Tutorial Set 4: Remote sensing

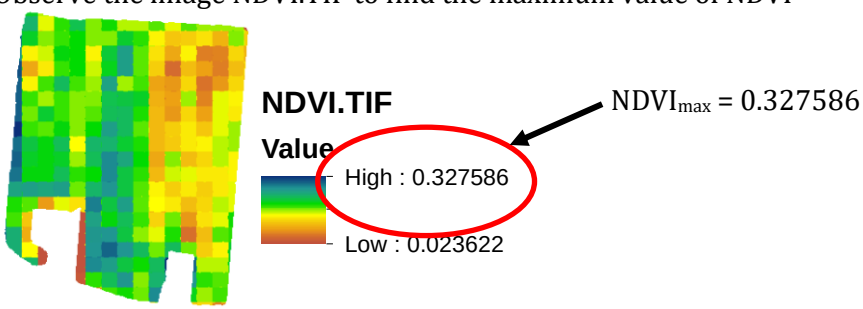
Exercise Site20_4-3 Nitrogen application based on NDVI

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

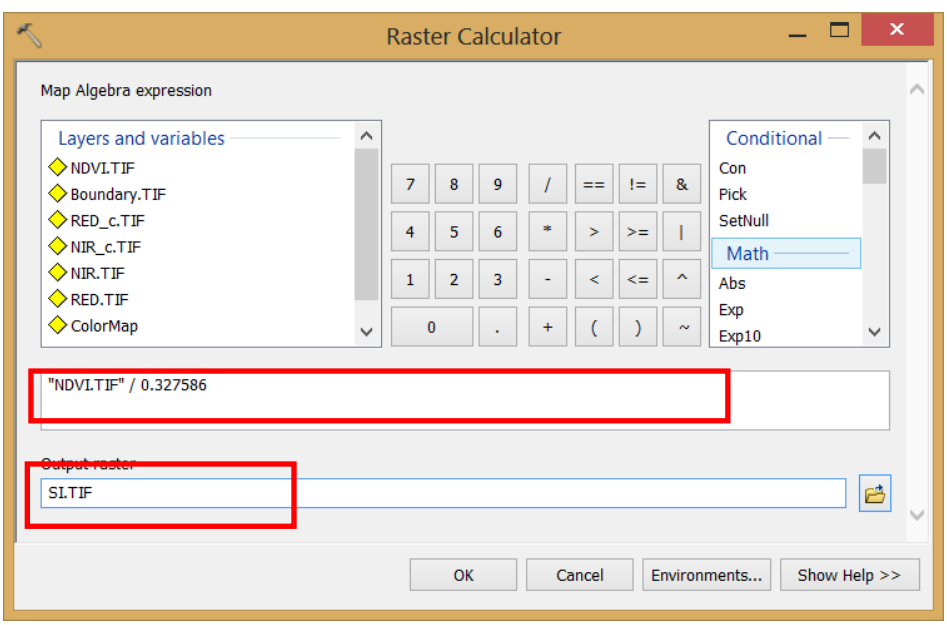
Part 1: Calculating sufficient index (SI)

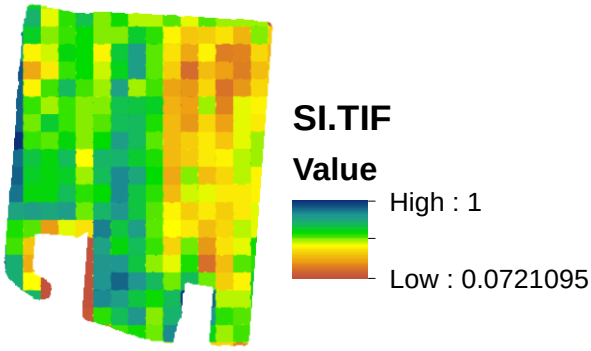
1. Sufficiency index formula
   SI = NDVI / $NDVI_{max}$

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

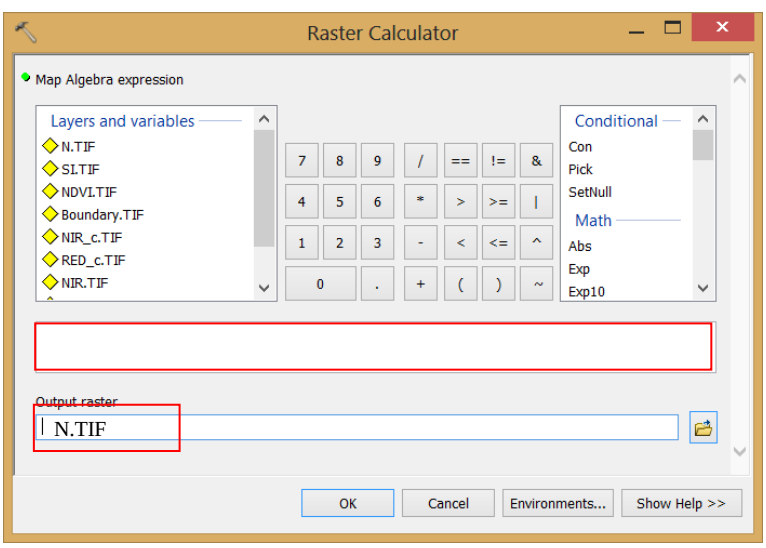
1. Formulas and conditions used to calculate nitrogen application (N) based on the sufficient index

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

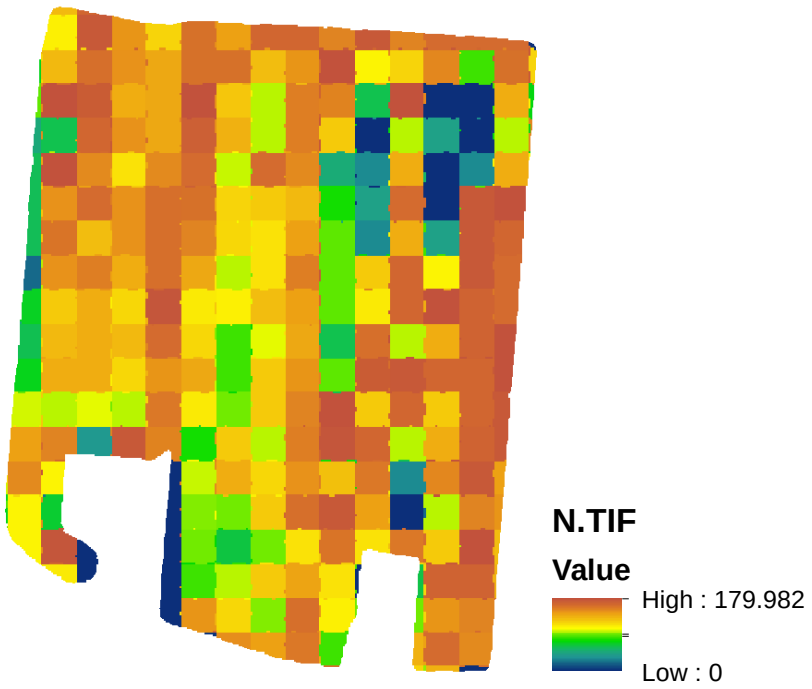
2. Compose nitrogen application (N) image using the **Raster Calculator**. Go to **ArcToolbox** > **Spatial Analyst Tools** > **Map Algebra** > **Raster Calculator**.

   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)))



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


N.TIF
Value
High : 179.982
Low : 0