

Using ArcGIS Pro: Creating Points from Coordinates

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Introduction

ArcGIS Pro® is a geographic information system (GIS) software platform developed by ESRI. The company began its development of GIS software in the early 1990s with the release of ArcView, which eventually evolved into ArcGIS Desktop. Since 2015, ESRI has been transitioning to replace ArcGIS Desktop with ArcGIS Pro.

A GIS is a software package that connects databases to geographically known locations usually depicted by geographic coordinates such as latitude and longitude. ArcGIS Pro breaks database features into three simple items: points, lines and polygons. Points may be defined spatially as a single pair of latitude and longitude coordinates, while a line is described by at least two pairs of coordinates. A polygon may be defined spatially by multiple pairs of coordinates with two sets overlapping so that the polygon is a closed shape, such as a field boundary. ArcGIS Pro allows for the efficient development of maps with spatial integrity, addition of features with coordinates collected with Global Positioning Systems (GPS), and overlay of spatially correlated data layers. It has many display and analysis features that make it a powerful tool in dealing with spatially explicit datasets.

A GIS has many uses in agriculture, such as displaying yield maps, satellite imagery, and defining a collection of points that represent a soil testing grid from which variable-rate

fertilizer application rates can be developed. For example, if a field boundary has been developed into a polygon and stored into a data file known as a shapefile, then a soil sampling grid can be developed within the boundary to guide exactly where grid soil samples should be collected. The grid points can be spaced based upon the user's desired coverage of the field. The shapefile containing the spatial coordinates can be easily exported to a GPS to navigate to its location within the field.

Points containing geographic coordinates can be made in ArcGIS Pro in the form of a shapefile or feature class. This is useful when presented with a list of X,Y coordinates that has information associated with each point, such as in soil test data. Generating a point shapefile or feature class containing this data allows for analysis of the data's geographic distribution. Furthermore, point shapefiles or feature classes containing data are the foundation for ArcGIS interpolation tools, which among other things can be used to analyze changes in soil over time or across different depths.

The goal of this fact sheet is to help the reader develop navigable grid points where soil or other sampling locations can be located and the results depicted in a spatially explicit map. The information included here assumes a basic knowledge of or exposure to ArcGIS Pro software navigation. ArcGIS Pro version 2.4.0 was used in the development of this fact sheet.

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Preparing the Data

The data containing the X,Y coordinates that will be used for the point shapefile or feature class must first be prepared in a spreadsheet application such as Excel. Each row that represents an object or point should have columns for a unique ID (such as a sample number), latitude coordinates, and longitude coordinates. Additional data associated with the points (i.e. Phosphorus, Nitrogen, Potassium, etc. soil test values) should also be in columns.

The data for each point shapefile or feature class that will be created should be contained in one sheet of a workbook. Therefore, divide the workbook into separate sheets for each category that is to be analyzed. For example, if there are soil test results from two depths for two different fields, there should be four sheets in the workbook (Depth A on Field 1, Depth B on Field 1, Depth A on Field 2, and Depth B on Field 2). Note that the unique ID, latitude and longitude should match across sheets if they represent the same point in the field. Organizing the data in this way is necessary for creating an interpolation map of results across a single category.

Creating the Point Feature or Shapefile

Open the **Catalog Pane** in the **View** tab (Fig. 1). Navigate to and open the folder where the spreadsheet is located. If not listed in the **Folders** tab, right click Folders and select **Add Folder Connection** (Fig. 2).

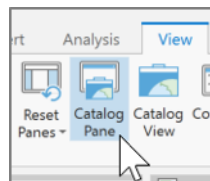


Figure 1. Catalog Pane button in the View tab.

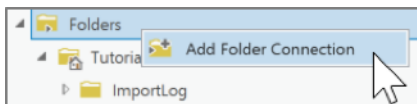


Figure 2. Add Folder Connection to link to where the spreadsheet is located.

Expand the workbook (Excel file) and right-click the individual sheet that will

be used. Select **Export > Table to Point Feature Class** (Fig. 3). This opens the Geoprocessing pane for the **XY Table to Point** tool.

The **Input Table** will be populated by default from the opening the tool. Press the folder by

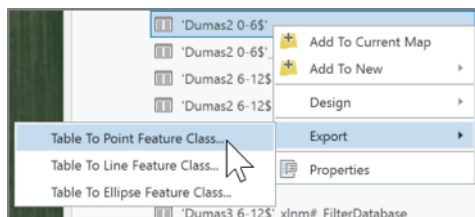


Figure 3. Selecting the **Table to Point Feature Class** option from right-clicking the desired sheet.

Output Feature Class to name and choose where the feature class or shapefile will be saved. Opening a **File Geodatabase (.gdb)** and saving there will create a point feature class within that geodatabase. To

create a point shapefile, save within a folder and not a File Geodatabase, in which case the **Output Feature Class** will automatically add **.shp** to the end of the file name.

File Geodatabases are useful for consolidating many features (i.e. polygons, points, and/or lines) into one location. Shapefiles are independent files that only represent one feature type (i.e. point, line, or polygon).

ArcGIS will attempt to automatically populate the **X Field** and **Y Field** based upon the data in the input table. Make sure these selections are correct by ensuring the **X Field** is the longitude and the **Y Field** is the latitude. If necessary, change assigned fields by selecting the drop-down menu arrow. Unless working with 3D data, the **Z Field** will remain blank.

Press the drop-down menu arrow of **Coordinate System** to select the same coordinate system as an existing layer on the map, or press the globe button to select an appropriate coordinate system. For the field scale of this example, the Projected Coordinate System NAD 1983 is used. Press **Run** to execute the tool (Fig. 4).

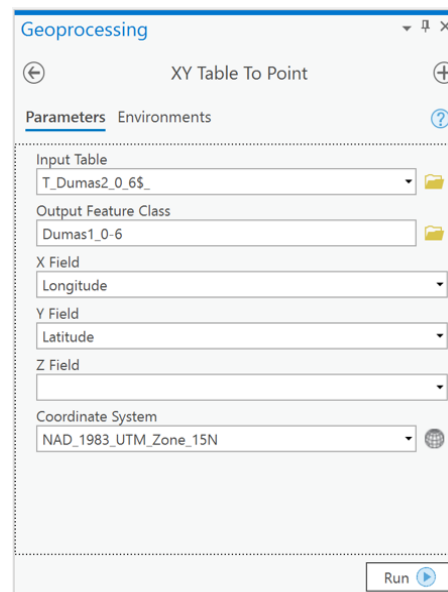


Figure 4. Settings for **XY Table to Point** tool in the Geoprocessing pane.

If desired, the process for the **XY Table to Point** tool can be repeated for each sheet that was created when preparing the data in the spreadsheet application. Change the **Input Table** to the new sheet, and prepare the remaining options accordingly as detailed above.

Add the newly created point shapefiles or feature classes to the map by right-clicking them in the **Contents** pane and pressing **Add to Map** or by pressing the **Add Data** button in the **Map** tab.

Labeling and Symbology

Apply labels by right-clicking the point shapefile or feature class in the **Contents** pane and press **Label**. From the **Labeling** tab of the **Feature Layer** menu, the label category and many other display settings for the labels can be defined (Fig. 5).

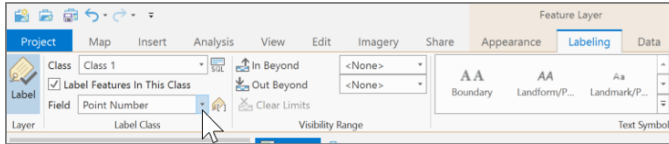


Figure 5. The **Labeling** tab of the **Feature Layer**, where detailed settings for labels can be specified.

Press the drop-down arrow by **Field** in the **Label Class** section to choose the desired category for labeling. Alter the font face, color, and size in the **Text Symbol** section. The label placement in relation to the point can also be specified. For both **Text Symbol** and **Label Placement**, open the menu for more advanced options by pressing the button in the bottom right corner of the section.

In the **Appearance** tab of the **Feature Layer** menu, press **Symbology** to open the Symbology pane. The primary symbology can be changed depending on the information that is being conveyed. By default, **Single Symbol** is selected. This setting is good for simply showing where the points are on a map; there is no distinction in appearance between the points. Press the image by the **Symbol** category to change the appearance (i.e. color and size) and press **Apply** to save the settings (Fig. 6).

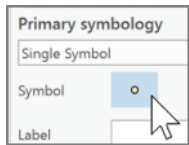


Figure 6. Pressing the Symbol image opens the appearance properties menu.

Back in the **Symbology** pane, the **Primary Symbology** of **Unique Values** makes each point associated with a certain value appear in a different color. In the case of soil test results, this setting is not particularly useful because each point's data is usually a different value. However, an example where Unique Values would be useful is if the point shapefile or feature class contained identifying features about objects in a field (i.e. each point represented either a tree, fence post, boulder, etc.). Applying Unique Values and specifying "Field 1" as the object type would make each point of that object type the same color (i.e. all trees are green, all fence posts are brown, etc.).

The **Primary Symbology** of **Graduated Colors** is highly suitable for soil test results, as points with values in a specified range appear the same color. For example, phosphorus soil test values can be divided by color in the range specified by the [University of Arkansas phosphorus fertilizer recommendations for soybean crops](#).

After selecting **Graduated Colors** as the **Primary Symbology**, the **Field** is the phosphorus soil test values column selected from the drop-down menu. The **Method** in this particular example would be **Manual Interval** (Fig. 7).

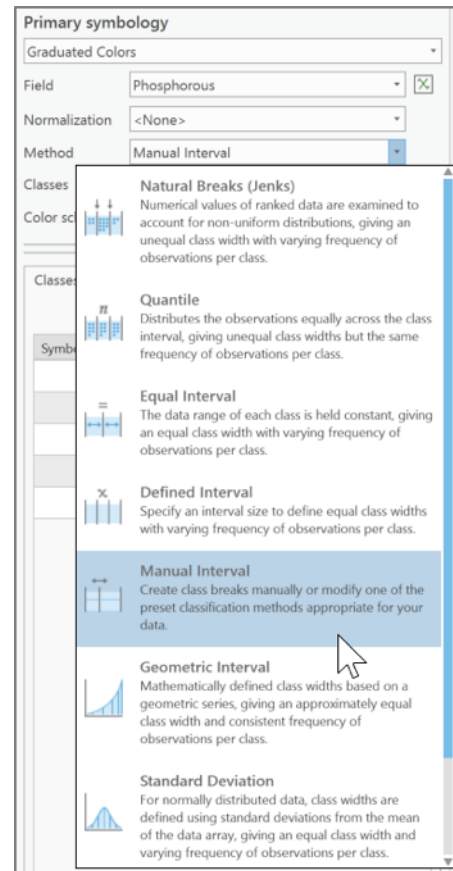


Figure 7. Use **Manual Interval** to enter specified numerical values that represent each color range.

Select a pre-defined color scheme, or change the symbol colors individually by clicking the point image in the **Classes** table (Fig. 8). Click the **Upper value** column for the first value in the **Classes** table and enter 15.999. This represents the "Very Low" soil test level for soybeans defined in the Arkansas Soybean Production Handbook. The next value entered is 25.999 to represent "Low" values of 16 – 25. This would be followed

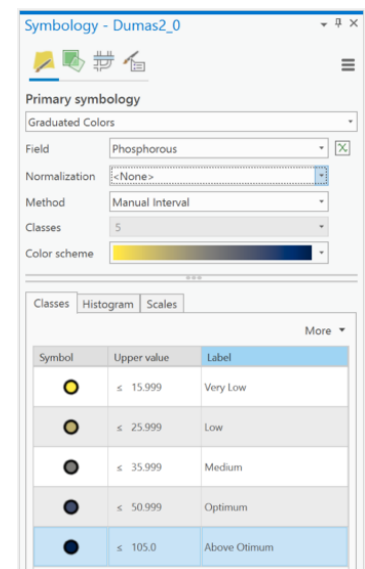


Figure 8. Settings of **Manual Interval** symbology based on the example of phosphorus soil test results following the University of Arkansas soybean fertilizer recommendations.

by 35.999 to represent “Medium” values of 26 – 35. The next entry would be 50.999 to represent “Optimum” values of 36 – 50. The last entry is by default the highest value included in the data set. If this value falls into the “Above Optimum” range of ≥ 51 , no change is necessary. However, if the highest value in the data set is below the “Above Optimum” range, the value of the last symbol entry would be entered as 51.999.

The **Label** column entries for each symbol can be changed to the soil test value ranges, or as text labels of “Very Low” through “Above Optimum” (Fig. 9).

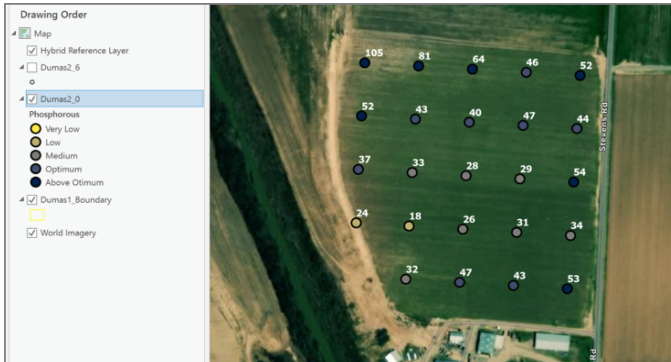


Figure 9. An example map display of phosphorus soil test results using the **Graduated Colors** symbology.

Conclusion

By preparing the data appropriately beforehand, creating a point shapefile or feature class can be a quick, straightforward way to visualize and communicate information associated with geographic locations. The versatile style capabilities of ArcGIS Pro allow for a personalized representation of the point shape, colors and labels. For additional learning, ESRI has highly informative [help resources](#) and [quick-start tutorials](#) available on its website, as well as a supportive [community of GIS users](#).