Appendix 2-2

"Typical" Period Analysis for the City of Terre Haute

LimnoTech
Water | Environment | Scientists | Engineers

MEMORANDUM

DATE: October 24, 2007

FROM: Carrie Turner

PROJECT: TRHCSO

FINAL FOR AGENCY REVIEW

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SUBJECT: "Typical" Period Analysis for the City of Terre Haute

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Summary

The purpose of this memo is to document the selection of a typical year period for evaluating combined sewer overflow (CSO), storm water, and nonpoint source pollutant loads on the Wabash River in the vicinity of Terre Haute, Indiana. The CSO Policy and subsequent EPA guidance recognizes that the annual performance of CSO controls will vary based on rainfall conditions. Long-term hourly rainfall and daily stream flow data were examined on an annual and recreation season (e.g April-October) basis, and compared to historical averages to make this selection, which is the year 1978. Slightly modifying the starting time of three storms in 1978 is recommended to improve the fit of the 1978 rainfall data to historical conditions. Therefore, the starting times of these storms (4/8/78, 5/7/78, and 7/9/78) were modified to create three additional back-to-back storms.

Annual and recreation season rainfall and stream flow conditions from 1954 to 2006 were evaluated. The evaluation of one-year interval rainfall and stream flow data suggested that 1978 provided the best representation of a "typical" year and most closely reflected historical averages. Table 1 provides the statistics for 1978 with comparisons to the annual and recreation season historical averages.

The City proposes to use a continuous modeling approach for the alternatives evaluations, using the rainfall data from 1978 for sizing controls, then evaluating the performance of the alternatives using 1978 rainfall and stream flow conditions. A preferred alternative will be identified based on collection system performance characteristics and in-stream water quality benefits.

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Table 1. Comparison of Criteria for Long-Term Historical Record and Representative Periods.

Amb-ient Factor	Criterion	Historical Annual Average [1]	1978 Annual	Historical Recreation season Average [1, 2]	1978 Recreation season [3]
Rainfall	Number of Storms > 0.25"	**42**	37	**27**	24
	Annual Volume (in)	**38.90**	38.28	**25.18**	25.12
	Number of Back-to-Back Storms [3]	**7**	3 (6)[5]	**5**	2 (5)[5]
	Maximum Peak Intensity[4] (in/hr)	**1.27**	1.21	**1.25**	1.21
Flow	25th Percentile (cfs)	**3,720**	3,713	**3,380**	3,353
	50th Percentile (cfs)	**7,100**	5,350	**6,320**	6,900
	75th Percentile (cfs)	**14,800**	13,900	**12,900**	16,925

Notes:
[1] The historical averages are based on 53 complete years of hourly rainfall and daily flow data recorded from 1954 through 2006.
[2] Recreation season is defined as April 1 through October 31.
[3] "Back-to-back" storms are defined as storms occurring within 24 hours of each other, with the first storm having at least 0.50" of total rainfall and the second storm having at least 0.10" of total rainfall.
[4] Maximum peak intensity is defined as the maximum peak rainfall intensity per hour that occurred over a specified time period (annual or recreation season).
5 LimnoTech recommends improving the fit of 1978 data to this metric by changing the starting time for three storms to 24 hours earlier (these storms occur on 4/8/78, 5/7/78, and 7/9/78). The number of back-to-back storms for the modified 1978 rainfall period is shown in parentheses.

Introduction

The urban drainage, sewers, and the nearby receiving waters in the City of Terre Haute, Indiana comprise a complex interrelated system. Several highly variable natural forces, primarily rainfall and river flow profoundly influence this system. Rainfall over the City, when it occurs in sufficient amount, generates urban storm water, CSO, and increased treated wastewater flow. These events can all contribute bacteria and pollutants to the Wabash River and nearby tributaries.

The effect of these contributors on the Wabash River mainly depends on the magnitude and duration of rainfall events and on the prevailing ambient river conditions controlling dilution and transport of the pollutants. This variability and complexity poses a significant challenge for assessing the performance of wet weather and CSO control alternatives for the City. Rainfall and river flow can vary over a wide range of values, and therefore the range of possible combinations is impossible to adequately define using a set of "design" or "reference" rainfall and river scenarios (e.g. a 6-month design storm).

A design storm approach can result in significant "over-design" of wet weather controls. This is because regulatory and public attention tends to focus on the improbable worst-case combinations without an objective means to put predicted river water quality into proper perspective. When sufficient long-term records are available, continuous simulation avoids these problems by matching rainfall with the actual prevailing river conditions. Therefore, continuous simulation is generally acknowledged as a superior approach for modeling wet weather controls and water quality effects (EPA, 1999).

For these reasons, a continuous simulation approach will be used to evaluate the effectiveness of potential controls of the Terre Haute combined sewer collection system. This approach will be used with the collection system model (SWMM) for the City of Terre Haute and the Wabash River Model developed for the portion of the river near the City (e.g. near Rte 63 bridge downstream to below the City's wastewater treatment plant). These models require hourly rainfall and daily average stream flow. Several candidate simulation periods were chosen from recent and complete data sets to provide representative and unbiased approximations of expected future conditions in terms of both averages and historical variability. Representativeness was assessed using objective criteria such as number of storms per year greater than 0.25 inches for each of the ambient factors (i.e., river flow and rainfall) for which continuous records are available.

Data

The City of Terre Haute has been recording daily rainfall data for over 50 years at several sites within their municipal boundary. Although this is a robust dataset, it provides limited information to relate pollutant loadings from the City to in-stream concentrations in the Wabash River. The magnitude of source and river response to storm events can be influenced by not only rainfall depth, but also by rainfall intensity, duration and antecedent conditions. Therefore, inclusion of these rainfall characteristics is necessary in the collection system model so that representative conditions (e.g. a "typical" period) that capture the range of pollutant loadings and river response can be identified. Rainfall data collected at an hourly frequency provides the necessary level of detail for identifying "typical" conditions and was used for this assessment.

Hourly rainfall data were obtained from the National Climatic Data Center (NCDC) from three gages located near Terre Haute in the cities of Clinton (approximately 12 miles north of the City, Coop ID = 121626), Brazil (approximately 16 miles northeast of the City, Coop ID = 120922), and Paris, Illinois (approximately 18 miles northwest of the City, Coop ID = 116605 (1954-Sept. 1992) and Coop ID = 116610 (Oct. 1992-2006)). Hourly records were obtained from each gage for the period of 1954 to 2006. Data from the Clinton gage were used as the primary data source since it is located closest to the City. Data from the Brazil and Paris gages were used when there were gaps in the Clinton record. Appendix 1 shows the periods when the data from each gage were used. These data were analyzed for their storm characteristics (e.g. total volume, duration, intensity, inter-event duration) using the U.S. EPA's Storm Water Management Model (SWMM) with a minimum inter-event period of six hours.

The U.S. Geological Survey (USGS) has monitored average daily flow in the Wabash River at several gages, including in the cities of Montezuma (gage ID 03340500, upstream of Terre Haute), Terre Haute (gage ID 03341500), and Riverton (gage ID 03342000, downstream of Terre Haute). Daily stream flow measurements from the Terre Haute gage were available from 1927 to the present. Data from 1954 through 2006 were used in this analysis.

Methodology

The methodology used to select a representative period for the City of Terre Haute was to evaluate the rainfall and flow data from 1954 to 2006 to determine a statistically based "typical" set of characteristics. An Excel-based objective function was developed to identify periods within the data records that most closely resembled these "typical" characteristics.

To quantitatively assess different periods for use as a "typical" period, a series of criteria were developed that allow a continuous period of time to be compared to long-term historical averages. The criteria include quantitative measurements and qualitative considerations that ensure the selection of a representative period meets project needs within the available resources.

Criteria used to assess the representativeness of rainfall were:

1. The number of storms per year greater than 0.25 inches. Based on model results from the City's collection system model, this event size is roughly the minimum volume of rainfall needed to trigger a combined sewer overflow event in at least one of the City's CSOs. Thus, this criterion is a measure of the number of rainfall events that could trigger overflows under existing conditions.

2. The annual average rainfall depth (total inches of rain). This criterion is routinely used as a fundamental indication of representativeness as compared to the historical period.

3. The number of times per year that a storm with at least 0.5 inches of rain is followed by a storm with at least 0.1 inches within 24 hours of each other (e.g. the number of back-to-back storms). The effectiveness of various CSO controls (e.g. flow-thru treatment vs. storage) may be influenced by the frequency of this combination of storms. This criterion is used to indicate the representativeness of these kinds of extreme events in a particular period.

4. The maximum peak rainfall intensity in inches per hour occurring over a specified time period (annual or recreation season). The effectiveness of CSO controls may be impacted by the intensity of the rainfall occurring in a short period of time. This criterion is a measure of rainfall intensity over time and is used to indicate the representativeness of extreme rainfall events in a given time period.

Criteria used to assess the representativeness of stream flow were:

1. The 25%, 50%, and 75% daily average flow in the Wabash River at Terre Haute. The nearness to the 1st, 2nd, and 3rd quartiles measures the selected period's nearness to the historical flow distribution in terms of low, average, and high flows.

The criteria were analyzed on an annual and recreation season (April-October) basis. Consideration of recreation season is important because it corresponds to the recreation season, as defined in the State of Indiana water quality standards. The rainfall volume and median flow criteria are the most descriptive measures of "typical" and so, were weighted twice as much as the other criteria (number of events, the number of back-to-back storms, maximum intensity, and the quartile flow criteria) in the data assessment.

One-year, two-year, and five-year intervals of rainfall and stream flow data records were analyzed and compared to the criteria characterizing "typical" annual conditions. The two-year and five-year period rainfall metrics are presented as an average of the one-year interval rainfall metrics, with the exception of the maximum peak intensity metric, which is the maximum value over the multi-year period. The stream flow metrics were calculated from the period comprising the multi-year period.

Further assessment of the distribution of storm and flow characteristics were done using statistical tools for identified candidate periods. These analyses served to further refine the identification of the most "typical" period.

Selected Period

Several candidate periods were identified as "representative" using the criteria described in the previous section. The evaluation resulted in three candidate time periods that most closely matched the criteria of the historical period. The following includes a list of the candidate periods:

1) 1978 (Candidate Period 1);
2) 1983 (Candidate Period 2); and,
3) 2002 (Candidate Period 3).

Statistics for rainfall and stream flow criteria for both annual and recreation season periods are presented in Table 2 for all years analyzed.

The year with the best match to the historical annual and recreation season averages of rainfall and stream flow is 1978. However, it has fewer back-to-back storms and lower median flow, on average, than observed in the other candidate years and the historical data. A comparison of daily rainfall and flow is shown in Figure 1, and indicates that stream flow and local rainfall are not well correlated ($P<0.05$). Therefore, depending on the collection system model sensitivity to back-to-back storms, it may be useful to rearrange storms within the 1978 record to increase the number of back-to-back storms. Three storms in 1978 have been identified, that, if shifted to a start time of 24 hours earlier, would increase the number of back-to-back storms in 1978 to a number more consistent with the historical data. The daily rainfall and flow conditions for 1978 are shown in Figure 2.

Each candidate period was further evaluated by comparing the distribution of storms and flows to the distributions from the entire historical period. Histograms of rainfall and stream flow for the entire year and the recreation season are shown in Figures 3-6. Comparisons for rainfall depth, maximum intensity, duration and stream flow are shown in Figures 7-10, respectively, using the entire period of data. Figures 11-14 show the same results for the recreation season datasets of each period. These figures indicate that 1978 has the best overall fit to the historical distribution of these characteristics.

The rainfall for each candidate period was also evaluated to identify the number of storms associated with key frequencies of occurrence (e.g. the number of one-year storms, number of six-month storms). The storm volumes for the historical record roughly correspond to 24-hour durations for the calculated return periods, based on a comparison to the corresponding range of precipitation frequency periods calculated by the National Oceanic and Atmospheric Administration (NOAA, 2006). Note that NOAA does not compute return periods less than one year. Table 3 presents a summary of the frequency of occurrence (e.g. return periods) and the number of storms corresponding to each return period interval for each candidate period. The results of these analyses served as the basis for recommending the candidate period 1 (1978) as the "typical" period as the results best match the return periods.

Table 2. Statistics for the Annual and Recreation season Periods for Years with Complete Datasets[1]

	Annual							*Summer (April-October)*						
	Rainfall				Wabash River Flow			Rainfall				Wabash River Flow		
Time Period	Events >0.25 in.	Volume	Back-to-Back	Max Peak Intensity	25th Pct	50th Pct	75th Pct	Events >0.25 in.	Volume	Back-to-Back	Max Peak Intensity	25th Pct	50th Pct	75th Pct
1954	37	37.68	4	1.55	2,320	3,150	5,058	22	26.92	2	1.55	2,270	3,470	7,035
1955	41	36.51	5	0.90	3,675	6,615	12,475	27	25.67	4	0.90	3,130	5,280	9,300
1956	40	36.06	5	1.18	1,930	4,280	10,600	26	21.18	4	1.18	1,860	5,430	9,550
1957	56	55.65	10	1.50	5,090	8,760	22,225	38	39.49	7	1.50	4,280	11,850	26,625
1958	39	35.35	2	0.82	4,710	7,300	12,950	31	26.92	2	0.82	4,750	7,385	18,600
1959	40	35.80	8	1.25	3,428	6,040	16,650	23	21.17	6	1.25	2,810	4,140	12,250
1960	36	29.78	2	1.19	2,435	6,540	10,750	19	17.97	2	1.19	2,980	7,630	11,050
1961	45	40.68	6	1.70	3,570	5,600	11,550	27	27.68	5	1.70	3,760	6,040	13,050
1962	40	35.08	2	1.23	2,925	6,600	14,000	23	20.60	2	1.23	3,180	6,200	10,750
1963	27	28.09	4	1.00	1,495	2,130	4,850	17	14.82	2	0.70	1,630	2,735	5,300
1964	41	31.65	9	0.79	1,480	2,420	7,900	22	15.48	4	0.79	1,540	3,800	9,550
1965	39	35.97	5	1.18	2,820	4,670	12,700	25	24.30	4	1.18	3,000	4,670	10,800
1966	35	30.04	5	1.03	1,720	4,120	8,550	17	14.56	0	0.75	1,370	2,490	5,020
1967	33	31.50	0	0.95	2,580	6,040	17,300	16	14.16	0	0.70	2,130	3,105	9,600
1968	37	31.15	4	1.37	4,860	7,670	13,850	19	18.59	2	1.37	3,815	7,195	12,275
1969	41	38.25	6	1.27	6,370	9,160	16,075	30	27.95	4	1.27	5,700	8,240	14,175
1970	40	32.42	4	1.15	5,063	7,135	10,875	29	24.84	3	1.15	4,530	6,770	11,750
1971	40	37.00	2	0.75	3,600	4,940	10,650	27	22.68	0	0.75	3,670	4,410	6,645
1972	47	39.66	7	1.05	6,025	11,000	21,750	33	25.13	6	1.05	5,333	10,250	16,725
1973	48	48.45	6	1.64	5,195	12,100	23,000	27	29.54	4	1.64	4,705	10,100	19,525
1974	66	44.12	6	1.20	4,543	12,200	27,700	35	28.55	5	1.20	3,718	6,435	18,100
1975	50	40.37	5	1.48	5,825	10,950	18,675	28	23.94	3	1.48	5,493	8,465	14,375
1976	35	27.49	5	1.30	2,350	4,410	8,725	24	16.99	2	1.20	2,580	3,890	5,743
1977	37	39.22	4	1.35	2,433	6,570	11,375	24	25.22	2	1.35	2,668	5,735	10,175
1978	37	38.28	3	1.21	3,713	5,350	13,900	24	25.12	2	1.21	3,353	6,900	16,925
1979	49	41.99	7	1.50	4,380	7,245	17,175	35	29.41	6	1.50	4,425	7,490	15,350
1980	36	29.54	5	1.20	3,660	5,870	11,300	23	20.97	5	1.20	3,863	6,225	11,525
1981	41	47.40	11	1.20	5,110	9,580	17,300	34	38.60	9	1.20	8,590	15,200	20,375
1982	52	49.70	17	1.30	5,648	11,700	30,625	30	28.10	10	1.30	3,333	7,650	15,450
1983	43	38.60	9	1.00	3,100	7,255	13,975	28	26.90	7	1.00	2,268	5,180	15,125
1984	50	44.20	11	1.10	3,905	7,400	12,350	34	29.10	7	1.10	2,675	5,865	12,0[illegible]
1985	46	47.50	19	0.80	4,140	6,095	21,350	24	21.40	9	0.70	3,170	4,730	7,0[illegible]
1986	39	39.80	9	0.90	5,620	8,525	13,375	27	29.50	8	0.90	4,748	7,355	12,900
1987	41	38.80	10	1.40	2,933	4,850	8,065	27	27.00	7	1.40	2,705	3,980	6,083
1988	33	33.60	5	0.80	1,685	3,720	9,490	18	17.80	2	0.80	1,533	1,840	3,690
1989	46	41.20	11	1.30	5,200	7,515	12,875	33	32.80	9	1.30	5,905	8,840	16,700
1990	52	48.60	14	1.00	9,335	13,900	22,650	31	27.60	11	1.00	8,525	12,650	17,900
1991	35	30.40	5	1.10	2,568	8,965	16,125	19	18.90	1	1.10	1,953	3,235	11,200
1992	44	44.60	12	1.90	5,770	8,640	16,150	31	26.50	8	1.90	5,100	7,760	13,000
1993	55	58.10	9	3.00	11,600	17,400	28,750	35	38.70	3	3.00	11,100	15,150	23,025
1994	35	32.10	7	2.20	3,890	6,530	10,675	19	21.80	5	2.20	2,935	5,330	10,175
1995	36	30.80	6	0.90	3,153	5,010	9,433	25	19.70	5	0.90	3,120	5,795	11,100
1996	47	47.20	9	1.60	4,225	7,450	17,700	33	33.20	8	1.60	3,683	6,555	23,300
1997	40	35.70	6	1.00	3,735	7,305	18,775	24	21.00	6	1.00	3,443	6,805	12,475
1998	54	45.40	17	1.40	5,013	9,995	24,975	34	31.40	11	1.40	7,568	18,900	28,350
1999	38	33.70	5	0.90	2,123	3,285	13,400	22	19.40	3	0.90	2,110	3,175	9,573
2000	39	39.10	6	1.20	2,860	4,360	6,725	27	28.00	5	1.20	3,180	4,425	7,923
2001	44	45.30	10	1.70	5,133	9,100	15,975	33	34.50	8	1.70	4,130	6,180	10,900
2002	38	38.28	5	1.30	3,203	6,860	20,725	24	25.88	4	1.30	2,980	6,005	22,975
2003	36	42.20	5	1.40	6,230	10,200	18,200	26	30.90	3	1.40	6,930	11,650	21,850
2004	40	37.20	6	1.50	6,295	8,550	15,550	26	23.80	5	1.50	4,813	7,115	12,325
2005	48	40.60	6	1.30	3,675	5,990	12,050	30	24.40	4	1.30	2,980	4,385	7,470
2006	53	44.10	10	1.20	6,610	10,900	17,300	32	28.00	4	1.20	4,943	8,520	12,975
Historical Period	*42*	*38.90*	*7*	*1.27*	*3,720*	*7,100*	*14,800*	*27*	*25.18*	*5*	*1.25*	*3,380*	*6,320*	*12,900*

[1]Header Notes:

Events > 0.25 in. is the number of storm events over a specified period (annual or recreation season) where total rainfall is at least 0.25 inches.

Volume is the total rainfall depth over a specified period in inches.

Back-to-back is the number of storms occurring within 24 hours of each other, with the first storm having at least 0.5" of total rainfall and the second storm having at least 0.10" of total rainfall.

Maximum peak intensity is the maximum peak rainfall intensity in inches per hour occurring over a specified period (annual or recreation season).

Table 3. Comparison of Storm Volume Occurrence and Approximate Frequency for the Long-Term Historical Record and Candidate Periods.

Occurrence Frequency (Yrs)	Description	Volume (inches)	Historical (Annualized)	1978	1983	2002
25	25 years	5.88	0.075	0	0	0
10	10 years	4.96	0.1	0	0	0
5	5 year	3.85	0.25	0	0	0
2	2 year	3.10	0.5	1	1	0
1	1 year	2.48	1	1	0	2
0.50	6 months	1.99	2	2	2	2
0.33	4 months	1.72	1	1	1	1
0.25	3 months	1.50	1	1	1	1
0.17	2 months	1.29	4	2	4	4
0.08333	1 month	0.89	5	5	5	7

Applications

The "typical" year (1978) will be used in the planning and development of the City's CSO Long Term Control Plan. The rainfall and river flow will provide inputs to the City's calibrated collection system model (SWMM) and the river water quality model. The hourly rainfall record from 1978 will be input to the SWMM to determine representative collection system overflow characteristics (e.g. number of overflows, total volume) and discharge hydrographs for each of the CSOs under current (baseline) conditions for the "typical" year period (on a continuous basis).

The SWMM results and the river flow data from 1978 will then be input to the river water quality model to understand "typical" water quality impacts in the Wabash River due to CSO overflows under current conditions. The river model will use the hourly rainfall from 1978 and the continuous results from SWMM to estimate CSO and storm water flows generated within the study area (which includes the city of Terre Haute). Results from the model simulation will be characterized for annual and recreation season periods for presenting key findings (e.g. number of events/year, number of hours above *E. coli* single sample maximum water quality standard, etc.).

The 1978 rainfall will be used to conduct a screening-level evaluation of the effectiveness of proposed control alternatives on reducing the frequency, magnitude, and duration of CSO discharges for particular events. The effectiveness of each of Terre Haute's proposed CSO control alternatives will be evaluated by repeating the SWMM and river model simulations using the 1978 rainfall and flow data with the design storm results for the proposed controls undertaking the same analysis of river model results as the baseline scenario (e.g. number of hours above *E. coli* water quality standards, etc. A preferred alternative will be identified based on collection system performance characteristics and in-stream water quality benefits.

References

United States Environmental Protection Agency (EPA). 1999. *Combined Sewer Overflow Guidance for Monitoring and Modeling*. EPA 832-B-99-002.

National Oceanic and Atmospheric Administration. 2006. *Precipitation Frequency Atlas of the United States*. NOAA Atlas 14, Volume 2. Silver Spring, MD.

Figure 1. Rainfall Depth and Corresponding Range of Observed Wabash River Flows

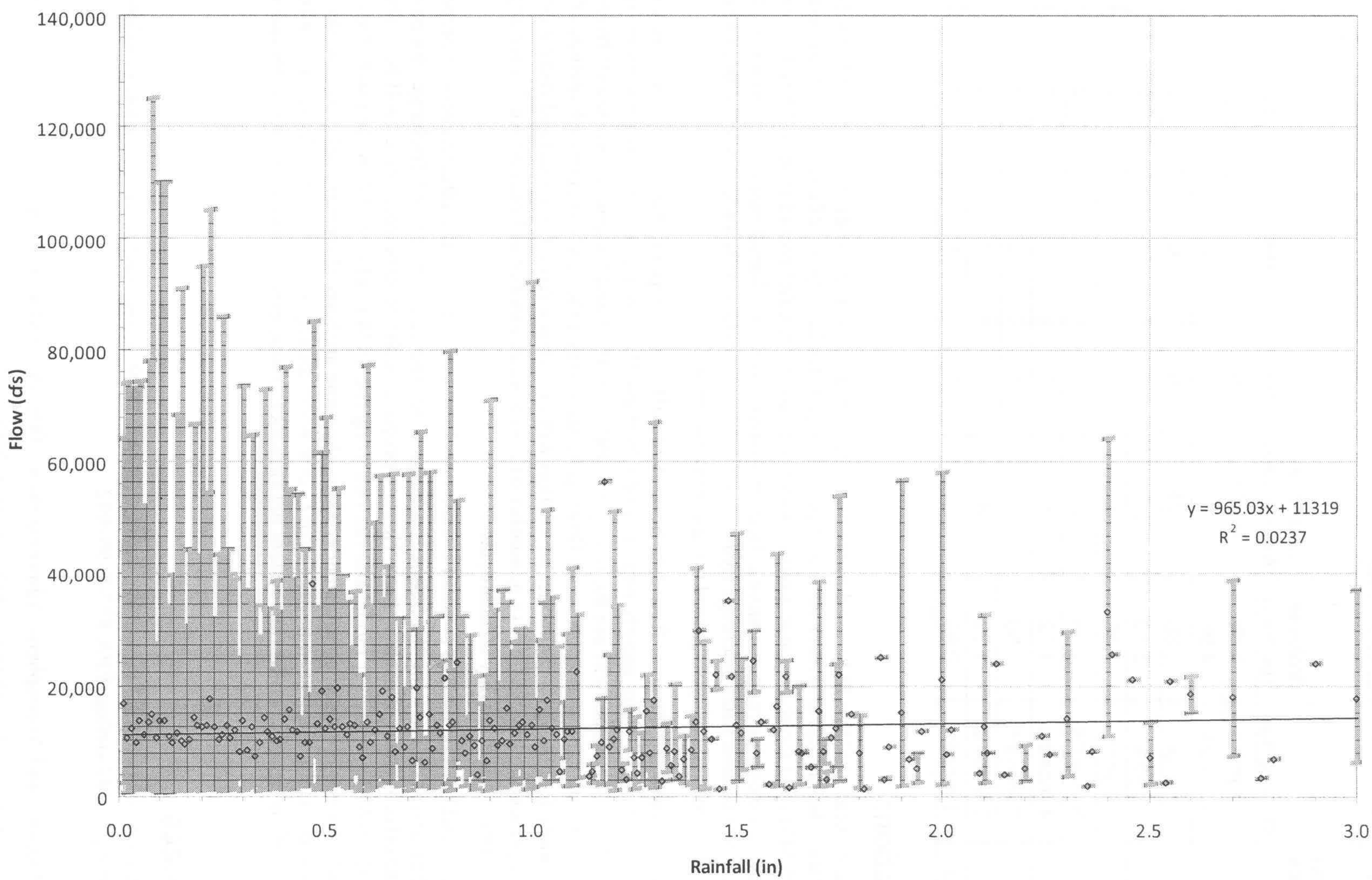


Figure 2. Terre Haute-Typical Environmental Condtions
1978

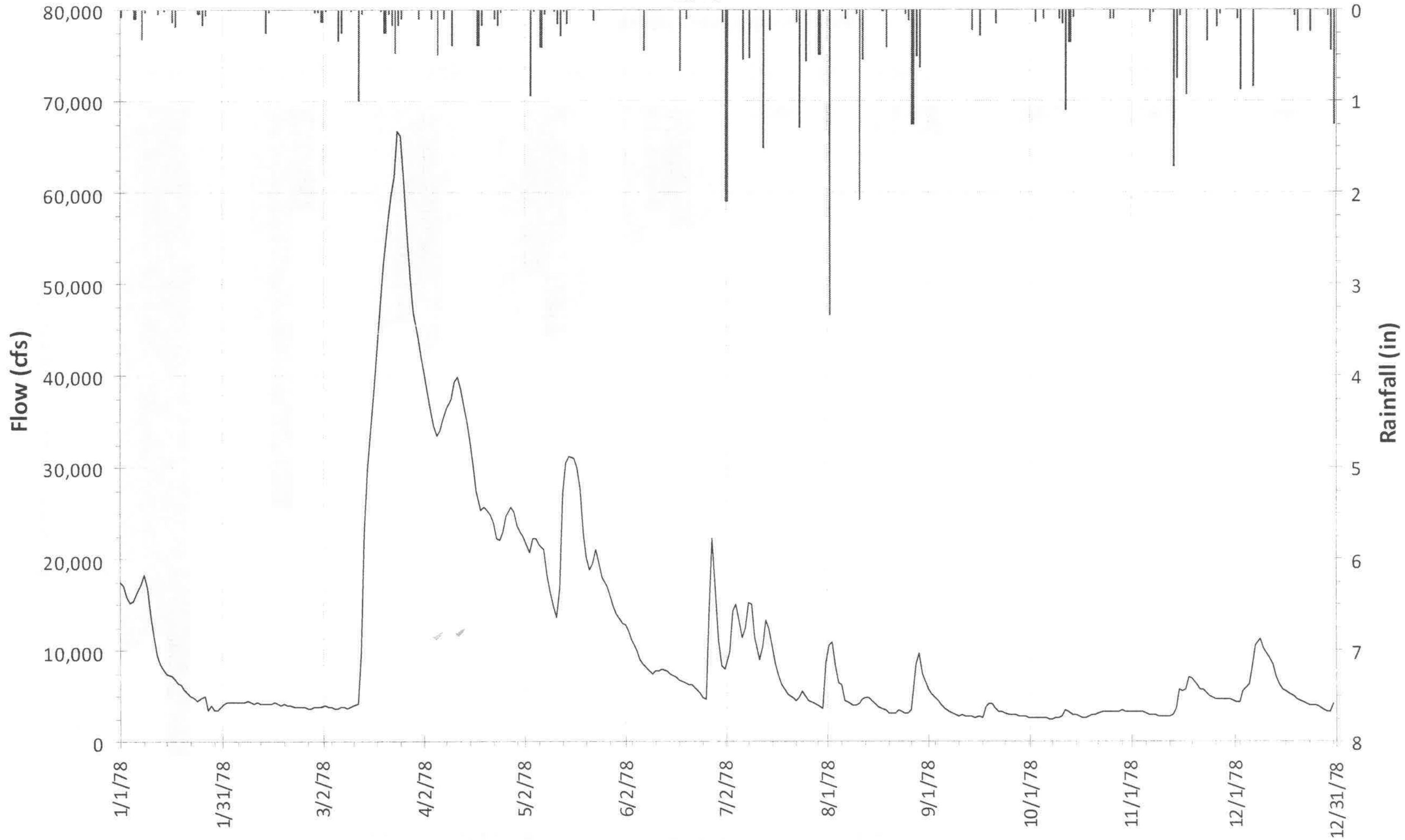


Figure 3. Distribution of Storm Events-Annual

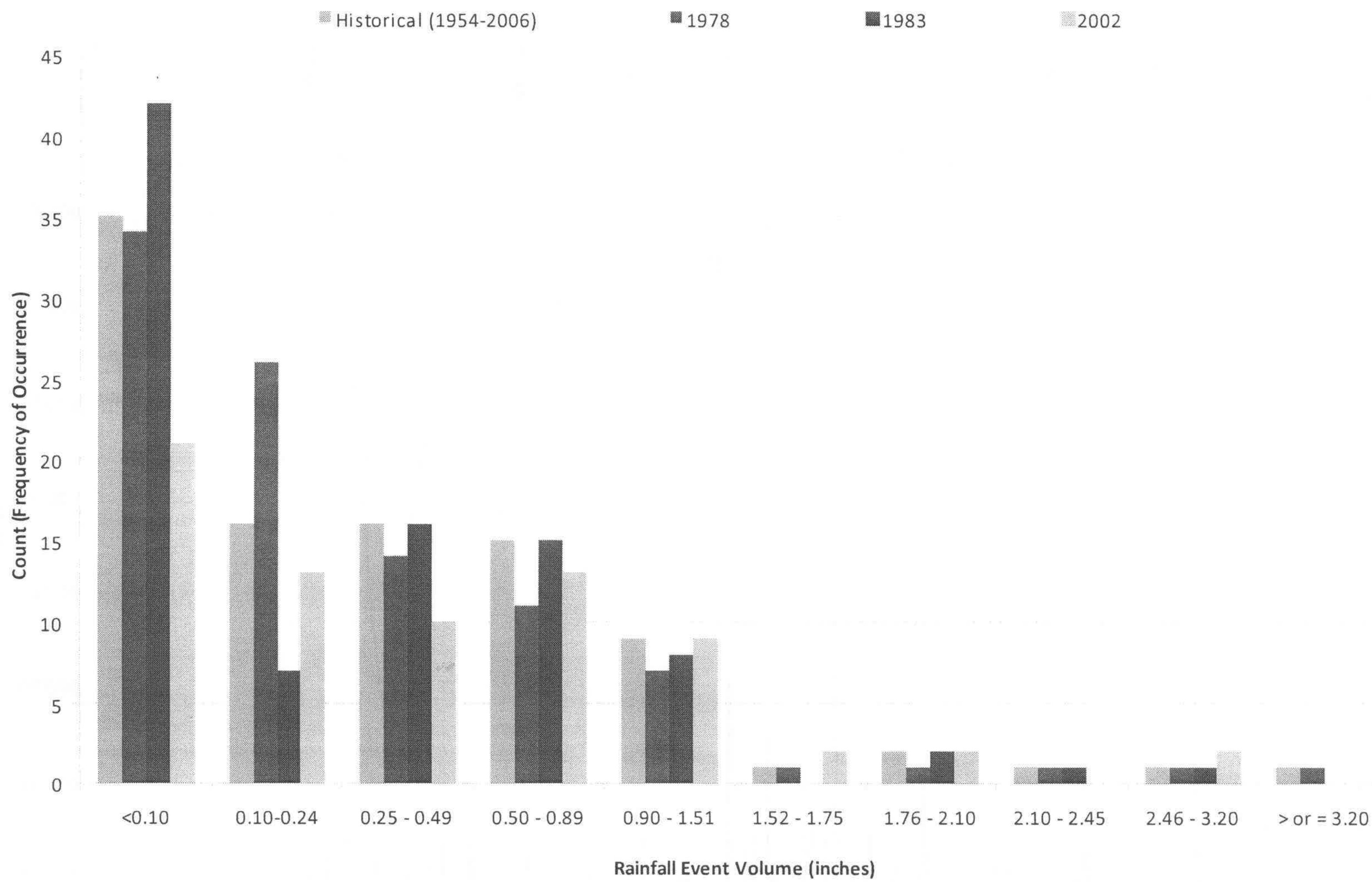


Figure 4. Distribution of Storm Events-Rec. Season

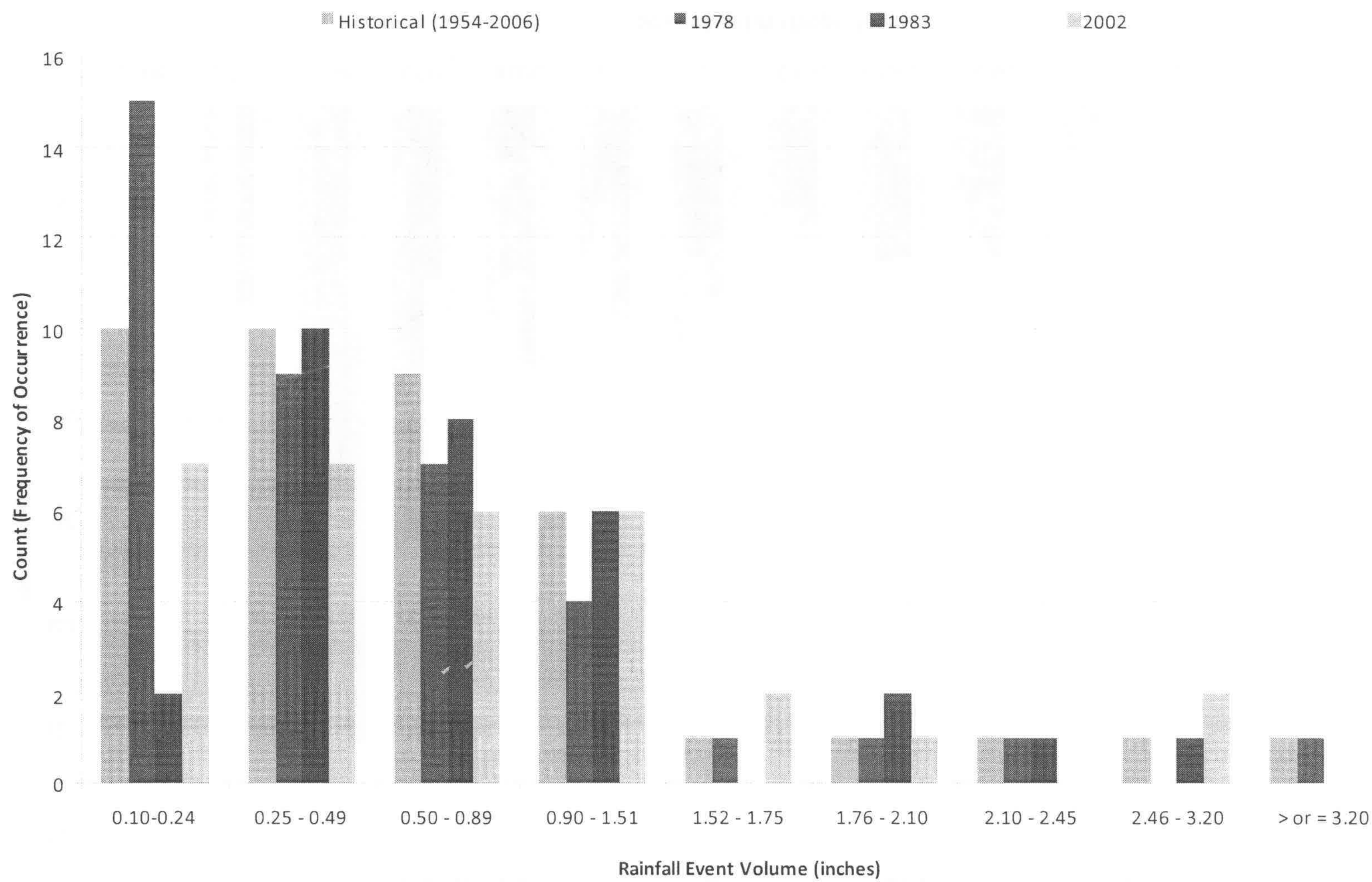


Figure 5. Distribution of Streamflow - Annual

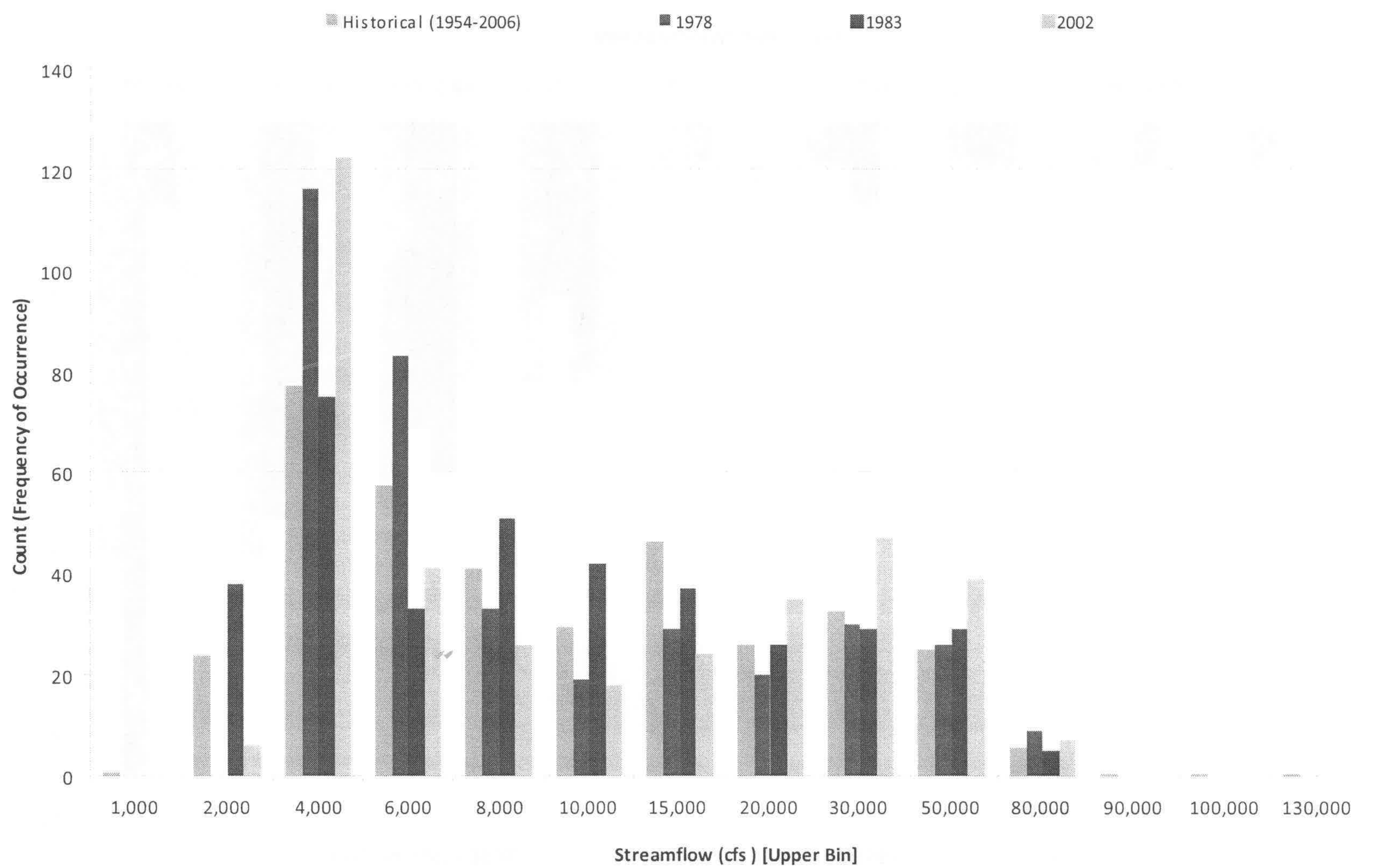


Figure 6. Distribution of Streamflow - Rec. Season

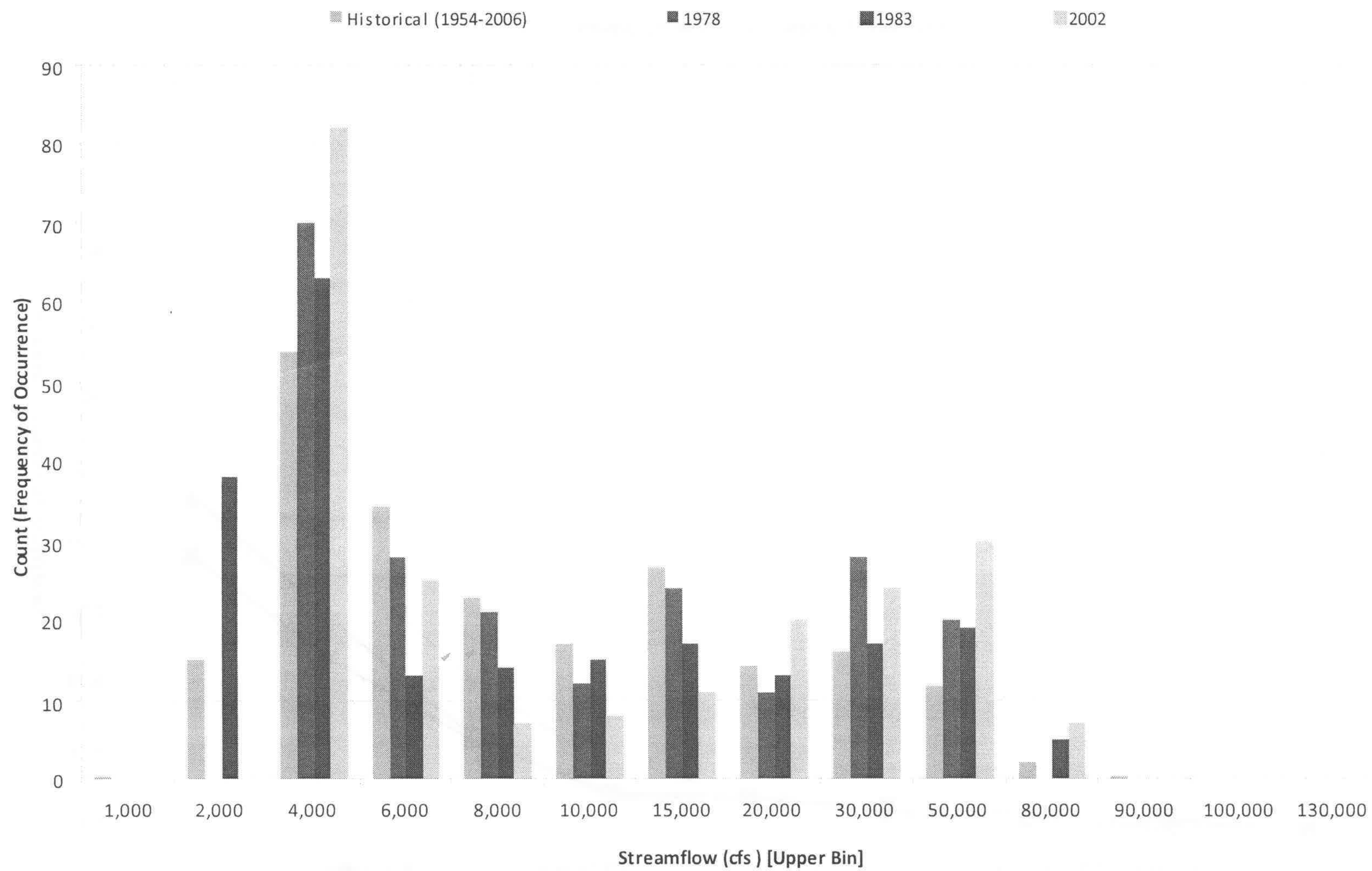


Figure 7. Rainfall Event Volume Exceedance Frequency-Annual

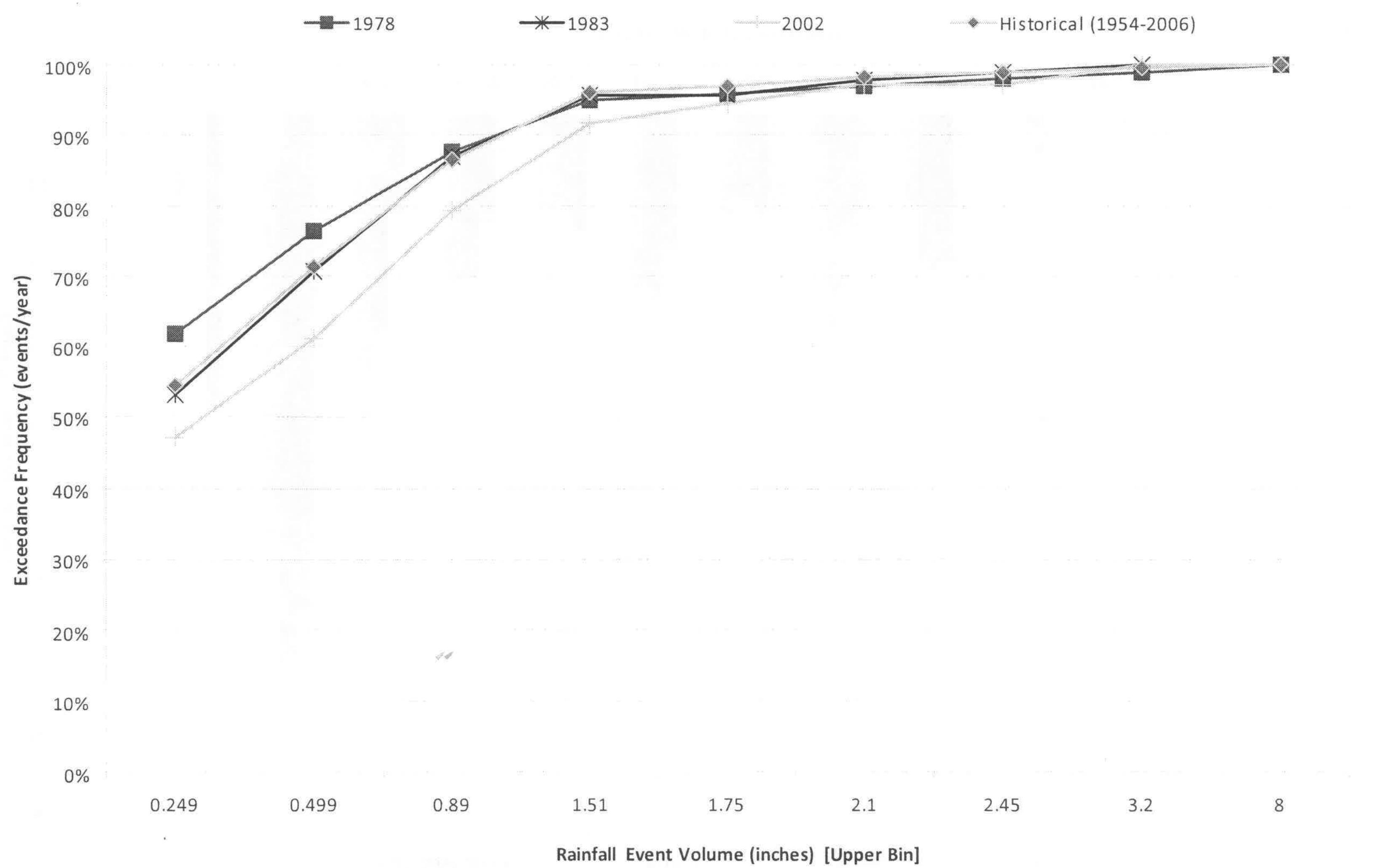
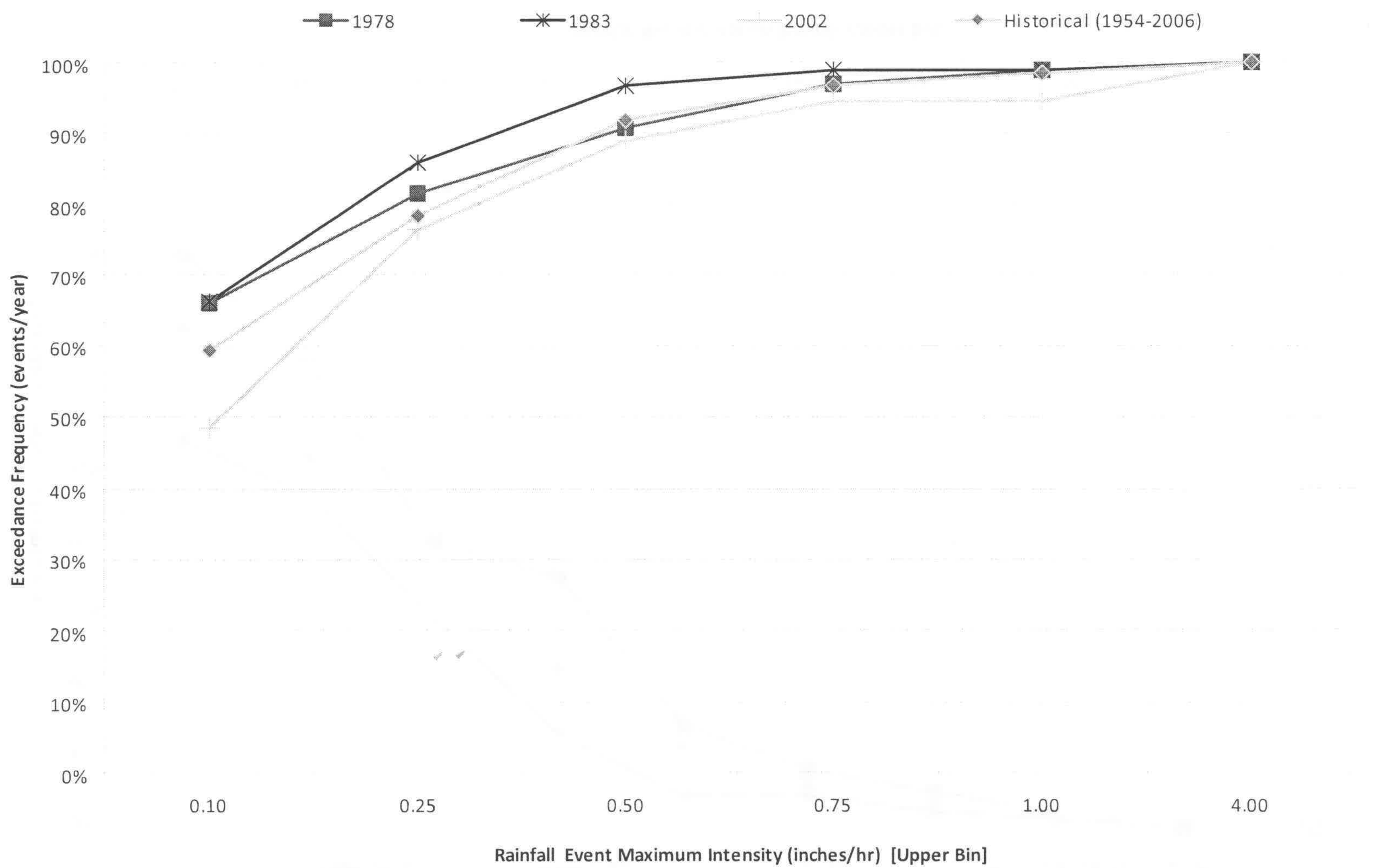


Figure 8. Rainfall Event Maximum Intensity Exceedance Frequency-Annual



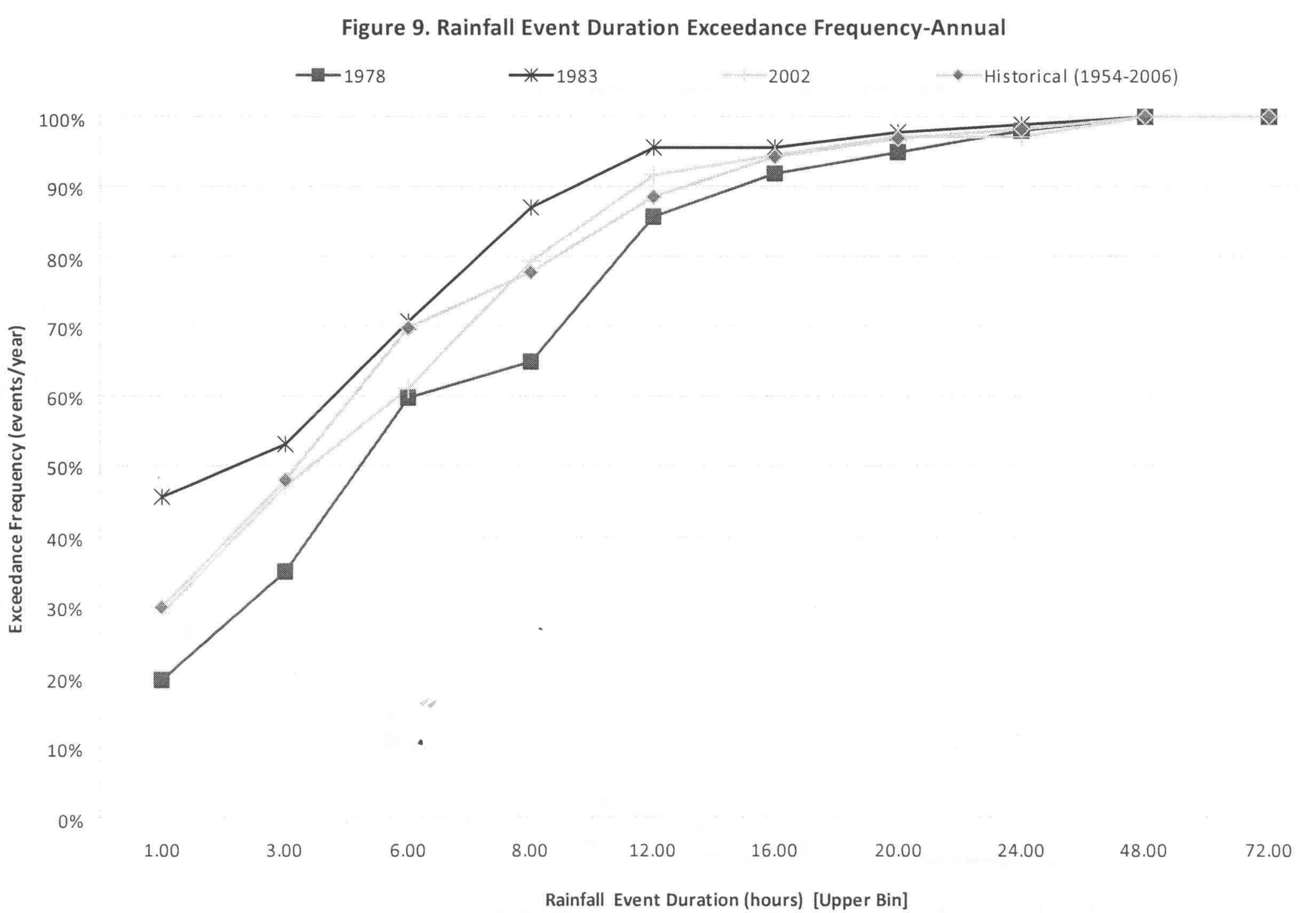


Figure 9. Rainfall Event Duration Exceedance Frequency-Annual
1978
1983
2002
Historical (1954-2006)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Exceedance Frequency (events/year)
1.00
3.00
6.00
8.00
12.00
16.00
20.00
24.00
48.00
72.00
Rainfall Event Duration (hours) [Upper Bin]

Figure 10. Wabash River Flow Exceedance Frequency-Annual

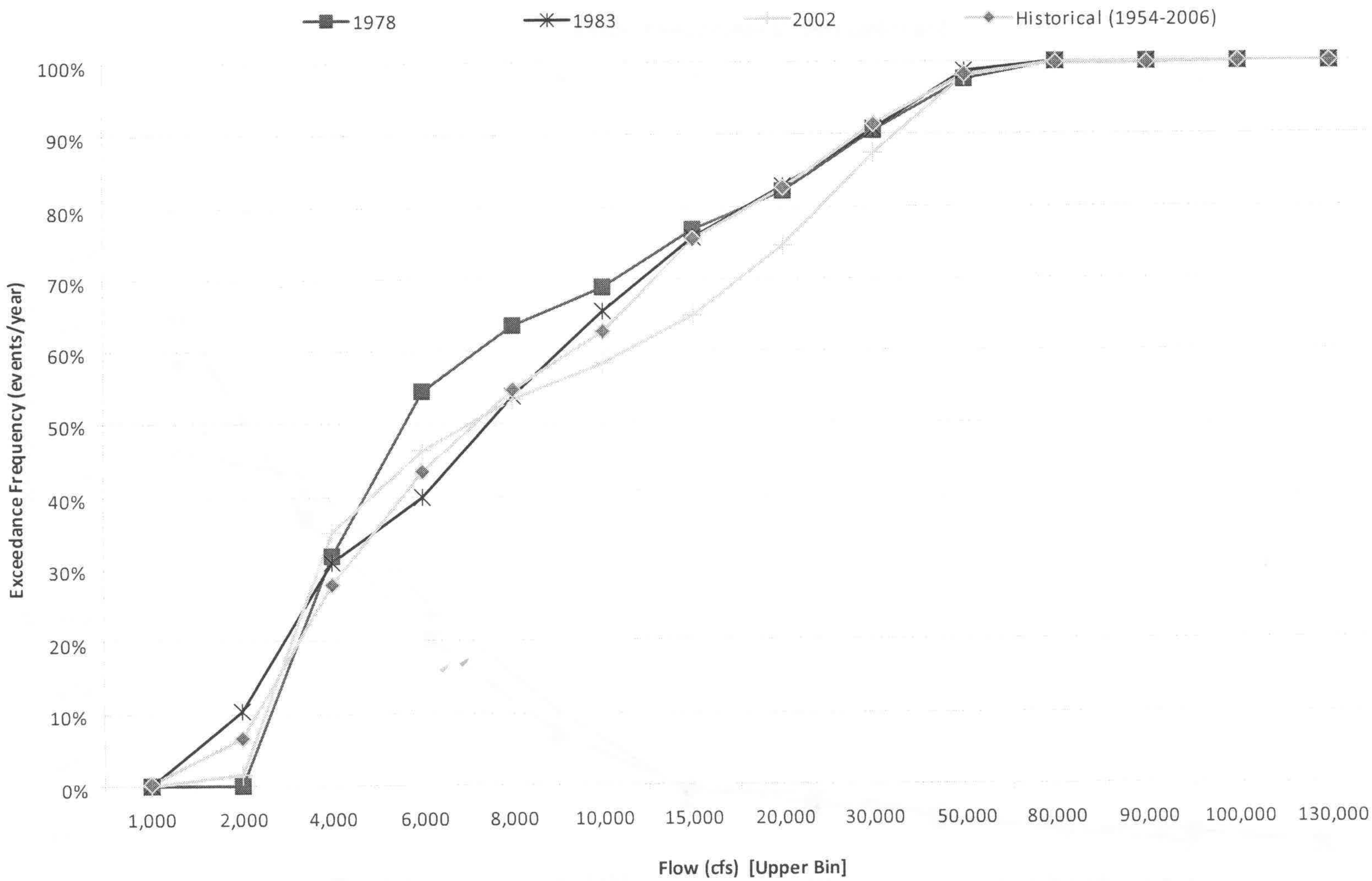


Figure 11. Rainfall Event Volume Exceedance Frequency-Rec Season

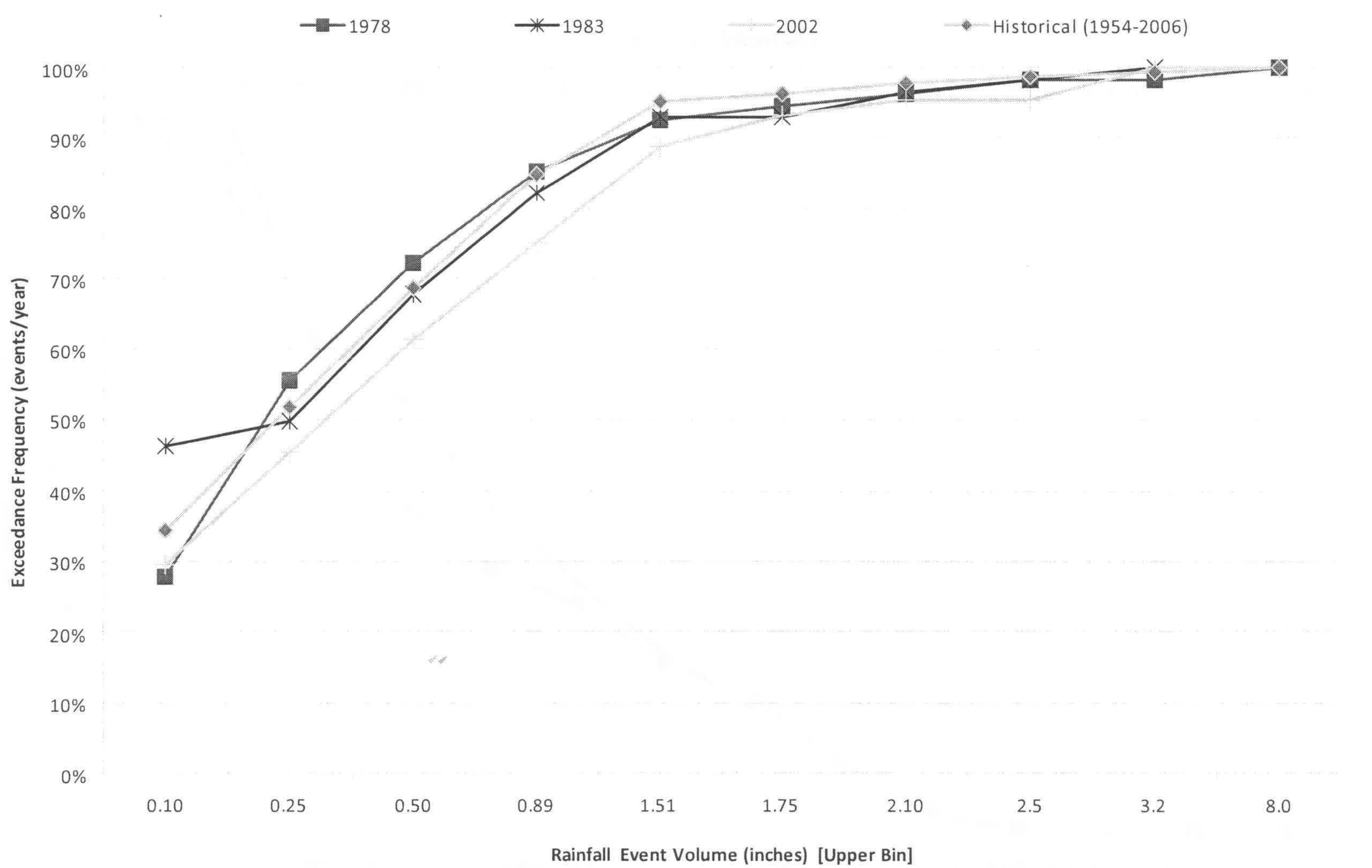


Figure 12. Rainfall Event Maximum Intensity Exceedance Frequency-Rec Season

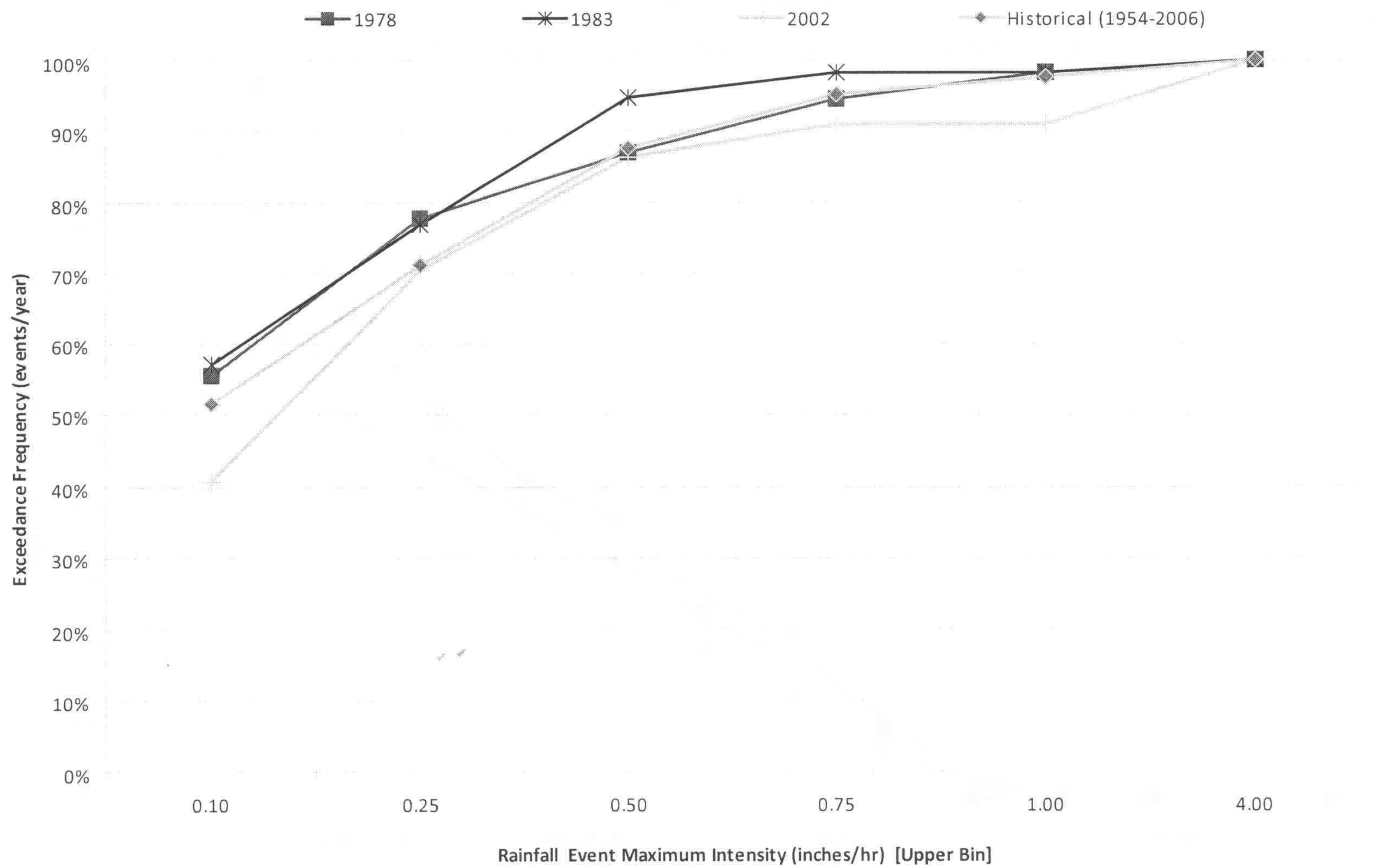
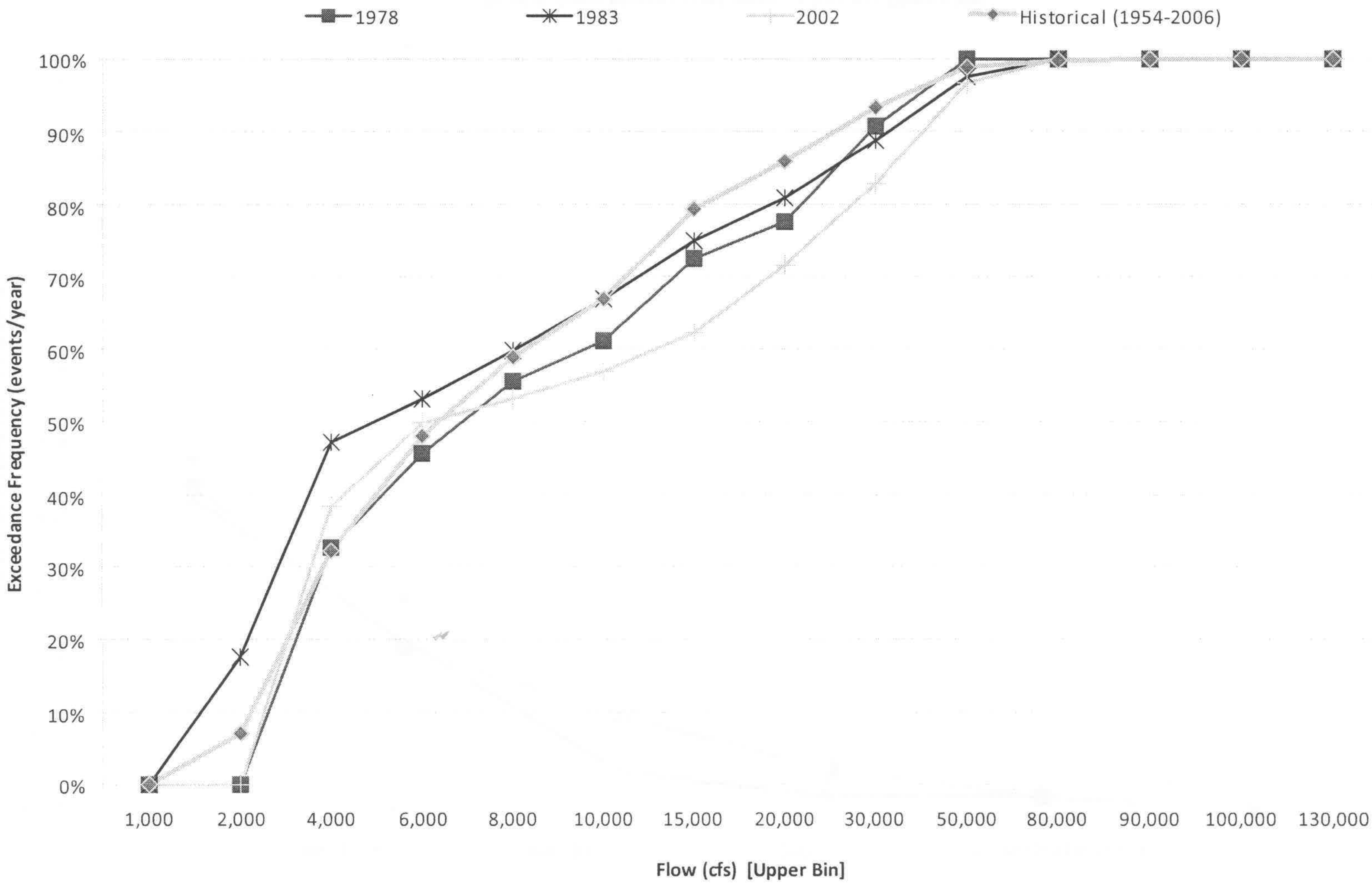


Figure 14. Wabash River Flow Exceedance Frequency-Rec Season



Appendix 1. Rain Gage Assignment by Month and Year

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton
2005	Clinton	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
2004	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
2003	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
2002	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton	Brazil	Clinton	Clinton
2001	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
2000	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1999	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1998	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Paris	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton
1997	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton
1996	Clinton	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton	Clinton
1995	Clinton/Paris	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1994	Brazil	Brazil	Brazil	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Brazil
1993	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Brazil	Clinton	Paris	Clinton/Brazil	Brazil
1992	Brazil	Brazil	Clinton	Clinton	Clinton	Clinton	Brazil	Brazil	Clinton	Clinton	Clinton	Clinton
1991	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton
1990	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Brazil	Clinton/Brazil	Clinton
1989	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Clinton
1988	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1987	Brazil	Brazil	Brazil	Clinton	Clinton	Clinton	Brazil	Brazil	Brazil	Brazil	Brazil	Brazil
1986	Brazil	Paris	Brazil	Brazil	Brazil	Brazil	Clinton	Clinton	Clinton	Clinton	Brazil	Brazil
1985	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Brazil	Clinton	Clinton	Brazil	Clinton/Brazil
1984	Brazil	Clinton	Brazil	Clinton/Paris	Paris	Clinton	Brazil	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton
1983	Brazil	Brazil	Brazil	Brazil	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1982	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Paris
1981	Clinton/Paris	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Brazil	Brazil	Brazil	Clinton
1980	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Brazil	Clinton	Brazil	Brazil
1979	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton
1978	Clinton	Clinton	Clinton/Brazil	Clinton/Paris	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton/Brazil
1977	Brazil	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton/Paris	Clinton	Clinton/Brazil
1976	Clinton	Clinton/Brazil	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton
1975	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Paris	Clinton	Clinton	Clinton	Clinton/Brazil
1974	Clinton/Paris	Brazil	Brazil	Clinton/Brazil	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil
1973	Clinton	Clinton/Brazil	Clinton	Clinton	Paris (-1 day)	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil
1972	Clinton	Clinton/Paris	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton	Clinton	Clinton/Paris	Clinton	Clinton
1971	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Paris	Clinton	Clinton	Clinton	Clinton
1970	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton/Brazil	Clinton/Paris	Clinton	Clinton	Clinton	Clinton	Clinton

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1969	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1968	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1967	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1966	Clinton	Clinton	Paris	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1965	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1964	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1963	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1962	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1961	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1960	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1959	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1958	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1957	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1956	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1955	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton
1954	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton	Clinton