# **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
<b>Techniques</b> :	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 <u>this short article</u>.



vlethods	Input Data		
Deterministic methods	🖯 Dataset		
Inverse Distance Weighting	Source Dataset	Field20_Soil_2008_pH	
Global Polynomial Interpolation	Data Field	Ind_pH_new	
Local Polynomial Interpolation	🖂 Dataset 2	12 AZ 2005	
Radial Basis Functions	Source Dataset	<none></none>	
Geostatistical methods	🖂 Dataset 3		
Kriging / CoKriging	Source Dataset	<none></none>	
Incerpolation with Darriers	🖯 Dataset 4		
Nerrier Smoothing	Source Dataset	<none></none>	-

- 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*".

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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.

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Nutrient Prescription     Nutrient Prescription     PH     PH     PH     Ind_pH     Field20_Soil_2008_pH     Field20_Soil_2008_pH     K20     W K20_shp	
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**Part 3**: Changing pixel values of a raster from "floating" to "integer"

 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.

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**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!

 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*.

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### 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.

Input raster			
Ind_pH_RC			I 🖻
Field (optional)			
VALUE			~
Output polygon feature	5		
H:\Class\GIS_Education	nal\TutorialPackages\Site2	0\Datasets\Dataset3\T_pH.shp	
Simplify polygons (o	otional)		

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.

	FID	Shape *	ID	GRIDCOD	T_pH	13	Type:	Double		
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	3	Polygon	4	69	0				1.00	
	4	Polygon	5	70	0					
	5	Polygon	6	69	0					
	6	Polygon	7	68	0					

### Part 5: Joining an external tabular file to shapefile 1. In the **Table of Contents**, right-click on *Tp***<b>H** 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.

oin Data	? ZAdd
Join lets you append additional data to this layer's attribute table so yo for example, symbolize the layer's features using this data. <u>What do you want to join to this layer?</u> Join attributes from a table 1. <u>Choose the field in this layer that the join will be based on:</u> <u>GRIDCODE</u> 2. Choose the table to join to this layer, or load the table from the	Look in:       Image: Home - Datasets\Dataset3       Image: Look in:       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Look in:       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Look in:       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3         Image: Look in:       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3       Image: Home - Datasets\Dataset3         Image: Look in:         Image: Look in:       Image: Look in:       Image: Look in:       Image: Look in:       Image: Look in:         Image: Look in:       Image: Look in:       Image: Look in:       Image: Look in:       Image: Look in:         Image: Look in:
Sheet1\$ Sheet1\$ Sheet1\$ Sheet1\$ Show the attribute tables of layers in this list Choose the field in the table to base the join on: Ind_pH Join Options Keep all records All records in the target table are shown in the resulting table Unmatched records will contain null values for all fields being appended into the target table from the join table. Keep only matching records If a record in the target table doesn't have a match in the join	Name: ~\$Soil_pH_Management.xlsx Add Show of type: Tables and feature classes Cancel Add Look in: Soil_pH_Management.xlsx II Sheet3\$ II Sheet3\$ II Sheet2\$ II Sheet1\$
About Joining Data	Name:     Sheet1\$       Show of type:     Tables and feature classes       Cancel

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></null>	<null></null>
3	Polygon	4	69	0	<null></null>	<null></null>	<null></null>
4	Polygon	6	70	0	<null></null>	<null></null>	<null></null>
5	Polygon	6	69	0	<null></null>	<null></null>	<null></null>
6	Polygon	7	68	0	<null></null>	<null></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\$.

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 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.

General Source Select	tion Display Symbology Fi	elds Definition Query Labe	ls Joins & Relates Tir	me HTML Popup
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As a result, the following polygonal lime requirement map is presented. The red area requires little or no lime.



6. Save the project.