

GIS Data Analysis

Methods for Generating Secondary Information

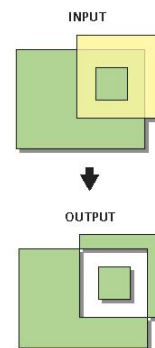
- Buffering – Generating AOI
- Overlay – Dasymetric Mapping (areal interpolation)
- Distance Measurement – Determining AOI
 - Thiessen polygons
- Pattern Analysis – Determining AOI
 - Nearest neighbor analysis
- Map Manipulation
 - Dissolve, clip, append, select, eliminate, update, erase
- Spatial interpolation
- Raster calculation

Buffering

- Proximity, edge effect, spatial interaction
- Point, line, polygon features
- Variations of buffering
- Irregular buffering (e.g., stream reaches)
- Applications
 - Protection zone
 - Neutral zone
 - Inclusion zone
 - Sampling scheme

Map overlay

- Overlay feature types
 - Point-in-polygon
 - Line-in-polygon
 - Polygon-on-polygon
- Overlay methods
 - Union
 - Intersect
 - Symmetrical Difference
 - Identity



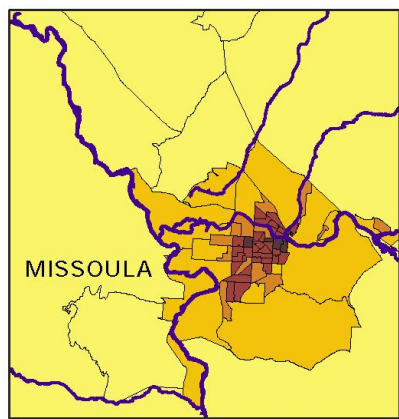
Overlay Procedures

- Determine the spatial reference for processing. All the input feature classes are projected (on the fly) into this spatial reference.
- Crack and **cluster** the features.
- Discover geometric relationships (overlap) between the input features and the overlap features.
- Assign attributes based on the type of overlay.
- Remove features based on the combinations of attributes and overlay types.

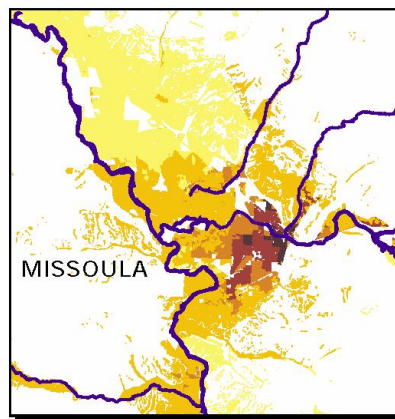
Map overlay (cont.)

- Considerations
 - Georeferencing, registration
 - Slivers (fuzzy tolerance, cluster tolerance, minimum mapping unit)
 - Error propagation (The expected accuracy of a composite map cannot be better than the least accurate individual input map.)
- Applications
 - Site analysis
 - Areal interpolation (dasymetric mapping)

Choropleth vs Dasymetric Maps

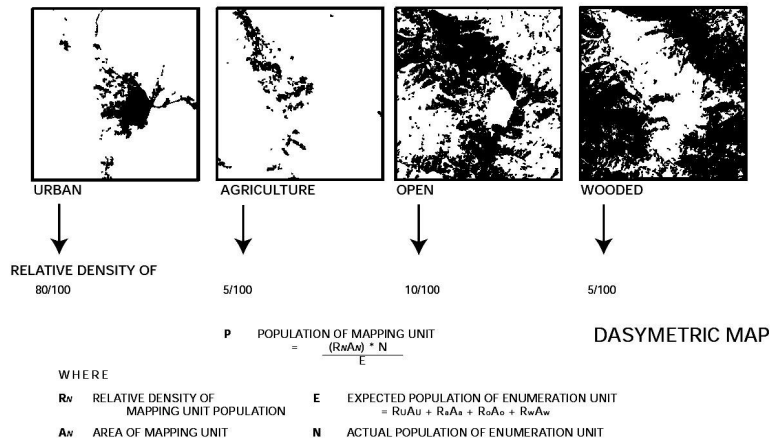


A

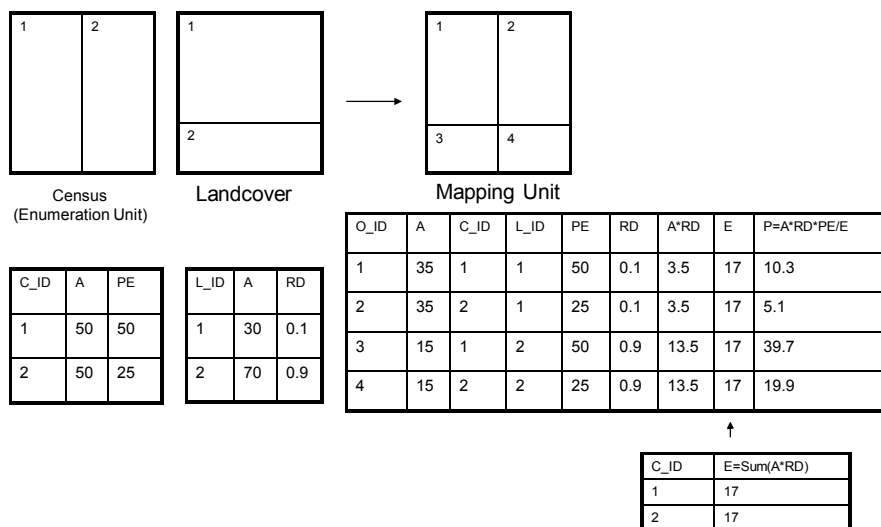


B

Dasymetric mapping



Dasymetric mapping (cont.)



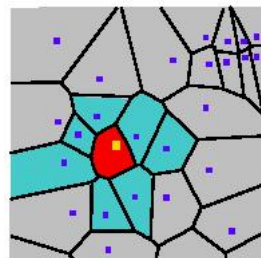
See <http://web.pdx.edu/~jduh/courses/geog492s08/lab04.htm> for exercise.

Distance measurement

- For features (i.e., points, lines) that cannot perform overlay analysis
- A method to link attributes between features that are not colocated
- For example, the NEAR and POINT-DISTANCE tools in Arctoolbox

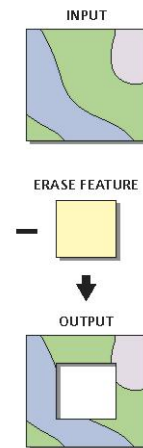
Voronoi Map (Thiessen Polygons)

- Why use a Voronoi map?
- Assigning values to polygons
 - Simple
 - Mean
 - Cluster
 - Standard deviation
 - ...



Map manipulation

- Dissolve
- Eliminate
- Append
- Erase/Clip
- Merge/Split



Raster Data Analysis

- Local (cell-by-cell) operations – multi-criteria analysis
- Neighborhood (moving-window) operations – “noise” reduction, raster map generalization, terrain analysis...
- Zonal operations – zonal statistics
- Raster distance measure operations - similar to buffering

Local Operations

- Cell-by-cell based
- Creates a new raster from either a single or multiple input rasters
- Includes Reclassification and Map Algebra

Neighborhood Operations

1	2	2	2	2
1	2	2	2	3
1	2	1	3	3
2	2	2	3	3
2	2	2	2	3

1.56	2.00	2.22
1.67	2.11	2.44
1.67	2.11	2.44

Neighborhood Means

1	2	2	2	2
1	2	2	2	3
1	2	1	3	3
2	2	2	3	3
2	2	2	2	3

2	2	2
2	2	3
2	2	3

Neighborhood Majority

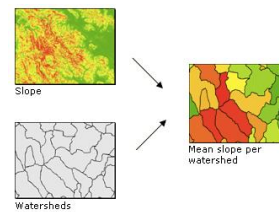
Zonal Operations

- Uses groups of cells that have the same value or like features
- Can be contiguous or noncontiguous
- For single rasters zonal operations measure the geometry of each zone (area, perimeter, thickness, centroid)
- For two rasters (an input raster and a zonal raster) a summary of values for the input values in each zone of the zonal raster is generated in an output raster (summary statistics and measures)

1	2	2	1
1	4	5	1
2	3	7	6
1	3	4	4

1	1	2	2
1	1	2	2
1	1	3	3
3	3	3	3

2.17	2.17	2.25	2.25
2.17	2.17	2.25	2.25
2.17	2.17	4.17	4.17
4.17	4.17	4.17	4.17



Raster to Vector / Vector to Raster

