

# GIS Workshop

## Selection & Overlay Analysis

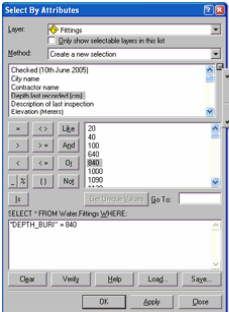
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 University Library (Evanston)  
 Northwestern University

## Typical Spatial Questions

- I want to know the area where wealthy households live
  - Define: geographic level (place? tract? block group?)
  - Select By Attributes: select entities based on attribute table contents**
- I want to know how many people live in my neighborhood
  - Define: boundary of "my neighborhood"
  - Select By Locations: select entities based on spatial relationship**

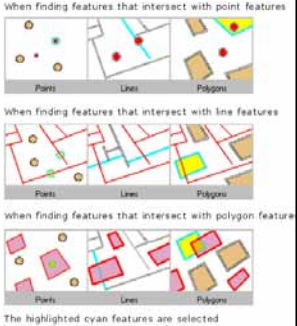
## Exercise 12 : Selection

- Select By Attributes**
  - Based on SQL concepts
  - "SELECT \* FROM "
  - Use of operators
    - Arithmetic
      - + , - , \* , /
    - Comparison
      - < , <= , > , >= , <> , NOT , LIKE , IS , ...
    - Logical (Boolean)
      - AND , OR , NOT




## Selection (cont.)

- Select By Location - Kudos of GIS!**
  - Intersect** (See right)
    - Are within a distance of (buffer)
    - Completely contain
    - Are completely within
    - Have their center in
    - Share a line segment with
    - Tough the boundary of
    - Are identical to
    - Are crossed by the outline of
    - Contain
    - Are contained by



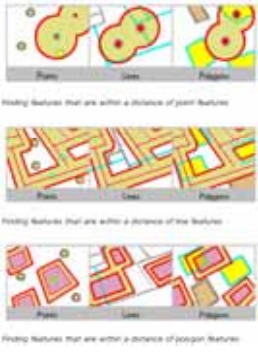
## Intersect

- Returns any feature that geometrically shares a common part with the source feature (or features).



## Are Within Distance Of

- Creates a buffer (or buffers) with a size equal to the distance specified around the source feature (or features), then returns all the features intersecting the buffer (or buffers).



## Contain

- This method differs from the Completely contain method in that the geometry of the source feature must fall inside the geometry of the target feature including its boundaries.



## Completely Contain

- For a feature to be considered as completely containing another feature, each point in the geometry of the source feature must fall inside the geometry of the target feature, excluding the target's boundaries (the boundaries cannot touch)



## Are Within

- This method differs from the "are completely within" method in that the geometry of the target feature must fall inside the geometry of the source feature including its boundaries.



## Are Completely Within

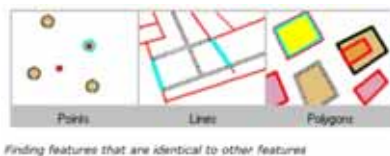
(Reverse of "completely contain")

- For a feature to be considered as being completely within another feature, each point in the geometry of the target feature must fall within the geometry of the source feature excluding the source's boundaries (the boundaries cannot touch).



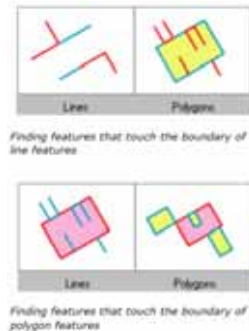
## Are Identical to

- Two features are considered identical if their geometries are strictly equal. The feature types must be the same.



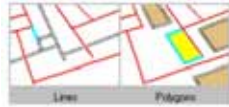
## Touch the Boundary of

- A target feature will be returned by this function if the intersection of its geometry with the geometry of the source feature is nonempty, but the intersection of their interiors is empty.

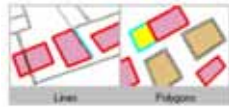


## Share a Line Segment With

- With this method, the source and target features will be considered as sharing a line segment if their geometries have at least two contiguous vertices in common.



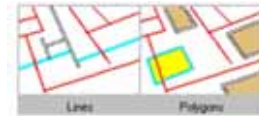
Finding features that share a line segment with line features



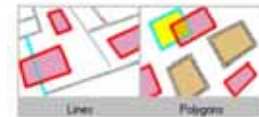
Finding features that share a line segment with polygon features

## Are Crossed by the Outline of

- For this operator, the boundaries of the source and target feature must have at least one edge, vertex, or endpoint in common but must not share a line segment.



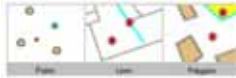
Finding features that are crossed by the outline of line features



Finding features that are crossed by the outline of polygon features

## Have Their Centroid in

- A target feature will be selected by this operator if the centroid of its geometry falls into the geometry of the source feature or on its boundaries.



Finding features that have their centroid within a distance of point features



Finding features that have their centroid within a distance of line features



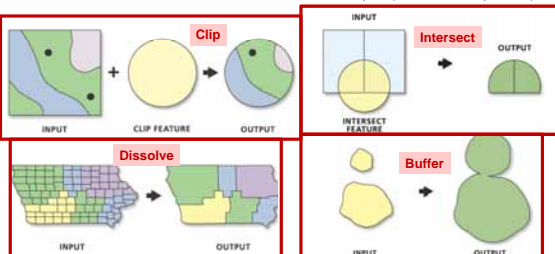
Finding features that have their centroid within a distance of polygon features

## Geoprocessing

(as part of selection/overlay analysis tools)

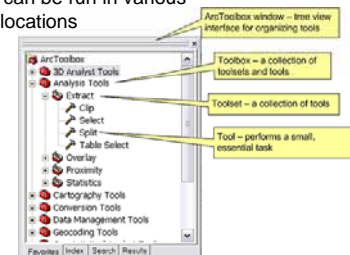
## Geoprocessing

- Geoprocessing
  - ESRI terminology
  - Geographic operations to modify, create, analyze spatial features
  - Difference from selections - creates an output (ex. new shapefiles)



## ArcToolbox

- Geoprocessing tools are found in ArcToolbox but they can be run in various ways, from different locations
  - ArcToolbox
  - Toolbars
  - Command lines
  - ModelBuilder
  - Scripts



To Learn more:  
[http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Geoprocessing\\_tutorial\\_index](http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Geoprocessing_tutorial_index)

## Spatial Join

- A type of table join operation in which fields from one layer's attribute table are appended to another layer's attribute table based on the relative locations of the features in the two layers.
- Good to way to find:
  - The closest feature to another feature.
  - What's inside a feature.
  - What intersects a feature.
  - How many points fall inside each polygon.



## Exercise 13

- Find potential rental properties in Chicago
- Conditions:
  - Close to CTA Purple/Red/Brown stations
  - Close to Starbucks
  - Close to a library
- Rental properties data:
  - Craig's List

