Living Shorelines

IN GULF COAST STATES: ALABAMA RESOURCE CATALOG

Purpose of this Resource Catalog

Living shorelines, or natural approaches to shoreline stabilization, have been increasingly recognized as an effective way to not only stabilize shorelines, but also provide numerous other benefits, including improvements in recreational fishing and birdwatching. This catalog was created to highlight resources that have been developed to inform coastal living shoreline project implementation in U.S. Gulf States. By compiling these available resources, we aim to help direct different key audiences to the most helpful and relevant resources. Target audiences include:

- **Environmental Consultants, Engineers, and Landscape Architects**
- **Installation contractors and suppliers**
- **Realtors and property developers**
- **Researchers**
- **Resource Managers and Local Land Use Planners**
- **Property Owners**
- **All** – *For resources relevant to all target audiences*

This catalog is organized into three primary sections highlighting resources relevant to the (1) design and construction considerations, (2) permitting, and (3) costs of living shoreline projects. The focus of this catalog (and thus the resources included) is coastal environments, those impacted by tidal waters. A brief description of each resource is included, along with information about the type of resource, topics covered, and target audiences. When you identify a resource of interest, follow the link provided to view the original resource. While this catalog was compiled for Alabama, resources developed for other states have been included when the information is highly applicable to Alabama. Some resources are included in more than one section when they contain information relevant to multiple sections.

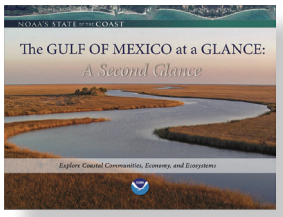
Table of Contents

Introduction

The Gulf Coast: Ecological, Economic, and Social Importance

The tidal shoreline of the U.S. Gulf Coast stretches over 17,000 miles from the Florida Keys to South Texas. The region is home to some of the most diverse and productive ecosystems, valuable natural resource economies, and culturally rich communities in the U.S.

Title: **The Gulf of Mexico at a Glance: A Second Glance**



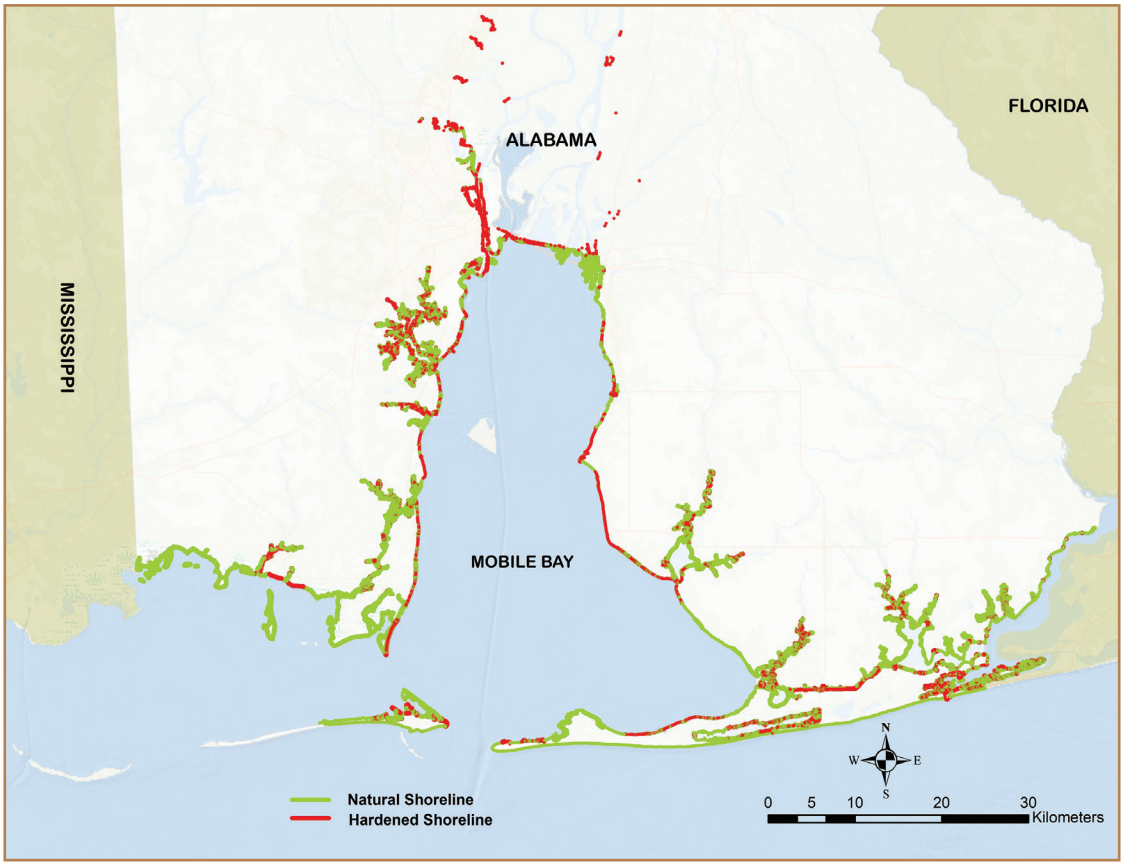
Resource Type: Technical Report

By: National Oceanic and Atmospheric Administration (2011)

Audience(s): **All**

Description: This report provides highlights about the U.S. Gulf of Mexico coastal region, including coastal ecosystems, economies, and communities. As well as regional information, many data are broken down by state. This is a great starting resource for general information regarding the Gulf States.

Alabama Shoreline Map



Natural and hardened shorelines in coastal Alabama, with a focus on areas below Interstate Highway I-10. Geological Survey of Alabama (2009 and 2012). Credit: Saranee Dutta.

Alabama's Gulf Coast: Key Facts and Figures

TIDAL SHORELINE[a]

607

MILES

HARDENED SHORELINE[b]

14%

LIVING SHORELINE[c]

15

PROJECTS

COASTAL POPULATION (2010)[d]

839,995

PEOPLE*

POPULATION LIVING WITHIN SPECIAL FLOOD HAZARD AREAS[d]

10%

OCEAN ECONOMY GDP (2015)[e]

$2.2

BILLION

LARGEST ECONOMIC SECTOR (% of Total)[e]

31%

SHIP AND BOAT BUILDING

[a] Shoreline mileage includes offshore islands, sounds, bays, rivers, and creeks to the head of tidewater or to a point where tidal waters narrow to a width of 100 feet. NOAA Shoreline Website. https://coast.noaa.gov/data/docs/states/shorelines.pdf

[b] Length of hardened shoreline (356 km, 221 mi) calculated using NOAA Office of Response and Restoration's Environmental Sensitivity Index geodatabases and includes all man-made structures (seawalls, bulkheads, riprap structures [revetments, breakwaters, groins/jetties], and hybrid seawall/bulkheads with riprap) along the 2606 km (1619 mi) of total shoreline including tidal creeks, Mobile-Tensaw River Delta, and other water ways. Gittman et al. (2015).

[c] Arkema, KK, SB Scyphers, and C Shepard (2017) Living shorelines for people and nature, In: Bilkovic, DM, MM Mitchell, MK La Peyre, JD Toft, Eds. Living shorelines: The science and management of nature-based coastal protection. CRC Press.

[d] National Oceanic and Atmospheric Administration (2011) The Gulf of Mexico at a Glance: A Second Glance. Washington, DC: U.S. Department of Commerce.

* Coastal population includes those residing within Coastal Watershed Counties, as defined by the National Oceanic and Atmospheric Administration. Definitions and maps are included in: National Oceanic and Atmospheric Administration (2013) National Coastal Population Report: Population trends from 1970 to 2020. https://coast.noaa.gov/digitalcoast/training/population-report.html

[e] Economics: National Ocean Watch (ENOW) Explorer. https://coast.noaa.gov/digitalcoast/tools/enow

Living Shorelines: Guiding Principles and Definitions

"Living shoreline" is a broad term used to describe a range of nature-based approaches to stabilize a shoreline. In suitable environments, living shorelines can be used instead of seawalls or bulkheads to reduce erosion and protect property. Living shoreline projects are made up of mostly natural materials, such as native wetland vegetation, natural fiber logs, or oyster reef breakwaters, thus maintaining natural shoreline features.

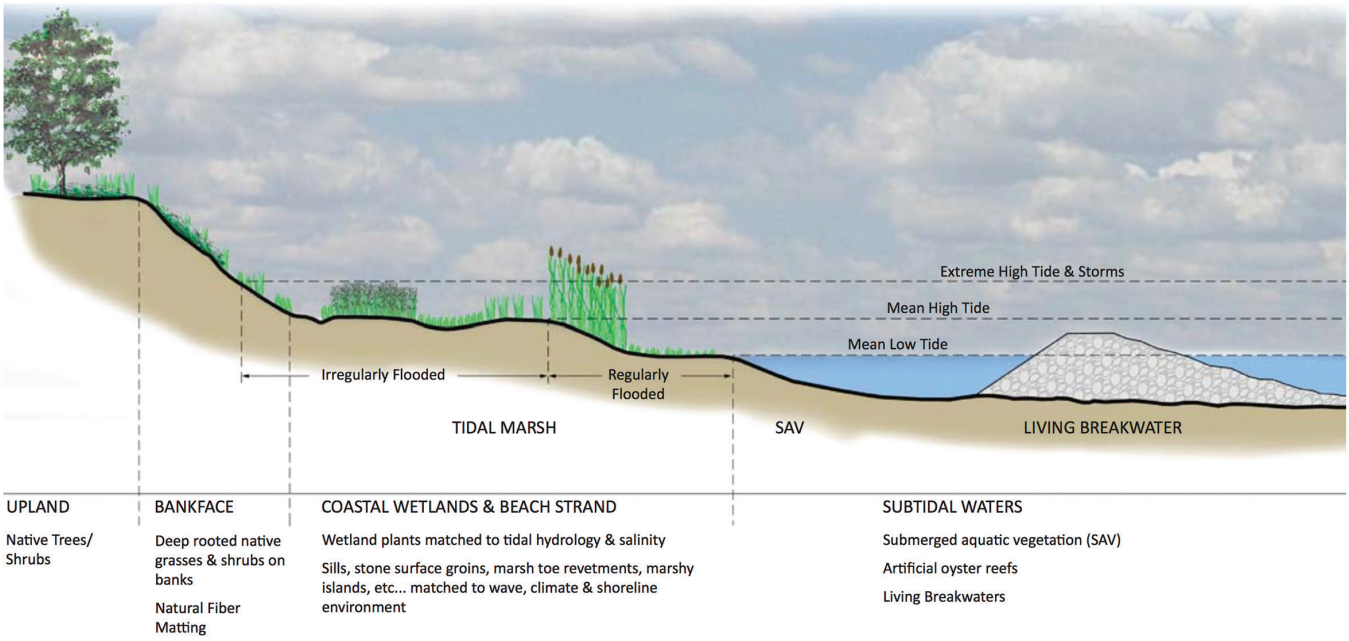


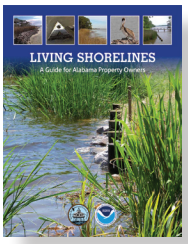
Figure: Coastal shoreline continuum and typical living shoreline treatments.
Credit: Allen Engineering and Science, Adapted from NOAA Habitat Conservation
[in: Mississippi Department of Marine Resources, Allen Engineering and Science. (2013) Alternative Shoreline Management Guidebook. (p. 4)]

Credit: Darryl Boudreau, The Nature Conservancy

Credit: Kaila Drayton, National Wildlife Federation

The following resources provide general information on living shorelines in Alabama and elsewhere. Descriptions of common living shoreline techniques are outlined below, as well as training modules and links to additional resources and databases.

Title: **Living Shorelines: A Guide for Alabama Property Owners**



Resource Type: Guidance Handbook

By: Herder (2014)

Audience(s): **All**

Description: This guide is comprised of seven sections focusing on living shoreline implementation, permitting, and costs in coastal Alabama.

See also: More information in Design and Construction, Permitting, and Cost sections

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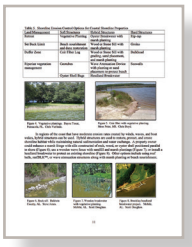
Title: **Coastal Alabama Living Shorelines Policies, Rules, and Model Ordinance Manual**



Resource Type: Technical Report

By: Boyd and Pace (2013)

Audience(s): **All**

Description: Chapter 2 provides an overview of **Alabama's coastal ecosystems** and economy, trends in coastal erosion and shoreline armoring, and potential shoreline management options. Several **local projects**, implemented between 1998 and 2012, are briefly reviewed.

See also: More information in Permitting section

Title: **Natural and Structural Measures for Shoreline Stabilization**

Resource Type: Guidance Handbook

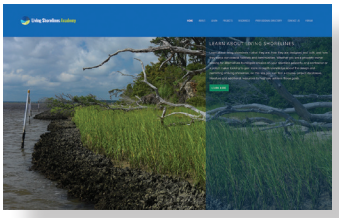
By: Systems Approach to Geomorphic Engineering (2015)

Audience(s): **All**

Description: The majority of the brief document is comprised of a table illustrating a **continuum of shoreline management approaches, ranging from "green" or "soft" techniques (e.g., vegetation planting, edging) through "gray" or "hard" techniques (e.g., bulkhead, seawall)**. Each technique example is accompanied by a brief outline of shoreline suitability, material options, benefits, disadvantages, as well as cost range estimates for initial construction and operations and maintenance.

Credit: Kaila Drayton, National Wildlife Federation

Title: **Living Shorelines Academy**



Resource Type: Website

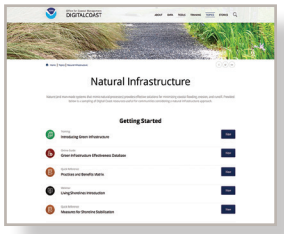
By: Restore America's Estuaries and North Carolina Coastal Federation

Audience(s): **All**

Description: The Academy has created tools to elevate the understanding, importance, and practice of using living shorelines to enhance on-the-ground storm resiliency and create new wetlands. In particular, this website provides:

- **Living shorelines training modules aimed at both homeowners and contractors**
- A database of papers and reports on the subject of living shorelines
- A database of existing living shorelines project databases
- A map of highlighted living shorelines projects across the US
- A library of living shoreline resources, including trainings, websites, print materials, videos, and more
- **A directory of living shorelines professionals**

Title: **Natural Infrastructure**



Resource Type: Website

By: National Oceanic and Atmospheric Administration

Audience(s): **All**

Description: This website hosts links to various resources, including online databases, publications, videos, quick reference guides, and other tools.

Title: **Green Infrastructure Effectiveness Database**

Resource Type: Website

By: National Oceanic and Atmospheric Administration

Audience(s): **All**

Description: This database contains records from a wide range of literature sources, such as peer-reviewed journals, online tools, and gray literature. The **database includes information on 32 different coastal green infrastructure types and techniques**, including living shorelines. Users have the ability to filter by coastal hazard type, green infrastructure approach, literature type, or geography.

Design and Construction

Resources found in this section provide information related to the design and construction of living shoreline projects in Alabama. Local considerations regarding the design, planning, and installation are reviewed, as well as guidance on the maintenance of living shoreline projects. The roles of various groups involved in living shoreline projects are also examined.

Local Considerations

Title: **Living Shorelines: A Guide for Alabama Property Owners**

Resource Type: Guidance Handbook

By: Herder (2014)

Audience(s): **All**

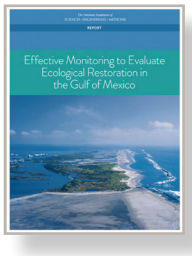
Description: Section 1 briefly reviews problems with shoreline armoring, alternatives to armoring, and **what factors to consider in selecting a shoreline management strategy. Descriptions of various living shoreline strategies** (e.g., plantings; coir logs, timber breakwaters, and marsh sills; grading and sand fill; rock headland breakwaters; and segmented offshore breakwaters) are provided in Section 2. **Native planting recommendations** can be found in Section 6.

See also: More information in Permitting and Cost sections

Maintenance and Troubleshooting

Monitoring of a living shoreline project is important in order to understand whether the project has resulted in the desired effect(s). This will also help inform potential maintenance needs, and identify any adaptive management that might be necessary. Depending on the type of project, monitoring a living shoreline can be very similar to monitoring a coastal habitat restoration project. The following resources provide general information on important metrics, monitoring methods, and critical timelines related to monitoring common coastal habitats (e.g., salt marsh, oyster reef, beach).

Title: **Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico**



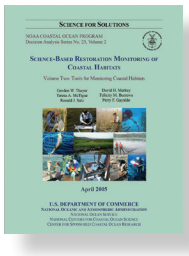
Resource Type: Guidance Handbook

By: National Academy of Sciences (2017)

Audience(s): **Property owners; Resource managers and local land use planners; Environmental consultants, engineers, and landscape architects**

Description: Part I of this handbook reviews Gulf restoration programs and outlines general principles of effective monitoring and evaluation. Part II summarizes good practices for monitoring restoration of selected habitats and species of concern, including those commonly involved in living shoreline projects: oyster reef, tidal wetland, and seagrass habitats.

Title: **Science Based Restoration Monitoring of Coastal Habitats, Volume Two: Tools for Monitoring Coastal Habitats**



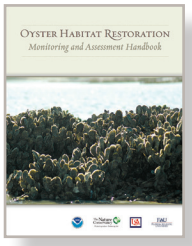
Resource Type: Guidance Handbook

By: Thayer et al. (2005)

Audience(s): **Property owners; Resource managers and local land use planners; Environmental consultants, engineers, and landscape architects**

Description: This handbook explains what can be measured during restoration monitoring, why it is important, and what information it provides about the progress of a restoration effort. The handbook contains 12 chapters specific to various coastal habitats, including those commonly involved in living shoreline projects in Alabama, such as oyster reefs (chapter 4), soft shoreline habitats (chapter 8), submerged aquatic vegetation (chapter 9), and coastal marshes (chapter 10). Additionally, human dimensions of restoration are reviewed (chapter 14), and cost estimates for monitoring are provided (chapter 16).

Title: **Oyster Habitat Restoration: Monitoring and Assessment Handbook**



Resource Type: Guidance Handbook

By: Baggett et al. (2014)

Audience(s): Property owners; Resource managers and local land use planners; Environmental consultants, engineers, and landscape architects

Description: This handbook outlines a set of Universal Metrics and Universal Environmental Variables to be monitored for all oyster restoration projects. Additionally, guidelines were developed for Restoration Goal-Based Metrics. The Universal Metrics allow for the assessment of the basic project performance of restoration projects (e.g., reef area, height and persistence, abundance, recruitment and size frequency of oysters), whereas the Restoration Goal-based Metrics allow practitioners to assess the performance of the restored reefs in meeting the ecosystem service-based restoration goal(s) associated with their project.

Title: **Long-term Monitoring of Estuarine Vegetation Communities: NERRS SWMP Vegetation Monitoring Protocol**

Resource Type: Technical Report

By: National Estuarine Research Reserve System (2013)

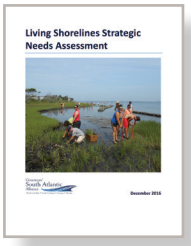
Audience(s): Property owners; Resource managers and local land use planners; Environmental consultants, engineers, and landscape architects

Description: This report provides guidance for implementing vegetation monitoring according to the National Estuarine Research Reserve System System-Wide Monitoring Program. Monitoring protocols for emergent and submersed vegetation communities are provided, including sampling design and methods. Appendix 4 provides guidance on monitoring ecotone boundaries, which may be especially useful for living shoreline projects.

Credit: Brittany Blomberg

Guidance for Target Audiences

Title: **Living Shorelines Strategic Needs Assessment**



Resource Type: Technical Report

By: Governors' South Atlantic Alliance (2016)

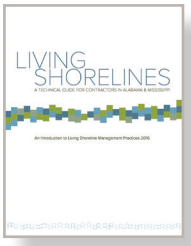
Audience(s): **All**

Description: This assessment is intended to assist those partners that address education and outreach needs and implement policies that promote wider use of living shorelines, including:

- State and federal agencies involved in shoreline management, whether that agency's focus is on regulation, research, or conservation
- Local land use planners and resource managers
- Academic institutions
- Non-government organizations
- Funders of conservation projects and research
- Legislators, and other public officials involved with shoreline policy
- Public landowners of shoreline (including the Department of Defense)
- Land trusts with shoreline interests

For each audience, information related to that group's role and needs are outlined.

Title: **Living Shorelines: A Technical Guide for Contractors in Alabama and Mississippi**



Resource Type: Guidance Handbook

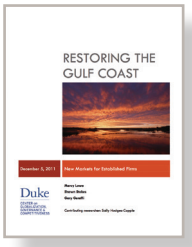
By: Bryars et al. (2016)

Audience(s): **Installation contractors and suppliers; Environmental consultants, engineers, and landscape architects**

Description: This document was **designed to be used by contractors during the design and construction of living shorelines** in Alabama and Mississippi. The authors include an important reminder that contractors should understand that project sites will differ, and principles outlined in this document need to be adapted to the conditions of each specific project site.

See also: More information in Cost section

Title: **Restoring the Gulf Coast: New Markets for Established Firms**



Resource Type: Technical Report

By: Lowe et al. (2011)

Audience(s): **Environmental consultants, engineers, and landscape architects; Installation contractors and suppliers**

Description: Habitat restoration in the Gulf, including the construction of living shorelines, can be an important part of the economy. Many currently established firms (e.g., materials suppliers, engineering and construction contractors) working in other sectors can often apply the same skills and equipment to coastal restoration. Thus, restoration provides an opportunity for firms to diversify and find new markets. This report describes in detail what coastal restoration comprises and what kinds of jobs it can save and create. The analysis provides the following:

- Overview of specific equipment and services that perform coastal restoration
- Value chain analysis of the firms involved
- Firm-level analysis of lead firms in the 13 most significant categories of the value chain
- Case study of two Gulf Coast firms that traditionally served the oil and gas industry but have found an additional market in coastal restoration
- Discussion of the types of jobs and geography of jobs in the coastal restoration value chain

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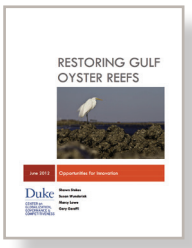
Title: **Restoring Gulf Oyster Reefs: Opportunities for Innovation**



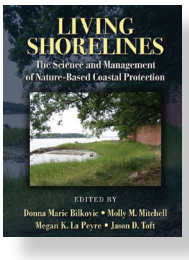
Resource Type: Technical Report

By: Stokes et al. (2012)

Audience(s): **Environmental consultants, engineers, and landscape architects; Installation contractors and suppliers**

Description: As a follow-up report to "Restoring the Gulf Coast: New Markets for Established Firms" (Lowe et al., 2011), this study examines how several approaches to restore oyster reefs fit into conventional coastal restoration strategies. Artificial oyster reefs are often incorporated into living shoreline projects. Three types of oyster reef projects were examined: 1) high-relief planted cultch, 2) contained cultch, and 3) precast concrete reefs.

Title: **Living Shorelines: The Science and Management of Nature-based Coastal Protection**



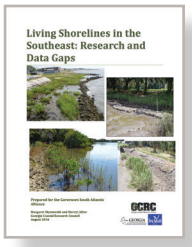
Resource Type: Book

By: Bilkovic et al., Eds. (2017)

Audience(s): **All**

Description: This book provides a recent and thorough compilation of living shorelines knowledge and research. The book is comprised of five sections: (1) Background: History and Evolution; (2) Management, Policy, and Design; (3) Synthesis of Living Shoreline Science: Physical Aspects; (4) Synthesis of Living Shoreline Science: Biological Aspects; and (5) Summary and Future Guidance. The regions, ecosystems, scales, and perspectives represented across the 24 chapters capture much of the variability in approaches to and results from living shorelines around the world.

Title: **Living Shorelines in the Southeast: Research and Data Gaps**



Resource Type: Technical Report

By: Myszewski and Alber (2016)

Audience(s): **All**

Description: While focus of this report is on the Southeastern U.S., the information is very relevant to all Gulf States. Part One of the report provides a brief overview of the types of approaches that have been used in the region. Parts Two, Three, and Four describe research on the physical, biological, and chemical characteristics, respectively, of living shorelines in salt marshes, while Part Five summarizes what little information is available regarding living shoreline projects in mangroves. Part Six is a summary and discussion of data gaps. It also includes appendices cataloging living shoreline projects in the southeast and documenting relevant case studies.

Permitting

All living shoreline projects require permits prior to implementation. Regulations and permit requirements exist at federal and state levels, with local municipalities sometimes imposing additional rules. Visit the following agency websites to learn more about permitting requirements in Alabama.

Federal, State, and Local Permitting

The primary federal entity involved in shoreline management is the **U.S. Army Corps of Engineers**. Information about federal regulations and permits can be found on their website: https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/.

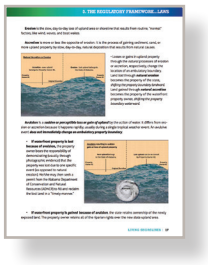
In south Alabama, permits are reviewed and issued by the **U.S. Army Corps of Engineers Mobile District**. More information about the Mobile District of the U.S. Army Corps of Engineers, including regional rules and regulations, can be found on their website: https://www.sam.usace.army.mil/.

In Alabama, two state entities are involved in permitting different portions of living shoreline projects. Information about state and local regulations can be found, along with permit applications, on their websites

- **Alabama Department of Environmental Management**
  http://www.adem.state.al.us/default.cnt
- **Alabama Department of Conservation and Natural Resources, State Lands Division**
  https://www.outdooralabama.com/about-us/state-lands-division

Utilize the resources below to navigate the necessary steps to successfully permitting a living shoreline project.

Title: **Living Shorelines: A Guide for Alabama Property Owners**



Resource Type: Guidance Handbook

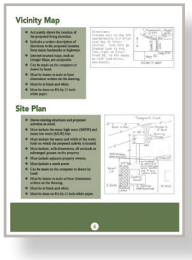
By: Herder (2014)

Audience(s): **All**

Description: Section 3 provides an overview of the regulatory framework. **Definitions of state-owned submerged lands, riparian rights, and ambulatory property lines** are provided, as well as **descriptions of erosion, accretion, and avulsion and how these processes affect property lines**. Section 5 explains the **permitting process**, and provides contact information for the agencies and divisions responsible for permitting living shoreline projects in coastal Alabama.

See also: More information in Design and Construction and Cost sections

Title: **Living Shorelines: A Permitting Guide for Alabama Homeowners**



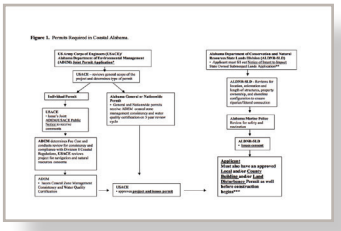
Resource Type: Guidance Handbook

By: Martin et al. (2017a)

Audience(s): Property owners

Description: This detailed guide **provides an application checklist, and an example application**. Requirements for attachments are outlined, and example drawings are provided. Helpful tips to submitting a successful permit application are also provided with contact information for Alabama permitting agencies.

Title: **Homeowners Guide to Permitting Living Shorelines in Mississippi and Alabama**



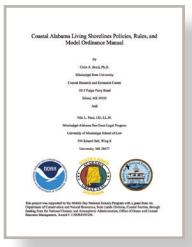
Resource Type: Guidance Handbook

By: Boyd and Pace (2010)

Audience(s): Property owners

Description: In this brief document, **necessary steps for obtaining a permit are outlined, including contact information for local permitting agencies**. Figure 1 outlines the permitting agencies involved, possible permit types, and the steps involved in the application, review, and issuance of permits.

Title: **Coastal Alabama Living Shorelines Policies, Rules, and Model Ordinance Manual**



Resource Type: Technical Report

By: Boyd and Pace (2013)

Audience(s): **All**

Description: This study reviews the rules and regulations governing living shoreline implementation in Alabama. Chapter 3 outlines **laws and regulations for shoreline erosion control in Alabama, as well as important definitions**. Permitting challenges are reviewed in Chapter 4. In Chapter 5, the authors review ordinances and incentive programs from other states that encourage more sustainable erosion control practices. U.S. Army Corps of Engineers' General Permits applicable in Alabama related to shoreline management are provided in Appendices 1-3.

See also: More information in Design and Construction section

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Title: **Protecting your Property and the Environment: A Homeowner's Guide to Living Shorelines in Alabama**

Resource Type: Brochure

By: Martin et al. (2017b)

Audience(s): Property owners

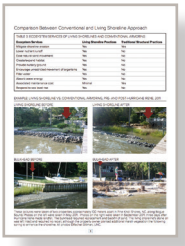
Description: This 2-page brochure provides a quick review of important information regarding living shoreline implementation in Alabama. Helpful tips, contacts, and a checklist are providing related to permitting requirements.

Cost $

Cost is an important factor to consider before planning a living shoreline project. Costs can vary based on project size, location, and technique(s). Resources outlined in this section provide information related to the cost (and potential benefits) of living shoreline projects in Alabama.

Costs and Benefits of Living Shorelines Compared to Traditional Armoring

Title: **Living Shorelines: A Technical Guide for Contractors in Alabama and Mississippi**



Resource Type: Guidance Handbook

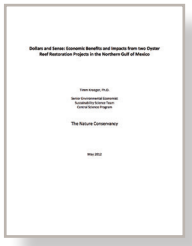
By: Bryars et al. (2016)

Audience(s): **Installation contractors and suppliers; Environmental consultants, engineers, and landscape architects**

Description: A **comparison between conventional armoring and living shoreline** approaches is provided on page 8. Table 3 lists the various ecosystem services, or benefits, provided by living shoreline and traditional structural techniques. On the same page, before and after photos of two properties impacted by Hurricane Irene are shown, one protected with a living shoreline and the other protected with a bulkhead.

See also: More information in Design and Construction section

Title: **Dollars and Sense: Economic Benefits and Impacts from Two Oyster Reef Restoration Projects in the Northern Gulf of Mexico**



Resource Type: Technical Report

By: Kroeger (2012)

Audience(s): **Resource managers and local land use planners**

Description: This technical report reviewed the provision of often cited benefits of living shorelines in two separate oyster reef restoration projects. The three benefits studied were: **enhanced fisheries, wave attenuation, and nitrogen removal**. In this study, the authors explored **economic tradeoffs between the benefits provided and the cost of construction and monitoring**. This information is then used to make estimates on the impact if restoration was conducted across Mobile Bay.

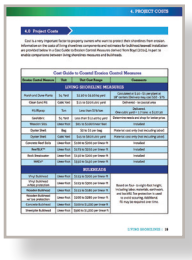
Implementation Costs (design, permitting, material, construction, & maintenance)

Title: **Living Shorelines: A Guide for Alabama Property Owners**

Resource Type: Guidance Handbook

By: Herder (2014)

Audience(s): **All**



Description: Section 4 consists of a table providing **unit cost ranges for various erosion control measures**. Section 7 provides a case study for determining a living shoreline project cost. **Using a hypothetical living shoreline project, readers can follow along as they determine the material cost of riprap breakwaters, sand fill, and plants**.

See also: More information in Design and Construction and Permitting sections

For estimates of design cost, contact a local environmental consultant, engineer, or landscape architect. Local coastal contractors can help you determine the construction cost of a project and state agencies can help you determine permitting costs.

Incentives and Grant Opportunities

At the time this guide was assembled, no financial incentives or grant opportunities were identified specific to Alabama.

The following websites discuss options for funding and financing a variety of green infrastructure projects. Some of this information may be helpful for living shoreline projects.

- **Green Infrastructure Funding Opportunities**
  https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities
  Maintained by: U.S. Environmental Protection Agency
- **Green Infrastructure Toolkit**
  https://www.georgetownclimate.org/adaptation/toolkits/green-infrastructure-toolkit/how-to-pay-for-green-infrastructure-funding-and-financing.html
  Maintained by: Georgetown Climate Center

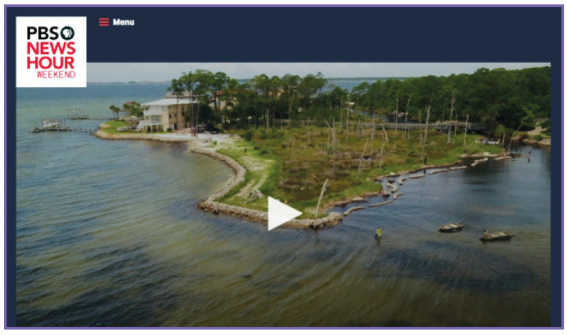
There is an incentive program operating in the Pacific Northwest called **Green Shores for Homes™**. This program rewards residents for implementing living shoreline projects, among other actions aimed at conserving natural shorelines. It is a voluntary, incentive-based program similar to green building rating programs such as Built Green™ and LEED™. A residential shoreline project receives points for design features from four categories of credits. More information about this program can be found on their website: http://greenshoresforhomes.org/.

Case Studies

Learn more about the following projects in this Climate Central article and PBS video:

As Seas Rise, Americans Use Nature to Fight Worsening Erosion
John Upton, Climate Central (2018)
https://www.climatecentral.org/news/americans-use-nature-to-fight-erosion-sea-level-rise-21884

'Living shorelines' use oyster shells and marsh grass to reverse coastal erosion
PBS (2018)
https://www.pbs.org/newshour/science/as-seas-rise-americans-use-nature-to-fight-worsening-erosion



McPeak Property, Destin, FL

"We were watching our biggest investment fall into the ocean." – Homeowner Jennifer McPeak

After learning about living shorelines, McPeak opted for a softer solution to her erosion problems. A local nonprofit environmental organization, the Choctawhatchee Basin Alliance, helped construct a living shoreline on the McPeak property using oyster shells and marsh grass.

Before (top) and after (bottom) photos of the McPeak shoreline show the transformation that has occurred over the past two and a half years (tree stump highlighted for reference).

With the money she saved on a seawall, she built a boathouse on her dock. And now she enjoys keeping track of the wildlife that visits her yard where the seawall would have been.

Other property owners are optimistic about seeing the benefits from their living shoreline projects.

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"Fishing is going to get good out here…"
– Homeowner Butch Richard

Credit: Choctawhatchee Basin Alliance

Project GreenShores, Pensacola, FL

The first phase, completed in 2003, involved the restoration of eight acres of salt marsh and seagrass and seven acres of oyster reef. One year later, it protected a section of roadway from the effects of Hurricane Ivan. Since then, the project has expanded to include over 30 acres of living shoreline in downtown Pensacola.

More than five times as many species of birds have been observed at the site since the project was built.

Visit the site:
500 Bayfront Pkwy, Pensacola, FL 32502

Credit: Darryl Boudreau, The Nature Conservancy

The following databases contain case studies of living shoreline projects.

Restoration Center Funded Living Shorelines Projects
https://www.habitatblueprint.noaa.gov/storymap/ls/index.html
Maintained by: U.S. National Oceanic and Atmospheric Administration

Green Infrastructure Effectiveness Database
https://coast.noaa.gov/gisearch/#/search
Maintained by: U.S. National Oceanic and Atmospheric Administration

SAGE Project Database
http://sagecoast.org/info/sagesearch.html
Maintained by: Systems Approach to Geomorphic Engineering

TNC's Natural Infrastructure + Restoration Projects Database
http://www.projects.tnc.org/coastal/
Maintained by: The Nature Conservancy

Credit: Brittany Blomberg

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Credit: Darryl Boudreau, The Nature Conservancy

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Contributing Organizations

Apalachicola National Estuarine Research Reserve
Baldwin County Soil and Water Conservation District
Choctawhatchee Basin Alliance
Climate and Resilience Community of Practice
Dauphin Island Sea Lab
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Gulf of Mexico Alliance
Louisiana Sea Grant
Mississippi-Alabama Sea Grant Consortium
Mission Aransas National Estuarine Research Reserve
Mississippi Department of Marine Resources
Mississippi State University Extension
National Academies of Sciences, Engineering, and Medicine Gulf Research Program
National Oceanic and Atmospheric Administration
National Wildlife Federation
Northern Gulf of Mexico Sentinel Site Cooperative
Nueces County
Tampa Bay Estuary Program
Texas A&M University Corpus Christi Harte Research Institute
The Nature Conservancy
The University of Texas at Austin Marine Science Institute
The University of Southern Mississippi
U.S. Fish and Wildlife Service
Weeks Bay National Estuarine Research Reserve

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