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Remote sensing approach to evaluate sediment diversions on the Lower Mississippi River

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This study presented a modified Normalized Difference Water Index (NDWI) for mapping the percentage of wetland loss and gain in the lower Mississippi river within Cubit's Gap Subdelta (CGSD). The Landsat-7 Enhanced Thematic Mapper (ETM+) and Landsat-8 Operational Land Imager (OLI) images were used to derive highly accurate land/water boundary maps at the 30 m resolution. The NDWI calculated from $(\text{blue} - \text{SWIR})/(\text{blue} + \text{SWIR})$, where SWIR is the shorter wavelength region was able to determine the water/land boundaries, and separate mixed water pixels better than the previously published NDWI. The overall accuracies of the ETM+ and OLI classified maps were above 90% confidence level, and Kappa statistics are well above 0.9. The classification accuracy reflects how well the water, non-water and mixed-water classes were identified from the newly developed NDWI. The GIS spatial analysis revealed that there were about 84 km of land gain and 38.1 km of land loss within in the CGSD between 2000 and 2015. Land gain occurred predominantly in the western section of the CGSD where sediment was imported either from Mississippi River crevasses or from dredging. Land loss typically occurred in the eastern part of CGSD with greater wave exposure. Areas with land loss generally correlate to high values of average loss of ignition, water content and salinity, where areas of land gain generally correlate with high shear strength and bulk density. This study suggests that diversions will be most successful if they have high sediment inputs.

Biography

Reda Amer has a PhD in Geophysics/Advanced Remote Sensing and GIS from Saint Louis University, USA. Currently, he is working as a Professor of Practice of Remote Sensing and GIS at Tulane University, in New Orleans, LA. His research focuses on the applications of remote sensing and GIS to the mineral exploration, evaluation of groundwater resources in arid and semi-arid lands, water quality, land use and land cover change, and other environmental studies. His research has been presented to the scientific community through publications and international conference presentations.

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