ARCHITECTURE OF THE BLACK MOSHANNON FOREST CANOPY MEASURED BY HEMISPHERICAL PHOTOGRAPHS AND A LI-COR LAI-2000 SENSOR

Y. S. Wang[1], J. Welles[2], D. R. Miller[1], D. E. Anderson[1] G. Heisler[3] and M. McManus[4]
[1]University of Connecticut, Storrs, CT
[2]Li-Cor Corp., Lincoln, NE
[3]USDA Forest Service, Northeastern Forest Experiment Station, State College, PA
[4]USDA Forest Service, Northeastern Forest Experiment Station, Hamden, CT 06514

ABSTRACT

Non-destructive measurements of light penetration were made at 10 heights in the canopy on twelve different sites in the PA oak forest where the Blackmo 88 spray-micrometeorological experiment was conducted. Vertical profiles of Leaf Area Index, LAI, were calculated from these measurements, and the data were used to define the spatial variability of the forest canopy density.

Two different sensors were used for the light measurements, a remotely controlled camera with a 180 degree hemispherical lens (polar projection) and a LI-COR LAI-2000 radiation sensor. The paper presented the physics and mathematical theoretical background for these measurements. The two sensors generally performed similarly with some differences near the top of the canopy.

The average leaf area index in this stand during the spray experiment was 3.72 square meters of leaf area per square meter of ground. This was reduced to 3.02, a 19% reduction, during partial defoliation in 1989. Spatially, the canopy was quite variable. The standard deviation of the leaf area density over the 12 measurement locations was approximately 70% of the mean (3.02).

This experiment demonstrated a relatively simple non-destructive sampling technique to measure leaf area distributions in mature forest stands. The realistic use of model simulations for spray operations or insect-host interactions will require the documentation of the leaf area distribution characteristics of a large range of forest types and stand densities. The sensors and techniques used here are dependable, accurate and inexpensive ways to accomplish this.