

# GEO 447 PRINCIPLES OF GIS

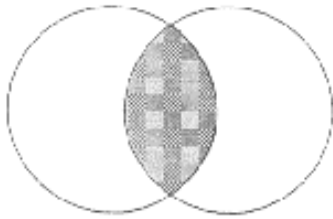
## Analysis Part 2

- Boolean Operators In-Depth
- SQL
- Topology Preservation & Planar Enforcement
- Vector Based Analysis

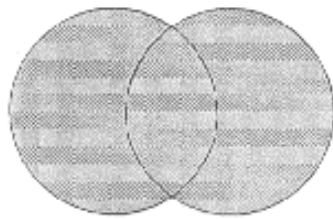
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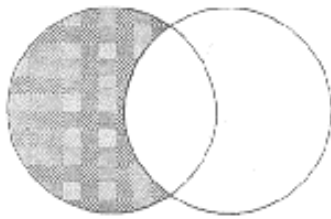
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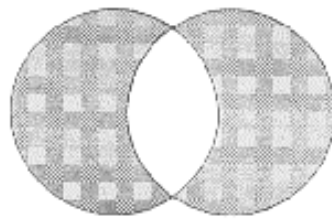
A AND B



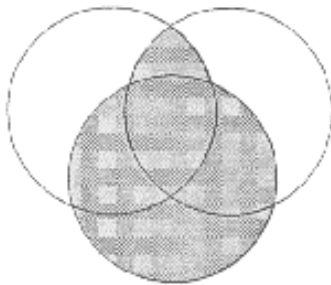
A OR B



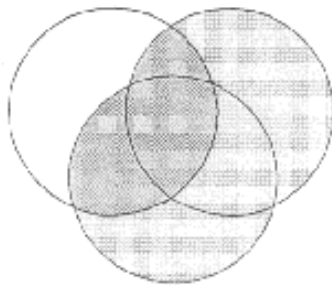
A NOT B



A XOR B



(A AND B) OR C



A AND (B OR C)

## Boolean

Venn Diagrams illustrate that Boolean operators are effective when combining criteria

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## SQL

- Since Vector GIS is closely associated with DBMS (particularly RDMS), the development of a standard query language (SQL) allows researchers to easily select criteria
  - Example:
    - `SELECT &AMPLTattribute name(s)> FROM &AMPLTtable> WHERE &AMPLTcondition statement>`
- Basic types of SQL operators:
  - relational: `>`, `&AMPLT=`, `>=`, `&AMPLT=`
  - arithmetic: `=`, `-`, `*`, `/` (only on numeric fields)
  - Boolean: `and`, `or`, `not` attributes are retrieved by the query
- The database query becomes the basis for all vector operations
  - Unlike the raster model where the cell is the target of the operation

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# GEO 447 PRINCIPLES OF GIS

## Topology & Planar Enforcement

- Topology must be enforced when operations create new polygons, intersect etc....

## Vector: Operations

- Unlike raster operations which may re-class or redefine values vector operations extend and expand topology
  - new nodes for intersections
  - new polygons from combine or split
  - vector analysis must engage and update the spatial & attribute
    - two types of joins ‘key’ and ‘spatial’

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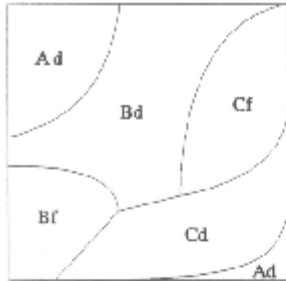
## Vector: Overlay

- Overlay results in a new layer of information
  - Two layers are overlaid
- The new information might be:
  - combined, dissolve, or merged (fewer than previous)
    - polygons
    - river network merged into 1 object
    - aggregate
  - split polygons (more than previous)
    - 1 roads split into 2 at an intersection
    - subtract
  - locate
    - find node for intersecting lines
    - find point in polygon

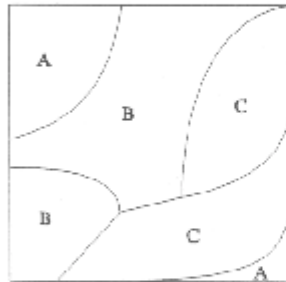
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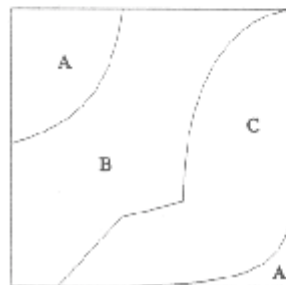
## Combine



Soil Types A, B and C with growth potentials d and f

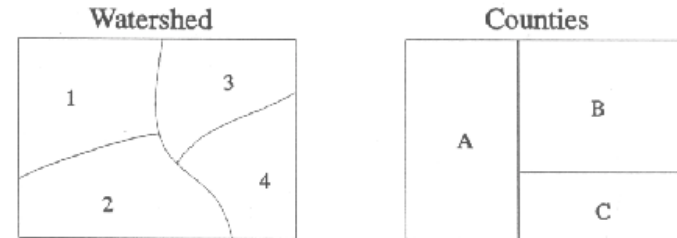


Soil Types A, B and C



Soil Types A, B and C

## Split



ID	Watershed ID	County ID
1	1	A
2	1	B
3	3	B
4	2	A
5	2	B
6	4	B
7	2	C
8	4	C

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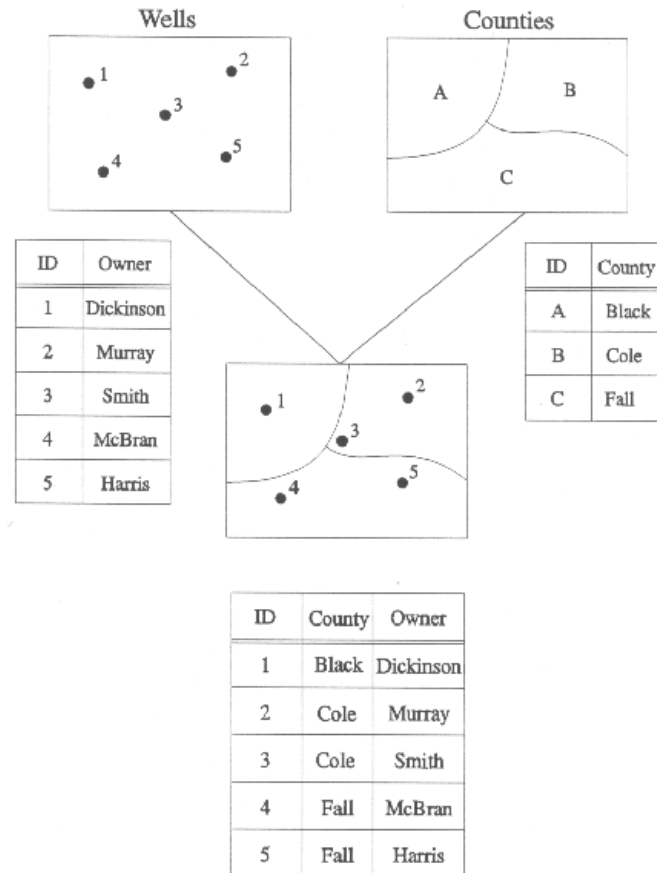
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From NCGIA core curriculum

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## Vector: Point in Polygon

- Is a well in a county?



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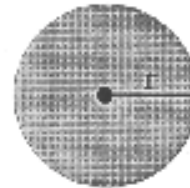
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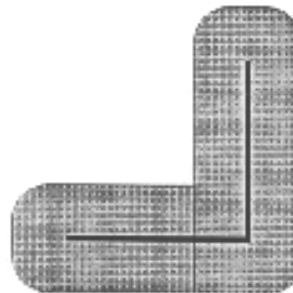
## Vector: Buffer

- New polygon is created



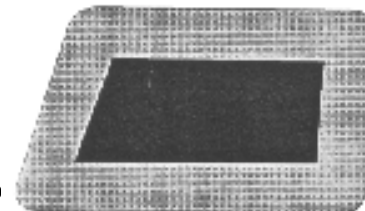
Buffering a Point

eg. All area within one mile of a city.



Buffering a Line

eg. All areas within 1000 meters of a road.



Buffering an Area

eg. All areas within 500 meters of a wetlands area.

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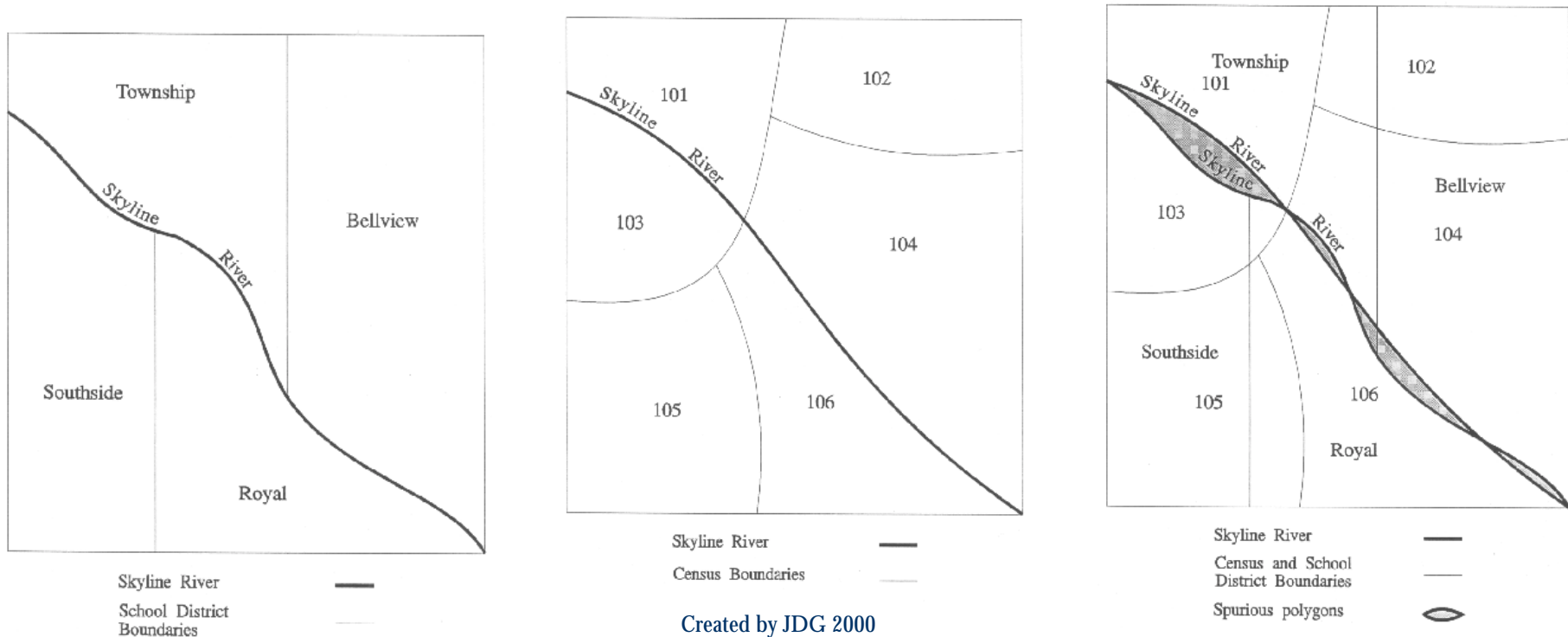
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## Vector: Operation Problems

- Spurious Polygons

- edges between layers that are supposed to meet that result in meaningless polygons following a ‘split’



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# GEO 447 PRINCIPLES OF GIS

## Vector Analysis

- Site Selection based on overlay criteria
- Site Selection based on SQL criteria

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