

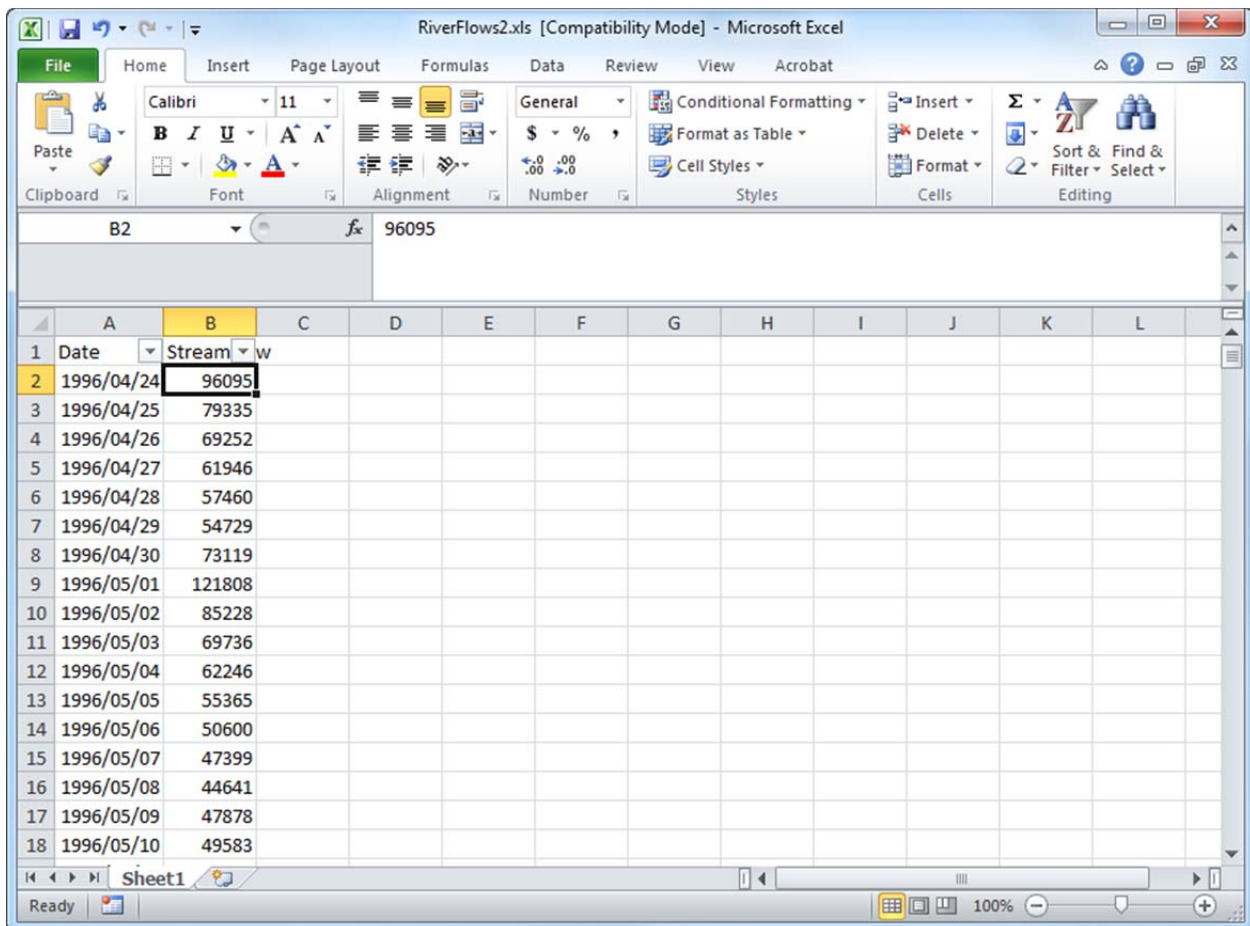
Groundwater Toolbox Tutorial

Using Scripting in the Groundwater Toolbox to import data from an Excel file

April 30, 2015

This document describes steps that can be taken to use the Scripting functionality of the Groundwater (GW) Toolbox to import data stored in an Excel file, such as data collected at a streamgage that is not part of the USGS National Water Information System (NWIS). There are two primary steps for using this functionality: preparing data in the Excel file for use in the GW Toolbox and then importing the data using the Scripting functionality.

If the Excel data consist of a column of date entries and a column of streamflow entries, as shown below, there are two approaches for importing the data into the Groundwater (GW) Toolbox. These two approaches are possible because data can be imported into the GW Toolbox in either a single-column date format, as shown below, or a three-column format of Month, Day, and Year.



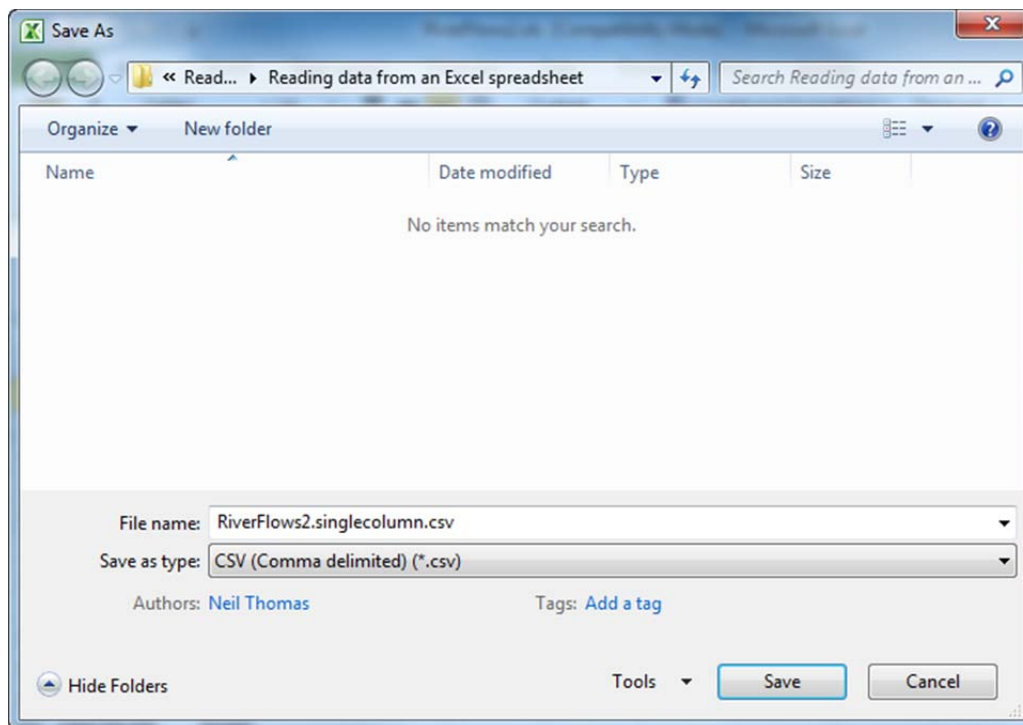
The screenshot shows a Microsoft Excel window titled "RiverFlows2.xls [Compatibility Mode] - Microsoft Excel". The ribbon includes File, Home, Insert, Page Layout, Formulas, Data, Review, View, and Acrobat. The Home ribbon is active, showing Font, Alignment, Number, Styles, Cells, and Editing groups. The active cell is B2, containing the value 96095. The data table is as follows:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Stream	w									
2	1996/04/24	96095										
3	1996/04/25	79335										
4	1996/04/26	69252										
5	1996/04/27	61946										
6	1996/04/28	57460										
7	1996/04/29	54729										
8	1996/04/30	73119										
9	1996/05/01	121808										
10	1996/05/02	85228										
11	1996/05/03	69736										
12	1996/05/04	62246										
13	1996/05/05	55365										
14	1996/05/06	50600										
15	1996/05/07	47399										
16	1996/05/08	44641										
17	1996/05/09	47878										
18	1996/05/10	49583										

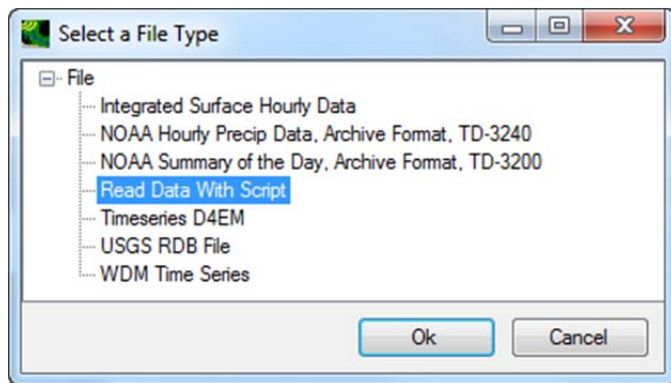
The first approach, which can be the simpler of the two approaches and therefore described first, is to directly read in the 2-column format into the GW Toolbox. The second approach, which is described beginning on page 11, is to first convert the 2-column format into a 4-column format, in which the single date column is converted to a 3-column date format (Month, Day, Year).

Approach A: Reading single-column date formatted data into the GW Toolbox:

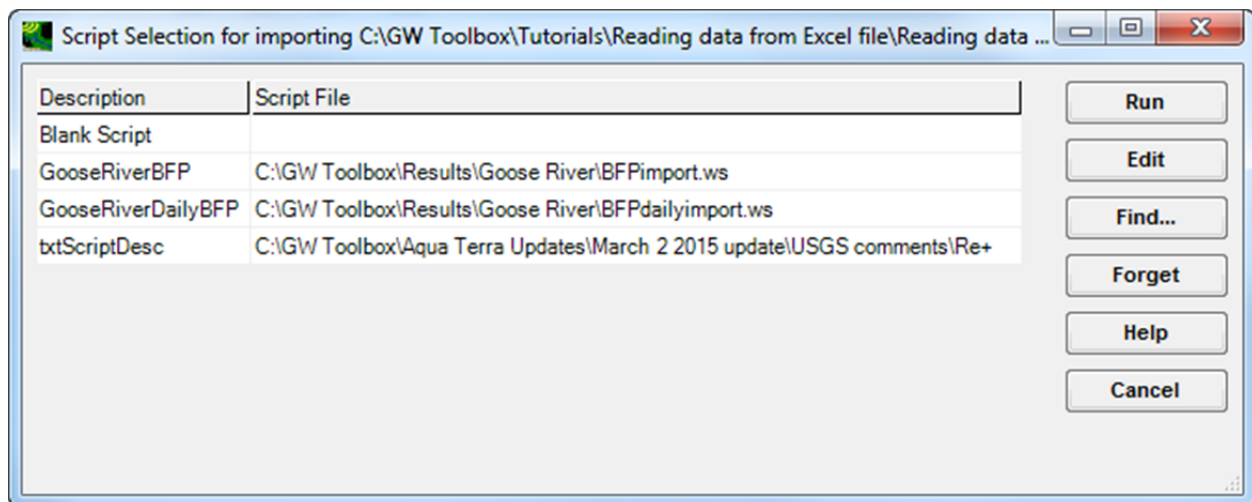
1. **Working with Excel data:** If data are in the '.xls' format, they must first be saved to a comma delimited ('.csv') file format. Using the Excel file shown on page 1, this is done simply in Excel as:



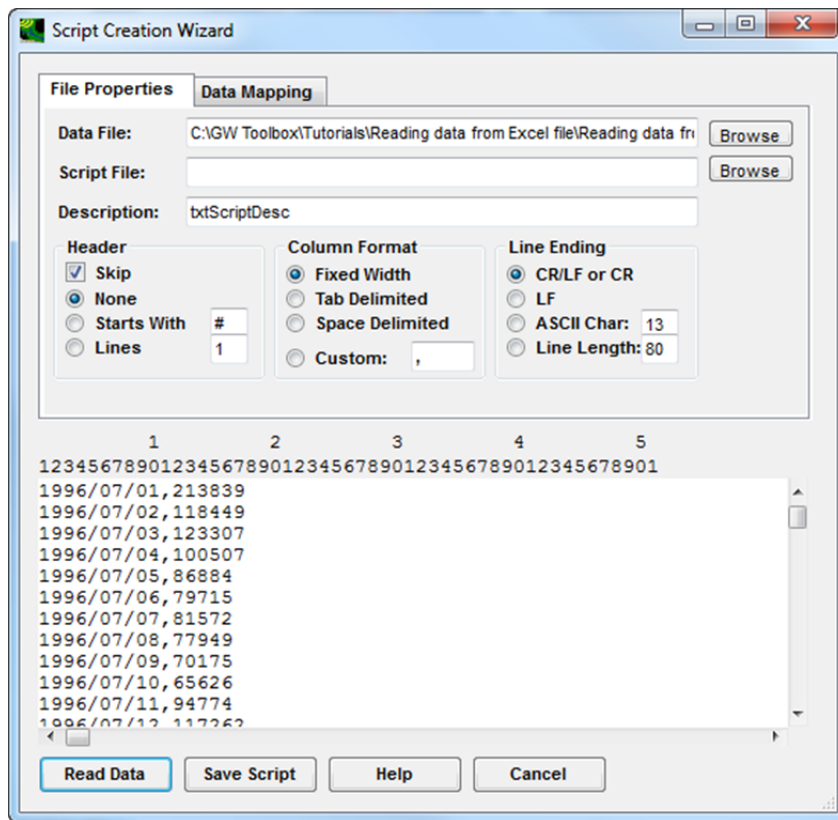
2. **Importing the data into the Groundwater Toolbox:** Next, open the Groundwater Toolbox. It is not necessary to have a project area defined in the GW Toolbox in order to import data, so close the 'Welcome to USGS GW Toolbox' dialog box and go directly to "**File>Open Data**" menu option, which gives the following dialog box:



Select the **“Read Data With Script”** option, as shown above. Navigate to the ‘.csv’ file of interest and **‘Open’** it. The ‘Script Selection for importing ...data’ dialog box will appear. At this point, the user can select a previously saved script, or simply select **‘Edit’** to read data without a script:



In this example, we select **‘Edit,’** which brings the user to the ‘Script Creation Wizard’ dialog box:



Under '**Header**' select the '**Lines**' radio button (and enter '1' in the white box if it doesn't already show). Under '**Column Format**' select the '**Custom**' radio button and ',' delimiter.

The following dialogue box results:

The dialog box is titled "Script Creation Wizard" and has two tabs: "File Properties" and "Data Mapping". The "Data Mapping" tab is active.

Data File: C:\GW Toolbox\Tutorials\Reading data from Excel file\Reading data fr [Browse]

Script File: [Browse]

Description: txtScriptDesc

Header:

- ☒ Skip
- ☐ None
- ☐ Starts With # [1]
- ☒ Lines [1]

Column Format:

- ☐ Fixed Width
- ☐ Tab Delimited
- ☐ Space Delimited
- ☒ Custom: ,

Line Ending:

- ☒ CR/LF or CR
- ☐ LF
- ☐ ASCII Char: 13
- ☐ Line Length: 80

Column Number:

1	2
1996/04/24	96095
1996/04/25	79335
1996/04/26	69252
1996/04/27	61946
1996/04/28	57460
1996/04/29	54729
1996/04/30	73119
1996/05/01	121808
1996/05/02	85228

Buttons: Read Data, Save Script, Help, Cancel

Now, by adding '/' to the the '**Custom**' radio button, in addition to the ',' delimiter, the GW Toolbox will create a 3-column format as shown below:

The screenshot shows the 'Script Creation Wizard' dialog box with the 'Data Mapping' tab selected. The 'Data File' is set to 'C:\GW Toolbox\Tutorials\Reading data from Excel file\Reading data fr'. The 'Script File' is empty. The 'Description' is 'txtScriptDesc'. Under 'Header', 'Skip' is selected. Under 'Column Format', 'Custom' is selected with a '/' delimiter. Under 'Line Ending', 'CR/LF or CR' is selected. A table of data is shown below the settings.

Column Number:	1	2	3	4
	1996	04	24	96095
	1996	04	25	79335
	1996	04	26	69252
	1996	04	27	61946
	1996	04	28	57460
	1996	04	29	54729
	1996	04	30	73119
	1996	05	01	121808
	1996	05	02	85228

Buttons at the bottom: Read Data, Save Script, Help, Cancel.

Now, select the "**Data Mapping**" option in the above dialogue box.

Below is the initial dialogue box that results:

The image shows a 'Script Creation Wizard' dialog box with two tabs: 'File Properties' and 'Data Mapping'. The 'Data Mapping' tab is active, displaying a table with columns: Name, Attribute, Input Column, Constant, and Skip Values. Below the table is a section labeled 'Column Number:' with a grid of data. At the bottom are four buttons: 'Read Data', 'Save Script', 'Help', and 'Cancel'.

Name	Attribute	Input Column	Constant	Skip Values
Value	no			
Year			1900	
Month	no			
Day			1	
Hour			0	
Minute			0	
Scenario	yes			
Location	yes			

Column Number:

1	2	3	4
1996	04	24	96095
1996	04	25	79335
1996	04	26	69252
1996	04	27	61946
1996	04	28	57460
1996	04	29	54729
1996	04	30	73119
1996	05	01	121808
1996	05	02	85228

The first step is to associate each column of data with an 'Input Column:'

Script Creation Wizard

Data Mapping

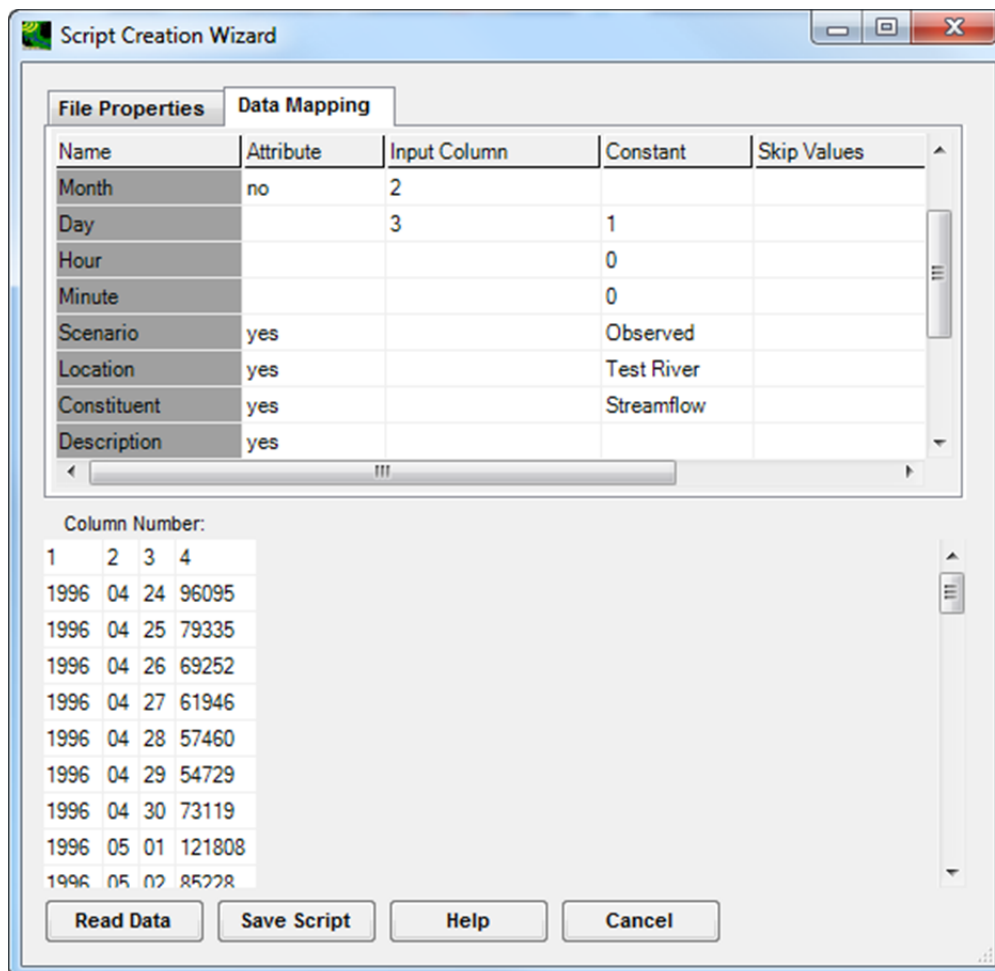
Name	Attribute	Input Column	Constant	Skip Values
Value	no	4		
Year		1	1900	
Month	no	2		
Day		3	1	
Hour			0	
Minute			0	
Scenario	yes			
Location	yes			

Column Number:

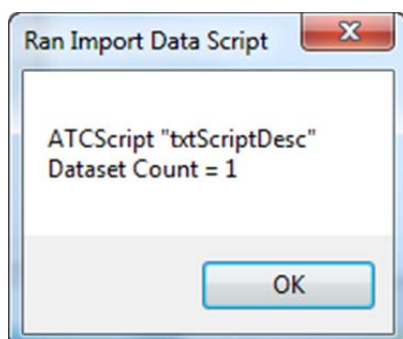
1	2	3	4
1996	04	24	96095
1996	04	25	79335
1996	04	26	69252
1996	04	27	61946
1996	04	28	57460
1996	04	29	54729
1996	04	30	73119
1996	05	01	121808
1996	05	02	85228

Read Data **Save Script** **Help** **Cancel**

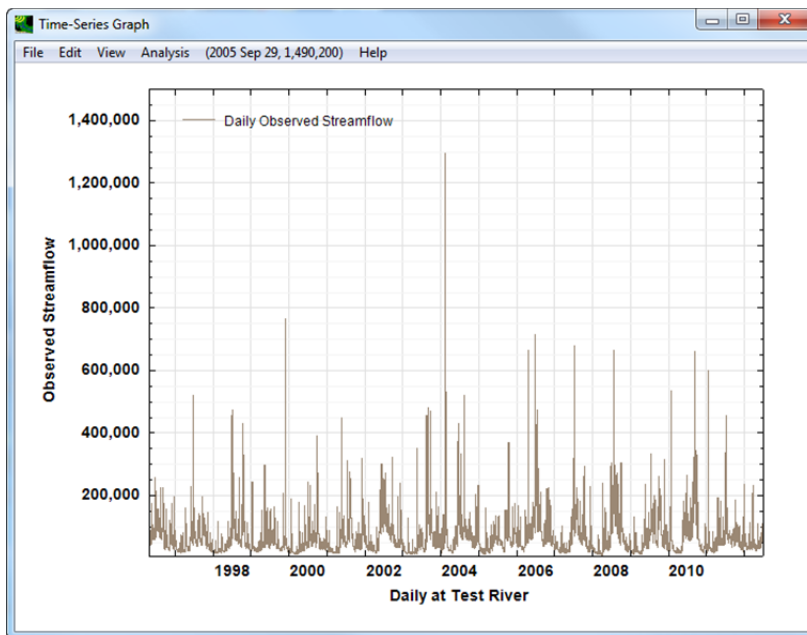
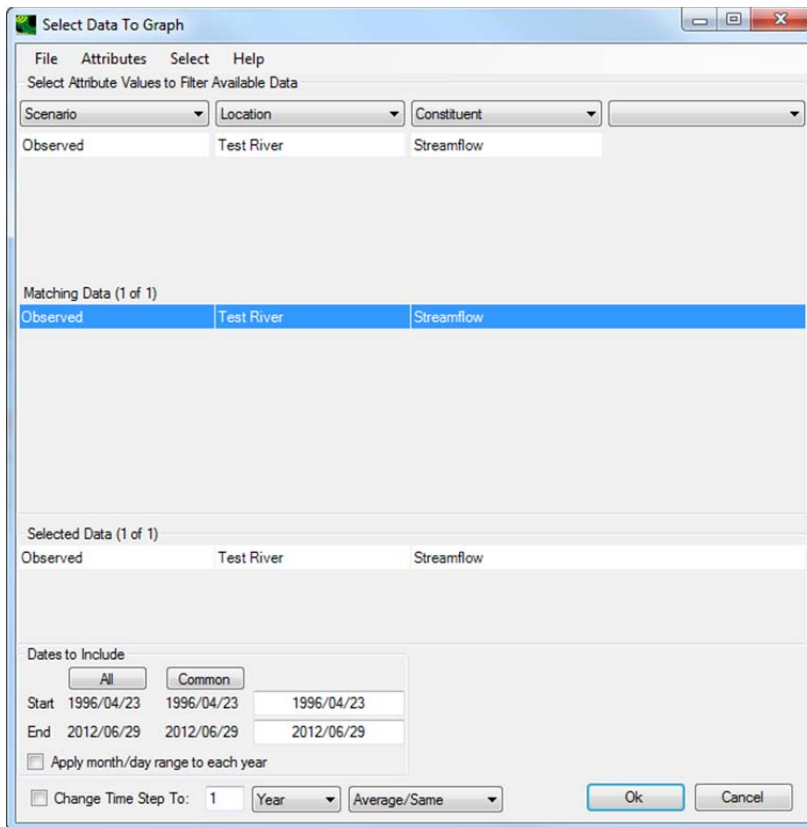
The user also might want to assign descriptive attributes to the data using the 'Scenario,' 'Location,' and other options under the 'Name' column. This is done by specifying the attribute values in the 'Constant' column, such as the following:



The user can now either read the data into the Toolbox ('Read Data') or save these scripting instructions to a script for later use. First, we'll save the script for later use using the "**Save Script**" option. This command results in the creation of a '.ws' file that can be used to read similar .csv files in the future. Now, the user can read the data ("**Read Data**"), which leads to the following message:



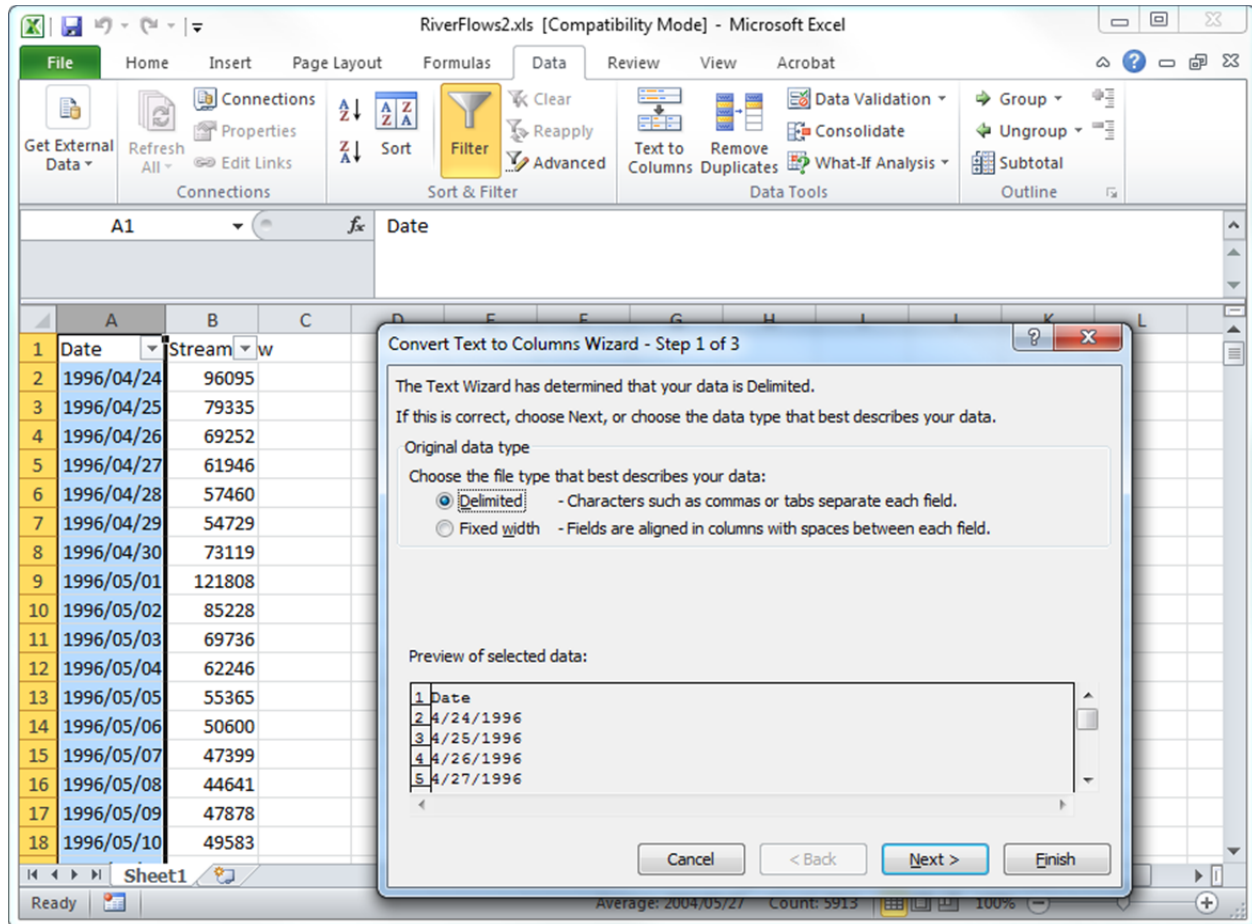
The user can now close 'Ran Import Data Script' dialog box, and then use the data for analyses, such as graphing:



Note, however, that if the Base-Flow Separation methods are selected for analysis, the drainage area (in square miles) must be entered manually into the dialog box.

Approach B: Converting single-column date formatted data into 3-column date format before reading data into the GW Toolbox:

1. **Working with Excel data:** The first step is to convert the single-column format to a three-column format by first selecting the Date column and the command 'Text to Columns' under the 'Data' tab, which results in the following 'Convert Text to Columns Wizard – Step 1 of 3' dialog box:



First, select 'Delimited', and then 'Next,' which results in the 'Step 2 of 3' dialog box below. Select 'Other:', add '/' to the white box after 'Other:', and 'Text qualifier: {none}' as follows:

Convert Text to Columns Wizard - Step 2 of 3

This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.

Delimiters

☐ Tab
☐ Semicolon
☐ Comma
☐ Space
☒ Other: /

☐ Treat consecutive delimiters as one

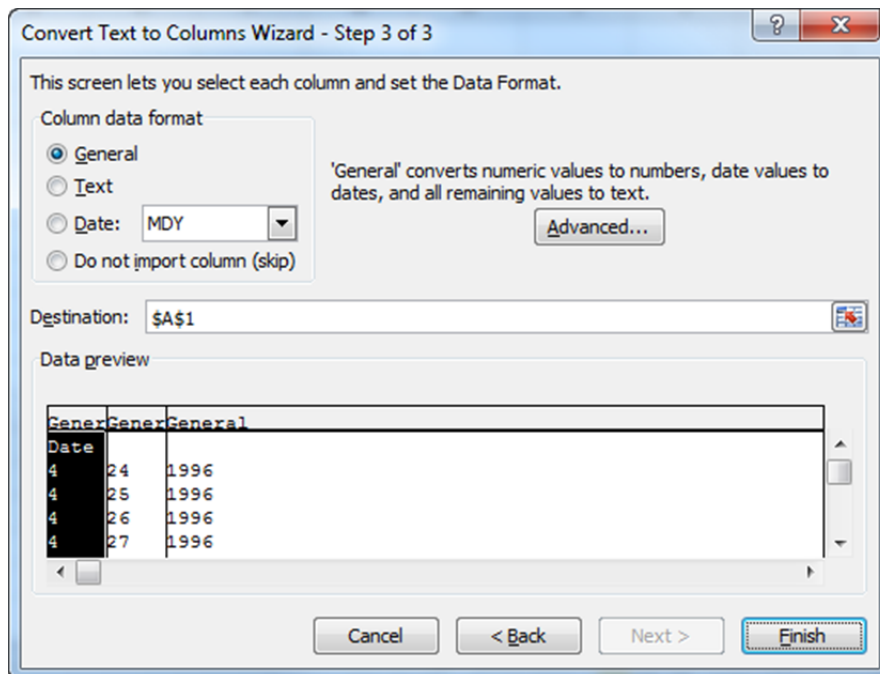
Text qualifier: {none}

Data preview

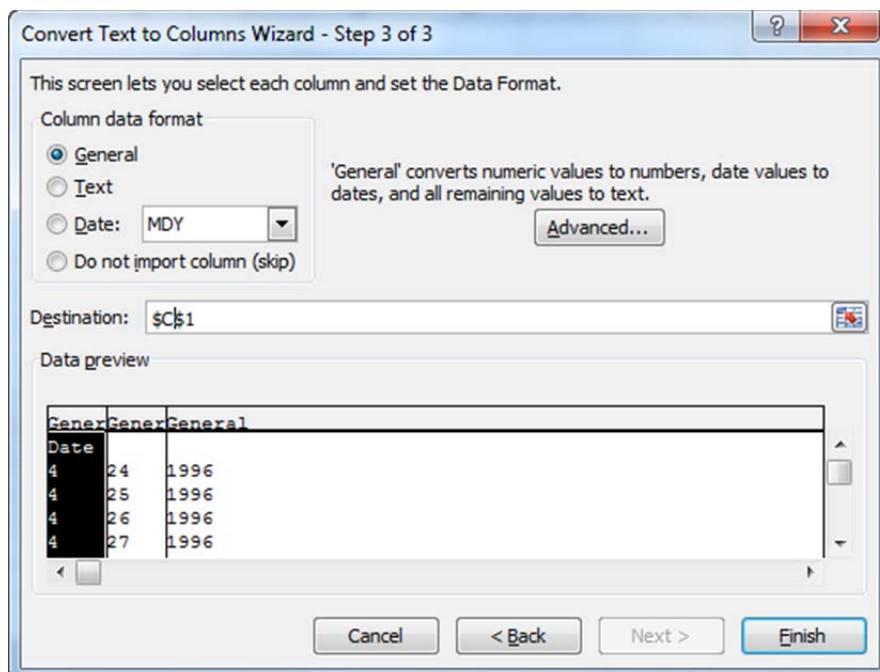
Date		
4	24	1996
4	25	1996
4	26	1996
4	27	1996

Buttons: Cancel, < Back, Next >, Finish

Now select 'Next' which results in the final step (next page).



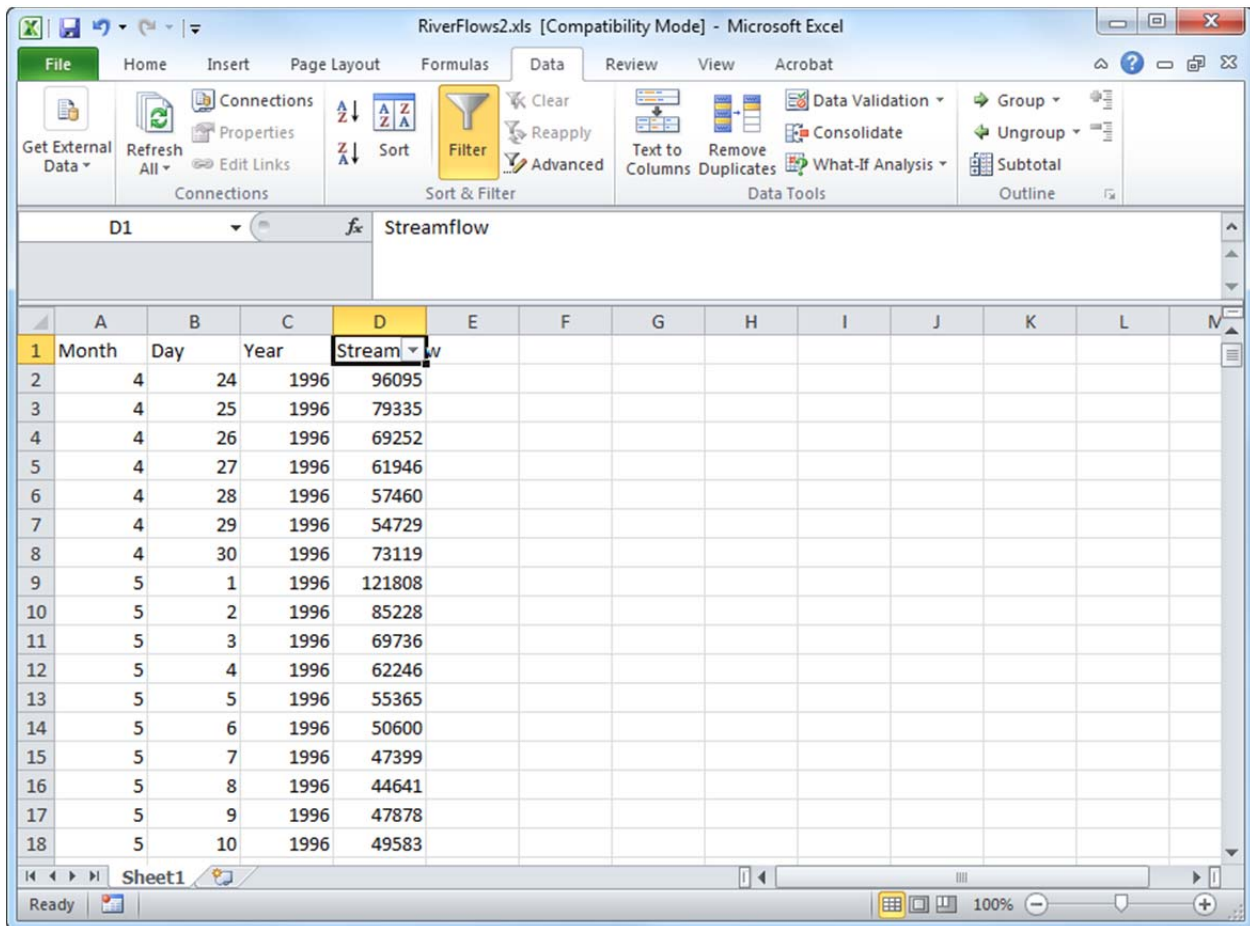
In the dialogue box above, select 'General' for each column, then use the 'Destination' function to select three columns into which the new (separated) data will be placed. In this case, columns C, D, and E, are chosen as the destination columns simply by specifying a starting column \$C\$1 in the 'Destination' option:



By specifying column C as the destination for the first date column (month), the following modified spreadsheet results (after hitting 'Finish' in the screen above):

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Stream	Date									
2	1996/04/24	96095	4	24	1996							
3	1996/04/25	79335	4	25	1996							
4	1996/04/26	69252	4	26	1996							
5	1996/04/27	61946	4	27	1996							
6	1996/04/28	57460	4	28	1996							
7	1996/04/29	54729	4	29	1996							
8	1996/04/30	73119	4	30	1996							
9	1996/05/01	121808	5	1	1996							
10	1996/05/02	85228	5	2	1996							
11	1996/05/03	69736	5	3	1996							
12	1996/05/04	62246	5	4	1996							
13	1996/05/05	55365	5	5	1996							
14	1996/05/06	50600	5	6	1996							
15	1996/05/07	47399	5	7	1996							
16	1996/05/08	44641	5	8	1996							
17	1996/05/09	47878	5	9	1996							
18	1996/05/10	49583	5	10	1996							

The user can then delete column A, which contains the original date format, and use 'Delete,' 'Cut,' and 'Paste,' commands to modify the spreadsheet to the following format:

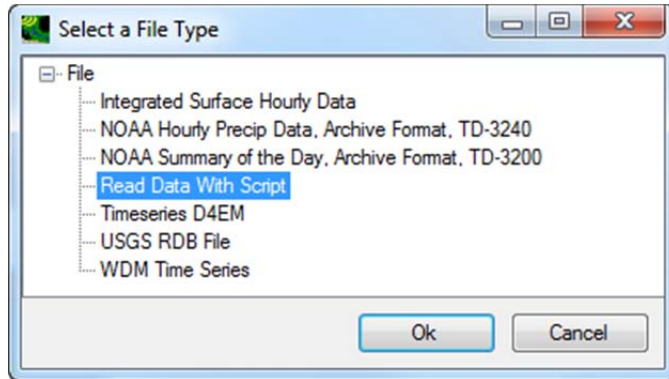


The screenshot shows the Microsoft Excel interface with the 'Data' tab selected. The spreadsheet has columns A through M. Column A is highlighted, indicating it is selected for deletion. The spreadsheet contains data for months, days, years, and streamflow values.

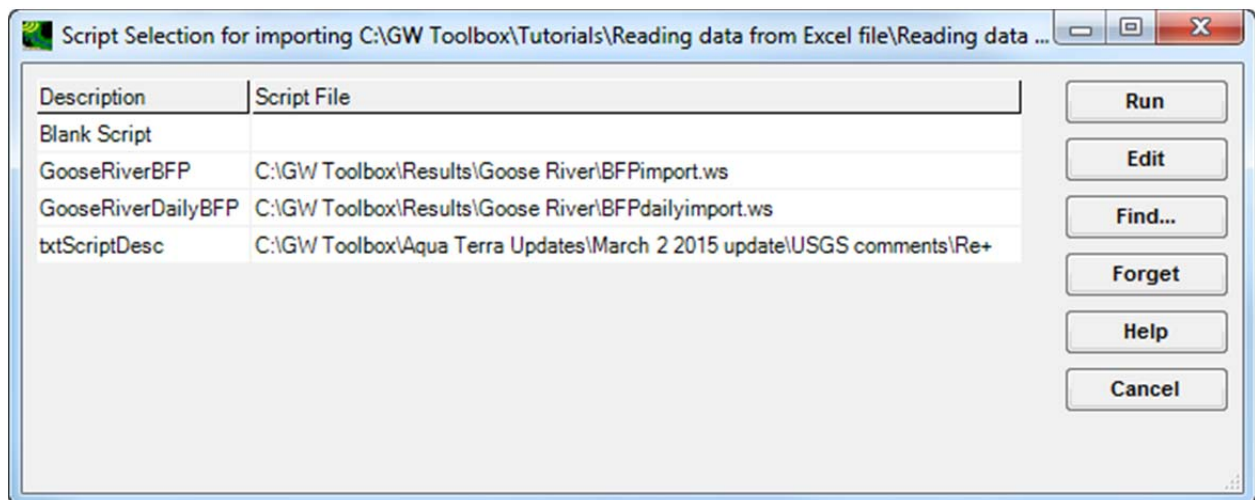
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Month	Day	Year	Streamflow									
2		4	24	1996	96095								
3		4	25	1996	79335								
4		4	26	1996	69252								
5		4	27	1996	61946								
6		4	28	1996	57460								
7		4	29	1996	54729								
8		4	30	1996	73119								
9		5	1	1996	121808								
10		5	2	1996	85228								
11		5	3	1996	69736								
12		5	4	1996	62246								
13		5	5	1996	55365								
14		5	6	1996	50600								
15		5	7	1996	47399								
16		5	8	1996	44641								
17		5	9	1996	47878								
18		5	10	1996	49583								

The user then saves the file in '.csv' format (in this case, saved as file 'RiverFlows2.fourcolumn.csv'). Close all Excel files.

2. Importing the data into the Groundwater Toolbox: Next, open the Groundwater Toolbox. It is not necessary to have a project area defined in the GW Toolbox in order to import data, so close the 'Welcome to USGS GW Toolbox' dialog box and go directly to **"File>Open Data"** menu option, which gives the following dialog box:



Select the **"Read Data With Script"** option, as shown above. Navigate to the '.csv' file of interest and **'Open'** it. The 'Script Selection for importing ...data' dialog box will appear. At this point, the user can select a previously saved script, or simply select **'Edit'** to read data without a script:



In this example, we select **'Edit'**, which brings the user to the 'Script Creation Wizard' dialog box:

Script Creation Wizard

File Properties **Data Mapping**

Data File: C:\GW Toolbox\Tutorials\Reading data from Excel file\Reading data fr Browse

Script File: Browse

Description: txtScriptDesc

Header

☒ Skip

☐ None

☐ Starts With #

☐ Lines 1

Column Format

☒ Fixed Width

☐ Tab Delimited

☐ Space Delimited

☐ Custom: ,

Line Ending

☒ CR/LF or CR

☐ LF

☐ ASCII Char: 13

☐ Line Length: 80

1 2 3 4 5

12345678901234567890123456789012345678901

7,1,1996,213839

7,2,1996,118449

7,3,1996,123307

7,4,1996,100507

7,5,1996,86884

7,6,1996,79715

7,7,1996,81572

7,8,1996,77949

7,9,1996,70175

7,10,1996,65626

7,11,1996,94774

7,12,1996,117262

Read Data Save Script Help Cancel

Under '**Header**' select the '**Lines**' radio button (and enter '1' in the white box if it doesn't already show). Under '**Column Format**' select the '**Custom**' radio button and ',' delimiter.

The following dialogue box results:

The image shows a 'Script Creation Wizard' dialog box with two tabs: 'File Properties' and 'Data Mapping'. The 'Data Mapping' tab is active. It contains fields for 'Data File', 'Script File', and 'Description'. Below these are three sections: 'Header', 'Column Format', and 'Line Ending'. The 'Header' section has radio buttons for 'Skip' (checked), 'None', 'Starts With' (with a '#' and '1' input), and 'Lines'. The 'Column Format' section has radio buttons for 'Fixed Width', 'Tab Delimited', 'Space Delimited', and 'Custom' (with a ',' input). The 'Line Ending' section has radio buttons for 'CR/LF or CR' (checked), 'LF', 'ASCII Char' (with '13' input), and 'Line Length' (with '80' input). At the bottom, there is a table with 5 columns and 10 rows of data. Below the table are four buttons: 'Read Data', 'Save Script', 'Help', and 'Cancel'.

File Properties **Data Mapping**

Data File: C:\GW Toolbox\Tutorials\Reading data from Excel file\Reading data fr Browse

Script File: Browse

Description: txtScriptDesc

Header

☒ Skip

☐ None

☐ Starts With # 1

☒ Lines

Column Format

☐ Fixed Width

☐ Tab Delimited

☐ Space Delimited

☒ Custom: ,

Line Ending

☒ CR/LF or CR

☐ LF

☐ ASCII Char: 13

☐ Line Length: 80

Column Number:

1	2	3	4
4	24	1996	96095
4	25	1996	79335
4	26	1996	69252
4	27	1996	61946
4	28	1996	57460
4	29	1996	54729
4	30	1996	73119
5	1	1996	121808
5	2	1996	85228

Read Data Save Script Help Cancel

Now select the '**Data Mapping**' option in the above dialogue box.

The following dialog box results:

The dialog box is titled "Script Creation Wizard" and has two tabs: "File Properties" and "Data Mapping". The "Data Mapping" tab is active, showing a table with five columns: "Name", "Attribute", "Input Column", "Constant", and "Skip Values". The table contains the following data:

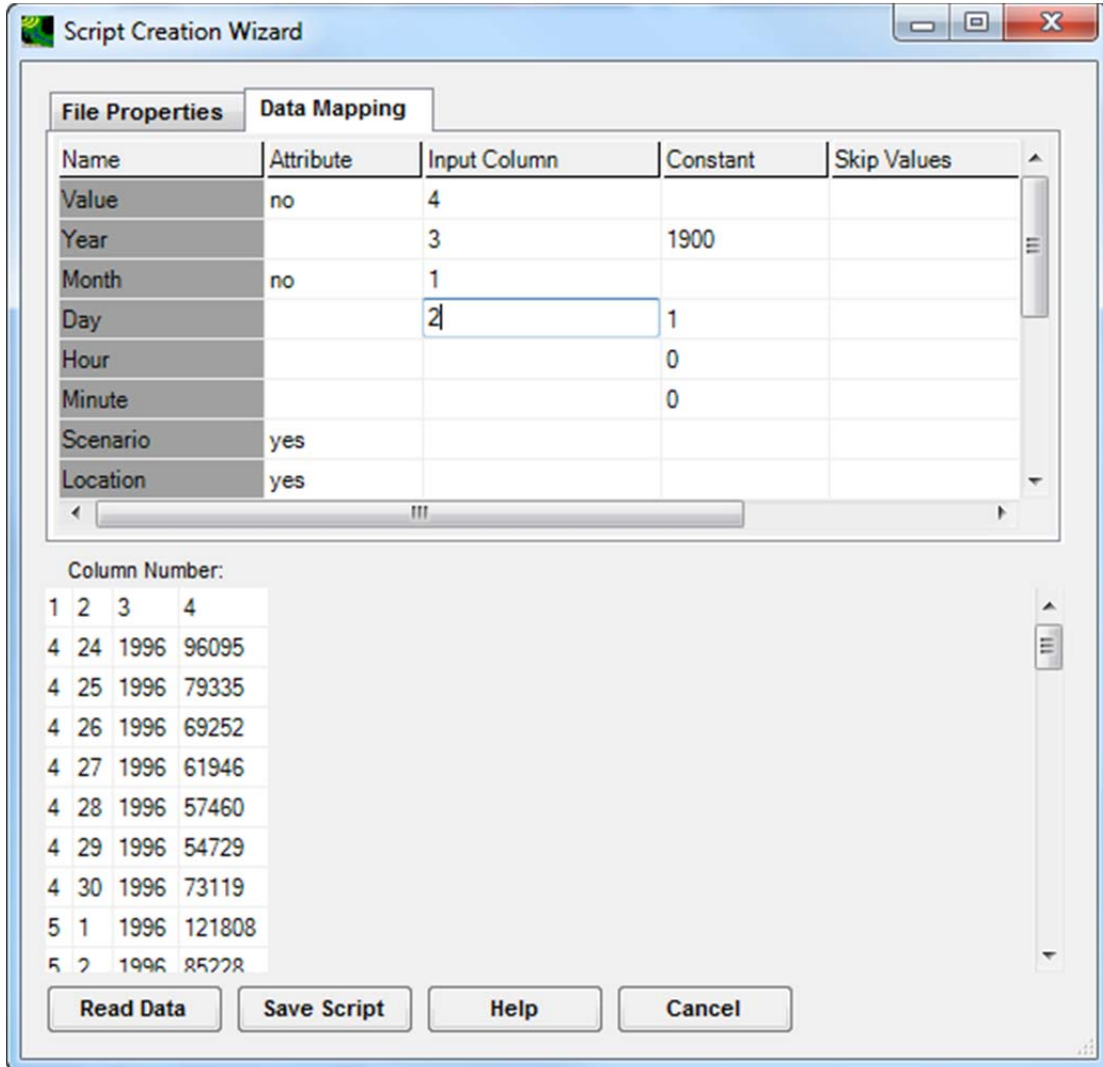
Name	Attribute	Input Column	Constant	Skip Values
Value	no			
Year			1900	
Month	no			
Day			1	
Hour			0	
Minute			0	
Scenario	yes			
Location	yes			

Below the table, there is a section labeled "Column Number:" with a table showing data for columns 1 through 4:

Column Number:	1	2	3	4
4	24	1996	96095	
4	25	1996	79335	
4	26	1996	69252	
4	27	1996	61946	
4	28	1996	57460	
4	29	1996	54729	
4	30	1996	73119	
5	1	1996	121808	
5	2	1996	85228	

At the bottom of the dialog box, there are four buttons: "Read Data", "Save Script", "Help", and "Cancel".

The first step is to associate each column of data with an 'Input Column:'



The image shows a 'Script Creation Wizard' window with the 'Data Mapping' tab selected. The window contains a table for mapping data attributes to input columns. Below the table is a preview of the data columns and rows. At the bottom are buttons for 'Read Data', 'Save Script', 'Help', and 'Cancel'.

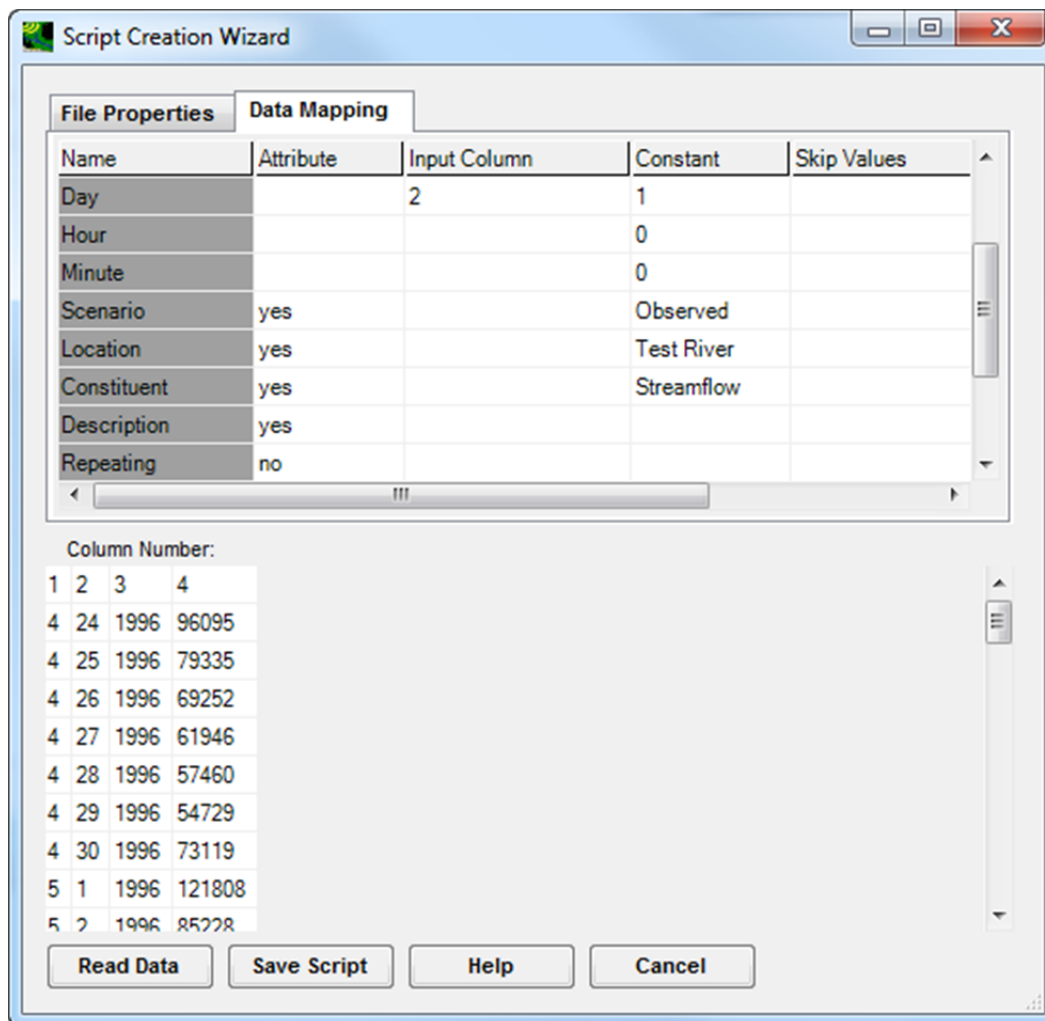
Name	Attribute	Input Column	Constant	Skip Values
Value	no	4		
Year		3	1900	
Month	no	1		
Day		2	1	
Hour			0	
Minute			0	
Scenario	yes			
Location	yes			

Column Number:

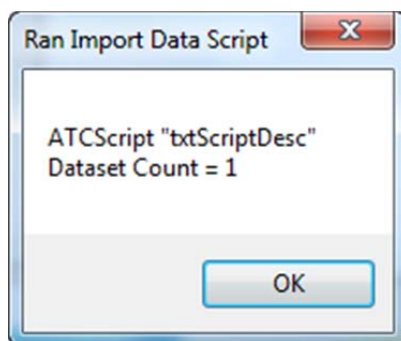
1	2	3	4
4	24	1996	96095
4	25	1996	79335
4	26	1996	69252
4	27	1996	61946
4	28	1996	57460
4	29	1996	54729
4	30	1996	73119
5	1	1996	121808
5	2	1996	85228

Read Data Save Script Help Cancel

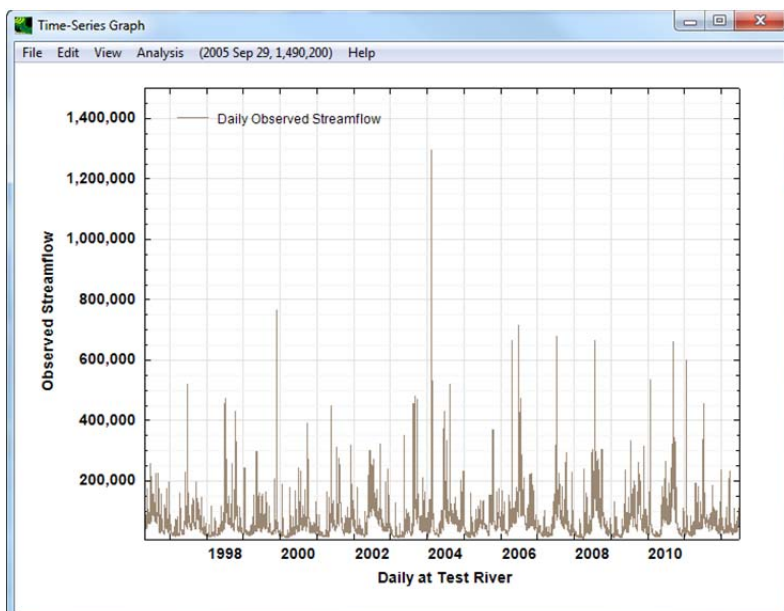
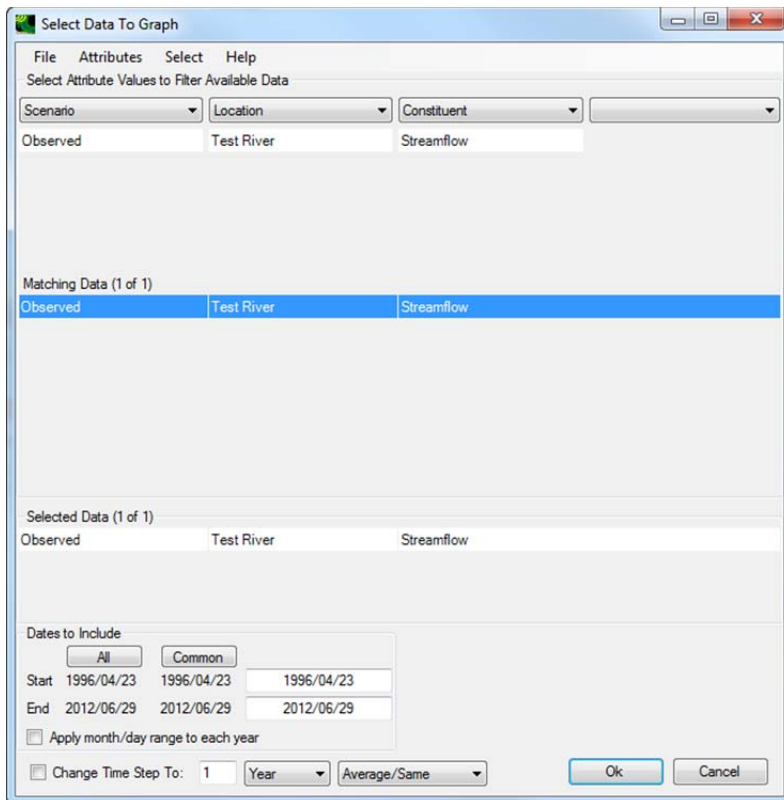
The user also might want to assign descriptive attributes to the data using the 'Scenario,' 'Location,' and other options under the 'Name' column. This is done by specifying the attribute values in the 'Constant' column, such as the following:



The user can now either read the data into the Toolbox ('**Read Data**') or save these read instructions to a script for later use. In this case, we'll read the data ('**Read Data**'), which leads to the following message:



The user can now close 'Run Import Data Script' dialog box, and then use the data for analyses, such as graphing:



Note, however, that if the Base-Flow Separation methods are selected for analysis, the drainage area (in square miles) must be entered manually into the dialog box.