

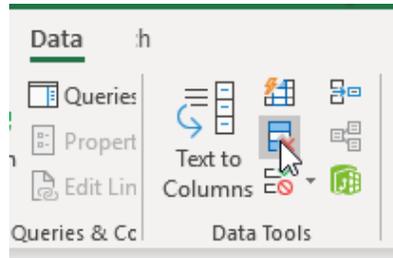
06_ReducingDATA

Data frequently are added or retrieved from data bases in a 3-column format. For example, groundwater levels from multiple sites might be retrieved as, Site, Date, and water level. 3-column format is more useful where a table is populated sparsely as with water-quality (QW) data.

Populate table from 3-column data – 01_3columnQW.xlsx

Define Table Guides																																																													
<p>Our QW example is in the form. Site Name, Constituent, and Value.</p> <p>A table with all constituents from each site on a single row will be created from the 3-column data.</p>	<table border="1"> <thead> <tr> <th></th> <th>B</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>Site Name</td> <td>Constituent</td> <td>Value</td> </tr> <tr> <td>4</td> <td>Cave Spring #1</td> <td>Ca, mg/L</td> <td>51</td> </tr> <tr> <td>5</td> <td>Cave Spring #1</td> <td>Cl, mg/L</td> <td>0.6</td> </tr> <tr> <td>6</td> <td>Cave Spring #1</td> <td>F, mg/L</td> <td>0.2</td> </tr> <tr> <td>7</td> <td>Cave Spring #1</td> <td>HCO3, mg/L</td> <td>200</td> </tr> <tr> <td>8</td> <td>Cave Spring #1</td> <td>K, mg/L</td> <td>0.4</td> </tr> <tr> <td>9</td> <td>Cave Spring #1</td> <td>Mg, mg/L</td> <td>10</td> </tr> <tr> <td>10</td> <td>Cave Spring #1</td> <td>Na, mg/L</td> <td>1</td> </tr> <tr> <td>11</td> <td>Cave Spring #1</td> <td>Silica, mg/L</td> <td>3.9</td> </tr> <tr> <td>12</td> <td>Cave Spring #1</td> <td>SO4, mg/L</td> <td>3.4</td> </tr> <tr> <td>13</td> <td>Cave Spring #1</td> <td>Specific Conductance, uS/cm</td> <td>240</td> </tr> <tr> <td>14</td> <td>Cave Spring #1</td> <td>Temperature, deg C</td> <td>5.3</td> </tr> <tr> <td>15</td> <td>Clark Spring</td> <td>Ca, mg/L</td> <td>75</td> </tr> <tr> <td>16</td> <td>Clark Spring</td> <td>Cl, mg/L</td> <td>1.5</td> </tr> </tbody> </table>		B	C	D	3	Site Name	Constituent	Value	4	Cave Spring #1	Ca, mg/L	51	5	Cave Spring #1	Cl, mg/L	0.6	6	Cave Spring #1	F, mg/L	0.2	7	Cave Spring #1	HCO3, mg/L	200	8	Cave Spring #1	K, mg/L	0.4	9	Cave Spring #1	Mg, mg/L	10	10	Cave Spring #1	Na, mg/L	1	11	Cave Spring #1	Silica, mg/L	3.9	12	Cave Spring #1	SO4, mg/L	3.4	13	Cave Spring #1	Specific Conductance, uS/cm	240	14	Cave Spring #1	Temperature, deg C	5.3	15	Clark Spring	Ca, mg/L	75	16	Clark Spring	Cl, mg/L	1.5
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<p>Copy site names with heading.</p> <p>Open a new workbook (Alt, F, N, L).</p> <p>Paste Special as values in new book.</p>	<table border="1"> <thead> <tr> <th></th> <th>A</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Site Name</td> </tr> <tr> <td>2</td> <td>Cave Spring #1</td> </tr> <tr> <td>3</td> <td>Cave Spring #1</td> </tr> <tr> <td>4</td> <td>Cave Spring #1</td> </tr> <tr> <td>5</td> <td>Cave Spring #1</td> </tr> <tr> <td>6</td> <td>Cave Spring #1</td> </tr> <tr> <td>7</td> <td>Cave Spring #1</td> </tr> <tr> <td>8</td> <td>Cave Spring #1</td> </tr> <tr> <td>9</td> <td>Cave Spring #1</td> </tr> <tr> <td>10</td> <td>Cave Spring #1</td> </tr> <tr> <td>11</td> <td>Cave Spring #1</td> </tr> <tr> <td>12</td> <td>Cave Spring #1</td> </tr> <tr> <td>13</td> <td>Clark Spring</td> </tr> <tr> <td>14</td> <td>Clark Spring</td> </tr> <tr> <td>15</td> <td>Clark Spring</td> </tr> <tr> <td>16</td> <td>Clark Spring</td> </tr> </tbody> </table>		A	1	Site Name	2	Cave Spring #1	3	Cave Spring #1	4	Cave Spring #1	5	Cave Spring #1	6	Cave Spring #1	7	Cave Spring #1	8	Cave Spring #1	9	Cave Spring #1	10	Cave Spring #1	11	Cave Spring #1	12	Cave Spring #1	13	Clark Spring	14	Clark Spring	15	Clark Spring	16	Clark Spring																										
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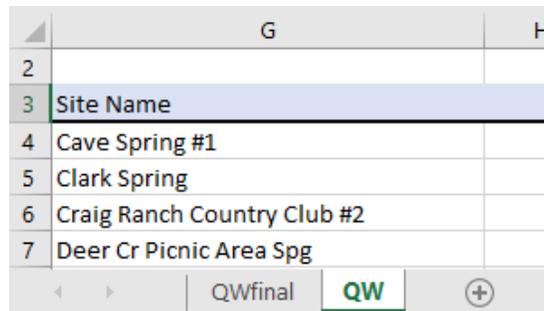
Select pasted range.
 Select Data tab on ribbon,
 Select “Remove Duplicates” tool,
(Alt, A, M)



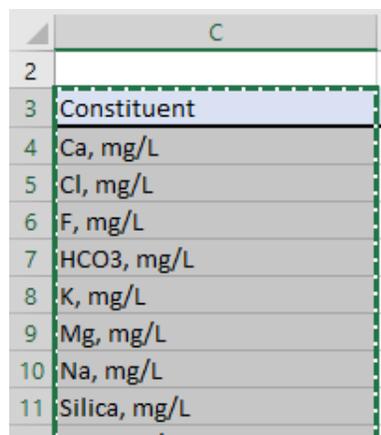
“Remove Duplicates” form will appear.
 Check “My data has headers.”
 Click OK.
 Dismiss message box.
 Copy range **A1:A37**.



Return to workbook,
 01_3columnQW.xlsx.
 Paste Special as Values in cell G3.



Copy Constituents from range **C2:C529**
 on QW page in 01_3columnQW.xlsx.



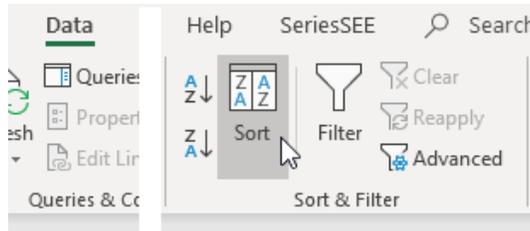
Select cell C1 in new workbook.
Paste Special as values in new book.

	C
1	Constituent
2	Ca, mg/L
3	Cl, mg/L
4	F, mg/L
5	HCO3, mg/L
6	K, mg/L
7	Mg, mg/L

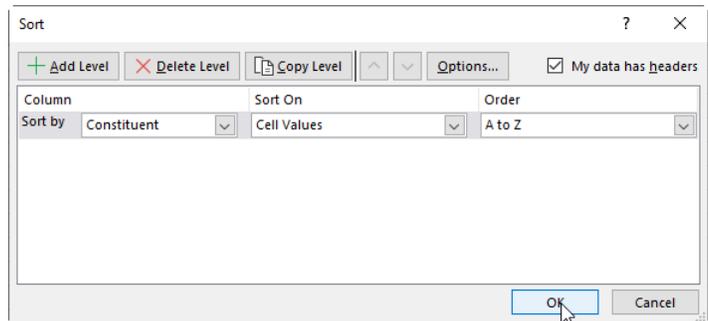
Reduce to list of unique constituents with
"Remove Duplicates"
Select range **C1:C20**.

	C
1	Constituent
2	Ca, mg/L
...	...
19	Tritium, pCi/L
20	CO3, mg/L
21	

Select Data tab on ribbon,
Select "Remove Duplicates" tool,
(Alt, A, SS)



Click OK on "Sort" form to sort.



Copy range **C2:C20** into memory.
Do NOT include header, **C1**.

	C
1	Constituent
2	C-13, permil
3	C-14, permil
4	Ca, mg/L
5	Cl, mg/L
6	CO3, mg/L
7	Deuterium, permil
8	Dissolved oxygen, mg/L
9	F, mg/L
10	HCO3, mg/L
11	K, mg/l

Return to workbook,
01_3columnQW.xlsx.
Paste Special to cell H3.
Select as Values and Transpose.

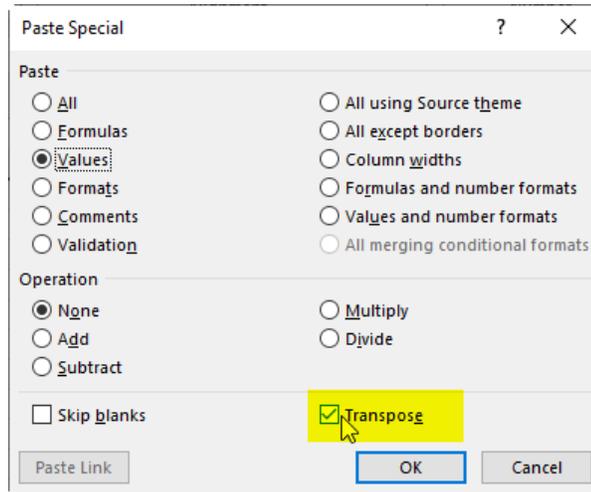
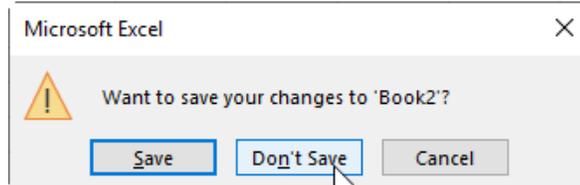


Table guides are defined.

	G	H	I	J
3	Site Name	C-13, permil	C-14, permil	Ca, mg/L Cl
4	Cave Spring #1			
5	Clark Spring			
6	Craig Ranch Country Club #2			
7	Deer Cr Picnic Area Spg			
8	Deer Creek Spring #1			
9	Deer Creek Spring #2			

Close the new workbook without saving.



Populate table from 3-column data – 01_3columnQW.xlsx

Add Unique Identifiers to 3-Column Data	
Label new column "UNIQ" in cell A3 .	
Concatenate Site Name and Constituent in column A . Add formula, "=B4&" "&C4" to cell A4 .	
Copy cell A4 . Paste to range A4:A529 .	

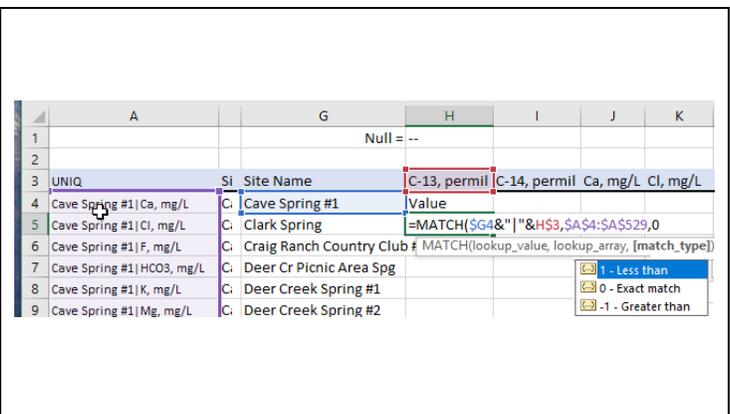
Populate table from 3-column data – 01_3columnQW.xlsx

Populate table from 3-Column Data	
Define null value in cell H1 . Note leading apostrophe (') before – Define with "Null =" in cell G1 .	
Add indirect reference to cell H4 , "=OFFSET(\$D\$3,0,0)".	

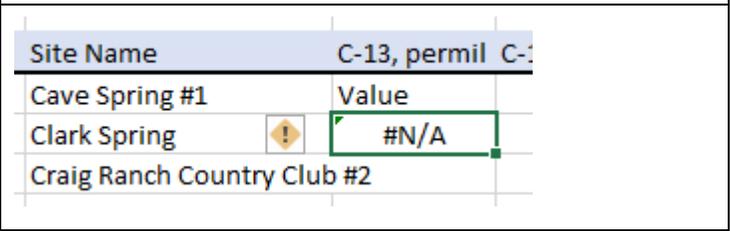
Add equation to find entry in 3-column data in cell **H5**,
 “=MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0)”.

Absolute and relative references mixed because of guides spanning columns and rows.

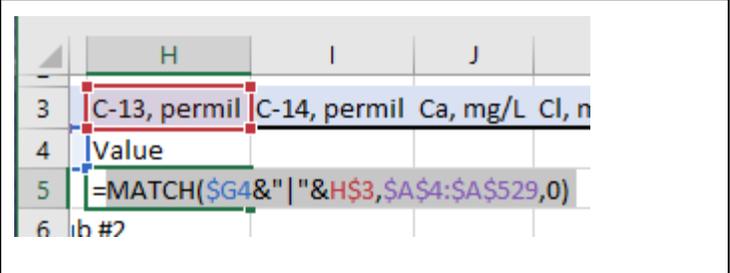
Note: Equation is on wrong row. This is a temporary location as we build parts for final equation.



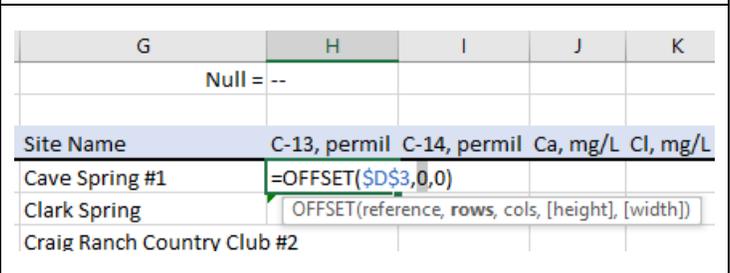
MATCH returns an error because, Cave Spring #1 | C-13, permit does not exist.



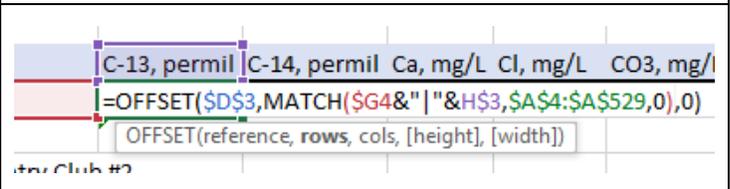
Open cell **H5** for editing with F2.
 Highlight equation without = sign, “MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0)”
 Copy, **ctrl+c**, text string into memory.
 Close cell **H5**.



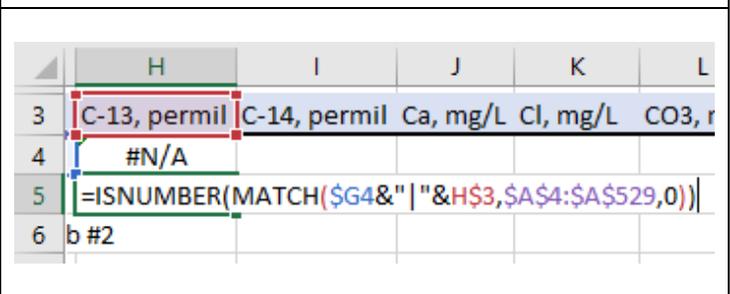
Open cell **H4** for editing with F2.
 Highlight rows entry in OFFSET function.



Paste, **ctrl+v**, text string into rows entry.
 Close cell **H4**.



Open cell **H5** for editing with F2.
 Expand formula by encapsulating with ISNUMBER function,
 “=ISNUMBER(MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0))”
 Close cell **H5**.

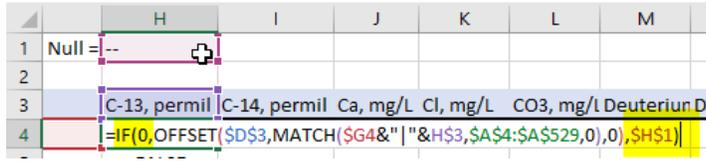


Open cell **H4** for editing with F2.

Expand formula by encapsulating with IF function,

"=IF(0, OFFSET(\$D\$3, MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0),0), \$H\$1)"

Close cell **H4**.

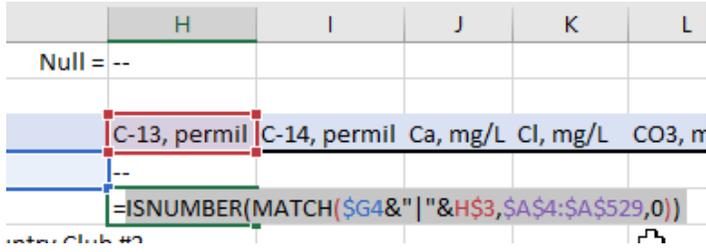


Open cell **H5** for editing with F2.

Highlight equation without = sign, **"ISNUMBER(MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0))"**

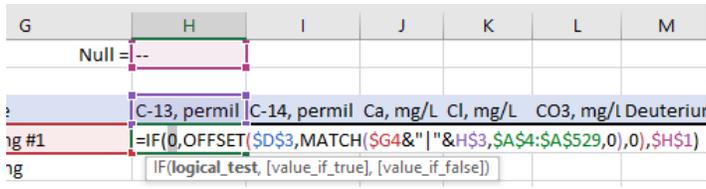
Copy, **ctrl+c**, text string into memory.

Close cell **H5**.



Open cell **H4** for editing with F2.

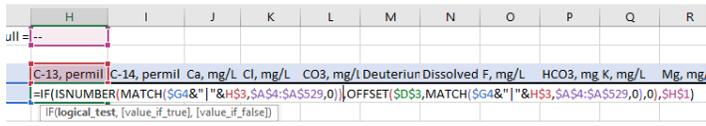
Highlight logical_test entry in IF function.



Paste, **ctrl+v**, text string into logical_test entry.

Resulting formula is, **"=IF(ISNUMBER(MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0)), OFFSET(\$D\$3, MATCH(\$G4&"|"&H\$3,\$A\$4:\$A\$529,0),0), \$H\$1)"**

Close cell **H4**.



Copy cell **H4**.

Paste to range **H4:Z39**.

Table is populated with null entries if a constituent is absent at a site.

	G	H	I	J	K	L
3	Site Name	C-13, permil	C-14, permil	Ca, mg/L	Cl, mg/L	CO3, r
4	Cave Spring #1	--	--		51	0.6 --
5	Clark Spring	--	--		75	1.5 --
6	Craig Ranch Country Club		-8.2	3	30	3.5 --
7	Deer Cr Picnic Area Spg	--	--		56	0.9 --
8	Deer Creek Spring #1		-8.4	--	45	0.5 --
9	Deer Creek Spring #2		-9.6	100	56	0.9 --
10	East Spring #2	--	--		40	0.8 --
11	G.P. Apex Well		-5.5	2.7	120	200 --
12	Gilbert Well		-8.8	61.4	60	1.8 --

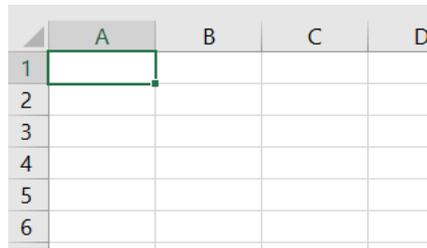
Data from browsers or text files frequently must be parsed into columns for analysis. are added or retrieved from data bases in a 3-column format. Daily discharges from the gage [09416000 MUDDY RV NR MOAPA, NV](#) are parsed with [text to columns](#) function as an example.

Reduce daily data with Pivot table & Match+Offset – 02_MuddyR_finish.xlsx

Get and Parse Data	
<p>Get discharge data for gage, 09416000 MUDDY RV NR MOAPA, NV</p>	
<p>Open 02_MuddyR_finish.xlsx as a guide and open Excel.</p>	

Open a new workbook (**Alt, F, N, L**).

Select cell **A1**.

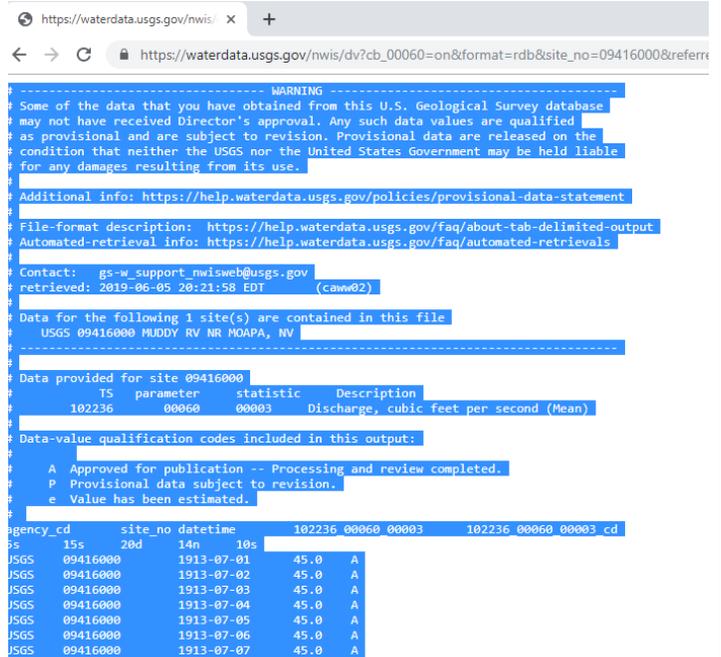


A screenshot of a new Microsoft Excel workbook. The grid shows columns A, B, C, and D, and rows 1 through 6. Cell A1 is highlighted with a green border, indicating it is the active cell.

Put cursor in browser window.

Type **Ctrl+A** to select all.

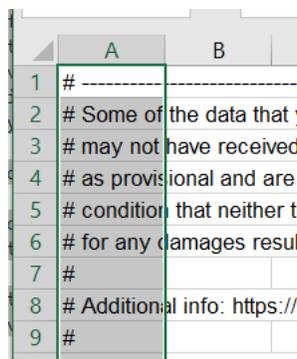
Type **Ctrl+C** to copy selection.



A screenshot of a web browser window displaying a USGS data page. The address bar shows the URL: <https://waterdata.usgs.gov/nwis/>. The page content includes a warning about provisional data, contact information, and a table of data for site 09416000. The text is highlighted in blue, indicating it has been selected.

```
----- WARNING -----
# Some of the data that you have obtained from this U.S. Geological Survey database
# may not have received Director's approval. Any such data values are qualified
# as provisional and are subject to revision. Provisional data are released on the
# condition that neither the USGS nor the United States Government may be held liable
# for any damages resulting from its use.
#
# Additional info: https://help.waterdata.usgs.gov/policies/provisional-data-statement
#
# File-format description: https://help.waterdata.usgs.gov/faq/about-tab-delimited-output
# Automated-retrieval info: https://help.waterdata.usgs.gov/faq/automated-retrievals
#
# Contact: gs-w_support_nwisweb@usgs.gov
# retrieved: 2019-06-05 20:21:58 EDT (caww02)
#
# Data for the following 1 site(s) are contained in this file
# USGS 09416000 MUDDY RV NR MOAPA, NV
#
# Data provided for site 09416000
# TS parameter statistic Description
# 102236 00060 00003 Discharge, cubic feet per second (Mean)
#
# Data-value qualification codes included in this output:
#
# A Approved for publication -- Processing and review completed.
# P Provisional data subject to revision.
# e Value has been estimated.
#
# agency_cd site_no datetime 102236 00060 00003 102236 00060 00003 cd
# ps 15s 20d 14n 10s
# USGS 09416000 1913-07-01 45.0 A
# USGS 09416000 1913-07-02 45.0 A
# USGS 09416000 1913-07-03 45.0 A
# USGS 09416000 1913-07-04 45.0 A
# USGS 09416000 1913-07-05 45.0 A
# USGS 09416000 1913-07-06 45.0 A
# USGS 09416000 1913-07-07 45.0 A
```

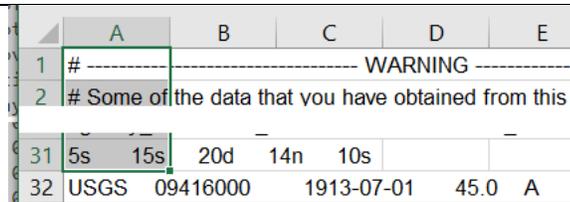
Paste **Ctrl+v** to new workbook.



A screenshot of an Excel workbook showing the text from the browser window pasted into cells A1 through A9. The text is as follows:

	A	B
1	# -----	
2	# Some of the data that y	
3	# may not have received	
4	# as provisional and are s	
5	# condition that neither th	
6	# for any damages resulti	
7	#	
8	# Additional info: https://h	
9	#	

Delete range **A1:A31**.



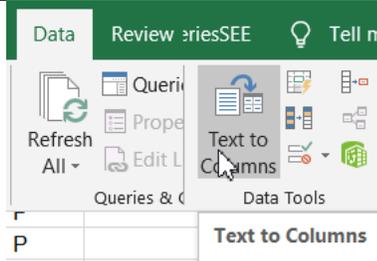
A screenshot of an Excel workbook showing the deletion of a range of cells. The text from the browser window is pasted into cells A1 through A31. The range A1:A31 is highlighted in green, indicating it is selected for deletion. The text is as follows:

	A	B	C	D	E
1	# -----				
2	# Some of the data that you have obtained from this l				
...					
31	5s 15s	20d 14n 10s			
32	USGS 09416000	1913-07-01	45.0	A	

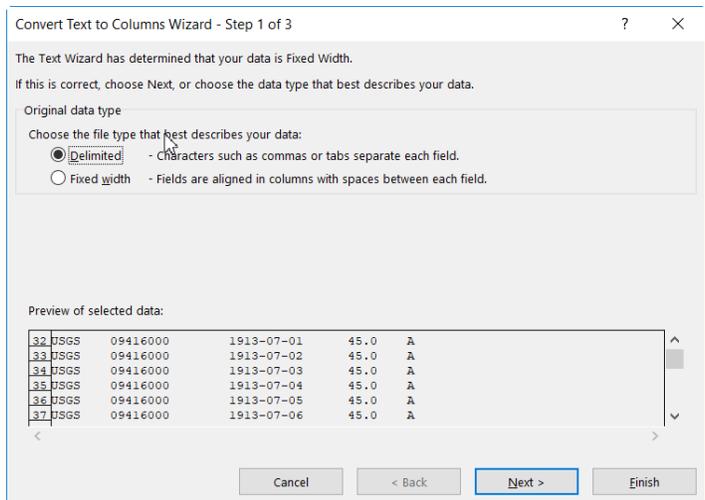
Select range **A32:A38721**.

	A	B	C	D	E
32	USGS	09416000	1913-07-01	45.0	A
33	USGS	09416000	1913-07-02	45.0	A
38720	USGS	09416000	2019-06-03	40.5	F
38721	USGS	09416000	2019-06-04	40.4	F

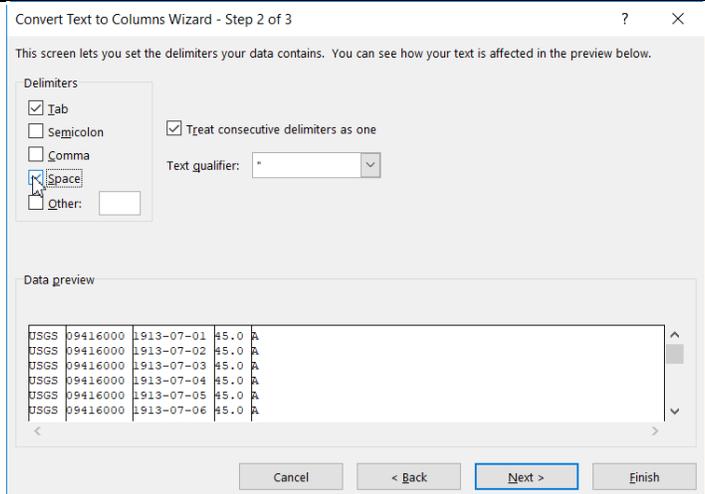
Select Data tab on ribbon,
Select "Text to Columns" tool,
(Alt, A, E)



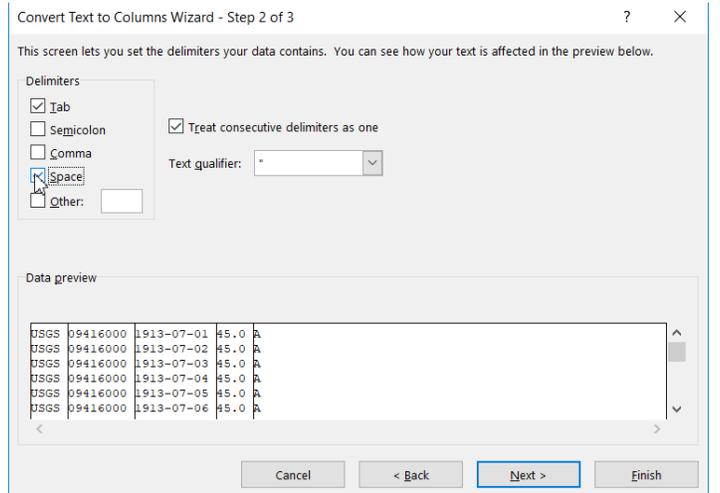
"Convert Text to Columns Wizard" form will appear.
Select Delimited.
Click Next.



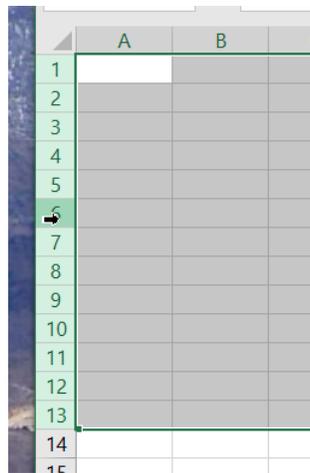
Check Space.
Click Next.



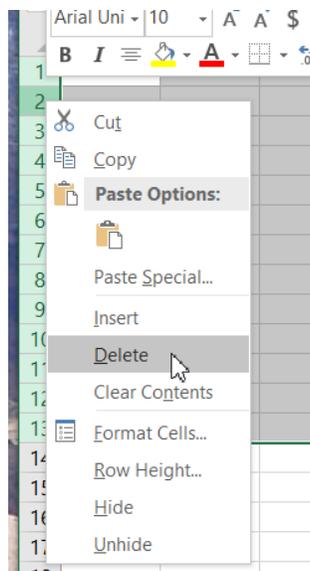
Click Finish on step 3 of 3 in
"Convert Text to Columns Wizard" form.



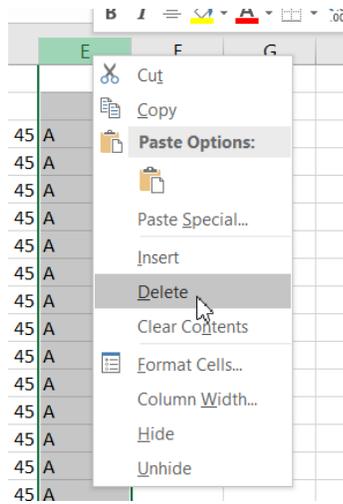
Delete first 13 rows by
Highlighting rows 1 and 13.



Right-click while arrow () appears.
Select Delete option on form.

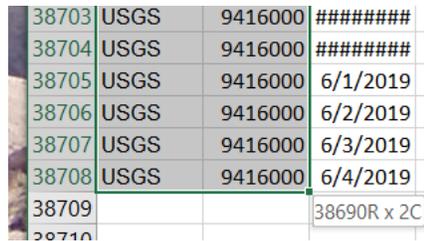


Delete column E

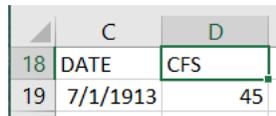


Select range **A19:B38708**.

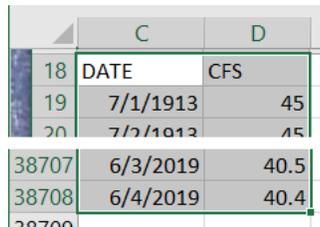
Clear contents.



Add headers DATE and CFS to cells **C18** and **D18**.

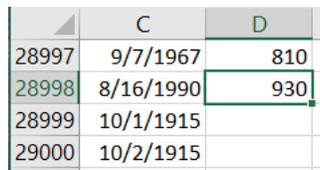


Select range **C18:D38708**.



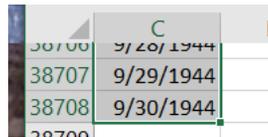
Sort data by CFS.

Go to last cell in CFS column after sorting, cell **D28998**.



Select dates without flow data and delete.

Range **C28999:C38708**.



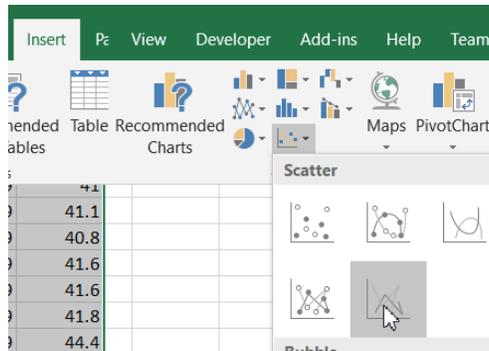
Select range **C18: D28998**.

	C	D
18	DATE	CFS
19	10/10/1997	19
20	10/6/2003	19.4
21	10/7/2003	19.6
22	10/13/2003	19.7

Sort data by DATE.

	C	D
17		
18	DATE	CFS
19	7/1/1913	45
20	7/2/1913	45
21	7/3/1913	45
22	7/4/1913	45

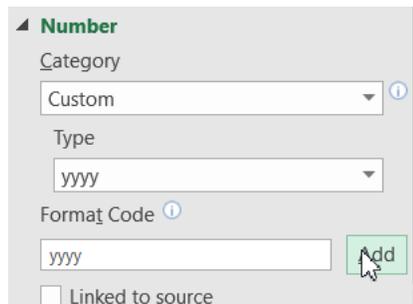
Add XY chart of DATE and CFS.
Select "Scatter with Straight Lines."



Format X-axis.
Begin 1/3/1910,
End 1/15/2020,
Major units, 3653.
Minor units, 1826.5



Custom format X-axis number to "yyyy".



Format Y-axis.

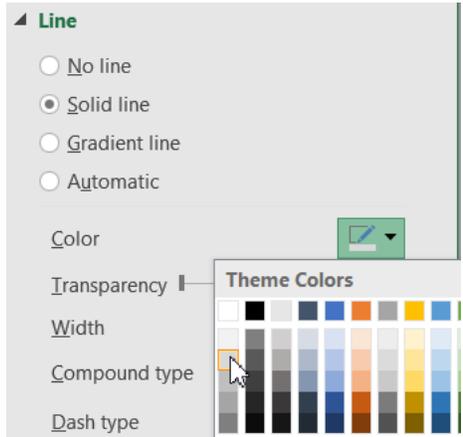
Minimum = 20

Maximum = 60.

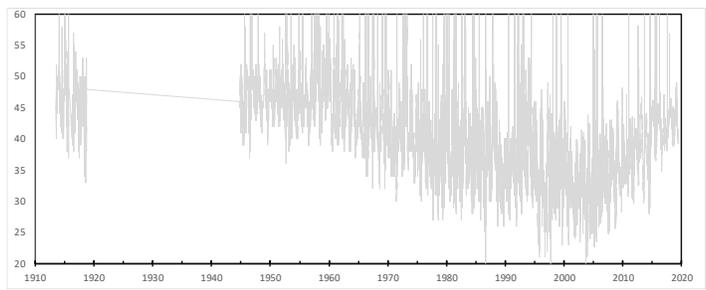


Format data series.

Light grey color with a weight of 0.25 pts.



Finished plot before reducing data.

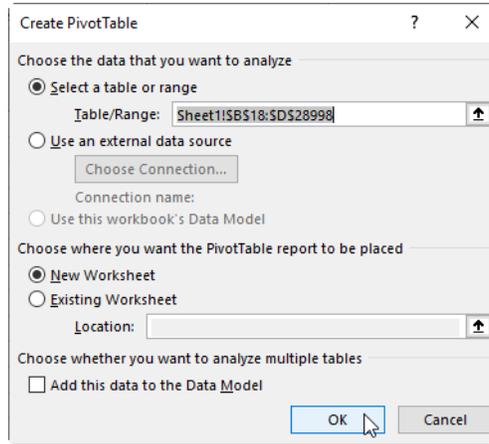


Pivot tables are a fast approach for reducing data and work best when desired outcome is known *a priori*. Data reduction with pivot tables is limited to sum, count, max, min, product, count numbers, standard deviation, and variance.

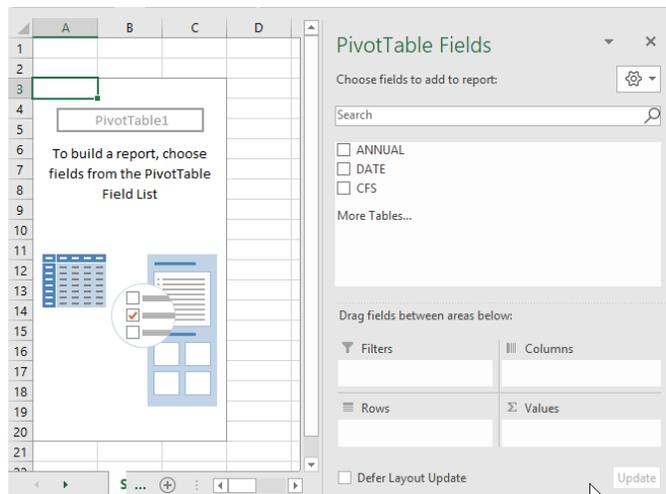
Reduce daily data with Pivot table & Match+Offset – 02_MuddyR_finish.xlsx

Reduce to Annual Average Discharges with Pivot Table	
<p>Add header "ANNUAL" in cell B18.</p>	
<p>Add equation, =TEXT(C19,"yyyy") to cell B19. Copy B19 with equation to range B19:B28998.</p>	
<p>Select range B19:D28998.</p>	
<p>Select Insert tab on ribbon, Select "Pivot Table" tool, (Alt, N, V)</p>	

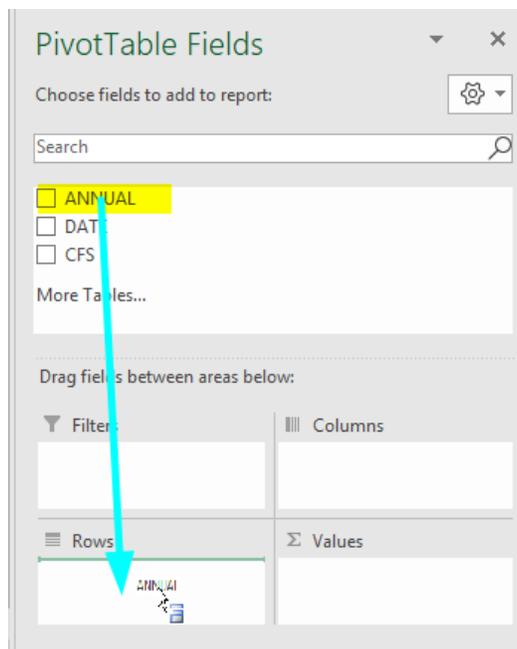
“Create Pivot Table” form will appear.
A new worksheet will be added with
Pivot table after clicking OK.



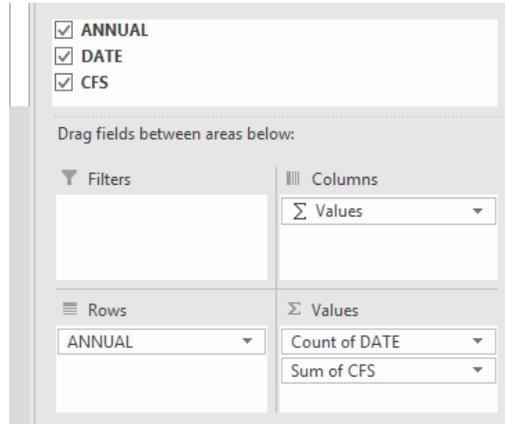
New worksheet with Pivot table.



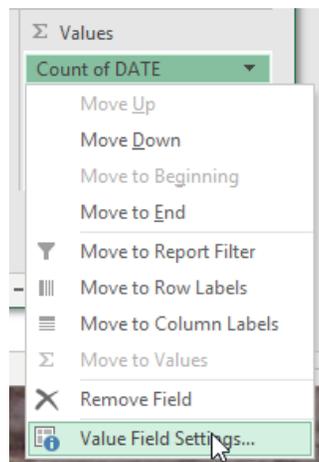
Drag ANNUAL field to Rows.



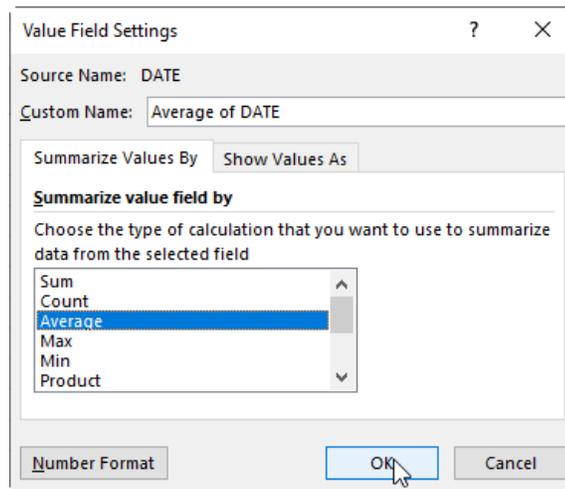
Add DATE and CFS fields to Values in lower, right corner.



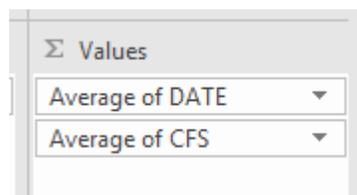
Select "Count of DATE"
Select "Value Field Settings..." from dialog.



"Value Field Settings" form will appear.
Change Count to Average.
Click OK.



Change "Sum of CFS" to "Average of CFS".



Select range **Sheet2!B3:C85**.

Copy into memory.

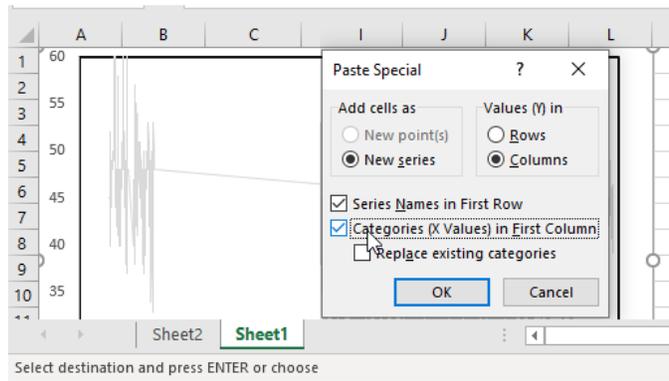
	A	B	C
3	Row Labels	Average of DATE	Average of CFS
4	1913	5022.5	47.11956522
5	1914	5297	46.73150685
...			
84	2018	43283	42.57150685
85	2019	43543	43.22322581

Select Sheet1.

Select XY chart on Sheet1 and paste special.

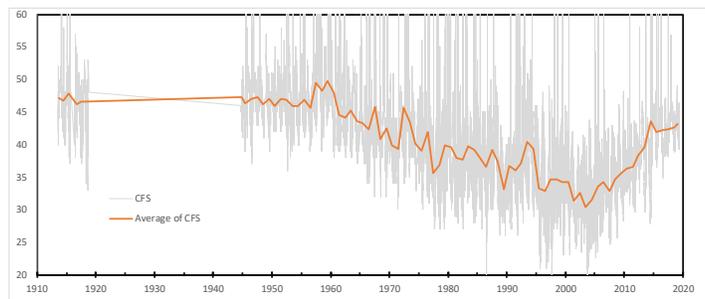
Check,
"Categories (X Values) in First Column."

Click OK.



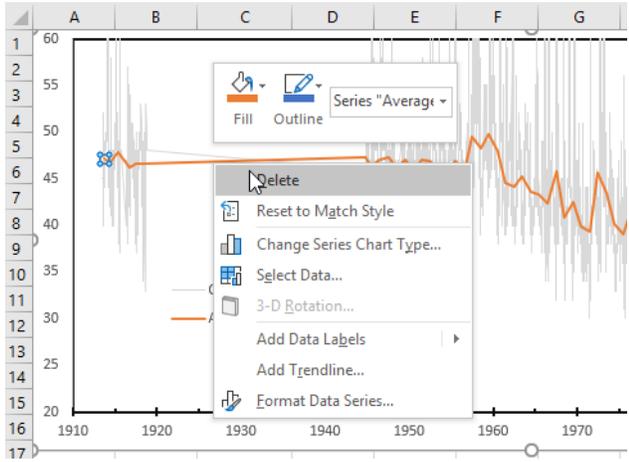
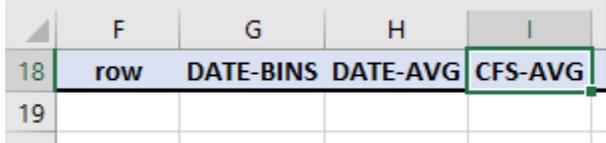
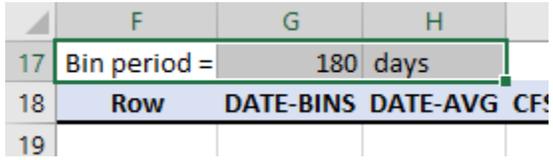
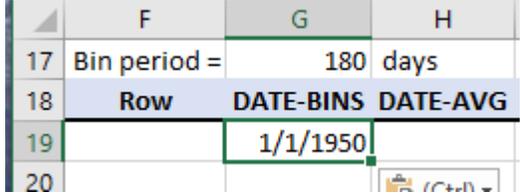
Add Legend.

Chart with daily and average annual discharges appears as,



Pivot tables are fast, but not as well suited to quick experimentation. MATCH and OFFSET functions allow for flexibly defining ranges, which allows reduction with any statistical function in Excel. Volatile calculation is both a benefit and penalty. This translates into instantaneous results with “small” data sets and never seeing an answer with “large” data sets. Small and large are defined by each user’s threshold for pain as latency increases. Waiting more than a couple of seconds qualifies as painfully large for me.

Reduce daily data with Pivot table & Match+Offset – 02_MuddyR_finish.xlsx

Reduce Arbitrary Average Discharges with MATCH+OFFSET	
Delete “Average of CFS” from previous exercise.	
Add headers, Row, DATE-BINS, DATE-AVG, and CFS-AVG to range F18:I18.	
Label and define bin periods in days. Add, Bin period =, 180, and “ days” to range F17:H17.	
Specify beginning of period of analysis in cell G19, 1/1/1950	

<p>Increment bin edges with equation, “=G19+\$G\$17” in cell G20.</p> <p>Copy cell G20.</p> <p>Paste to range G20:G239.</p>	
<p>Find occurrence of edges in original data set, range C19: C28998 with MATCH function.</p> <p>Add “=MATCH(G19,\$C\$19:\$C\$28998,1)” to cell F19.</p>	
<p>Response of indicates that 1/1/1950 equals 3,624th row in the range \$C\$19:\$C\$28998 or falls between values in 3,624th and 3,625th rows.</p>	
<p>Copy cell F19.</p> <p>Paste to range F19:F239.</p>	
<p>Range of times in first bin is defined in cell H19, =OFFSET(C\$18,\$F19,0,\$F20-\$F19,1).</p>	
<p>This returns an error, #VALUE!, because the range references 200 cells without being reduced by a statistical function.</p>	
<p>Type F2 to open cell H19 for editing.</p> <p>Revise equation to, “=AVERAGE(OFFSET(C\$18,\$F19,0,\$F20-\$F19,1))”, where bold characters were added to formula.</p>	
<p>Copy cell G19.</p> <p>Paste Special formats to cell H19. (Alt H, V, S, t, return)</p>	

Copy cell **H19**.

Paste Special formulas to cell **I19**.
(**Alt H, V, S, f, return**)

Copy range **H19:I19**.

Paste to range **H19:I239**.

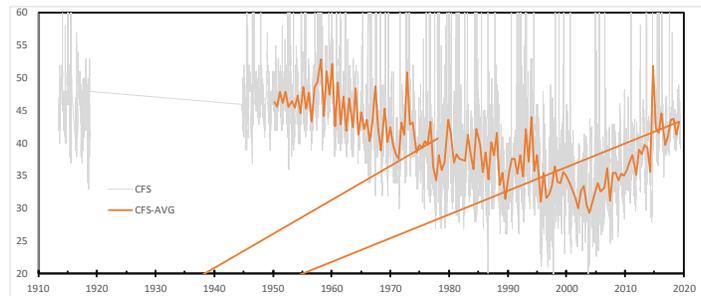
	G	H	I
18	DATE-BINS	DATE-AVG	CFS-AVG
19	1/1/1950	3/31/1950	46.35
20	6/30/1950		

Copy range **H18:I239**.

Select XY chart and paste special.
Check, "Categories (X Values) in First Column."
Click OK.

	H	I
17	days	
18	DATE-AVG	CFS-AVG
19	3/31/1950	46.35
20	9/27/1950	45.59444
21	3/26/1951	47.85556

New series resembles expected averages except for 2 lines that appear to go to (0,0).



2 lines results from errors when bin edges extend beyond available data.

#REF! is returned because we asked for an average with N=0.

Need to revise equations with IF function to trap errors.

	F	G	H	I	J	K	L
158	28644	7/3/2018	9/30/2018	41.29778			
159	28824	12/30/2018	3/17/2019	43.25833			
160	28980	6/28/2019	=AVERAGE(OFFSET(C\$18,\$F160,0,\$F161-\$F160,1))				
161	28980	12/25/2019	#REF!	#REF!			
162	28980	6/22/2020	#REF!	#REF!			

Type F2 to open cell **H19** for editing.

Revise equation to, "**=IF(\$F20>\$F19, AVERAGE(OFFSET(C\$18,\$F19,0,\$F20-\$F19,1)),H18)**", where bold characters were added to formula.

	F	G	H	I	J	K	L	M
18	Row	DATE-BINS	DATE-AVG	CFS-AVG				
19	3624	1/1/1950	=IF(\$F20>\$F19, AVERAGE(OFFSET(C\$18,\$F19,0,\$F20-\$F19,1)),H18)					
20	3804	6/30/1950	9/27/1950	45.59444				
21	3984	12/27/1950	3/26/1951	47.85556				
22	4164	6/25/1951	9/22/1951	46.15				

Copy cell H19.

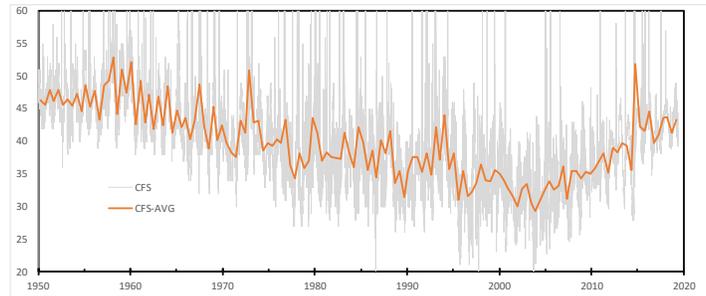
Paste Special formulas to range H19:I239.
(Alt H, V, S, f, return)

Error is trapped with revised formula and last valid calculation is repeated when bin edges extend beyond available data.

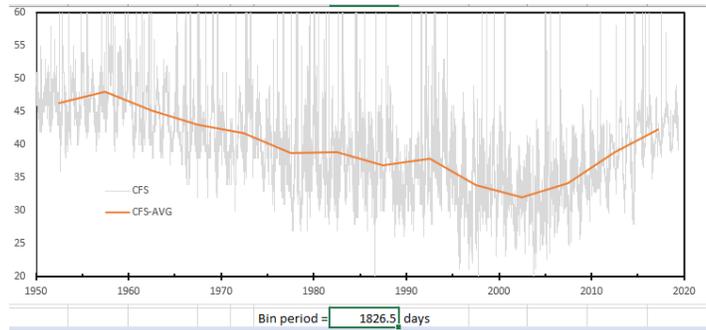
	F	G	H	I	J
158	28644	7/3/2018	9/30/2018	41.29778	
159	28824	12/30/2018	3/17/2019	43.25833	
160	28980	6/28/2019	3/17/2019	=IF(\$F161>\$F160,A\	
161	28980	12/25/2019	3/17/2019	43.25833	
162	28980	6/22/2020	3/17/2019	43.25833	
163	28980	12/19/2020	3/17/2019	43.25833	

Erroneous lines were removed from XY chart.

NOTE: Format of X-axis revised to begin 1/3/1950 to coincide with period of analysis.



Changing Bin period to 1826.5 days instantly shows 5-year averages instead of the previous 0.5-year averages.



Reduce daily data with Pivot table & Match+Offset – 02_MuddyR_finish.xlsx

Reduce Discharges with Other Statistics

Daily data also can be reduced with percentiles.

Add lower bound in cell **J17**.

	F	G	H	I	J
17	Bin period =	1826.5	days		0.1
18	Row	DATE-BINS	DATE-AVG	CFS-AVG	
19	3624	1/1/1950	7/1/1952	46.3483	

Add header to cell **J18** with an equation that reports specified percentile,
 “=“P”&TEXT(J17,“0.00”)”

	F	G	H	I	J	K
17	Bin period =	1826.5	days		0.1	
18	Row	DATE-BINS	DATE-AVG	CFS-AVG	=“P”&TEXT(J17,“0.00”)”	
19	3624	1/1/1950	7/1/1952	46.3483		

Add formula to cell **J19**,
 “=IF(\$F20>\$F19,PERCENTILE.INC(OFFSET(\$D\$18,\$F19,0,\$F20-\$F19,1),J\$17),J18)”

Formula similar to averages but changed where bold.

	D	E	F	G	H	I	J	K	L	M	N	O	P
17			Bin period =	1826.5	days		0.1						
18	CFS	Row	DATE-BINS	DATE-AVG	CFS-AVG	P0.10							
19	45	3624	1/1/1950	7/1/1952	46.3483	=IF(\$F20>\$F19,PERCENTILE.INC(OFFSET(\$D\$18,\$F19,0,\$F20-\$F19,1),J\$17),J18)							
20	45	5450	1/1/1955	7/2/1957	48.01697								
21	45	7277	1/2/1960	7/2/1962	45.10624								

Add upper bound in cell **K17** with,
 “=1-J17”.

	J	K
16	2010	
17	0.1	=1-J17
18	P0.10	
19	42	
20		

Copy header and percentile equations in range **J18:J19**.

Paste to range **K18:K19**.

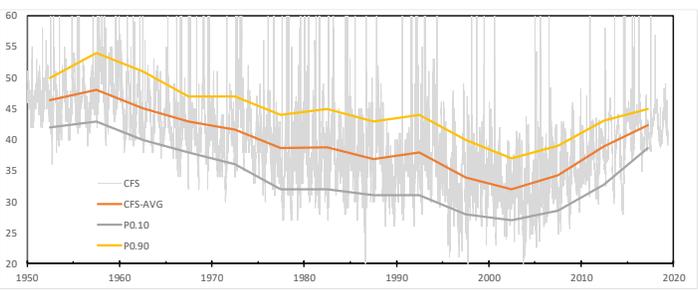
	I	J	K
16	2000	2010	
17		0.1	0.9
18	CFS-AVG	P0.10	P0.90
19	46.3483	42	50
20	48.01697		
21	45.10624		

Copy percentile equations in range **J19:K19**.

Paste to range **J19:K239**.

	I	J	K	L
16	2000	2010		2020
17		0.1	0.9	
18	CFS-AVG	P0.10	P0.90	
19	46.3483	42	50	
20	48.01697	43	54	
21	45.10624	40	51	
22	42.95293	38	47	
23	41.67908	36	47	
24	38.67269	32	44	
25	38.81225	32	45	

Add series to XY chart.



Changing percentiles from 0.100—0.900 to 0.025—0.975 is reflected instantly.

