

Spatial Analysis (Part 2)

1. Geospatial Analysis
2. Select by Location
3. Geoprocessing Tools
4. Prep for Thursday

Course Website

<https://sites.google.com/site/garp0244fall2014/home>

GIS Resources

<http://www.westfield.ma.edu/cbraun/resources/gis-resources/>

Cool Maps

[Where Did Your Thanksgiving Dinner Come From?](#)

[How Far Can You Get From McDonald's?](#)

The rest of the semester:

Date	Topic	Work outside of class
Tu (11/25)	Spatial Analysis 1	GTKArcGIS Ex. 15b, 17a, 17b Look-over the Land Use Project and get started if possible.
Tu (12/2)	Spatial Analysis 2	Prep for Th: GTKArcGIS Ex. 19a, 19b Work on the Land Use Project
Th (12/4)	Spatial Analysis 3	Work on the Land Use Project GTKArcGIS 18a, 18b
Tu (12/9)	Spatial Analysis 4	Work on the Land Use Project
Th (12/11)	Spatial Analysis 5	Due: Land Use Project Out: Final Project
Th (12/18)		Due: Final Project via Email

1) Geospatial Analysis

It all comes back to Week 1: Geospatial data are spatial data and attribute data linked together. This allows us to perform GIS analysis using the location of a feature and/or its characteristics.

- For example, we can select an important wetland using some biodiversity indicator and create a 1 mile buffer around the wetland for protection.
- Then we can determine which building parcels are located inside this buffer.
- Then we can talk to the homeowners about reducing pesticide runoff from their lawns into the wetland.

This basic sequence described above is referred to as Geospatial Analysis, Geoprocessing, GIS Analysis, Spatial Analysis, GIS Modeling, etc. Whatever the name, the basic idea is the same: Use the power of geospatial data for meaningful analysis.

Finally, we can present the results of our analysis as a GIS poster combining maps, tables, graphs, text, photographs, and more. Plus, we document our analysis as a report.

Step 1: Project Organization. This is often overlooked...before you start anything you need to organize the project in your head! What do I need to do? How do I get the data? What is the outcome? Here you should create a flowchart of your entire project!

Step 2: Data Acquisition. What data do I need? Do I have the data? Can I get the data from MassGIS? Do I have to digitize and create the data myself?

Step 3: Data Exploration = test-drive your data to make sure that you really have the data you need to perform your analysis.

Step 4: Data Manipulation, for example editing, sub-selecting the needed features using Select By Attributes, Select By Location, clipping, merging, combining, etc. Data often cannot be used 'as-is', but need some manipulation.

Step 5 : Data Analysis = translating the three written criteria above into a logical sequence of ArcGIS Tools. This is best done by creating a flow chart to visualize the analysis steps.

Step 6: Map Creation (= making your analysis meaningful for other people).

Common mistakes:

- People tend to skip Step 1! Big mistake!
- People tend to start with Step 2 and then immediately to Step 5 and 6. This usually does not work, since you first need to explore and manipulate the data.
- Data often need to be 'massaged' before they are usable in your specific application!
- People tend to forget creating a flow chart before starting their data analysis.
- People tend to be too focused initially with the end product...the final map. Nothing wrong with planning, but Step 6 is impossible without Steps 1 to 5.
- People forget to adequately document their project.
- **People do not back-up their data!**

2) Select by Location

Filtering data means analyzing and mapping only a subset of the full data set. And, with geospatial data, you can filter both based on feature attribute and feature location.

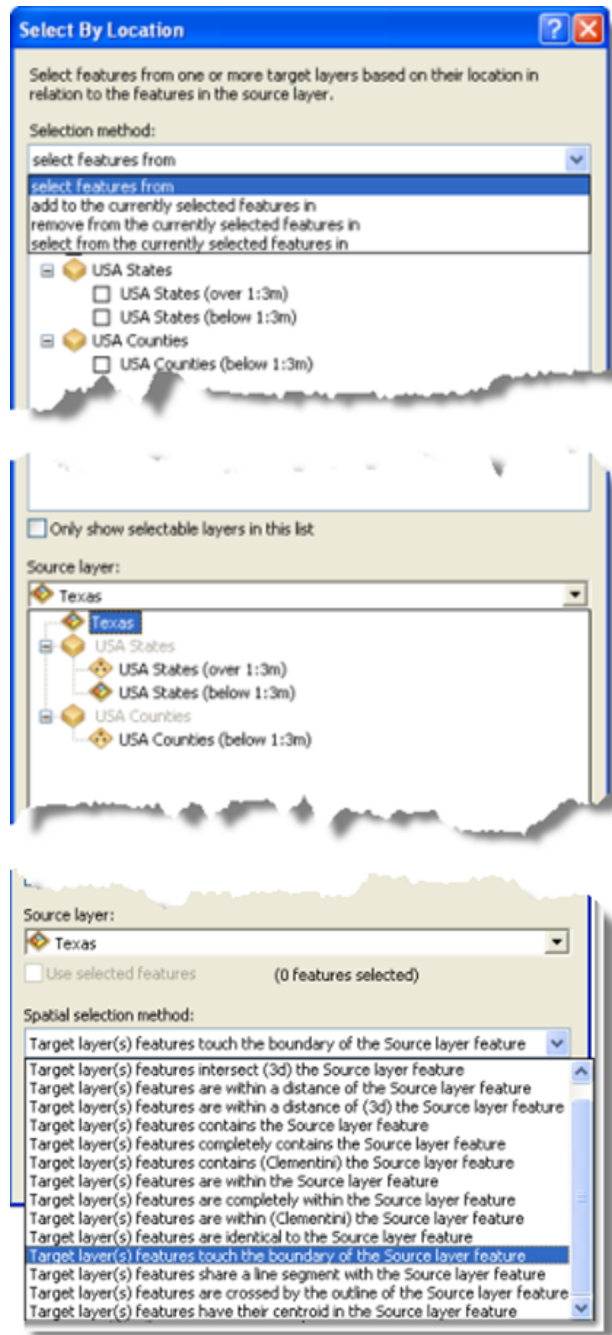
Select by Location (often combined with proximity or buffer analysis)

- Analyze all underground oil tanks within 10,000 feet of the river.
- Analyze all towns that a river flows through.
- How many towns are located inside the Quabbin watershed?

The Select By Location tool lets you select features based on their location relative to features in another layer. For instance, if you want to know how many homes were affected by a recent flood, you could select all the homes that fall within the flood boundary. You can use a variety of selection methods to select the point, line, or polygon features in one layer that are near or overlap the features in the same or another layer.

You select features from the target layer based on their location relative to features in the source layer.

1. Click Selection > Select By Location to open the Select by Location dialog box.
2. Choose your Selection method. Click the drop-down arrow to see your choices.
3. Choose the target layer(s) from which features will be selected.
4. Specify the source layer that will be used to select features from the target layer.
5. Choose the spatial selection method that will be used for selection.
6. Export you selection as a new data set.



More about Select by Location on the ArcGIS Resource Center!

<http://resources.arcgis.com/en/help/main/10.2/index.html#//00s50000002q000000>

Exercise 1. How many cities/towns are located within the Westfield River and Quabbin watersheds? How many different ways can you answer this question? Make a map thereof.

Exercise 2. How many underground storage tanks are located a) in Amherst, b) within the Westfield River watershed, and c) within 2 miles of the Westfield River?

Exercise 3. Map all cities/towns and firestations located within 3 miles of the MassPike and I91. How many different ways can you answer this question? Hint: use the Major Roads layer from the course website.

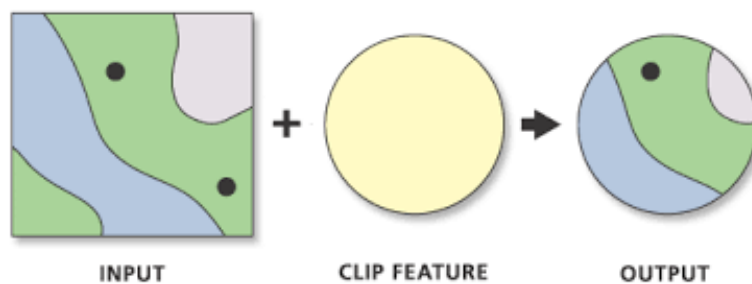
You a) already have the data or b) I provided the data for you - check the course website or c) you may need to download the data from MassGIS.

3) Geoprocessing Tools

In the simplest form a geoprocessing tool takes an input data set, perform some type of geoprocessing, and creates a new output data set. For example, you might have a stream network (as lines) as your input data set and use the Buffer tool to create a new output data set showing the 100 foot buffer polygons around the streams.



A somewhat more complex geoprocessing tool begins with two input data sets, performs some type of geoprocessing, and creates a new output data set. For example you may have one input data set with all streams, lakes, and ponds in Massachusetts, but you are only interested in those that fall within your particular area of interest. Here you can use the Clip tool or Intersect tool in ArcGIS.



4) Prep for Thursday

1. Work through GTKArcGIS Ex. 19a (Buffering features) and print the map you have on your screen at the end of the exercise.
2. Work through GTKArcGIS Ex. 19b (Overlaying data) and print the map you have on your screen at the end of the exercise.
3. Finish our three in-class exercises.
4. Work on the Land Use Change Project.