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| **Exploration of Coastal Degradation in the Eastern United States** |
| Degradation of coastal ecosystems is of increasing concern due to sea level rise, salt water intrusion, storm events, land management decisions, and other factors. Areas of vegetation stress and reduced productivity can be observed from multispectral imagery and multitemporal lidar. We examine the eastern coast of the United States from New Jersey to southern Georgia within forests, agriculture, and marshland areas. For a pilot area in the Delmarva Peninsula (Delaware, Maryland, and Virginia) we conducted a preliminary high-resolution analysis with multitemporal lidar from 2010 and 2015 combined with PlanetScope data from spring and fall 2022. Exploratory machine learning CART classification demonstrated the ability to separate degraded and healthy vegetated areas with an overall accuracy of 93% and 5 tree splits for 43 samples, with the red edge band, blue band and height metrics being the deciding predictors. The largest confusion in the classification was between degraded forest versus ghost forest. At the regional scale, classification analysis is driven by the 10m Sentinel-2 bands from April and September 2022, 10 m ESA 2020 World Cover product, and the 10 m ETH Global Sentinel-2 Canopy Height product. Preliminary results from machine learning classification (random forest model with 50-fold cross validation) showed an overall accuracy 83%, respectively with 801 samples derived from manual interpretation of high-resolution imagery and some field visits, with a class accuracy of 85% for total degraded forests, but significant confusion between ghost forests and other degraded forests. We also examined the Landsat time series data from 2000-present using the Continuous Change Detection and Classification (CCDC) algorithm for selected degraded versus healthy forested sites. For degraded forests, we see some evidence of decline in NDVI and tasseled-cap greenness over time prior to disturbance that is not evident in nearby healthy forest sites. Our results highlight the value of incorporating lidar-derived vegetation height and ground elevation into multitemporal/multispectral classification of coastal degradation.  |