

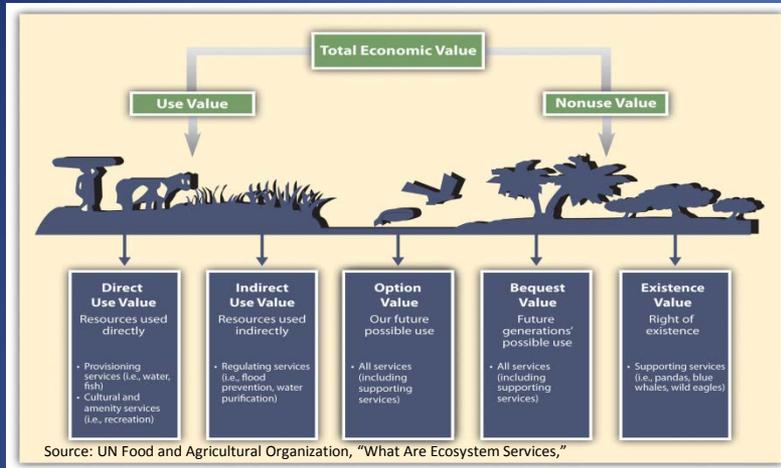
Living Shorelines and Coastal Resilience: Green is the New Black



**Holly Bamford, Ariana Sutton-Grier, Lindsey
Kraatz, and Leah Fisher**

National Oceanic and Atmospheric Administration &
University of Maryland

Leveraging Ecosystem Services through Nature-Based Strategies to Increase Hurricane Resilience



Let's use these unspent federal dollars to prepare for disasters

Vehicles submerged in water in New York's financial district in October 2012 following Hurricane Sandy. (Victor J. Blue/Bloomberg)

By R. David Paulison November 1

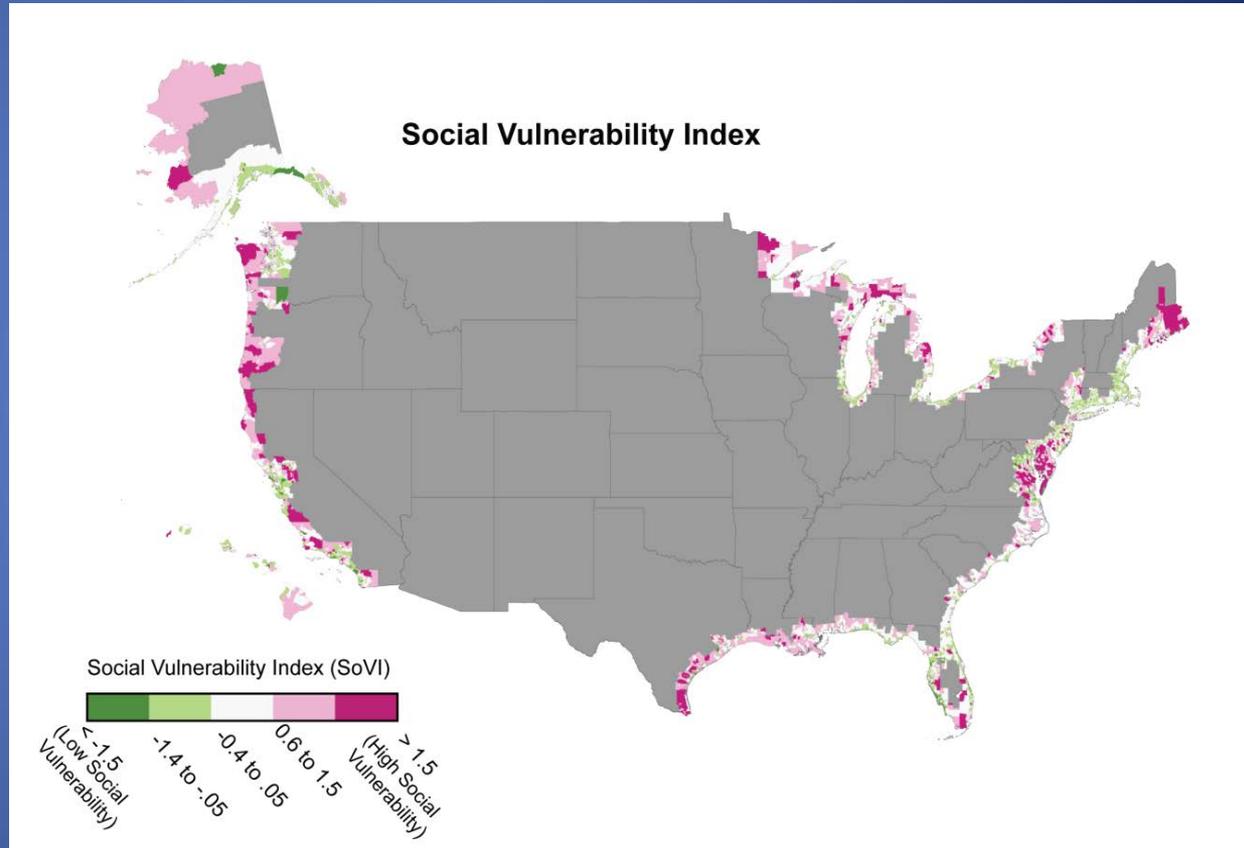
R. David Paulison was FEMA administrator from 2005 to 2009.

Three years ago, Hurricane Sandy struck the United States, causing catastrophic losses up and down the East Coast. With families still struggling to get back on their feet, I'm shocked to report that — after all this time — billions of dollars in Sandy relief aid has yet to be spent.



- Science is a key part of the equation
 - We need a multi-disciplinary approach to building resilience and reducing risk from storms and environmental change
 - Decision makers are needed at the table

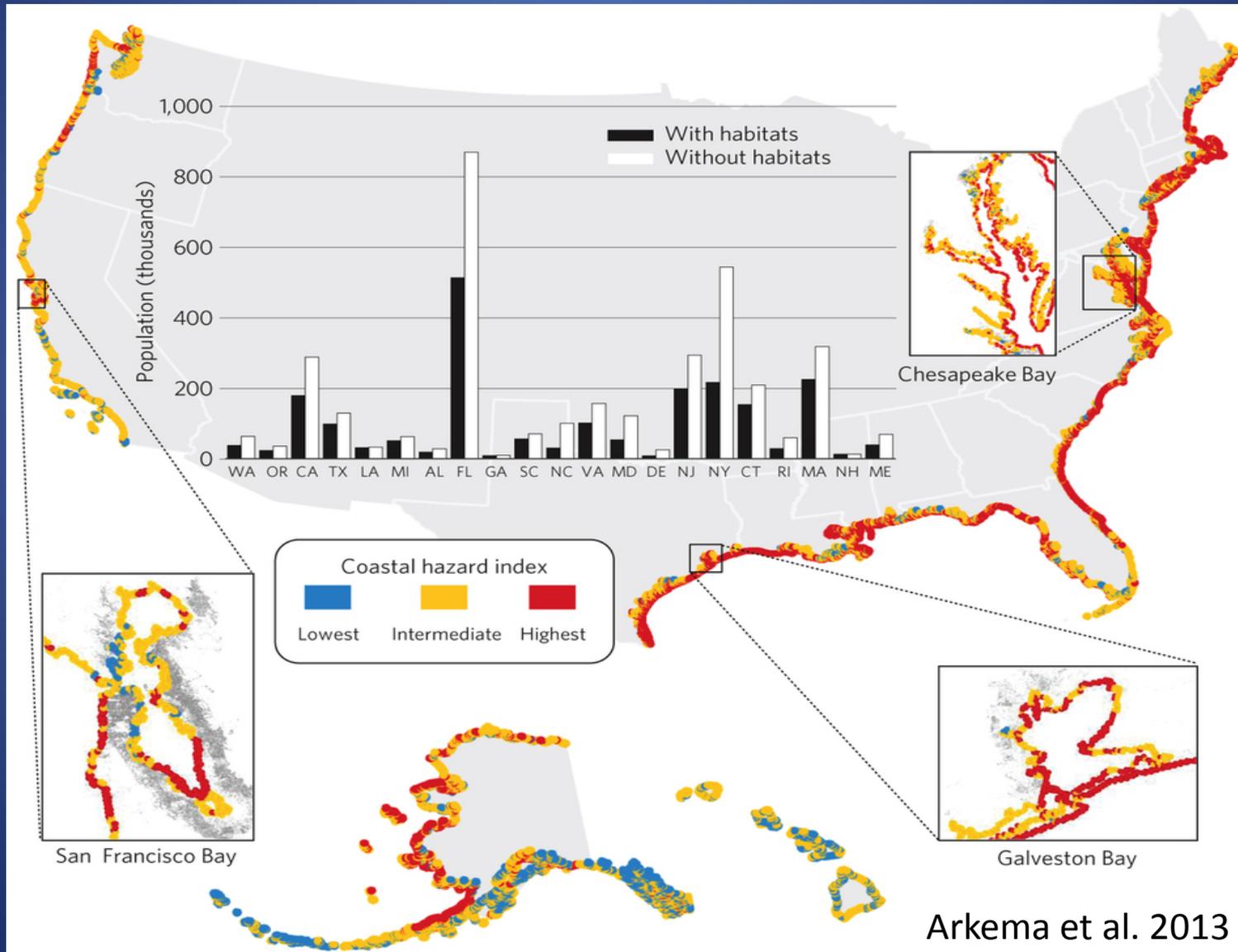
Today's Most Vulnerable Populations



SOVI available at:

<http://coast.noaa.gov/dataregistry/search/collection/info/sovi>

Risk exposure of the U.S. coastal population to storms and sea-level rise in 2100



Many Factors Influence the Amount of Coastal Protection Provided by Natural Infrastructure

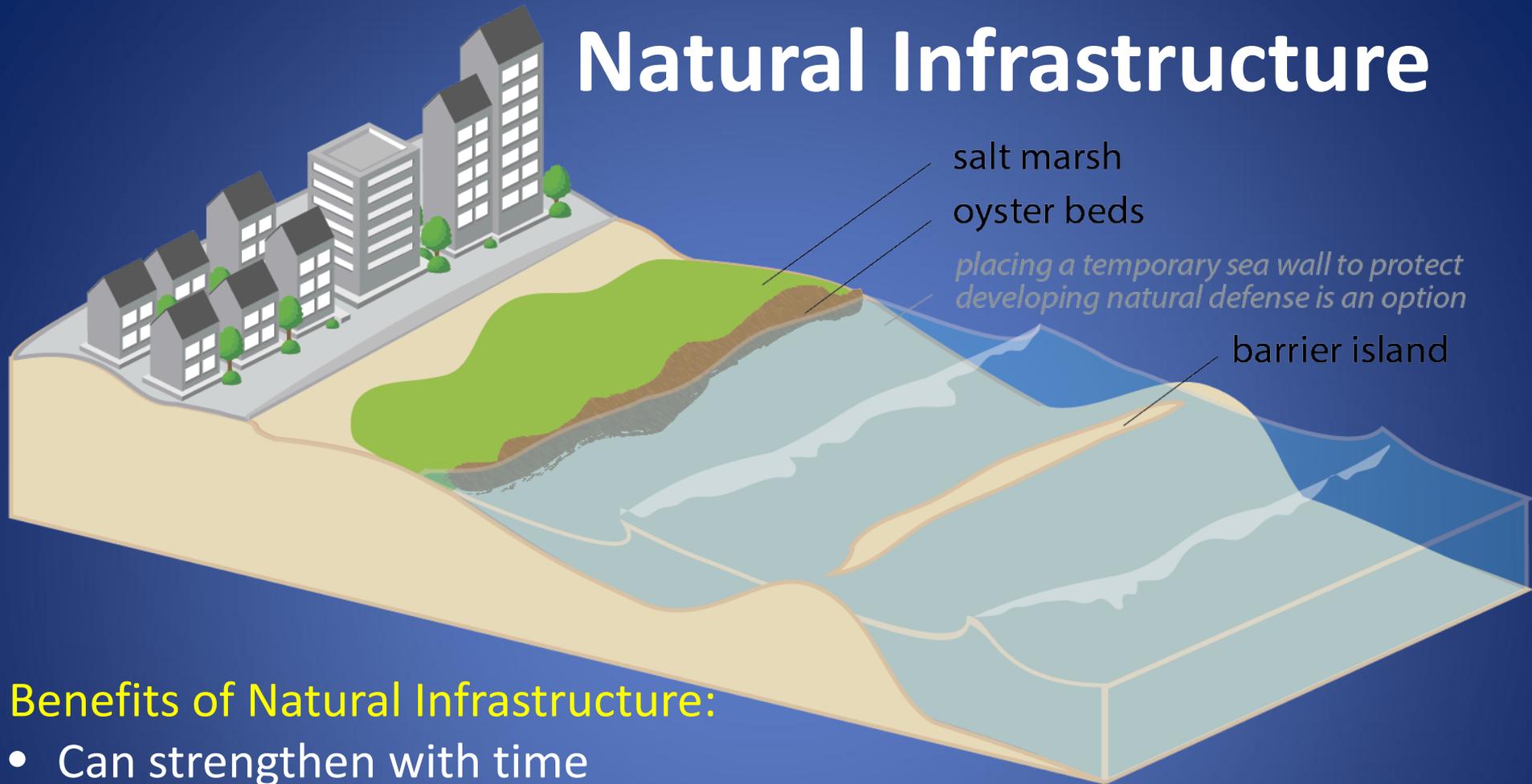


Analysis of 34 hurricanes → loss of 1 hectare of wetland in the model corresponded with increased average storm damages of \$33,000 per storm



U.S. coastal wetlands provide \$23.2 billion storm protection benefits annually (Constanza et al.2008)

Natural Infrastructure



Benefits of Natural Infrastructure:

- Can strengthen with time
- Can be self-maintaining and has the potential for self-repair after storms
- Can grow and keep pace with sea level rise
- Can be more cost-effective
- Provides benefits all the time



Additional Coastal Ecosystem Services

1. Fisheries (recreational and commercial)
2. Recreation & tourism
3. Water filtration
4. Cultural services
5. Habitat for other species
6. Carbon sequestration & storage

Dow Chemical: Wetlands vs. Wastewater Treatment Plant



Natural Capital Case Study

Hybrid Approach

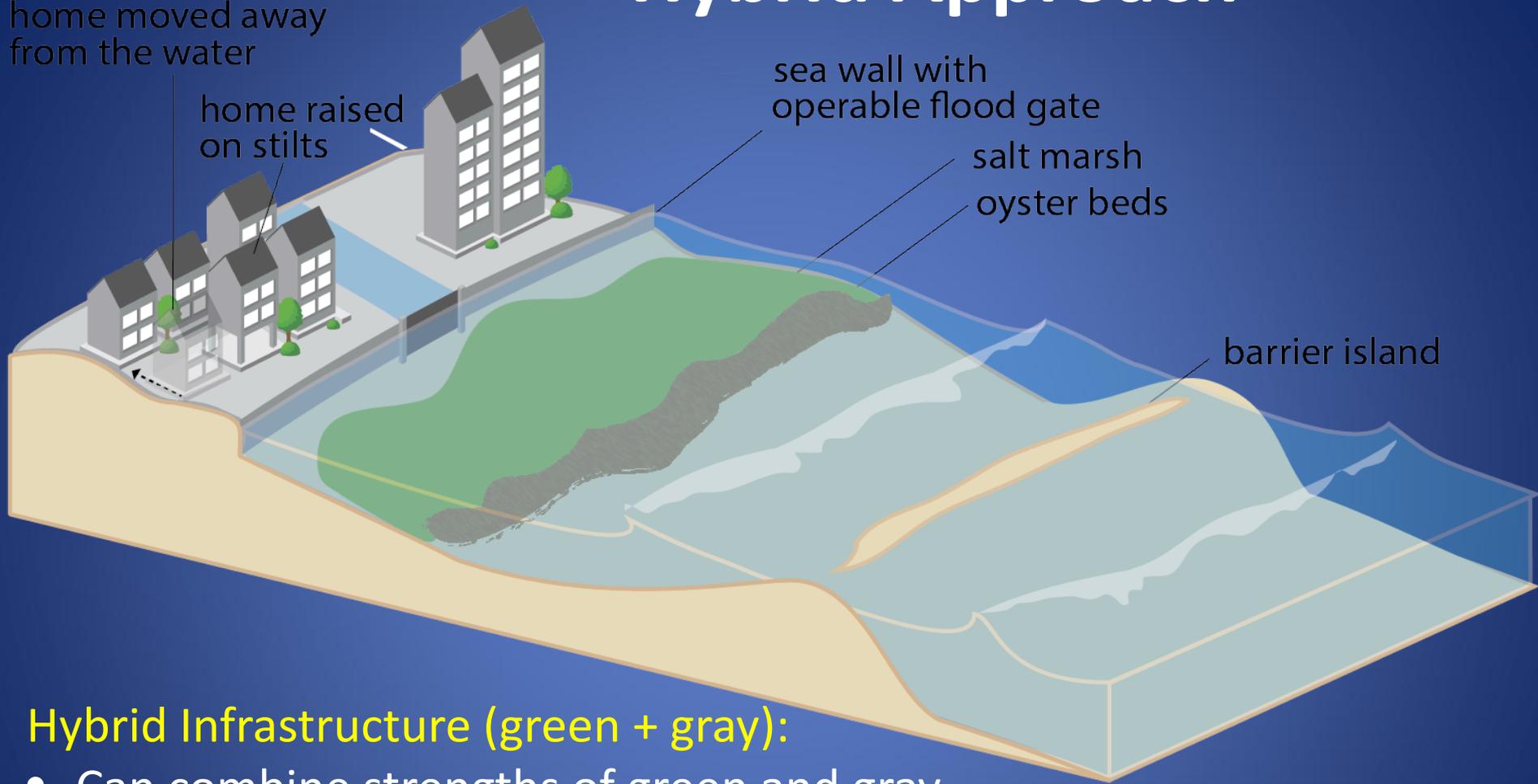
home moved away
from the water

home raised
on stilts

sea wall with
operable flood gate

salt marsh
oyster beds

barrier island



Hybrid Infrastructure (green + gray):

- Can combine strengths of green and gray
- Can use gray to protect green as it establishes
- Can use green to protect gray to limit degradation and reduce construction costs

Rebuild By Design: “Big U” Project Provides Climate Adaptation, Some Storm Surge Protection and Recreational Opportunities

- Goal is to provide storm and climate adaptation with improved recreational access
- Combines hard (flood walls, berms, removable walls) and soft (knolls, gardens) infrastructure
- Nature-as-buffer approach



Green and Hybrid Research Needs to Support Policy

- Natural and hybrid options for best protection?
- Value of storm protection benefits and co-benefits?
- Risk of NOT employing green/hybrid approaches?
- Best practices for design?
- Implementation and regulation?



Sandy was a Turning Point

Guidance for Considering the Use of Living Shorelines

2015



Final Report

Economic Assessment of Green Infrastructure Strategies for Climate Change Adaptation: Pilot Studies in The Great Lakes Region

May 2014

Eastern Research Group, Inc.

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RESILIENT SHORELINES
SAGE
THRIVING COMMUNITIES

Approach to Geomorphic Engineering

Focus on coastal (landscape) transformation

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;
- Broader science, engineering, policy and marketing activity both domestically and internationally;
- Engage community partners in regional demonstrations

Featured Tools

- Resilient Project Database:** Multiple project types and locations.
- 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.

News

SAGE Organizations Without Online Accounts (00000000)

Spotlights

SAGE Living Shoreline Brochure

Hurricane Sandy Rebuilding Task Force

HURRICANE SANDY REBUILDING STRATEGY

Stronger Communities, A Resilient Region

August 2013

ECOSYSTEM-SERVICE ASSESSMENT: RESEARCH NEEDS FOR COASTAL GREEN INFRASTRUCTURE

PRODUCT OF THE
Committee on Environment, Natural Resources, and Sustainability
OF THE
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL



August 2015

Incorporating Natural Infrastructure and Ecosystem Services in Federal Decision-Making

Summary: Today, the Administration released a new memorandum directing Federal agencies to factor the value of ecosystem services into Federal planning and decision-making.

Our natural world provides critical contributions that support and protect our communities and economy. For instance, Louisiana's coastal wetlands provide billions of dollars worth of flood protection and other benefits. Preserving and restoring forests in the Catskill Mountains enables New York City to access clean water at a cost several times less than the cost of building a new water-filtration plant. And current efforts to plant trees along Oregon's salmon-rich rivers will improve local water quality - saving costs associated with installing expensive machinery to achieve the same purpose.

These are just a few examples of the many ways that nature creates benefits that contribute to our economic prosperity, protect the health and safety of vulnerable populations, and help build more resilient communities. But these "ecosystem services" are often overlooked. Integrating ecosystem services into planning and decision-making can lead to better outcomes, fewer unintended consequences, and more efficient use of taxpayer dollars and other resources.

Why, today, the Administration is issuing a memorandum directing all Federal agencies to "the value of natural, or "green," infrastructure and ecosystem services into Federal decision-making. The memorandum directs agencies to develop and institutionalize a "cost-benefit analysis of ecosystem services" where appropriate and practicable in

DigitalCoast

OFFICE FOR COASTAL MANAGEMENT

About

A Coastal Services Center
ONLINE INFORMATION AND TECHNOLOGY

Green Infrastructure

Natural areas (and man-made systems that mimic natural processes) provide numerous benefits, from natural water storage areas that protect communities from floods to cleaner air and water and great spaces for people to play. Here's a sample of what NOAA's Digital Coast provides to address this topic.

- Tools
- Training
- Information

Coastal Flood Exposure Mapper
See where your community assets are most vulnerable to coastal flooding. Use this information to start conversations about local risk reduction strategies.

[Get It Now](#)

Introducing Green Infrastructure for Coastal Resilience
Learn about key green infrastructure concepts and practices that support coastal resilience.

[Get It Now](#)

Assessing Green Infrastructure Costs and Benefits for Flood Reduction
Follow a six-step watershed-based approach to calculating benefits and costs of reducing flooding with green infrastructure over the long term.

[Get It Now](#)

Coastal Resilience
Access a suite of nature-based solutions that reduce social and economic risks.

[Get It Now](#)

Green Infrastructure Mapping Guide
Develop a GIS work plan to prioritize green infrastructure for coastal resilience.

[Get It Now](#)

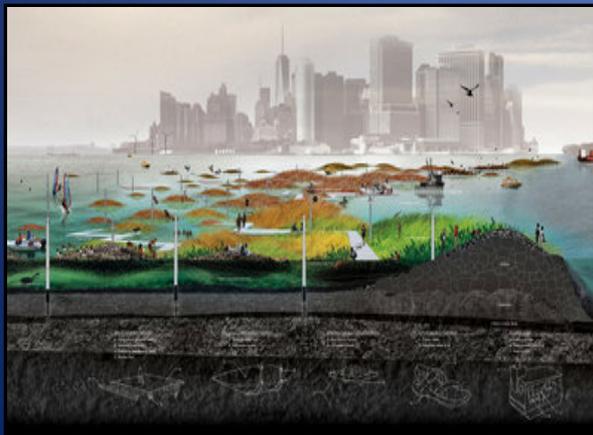
Natural and Structural Measures for Shoreline Stabilization
Learn techniques that can help reduce coastal risks and improve resilience.

[Get It Now](#)

Coastal County Snapshots

Coastal Restoration Project Design and Evaluation

We know enough to implement these alternatives now. The choice is up to society: How do **we** want our future coasts to look?



Thank you!



For more info: ariana.sutton-grier@noaa.gov

Sutton-Grier et al. 2015. Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems. Environmental Science & Policy.

Paper open access:

<http://www.sciencedirect.com/science/article/pii/S1462901115000799>