

# Building a Community: Systems Approach to Geomorphic Engineering



**Kim Penn, NOAA's Office for Coastal Management  
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**Social Coast Forum – February 11, 2016**

# Our coasts are critical



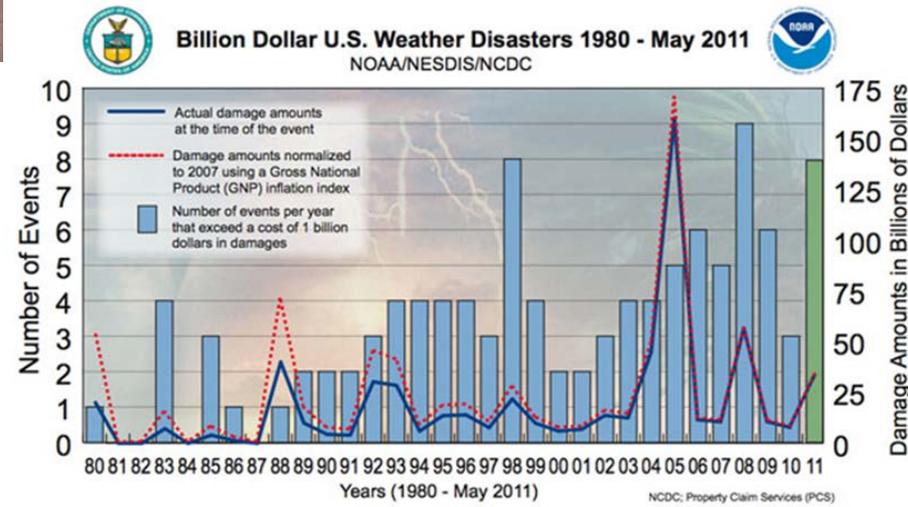
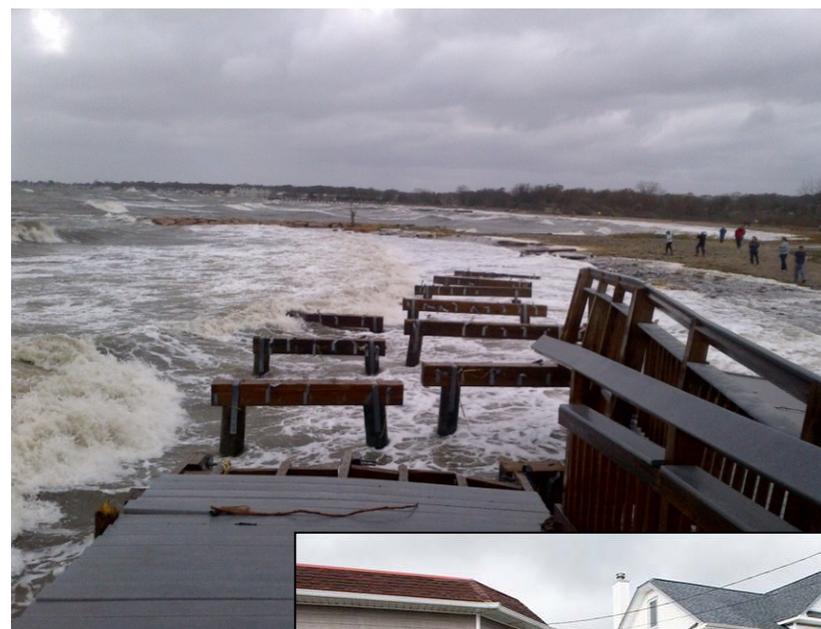
# Increasing Vulnerability



Earth at Night  
More information available at:  
<http://antwrp.gsfc.nasa.gov/apod/ap001127.html>

Astronomy Picture of the Day  
2000 November 27  
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

# Increasing Vulnerability



# Reducing risk



# Natural and nature-based solutions



Provide protective services:

- Wave attenuation
- Flood storage capacity
- Erosion control



# Multiple approaches, multiple services



# Building resilience



Systems approach

Integrate green and gray solutions

Consider a variety of scales

Engage sectors

Build partnerships

# Systems Approach to Geomorphic Engineering



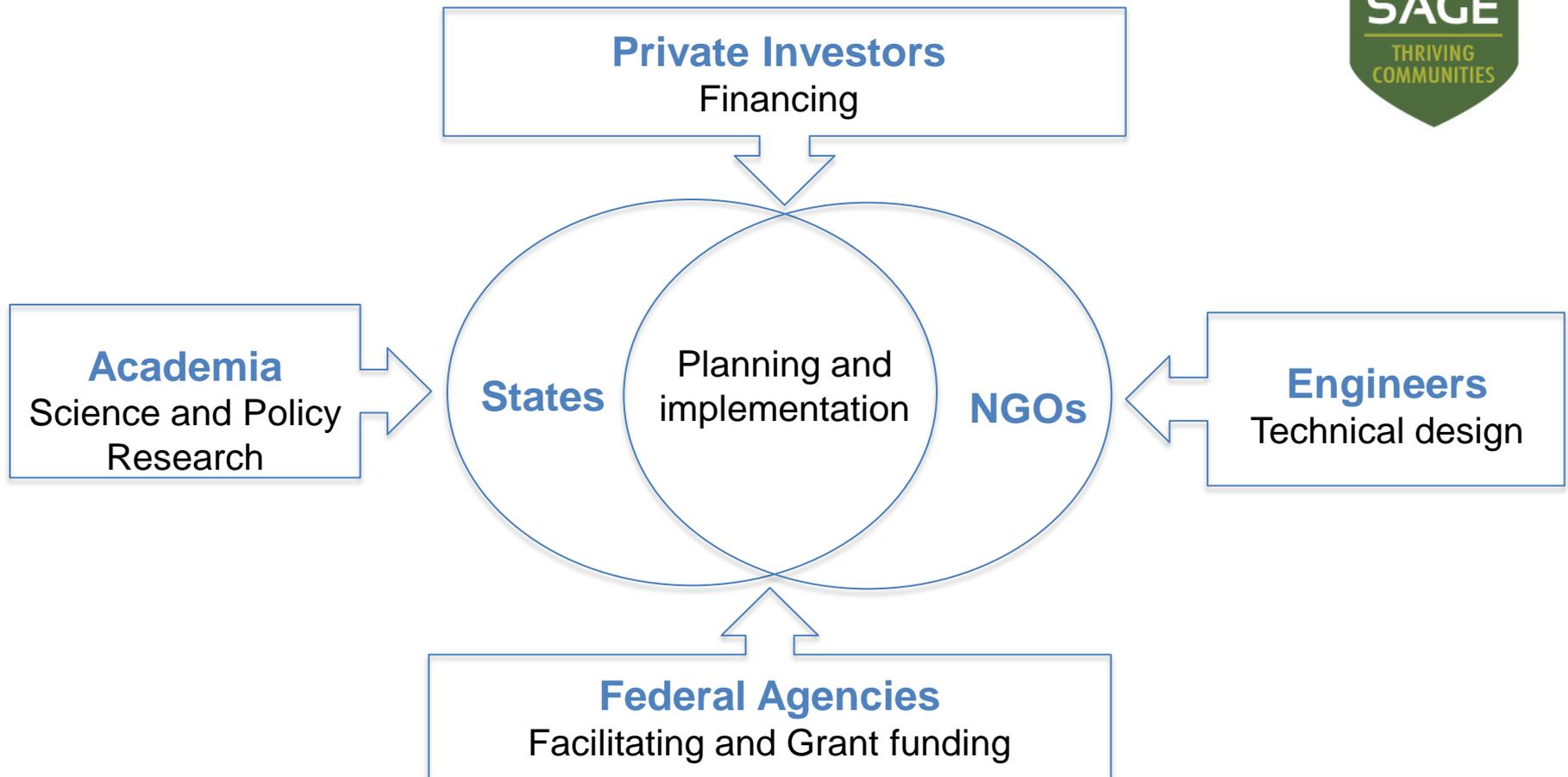
## A Community of Practice

- Collaborative effort
- Sharing knowledge and advancing understanding
- Leveraging resources
- Providing support for practitioners



THE  
CONSERVATION FUND

# Bringing capabilities and capacity





Advance integrated, landscape scale solutions for coastal resilience

Protect and enhance natural coastal features

Collaborate across public and private sectors

Share science, tools and best practices to facilitate implementation

# What is SAGE doing?

Building partnerships

Creating communication tools

Developing and disseminating knowledge

Facilitating implementation



# SAGE Organization



## Workgroups

- science and engineering
- policy
- financing
- communications

## Regional CoPs

## Management Team

## Leadership Team

# Understand natural solutions



## Science and Engineering Technical Workgroup

### Framework:

- Develop, synthesize and disseminate knowledge
- Provide technical assistance to practitioners



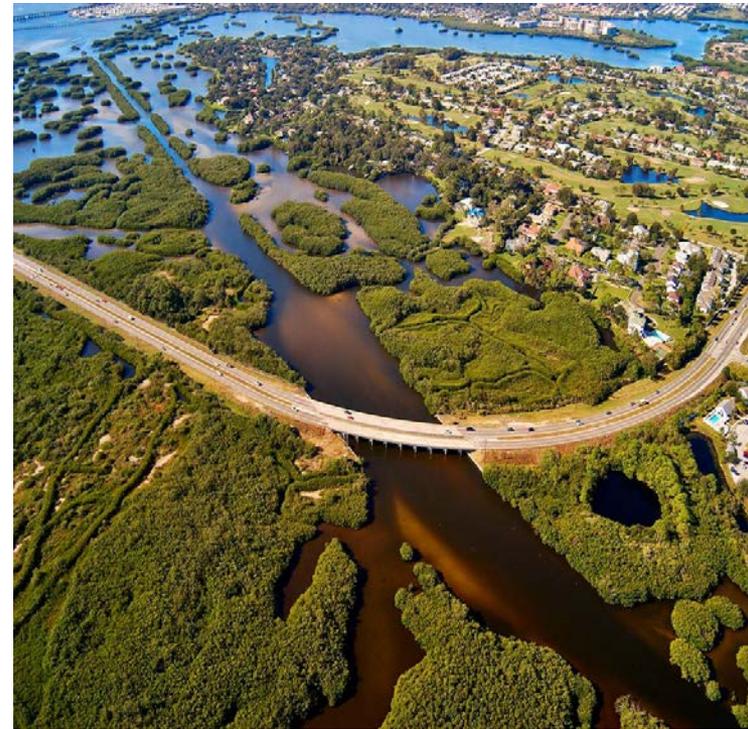
# Understand natural solutions



## Science and Engineering Technical Workgroup

### Activities:

- Develop a suite of metrics for natural infrastructure performance
- Collaborate on a project that responds to Coastal Green Infrastructure and Ecosystem Services Research Agenda
- Leverage resources for extreme event monitoring in the Chesapeake



# Enable implementation



## Finance Workgroup

- Address reliance on federal dollars
- Identify alternative financing mechanisms

## Policy Workgroup

- Understand and advance policies and regulations
- Act as a resource for SAGE partners and practitioners



# Communicate and collaborate



## Communications Workgroup

- Facilitate collaboration across the community of practice
- Develop communication tools and materials
- Provide resources for practitioners

A screenshot of the SAGE website. The top navigation bar includes "SAGE ...", "Featured Tools", and "News". The "SAGE ..." section describes the community and lists key activities: "Use and promote green-gray approaches to ensure coastal community and shoreline resilience", "Broaden science, engineering, policy and marketing activity both domestically and internationally", and "Engage community partners in regional demonstrations". Below this are two call-to-action buttons: "Join the SAGE community" and "Let us hear from YOU". The "Featured Tools" section includes a "Searchable Project Database" and an "Interactive Map". The "Spotlights" section features a "SAGE Living Shoreline Brochure" and a video titled "Watch how communities use nature's services to prepare for coastal storms". The "News" section lists several recent articles, including "REBUILD BY DESIGN" and "Study Identifies Probable Causes Of Serious Flooding In US Coastal Cities". The bottom of the page features a "Quick Links" section with links to the Project Database, Sage Mapper, Organization, and Glossary. It also includes a disclaimer about data accuracy and a list of partner organizations such as FEMA, US Army Corps of Engineers, RDRR, The Nature Conservancy, National Wildlife Federation, and VIMS.



## SAGE ...

is a **Community of Practice** of Federal, State, and Local Agencies, non-governmental organizations, academic institutions, engineers, and private businesses working together to:

- Use and promote green-gray approaches to ensure coastal community and shoreline resilience;
- Broaden science, engineering, policy and marketing activity both domestically and internationally;
- Engage community partners in regional [demonstrations](#).

### + Join the SAGE community

Register to receive information about sage activities via email.

[JOIN NOW »](#)

### Let us hear from YOU.

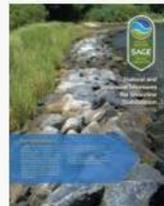
Please take a few moments to give us your advice about the SAGE website.

[TAKE SURVEY NOW »](#)

## Featured Tools

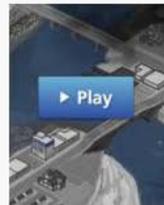
- **Searchable Project Database:** Multiple project types and sources.
- **Interactive Map:** Projects with known locations. The Map tool is best viewed using Firefox or Internet Explorer. Google Chrome is not currently supporting the map tool.

## Spotlights



### SAGE Living Shoreline Brochure

Numerous SAGE partners contributed to the content in this informative brochure that provides a helpful overview of the different types of shoreline solutions. This document is a great handout to help people learn about natural and nature-based shorelines.



**Watch how communities use nature's services** to prepare for coastal storms in this animated video from NOAA.

## Natural and Nature-Based Features



### UPCOMING SAGE EVENTS

Training Workshop: Engineering, Design, and

## News

Follow @sagecoastnews 81 followers



**Corps of Engineers** @norfolkdistrict · 3 Feb  
LIVE on #Periscope: @NorfolkVa flood study agreement signing  
[periscope.tv/w/aYINTzFXTEtS...](https://periscope.tv/w/aYINTzFXTEtS...)

Retweeted by SAGE

Expand



**Nat'l Ocean Policy** @NatlOceanPolicy · 2 Feb  
Could sinks and toilets help combat sea-level rise in Hampton Roads, #Virginia? [ow.ly/i/gon4q](https://ow.ly/i/gon4q)

Retweeted by SAGE

Show Summary



**SAGE** @sagecoastnews · 2 Feb  
County staff proposes to raise building heights for flood mitigation | [KeysNews.com](https://keysnews.com/node/72774)  
[keysnews.com/node/72774](https://keysnews.com/node/72774) via @KeyWestCitizen

<http://sagecoast.org/index.html>

# Resources



## Science And Engineering

[Technical Guidance](#)

[Websites](#)

[Webinars](#)

[Conference Proceedings & Presentations](#)

[Research](#)

### Technical Guidance

[NOAA Living Shorelines Workgroup](#)

[Ecosystem Service Assessment: Research Needs For Coastal Green Infrastructure](#)  
National Science and Technology Council  
Committee on Environment, Natural Resources, and Sustainability

[Coastal Risk Reduction and Resilience: Using the Full Array of Measures](#)  
U.S. Army Corps of Engineers, ERDC

[Shore Protection Assessment. Beach Nourishment, How Beach Nourishment Projects Work.](#)  
U.S. Army Corps of Engineers, ERDC

[Making Great Lakes Coastal Structures Greener](#)  
U.S. Army Corps of Engineers, ERDC

[Low Cost Shore Protection...a Guide for Engineers and Contractors](#)  
U.S. Army Corps of Engineers, Baltimore District

[Urban Waterfront Adaptive Strategies – New York City](#)

[Hudson River Shoreline Restoration Alternatives Analysis](#)

[Practical Guidance for Coastal Climate-Smart Conservation Projects in New England.](#)  
The National Wildlife Federation (NWF) 2011

[Living Shoreline Design Guidance Class](#)  
Virginia Institute of Marine Science, Center for Coastal Resource Management

[Shoreline Management in Chesapeake Bay](#)  
Virginia Institute of Marine Science, Shoreline Studies

[Marine Shoreline Design Guidelines](#)  
Washington Department of fish and Wildlife

[Envision Sustainability Rating System](#)  
Institute for Sustainable Infrastructure –

# Information

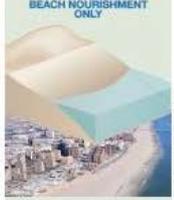
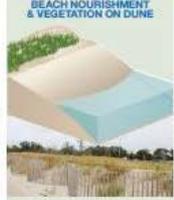
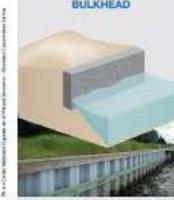


## Natural and Structural Measures for Shoreline Stabilization

**GREEN - SOFTER TECHNIQUES**  
Small Waves | Small Fetch | Gentle Slope | Sheltered Coast

**HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?**

**GRAY - HARDER TECHNIQUES**  
Large Waves | Large Fetch | Steep Slope | Open Coast

LIVING SHORELINE				COASTAL STRUCTURE				
VEGETATION ONLY	EDGING	SILLS	BEACH NOURISHMENT ONLY	BREAKWATER	GROIN	REVETMENT	BULKHEAD	SEAWALL
 <p><b>Flots</b> hold soil in place to reduce erosion. Provide a buffer to upland areas and breaks small waves.</p> <p><b>Suitable For</b> Low wave energy environments.</p> <p><b>Material Options</b> • Native plants*</p> <p><b>Benefits</b> • Dissipates wave energy • Slows inland water transfer • Increases natural storm water infiltration • Provides habitat and ecosystem services • Minimal impact to natural community and ecosystem processes • Maintains aquifer/recharge/infiltrate and connectivity • Flood water storage</p> <p><b>Disadvantages</b> • No storm surge reduction ability • No high water protection • Uncertainty of successful vegetation growth and competition with invasive</p>	 <p>Structure to hold the toe of existing or vegetated slope in place. Protects against shoreline erosion.</p> <p><b>Suitable For</b> Most areas except high wave energy environments.</p> <p><b>Vegetation* Best with Material Options</b> (low wave only, temporary) • "Shore" fencing • Erosion control blankets • Geotextile tubes • Living reef (oyster/mussel) • Rock gabion baskets</p> <p><b>Benefits</b> • Dissipates wave energy • Slows inland water transfer • Provides habitat and ecosystem services • Increases natural storm water infiltration • Toe protection helps prevent wetland edge loss</p> <p><b>Disadvantages</b> • No high water protection • Uncertainty of successful vegetation growth and competition with invasive</p>	 <p>Parallel to existing or vegetated shoreline, reduces wave energy and prevents erosion. A gapped approach would allow habitat connectivity, greater tidal exchange, and better waterfront access.</p> <p><b>Suitable For</b> Most areas except high wave energy environments.</p> <p><b>Vegetation* Best with Material Options</b> • Stone • Sand breakwaters • Rock gabion baskets</p> <p><b>Benefits</b> • Dissipates wave energy • Slows inland water transfer • Provides habitat and ecosystem services • Increases natural storm water infiltration • Toe protection helps prevent wetland edge loss</p> <p><b>Disadvantages</b> • Require more land area • No high water protection • Uncertainty of successful vegetation growth and competition with invasive</p>	 <p>Large volume of sand added from outside source to an eroding beach, and prevents erosion. Widens the beach and moves the shoreline seaward.</p> <p><b>Suitable For</b> Low-lying coastfront areas with existing sources of sand and sediment.</p> <p><b>Material Options</b> • Sand</p> <p><b>Benefits</b> • Expands usable beach area • Thin land structures • Flexible strategy • Designed with relative ease • Provides habitat and ecosystem services</p> <p><b>Disadvantages</b> • Requires continual sand resources for replenishment • No high water protection • Appropriate in limited situations • Possible impacts to regional sediment transport</p>	 <p>Offshore structures intended to break waves, reducing the force of wave action and encourage sediment accretion. Can be floating or fixed to the ocean floor, attached to shore or not, and continuous or segmented. A gapped approach would allow beach connectivity, greater tidal exchange, and better waterfront access.</p> <p><b>Suitable For</b> Most areas except high wave energy environments often in conjunction with marshes.</p> <p><b>Material Options</b> • Wood • Armored • Pre-cast concrete blocks • Living reef (oyster/mussel) • Few wave environments</p> <p><b>Benefits</b> • Expands usable beach area • Lower environmental impact • Flexible strategy • Redesigned with relative ease • Vegetation strengthens dunes, and increases their resilience to storm events • Provides habitat and ecosystem services</p> <p><b>Disadvantages</b> • Requires continual sand resources for replenishment • No high water protection • Appropriate in limited situations • Possible impacts to regional sediment transport</p>	 <p>Perpendicular, projecting from shoreline, intercept water flow and sand moving parallel to the shoreline to prevent beach erosion and break waves. Retain sand placed on beach.</p> <p><b>Suitable For</b> Coordination with beach nourishment.</p> <p><b>Material Options</b> • Concrete/stone rubble* • Timber • Metal sheet piles</p> <p><b>Benefits</b> • Protection from wave knowers • Methods and materials are adaptable • Can be combined with beach nourishment projects to extend their life</p> <p><b>Disadvantages</b> • Erosion of adjacent sites • Can be detrimental to shoreline ecosystem (e.g. replace native substrate with rock and reduces natural habitat availability) • No high water protection</p>	 <p>Lays over the slope of a shoreline. Protects slope from erosion and waves.</p> <p><b>Suitable For</b> Sites with pre-existing hardened shoreline structures.</p> <p><b>Material Options</b> • Stone rubble* • Concrete blocks • Cast concrete slabs • Sand/concrete filled bags • Rock-filled gabion basket</p> <p><b>Benefits</b> • Mitigates wave action • Little maintenance • Inflexible structure • Minimizes adjacent site impact</p> <p><b>Disadvantages</b> • No major flood protection • Require more land area • Loss of intertidal habitat • Erosion of adjacent nonretained sites • Requires more land area • No high water protection • Prevents upland from being a sediment source to the system</p>	 <p>Parallel to the shoreline, vertical or sloped wall. Intended to hold soil in place and allow for a stable shoreline.</p> <p><b>Suitable For</b> High energy settings and sites with pre-existing hardened shoreline structures. Accommodates working wave forces (e.g. docking for ships and ferries).</p> <p><b>Material Options</b> • Steel sheet piles • Timber • Composite carbon fibers • Gabions</p> <p><b>Benefits</b> • Moderate wave action • Manages tide level fluctuation • Long lifespan • Simple repair</p> <p><b>Disadvantages</b> • No major flood protection • Erosion of seaward seabed • Erosion of adjacent nonretained sites • May be damaged from overtopping/coastfront storm waves • Prevents upland from being a sediment source to the system • May be damaged from overtopping coastfront storm waves</p>	 <p>Parallel to shoreline, vertical or sloped wall. Built on one side of wall in the same elevation as water on the other. Absorbs and limits impacts of large waves and directs flow away from land.</p> <p><b>Suitable For</b> Areas highly vulnerable to storm surge and wave forces.</p> <p><b>Material Options</b> • Stone • Rock • Concrete • Steel/concrete sheets • Steel sheet piles</p> <p><b>Benefits</b> • Prevents storm surge flooding • Results along wave forces • Shoreline stabilization behind structure • Low maintenance costs • Less space intensive horizontally than other techniques (e.g. vegetation only)</p> <p><b>Disadvantages</b> • Erosion of seaward seabed • Direct sediment transport leading to beach erosion • Higher up-front costs • Visually obstructive • Loss of intertidal zone • Prevents upland from being a sediment source to the system • May be damaged from overtopping coastfront storm waves</p>
<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●●●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●</p>	<p><b>Initial Construction:</b> ●●●●● <b>Operations &amp; Maintenance:</b> ●●●●●</p>
<p><b>GRAY CAN BE OPENED:</b> e.g., "Living Breakwater" using oysters to colonize rock or "Shorewall Revetment" using vegetation, alternative forms and materials</p>								
<p><b>Initial Construction:</b> ● = up to \$1000 per linear foot, ●● = \$1001 - \$2000 per linear foot, ●●● = \$2001 - \$5000 per linear foot, ●●●● = \$5001 - \$10,000 per linear foot <b>Operations and Maintenance (yearly for a 50 year project life):</b> ● = up to \$100 per linear foot, ●● = \$101 - \$500 per linear foot, ●●● = over \$500 per linear foot</p>								

\* Native plants and materials must be appropriate for current salinity and site conditions.

\* Rock/stone needs to be appropriately sized for site specific wave energy.

# SAGE Database



## SAGE Searchable Project Database

Region:   
 North Atlantic  
 Mid-Atlantic  
 South Atlantic

State:   
 Alabama  
 California  
 Connecticut

Project Type:   
 Regional Demonstration  
 Living Shoreline - All  
 Living Shoreline - Non-Structural Only

Project Techniques:   
 Bank grading  
 Beach Nourishment  
 Berms/Levees

Site Rehab:   
 Bulkhead removal  
 Revetment removal  
 Fill removal

Key Word:

## To Search The Database

- To select a consecutive group of files or folders, click the first item, press and hold down the Shift key, and then click the last item.
- To select non-consecutive files or folders, press and hold down the Ctrl key, and then click each item that you want to select.

This database contains multiple coastal resilience projects around the nation, including Living Shorelines for shoreline stabilization, habitat restoration, and floodplain management. Each project includes a variety of site, design, and partner information. Use the pull-down lists or a Key Word search to find certain project names, partners, and other unique information.

SAGE partners at the US Army Corps of Engineers Institute for Water Resources and the Virginia Institute of Marine Science, College of William & Mary collected project records from a variety of sources like the [NOAA Restoration Atlas](#), the [COPRI Living Shorelines Database](#), state and local agencies, watershed organizations, private foundations, and others.

Every attempt has been made to ensure that these data and the documentation are reliable and accurate. This database is provided with the understanding that the records are not guaranteed and the data set are the sole responsibility of the collaborative agency making the data available. SAGE does not warrant the completeness, or utility of the data, or any liability arising from its use, or any warranty.

## Database Record Detail

Record ID	MD1
Latitude	38.179405
Longitude	-76.433584
State	MD
Region	Mid-Atlantic
Location	St. Mary's City
Name	St. Mary's City Gapped Sill
Description	Sill
Category	Living Shoreline-with structures
Techniques	sill, sand fill for marsh, vegetation planting
Site Rehab	
Date Complete	2005
URL	<a href="http://mycopri.org/node/102">http://mycopri.org/node/102</a>
Source	COPRI Living Shoreline Case Study Database, Chesapeake Bay Trust
Sponsored/Funded	Chesapeake Bay Trust

## Database Search Results

[Click Here to export these data as a CSV file](#)

	State	Project	Type	Description
<a href="#">details</a>	MD	St. Mary's City Gapped Sill	Living Shoreline-with structures	Sill
<a href="#">details</a>	MD	Oxford Living Shoreline	living shoreline-with structures	Living shoreline in the Tred Avon River to protect approximately 500 feet of eroding shoreline along two sections of waterfront in the Town of Oxford. This project will stabilize the shoreline with Spartina marshes.
<a href="#">details</a>	MD	Oxford-Bellevue Ferry landing	Living Shoreline-with structures	Applicant is requesting funds for the construction of a bioretention swale and a 215 linear foot Living Shoreline project at the Oxford-Bellevue Ferry landing in Oxford, Maryland.
<a href="#">details</a>	MD	Piscataway Park	Living Shoreline-with structures	Living Shoreline on a higher energy part of the Potomac River. Project restored 2,800 feet of shoreline and created two acres of spawning and nursery habitat for more than a dozen fish species, reduces shoreline erosion, improves water quality and provides protection for more than 30 acres of freshwater wetland and threatened Native American archeological sites nearby.
<a href="#">details</a>	MD	Kingston Public Landing	Living Shoreline-with structures	0
<a href="#">details</a>	MD	Chesapeake Bay Maritime Museum	Living Shoreline-with structures	The Chesapeake Bay Maritime Museum (CBMM) proposes to complete Phase 3 of its living shoreline. Phase 3 will restore 270 feet of wetlands in front of an existing bulkhead and will treat point source discharge from stormwater outfalls that drain the property. Phase 3 will connect existing CBMM Living Shoreline Phases 1 and 2 with the living shoreline at the Inn at Perry Cabin.
<a href="#">details</a>	MD	Franklin Manor Citizens Association	Living Shoreline-with structures	This project will protect 990 feet of wetland habitat and add 51,600 square feet of new wetlands on the open Chesapeake Bay.
<a href="#">details</a>	MD	West River United Methodist Center	Living Shoreline-with structures	Replacement of 370 linear feet of bulkhead with a living shoreline. Reestablished 2000 feet of contiguous natural shoreline with a 473-linear foot Living Shoreline project.
<a href="#">details</a>	MD	Galesville	Living Shoreline-with structures	80-linear foot Living Shoreline project in downtown Galesville at a public, county-owned park.
<a href="#">details</a>	MD	Smithsonian Environmental Research Center	Living Shoreline-with structures	The project design is comprised of a series of breakwaters creating stable embayments, which will be planted with Spartina. Phase 1A construction is scheduled for summer 2012.

# SAGE Mapper



**SAGE Projects**

Search for  in the attributes of SAGE Projects

**Data Layers**

- Street map
- USGS topos
- Data
  - SAGE Projects
    - Living Shoreline - All
    - Living Shoreline - Non-Structural Only
    - Living Shoreline - with Structures
    - Living Shoreline - with Shellfish
    - Dune Restoration
    - Wetland Restoration
    - Submerged Aquatic Vegetation Restoration
    - Stream Restoration

**Project Details:**

**ID:** NJ1  
**State:** NJ  
**Location:** Maurice River  
**Project Name:** Shellfish Reef Enhancement Along Eroding Marshes  
**Description:** The Partnership for the Delaware Estuary will enhance and stabilize a new 1000 ft section of tidal marsh using living shellfish reefs as soft armor on eroding shorelines, and an additional 1,250 linear feet of existing treated area will receive significant enhancement.  
**Project Category:** Living Shoreline - with Shellfish  
**Project Techniques:** biologs, sand fill, vegetation planting  
**Site Rehabilitation:**  
**Date Complete:** 2010  
**Sponsored:** National Fish and Wildlife Foundation - Delaware, National Fish and Wildlife Foundation, Partnership for the Delaware Estuary

A map of the Eastern United States showing the locations of SAGE projects. The map includes state boundaries for Pennsylvania, Ohio, West Virginia, Maryland, Delaware, Virginia, New Jersey, and New York. Major cities and interstate highways are labeled. A search bar at the top allows filtering projects by state (currently set to NY). A data layers panel on the right shows various project types, with "Living Shoreline - Non-Structural Only" selected. A popup window provides detailed information for project NJ1, including its location on the Maurice River in New Jersey and a description of the shellfish reef enhancement project.

# Support implementation



Supporting partner activities

Providing expertise to practitioners  
via workgroups

Supporting regional communities of  
practice

# Why Join SAGE?

Build new partnerships

Leverage resources

Collaborate on landscape-scale approaches

Access a multi-disciplinary knowledge base

Advance the field of natural and nature-based approaches



# Get Involved



## Management Team

SAGE's Management Team is responsible for day-to-day development, implementation and coordination of SAGE activities. Please contact a management team representative within your practice to find out how to get plugged into SAGE.

- **Naomi Edelson** SAGE NGO lead  
*Director, State and Federal Wildlife Partnerships  
National Wildlife Federation*
- **Debbie Larson-Salvatore** IWR contact  
*Institute for Water Resources, US Army Corps of Engineers*
- **Pamela Mason** SAGE Academic lead  
*Senior Coastal Management Scientist  
Center for Coastal Resources Management, Virginia  
Institute of Marine Science*
- **Susan Meredith Taylor** SAGE Private sector lead  
*Associate, Abt Associates*
- **Kim Penn (NOAA)** Climate Change Coordinator  
*National Oceanic & Atmospheric Administration  
(NOAA)*
- **Bradley Watson** SAGE State and Pilots lead  
*Counsel and Director of Coastal Resilience  
Coastal States Organization*
- **Sarah Murdock** Management team representative, policy expert  
*Director, US Climate Adaptation Policy  
The Nature Conservancy*
- **Marriah Abellera** IWR contact  
*Institute for Water Resources  
US Army Corps of Engineers*

## Contact SAGE!

### Contact us for more information and to join the SAGE Community of Practice

Email SAGE at [info@sagecoast.org](mailto:info@sagecoast.org) for general information or questions, or [contact a SAGE management team representative](#) within your practice to find out how to get plugged into SAGE.

#### About our logo and brand

The SAGE logo is the official emblem of the SAGE project. It may only be used in conjunction with SAGE endorsed or sponsored activities, or within the context of providing information about SAGE.

The SAGE logo may not be used to promote or endorse commercial products or activities without the written permission of SAGE.

The logo may not be distorted, displayed in alternative colors, cropped or otherwise altered. It may however, in black and white applications where color is not an option, be displayed in grayscale.

[DOWNLOAD SAGE LOGO >](#)

#### Register to receive SAGE information and updates

Your email address

Your first name

Your last name

Affiliation/business

Reason for your interest in SAGE

[REGISTER NOW](#)

# Questions

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