

CHaMP - Vector Editing Tutorial |2015

Introduction

Vector objects come in three forms: 1) points, 2) polylines or lines and 3) polygons. In ArcGIS terminology, vector data is also known as “Feature” data. Points represent a dimensionless location in space, which means they have no length or area. Polylines represent the linear distance between two or more points. Polygons represent an enclosed area. In ArcMap (ArcGIS), all three feature types have Spatial (Location) and Attribute (Descriptive) information associated with them.

Objectives of this Tutorial

- Turn layers (e.g. features) and labels on and off.
- Review and work with attribute tables.
- Create and Edit lines and polygons.

Files Used for Tutorial

Map Document: Vector_Editing.mxd
Survey Geodatabase: Vector_Editing.gdb
Feature Classes: Breaklines
EdgeofWater_Points
Survey_Extent
Thalweg
Topo_Points

Metadata:

Site Name: CBW05583-031546
Projection: UTM 11N
Watershed: Upper Grande Ronde
Visit Year: 2013
Visit ID: 1329

Instructions

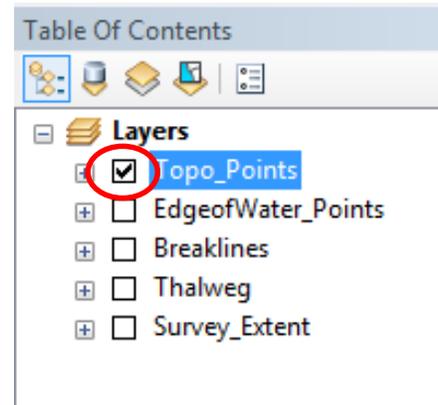
Getting Started

1. **Navigate to folder location provided by instructor and DOUBLE CLICK** on the “Vector_Editing.mxd” project file and ArcGIS will open.
2. Begin the exercises.

Exercise 1: Getting to Know ArcGIS Data Types

ArcMap projects (.mxd files) contain layers of data. These layers can be in the form of either Vector data (i.e. Features Classes or shapefiles) or Surface data (i.e. Raster or TIN data). Vector data contain features in the form of geometric shapes (points, lines, polygons). Surfaces represent data over a continuous area, such as grids of cells (raster datasets) or triangles (TINs) and will be reviewed in a separate Tutorial. You can display one or more layers in the MAP DISPLAY window. Layers are listed in the “Table of Contents” (TOC), where you can control whether they are currently displayed (visible) and the order in which they are displayed.

1. To turn a layer on, **CLICK** the “check-box” next to the layer. The layer will become visible in the map window and a check mark will appear in the box.
2. To turn a layer off, **CLICK** the “check-box” next to the layer again. The layer will no longer be visible and the check will disappear.



Hint

Sometimes the list of features in the TOC gets long and cumbersome.

1. You can expand or collapse feature classes in the TOC to show the Symbology by **CLICKING** on the “plus sign (+)” to expand or the “minus sign (-)” to collapse the Symbology next to the feature.
2. Collapsing a feature in the TOC does not turn ‘off’ in the MAP DISPLAY window.
3. You can expand and collapse the Symbology for all layers in the TOC by holding down the **CTRL** button while clicking the plus/minus symbol. In addition, all layers can be turned on or off at once by holding down the **CTRL** button and clicking the check box for any layer in the TOC.

3. The symbol for each layer shows what its feature type is.

- ◆ Point
- Line
- Polygon

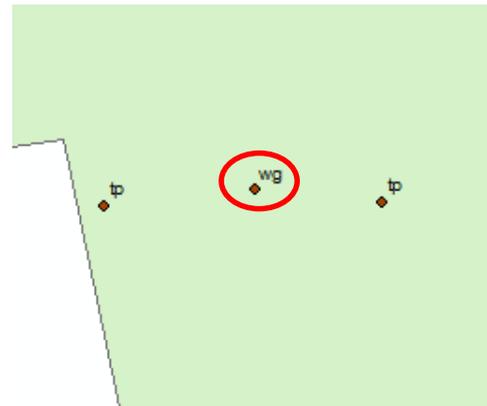
- a. *In the Exercise data, what type of data is the “Thalweg”?*

- b. **EXPAND** the other features in the TOC and list the layers and determine their data type.
 - i. Edge of Water Points:
 - ii. Breaklines:
 - iii. Topo Points:
 - iv. Survey_Extent:

Labeling your Data

Descriptive data from the Attribute Table associated with a feature class can be added to the map as a label (see figure). A user can choose whether the labels are visible or not and how the text is formatted.

Sometimes it's easier to look at points and lines without the labels. You may also need to update incorrectly labeled survey information. We will be updating a label later in the tutorial, but let's practice turning them on and off.



1. Turning Labels off and on
 - a. **RIGHT CLICK** on the “Topo Points” feature class.
 - b. **UNCHECK** “Label Features”.
 - i. The labels are now turned off.
 - c. **RIGHT CLICK** again on the “Topo Points” feature class.
 - d. **CHECK** “Label Features” to turn the labels back on.

Symbolizing your Data:

The display settings of a layer are called its “Symbology”. You can customize the symbology of each layer within the display to make it easier to identify particular items on a map. Symbology can also be imported from other layers or saved for future use as an external layer (.lyr) file type.

1. Changing Symbology
 - a. To view the symbology,
 - i. **RIGHT CLICK** on the “Breaklines” layer.
 - ii. **SELECT** the “PROPERTIES” menu item.
 - iii. **SELECT** the “SYMBOLOLOGY” tab.
 - iv. **USE THE SCROLL BUTTON** to view all of the “Default CHaMP Symbology”.
 - v. **CLICK** “Cancel” to discard changes to the symbology.

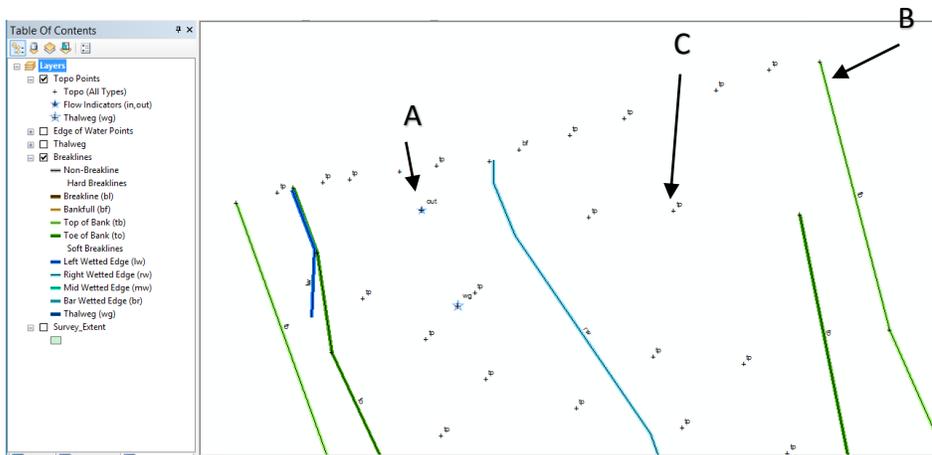
- b. **RIGHT CLICK** on the “Survey_Extent” layer.
 - i. **SELECT** the “PROPERTIES” menu item.
 - ii. **SELECT** the “SYMBOLOLOGY” tab.
 - iii. **LEFT CLICK** on the “colored box” under Symbol. This opens the “Symbol Selector” dialog box.
 - iv. **SELECT** the “Blue with a black border” symbol.
 - v. **CLICK OK** to select the symbol.
 - vi. **CLICK OK** on the “Layer Properties” box to apply the new symbology.

2. **REVIEW** the image below. *What do A, B, and C symbolize?* (HINT: Symbology definitions are in the TOC).

A:

B:

C:



Exercise 2: Exploring the Attribute Table

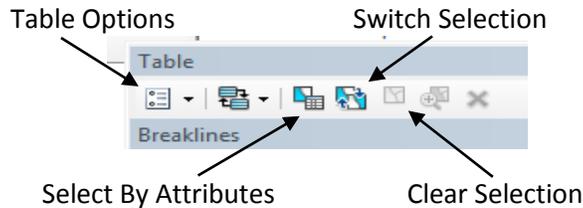
Feature classes have an attribute table associated with them. An attribute table contains descriptive data associated with each feature. You can add fields, delete fields, add and update values in the table.

1. **RIGHT CLICK** on the “Breaklines” layer.
2. **SELECT** the “Open Attribute Table” option.
 - a. You should now see a window with a table pop up on your screen.
3. Information in each column can be sorted.
 - a. **RIGHT CLICK** on the “Description” box and choose “Sort Ascending” or “Sort Descending”.
 - b. Alternatively, **DOUBLE CLICK** to sort in ascending order, and **DOUBLE CLICK** again to sort in descending order.

4. Selecting data is a common operation when one wants to edit, create a new “Feature Class”, or find descriptive data on an item selected in the MAP DISPLAY window. Items can be selected from the map or from the attribute table.

Selecting a feature record in the Attribute Table

1. In the “Attribute Table”, you can select descriptive data as a table record by clicking on a row or by using the “Select By Attributes” and the “Switch Selection” tools in the MAP DISPLAY window.



- a. **SELECT** a record by clicking on the gray square next to the row you want to choose.

	OBJECTID *	Shape *	Join_Count	TARGET_FID	DESCRIPTION
	36	Polyline Z	12	36	to
	38	Polyline Z	3	38	to
	41	Polyline Z	9	41	to
	42	Polyline Z	3	42	to

- b. **What happens to it in the MAP DISPLAY window?**

2. **CLICK** the “Select By Attributes” tool .
 - a. **SCROLL** down through the list of attribute field name (in the box at the top) until you see “LineType”.
 - b. **DOUBLE CLICK**.
 - c. **CLICK** the “equals sign (=)”.
 - d. **CLICK** “Unique Values”.
 - e. **SELECT** “Hard” and **DOUBLE CLICK**. These are the hard breaklines.
 - f. **CLICK** “Apply”.
 - g. **CLICK** “Close”.
 - h. **What happens in the MAP DISPLAY window?**

3. **CLICK** on the “Switch Selection” tool to flip the selection to the records that were NOT previously selected.
4. **CLICK** the “Clear Selected Features” tool.

Selecting a feature in the MAP DISPLAY Window

1. In the MAP DISPLAY window, you can select data by using the “Select Features” tool.

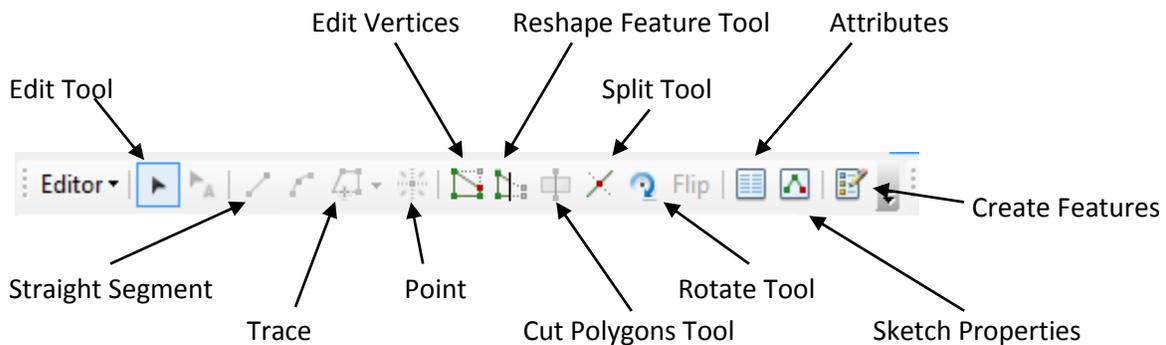


2. In the Map Display window **SELECT** a “Top of Bank” line from the “Breaklines” layer using the SELECT FEATURES tool. You may need to turn off the other layers to do this easily.
 - a. **CHECK** the “Attribute Table” of the “Breaklines layer” (an item should now be selected in the table).
3. **USE** the “Unselect” button to clear your selection 
4. Using the mouse, **CLICK** “on the screen” near the feature.
 - a. **HOLD** the “left mouse button” down.
 - b. **DRAG** the “cursor” over your intended target.
 - c. **RELEASE** the “left mouse button” and the line should be highlighted.
 - d. Zoom to the selected feature by **RIGHT CLICKING** and **CHOOSING** “Zoom to Selected Features”.
5. **CLEAR** your selection.

Exercise 3: Editing Data

Both the attribute table information and spatial information of a feature class can be edited using the EDITOR toolbar.

Introducing the Editor Toolbar

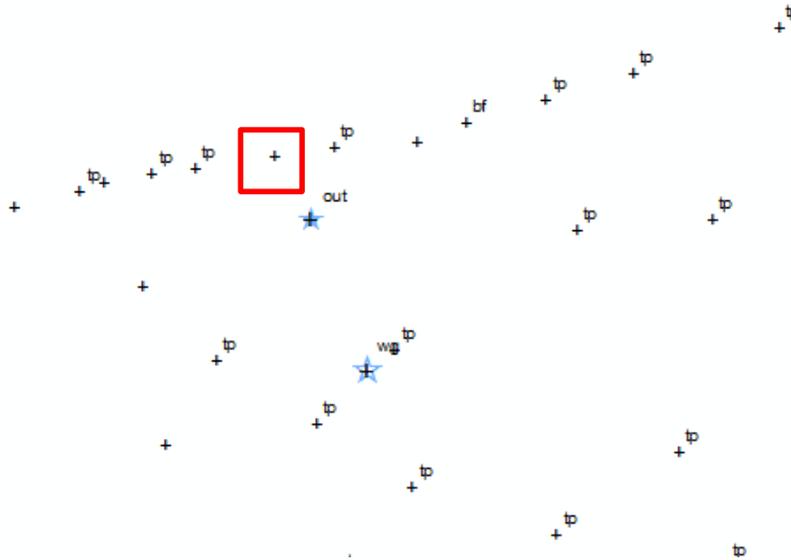


For the CHaMP toolbar, the main editing actions you will need to be familiar with are listed below:

- Editing attributes.
- Creating and deleting features.
- Adding and deleting vertices to polygons.

Updating the Attribute Table

You may need to update a feature's label. In the image below, note that the highlighted point does not have a label. This might be caused by a missing value in the attribute table for this feature.

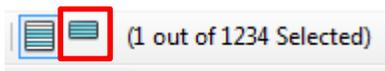


1. In the MAP DISPLAY window, **LOCATE** this “point” without a label. It is located in the upper left hand side of the data.
2. **SELECT** the “point” in the MAP DISPLAY window.
3. **OPEN** the “Attribute Table” of the “Topo_Points” layer.

Note

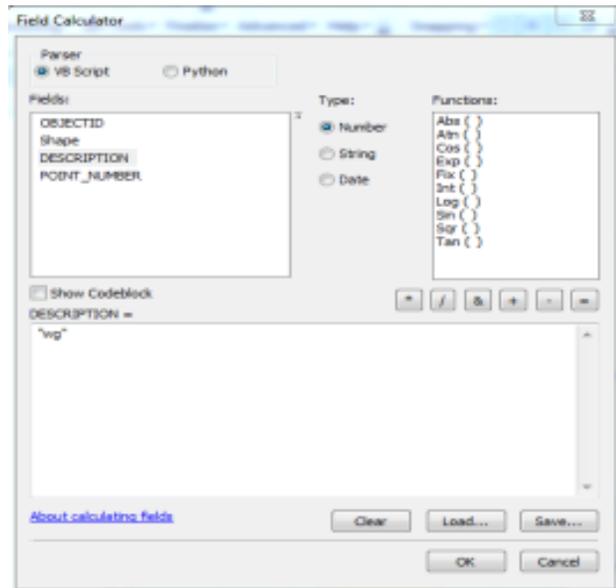
At the bottom of the table window are the “Show All Records” and “Show Selected Records” tools.

4. **CLICK** on the “Show Selected Records”.



NOTICE the value in the “Description” field. It is for a Thalweg point, however, it is in “all-caps”. ArcMap tables are Case-Sensitive, so we need to change the label to lower case.

- a. **CLICK** on the “Description” column.
- b. **RIGHT CLICK** to bring up a “tool menu”.
- c. **CLICK** on “Field Calculator.”
- d. **CLICK OK** through the message.
- e. The DIALOG BOX appears.
- f. In the lower window, **TYPE** “wg”.
- g. Use Double Quotes to surround text in the Field Calculator. Numbers do not need double quotes.
- h. **CLICK OK**.



5. **NOTICE** that the point is now labeled and symbolized correctly.
6. **CLEAR** your selection.
7. **CLOSE** the “Attribute Table” by clicking the “X” in the upper right-hand corner.

TIP: Items in the Attribute Table can also be edited by hand.

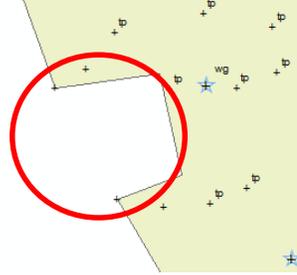
- **TURN** on the Editor Toolbar.
- **SELECT** the record you wish to update.
- **DOUBLE CLICK** in the field to change.
- **TYPE** in the new information.
- In the EDITOR toolbar menu, **SELECT** “Save Edits”.

Working with Polygons

Polygons are made of vertices, but you can't see the vertices on the map unless you are in an Edit session. Vertices occur wherever there is a direction change in a line or polygon segment or when lines start and stop. To edit the shape of a polygon or line, you edit the location or number of vertices.

1. **TURN OFF** all the layers except for the “Topo Points” and the “Survey_Extent”.

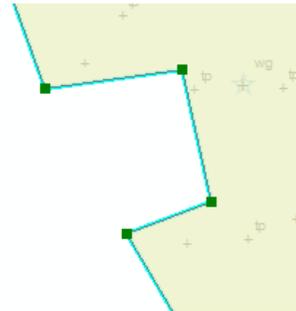
2. **NOTICE** that there is a large gap in the polygon near the upper left of the map. We will remove this gap in the survey extent polygon by modifying the vertices.
3. **ZOOM** to the spot in question.



4. **CLICK** the EDITOR toolbar.
5. **SELECT** "Start Editing".
6. **CHOOSE** "Survey_Extent" in the "Edit Dialog" box if it appears.
7. A small black triangle will be greyed-in in the tool bar. This is the EDIT tool.



8. **CLICK** on the black triangle (arrow).
9. **DOUBLE CLICK** on the edge of the polygon near the hole. You should now see all the vertices (points) which comprise the boundary of the polygon.



10. Additionally, a small toolbox labeled "Edit Vertices" will appear on your screen. You can dock the toolbox by clicking on it and dragging it up into your toolbar area or you can leave it floating in the DISPLAY window.



11. **SELECT** the "DELETE VERTEX" tool.



12. **CLICK ONCE** on “each of the two vertices” that make up the gap in the polygon.

a. It should now look like this:

b. Once you have deleted them, **DOUBLE CLICK** “over the white part” (i.e. the background) of your map display window to finish the sketch.

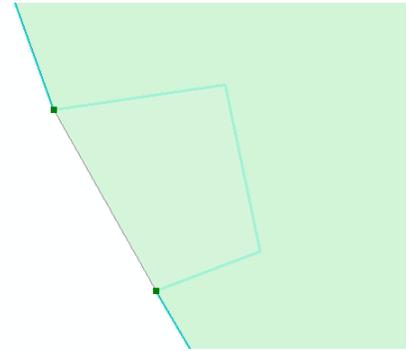
c. **CLICK** “Save Edits” in the EDITOR toolbar.

d. There are three more areas in the polygon that need to be repaired. Please repair them.

i. Note, sometimes when a Survey or Water extent polygon is created, small holes are created in the polygon. One of the three repairs is a small internal polygon.

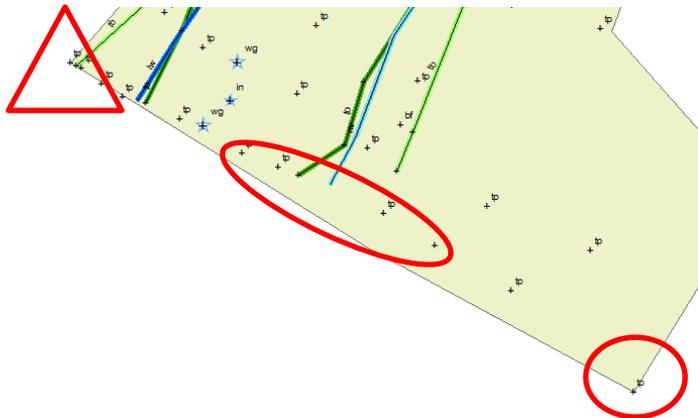
e. When you are done, **CLICK** “Save Edits” again.

f. If you are finished or pausing this exercise, **CLICK** “Stop Editing” to close your edit session.



Adding Vertices to Polygons

1. **ZOOM** to the “lower end” of the polygon.



a. The CHaMP survey extents should follow the survey points (you'll learn this later, don't worry!). Notice that the polygon does not follow the points and ends of the lines and the edge of the polygon extends from the triangle to the circled points, skipping points in the middle, such as the three “tp” points circled in red.

2. We are going to add vertices along the end of the polygon to include all the points in the survey in the survey extent.

a. **START EDITING** the Survey_Extent (see deleting vertices section if you need a reminder).

b. **TURN** on the SNAPPING toolbar either from the CUSTOMIZE menu or from the EDITOR toolbar menu.

c. On the SNAPPING toolbar, **CLICK** the “Snapping” drop down menu.

d. **CLICK** “Use Snapping”.

- e. Then on the toolbar, make sure Point Snapping and Vertex Snapping are selected (grayed).



- f. **ZOOM** in to the “lower left corner” of the polygon.
g. **DOUBLE CLICK** on the “edge” to show the vertices (see triangle in the previous diagram).
h. **SELECT** the “ADD VERTICES” tool.
i. **CLICK** on the “line” near the green “Top of Bank” line vertex. You should see a new point on the line.

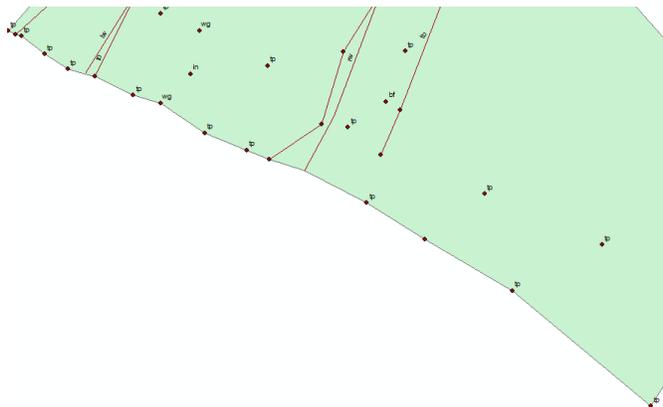


- j. **DRAG** the “vertex” to the nearest “Topo Point (+)”. You should see a clear circle appear to show you are within the snapping zone.
k. **RELEASE** the “mouse button”. The line should snap to the point.

Note

We recommend generating a vertex anywhere on the appropriate line segment and then using the 'snapping' feature to drag and drop the new vertex to the point location that needs to be added.

3. You will now see two lines. The light-blue highlighted line is the original line. You will continue working with the regular black line.
4. Continue this process until you reach the opposite corner on the lower right of the polygon (see circle in the above diagram) so that the edge of the Survey Extent snaps to the “Topo Points” and end vertices of breaklines.
5. The polygon edge should now closely follow the survey extent.



6. When you are finished editing, in the EDITOR toolbar.
a. **SELECT** “Save Edits”.
b. **SELECT** “Stop Editing”.

Note

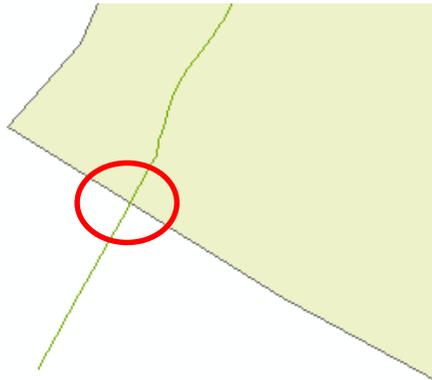
You can also just choose “Stop Editing” and it should ask you if you want to save or not. However is it always better to save manually.

Working With Lines

Like polygons, lines are also made of vertices. For the CHaMP toolbar, editing attributes, splitting lines and adding and deleting vertices to lines are the main editing actions that you'll need to be familiar with, and will SOMETIMES, but not always, need to be used when processing data. For example, if a line extends beyond a survey extent polygon and has many vertices outside the polygon, it is easier to Split the line and delete the line segment outside the rather than deleting each vertex individually.

Splitting a Line

1. **ZOOM** to the “lower end” of the site.
 - a. **NOTICE** that the “Thalweg” line extends beyond the polygon.

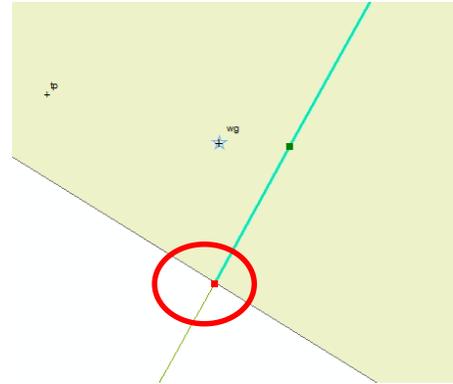


2. **ZOOM IN** close to the intersection of the “Thalweg” and the “Survey Extent” layers.
3. **SELECT** the “Thalweg” line.
4. **USE** the “SPLIT”  tool to cut the line at the edge of the “Survey Extent” layer.
 - a. To do this, **PLACE** the “cursor” on the spot where you want to cut the line.
 - b. **CLICK** once. Part of the line will briefly flash.
 - c. You will now be able to separately select the pieces of the line either inside or outside of the survey extent.
5. **SELECT** the “line segment” outside of the “Survey Extent” that was just split.
6. **HIT** the “Delete” button on your keyboard.

Moving a Line Vertex

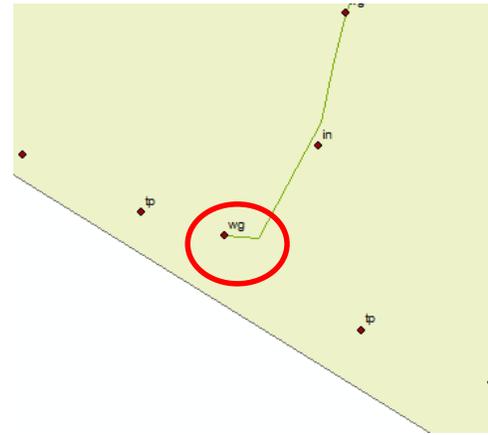
1. The “Thalweg” line should stop at either a “wg” or “out” point. In this case we will move the end of the line we just split to the “wg” point nearest it.
2. If the “Topo Point” layer does not have the labels turned on, **TURN THEM ON**.

- a. **DOUBLE CLICK** the “Thalweg line” using the EDIT tool, and a vertex symbolized with a red square should appear. See the circle in the diagram below.
- b. **HOVER** your “cursor” over the square and a box with 4 white arrows should appear.
- c. **CLICK** once.



- d. **DRAG** the “vertex” to the “wg” point. It should snap because the SNAPPING tool is still on.
- e. **RELEASE** the “mouse button”.

3. **NOTICE** now that the “Thalweg” turns sharply rather than smoothly arcing to the point.
 - a. Using your EDITOR toolbar, **DELETE** the “vertex” where the line turns.
 - b. You should now have a much smoother line.
4. The Thalweg also has a problem at its other end. Please repeat these steps, however this time, snap the line to the “out” point.



Finish and Close

1. **SAVE** your edits and “Stop Editing”.

Tip:

- You should get in the habit of regularly saving your edits. In the event ArcMap unexpectedly closes, if you are not saving regularly, you may lose a lot of work.
- Saving the map document (.mxd) file is **not** the same as saving edits to your data. Make sure to use the **Save Edits** command on the EDITING toolbar when you make changes to features or attributes.
- The .mxd file only saves the display and layer properties of your map.

2. **SAVE** the “.mxd document”.
3. **CLOSE** ArcMap.

Resources

ArcGIS 10.1 Help

<http://resources.arcgis.com/en/help/main/10.1>