COASTAL RESILIENCE THROUGH NATURE-BASED SOLUTIONS – A GIS SUITABILITY ANALYSIS MODEL FOR LIVING SHORELINES AT ABERDEEN PROVING GROUND, MARYLAND

*Dr. Jules Bruck[1], **Afsheen Sadaf**[1], Mojtaba Tahmasebi[1], and Martha Ryan[2]*

[1]Department of Landscape Architecture, College of Design, Construction & Planning, University of Florida, Gainesville, FL, USA

[2]School of Plants and Soils Sciences, University of Delaware, Newark, DE, USA

Coastal ecosystems, habitats, coastline infrastructure, and communities are increasingly vulnerable due to sea level rise (SLR), storm surge, coastal erosion, and population growth in coastal areas. Traditionally, shorelines have been protected using hardened approaches such as seawalls, bulkheads, revetments, etc. but recently there has been a shift towards more sustainable soft engineering approaches such as living shorelines and hybrid solutions. These nature-based solutions are considered more ecologically balanced methods to protect and enhance shorelines and coastal habitats by dissipating wave energy, unlike hardened approaches which can lead to permanent habitat loss. Several tools have been developed to help evaluate the feasibility of constructing and maintaining a living shoreline in a specific location. However, this study incorporated methodology from a regionally specific integrative tool called the Living Shoreline Feasibility Model (LSFM)" developed by the Partnership for the Delaware Estuary to spatialize model output. The LSFM guides users in collecting information on physical, ecological, and community (social) characteristics. Output includes a relative evaluation of a site brought to the model. In this study, conducted at Aberdeen Proving Ground (APG) located in Harford County, Maryland, a GIS model was developed based on the LSFM to spatialize output for use as a predictive tool.

Three scenarios of suitability analysis are identified by the GIS model including suitable for living shorelines (LS), suitable for hybrid solutions (HS), and not suitable for living shorelines (NLS) through a scale with assigned values of 3,2, and 1 respectively. The GIS spatial data input includes shapefiles and raster data set on "elevation/slope, bathymetry (contours), shoreline sensitivity (geomorphology), topography, marsh, dunes, structures, and submerged aquatic vegetation (sav) presence, erosion level, tree canopy, threatened and endangered species, wetlands, storm surge and wind energy, wave hazard, fetch and current shoreline type". The weighting method includes assessing each parameter separately and later assigning a weighting method based on percentage calculation derived from LSFM. All GIS raster data was converted into 10m x 10m cell size and analyzed using the "Suitability Modeler" in ArcGIS Pro 3.1.0. Ultimately, this project will demonstrate the thorough integration of shoreline and upland data through mosaic and overlay analysis and will identify the most suitable sites for the installation of living shorelines at APG.

PRESENTER BIO: Afsheen Sadaf received her Ph.D. in Urban & Regional Planning from the School of Landscape Architecture and Planning, UF. Currently, she is a Post-Doctoral Research Associate at the Department of Landscape Architecture & Planning at UF. Her research interests include Coastal Resilience, GIS, Sustainability and Environment, Health & Built Environment, Health Inequalities (SES & Gender). She has earned several prestigious awards including ACSP-FWIG Marsha Ritzdorf Award, ACSP Diversity Fellowship etc.