Geoprocessing and Spatial Data Editing in ArcGIS

I.   Geoprocessing – a set of software functions used to manipulate and transform spatial data (single layers or multiple sets of layers), to create new information. Manipulation of features classes and attribute tables to extract new information.

    a.   Map Overlay functions – combining layers to create single output

        i.   Extraction Functions - Layer Attributes Not Combined – features are separated from a larger group of features within a map layer

            1.   Clip – a cookie cutter function that truncates the features of one file based upon the outline of another.

                a.   Layers to be clipped – points, lines or polygons
                    i.   Clip a subset of a map theme
                    ii.   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.

                b.   Clipping (cutter) Layer – must be polygon

                    i.   Features inside the clip boundary will be preserved, all those outside are removed

                    ii.   Attributes of the clipped layer are preserved as in the original, only clipped to the preserved features

            2.   Erase – opposite of clip, all information outside of the operational polygon are preserved, and the interior features are erased.
                a.   Attributes of the erased layer are preserved in their original composition.

        ii.   Intersection Functions - Layer Attributes Combined

            1.   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.

            2.   Intersect – merges attributes between layers, points-lines-polygons

            3.   Union – combines two polygon layers, keeping all areas and merging attributes

        iii.   Dissolve – combines and dissolves polygons together based on common attributes
            1.   For example, Dissolve could be used to create a theme showing sales regions by salesperson where each salesperson is responsible for several counties.

        iv.   Buffer – creates new polygons that form a zone or region, with a known radius, about map features (points or lines).

1. Undissolved buffers –separate polygons
2. Dissolved buffers – merged polygons

    v. Append and Merge – tools that merge "edges" of adjoining layers with identically matching polygons and attributes. Result takes individual map mosaics and combines them into one output layer.
        1. Merge
            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.

b. ArcGIS Tools for Geoprocessing

    i. ArcToolbox – geoprocessing tools take an "input file", modify it, and create a new "output file" via geoprocessing transformation.

        1. command line – allows scripting of tool menus
        2. model builder – provides graphic visualization of tools and their resultant outputs
        3. scripting – user may customize the tool with options and special function

    ii. Coordinate System Management

        1. Arc geoprocessing tools will default such that the new output files will have the same projection as the input files
        2. Environment Settings – may create different projections for the output files (essentially geoprocessing and re-projecting at the same time).

    iii. Updating feature measurements
        1. geoprocessing and resulting output attribute tables will automatically be updated with resrpect to areas, lengths, and perimeters of map features
            a. e.g. clipped polygons will have their area fields updated upon modification via geoprocessing.

II.   Quick Guide to ArcTool Box and Geoprocessing Functions

Tab Functions – place the arctool box menu on your workspace
    The toolbox menu has three tabs:
        Favorites – list of all tools and pull down menus
        Index – search by key words (locate – finds the tool)
        Search – search by key words (finds tool by key word)

a. Clip tool
ArcTool Box- Analysis Tools – Extract - Clip

b. Erase tool
ArcTool Box – Analysis Tools – Overlay - Erase

c. Intersect tool
ArcTool Box – Analysis Tools – Overlay – Intersect

d. Union tool
ArcTool Box - Analysis Tools – Overlay - Union

e. Dissolve tool
Arc Tool Box – Data Management Tools – Generalization - Dissolve
f. Buffer tool
ArcTool Box - Analysis Tools – Proximity - Buffer

g. Append tool
Arc Tool Box – Data Management Tools-General – Append

h. Merge tool
Arc Tool Box – Data Management Tools- General – Merge

In-Class Exercise - Geoprocessing Functions with ArcView

Task 1 - Getting the Tutorial Data and creating projection definition files

- create a new class subfolder on your H:\drive = "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

- Once you've extracted all the shape files, check to see if there are existing *.prj projection files for each shape in the tutorial dataset. If not, use the Project-Define tool in Arctool Box to create projection files for all of your data. They are in UTM Zone10 N, NAD1927 CONUS, meters.

-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

- add streams.shp and clipbox.shp to the view; Using the symbol / properties 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

ArcTool Box- Analysis Tools – Extract - Clip

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"

Add 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 ArcToolbox 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 properties/symbol 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 (name, title, north area, scale, etc.)

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

Arc Tool Box – Data Management Tools- General – Merge

1) Select the two themes to merge as input files: 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 boundar 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 (name, title, north arrow, etc.)

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 data frame

Arc Tool Box – Data Management Tools – Generalization - Dissolve

1) select theme to dissolve = srfmerge.shp

2) select an attribute to dissolve = map_unit
3) specifiy 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 srfdislv.shp, set the legend type to "unique value", the values field to "map unit", and the color scheme to "pastels". Note the polygon boundar 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 (name, north arrow, scale, etc.)