NORMALIZED DIFFERENCE VEGETATION INDEX CALCULATION OF SOM RIVER CATCHMENT

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Abstract
The entire Som river catchment lies in Udaipur, Banswara, Chittorgarh, Pratapgarhand andDungarpur districts.Som river catchment is one of the predominately vegetation rich area of southern Rajasthan. Vegetation is main aspect of ecosystems and NDVI is a better way to measure the condition of vegetation of a particular area. NDVI is a vegetation index to monitor the vegetation health. NDVI is the widely used vegetation index for assessing and monitoring vegetation all over the globe. There are many other vegetation indices like Ratio Vegetation Index (RVI), Enhanced Vegetation Index (EVI) and Perpendicular Vegetation Index (PVI) that takes into account the soil emissivity (That is one of the major drawback of NDVI). The entire catchment has NDVI near 0.3-0.6 that shows healthy vegetation simultaneously signs of deterioration of plant health.

INTRODUCTION

Vegetation is an important component of global ecosystems and knowledge of the Earth's vegetation cover is important to understand land-atmosphere interactions and their effects on climate. Changes in vegetation cover directly impact surface water and energy budgets through plant transpiration, albedo, emissivity, and roughness (Aman et al., 1992).

Development in the field of remote sensing and GIS has made it possible to get more information from multi-date and multi-spectral remote sensing data, which afford expert methods to study the vegetationdistribution pattern and inter-annual changes in a given area (Glenn et al., 2008).

The Normalized Difference Vegetation Index (NDVI) is an index of plant “greenness” or photosynthetic activity, and is one of the most commonly used vegetation indices. Vegetation indices are based on the observation that different surfaces reflect different types of light differently.NDVI gives information on vegetation efficiency and phenology for large spatio-temporal scales and has been broadly used in present time ecological studies as a proxy for vegetation efficiency and phenology. Photo synthetically active vegetation, in particular, absorbs most of the red light that hits it while reflecting much of the near infrared light. Vegetation that is dead or stressed reflects more red lights and less near infrared light. Likewise, non-vegetated surfaces have a much more even reflectance across the light spectrum. The NDVI, ranges from -1 to 1, is derived from near-infrared and red bands of remotely sensed images $(NIR - RED)/(NIR + RED)$.

The concept behind NDVI is that chlorophyll of plant absorbs sunlight, which is captured in the red light region of the electromagnetic spectrum, while spongy mesophyll leaf’s plant structure creates considerable reflectance in the near-infrared region of the spectrum. Due to this, dense-green vegetation’s red light reflectance is very low and high near-infrared reflectance, and subsequently high NDVI values. On the other hand, near 0 and negative values show bare and non-vegetation surface features such as rock, soil, water, ice and clouds. NDVI is calculated on a per-pixel basis as the normalized difference between the red and near infrared bands from an image:

NDVI= (NIR-RED)/(NIR+RED)

This has been used to evaluate vegetation and changes in vegetation of the whole globe. NDVI normally ranges from 0.3 to 0.8, with the larger values representing "Green surfaces". The value of bare surface or bare soil ranges between 0.2-0.3. The near infrared part of the spectrum shows high reflection for healthy vegetation.

NDVI provides an accurate estimation of vegetation health. It is useful in estimation of spatial and temporal change in vegetation health. The typical range for NDVI lies from -0.1 (very less vegetation) to 0.6 (very green area).

The table given below shows the typical values of NDVI

Table 1:- landscape with their NDVI values

Landscape	**NDVI value**
Clouds	0-0.075
Sparse desert type vegetation	0-0.01
River, lakes, sea type	Negative value
Non-desert vegetation	0.01-0.75

Satellite data gives a spatially and temporally, comprehensive view of vegetation cover on land. Several spectral vegetation indices have been used over the last few years which have been used to estimate biophysical properties of canopy cover such as LAI, biomass.

Table 2:- Satellite data used

Data	Year of observation	Spatial resolution
Landsat 5 TM	2001	30 meter
Landsat 8 OLI TIRS	2016	30 meter

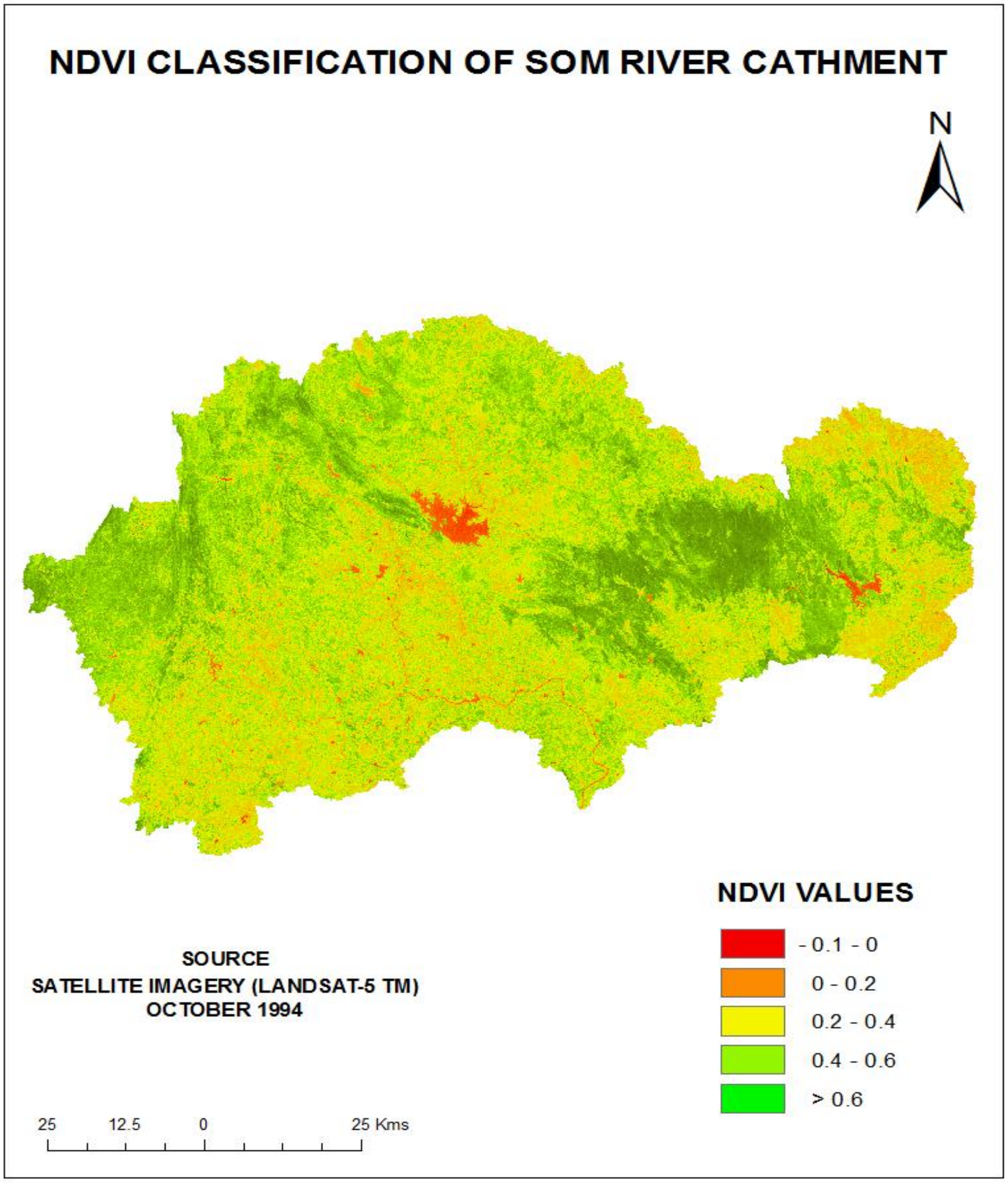

Figure: - 1 Map showing NDVI value for the year October 1994

The satellite imagery LANDSAT-5 TM for the year October 1994 has been used while for year October 2015 satellite image LANDSAT-8 OLI TIRS has been used. The two map of year 1994 and 2015 shows clear deterioration in the health of the vegetation in the catchment.If the NDVI values are between 0 and 0.2, it is considered as low or less vegetation cove. If the NDVI values ranges from between 0.2 to 0.4 then the area is under medium vegetation. If NDVI is more than 0.4, then the vegetation is considered to reach mature stage.

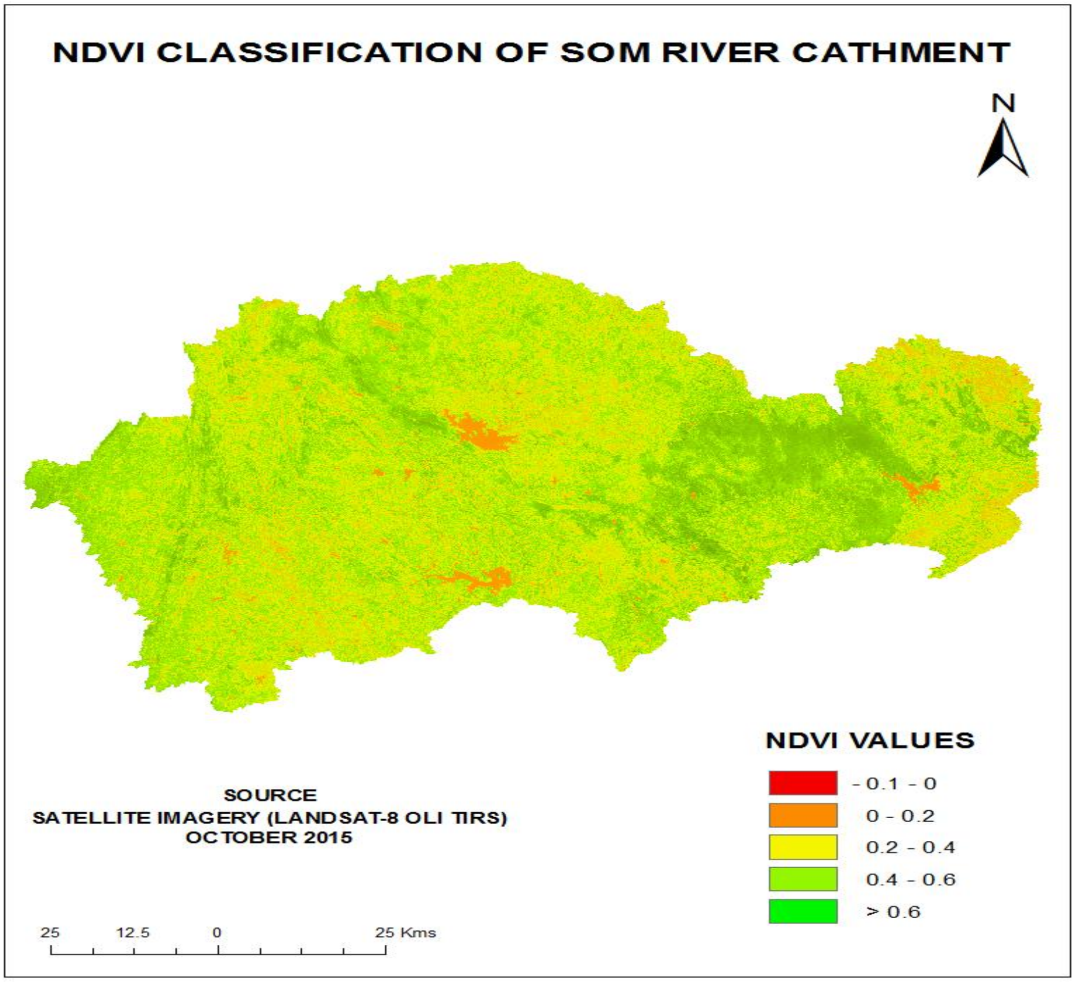

Figure: - 2 Map showing NDVI value for the year October 2015

The NDVI value is reflectance of precipitation and growing period of vegetation (Bhunia et al., 2012).

RESULTS

The reason for this decline in the health of the vegetation is directly linked to the illegal mining in the study area since the region is highly abundant in terms of minerals. The opencast mining is still going on in this area. Though the study area has long tradition of afforestation programs that is run by local tribes but still some part of catchment observe negative value of NDVI. Thus this region has mature vegetation in the Eastern and Western part.The results show that the NDVI is highly beneficial in detecting the surface features of the visible area which are extremely beneficial for policy makers in decision making.The Vegetation analysis is helpful in predicting the unfortunate natural calamities to provide humanitarian aid, damage control and furthermore to make protection strategies. Though the study area has positive value of NDVI but it is deteriorating day by day. It requires stringent action for its improvement.

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