



United States Department of Agriculture

Working With Tables



Geospatial Technology
and Applications Center












Forest Service

Lesson overview

- Table types ArcGIS can open
- View a table's structure and its properties
- Manipulate tabular data
 - Add a field
 - Summarize command
 - Statistics command
 - Field Calculator
 - Import and Export tables

Tables you can open in ArcGIS

- Open table through Context menu
- Spatial (attribute) tables
 - Shapefile (DBF) 
 - Coverage (Info) 
 - Geodatabase (MDB, GDB, RDBMS) 
- Non-spatial tables
 - Info 
 - Database IV (DBF) 
 - Text (TXT) 
 - MS Access (MDB) 
 - MS Excel (XLS) 
 - RDBMS tables (e.g., Oracle) 

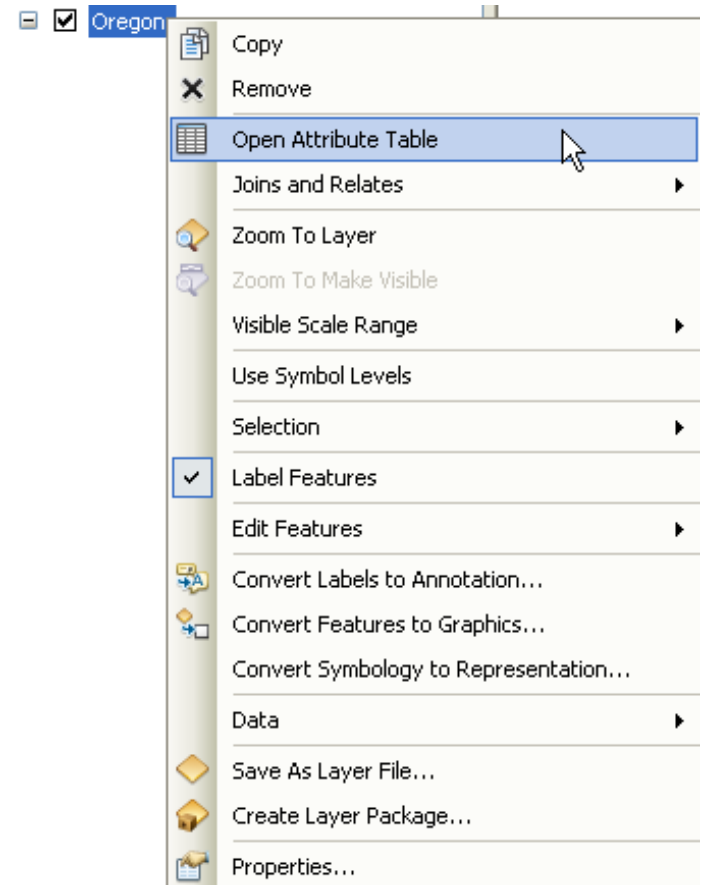


Table structure

- Rows are records; columns are fields
- Field names
 - Must be unique
 - Avoid restricted characters (@#\$%!)
 - May be reordered/resized

Field names

Field

Records

Selected records

Cell values

Selected records out of total

Proposed VRM Management Class	Proposed VRM Management Label	Proposed VRM	Proposed VR	PMVRMNEW	shape_Length	shape_Area
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.041403	0.000025
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.020863	0.000001
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.006904	0.000002
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.004079	0.000001
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.071388	0.000134
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.0418	0.000075
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.12542	0.00047
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.136736	0.000507
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.050315	0.000108
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.004384	0
VRM 1 - Managed to preserve the existing landscape	VRM 1	Proposed		VRM 1	0.014439	0.000007
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.001567	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.000721	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.003639	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.026425	0.000034
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.007265	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.002821	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.005215	0
VRM 2 - Managed to retain the existing landscape	VRM 2	Proposed		VRM 2	0.015258	0.000012

(2 out of 2703 Selected)

Table options

- Query values
- Add field
- Create graph
- Export table
- Table appearance

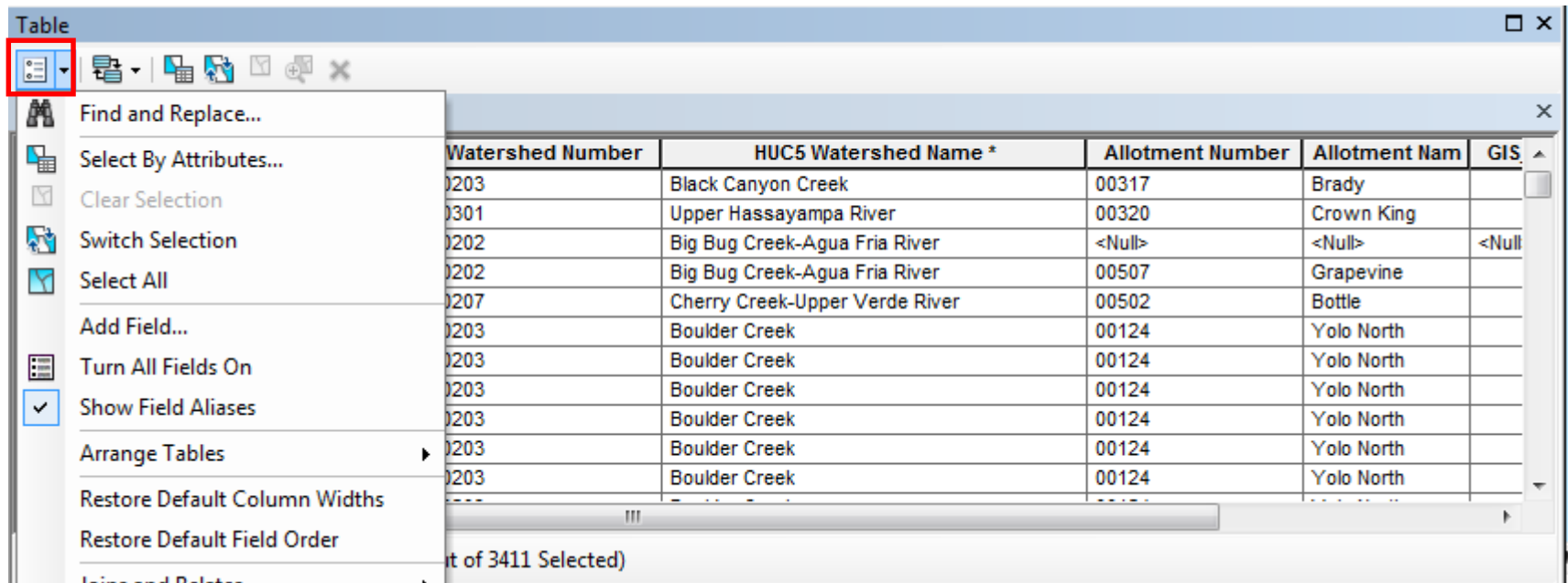
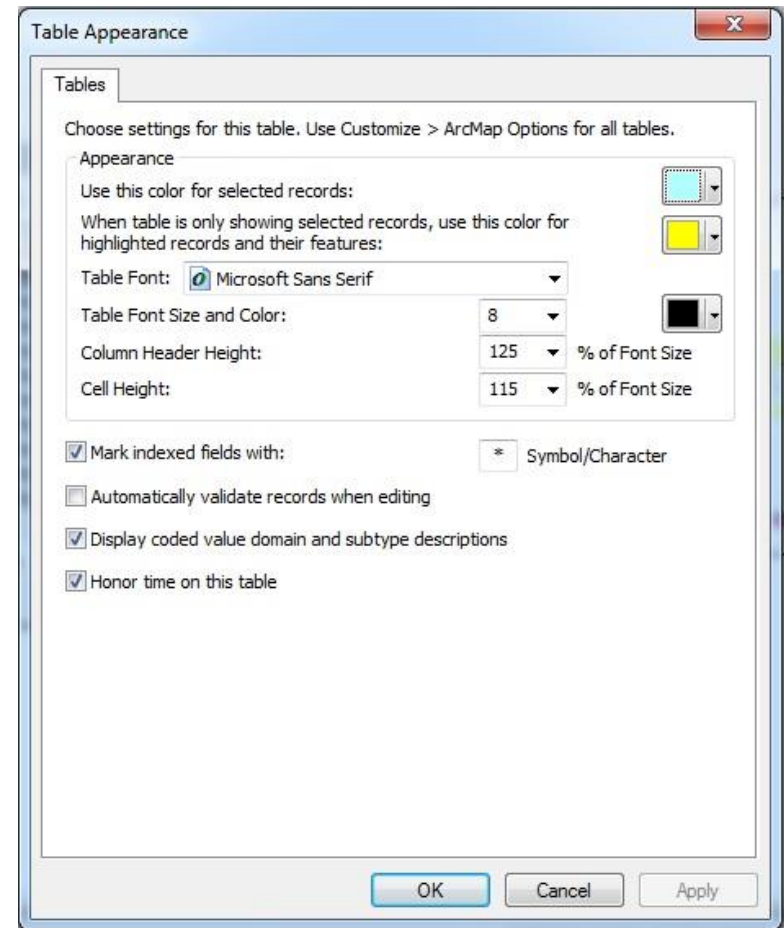


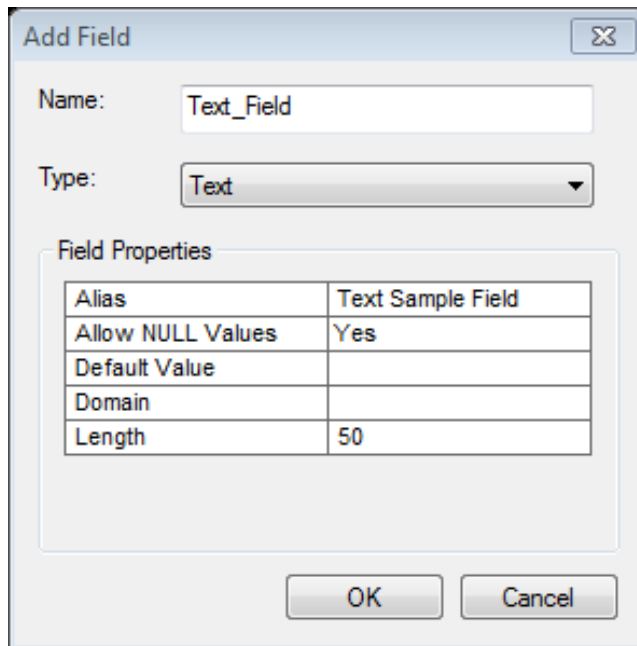
Table appearance

- Settings
 - Table font, size, and color
 - Selection color
 - Cell height
- For open table, Options button → Appearance
- For all tables, Customize menu → ArcMap Options → Tables tab



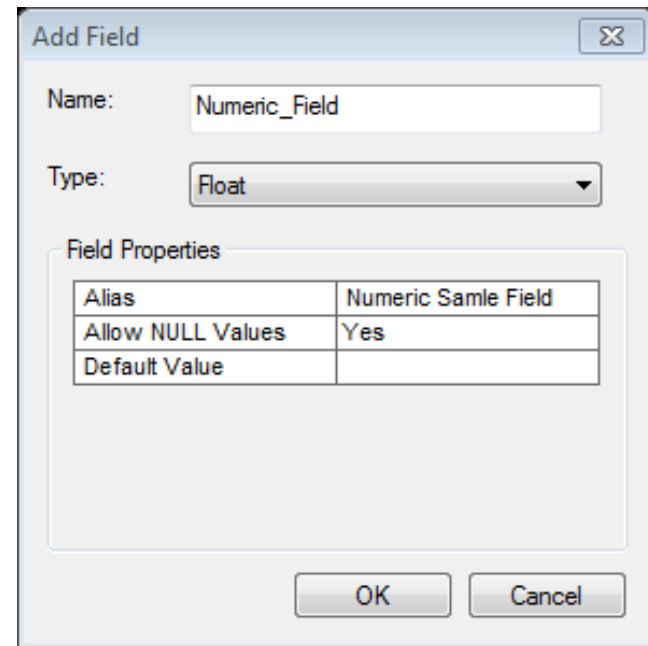
Add a field

- Specify field name, type, and properties
- Older table formats have the following field properties:
 - Length: maximum field length for text values
 - Precision: maximum field length for numeric values
 - Scale: maximum number of decimal places



The 'Add Field' dialog box shows the configuration for a new text field. The 'Name' field contains 'Text_Field' and the 'Type' dropdown is set to 'Text'. The 'Field Properties' table is populated with values for Alias, Allow NULL Values, Default Value, Domain, and Length.

Field Properties	
Alias	Text Sample Field
Allow NULL Values	Yes
Default Value	
Domain	
Length	50

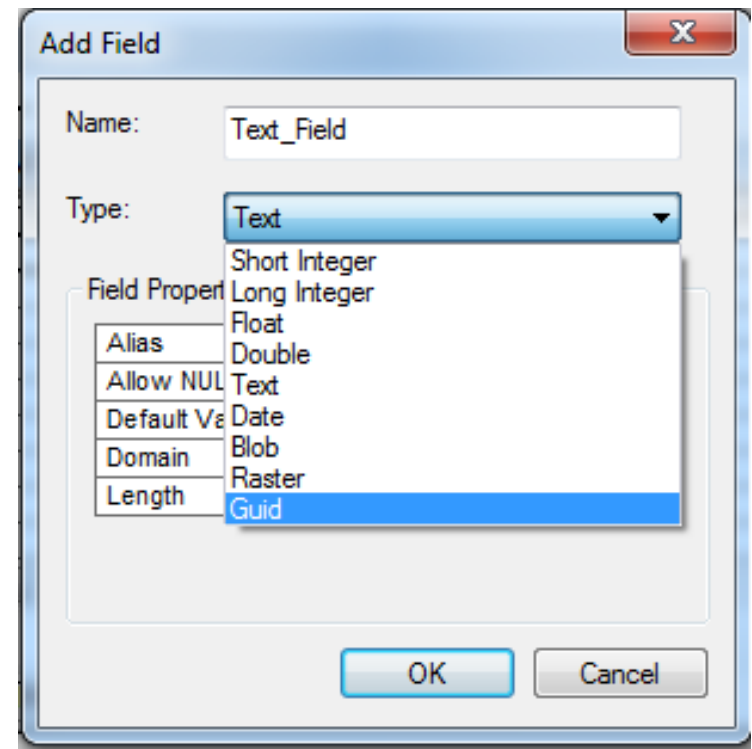


The 'Add Field' dialog box shows the configuration for a new numeric field. The 'Name' field contains 'Numeric_Field' and the 'Type' dropdown is set to 'Float'. The 'Field Properties' table is populated with values for Alias, Allow NULL Values, Default Value, and Domain.

Field Properties	
Alias	Numeric Samle Field
Allow NULL Values	Yes
Default Value	
Domain	

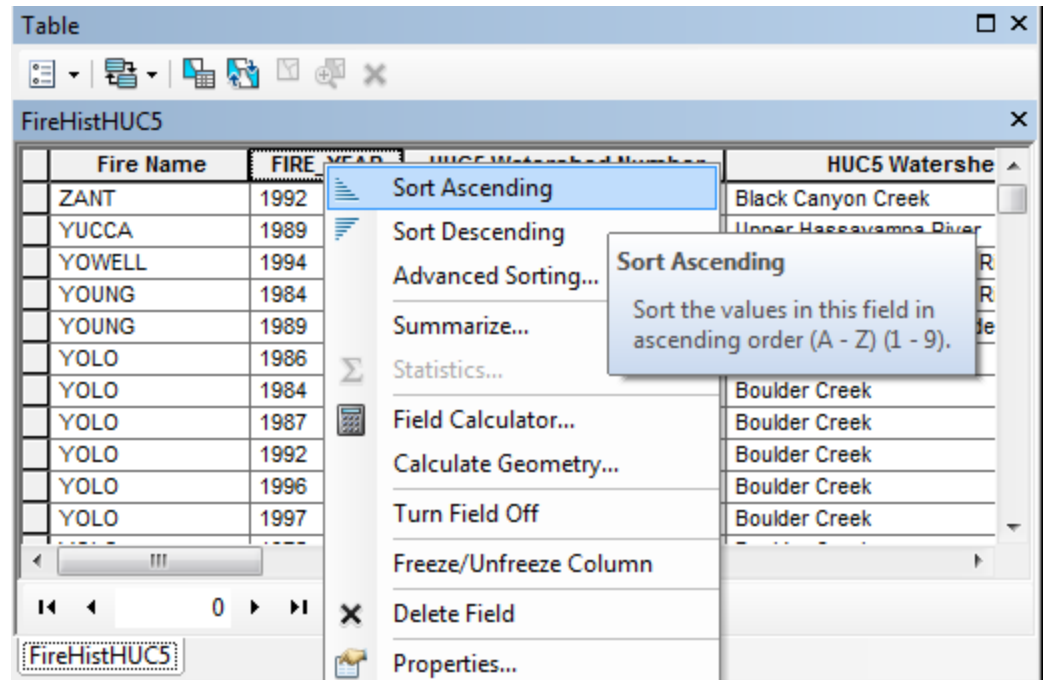
Types of fields

- Defines type of value that can be stored in field
- Available field types vary according to table format
- Cannot convert field types
 - Tip: copy values to new field
- Field type examples:
 - Integer: 346
 - Float: 346.1
 - Double (float): 346.123456
 - Text: ABCD_1234@abcd!
 - Date: 03/17/2009
 - BLOB: annotation
 - [ESRI Field Type Definitions](#)



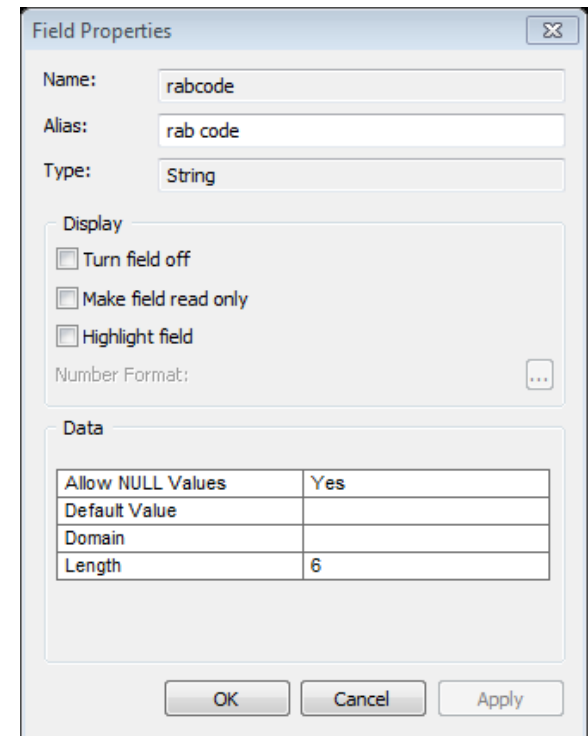
Field options

- Right-click field name for Context menu
- Field options
 - Sort
 - Summarize
 - Statistics
 - Calculate values
 - Field visibility
 - Freeze column
 - Delete field
 - Properties



Field properties

- Right-click field name → Properties
- Property settings
 - Alias name
 - Field visibility
 - Number Format (numeric fields)
 - Length (text fields)
- Saved to MXD



The image shows a 'Field Properties' dialog box with the following settings:

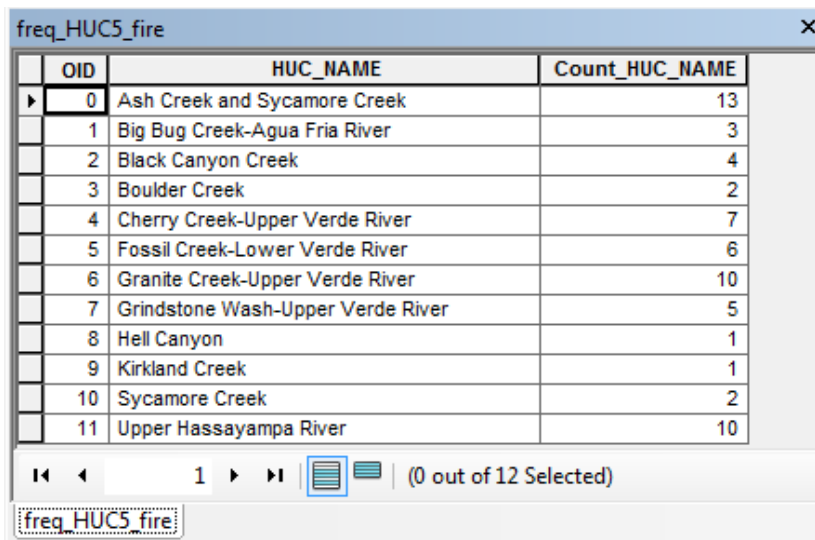
- Name: rabcode
- Alias: rab code
- Type: String
- Display section:
 - ☐ Turn field off
 - ☐ Make field read only
 - ☐ Highlight field
 - Number Format: ...
- Data section:

Allow NULL Values	Yes
Default Value	
Domain	
Length	6

Buttons at the bottom: OK, Cancel, Apply.

Summarize command

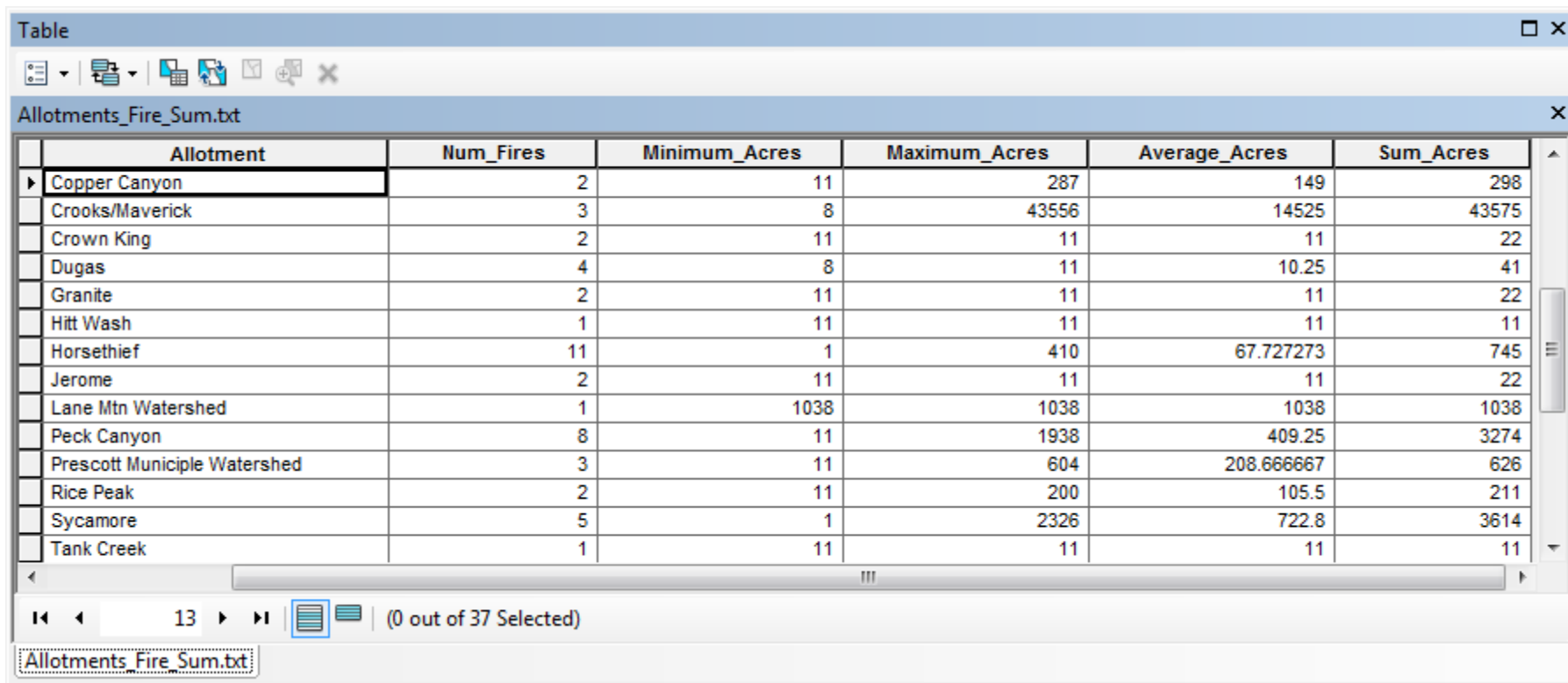
- Report number of times a field's value repeats
 - Example: Number fires in each allotment
- Optional: Report summary statistics from multiple fields
 - Example: For each allotment with a fire, what is the range of burned acres? Average burn size? Total acres burned?



OID	HUC_NAME	Count_HUC_NAME
0	Ash Creek and Sycamore Creek	13
1	Big Bug Creek-Agua Fria River	3
2	Black Canyon Creek	4
3	Boulder Creek	2
4	Cherry Creek-Upper Verde River	7
5	Fossil Creek-Lower Verde River	6
6	Granite Creek-Upper Verde River	10
7	Grindstone Wash-Upper Verde River	5
8	Hell Canyon	1
9	Kirkland Creek	1
10	Sycamore Creek	2
11	Upper Hassayampa River	10

Summary Output

- Summary output is a non-spatial table
- Each record is an allotment with a fire



Table

Allotments_Fire_Sum.txt

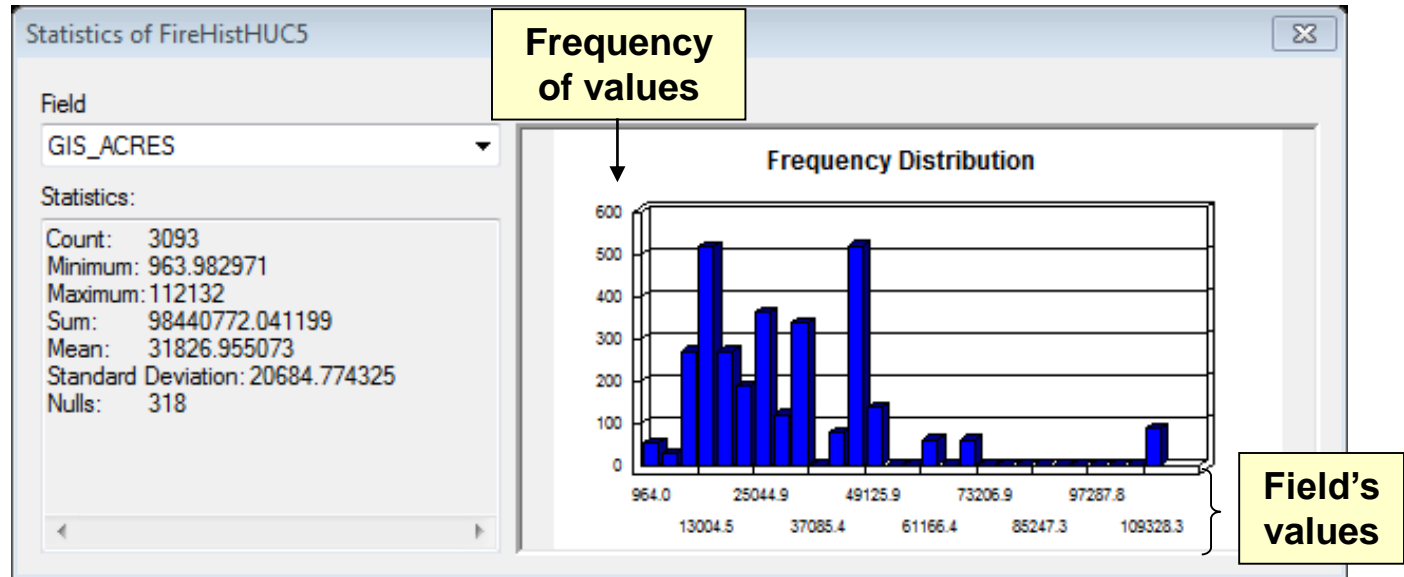
Allotment	Num_Fires	Minimum_Acres	Maximum_Acres	Average_Acres	Sum_Acres
Copper Canyon	2	11	287	149	298
Crooks/Maverick	3	8	43556	14525	43575
Crown King	2	11	11	11	22
Dugas	4	8	11	10.25	41
Granite	2	11	11	11	22
Hitt Wash	1	11	11	11	11
Horsethief	11	1	410	67.727273	745
Jerome	2	11	11	11	22
Lane Mtn Watershed	1	1038	1038	1038	1038
Peck Canyon	8	11	1938	409.25	3274
Prescott Municipal Watershed	3	11	604	208.666667	626
Rice Peak	2	11	200	105.5	211
Sycamore	5	1	2326	722.8	3614
Tank Creek	1	11	11	11	11

13 (0 out of 37 Selected)

Allotments_Fire_Sum.txt

Statistics command (Σ)

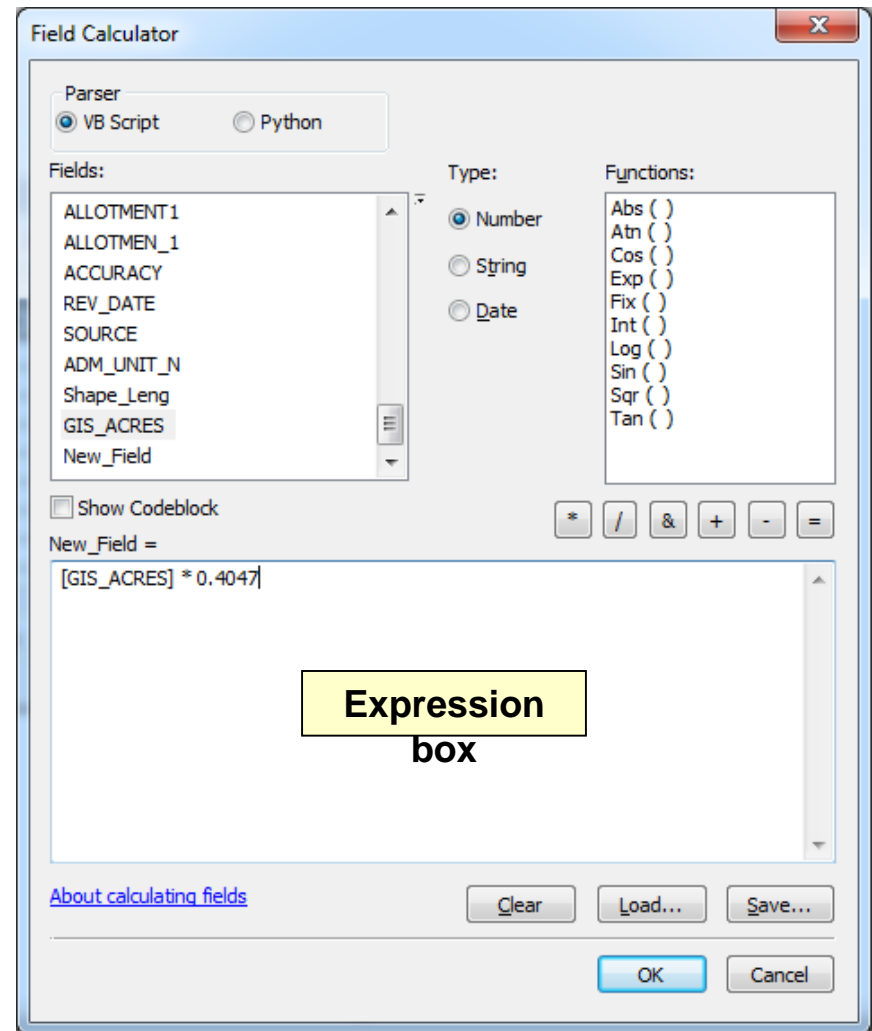
- Summary statistics for values in single field
- Report and graph combined in separate window
- Example: What is the average allotment size?



- Tip: <Alt>+<PrtScn> to copy to another application

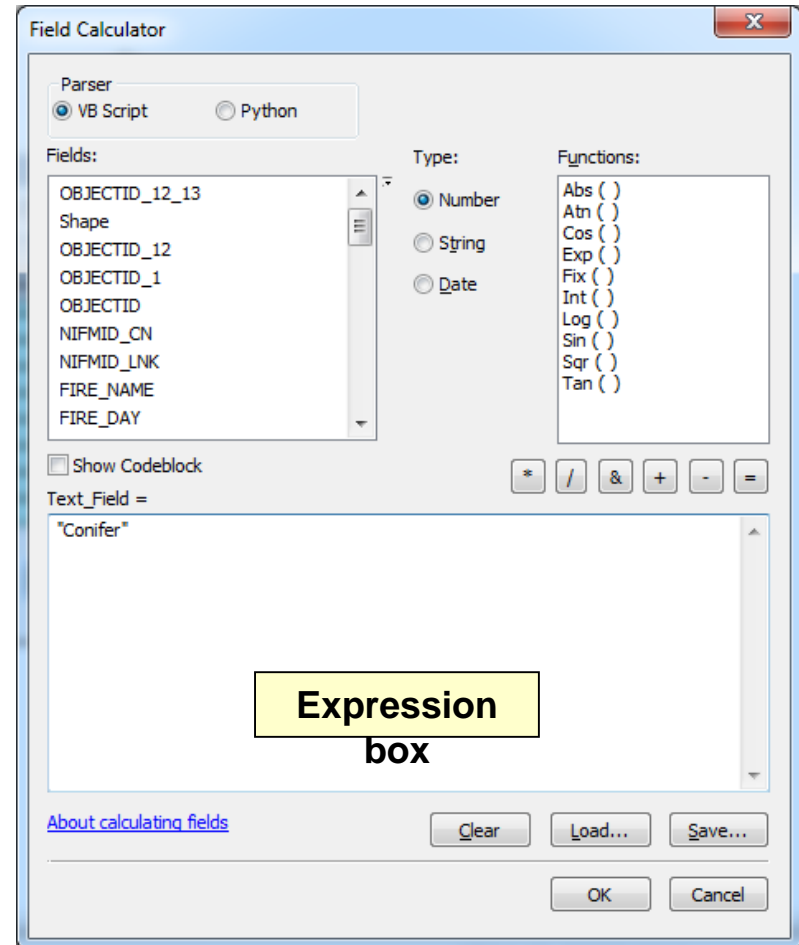
Field Calculator command

- Complete expression (Field name = ?)
- Execute in or outside edit session
 - If outside, cannot undo results; but calculation runs faster
- Optional: limit to selected set
- Example: Calculating hectares



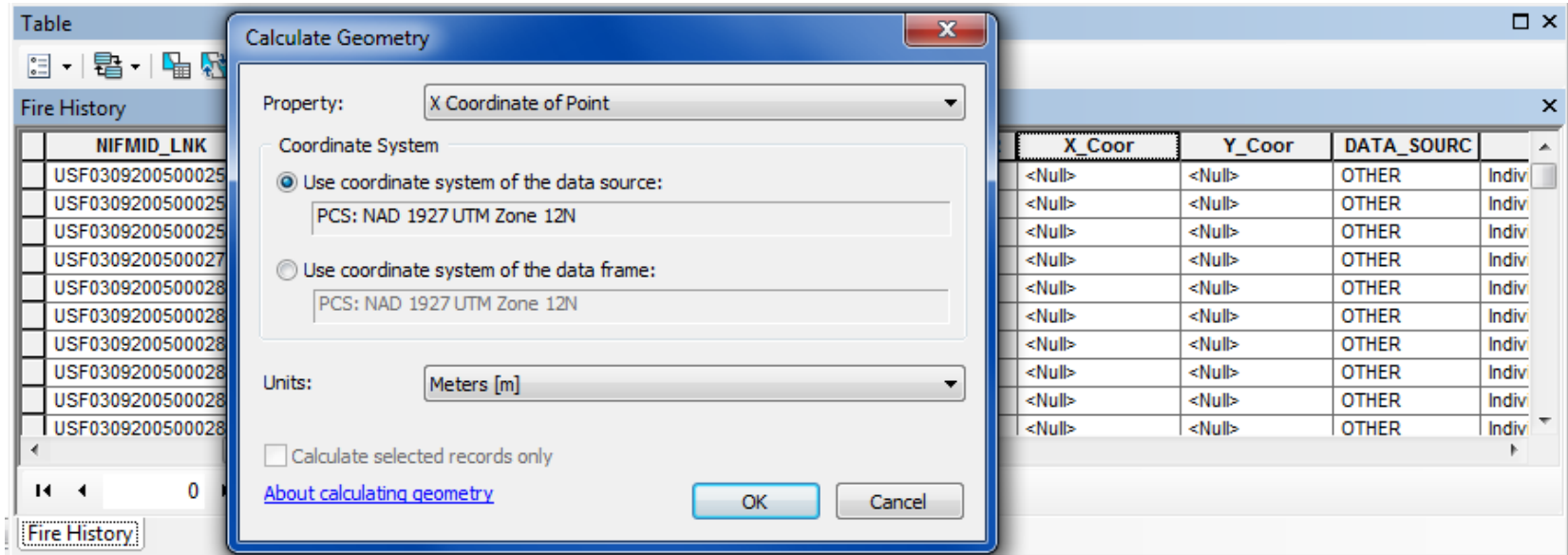
Field Calculator command (text)

- Example: Populating text fields
- Make sure to put the text in “quotations”



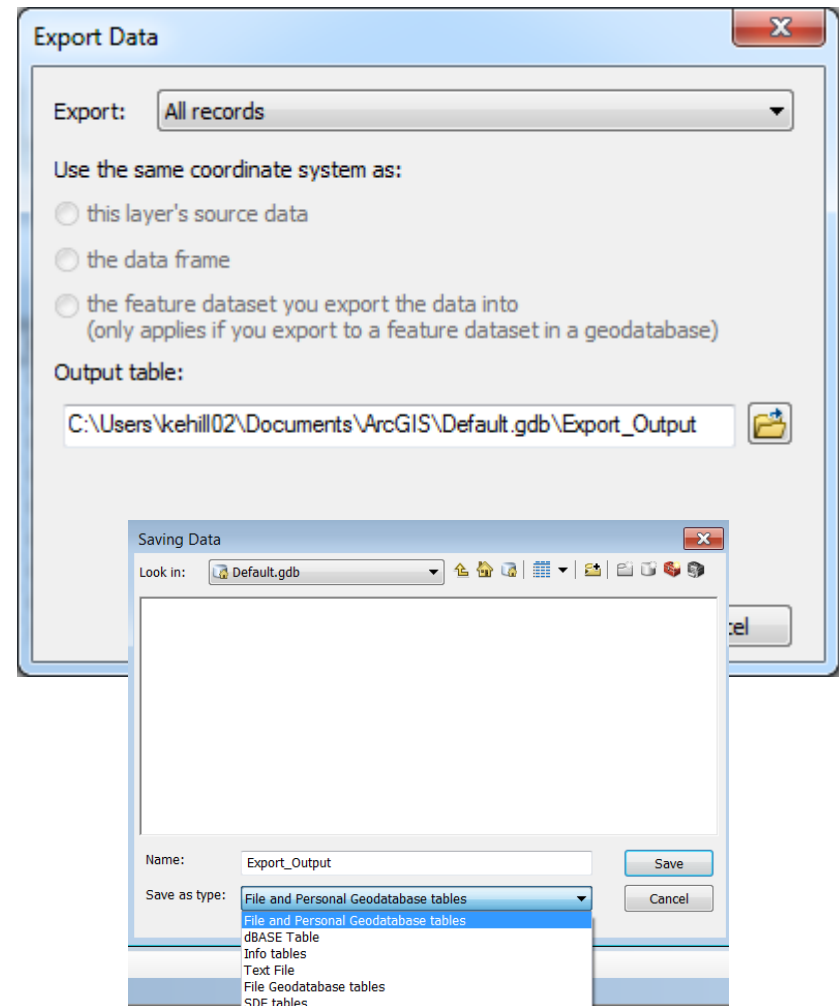
Calculate Geometry

- Calculates layer's geometric measurements
 - Length, Area, Perimeter
 - XY coordinates
- Output units specified by user
- Requires user-defined field



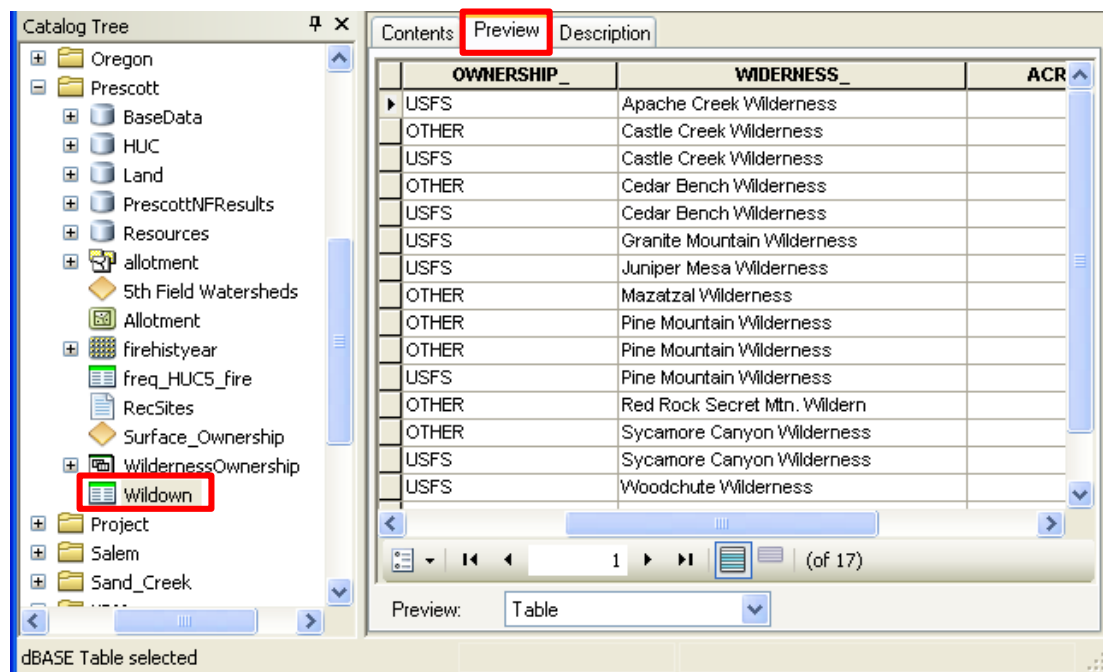
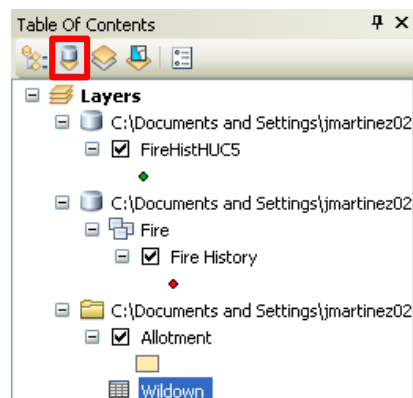
Exporting tables

- Table's Options button → Export
- All or selected records
- Output formats
 - dBase (dbf)
 - Text (txt)
 - Info
 - Geodatabase
 - MDB, GDB, RDBMS

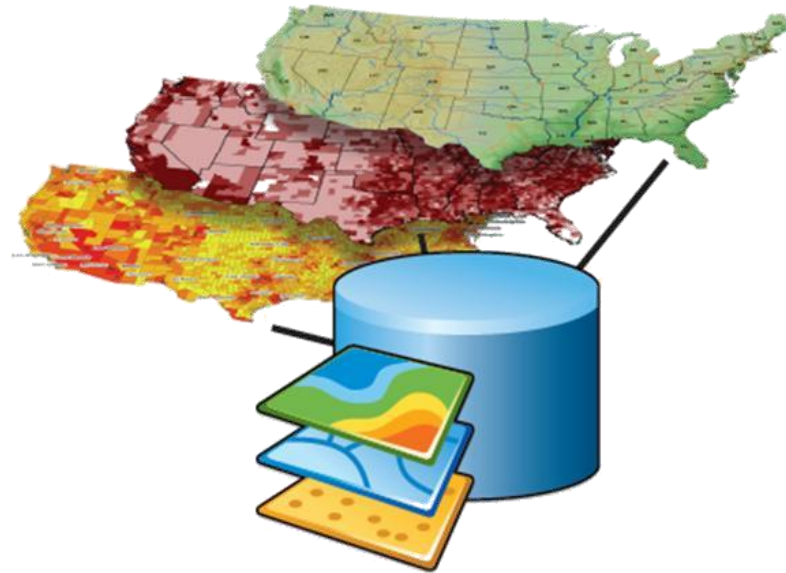


Importing tables

- ArcMap
 - Add Data
- ArcCatalog
 - Preview window



Demonstration





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Querying Tables



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Forest Service

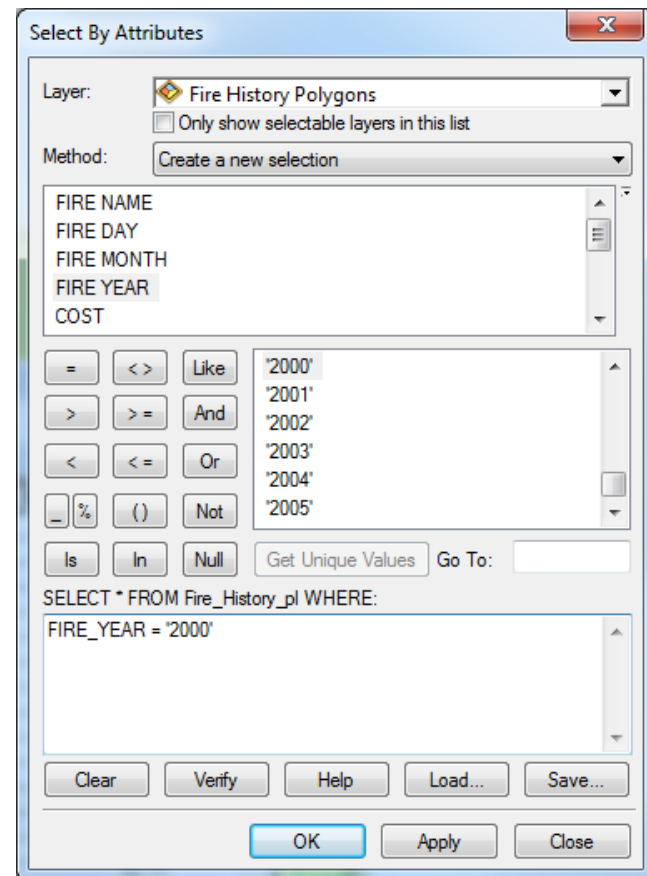
Lesson Overview

- Components of an SQL query
- Searching Single and Multiple Strings
- Wildcards
- Searching for <NULL> Values



Querying Tables

- Querying is the process of requesting attribute information from a database to select features or records with various perspectives and combinations of factors.
- Structured Query Language (SQL)
 - A language for storing, retrieving, and editing data in a database.
- Example:
“FIRE_YEAR” = 2000



Queries - Specifying fields

SQL syntax differs slightly between data sources

- ArcInfoTM coverages, shapefiles, INFO tables, file gdb or dBASE tables :

`"AREA"` *enclose fields in double quotes*

- Personal geodatabase data:

`[AREA]` *enclose fields in square brackets*

- Shared geodatabase data:

`AREA` *don't enclose fields*

Searching Values & Building Expressions

“Field”

Operator

‘Value’

Select by Attributes

Enter a WHERE clause to select records in the table window.

Method: Create a new selection

FIRE_NAME
FIRE_DAY
FIRE_MONTH
FIRE_YEAR
DATA_SOURC
DATA_SOURC

= <> Like
> >= And
< <= Or
- % () Not
Is In Null

'APPLE'
'BEAR'
'BLACK'
'KENYON'
'LYNX'
'MOSCOW'

Go To:

SELECT * FROM Fire_History_pt WHERE:
FIRE_NAME =

Clear Verify Help Load... Save...
Apply Close

Searching Values & Building Expressions

Arithmetic operators

Operator	Description
*	Arithmetic operator for multiplication
/	Arithmetic operator for division
+	Arithmetic operator for addition
-	Arithmetic operator for subtraction

Searching Values & Building Expressions

Comparison operators

Operator	Description
<	Less than. Can be used with strings (comparison is based on alphabetical order), numbers, and dates.
<=	Less than or equal to. Can be used with strings (comparison is based on alphabetical order), numbers, and dates.
<>	Not equal to. Can be used with strings (comparison is based on alphabetical order), numbers, and dates.
>	Greater than. Can be used with strings (comparison is based on alphabetical order), numbers, and dates.
>=	Greater than or equal to. Can be used with strings (comparison is based on alphabetical order), numbers, and dates. For example, this query selects all the cities with names starting with the letters M to Z: "CITY_NAME" >= 'M'

Searching Values & Building Expressions

Logical operators

Operator	Description
AND	Combines two conditions together. Selects a record if both conditions are true. For example, the following expression selects any house with more than 1,500 square feet and a garage for more than two cars: "AREA" > 1500 AND "GARAGE" > 2
OR	Combines two conditions together. Selects a record if at least one condition is true. For example, the following expression selects any house with more than 1,500 square feet or a garage for more than two cars: "AREA" > 1500 OR "GARAGE" > 2
NOT	Selects a record if it doesn't match the following expression. For example, the following expression selects all states but California. NOT "STATE_NAME" = 'California'

Queries - Searching Strings

A string is an ordered sequence of symbols/data types.

- Strings must always be enclosed within single quotes.

For example "STATE_NAME" = 'California'

Case sensitivity:

- Strings are case-sensitive for coverages, shapefiles, file geodb, INFO tables, dBASE tables, and shared geodatabases.
- Strings are not case-sensitive for personal geodatabases.



Queries - Searching multiple Strings

- To search for several strings or values in a field, use the IN operator.
 - For example - Search for 4 different state names in a shared GDB:

STATE_NAME IN ('Alabama', 'Alaska', 'California', 'Florida')



Queries - Searching Strings

Combining expressions

- Complex expressions can be built by combining expressions with the AND and OR operators.
- To build an expression with more than one criteria when both criteria must be true, use the AND operator.
- For example, to find areas of pine forest larger than 100 square km:

VEGETATION = 'Pine Forest' AND AREA > 100



Queries - Searching Strings

Combining expressions

- Complex expressions can be built by combining expressions with the AND and OR operators.
- When you use the OR operator, at least one side of the expression of the two separated by the OR operator must be true for the record to be selected.
- For example:

"RAINFALL" < 20 OR "SLOPE" > 35



Queries - Searching Strings

Combining expressions

- Complex expressions can be built by combining expressions with the AND and OR operators.
- When you use the OR operator, at least one side of the expression of the two separated by the OR operator must be true for the record to be selected.
- NOT expressions can be combined with AND and OR. Use the NOT operator at the beginning of an expression to find features or records that don't match the specified expression.
- For example:

NOT "STATE_NAME" = 'Colorado'



Queries - Searching Strings

Combining expressions

- Complex expressions can be built by combining expressions with the AND and OR operators.
- When you use the OR operator, at least one side of the expression of the two separated by the OR operator must be true for the record to be selected.
- NOT expressions can be combined with AND and OR. Use the NOT operator at the beginning of an expression to find features or records that don't match the specified expression.
- For example, this expression would select all the New England states except Maine:

"SUB_REGION" = 'New England' AND NOT "STATE_NAME" = 'Maine'



Queries - Searching Strings

Wild cards - match any single character within the specified range or set that is specified between the brackets.

Use LIKE with wildcards.

- If querying a coverage, shapefile, INFO table, dBASE table, or shared geodatabase:
 - ‘_’ represents any one character
 - ‘%’ any group of characters.
- For example, query Mississippi and Missouri in a shared geodatabase:
STATE_NAME LIKE ‘Miss%’
- If querying a personal geodatabase:
 - ‘?’ represents any one character
 - ‘*’ any group of characters.
- For example, query Catherine & Katherine in a personal GDB:
[OWNER_NAME] LIKE ‘?atherine’

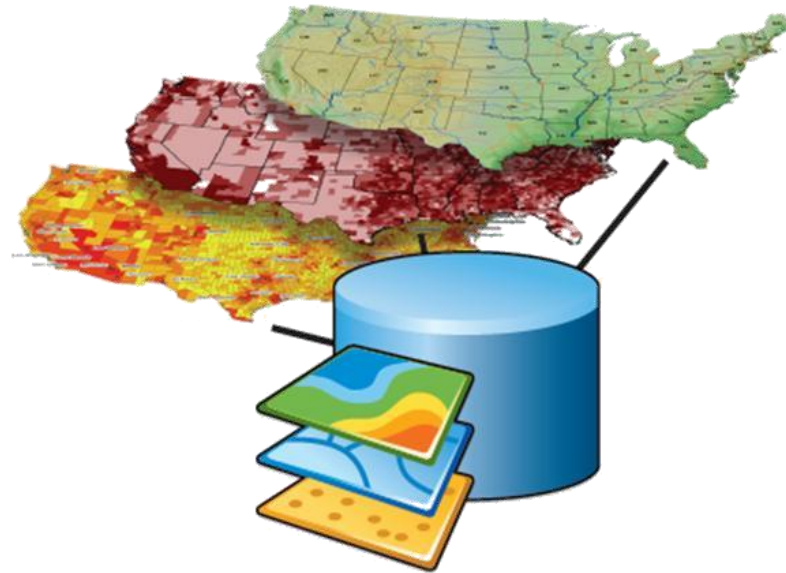


Queries - Searching Strings

- The NULL keyword selects records that have null values.
- The NULL keyword is always preceded by IS or IS NOT.
 - For example - Find cities whose 1996 population has not been entered:
"POPULATION96" IS NULL
 - Find cities whose 1996 population has been entered:
"POPULATION96" IS NOT NULL



Demonstration





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Joining and Relating Tables



Geospatial Technology
and Applications Center



Forest Service

Cardinality

- Associate multiple tables through a ...
 - Table Join
 - Spatial Join
 - Relate tables

Associating multiple tables

- A way to connect information stored in multiple tables
- Types of table associations:
 - Join
 - Attribute join
 - Spatial join
 - Relate

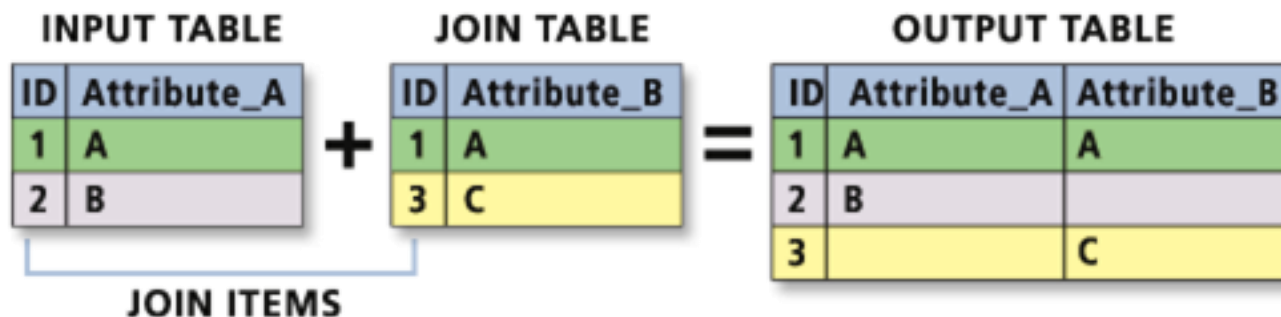


Table Join

- Append data from separate tables into one table
 - Identify “Target” and “Join” tables
 - In each table, identify key field
 - Field type and field values must match*
 - Identify cardinality between key fields (see next slide)

OBJECTID *	Shape *	5th Field W	5th Field Watershed Name	Shape_Leng	Shape_Le
44	Polygon	1507010205	Agua Fria River-Lake Pleasant	82653.550629	182653.5
51	Polygon	1507010209	Agua Fria River below Lake Pleasant	244186.21207	244186.2
32	Polygon	1507010201	Ash Creek and Sycamore Creek	71309.054902	171309.0
9	Polygon	1506020103	Ash Fork Draw-Jumbo Tank	99503.748454	99503.7
1	Polygon	1506020101	Aubrey Valley	98389.246144	198389.2
22	Polygon	1506020206	Beaver Creek	84748.022157	184748.0
29	Polygon	1507010202	Big Bug Creek-Agua Fria River	72018.321421	172018.3
41	Polygon	1507010204	Bishop Creek	48686.561825	148686.5
38	Polygon	1507010203	Black Canyon Creek	42028.970597	142028.9
25	Polygon	1503020203	Boulder Creek	29634.979427	129634.9
52	Polygon	1506020307	Camp Creek-Lower Verde River	57283.061707	157283.0
47	Polygon	1507010206	Cave Creek-Arizona Canal Diversion Ch	228089.123691	228089.1

OID	HUC_NAME	Cnt_HUC_NA	First_FIRE	Last_FIRE
0	Agua Fria River-Lake Pleasant	91	1970	2004
1	Ash Creek and Sycamore Creek	277	1970	2005
2	Beaver Creek	4	1972	1983
3	Big Bug Creek-Agua Fria River	320	1970	2005
4	Bishop Creek	19	1972	1994
5	Black Canyon Creek	448	1970	2005
6	Boulder Creek	45	1971	2005
7	Cherry Creek-Upper Verde River	256	1970	2005
8	Fossil Creek-Lower Verde River	104	1970	2005
9	Granite Creek-Upper Verde River	449	1970	2005
10	Grindstone Wash-Upper Verde River	136	1970	2005

Cardinality

- Relationship between records from each key field

- Types of cardinality

- One-to-one

- One record relates to one record
- Works with join
- Works with relate
- Some records may not have matches
- No record has more than one match in either table

One - to - One

HUC_NAME
Agua Fria River-Lake Pleasant
Agua Fria River below Lake Pleasant
Ash Creek and Sycamore Creek
Ash Fork Draw-Jumbo Tank
Aubrey Valley
Beaver Creek
Big Bug Creek-Agua Fria River
Bishop Creek
Black Canyon Creek
Boulder Creek
Camp Creek-Lower Verde River
Cave Creek-Arizona Canal Diversion Channel
Cherry Creek-Upper Verde River
Date Creek
East Verde River
Fossil Creek-Lower Verde River
Francis Creek
Granite Creek-Upper Verde River
Grindstone Wash-Upper Verde River
Heaven's Gate
Hell Canyon
Jackrabbit Wash
Kirkland Creek
Knight Creek
Lower Big Chino Wash
Lower Big Sandy River

Target table

HUC_NAME
Agua Fria River-Lake Pleasant
Ash Creek and Sycamore Creek
Beaver Creek
Big Bug Creek-Agua Fria River
Bishop Creek
Black Canyon Creek
Boulder Creek
Cherry Creek-Upper Verde River
Fossil Creek-Lower Verde River
Granite Creek-Upper Verde River
Grindstone Wash-Upper Verde River
Heaven's Gate
Hell Canyon
Kirkland Creek
Lower Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Muddy Creek
Oak Creek
Sycamore Creek
Tangle Creek-Lower Verde River
Upper Burro Creek
Upper Hassayampa River
Williamson Valley Wash

Join table

Cardinality

- Relationship between records from each key field

One - to - Many

- Types of cardinality

- One-to-many

- One record in the destination table relates to many records in join table
- Does not work with join
 - Join would only take the first matching record in the join table
- Works with relate
- Each record in the destination table may have several matches in the join table

HUC_NAME
Agua Fria River-Lake Pleasant
Ash Creek and Sycamore Creek
Beaver Creek
Big Bug Creek-Agua Fria River
Bishop Creek
Black Canyon Creek
Boulder Creek
Cherry Creek-Upper Verde River
Fossil Creek-Lower Verde River
Granite Creek-Upper Verde River
Grindstone Wash-Upper Verde River
Heaven's Gate
Hell Canyon
Kirkland Creek
Lower Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Muddy Creek
Oak Creek
Sycamore Creek
Tangle Creek-Lower Verde River
Upper Burro Creek
Upper Hassayampa River
Williamson Valley Wash

Target table

HUC_NAME
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Muddy Creek
Muddy Creek
Muddy Creek
Oak Creek
Oak Creek
Oak Creek
Oak Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

Join table

Cardinality

- Relationship between records from each key field

- Types of cardinality

- Many-to-one

- Many records in the destination table relate to one record in join table
- Works with join
- Works with relate
- Each record in the destination table has only one match in the table to be joined

Many - to - One

HUC_NAME
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Muddy Creek
Muddy Creek
Muddy Creek
Oak Creek
Oak Creek
Oak Creek
Oak Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

Target table

HUC_NAME
Agua Fria River-Lake Pleasant
Ash Creek and Sycamore Creek
Beaver Creek
Big Bug Creek-Agua Fria River
Bishop Creek
Black Canyon Creek
Boulder Creek
Cherry Creek-Upper Verde River
Fossil Creek-Lower Verde River
Granite Creek-Upper Verde River
Grindstone Wash-Upper Verde River
Heaven's Gate
Hell Canyon
Kirkland Creek
Lower Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Muddy Creek
Oak Creek
Sycamore Creek
Tangle Creek-Lower Verde River
Upper Burro Creek
Upper Hassayampa River
Williamson Valley Wash

Join table

Cardinality

- Relationship between records from each key field

- Types of cardinality

- Many-to-Many**

- Many records relate to many records
 - Does not work with join
 - Join would only take the first matching record in the join table
 - Works with relate
 - May be more than one record that matches in either table

Many - to - Many

HUC_NAME
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Muddy Creek
Muddy Creek
Muddy Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
► Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

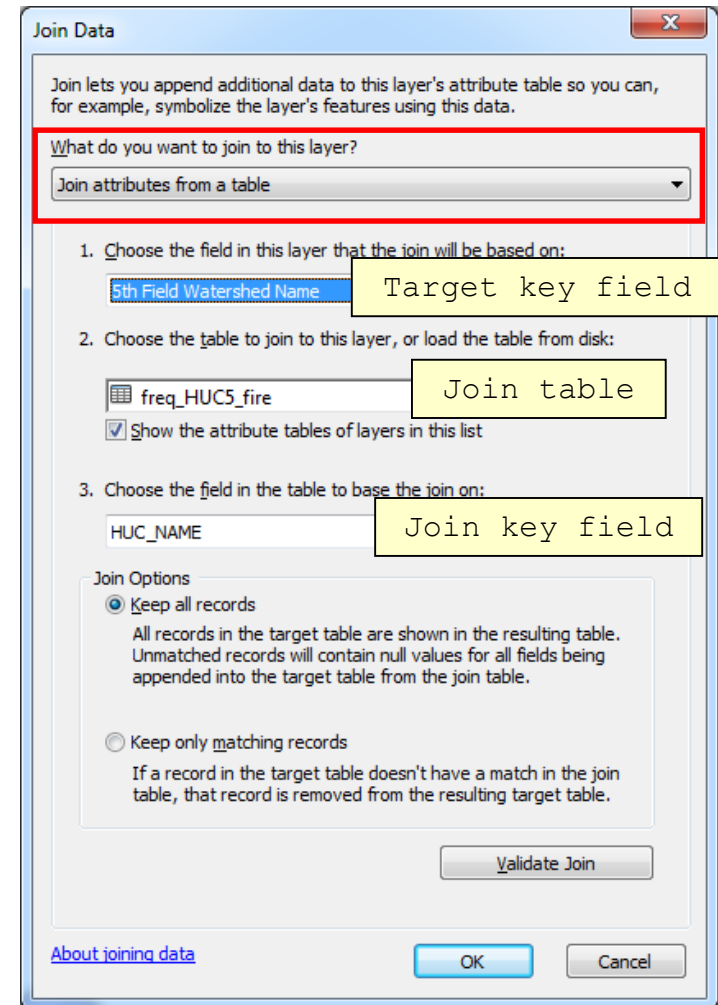
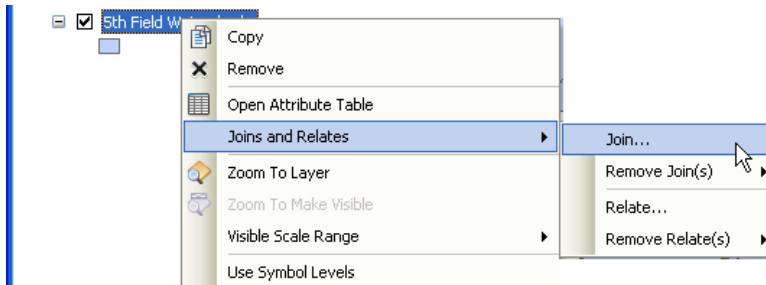
Target table

HUC_NAME
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Big Chino Wash
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Middle Hassayampa River
Muddy Creek
Muddy Creek
Muddy Creek
Muddy Creek
Oak Creek
Oak Creek
Oak Creek
Oak Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

Join table

Joining tables in ArcMap

1. Identify target and origin tables
2. Identify key fields
3. Identify cardinality
 - Join is only correct for a one-to-one or many-to-one relationship
4. In TOC, right click the target table or layer to open context menu, Joins and Relates → Join
5. Complete Join Data window



Join results

- Fields from the join table are appended to the target table
- Table join only exists in the map document
 - For a permanent table, click:

Options → Export

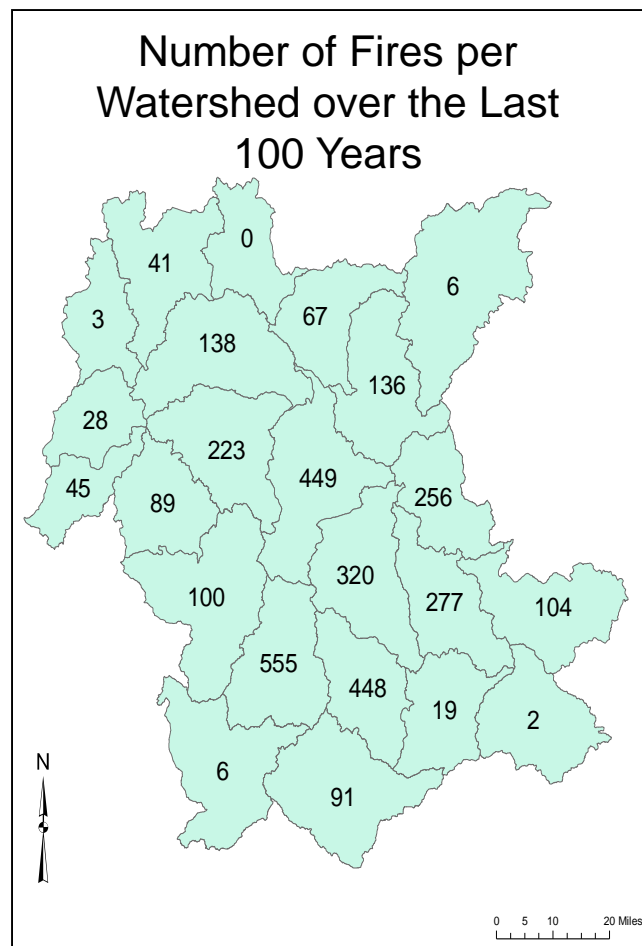
Fields of the target table

Fields of the joined table

Hydrologic Unit 5th Code.Shape Length	Hydrologic Unit 5th Code.Shape Area	freq HUC5 fire.OID	freq HUC5 fire.HUC NAME	freq HUC5 fire.Cnt HUC NA	freq
198389.246144	923696739.295819	<Null>	<Null>	<Null>	<Null>
156192.668969	668301290.707982	<Null>	<Null>	<Null>	<Null>
164646.058051	602344492.614189	<Null>	<Null>	<Null>	<Null>
118378.649226	464852781.509044	<Null>	<Null>	<Null>	<Null>
108286.401071	406322101.054937	<Null>	<Null>	<Null>	<Null>
150561.515944	529667814.685643	<Null>	<Null>	<Null>	<Null>
625734.688888	400000000.000000	<Null>	<Null>	<Null>	<Null>

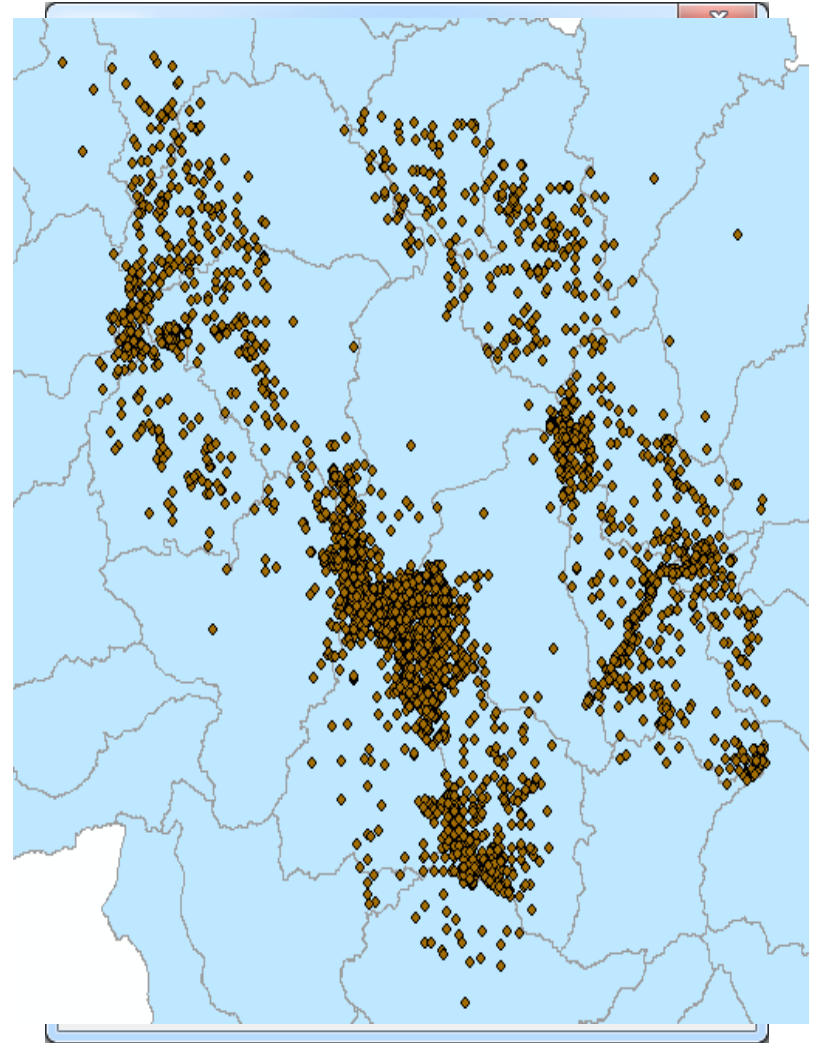
Benefits in using joined tables

- Joined data allows for further:
 - Queries
 - Statistics
 - Labels
 - Data classifications



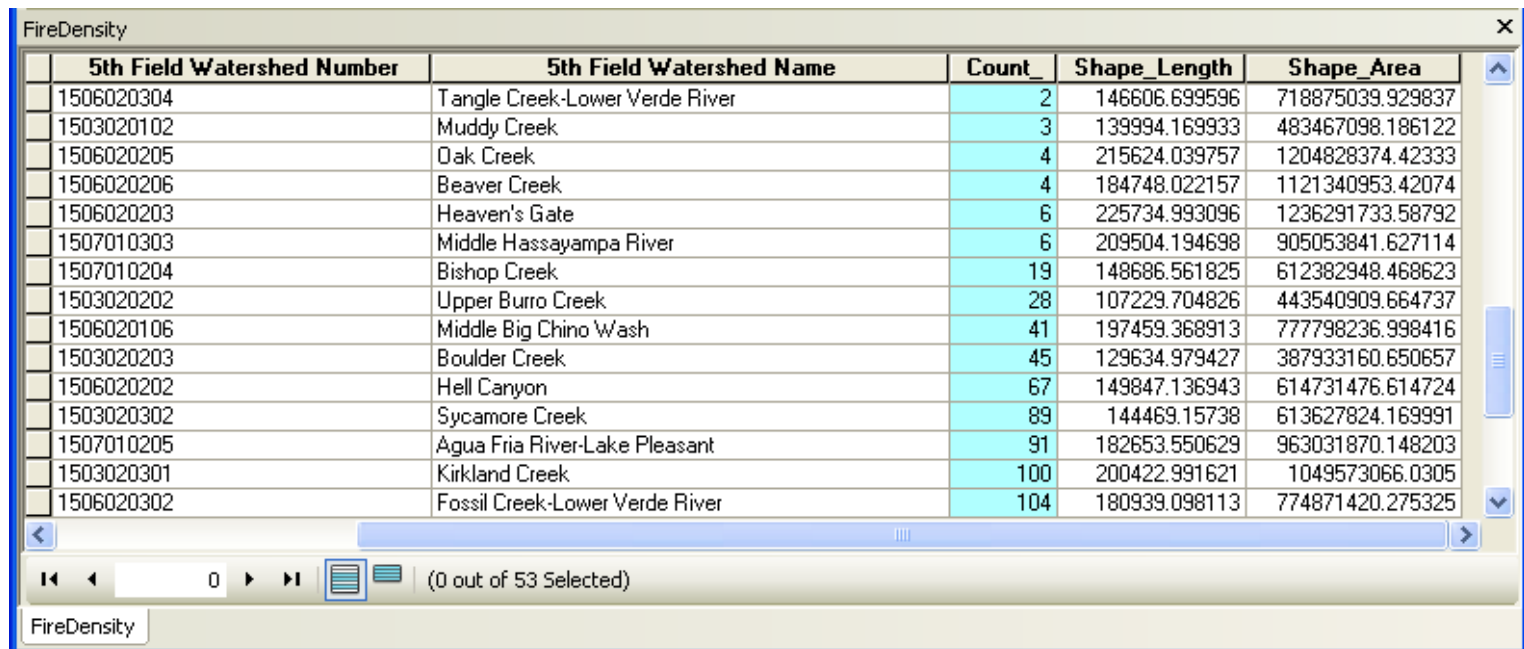
Spatial Join

- Joins attributes based on relative location of features
 - Find nearest feature
 - Find features inside polygons
 - Find intersecting features
- No key field or cardinality requirements
- Right click target layer (Watersheds) → Join
 - Example: Join Fire points inside Watershed polygons to determine fire density



Spatial Join results

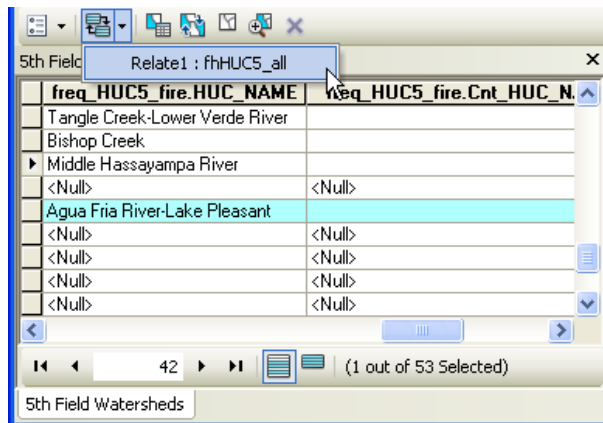
- Output is new layer with combined attributes
- Depending upon settings, Count and/or Distance fields added
- Example: Count field represents number of fires for each watershed



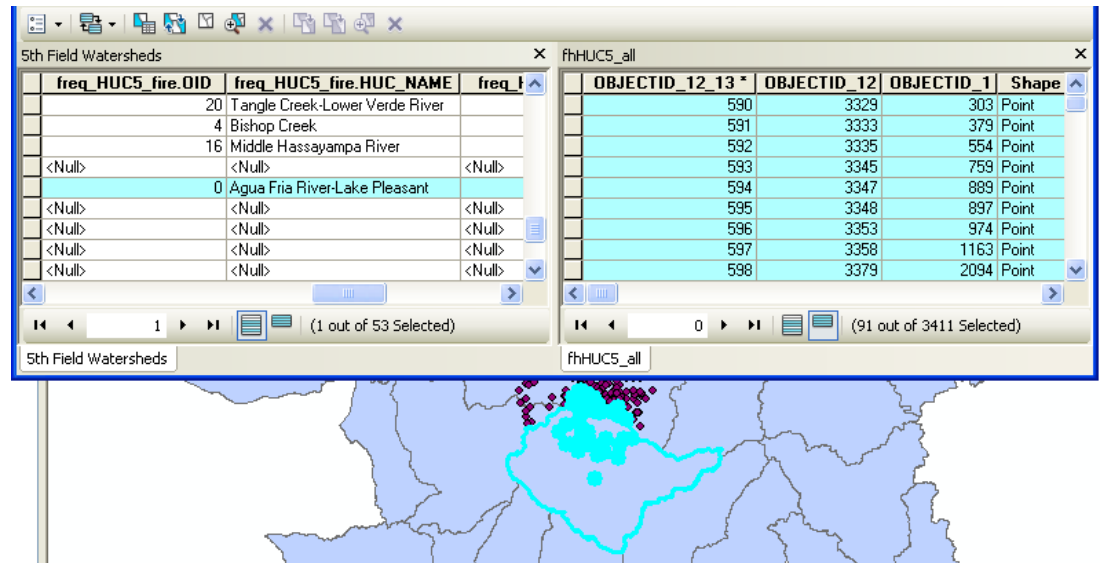
5th Field Watershed Number	5th Field Watershed Name	Count_	Shape_Length	Shape_Area
1506020304	Tangle Creek-Lower Verde River	2	146606.699596	718875039.929837
1503020102	Muddy Creek	3	139994.169933	483467098.186122
1506020205	Oak Creek	4	215624.039757	1204828374.42333
1506020206	Beaver Creek	4	184748.022157	1121340953.42074
1506020203	Heaven's Gate	6	225734.993096	1236291733.58792
1507010303	Middle Hassayampa River	6	209504.194698	905053841.627114
1507010204	Bishop Creek	19	148686.561825	612382948.468623
1503020202	Upper Burro Creek	28	107229.704826	443540909.664737
1506020106	Middle Big Chino Wash	41	197459.368913	777798236.998416
1503020203	Boulder Creek	45	129634.979427	387933160.650657
1506020202	Hell Canyon	67	149847.136943	614731476.614724
1503020302	Sycamore Creek	89	144469.15738	613627824.169991
1507010205	Agua Fria River-Lake Pleasant	91	182653.550629	963031870.148203
1503020301	Kirkland Creek	100	200422.991621	1049573066.0305
1506020302	Fossil Creek-Lower Verde River	104	180939.098113	774871420.275325

Relating tables

- Tables remain separate
- Selection in one table shows related records in associated table
- Example: Report fire history for selected watershed



freq_HUC5_fire.HUC_NAME	freq_HUC5_fire.Cnt_HUC_N.
Tangle Creek-Lower Verde River	
Bishop Creek	
Middle Hassayampa River	
<Null>	<Null>
Agua Fria River-Lake Pleasant	<Null>
<Null>	<Null>
<Null>	<Null>
<Null>	<Null>
<Null>	<Null>
<Null>	<Null>



freq_HUC5_fire.OID	freq_HUC5_fire.HUC_NAME	freq_HUC5_fire.Cnt_HUC_N.
20	Tangle Creek-Lower Verde River	
4	Bishop Creek	
16	Middle Hassayampa River	
<Null>	<Null>	<Null>
0	Agua Fria River-Lake Pleasant	<Null>
<Null>	<Null>	<Null>
<Null>	<Null>	<Null>
<Null>	<Null>	<Null>
<Null>	<Null>	<Null>
<Null>	<Null>	<Null>

OBJECTID_12_13 *	OBJECTID_12	OBJECTID_1	Shape
590	3329	303	Point
591	3333	379	Point
592	3335	554	Point
593	3345	759	Point
594	3347	889	Point
595	3348	897	Point
596	3353	974	Point
597	3358	1163	Point
598	3379	2094	Point

Properties of a Relate

- A Relate is bidirectional (no target/join tables)
- A Relate works with any cardinality
 - One-to-one, one-to-many, many-to-one, many-to-many
- A Relate requires the identification of key fields
 - Field type and field values must match
 - Different field names okay

OBJECTID	Shape	5th Field W	5th Field Watershed Name	Shape_Leng	Shape_Le
44	Polygon	1507010205	Agua Fria River-Lake Pleasant	182653.550629	182653.5
51	Polygon	1507010209	Agua Fria River below Lake Pleasant	244186.21207	244186.2
32	Polygon	1507010201	Ash Creek and Sycamore Creek	171309.054902	171309.0
9	Polygon	1506020103	Ash Fork Draw-Jumbo Tank	99503.748454	99503.7
1	Polygon	1506020101	Aubrey Valley	198389.246144	198389.2
22	Polygon	1506020206	Beaver Creek	184748.022157	184748.0
29	Polygon	1507010202	Big Bug Creek-Agua Fria River	172018.321421	172018.3
41	Polygon	1507010204	Bishop Creek	148686.561825	148686.5
38	Polygon	1507010203	Black Canyon Creek	142028.970597	142028.9
25	Polygon	1503020203	Boulder Creek	129634.979427	129634.9
52	Polygon	1506020307	Camp Creek-Lower Verde River	157283.061707	157283.0
47	Polygon	1507010206	Cave Creek-Arizona Canal Diversion Ch	228089.123691	228089.1

OID	HUC_NAME	Cnt_HUC_NA	First_FIRE	Last_FIRE
0	Agua Fria River-Lake Pleasant	91	1970	2004
1	Ash Creek and Sycamore Creek	277	1970	2005
2	Beaver Creek	4	1972	1983
3	Big Bug Creek-Agua Fria River	320	1970	2005
4	Bishop Creek	19	1972	1994
5	Black Canyon Creek	448	1970	2005
6	Boulder Creek	45	1971	2005
7	Cherry Creek-Upper Verde River	256	1970	2005
8	Fossil Creek-Lower Verde River	104	1970	2005
9	Granite Creek-Upper Verde River	449	1970	2005
10	Grindstone Wash-Upper Verde River	136	1970	2005

Relating tables

1. Identify key fields
2. In TOC, right click layer or table
→ Relate
3. Specify key fields and related table
4. Enter name for Relate

Relate saved in the ArcMap document only !

Relate

Relate lets you associate data with this layer. The associated data isn't appended into this layer's attribute table like it is in a Join. Instead you can access the related data when you work with this layer's attributes or vice-versa.

Establishing a relate is particularly useful if there is a 1-to-many or many-to-many association between the layer and the related data.

1. Choose the field in this layer that the relate will be based on:
HUC_NAME **Key field**

2. Choose the table or layer to relate to this layer, or load from disk:
FireHUC **Related table**

3. Choose the field in the related table or layer to base the relate on:
HUC_NAME **Key field**

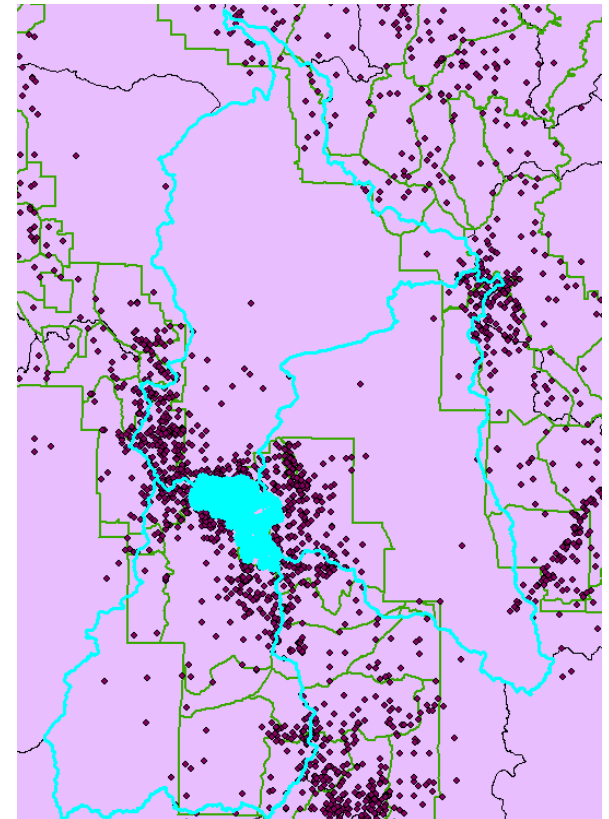
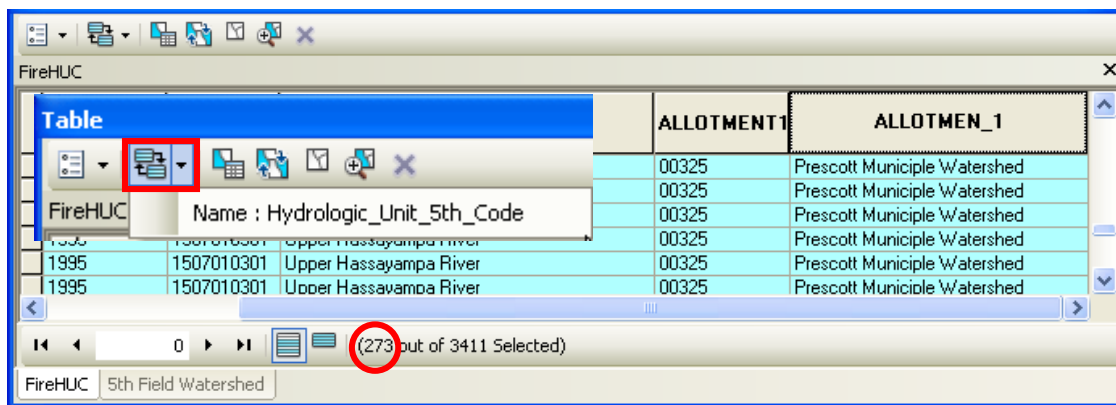
4. Choose a name for the relate:
Name **Relationship name**

[About relating data](#) **OK** **Cancel**

Applying the Relate

Example: Show HUC's for all fires in Prescott Municipal Watershed Allotment

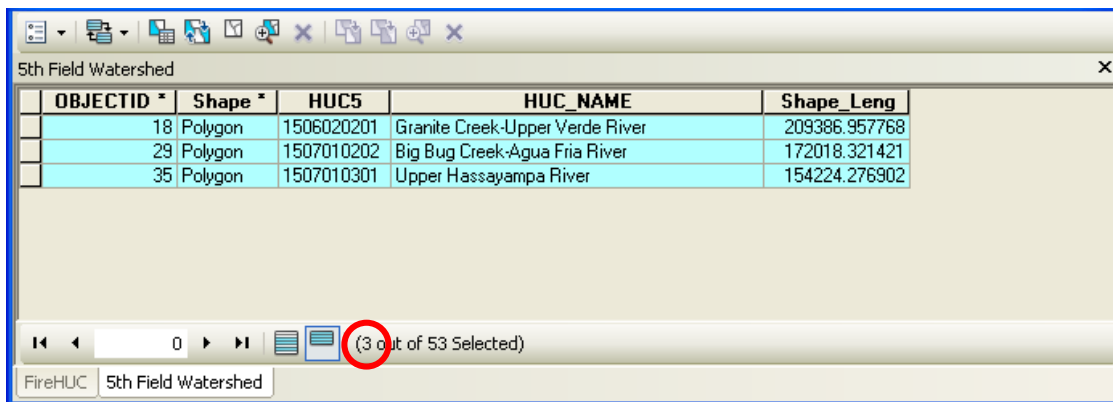
1. Query records where Allotmen_1 = Prescott Municiple Watershed
2. Related Tables → Name : Hydrologic_Unit_5th_Code



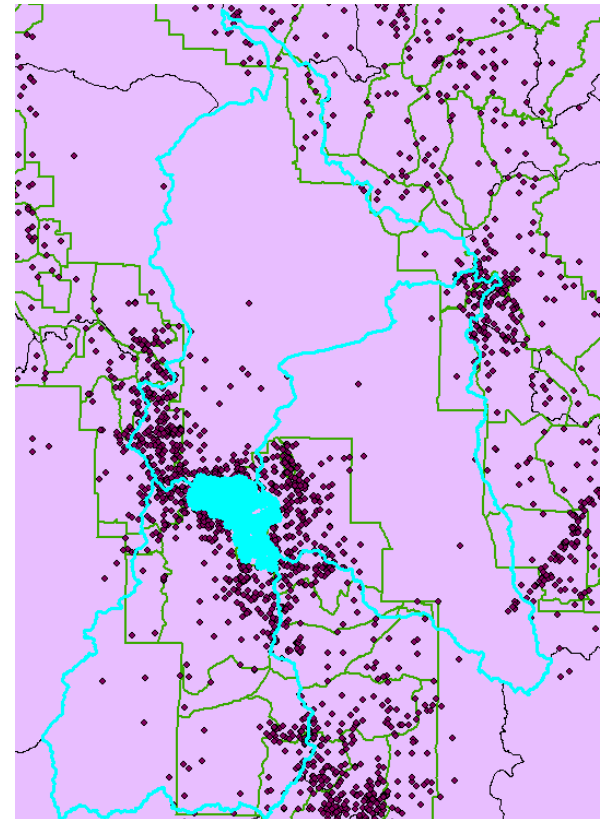
Applying the Relate

Example: Show HUC's for all fires in Prescott Municipal Watershed Allotment

1. Query records where Allotmen_1 = Prescott Municiple Watershed
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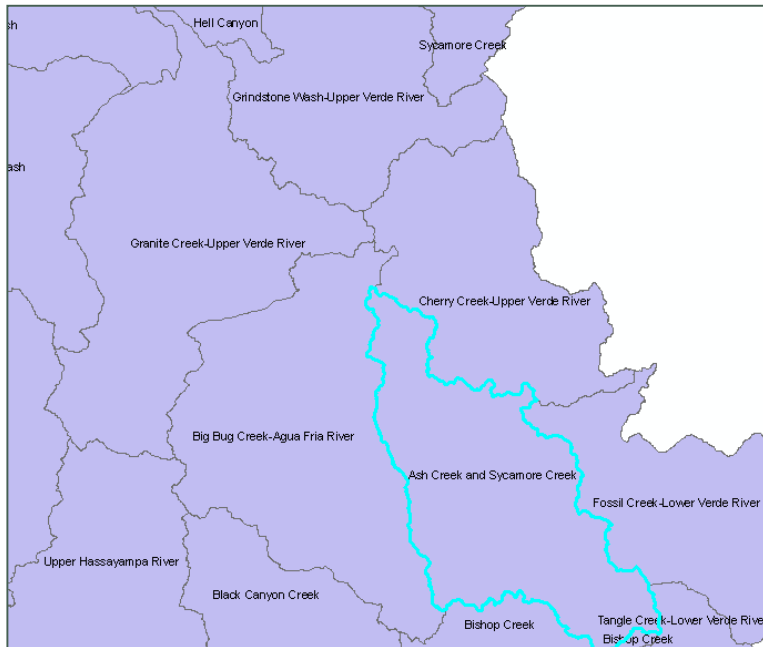
OBJECTID *	Shape *	HUC5	HUC_NAME	Shape_Leng
18	Polygon	1506020201	Granite Creek-Upper Verde River	209386.957768
29	Polygon	1507010202	Big Bug Creek-Agua Fria River	172018.321421
35	Polygon	1507010301	Upper Hassayampa River	154224.276902



Benefits of a Relate

- Can incorporate data stored in separate tables
- Can summarize statistics for related data
- Can export related features to a report, chart, or new table

Selected watershed



**Click Options to export
or graph table**

Fires related to selected watershed

Table

FireHUC

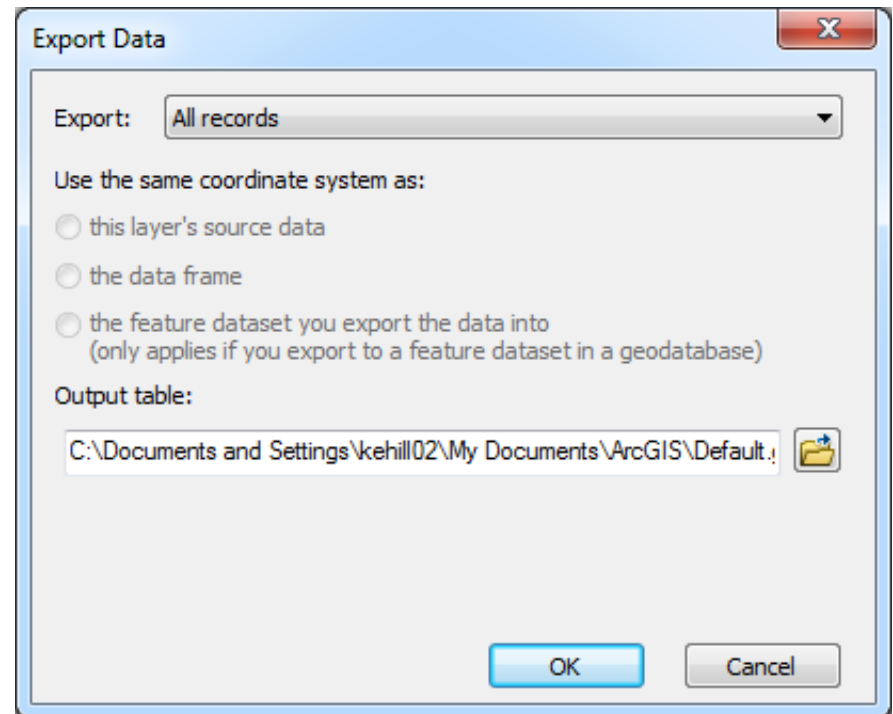
Fire Name	Fire Year	HUC5	HUC_NAME	ALLOTMENT 1	ALLOTMEN_1
WEBSTER	1993	1507010203	Black Canyon Creek	00316	Blue Bell
SNAKE	1983	1507010203	Black Canyon Creek	00316	Blue Bell
ESE	1994	1507010203	Black Canyon Creek	00316	Blue Bell
DESOTO	1989	1507010203	Black Canyon Creek	00316	Blue Bell
DESOTO	1977	1507010203	Black Canyon Creek	00316	Blue Bell
DESOTO	1976	1507010203	Black Canyon Creek	00316	Blue Bell
DE SOTO	1984	1507010203	Black Canyon Creek	00316	Blue Bell
CORNER	1995	1507010202	Big Bug Creek-Agua Fria River	00316	Blue Bell
BOULDER	1983	1507010203	Black Canyon Creek	00316	Blue Bell
BELL	2004	1507010203	Black Canyon Creek	00316	Blue Bell
	1974	1507010203	Black Canyon Creek	00316	Blue Bell

1 (13 out of 3411 Selected)

FireHUC

Exporting tables

- Table's Options button → Export
- All or selected records
- Output formats
 - dBase (dbf)
 - Text (txt)
 - Info
 - Geodatabase
 - MDB, GDB, RDBMS



Demonstration

