

Assessment of the Reach and Ecological Condition Due to Coastal Flooding in Georgia Coast with Advanced Geospatial Technology Application

Sudhanshu Panda

Affiliation: Associate Professor, Institute of Environmental Spatial Analysis, University of North Georgia, Gainesville Campus, 3820 Mundy Mill Rd., Oakwood GA 30566

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Abstract. Tidal freshwater wetlands are the interface between marine and terrestrial ecosystems. They are being directly impacted by sea level rise as a consequence of climate change. These wetlands are common in the rapidly urbanizing landscape of the southeastern Atlantic coastal plain, as well as other coastal areas. Coastal flooding has increased many folds recently including the Georgia coast. Tidal freshwater forested wetlands (TFFW) occur in floodplains situated near the coastal zone along freshwater rivers are subject to these coastal flooding related tidal surge. The brackish water intrusion to these TFFW is creating tremendous damage. The objectives of this study conducted in Georgia coast were to: i) acquire and process the LiDAR data to develop latest and ultrahigh resolution DEM for the study area; ii) use the average climate change related high tidal surge heights (presumably 2 m) to develop land topography model showing the TFFW area affected by salt water intrusion and use soil properties to exact delineate the area that will affect freshwater ecosystems; and finally, iii) use advanced object based image analysis (OBIA) image segmentation algorithm to classify/differentiate the saltwater and freshwater ecosystems in a selected county (Chatham County) with other land uses. LiDAR tiles (*.LAS files) of Georgia Coastal counties were downloaded from NOAA Digital Coast library. The LiDAR tiles were processed and mosaicked to develop DEM with ground returns. The DEM developed from the LiDAR data of 2010 is much updated and represents present and accurate topography of the area. Then the ultrahigh resolution (30 cm) DEM was used to delineate the area under 2 m (high estimated tidal height in recent years in Atlantic Ocean) ground elevation showing that these coastal ecosystem will be under submergence in high tide period. Another study was conducted on these

areas under 2 m elevation with the use of SSURGO soil data. Soil Hydrologic Group (HG) and Available Water Storage/Capacity (AWS) characteristics provide insight about the saltwater percolation to the soil. Soil HG C, C/D, and D tend to help slow percolation and high (more than 18 cm) AWS also do the same. Spatial areas with Soil HG C, C/D, and D and AWS greater than 18 cm were overlaid with areas under 2 m elevation with the use of Weighted Sum tool of ArcGIS 10.2 to obtain the exact spatial area that will be affected by tidal surge and altering/stressing the freshwater ecosystems. Finally, for the selected Chatham County, we used 1 m resolution National Agricultural Imagery Program (NAIP) imagery to per-form image segmentation with OBIA to differentiate plant species, and other land uses in the area affected by tidal surge. We took the help of training sample development with preground verification of land uses, shrub raster, short tree raster, tall tree raster, and other height raster created from LiDAR data, NAIP based NDVI and other image indices to develop rule sets for OBIA. The resultant data would provide coastal ecosystems management people to know the probable spatial and ecological extent of damage due to coastal flooding.