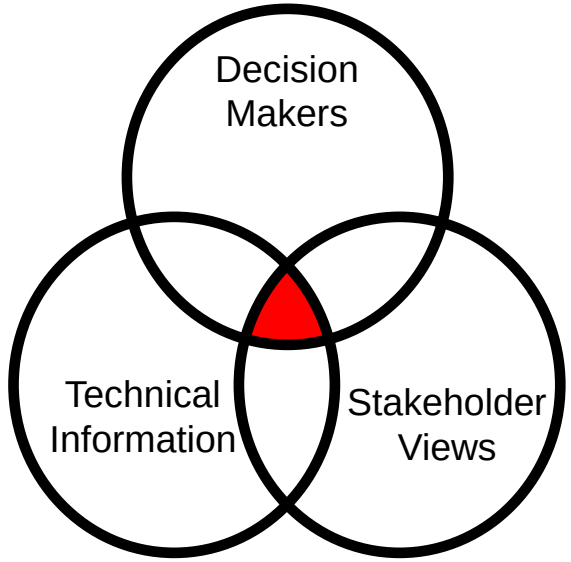
The widespread acceptance of, and increased investment, in natural infrastructure projects as a means to advance the economic vitality, environmental health and security of our nation.

Natural *AND* Built Infrastructure, not OR

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

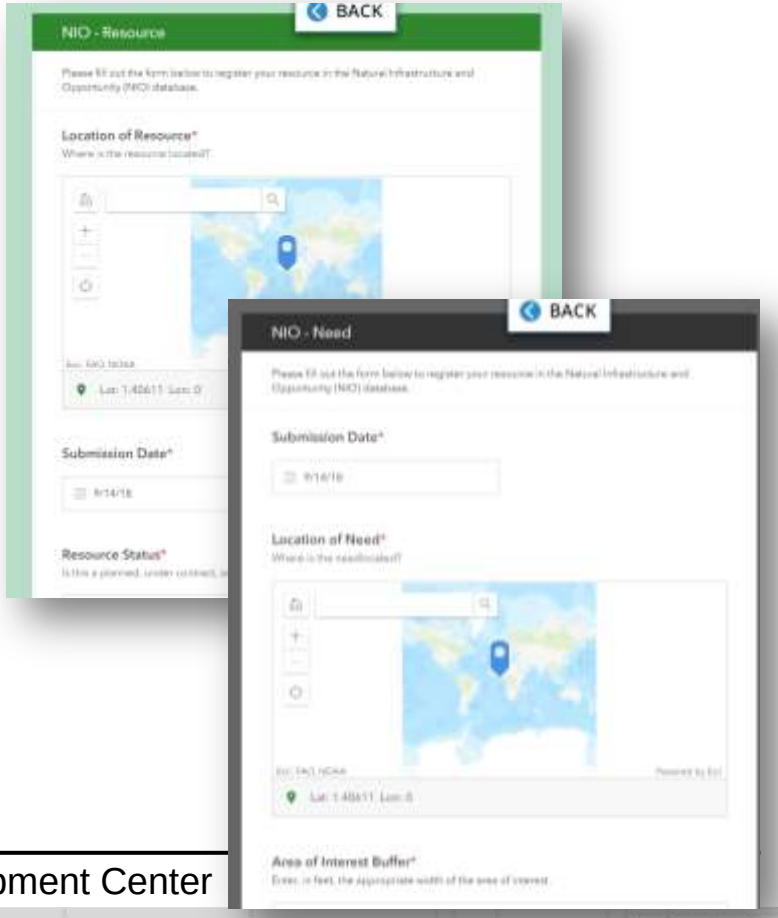
Tool Development: Natural Infrastructure Opportunities Tool

- The public facing *NIOT* 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?

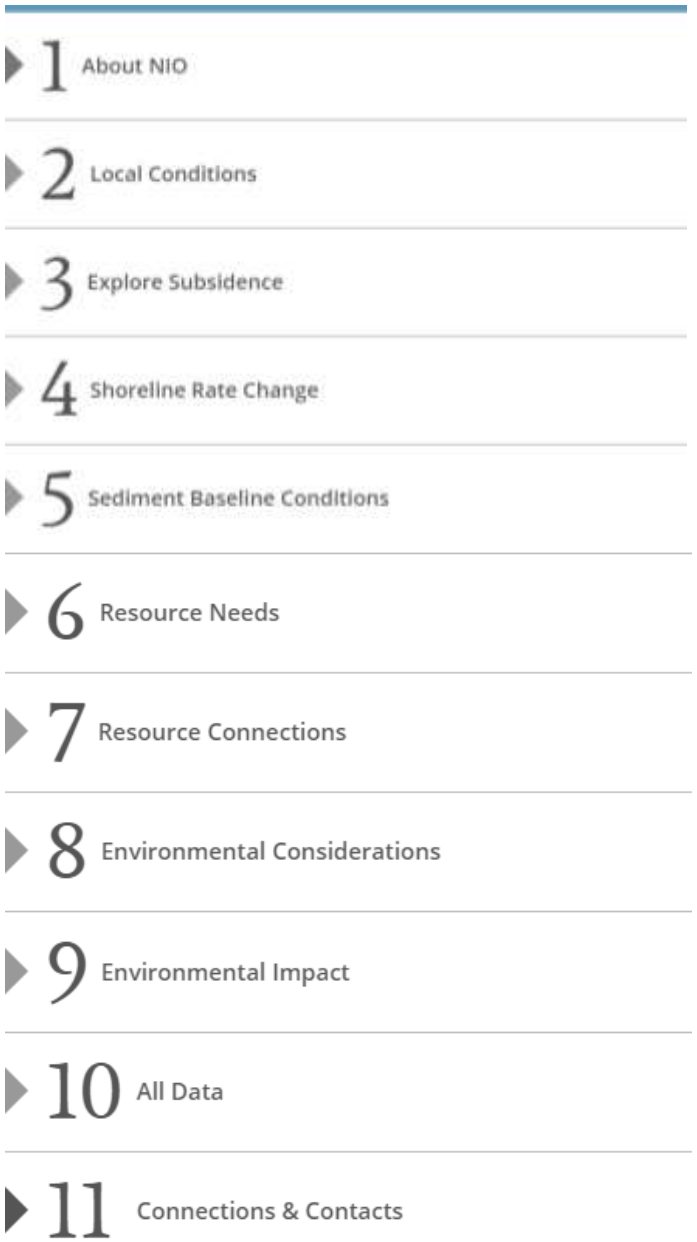
By using map based visualizations of environmental, geomorphic and sediment conditions, as well as upcoming USACE projects, and an interface for users to add their resource needs and resource availability, this portal will help discover natural infrastructure connections and inspire innovative opportunities.



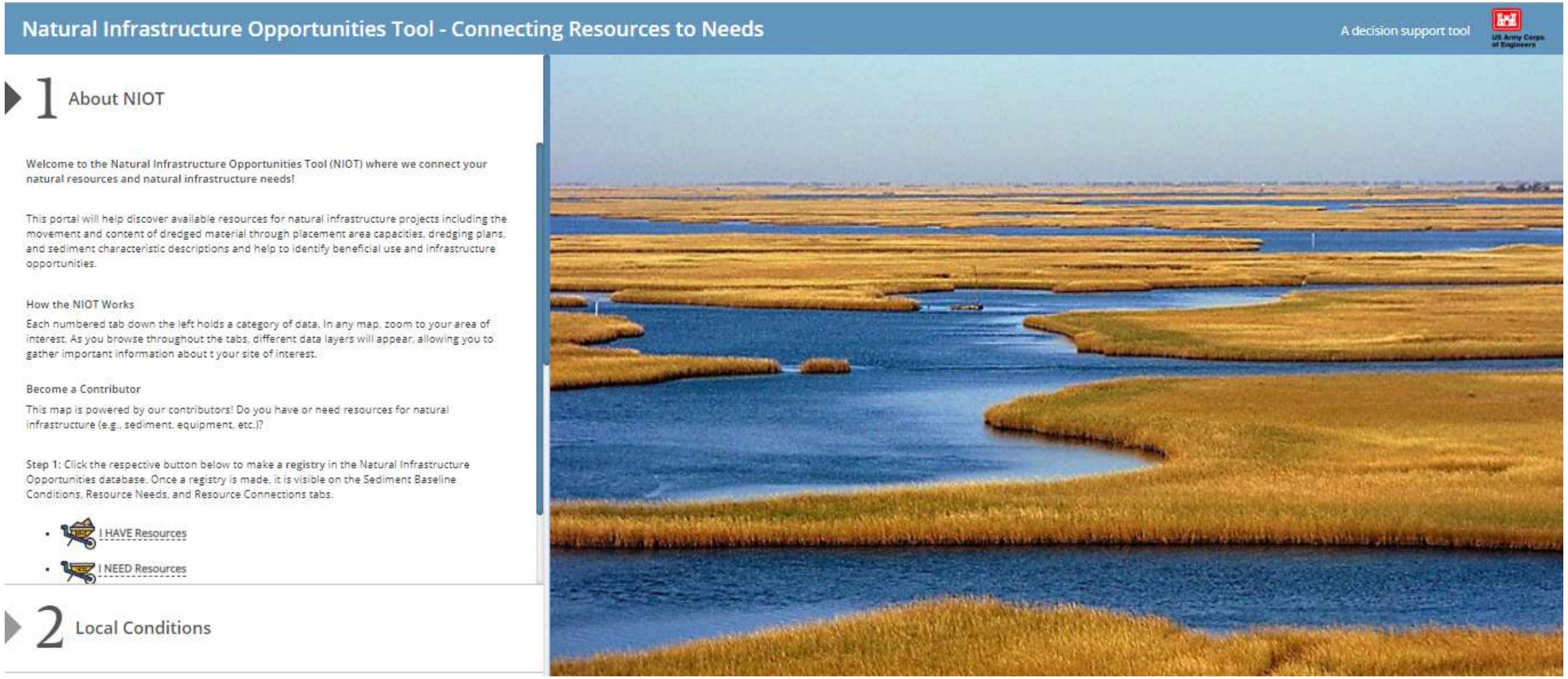
How the NIOT Works

- The NIOT brings together datasets from multiple sources all in one place
- 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.

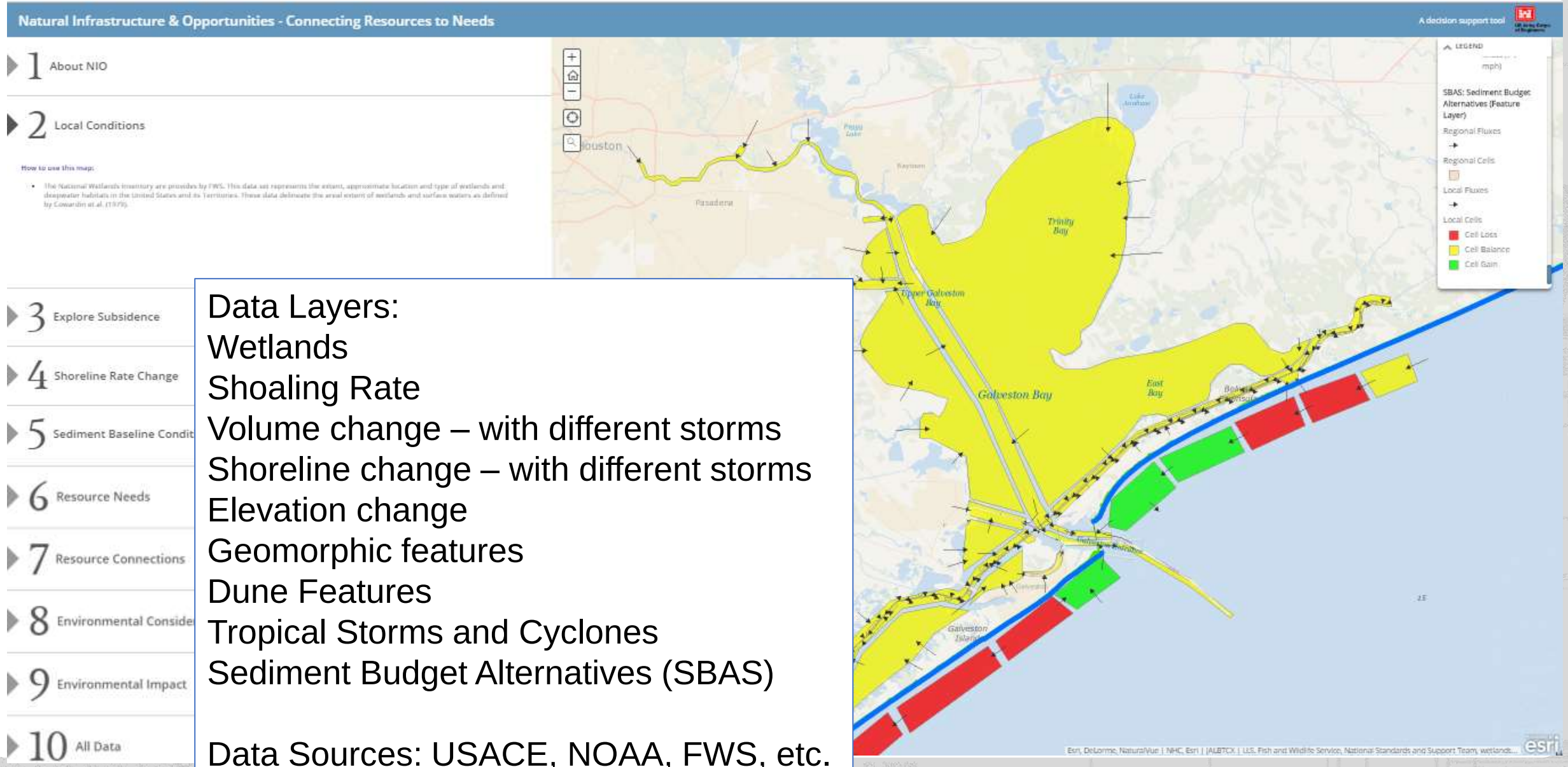


Open, Online Application



Supported by Arc Story Maps

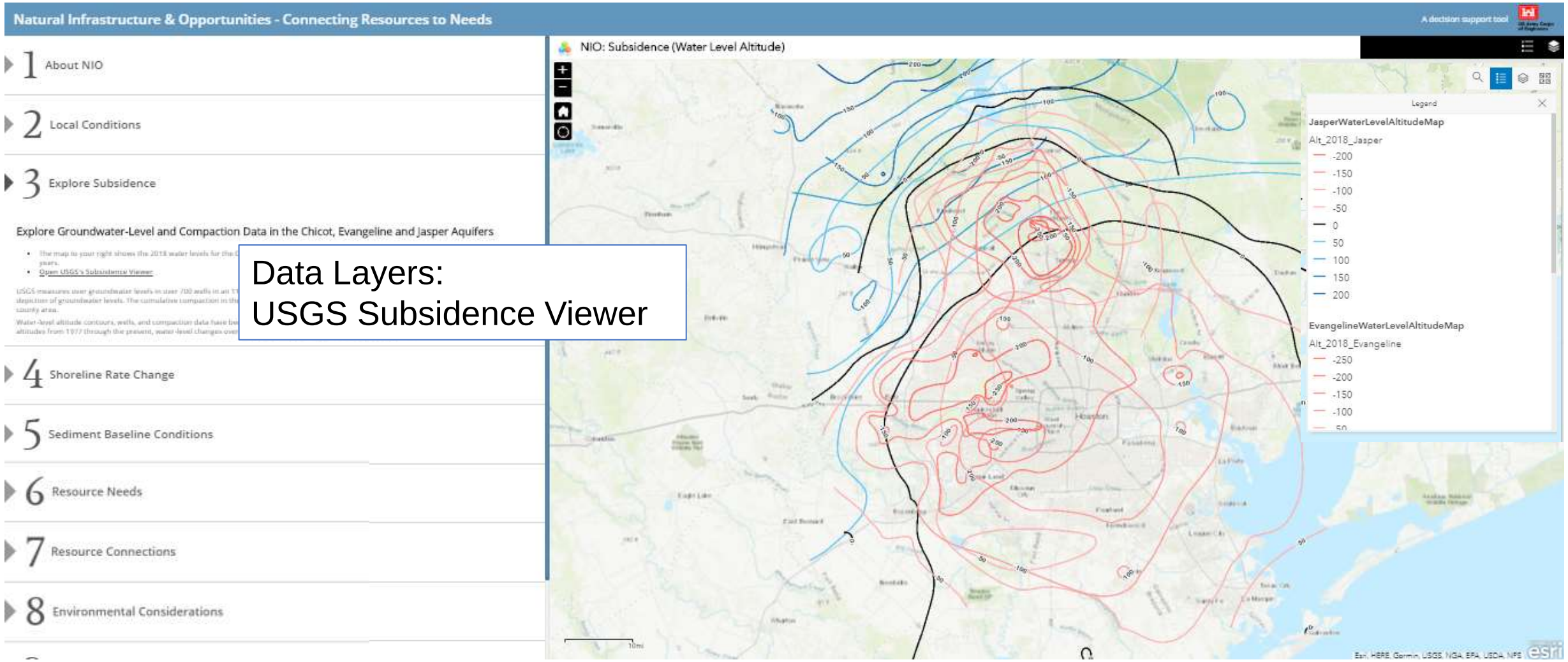
Local Conditions



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)

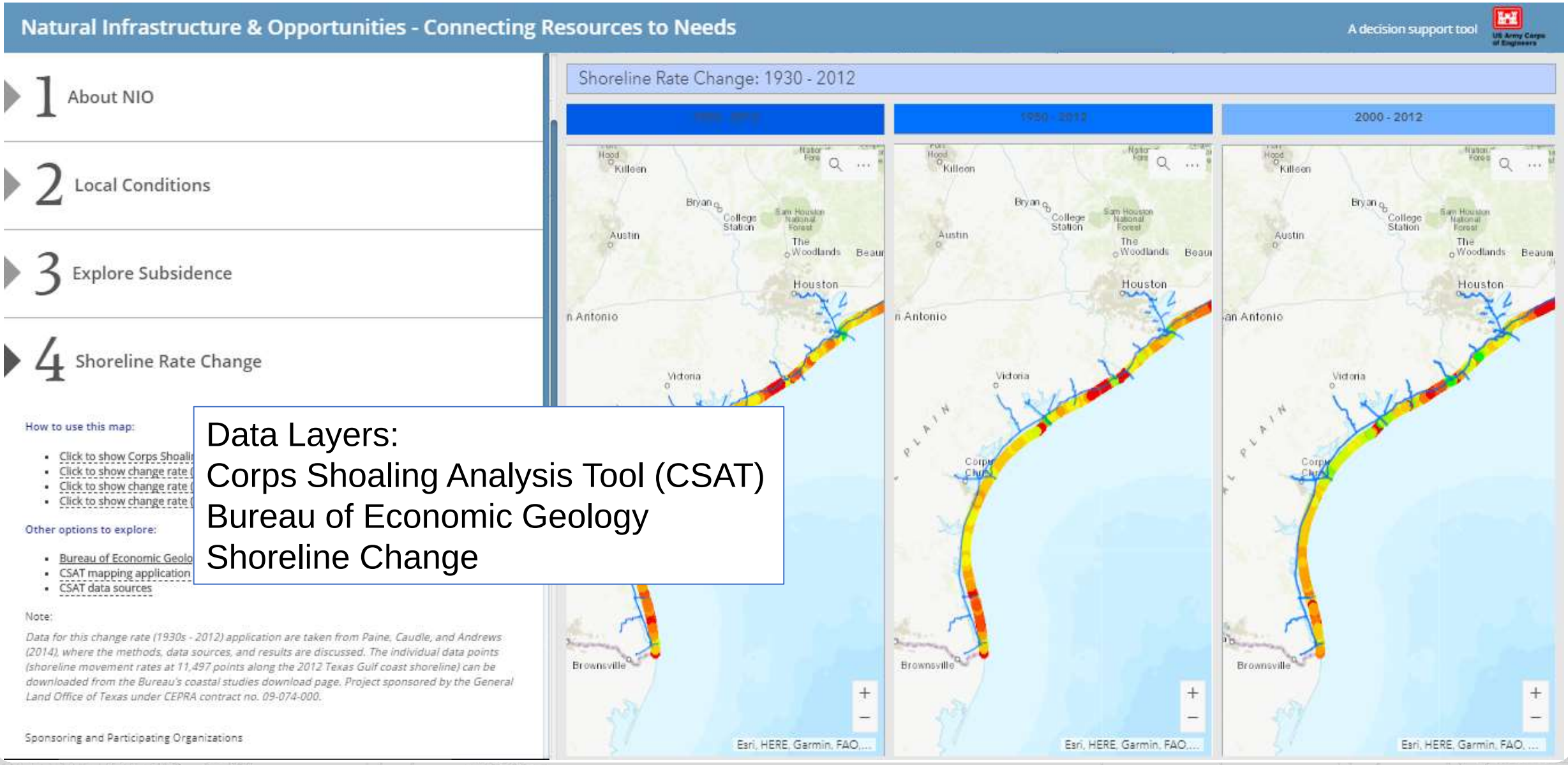
Data Sources: USACE, NOAA, FWS, etc.

Subsidence



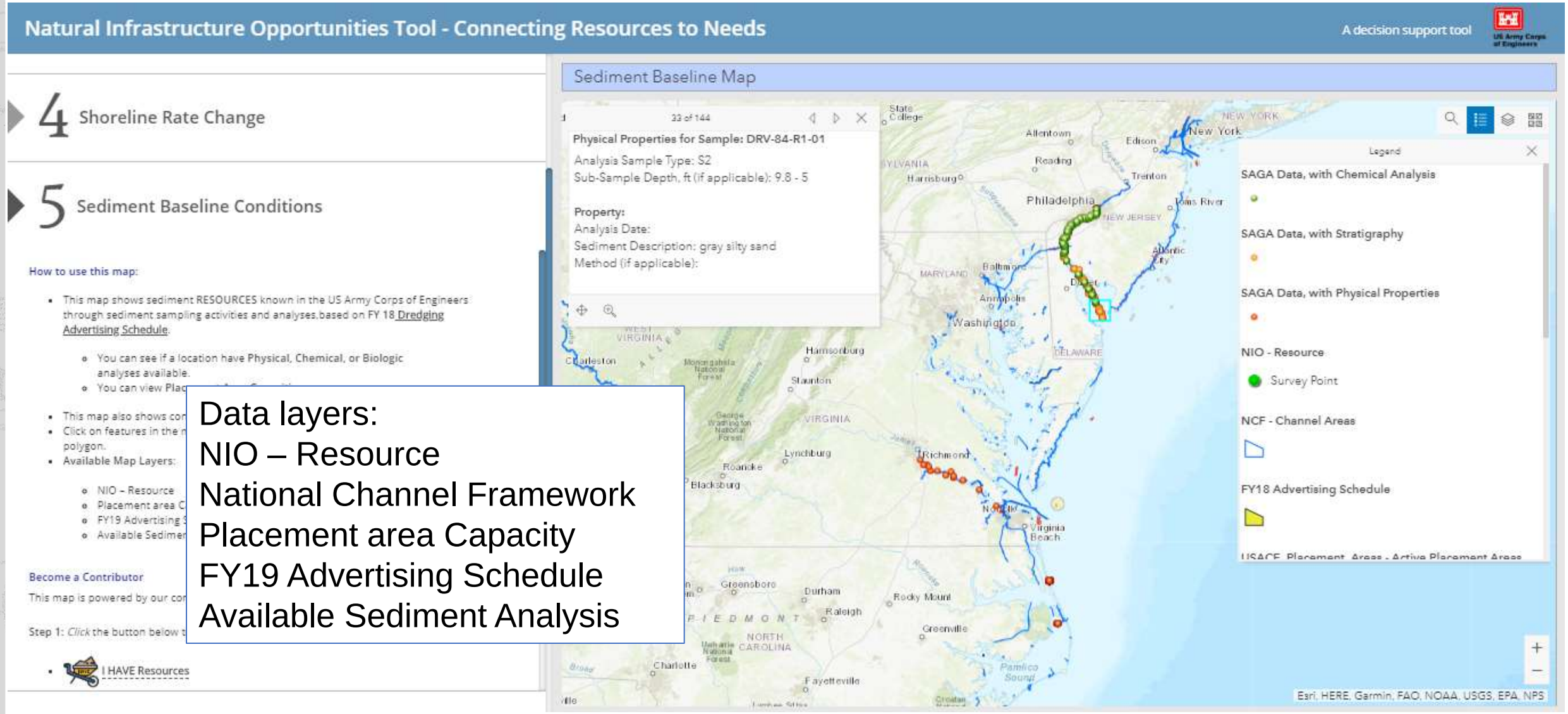
Data Layers:
USGS Subsidence Viewer

Shoreline Change



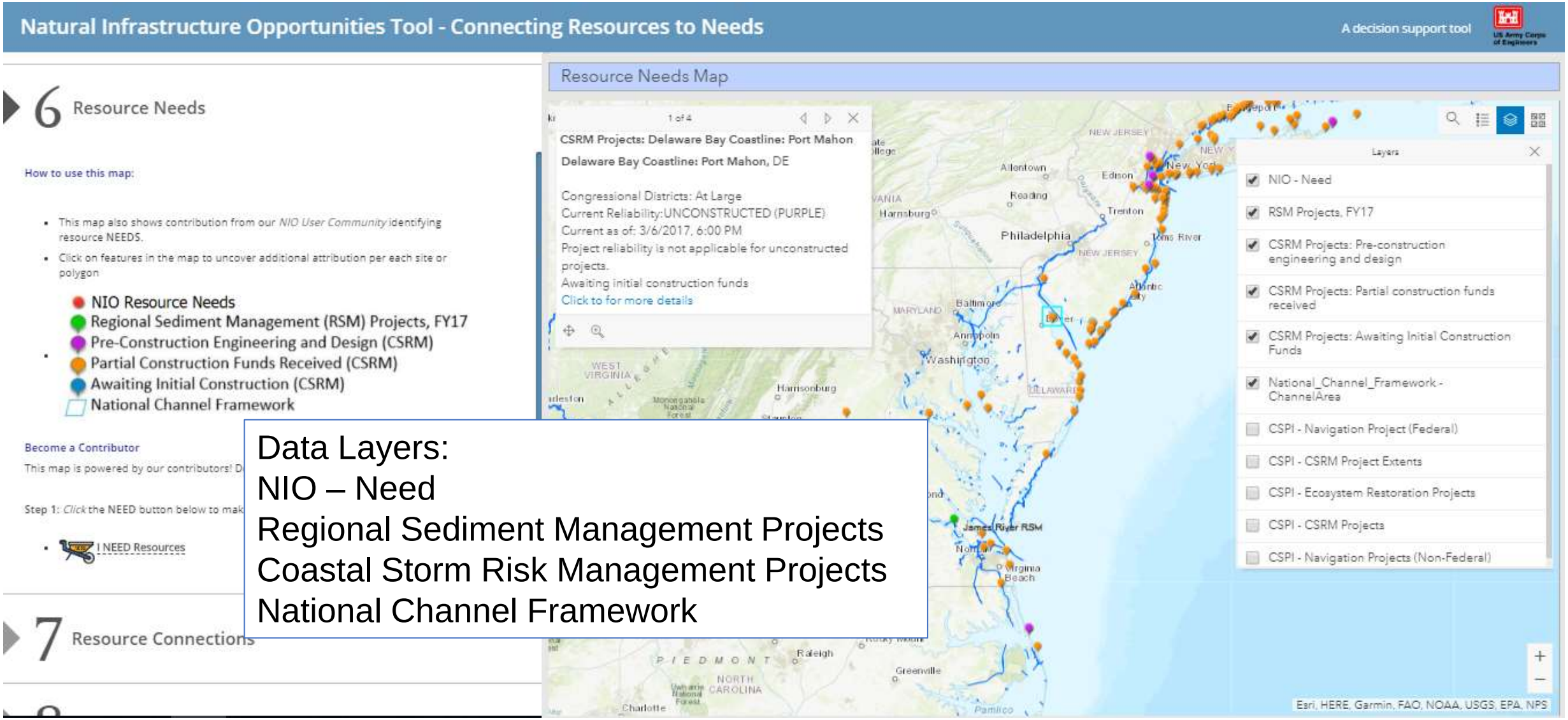
Data Layers:
Corps Shoaling Analysis Tool (CSAT)
Bureau of Economic Geology
Shoreline Change

Baseline Conditions



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

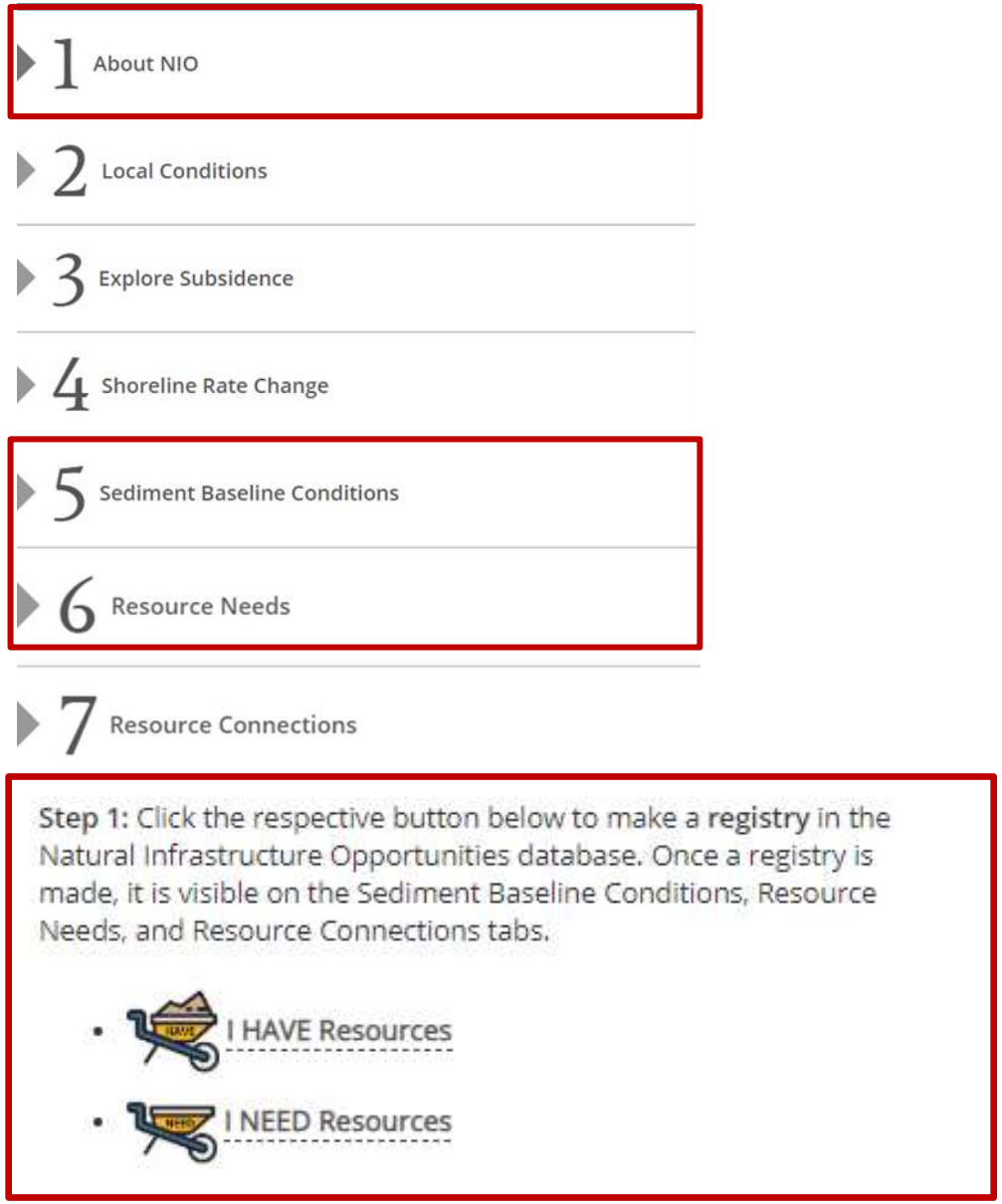
NI Resource Need



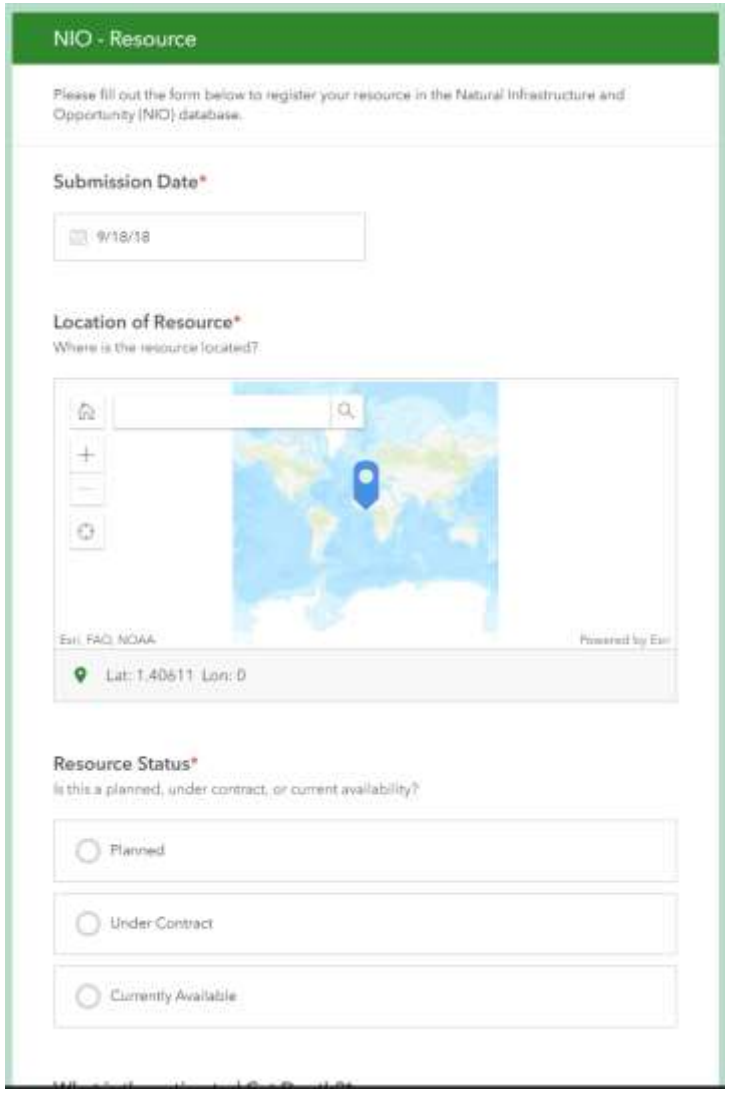
Data Layers:
NIO – Need
Regional Sediment Management Projects
Coastal Storm Risk Management Projects
National Channel Framework

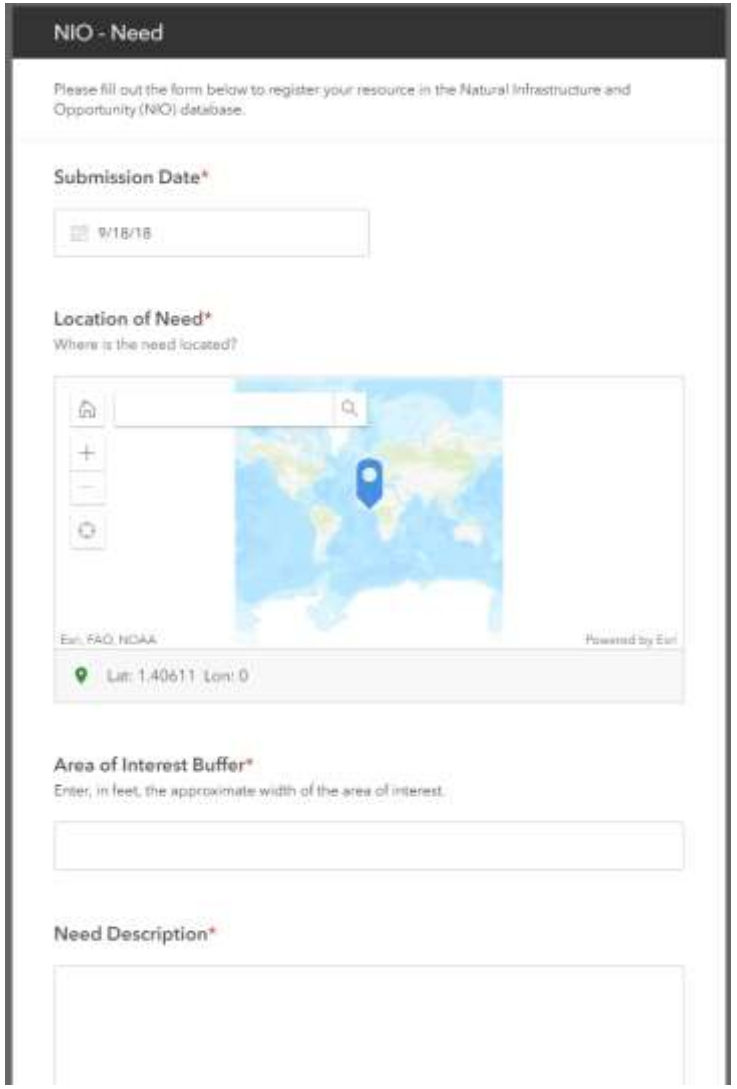
NIO Contributors

- 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.

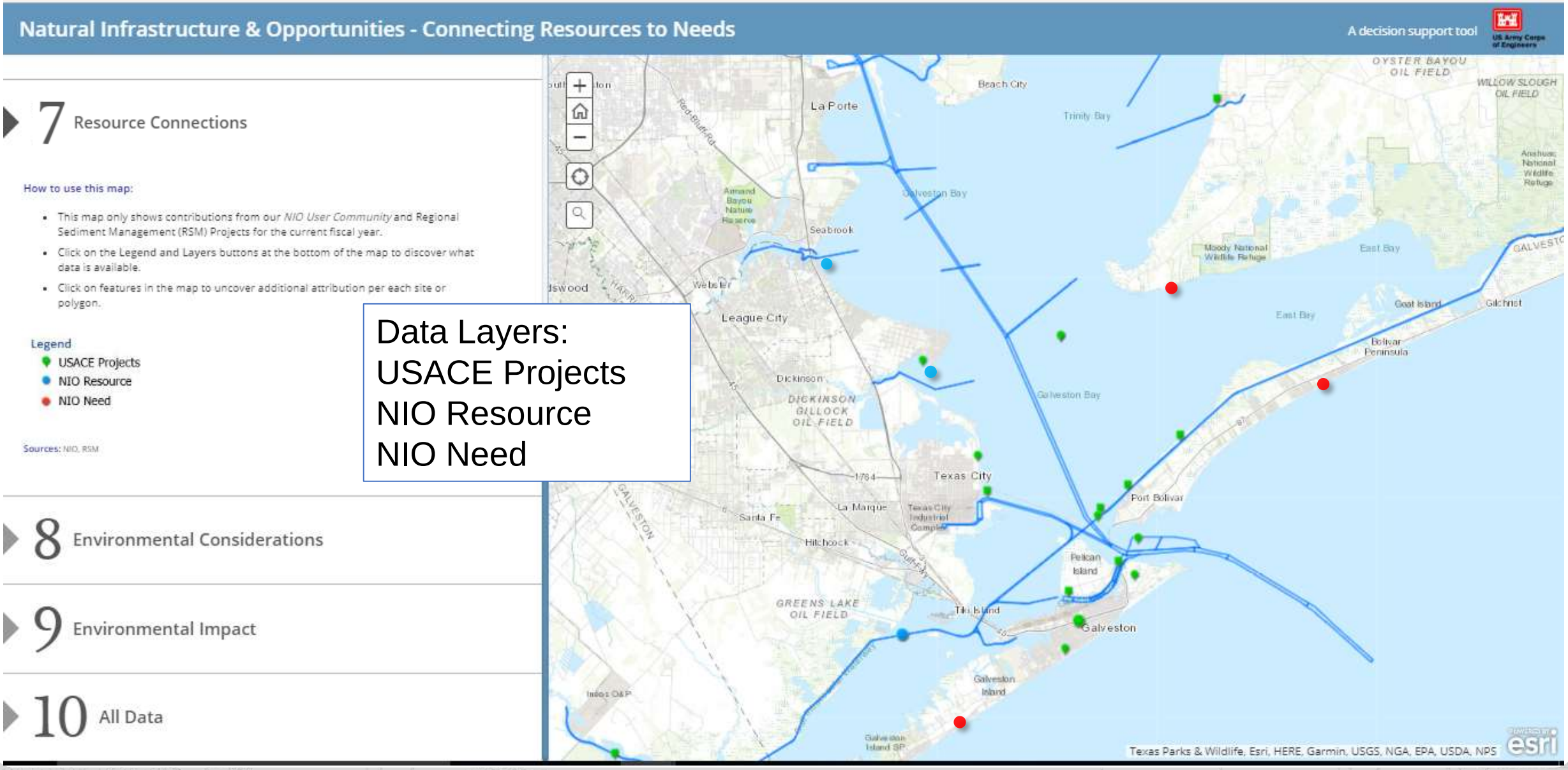


NIO Contributors | Forms

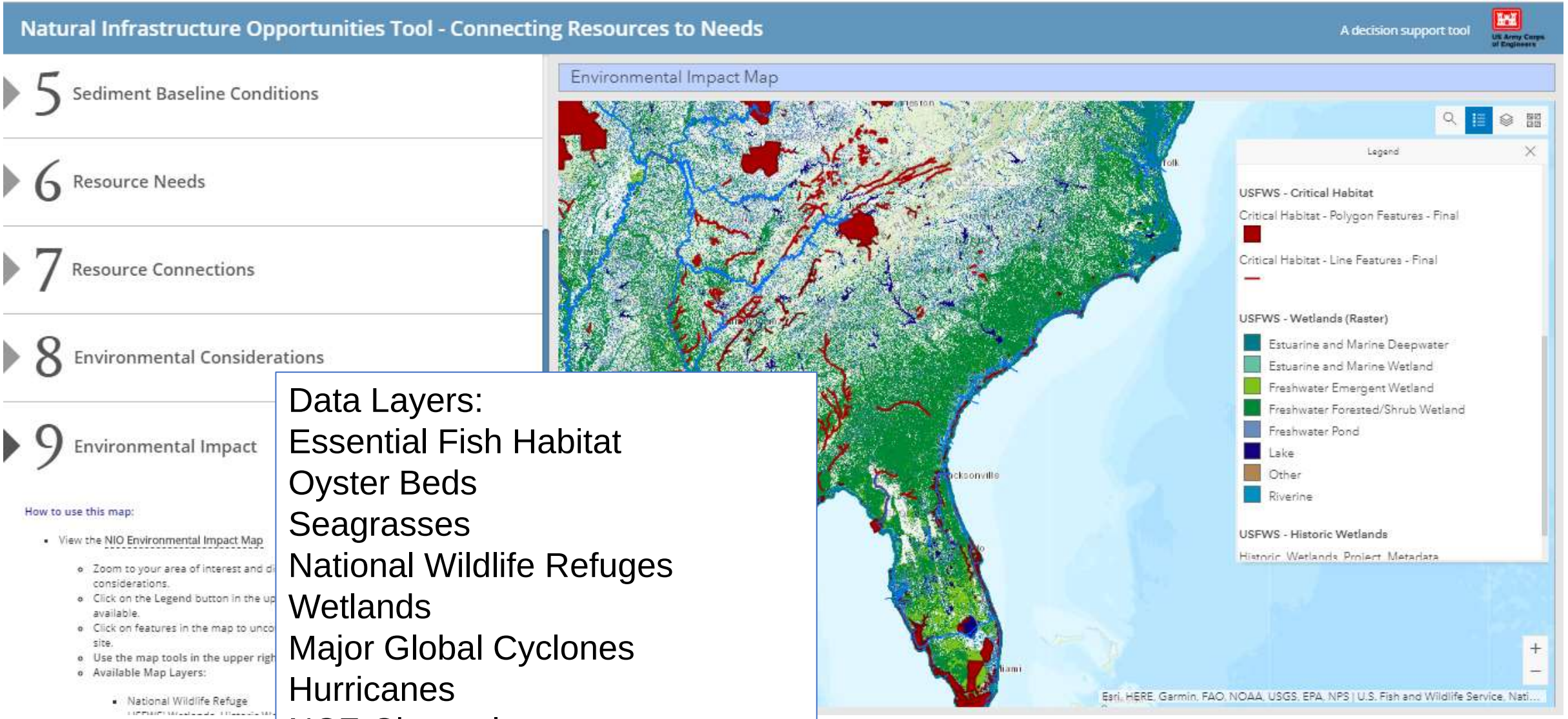




NIO Resource Connections



Environmental



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

Contacts and Connections

Natural Infrastructure Opportunities Tool - Connecting Resources to Needs

A decision support tool

US Army Corps of Engineers

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.erdc.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

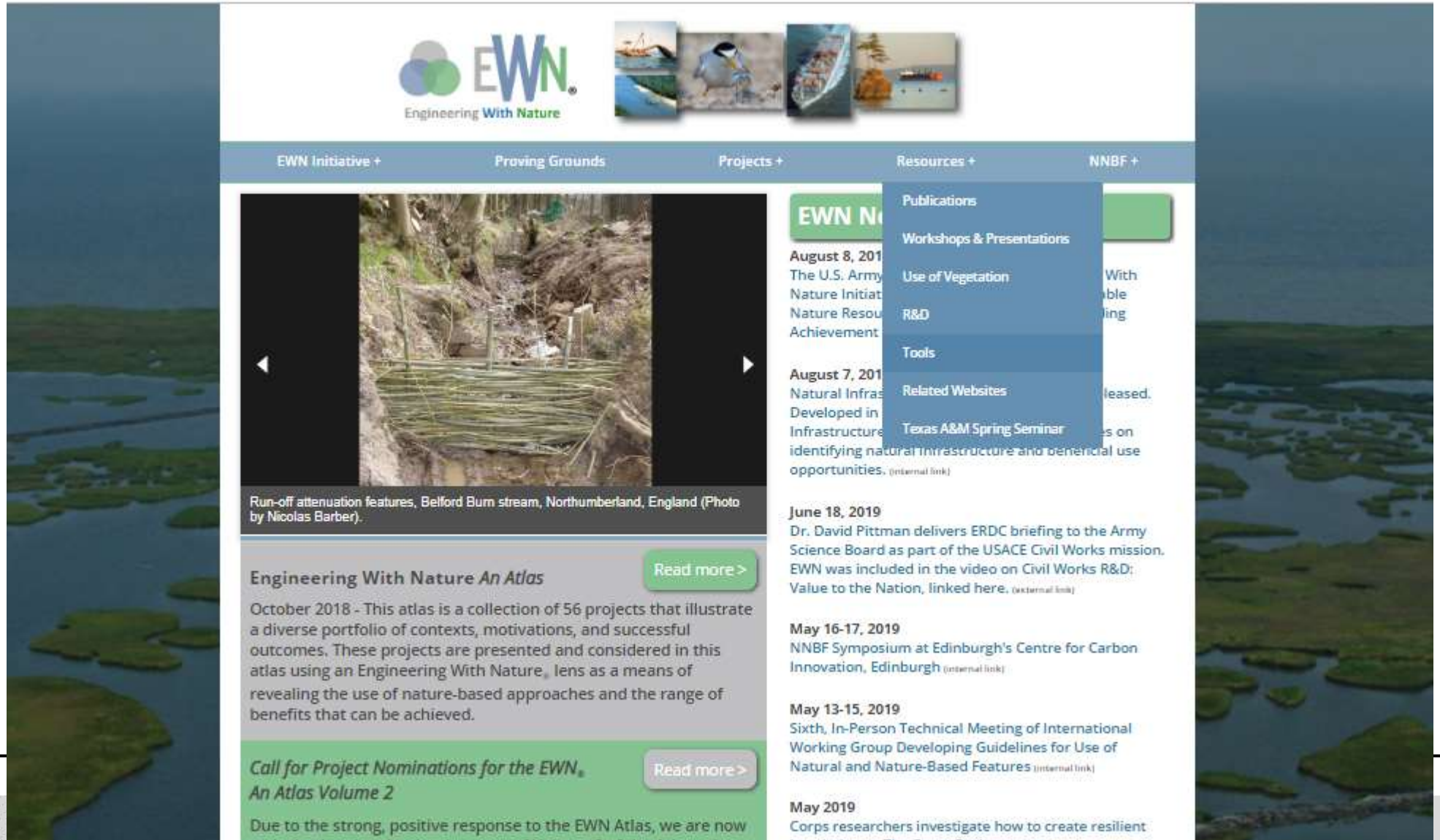
Last update: 2 hours ago

Have Resources

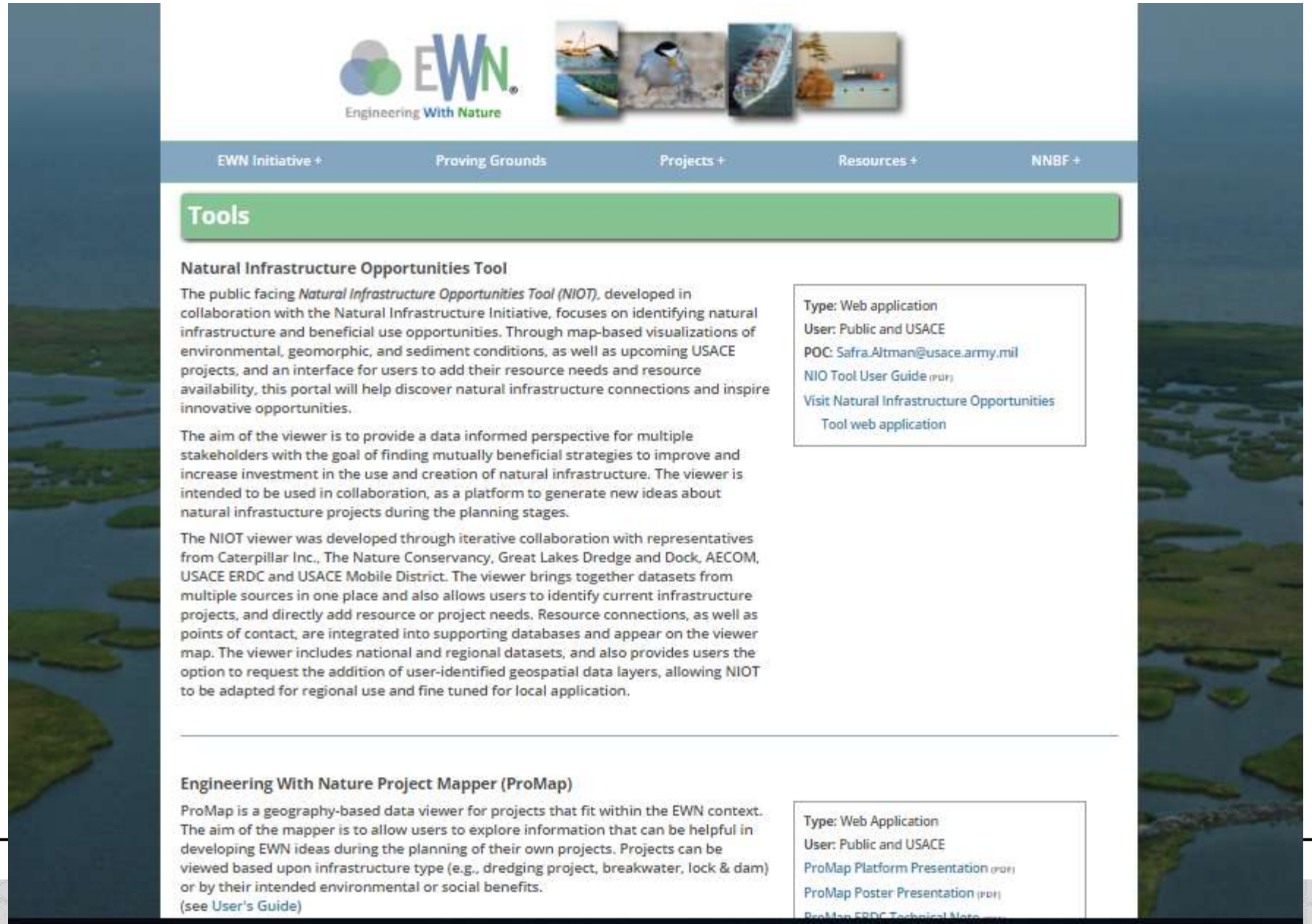
Title of Resource Here
Your Agency Name Here
Your Office Name Here
Your Website Here
Amount of Resource: 10000 cy

Last update: 2 hours ago

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



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



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.
- We are looking forward to user additions and feedback to revise and improve the viewer.