ENV208/ENV508 – Applied GIS

Week 5: Geoprocessing tools

Geoprocessing

Processing of geographic data

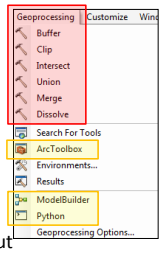
- Combine spatial and attribute data from two or more layers
- Creates a new data layer from existing GIS data
  - But new data layer does not have new data – just a subset or reorganisation of the original data
- Original (input) data always retained, unaltered

An important process in turning spatial data into information

Geoprocessing tools

Three general groups of geoprocessing tools:

1. Creating new polygon features
   - Buffer
2. Breaking features into smaller features
   - Clip, Erase, Intersect, Union
3. Aggregating features into larger features
   - Merge, Dissolve



Same tools in most GIS software packages, but name may differ

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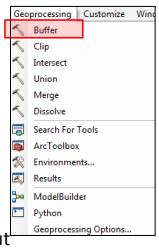

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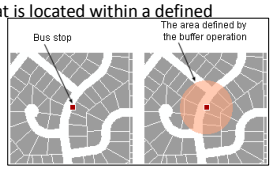
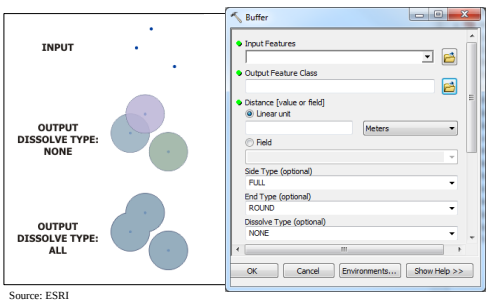
Buffer

- Buffers are zones of equal distance that are created around specific features
  - Select a layer (e.g. bus stops) and designate a distance (e.g. 100m) - all land within 100m of any bus stop will be contained in the new polygon layer
- Enable the analysis of data that is located within a defined distance of a feature
- Input: point, line, or polygon
- Positive or negative
- Undissolved or dissolved



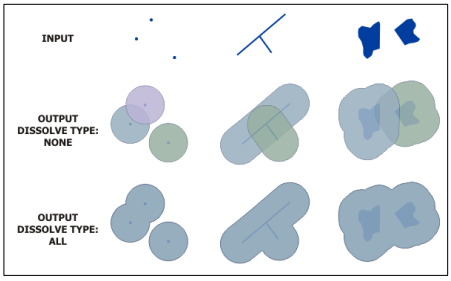
Source: ESRI

Buffer



Source: ESRI

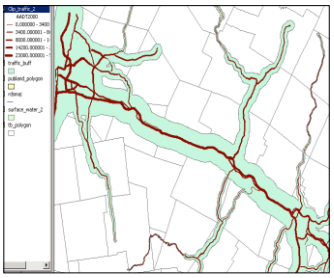
Buffer



Source: ESRI

Buffer

Variable width buffering..



Source: Austin Troy 2007

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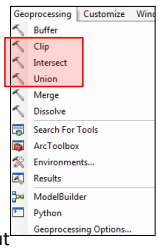
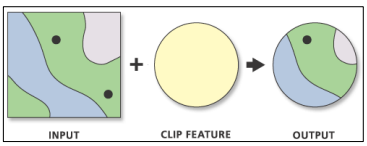


Same tools in most GIS software packages, but name may differ

Clip

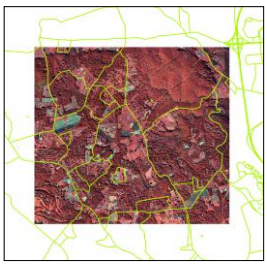
- Clips the boundaries of one layer based on the reference boundaries of another layer
- 'Cookie cutter' (keep the cookie and discard the dough)
- Useful for extracting data relevant to a particular study area

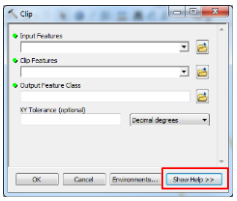


Source: ESRI

Clip

Clipping roads..





Source: Austin Troy 2007

Clip

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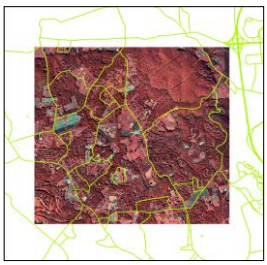

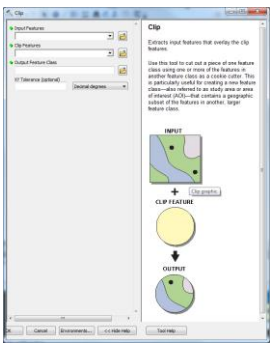

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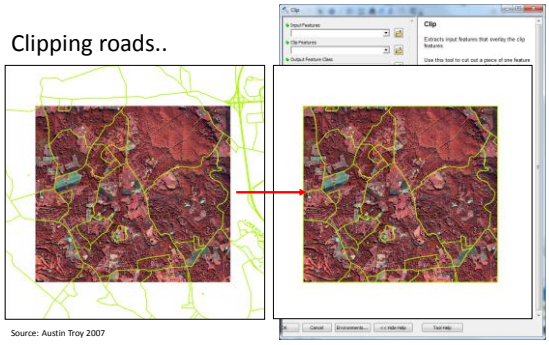
Clip

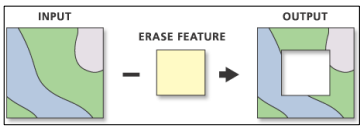
Clipping roads..



Source: Austin Troy 2007

Erase

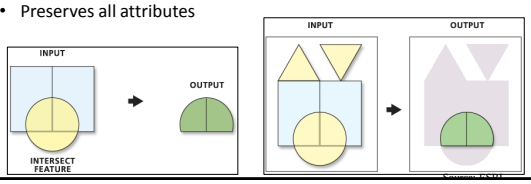
- Erases input features coincident with the reference boundary
- Opposite of Clip
- 'Cookie cutter'.. But keep the dough and throw away the cookie



Source: ESRI

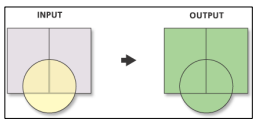
Intersect

- Integrates spatial data sets while preserving only those features falling within the spatial extent common to both layers
- Features or portions of features which overlap in all input layers will be written to the output feature class
- Usually creates many new, smaller polygons
- Preserves all attributes



Union

- Computes a geometric union of the input layers
- Breaks down features, and creates new polygons
- Preserves all attributes of input features



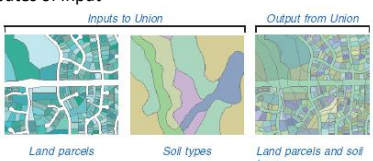
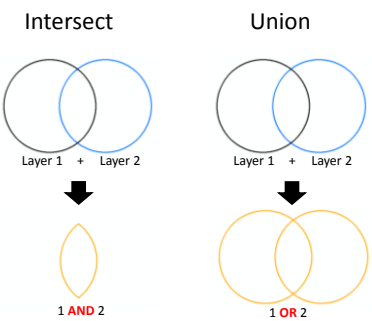


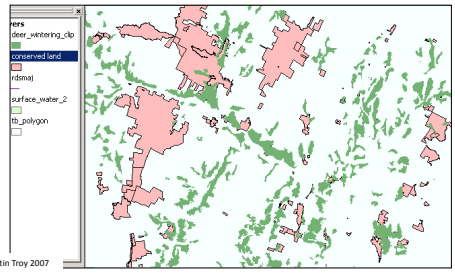
Image source: ESRI Arc Info electronic help

Intersect vs. Union



Intersect vs. Union

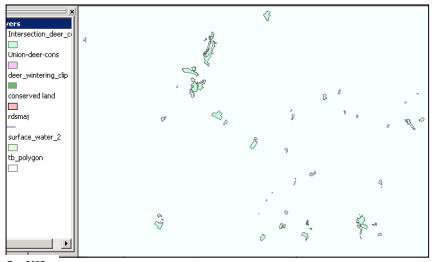
Example: Data for deer wintering areas in one layer (green) and conserved lands in another (pink)



Source: Austin Troy 2007

Intersect vs. Union

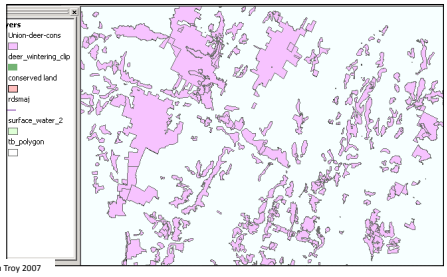
Intersect produces a layer showing land that is **BOTH** a deer wintering areas **AND** conserved



Source: Austin Troy 2007

Intersect vs. Union

Union produces a layer showing land that is **EITHER** a deer wintering area **OR** is conserved



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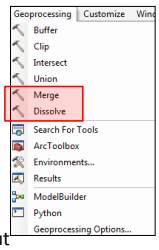

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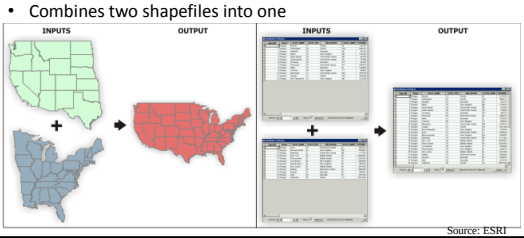
Merge

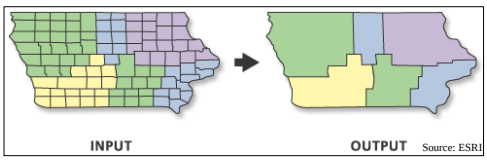
- Merges (joins) input datasets into a single, new output dataset
- Attributes are retained if they have the same name
- Can combine point, line, or polygon features classes or tables
- Combines two shapefiles into one



Source: ESRI

Dissolve

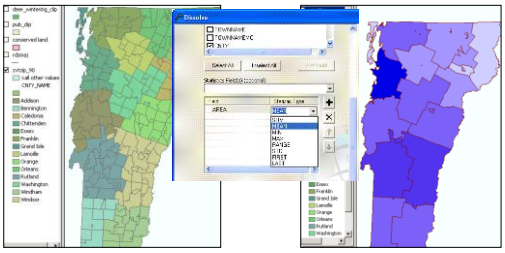
- Dissolves (and aggregates) features in a single layer based on an attribute value you choose
- Creates new features by merging adjacent polygons, lines or regions that have the same value for a specified attribute
- Useful if data is captured at a high scale but the information that is required is at a smaller scale
- Creates a simplified coverage from one that is more complex



Source: ESRI

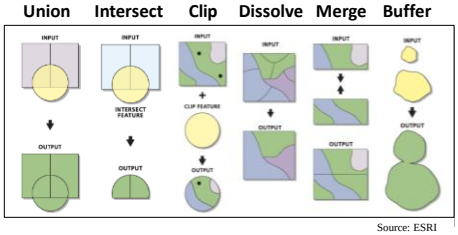
Dissolve

Dissolve postcodes into counties..



Source: Austin Troy 2007

Geoprocessing tools in ArcGIS

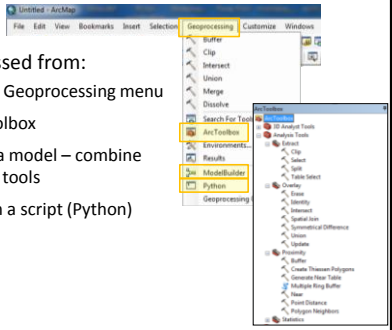


Source: ESRI

Geoprocessing tools in ArcGIS

Performed/accessed from:

- Tools from the Geoprocessing menu
- Tools in ArcToolbox
- Build and run a model – combine geoprocessing tools
- Create and run a script (Python)



Geoprocessing in ArcGIS

Output feature class will have the attributes of the input features

- a table is created for each new layer
- a row is created for each new spatial object
- a column is added for each column in the overlayed layers
- each feature therefore has all the attributes of its parents

Spatial reference of the output feature class will be the same as the input features

Questions

Which geoprocesssing tool to use..

- To reduce the extent of a layer
  - **clip** one layer with another
  - **intersect** two layers
- To combine features in one layer that are alike
  - **dissolve** features based on an attribute
- To combine features in two or more layers
  - **union** two layers
  - **merge** layers together

Useful videos

Geoprocessing:
http://www.youtube.com/watch?v=mJnQedlDI1Y
http://video.esri.com/watch/634/what-is-geoprocessing_question_

Union tool: http://www.youtube.com/watch?v=JazoNrt_v-o
Intersect: http://www.youtube.com/watch?v=flwEcuBtnss
Buffer: http://www.youtube.com/watch?v=DcWPxu5xkVo
Clip: http://www.youtube.com/watch?v=kD9_k28JzIo
Dissolve: http://www.youtube.com/watch?v=FC85Admh3fg
Merge: http://www.youtube.com/watch?v=EXh-QZ2Tmdg

Select by Attributes: http://www.youtube.com/watch?v=Q5sz19gdrAc