

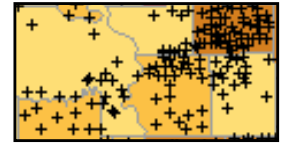
GEOL 452/552 - GIS for Geoscientists I

Lecture 12 - chapter 6a

- Chapter 6: Spatial joins
- This lecture: Theory of spatial joins, some simple examples
- Next lecture: More complex examples, in combination with queries, selects, summarize, statistics, AWICAW

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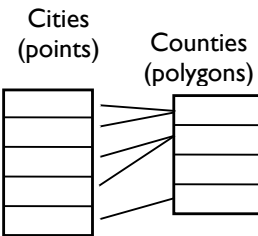
Spatial joins



- Don't confuse it with spatial query!
- Uses a feature's location (spatial) to link it to other feature(s) from a different layer.
- Ex: for each point feature (city), append data from the county feature the city is **inside**.
- Spatial join creates new data file (permanent data layer), no "remove spatial join"
- There's no spatial relate

2

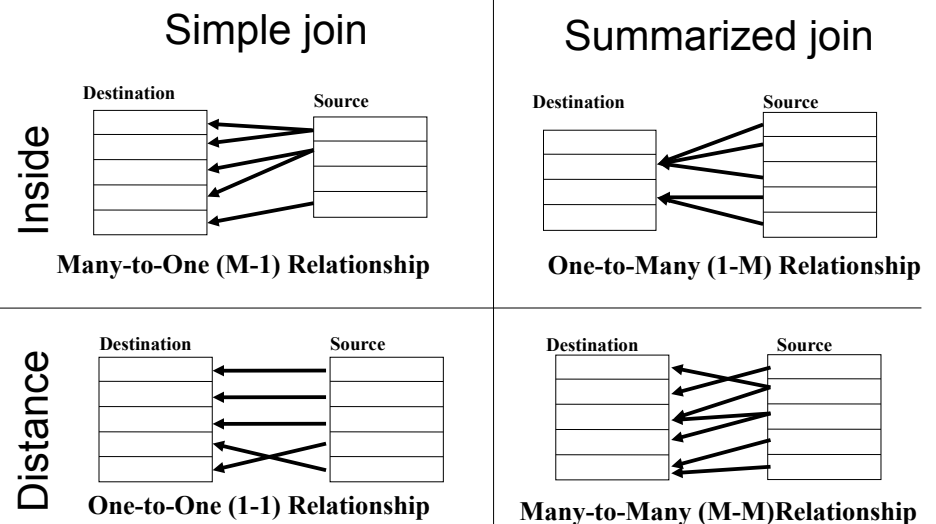
Source layer – destination layer



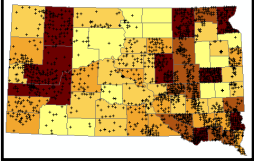
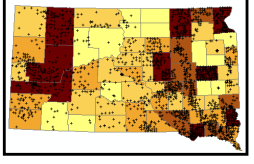
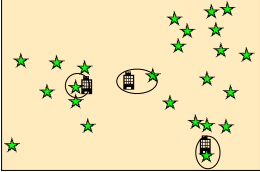
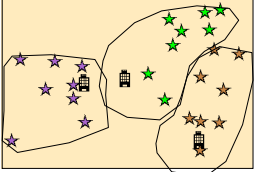
- Make the (new) city layer "smarter" by adding the name of the county the city is inside of (Ames - inside Story county)
- The destination is the city layer (which becomes smarter)
- The source is the county layer (which delivers the add-on info)
- Destination layer (the one you right-click – join) determines data type of join (point destination > point joined layer, etc.)
- make sure to select "... based on spatial location" in Layer - Join Data dialog! (don't database join!)
- Destination will have (something of) the source table appended

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Spatial joins: Four cases (p. 158, fig 6.5) (Diagrams show the logical relationships or cardinality)

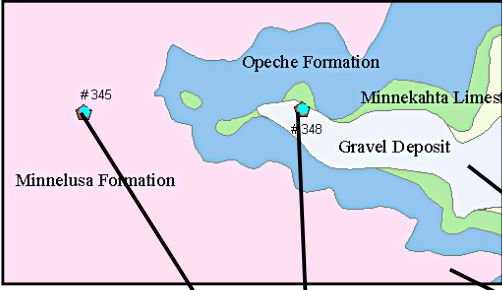


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	Simple (adds 1 piece of information)	Summarized (adds a summary of many pieces of information)
Inside	 <p>Hospitals ← Counties</p> <p>Which county is each hospital in? ___ to ___</p>	 <p>Counties ← Hospitals</p> <p>How many hospitals in each of the counties? ___ to ___</p>
Distance	 <p>Hotels ← Attractions</p> <p>Which attraction is closest to each hotel? How far is it? ___ to ___</p>	 <p>Hotels (!) ← Attractions</p> <p>How many attractions are closest to each hotel? ___ to ___</p>

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To each well point add the geologic rock name of the polygon that the point is **inside of**. (Question: which well has better pump potential?)



Type of join? _____

Dest.: _____

Source: _____

FID	Shape	FID_1	ONSITE_ID	TOWN	RANGE	SECT	DWELLING	FID_2	SYMB	NAME
21	Point	324	348	1N	07E	17		121	Tg	Gravel Deposit
71	Point	325	345	1N	07E	17		236	PPm	Minnelusa Formation

Attribute table of points with rock name added

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- Example: For all **rivers** add the population of its intersecting **counties**

1. Choose the layer to join to this layer, or load spatial data from disk:

Counties

2. You are joining: Polygons to Lines

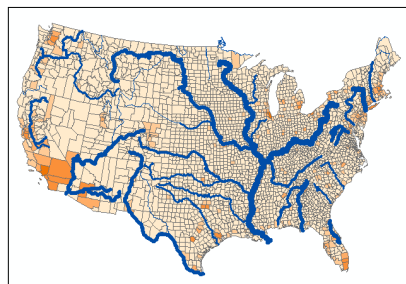
Select a join fit **Source** to **Destination** given different options based on geometry types or the source feature class and the join feature class.

Each line will be given a summary of the numeric attributes of the _____ and a count field showing how many polygons it intersects.

How do you want the attributes to be summarized?

Average Minimum Standard Deviation

Sum Maximum Variance



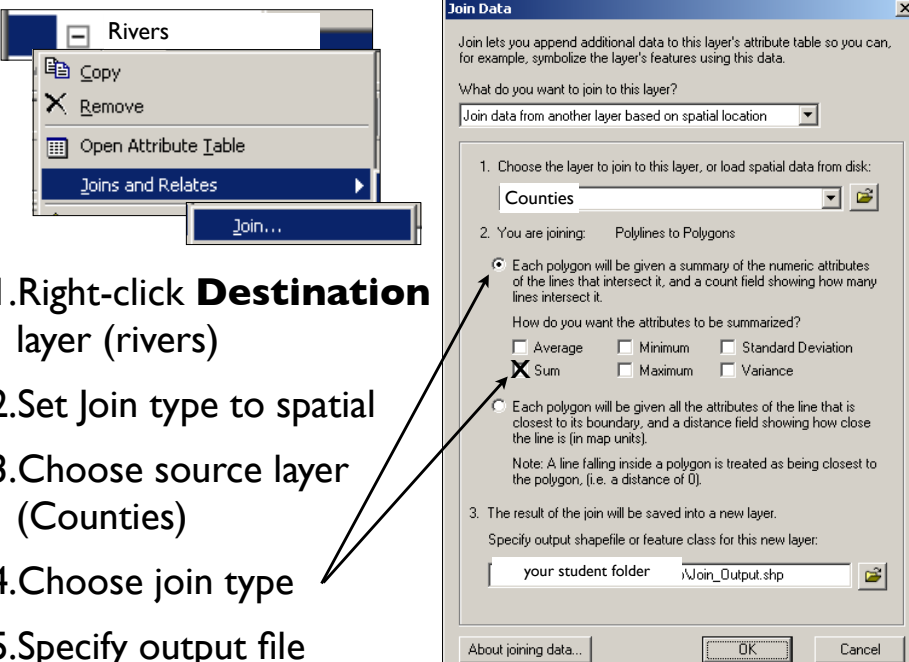
river_name	Count	Sum_POP200	Sum_POP90	Sum_HOUSE
Alabama	24	2030000	2424	614442
Arkansas	50	2860000	3242	1003472
Bear	9	222000	110	54880
Brazos	34	1630000	1521	461035
Canadian	29	967000	1058	329050
Chattahoochee	33	3290000	6273	960113
Clark Fork	8	194000	116	68974

Type of join? (p. 158)

Dest.: _____

Source: _____

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- Right-click **Destination** layer (rivers)
- Set Join type to spatial
- Choose source layer (Counties)
- Choose join type
- Specify output file

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For Summarized Spatial Joins:

Each statistic is performed for each numeric fields

A **Count_** field is generated automatically to count the **number of features** used to calculate the summary statistic(s)

NAME	Count_	Sum_POP200	Sum_POP90	Sum_HOUSE
Alabama	24	2030000	2424	614442
Arkansas	50	2860000	3242	1003472
Bear	9	222000	110	54880
Brazos	34	1630000	1521	461035
Canadian	29	967000	1058	329050
Chattahoochee	33	3290000	6273	960113
Clark Fork	8	194000	116	66974

Sum of POP 2000 for the 34 features inside Brazos County is 1,630,000

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1. Choose the layer to join to this layer, or load spatial data from disk:
 Roads

2. You are joining: Polyline to Polygons

A Each polygon will be given a _____ of the numeric attributes of the lines that intersect it. _____ field showing how many lines intersect it.

How do you want the attributes to be summarized?

Average Minimum Standard Deviation
 Sum Maximum Variance

B Each polygon will be given all the attributes of the line that is its boundary, and a _____ field showing how close the line is (in map units).

Note: A line falling inside a polygon is treated as being closest to the polygon, (i.e. a distance of 0).

Based on the two geometries and the destination ArcMap picks the possible two join types.

These 2 choices (A, B) vary per destination/source combination type
 Usually one is **simple** and one is **summarized**.

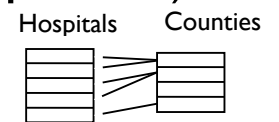
Read the text for key words, they will indicate which of the four cases from p. 224 you would get as result!

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- Follow along: copy data/follow along/ch6A_class_ex into you student folder
- Run Ch6a_class_ex_spatial_join.mxd
- Save the newly made spatial joins
 - into geodb (Make this you default geoDB)
 - as shapefiles in your folder
- naming suggestion :
 <destination>_<source>_simple_inside
 (e.g. county_hospital_simple_inside)

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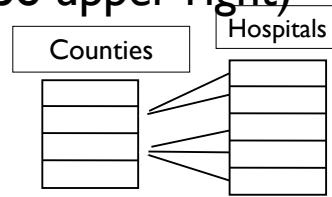
Simple inside join (p. 224, upper left)



- Each of the (**many**) hospitals (destination) is inside **exactly one** county (source)
- M-1 cardinality
- Q: In which county is a hospital? (a hospital is inside which county?)
- gets the polygon that the point is inside of (A), joins it to the point
- Add a county name (COUNTY) to hospital feature
- Label each Hospital with its joined county name

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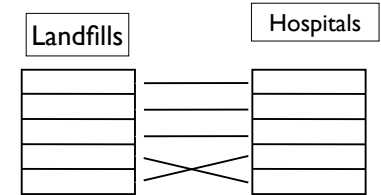
Summarized inside join (p. 158 upper right)



- 1-Many cardinality - Each county has many hospitals
- Summarize those hospitals inside a county, joins it to county
- Q: Each county has how many hospitals?
- For each county append
 - A) **Summary stats** + number (count) of the numerical hospital fields (let's use SUM)
- Color county by number of hospitals (COUNT_)

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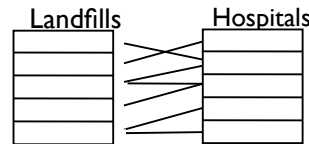
Simple distance join (p. 158, lower left)



- 1-1 cardinality
- Operates on based on distance
- Grabs a single feature (the closest) from source to join
- **For each** landfill point, give me the **one** hospital that is closest (plus the distance to it)
- Type: B) (look for **closest** in the text)
- Label landfills by DISTANCE to closest hospital (last field)
- Find the landfill closest to any hospital? What's its distance?

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Summarized distance join (p 158, lower right)



- Many-Many cardinality
- For each landfill find the sum of all nearby hospital beds
- Group the closest hospitals (by distance) around each landfill
- For each group get sum of beds (summary) and join
- Type A): summary stats but based on distance grouping
- Get **summary** of BEDS (SUM_____), count hospitals and join to landfill
- Symbolize with Size by Sum_BEDS
- What's the landfill with the most hospitals?

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Wrap up

- Lab: Ch 6 tut. 1- 38 (-42 optional)
- HW 6: ch 6. 1, 3, 4, 5 (#4 is particularly important, in case nature calls ...) extra 7 & 10
- due Oct 18 (but you can start now)
- which of the four cases is it? (p. 158 is your friend!!)
- next session: practice multi-step operations (join/query/select/summary)
- Oct 13: Midterm prep (1 Question in WebCT Request for review discussion for each of you!)
- Oct 18: Midterm (20 min Mult. Ch. + 60 min practical)
- multiple choice: similar to voting questions, practical, similar to HW exercises.

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