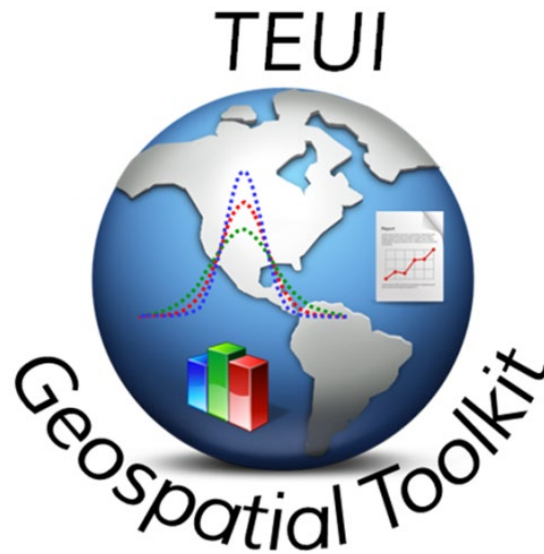# Graphs and Tables

Welcome to the Graphs and Tables training module for the TEUI Geospatial Toolkit!

Training Objective:

Learn to visualize statistics using the Toolkit graphs and tables. Learn to export statistics data in a .csv file format for use in other programs.

You will learn how to:

- Open an existing project
- Use TEUI graphs
- Use TEUI tables
- Export data to a .csv file

Required data:

- Your Toolkit project (with statistics already completed) from **Exercise 2: Data Management and Statistics.** In case you had trouble generating statistics, they are provided for you in the **TEUI_Training | wa680_stats** folder.
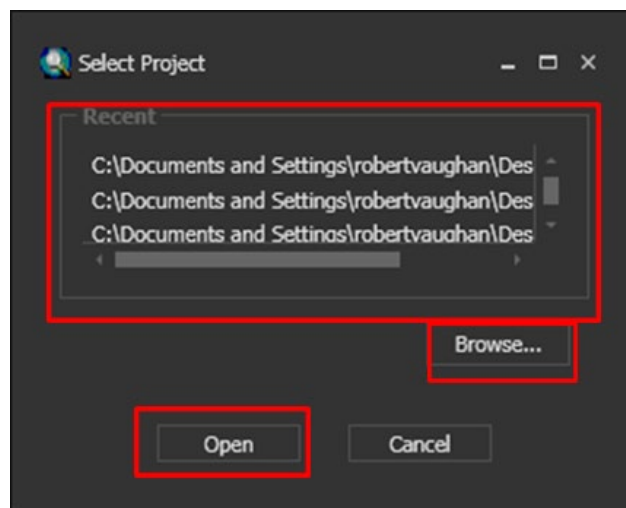
Contents

Part 1: Opening a Toolkit Project

A. Open an existing Toolkit Project

1. Start an ArcMap session.

2. Select the Folder icon on the Toolkit toolbar.

3. The Select Project dialog will appear.

4. Recent projects can be opened by selecting a project in the '**Recent**' panel and clicking **Open**.

5. If you don't see your project in the Recent panel, select **Browse….** and navigate to the location of the project.

# Part 2: Visualizing Data with Graphs and Tables

A primary feature of the Toolkit is visualizing zonal statistics using graphs and tables.

A. Overview of graphs and tables

1. To create a graph, click on the **Display Graph** button on the Toolkit Toolbar.

2. A blank graph window will appear. You can open as many individual graph windows as you want. Let's stick with just one for this training. Next, we will look at some of the features of the graph window.

3. Click on the **green plus button** in the upper left corner of the graph window.
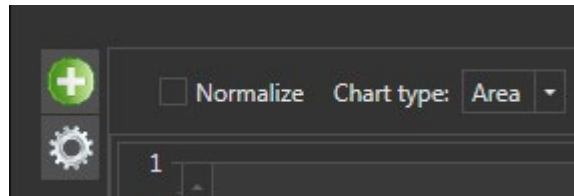

- The Add Series window will appear. You can pin the window open or close by clicking the pin in the upper right corner of the window. You can also move the Add Series window and dock it to any side of the main graph window by clicking and dragging the orange bar.

- The **Data View Type** dropdown has two options:
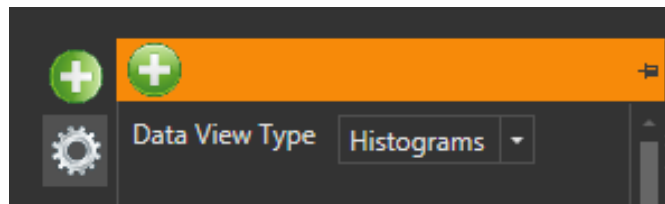
   o **Histograms**: This is the default option. This option allows the greatest flexibility when comparing individual polygons against other individual polygons, individual polygons against map units, or map units against map units (if map units were chosen when the statistics were calculated).

   o **Map Units**: This data view type contains default graphs useful for comparing map units or other aggregated statistics types. These graphs have the mean (solid line), range (darker colored area), and standard deviation (lighter colored area) on the same graph, for each polygon within a map unit.

- **Analysis Features** section:
   o **Feature Source**: Choose which feature analysis layer you would like to graph. Remember, this can be either a feature class or a discrete raster dataset.
   o **Map Unit**: Chose from which map unit you would like to select a feature to graph. Alternatively, select just the map unit you want to graph as a whole (i.e., don't select an individual feature below).

- Feature: Select the individual feature you would like to view statistics for. This is the Feature ID or FID.

- **Raster Data** section:
  - **Raster Source**: Select the raster layer you wish to view the statistics from.
  - **Raster Band**: If the Raster Source is a multi-band raster, such as a Landsat multi-spectral image, select the band of interest.

- **Statistics** section:
  - Check the boxes next to **average** and **standard deviation** if you want them to be included in the graph.
  - Set a **percentile** to display.

- **Set Graph** button: Click once to finish and the graph should appear.

- **Add Series From Attribute Column:** graph a field from one of the Feature Layers.

- **Top of graph window**:
  - **Chart type**: You can choose the type of graph that best represents your data. The default is the **Area** chart. The **Radial** type is only meant for displaying **Aspect** data.
  - **Normalize**: Check this box to normalize data when you have very large differences between map units or data types. This will graph the layer as a percent (out of 100%) of its total cell count.

4. Click the sprocket button on the upper left corner of the graph window.
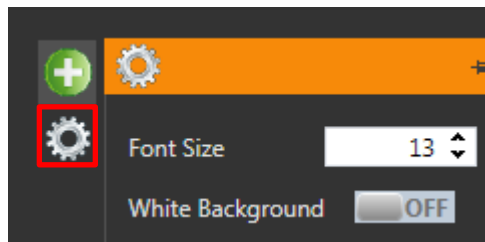

5. In the sprocket window, try adjusting the font size and changing the background color.

B. Histograms

1. Click the green plus button in the upper left corner of the graph window.

2. Confirm that the **Histograms** is selected as the **Data View Type.**

3. In the **Feature Source** drop down menu select the **soilmu_a_wa680 layer**. Be sure it is **not** the **soilmu_a_wa680_raster** option.

4. In the **Map Unit** drop down menu select map unit **128** and click OK.

5. Leave the **Feature** field blank**.**

6. For **Raster Source** select **DEM**.

7. For **Raster Band** select **Layer_1**.

8. For **Statistics** check the boxes next to **average** and **standard deviation**.
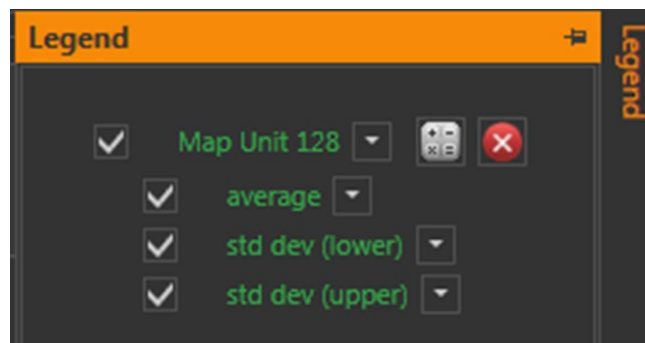
9. Click **Set Graph**.
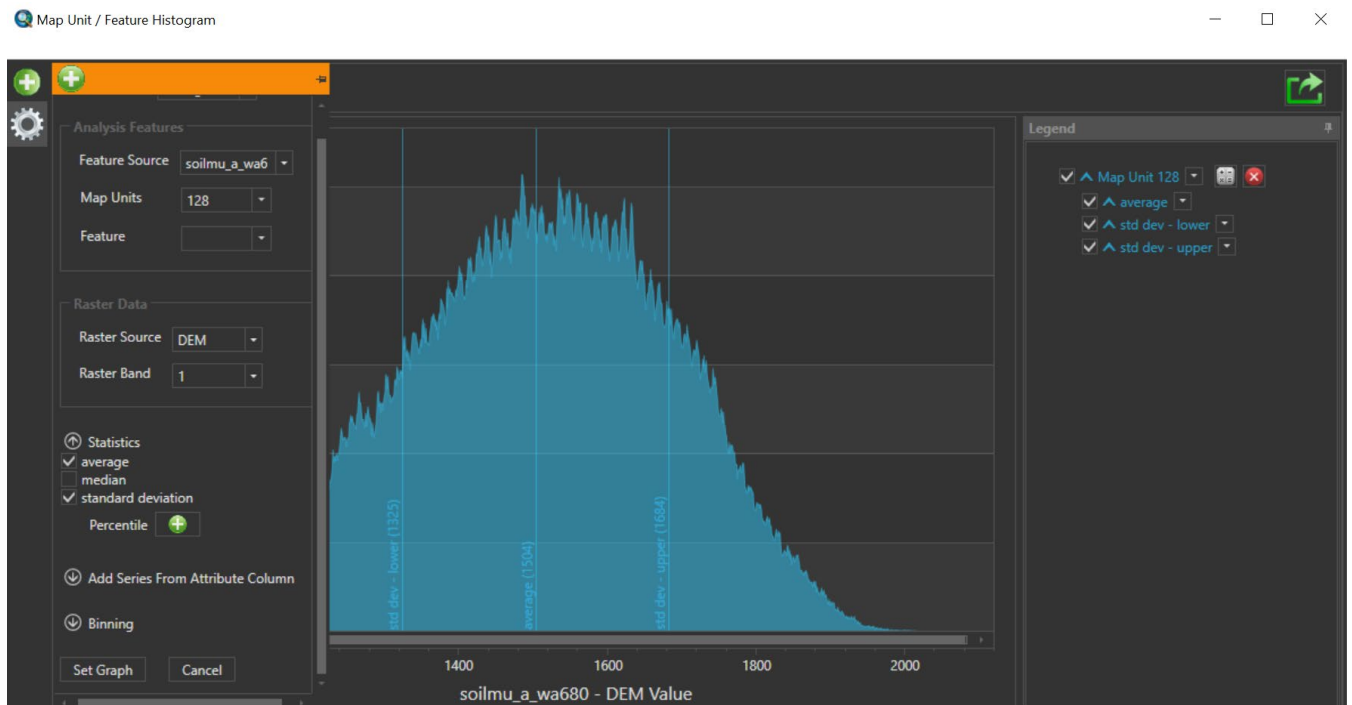
Hint: If needed, make the graph pane larger or smaller by hovering your mouse over the right side of the graph until the cursor changes to a double arrow. Click and drag the graph window to the desired size. You can also do this to the individual elements of the graph such as the legend.
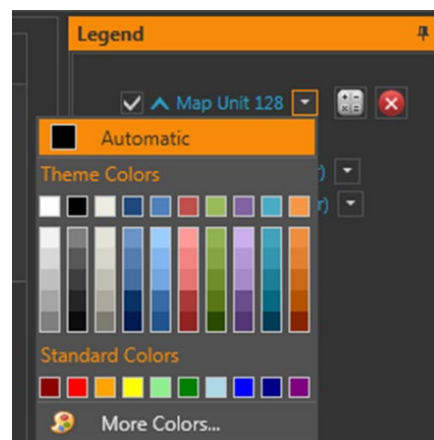
10. At the top of the graph window, select the **Chart type** drop down menu and set it to **Line**.
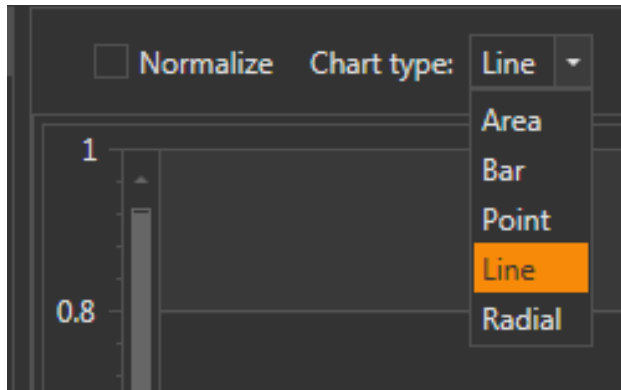
11. Now, let's take a closer look at the graph legend and its functionality.

12. Click on the **down arrow** to the right of "**Map unit 128**". A color palette will open up which will allow you to change the color of the series in the graph.

13. In the **Add Series** pane, click the arrow next to **Feature**, select any number, then click **Set Graph**. You will then see that feature (**Zone**) listed under its **Map Unit** in the **Legend** pane.
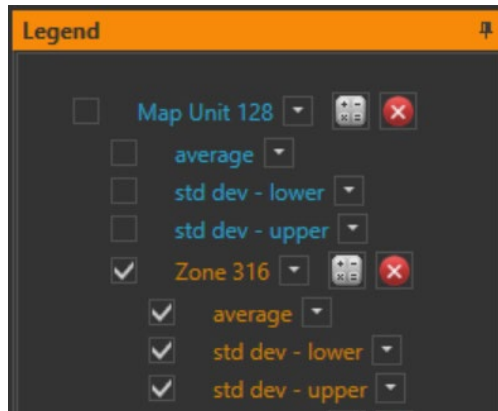
14. The button next to the red x is the **table button**. Clicking on this button will display a table of the statistics associated with that zone (feature). Take a moment to check out the statistics calculated.


Statistic	Value
FeatureId	316
RasterBand	1
Mean	1701.97
Majority	1699
MajorityPercentage	0.009287
Maximum	1953
Minimum	1553
Minority	1553
Range	400
Std	72.63
Sum	11362358
Median	1696
Variety	391
Count	6676
NoDataCount	0
TotalDataCount	6676

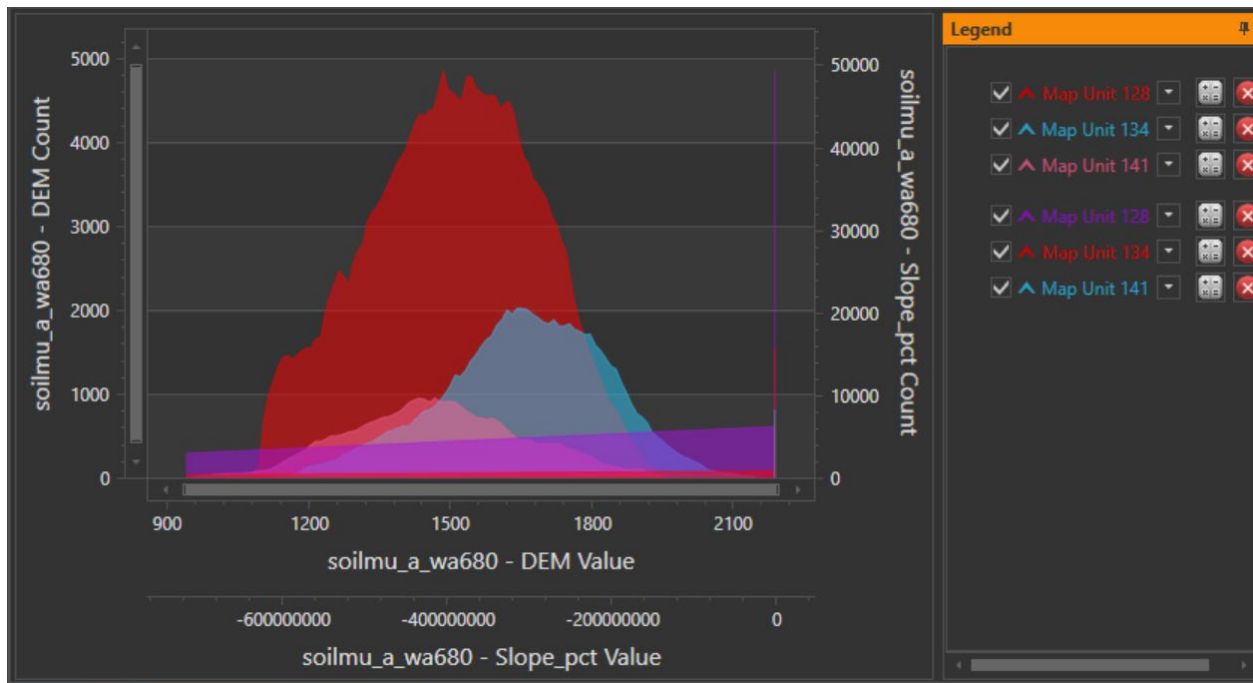15. Close the table by hitting the **x** in the upper right corner.

16. To print a graph, click the **print** button (green box with arrow in upper right of graph window. A dialog will open up and allow the user to print or export the graph in many different formats (.jpeg, .bmp, .pdf, etc.).
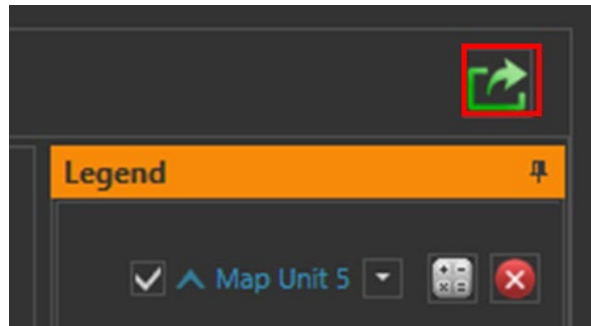
17. Close the print preview.

18. Finally, the **red circle x** button removes a graph series from the legend and the graph window. Remove all series from the graph.

19. Next, using the **same** Data View Type, Feature Source, Raster Source, and Raster Band, add map units **134** and **141** to your graph.

20. Next, using the same data view type and feature source, select **map unit 128**. Leave the feature selection blank. This time, select for your **Raster Source**, **Slope_pct**. Select raster band **Layer_1** and select **Set Graph**.

*Note: Notice that you can graph the statistics of more than one layer at a time (in this case **DEM** and **Slope_pct**). New axes have been added to accommodate the new layer. You can add as many as you wish. Also, notice that the new layer has been added to the legend under the DEM.*

Legend

✓ ∧ Map Unit 128 ▾ ⊞ ✕
✓ ∧ Map Unit 134 ▾ ⊞ ✕
✓ ∧ Map Unit 141 ▾ ⊞ ✕

✓ ∧ Map Unit 128 ▾ ⊞ ✕
✓ ∧ Map Unit 134 ▾ ⊞ ✕
✓ ∧ Map Unit 141 ▾ ⊞ ✕

Hint: *One neat feature that you have probably noticed already is that if you place your cursor in the graph area when you have data a window will appear that tells you the value of your data.*

21. Check the **Normalize** box in the upper left hand corner of the graph area.
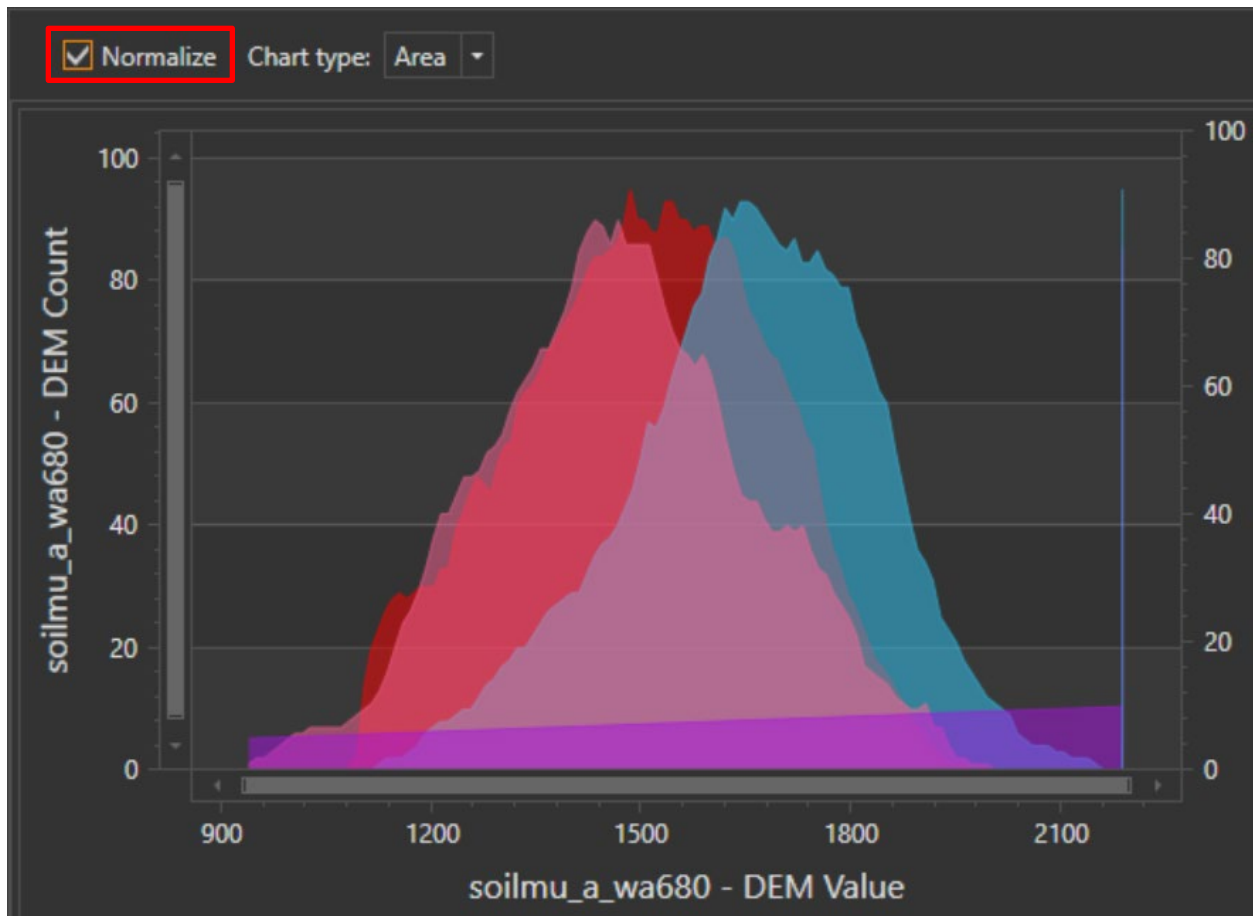
> i. Notice that each layer is now graphed as a percent of its total cell count . This is useful for comparing the distribution of values in different sized units.

Part 3: Map Unit Analysis

So far, you have been viewing the statistics of individual map units and polygons. These statistics were limited to viewing a histogram of all the cells under a specific polygon or all the polygons in a map unit. While viewing a histogram can reveal many things, especially when looking at a table of associated descriptive statistics, sometimes it is also nice to view a graph of the associated descriptive statistics for whole map units.

1. Just as before, **remove all map units** from the graph window by clicking on each **red x** in the graph legend.

2. Under the **Add series** tab, select **Map Units**. For Feature Source select **soilmu_a_wa680** and **map unit 2**. Raster source should be **DEM** and Raster Band is **Layer_1**. Click **Set Graph**.
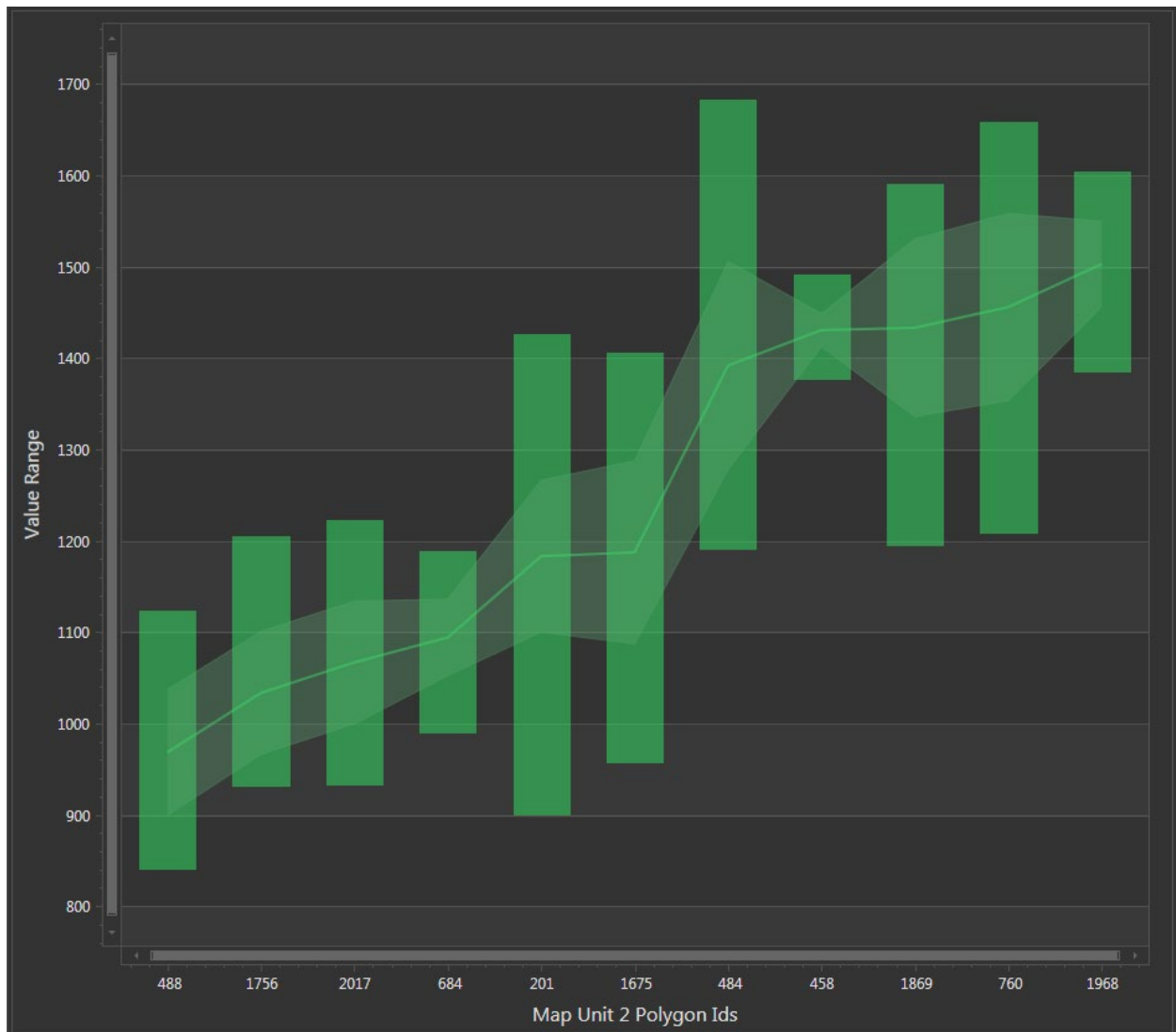
- So let's take a minute and see what all these lines on the above graph represent for map unit 2. The x-axis represents each polygon found within map unit 2, and on the y-axis is the raster data layer (DEM). The solid line in the center represents the mean DEM value for each polygon. The shading around the mean line is the standard deviation. The bars represent the range of values for each polygon. You can get specific numbers by running your cursor over the graph area.

Part 4: Exporting Statistics Data to .csv
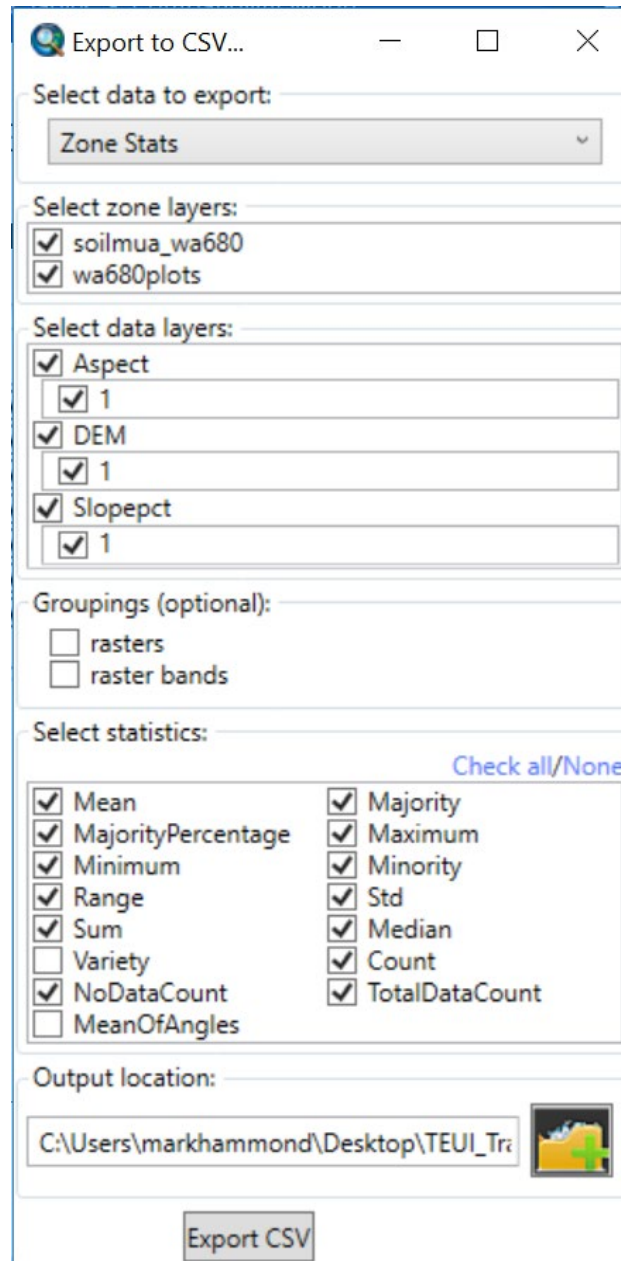
The statistical data summaries produced by the toolkit can be exported as a .csv file for further use.

A. Export individual feature statistics

1. On the toolkit toolbar in ArcMap, click the **Export Data to CSV** button.
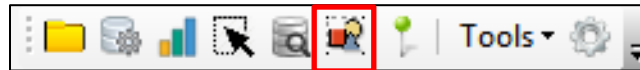
2. In the Export to CSV dialog, choose which layers and statistics you want to export.

3. Click **Export CSV**.

4. Open the output CSV and examine the data.

	A	B	C	D	E	F	G	H
1	Feature	FeatureId	RasterBan	Mean_Slo	Majority_	MajorityP	Maximum	Minimum
2	soilmu_a_wa680	1897	1	27.64907	25	0.020581	77.96	0
3	soilmu_a_wa680	1795	1	51.64738	49.53	0.00935	121.46	8.84
4	soilmu_a_wa680	378	1	39.21134	3.95	0.013846	105.01	0
5	soilmu_a_wa680	1396	1	28.99645	31.87	0.021201	84.89	1.77
6	soilmu_a_wa680	526	1	56.27207	69.03	0.008065	284.08	1.77
7	soilmu_a_wa680	122	1	13.46656	5.59	0.061131	44.3	0
8	soilmu_a_wa680	1393	1	23.22558	5	0.044365	303.78	0
9	soilmu_a_wa680	1891	1	27.23712	25	0.015298	73.87	0
10	soilmu_a_wa680	1440	1	28.83141	27.95	0.026144	49.81	6.37
11	soilmu_a_wa680	1885	1	35.18345	25	0.012273	127.52	0
12	soilmu_a_wa680	428	1	31.46156	31.87	0.01426	77.54	0
13	soilmu_a_wa680	872	1	10.07388	0	0.124283	28.34	0
14	soilmu_a_wa680	1467	1	10.87245	0	0.156413	41.12	0

Congratulations!

You have completed the Graphs and Tables toolkit training module!