

Tutorial Set 4: Remote sensing

Exercise Site20_4-3 Nitrogen application based on NDVI

Learning objective: Calculating the in-season N application rate based on NDVI

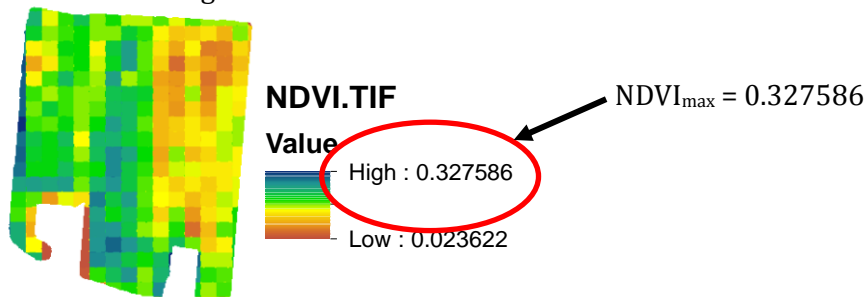
Techniques: Use conditional expressions in the Raster Calculator to calculate the sufficient index

Data Source: Dataset5

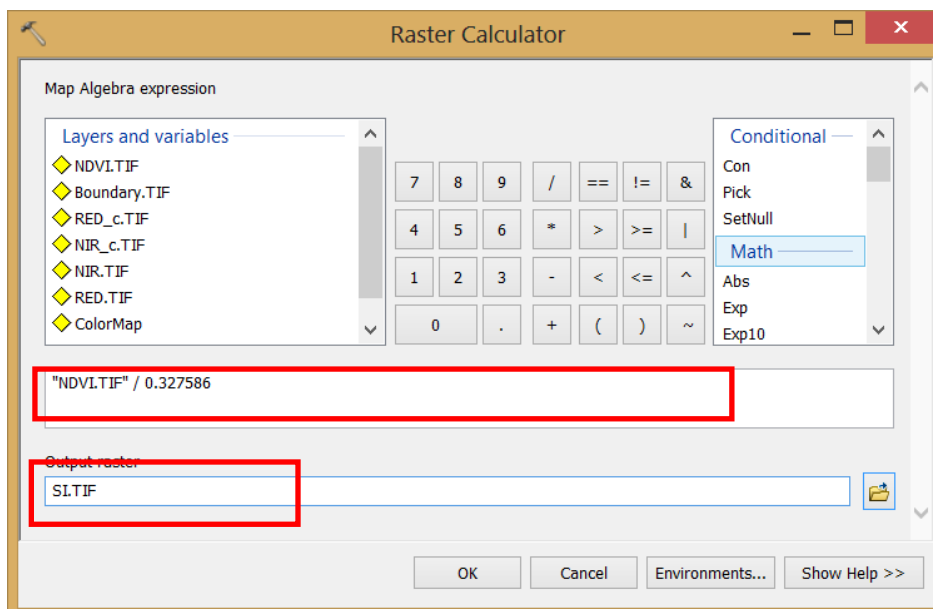
Part 1: Calculating sufficient index (SI)

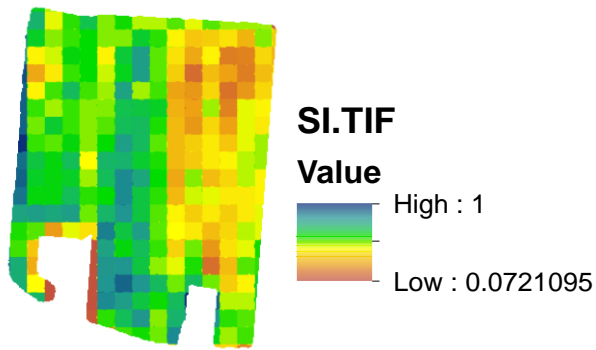
1. Sufficiency index formula

$$SI = NDVI / NDVI_{max}$$
2. Observe the image NDVI.TIF to find the maximum value of NDVI



3. Calculate SI using Raster Calculator. Go to **ArcToolbox > Spatial Analyst Tools > Map Algebra > Raster Calculator**.
Algebra expression = "NDVI.TIF"/0.327586
Output raster = SI.TIF





Part 2: Generating nitrogen application (N) map

1. Formulas and conditions used to calculate nitrogen application (N) based on the sufficient index

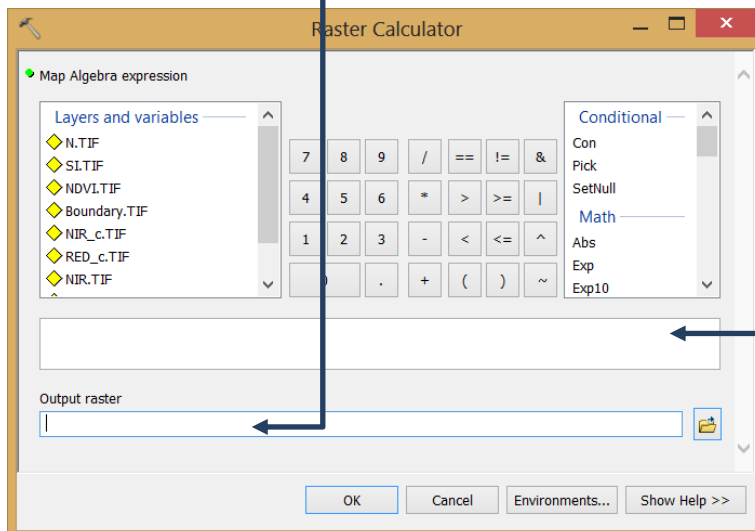
$$N = \begin{cases} 0, & \text{if } SI < 0.4 \\ 180 \times \left(\frac{SI - 0.4}{0.2} \right), & \text{if } 0.4 \leq SI < 0.6 \\ 20 + 160 \times \sqrt{\frac{1 - SI}{0.4}}, & \text{if } 0.6 \leq SI < 1 \\ 20, & \text{if } SI \geq 1 \end{cases}$$

2. Compose nitrogen application (N) image using the **Raster Calculator**. Go to **ArcToolbox > Spatial Analyst Tools > Map Algebra > Raster Calculator**.

Algebra expression:

Con("SI.TIF" < 0.4, 0, Con("SI.TIF" < 0.6, 180*(("SI.TIF" - 0.4)/0.2, Con("SI.TIF" < 1, 20+160*SquareRoot((1-"SI.TIF")/0.4), 20)))

Output raster: **N.TIF**



3. Result of nitrogen application image – N.TIF.

