Using hyperspectral vegetation indices to detect Differences in *Quercus rubra* Leaf Pigment Content & Phenology Along an Urban-to-Rural Gradient

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Environmental changes associated with urbanization such as urban heat island effect, higher CO2 concentrations, and higher nitrogen deposition may affect the growth rates and physiological processes of terrestrial vegetation. Remote sensing and hyperspectral vegetation indices can be an effective tool in quantifying foliar leaf pigment content to determine stress levels and physiological differences between vegetation in urban areas and vegetation in rural areas. In this study, hyperspectral vegetation indices were used to detect differences in the foliar pigment content of one-year-old *Quercus rubra* seedlings at four sites along an urban-to-rural gradient during June 2008. The Chlorophyll Index (CHL), the Carotenoid Reflectance Index (CRI), and the Photochemical Reflectance Index (PRI) were calculated from the reflectance spectra measured using a field spectrometer. Plant biomass was also quantified at each site. Average chlorophyll content, measured by CHL, was significantly higher at Central Park (CP) and Lamont-Doherty Earth Observatory (LDEO) than at Black Rock Forest (BRF) and the Ashokan Reservoir (ASH). Average foliar carotenoid content, measured by CRI, was highest at the most urban site (CP) and decreased with increasing distance from the city. PRI, which is positively correlated with light use efficiency, was highest at LDEO, followed by CP, ASH, and BRF. Average seedling biomass was highest at the urban site and then decreased in order of site location along the gradient. All of the data indicated that seedlings in rural areas are more stressed than those in urban areas. Further research using remote sensing techniques to measure pigment content and phenology along the urban-to-rural gradient will provide a larger body of data with which to observe the relationship between plant stress level and site location along the gradient.