LEAF AREA INDEX ESTIMATION IN LOBLOLLY PINE PLANTATIONS WITH LANDSAT 8

C. E. Blinn [a, *], R. H. Wynne [a], V. A. Thomas [a], T. R. Fox [a], A. Gerace [b], J. R. Schott [b]

[a] Dept. of Forest Resources & Environmental Conservation, Virginia Tech, Blacksburg, VA, USA - cblinn@vt.edu
[b] Rochester Institute of Technology, Chester F. Carlson Center for Imaging Science, Rochester, NY, USA

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ABSTRACT:

Leaf area index (LAI) is an important stand characteristic used in silvicultural management decisions in loblolly pine plantations across the south-eastern U.S. Since loblolly pine has two needle cohorts, it has a LAI minimum in the winter when only one needle cohort is present and a peak LAI in the late summer when both needle cohorts are present. The overall objective of this research was to determine how the relationship between ground LAI measurements and Landsat vegetation indices change through the year, especially at minimum and peak LAI, in loblolly pine stands. Additionally, the impact of four different levels of noise in the Landsat imagery was explored.

Twenty-two 30 by 30 meter ground plots were installed at two study sites near Appomattox, Virginia and Tuscaloosa, Alabama. The LI-COR LAI-2200 Plant Canopy Analyzer was used to estimate the ground LAI within each plot. The Virginia site was measured in April 2013, September 2013 and March 2014 while the Alabama site was measured in February 2014. Both sites will be re-measured during the summer of 2014. Landsat vegetation indices based on top-of-atmosphere reflectance from the best available images closest in time to ground LAI measurements were used in regression equations to estimate LAI. The largest decrease in RMSE occurred when the signal to noise level was changed from L7 levels to any L8 level. R-squares ranged from 73.3 to 93.5 with Landsat 8 and from 57.9 to 96.8 with Landsat 7 at the Virginia site while the R-squares were 65.6 and 73.8, respectively for L8 and L7, at the Alabama site. How these equations compare with previously published equations and across sites, time and sensors will be presented.

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* Corresponding author.