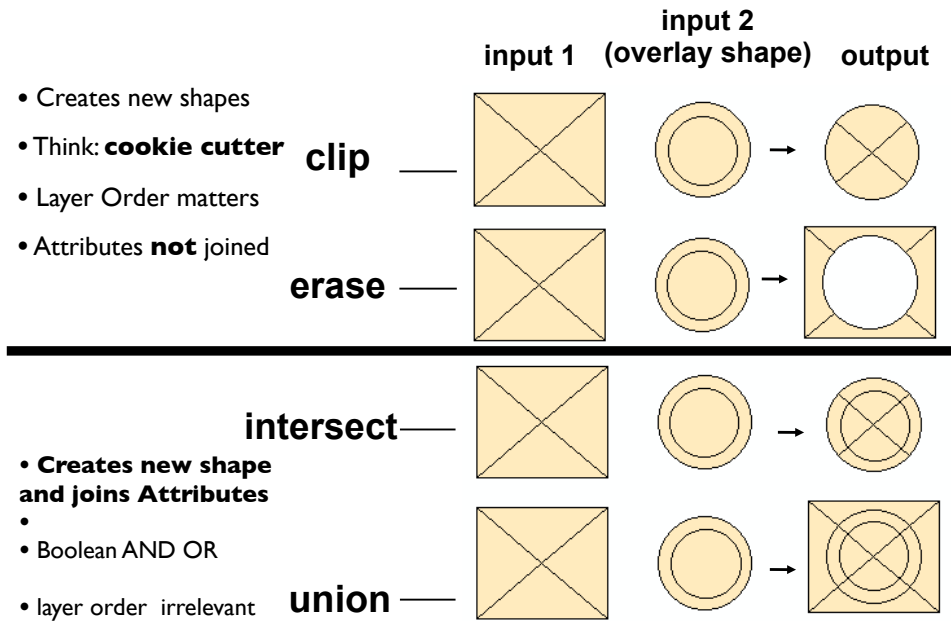## Slide 1

GEOL 452/552 - GIS for Geoscientists I

Lecture 16 - Chapter 7 Geoprocessing

- HW5 (6?) corrected
- Chapter 7: Geoprocessing ("Overlays")
- Today: intersections, union, clip, erase
  (next lecture: dissolve, buffer, merge)
- clip to shape (graphical-only clipping)
- class exercise: copy follow_along_data\Ch7A_class_ex
  folder and run mxd file inside
- (Short version of the tutorial, so you can concentrate on
 mini proj.2 in today's lab ...)

1

Slide 2

Overlay operations (fig. 7.8, p. 189)

input 1   input 2 (overlay shape)   output

- Creates new shapes
- Think: **cookie cutter**   **clip**
- Layer Order matters
- Attributes **not** joined

erase

intersect

- **Creates new shape and joins Attributes**
-
- Boolean AND OR
- layer order irrelevant   **union**

2

Slide 3

Why overlay procedures?

Poly 1
Poly 2

- Which polygon is each road (segment) in?
- Spatial Join would only be able to fit the leftmost line into Poly 1
- But: the other lines cover more than one polygon
- Geoprocessing **splits** the road along the polygon shape (into 3 + 2 new lines)
- Use *intersection* method create a new layer with split lines
- Intersect can assign the polygon's name to each line segment (i.e. free join :)
- How would you get the total length (post split) per polygon?

Poly 1
Poly 2

3

Slide 4
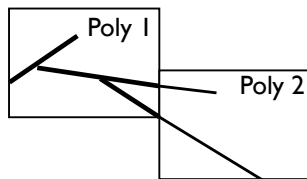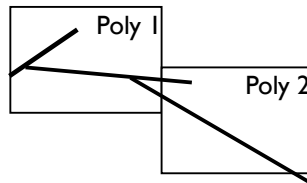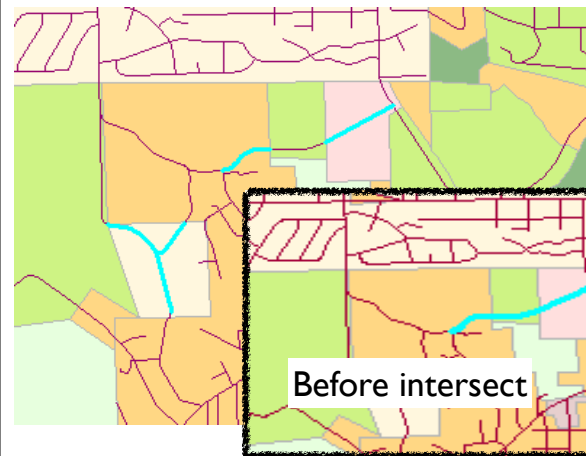
Intersect Splits roads along the land use polygons.
The underlying land use type (LU_CODE) is joined to each road. segment

Before intersect

Selected Attributes of road-lu

| FID	Shape*	LENGTH	ROADNAME	LANDUSE_ID	LU_CODE
2348	Polyline	0.00964	RANGE RD	72	Office/Commercial
2535	Polyline	0.00964	RANGE RD	70	Medium Density Residential
2564	Polyline	0.00579	CANYON LAKE DR	73	Public
3568	Polyline	0.00574	HILLSVIEW DR	354	Low Density Residential
3569	Polyline	0.00574	HILLSVIEW DR	354	Low Density Residential
3570	Polyline	0.00242		354	Low Density Residential
3653	Polyline	0.00482	CANYON LAKE DR	75	General Commercial
4984	Polyline	0.00733	32 ST	40	Floodway

4

Intersect: Output type geometry
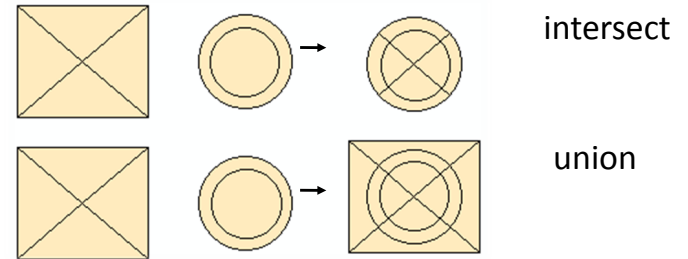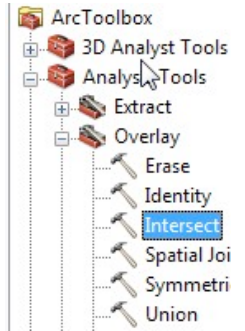
Polygon - line intersection can create lines or points:
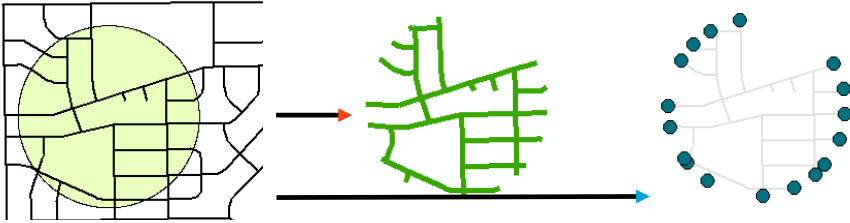
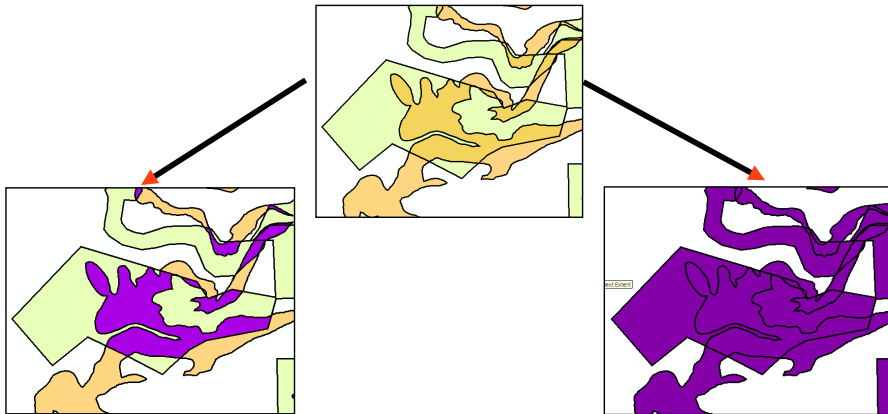Polygon - polygon intersection can create polygons, lines or points:

INPUT	OUTPUT	OUTPUT	OUTPUT
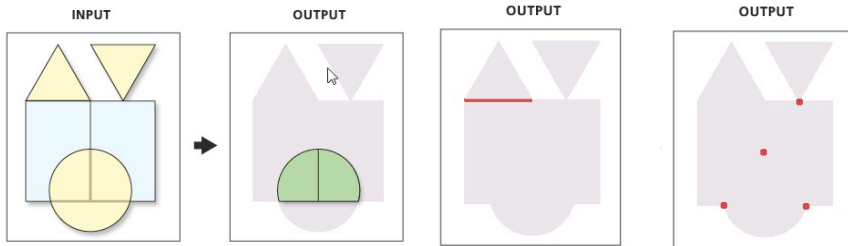
ArcGIS Help: Intersect Tool - Tools Help - Learn how intersect works

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ArcTools: Intersect and Union

- Intersect: combines features and keeps what is common to both

- Union: combines features from different layers

- Works on feature shape AND feature attributes!

- To perform a spatial join set Join Attributes to ALL

ArcToolbox
- 3D Analyst Tools
- Analysis Tools
  - Extract
  - Overlay
    - Erase
    - Identity
    - **Intersect**
    - Spatial Joi
    - Symmetri
    - Union

intersect

union

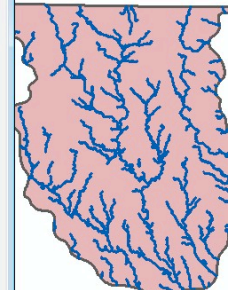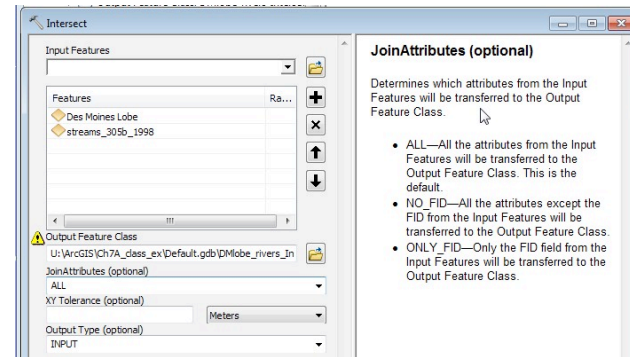
Intersect vs. Union of 2 polygon layers

Intersect gives only those polygons present in both layers (Boolean AND)

Union combines polygons from all layers (Boolean OR)

Output layer: Join all attributes from each table

Class ex. - Intersect and Union

- Open ArcToolbox - Analysis Tools - Overlay
- Total length of streams inside the Des Moines Lobe?
- Run Intersect tool - Show Help
- Input features: both layers - order does not matter
- output: DMLobe_rivers_intersect (in Ch7a_class_ex Default.gdb)
- Set JoinAttributes to All
- Output type: Input (What will the Output geometry be?)

Slide 9
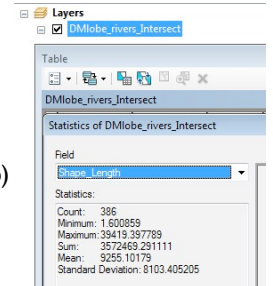
- What area is covered by the DM lobe **or** by Middle devonian rocks?
- Analysis Tools - Overlay - Union
- JoinAttribs = All
- Output: DMLobe_MDev_Union
- Examine Table - which features cover BOTH?

| OBJECTID *	Shape *	FID_landform	REGION	NAME	FID_ia_geology	GLG	DESC_	Shape_Length	Shape_Area
1	Polygon	-1	0		-1			1060180.443987	28881801686.1544
2	Polygon	-1	0	Des Moines Lobe	42	D2	Middle Devonian	38227.348391	70061013.607781
3	Polygon	-1	0		47	D2	Middle Devonian	673932.633275	2495626906.20782
4	Polygon	-1	0		55	D2	Middle Devonian	27448.092423	49599626.151676
5	Polygon	-1	0		65	D2	Middle Devonian	31543.037448	66367816.44068
6	Polygon	-1	0		93	D2	Middle Devonian	33709.797684	4895147.0.841792
7	Polygon	-1	0		119	D2	Middle Devonian	1511050.197989	12869973652.1858
8	Polygon	1	2	Des Moines Lobe	109	D2	Middle Devonian	16377.088757	18419901.872545
9	Polygon	1	2	Des Moines Lobe	112	D2	Middle Devonian	17633.38218	19299671.524572
10	Polygon	1	2	Des Moines Lobe	113	D2	Middle Devonian	19953.771562	23502099.106012
11	Polygon	1	2	Des Moines Lobe	115	D2	Middle Devonian	15125.880244	16858198.053395
12	Polygon	1	2	Des Moines Lobe	119	D2	Middle Devonian	283288.671782	1637961596.6756
13	Polygon	1	2	Des Moines Lobe	120	D2	Middle Devonian	50477.794383	103217970.004546

Could be graphically dissolved into 1 single polygon

Slide 10

Geoprocessing - Results window

- **Get Results window**

- drag in a corner

- Will show you data on each tool used

- Good to find errors

- To repeat a tool, 2 x click on it!

Slide 11

Clip and Erase - extraction operations

- Work on feature shape only, do not alter (join) the attributes

  – Clip extracts features **inside** the boundary

  – Erase keeps features **outside** the boundary

Dough   Cookie-cutter

clip

erase

Slide 12
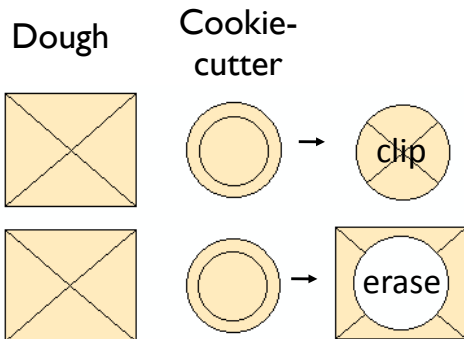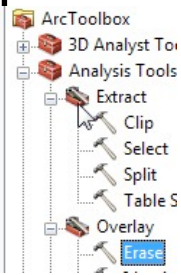
- Erase the Mera Formation **from** the Des Moines Lobe
- Analysis Tools - Overlay - Erase
- Input Features (Dough): Des Moines Lobe
- Erase Feature (Cookie Cutter): Mera Formation
- Output: DMLobe_Mera_Erased
- Table of output?

OBJECTID *	Shape *	REGION	NAME	Shape_Length	Shape_Area
1	Polygon	2	Des Moines Lobe	1173598.613894	29342976599.3908

- Clip the Des Moines Lobe (Dough) with Middle Devonian (cutter)
- Analysis Tools - **Extract** - clip
- Input Features (Dough): Des Moines Lobe
- Erase Feature (Cookie Cutter): Middle Devonian
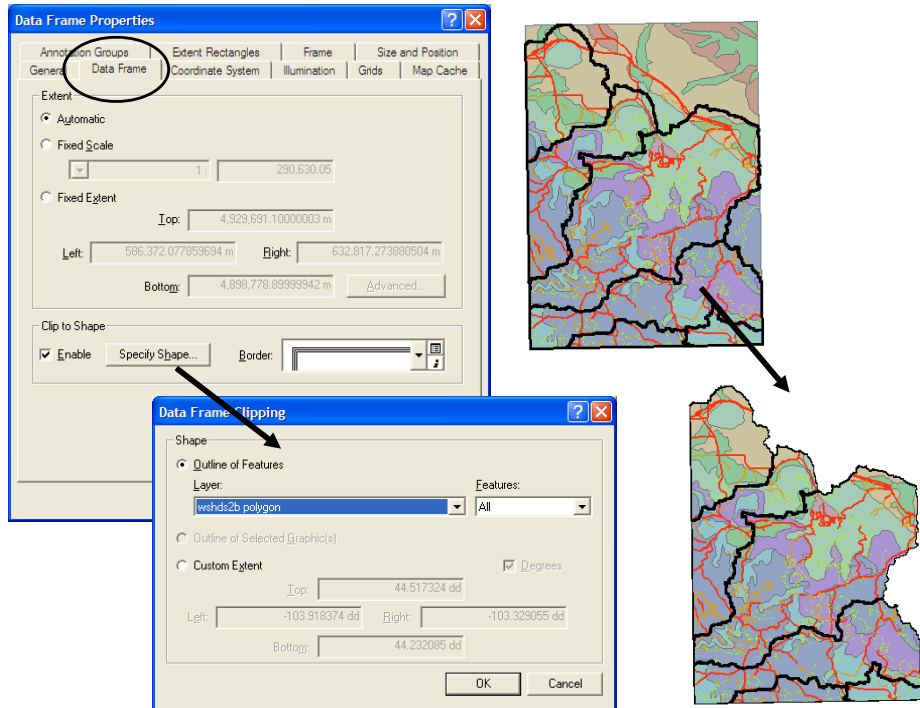- Output: DMLobe_MDev_Clipped
- Table of output?
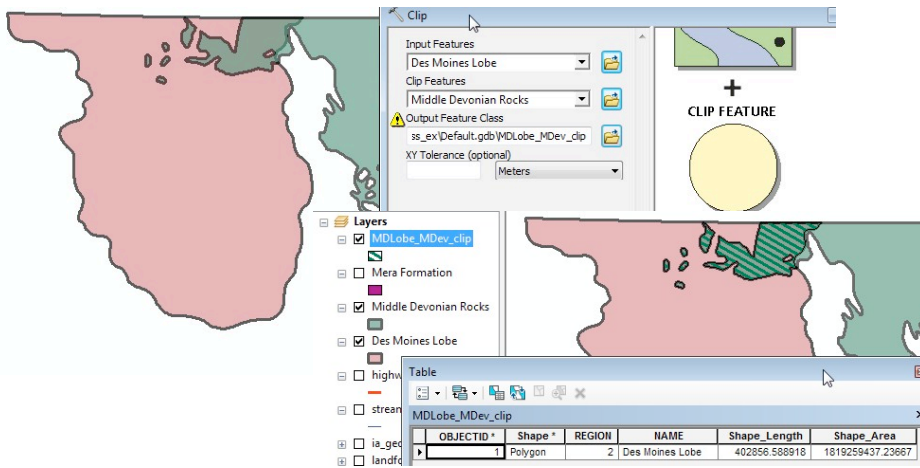
Graphical (On-the-fly) clipping: Clip to Shape

- Temporary clip applied to a map layout

- Does not create new layers

- Can be performed on many layers simultaneously

- Can be removed when no longer needed

- Set as a data frame property

Wrap up

- Lab: Work on HW 8 (create 2 interesting chains of query/joins (Due Thursday)

- Look at data in \\pub\pub\IowaDNR\Iowa_State

- I'm here to give you feedback on your ideas

- On Thursday: Will start Mini proj 3 (HW9) - will focus on overlay operations (no HW from ch. 7 book ex.)

- Tutorial for CH 7 is optional (after you've done HW 8!)