

Homework #11
SOLUTIONS
 Geology 4113 (Remote Sensing)
 Assigned April 13, 2018
 Due Friday April 20, 2018

1. Vegetation Indices (15 points)

Calculate SR (Simple Ratio), NDVI, and NDMI (Normalized Difference Moisture Indices) from the following observations by Everitt & Nixon. Note that they used a ground-based system so the wavelengths are slightly different than those quoted for Landsat TM. Use the closest ones available to those specified for the indices.

TABLE 2. MEAN CANOPY PERCENT REFLECTANCE OF STRESSED AND NONSTRESSED TEXAS PERSIMMON AND LIME PRICKLYASH PLANTS FOR FIVE WAVELENGTHS.

Wavelength (μm)	Texas Persimmon		Lime Pricklyash	
	Stressed	Nonstressed	Stressed	Nonstressed
0.55	6.5*	4.8	6.0*	4.0
0.65	4.6*	2.9	4.6*	1.9
0.85	24.1*	31.2	19.8*	31.3
1.65	21.6*	18.8	17.6*	14.7
2.20	14.4*	9.7	11.9*	6.6

*Significantly different from nonstressed at the 0.05 percent probability level.

For SR and NDVI the infrared and red bands to use in the above list would be IR = 0.85 μm and R = 0.65 μm . With that choice the following results would be obtained for the four cases for SR = IR/R and NDVI = (IR-R)/(IR+R):

	SR	NDVI
Texas Persimmon Stressed:	$24.1/4.6 = 5.23$	$(24.1-4.6)/(24.1+4.6) = 0.68$
Texas Persimmon Nonstressed:	$31.2/2.9 = 10.75$	$(31.2-2.9)/(31.2+2.9) = 0.83$
Lime Pricklyash Stressed:	$19.8/4.6 = 4.30$	$(19.8-4.6)/(19.8+4.6) = 0.62$
Lime Pricklyash Nonstressed:	$31.3/1.9 = 16.47$	$(31.3-1.9)/(31.3+1.9) = 0.89$

You can see in the above results the SR and NDVI is higher for the nonstressed vegetation. For that vegetation the IR reflectance is higher and the red reflectance is lower.

NDMI is calculated similarly except we measure the difference between Landat TM4 (0.83 μm) and TM (1.56 μm). The closest bands available for that would be 0.85 μm and 1.65 μm . For the four materials listed above that gives $(24.1-21.6)/(24.1+21.6)=0.055$, and for the others, 0.248, 0.059, and 0.361. Once again, the values are much higher for the non-stressed vegetation.