GEO INFORMATION

# Methods in Spatial Analysis
# PS | LV.Nr. 856.141

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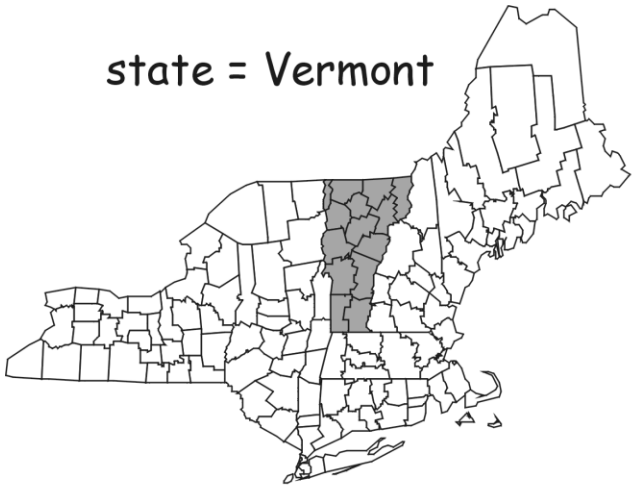
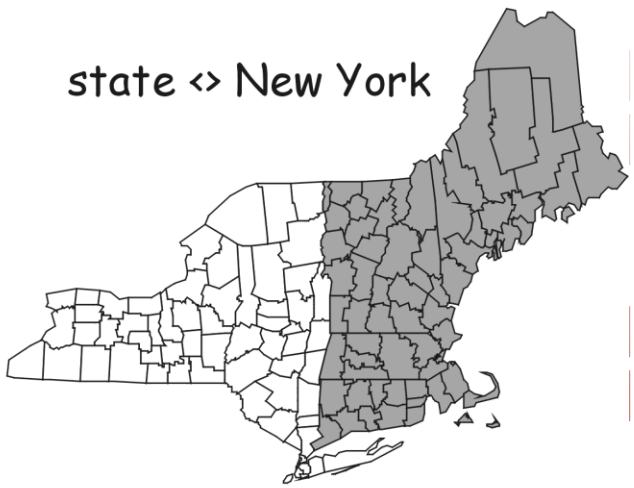
# Selection & Classification

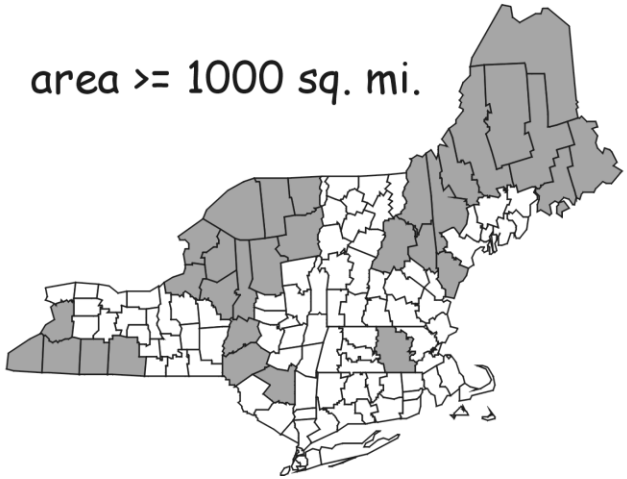
- Selection:
  - Identification of objects that fit a set of criteria
  - Purpose: further analysis and/or visualization of these objects

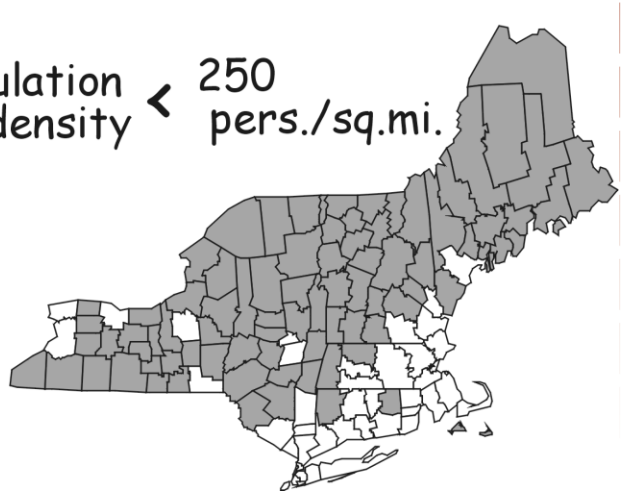
- Selection by set theory
  - Based on set theory we select spatial objects
  - For the definition of set mathematical operators are used: >, <, =, <> (=!), <=, =>
    - E.g.: counties with an area > 50 $km^2$
    - Communities having a population <= 2500

# Selection & Classification



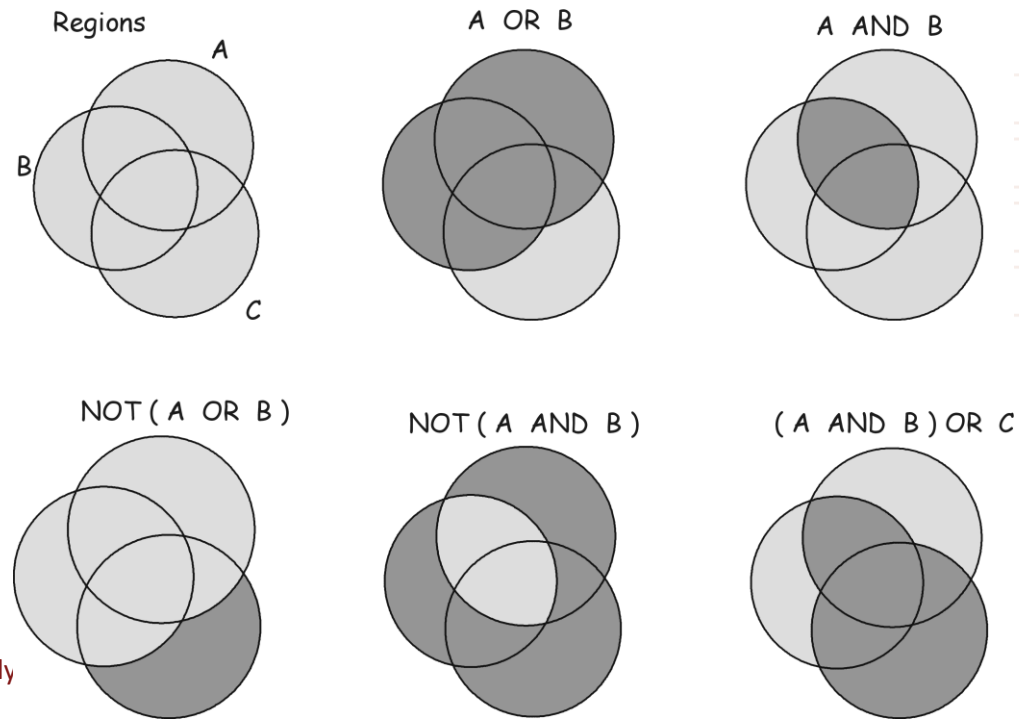



# Selection & Classification

- Selection using Boolean Algebra
  - Boolean Algebra: AND, OR, NOT, XOR
    - …. A combination thereof can result in complex queries
  - E.g.: Community population <= 2500 >> Set *A*

    *budget surplus* > 0 >> *Set B*

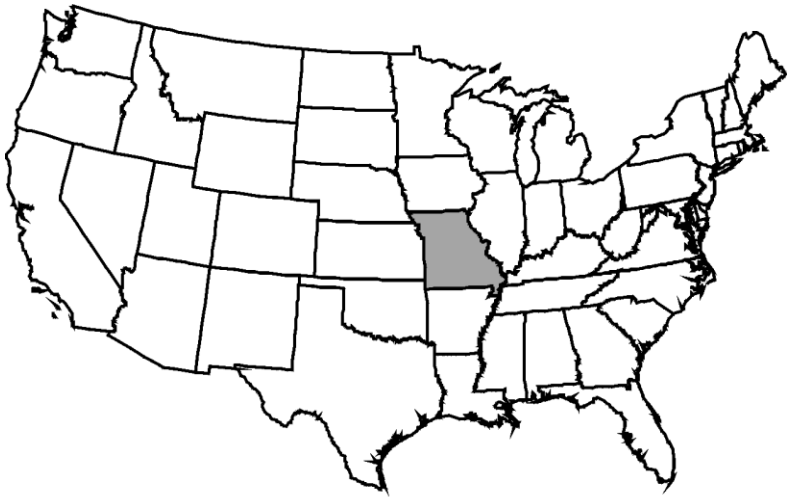


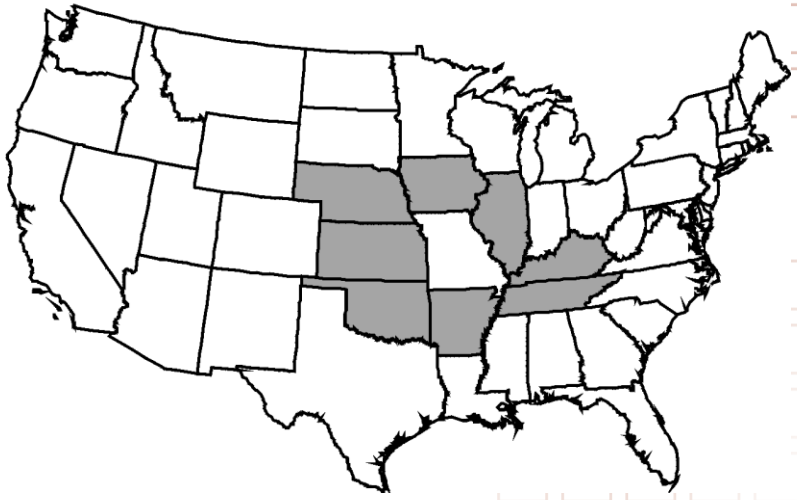
# Selection & Classification

(County = Rice)
AND
(Wshed = Canon)

# Selection & Classification

- Spatial Selection
  - Selection based on geometrical properties
  - **Adjacency**: i.e. *touch*

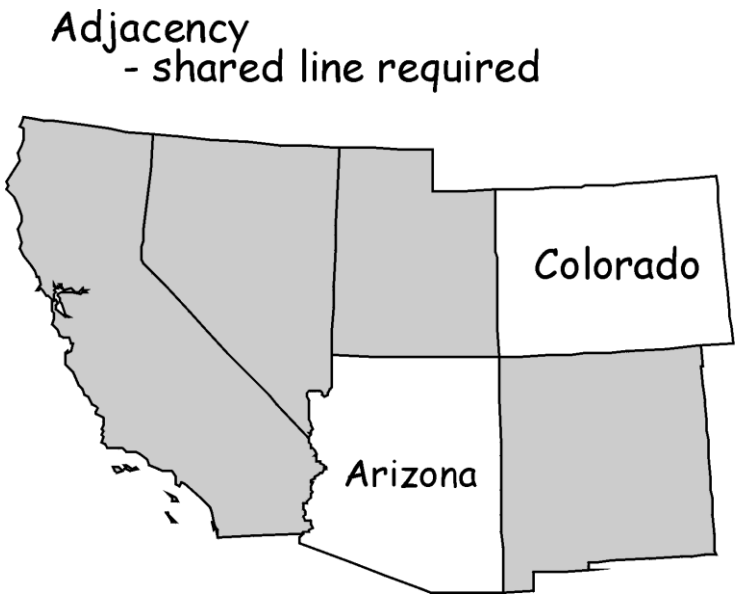


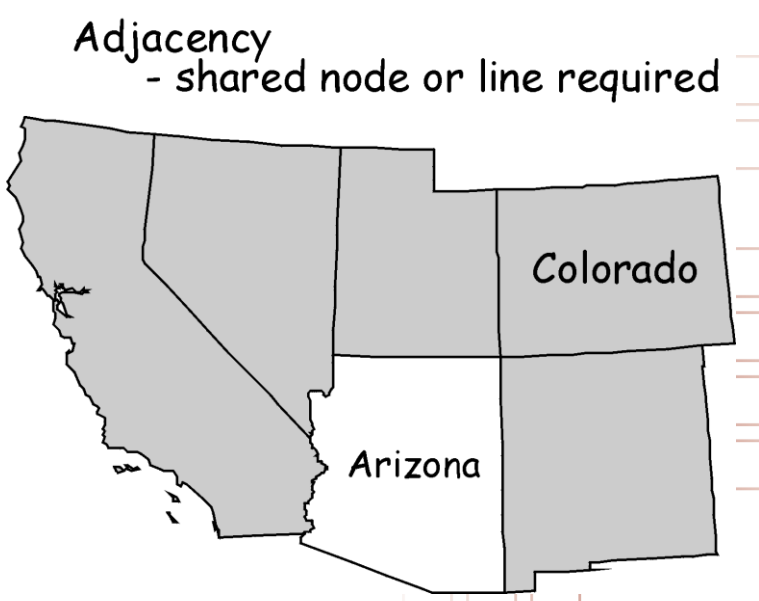


  - **Containment:** checks if an object is within another object
    - … which provinces are crossed by the Danube?
    - … villages in Styria

    >> exploiting of Spatial Relations

# Selection & Classification




*Containment* – Mississippi and inflow rivers are located in which states?

# Selection & Classification

- Categorization of Objects based on one or more attributes
  - E.g.: area, population, soil type, land use, …

- Classification types
  - Binary: 0/1, true/false
  - Equal Interval
  - Equal Area
  - Natural Breaks
  - Statistical methods
    - E.g.: percentile: 0-25, 25-50, 50-75, 75-100

# Selection & Classification

- **Binary classification**

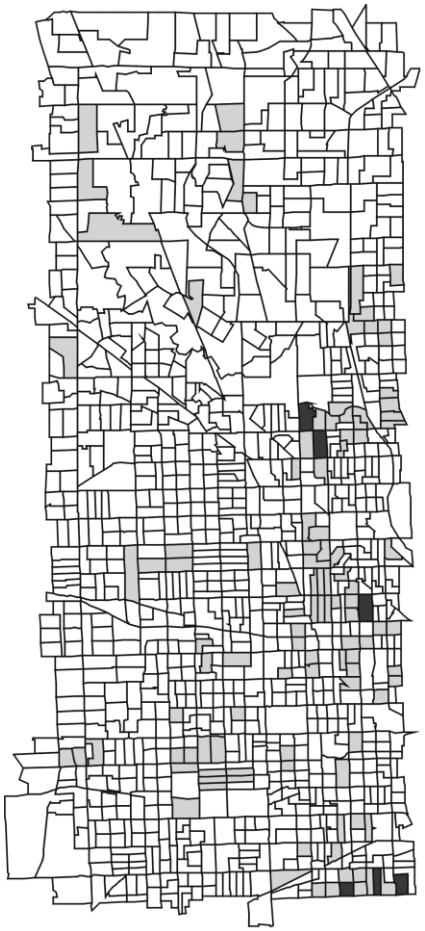

States west of the main branch of the Mississippi River assigned 1, east of the River assigned 0

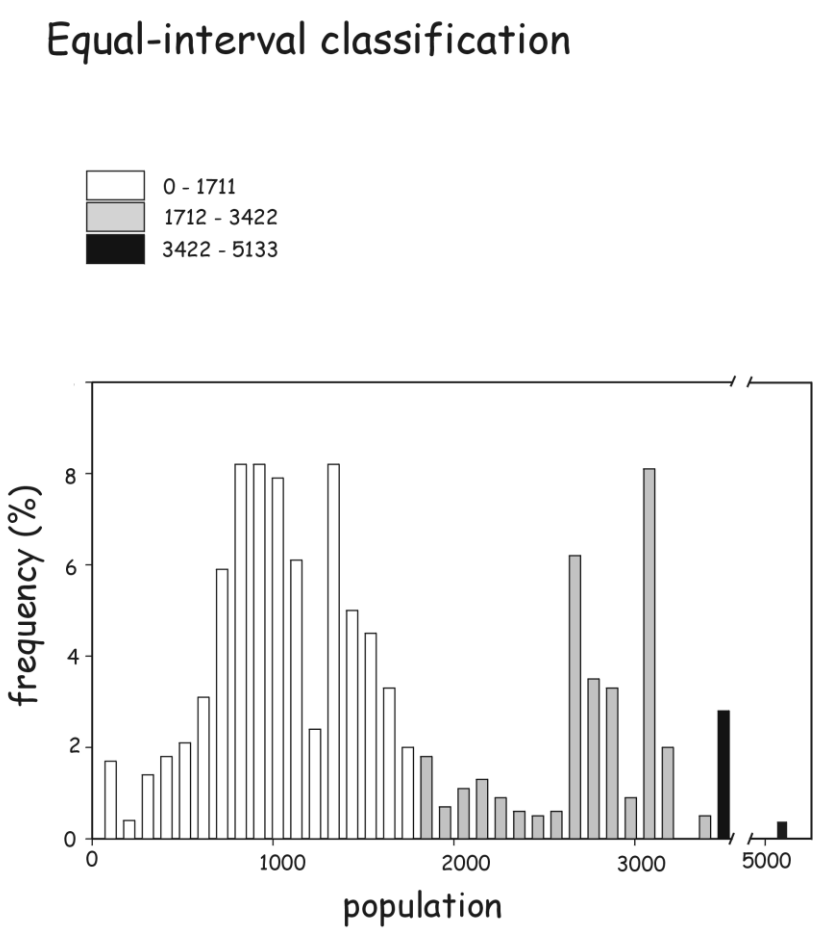
Classification table

| state name | is_west |
|---|---|
| Alabama | 0 |
| Arizona | 1 |
| Arkansas | 1 |
| Colorado | 1 |
| Connecticut | 0 |
| .... | ... |
| Wyoming | 1 |

# Selection & Classification

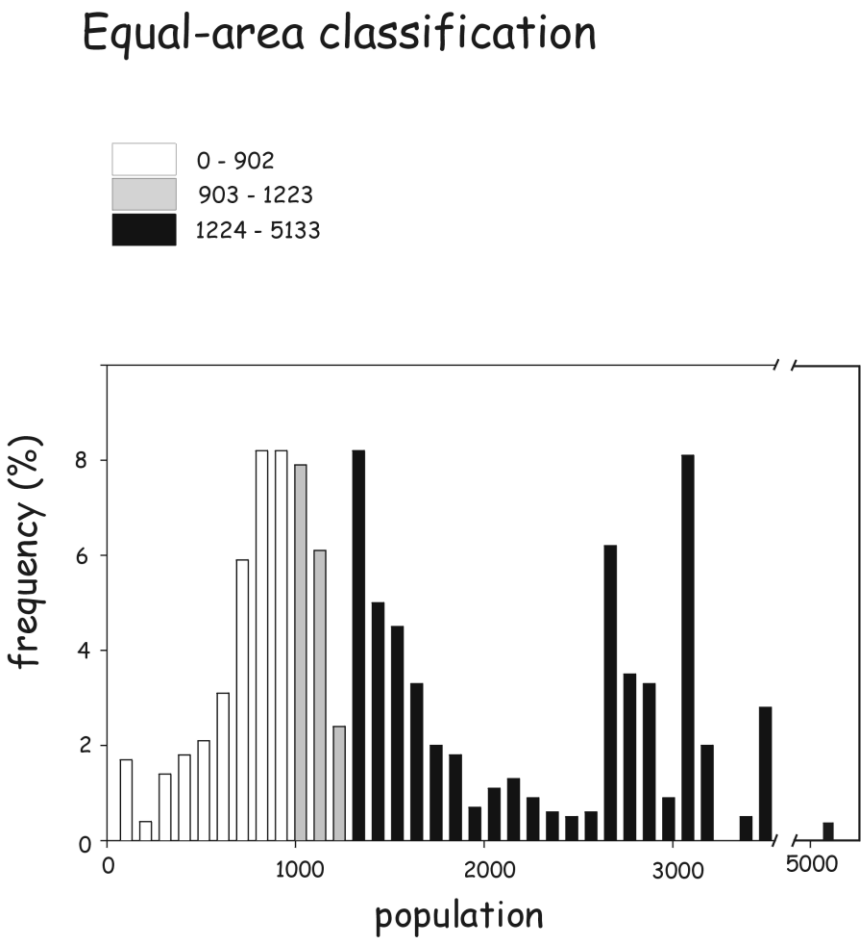
- **Equal Interval**





# Selektion & Klassifikation

- **Equal Area**

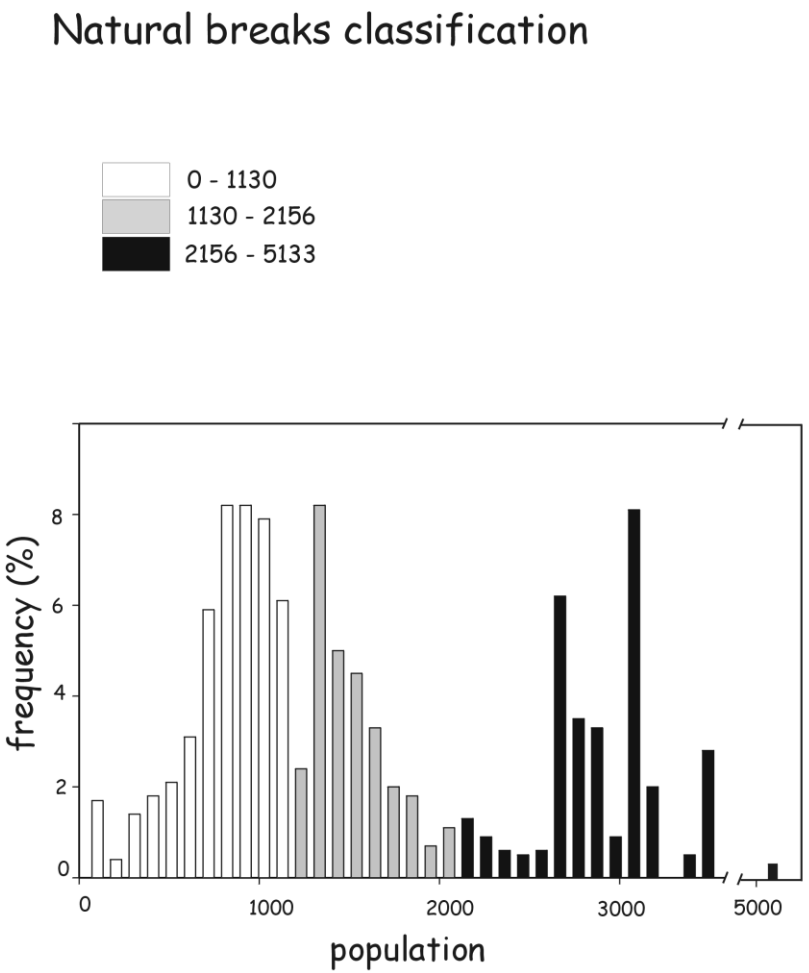


# Selection & Classification

- **Natural Breaks**
  - Method to classify data – by determining „natural“ groups to be found in the data.
  - Natural Breaks method creates a histogram of the data and then calculates the groups – based on the histogram.
    - Break points are „valleys“
    - The „deeper“ the valley the more important is a break point.
  - Objective of Natural Breaks (Jenks, 1967)
    - minimize the average deviation from the class mean, while maximizing the deviation from the means of the other groups;
    - reduces the variance within classes and maximizes the variance between classes

# Selection & Classification

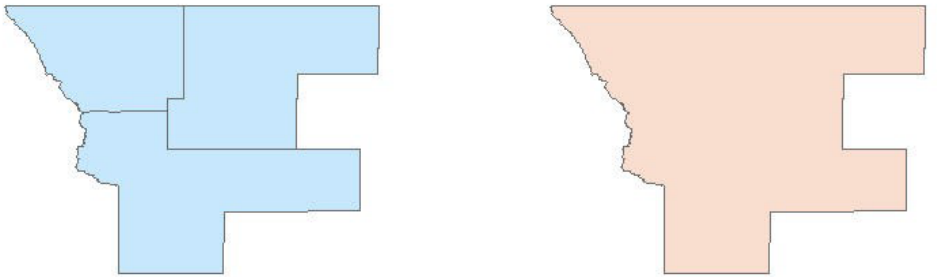
- **Natural Breaks**



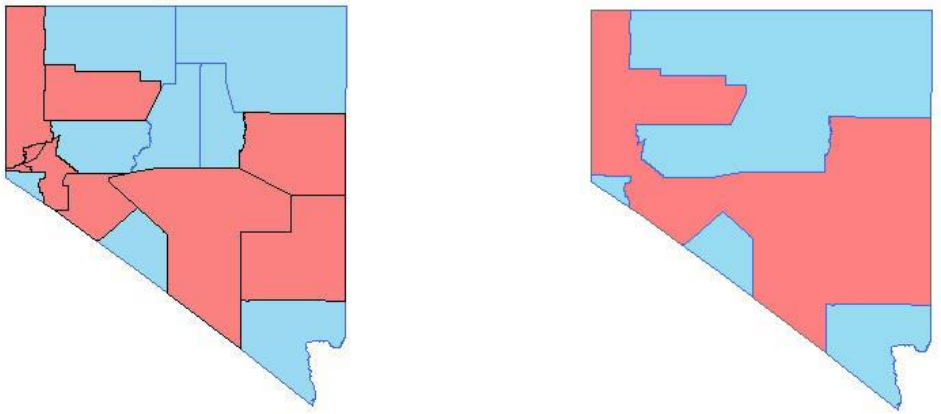
# Dissolve

- Aggregation of objects with similar properties

Dissolve of polygons



Dissolve of polygonens based on an attribute

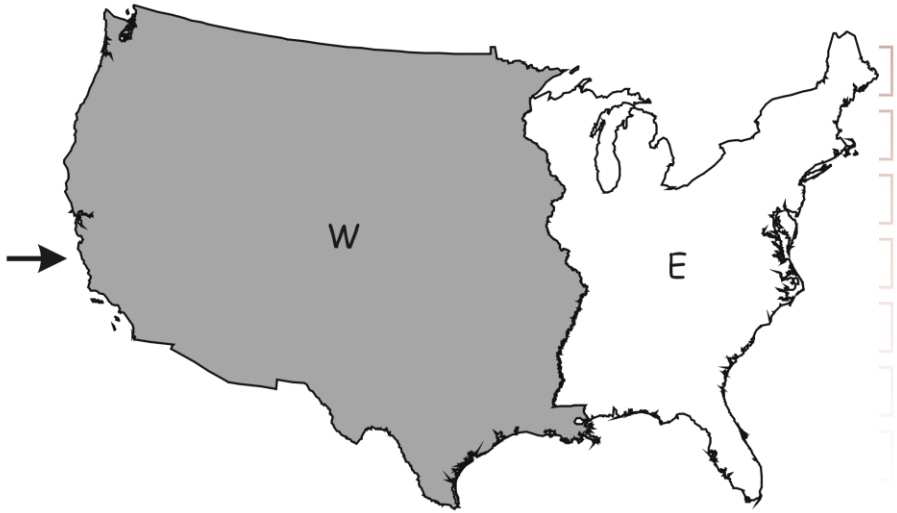


# Dissolve

Dissolve operation

Dissolve table

| state name | is_west | dissolve value |
|---|---|---|
| Alabama | 0 | E |
| Arizona | 1 | W |
| Arkansas | 1 | W |
| Colorado | 1 | W |
| Connecticut | 0 | E |
| .... | ... | ... |
| Wyoming | 1 | W |



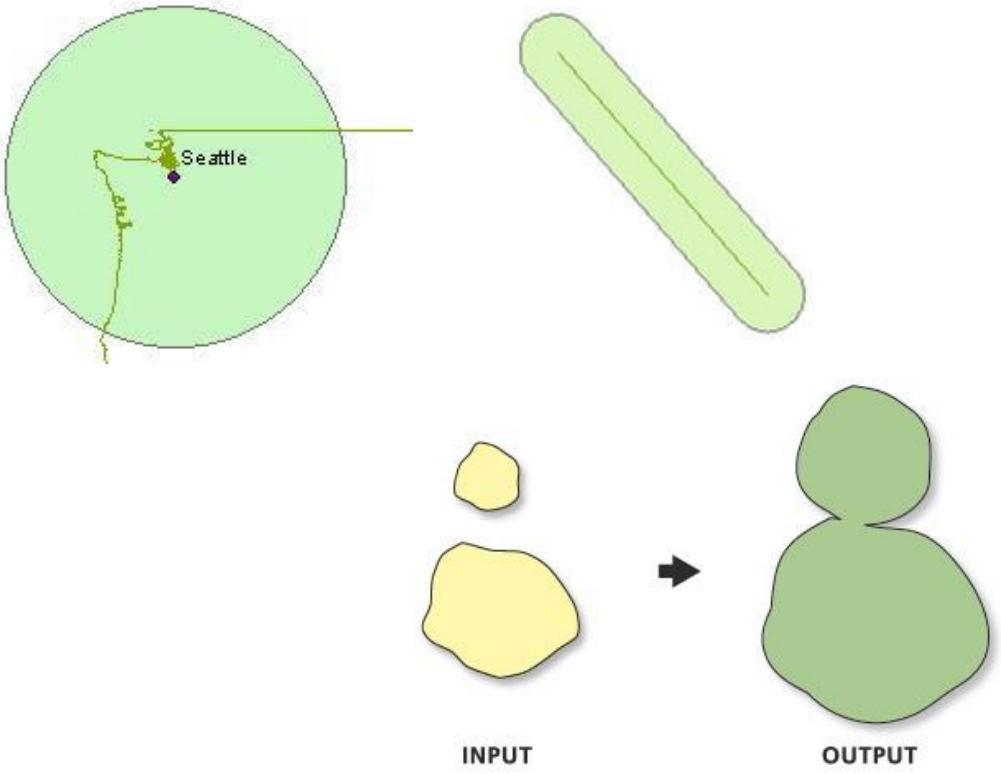
# Dissolve

Before dissolve

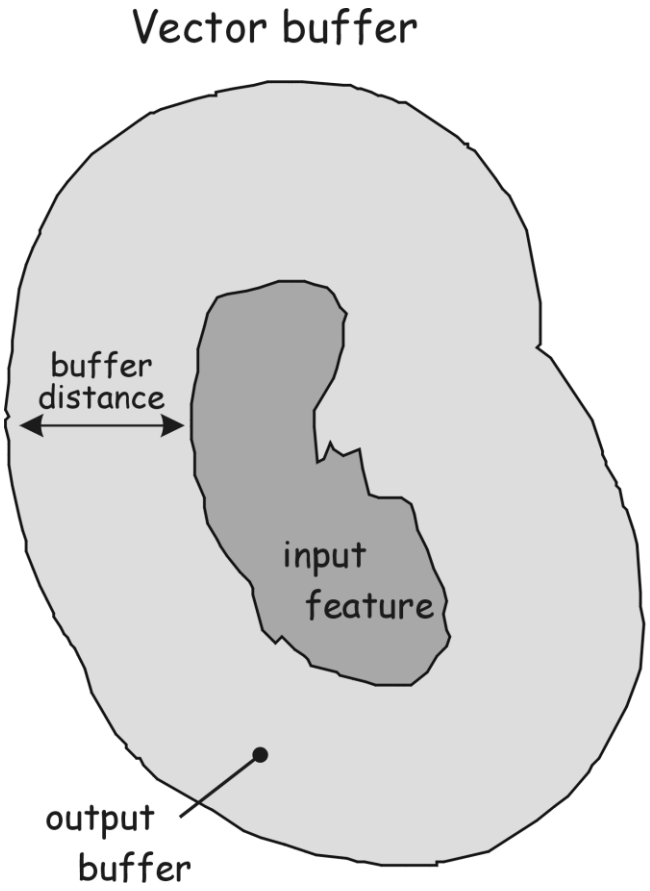
After dissolve

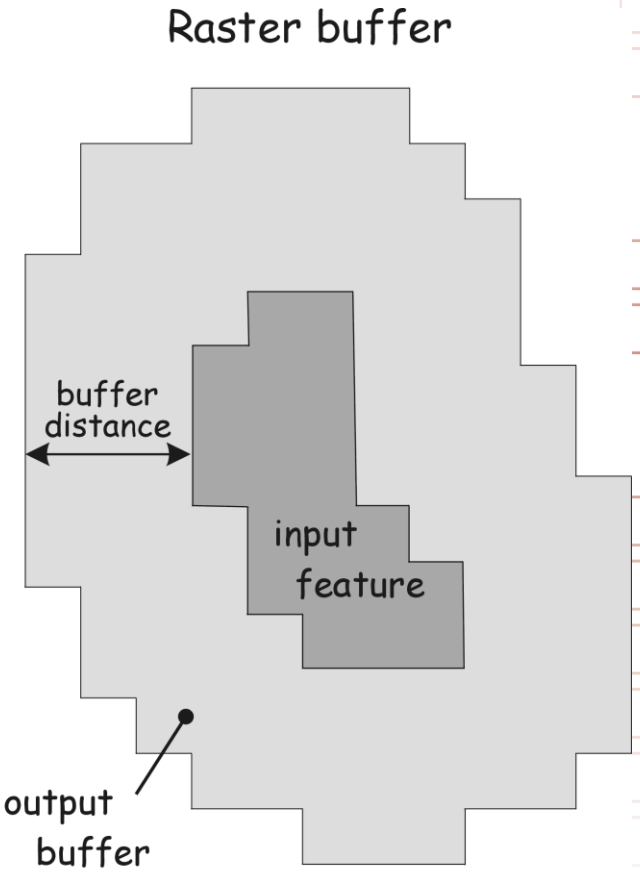
# Proximity Functions

- **Buffer**
  - Is a region within a defined distance around on or several objects

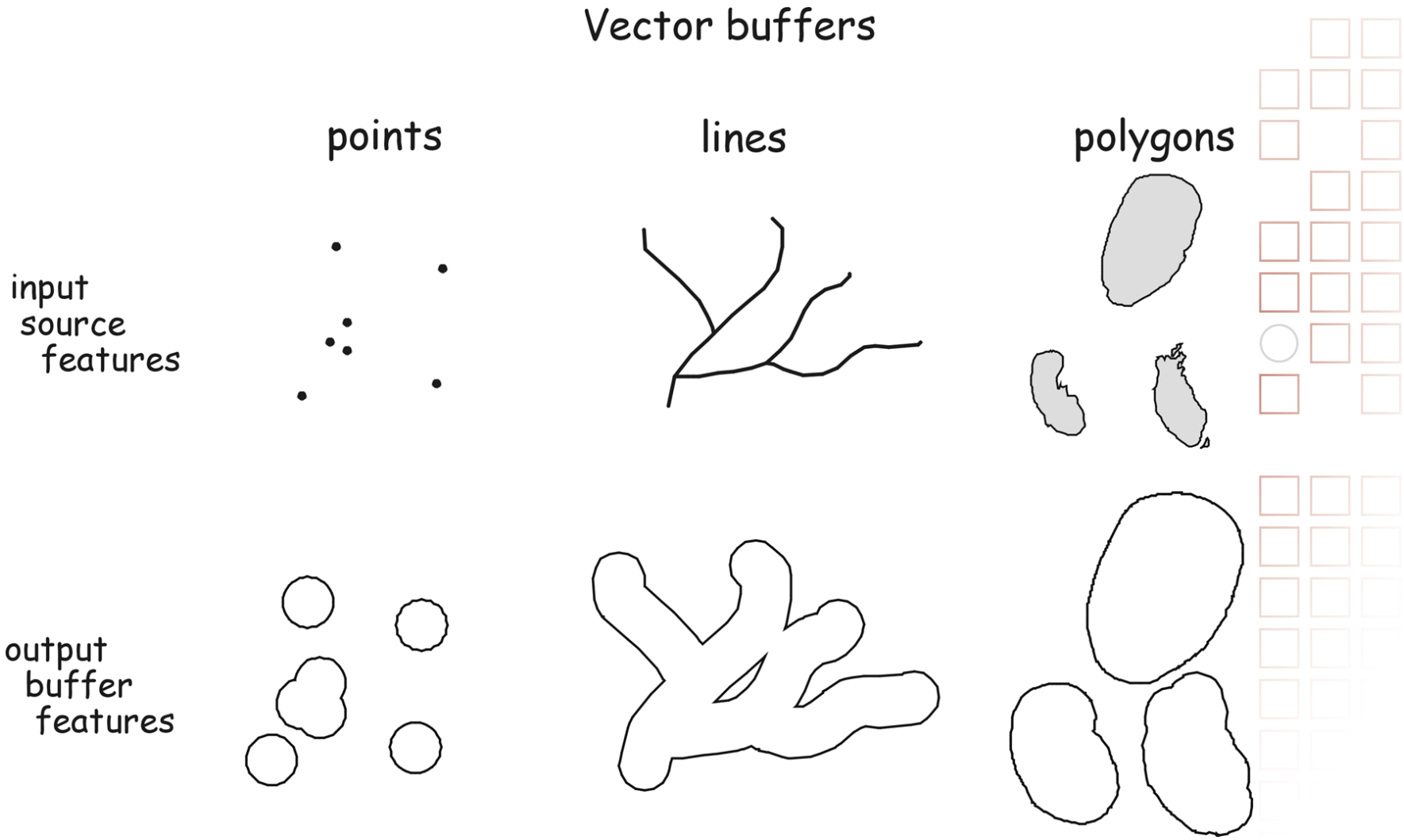


# Proximity Functions



# Proximity Functions



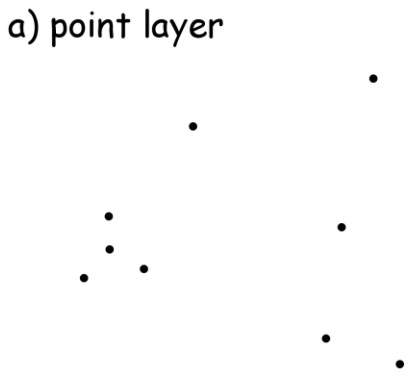
# Proximity Functions

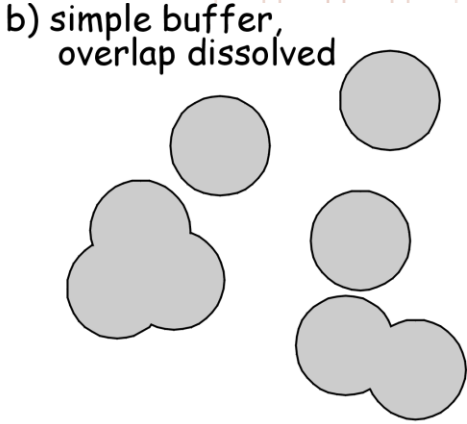
- **Buffer:**
  - Nb! overlapping buffer

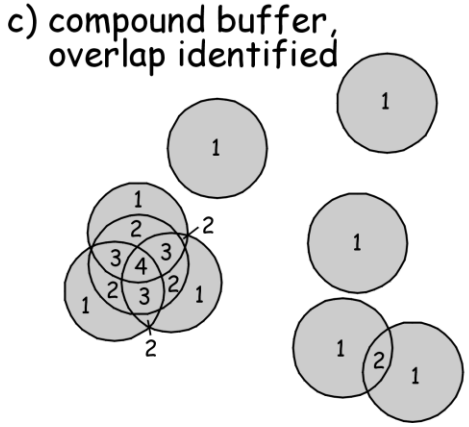
  >> Dissolve of overlapping areas

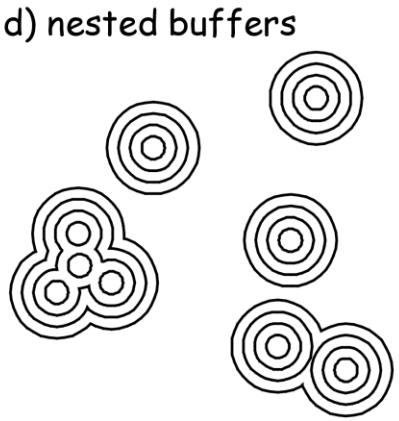
  >> Idenfication of the overlapping areas

  - *nested buffers*



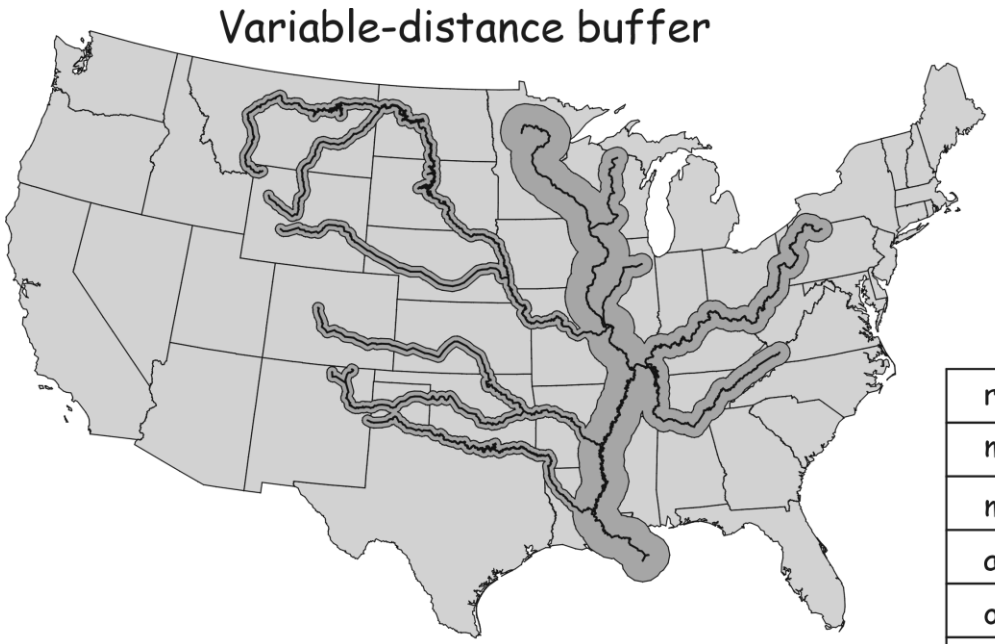



# Proximity Functions

- **Buffer (cont'd)**
  - Fix distance
  - Variable distance

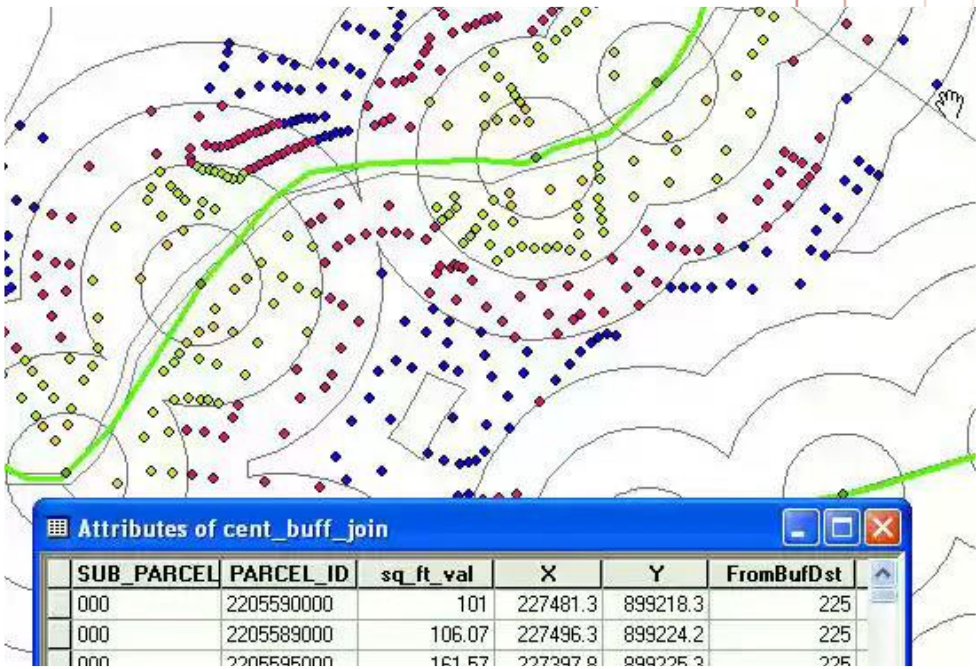



| river_identifier | buffdist |
|---|---|
| mississippi | 100 |
| missouri | 50 |
| arkansas | 50 |
| ohio | 75 |
| tennessee | 75 |
| st. croix | 75 |
| illinois | 75 |
| wisconsin | 75 |

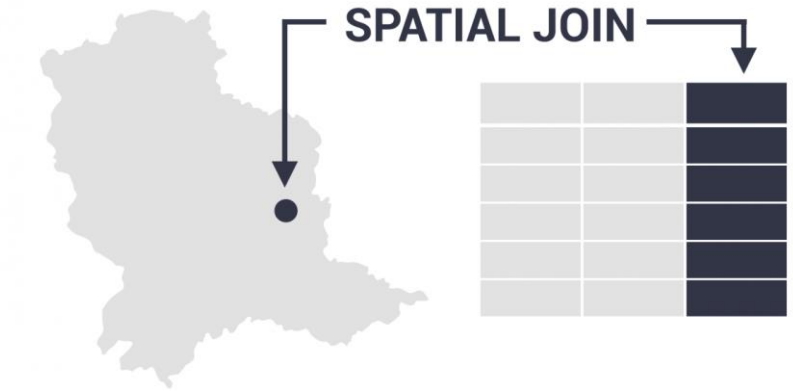
# Proximity Functions – Spatial Join

- Combination of 2 layers based on their spatial relation
  - Attributes and geometry are in the combined result layer
  - *"The spatial join appends the attributes in one layer to the features in another, based on their relative locations (i.e. how they overlap or how close they are to each other."*
- All topological relations can be queried:
  - Intersect
  - Contains
  - Within
  - Closest

Spatial Join of Centroids of parcels (polygons) with buffer around bus stops



# Proximity Functions – Spatial Join




- Spatial Relations

**Intersect**

Two features touch at any location

**Within a distance**

Two features are within a set distance

**Completely within**

The join feature is within the target feature

**Identical**

Both features match identically

**Closest**

The join feature is closest to the target feature

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