

Flow Duration Curves

To establish representative low flows and floods (high flows) for a river course a hydrologist will analyse the frequency of daily flows in the form of a flow duration curve. A flow duration curve is a plot of discharge vs. amount of time that a certain discharge was exceeded. For most studies the data needed for this analysis is the daily average flow (the average *discharge* or *flow* for each day), hence this is used in this example.

Example

1. Within the Datasheet ensure you are viewing the variables required for the calculation:
Flow and two variables to output *Daily Average Flow* and *Percent of time exceeded*.
2. To calculate the **Daily average flow**
 - Open the conversion tool
 - Select Master Variable A (*140 Flow*)
 - Enter the formula *dailyavgA*
 - Select the output variable (Daily Avg Flow)

Station	Date	Time	140 Flow	Flow (Daily Avg)	Percent (%)
GS 105450	1/01/2009	12:00:00 AM	113.678		
GS 105450	1/01/2009	12:15:00 AM	119.642		
GS 105450	1/01/2009	12:30:00 AM	122.876		
GS 105450	1/01/2009	12:45:00 AM	124.558		
GS 105450	1/01/2009	1:00:00 AM	124.687		
GS 105450	1/01/2009	1:15:00 AM	123.523		
GS 105450	1/01/2009	1:30:00 AM	123.135		
GS 105450	1/01/2009	1:45:00 AM	122.747		
GS 105450	1/01/2009	2:00:00 AM	121.712		
GS 105450	1/01/2009	2:15:00 AM	122.230		
GS 105450	1/01/2009	2:30:00 AM	123.523		

The screenshot shows the 'Conversions - New Conversion Set' dialog box. The 'Master Variable A'' section is set to 'Newry, GS 105450 Frieda DS Nena' with '140 Flow' as the variable. The 'Output' section has the formula 'dailyavgA' and 'Flow (Daily Avg)' selected as the output variable. The 'Update database variable' checkbox is checked. A 'Conversion Graph' window is open, showing a line graph of flow data over time.

- Check the *Update database variable* box and the *Update conversion form variable* box and click **Update data**.

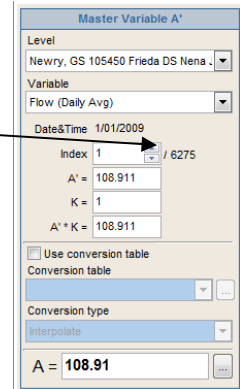
3. Once the conversion has run you will have the *Daily Average Flow* for the river and you can **calculate the Percent of time exceeded**

- Within the conversion tool select the *Daily Average Flow* variable you have just populated with the previous calculation

- Enter the following formula $(\text{RankDSCA}/(n + 1)) * 100$

RankDSC is used in the formula to sort (rank) the average daily discharges for the period of record from the largest value to the smallest value, involving a total of *n* values, where *n* equals the number of points or events for the period of flow records being analysed.

So, in our example, there are 6275 flow points in the period, and this is displayed in the conversion tool window.



So, the formula to be entered is $(\text{RankDSCA}/(6275+1)) * 100$

- Select an output variable (for example, *Percent*)
- Check the *Update database variable* box
- Click **Update data**.

4. Close the conversion tool window, ensuring you *refresh the datasheet* to see the current data.

Creating the Flow Duration Curve

Using your calculated data you can now create a Flow Duration Curve

- Click the **New Graph** tab
- Place the *Percent exceeded* variable on to the x-axis
- Place the *Daily Average Flow* variable on the y-axis

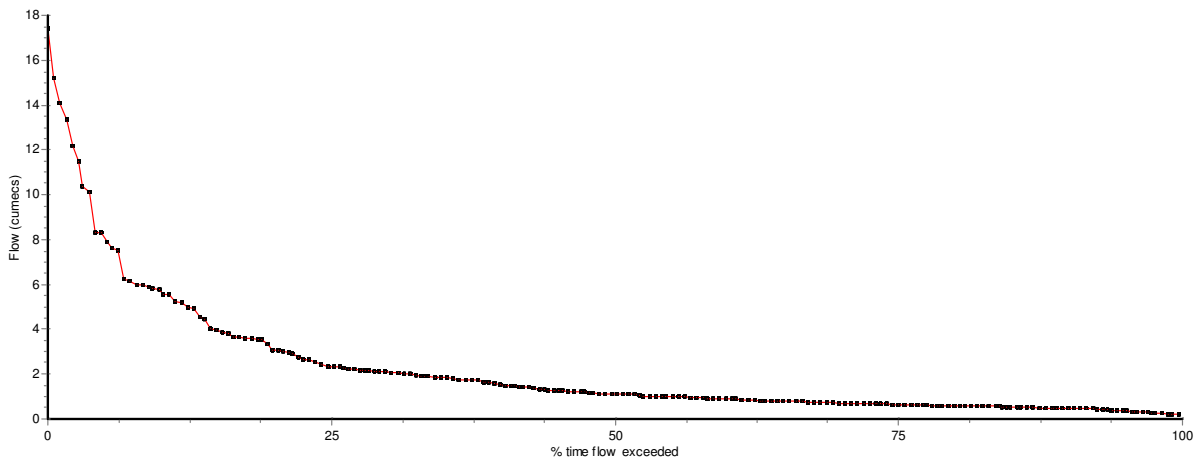


Figure 1.1 Flow duration curve for the East Creek (2008-09 data).

