

Appendix C: Flood-Frequency Computations



06321000, South Piney Creek



06323500, Piney Creek



06324000, Clear Creek



06324500, Powder River

Project: *Cloud Peak Dam Breach*
 Streamgage: *SOUTH PINEY CREEK NEAR STORY, WYO.*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Without Generalized Skew

Average: 6.5524
 Standard Deviation: 0.50935925
 Skew Coefficient⁽¹⁾: 0.00080629

Length of systematic record: 30
 Number of historic peaks: 0
 Length of Data Record: 30
 Length of Historic Record⁽⁵⁾: ----

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.577	7.8649	2,600	3,890	1,980
100	1	2.327	7.7375	2,290	3,320	1,780
50	2	2.054	7.5989	2,000	2,790	1,580
25	4	1.751	7.4445	1,710	2,310	1,380
10	10	1.282	7.2055	1,350	1,720	1,120
5	20	0.842	6.9813	1,080	1,320	914
2	50	0.000	6.5524	701	820	599
1.25	80	-0.842	6.1235	456	537	372

With Generalized Skew

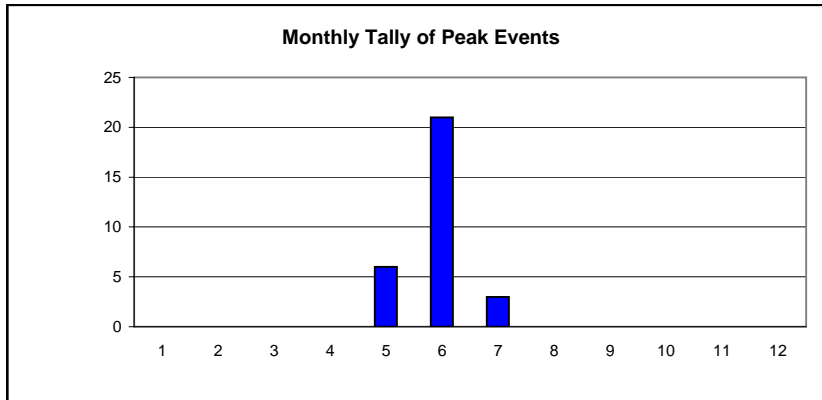
Generalized Skew Coefficient⁽³⁾: 0.0000
 MSE Generalized Skew⁽³⁾: 0.3020
 A: -0.329935
 B: 0.939790
 station skew: 0.000806
 MSE Station Skew: 0.16659829
 Weighted skew coefficient⁽¹⁾: 0.00051999

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.576	7.8648	2,600	3,890	1,980
100	1	2.326	7.7374	2,290	3,310	1,780
50	2	2.054	7.5988	2,000	2,790	1,580
25	4	1.751	7.4444	1,710	2,310	1,380
10	10	1.282	7.2055	1,350	1,720	1,120
5	20	0.842	6.9813	1,080	1,320	914
2	50	0.000	6.5524	701	820	599
1.25	80	-0.842	6.1235	456	537	372

- (1) Station and generalized skews must be between -2.00 and +3.00 in this spreadsheet.
- (2) Considering the relatively short length of most gage records, less frequent peak estimates need to be used with considerable care.
- (3) Computed one of four ways (see "generalized skew coefficient" worksheet): Mean and variance (standard deviation²) of station skews coefficients in region; skew isolines drawn on a map or regions; skew prediction equations; read from Plate 1 of Bulletin 17B (reproduced in this spreadsheet), with MSE Generalized Skew = 0.302.
- (4) Results are automatically rounded to three significant figures, the dominant number of significant figures in the K-Value table.
- (5) Historic frequency analysis assumes that intervening years reflect systematic record.

Comments:

Peak Timing:



Month	Count
1	0
2	0
3	0
4	0
5	6
6	21
7	3
8	0
9	0
10	0
11	0
12	0

Project: *Cloud Peak Dam Breach*
 Streamgage: *SOUTH PINEY CREEK NEAR STORY, WYO.*
 Date: *5/25/2004* Performed By: *Steve Yochum*

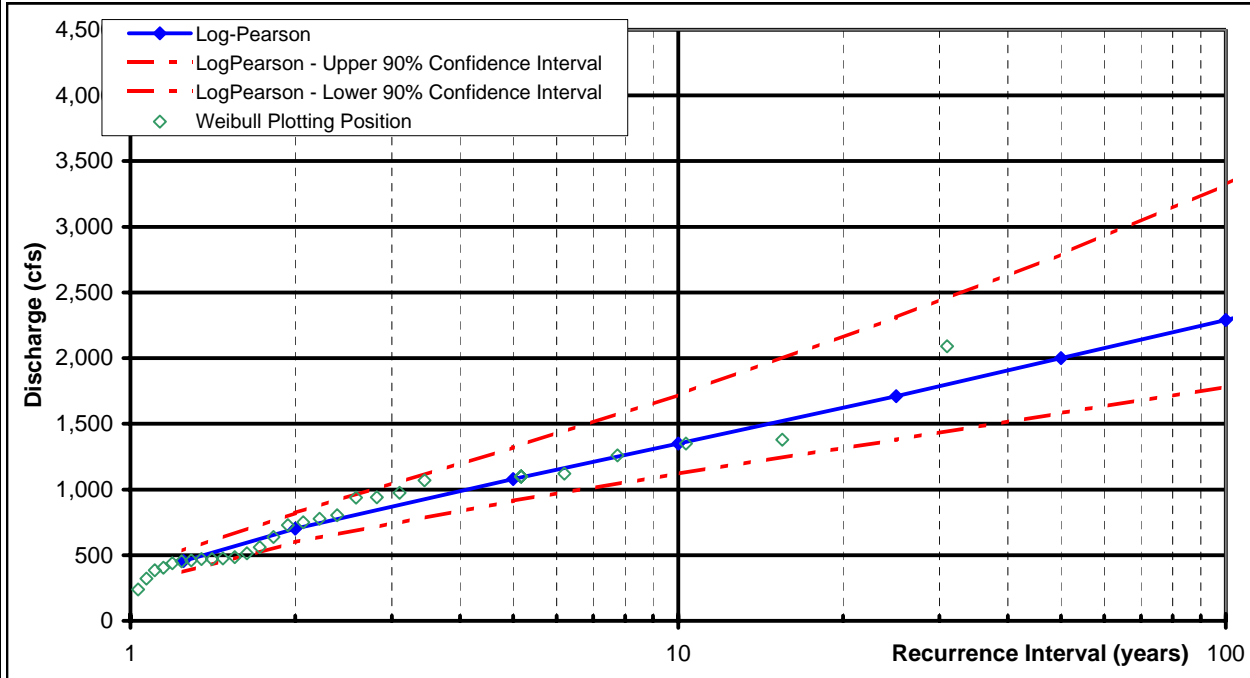
Input Data

Station ID: *06321000* Latitude, Longitude: -- --
 Drainage Area (mi²): *69.4* County: *Johnson*
 Number of low outliers eliminated: *0* State: *Wyoming*

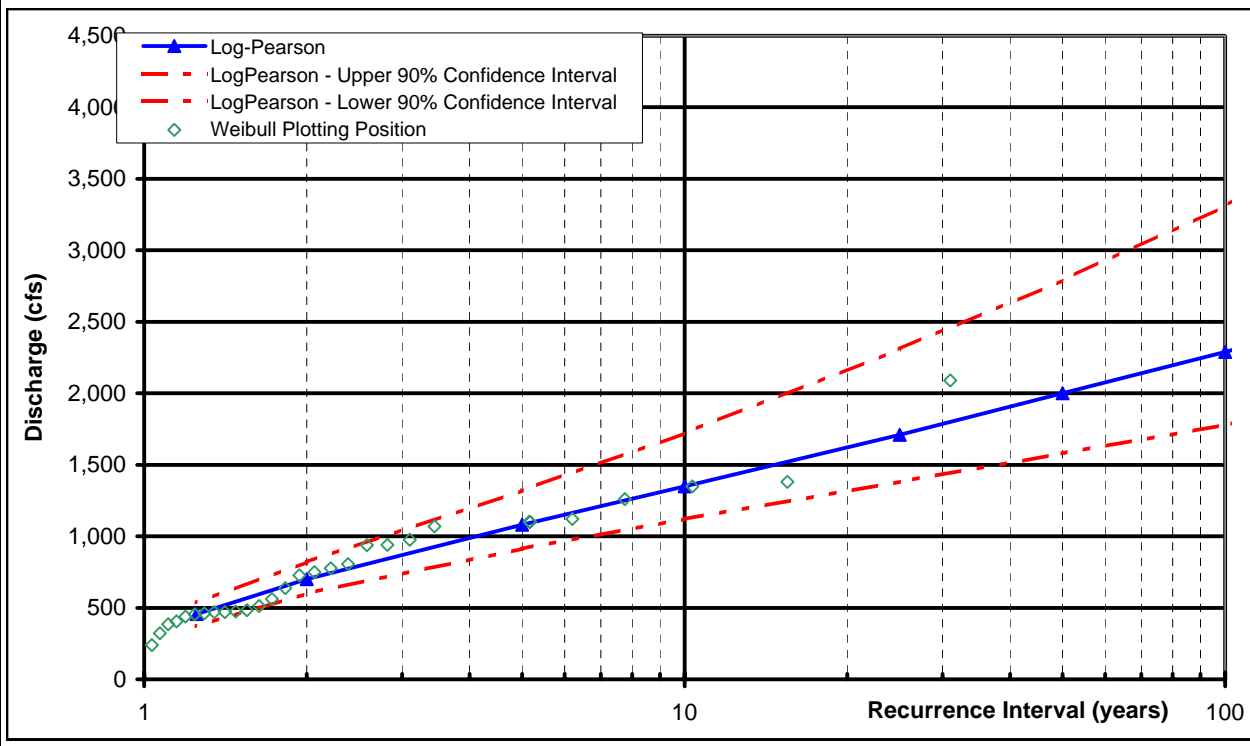
	Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?
1	07/22/1951	322	n	n	51	----	----	n	n	101	----	----	n	n
2	06/07/1952	1,260	n	n	52	----	----	n	n	102	----	----	n	n
3	06/15/1953	1,100	n	n	53	----	----	n	n	103	----	----	n	n
4	05/20/1954	471	n	n	54	----	----	n	n	104	----	----	n	n
5	06/26/1955	460	n	n	55	----	----	n	n	105	----	----	n	n
6	05/28/1956	805	n	n	56	----	----	n	n	106	----	----	n	n
7	06/10/1957	1,350	n	n	57	----	----	n	n	107	----	----	n	n
8	05/21/1958	728	n	n	58	----	----	n	n	108	----	----	n	n
9	06/16/1959	484	n	n	59	----	----	n	n	109	----	----	n	n
10	06/12/1960	239	n	n	60	----	----	n	n	110	----	----	n	n
11	05/30/1961	475	n	n	61	----	----	n	n	111	----	----	n	n
12	06/16/1962	638	n	n	62	----	----	n	n	112	----	----	n	n
13	06/15/1963	2,090	n	n	63	----	----	n	n	113	----	----	n	n
14	06/29/1964	975	n	n	64	----	----	n	n	114	----	----	n	n
15	06/17/1965	1,070	n	n	65	----	----	n	n	115	----	----	n	n
16	06/01/1966	404	n	n	66	----	----	n	n	116	----	----	n	n
17	06/23/1967	1,100	n	n	67	----	----	n	n	117	----	----	n	n
18	06/09/1968	940	n	n	68	----	----	n	n	118	----	----	n	n
19	05/28/1969	385	n	n	69	----	----	n	n	119	----	----	n	n
20	06/25/1970	561	n	n	70	----	----	n	n	120	----	----	n	n
21	06/19/1971	1,120	n	n	71	----	----	n	n	121	----	----	n	n
22	06/10/1972	938	n	n	72	----	----	n	n	122	----	----	n	n
23	06/10/1973	1,380	n	n	73	----	----	n	n	123	----	----	n	n
24	06/14/1974	776	n	n	74	----	----	n	n	124	----	----	n	n
25	07/04/1975	1,100	n	n	75	----	----	n	n	125	----	----	n	n
26	06/10/1976	470	n	n	76	----	----	n	n	126	----	----	n	n
27	05/10/1977	513	n	n	77	----	----	n	n	127	----	----	n	n
28	06/24/1978	750	n	n	78	----	----	n	n	128	----	----	n	n
29	07/05/1979	454	n	n	79	----	----	n	n	129	----	----	n	n
30	06/12/1980	438	n	n	80	----	----	n	n	130	----	----	n	n
31	----	----	n	n	81	----	----	n	n	131	----	----	n	n
32	----	----	n	n	82	----	----	n	n	132	----	----	n	n
33	----	----	n	n	83	----	----	n	n	133	----	----	n	n
34	----	----	n	n	84	----	----	n	n	134	----	----	n	n
35	----	----	n	n	85	----	----	n	n	135	----	----	n	n
36	----	----	n	n	86	----	----	n	n	136	----	----	n	n
37	----	----	n	n	87	----	----	n	n	137	----	----	n	n
38	----	----	n	n	88	----	----	n	n	138	----	----	n	n
39	----	----	n	n	89	----	----	n	n	139	----	----	n	n
40	----	----	n	n	90	----	----	n	n	140	----	----	n	n
41	----	----	n	n	91	----	----	n	n	141	----	----	n	n
42	----	----	n	n	92	----	----	n	n	142	----	----	n	n
43	----	----	n	n	93	----	----	n	n	143	----	----	n	n
44	----	----	n	n	94	----	----	n	n	144	----	----	n	n
45	----	----	n	n	95	----	----	n	n	145	----	----	n	n
46	----	----	n	n	96	----	----	n	n	146	----	----	n	n
47	----	----	n	n	97	----	----	n	n	147	----	----	n	n
48	----	----	n	n	98	----	----	n	n	148	----	----	n	n
49	----	----	n	n	99	----	----	n	n	149	----	----	n	n
50	----	----	n	n	100	----	----	n	n	150	----	----	n	n

Project: Cloud Peak Dam Breach
 Streamgage: SOUTH PINEY CREEK NEAR STORY, WYO.
 Date: 5/25/2004 Performed By: Steve Yochum

Discharge-Frequency, with Gage Skew
 SOUTH PINEY CREEK NEAR STORY, WYO.



Discharge-Frequency, with Generalized Skew
 SOUTH PINEY CREEK NEAR STORY, WYO.



Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06323500 PINEY CREEK AT UCROSS, WY*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Without Generalized Skew

Average: 6.8174
 Standard Deviation: 0.72094941
 Skew Coefficient⁽¹⁾: -0.8440086

Length of systematic record: 59
 Number of historic peaks: 0
 Length of Data Record: 59
 Length of Historic Record⁽⁵⁾: ----

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	1.798	8.1139	3,340	4,450	2,670
100	1	1.701	8.0437	3,110	4,110	2,500
50	2	1.581	7.9572	2,860	3,720	2,320
25	4	1.430	7.8483	2,560	3,290	2,100
10	10	1.158	7.6520	2,100	2,630	1,750
5	20	0.855	7.4339	1,690	2,060	1,430
2	50	0.139	6.9177	1,010	1,180	865
1.25	80	-0.775	6.2586	522	617	431

With Generalized Skew

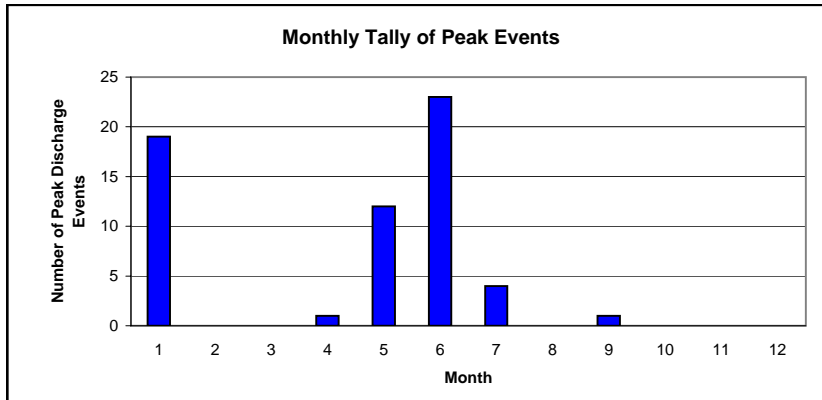
Generalized Skew Coefficient⁽³⁾: 0.0000
 MSE Generalized Skew⁽³⁾: 0.3020
 A: -0.262479
 B: 0.720558
 station skew: -0.844009
 MSE Station Skew: 0.15208182
 Weighted skew coefficient⁽¹⁾: -0.5613316

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.052	8.2965	4,010	5,490	3,140
100	1	1.909	8.1937	3,620	4,880	2,870
50	2	1.742	8.0733	3,210	4,250	2,570
25	4	1.543	7.9299	2,780	3,610	2,260
10	10	1.206	7.6870	2,180	2,740	1,810
5	20	0.857	7.4350	1,690	2,070	1,430
2	50	0.093	6.8843	977	1,140	837
1.25	80	-0.803	6.2384	512	605	422

- (1) Station and generalized skews must be between -2.00 and +3.00 in this spreadsheet.
- (2) Considering the relatively short length of most gage records, less frequent peak estimates need to be used with considerable care.
- (3) Computed one of four ways (see "generalized skew coefficient" worksheet): Mean and variance (standard deviation²) of station skews coefficients in region; skew isolines drawn on a map or regions; skew prediction equations; read from Plate 1 of Bulletin 17B (reproduced in this spreadsheet), with MSE Generalized Skew = 0.302.
- (4) Results are automatically rounded to three significant figures, the dominant number of significant figures in the K-Value table.
- (5) Historic frequency analysis assumes that intervening years reflect systematic record.

Comments: Events marked as occurring on 1/1 did not have an event day in the record. Only the year was noted.

Peak Timing:



Month	Count
1	19
2	0
3	0
4	1
5	12
6	23
7	4
8	0
9	1
10	0
11	0
12	0

Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06323500 PINEY CREEK AT UCROSS, WY*
 Date: *5/25/2004* Performed By: *Steve Yochum*

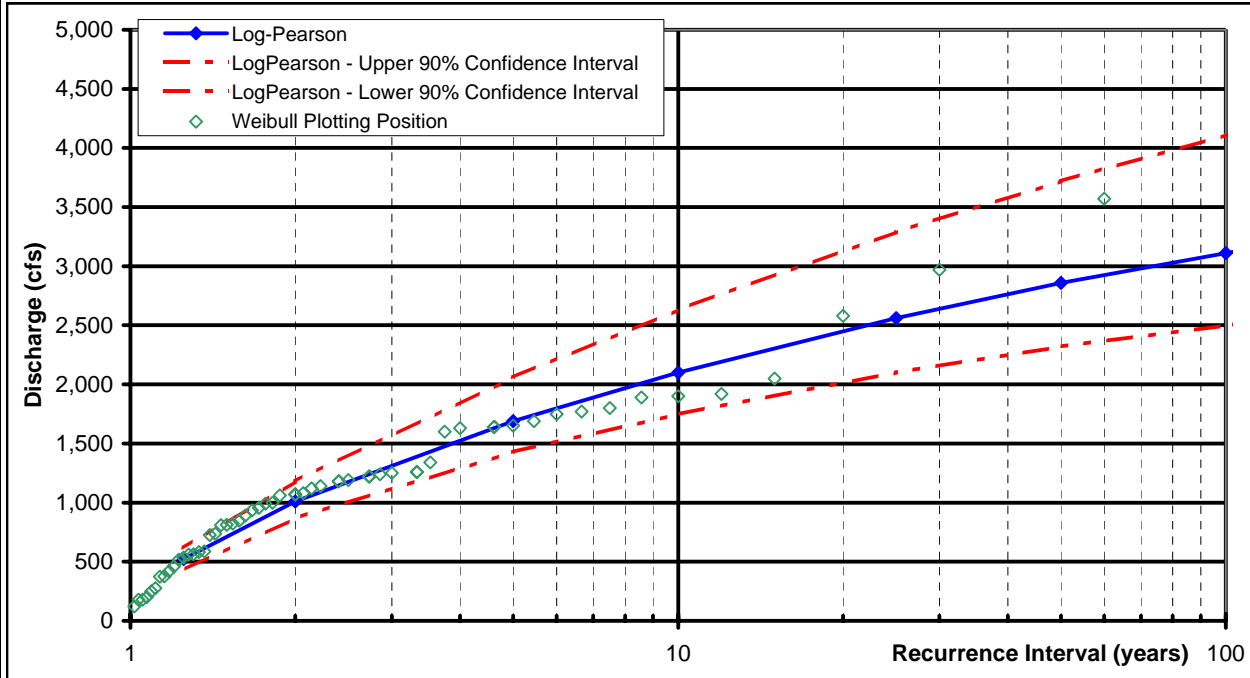
Input Data

Station ID: *06323500* Latitude, Longitude: -- --
 Drainage Area (mi²): *267* County: *Sheridan*
 Number of low outliers eliminated: *0* State: *Wyoming*

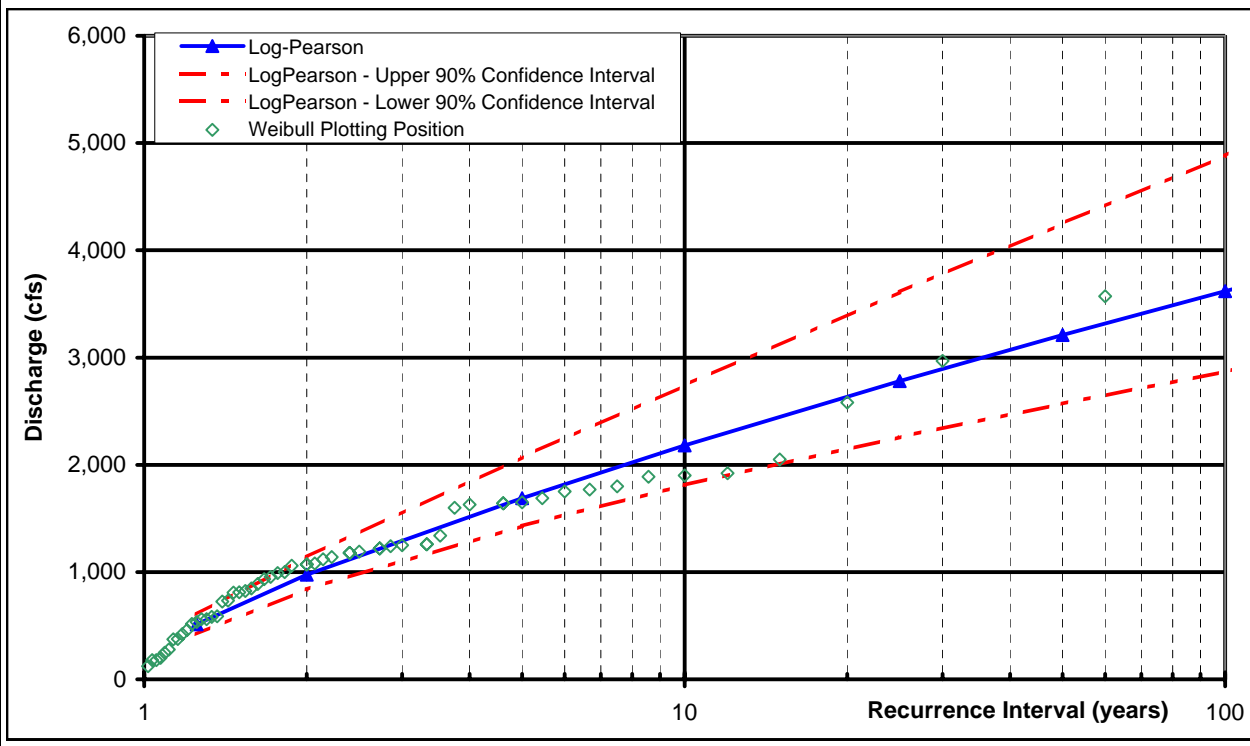
	Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?
1	01/01/1903	726	n	n	51	06/10/1973	1,600	n	n	101	----	----	n	n
2	01/01/1904	1,070	n	n	52	05/29/1974	955	n	n	102	----	----	n	n
3	01/01/1905	1,690	n	n	53	06/18/1975	1,180	n	n	103	----	----	n	n
4	01/01/1906	2,050	n	n	54	06/24/1976	582	n	n	104	----	----	n	n
5	01/01/1911	516	n	n	55	05/15/1977	1,250	n	n	105	----	----	n	n
6	01/01/1912	1,190	n	n	56	05/19/1978	1,260	n	n	106	----	----	n	n
7	01/01/1913	735	n	n	57	07/04/1979	179	n	n	107	----	----	n	n
8	01/01/1914	1,220	n	n	58	06/26/1980	562	n	n	108	----	----	n	n
9	01/01/1915	846	n	n	59	05/23/1981	122	n	n	109	----	----	n	n
10	01/01/1916	810	n	n	60	07/25/1982	201	n	n	110	----	----	n	n
11	06/20/1917	1,070	n	n	61	----	----	n	n	111	----	----	n	n
12	06/11/1918	1,900	n	n	62	----	----	n	n	112	----	----	n	n
13	05/21/1919	460	n	n	63	----	----	n	n	113	----	----	n	n
14	06/10/1920	1,140	n	n	64	----	----	n	n	114	----	----	n	n
15	06/08/1921	560	n	n	65	----	----	n	n	115	----	----	n	n
16	06/09/1922	1,260	n	n	66	----	----	n	n	116	----	----	n	n
17	09/28/1923	2,580	n	n	67	----	----	n	n	117	----	----	n	n
18	06/01/1929	----	n	n	68	----	----	n	n	118	----	----	n	n
19	01/01/1941	1,120	n	n	69	----	----	n	n	119	----	----	n	n
20	01/01/1942	1,770	n	n	70	----	----	n	n	120	----	----	n	n
21	01/01/1943	813	n	n	71	----	----	n	n	121	----	----	n	n
22	01/01/1944	2,970	n	n	72	----	----	n	n	122	----	----	n	n
23	01/01/1945	1,890	n	n	73	----	----	n	n	123	----	----	n	n
24	01/01/1946	991	n	n	74	----	----	n	n	124	----	----	n	n
25	01/01/1947	933	n	n	75	----	----	n	n	125	----	----	n	n
26	01/01/1948	1,630	n	n	76	----	----	n	n	126	----	----	n	n
27	01/01/1949	1,180	n	n	77	----	----	n	n	127	----	----	n	n
28	06/08/1950	890	n	n	78	----	----	n	n	128	----	----	n	n
29	07/11/1951	420	n	n	79	----	----	n	n	129	----	----	n	n
30	07/13/1952	1,650	n	n	80	----	----	n	n	130	----	----	n	n
31	06/15/1953	1,340	n	n	81	----	----	n	n	131	----	----	n	n
32	05/21/1954	587	n	n	82	----	----	n	n	132	----	----	n	n
33	05/22/1955	535	n	n	83	----	----	n	n	133	----	----	n	n
34	05/28/1956	1,640	n	n	84	----	----	n	n	134	----	----	n	n
35	06/10/1957	1,220	n	n	85	----	----	n	n	135	----	----	n	n
36	05/22/1958	1,240	n	n	86	----	----	n	n	136	----	----	n	n
37	06/17/1959	374	n	n	87	----	----	n	n	137	----	----	n	n
38	06/11/1960	180	n	n	88	----	----	n	n	138	----	----	n	n
39	05/28/1961	277	n	n	89	----	----	n	n	139	----	----	n	n
40	06/16/1962	1,800	n	n	90	----	----	n	n	140	----	----	n	n
41	06/16/1963	3,570	n	n	91	----	----	n	n	141	----	----	n	n
42	06/09/1964	1,920	n	n	92	----	----	n	n	142	----	----	n	n
43	06/17/1965	822	n	n	93	----	----	n	n	143	----	----	n	n
44	05/23/1966	249	n	n	94	----	----	n	n	144	----	----	n	n
45	06/23/1967	1,640	n	n	95	----	----	n	n	145	----	----	n	n
46	06/09/1968	1,750	n	n	96	----	----	n	n	146	----	----	n	n
47	04/25/1969	376	n	n	97	----	----	n	n	147	----	----	n	n
48	06/12/1970	1,060	n	n	98	----	----	n	n	148	----	----	n	n
49	05/31/1971	1,080	n	n	99	----	----	n	n	149	----	----	n	n
50	06/10/1972	1,000	n	n	100	----	----	n	n	150	----	----	n	n

Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06323500 PINEY CREEK AT UCROSS, WY*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Discharge-Frequency, with Gage Skew
 # **USGS 06323500 PINEY CREEK AT UCROSS, WY**



Discharge-Frequency, with Generalized Skew
 # **USGS 06323500 PINEY CREEK AT UCROSS, WY**



Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06324000 CLEAR CREEK NEAR ARVADA WYO*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Without Generalized Skew

Average: 7.7893
 Standard Deviation: 0.76788829
 Skew Coefficient⁽¹⁾: -0.2076532

Length of systematic record: 48
 Number of historic peaks: 0
 Length of Data Record: 48
 Length of Historic Record⁽⁵⁾: ----

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.381	9.6175	15,000	22,900	11,000
100	1	2.172	9.4574	12,800	19,000	9,530
50	2	1.941	9.2796	10,700	15,400	8,140
25	4	1.677	9.0772	8,750	12,200	6,800
10	10	1.257	8.7545	6,340	8,380	5,080
5	20	0.850	8.4422	4,640	5,880	3,810
2	50	0.034	7.8156	2,480	2,990	2,060
1.25	80	-0.830	7.1523	1,280	1,560	1,010

With Generalized Skew

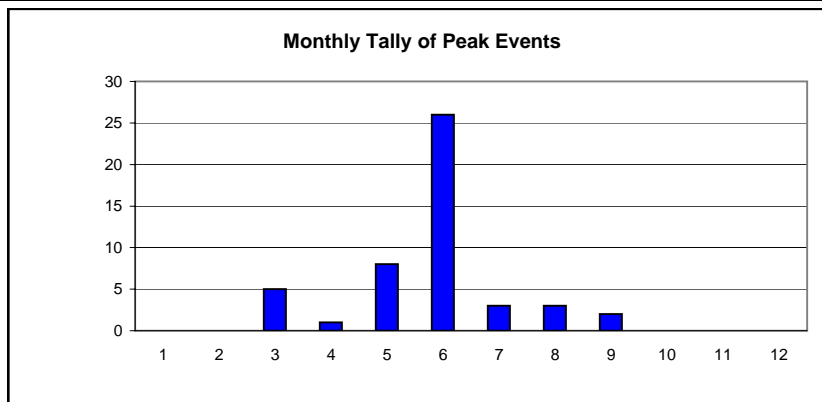
Generalized Skew Coefficient⁽³⁾: 0.0000
 MSE Generalized Skew⁽³⁾: 0.3020
 A: -0.313388
 B: 0.886010
 station skew: -0.207653
 MSE Station Skew: 0.12106695
 Weighted skew coefficient⁽¹⁾: -0.1482273

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.437	9.6604	15,700	24,100	11,400
100	1	2.216	9.4912	13,200	19,800	9,810
50	2	1.973	9.3047	11,000	15,900	8,320
25	4	1.699	9.0937	8,900	12,400	6,900
10	10	1.264	8.7601	6,370	8,430	5,100
5	20	0.848	8.4404	4,630	5,870	3,800
2	50	0.025	7.8083	2,460	2,960	2,050
1.25	80	-0.833	7.1496	1,270	1,550	1,010

- (1) Station and generalized skews must be between -2.00 and +3.00 in this spreadsheet.
- (2) Considering the relatively short length of most gage records, less frequent peak estimates need to be used with considerable care.
- (3) Computed one of four ways (see "generalized skew coefficient" worksheet): Mean and variance (standard deviation²) of station skews coefficients in region; skew isolines drawn on a map or regions; skew prediction equations; read from Plate 1 of Bulletin 17B (reproduced in this spreadsheet), with MSE Generalized Skew = 0.302.
- (4) Results are automatically rounded to three significant figures, the dominant number of significant figures in the K-Value table.
- (5) Historic frequency analysis assumes that intervening years reflect systematic record.

Comments:

Peak Timing:



Month	Count
1	0
2	0
3	5
4	1
5	8
6	26
7	3
8	3
9	2
10	0
11	0
12	0

Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06324000 CLEAR CREEK NEAR ARVADA WYO*
 Date: *5/25/2004* Performed By: *Steve Yochum*

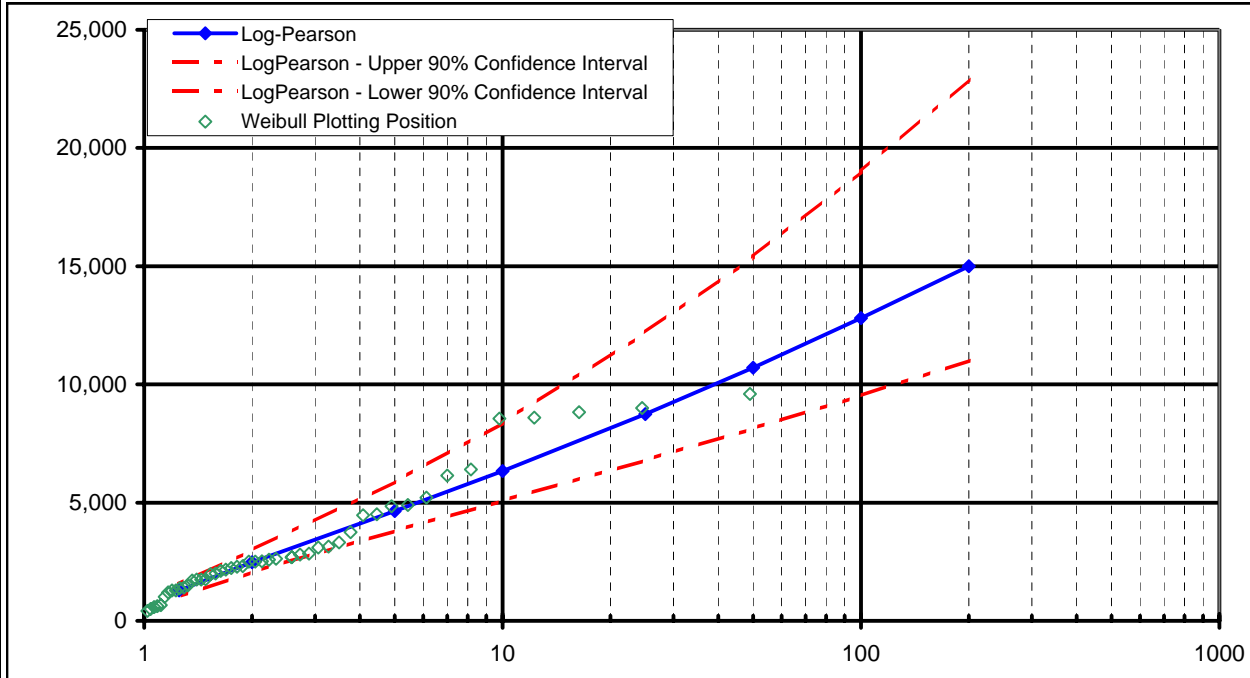
Input Data

Station ID: *06324000* Latitude, Longitude: -- --
 Drainage Area (mi²): *1110* County: *Sheridan*
 Number of low outliers eliminated: *0* State: *Wyoming*

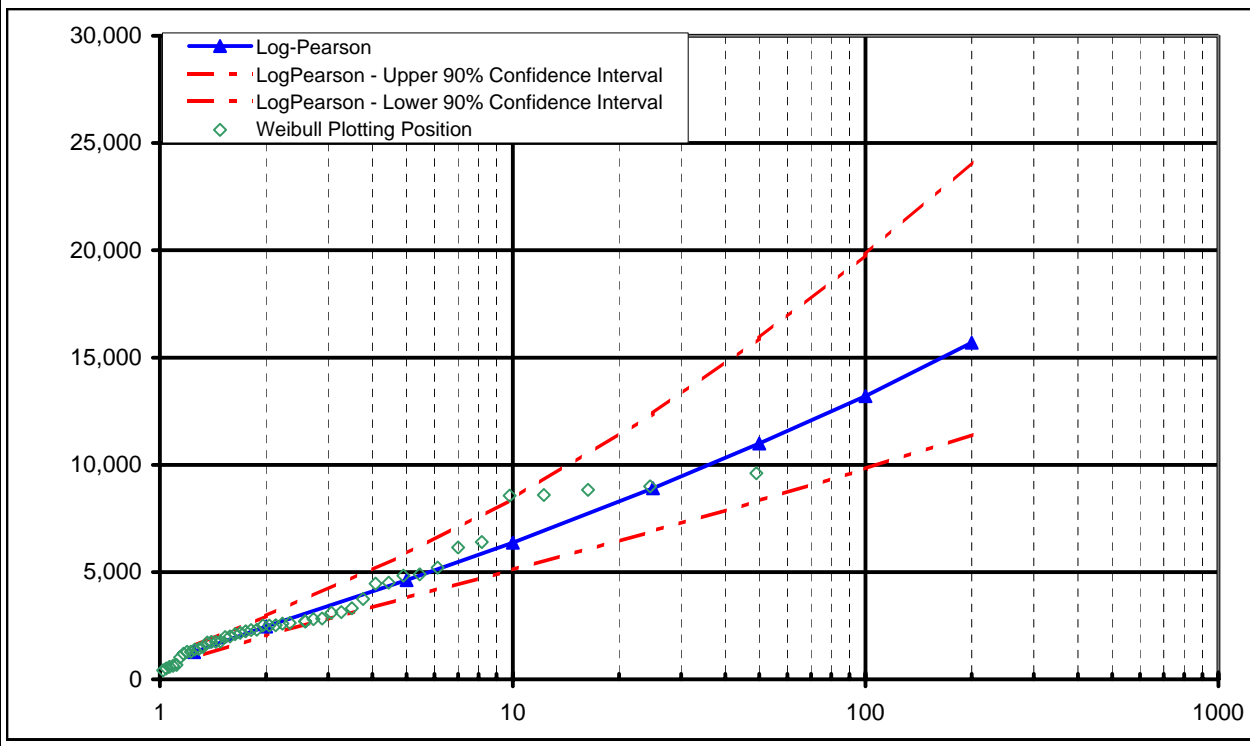
	Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?
1	06/20/1916	1,410	n	n	51	----	----	n	n	101	----	----	n	n
2	06/18/1917	2,630	n	n	52	----	----	n	n	102	----	----	n	n
3	06/08/1918	2,840	n	n	53	----	----	n	n	103	----	----	n	n
4	07/17/1928	4,510	n	n	54	----	----	n	n	104	----	----	n	n
5	05/30/1929	8,600	n	n	55	----	----	n	n	105	----	----	n	n
6	06/22/1940	2,110	n	n	56	----	----	n	n	106	----	----	n	n
7	08/06/1941	2,160	n	n	57	----	----	n	n	107	----	----	n	n
8	06/26/1942	9,000	n	n	58	----	----	n	n	108	----	----	n	n
9	03/26/1943	3,100	n	n	59	----	----	n	n	109	----	----	n	n
10	06/22/1944	8,830	n	n	60	----	----	n	n	110	----	----	n	n
11	06/25/1945	3,140	n	n	61	----	----	n	n	111	----	----	n	n
12	06/25/1946	1,750	n	n	62	----	----	n	n	112	----	----	n	n
13	05/12/1947	2,290	n	n	63	----	----	n	n	113	----	----	n	n
14	06/23/1948	2,240	n	n	64	----	----	n	n	114	----	----	n	n
15	06/07/1949	2,500	n	n	65	----	----	n	n	115	----	----	n	n
16	06/08/1950	1,380	n	n	66	----	----	n	n	116	----	----	n	n
17	09/02/1951	1,280	n	n	67	----	----	n	n	117	----	----	n	n
18	07/14/1952	1,740	n	n	68	----	----	n	n	118	----	----	n	n
19	06/15/1953	2,700	n	n	69	----	----	n	n	119	----	----	n	n
20	08/05/1954	9,600	n	n	70	----	----	n	n	120	----	----	n	n
21	06/26/1955	2,520	n	n	71	----	----	n	n	121	----	----	n	n
22	03/21/1956	8,560	n	n	72	----	----	n	n	122	----	----	n	n
23	06/07/1957	2,310	n	n	73	----	----	n	n	123	----	----	n	n
24	06/08/1958	3,310	n	n	74	----	----	n	n	124	----	----	n	n
25	03/18/1959	2,800	n	n	75	----	----	n	n	125	----	----	n	n
26	03/20/1960	1,710	n	n	76	----	----	n	n	126	----	----	n	n
27	05/30/1961	623	n	n	77	----	----	n	n	127	----	----	n	n
28	06/17/1962	4,900	n	n	78	----	----	n	n	128	----	----	n	n
29	06/17/1963	6,150	n	n	79	----	----	n	n	129	----	----	n	n
30	06/23/1964	2,700	n	n	80	----	----	n	n	130	----	----	n	n
31	04/02/1965	4,460	n	n	81	----	----	n	n	131	----	----	n	n
32	09/01/1966	415	n	n	82	----	----	n	n	132	----	----	n	n
33	06/06/1967	6,400	n	n	83	----	----	n	n	133	----	----	n	n
34	06/10/1968	3,750	n	n	84	----	----	n	n	134	----	----	n	n
35	03/19/1969	1,500	n	n	85	----	----	n	n	135	----	----	n	n
36	05/30/1970	1,760	n	n	86	----	----	n	n	136	----	----	n	n
37	06/01/1971	2,510	n	n	87	----	----	n	n	137	----	----	n	n
38	06/09/1972	2,590	n	n	88	----	----	n	n	138	----	----	n	n
39	06/11/1973	2,000	n	n	89	----	----	n	n	139	----	----	n	n
40	05/30/1974	1,290	n	n	90	----	----	n	n	140	----	----	n	n
41	07/06/1975	4,840	n	n	91	----	----	n	n	141	----	----	n	n
42	06/25/1976	1,010	n	n	92	----	----	n	n	142	----	----	n	n
43	05/12/1977	1,970	n	n	93	----	----	n	n	143	----	----	n	n
44	05/18/1978	5,210	n	n	94	----	----	n	n	144	----	----	n	n
45	06/30/1979	582	n	n	95	----	----	n	n	145	----	----	n	n
46	08/15/1980	665	n	n	96	----	----	n	n	146	----	----	n	n
47	05/24/1981	1,200	n	n	97	----	----	n	n	147	----	----	n	n
48	06/30/1982	504	n	n	98	----	----	n	n	148	----	----	n	n
49	----	----	n	n	99	----	----	n	n	149	----	----	n	n
50	----	----	n	n	100	----	----	n	n	150	----	----	n	n

Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06324000 CLEAR CREEK NEAR ARVADA WYO*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Discharge-Frequency, with Gage Skew
 # *USGS 06324000 CLEAR CREEK NEAR ARVADA WYO*



Discharge-Frequency, with Generalized Skew
 # *USGS 06324000 CLEAR CREEK NEAR ARVADA WYO*



Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06324500 Powder River at Moorhead MT*
 Date: *5/25/2004* Performed By: *Steve Yochum*

Without Generalized Skew

Average: 8.6767
 Standard Deviation: 0.70000434
 Skew Coefficient⁽¹⁾: -0.3817639

Length of systematic record: 70
 Number of historic peaks: 0
 Length of Data Record: 70
 Length of Historic Record:⁽⁵⁾ ----

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.218	10.2293	27,700	37,100	22,000
100	1	2.043	10.1066	24,500	32,300	19,700
50	2	1.844	9.9677	21,300	27,600	17,400
25	4	1.613	9.8056	18,100	23,000	15,000
10	10	1.234	9.5402	13,900	17,000	11,800
5	20	0.855	9.2750	10,700	12,700	9,170
2	50	0.063	8.7209	6,130	7,050	5,340
1.25	80	-0.817	8.1045	3,310	3,840	2,780

With Generalized Skew

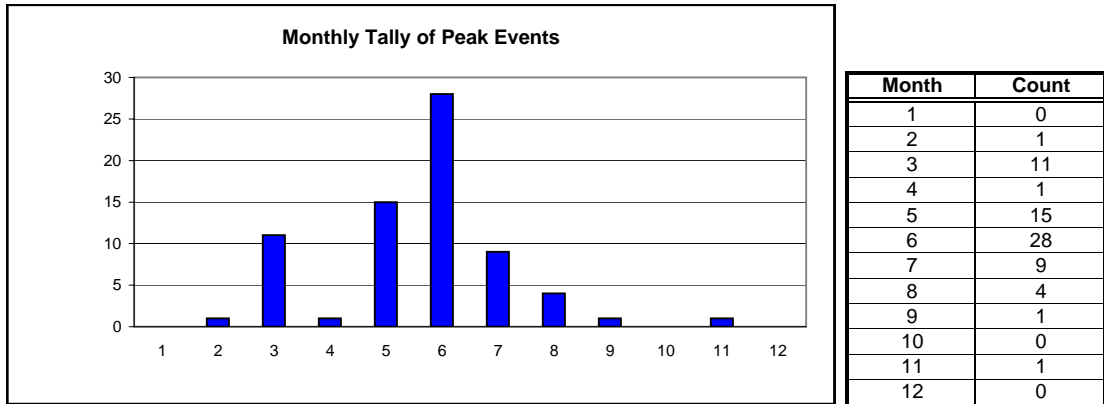
Generalized Skew Coefficient⁽³⁾: 0.0000
 MSE Generalized Skew⁽³⁾: 0.3020
 A: -0.299459
 B: 0.840741
 station skew: -0.381764
 MSE Station Skew: 0.09773097
 Weighted skew coefficient⁽¹⁾: -0.2884233

Recurrence Interval ⁽²⁾ (years)	Percent Chance	K-Value	Ln(Q)	Peak ⁽⁴⁾ Discharge (cfs)	90% Confidence Interval	
					Upper (cfs)	Lower (cfs)
200	0.5	2.305	10.2901	29,400	39,800	23,200
100	1	2.113	10.1555	25,700	34,100	20,600
50	2	1.896	10.0042	22,100	28,700	18,000
25	4	1.647	9.8298	18,600	23,600	15,300
10	10	1.247	9.5493	14,000	17,200	11,800
5	20	0.853	9.2736	10,700	12,700	9,160
2	50	0.048	8.7103	6,070	6,970	5,280
1.25	80	-0.825	8.0994	3,290	3,830	2,770

- (1) Station and generalized skews must be between -2.00 and +3.00 in this spreadsheet.
- (2) Considering the relatively short length of most gage records, less frequent peak estimates need to be used with considerable care.
- (3) Computed one of four ways (see "generalized skew coefficient" worksheet): Mean and variance (standard deviation²) of station skews coefficients in region; skew isolines drawn on a map or regions; skew prediction equations; read from Plate 1 of Bulletin 17B (reproduced in this spreadsheet), with MSE Generalized Skew = 0.302.
- (4) Results are automatically rounded to three significant figures, the dominant number of significant figures in the K-Value table.
- (5) Historic frequency analysis assumes that intervening years reflect systematic record.

Comments: *High outlier on 9/30/23 (a historic estimate) was eliminated.*

Peak Timing:



Project: *Cloud Peak Dam Breach*
 Streamgage: # *USGS 06324500 Powder River at Moorhead MT*
 Date: *5/25/2004* Performed By: *Steve Yochum*

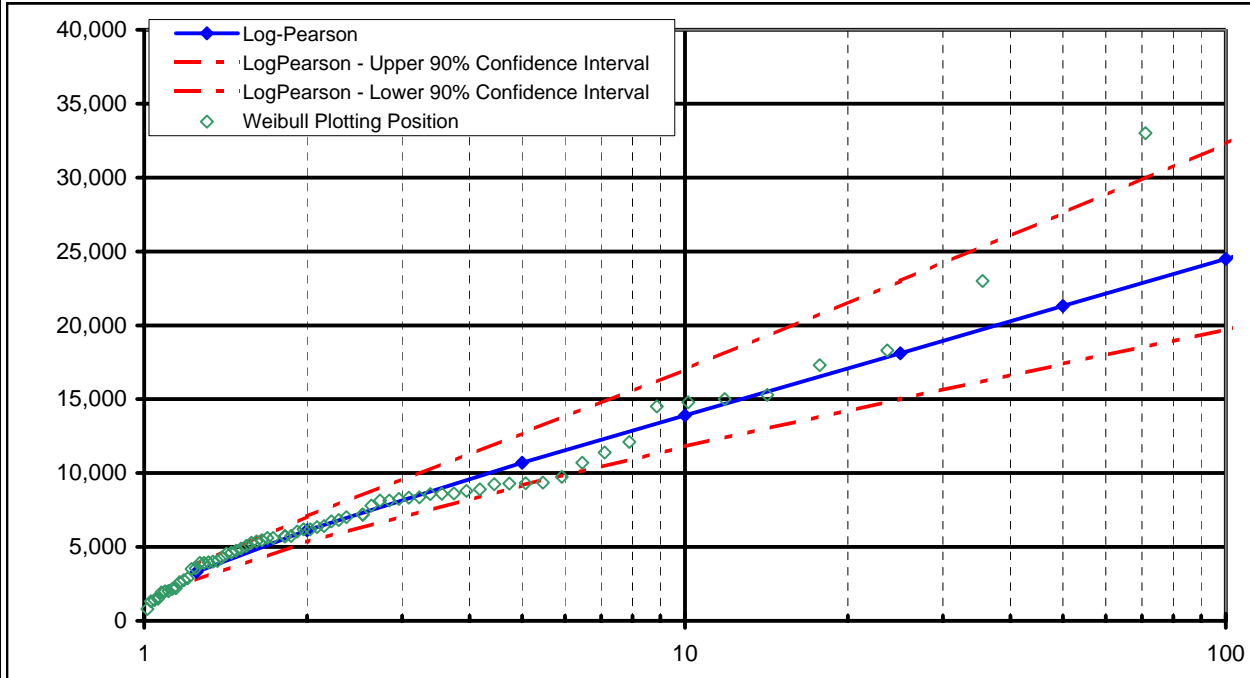
Input Data

Station ID: *06324500* Latitude, Longitude: -- --
 Drainage Area (mi²): *8088* County: *Powder River*
 Number of low outliers eliminated: *0* State: *MT*

	Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?		Date	Discharge (cfs)	Historic?	Outlier?
1	----	----	n	n	51	05/27/1980	2,210	n	n	101	----	----	n	n
2	06/03/1929	8,610	n	n	52	05/31/1981	2,160	n	n	102	----	----	n	n
3	07/14/1930	4,040	n	n	53	07/26/1982	6,350	n	n	103	----	----	n	n
4	05/06/1931	6,040	n	n	54	06/13/1983	2,870	n	n	104	----	----	n	n
5	06/08/1932	3,550	n	n	55	05/19/1984	4,620	n	n	105	----	----	n	n
6	08/30/1933	14,800	n	n	56	07/31/1985	1,410	n	n	106	----	----	n	n
7	06/16/1934	1,920	n	n	57	06/09/1986	4,540	n	n	107	----	----	n	n
8	06/01/1935	8,140	n	n	58	07/18/1987	11,400	n	n	108	----	----	n	n
9	03/02/1936	9,240	n	n	59	05/19/1988	1,990	n	n	109	----	----	n	n
10	07/14/1937	14,500	n	n	60	03/12/1989	800	n	n	110	----	----	n	n
11	05/30/1938	5,720	n	n	61	08/21/1990	8,150	n	n	111	----	----	n	n
12	06/02/1939	7,200	n	n	62	06/04/1991	5,460	n	n	112	----	----	n	n
13	06/04/1940	6,820	n	n	63	11/12/1991	6,410	n	n	113	----	----	n	n
14	08/13/1941	8,360	n	n	64	06/09/1993	6,740	n	n	114	----	----	n	n
15	06/26/1942	5,070	n	n	65	07/09/1994	3,920	n	n	115	----	----	n	n
16	03/26/1943	8,800	n	n	66	05/11/1995	8,250	n	n	116	----	----	n	n
17	05/20/1944	10,700	n	n	67	03/13/1996	3,500	n	n	117	----	----	n	n
18	06/06/1945	6,190	n	n	68	06/10/1997	4,290	n	n	118	----	----	n	n
19	06/11/1946	5,720	n	n	69	07/04/1998	2,760	n	n	119	----	----	n	n
20	03/19/1947	9,300	n	n	70	05/04/1999	3,960	n	n	120	----	----	n	n
21	06/17/1948	9,320	n	n	71	05/20/2000	3,930	n	n	121	----	----	n	n
22	03/06/1949	9,360	n	n	72	07/13/2001	1,490	n	n	122	----	----	n	n
23	05/19/1950	2,620	n	n	73	----	----	n	n	123	----	----	n	n
24	09/09/1951	2,020	n	n	74	----	----	n	n	124	----	----	n	n
25	03/25/1952	15,300	n	n	75	----	----	n	n	125	----	----	n	n
26	06/15/1953	8,590	n	n	76	----	----	n	n	126	----	----	n	n
27	08/06/1954	9,740	n	n	77	----	----	n	n	127	----	----	n	n
28	06/18/1955	5,610	n	n	78	----	----	n	n	128	----	----	n	n
29	06/16/1956	7,200	n	n	79	----	----	n	n	129	----	----	n	n
30	06/07/1957	5,600	n	n	80	----	----	n	n	130	----	----	n	n
31	06/12/1958	4,900	n	n	81	----	----	n	n	131	----	----	n	n
32	03/19/1959	5,740	n	n	82	----	----	n	n	132	----	----	n	n
33	03/20/1960	6,200	n	n	83	----	----	n	n	133	----	----	n	n
34	05/30/1961	1,320	n	n	84	----	----	n	n	134	----	----	n	n
35	06/17/1962	23,000	n	n	85	----	----	n	n	135	----	----	n	n
36	06/15/1963	7,010	n	n	86	----	----	n	n	136	----	----	n	n
37	06/24/1964	15,000	n	n	87	----	----	n	n	137	----	----	n	n
38	04/02/1965	18,300	n	n	88	----	----	n	n	138	----	----	n	n
39	03/13/1966	4,000	n	n	89	----	----	n	n	139	----	----	n	n
40	06/17/1967	17,300	n	n	90	----	----	n	n	140	----	----	n	n
41	06/08/1968	8,580	n	n	91	----	----	n	n	141	----	----	n	n
42	07/16/1969	5,280	n	n	92	----	----	n	n	142	----	----	n	n
43	05/24/1970	8,900	n	n	93	----	----	n	n	143	----	----	n	n
44	06/01/1971	8,340	n	n	94	----	----	n	n	144	----	----	n	n
45	02/29/1972	7,800	n	n	95	----	----	n	n	145	----	----	n	n
46	06/19/1975	12,100	n	n	96	----	----	n	n	146	----	----	n	n
47	06/23/1976	5,370	n	n	97	----	----	n	n	147	----	----	n	n
48	05/17/1977	4,750	n	n	98	----	----	n	n	148	----	----	n	n
49	05/20/1978	33,000	n	n	99	----	----	n	n	149	----	----	n	n
50	03/17/1979	----	n	n	100	----	----	n	n	150	----	----	n	n

Project: Cloud Peak Dam Breach
 Streamgage: # USGS 06324500 Powder River at Moorhead MT
 Date: 5/25/2004 Performed By: Steve Yochum

Discharge-Frequency, with Gage Skew
 # USGS 06324500 Powder River at Moorhead MT



Discharge-Frequency, with Generalized Skew
 # USGS 06324500 Powder River at Moorhead MT

