

ArcGIS

Overlay Analysis

THE ISSUE

As previously outlined, this lab continues on from where the previous buffer lab ended. First you will add a map layer (recreation trails) and then create a map layer that contains bear dens. Buffers will be generated for these two feature classes. Then you need to create a map layer that consolidates all of the previous buffer zones as these areas will impose restrictions on harvesting.

After the buffers are consolidated (merged) into one map layer, this new layer will be overlaid on top of the VIU Forest layer as we are interested in the value of the land within these reserve zones.

LEARNING OBJECTIVES

You will further develop the following ArcGIS skill sets

- Export a feature class map layer from one geodatabase and add it to your
- Create/edit attribute tables
- Create a map layer from X,Y coordinates
- Create buffers
- Conduct queries using both Select-By-Attributes and Select-By-Location
- Export selected features from a feature class and create a new map layer
- Learn to use 3 new ToolBox functions (Merge, Dissolve, Clip)
- Determine area of polygons
- Calculate values within a database table
- Create an effective map layout.

CREATE/ ADD DATA (ArcCatalog)

You have two tasks to conduct in ArcCatalog:

1. export the recreation trail map from the original geodatabase to your project
2. create a dBase table for bear den coordinates.

Add Existing Feature Class Map Layer from Original Geodatabase

You need to add the Recreation Trail feature class (map layer) from the original geodatabase into your woodlot geodatabase.

- Open ArcCatalog and connect to **G:\FRST_328\GIS Dataset**. This is the complete woodlot data set and is enormous (168 MB). We only need one of the feature class map layers ...
- Click on the “+” beside the **VIU Forest Woodlot W0020.gbd** geodatabase to view the groupings. Click on the “+” beside **Roads_Trails**. Right-click on **Recreation_Trails**

- Click **Export**, then **To Geodatabase (single)**
- For the *Output Location*, browse to your woodlot geodatabase on your U:\ drive, then click the **VIUWoodlot.gdb** file and click **Add**
- For the *Output Feature Class* type **Rec_Trails**

Create a Database File

The locations of six bear dens were determined using GPS (well ... actually you will be making up the coordinates shortly).

- Create a *dBase Table* called **BearDens.dbf** in your VIUWoodlot.gdb
- Close **ArcCatalog** and open your woodlot map document in **ArcMap**
 - If you are still in “layout View”, switch to “Data View”

Edit Database File

- Add the **BearDen** table to your map document. Then add the following fields:
 - DenID – contains an ID number (i.e. 1 – 6)
 - Easting – contains 6 digit easting coordinate
 - Northing – contains 7 digit northing coordinate
 - TreeCode – contains 2 digit tree code (e.g. Fd, Cw)
- Close ArcCatalog and open your woodlot map document in ArcMap
 - If you are still in “layout View”, switch to “Data View”
 - Click the **Full Extent** button (looks like a globe) – you now see the full area covered by all the map layers
 - If not already visible, turn on the Contours and Roads layers – you can see we have coverage of some features that extend beyond the woodlot boundary

Enter bear den data

- Enter the values into the table just created. You are responsible to ‘make-up’ unique data for this table. Locate the bear dens within 2 different stands that have trees greater than 120 years old (Forest_STA contains ages) ... i.e. you will first need to conduct a query (select by attributes) that shows these stands, and then figure out 6 acceptable coordinates.
- Create a map layer showing these point locations
- Symbolize the points with black triangles of an appropriate size.
- Now that we have finished adding new data, **Save** your map document.

ANALYSIS & INTERPRETATION (you should interpret all new data layers as you create them)

**** When conducting analysis new layers will be created ** Be sure to save the new layers with names provided ** Failure to do so will result in loss of marks *****

Buffer Bear Dens

- Create a 60-metre buffer around the bear dens – call the new layer **DenBuffer** and be sure to save it to your working folder on your U: drive (or USB drive).

Clip recreation trails to match area covered by contours

- Click the **Full Extent** button (looks like a globe) – you now see the total coverage of all map layers. Turn on for view contours and roads, if they are not already turned on
- Although you have added Rec_Trails to the geodatabase, you have not yet added the layer to your map document so you can work with it. Use the **Add Data** button to add Rec_Trails
- Once more click the **Full Extent** button – what happened? Why?
- Since the Rec_Trails map covers an area very much larger than our woodlot we will trim it down a bit. Right-click on *Contours* and **Zoom to Layer**.
- Turn off all map layers except Rec_Trails, Contours, Forest_Cover and Legal
- On the Selection menu click Select By Location and ensure the following:
 - Selection method: select features from
 - Target layers: select only Rec_Trails
 - Source layer: Contours
 - Spatial selection method: Target layer(s) features intersect the Source layer feature (... this should be the default option)
 - Click OK. Now only the trails located within the contour map area are selected
- Next you need to create a new feature class map with only these selected trails. Right-click **Rec_Trails**, use the **Browse** button to navigate to your *VIU_Woodlot2012* folder. For *Save as type* select *File and Personal Geodatabase feature classes*. Double-click on the *VIUwoodlot.gdb*, then change the name to **Recreation_Trails** and click **Save** and then **OK**. Click **Yes** when prompted to add the data to you map.
- Remove the original *Rec_Trail* from the table of contents and then click the Full Extent button. Note we now have recreation trails that are only contained within close proximity of the woodlot.

Create a 70-metre buffer around only those trails that are contained within the woodlot

- First, use **Select by Location** and ensure the following
 - Selection method: select features from
 - Target layer: Recreation_Trail
 - Source layer: Woodlot0020
 - Spatial selection method: Target layer(s) feature are within Source layer feature
- Then conduct the buffer and call the new layer **TrailBuffer**.
- Drag these new buffer layers into the *My Buffers* grouping

Save your map document.

Consolidate the buffers into one map layer

Thus far we have created buffer layers around four types of features: nests, streams, trails and bear dens. Future analyses will be much simplified if we consolidate these four layers into one. One option for consolidating these layers is to use the **Merge** tool. With this tool you will select the 4 layers of interest and Merge will create a new layer that contains all the features from these input layers.

- First you will need to ensure that no features are selected (highlighted in light blue) or Merge will only use those feature – clear any selected features.
- In ArcToolBox expand **Data Management Tools**, then expand **General**, then double-click **Merge**
 - Using the top drop-down box select each of the four buffer layers you wish to consolidate
 - For the *Output Dataset* select browse to your working folder
 - Type **Merge** for the filename
 - Click OK
 - Drag it to *My Buffers*

You now have a new map layer that contains all the buffer zones. Take a look at this new layer. What fields exist in the table? Select a few of the records in the table and take note of the associated polygons. What happened to the areas where the original buffers overlap? Do the overlap areas “merge together” or do they remain separate?

Save your map document.

Dissolve internal boundaries within the Reserves

The buffer polygons in the Reserves layer overlap each other. This does not make sense for our intended use – we want a map where the buffers are merged. Dissolving the internal boundaries is necessary. We will use the Dissolve function to accomplish this task. This function compares overlapping and adjacent polygons and dissolves the boundary based on values in a specified field in the data table (i.e. you could dissolve based on age classes, whereby the boundaries between adjacent forest stands in the same age class would be dissolved). If no field is selected then all internal boundaries will be dissolved.

- In ArcToolBox expand **Data Management Tools**, then **Generalization**, then double-click **Dissolve**
 - Using the Input Feature drop-down box select **Merge**
 - For the Output Feature Class be sure the layer will be created in your working directory and call the new layer **All_Reserves**
 - Do NOT select a “Dissolve Field” as we simply want all internal boundaries dissolved
 - Scroll down and ensure that “Create multipart features” is NOT checked
 - Click OK

- Look in the data table – how many records are there?
- Do the dissolve a 2nd time but ensure the “Create multipart features” IS checked. Call the layer **Reserves_All**.
- Compare the difference between the two layers. You want the layer that has only one record in the table.
- Determine which layer you want to save and remove the other. Add a field called Hectares (with 1 decimal place) and calculate the area of the reserves.

Save your map document.

Dissolve internal boundaries within the VIU Forest

The VIU Forest layer currently is comprised of several adjacent polygons. These polygons have different legal status. However, for our present use, all we need is a single polygon to delineate the boundary of forests managed by VIU.

- Run the **Dissolve** function again to produce a new map that is a simple outline of the Woodlot0020 (i.e. there are no internal boundaries). Call the new layer **Woodlot_Outline**.
- Symbolize the layer so that it is hollow with a black outline with a thickness of 2
- Drag the layer to the **Legal** grouping
- Ensure that Woodlot0020 is turned off from view

Save your map document.

Clip the Reserves and VIU boundary together

Next we will combine the Woodlot_Outline and the Reserves layers to create a map layer with the reserves contained only within the woodlot.

- From the ArcToolBox expand **Analysis Tools**, then **Extract**, double-click **Clip**.
 - Click the Show Help button and scroll down to view the diagram
 - Consider the helpful diagram and then select the appropriate layers for the Input and Clip layers – choose wisely
 - For the Output Feature Class be sure the layer will be created in your working directory and call the new layer **VIU_Reserves.shp**
 - Click OK
 - How does the new layer differ from the original Reserves layer? Note: if your output layer contains no polygons, then remove it from the TOC, click the Clear Selected Features button and then try clipping again.

Save your map document.

Determine the land area and value within the reserves

Next we need to calculate the areas of each of the polygons within the VIU_Reserves data layer.

- Open the data table for VIU_Reserves.
 - Add a field called **AREAha** (it should be real number that can have up to 9 digits with 1 decimal place)
 - Right-click on AREAha and select **Calculate Geometry**, click Yes at the next prompt
 - Property should be **Area** and Units should be **Hectares**, click OK
 - Add a field called Value (long integer)
 - Use the field calculator and multiply the AREAha by 55,000 (i.e. \$55,000 per ha) to derive the land value

Save your map document.

Map Layout

Create a map layout that displays the Forest, Lakes, Streams, Trails, Nests, Dens, VIU_Outline and VIU_Reserves layers. ~~Ensure the order of the layers is appropriate and no other layers are displayed.~~

- ~~• Use the map template: LetterLandscape.mxt~~
- ~~• With regards to map elements and actual layout you are on your own ... er, I mean follow the principles of “good cartography”~~

~~Export your map as a .png file to your U drive (note that png's are typically smaller than jpg's and less taxing on my email quota).~~

~~Also prepare a brief write-up, in your own words, that clearly summarizes purpose and utility of the functions Append, Dissolve and Clip. Be sure to address what happens to both the spatial and attribute data, provide examples of when they would be appropriate to use and describe any “issues” regarding their use.~~

~~Name the files SurnameLab3 (i.e. CorrinLab3.png and CorrinLab3.doc). Email the documents to doug.corrin@viu.ca~~

~~Save your map document for the final time and exit ArcMap.~~