

# **Early Detection of Plant Stress Due to Human Activity via Spectral Remote Sensing**

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## **ABSTRACT**

The remote detection of plant stress due to air or soil contaminants is of interest to groups that monitor environmental quality, agricultural contamination, and human activity. In this paper we present the results of experiments in the early detection of plant stress due to various chemical agents applied in vapor form to the plant canopy. Initial experiments measure plant reflectivity at short-range distances using a hyperspectral sensor sensitive from 350 nanometers (nm) to 2500 nm with a 1-nanometer sampling interval. Chemical agents used in preliminary stress studies are ones that have been associated with certain types of human activity that is destructive to the environment. Stress measures are various band ratios indicative of plant biomass, chlorophyll and water content. Additionally we measure plant fluorescence and compute fluorescence band ratios indicative of plant stress. Inclusion of control and drought stressed plants provides a reference for the detection of unique indicators of chemical stress. We also will present regression analysis of hyperspectral indicators of stress with physical plant measures such as dry weight density and leaf area. Finally, we will present plans for future studies that include soil delivery of contaminants, standoff tests that include remote fluorescence detection, and airborne hyperspectral measurements over controlled sites.