



United States Department of Agriculture

Tables in ArcGIS Pro



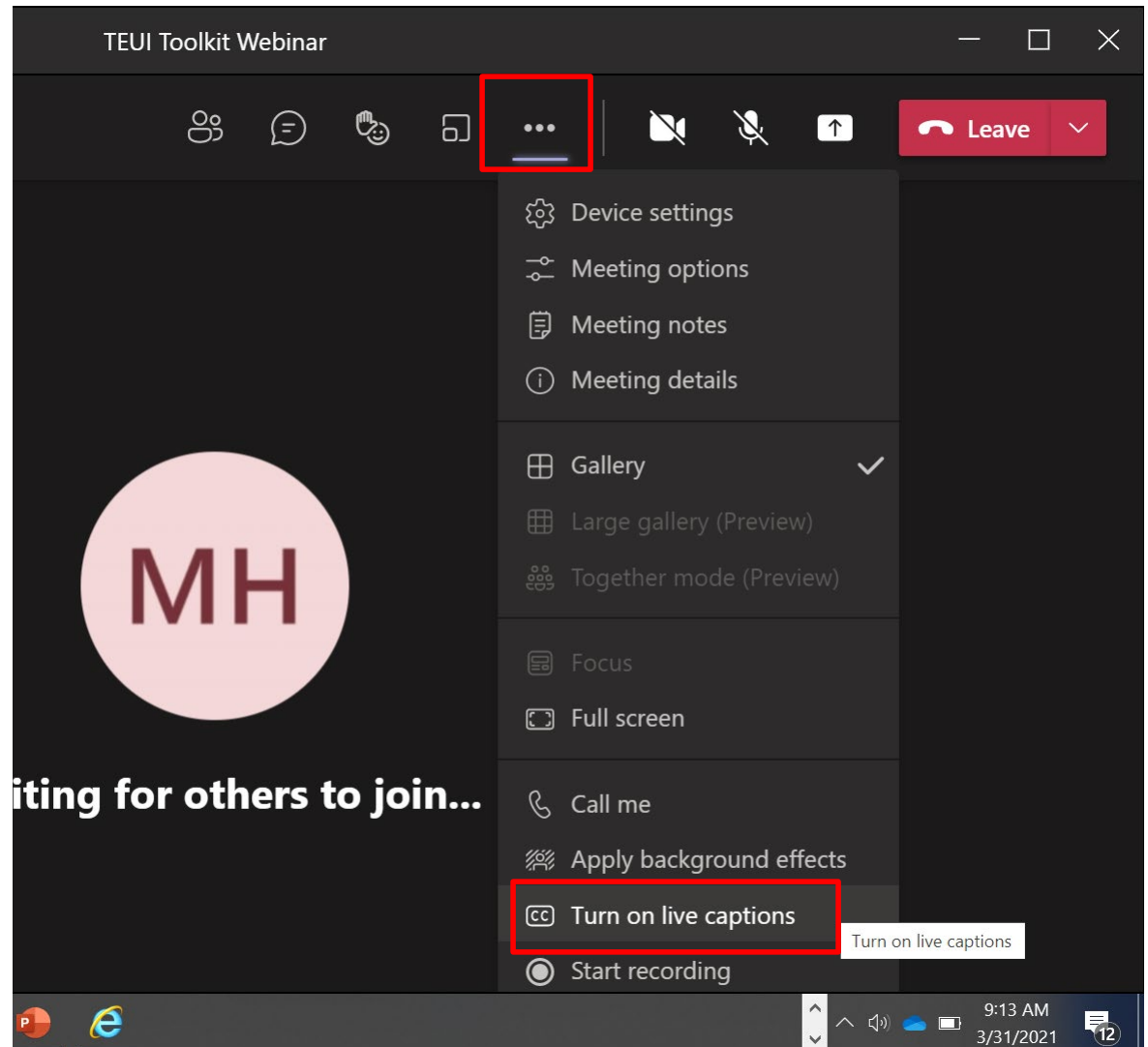
Geospatial Technology
and Applications Center



Forest Service

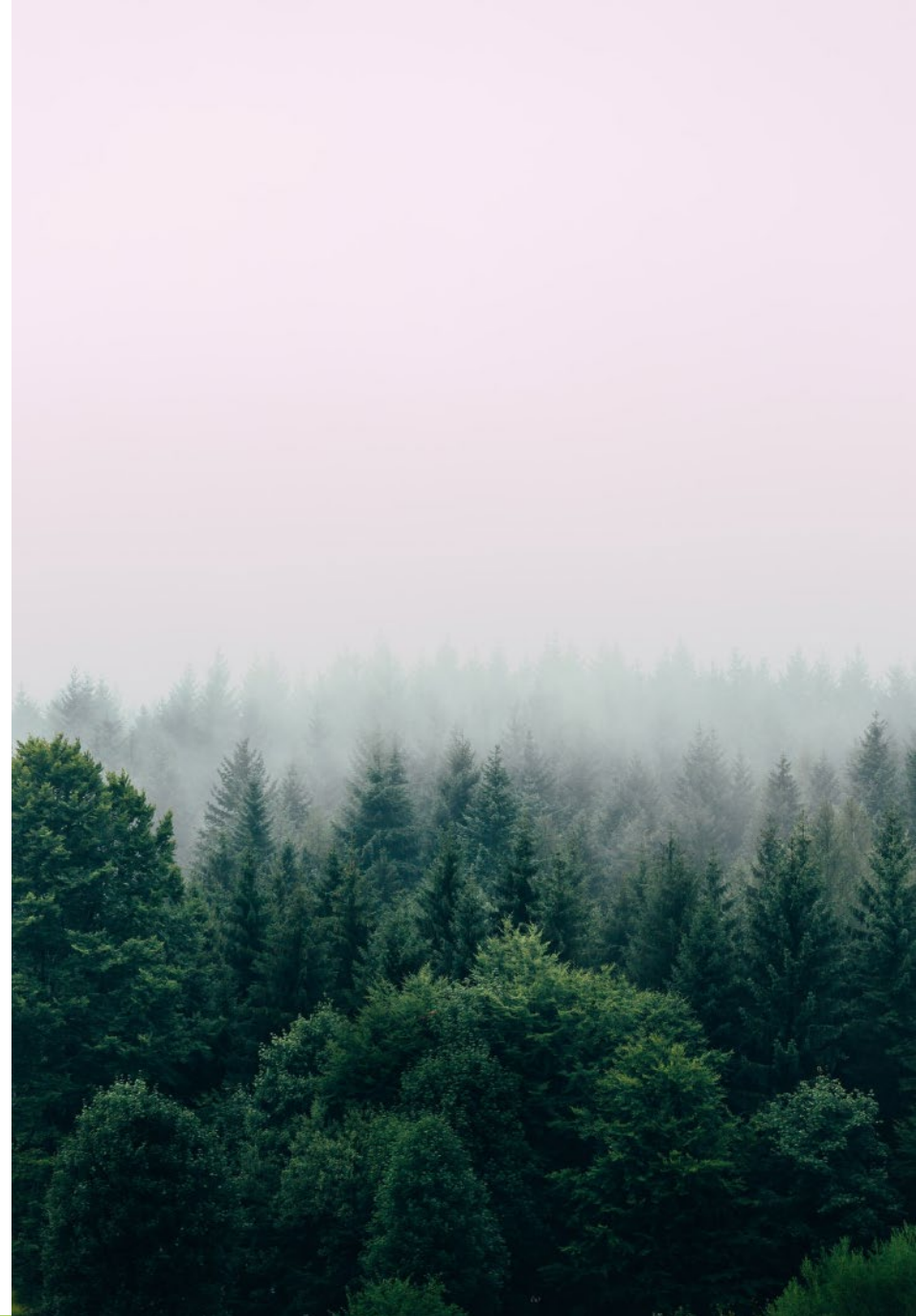
Housekeeping

- Question or comment?
 - Type it in chat
- Closed Captioning available in the More Options menu



Course Outline

- **Lesson 1- Working with Tables**
 - Exercise
- **Noon: Lesson 2: Querying Tables**
 - Exercise
- **1:30 pm: Lesson 3- Joining and Relating Tables**
 - Exercise












Lesson overview

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

Tables you can open in ArcGIS Pro

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

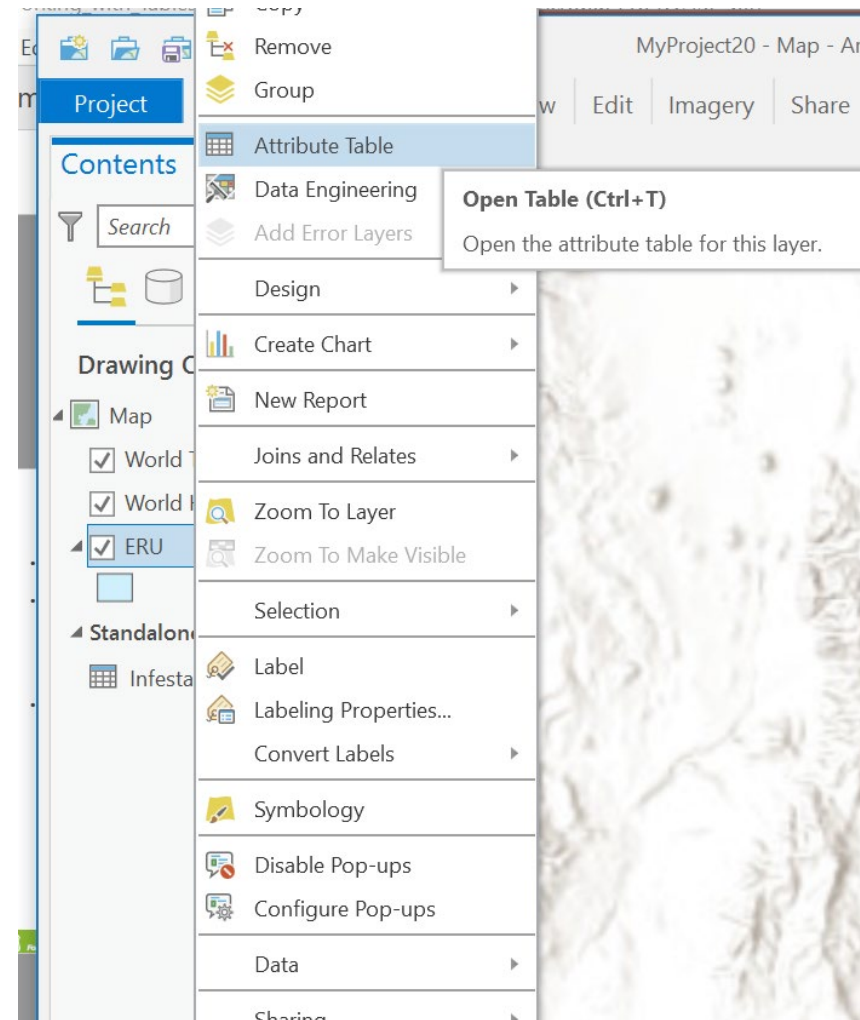


Table structure

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

The screenshot shows a GIS application window with a table of ecological data. The table has six columns: OBJECTID *, Shape *, FID_ECOLOGICAL_RESPONSE_UNIT, r3ERU, r3ERUcode, and r3ERUsubcl. The first two rows are highlighted in light blue, indicating they are selected. A red rectangle highlights the first two rows and the first three columns. A yellow box labeled 'Selected records' points to the first two rows. A yellow box labeled 'Cell values' points to the first three columns of the first two rows. A yellow box labeled 'Fields' points to the first column header. A yellow box labeled 'Records' points to the first row. A yellow box labeled 'Selected records out of total' points to the status bar text '2 of 9,560 selected'.

	OBJECTID *	Shape *	FID_ECOLOGICAL_RESPONSE_UNIT	r3ERU	r3ERUcode	r3ERUsubcl
1	2	Polygon	420176	Montane / Subalpine...	MSG	
2	7	Polygon	415845	Mixed Conifer - Frequ...	MCD	
3		Polygon	502081	Port...	PPF	Ponderosa Pine / Ga...
4	87	Polygon	368850	He...	190	Herbaceous Wetland
5	102	Polygon	416561	Mixed Conifer - Frequ...	MCD	n/a

Fields

Selection:

Selected records

Records

Cell values

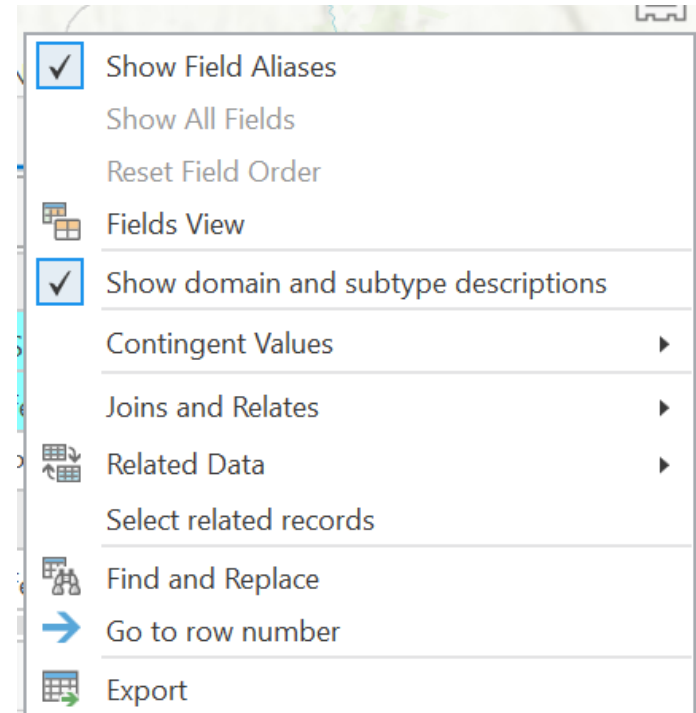
Selected records out of total

2 of 9,560 selected

100%

Table functions

- Add field
- Calculate Field
- Select by Attributes
- Zoom to Selection
- Switch Selection
- Clear Selection
- Delete Selection
- Copy Selection



A screenshot of the ERU table interface. The table has 7 columns: OBJECTID *, Shape *, FID_ECOLOGICAL_RESPONSE_UNIT, r3ERU, r3ERUcode, and r3ERUsubcl. The first four rows of data are highlighted in light blue. A red box highlights the toolbar at the top of the table, which contains icons for 'Field' and 'Selection'. A red arrow points from the 'Table' menu in the previous image to the menu icon (three horizontal lines) in the top right corner of the table interface.

	OBJECTID *	Shape *	FID_ECOLOGICAL_RESPONSE_UNIT	r3ERU	r3ERUcode	r3ERUsubcl
1	2	Polygon	429176	Montane / Subalpine...	MSG	n/a
2	7	Polygon	415845	Mixed Conifer - Frequ...	MCD	n/a
3	16	Polygon	502081	Ponderosa Pine Forest	PPF	Ponderosa Pine / Ga
4	87	Polygon	368850	Herbaceous (wetland)	190	Herbaceous Wetland

Table functions

ERU X

Field: Selection:

	OBJECTID *	Shape *	FID_ECOLOGICAL_RESPONSE_UNIT	r3ERU	r3ERUcode	r3ERUsubcl
1	2	Polygon	429176	Montane / Subalpine...	MSG	n/a
2	7	Polygon	415845	Mixed Conifer - Frequ...	MCD	n/a
3	16	Polygon	502081	Ponderosa Pine Forest	PPF	Ponderosa Pine / Gar
4	87	Polygon	368850	Herbaceous (wetland)	190	Herbaceous Wetland
5	102	Polygon	416561	Mixed Conifer - Frequer	MCD	n/a

2 of 9,560 selected

Filters: Extent filtering 99%




Show all records
Show selected records

Extent filtering


Adjust zoom

Add a field

- Set field parameters:
 - Name, Alias
 - Data Type
 - Format (e.g. number of decimal places)
 - Domain
 - Length: maximum field length for text values

 Invasive_PL  *Fields: Invasive_PL 

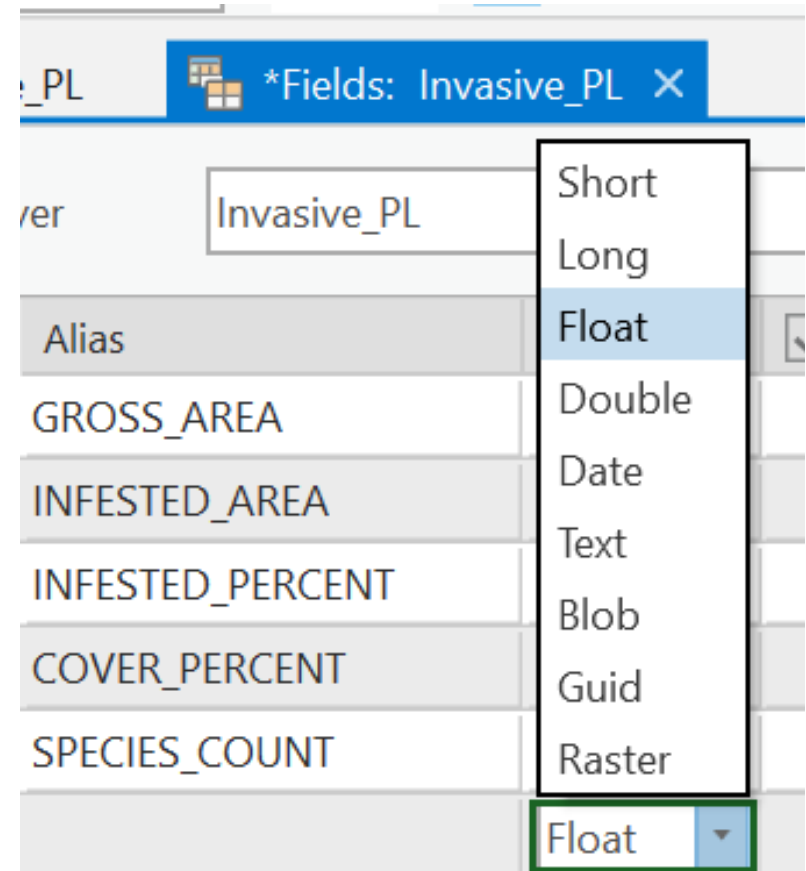
Current Layer:

	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format
	SHAPE	SHAPE	Geometry	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	ERU	ERU	Long	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric
	District	District Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	SHAPE_Length	SHAPE_Length	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric
	SHAPE_Area	SHAPE_Area	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric
	<input type="text"/>		Float	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Percentage 

[Click here to add a new field.](#)

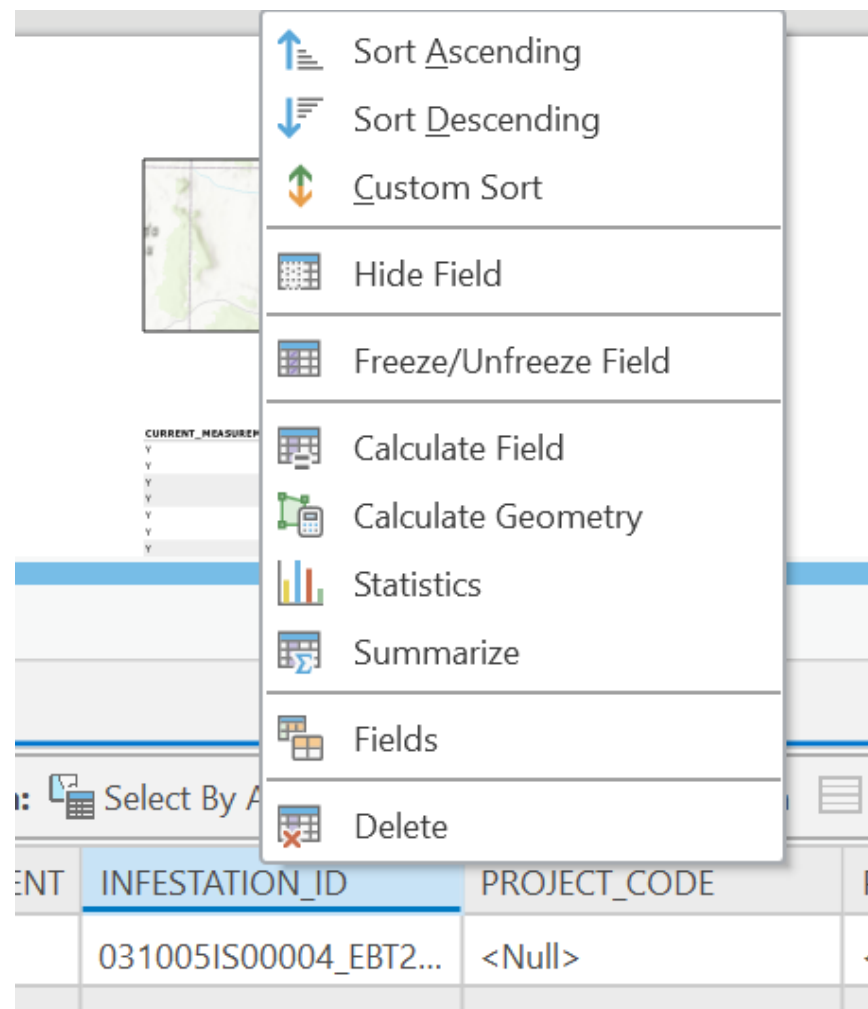
Data Types

- 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](#)



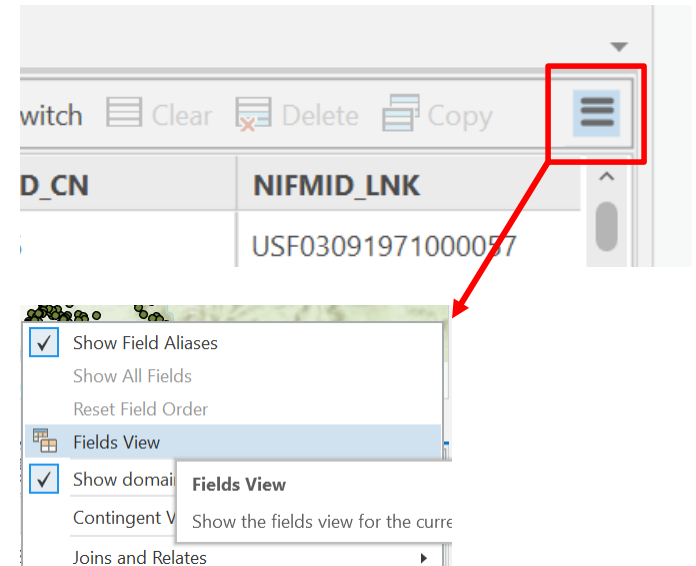
Field options

- Right-click field name for Context menu
- Field options
 - Sort
 - Hide Field
 - Freeze/Unfreeze Field
 - Calculate Field
 - Calculate Geometry
 - Statistics
 - Summarize
 - Fields (Properties)
 - Delete



Field properties

- Click Fields button on Data contextual tab or Fields View in table menu
- Property settings
 - Alias name
 - Field visibility
 - Number Format (numeric fields)
 - Length (text fields)
- Saved to MXD



FireHistHUC5		Fields: FireHistHUC5							
Current Layer		FireHistHUC5							
	<input checked="" type="checkbox"/> Visible	<input type="checkbox"/> Read Only	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format	
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID_12_13	OBJECTID_12_13	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric	
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Shape	Shape	Geometry	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	OBJECTID_12	OBJECTID_12	Long	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	

Summarize command

- Report number of times a field's value repeats

Calculate Geometry

Statistics

Summarize

Fields

Delete

Summary Table

Create a summary of the current field. If currently selected, rows will be calculated.

OBJECTID_2	HUC5	HUC_NAME
15	1507010201	Ash Creek and Sycam...
15	1507010201	Ash Creek and Sycam...
15	1507010201	Ash Creek and Sycam...
15	1507010201	Ash Creek and Sycam...

freq_HUC5_fire			
Field:		Selection:	
	OBJECTID *	HUC_NAME *	Cnt_HUC_NA
1	1	Ash Creek and Sycam...	13
2	2	Big Bug Creek-Agua...	3
3	3	Black Canyon Creek	4
4	4	Boulder Creek	2
5	5	Cherry Creek-Upper V...	7
6	6	Fossil Creek-Lower Ve...	6
7	7	Granite Creek-Upper...	10

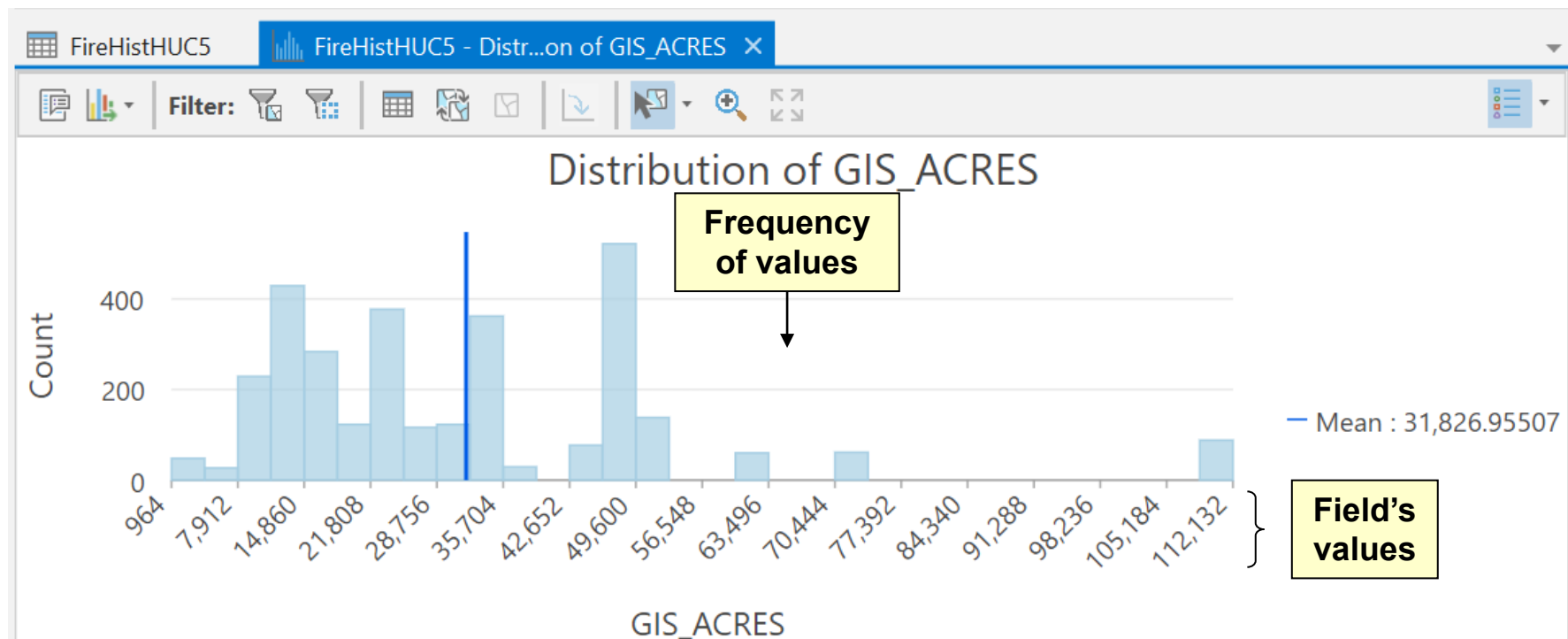
Summary Output

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

FireHistHUC5							
FireHistHUC5_Statistics4							
Field: Selection: Rows:							
	OBJECTID_12_13 *	ALLOTMEN_1	Num_Fires	MEAN_ACRES	MIN_ACRES	MAX_ACRES	SUM_ACRES
9	37	Long Gulch	4	12211.200195	12211.200195	12211.200195	48844.800781
10	48	Stephens	4	3409.350098	3409.350098	3409.350098	13637.400391
11	59	Walnut Grove	4	8369.070313	8369.070313	8369.070313	33476.28125
12	28	Horner Mountain	5	18159.400391	18159.400391	18159.400391	90797.001953
13	43	Quartz Wash	5	7004.259766	7004.259766	7004.259766	35021.298828
14	53	Toohey	5	9832.959961	9832.959961	9832.959961	49164.799805
15	65	Yolo South	5	3457.679932	3457.679932	3457.679932	17288.399658
16	26	Hassavampa	7	10574	10574	10574	74018

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

Calculate Field command

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

Calculate Field

This tool modifies the Input Table

Input Table
FireHistHUC5

Field Name (Existing or New)
Hectares

Expression Type
Python 3

Expression

Fields	Helpers
ACCURACY	.as_integer_ratio()
REV_DATE	.capitalize()
SOURCE	.center()
ADM_UNIT_N	.conjugate()
Shape_Leng	.count()
GIS_ACRES	.decode()
Hectares	.denominator()

Insert Values

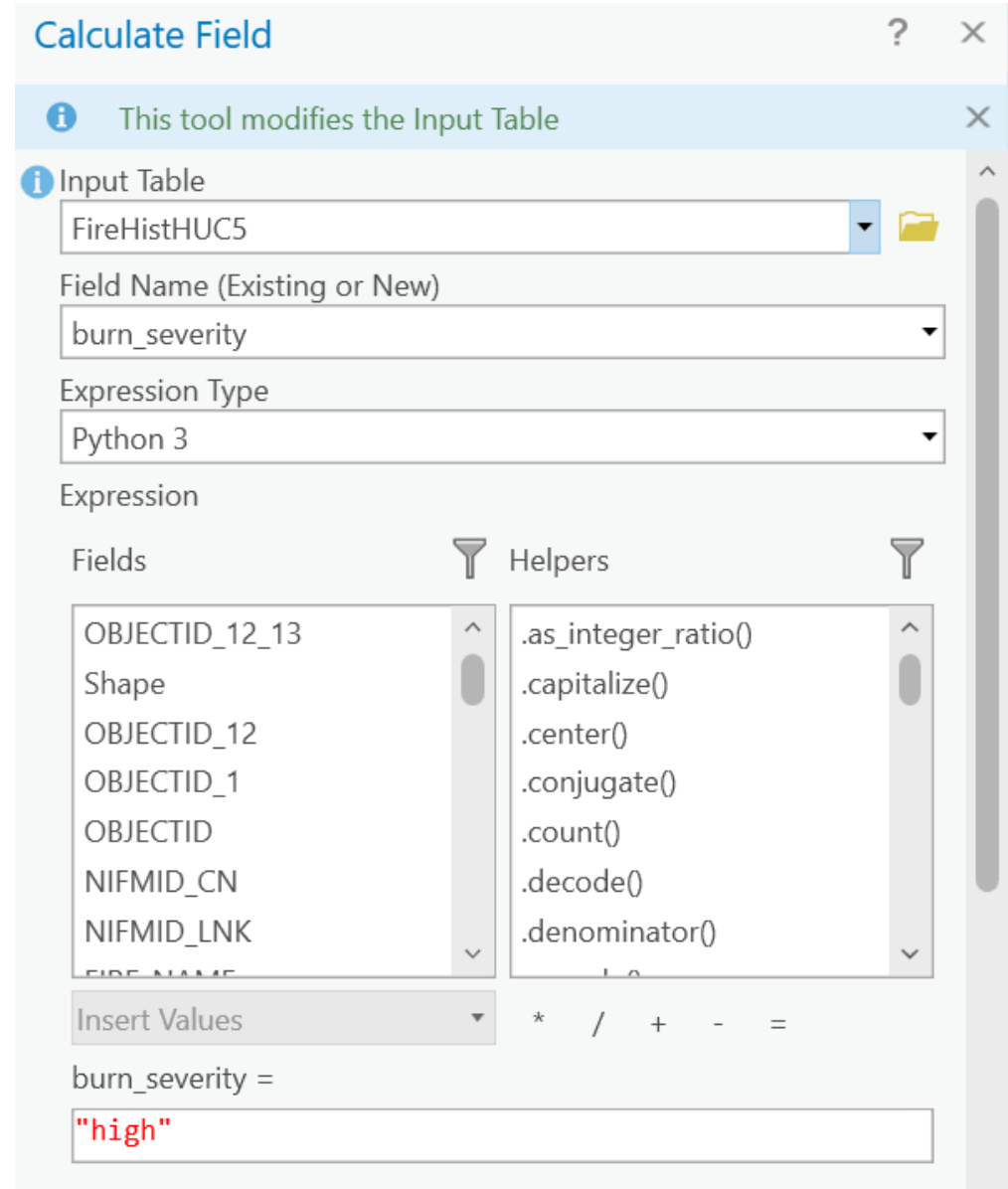
Field =
!GIS_ACRES! * 0.4047

Code Block

Expression Box

Calculate Field command (text)

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



Calculate Field

This tool modifies the Input Table

Input Table
FireHistHUC5

Field Name (Existing or New)
burn_severity

Expression Type
Python 3

Expression

Fields	Helpers
OBJECTID_12_13	.as_integer_ratio()
Shape	.capitalize()
OBJECTID_12	.center()
OBJECTID_1	.conjugate()
OBJECTID	.count()
NIFMID_CN	.decode()
NIFMID_LNK	.denominator()
FIRE_NAME	

Insert Values

burn_severity =

"high"

Calculate Geometry

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

Calculate Geometry

This tool modifies the Input Features

Input Features
FireHistHUC5

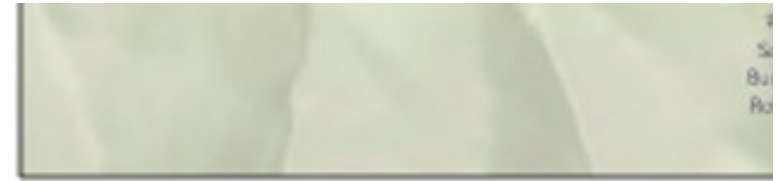
Geometry Attributes
Field (Existing or New) ▼

Field	Property
XCoord	Point x-coordinate
YCoord	Point y-coordinate

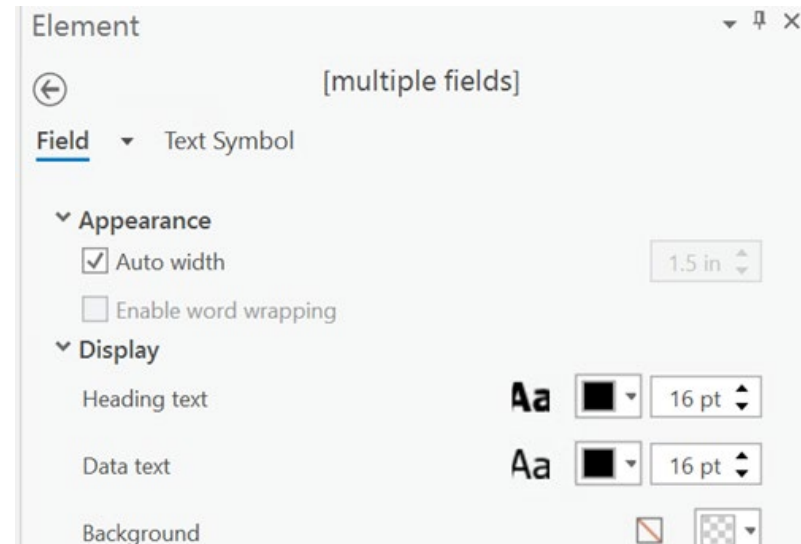
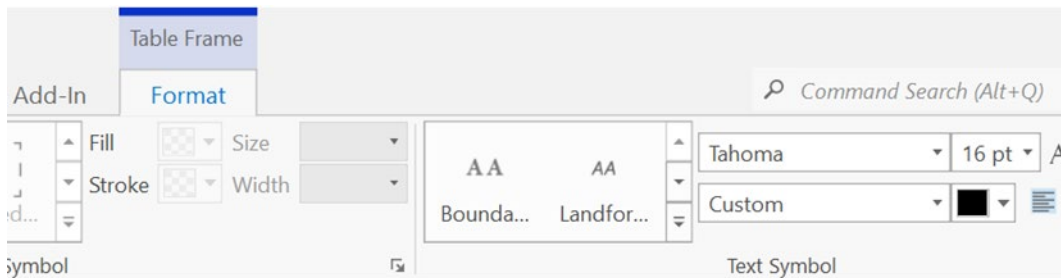
ADM_UNIT_N	Shape_Leng	GIS_ACRES	XCoord	YCoord
20405			<Null>	<Null>
20405			<Null>	<Null>
20405			<Null>	<Null>
20405			<Null>	<Null>
20405			<Null>	<Null>
20405			<Null>	<Null>
20405			<Null>	<Null>

Table appearance

- Must add table to layout to adjust its appearance
 - Font, size, and color
 - Background
 - Border
 - Cell height
 - Many other options

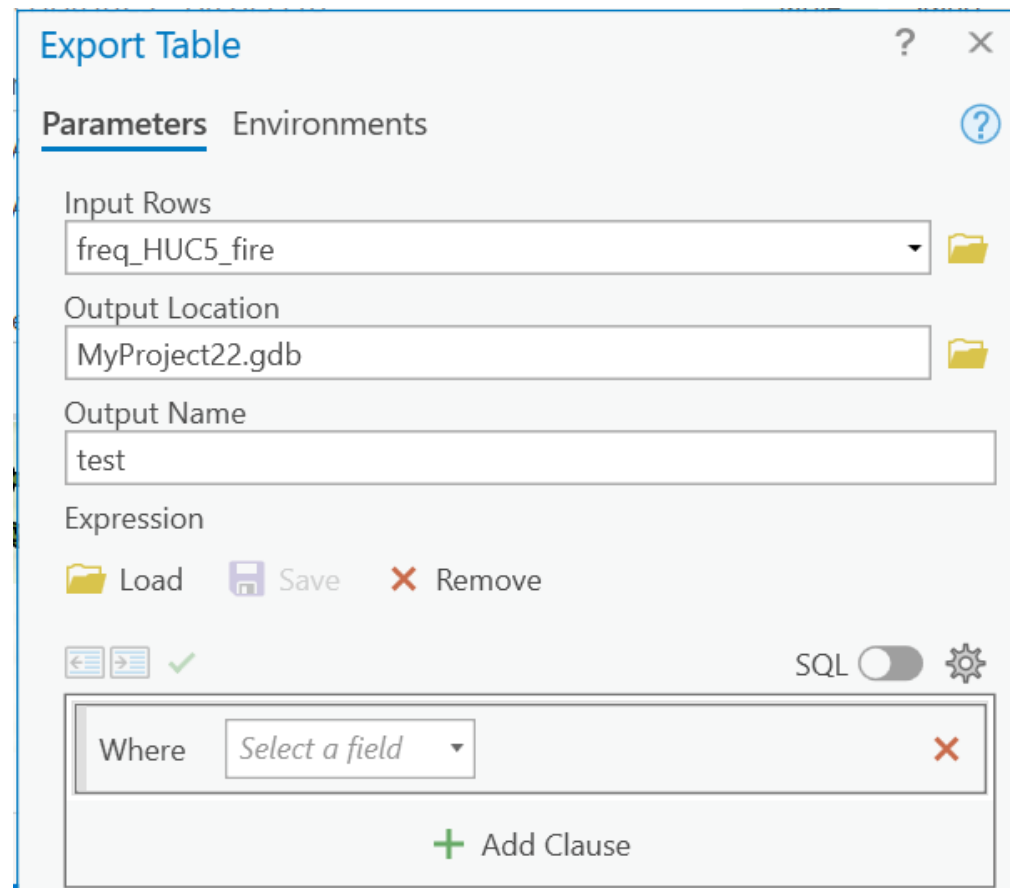


FID	Leaf Retention	Canopy Cover	Size Class
9093	Deciduous	3) 50-75%	3) 5-12 metr
9094	Deciduous	4) 75-100%	3) 5-12 metr
9096	Deciduous	4) 75-100%	3) 5-12 metr
14326	Mixed Evergreen-Deciduous	3) 50-75%	3) 5-12 metr
14327	Mixed Evergreen-Deciduous	3) 50-75%	3) 5-12 metr



Exporting tables

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



The screenshot shows the 'Export Table' dialog box with the following fields and options:

- Parameters** (selected tab) and **Environments** tab.
- Input Rows**: A dropdown menu showing 'freq_HUC5_fire'.
- Output Location**: A text field showing 'MyProject22.gdb'.
- Output Name**: A text field showing 'test'.
- Expression**: A section with 'Load', 'Save', and 'Remove' buttons.
- SQL**: A toggle switch is turned off.
- Where**: A dropdown menu showing 'Select a field'.
- Add Clause**: A green plus button.

Importing tables

- ArcGIS Pro
 - Add Data
- Catalog View
 - Table tab

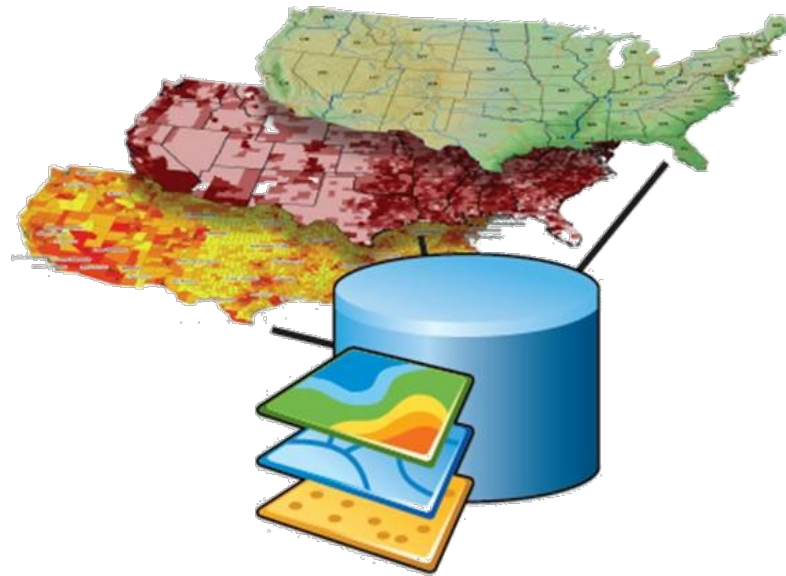
The screenshot shows the ArcGIS Pro interface with the Catalog View open. The 'Table' tab is selected and highlighted with a red box. The table 'freq_HUC5_fire' is selected in the left pane. The right pane displays the table's metadata, including a list of records with columns: OBJECTID *, HUC_NAME *, and Cnt_HUC_NA.

	OBJECTID *	HUC_NAME *	Cnt_HUC_NA
1	1	Ash Creek and Sycam...	13
2	2	Big Bug Creek-Agua...	3
3	3	Black Canyon Creek	4
4	4	Boulder Creek	2
5	5	Cherry Creek-Upper V...	7

4 Items 1 Item Selected



Demonstration





United States Department of Agriculture

Querying Tables



**Geospatial Technology
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Forest Service

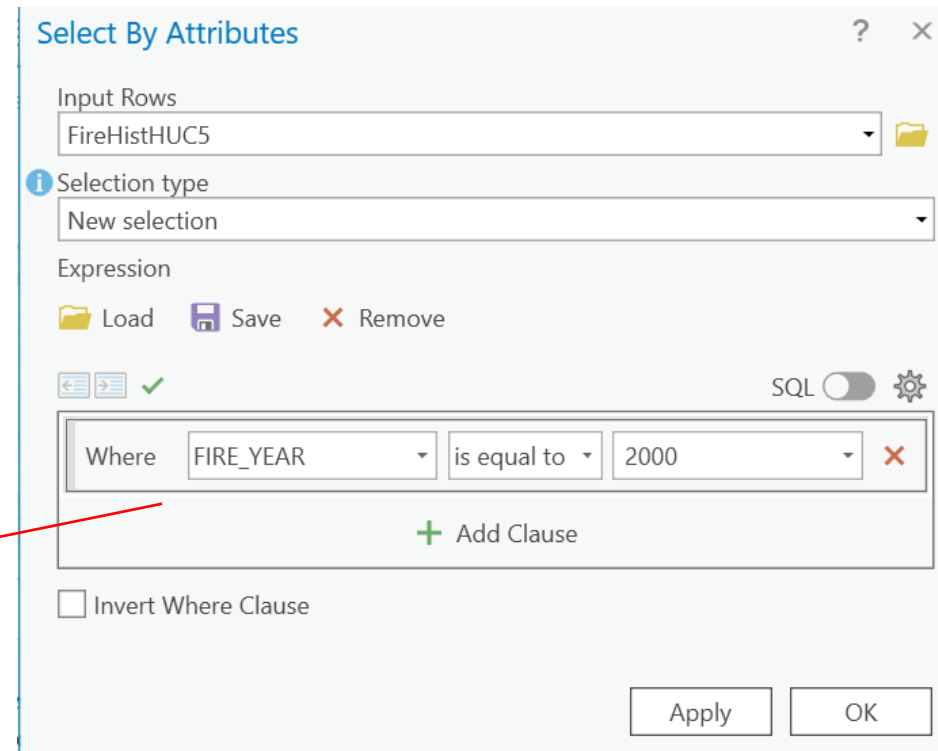
Lesson Overview

- 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



Select By Attributes

Input Rows
FireHistHUC5

Selection type
New selection

Expression
Load Save Remove

SQL ☐

Where FIRE_YEAR is equal to 2000

+ Add Clause

☐ Invert Where Clause

Apply OK



✓ SQL ☒

FIRE_YEAR = '2000'

Searching Values & Building Expressions

“Field”

Operator

Select By Attributes

Input Rows
FireHistHUC5

Selection type
New selection

Expression
Load Save Remove

SQL ☐

Where FIRE_YEAR is equal to 2000

☐ Invert Where Clause

is equal to
is not equal to
begins with
does not begin with
ends with
does not end with
includes the value(s)
does not include the value(s)
contains the text
does not contain the text
is null
is not null
is less than
is greater than
is less than or equal to
is greater than or equal to

YEAR	DATA_SOURC	DATA_SOU_1
	OTHER	NIFMID
	OTHER	NIFMID
	OTHER	NIFMID

CAUSE	RE
1	
1	
1	

“Value”

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

Where ALLOTMEN_1 is equal to Brown Springs

And FIRE_YEAR is less than 2000

Or

+ Add Clause



Queries - Searching Strings

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

- Strings must always be enclosed within single quotes (ArcPro does this automatically)

For example STATE_NAME = 'California'

- **Strings are case-sensitive!**



Queries - Searching multiple Strings

- To search for several strings or values in a field, use the **includes the values(s)** operator.
 - For example - Search for 4 allotment names in a shared GDB:

The screenshot shows a GIS query builder interface. At the top, there is a 'Where' clause dropdown set to 'ALLOTMEN_1' and an operator dropdown set to 'includes the value(s)'. Below these is a green '+ Add Clause' button. To the left of the main query area is a checkbox labeled 'Invert Where Clause'. On the right, a list of values is displayed, including 'Brown Springs', 'Burnt Ranch', 'Camp Wood', 'Brady', 'Bottle', 'China Dam', 'Cienega', 'Cold Springs', and 'Contreras'. The first four are checked. A red arrow points from the 'includes the value(s)' operator to the SQL query box at the bottom. The SQL query box contains the text: `ALLOTMEN_1 IN ('Brown Springs', 'Burnt Ranch', 'Camp Wood', 'Brady')`. A green checkmark is visible to the left of the SQL query box.

Where: ALLOTMEN_1 includes the value(s)

+ Add Clause

☐ Invert Where Clause

ngs,Burnt Ranch,Camp Wood,Brady

- ☐ Bottle
- ☒ Brady
- ☒ Brown Springs
- ☒ Burnt Ranch
- ☒ Camp Wood
- ☐ China Dam
- ☐ Cienega
- ☐ Cold Springs
- ☐ Contreras

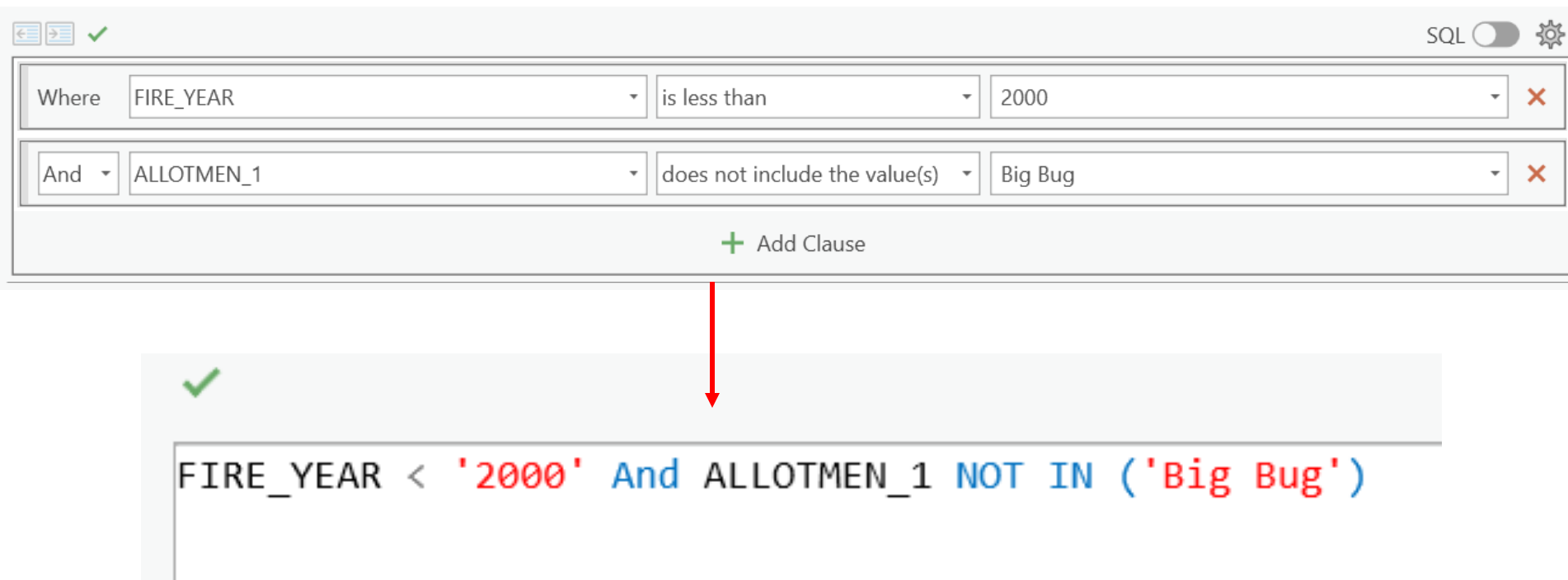
✓

ALLOTMEN_1 IN ('Brown Springs', 'Burnt Ranch', 'Camp Wood', 'Brady')

Queries - Searching Strings

Combining expressions

- NOT expressions can be combined with AND and OR to find features or records that don't match the specified expression.



The screenshot shows a query builder interface with two clauses defined:

- Where FIRE_YEAR is less than 2000
- And ALLOTMEN_1 does not include the value(s) Big Bug

A red arrow points from the "+ Add Clause" button to the resulting SQL query:

```
FIRE_YEAR < '2000' And ALLOTMEN_1 NOT IN ('Big Bug')
```



Queries - Searching Strings

Wild cards - match any single character within the specified range or set.

Use the **contains the text** operator (LIKE in SQL syntax)

The image shows a query builder interface. At the top, there are navigation icons (left arrow, right arrow, and a green checkmark) and a toggle for 'SQL' (currently off) with a settings gear icon. Below this is a clause editor. It contains a 'Where' label, a dropdown menu with 'ALLOTMEN_1', an operator dropdown with 'contains the text', and another dropdown with 'Wal'. A red 'X' icon is to the right of the 'Wal' dropdown. Below the clause editor is a green '+ Add Clause' button.

```
ALLOTMEN_1 LIKE '%Wal%'
```

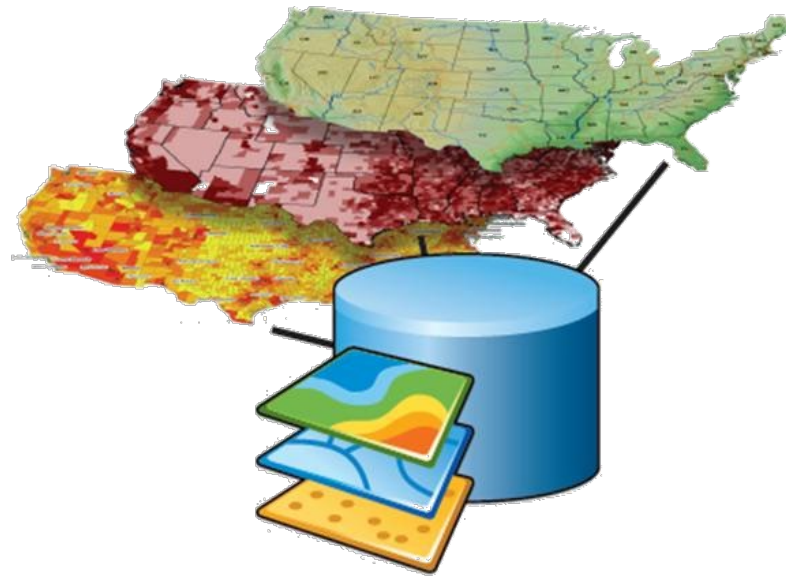


Queries - Searching Strings

- The NULL keyword selects records that have null values.
- The NULL keyword is always preceded by IS or IS NOT.

The screenshot shows a query builder interface. At the top left, there are two icons for navigating between clauses (left and right arrows) and a green checkmark. Below these is a horizontal bar with a 'Where' label. To the right of 'Where' is a dropdown menu containing 'ALLOTMEN_1'. To the right of that dropdown is another dropdown menu containing 'is null'. Below this bar is a green plus icon followed by the text 'Add Clause'. At the bottom of the interface, there is a preview area with a green checkmark and the SQL query 'ALLOTMEN_1 IS NULL'.

Demonstration





United States Department of Agriculture

Joining and Relating Tables



Geospatial Technology
and Applications Center



Forest Service



Overview

- 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

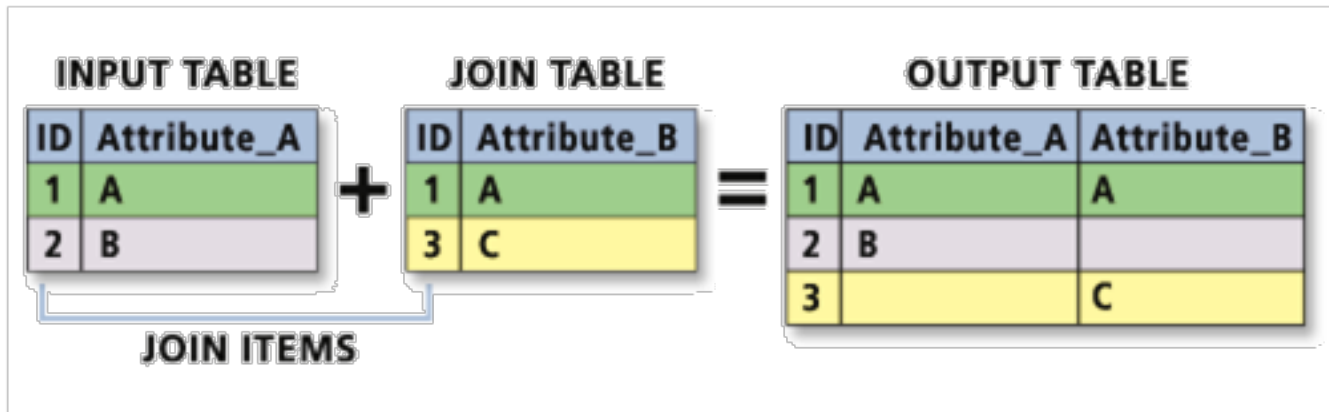


Table Join

- 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*)

5th Field Watersheds					
freq_HUC5_fire					
Field:	Selection:				
TID *	Shape *	5th Field Watershed Number	5th Field Watershed Name	Shape_Ler	
1	Polygon	1506020101	Aubrey Valley	198389.24	
2	Polygon	1506020102	Upper Big Chino Wash	156192.66	
3	Polygon	1506020104	Upper Partridge Creek	164646.05	
4	Polygon	1503020101	Markham Wash Area	118378.64	
5	Polygon	1503020103	Willow Creek	108286.40	
6	Polygon	1506020105	Lower Partridge Creek	150561.51	
7	Polvaon	1506020203	Heaven's Gate	225734.99	

5th Field Watersheds					
freq_HUC5_fire					
Field:	Selection:				
OBJECTID *	HUC_NAME	Cnt_HUC_NA	First_FIRE	Last_FIRE	
1	Agua Fria River-Lake...	91	1970	2004	
2	Ash Creek and Sycam...	277	1970	2005	
3	Beaver Creek	4	1972	1983	
4	Big Bug Creek-Agua...	320	1970	2005	
5	Bishop Creek	19	1972	1994	
6	Black Canyon Creek	448	1970	2005	
7	Boulder Creek	45	1971	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

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

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
- Each record in the destination table may have several matches in the join table

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

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
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

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
Oak Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

Target table

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-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

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
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

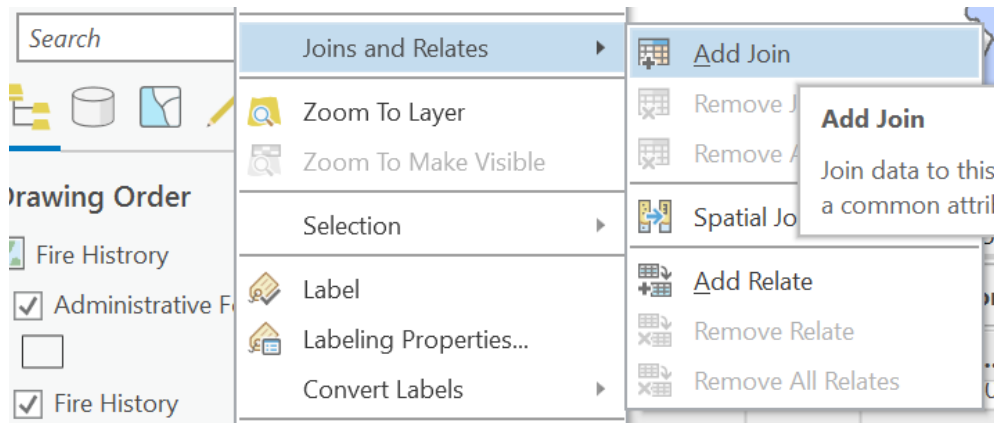
Target table

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
Oak Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek
Sycamore Creek

Join table

Joining tables in ArcGIS Pro

1. Identify target and origin tables
2. Identify key fields
3. In the Contents pane, right click the target table or layer to open context menu, Joins and Relates → Add Join
5. Complete Add Join window



Add Join ?

Input Table
5th Field Watersheds

⚠ Input Join Field
5th Field Watershed Name

Join Table
freq_HUC5_fire

Join Table Field
HUC_NAME

☒ Keep All Target Features
☐ Index Joined Fields

Validate Join

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:

Table Options → Export

Fields of the target table

Fields of the joined table

5th Field Watersheds		freq_HUC5_fire			
Field:		Selection:			
Add		Calculate			
Select By Attributes		Zoom To			
Switch		Clear			
Delete		Copy			
5th Field Watershed Number		5th Field Watershed Name *		OBJECTID	HUC_NAME
Cnt_HUC_NA					
13	1506020202	Hell Canyon	13	Hell Canyon	67
14	1506020108	Lower Big Chino Wash	15	Lower Big Chino Wash	138
15	1506020204	Grindstone Wash-Upper Verd...	11	Grindstone Wash-Up...	136
16	1506020205	Oak Creek	19	Oak Creek	4



Benefits in using joined tables

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

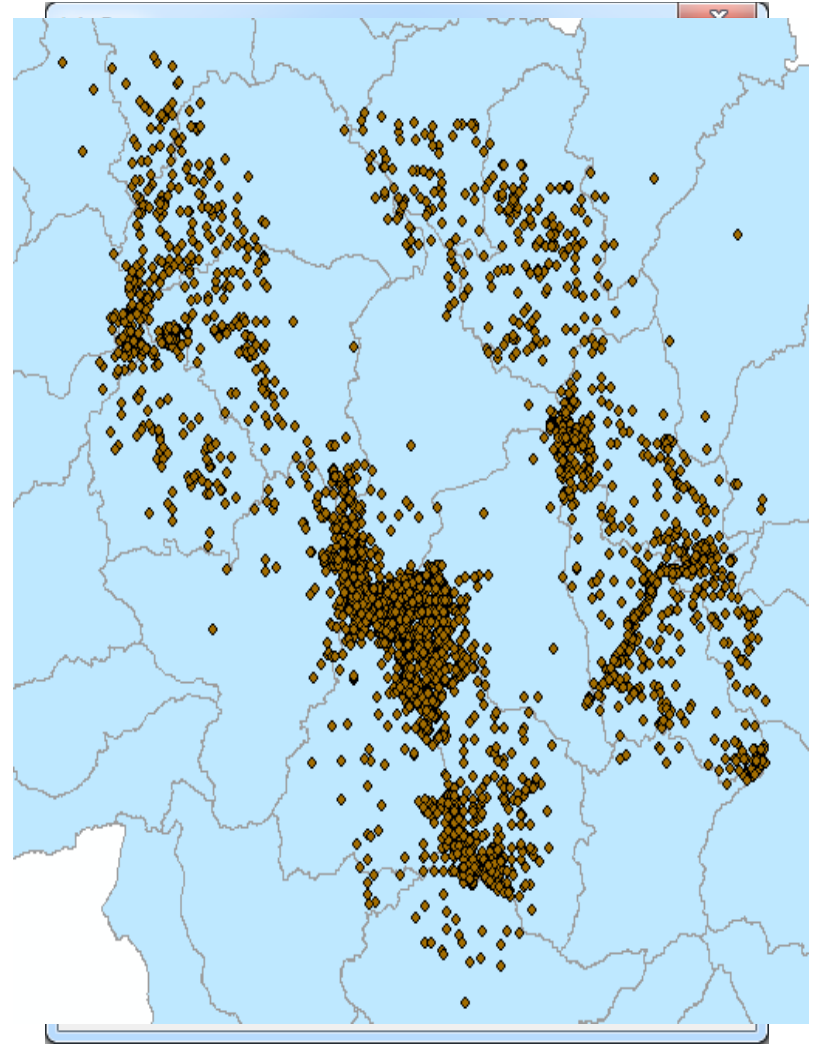
Number of Fires per
Watershed over the Last
100 Years





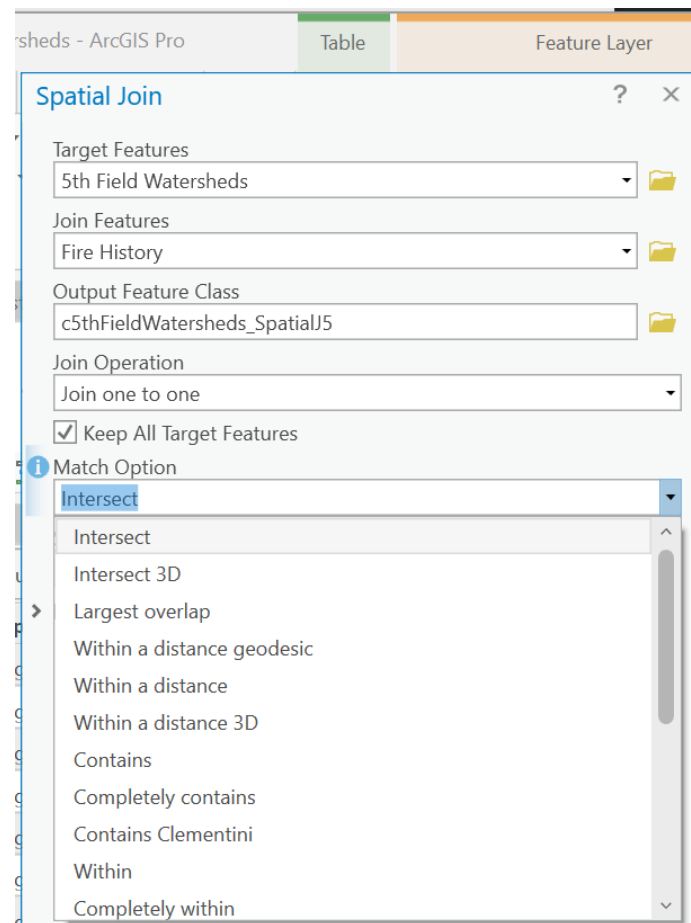
Spatial Join

- 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 – Joins and Relates → Spatial Join
 - Example: Join Fire points inside Watershed polygons to determine fire density



Spatial Join

- Output is new layer with combined attributes
 - Can have Count field if One to One join operation is used
 - Can have multiple copies of target feature if One to Many is used

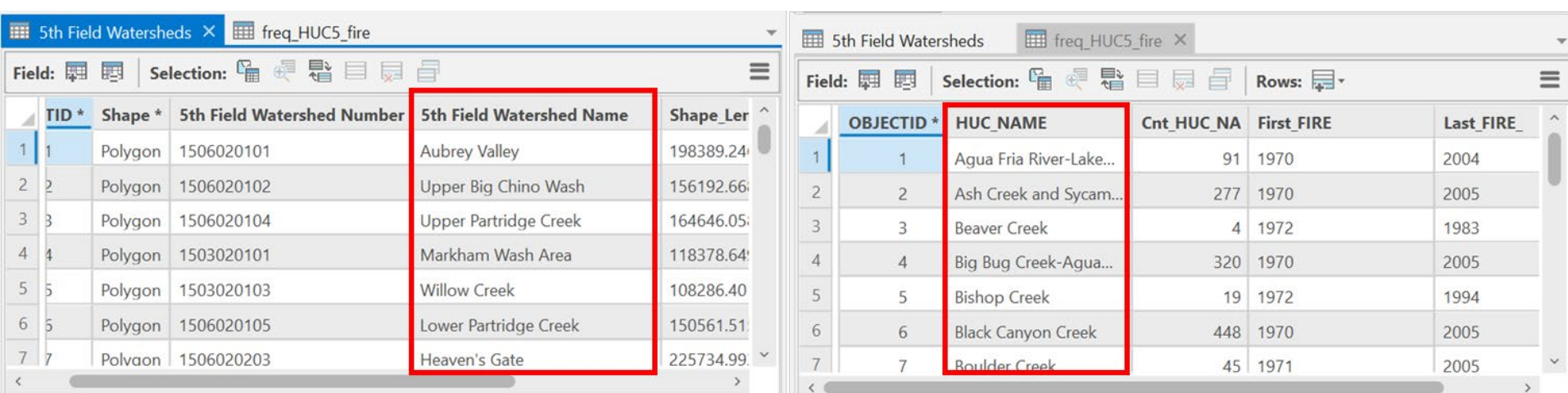


The screenshot shows the attribute table for the output of the Spatial Join. The table has four columns: 'Number', '5th Field Watershed Name', 'Join_Count', and 'FIRE_NAME'. The 'Join_Count' column is highlighted with a red box. The data is as follows:

Number	5th Field Watershed Name	Join_Count	FIRE_NAME
7	Heaven's Gate	6	SUNNY BROOK
8	Middle Big Chino Wash	41	JUNIPER
9	Ash Fork Draw-Jumbo Tank	0	<Null>
10	Knight Creek	0	<Null>
11	Trout Creek	0	<Null>
12	Muddy Creek	3	CHECKER
13	Hell Canyon	67	Stringfield
14	Lower Big Chino Wash	138	POWER LINE

Relating Tables

- Tables remain separate
- 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



The image shows two side-by-side screenshots of ArcGIS Desktop tables. The left table, '5th Field Watersheds', contains watershed data with columns: TID, Shape, 5th Field Watershed Number, 5th Field Watershed Name, and Shape_Ler. The right table, 'freq_HUC5_fire', contains fire frequency data with columns: OBJECTID, HUC_NAME, Cnt_HUC_NA, First_FIRE, and Last_FIRE. Both tables have a red box highlighting the '5th Field Watershed Name' and 'HUC_NAME' columns, respectively, indicating they are the key fields for the relationship.

TID *	Shape *	5th Field Watershed Number	5th Field Watershed Name	Shape_Ler
1	Polygon	1506020101	Aubrey Valley	198389.24
2	Polygon	1506020102	Upper Big Chino Wash	156192.66
3	Polygon	1506020104	Upper Partridge Creek	164646.05
4	Polygon	1503020101	Markham Wash Area	118378.64
5	Polygon	1503020103	Willow Creek	108286.40
6	Polygon	1506020105	Lower Partridge Creek	150561.51
7	Polvaon	1506020203	Heaven's Gate	225734.99

OBJECTID *	HUC_NAME	Cnt_HUC_NA	First_FIRE	Last_FIRE
1	Agua Fria River-Lake...	91	1970	2004
2	Ash Creek and Sycam...	277	1970	2005
3	Beaver Creek	4	1972	1983
4	Big Bug Creek-Agua...	320	1970	2005
5	Bishop Creek	19	1972	1994
6	Black Canyon Creek	448	1970	2005
7	Boulder Creek	45	1971	2005



Relating tables

1. Identify key fields
2. In the Contents Pane, right click layer or table → Relate
3. Specify key fields and related table
4. Enter name for Relate
5. Choose a cardinality

Relate saved in the ArcGIS Pro document only!

Add Relate

Layer Name or Table View
5th Field Watersheds

i

Input Relate Field
5th Field Watershed Name

Key field

Relate Table
freq_HUC5_fire

Output Relate Field
HUC_NAME

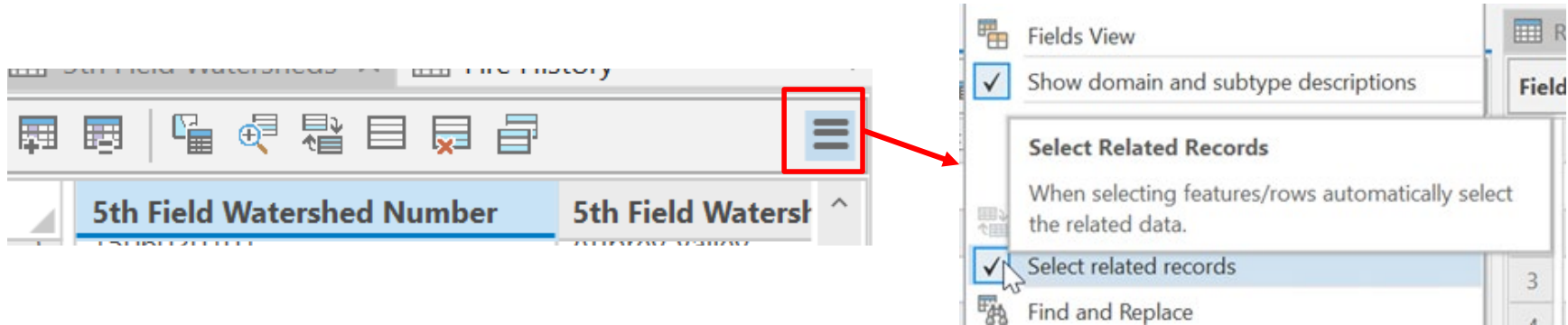
Key field

Relate Name
Relate1

Cardinality
One to many

Applying the Relate

In the Table Options turn on **Select Related Records**



Selecting records in one table will automatically select matching records in the related table

A screenshot showing two related tables. The left table is '5th Field Watersheds' and the right table is 'freq_HUC5_fire'. Red arrows point from the highlighted rows in the left table to the corresponding highlighted rows in the right table, demonstrating the 'Relate' functionality.

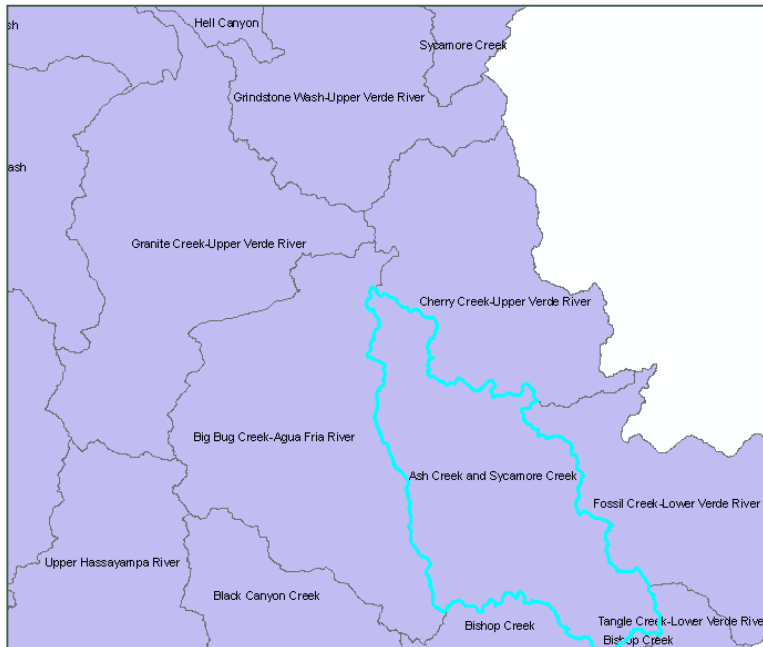
	5th Field Watershed Number	5th Field Watershed Name
5	1506020101	Audley valley
6	1506020206	Beaver Creek
7	1507010202	Big Bug Creek-Agua
8	1507010204	Bishop Creek
9	1507010203	Black Canyon Creek

	HUC_NAME *	Cnt_HUC_NA	Fi
1	Beaver Creek	4	19
2	Big Bug Creek-Agua Fria River	320	19
3	Bishop Creek	19	19
4	Black Canyon Creek	448	19

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



Fires related to selected watershed

Fire History		FireHistory_SpatialJoin X				
Field:		Selection:				
		5th Field...	FIRE_NAME	FIRE_DAY	FIRE_MONTH	FIRE_YEAR
234	048	Ash Creek and Sycam...	SPRING	03	08	1993
235	059	Ash Creek and Sycam...	SYCAMORE	18	08	1993
236	002	Ash Creek and Sycam...	MISTAKE	12	04	1994
237	007	Ash Creek and Sycam...	MILL	04	05	1994
238	015	Ash Creek and Sycam...	CEDAR	15	06	1995
239	016	Ash Creek and Sycam...	MEDIAN	18	06	1995
240	022	Ash Creek and Sycam...	ORME	28	06	1995
241	023	Ash Creek and Sycam...	ASH	29	06	1995

Demonstration

