

## Lesson 3.4: Developing a Yield Goal and N fertilizer prescription maps

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**Data Source:** *dataset3.zip*

**Part 1:** Creating a Yield Goal for corn based on a 5-year yield record.

1. Open the previously saved project.
2. Add a subgroup named “**Nitrate**” under the group “**Soil Prescription**”.
3. Add a group named “**Yield Interpolation**” under your map.
4. The maps you create in this lesson are **based on the following formulas**. If you find yourself confused by the instructions, you can return to these formulas to better understand the instructions.

Yield normalization:

$$y_{relative\_year} = \frac{Y_{actual\_year}}{\overline{Y}_{year}}$$

Temporal statistics of historical yields:

- Average

$$avg\ y_{relative} = \frac{y_{relative\_year1} + y_{relative\_year2} + \dots + y_{relative\_yearN}}{N}$$

- Standard Deviation

$$StDev\ y_{relative} = \sqrt{\frac{(y_{relative\_year1} - avg\ y_{relative})^2 + \dots + (y_{relative\_yearN} - avg\ y_{relative})^2}{N - 1}}$$

- Coefficient of Variation (%)

$$CV = \frac{StDev\ y_{relative}}{avg\ y_{relative}} \cdot 100$$

Yield Goal:

$$YG = 1.1 \cdot avg\ y_{relative} \cdot \overline{Y_{average\_crop}}$$

5. Add the following layers to your map.

$$Y_{corn06} = corn06$$

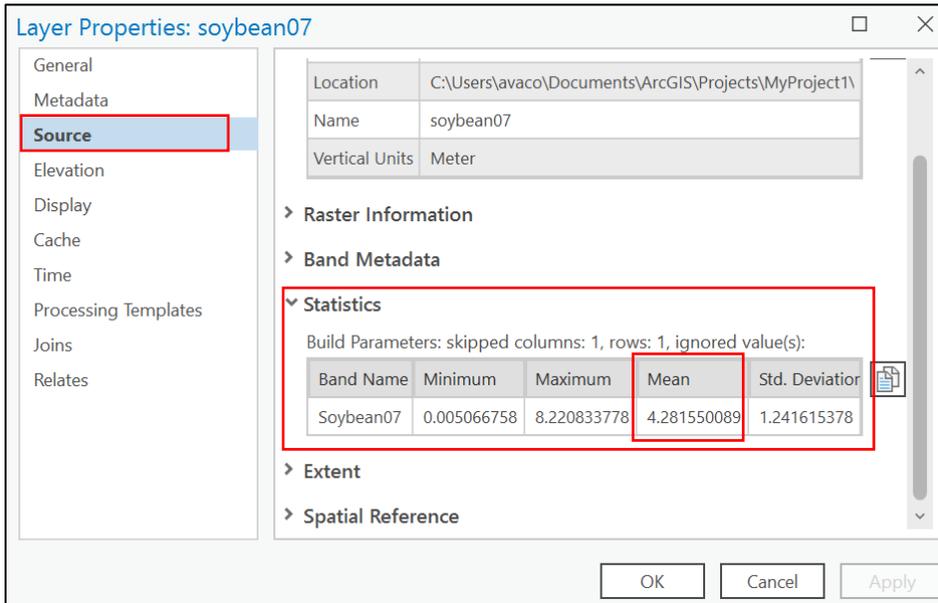
$$Y_{soybean07} = soybean07$$

$$Y_{wheat08} = wheat08$$

$$Y_{corn09} = corn09$$

$$Y_{soybean10} = soybean10$$

- Right click on each of the added layer and select **Properties**. Find the **statistics** for the layer and write down the mean value for each layer.

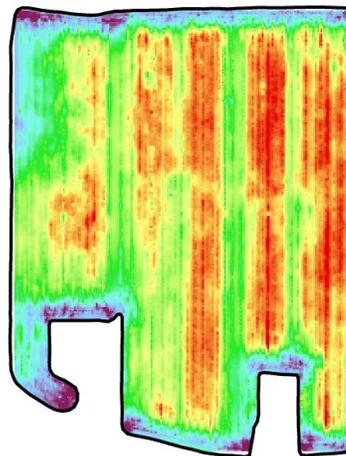
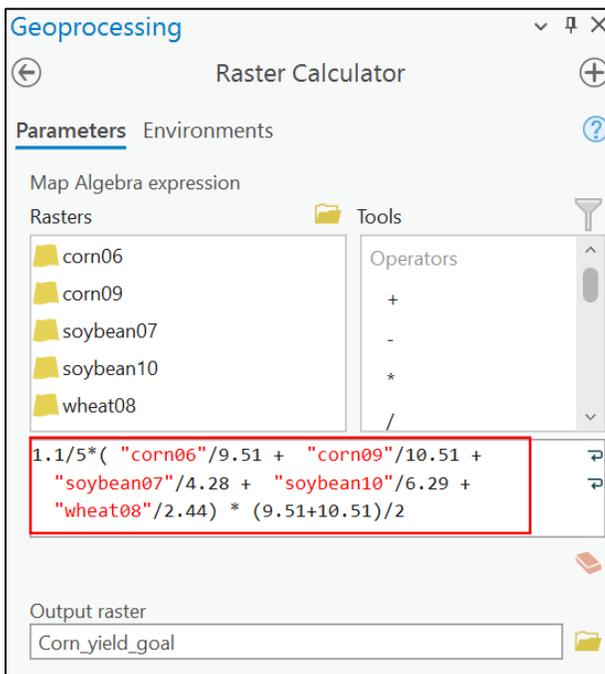


Take note of these values for further use:

$$\bar{Y}_{corn06} = 9.51; \bar{Y}_{corn09} = 10.51; \bar{Y}_{soybean07} = 4.28; \bar{Y}_{soybean10} = 6.29; \bar{Y}_{wheat08} = 2.44$$

- Search **Raster Calculator ( Spatial Analyst)**.
- Input the following formula**, as shown below, into the box. In the **environments** tab, select the extent to be *Field20\_boundary*. Then hit **Run**.

$$YG = 1.1 \cdot \left( \frac{y_{relative_{corn06}} + y_{relative_{soybean07}} + y_{relative_{wheat08}} + y_{relative_{corn09}} + y_{relative_{soybean10}}}{5} \right) \cdot \frac{(\bar{Y}_{corn06} + \bar{Y}_{corn09})}{2}$$

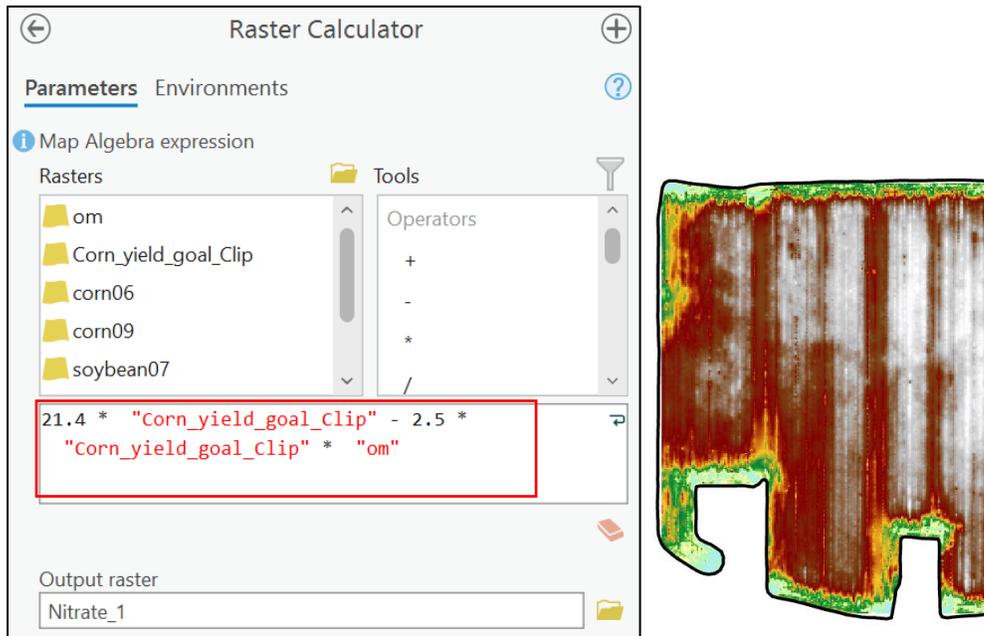


**Part 3: Creating a nitrate prescription variability map**

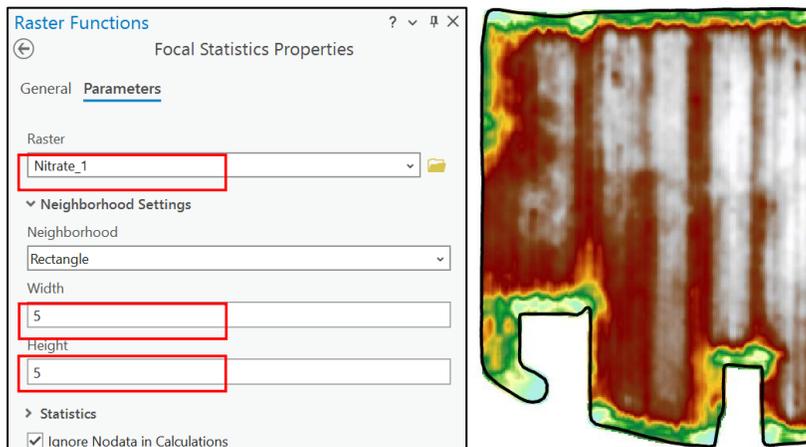
1. The nitrate prescription map will be based off the following formula. YG is the yield goal calculated in Part 1 of this lesson and OM is the field interpolated organic matter (%) map obtained from Lesson 2 – Exercise 1.

$$N = 21.4YG - 2.5YG \cdot OM$$

2. Search **Raster Calculator** and **Input the following formula**, as shown below, into the box. In the **environments** tab, select the extent to be *Field20\_boundary*. Then hit **Run**.

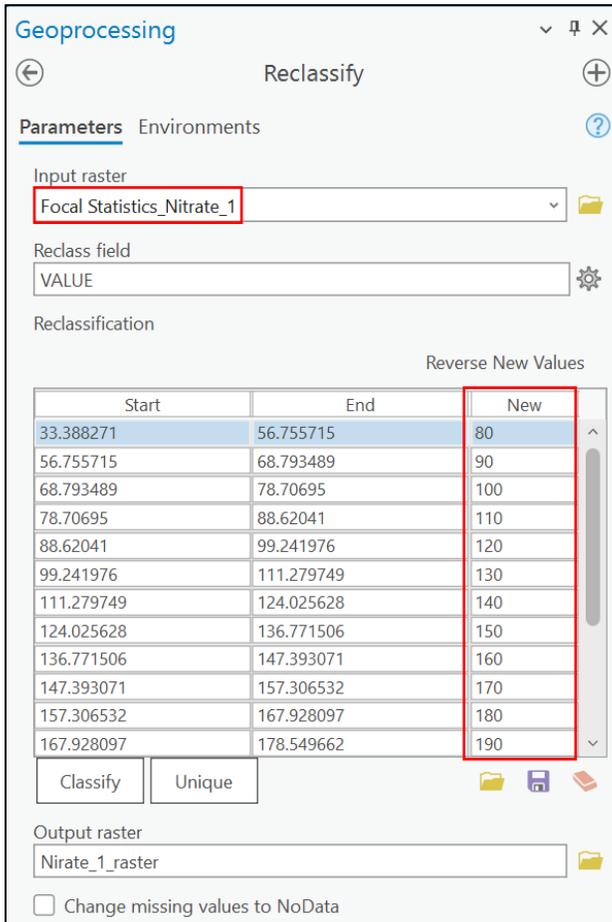


3. Search **Focal Statistics**.
4. In the window, select raster to be *Nitrate\_1* and change the rectangle width and height to 5. Hit **Run**.

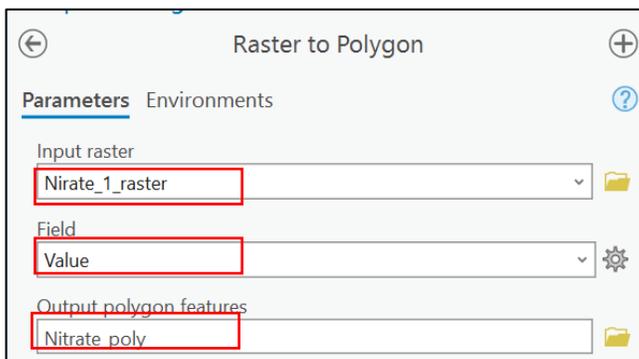


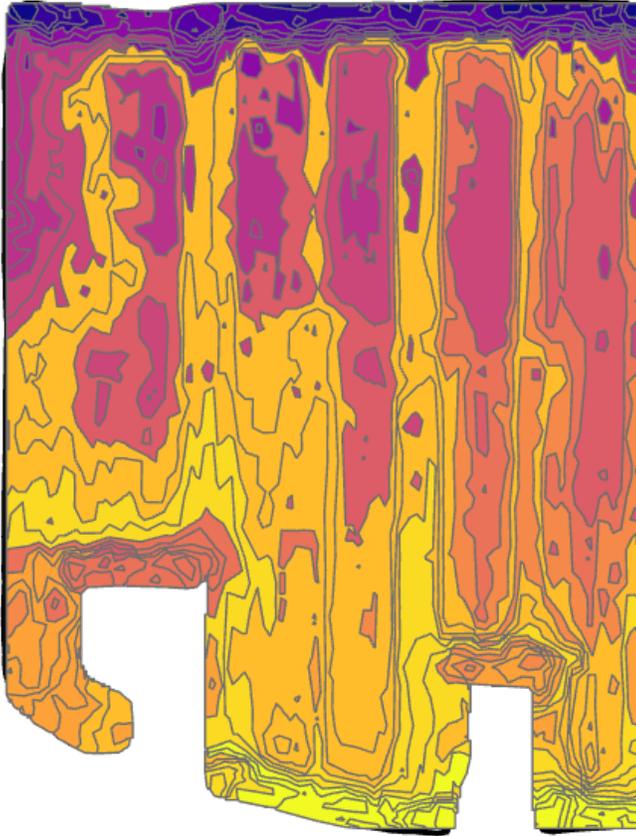
5. Right-click on the new Nitrate layer and select **Symbology**.
6. Change the symbology to **classify** and change the **classes to 15**.

7. Search **Reclassify**.
8. In the window, select your *focal statistics layer*. Then change the new values. **Starting at 80 increase each new value by 10 until you reach 220. Hit Run.**



9. Search **Raster to Polygon**.





10. This is your final map. Save your project.