Installation of A Reinforced Living Shoreline for Stabilization in the North Inlet Estuary: An Alternative to Vertical Wall Structures

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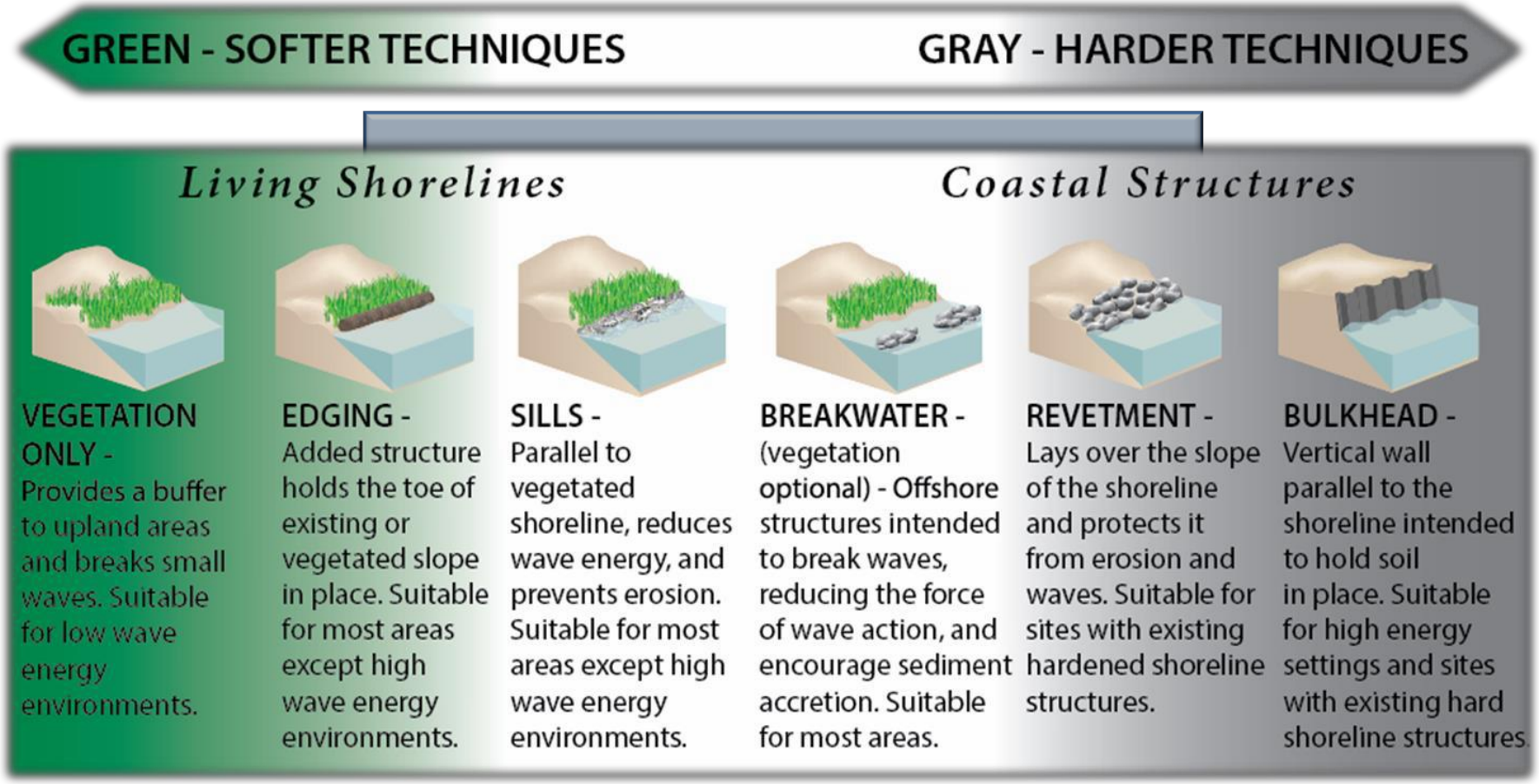
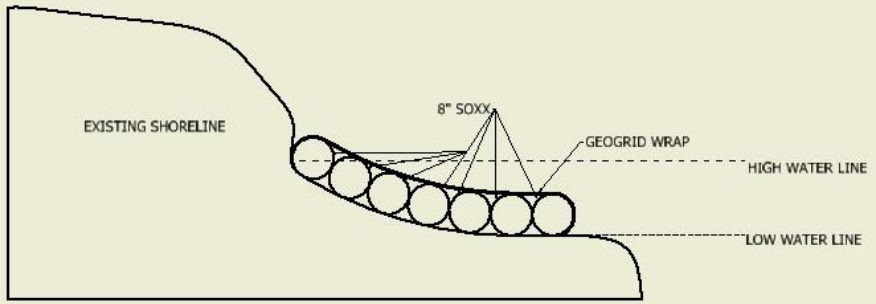


Figure 1: A continuum of green (soft) to gray (hard) shoreline stabilization techniques. Source: This continuum is based on the more detailed continuum in the Systems Approach to Geomorphic Engineering (SAGE) Natural and Structural Measures for Shoreline Stabilization brochure (SAGE 2015).

Living Shorelines are becoming more common. With the passing of recent federal regulation (American Water Infrastructure Act Oct. 10, 2018), more designs will be required along coastal areas in the US as options to traditional alternatives

Problem:

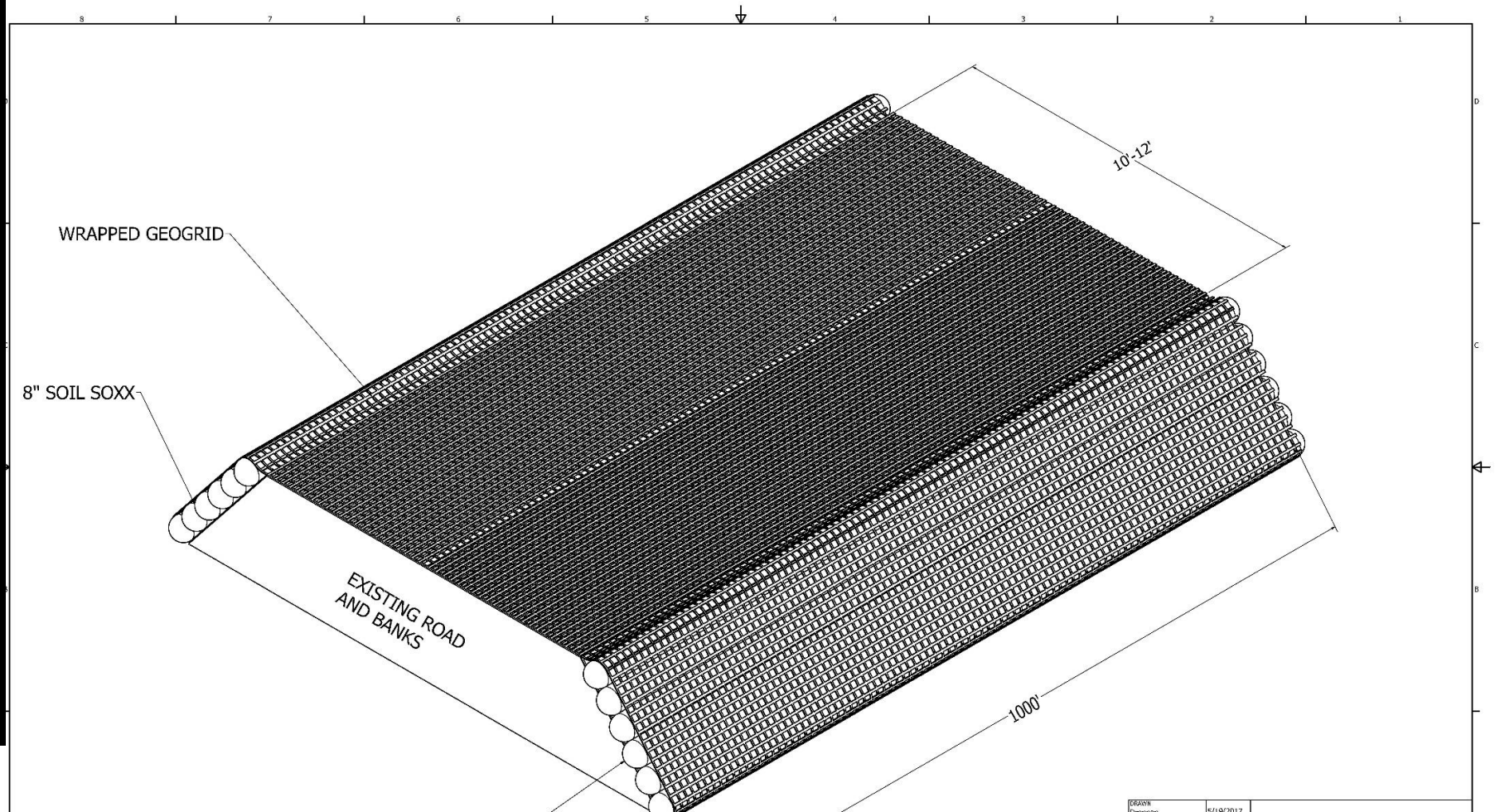
- Roadway is eroding
- Jeopardizes access to longstanding ongoing research
- Safety issues with trailers
- Limited access with heavy vehicles (< 5 ton for bridge)
- Distance is about 15 min from entrance via narrow forest roads
- Limited budgets
- Limited labor and staff for doing work



Plant roots form a mat between mesh containment and geotextile wrap, providing a 'Velcro mattress' effect to reduce impact

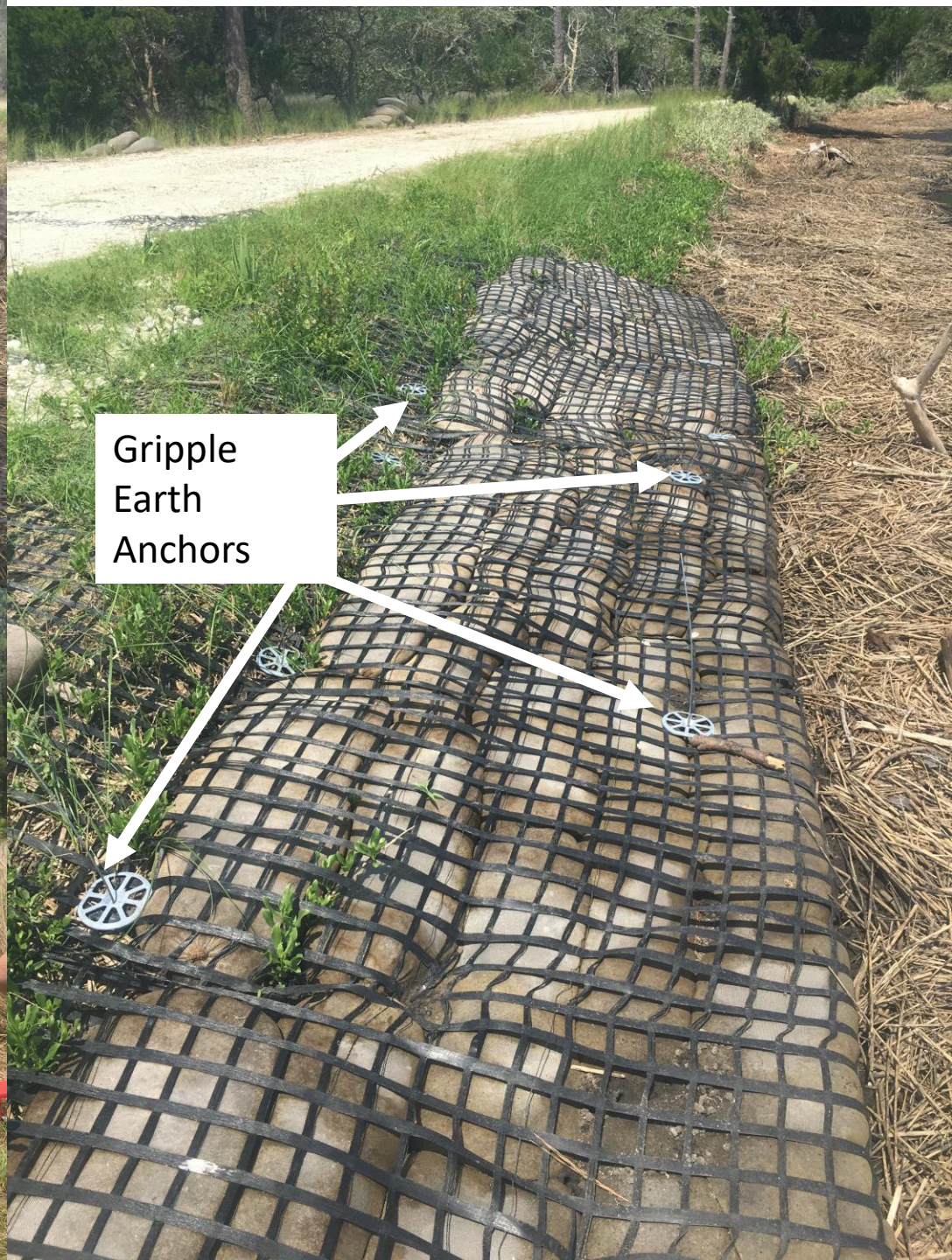
Principles of Design:

- ***Containment*** using local materials
  - Sand
  - Dredge
  - Compost/sand-dredge mix
- ***Vegetation*** Establishment
- ***Retention*** of local materials (sand, gravel, compost)
- ***Reinforcement*** using geogrid wraps



Keys to success:

- Local materials
- Volunteer Labor
- Local filling/mix equipment
- Donations from vendors
- Cooperative University and foundation staff
- Progressive property managers



Each section of geotextile is filled with mesh tubes (filled with compost/sand mix) then wrapped tight to conform to the shoreline to increase ground contact and reduce further erosion.

Geotextile is wrapped back up to shoulder and zip tied then covered with gravel to complete the section, ensuring less concerns with ‘pull outs’. Vegetation grows through the openings in the geotextile, further enhancing the structural ‘mattress effect’.

Plugs are planted between the mesh tubes, and grow out through the openings in geotextile. Volunteer vegetation also emerges easily

Shoreline Stabilization Research and Monitoring

- Research plan established between Clemson University (Hitchcock) and the North Inlet-Winyah Bay National Estuarine Research Reserve (NI-WB NERR) (Dr. Erik Smith)

- Vegetative growth – difficult to measure, primarily inundated with Spartina “rack” due to NE winds

- Sedimentation – 3-D imaging was proposed but difficult to execute due to length of installation

- Drone imaging – alternative to 3-D imaging, high resolution quantification of shoreline change (accretion/erosion and plants)

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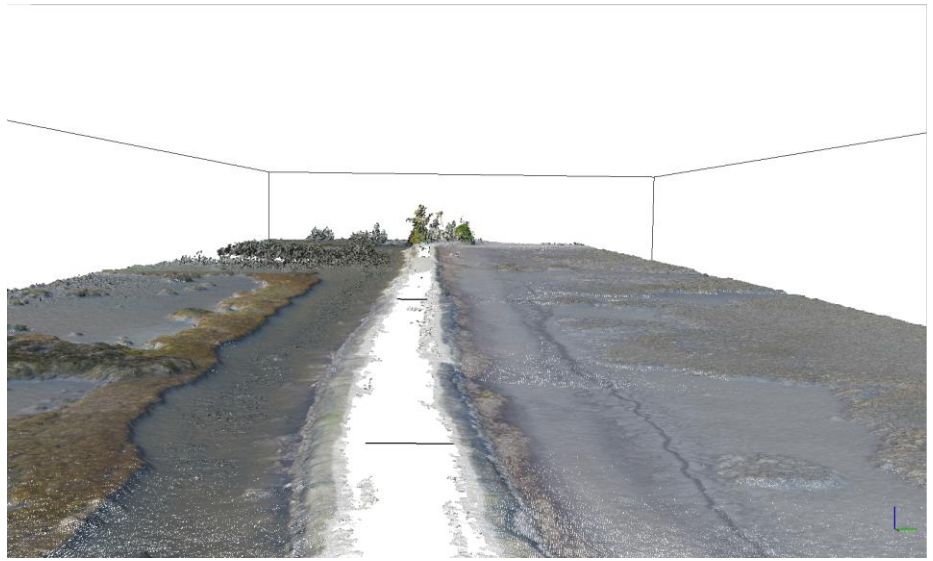
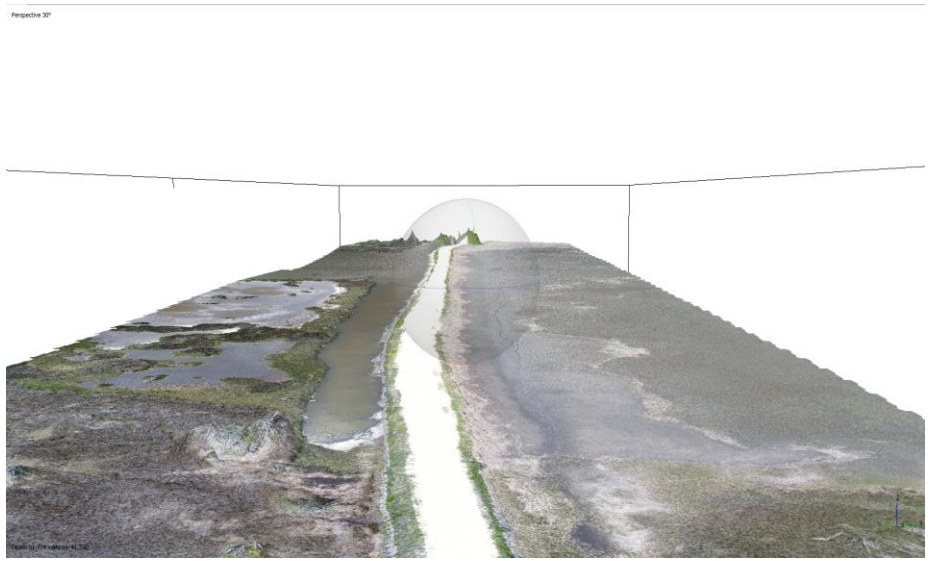
Shoreline Stabilization Research and Monitoring

Examples of Drone Imaging

August 2017 (after installation)



May 2018 (9 months after Hurricane Irma)



- Image analyses allow us to quantify sediment accretion/erosion and vegetative cover to evaluate the shoreline stabilization performance

- Images show that the project has remained in place with plants well established after Hurricane Irma – detailed results forthcoming

Images credit: Dr. Tom Williams, Clemson – Baruch Institute

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Lessons Learned:

1. Never enough volunteer labor but organization is key
2. Perform manual labor during cooler periods
3. Ensure grain size of sand selected is larger than openings in mesh
4. Select *native* plants
5. Perform work so plants are *established* when storms hit
6. Use designs that still work without establishment of plants

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Questions?

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