

# Going from Opportunistic to Strategic Green Infrastructure



# Agenda:

- Background on green infrastructure practices for hazards resilience
- Demonstrations and highlights:
  - *Guide for Considering Climate Change in Coastal Conservation (and Upcoming “How To”)*
  - Green Infrastructure Mapping Guide
  - *Green Infrastructure Costs and Benefits for Flood Reduction*
  - Natural and Structural Measures for Shoreline Stabilization
  - Green Infrastructure Protective Services Animation
- Questions

# Find Products Here

The screenshot shows the NOAA Digital Coast website. At the top left is the NOAA logo and the text "Office for Coastal Management DIGITALCOAST". A navigation menu includes "ABOUT", "DATA", "TOOLS", "TRAINING", "TOPICS" (which is underlined), and "STORIES", followed by a search icon. Below the navigation is a banner image of a gravel path next to tall grass. A breadcrumb trail reads "Home | Topics | Green Infrastructure" with social media icons for Facebook, Twitter, and Email to the right. The main heading is "Green Infrastructure". Below it is a paragraph: "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." Below this is a filter bar with three options: "ALL" (with a refresh icon), "TOOLS" (with a briefcase icon), and "TRAINING" (with a lightbulb icon). The "TRAINING" filter is selected. Below the filter bar are three training cards. Each card has a "TRAINING" label above it. The first card is titled "Coastal Restoration Project Design and Evaluation" and describes obtaining knowledge and skills for measurable impacts. The second card is titled "Green Infrastructure Mapping Guide" and describes developing a GIS work plan. The third card is titled "Introducing Green Infrastructure for Coastal Resilience" and describes learning about key concepts and practices.

NOAA Office for Coastal Management  
DIGITALCOAST

ABOUT DATA TOOLS TRAINING TOPICS STORIES

Home | Topics | Green Infrastructure

## 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.

ALL TOOLS TRAINING

TRAINING

### Coastal Restoration Project Design and Evaluation

Obtain the knowledge, skills, and tools to design and implement projects that have measurable impacts on a site.

TRAINING

### Green Infrastructure Mapping Guide

Develop a GIS work plan to prioritize green infrastructure for coastal resilience.

TRAINING

### Introducing Green Infrastructure for Coastal Resilience

Learn about key green infrastructure concepts and practices that support coastal resilience.

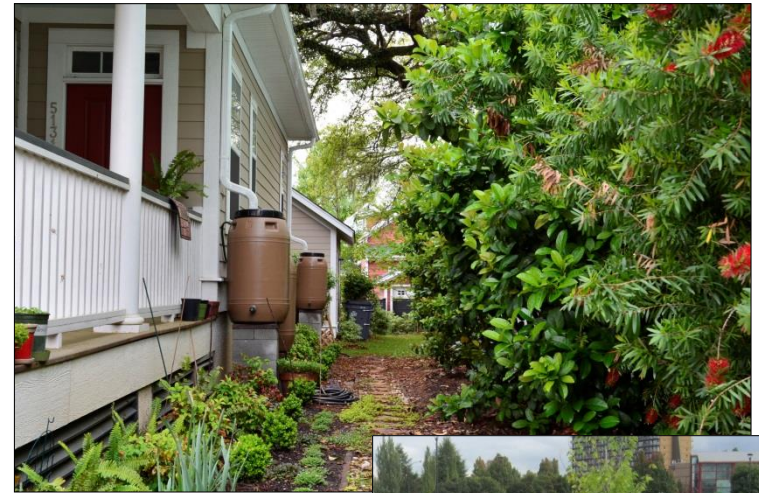
[coast.noaa.gov/digitalcoast/topics/green-infrastructure](https://coast.noaa.gov/digitalcoast/topics/green-infrastructure)



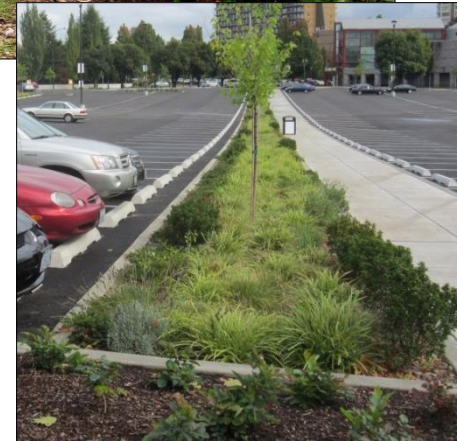
# What is Green Infrastructure?



**Landscape**



**Community  
and Site**



**Shoreline**



# Why Green Infrastructure?



# Coastal Flood Exposure Mapper

Coastal Flood **Exposure Mapper**

## Select the Flood Hazards Map or One of the Community Exposure Maps

Select a section below to view maps showing flood hazards or different aspects of community exposure to those flood hazards.

First-time user? Starting with  
Flood Hazards is a good idea.



### Flood Hazards

Flooding events are among the more frequent, costly, and deadly hazards that can impact coastal communities. There are two types:

- Short-term (episodic) – Temporary flooding caused by extreme conditions, including storm surge, tsunamis, inland flooding, and shallow coastal flooding.
- Long-term (chronic) – Flooding caused by a rise in relative sea



### Societal Exposure

Understanding the populations that live in or near coastal flood-prone areas is an important information need, since residents who are elderly, who live in high-density areas, or who are impoverished may merit special considerations.



### Infrastructure Exposure

Community infrastructure, including roads, bridges, and water and sewer systems, can be damaged by coastal flooding. Communities should first assess infrastructure vulnerabilities and associated environmental and economic issues to determine what steps are needed to protect these assets.



### Ecosystem Exposure

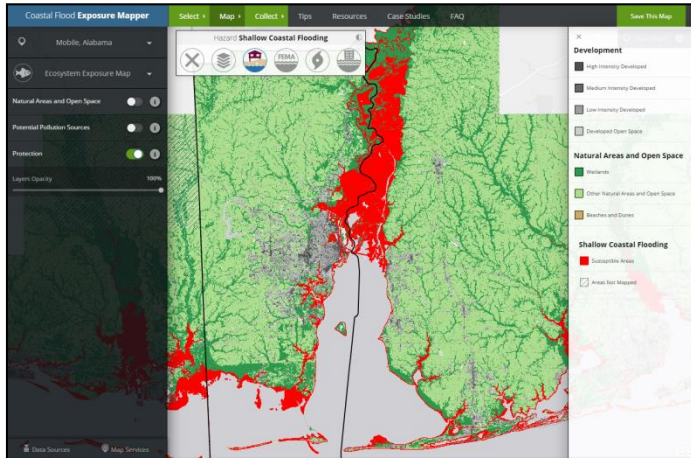
Natural areas provide important benefits to coastal communities, including hazard protection, flood storage, water quality maintenance, fisheries support, and recreational opportunities. Communities can increase resilience by protecting natural areas along the coast that are exposed to flooding and adjacent inland areas.

[coast.noaa.gov/digitalcoast/tools/flood-exposure](https://coast.noaa.gov/digitalcoast/tools/flood-exposure)

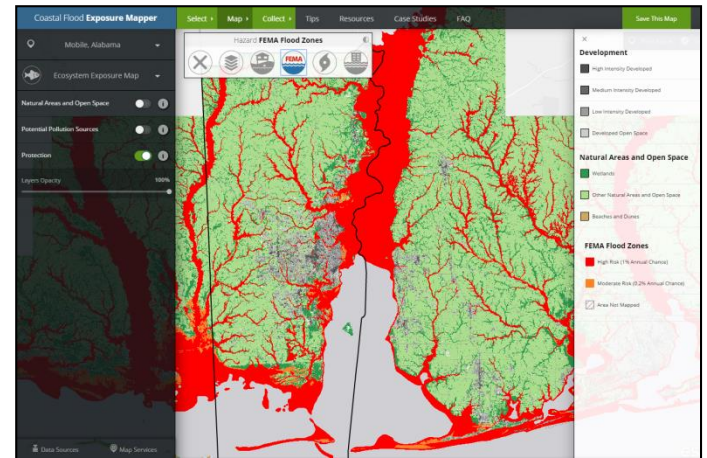


# Coastal Flood Exposure Mapper

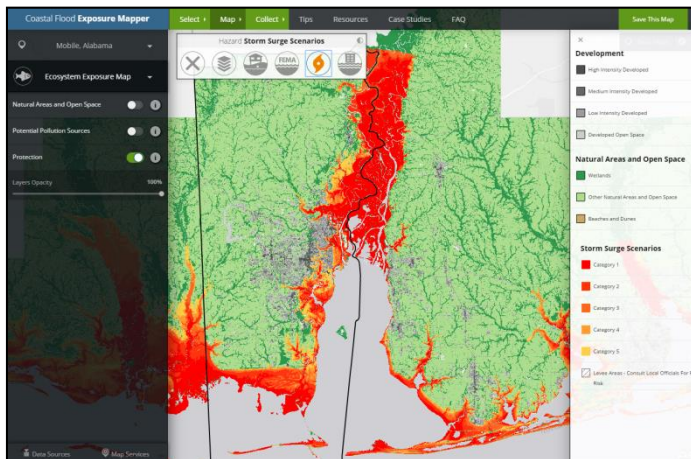
[coast.noaa.gov/digitalcoast/tools/flood-exposure](https://coast.noaa.gov/digitalcoast/tools/flood-exposure)



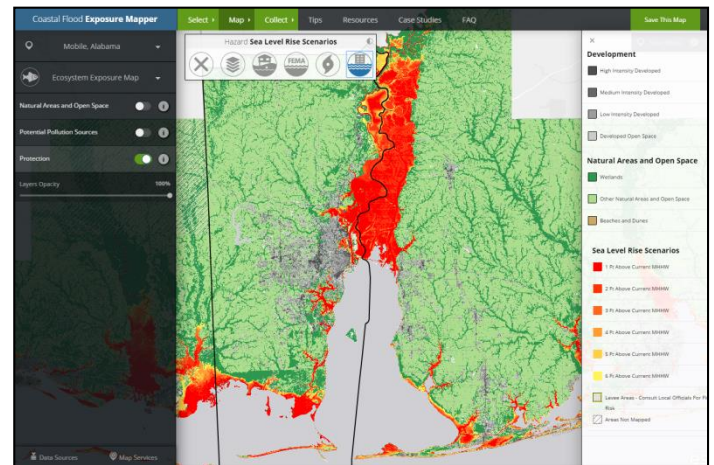
**Shallow Coastal Flooding**



**Flood Zones**



**Storm Surge**



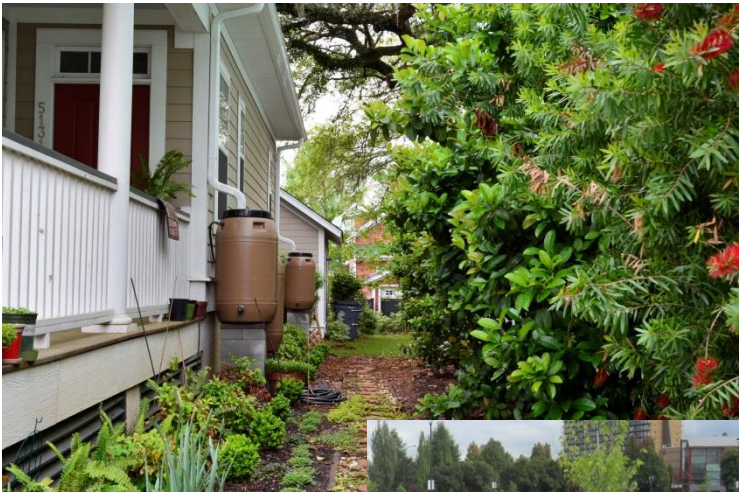
**Sea Level Rise**



# Green Infrastructure Approaches and Resources



**Landscape**



**Community  
and Site**



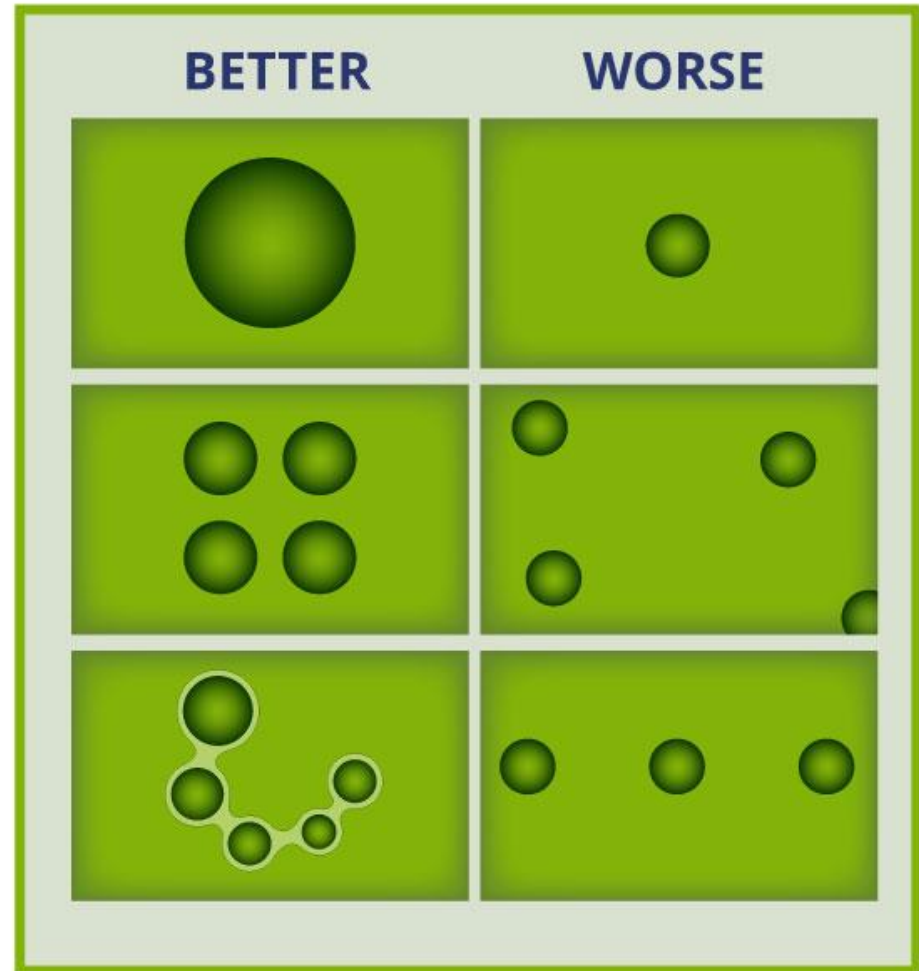
**Shoreline**



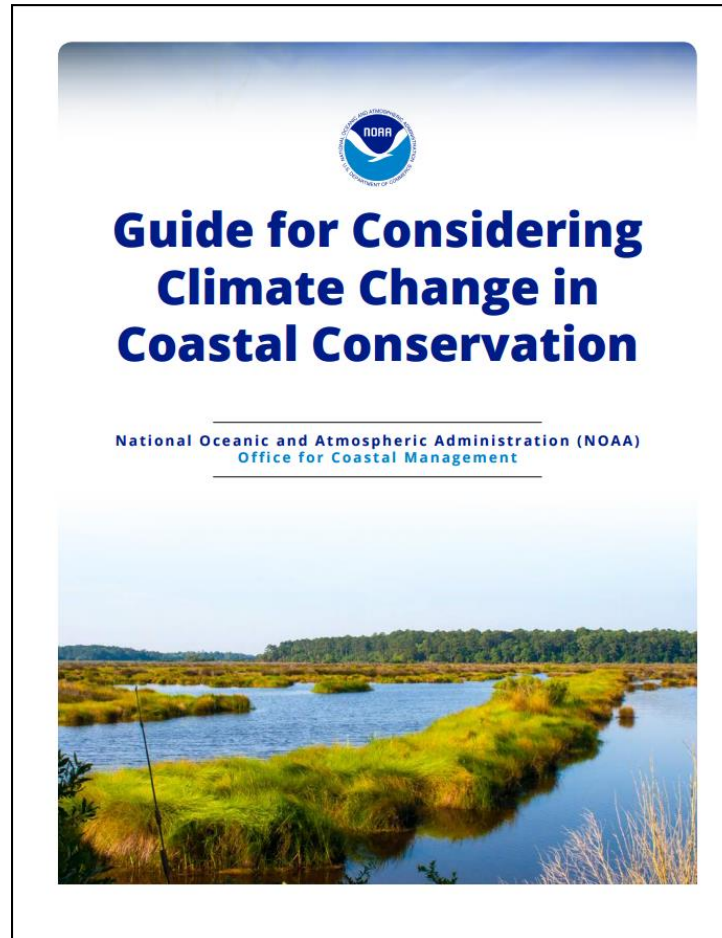


# Landscape Conservation

- Area
- Proximity
- Connectivity
- Buffer



# Guide for Considering Climate Change in Coastal Conservation

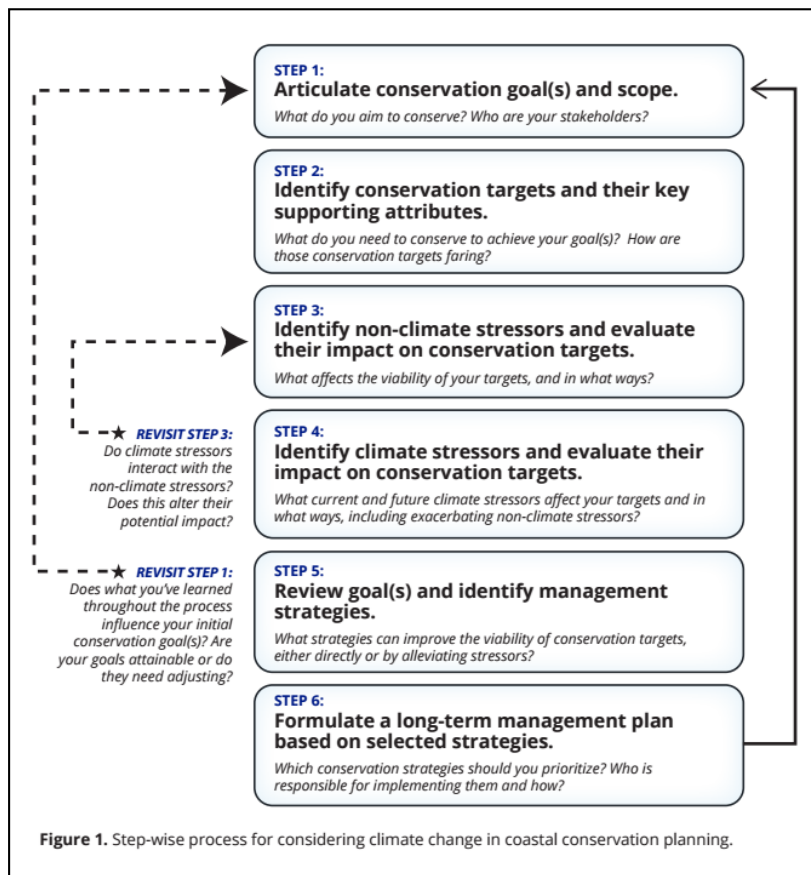


*[coast.noaa.gov/digitalcoast/training/considering-climate-change](https://coast.noaa.gov/digitalcoast/training/considering-climate-change)*

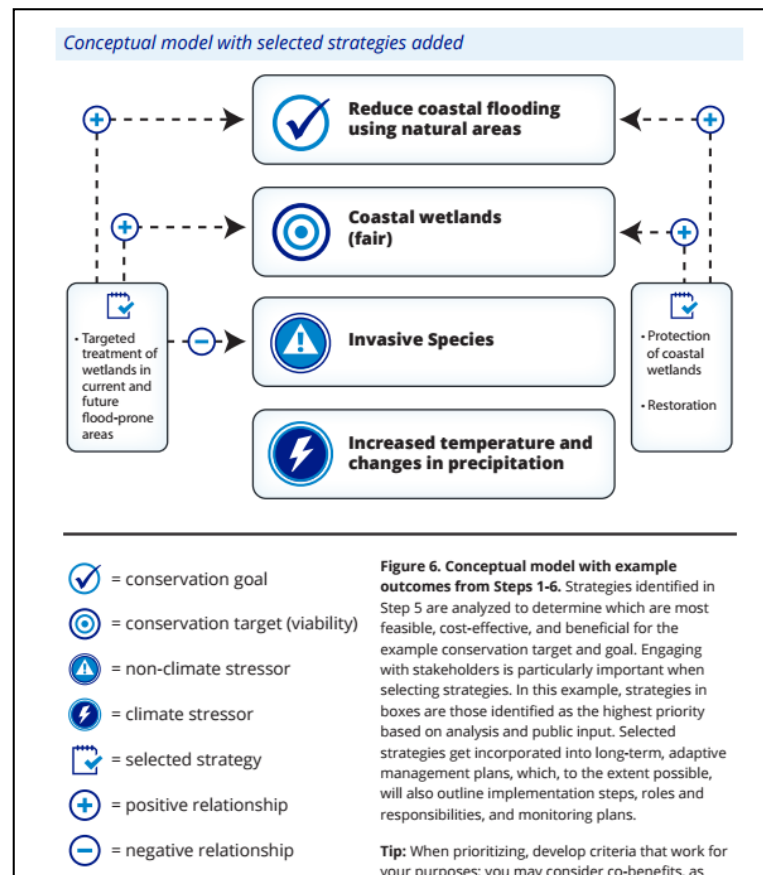


# Guide for Considering Climate Change in Coastal Conservation

## Six Steps



## Conceptual Model



# Green Infrastructure Mapping Guide

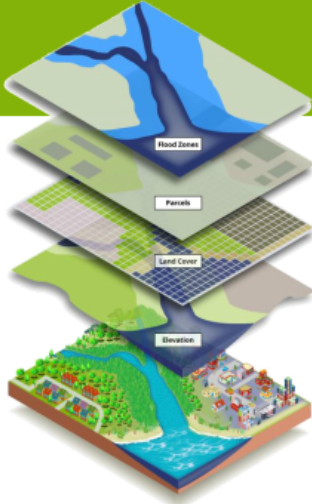
[Menu](#) | [Resources](#)

## Green Infrastructure Mapping Guide


This guide supports spatial analysts mapping green infrastructure for resilience to coastal hazards. The guide helps analysts incorporate green infrastructure strategies into a GIS work plan, and rank and prioritize green infrastructure for their study area.

Ways to use this guide:

- Use the **work plan** to follow an example project and see how a spatial analyst looks at multiple criteria to generate a final prioritization layer.
- At each step, track a **case study** to see how others have approached the work, or access **detailed guidance** for completing the step.
- View or download **worksheets and templates** that will make the job easier. Access **related resources** or full case study reports.



[Get Started](#)



Not familiar with green infrastructure?

Watch this short animation to see how green infrastructure supports coastal communities.



# Community and Site Approaches

## Low Impact Development Practices



### **Bioretention (Infiltration and Filtering)**

- Rain gardens
- Bioswales
- Stormwater planters



### **Green Roofs (Storage and Evapotranspiration)**

- Blue roofs
- Cisterns



### **Permeable Pavements (Infiltration)**

- Porous asphalt or concrete
- Grass or gravel pavers
- Pavers

# Community and Site Approaches

## Green Streets

- Key linking component in green infrastructure network
- Design dependent on local conditions but generally includes

Alternative street widths

Swales

Bioretention

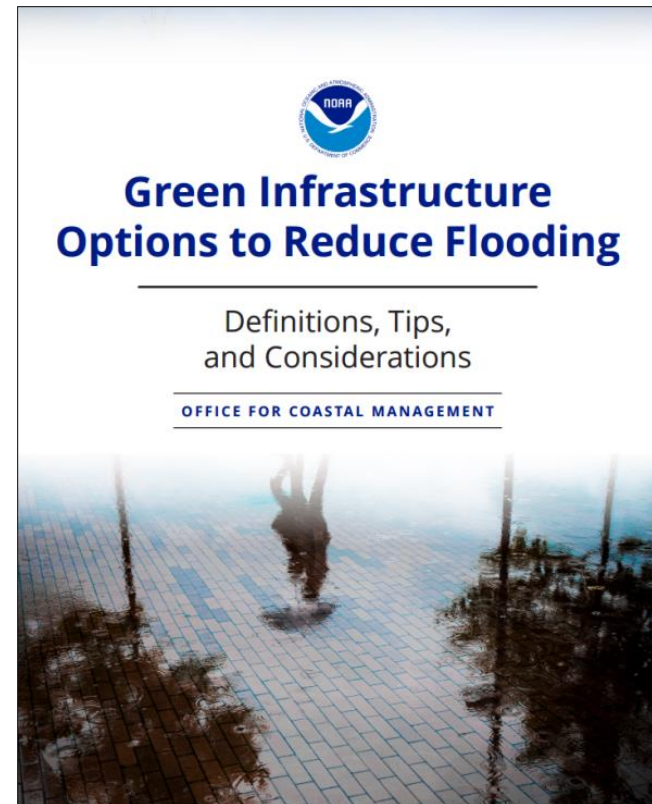
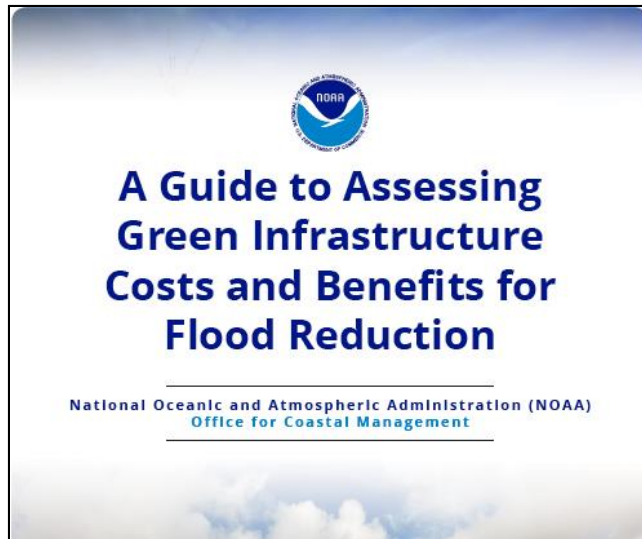
Permeable pavements

- Provides multiple benefits





# Green Infrastructure Costs and Benefits for Flood Reduction



[coast.noaa.gov/digitalcoast/training/gi-cost-benefit](https://coast.noaa.gov/digitalcoast/training/gi-cost-benefit)

# Shoreline Approaches

## Natural



### Dunes and Beaches

- Break offshore waves
- Attenuate wave energy
- Slow inland water transfer



### Salt Marshes, Wetlands, Vegetation, Submerged Aquatic Vegetation

- Break offshore waves
- Attenuate wave energy
- Slow inland water transfer
- Increase infiltration

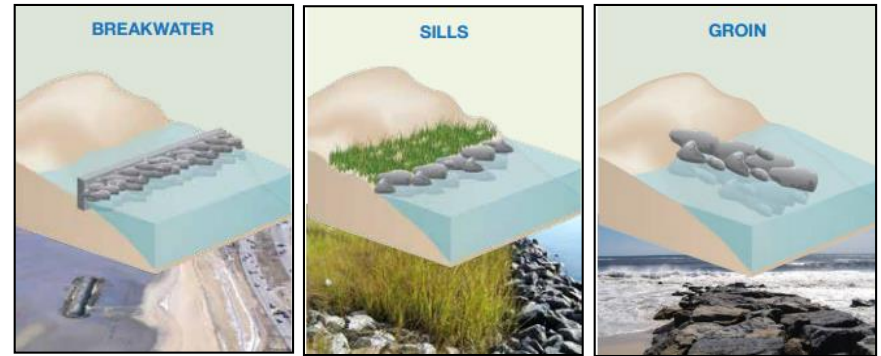


### Oysters and Coral Reefs

- Break offshore waves
- Attenuate wave energy
- Slow inland water transfer

# Shoreline Approaches

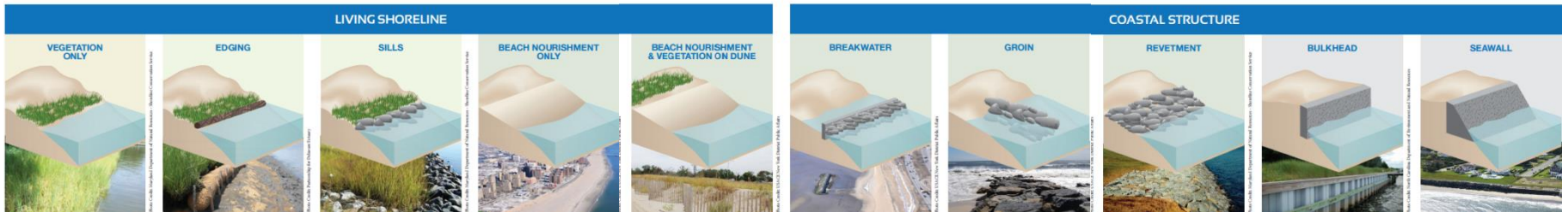
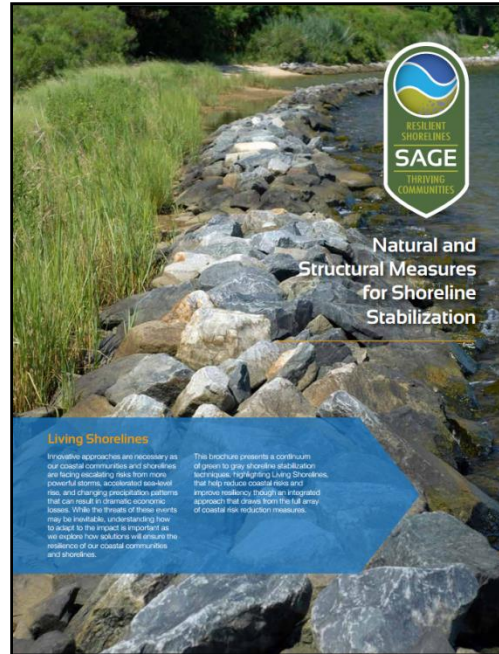
## Hybrid



- Blends both nature-based and structural approaches
- Dissipates wave energy from structural practices
- Ecosystem service benefits from nature-based practices



# Natural and Structural Measures for Shoreline Stabilization



[coast.noaa.gov/digitalcoast/training/living-shorelines](https://coast.noaa.gov/digitalcoast/training/living-shorelines)

# Engaging Stakeholders

- Make it local
- Offer solutions
- Use visualizations

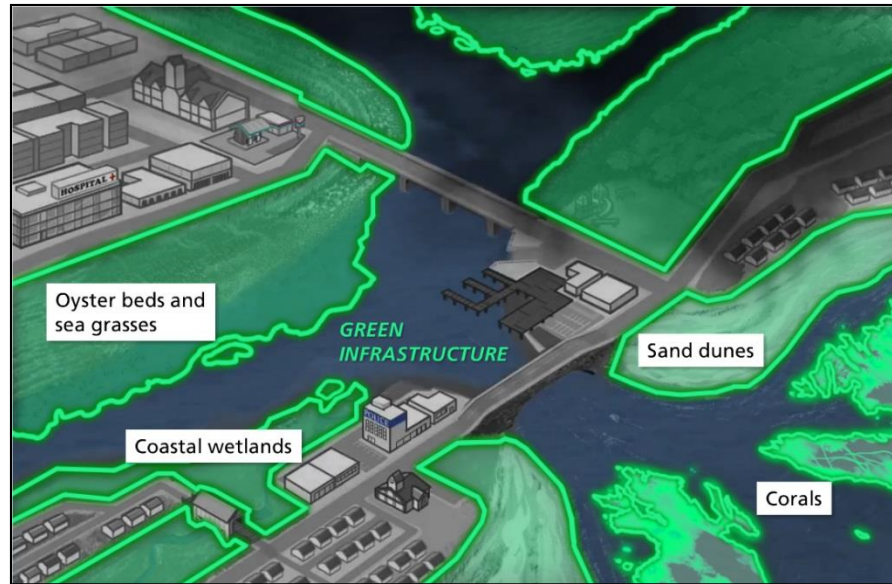


# Green Infrastructure Protective Services Animation



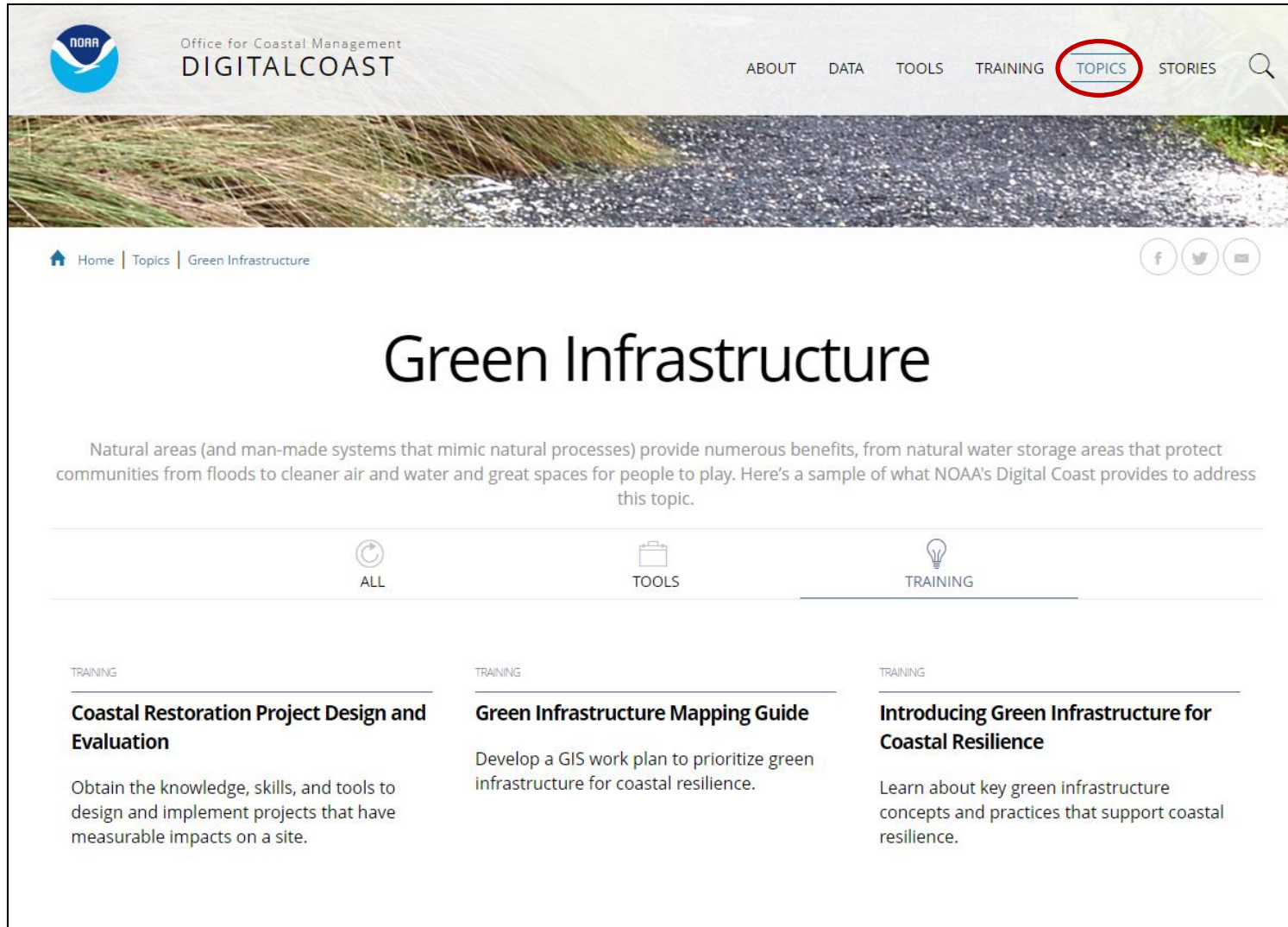
[coast.noaa.gov/digitalcoast/training/gi-animation](https://coast.noaa.gov/digitalcoast/training/gi-animation)





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- Coastal Restoration Project Design and Evaluation**  
Obtain the knowledge, skills, and tools to design and implement projects that have measurable impacts on a site.
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Develop a GIS work plan to prioritize green infrastructure for coastal resilience.
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Learn about key green infrastructure concepts and practices that support coastal resilience.

[coast.noaa.gov/digitalcoast/topics/green-infrastructure](https://coast.noaa.gov/digitalcoast/topics/green-infrastructure)

# Questions?

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