

GEOL 452/552

GIS for Geoscientists I

Lecture 8

Chapter 4 - Attribute Data

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- Today Chapter 4: Attribute Data
- Tables (general, import formats, field types),
- Selecting, SQL Query, Statistics, field calculator,
- Next lecture: Joins, Summarize, import x/y tables
- Follow along: copy data\follow along\ch4A_class_ex folder in you student folder. Open mxd file in ArcMap and open ArcCatalog
- installed: screen capture tool (printscreen)

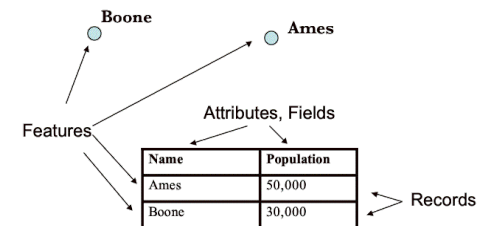
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13-Sep		map layout design, scale bars, text	ch 3 tut 1-48
15-Sep	Ch 3 - Presenting GIS Data	labeling + Mini project 1 (census data) (= HW3)	work on mini proj. 1
20-Sep	Ch 4 - Attribute Data	Tables, field types, SQL query, Selection, field Stats, field calculator,	tut ch 4: 1 - 18 & 37 - 46
22-Sep		join, summary, load (x/y) tables	HW 4: (1, 2, 4, 5, 6, extra 9,10)
27-Sep	Ch 5 - Queries (former Ch 5)		
29-Sep			
4-Oct	Ch 6 - Spatial Joins		

- Plan: Midterm review oct. 11, midterm oct. 13

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ArcGIS Tables



OBJECTID, OID, FID: internal(*) record counter
Shape: Type of geometry, internal (*) coordinates

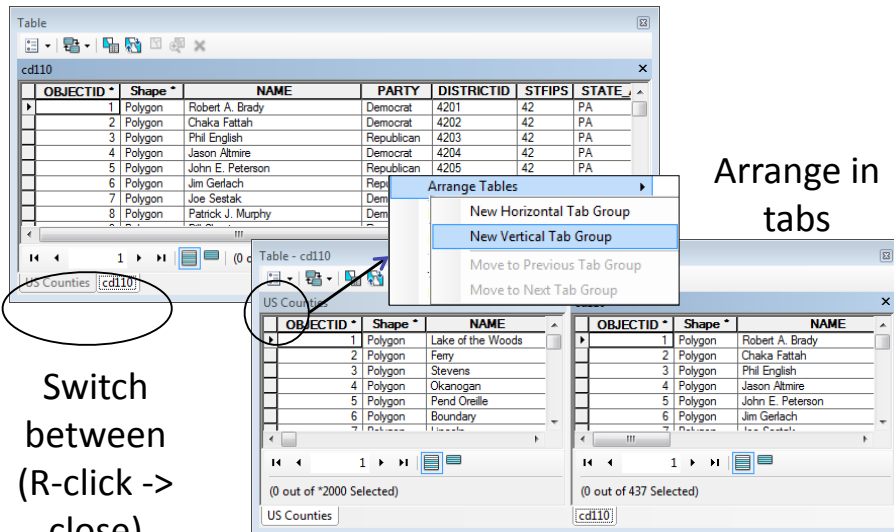
Each field's **type** is specifically defined and must be set before any data can be entered.

Right-click field name to get menu

OBJECTID	Shape	NAME	STATE_NAM	STATE_FIPS	CNTY_FIPS	FIPS	POP2000	POP
1	Polygon	Lake of the Woods	Minnesota	27	077	27077		
2	Polygon	Ferry	Washington	53	019	53019		
3	Polygon	Stevens	Washington	53	065	53065		
4	Polygon	Okanogan	Washington	53	047	53047		
5	Polygon	Pend Oreille	Washington	53	051	53051		
6	Polygon	Boundary	Idaho	16	021	16021		
7	Polygon	Lincoln	Montana	30	053	30053		
8	Polygon	Flathead	Montana	30	029	30029		
9	Polygon	Glacier	Montana	30	035	30035		
10	Polygon	Toole	Montana	30	101	30101		
11	Polygon	Liberty	Montana	30	051	30051		
12	Polygon	Hill	Montana	30	041	30041		
13	Polygon	Sheridan	Montana	30	091	30091		

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Managing multiple tables



Switch between (R-click -> close)

Types of tables

Attribute table

- Stores attributes of map features
- Already associated with a spatial data layer (georef'ed.)
- Has **special fields** for feature coordinates (called ?)

Standalone table

- Stores any tabular data (spreadsheet)
- **Not** associated with spatial data
- When imported into ArcGIS: OID instead of FID

FID	Shape*	NAME	STATE_NAME
0	Polygon	Lake of the Woods	Minnesota
1	Polygon	Ferry	Washington
2	Polygon	Stevens	Washington
3	Polygon	Okanogan	Washington
4	Polygon	Pend Oreille	Washington

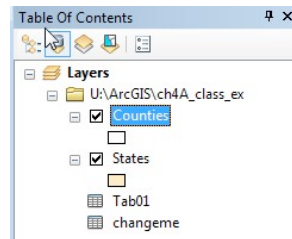
ArcCatalog: counties.shp

OID	FIPS	POP1998	POP1997	POP1996
0	01001	42095	41284	40251
1	01003	132828	128820	124257
2	01005	26895	26791	26870
3	01007	18926	18595	18227
4	01009	46266	44930	43548

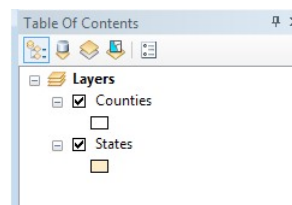
ArcCatalog: Tab01.dbf

Use "List by Source" to see standalone tables in TOC

- List by Drawing order



- List by source



Fields

- Fields have data types (numbers, words, ...)
- Type must be defined before use
- Once defined, a field's type cannot be changed
- Naming rules for field (attribute) names:
 - Use only letters and numbers (no space!)
 - Must start with a letter
 - No more than 13 characters (hence the cryptic names!)
 - You can define longer (better) names as an **alias** (in: Layer properties - Fields, "Pop Density")

Field types (data formats)

Short	Small integers: -32,768 to 32,767	255 1201
Long	Large integers: -2,147,483,648 to 2,147,483,647	156000
Float	Floating point decimal numbers (single precision = precise to about 7 decimal places)	1.23456
Double	Double-precision floating point (precise 15 decimals)	0.000000000123
Text	Alphanumeric strings (up to 255 letters, must be defined at creation)	Maple St
Date		07/12/92
BLOB	Binary large object; any complex binary data including images, documents, etc. (uncommon!)	

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- What type would you use?
- **Population of countries in the world?**
[] very large number but you don't need decimals.
- **Average price for 1 gallon of gas?**
[] - need a few decimal places, number itself is not very large.
- **Number of counties in a state?**
- [] small integer
- **Highway name?**
[] (how long?)
- **Distances between cities, in meters**
- [] - if high precision for these large numbers needed or [] if fractions of meters don't matter.
-
-

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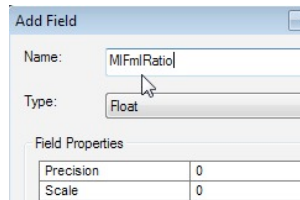
Field characteristics

- Length
 - The total characters a **text** field can store

Length = 10:
"Maple St. "
"Maple Stre"
- Precision
 - The total width of digits a **numeric** field can store (on both sides of .)

156
1985.128
-1922.5632
- Scale
 - The number of decimal (after .) places

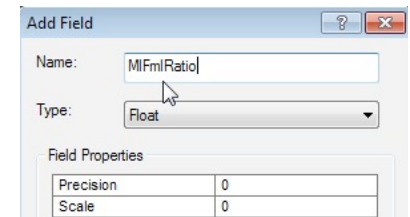
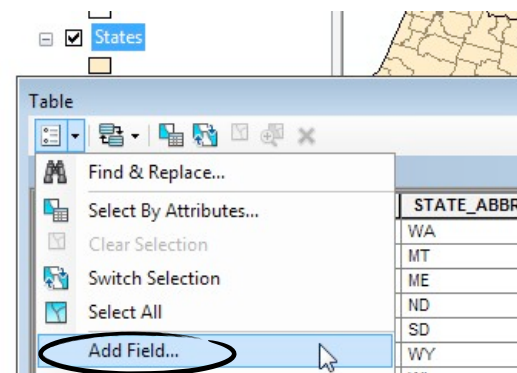
0.001
0.00001
- When creating a new attribute (column) YOU decide its "size"
- 0 precision, 0 scale means "let the computer decide"
- **For numbers usually 0 precision, 0 scale is OK**
- Exception: think about text length (are 50 letters long enough?)



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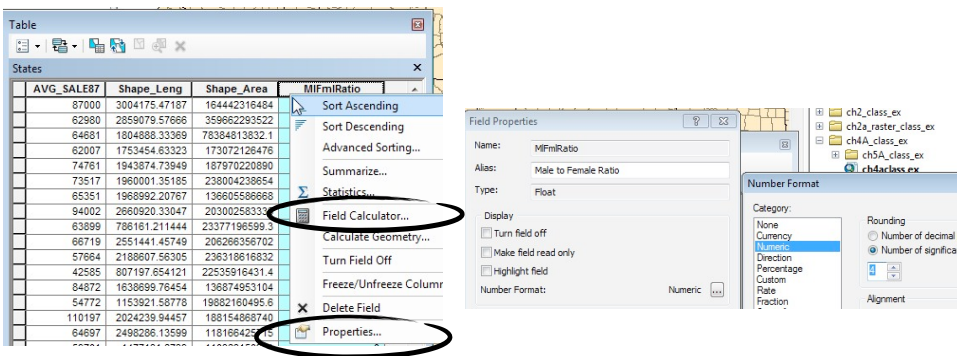
Adding a new field to a table

- Let's add a new decimal number field to table in States
- Right click - Open Attrib. Table - Table Options - Add Field
- Name: MIFmLRatio, Type: **Float**, leave "sizes" at 0



0 means: let the computer decide

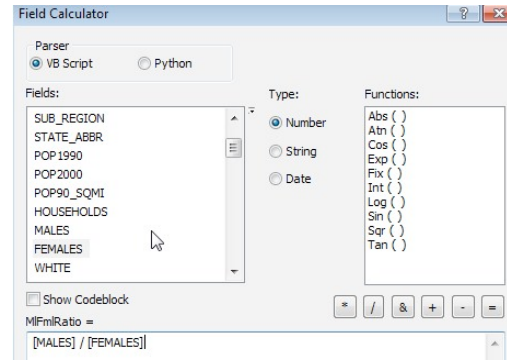
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- Let's give our new attribute a longer name
- Scroll to the LAST field on the right
- R-click on precip (Column header)
- Properties > change Alias for Precip to "Male to Female Ratio"
- (Numeric... > round to 4 significant digits)
- R-click also gives access to Summarize, Statistics, **Field Calculator** for this field
- (Delete field - removes the field from table - but don't do that now)

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Calculate field values (Field calculator)



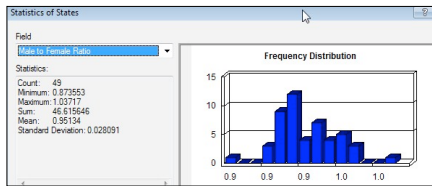
- Let's **calculate the ratio**
- Expression:
MIFmRatio = MALES / FEMALES
- go through all cells of this row
- divide this row's FEMALE value by MALE
- write it into the current row
- repeat until done

- freeze column, sort descending, scroll left
- which three states have more woman then men?

Male to Female	STATE_NAME	SUB_REGION	STATE_ABBR
Sort Ascending	Mtn	NV	
Sort Descending	Pacific	CA	
Advanced Sorting...	Mtn	WY	
Summarize...	W N Cen	ND	
Statistics...	Mtn	ID	
Field Calculator...	Mtn	UT	
Calculate Geometry...	Pacific	WA	
Turn Field Off	Mtn	CO	
Turn Field Off	Mtn	AZ	
Turn Field Off	W S Cen	TX	
Turn Field Off	W N Cen	SD	
Freeze/Unfreeze Column	Mtn	NM	
Freeze/Unfreeze Column	Pacific	OR	

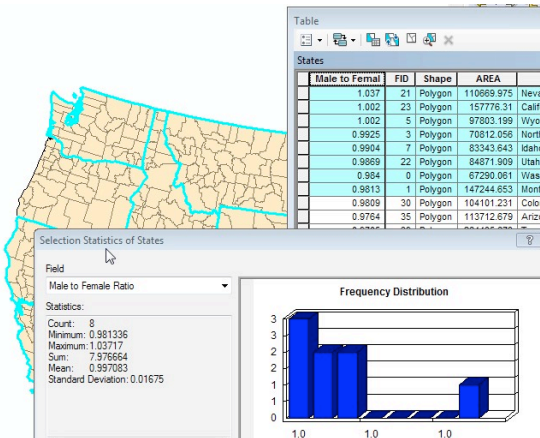
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Per column Statistics



Male to Female	FID	Shape	AREA
1.037	21	Polygon	110689.975
1.002	23	Polygon	157776.31
1.002	5	Polygon	97803.199
0.9925	3	Polygon	70812.056
0.9904	7	Polygon	83343.643
0.9889	22	Polygon	84871.909
0.984	0	Polygon	67290.061
0.9813	1	Polygon	147244.653
0.9809	30	Polygon	104101.231
0.9764	35	Polygon	113712.679

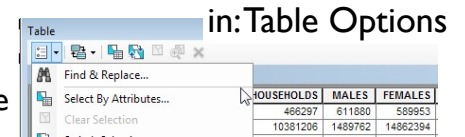
- Typical statistics on numeric column
- Use **only** the **selected** rows (if any)!
- Count: number of selected rows



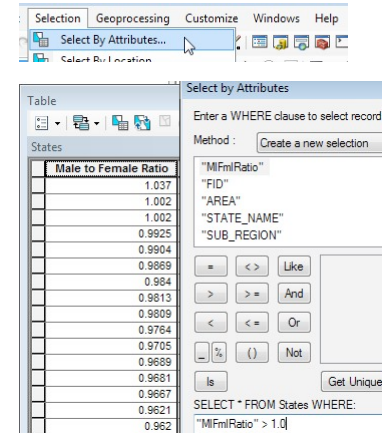
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Select by Attribute

- Uses Structured Query Language
- More on SQL in Chapter 5
- Query means:
- "give me **only** those records for which <statement> is true"
- Result: new **selection** (light blue)
- Examples of statements:
 - "POPI990" > 1000000
 - "MALES" >= "FEMALES"
 - "STATE_NAME" = 'Alabama'
 - "MIFmRatio" > 1.0



in: Main menu - Selection



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Elements of a SQL query (more detail in chapter 6)

● <Field> <Relation> <Value>

“POP2000” > 1000000

- Field in **double quotes**: “POP2000”
- Relation: >, =, <=, <>, LIKE, AND, OR, ...
- Value:
 - Strings (words) : ‘lowa’ (in **single quotes!**)
 - Floating point: 1.2353245 (no quotes)
 - Integer: 1984 (no quotes)

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Lab

- Who’s going to GSA in Oct?
- Lecture feedback on Blackboard?

- Today: Finish HW3
- Tutorial ch 4: 1 - 18 & 37 - 46 (rest next lab, + HW4)
- Try printscreen - should have rectangle screen capture
- May ask you to create a folder U:\screenshots on star

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- Select manually:
Click on left-most “column”
- **Control**-left-click
adds/removes
- Where in US are high ration states?
- flip selected/unselected
- show only selected
- Clear Selection - un-selects
all currently selected
features/rows

Male to Female Ratio	AREA
1.037	110669.975
1.002	157776.31
1.002	97803.199
0.9925	70812.056
0.9904	83343.643

Male to Female Ratio	FID	Shape	AREA	
1.037	21	Polygon	110669.975	Nevada
1.002	23	Polygon	157776.31	California
1.002	5	Polygon	97803.199	Wyoming
0.9925	3	Polygon	70812.056	North Dakota
0.9904	7	Polygon	83343.643	Idaho
0.9869	22	Polygon	84871.909	Utah

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