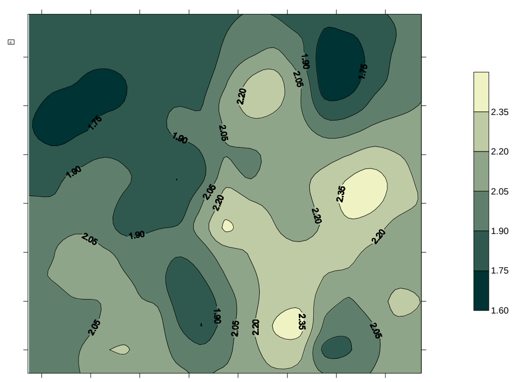
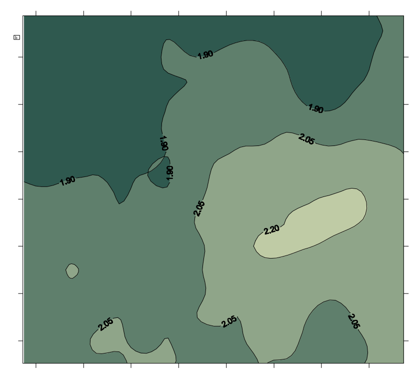
Quantifying Within-Field Crop Variability with Remote Sensing

Delineating *crop management zones* within a field for precision farming management requires analysis of within-field crop variability. Identifying areas where crops respond similarly over multiple growing seasons into *crop response zones* stratifies crop variability into homogeneous units. The crop response zones can then be analyzed to determine factors causing the variability.

Mapping the foliage density (expressed as leaf area index or LAI), of the crop response zones offers a means of quantifying the variability for analysis. LAI can be used to infer causal factors of the variability via various modeling techniques.

Mapping LAI is possible using remote sensing imagery. Linear combinations of spectral reflectances from red and near infrared wavelengths known as *spectral vegetation indexes* (SVIs) have been shown to be correlated with LAI for a variety of crops and sensor systems. Traditional uses of SVIs require surface-based measurements of LAI to calibrate the LAI-SVI relationship. These procedures often fail with high spatial resolution imagery and do not fully exploit the spatial information available from imagery.





Investigations into new procedures that use the spatial and spectral information from imagery are being conducted as a part of OPE3. Figure (a) shows LAI mapped from an intensive LAI sample acquired on the surface using geostatistical interpolation techniques. Figure (b) shows LAI mapped from remotely sensed data (1.5 m pixels) using a combined SVI-spatial variance approach. Tests of the SVI-spatial approach show that this may provide better results that traditional linear regression-based SVI procedures.

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