Associated Challenges with the Development of Living Shorelines Suitability Models for Select Waterbodies within the Gulf of Mexico

by

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**Project Title:** Living shoreline site suitability model transfer for selected water bodies within the Gulf of Mexico: A GIS & remote sensing-based approach

**Funding Agency:** NOAA RESTORE Act Science Program

**Project Team:**
- **Lead PI** - Chris Boyd, Troy University
- **Co – PIs** - Marcia Berman, Virginia Institute of Marine Science
- Steve Jones, Geological Survey of Alabama
- Xutong Niu, Troy University
- Lee Anne Wilde, Galveston Bay Foundation

**Project Partners:**
- Tampa Bay Watch
- Florida Fish and Wildlife Conservation Commission
- Louisiana Sea Grant Law and Policy Program
- Gulf of Mexico Alliance
The Gulf of Mexico:

The lands adjacent to the Gulf of Mexico are made up of marshlands, bays, barrier islands, peninsulas, and are intersected by numerous rivers and streams that enter the gulf. Soils range from mineral sands to heavy organic mucks common to areas adjacent to the Mississippi river delta.

The area contains a vast diversity of plant life adapted to freshwater, brackish, and saline marshes and mangrove swamps, as well as terrestrial species that grow on upland sites associated with coastal dunes and barrier islands (NRCS plant materials center). Also would include SAV, Oyster Reefs, Mussels, Clams, etc.
Target Audience:

**Primary**

- Permitting agencies, planners, and contractors to assist with better site selection for erosion control and restoration projects.

**Secondary**

- Homeowners and Homeowner Associations

- They can use the LSSM to better determine the living shorelines options that are available and determine if their property is suitable for installing living shoreline type projects.

- Additionally; natural techniques are encouraged over hard structures
Explanation of the Model

- The original Living Shorelines Suitability Model (LSSM) was created by the Virginia Institute of Marine Science.

- It was developed for tidal shoreline erosion control by the Virginia Institute of Marine Science.

- It’s end product delineates the most appropriate shoreline and upland “Best Management Practices” to control erosion where nature-based solutions are possible.
Upland Best Management Practices

1. Highly Modified Area (formerly called “Area of Special Concern”)

2. Land Use Management

3. Maintain/Enhance/Restore Riparian Buffer

4. No Action Needed
Shoreline Best Management Practices can include

1. No Action Needed
2. Enhance/Maintain/Create Marsh
3. Plant Marsh with Sill
4. Maintain Beach OR Offshore Breakwaters w/ Beach Nourishment
5. Revetment
6. Groin Field with Beach Nourishment
7. Highly Modified Area or Environmental Sensitivity (formerly called “Area of Special Concern”)
Data Needed for LSSM

The datasets include:
- Riparian land use
- Bathymetry
- Marsh
- Bank height
- Canal
- Sand spit
- Forest
- Shoreline armoring structure
- Offshore armoring structures
- Fetch
- Roads
- Permeant structures
- Beach
- Tidal creek.

*Submerged Aquatic Vegetation (VIMS newest model)
Many of these data sets can be acquired through using the Environmental Sensitivity Index (ESI) data created by the NOAA Office of Response and Restoration.
Permitting Challenges and/or Policy Issues

- Each Geographic Waterbody Region has different challenges

- Shoreline and Upland Best Management Practices should be appropriate and permittable for the LSSM BMP being suggested by the model

- Classification of structures (on-shore and off-shore) and their definitions matter. Ex. Sea wall vs Bulkhead; Revetment vs. Rip-rap; Sill vs. Revetment
Model Development for the GOM Living Shorelines Suitability Model

- The project team is using the VIMS SSM v.4 (v.5?)
- Data mining is being done to acquire existing and available data sets
- Missing Data Layers are being created for each water body region

GIS Leads

- **Lake Pontchartrain**: Dr. Xutong Niu, Troy University, Chair, Department of Geospatial Info, xniu@troy.edu
- **Coastal Alabama; (Perdido Bay/Wolf Bay/Ono Island, Complex)**: Stephen C. Jones, P.G., Director of Groundwater and Director of the Coastal Division for the Geological Survey of Alabama, sjones@gsa.alabama.gov
- **Galveston Bay**, Lee Anne Wilde, Living Shorelines Program Manager (lead) and Haille Leija, Habitat Restoration Program Manager, Galveston Bay Foundation
- **Project Team Lead GIS Support Professional**: Tamia Rudnicky, GIS Programmer, Virginia Institute of Marine Sciences
There are a number of definitions for a living shoreline throughout the United States.
- A living shoreline definition will be agreed upon for each water body region, if it has not been defined by the State (AL, LA, FL, TX)

1. Living shorelines are a green infrastructure technique using native vegetation alone or in combination with offshore sills to stabilize the shoreline. Living shorelines provide a natural alternative to ‘hard’ shoreline stabilization methods like stone sills or bulkheads, and provide numerous benefits including nutrient pollution remediation, essential fish habitat provision, and buffering of shoreline from waves and storms (NOAA).

2. Living Shoreline Treatments address erosion in lower energy situations by providing long-term protection, restoration or enhancement of vegetated shoreline habitats through strategic placement of plants, stone, sand fill and other structural or organic materials. Living Shoreline Treatments do not include structures that sever the natural processes & connections between uplands and aquatic areas. (Virginia Institute of Marine Science).

3. Any Shoreline Management System that is designed to protect or restore natural shoreline ecosystems through the use of natural elements and if appropriate, manmade elements. Any elements used must not interrupt the natural water/land continuum to the detriment of natural shoreline ecosystems (Restore Americas Estuaries).
Challenges with Implementing LSSM in the Gulf of Mexico

- Some geographic areas have greater amounts of hard armoring. Leading to model not being able to make accurate recommendation. Instead it recommends highly modified area; formerly area of concern.

- Mangroves, SAV, Cyprus Swamps

- Some shoreline best management practice names need to be modified

- Some water body regions have installed more Living Shorelines than others

- Some waterbodies contain more available data than others
Outreach

1. Living Shorelines Advisory Boards have been created for each waterbody region to discuss model, obtain shoreline management input, address concerns, and to assist with disseminating models among potential user groups. In addition, an advisory board was created in Tampa to discuss the Living Shorelines Decision Support Tool associated with this project.

2. NOAA’s Digital Coast will showcase the availability of the model on their Tools Portal and the model developers will submit source data and data products to NOAA’s National Centers for Environmental Information (NCEI) to archive the oceanographic data for long term preservation. https://coast.noaa.gov/digitalcoast/tools/.

3. Write a Living Shorelines Suitability Model Operators Manual to provide a protocol for future GIS Analysts to allow for replication and/or customization of models.

4. The Project Team will host “Living Shorelines” workshops in each waterbody region to provide access to the models and to promote their use among the stakeholders.

5. The Model will also be made available on the Nation Centers for Coastal Ocean Science MapServer @ https://www.ncddc.noaa.gov/arcgis/rest/services
Links to LSSM Viewers:

http://www.vims.edu/ccrm/research/inventory/virginia/index.php (click on county, then click on comprehensive map viewer)

www.gsa.state.al.us/apps/CASIS/ (Click dropdown arrow CASIS, Click Mobile Bay BMP, Click Dropdown arrow, Select upland or shoreline BMP, add dynamic legend, and you can change basemap)

http://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=e4d76fa267dc4bac97d407d20566ae42
Water Access is Essential for All of Us

Let’s Protect our Remaining Natural Resources!

For more information please contact:

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