GST 102: Spatial Analysis Lab Series

Lab 4: Vector Data Analysis – Overlay Techniques

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Introduction

This lab is part of a series of lab exercises designed through a grant initiative by the National Information, Security & Geospatial Technologies Consortium (NISGTC), funded by the United States Department of Labor in partnership with the Department of Education under the Trade Adjustment Assistance Community College and Career Training Grant Program (TAACCCT).

In this lab, we will be looking at the environmental variables of ArcGIS, particularly the workspace variable as it streamlines the process when running tools. We will look at another file format (.e00) and import a dataset into ArcMap. We will use tools to remove and change the data to see how the similar tools operate.

Your instructor may require that you provide screen captures and/or exported files. Please check with your instructor for the requirements specific to your class.

This lab includes the following tasks:

1. Using Environment Settings for Data Organization
2. Importing Coverage
3. Introduction to Vector Overlays (clip, Intersection, union, identify)

Objective: Understanding Data and Using Overlays

The objective of this lab is for the student to understand the use of data organization and setting environmental variables. We will demonstrate how to import coverage or interchange files (.e00) into ArcGIS. We will explore the use of vector overlay and extraction tools such as Clip, Intersect, Union, and Identity.

Vector Overlays – combine spatial and attribute data from two or more spatial data layers; combine point, line, polygon geometry and associated attributes to create a new geometry:

- **clip** – defines the areas for which features will be output based on a 'clipping' polygon
- **intersection** – combines data from at least two layers but only for regions where all layers contain common data
- **union** – includes all data from any of the input data layers
- **identity** – geometric intersection of input and identity datasets

Lab Settings

Required Virtual Machines and Applications

Windows Machine User Account	Train
Windows Machine User Password	Train1ng$

1 Using Environment Settings for Data Organization

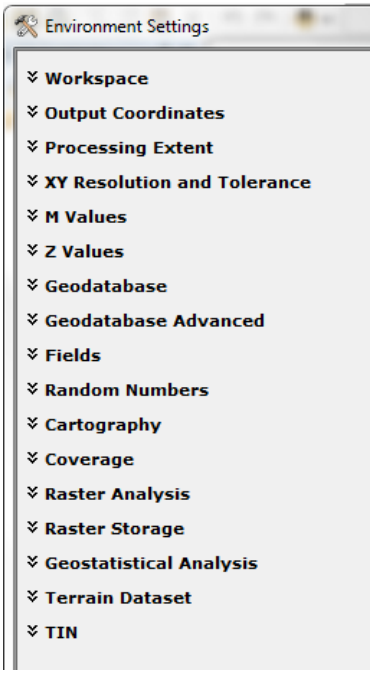
Environment Settings are settings we can change to streamline the process of working with a GIS. Using the workspace settings we can set up our workspace before we start using tools in ArcGIS so that changes we make will output to a specified file or folder.

Workspaces:

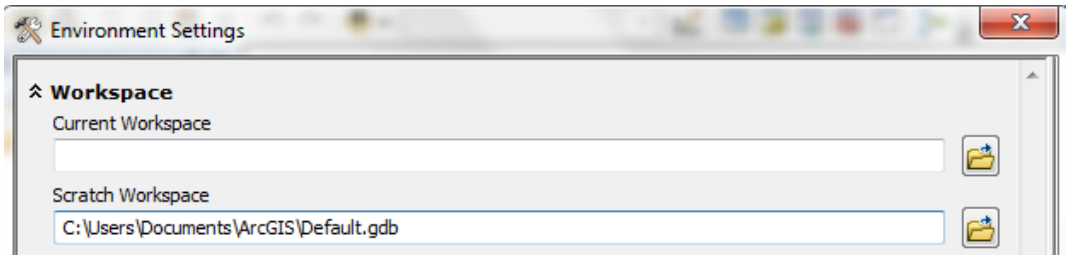
- **Current Workspace** – This is the location currently being used, the location of the files that we are going to input and the location to be used for output files.

- **Scratch Workspace** – This is a workspace where intermediate data resides. When we run tools, data is created in runtime, which we do not need to keep. It stores the unnecessary data files.

1. Log into the computer, using the information provided in the Lab Settings section.
2. The data for this lab is located on the lab machine at: *Shared Drive\GST 102\Lab 4.* Copy the *Lab 4* folder into your *C:\GST 102* folder and rename the folder *Lab_4*. This is needed for an operation in the lab to work.
3. Click **Start->All Programs->ArcGIS->ArcMap 10.1**. ArcMap will open. Create a blank map.
4. Click the ArcCatalog icon on the toolbar  and ArcCatalog will open in a tab inside ArcMap.
5. Click the Connect to Folder Icon  on the top of the catalog tab, navigate to, and select *C:\GST 102\Lab_4* from the folder listing and click **OK**.
6. Click **Geoprocessing->Environments…**The Environment Settings window will open. There are several settings we can change in the ArcMap environment to make working with tools easier. We will focus on the **Workspace** variable.



7. Click on **Workspace** and 2 textboxes will dropdown. In the first textbox, we will set the Current Workspace. Set this to the *Lab_4* Data Folder, as this is where the data outputs will go. Leave the scratch workspace as default. Click **OK**.

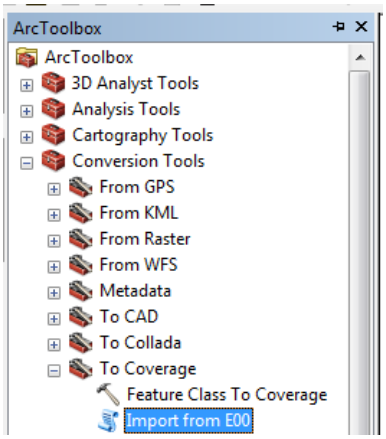


8. Keep ArcMap open for the next task.

2 Importing a Coverage

A coverage is a georelational data model that stores vector data—it contains both the spatial and attributes data for geographic features (ESRI). These files present themselves in an .e00 format and can be extracted and imported into ArcGIS. Once a coverage is extracted, it appears as a feature dataset.

1. Open the toolbox in ArcMap and expand the Conversion toolbox then expand the To Coverage toolset.

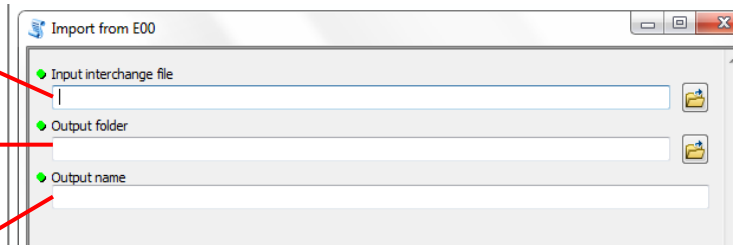


2. Right-click on the Import from E00 and then **Open**. The Script tool will open. Examine the Figure below for more information on this window. In the data folder there is a file named **clpoint.e00**. This file contains Cultural Landmarks – Points.
3. Choose the **clpoint.e00** as the input interchange file
4. For your output folder use the Lab_4 data folder. Remember that there can be no spaces in the folder names, otherwise it may not output correctly.
5. For the Output Name, name it `Culture`.
6. Click **OK.**
7. In the ArcCatalog tab, right-click on the Lab_4 data folder and click **Refresh**.
8. Expand the **culture** coverage you just created and add the **point** feature class to the map from the Catalog tab by dragging and dropping.
9. Do not close ArcMap as we will use it in the next task.

Input interchange file – This is the .e00 File

Output Folder – Destination for the data

Output name – The Name given to the output feature dataset



3 Vector Overlays

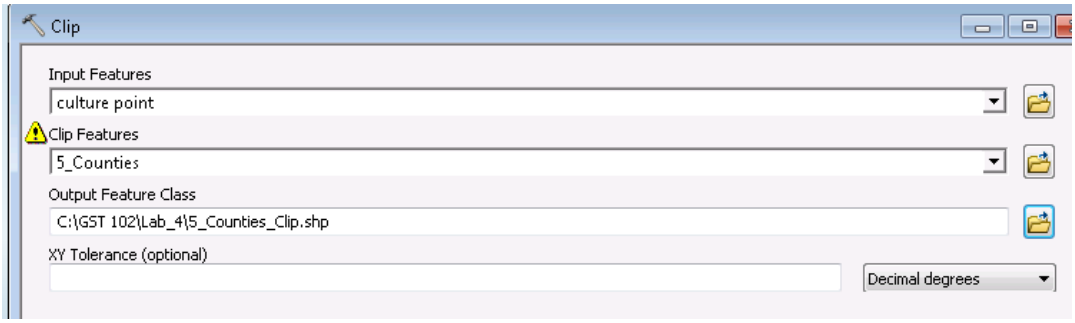
In this section, we will introduce several tools that can be used with vector overlays.

3.1 Clip

Using the *5_Counties* shapefile, we are going to extract the cultural landmark points using the Clip tool.

1. From the *Lab_4* folder add the **5_Counties.shp** to the map and put the layer underneath the cultural point layer in the Table of Contents. Ignore the coordinate system warning.
2. **Open ArcToolbox** and expand the **Analysis Toolbox->Extract Toolset** and **double click** on the **Clip tool**.
3. We will extract from the input features. Select the **culture point** layer. The Clip Features should be set to **5_Counties.shp**. The output feature class should be named `5_Counties_Clip`.
4. There will be a warning about the datums being different; ignore this warning.

Ignore the warning **for this lab only**.



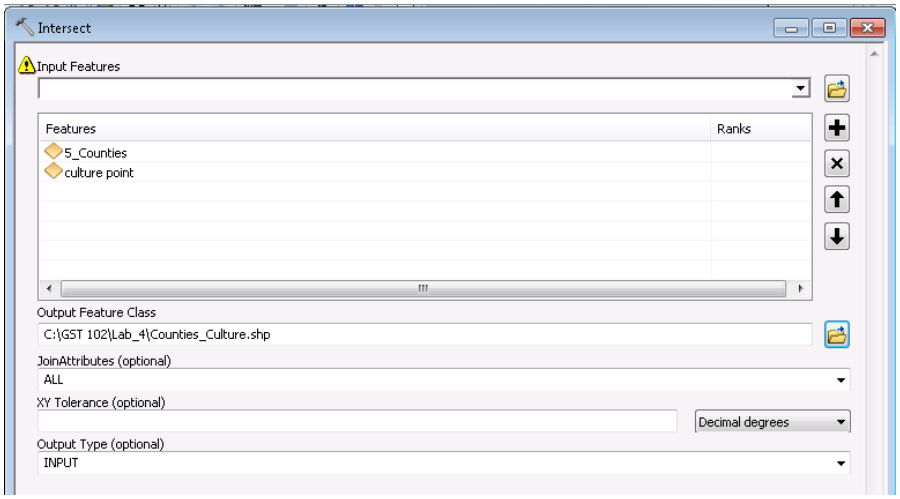
5. Click **OK.**

The clip will extract all the dots that were within the boundaries of the **5_Counties** layer into the **5_Counties_Clip** layer**.**

3.2 Intersection

Using the 5_Counties shapefile, we are going to overlay the cultural points using the Intersect tool.

1. Open ArcToolbox and expand the **Analysis Toolbox->Overlay Toolset** and **double click** on the **Intersect** tool.
2. For the Input Features, we will add both the 5_Counties shapefile and the culture point layer. We are going to select the points that intersect with the 5_Counties. It is similar to the Clip tool with a few differences.
3. The Output Feature class should be named **`Counties_Culture`**.



4. There will be a warning about the datums being different, ignore this warning.

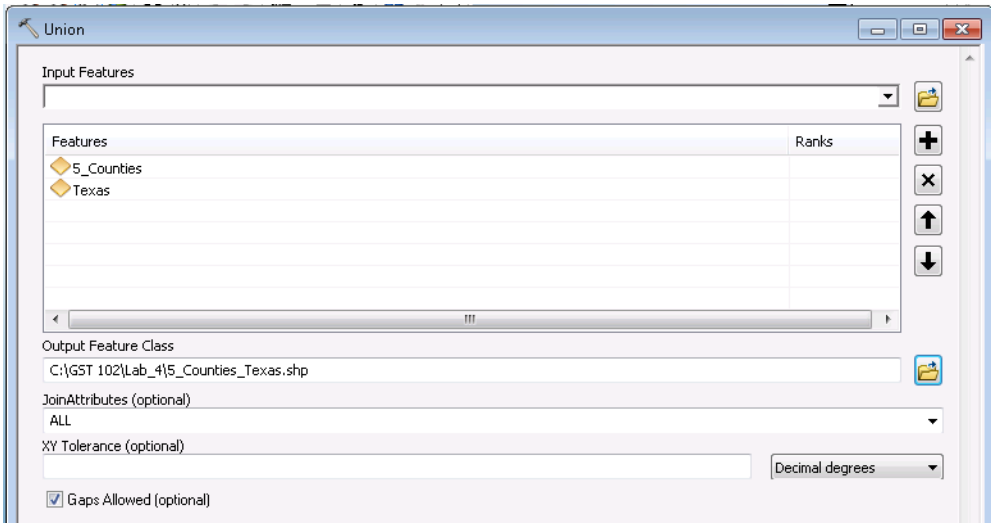
Ignore this warning **for this lab only**.

5. Click **OK**. This will give you the output intersection of the 2 datasets.
6. Open up the attribute tables of your newly created intersection and clipped layers and note the major differences between the two datasets.

3.3 Union

Next, we are going to union the 5_Counties shapefile and the **culture point** using the Union tool.

1. From the *Lab_4* folder, add **Texas.shp** to the map and put the layer underneath the other layers in the table of contents. Ignore the coordinate systems warning.
2. Open ArcToolbox and expand the **Analysis Toolbox->Overlay Toolset** and double click on the **Union** tool.
3. For the Input Features, we will add the 5_Counties Shapefile and Texas shapefile. We are going to union Texas and the 5_Counties shapefile. The Output feature class should be named **`5_Counties_Texas`**.

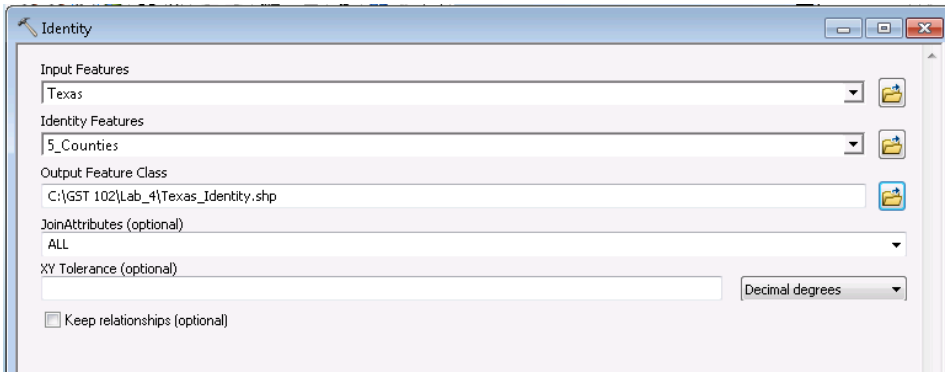


4. This will add the 5 Counties to the Texas layer displaying Texas with 5 county outlines inside it.
5. Click **OK**.
6. This will show you the union of the 2 datasets.

3.4 Identity

Using the 5_Counties shapefile, we are going to use the Identity tool against Texas. This is similar to the intersection, however, the feature types (i.e. point, line, polygon) must be the same.

1. **Open ArcToolbox** and expand the **Analysis Toolbox->Overlay Toolset** and double-click on the **Identity** tool.
2. For the Input Features, we will use **Texas**. For the Identity Features we will use the **5_Counties** and the Output Feature Class will be named **`texas_identity`**.
3. Click **OK.**



Conclusion

In this lab, we explored the use of vector overlays. The tools may seem similar, however, they allow for different parameters to be parsed. These tools allow us to extract data and turn it into useful information by narrowing down the area of interest.

Discussion Questions

1. How do environmental settings help streamline the process?

2. How do coverages help for data storage?

3. How do intersect and clip compare in their operation and results?
   (Hint: refer to desktop help)