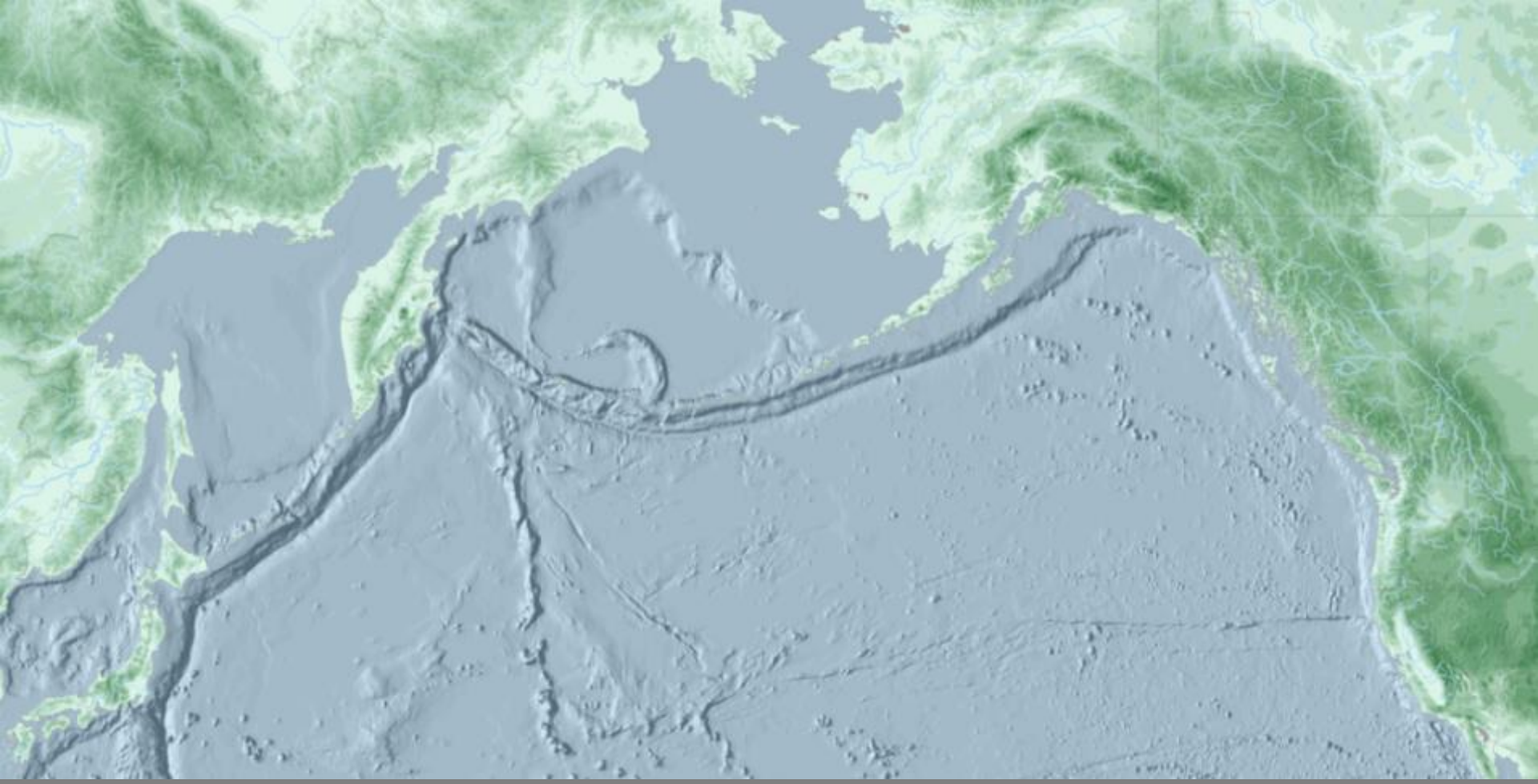
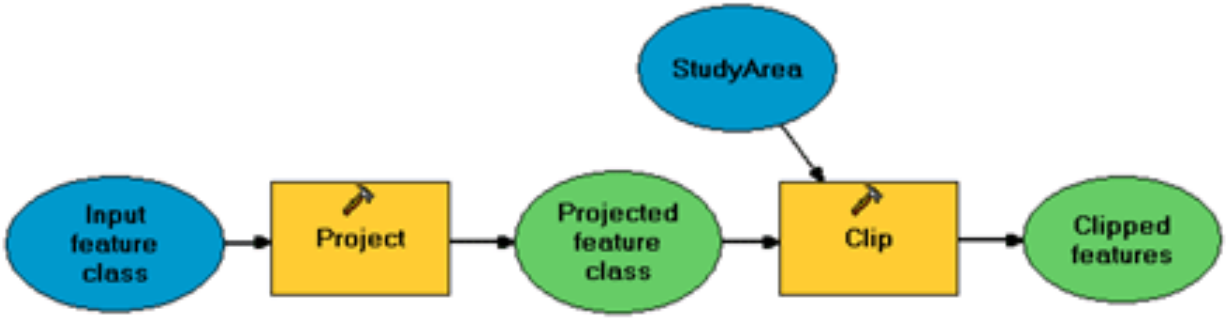


VECTOR ANALYSIS: QUERIES, MEASUREMENTS & TRANSFORMATIONS

GIS Analysis| Winter 2016

Spatial Analysis

- Operations performed on spatial data that add value
- Can reveal things that might otherwise be invisible --- it can make what is implicit, explicit



Vector Analysis

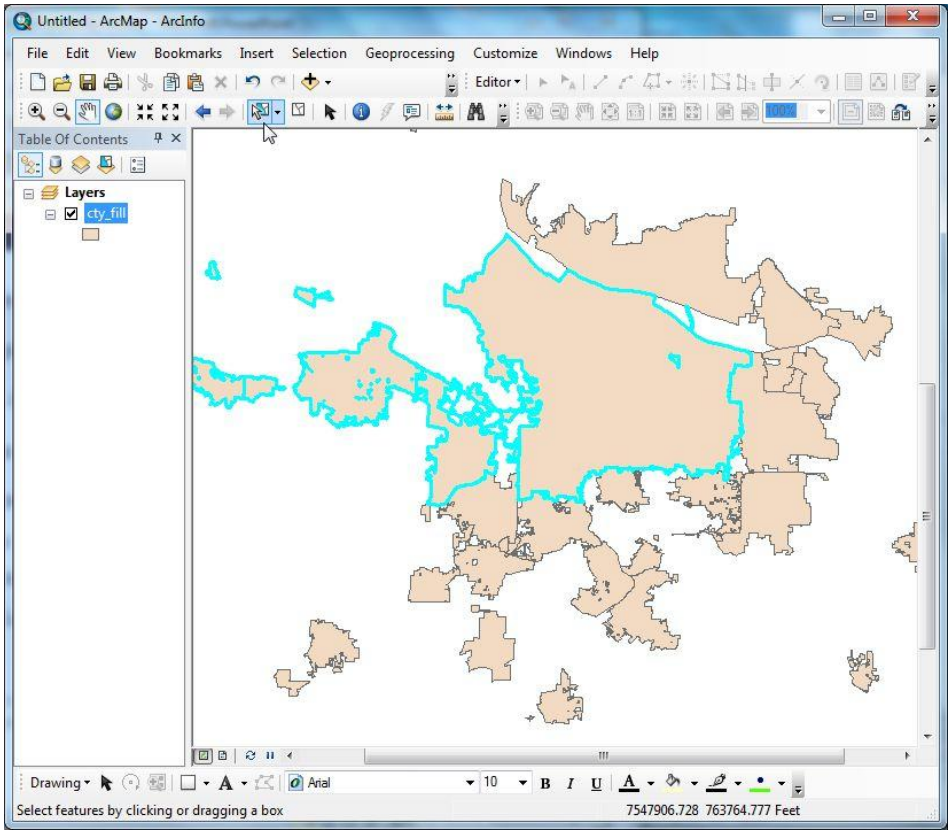
- **Queries/Selections**
- Measurements
- Transformations

Queries | Selections

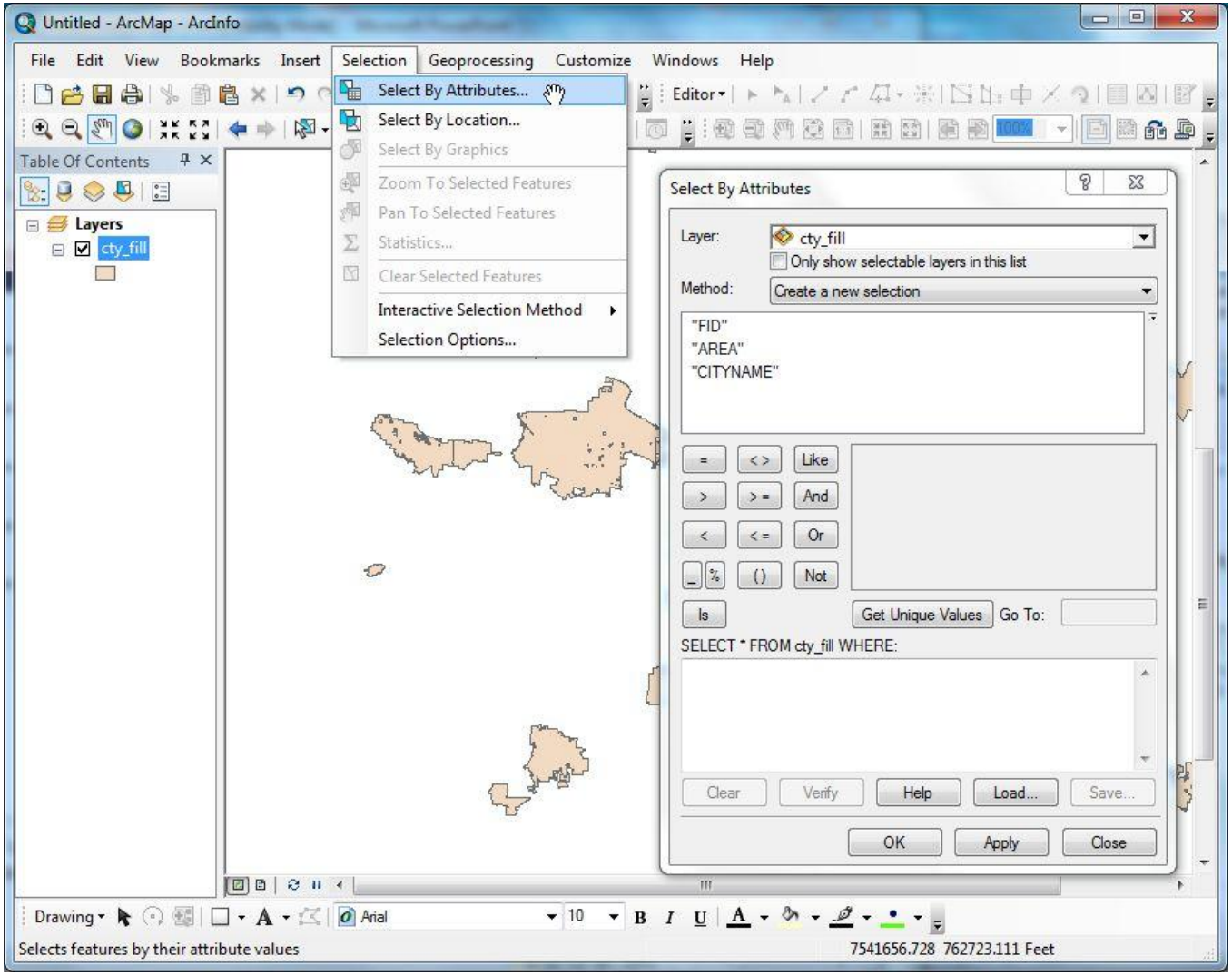
- Queries/Selections are the *most basic* analytical operations
  - Answer simple *questions* posed by the user
  - No changes in the database occur
  - No new data is created

Interactive Selection Tool

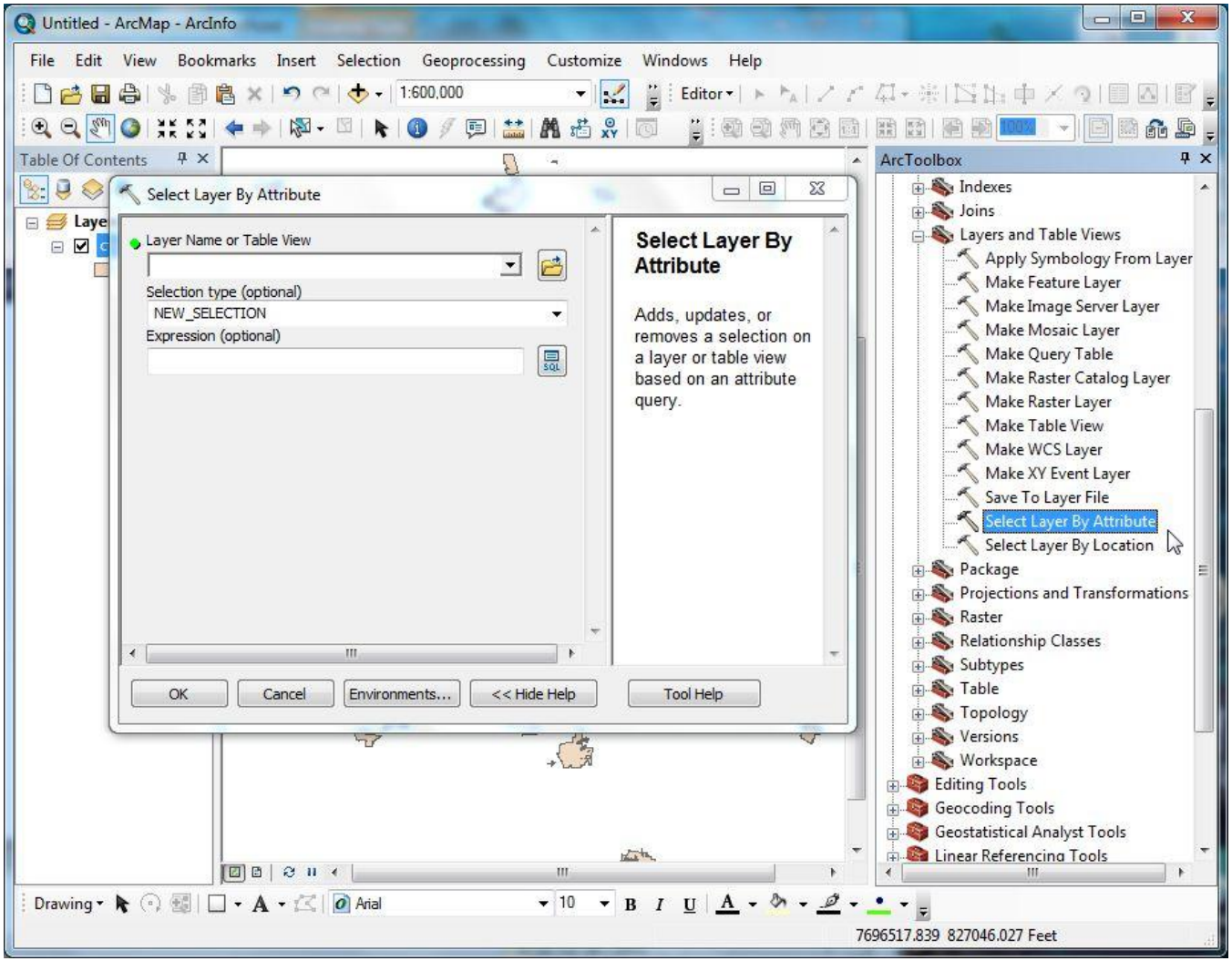
- Found on the ***Tools*** Toolbar
- No counterpart in ArcToolbox



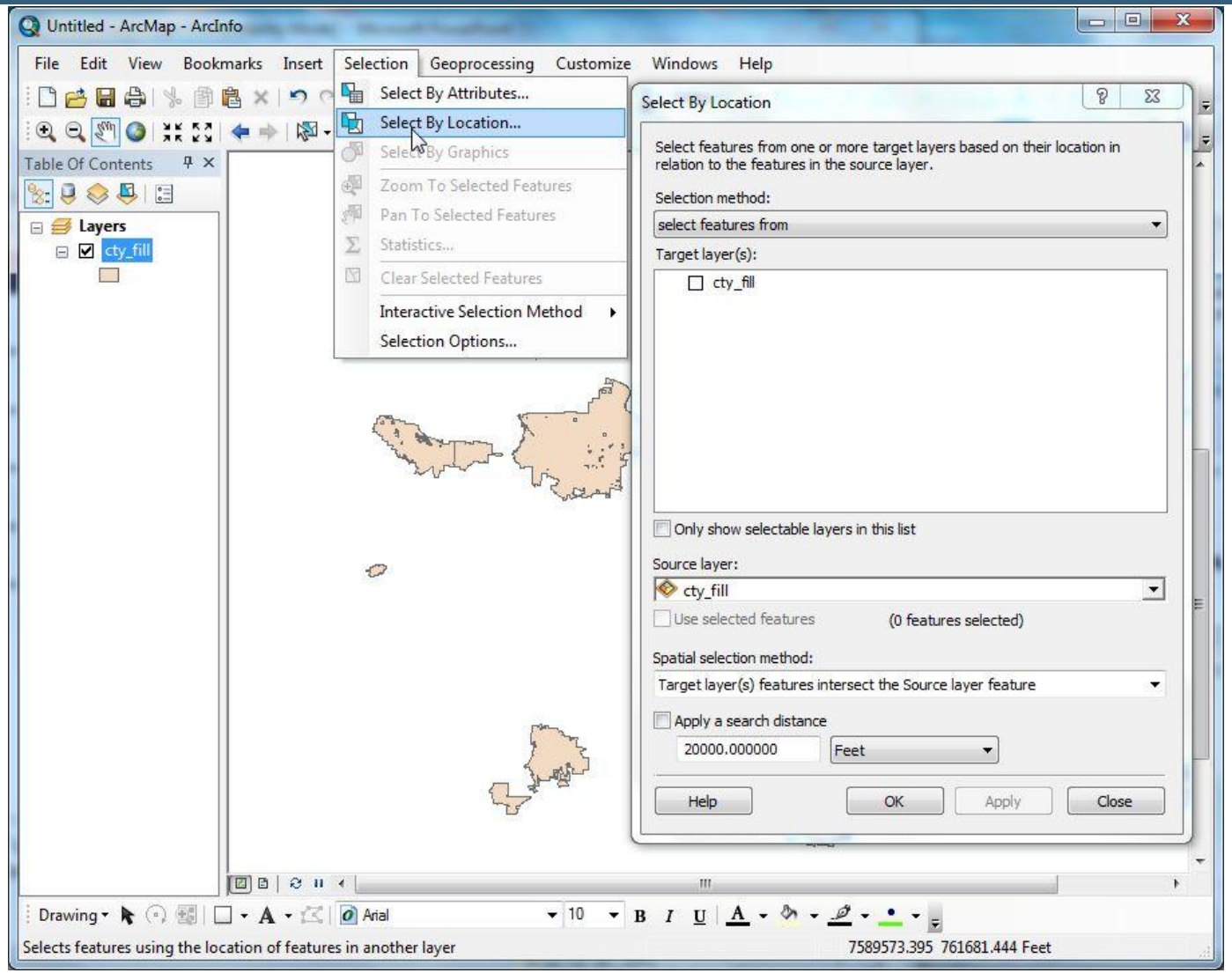
Select by Attributes



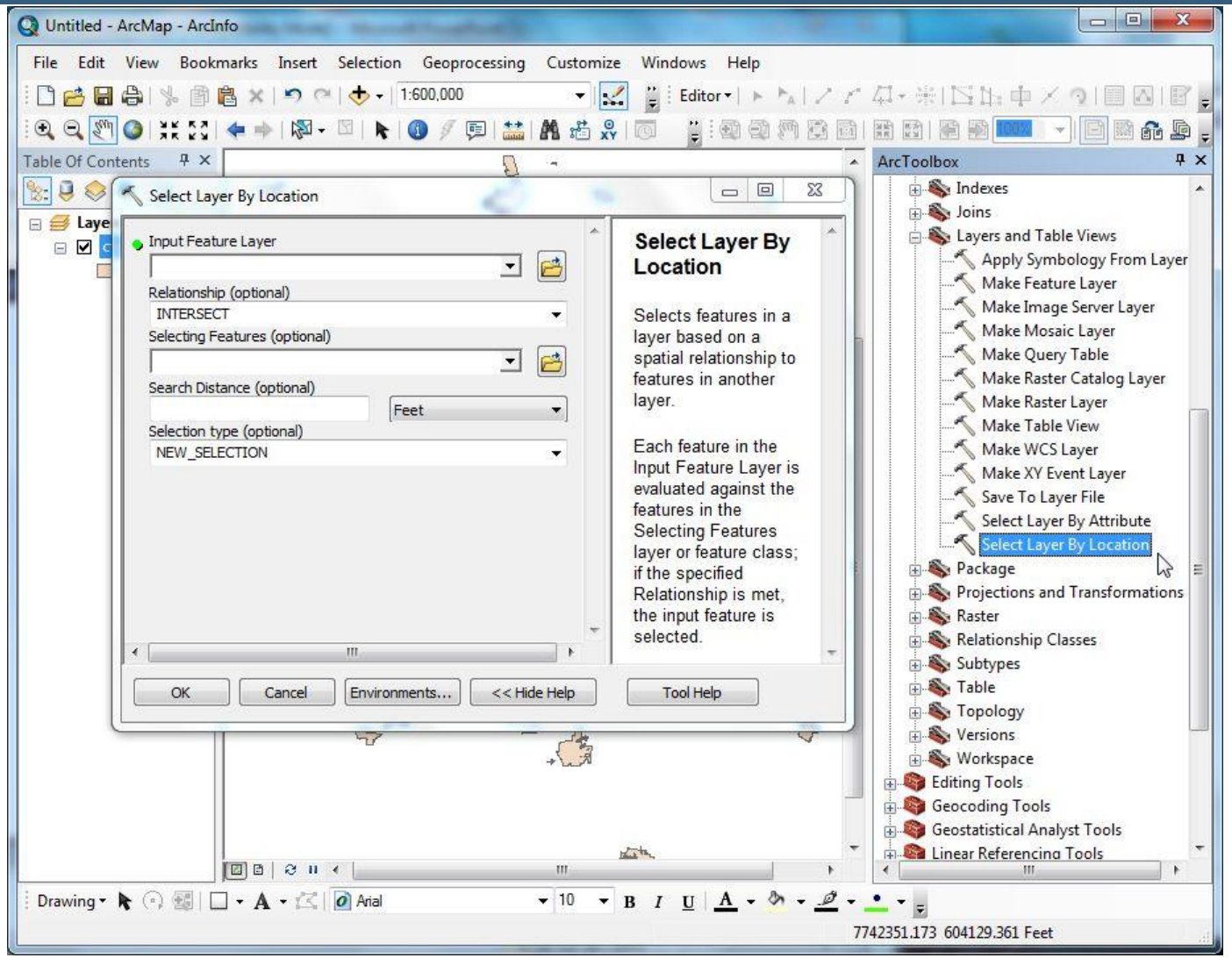
Select by Attributes - ArcToolbox



Select by Location



Select by Location - ArcToolbox



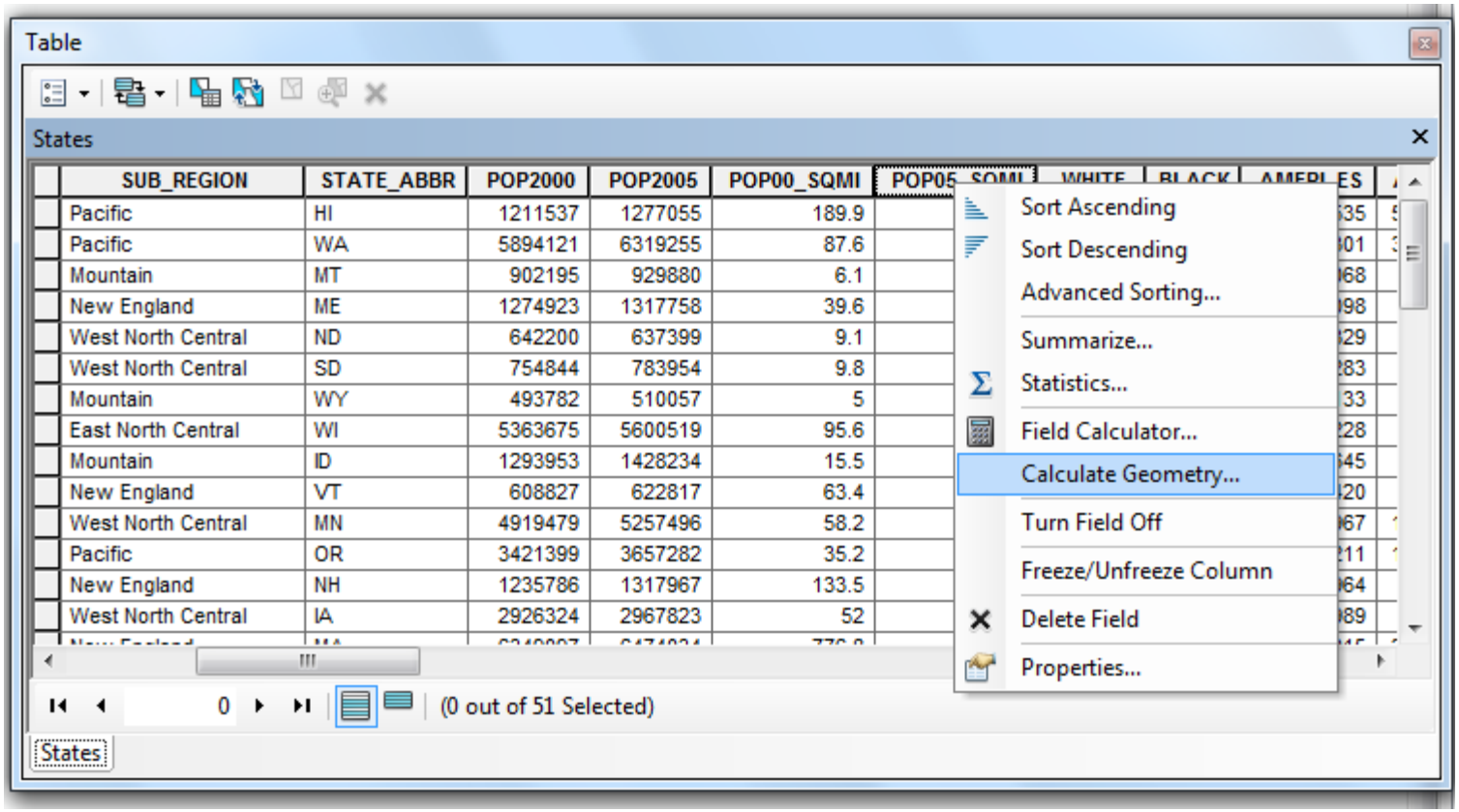
Vector Analysis

- Queries/Selections
- **Measurements**
- Transformations

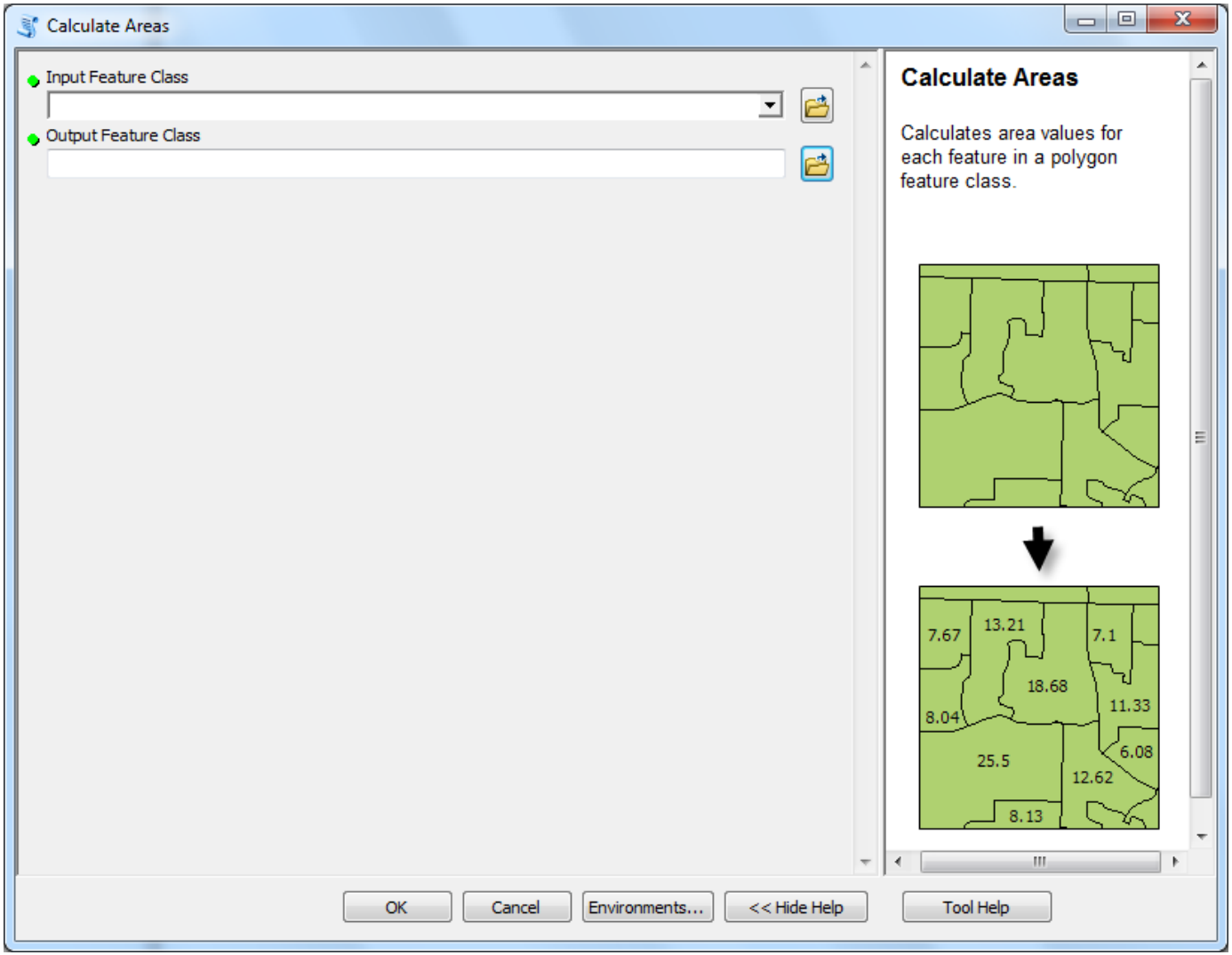
Measurements

- Calculations of length, area, distance, etc.
- Easy to do in GIS, difficult and tedious to do on paper maps

Attribute table – Calculate Geometry



Calculate Areas - ArcToolbox



Vector Analysis

- Queries/Selections
- Measurements
- **Transformations**

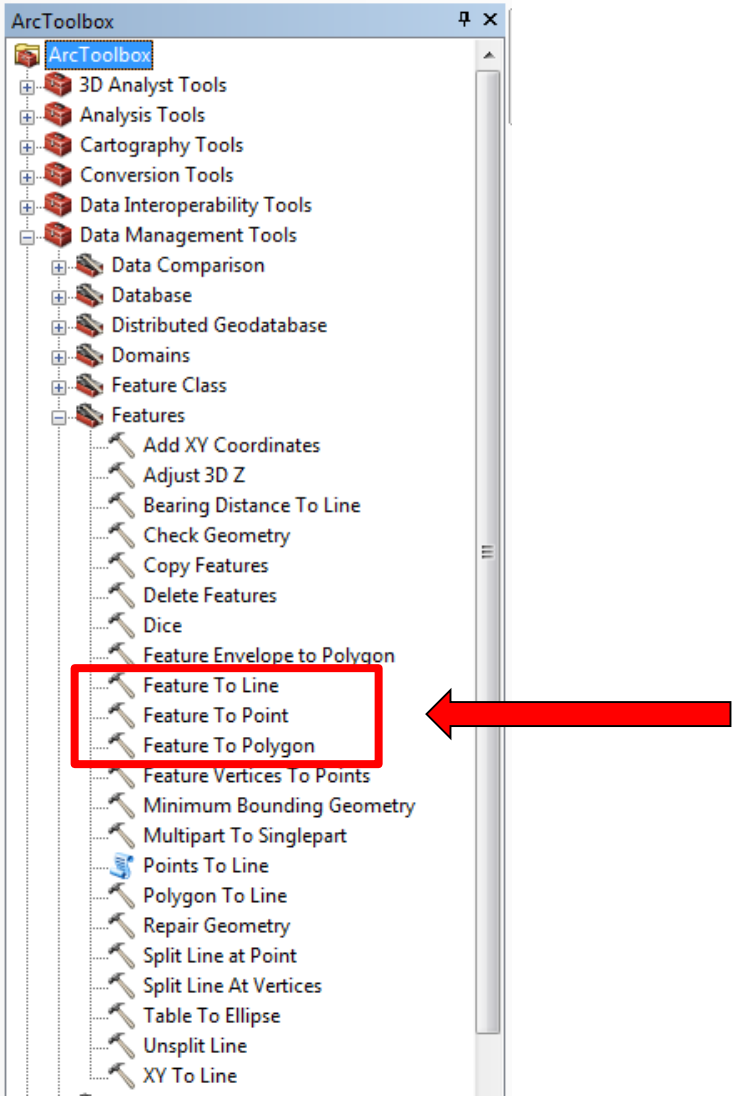
Transformations

- Create "*products*" from GIS data using simple rules and algorithms;
- Reveal aspects of the data that may not be visible in the original data.
- Datasets are "transformed" into something new

Types of Transformations

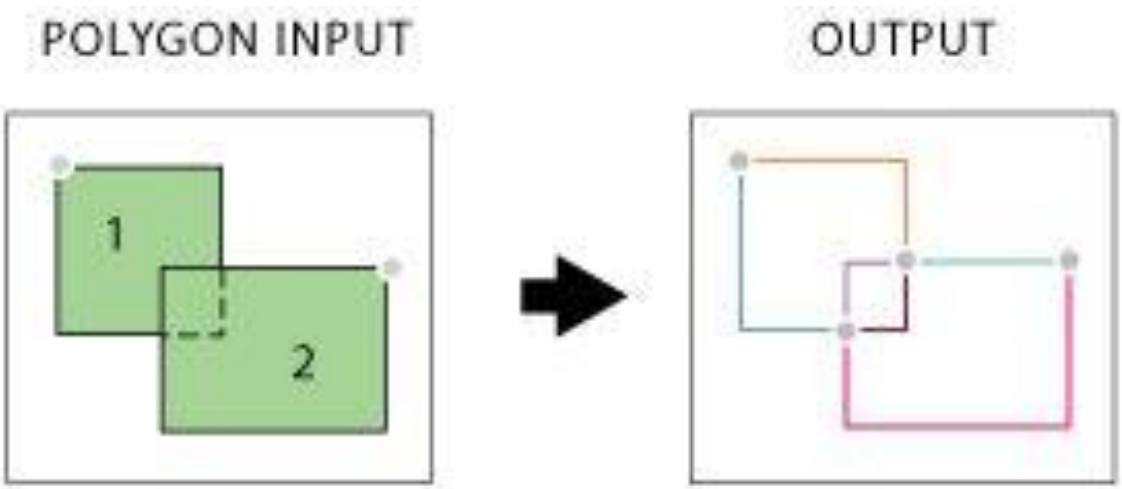
- Converting feature types (Conversions)
- Generalization
- Proximity
- Overlays/Adjacency

Converting Features



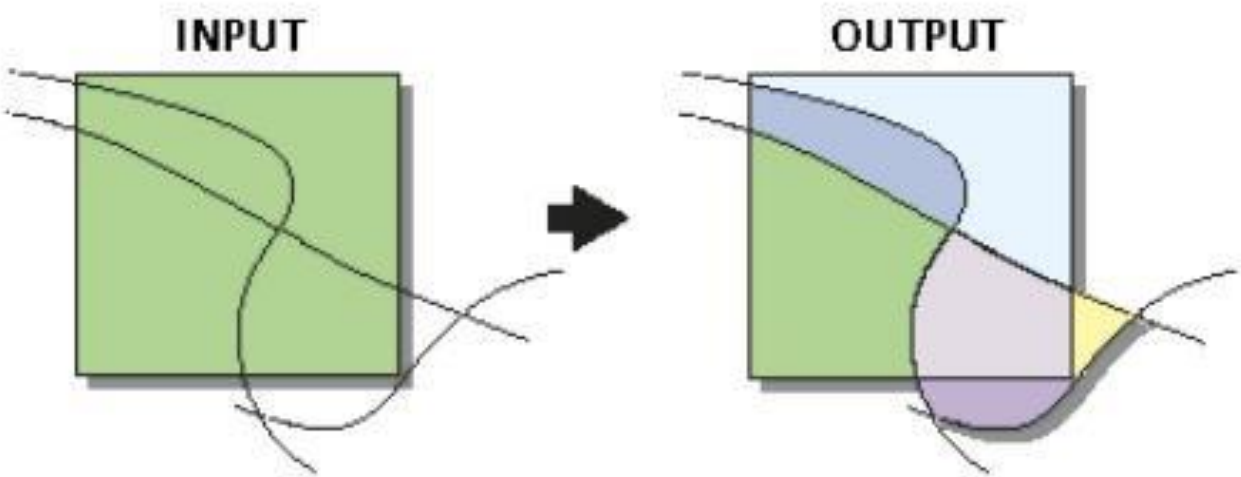
Converting Features

- **Feature to Line.** convert feature boundaries into lines, e.g. polygons to outline segments



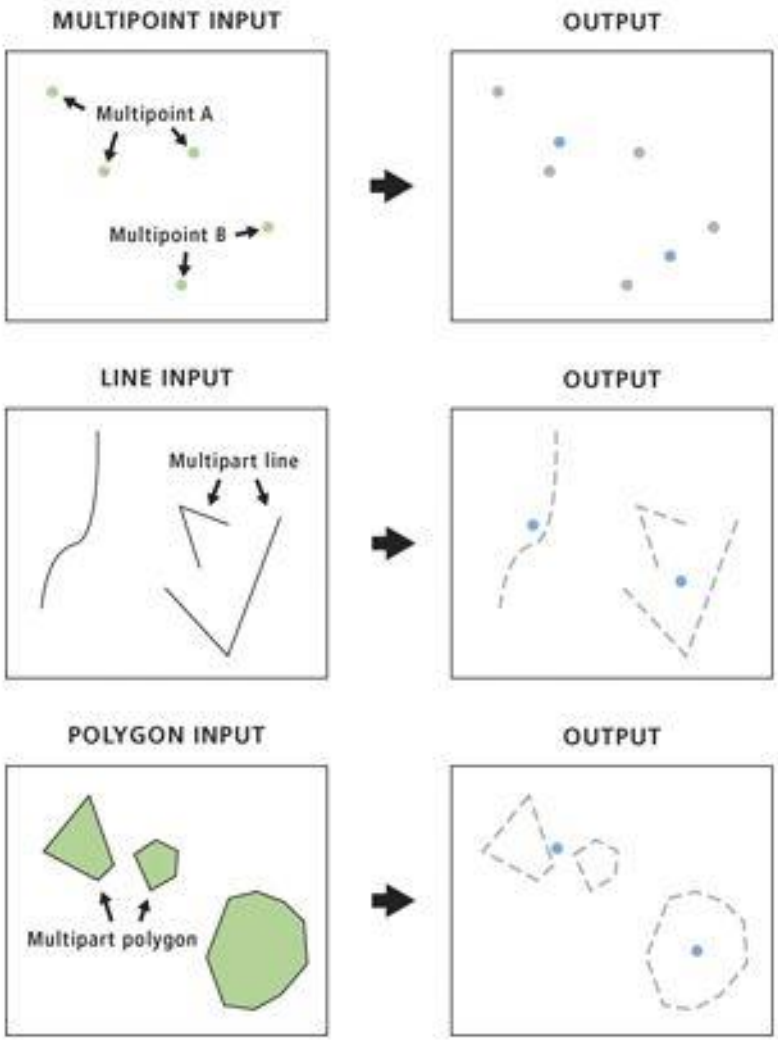
Converting Features

- **Feature to Polygon**. convert closed areas of features into polygons, e.g. lines to polygons.

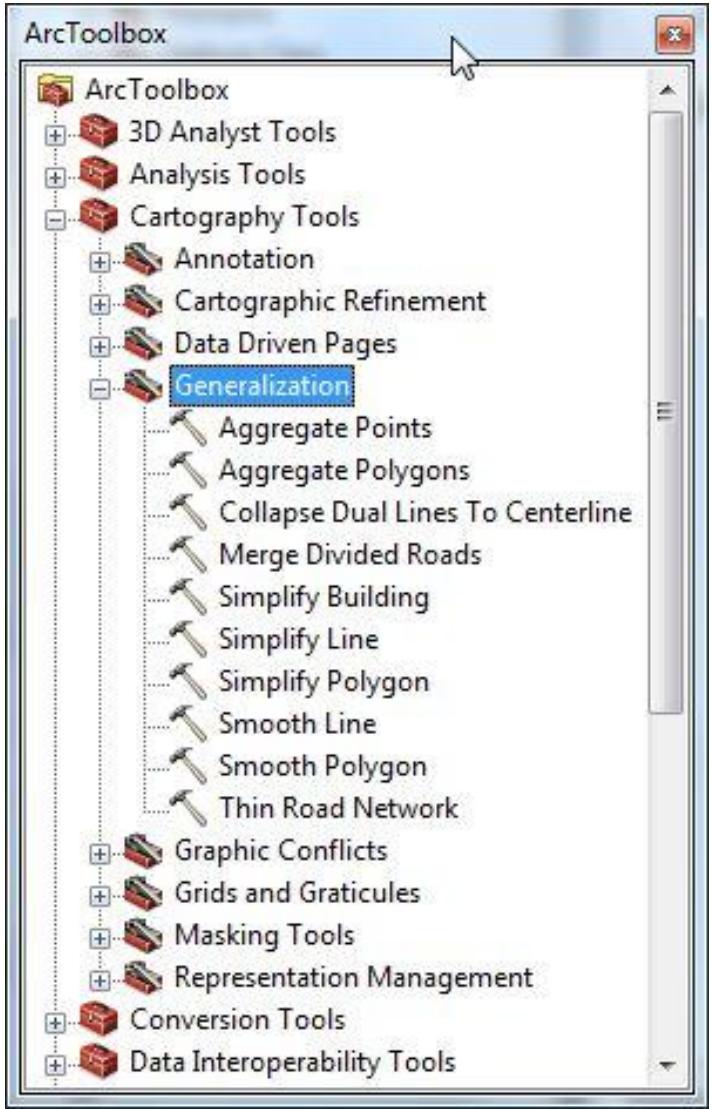


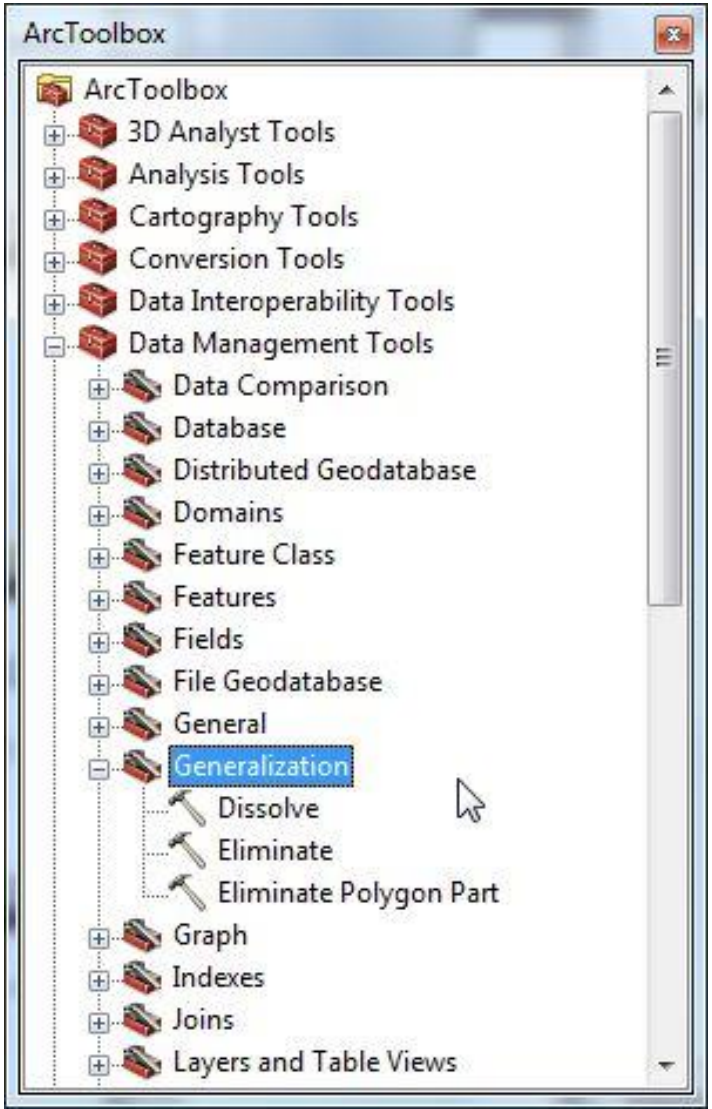
Converting Features

- **Feature to Point.** creates points located at input feature *centroid* locations



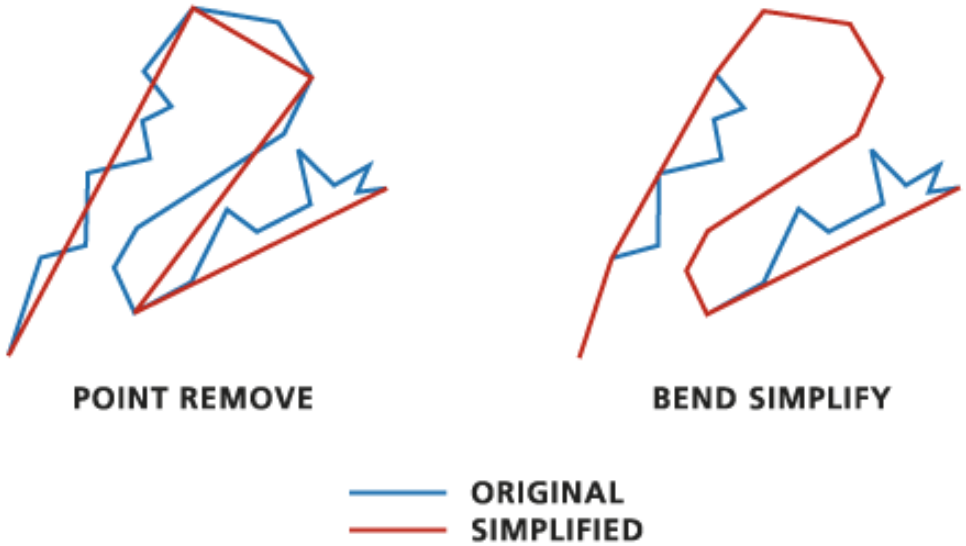
Generalization Tools





Generalization - Cartography

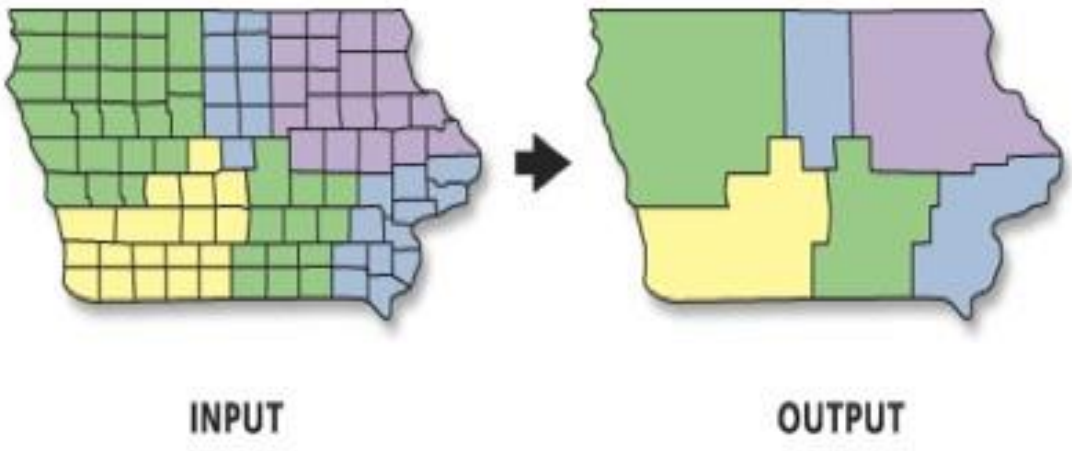
Simplify Line. removes unnecessary vertices from a line



- Why or when would this tool would be helpful?
- **Note.** this is <u>not</u> the same as the "Smooth Line" tool!

Generalization - Data Management

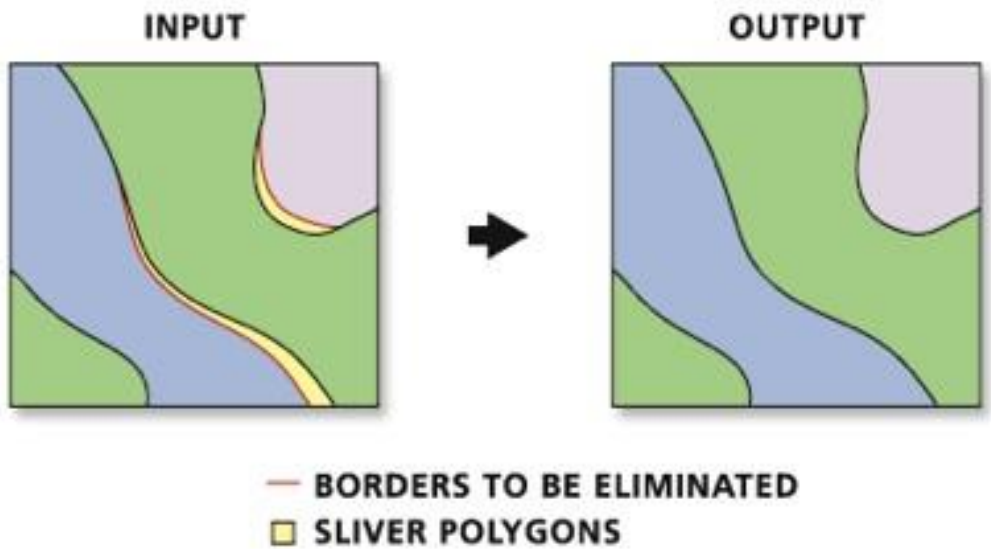
Dissolve. aggregates features based on 1 or more attributes



- **Note.** Attributes can be *summarized* based on the aggregated features; summary statistics in output table

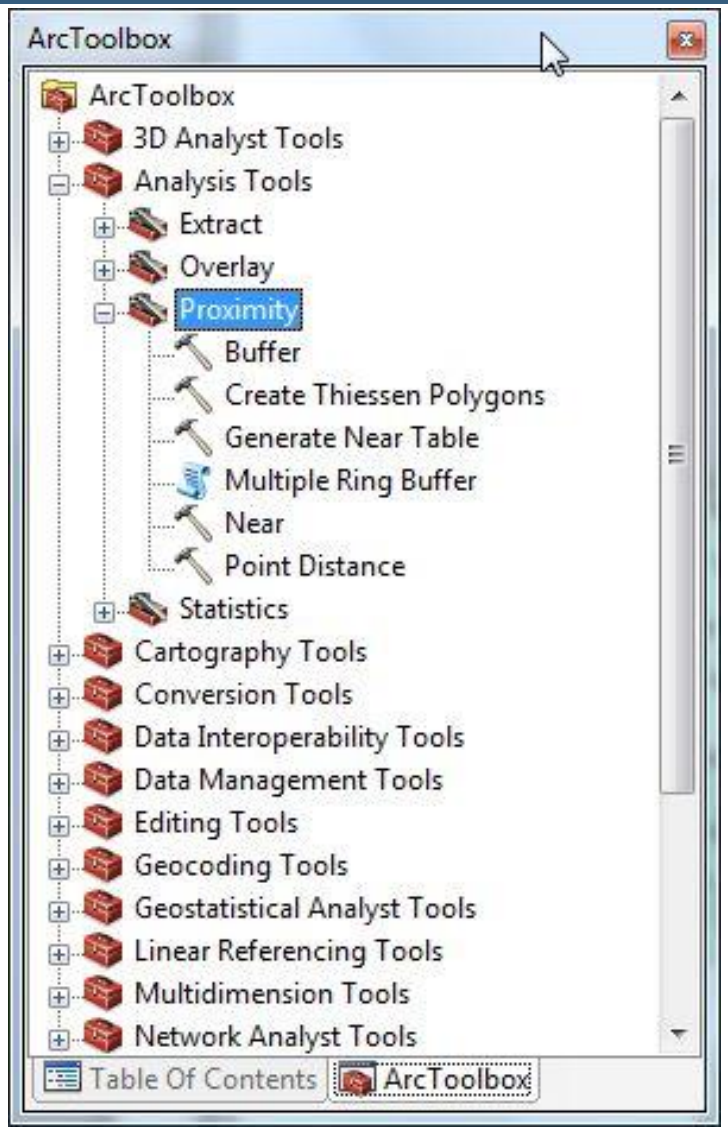
Generalization - Data Management

Eliminate. removes unwanted (e.g. "sliver") polygons



- What is another method for dealing with sliver polygons?

Proximity Tools

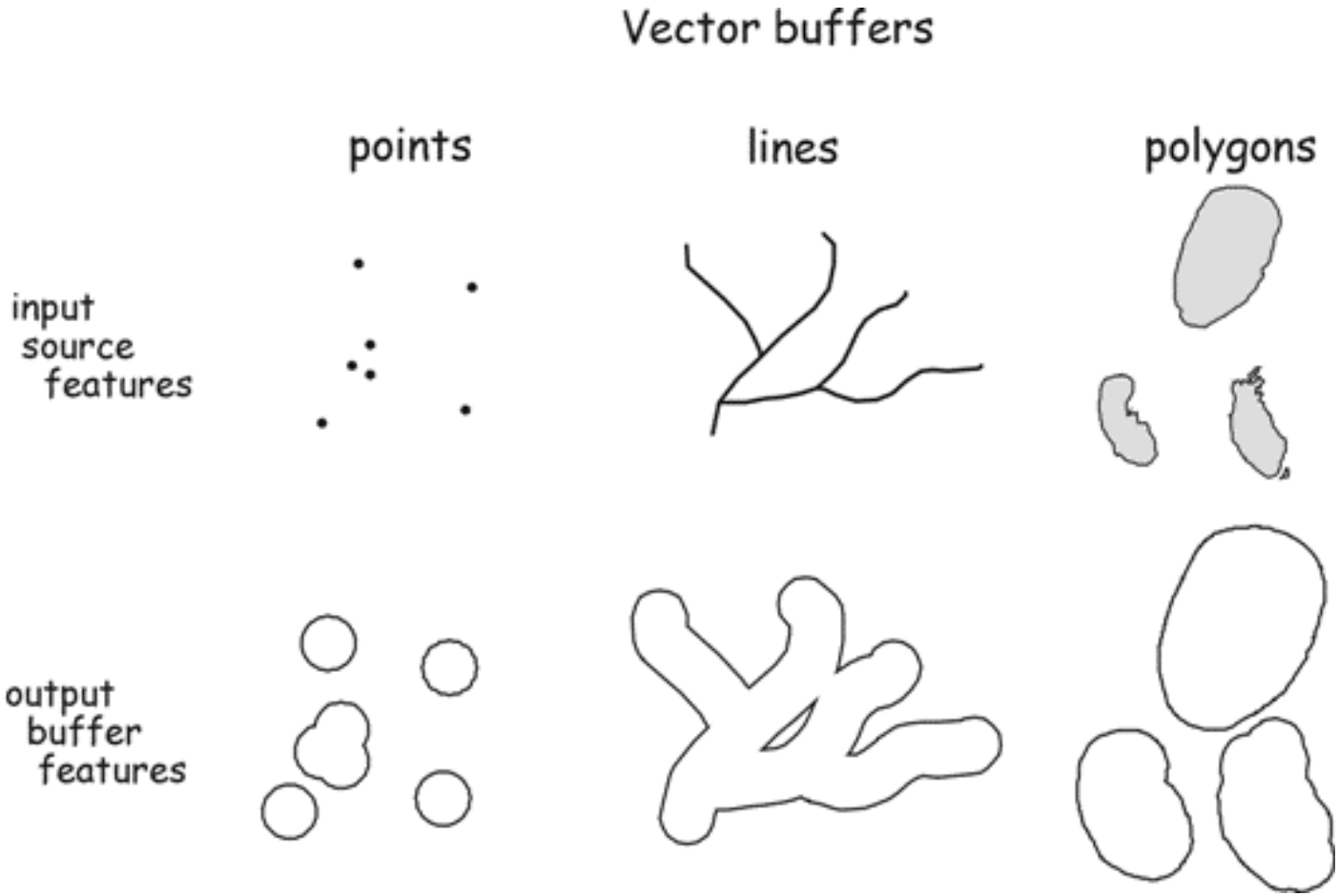


Proximity | Buffer

Buffer. builds a new object or objects by identifying all areas that are within a certain *specified distance* of the original object(s)

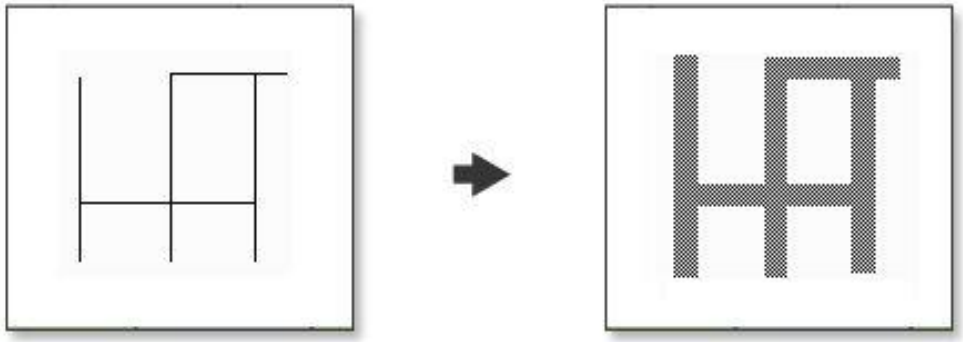
- Likely the *most common* analytical operation

Proximity | Buffer



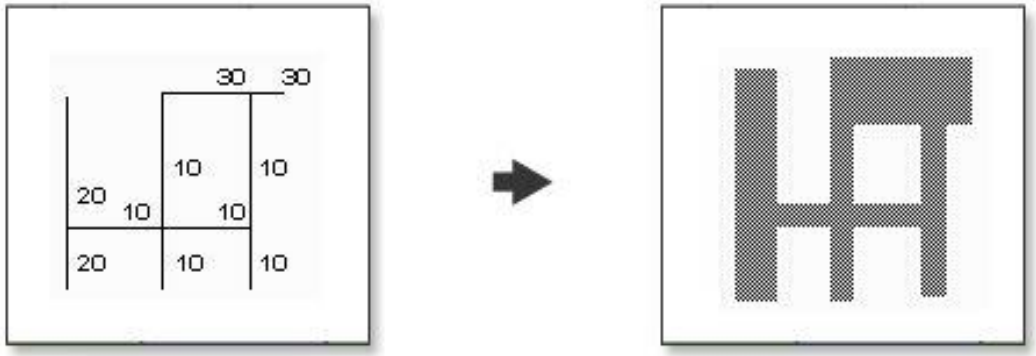
Proximity | Buffer

Buffers can be created at a *fixed distance*…



INPUT OUTPUT

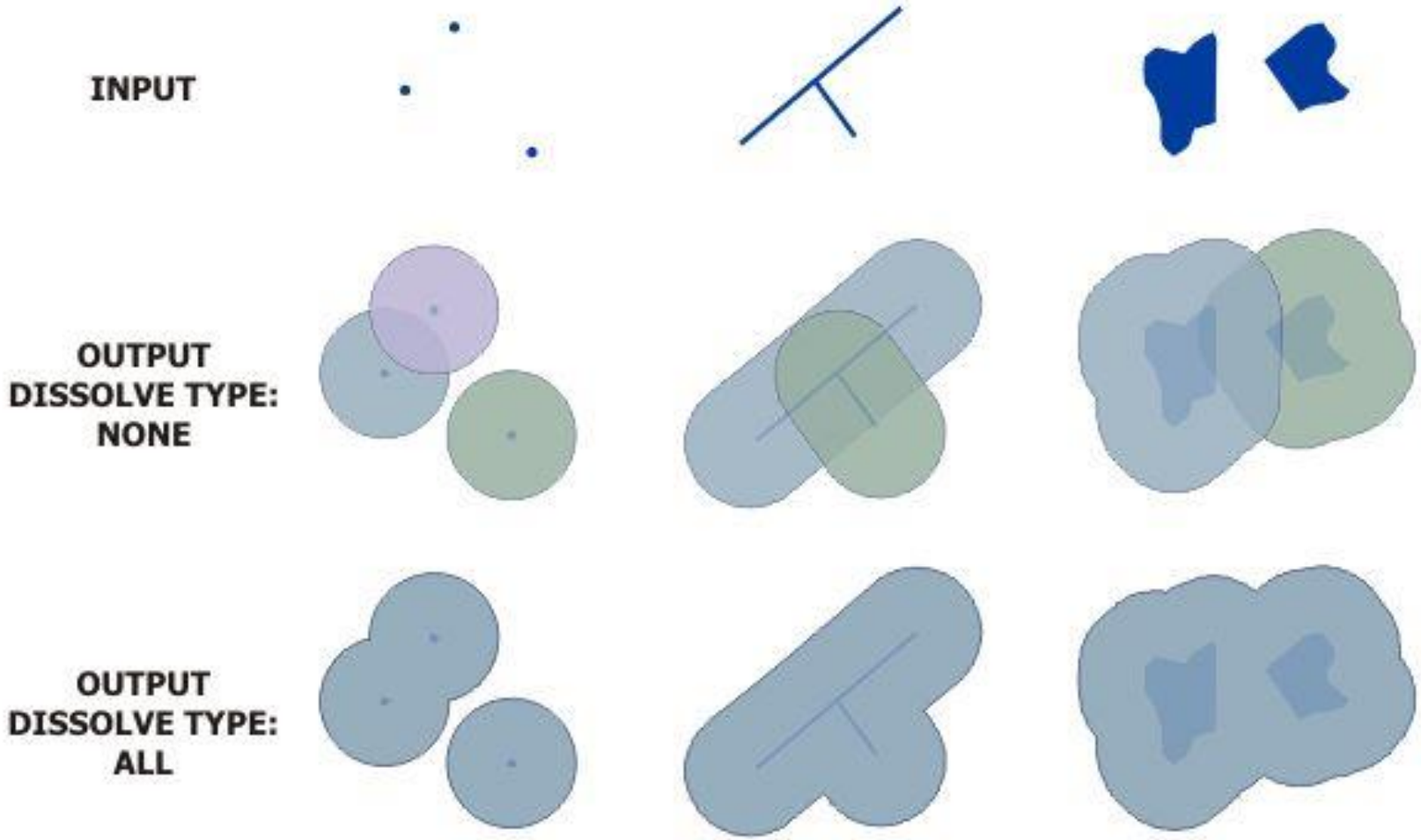
Or based on *weighted distances* (from attribute field)…



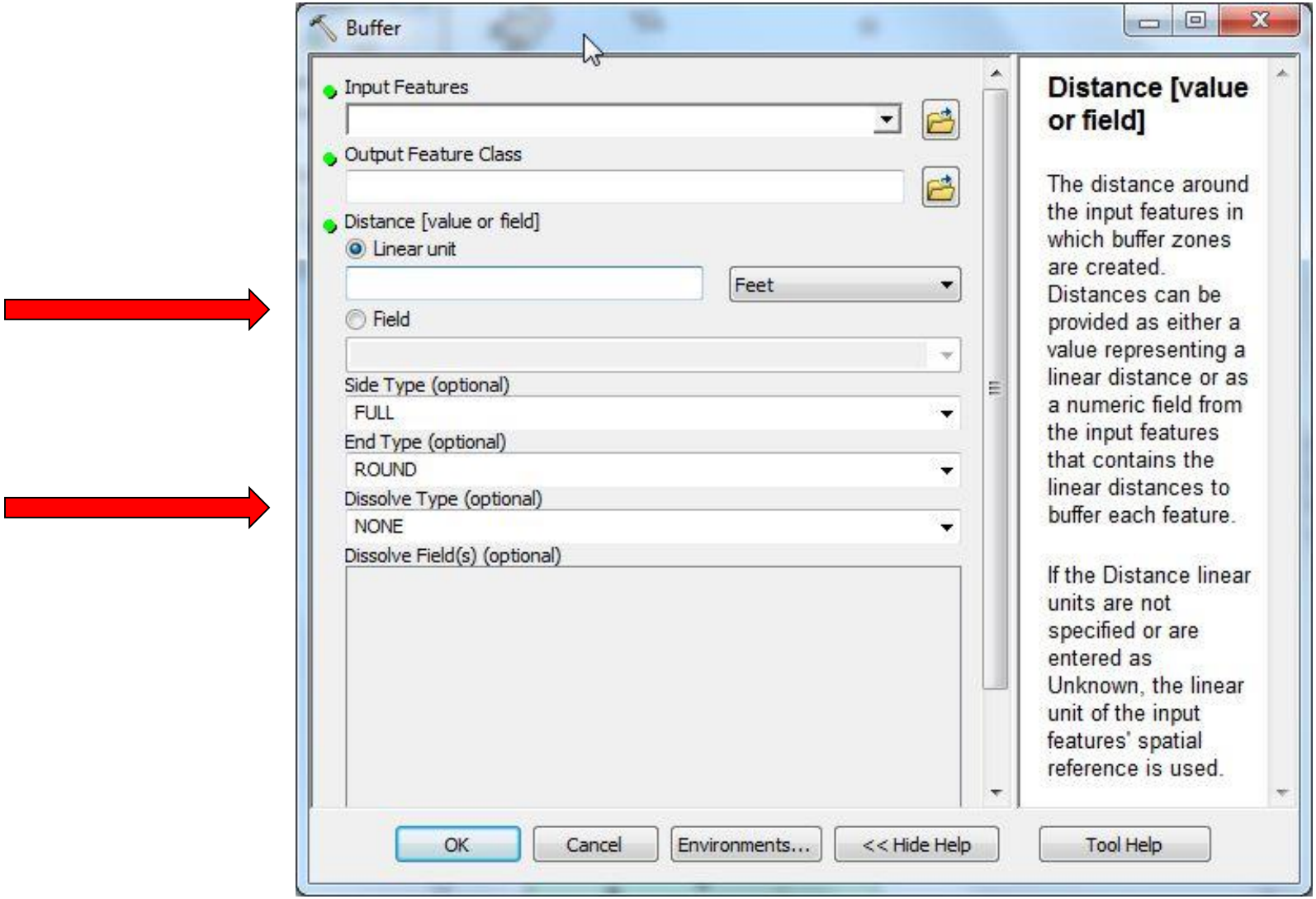
INPUT OUTPUT

Proximity | Buffer

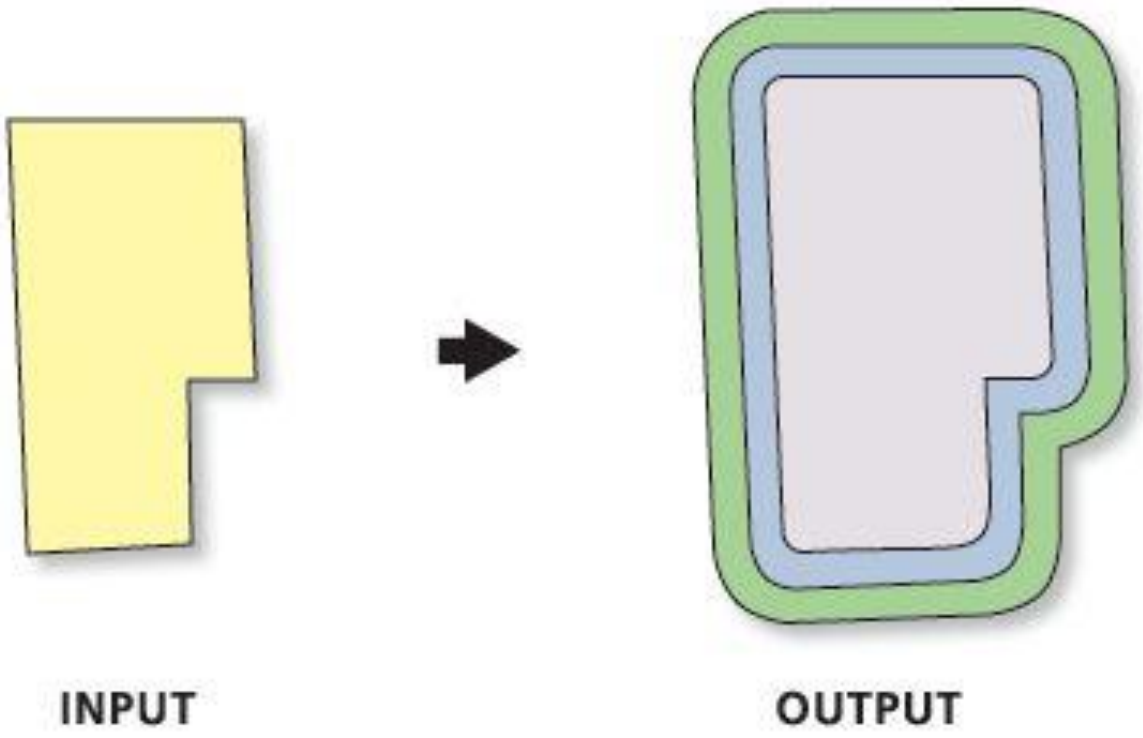
Effects of the "Dissolve Type" settings…



Proximity | Buffer



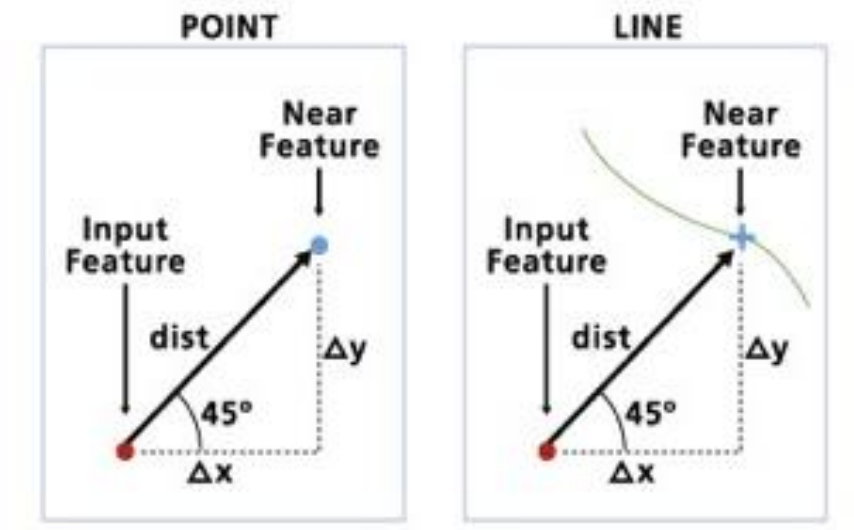
Proximity | Buffer



"Multi-Ring" Buffer tool (watch the Dissolve Type!)

Proximity | Near

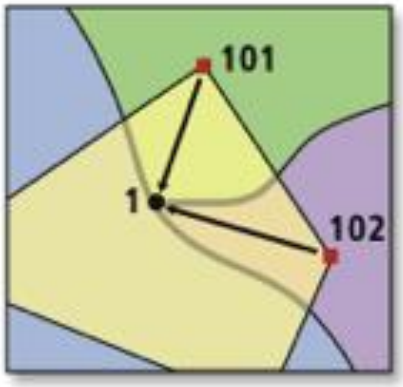
Near. computes the distance and direction between a feature (point/line/polygon) and the nearest feature



- **Note.** Results recorded in *input attribute table*

Proximity | Point Distance

Point Distance. Computes distances between a point feature in one layer and *all points* in another layer within a specified radius



Input_FID	Near_FID	Distance
101	1	65
102	1	83

OUTPUT TABLE

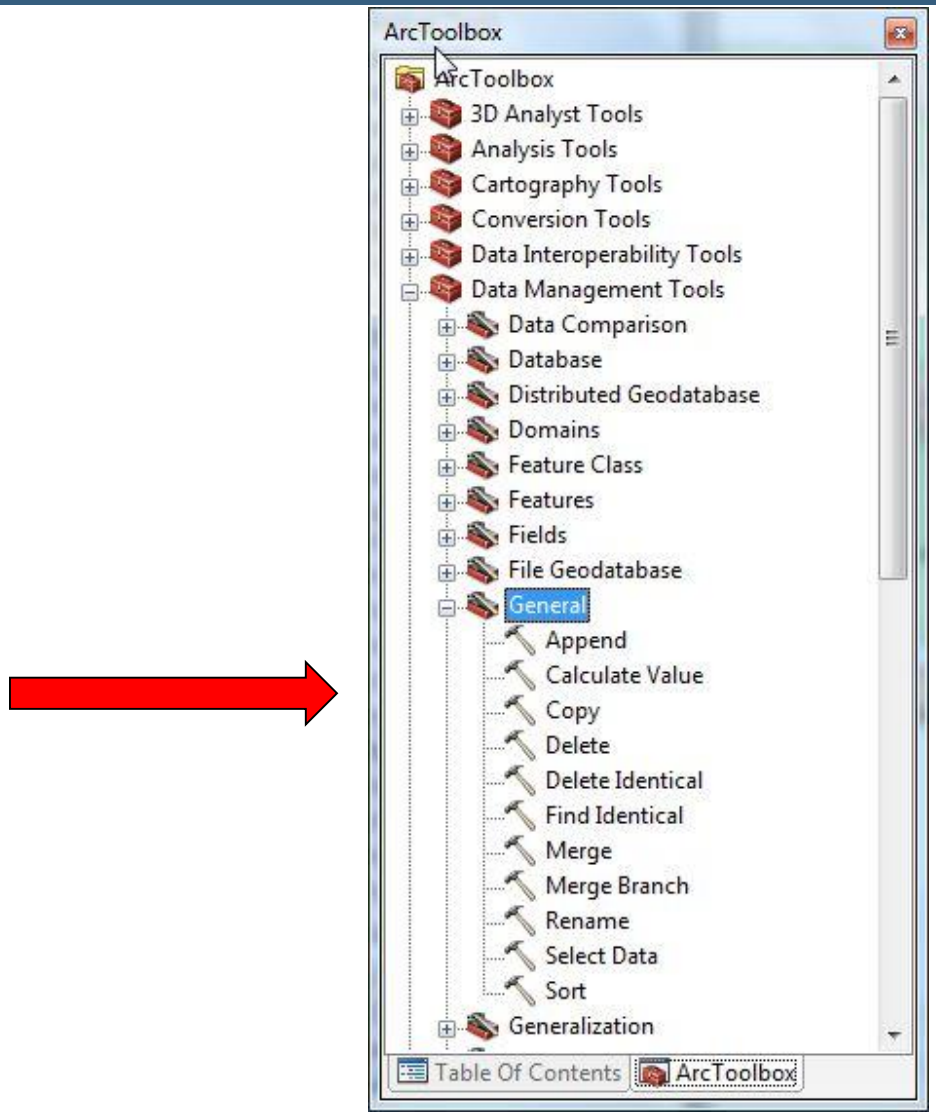
▪ INPUT FEATURES
• NEAR FEATURES

- **Note.** Results recorded in *new output table*

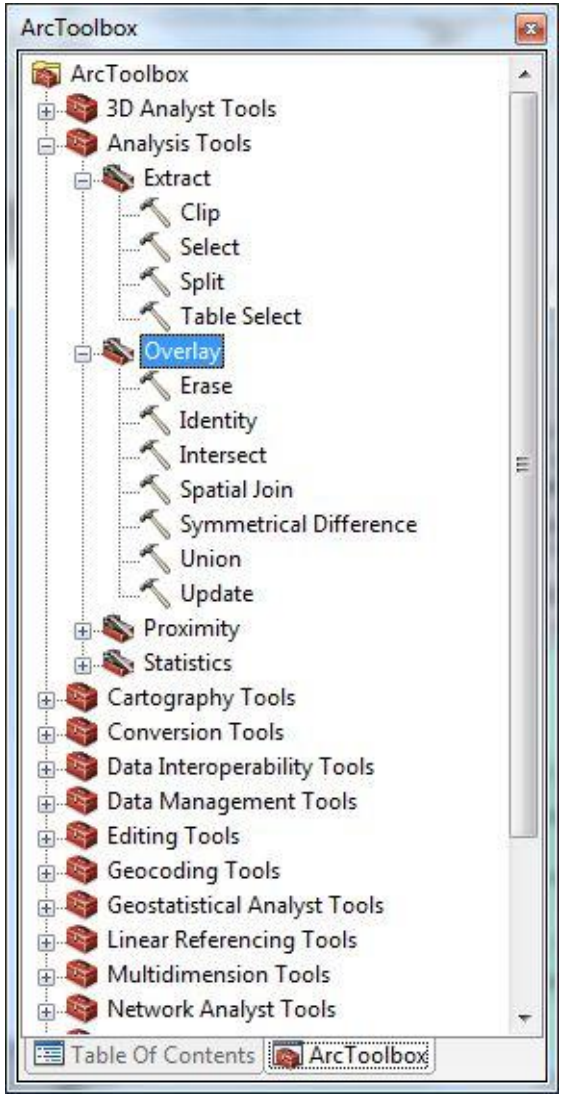
Adjacency/Overlays

- **Adjacency.** tool actions based on whether or not features are located *directly next to each other*
- **Overlays.** tool actions based on the *overlapping* geometric relationships of input features
  - Can be computationally complex
  - Fields containing *feature geometry* (area, perimeter, length) must be *updated* after some of these tools

Adjacency Tools

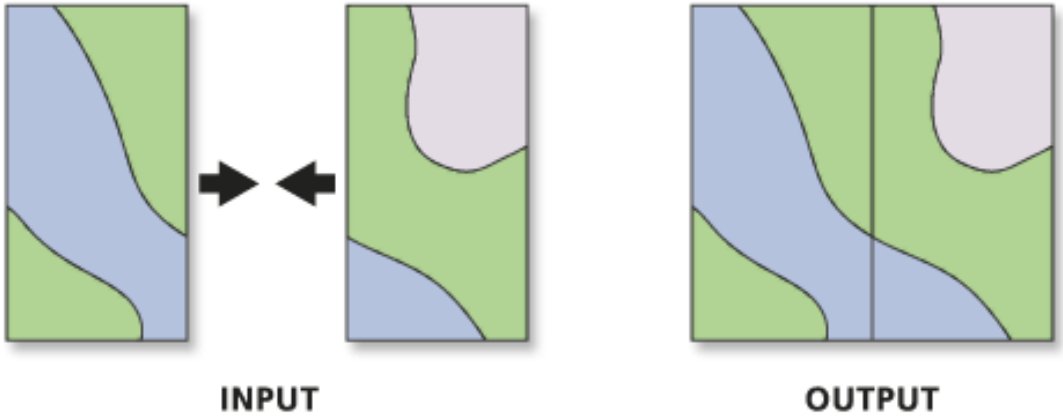


Overlay Tools



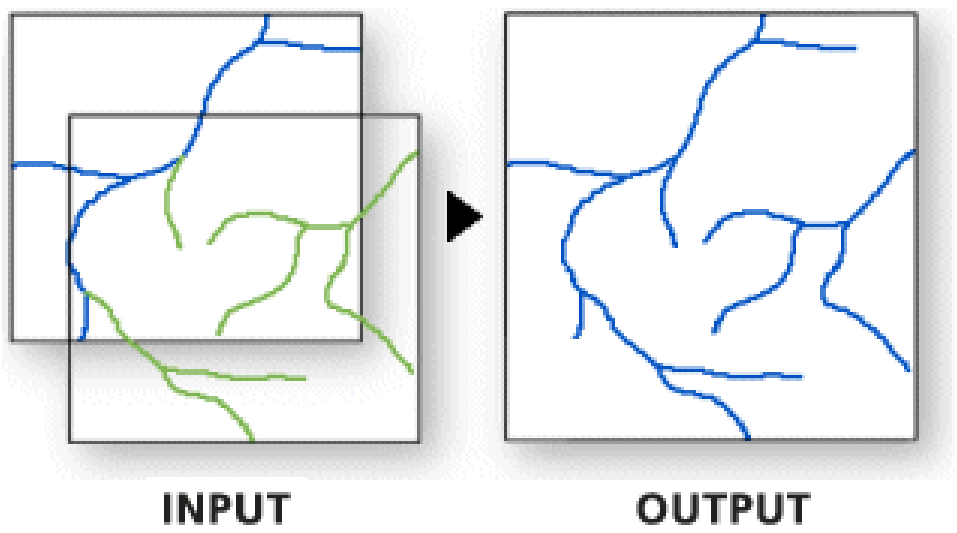
Adjacency | Merge

Merge. combines adjacent input datasets from *multiple input* datasets into a *single, new output* dataset



Adjacency | Merge

Append. adds *multiple input* datasets to an *existing* dataset; no new output dataset created



Merge vs. Append

- Open tool dialog – is there a visual illustration?
- Open Help page for tool – does it work with points, lines and/or polygon features?
- What would a basic workflow diagram look like?
- What is one example of when you would use this tool?
- What do the results look like (attributes and/or features)?