DRAFT

Governors' South Atlantic Alliance (GSAA)

Issue Area Project and Resource Needs "Snap Shot"

This Snap Shot is designed to collect brief information on the prospective projects and resource needs of the GSAA Issue Area Technical Teams to progress the GSAA Action Plan and Implementation Plan.

Issue Area: Disaster Resilient Communities

Project Title:

Predict future shoreline migration patterns and future shoreline vulnerability, in terms of property and habitat loss, given current and future development, shoreline stabilization, and sea level rise.

Action to be Addressed: *DRC5A*

Resources Needed:

Phase 1, Step 1:

- Staff or graduate student(s) time to research shoreline change, shoreline alterations, and current and future land use for each state. Total cost estimated $20,000.

Phase 2, Steps 1 and 2

- Staff time to run AMBUR forecast function on pilot regions, if it is not performed by the HVA team. If it is done by the HVA team, staff time to gather and summarize the results from all four states. $ 5,000-15,000
- Staff time to run AMBUR forecast function on ocean front areas if not performed by the HVA team. If it is done by the HVA team, staff time to gather and summarize results from all four states. $5,000-15,000

Phase 3, Step 1

- Staff or graduate student time to digitize estuarine areas outside of the pilot area. Costs will vary depending on the size of the area selected. To do full coverage for all four states, with 4-5 timesteps each, estimated cost $400,000.

Phase 4, Step 1, 2, and 3

- Staff or graduate student time needed to gather and/or create data layers, including low/high marsh, shoreline stabilization, higher quality elevation data in subtidal regions. Estimated cost: $200,000 (marsh/stabilization layers) – $120,000 (elevation data).
- Staff time needed to incorporate sea level rise into the AMBUR tool to better predict shoreline locations in the future. $50,000

- Staff time needed to incorporate habitat layers in AMBUR analysis to examine habitat loss. $50,000

Expected Timescale:

Phase 1: 1 year

Phase 2: 1 year (could run concurrently with Phase 1)

Phase 3: 2-3 years

Phase 4: 2-3 years

Description

Background:

In the southeast, more than 10 million people live and work in coastal counties (US Census Bureau, 2010). As coastal shorelines change, from storms, sea level rise, and natural erosion, many coastal areas may become eroded and inundated. Knowing where and when oceanfront and estuarine areas will be affected is crucial information for local, state, federal, private, public, and non-profit stakeholders. In addition, unlike built-out oceanfront areas, many estuarine areas are still undeveloped. Gathering information on estuarine areas that might be most vulnerable to shoreline changes and/or sea level rise will be crucial for predicting future problem areas. Moreover, identifying these problematic areas can promote proactive planning and prevent development in areas likely to be impacted.

This snapshot is a multi-objective, multi-step process to review what techniques and data are currently available for shoreline change, to use new tools to predict future shoreline locations, and to examine how sea level rise and shoreline change might affect coastal habitats and properties in the future. The AMBUR tool, (Jackson et al., 2012) developed by Dr. Chester Jackson of Georgia Southern University, will be used to help answer shoreline questions such as how far will it move, how fast will it move, and how variable will it be?

Objectives:

As mentioned above, this is a multi-objective, multi-phase project to process all the components of DRC5A.

Phase 1 Objective 1.) To review how each state calculates shoreline change.

Objective 2.) To review and gather existing data on oceanfront and estuarine shoreline alterations (ie. bulkheads, seawalls, docks).

Objective 3.) To review and gather information from local governments on their comprehensive plans to understand current and future land use plans, especially in estuarine areas.

Phase 2 Objective 1.) To predict shoreline locations in the pilot test areas 30 years into the future. Note: This objective is already being considered by the HVA project team.

Objective 2.) To predict shoreline locations along all oceanfront areas since all of the states already have multiple historic oceanfront shorelines digitized.

Phase 3 Objective 1.) To predict shoreline locations in additional areas outside of the pilot test areas along estuarine shores with current and additional time steps.

Phase 4: Objective 1.) To incorporate sea level rise (SLR) into AMBUR in order to more accurately predict shoreline locations in the future. For example, if sea level rise was incorporated into AMBUR, and we had stabilization structures with elevation, then when the AMBUR forecast transect crosses a parcel with a seawall/bulkhead, we would be able to say if that property would be at risk for inundation.

Objective 2.) To incorporate additional current and future GIS layers to examine shoreline alteration and habitat loss/change at the parcel level.

Approach/Methods:

Phase 1

Step 1: Review how each state currently calculates ocean-front shoreline change projections and estuarine shoreline change projections (if applicable). Review what data is available from each state on oceanfront and shoreline alterations (ie. bulkheads, seawalls, docks). Review and gather information about current and future land use, especially in estuarine areas.

Phase 2

Step 1: AMBUR is already being used in the pilot test areas to estimate shoreline change. One of the functions currently available in AMBUR is the "ambur.forecast" function, which allows the user to extrapolate estimated change rates into the future at different time frames (ie. 20, 30, 50 years). This step would use the digitized historic shorelines and the historic change rates to extend transects into the future 30 years.

Step 2: Use the estimated future shoreline to create a "shoreline envelope" or "envelope of change" polygon between the current shoreline and the future shoreline.

Step 3: Run AMBUR on ocean front historic shorelines to calculate rates of change and forecast future shoreline.

Phase 3

Step 1: Digitize shoreline areas outside of the pilot test areas. Three shorelines representing different time steps (years) is the minimum, but additional years would make the analysis more robust.

Phase 4

Step 1: Gather and/or create GIS datasets for each state, including parcel layer, National Wetlands Inventory (NWI), elevation data, and shoreline stabilization structures with associated elevations. GA and SC (and possibly NC and FL) are in need of an accurate low marsh/high marsh layer(s). LIDAR data in the subtidal regions needs to be cleaned up.

Step 2: Join the "envelopes of change" layer with the parcel layer, and intersect with the NWI layer to examine land cover change during designated time period(s). If there is land cover change (from low marsh to high marsh), then that would indicate increased vulnerability for property and habitat.

Step 3: Using the revised elevation data, and other GIS layers, incorporate sea level rise into AMBUR and run a revised forecast tool on the southeastern estuarine shorelines.

Potential Partners: NC, SC, GA, FL CZM, FEMA, HVA Project Team, Sea Grant; USACE; EPA; NOAA; NERRs; universities

References:

Jackson, C.W., Alexander, C.R., Bush, D.M. 2012. Application of the AMBUR R package for spatio-temporal analysis of shoreline change: Jekyll Island, Georgia, USA. Computers & Geosciences 41, 199-207.