Analysis Techniques: Flow Duration Analysis Tutorial

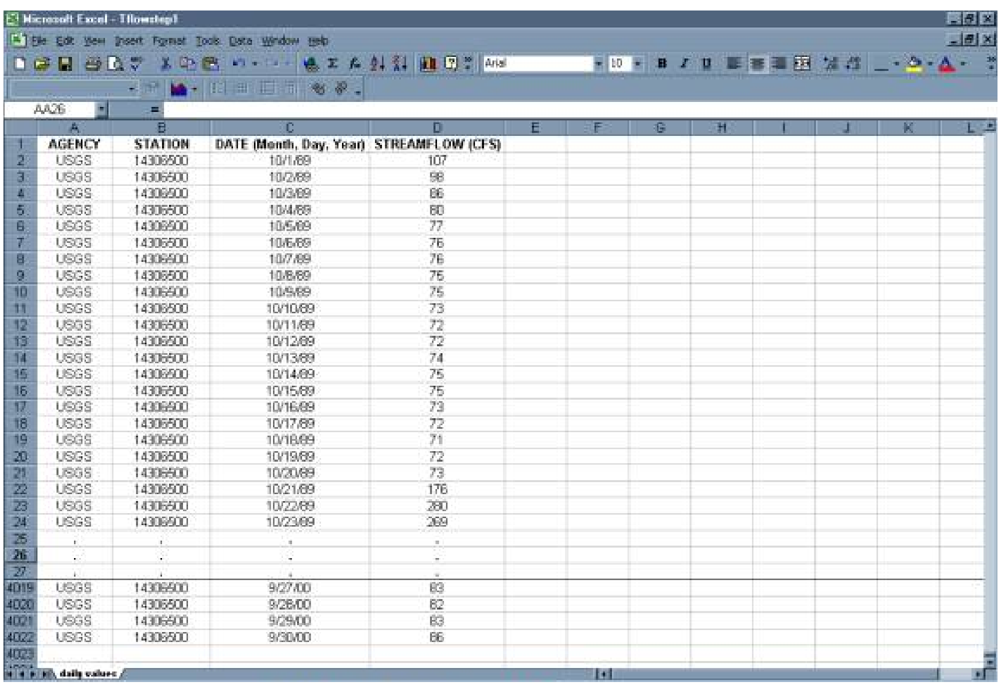
Information to get started:

- The lesson below contains step-by-step instructions and "snapshots" of what each step looks like when carried out in a Microsoft Excel workbook. Blue shading of information in the Excel illustrations denotes changes made from the previous step. Dots placed in three consecutive rows indicate that a portion of data is hidden from sight.
- You can download an Excel workbook containing the complete data set by clicking on the "Download Data" link below. It contains each calculation step on a separate worksheet. To move between steps, click on the tabs at the bottom of the excel window.
- When you download the file, it may open in your browser window. You may wish to use the "save as" function to save the file to a local drive and then reopen it in Excel. This will make it easier to flip between the online lesson and the example workbook.
- Finally, we want to remind you that the techniques explained on this site are statistically based; therefore results must be viewed as predictions and not as facts. Please use the techniques and the information obtained from them responsibly!

Download Data

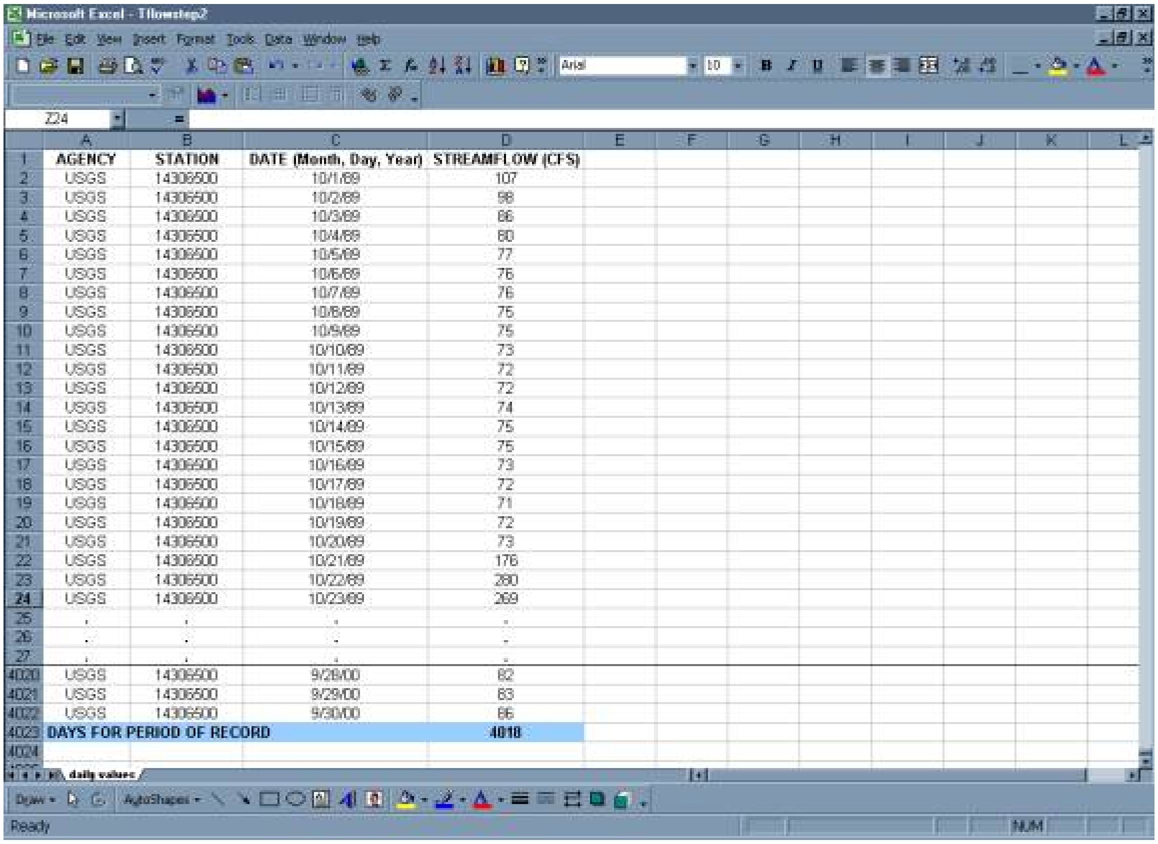
Step 1: Select the time step value (day, month, etc.) and download the chronological record of discharge

- For the Alsea Example and Tutorial, the analysis will be done using a daily time step.



	A	B	C	D
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)
2	USGS	14306500	10/1/89	107
3	USGS	14306500	10/2/89	98
4	USGS	14306500	10/3/89	86
5	USGS	14306500	10/4/89	80
6	USGS	14306500	10/5/89	77
7	USGS	14306500	10/6/89	76
8	USGS	14306500	10/7/89	76
9	USGS	14306500	10/8/89	75
10	USGS	14306500	10/9/89	75
11	USGS	14306500	10/10/89	73
12	USGS	14306500	10/11/89	72
13	USGS	14306500	10/12/89	72
14	USGS	14306500	10/13/89	74
15	USGS	14306500	10/14/89	75
16	USGS	14306500	10/15/89	75
17	USGS	14306500	10/16/89	73
18	USGS	14306500	10/17/89	72
19	USGS	14306500	10/18/89	71
20	USGS	14306500	10/19/89	72
21	USGS	14306500	10/20/89	73
22	USGS	14306500	10/21/89	176
23	USGS	14306500	10/22/89	280
24	USGS	14306500	10/23/89	269
25	.	.	.	.
26	.	.	.	.
27	.	.	.	.
4019	USGS	14306500	9/27/00	83
4020	USGS	14306500	9/28/00	82
4021	USGS	14306500	9/29/00	83
4022	USGS	14306500	9/30/00	86
4023				

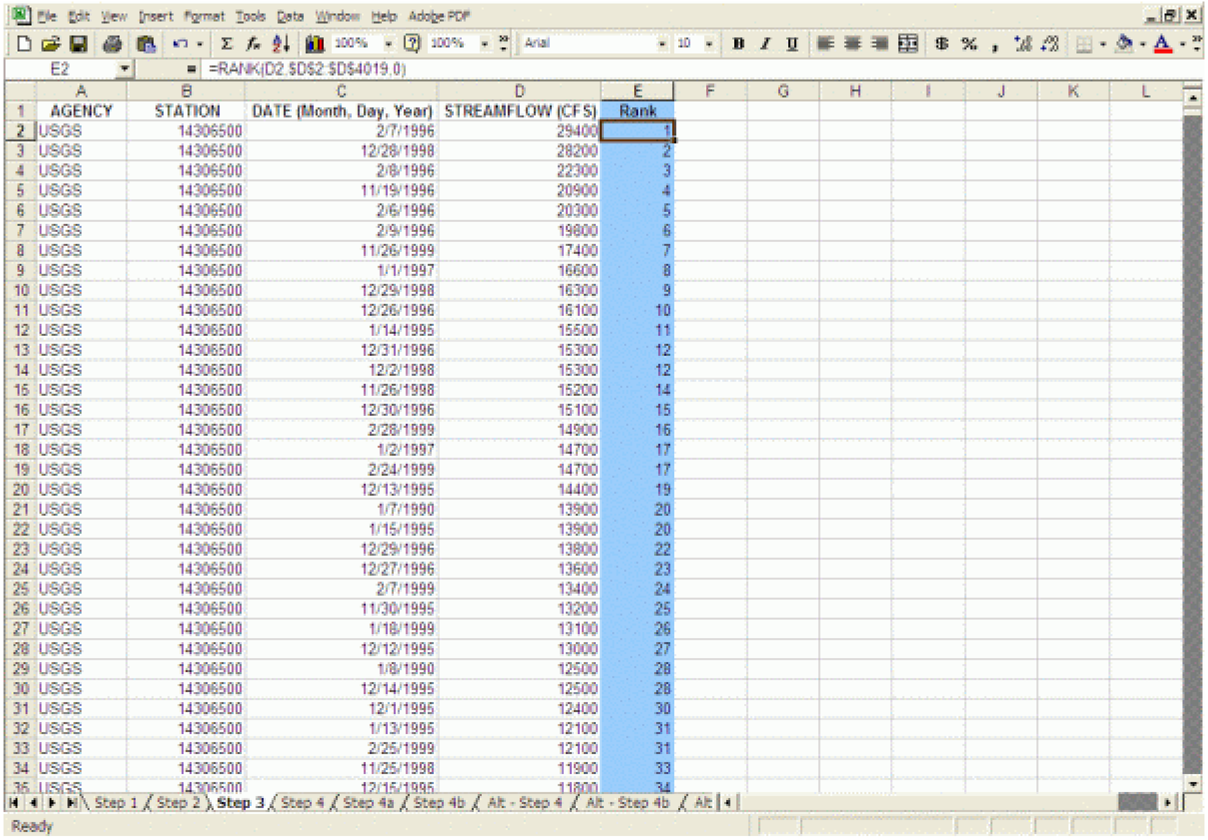
Step 2: Compute the total number of time step intervals in the period of record.



	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)
2	USGS	14306500	10/1/89	107
3	USGS	14306500	10/2/89	98
4	USGS	14306500	10/3/89	86
5	USGS	14306500	10/4/89	80
6	USGS	14306500	10/5/89	77
7	USGS	14306500	10/6/89	76
8	USGS	14306500	10/7/89	76
9	USGS	14306500	10/8/89	75
10	USGS	14306500	10/9/89	75
11	USGS	14306500	10/10/89	73
12	USGS	14306500	10/11/89	72
13	USGS	14306500	10/12/89	72
14	USGS	14306500	10/13/89	74
15	USGS	14306500	10/14/89	75
16	USGS	14306500	10/15/89	75
17	USGS	14306500	10/16/89	73
18	USGS	14306500	10/17/89	72
19	USGS	14306500	10/18/89	71
20	USGS	14306500	10/19/89	72
21	USGS	14306500	10/20/89	73
22	USGS	14306500	10/21/89	176
23	USGS	14306500	10/22/89	280
24	USGS	14306500	10/23/89	269
25	.	.	.	.
26	.	.	.	.
27	.	.	.	.
4020	USGS	14306500	9/28/00	82
4021	USGS	14306500	9/29/00	83
4022	USGS	14306500	9/30/00	86
4023	DAYS FOR PERIOD OF RECORD			4018
4024				

Step 3: Rank discharge by magnitude.

- Use the "sort" command to rank the entries by discharge, from largest to smallest.
- Create a new column called "Rank". Use the excel "rank" function to determine the rank of each discharge in the period of record.



E2 = =RANK(D2,$D$2:$D$4019,0)

	A	B	C	D	E
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)	Rank
2	USGS	14306500	2/7/1996	29400	1
3	USGS	14306500	12/28/1998	28200	2
4	USGS	14306500	2/8/1996	22300	3
5	USGS	14306500	11/19/1996	20900	4
6	USGS	14306500	2/6/1996	20300	5
7	USGS	14306500	2/9/1996	19800	6
8	USGS	14306500	11/26/1999	17400	7
9	USGS	14306500	1/1/1997	16600	8
10	USGS	14306500	12/29/1998	16300	9
11	USGS	14306500	12/26/1996	16100	10
12	USGS	14306500	1/14/1995	15500	11
13	USGS	14306500	12/31/1996	15300	12
14	USGS	14306500	12/2/1998	15300	12
15	USGS	14306500	11/26/1998	15200	14
16	USGS	14306500	12/30/1996	15100	15
17	USGS	14306500	2/28/1999	14900	16
18	USGS	14306500	1/2/1997	14700	17
19	USGS	14306500	2/24/1999	14700	17
20	USGS	14306500	12/13/1995	14400	19
21	USGS	14306500	1/7/1990	13900	20
22	USGS	14306500	1/15/1995	13900	20
23	USGS	14306500	12/29/1996	13800	22
24	USGS	14306500	12/27/1996	13600	23
25	USGS	14306500	2/7/1999	13400	24
26	USGS	14306500	11/30/1995	13200	25
27	USGS	14306500	1/18/1999	13100	26
28	USGS	14306500	12/12/1995	13000	27
29	USGS	14306500	1/8/1990	12500	28
30	USGS	14306500	12/14/1995	12500	28
31	USGS	14306500	12/1/1995	12400	30
32	USGS	14306500	1/13/1995	12100	31
33	USGS	14306500	2/25/1999	12100	31
34	USGS	14306500	11/25/1998	11900	33
35	USGS	14306500	12/15/1995	11800	34

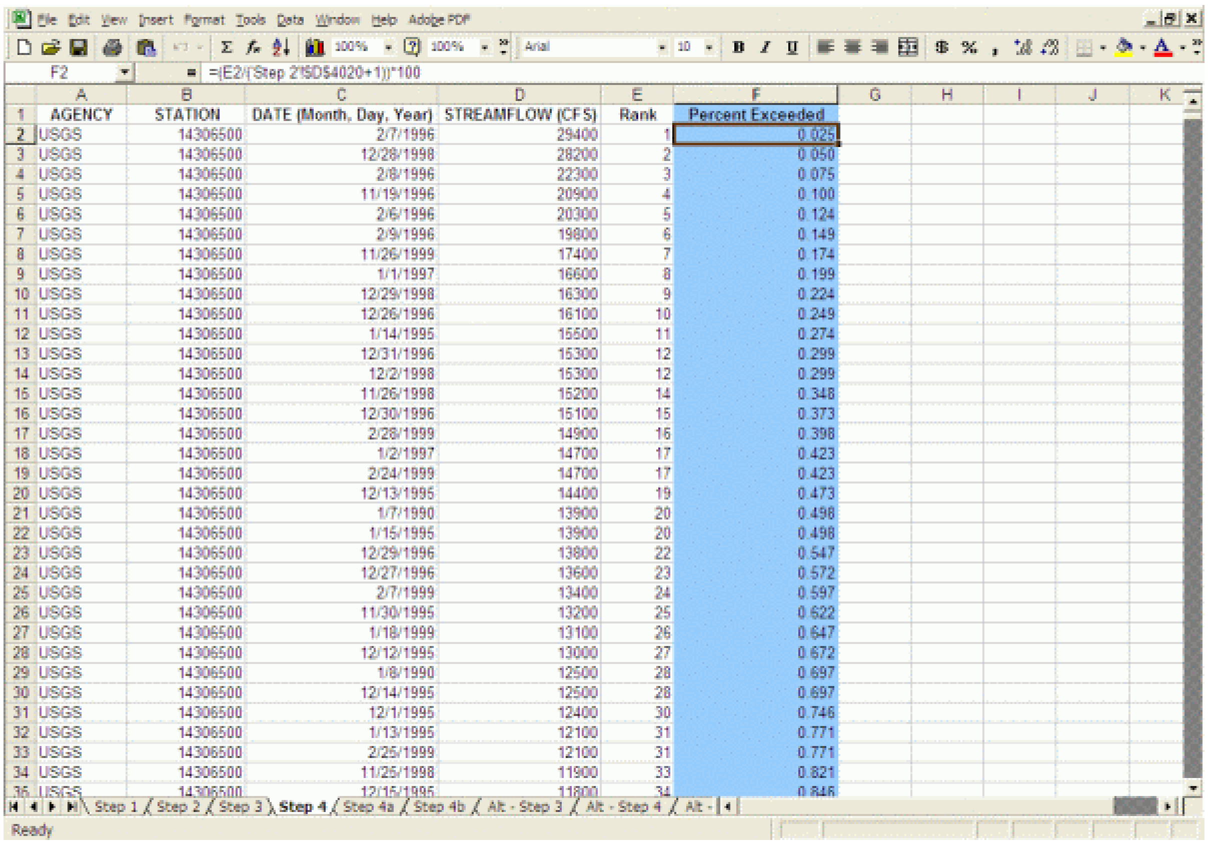
Step 4: Calculate the percent of time that each discharge is equaled or exceeded.

- Create a new column called "Exceedence Probability". As noted on the **flow duration page**, the exceedence probability can be calculated as follows:

  P = 100 * [M / (n + 1)]

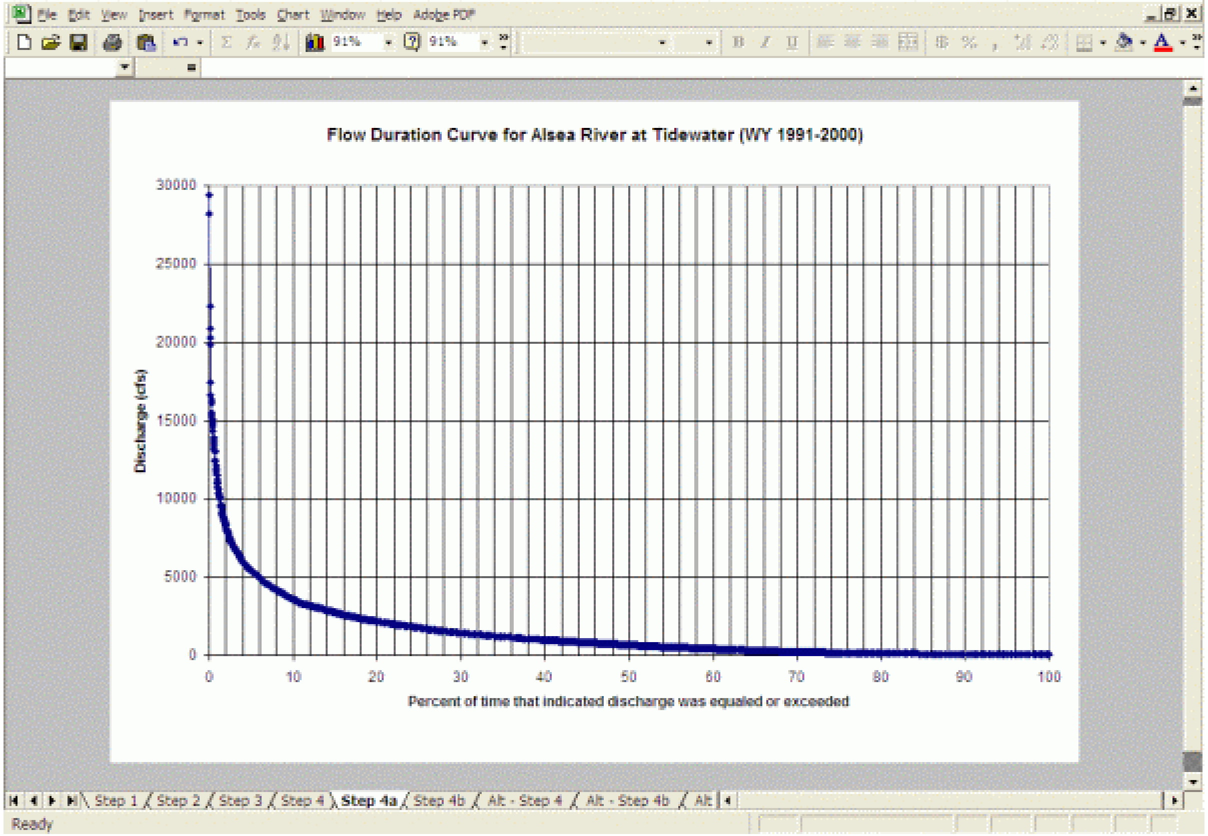
  P = the probability that a given flow will be equaled or exceeded (% of time)
  M = the ranked position on the listing (dimensionless)
  n = the number of events for period of record (dimensionless)

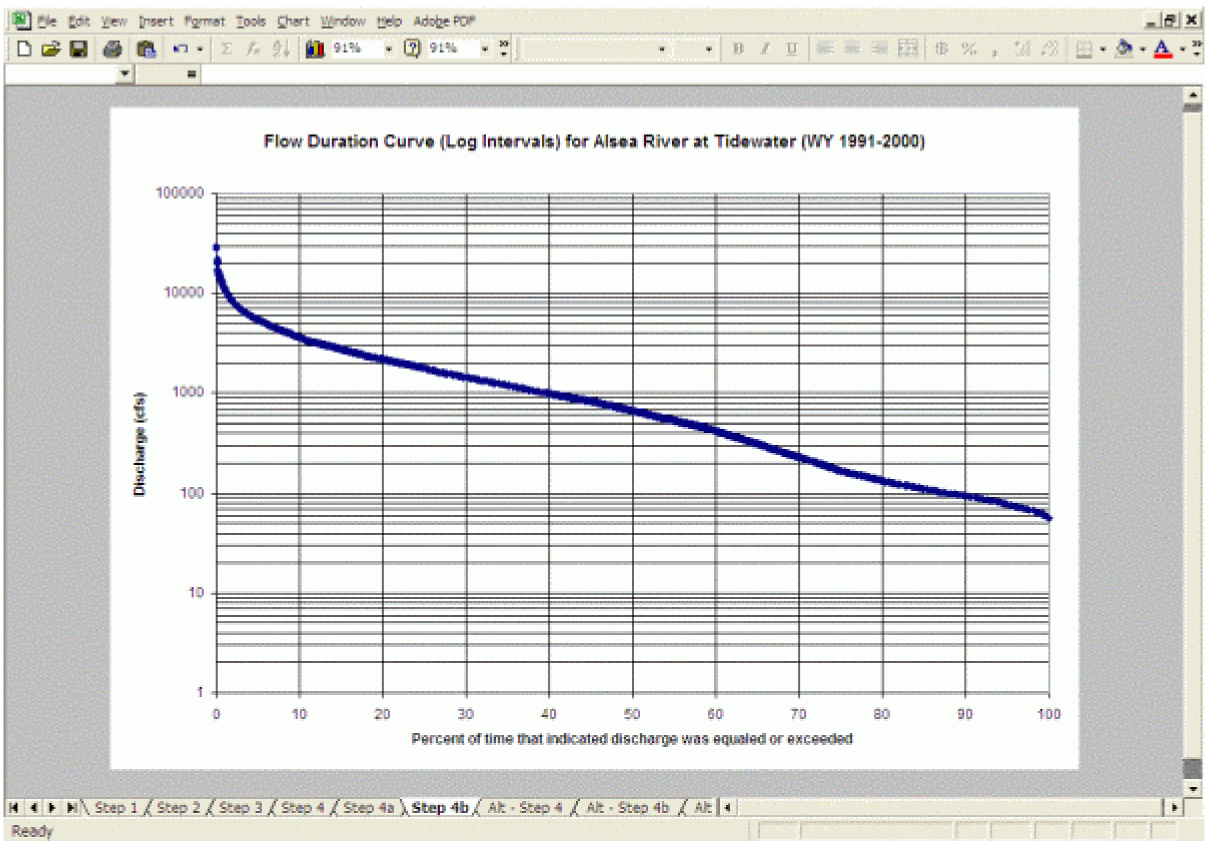
  Create a formula to calculate this value for each record using the information from Step 2 (=(E2/('Step 2'!$D$4020+1))*100).



	A	B	C	D	E	F
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)	Rank	Percent Exceeded
2	USGS	14306500	2/7/1996	29400	1	0.025
3	USGS	14306500	12/28/1998	28200	2	0.050
4	USGS	14306500	2/8/1996	22300	3	0.075
5	USGS	14306500	11/19/1996	20900	4	0.100
6	USGS	14306500	2/6/1996	20300	5	0.124
7	USGS	14306500	2/9/1996	19800	6	0.149
8	USGS	14306500	11/26/1999	17400	7	0.174
9	USGS	14306500	1/1/1997	16600	8	0.199
10	USGS	14306500	12/29/1998	16300	9	0.224
11	USGS	14306500	12/26/1996	16100	10	0.249
12	USGS	14306500	1/14/1995	15500	11	0.274
13	USGS	14306500	12/31/1996	15300	12	0.299
14	USGS	14306500	12/2/1998	15300	12	0.299
15	USGS	14306500	11/26/1998	15200	14	0.348
16	USGS	14306500	12/30/1996	15100	15	0.373
17	USGS	14306500	2/28/1999	14900	16	0.398
18	USGS	14306500	1/2/1997	14700	17	0.423
19	USGS	14306500	2/24/1999	14700	17	0.423
20	USGS	14306500	12/13/1995	14400	19	0.473
21	USGS	14306500	1/7/1990	13900	20	0.498
22	USGS	14306500	1/15/1995	13900	20	0.498
23	USGS	14306500	12/29/1996	13800	22	0.547
24	USGS	14306500	12/27/1996	13600	23	0.572
25	USGS	14306500	2/7/1999	13400	24	0.597
26	USGS	14306500	11/30/1995	13200	25	0.622
27	USGS	14306500	1/18/1999	13100	26	0.647
28	USGS	14306500	12/12/1995	13000	27	0.672
29	USGS	14306500	1/8/1990	12500	28	0.697
30	USGS	14306500	12/14/1995	12500	28	0.697
31	USGS	14306500	12/1/1995	12400	30	0.746
32	USGS	14306500	1/13/1995	12100	31	0.771
33	USGS	14306500	2/25/1999	12100	31	0.771
34	USGS	14306500	11/25/1998	11900	33	0.821
35	USGS	14306500	12/15/1995	11800	34	0.846

- Graph the "exceedence probability" versus the discharge. The graph can have either linear or logarithmic axes.


Flow Duration Curve for Alsea River at Tidewater (WY 1991-2000)
Discharge (cfs)
Percent of time that indicated discharge was equaled or exceeded
Step 1
Step 2
Step 3
Step 4
Step 4a
Step 4b
Alt - Step 4
Alt - Step 4b
Ready

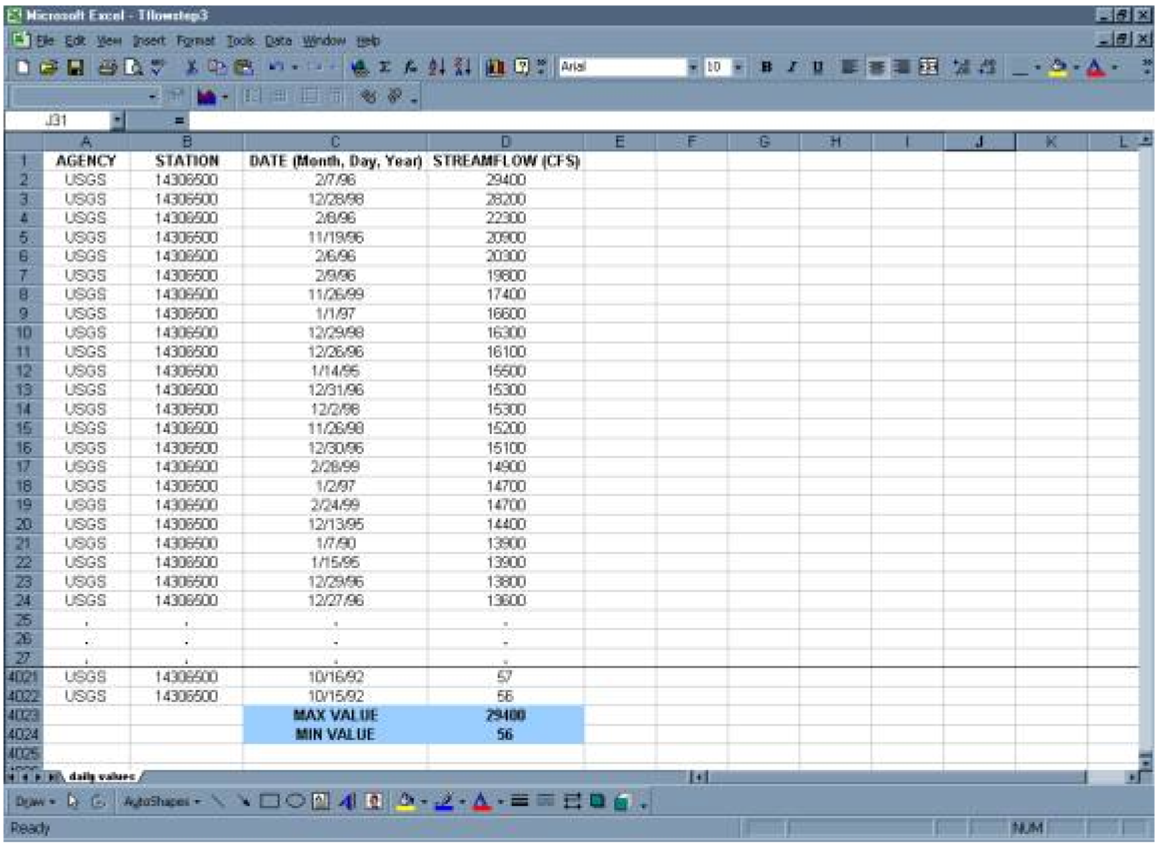

Flow Duration Curve (Log Intervals) for Alsea River at Tidewater (WY 1991-2000)
Discharge (cfs)
Percent of time that indicated discharge was equaled or exceeded
Step 1
Step 2
Step 3
Step 4
Step 4a
Step 4b
Alt - Step 4
Alt - Step 4b
Ready

Alternative Approach:

Before spreadsheet programs were common, flow duration curves were constructed by grouping the data into discharge size classes (bins). This avoided the once time-consuming tasks of sorting, ranking, and graphing the individual discharge records. With modern spreadsheet programs, these steps can be done quickly and flow duration curves can be created as we described above.

However, some flow duration analyses are still made by grouping data into size classes. The steps below will guide you through this alternative approach.

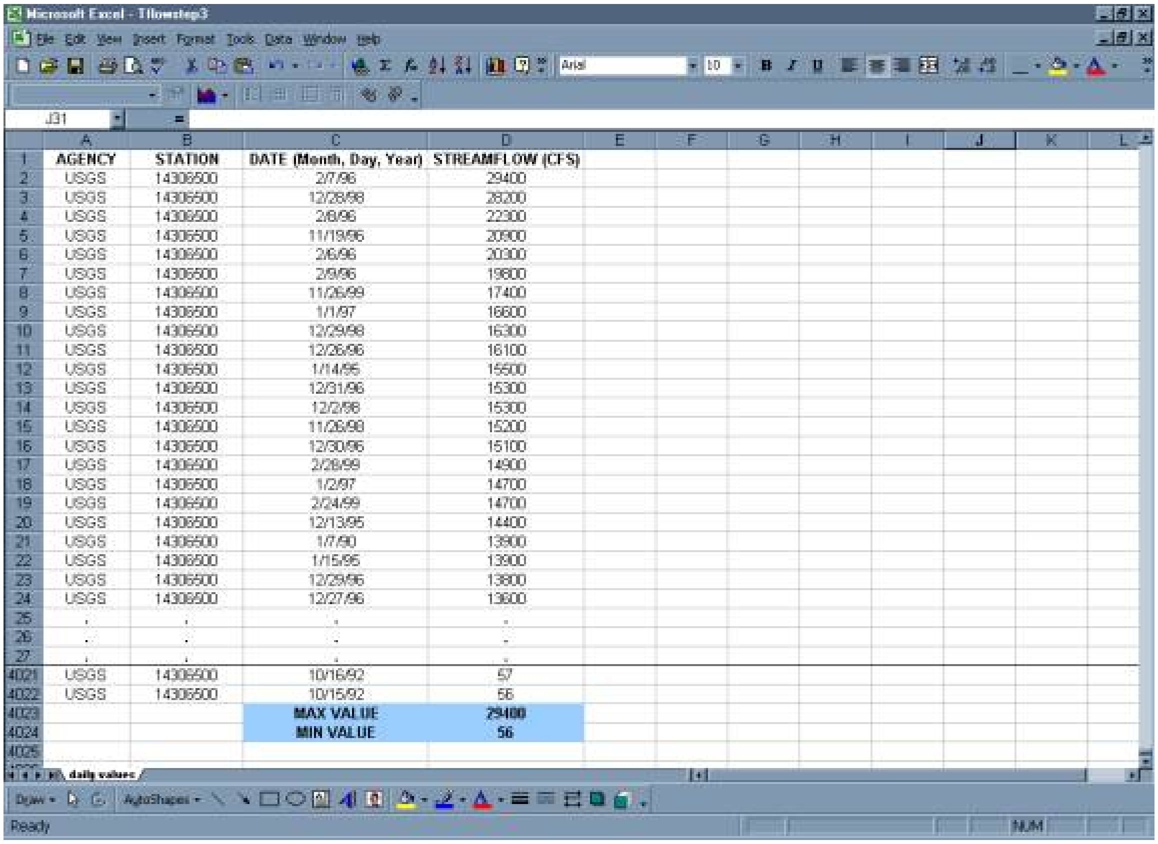
Alternative Step 3: Rank discharge by magnitude and calculate maximum and minimum discharge.



	A	B	C	D
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)
2	USGS	14306500	2/7/96	29400
3	USGS	14306500	12/28/98	28200
4	USGS	14306500	2/8/96	22300
5	USGS	14306500	11/19/96	20900
6	USGS	14306500	2/6/96	20300
7	USGS	14306500	2/9/96	19800
8	USGS	14306500	11/26/99	17400
9	USGS	14306500	1/1/97	16600
10	USGS	14306500	12/29/98	16300
11	USGS	14306500	12/26/96	16100
12	USGS	14306500	1/14/96	15500
13	USGS	14306500	12/31/96	15300
14	USGS	14306500	12/2/98	15300
15	USGS	14306500	11/26/98	15200
16	USGS	14306500	12/30/96	15100
17	USGS	14306500	2/28/99	14900
18	USGS	14306500	1/2/97	14700
19	USGS	14306500	2/24/99	14700
20	USGS	14306500	12/13/95	14400
21	USGS	14306500	1/7/90	13900
22	USGS	14306500	1/15/96	13900
23	USGS	14306500	12/29/96	13800
24	USGS	14306500	12/27/96	13600
25	.	.	.	.
26	.	.	.	.
27	.	.	.	.
4021	USGS	14306500	10/16/92	57
4022	USGS	14306500	10/15/92	56
4023			MAX VALUE	29400
4024			MIN VALUE	56
4025				

Alternative Step 4: Divide the range of average values into classes.

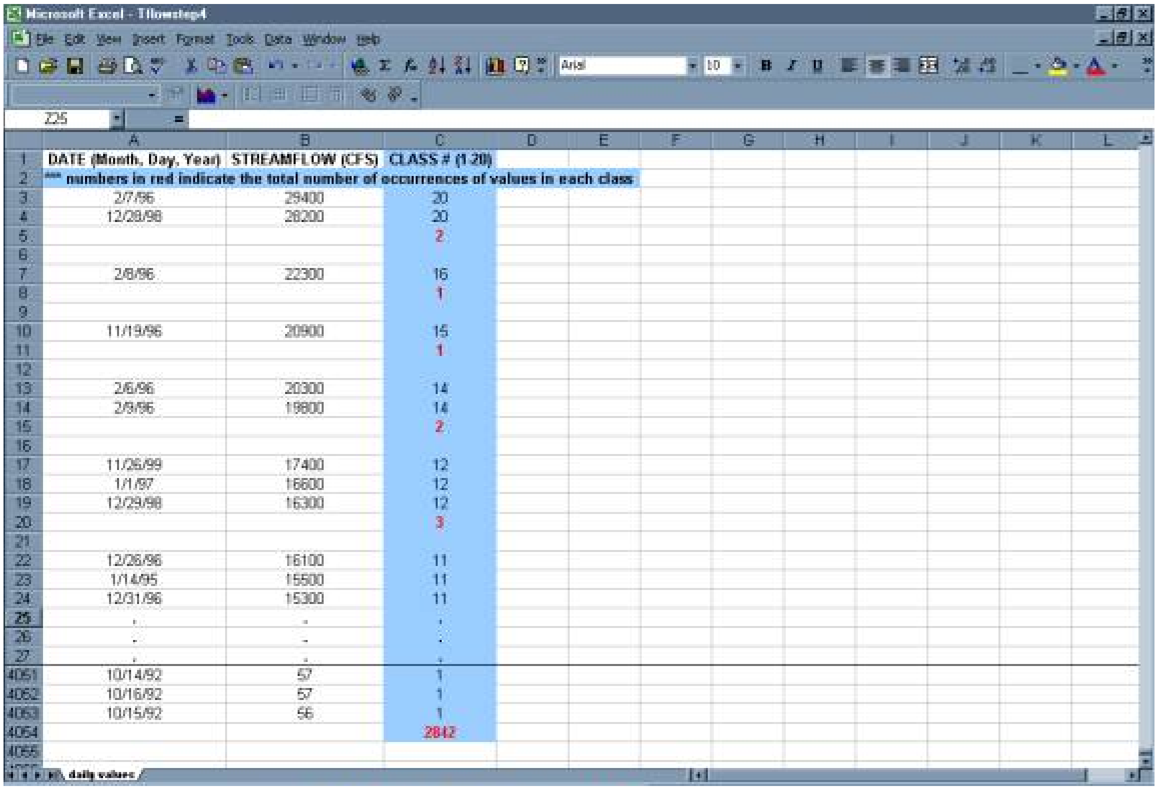
- Calculate the average value of the variable of interest within each time step (average daily value) for the period of record and note the largest and smallest of these average values.



	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)
2	USGS	14306500	2/7/96	29400
3	USGS	14306500	12/28/98	28200
4	USGS	14306500	2/8/96	22300
5	USGS	14306500	11/19/96	20900
6	USGS	14306500	2/6/96	20300
7	USGS	14306500	2/9/96	19800
8	USGS	14306500	11/26/99	17400
9	USGS	14306500	1/1/97	16600
10	USGS	14306500	12/29/98	16300
11	USGS	14306500	12/26/96	16100
12	USGS	14306500	1/14/96	15500
13	USGS	14306500	12/31/96	15300
14	USGS	14306500	12/2/98	15300
15	USGS	14306500	11/26/98	15200
16	USGS	14306500	12/30/96	15100
17	USGS	14306500	2/28/99	14900
18	USGS	14306500	1/2/97	14700
19	USGS	14306500	2/24/99	14700
20	USGS	14306500	12/13/95	14400
21	USGS	14306500	1/7/90	13900
22	USGS	14306500	1/15/96	13900
23	USGS	14306500	12/29/96	13800
24	USGS	14306500	12/27/96	13600
25	.	.	.	.
26	.	.	.	.
27	.	.	.	.
4021	USGS	14306500	10/16/92	57
4022	USGS	14306500	10/15/92	56
4023			**MAX VALUE**	**29400**
4024			**MIN VALUE**	**56**

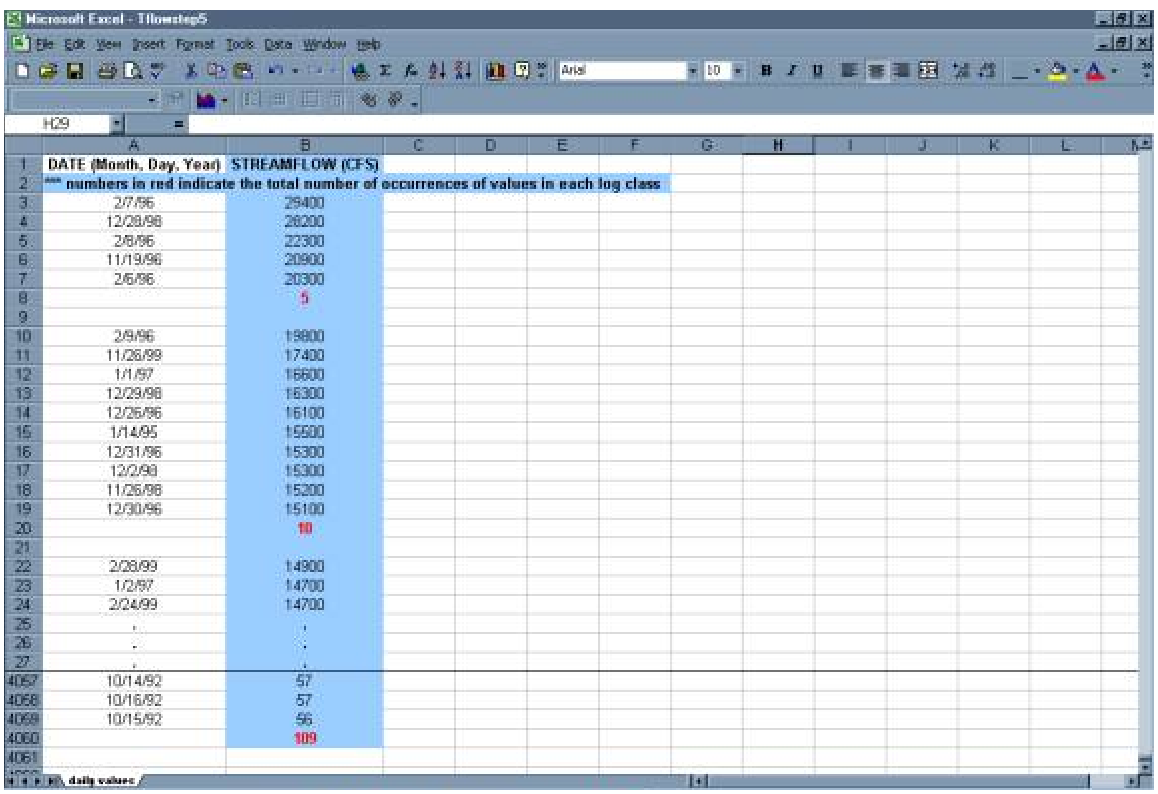
- It is recommended to have between twenty to thirty class intervals for the period of record. Classes can either be equal interval or based on log cycles. Log cycles are often used to sort data because the probability of choosing appropriate interval spacing is higher than if the data were separated into 20 to 30 equal classes. If improper intervals are chosen, the amount of information the flow duration curve can provide is diminished.
    - For the equal interval method, determine the discharge range for each class by dividing the max discharge value by the desired number of size classes. In the tutorial data, the max discharge value is 29400 cfs. That value divided by 20 is 1470. So for twenty size classes with equal intervals in each class, the smallest size class will be discharges between 0-1470 cfs. The second size class will be 1471-2940 cfs and so on, up to the max value.
    - For classes based on log cycles, select classes of discharge values based on a spacing of 1, 1.5, 2, 3, 4, 5, 7, 10, or on multiples of 10 of these values. For the tutorial data, the size classes will be 10-14 cfs, 15-19 cfs, 20-29 cfs on up to 20,000-29,999 cfs.
- Use the ranked data to count the total number of occurrences of values in each class.

20 Equal Class Intervals:



	A	B	C
1	DATE (Month, Day, Year)	STREAMFLOW (CFS)	CLASS # (1-20)
2	*** numbers in red indicate the total number of occurrences of values in each class		
3	2/7/96	29400	20
4	12/28/98	28200	20
5			2
6			
7	2/8/96	22300	16
8			1
9			
10	11/19/96	20900	15
11			1
12			
13	2/6/96	20300	14
14	2/9/96	19800	14
15			2
16			
17	11/26/99	17400	12
18	1/1/97	16600	12
19	12/29/98	16300	12
20			3
21			
22	12/26/96	16100	11
23	1/14/95	15500	11
24	12/31/96	15300	11
25	.	.	.
26	.	.	.
27	.	.	.
4051	10/14/92	57	1
4052	10/16/92	57	1
4053	10/15/92	56	1
4054			2842
4055			

Using Log Cycles:

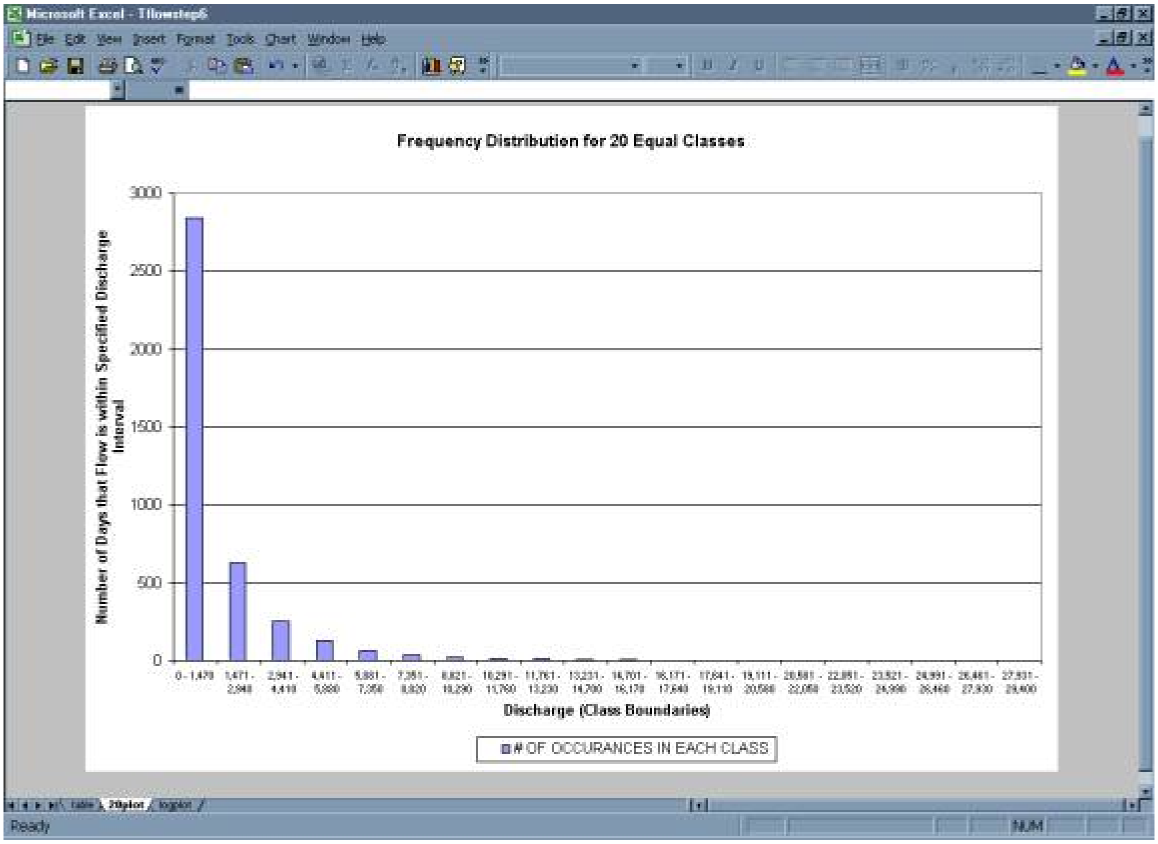


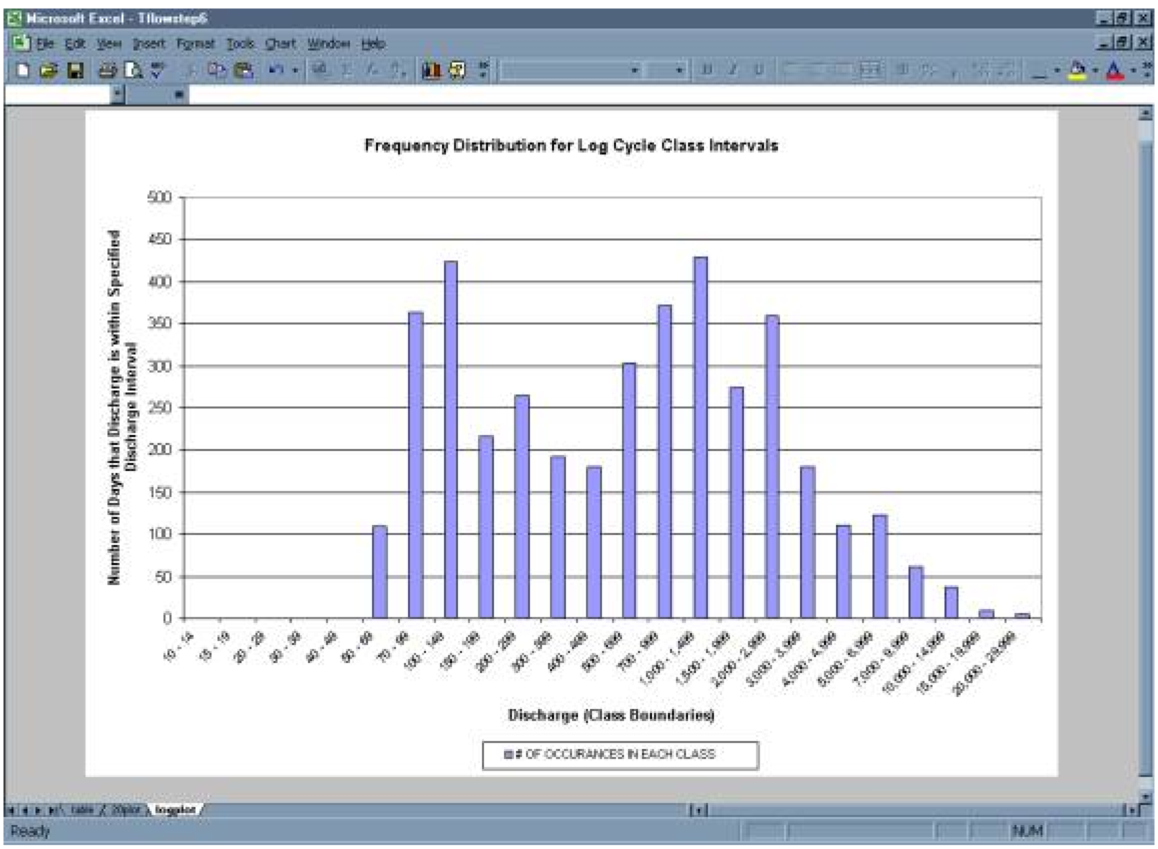
	A	B
1	DATE (Month, Day, Year)	STREAMFLOW (CFS)
2	*** numbers in red indicate the total number of occurrences of values in each log class	
3	2/7/96	29400
4	12/28/98	28200
5	2/8/96	22300
6	11/19/96	20900
7	2/6/96	20300
8		5
9		
10	2/9/96	19800
11	11/26/99	17400
12	1/1/97	16600
13	12/29/98	16300
14	12/26/96	16100
15	1/14/95	15500
16	12/31/96	15300
17	12/2/98	15300
18	11/26/98	15200
19	12/30/96	15100
20		10
21		
22	2/28/99	14900
23	1/2/97	14700
24	2/24/99	14700
25	.	.
26	.	.
27	.	.
4057	10/14/92	57
4058	10/16/92	57
4059	10/15/92	56
4060		109
4061		

Alternative Step 5: Summarize the results in a table.

	20 EQUAL CLASSES		LOG CYCLE INTERVALS	
	CLASS BOUNDARIES	# OF OCCURANCES IN EACH CLASS	CLASS BOUNDARIES	# OF OCCURANCES IN EACH CLASS
1	0 - 1,470	2842	10 - 14	0
2	1,471 - 2,940	626	15 - 19	0
3	2,941 - 4,410	256	20 - 29	0
4	4,411 - 5,880	128	30 - 39	0
5	5,881 - 7,350	65	40 - 49	0
6	7,351 - 8,820	33	50 - 69	109
7	8,821 - 10,290	21	70 - 99	363
8	10,291 - 11,760	12	100 - 149	424
9	11,761 - 13,230	11	150 - 199	217
10	13,231 - 14,700	8	200 - 299	265
11	14,701 - 16,170	7	300 - 399	192
12	16,171 - 17,640	3	400 - 499	180
13	17,641 - 19,110	0	500 - 699	304
14	19,111 - 20,580	2	700 - 999	372
15	20,581 -22,050	1	1,000 - 1,499	429
16	22,051 - 23,520	1	1,500 - 1,999	274
17	23,521 - 24,990	0	2,000 - 2,999	360
18	24,991 - 26,460	0	3,000 - 3,999	180
19	26,461 - 27,930	0	4,000 - 4,999	111
20	27,931 - 29,400	2	5,000 - 6,999	123
			7,000 - 9,999	62
			10,000 - 14,999	38
			15,000 - 19,999	10
			20,000 - 29,999	5

- A plot of the total number of occurrences in each class versus discharge gives a frequency distribution.


Microsoft Excel - Tflowstep6
File Edit View Insert Format Tools Chart Window Help
Frequency Distribution for 20 Equal Classes
Number of Days that Flow is within Specified Discharge Interval
3000
2500
2000
1500
1000
500
0
0 - 1,470
1,471 - 2,940
2,941 - 4,410
4,411 - 5,880
5,881 - 7,350
7,351 - 8,820
8,821 - 10,290
10,291 - 11,760
11,761 - 13,230
13,231 - 14,700
14,701 - 16,170
16,171 - 17,640
17,641 - 19,110
19,111 - 20,580
20,581 - 22,050
22,051 - 23,520
23,521 - 24,990
24,991 - 26,460
26,461 - 27,930
27,931 - 29,400
Discharge (Class Boundaries)
OF OCCURANCES IN EACH CLASS
table
20plot
logplot
Ready
NUM


Microsoft Excel - Tflowstep6
File Edit View Insert Format Tools Chart Window Help
Frequency Distribution for Log Cycle Class Intervals
Number of Days that Discharge is within Specified Discharge Interval
500
450
400
350
300
250
200
150
100
50
0
Discharge (Class Boundaries)
OF OCCURANCES IN EACH CLASS
table
20plot
logplot
Ready
NUM

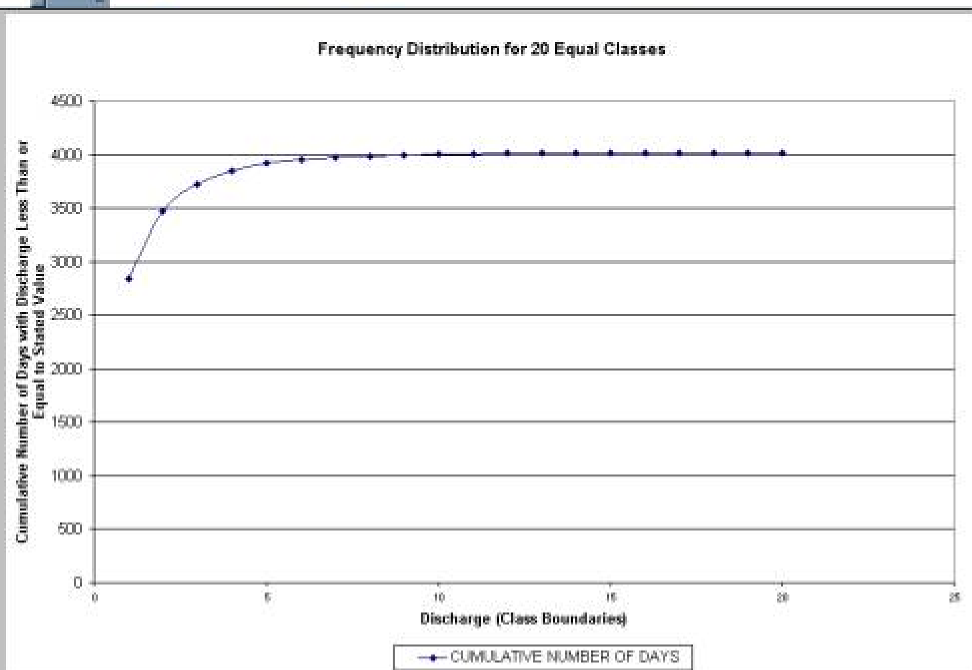
Alternative Step 6: Beginning with the upper boundary of the highest class, add up the total number of values that are greater than the lower boundary for each successive class.

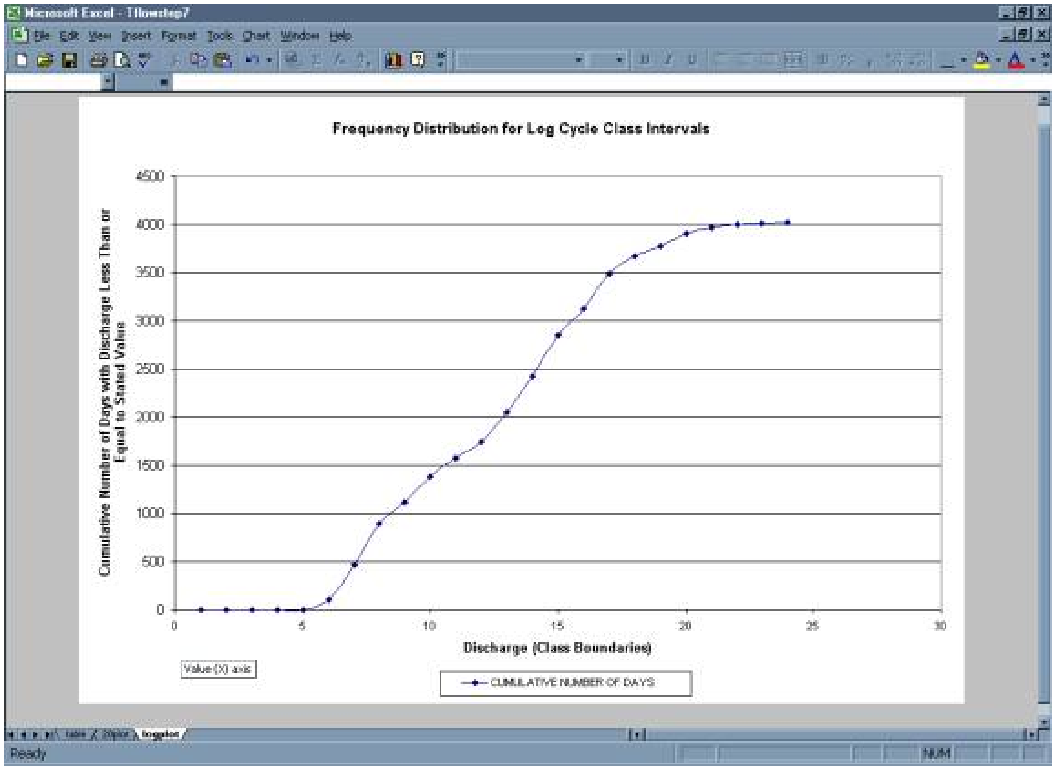
20 EQUAL CLASSES

	CLASS BOUNDARIES	NUMBER OF DAYS IN EACH CLASS	CUMULATIVE NUMBER OF DAYS
1	0 - 1,470	2842	2842
2	1,471 - 2,940	626	3468
3	2,941 - 4,410	256	3724
4	4,411 - 5,880	128	3852
5	5,881 - 7,350	65	3917
6	7,351 - 8,820	33	3950
7	8,821 - 10,290	21	3971
8	10,291 - 11,760	12	3983
9	11,761 - 13,230	11	3994
10	13,231 - 14,700	8	4002
11	14,701 - 16,170	7	4009
12	16,171 - 17,640	3	4012
13	17,641 - 19,110	0	4012
14	19,111 - 20,580	2	4014
15	20,581 -22,050	1	4015
16	22,051 - 23,520	1	4016
17	23,521 - 24,990	0	4016
18	24,991 - 26,460	0	4016
19	26,461 - 27,930	0	4016
20	27,931 - 29,400	2	4018

LOG CYCLE INTERVALS

CLASS BOUNDARIES	NUMBER OF DAYS IN EACH CLASS	CUMULATIVE NUMBER OF DAYS
10 - 14	0	0
15 - 19	0	0
20 - 29	0	0
30 - 39	0	0
40 - 49	0	0
50 - 69	109	109
70 - 99	363	472
100 - 149	424	896
150 - 199	217	1113
200 - 299	265	1378
300 - 399	192	1570
400 - 499	180	1750
500 - 699	304	2054
700 - 999	372	2426
1,000 - 1,499	429	2855
1,500 - 1,999	274	3129
2,000 - 2,999	360	3489
3,000 - 3,999	180	3669
4,000 - 4,999	111	3780
5,000 - 6,999	123	3903
7,000 - 9,999	62	3965
10,000 - 14,999	38	4003
15,000 - 19,999	10	4013
20,000 - 29,999	5	4018





Alternative Step 7: The cumulative number of occurrences is converted to a percentage of the time.

- Divide the values developed above by the total number of time steps from Step 2; this gives the frequency with which the lower values of each class have been equaled or exceeded in the period of record.

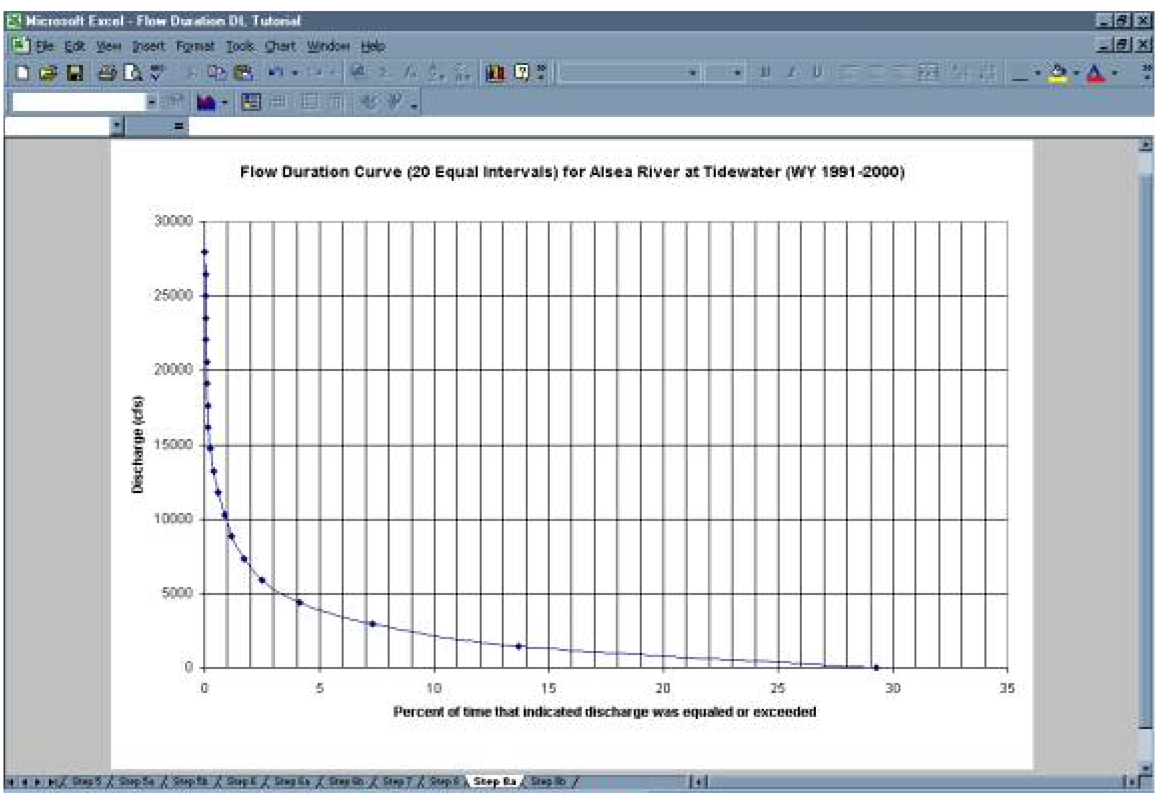
20 EQUAL CLASSES

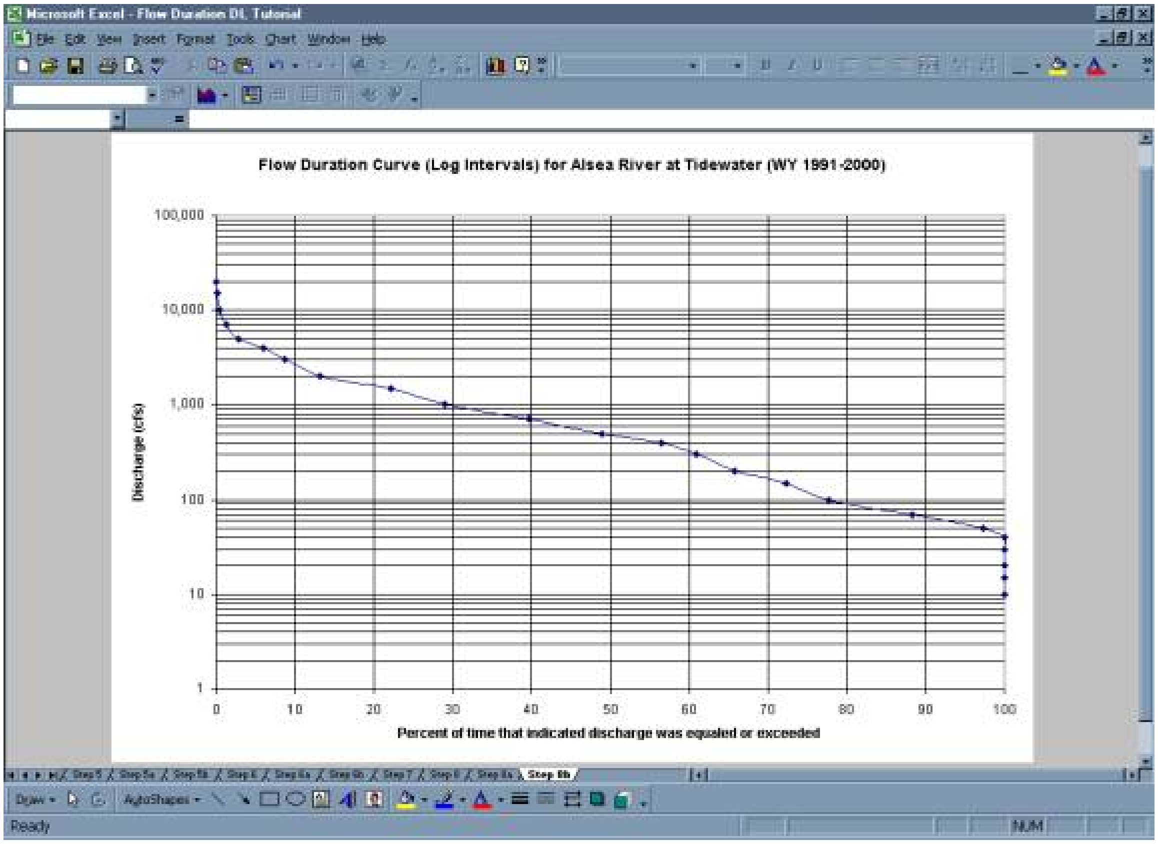
	CLASS BOUNDARIES	NUMBER OF DAYS IN EACH CLASS	CUMULATIVE NUMBER OF DAYS	PERCENT OF TIME FLOW IS NOT EXCEEDED (%)	PERCENT OF TIME FLOW IS EQUALED OR EXCEEDED (%) (100-% NOT EXCEEDED)	CLASS BO
1	0 - 1,470	2842	2842	70.73	29.27	10 -
2	1,471 - 2,940	626	3468	86.31	13.69	15 -
3	2,941 - 4,410	256	3724	92.68	7.32	20 -
4	4,411 - 5,880	128	3852	95.87	4.13	30 -
5	5,881 - 7,350	65	3917	97.49	2.51	40 -
6	7,351 - 8,820	33	3950	98.31	1.69	50 -
7	8,821 - 10,290	21	3971	98.83	1.17	70 -
8	10,291 - 11,760	12	3983	99.13	0.87	100 -
9	11,761 - 13,230	11	3994	99.40	0.60	150 -
10	13,231 - 14,700	8	4002	99.60	0.40	200 -
11	14,701 - 16,170	7	4009	99.78	0.22	300 -
12	16,171 - 17,640	3	4012	99.85	0.15	400 -
13	17,641 - 19,110	0	4012	99.85	0.15	500 -
14	19,111 - 20,580	2	4014	99.90	0.10	700 -
15	20,581 -22,050	1	4015	99.93	0.07	1,000 -
16	22,051 - 23,520	1	4016	99.95	0.05	1,500 -
17	23,521 - 24,990	0	4016	99.95	0.05	2,000 -
18	24,991 - 26,460	0	4016	99.95	0.05	3,000 -
19	26,461 - 27,930	0	4016	99.95	0.05	4,000 -
20	27,931 - 29,400	2	4018	100.00	0.00	5,000 -
						7,000 -
						10,000 -

LOG CYCLE INTERVALS

CLASS BOUNDARIES	NUMBER OF DAYS IN EACH CLASS	CUMULATIVE NUMBER OF DAYS	PERCENT OF TIME FLOW IS NOT EXCEEDED (%)	PERCENT OF TIME FLOW IS EQUALED OR EXCEEDED (%) (100-% NOT EXCEEDED)
10 - 14	0	0	0.00	100.00
15 - 19	0	0	0.00	100.00
20 - 29	0	0	0.00	100.00
30 - 39	0	0	0.00	100.00
40 - 49	0	0	0.00	100.00
50 - 69	109	109	2.71	97.29
70 - 99	363	472	11.75	88.25
100 - 149	424	896	22.30	77.70
150 - 199	217	1113	27.70	72.30
200 - 299	265	1378	34.30	65.70
300 - 399	192	1570	39.07	60.93
400 - 499	180	1750	43.55	56.45
500 - 699	304	2054	51.12	48.88
700 - 999	372	2426	60.38	39.62
1,000 - 1,499	429	2855	71.06	28.94
1,500 - 1,999	274	3129	77.87	22.13
2,000 - 2,999	360	3489	86.83	13.17
3,000 - 3,999	180	3669	91.31	8.69
4,000 - 4,999	111	3780	94.08	5.92
5,000 - 6,999	123	3903	97.14	2.86
7,000 - 9,999	62	3965	98.68	1.32
10,000 - 14,999	38	4003	99.63	0.37
15,000 - 19,999	10	4013	99.88	0.12
20,000 - 29,999	5	4018	100.00	0.00

Alternative Step 8: Finally the diagram is turned so that discharge is given on the vertical axis and exceedence frequency is given on the horizontal axis.




Microsoft Excel - Flow Duration DL Tutorial
Flow Duration Curve (Log Intervals) for Alsea River at Tidewater (WY 1991-2000)
100,000
10,000
1,000
100
10
1
Discharge (cfs)
0
10
20
30
40
50
60
70
80
90
100
Percent of time that indicated discharge was equaled or exceeded
Ready
NUM