Predicting Aboveground Biomass using Remote Sensing Imagery in the Land Between the Lakes (LBL) National Recreation Area Forest

Forests play a significant role in providing social, economic, and ecological services to society. Accurate prediction of aboveground biomass (ABG) is important for informed decision-making in forest management, more specifically on strategic and tactical decision-making processes. While field based conventional biomass measurement methods are labor intensive and time consuming, recent advancements in satellite technology have enabled us to develop reliable and accurate predictive models using remote sensing and Geographic Information System (GIS) techniques. . This study aims to predict and map the spatial distribution of AGB in the Land Between the Lakes (LBL) National Recreation Area. We hypothesized that combining spectral matrices derived from Landsat imagery with GEDI (Global Ecosystem Dynamics Investigation) LiDAR point cloud data will yield accurately ABG prediction. The research methodology employs GEDI LiDAR point clouds as target sample data with known AGB values, while Landsat 9 imagery and digital elevation model (DEM) serve as predictor variables. These datasets will train a regression model to predict AGB values across the study area. Model performance will be evaluated using model fit statistics such as R^2 and RMSE with iterative improvements to enhance model prediction accuracy. The resulting AGB estimates will be used to predict ABG for the whole LBL forest, producing a comprehensive spatial distribution map for the area of interest. The approach discussed in the paper leverages remote sensing technology has gained popularity among resource managers, researchers, and landowners for estimating forest biomass and carbon stock across the large forest landscapes. The findings will contribute to our understanding of forest conditions in the LBL National Recreational Area, and support long-term monitoring of production, aesthetic, and ecological functions of forests in the study area. By utilizing advanced remote sensing techniques, this research aims to overcome the limitations of traditional field-based biomass measurement methods, providing more efficient and accurate estimates of AGB across extensive forested areas. The results from this study are expected to offer valuable insights into the effectiveness of forest management interventions and inform future strategies in the study area.