

# Data Assembling

## Topics:

After gathering spatial data, data assembling and manipulation become a big part of a GIS project. With all the datasets in place (from previous lab), we can proceed for further data manipulation to make the data better fit our needs.

1. Examining Datasets
2. Clipping datasets
3. Extracting Features
4. Merging and re-projecting data
5. Working with Raster DEM
6. Using NTS data

**Data locations:** L:\labs\geog413\data\assembling

<i>bdy</i>	Study boundary (L:\labs\geog413\data\assembling)
TRIM <i>tlake</i> - Lakes <i>troad</i> - Roads <i>trivr</i> - River/Streams <i>tctrl</i> - Contour lines <i>twtrl</i> - water body	TRIM data converted from previous lab are located in your local folder (conversion/trim). If you do not have them, convert these trim data to shape file (see previous lab)
<i>93i-dem25m-utm10.asc</i> <i>93j- dem25m-utm10.asc</i>	Raster DEM in ASCII format (L:\labs\geog413\data\assembling)
<i>fc93j10, fc93j20</i> <i>fc93i01, fc93i11</i>	Forest coverage data imported from E00 files (previous lab). Forest coverage files are located in your local <b>conversion</b> directory. If you do not have these datasets, import them from L:\labs\geog413\data\conversion\

## 1. Examine datasets

- Create a new folder **assembling** under your geog413 directory.
- Open a new map file and add all TRIM layers listed above and *bdy* to ArcMap.
- Rearrange the order of each layer to make most of them visible.
- Change the symbol for *bdy* layer to Hollow symbol.
- Change the default data frame **Layers** to **Aleza** as all data here are for Aleza Lake Research Forest
- Open the properties window of data frame **Aleza**, set Coordinate System to NAD\_1983\_UTM\_Zone\_10N.
- Save the map file as **assembling.mxd** in your **assembling** folder.

The *bdy* defines the study boundary of Aleza Lake research forest area. You probably notice that most datasets cover larger area than the study boundary

We will clip the datasets with *bdy*

- Examine the properties of each dataset by double-click the dataset in the table of contents.
- In the properties window, click Source tab to check the properties

Notice that all TRIM layers and *bdy* are in NAD83 UTM 10N projection so they are ready to go for clipping

## 2. Clipping

We will first clip TRIM data using Aleza Lake study boundary (*bdy*) as cookie cutter.

*trivr*, *tlake*, *troad*, *tctrl*, *twtrl* and *bdy* are all in UTM10 projection, we can directly clip these datasets with the *bdy*

Before precede, we will set working environments to make sure all output data go to the same spot.

- Click Geoprocessing->Environments. Expend Workspace and set your local folder (K:\geog413\assembling) for both Current Workspace and Scratch Workspace
- Click Geoprocessing->Geoprocessing Options and remove the check mark beside 'Enable to turn off Background Processing'. This will let you see the progress when the tool is running
- Make sure you have all extensions enabled by clicking Customize->Extensions. Place a check mark for each extension (exclude FME and Survey Analyst)
- In ArcToolbox, click **Analysis Tools->Extract->CLIP**

Input Features	<i>trivr</i>
Clip Feature	<i>bdy</i>
Output Feature Class	<i>rivers_clip</i> (your local folder)
- Repeat the steps clip the rest of TRIM layers (*trivr*, *tlake*, *troad*, *tctrl*, *twtrl*) with *bdy* as the cookie cutter and save the output in your **assembling** folder.

Input Feature	Output Feature
<i>twtrl</i>	<i>water_clip</i>
<i>tlake</i>	<i>lakes_clip</i>
<i>troad</i>	<i>roads</i>
<i>tctrl</i>	<i>contours</i>

Notice that the Feature Type for these datasets is LINE as TRIM data do not come with polygon features. They are either in line feature or point feature. Some ground features obviously should be a polygon feature such as lakes. The polygon features can be built up with the outlines.

After clipping, you should have *bdy*, *rivers\_clip*, *lakes\_clip*, *roads*, *contours*, *water\_clip* in your local folder.

- Remove all original TRIM datasets (*trivr*, *tlake*, *troad*, *tctrl*, *twtrl*) from the table of contents by right-click on the dataset and choose Remove. Examine each clipped dataset.

## 3. Extracting Features

### Extract Streams and River Banks

Now take a closer look on *rivers\_clip*

- Examine the dataset *rivers\_clip* which contains water bodies. Open the attribute table and examine TYPE field, there are several types of water body:
 

'Ditch'
'River - Definite'
'River - Indefinite'
'River - Left Bank'
'River - Right Bank'

"Left Bank" and "Right Bank" are the outlines for big rivers and the rest of lines can be treated as streams. We will separate these features to form up new datasets

- Make attribute selection on *rivers\_clip* with following expression to extract all none river bank features:

```
"TYPE" <> 'River - Left Bank' AND "TYPE" <> 'River - Right Bank'
```

This query will filter out all the features that are not types of river banks

- With the selection on, right-click on **rivers\_clip** and choose Data->Export Data
- Set 'Selected Features' for Export. That means only selected features will be exported.
- Set the Output Shapefile to K:\geog413\assembling\streams.shp

Now examine the rest of river lines. The river lines with "River-Left Bank" or "River-Right Bank" type indicate that these are big rivers and should be formed up as polygon features.

- As all the selected features are none river banks, the river banks can be selected by simply switching the selection. Right-click **rivers\_clip** ->Selection->Switch Selection.
- With the selection on, in the ArcToolbox, click

**ArcToolbox->Data Management Tools->Features->Feature To Polygon**

Input Features: **rivers\_clip, bndy** (add each)

Output Feature Class: K:\geog413\assembling\rivers.shp

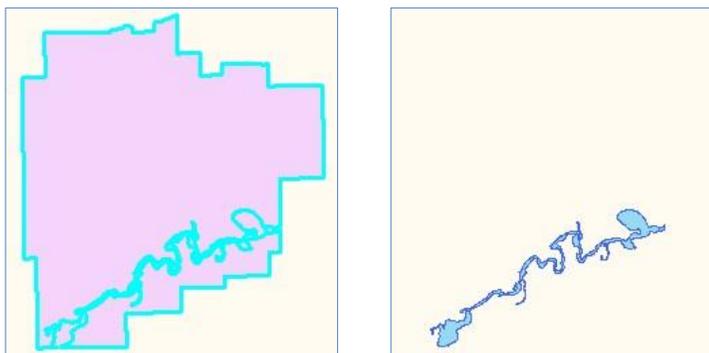
This tool allows you to build polygon features from lines (selectí)

You may notice that we use two layers to form up the polygons: **rivers\_clip** and **bndy**. If you look at **rivers\_clip** at edge on both left and right sides, you should see that the two river bank lines are open, not closed. The **bndy** can be used to make up this part. Of course, you can manually change/modify the features to make it closed in Editing mode.

- You will have the resulting dataset **rivers** added to ArcMap.

The resulting dataset **rivers** will have polygon features from both **bndy** and the selected features from **rivers\_clip**. You probably notice that **rivers** includes **rivers** and **bndy**. Some parts of **bndy** are not rivers. We need to remove these parts to keep only the river polygons.

- Turn on Editor, in Editing mode, set **rivers** as the editing layer. Delete the parts that are not rivers. Save the edits and stop editing. The resulting dataset **rivers.shp** contains the only river polygons.



### Build polygon features from **lakes\_clip**

The **lakes\_clip** contains lake outlines which can be used to build up lake polygons

**Note:** Check the dataset to see if any of them are not closed, especially at edge of the data. If Yes, you can either turn on the editing mode to close those features or use **lakes\_clip** and **bndy** together to build polygons (like above). Otherwise **lakes\_clip** itself is good enough.

- Follow the same steps above build polygon features from **lakes\_clip**. Note: there is no need to do any selection as all lines are lake lines.
- Save the final output as **lakes** in your **assembling** folder.

## Extract Island and Flood Land

Examine *water\_clip* which contains water related information, such as flood land, island, marsh and etc.

Examine the data field CLASS in the attribute table of *water\_clip*. We will extract island and flood land to make a separated layer for each type of feature class.

- Select all Island feature from *water\_clip* and build polygon features. Save the output polygon features as *island* in your local folder
- Select all Flood Land feature from *water\_clip* and build polygon features. Save the output polygon features as *floodland* in your local folder

In the table of content, keep the layers *bandy*, *streams*, *rivers*, *lakes*, *island*, *floodland*, *roads*, *contours* and remove the rest of data layers.

- Save the map file

## Update Attributes

The spatial operations that modify the spatial locations/geometry do not automatically update the attributes related to the geometry such as AREA, LENGTH, and PERIMETERS etc. These information need to be updated manually.

You have the newly created polygon layers *lakes*, *rivers*, *floodland*, and *island*. It would be nice to know the area of each polygon. You need to update the AREA

- Open the attribute table of *lakes*. If there is no AREA field, add a new field AREA to store the area value for each polygon (Note: use FLOAT or DOUBLE data type and give two digits for decimal).
- Calculate the AREA with Calculate Geometry.
- Calculate the AREA for each polygon layer (*rivers*, *floodland*, and *island*)
- In the same way, calculate the LENGTH for the line features (*streams*, *roads*).
- Save the map.

## 4. Merging and Re-projecting data

Now we will look at forest coverage data *fc93i01*, *fc93i11*, *fc93j10*, *fc93j20* (from your local folder). Forest coverage data are stored in four separated files and not merged together like the TRIM data,

The next task is to merge all forest coverage datasets together. Merging datasets can be done with Merge tool in ArcToolbox.

- Turn off all layers in the table of content for now.
- Add all forest coverage data *fc93i01*, *fc93i11*, *fc93j10*, *fc93j20* from your local folder to ArcMap. If you do not have them in your local folder, import them from L:\labs\geog413\data\conversion
- In ArcToolbox, go to **Data Management Tools->General->Merge**

Input Datasets:	<i>fc93i01</i> , <i>fc93i11</i> , <i>fc93j10</i> , <i>fc93j20</i>
Output Dataset:	<i>fc_merged</i> (in your local folder)

The merged data *fc\_merged* includes all four sheets of forest data

- Open the properties window of *fc\_merged* and click Source tab

Notice that the dataset *fc\_merged* is in BC Albers projection which is different from the rest of datasets you have (UTM 10N). In order to work with other spatial data for later analysis, we need to reproject *fc\_merged* from BC Albers to UTM 10N.

Two ways to reproject a dataset from one coordinate system to another:

- By exporting data using the coordinate system defined for data frame
- By using the PROJECT tool in ArcToolbox

The easiest way to reproject a dataset is by exporting using the coordinate system defined in data frame.

### Reproject data by exporting

- Right-click on the data frame **Aleza** and open the Properties window. Click Coordinate System tab.
- Make sure the Coordinate System is set to UTM10N. If NOT.
- Right-click on *fc\_merged*->Data->Export Data. Make sure the Export is set to 'All Features'
- Set 'Use the same coordinate system as the data frame'. That will export the data using the same coordinate system to the data frame.
- Set the output feature class to *fc\_utm\_export.shp* (in your local folder)

### Reproject data using ArcToolbox

You can also reproject a dataset using ArcToolbox

- In ArcToolbox: **Data Management Tools->Projection and Transformation->Feature->Project**

Input Dataset:	<i>fc_merged</i>
Input Coordinate System:	NAD_1983_Albers
Output Dataset:	<i>fc_utm_proj.shp</i> (in your local folder)
Output Coordinate System:	NAD_1983_UTM_Zone_10N.

You may notice that once you choose input dataset, the Input Coordinate System is filled up automatically and grayed out. This information comes from the input data. If the input dataset does not have coordinate system information available, you need to specify the input coordinate system. Without knowing the input coordinate system, the system can't perform re-projection operation.

- The output dataset *fc\_utm\_proj* now is in UTM 10N projection. Examine the properties of the dataset.

You have two identical forest coverage datasets in UTM 10N projection. You can keep one for analysis and remove the other one.

- Keep the *fc\_utm\_proj.shp* for later use. Remove *fc\_utm\_export.shp* from the table of contents

With forest coverage data merged and reprojected, we can clip the forest coverage data with *bndy* to make it fit into study boundary

- Use *bndy* as a cookie cutter, clip *fc\_utm\_proj.shp* and save the output as *fc.shp* in your local folder.
- Now remove all the rest of forest coverage data *fc93i01, fc93i11, fc93j10, fc93j20, fc\_merged, fc\_utm\_export.shp, fc\_utm\_proj.shp* from the table of contents

You should have following layers in the table of contents:

*bndy, streams, roads, contours, rivers, lakes, island, floodland, fc*

- Turn all layers on and save the map file

## 5. Working with raster DEM

DEM (Digital Elevation Model) information is required for our analysis.

We have a dataset contour line (*contours*) from the TRIM layer with 20 meters interval and two DEM sheets (*93i* and *93j*) stored in ASCII format at 250000 scale. Both data sources can be used to create a raster DEM.

### Create a raster DEM from contour lines (*contours*)

- In ArcToolbox: **3D Analyst Tools->Raster Interpolation->Topo to Raster**
  - Input Feature: *contours*
  - Field: ELEVATION
  - Type: Contour
  - Output raster: *dem\_cont* (your local **assembling** folder)
  - Cell size: 25

The resulting raster *dem\_cont* will have 25 meters resolution

### Creating a raster DEM from ASCII file

We have another data source *93i-dem25m-utm10.asc* and *93j-dem25m-utm10.asc* stored in ASCII format containing x,y,z value. The data source can be converted to raster DEM.

As the working area is across two 250000 scale map sheets, we will need two DEM mapsheets (*93i* and *93j*) to cover the area.

To do the conversion, ASCII to Raster tool will be used to convert ASCII file to raster DEM.

- In ArcToolbox: **Conversion Tools->To Raster->ASCII to Raster**
  - Input ASCII file: L:\labs\geog413\data\assembling\93i-dem25m-utm10.asc
  - Output Raster: *93i\_dem* (in your local folder)
- In the same way convert *93j-dem25m-utm10.asc* and save the output as *93j\_dem* in your local folder

### Merging Raster

Now with two raster DEMs, we will merge/mosaic them together

- In ArcToolbox: **Data Management Tools->Raster->Raster Dataset->Mosaic to New Raster**
  - Input Raster: *93i\_dem* and *93j\_dem*
  - Output Location: K:\geog413\assembling (your local)
  - Raster Dataset Name: *93ij\_dem*
  - Number of Bands: 1
- Click OK. Check the properties of this dataset by right-click on it and open the properties->Source
- If the coordinate system (Spatial Reference) of *93ij\_dem* is not defined, define the coordinate system to UTM10N in ArcCatalog by clicking the Edit button right beside and define the coordinate system to UTM 10N (Note: you need to remove datasets from ArcMap first)

### Clipping Raster

As the *93ij\_dem* covers way larger area than study boundary, you will need to clip this raster to make it fit into study area.

- In ArcToolbox: **Data Management Tools -> Raster -> Raster Processing ->CLIP**
  - Input Raster: *93ij\_dem*
  - Output Extent: *bndy*
  - Output Raster: *dem* (in your local folder)

Examine the output raster *dem*.

Now you have two raster DEMs *dem\_cont* created from contour line and *dem* generated from ASCII file. Examine two datasets and use one of them for later analysis. Either datasets will work fine.

- Keep one raster DEM (*dem*) and remove the rest of raster DEM layers
- Save the map file in your local folder.

Now the spatial datasets including trim data, forest coverage, boundary and DEM are ready for analysis.

**Clean up your working directory and delete the temporary datasets you do not need, especially the raster datasets (*93i\_dem*, *93j\_dem* and *93ij\_dem*) and forest coverage data**

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~~~~~ The End ~~~~~