

G492 GIS Applications in Earth Science - Spatial Data Editing

I. Spatial Data Editing and Geoprocessing

A. Purpose

1. Manipulation of vector-based map features

B. Geoprocessing Basics

1. Geoprocessing Wizard: Applicable only to Vector-Based Shape Files

a. How to invoke in ArcView

- (1) File-Extensions-Geoprocessing Wizard

2. Geoprocessing Functions

a. Goal: to rework existing map, point, and polygon map features into more useful map elements

- (1) Basic Assumption: map themes are in the same projection

b. Functions

- (1) **Merge**-Use the Merge process when you want to create a new theme containing two or more adjacent themes of the same shapefile type.

- (a) Combines two shape files into 1

- (b) For example, you may want to merge or append highway data delivered as a series of tiles. Merge allows you to append the data while maintaining the attributes contained in whichever shapefile you select.

- (2) **Clip** - Use the clip operation when you want to cut out a piece of one theme using another theme as a "cookie cutter".

- (a) Clip a subset of a map theme

- (b) For example, you may want to select a county boundary from your counties theme to extract the roads from your roads theme to create a new theme containing a smaller number of roads.

- (3) **Dissolve** - Use the Dissolve process when you want to remove boundaries or nodes between adjacent polygons or lines that have the same values for a specified attribute.

- (a) For example, Dissolve could be used to create a theme showing sales regions by salesperson where each salesperson is responsible for several counties.

- (4) **Intersect** - Use the Intersect process when you want to integrate two spatial data sets while preserving only those features falling within the spatial extent common to both themes.

- (a) For example, suppose you are a builder and want to build a retirement center within the city boundaries.

- (5) **Union** - Use the Union process when you want to produce a new theme containing the features and attributes of two polygon themes.

- (a) Let's look at using Union to provide the basis for performing an erosion analysis of soils during a flood. Some combinations of slope and soil type represent high risk for erosion, and knowing where these conditions are enables risk assessment of crops. For instance, rocky or sandy soil on a relatively steep slope could represent flash-flooding dangers to either crop or grazing agricultural activities during rainstorms.
- (6) **Assign Data** - Use Assign data by location when you want to use a spatial relationship to join data from the attribute table of one theme to the attribute table of another theme.

In-Class Exercise - Geoprocessing Functions with ArcView

Task 1 - Getting the Tutorial Data

- start ArcView - File-Extensions-Geoprocessing
- visit class website, go to lab data section, download and unzip "geoprocessing tutorial data" to your network drive (geoprdata.zip), extract the data to a new folder
- Add the surfgeo.shp and streams.shp to the view, check out the data (projection: UTM zone10N, surficial geology and stream tributaries for a portion of the Luckiamute watershed)

Task 2 - Clipping

Goal: to use a "clip" file (a cookie cutter) to cut out a subset of the streams.shp, and create a new shape theme

- make sure the geoprocessing extension is checked and activated
 - add streams.shp and clipbox.shp to the view; Using the legend editor, make the clipbox.shp a clear and open polygon with no fill color
 - you will be using the clip box as a cookie cutter to create a subset of streams and save them to a new shape file
- View-Geoprocessing Wizard-"Clip one theme based on another" - Next
- 1)select input theme to select = streams.shp
 - 2)select a polygon overlay theme = clipbox.shp
 - 3) specify output file: browse to your network drive and save the new shape file as "strmclip.shp"
- Finish (note that the new strmclip.shp is added to the table of contents, activate it and check out what happened"
- Turn off the streams.shp, go to layout and print out your view with the clip box and strmclip.shp (remember to put your name, north arrow, scale bar, etc. on it)
 - Clear the view, and add the following themes: srfclip1.shp, srfclip2.shp, and surfgeo.shp; activate the

themes and check them out (surfgeo.shp shows surficial geology, the *clip*.shp files will be used to clip the surfgeo into subset themes)

-Use the Geoprocessing Wizard and srfclip1.shp and srfclip2.shp to clip two new subset surficial geology maps: name them srfgeo_n.shp and srfgeo_s.shp respectively.

-After you clip and make the new shape files, create a layout and print your work, as above.

- Remove surfgeo.shp, srfclip1.shp, and srfclip2.shp from the table of contents

-Using the legend editor, for srfgeo_n.shp and srfgeo_s.shp, set the legend type to "unique value", the values field to "map unit", and the color scheme to "pastels". Note the polygon boundary line that separates srfgeo_n.shp and srfgeo_s.shp. Use the inquire tool to make sure that the surficial map polygons have the same attributes on both sides of the map boundary dividing.

-Use layout to print out maps with all the bells and whistles

Task 3 Merging Two Shape Files

Goal: to merge the srfgeo_n.shp and srfgeo_s.shp into a new combined shape file

-Add srfgeo_n.shp and srfgeo_s.shp to the view, make sure the Geoprocessing extension is activated.

View-Geoprocessing Wizard-Merge Themes Together-Next

1) Select at least two themes to merge: use a "shift-click" of the mouse to select the srfgeo_n.shp and srfgeo_s.shp themes

2) Specify the output file: browse to your network drive, name the new shape file "srfmerge.shp"

Finish

-Turn off srfgeo_n.shp and srfgeo_s.shp in the table of contents, use the legend editor for srfmerge.shp, set the legend type to "unique value", the values field to "map unit", and the color scheme to "pastels". Note the polygon boundary line from the previous example. Use the inquire tool to make sure that the surficial map polygons have the same attributes on both sides of the map boundary dividing.

-Use layout to print out maps with all the bells and whistles

Task 4 Dissolving Polygons with Common Attributes

Goal: to dissolve the surficial map polygons on both sides of the dividing line in srfmerge.shp

-Add srfmerge.shp to the view, make sure the Geoprocessing extension is activated

View-Geoprocessing Wizard-Dissolve features based on attribute-Next

1) select theme to dissolve = srfmerge.shp

2) select an attribute to dissolve = map_unit

3) specify output file: browse to your network drive, save the new map file as srfdislv.sp

NEXT

-Choose one or more additional field and operations to be included in the output file: use "shift click" to select "Area by Average" and "Perimeter by Average"

FINISH

-Remove srfmerge.shp from the table of contents, activate srfdisl.v.shp, set the legend type to "unique value", the values field to "map unit", and the color scheme to "pastels". Note the polygon boundary line from the previous example is now dissolved. Use the inquire tool to make sure that the surficial map polygons have the correct attributes as you specified above.

-Use layout to print out maps with all the bells and whistles

C. Non-Topological Editing

1. Convert to Shapefile Function - saves a theme to a new shape file

Short Editing Exercise 1: add streams.shp to the view and activate, go to Theme-Convert to Shapefile -

browse to your network directory and name the new shape file - "streamedit.shp", add it to the view and activate, remove "streams.shp" from the view.

2. Shape File Editing - use arcview tools to edit and add to the shape file

Short Editing Exercise 2: Theme - Start Editing (note that the legend box becomes dashed in the table of contents when you are in edit mode)

Use the polyline drawing tool to add an arbitrary stream tributary to the shape file, double-click to finish the line (the farthest right tool icon below the zoom icons)

Use the "create a line to split line features" tool (the farthest right tool icon below the zoom icons) to split a segment of the Willamette River in two, double click to finish the split line segment

Use the "select features" tool to select a line segment, hit the "delete" button, delete the line segment

Use the "select features" tool to select another line segment, right click and select "zoom to selected"

While the line is still highlighted, right click and select "Shape Properties", examine the coordinates that make up all of the line vertices

Use the "add point" tool, pick a location for the new point, click OK, play with the editing features to familiarize yourself with non-topological editing tools.

In-Class Exercise - Editing Polygons Using ArcView

Task 1 - Getting the Tutorial Data

- start ArcView - File-Extensions-Geoprocessing
- visit class website, go to lab data section, download and unzip "polyedit.zip" to your network drive, extract the data to a new folder. Follow the instructions below:

Task 3: Spatial Data Editing Using ArcView

What you need: *editmap2.shp* (Figure 5.30), *editmap3.shp* (Figure 5.31).

Task 3 covers three common edit functions in ArcView: merging polygons, splitting a polygon, and reshaping the polygon boundary. You will work with *editmap2.shp*, while *editmap3.shp* shows how *editmap2.shp* looks like after editing.

1. Start ArcView, open a new view, and add *editmap2.shp* and *editmap3.shp* to view. Spatial data editing in ArcView only applies to shapefiles.
2. Activate *editmap2.shp* and select Start Editing from the Theme menu. A dashed line around the check box for *editmap2.shp* indicates that the theme is in edit mode. The

first part of Task 3 is to merge Polygons 74 and 75. Click on the Pointer tool. Click inside Polygon 74, and then click inside Polygon 75 while holding down the shift key. The handles now appear around the two polygons. Select Union Features from the Edit menu.

3. The second part of Task 3 is to split Polygon 71. Click the Drawing tool and select the Draw Line to Split Polygon tool. To split a polygon, the split line must cross over the polygon boundary; in other words, you want to have "overshoots" at both ends of the split line. Click the left mouse button where you want the split line to start, click each vertex that makes up the split line, and double-click the end vertex.

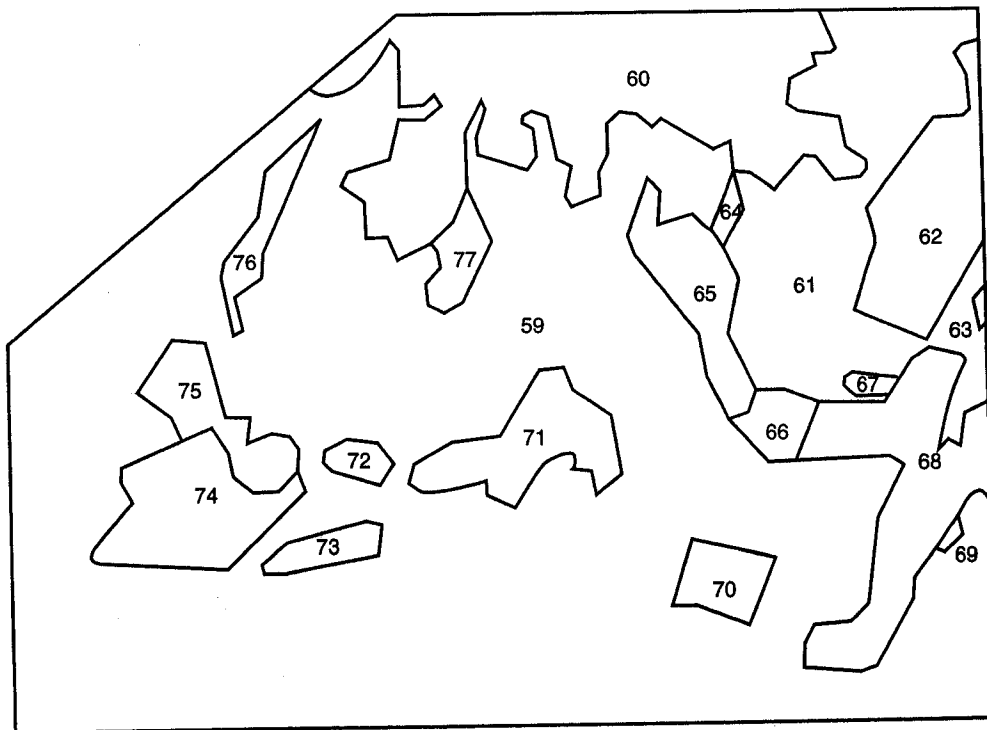


Figure 5.30

editmap2.shp is a polygon shapefile to be edited in ArcView for polygon merging, polygon splitting, and reshaping of the polygon boundary.

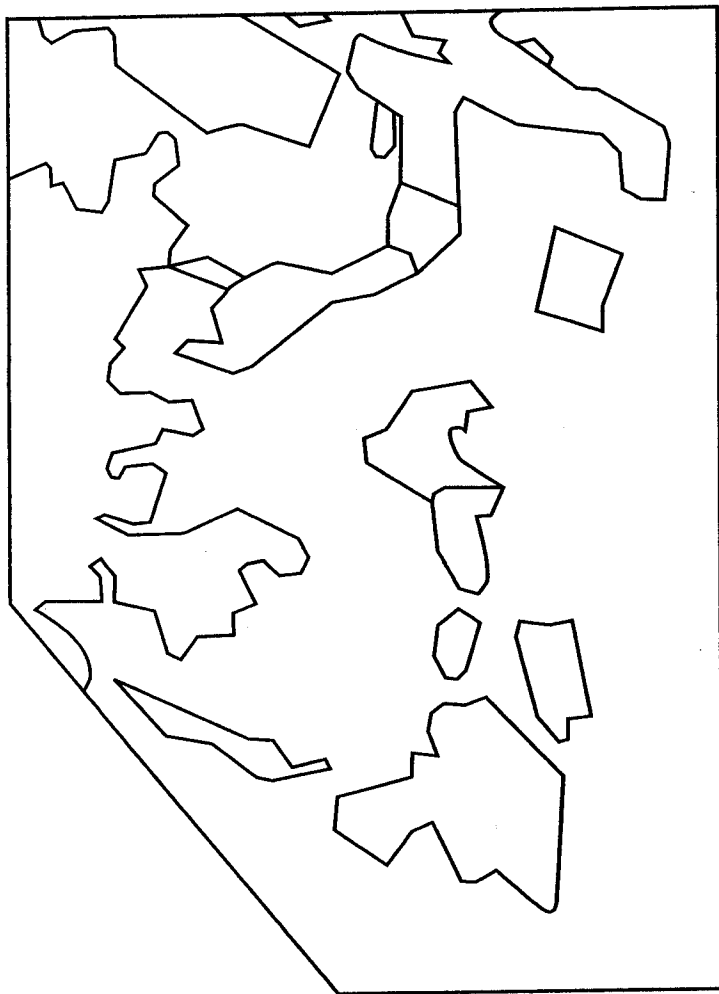


Figure 5.31

Editmap2.shp after editing.

4. The third part of Task 3 is to reshape Polygon 73 by extending its southern border in the form of a rectangle. The strategy in reshaping the polygon is to add three new vertices and to drag the vertices to form the new shape. Zoom in the area around Polygon 73. Click on the Vertex Edit tool. Do the following to add a new vertex: click inside Polygon 73 to see the existing vertices in the form of small squares; move the cursor to where a new vertex is to be added; and, when you see a cross-hair symbol, left click on the mouse. Create a new vertex (vertex 1) anywhere along the southern border of Polygon 73. To drag a vertex, click the vertex a couple of times until the vertex changes to a square, which is linked to two circles (i.e., anchor vertices). Now, drag vertex 1 to where the new border is going to be (use *editmap3.shp* as a guide), and release the mouse button. Click inside Polygon 73 again (the square symbols should appear around the polygon again). Next, add another vertex (vertex 2) along the line connecting vertex 1 and the original SE corner of Polygon 73. Click vertex 2 a couple of times and drag vertex 2 to the SE corner of the new boundary. Do the same to form the SW corner of the new boundary.