Tutorial Set 3: Spatial data analysis

Exercise Site20_3-3 Developing a lime prescription map

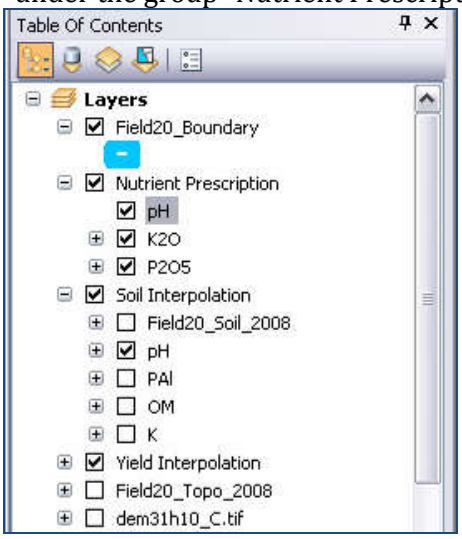
Learning objective: Developing a lime prescription map by joining an external tabular file containing soil pH management information

Techniques: Geostatistical Analyst – Ordinary Kriging
Attribute Table – Join

Data Source: Dataset3

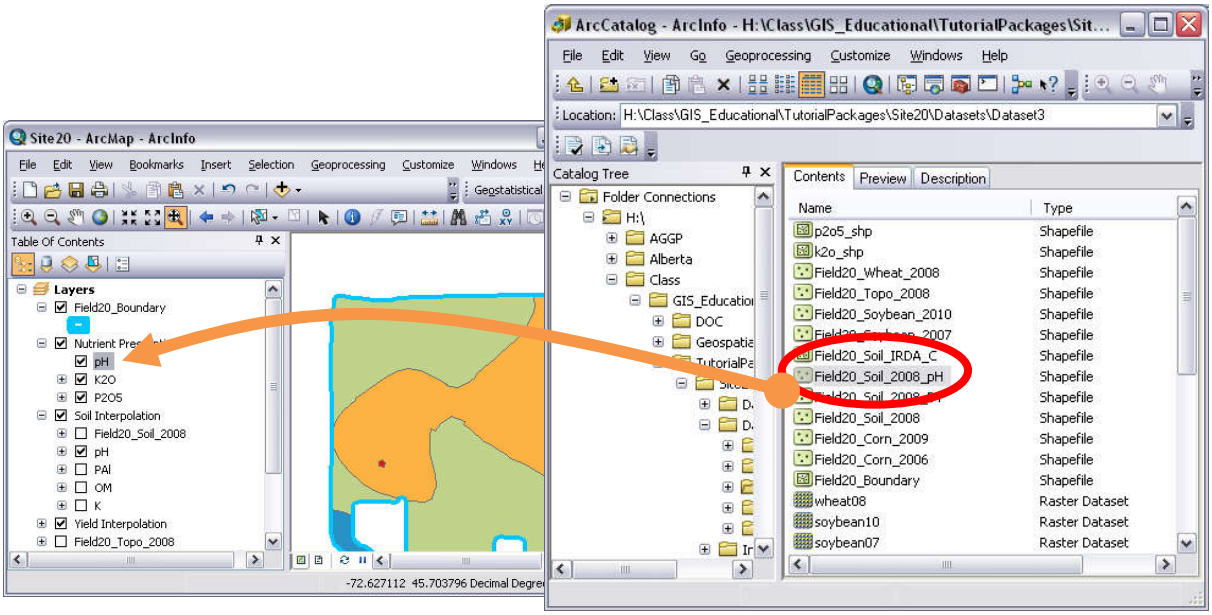
Part 1: Layer management

1. Open the previously saved project.
2. Add a subgroup named "**pH**" under the group "Nutrient Prescription".

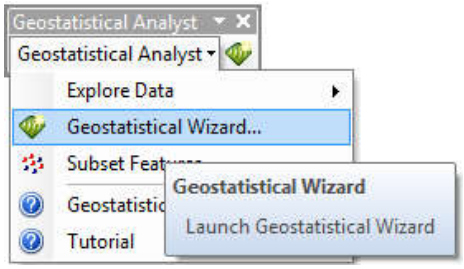


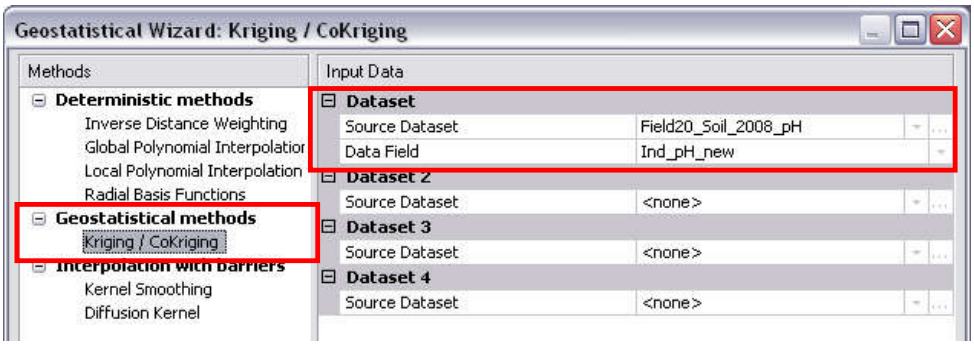
Part 2: Interpolating a soil pH map

1. Drag and drop the layer ***Field20_Soil_2008_pH*** from ArcCatalog to ArcMap (**pH** subgroup).

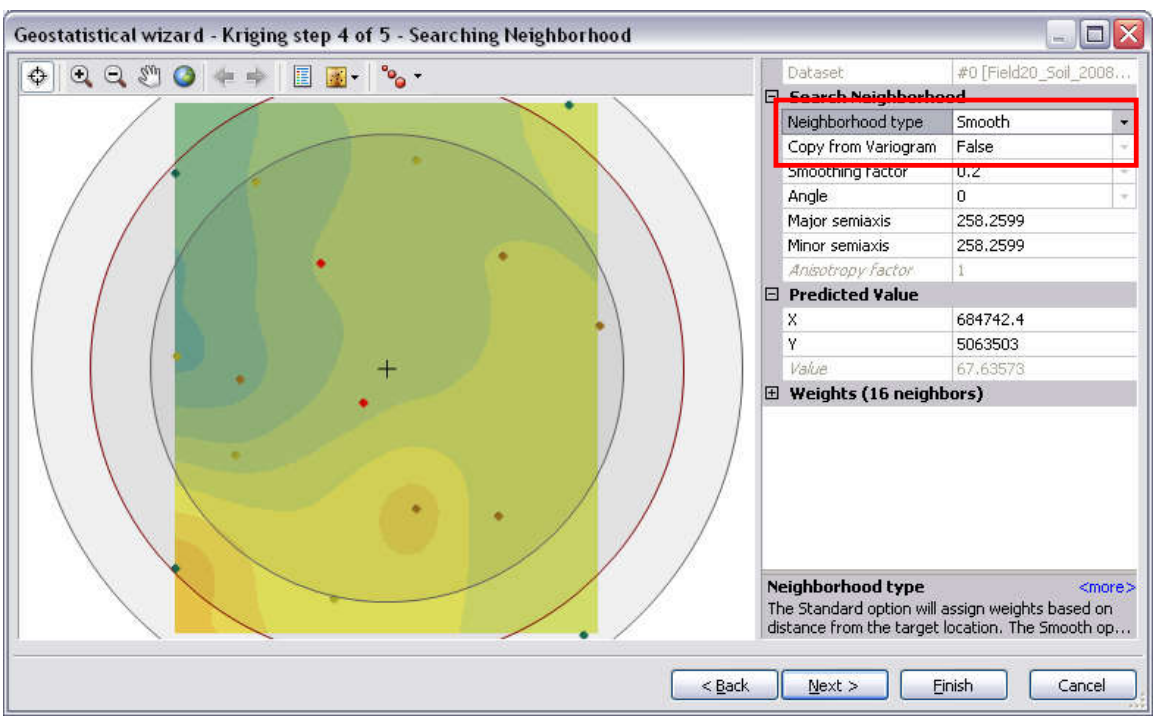


2. Launch **Geostatistical Wizard** from the **Geostatistical Analyst** toolbar to interpolate a modified soil pH map. Choose **Kriging** method, and set the parameters as follows. As we are planning to create a prescription map for lime, we will use the variable "Ind_pH_new" from Field20_Soil_2008_pH. This variable refers to **Index pH**, also known as **Lime Index**, if you want to learn more about this you can read [this short article](#).

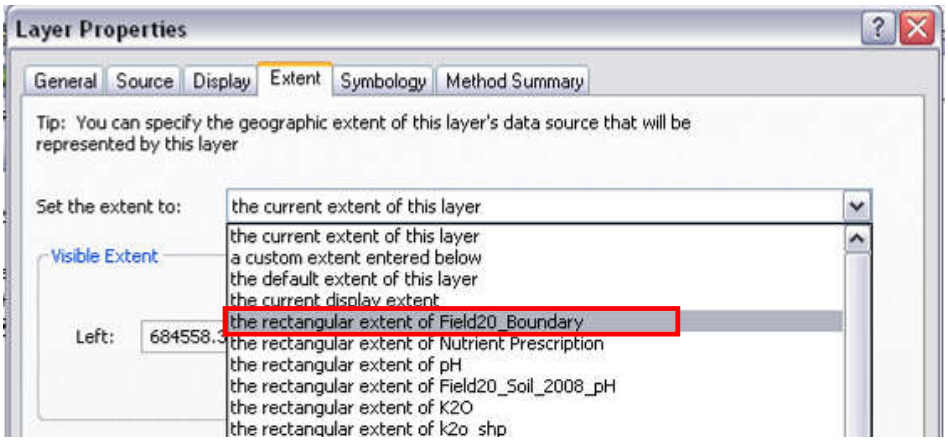




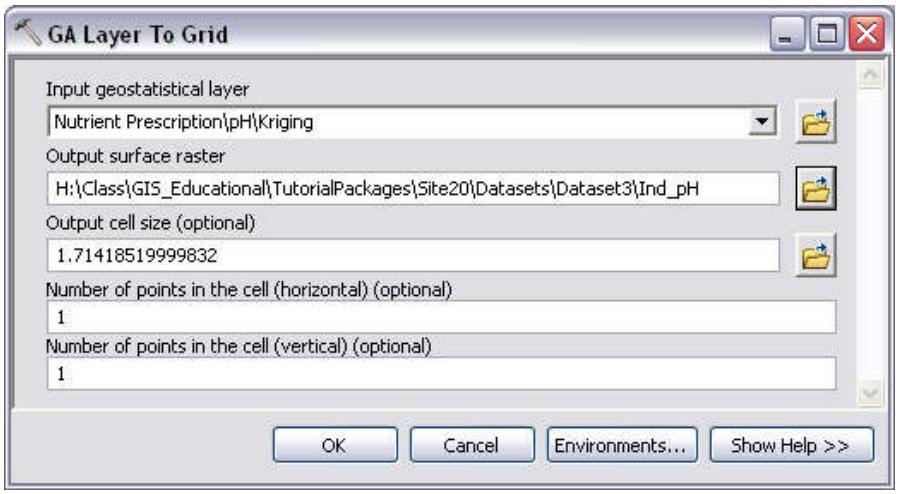
3. In **Step 2**, **Kriging Type** = **Ordinary** and click Next.
4. In **Step 3**, **Model#1** = **Spherical** and click **Next.**
5. In **Step 4**, **Neighborhood type** = **Smooth**, and click **Finish**.

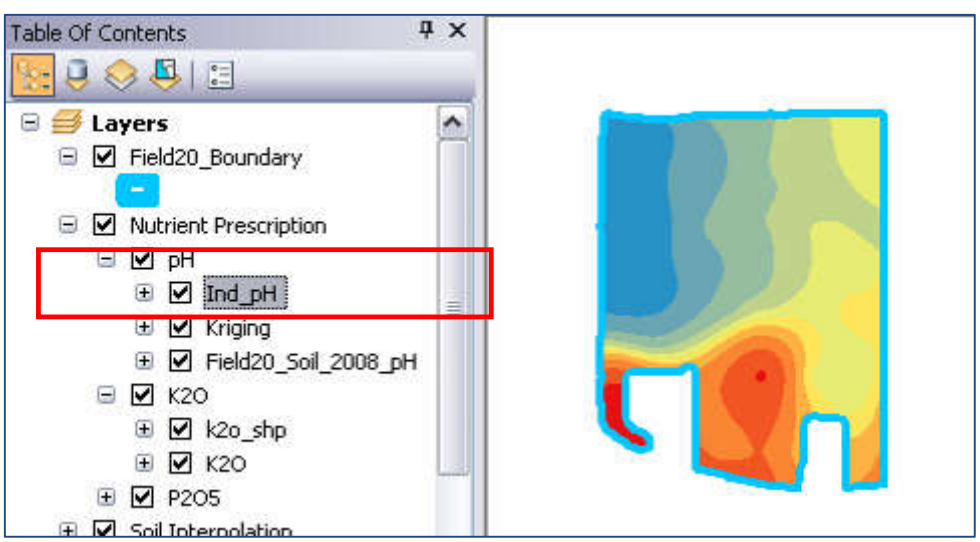


6. A temporary interpolated Kriging pH raster is added to the **Table of Contents**. Right-click on this layer and go to **Layer Properties** > **Extent**. Set the extent to "the rectangular extent of ***Field20_Boundary***".



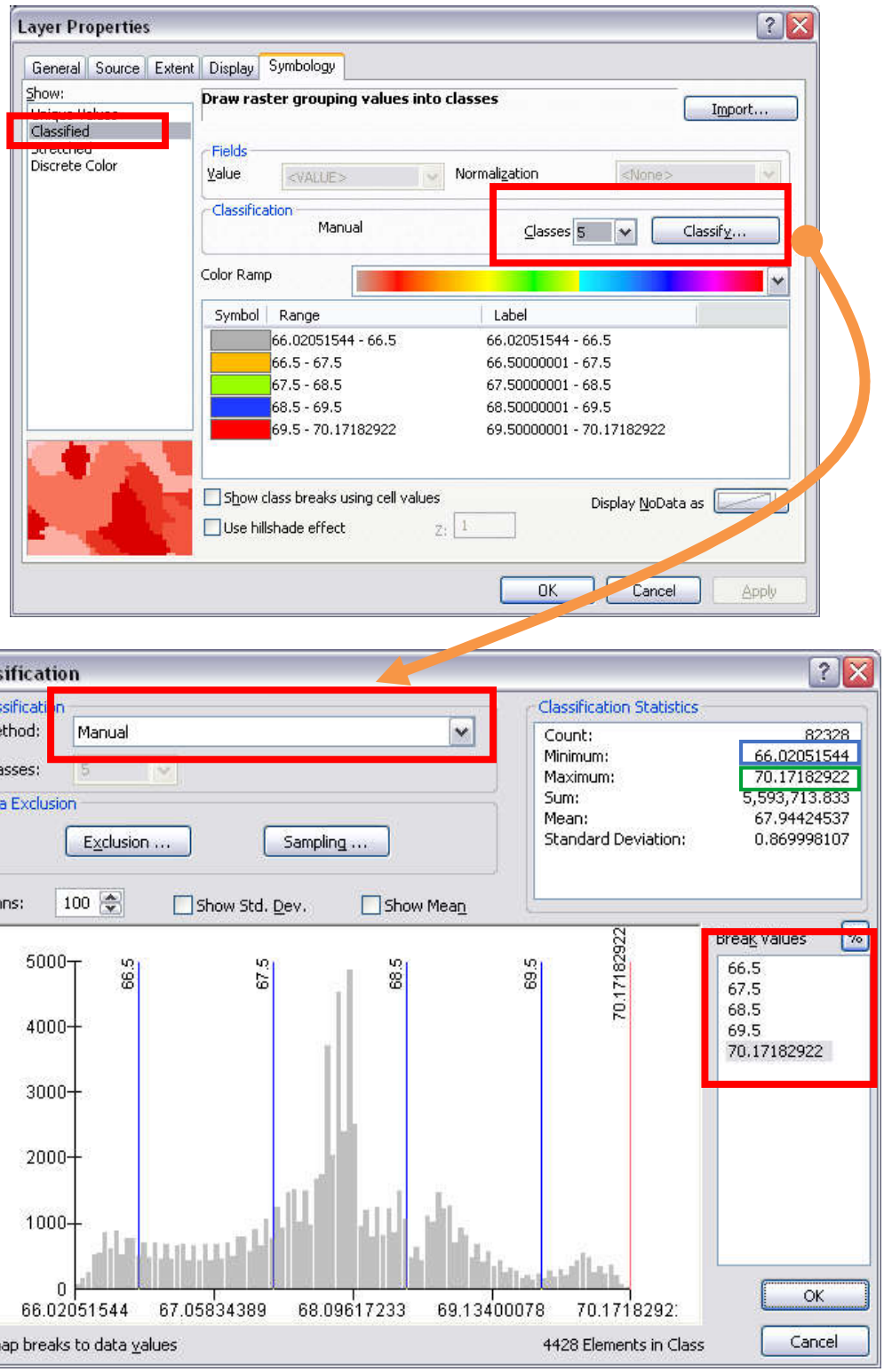
7. Permanently store this kriging map to a raster by right-clicking on **kriging layer** > **Data** > **Export to Raster**. Save this layer as "***Ind_pH***" in the folder Dataset3. Once finish, remove this Kriging layer from the **Table of Contents**.





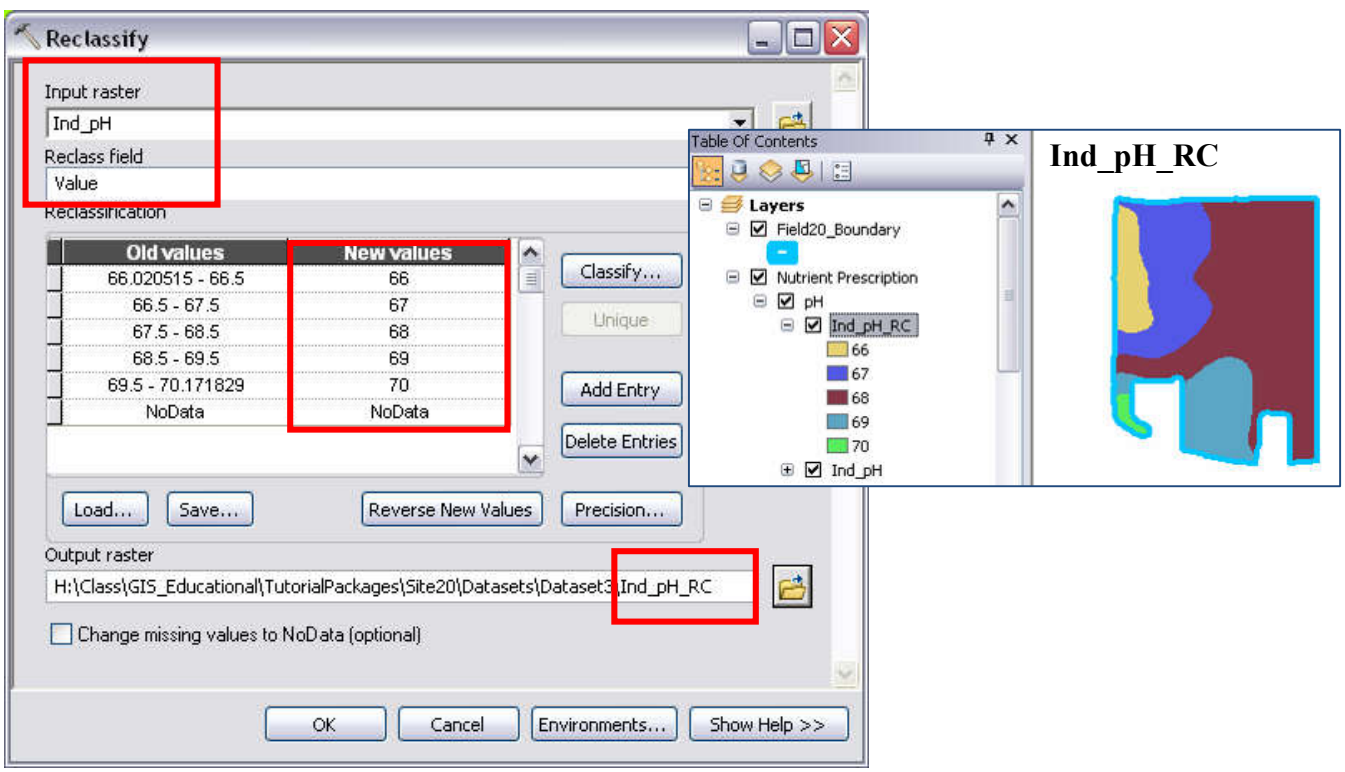
Part 3: Changing pixel values of a raster from "floating" to "integer"

1. In the **Table of Contents**, right-click on ***Ind_pH***. Go to **Layer Properties** > **Symbology**. Choose method = **Classified**; **Classes** = 5. Click **Classify** and choose the classification method as **Manual**. Set **Break Values** as shown. Once done, click **OK** to proceed.



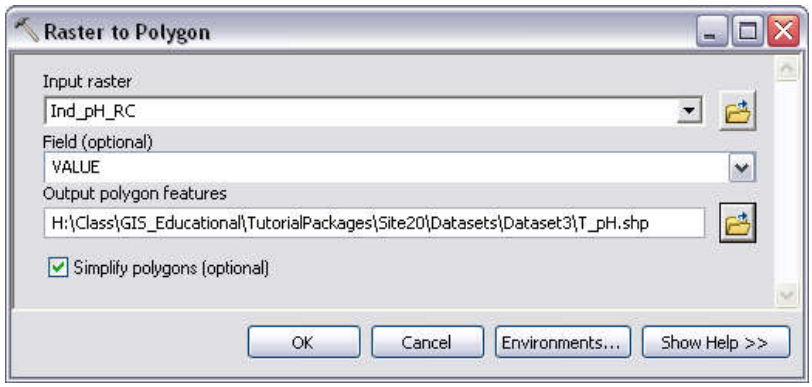
How to determine the number of classes for Lime Index? If you access the file "Soil_pH_Management.xls" under Dataset3 you see that three columns are available. The first "pH_tam" refers to Buffer pH (we are not using this column for this exercise), the second "Ind_pH" refers to Index pH or Lime Index, and the third "pH_17cm" is the Lime Prescription in ton/ha to correct the soil pH to a certain level. The column containing the Lime Index (Ind_pH) presents values that change at a magnitude of 1. Thus the classes created here should also change at the same magnitude. The **Break Values** selected here should start at the integer of the dataset's minimum value+0.5 and finish at the dataset's maximum value. In the example above, the minimum value is approx. 66.02 (blue box), in this case, the first break value should be 66.5 (66, integer of 66.02, + 0.5), while the maximum break value approx. 70.171 (green box). Be aware that these break values are dataset-dependent, as each dataset has different minimum and maximum values. They WILL change for other fields!

2. Reclassify the raster layer ***Ind_pH*** to a new raster containing pixels with integer values.
   Go to **ArcToolbox** > **Spatial Analyst Tools** > **Reclass** > **Reclassify**. Assign new values to reclassify ***Ind_pH*** by clicking **Classify…** and set the number of classes to 5 and break values to be the same as on the table from the step above (Step 1). Click Ok and save it as ***Ind_pH_RC***.

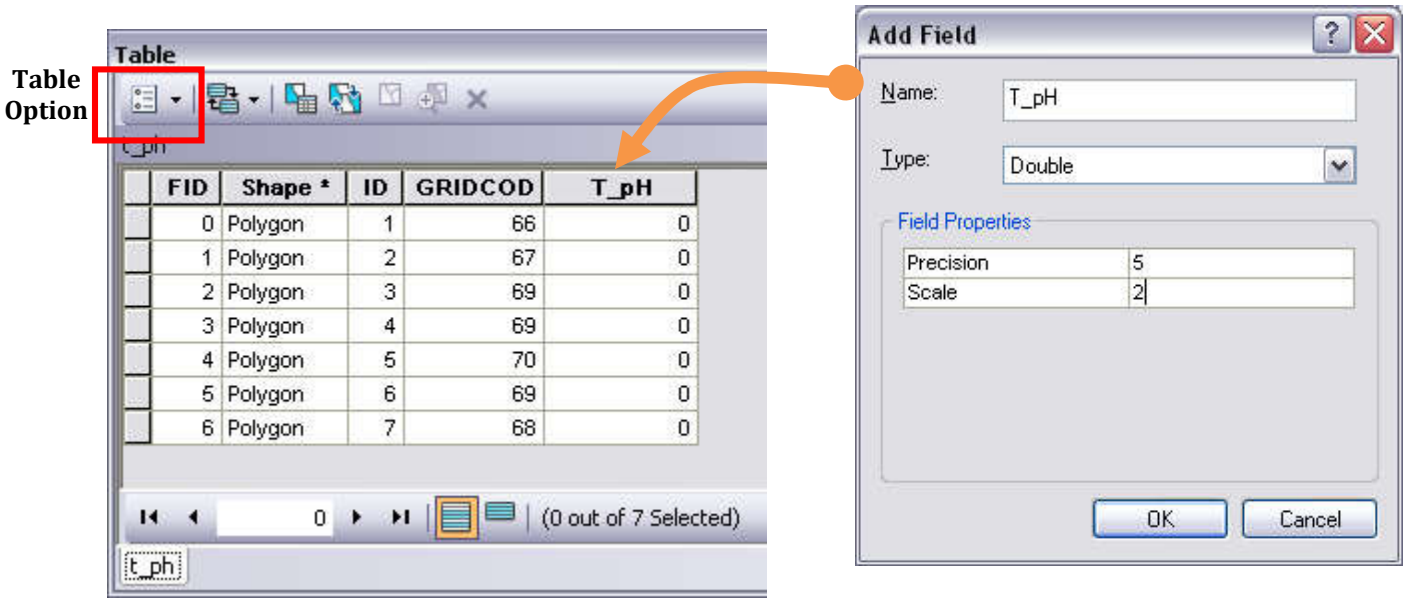


Part 4: Converting integer raster to polygon shapefile

1. Go to **ArcTookbox** > **Conversion Tools** > **From Raster** > **Raster to Polygon**.
   Save the output polygon shapefile as ***T_pH*** (e.q. Target pH). Click OK to proceed.

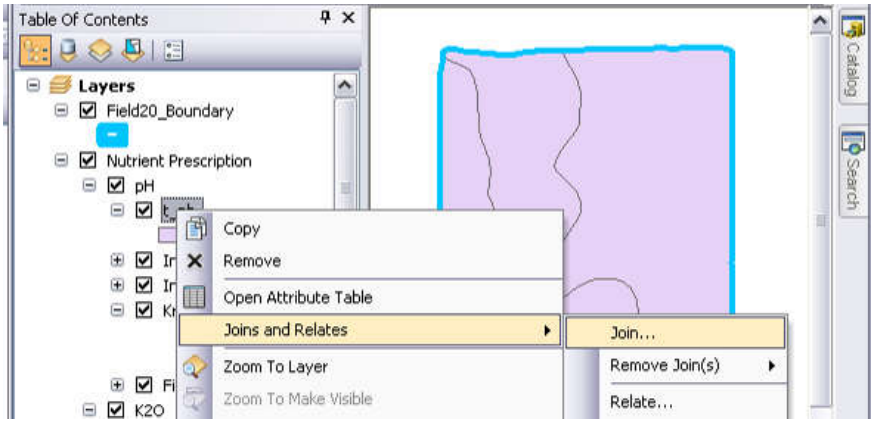


2. In **Table of Contents**, right-click on the new layer ***T_pH*** and select **Open Attribute Table**.
   From the attribute table, click **Table Option** and select **Add Field.**
   In **Add Field** dialog window, set parameters as shown.
   Click OK to proceed and a new field T_pH is added. Close the table.

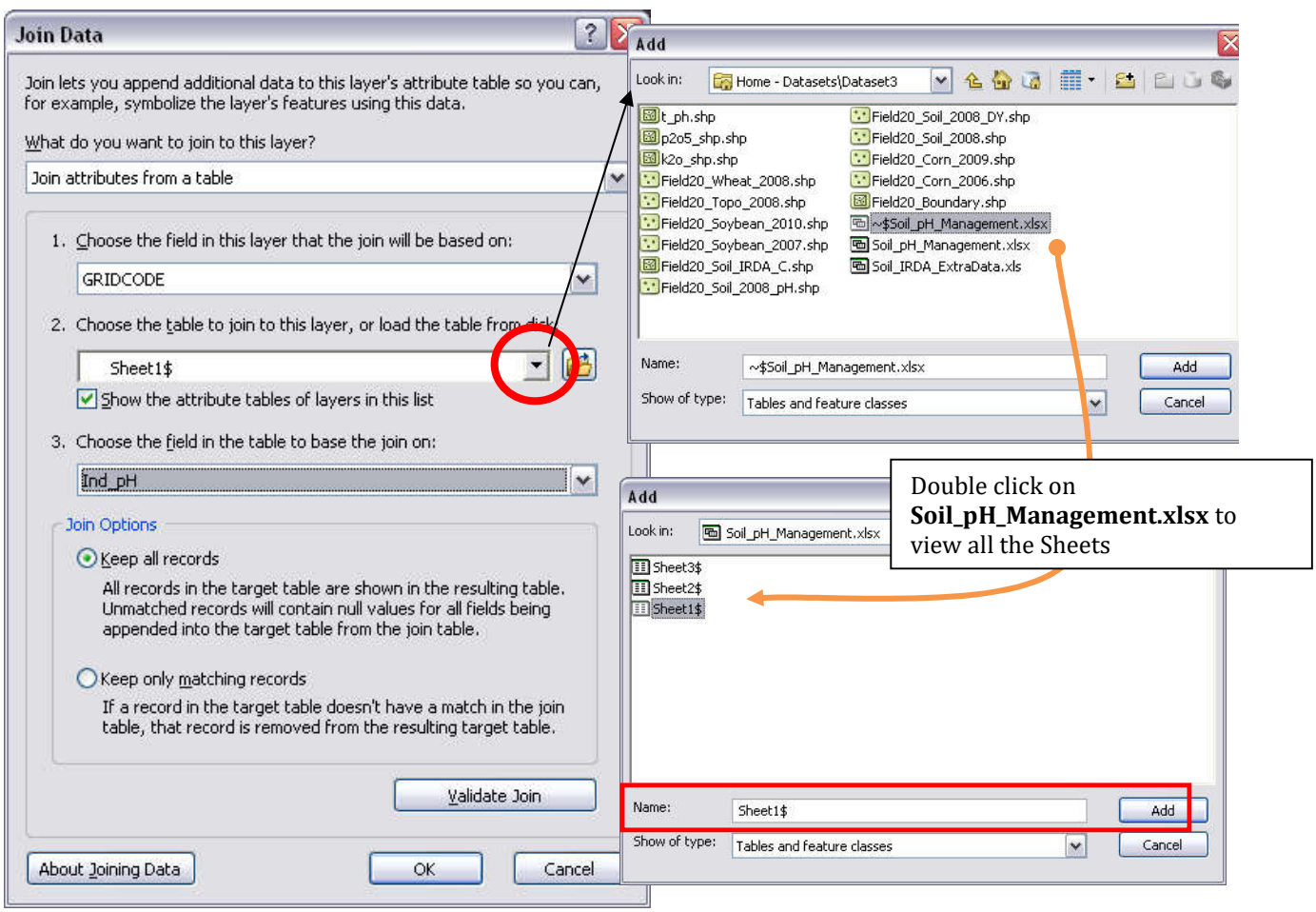


Part 5: Joining an external tabular file to shapefile

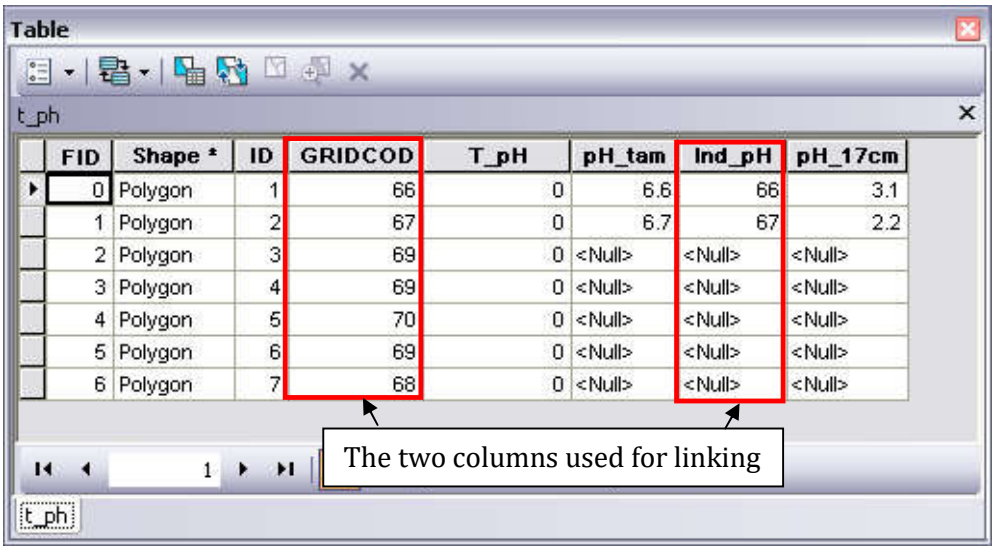
1. In the **Table of Contents**, right-click on ***T_pH*** and select **Joins and Relates** > **Join**



2. In **Join Data** dialog window, select **Join attributes from a table** and the first parameter to be "**GRIDCODE**".
   Set the second parameter by clicking **Add** button. Locate the file ***Soil_pH_Management.xlsx*** in Dataset3 folder. Double-click on the file to locate ***Sheet1$***. Choose this sheet and click Add. Set the third parameter to "**Ind_pH**". Click **OK** to close the Join Data window.



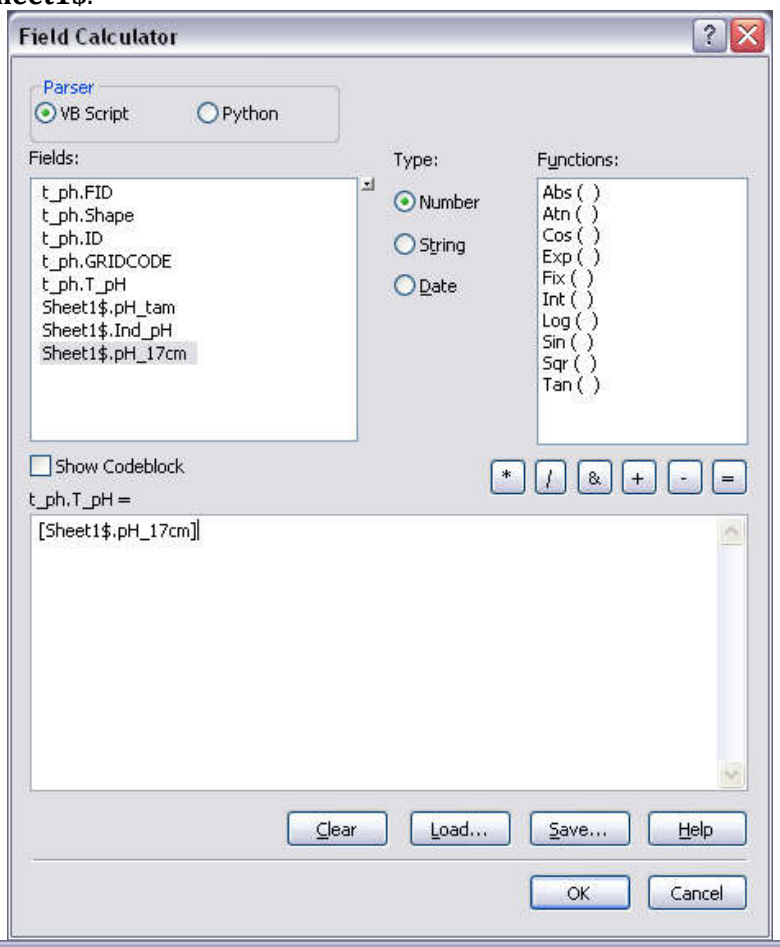
3. Once the external table is joined, the attribute table of ***T_pH*** layer appears as follows.

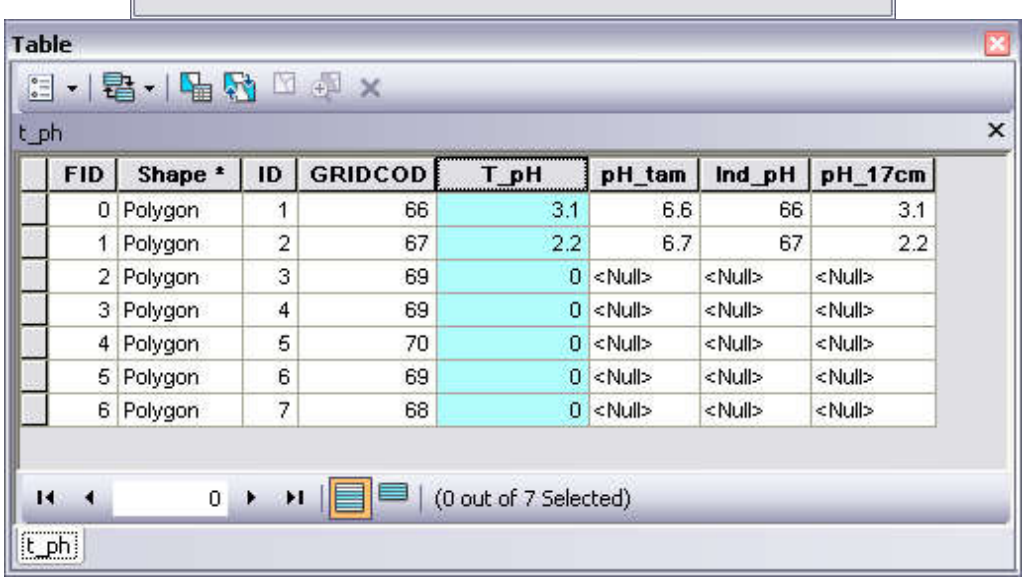


FID	Shape *	ID	GRIDCOD	T_pH	pH_tam	Ind_pH	pH_17cm
0	Polygon	1	66	0	6.6	66	3.1
1	Polygon	2	67	0	6.7	67	2.2
2	Polygon	3	69	0	<Null>	<Null>	<Null>
3	Polygon	4	69	0	<Null>	<Null>	<Null>
4	Polygon	5	70	0	<Null>	<Null>	<Null>
5	Polygon	6	69	0	<Null>	<Null>	<Null>
6	Polygon	7	68	0	<Null>	<Null>	<Null>

4. Now, copy the values of column **pH_17cm** to the column **T_pH** field. Right-click on the field **T_pH** and select **Field Calculator**. In the **Field Calculator** window, double-click on "Sheet1$.pH_17cm" and click **OK**. The field T_pH is updated.
   Once done, close this attribute table.

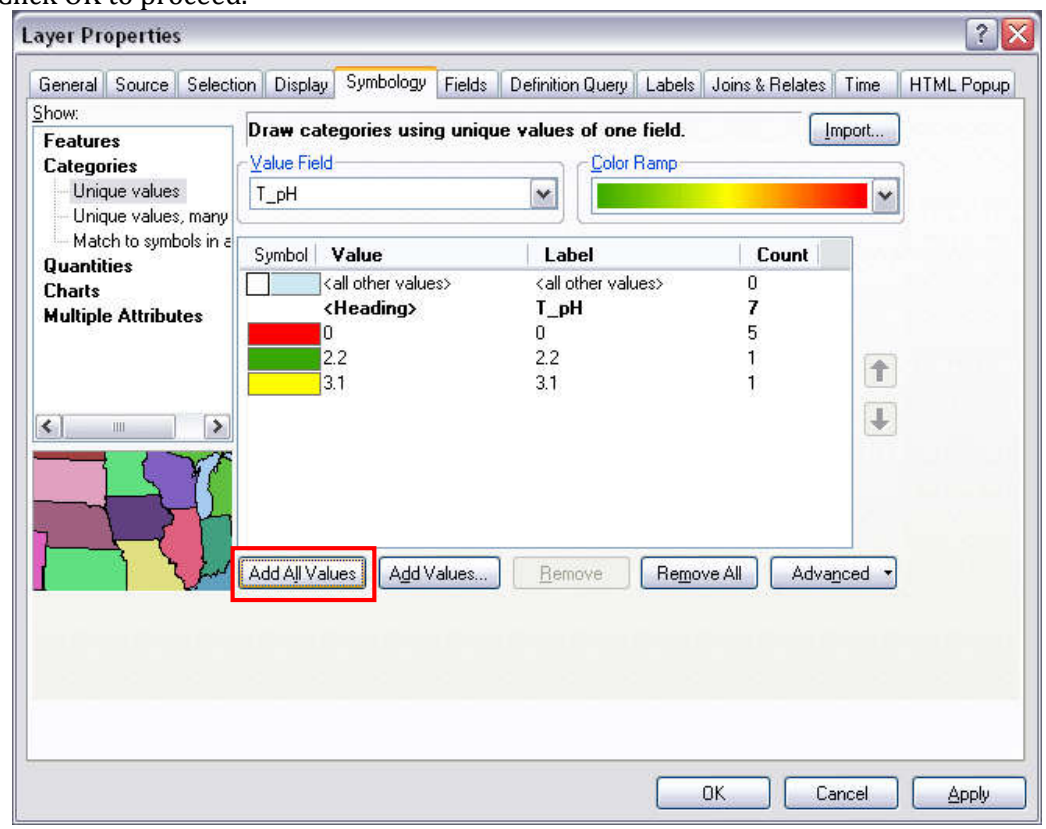
   Remove the joined table by right clicking on the layer ***T_pH*** > **Joins and Relates** > **Remove Join(s)** > **Sheet1$**.



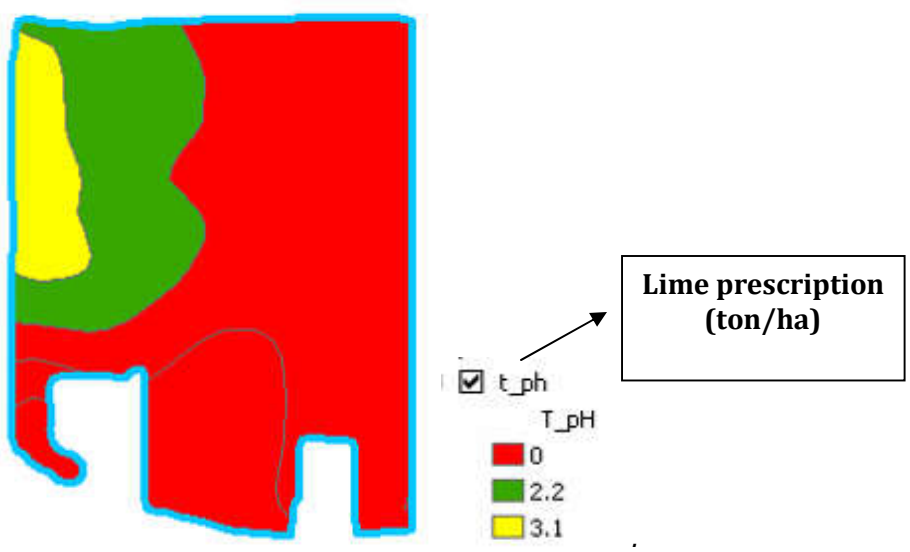


FID	Shape *	ID	GRIDCOD	T_pH	pH_tam	Ind_pH	pH_17cm
0	Polygon	1	66	3.1	6.6	66	3.1
1	Polygon	2	67	2.2	6.7	67	2.2
2	Polygon	3	69	0	<Null>	<Null>	<Null>
3	Polygon	4	69	0	<Null>	<Null>	<Null>
4	Polygon	5	70	0	<Null>	<Null>	<Null>
5	Polygon	6	69	0	<Null>	<Null>	<Null>
6	Polygon	7	68	0	<Null>	<Null>	<Null>

5. Open Layer Properties of the layer ***T_pH*** and go to **Symbology.** Choose Categories = Unique values and Value Field = T_pH.
   Click OK to proceed.



As a result, the following polygonal lime requirement map is presented. The red area requires little or no lime.



6. Save the project.