ES341 Fundamentals of GIS
Quick Start Guide to Creating Shapefiles from Scratch
Geoprocessing: Clipping, Dissolving, and Mosaic

Objective – to prepare ES341 students with basic tools for completing the class watershed project.

I. DOWNLOAD THE TUTORIAL DATA

(1) Create a "geoprocessing" subfolder in your H:\ES341 class folder
(2) From the class web site, download the zipped Monmouth Quad DRG
(monmouth_DRG.zip; UTM Zone 10 N, 1927 NAD, meters)
(3) Unzip, extract into a subfolder on your class H:\ drive location
(4) Download the zipped Monmouth Quad 10-DEM
(monmouth_dem.zip; UTM Zone 10 N, 1927 NAD, meters)
(5) Unzip, extract into a subfolder on your class H:\ drive location
(6) Download the zipped Monmouth Quad Geology shapefile
(monmouth_geo.zip; UTM Zone 10 N, 1927 NAD, meters)
(7) Unzip, extract into a subfolder on your class H:\ drive location
(8) Download the zipped "Luckiamute Watershed" shapefile
(luckiamute_subbasins.zip; UTM Zone 10 N, 1927 NAD, meters)
(9) Download the zipped Lewisburg Quad 10-DEM
(lewisburg_dem.zip; UTM Zone 10 N, 1927 NAD, meters)
(10) Unzip, extract into a subfolder on your class H:\ drive location

II. DIGITIZING AND CREATING A SHAPEFILE FROM SCRATCH - Example Tutorial

(1) Add the DRG to your ArcMap table of Contents
*Would you like to create pyramids? Say no for now (this has to do with speed of raster-based image display in the view environment, don't' worry about it now).
(2) Open ArcToobox, click on the index tab and type "create" on the search window and double-click the "create feature class (management)" tool
- Feature Class Location – browse to your working folder
- Single click on your working folder, to connect
- Feature Class Name = key in "Independence_city_clip_box" (this will be the name of your new feature class layer"
- Geometry type = set to "Polygon"
- Coordinate System (optional) = set to UTM Zone 10 N, 1927 NAD, meters

When tool processing is completed, you'll now have a new layer on your table of contents; keep it active

Make sure the editor toolbar is checked on – View – Toolbars – check Editor

(3) Start Editing (from editor toolbar) to create a new polygon on the feature class you just created.
- Pull down the Editor Tool bar – "more editing tools" – make sure the "advanced editing" box is checked
- You will now see a series of drawing / sketch tools to create new map features.
- Zoom in on the city of Independence
- Use the "rectangle" tool, and drag a rectangular polygon box around Independence City limits; double click to complete digitizing (this will form your clip / cookie cutter box below)
- Pull down editor menu – save edits – stop editing

You've now just created your own shape file; that will be used as a cookie cutter clip box for Geoprocessing below.

III. GEOPROCESSING –CLIP SUB-AREA OF DATA LAYERS – Example Tutorial

(1) Add the "Independence_city_clip_box" to table of contents
(2) Add the "Monmouth DEM" to the table of contents
Note: if the DEM is rendered as all black on the display, highlight it, rt-click-properties-symbology; choose the classified option on the left, then click back to the "stretched option" and choose a color ramp for display (play around with the different symbology settings). This is a default-symbolization glitch that is confusing.

Your goal is to use the clip box to extract and cut out a DEM for the city of Independence.

(3) place the Independence city clip box on top of the DEM (you created the clip layer in Section II above).
(4) Arc Toolbox, in the search tab, type "clip" and choose the "Clip (Management)" tool for raster data
- Input Raster = Monmouth. DEM
- Output extent, choose the Independence City Clip Box you created in Section II above.
- Output Raster Dataset = browse to your folder, and give your clipped DEM a relevant new file name like "Independence_Clip" (NOTE: do not use a file extension, delete the default *.img extension)
- click OK, the tool will process and a new clipped Independence DEM will now appear on your table of contents; clipped to the scale of your clip box, congratulations

(5) Now repeat the above clip steps, using the Independence City Clip Box; and clip out a subsection of the Monmouth DRG, using the "Clip (Management)" tool

You should now have clipped DRG of Independence.

(6) Now repeat the above clip steps to clip the Monmouth Quad. Geology Layer down to Independence-Scale size, only this time you'll need to use the "Clip (Analysis)" tool since the geology is a vector-based layer
- Input Features = Monmouth Geo.shp
- Clip Features = Independence City Clip Box
- Output Feature Class – browse to your subfolder, and give it a meaningful file name like "independence_geo_clip.shp"

YOU SHOULD NOW HAVE THREE CLIPPED LAYERS FOR THE CITY OF INDEPENDENCE: A GEOLOGY LAYER (SHAPEFILE); USGS DRG; USGS DEM

OUTPUT TASK: Print out a set of maps showing Independence City geology on top of DRG, and geology on top of DEM; include your name, scale, north arrow, legend. Make it look professional! Include in your portfolio.

III. GEOPROCESSING –DISSOLVING POLYGON BOUNDARIES – Example Tutorial

(1) Clear your table of contents, or start a new ArcGIS project / fresh.
(2) Add the Luckiamute 6th-Field Subbasins to your table of contents
(3) Open the attribute table and examine the field headings; note the "Watershed_" field, which is formatted as a text string, and all records have the same value = "Luckiamute River"; note that there are 12 records in the database, corresponding to the 12 polygons on the data layer.

Your goal is to merge the 12 polygons into a single watershed boundary layer; forming the outline of the Luckiamute

(4) Arc Toolbox, in the search tab, type “dissolve” and choose the “Dissolve (Management)” tool for vector data;

- Input Features = Choose the watershed shape file
- Output Feature Class – point to your folder and give it a name like “luckiamute_boundary”
- Dissolve Fields = check only the “Watershed_” field name
- Click OK

You will now have a new shape file on your table of contents, in which the 12 subbasins were dissolved into one polygon, based on the fact they all had the same “Watershed_” field value = “Luckiamute River”.

OUTPUT TASK: Print out a set of maps showing Luckiamute Subbasins and the dissolved watershed boundary; include your name, scale, north arrow, legend. Make it look professional! Include in your portfolio.

IV. MOSAIC TOOL – STITCHING ADJACENT LAYERS TOGETHER– Example Tutorial

(1) Clear your table of contents, or start a new ArcGIS project / fresh.
(2) Add the Monmouth DEM and Lewisburg DEM to the table of contents
(3) Using the rt-click properties, adjust the symbology of each to match in style and color ramping.

Note: if the DEM is rendered as all black on the display, highlight it, rt-click-properties-symbology; choose the classified option on the left, then click back to the “stretched option” and choose a color ramp for display (play around with the different symbology settings). This is a default-symbolization glitch that is confusing.

Your goal is to mosaic the 2 adjacent DEMs together

(4) Arc Toolbox, in the search tab, type “mosaic” and choose the “Mosaic to New Raster” tool

- Input Rasters = Monmouth. + Lewisburg DEMs
- Output Location = browse to your target folder
- Rastere Dataset Name with Extension = “mosaic” and do not place a file extension on the end, this will default the format to an ESRI Grid.
- Coordinate System for the Raster = set to UTM Zone 10 N, NAD1927
- Mosaic Method = set to the “Blend” option on the list
- Take the other defaults
- click OK, the tool will process and a new mosaic DEM of the combined Monmouth and Lewisburg quads will now appear on the table of contents.

There you have it, you now know how to create your own shapefiles, digitize them in georeferenced coordinate space, clip subsets of information from both raster and vector-based data layers, and dissolve individual map elements into larger elements based on similarity of attribute.

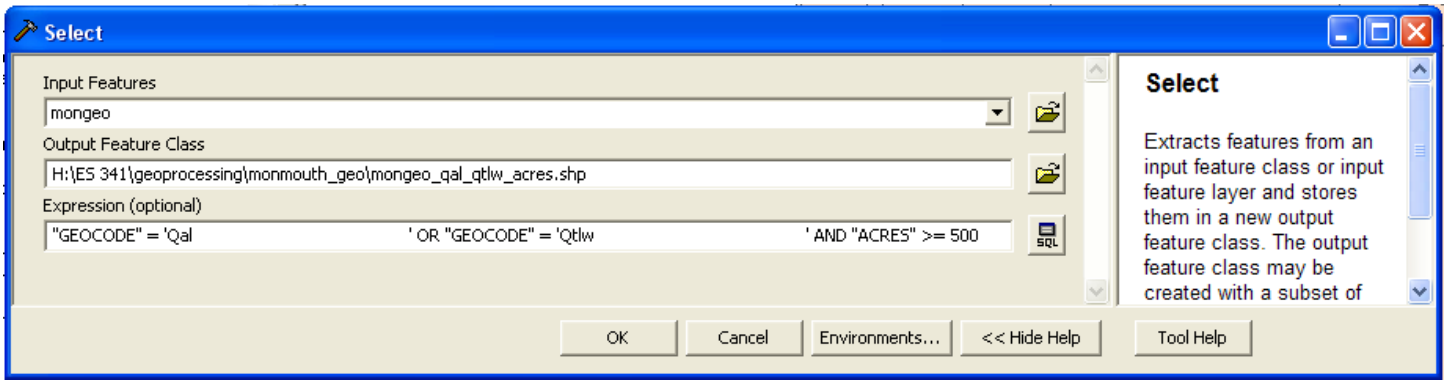
This will be useful in working up your final project and create a data set for your chose watershed area.

V. GEOPROCESSING – SELECTING AND EXTRACTING DATA – Example Tutorial

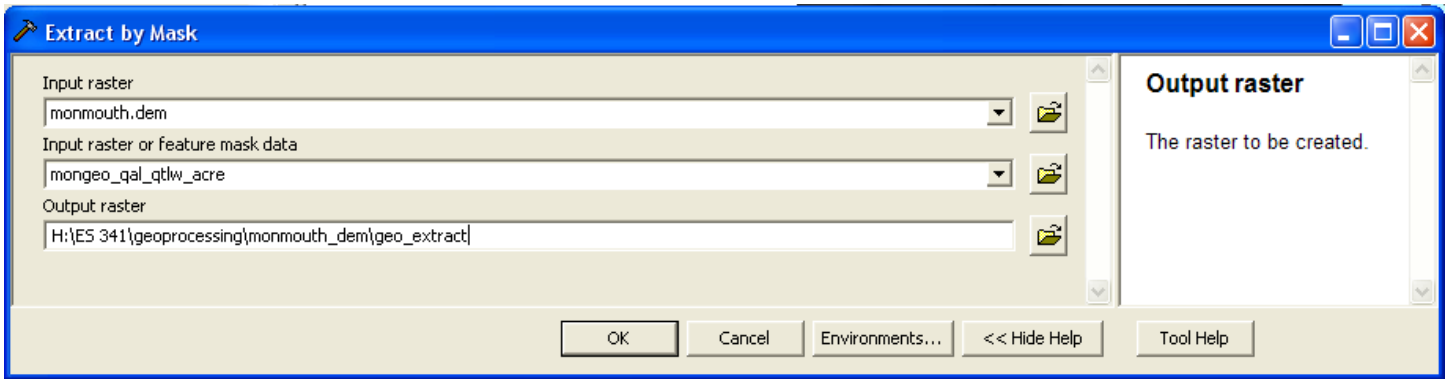
(1) Clear your table of contents, or start a new ArcGIS project / fresh.
(2) Add the Monmouth DEM and Monmouth Quad Geology to the table of contents.
(3) Open the geology attribute table and examine the field headings; note the “GEOCODE” and “ACRES” fields.

Your goal is to select features from the Monmouth Quad geology, save to a new shapefile, and then use that layer as a mask to clip the Monmouth DEM.

(4) Open ArcToobox, click on the index tab and type “Select” on the search window and double-click the “Select (analysis)” tool.
(5) Select the Monmouth Geology Quad as the input feature.
(6) You will use an SQL expression to query the Quad Geology attribute table and save a subset of features to a new shapefile. Type an expression that selects only Qal and Qtlw geologic units that have areas greater than or equal to 500 acres.
(7) Type a meaningful name for the output feature class and click OK. The layer will appear in the table of contents.



(8) In ArcToolbox, click on the index tab and type “Extract”, then choose the “Extract by Mask (sa)” tool.
(9) Select the Monmouth DEM for the input raster and select the previously generated geology shapefile for feature mask data. Type an output name and click OK.



The newly extracted raster conforms to the perimeter of the Monmouth geology subset shapefile.

NOTE: The “Clip (management)” tool duplicates the functionality of the “Extract by Mask” tool ONLY when the following box is checked in the Clip tool:

If the box is not checked, the “Clip” tool calculates the extents of your input features and clips a raster using a rectangle.

OUTPUT TASK: Print out a map showing the subset of geologic units on top of the extracted Monmouth DEM. Choose no fill color for the geology but apply an outline width of 2.00. Include your name, scale, north arrow, legend. Make it look professional! Include in your portfolio.