Methodology of Drought map

This map began with the maximum value Normalized Vegetation Index (NDVI) composite images for the conterminous United States, produced by the U.S. Geological Survey Earth Resources Observation System (EROS) Data Center since 1989 (Eidenshink, 1992). The maximum value composite procedure is based on a time series where the daily NDVI for each pixel is examined during the 14-day period and only the highest value is retained. Holben (1986) found that, by compositing Landsat 8 data over short-time periods, spatially continuous cloud-free images of large areas could be produced. A linear interpolation method was used to derive weekly NDVI composite images. The procedure resulted in a weekly maximum value composite data set for the growing seasons of 2015 through 2020.

The SVI is based on calculation of a Z score for each Landsat 8 pixel location in the Great Plains of the Rajshahi, Naogaon and Chapai Nawabganj (138 and 139 path by 43 row).

NDVI Calculation

NDVI is used to quantify vegetation greenness and is useful in understanding vegetation density and assessing changes in plant health. NDVI is calculated as a ratio between the red (R) and near infrared (NIR) values in traditional fashion. (Equation-I)

$$NDVI = \frac{NIR-R}{NIR+R} \text{- - - - - - - - - - - - I}$$

Where,

NIR = Near Infrared Band (In Landsat 4-7, this band is Band 4 and In Landsat 8-9, this band is Band 5)

R = Red Band (In Landsat 4-7, this band is Band 3 and In Landsat 8-9, this band is Band 4)

The Z score is a deviation from the mean in units of the standard deviation, calculated from the NDVI values. The Z-core can be calculated via the following equation-II (Peters et al., 2002; Anyamba and Tucker, 2012).

$$Z_{ijk} = \frac{VI_{ijk} - \mu_{ij}}{\sigma_{ij}} \text{- - - - - - - - - - - - II}$$

Where,

Z_{ij} is the Z-value for the pixel i during week j for year k,

VI_{ijk} is the weekly VI value for pixel i during week j for year k (whereby both the NDVI or EVI can be utilized as VI)

μ_{ij} is the mean for pixel i during week j over n years,

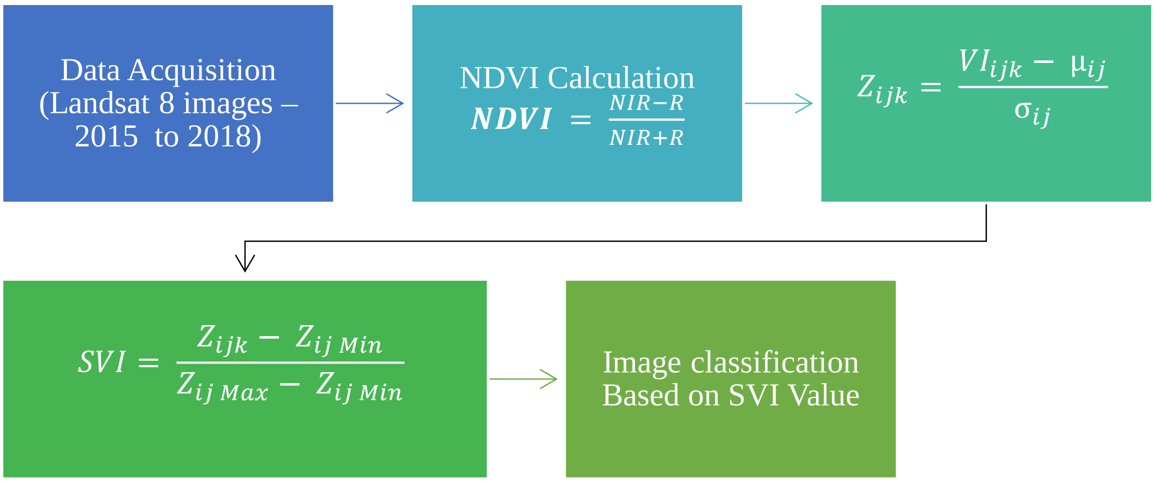
σ_{ij} is the standard deviation of pixel i during week j over n years.

Therefore, the SVI can be calculated from equation II (Peters et al., 2002).

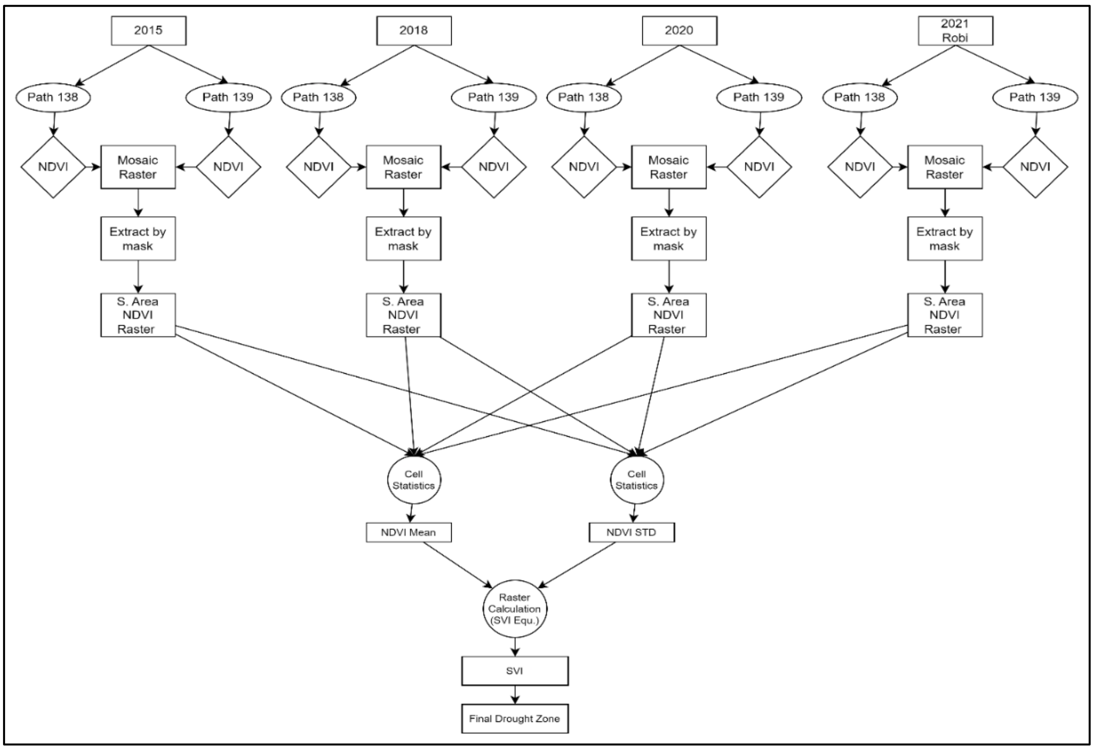
$$SVI = \frac{Z_{ijk} - Z_{ij\,Min}}{Z_{ij\,Max} - Z_{ij\,Min}} \text{------------ II}$$

This per-pixel probability, expressed as the Standardized Vegetation Index (SVI), is an estimate of the "probability of occurrence" of the present vegetation condition. The values of the SVI range between greater than zero to less than one (0 < SVI < 1). Zero is the baseline condition in which a pixel NDVI value is lower than all possible NDVI values for that week in other years. One is the baseline condition in which the pixel NDVI value for the respective week is higher than all the NDVI values of the same week in the other years. Subsequently, for mapping purposes, SVI values were grouped into five classes, each of which comprises different and consecutive ranges of values.

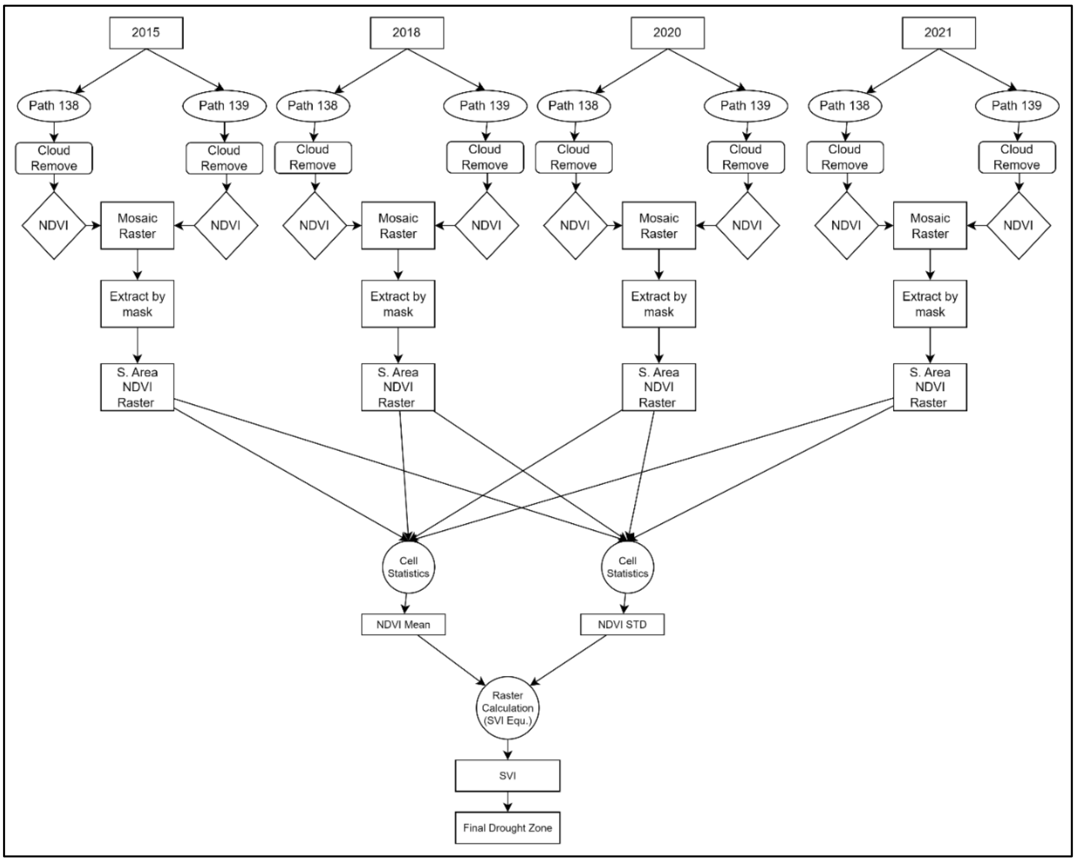
In result, these classes were termed very poor (0 to 0.05), poor (0.05 to 0.25), average (0.25 to 0.75), good (0.75 to 0.95), and very good (0.95 to 1). The distribution of vegetation conditions into these classes was intended to mimic a normal probability density function. For instance, a pixel that is classified as "very poor" indicates that its NDVI value is lower than the average during the same year relative to that in other years of the study. A pixel classified as very good indicates that its NDVI value is higher than average, or that vegetation is in very good relative condition.



Flow chart for Robi and Pre-Kharip Season



Flow chart for Kharip Season



Methodology of LULC map

- Data Acquisition (Landsat 8 images – February, 2021)
- Image Processing
- Radiometric, Atmospheric and Geometric Corrections
- Band Composition
- Mosaicking and Masking (Study area)
- Image Classification
- LULC maps