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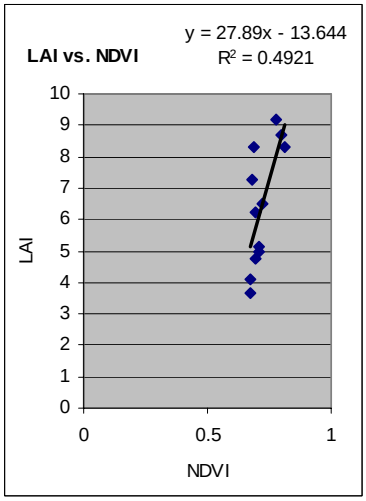
Geog 577 Advanced Remote Sensing
Due: 5pm Friday, April 6, 2007

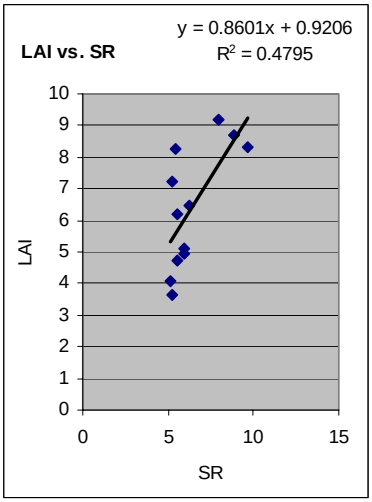
Lab 5 Estimating Leaf Area Index (LAI) from Remotely Sensed Images

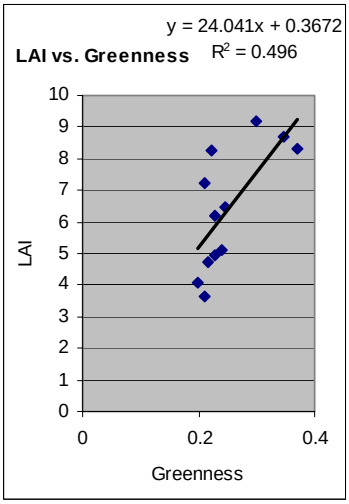
1) *Include the StandStructure.xls as a table with NDVI, SR and greenness for each stand added. Report the three scatter plots with regression equation, trend line and R^2 shown in the graph. Discuss how well the relationships are.*

PID	LAI	NDVI	SR	Greenness (TC band 2)
1	5.115992	0.709011	5.895840953	0.239723196
2	8.284911	0.690035	5.469772373	0.22300779
3	4.088829	0.673291	5.137448788	0.198890778
4	6.478986	0.722174	6.215364842	0.246555486
5	3.658306	0.677027	5.197750194	0.211797324
6	7.249602	0.677097	5.220944254	0.210093567
7	6.203952	0.694052	5.579915654	0.228445928
8	4.741687	0.695123	5.570864012	0.216732274
9	4.961208	0.710172	5.92827691	0.227968032
10	8.70996	0.795918	8.830503782	0.34695914
11	8.324386	0.812188	9.669836735	0.369329039
12	9.168936	0.774703	7.944515281	0.299531149

Formatted Table







The format of the figure can be improved significantly.

All three spectral vegetation indices (SVI) give roughly equal R^2 values, from 0.4795-0.496. The R^2 values in each of the 3 graphs describe the variability of the LAI/SVI relationship in the 12 stands. Since the R^2 values are rather low, this indicates a high

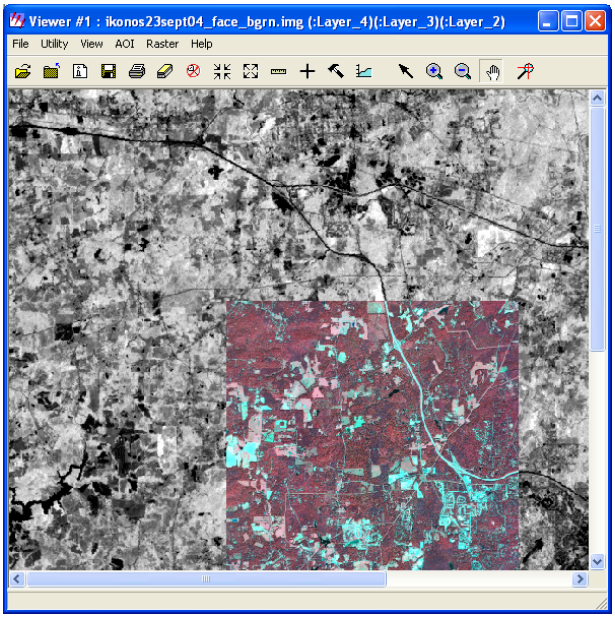
variability of LAI/SVI in the 12 stands. Thus for a given stand, I can only determine with low accuracy what its LAI might be if I had a measurement of its NDVI, SR, or greenness.

A reason that the R^2 values do not change much in each graph might be because the reflectance values are being described by vegetation indices that all use similar information. NDVI and SR both use bands 3 and 4 in slightly different ways, and Tasseled Cap greenness also uses this information. To try to explain this better, this can be seen in the similar pattern of distribution of the individual points in each of the three graphs. The pattern of points in the LAI vs. NDVI graph seems to grow broader in a left-right direction in the other two graphs (the horizontal separation between points changes, but not the vertical separation).

LAI vs. Greenness gives the highest R^2 value, with an equation of LAI = 0.3672 + 24.041*Greenness. This could be because of how the Tasseled Cap transformation compresses most of the variability in the 6 Landsat bands into 3 bands (brightness, greenness, and wetness). The greenness band may contain more information about vegetation than the information provided from bands 3 and 4, from which NDVI and SR are derived.

2) *Include the LAI image in your report. Describe how well the spatial pattern corresponds with the Ikonos image (swipe your LAI image on top of the Ikonos image).*

Below I have the Ikonos image superimposed on the LAI image for comparison. The dark areas on the LAI image correspond very well with the cyan areas on the Ikonos image, which indicate impervious surfaces such as roads and buildings. These are areas that are certain to have very low LAI. In contrast, the bright areas on the LAI image correspond very well to the redder areas in the Ikonos image, which represent areas of plentiful vegetation.



3) *Discussion: The Landsat 7 image was collected on May 24, 2002, the LAI was estimated using allometric relationships based on DBH (Diameter at Breast Height) measured in June of 2005. What are the potential problems we might have because of the difference in time between the image collection and the ground data collection?*

The spectral vegetation indices (NDVI, SR, and greenness) were calculated using May 24, 2002 data, but the LAI was estimated from ground data taken 3 years and 1 month later. The biggest problem is that young stands of trees are likely to have grown larger canopies over that time (and thus their LAI would be greater). The actual LAI/SVI relationship would thus be different than what we determined from the above graphs. If the image and LAI collection were done at the same time in 2002, the measured LAI would have been lower than the LAI in 2005. This would cause the slope of the LAI vs. SVI graphs to decrease.

Comment: Good point!

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