

Tutorial Set 3: Spatial data analysis

Exercise Site20_3-1 Developing a P fertilizer prescription map

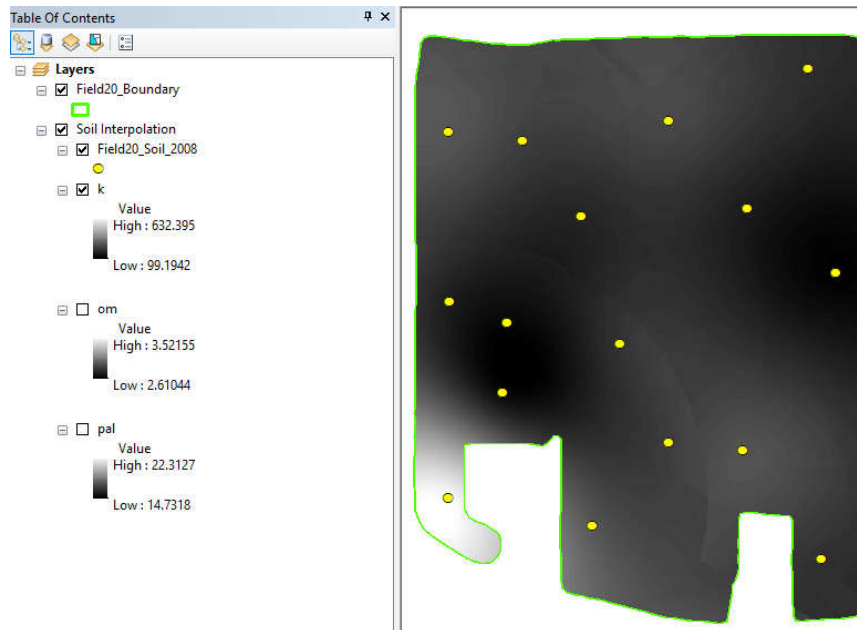
Learning objective: Generating a phosphorus (P_2O_5) prescription variability map (raster) and converting it to a classified polygon layer

Techniques: ArcToolbox – Spatial Analyst – Map Algebra – Raster Calculator
ArcToolbox – Spatial Analyst – Reclass – Reclassify
ArcToolbox – Conversion Tools – From Raster – Raster to Polygon

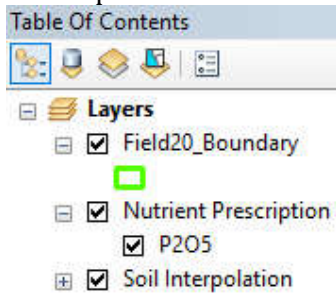
Data Source: Dataset3

Part 1: Layer management

1. Unzip **Dataset3.zip**, bring in data layers (Field20_Boundary, Field20_Soil_2008, k, om, pal) into ArcMap, and set layers extent to field20 boundary. Right-click on Layers in the Table of Contents to add **New Group Layer**, name it “**Soil Interpolation**” and arrange them as shown below. k, om and pal layers are interpolated soil properties from Lesson 2 Exercise 1.

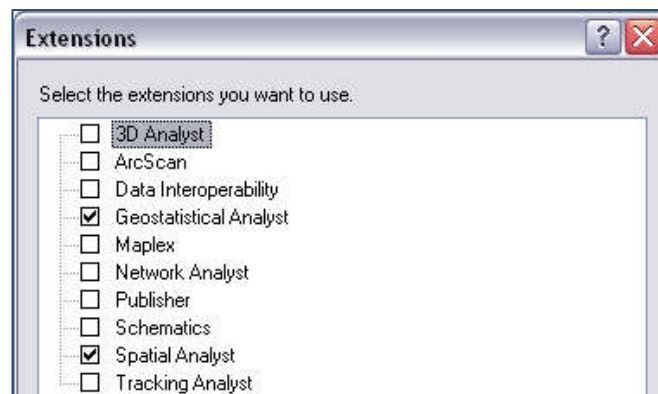


- Right-click on **Layers** in **Table of Contents** to add another **New Group Layer**, name it "**Nutrient Prescription**". Then add a subgroup named "**P2O5**" under the group "Nutrient Prescription".



Part 2: Activating Spatial Analyst

- Go to **Customize > Extensions** to launch **Extension** dialog window and select **Spatial Analyst** and **Close**. (By default, the Spatial Analyst is not activated in ArcGIS. You need to activate it only once - however, **when using McGill's computers you have to activate these extensions every time you use ArcGIS!**)

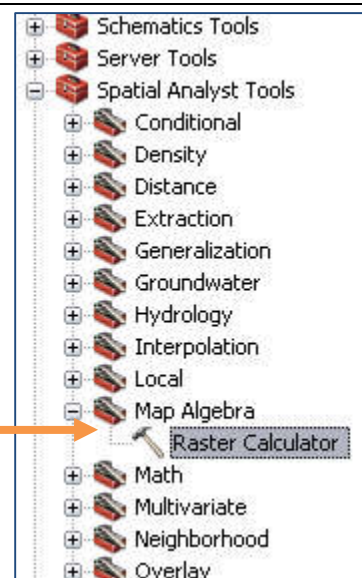
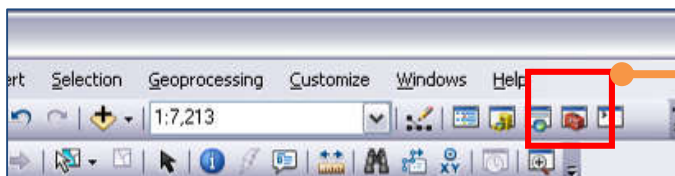


Part 3: Creating a P₂O₅ prescription map using the ArcToolbox -> Raster Calculator

- Understand the formula used to estimate the P₂O₅ prescription

$$\begin{cases} \text{if } \frac{P}{AI} > 20 \rightarrow P_2O_5 \text{ rate} = 0 \text{ kg/ha} \\ \text{if } \frac{P}{AI} \leq 20 \rightarrow P_2O_5 \text{ rate} = (20 - P/AI) \times 4 \text{ kg/ha} \end{cases}$$

- Launch the **ArcToolbox** by clicking on the **ArcToolbox** button. Go to **ArcToolbox > Spatial Analyst Tools > Map Algebra > Raster Calculator**.

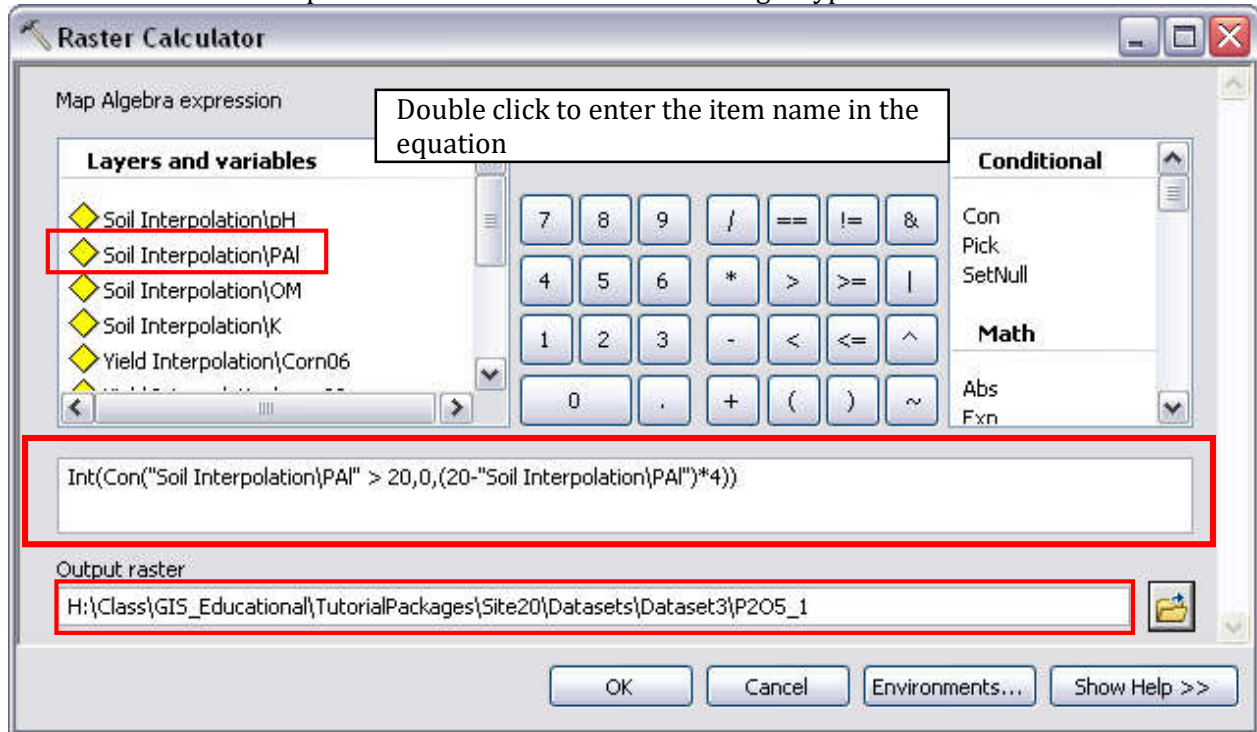


3. Generate a P_2O_5 prescription map by entering the following map algebra expression (without any space) in the **Raster Calculator** dialog window. Change the Output raster file location and name it **P205_1**. A new raster **P205_1** is added to the **Table of Contents**.

Meaning of the operators:

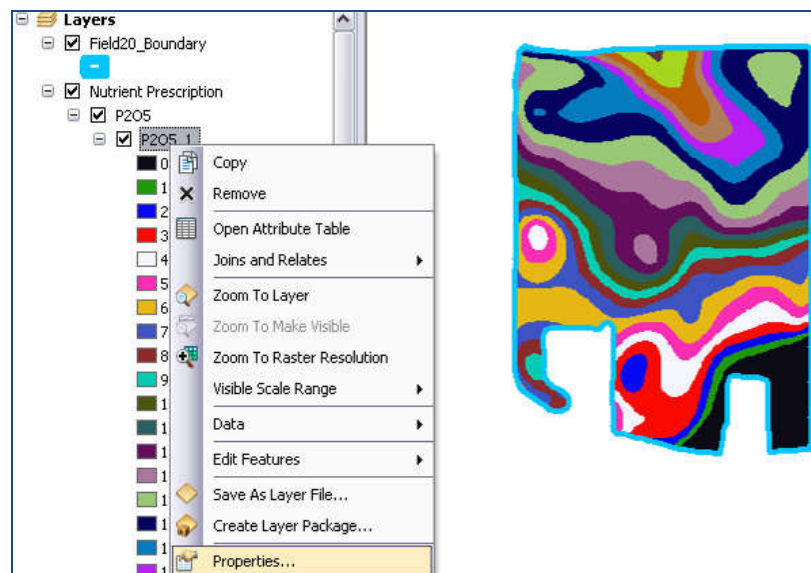
Con: an operator for IF statement

Int: an operator to convert the values to integer type

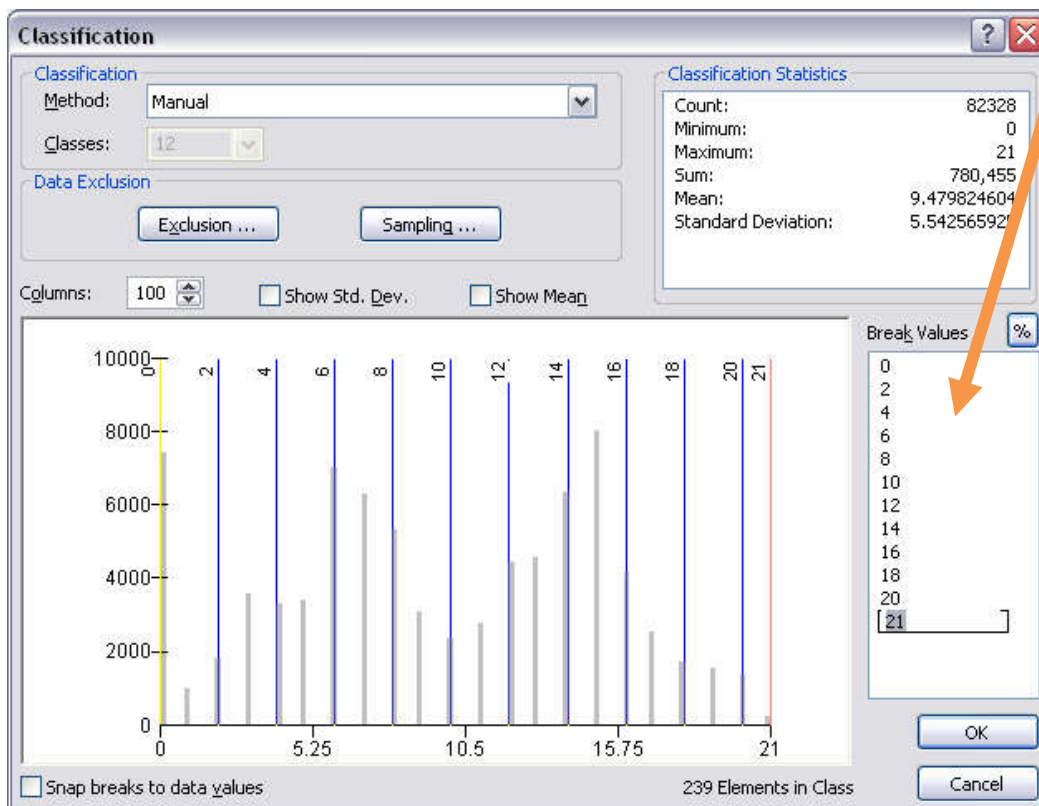
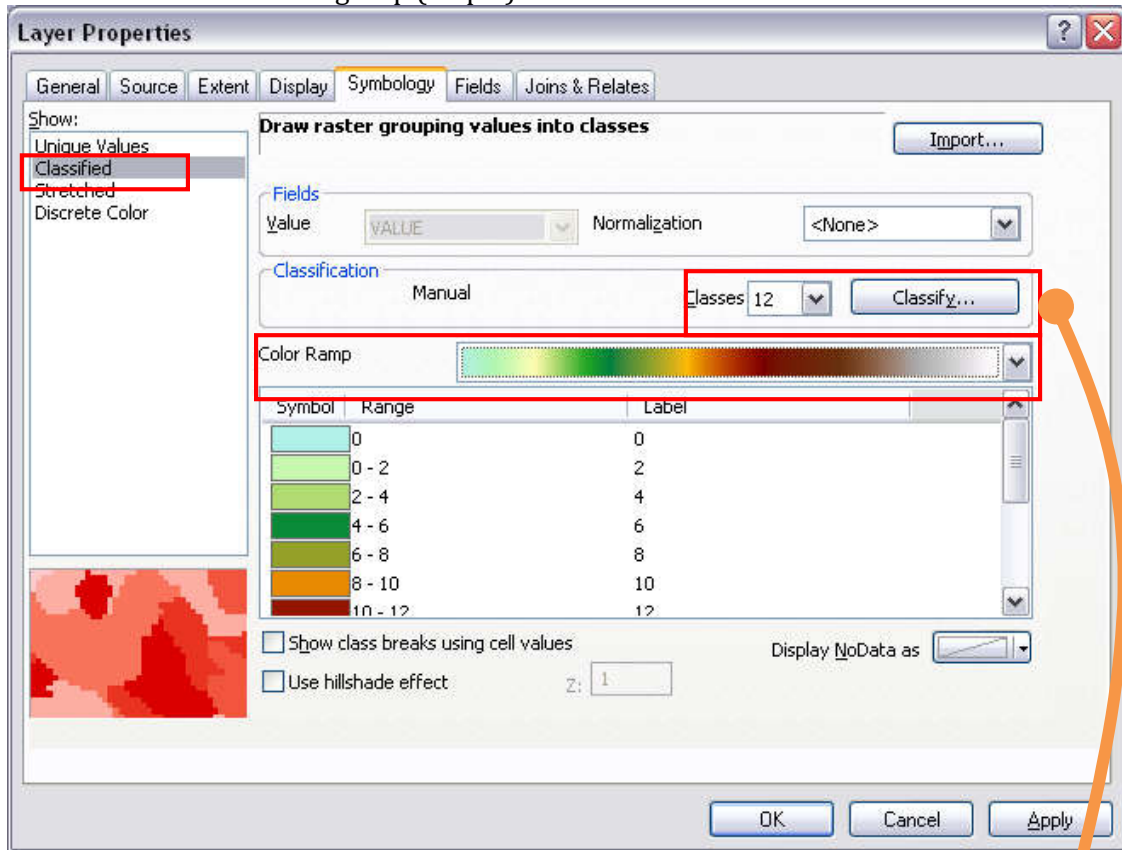


Part 3: Converting P_2O_5 prescription map (raster) into a classified polygon layer

1. In **Table of Contents**, right-click on **P205_1** layer and then click **Properties**. Change **Symbology** to show the values as **Classified**.

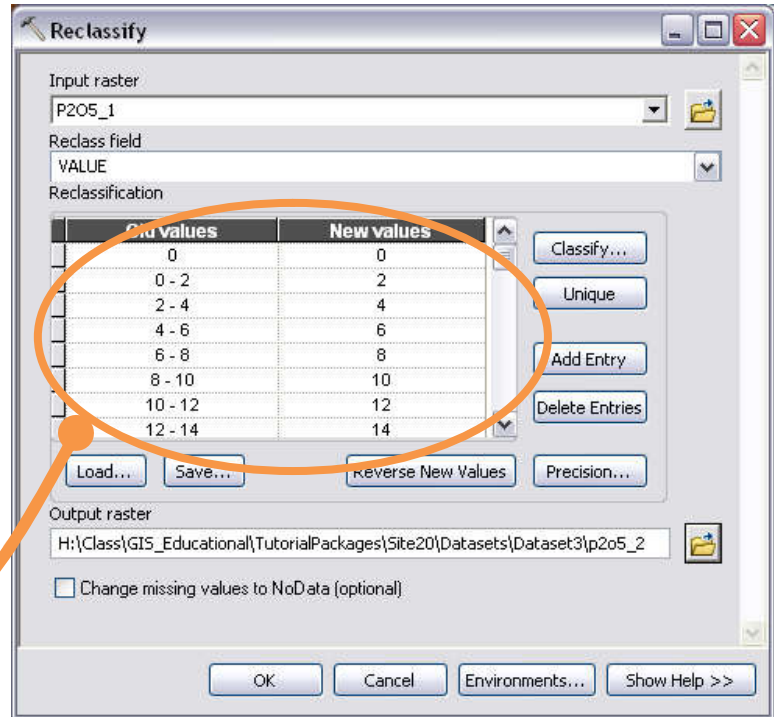


- Click **Classify** and choose the classification method as **Manual**. Set **Break Values** as shown. Once done, click **OK** to proceed. This process only changes the classification for visualization. To permanently create a raster with classes you should use the same **Break Values** under the following step (Step 3)

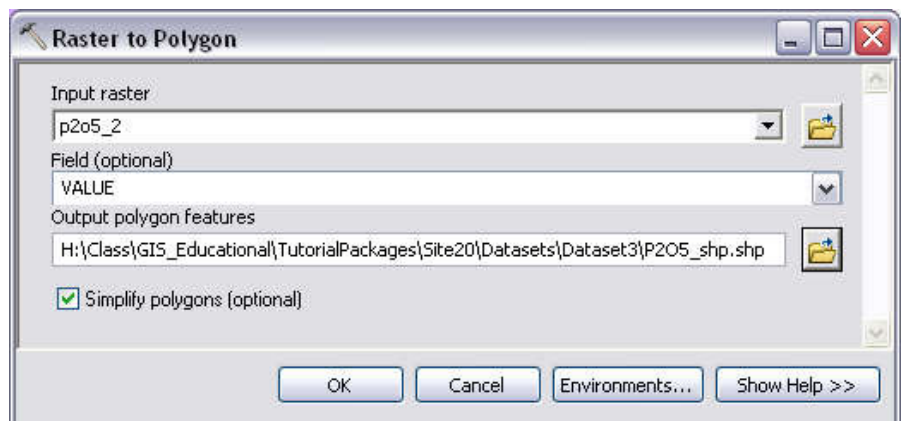
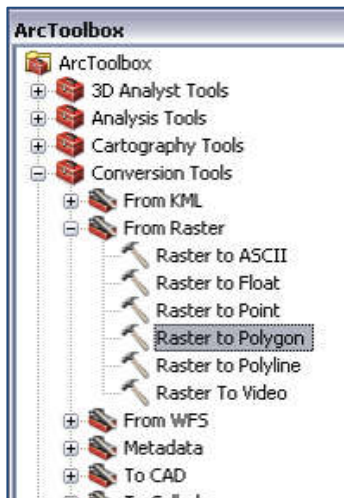


- Reclassify the raster layer **P205_1** to a new raster containing pixels with integer values. Go to **ArcToolbox > Spatial Analyst Tools > Reclass > Reclassify**. Assign new values to reclassify **P205_1** by clicking **Classify...** and set the number of classes to 12 and break values to be the same as on the table from the step above (Step 2). Click OK and save it as **P205_2**.

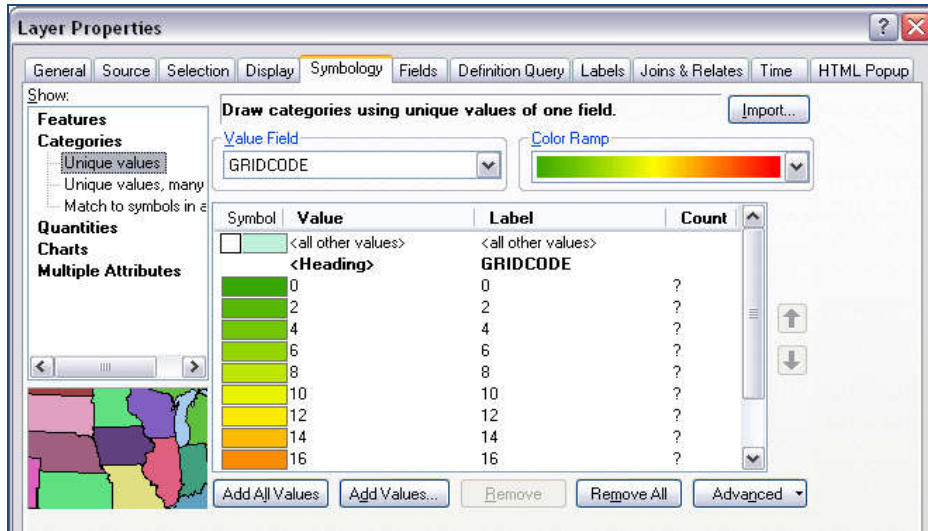
Old values	New values
0	0
0-2	2
2-4	4
4-6	6
6-8	8
8-10	10
10-12	12
12-14	14
14-16	16
16-18	18
18-20	20
20-21	21



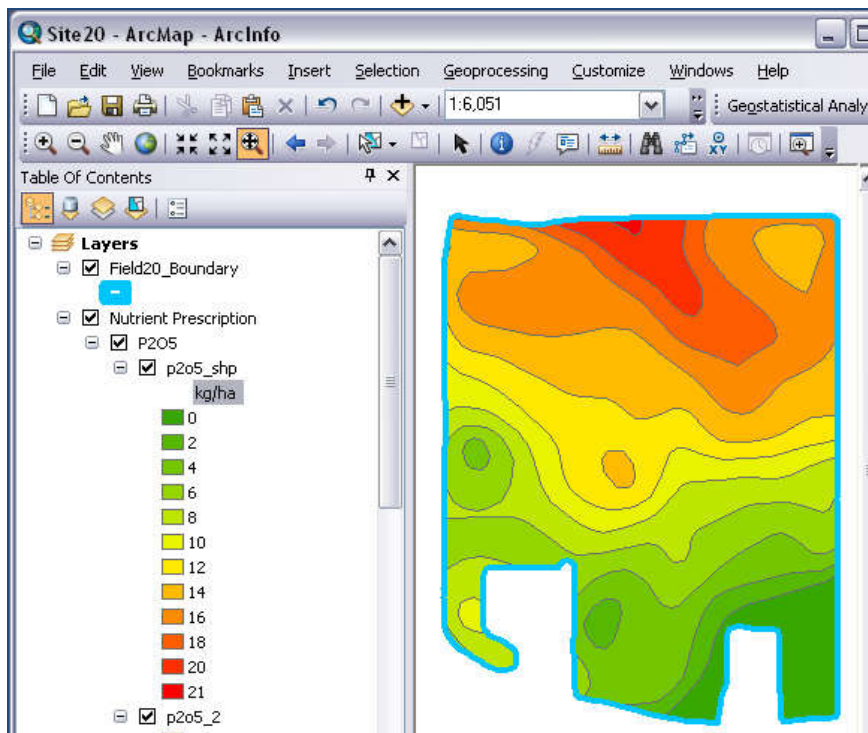
- Convert the raster layer **P205_2** to a shapefile using the **ArcToolbox**. Go to **ArcToolbox > Conversion Tools > From Raster > Raster to Polygon**.



- Now, modify the **Symbology** of **P205_shp** as follows. When using **Categories**, ArcGIS tend to randomly select the color assignment (the color ramp does not follow the data distribution). If you encounter this problem, just select a random color ramp, then pick again the one you chose. This should fix it. In addition, if you wish to invert the color ramp (e.g.: in the image below 0 be red and 21 be green), right-click on the green-box region below and click **Flip Colors**



- The map showing different zones of P₂O₅ prescription is shown as follows.



- Save the project.