

Utility of Remote Sensing for Rangeland Applications

1. Spectral distinction between land cover types

In order to differentiate between land cover types using visible and near-infrared remote sensing, those land cover types must be distinctly different. Photosynthetic vegetation (the green leaves) has a distinct spectral signature that is readily apparent using remote sensing (Figure 1). Senesced and woody vegetation looks spectrally more similar to soil than to green leaves, so it is difficult to distinguish branches and stems from soil below. Remote sensing is good at estimating percent live cover of green vegetation (possible to $\pm 5\%$), and estimating changes in greenness over time. Remote sensing cannot distinguish community structure, heights, or understories, nor can it differentiate between similar species.

2. Normalized Difference Vegetation Index (NDVI)

$$\text{NDVI} = (\text{IR} - \text{Red}) / (\text{IR} + \text{Red})$$

NDVI is a measure of the 'red edge' of photosynthetic vegetation (Figure 1) which occurs around $0.7\mu\text{m}$ (just beyond the visible spectrum). NDVI values range from 0-1 for typical land surface materials, where values closer to 1 indicate greener, denser vegetation. Changes to NDVI over time are typically used as a proxy for land cover change.

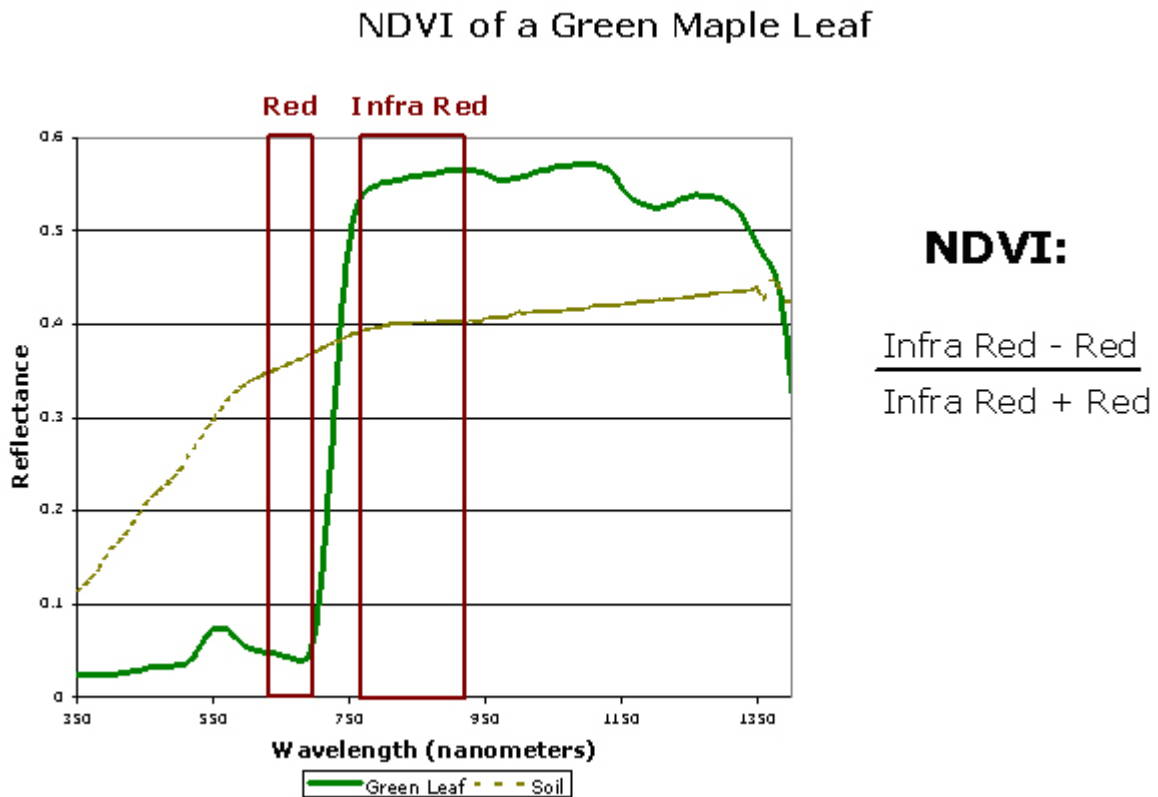


Figure 1: Lab reflectance of a green maple leaf and brown soil from 350-1400 nm. NDVI for the green leaf is higher than for the soil.

3. Types of data available

Sensor	Spatial Coverage	Spatial Resolution	Spectral Resolution	Data Available	Cost
AVHRR/ MODIS	Regional	250 m – 1 km	2-6 bands in VIS/NIR	1990-2000 (AVHRR) 2000-present (MODIS)	Free
Landsat TM/ETM+	185 km width	30 m	6 bands in VIS/NIR	1983-present	\$425- 600
Ikonos	13 km	1-4 m	4 bands in VIS/NIR	1999-present	\$3000 +
AVIRIS	~ 11 km	1 m	224 bands in VIS/NIR	1994 – present	??

Websites:

AVHRR/MODIS download (EOS data gateway): edcimswww.cr.usgs.gov

Landsat orders: glovis.usgs.gov or earthexplorer.usgs.gov

Landsat (free): glcf.umiacs.umd.edu/data
keck.library.unr.edu/data/landsat/pathrow.html

Ikonos: <http://www.spaceimaging.com/>

AVIRIS: aviris.jpl.nasa.gov