Analyses of Flows of the Brazos and Trinity Rivers and Tributaries

Ralph Wurbs and Yiwen Zhang
Texas A&M University
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Texas Water Development Board
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TWDB Contract No. 1348311643

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CHAPTER 1
INTRODUCTION

The objective of the study documented by this report is to develop a better understanding of flow characteristics of the Trinity River and its tributaries and the Brazos River and its tributaries and changes in flow characteristics that have occurred in response to water resources development and use. This work is designed to support studies of environmental instream flow issues and standards. The river system hydrology information presented is fundamental to environmental flow studies and other aspects of water resources planning and management. Datasets are compiled and graphical and statistical analyses are presented for daily, monthly, and annual flows and annual peak flow rates observed at U.S. Geological Survey (USGS) gages and computed naturalized and regulated flows and other simulation results from developmental versions of the daily Brazos and Trinity water availability models (WAMs) that are still being tested and improved.

Population and economic growth and accompanying water resources development such as reservoir storage, diversions to supply agricultural, municipal, and industrial needs, and return flows from surface and groundwater sources have impacted river flows throughout Texas. The impacts of climate change on hydrology and water management throughout the world have been investigated extensively by the scientific and water management communities and continues to be a major research focus. Quantifying long-term changes is difficult due to the great natural variations in flows that hide long-term trends. The impacts of human activities on low flows may be very different than on high flows. For example, regulation of rivers by dams reduces peak flood flows but may increase low flows at downstream locations. The impacts of reservoir storage and water use on daily flows versus monthly or annual flows may also be significantly different.

The Texas Commission on Environmental Quality (TCEQ) WAM System combines historical natural river basin hydrology with specified scenarios of water resources development, allocation, management, and use. Hydrologic period-of-analysis sequences of naturalized, regulated, and unappropriated flows are generated. Naturalized stream flows represent natural conditions without human water resources development and use. WAM naturalized monthly flows were computed by adjusting observed flows to remove the historical impacts of water development and use. Regulated and unappropriated flows are computed by the simulation model for a specified water management scenario. Regulated flows are physical flows at a location reflecting the water management scenario incorporated in the simulation model. Unappropriated flows represent water still available for further appropriation. Unappropriated flows may be less than regulated flows due to some of the water being committed to in-stream flow requirements at that location or committed to other diversion, storage, and in-stream flow requirements at downstream locations.

This report documents analyses of observed flows from gage records and naturalized and regulated flows from developmental daily WAMs at selected sites on the Brazos and Trinity Rivers and their tributaries. Observed flows are non-stationary, reflecting the history of actual water resources development. Naturalized flows are based on observed flows but have been adjusted to remove the effects of historical water resources development and thus conceptually are essentially stationary with no long-term changes. The WAM regulated flows are also conceptually stationary, reflecting a specified condition of water resources development, which could be conditions at a specified point in time or a scenario representing specified premises such as the premise that all water right permit holders use the full amounts of water authorized by their permits.

Computer Programs and Databases

This report focuses primarily on statistical analyses of observed stream flows from the USGS National Water Information System (http://waterdata.usgs.gov/tx/nwis/nwis) and computed flows from developmental daily versions of the Brazos and Trinity WAM simulation models. The analyses are performed using the HEC-DSSVue, HEC-SSP, and WRAP software packages.

The Hydrologic Engineering Center (HEC) of the U.S. Army Corps of Engineers developed its Data Storage System (DSS) for use with HEC models (http://www.hec.usace.army.mil/). However, HEC-DSS is also useful in applying the Water Rights Analysis Package (WRAP). WRAP programs incorporate routines from a HEC electronic library that allow creating and accessing DSS files. The HEC-DSS Visual Utility Engine (HEC-DSSVue) is an interface for viewing, editing, plotting, manipulating, and analyzing data in DSS files [1]. [Numbers in brackets refer to the list of references on page 87.] HEC-DSSVue reads DSS files created with WRAP containing simulation results as well as results from HEC simulation models, observed data from the USGS NWIS and other databases, and Microsoft Excel spreadsheets. HEC-DSSVue accesses databases, plots graphs, performs arithmetic and statistical computations, and otherwise manages time series data.

The HEC-SSP Statistical Software Package [2] is also available at the HEC website. HEC-SSP performs frequency analyses with the results presented both in tables and graphs. The log-Pearson type III, Pearson type III, log-normal, and normal probability distribution functions are used to perform frequency analyses for annual series of peak flows or other variables. The Weibull relative frequency formula can also be applied. A volume frequency analysis component is designed for analyzing daily stream flow or stage data. Annual series of minimum or maximum volumes each year during durations of one or more days are analyzed based on an input daily dataset. A duration analysis component shows the percent-of-time that a hydrologic variable exceeds specified values.

The Water Availability Modeling (WAM) System maintained by the TCEQ consists of the Water Rights Analysis Package (WRAP) modeling system and input datasets for the 15 major river basins and eight coastal basins of Texas. The generalized WRAP modeling system combined with an input dataset from the TCEQ WAM System for a particular river basin, or modification thereof, is called a water availability model (WAM). The authorized and current condition scenario WAM datasets are used in the TCEQ water rights permitting process. The TWDB has developed datasets based on projected future water use scenarios for use in planning studies.

The routinely applied TCEQ WAM System is based on a monthly time step. The TCEQ is sponsoring continuing research at Texas A&M University that includes development of daily versions of selected WAMs along with updating hydrology input datasets. The test versions of the daily WAMs employed in the study reported here are continuing to be further refined.

The monthly WRAP input datasets for all of the river basins of the state along with an array of information regarding water availability modeling are available at the TCEQ WAM website.

http://www.tceq.state.tx.us/permitting/water_rights/wr_technical-resources/wam.html

Daily versions of the Brazos and Trinity WAMs are applied in the studies documented by this report. WRAP is documented by a set of manuals [3, 4, 5, 6, 7, 8, 9]. The August 2015 version of the WRAP software and documentation and other related information are available at the TAMU WRAP website. https://ceprofs.civil.tamu.edu/rwurbs/wrap.htm

WRAP, HEC-DSSVue, and HEC-SSP are convenient to apply in combination since all work with DSS files. Statistical analysis can be performed with either HEC-DSSVue, HEC-SSP, or WRAP, but each of the analysis packages has certain features that are not available in the others. HEC-SSP is oriented toward flood studies. Although including flood frequency analysis, WRAP reliability and flow and storage frequency analysis capabilities are motivated primarily by water supply applications.

Water Availability Model Improvements and Updates

The TCEQ, TWDB, TPWD, and their contractors consisting of university researchers and consulting engineering firms initially implemented the WAM System during 1997-2003 pursuant to the 1997 Senate Bill 1 (SB1) [10]. TCEQ requires that water right permit applicants or their consultants apply the WAM System to evaluate reliabilities associated with their proposed plans and the effects on the reliabilities of all other water rights. TCEQ staff uses the model to evaluate water right permit applications. The TWDB, regional planning groups, and their consultants apply the WAM System in SB1 planning studies. The WAM System is also used by water agencies and consulting firms to support various other types of water planning and management endeavors.

TCEQ continues to update WAM input datasets as new and revised water right permits are approved, environmental flow standards are established, hydrology data accumulates, and modeling capabilities are expanded. The generalized WRAP modeling system has continued to be expanded and improved at Texas A&M University (TAMU) under the sponsorship of the TCEQ and other agencies. Work at TAMU sponsored by the TCEQ during September 2011 through August 2016 is focused on expanding capabilities for simulating environmental flow standards established pursuant to the 2007 Senate Bill 3 and their impacts on water supply capabilities. Developing daily WRAP/WAM modeling capabilities has been a central focus of this work.

The routinely applied WRAP/WAM modeling system uses a monthly computational time step. The recently developed daily modeling system [7] includes flow forecasting and routing, disaggregation of monthly naturalized flows and water demands to daily, simulation of flood control reservoir operations, and tracking high flow pulses of specified frequencies for environmental flow standards along with subsistence and base flows. Daily versions of the water availability models (WAMs) for the Brazos, Trinity, Colorado, Sabine, Neches, and Guadalupe-San Antonio River (GSA) Basins River Basins have been developed at TAMU for the TCEQ [11, 12, 13, 14, 15, 16, 17, 18]. The daily WAMs are still in a developmental mode, continue to be tested and refined, and have not been adopted by the TCEQ for use in the water right permitting process. Input datasets and documentation are available at the WRAP website.

Monthly naturalized flows are disaggregated to daily in the WAMs using daily pattern hydrographs derived from either observed flows at USGS gages, flows synthesized with the Soil and Water Assessment Tool (SWAT) watershed rainfall-runoff model [25], or unregulated flows from a U.S. Army Corps of Engineers (USACE) Fort Worth District reservoir operations modeling system. Monthly naturalized flows in the Brazos and Trinity WAMs are disaggregated to daily using observed flows and unregulated flows from the USACE modeling system.

The hydrologic periods-of-analysis of the 20 WAM System monthly WAMs are either 1940-1996, 1940-1997, 1940-1998, or 1934-1989. The original and still official hydrologic period-of-analysis for the Brazos WAM is 1940-1997 and for the Trinity WAM is 1940-1996. The hydrologic periods-of-analysis have been extended in the daily WAMs through either 2012 or 2013 [19, 20, 21, 22, 23, 24]. The extensions of monthly naturalized flows and reservoir evaporation-precipitation rates were performed using recently developed methodologies described in the *WRAP Hydrology Manual* [6] based on TWDB databases of monthly precipitation and reservoir evaporation rates by one-degree quadrangle.

The hydrology input data for the daily Brazos and Trinity WAMs were recently improved and extended to cover a 1940-2015 hydrologic period-of-analysis [31, 32]. Flow datasets stored in DSS files compiled for the hydrology updates complement and extend the present report. The updated hydrology is incorporated in the simulation studies presented in the present report.

Scope and Organization of this Report

The investigation documented by this report focuses on compiling, analyzing, and displaying observed and simulated stream flow data at the gage sites in the Brazos and Trinity River Basins listed in Tables 1.1 and 1.2. Other relevant related information is also explored. The data analyses are presented in the appendices and discussed in Chapters 3 and 4. The flow data are stored in DSS files accessible through HEC-DSSVue. Time series plots and statistical analyses are presented in this report. The primary data compiled and analyzed in this study consists of:

- sequences of daily, monthly, and annual observed flow rates and annual peaks from the National Water Information System (NWIS) maintained by the USGS and
- naturalized and regulated flows and other simulation results from the Brazos and Trinity WAMs.

Chapter 2 provides a brief summary of an August 2014 report entitled *River System Hydrology in Texas* [26]. Plots and statistics in Chapter 2 are updated to include additional recent data accumulated since the compilations of the previous report. Precipitation and stream flow is demonstrated to be extremely variable, exhibiting extremes of major floods and multiple-year droughts as well as year-to-year, seasonal, and continuous random fluctuations. Long-term changes or trends are not evident in 1940-2014 monthly precipitation. Stream flow characteristics have changed at many sites throughout Texas due to human water resources development and use.

The general discussion of river system hydrology statewide in Chapter 2 provides a framework for the studies of the flows of Brazos and Trinity Rivers and tributaries presented in Chapters 3 and 4, respectively. A summary and conclusions are presented in Chapter 5. The 12 appendices comprise most of the pages of this report. Plots and statistical frequency analyses of observed and simulated river flows found in the appendices are discussed in Chapters 3 and 4 along with other analyses directly documented in these chapters. The contents of Chapters 3 and 4 and the appendices are described in the remainder of the present Chapter 1.

Observed flows at 47 USGS gaging stations are investigated in Chapters 3 through 5 and Appendices A through H. Likewise, WAM simulation results are explored in Chapters 3 through 5 and Appendices I through L. The same types of flow plots and flow frequency analyses for the two different river basins are presented in separate appendices. The plots and statistical frequency analyses for the sites on the Brazos River and its tributaries are found in Appendices A, C, E, G, I, and K. The same types of information for the sites on the Trinity River and its tributaries are found in Appendices B, D, F, H, J, and L.

Selected USGS Gaging Stations

The 30 USGS gaging stations on the Brazos River and tributaries and 17 gaging stations on the Trinity River and tributaries adopted for this investigation are listed in Tables 1.1 and 1.2, respectively. Additional information regarding these sites are provided in Tables 3.2 and 4.2 of Chapters 3 and 4, including the periods-of-record and identification of the sites at which environmental flow standards have been established pursuant to the 2007 Senate Bill 3 (SB3).

Table 1.1
Selected Stream Flow Gaging Stations in the Brazos River Basin

ID	USGS Gage ID	WAM CP ID	Location by River and Nearest City	County	Drainage Area (sq mile)
B1	08080500	DMAS09	Double Mountain Fork near Aspermont	Stonewall	1,891
B2	08082000	SFAS06	Salt Fork Brazos River near Aspermont	Stonewall	2,504
B3	08082500	BRSE11	Brazos River near Seymour	Baylor	5,996
B4	08084000	CFNU16	Clear Fork Brazos near Nugent	Jones	2,236
B5	08085500	CFFG18	Clear Fork Brazos near Fort Griffin	Shackelford	4,031
B6	08088000	BRSB23	Brazos River near South Bend	Young	13,171
B7	08089000	BRPP27	Brazos River near Palo Pinto	Palo Pinto	14,309
B8	08091000	BRGR30	Brazos River near Glen Rose	Somervell	16,320
B9	08095000	NBCL36	North Bosque River near Clifton	Bosque	977
B10	08096500	BRWA41	Brazos River at Waco	Mclennan	20,065
B11	08097500	–	Brazos River near Marlin	Falls	30,211
B12	08098290	BRHB42	Brazos River near Highbank	Falls	20,900
B13	08100000	LEHM46	Leon River near Hamilton	Hamilton	1,928
B14	08100500	LEGT47	Leon River near Gatesville	Coryell	2,379
B15	08102500	LEBE49	Leon River near Belton	Bell	3,579
B16	08103800	LAKE50	Lampasas River near Kempner	Lampasas	817
B17	08104500	LRLR53	Little River near Little River	Bell	5,266
B18	08106500	LRCA58	Little River near Cameron	Milam	7,100
B19	08108700	–	Brazos River at SH 21 near Bryan	Burleson	20,645
B20	08109000	BRBR59	Brazos River near Bryan	Brazos	20,900
B21	08110000	YCSO62	Yegua Creek near Somerville	Burleson	1,011
B22	08110100	DCLY63	Davidson Creek near Lyons	Burleson	195
B23	08110200	–	Brazos River at Washington	Washington	31,626
B24	08110500	NAEA66	Navasota River at Easterly	Leon	936
B25	08110800	–	Navasota River at Old Spanish Rd Bryan	Robertson	1,287
B26	08111000	NABR67	Navasota River near Bryan	Brazos	1,427
B27	08111010	–	Navasota River near College Station	Grimes	1,809
B28	08111500	BRHE68	Brazos River near Hempstead	Washington	34,374
B29	08114000	BRRI70	Brazos River near Richmond	Fort Bend	35,541
B30	08116650	BRRO72	Brazos River near Rosharon	Fort Bend	35,773

Table 1.2
Selected USGS Stream Flow Gaging Stations in the Trinity River Basin

ID	USGS Gage ID	WAM CP ID	Location by River and Nearest City	County	Drainage (sq miles)
T1	08044000	8BSBR	Big Sandy Creek near Bridgeport	Wise	333
T2	08047500	8CTFW	Clear Fork Trinity River at Fort Worth	Tarrant	518
T3	08048000	8WTFW	West Fork Trinity River at Fort Worth	Tarrant	2,615
T4	08049500	8WTGP	West Fork Trinity River at Grand Prairie	Dallas	3,065
T5	08057000	8TRDA	Trinity River at Dallas	Dallas	6,106
T6	08057410	−	Trinity River below Dallas	Dallas	6,278
T7	08062500	8TRRS	Trinity River near Rosser	Ellis	8,146
T8	08062700	8TRTR	Trinity River at Trinidad	Henderson	8,538
T9	08063020	−	Cedar Creek at Trinidad	Henderson	1,011
T10	08064700	8TEST	Tehuacana Creek near Streetman	Freestone	142
T11	08064800	−	Catfish Creek near Tennessee Colony	Anderson	207
T12	08065000	8TROA	Trinity River near Oakwood	Anderson	12,833
T13	08065200	−	Upper Keechi Creek near Oakwood	Leon	150
T14	08065350	8TRCR	Trinity River near Crockett	Houston	13,911
T15	08065500	8TRMI	Trinity River near Midway	Madison	14,450
T16	08066000	8TRRI	Trinity River at Riverside	Walker	15,589
T17	08066500	8TRRO	Trinity River at Romayor	Liberty	17,186

The identifiers in the first column of the tables were created specifically for this report for convenient labeling. The USGS gaging station identifiers and WAM control point identifiers are listed in the second and third columns of Tables 1.1 and 1.2. Thirty-eight of the 47 gage sites serve as primary control points in the WAMs. Most of the selected USGS gaging stations have long periods of record as indicated in Tables 3.2 and 4.2. The selected gages include all sites in the Brazos and Trinity River Basins for which SB3 environmental flow standards have been established. As discussed in Chapters 3 and 4, SB3 environmental flow standards have been established at 19 sites in the Brazos River Basin and four sites in the Trinity River Basin.

Analyses Documented in Chapters 3 and 4

Chapters 3 and 4 provide the same types of information for the Brazos and Trinity systems, respectively. Chapters 3 and 4 include: (1) statistical analyses of observed daily flows at the 47 gages, (2) discussions of additional graphical and statistical analyses of daily, monthly, annual, and annual peak flows presented in the appendices, and (3) WAM simulation studies with results presented both in the two chapters and the accompanying appendices. Datasets compiled in conjunction with the investigation are stored in DSS files.

Stream Flow Plots in Appendices A and B

Appendices A and B consist of four time series plots developed with HEC-DSSVue for each of the 47 sites (188 graphs): (1) mean daily flow in cfs, (2) monthly means in cfs, (3) annual peak instantaneous flow in cfs, and (4) annual volume in acre-feet/year. The periods-of-analysis vary for the different gages. The period-of-analysis is 90 years or longer at about half of the sites.

All of the plots exhibit the great variability that characterizes stream flow throughout Texas. Significant long-term changes have occurred at some of the sites due primarily to water resources development and use. Frequency analysis methods are designed for homogeneous datasets. Non-stationarity due to reservoir project construction, water use, land use, and other changes over time may affect the validity of statistical analyses of historical flows.

Flood Frequency Analyses in Appendix C and D

Results of flood frequency analyses performed with the HEC-SSP Statistical Software Package [2] are presented in Appendices C and D, respectively, for the gaging stations in the Brazos and Trinity River Basins. The log-Pearson Type III probability distribution was applied to the annual series of peak instantaneous flows. The data series consisting of the maximum flow in each year is included in the plots of Appendices A and B. The flow frequency analysis results are presented in Appendices C and D in both table and graph format.

The random variable (Q_P) is the flow rate at the gage site. The annual exceedance probability (P) is the probability that a specific value of Q_P is equaled or exceeded in any year. The return period (T) in years is the reciprocal of the annual exceedance probability (T=1/P).

The three parameters of the log-Pearson type probability distribution are the mean, standard deviation, and skew coefficient. With a value of zero for the skew coefficient, the log-Pearson type III distribution is equivalent to the log-normal probability distribution and plots as a straight line on the log Q_P versus normal probability graphs. With a value of zero for the skew coefficient, the Pearson type III distribution is equivalent to the normal (Gaussian) probability distribution and plots as a straight line on the Q_P versus normal probability graphs. The log-Pearson III consists of applying the Pearson III to the logarithms of the data just like the log-normal consists of applying the normal probability distribution to the logarithms of the data.

HEC-SSP provides options for applying either generalized and/or site-specific skew coefficients with the log-Pearson III methodology. The option adopted for this study is to compute the station skew coefficients directly from the data.

The statistical procedures for estimating confident limits are based on the noncentral t-distribution. Confidence limits are a function of sample size, which is the number of years in the period-of-analysis. The 0.05 and 0.95 confidence limits in the frequency plots and tables can be interpreted as follows. Although physically impossible, hypothetically assume that millions of years of recorded flows are available at a gage site. The data set is divided into thousands of sequences with length equal to the actual period-of-record of the gage (say 75 years). Applying the log-Pearson type III methodology, each of the thousands of 75-year series would yield a different flow-frequency relationship. A computed flow will be greater than the 95% lower confidence limit for 95% percent of the series and greater than the 5% confidence for 5% of the series. Thus, based on the premises reflected in the statistical confidence limit computations, there is an estimated 90% probability that true flow for a specified exceedance probability will fall between the 5% and 95% confidence limits.

The computed curve consists of values for Q_P that are equally likely to be higher or lower than the unknown truly correct values. The expected value curve reflects adjustment to convert from median to mean values. The circles on the plots represent values computed with the Weibull plotting position formula [(P=m/(N+1)].

The frequency analysis methodology is based on the premise of stationarity. Numerous reservoirs have been constructed and land use changes have changed over time. Long-term changes (non-homogeneities) in historical observed flows may affect the validity of the analyses.

Minimum and Maximum Volume Duration Analyses in Appendices E, F, G, and H

Results of low flow volume frequency analyses performed with the HEC-SSP Statistical Software Package are presented in Appendices E and F, respectively, for the gaging stations in the Brazos and Trinity River Basins. Likewise, Appendices G and H contain the results for high flow volume frequency analyses performed in the same manner. Annual data series are defined as the mean flow during the 1-day, 7-day, 10-day, 30-day, 60-day, and 120-day period of each year that have the minimum flow volume for that year (6 data series) or the maximum flow volume during that year (another 6 data series). The log-Pearson Type III frequency analysis methodology is applied to each of these annual data series at each of the gaging stations.

The annual exceedance frequency versus mean minimum or mean maximum flow rates in cfs during specified durations (1, 7, 10, 30, 60, and 120 days) relationships, based on the log-Pearson III probability distribution, are presented both as tables and graphs. The graphs also include Weibull (P=m/(N+1)) plots. The means, standard deviations, and skew coefficients of the logarithms of the data used in the log-Pearson III computations are also tabulated.

WAM Naturalized and Regulated Flows in Appendices I, J, K, and L

Water availability model (WAM) simulations are presented in the latter sections of Chapters 3 and 4, respectively. Appendices I through L deal with WRAP/WAM generated naturalized and regulated flows at the 38 of the 47 gaging station sites listed in Tables 1.1 and 1.2 that are included as primary control points in the Brazos and Trinity WAMs. Primary control points are sites at which naturalized monthly flows are included in the WAM datasets. These sites have WAM control point identifiers that are listed in the third column of Tables 1.1 and 1.2. Naturalized and regulated flows from the WAMs are homogeneous sequences representing natural versus developed conditions for a hydrologic period-of-analysis of January 1940 through December 2015. The hydrology input for the daily Brazos and Trinity WAMs has been recently updated [31, 32].

Frequency statistics for naturalized and regulated daily flows and other WAM simulation results are presented in Chapters 3 and 4. Appendices I and J contain plots of daily naturalized flows from the Brazos and Trinity WAMs.

Annual observed, naturalized, and regulated flows for the Brazos and Trinity WAMs are tabulated for comparison in Appendices K and L, respectively. Annual flow volumes in acre-feet are tabulated. Naturalized and regulated annual flow volumes are also shown as a percentage of observed annual flow volumes. Regulated flows are also shown as a percentage of naturalized flows.

CHAPTER 2
RIVER SYSTEM HYDROLOGY IN TEXAS

The Brazos and Trinity River Basins are described in Chapters 3 and 4, respectively, of this report. The locations of the Brazos and Trinity Rivers relative to the other major rivers of Texas are shown in the map of Figure 2.1. The 15 major river basins and 8 coastal basins of the state are delineated in Figure 2.2. Climate, hydrology, economic development, and water resources development and management vary dramatically across Texas. For example, mean annual precipitation varies from less than 10 inches/year in much of the Rio Grande Basin to over 50 inches/year in most of the Sabine River Basin.

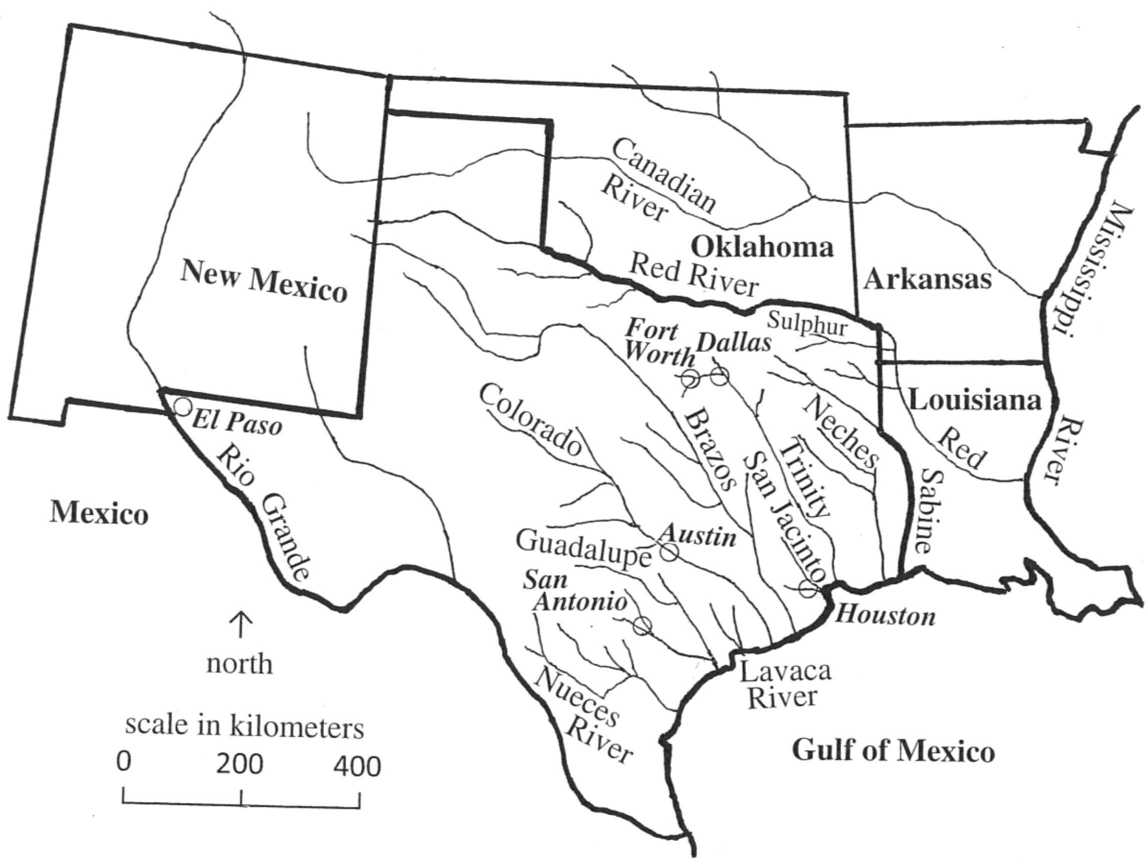


Figure 2.1 Major Rivers and Largest Cities in Texas

Texas is characterized by rapid population growth, declining groundwater supplies, intensifying demands on surface water resources, and progressive water management policies. The states′s population increased from 20,850,000 in 2000 to 25,388,000 in 2010 and is projected to increase to 29,510,000 by 2020 and 46,355,000 by 2060 [27]. Municipal and industrial water use is steadily increasing along with a leveling off of agricultural irrigation. Declining groundwater supplies combined with population growth are resulting in intensified demands on surface water resources. Instream flows for ecosystem preservation are a major concern. The Texas Instream Flow Program was created by the 2001 Senate Bill 2 (SB2) and environmental flow standards have been established for priority river systems pursuant to the 2007 Senate Bill 3 (SB3) [18].

Figure 2.2 Texas River Basins as Delineated by the TWDB

Stream flow in Texas is extremely variable both spatially and temporally. Daily, seasonal, and multiple-year fluctuations reflect the extremes of floods and droughts as well as less severe variability. The hydrologically most severe drought on record for much of the state including the Brazos and Trinity River Basins began gradually in 1950 and ended in April 1957 with a major widespread flood event. Droughts during the 1910's and 1930's were also extended multiple-year dry periods over large land areas. More recent dry periods such as the 1996 drought that motivated enactment of the 1997 Senate Bill 1 were much more costly than earlier droughts due to population and economic growth. The 2008-2014 drought is comparable in hydrologic severity to the 1950-1957 drought in some western regions of the state. For more than half of Texas including most of the Brazos and Trinity River Basins, 2011 experienced the lowest annual precipitation since the beginning of official precipitation records in 1895. On the other extreme, 2015 was exceptionally wet and severe flooding occurred during the Spring 2016 as well as during the Spring and Fall of 2015.

Hydrologic Quantities Characterizing River Basins

The hydrologic cycle is complex with human activities superimposed on natural hydrologic processes. Precipitation is the source of stream flow. Of the total volume of water falling to the ground as precipitation in a particular year, most returns to the atmosphere through evaporation or transpiration prior to reaching the ocean as stream flow or subsurface flow. Precipitation replenishes soil moisture and groundwater and becomes surface runoff and stream flow. The rivers of Texas flow to the Gulf of Mexico or are tributaries of rivers that eventually flow to the Gulf of Mexico. Groundwater may also flow to the ocean as well as contribute to stream flow.

A previous investigation of river system hydrology statewide [26] provides a foundation for the more detailed studies of Brazos and Trinity River flows documented in the present report. Wurbs and Zhang [26] plotted and performed statistical analyses of (1) monthly precipitation and reservoir evaporation rates in TWDB databases for the 92 one-degree quadrangles that cover Texas, (2) observed flows at 35 USGS gaging stations, and (3) WAM generated naturalized and regulated flows and reservoir storage contents. Precipitation, evaporation, and stream flow characteristics were explored in general with a particular focus on long-term changes.

Using TWDB precipitation data and TCEQ WAM System simulation results, volume budget analyses were performed in the previous work [26] for each of the 20 WAM river basin datasets that model the 15 major river basins and 8 coastal basins of Texas. The eight WAMs listed in Table 2.1 include eight major river basins and two coastal basins. The Brazos WAM includes the San Jacinto–Brazos Coastal Basin as well as the Brazos River Basin. The Colorado WAM includes the Brazos-Colorado Coastal Basin as well as the Colorado River Basin. The GSA WAM includes both the Guadalupe and San Antonio River Basins. The other WAMs each model a single river basin. With the exception of the Sabine Basin, the selected river basins in Table 2.1 are contained almost entirely within the state boundaries and flow directly into the Gulf of Mexico.

Table 2.1
Hydrologic Quantities Characterizing Selected River Basins

1	2	3	4	5	6	7	8	9
	Basin	Mean	Naturalized Flow		Reservoirs			Mean
WAM	Area	Precip	at Basin Outlet		Number	Storage Capacity		Evap
	(mile^2)	(inch/yr)	(% Prec)	(ac-ft/yr)		(acre-feet)	(% Nat)	(inches)
Brazos	44,310	29.4	10.4	7,246,000	719	4,016,000	55.4	60.2
Colorado	41,280	24.5	5.79	3,119,000	489	4,710,000	151.	63.1
GSA	10,133	32.4	12.7	2,220,000	241	757,000	34.1	54.1
Lavaca	2,310	39.7	17.6	860,000	21	168,000	19.5	50.8
Neches	9,940	48.7	24.1	6,224,000	180	3,656,000	58.7	48.5
Nueces	16,700	24.8	2.93	648,000	125	960,000	148.	59.6
Sabine	7,570	47.8	34.4	6,633,000	213	6,262,000	94.4	50.9
San Jacinto	3,940	46.6	23.2	2,270,000	114	588,000	25.9	49.0
Trinity	17,910	39.4	17.6	6,630,000	700	7,356,000	111.	55.1

The watershed drainage areas in column 2 of Table 2.1 exclude areas lying outside of Texas. Additional areas of the Brazos and Colorado River Basins of 2,710 and 200 square miles, respectively, in New Mexico contribute essentially no flow to these rivers. The Sabine River Basin contains another 2,200 square miles in Louisiana in addition to the 7,570 square miles in Texas. The Brazos WAM basin area in Texas of 44,310 square miles includes 43,160 square miles in the Brazos River Basin and 1,150 square miles in the San Jacinto–Brazos Coastal Basin.

The 1940-2012 mean annual precipitation depths falling on the watershed areas of column 2 are tabulated in column 3. The 1954-2012 mean annual reservoir surface evaporation rates are tabulated in column 9. These precipitation and evaporation rates were computed from the TWDB databases for quadrangles of one degree latitude by one degree longitude, which have areas of about 4,000 square miles. Watersheds delineations were superposed on the quadrangles [26].

The 1940-2012 mean annual precipitation depths of 29.4 inches/year and 39.4 inches/year are averaged spatially over the Brazos and Trinity River Basins. Mean annual precipitation varies dramatically from west to east across Texas which also includes varying greatly from west to east across the Brazos and Trinity River Basins. The spatial variability of reservoir surface evaporation rates is significant but much less variable than precipitation. The average reservoir evaporation rates in the Brazos and Trinity River Basins are 60.2 and 55.1 inches/year.

The naturalized flows have been extended for the Brazos, Trinity, Colorado, Guadalupe and San Antonio (GSA), Neches, and Sabine WAMs as described in reports cited in Chapter 1. The extended periods-of-analysis reflected in the quantities in Table 2.1 are 1934-2012 for the GSA WAM and 1940-2012 for the other six updated WAMs. The naturalized flows for the Nueces and San Jacinto WAMs reflect the original 1934-1996 and 1940-1996 periods-of-analysis.

The means of the WAM naturalized flow volumes at the basin outlets are shown in columns 4 and 5 in acre-feet/year and as a percent of the mean precipitation over the river basins from column 3. The long-term means of naturalized flow volumes of the Brazos and Trinity Rivers discharging into the Gulf of Mexico are estimated to be about 10.4% and 17.6%, respectively, of the corresponding long-term mean of the volumes of precipitation falling of the Brazos and Trinity River Basins. The 1940-2012 means of the annual naturalized flow volumes at the outlets of the Brazos and Trinity WAMs are equivalent to covering the watersheds to depths of 3.06 and 6.94 inches each year as compared to precipitation depths of 29.4 and 39.4 inches/year, respectively.

Information on the permitted reservoirs included in the WAMs is provided in columns 6, 7, and 8 of Table 2.1. The number of reservoirs and total conservation storage capacity in each WAM are listed in columns 6 and 7. The conservation storage capacity (column 7) is expressed in column 8 as a percentage of the annual naturalized flow volume (column 5) for comparison.

Stream flow is regulated by constructed reservoir projects which are integral components of river systems. Most of the total conservation and flood control storage capacity in Texas is contained in some number of the largest of the approximately 200 major reservoirs with more than 5,000 acre-feet of conservation storage capacity [26]. The thousands of smaller reservoirs account for a relatively small portion of the total storage capacity. The quantities in Table 2.1 are for conservation storage capacity, which means primarily municipal, industrial, and agricultural water supply but also recreation, hydroelectric power generation, and other conservation purposes. Flood control and stormwater detention storage is not included in Table 2.1. The large flood control pools of the 30 federal reservoirs (including nine and eight USACE reservoirs in the Brazos and Trinity Basins), 2,000 smaller rural flood retarding structures constructed by the Natural Resources

Conservation Service in Texas, and countless small urban stormwater detention basins are not reflected in Table 2.1.

Reservoir evaporation is a major component of river system water budgets. Based on WAM simulation studies, Wurbs and Zhang [26] estimate that the long-term average of the statewide total volume of evaporation from the over 3,000 reservoirs included in the TCEQ WAM System exceed TWDB estimates of the total annual 2010 municipal water supply diversions from all surface and groundwater sources statewide. Estimates of reservoir water surface evaporation rates also provide approximate maximum limits on evapotranspiration rates. The majority of the precipitation that falls to the ground is loss through evapotranspiration.

Precipitation and evaporation rates are key climatic variables. Stream flow is controlled by watershed processes and human water resources development and use as well as climate. The previous investigation [26] explored long-term changes in hydrology and found that: (1) any long-term changes or trends in precipitation that may have occurred since 1940 are hidden by the great continuous variability, (2) evaporation rates may have increased slightly over the past several decades, (3) stream flow is consistently extremely variable, and (4) significant long-term changes in stream flow characteristics have occurred at some locations but vary greatly between locations.

Precipitation and Reservoir Surface Evaporation Rates

The area-weighted 1940-2015 mean precipitation for the 92 one-degree quadrangles covering the state of Texas is 28.08 inches/year. The mean precipitation for individual quads varies from 9.35 inches/year (33% of the mean) in the extreme west increasing from west to east to 56.5 inches/year (201% of the mean) in southeast Texas. The statewide means of the monthly precipitation depths are plotted in Figure 2.3. The 1940-2015 statewide annual precipitation depth and maximum and minimum two-month depths each year are plotted in Figure 2.4. The maximum or minimum two-month depth is the total depth during the two consecutive months of each calendar (January-December) year that represents the maximum or minimum for that year.

A linear regression line through the 76 years of annual precipitation depths averaged over the entire state has a slope of 0.01125 inch/year. The 1940-2015 trend slopes for total annual precipitation for the 92 individual quads are negative for 26 of the quads and positive for the other 66 quads. Wurbs and Zhang [26] present plots and regression statistics of 1940-2012 annual, two-month minimum, and two-month maximum precipitation depths for each of the 92 individual quadrangles. The computed linear regression slopes for precipitation are too small to conclude that any long-term trends are evident. Likewise, long-term trends are not apparent in the plots. Any trends that may have occurred are hidden in the great random variability exhibited by the rainfall.

These same types of analyses were also applied to reservoir evaporation rates. The area-weighted 1954-2015 statewide mean is 59.4 inches/year. A linear regression line through the 62 years of annual evaporation depths averaged over the entire state has a slope of 0.06923 inch/year. The 1954-2015 trend slopes for total annual evaporation for the 92 individual quads are negative for 27 of the quads and positive for the other 65 quads. Thus, the trend analyses show possible gradually increasing reservoir evaporation rates over the past several decades in some regions of the state. Long-term trends in both annual precipitation and evaporation are very dependent on the period-of-analysis adopted.

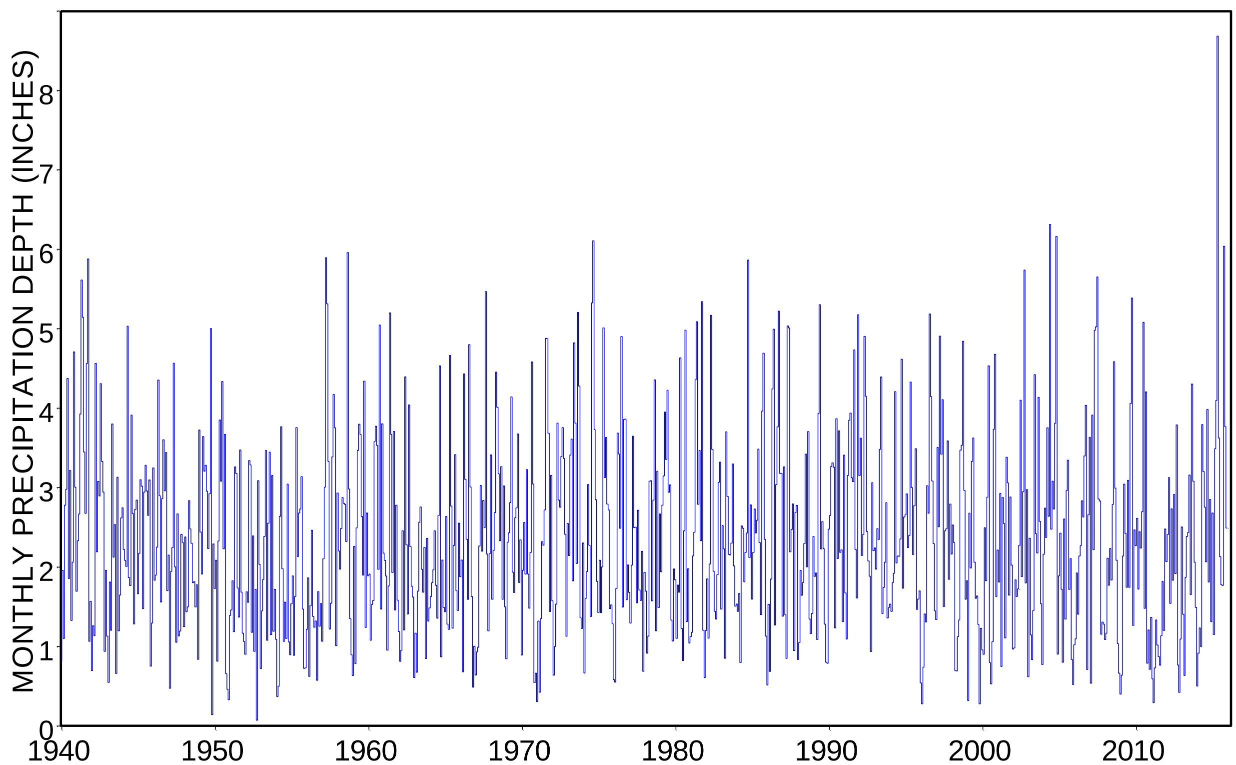


Figure 2.3 Monthly Statewide Mean Precipitation during January 1940 through December 2015

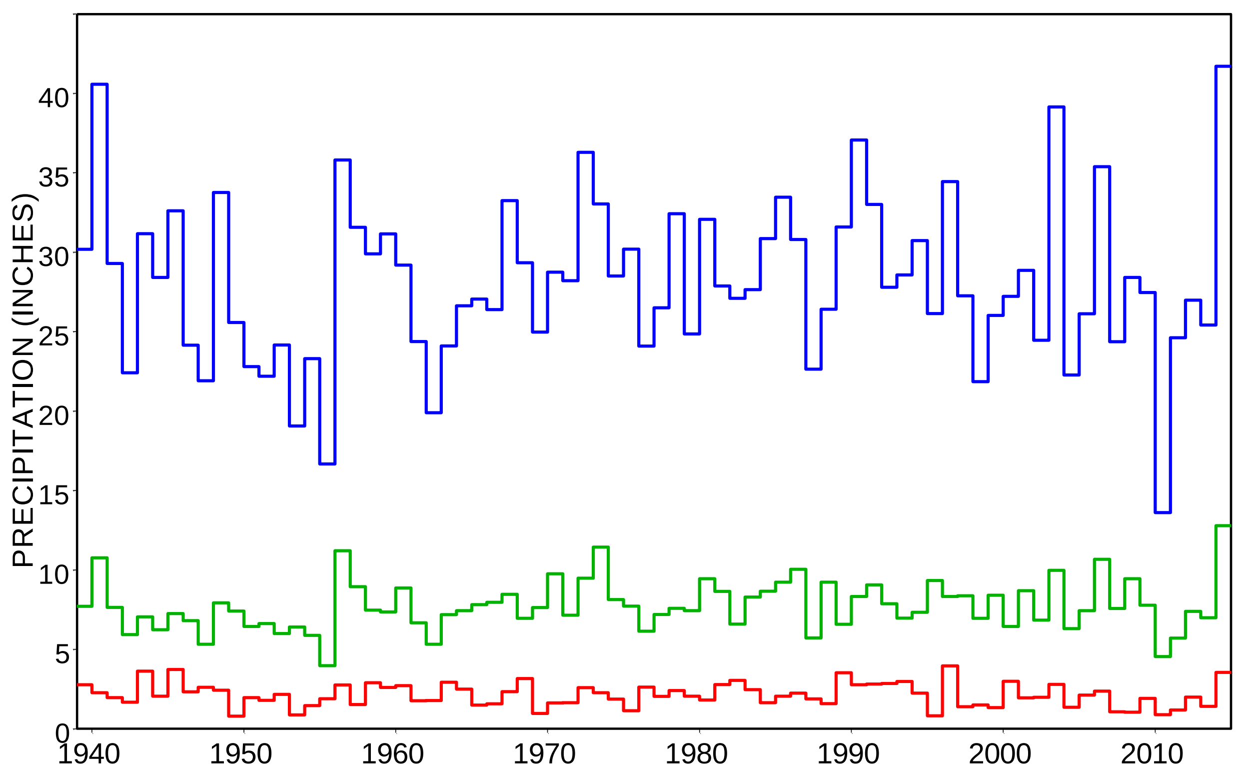


Figure 2.4 Annual Total (top plot), Two-Month Maximum (middle plot), and Two-Month Minimum (bottom plot) Precipitation Depth in Each Year during 1940-2015

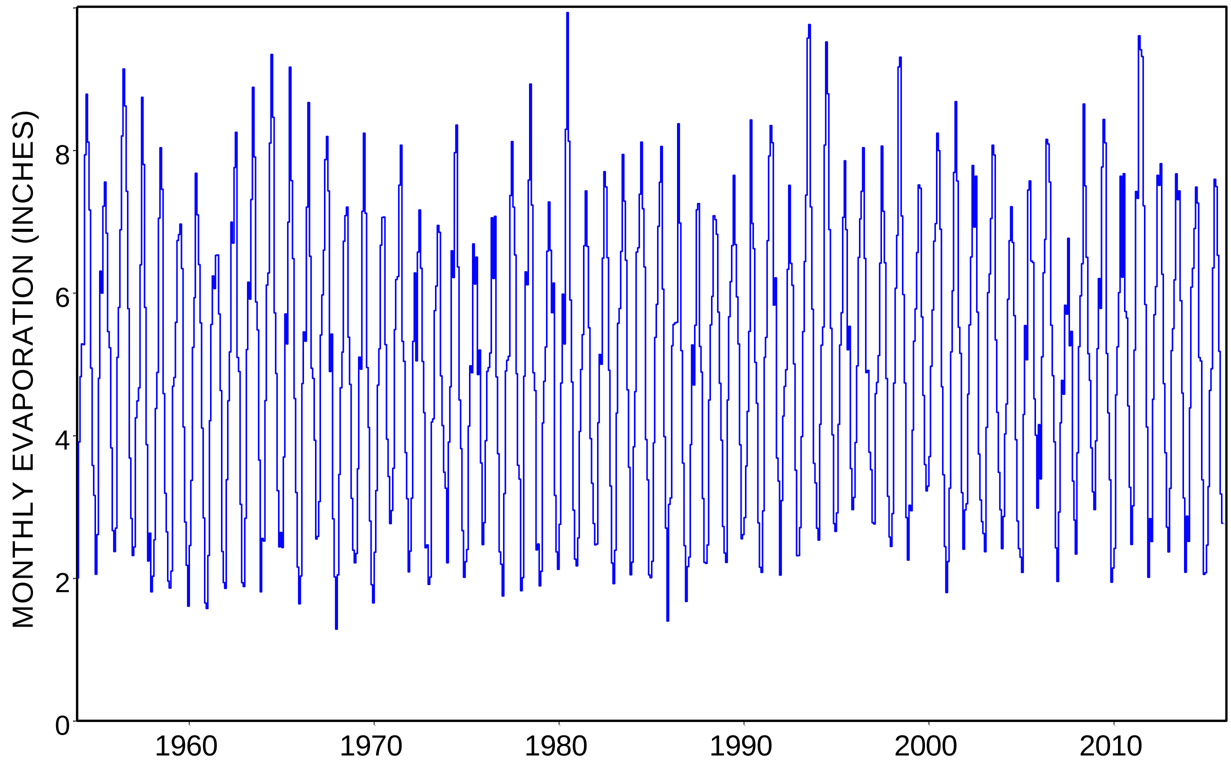


Figure 2.5 Monthly Statewide Mean Reservoir Surface Evaporation Rates during 1954-2015

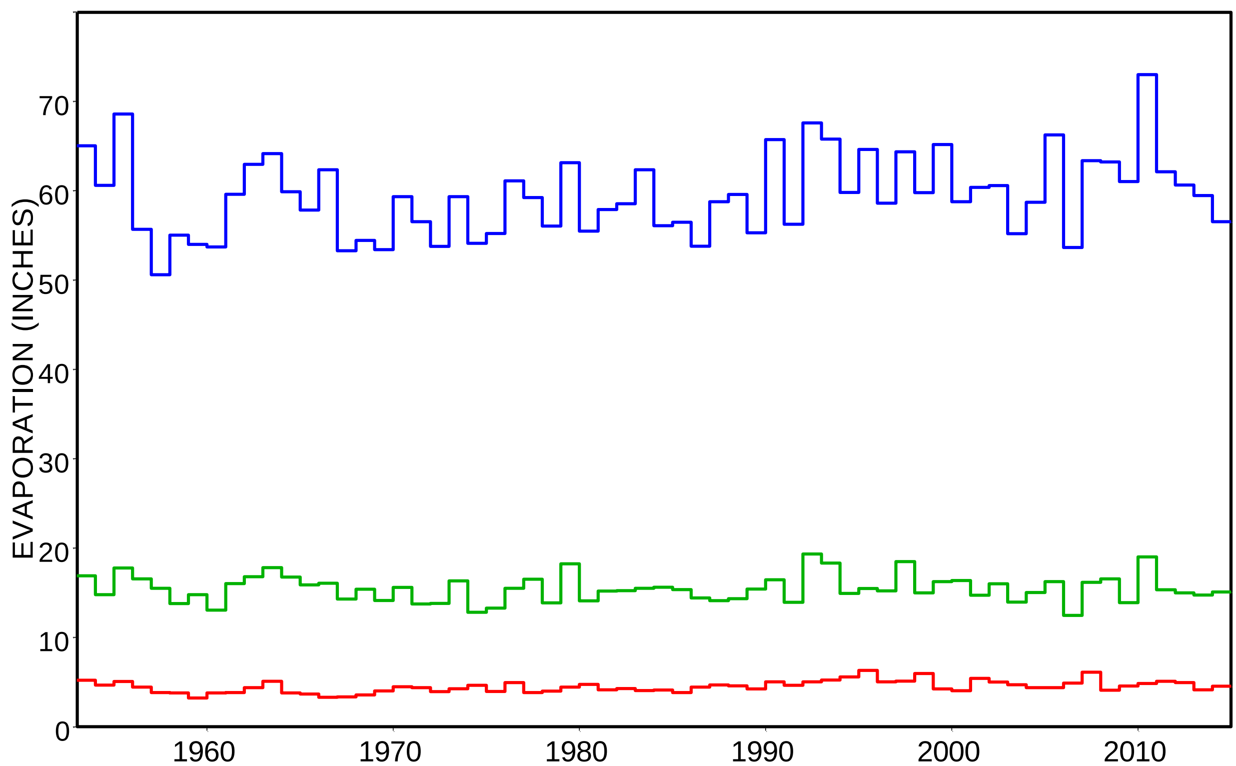


Figure 2.6 Annual Total (top plot), Two-Month Maximum (middle plot), and Two-Month Minimum (bottom plot) Reservoir Evaporation Depth in Each Year during 1954-2015

River Flow Characteristics

The statistical analyses of various hydrologic variables reported by Wurbs and Zhang [26] include analyses of observed flows at 35 selected USGS gaging stations on major rivers throughout Texas with records of at least 70 years. All sites exhibit dramatic fluctuations including severe droughts and major floods along with continuous variability. Long-term trends of decreases in flows are evident at some gages, increases are evident at others, some exhibit both increases and decreases, and some sites exhibit no evident long-term changes. For sites with long-term changes, the characteristics of the changes may vary significantly between daily, monthly, and annual flows. Long-term changes may also differ greatly between high flows and low flows.

Both high flows and low flows are observed to have decreased drastically over the past several decades at gage sites on the Rio Grande and Canadian River. Construction of Falcon, Amistad, and other reservoirs and intensive development of irrigated agriculture supplied by the Rio Grande since the early 1900s has dramatically decreased the flow of the Rio Grande. The severe long-term reduction of the Texas portion of the Canadian River is presumably due largely to pumping groundwater for agricultural irrigation.

Both high flows and low flows have increased significantly over the past several decades at gage sites on the San Antonio River below the city of San Antonio and Buffalo Bayou in Houston. Water supply for San Antonio is essentially entirely from groundwater and wastewater treatment plant effluent and other return flows discharge into the San Antonio River or its tributaries. Likewise, Houston is supplied primarily from local groundwater and surface water transported from the Trinity and San Jacinto River Basins. Return flows are discharged into Buffalo Bayou. Increased rainfall runoff due to urbanization in these watersheds can also be expected to contribute to increased stream flow.

High flows have decreased and low flows have increased at a number of sites due to construction and operation of reservoir projects. At other sites, changes are evident in either only high flows or only low flows. Long-term changes are not evident at all at many sites [26].

Observed mean daily and mean monthly flows at a gaging station on the lower Trinity River from May 1924 through June 2016 are plotted in Figures 2.7 and 2.8, respectively. The mean flow during each calendar year and the minimum monthly mean flow in each year during 1925-2015 at this site are plotted in Figure 2.9. This gage (T17 in Table 2.2) is 20 miles below Livingston Dam and 50 miles above Galveston Bay. The hydrographs illustrate the extreme continuous variability characteristic of river flows throughout Texas. Low flows appear perhaps to have increased (Table 2.9) at this sites, but otherwise the characteristics of long-term changes in stream flows are hidden by the tremendous continuous variability.

The plots of Figures 2.7, 2.8, 2.9, 2.10, 2.11, and 2.12 illustrate the extreme variability that characterizes stream flow in Texas. However, variability characteristics of low flows are masked to a significant degree in daily plots due to the scale necessary to plot high flows. Long-term trends in low flow characteristics may also be hidden. The averaging of flows inherent in plots of monthly and annual means also tends to hide low flow variability. Figures 2.9 and 2.12 include plots of the mean flow during the month in each calendar year that has the smallest mean flow. These annual minimum-month mean flow plots are designed to contribute to exploration of low flow trends.

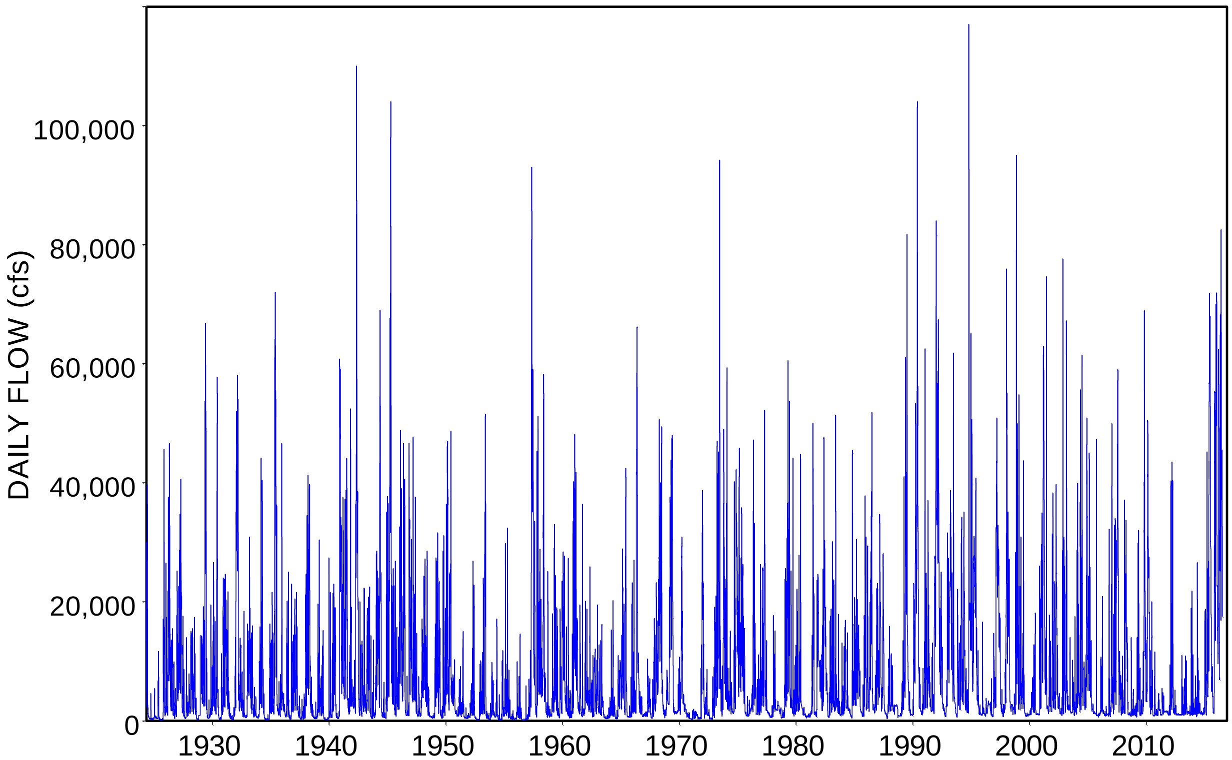


Figure 2.7 Daily Gaged Flows of Trinity River at Romayor during May 1, 1924 – July 4, 2016

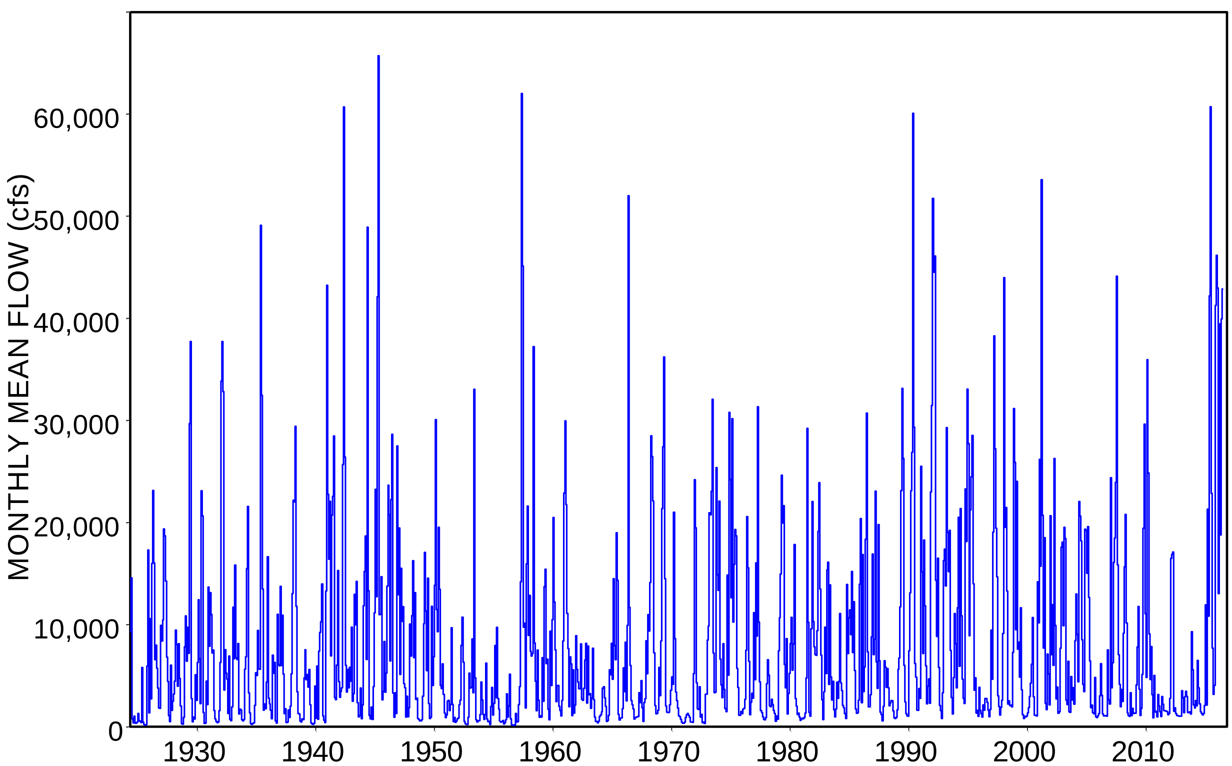


Figure 2.8 Monthly Means of Flows of the Trinity River at Romayor
from May 1924 through June 2016

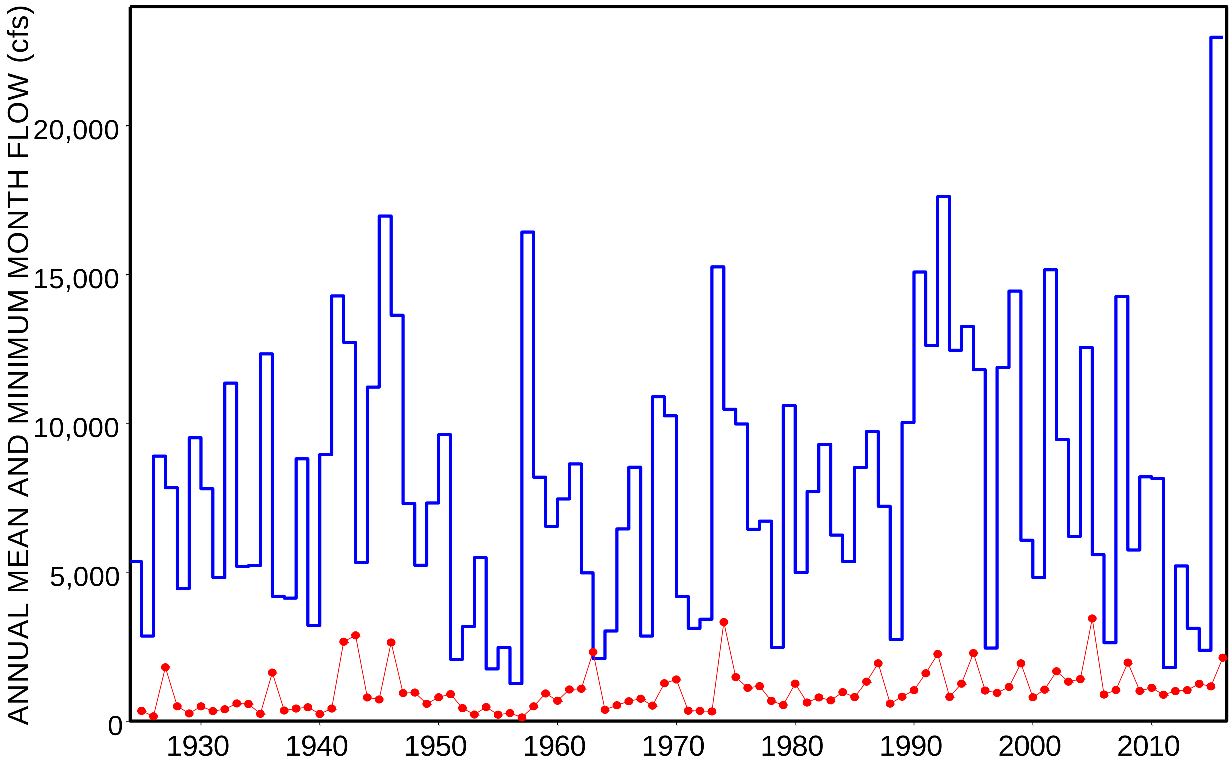


Figure 2.9 1924-2015 Annual Mean Flow (blue solid line) and Annual Minimum Monthly Flow (red dots) of the Trinity River at Romayor

Observed daily mean flows of the Brazos River at the USGS gage near Waco (B10 in Table 1.1) are plotted in Figures 2.10, 2.11 and 2.12. The period-of-record dates back to October 1, 1898 for this gage, and Figure 2.10 extends through July 4, 2016. Figure 2.12 covers the 117 years from January 1899 through December 2015.

The hydrographs at the Waco gage on the Brazos River are presented here to highlight the possibility that long-term changes in flow characteristics may differ significantly between daily, monthly, and annual means. Likewise, the variability of instantaneous flow rates conceptually may be hidden in daily mean flow rates. The effects of three multiple-purpose reservoirs (Lakes Whitney, Waco, and Aquilla) with large flood control pools constructed by the U.S. Army Corps of Engineers upstream of this site during the 1950s-1980s are evident from the plot of daily flows in Figure 2.10. Flood control operations are based on making no reservoir releases that contribute to flows at the Waco gage exceeding 25,000 cfs. The effects of the reservoir flood control operations are not evident in the plots of monthly flows or annual flows in Figures 2.11 and 2.12. Flood control storage attenuates flood hydrographs without reducing long-term flow volumes.

The remainder of this report focuses on analyzing flows at 30 sites on the Brazos River and its tributaries and 17 sites on the Trinity River and its tributaries. Various types of datasets are compiled and various types of analyses are performed.

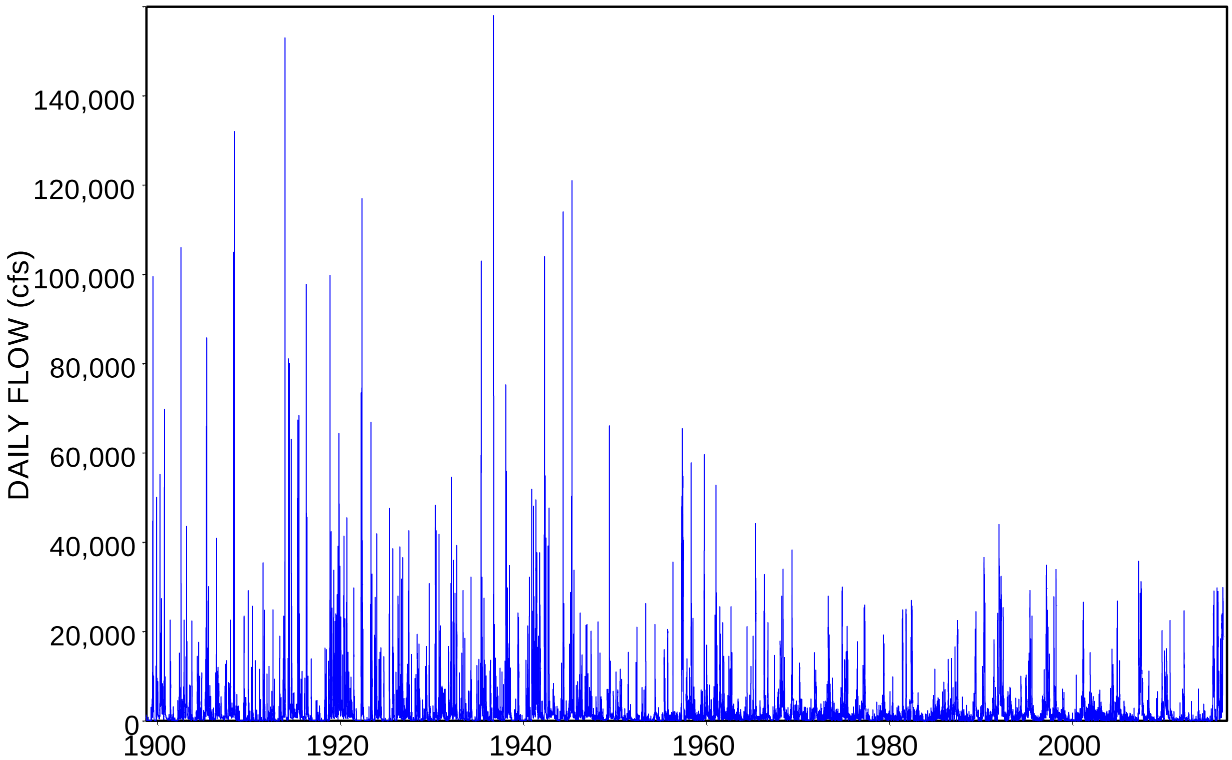


Figure 2.10 Daily Gaged Flows of Brazos River at Waco during October 1, 1898 – July 4, 2016

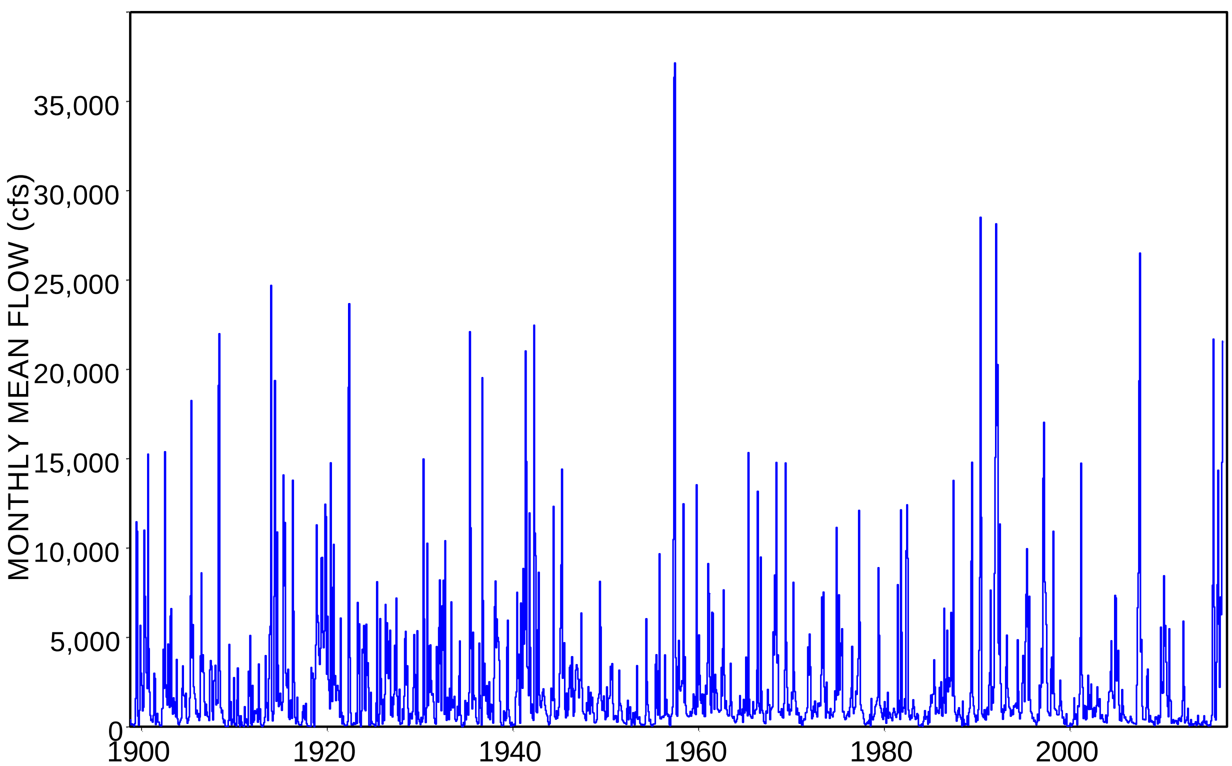


Figure 2.11 Monthly Means of Flows of the Brazos River at Waco from October 1898 through June 2016

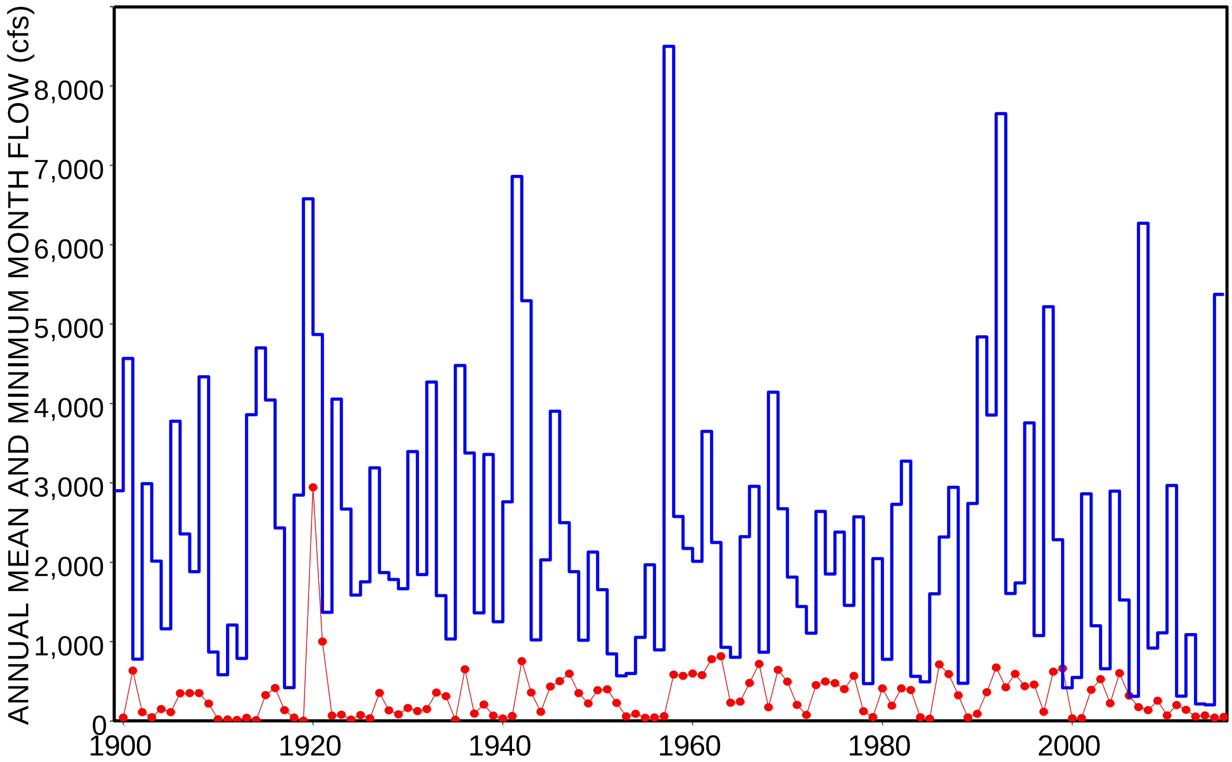


Figure 2.12 1899-2015 Annual Mean Flow (blue solid line) and Annual Minimum Monthly Flow (red dots) of the Brazos River at Waco

CHAPTER 3
BRAZOS RIVER BASIN

As discussed in Chapter 1, plots and statistical analyses of actual observed flows and WAM simulated flows at selected locations on the Brazos and Trinity Rivers and their tributaries are presented in Chapters 3 and 4, respectively, and associated appendices. Chapter 3 and Appendices A, C, E, G, I, J, and K focus on the Brazos River and its tributaries. The Trinity River and tributaries are covered in Chapter 4 and the other six appendices.

The Brazos River Basin delineated in Figures 2.2, 3.1, and 3.2 has a total area of 45,870 square miles, with about 43,160 square miles in Texas and the remainder in New Mexico. The extreme upper end of the basin in and near New Mexico is an arid flat area that rarely contributes to stream flow. The climate, hydrology, and geography of the basin vary greatly across Texas from New Mexico to the Gulf of Mexico. Mean annual precipitation varies from 19 inches in the upper basin which lies in the High Plains to 45 inches in the lower basin in the Gulf Coast region. The Brazos River flows in a meandering path about 920 miles from the confluence of the Salt Fork and Double Mountain Fork to the city of Freeport at the Gulf of Mexico. In its upper reaches, the Brazos River is a gypsum-salty intermittent stream. Toward the coast it is a rolling river flanked by levees, agricultural fields, and hardwood bottoms. The 2010 population of the Brazos River Basin was about 2,440,000 people.

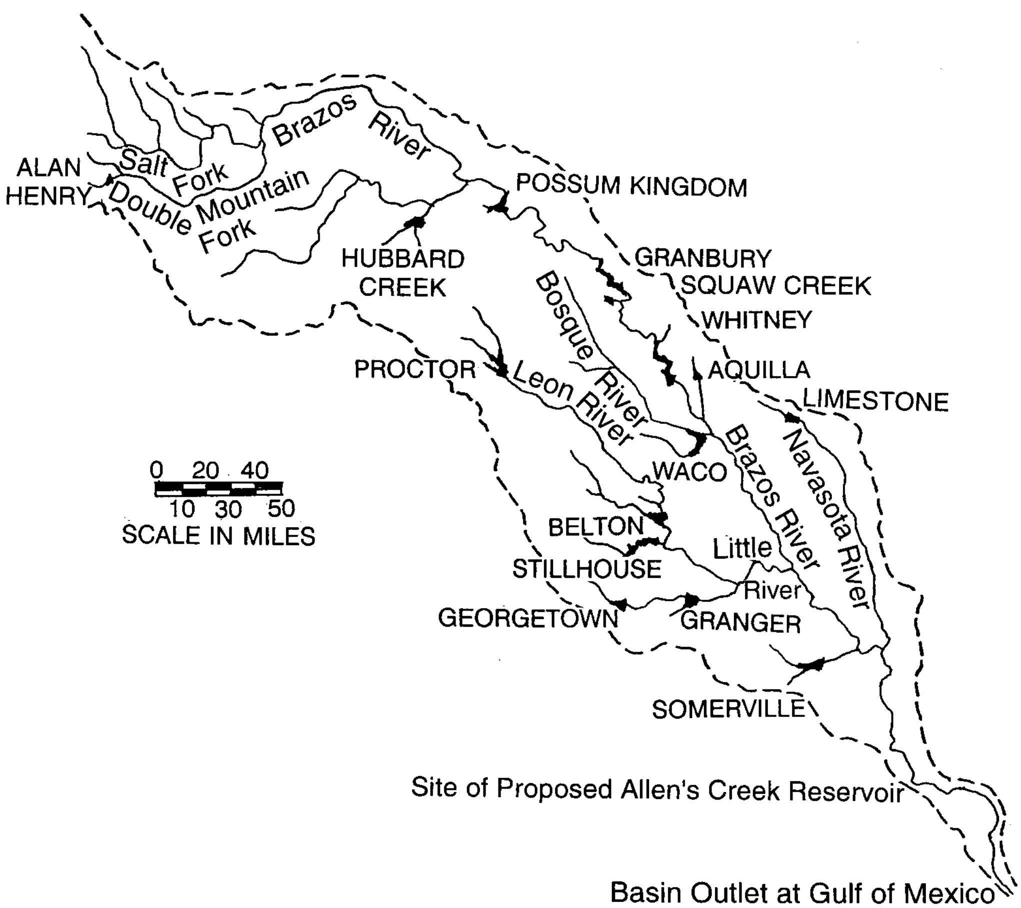


Figure 3.1 Major Tributaries and Largest Reservoirs in the Brazos River Basin

Selected USGS Gaging Stations

Graphs and statistical analyses of observed flows at the USGS gaging stations on the Brazos River and tributaries listed in Tables 3.1 and 3.2 are presented in this section of this chapter and in Appendices A, C, E, and G. The same types of information for the Trinity River and tributaries are covered in Chapter 4. The identifiers in the first column of the tables were created for convenience in referencing the gaging stations. The location of the selected gaging stations in the Brazos River Basin are shown in Figure 3.2. The numbers on the map below refer to the gaging station labels (without the B for Brazos) in the first column of Tables 3.1 and 3.2.

Table 3.1
Selected Stream Flow Gaging Stations in the Brazos River Basin

ID	USGS Gage ID	WAM CP ID	Location by River and Nearest City	County	Drainage Area (sq mile)
B1	08080500	DMAS09	Double Mountain Fork near Aspermont	Stonewall	1,891
B2	08082000	SFAS06	Salt Fork Brazos River near Aspermont	Stonewall	2,504
B3	08082500	BRSE11	Brazos River near Seymour	Baylor	5,996
B4	08084000	CFNU16	Clear Fork Brazos near Nugent	Jones	2,236
B5	08085500	CFFG18	Clear Fork Brazos near Fort Griffin	Shackelford	4,031
B6	08088000	BRSB23	Brazos River near South Bend	Young	13,171
B7	08089000	BRPP27	Brazos River near Palo Pinto	Palo Pinto	14,309
B8	08091000	BRGR30	Brazos River near Glen Rose	Somervell	16,320
B9	08095000	NBCL36	North Bosque River near Clifton	Bosque	977
B10	08096500	BRWA41	Brazos River at Waco	Mclennan	20,065
B11	08097500	–	Brazos River near Marlin	Falls	20,645
B12	08098290	BRHB42	Brazos River near Highbank	Falls	20,900
B13	08100000	LEHM46	Leon River near Hamilton	Hamilton	1,928
B14	08100500	LEGT47	Leon River near Gatesville	Coryell	2,379
B15	08102500	LEBE49	Leon River near Belton	Bell	3,579
B16	08103800	LAKE50	Lampasas River near Kempner	Lampasas	817
B17	08104500	LRLR53	Little River near Little River	Bell	5,266
B18	08106500	LRCA58	Little River near Cameron	Milam	7,100
B19	08108700	–	Brazos River at SH 21 near Bryan	Burleson	29,483
B20	08109000	BRBR59	Brazos River near Bryan	Brazos	29,949
B21	08110000	YCSO62	Yegua Creek near Somerville	Burleson	1,011
B22	08110100	DCLY63	Davidson Creek near Lyons	Burleson	195
B23	08110200	–	Brazos River at Washington	Washington	31,626
B24	08110500	NAEA66	Navasota River at Easterly	Leon	936
B25	08110800	–	Navasota River at Old Spanish Rd Bryan	Robertson	1,287
B26	08111000	NABR67	Navasota River near Bryan	Brazos	1,427
B27	08111010	–	Navasota River near College Station	Grimes	1,809
B28	08111500	BRHE68	Brazos River near Hempstead	Washington	34,374
B29	08114000	BRRI70	Brazos River near Richmond	Fort Bend	35,541
B30	08116650	BRRO72	Brazos River near Rosharon	Fort Bend	35,773

Table 3.2
Selected Stream Flow Gaging Stations in the Brazos River Basin

ID	River and Nearest City	Period-of-Analysis			SB3 IFS
		From	To (Appd)	To (Ch 3)	
B1	Double Mountain Fork Aspermont	1/1924	5/2015	11/2015	SB3 IFS
B2	Salt Fork Brazos River Aspermont	1/1924	5/2015	11/2015	SB3 IFS
B3	Brazos River near Seymour	12/1923	5/2015	11/2015	SB3 IFS
B4	Clear Fork Brazos near Nugent	3/1924	5/2015	11/2015	SB3 IFS
B5	Clear Fork Brazos near Fort Griffin	2/1924	5/2015	11/2015	SB3 IFS
B6	Brazos River near South Bend	10/1938	5/2015	11/2015	SB3 IFS
B7	Brazos River near Palo Pinto	2/1924	5/2015	11/2015	SB3 IFS
B8	Brazos River near Glen Rose	10/1923	5/2015	11/2015	SB3 IFS
B9	North Bosque River near Clifton	10/1923	5/2015	11/2015	SB3 IFS
B10	Brazos River at Waco	10/1898	12/2014	11/2015	SB3 IFS
B11	Brazos River near Marlin	10/1938	9/1951	9/1951	–
B12	Brazos River near Highbank	10/1965	12/2014	11/2015	–
B13	Leon River near Hamilton	1/1925	5/2015	11/2015	–
B14	Leon River near Gatesville	10/1950	5/2015	11/2015	SB3 IFS
B15	Leon River near Belton	10/1923	5/2015	11/2015	–
B16	Lampasas River near Kempner	10/1962	5/2015	11/2015	SB3 IFS
B17	Little River near Little River	10/1923	5/2015	11/2015	SB3 IFS
B18	Little River near Cameron	11/1916	12/2014	11/2015	SB3 IFS
B19	Brazos River at SH 21 near Bryan	7/1993	12/2014	11/2015	–
B20	Brazos River near Bryan	9/1899	10/1993	11/2015	–
B21	Yegua Creek near Somerville	5/1924	6/2014	6/2014	SB3 IFS
B22	Davidson Creek near Lyons	10/1962	12/2014	11/2015	–
B23	Brazos River at Washington	11/1965	3/1987	3/1987	–
B24	Navasota River at Easterly	3/1924	5/2015	11/2015	SB3 IFS
B25	Navasota River Old Spanish Rd	4/1997	12/2014	11/2015	–
B26	Navasota River near Bryan	1/1951	3/1997	3/1997	–
B27	Navasota River College Station	5/1977	9/1985	9/1985	–
B28	Brazos River near Hempstead	10/1938	12/2014	11/2015	SB3 IFS
B29	Brazos River near Richmond	10/1922	5/2015	11/2015	SB3 IFS
B30	Brazos River near Rosharon	4/1967	5/2015	11/2015	SB3 IFS

USGS gaging station identifiers and WAM control point identifiers are listed in the second and third columns of Table 3.1. The 25 stations included in the WAM analyses presented later have WAM identifiers in the second column of Table 3.1. Contributing drainage areas are tabulated in the last column of Table 3.1. A 9,566 square mile area of the flat arid upper Brazos River Basin in and near New Mexico contributes essentially no precipitation runoff to stream flow and is not included in the contributing areas of Table 3.1. The selected gages include all sites for which environmental flow standards have been established in the Brazos River Basin pursuant to procedures created by the 2007 Senate Bill 3 (SB3). As indicated by the last column of Table 3.2, SB3 environmental flow standards have been established at 19 sites in the Brazos River Basin.

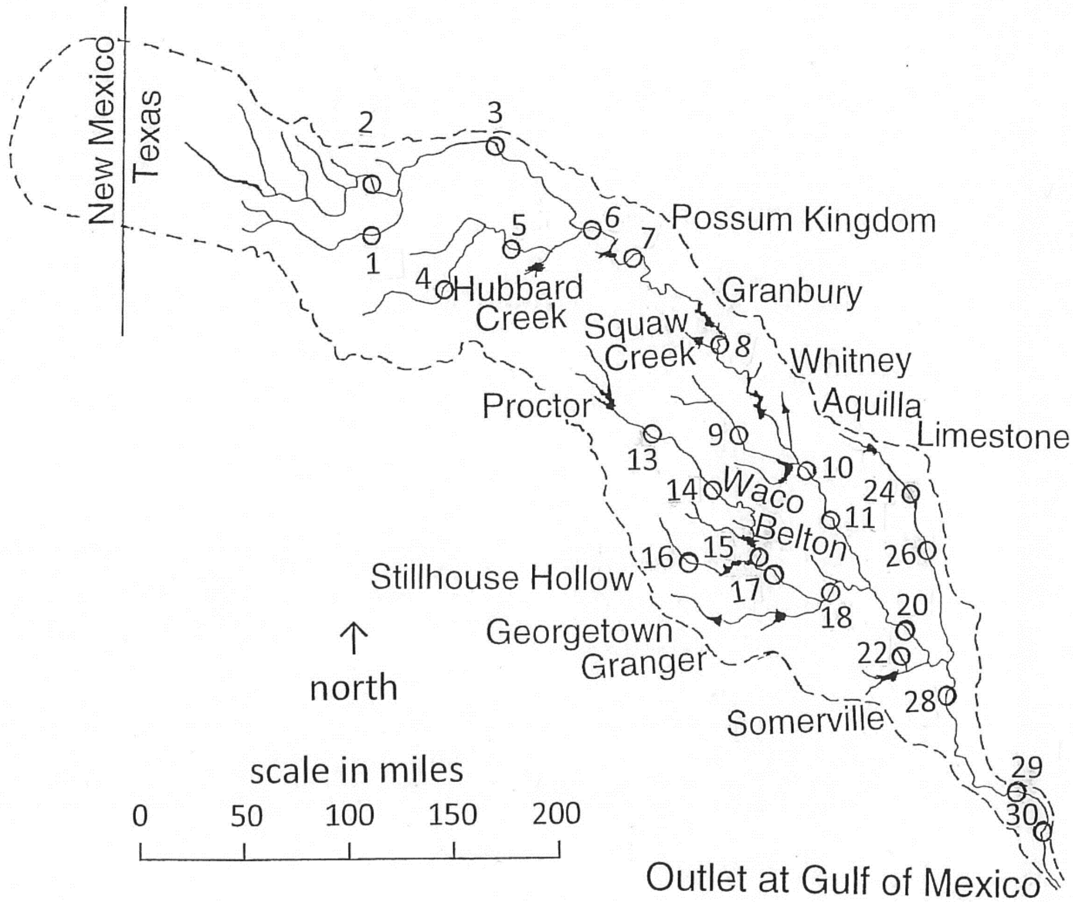


Figure 3.2 Largest Reservoirs and Selected USGS Gaging Stations in Brazos River Basin

The periods-of-analysis for the daily flow datasets shown in Table 3.2 begin with the beginning of the gage period-of-record, and all available valid data are used. Gages B11, B20, B23, B26, and B27 are no longer active, but periods-of-record for the 25 other gages extend to the present. The December 2014 and May 2015 dates represent the end of the daily flow data as adopted in the appendices. The daily flow datasets for the statistical analyses presented in this chapter are updated to November 18, 2015 for the gages that are still active. The gage B29 dataset adopted for the analysis of the next section extends October 1, 1922 through November 18, 2015. However, the appendices include data for site B29 that includes 1903-1906 as well as October 1922 to near the present. Gages B11 and B12 cover different periods of time at close to the same location. The USGS replaced gage B20 with B19 in 1993 and replaced B26 with B25 in 1997.

Observed Mean Daily Flows

Plots of mean daily flow rates at the 30 gaging station are included in Appendix A. Frequency statistics for the 30 sites are provided in Table 3.3. Flow frequency curves are plotted in Figure 3.3. This dataset consists of the mean flow in each day of the period-of-record through November 18, 2015. The data were downloaded from the USGS NWIS website using HEC-DSSVue. The frequency statistics in Table 3.3 were computed using the basic statistics and duration analysis features of HEC-DSSVue.

Table 3.3
Frequency Statistics for Observed Mean Daily Flow Rates at Gaging Stations B1-B10

Gage	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Days	31,826	28,508	33,591	33,500	33,529	28,173	33,529	33,652	33,652	42,782
Missing	1,734	5,052	0	0	0	0	0	0	0	0
Min (cfs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean (cfs)	135.4	88.3	329.7	87.7	203.5	737.4	904.1	1,252.9	289.0	2,337
Max (cfs)	55,600	23,300	62,600	30,800	72,800	84,300	81,700	85,100	96,800	158,000
SD (cfs)	858.8	562.7	1,589.2	528.3	1,093	2,825	3,084	4,058	1,278	5,835
0.1%	11,152	8,695	22,726	7,460	14,094	35,430	38,594	50,335	16,300	66,165
0.2%	7,664	5,780	16,682	5,060	10,500	29,396	32,976	41,308	11,639	50,743
0.5%	4,169	3,015	9,221	2,980	6,658	19,800	21,370	29,200	6,660	35,808
1%	2,540	1,630	5,501	1,600	3,940	13,426	15,800	19,147	3,630	28,100
2%	1,295	785	3,030	830	2,080	7,900	9,214	11,694	1,729	20,934
5%	467	279	1,240	292	732	2,840	3,050	4,634	694	9,989
10%	184	111	551	101	271	1,250	1,630	2,490	336	4,960
15%	98	62	310	55	146	749	1160	1610	207	3,350
20%	62	38	206	36	97	507	863	1160	139	2,460
30%	30	18	109	22	52	272	495	660	70	1,500
40%	17	10	64	14	33	161	274	428	37	1,030
50%	8	5.6	40	10	21	108	154	270	22	730
60%	3	2.9	24	6.8	13	72	99	158	14	486
70%	1	0.9	13	4.3	8	45	65	80	8	304
80%	0	0.3	5	2	2	21	42	44	4	172
85%	0	0.2	2	1	0	12	34	33	2	124
90%	0	0.1	0	0.3	0	5	26	25	1	82
95%	0	0.1	0	0	0	1	17	16	0	45
98%	0	0	0	0	0	0	5	9	0	22
99%	0	0	0	0	0	0	0	4	0	12
99.5%	0	0	0	0	0	0	0	1	0	8
99.8%	0	0	0	0	0	0	0	0	0	3
99.9%	0	0	0	0	0	0	0	0	0	1

The gage identifiers in the first row of Table 3.3 are the identifiers from column 1 of Tables 3.1 and 3.2. The second row labeled "Days" shows the number of days during the period-of-record with valid values. This is the sample size of the statistical computations. The second row labeled "missing" shows the number of days in the gaps of missing data for which valid values are not available in the USGS datasets. The following statistical metrics, all in units of cubic feet per second (cfs), are provided in Table 3.3.

Minimum value of daily flow rates (cfs) in the dataset.

Mean of the mean daily flows (cfs).

Maximum value of the daily flow rates (cfs) in the dataset.

Standard deviation (SD) of the daily flows (cfs).

Daily flow rates (cfs) corresponding to the exceedance frequencies in the first column computed based on the Weibull formula [(P = m/(N+1))100%].

Table 3.3 Continued
Frequency Statistics for Observed Mean Daily Flow Rates at Gaging Stations B11-B20

Gage	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Days	4,748	18,311	18,610	23,790	33,652	19,407	21,507	36,177	8,163	28,675
Missing	0	0	14,584	0	0	0	12,145	0	0	5,719
Min (cfs)	23.0	23.0	0.0	0.0	0.0	1.4	8.2	0.0	120.0	89.0
Mean(cfs)	2,923	2,696	183.1	308.4	598.4	160.0	989.5	1,736	4,661	5,287
Max (cfs)	116,000	70,300	21,200	49,100	45,000	42,500	62,000	420,000	84,400	172,000
SD (cfs)	6,779	5,377	577	1,009	1,394	793.6	1,827	4,563	8,525	10,314
0.1%	90,787	39,406	7,099	11,421	13,135	10,759	12,498	50,751	71,554	112,648
0.2%	64,764	37,300	5,302	9,384	10,300	7,193	10,200	36,064	66,605	97,054
0.5%	43,828	33,600	3,079	6,331	7,230	3,819	9,550	22,300	52,372	64,186
1%	34,000	29,888	2,118	4,442	6,060	2,249	8,889	15,300	43,100	49,524
2%	21,400	24,700	1,620	2,640	5,080	1,248	6,950	11,200	33,572	38,800
5%	11,755	12,500	989	1,410	3,400	550	4,906	7,671	21,600	22,220
10%	6,220	6,070	500	710	1,880	276	3,120	4,820	13,300	13,000
15%	4,390	4,140	325	466	1,060	167	2110	3,250	8,624	8,910
20%	3,250	2,950	185	314	667	117	1320	2,320	5,960	6,630
30%	2,020	1,770	59	135	326	65	681	1,210	3,138	3,990
40%	1,430	1,222	32	69	141	42	390	718	1,880	2,640
50%	1,060	911	15	37	58	31	216	435	1,260	1,780
60%	779	675	8.3	20	32	24	137	270	986	1,280
70%	543	472	4.1	11	21	19	102	177	754	953
80%	365	299	1.8	5	12	15	80	117	543	670
85%	280	233	0.9	3	8	13	69	92	460	536
90%	210	174	0.2	2	5	11	60	65	378	407
95%	110	117	0	0	2	9	50	33	293	283
98%	73	76	0	0	0	7	37	16	220	190
99%	58	55	0	0	0	6	27	8	189	155
99.5%	40	42	0	0	0	4	18	2	156	127
99.8%	36	31	0	0	0	3	12	1	137	108
99.9%	28	27	0	0	0	3	11	0	132	97

Flow frequency or duration relationships for the 30 sites are tabulated in Table 3.3 and plotted in Figure 3.3. The bottom plot in Figure 3.3 is limited to a smaller range of flows and frequencies than the full version at the top of the figure. The random variable is the mean flow in each day in cfs. The exceedance frequencies in percent represent the number of days that the mean flow during the day exceeded the indicated magnitudes. This information can be viewed as either flow frequency, probability, or duration relationships. From a duration analysis perspective, the percentages are the percent of time that the flow exceeds the indicated magnitudes.

The frequency relationships were developed using the math functions/statistics/duration analysis feature of HEC-DSSVue. Exceedance probabilities or frequencies (P) are assigned to each daily flow quantity in the dataset using the Weibull formula, where m is rank and N is sample size.

$$P = \frac{m}{N+1} 100\%$$

An interpolation routine determines the flow quantities associated with the 23 specified exceedance frequencies included in Table 3.3.

Table 3. 3 Continued
Frequency Statistics for Observed Mean Daily Flow Rates at Gaging Stations B21-B30

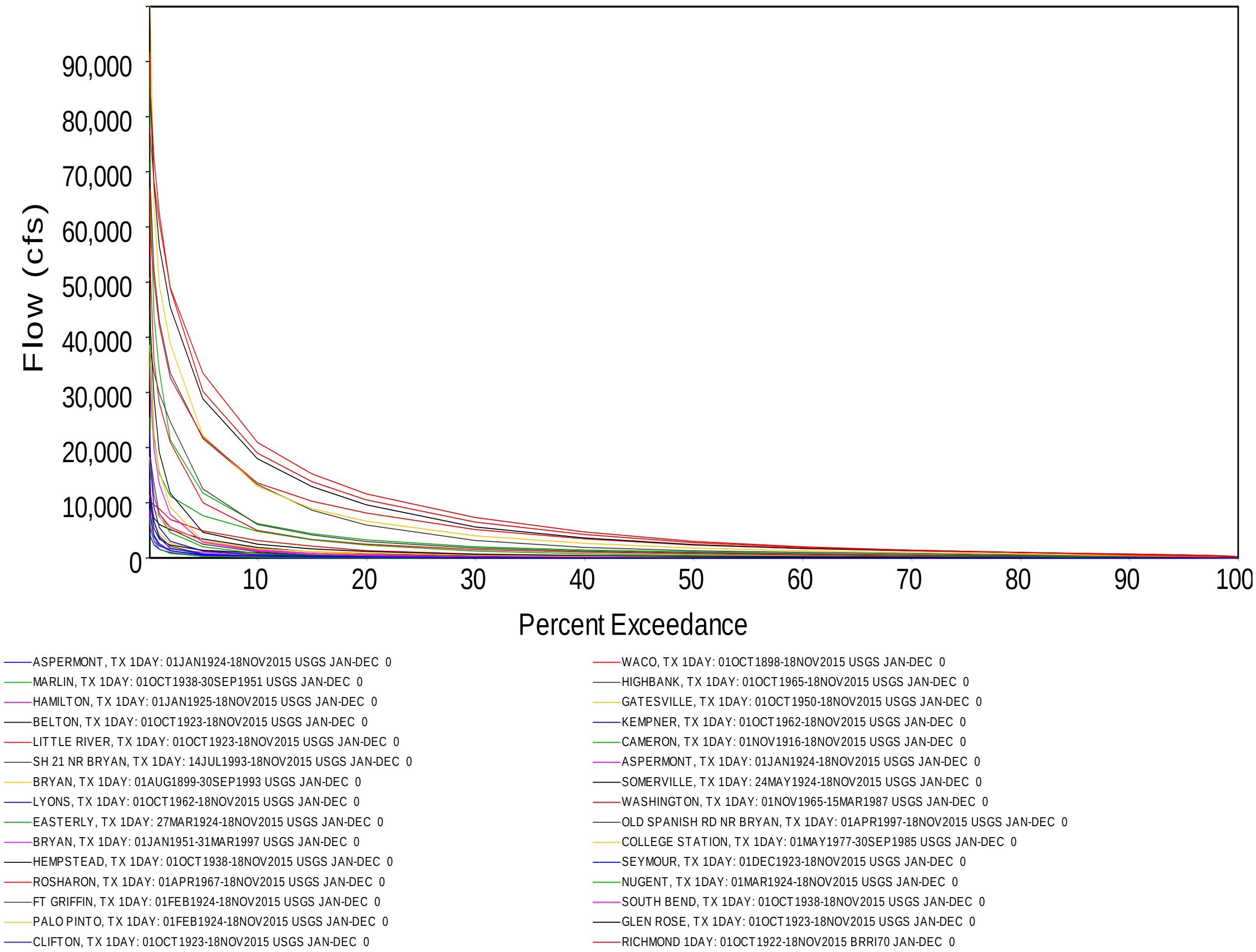
Gage	B21	B22	B23	B24	B25	B26	B27	B28	B29	B30
Days	27,206	19,407	6,789	33,474	6,806	16,091	3,075	28,173	34,017	16,446
Missing	6,210	0	1,016	0	0	801	0	0	0	1,318
Min (cfs)	0.0	0.0	196.0	0.0	3.4	0.0	0.1	58.0	35.0	27.0
Mean(cfs)	275.0	71.5	5,521	419.4	501.4	570.4	591.5	6,821	7,378	7,852
Max (cfs)	49,900	18,000	76,600	57,400	37,700	587,000	23,200	138,000	123,000	83,900
SD (cfs)	992.4	371.1	8,127	1,787	1,796	1,825	1,520	11,261	11,845	11,880
0.1%	13,259	4,646	67,099	25,372	23,047	22,899	18,270	100,826	91,687	78,187
0.2%	9,492	3,777	58,320	18,210	17,977	16,945	15,339	83,030	83,793	75,811
0.5%	5,360	2,340	50,325	11,463	13,579	11,300	8,872	67,700	72,491	68,276
1%	3,420	1,539	42,200	7,528	8,049	7,992	7,340	56,600	62,600	60,900
2%	2,320	959	32,620	4,590	5,207	5,592	5,315	45,452	48,800	49,006
5%	1,350	304	21,900	2,010	2,456	3,010	3,060	28,800	30,200	33,500
10%	917	73	13,600	811	1,110	1,480	1,700	18,000	19,000	20,930
15%	491	32	10,250	334	512	809	1070	12,900	13,800	15,200
20%	214	20	8,140	165	276	449	600	9,592	10,500	11,600
30%	54	9.3	5,140	72	119	169	228	5,610	6,480	7,300
40%	17	4.8	3,450	43	77	86	120	3,600	4,230	4,690
50%	6	2.3	2,310	27	59	54	81	2,390	2,760	3,000
60%	2	1	1,680	17	42	34	54	1,710	1,890	1,990
70%	1	0.4	1,260	11	32	22	32	1,300	1,380	1,380
80%	0	0	960	6	23	11	22	968	1,000	955
85%	0	0	811	4	19	7	15	804	839	748
90%	0	0	664	2	15	4	10	646	680	535
95%	0	0	520	1	10	1	5	475	515	357
98%	0	0	413	0	6	0	2	360	384	235
99%	0	0	332	0	5	0	1	302	305	165
99.5%	0	0	295	0	5	0	1	256	251	114
99.8%	0	0	261	0	4	0	0	191	173	71
99.9%	0	0	237	0	4	0	0	153	119	50

Site B30 is the USGS gage on the Brazos River near Rosharon which is about 40 miles upstream of the river outlet at the Gulf of Mexico. The dataset consists of 16,446 mean daily flows, which are plotted on page A-59 of Appendix A. The April 1, 1967 through November 18, 2015 period-of-analysis contains 17,764 days, but data are missing for 1,318 of these days during the early 1980s. The 16,446 flows range from 27 cfs to 83,900 cfs and have a mean and standard deviation (SD) of 7,852 cfs and 11,880 cfs, respectively.

An exceedance frequency or exceedance duration (P) is assigned to each of the daily flow quantities using the Weibull formula with N equal to 16,446 days.

$$P = \frac{m}{N+1} 100\%$$

The relative rank (m) of each of the mean daily flow rates ranges from m of 1 for the largest to m of 16,446 for the smallest. The median (50% exceedance frequency) daily flow is 3,000 cfs. The mean daily flow is greater than 357 cfs during 95 percent of the 16,446 days considered. A mean daily flow of 33,500 cfs has an exceedance frequency of 5.0 percent.



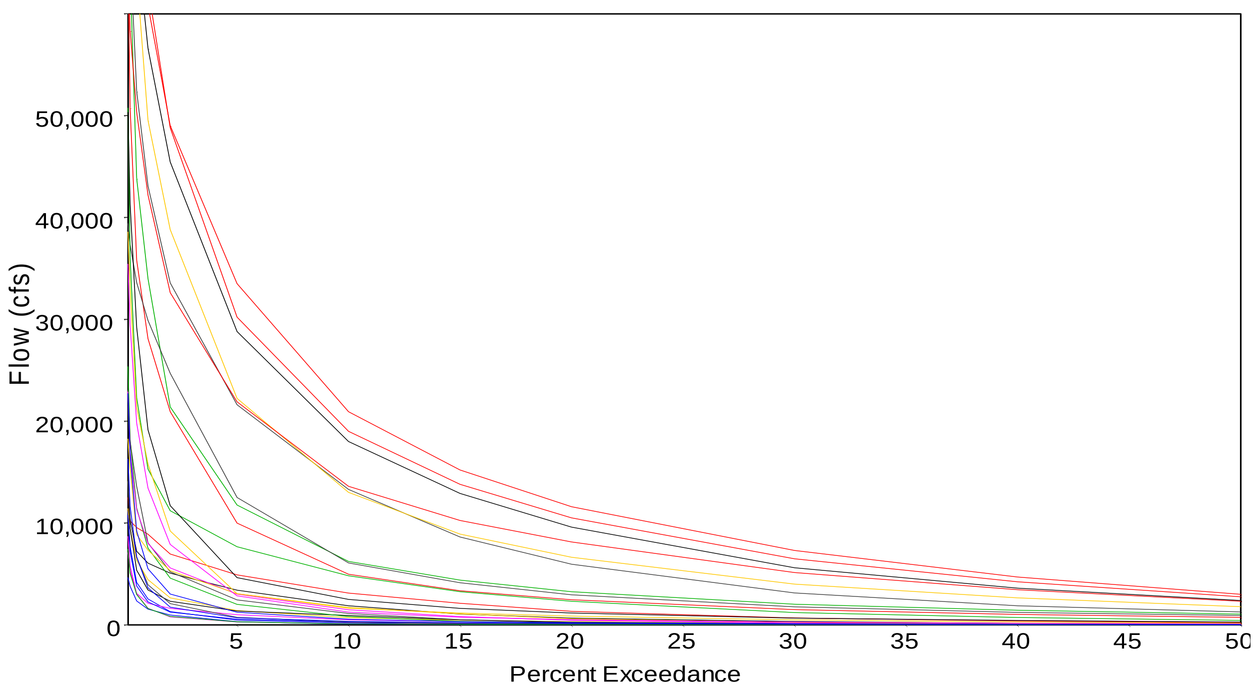


Figure 3.3 Flow Frequency or Duration Curves for the 30 Sites

Seasonality of Observed Mean Daily Flows

The frequency analysis methods reflected in the quantities of Table 3.3 were also applied to explore seasonal variations in flows. Seasons are defined for the analyses presented here as shown in Table 3.4 in accordance with the SB3 environmental flow standards. The SB3 flow standards for the 19 sites in the Brazos River Basin are based on defining three seasons as noted in Table 3.4. The SB3 standards for sites in the Trinity River Basin were created using four seasons.

Table 3.4
Seasons Defined by SB3 Environmental Flow Standards
and Adopted Here for the Frequency Analyses

Season	Brazos River Basin	Trinity River Basin
Winter	November, December, January, February	December, January, February
Spring	March, April, May, June	March, April, May
Summer	July, August, September, October	June, July, August
Fall	–	September, October, November

Table 3.5
Mean and Median of Seasonal Flows at SB3 Gage Sites in the Brazos River Basin

	Location of USGS Gage by	Mean Flow (cfs)			Median Flow (cfs)		
ID	River and Nearest City	Winter	Spring	Summer	Winter	Spring	Summer
B1	Double Mountain Fork Aspermont	31.71	179.5	191.9	5.8	10.0	9.2
B2	Salt Fork Brazos River Aspermont	20.02	127.4	115.4	6.2	6.8	2.6
B3	Brazos River near Seymour	94.18	452.0	439.1	33	54	41.0
B4	Clear Fork Brazos near Nugent	33.66	126.9	101.1	10	13	7.4
B5	Clear Fork Brazos near Fort Griffin	83.56	302.2	223.5	20	32	14
B6	Brazos River near South Bend	293.8	1,118	798.7	89	154	107
B7	Brazos River near Palo Pinto	427.7	1,270	1,012	100	187	226
B8	Brazos River near Glen Rose	703.0	1,873	1,196	198	411	281
B9	North Bosque River near Clifton	182.6	364.5	102.6	23	64	9.3
B10	Brazos River at Waco	4,406	7,656	4,695	552	1,110	650
B14	Leon River near Gatesville	230.3	481.9	222.4	29	84	18
B16	Lampasas River near Kempner	147.6	258.1	77.22	32	57	21
B17	Little River near Little River	787.9	1,511	705.7	158	561	144
B18	Little River near Cameron	1,557	2,577	1,100	383	988	234
B21	Yegua Creek near Somerville	284.4	390.0	163.0	9.9	28	0.8
B24	Navasota River at Easterly	519.1	625.6	128.4	33	52	9.3
B28	Brazos River near Hempstead	6,735	10,042	3,875	2,550	4,450	1,580
B29	Brazos River near Richmond	6,919	8,103	4,359	2,260	2,910	1,150
B30	Brazos River near Rosharon	8,527	11,070	4,300	4,210	5,200	1,600

Seasonal frequency statistics are tabulated in Tables 3.5 and 3.6 for the 19 USGS gaging stations in the Brazos River Basin for which SB3 environmental flow standards have been established. A complete set of frequency metrics for the 19 sites is provided in Table 3.6. The mean and median (50% exceedance frequency) of the flows at each site from Table 3.6 are tabulated in the summary Table 3.5. The statistics are for daily flows in cubic feet per second (cfs) for the period-of-record through January 2016 at each gage. The period-of-record of daily flows is sub-divided within HEC-DSSVue into the three seasons defined in Table 3.4. The statistical analysis is repeated for the daily flows grouped within each season.

The random variable is the mean flow rate in cfs in each day at a gage. The first two statistics in Table 3.6 are the mean and standard (SD) in cfs. The seasonal flow rates in cfs corresponding to the exceedance frequencies in the first column of Table 3.5 are computed based on the Weibull formula [(P = m/(N+1))100%] using the basic statistics and duration analysis features of HEC-DSSVue. The exceedance frequency percentages in the first column of Table 3.5 are the percentage of the days included in the analysis that the quantity is equaled or exceeded.

The median flow is the mean daily flow rate that is equaled or exceeded during 50 percent of the days of the period-of-record that fall with the particular season. As shown in Table 3.5, the median of the mean daily flows is much smaller than the period-of-record mean of the mean daily flows in each season.

Table 3.6
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B1 Double Mountain Fork Brazos near Aspermont			B2 Salt Fork Brazos River near Aspermont			B3 Brazos River near Seymour		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	31.71	179.5	191.9	20.02	127.4	115.4	94.18	452.0	439.1
SD	144.1	884.0	1171	75.17	656.5	705.6	358.3	11.37	2,061
95%	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	2	2	0
85%	0	0	0	0	0	0	4	5	0
80%	0	0	0	1	1	0	6	9	0
70%	1	1	0	2	2	0	14	20	6
60%	2	4	3	4	4	1	23	33	18
50%	6	10	9	6	7	3	33	54	41
40%	12	21	21	9	14	8	45	97	79
30%	20	42	44	13	28	20	64	170	140
20%	30	90	102	20	63	52	99	337	281
15%	40	146	166	27	97	88	127	540	443
10%	59	276	293	40	184	169	182	894	771
5%	104	722	682	75	452	406	319	1,800	1,650
2%	218	2,017	1,851	141	1,320	1,089	598	4,125	4,163
1%	396	3,209	3,551	225	2,478	2,173	1,048	7,520	7,367
0.50%	815	4,878	5,306	386	4,613	3,776	1,779	11,200	12,242

Daily flows at these 19 sites on the Brazos River and its tributaries are characterized as differing significantly between seasons of the year. Both means and medians of the flows are higher during the four Spring months than during the four Winter months and four Summer months at all 19 gage sites. Median flows are lowest during the Winter at six sites and lowest during the Summer at 13 sites. Seasonal means are lowest during the Winter at nine sites and lowest during the Summer at ten sites.

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B4 Clear Fork Brazos River near Nugent			B5 Clear Fork Brazos River near Fort Griffin			B6 Brazos River near South Bend		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	33.66	126.9	101.1	83.56	302.2	223.5	293.8	1,118	798.7
SD	188.7	649.9	606.7	463.0	1,1705	1,398	1,272	3,640	2,940
99.5%	0	0	0	0	0	0	0	0	0
99%	0	0	0	0	0	0	0	0	0
98%	0	0	0	0	0	0	1	1	0
95%	0	0	0	0	0	0	2	4	0
90%	1	1	0	0	1	0	6	12	1
85%	2	2	0	2	4	0	14	23	5
80%	4	3	0	5	6	0	24	35	11
70%	5	6	2	10	12	1	45	62	29
60%	7	9	4	14	20	6	64	96	62
50%	10	13	7	20	32	14	89	154	107
40%	13	18	13	29	52	25	114	265	181
30%	17	29	22	40	91	46	154	458	318
20%	25	55	43	57	168	96	244	884	586
15%	30	90	68	75	273	156	332	1,330	860
10%	42	180	130	110	520	304	490	2,190	1,450
5%	88	472	371	225	1,270	825	882	4955	3219
2%	235	1,255	1,040	636	3,390	2,297	2,024	12,110	8,619
1%	433	2,285	1,920	1,204	5,988	4,023	4,098	18,305	13,797
0.50%	806	4,269	3,360	2,334	8,428	6,885	7,498	24,810	19,934

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B7 Brazos River near Palo Pinto			B8 Brazos River near Glen Rose			B9 North Bosque River near Clifton		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	427.7	1,270	1,012	703.0	1,873	1,196	182.6	364.5	102.6
SD	1,394	3,985	3,203	2,484	5,302	3,850	1,450	1,497	751.2
99.5%	1	0	0	8	4	0	0	0	0
99%	2	2	0	12	7	0	0	0	0
98%	6	9	0	16	12	3	0	1	0
95%	17	19	14	21	20	10	1	2	0
90%	26	27	25	27	32	17	2	4	0
85%	33	36	34	35	44	24	4	8	1
80%	38	50	45	43	63	32	5	11	1
70%	52	82	77	69	125	64	9	21	3
60%	70	114	125	112	236	148	15	37	6
50%	100	187	226	198	411	281	23	64	9
40%	160	344	404	293	629	443	33	103	15
30%	266	645	649	436	1,060	677	62	171	25
20%	475	1,180	998	697	1,870	1,140	130	302	45
15%	644	1,560	1,275	967	2,620	1,520	184	404	67
10%	948	2,495	1,770	1,370	3,810	2,340	284	632	111
5%	1,560	4,938	3,160	2,390	8,275	4,312	566	1,258	238
2%	2,709	13,350	9,773	5,230	18,250	10,904	1,340	3,290	720
1%	4,734	20,000	16,583	9,800	26,775	18,556	2,690	6,350	1,615
0.50%	10,743	29,150	22,883	14,880	38,738	28,904	4,798	10,100	3,776

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B10 Brazos River at Waco			B14 Leon River near Gatesville			B16 Lampasas River near Kempner		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	1,640	3,649	1,759	230.3	481.9	222.4	147.6	258.1	77.22
SD	4,406	7,656	4,695	934.7	1,192	850.9	880.0	965.2	409.0
99.5%	8	10	5	0	0	0	8	6	3
99%	11	19	10	0	0	0	9	7	4
98%	20	34	17	0	1	0	10	8	5
95%	40	70	37	1	3	0	12	11	7
90%	66	126	79	2	6	0	14	14	9
85%	96	185	120	4	9	1	15	18	10

80%	125	265	173	6	13	2	17	21	11
70%	210	468	294	12	27	4	21	28	14
60%	348	751	450	19	50	9	26	39	18
50%	552	1,110	650	29	84	18	32	57	21
40%	824	1,650	873	58	156	33	43	90	26
30%	1,210	2,590	1,170	96	302	68	64	143	33
20%	1,890	4,410	1,750	208	568	199	111	256	47
15%	2,442	5,810	2,360	330	845	357	158	361	62
10%	3,410	9,060	3,520	515	1310	518	232	521	91
5%	5,950	17,300	6,660	963	2,040	1,127	432	922	180
2%	12,500	27,450	14,554	2,030	4,080	1,715	1,060	1,887	538
1%	21,705	36,050	22,777	3,273	6,104	3,510	1,974	3,277	1,100
0.50%	29,000	46,425	28,689	4,793	8,120	4,699	3,298	5,633	2,612

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B17 Little River near Little River			B18 Little River near Cameron			B21 Yegua Creek near Somerville		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	787.9	1,511	705.7	1,557	2,577	1,100	284.4	390.0	163.0
SD	1,497	2,246	1,563	3,308	4,744	5,266	769.6	1,150	1,008
99.5%	36	39	11	14	16	1	0	0	0
99%	41	45	16	19	23	1	0	0	0
98%	49	49	22	24	33	4	0	0	0
95%	55	62	37	38	72	18	0	0	0
90%	62	78	51	71	114	37	0	0	0
85%	69	94	59	94	161	60	0	1	0
80%	77	111	67	115	216	79	0	2	0
70%	94	183	85	171	384	120	1	4	0
60%	116	328	109	245	620	165	3	11	0
50%	158	561	144	383	988	234	10	28	1
40%	276	853	218	665	1,510	349	28	58	2
30%	548	1450	381	1,140	2,443	560	82	161	5
20%	1,060	2,750	645	2,080	4,040	955	330	595	23
15%	1,460	3,500	1,050	2,975	5,060	1,460	590	926	70
10%	2,370	4,420	2,132	4,333	6,630	2,640	940	1,100	228
5%	3,740	5,971	3,450	6,922	9,760	5,331	1,490	1,630	912
2%	6,230	8,200	5,947	10,512	14,000	9,452	2,340	2,747	2,070
1%	7,480	9,210	8,984	13,900	20,900	11,300	3,308	4,680	2,430
0.50%	9,148	9,513	9,811	20,852	27,821	15,400	4,654	6,790	3,910

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B24 Navasota River at Easterly			B28 Brazos River near Hempstead			B29 Brazos River near Richmond		
	Winter	Spring	Summer	Winter	Spring	Summer	Winter	Spring	Summer
Mean	519.1	625.6	128.4	6,735	10,042	3,875	6,919	8,103	4,359
SD	2,029	2,140	958.0	11,089	13,731	7,344	10,782	12,183	9,444
99.5%	1	0	0	237	343	234	163	189	201
99%	1	1	0	275	391	289	210	210	223
98%	2	3	0	327	452	338	270	250	255
95%	3	5	0	422	653	449	364	333	315
90%	6	9	1	557	904	602	435	496	382
85%	9	13	1	690	1140	733	516	629	454
80%	11	16	2	845	1400	855	603	799	520
70%	15	24	3	1,220	2,010	1,080	944	1210	677
60%	22	36	6	1,720	2,960	1,300	1,330	1,970	858
50%	33	52	9	2,550	4,450	1,580	2,260	2,910	1,150
40%	55	84	13	3,950	6,650	1,948	4,004	4,496	1,564
30%	107	162	23	5,990	10,300	2,721	6,406	7,300	2,340
20%	265	457	45	9,670	16,200	4,304	11,200	11,780	4,670
15%	549	848	61	12,600	20,000	5,820	13,940	15,900	6,796
10%	1,120	1,480	79	17,200	27,000	8,620	19,600	24,300	10,710
5%	2,587	3,060	226	26,800	38,725	15,200	31,380	36,545	19,300
2%	5,275	6,380	1,273	44,980	54,010	27,200	44,084	48,158	43,256
1%	8,415	9,500	2,780	55,640	63,710	40,291	49,256	58,332	58,641
0.50%	14,337	13,401	5,150	69,585	76,410	52,897	58,084	66,384	63,182

Table 3.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates (cfs)

	B30 Brazos River near Rosharon		
	Winter	Spring	Summer
Mean	8,527	11,070	4,300
SD	12,129	13,890	8,274
99.5%	263	70	129
99%	300	98	181
98%	369	159	228
95%	506	305	309
90%	748	532	423
85%	995	893	566

80%	1,210	1,240	708
70%	1,780	2,110	970
60%	2,740	3,350	1,250
50%	4,210	5,200	1,600
40%	5,880	8,530	2,140
30%	8,290	12,300	3,120
20%	12,400	18,700	5,090
15%	15,300	23,500	6,950
10%	21,200	30,900	10,000
5%	35,420	41,665	16,960
2%	49,400	53,938	31,088
1%	64,544	63,173	52,148
0.50%	72,072	70,229	62,072

Additional Analyses of Observed Flows in the Appendices

The first eight appendices consist of plots and tables dealing with observed flows at the 30 gage sites in the Brazos River Basin and 17 gage sites in the Trinity River Basin. Appendices A, C, E, and G deal with observed flows at the sites on the Brazos River and tributaries. Appendices B, D, F, and H present the same information for the sites on the Trinity River and its tributaries.

Two datasets consisting of mean daily flow rates in cfs and the annual series of peak instantaneous flow rate in each year in cfs were downloaded from the USGS NWIS using HEC-DSSVue for each of the sites. Daily flows were aggregated to develop datasets of flow volumes or mean flow rates over periods of several days, monthly, or yearly. Time series plots were created with HEC-DSSVue. Statistics were computed with the HEC-SSP Statistical Software Package.

The periods-of-analysis for the plots and computations for the sites in the Brazos River Basin are listed in Table 3.2. The periods-of-analysis begin with the beginning of the gage record, and all available valid data are used. Gages B11, B20, B23, B26, and B27 are no longer active, but periods-of-record for the 25 other gages extend to the present. The analyses presented in Tables 3.3 and 3.6 are based on available flows through November 18, 2015 and January 31, 2016, respectively. The appendices are based on daily flows through either December 2014 or May 2015. With the exception of site B29, the daily flow datasets adopted in the appendices begin at exactly the same time as the datasets reflected in the statistics of the preceding section. The Table 3.3 statistics are based on a B29 dataset that extends from October 1, 1922 through November 18, 2015. The appendices include data for site B29 that includes 1903-1906 as well as October 1922 to the present.

Appendices A, C, E, G, and K provide the following information for the gage sites in Tables 3.1 and 3.2. These analyses are described in Chapter 1 and further discussed below.

Appendix A consists of four time series plots developed for each of the 30 sites (120 graphs): (1) mean daily flow rate in cfs, (2) mean monthly flow rate in cfs, (3) annual peak instantaneous flow rate in cfs, and (4) annual flow volume in acre-feet/year.

Appendix C consists of log-Pearson III exceedance frequency plots and tables for peak annual flow rates in cfs for each of the 30 sites (30 graphs and corresponding 30 tables).

Appendix E consists of minimum volume-duration plots and tables for specified time periods for each of the 30 sites (30 graphs and corresponding 30 tables).

Appendix G consists of maximum volume-duration plots and tables for specified time periods for each of the 30 sites (30 graphs and corresponding 30 tables).

Appendix K presents tables of annual flow volumes for observed, naturalized, and regulated flows.

The four HEC-DSSVue [1] time series plots in Appendix A for each of the 30 gages include mean daily flows for each day, mean monthly flows for each month, maximum instantaneous flow in each year, and total flow volume in each year. Flows at all sites exhibit extreme variability at time scales of either daily, monthly, or yearly. Long-term changes vary between sites. Long-term changes or trends tend to be hidden in the tremendous continuous variability. However, flows appear to have trended downward over the past 70 years in the plots at gaging stations B1, B2, B3, B4, B5, B6, B7, and B8 in the upper basin. Gages B10 (below Lakes Whitney, Waco, and Aquilla), B15 (below Lake Belton), and B21 (below Lake Somerville) are located short distances below USACE reservoirs, and the effects of flood control operations are evident in the daily flows. Long-term changes or trends are not clearly evident in the plots at the other gage sites.

Results of flood frequency analyses performed with the HEC-SSP Statistical Software Package [2] are presented in Appendix C in both table and graph format. The log-Pearson Type III probability distribution was applied to the annual series of peak instantaneous flows. The data series consisting of the maximum flow in each year is included in the plots of Appendix A. The flow frequency results are presented in Appendix C. The random variable (Q_P) is the flow rate in cfs at the gage site. The annual exceedance probability (P) is the probability that a particular value of Q_P is equaled or exceeded in any randomly selected year. The return period (T) in years is the reciprocal of the annual exceedance probability (T=1/P).

Low flow and high flow volume frequency analyses performed with HEC-SSP are presented in Appendices E and G. The annual data series are defined as the mean flow during the 1-day, 7-day, 10-day, 30-day, 60-day, and 120-day period of each year that have the minimum flow volume for that year (Appendix E) or the maximum flow volume during that year (Appendix G). The log-Pearson Type III frequency analysis methodology is applied to each of the annual data series at each of the gaging stations. The annual exceedance frequency relationships for mean minimum or mean maximum flow rates in cfs during specified durations (1, 7, 10, 30, 60, and 120 days) relationships, based on the log-Pearson III probability distribution, are presented both as tables and graphs. The graphs also include Weibull (P=m/(N+1)) plots. The means, standard deviations, and skew coefficients of the logarithms of the data used in the log-Pearson III computations are also tabulated.

Appendices I and K deal with WRAP/WAM generated naturalized and regulated flows at the 25 of the 30 gaging station sites that are included as primary control points in the Brazos WAM. These gage sites have WAM control point identifiers in the third column of Table 3.1. These appendices are discussed in the next section.

Brazos Water Availability Model

The Brazos River Basin and adjoining much smaller San-Jacinto-Brazos Coastal Basin are combined in the same WRAP input dataset in the TCEQ WAM System. The coastal basin has a watershed drainage area of 1,150 square miles compared to 45,870 square miles for the Brazos River Basin. The original Brazos WAM completed in 2001 contained 1,216 water rights, all with seniority dates senior to February 2, 2000, which included 1,160 rights in the Brazos River Basin and 56 rights in the San Jacinto-Brazos Coastal Basin [29]. Excluding hydropower and the portion of thermal electric cooling water returned to streams, diversion rights for municipal, industrial, agricultural irrigation, and other uses account for 47.6%, 30.1%, 18.0%, and 4.3% the total authorized consumptive water use in the Brazos River Basin (95.2%) and adjoining coastal basin (4.8%). About 120 of the water right permits for water supply diversions contain special conditions requiring that minimum instream flow rates must be maintained in the river or stream.

Counts of system components for the September 2008 update of the authorized use and current use scenario versions of the Brazos WAM are tabulated in Table 3.7. The dataset includes naturalized monthly flows for 1940-1997 at 77 primary control points that are distributed to over 3,000 secondary control points each time the simulation model is executed.

Table 3.7
Number of System Components in
September 2008 Versions of the Brazos WAM Datasets

Water Use Scenario	Authorized	Current
total number of control points	3,842	3,852
number of primary control points	77	77
number of reservoirs	678	719
number of water right *WR* records	1,643	1,734
number of instream flow *IF* records	122	145

The development and initial application of the original Brazos WAM datasets are documented by reports dated 2001 prepared for the TCEQ by Freese and Nichols, Inc. and HDR Engineering [28, 29]. All datasets in the TCEQ WAM System, including the Brazos WAM, are based on a monthly computational time interval. The Brazos River Basin has served as the case study for continuing endeavors in expanding WRAP sponsored by the TCEQ. The monthly Brazos WAM has been converted to a daily time step using capabilities covered in the *Daily Manual* [7, 12, 18]. The original Brazos WAM has a hydrologic period-of-analysis of 1940-1997. Hydrology extension capabilities documented in the *Hydrology Manual* [6] were originally tested and demonstrated by updating the Brazos WAM period-of-analysis to cover 1940-2011 [19]. The hydrology has been further improved and extended through 2015 [31].

Largest Reservoirs in the Brazos River Basin

The authorized use scenario Brazos WAM contains 678 reservoirs cited in water right permits, with a total permitted storage capacity of 4,694,850 acre-feet. Forty-three of these reservoirs have conservation storage capacities of 5,000 acre-feet or greater. The 16 reservoirs in Table 3.8 and Figure 3.1 are the only reservoirs in the Brazos River Basin that have a combined conservation and flood control storage capacity of greater than 75,000 acre-feet. There are no reservoirs of this size in the San Jacinto-Brazos Coastal Basin. The reservoir data in Table 3.8 is from the TCEQ WAM System authorized use scenario dataset, which is compiled from the water right permits which exclude flood control storage capacity since no permits have been issued for flood control. The flood control pools of the nine federal reservoirs are included in the daily version of the Brazos WAM. Table 3.8 includes the rivers, initial impoundment dates, and flood control storage capacities.

Table 3.8
Largest Reservoirs in the Brazos River Basin

Reservoir	Stream	Initial Impound ment	Storage Capacity Conservation (acre-feet)	Storage Capacity Flood Control (acre-feet)	Total (acre-feet)
Brazos River Authority and U.S. Army Corps of Engineers					
Possum Kingdom	Brazos River	1941	724,739	–	724,739
Granbury	Brazos River	1969	155,000	–	155,000
Whitney	Brazos River	1951	636,100	1,363,400	1,999,500
Aquilla	Aquilla Creek	1983	52,400	93,600	146,000
Waco	Bosque River	1965	206,562	519,840	726,400
Proctor	Leon River	1963	59,400	314,800	374,200
Belton	Leon River	1954	457,600	640,000	1,097,600
Stillhouse Hollow	Lampasas River	1968	235,700	394,700	630,400
Georgetown	San Gabriel	1980	37,100	93,700	130,800
Granger	San Gabriel	1980	65,500	178,500	244,000
Somerville	Yequa Creek	1967	160,110	347,290	507,400
Limestone	Navasota River	1978	225,400	–	225,400
Allen′s Creek	Allen′s Creek	proposed	145,533	–	145,533
City of Lubbock					
Alan Henry	Double Mountain	1993	115,937	–	115,937
West Central Texas Municipal Water District					
Hubbard Creek	Hubbard Creek	1962	317,750	–	317,750
Texas Utilities Services (cooling water for Comanche Peak Power Plant)					
Squaw Creek	Squaw Creek	1977	151,500	–	151,500

The 16 largest reservoirs contain permitted conservation capacities totaling 4,694,850 acre-feet and 4,023,350 acre-feet, which is about 79.7 percent and 80.7 percent of the total conservation storage capacity of the 678 and 719 reservoirs in the authorized use and current use scenario datasets. The diversion targets associated with the 16 largest reservoirs account for about 39.7 percent and 31.7 percent of the total authorized diversion amounts of 2,437,340 and 1,496,430 acre-feet/year for the authorized use scenario and current use scenario WAM datasets. The nine USACE reservoirs with designated flood control pools have a total flood control storage capacity of 3,945,830 acre-feet.

The U.S. Army Corps of Engineers (USACE) Fort Worth District owns and operates a system of nine multiple-purpose reservoirs. The Brazos River Authority (BRA) has contracted for the conservation storage capacity in the nine federal reservoirs and owns three other reservoirs. The City of Waco has water right permits for Lake Waco, and the BRA holds permits for the 11 other reservoirs of the 12-reservoir USACE/BRA system.

Possum Kingdom Lake has the largest conservation storage capacity in the Brazos River Basin, and Lake Whitney has the second largest conservation storage capacity. Considering the total of both flood control and conservation capacity, Lake Whitney is the largest reservoir in the Brazos River Basin and the seventh largest reservoir in Texas. Whitney, Granbury, and Possum Kingdom are on the Brazos River and the other reservoirs are on tributaries.

Several major water users divert from the lower reaches of the Brazos River and its tributaries supplied from BRA releases from multiple reservoirs. Thus, flows in river reaches between the dams and downstream diversion sites may be increased by water supply releases. Water right permits held by the BRA since 1964 facilitate coordination of multiple-reservoir operations. A water right application for a system operation permit submitted by the BRA in 2004 and pending TCEQ approval is designed to increase the effectiveness of system operations.

Hydroelectric power is generated at Whitney Reservoir and until recently was generated at Possum Kingdom Reservoir. Hydropower generation at Possum Kingdom was recently terminated. The Southwest Power Administration is responsible for marketing hydroelectric power generated at Lake Whitney, which it sells to the Brazos Electric Power Cooperative. Hydropower is generated by excess flows (spills) and releases for downstream water supply diversions. The inactive pool at Lake Whitney provides dead storage for hydropower. No water rights exist specifically for hydropower at the two Brazos River reservoir/hydropower projects.

In addition to releases for water supply diversions from the lower Brazos River, Possum Kingdom and Granbury Reservoirs supply water as needed to maintain constant operating levels in Lakes Squaw Creek, Tradinghouse Creek, and Lake Creek which are owned and operated by utility companies for steam-electric power plant cooling. The BRA operates a desalting water treatment plant that allows use of water from Lake Granbury to supplement the water supply for the City of Granbury and other water users in Johnson and Hood Counties.

Allen′s Creek Reservoir is the only proposed but not yet constructed project listed in Table 3.8. The BRA, City of Houston, and Texas Water Development Board jointly hold a water right permit for this proposed off-channel reservoir project.

Lake Alan Henry in the upper basin is owned and operated by Lubbock for municipal water supply. The West Central Texas Municipal Water District operates Hubbard Creek Reservoir to supply the cities of Abilene, Albany, Anson, and Breckenridge and other water users.

Squaw Creek Reservoir owned by Texas Utilities Services Company provides cooling water for the Comanche Peak Nuclear Power Plant. The lake is located between the cities of Glen Rose and Granbury on Squaw Creek which flows into the Brazos River between Lakes Granbury and Whitney. The BRA supplies water from Lakes Possum Kingdom and Granbury as needed to maintain a constant water level in Squaw Creek Reservoir.

SB3 Environmental Flow Standards

Environmental flow standards that have been adopted for the river systems of the state are published in Chapter 298 in Title 30 of the Texas Administrative Code. Environmental flow standards for the Brazos River and its associated bay and estuary system are in Subchapter G.

The Basin and Bay Expert Science Team (BBEST) for the Brazos River Basin submitted its Environmental Flow Regime Recommendation Report to the Brazos Basin Area Stakeholders Committee (BBASC), Environmental Flows Advisory Group, and TCEQ in March 2012. The BBASC submitted its Environmental Flow Standards and Strategies Recommendations Report to the TCEQ in August 2012. The Work Plan for Adaptive Management was submitted in November 2013. These three reports are available at the following TCEQ website.

https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/eflows/brazos-river-and-associated-bay-and-estuary-system-stakeholder-committee-and-expert-science-team

The geographic area assigned to the Brazos River Basin BBASC and BBEST consists of the entire Brazos Basin in Texas, the Oyster Creek and Austin Creek watersheds in the San Jacinto-Brazos coastal basin to the east, and the San Barnard River Basin which adjoins the lower Brazos Basin to the west. Environmental instream flow recommendations are developed at 19 stream gaging stations on the Brazos River and its tributaries and one gaging station on the San Bernard River. The 19 sites in the Brazos River basin with SB3 environmental flow standards are indicated in the last column of Table 3.2. The USGS discontinued gage 08109000 on the Brazos River near Bryan in 1994 but gage 08108700 installed nearby allowed the two records to be combined to extend the period-of-record to the present.

The Brazos and San Bernard Rivers do not have bays. Their estuaries are classified as riverine in contrast to the lagoon-type estuaries (shallow bays) that dominate the Texas coast. No additional environmental flow requirements are recommended specifically for freshwater inflows to the estuaries. The premise is that instream flow requirements that satisfy the needs of riverine ecosystems will also maintain a sound estuarine ecosystem.

Improved and Updated Hydrology

The Brazos WAM hydrology input data includes monthly naturalized stream flows at 77 primary control points, monthly net evaporation less precipitation depths assigned to 67 control point identifiers, and daily pattern hydrographs at 58 control points that are applied within the simulation to disaggregate monthly naturalized flows to daily.

The original hydrologic period-of-record of 1940-1996 is still employed for the official monthly Brazos WAM in the TCEQ WAM System. The developmental daily Brazos WAM hydrology input dataset was recently improved and extended to cover a 1940-2015 hydrologic period-of-analysis [32]. The simulation results presented here reflect the new and improved hydrology input dataset. The DSS files of daily and monthly observed, naturalized, and regulated flows compiled in the process of improving and updating the WAM hydrology complements the datasets documented by the present report.

Brazos WAM Simulation Results

The WRAP daily simulation model *SIMD* was executed with the Brazos WAM input dataset. The simulation combines the TCEQ WAM authorized water use scenario with the refined and updated January 1940 through December 2015 hydrology. There are 27,759 days in the daily computational time step 1940-2015 simulation. Simulation results are organized, analyzed, and displayed in this report using HEC-DSSVue and the WRAP program *TABLES*.

The daily Brazos WAM employed in this study is in a developmental testing status subject to further refinements. As noted on the preceding page, a recently updated and improved hydrology input dataset is incorporated into the version of the daily Brazos WAM adopted for the simulation presented here. The naturalized daily flows derived from the WAM are dependent only on the naturalized monthly flows and daily pattern hydrographs provided in the *SIMD* hydrology input dataset. The simulated regulated flows are dependent upon the *SIMD* water rights input data and various parameter option selections as well as the hydrology input.

Simulation results necessarily reflect the various premises and approximation inherent in the WAM. The simulation is based on the premise that water resources are developed and managed in accordance with the water rights permits and water users use the full amounts authorized by their permits during a repetition of 1940-2015 river basin hydrology. However, in reality, permit holders do not necessarily divert the full amounts authorized by their permits in any particular year. The authorized use scenario in the TCEQ WAM System includes return flows from water supply diversions only if return flows are required in the permits. Most permits require no return flows. The exclusion of return flows may significantly lower the computed regulated flows. The flood control pools of the nine USACE reservoirs and operations thereof are incorporated in the daily WAM and thus reflected in the simulation results presented here.

The datasets in the TCEQ WAM System for all of the river basins begin their simulations with all reservoirs filled to full conservation storage capacity. The 678 reservoirs in the Brazos WAM are likewise assumed in the simulation presented in this chapter to be full to conservation storage capacity, with empty flood control pools at the beginning of the 1940-2015 hydrologic period-of-analysis. Since the late 1930's and early 1940's was a relatively wet period, beginning the 1940-2015 simulation with the reservoirs filled to full conservation storage capacity at the beginning of January 1940 is not unreasonable.

The storage contents of each of the reservoirs were set at full conservation capacity at the beginning of January 1, 1940. The total conservation storage capacity of the 678 reservoirs is 4,694,850 acre-feet. Encroachment into the flood control pools of the nine USACE reservoirs may occur during floods when the conservation pools are full. The year 2015 was very wet. Though not included in the model, major floods also continued through Spring 2016.

The summation of the end-of-month storage contents in acre-feet for the 678 reservoirs for each of the 912 months of the 1940-2015 daily simulation are plotted in Figure 3.4. Although the simulation is performed with a daily time step, end-of-month storage volumes are plotted in Figure 3.4. The severe 1950-1957 drought ending with a major flood in April 1957 is evident in the plot. The total storage contents of the 678 reservoirs begins to decrease during 1950, reaching a minimum in December 1956. Storage dramatically refills during the March-May 1957 flood.

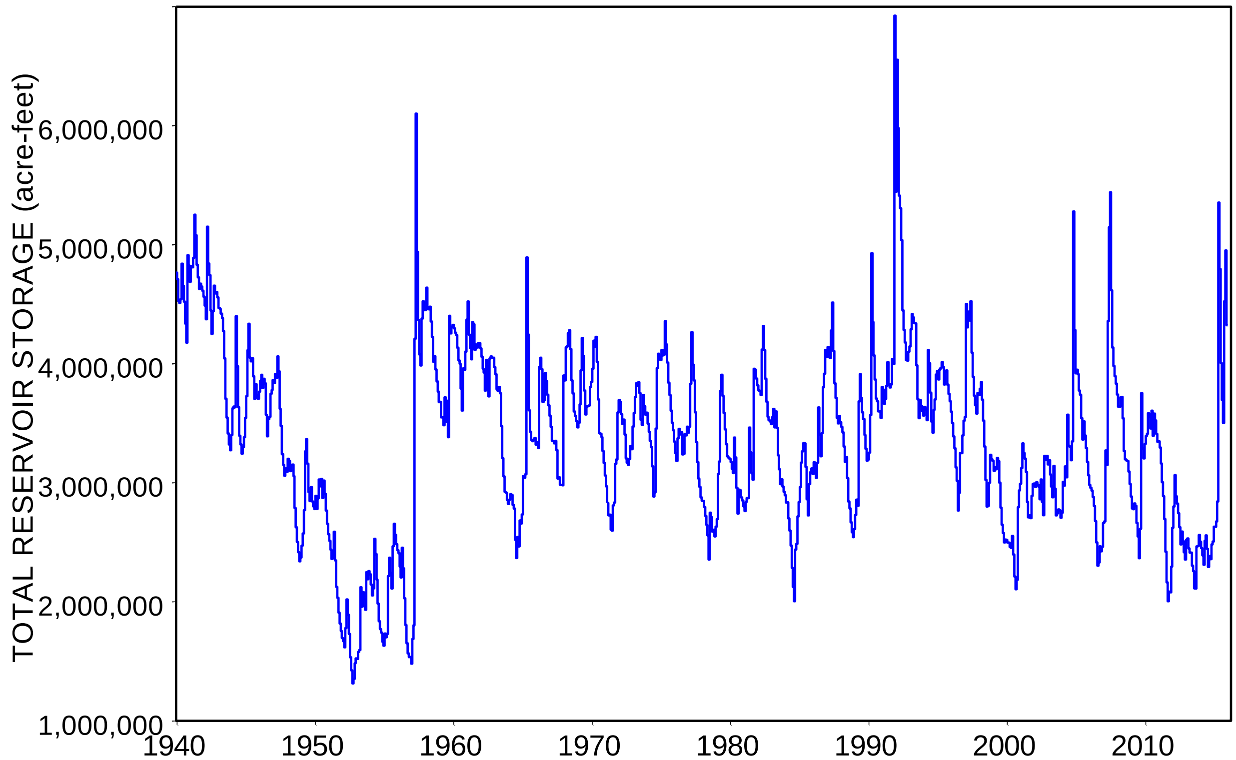


Figure 3.4 Simulated Total Storage Volume in the 678 Reservoirs in the Brazos WAM

The simulated reservoir draw-downs during 2010-2013 shown in Figure 3.4 are also indicative of severe drought conditions. However, employing basin-wide total storage contents as a hydrologic drought severity index, the Brazos and Trinity (Figure 4.5 in Chapter 4) River Basins have never experienced hydrologic drought conditions as severe as the 1950-1957 drought with present or near-present population and economic development.

Daily naturalized stream flows are computed within the *SIMD* simulation based on distributing monthly flows from primary to secondary control points and disaggregating monthly flow volumes to daily in proportion to the input daily pattern hydrographs. Daily regulated flows are the stream flows at a site after considering reservoir evaporation, storage, and releases, water supply diversions and return flows, and other actions of all the water rights in the model.

Daily flow volumes in acre-feet are computed by *SIMD*. The flow plots in Figures 3.5 and 3.6 and Appendix I are converted to cubic feet per second (cfs) by multiplying quantities in acre-feet/day by 0.5041667. Time series plots and frequency statistics are presented in this report for the 25 gage sites in Tables 1.1 and 3.1 that serve as WAM control points. The control point identifiers are listed in the third column of Tables 1.1 and 3.1. The locations of the control points are shown in Figure 3.2.

Naturalized, regulated, and gaged 1940-2015 mean daily flow rates in cfs at control point BRRI70 at the USGS gage on the lower Brazos River near Richmond are plotted in Figures 3.5, 3.6, and 3.7. Similar plots are presented in Appendix I for the 27,759 daily naturalized flows for all 25 control points in listed in Table 3.1.

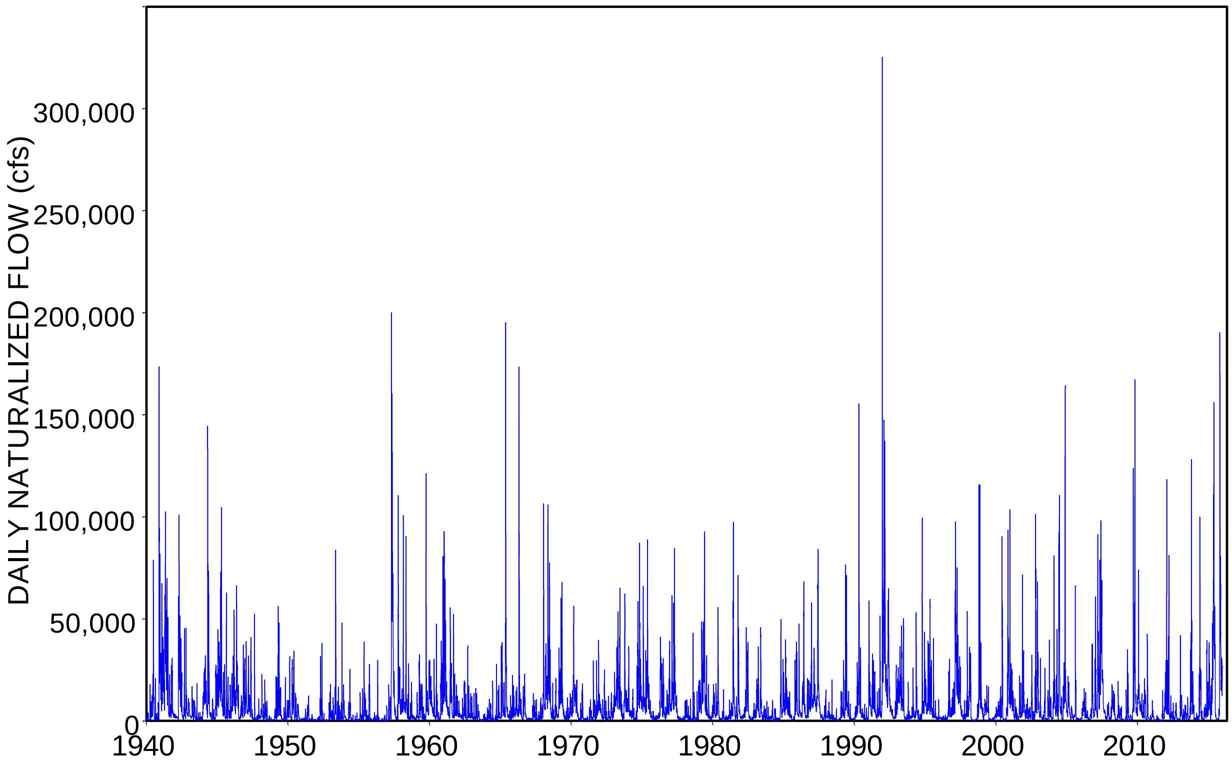


Figure 3.5 Daily Naturalized Flows at Control Point BRRI70 on the Brazos River at Richmond

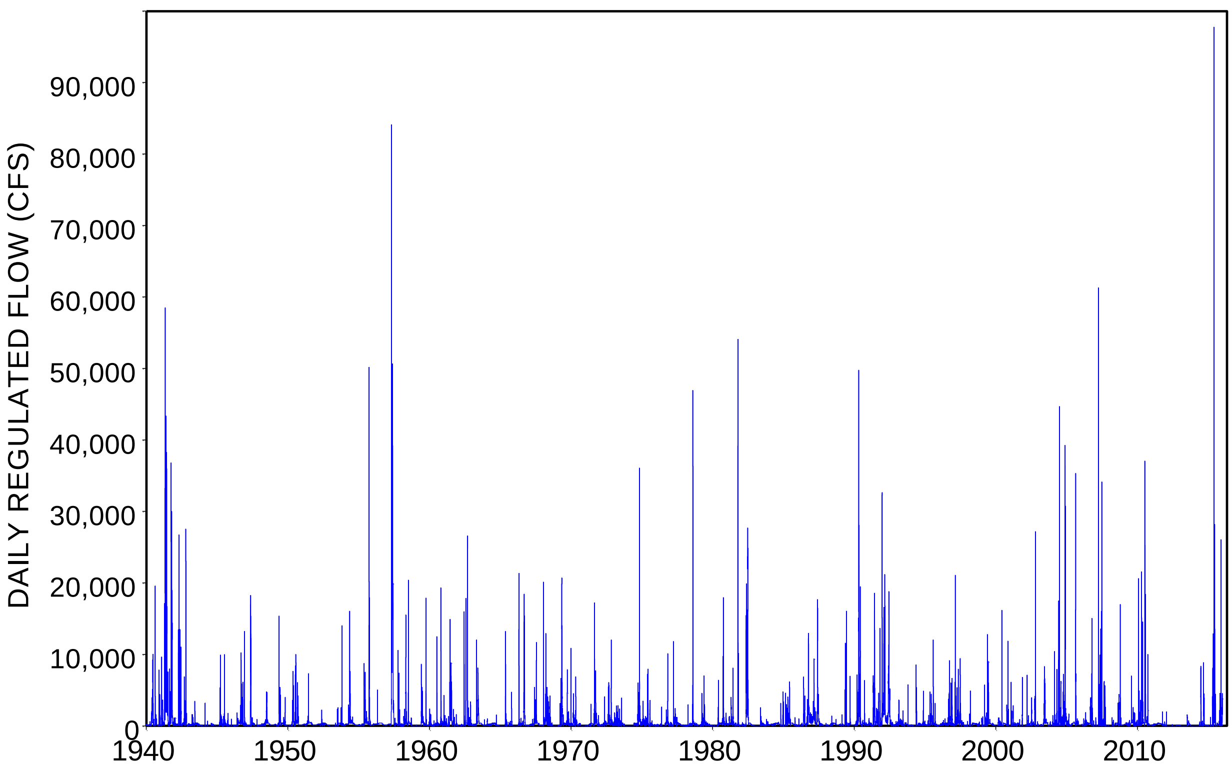


Figure 3.6 Daily Regulated Flows at Control Point BRRI70 on the Brazos River at Richmond

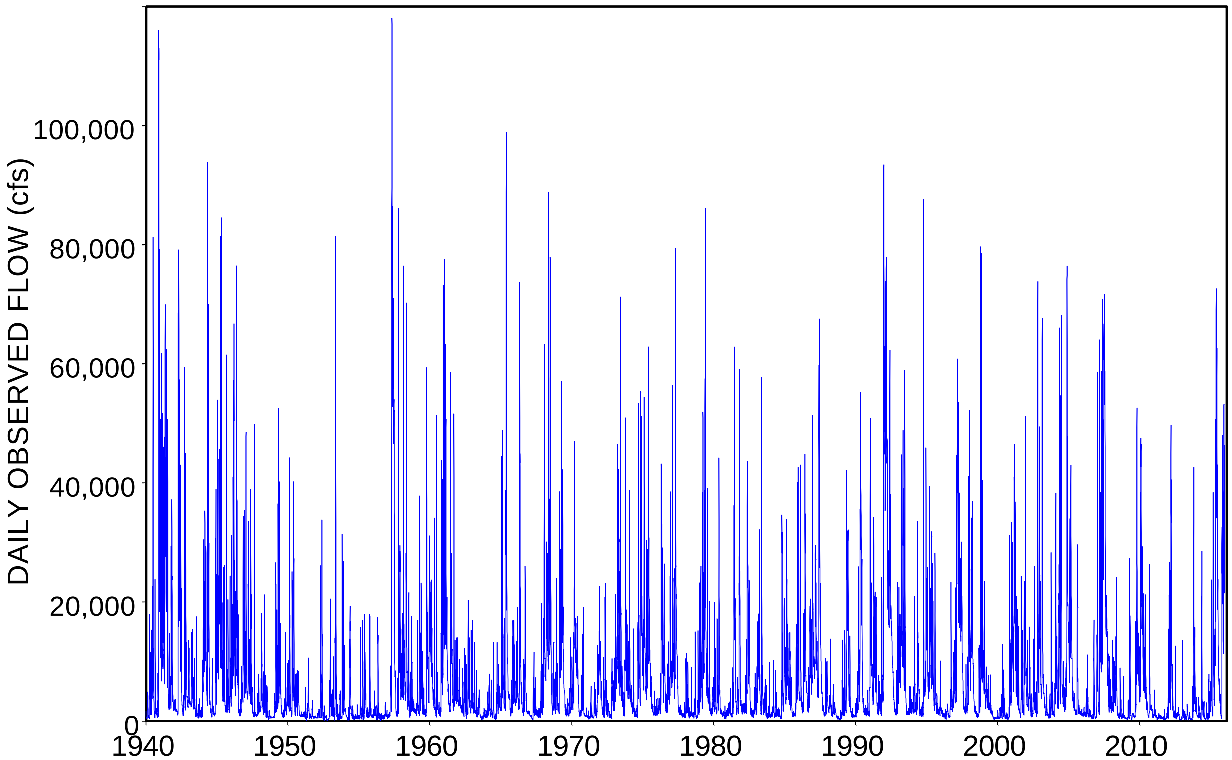


Figure 3.7 Daily Observed Flows at Control Point BRRI70 on the Brazos River at Richmond

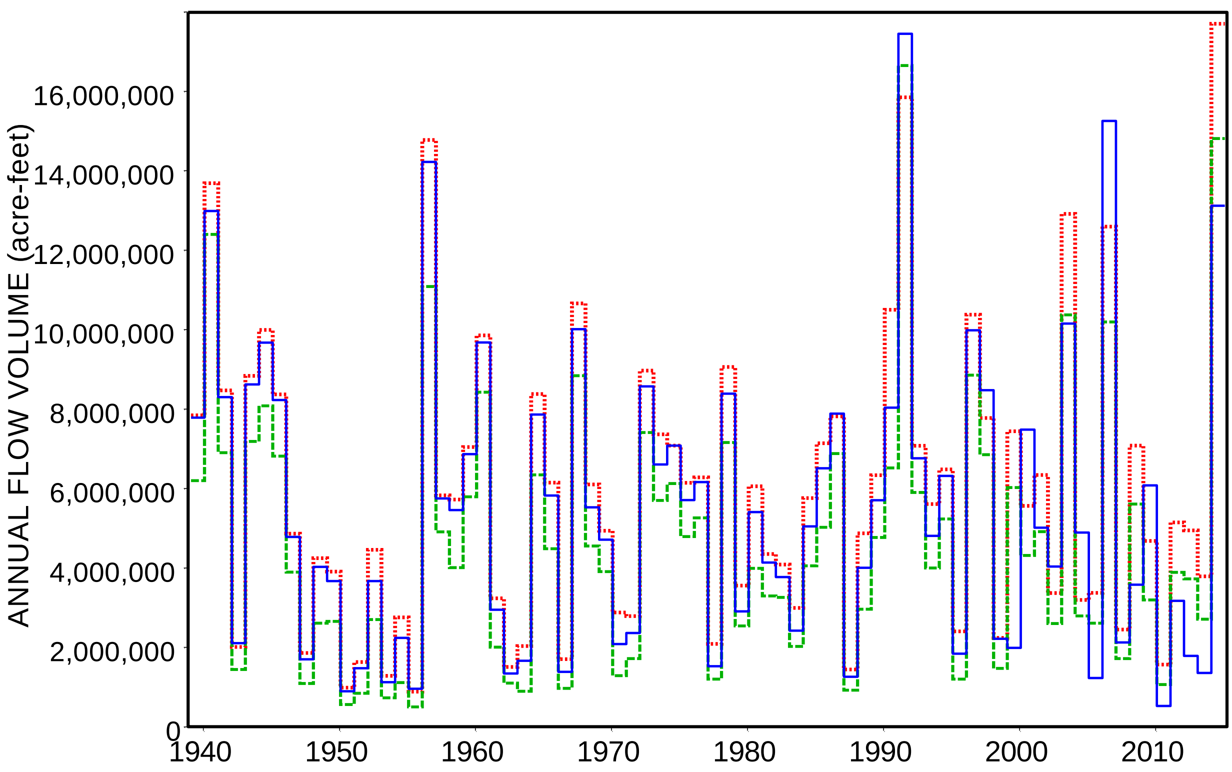


Figure 3.8 Annual Volumes of Naturalized (red dotted line), Regulated (green dashed line), and Observed (blue solid line) Flows at Control Point BRRI70 on the Brazos River at Richmond

Annual volumes in acre-feet for naturalized, regulated, and gaged flows during the 76 years of 1940-2015 at control point BRRI70 are compared in Figure 3.8. Tables comparing naturalized, regulated, and observed annual volumes at the 25 control points are presented in Appendix K.

Flow volumes in the WRAP simulation are in units of acre-feet. Frequency statistics for daily naturalized and regulated flows in acre-feet/day (af) are compared in Table 3.9. The frequency analysis is performed with the 6FRE routine in *TABLES*. The mean and standard deviation are computed for the 27,759 days of the 1940-2015 simulation. Flow rates that are equaled or exceeded specified percentages of the time are based on the relative frequency formula:

$$\text{exceedance frequency} = \frac{m}{N}(100\%)$$

where m is the relative rank from 1 to 27,759 with 1 being the largest and N is the 27,759 days.

Table 3.9
Frequency Statistics for Daily Naturalized and Regulated Flows

ID	B1			B2			B3		
CP	SFA06			DMAS09			BRSE11		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	180.0	164.96	91.67%	264.1	195.0	73.86%	609.3	558.9	91.74%
Std Dev	1,110	1030.76	92.84%	1681	1349	80.25%	2711	2530	93.33%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	0.00		0.00	0.00	
99%	0.00	0.00		0.00	0.00		0.00	0.00	
98%	0.00	0.00		0.00	0.00		0.00	0.00	
95%	0.10	0.00	0.00%	0.00	0.00		0.00	0.00	
90%	0.30	0.19	63.33%	0.00	0.00		1.87	1.25	66.84%
85%	0.56	0.39	69.64%	0.08	0.00	0.00%	7.92	6.66	84.09%
80%	0.94	0.73	77.66%	0.47	0.01	2.13%	15.09	13.44	89.07%
75%	1.60	1.24	77.50%	1.34	0.07	5.22%	23.68	21.42	90.46%
70%	2.75	2.13	77.45%	3.09	0.37	11.97%	33.94	31.15	91.78%
60%	6.81	5.91	86.78%	9.09	3.03	33.33%	57.24	51.5	89.97%
50%	12.89	11.66	90.46%	20.34	8.77	43.12%	89.32	80.74	90.39%
40%	21.82	19.76	90.56%	38.88	18.86	48.51%	138.7	127.1	91.62%
30%	38.59	35.29	91.45%	67.20	39.65	59.00%	229.3	208.5	90.93%
25%	55.48	49.51	89.24%	92.19	58.06	62.98%	302.0	273.9	90.70%
20%	83.30	74.36	89.27%	134.2	88.45	65.92%	424.4	385.5	90.83%
15%	134.3	120.6	89.81%	211.7	144.6	68.30%	636.5	574.3	90.23%
10%	246.9	220.8	89.44%	384.7	271.6	70.60%	1,107	1,009	91.13%
5%	617.2	554.0	89.75%	970.3	695.8	71.72%	2,384	2,142	89.86%
2%	1,557	1,441	92.54%	2,372	1,771	74.64%	5,395	4,919	91.18%
1%	3,150	2,874	91.25%	4,423	3,370	76.19%	9,311	8,606	92.43%
0.50%	6,023	5,752	95.50%	7,764	5,944	76.56%	15,581	14,463	92.82%
Maximum	46,214	43,436	93.99%	110,269	93,124	84.45%	92,824	84,361	90.88%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B4			B5			B6		
CP	CFNU16			CFFG18			BRSB23		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	247.8	124.9	50.40%	412.6	300.9	72.92%	1,565	1,314	83.92%
Std Dev	1076	713	66.24%	2313	1990	86.04%	5,889	5,040	85.58%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	0.00		0.00	0.00	
99%	0.00	0.00		0.00	0.00		0.00	0.00	
98%	0.00	0.00		0.00	0.00		0.00	0.00	
95%	0.00	0.00		0.00	0.00		2.38	0.00	0.00%
90%	0.00	0.00		0.00	0.00		12.59	1.7	13.50%
85%	0.98	0.43	43.88%	0.00	0.01		29.19	13.47	46.15%
80%	5.79	2.80	48.36%	0.96	0.04	4.17%	51.67	32.44	62.78%
75%	10.63	5.83	54.84%	4.42	0.18	4.07%	73.42	54.73	74.54%
70%	15.63	8.8	56.30%	9.31	0.24	2.58%	96.81	76.54	79.06%
60%	26.60	14.86	55.86%	22.68	5.78	25.49%	155.1	130.5	84.14%
50%	41.49	23.01	55.46%	40.65	21.18	52.10%	232.1	200.0	86.16%
40%	61.22	34.29	56.01%	67.11	41.95	62.51%	359.6	304.9	84.77%
30%	91.68	50.51	55.09%	116.8	76.92	65.88%	604.7	514.5	85.09%
25%	113.2	59.33	52.43%	159.3	104.9	65.85%	806.0	684.0	84.87%
20%	148.4	65.25	43.97%	223.8	145.9	65.18%	1,121	941.7	83.98%
15%	218.3	83.08	38.05%	326.4	216.5	66.32%	1,672	1,390	83.15%
10%	381.5	149.8	39.26%	566.2	378.3	66.82%	2,858	2,357	82.48%
5%	917.2	393.3	42.89%	1,475	1,029	69.72%	5,992	5,063	84.50%
2%	2,387	1,087	45.54%	4,127	2,902	70.30%	15,962	13,602	85.21%
1%	4,437	2,042	46.03%	7,701	5,482	71.19%	27,529	23,473	85.26%
0.50%	7,153	3,591	50.20%	13,059	9,612	73.60%	41,335	36,153	87.46%
Maximum	38,390	38,225	99.57%	160,721	159,424	99.19%	184,581	181,400	98.28%

Frequency metrics are tabulated in Table 3.9 for the 25 sites included in Table 3.1 that serve as WAM control points. The Figure 3.2 IDs and control point identifiers are listed in the first and third columns of Table 3.1 and the first two rows of 3.9. Frequency statistics are tabulated in Table 3.9 for naturalized (Nat) and regulated (Reg) flows in acre-feet/day. Frequency statistics for regulated flows are also shown as a percentage of naturalized flows. The third column for each site, labeled Reg (%), is computed as:

$$\text{Reg (\%)} = \left(\frac{\text{Reg}}{\text{Nat}}\right)(100\%)$$

Site B4 at control point CFNU16 is used as an example for interpreting Table 3.9. The median (50% exceedance frequency) daily naturalized and regulated flow volumes of 41.49 and 23.01 acre-feet/day are equaled or exceeded during 50 percent of the 27,759 days of the simulation. The 50% exceedance frequency (median) daily regulated flow is 55.46 percent as large as the daily naturalized flow volume that is likewise equaled or exceeded 50% of the time.

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B7			B8			B9		
CP	BRPP27			BRGR30			NBCL36		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	2,149	1,487	69.20%	3,006	2,035	67.72%	470.3	449.5	95.59%
Std Dev	7,313	6,049	82.71%	9,521	7,931	83.30%	2,574	2,542	98.77%
Minimum	0.00	9.88		0.00	0.00		0.00	0.00	
99.50%	0.00	12.23		0.00	0.00		0.00	0.00	
99%	0.00	12.56		0.00	0.00		0.00	0.00	
98%	0.00	12.62		0.00	0.89		0.00	0.00	
95%	0.00	12.68		29.22	4.49	15.37%	0.00	0.00	
90%	24.66	12.81	51.95%	79.51	10.18	12.80%	0.00	0.00	
85%	65.02	13.22	20.33%	128.0	21.94	17.14%	3.73	3.48	93.30%
80%	105.3	18.25	17.33%	183.6	57.87	31.51%	7.68	7.44	96.88%
75%	147.3	19.32	13.12%	235.4	114.2	48.53%	13.69	12.62	92.18%
70%	192.3	29.95	15.57%	294.8	175.3	59.47%	18.26	17.48	95.73%
60%	292.4	208.7	71.38%	439.0	285.6	65.04%	31.94	26.51	83.00%
50%	428.4	315.7	73.69%	635.8	425.4	66.90%	49.72	40.94	82.34%
40%	621.1	485.2	78.12%	942.3	568.3	60.30%	84.47	69.52	82.30%
30%	961.7	646.8	67.26%	1,447	737.0	50.92%	156.1	131.5	84.27%
25%	1,247	760.1	60.97%	1,882	877.3	46.62%	221.7	191.5	86.38%
20%	1,721	808.4	46.98%	2,574	1,213	47.11%	314.0	282.0	89.81%
15%	2,524	1,256	49.77%	3,828	1,876	49.01%	475.2	436.9	91.93%
10%	4,102	2,237	54.53%	6,012	3,368	56.02%	761.0	719.8	94.59%
5%	8,940	5,560	62.19%	12,502	7,922	63.36%	1,614	1,535	95.12%
2%	20,803	15,285	73.48%	27,819	21,215	76.26%	3,915	3,865	98.73%
1%	34,309	27,710	80.77%	45,073	36,233	80.39%	8,200	8,150	99.40%
0.50%	46,400	38,309	82.56%	65,867	55,213	83.83%	13,742	13,682	99.56%
Maximum	203,688	193,831	95.16%	278,067	257,992	92.78%	183,110	183,006	99.94%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B10			B12			B13		
CP	BRWA41			BRNB42			LEHM46		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	5,217	3,580	68.63%	6,238	4,454	71.41%	455.8	357.7	78.47%
Std Dev	13,120	8,566	65.28%	14,683	10,010	68.17%	1,848	1,239	67.04%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	3.77		50.98	0.55	1.08%	0.00	0.00	
99%	18.65	7.14	38.28%	75.37	8.25	10.95%	0.00	0.00	
98%	46.52	16.75	36.01%	114.1	105.0	91.99%	0.00	0.00	
95%	114.2	207.1	181.3%	202.7	290.2	143.1%	0.00	0.00	
90%	207.0	463.6	224.0%	314.4	548.6	174.5%	0.72	0.00	0.00%

85%	296.7	648.6	218.6%	429.2	703.4	163.9%	3.34	0.00	0.00%
80%	395.4	750.3	189.8%	556.2	804.7	144.7%	7.46	0.00	0.00%
75%	503.3	814.9	161.9%	698.8	890.4	127.4%	12.45	1.23	9.88%
70%	630.2	866.5	137.5%	848.5	987.8	116.4%	18.28	3.46	18.93%
60%	947.6	1,007	106.3%	1,224	1,215	99.25%	35.23	10.92	31.00%
50%	1,412	1,221	86.44%	1,769	1,571	88.81%	63.23	24.22	38.30%
40%	2,097	1,668	79.57%	2,634	2,008	76.23%	105.6	47.61	45.07%
30%	3,268	2,142	65.54%	4,090	2,464	60.24%	184.3	101.8	55.22%
25%	4,185	2,330	55.68%	5,244	2,968	56.59%	249.9	155.7	62.29%
20%	5,492	2,846	51.82%	6,878	3,899	56.69%	351.9	266.3	75.66%
15%	7,719	3,919	50.77%	9,547	5,552	58.16%	534.5	513.4	96.05%
10%	11,993	6,568	54.77%	14,693	9,083	61.82%	897.5	800.9	89.23%
5%	22,314	14,292	64.05%	26,285	19,338	73.57%	1,750	1,442	82.36%
2%	43,917	34,096	77.64%	52,073	42,734	82.07%	4,256	4,914	115.5%
1%	63,847	51,167	80.14%	74,593	58,033	77.80%	7,308	5,986	81.92%
0.50%	87,258	61,197	70.13%	97,011	69,917	72.07%	11,343	6,993	61.65%
Maximum	417,599	119,010	28.50%	425,290	126,957	29.85%	62,231	44,218	71.06%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B14			B15			B16		
CP	LEGT47			LEBE49			LAKE50		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	726.2	625.0	86.07%	1,433	1,042	72.76%	325.8	316.6	97.19%
Std Dev	2,758	2,093	75.88%	4,286	2,904	67.77%	1,368	1,364	99.69%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	0.00		0.00	0.00	
99%	0.00	0.00		0.00	0.00		0.00	0.00	
98%	0.00	0.00		0.00	0.00		0.00	0.00	
95%	0.00	0.00		0.00	21.03		2.94	2.05	69.73%
90%	0.00	0.00		0.00	72.07		8.53	6.72	78.78%
85%	1.89	0.00	0.00%	13.01	85.46	656.9%	12.69	10.07	79.35%
80%	7.91	1.94	24.53%	33.88	97.2	286.9%	17.59	14.51	82.49%
75%	16.76	7.29	43.50%	59.01	111.8	189.4%	22.78	18.9	82.97%
70%	28.23	14.24	50.44%	87.19	119.0	136.5%	27.61	23.33	84.50%
60%	58.79	32.81	55.81%	171.0	147.8	86.39%	40.24	34.92	86.78%
50%	110.4	68.94	62.45%	298.9	176.8	59.15%	61.20	52.72	86.14%
40%	190.1	132.1	69.50%	492.3	223.9	45.48%	94.85	83.24	87.76%
30%	333.1	259.9	78.03%	846.0	345.9	40.88%	159.8	146.3	91.51%
25%	440.9	374.3	84.90%	1,123	484.9	43.18%	222.7	207.0	92.96%
20%	609.8	562.0	92.16%	1,501	731.0	48.69%	307.2	292.3	95.16%
15%	917.7	844.5	92.02%	2,132	1,268	59.47%	448.0	431.6	96.33%
10%	1,468	1,351	92.03%	3,318	2,726	82.16%	697.1	681.7	97.79%
5%	2,919	2,935	100.5%	6,017	5,576	92.68%	1,314	1,294	98.49%
2%	6,900	6,561	95.09%	12,479	10,583	84.81%	2,511	2,494	99.34%
1%	11,062	8,964	81.03%	18,334	12,680	69.16%	4,074	4,016	98.58%
0.50%	16,088	11,345	70.52%	24,496	17,351	70.83%	6,341	6,308	99.48%
Maximum	94,544	74,184	78.46%	125,915	99,616	79.11%	93,085	92,829	99.72%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B17			B18			B20		
CP	LRLR53			LRCA58			BRBR59		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	2,334	1,674	71.70%	3,808	2,928	3,808	11,047	8,383	75.89%
Std Dev	6,570	4,090	62.25%	10,473	7,138	10,473	24,873	16,971	68.23%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	6.61		94.83	120.2	126.7%
99%	4.36	0.00	0.00%	4.16	9.74	234.1%	171.8	227.5	132.4%
98%	10.61	0.00	0.00%	12.54	16.27	129.7%	235.7	310.1	131.6%
95%	21.50	2.84	13.21%	40.63	28.81	70.91%	397.6	563.8	141.8%
90%	54.78	17.02	31.07%	89.34	39.67	44.40%	621.3	833.1	134.1%
85%	86.39	26.80	31.02%	154.4	50.87	32.95%	842.7	1,026	121.7%
80%	123.7	44.62	36.07%	232.3	85.8	36.93%	1,068	1,193	111.7%
75%	173.9	69.44	39.92%	320.7	133.9	41.75%	1,323	1,371	103.6%
70%	226.0	93.90	41.54%	405.8	195.7	48.24%	1,616	1,569	97.09%
60%	360.7	160.7	44.56%	623.7	328.1	52.61%	2,339	1,992	85.15%
50%	565.5	252.8	44.69%	962.9	502.6	52.19%	3,403	2,403	70.60%
40%	922.1	405.0	43.92%	1,484	800.8	53.97%	5,009	3,133	62.56%
30%	1,488	720.1	48.41%	2,400	1,440	59.98%	7,670	4,800	62.58%
25%	1,927	1,001	51.97%	3,111	2,086	67.04%	9,692	6,482	66.88%
20%	2,530	1,527	60.37%	4,171	3,125	74.93%	12,661	9,339	73.76%
15%	3,528	2,624	74.38%	5,732	5,483	95.65%	17,385	13,939	80.18%
10%	5,259	5,745	109.3%	8,756	9,106	104.0%	26,296	22,189	84.38%
5%	9,729	11,901	122.3%	15,911	16,838	105.8%	47,135	38,275	81.20%
2%	19,380	13,778	71.09%	30,716	19,835	64.58%	87,420	67,033	76.68%
1%	28,711	19,314	67.27%	46,321	24,595	53.10%	117,984	90,717	76.89%
0.50%	38,694	19,835	51.26%	64,957	37,307	57.43%	158,259	106,984	67.60%
Maximum	212,726	126,064	59.26%	301,054	270,209	89.75%	719,015	312,701	43.49%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B21			B22			B24		
CP	YCS62			DCLY63			NAEA66		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	642.4	577.3	89.87%	130.9	130.5	99.72%	872.5	643.8	73.78%
Std Dev	2,318	1,045	45.07%	493.9	493.5	99.93%	3,258	2,911	89.37%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	0.00		0.00	0.00	
99%	0.00	0.00		0.00	0.00		0.00	0.00	
98%	0.00	0.00		0.00	0.00		0.00	1.08	
95%	0.00	0.00		0.00	0.00		0.00	7.77	
90%	0.00	0.00		0.00	0.00		3.48	12.87	369.8%
85%	0.00	0.00		0.00	0.00		6.53	14.45	221.3%
80%	3.52	0.00	0.00%	0.03	0.03	100.0%	10.85	16.26	149.9%
75%	9.23	0.00	0.00%	0.46	0.48	104.4%	16.45	18.63	113.3%
70%	16.17	0.00	0.00%	1.18	1.17	99.15%	22.69	21.34	94.05%
60%	35.8	15.27	42.65%	3.71	3.6	97.04%	38.77	26.35	67.96%
50%	66.82	60.4	90.39%	8.23	7.97	96.84%	66.19	29.2	44.12%
40%	116.4	136.4	117.2%	17.02	16.63	97.71%	119.4	39.99	33.50%
30%	216.4	331.5	153.2%	36.92	36.54	98.97%	234.0	78.64	33.60%
25%	306.2	487.7	159.3%	56.29	55.82	99.17%	344.5	122.7	35.62%
20%	452.6	1,709	377.6%	90.01	89.32	99.23%	543.9	221.4	40.70%
15%	709.9	1,983	279.4%	148.0	147.4	99.56%	940.3	430.5	45.78%
10%	1,272	1,983	155.9%	270.8	269.3	99.44%	1,837	1,011	55.01%
5%	2,992	1,983	66.28%	641.4	640.4	99.85%	4,270	3,057	71.58%
2%	6,875	4,959	72.13%	1,380	1,379	99.95%	9,192	7,800	84.86%
1%	10,663	4,959	46.50%	2,193	2,184	99.58%	14,870	12,882	86.63%
0.50%	15,476	4,959	32.04%	3,084	3,084	100.0%	20,849	19,091	91.57%
Maximum	78,735	12,020	15.27%	16,062	16,060	99.99%	136,178	135,805	99.73%

Table 3.9 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B26			B28			B29		
CP	NABR67			BRHE68			BRRI70		
Flow	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)	Nat (af)	Reg (af)	Reg (%)
Mean	1,213	927.7	76.51%	14,749	11,739	79.60%	16,263	12,629	77.65%
Std Dev	3,856	3,473	90.07%	29,010	20,554	70.85%	29,627	22,100	74.59%
Minimum	0.00	0.00		4.72	0.00	0.00%	0.00	7.75	
99.50%	0.00	0.00		223.7	246.4	110.1%	0.00	88.07	
99%	0.00	0.00		297.8	348.3	117.0%	295.3	105.5	35.71%
98%	0.00	0.00		407.4	496.8	122.0%	484.3	168.4	34.77%
95%	0.59	0.00	0.00%	632.3	788.5	124.7%	787.8	473.1	60.06%
90%	5.55	0.00	0.00%	955.7	1,148	120.1%	1,166	941.6	80.77%
85%	10.96	0.00	0.00%	1,299	1,408	108.4%	1,581	1,282	81.10%
80%	18.99	0.00	0.00%	1,647	1,681	102.1%	1,973	1,584	80.29%
75%	29.94	0.00	0.00%	2,047	1,949	95.19%	2,405	1,826	75.93%
70%	45.37	2.44	5.38%	2,474	2,206	89.17%	2,897	1,933	66.74%
60%	81.8	16.14	19.73%	3,476	2,826	81.30%	4,168	2,593	62.20%
50%	140.4	41.44	29.52%	5,045	3,717	73.68%	6,024	3,787	62.86%
40%	244.7	93.89	38.37%	7,594	5,456	71.84%	8,948	5,976	66.79%
30%	445.8	217.1	48.69%	11,727	8,992	76.68%	13,555	9,922	73.20%
25%	646.0	332.9	51.53%	14,814	11,845	79.96%	16,975	13,096	77.15%
20%	1,025	535.1	52.21%	19,081	15,800	82.81%	21,438	17,481	81.54%
15%	1,691	1,036	61.28%	25,791	21,770	84.41%	28,677	24,049	83.86%
10%	2,984	2,105	70.54%	37,114	31,374	84.54%	40,909	34,133	83.44%
5%	5,942	4,791	80.62%	60,633	51,609	85.12%	65,330	56,524	86.52%
2%	11,667	10,020	85.88%	101,612	81,568	80.27%	109,940	89,749	81.64%
1%	17,262	15,642	90.61%	137,448	108,185	78.71%	146,027	114,409	78.35%
0.50%	24,159	20,835	86.24%	174,240	118,168	67.82%	184,477	129,683	70.30%
Maximum	120,290	119,710	99.52%	759,901	309,236	40.69%	645,001	312,753	48.49%

Table 4.14 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	B30		
CP	BRR07		
Flow	Nat (af)	Reg (af)	Reg (%)
Mean	16,973	12,323	72.60%
Std Dev	28,788	23,434	81.40%
Minimum	0.00	8.65	
99.50%	267.8	9.36	3.50%
99%	452.8	9.71	2.14%
98%	621.1	9.95	1.60%
95%	946.1	12.02	1.27%
90%	1,412	69.15	4.90%
85%	1,836	386.83	21.07%
80%	2,313	595.49	25.74%
75%	2,823	811.89	28.76%
70%	3,361	1,031	30.66%
60%	4,658	1,790	38.43%
50%	6,530	3,012	46.12%
40%	9,576	5,151	53.78%
30%	14,446	9,367	64.84%
25%	17,926	12,757	71.16%
20%	22,889	17,386	75.96%
15%	30,119	23,780	78.95%
10%	41,927	34,756	82.90%
5%	69,102	58,628	84.84%
2%	114,854	94,795	82.54%
1%	146,510	118,717	81.03%
0.50%	178,571	141,868	79.45%
Maximum	385,036	348,886	90.61%

CHAPTER 4
TRINITY RIVER BASIN

The Trinity River Basin extends approximately 400 miles across Texas, originating near the Texas-Oklahoma border north of the Dallas-Fort Worth metropolitan area and terminating at Galveston Bay east of Houston. Average annual rainfall gradually decreases moving from east to west across the basin. Average annual rainfall is 53 inches near Galveston Bay at the southeastern-most point of the basin and 29 inches at the northwestern-most point of the basin. The basin encompasses an area of about 17,900 square miles. Major tributaries include the West Fork Trinity River, Elm Fork Trinity River, East Fork Trinity River, Cedar Creek, Chambers Creek, and Richland Creek. A large proportion of the population in the Trinity River Basin is located in the Dallas-Fort Worth metropolitan area in the upper basin. According to the 2012 Texas Water Plan [26], the population in 2010 in Region C, which encompasses the Dallas-Fort Worth area, was approximately 6.7 million, representing about one quarter of the population of Texas.

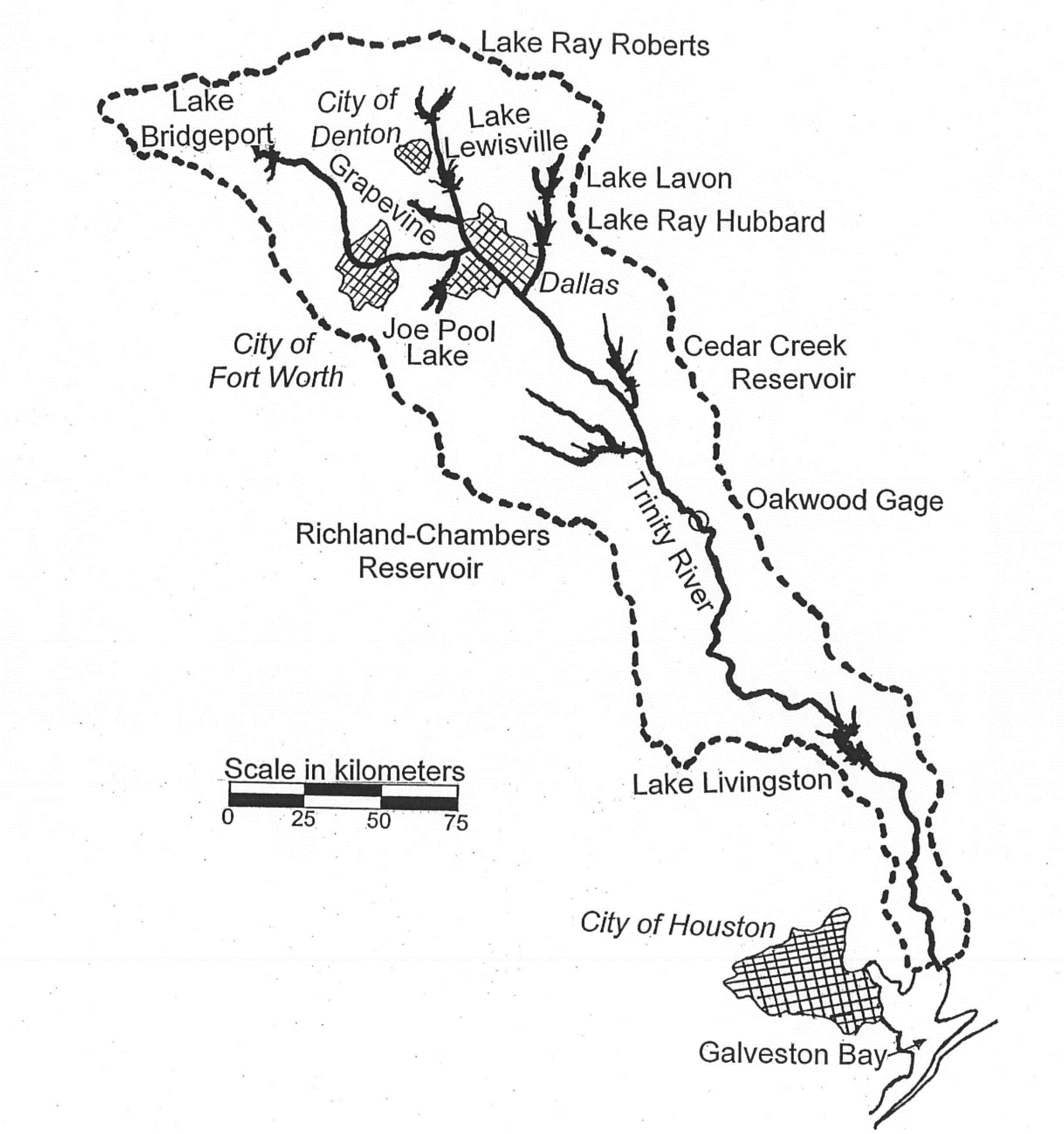


Figure 4.1 Trinity River Basin

Selected USGS Gaging Stations

Observed flows at the USGS gaging stations on the Trinity River and tributaries listed in Tables 4.1 and 4.2 are displayed and analyzed in this section of Chapter 4 and in Appendices B, D, F, and H. The same types of information for the Brazos River Basin is discussed in the preceding Chapter 3. The location of the 17 selected gaging stations in the Trinity River Basin are shown in Figure 4.2. The numbers on the map refer to the gaging station labels (without the T for Trinity) in the first column of Tables 4.1 and 4.2. The map of Figure 4.2 also shows the 40 Trinity WAM primary control points, discussed later, of which 13 are located at gaging stations adopted for this study. The selected gages include all sites for which environmental flow standards have been established in the Trinity River Basin pursuant to procedures created by the 2007 Senate Bill 3 (SB3). As indicated by the last column of Table 4.2, SB3 environmental flow standards have been established at four sites in the Trinity River Basin.

The periods-of-analysis for the daily flow datasets shown in Table 4.2 begin with the beginning of the gage period-of-record, and all available valid data are used. Gages T9, T11, and T16 are no longer active, but periods-of-record for the 14 other gages extend to the present. The December 2014 and May 2015 dates listed in Table 4.2 represent the end of the daily flow data as adopted in the appendices. The daily flow datasets for the statistical analyses presented in this chapter are updated to November 17, 2015 for the 14 gages that are still active.

Observed Mean Daily Flows

Plots of mean daily flow rates at the 17 gaging stations are included in Appendix B. Frequency statistics for the 17 sites are provided in Table 4.3. Flow frequency curves are plotted in Figure 4.3. This dataset consists of the mean flow in each day of the period-of-record through November 17, 2015. The data were downloaded from the USGS NWIS website using HEC-DSSVue. The frequency statistics in Table 4.3 were computed using the basic statistics and duration analysis features of HEC-DSSVue.

The gage identifiers in the first row of Table 4.3 are the identifiers from column 1 of Tables 3.1 and 3.2. The second row labeled "Days" shows the number of days during the period-of-record with valid values. This is the sample size of the statistical computations. The second row labeled "missing" shows the number of days in the gaps of missing data for which valid values are not available in the USGS datasets. The following statistical metrics, all in units of cubic feet per second (cfs), are provided in Table 4.3.

Minimum value of daily flow rates (cfs) in the dataset.

Mean of the mean daily flows (cfs).

Maximum value of the daily flow rates (cfs) in the dataset.

Standard deviation (SD) of the daily flows (cfs).

Daily flow rates (cfs) corresponding to the exceedance frequencies in the first column computed based on the Weibull formula [(P = m/(N+1))100%].

Table 4.1
Selected USGS Stream Flow Gaging Stations in the Trinity River Basin

ID	USGS Gage ID	WAM CP ID	Location by River and Nearest City	County	Drainage (sq miles)
T1	08044000	8BSBR	Big Sandy Creek near Bridgeport	Wise	333
T2	08047500	8CTFW	Clear Fork Trinity River at Fort Worth	Tarrant	518
T3	08048000	8WTFW	West Fork Trinity River at Fort Worth	Tarrant	2,615
T4	08049500	8WTGP	West Fork Trinity River at Grand Prairie	Dallas	3,065
T5	08057000	8TRDA	Trinity River at Dallas	Dallas	6,106
T6	08057410	–	Trinity River below Dallas	Dallas	6,278
T7	08062500	8TRRS	Trinity River near Rosser	Ellis	8,146
T8	08062700	8TRTR	Trinity River at Trinidad	Henderson	8,538
T9	08063020	–	Cedar Creek at Trinidad	Henderson	1,011
T10	08064700	8TEST	Tehuacana Creek near Streetman	Freestone	142
T11	08064800	–	Catfish Creek near Tennessee Colony	Anderson	207
T12	08065000	8TROA	Trinity River near Oakwood	Anderson	12,833
T13	08065200	–	Upper Keechi Creek near Oakwood	Leon	150
T14	08065350	8TRCR	Trinity River near Crockett	Houston	13,911
T15	08065500	8TRMI	Trinity River near Midway	Madison	14,450
T16	08066000	8TRRI	Trinity River at Riverside	Walker	15,589
T17	08066500	8TRRO	Trinity River at Romayor	Liberty	17,186

Table 4.2
Period-of-Record for Gaging Stations in the Trinity River Basin

ID	Location by River and Nearest City	Period-of-Analysis		SB3 IFS
T1	Big Sandy Creek near Bridgeport	10/1936	5/2015	
T2	Clear Fork Trinity River at Fort Worth	3/1924	5/2015	
T3	West Fork Trinity River at Fort Worth	10/1920	5/2015	
T4	West Fork Trinity River at Grand Prairie	1/1925	5/2015	SB IFS
T5	Trinity River at Dallas	10/1903	5/2015	SB IFS
T6	Trinity River below Dallas	11/1956	12/2014	
T7	Trinity River near Rosser	8/1924	12/2014	
T8	Trinity River at Trinidad	10/1964	12/2014	
T9	Cedar Creek at Trinidad	11/1964	9/1971	
T10	Tehuacana Creek near Streetman	4/1968	12/2014	
T11	Catfish Creek near Tennessee Colony	5/1962	9/1989	
T12	Trinity River near Oakwood	10/1923	12/2014	SB3 IFS
T13	Upper Keechi Creek near Oakwood	5/1962	12/2014	
T14	Trinity River near Crockett	1/1964	12/2014	
T15	Trinity River near Midway	4/1939	11/1970	
T16	Trinity River at Riverside	10/1923	9/1968	
T17	Trinity River at Romayor	5/1924	5/2015	SB3 IFS

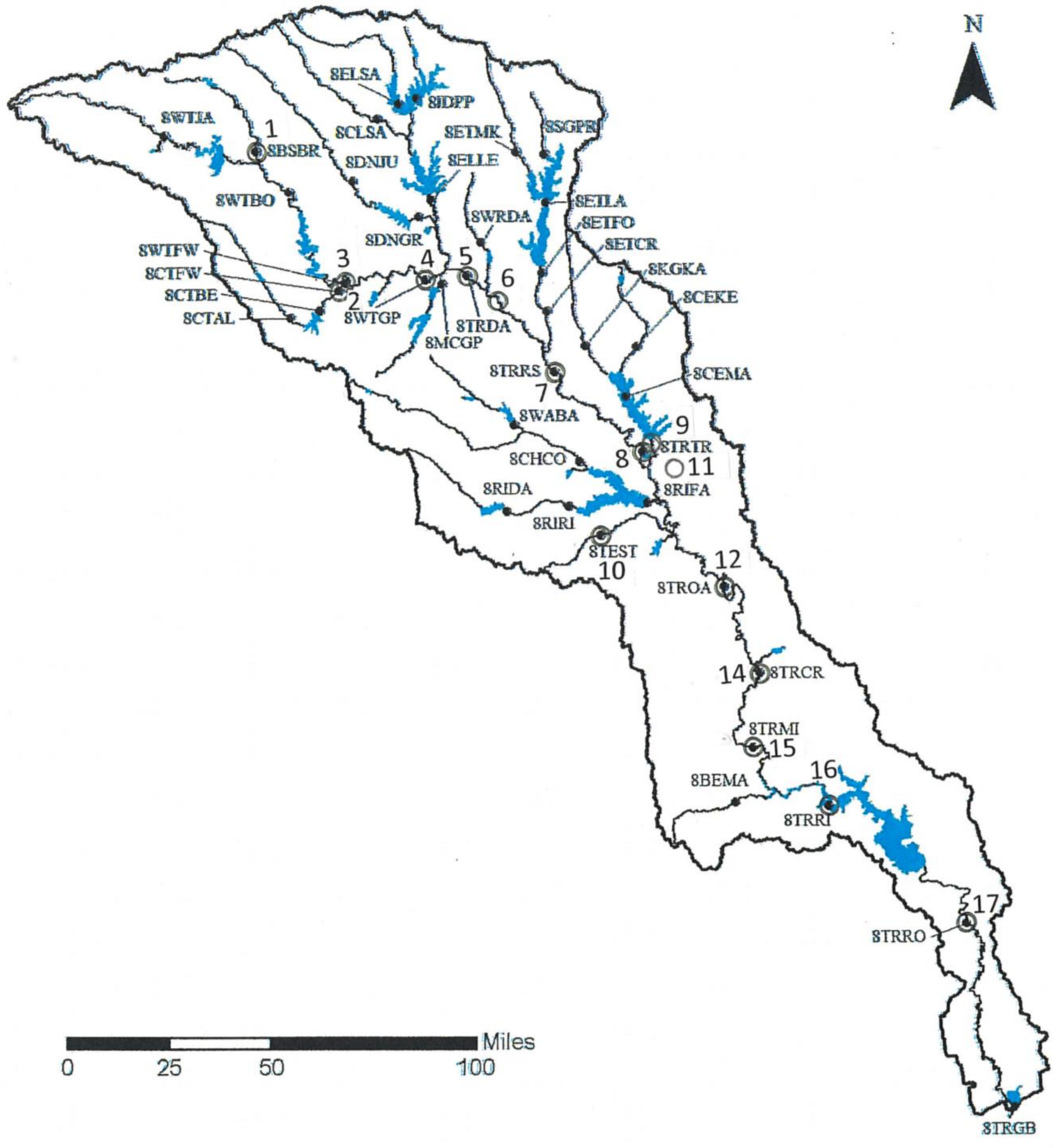


Figure 4.2 Selected USGS Gaging Stations and WAM Primary Control Points

Flow frequency or flow duration relationships for the mean flow in each day in cfs at the 17 sites are tabulated in Table 4.3 and plotted in Figures 4.3 and 4.4. This can be viewed as either flow frequency, probability, or duration analyses. From a duration analysis perspective, the percentages are the percent of time that the flow exceeds the indicated magnitudes. The exceedance frequencies in percent represent the number of days that the mean flow during the day exceeded the indicated magnitudes. These relationships provide estimates of exceedance probabilities.

Table 4.3
Frequency Statistics for Observed Mean Daily Flow Rates at the 17 Gaging Stations

	T1	T2	T3	T4	T5	T6	T7	T8	T9
Days	25,614	33,499	34,746	33,095	39,859	20,469	28,528	18,675	2,525
Missing	3,288	0	0	13	1,097	1,097	4,818	0	0
Min (cfs)	0.0	0.0	0.0	4.5	0.0	131.0	32.0	312.0	0.0
Mean (cfs)	75.5	125.6	396.7	682.7	1,901.0	2,357.2	3,159.7	4,378.1	51.5
Max (cfs)	23,800	42,500	47,300	48,900	152,000	79,200	133,000	94,100	2,010
SD (cfs)	473.6	500.8	1,314	1,705	4,219	3,957	5,791	7,138	273.9
0.1	6,732	5,490	17,000	20,290	47,100	41,259	58,847	65,462	2,000
0.2	4,412	3,910	12,951	16,281	35,656	31,306	49,471	56,765	1,999
0.5	2,619	2,925	8,128	11,452	25,100	23,530	34,836	42,300	1,960
1	1,569	2,070	5,340	7,981	18,600	18,830	27,300	34,800	1,880
2	789.7	1,350	3,750	5,151	13,380	14,100	19,300	26,848	1,560
5	245.0	562.0	1,980	2,950	8,500	9,580	13,100	17,700	87.1
10	84.0	246.0	985.0	1,600	5,250	6,430	8,850	12,400	14.0
15	44.0	142.0	550.0	1,010	3,400	4,820	6,360	8,886	4.8
20	28.0	86.0	320.0	682.0	2,160	3,380	4,450	6,638	2.5
30	15.0	42.0	130.0	382.0	1,110	1,620	2,283	3,562	1.4
40	8.7	25.0	61.0	261.0	770.0	1,030	1,360	1,960	1.0
50	4.3	17.0	39.0	200.0	609.0	802.0	980.0	1,290	0.8
60	1.4	11.0	28.0	162.0	461.0	680.0	800.0	1,020	0.5
70	0.1	6.5	21.0	128.0	316.0	593.0	638.0	865.0	0.3
80	0.0	2.7	14.0	95.0	152.0	500.0	465.0	735.0	0.1
85	0.0	1.1	11.0	75.0	92.0	441.0	380.0	659.0	0.1
90	0.0	0.0	7.0	54.0	55.0	382.0	266.0	574.0	0.0
95	0.0	0.0	3.0	30.0	24.0	316.0	155.0	470.0	0.0
98	0.0	0.0	1.0	19.0	0.0	253.0	116.0	411.0	0.0
99	0.0	0.0	0.0	15.0	0.0	220.0	57.0	385.0	0.0
99.5	0.0	0.0	0.0	13.0	0.0	194.0	40.0	360.0	0.0
99.8	0.0	0.0	0.0	10.0	0.0	153.0	36.0	343.0	0.0
99.9	0.0	0.0	0.0	9.0	0.0	150.0	32.0	333.0	0.0

The frequency relationships were developed using the math functions/statistics/duration analysis feature of HEC-DSSVue. Exceedance probabilities or frequencies (P) are assigned to each daily flow quantity in the dataset using the Weibull formula, where m is rank and N is sample size.

$$P = \frac{m}{N+1} 100\%$$

An interpolation routine determines the flow quantities associated with the 23 specified exceedance frequencies included in Table 4.3.

Site T17 is the USGS gage on the Trinity River near Romayor which is about 50 miles upstream of the river outlet at Galveston Bay. The May 1, 1924 through November 17, 2015 period-of-analysis contains 33,438 days. There are zero days with missing data.

Table 4.3 Continued
Frequency Statistics for Observed Mean Daily Flow Rates at the 17 Gaging Stations

Gage	T10	T11	T12	T13	T14	T15	T16	T17
Days	17,395	10,015	33,651	19,559	18,949	11,550	16,435	33,438
Missing	2	0	0	0	0	0	2	0
Min (cfs)	0.0	0.8	7.8	0.0		87.0	70.0	104.0
Mean (cfs)	88.4	100.9	5,259.4	71.3	278.0	5,716.5	6,333.5	7,790.5
Max (cfs)	42,000	6,400	153,000	22,100	6,371	144,000	120,000	117,000
SD (cfs)	696.5	197.9	9,210	325.6	9,370	10,311	10,382	11,579
0.1	2,000	7,368	2,399	87,439	3,838	76,945	106,898	91,541
0.2	1,999	5,633	1,490	72,639	2,450	67,110	92,714	73,826
0.5	1,960	3,730	969.8	56,400	1,712	51,450	60,894	58,264
1	1,880	2,070	723.8	44,548	1,090	42,150	46,600	48,592
2	1,560	1,041	528.7	33,900	711.8	34,600	38,400	40,056
5	87.1	227.2	345.0	21,400	308.0	24,900	23,000	26,900
10	14.0	49.0	227.0	15,100	123.0	18,700	16,500	18,100
15	4.8	22.0	169.6	11,200	68.0	14,200	11,800	13,600
20	2.5	13.0	137.0	7,940	47.0	10,300	8,600	10,200
30	1.4	6.1	97.0	4,200	28.0	5,600	4,640	5,572
40	1.0	3.0	72.0	2,340	17.0	3,280	2,670	3,160
50	0.8	1.4	55.0	1,500	11.0	2,150	1,640	1,950
60	0.5	0.6	39.0	1,070	6.4	1,590	1,090	1,240
70	0.3	0.2	24.0	821.0	3.0	1,260	770.0	820.0
80	0.1	0.0	13.0	602.0	0.9	989.0	563.0	540.0
85	0.1	0.0	10.0	484.0	0.3	880.0	450.0	418.0
90	0.0	0.0	7.2	340.0	0.1	778.0	349.0	300.0
95	0.0	0.0	4.4	191.0	0.0	638.0	227.0	194.0
98	0.0	0.0	2.9	113.0	0.0	506.0	165.0	135.0
99	0.0	0.0	2.0	85.0	0.0	436.0	140.0	110.0
99.5	0.0	0.0	1.6	66.0	0.0	383.0	122.0	92.0
99.8	0.0	0.0	1.3	50.0	0.0	325.0	106.0	85.0
99.9	0.0	0.0	1.2	42.0	0.0	310.0	102.0	70.0

The last column of Table 4.3 provides statistics for site B17, which is the gage on the Trinity River near Romayor. The 33,438 daily flows range from 104 cfs to 117,000 cfs and have a mean and standard deviation (SD) of 7,790 cfs and 11,579 cfs, respectively. The daily flows are plotted in Figure 2.7 of Chapter 2 and on page B-33 of Appendix B.

An exceedance frequency or exceedance duration (P) is assigned to each of the daily flow quantities using the Weibull formula with N equal to 33,438 days. The relative rank (m) of each of the mean daily flow rates ranges from m of 1 for the largest to m of 33,438 for the smallest. The median (50% exceedance frequency) daily flow is 1,950 cfs. The mean daily flow is greater than 194 cfs during 95 percent of the 33,438 days of the period-of-analysis. A mean daily flow of 26,900 cfs has an exceedance frequency of 5.0 percent.

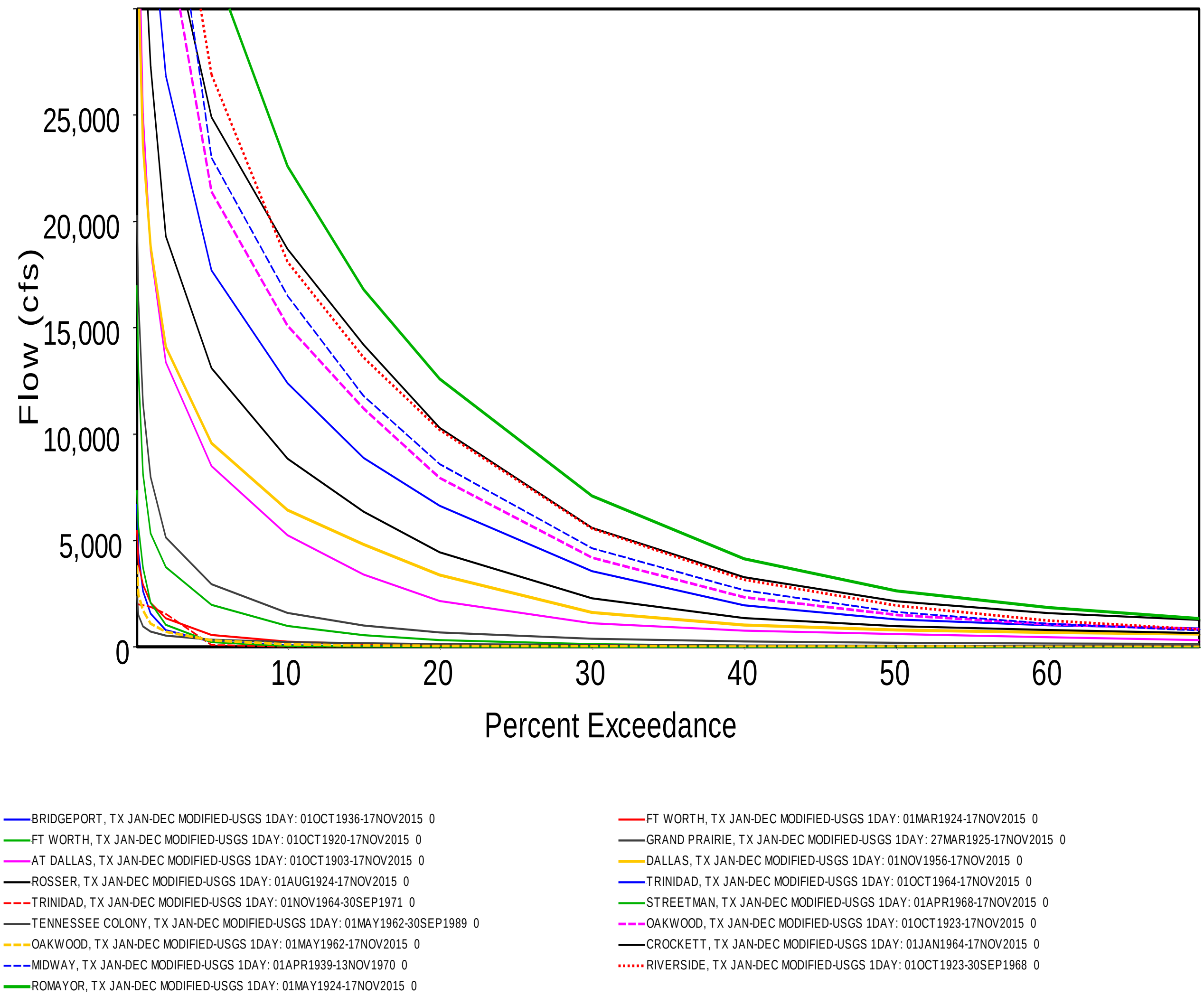


Figure 4.3 Exceedance Frequency Curves for Daily Flows at 17 Gaging Stations

The exceedance frequency relationships at the 17 sites tabulated in Table 4.3 are plotted in Figure 4.3. The plots are truncated at 70 percent and 30,000 cfs. Figure 4.3 illustrates the highly nonlinear shape of frequency curves. For example, the difference in magnitude between the flow rates exceeded 10 percent versus 30 percent of the time is much greater than the difference between the flow rates exceeded 30 percent versus 100 percent of the time.

Curves for all 17 sites are included in Figure 4.3. Flows at the eight sites on the tributaries are much smaller than the flows at the nine sites on the main-stem Trinity River. Flows are zero during a significant portion of the time at some of these sites. The frequency curves for the eight sites on the tributaries are plotted again in Figure 4.4 at a more appropriate scale.

Differing periods-of-analysis and non-stationarity are two significant issues in interpreting and comparing frequency statistics. The gages have different periods-of-record. Flow series at some sites are significantly non-homogeneous due to the historical evolution of water development and use. Observed flows are compared with homogeneous WAM naturalized and regulated flows over consistent periods-of-analysis later in this chapter in conjunction with WAM simulation studies.

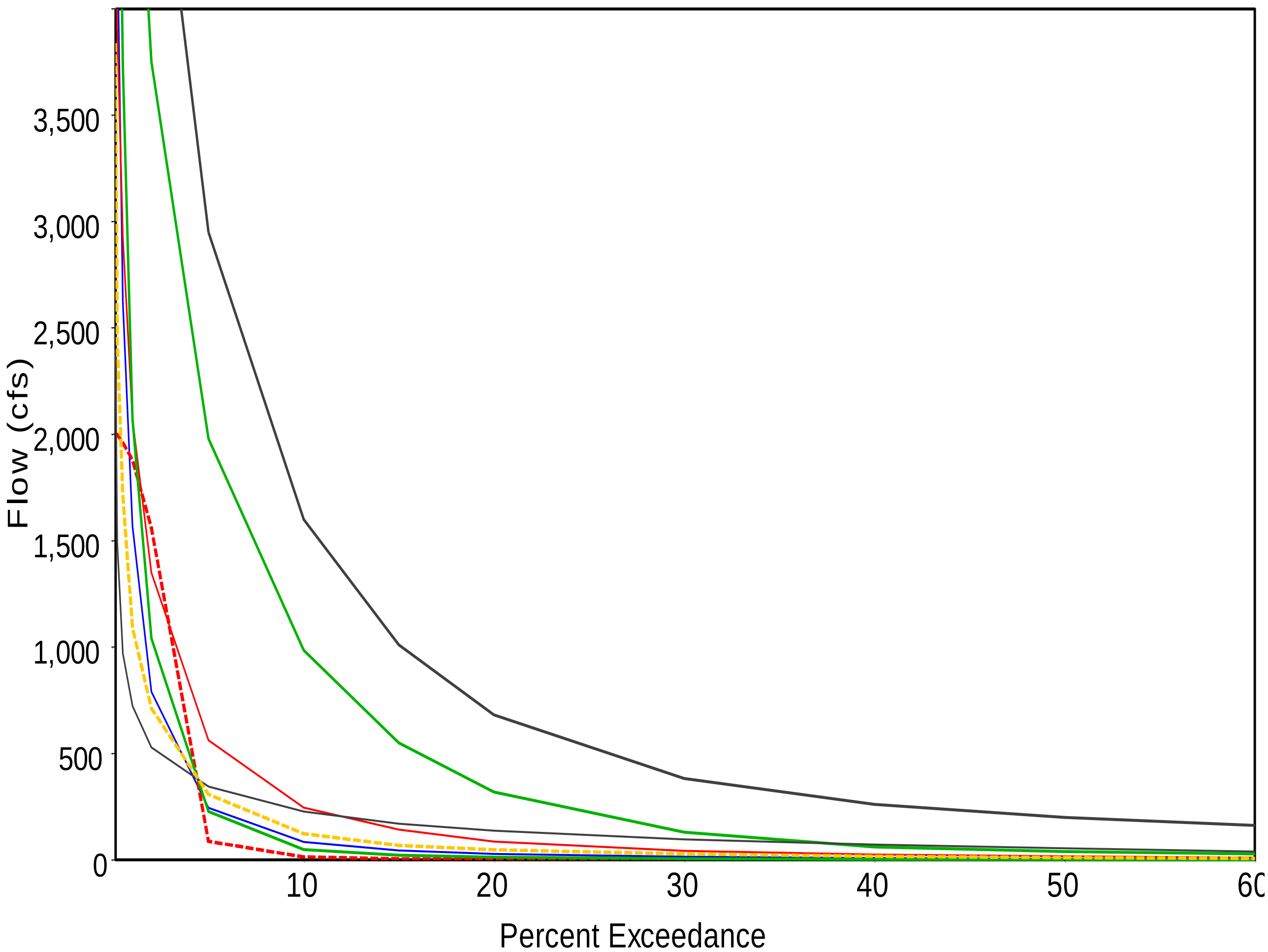


Figure 4.4 Exceedance Frequency Curves for Daily Flows at Gages on Tributaries

Seasonality of Observed Mean Daily Flows

Seasonal variations in flow frequency metrics are investigated using the same HEC-DSSVue computational methods reflected in the quantities of Table 4.3. The seasons shown in Table 4.4 are specified by the SB3 environmental flow standards for the four sites in the Trinity River Basin and are adopted for the analyses presented here. As previously noted, the Brazos SB3 standards were created using three seasons. The statistical analysis is repeated for the daily flows grouped within each season.

Seasonal frequency metrics are tabulated in 4.6 for the 17 control points on the Trinity River and its tributaries listed in Tables 4.1 and 4.2. A complete set of frequency metrics for the 17 sites is provided in Table 4.6. The mean and median of the flows are tabulated in Table 4.5.

Table 4.4
Seasons Defined by SB3 Environmental Flow Standards
and Adopted Here for the Frequency Analyses

Season	Trinity River Basin	Brazos River Basin
Winter	December, January, February	November, December, January, February
Spring	March, April, May	March, April, May, June
Summer	June, July, August	July, August, September, October
Fall	September, October, November	–

Table 4.5
Mean and Median of Seasonal Flows at 17 Gage Sites in the Trinity River Basin

ID	Location of USGS Gage by River and Nearest City	Mean Flow (cfs)				Median Flow (cfs)			
		Winter	Spring	Summ	Fall	Winter	Spring	Summ	Fall
T1	Big Sandy Creek near Bridgeport	38.33	139.9	72.16	54.77	7.6	15	0.8	0.2
T2	Clear Fork Trinity at Fort Worth	114.4	231.1	103.8	58.93	19	45	12	9.0
T3	West Fork Trinity at Fort Worth	290.6	701.4	388.4	225.3	44	106	30	26
T4	West Fork Trinity at Grand Prairie	573.6	1,097	629	465	213	312	171	161
T5	Trinity River at Dallas	1,537	2,008	2,108	1,345	552	761	513	477
T6	Trinity River below Dallas	2,080	3,398	2,361	1,726	828	1,280	735	658
T7	Trinity River near Rosser	2,954	4,958	2,942	1,966	1,060	1,900	861	762
T8	Trinity River at Trinidad	4,581	6,822	3,672	2,749	1,430	3,080	1,060	929
T9	Cedar Creek at Trinidad	59.24	90.25	50.72	3.023	1.1	1.3	0.3	0.7
T10	Tehuacana Creek near Streetman	126.3	145.0	29.07	54.23	4.5	5.4	0.2	0.2
T11	Catfish Creek nr Tennessee Colony	149.7	311.8	139.7	74.73	95	97	17	22
T12	Trinity River near Oakwood	5,695	8,726	4,107	2,736	1,910	3,740	1,080	872
T13	Upper Keechi Creek near Oakwood	104.1	116.3	29.02	40.90	27	26	1.9	2.7
T14	Trinity River near Crockett	7,152	9,860	5,067	3,746	2,750	4,895	1,570	1,350
T15	Trinity River near Midway	5,240	10,752	4,366	2,485	2,160	4,440	1,140	800
T16	Trinity River at Riverside	6,872	11,075	4,710	2,648	3,060	5,220	1,180	784
T17	Trinity River at Romayor	9,190	12,268	6,075	3,954	4,300	6,350	2,030	1,210

The statistics in Tables 4.5 and 4.6 are for daily flow rates in cfs during specified seasons of the period-of-record through January 2016. The random variable is the daily flow rate in cfs during the season defined in Table 4.4. The first two statistics in Table 4.6 are the mean and standard (SD) in cfs. The daily mean flow rates in cfs corresponding to the exceedance frequencies in the first column of Table 4.6 are computed based on the Weibull formula [(P = m/(N+1))100%] using the basic statistics and duration analysis features of HEC-DSSVue. The first column of Table 4.6 is the exceedance frequency or the percentage of the time that the quantity is equaled or exceeded. The median flow is the mean daily flow rate that is equaled or exceeded during 50 percent of the days of the period-of-record that fall with the particular season.

As shown in Table 4.5, the median of the mean daily flows is much smaller than the period-of-record mean of the mean daily flows in each season. Means are much more dominated by high flows and major floods than are median flows. Median flows provide a better representation of more normal flows and low flows.

Daily flows differ significantly between seasons of the year. The medians of the flows are higher during the Spring months than during the three other seasons at all 17 gage sites. The means of the flows are higher during the Spring months than during the three other seasons at all gage sites except site T5 on the Trinity River at Dallas. Median flows are lowest during the Fall at 15 sites and lowest during the Summer at two sites. Seasonal means are lowest during the Fall at 13 gage sites, lowest during the Summer at three sites, and lowest during the winter at one site.

Table 4.6
Seasonal Frequency Statistics for Observed Flow Rates

	T1 Big Sandy Creek near Bridgeport				T2 Clear Fork Trinity River at Fort Worth			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	38.33	139.9	72.16	54.77	114.4	231.1	103.8	58.93
SD	184.0	618.5	462.3	515.5	395.0	781.3	380.5	284.0
9.5%	0	0	0	0	0	0	0	0
99%	0	0	0	0	0	0	0	0
98%	0	0	0	0	0	0.2	0	0
95%	0	0	0	0	0	1.4	0	0
90%	0	0	0	0	2.2	3.8	0	0
85%	0	0.5	0	0	3.6	6.7	0	0
80%	0.2	1.5	0	0	5.0	10	0.7	0
70%	1.8	5.6	0	0	10	17	3.4	2.1
60%	4.2	9.5	0	0	14	29	7.1	5.4
50%	7.6	15	0.8	0.2	19	45	12	9.0
40%	11	21	2.9	2.2	29	72	19	13
30%	16	35	7.2	5.1	47	129	29	18
20%	25	70	20	13	85	232	52	29
15%	34	110	36	19	132	339	86	40
10%	56	209	82	37	235	519	177	76
5%	143	601	274	102	498	1,090	468	202
2%	354	1532	817	474	1,243	1,950	1,300	576
1%	619	2,750	1,604	1,330	1,740	2,861	2,054	1,113
0.50%	966	4,486	2,457	2,057	2,330	3,517	2,887	2,281

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T3 West Fork Trinity River at Fort Worth				T4 West Fork Trinity River at Grand Prairie			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	290.6	701.4	388.4	225.3	573.6	1,097	629	465
SD	915.3	1,911	1,278	872.0	1,371	2,3890	1,607	1,271
99.5%	2.4	2.7	0	0	19	20	10	11
99%	3.1	3.6	0	0	21	22	14	13
98%	3.9	5.2	0	0	25	28	16	15
95%	7.6	8.7	1.1	1.2	42	54	25	22
90%	12	14	3.6	4.4	63	84	45	40
85%	16	19	6.2	7.0	86	110	64	56
80%	19	24	9.2	10	102	131	82	73
70%	26	35	15	15	135	184	113	107
60%	34	56	22	20	174	237	143	137
50%	44	106	30	26	213	312	171	161
40%	69	200	43	34	262	457	216	188
30%	120	378	89	47	354	769	318	249
20%	237	795	275	109	574	1360	549	425
15%	383	1,220	488	197	832	1,920	904	614
10%	687	1,909	1,030	512	1,240	2,800	1,527	937
5%	1,330	3,350	2,120	1,130	2,232	4,470	2,834	1,760
2%	2,914	5,260	3,842	2,360	4,625	7,730	4,842	3,630
1%	4,014	8,072	5,929	3,518	6,580	11,800	7,980	5,470
0.50%	5,747	12,059	9,149	5,300	8,443	16,333	11,214	9,177

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T5 Trinity River at Dallas				T6 Trinity River below Dallas			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	1,537	2,008	2,108	1,345	2,080	3,398	2,361	1,726
SD	2,554	3,062	4,169	2,676	3,306	5,218	3,835	3,195
99.5%	331	329	302	276	160	208	213	181
99%	346	344	314	288	200	221	248	215
98%	377	364	320	299	231	274	274	240
95%	396	401	336	324	304	332	332	292
90%	411	449	355	345	379	432	383	366
85%	429	471	381	379	442	537	432	415

80%	445	503	404	393	501	616	481	451
70%	469	566	439	413	618	746	570	532
60%	502	656	464	440	712	943	638	593
50%	552	761	513	477	828	1280	735	658
40%	636	991	591	535	1,030	2,020	906	762
30%	824	1,550	755	689	1,460	3,440	1,530	979
20%	1,242	3,176	1,654	1,160	2,600	5,430	3,870	1,650
15%	2,125	4,376	5,199	2,125	3,930	6,670	5,010	2,500
10%	4,392	5,450	6,630	3,640	5,647	8,640	6,737	4,430
5%	8,241	6,556	9,129	5,458	8,348	11,700	9,740	7,733
2%	10,100	10,748	18,256	8,784	13,400	18,500	14,094	11,746
1%	11,361	15,572	23,534	11,320	15,727	24,747	19,294	15,500
0.50%	13,036	19,096	26,119	19,295	19,414	32,294	22,747	21,337

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T7 Trinity River near Rosser				T8 Trinity River at Trinidad			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	2,954	4,958	2,942	1,966	4,581	6,822	3,672	2,749
SD	5,113	7,883	5,460	3,887	7,331	9,2123	6,272	5,003
99.5%	48	51	38	34	375	395	339	363
99%	63	112	48	39	391	445	363	374
98%	94	155	117	109	411	515	399	399
95%	152	240	153	132	469	627	453	436
90%	242	430	284	194	578	767	543	499
85%	369	575	382	282	702	873	621	575
80%	465	722	453	361	794	985	681	637
70%	692	948	593	502	952	1280	795	733
60%	860	1,280	716	629	1,130	1,870	905	828
50%	1,060	1,900	861	762	1,430	3,080	1,060	929
40%	1,400	3,000	1100	885	2,140	4,870	1,480	1,110
30%	2,180	5,000	1,920	1,140	3,790	7,600	2,710	1,550
20%	3,910	8,000	4,250	1,984	6,852	11,500	5,528	2,764
15%	5,550	10,000	6,060	2,923	9,094	13,800	7,502	4,390
10%	8,364	12,600	8,280	5,060	12,700	16,900	9,937	6,777
5%	12,700	17,100	12,000	9,051	19,400	23,870	14,500	13,485
2%	18,496	27,846	18,284	14,124	28,430	34,028	22,000	20,094
1%	24,396	37,223	26,392	18,924	35,783	42,300	32,807	26,597
0.50%	30,460	47,735	36,724	24,231	44,025	56,935	43,361	32,340

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T9 Cedar Creek at Trinidad				T10 Tehuacana Creek near Streetman			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	59.24	90.25	50.72	3.023	126.3	145.0	29.07	54.23
SD	298.5	355.2	276.9	24.22	754.1	1,090	242.4	378.8
99.5%	0	0	0	0	0	0	0	0
99%	0	0	0	0	0	0	0	0
98%	0	0	0	0	0	0	0	0
95%	0	0	0	0	0	0	0	0
90%	0	0.1	0	0	0.1	0.3	0	0
85%	0.1	0.2	0	0	0.2	0.6	0	0
80%	0.3	0.3	0.1	0	0.4	1.0	0	0
70%	0.6	1.1	0.1	0.2	1.1	1.8	0	0
60%	0.9	1.0	0.2	0.4	2.6	3.2	0.1	0
50%	1.1	1.3	0.3	0.7	4.5	5.4	0.2	0.2
40%	1.6	1.8	0.5	0.8	7.0	8.8	0.5	0.6
30%	2.2	4.0	0.5	1.0	12	14	1.0	1.8
20%	4.0	14	0.8	1.5	25	29	2.6	4.6
15%	7.1	40	1.0	1.8	42	54	5.1	8.4
10%	19	90	2.0	2.2	104	135	11	18
5%	74	431	47	4.9	421	588	38	99
2%	1,760	1,960	1,564	12	1,530	1,733	203	676
1%	1,846	1,980	1,862	49	2,880	3,005	792	1,606
0.50%	1,890	2,000	1,920	159	5,127	4,661	1,675	2,646

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T11 Catfish Creek near Tennessee Colony				T12 Trinity River near Oakwood			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	138.9	167.0	49.97	47.67	5,695	8,726	4,107	2,736
SD	149.7	311.8	139.7	74.73	8,941	12,540	7,551	5,665
99.5%	16	11	1.2	1.4	130	165	51	58
99%	20	12	1.4	1.6	151	246	62	66
98%	28	17	2.2	2.0	186	295	86	85
95%	35	23	3.0	3.3	305	491	151	124
90%	45	29	4.3	4.5	480	764	265	195
85%	51	38	5.8	5.6	623	932	391	292
80%	56	47	7.1	7.6	755	1,100	488	383

70%	66	60	10	11	1,030	1,590	666	561
60%	79	79	13	16	1,360	2,350	838	725
50%	95	97	17	22	1,910	3,740	1,080	872
40%	114	122	24	33	2,930	6,010	1,550	1,090
30%	141	156	35	47	5,090	9,700	2,760	1,620
20%	180	214	55	66	9,020	14,600	5,750	2,820
15%	220	262	72	79	12,100	17,200	8,083	4,290
10%	280	345	100	110	15,500	21,500	12,600	7,040
5%	397	500	200	182	22,600	30,375	17,700	13,000
2%	557	800	367	282	36,064	45,710	27,270	20,032
1%	721	1,140	500	372	45,700	61,705	38,075	28,132
0.50%	946	1,700	656	454	53,800	79,878	51,503	39,166

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T13 Upper Keechi Creek near Oakwood				T14 Trinity River near Crockett			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	104.1	116.3	29.02	40.90	7,152	9,860	5,067	3,746
SD	346.4	387.1	177.1	357.4	9,913	10,668	8,037	6,514
99.5%	0.1	0.6	0	0	549	560	328	385
99%	0.7	0.9	0	0	622	624	373	427
98%	1.3	1.4	0	0	657	750	429	465
95%	3.0	2.8	0	0	781	978	539	565
90%	6.1	5.1	0	0	931	1,200	660	667
85%	7.6	7.2	0	0	1,120	1,410	770	748
80%	10	9.2	0.1	0.1	1,256	1,570	840	813
70%	14	13	0.3	0.4	1,560	2,120	992	935
60%	19	19	0.9	1.3	1,980	3,200	1,200	1,120
50%	27	26	1.9	2.7	2,750	4,895	1,570	1,350
40%	36	36	3.6	4.8	4,190	7,990	2,290	1,690
30%	50	51	6.8	8.3	6,890	12,550	4,140	2,381
20%	79	88	13	16	11,600	18,100	7,510	3,954
15%	118	142	19	24	15,530	20,500	10,225	5,890
10%	221	252	35	42	20,000	24,200	15,200	10,400
5%	439	525	101	145	27,500	31,200	20,975	17,900
2%	899	1,018	296	455	37,644	42,230	29,130	25,300
1%	1,381	1,609	515	795	44,566	51,660	37,220	33,100
0.50%	2,160	2,095	999	1,043	55,400	67,083	52,060	39,167

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T15 Trinity River near Midway				T16 Trinity River at Riverside			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mean	5,240	10,752	4,366	2,485	6,872	11,075	4,710	2,648
SD	7,2420	15,8743	7,644	4,753	8,847	14,515	8,632	5,242
99.5%	190	380	104	116	213	300	85	85
99%	207	394	116	126	242	353	99	92
98%	267	427	144	138	276	438	110	102
95%	354	512	212	164	379	585	170	139
90%	490	706	280	203	540	850	235	176
85%	630	945	374	279	720	1,160	300	210
80%	725	1,150	450	334	850	1,410	388	280
70%	1,020	1,782	630	480	1,300	2,140	566	410
60%	1,460	2,820	825	618	1,984	3,350	800	577
50%	2,160	4,440	1,140	800	3,060	5,220	1,180	784
40%	3,200	7,010	1,860	1,060	4,830	8,100	1,920	1,100
30%	5,340	11,900	3,180	1,660	7,466	12,700	3,210	1,730
20%	8,500	17,300	6,060	2,880	12,200	18,200	6,440	3,054
15%	11,300	21,000	9,055	4,140	14,800	22,000	9,340	4,496
10%	15,000	27,300	13,250	6,760	18,100	28,300	14,000	7,200
5%	19,750	40,560	19,300	10,900	26,200	40,200	21,600	11,920
2%	26,040	58,560	29,820	17,924	37,184	55,440	34,380	20,516
1%	37,950	80,178	40,840	23,612	41,400	67,380	45,460	27,216
0.50%	42,800	100,860	47,820	34,516	43,846	82,790	53,460	34,152

Table 4.6 Continued
Seasonal Frequency Statistics for Observed Flow Rates

	T17 Trinity River at Romayor			
	Winter	Spring	Summer	Fall
Mean	9,190	12,268	6,075	3,954
SD	11,652	14,279	10,219	8,052
99.5%	333	415	145	152
99%	348	540	182	192
98%	389	670	245	220
95%	648	970	365	281
90%	874	1,290	530	400
85%	1,030	1,640	750	496
80%	1,240	1,920	954	618
70%	1,930	2,740	1,240	830
60%	2,790	4,100	1,530	1,030
50%	4,300	6,350	2,030	1,210
40%	6,620	9,840	2,730	1,550
30%	10,100	14,800	4,295	2,210
20%	15,600	21,300	8,040	4,010
15%	19,095	25,500	11,700	6,170
10%	23,700	31,200	17,300	10,100
5%	34,200	40,700	27,100	19,235
2%	47,800	55,300	42,170	32,200
1%	54,800	63,796	54,135	43,254
0.50%	61,866	72,000	60,200	51,200

Additional Analyses of Observed Flows in the Appendices

Appendices B, D, F, H, and J contain plots and statistical analyses of observed flows at the USGS gaging stations on the Trinity River and tributaries listed in Tables 4.1 and 4.2. Appendices B, D, F, and H provide the following information for the 17 gage sites as explained in Chapter 1.

Appendix B consists of four time series plots developed for each of the 17 sites (68 graphs): (1) mean daily flow in cfs, (2) mean monthly flow in cfs, (3) annual instantaneous peak flow in cfs, and (4) annual flow volume in acre-feet/year.

Appendix D consists of log-Pearson type III exceedance frequency plots and tables for the instantaneous peak annual flows for each of the 17 sites (17 graphs and corresponding 17 tables).

Appendix F consists of minimum volume-duration plots and tables for specified time periods for each of the 17 sites (17 graphs and corresponding 17 tables).

Appendix H consists of maximum volume-duration plots and tables for specified time periods for each of the 17 sites (17 graphs and corresponding 17 tables).

The four HEC-DSSVue [1] time series plots for each of the 17 gages include mean daily flows for each day, mean monthly flows for each month, maximum instantaneous flow in each year, and total flow volume in each year. Flows at all sites exhibit extreme variability at time scales of either daily, monthly, or yearly. Long-term changes vary between sites.

Long-term changes or trends are hidden in the dramatic continuous variability. High flow, low flow, and average flow characteristics may change differently in response to construction of river regulation structures and water resources development and use.

- A qualitative review of the annual volume plots in Appendix B plots indicate that annual flow volumes appear to have trended downward slightly during the period-of-record in the plots at gaging station T1 and increased slightly at gaging stations T2, T4, T5, T6, and T7. No long-term trends are evident in the annual flows at gages T3, T8, T10, T12, T13, T14, T15, and T17.

- The monthly flow plots in Appendix B imply that total low flows appear to have increased over the period-of-record at gaging stations T4, T5, T6, T7, and T12. No long-term changes in low flows are evident from the plots at gages T1, T2, T3, T8, T10, T13, T14, T15, and T17.

- A qualitative review of the daily flow plots and annual instantaneous peak flow plots in Appendix B seems to indicate that high flows have decreased over the period-of-record at gaging stations T1, T2, T5, T12, and T15. No long-term changes in flood flows are evident from the plots for gages T3, T4, T6, T7, T8, T10, T13, T14, and T17.

Results of flood frequency analyses performed with the HEC-SSP Statistical Software Package [2] are presented in Appendix D. The log-Pearson Type III probability distribution was applied to the annual series of peak instantaneous flows, which is described in Chapter 1. The data series consisting of the maximum instantaneously occurring flow rate in each year is included in the plots of Appendix B.

The flood frequency results are presented in Appendix D in both table and graph format. The random variable (Q_P) is the flow rate in cfs at the gage site. The exceedance probability (P) is the probability that a specific value of Q_P is equaled or exceeded in any randomly selected year. The return period (T) in years is the reciprocal of the annual exceedance probability (T=1/P).

Appendices F and H contain low flow and high flow volume frequency analyses performed with HEC-SSP. The annual data series are defined as the mean flow during the 1-day, 7-day, 10-day, 30-day, 60-day, and 120-day period of each year that have the minimum flow volume for that year (Appendix F) or the maximum flow volume during that year (Appendix H). The log-Pearson III frequency analysis methodology is applied to each of the annual data series at each of the gages. The annual exceedance frequency relationships for mean minimum or mean maximum flow rates in cfs during specified durations (1, 7, 10, 30, 60, and 120 days) relationships, based on the log-Pearson III probability distribution, are presented both as tables and graphs. The graphs also include Weibull (P=m/(N+1)) plots. The means, standard deviations, and skew coefficients of the logarithms of the data used in the log-Pearson III computations are also shown.

Appendices J and L deal with WRAP/WAM generated naturalized and regulated flows at the 13 of the 17 gaging station sites that are included as primary control points in the Trinity WAM. These appendices are discussed in the next section.

Trinity Water Availability Model

The term *Trinity WAM* refers to the WRAP input dataset for the Trinity River Basin in the TCEQ Water Availability Modeling (WAM) System and modified versions thereof. The original monthly Trinity WAM was developed by Espey Consultants, Inc. [30], under contract with the Texas Natural Resource Conservation Commission, now the TCEQ. The TCEQ has periodically updated the Trinity WAM along with the WAMs for the other river basins. As noted in Chapter 1, the Trinity is one of six WAMs for which daily versions have been developed and the hydrologic period-of-analyses extended in research and development studies at TAMU [14, 21, 31]. These six daily WAMs, including the Trinity WAM employed here, are still being tested and improved.

The authorized use scenario Trinity WAM water rights dataset (DAT file) with draft revisions by the TCEQ dated October 26, 2012 was adopted for this investigation. The Trinity WAM files for the authorized use scenario (run3) and current use scenario (run8) have the filename roots Trin3 and Trin8, respectively. *WRAP-SIM* prints a listing to its message file of the number of various system components. The *SIM* counts for the Trinity WAM are shown in Table 4.8.

Table 4.8
Number of System Components in Trinity WAM Datasets

Water Use Scenario	Authorized	Current
total number of control points	1,398	1,418
number of primary control points	40	40
number of reservoirs	697	700
number of water right *WR* records	1,061	1,067
number of instream flow *IF* records	71	89

The original hydrologic period-of-record of 1940-1996 is still employed for the official monthly Trinity WAM in the TCEQ WAM System. The hydrology for the developmental daily Trinity WAM adopted for this report was recently improved and extended to cover 1940-2015.

Hydrology extension capabilities documented in the *Hydrology Manual* [6] have been tested and demonstrated by updating the period-of-analysis of six WAMs including the Trinity WAM [21]. All datasets in the TCEQ WAM System, including the Trinity WAM, are based on a monthly computational time interval. Daily modeling capabilities documented in the *Daily Manual* [7] have applied to create developmental daily versions of six WAMs including the Trinity WAM [14]. The original 1940-1996 and 1940-1997 hydrologic period-of-analysis for the developmental daily Trinity and Brazos WAMs have recently been extended through 2015 [31, 32].

Primary control points are locations at which naturalized flows are provided in a *SIM* input dataset. Naturalized flows at all other control points, called *secondary* control points, are computed within the *SIM* simulation based on the naturalized flows provided at the primary control points and watershed parameters provided on DIS file flow distribution *FD* and watershed parameter *WP* records and/or DAT file control point *CP* records.

The Trinity WAM has 40 primary control points, as shown in Figure 4.2 for which monthly naturalized flows are provided in the FLO file. Naturalized flows are synthesized during execution of *SIM* for the over 1,300 secondary control points based on information provided in the DIS file. In most cases, naturalized flows are distributed to secondary control points using the drainage area ratio method, in some cases in combination with channel loss factors, as specified by options 6 and 7 in *CP* record field 6. All of the 40 primary control points are the sites of USGS stream gaging stations, with the exception of control point 8TRGB, Trinity River at Galveston Bay. One of the gages (USGS Gage 08064600, Richland Creek near Fairfield) is located immediately downstream of Richland-Chambers Reservoir and only records peak stream flow data.

<u>Major Reservoirs in the Trinity River Basin</u>

The 697 reservoirs included in the October 2012 authorized use scenario Trinity WAM include the 32 major reservoirs listed in Table 4.8 that have permitted storage capacities exceeding 5,000 acre-feet. The total permitted conservation storage capacity of 7,447,970 acre-feet of the 32 major reservoirs account for 98 percent of the total storage capacity of 7,596,680 acre-feet in the 697 reservoirs. The numbers in the first column of Table 4.8 refer to the numbered reservoirs in the map of Figure 4.4. The reservoirs are listed in Table 4.8 in order of descending authorized water supply storage capacity.

The United States Army Corps of Engineers (USACE) Fort Worth District (FWD) operates eight multiple purpose reservoirs for flood control. Flood control operations are not represented in the monthly Trinity WAM but have been added to the daily WAM. Although a low-head run-of-river hydroelectric power generation facility is installed below Lake Lewisville, no hydroelectric power rights are included in the Trinity WAM.

The original Trinity WAM contained 552 water rights with a total diversion of 5,322,610 acre-feet/year, with approximately 58% used for municipal purposes, 35% for industrial purposes, and 7% for agricultural irrigation. Most water supply is from rivers and reservoirs. The major regional water suppliers in the upper basin are Dallas Water Utilities (DWU), North Texas Municipal Water District (NTMWD), Tarrant Regional Water District (TRWD), and Trinity River Authority (TRA). Significant local water providers in the upper basin include the City of Denton, City of Grapevine, City of Weatherford, and Dallas County Park Cities Municipal Utilities District.

TRWD supplies water to Fort Worth and other cities from its Lakes Bridgeport, Eagle Mountain, Richland-Chambers, and Cedar Creek. Lakes Bridgeport and Eagle Mountain are operated as a system, along with Lake Worth which is located immediately below Eagle Mountain Lake. Lake Worth is operated by the City of Fort Worth as a pass-through reservoir and is used for recreation and water supply. The TRWD also supplies water to the Cities of Fort Worth, Weatherford, and Benbrook from Lake Benbrook which is owned by the USACE FWD.

TRA supplies its customers in the upper and middle Trinity River Basin with water from Lakes Bardwell, Navarro Mills, and Joe Pool, owned by the USACE, and supplies Houston with water from Lake Livingston. DWU supplies water to about 30 cities in addition to Dallas from Lakes Ray Roberts, Lewisville, and Grapevine owned by the USACE and Lake Ray Hubbard owned by the City of Dallas. NTMWD supplies water to its customers from Lavon Lake under a water supply storage contract with the USACE.

The USACE FWD owns and operates eight of the 14 largest reservoirs in the Trinity River Basin (Lakes Ray Roberts, Lewisville, Lavon, Joe Pool, Grapevine, Benbrook, Navarro Mills, and Bardwell). These eight multiple-purpose reservoirs are operated by the USACE for flood control, and nonfederal sponsors hold contracts for their water supply storage capacity. The nonfederal water supply sponsors for the eight federal reservoirs include the TRA, TRWD, NTMWD, Dallas, Fort Worth, and other cities. The City of Dallas (DWU) owns Ray Hubbard Lake and White Rock Lake. The other major reservoirs are owned by various cities and electric power companies.

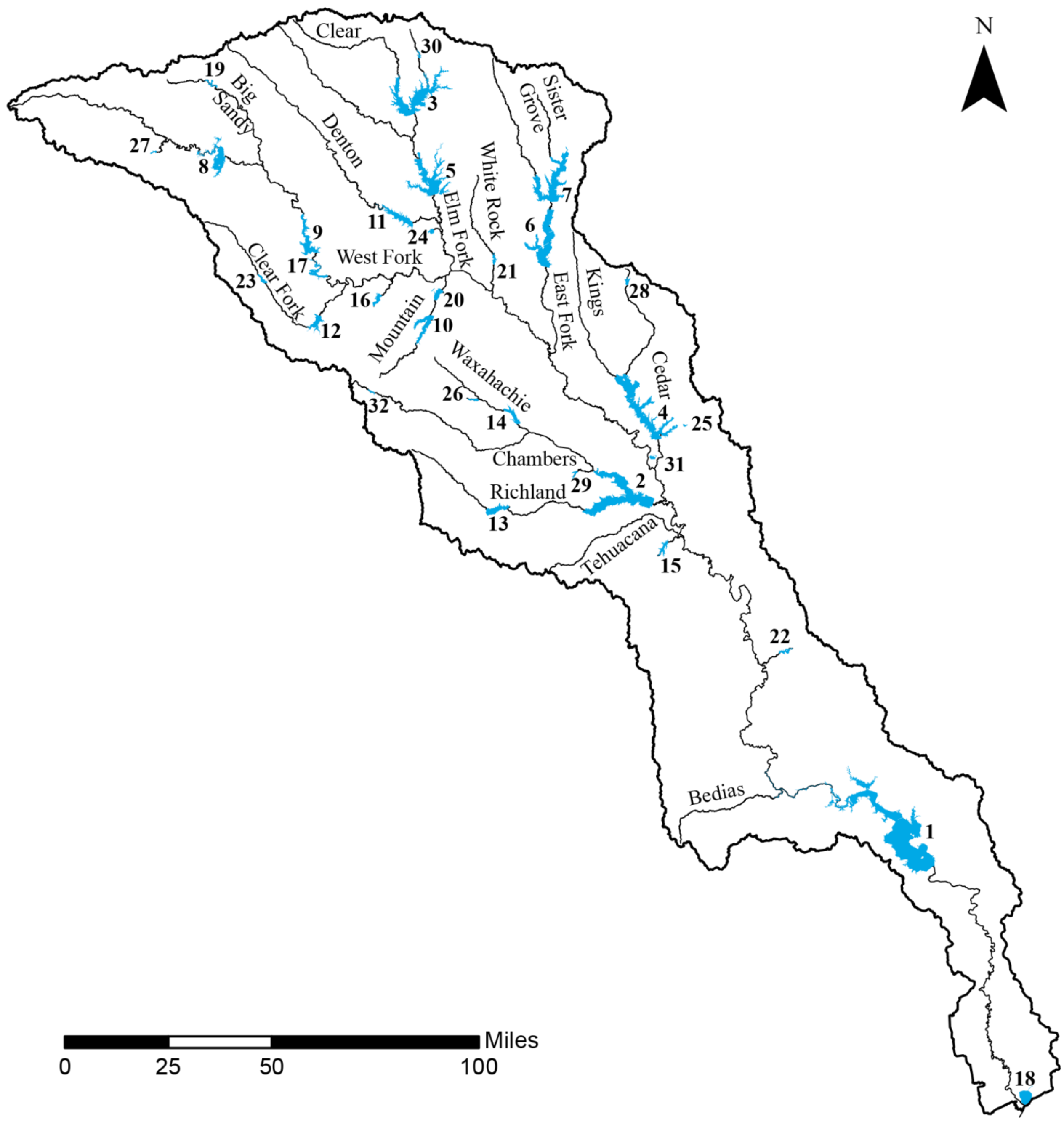


Figure 4.4 Major Tributaries and Largest Reservoirs in the Trinity River Basin

Lake Lewisville is currently the only reservoir in the Trinity River Basin with capabilities for hydroelectric energy generation. A low-head run-of-river hydropower unit is located in the river below the dam. A 24-megawatt hydroelectric energy generation facility is being installed at Lake Livingston, which will operate using run-of-river flows through the dam. Recreation is popular at most of the lakes in the basin.

Table 4.8
Major Reservoirs in the Trinity River Basin

Map ID	Reservoir	WAM Identifier	WAM CP ID	Initial Impoundment	Authorized Storage
					(acre-feet)
1	Lake Livingston	LIVSTN	B4248B	1969	1,750,000
2	Richland-Chambers Reservoir	RICHCH	B5035A	1987	1,135,000
3	Ray Roberts Lake	ROBDEN	B2335A	1987	799,600
4	Cedar Creek Reservoir	CEDAR	B4976A	1965	678,900
5	Lewisville Lake	LEWDE1	B2456A	1954	618,400
6	Lake Ray Hubbard	HUBBRD	B2462A	1968	490,000
7	Lavon Lake	LAVON0	B2410A	1953	456,500
8	Lake Bridgeport	BRIDGE	B3808A	1932	387,000
9	Eagle Mountain Lake	EGLMTN	B3809A	1934	210,000
10	Joe Pool Lake	JOPOOL	B3404A	1986	176,900
11	Grapevine Lake	GPVGP1	B2362A	1952	162,500
12	Benbrook Lake	BENBRK	B5157P	1952	88,250
13	Navarro Mills Lake	NAVARO	B4992A	1963	63,300
14	Bardwell Lake	BARDWL	B5021A	1965	54,900
15	Fairfield Lake	FAIRFD	B5040A	1969	50,600
16	Lake Arlington	ARLING	B3391A	1957	45,710
17	Lake Worth	WORTH	B3340A	1914	38,124
18	Lake Anahuac	ANAHUA	B4279C	1914	35,300
19	Lake Amon G. Carter	CARTER	B3320B	1956	28,589
20	Mountain Creek Lake	MTNCRK	B3408A	1937	22,840
21	White Rock Lake	WHITER	B2461A	1911	21,345
22	Houston County Lake	HOUCTY	B5097A	1966	19,500
23	Lake Weatherford	WTHRFD	B3356A	1957	19,470
24	North Lake	NORTH	B2365A	1957	17,100
25	Forest Grove Reservoir	FOREST	B4983A	1976	16,348
26	Lake Waxahachie	WAXAHC	B5018A	1956	13,500
27	Lost Creek Reservoir	LOSTCK	B3313B	1990	11,961
28	New Terrell City Lake	TERREL	B4972A	1955	8,712
29	Lake Halbert	HALBRT	B5030A	1921	7,357
30	Lake Kiowa	KIOWA	B2334A	1970	7,000
31	Trinidad Lake	TRINDD	B4970A	1925	6,200
32	Alvarado Park Lake	B5001	B5001A	1966	4,781
		BCANEY	B4148P		7,064

SB3 Environmental Flow Standards

The Bay and Basin Expert Science Team (BBEST) for the Trinity and San Jacinto Rivers and Galveston Bay submitted its Recommendation Report to the Basin and Bay Area Stakeholder Committee (BBASC) and TCEQ in November 2009. The BBEST was unable to reach a consensus recommendation and instead submitted two recommendations endorsed by alternate members of the team. The BBASC submitted its Recommendation Report to the TCEQ in May 2010 and submitted a work plan in May 2012. Environmental flow standards for the Trinity and San Jacinto Rivers and Galveston Bay were adopted by the TCEQ effective May 15, 2011.

The environmental flow standards for surface water for the Trinity and San Jacinto Rivers and Galveston Bay are documented in Texas Administrative Code Title 30, Part 1, Chapter 298, Subchapter B. Instream flow standards are established at six locations, including four sites in the Trinity River Basin and two sites in the San Jacinto River Basin. Bay and estuary freshwater inflow standards for Galveston Bay are also established for the Trinity and San Jacinto river outflows. The four USGS gaging station with SB3 flow standards are noted in the last column of Table 4.2. The SB3 flow standards are incorporated in the daily WAM employed in the study presented here.

The instream flow standards consist of seasonal subsistence flows, base flows, and high flow pulses. Four seasons are defined according to the months listed in Table 4.9. For the purposes of tracking the frequency for which high flow pulses are engaged, the six-month period from June through November is considered as a single season rather than two separate seasons.

Table 4.9
Months Included in Each Season

Season	Months
Winter	December, January, February
Spring	March, April, May
Summer	June, July, August
Fall	September, October, November

If the flow at a control point is less than the applicable subsistence flow standard, then water right holders may not make diversions from the river. If the flow is greater than the subsistence flow standard and less than the applicable base flow standard, then water right holders may make diversions as long as the flow does not drop below the subsistence flow standard. The subsistence flow standards for the four control points are shown in Table 4.10.

Table 4.10
Subsistence Flow Standards (cfs)

Site	Gage	Winter	Spring	Summer	Fall
T4	08049500	19	25	23	21
T5	08057000	26	37	22	15
T12	08065000	120	160	75	100
T17	08066500	495	700	200	230

If the flow at a control point is greater than the applicable base flow standard and less than the applicable pulse flow trigger level, water right holders may make diversions as long as the flow does not drop below the base flow standard. The base flow standards are shown in Table 4.11.

Table 4.11
Base Flow Standards (cfs)

Site	Winter	Spring	Summer	Fall
T4	45	45	35	35
T5	50	70	40	50
T12	340	450	250	260
T17	875	1,150	575	625

The high flow pulse standards are engaged when flow at a control point exceeds the applicable high flow pulse trigger level. Water right holders may not make diversions until either the applicable volume or duration time has passed since engagement of the trigger flow level. However, diversions can be made before the volume or duration criteria are met if the flow at the control point exceeds the high flow pulse trigger level, as long as diversions do not cause the flow to drop below the high flow pulse trigger level. Two pulses per season are specified for all four control points according to the criteria specified in Table 4.12. The tracking of high flow pulse events each season is performed independently of preceding and subsequent seasons. As mentioned previously, the summer and fall seasons are combined as a single six-month season for the purposes of tracking high flow pulse events.

For some water right permits issued after the effective date of the environmental flow standards, only a portion of the flow standards will apply, depending on the conditions of the new permit. Permits with an authorization to divert 10,000 acre-feet or less per year are not required to protect the high flow pulse requirements. However, the input records modeling SB3 standards in the daily Trinity WAM have not been configured to allow junior water right exemptions from honoring downstream senior instream flow requirements.

Table 4.12
High Flow Pulse Standards

Site	Criteria	Winter	Spring	Summer/Fall
T4	Trigger (cfs):	300	1,200	300
	Volume (ac-ft):	3,500	8,000	1,800
	Duration (days):	4	8	3
T5	Trigger (cfs):	700	4,000	1,000
	Volume (ac-ft):	3,500	40,000	8,500
	Duration (days):	3	9	5
T12	Trigger (cfs):	3,000	7,000	2,500
	Volume (ac-ft):	18,000	130,000	23,000
	Duration (days):	5	11	5
T17	Trigger (cfs):	8,000	10,000	4,000
	Volume (ac-ft):	80,000	150,000	60,000
	Duration (days):	7	9	5

Improved and Updated Hydrology

The Trinity WAM hydrology input data includes monthly naturalized stream flows at 40 primary control points, monthly net evaporation less precipitation depths assigned to 50 control point identifiers, and daily pattern hydrographs at 49 control points that are applied within the simulation to disaggregate monthly naturalized flows to daily. The original hydrologic period-of-record of 1940-1996 is still employed for the official monthly Trinity WAM in the TCEQ WAM System. The developmental daily Trinity WAM hydrology input dataset was recently refined and extended to cover a 1940-2015 hydrologic period-of-analysis [31]. The simulation results presented here reflect the new and improved hydrology input dataset. The DSS files of daily and monthly observed, naturalized, and regulated flows compiled in the process of improving and updating the WAM hydrology complements the datasets documented by the present report.

Trinity WAM Simulation Results

The WRAP daily simulation model *SIMD* was executed with the previously described Trinity WAM input dataset. The TCEQ WAM authorized water use scenario is combined with the refined and updated January 1940 through December 2015 hydrology. There are 27,759 days in the daily computational time step 1940-2015 simulation. Simulation results are organized, analyzed, and displayed in this report using HEC-DSSVue and the WRAP program *TABLES*.

Simulation results reflect the assumptions and approximation inherent in the WAM. The simulation is based on the premise that water resources are developed and managed in accordance with the water rights permits and water users use the full amounts authorized by their permits during a repetition of 1940-2015 river basin hydrology. However, in reality, permit holders do not necessarily divert the full amounts authorized by their permits in any particular year. The authorized use scenario in the TCEQ WAM System includes return flows from water supply diversions only if return flows are required in the permits. Most permits require no return flows. Exclusion of return flows in the authorized use scenario WAM results in the regulated flows being conservatively low.

The datasets in the TCEQ WAM System for all of the river basins begin their simulations with all reservoirs filled to full conservation storage capacity. The 697 reservoirs in the Trinity WAM are likewise assumed in this simulation to be full to conservation storage capacity, with empty flood control pools, at the beginning of the 1940-2015 hydrologic period-of-analysis. The eight USACE reservoirs have flood control pools in the daily WAM. Since the late 1930’s and early 1940’s was a relatively wet period, beginning the 1940-2015 simulation with the reservoirs filled to full conservation storage capacity at the beginning of January 1940 is reasonable.

The summation of the end-of-month storage contents in acre-feet for the 697 reservoirs for each of the 912 months of the 1940-2015 daily simulation are plotted in Figure 4.5. The storage contents of each of the reservoirs was set at full conservation capacity at the beginning of January 1, 1940. The total conservation capacity of the 697 reservoirs is 7,596,680 acre-feet. The total storage contents in the simulation results at the end of October 2015, November 2015, and December 2015 are 6,614,400 acre-feet, 7,963,400 acre-feet, and 8,253,450 acre-feet, indicating encroachment into the flood control pools of the eight USACE reservoirs. The year 2015 was very wet. Though not included in the model, major floods also continued through early 2016.

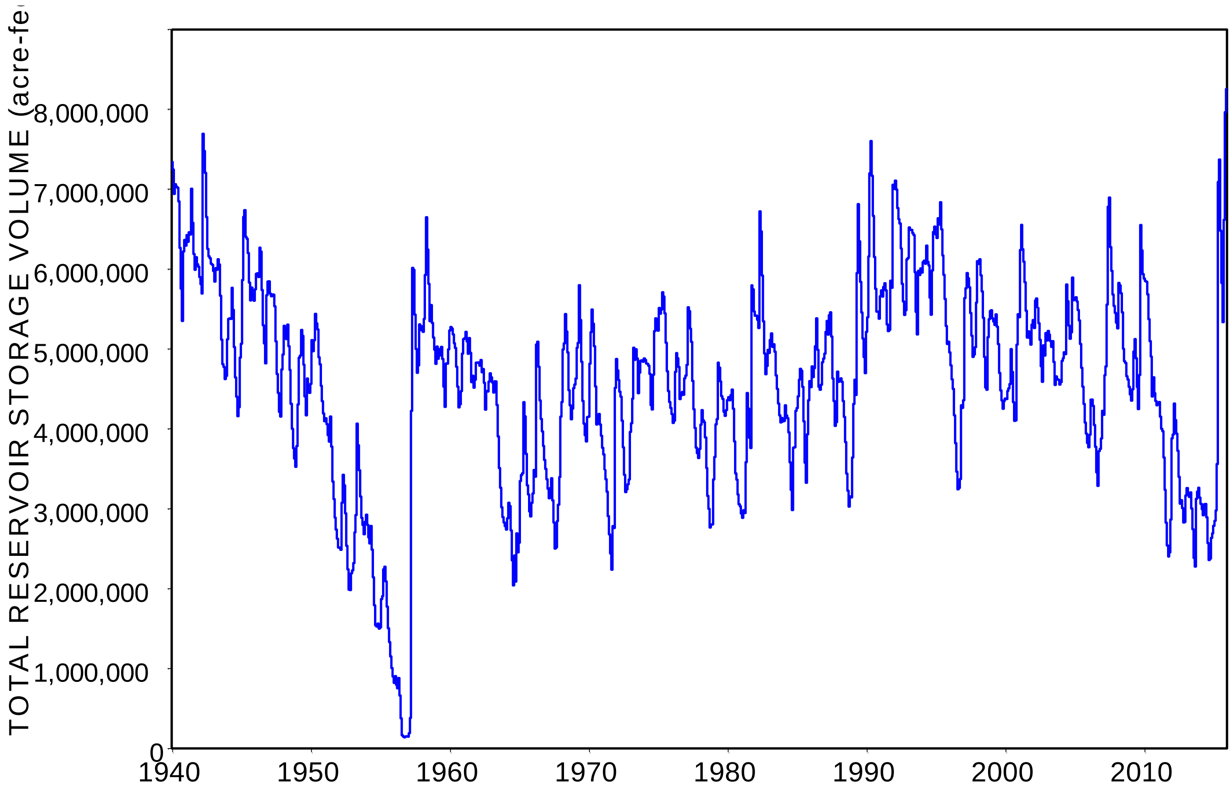


Figure 4.5 Simulated Total Storage Volume in the 697 Reservoirs in the Trinity WAM

The severe 1950-1957 drought which ended in a major flood in April 1957 is evident in Figure 4.5. The basin total reservoir storage contents, in the model, begins to decrease during 1950, reaching a minimum of 140,450 acre-feet in October 1956. A major flood increases the volume of water in storage in the 697 reservoirs from 381,750 acre-feet at the end of March 1957 to 4,224,790 acre-feet at the end of March 1957 and 6,013,820 acre-feet at the end of May 1957.

The simulated reservoir draw-downs during 2010-2013 shown in Figure 4.5 are also indicative of severe drought conditions. However, using the basin-wide total storage contents as a hydrologic drought severity index, 1950-1997 is still the hydrologically worst drought since 1940.

Daily naturalized stream flows are computed within the *SIMD* simulation based on distributing monthly flows from primary to secondary control points and disaggregating monthly flow volumes to daily in proportion to the input daily pattern hydrographs. Daily regulated flows are the stream flows at a site after considering reservoir evaporation, storage, and releases, water supply diversions and return flows, and other actions of all model water rights.

Daily flow volumes in acre-feet are computed by *SIMD*. The flow plots in Figures 4.6 and 4.7 and Appendix J and the flow statistics in Table 4.13 are converted to cubic feet per second (cfs) by multiplying quantities in acre-feet/day by 0.5041667.

Time series plots and frequency statistics are presented in this report for the 13 gage sites in Tables 1.2 and 4.1 that serve as WAM control points. The control point identifiers are listed in the third column of Tables 1.2 and 4.1. The locations of the control points are shown in Figure 4.2.

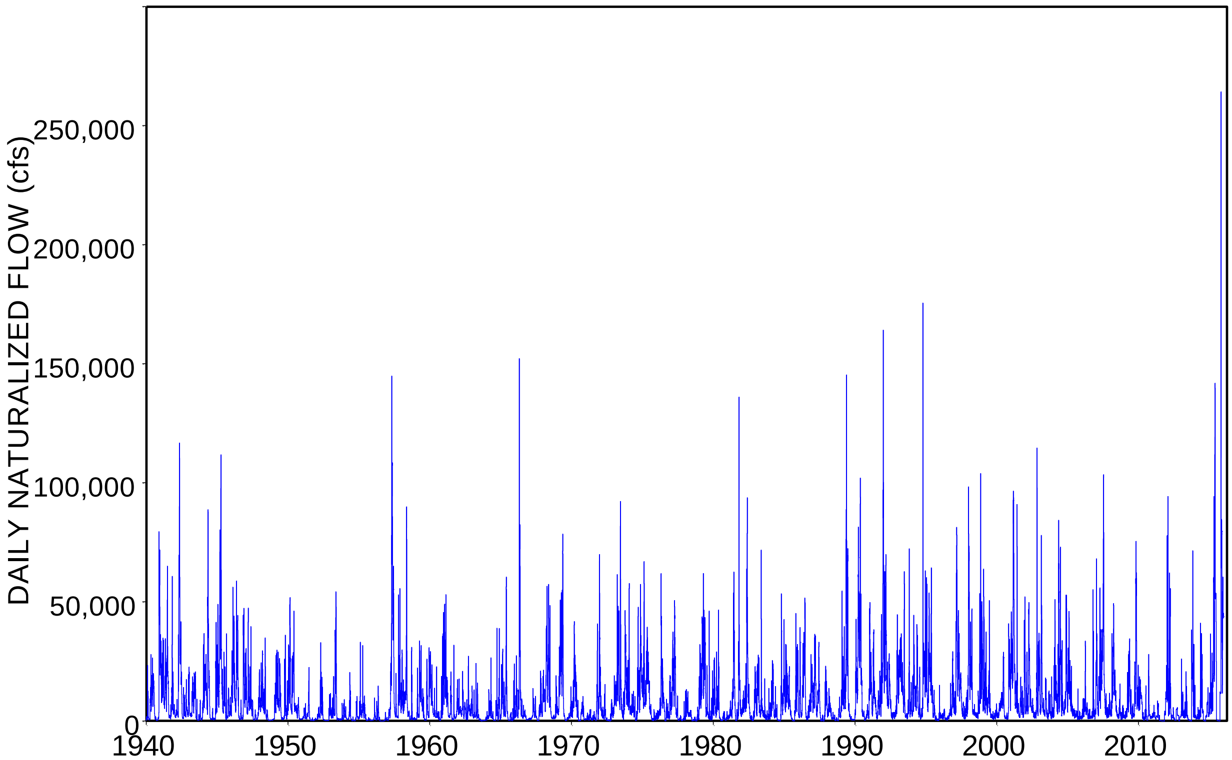


Figure 5.6 Daily Naturalized Flows at Control Point 8TTRO on the Trinity River at Romayor

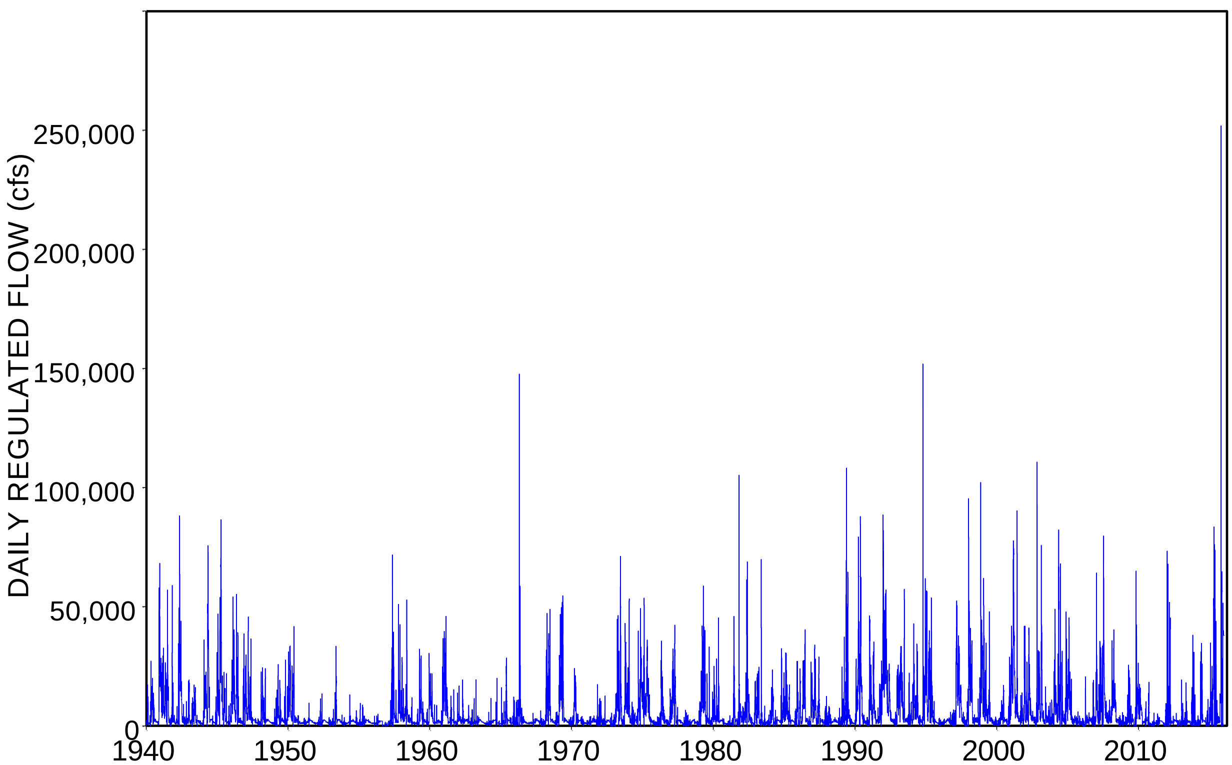


Figure 4.7 Daily Regulated Flows at Control Point 8TTRO on the Trinity River at Romayor

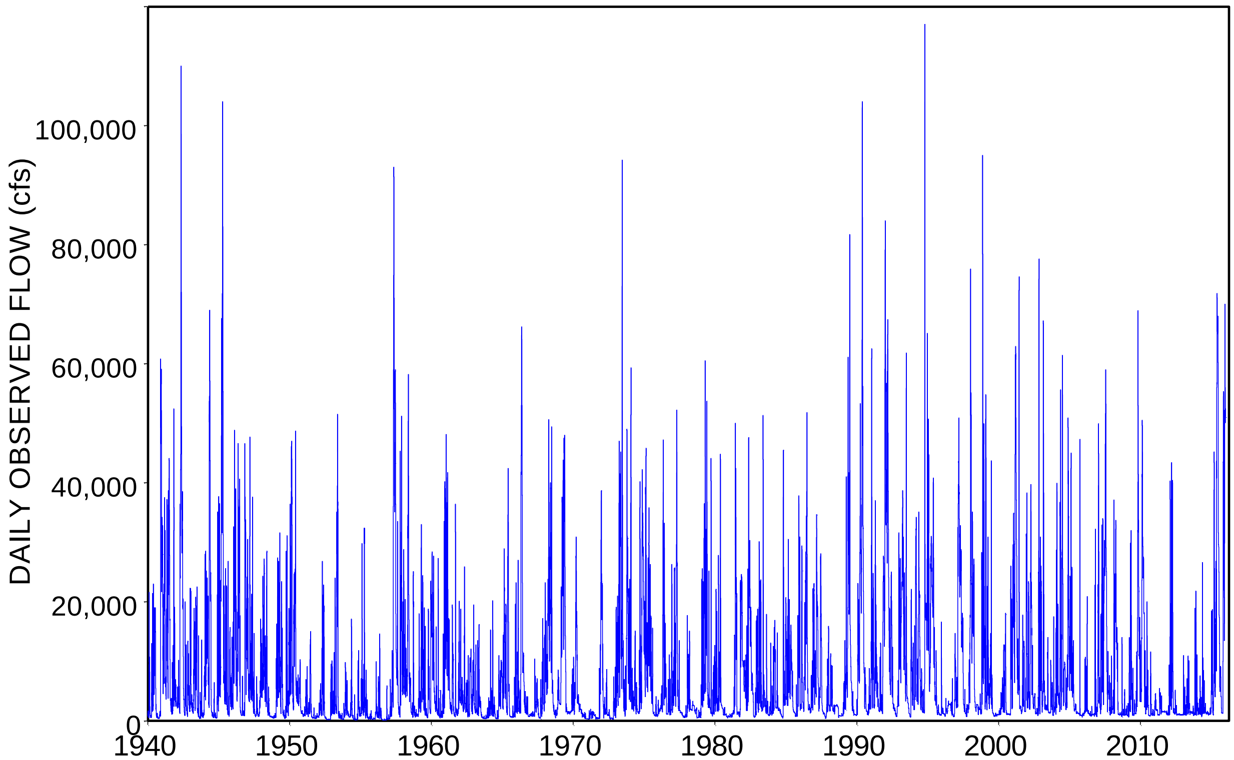


Figure 4.8 Daily Observed Flows at Control Point 8TTRO on the Trinity River at Romayor

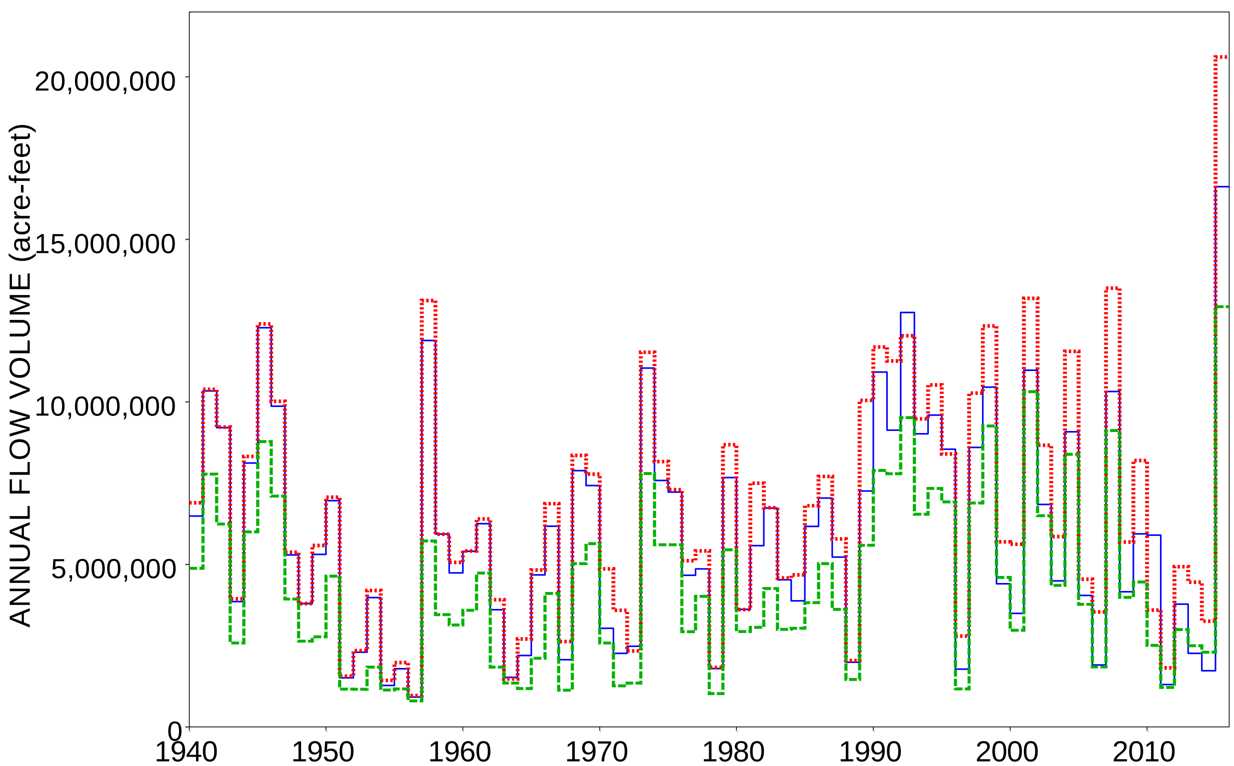


Figure 4.9 Annual Volumes of Naturalized (red dotted line), Regulated (green dashed line), and Observed (blue solid line) Flows at Control Point 8TTRO

Naturalized, regulated, and gaged 1940-2015 mean daily flow rates in cfs at control point 8TTRO at the USGS gage on the Trinity River near Romayor are plotted in Figures 4.6, 4.7, and 4.8. This is the most downstream gage. Similar plots of the 27,759 daily naturalized flows for the other 12 control points in Table 4.1 are presented in Appendix J. The WAM naturalized daily flow volumes in acre-feet are converted to mean daily flow rates in cfs for consistency in comparing with the observed flows.

Annual volumes in acre-feet for naturalized, regulated, and gaged flows during the 76 years of 1940-2015 at control point 8TRRO are compared in Figure 4.9. Similar plots of annual flow volumes at the other 12 control points are presented in Appendix L. The relative magnitude of actual observed and simulated naturalized and regulated annual flow volumes are compared by these plots.

Frequency statistics for daily naturalized and regulated flows are compared in Table 4.13. The frequency analysis is performed with the 6FRE routine in *TABLES*. The mean and standard deviation are computed for the 27,759 days of the 1940-2015 simulation. Flow rates that are equaled or exceeded specified percentages of the time are based on the relative frequency formula:

$$\text{exceedance frequency} = \frac{m}{N}(100\%)$$

where m is the relative rank from 1 to 27,759 with 1 being the largest and N is the 27,759 days.

Frequency metrics are tabulated in Table 4.13 for the 13 sites included in Table 4.1 that serve as WAM control points. The Figure 4.2 IDs and control point identifiers are listed in the first and third columns of Table 4.1 and the first two rows of 4.13. Frequency statistics in are tabulated in Table 4.13 for naturalized (Nat) and regulated (Reg) flows in cfs. Frequency statistics for regulated flows are also shown as a percentage of naturalized flows. The third column for each site, labeled Reg (%), is computed as:

$$\text{Reg (\%)} = \left(\frac{\text{Reg}}{\text{Nat}}\right)(100\%)$$

Table 4.13
Frequency Statistics for Naturalized and Regulated Flows

ID	T1			T2			T3		
CP	8BSBR			8CTFW			8WTFW		
Flow	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)
Mean	76.40	70.58	92.4%	169.5	137.3	81.0%	636.9	317.4	49.8%
Std Dev	475.5	455.3	95.8%	813.2	497.3	61.2%	2,235	1,399	62.6%
Minimum	0.00	0.00		0.00	0.00		0.00	0.00	
99.50%	0.00	0.00		0.00	0.00		0.00	0.00	
99%	0.00	0.00		0.00	0.00		0.00	3.03	
98%	0.00	0.00		0.00	3.03		0.00	3.03	
95%	0.00	0.00		0.00	3.30		0.00	3.30	
90%	0.00	0.00		0.00	4.23		0.00	3.86	
85%	0.00	0.00		0.69	4.82	702.9%	15.48	4.36	28.2%
80%	0.00	0.00		2.76	5.48	198.4%	33.46	5.48	16.4%

75%	0.00	0.00		5.00	6.61	132.2%	49.13	6.83	13.9%
70%	0.00	0.00		8.31	8.48	102.1%	64.96	11.38	17.5%
60%	1.00	0.98	98.5%	15.55	12.95	83.3%	101.6	24.55	24.2%
50%	3.65	3.40	93.2%	25.93	19.41	74.8%	144.2	42.61	29.6%
40%	8.50	8.00	94.1%	44.14	30.86	69.9%	202.7	72.17	35.6%
30%	15.20	14.53	95.6%	77.01	54.68	71.0%	307.8	126.3	41.0%
25%	20.86	19.74	94.7%	101.4	79.7	78.6%	401.0	176.6	44.1%
20%	30.00	28.04	93.5%	138.0	125.1	90.7%	537.7	283.0	52.6%
15%	47.95	43.99	91.8%	195.2	259.4	132.9%	762.3	575.1	75.4%
10%	90.05	82.73	91.9%	304.5	600.0	197.1%	1,252	678.7	54.2%
5%	249.3	227.0	91.1%	614.1	600.0	97.7%	2,561	1,071	41.8%
2%	804.5	711.0	88.4%	1,410	600.0	42.6%	5,034	2,382	47.3%
1%	1,573	1,443	91.7%	2,313	1,061	45.9%	9,342	4,302	46.1%
0.50%	2,690	2,372	88.2%	4,007	1,858	46.4%	14,923	7,415	49.7%
Maximum	25,698	25,698	100.0%	42,474	25,523	60.1%	70,446	54,969	78.0%

Table 4.14 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	T4			T5			T7		
CP	8WTGP			8TRDA			8TRRS		
Flow	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)
Mean	849.2	487.9	57.5%	2,412	1,005	41.7%	3,759	2,016	53.6%
Std Dev	2,664	1,753	65.8%	7,370	2,964	40.2%	9,328	4,576	49.1%
Minimum	0.00	0.00		0.00	0.00		0.00	0.04	
99.50%	0.00	3.03		0.00	0.00		0.00	2.80	
99%	0.00	3.06		0.00	0.00		0.00	2.83	
98%	0.00	3.18		0.00	3.03		0.00	3.06	
95%	0.00	3.86		0.00	3.30		0.00	3.57	
90%	10.73	5.17	48.1%	45.57	4.36	9.6%	71.89	4.87	6.8%
85%	37.02	6.31	17.0%	98.52	5.48	5.6%	152.8	28.69	18.8%
80%	58.02	15.53	26.8%	144.1	20.34	14.1%	232.0	70.96	30.6%
75%	78.00	23.79	30.5%	194.2	39.29	20.2%	325.7	111.9	34.4%
70%	98.98	32.04	32.4%	249.5	60.06	24.1%	444.7	164.1	36.9%
60%	146.9	52.54	35.8%	369.2	112.9	30.6%	696.8	296.7	42.6%
50%	206.4	80.46	39.0%	520.0	190.8	36.7%	1,001	510.2	51.0%
40%	295.4	127.8	43.3%	760.0	294.7	38.8%	1,497	826.0	55.2%
30%	442.1	228.5	51.7%	1,189	515.3	43.3%	2,326	1,400	60.2%
25%	571.0	333.5	58.4%	1,538	687.7	44.7%	3,013	1,880	62.4%
20%	765.9	551.9	72.1%	2,129	964.1	45.3%	4,083	2,576	63.1%
15%	1,104	714.0	64.7%	3,135	1,492	47.6%	5,782	3,673	63.5%
10%	1,766	1,018	57.6%	5,125	2,499	48.8%	8,887	5,387	60.6%
5%	3,464	1,881	54.3%	10,589	4,659	44.0%	16,265	9,169	56.4%
2%	7,163	3,991	55.7%	21,459	8,812	41.1%	31,457	14,591	46.4%
1%	11,571	6,785	58.6%	34,201	12,472	36.5%	46,521	19,683	42.3%
0.50%	17,420	10,305	59.2%	49,398	18,297	37.0%	62,061	28,974	46.7%
Maximum	72,497	57,265	79.0%	159,494	84,119	52.7%	189,464	115,643	61.0%

Table 4.14 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	T8			T10			T12		
CP	8TRTR			8TEST			8TROA		
Flow	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)
Mean	4,203	2,484	59.1%	88.36	88.33	100.0%	6,278	3,755	59.8%
Std Dev	9,452	5,692	60.2%	609.8	609.7	100.0%	12,504	7,718	61.7%
Minimum	0.00	0.00		0.00	0.00		0.00	0.20	
99.50%	0.00	2.75		0.00	0.00		0.00	2.92	
99%	0.00	2.75		0.00	0.00		0.00	3.14	
98%	0.00	2.78		0.00	0.00		0.00	3.47	
95%	3.14	3.00	95.7%	0.00	0.00		41.93	4.60	11.0%
90%	95.86	3.97	4.1%	0.00	0.00		200.8	52.3	26.0%
85%	179.3	7.80	4.3%	0.00	0.00		358.7	142.4	39.7%
80%	273.9	57.51	21.0%	0.02	0.02	100.0%	511.0	224.1	43.9%
75%	383.7	104.7	27.3%	0.05	0.05	100.0%	692.0	315.7	45.6%
70%	510.0	168.8	33.1%	0.20	0.20	100.0%	894.0	424.5	47.5%
60%	792.9	349.3	44.1%	0.67	0.67	100.0%	1,302	690.0	53.0%
50%	1,176	605.1	51.5%	1.78	1.78	100.0%	1,956	1,077	55.1%
40%	1,775	1,002	56.4%	4.00	4.00	100.0%	2,989	1,753	58.6%
30%	2,823	1,715	60.8%	8.00	8.00	100.0%	4,780	2,850	59.6%
25%	3,631	2,272	62.6%	12.00	11.99	99.9%	6,228	3,748	60.2%
20%	4,927	3,111	63.2%	18.00	17.99	99.9%	8,284	5,006	60.4%
15%	6,908	4,386	63.5%	30.66	30.65	100.0%	11,305	6,973	61.7%
10%	10,312	6,571	63.7%	72.00	71.98	100.0%	16,024	10,262	64.0%
5%	18,579	11,362	61.2%	292.0	292.0	100.0%	26,930	16,684	62.0%
2%	33,688	19,046	56.5%	1,020	1,020	100.0%	46,155	24,845	53.8%
1%	48,726	26,406	54.2%	1,955	1,954	99.9%	63,233	35,208	55.7%
0.50%	61,646	35,168	57.0%	3,192	3,192	100.0%	79,936	46,385	58.0%
Maximum	179,648	146,782	81.7%	42,000	41,993	100.0%	254,947	210,844	82.7%

Table 4.14 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	T14			T15			T16		
CP	8TRCR			8TRMI			8TRRI		
Flow	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)	Nat (cfs)	Reg (cfs)	Reg (%)
Mean	6,670	4,137	62.0%	7,330	4,795	65.4%	8,123	5,583	68.7%
Std Dev	12,242	7,965	65.1%	12,938	8,718	67.4%	13,448	9,564	71.1%
Minimum	0.00	2.69		0.00	2.69		0.00	2.69	0.00
99.50%	0.00	2.72		0.00	2.94		0.00	2.92	0.00
99%	0.00	2.74		0.00	3.14		0.00	3.12	0.00
98%	0.00	2.94		38.28	3.63	9.5%	70.76	3.63	5.1%
95%	123.6	3.8	3.1%	162.6	6.96	4.3%	184.6	44.8	24.3%
90%	257.2	4.9	1.9%	358.2	178.1	49.7%	390.9	193.5	49.5%
85%	409.4	122.3	29.9%	559.7	297.2	53.1%	633.1	323.6	51.1%
80%	583.7	232.1	39.8%	772.9	425.4	55.0%	865.4	464.9	53.7%

75%	777.8	336.5	43.3%	1,005	579.7	57.7%	1,122	634.6	56.6%
70%	1,002	468.5	46.8%	1,250	734.4	58.7%	1,396	832.4	59.6%
60%	1,552	788.2	50.8%	1,859	1,120	60.2%	2,119	1,303	61.5%
50%	2,336	1,275	54.6%	2,719	1,683	61.9%	3,158	2,034	64.4%
40%	3,608	2,032	56.3%	4,142	2,618	63.2%	4,787	3,145	65.7%
30%	5,575	3,324	59.6%	6,325	4,092	64.7%	7,434	4,958	66.7%
25%	7,165	4,353	60.8%	8,084	5,292	65.5%	9,413	6,341	67.4%
20%	9,367	5,789	61.8%	10,508	6,865	65.3%	11,988	8,279	69.1%
15%	12,443	7,951	63.9%	13,725	9,309	67.8%	15,587	10,988	70.5%
10%	16,949	11,295	66.6%	18,557	12,906	69.6%	21,044	15,093	71.7%
5%	27,049	17,565	64.9%	29,348	19,863	67.7%	32,211	23,004	71.4%
2%	45,152	28,662	63.5%	47,444	30,337	63.9%	49,703	34,781	70.0%
1%	62,540	38,546	61.6%	64,724	37,842	58.5%	65,436	43,165	66.0%
0.50%	81,801	48,354	59.1%	80,730	50,286	62.3%	85,584	56,791	66.4%
Maximum	207,599	171,362	82.5%	273,090	258,149	94.5%	228,989	218,597	95.5%

Table 4.14 Continued
Frequency Statistics for Naturalized and Regulated Flows

ID	T17		
CP	8TRRO		
Flow	Nat (cfs)	Reg (cfs)	Reg (%)
Mean	9,109	5,973	65.6%
Std Dev	13,987	10,144	72.5%
Minimum	0.00	2.69	
99.50%	0.00	3.67	
99%	0.00	5.17	
98%	64.74	160.0	247.1%
95%	228.1	598.7	262.5%
90%	482.5	935.7	193.9%
85%	736.4	1,049	142.5%
80%	1,027	1,151	112.0%
75%	1,354	1,292	95.4%
70%	1,706	1,414	82.9%
60%	2,542	1,741	68.5%
50%	3,762	2,133	56.7%
40%	5,650	2,556	45.2%
30%	8,803	4,114	46.7%
25%	11,093	5,804	52.3%
20%	13,951	8,184	58.7%
15%	17,832	11,288	63.3%
10%	23,878	15,957	66.8%
5%	35,610	25,098	70.5%
2%	53,349	39,145	73.4%
1%	68,954	50,400	73.1%
0.50%	86,831	63,045	72.6%
Maximum	264,175	251,818	95.3%

The plots in Appendices I and J of 1940-2015 daily naturalized flows for the 13 sites in the Trinity River Basin and 25 sites in the Brazos River Basin demonstrate the great continuous fluctuation of river flows in Texas. Low flow variability tends to be hidden in plots of daily flows due to the plot scale required to show extreme high flood flows. The objective of the flow naturalization adjustment process is to develop homogeneous natural flow sequences by removing the effects (non-homogeneities) of water resources development and use. A visual inspection of the graphs in Appendices I and J indicate that the daily naturalized flow sequences appear to be stationary. Any non-stationarities that exist are hidden by the tremendous natural random variability.

Annual volumes in acre-feet/year of observed, naturalized, and regulated flow are tabulated in Appendices K and L. For convenient comparison, naturalized and regulated annual flow volumes are also shown as a percentage of observed annual flow volumes. Regulated flows are also shown as a percentage of naturalized flows. Naturalized and observed flows are about the same in the 1940s before extensive population and economic development and accompanying water resources development and river regulation. The differences between naturalized and observed flows increase over time with reservoir construction and increased water use. Both simulated regulated and naturalized flows sequences should be stationary with WAM regulated flows generally being significantly smaller than naturalized flows.

CHAPTER 5
SUMMARY AND CONCLUSIONS

Stream flow in the Brazos and Trinity River Basins is characterized by tremendous variability that includes continual short-term fluctuations, seasonality, and the extremes of severe multiple-year droughts and intense floods. The hydrologically most severe drought on record for the Brazos and Trinity River Basins and much of Texas began gradually in 1950 and ended in April-May 1957 with a widespread, devastating flood event. The Trinity and Brazos River Basins have never experienced extended hydrologic drought conditions as dramatic as 1950-1957 in combination with present or near-present population and economic development and associated water demands. The 2010-2014 drought is probably the second most hydrologically severe of the several extended droughts since 1940 in this region and much more economically damaging than earlier droughts due to the population and economic growth that has occurred. The recent major drought ended with high precipitation and stream flow during 2015-2016 that included multiple periods of severe flooding.

Population and economic growth and accompanying water resources development and use have impacted the flow characteristics of the Brazos and Trinity Rivers and their tributaries over the past 100 years. River flow is affected by reservoir storage, diversions to supply agricultural, municipal, and industrial needs, return flows from surface and groundwater sources, inter-basin transport of water, and land use changes. Reservoirs are an integral component of these river systems. Reservoir regulation is essential for reliable water supplies and significantly affects the timing and magnitude of downstream stream flow. Reservoir evaporation is a major water loss. The impacts of human activities on low flows is very different than on high flows. Regulation of rivers by dams reduces peak flood flows but increases low flows of many reaches of the Brazos and Trinity River Systems. Water supply diversions reduce flows but return flows from surface and groundwater sources stabilize low flows in rivers. The effects of reservoir storage and water use on daily flows versus monthly or annual flows are significantly different. Quantifying long-term changes is difficult due to the great natural variability of flows that hide long-term trends.

This report provides compilations and analyses of observed and computed flows designed to facilitate an improved understanding of flow characteristics and long-term changes in flow characteristics. The report focuses on observed flows at 47 USGS gaging stations on the Brazos and Trinity Rivers and their tributaries. Naturalized and regulated flows from developmental daily WAMs are also compiled and analyzed. Observed flows are non-stationary, reflecting the history of actual water resources development. WAM naturalized flows are based on observed flows but have been adjusted to remove the effects of historical water resources development and thus are essentially stationary with no long-term changes. The WAM regulated flows are also conceptually stationary, reflecting a specified condition of water resources development. The WAM regulated flows reflect the premises, assumptions, and approximations inherent in the modeling system.

River flow characteristics are displayed in this report using time series plots, frequency or duration plots, and an array of different types of computed statistical frequency metrics. The flow datasets discussed in the report are stored in data storage system (DSS) files which are readily accessible using HEC-DSSVue to develop additional graphs or frequency metric tabulations. The analyses focus on sequences of daily mean observed, naturalized, and regulated flows but aggregated monthly and annual flows are also presented.

The data compilation and computation tasks are performed with the HEC-DSSVue, HEC-SSF, and WRAP software packages. The combined application of these computer programs is concluded to be very effective. The DSS connects these different modeling and analysis tools. DSS files provide a convenient mechanism to store data for further continuing analysis and/or display.

A general overview of river system hydrology in Texas is presented in Chapter 2 that allows the Brazos and Trinity River Basins to be compared with the other river basins of the state. Chapters 3 and 4 focus specifically on the Brazos and Trinity River Basins, respectively. Chapters 3 and 4 describe the river systems and analyze flow characteristics primarily in terms of statistical frequency metrics. Comparative frequency analyses are presented for observed flows at USGS gages and WAM generated naturalized and regulated flows.

Observed daily flows are plotted in Appendices A and B for 30 and 17 gages in the Brazos and Trinity River Basins with long periods-of-record. WAM naturalized daily flows are plotted in Appendices I and J. The time series plots provide a clear visual display of stationarity or departures therefrom and the nature of the tremendous variability that characterize daily flows.

The flood frequency analyses of Appendices C and D are based on applying the log-Pearson type III probability distribution to observed annual series of peak daily flow rates to analyze extreme flood events. Minimum and maximum volume duration analyses are presented in Appendices E, F, G, and H to quantify frequency relationships of low and high flows for various time durations.

Annual volumes of observed, naturalized, and regulated flows at 25 and 13 control points in the Brazos and Trinity WAMs are compared in Appendices K and L. These comparisons provide insight on the changes in annual flow volumes that have occurred over time.

Recent hydrology updates and improvements for the Brazos and Trinity WAMs support and complement this study. The primary objective of the other parallel complementary work was to update and improve the WAM hydrology input data, but the data compilations are also designed to support further investigations of flow characteristics. The products of the Brazos and Trinity WAM hydrology updates are sets of DSS files of observed and naturalized daily and monthly flows documented in detail by reports [31, 32]. Flows are compiled for about 70 gage sites in the Brazos River Basin and 40 gage sites in the Trinity River Basin which include essentially all of the USGS gages with long periods of record. The DSS files are conveniently accessible with HEC-DSSVue.

References

1. Hydrologic Engineering Center, *HEC-DSSVue HEC Data Storage System Visual Utility Engine, User's Manual*, Version 2.0, CPD-86, U.S. Army Corps of Engineers, October 2010.

2. Hydrologic Engineering Center, *HEC-SSP Statistical Software Package, User's Manual*, Version 2.0, CPD-78, U.S. Army Corps of Engineers, Davis, CA, July 2009.

3. *Water Rights Analysis Package Modeling System (WRAP) Reference Manual*, R. Wurbs, TWRI TR-255, 11th Edition, 405 pages, August 2015.

4. *Water Rights Analysis Package (WRAP) Modeling System Users Manual*, R. Wurbs, TWRI TR-256, 11th Edition, 182 pages, August 2015.

5. R.A. Wurbs, *Fundamentals of Water Availability Modeling with WRAP*, R. Wurbs, TWRI TR-283, 7th Edition, 120 pages, August 2013.

6. *Water Rights Analysis Package (WRAP) River System Hydrology*, R. Wurbs, TWRI TR-431, 2nd Edition, 195 pages, August 2013.

7. *Water Rights Analysis Package (WRAP) Daily Modeling System*, R. Wurbs and R. Hoffpauir, TWRI TR-430, 2nd Edition, 286 pages, August 2015.

8. *Salinity Simulation with WRAP*, R. Wurbs, TWRI TR-317, 87 pages, July 2009.

9. *Water Rights Analysis Package Modeling System Programming Manual*, R. Wurbs and R. Hoffpauir, TWRI TR-388, 4rd Edition, 196 pages, August 2015.

10. "Texas Water Availability Modeling System," R. Wurbs, *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 131, No. 4, July/August 2005.

11. Daily Water Availability Models, R. Wurbs, Texas Commission on Environmental Quality, August 2015.

12. *Application of Expanded WRAP Modeling Capabilities to the Brazos WAM*, R. Wurbs, R. Hoffpauir, and S. Schnier, TWRI TR-389, 2nd Edition, 356 pages, August 2012.

13. *Application of Expanded WRAP Modeling Capabilities to the Colorado WAM*, R. Hoffpauir, M. Pauls, and R. Wurbs, for Texas Commission on Environmental Quality, 153 pages, September 2013.

14. *Daily Water Availability Model for the Trinity River Basin*, R. Hoffpauir, M. Pauls, and R. Wurbs, for Texas Commission on Environmental Quality, 109 pages, April 2014.

15. *Daily Water Availability Model for the Neches River Basin*, R. Wurbs, R. Hoffpauir, M. Pauls, M. Ryu, and A. Bista, for Texas Commission on Environmental Quality, 117 pages, July 2014.

16. *Daily Water Availability Model for the Sabine River Basin*, R. Wurbs, R. Hoffpauir, M. Pauls, M. Ryu, and A. Bista, for Texas Commission on Environmental Quality, 182 pages, July 2014.

17. *Daily Water Availability Model for the Guadalupe and San Antonio River Basins*, R. Wurbs, M. Ryu, M. Pauls, and R. Hoffpauir, for Texas Commission on Environmental Quality, 171 pages, August 2014.

18. *Environmental Flows in Water Availability Modeling*, R. Wurbs and R. Hoffpauir, TWRI TR-440, 285 pages, May 2013.

19. *Hydrologic Period-of-Analysis Extension for the Brazos River Basin and San Jacinto-Brazos Coastal Basin Water Availability Model*, R. Wurbs and G. Chun, for Texas Commission on Environmental Quality, 359 pages, October 2012.

20. *Hydrologic Period-of-Analysis Extension for the Colorado River Basin and Brazos-Colorado Coastal Basin Water Availability Model*, M. Pauls, R. Hoffpauir, and R. Wurbs, for Texas Commission on Environmental Quality, 455 pages, August 2013.

21. *Hydrologic Period-of-Analysis Extension for the Trinity River Basin Water Availability Model*, M. Pauls, R. Hoffpauir, and R. Wurbs, for Texas Commission on Environmental Quality, 219 pages, August 2013.

22. *Hydrologic Period-of-Analysis Extension for the Neches River Basin Water Availability Model*, M. Pauls and R. Wurbs, for Texas Commission on Environmental Quality, 103 pages, March 2014.

23. *Hydrologic Period-of-Analysis Extension for the Sabine River Basin Water Availability Model*, M. Pauls and R. Wurbs, for Texas Commission on Environmental Quality, 109 pages, March 2014.

24. *Hydrologic Period-of-Analysis Extension for the Guadalupe and San Antonio River Basins Water Availability Model*, M. Pauls and R. Wurbs, for Texas Commission on Environmental Quality, 317 pages, April 2014.

25. *Soil and Water Assessment Tool, Input/Output Documentation*, *Version 2012*, J.G. Arnold, J.R. Kiniry, R. Srinivasan, J.R. Williams, E.B. Haney, and S.L. Neitsch, TWRI TR- 439, 650 pages, 2012.

26. *River System Hydrology in Texas*, R. Wurbs and Y. Zhang, TWRI TR-461, 442 pages, August 2014.

27. *Water for Texas, 2017 State Water Plan*, Texas Water Development Board, Austin, Texas, 2016. http://www.twdb.texas.gov/waterplanning/swp/2017/index.asp

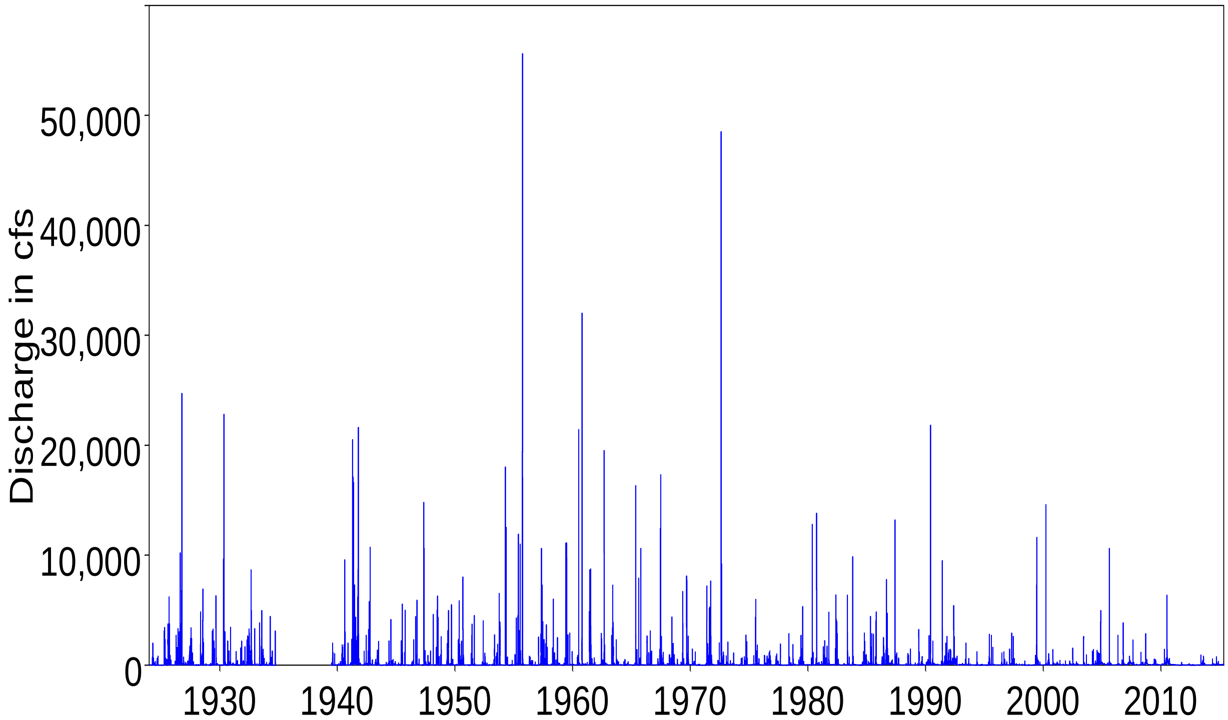
28. *Naturalized Flow Estimates for the Brazos River Basin and the San Jacinto-Brazos Coastal Basin*, Prepared by Freese and Nichols, Inc., HDR Engineering, Inc., Crespo Consulting Services, Inc., and Densmore and DuFrain Consulting for the Texas Natural Resource Conservation Commission, October 2001.

29. *Water Availability in the Brazos River Basin and the San Jacinto-Brazos Coastal Basin*, Prepared by HDR Engineering, Inc. for the Texas Natural Resource Conservation Commission, December 2001.

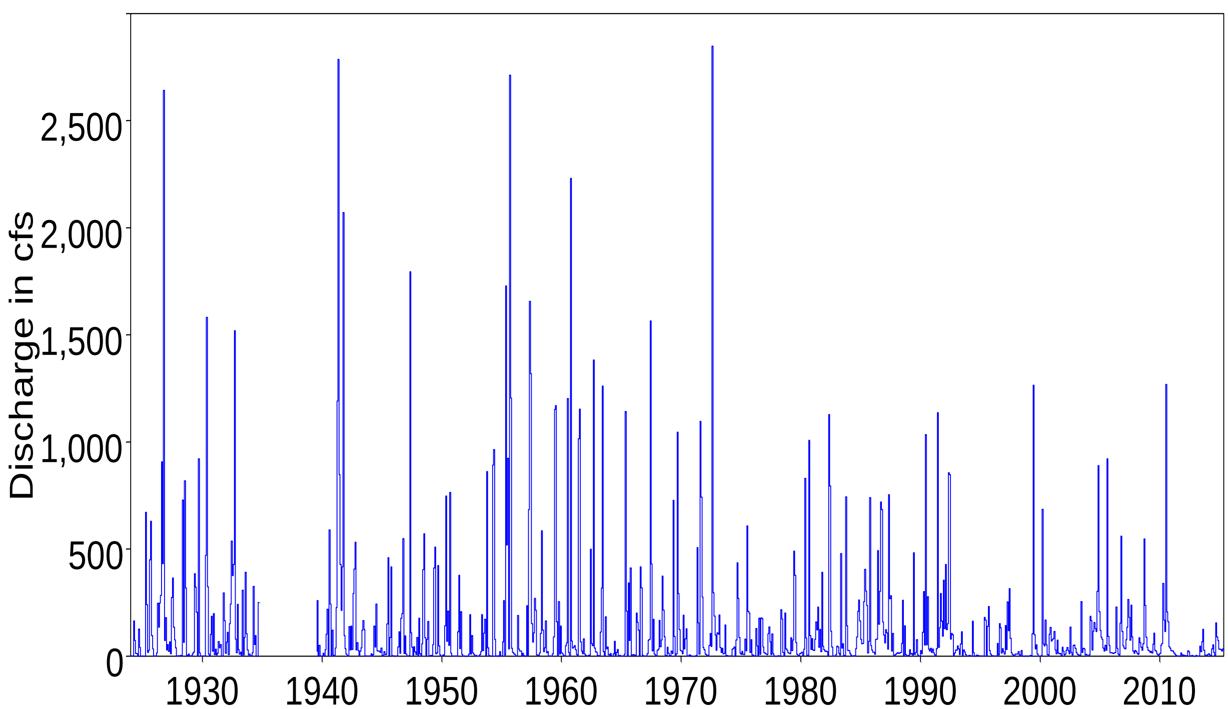
30. *Water Availability Models for the Trinity, Trinity-San Jacinto, and Neches-Trinity River Basins – Final Report*, Prepared by Espey Consultants, Inc. for the Texas Natural Resource Conservation Commission, March 2002.

31. *Hydrology Update of the Trinity River Basin Water Availability Model*, R.A. Wurbs, for Texas Commission on Environmental Quality, 53 pages, June 2016.

32. *Hydrology Update of the Brazos River Basin Water Availability Model*, R.A. Wurbs, for Texas Commission on Environmental Quality, 57 pages, June 2016.



Mean daily flow of the Double Mountain Fork near Aspermont B1



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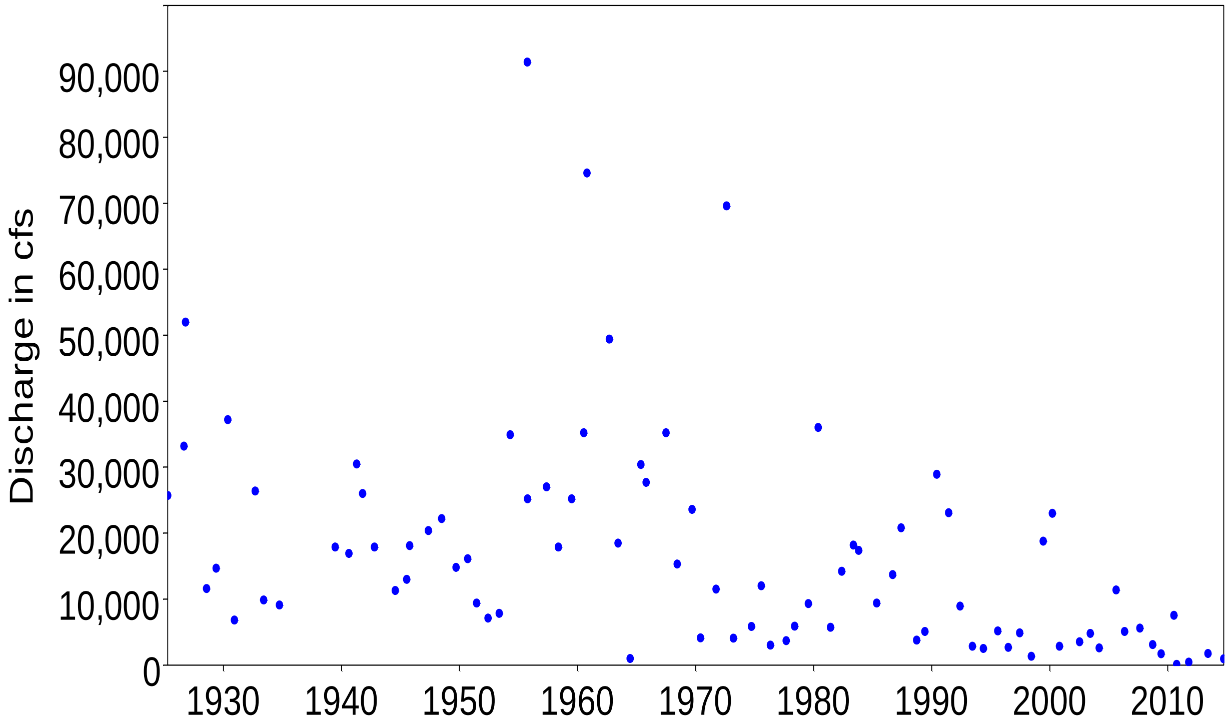

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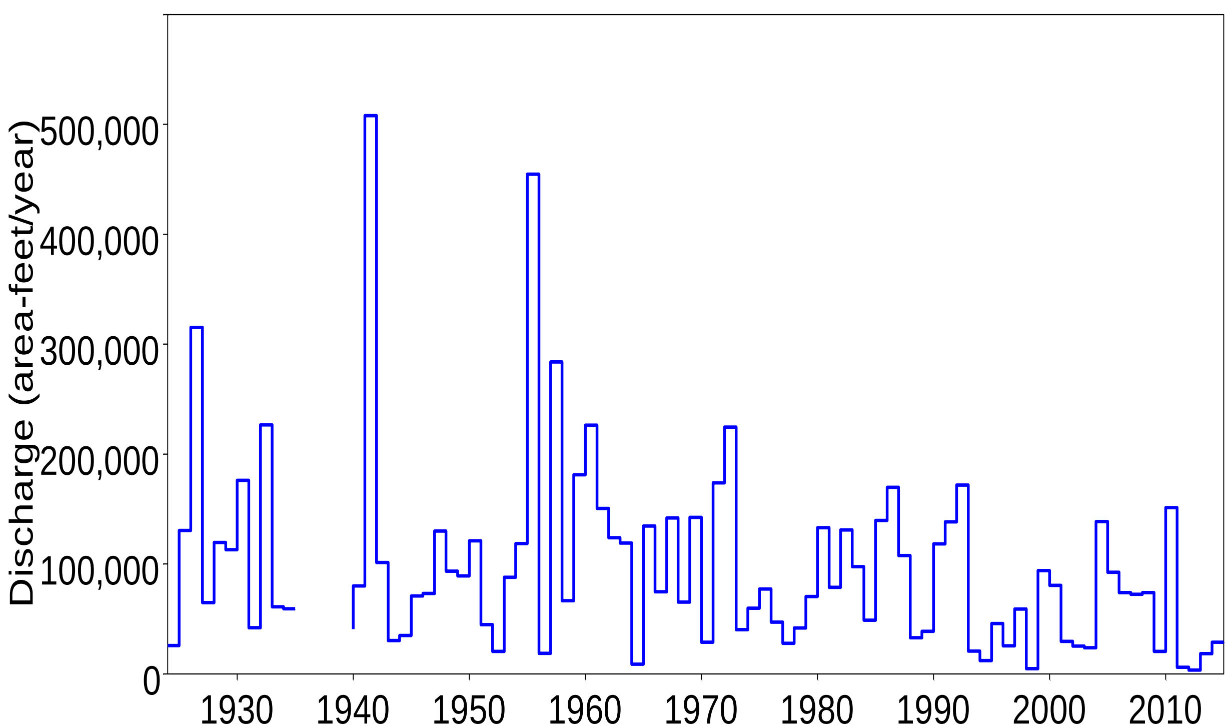

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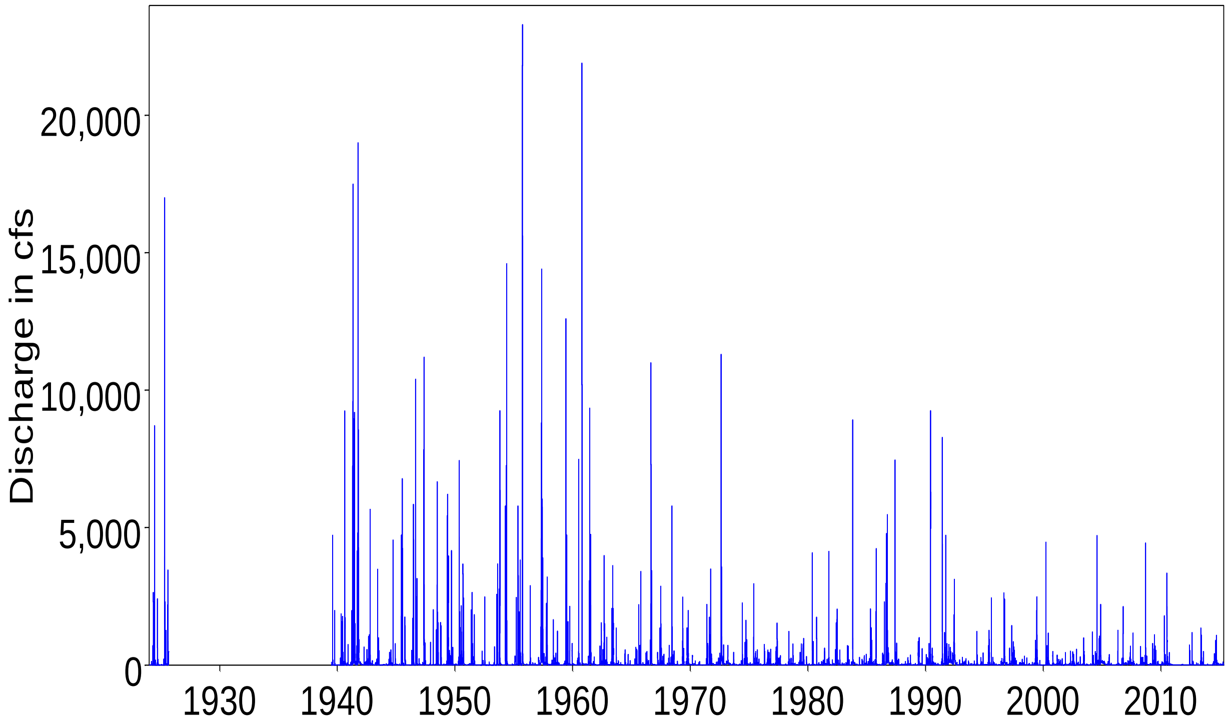
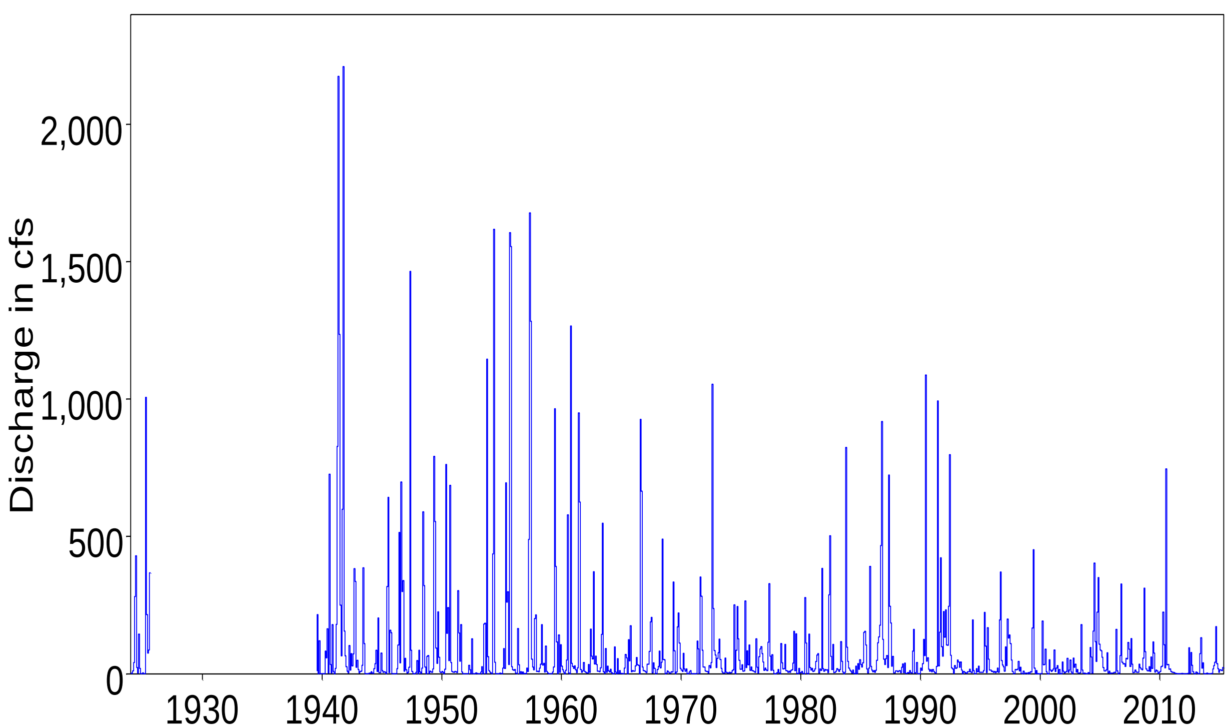
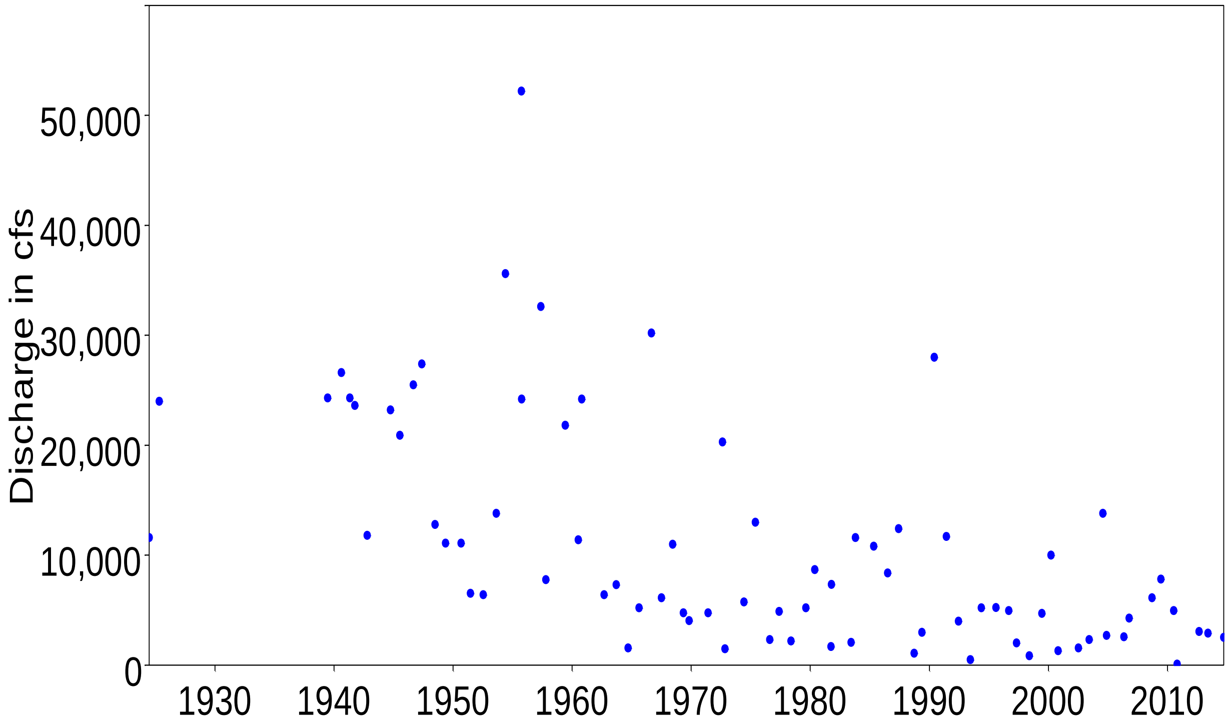


Mean daily flow of the Salt Fork Brazos River near Aspermont B2



Mean monthly flow of the Salt Fork Brazos River near Aspermont B2



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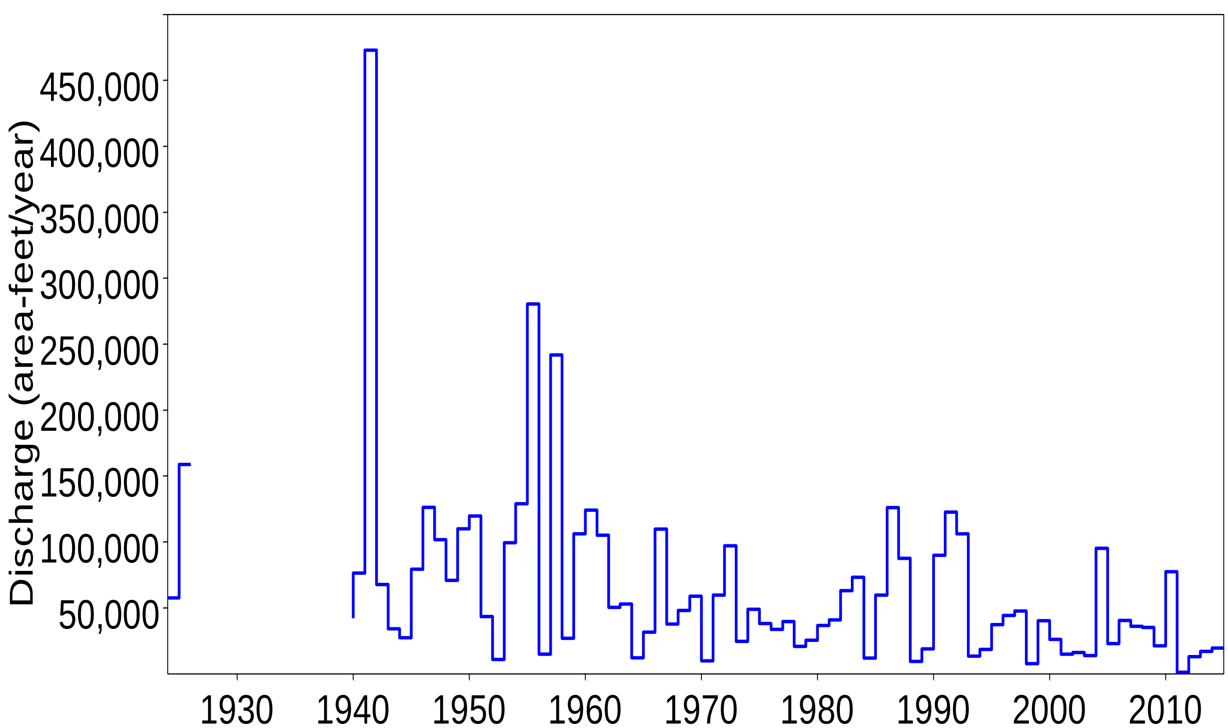

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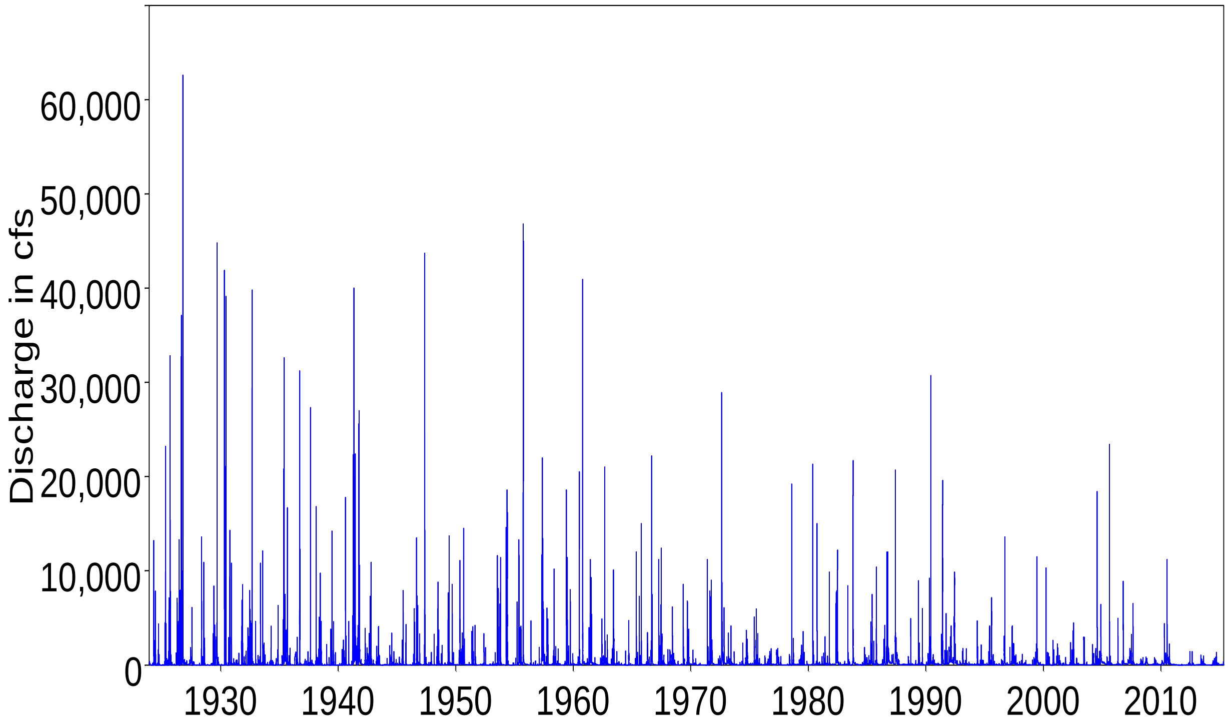
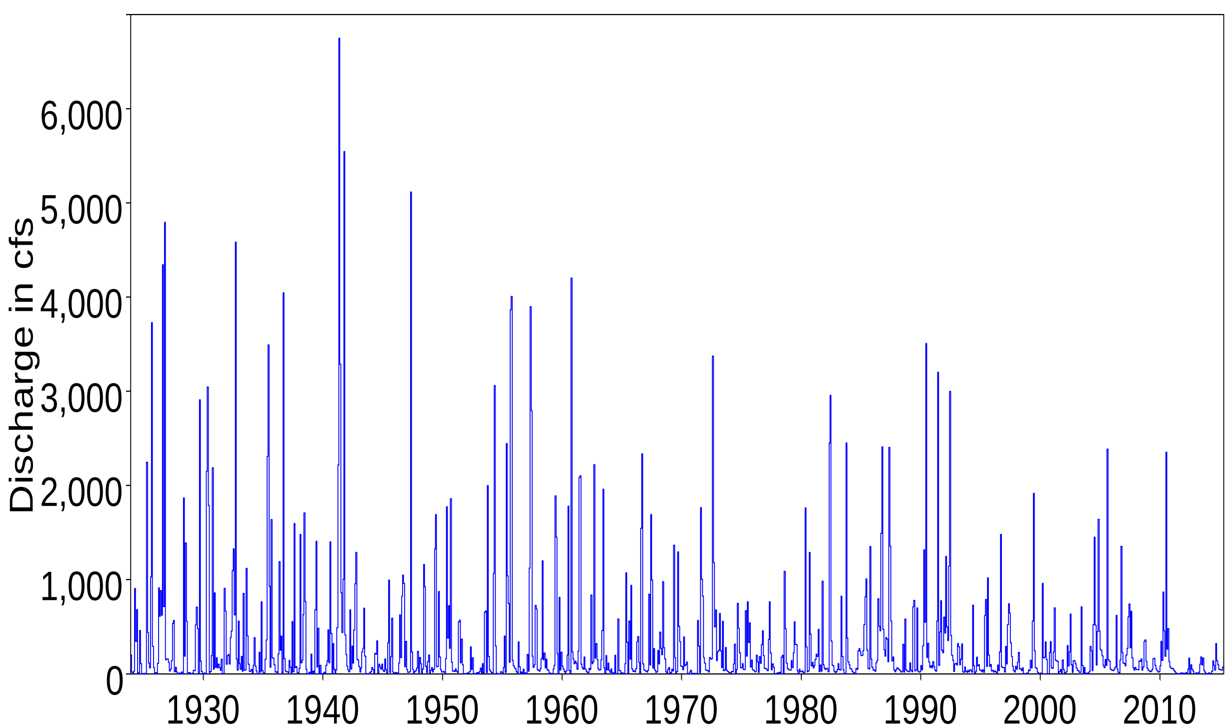
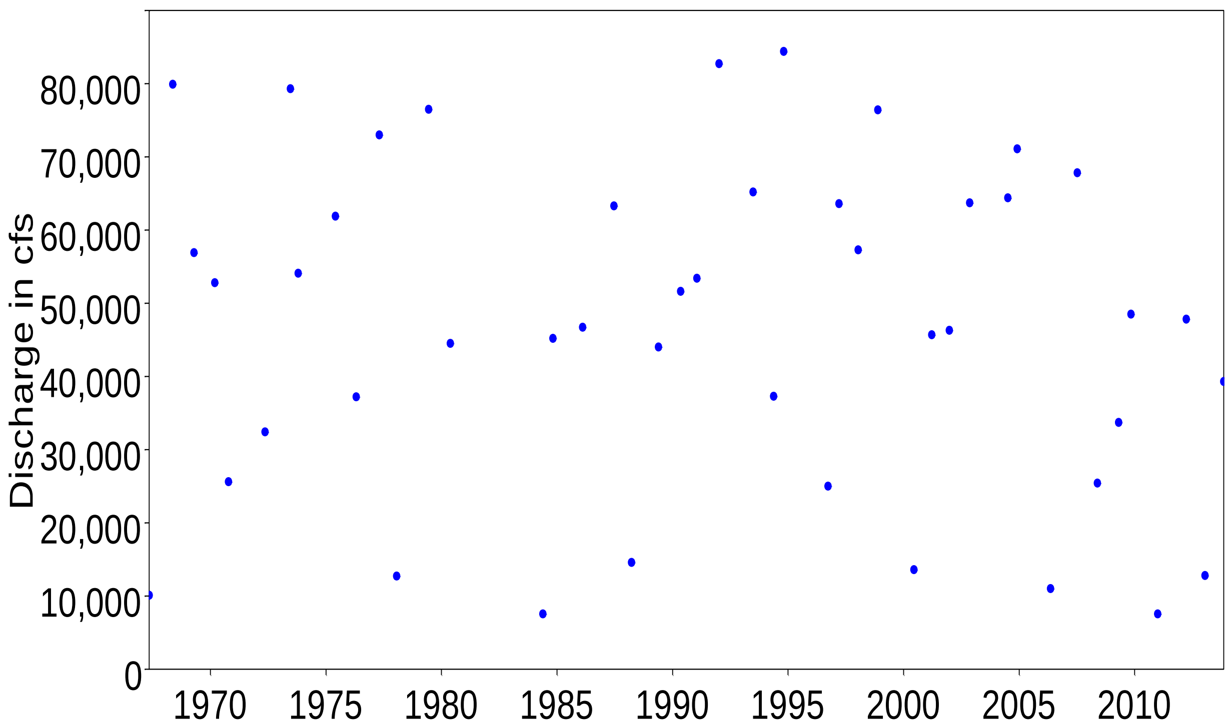


Mean daily flow of the Brazos River near Seymour B3



Mean monthly flow of the Brazos River near Seymour B3



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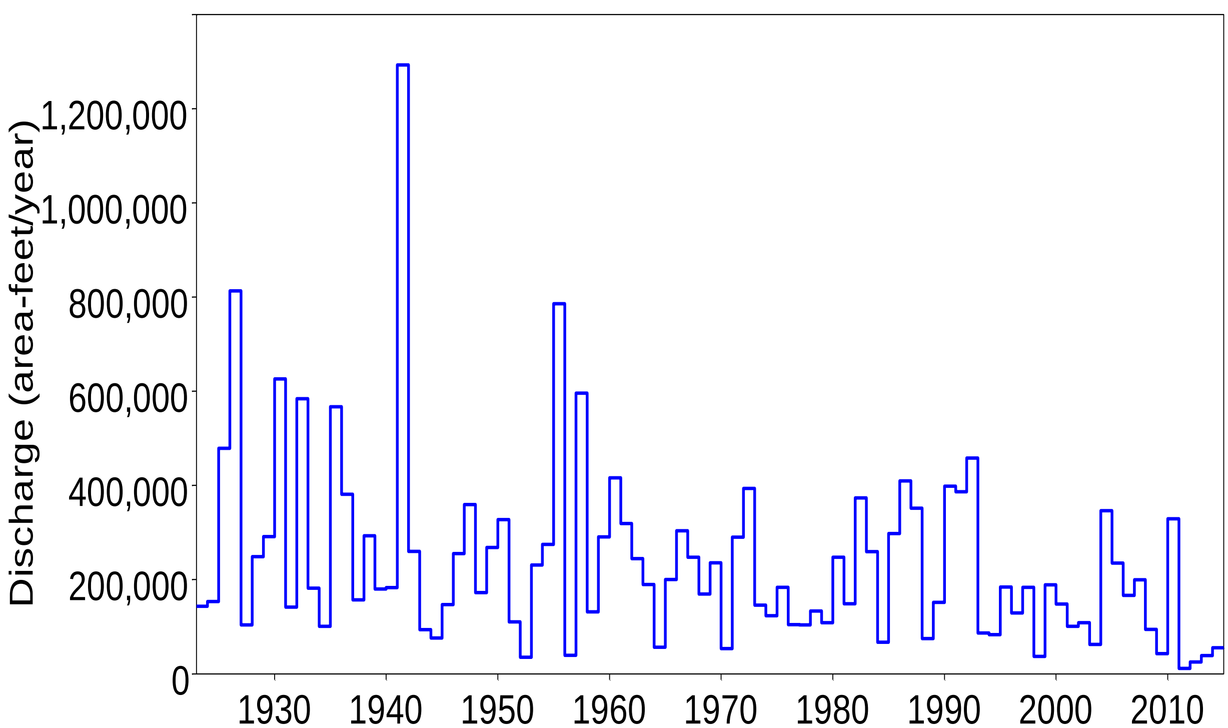

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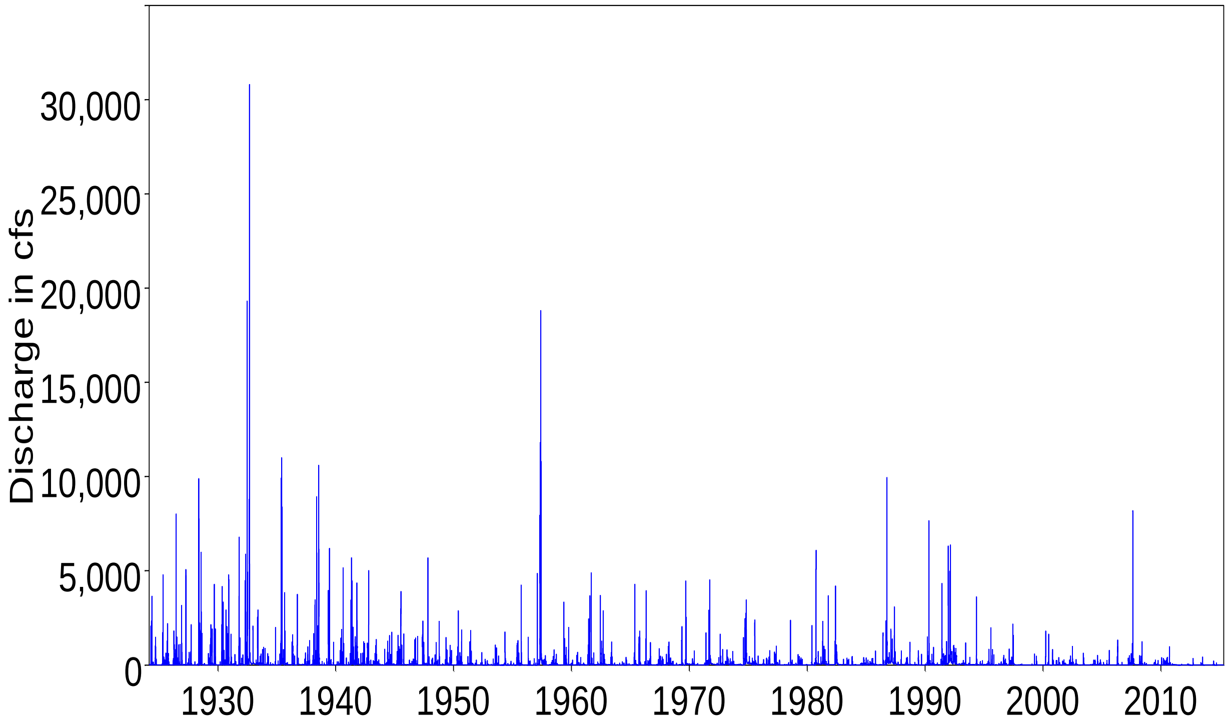
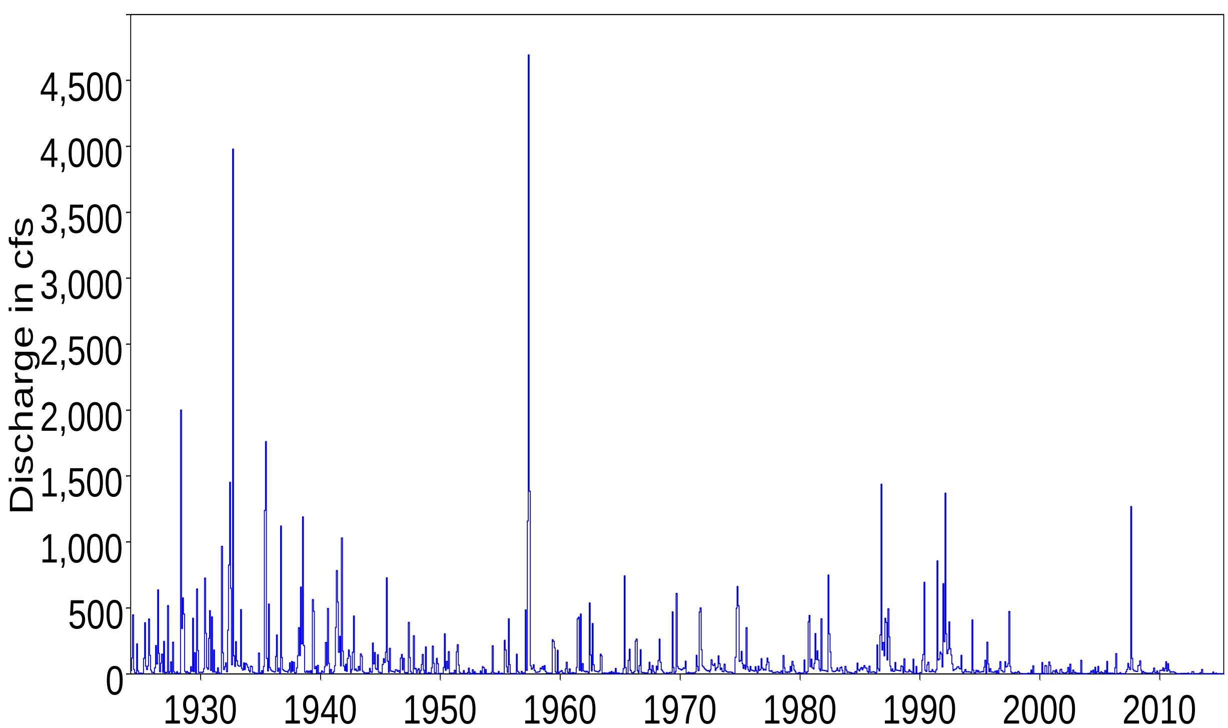
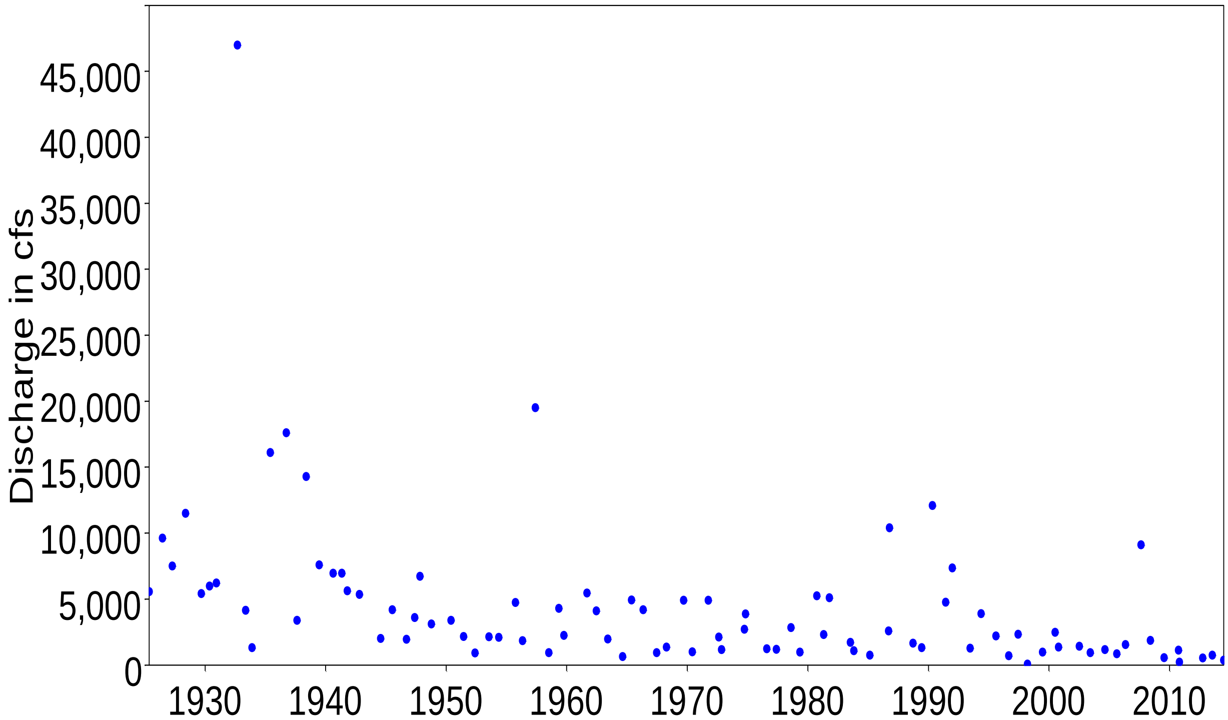


Mean daily flow of the Clear Fork Brazos near Nugent B4



Mean monthly flow of the Clear Fork Brazos near Nugent B4



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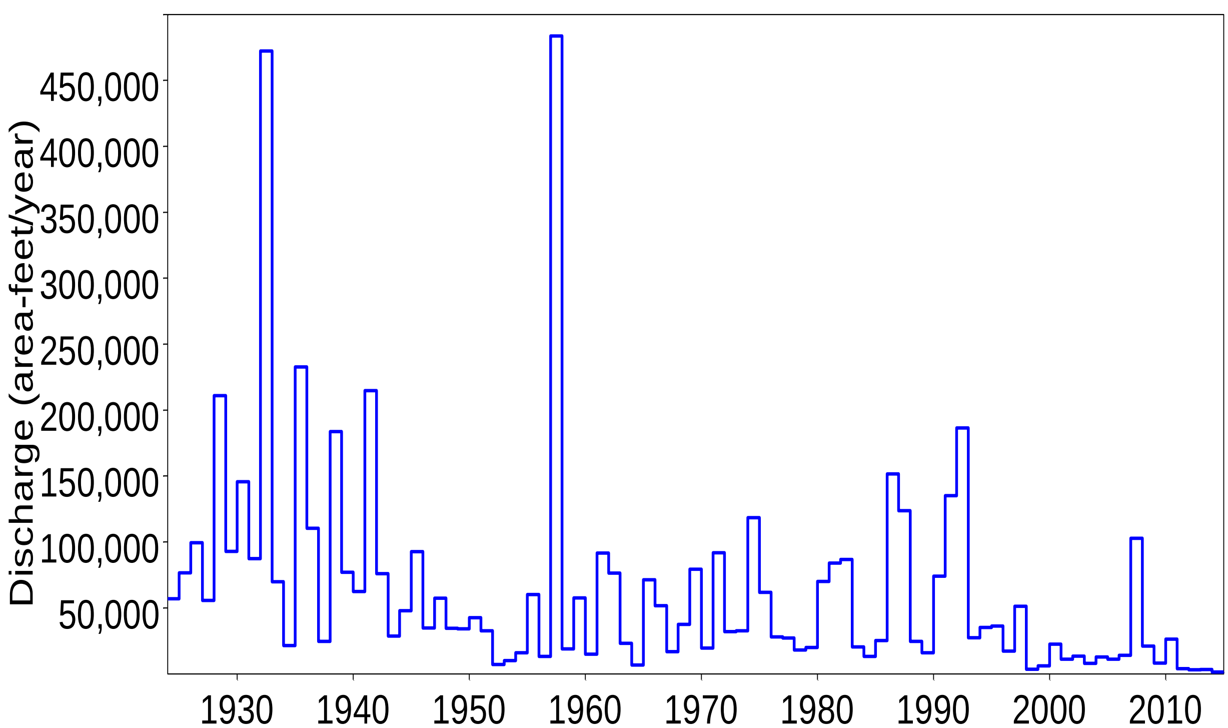

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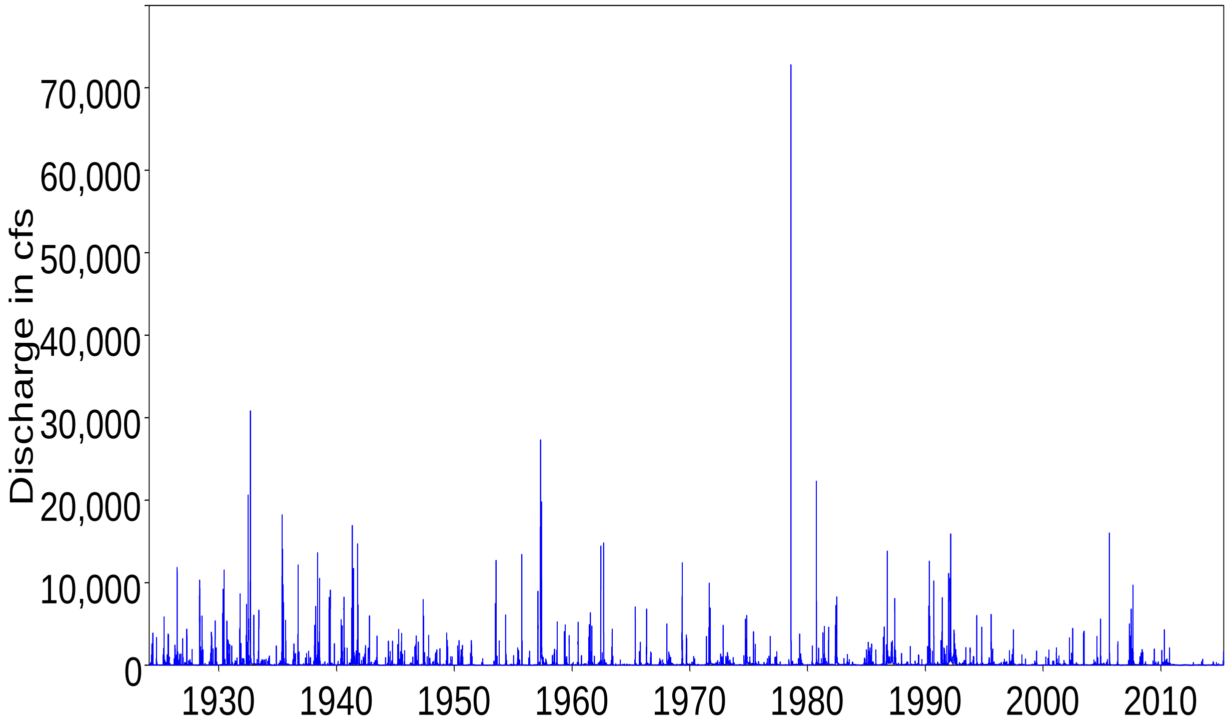
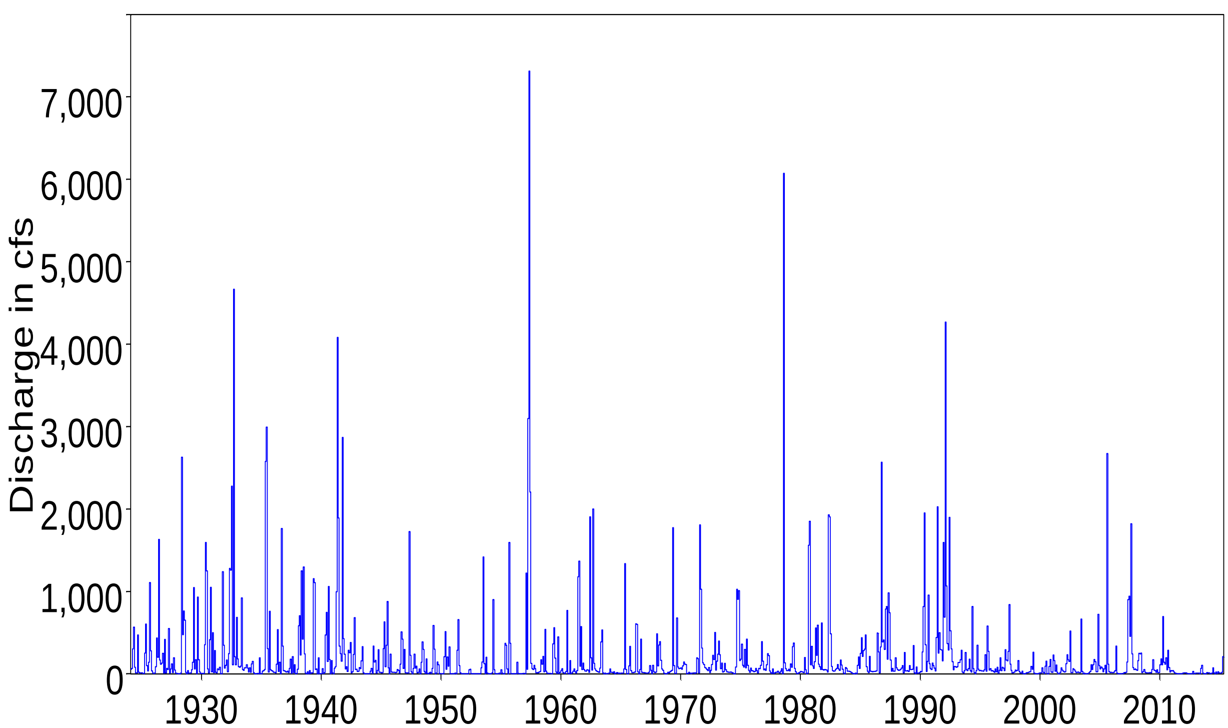
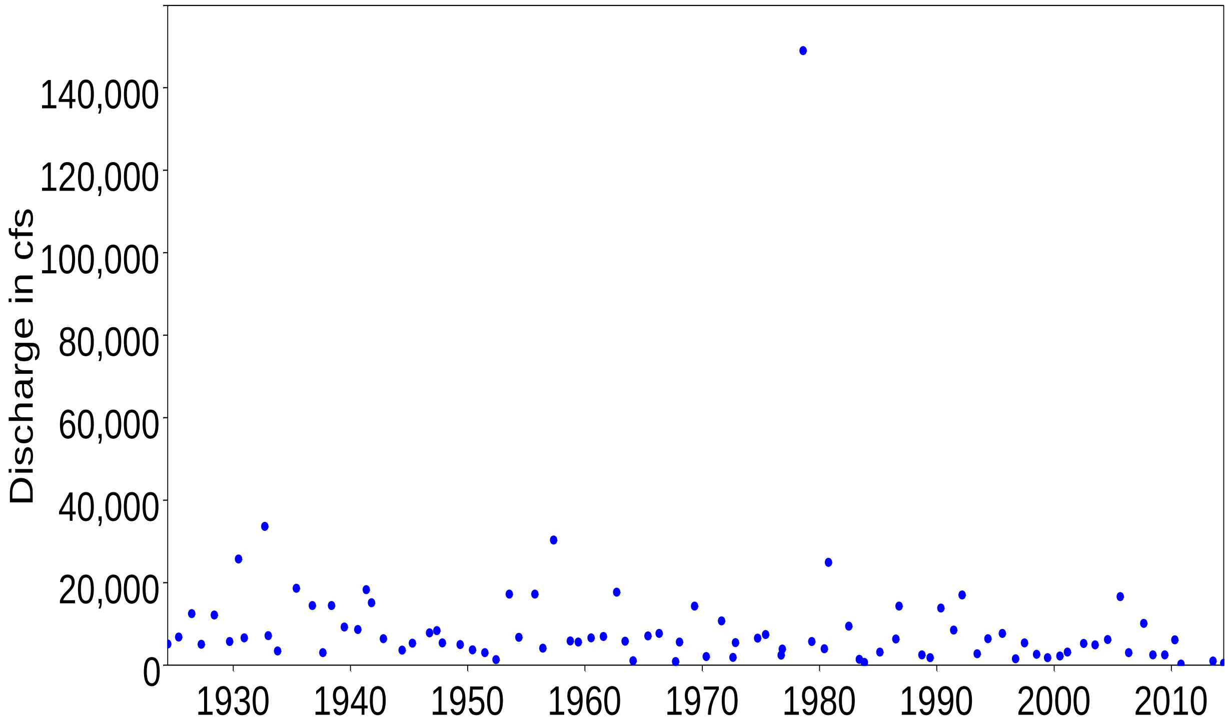


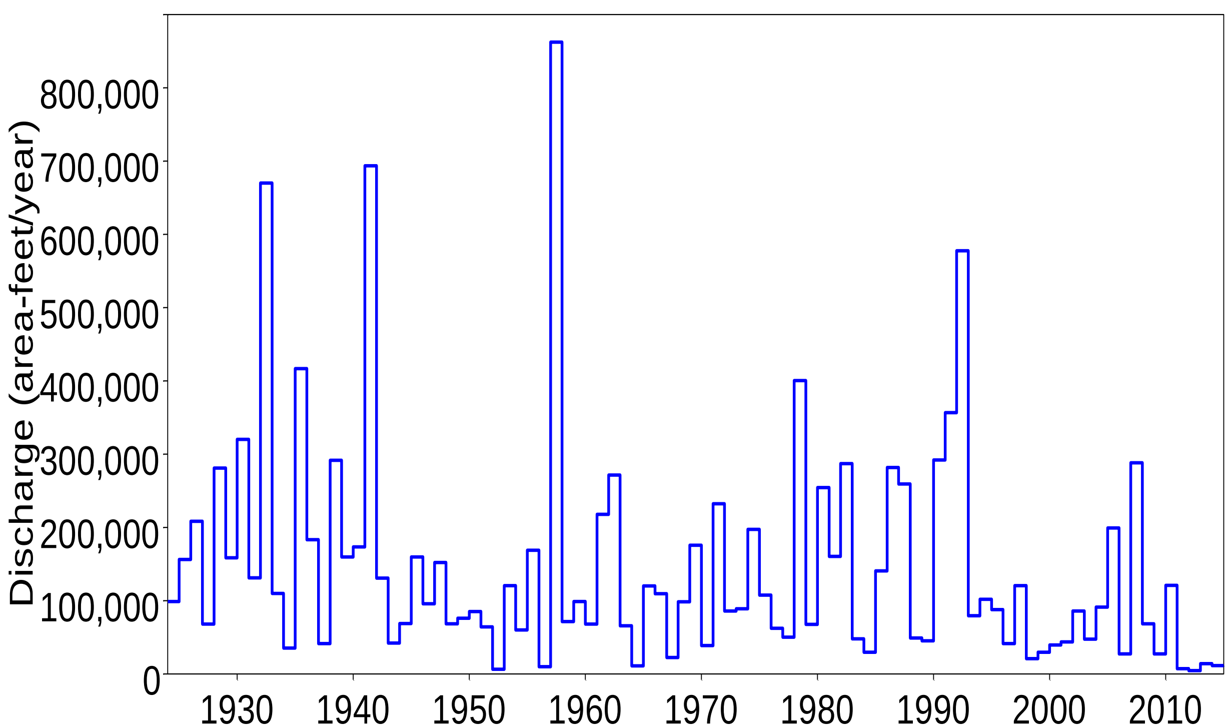
Mean daily flow of the Clear Fork Brazos near Fort Griffin B5



Mean monthly flow of the Clear Fork Brazos near Fort Griffin B5



Annual peak flow of the Clear Fork Brazos near Fort Griffin B5



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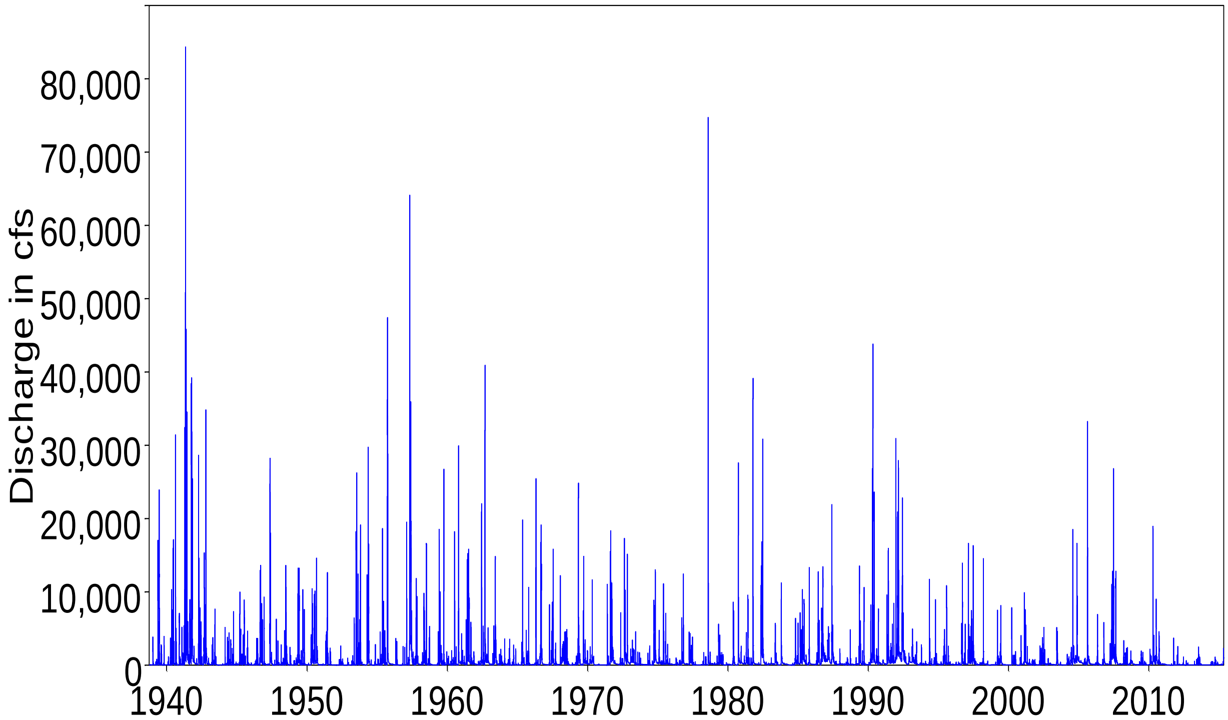
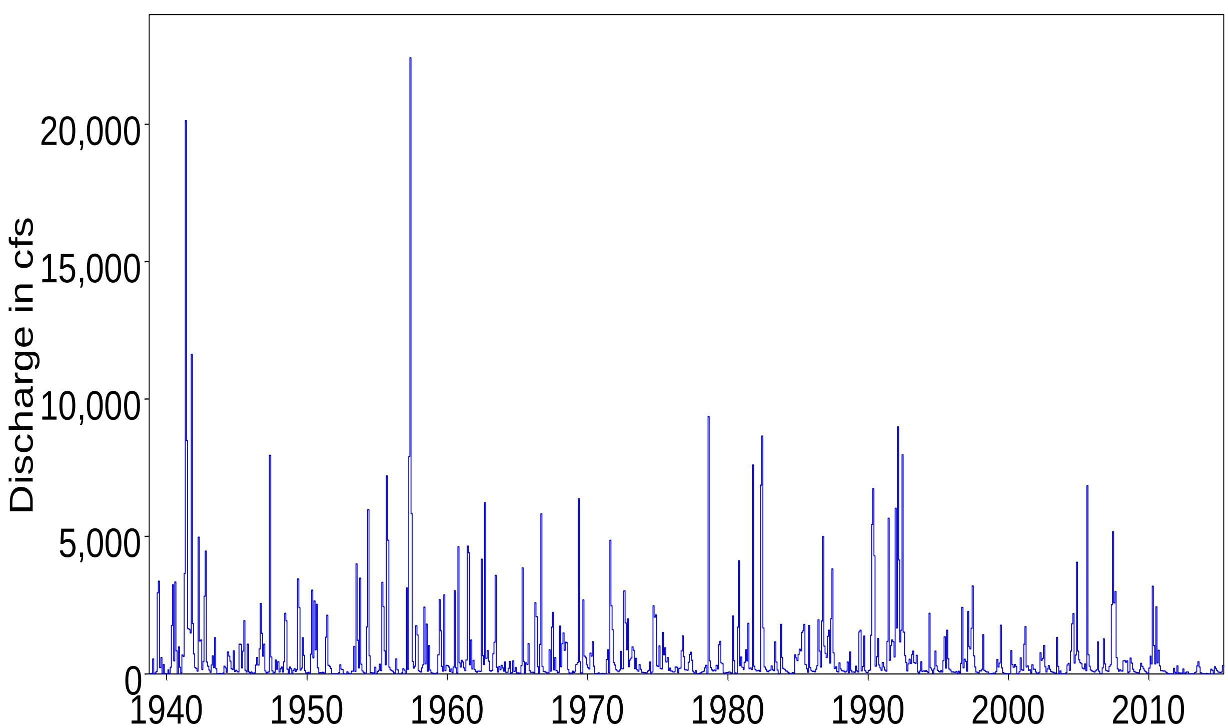
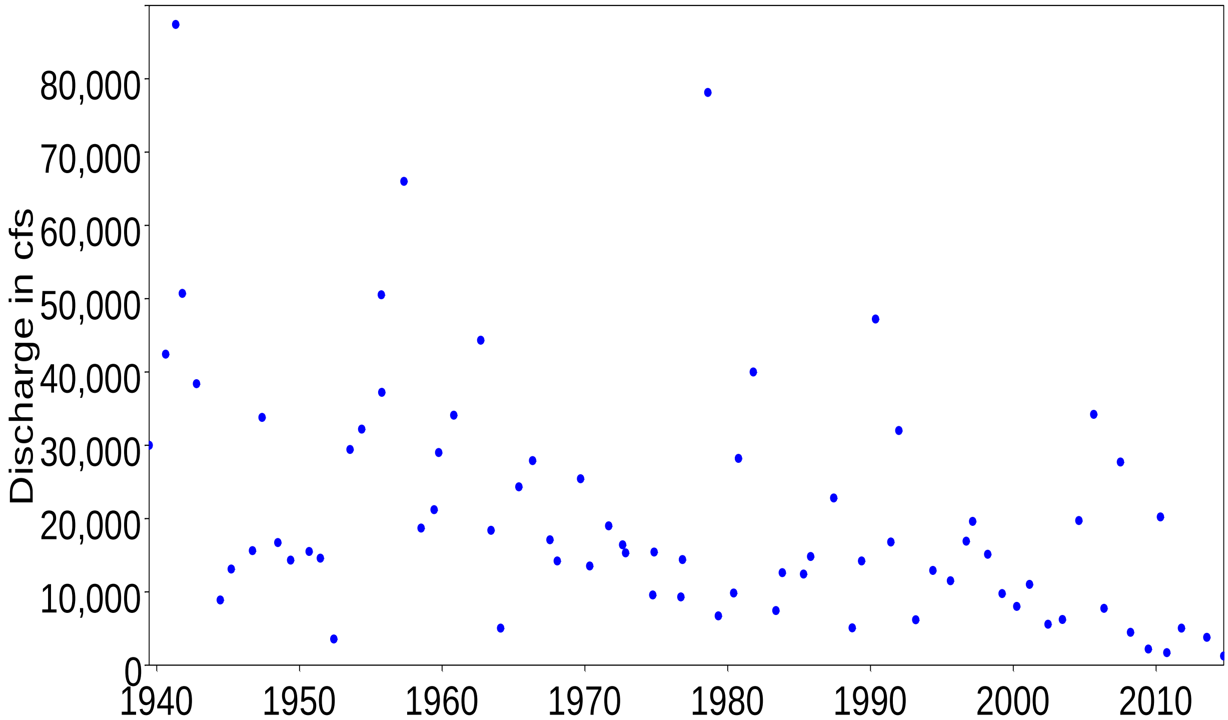


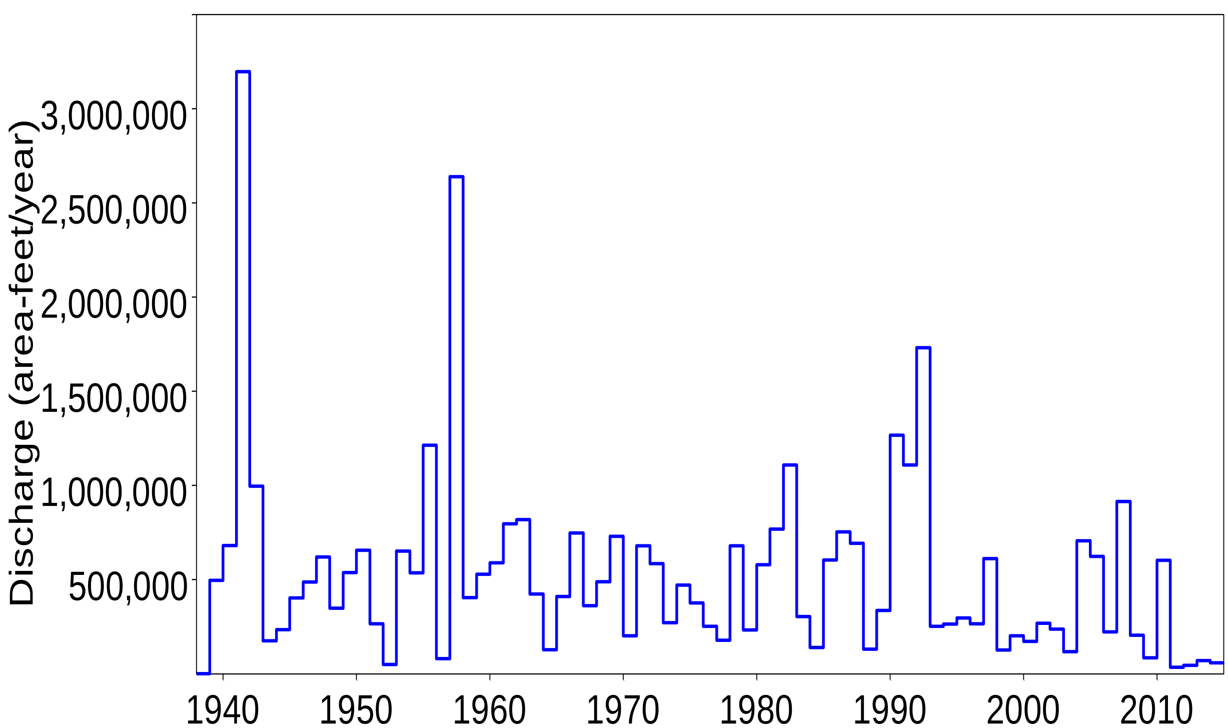
Mean daily flow of the Brazos River near South Bend B6



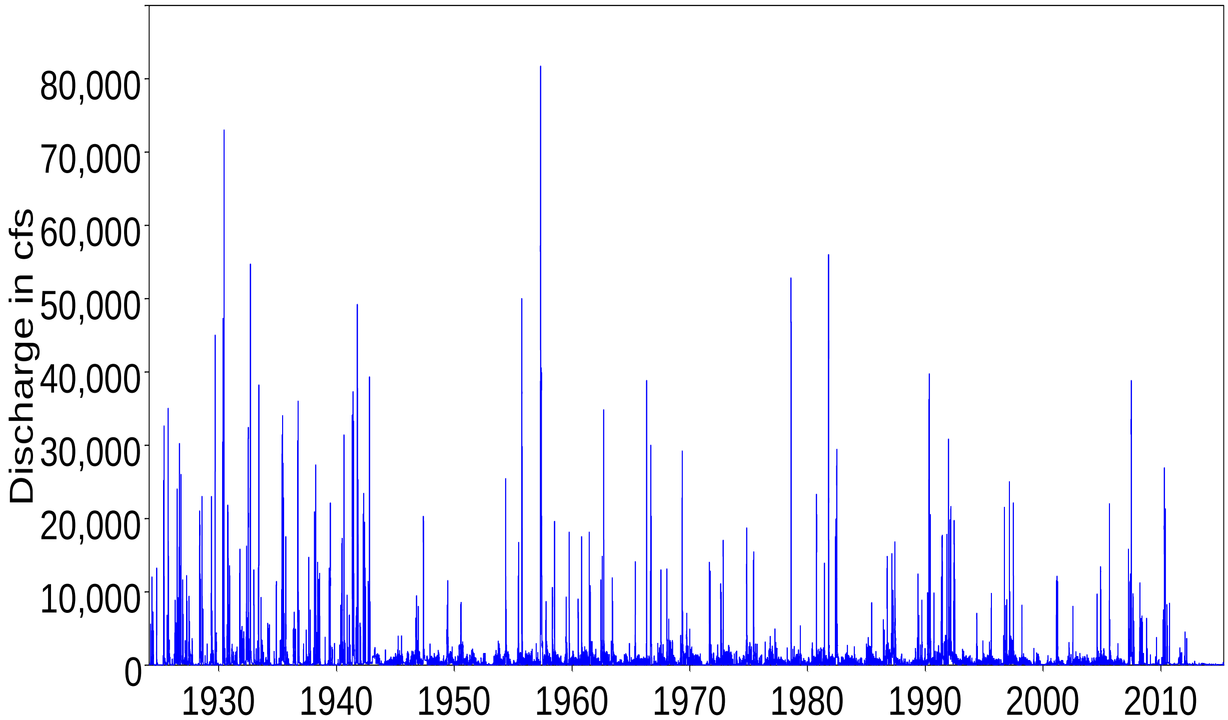
Mean monthly flow of the Brazos River near South Bend B6



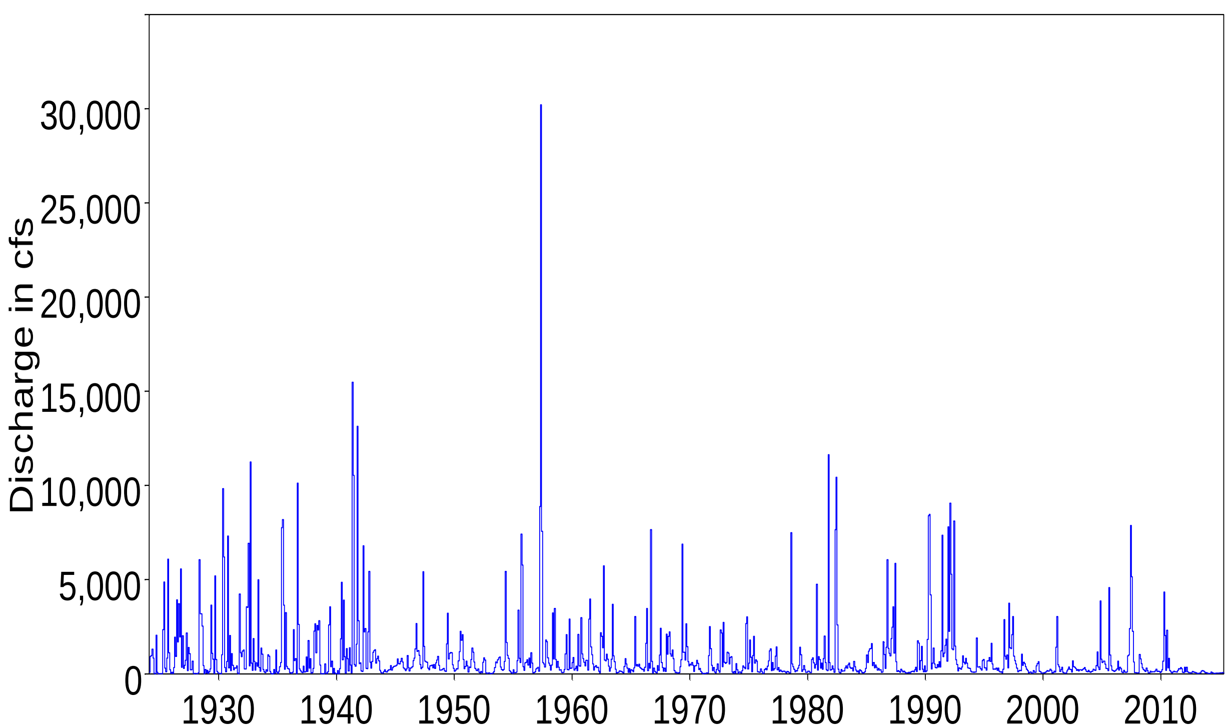
Annual peak flow of the Brazos River near South Bend B6



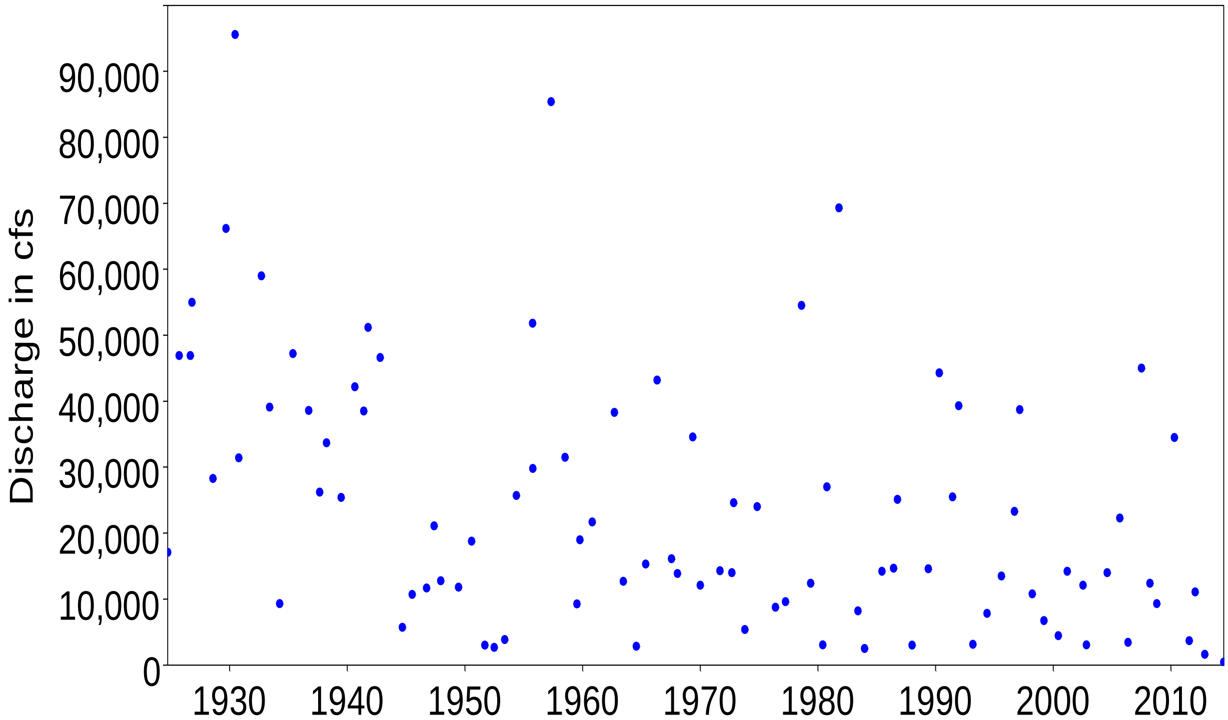
Annual flow of the Brazos River near South Bend B6



Mean daily flow of the Brazos River near Palo Pinto B7



Mean monthly flow of the Brazos River near Palo Pinto B7



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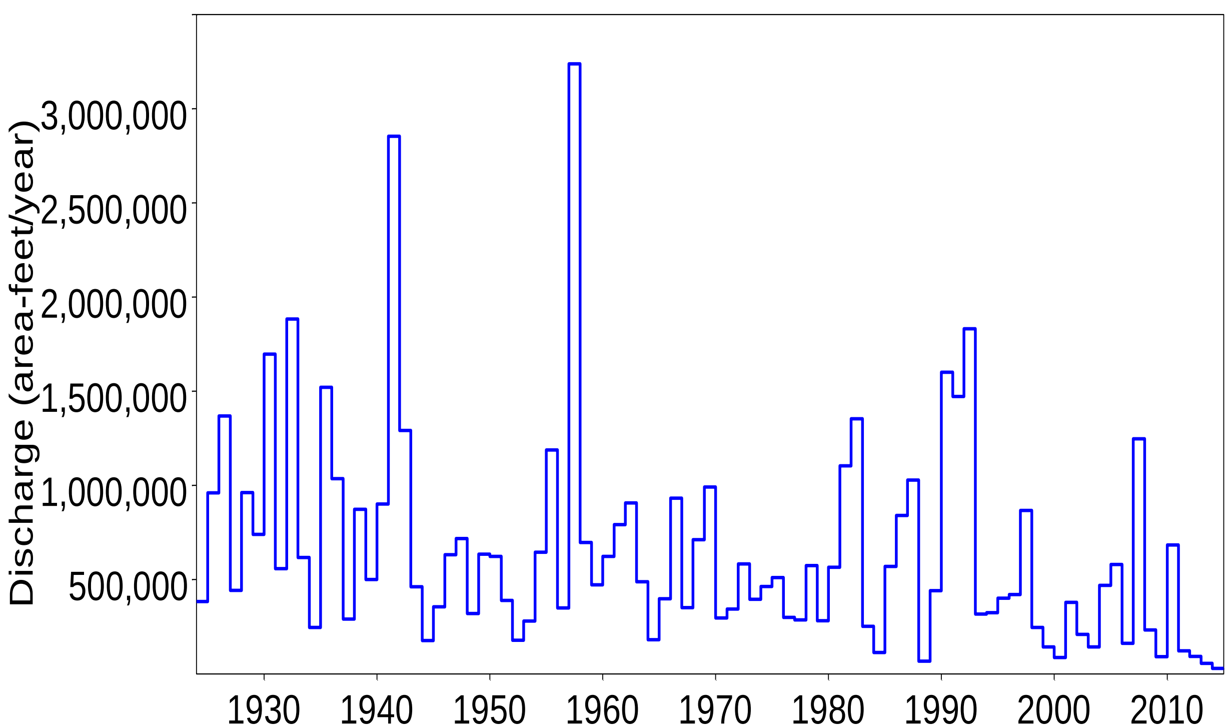
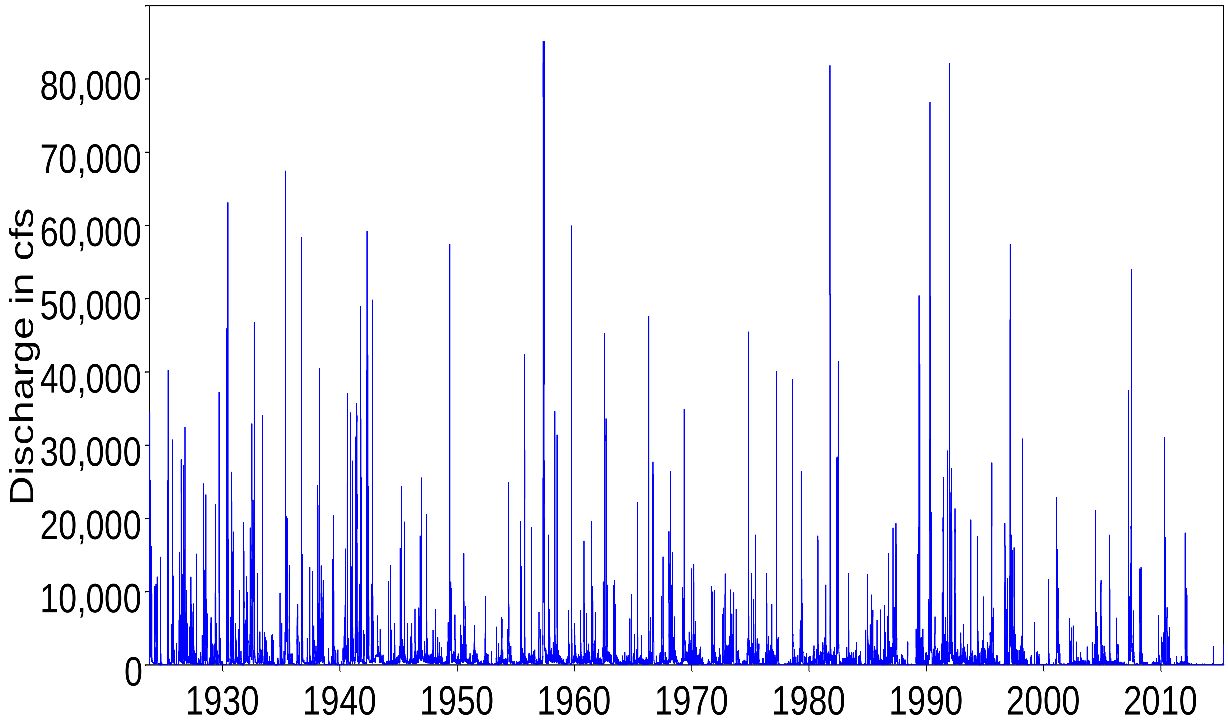
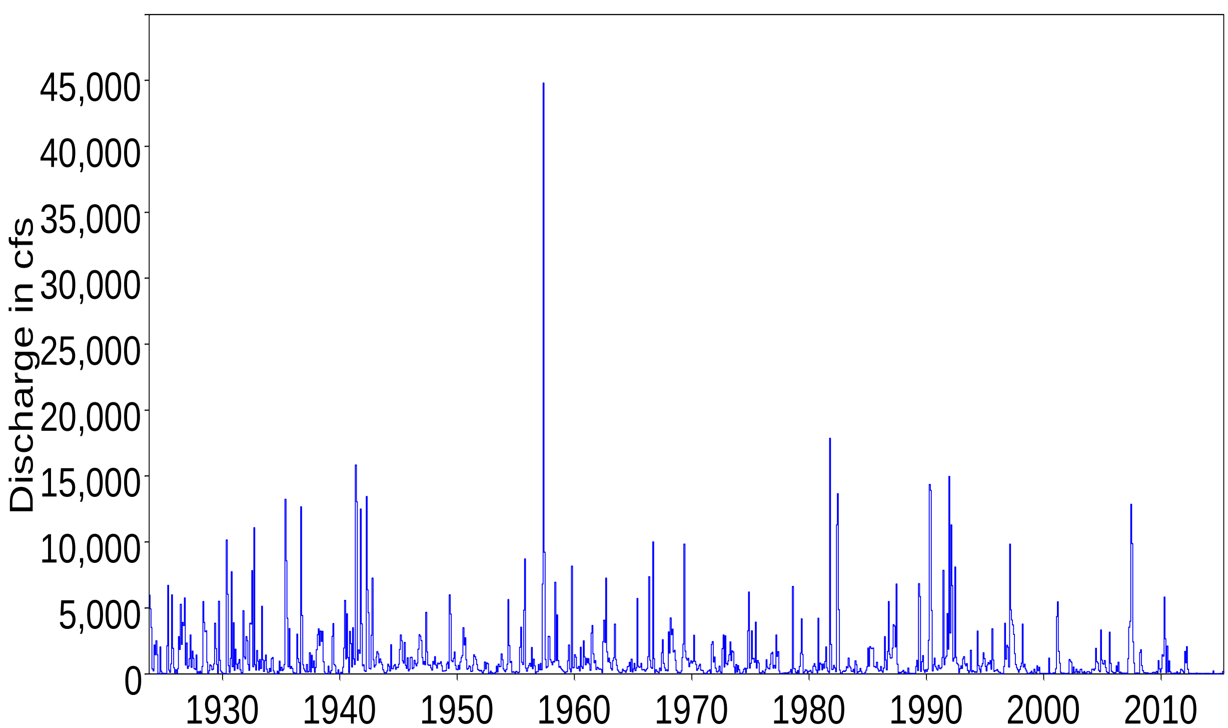


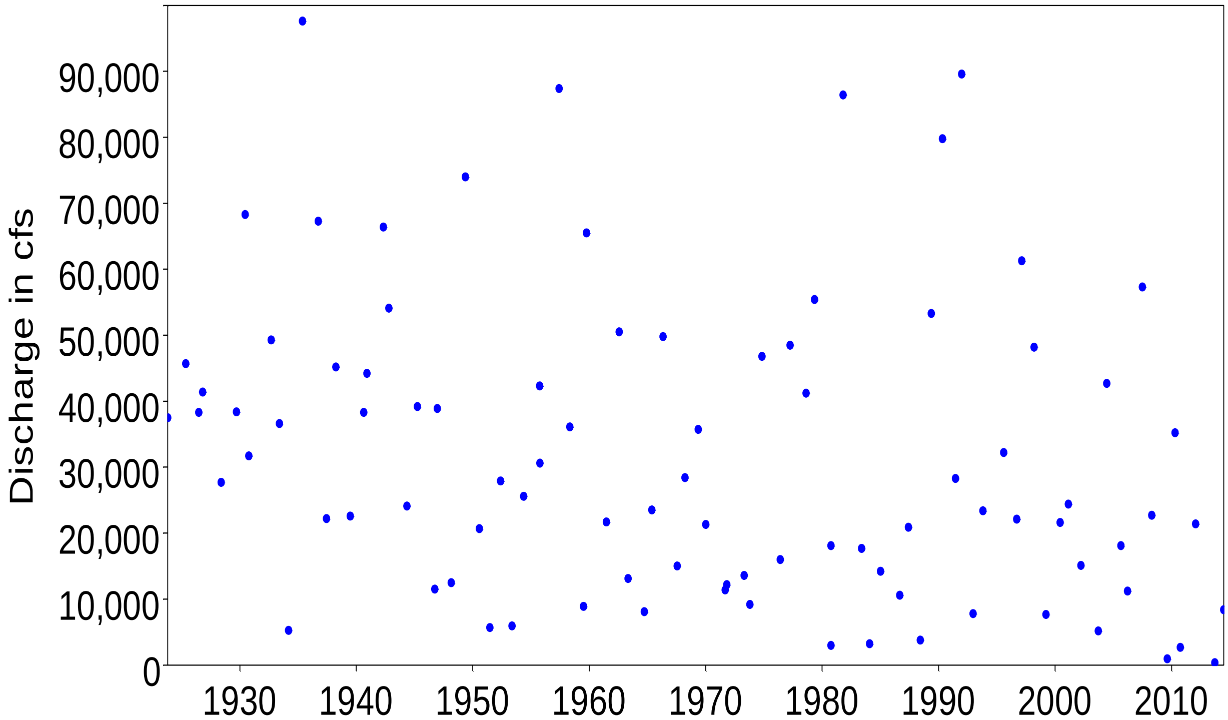
Annual flow of the Brazos River near Palo Pinto B7



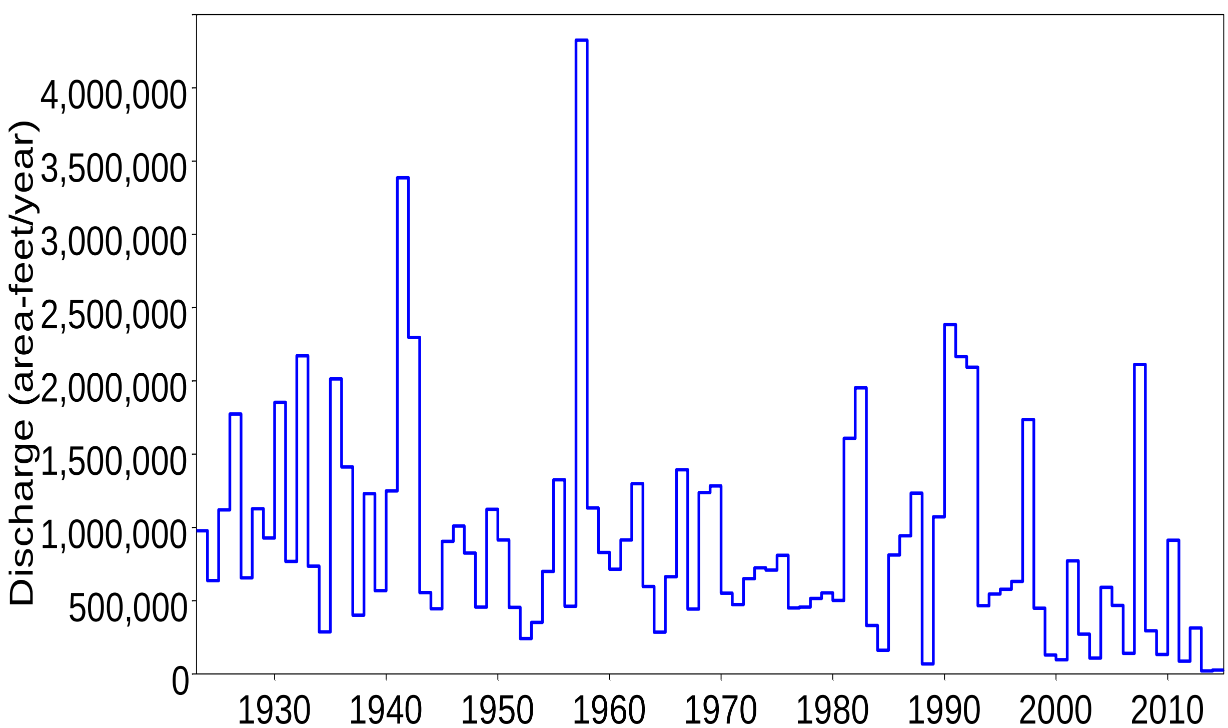
Mean daily flow of the Brazos River near Glen Rose B8



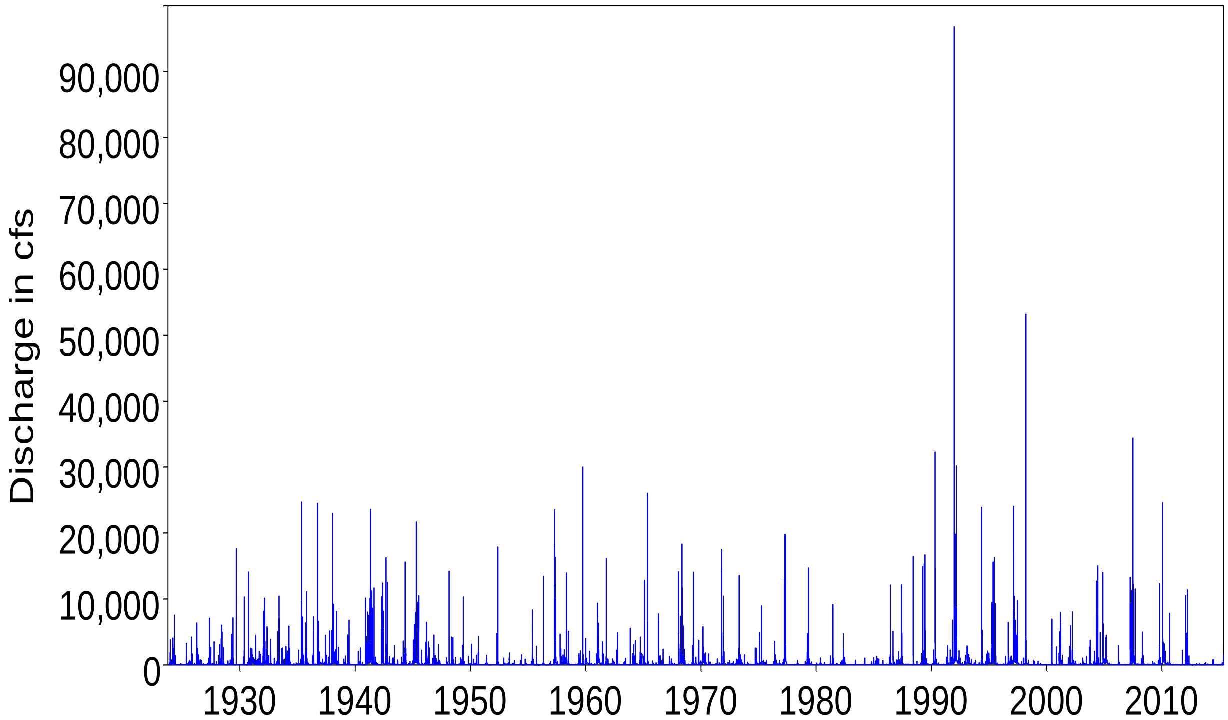
Mean monthly flow of the Brazos River near Glen Rose B8



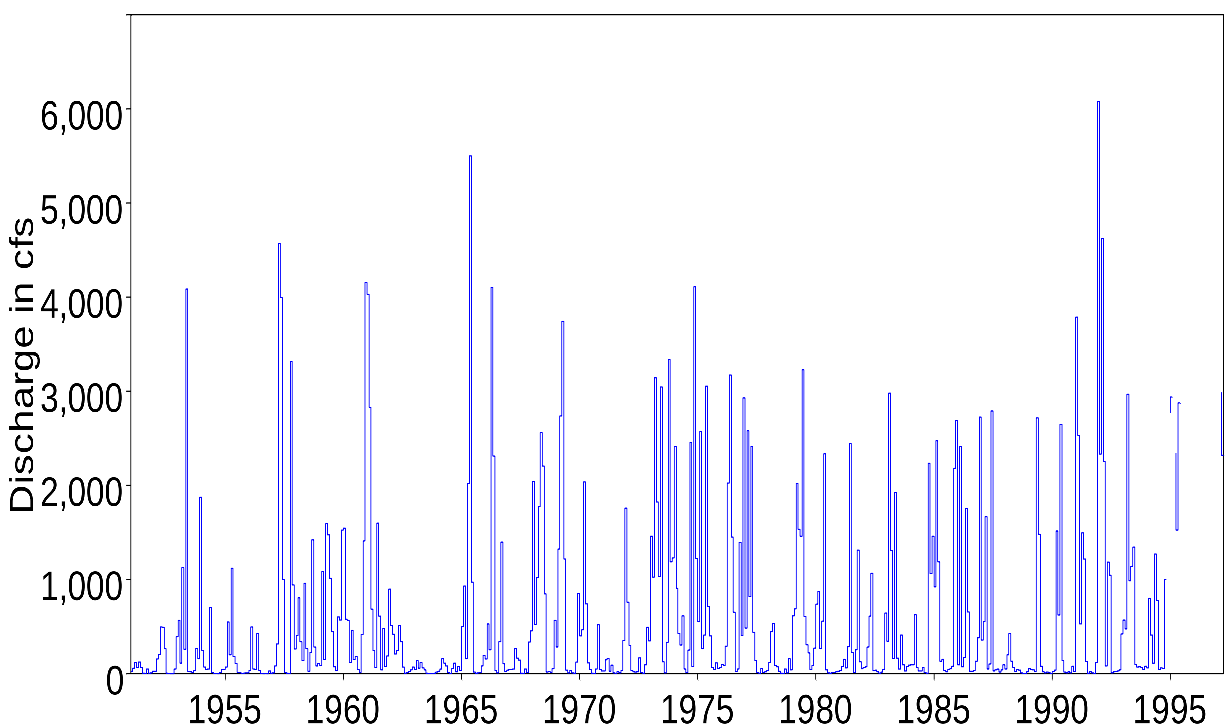
Annual peak flow of the Brazos River near Glen Rose B8



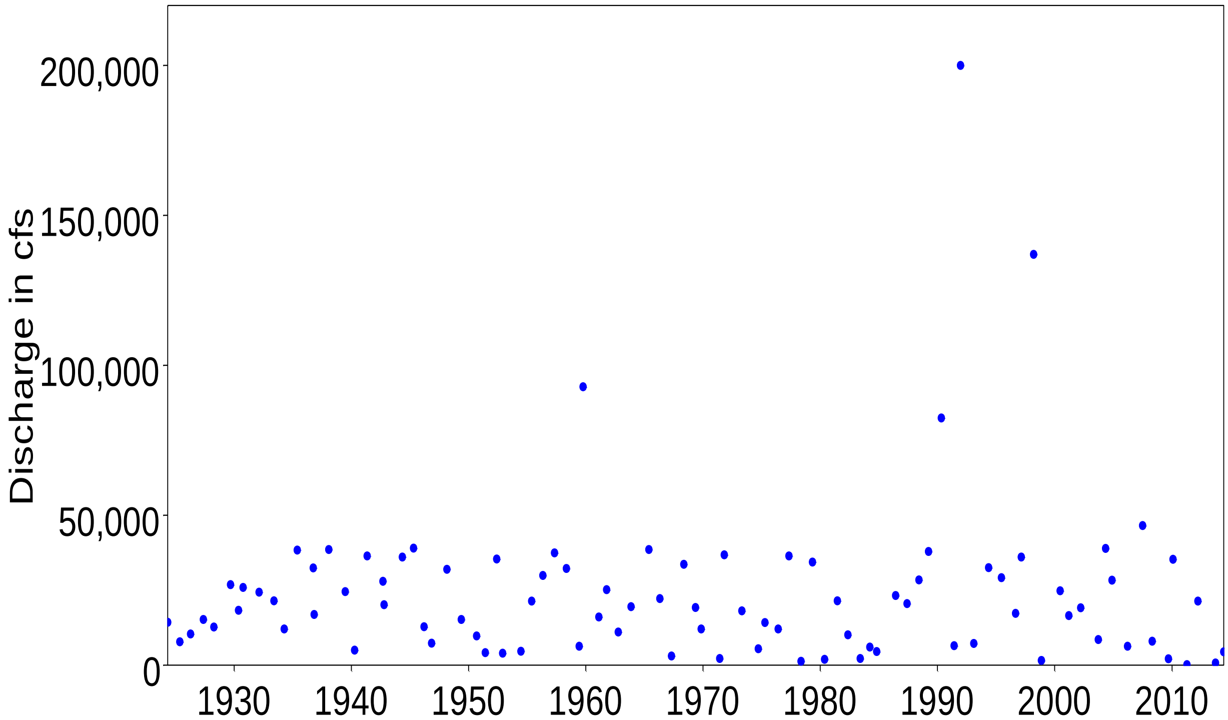
Annual flow of the Brazos River near Glen Rose B8



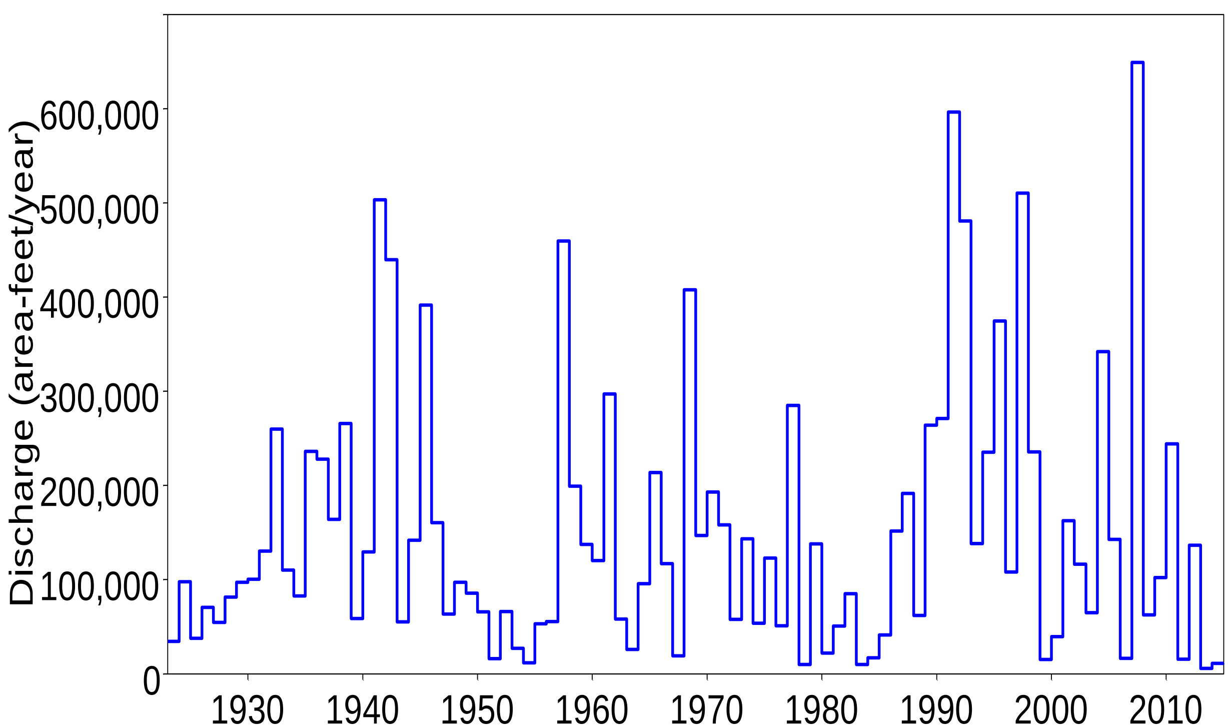
Mean daily flow of the North Bosque River near Clifton B9



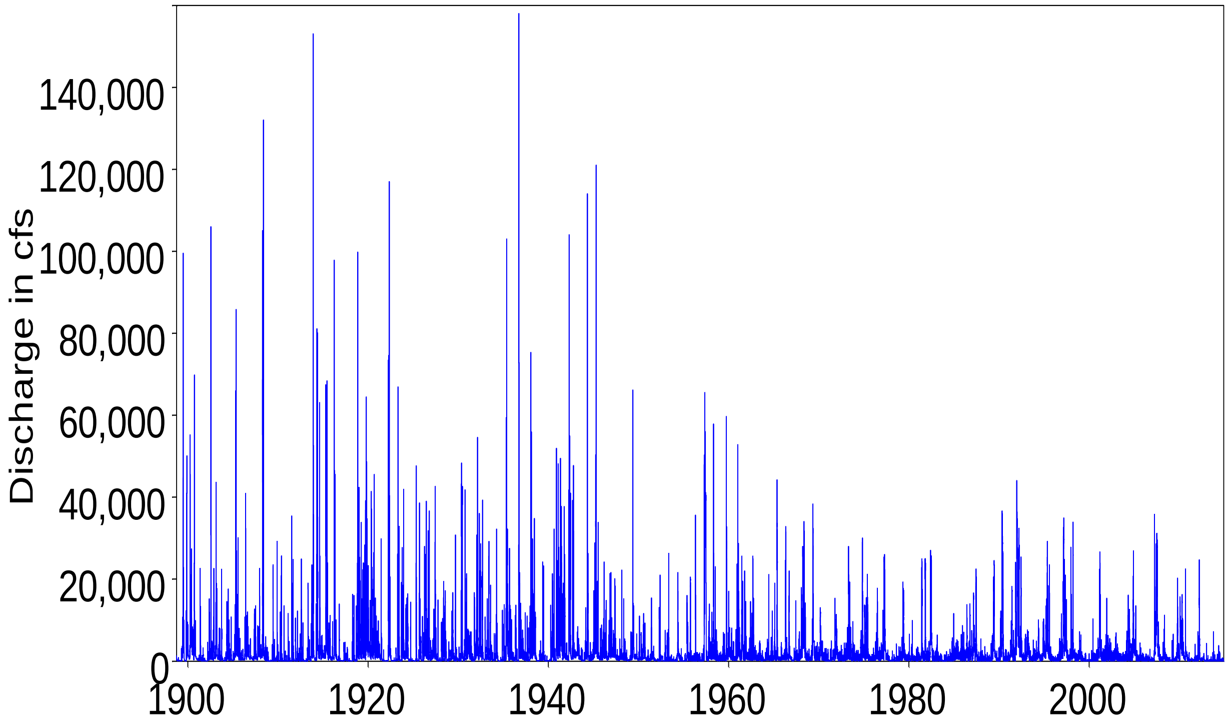
Mean monthly flow of the North Bosque River near Clifton B9



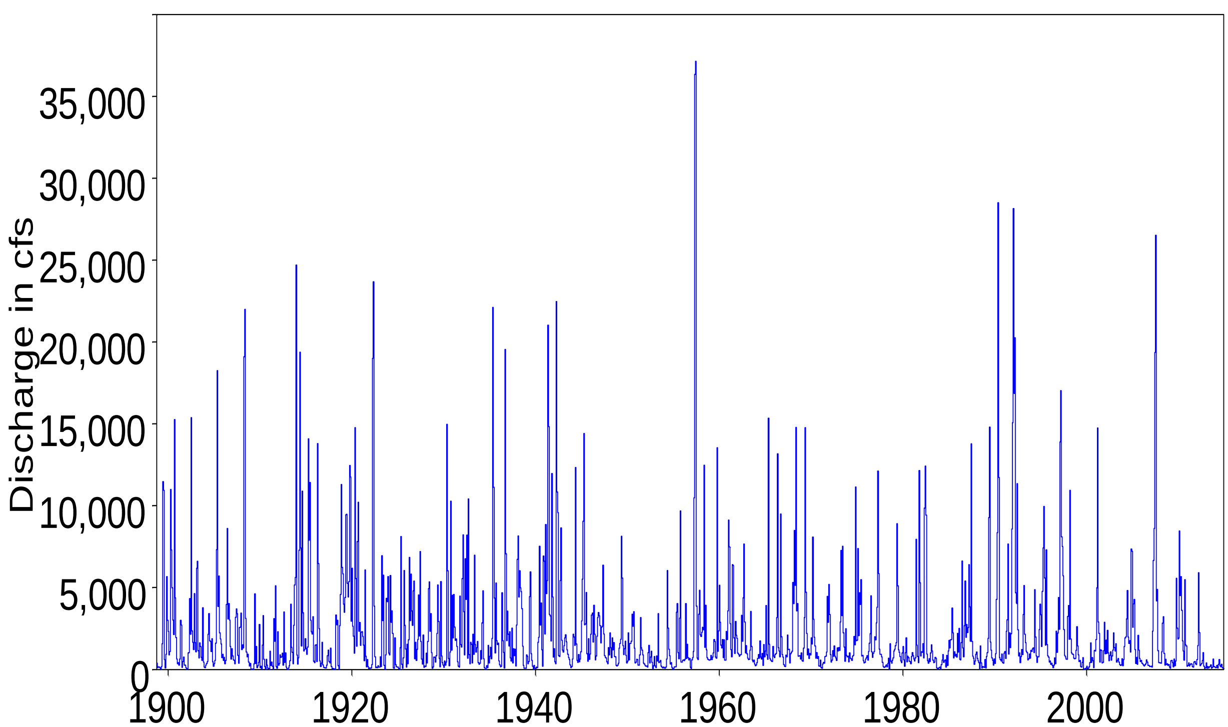
Annual peak flow of the North Bosque River near Clifton B9



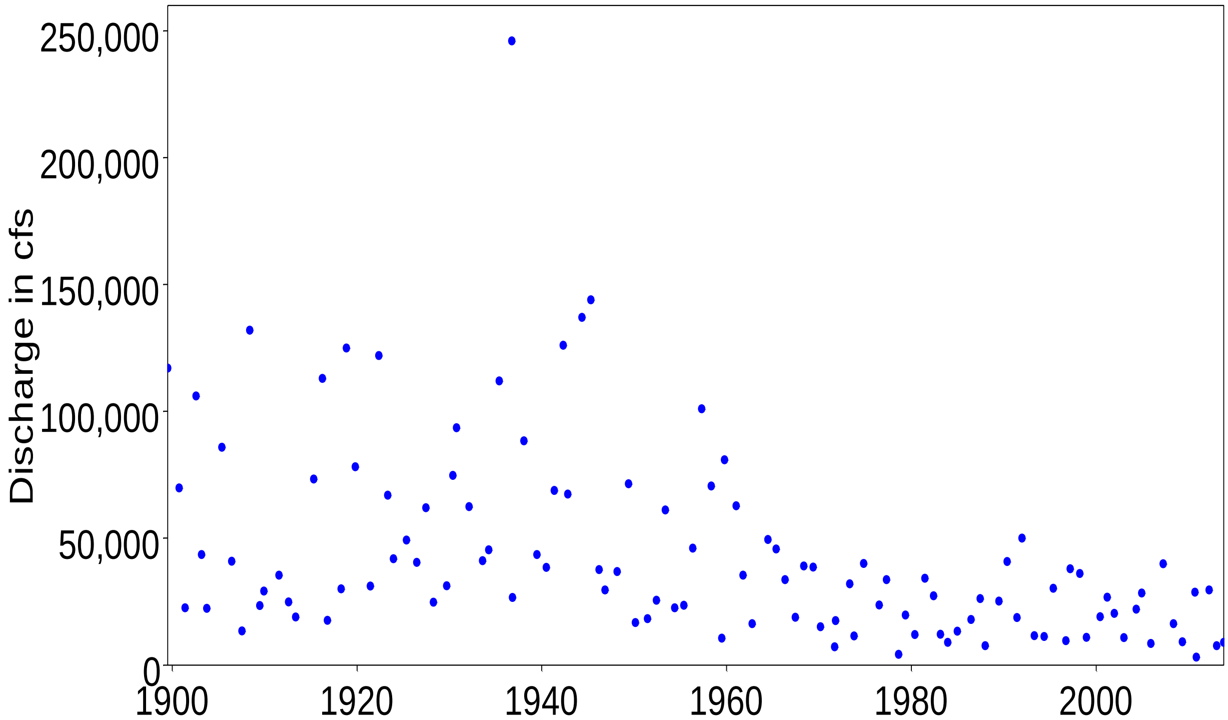
Annual flow of the North Bosque River near Clifton B9



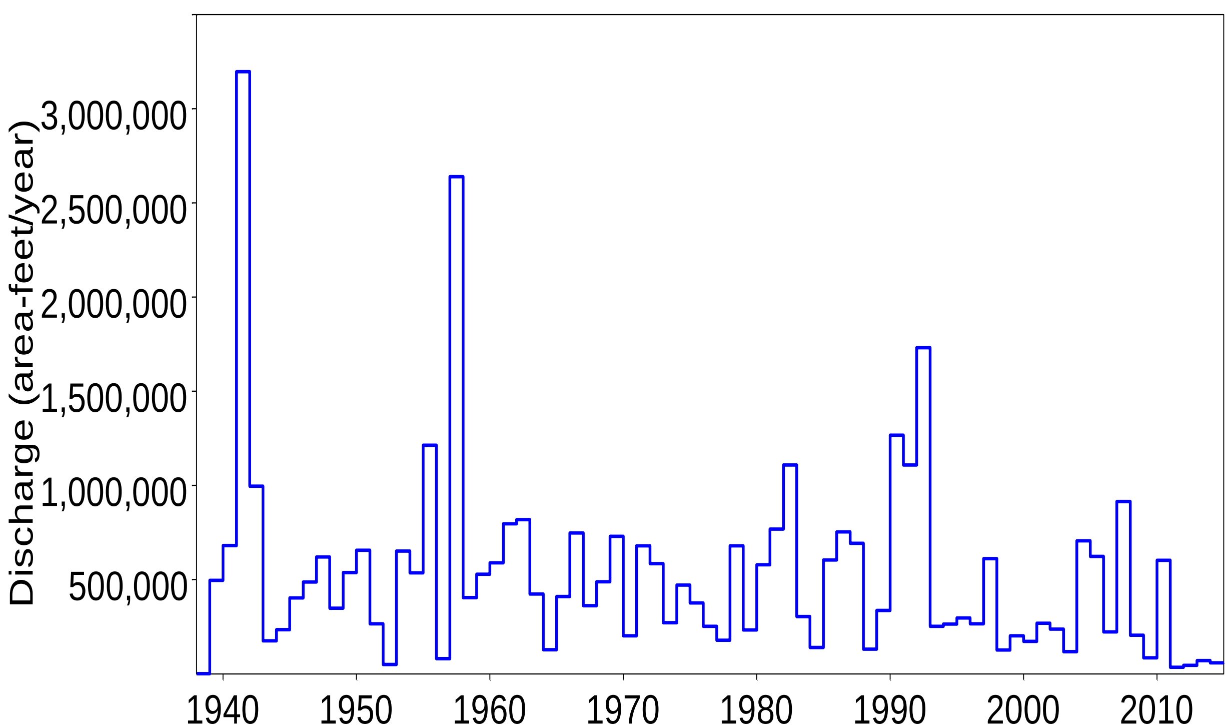
Mean daily flow of the Brazos River at Waco B10



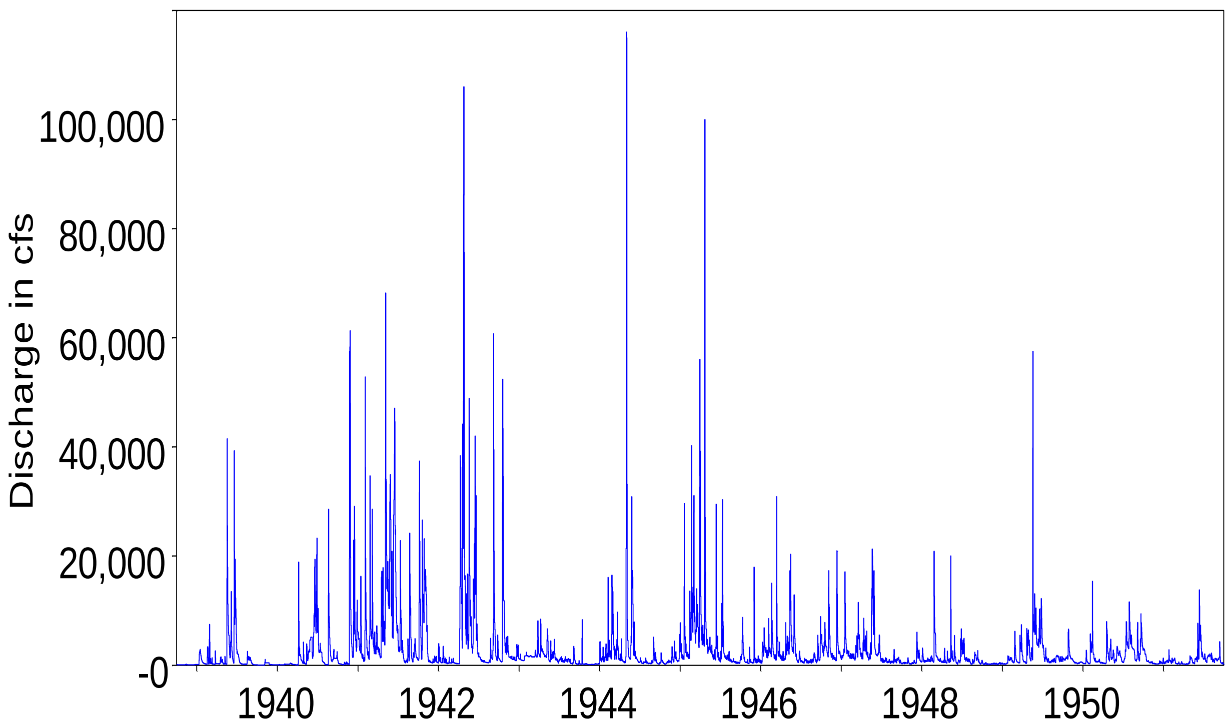
Mean monthly flow of the Brazos River at Waco B10



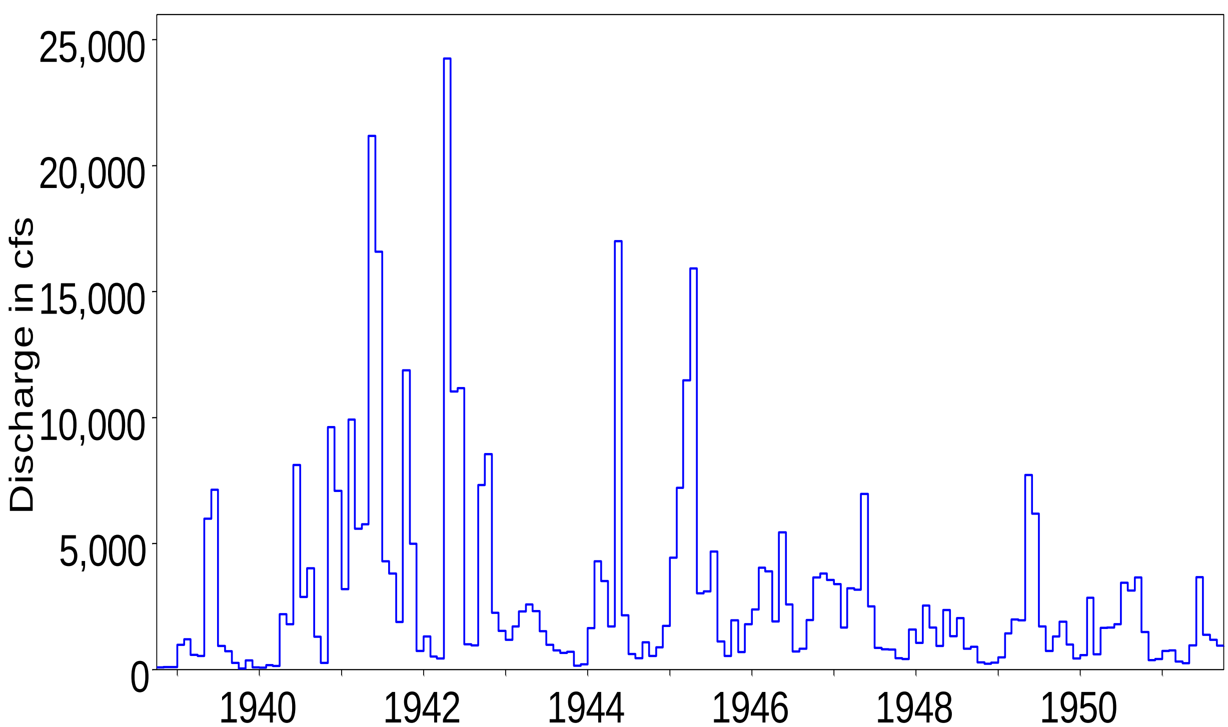
Annual peak flow of the Brazos River at Waco B10



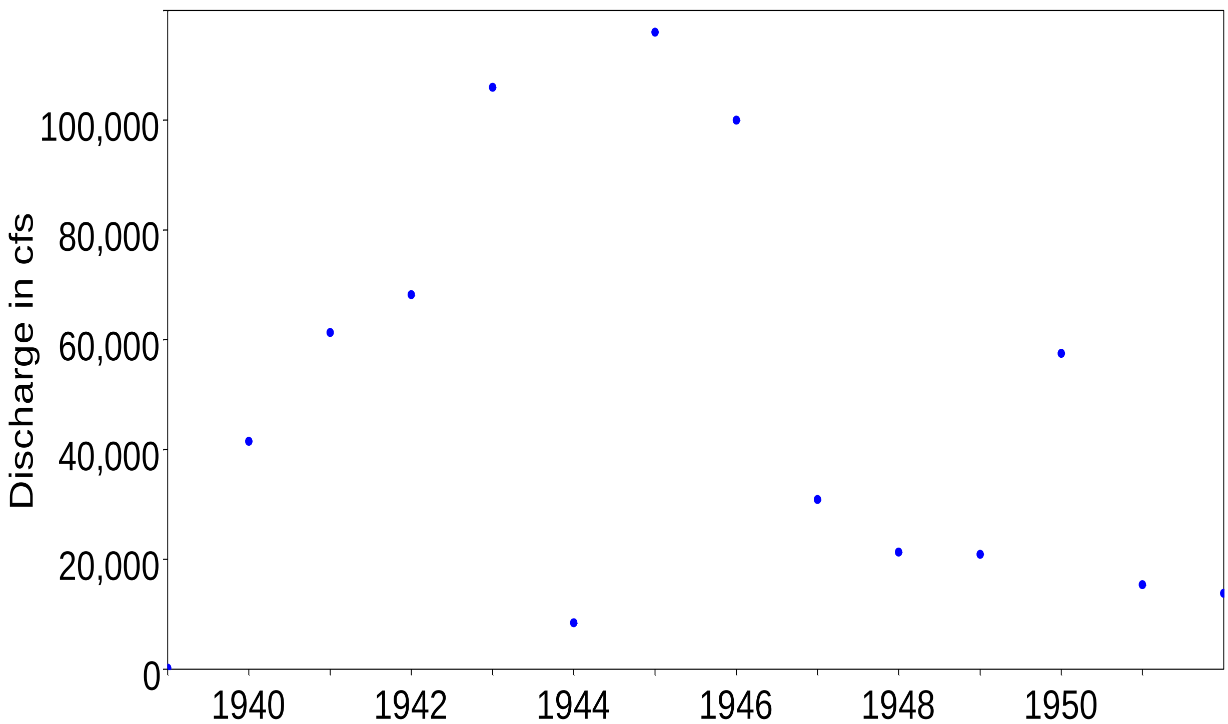
Annual flow of the Brazos River at Waco B10



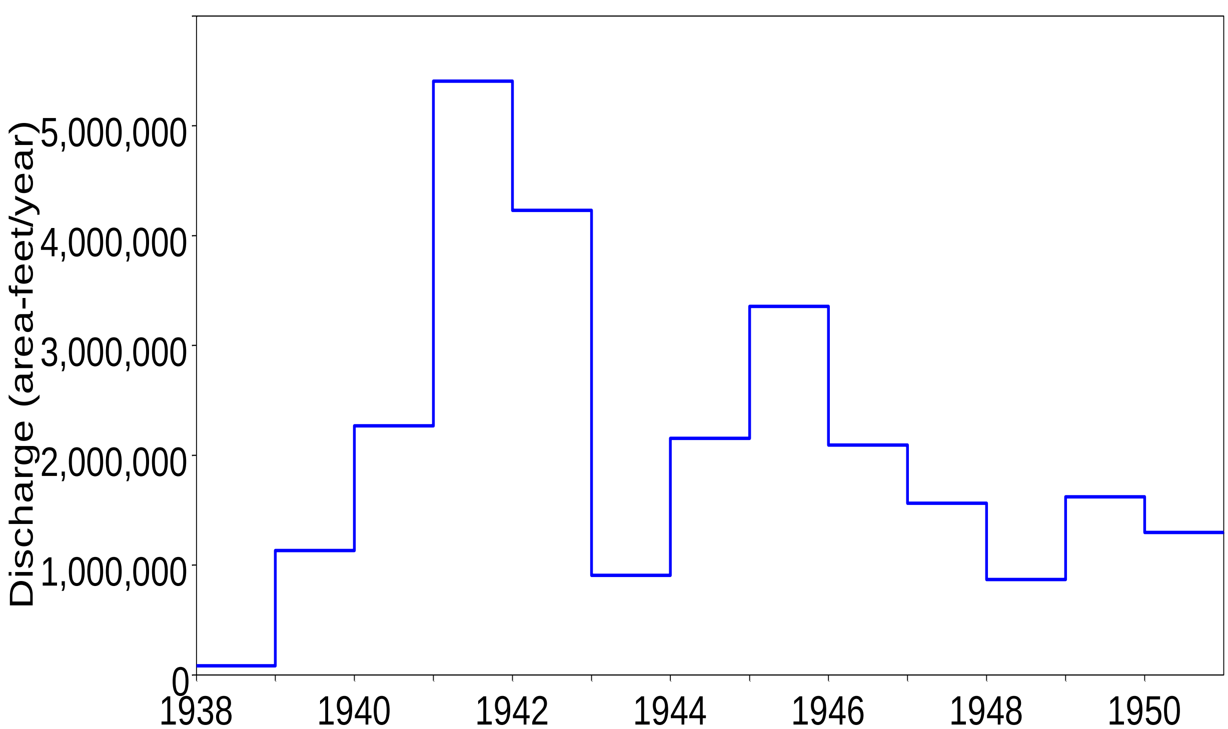
Mean daily flow of the Brazos River near Marlin B11



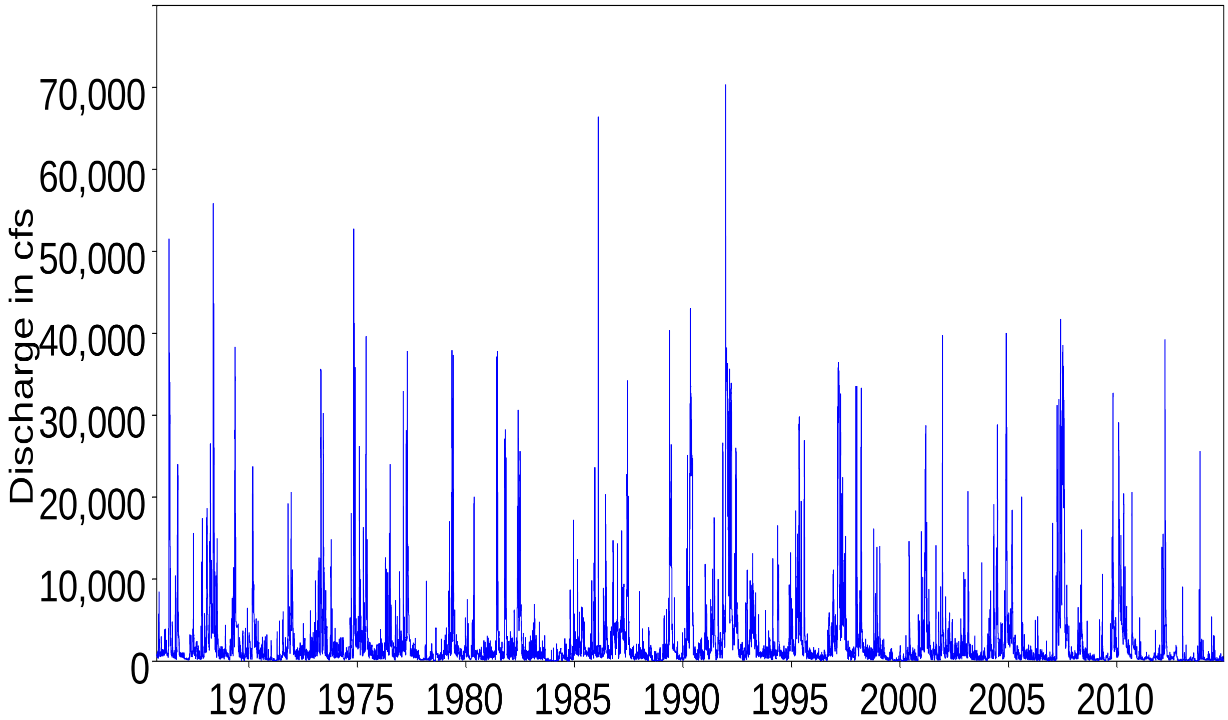
Mean monthly flow of the Brazos River near Marlin B11



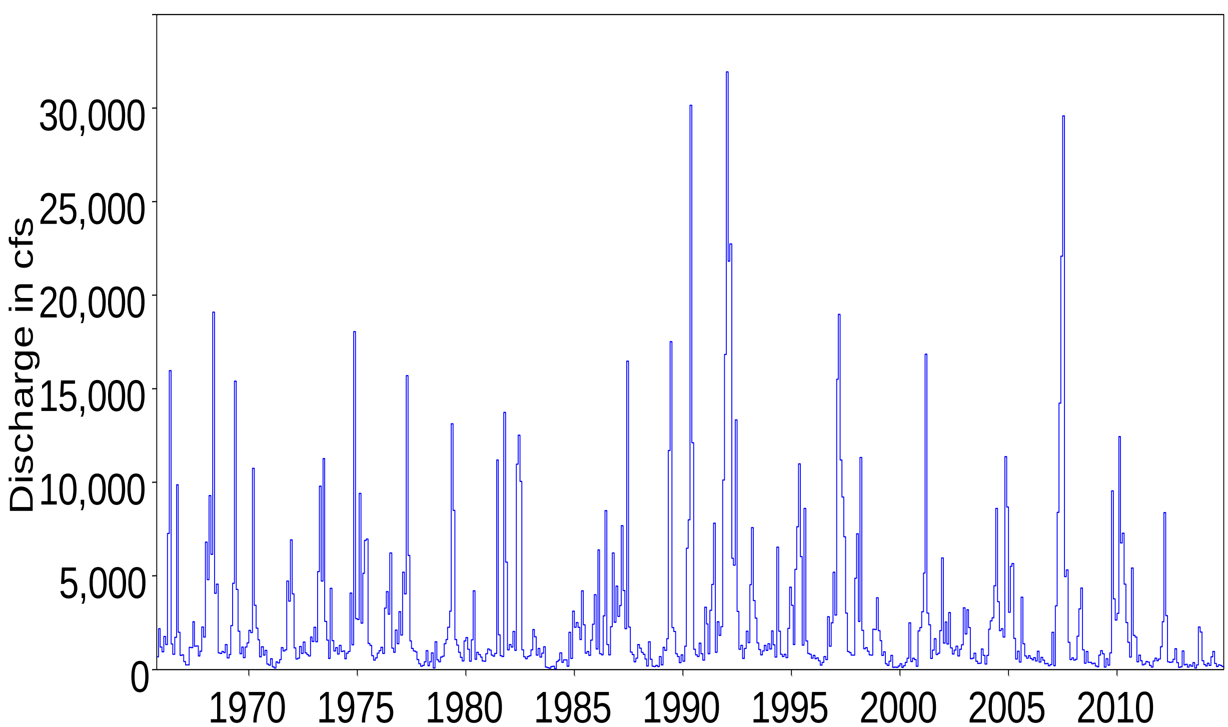
Annual peak flow of the Brazos River near Marlin B11



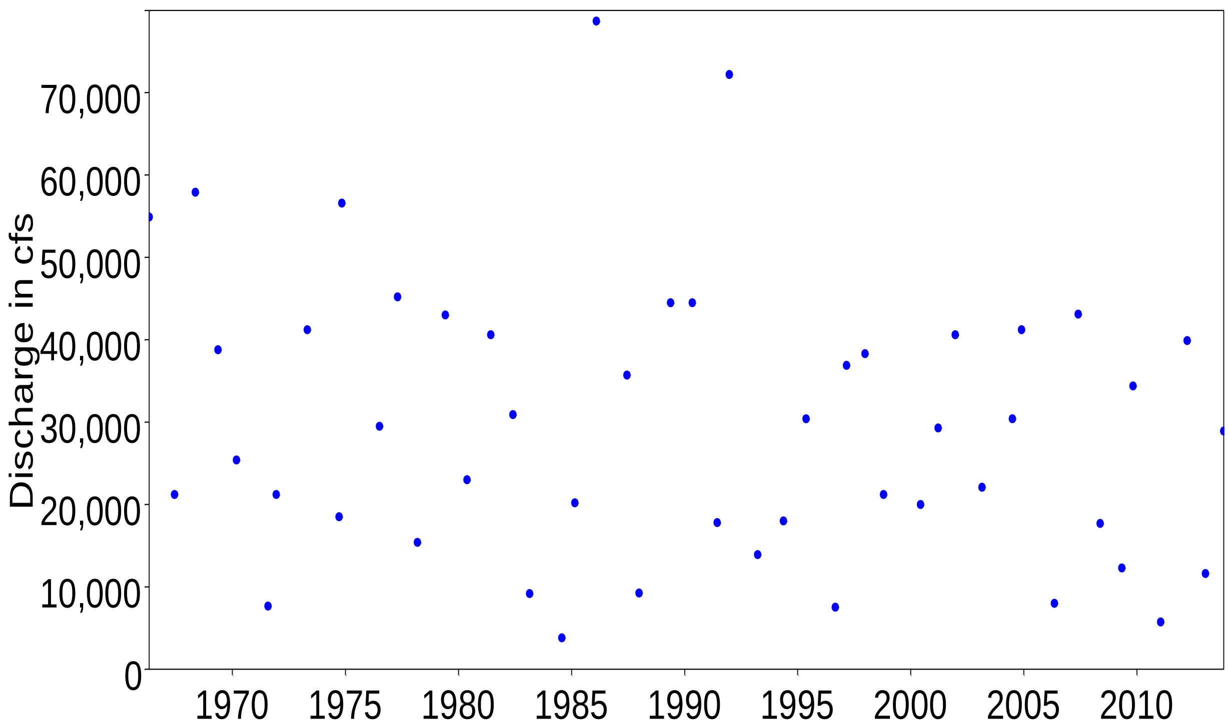
Annual flow of the Brazos River near Marlin B11



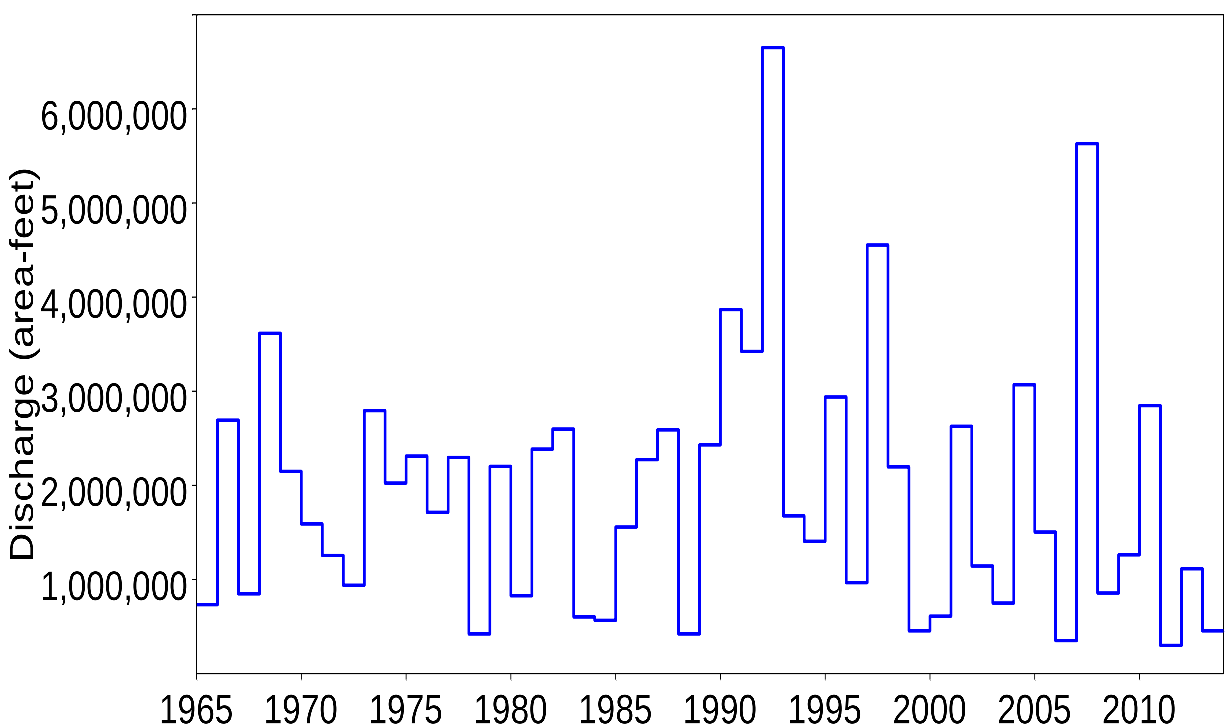
Mean daily flow of the Brazos River near Highbank B12



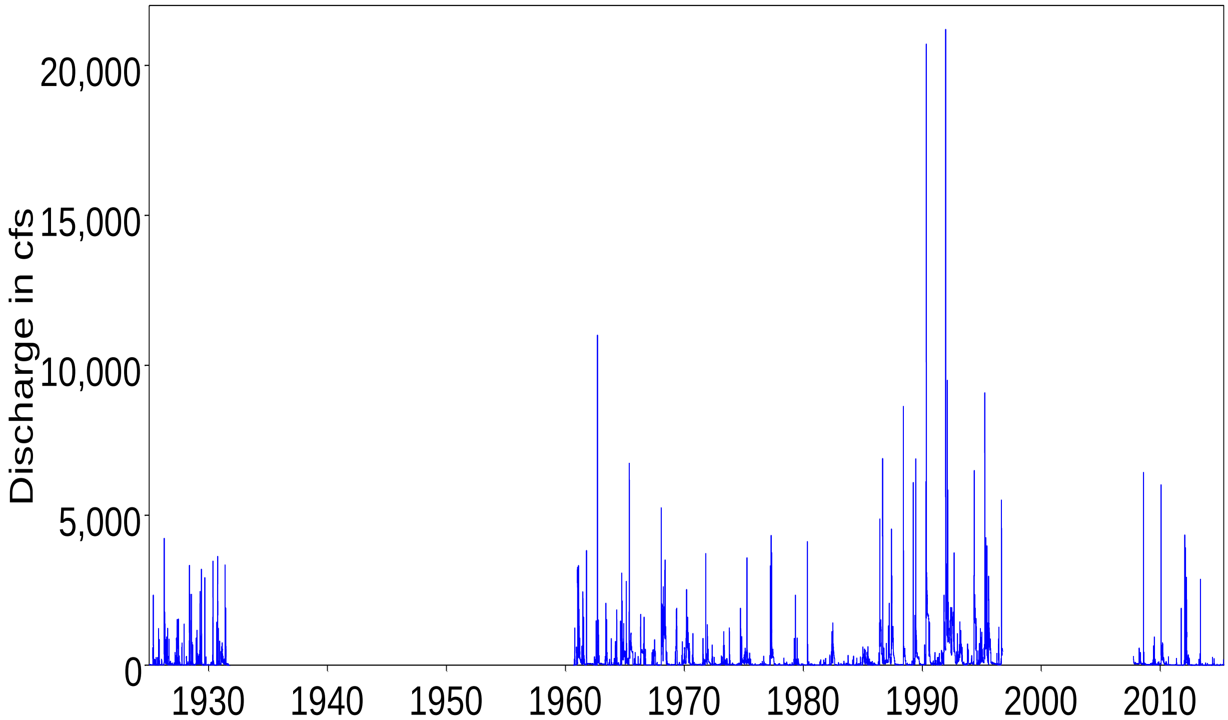
Mean monthly flow of the Brazos River near Highbank B12



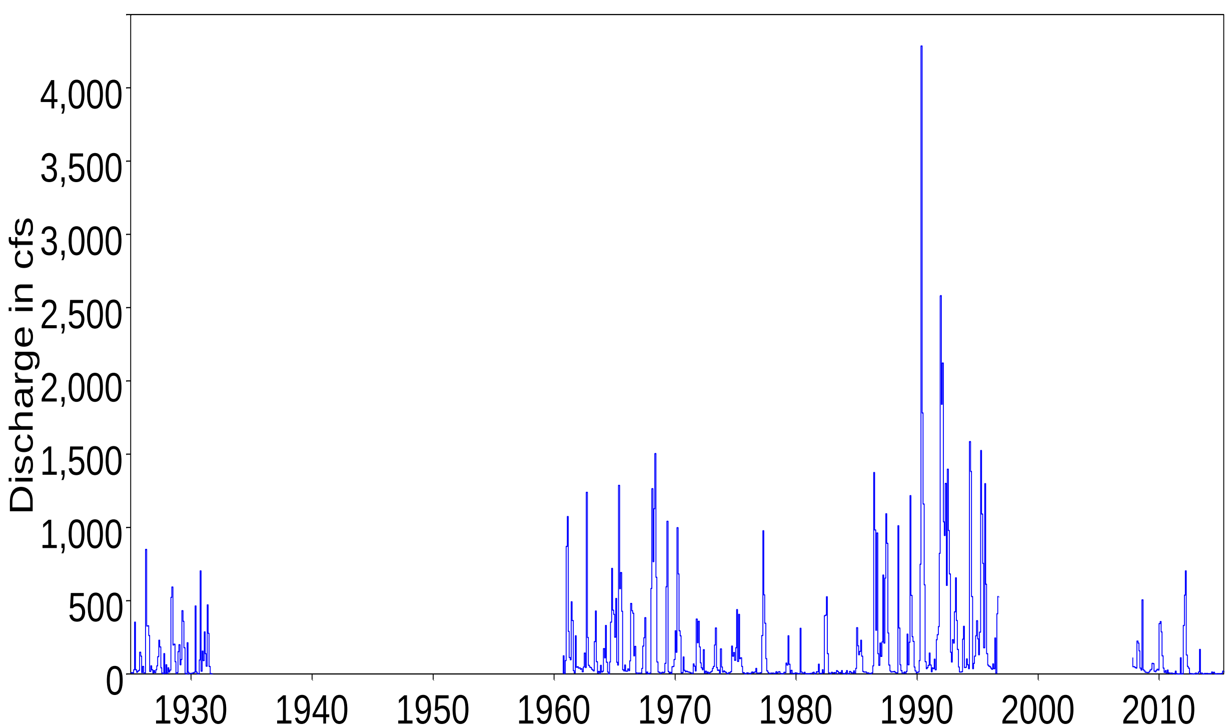
Annual peak flow of the Brazos River near Highbank B12



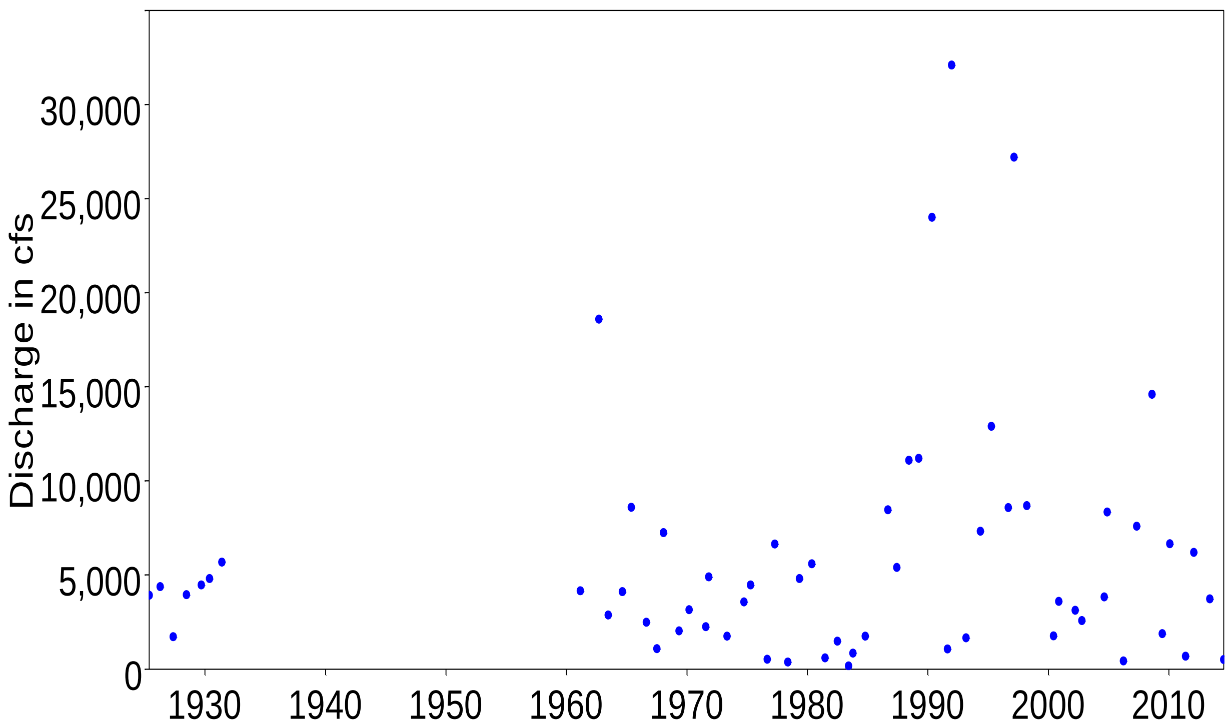
Annual flow of the Brazos River near Highbank B12



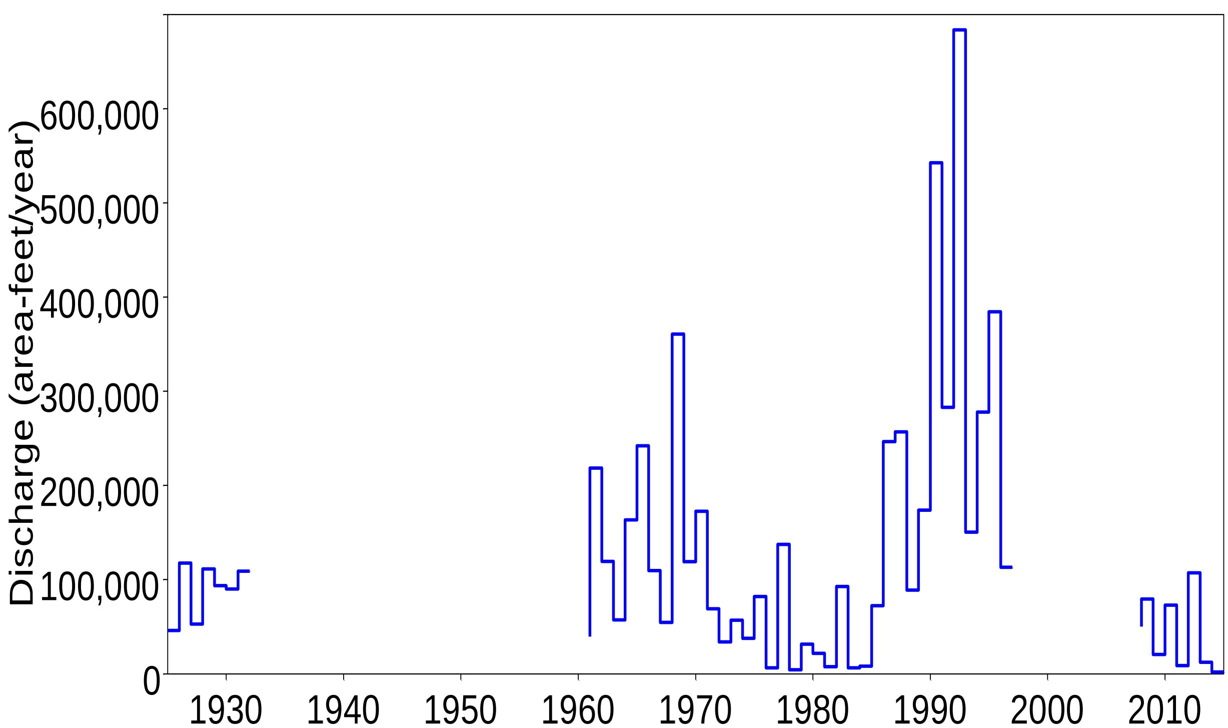
Mean daily flow of the Leon River near Hamilton B13



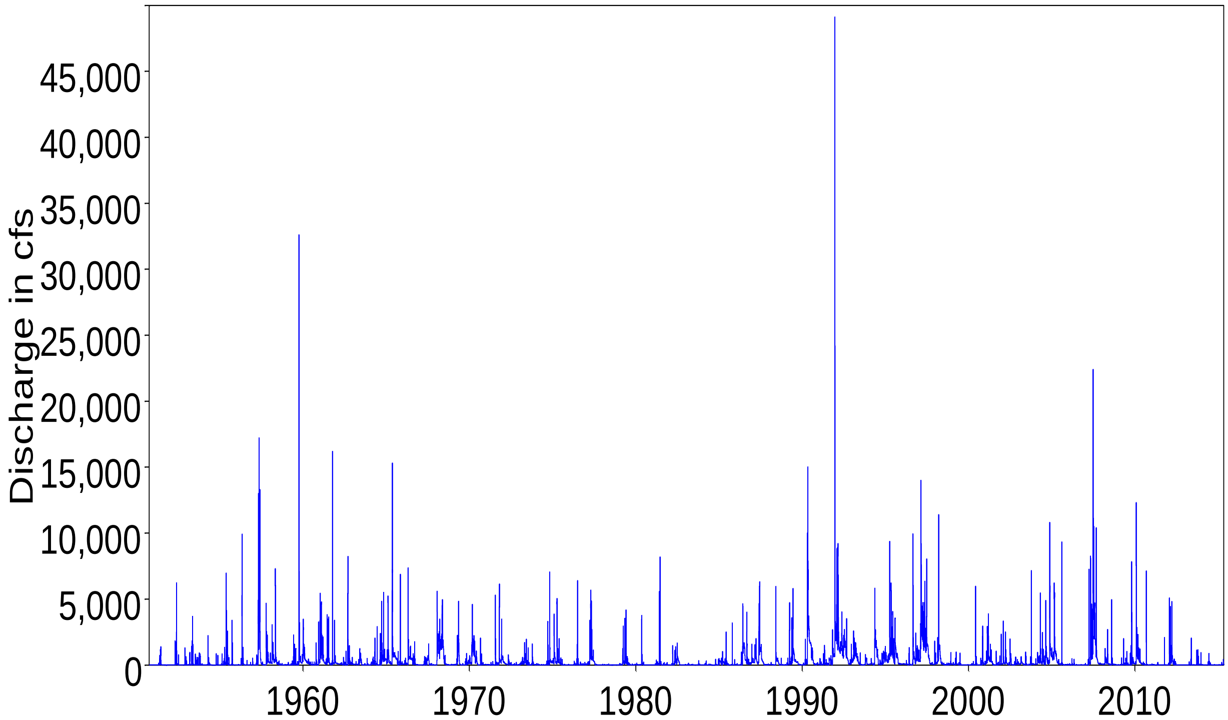
Mean monthly flow of the Leon River near Hamilton B13



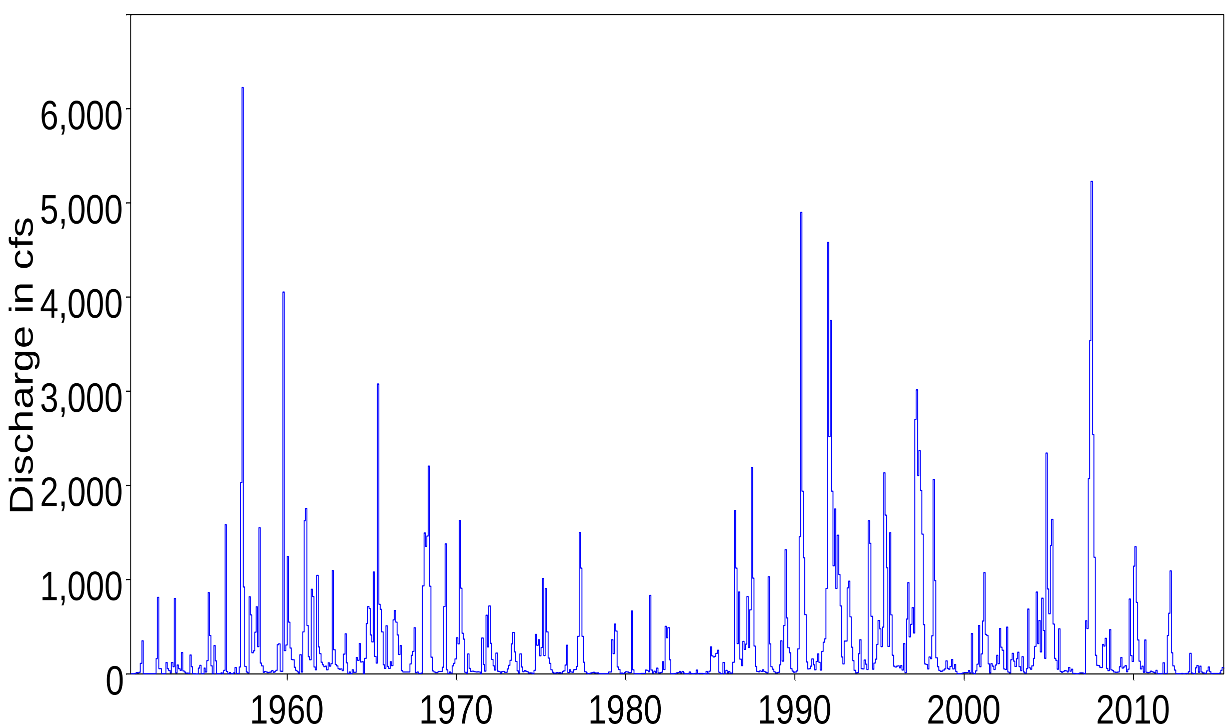
Annual peak flow of the Leon River near Hamilton B13



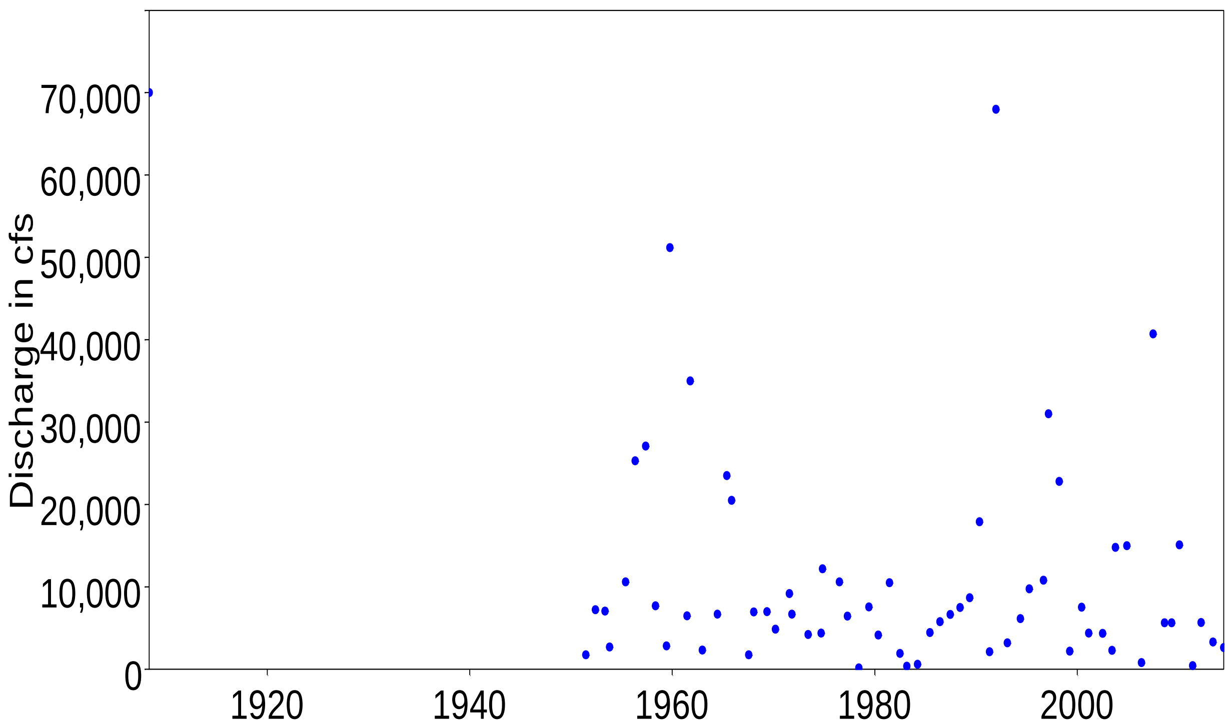
Annual flow of the Leon River near Hamilton B13



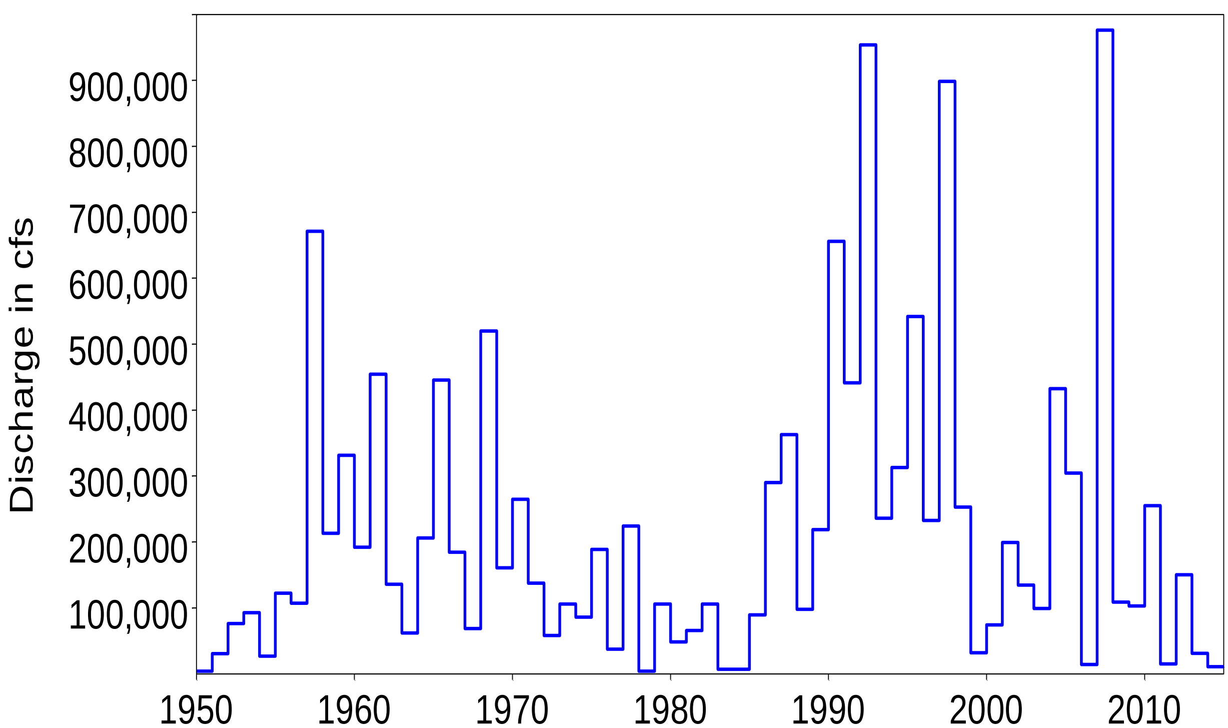
Mean daily flow of the Leon River near Gatesville B14



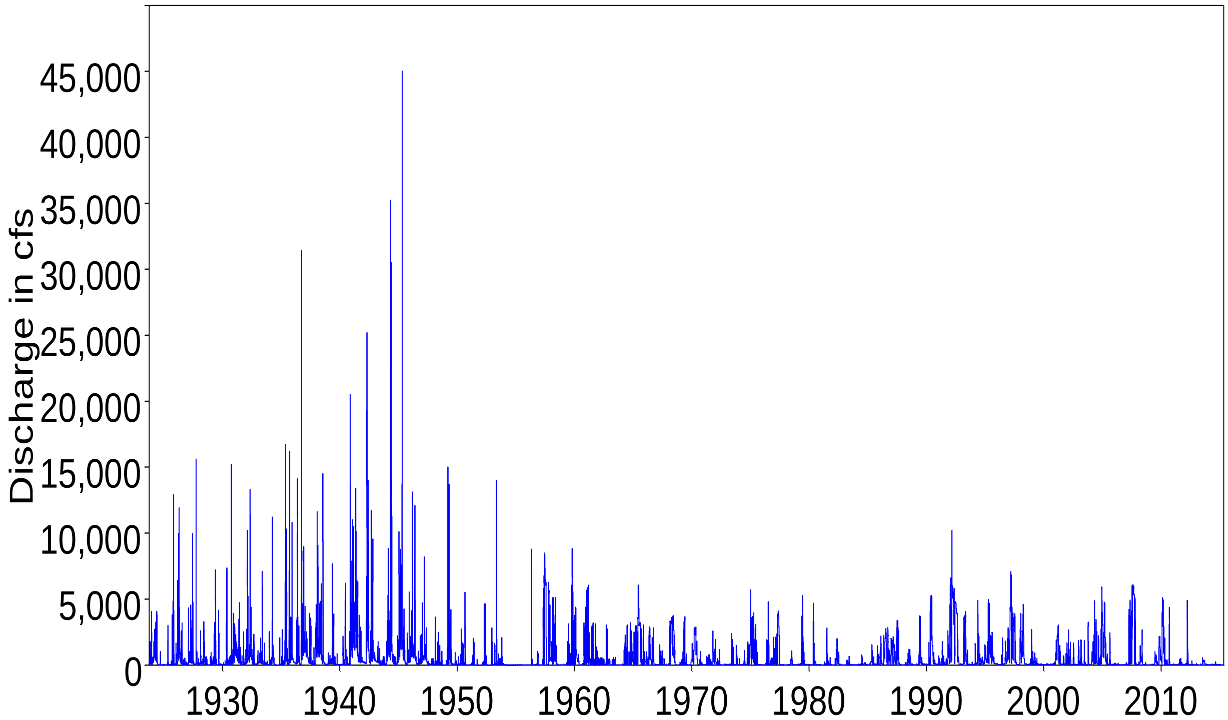
Mean monthly flow of the Leon River near Gatesville B14



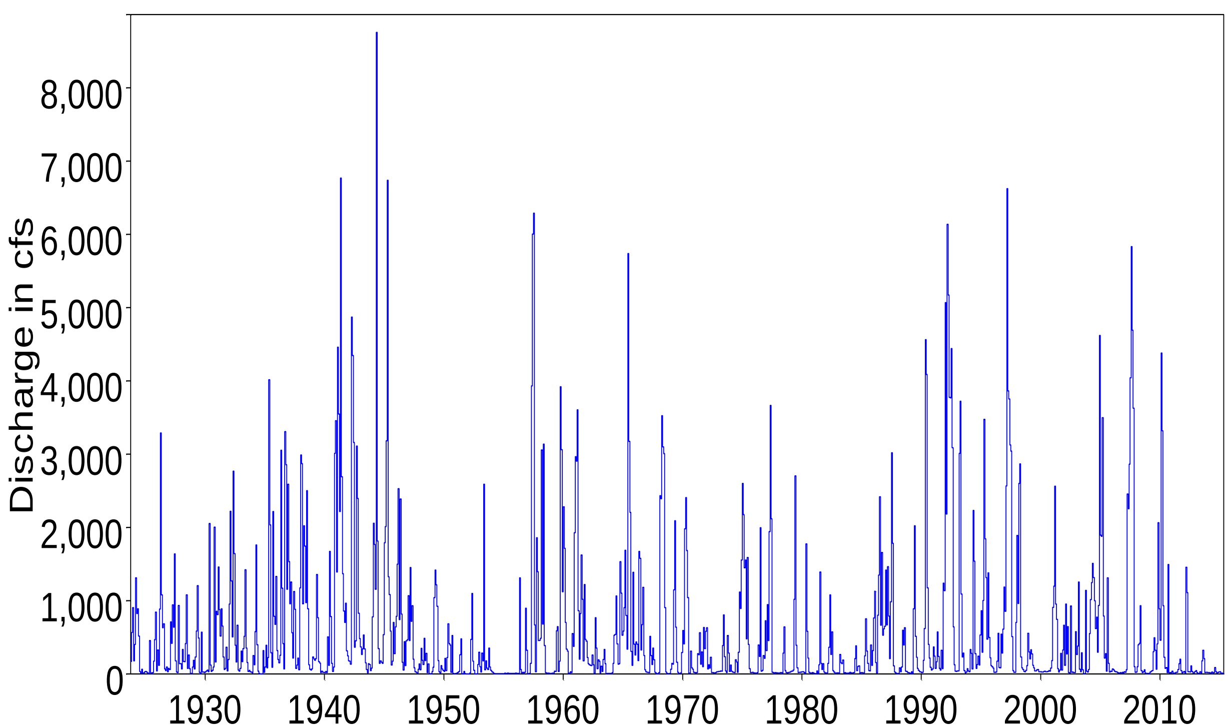
Annual peak flow of the Leon River near Gatesville B14



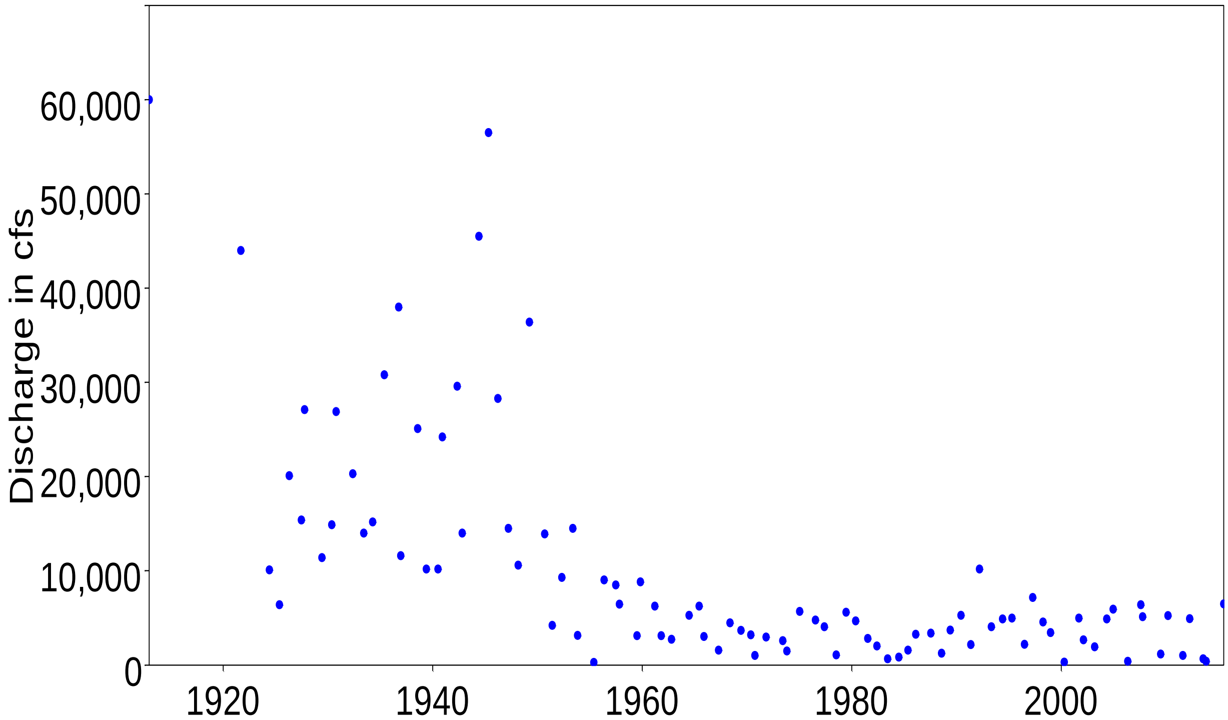
Annual flow of the Leon River near Gatesville B14



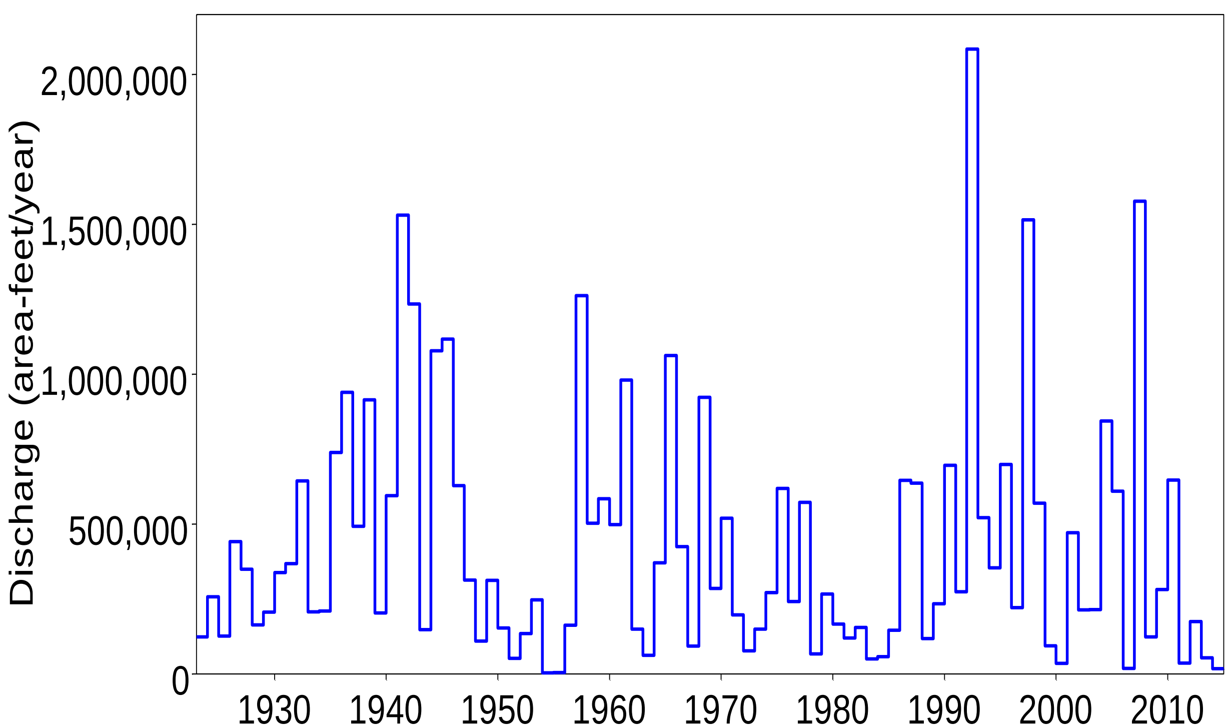
Mean daily flow of the Leon River near Belton B15



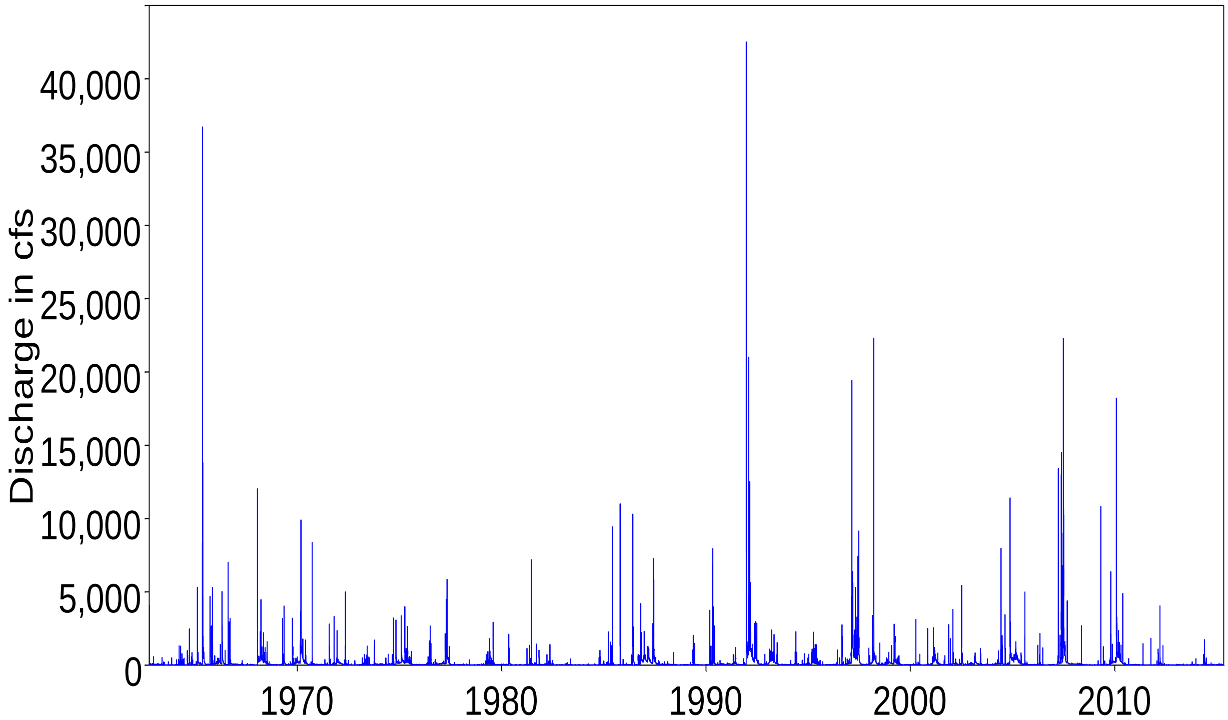
Mean monthly flow of the Leon River near Belton B15



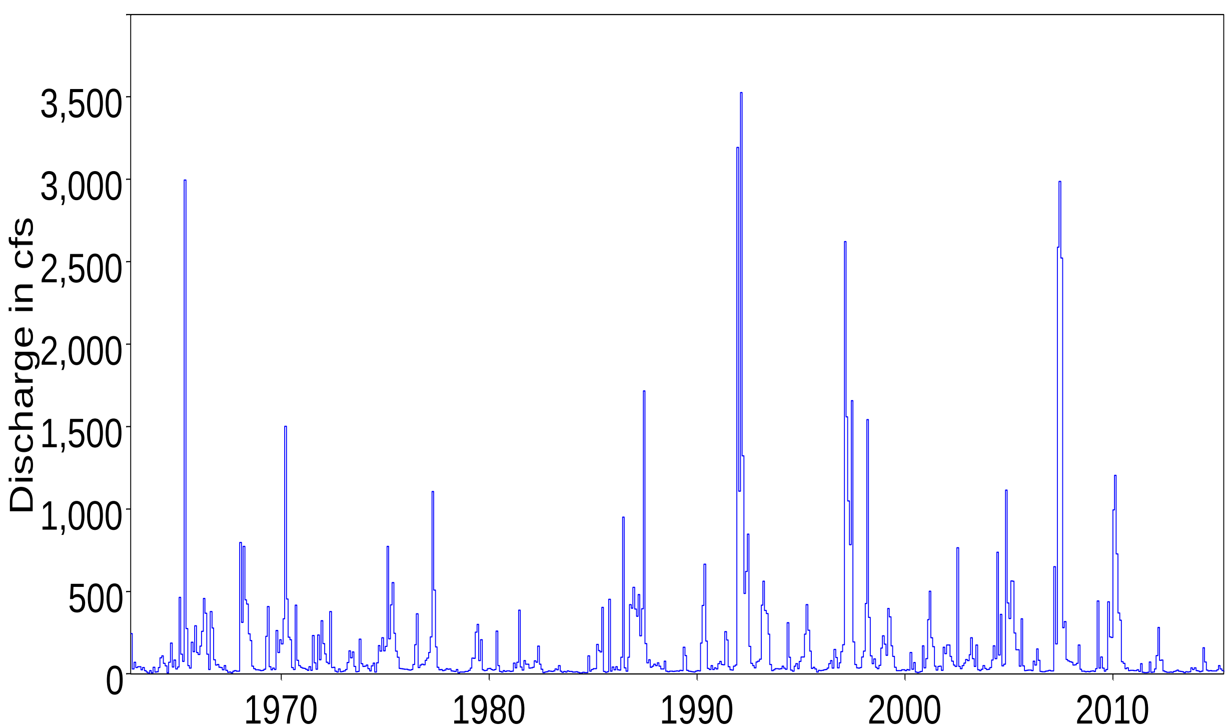
Annual peak flow of the Leon River near Belton B15



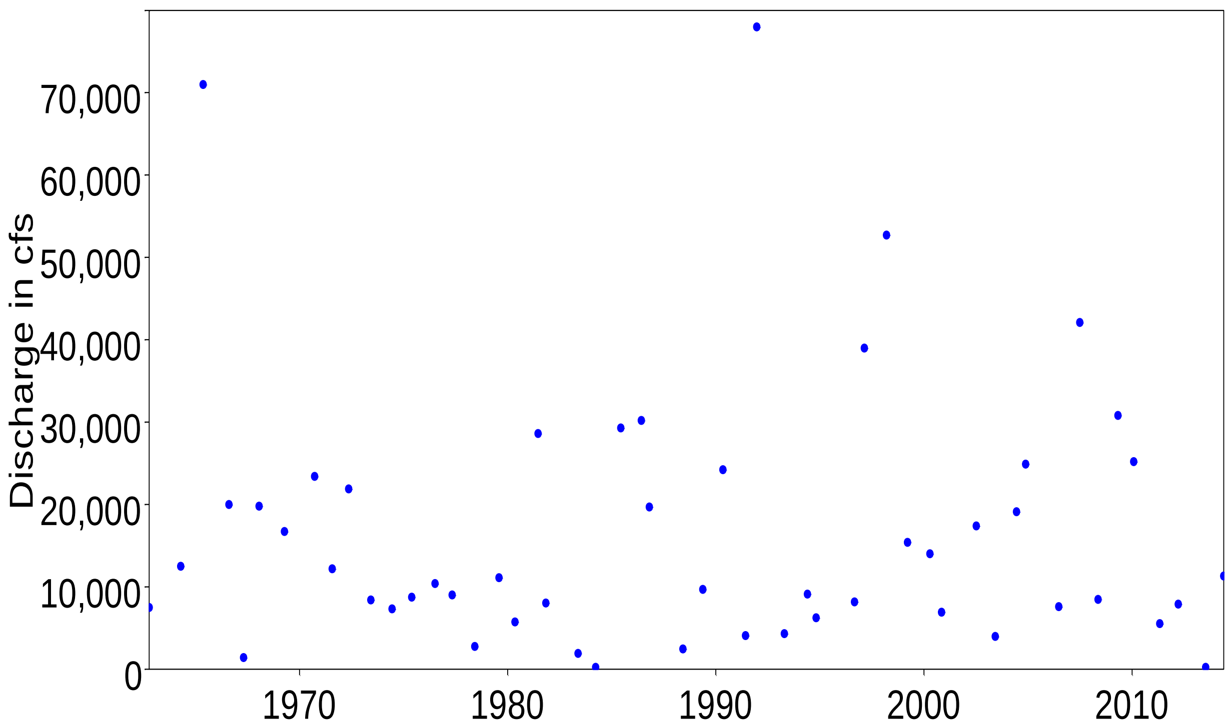
Annual flow of the Leon River near Belton B15



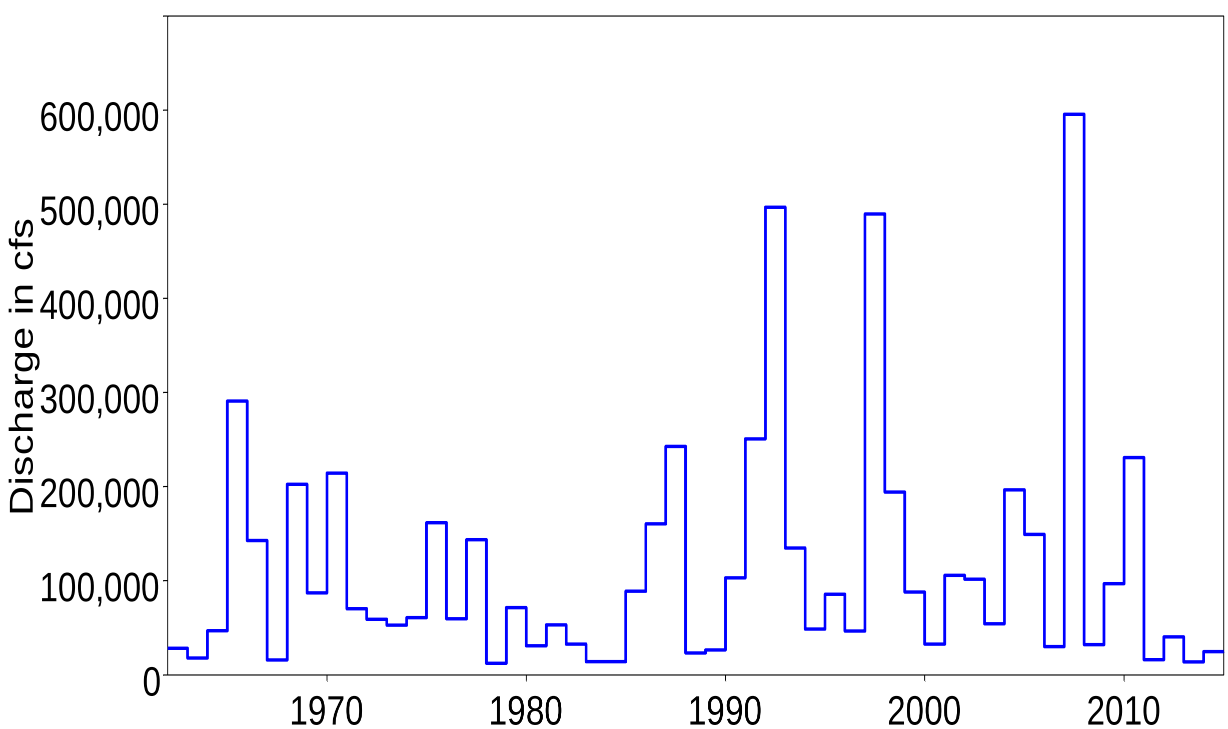
Mean daily flow of the Lampasas River near Kempner B16



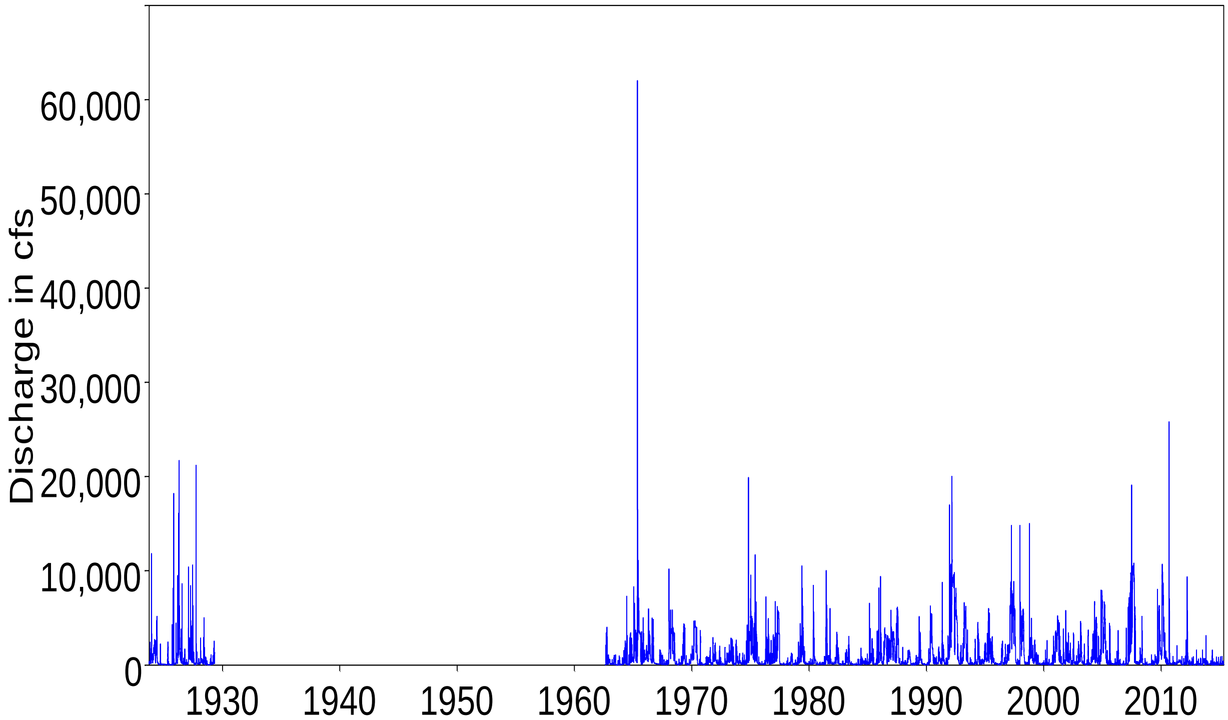
Mean monthly flow of the Lampasas River near Kempner B16



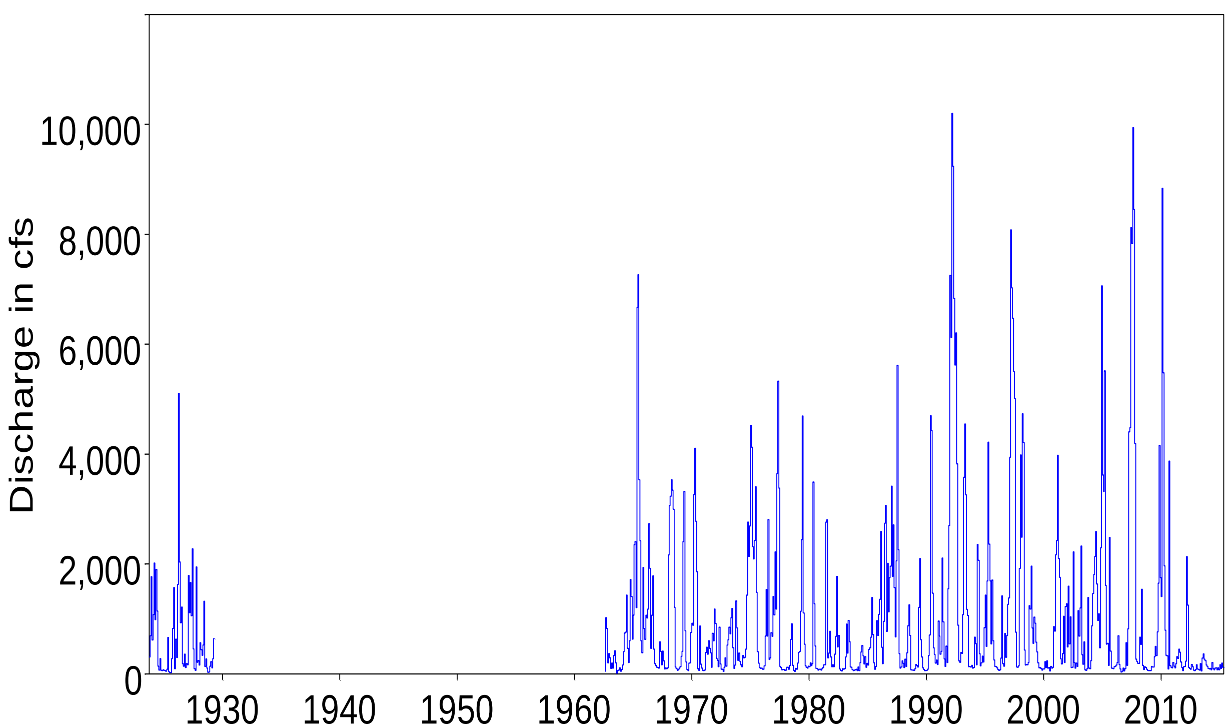
Annual peak flow of the Lampasas River near Kempner B16



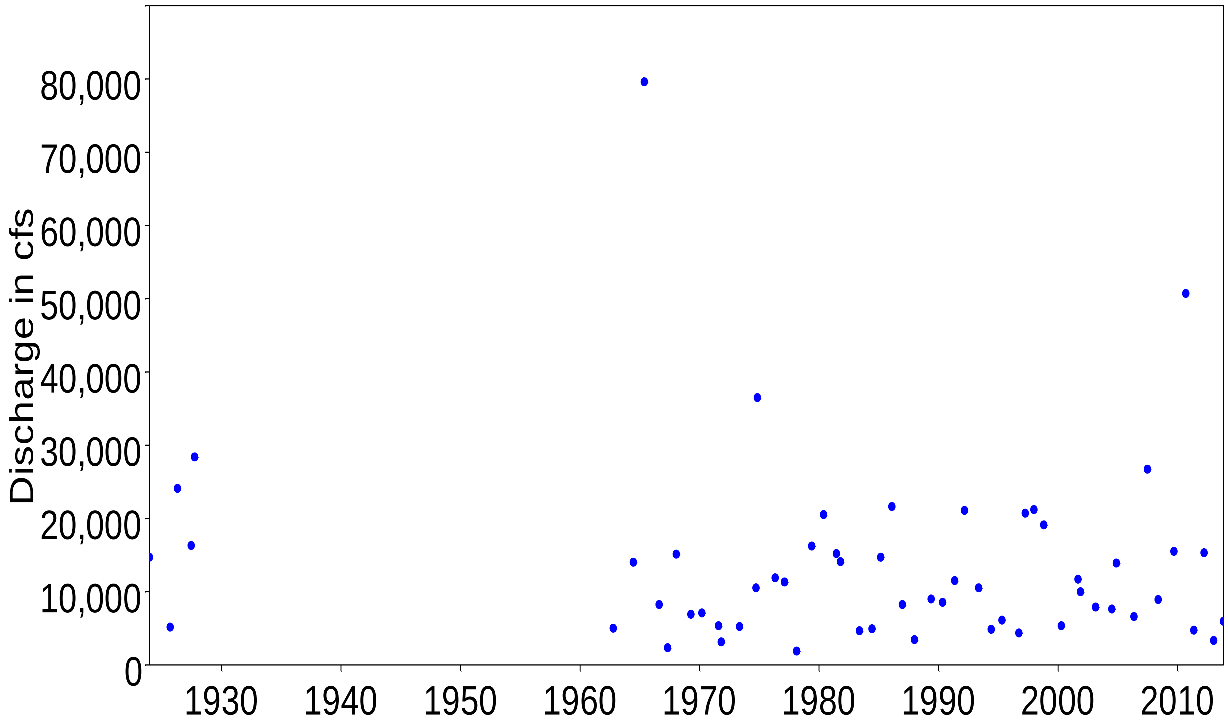
Annual flow of the Lampasas River near Kempner B16



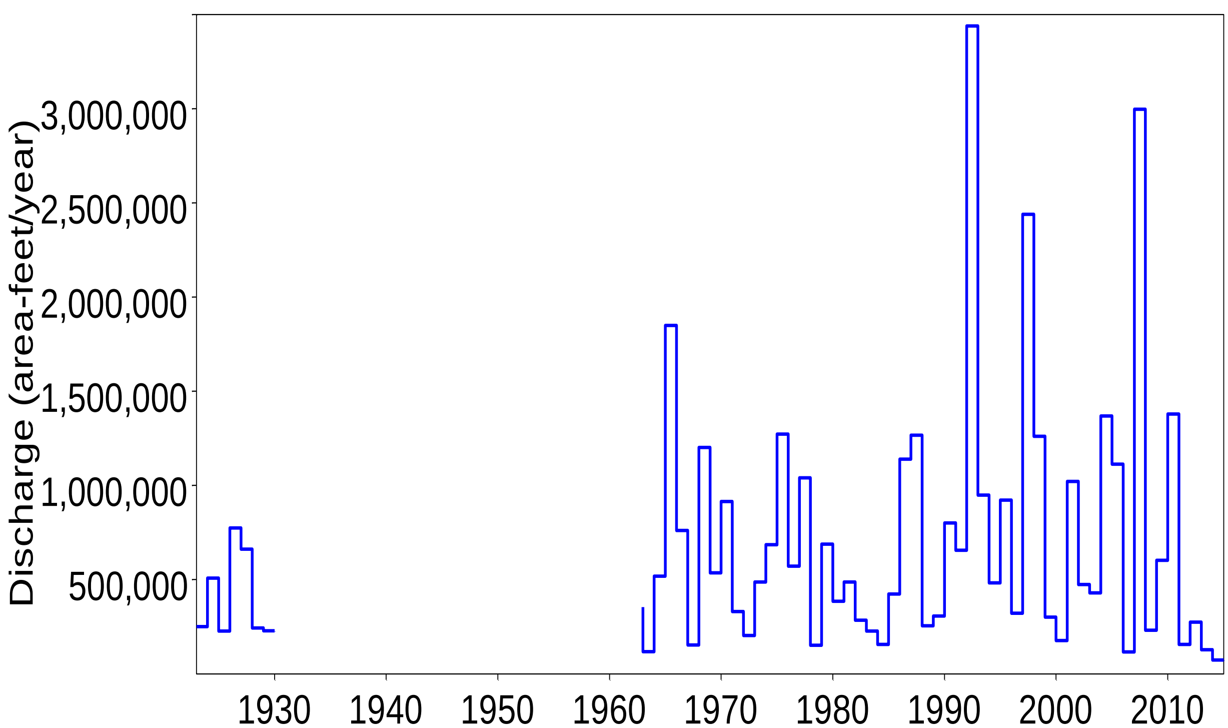
Mean daily flow of the Little River near Little River B17



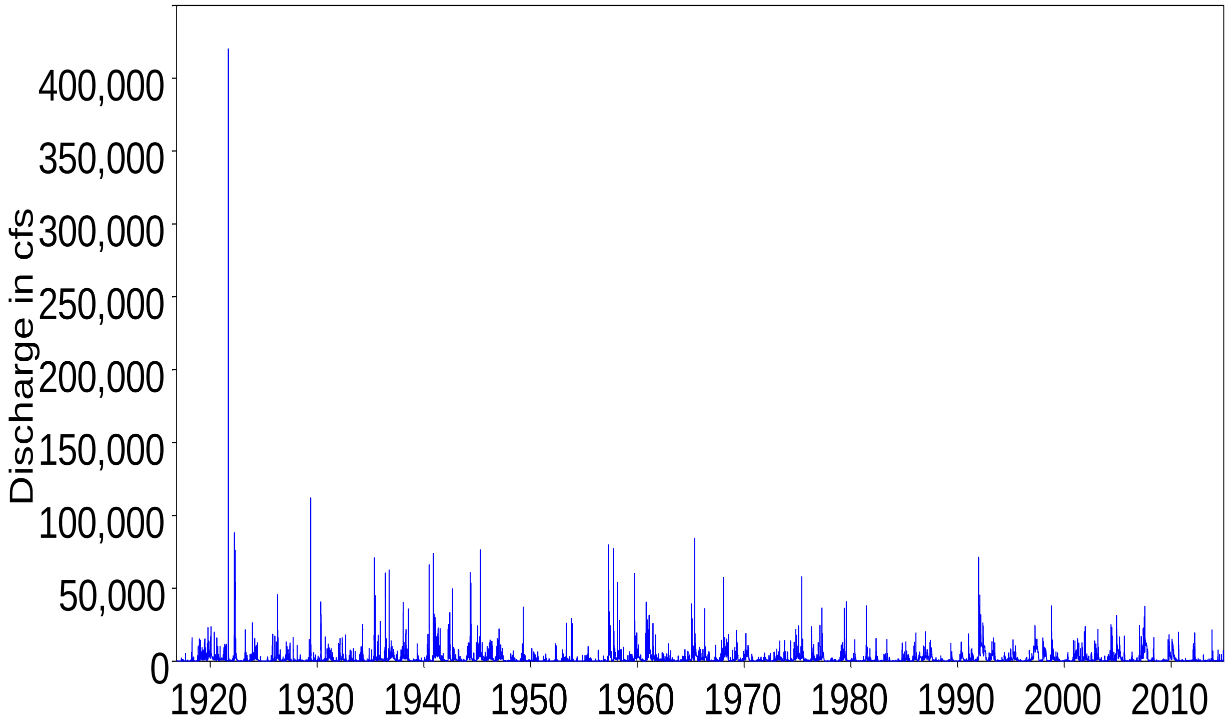
Mean monthly flow of the Little River near Little River B17



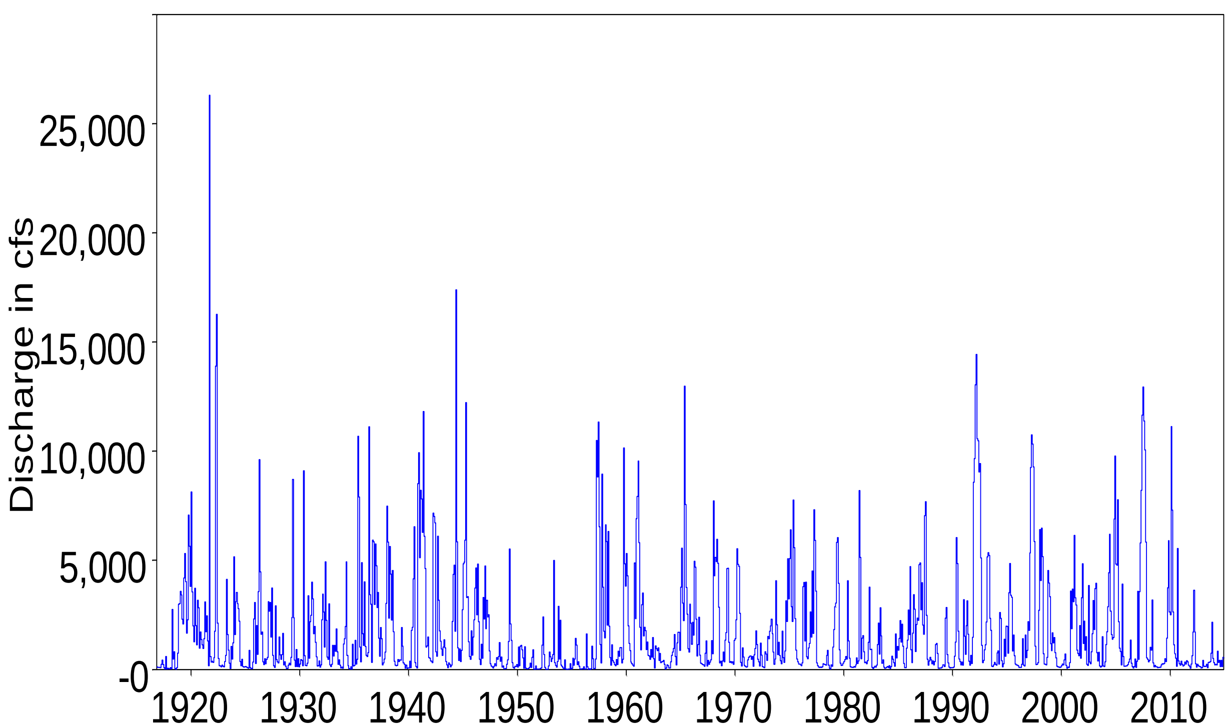
Annual peak flow of the Little River near Little River B17



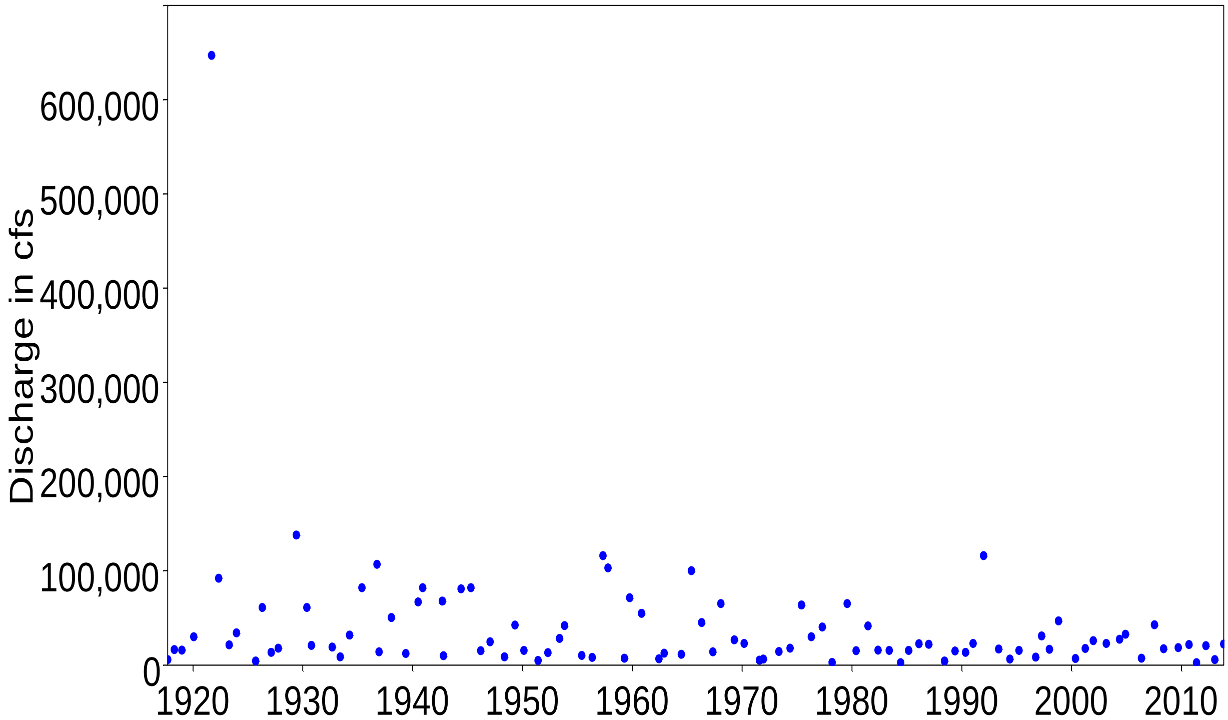
Annual flow of the Little River near Little River B17



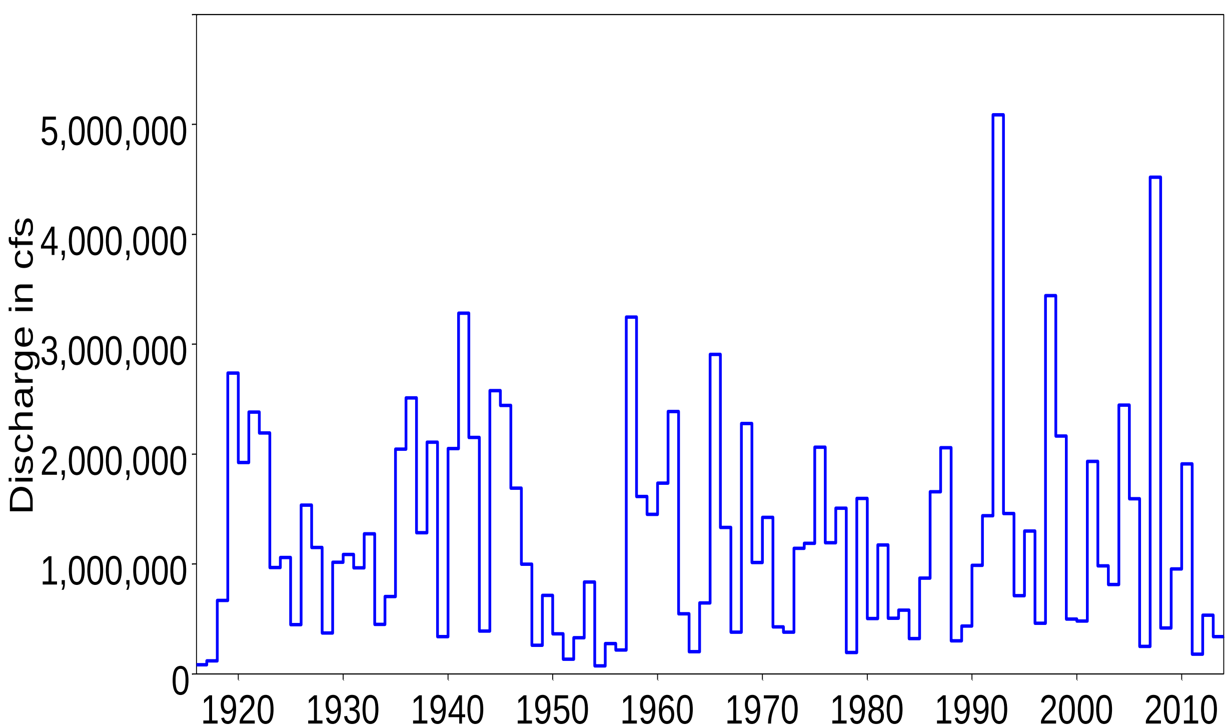
Mean daily flow of the Little River near Cameron B18



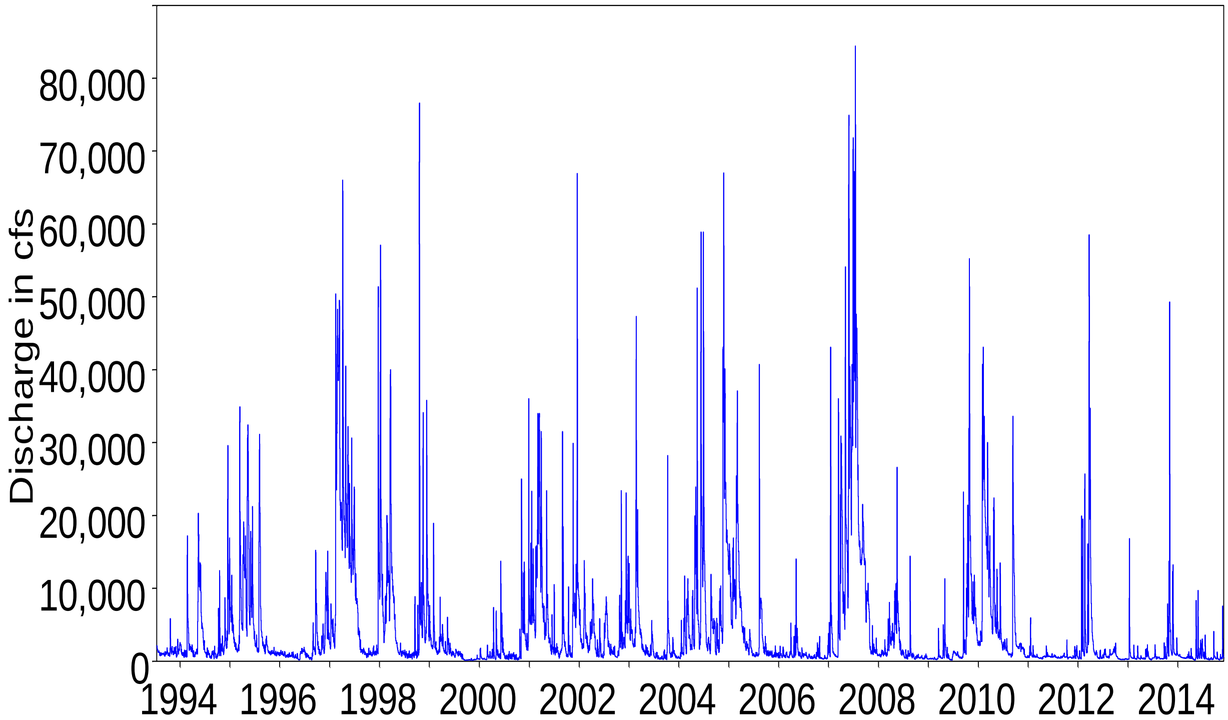
Mean monthly flow of the Little River near Cameron B18



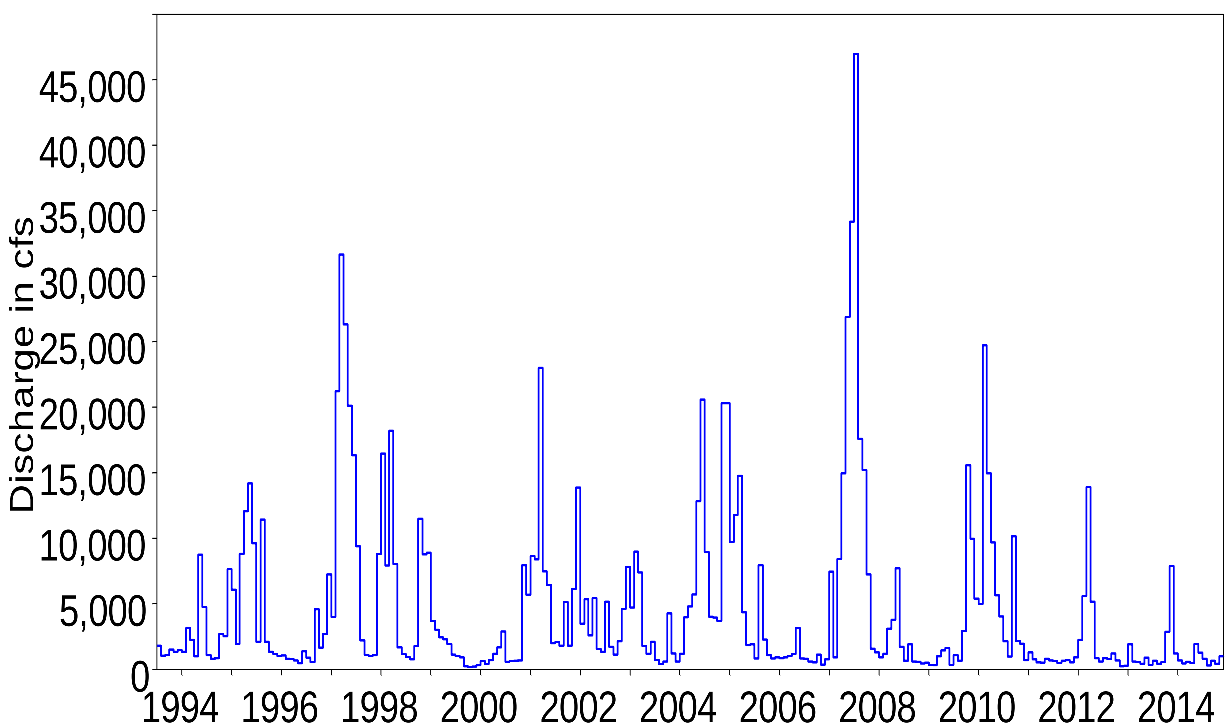
Annual peak flow of the Little River near Cameron B18



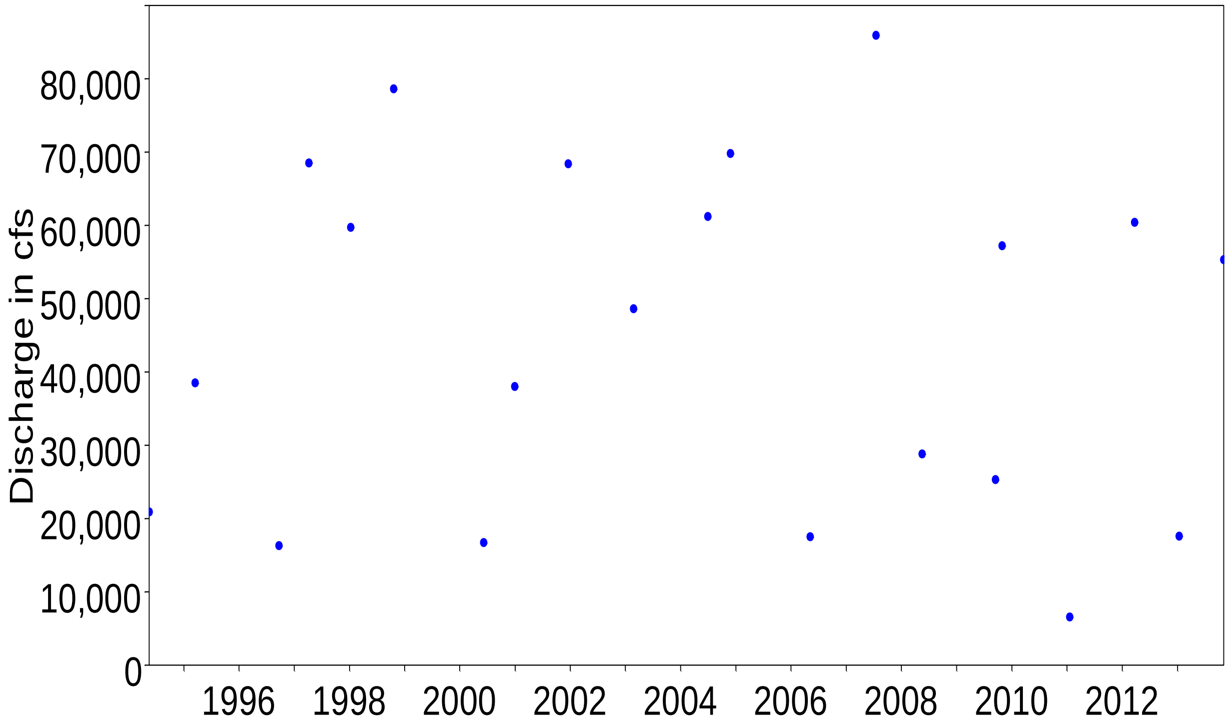
Annual flow of the Little River near Cameron B18



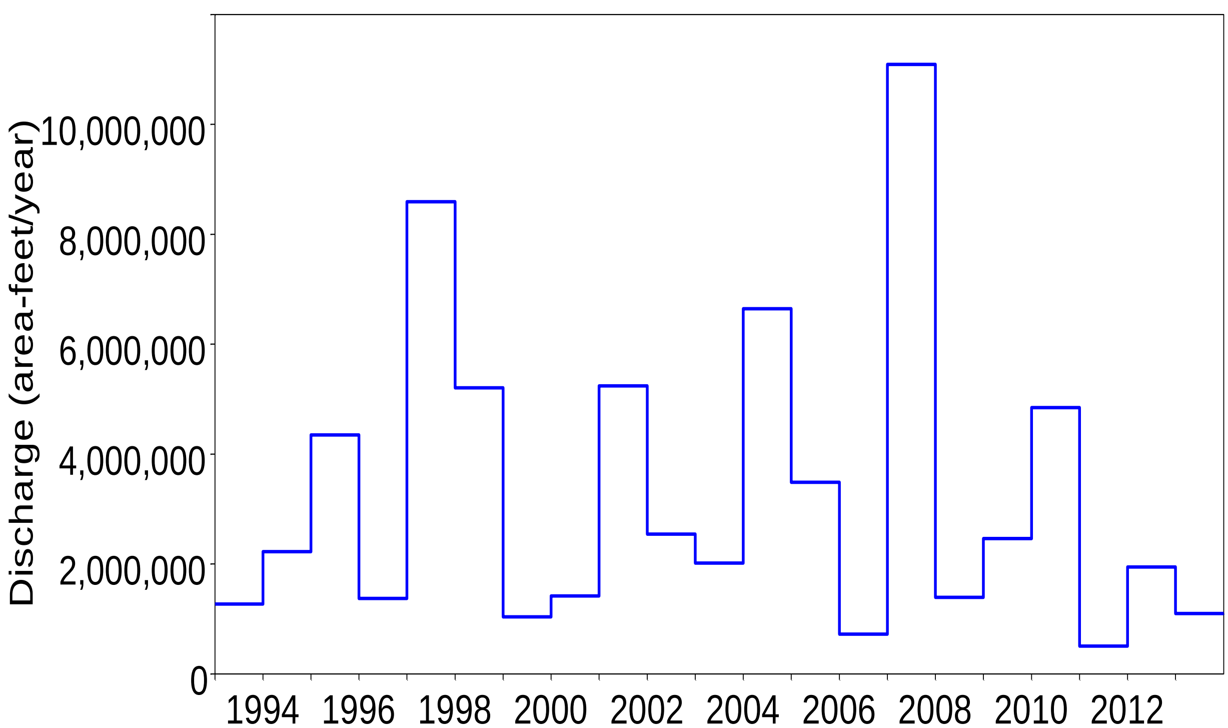
Mean daily flow of the Brazos River at SH 21 near Bryan B19



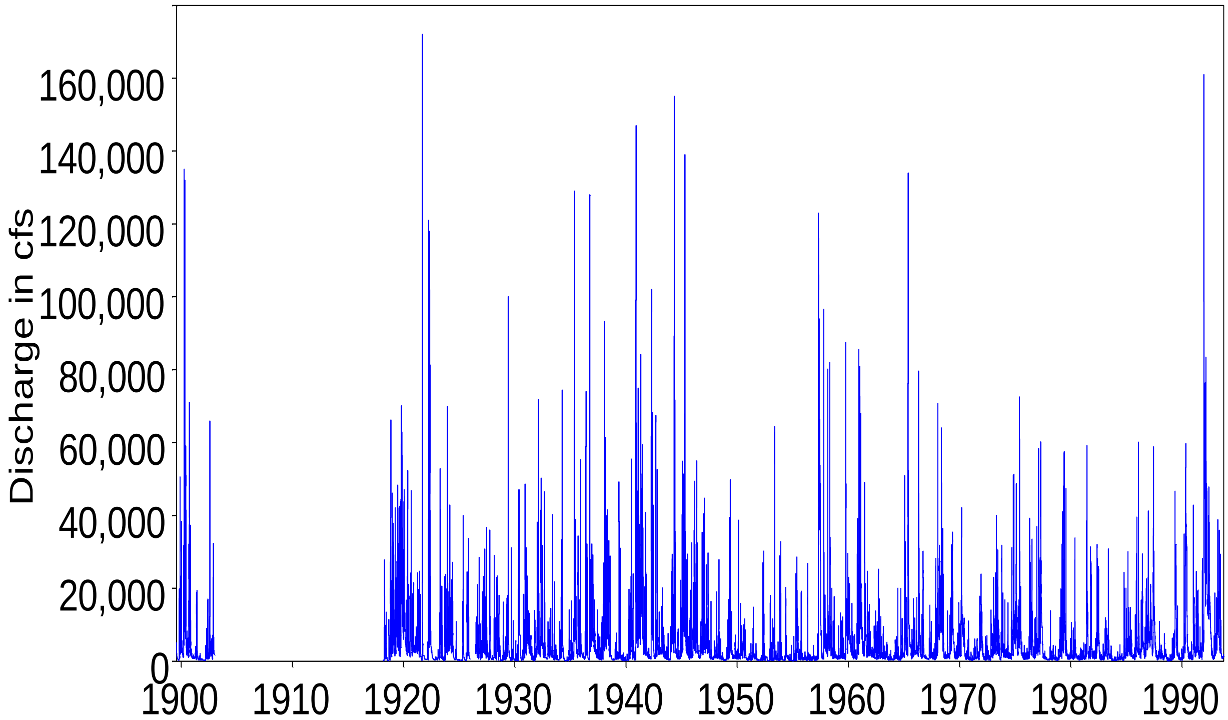
Mean monthly flow of the Brazos River at SH 21 near Bryan B19



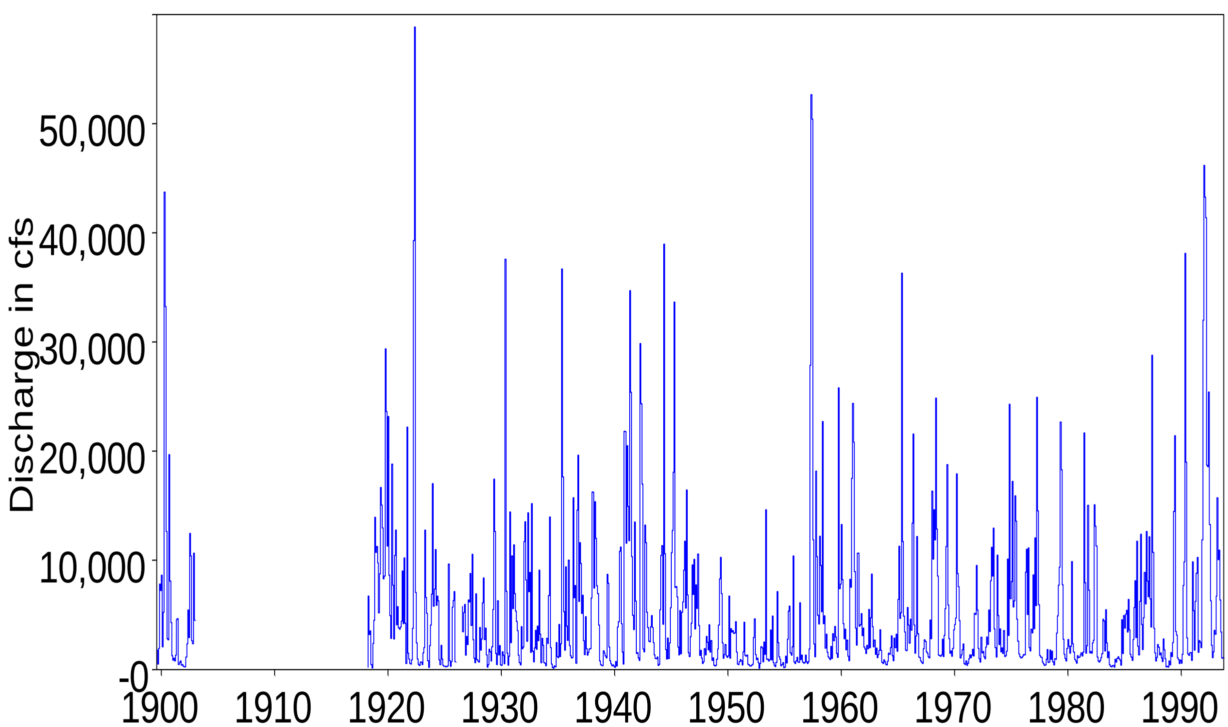
Annual peak flow of the Brazos River at SH 21 near Bryan B19



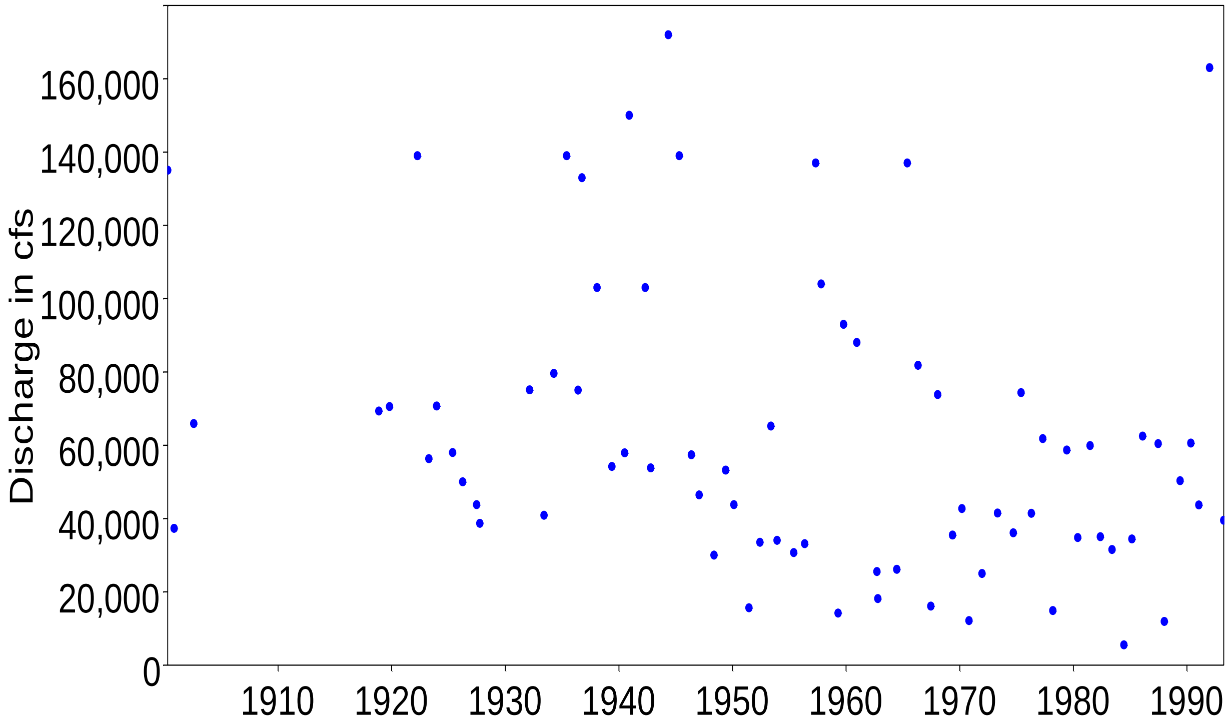
Annual flow of the Brazos River at SH 21 near Bryan B19



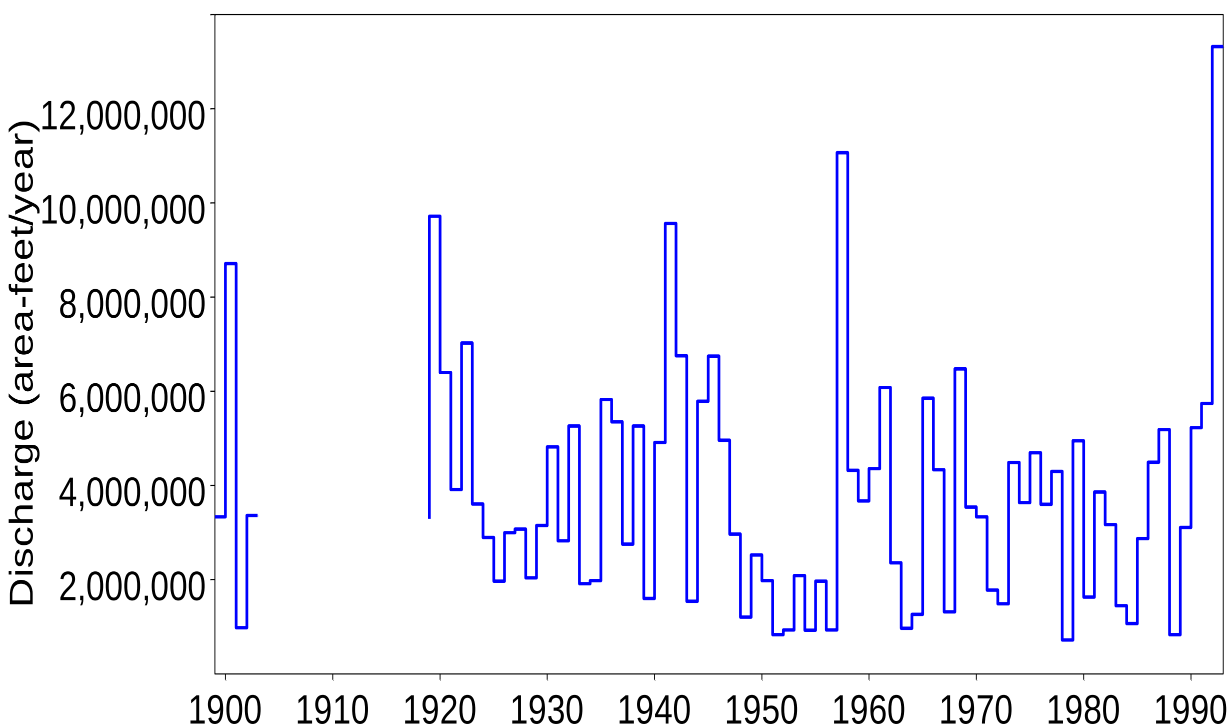
Mean daily flow of the Brazos River near Bryan B20



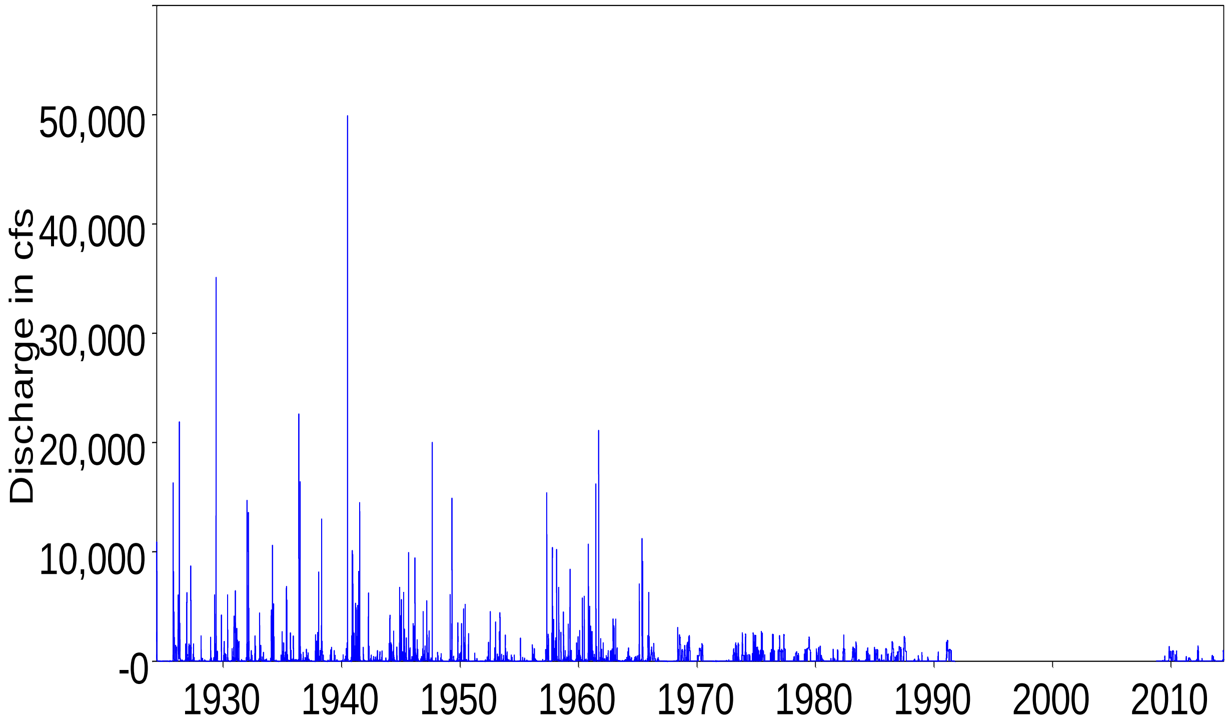
Mean monthly flow of the Brazos River near Bryan B20



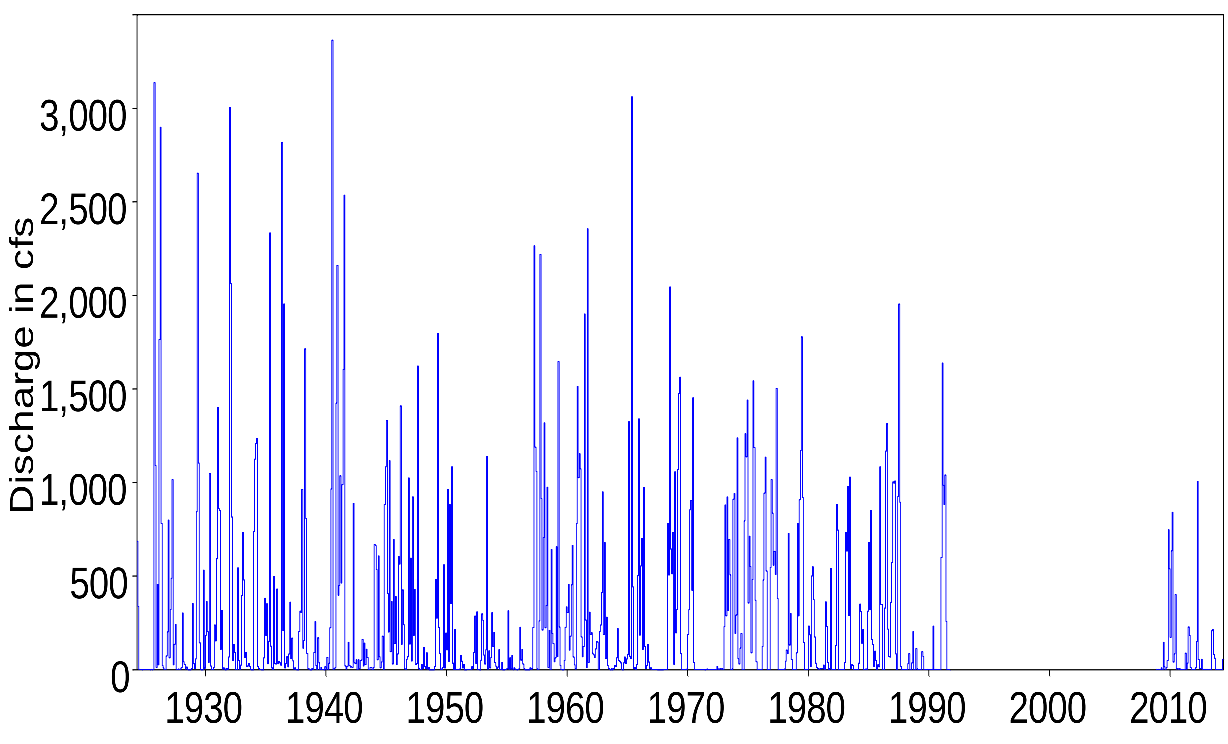
Annual peak flow of the Brazos River near Bryan B20



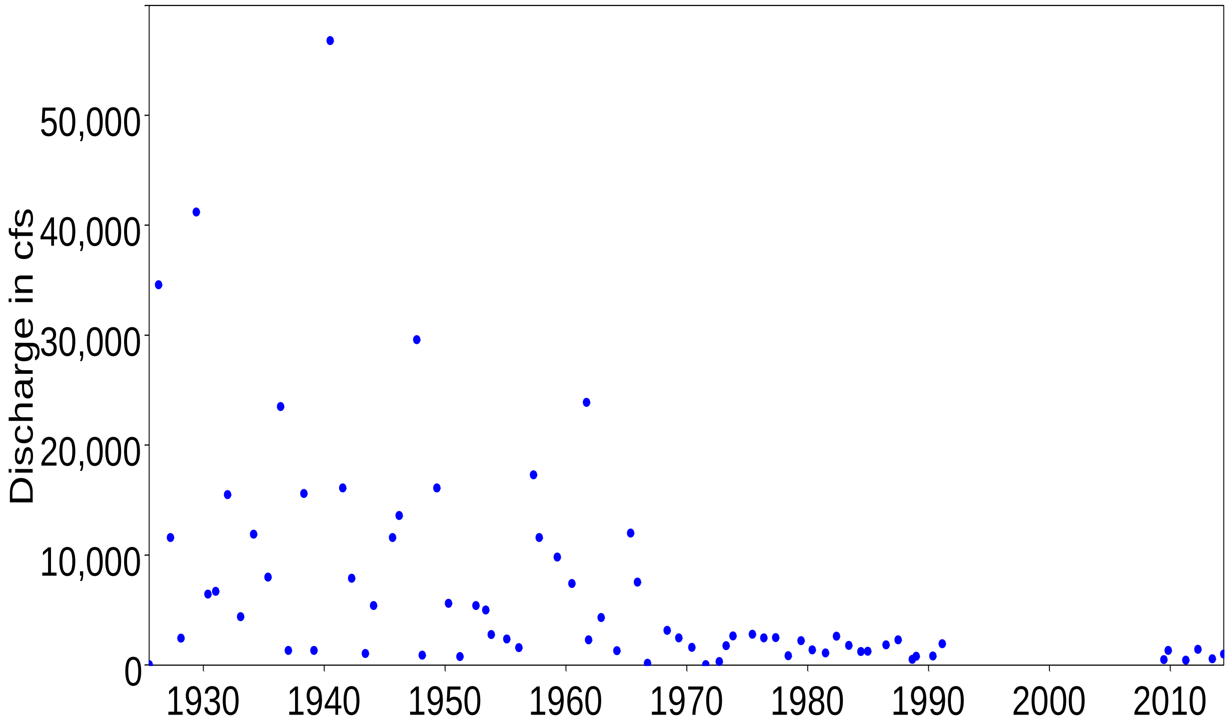
Annual flow of the Brazos River near Bryan B20



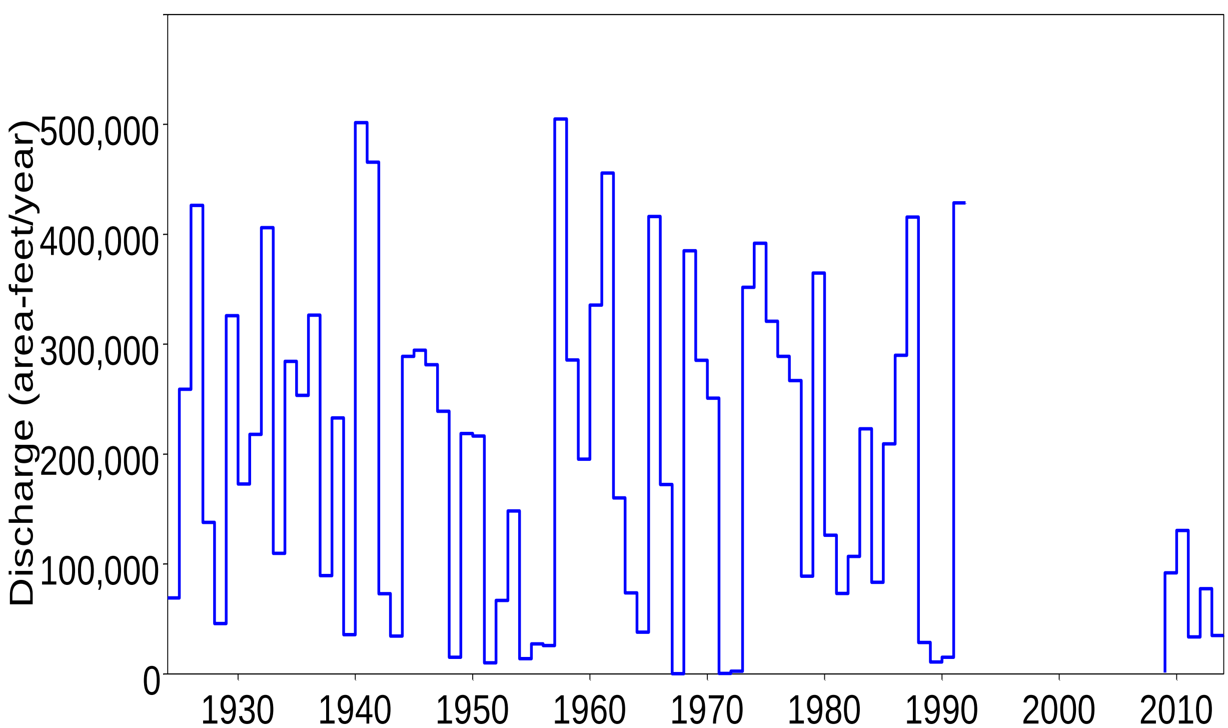
Mean daily flow of the Yegua Creek near Somerville B21



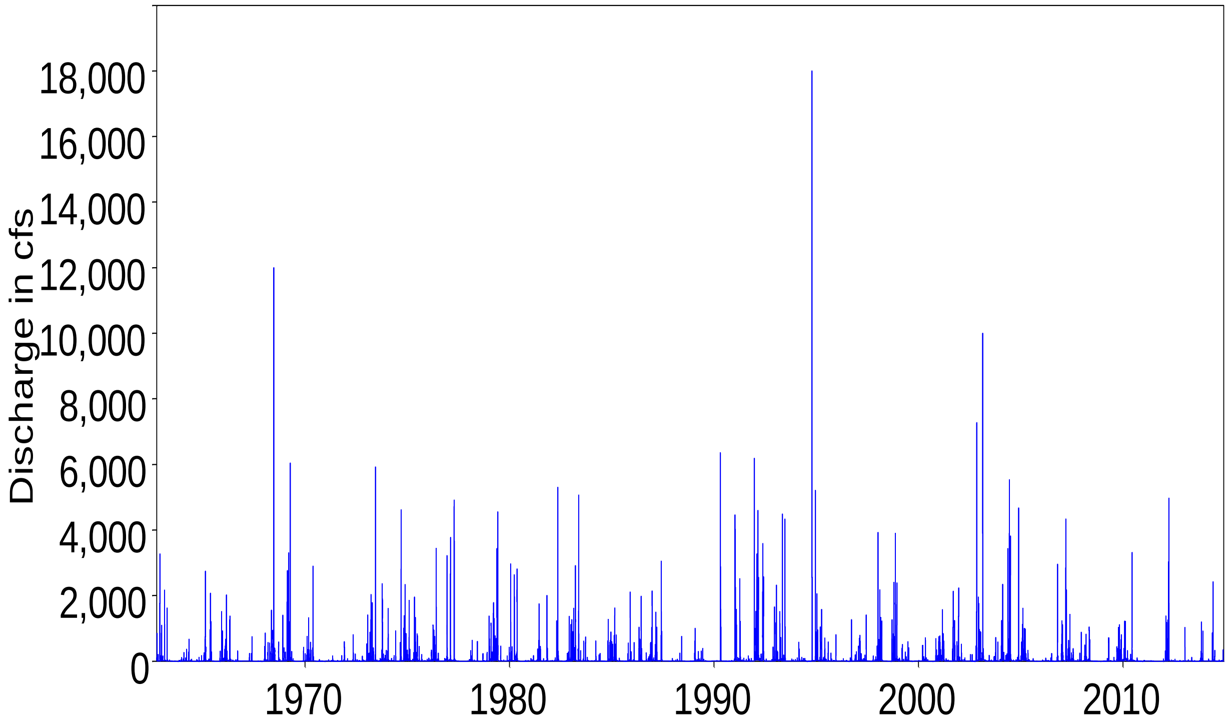
Mean monthly flow of the Yegua Creek near Somerville B21



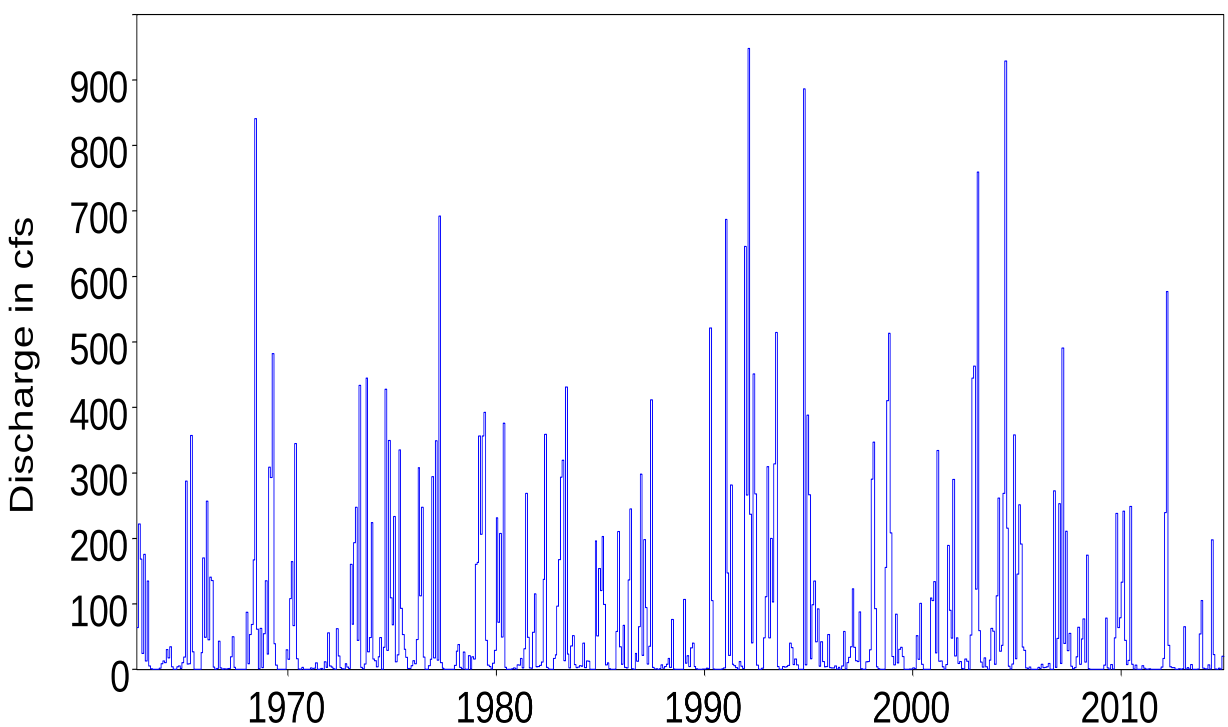
Annual peak flow of the Yegua Creek near Somerville B21



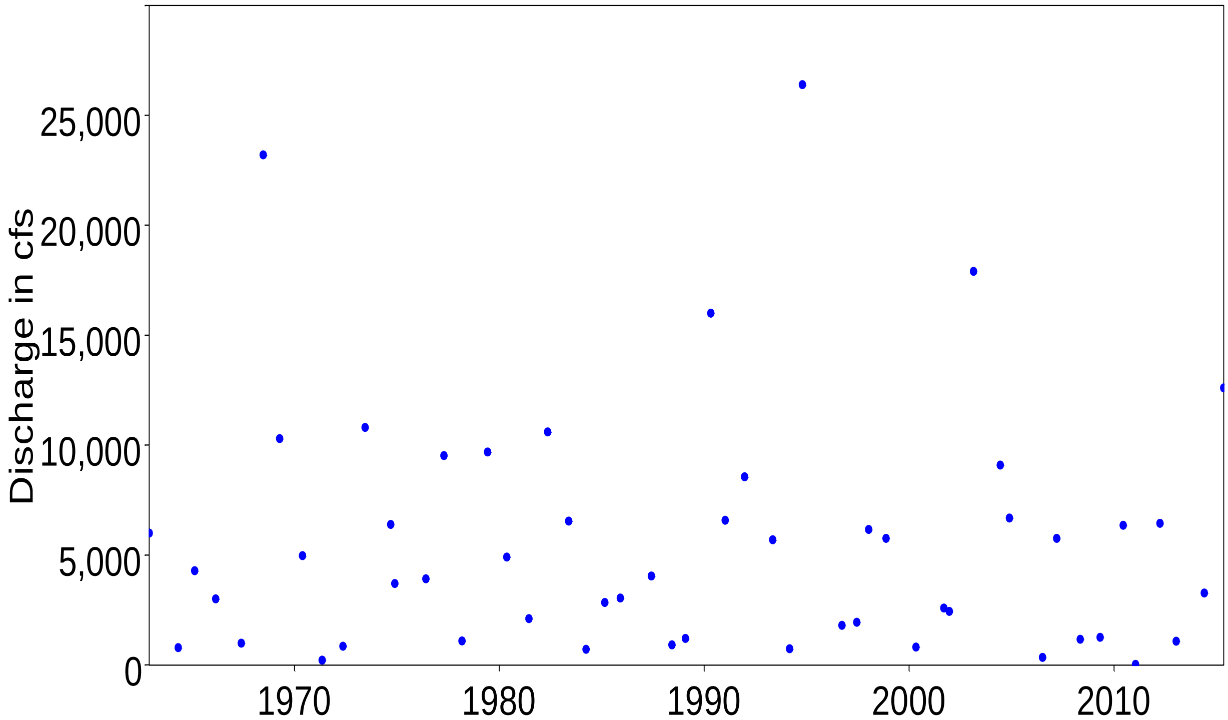
Annual flow of the Yegua Creek near Somerville B21



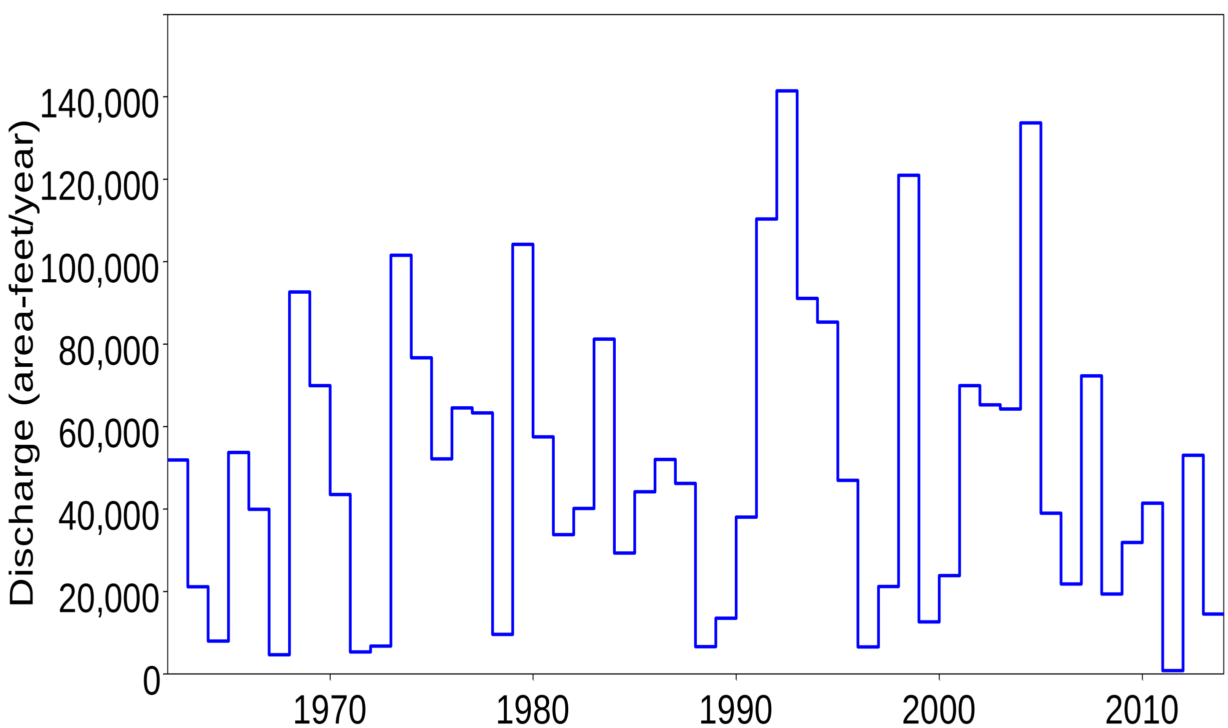
Mean daily flow of the Davidson Creek near Lyons B22



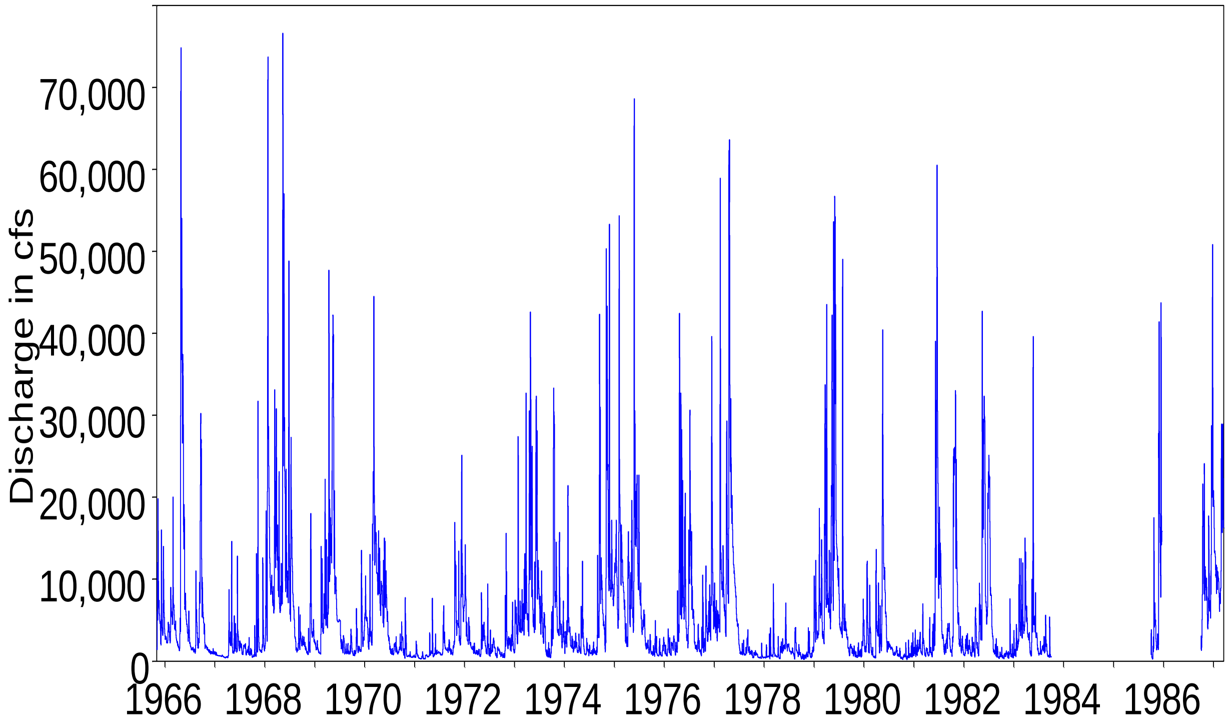
Mean monthly flow of the Davidson Creek near Lyons B22



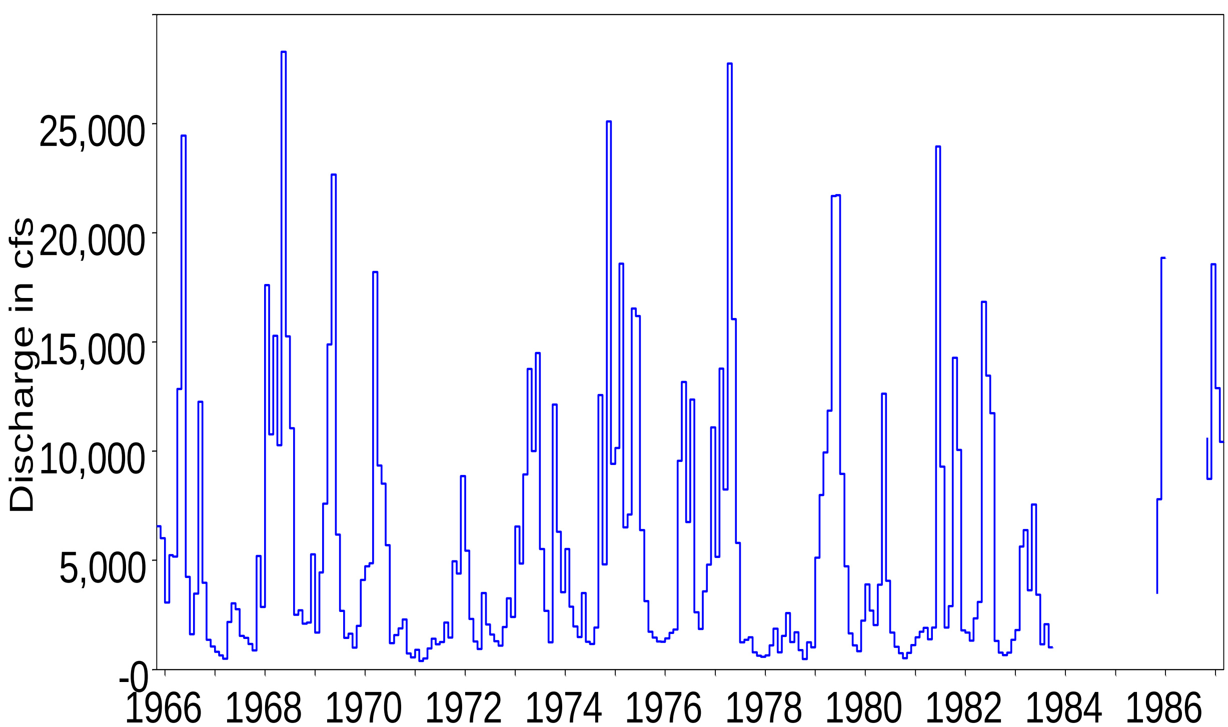
Annual peak flow of the Davidson Creek near Lyons B22



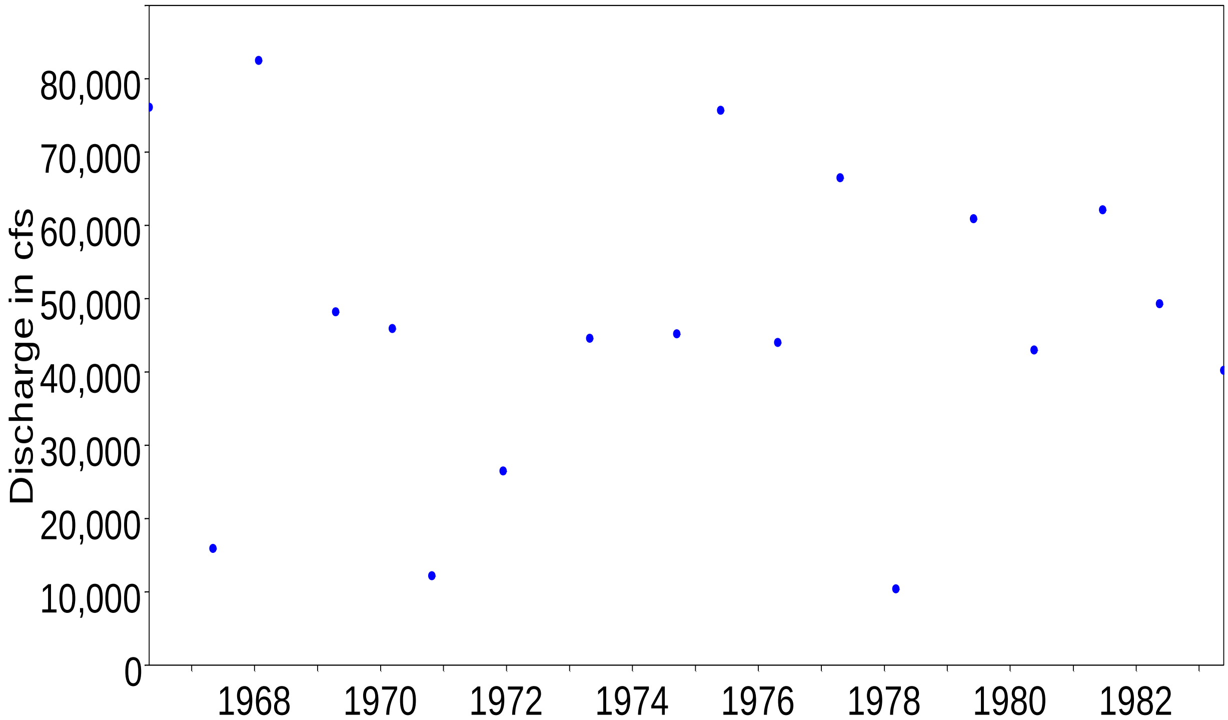
Annual flow of the Davidson Creek near Lyons B22



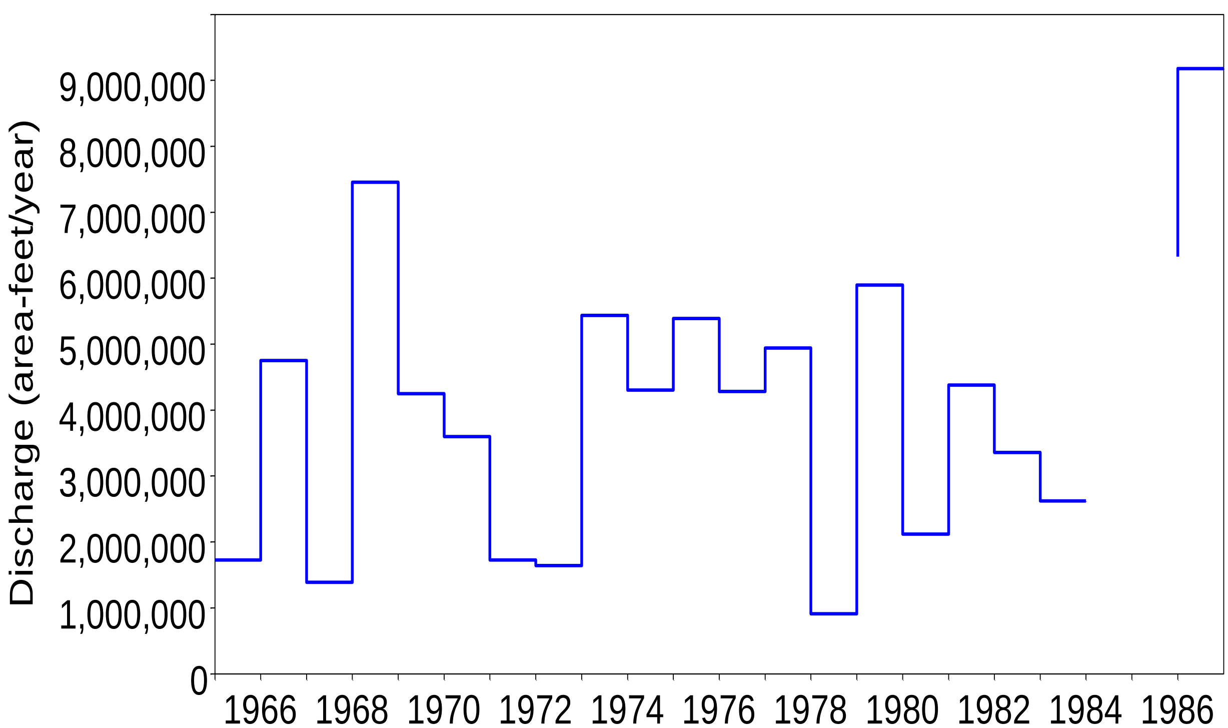
Mean daily flow of the Brazos River at Washington B23



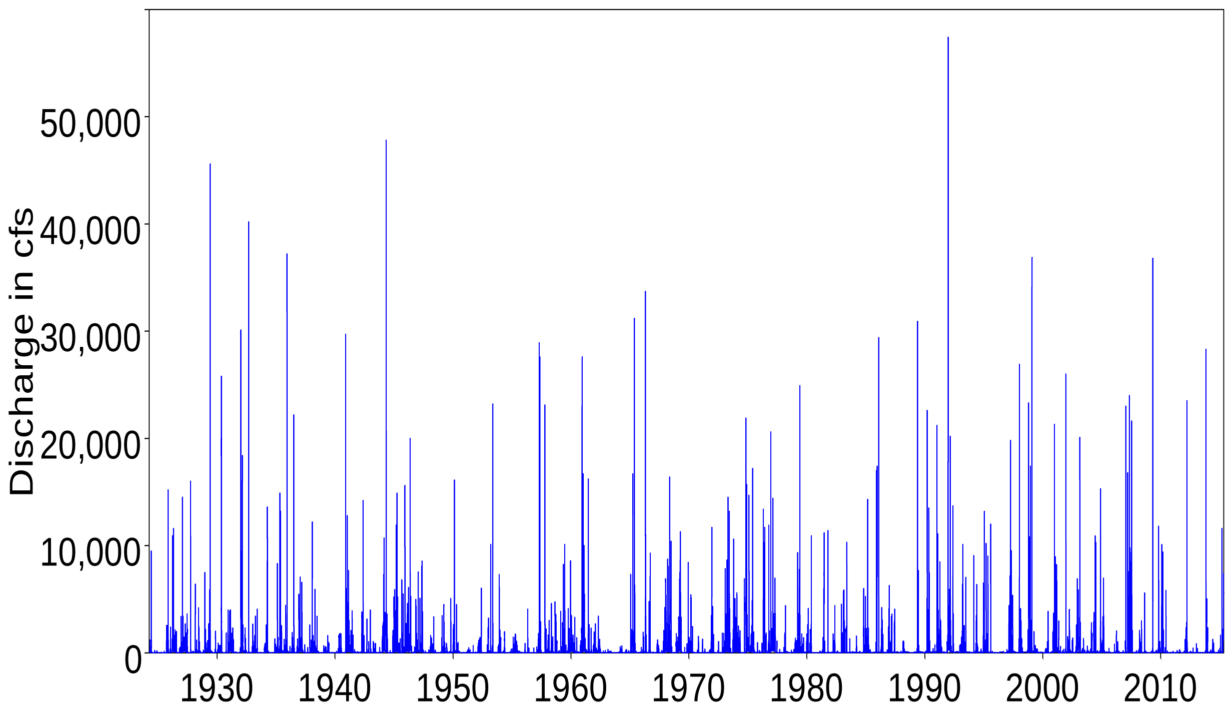
Mean monthly flow of the Brazos River at Washington B23



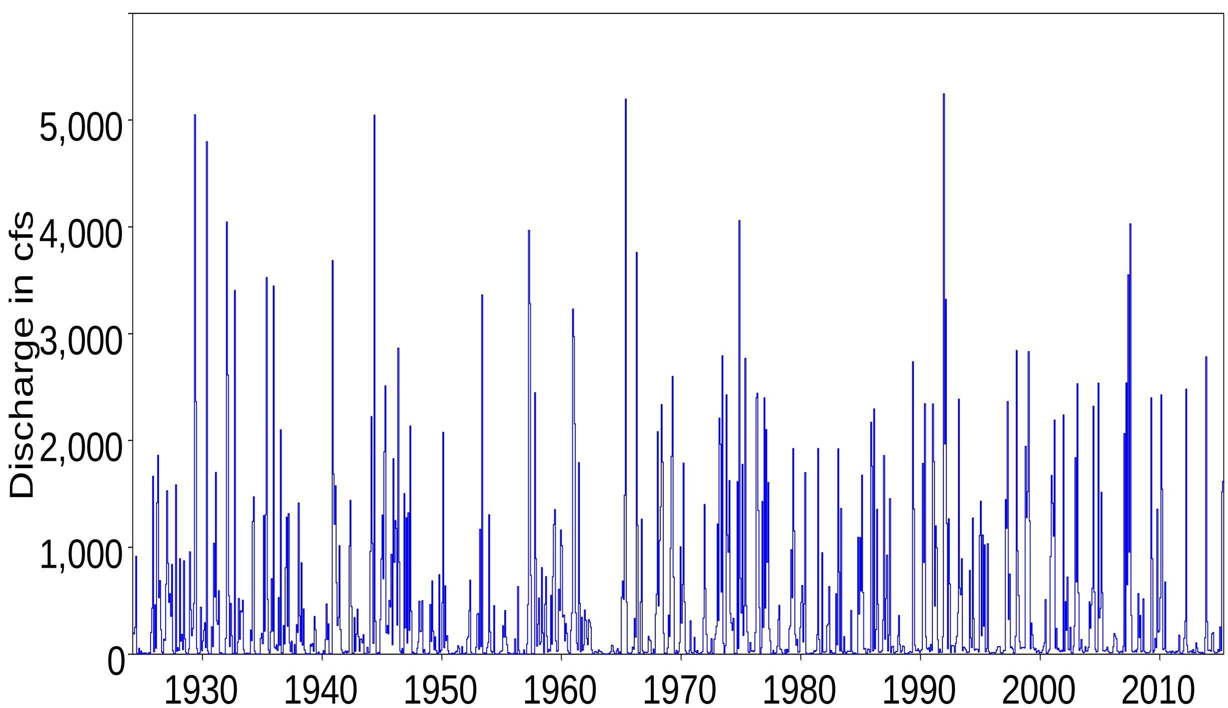
Annual peak flow of the Brazos River at Washington B23



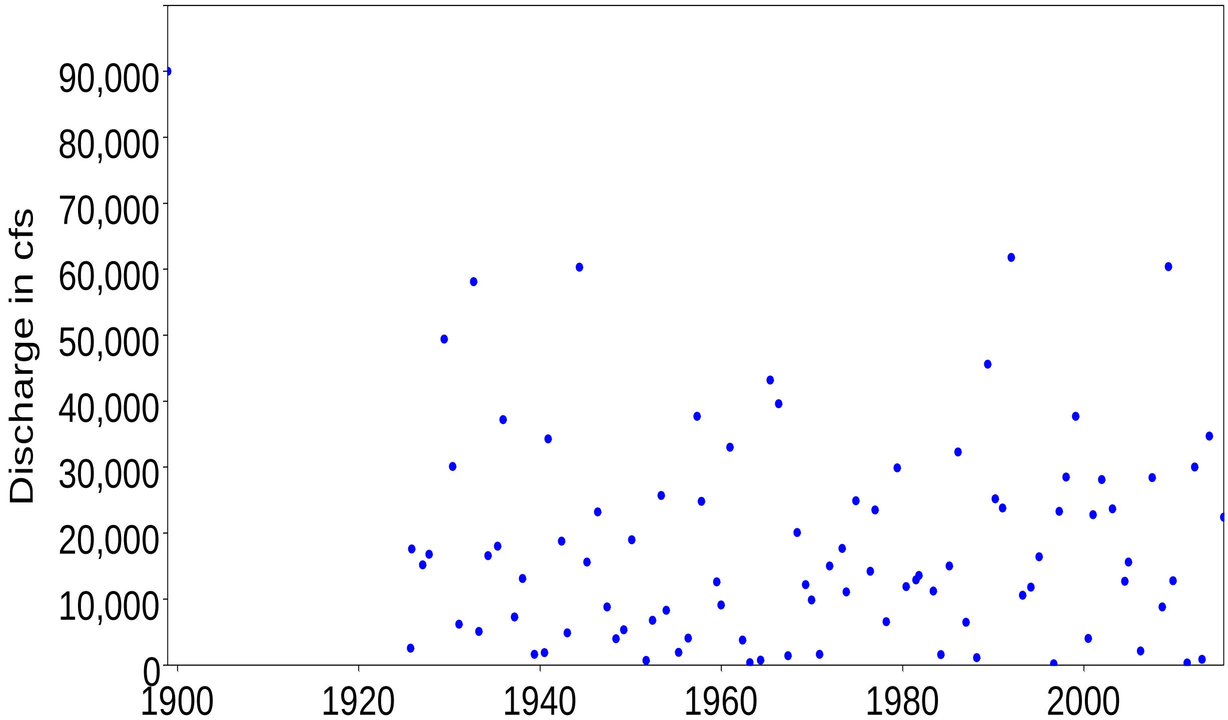
Annual flow of the Brazos River at Washington B23



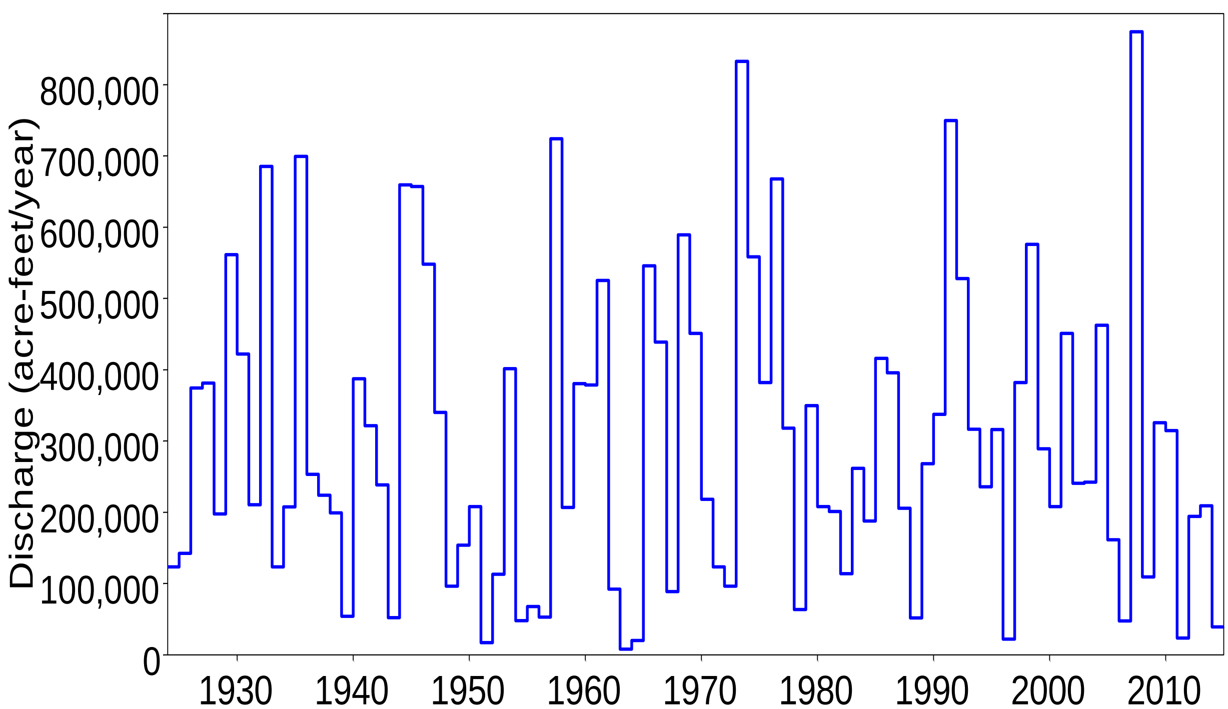
Mean daily flow of the Navasota River at Easterly B24



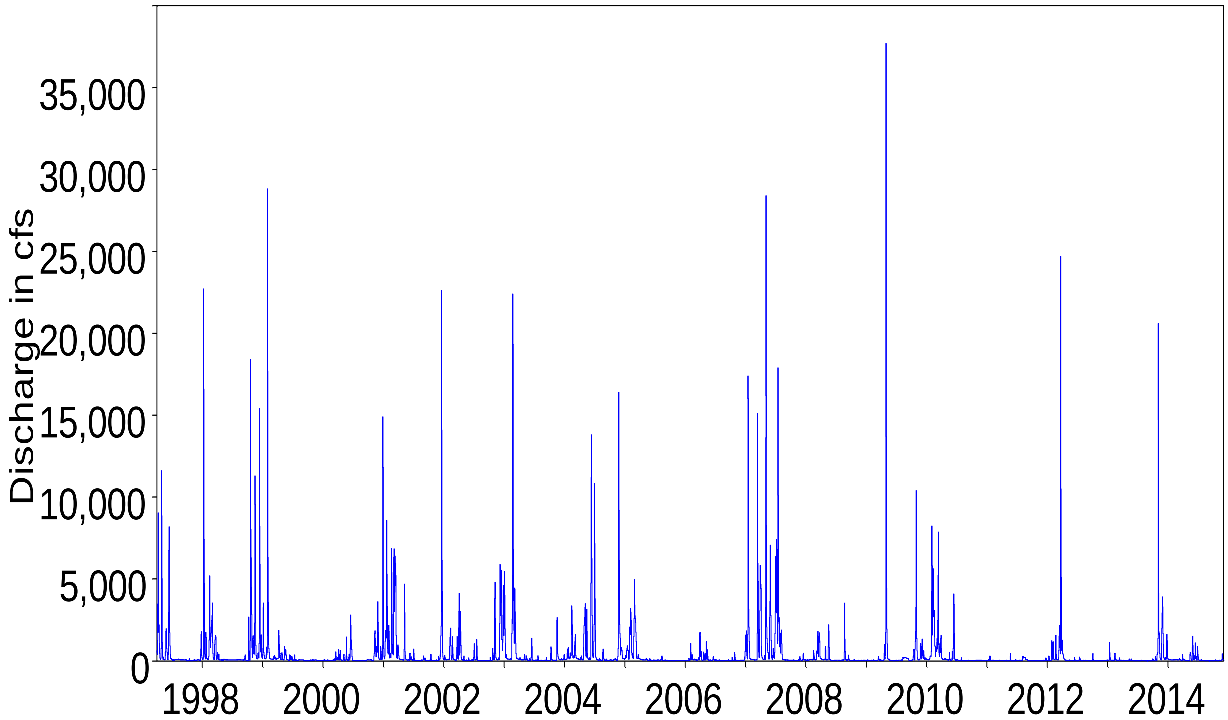
Mean monthly flow of the Navasota River at Easterly B24



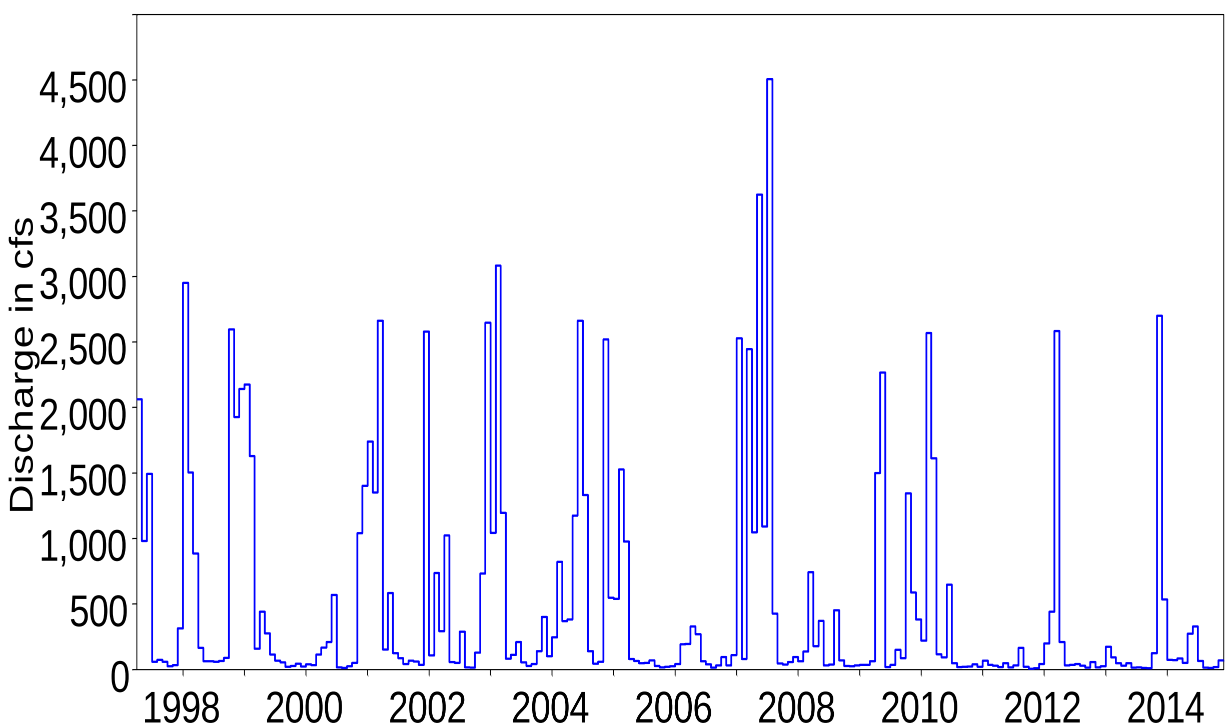
Annual peak flow of the Navasota River at Easterly B24



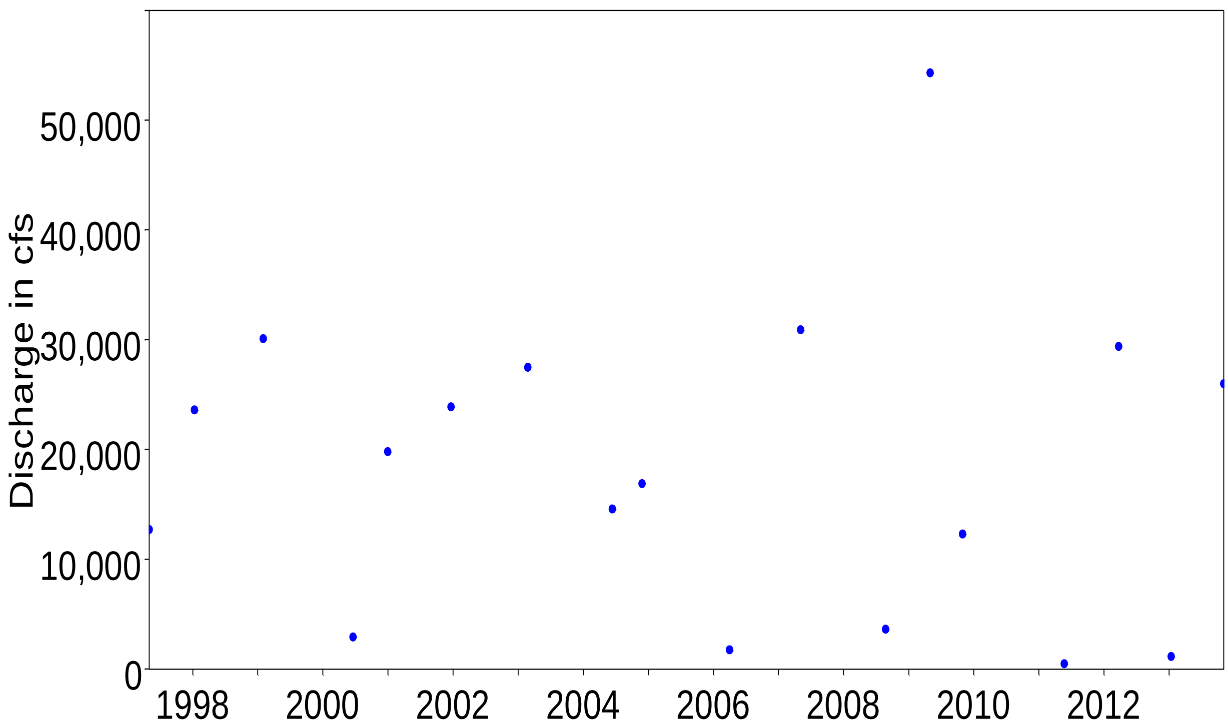
Annual flow of the Navasota River at Easterly B24



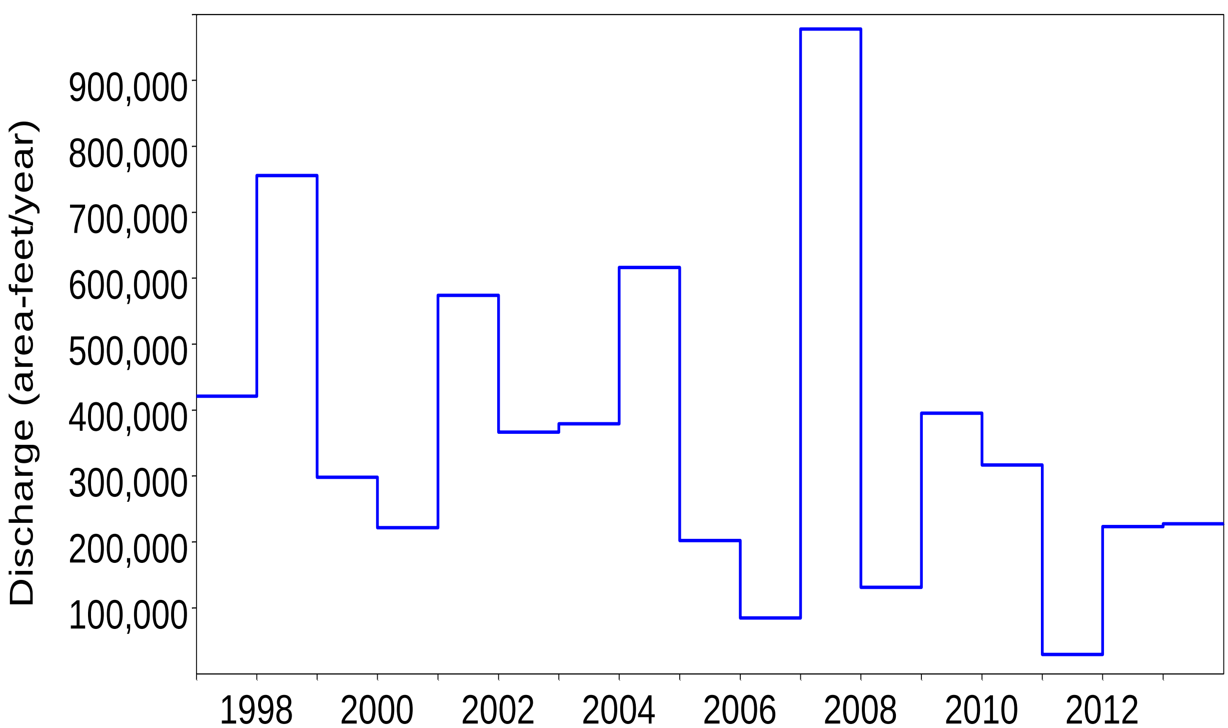
Mean daily flow of the Navasota River at Old Spanish Road near Bryan B25



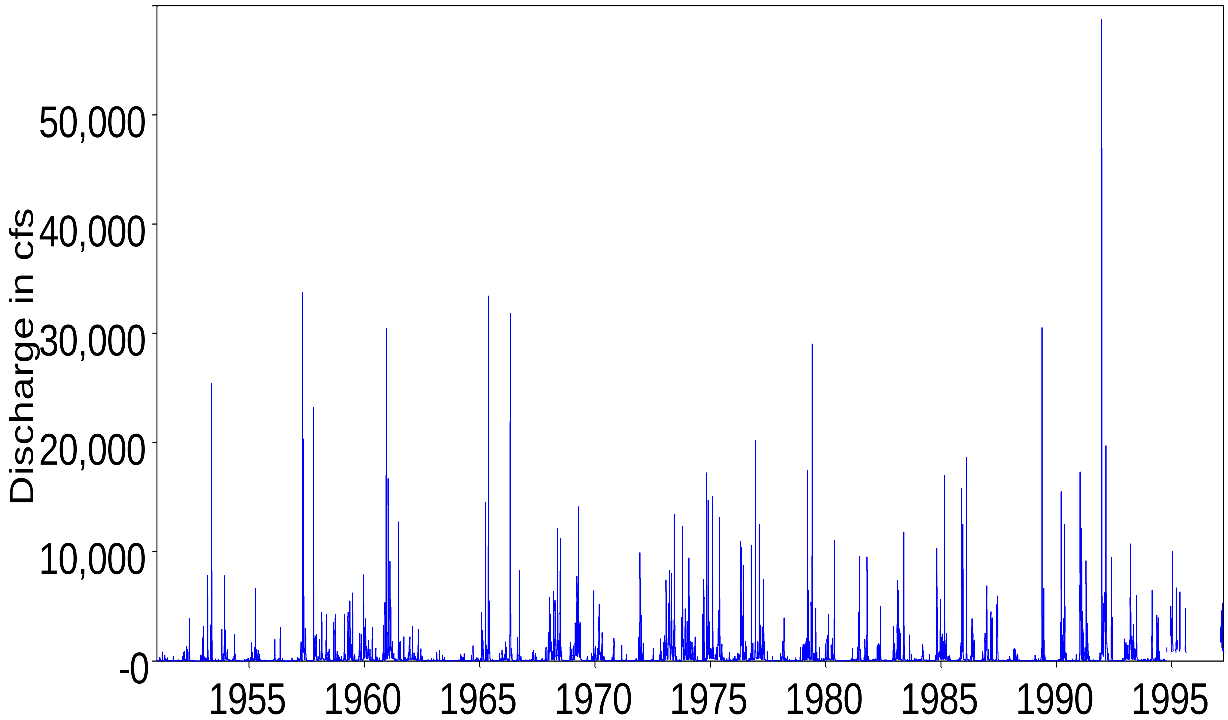
Mean monthly flow of the Navasota River at Old Spanish Road near Bryan B25



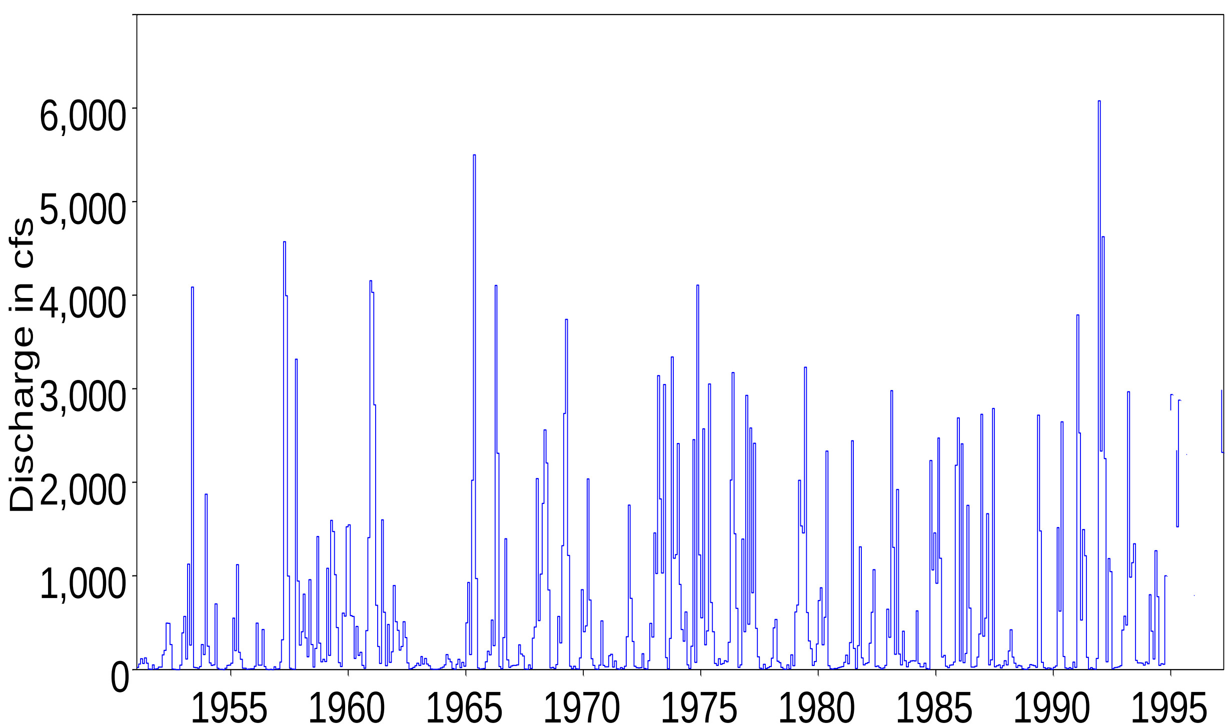
Annual peak flow of the Navasota River at Old Spanish Road near Bryan B25



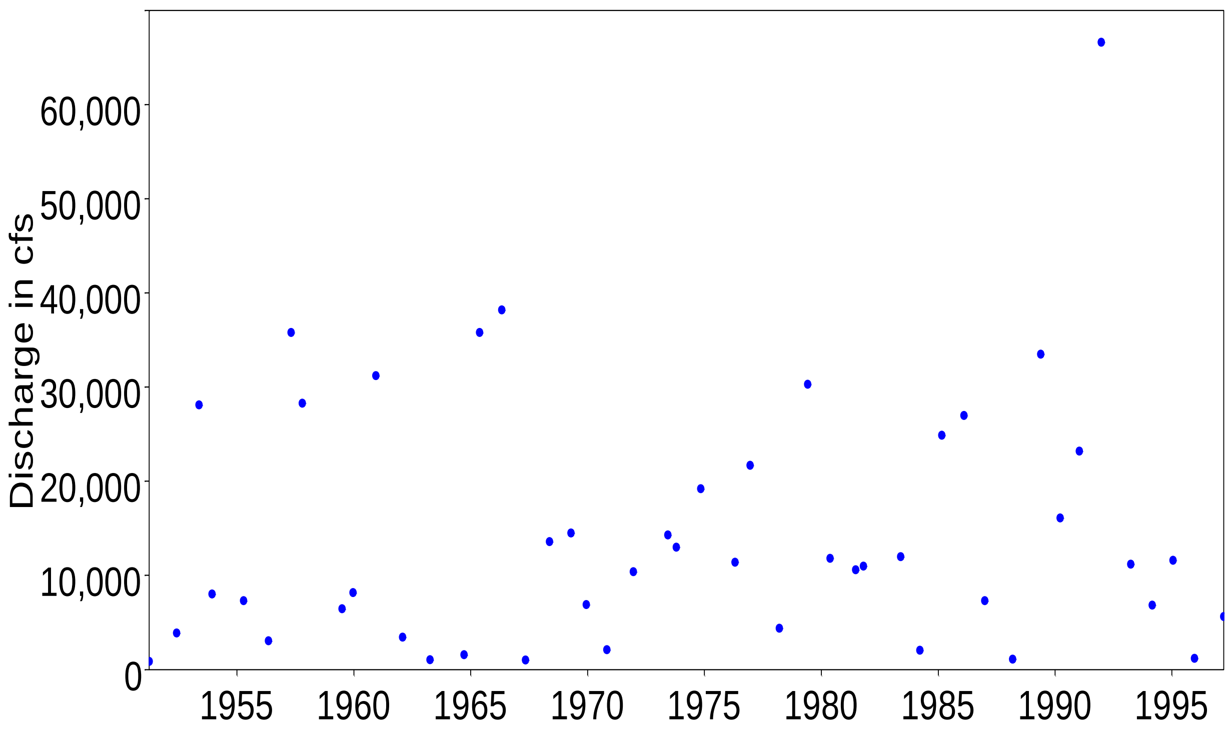
Annual flow of the Navasota River at Old Spanish Road near Bryan B25



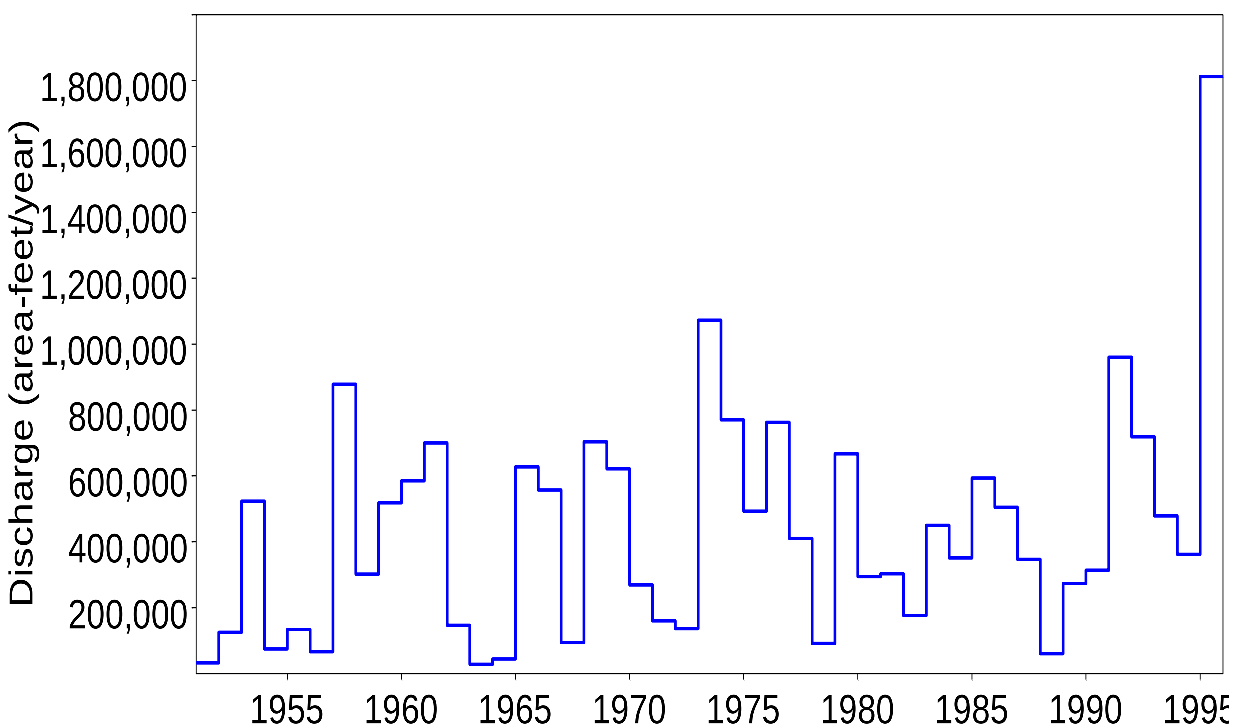
Mean daily flow of the Navasota River near Bryan B26



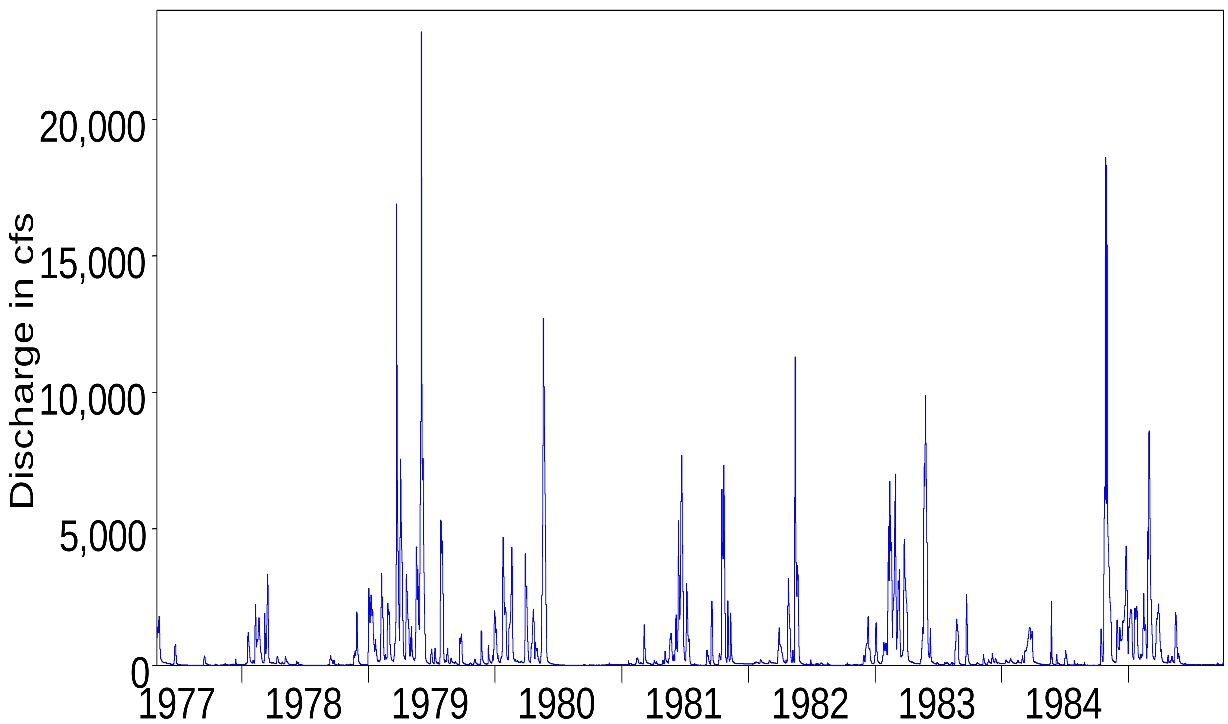
Mean monthly flow of the Navasota River near Bryan B26



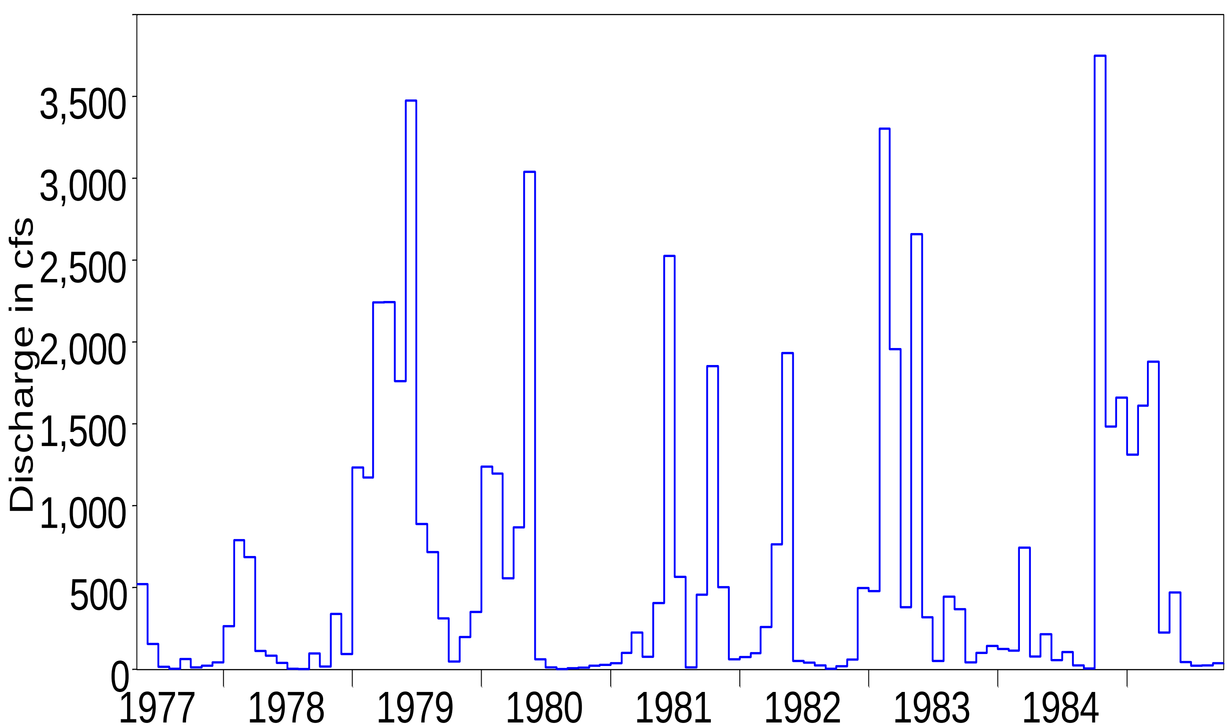
Annual peak flow of the Navasota River near Bryan B26



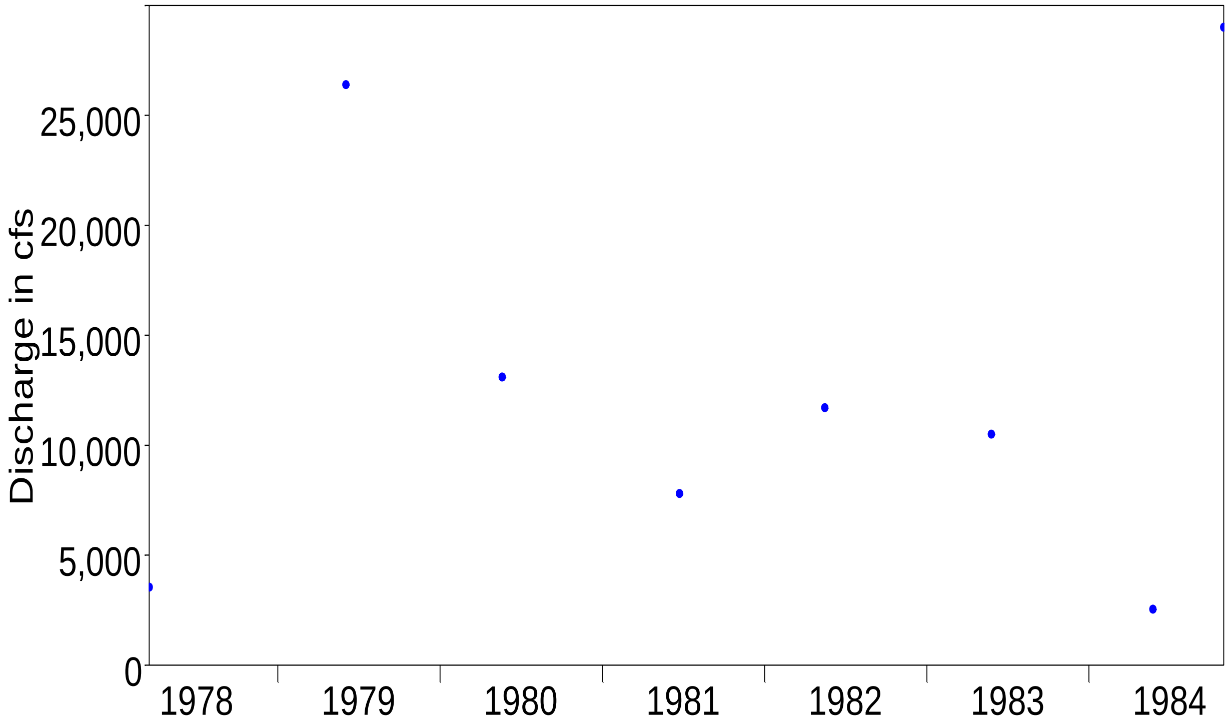
Annual flow of the Navasota River near Bryan B26



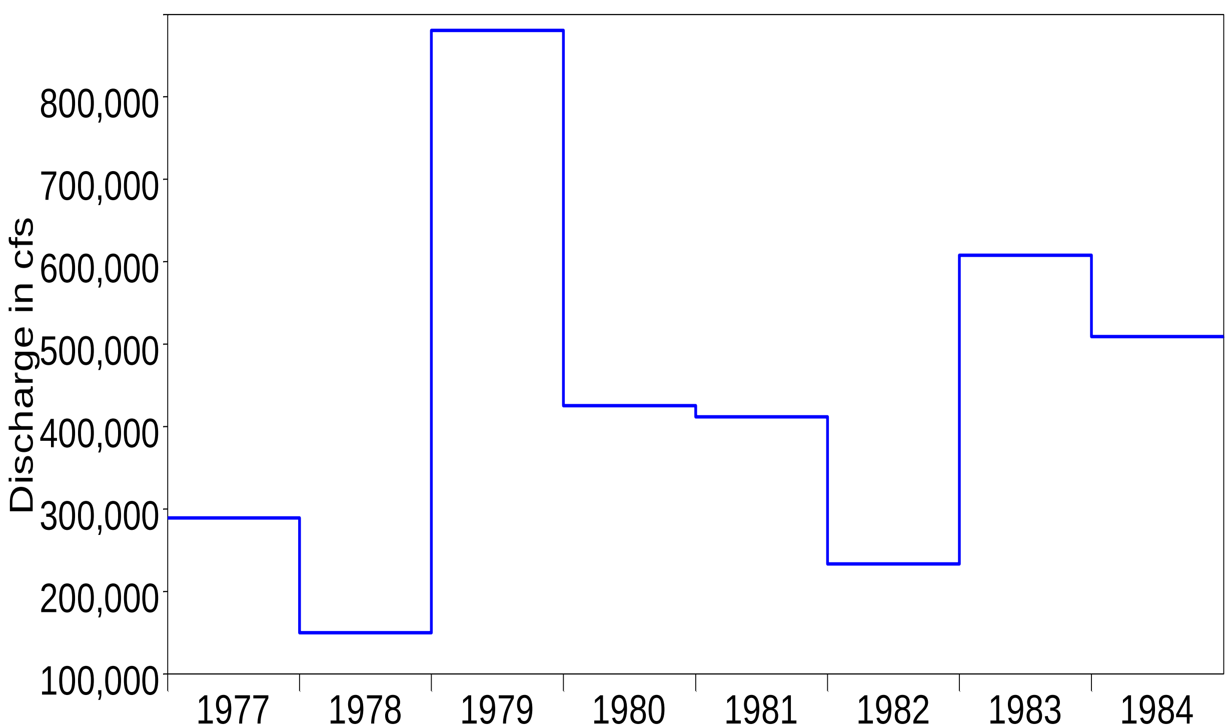
Mean daily flow of the Navasota River near College Station B27



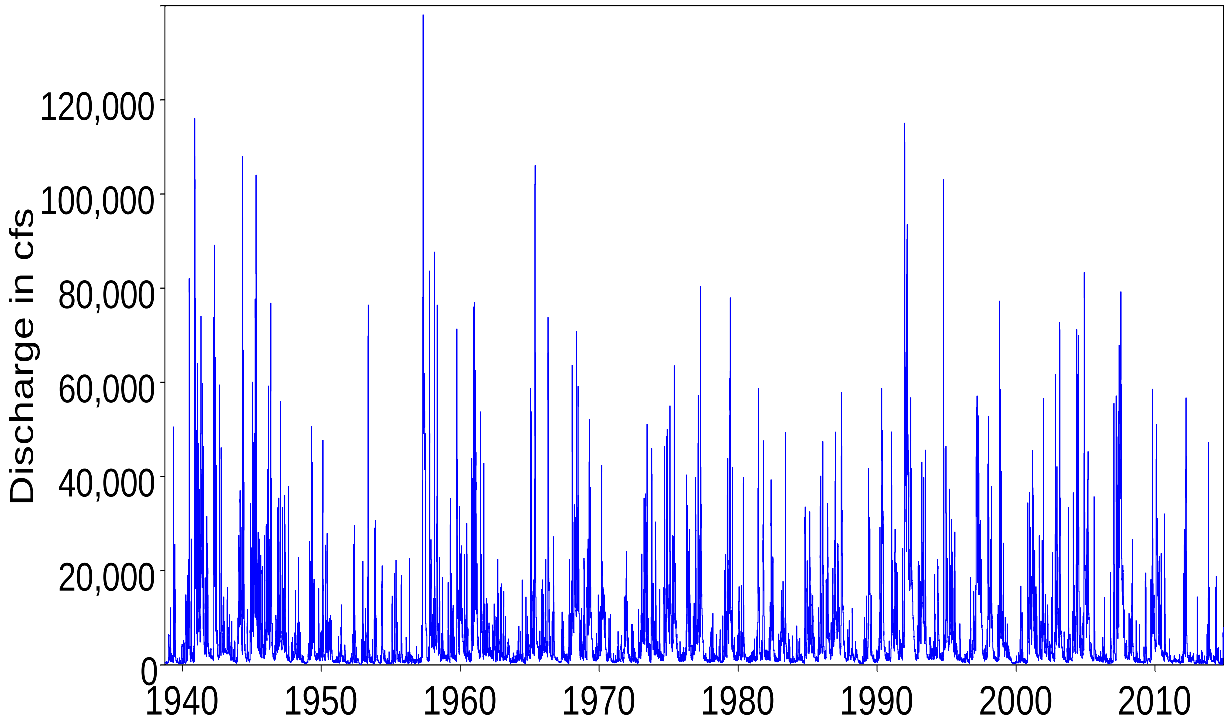
Mean monthly flow of the Navasota River near College Station B27



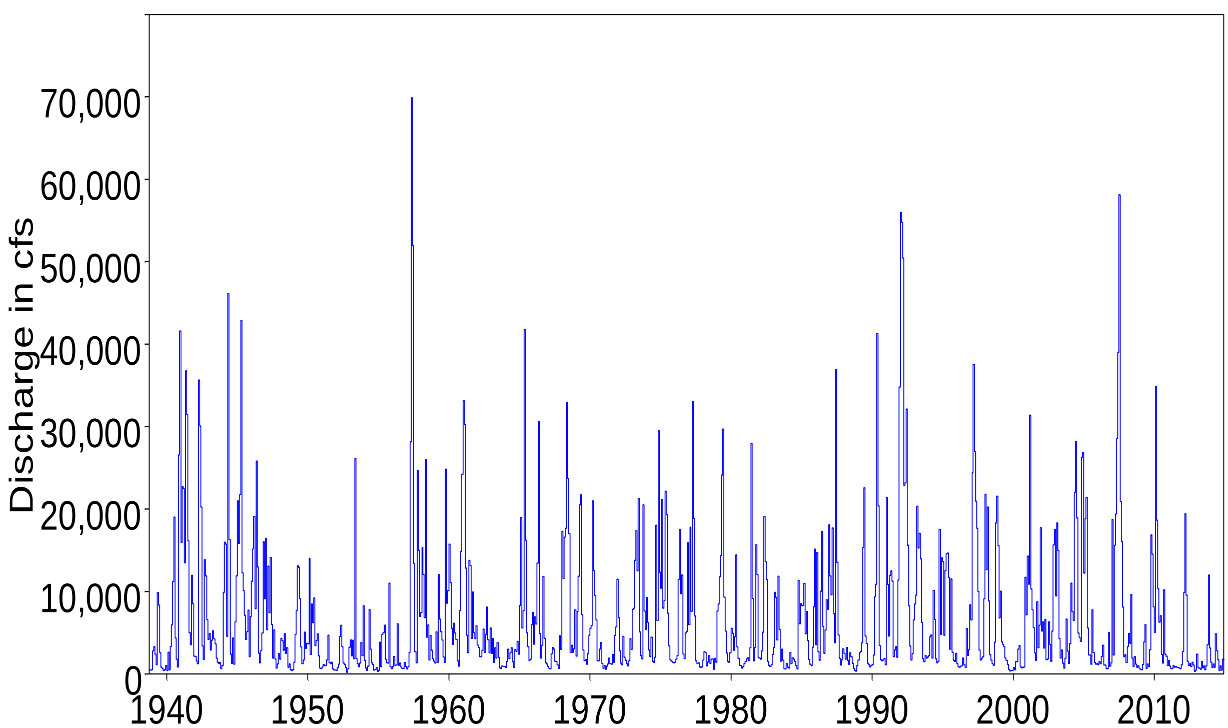
Annual peak flow of the Navasota River near College Station B27



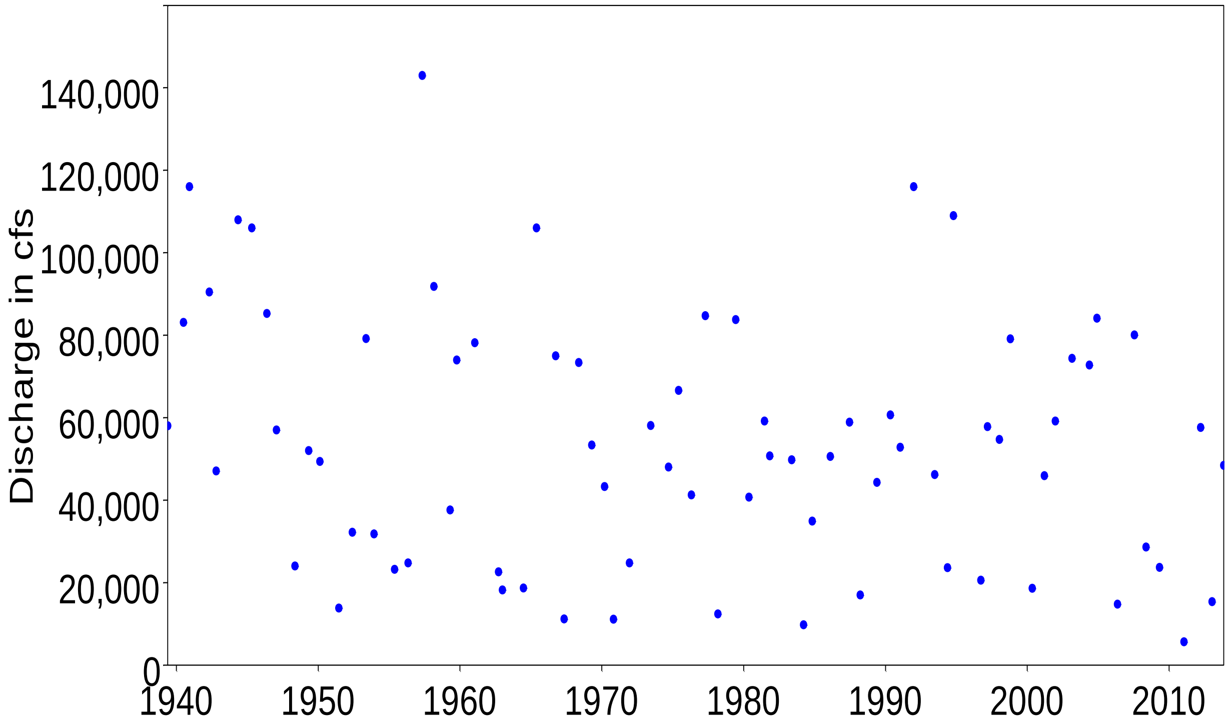
Annual flow of the Navasota River near College Station B27



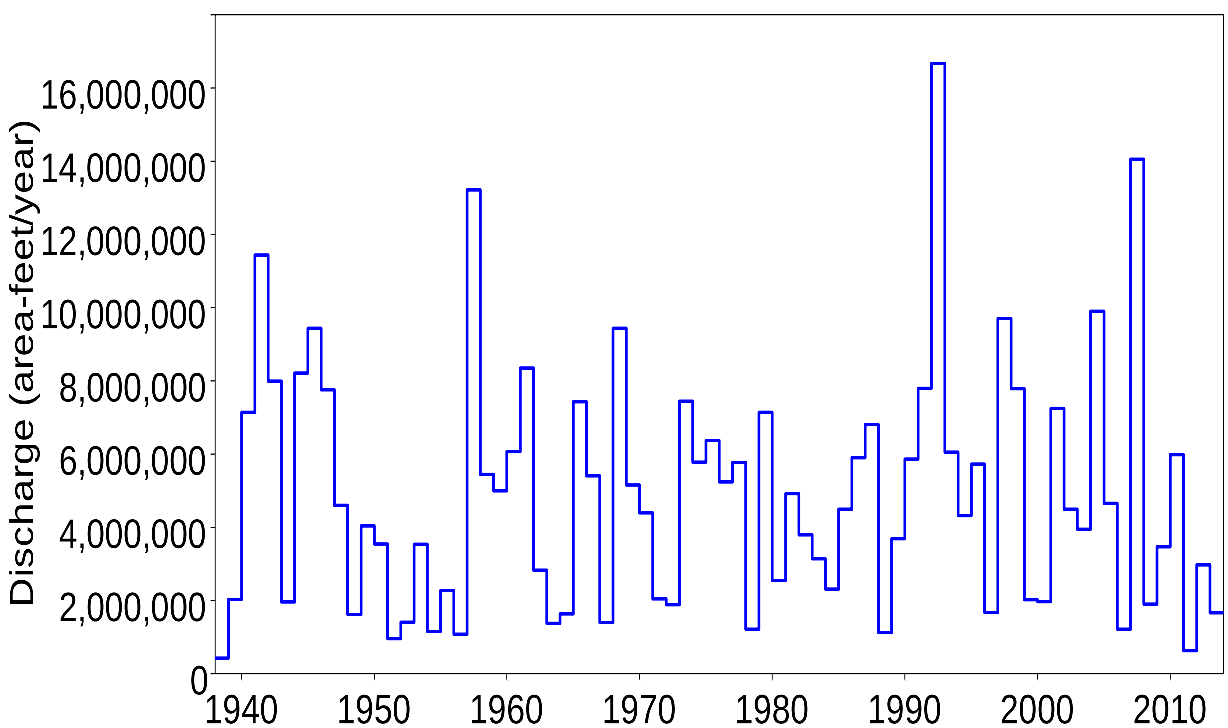
Mean daily flow of the Brazos River near Hempstead B28



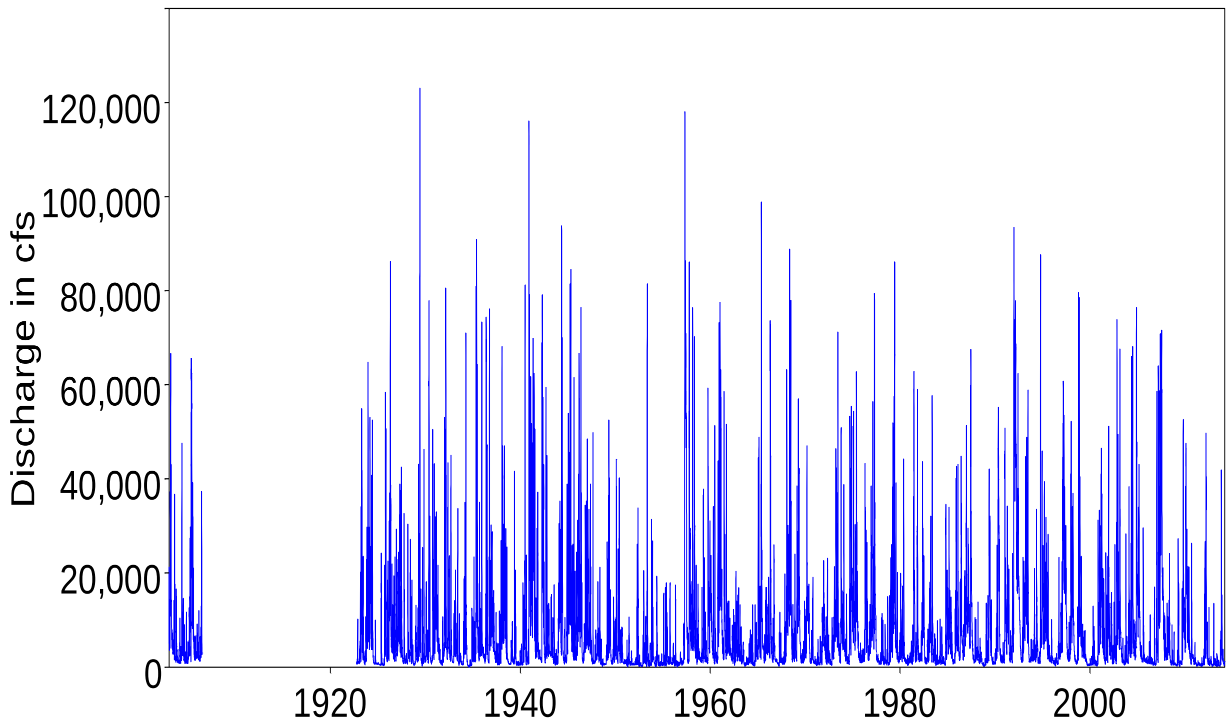
Mean monthly flow of the Brazos River near Hempstead B28



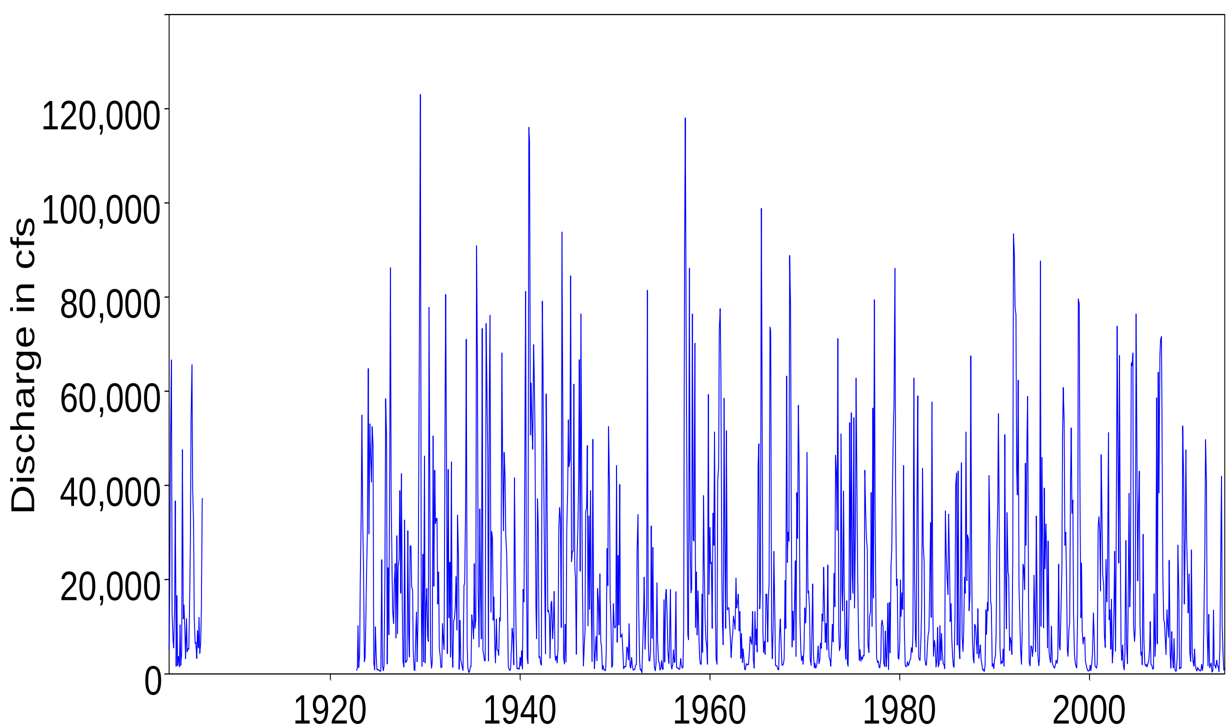
Annual peak flow of the Brazos River near Hempstead B28



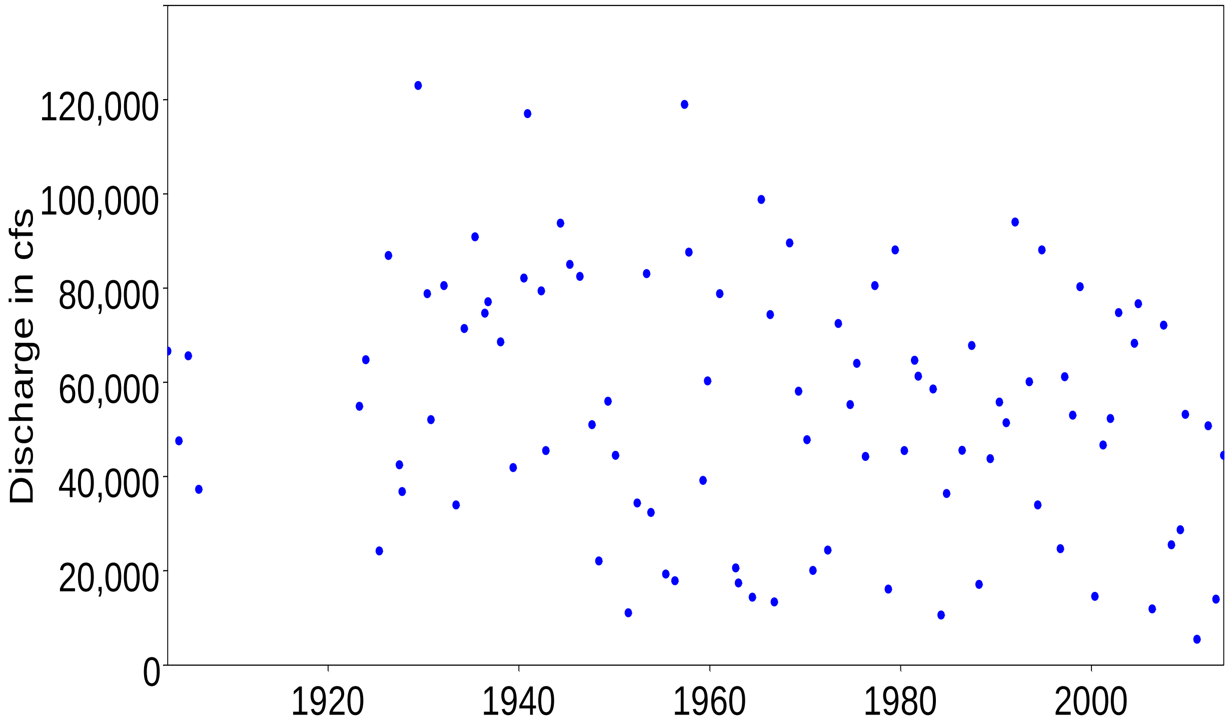
Annual flow of the Brazos River near Hempstead B28



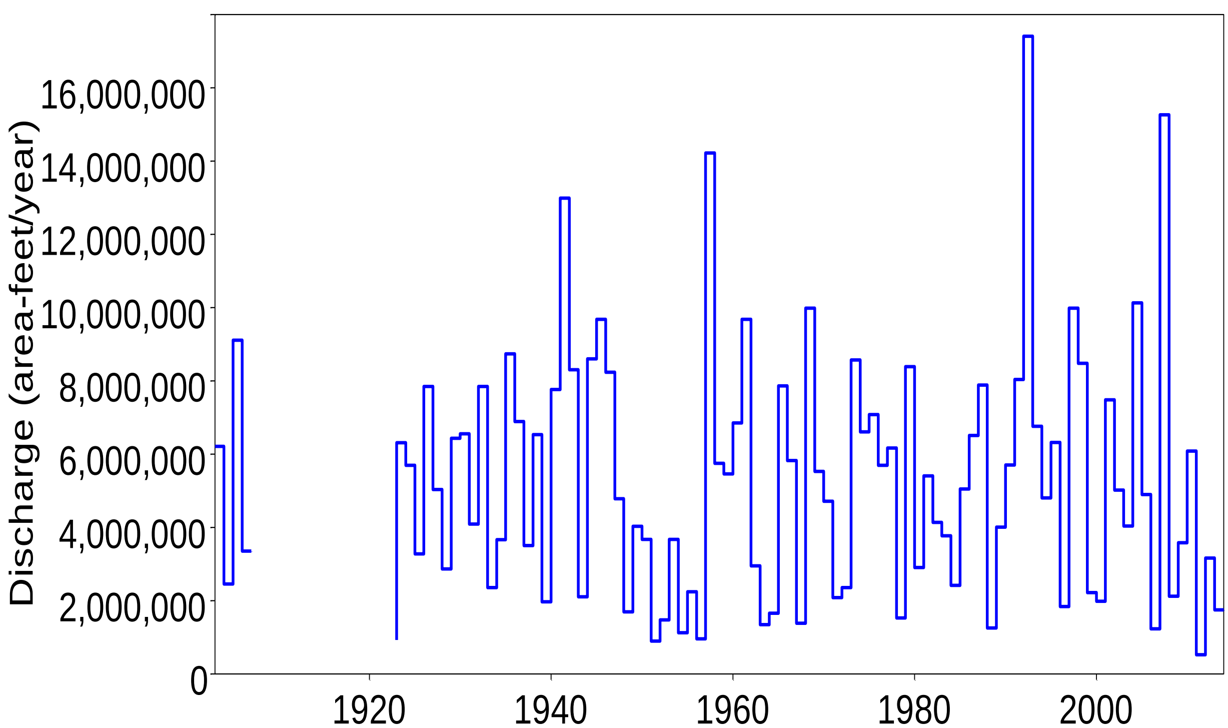
Mean daily flow of the Brazos River near Richmond B29



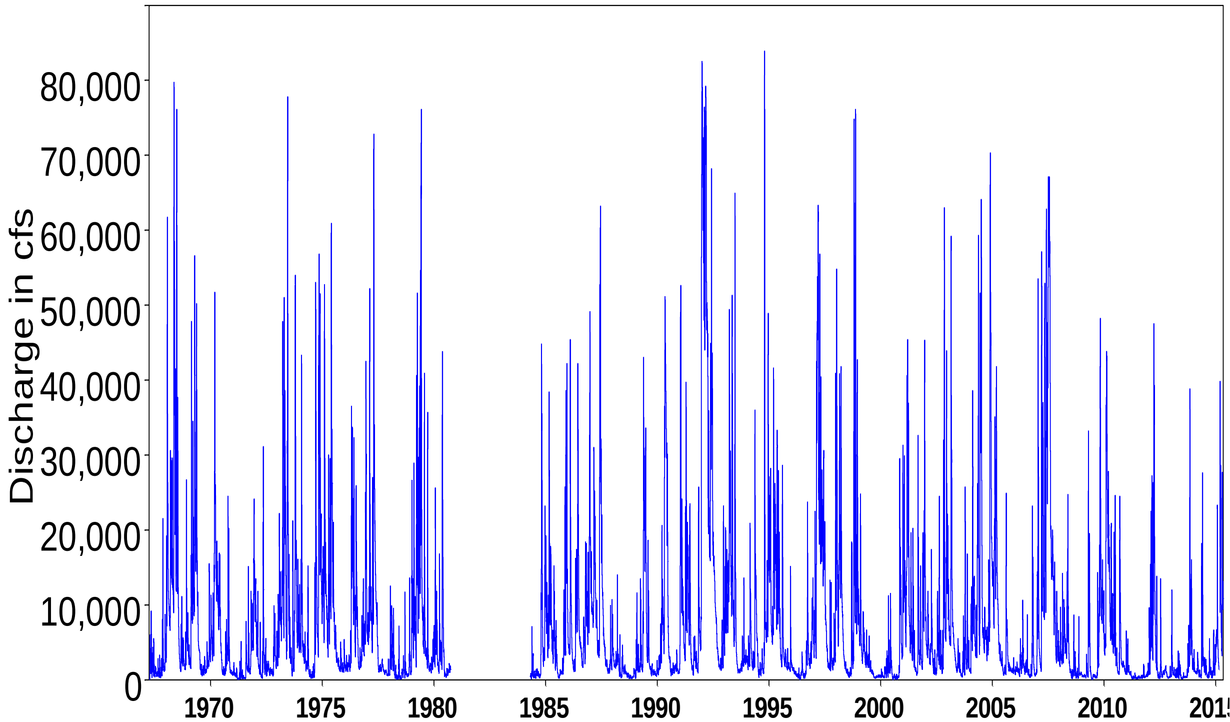
Mean monthly flow of the Brazos River near Richmond B29



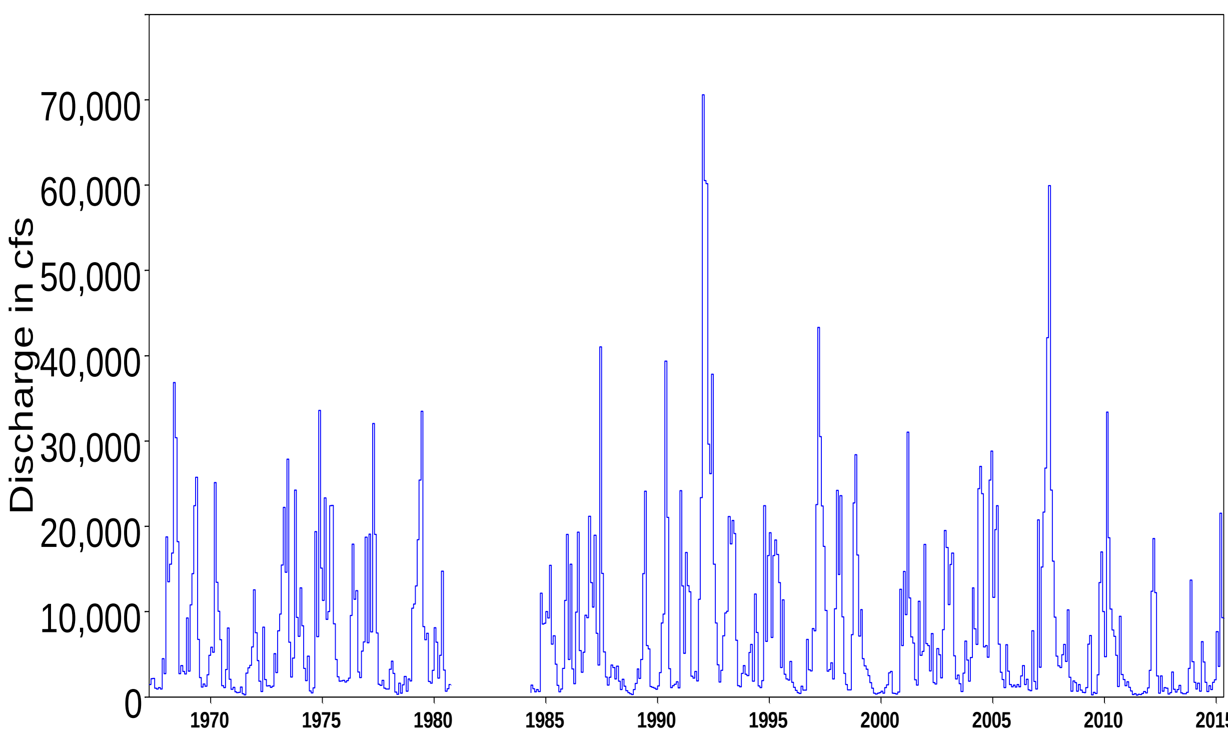
Annual peak flow of the Brazos River near Richmond B29



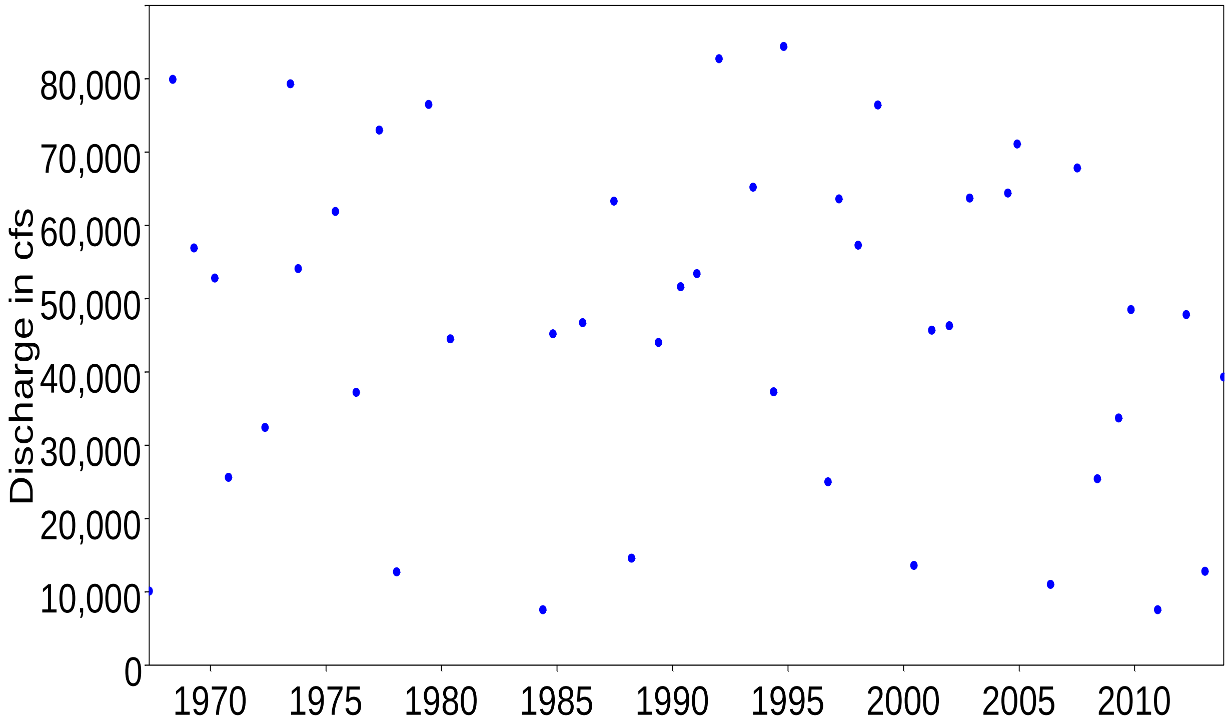
Annual flow of the Brazos River near Richmond B29



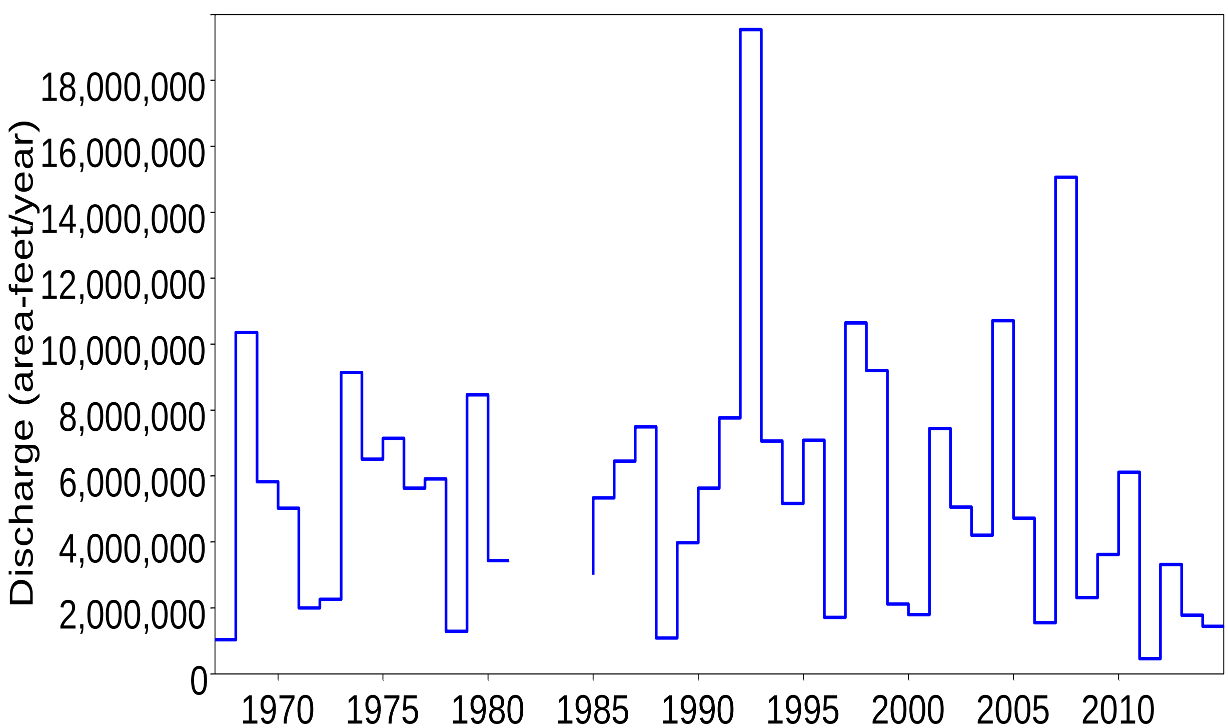
Mean daily flow of the Brazos River near Rosharon B30



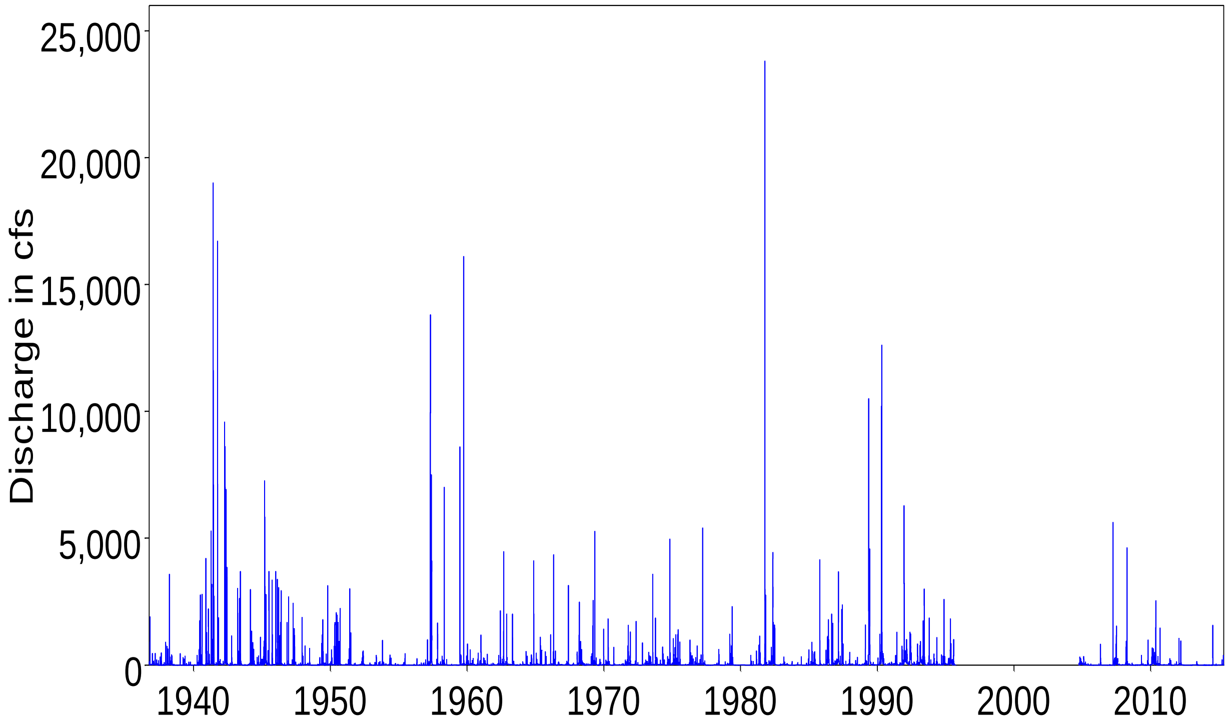
Mean monthly flow of the Brazos River near Rosharon B30



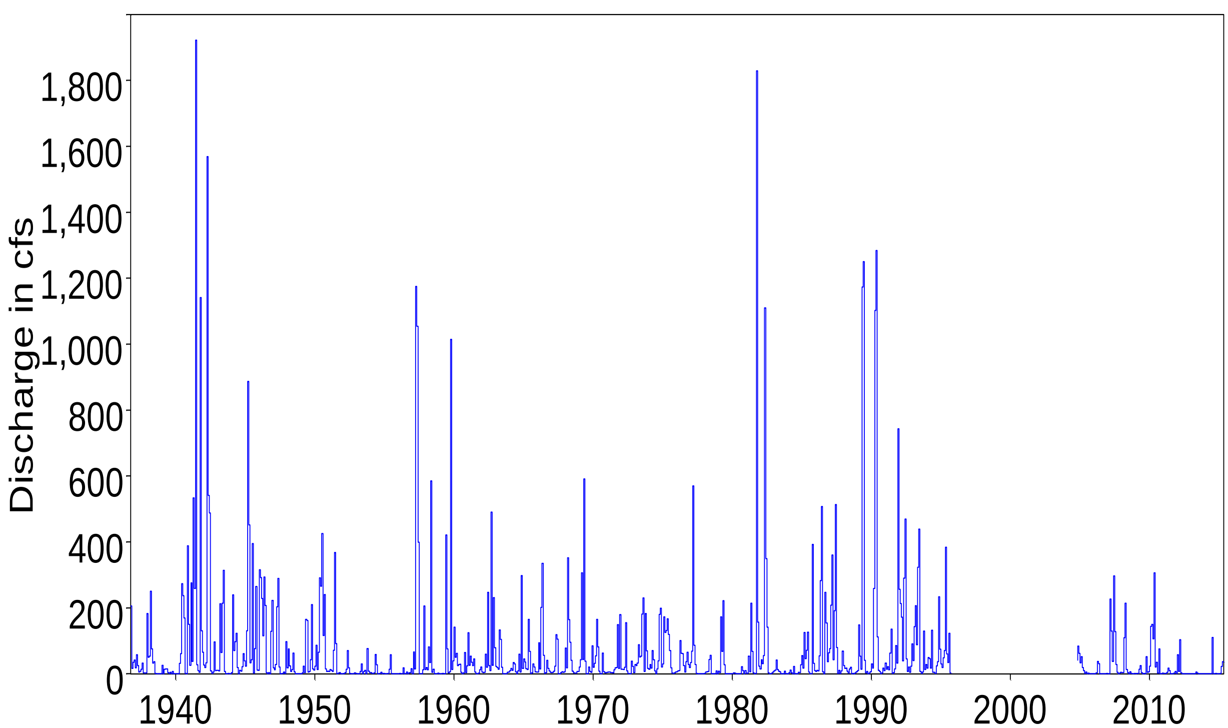
Annual peak flow of the Brazos River near Rosharon B30



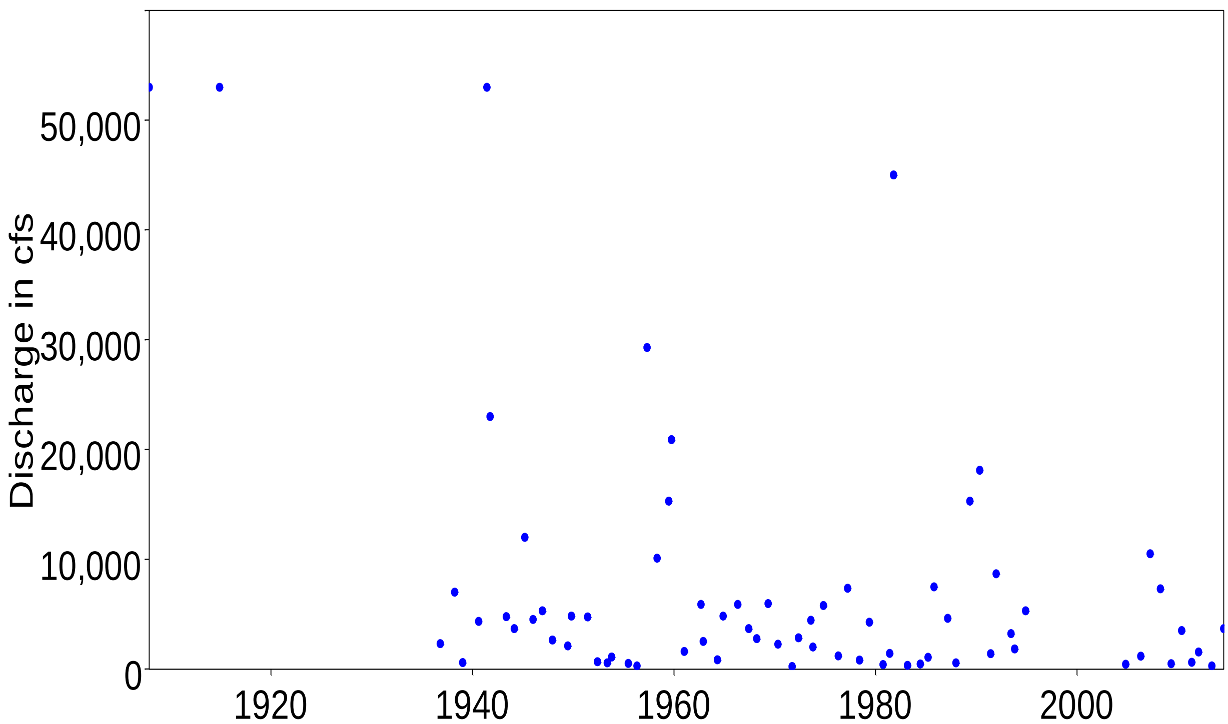
Annual flow of the Brazos River near Rosharon B30



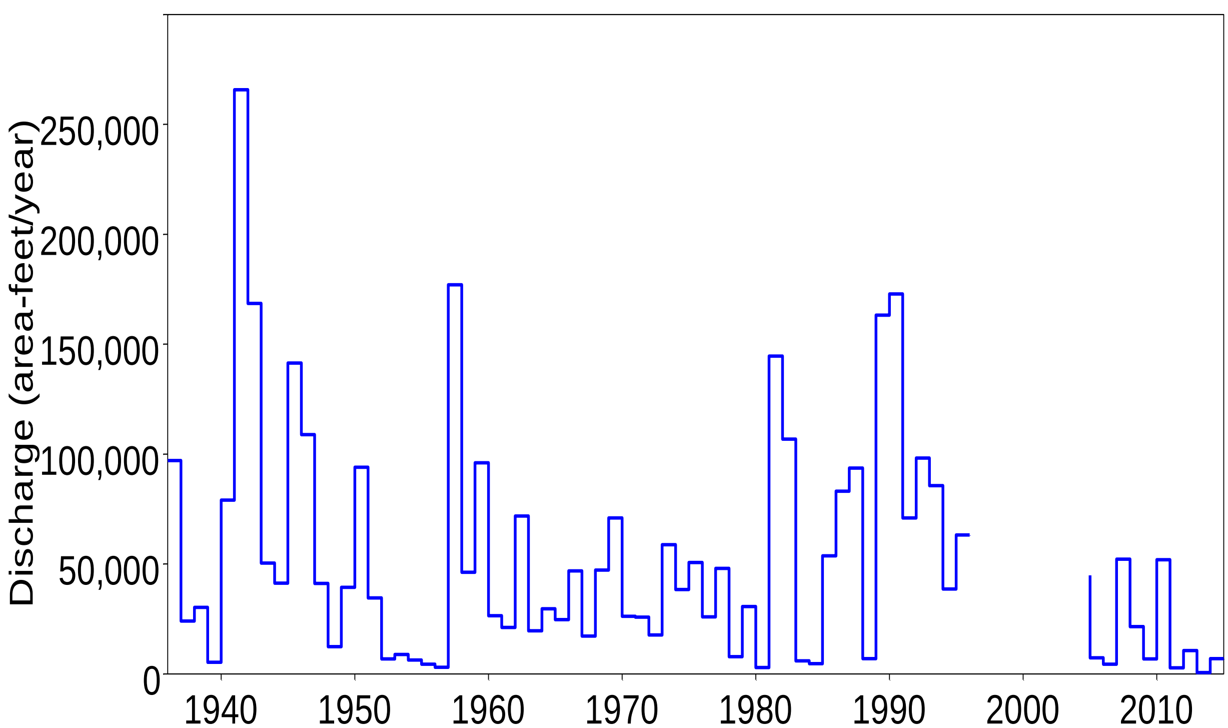
Mean daily flow of the Big Sandy Creek near Bridgeport T1



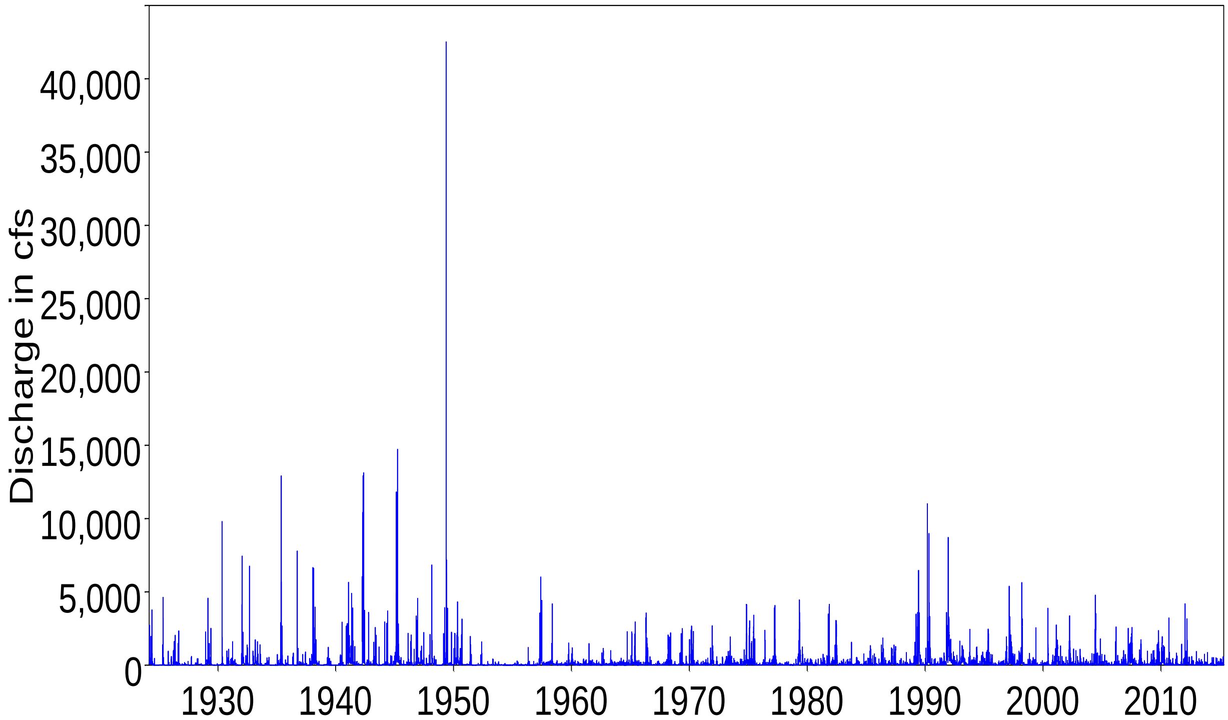
Mean monthly flow of the Big Sandy Creek near Bridgeport T1



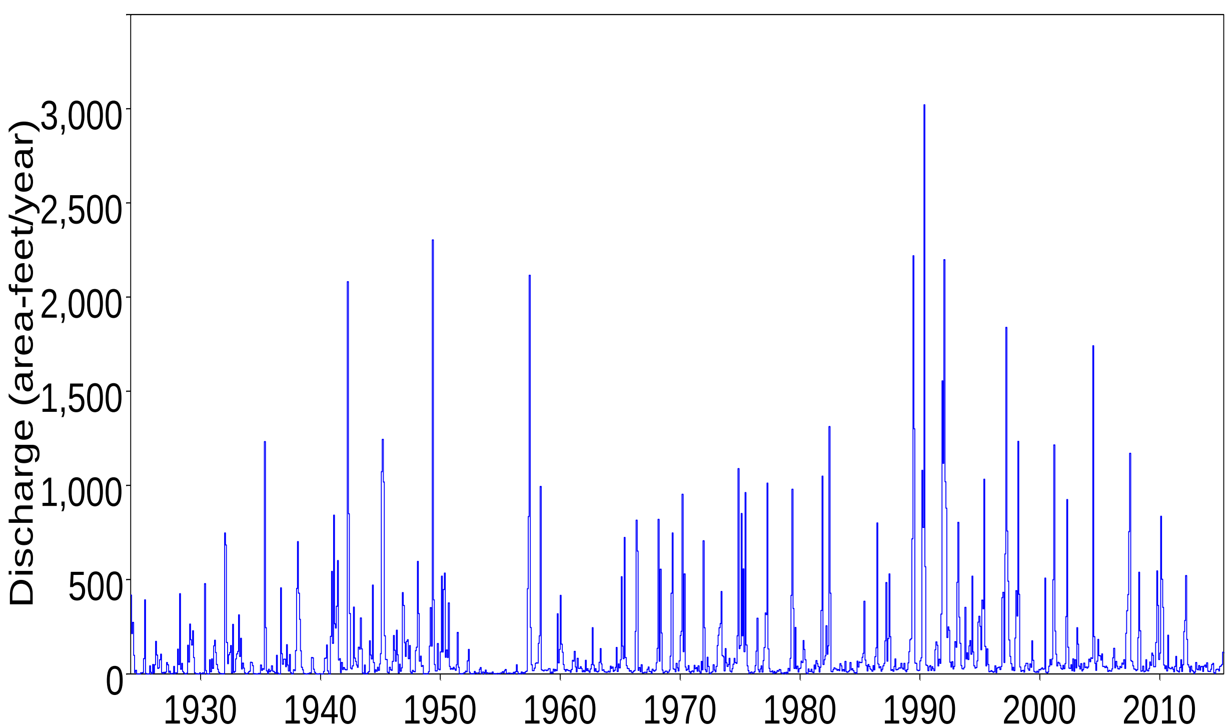
Annual peak flow of the Big Sandy Creek near Bridgeport T1



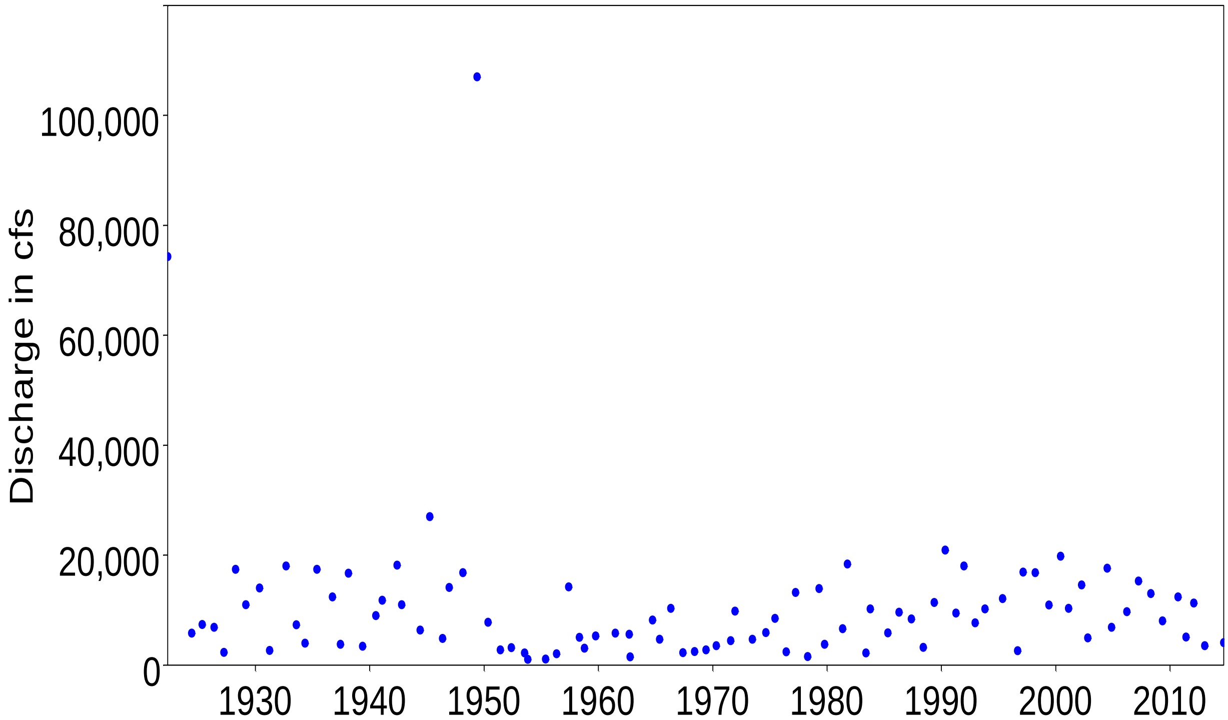
Annual flow of the Big Sandy Creek near Bridgeport T1



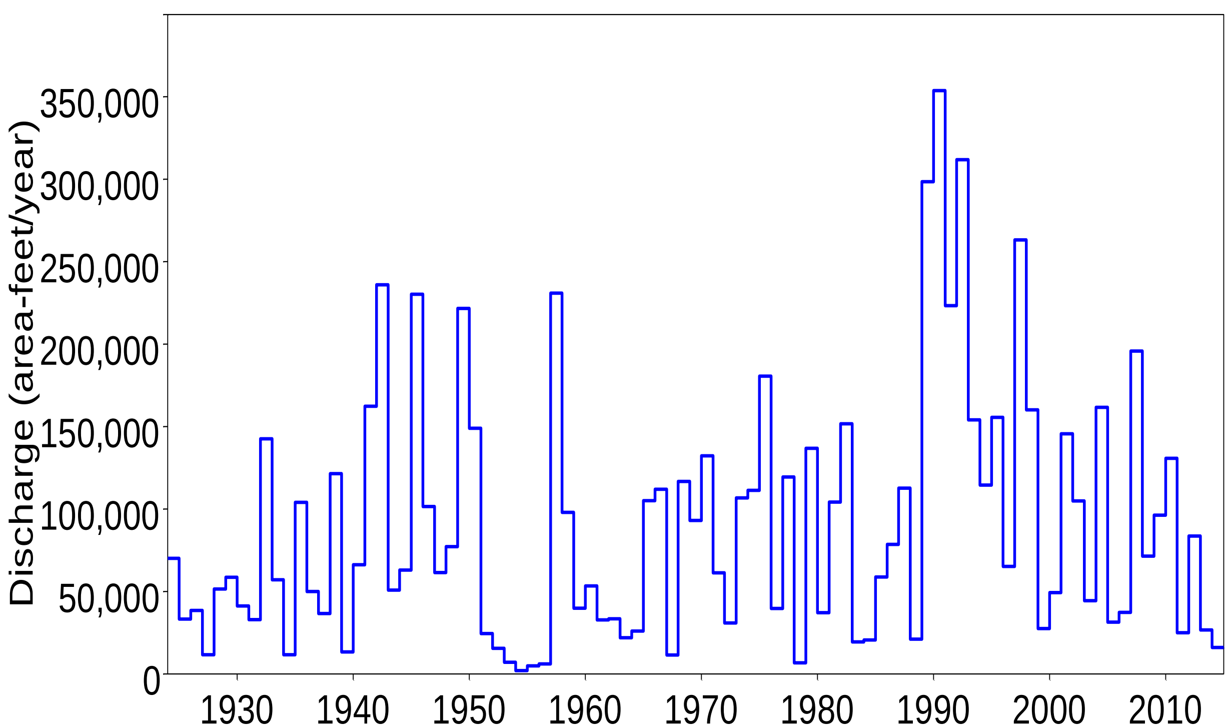
Mean daily flow of the Clear Fork Trinity River at Fort Worth T2



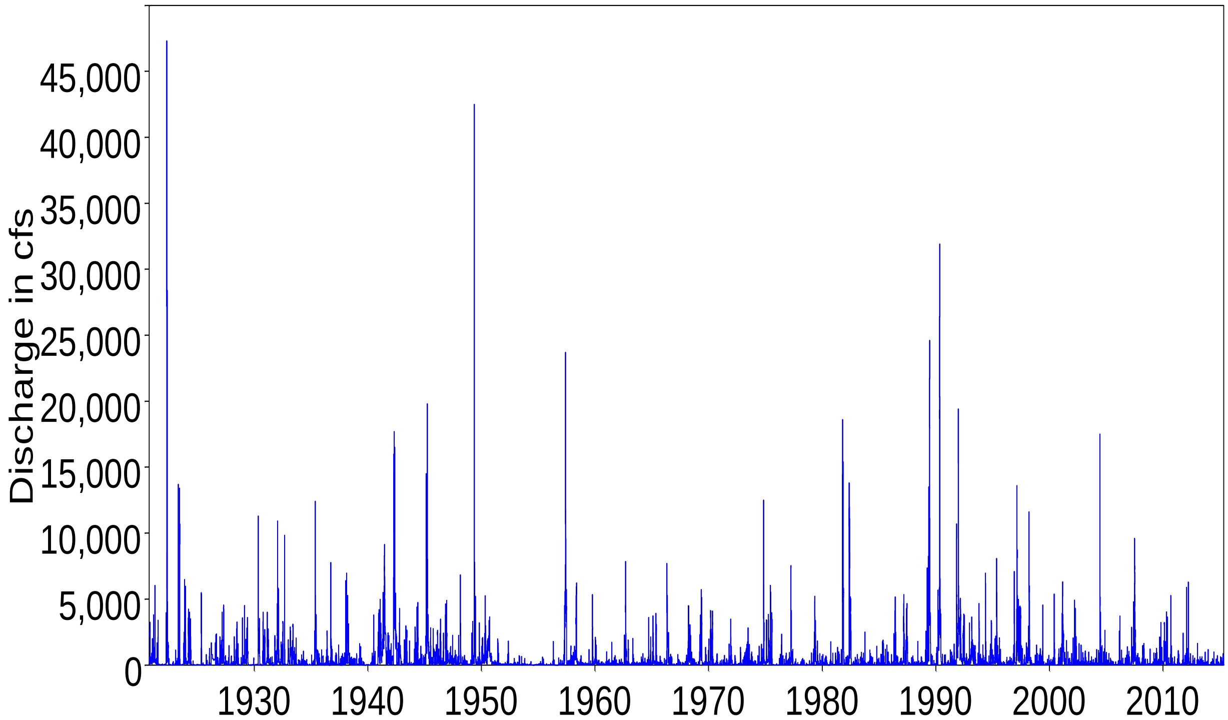
Mean monthly flow of the Clear Fork Trinity River at Fort Worth T2



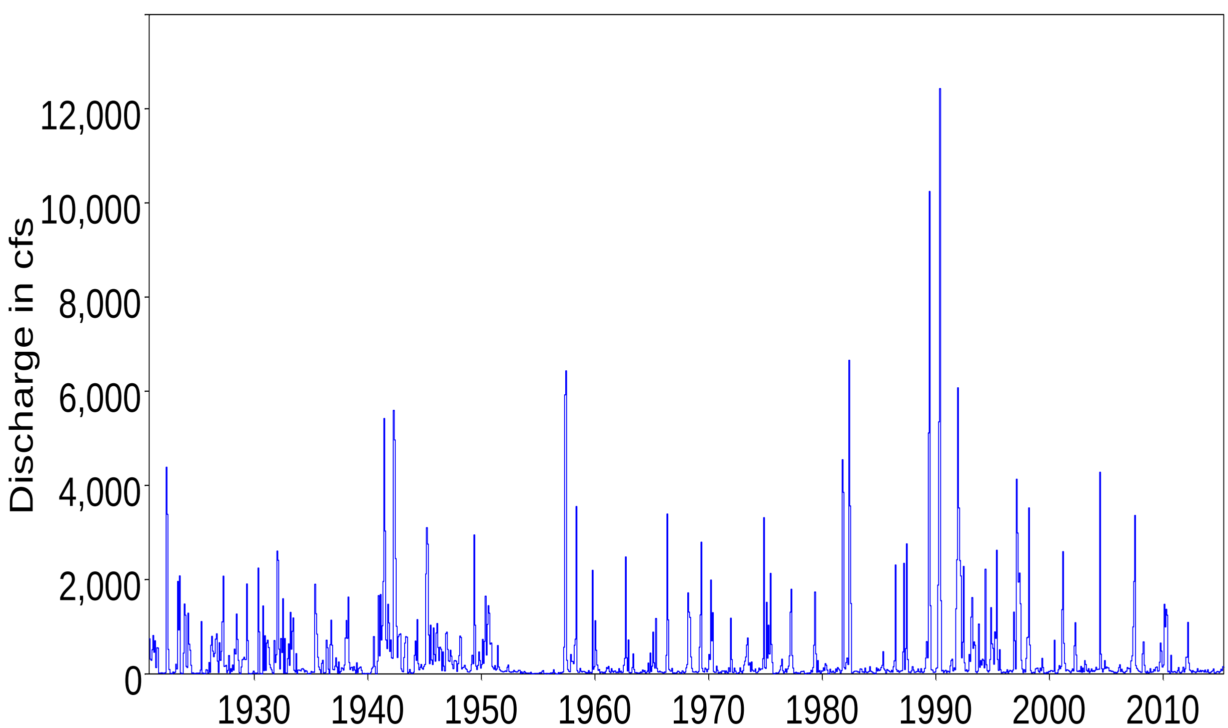
Annual peak flow of the Clear Fork Trinity River at Fort Worth T2



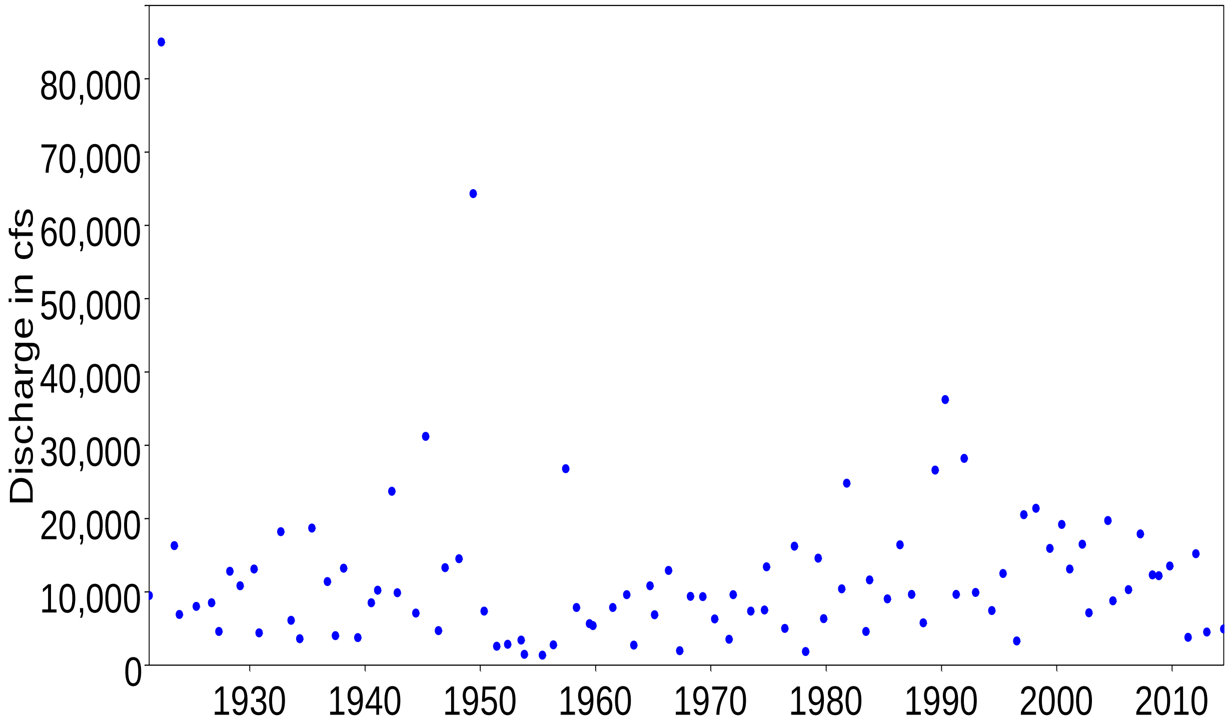
Annual flow of the Clear Fork Trinity River at Fort Worth T2



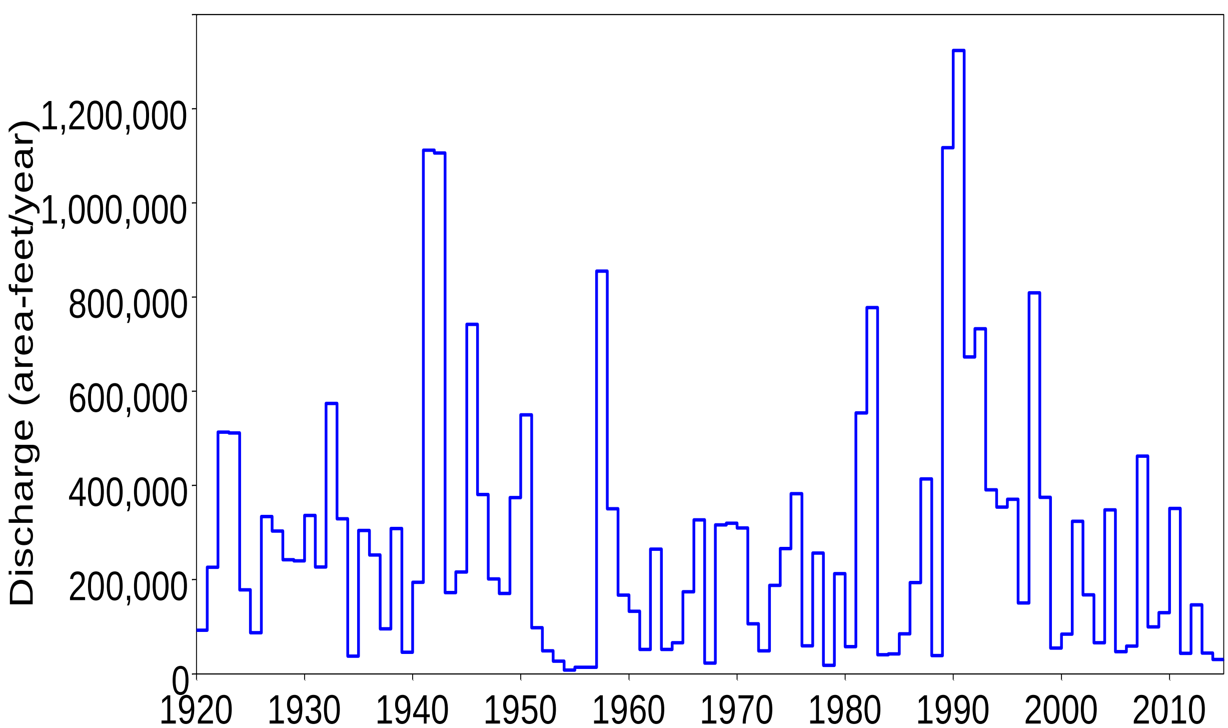
Mean daily flow of the West Fork Trinity River at Fort Worth T3



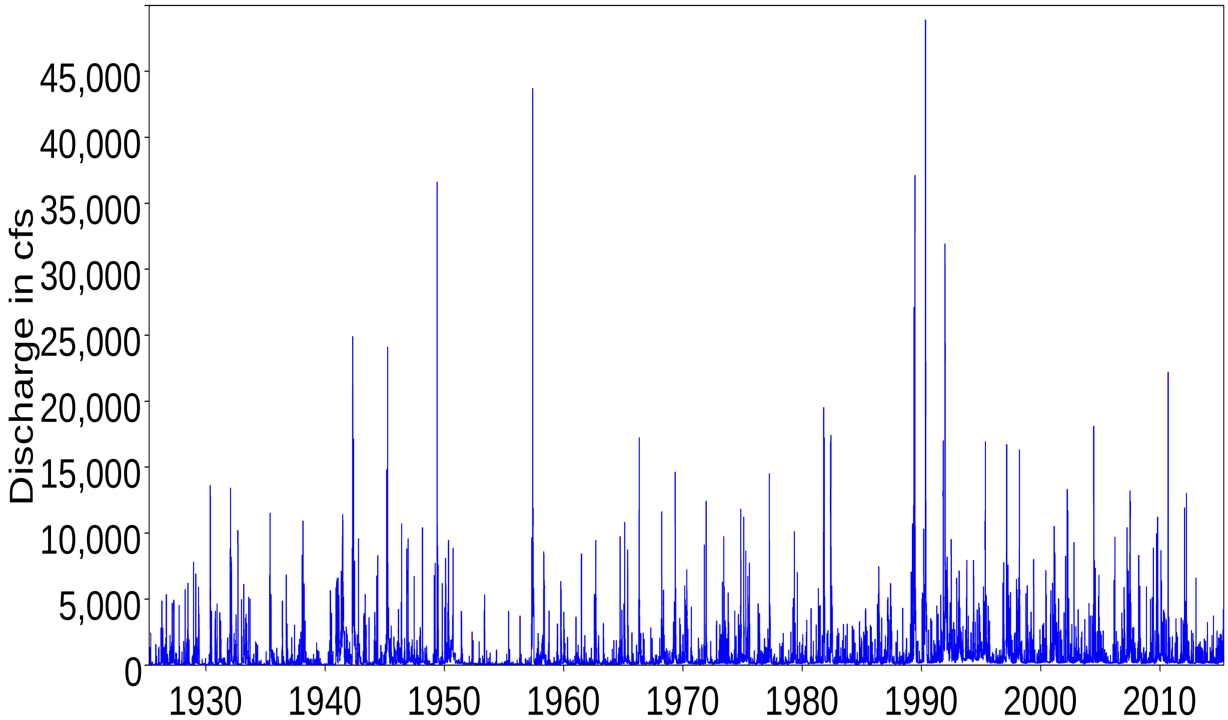
Mean monthly flow of the West Fork Trinity River at Fort Worth T3



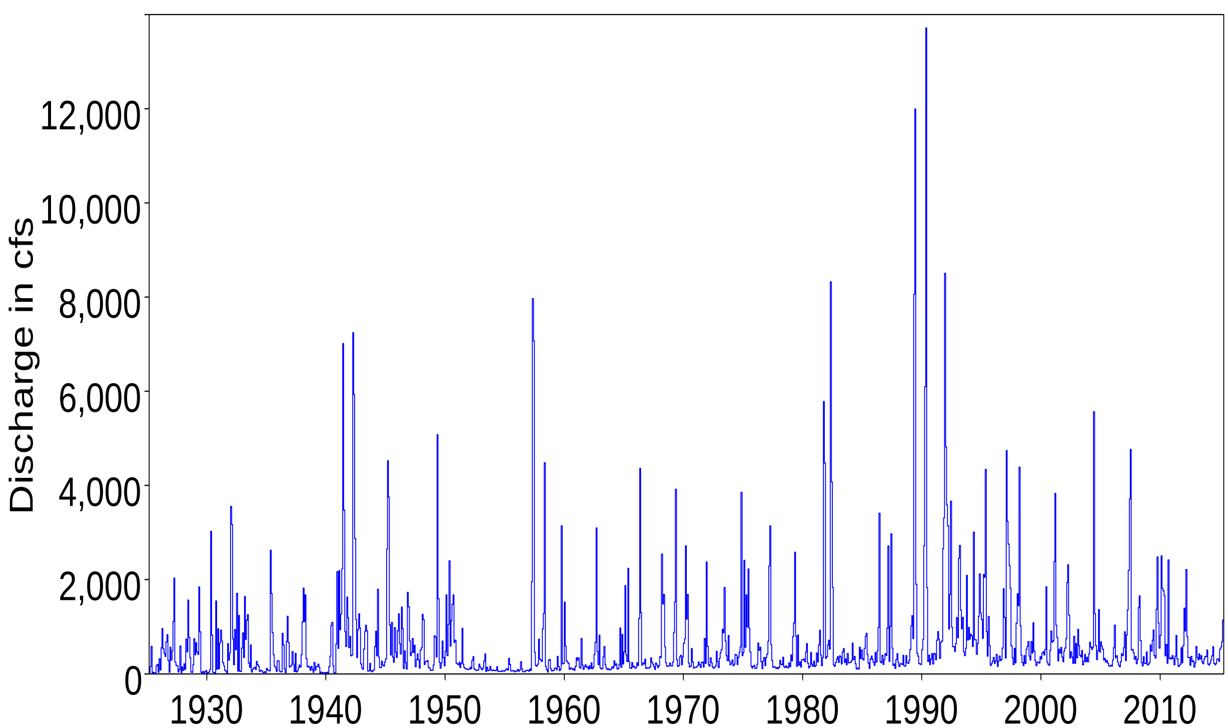
Annual peak flow of the West Fork Trinity River at Fort Worth T3



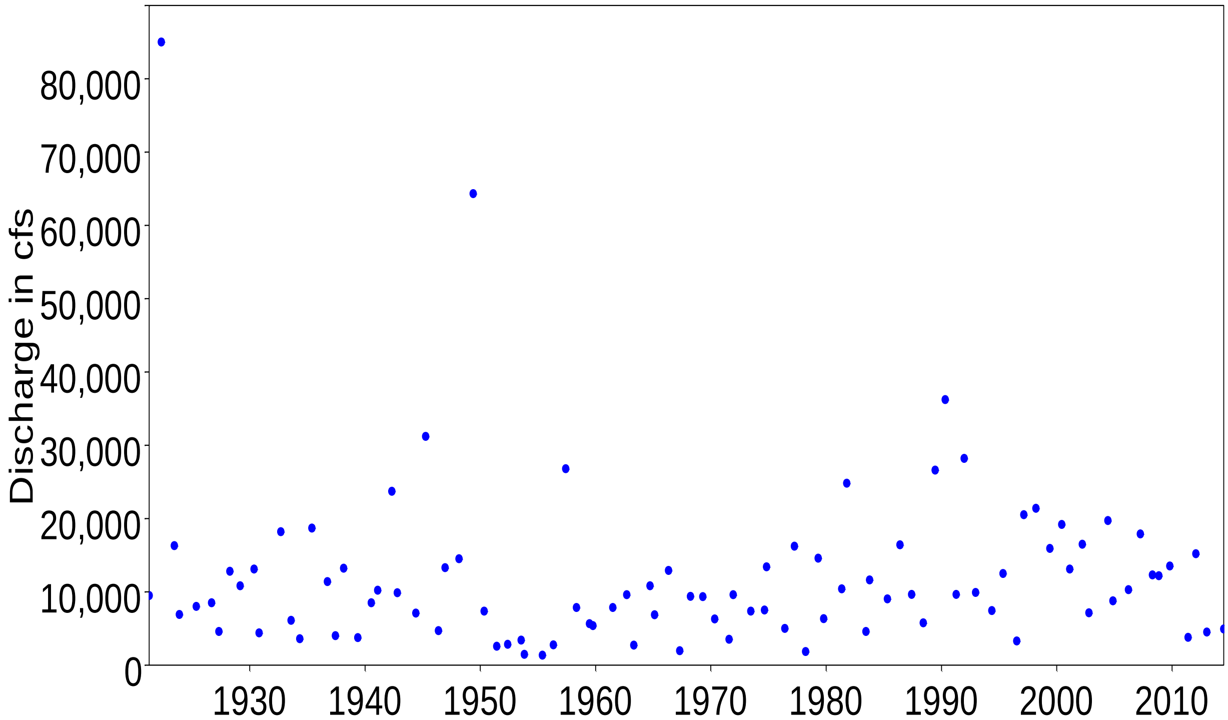
Annual flow of the West Fork Trinity River at Fort Worth T3



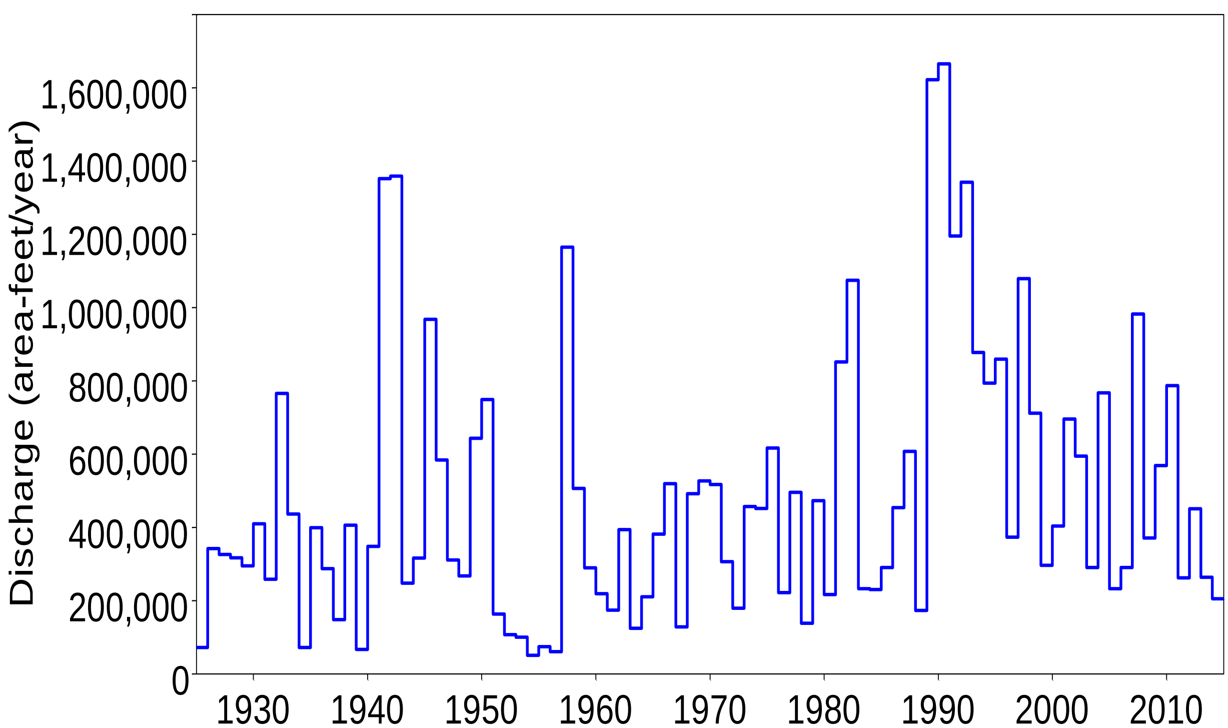
Mean daily flow of the West Fork Trinity River at Grand Prarie T4



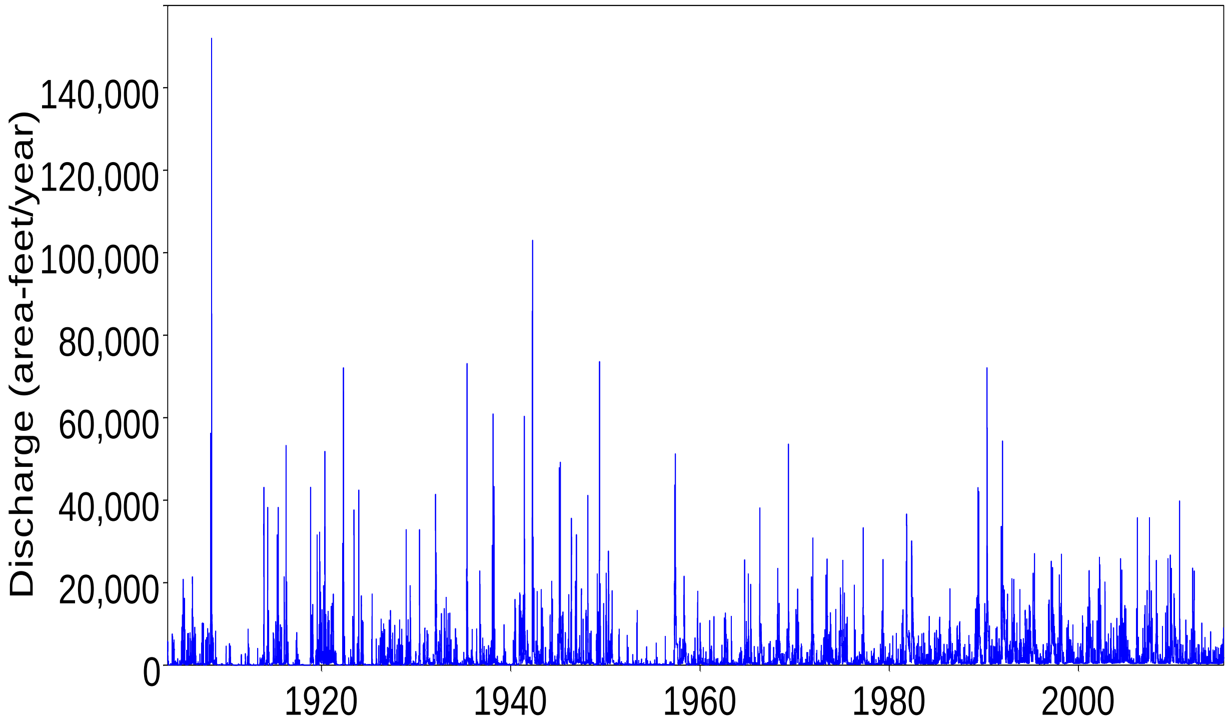
Mean monthly flow of the West Fork Trinity River at Grand Prarie T4



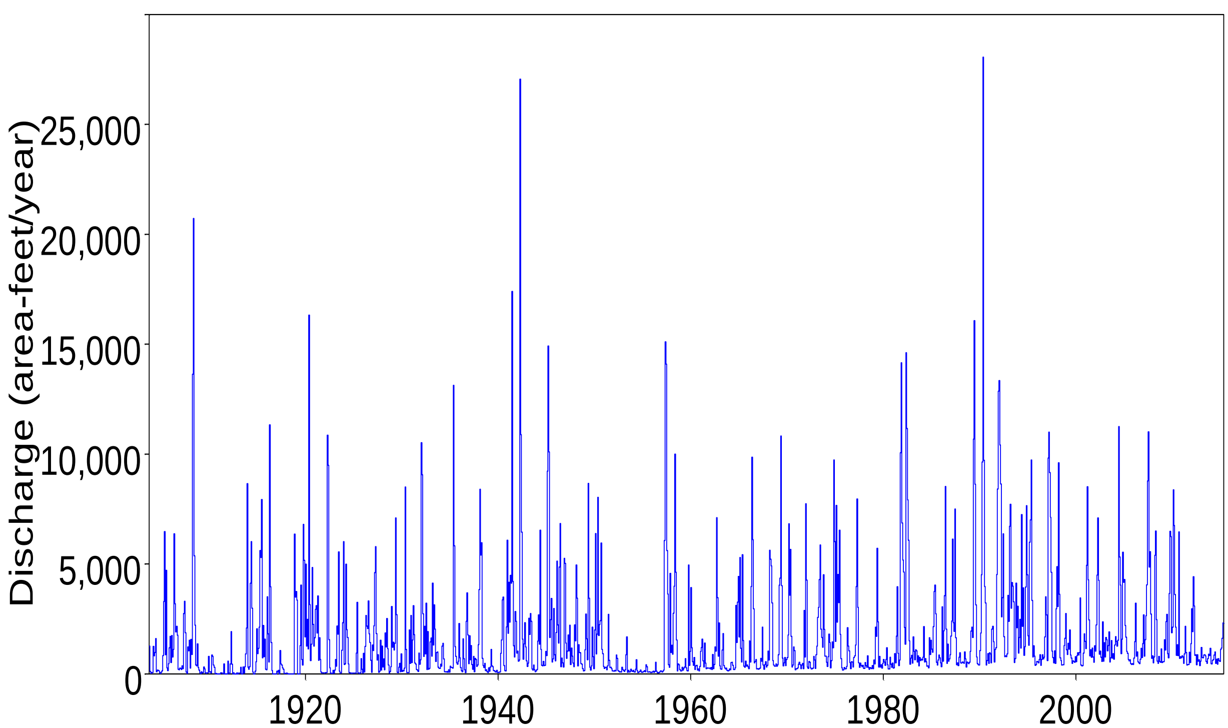
Annual peak flow of the West Fork Trinity River at Grand Prarie T4



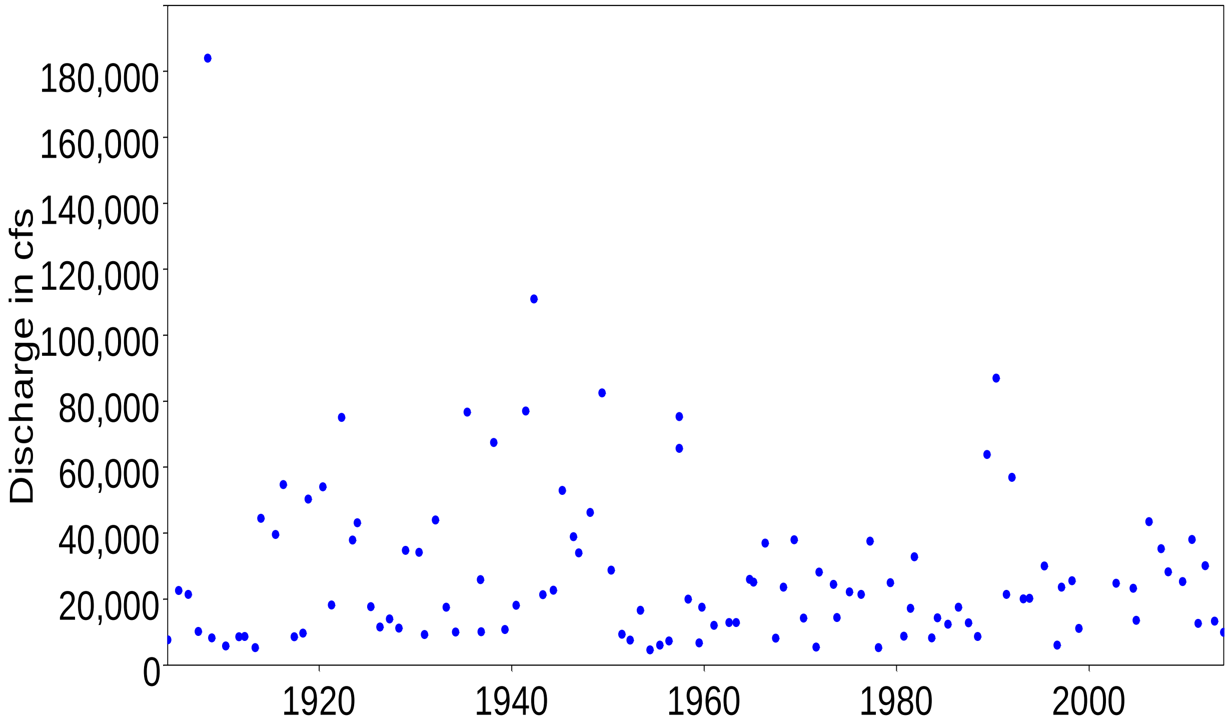
Annual flow of the West Fork Trinity River at Grand Prarie T4



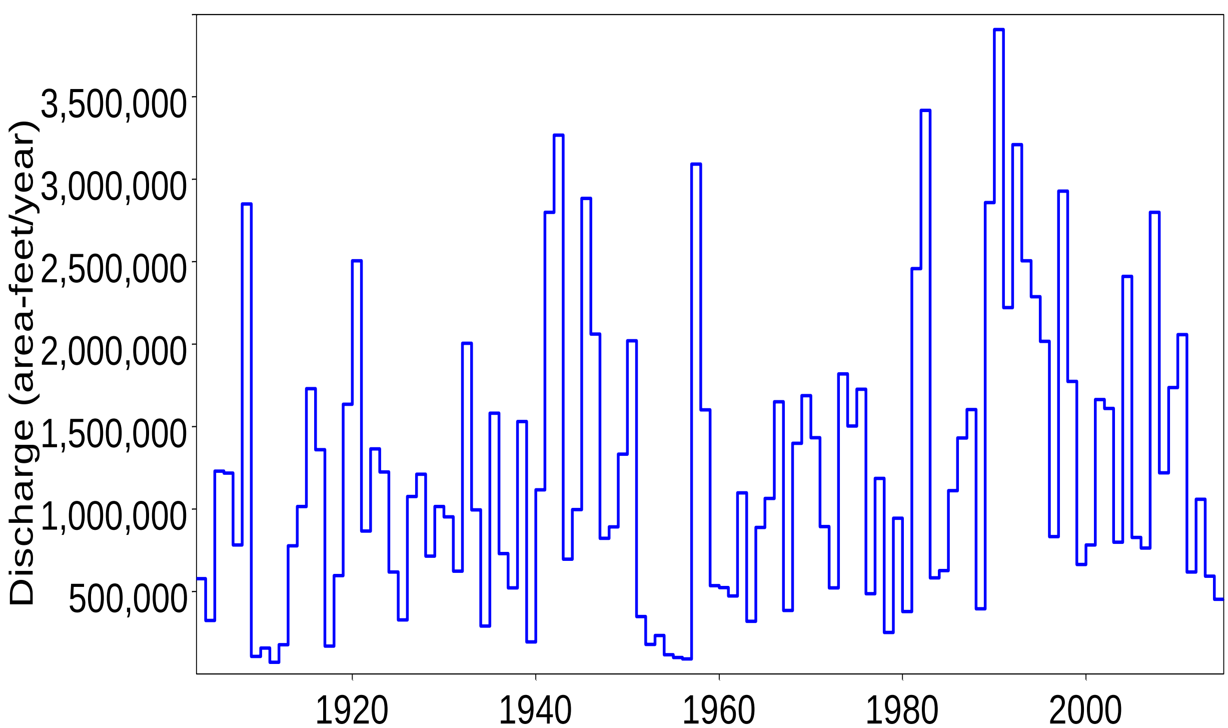
Mean daily flow of the Trinity River at Dallas T5



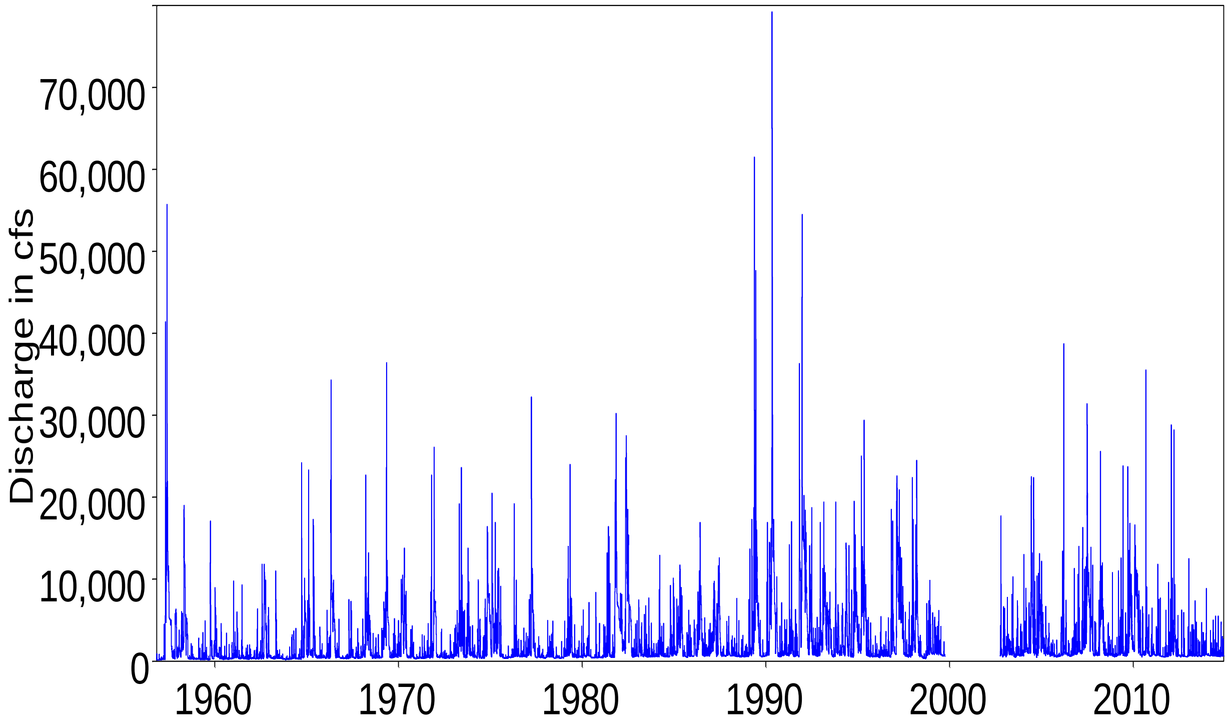
Mean monthly flow of the Trinity River at Dallas T5



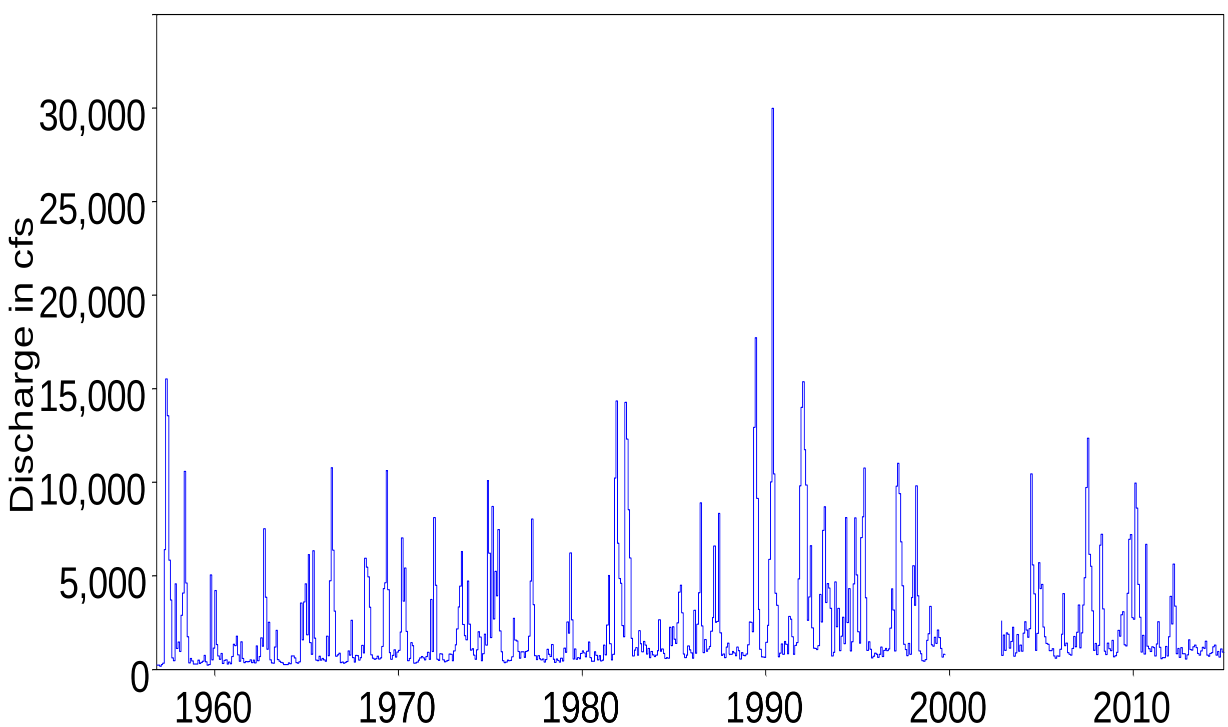
Annual peak flow of the Trinity River at Dallas T5



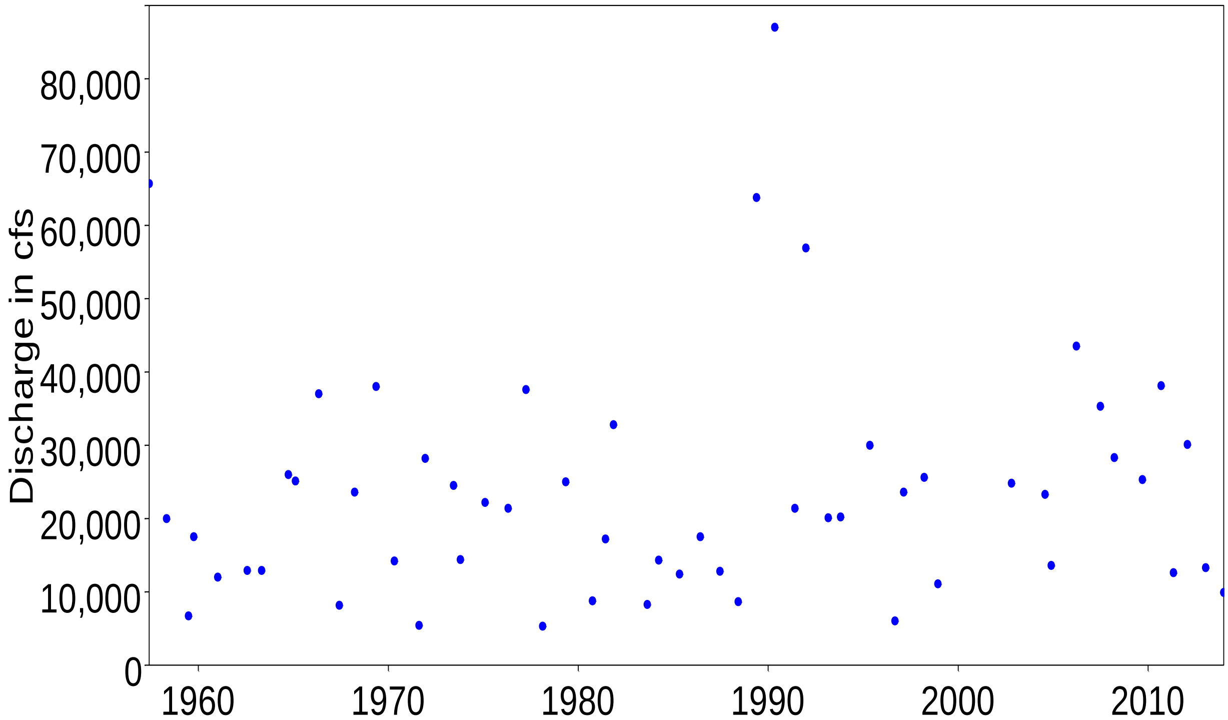
Annual flow of the Trinity River at Dallas T5



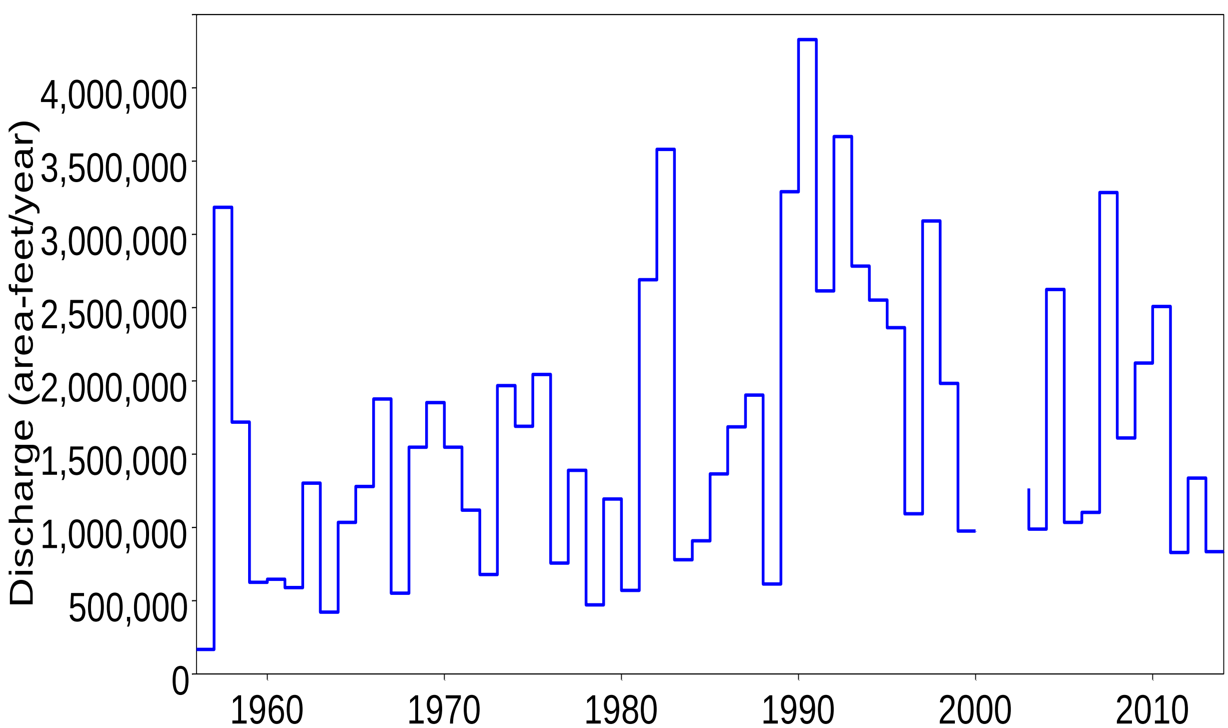
Mean daily flow of the Trinity River below Dallas T6



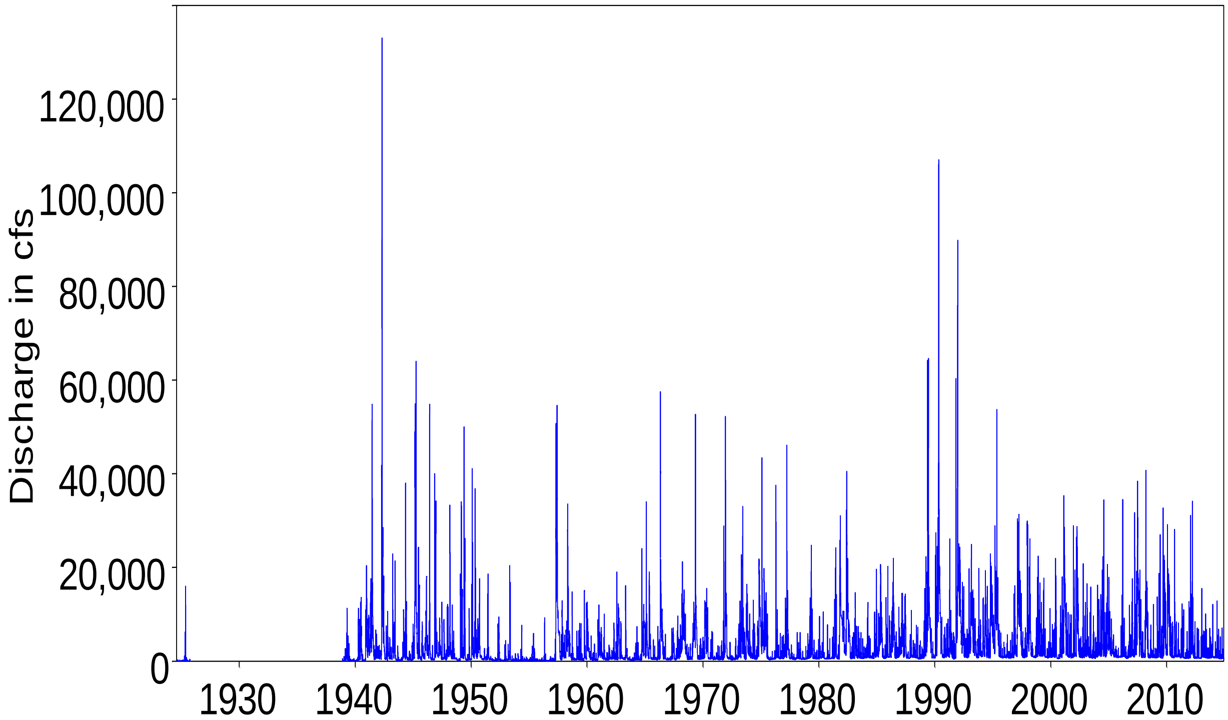
Mean monthly flow of the Trinity River below Dallas T6



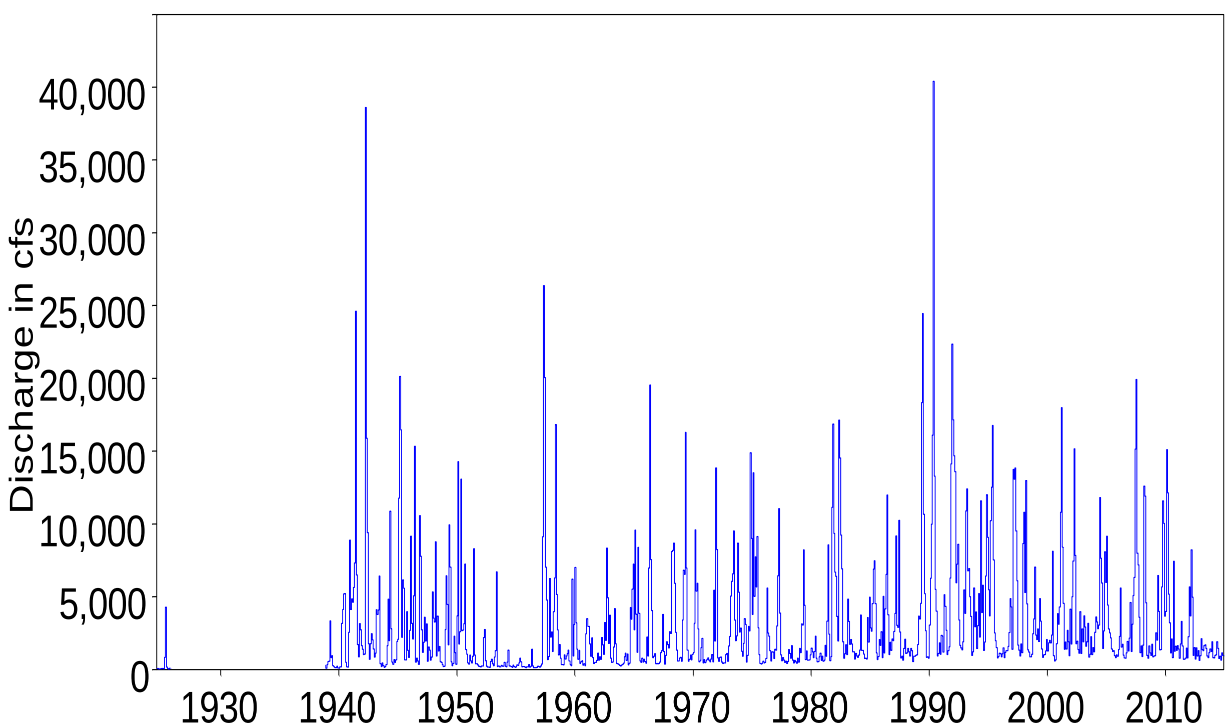
Annual peak flow of the Trinity River below Dallas T6



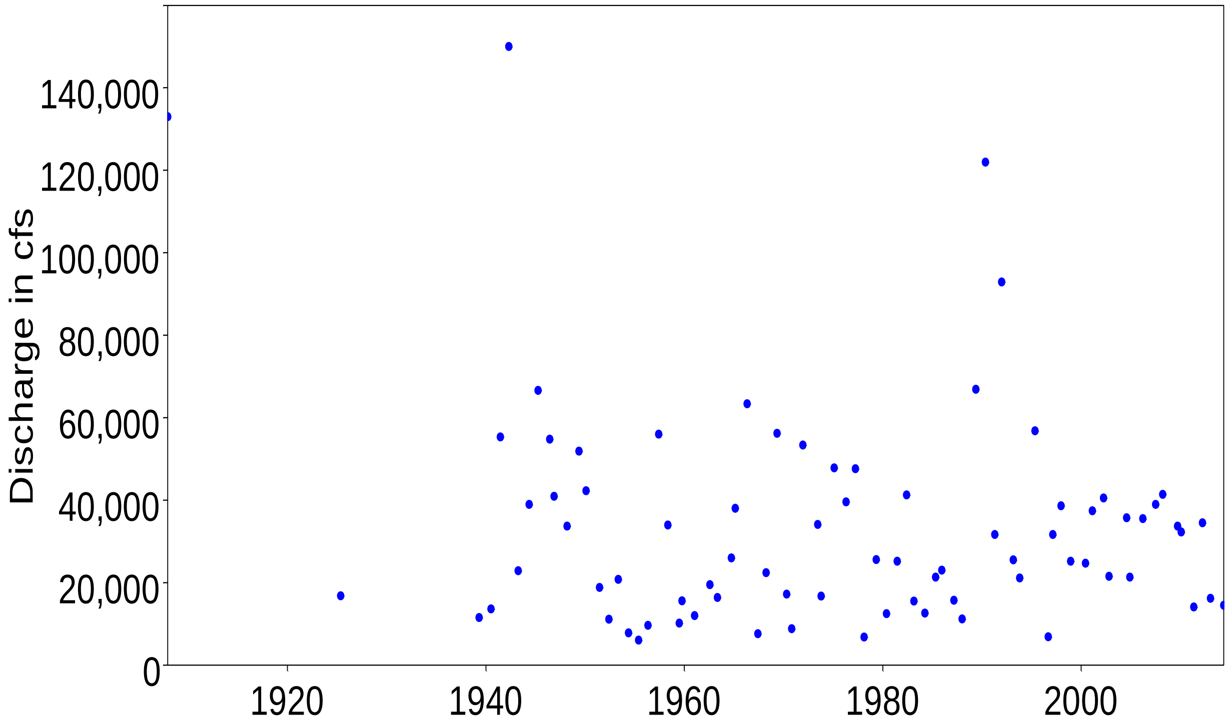
Annual flow of the Trinity River below Dallas T6



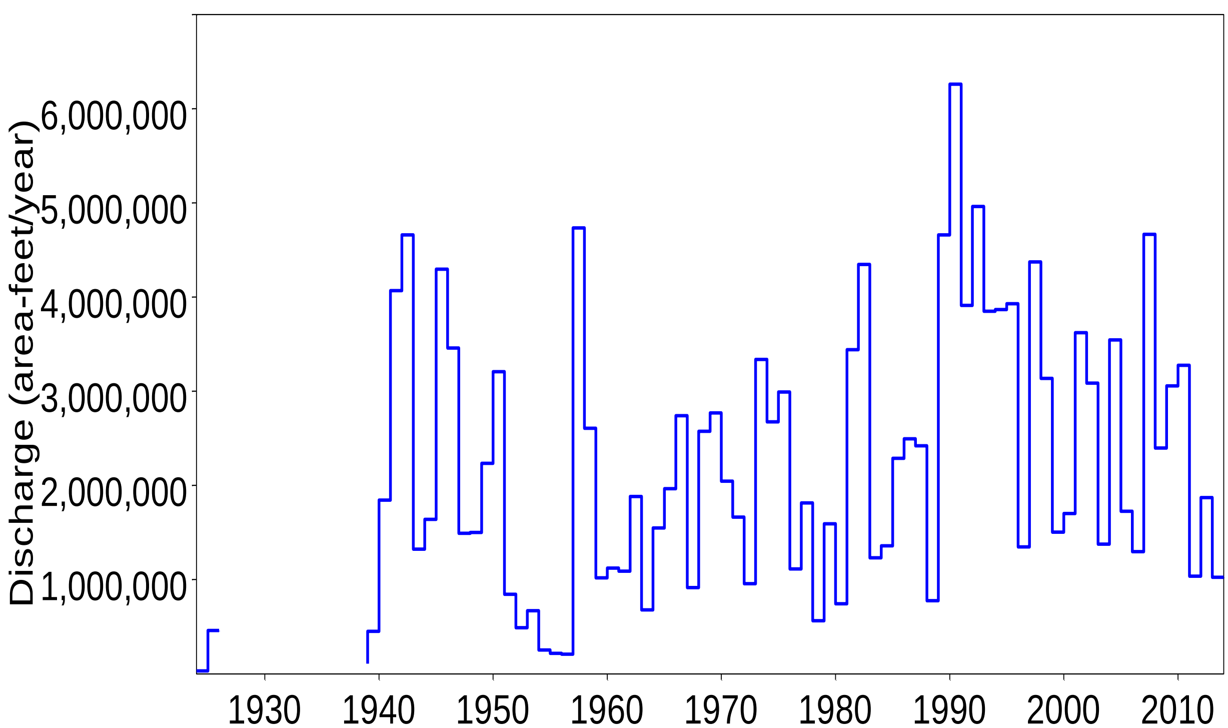
Mean daily flow of the Trinity River near Rosser T7



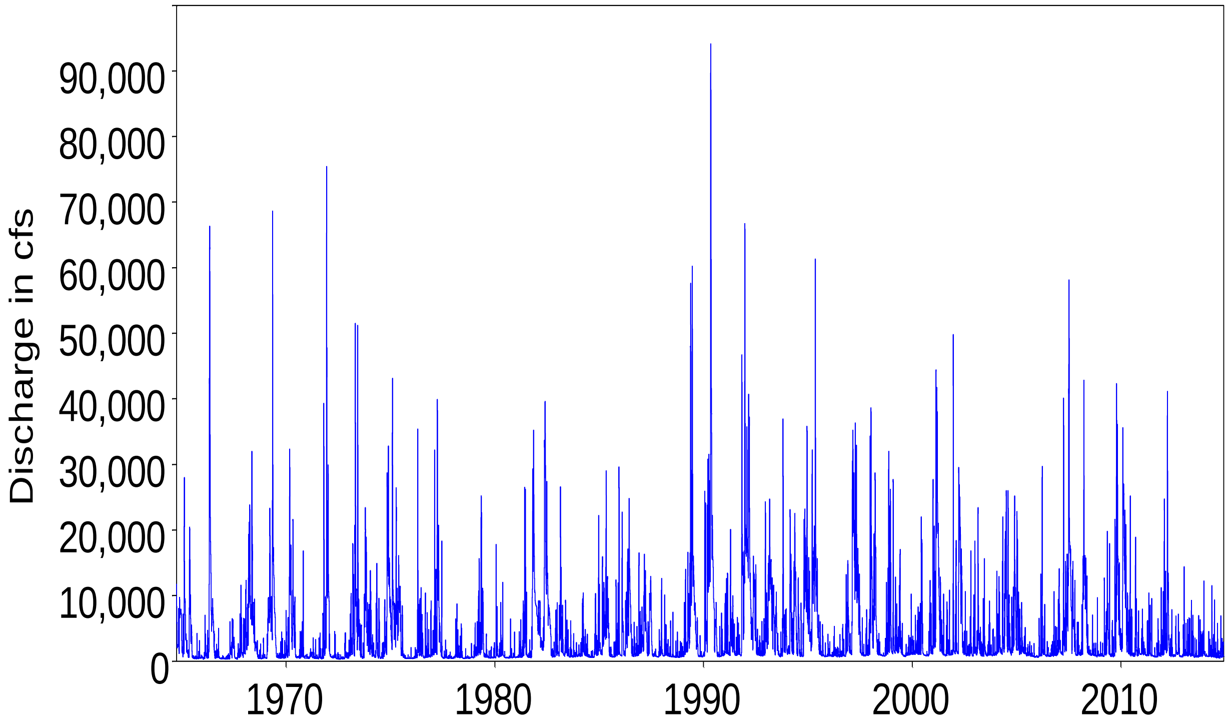
Mean monthly flow of the Trinity River near Rosser T7



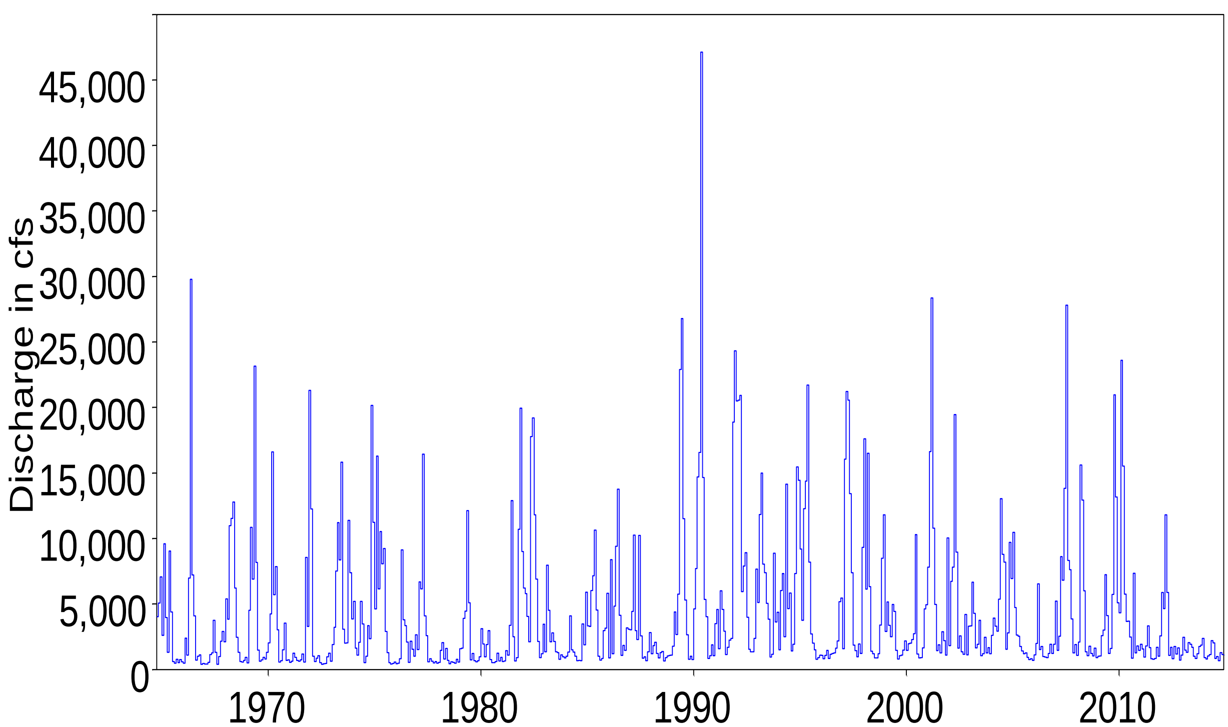
Annual peak flow of the Trinity River near Rosser T7



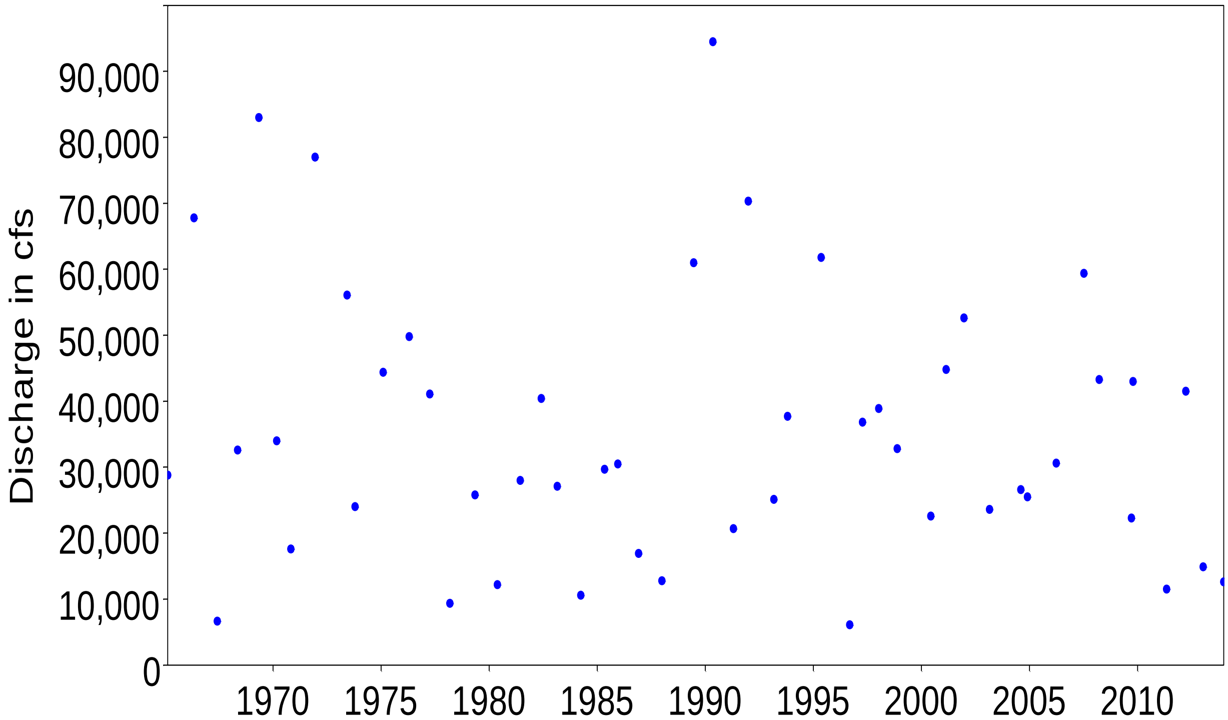
Annual flow of the Trinity River near Rosser T7



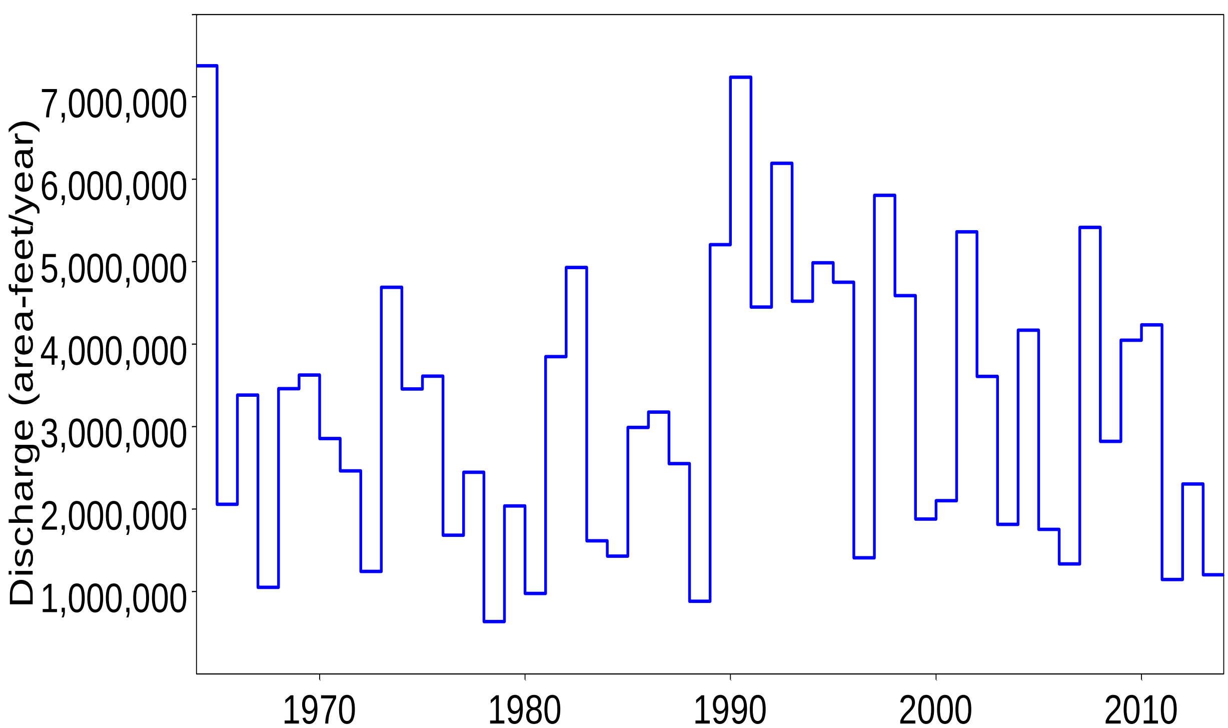
Mean daily flow of the Trinity River at Trinidad T8



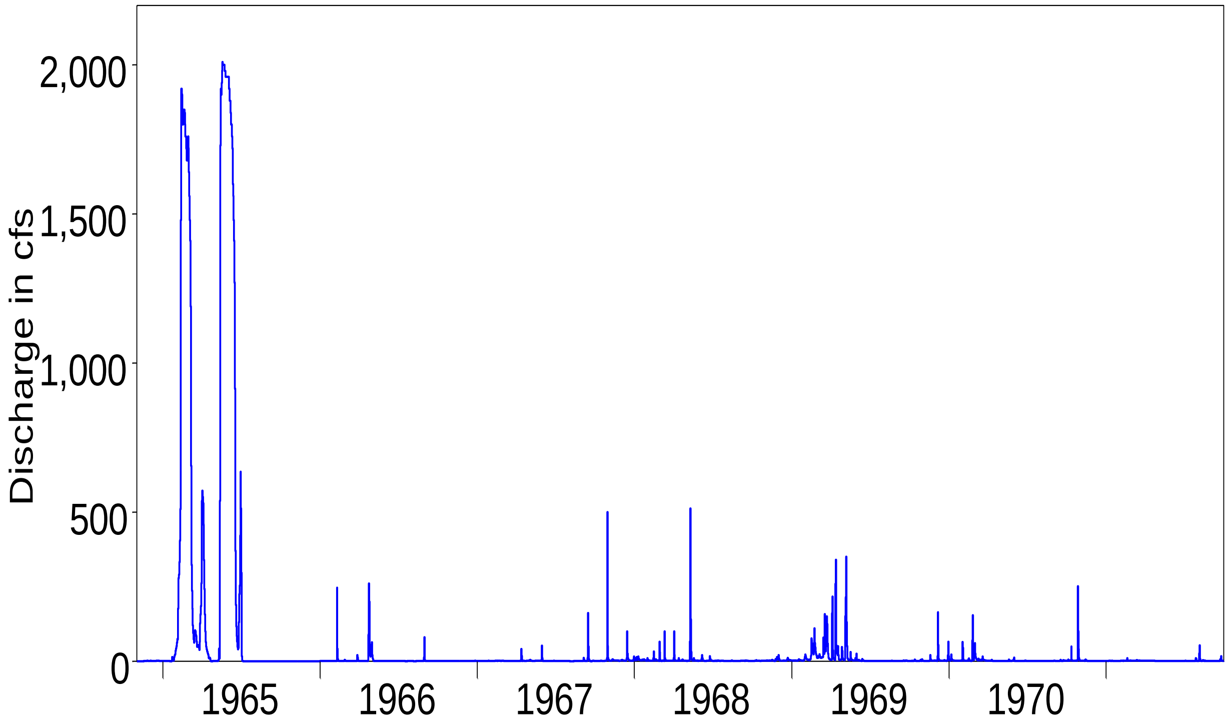
Mean monthly flow of the Trinity River at Trinidad T8



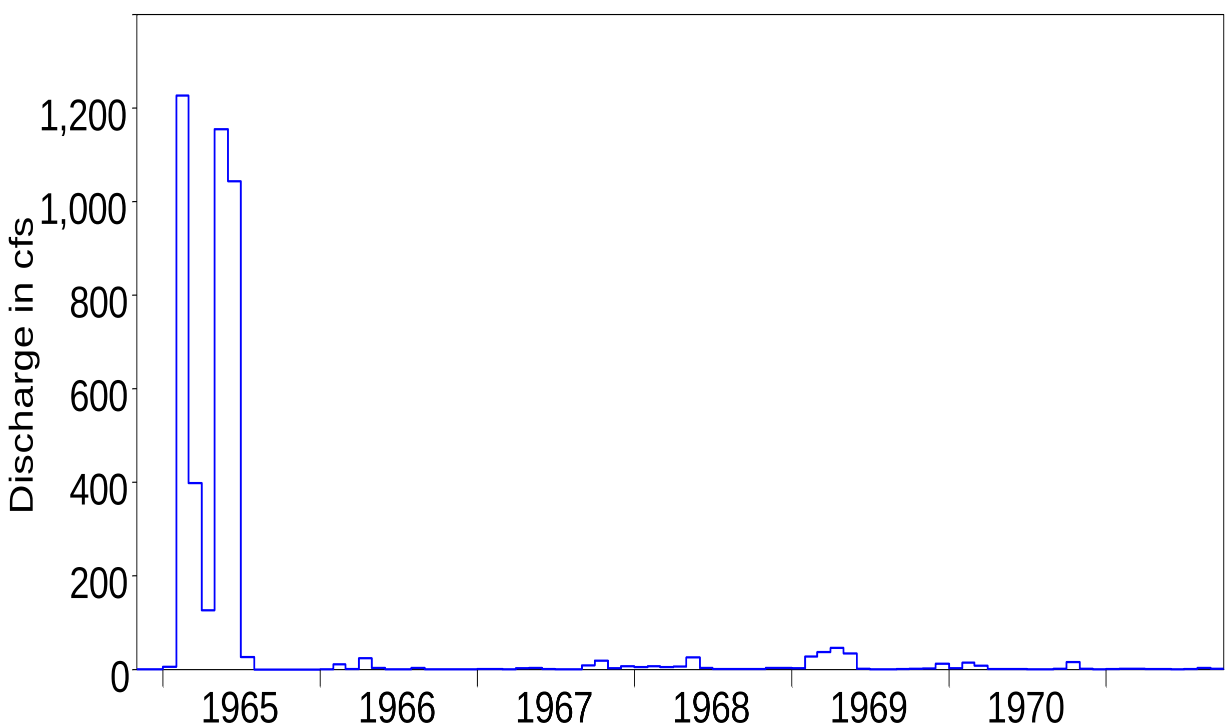
Annual peak flow of the Trinity River at Trinidad T8



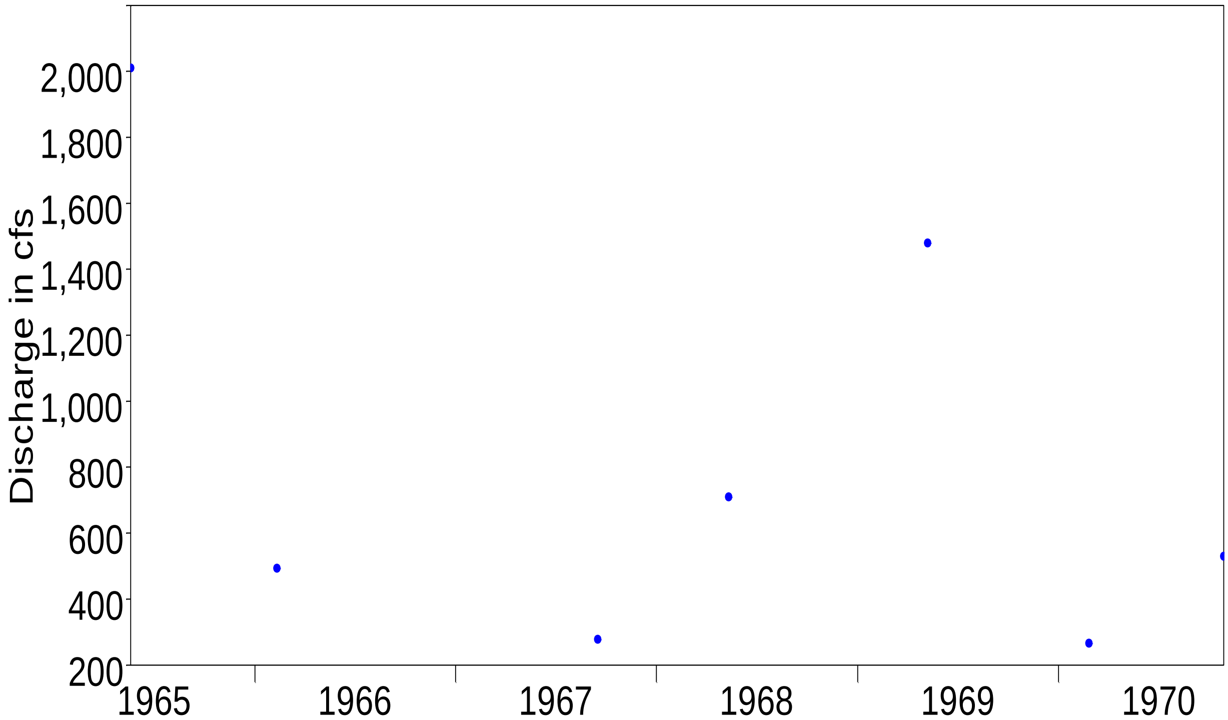
Annual flow of the Trinity River at Trinidad T8



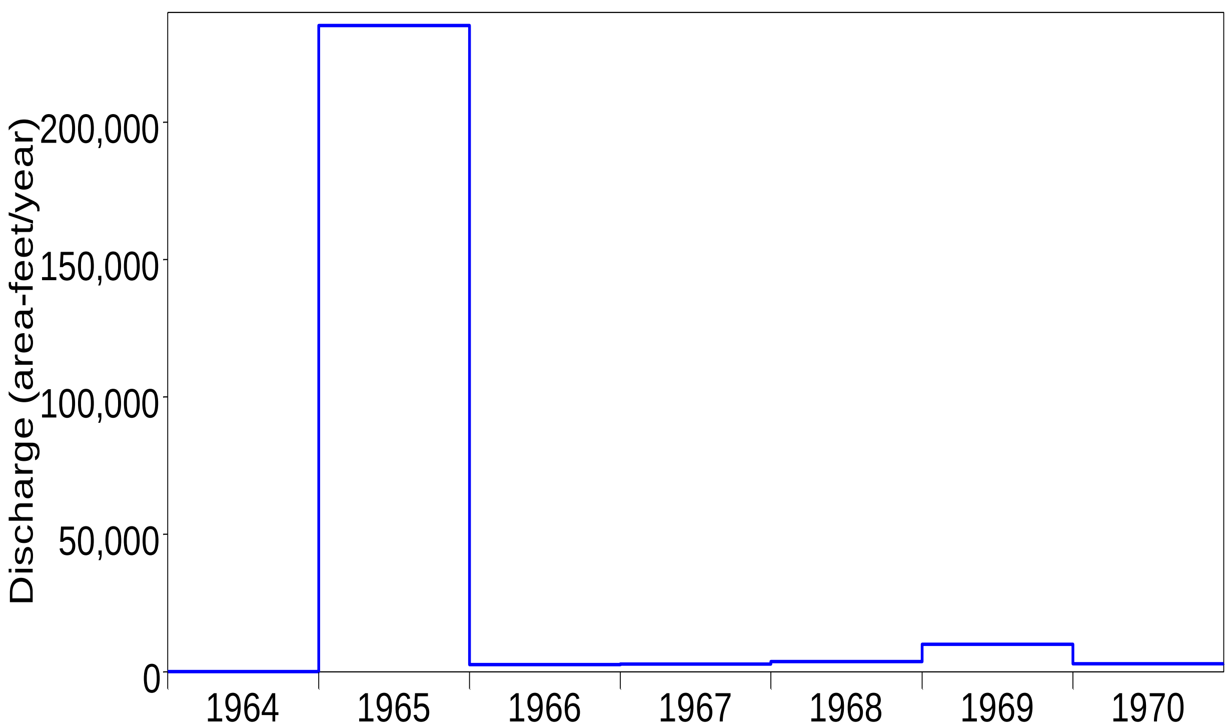
Mean daily flow of the Cedar Creek at Trinidad T9



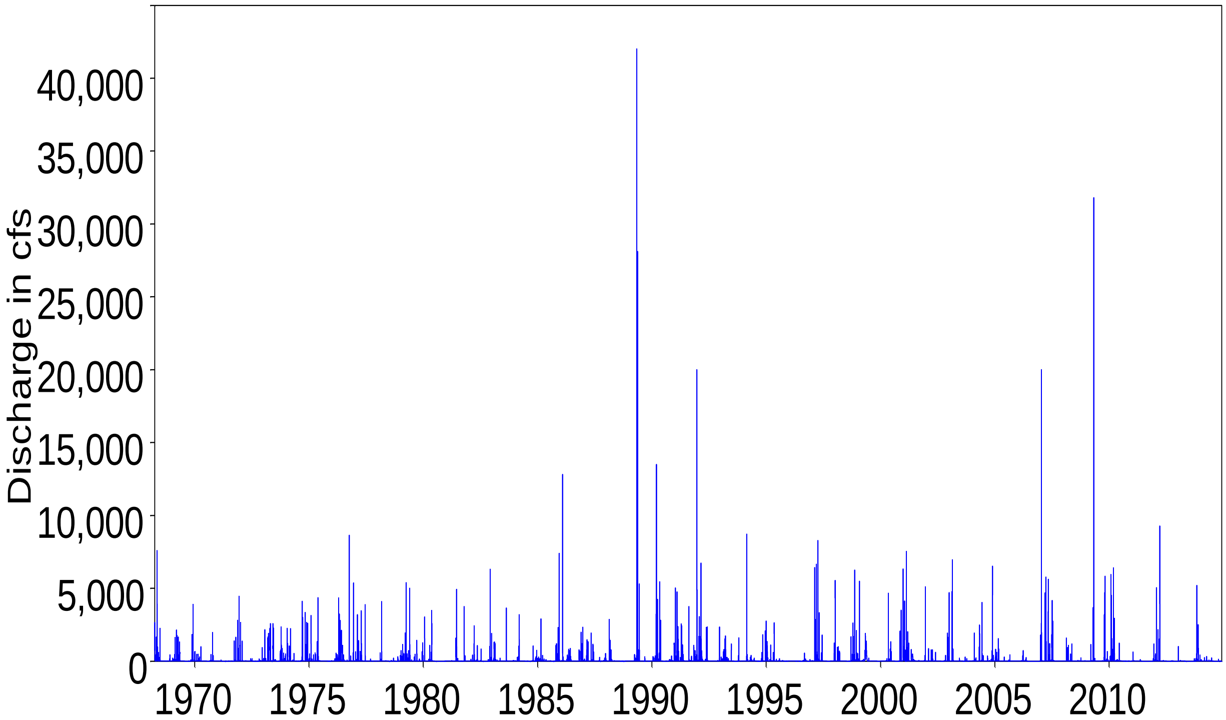
Mean monthly flow of the Cedar Creek at Trinidad T9



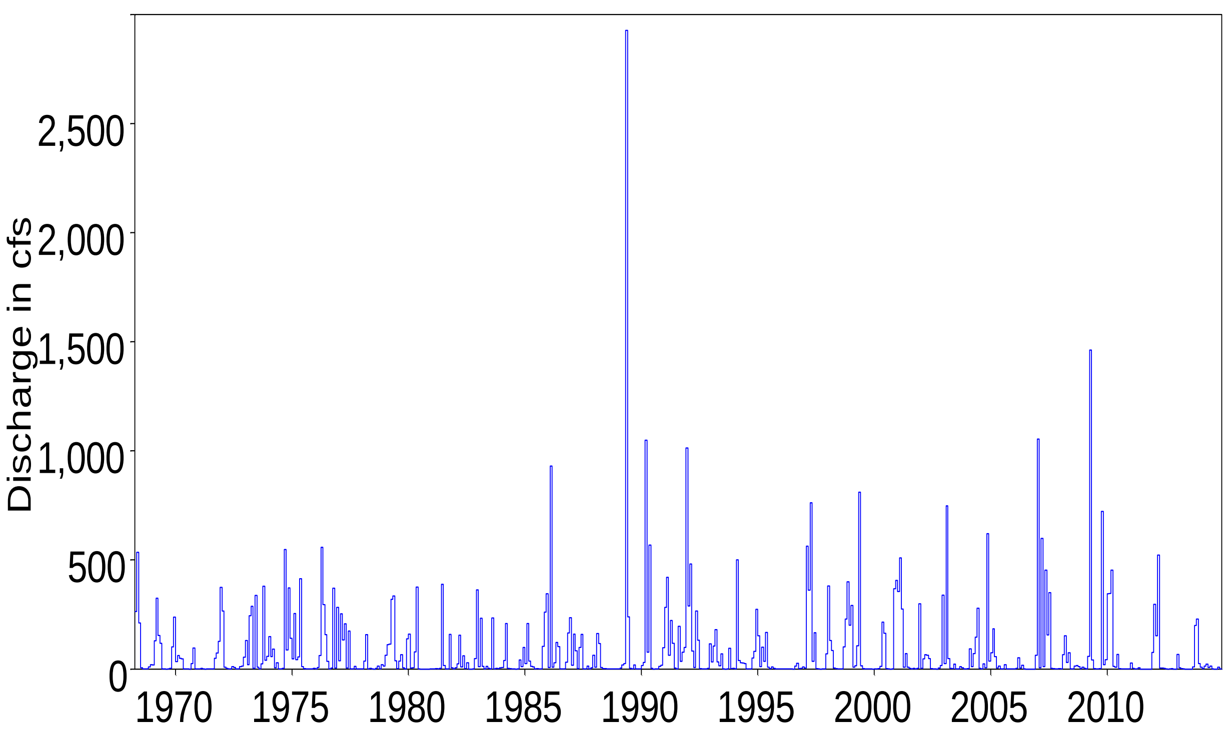
Annual peak flow of the Cedar Creek at Trinidad T9



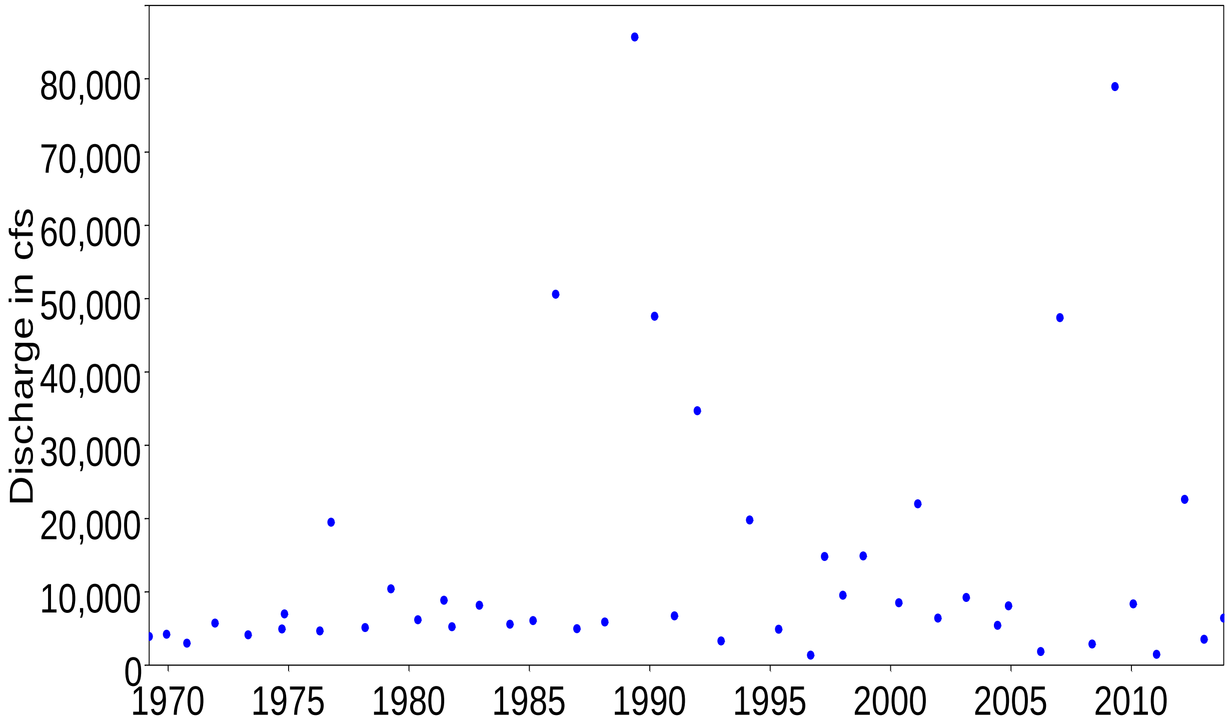
Annual flow of the Cedar Creek at Trinidad T9



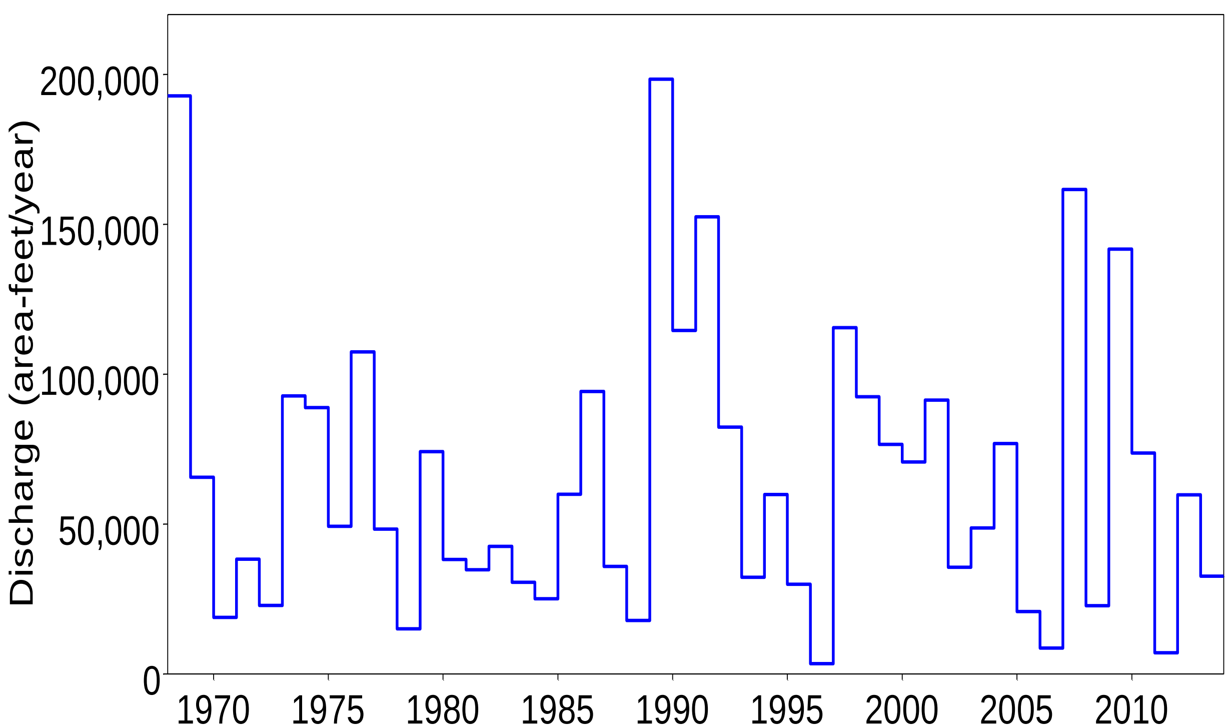
Mean daily flow of the Tehuacana Creek near Streetman T10



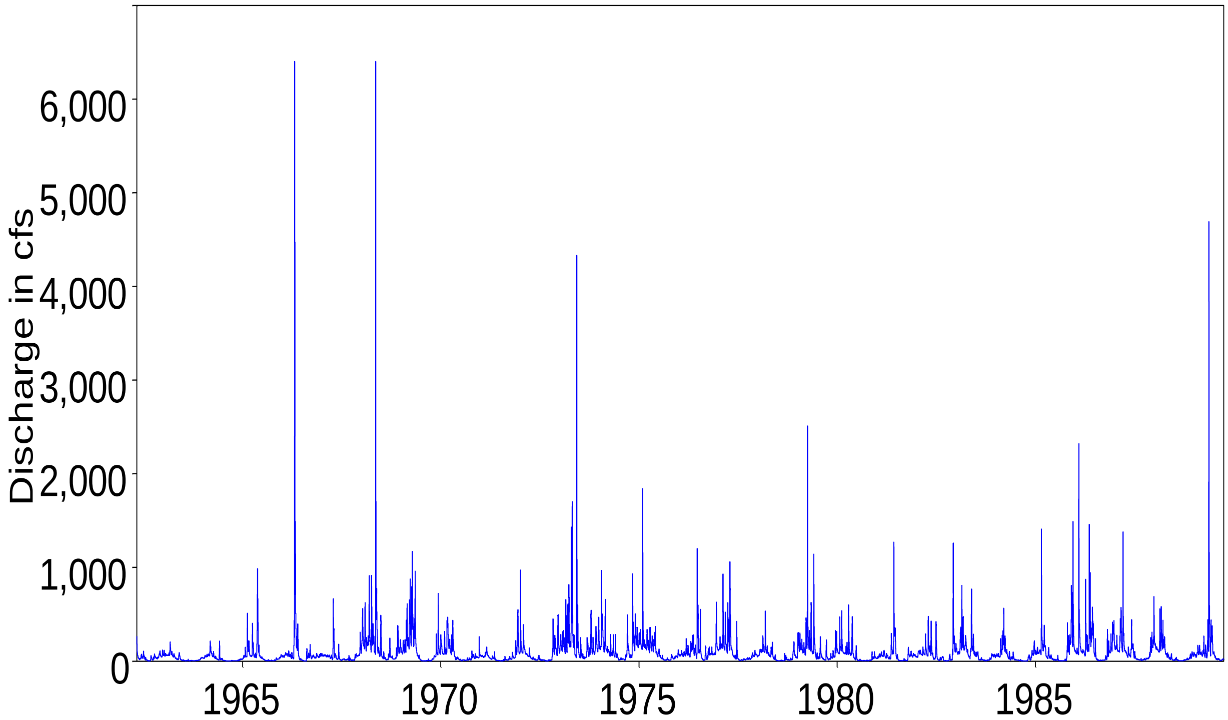
Mean monthly flow of the Tehuacana Creek near Streetman T10



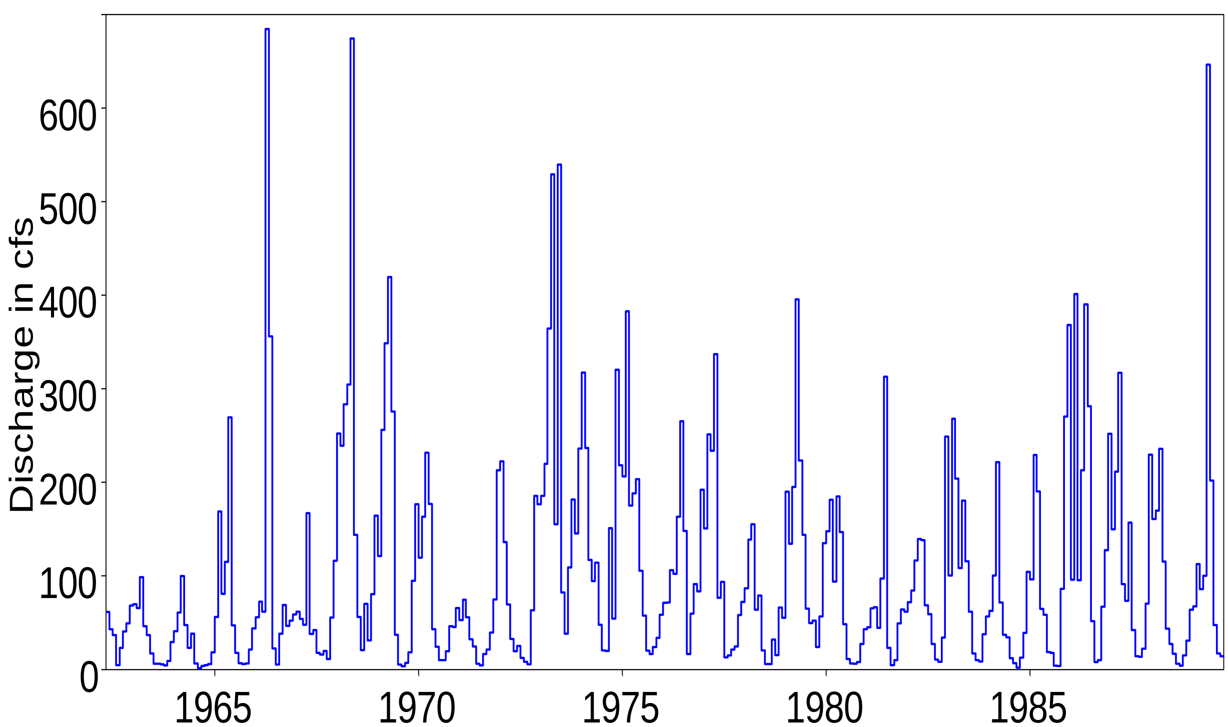
Annual peak flow of the Tehuacana Creek near Streetman T10



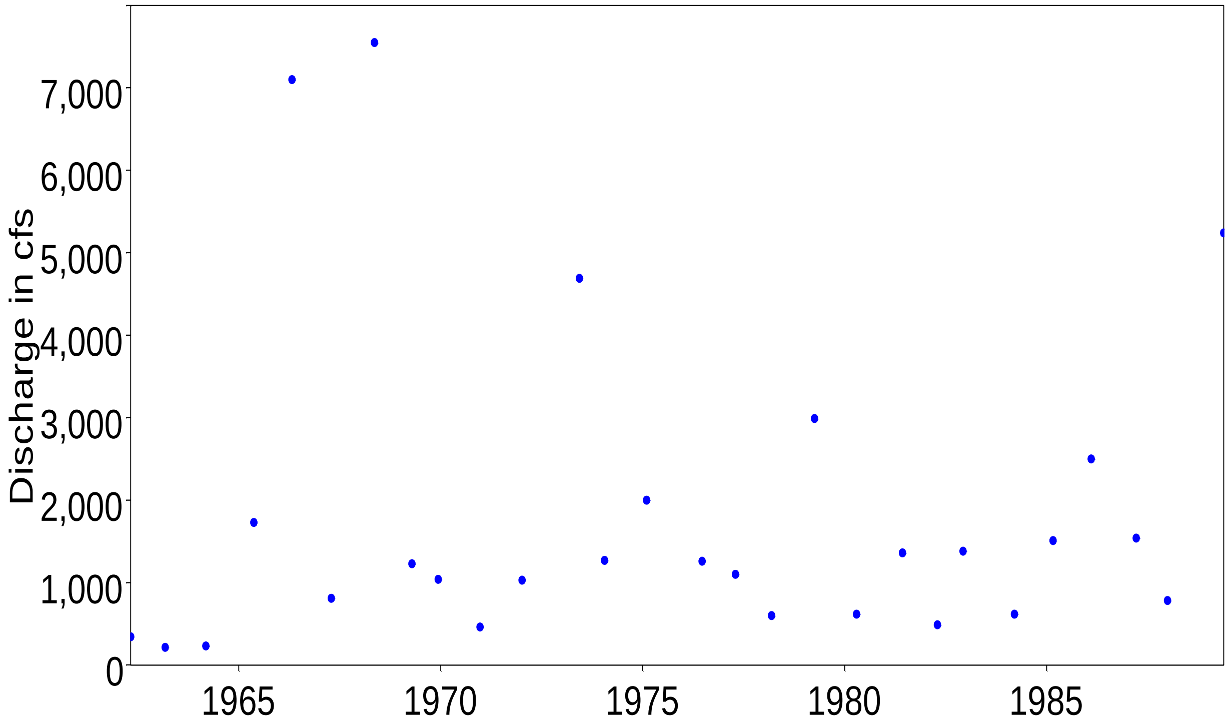
Annual flow of the Tehuacana Creek near Streetman T10



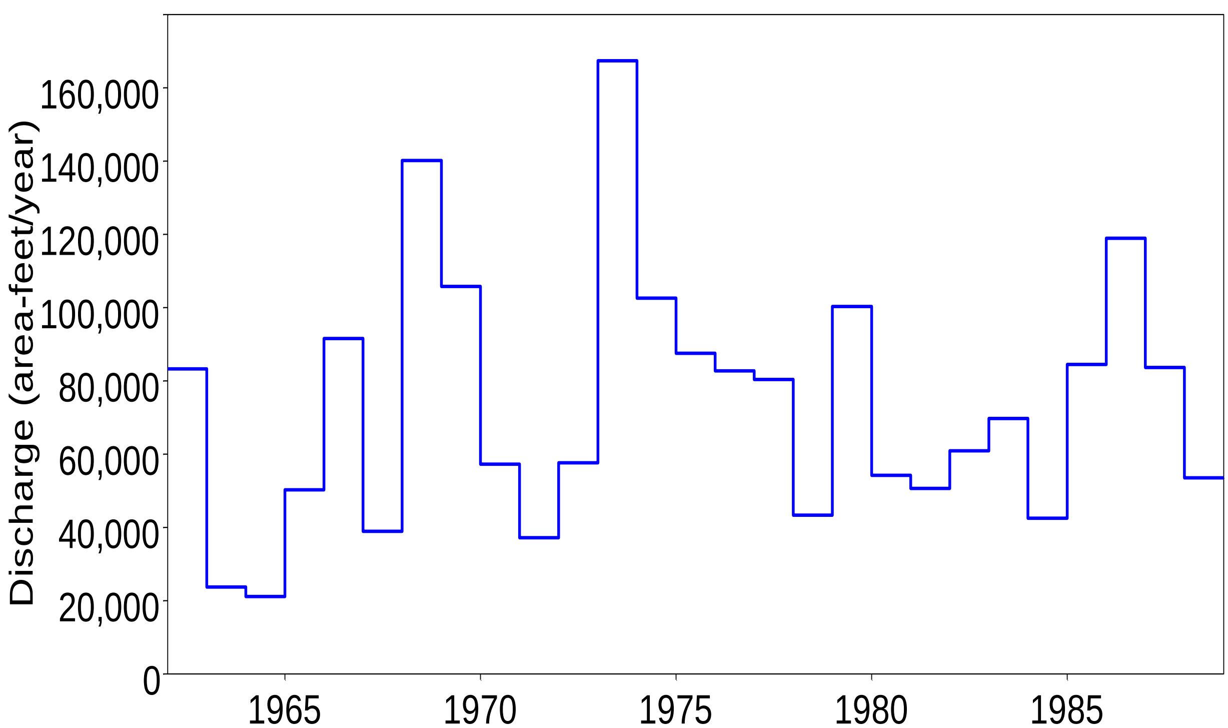
Mean daily flow of the Catfish Creek near Tennessee Colony T11



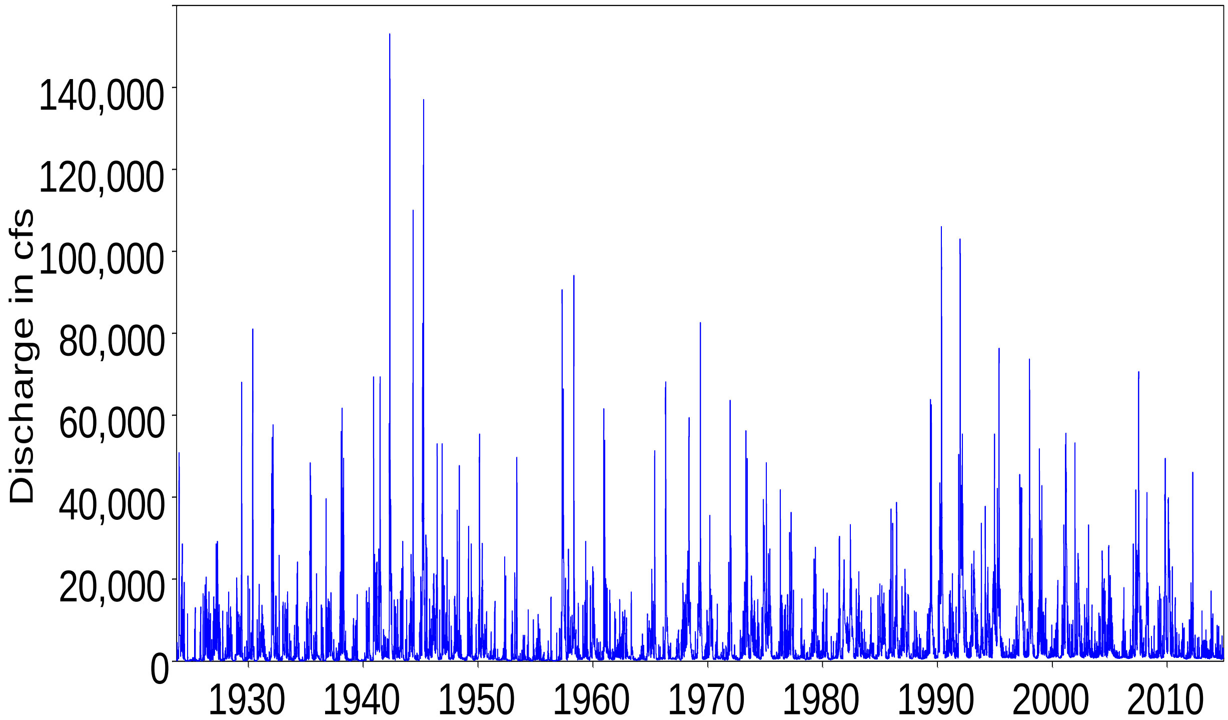
Mean monthly flow of the Catfish Creek near Tennessee Colony T11



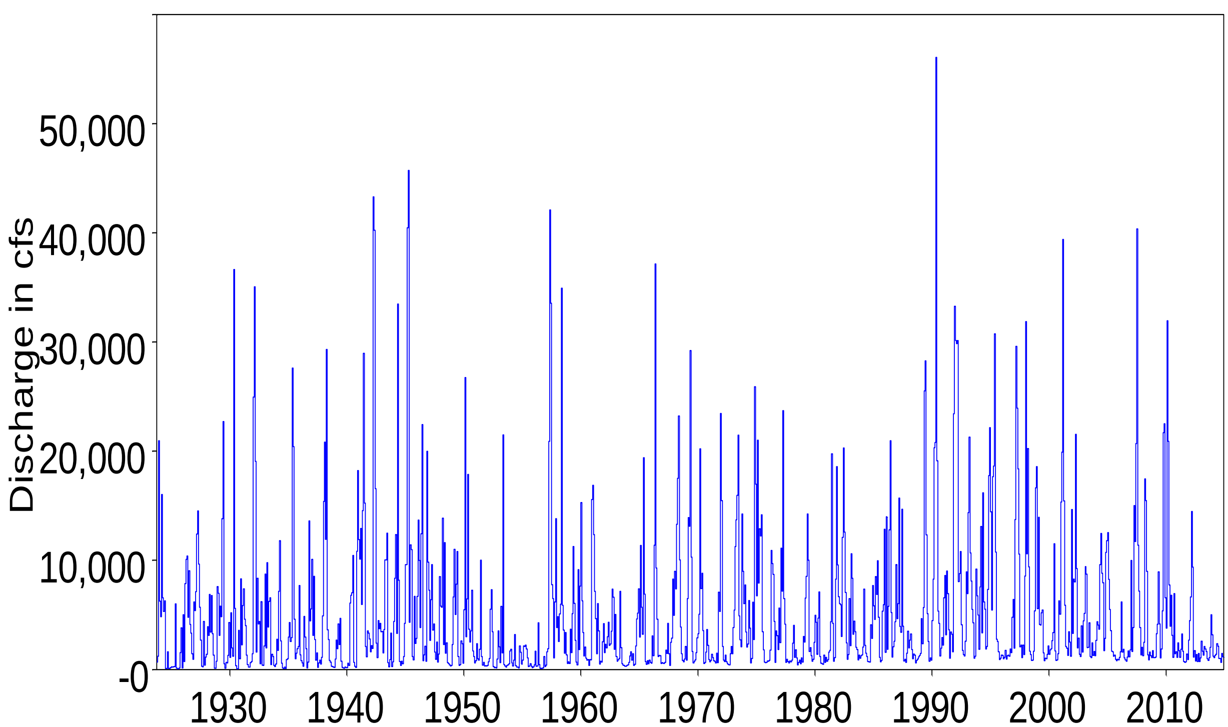
Annual peak flow of the Catfish Creek near Tennessee Colony T11



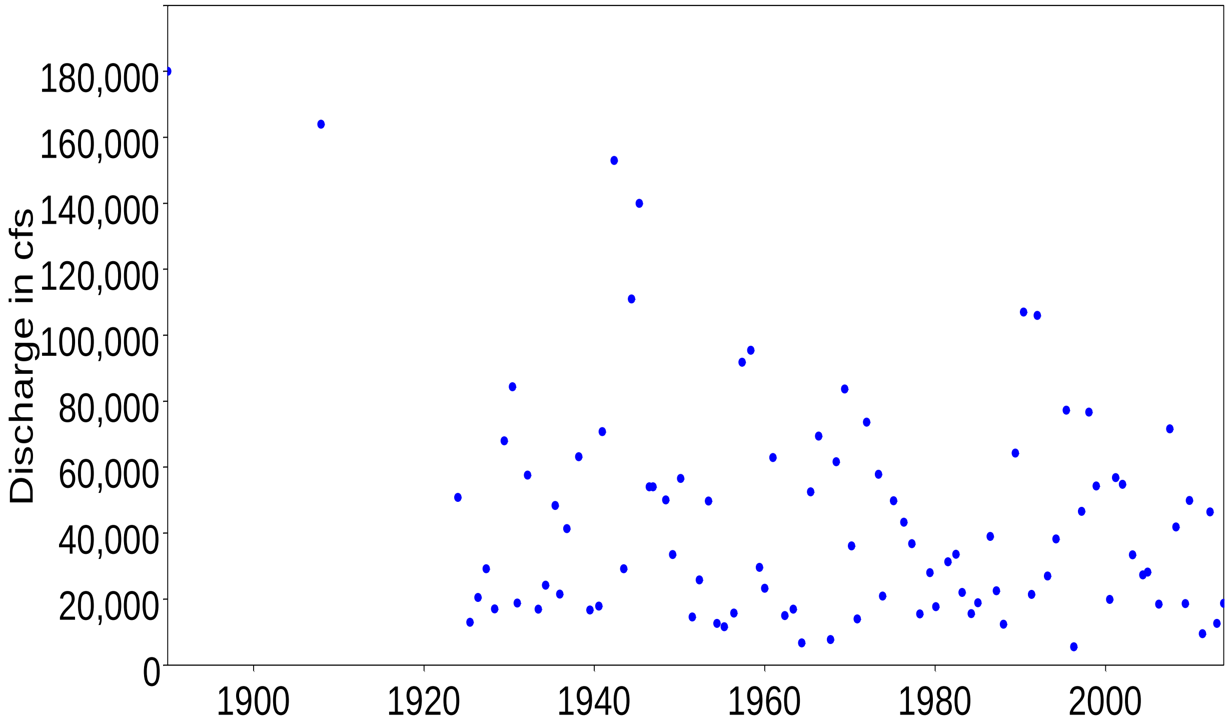
Annual flow of the Catfish Creek near Tennessee Colony T11



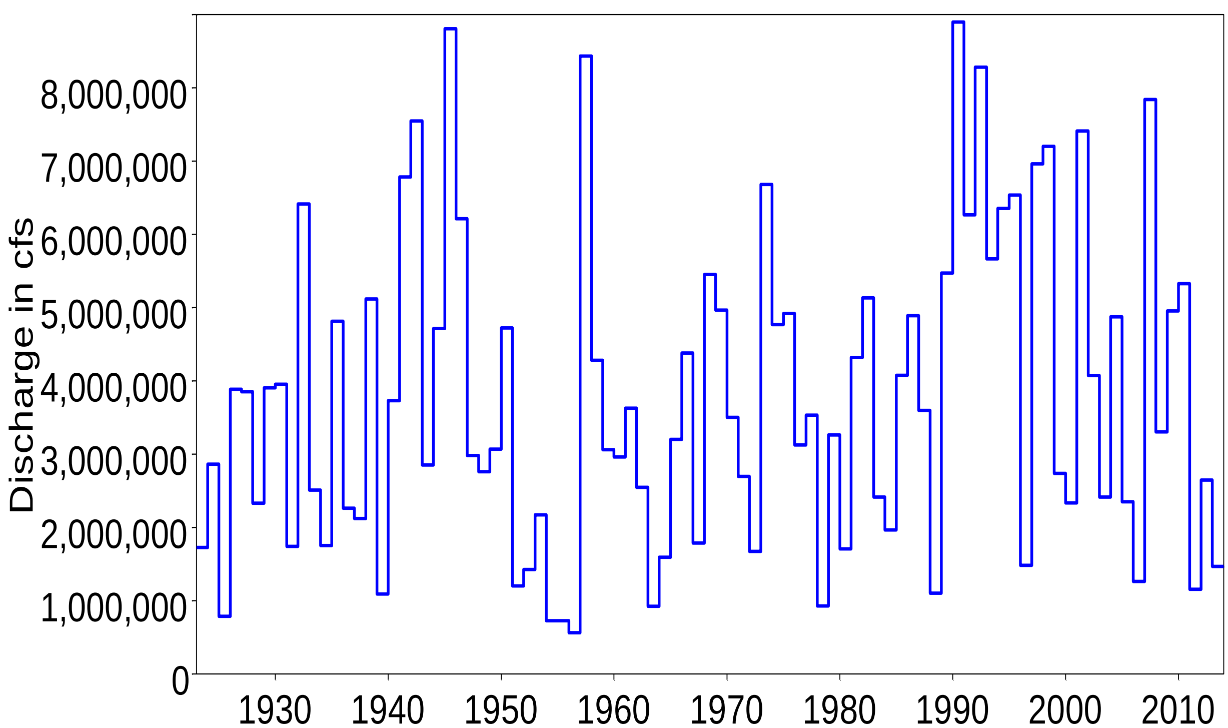
Mean daily flow of the Trinity River near Oakwood T12



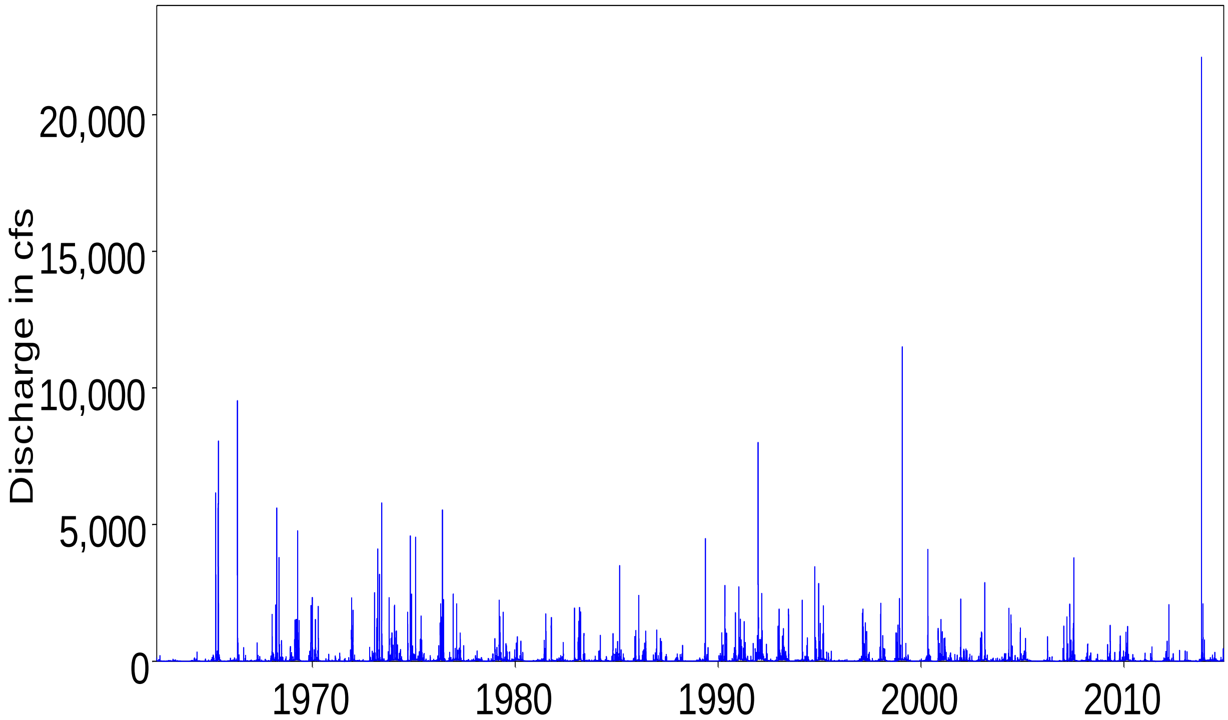
Mean monthly flow of the Trinity River near Oakwood T12



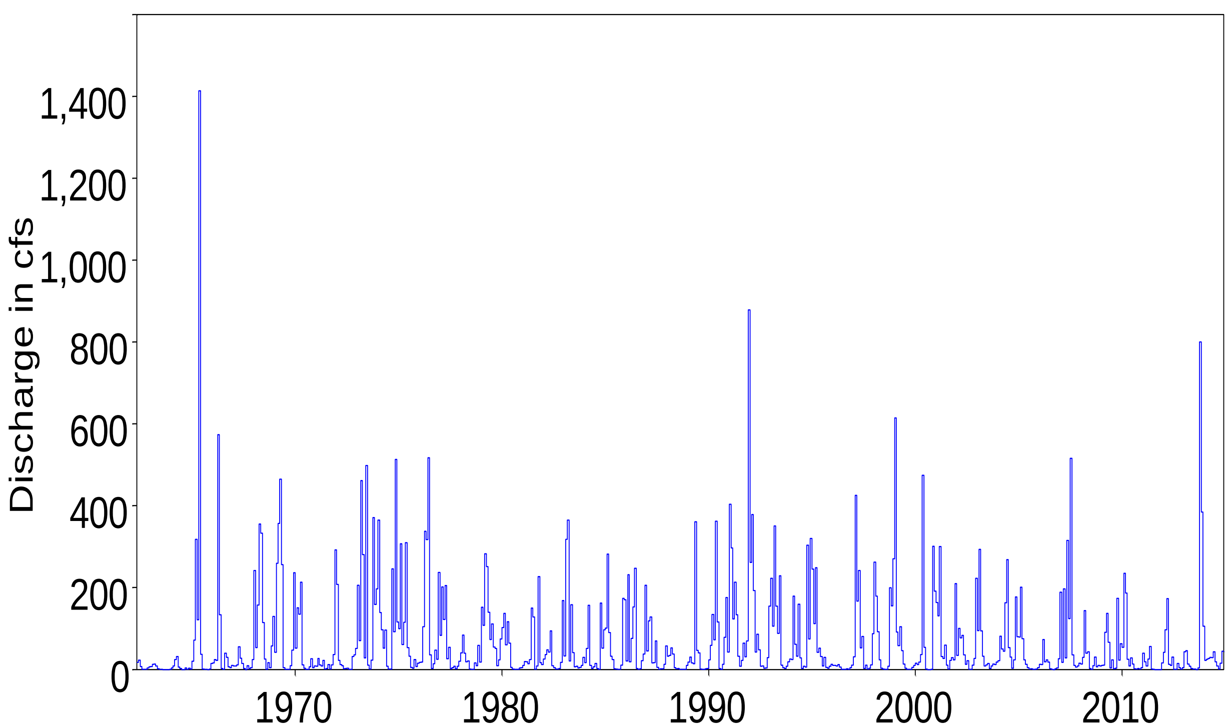
Annual peak flow of the Trinity River near Oakwood T12



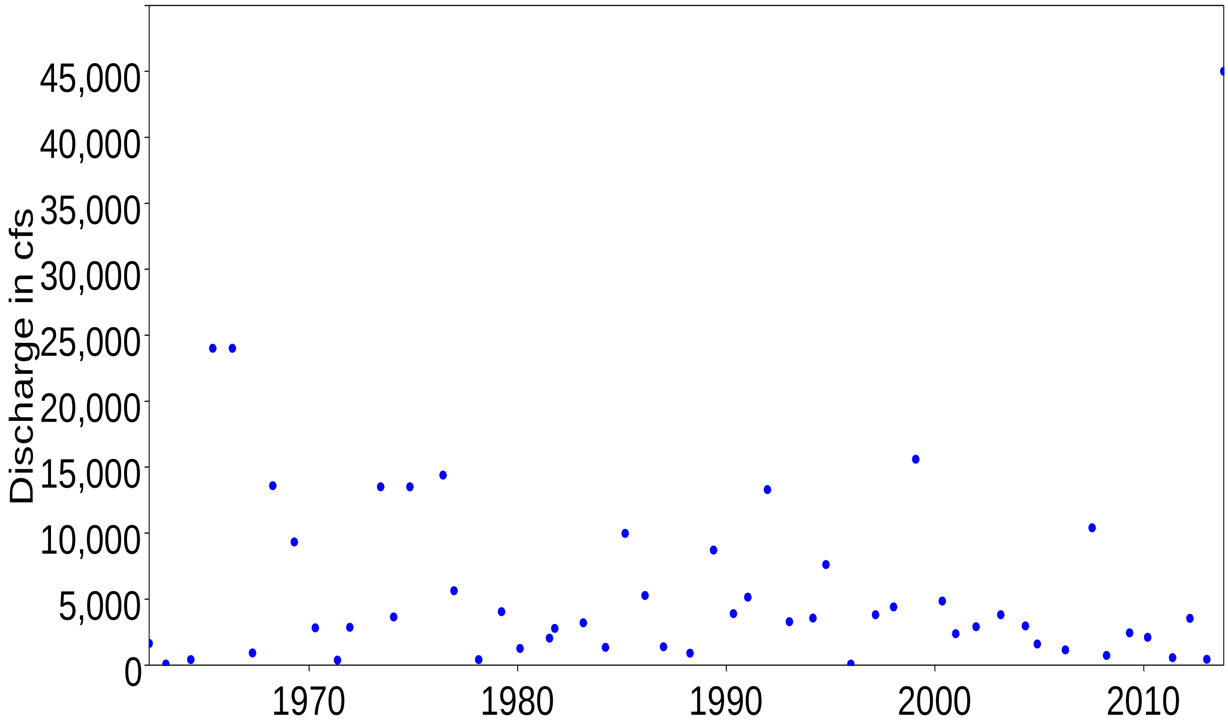
Annual flow of the Trinity River near Oakwood T12



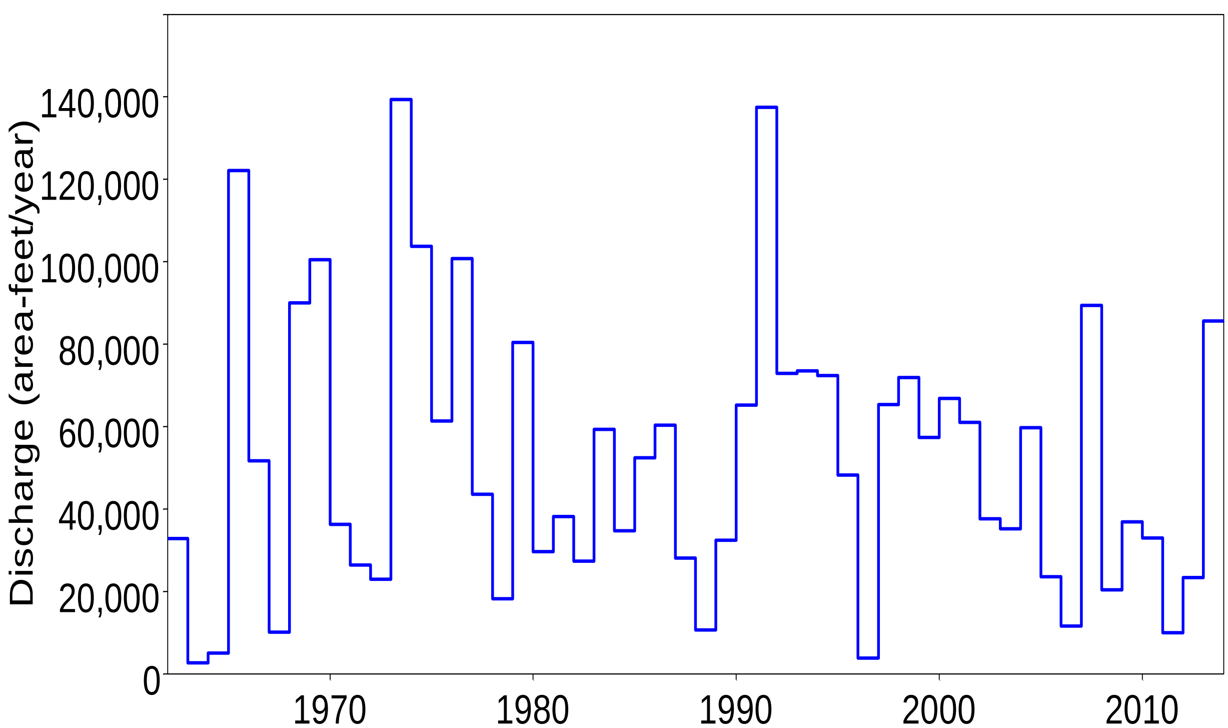
Mean daily flow of the Upper Keechi Creek near Oakwood T13



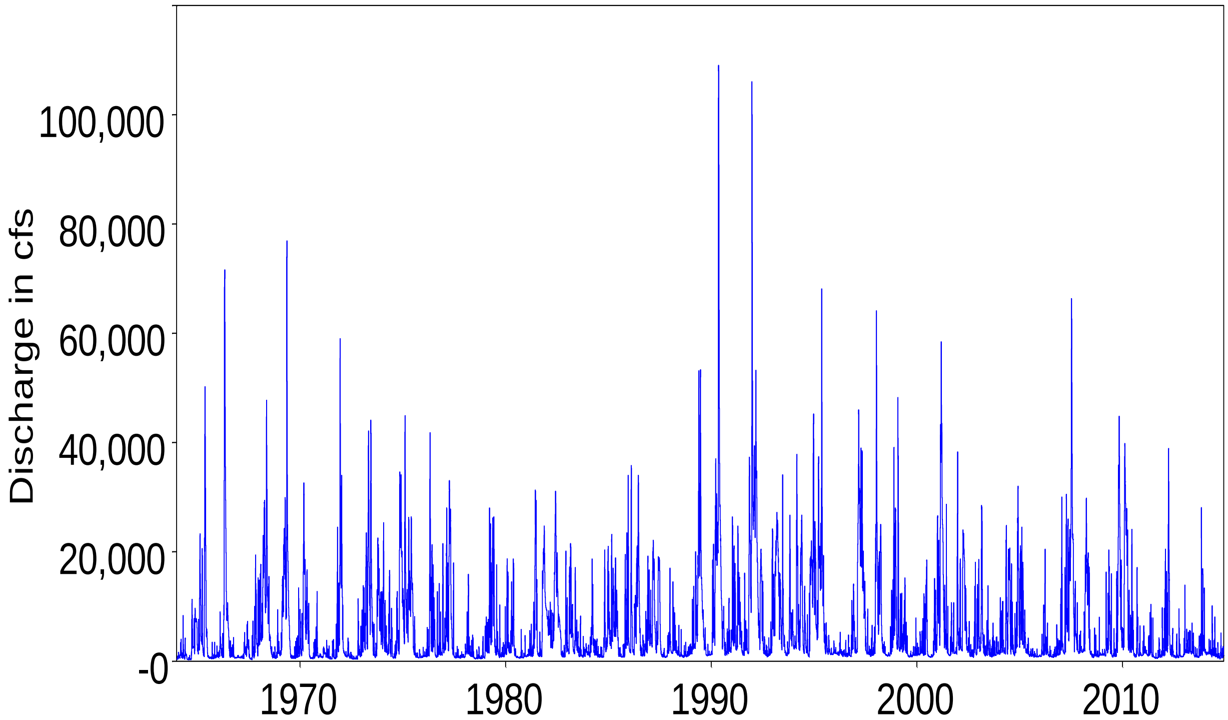
Mean monthly flow of the Upper Keechi Creek near Oakwood T13



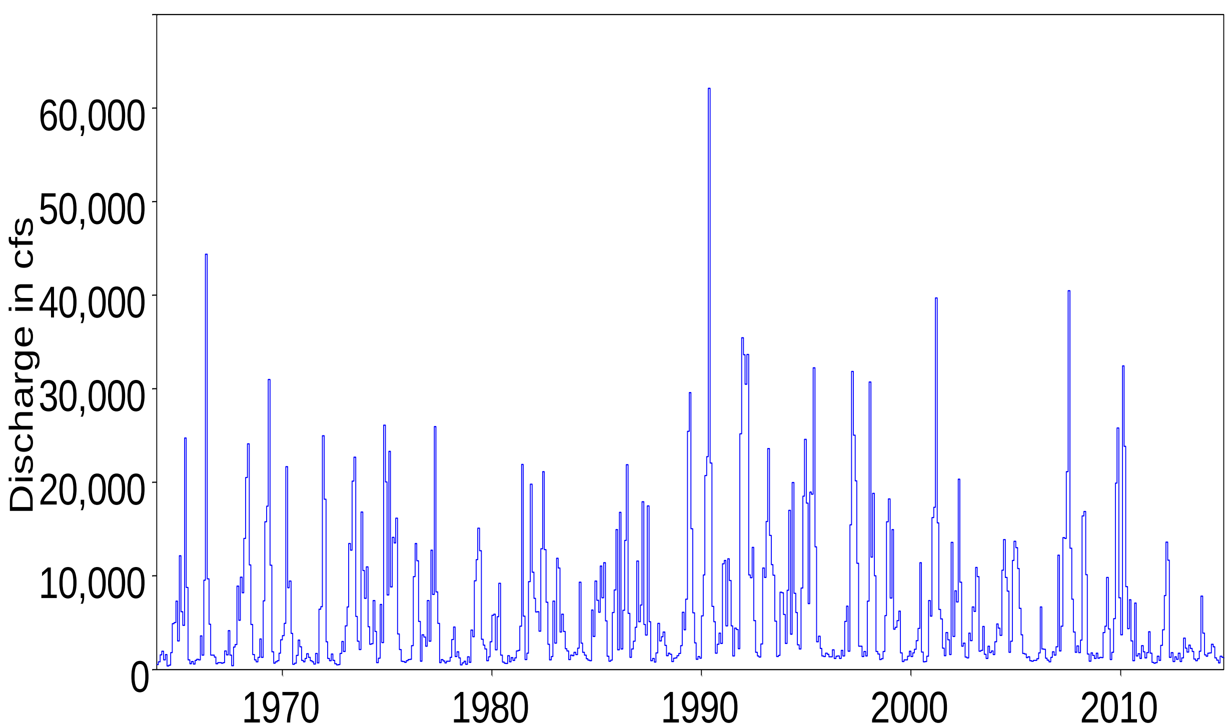
Annual peak flow of the Upper Keechi Creek near Oakwood T13



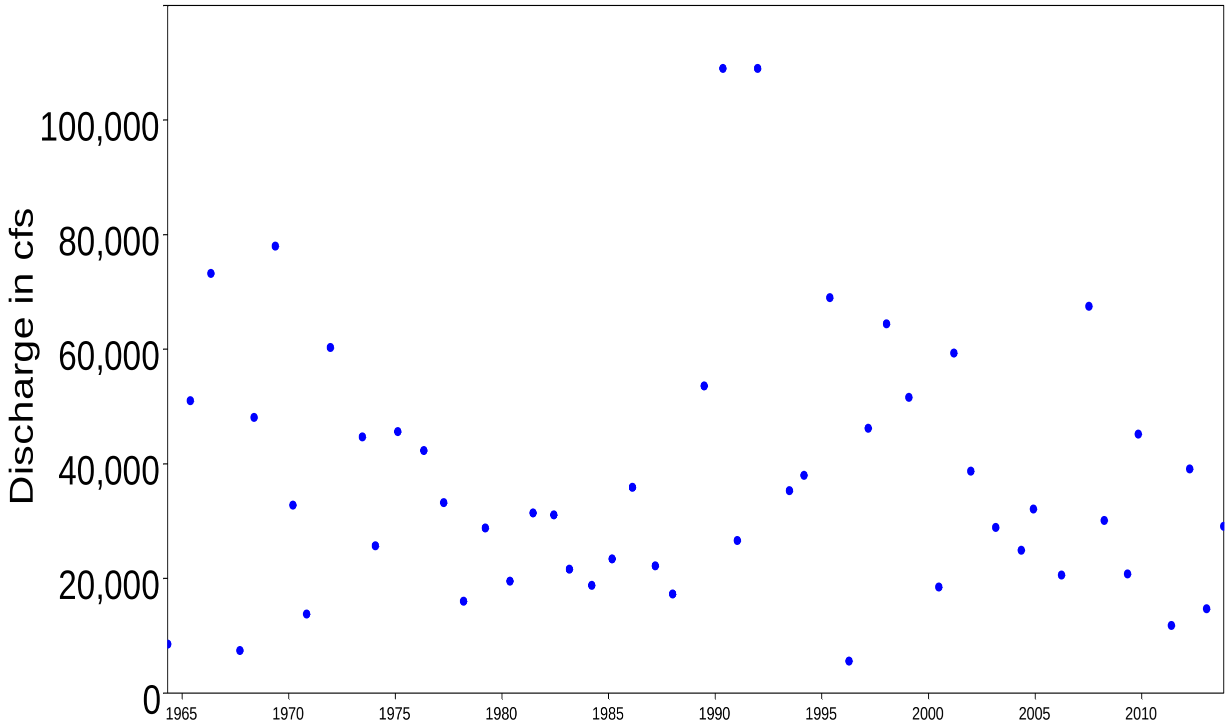
Annual flow of the Upper Keechi Creek near Oakwood T13



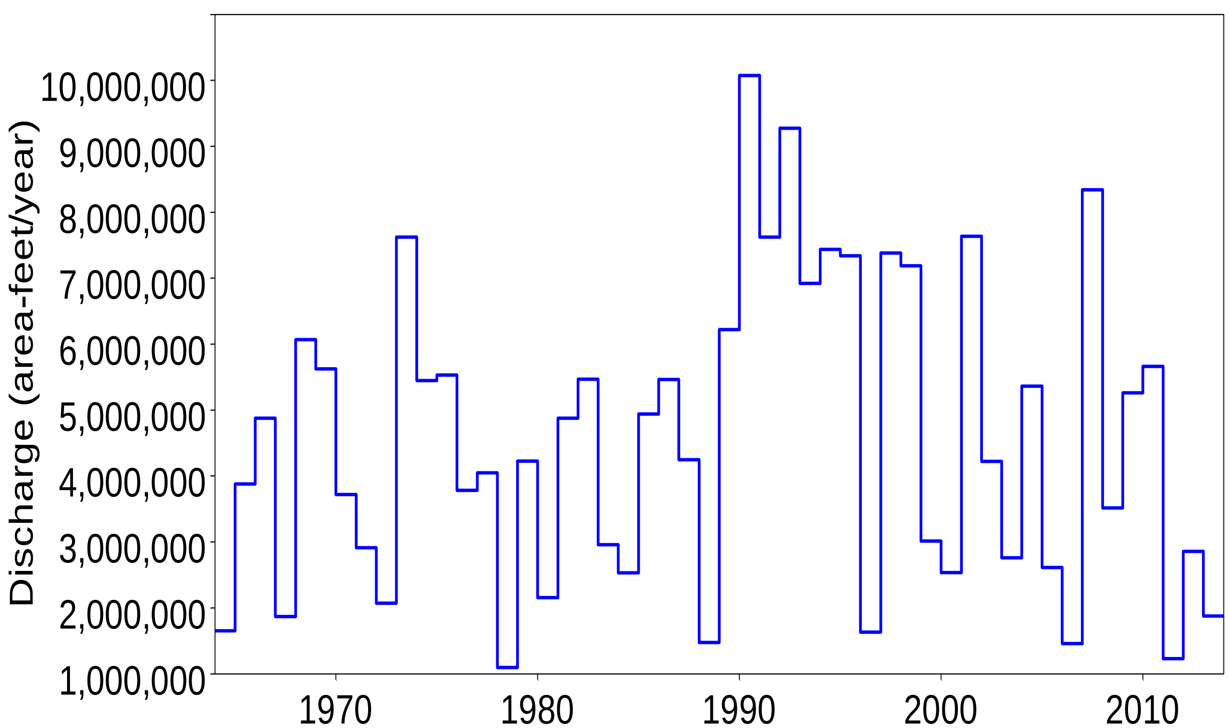
Mean daily flow of the Trinity River near Crockett T14



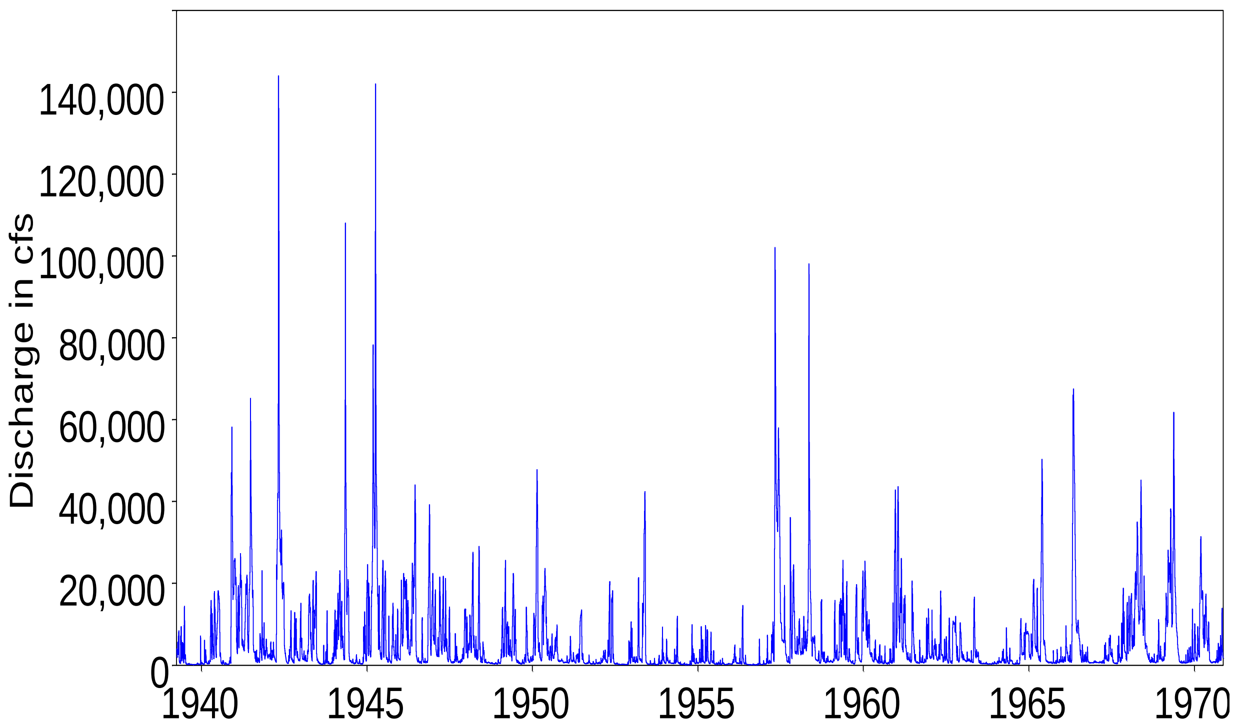
Mean monthly flow of the Trinity River near Crockett T14



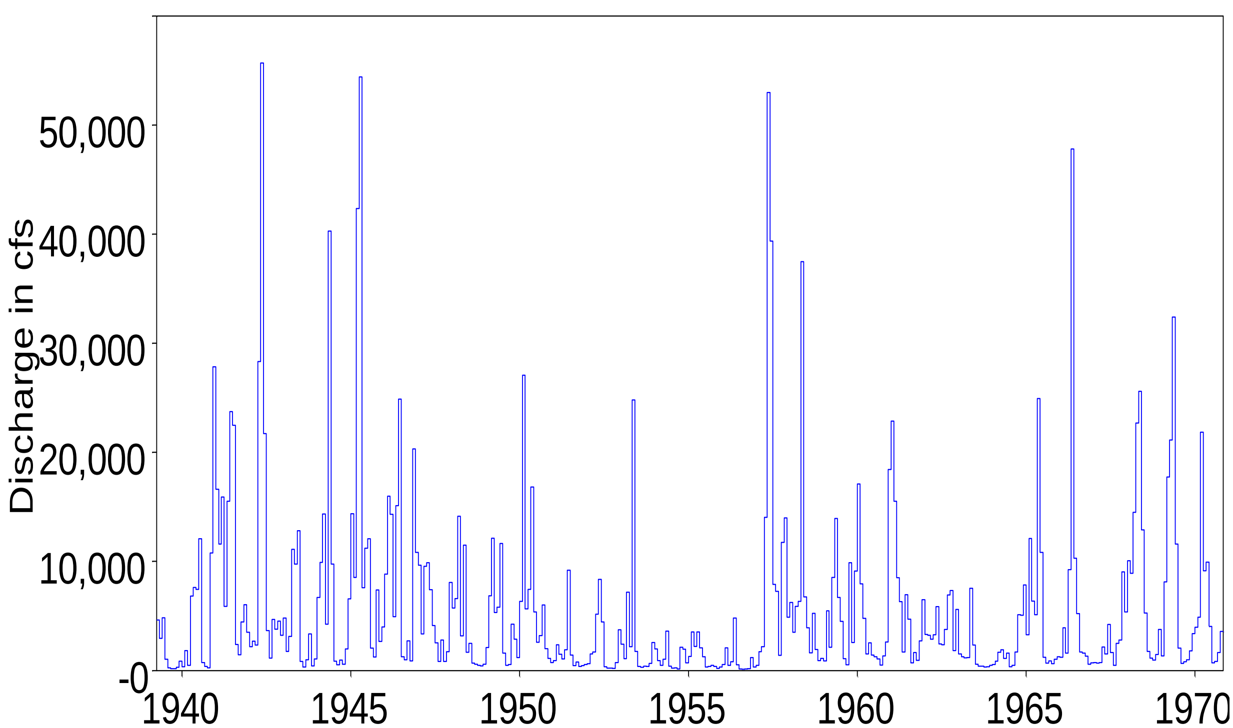
Annual peak flow of the Trinity River near Crockett T14



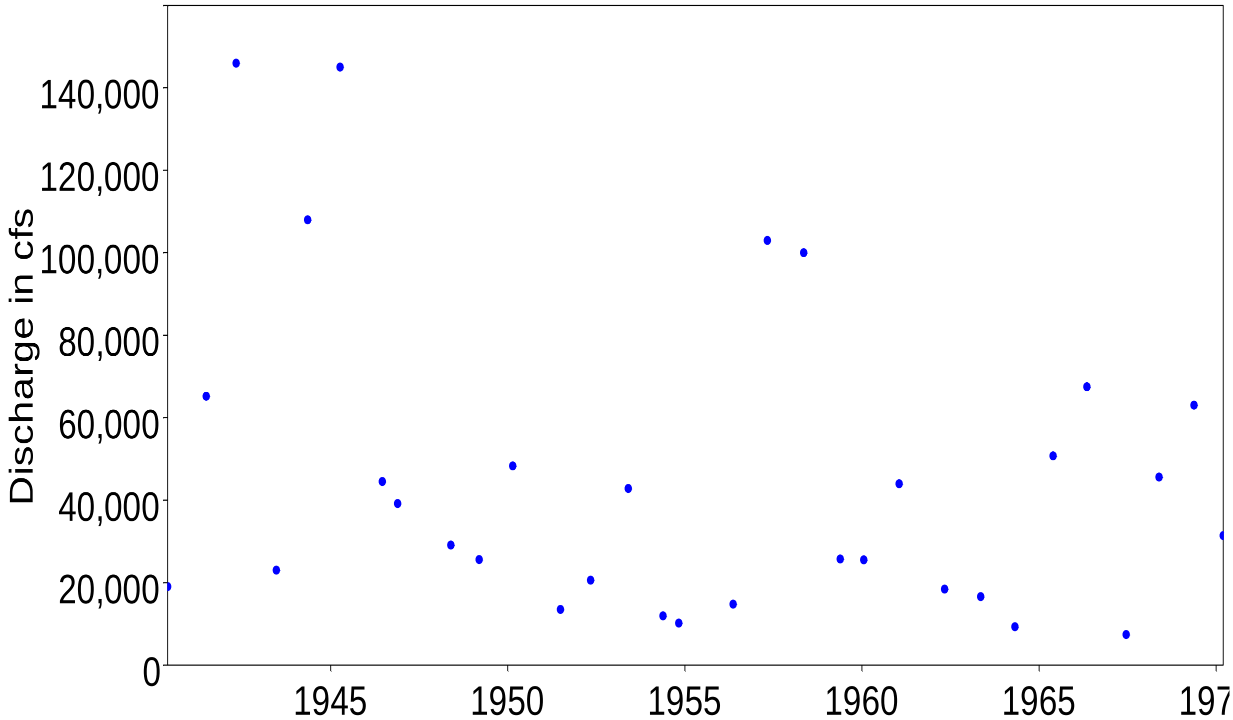
Annual flow of the Trinity River near Crockett T14



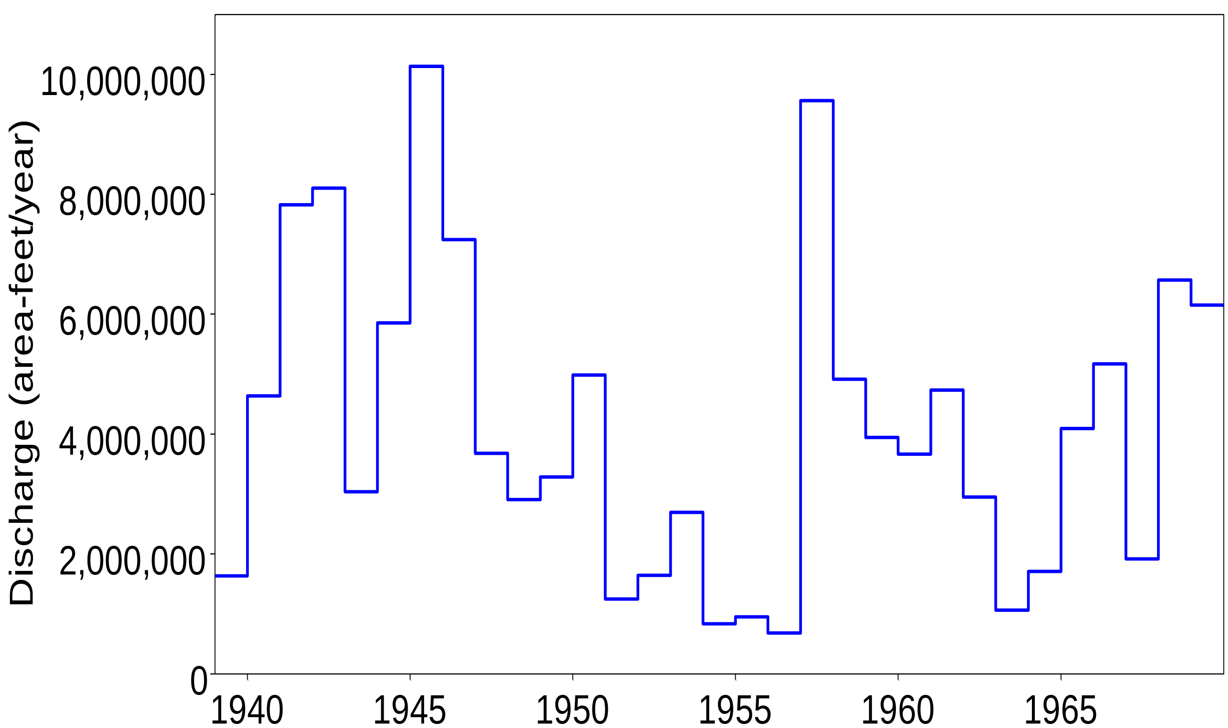
Mean daily flow of the Trinity River near Midway T15



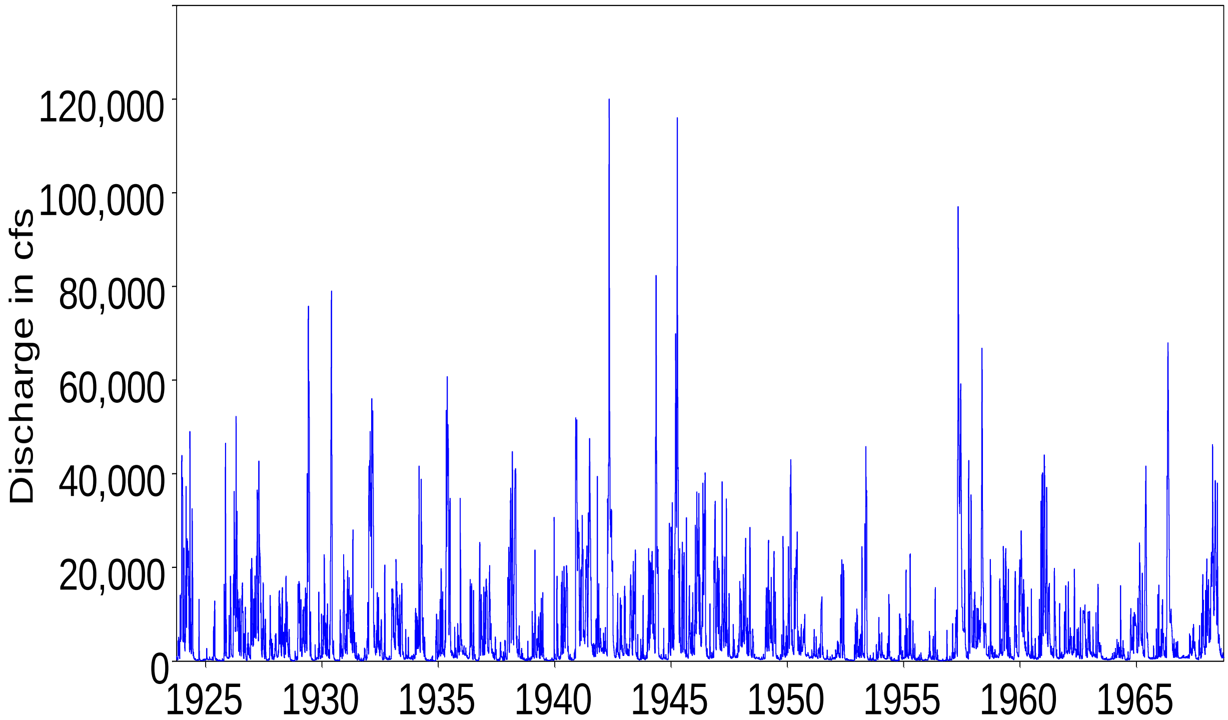
Mean monthly flow of the Trinity River near Midway T15



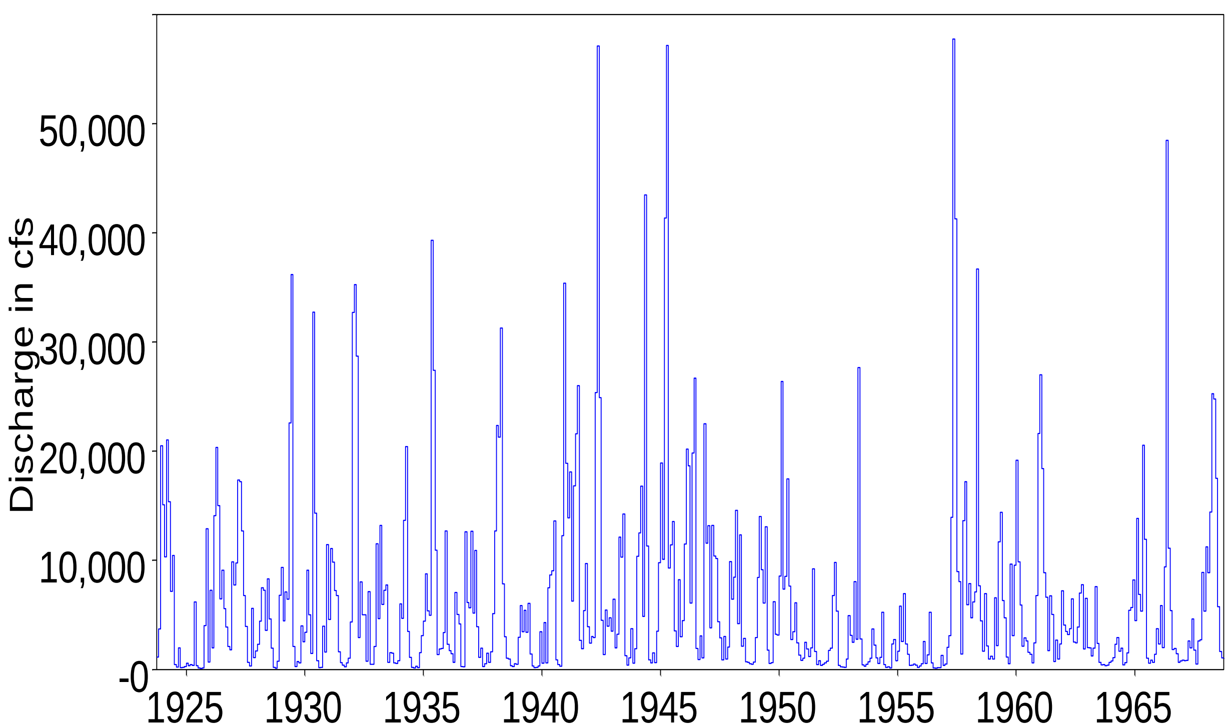
Annual peak flow of Trinity River near Midway T15



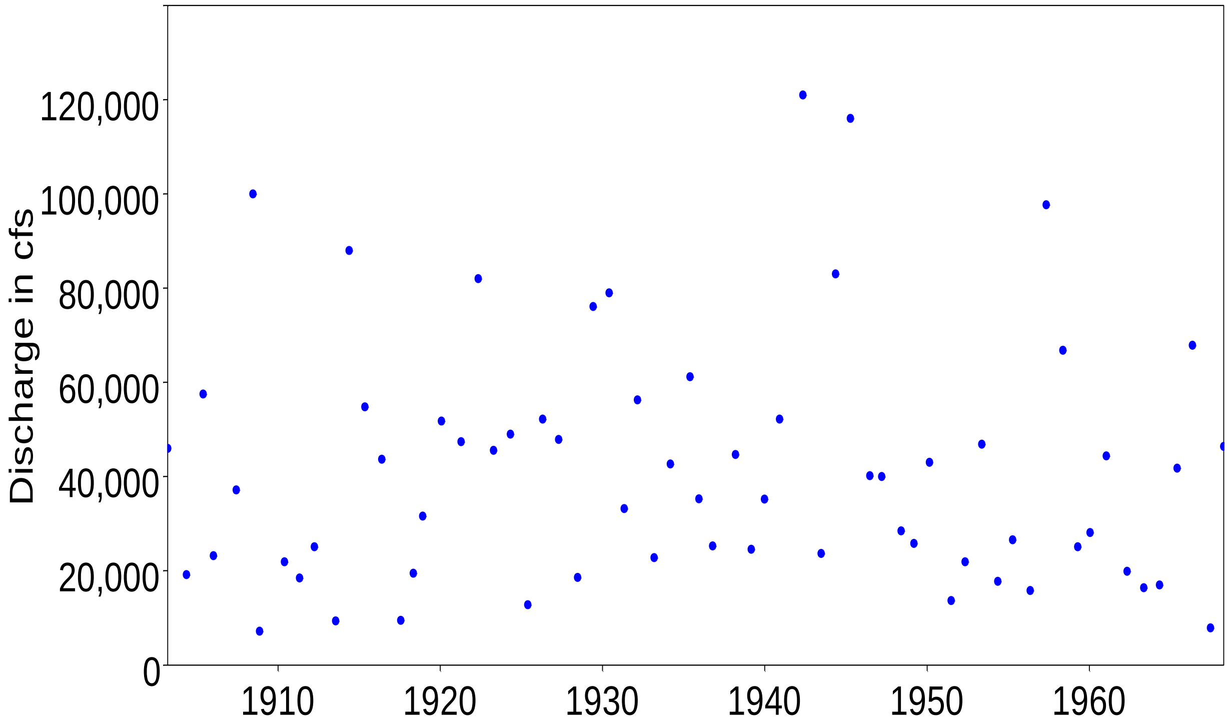
Annual flow of Trinity River near Midway T15



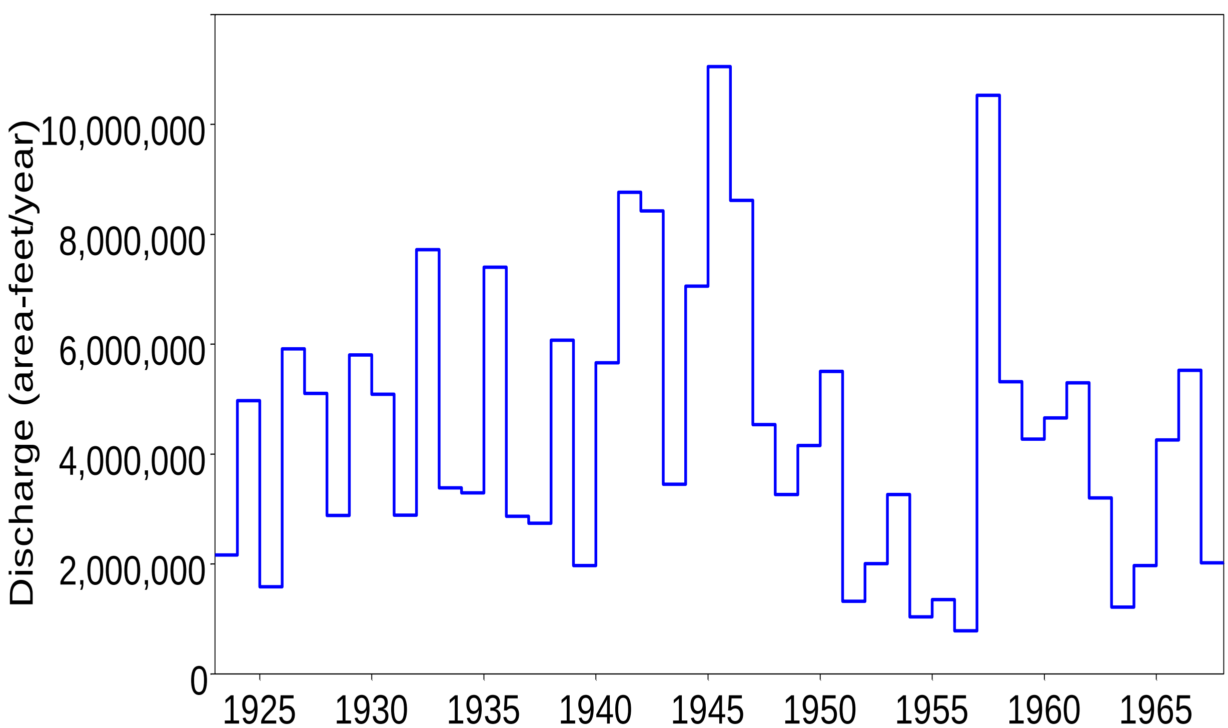
Mean daily flow of the Trinity River at Riverside T16



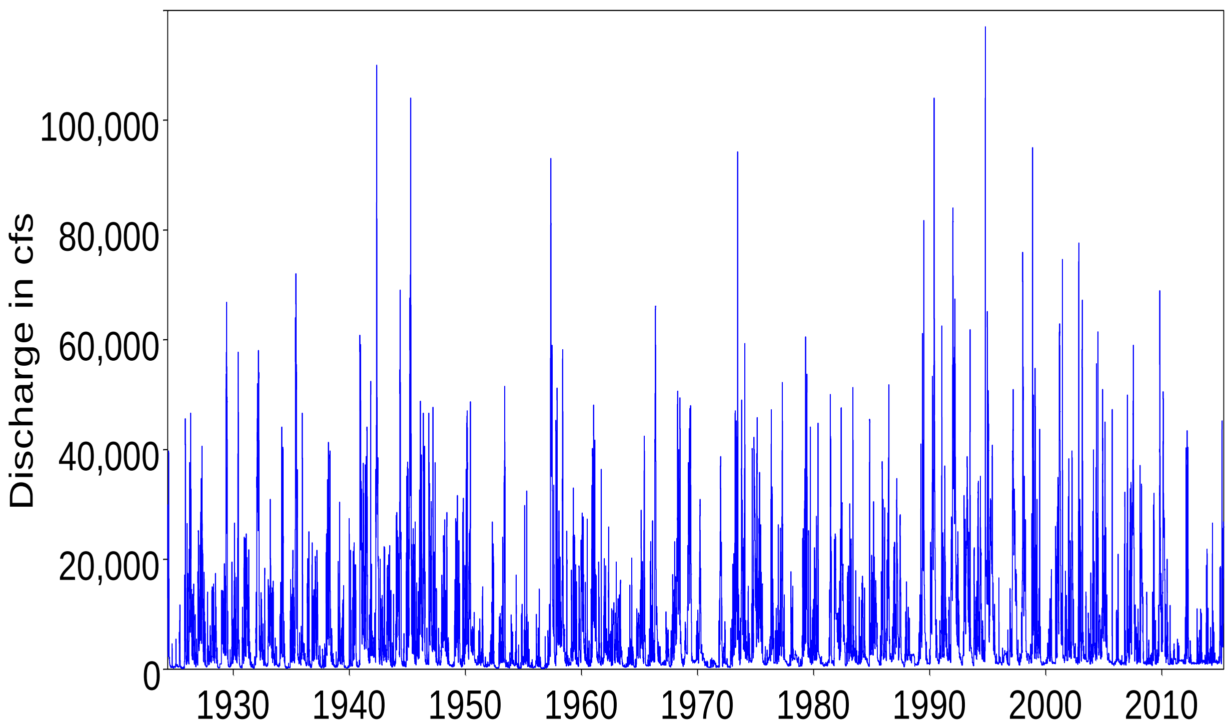
Mean monthly flow of the Trinity River at Riverside T16



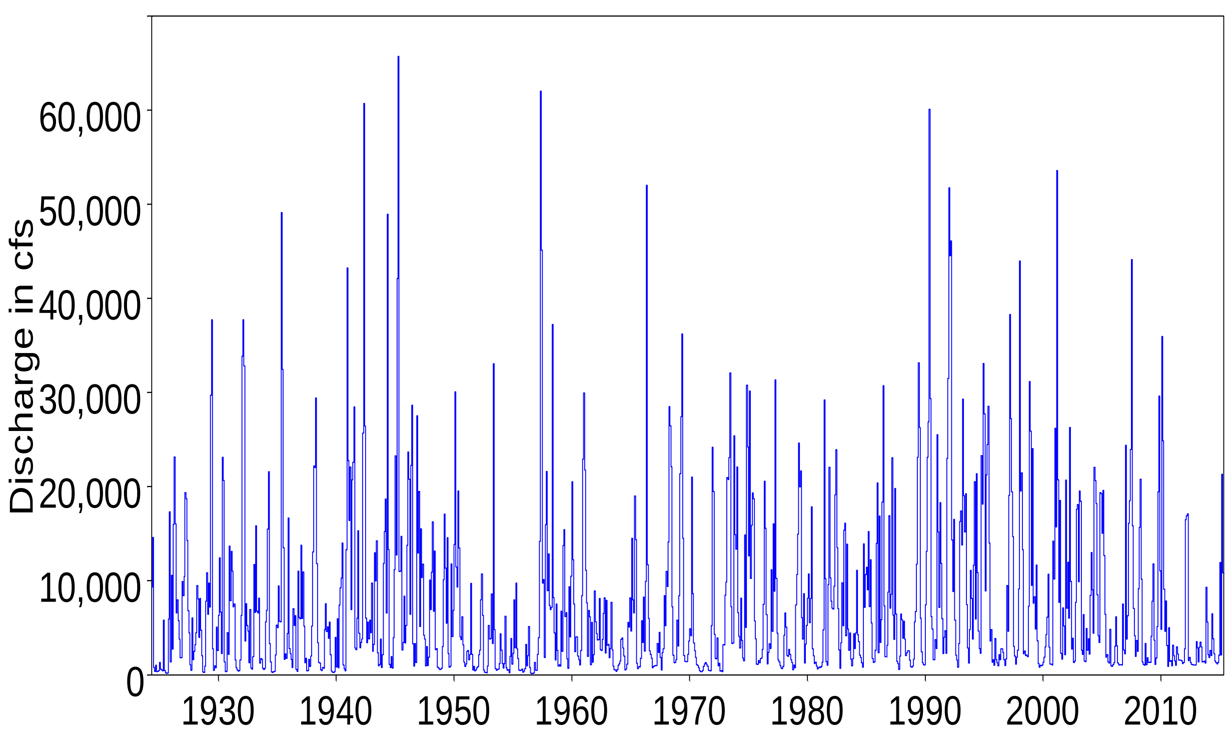
Annual peak flow of the Trinity River at Riverside T16



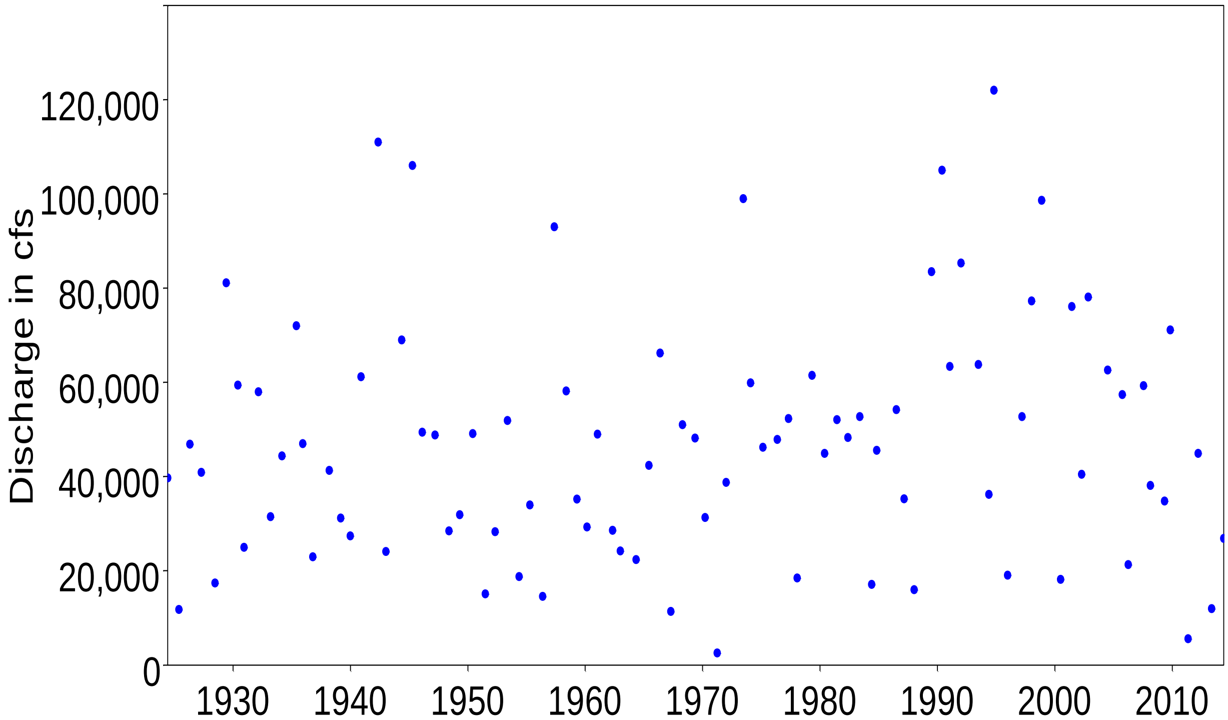
Annual flow of the Trinity River at Riverside T16



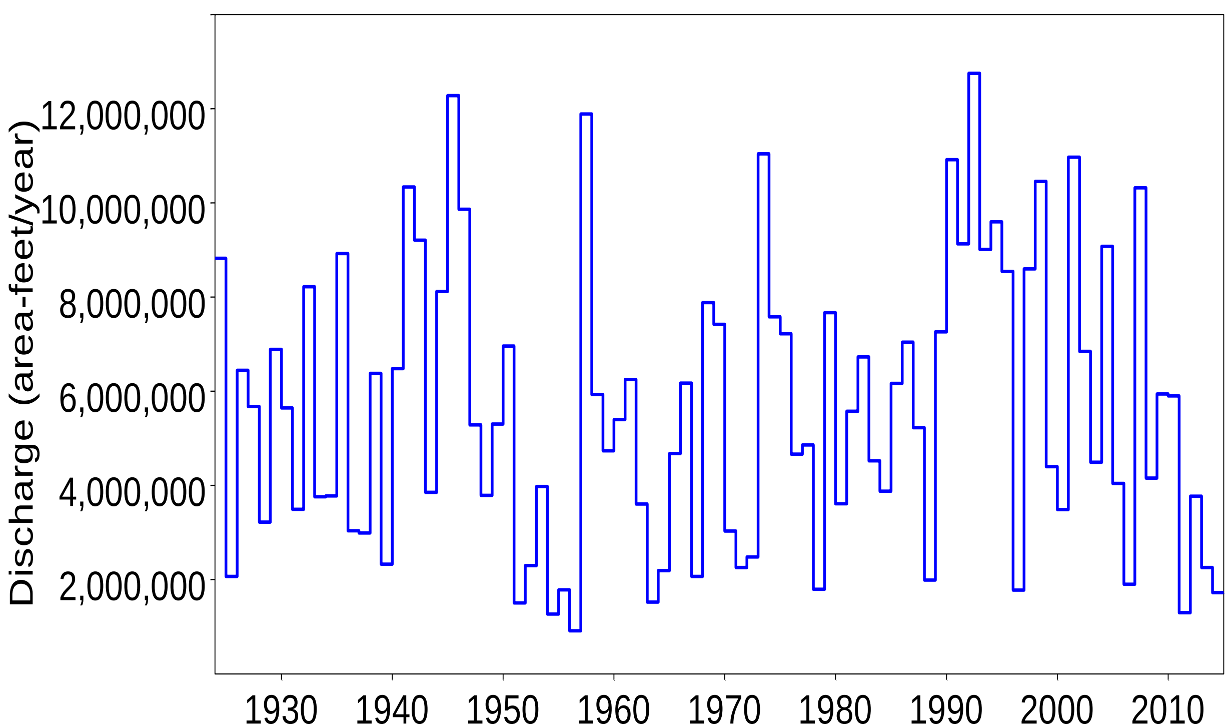
Mean daily flow of the Trinity River at Romayor T17



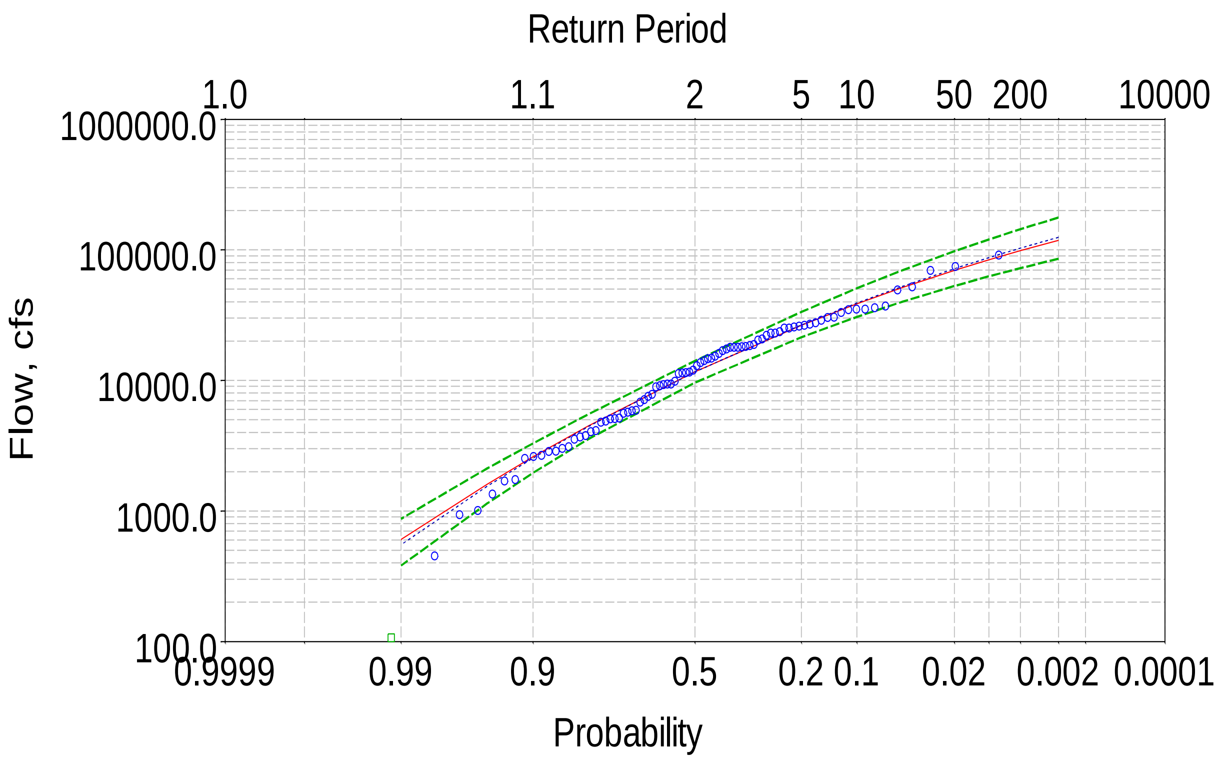
Mean monthly flow of the Trinity River at Romayor T17



Annual peak flow of the Trinity River at Romayor T17



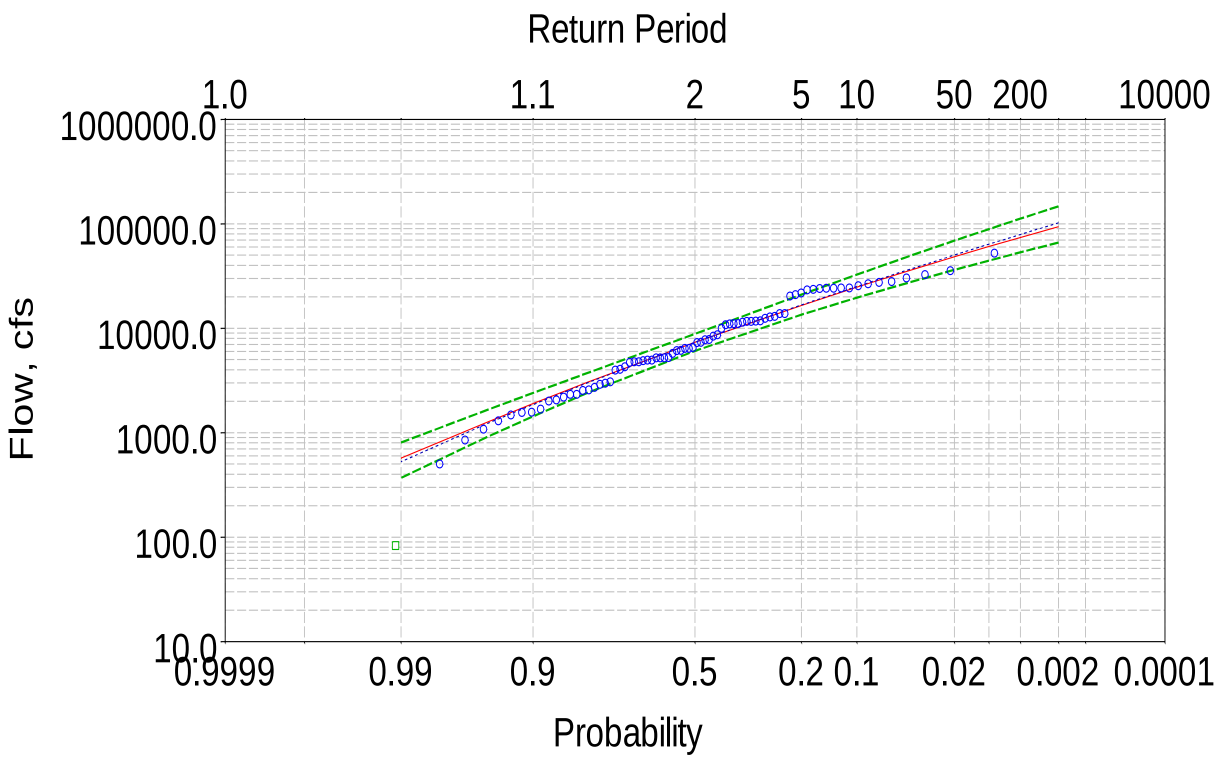
Annual flow of the Trinity River at Romayor T17



Log-Pearson type III frequency analysis for peak annual flow

B1 Double Mountain Fork near Aspermont

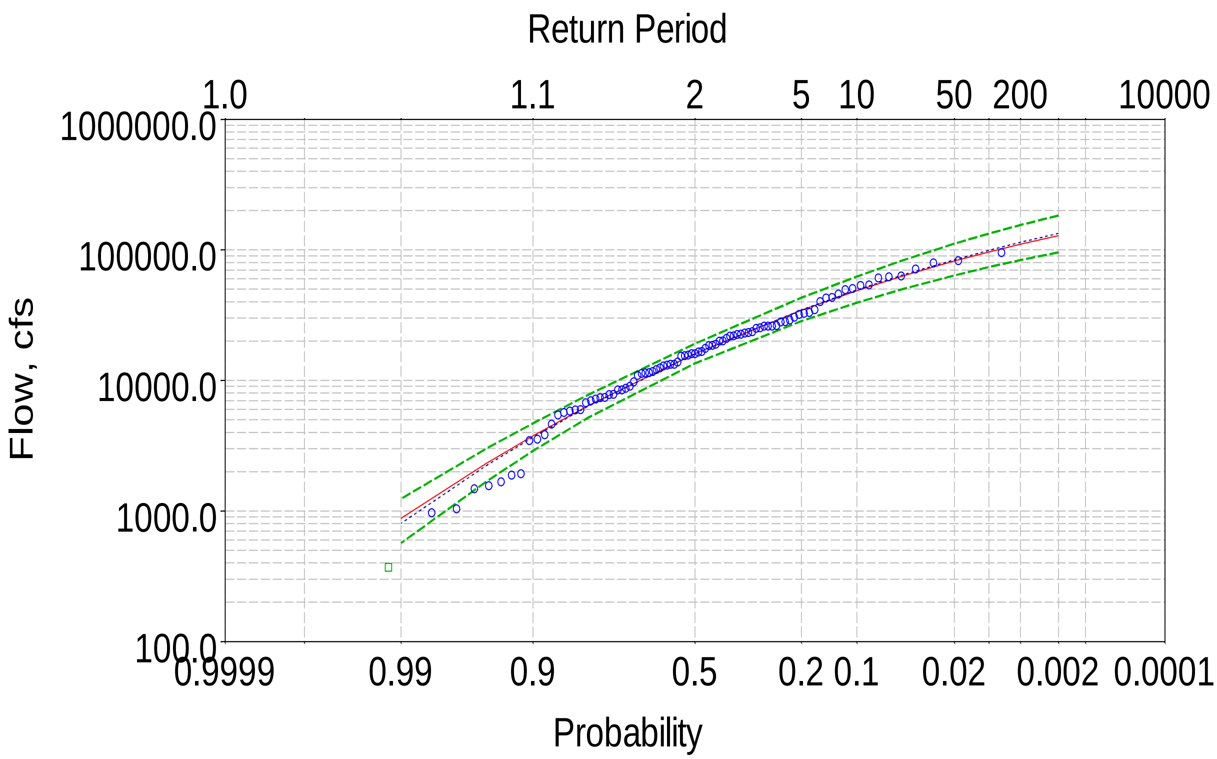
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	118,378	125,141	176,947	85,621
0.5	98,608	103,141	144,088	72,528
1.0	83,962	87,183	120,311	62,649
2.0	69,690	71,822	97,677	52,843
5.0	51,579	52,678	69,866	40,076
10.0	38,603	39,147	50,720	30,634
20.0	26,396	26,606	33,485	21,430
50.0	11,622	11,622	14,081	9,620
80.0	4,499	4,448	5,527	3,562
90.0	2,597	2,537	3,299	1,953
95.0	1,603	1,543	2,116	1,143
99.0	604	553	872	381



Log-Pearson type III frequency analysis for peak annual flow

B2 Salt Fork Brazos River near Aspermont

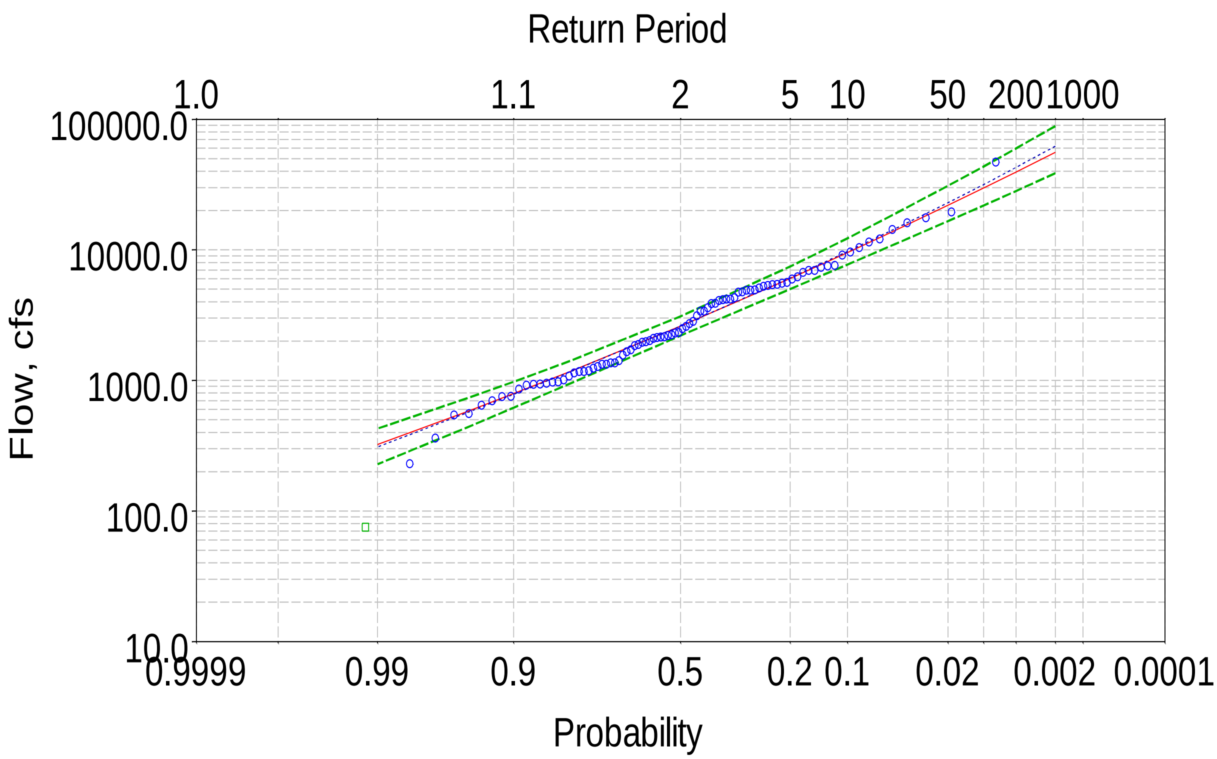
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	93,940	102,096	146,422	66,127
0.5	74,016	78,975	111,704	53,353
1.0	60,490	63,734	88,882	44,463
2.0	48,262	50,250	68,876	36,231
5.0	34,032	34,948	46,522	26,341
10.0	24,684	25,110	32,531	19,590
20.0	16,501	16,654	20,898	13,433
50.0	7,316	7,316	8,841	6,062
80.0	3,062	3,028	3,756	2,422
90.0	1,897	1,856	2,399	1,431
95.0	1,262	1,218	1,649	908
99.0	569	527	802	369



Log-Pearson type III frequency analysis for peak annual flow

B3 Brazos River near Seymour

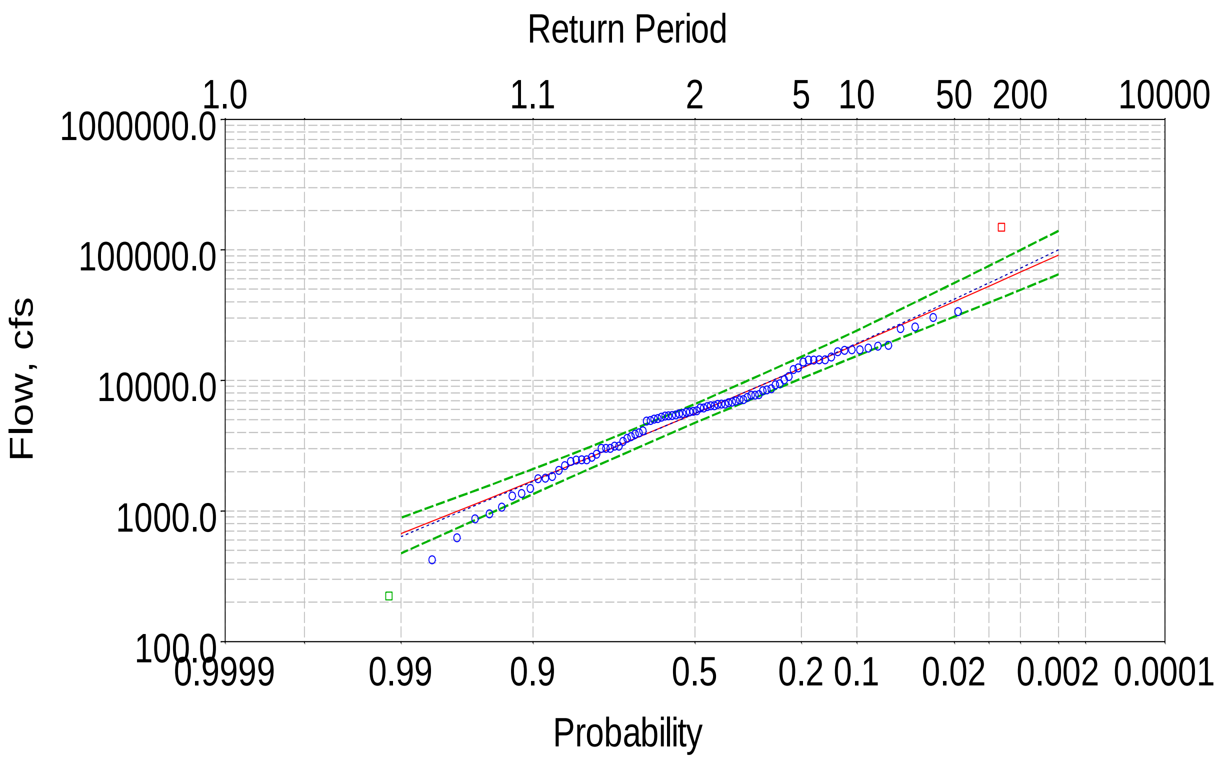
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	128,317	133,911	183,388	95,969
0.5	110,279	114,224	154,802	83,586
1.0	96,287	99,218	133,047	73,834
2.0	82,071	84,097	111,367	63,772
5.0	63,087	64,204	83,197	50,037
10.0	48,720	49,297	62,598	39,351
20.0	34,489	34,724	42,974	28,423
50.0	16,036	16,036	19,163	13,461
80.0	6,440	6,372	7,792	5,193
90.0	3,760	3,679	4,697	2,888
95.0	2,332	2,250	3,024	1,702
99.0	877	806	1,242	569



Log-Pearson type III frequency analysis for peak annual flow

B4 Clear Fork Brazos near Nugent

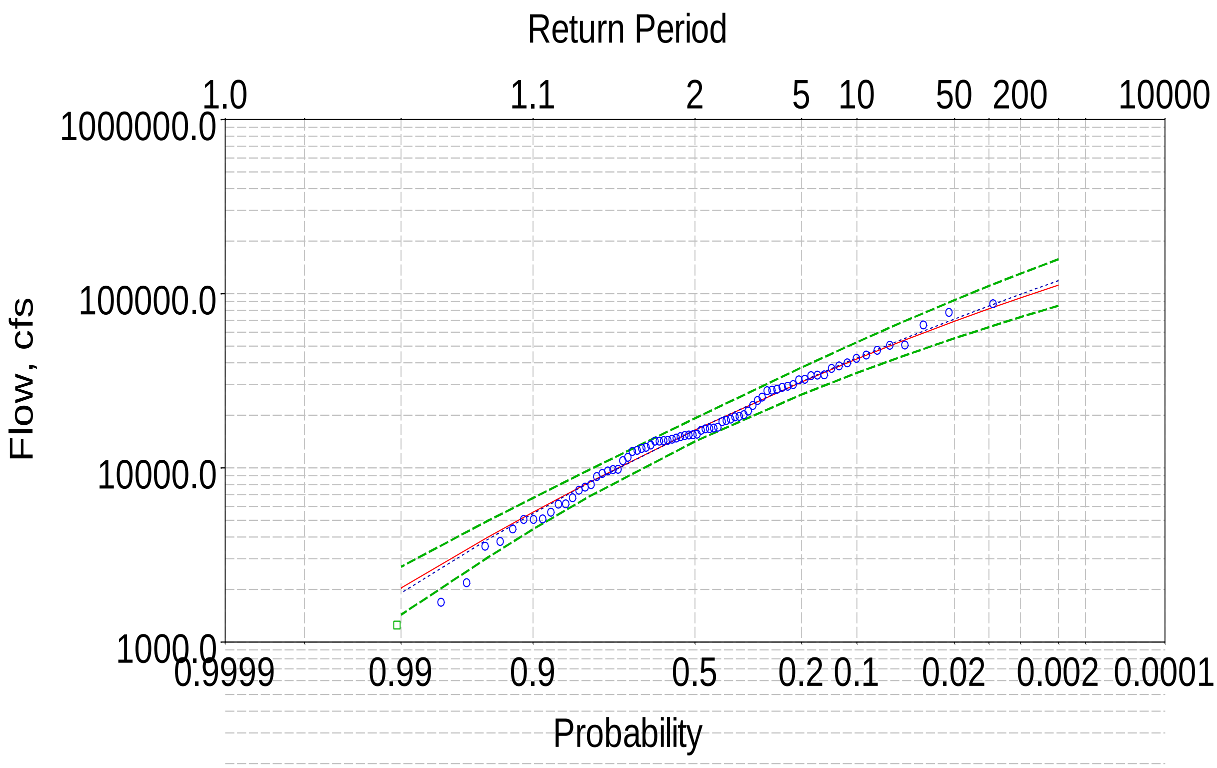
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	55,808	62,227	88,632	38,587
0.5	39,422	42,773	59,873	28,198
1.0	29,729	31,664	43,576	21,843
2.0	21,945	22,998	30,992	16,579
5.0	14,048	14,457	18,833	11,027
10.0	9,540	9,711	12,271	7,712
20.0	6,040	6,095	7,452	5,018
50.0	2,609	2,609	3,090	2,200
80.0	1,179	1,169	1,420	954
90.0	792	780	977	618
95.0	575	562	727	434
99.0	323	309	428	228



Log-Pearson type III frequency analysis for peak annual flow

B5 Clear Fork Brazos near Fort Griffin

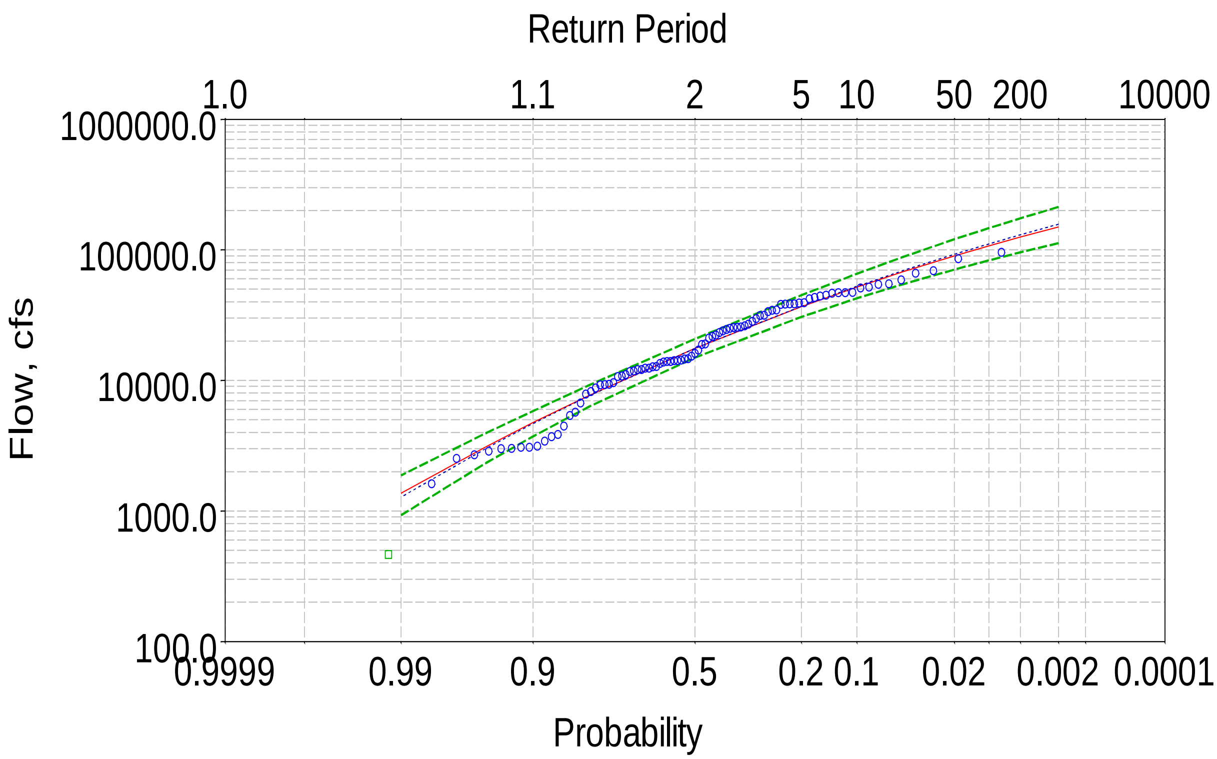
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	91,353	100,348	140,160	64,883
0.5	67,500	72,468	99,644	49,364
1.0	52,670	55,672	75,380	39,427
2.0	40,230	41,939	55,721	30,860
5.0	26,943	27,650	35,626	21,384
10.0	18,931	19,241	24,110	15,429
20.0	12,397	12,502	15,193	10,364
50.0	5,584	5,584	6,578	4,739
80.0	2,556	2,536	3,058	2,085
90.0	1,710	1,684	2,096	1,344
95.0	1,231	1,202	1,546	935
99.0	669	637	886	474



Log-Pearson type III frequency analysis for peak annual flow

B6 Brazos River near South Bend

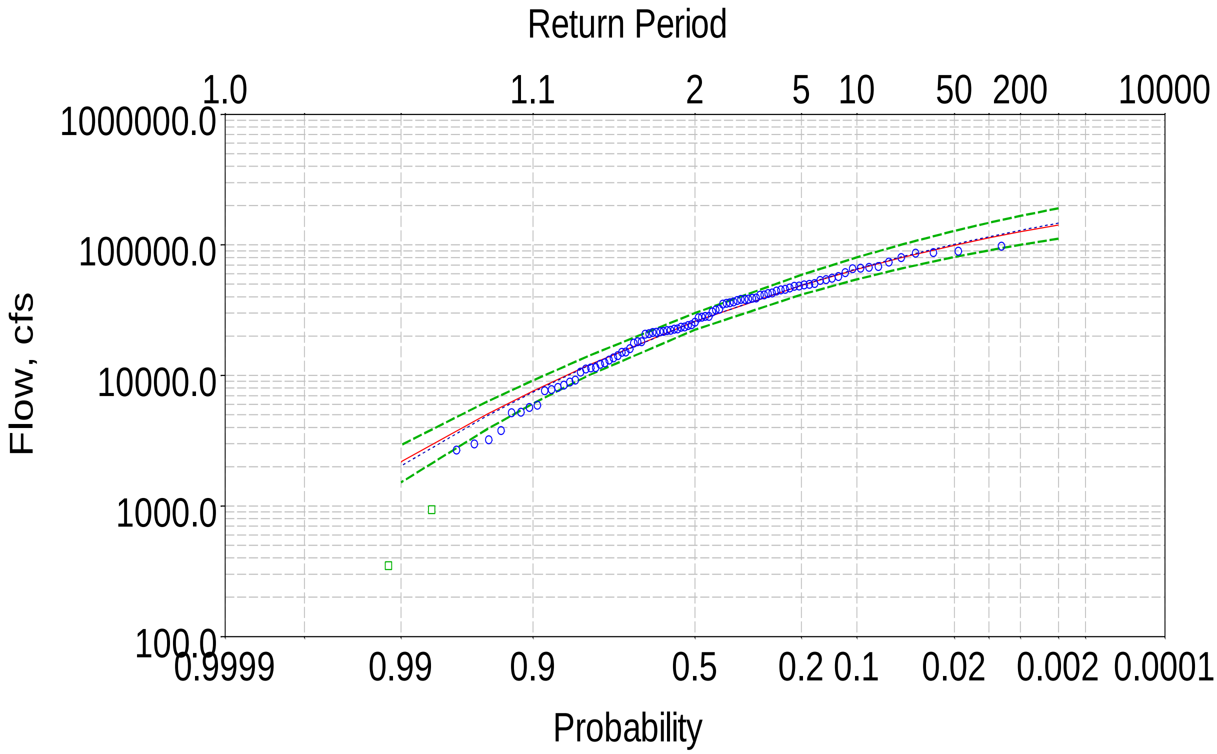
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	111,930	118,848	157,854	85,293
0.5	94,513	99,087	130,255	73,242
1.0	81,757	84,971	110,518	64,251
2.0	69,384	71,506	91,812	55,368
5.0	53,632	54,727	68,734	43,773
10.0	42,169	42,727	52,572	35,070
20.0	31,047	31,272	37,536	26,328
50.0	16,489	16,489	19,198	14,185
80.0	8,215	8,140	9,674	6,811
90.0	5,560	5,459	6,714	4,431
95.0	3,972	3,856	4,932	3,042
99.0	2,043	1,909	2,703	1,432



Log-Pearson type III frequency analysis for peak annual flow

B7 Brazos River near Palo Pinto

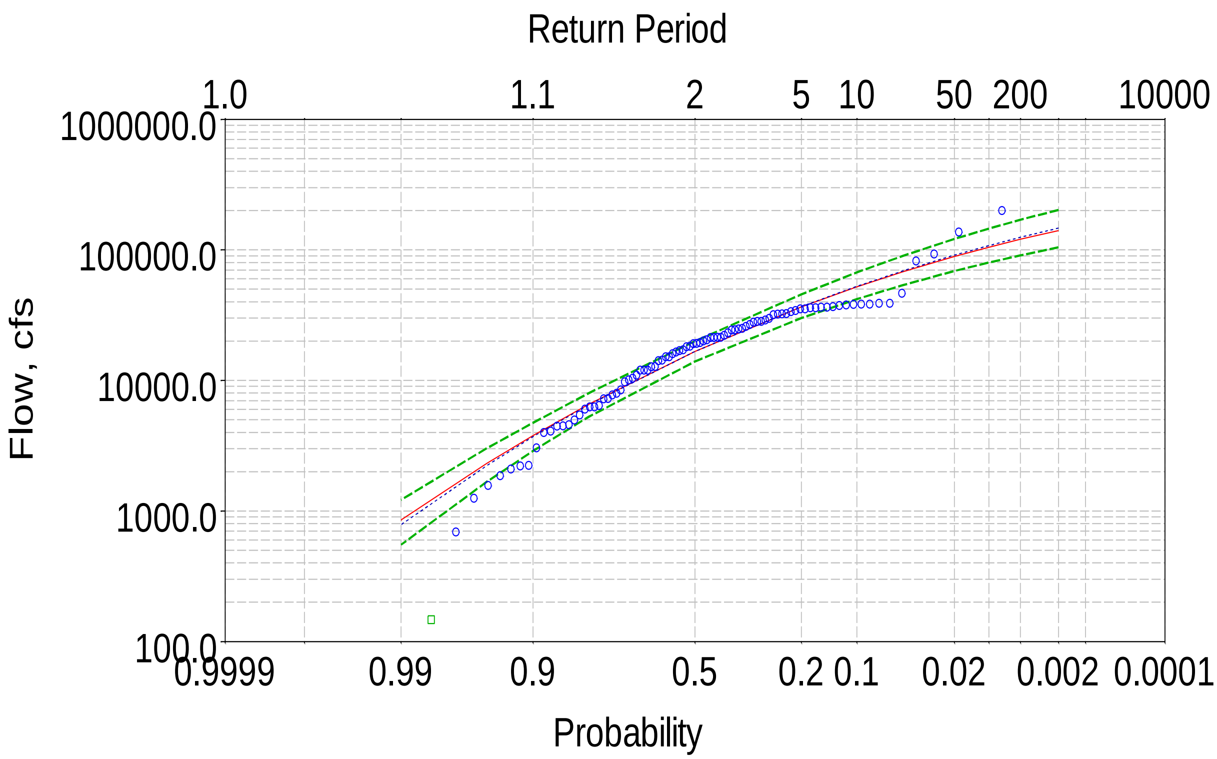
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	149,653	157,550	213,123	112,415
0.5	125,341	130,604	174,708	95,677
1.0	107,431	111,155	147,032	83,127
2.0	90,020	92,483	120,709	70,711
5.0	67,899	69,171	88,255	54,550
10.0	51,940	52,578	65,687	42,539
20.0	36,711	36,963	45,010	30,687
50.0	17,599	17,599	20,748	14,960
80.0	7,651	7,579	9,135	6,260
90.0	4,753	4,665	5,839	3,726
95.0	3,140	3,045	3,983	2,354
99.0	1,368	1,274	1,869	928



Log-Pearson type III frequency analysis for peak annual flow

B8 Brazos River near Glen Rose

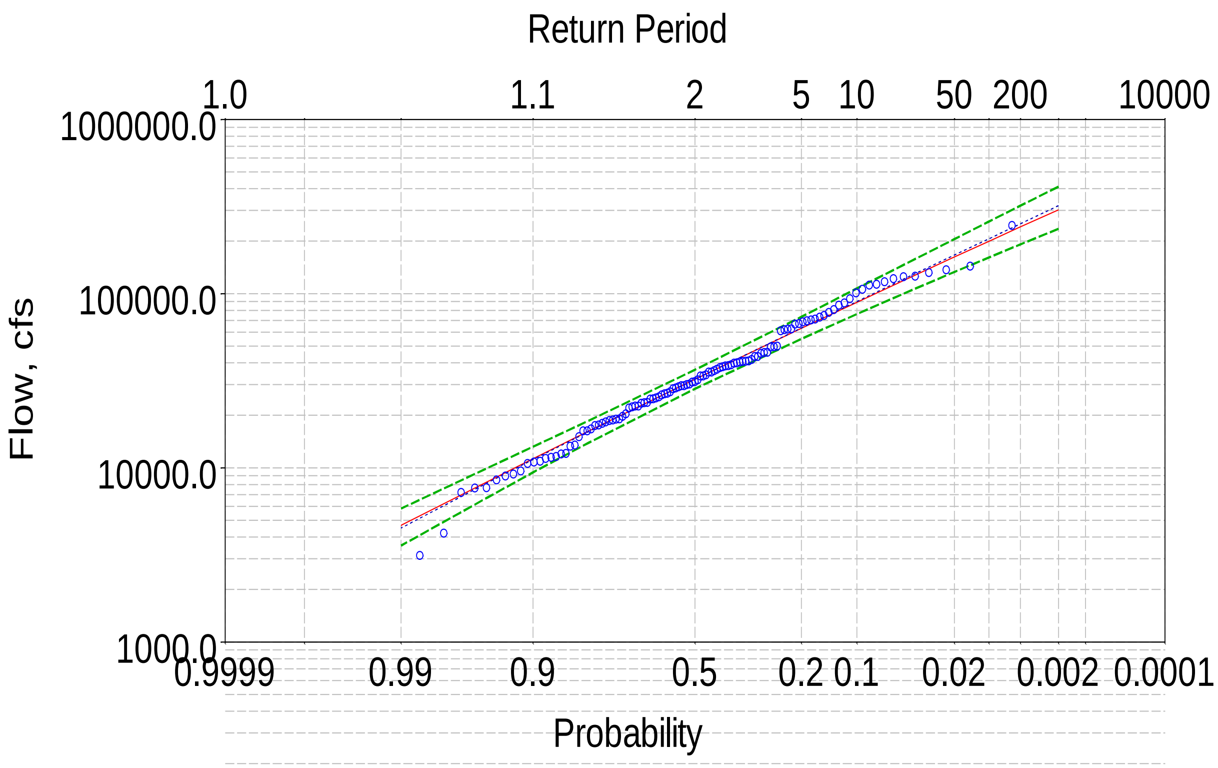
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	141,812	146,633	190,509	111,502
0.5	125,819	129,361	166,656	99,967
1.0	112,935	115,663	147,734	90,559
2.0	99,357	101,319	128,107	80,515
5.0	80,314	81,466	101,200	66,166
10.0	65,045	65,673	80,242	54,384
20.0	48,953	49,227	58,887	41,611
50.0	25,879	25,879	30,062	22,341
80.0	11,996	11,889	14,076	10,014
90.0	7,594	7,455	9,157	6,084
95.0	5,054	4,902	6,290	3,875



Log-Pearson type III frequency analysis for peak annual flow

B9 North Bosque River near Clifton

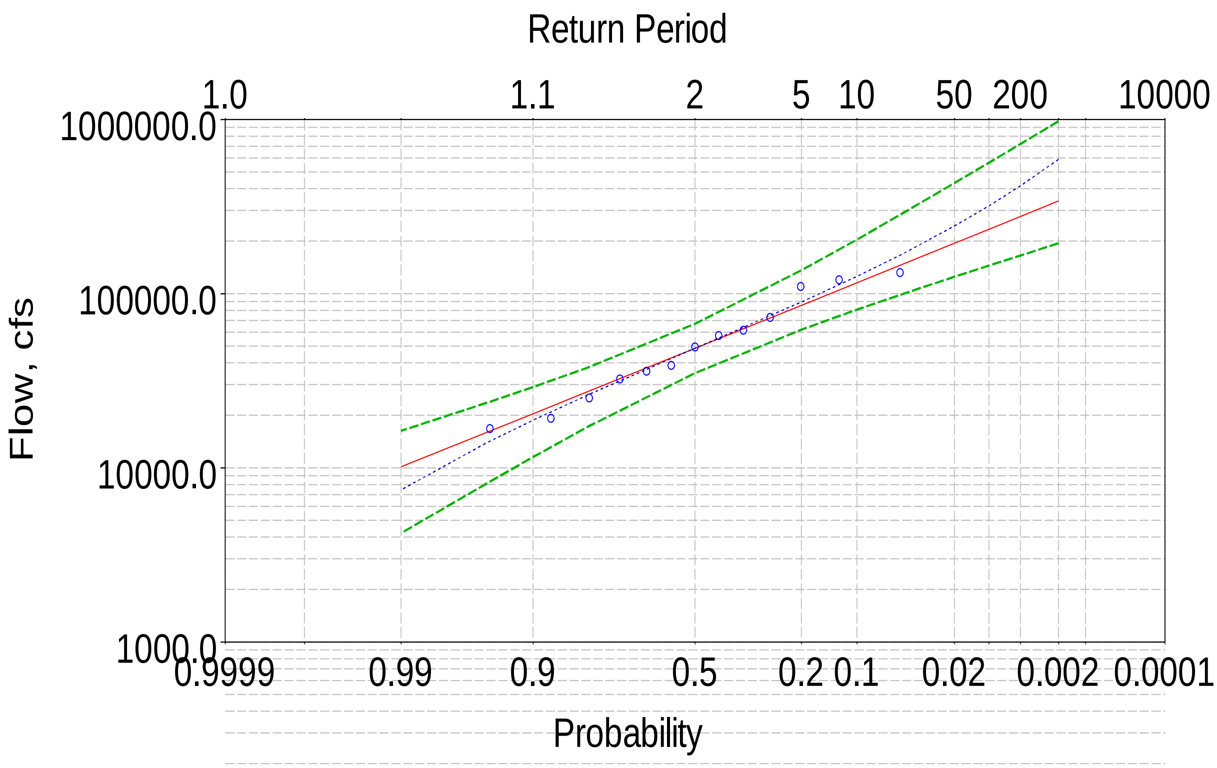
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	140,815	147,069	202,593	104,717
0.5	120,487	124,875	170,190	90,833
1.0	104,795	108,040	145,658	79,950
2.0	88,928	91,159	121,336	68,770
5.0	67,874	69,095	89,950	53,602
10.0	52,064	52,690	67,188	41,888
20.0	36,535	36,787	45,696	30,004
50.0	16,674	16,674	19,989	13,954
80.0	6,557	6,487	7,961	5,267
90.0	3,782	3,700	4,744	2,892
95.0	2,322	2,239	3,024	1,685
99.0	855	785	1,219	550



Log-Pearson type III frequency analysis for peak annual flow

B10 Brazos River at Waco

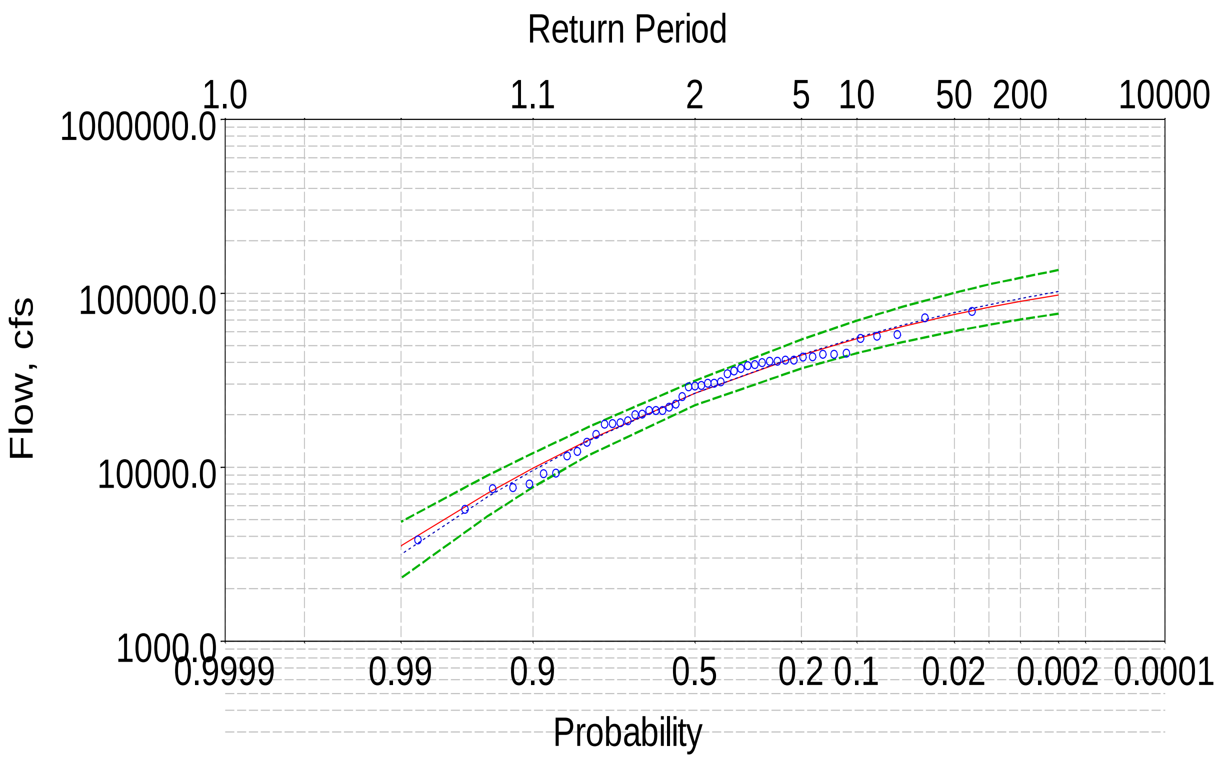
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	9,091	97,213	110,494	3,528
0.5	6,490	33,434	58,869	2,773
1.0	4,960	15,986	35,717	2,283
2.0	3,733	8,265	21,132	1,853
5.0	2,483	3,826	10,044	1,359
10.0	1,760	2,246	5,441	1,032
20.0	1,186	1,329	2,779	730
50.0	597	597	1,014	339
80.0	327	301	532	136
90.0	246	211	415	84
95.0	198	156	347	58
99.0	137	85	260	30



Log-Pearson type III frequency analysis for peak annual flow

B11 Brazos River near Marlin

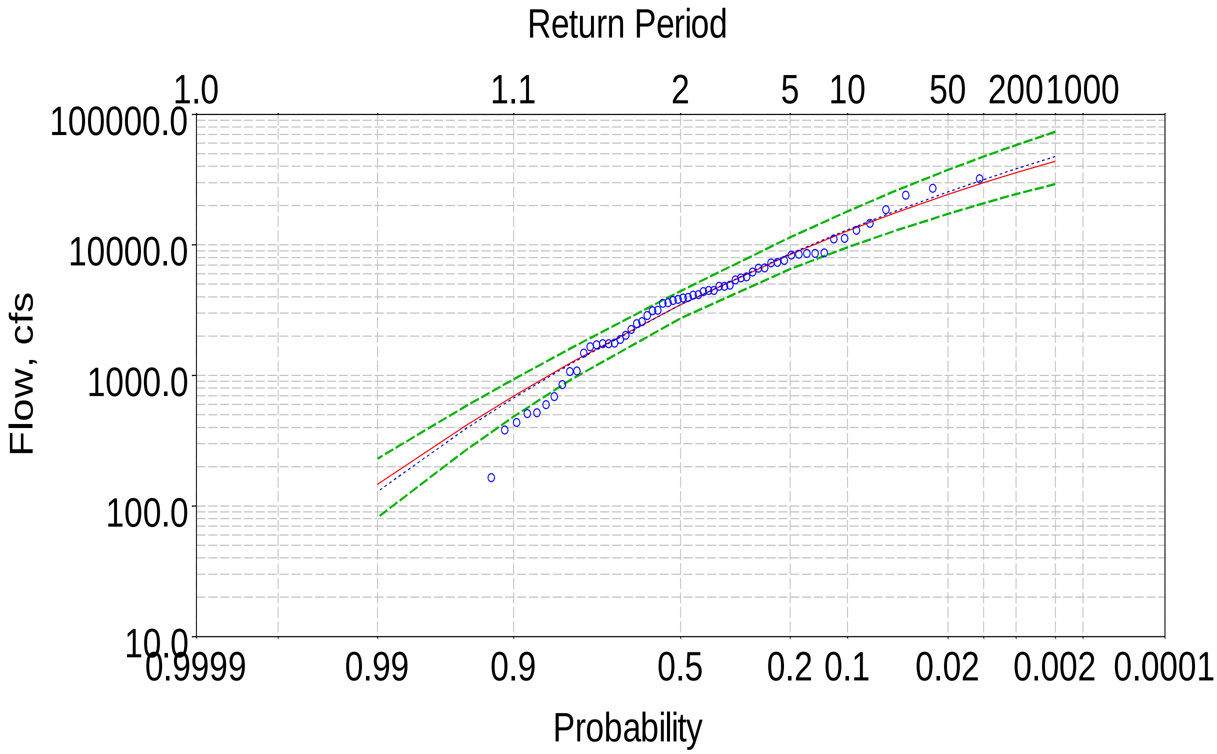
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	340,199	588,556	976,307	194,510
0.5	277,012	414,853	721,833	165,557
1.0	233,839	318,721	563,397	144,780
2.0	194,343	244,110	430,530	124,855
5.0	147,283	169,211	288,969	99,570
10.0	115,152	125,400	204,169	80,922
20.0	85,502	89,282	135,891	62,147
50.0	48,420	48,420	67,134	34,915
80.0	27,453	26,297	37,771	17,270
90.0	20,417	18,760	29,048	11,520
95.0	15,991	13,936	23,642	8,161
99.0	10,118	7,453	16,317	4,214



Log-Pearson type III frequency analysis for peak annual flow

B12 Brazos River near Highbank

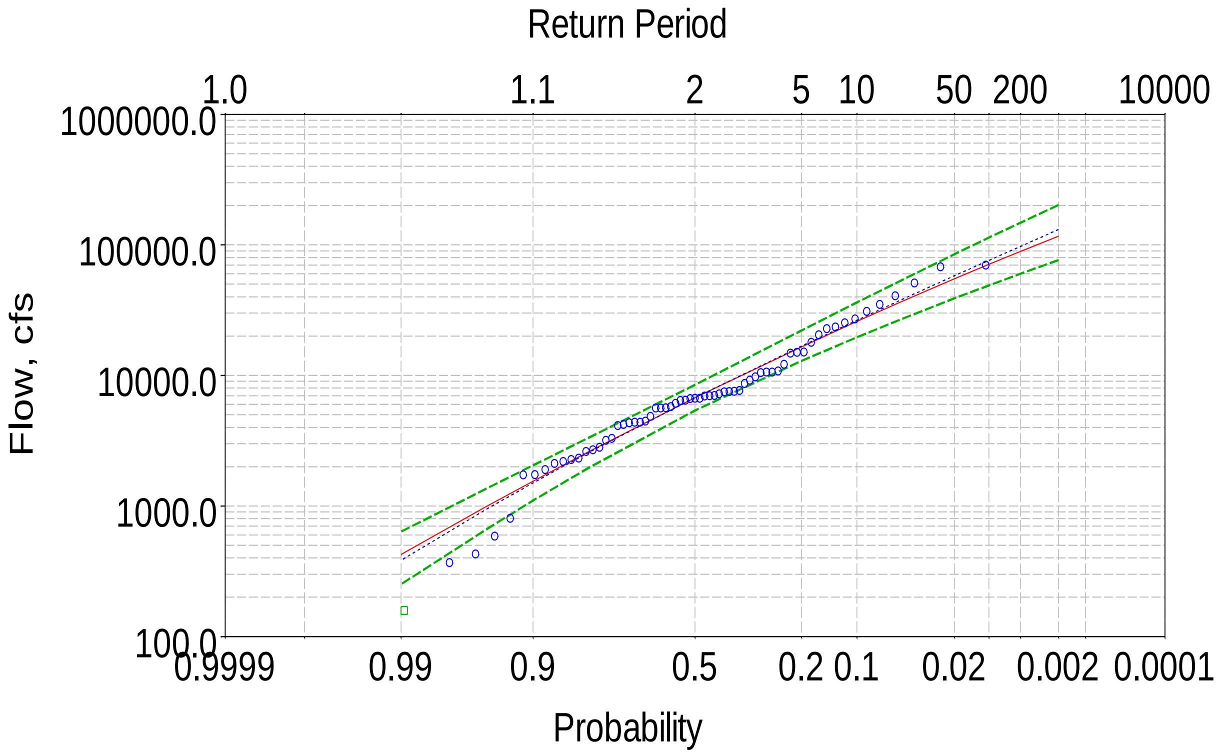
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	97,786	102,311	135,893	76,243
0.5	89,734	93,207	122,890	70,644
1.0	82,940	85,725	112,099	65,859
2.0	75,456	77,546	100,418	60,518
5.0	64,330	65,646	83,491	52,418
10.0	54,788	55,546	69,446	45,287
20.0	43,986	44,343	54,171	36,948
50.0	26,616	26,616	31,407	22,663
80.0	14,336	14,141	17,019	11,706
90.0	9,876	9,598	12,059	7,673
95.0	7,070	6,742	8,928	5,209



Log-Pearson type III frequency analysis for peak annual flow

B13 Leon River near Hamilton

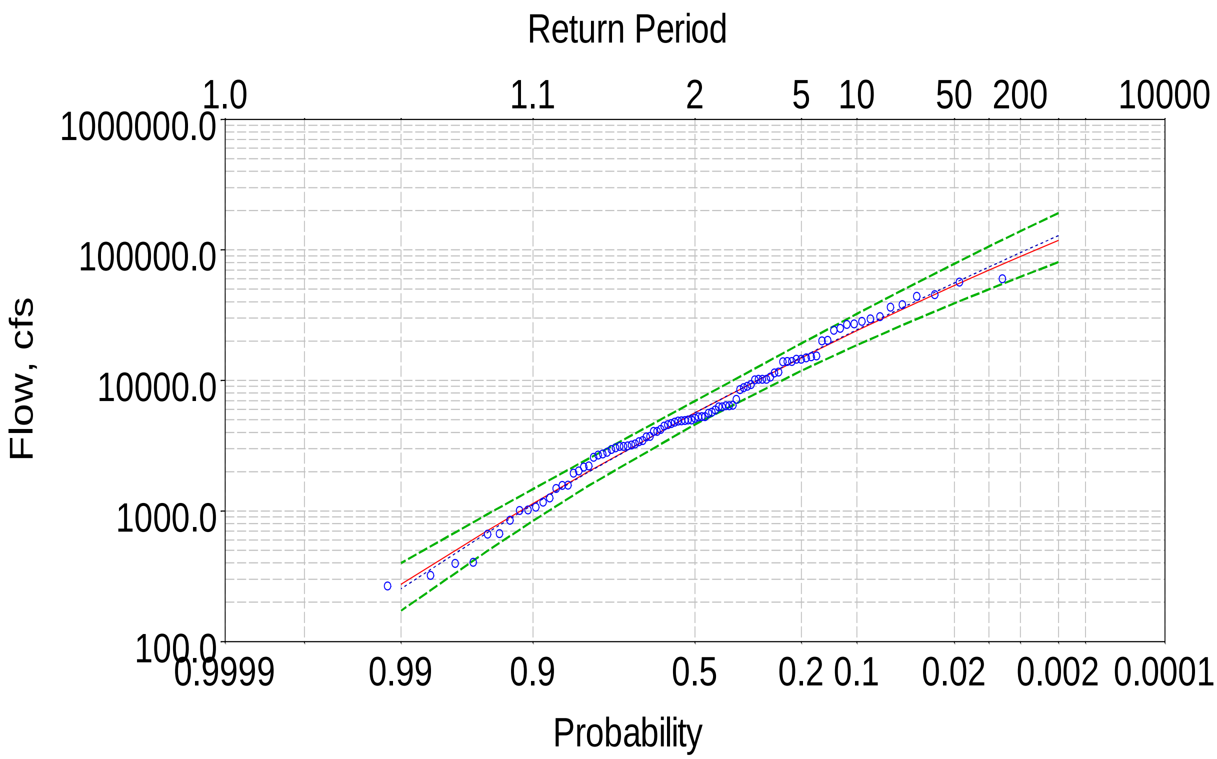
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	43,771	47,609	73,443	29,274
0.5	35,745	38,247	58,198	24,419
1.0	29,929	31,665	47,484	20,819
2.0	24,378	25,498	37,565	17,303
5.0	17,524	18,080	25,817	12,823
10.0	12,769	13,035	18,074	9,591
20.0	8,443	8,542	11,413	6,521
50.0	3,475	3,475	4,420	2,743
80.0	1,252	1,232	1,616	931
90.0	695	672	934	484
95.0	415	393	584	270
99.0	147	129	230	82



Log-Pearson type III frequency analysis for peak annual flow

B14 Leon River near Gatesville

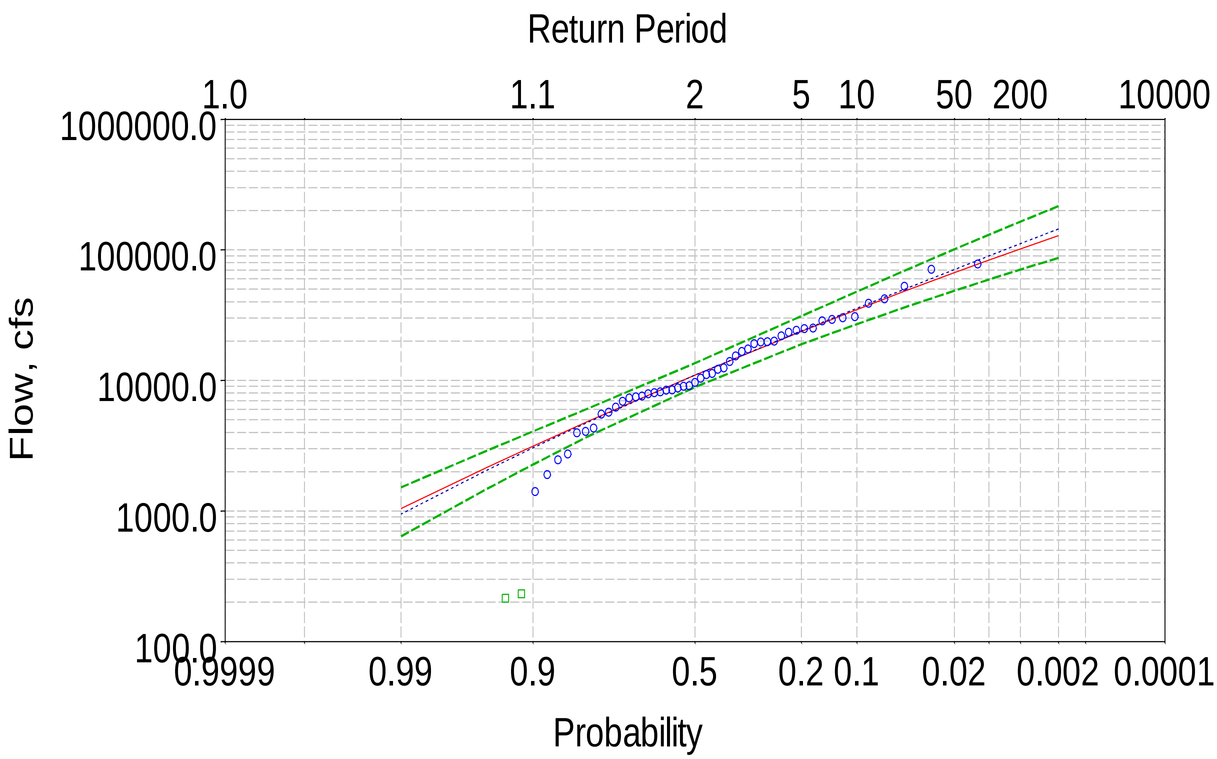
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	116,855	131,115	202,168	76,526
0.5	89,070	97,384	147,891	60,071
1.0	70,847	76,101	113,705	48,945
2.0	54,890	57,995	84,903	38,916
5.0	37,059	38,414	54,295	27,272
10.0	25,875	26,478	36,211	19,628
20.0	16,531	16,737	22,012	12,927
50.0	6,737	6,737	8,461	5,373
80.0	2,602	2,565	3,323	1,958
90.0	1,548	1,505	2,048	1,099
95.0	996	952	1,370	668
99.0	424	383	636	251



Log-Pearson type III frequency analysis for peak annual flow

B15 Leon River near Belton

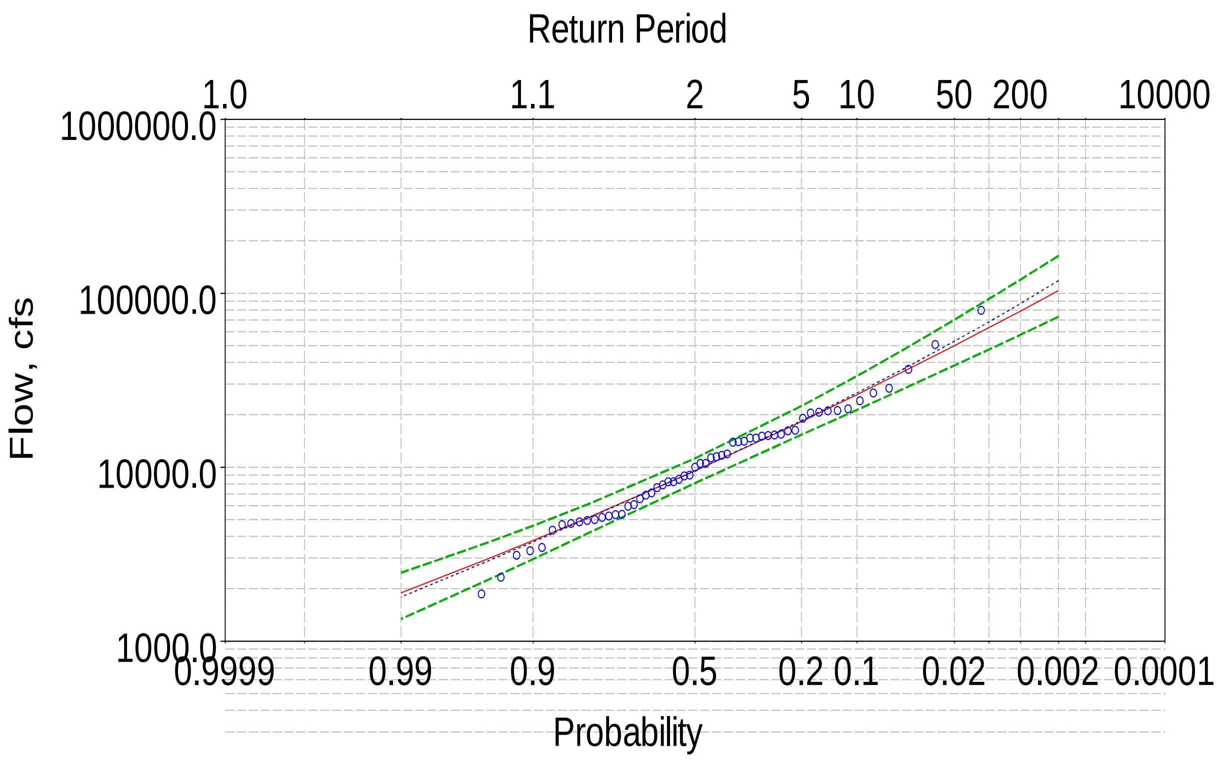
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	118,549	128,815	191,204	80,603
0.5	89,141	95,099	138,855	62,223
1.0	70,038	73,785	105,998	49,957
2.0	53,481	55,678	78,438	39,048
5.0	35,251	36,197	49,363	26,623
10.0	24,038	24,451	32,368	18,665
20.0	14,880	15,018	19,202	11,885
50.0	5,656	5,656	6,947	4,611
80.0	2,011	1,989	2,515	1,562
90.0	1,140	1,116	1,474	842
95.0	703	679	943	494
99.0	274	254	399	172



Log-Pearson type III frequency analysis for peak annual flow

B16 Lampasas River near Kempner

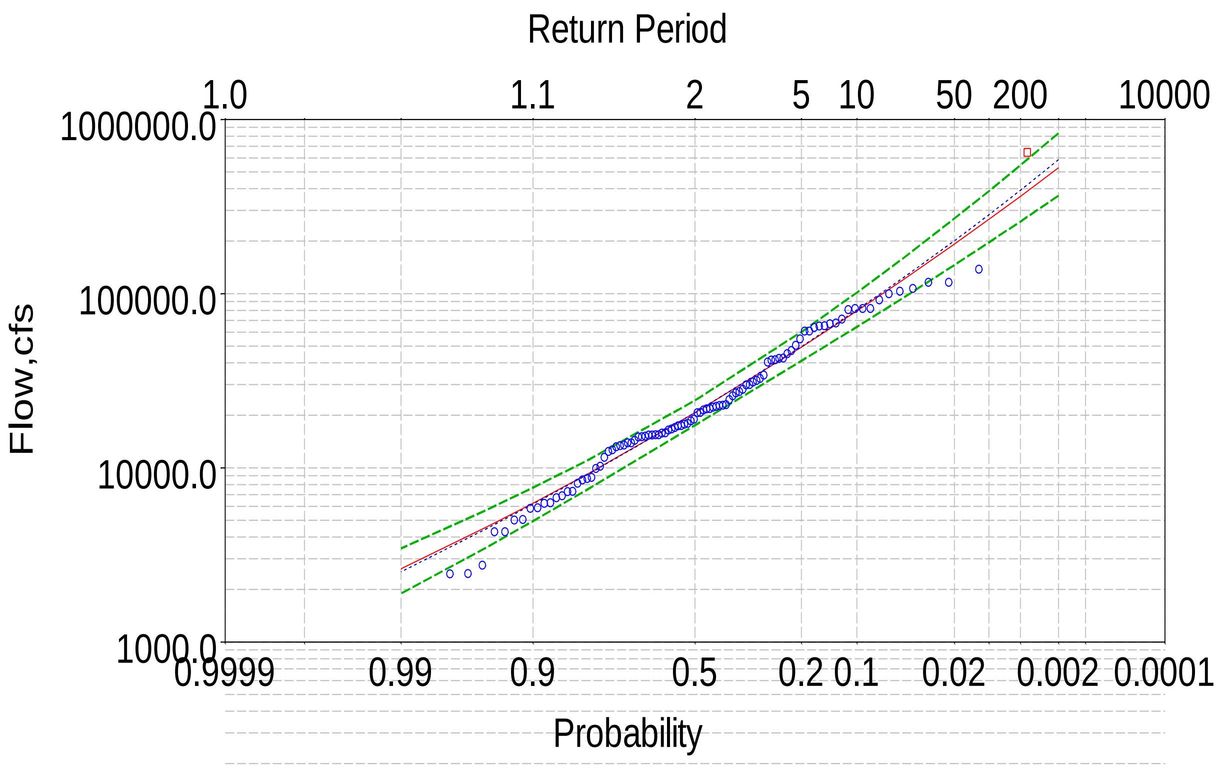
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	43,771	47,609	73,443	29,274
0.5	35,745	38,247	58,198	24,419
1.0	29,929	31,665	47,484	20,819
2.0	24,378	25,498	37,565	17,303
5.0	17,524	18,080	25,817	12,823
10.0	12,769	13,035	18,074	9,591
20.0	8,443	8,542	11,413	6,521
50.0	3,475	3,475	4,420	2,743
80.0	1,252	1,232	1,616	931
90.0	695	672	934	484
95.0	415	393	584	270
99.0	147	129	230	82



Log-Pearson type III frequency analysis for peak annual flow

B17 Little River near Little River

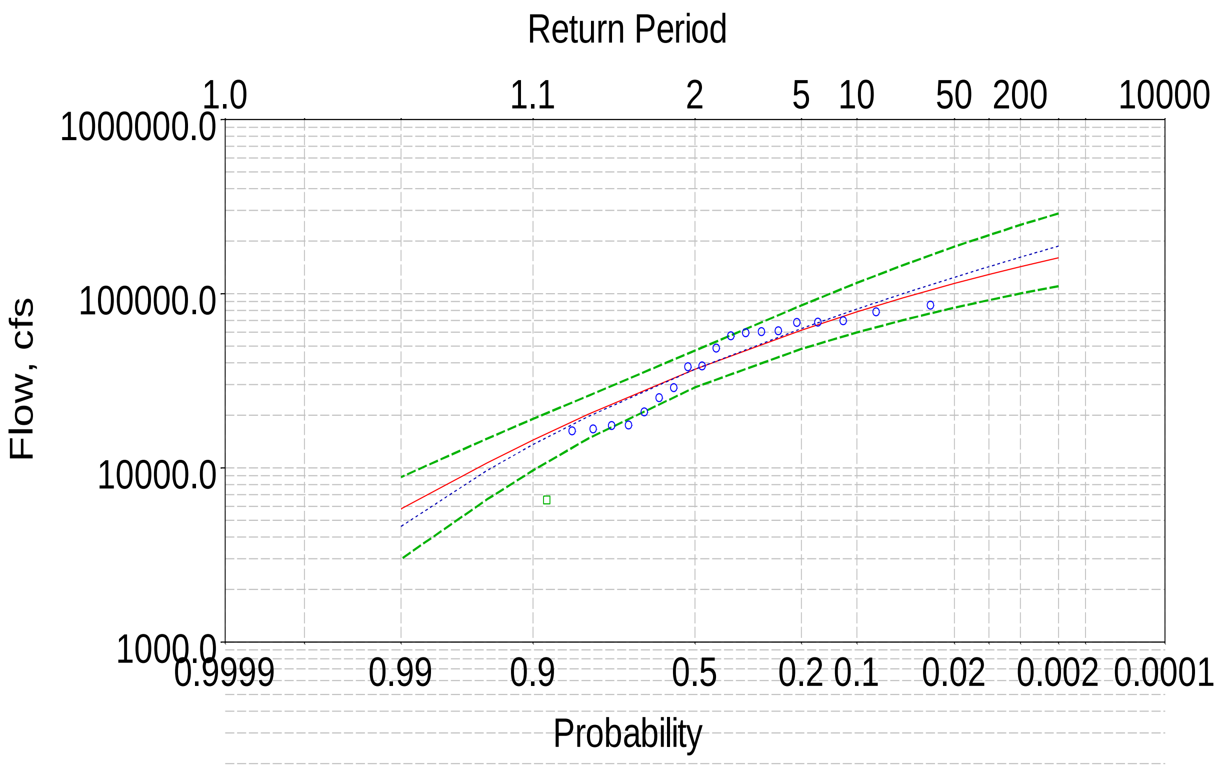
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	103,602	118,247	164,145	73,195
0.5	78,956	87,153	119,601	57,593
1.0	63,337	68,350	92,575	47,380
2.0	49,974	52,877	70,359	38,373
5.0	35,290	36,525	47,146	28,086
10.0	26,102	26,665	33,444	21,350
20.0	18,287	18,486	22,462	15,340
50.0	9,524	9,524	11,210	8,081
80.0	5,144	5,096	6,137	4,181
90.0	3,781	3,716	4,610	2,964
95.0	2,954	2,875	3,681	2,239
99.0	1,892	1,792	2,467	1,342



Log-Pearson type III frequency analysis for peak annual flow

B18 Little River near Cameron

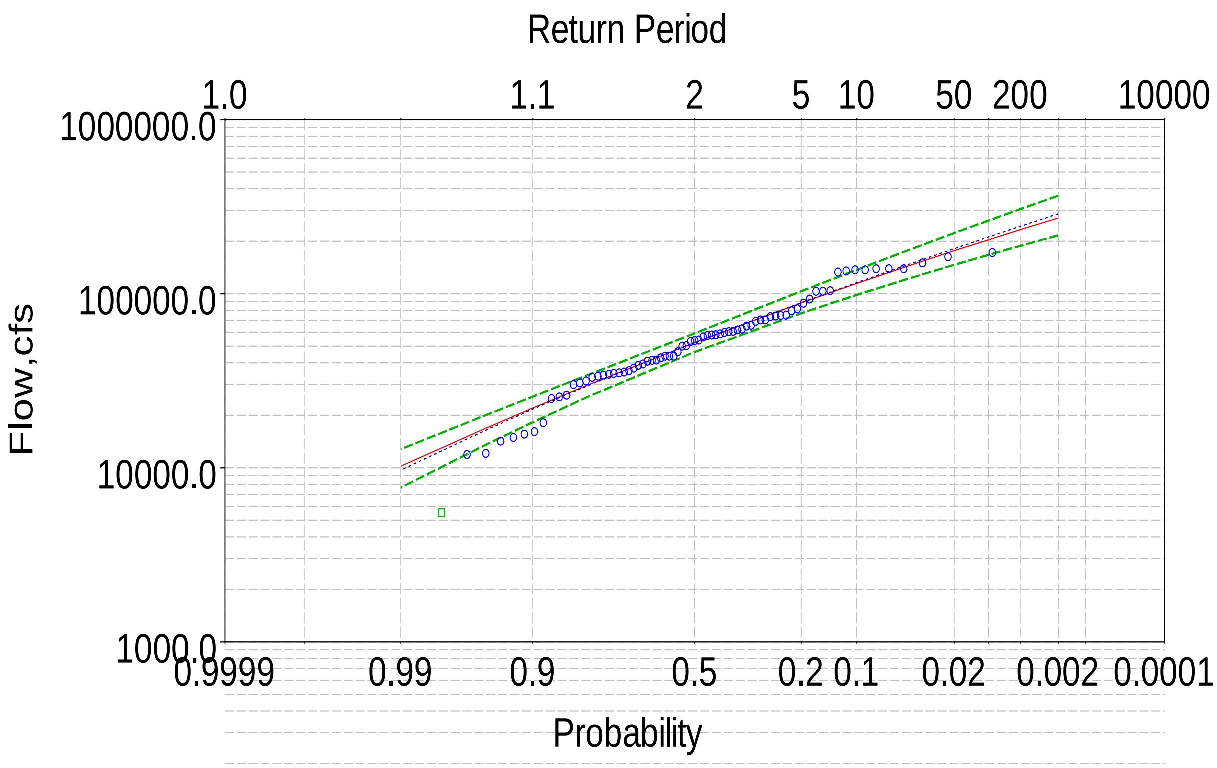
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	527,706	587,143	833,421	365,050
0.5	361,621	391,583	545,505	259,175
1.0	266,541	283,364	387,753	196,421
2.0	192,323	201,224	269,406	145,862
5.0	119,487	122,803	158,827	94,249
10.0	79,346	80,702	101,209	64,485
20.0	49,151	49,573	60,183	41,063
50.0	20,678	20,678	24,364	17,528
80.0	9,280	9,215	11,122	7,564
90.0	6,260	6,179	7,673	4,935
95.0	4,580	4,489	5,738	3,502
99.0	2,627	2,527	3,442	1,892



Log-Pearson type III frequency analysis for peak annual flow

B19 Brazos River at SH 21 near Bryan

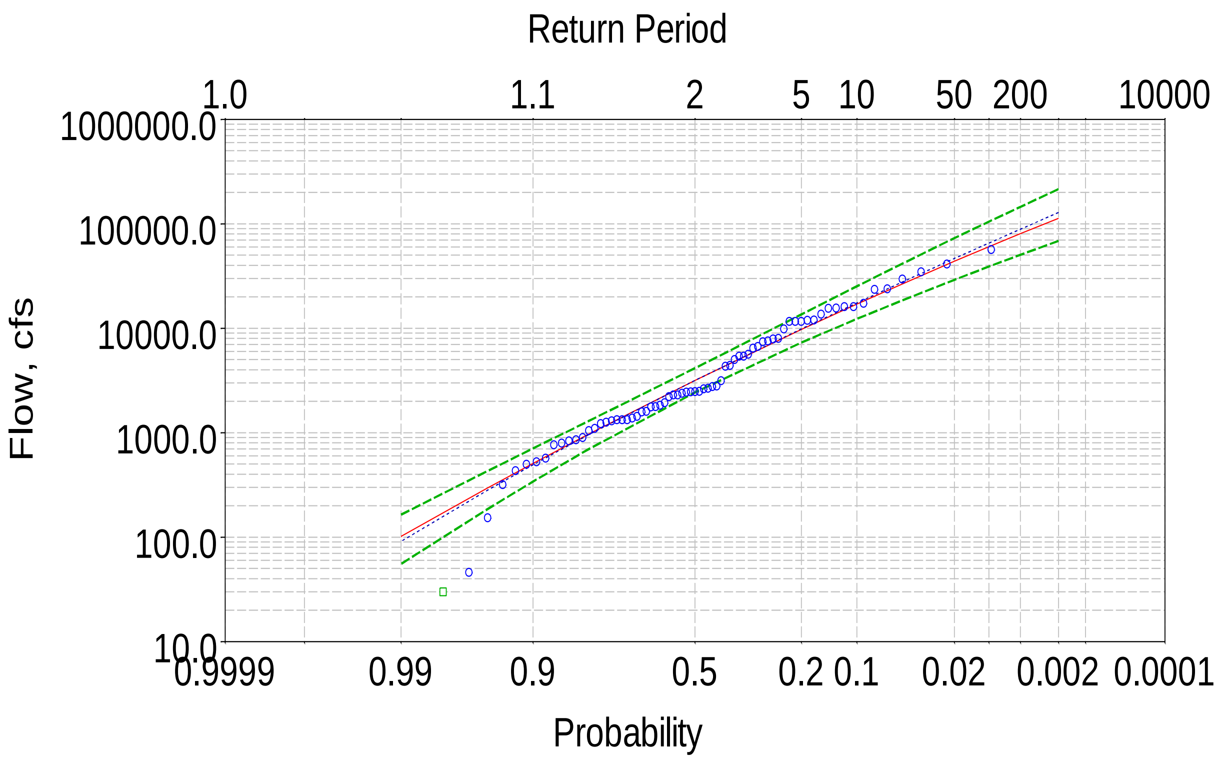
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	160,663	187,083	288,490	110,437
0.5	142,834	161,659	247,561	100,082
1.0	128,831	142,739	216,584	91,753
2.0	114,352	123,983	185,721	82,928
5.0	94,383	99,749	145,302	70,325
10.0	78,510	81,402	115,179	59,850
20.0	61,715	62,969	85,570	48,156
50.0	36,804	36,804	47,080	28,989
80.0	20,307	19,733	25,963	14,745
90.0	14,409	13,583	19,060	9,646
95.0	10,669	9,672	14,701	6,579
99.0	5,817	4,599	8,847	2,989



Log-Pearson type III frequency analysis for peak annual flow

B20 Brazos River near Bryan

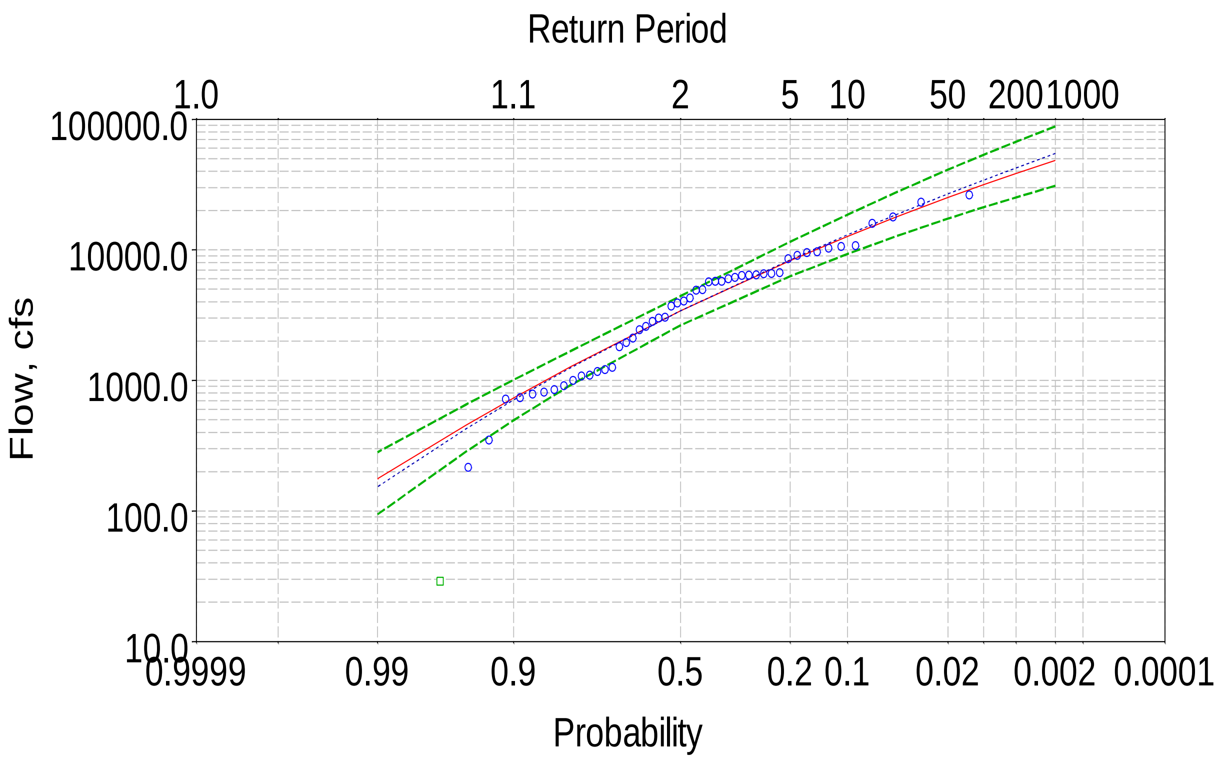
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	271,946	287,722	364,427	215,987
0.5	232,939	243,384	305,526	187,934
1.0	204,356	211,697	263,313	167,015
2.0	176,537	181,410	223,105	146,301
5.0	140,821	143,361	172,959	119,075
10.0	114,434	115,758	137,189	98,371
20.0	88,255	88,805	103,056	77,140
50.0	52,290	52,290	59,198	46,231
80.0	29,901	29,683	34,184	25,641
90.0	22,006	21,690	25,661	18,290
95.0	16,954	16,564	20,199	13,659
99.0	10,202	9,687	12,761	7,682



Log-Pearson type III frequency analysis for peak annual flow

B21 Yegua Creek near Somerville

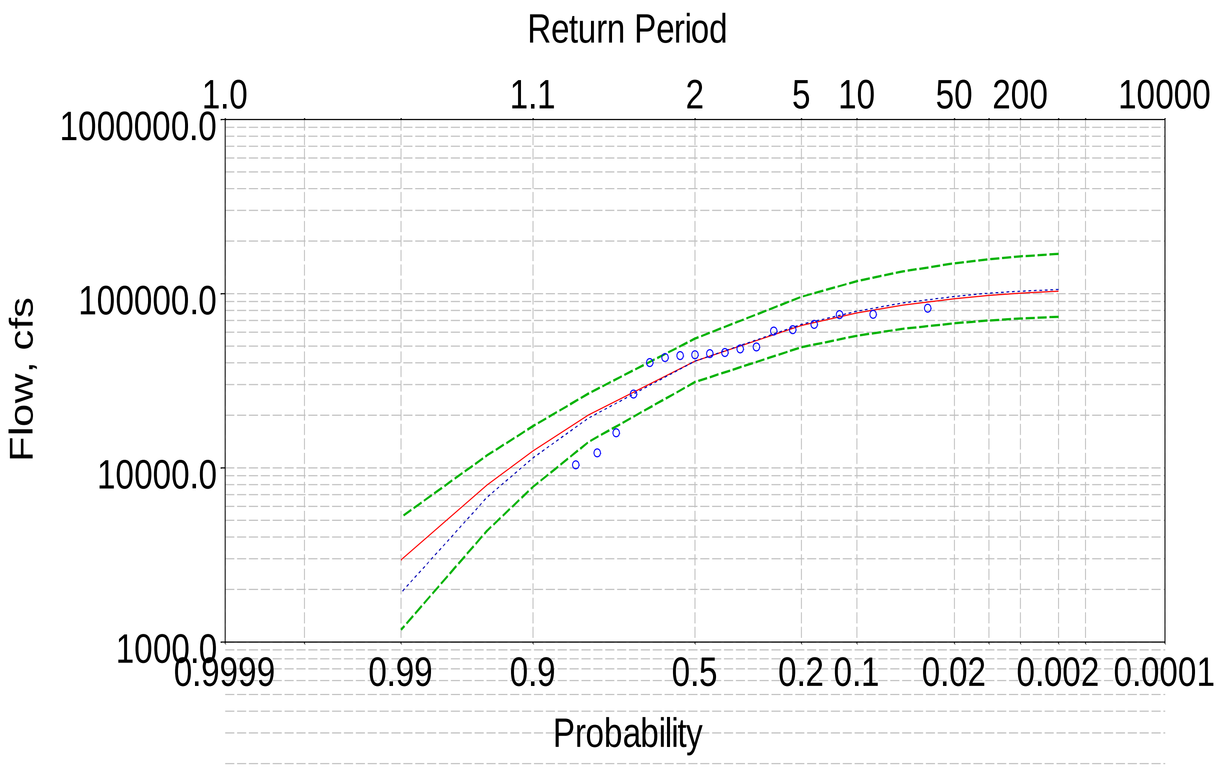
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	113,040	128,541	214,635	68,388
0.5	80,318	88,727	145,314	50,334
1.0	60,229	65,231	104,711	38,848
2.0	43,709	46,474	72,774	29,079
5.0	26,699	27,788	41,719	18,572
10.0	17,020	17,462	25,210	12,277
20.0	9,715	9,849	13,580	7,267
50.0	3,166	3,166	4,138	2,426
80.0	967	952	1,291	694
90.0	507	492	706	340
95.0	293	279	428	184
99.0	102	91	164	55



Log-Pearson type III frequency analysis for peak annual flow

B22 Davidson Creek near Lyons

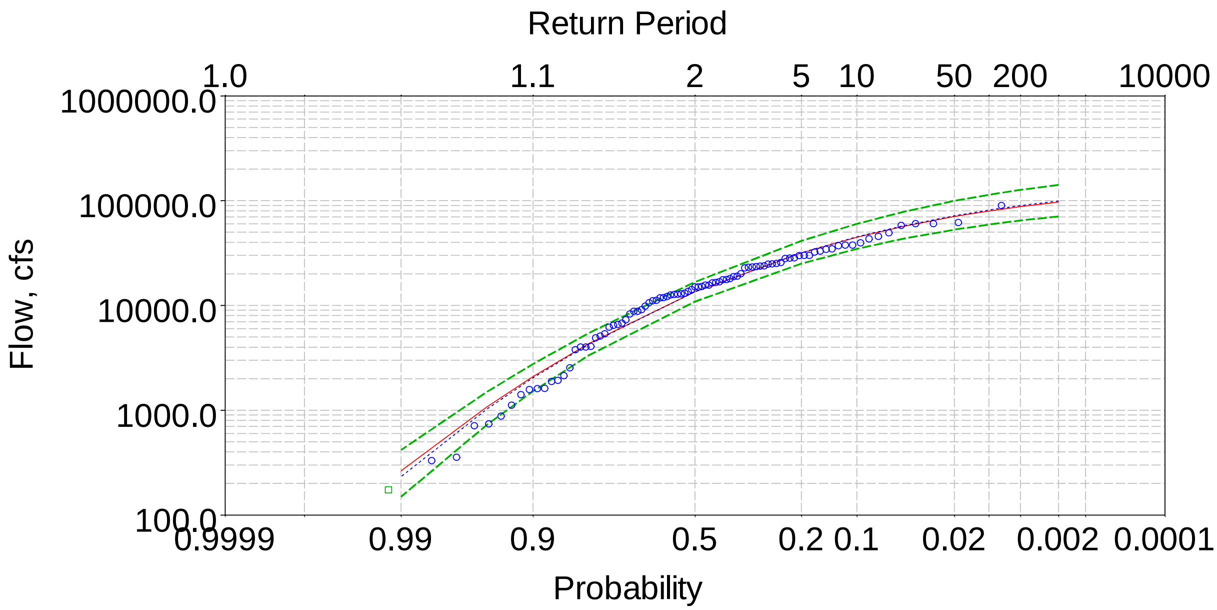
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	48,548	54,809	88,257	30,976
0.5	38,552	42,424	67,372	25,269
1.0	31,616	34,187	53,442	21,193
2.0	25,239	26,831	41,118	17,340
5.0	17,697	18,442	27,271	12,608
10.0	12,686	13,030	18,624	9,316
20.0	8,287	8,410	11,521	6,278
50.0	3,417	3,417	4,433	2,644
80.0	1,279	1,255	1,684	924
90.0	735	708	1,009	495
95.0	456	428	655	285
99.0	176	153	282	94



Log-Pearson type III frequency analysis for peak annual flow

B23 Brazos River at Washington

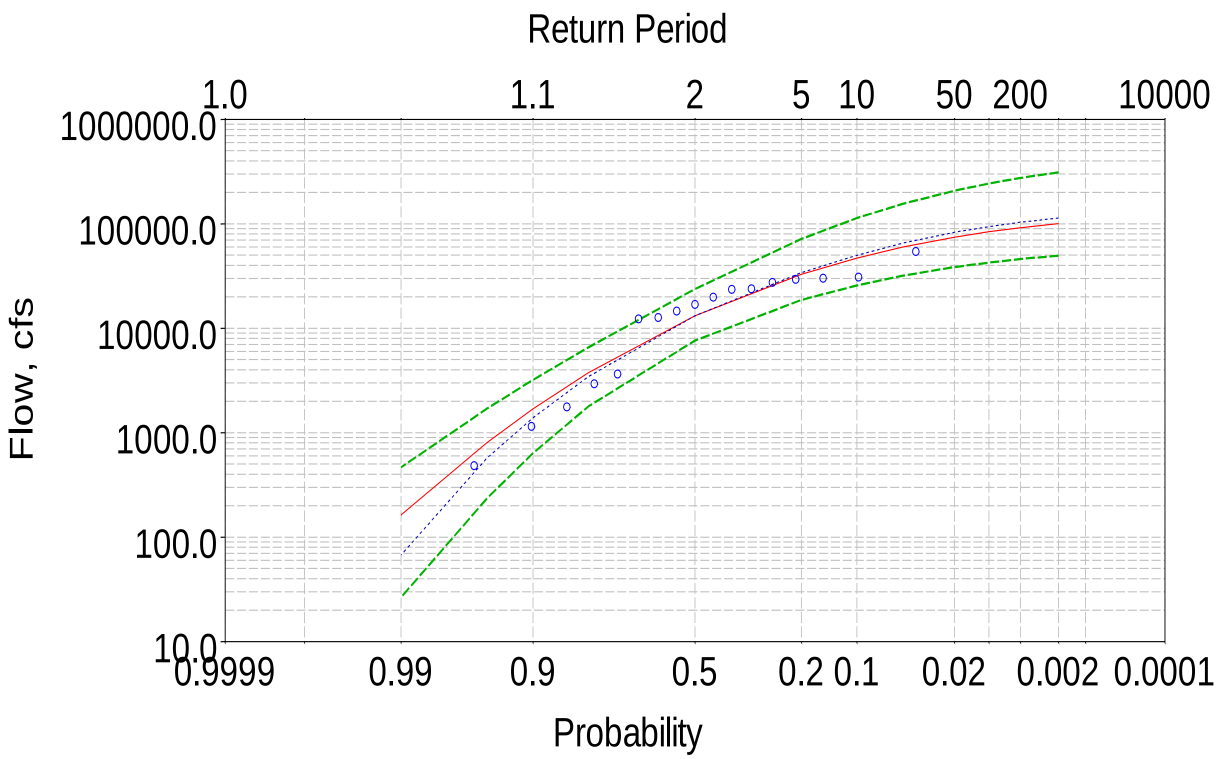
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	103,066	105,619	168,971	73,633
0.5	100,400	103,290	163,416	71,974
1.0	97,507	100,501	157,445	70,162
2.0	93,536	96,353	149,349	67,654
5.0	85,888	88,330	134,094	62,751
10.0	77,437	79,110	117,783	57,209
20.0	65,521	66,489	95,841	49,128
50.0	40,866	40,866	55,091	31,047
80.0	20,131	19,309	26,680	14,038
90.0	12,515	11,403	17,359	7,783
95.0	7,975	6,783	11,797	4,356
99.0	2,955	1,915	5,195	1,176



Log-Pearson type III frequency analysis for peak annual flow

B24 Navasota River at Easterly

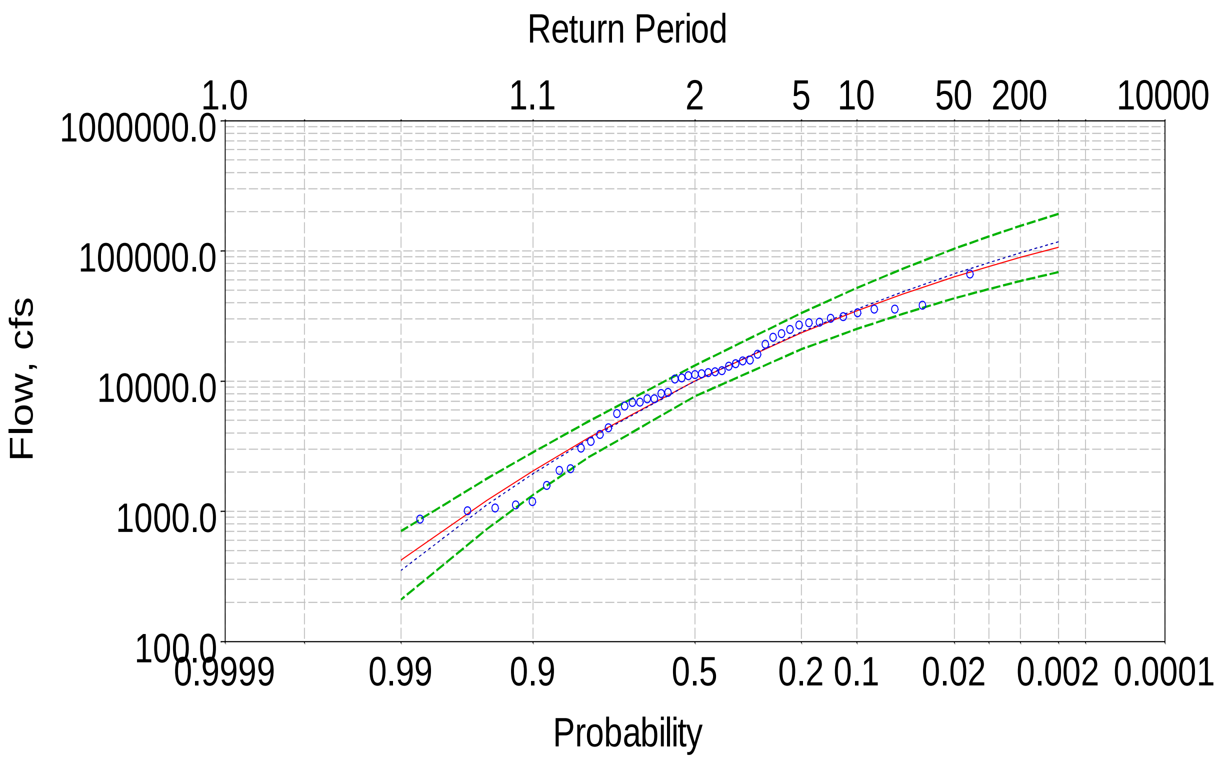
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	96,642	99,092	141,098	70,726
0.5	87,665	89,670	126,604	64,666
1.0	79,674	81,375	113,862	59,220
2.0	70,545	71,868	99,503	52,929
5.0	56,621	57,489	78,063	43,171
10.0	44,683	45,167	60,201	34,612
20.0	31,668	31,883	41,405	25,014
50.0	13,480	13,480	16,790	10,888
80.0	4,310	99,092	141,098	70,726
90.0	2,099	89,670	126,604	64,666
95.0	1,083	81,375	113,862	59,220
99.0	264	71,868	99,503	52,929



Log-Pearson type III frequency analysis for peak annual flow

B25 Navasota River at Old Spanish Road near Bryan

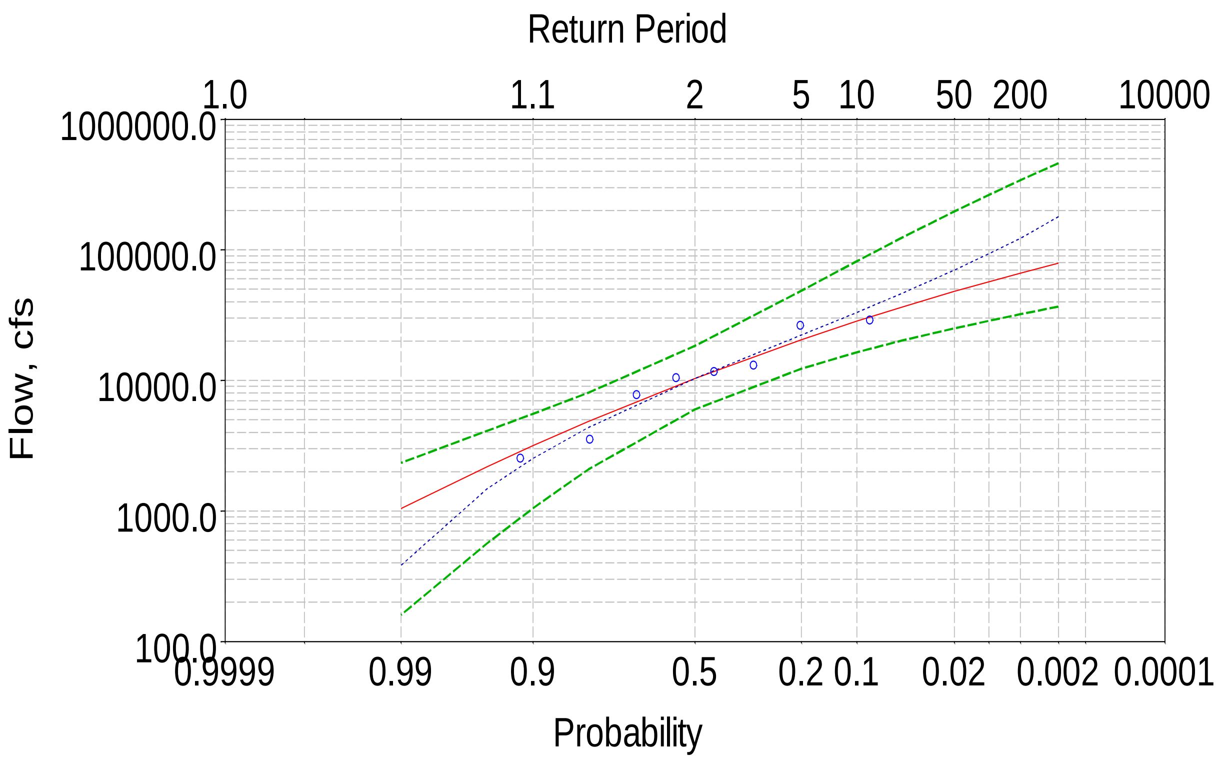
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	100,430	113,245	309,617	49,552
0.5	91,725	103,627	274,184	45,900
1.0	83,739	94,024	242,761	42,487
2.0	74,387	82,792	207,355	38,402
5.0	59,743	65,128	155,187	31,784
10.0	46,914	49,941	113,151	25,706
20.0	32,769	34,080	71,424	18,595
50.0	13,132	13,132	23,731	7,591
80.0	3,756	3,441	6,554	1,784
90.0	1,686	1,391	3,196	636
95.0	803	575	1,705	236
99.0	163	68	466	26



Log-Pearson type III frequency analysis for peak annual flow

B26 Navasota River near Bryan

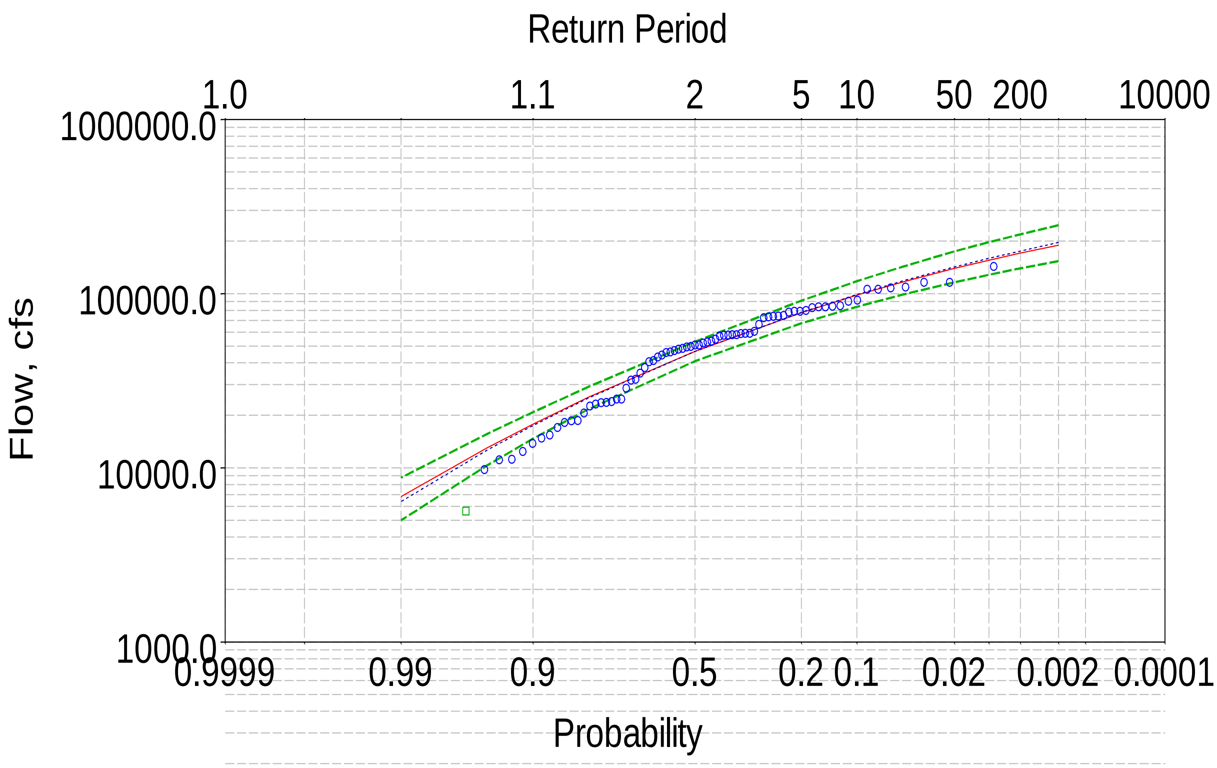
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	106,530	117,916	192,065	68,627
0.5	89,088	96,756	155,571	58,614
1.0	76,010	81,487	129,093	50,928
2.0	63,140	66,775	103,885	43,182
5.0	46,651	48,534	73,034	32,921
10.0	34,751	35,677	52,005	25,201
20.0	23,524	23,879	33,388	17,567
50.0	10,013	10,013	13,203	7,643
80.0	3,670	3,588	4,896	2,605
90.0	2,040	1,948	2,848	1,336
95.0	1,215	1,126	1,788	731
99.0	423	353	706	210



Log-Pearson type III frequency analysis for peak annual flow

B27 Navasota River near College Station

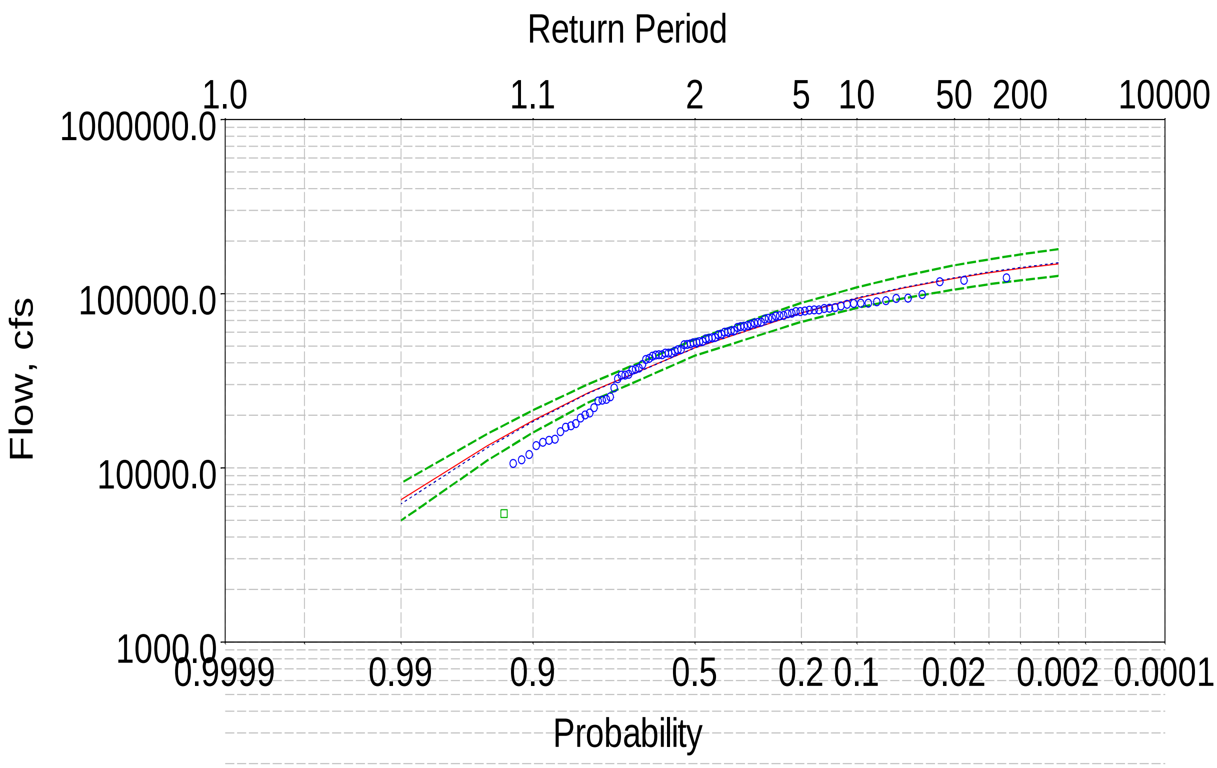
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	79,006	179,567	461,599	36,721
0.5	66,329	122,587	341,419	32,181
1.0	57,047	93,245	263,618	28,681
2.0	48,055	70,020	196,795	25,112
5.0	36,652	46,699	124,692	20,249
10.0	28,412	33,131	81,869	16,404
20.0	20,499	22,222	48,595	12,303
50.0	10,371	10,371	18,365	6,012
80.0	4,855	4,367	8,071	2,085
90.0	3,163	2,529	5,540	1,050
95.0	2,183	1,481	4,103	565
99.0	1,044	383	2,337	160



Log-Pearson type III frequency analysis for peak annual flow

B28 Brazos River near Hempstead

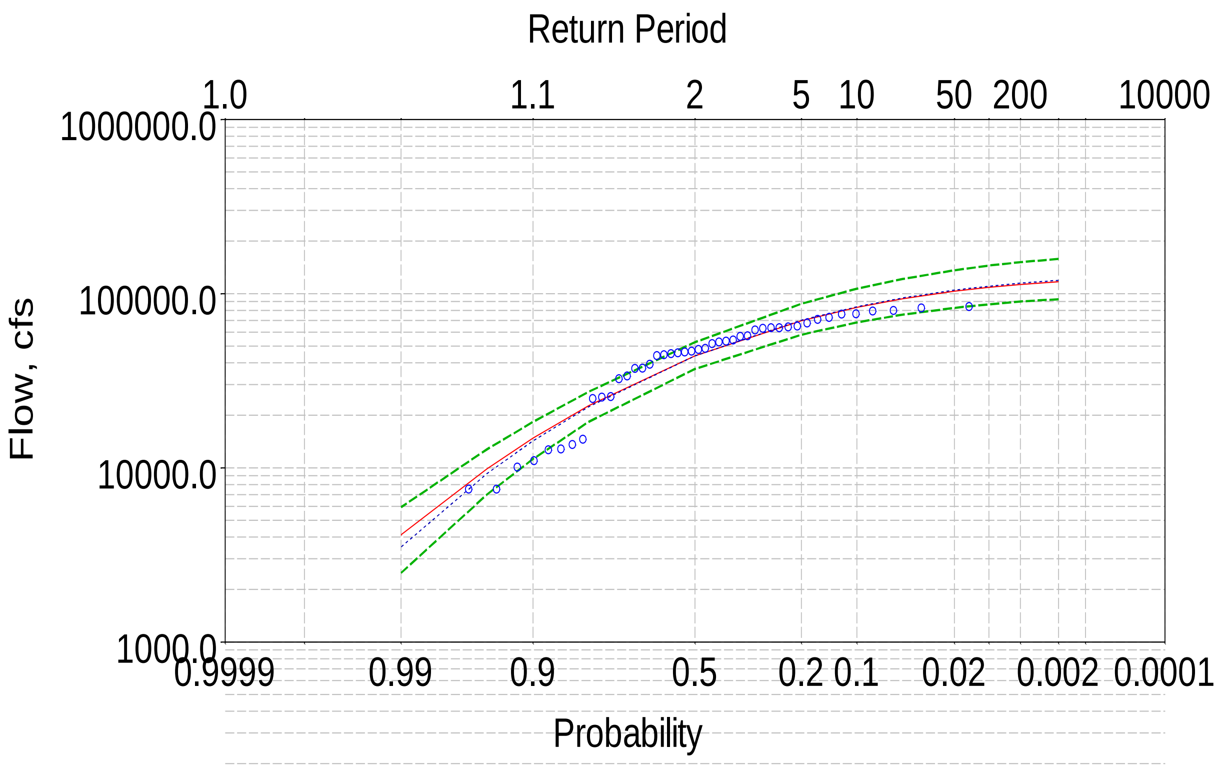
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	189,488	196,256	246,627	153,555
0.5	170,719	175,700	219,174	139,725
1.0	155,559	159,401	197,333	128,417
2.0	139,486	142,269	174,535	116,277
5.0	116,656	118,314	142,863	98,719
10.0	97,958	98,885	117,642	83,998
20.0	77,641	78,062	91,129	67,549
50.0	46,535	46,535	52,943	41,001
80.0	25,401	25,191	29,138	21,713
90.0	17,800	17,500	20,887	14,684
95.0	12,995	12,637	15,652	10,326
99.0	6,834	6,396	8,762	4,985



Log-Pearson type III frequency analysis for peak annual flow

B29 Brazos River near Richmond

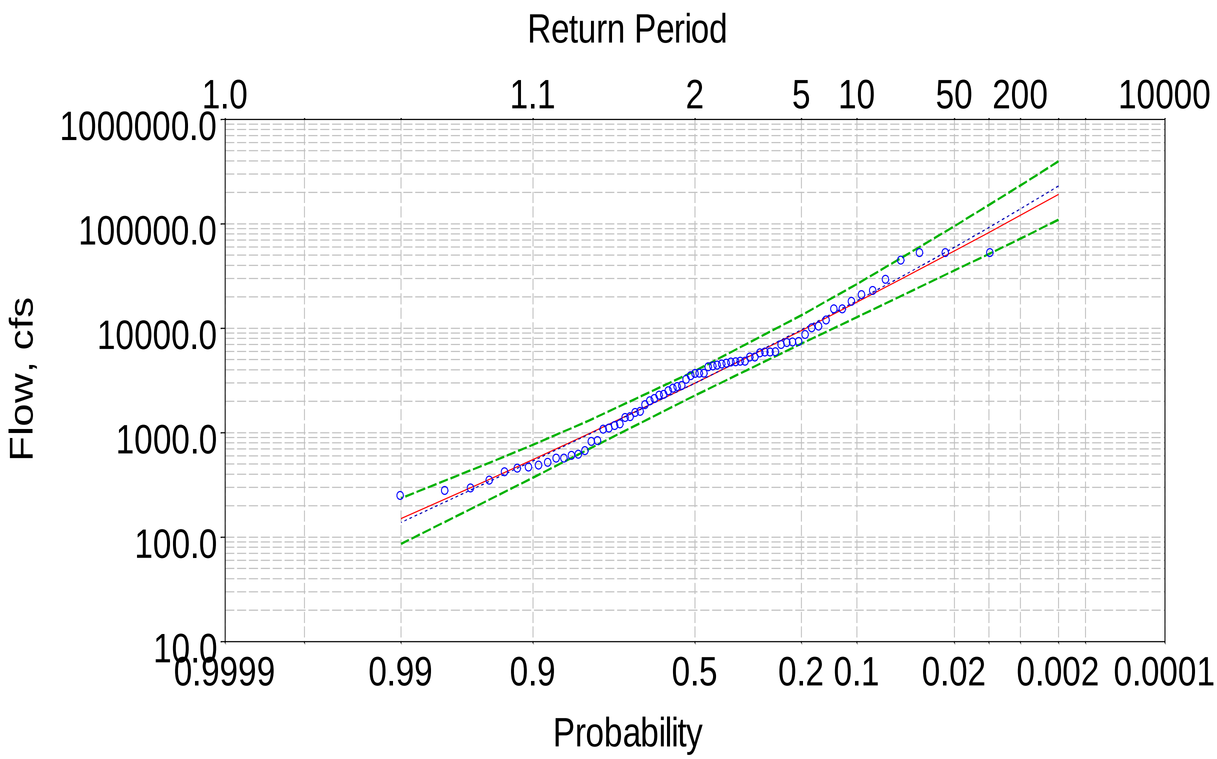
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	148,215	150,383	179,784	126,246
0.5	139,332	141,121	167,902	119,263
1.0	131,361	132,891	157,325	112,953
2.0	122,085	123,306	145,126	105,555
5.0	107,348	108,194	126,007	93,665
10.0	93,810	94,325	108,762	82,569
20.0	77,480	77,740	88,436	68,912
50.0	48,932	48,932	54,529	44,024
80.0	26,994	26,820	30,275	23,744
90.0	18,666	18,413	21,375	15,920
95.0	13,338	13,037	15,661	10,994
99.0	6,559	6,200	8,193	4,984



Log-Pearson type III frequency analysis for peak annual flow

B30 Brazos River near Rosharon

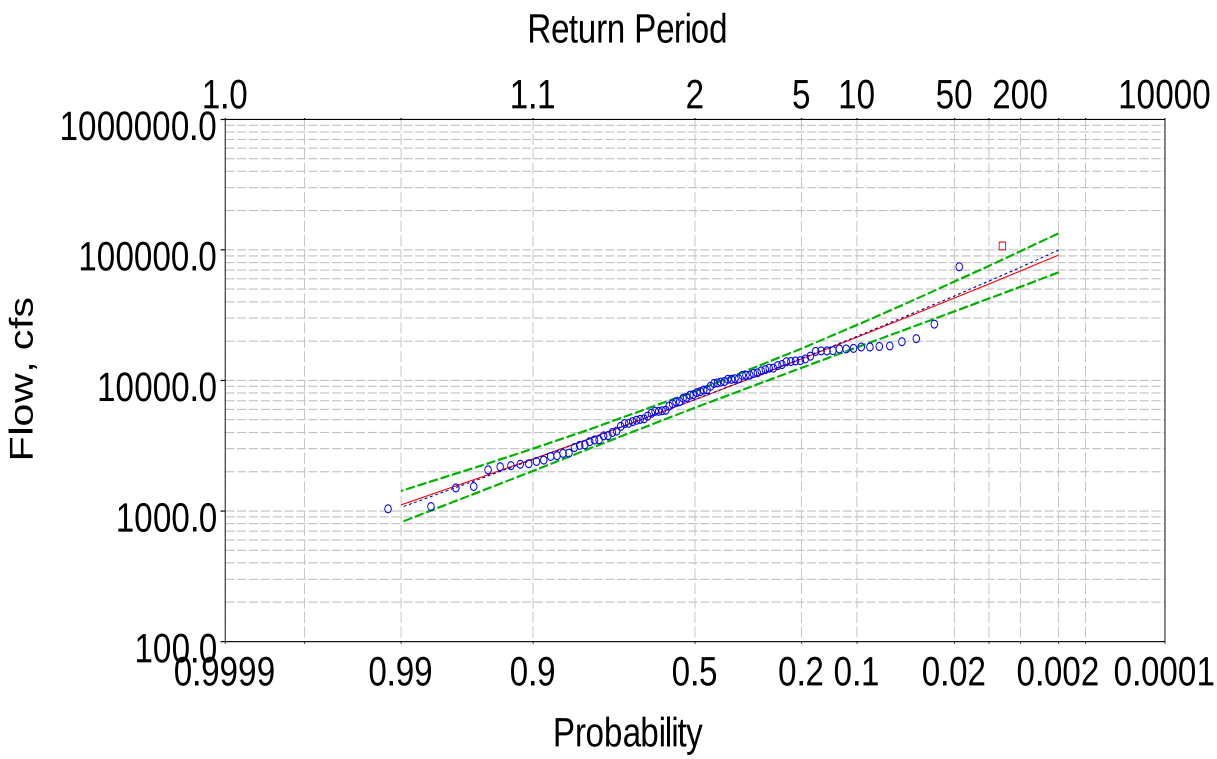
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	117,003	119,136	157,936	92,887
0.5	112,776	114,754	151,312	89,869
1.0	108,520	110,408	144,696	86,812
2.0	103,046	104,705	136,266	82,851
5.0	93,273	94,609	121,456	75,689
10.0	83,221	84,091	106,569	68,187
20.0	69,872	70,352	87,410	57,970
50.0	43,932	43,932	52,647	36,971
80.0	22,727	22,347	27,270	18,337
90.0	14,780	14,247	18,320	11,240
95.0	9,884	9,285	12,779	7,029
99.0	4,124	3,509	5,948	2,491



Log-Pearson type III frequency analysis for peak annual flow

T1 Big Sandy Creek near Bridgeport

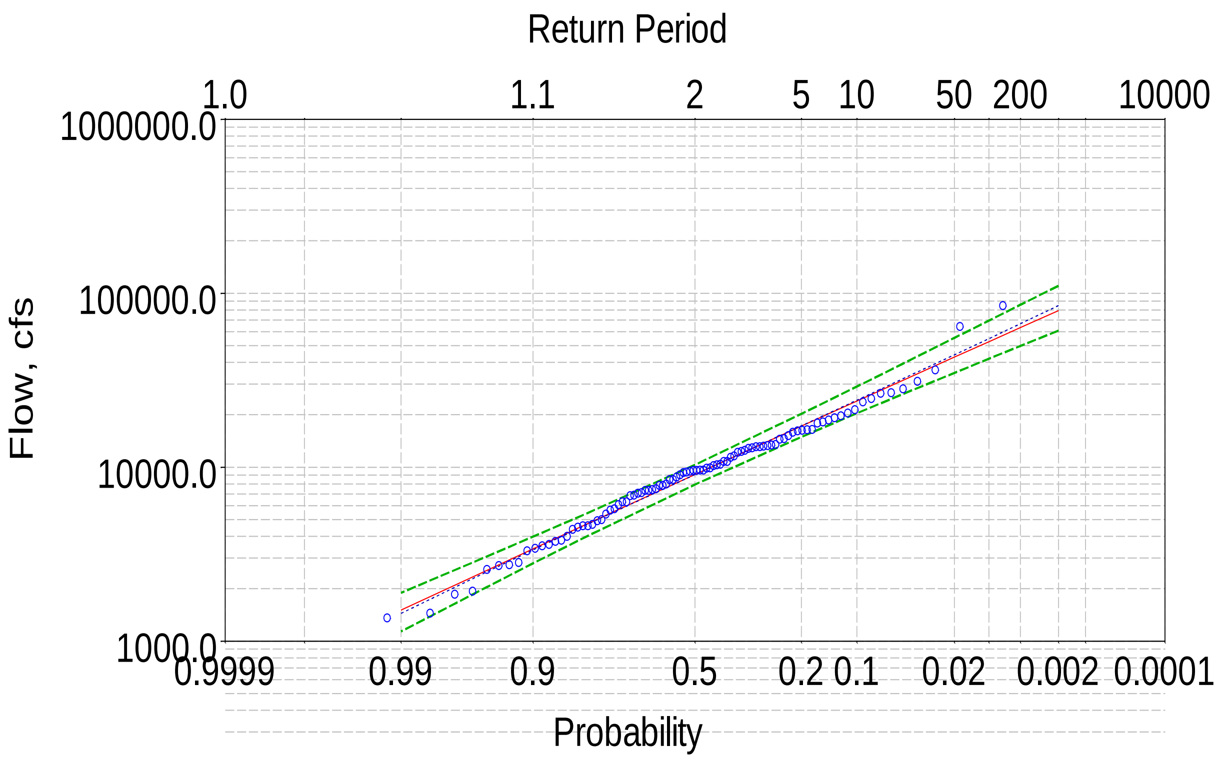
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	191,571	230,449	395,717	109,150
0.5	120,573	138,531	232,639	72,217
1.0	82,662	92,061	151,036	51,511
2.0	54,981	59,577	94,859	35,705
5.0	30,099	31,624	47,901	20,694
10.0	17,785	18,342	26,528	12,778
20.0	9,513	9,664	13,284	7,123
50.0	2,975	2,975	3,885	2,276
80.0	973	959	1,301	696
90.0	552	538	766	372
95.0	349	335	503	222
99.0	151	138	235	86



Log-Pearson type III frequency analysis for peak annual flow

T2 Clear Fork Trinity River at Fort Worth

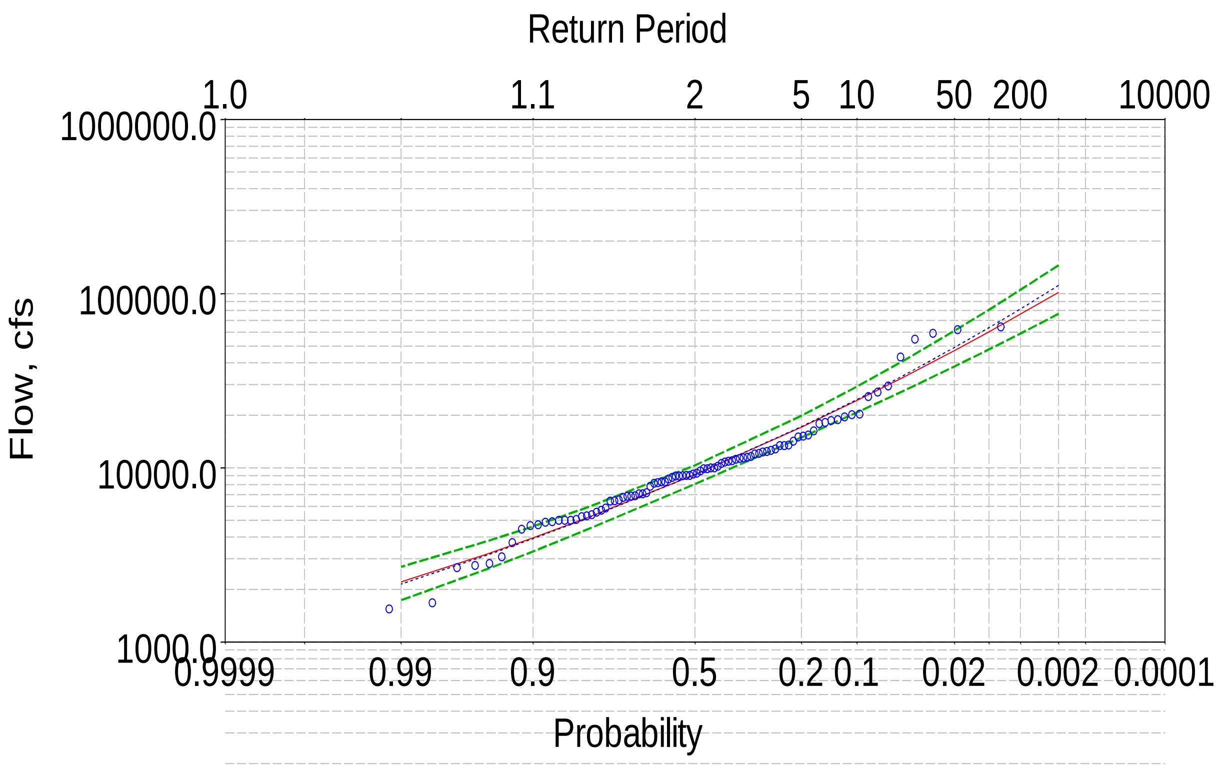
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	91,295	99,441	133,950	67,163
0.5	68,946	73,534	97,638	52,108
1.0	54,817	57,634	75,459	42,327
2.0	42,769	44,402	57,141	33,772
5.0	29,615	30,309	37,934	24,122
10.0	21,465	21,778	26,580	17,910
20.0	14,622	14,732	17,494	12,483
50.0	7,143	7,143	8,254	6,178
80.0	3,571	3,546	4,185	2,982
90.0	2,508	2,476	3,001	2,029
95.0	1,882	1,844	2,300	1,478
99.0	1,111	1,066	1,420	821



Log-Pearson type III frequency analysis for peak annual flow

T3 West Fork Trinity River at Fort Worth

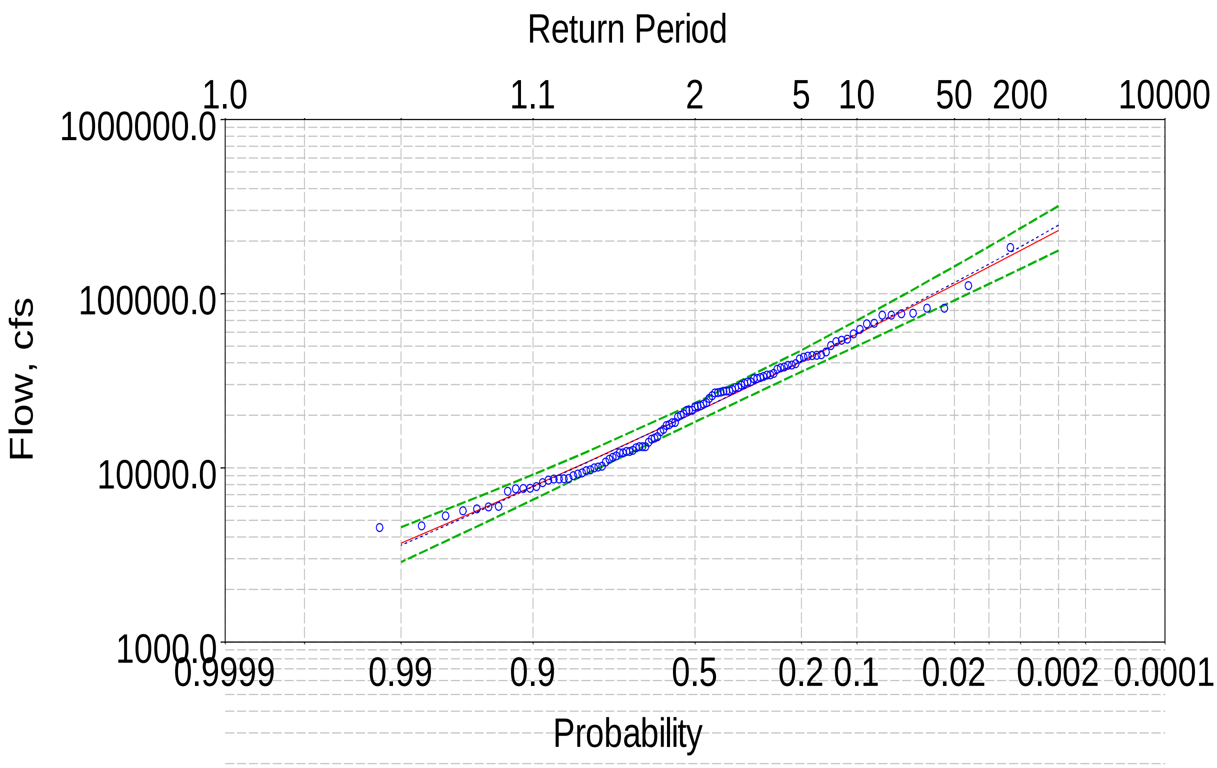
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	79,469	84,924	110,373	61,011
0.5	63,420	66,714	85,665	49,732
1.0	52,626	54,767	69,500	41,977
2.0	42,901	44,215	55,310	34,842
5.0	31,549	32,157	39,297	26,281
10.0	23,988	24,279	29,048	20,388
20.0	17,195	17,304	20,218	14,904
50.0	9,063	9,063	10,327	7,954
80.0	4,755	4,724	5,485	4,044
90.0	3,388	3,346	3,987	2,796
95.0	2,558	2,508	3,073	2,051
99.0	1,506	1,445	1,893	1,137



Log-Pearson type III frequency analysis for peak annual flow

T4 West Fork Trinity River at Grand Prairie

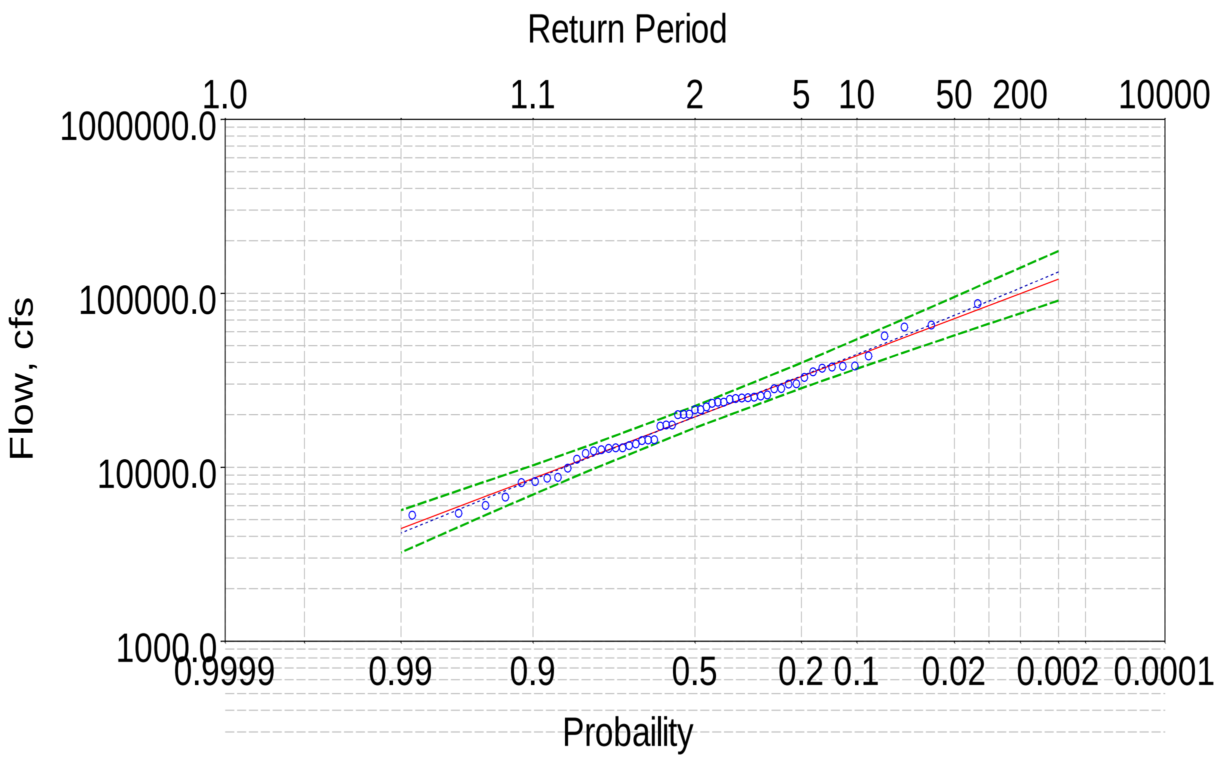
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	101,771	111,551	145,571	76,544
0.5	76,163	81,524	104,922	58,948
1.0	60,361	63,581	80,732	47,775
2.0	47,138	48,972	61,146	38,177
5.0	32,963	33,723	40,993	27,539
10.0	24,305	24,648	29,251	20,787
20.0	17,081	17,201	19,908	14,922
50.0	9,132	9,132	10,335	8,058
80.0	5,193	5,165	5,952	4,447
90.0	3,959	3,921	4,611	3,308
95.0	3,202	3,155	3,788	2,618
99.0	2,213	2,151	2,699	1,734



Log-Pearson type III frequency analysis for peak annual flow

T5 Trinity River at Dallas

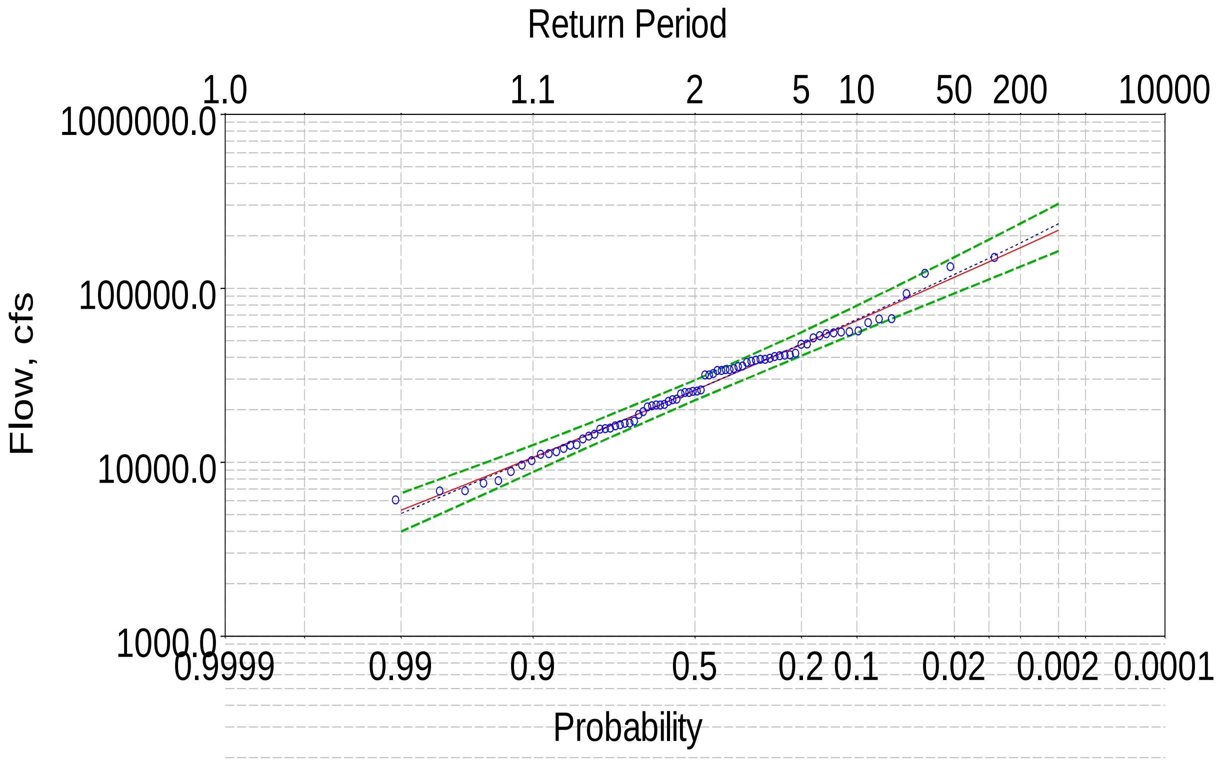
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	230,599	246,629	319,138	176,838
0.5	176,488	185,650	236,956	138,583
1.0	141,910	147,601	185,973	113,543
2.0	112,123	115,464	143,244	91,486
5.0	79,158	80,605	97,573	66,364
10.0	58,401	59,066	69,956	50,003
20.0	40,675	40,912	47,332	35,528
50.0	20,768	20,768	23,486	18,356
80.0	10,878	10,821	12,460	9,341
90.0	7,837	7,759	9,139	6,556
95.0	6,008	5,916	7,134	4,904
99.0	3,696	3,582	4,558	2,869



Log-Pearson type III frequency analysis for peak annual flow

T6 Trinity River below Dallas

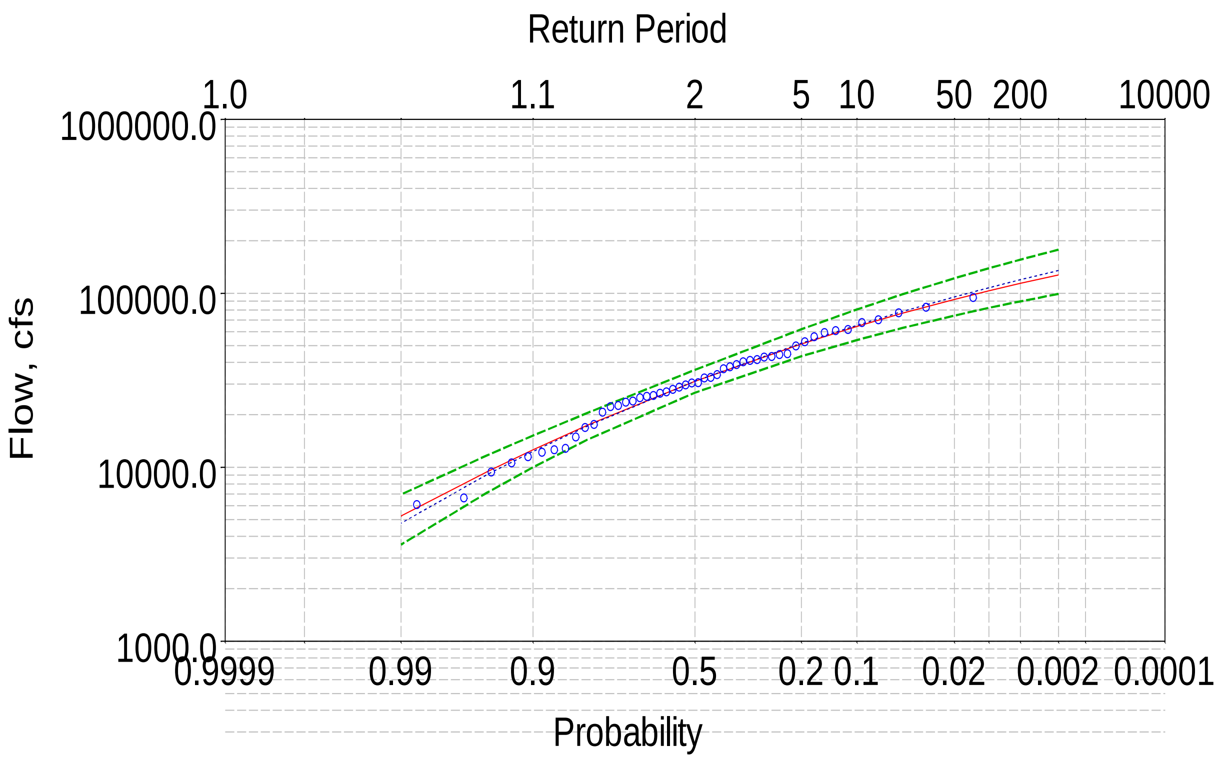
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	120,278	132,747	175,031	90,767
0.5	99,344	107,064	139,934	76,696
1.0	84,840	89,968	116,395	66,704
2.0	71,400	74,626	95,242	57,227
5.0	55,120	56,671	70,626	45,384
10.0	43,794	44,567	54,294	36,831
20.0	33,145	33,449	39,696	28,445
50.0	19,446	19,446	22,422	16,866
80.0	11,405	11,301	13,289	9,523
90.0	8,627	8,477	10,259	6,959
95.0	6,851	6,663	8,321	5,346
99.0	4,445	4,191	5,655	3,239



Log-Pearson type III frequency analysis for peak annual flow

T7 Trinity River near Rosser

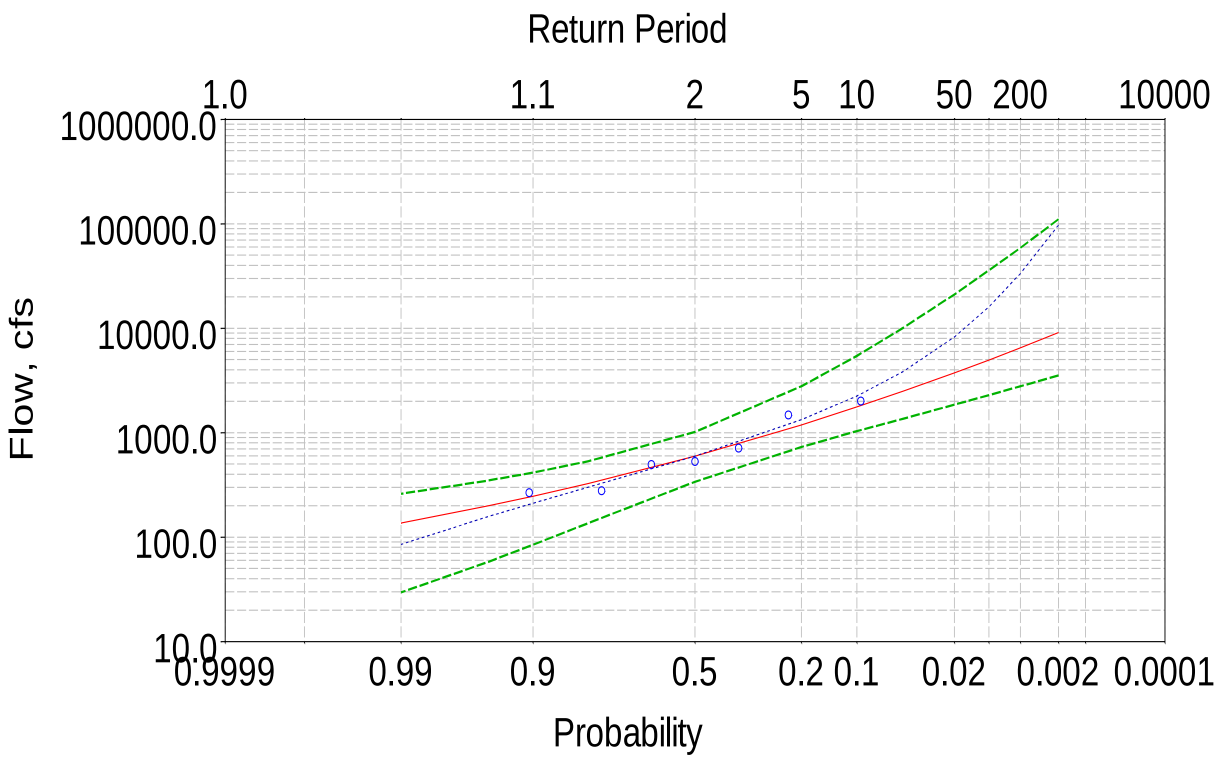
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	215,592	234,262	306,406	163,571
0.5	171,214	182,292	235,672	133,022
1.0	141,764	148,864	190,192	112,245
2.0	115,514	119,820	150,827	93,290
5.0	85,211	87,169	107,068	70,737
10.0	65,213	66,149	79,440	55,309
20.0	47,342	47,692	55,864	40,978
50.0	25,938	25,938	29,617	22,708
80.0	14,415	14,315	16,658	12,209
90.0	10,663	10,524	12,561	8,766
95.0	8,338	8,167	10,014	6,663
99.0	5,292	5,072	6,626	3,992



Log-Pearson type III frequency analysis for peak annual flow

T8 Trinity River at Trinidad

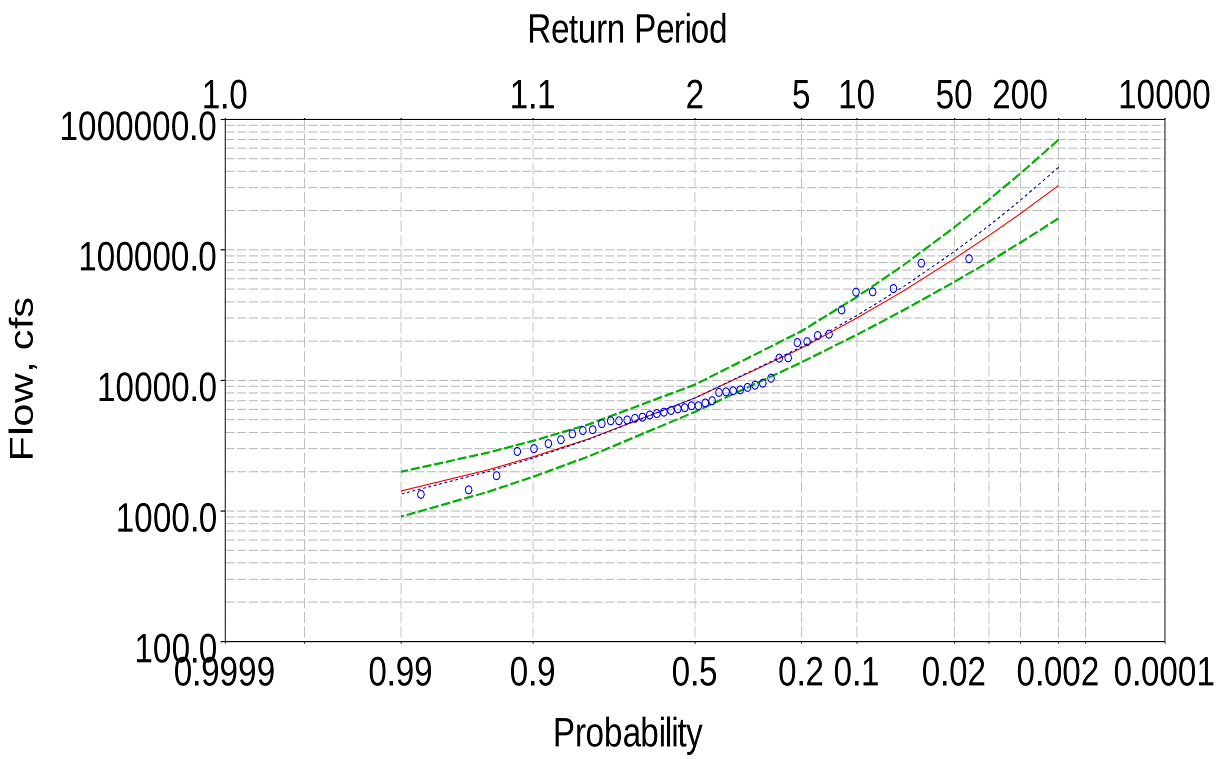
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	127,284	135,145	177,723	99,055
0.5	113,851	119,479	155,930	89,756
1.0	103,221	107,462	139,041	82,281
2.0	92,152	95,157	121,820	74,369
5.0	76,742	78,475	98,545	63,099
10.0	64,361	65,317	80,525	53,774
20.0	51,114	51,540	62,055	43,438
50.0	31,116	31,116	36,273	26,774
80.0	17,547	17,339	20,609	14,506
90.0	12,599	12,297	15,172	9,970
95.0	9,423	9,054	11,678	7,127
99.0	5,239	4,768	6,951	3,579



Log-Pearson type III frequency analysis for peak annual flow

T9 Cedar Creek at Trinidad

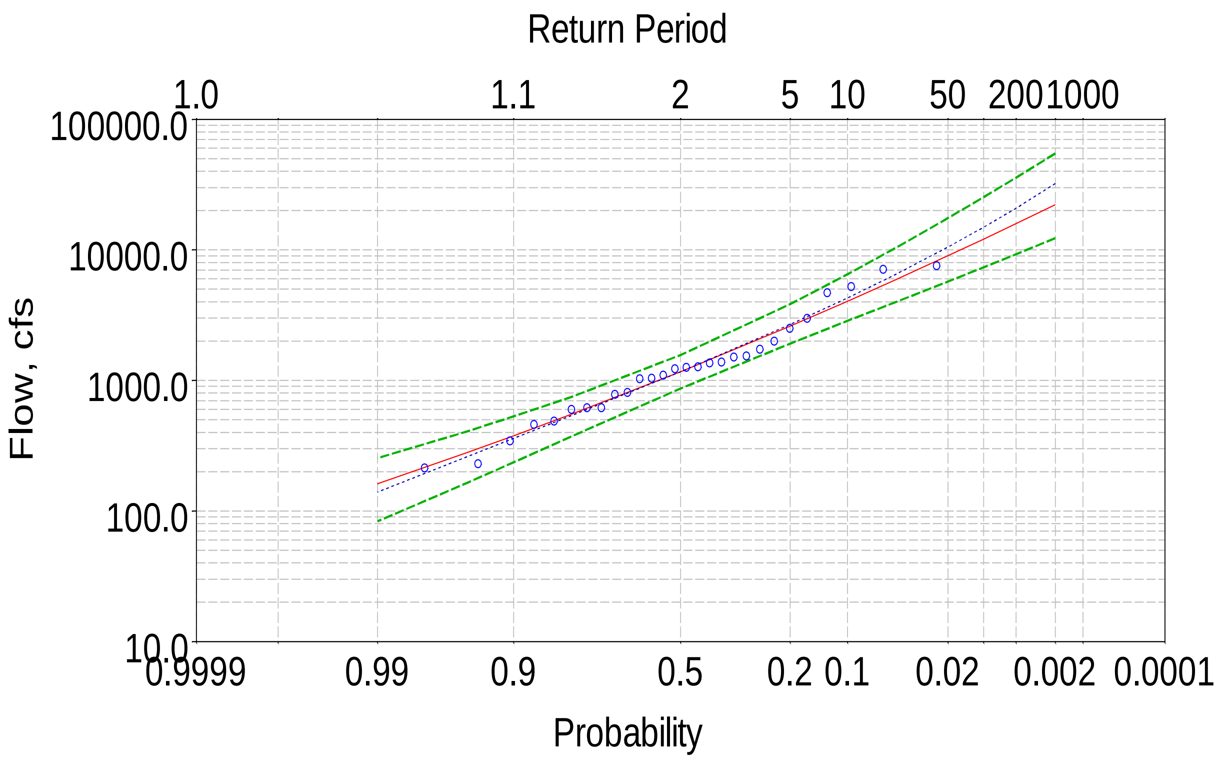
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	9,091	97,213	110,494	3,528
0.5	6,490	33,434	58,869	2,773
1.0	4,960	15,986	35,717	2,283
2.0	3,733	8,265	21,132	1,853
5.0	2,483	3,826	10,044	1,359
10.0	1,760	2,246	5,441	1,032
20.0	1,186	1,329	2,779	730
50.0	597	597	1,014	339
80.0	327	301	532	136
90.0	246	211	415	84
95.0	198	156	347	58
99.0	137	85	260	30



Log-Pearson type III frequency analysis for peak annual flow

T10 Tehuacana Creek near Streetman

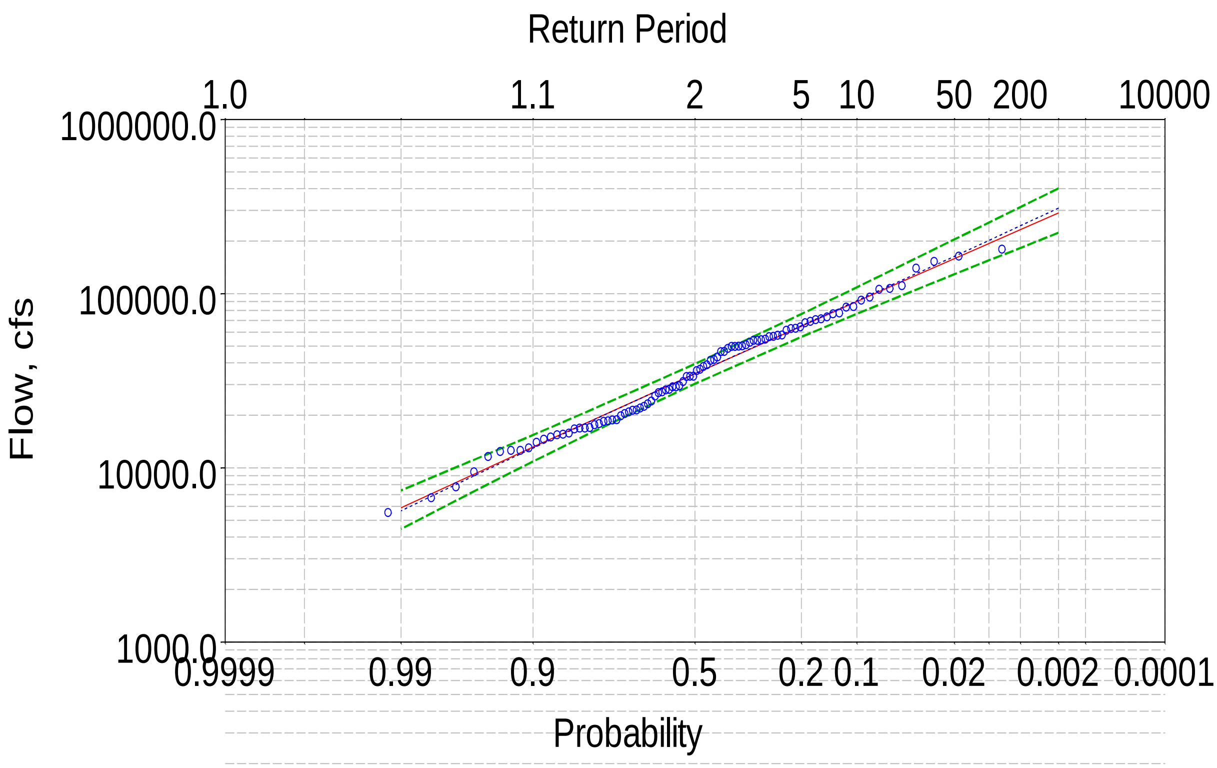
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	311,174	429,326	696,185	174,239
0.5	189,736	239,692	385,044	113,588
1.0	128,510	153,037	241,840	80,984
2.0	85,562	97,005	149,097	56,781
5.0	48,216	51,810	75,758	34,247
10.0	30,030	31,356	43,633	22,398
20.0	17,694	18,064	23,883	13,748
50.0	7,327	7,327	9,286	5,741
80.0	3,565	3,521	4,607	2,620
90.0	2,597	2,543	3,437	1,828
95.0	2,058	1,995	2,783	1,398
99.0	1,421	1,350	1,997	907



Log-Pearson type III frequency analysis for peak annual flow

T11 Catfish Creek near Tennessee Colony

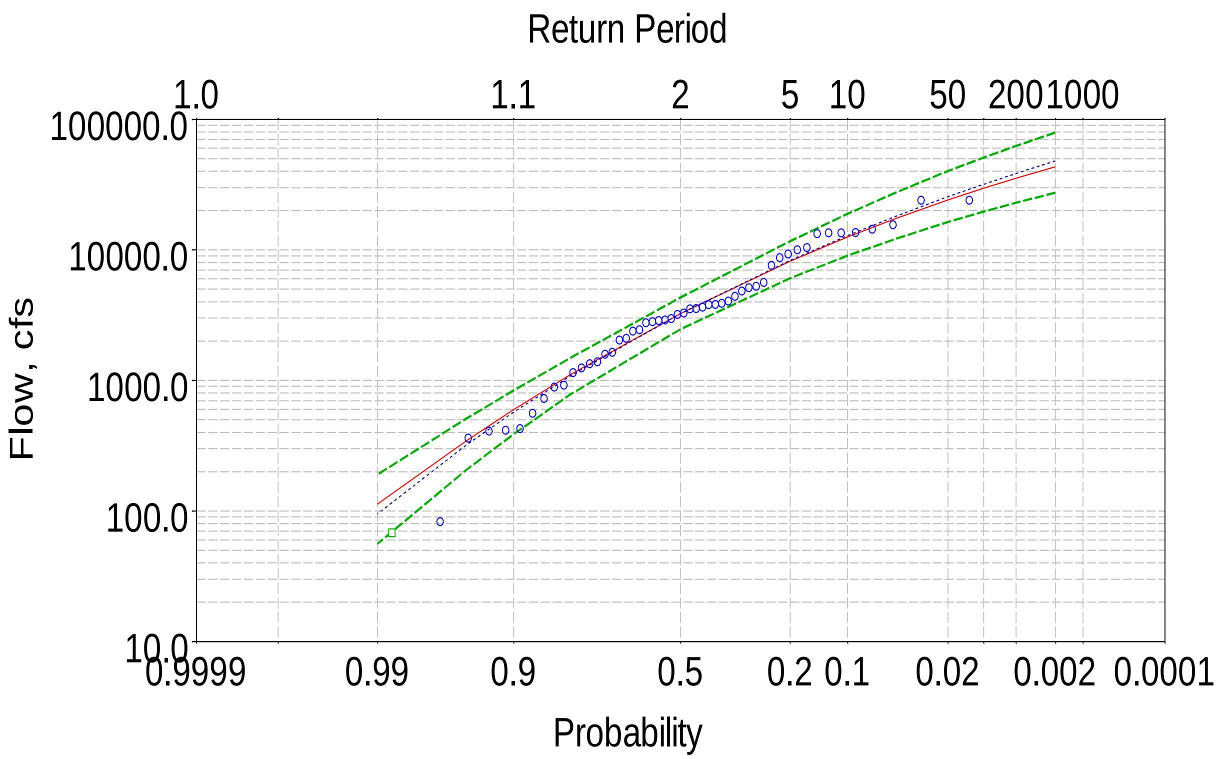
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	22,241	32,161	54,787	12,279
0.5	15,879	20,839	35,749	9,257
1.0	12,084	14,879	25,325	7,353
2.0	9,011	10,502	17,517	5,731
5.0	5,860	6,427	10,250	3,959
10.0	4,038	4,274	6,488	2,854
20.0	2,604	2,679	3,836	1,916
50.0	1,167	1,167	1,566	866
80.0	548	535	746	371
90.0	376	359	530	236
95.0	278	259	406	163
99.0	162	140	254	83



Log-Pearson type III frequency analysis for peak annual flow

T12 Trinity River near Oakwood

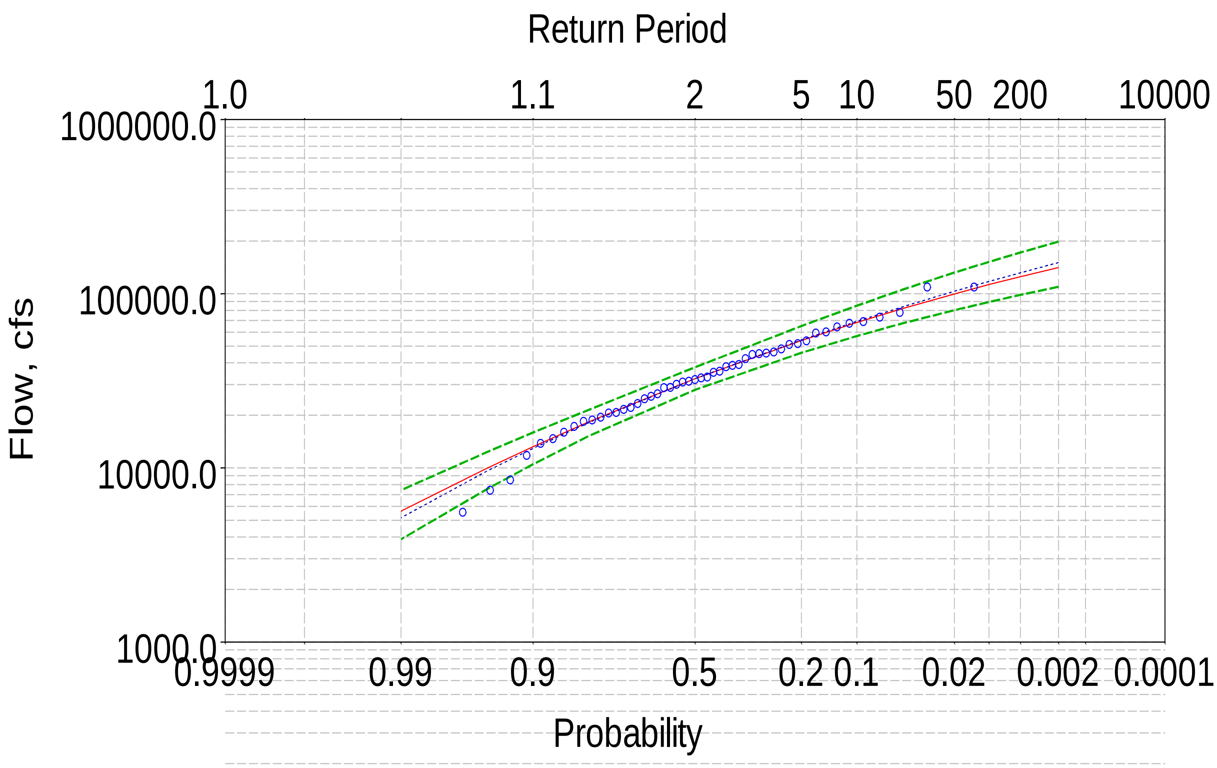
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	290,036	309,874	401,786	223,266
0.5	232,755	244,807	313,694	182,946
1.0	194,001	201,877	255,705	155,065
2.0	158,900	163,760	204,519	129,283
5.0	117,652	119,919	146,353	98,149
10.0	89,974	91,068	108,837	76,566
20.0	64,927	65,340	76,275	56,333
50.0	34,623	34,623	39,421	30,413
80.0	18,352	18,233	21,149	15,624
90.0	13,137	12,974	15,444	10,855
95.0	9,956	9,760	11,948	7,991
99.0	5,900	5,657	7,406	4,456



Log-Pearson type III frequency analysis for peak annual flow

T13 Upper Keechi Creek near Oakwood

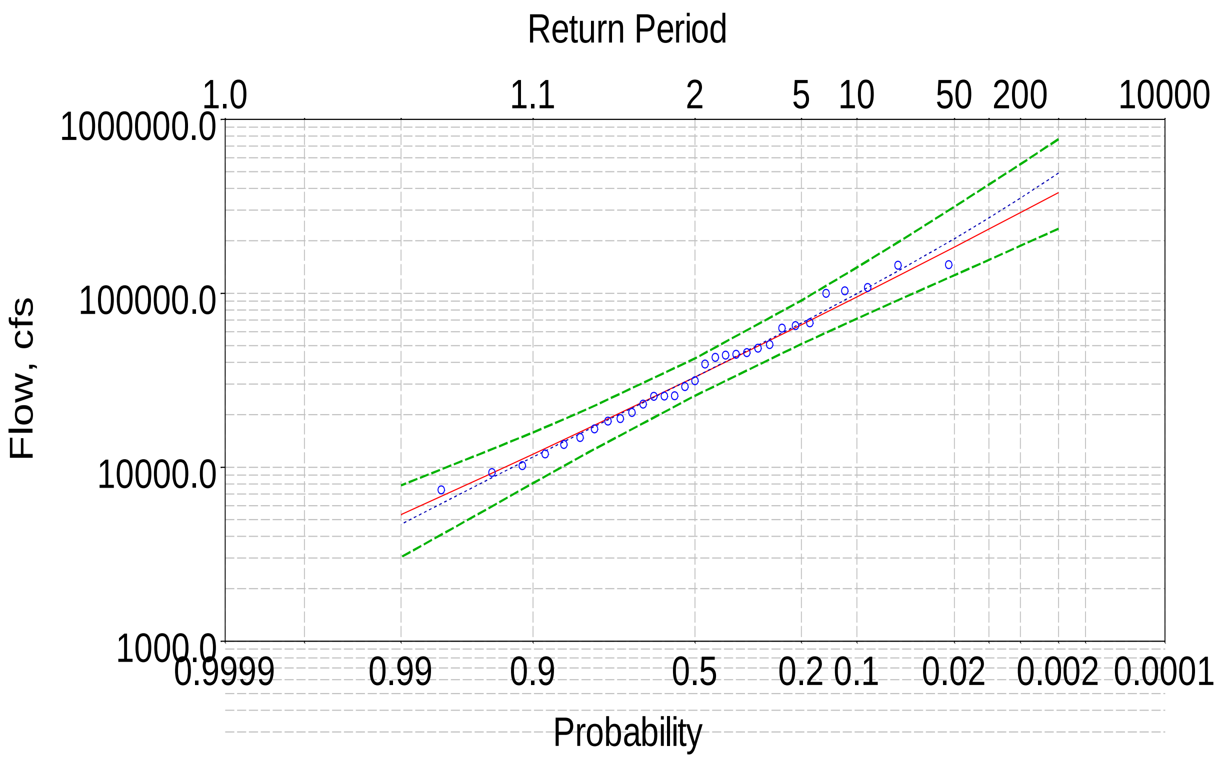
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	43,314	48,007	79,150	27,452
0.5	35,442	38,519	62,618	22,981
1.0	29,690	31,837	50,946	19,631
2.0	24,166	25,556	40,115	16,333
5.0	17,307	18,000	27,286	12,094
10.0	12,533	12,863	18,863	9,014
20.0	8,193	8,315	11,683	6,078
50.0	3,257	3,257	4,315	2,473
80.0	1,113	1,089	1,495	786
90.0	596	570	838	388
95.0	344	320	511	206
99.0	113	95	190	56



Log-Pearson type III frequency analysis for peak annual flow

T14 Trinity River near Crockett

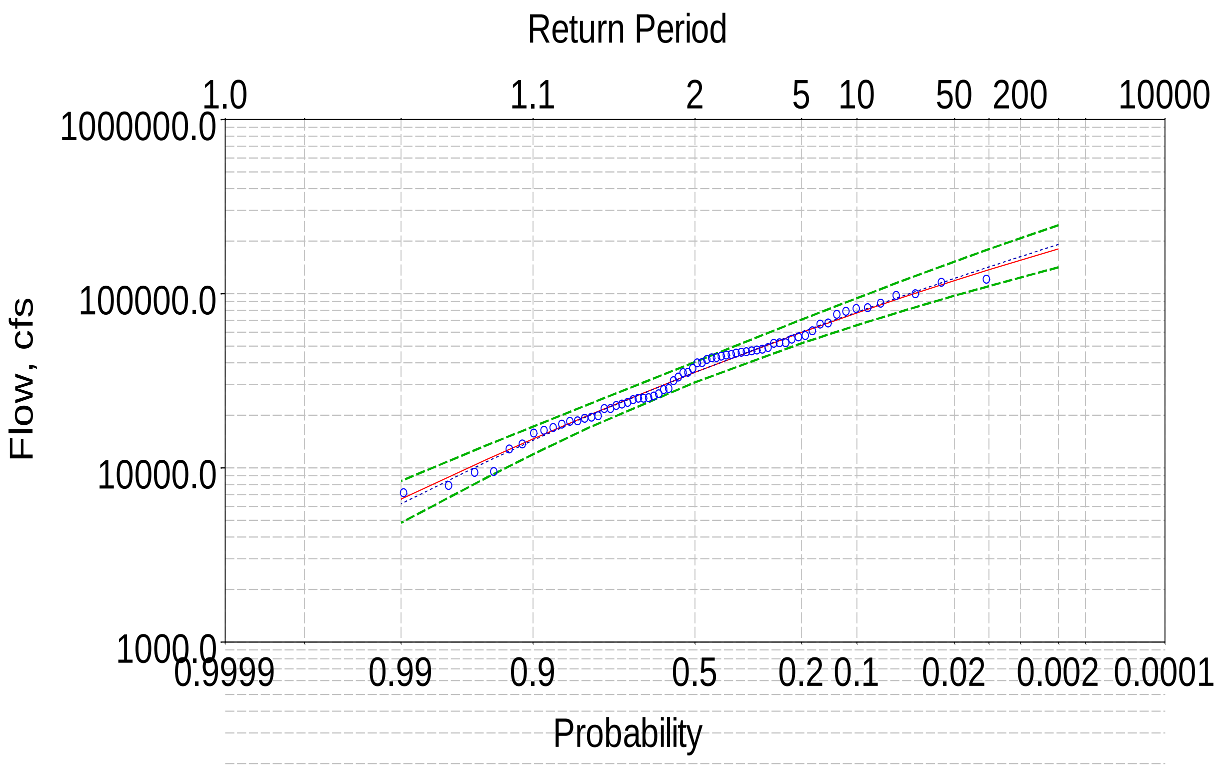
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	79,006	179,567	461,599	36,721
0.5	66,329	122,587	341,419	32,181
1.0	57,047	93,245	263,618	28,681
2.0	48,055	70,020	196,795	25,112
5.0	36,652	46,699	124,692	20,249
10.0	28,412	33,131	81,869	16,404
20.0	20,499	22,222	48,595	12,303
50.0	10,371	10,371	18,365	6,012
80.0	4,855	4,367	8,071	2,085
90.0	3,163	2,529	5,540	1,050
95.0	2,183	1,481	4,103	565
99.0	1,044	383	2,337	160



Log-Pearson type III frequency analysis for peak annual flow

T15 Trinity River near Midway

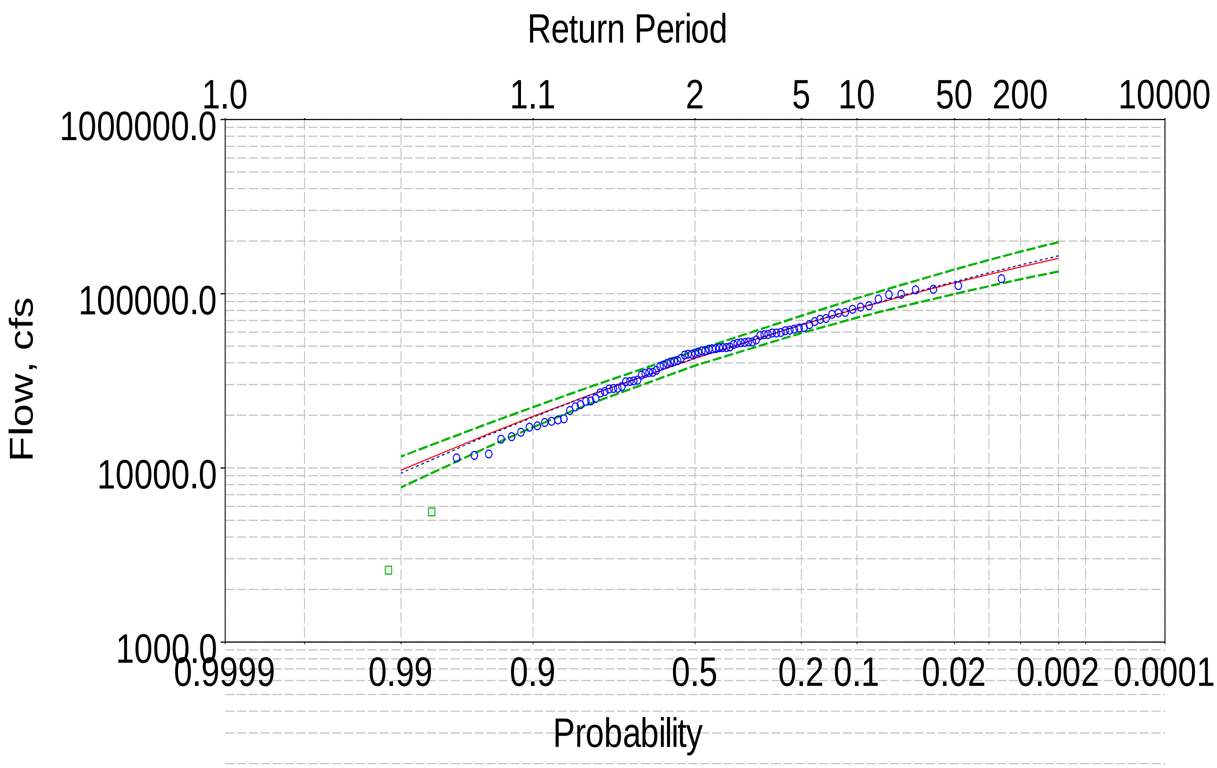
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	378,896	490,101	769,259	234,752
0.5	290,278	351,811	551,725	187,336
1.0	233,404	270,851	420,727	155,592
2.0	184,253	205,814	313,996	127,051
5.0	129,696	138,824	204,064	93,705
10.0	95,277	99,394	140,476	71,349
20.0	65,877	67,319	90,770	50,982
50.0	32,966	32,966	42,121	25,771
80.0	16,790	16,453	21,706	12,171
90.0	11,882	11,432	15,841	8,085
95.0	8,963	8,431	12,341	5,750
99.0	5,328	4,688	7,867	3,035



Log-Pearson type III frequency analysis for peak annual flow

T16 Trinity River at Riverside

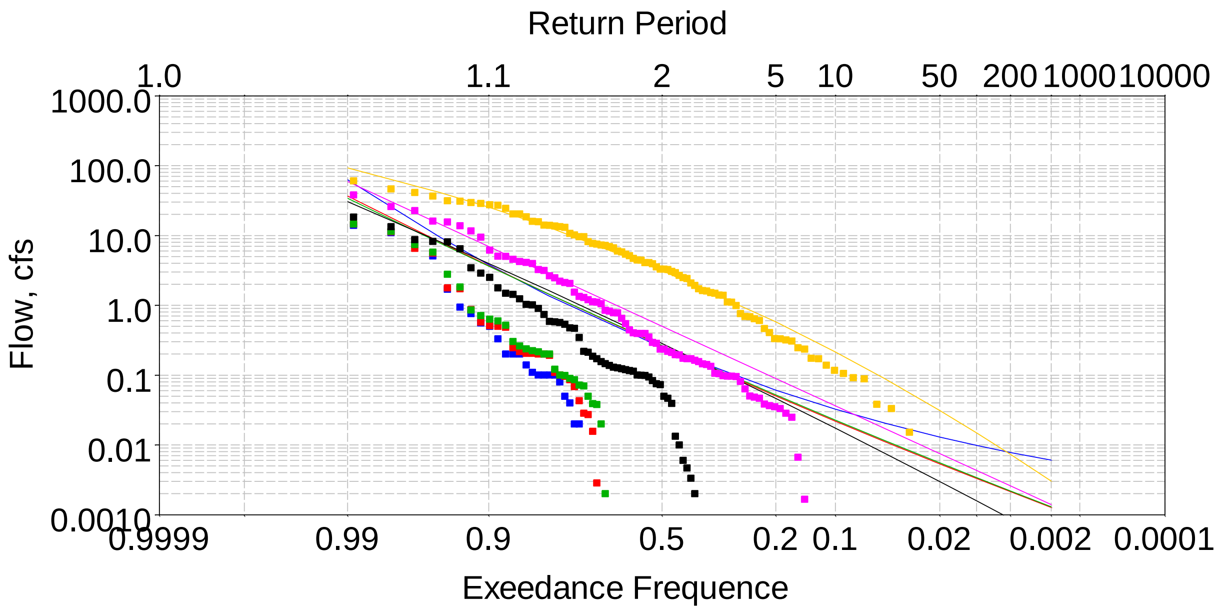
Change Exceedance	Computed Curve	Expected Curve	Confidence Limits Flow in cfs	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	180,387	191,905	246,912	141,422
0.5	155,343	163,039	207,944	123,745
1.0	136,808	142,261	179,765	110,424
2.0	118,613	122,260	152,719	97,113
5.0	95,017	96,940	118,701	79,426
10.0	77,407	78,415	94,238	65,821
20.0	59,784	60,205	70,748	51,726
50.0	35,337	35,337	40,411	30,939
80.0	20,016	19,846	23,112	16,943
90.0	14,615	14,370	17,240	11,949
95.0	11,170	10,868	13,488	8,820
99.0	6,595	6,201	8,401	4,826



Log-Pearson type III frequency analysis for peak annual flow

T17 Trinity River at Romayor

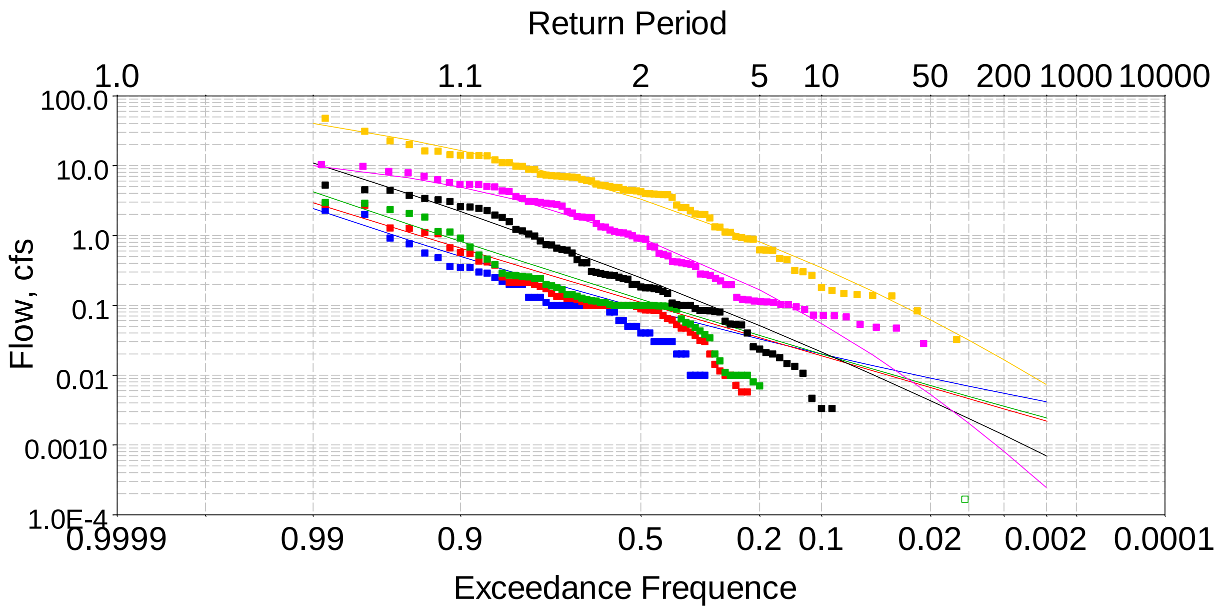
Change Exceedance	**Computed Curve**	**Expected Curve**	**Confidence Limits Flow in cfs**	
Percent	Flow in cfs	Flow in cfs	0.05	0.95
0.2	159,403	164,848	197,689	133,962
0.5	142,138	145,969	173,828	120,713
1.0	128,783	131,622	155,651	110,336
2.0	115,127	117,114	137,341	99,591
5.0	96,480	97,603	112,857	84,657
10.0	81,738	82,358	93,997	72,587
20.0	66,113	66,389	74,597	59,451
50.0	42,509	42,509	46,858	38,604
80.0	26,034	25,893	28,923	23,109
90.0	19,749	19,535	22,306	17,098
95.0	15,554	15,282	17,892	13,127
99.0	9,681	9,299	11,616	7,720



Minimum Volume-Duration Frequency Analysis for Double Mountain Fork near Aspermont B1

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	63	37	34	31	59	93
95.0	10	8	8	8	15	41
90.0	4	4	4	4	7	25
80.0	1	2	2	2	3	13
50.0	0	0	0	0	1	3
20.0	0	0	0	0	0	1
10.0	0	0	0	0	0	0
5.0	0	0	0	0	0	0
2.0	0	0	0	0	0	0
1.0	0	0	0	0	0	0
0.5	0	0	0	0	0	0
0.2	0	0	0	0	0	0

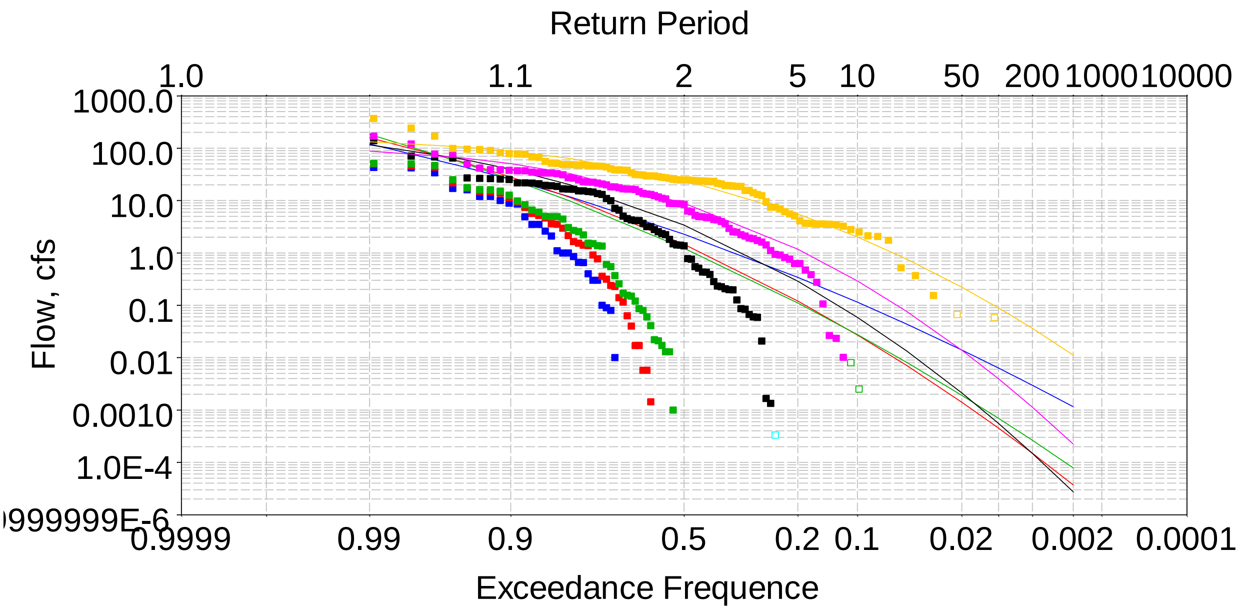
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.512	-0.562	-0.555	-0.567	-0.3	0.418
Standard Dev.	0.822	0.87	0.86	0.921	0.89	0.819
Station Skew	0.684	0.162	0.138	-0.134	0.005	-0.582



Minimum Volume-Duration Frequency Analysis for Salt Fork Brazos River near Aspermont B2

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	2.4	2.9	4.2	10.9	10.0	40.1
95.0	0.9	1.1	1.4	3.9	6.7	23.4
90.0	0.5	0.7	0.8	2.2	4.9	16.5
80.0	0.3	0.4	0.4	1.1	3.1	10.2
50.0	0.1	0.1	0.1	0.2	0.9	3.3
20.0	0.0	0.0	0.0	0.1	0.2	0.8
10.0	0.0	0.0	0.0	0.0	0.1	0.3
5.0	0.0	0.0	0.0	0.0	0.0	0.2
2.0	0.0	0.0	0.0	0.0	0.0	0.1
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

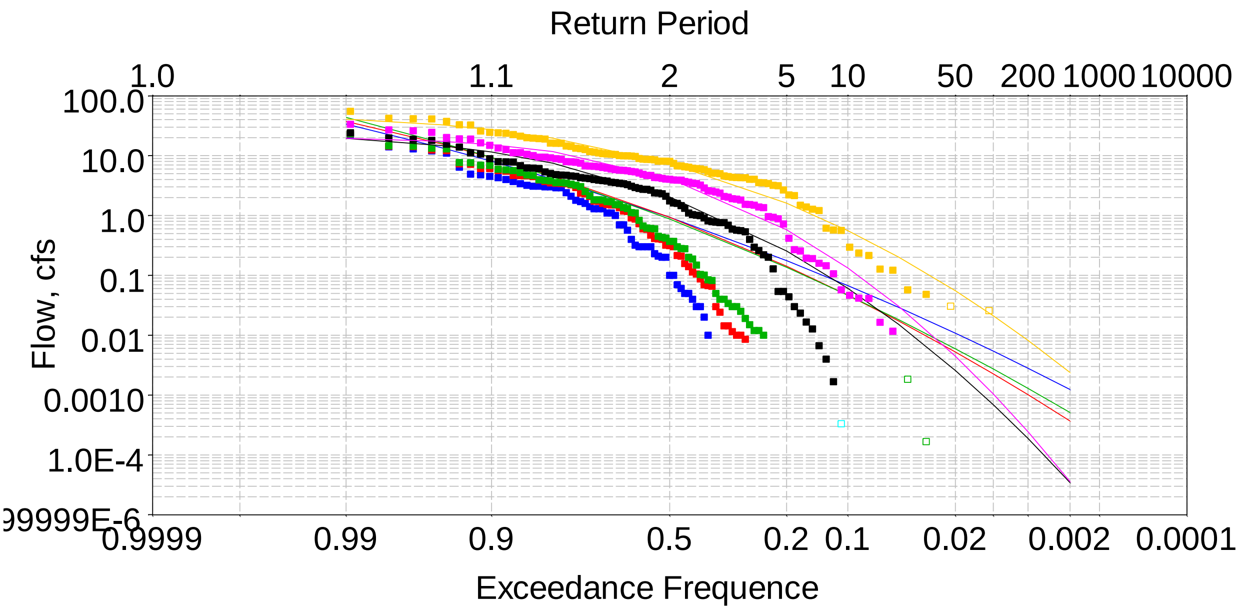
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-1.017	-0.955	-0.899	-0.642	-0.186	0.434
Standard Dev.	0.548	0.603	0.630	0.787	0.802	0.671
Station Skew	0.321	0.044	0.128	-0.259	-1.158	-0.786



Minimum Volume-Duration Frequency Analysis for Brazos River near Seymour B3

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	120.5	159.0	183.5	116.0	87.9	132.4
95.0	45.0	54.7	53.3	62.3	65.4	106.0
90.0	25.1	28.1	25.6	39.6	50.5	87.4
80.0	11.7	11.4	9.8	20.0	32.7	63.3
50.0	2.3	1.5	1.2	3.4	8.9	24.4
20.0	0.3	0.1	0.1	0.3	1.2	5.6
10.0	0.1	0.0	0.0	0.1	0.3	2.0
5.0	0.0	0.0	0.0	0.0	0.1	0.8
2.0	0.0	0.0	0.0	0.0	0.0	0.2
1.0	0.0	0.0	0.0	0.0	0.0	0.1
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

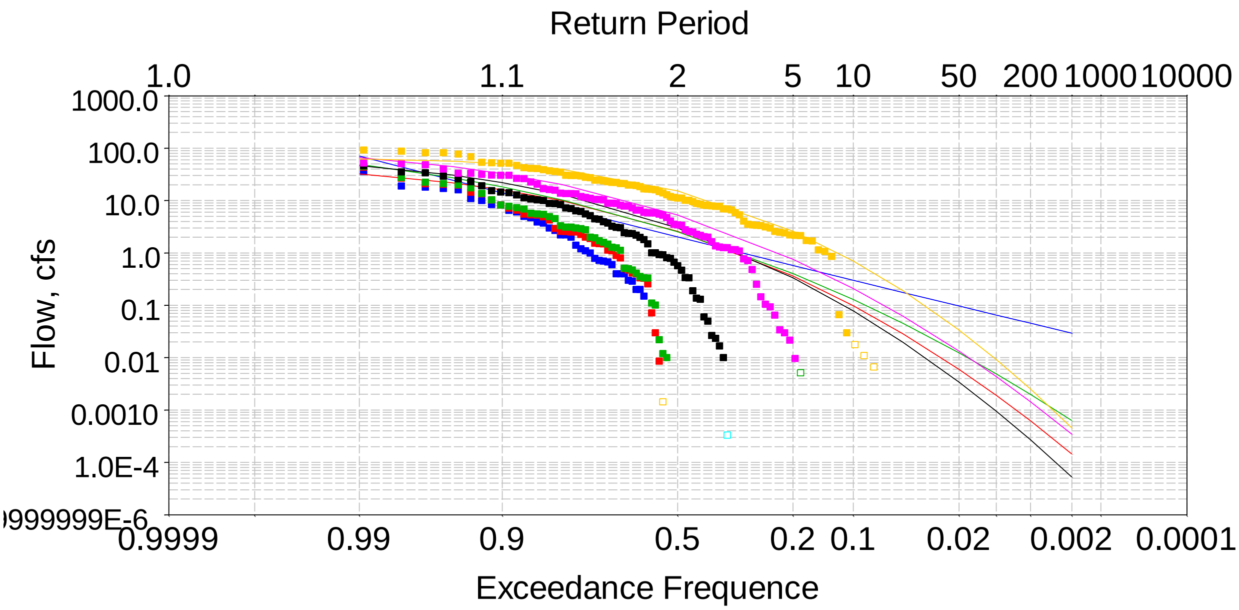
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.278	0.028	-0.012	0.321	0.730	1.228
Standard Dev.	0.922	1.199	1.169	1.156	0.948	0.691
Station Skew	-0.500	-0.691	-0.511	-1.114	-1.460	-1.440



Minimum Volume-Duration Frequency Analysis for Clear Fork Brazos near Nugent B4

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	33.7	37.5	43.6	19.4	19.4	40.6
95.0	13.7	15.8	16.6	14.7	17.4	32.8
90.0	8.1	9.3	9.3	11.5	15.3	27.1
80.0	4.1	4.6	4.4	7.5	11.7	19.6
50.0	0.9	0.9	0.9	2.0	4.1	7.4
20.0	0.2	0.1	0.1	0.3	0.6	1.6
10.0	0.1	0.0	0.0	0.1	0.1	0.6
5.0	0.0	0.0	0.0	0.0	0.0	0.2
2.0	0.0	0.0	0.0	0.0	0.0	0.1
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

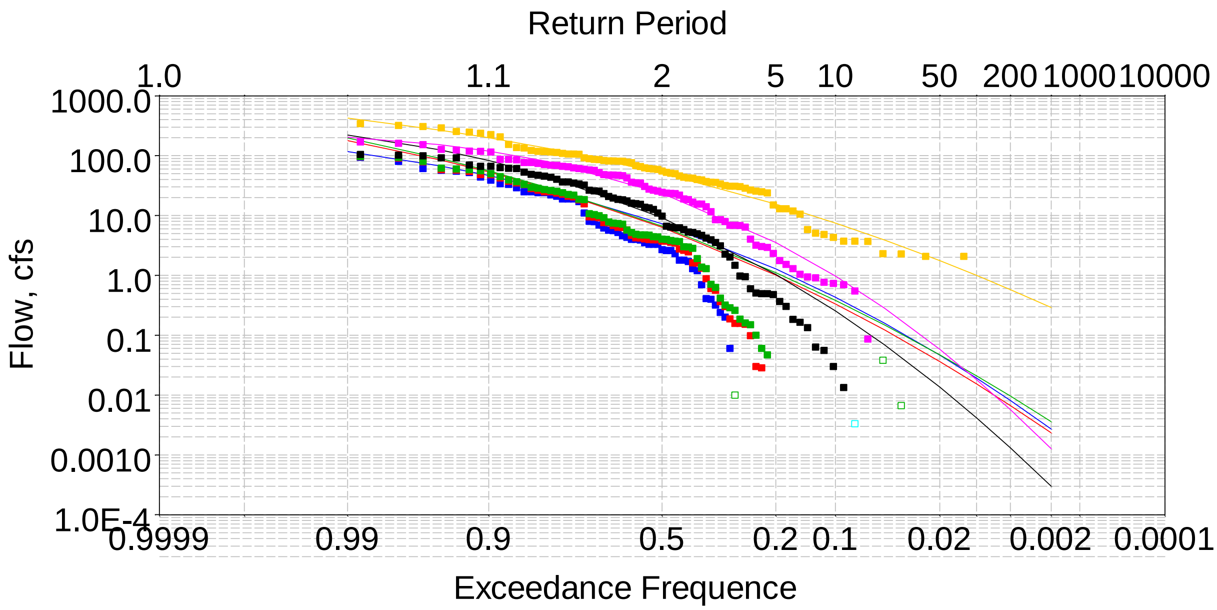
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.092	-0.122	-0.133	0.076	0.338	0.702
Standard Dev.	0.817	0.911	0.906	0.970	0.930	0.715
Station Skew	-0.464	-0.624	-0.499	-1.512	-1.936	-1.483



Minimum Volume-Duration Frequency Analysis for Clear Fork Brazos near Fort Griffin B5

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	70.7	32.1	49.5	46.4	65.9	62.1
95.0	24.6	21.8	27.3	30.7	44.4	56.4
90.0	14.1	16.1	18.3	22.1	32.6	50.1
80.0	7.2	9.9	10.3	13.0	20.1	39.1
50.0	2.0	2.6	2.5	3.0	5.3	15.3
20.0	0.6	0.4	0.4	0.3	0.8	2.6
10.0	0.3	0.1	0.1	0.1	0.2	0.7
5.0	0.2	0.0	0.0	0.0	0.1	0.2
2.0	0.1	0.0	0.0	0.0	0.0	0.0
1.0	0.1	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

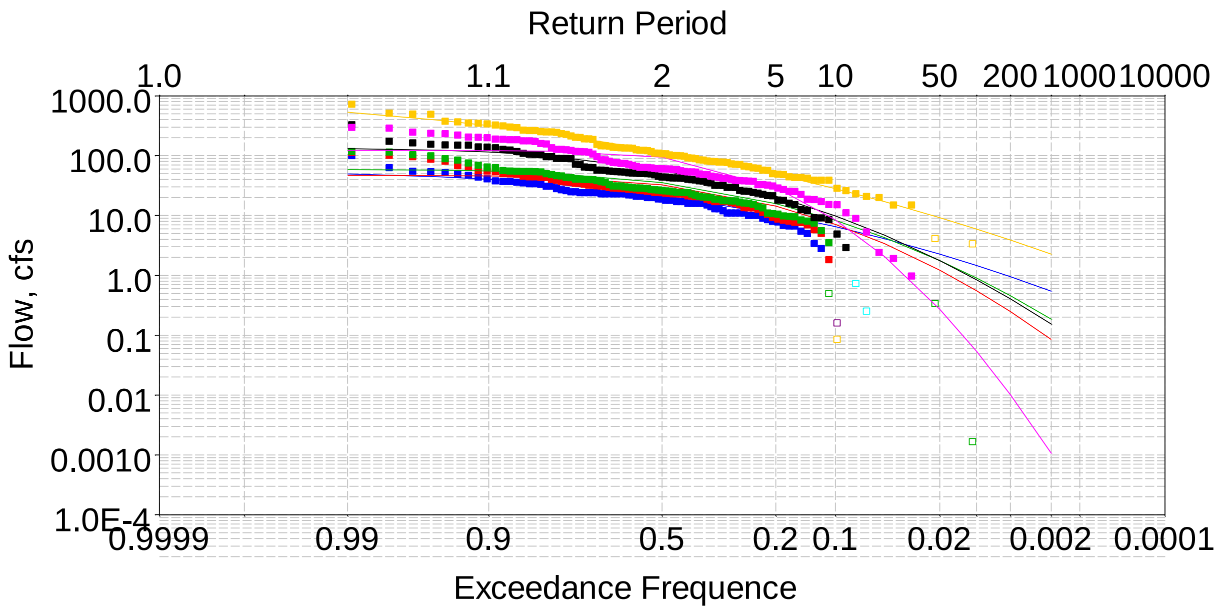
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.309	0.223	0.271	0.259	0.538	0.937
Standard Dev.	0.653	0.920	0.868	1.021	0.910	0.834
Station Skew	0.047	-1.280	-0.927	-1.306	-1.262	-1.922



Minimum Volume-Duration Frequency Analysis for Brazos River near South Bend B6

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	117.2	178.6	198.0	220.6	202.9	425.9
95.0	67.7	85.4	90.8	125.0	152.8	268.2
90.0	46.5	53.4	55.9	82.8	119.5	199.3
80.0	27.2	28.1	29.0	44.8	79.2	132.2
50.0	7.3	6.4	6.6	9.2	23.5	51.0
20.0	1.3	1.0	1.1	1.0	3.5	15.5
10.0	0.4	0.3	0.4	0.3	1.0	7.5
5.0	0.2	0.1	0.1	0.1	0.3	3.9
2.0	0.0	0.0	0.0	0.0	0.1	1.8
1.0	0.0	0.0	0.0	0.0	0.0	1.0
0.5	0.0	0.0	0.0	0.0	0.0	0.6
0.2	0.0	0.0	0.0	0.0	0.0	0.3

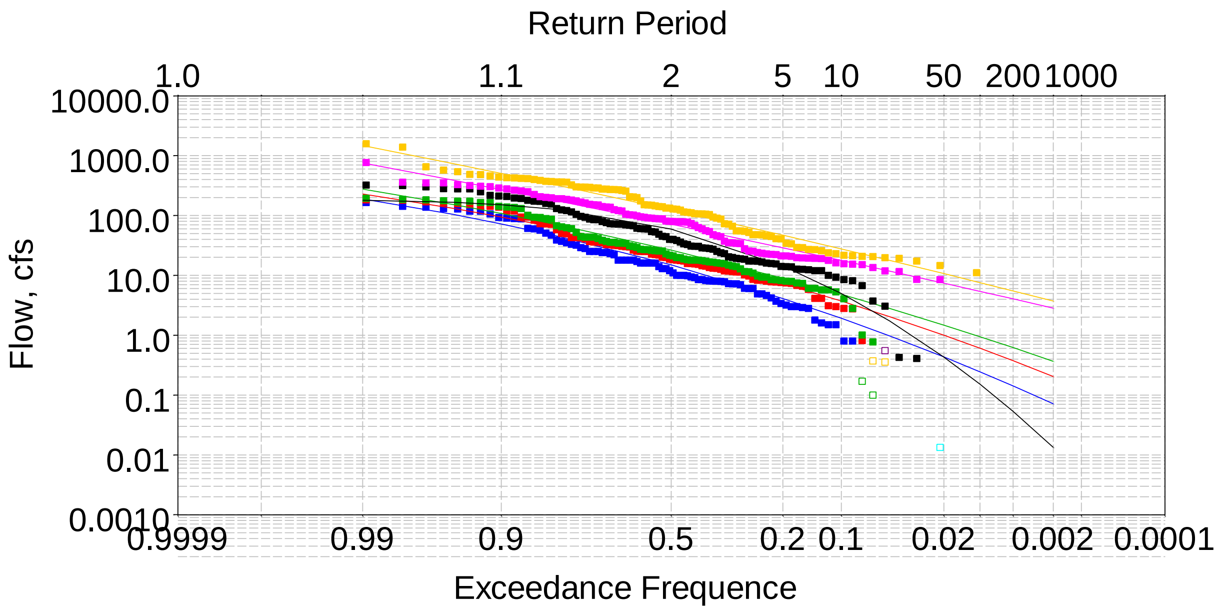
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.734	0.695	0.727	0.781	1.167	1.634
Standard Dev.	0.820	0.879	0.859	1.026	0.883	0.569
Station Skew	-0.946	-0.748	-0.671	-1.093	-1.442	-0.777



Minimum Volume-Duration Frequency Analysis for Brazos River near Palo Pinto B7

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	49.5	46.5	58.2	131.2	120.9	532.0
95.0	44.3	46.3	57.2	123.6	120.9	389.6
90.0	40.2	45.8	55.5	115	120.8	317
80.0	34.3	43.8	51.4	99.4	119.3	237.1
50.0	21.6	32.6	35.5	57.6	94.5	118.5
20.0	10.6	14.4	15.8	20.9	29.3	48.7
10.0	6.5	7.1	8.3	9.9	8.4	28.1
5.0	4.1	3.4	4.3	4.7	2.1	17
2.0	2.3	1.2	1.8	1.8	0.3	9.2
1.0	1.5	0.6	0.9	0.8	0.1	5.9
0.5	1	0.2	0.5	0.4	0	3.9
0.2	0.5	0.1	0.2	0.2	0	2.3

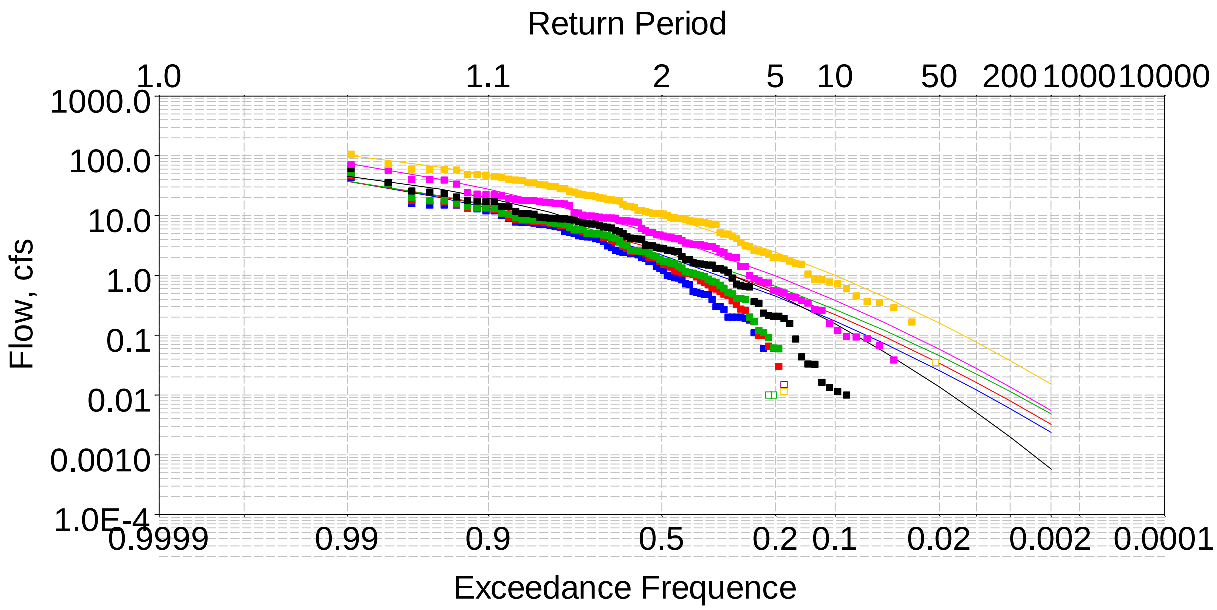
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.259	1.359	1.419	1.620	1.687	2.014
Standard Dev.	0.333	0.412	0.392	0.477	0.698	0.422
Station Skew	-1.416	-2.672	-2.258	-1.889	-3.534	-0.864



Minimum Volume-Duration Frequency Analysis for Brazos River near Glen Rose B8

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	189.9	228.0	276.7	179.6	755.6	1476.0
95.0	104.2	132.0	152.6	166.6	388.0	737.8
90.0	72.2	94.7	107.8	151.9	269.9	504.3
80.0	44.2	60.9	68.7	125.0	172.6	314.9
50.0	14.9	23.1	26.4	59.2	71.7	124.0
20.0	4.1	7.3	8.9	14.3	28.9	46.8
10.0	1.9	3.7	4.8	5.0	17.8	27.7
5.0	1.0	2.0	2.8	1.7	11.8	17.8
2.0	0.4	1.0	1.5	0.4	7.4	10.7
1.0	0.2	0.6	0.9	0.2	5.4	7.6
0.5	0.1	0.4	0.6	0.1	4.0	5.5
0.2	0.1	0.2	0.4	0.0	2.8	3.7

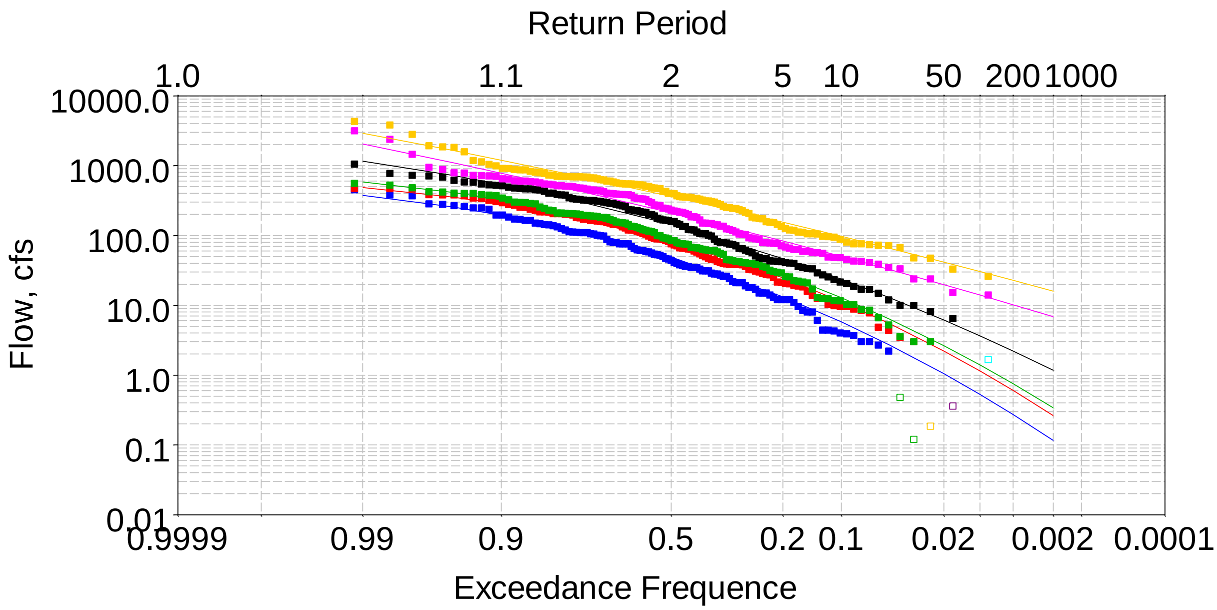
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.111	1.309	1.382	1.572	1.846	2.081
Standard Dev.	0.623	0.556	0.531	0.669	0.461	0.492
Station Skew	-0.611	-0.589	-0.446	-1.937	-0.120	-0.156



Minimum Volume-Duration Frequency Analysis for North Bosque River near Clifton B9

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	37.6	37.4	37.5	45.3	74.6	101.8
95.0	20.1	21.1	21.5	27.8	40.7	64.7
90.0	13.5	14.5	15.0	19.6	27.6	47.5
80.0	7.8	8.7	9.1	11.6	16.1	30.5
50.0	2.2	2.6	2.8	3.1	4.7	10.3
20.0	0.4	0.6	0.7	0.5	1.0	2.4
10.0	0.2	0.2	0.3	0.2	0.4	1.0
5.0	0.1	0.1	0.1	0.1	0.2	0.4
2.0	0.0	0.0	0.0	0.0	0.1	0.2
1.0	0.0	0.0	0.0	0.0	0.0	0.1
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

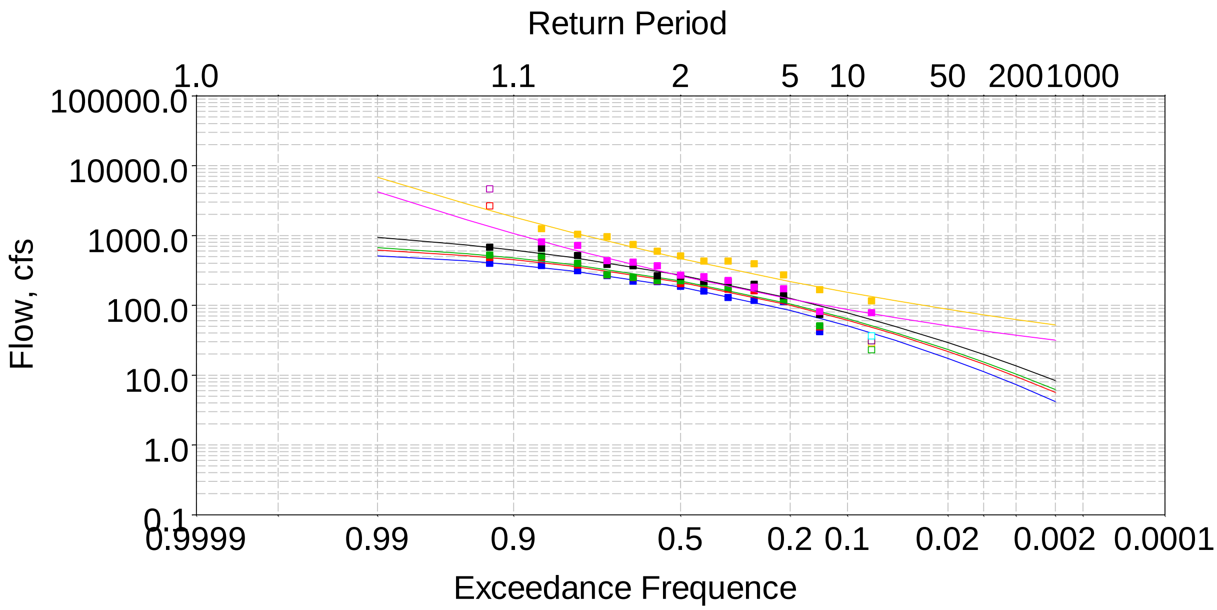
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.244	0.315	0.362	0.338	0.573	0.906
Standard Dev.	0.755	0.728	0.697	0.857	0.742	0.677
Station Skew	-0.757	-0.804	-0.792	-1.070	-0.772	-0.946



Minimum Volume-Duration Frequency Analysis for Brazos River at Waco B10

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	376	484	586	1,155	2,043	2,914
95.0	255	354	414	724	1,099	1,645
90.0	195	282	324	539	778	1,197
80.0	131	201	227	360	505	805
50.0	49	83	93	144	211	362
20.0	13	25	28	47	84	155
10.0	6	11	13	24	50	97
5.0	3	6	6	13	33	66
2.0	1	2	3	6	20	42
1.0	1	1	1	4	14	30
0.5	0	1	1	2	10	23
0.2	0	0	0	1	7	16

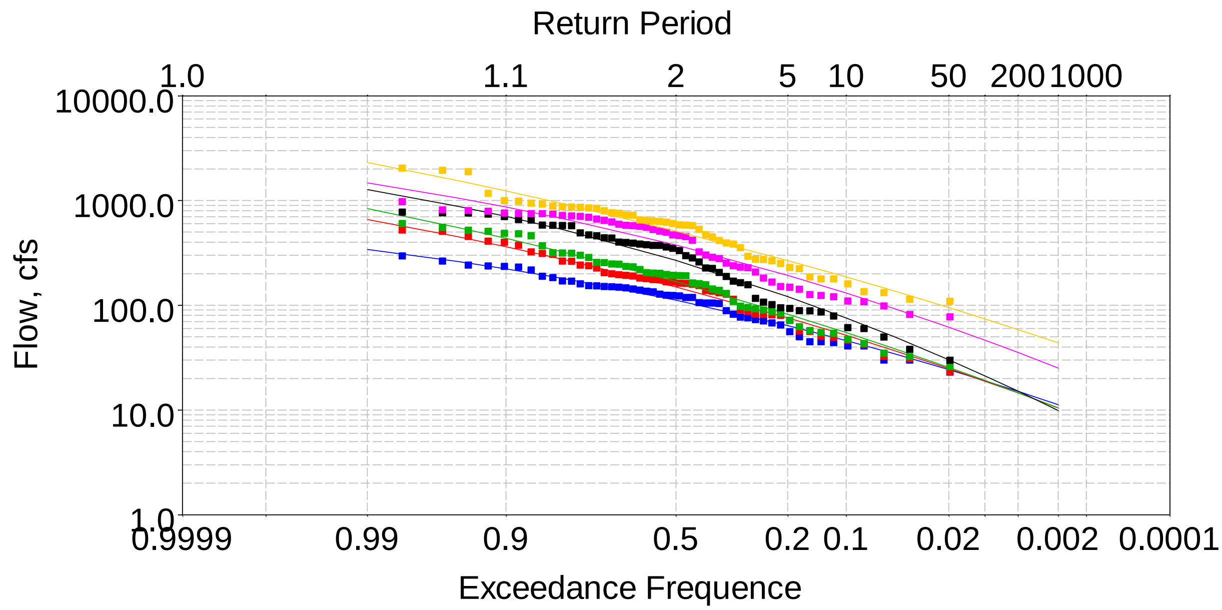
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.591	1.819	1.872	2.094	2.307	2.543
Standard Dev.	0.619	0.570	0.569	0.540	0.465	0.426
Station Skew	-0.998	-1.099	-1.019	-0.717	-0.231	-0.221



Minimum Volume-Duration Frequency Analysis for Brazos River near Marlin B11

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	510	619	668	939	4,224	6,813
95.0	432	515	549	733	1,676	2,835
90.0	381	449	476	619	1,064	1,833
80.0	312	366	385	487	635	1,113
50.0	183	213	223	271	262	467
20.0	85	100	104	126	123	218
10.0	51	61	64	78	87	153
5.0	32	39	41	50	67	116
2.0	17	22	23	29	51	87
1.0	11	14	15	20	43	73
0.5	7	10	10	14	37	63
0.2	4	6	6	8	32	52

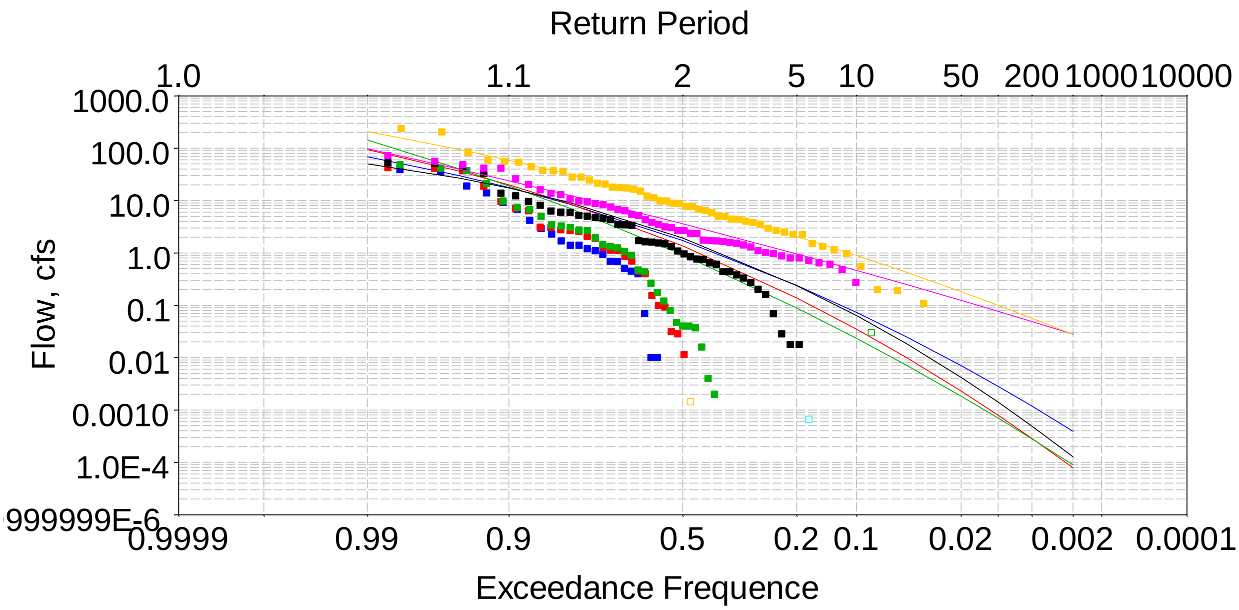
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.190	2.262	2.284	2.377	2.457	2.703
Standard Dev.	0.361	0.355	0.355	0.363	0.430	0.424
Station Skew	-1.222	-1.140	-1.093	-0.930	0.549	0.470



Minimum Volume-Duration Frequency Analysis for Brazos River near Highbank B12

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	341	659	837	1,272	1,478	2,312
95.0	262	451	553	883	1,059	1,549
90.0	223	362	436	705	867	1,234
80.0	180	273	321	523	666	925
50.0	112	150	169	269	376	512
20.0	64	76	82	121	193	268
10.0	46	52	55	76	131	186
5.0	35	37	39	50	93	137
2.0	24	25	26	30	62	95
1.0	19	19	19	21	47	74
0.5	15	15	15	15	35	59
0.2	11	11	10	10	25	44

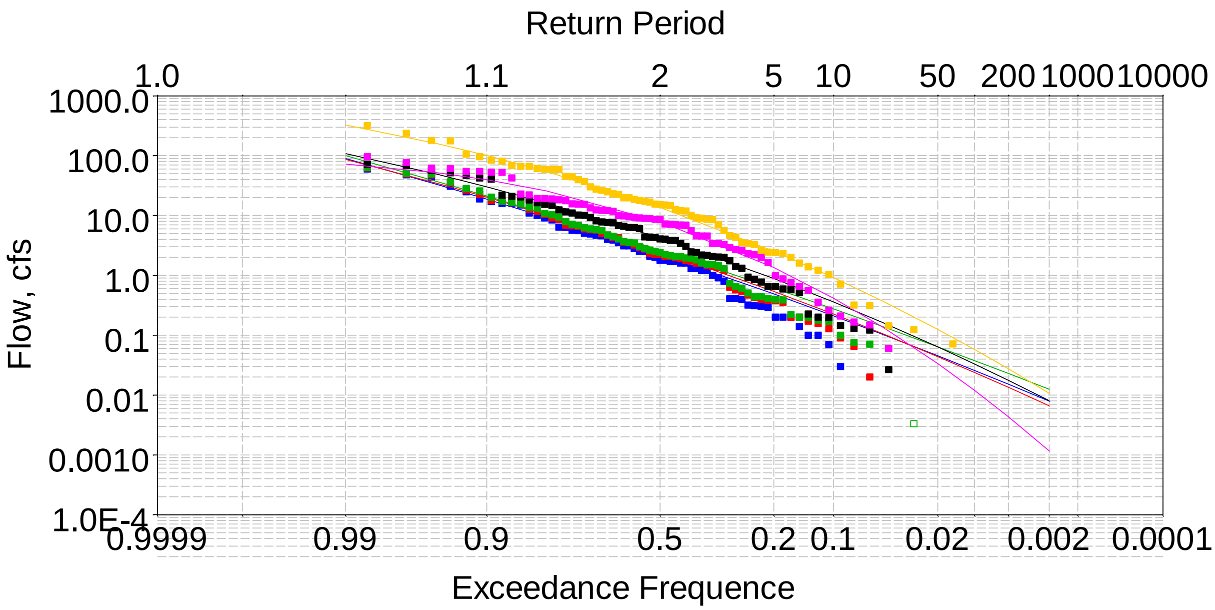
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.022	2.151	2.204	2.389	2.546	2.692
Standard Dev.	0.270	0.332	0.353	0.384	0.324	0.321
Station Skew	-0.587	-0.429	-0.392	-0.622	-0.540	-0.318



Minimum Volume-Duration Frequency Analysis for Leon River near Hamilton B13

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	68.8	94.4	144.0	50.4	98.2	208.5
95.0	29.8	36.4	40.2	26.9	39.5	93.8
90.0	17.7	19.9	19.1	17.4	23.8	58.8
80.0	8.7	8.8	7.2	9.2	12.7	32.1
50.0	1.7	1.4	0.9	1.9	3.6	8.9
20.0	0.2	0.1	0.1	0.2	1.0	2.1
10.0	0.1	0.0	0.0	0.1	0.5	0.9
5.0	0.0	0.0	0.0	0.0	0.3	0.4
2.0	0.0	0.0	0.0	0.0	0.1	0.2
1.0	0.0	0.0	0.0	0.0	0.1	0.1
0.5	0.0	0.0	0.0	0.0	0.0	0.1
0.2	0.0	0.0	0.0	0.0	0.0	0.0

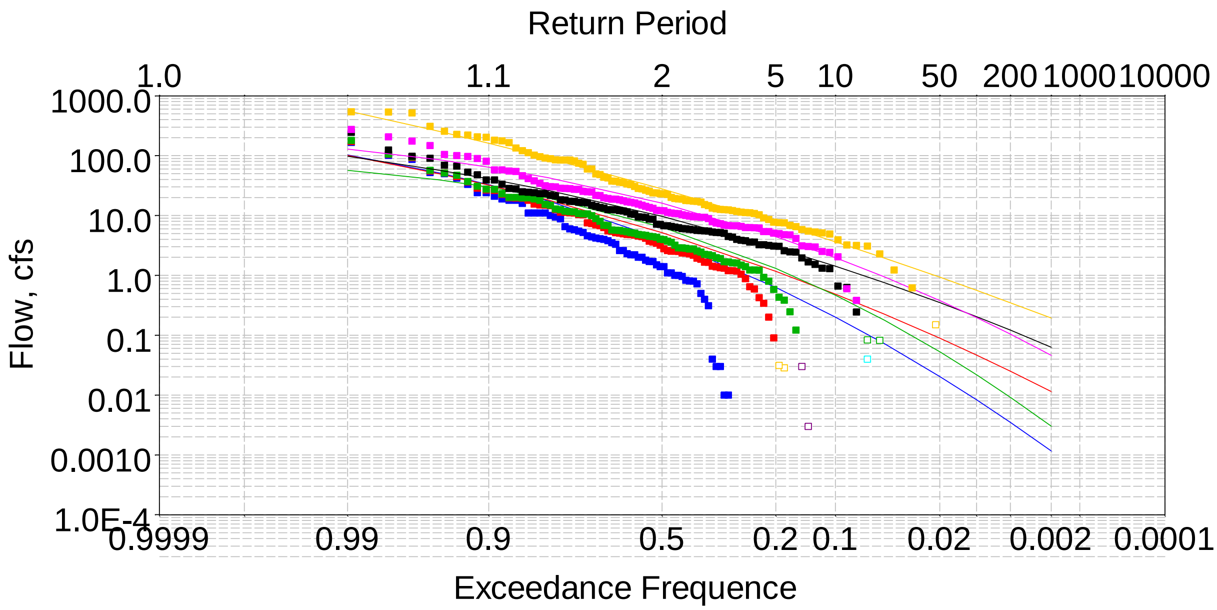
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.126	0.005	-0.120	0.125	0.536	0.895
Standard Dev.	0.947	1.096	1.145	0.987	0.669	0.715
Station Skew	-0.699	-0.712	-0.452	-0.986	-0.202	-0.449



Minimum Volume-Duration Frequency Analysis for Leon River near Gatesville B14

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	89.8	86.5	99.9	108.4	72.5	325.5
95.0	32.9	34.4	36.7	48.7	51.9	158.3
90.0	18.8	20.3	21.1	30.2	39.7	100.8
80.0	9.3	10.3	10.6	16.2	25.9	54.7
50.0	2.2	2.5	2.6	4.2	7.9	13.7
20.0	0.5	0.5	0.6	0.9	1.3	2.5
10.0	0.2	0.2	0.3	0.4	0.4	0.9
5.0	0.1	0.1	0.1	0.2	0.1	0.4
2.0	0.0	0.0	0.1	0.1	0.0	0.1
1.0	0.0	0.0	0.0	0.0	0.0	0.1
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

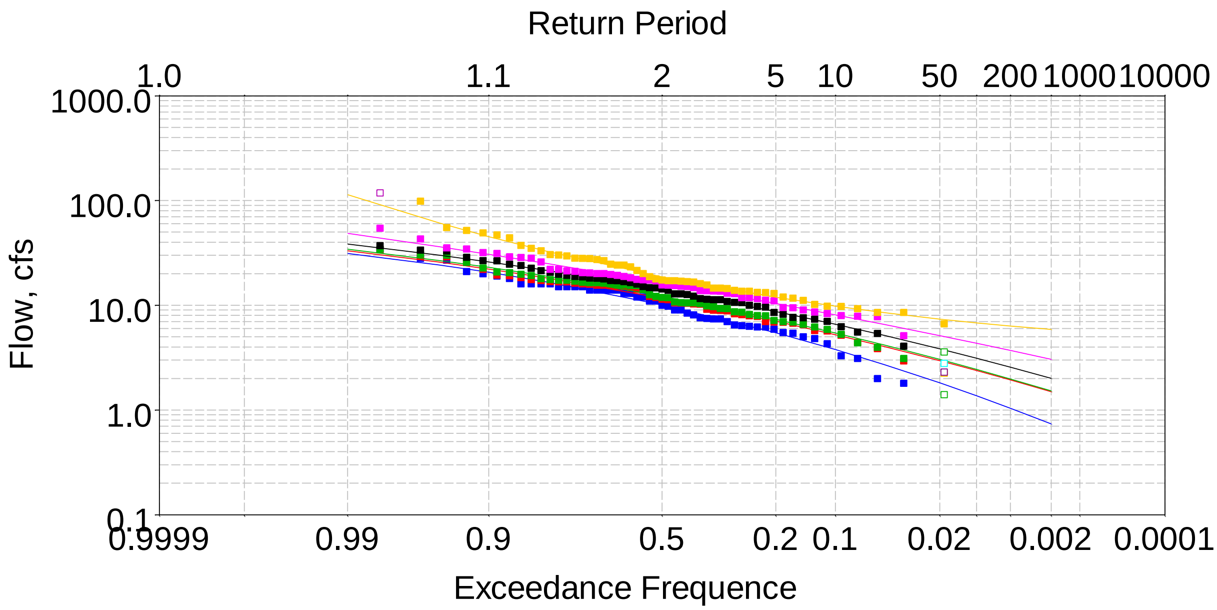
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.320	0.359	0.398	0.560	0.722	1.043
Standard Dev.	0.762	0.766	0.736	0.758	0.824	0.810
Station Skew	-0.247	-0.359	-0.204	-0.512	-1.301	-0.691



Minimum Volume-Duration Frequency Analysis for Leon River near Belton B15

Exceedance Frequency (percent)	**1 Day Cfs**	**7 Day Cfs**	**10 Day Cfs**	**30 Day Cfs**	**60 Day Cfs**	**120 Day Cfs**
99.0	103	101	57	98	129	559
95.0	52	50	39	57	85	253
90.0	33	32	30	41	64	161
80.0	18	18	20	26	43	91
50.0	4	5	6	10	16	28
20.0	1	1	1	3	4	8
10.0	0	1	1	1	2	4
5.0	0	0	0	1	1	2
2.0	0	0	0	0	0	1
1.0	0	0	0	0	0	1
0.5	0	0	0	0	0	0
0.2	0	0	0	0	0	0

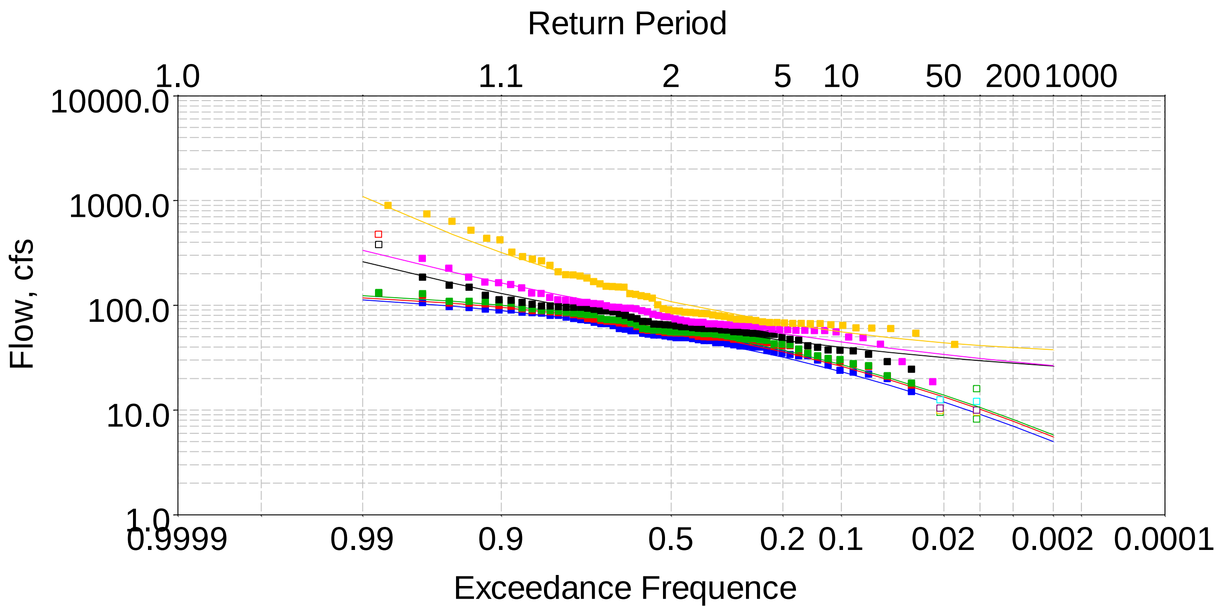
Simple Statistics	**1 Day**	**7 Day**	**10 Day**	**30 Day**	**60 Day**	**120 Day**
Mean	0.487	0.642	0.664	0.924	1.112	1.407
Standard Dev.	0.885	0.719	0.743	0.579	0.611	0.645
Station Skew	-0.814	-0.584	-1.171	-0.652	-0.933	-0.336



Minimum Volume-Duration Frequency Analysis for Lampasas River near Kempner B16

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	31.2	33.2	34.4	38.3	48.6	113.8
95.0	24.2	25.8	26.8	30.0	36.2	61.1
90.0	20.6	22.1	23.0	26.0	30.6	45.3
80.0	16.6	18.1	18.9	21.4	24.9	32.4
50.0	10.1	11.7	12.2	14.1	16.3	18.7
20.0	5.5	7.0	7.3	8.7	10.4	11.9
10.0	3.8	5.2	5.4	6.6	8.1	9.8
5.0	2.7	4.0	4.2	5.2	6.6	8.5
2.0	1.8	3.0	3.0	3.8	5.1	7.4
1.0	1.4	2.4	2.4	3.1	4.3	6.8
0.5	1.0	1.9	2.0	2.6	3.7	6.3
0.2	0.7	1.5	1.5	2.0	3.0	5.9

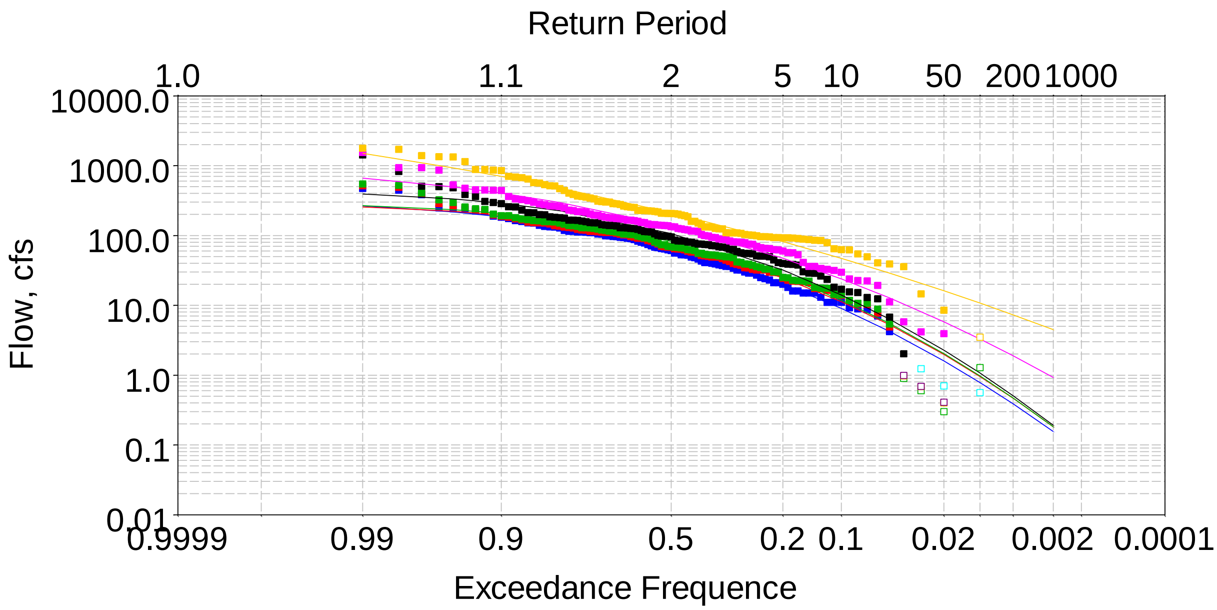
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.969	1.046	1.063	1.130	1.204	1.303
Standard Dev.	0.293	0.247	0.248	0.235	0.226	0.265
Station Skew	-0.721	-0.540	-0.561	-0.528	-0.252	0.735



Minimum Volume-Duration Frequency Analysis for Little River near Little River B17

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	112.3	117.7	123.3	260.8	334.6	1095.6
95.0	97.9	104.6	109.2	162.7	207.3	471.6
90.0	88.7	95.8	99.9	129.5	163.8	318.8
80.0	76.7	83.8	87.2	100.4	125.4	209.0
50.0	53.1	59.0	61.3	65.6	79.3	108.2
20.0	32.1	36.1	37.4	46.3	53.5	67.1
10.0	23.2	26.2	27.2	39.7	44.7	55.7
5.0	17.3	19.4	20.2	35.5	39.0	49.1
2.0	11.9	13.4	13.9	31.7	33.9	43.9
1.0	9.1	10.2	10.6	29.6	31.0	41.3
0.5	7.0	7.8	8.1	28.0	28.8	39.4
0.2	5.0	5.5	5.8	26.3	26.5	37.7

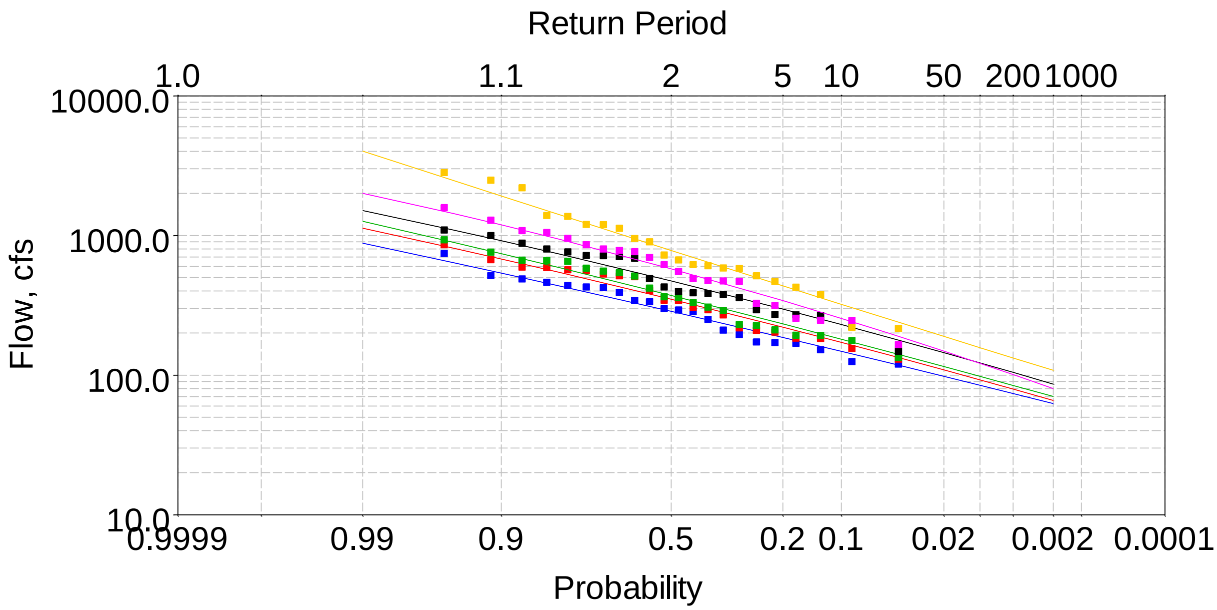
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.684	1.728	1.745	1.840	1.919	2.089
Standard Dev.	0.237	0.231	0.232	0.204	0.223	0.309
Station Skew	-1.059	-1.148	-1.133	0.699	0.548	1.082



Minimum Volume-Duration Frequency Analysis for Little River near Cameron B18

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	265	255	268	392	662	1,502
95.0	218	222	234	334	496	931
90.0	185	195	206	289	404	700
80.0	142	155	165	226	298	480
50.0	65	77	82	106	137	212
20.0	20	25	26	32	47	82
10.0	9	11	12	14	24	47
5.0	4	5	6	6	13	29
2.0	2	2	2	2	6	16
1.0	1	1	1	1	3	11
0.5	0	1	1	1	2	7
0.2	0	0	0	0	1	5

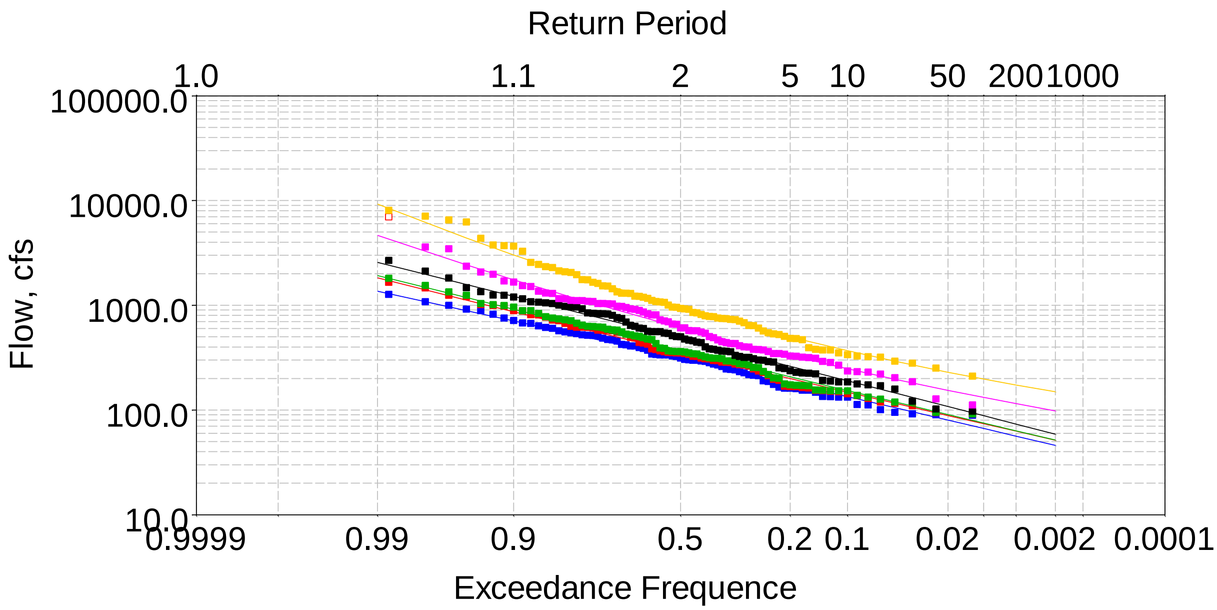
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.692	1.756	1.782	1.892	2.049	2.285
Standard Dev.	0.551	0.529	0.532	0.559	0.500	0.462
Station Skew	-1.388	-1.544	-1.572	-1.501	-1.064	-0.536



Minimum Volume-Duration Frequency Analysis for Brazos River at SH 21 near Bryan B19

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	881	1,126	1,263	1,510	2,003	4,019
95.0	640	812	893	1,096	1,435	2,477
90.0	538	678	740	917	1,189	1,916
80.0	434	543	586	735	938	1,406
50.0	286	349	372	473	578	780
20.0	186	220	233	297	341	435
10.0	148	171	181	230	255	321
5.0	122	139	147	186	199	250
2.0	98	109	115	145	148	189
1.0	85	93	98	122	122	157
0.5	74	80	84	105	101	133
0.2	63	66	70	86	80	108

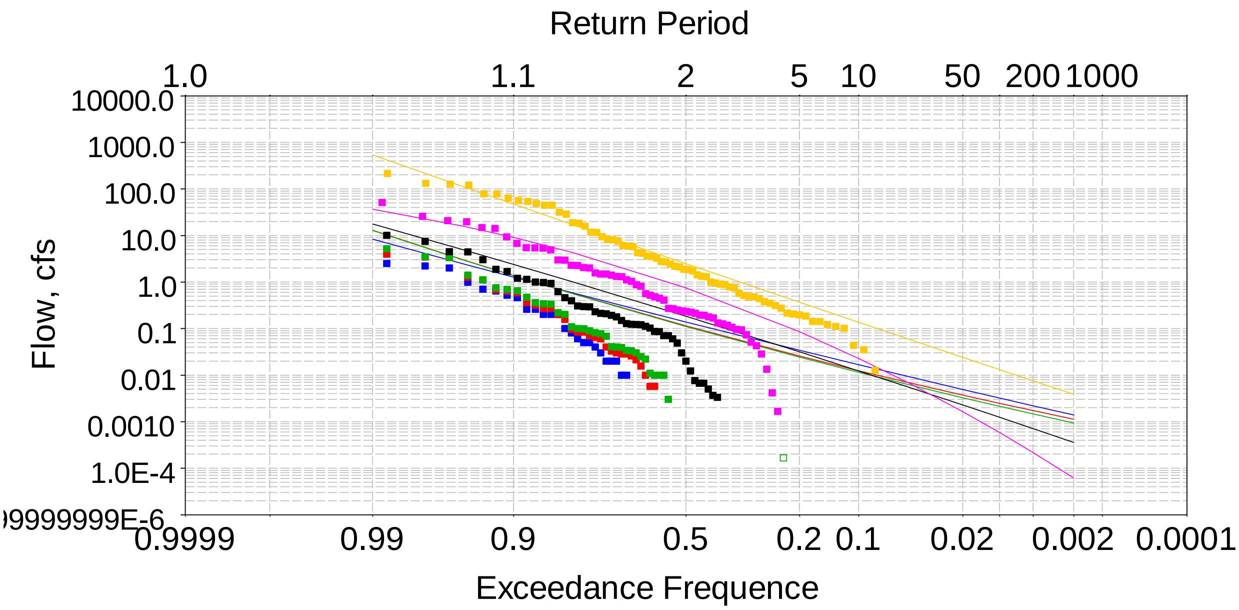
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.453	2.537	2.566	2.667	2.749	2.894
Standard Dev.	0.219	0.233	0.239	0.235	0.262	0.303
Station Skew	-0.101	-0.162	-0.112	-0.196	-0.290	0.030



Minimum Volume-Duration Frequency Analysis for Brazos River near Bryan B20

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,364	1,828	1,926	2,567	4,652	9,257
95.0	890	1,122	1,186	1,578	2,428	4,385
90.0	708	867	917	1,216	1,749	3,026
80.0	535	636	672	887	1,197	1,980
50.0	311	355	373	483	610	947
20.0	180	199	208	262	332	497
10.0	134	148	154	190	248	368
5.0	105	116	120	146	197	292
2.0	80	89	90	108	154	230
1.0	67	74	75	88	132	197
0.5	56	63	63	73	115	173
0.2	46	52	52	59	98	149

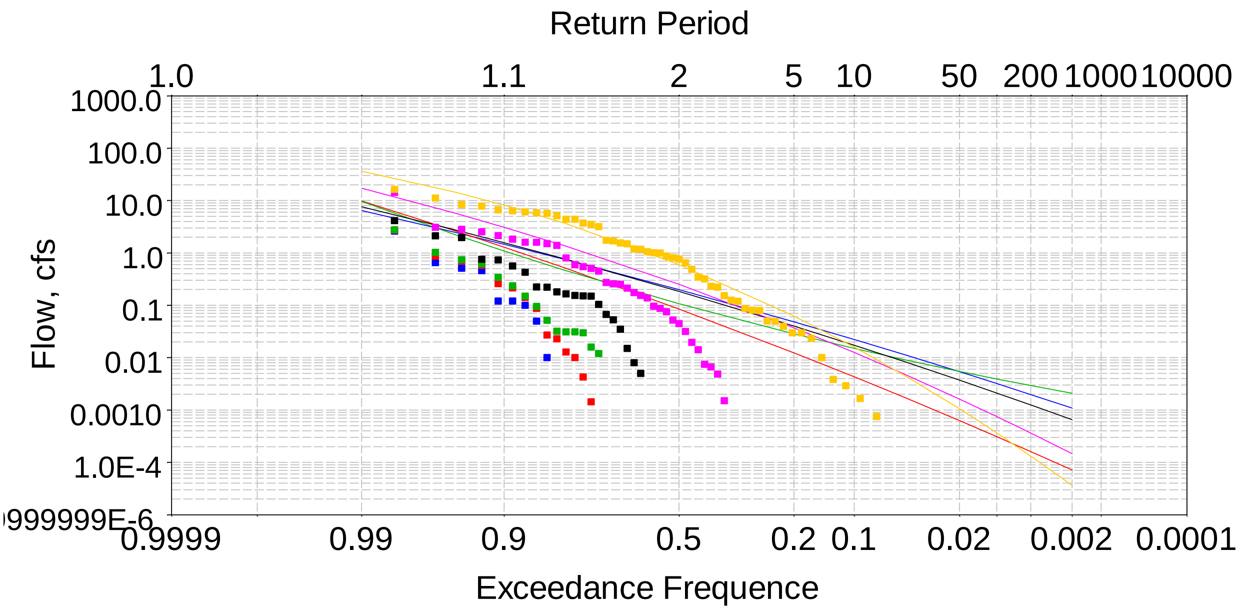
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.490	2.553	2.573	2.683	2.805	3.005
Standard Dev.	0.282	0.299	0.303	0.315	0.333	0.360
Station Skew	-0.053	0.059	0.031	-0.022	0.364	0.478



Minimum Volume-Duration Frequency Analysis for Yegua Creek near Somerville B21

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	8.3	12.9	12.8	17.8	36.5	535.5
95.0	2.4	2.9	2.9	4.9	15.6	109.3
90.0	1.3	1.4	1.4	2.4	9.1	47.1
80.0	0.6	0.6	0.6	1.0	4.3	17.1
50.0	0.1	0.1	0.1	0.2	0.8	2.5
20.0	0.0	0.0	0.0	0.0	0.1	0.4
10.0	0.0	0.0	0.0	0.0	0.0	0.1
5.0	0.0	0.0	0.0	0.0	0.0	0.1
2.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

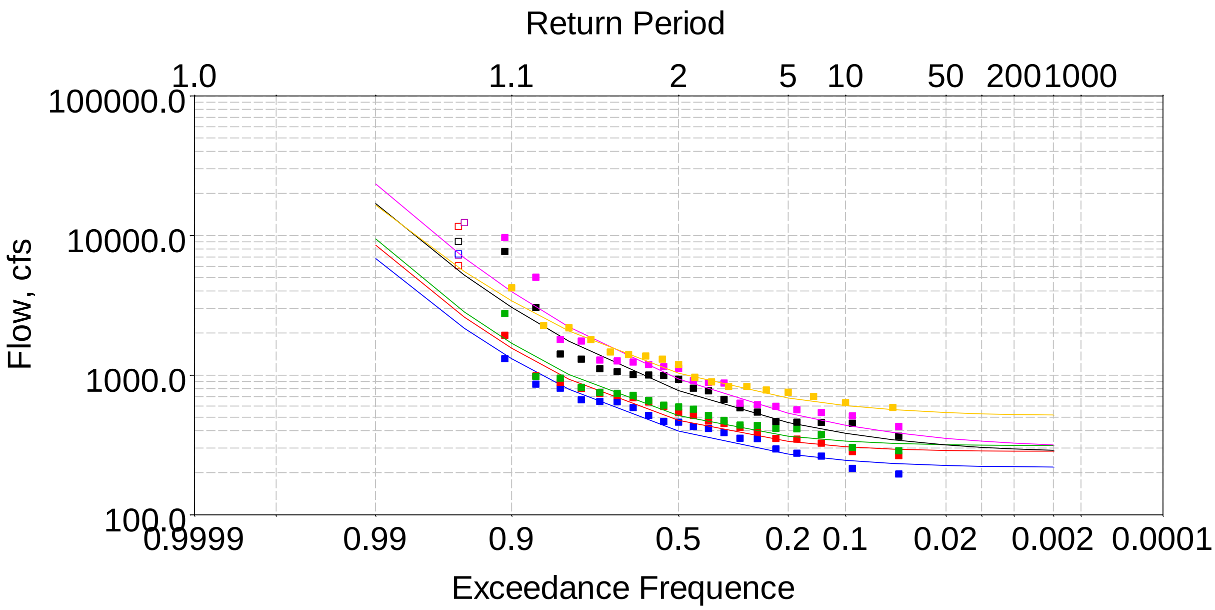
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.846	-0.907	-0.922	-0.754	-0.256	0.400
Standard Dev.	0.734	0.800	0.812	0.893	1.036	0.991
Station Skew	0.112	0.273	0.238	-0.114	-0.770	0.033



Minimum Volume-Duration Frequency Analysis for Davidson Creek near Lyons B22

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	6	10	10	8	17	36
95.0	3	3	2	3	6	15
90.0	2	1	1	2	3	8
80.0	1	1	1	1	1	4
50.0	0	0	0	0	0	1
20.0	0	0	0	0	0	0
10.0	0	0	0	0	0	0
5.0	0	0	0	0	0	0
2.0	0	0	0	0	0	0
1.0	0	0	0	0	0	0
0.5	0	0	0	0	0	0
0.2	0	0	0	0	0	0

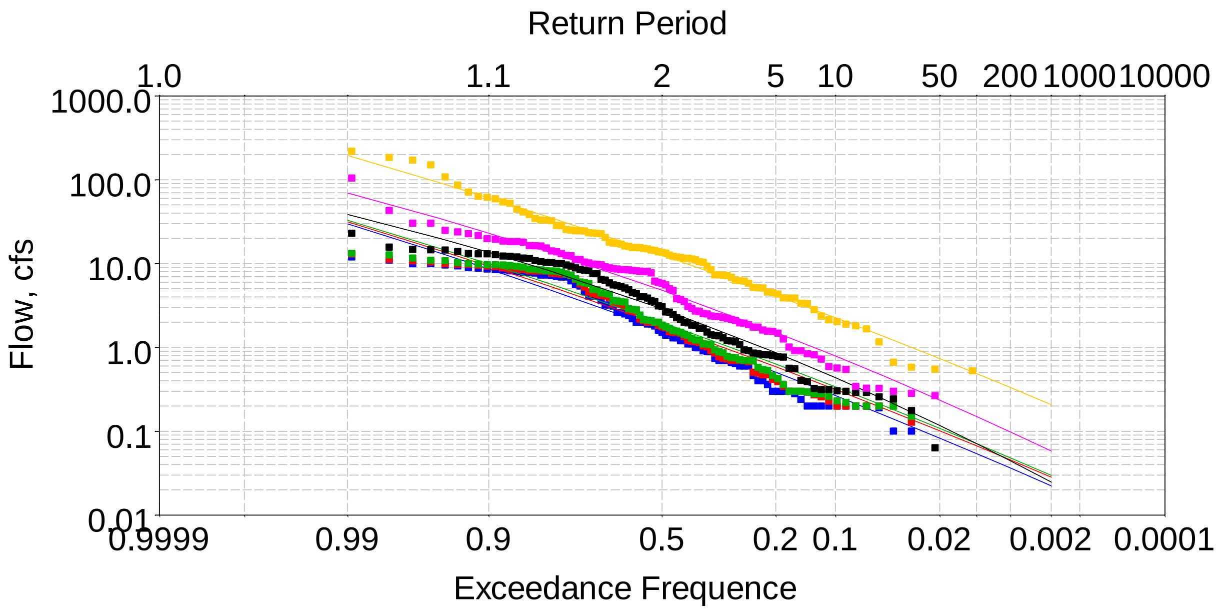
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.727	-1.107	-0.924	-0.764	-0.664	-0.357
Standard Dev.	0.710	0.968	0.730	0.765	0.939	1.080
Station Skew	-0.223	-0.212	0.395	-0.236	-0.409	-0.744



Minimum Volume-Duration Frequency Analysis for Brazos River at Washington B23

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	6,848	8,562	9,485	16,996	23,428	16,531
95.0	2,167	2,604	2,836	5,202	6,893	5,523
90.0	1,313	1,560	1,689	3,054	3,964	3,404
80.0	791	934	1,008	1,749	2,216	2,072
50.0	397	475	513	773	938	1,032
20.0	272	335	365	458	533	685
10.0	245	307	336	383	438	604
5.0	233	295	324	344	388	565
2.0	225	289	317	316	352	539
1.0	222	287	315	304	336	528
0.5	221	285	314	296	326	522
0.2	220	285	314	290	317	518

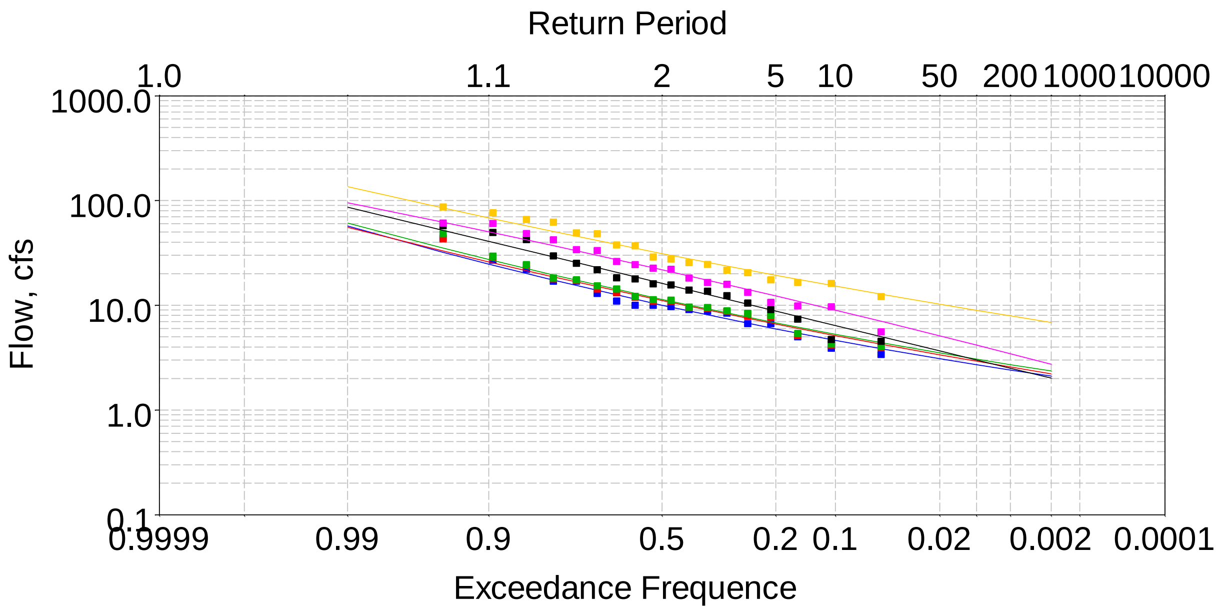
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.692	2.775	2.810	2.976	3.061	3.100
Standard Dev.	0.324	0.321	0.321	0.381	0.401	0.326
Station Skew	1.848	2.001	2.047	1.437	1.379	1.673



Minimum Volume-Duration Frequency Analysis for Navasota River near Easterly B24

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	29.8	31.4	32.8	38.4	69.6	194.3
95.0	13.4	14.3	15.2	20.0	34.4	92.0
90.0	8.6	9.3	9.9	13.6	23.0	60.7
80.0	4.9	5.4	5.8	8.3	13.8	36.1
50.0	1.6	1.8	2.0	2.9	23.5	12.7
20.0	0.5	0.6	0.6	0.9	4.8	4.1
10.0	0.3	0.3	0.3	0.4	1.5	2.3
5.0	0.2	0.2	0.2	0.2	0.5	1.3
2.0	0.1	0.1	0.1	0.1	0.2	0.7
1.0	0.1	0.1	0.1	0.1	0.1	0.5
0.5	0.0	0.0	0.0	0.0	0.1	0.3
0.2	0.0	0.0	0.0	0.0	0.1	0.2

Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.192	0.246	0.276	0.415	0.649	1.081
Standard Dev.	0.590	0.574	0.573	0.589	0.574	0.559
Station Skew	-0.205	-0.203	-0.220	-0.459	-0.334	-0.228

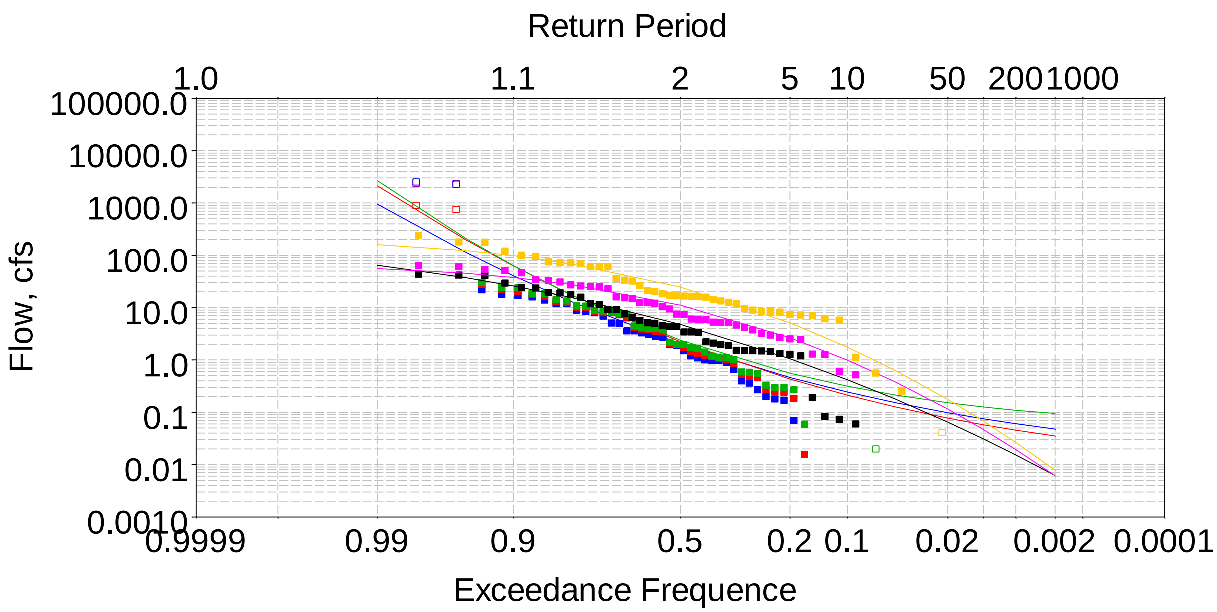


Minimum Volume-Duration Frequency Analysis for

Navasota River at Old Spanish Road near Bryan B25

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	33	34	36	53	63	86
95.0	25	26	27	41	50	68
90.0	18	19	20	30	38	52
80.0	10	11	11	16	22	31
50.0	6	7	7	9	12	19
20.0	5	5	5	6	9	15
10.0	4	4	4	5	7	13
5.0	3	3	4	4	5	10
2.0	3	3	3	3	4	9
1.0	2	3	3	3	3	8
0.5	2	2	2	2	3	7
0.2	33	34	36	53	63	86

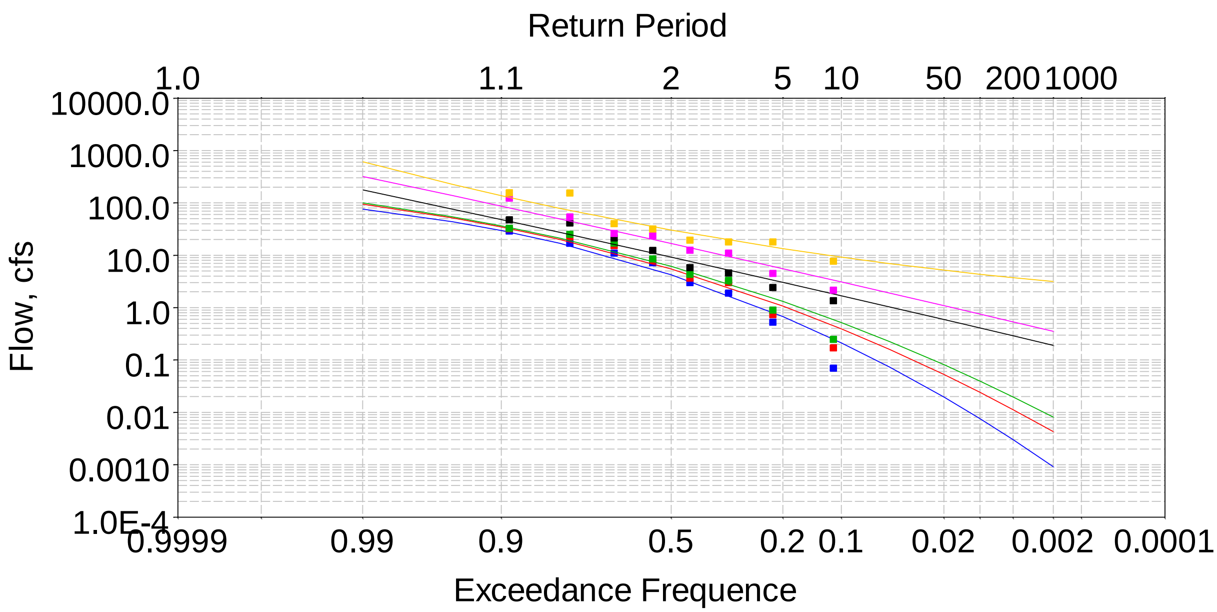
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	1.018	1.055	1.071	1.209	1.333	1.503
Standard Dev.	0.285	0.275	0.279	0.313	0.292	0.254
Station Skew	0.369	0.248	0.315	-0.007	-0.155	0.213



Minimum Volume-Duration Frequency Analysis for Navasota River near Bryan B26

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	957	2,135	2,682	65	56	160
95.0	113	197	208	37	45	123
90.0	41	63	63	26	38	99
80.0	13	18	18	16	28	69
50.0	2	2	2	5	11	25
20.0	1	0	1	1	3	5
10.0	0	0	0	0	1	2
5.0	0	0	0	0	0	1
2.0	0	0	0	0	0	0
1.0	0	0	0	0	0	0
0.5	0	0	0	0	0	0
0.2	0	0	0	0	0	0

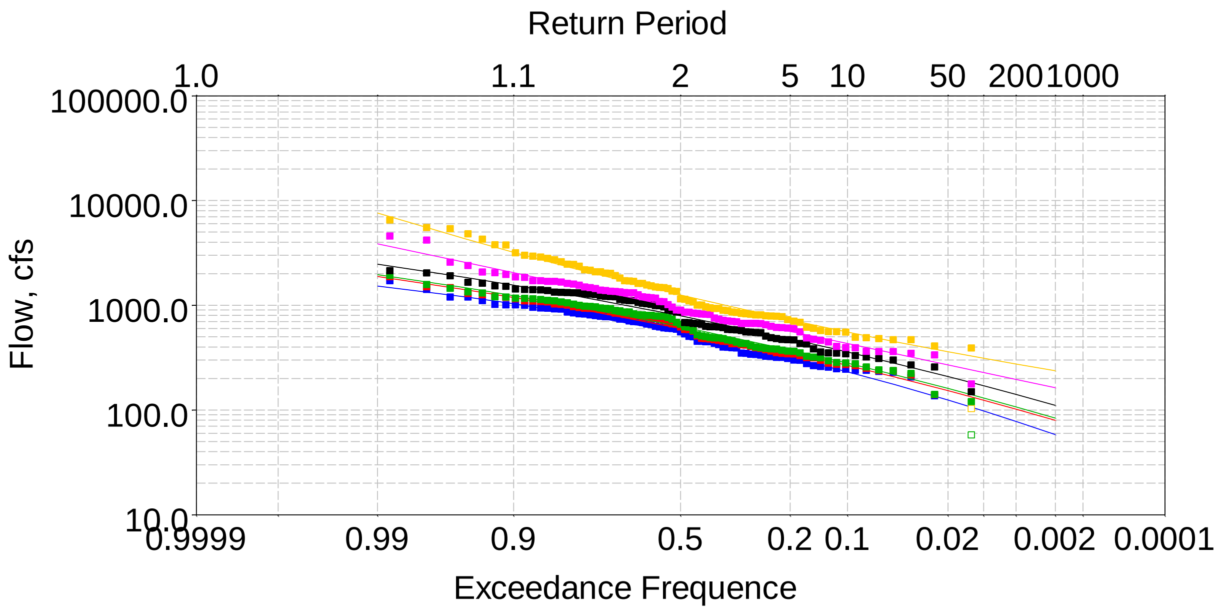
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.425	0.478	0.543	0.582	0.891	1.229
Standard Dev.	0.887	0.988	0.940	0.718	0.670	0.734
Station Skew	0.783	0.793	1.076	-0.830	-1.470	-1.387



Minimum Volume-Duration Frequency Analysis for Navasota River near College StationB27

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	76	95	100	177	320	613
95.0	44	52	54	76	137	225
90.0	30	35	37	48	87	137
80.0	17	20	21	27	50	78
50.0	4	6	6	9	17	30
20.0	1	1	1	3	6	13
10.0	0	0	1	2	3	9
5.0	0	0	0	1	2	7
2.0	0	0	0	1	1	5
1.0	0	0	0	0	1	4
0.5	0	0	0	0	1	4
0.2	0	0	0	0	0	3

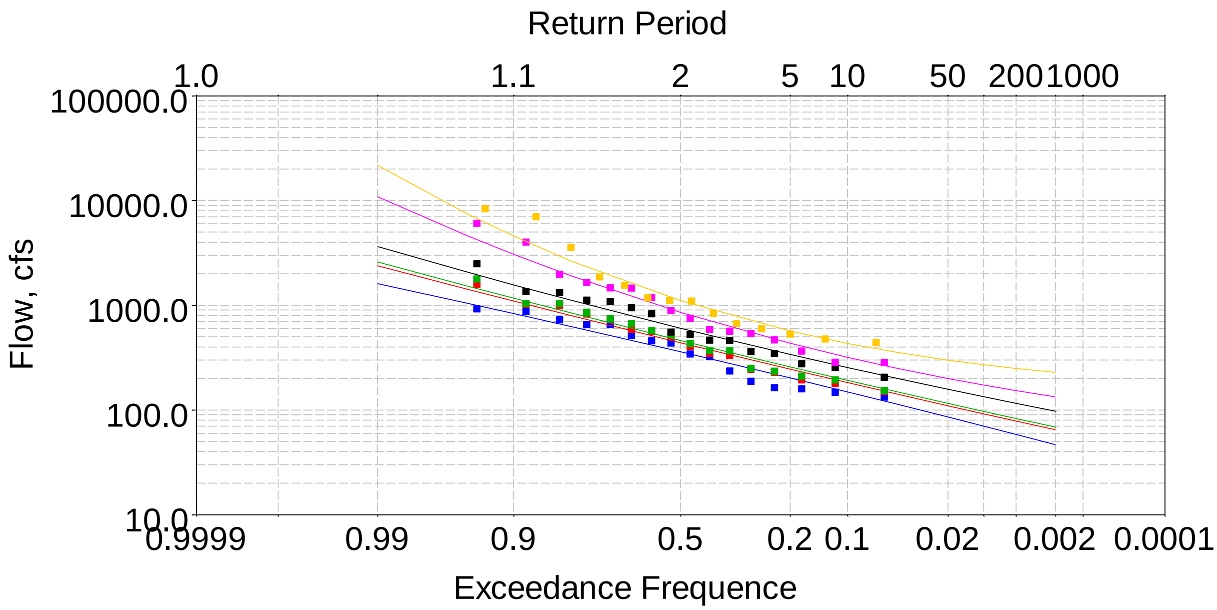
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.490	0.636	0.698	0.958	1.217	1.522
Standard Dev.	0.868	0.778	0.736	0.567	0.565	0.464
Station Skew	-0.980	-0.813	-0.752	-0.070	-0.064	0.564



Minimum Volume-Duration Frequency Analysis for Brazos River near Hempstead B28

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,524	1,882	1,959	2,472	3,859	7,605
95.0	1,199	1,405	1,464	1,842	2,552	4,284
90.0	1,034	1,186	1,236	1,555	2,047	3,205
80.0	847	953	994	1,251	1,567	2,287
50.0	543	601	628	794	940	1,252
20.0	318	358	375	478	563	723
10.0	232	267	280	358	431	554
5.0	175	207	217	279	346	450
2.0	124	153	161	209	270	360
1.0	98	124	130	170	228	312
0.5	78	102	107	141	196	275
0.2	58	80	84	111	163	237

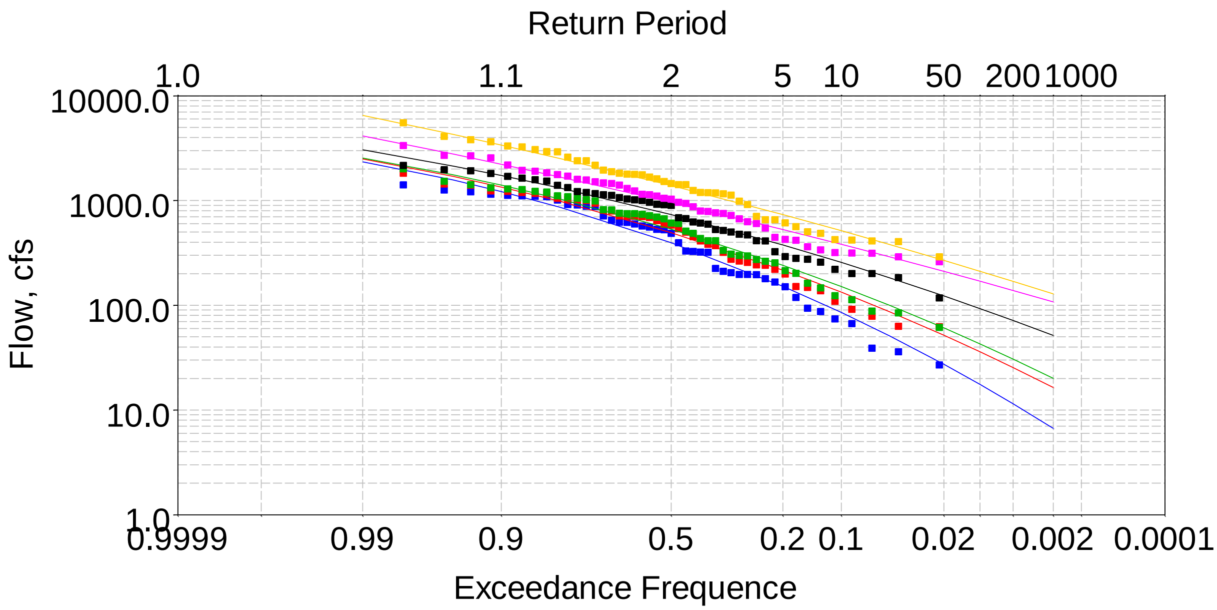
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.707	2.761	2.781	2.883	2.973	3.114
Standard Dev.	0.257	0.254	0.253	0.250	0.264	0.299
Station Skew	-0.644	-0.416	-0.416	-0.390	-0.002	0.335



Minimum Volume-Duration Frequency Analysis for Brazos River near Richmond B29

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,609	2,387	2,593	3,643	10,897	21,765
95.0	1,052	1,432	1,536	2,086	4,643	7,542
90.0	835	1,096	1,169	1,566	3,058	4,577
80.0	629	796	844	1,118	1,908	2,651
50.0	360	438	461	604	855	1,107
20.0	203	245	258	339	434	569
10.0	149	183	192	255	319	433
5.0	115	143	151	202	253	358
2.0	86	110	116	158	200	299
1.0	70	92	97	134	173	270
0.5	59	79	83	116	153	249
0.2	47	65	69	98	134	229

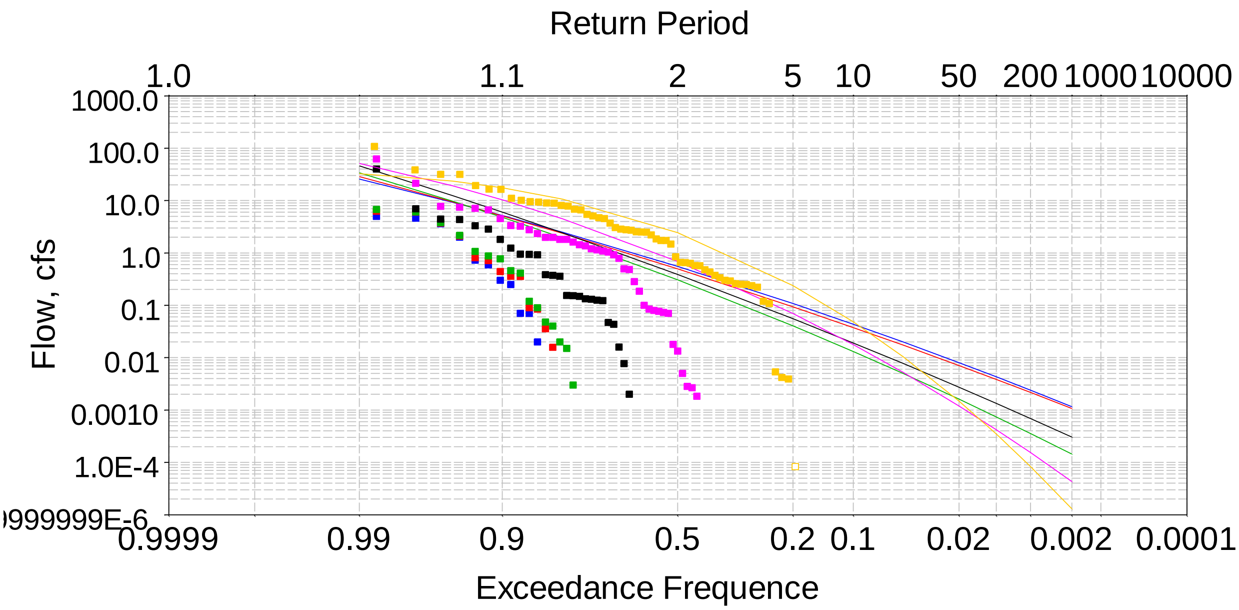
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.551	2.647	2.671	2.793	2.970	3.107
Standard Dev.	0.292	0.304	0.307	0.308	0.388	0.413
Station Skew	-0.113	0.107	0.133	0.227	0.593	0.933



Minimum Volume-Duration Frequency Analysis for Brazos River near Rosharon B30

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	2,347	2,491	2,543	3,049	4,146	6,498
95.0	1,571	1,699	1,758	2,136	2,776	4,282
90.0	1,221	1,345	1,403	1,732	2,221	3,390
80.0	866	985	1,039	1,318	1,681	2,527
50.0	396	493	533	735	961	1,393
20.0	152	217	241	377	530	734
10.0	85	133	151	257	383	516
5.0	51	87	100	183	290	381
2.0	27	52	61	123	211	269
1.0	18	36	43	93	170	212
0.5	12	25	31	72	139	169
0.2	7	16	20	51	108	128

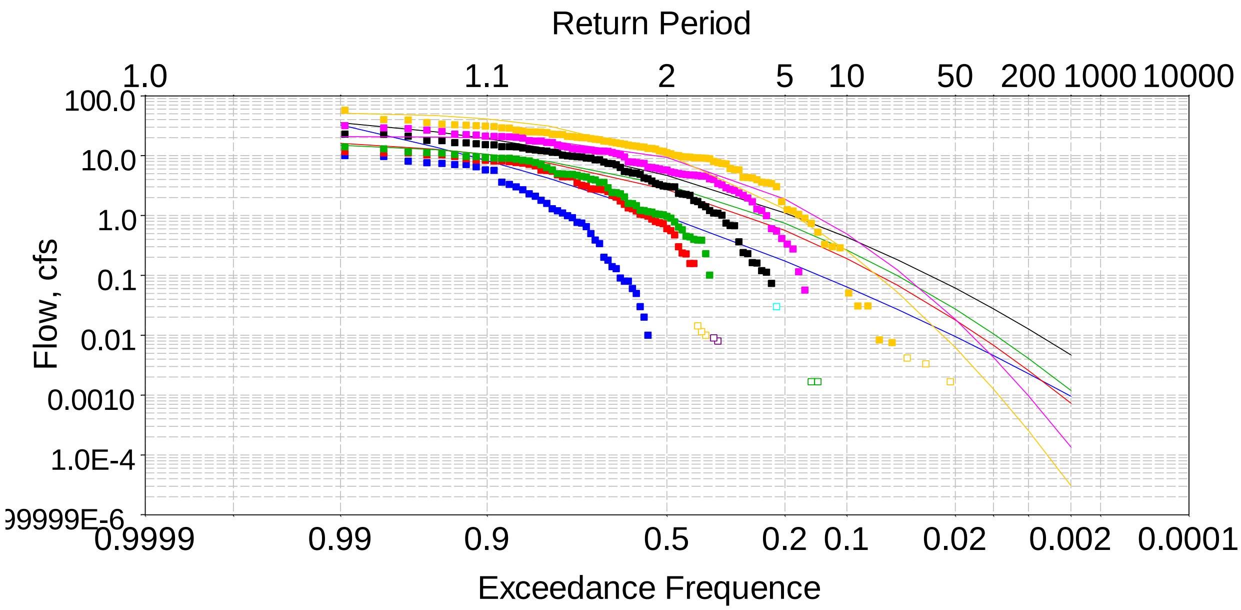
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.544	2.653	2.688	2.840	2.972	3.130
Standard Dev.	0.459	0.397	0.383	0.326	0.298	0.320
Station Skew	-0.709	-0.611	-0.609	-0.477	-0.219	-0.260



Minimum Volume-Duration Frequency Analysis for Big Sandy Creek near Bridgeport T1

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	25.8	28.8	34.0	46.1	51.0	32.7
95.0	9.2	9.5	9.7	12.4	19.1	23.5
90.0	5.2	5.1	4.8	6.0	10.3	17.5
80.0	2.5	2.4	1.9	2.4	4.5	10.7
50.0	0.6	0.5	0.3	0.4	0.7	2.4
20.0	0.1	0.1	0.0	0.1	0.1	0.2
10.0	0.0	0.0	0.0	0.0	0.0	0.0
5.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

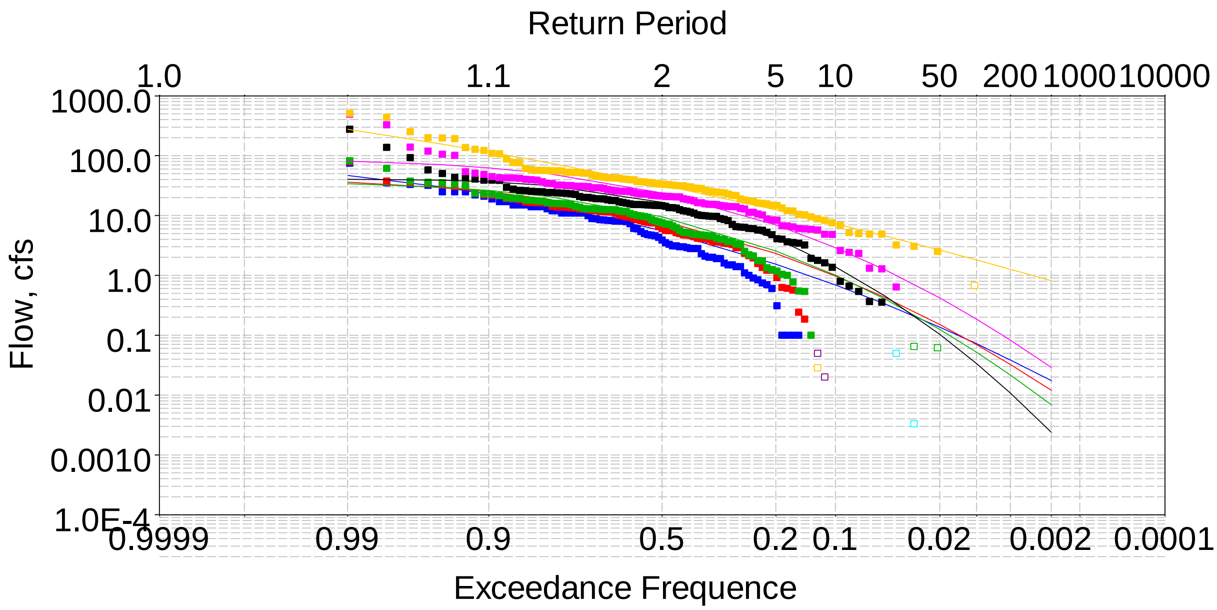
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.298	-0.338	-0.567	-0.448	-0.288	0.131
Standard Dev.	0.813	0.834	1.003	0.976	1.098	1.084
Station Skew	-0.301	-0.231	-0.317	-0.218	-0.685	-1.467



Minimum Volume-Duration Frequency Analysis for Clear Fork Trinity River at Fort Worth T2

Exceedance Frequency (percent)	**1 Day Cfs**	**7 Day Cfs**	**10 Day Cfs**	**30 Day Cfs**	**60 Day Cfs**	**120 Day Cfs**
99.0	32.5	16.1	14.9	35.5	20.8	51.2
95.0	13.7	12.8	12.5	25.0	20.5	46.5
90.0	8.2	10.5	10.6	19.3	19.7	41.1
80.0	4.2	7.5	7.9	13.0	17.7	31.3
50.0	1.0	2.7	3.2	4.7	9.3	10.6
20.0	0.2	0.6	0.7	1.1	1.9	1.3
10.0	0.1	0.2	0.3	0.4	0.5	0.3
5.0	0.0	0.1	0.1	0.2	0.1	0.1
2.0	0.0	0.0	0.0	0.1	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

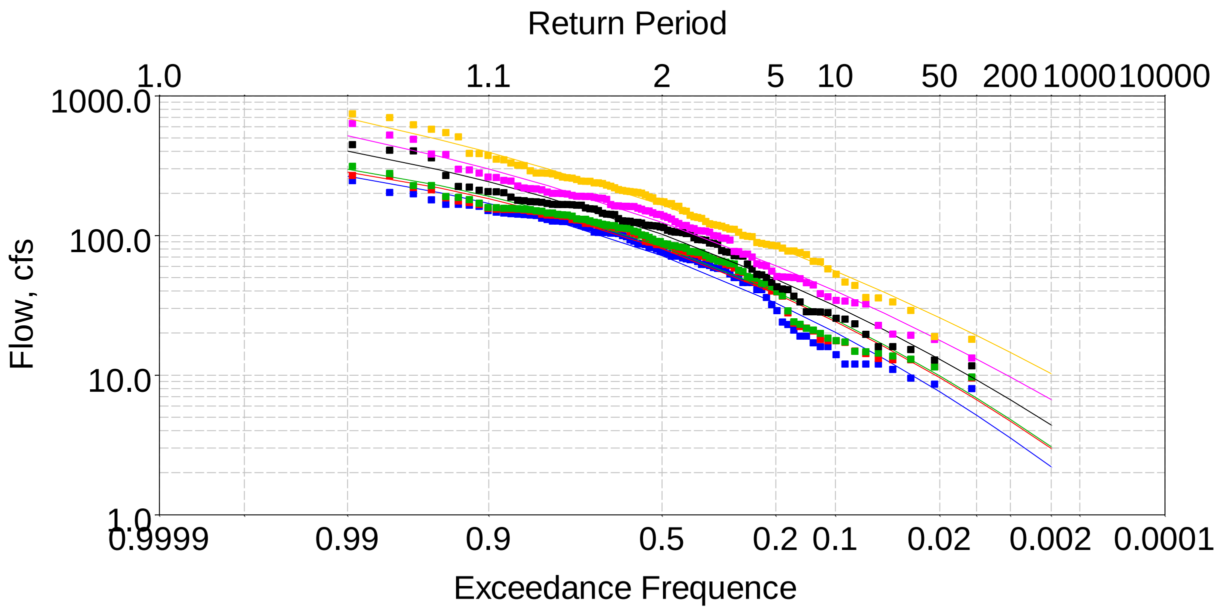
Simple Statistics	**1 Day**	**7 Day**	**10 Day**	**30 Day**	**60 Day**	**120 Day**
Mean	-0.092	0.263	0.337	0.543	0.685	0.716
Standard Dev.	0.831	0.736	0.687	0.675	0.794	1.003
Station Skew	-0.531	-1.456	-1.568	-1.140	-2.505	-2.000



Minimum Volume-Duration Frequency Analysis for West Fork Trinity River at Fort Worth T3

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	46.7	36.0	34.1	40.4	81.0	277.0
95.0	30.3	29.5	29.9	38.9	71.1	158.6
90.0	22.7	24.8	26.3	36.7	62.7	115.1
80.0	15.0	18.7	20.7	31.8	49.8	76.3
50.0	5.6	8.2	9.5	16.6	23.8	32.4
20.0	1.5	2.3	2.6	4.1	7.0	12.5
10.0	0.7	1.0	1.0	1.4	2.9	7.3
5.0	0.3	0.4	0.4	0.5	1.3	4.6
2.0	0.1	0.2	0.1	0.1	0.4	2.6
1.0	0.1	0.1	0.1	0.0	0.2	1.8
0.5	0.0	0.0	0.0	0.0	0.1	1.3
0.2	0.0	0.0	0.0	0.0	0.0	0.8

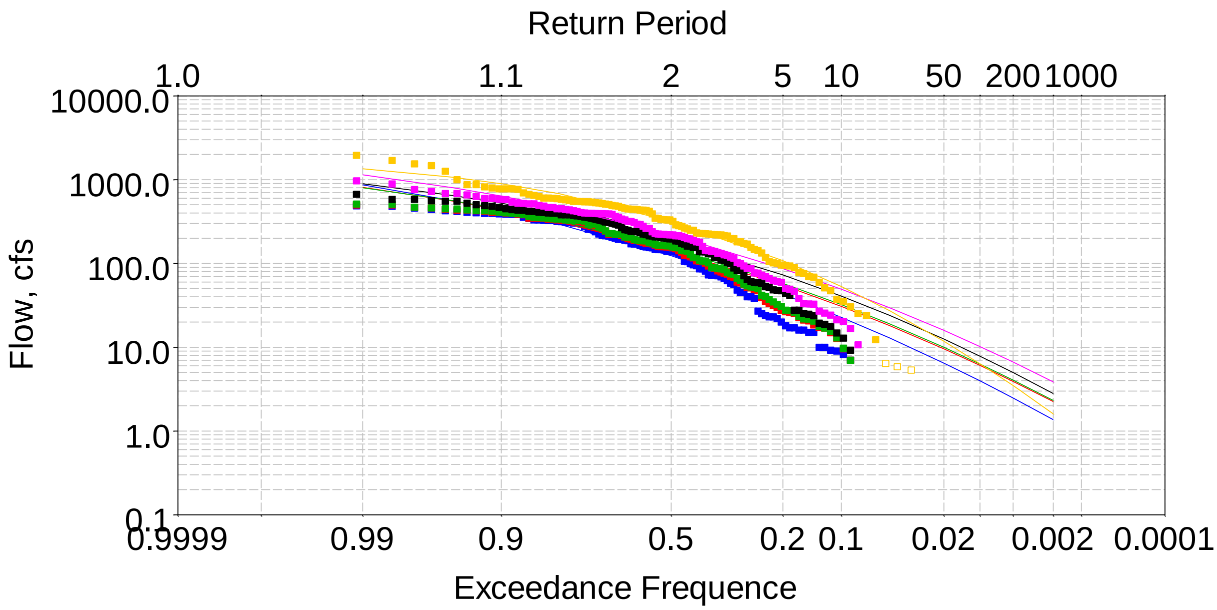
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.657	0.781	0.817	0.999	1.229	1.481
Standard Dev.	0.609	0.591	0.615	0.668	0.576	0.470
Station Skew	-0.898	-1.411	-1.659	-2.193	-1.628	-0.379



Minimum Volume-Duration Frequency Analysis for West Fork Trinity River at Grand Prairie T4

Exceedance Frequency (percent)	**1 Day Cfs**	**7 Day Cfs**	**10 Day Cfs**	**30 Day Cfs**	**60 Day Cfs**	**120 Day Cfs**
99.0	265.5	284.5	298.4	401.2	518.8	689.8
95.0	202.6	218.5	228.1	294.6	368.0	485.5
90.0	169.4	183.6	191.2	242.6	299.0	393.8
80.0	131.4	143.8	149.3	186.2	226.9	299.1
50.0	71.7	80.4	83.1	101.9	123.9	165.1
20.0	32.8	38.2	39.4	48.7	60.7	82.8
10.0	20.2	24.2	24.9	31.3	40.0	55.5
5.0	13.0	16.0	16.4	21.0	27.6	39.1
2.0	7.6	9.6	9.9	13.0	17.8	25.7
1.0	5.2	6.7	6.8	9.2	13.0	19.2
0.5	3.6	4.7	4.8	6.7	9.7	14.5
0.2	2.2	3.0	3.1	4.4	6.7	10.3

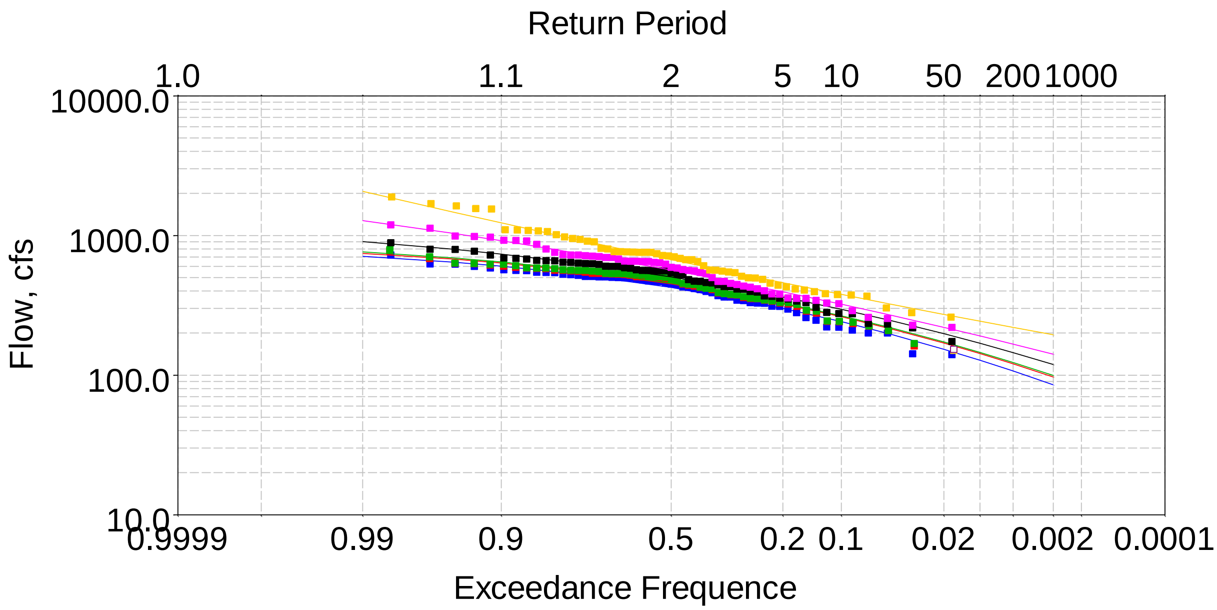
Simple Statistics	**1 Day**	**7 Day**	**10 Day**	**30 Day**	**60 Day**	**120 Day**
Mean	1.802	1.856	1.871	1.967	2.060	2.189
Standard Dev.	0.371	0.353	0.355	0.354	0.345	0.335
Station Skew	-0.874	-0.852	-0.841	-0.709	-0.577	-0.521



Minimum Volume-Duration Frequency Analysis for Trinity River at Dallas T5

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	865	809	801	891	1,142	1,351
95.0	559	554	559	646	799	1,069
90.0	424	435	443	522	635	893
80.0	291	311	321	385	462	676
50.0	123	144	150	186	220	319
20.0	43	55	58	73	87	108
10.0	23	31	32	41	49	53
5.0	13	18	19	24	30	27
2.0	7	10	10	13	16	12
1.0	4	6	6	8	10	6
0.5	3	4	4	5	7	4
0.2	1	2	2	3	4	2

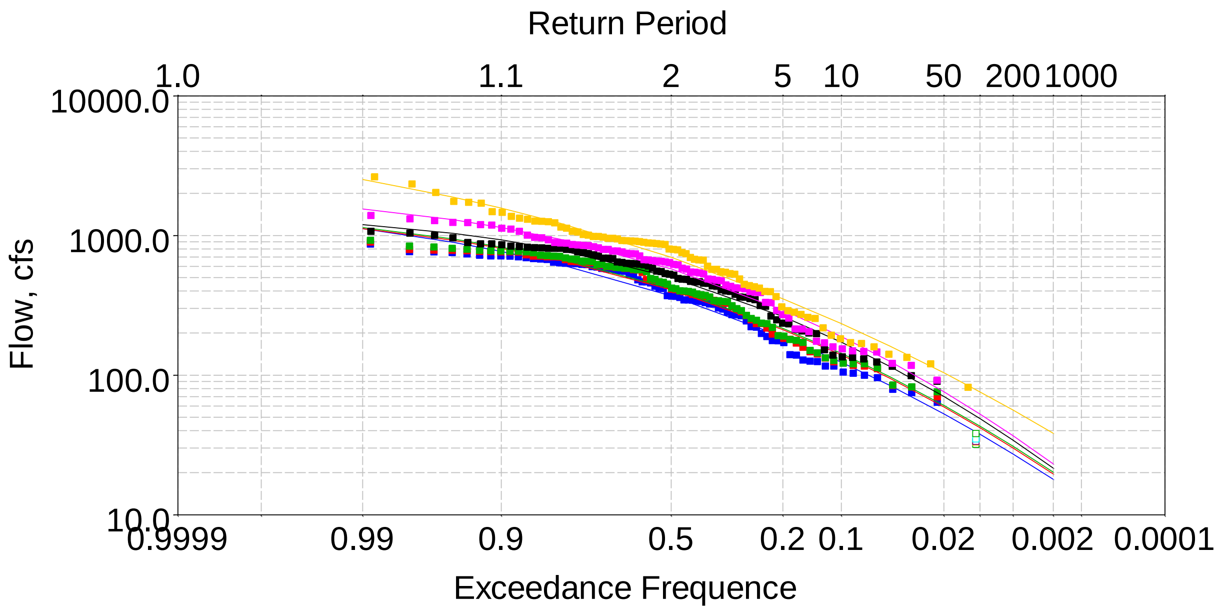
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.031	2.099	2.116	2.205	2.285	2.403
Standard Dev.	0.505	0.460	0.455	0.445	0.443	0.506
Station Skew	-0.720	-0.763	-0.803	-0.882	-0.786	-1.219



Minimum Volume-Duration Frequency Analysis for Trinity River below Dallas T6

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	709	745	764	904	1,280	2,073
95.0	645	677	692	798	1,035	1,471
90.0	603	634	646	735	916	1,231
80.0	546	575	584	657	783	995
50.0	424	450	456	505	566	671
20.0	301	323	328	363	395	459
10.0	242	262	266	296	322	378
5.0	197	216	219	247	270	324
2.0	153	170	173	198	220	272
1.0	128	143	146	169	191	243
0.5	107	120	123	145	167	219
0.2	85	97	100	119	141	194

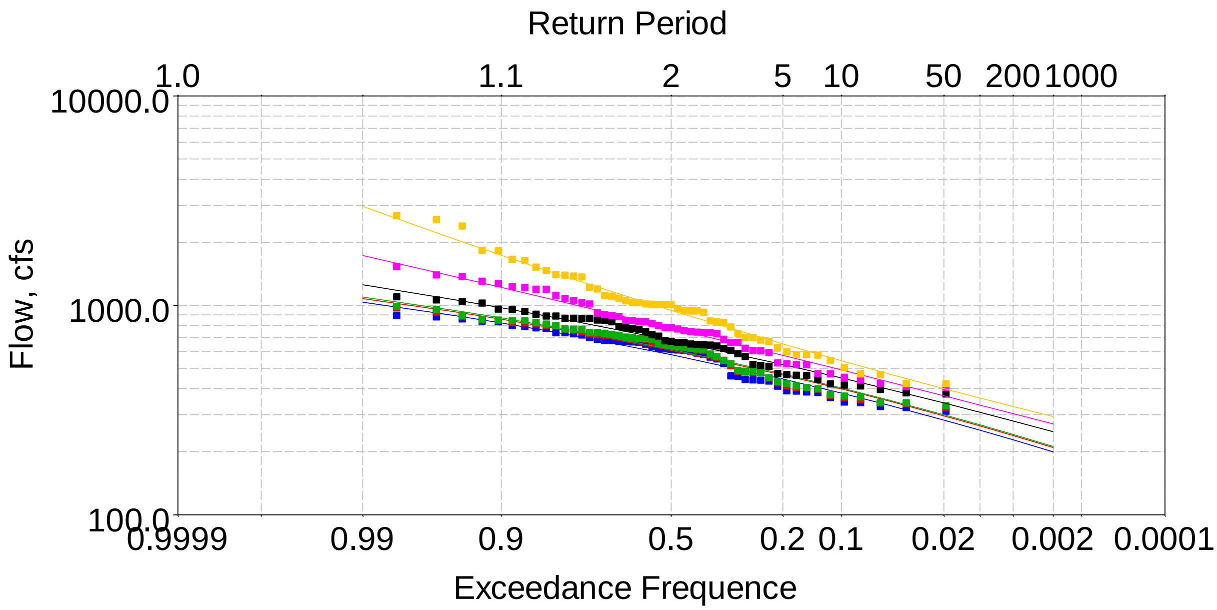
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.600	2.627	2.634	2.682	2.742	2.831
Standard Dev.	0.162	0.156	0.156	0.158	0.178	0.200
Station Skew	-1.049	-1.022	-0.989	-0.794	-0.370	0.136



Minimum Volume-Duration Frequency Analysis for Trinity River near Rosser T7

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,120	1,117	1,141	1,194	1,546	2,519
95.0	894	923	943	1,036	1,296	1,883
90.0	769	808	825	929	1,141	1,570
80.0	620	664	679	786	943	1,226
50.0	369	408	417	501	577	699
20.0	188	212	217	263	292	352
10.0	124	140	143	172	189	234
5.0	85	95	98	116	126	162
2.0	53	59	61	70	76	104
1.0	38	42	43	49	53	76
0.5	27	30	31	34	37	56
0.2	18	20	20	22	23	38

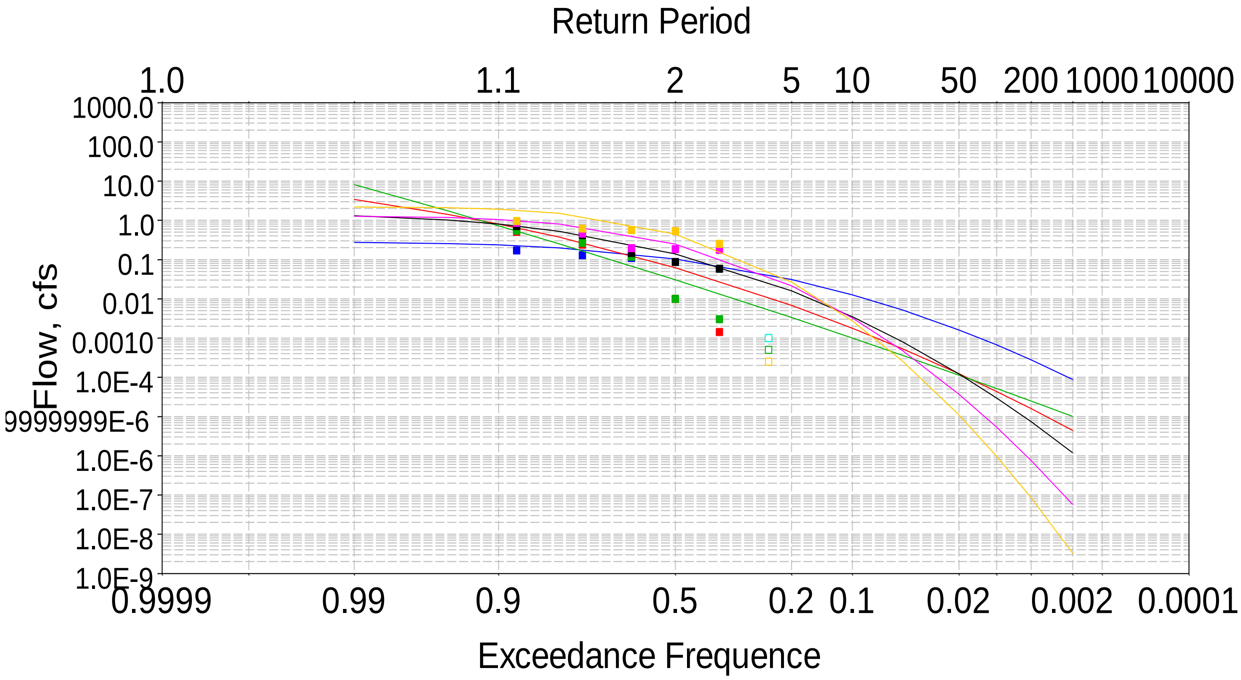
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.520	2.559	2.569	2.640	2.704	2.807
Standard Dev.	0.319	0.309	0.309	0.302	0.319	0.329
Station Skew	-0.901	-1.010	-1.009	-1.206	-1.095	-0.695



Minimum Volume-Duration Frequency Analysis for Trinity River at Trinidad T8

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,036	1,077	1,095	1,254	1,731	2,966
95.0	896	934	948	1,067	1,377	2,080
90.0	823	858	870	973	1,216	1,733
80.0	737	769	779	866	1,045	1,398
50.0	582	609	616	680	779	944
20.0	444	465	471	522	576	653
10.0	381	399	403	450	491	544
5.0	333	348	352	397	430	469
2.0	283	297	300	342	370	400
1.0	253	265	269	309	334	361
0.5	228	239	242	280	304	329
0.2	200	209	212	249	271	294

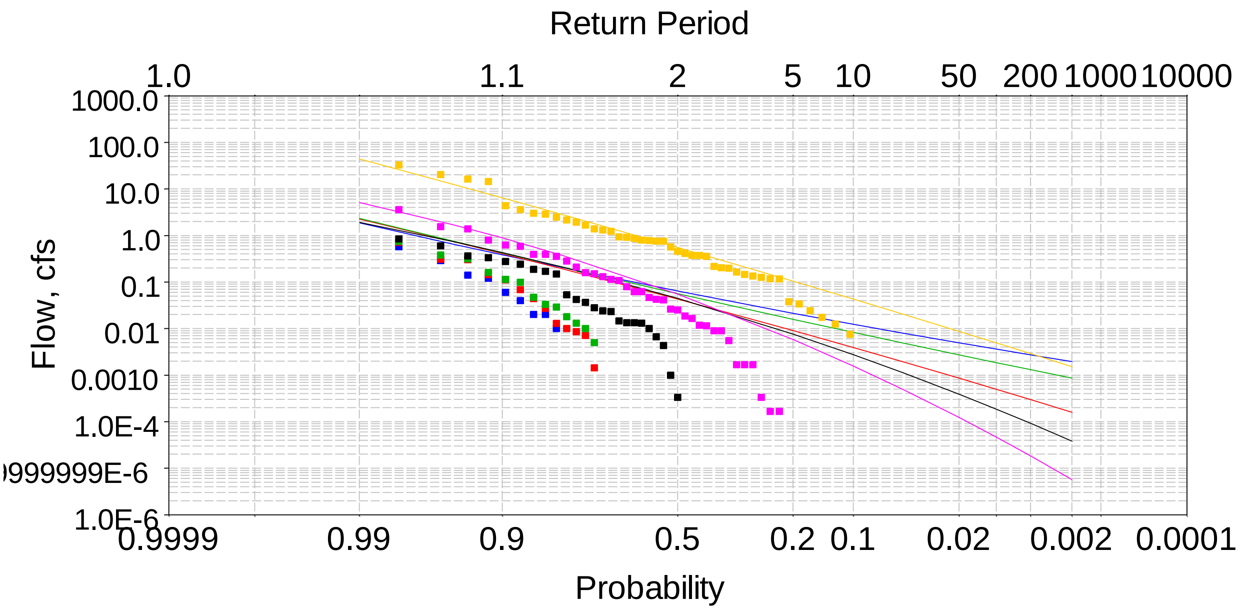
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.755	2.774	2.779	2.825	2.889	2.982
Standard Dev.	0.132	0.131	0.131	0.131	0.154	0.197
Station Skew	-0.467	-0.479	-0.466	-0.329	-0.075	0.223



Minimum Volume-Duration Frequency Analysis for Cedar Creek at Trinidad T9

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	0.3	3.4	8.2	1.3	1.3	2.2
95.0	0.3	1.4	1.7	1.0	1.2	2.1
90.0	0.2	0.8	0.7	0.8	1.0	1.9
80.0	0.2	0.4	0.3	0.5	0.8	1.5
50.0	0.1	0.1	0.0	0.1	0.2	0.4
20.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0
5.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

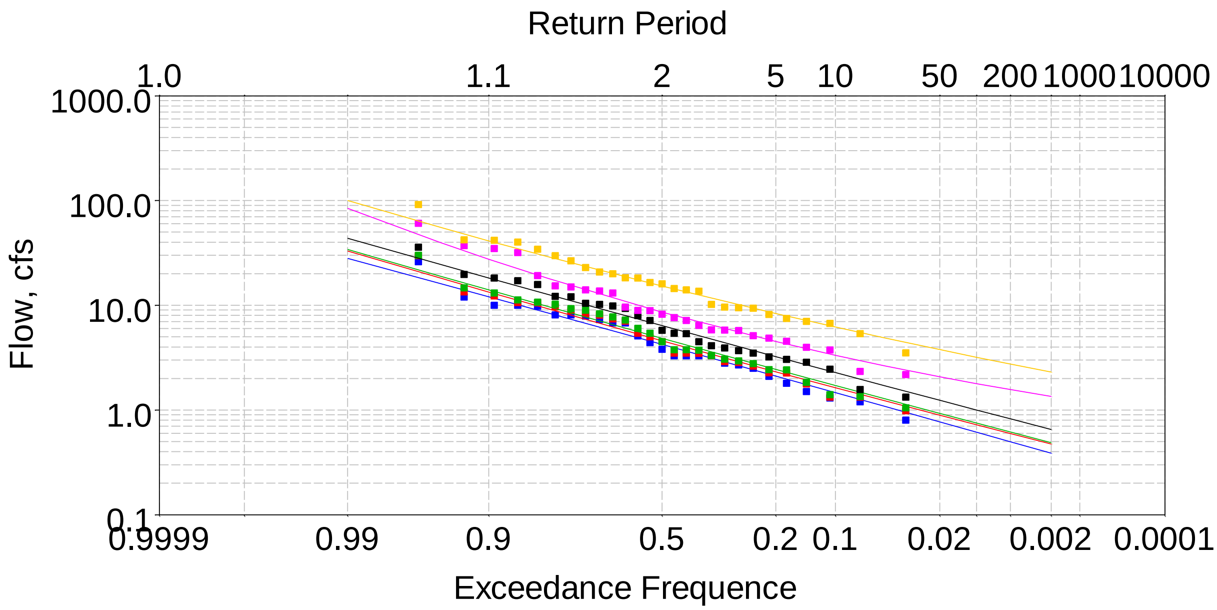
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-1.154	-1.337	-1.547	-1.108	-0.984	-0.825
Standard Dev.	0.570	1.059	1.118	1.014	1.168	1.374
Station Skew	-1.887	-0.753	-0.172	-1.577	-2.138	-2.350



Minimum Volume-Duration Frequency Analysis for Tehuacana Creek near Streetman T10

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1.9	2.3	2.3	1.9	5.1	44.0
95.0	0.7	0.7	0.8	0.7	1.7	12.7
90.0	0.4	0.4	0.4	0.4	0.9	6.5
80.0	0.2	0.2	0.2	0.2	0.4	2.8
50.0	0.1	0.0	0.1	0.0	0.1	0.6
20.0	0.0	0.0	0.0	0.0	0.0	0.1
10.0	0.0	0.0	0.0	0.0	0.0	0.0
5.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.0	0.0	0.0	0.0	0.0	0.0

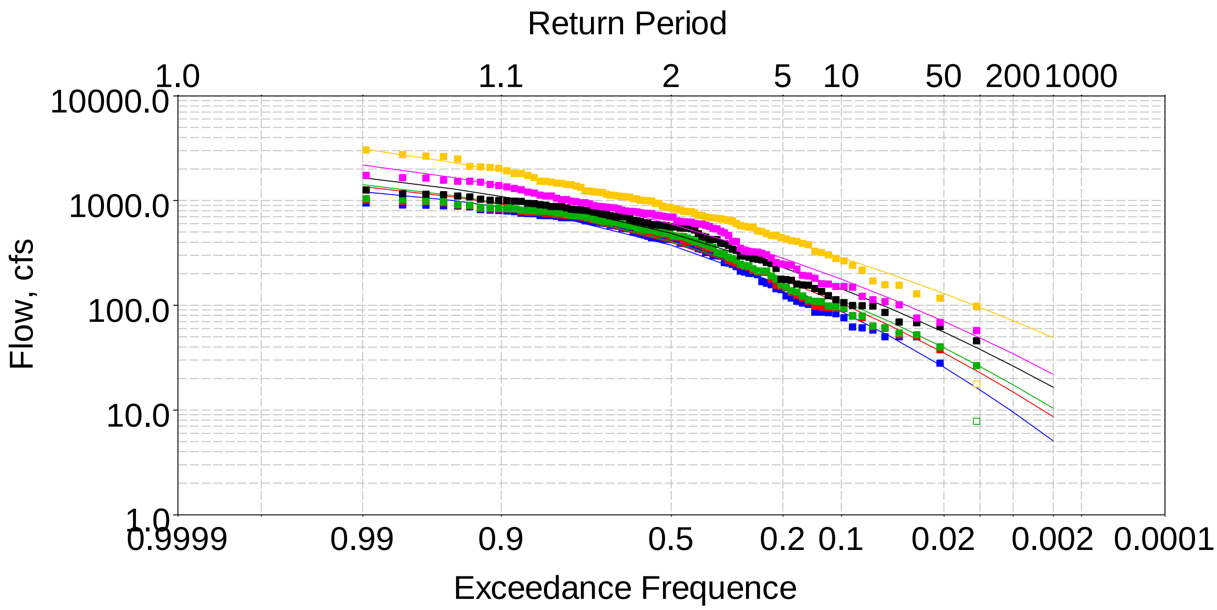
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-1.175	-1.385	-1.236	-1.420	-1.363	-0.269
Standard Dev.	0.583	0.787	0.666	0.865	1.088	0.850
Station Skew	0.206	-0.155	0.108	-0.483	-0.565	-0.101



Minimum Volume-Duration Frequency Analysis for Catfish Creek near Tennessee Colony T11

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	28	33	34	44	84	100
95.0	16	18	19	25	40	56
90.0	12	13	14	18	28	41
80.0	8	9	10	13	18	29
50.0	4	5	5	6	9	15
20.0	2	2	2	3	5	8
10.0	2	2	2	2	3	6
5.0	1	1	1	2	3	5
2.0	1	1	1	1	2	4
1.0	1	1	1	1	2	3
0.5	1	1	1	1	2	3
0.2	0	1	1	1	1	2

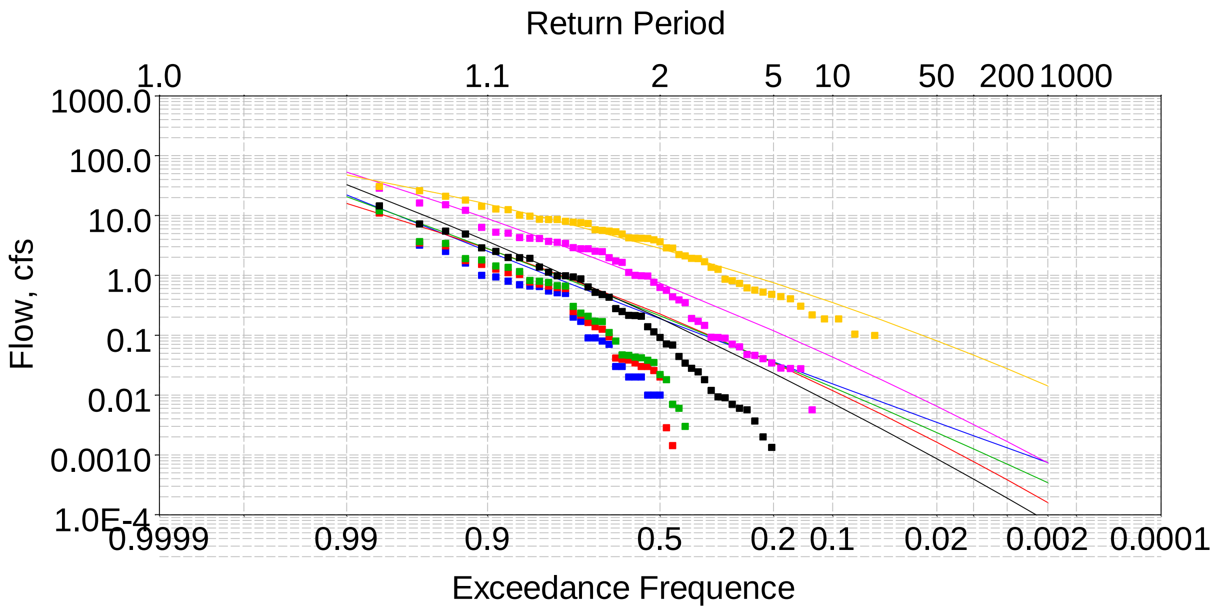
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	0.624	0.666	0.688	0.808	0.963	1.196
Standard Dev.	0.357	0.357	0.356	0.352	0.361	0.322
Station Skew	-0.024	0.085	0.059	0.048	0.476	0.237



Minimum Volume-Duration Frequency Analysis for Trinity River near Oakwood T12

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,211	1,355	1,417	1,651	2,184	3,120
95.0	1,001	1,081	1,115	1,291	1,658	2,306
90.0	865	921	945	1,094	1,385	1,913
80.0	690	726	743	864	1,078	1,487
50.0	375	398	408	486	597	846
20.0	156	175	184	230	282	429
10.0	87	104	111	144	178	287
5.0	51	64	70	94	117	200
2.0	26	35	39	55	70	130
1.0	16	23	26	38	49	95
0.5	10	15	17	26	34	71
0.2	5	9	10	17	22	49

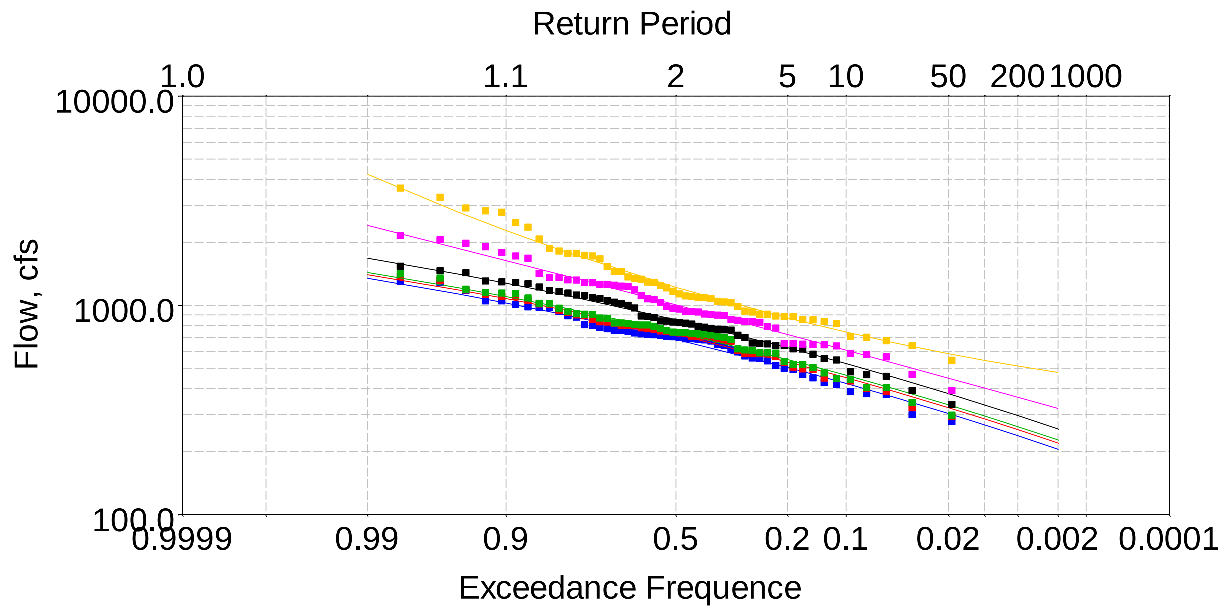
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.492	2.534	2.550	2.633	2.727	2.892
Standard Dev.	0.411	0.385	0.377	0.355	0.357	0.327
Station Skew	-1.219	-1.050	-0.988	-0.919	-0.825	-0.652



Minimum Volume-Duration Frequency Analysis for Upper Keechi Creek near Oakwood T13

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	22.1	16	20.7	32.7	53	47.3
95.0	5.3	5.3	5.7	8.1	17	23.4
90.0	2.5	2.8	2.8	3.7	8.9	15.5
80.0	1	1.2	1.2	1.4	3.9	9
50.0	0.2	0.2	0.2	0.2	0.7	2.8
20.0	0	0	0	0	0.1	0.8
10.0	0	0	0	0	0	0.3
5.0	0	0	0	0	0	0.2
2.0	0	0	0	0	0	0.1
1.0	0	0	0	0	0	0
0.5	0	0	0	0	0	0
0.2	0	0	0	0	0	0

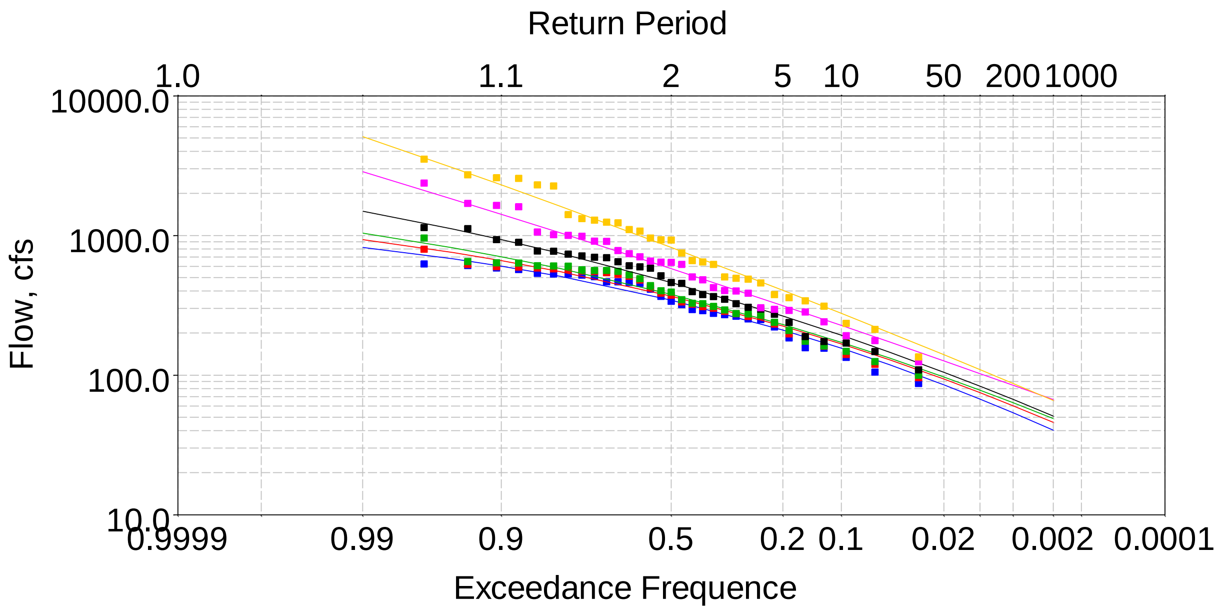
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	-0.712	-0.704	-0.696	-0.758	-0.178	0.400
Standard Dev.	0.865	0.929	0.906	1.058	0.907	0.648
Station Skew	0.070	-0.369	-0.144	-0.242	-0.309	-0.484



Minimum Volume-Duration Frequency Analysis for Trinity River near Crockett T14

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,345	1,400	1,433	1,679	2,408	4,232
95.0	1,133	1,186	1,214	1,411	1,872	2,793
90.0	1,026	1,076	1,101	1,276	1,635	2,278
80.0	902	949	971	1,120	1,385	1,808
50.0	687	726	744	852	1,005	1,217
20.0	505	536	551	627	725	868
10.0	424	451	464	526	610	744
5.0	364	388	399	452	528	662
2.0	304	324	334	378	448	587
1.0	268	286	296	334	402	546
0.5	238	254	263	297	363	512
0.2	205	220	228	256	321	477

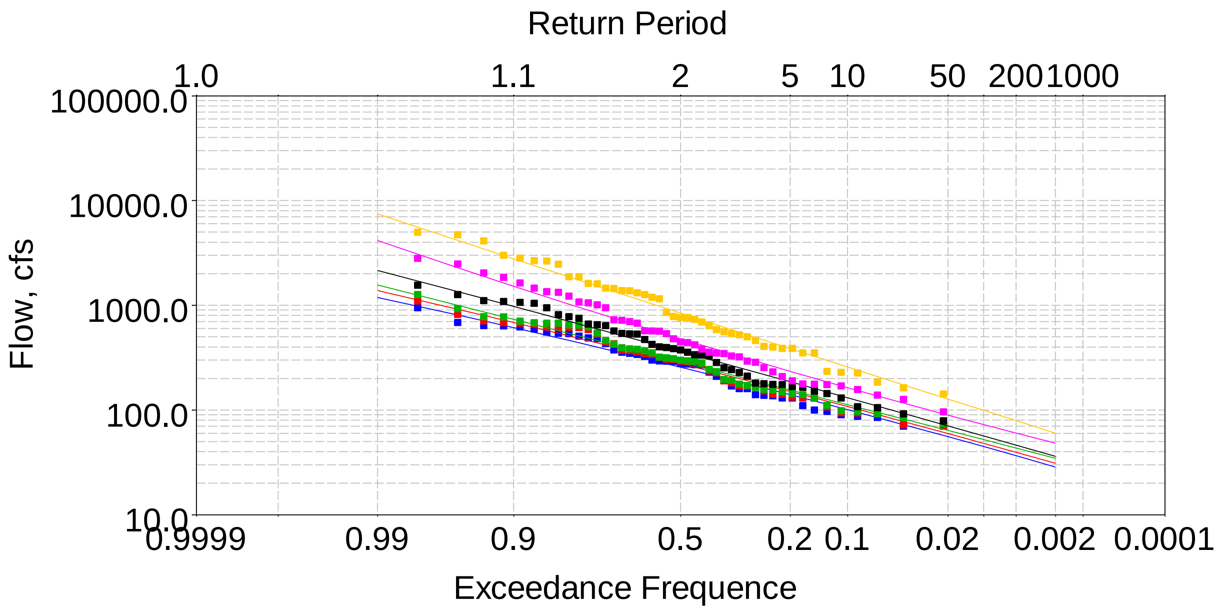
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.826	2.850	2.861	2.920	3.000	3.103
Standard Dev.	0.151	0.149	0.148	0.151	0.167	0.192
Station Skew	-0.432	-0.447	-0.438	-0.416	-0.061	0.562



Minimum Volume-Duration Frequency Analysis for Trinity River near Midway T15

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	822	933	1,038	1,489	2,861	5,113
95.0	681	754	815	1,111	1,816	3,049
90.0	603	661	705	935	1,419	2,300
80.0	510	552	581	746	1,048	1,625
50.0	344	368	380	460	579	821
20.0	210	225	230	265	314	405
10.0	156	167	172	193	227	277
5.0	119	129	132	146	173	201
2.0	85	94	97	105	127	140
1.0	67	75	78	83	103	109
0.5	54	60	63	67	85	87
0.2	40	46	49	51	67	66

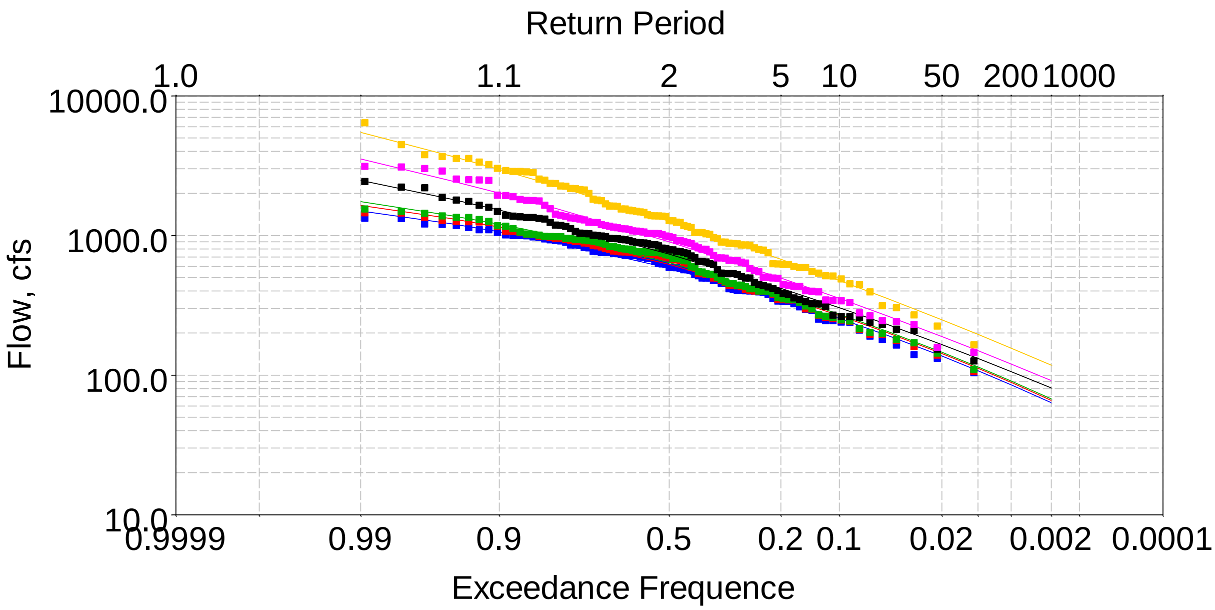
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.506	2.539	2.556	2.642	2.757	2.907
Standard Dev.	0.235	0.237	0.242	0.270	0.311	0.359
Station Skew	-0.789	-0.682	-0.576	-0.481	-0.103	-0.125



Minimum Volume-Duration Frequency Analysis for Trinity River at Riverside T16

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,186	1,381	1,563	2,155	4,163	7,459
95.0	774	876	954	1,285	2,143	3,916
90.0	612	684	733	974	1,520	2,782
80.0	458	505	532	694	1,012	1,842
50.0	257	278	288	361	478	841
20.0	140	150	156	186	234	386
10.0	101	108	113	131	164	258
5.0	76	82	86	98	123	185
2.0	56	60	64	71	89	127
1.0	45	48	52	57	73	99
0.5	37	40	43	46	60	79
0.2	29	31	35	36	48	60

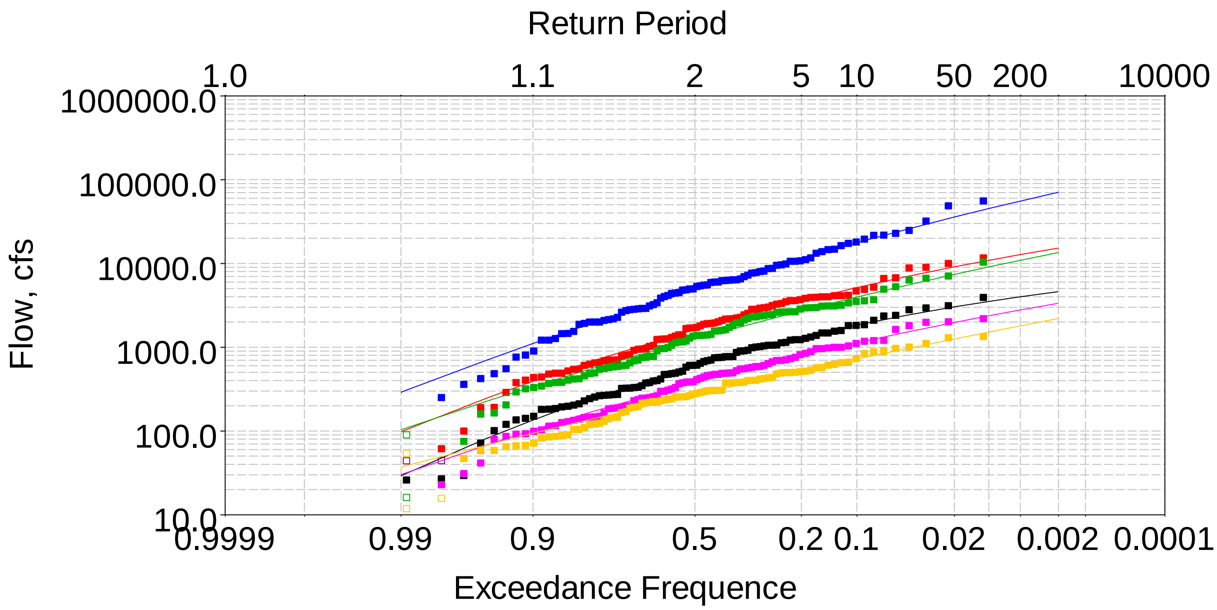
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.401	2.438	2.459	2.555	2.691	2.927
Standard Dev.	0.306	0.313	0.317	0.340	0.378	0.403
Station Skew	-0.170	-0.115	-0.015	-0.047	0.178	0.028



Minimum Volume-Duration Frequency Analysis for Trinity River at Romayor T17

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
99.0	1,499	1,641	1,746	2,482	3,526	5,467
95.0	1,215	1,319	1,388	1,822	2,464	3,703
90.0	1,064	1,150	1,202	1,521	2,007	2,969
80.0	886	953	991	1,204	1,546	2,245
50.0	583	621	639	734	900	1,264
20.0	348	367	375	419	495	675
10.0	255	267	273	304	354	476
5.0	192	201	206	230	265	353
2.0	137	143	146	166	189	249
1.0	108	112	114	132	150	196
0.5	85	89	91	106	120	156
0.2	64	66	68	81	91	118

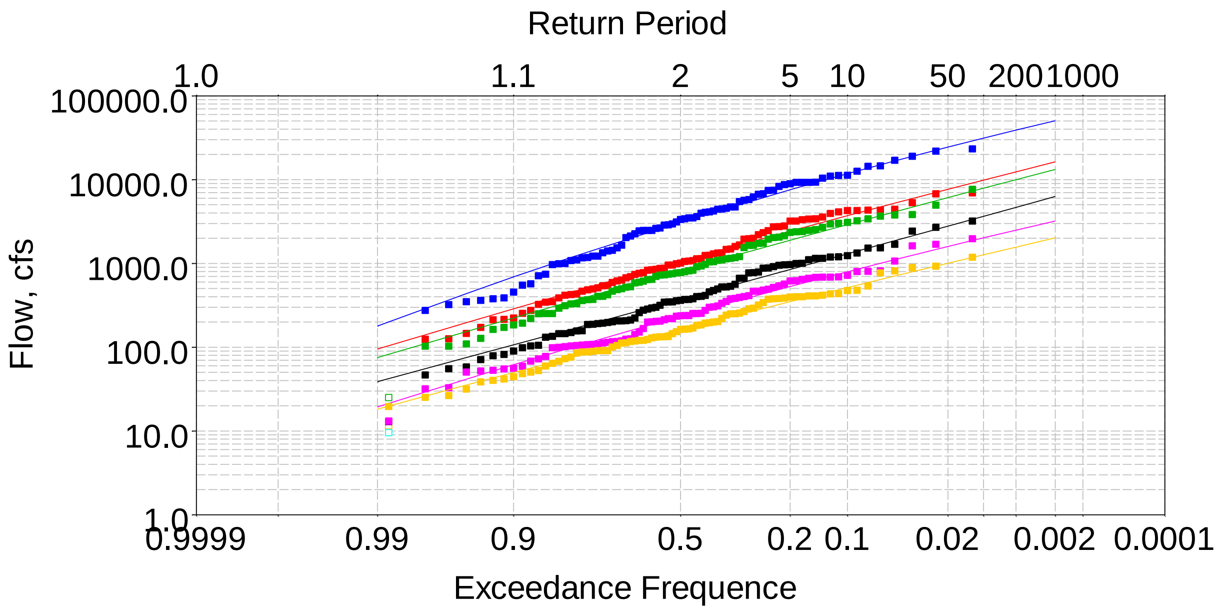
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.736	2.763	2.777	2.846	2.937	3.086
Standard Dev.	0.247	0.252	0.256	0.275	0.295	0.311
Station Skew	-0.736	-0.716	-0.681	-0.440	-0.350	-0.311



Maximum Volume-Duration Frequency Analysis for Double Mountain Fork near Aspermont B1

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	70,721	15,201	13,506	4,593	3,336	2,199
0.5	55,442	12,732	10,891	3,994	2,776	1,796
1.0	45,057	10,897	9,066	3,519	2,368	1,515
2.0	35,674	9,102	7,374	3,025	1,974	1,254
5.0	24,790	6,809	5,343	2,351	1,479	939
10.0	17,690	5,152	3,963	1,828	1,126	721
20.0	11,547	3,577	2,716	1,300	793	519
50.0	4,827	1,631	1,254	602	379	270
80.0	1,871	660	541	236	165	136
90.0	1,105	391	339	135	103	94
95.0	704	247	227	82	68	68
99.0	290	98	103	29	30	37

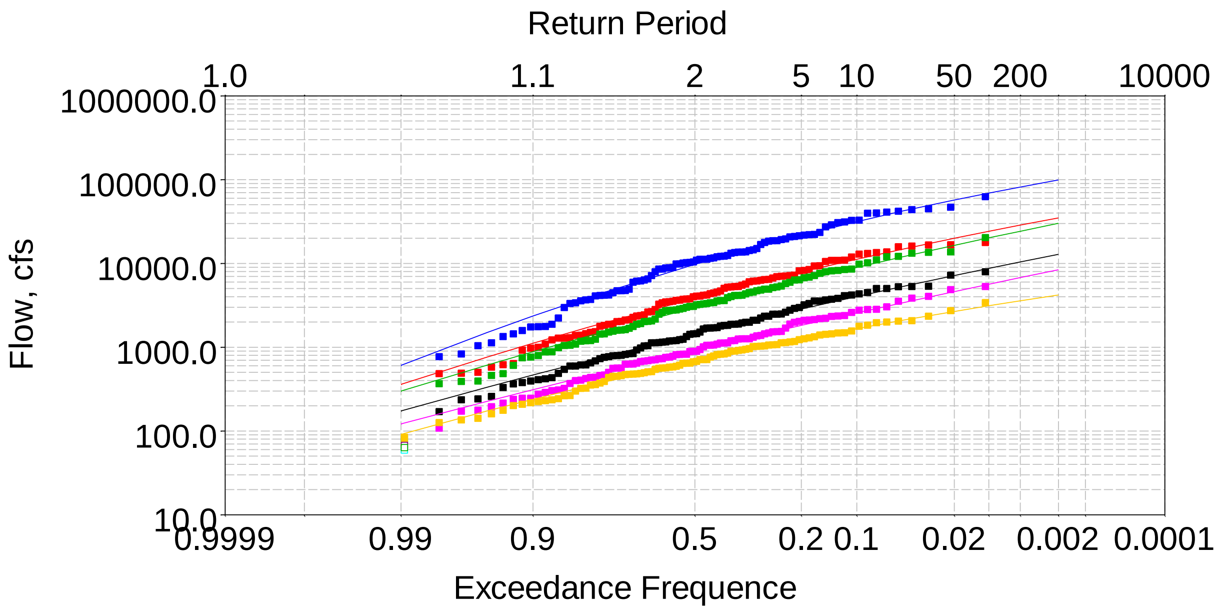
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.660	3.176	3.077	2.729	2.550	2.421
Standard Dev.	0.471	0.441	0.418	0.449	0.408	0.346
Station Skew	-0.296	-0.502	-0.299	-0.682	-0.412	-0.182



Maximum Volume-Duration Frequency Analysis for Salt Fork Brazos River near Aspermont B2

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	50,348	16,287	13,244	6,302	3,205	2,015
0.5	38,934	12,381	9,980	4,669	2,491	1,564
1.0	31,299	9,852	7,889	3,647	2,015	1,267
2.0	24,499	7,658	6,092	2,785	1,592	1,004
5.0	16,749	5,223	4,120	1,861	1,108	706
10.0	11,792	3,701	2,901	1,301	797	515
20.0	7,581	2,424	1,889	845	529	349
50.0	3,090	1,060	821	371	233	164
80.0	1,174	452	351	163	99	75
90.0	688	287	223	107	62	50
95.0	436	196	153	75	42	35
99.0	178	95	75	39	19	18

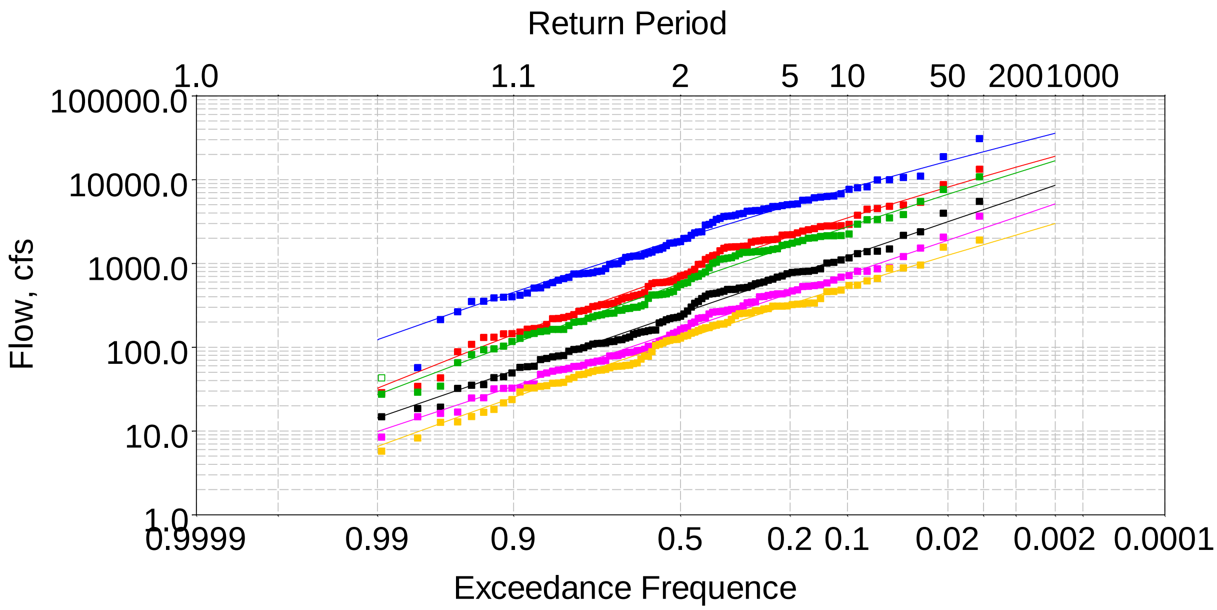
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.468	3.018	2.909	2.570	2.355	2.208
Standard Dev.	0.483	0.433	0.435	0.424	0.434	0.396
Station Skew	-0.268	-0.102	-0.072	0.017	-0.187	-0.090



Maximum Volume-Duration Frequency Analysis for Brazos River near Seymour B3

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	98,856	34,951	30,056	12,861	8,389	4,203
0.5	81,639	28,658	24,205	10,424	6,752	3,581
1.0	69,114	24,188	20,154	8,733	5,630	3,121
2.0	57,091	19,975	16,422	7,171	4,604	2,671
5.0	42,082	14,810	11,965	5,297	3,387	2,091
10.0	31,487	11,214	8,946	4,017	2,564	1,663
20.0	21,621	7,880	6,214	2,846	1,818	1,242
50.0	9,740	3,818	2,980	1,429	922	678
80.0	3,941	1,729	1,358	690	454	348
90.0	2,350	1,112	882	464	310	239
95.0	1,497	761	611	332	225	173
99.0	606	361	299	173	122	91

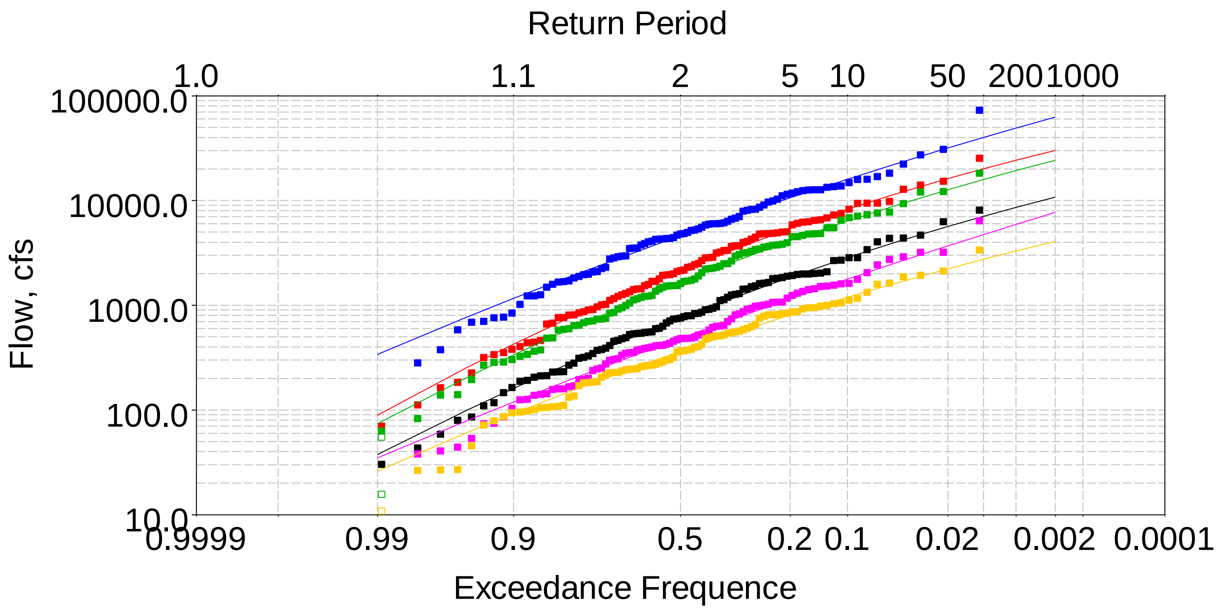
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.956	3.561	3.459	3.143	2.956	2.812
Standard Dev.	0.443	0.393	0.393	0.366	0.358	0.330
Station Skew	-0.446	-0.315	-0.238	-0.198	-0.145	-0.351



Maximum Volume-Duration Frequency Analysis for Clear Fork Brazos near Nugent B4

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	35,828	19,029	16,780	8,555	5,136	2,986
0.5	27,164	14,024	12,015	5,922	3,558	2,179
1.0	21,516	10,839	9,089	4,371	2,629	1,674
2.0	16,596	8,130	6,675	3,135	1,890	1,250
5.0	11,134	5,220	4,170	1,903	1,152	801
10.0	7,734	3,478	2,726	1,220	743	535
20.0	4,912	2,095	1,613	712	437	325
50.0	1,983	757	575	253	159	122
80.0	760	256	197	90	58	44
90.0	451	142	111	52	34	25
95.0	290	86	68	33	22	16
99.0	123	32	27	14	10	7

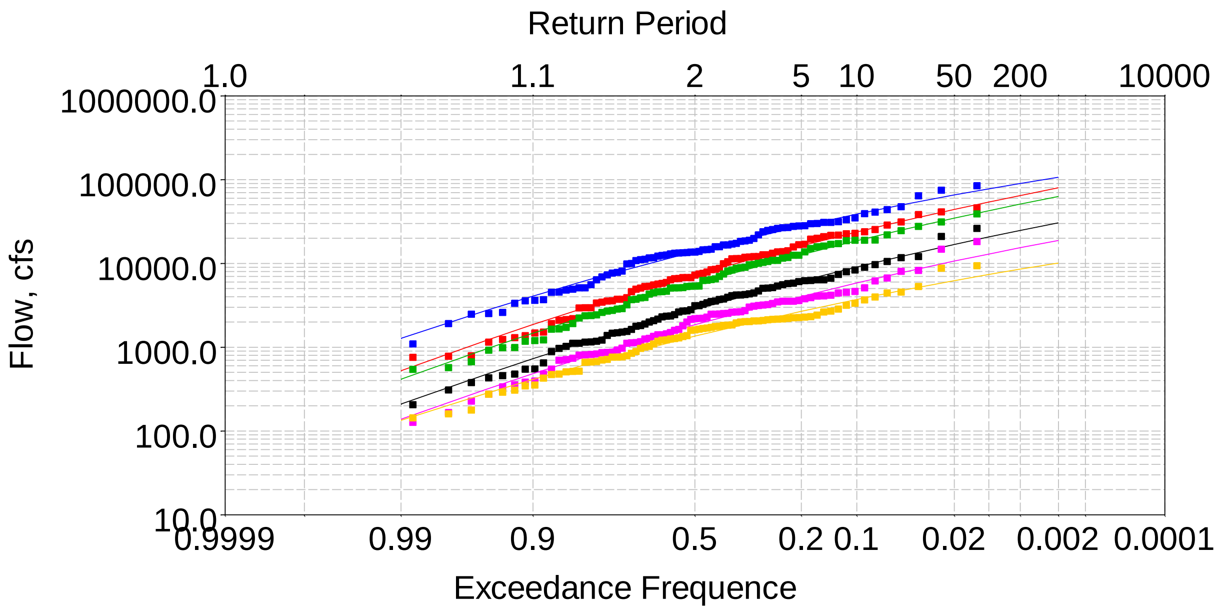
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.281	2.859	2.748	2.403	2.202	2.073
Standard Dev.	0.482	0.543	0.543	0.534	0.522	0.518
Station Skew	-0.198	-0.218	-0.131	-0.012	0.012	-0.142



Maximum Volume-Duration Frequency Analysis for Clear Fork Brazos near Fort Griffin B5

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	67,708	40,410	36,414	22,435	14,654	7,795
0.5	51,701	32,462	29,488	18,088	11,822	6,463
1.0	41,281	26,785	24,459	14,943	9,777	5,469
2.0	32,196	21,447	19,665	11,957	7,838	4,496
5.0	22,063	14,993	13,784	8,314	5,474	3,261
10.0	15,688	10,633	9,762	5,841	3,866	2,383
20.0	10,313	6,783	6,185	3,661	2,444	1,570
50.0	4,529	2,581	2,283	1,319	901	626
80.0	1,936	848	710	398	281	211
90.0	1,228	446	359	198	143	111
95.0	839	254	197	107	79	63
99.0	404	82	58	30	23	20

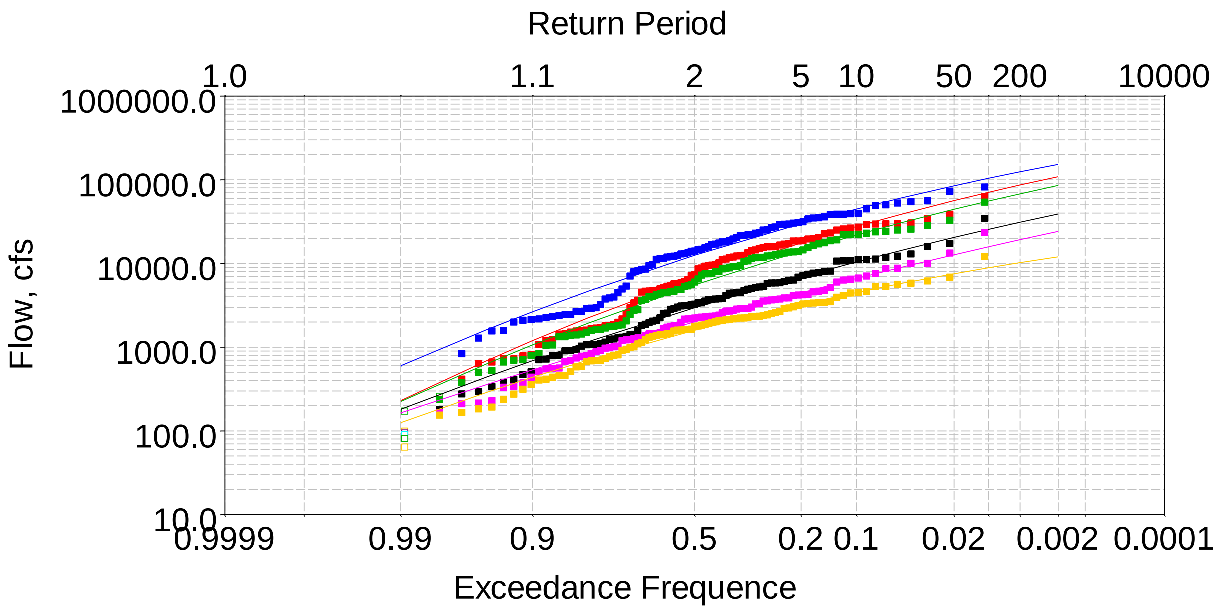
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.648	3.367	3.306	3.066	2.904	2.745
Standard Dev.	0.432	0.542	0.566	0.581	0.565	0.526
Station Skew	-0.115	-0.498	-0.558	-0.561	-0.544	-0.589



Maximum Volume-Duration Frequency Analysis for Brazos River near South Bend B6

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	106,727	79,687	62,906	30,547	18,795	10,123
0.5	89,969	64,641	50,981	24,747	15,379	8,534
1.0	77,581	54,009	42,566	20,661	12,940	7,363
2.0	65,488	44,054	34,697	16,843	10,634	6,221
5.0	50,020	31,978	25,165	12,224	7,804	4,764
10.0	38,755	23,695	18,636	9,061	5,836	3,703
20.0	27,879	16,163	12,705	6,189	4,023	2,678
50.0	13,918	7,312	5,746	2,815	1,854	1,357
80.0	6,361	3,043	2,394	1,182	784	634
90.0	4,074	1,860	1,464	727	482	412
95.0	2,765	1,216	958	479	317	283
99.0	1,274	524	414	209	138	134

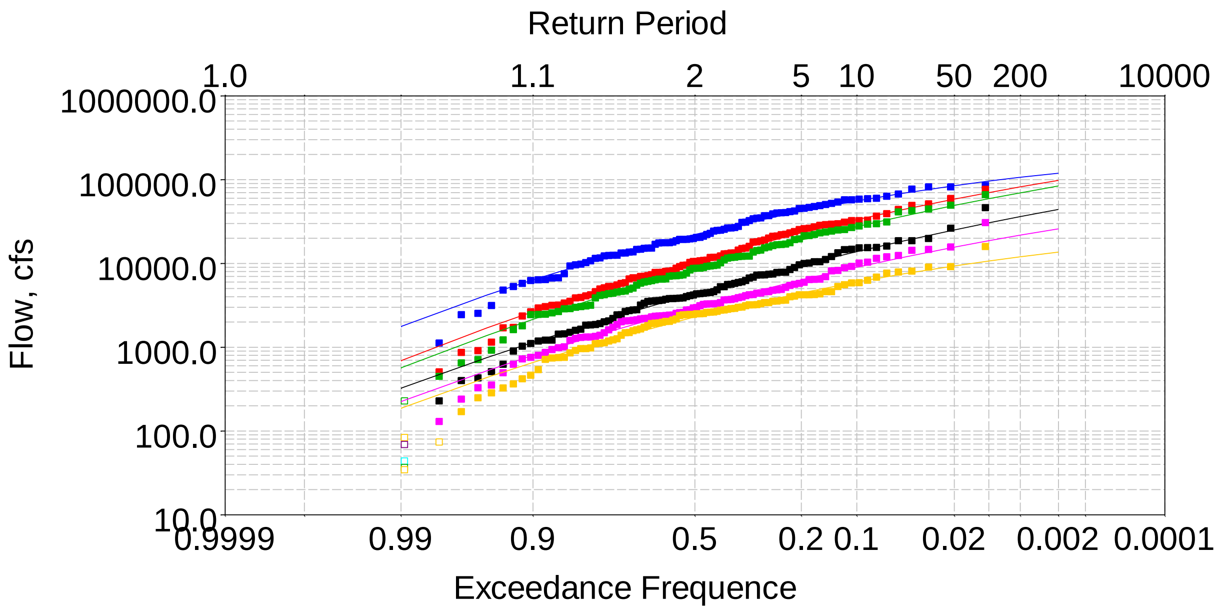
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.117	3.839	3.734	3.425	3.242	3.108
Standard Dev.	0.384	0.433	0.433	0.429	0.425	0.374
Station Skew	-0.423	-0.354	-0.350	-0.341	-0.373	-0.402



Maximum Volume-Duration Frequency Analysis for Brazos River near Palo Pinto B7

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	152,393	108,629	85,463	38,914	24,204	11,986
0.5	124,202	86,422	67,918	30,965	19,210	10,207
1.0	103,907	70,804	55,649	25,462	15,793	8,864
2.0	84,635	56,311	44,309	20,407	12,682	7,530
5.0	60,953	39,046	30,845	14,425	9,027	5,790
10.0	44,575	27,550	21,891	10,437	6,602	4,499
20.0	29,683	17,519	14,063	6,916	4,456	3,233
50.0	12,491	6,690	5,532	2,958	2,011	1,589
80.0	4,659	2,238	1,934	1,164	856	701
90.0	2,647	1,195	1,063	690	535	437
95.0	1,616	692	632	440	358	289
99.0	600	230	224	181	163	125

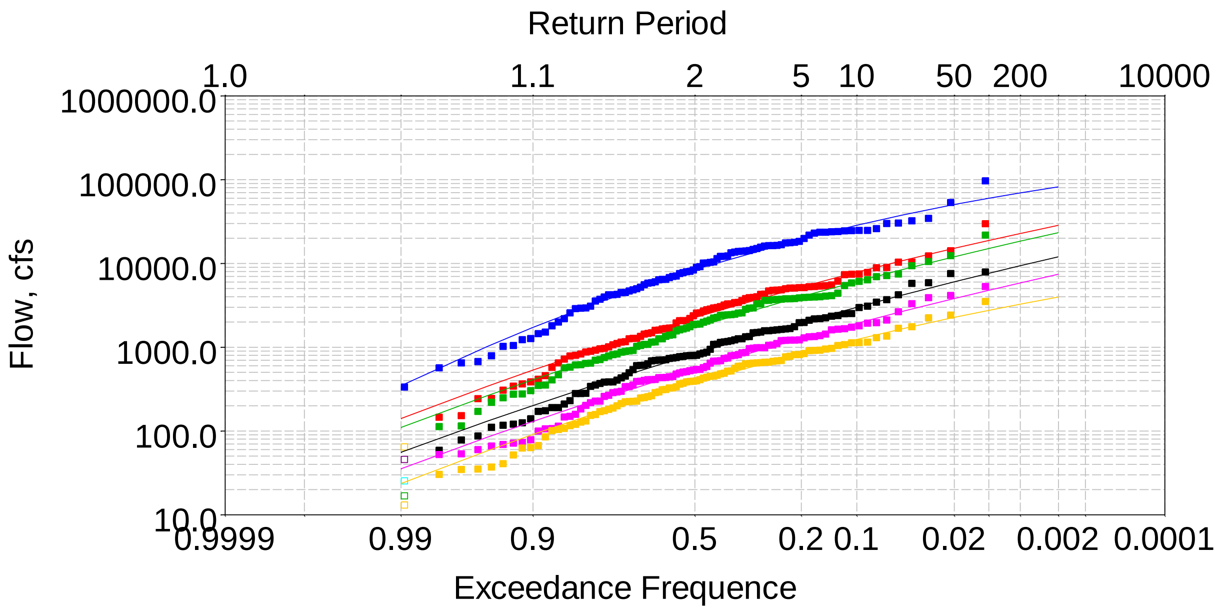
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.060	3.785	3.707	3.445	3.285	3.168
Standard Dev.	0.482	0.536	0.516	0.462	0.427	0.399
Station Skew	-0.461	-0.456	-0.421	-0.334	-0.254	-0.500



Maximum Volume-Duration Frequency Analysis for Brazos River near Glen Rose B8

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	119,299	97,588	83,886	44,166	25,856	13,653
0.5	106,361	81,679	69,606	36,201	21,692	12,003
1.0	95,815	69,896	59,164	30,499	18,612	10,693
2.0	84,591	58,398	49,091	25,096	15,608	9,331
5.0	68,667	43,753	36,436	18,447	11,777	7,452
10.0	55,757	33,187	27,435	13,812	9,004	5,972
20.0	42,024	23,140	18,987	9,533	6,353	4,440
50.0	22,151	10,691	8,689	4,397	3,024	2,297
80.0	10,150	4,411	3,575	1,858	1,299	1,045
90.0	6,363	2,649	2,150	1,143	800	656
95.0	4,192	1,696	1,381	750	524	434
99.0	1,769	690	567	325	224	186

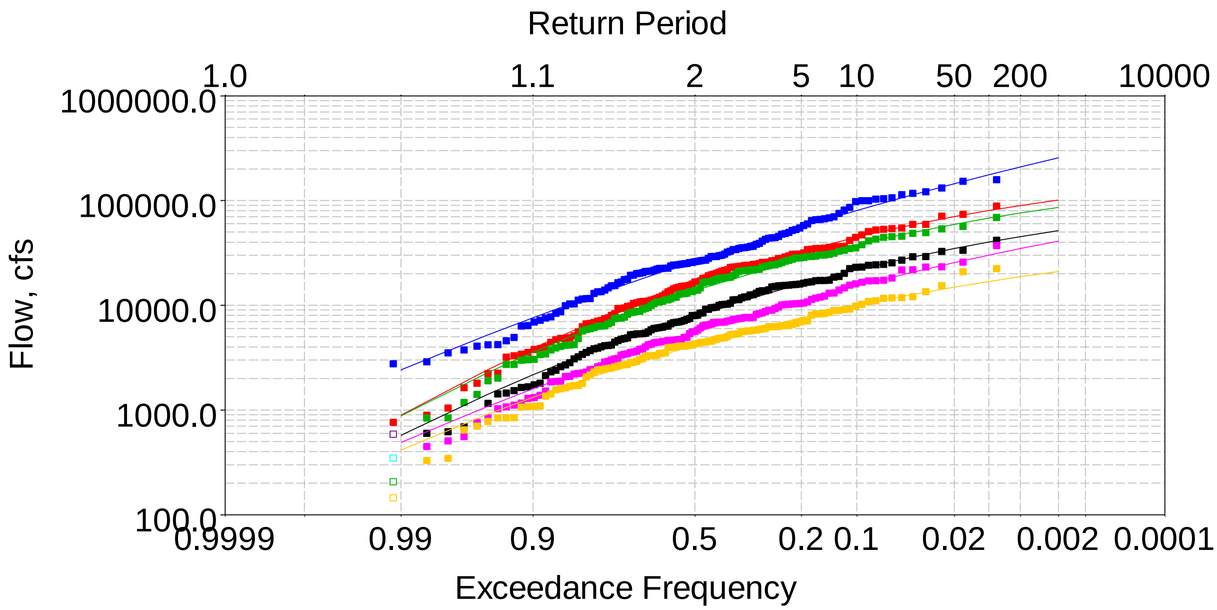
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.303	3.994	3.906	3.616	3.449	3.322
Standard Dev.	0.374	0.432	0.435	0.425	0.413	0.380
Station Skew	-0.691	-0.483	-0.451	-0.380	-0.460	-0.624



Maximum Volume-Duration Frequency Analysis for North Bosque River near Clifton B9

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	81,921	28,456	23,230	12,012	7,407	3,980
0.5	69,464	22,765	18,367	9,392	5,848	3,268
1.0	59,916	18,799	15,032	7,622	4,781	2,754
2.0	50,335	15,135	11,994	6,031	3,810	2,264
5.0	37,770	10,768	8,431	4,194	2,675	1,659
10.0	28,478	7,833	6,079	3,000	1,927	1,235
20.0	19,517	5,222	4,018	1,969	1,273	843
50.0	8,437	2,257	1,720	838	545	377
80.0	3,102	895	683	334	217	152
90.0	1,718	532	408	201	130	91
95.0	1,017	341	263	130	84	58
99.0	347	141	110	56	35	24

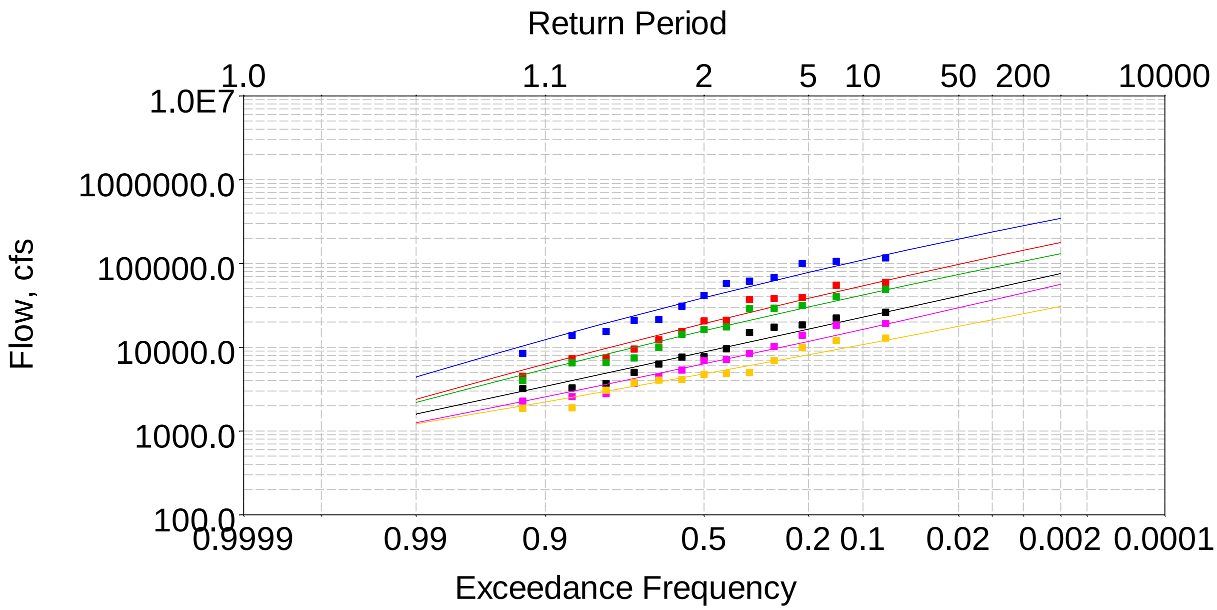
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.877	3.327	3.212	2.903	2.714	2.545
Standard Dev.	0.483	0.458	0.459	0.459	0.459	0.446
Station Skew	-0.619	-0.346	-0.304	-0.263	-0.297	-0.427



Maximum Volume-Duration Frequency Analysis for Brazos River at Waco B10

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	256,404	100,870	85,985	51,562	40,990	20,996
0.5	209,269	89,465	75,982	45,151	34,746	18,711
1.0	175,943	80,126	67,886	40,069	30,087	16,868
2.0	144,677	70,166	59,337	34,798	25,503	14,921
5.0	106,571	56,052	47,351	27,557	19,583	12,180
10.0	80,215	44,681	37,785	21,891	15,231	9,968
20.0	55,960	32,740	27,802	16,072	10,993	7,615
50.0	26,724	16,030	13,859	8,070	5,500	4,174
80.0	11,925	6,629	5,923	3,533	2,504	2,028
90.0	7,607	3,890	3,560	2,166	1,596	1,322
95.0	5,172	2,410	2,257	1,402	1,078	904
99.0	2,418	891	880	574	490	414

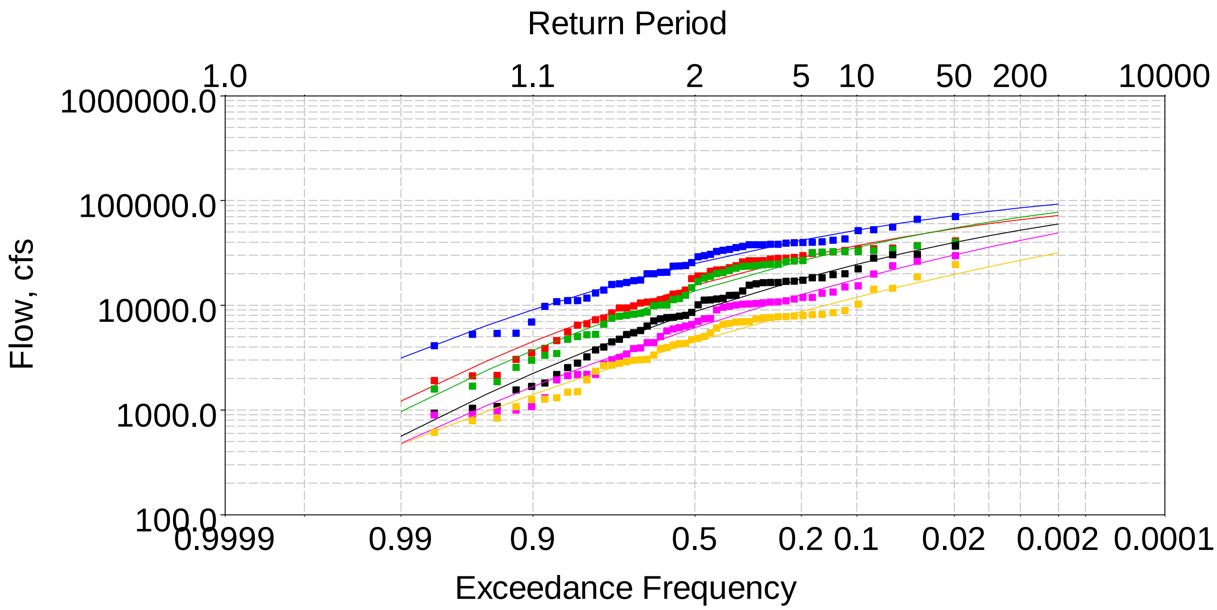
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.406	4.153	4.095	3.865	3.711	3.584
Standard Dev.	0.401	0.422	0.408	0.398	0.385	0.348
Station Skew	-0.312	-0.740	-0.697	-0.635	-0.451	-0.640



Maximum Volume-Duration Frequency Analysis for Brazos River near Marlin B11

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	344,379	177,472	130,507	75,765	56,467	30,731
0.5	281,015	142,911	106,104	60,281	44,401	25,076
1.0	236,569	119,162	89,200	49,936	36,478	21,233
2.0	195,106	97,394	73,583	40,668	29,483	17,731
5.0	144,808	71,522	54,825	29,912	21,503	13,572
10.0	110,086	54,022	41,972	22,786	16,304	10,734
20.0	78,056	38,152	30,153	16,405	11,715	8,110
50.0	38,969	19,132	15,661	8,776	6,312	4,798
80.0	18,515	9,284	7,896	4,714	3,464	2,880
90.0	12,297	6,277	5,454	3,411	2,549	2,219
95.0	8,679	4,512	3,993	2,614	1,986	1,794
99.0	4,397	2,387	2,190	1,589	1,255	1,213

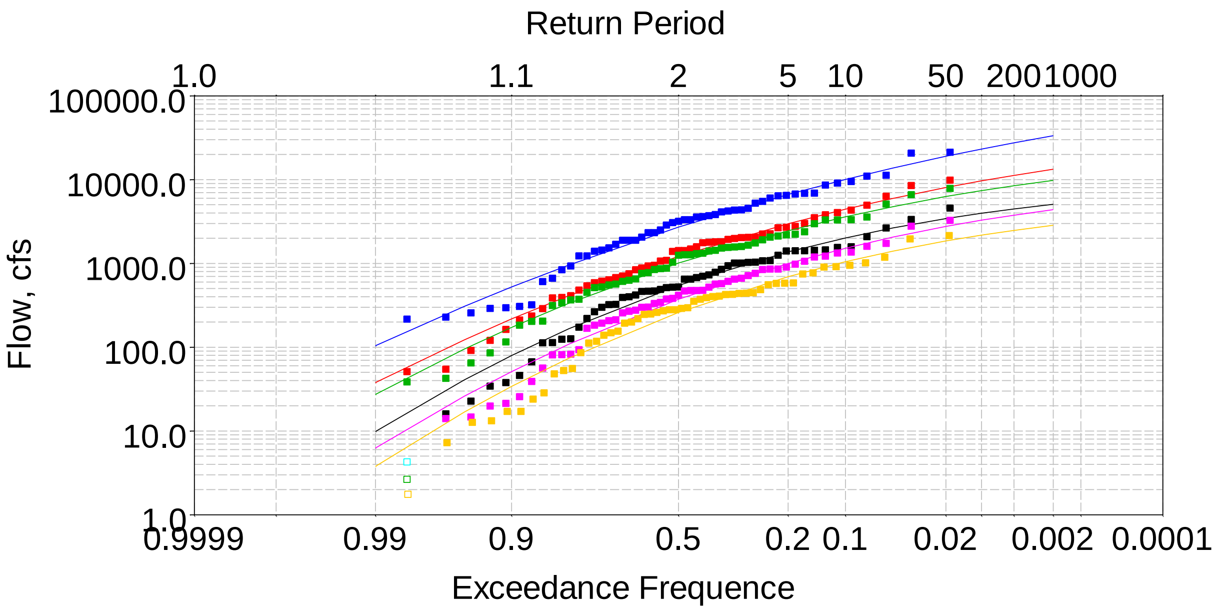
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.576	4.272	4.186	3.945	3.806	3.686
Standard Dev.	0.372	0.365	0.346	0.322	0.315	0.267
Station Skew	-0.245	-0.166	-0.158	0.022	0.106	0.101



Maximum Volume-Duration Frequency Analysis for Brazos River near Highbank B12

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	92,665	72,023	77,710	59,757	49,158	31,650
0.5	85,167	65,522	69,145	52,063	41,506	26,822
1.0	78,799	59,998	62,154	45,996	35,804	23,243
2.0	71,744	53,893	54,710	39,733	30,203	19,739
5.0	61,189	44,832	44,157	31,190	22,996	15,233
10.0	52,084	37,134	35,623	24,565	17,726	11,927
20.0	41,735	28,586	26,587	17,829	12,633	8,705
50.0	25,049	15,516	13,664	8,726	6,132	4,493
80.0	13,293	7,194	6,047	3,706	2,686	2,141
90.0	9,061	4,502	3,708	2,232	1,672	1,405
95.0	6,419	2,948	2,393	1,422	1,105	976
99.0	3,133	1,216	966	563	481	471

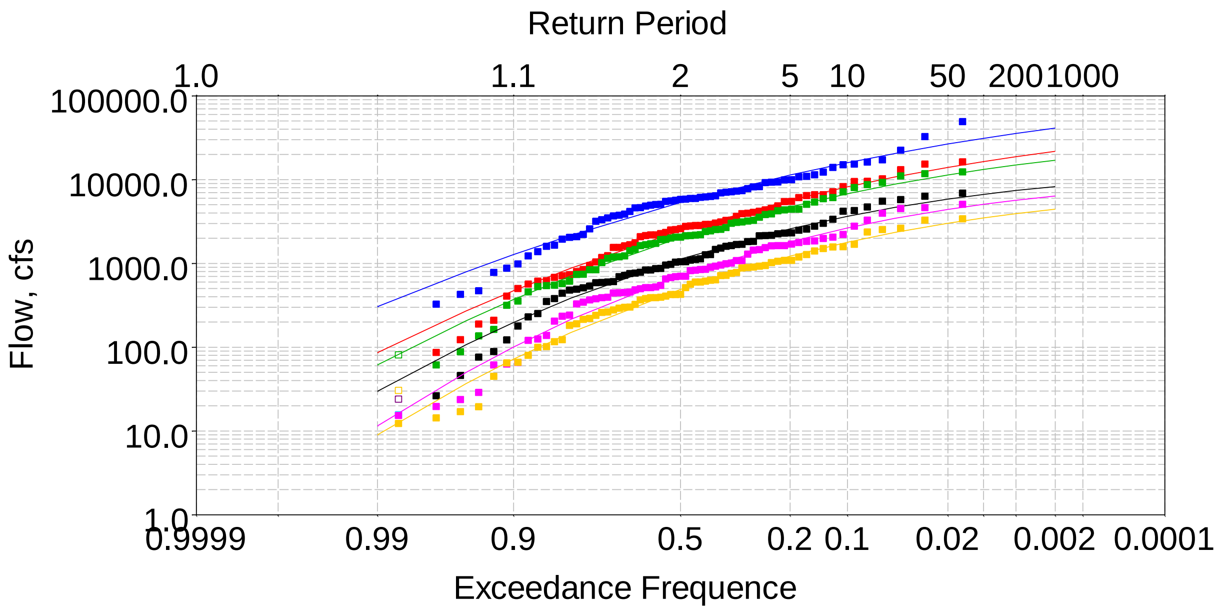
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.361	4.143	4.090	3.897	3.756	3.628
Standard Dev.	0.303	0.366	0.391	0.413	0.403	0.365
Station Skew	-0.752	-0.796	-0.707	-0.635	-0.469	-0.406



Maximum Volume-Duration Frequency Analysis for Leon River near Hamilton B13

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	33,410	13,290	9,808	5,067	4,379	2,844
0.5	27,495	11,227	8,464	4,470	3,766	2,479
1.0	23,149	9,641	7,390	3,968	3,271	2,176
2.0	18,955	8,049	6,275	3,422	2,755	1,853
5.0	13,708	5,965	4,755	2,640	2,052	1,400
10.0	10,022	4,433	3,592	2,013	1,518	1,046
20.0	6,635	2,972	2,443	1,371	998	693
50.0	2,712	1,213	1,006	546	374	260
80.0	958	412	335	166	109	74
90.0	523	217	172	80	51	34
95.0	307	123	95	41	26	17
99.0	104	38	27	10	6	4

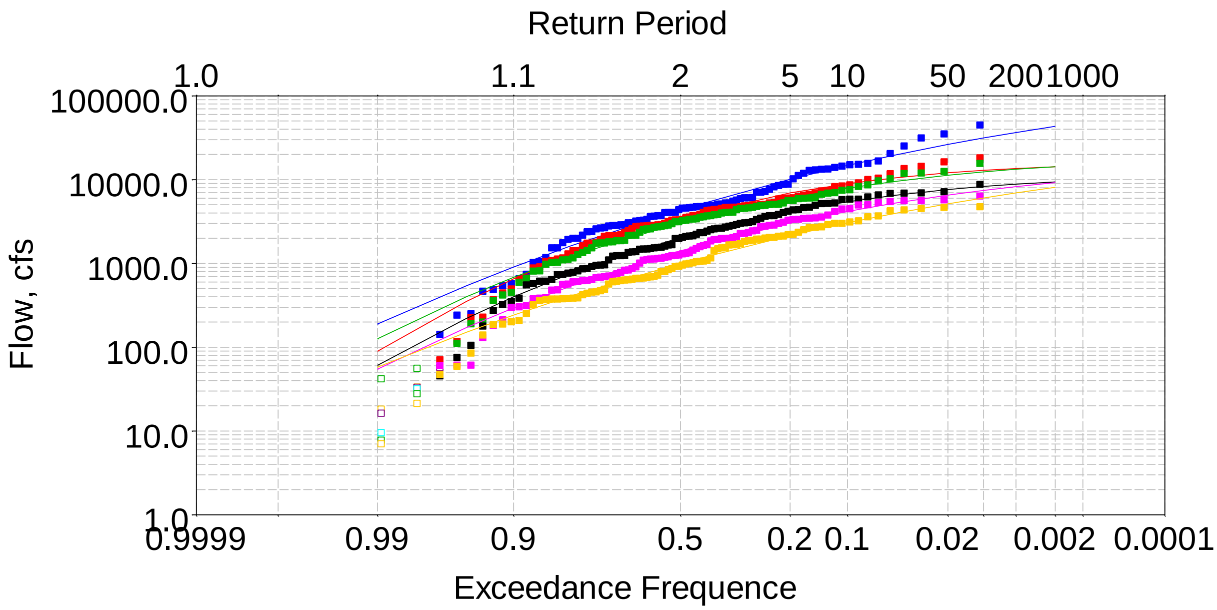
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.389	3.028	2.938	2.655	2.495	2.330
Standard Dev.	0.506	0.520	0.526	0.564	0.588	0.597
Station Skew	-0.533	-0.654	-0.748	-0.882	-0.800	-0.863



Maximum Volume-Duration Frequency Analysis for Leon River near Gatesville B14

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	41,242	21,690	17,023	8,265	6,354	4,441
0.5	35,531	18,758	14,912	7,404	5,664	3,927
1.0	31,090	16,425	13,187	6,666	5,069	3,492
2.0	26,566	14,008	11,356	5,848	4,410	3,019
5.0	20,505	10,715	8,792	4,644	3,441	2,337
10.0	15,899	8,187	6,771	3,646	2,644	1,787
20.0	11,315	5,670	4,715	2,585	1,811	1,221
50.0	5,322	2,453	2,029	1,128	720	490
80.0	2,167	877	705	385	214	150
90.0	1,275	472	370	198	100	72
95.0	797	271	207	107	50	37
99.0	304	86	62	30	12	9

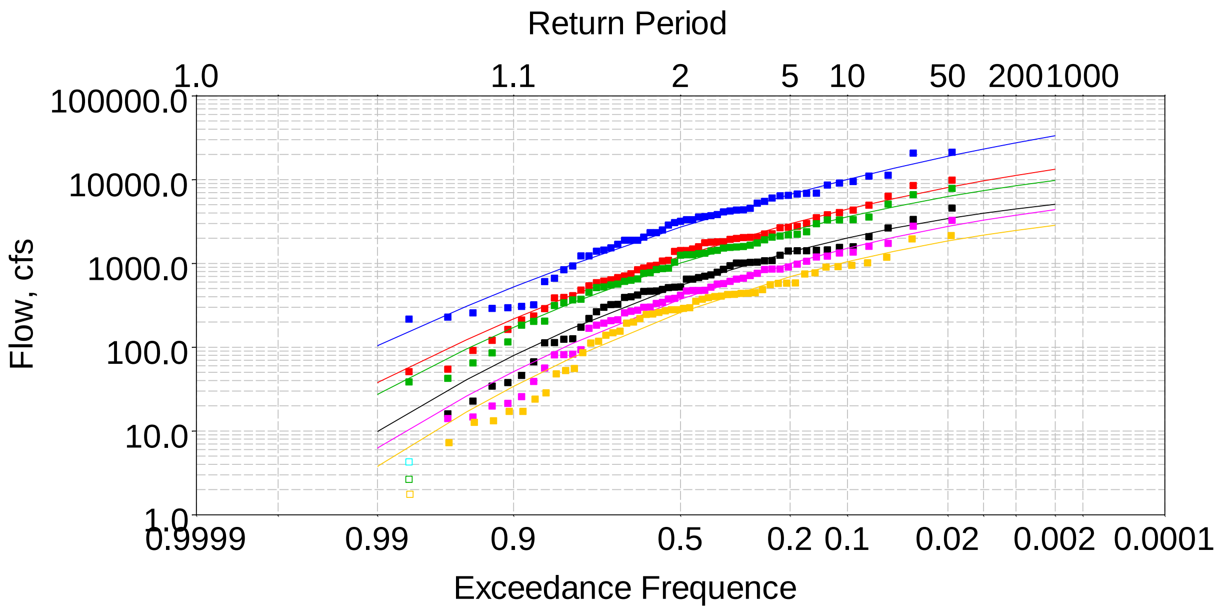
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.682	3.331	3.242	2.977	2.769	2.608
Standard Dev.	0.434	0.493	0.504	0.509	0.573	0.561
Station Skew	-0.615	-0.716	-0.787	-0.897	-0.937	-0.889



Maximum Volume-Duration Frequency Analysis for Leon River near Belton B15

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	43,187	14,248	14,269	9,380	9,198	8,092
0.5	36,464	13,589	13,274	8,818	8,242	6,933
1.0	31,353	12,915	12,356	8,277	7,431	6,040
2.0	26,258	12,042	11,266	7,610	6,543	5,138
5.0	19,629	10,488	9,517	6,490	5,246	3,941
10.0	14,764	8,919	7,919	5,425	4,173	3,040
20.0	10,103	6,920	6,044	4,137	3,027	2,153
50.0	4,376	3,467	3,064	2,039	1,414	1,006
80.0	1,623	1,270	1,223	758	535	409
90.0	906	654	682	399	295	241
95.0	541	350	398	220	171	151
99.0	188	90	126	61	55	58

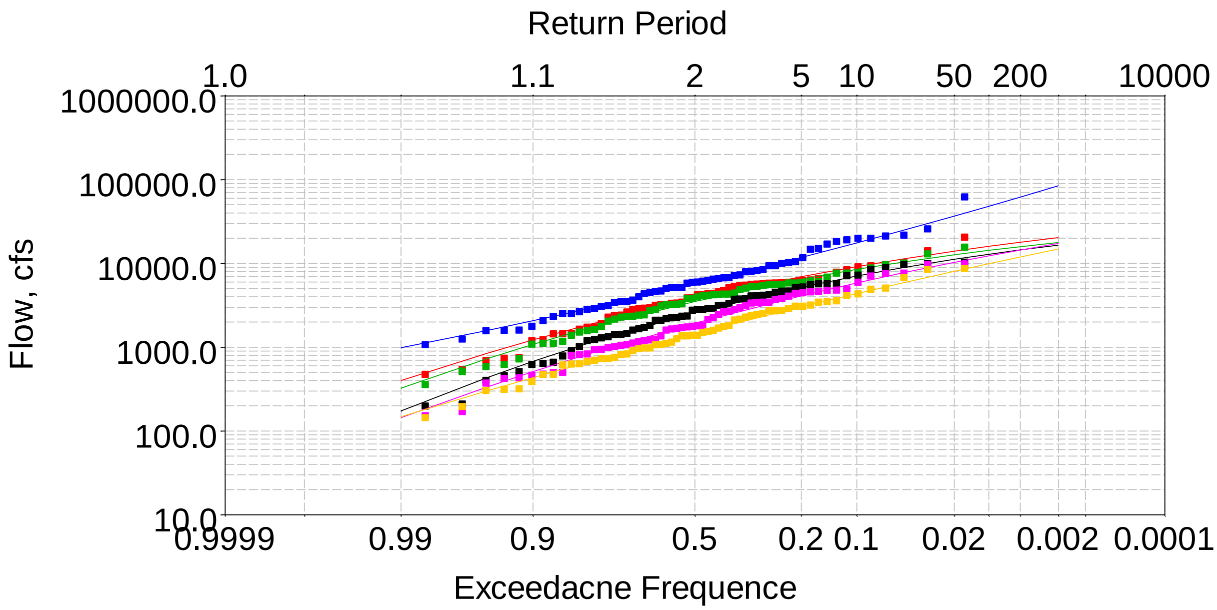
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.594	3.445	3.414	3.224	3.086	2.960
Standard Dev.	0.479	0.470	0.432	0.464	0.462	0.435
Station Skew	-0.596	-1.247	-1.028	-1.133	-0.844	-0.592



Maximum Volume-Duration Frequency Analysis for Lampasas River near Kempner B16

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	33,410	13,290	9,808	5,067	4,379	2,844
0.5	27,495	11,227	8,464	4,470	3,766	2,479
1.0	23,149	9,641	7,390	3,968	3,271	2,176
2.0	18,955	8,049	6,275	3,422	2,755	1,853
5.0	13,708	5,965	4,755	2,640	2,052	1,400
10.0	10,022	4,433	3,592	2,013	1,518	1,046
20.0	6,635	2,972	2,443	1,371	998	693
50.0	2,712	1,213	1,006	546	374	260
80.0	958	412	335	166	109	74
90.0	523	217	172	80	51	34
95.0	307	123	95	41	26	17
99.0	104	38	27	10	6	4

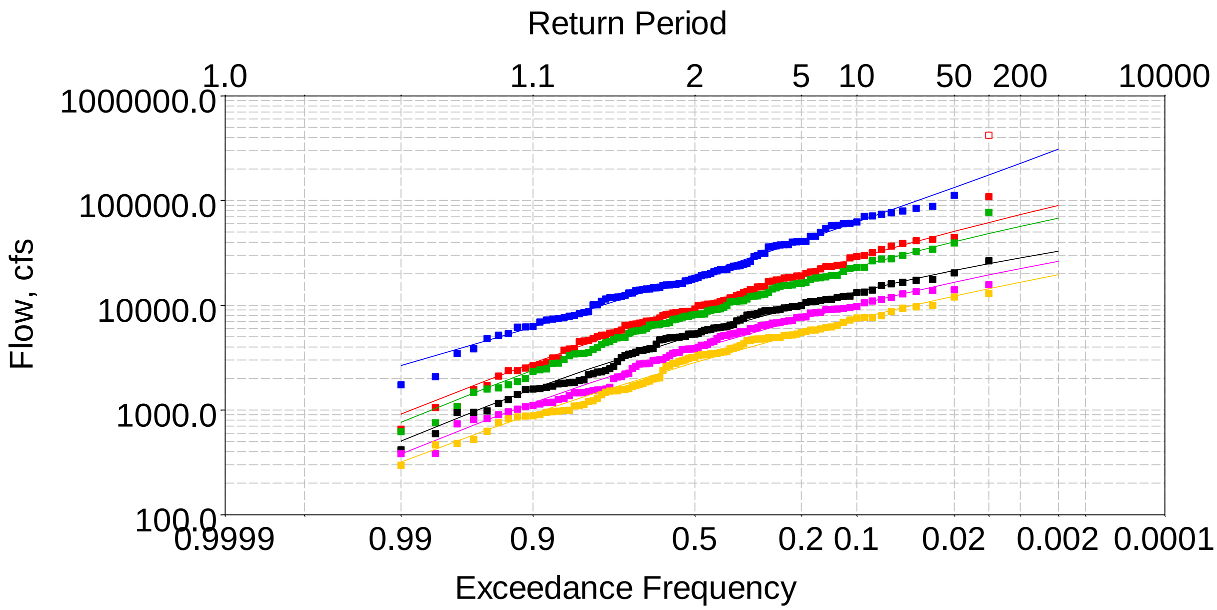
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.389	3.028	2.938	2.655	2.495	2.330
Standard Dev.	0.506	0.520	0.526	0.564	0.588	0.597
Station Skew	-0.533	-0.654	-0.748	-0.882	-0.800	-0.863



Maximum Volume-Duration Frequency Analysis for Little River near Little River B17

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	84,660	20,312	17,716	16,454	17,324	14,860
0.5	61,942	17,878	15,832	14,455	14,435	11,928
1.0	48,114	15,964	14,299	12,857	12,319	9,907
2.0	36,704	13,986	12,670	11,189	10,273	8,053
5.0	24,710	11,274	10,356	8,880	7,693	5,850
10.0	17,566	9,141	8,475	7,060	5,846	4,365
20.0	11,771	6,925	6,464	5,180	4,099	3,027
50.0	5,688	3,774	3,512	2,585	1,935	1,451
80.0	2,889	1,850	1,678	1,116	828	663
90.0	2,067	1,220	1,080	677	510	432
95.0	1,583	845	729	433	335	300
99.0	982	399	324	173	144	148

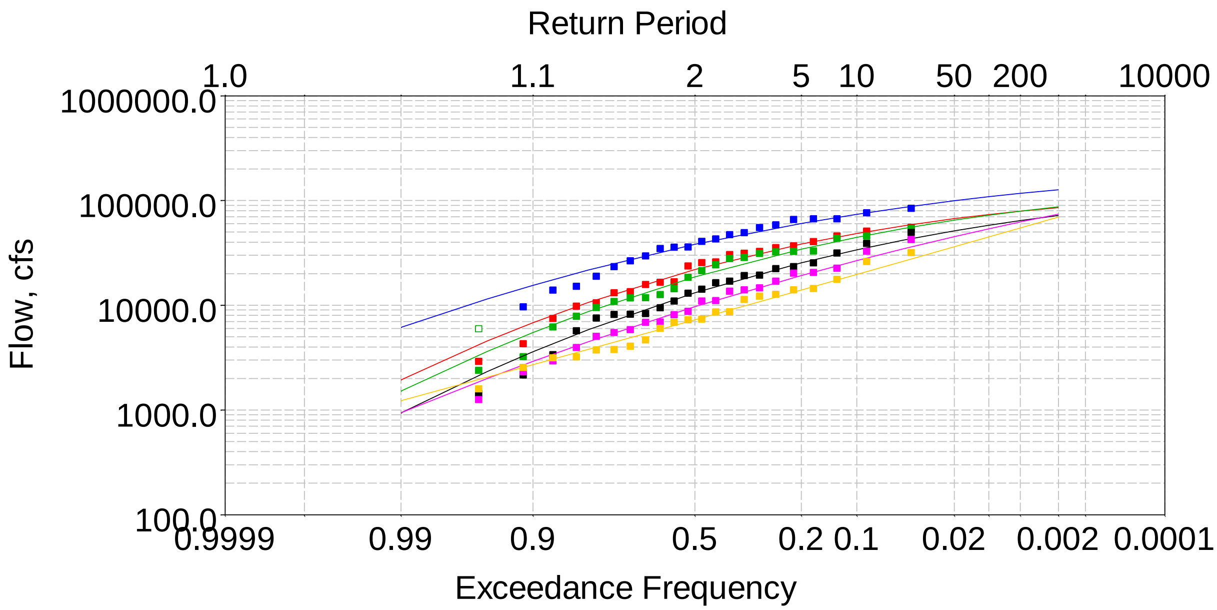
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.770	3.544	3.506	3.368	3.257	3.147
Standard Dev.	0.364	0.345	0.355	0.404	0.416	0.393
Station Skew	0.251	-0.564	-0.670	-0.662	-0.434	-0.222



Maximum Volume-Duration Frequency Analysis for Little River near Cameron B18

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	309,259	89,772	68,044	32,848	26,298	19,561
0.5	226,331	73,319	56,589	28,385	22,403	16,579
1.0	175,530	61,697	48,290	24,966	19,488	14,375
2.0	133,430	50,797	40,331	21,520	16,610	12,219
5.0	89,039	37,514	30,367	16,935	12,874	9,452
10.0	62,584	28,320	23,271	13,451	10,106	7,423
20.0	41,188	19,845	16,558	9,947	7,388	5,444
50.0	18,985	9,586	8,157	5,193	3,804	2,847
80.0	9,047	4,344	3,720	2,453	1,794	1,382
90.0	6,222	2,798	2,390	1,590	1,168	918
95.0	4,598	1,919	1,631	1,087	804	645
99.0	2,650	915	764	504	380	319

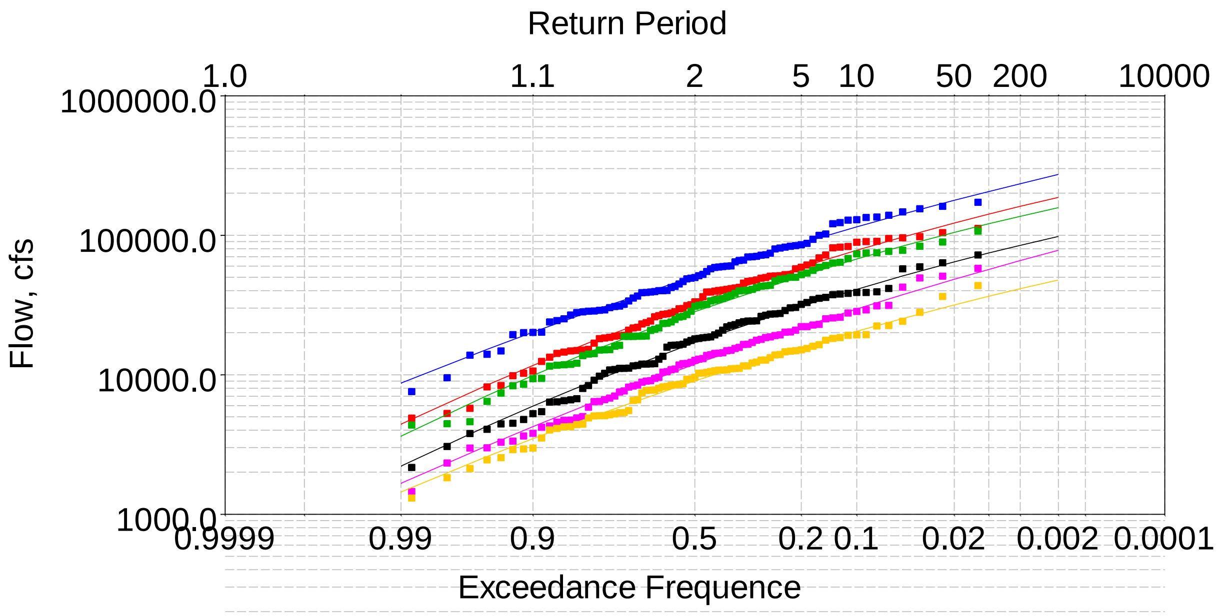
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.289	3.962	3.888	3.685	3.553	3.432
Standard Dev.	0.392	0.393	0.388	0.365	0.368	0.356
Station Skew	0.157	-0.299	-0.367	-0.506	-0.440	-0.387



Maximum Volume-Duration Frequency Analysis for Brazos River at SH 21 near Bryan B19

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	126,743	85,576	87,132	71,904	74,150	69,741
0.5	116,901	79,164	79,116	64,328	62,326	54,811
1.0	108,590	73,532	72,343	58,082	53,642	44,956
2.0	99,419	67,117	64,897	51,369	45,208	36,224
5.0	85,730	57,225	53,906	41,744	34,485	26,232
10.0	73,906	48,465	44,617	33,866	26,719	19,716
20.0	60,384	38,333	34,346	25,432	19,250	13,973
50.0	38,140	21,898	18,699	13,192	9,687	7,264
80.0	21,737	10,658	8,736	5,869	4,495	3,799
90.0	15,514	6,830	5,500	3,601	2,910	2,713
95.0	11,471	4,558	3,623	2,323	1,997	2,057
99.0	6,140	1,943	1,516	935	943	1,228

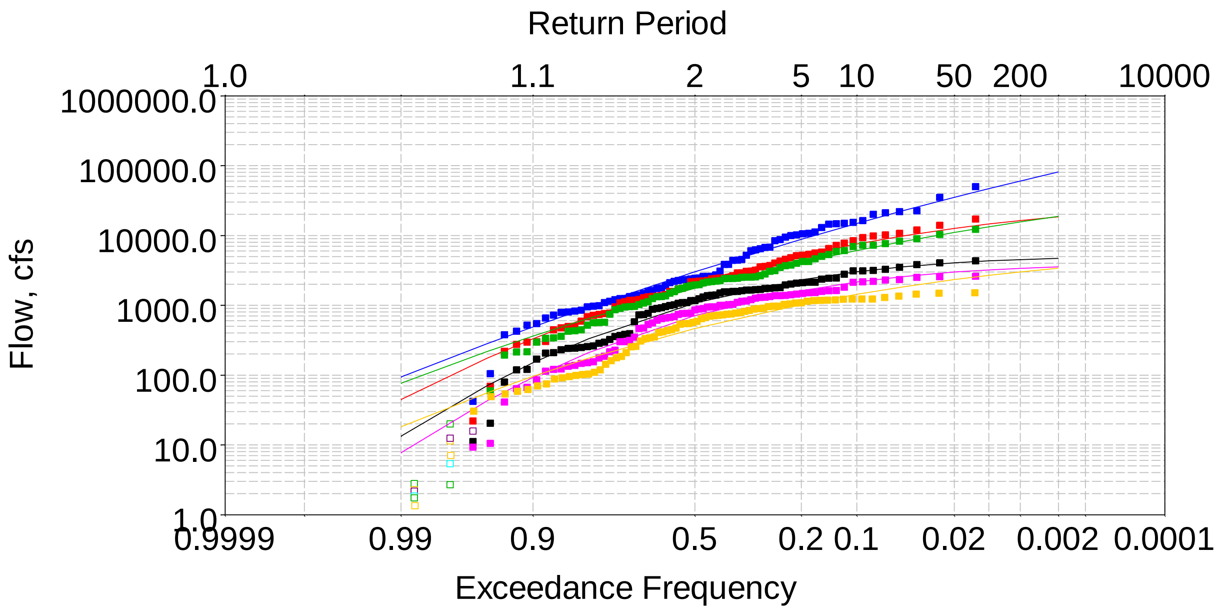
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.550	4.292	4.225	4.073	3.961	3.863
Standard Dev.	0.269	0.342	0.363	0.388	0.378	0.336
Station Skew	-0.705	-0.868	-0.780	-0.733	-0.395	0.032



Maximum Volume-Duration Frequency Analysis for Brazos River near Bryan B20

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	272,414	187,029	157,411	98,121	77,975	47,851
0.5	234,095	161,173	136,611	84,651	65,769	41,327
1.0	205,707	141,731	120,759	74,487	56,887	36,442
2.0	177,827	122,409	104,823	64,357	48,313	31,602
5.0	141,687	97,059	83,629	51,027	37,452	25,261
10.0	114,759	77,989	67,466	40,972	29,577	20,489
20.0	87,894	58,875	51,074	30,875	21,945	15,688
50.0	50,913	32,665	28,300	17,022	11,920	9,025
80.0	28,099	16,900	14,484	8,715	6,140	4,902
90.0	20,193	11,636	9,876	5,957	4,247	3,481
95.0	15,211	8,420	7,074	4,281	3,097	2,591
99.0	8,713	4,419	3,622	2,212	1,665	1,444

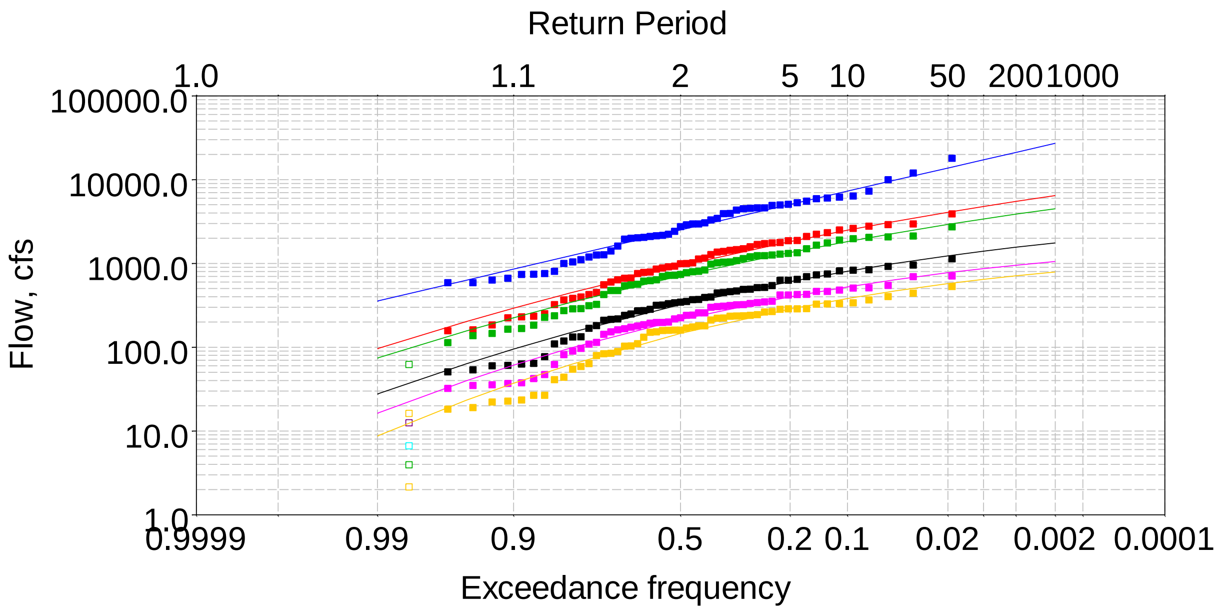
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.692	4.493	4.427	4.208	4.060	3.938
Standard Dev.	0.295	0.324	0.328	0.329	0.330	0.302
Station Skew	-0.301	-0.397	-0.446	-0.415	-0.296	-0.350



Maximum Volume-Duration Frequency Analysis for Yegua Creek near Somerville B21

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	81,156	18,494	18,710	4,685	3,539	3,409
0.5	60,269	16,364	15,616	4,511	3,381	3,008
1.0	46,761	14,568	13,305	4,320	3,213	2,678
2.0	35,134	12,614	11,039	4,057	2,988	2,327
5.0	22,491	9,804	8,146	3,558	2,577	1,830
10.0	14,869	7,535	6,065	3,024	2,153	1,433
20.0	8,807	5,193	4,107	2,315	1,612	1,021
50.0	3,014	2,131	1,755	1,073	713	465
80.0	938	676	648	332	210	174
90.0	490	332	363	150	93	96
95.0	281	174	217	71	43	56
99.0	94	45	77	13	8	18

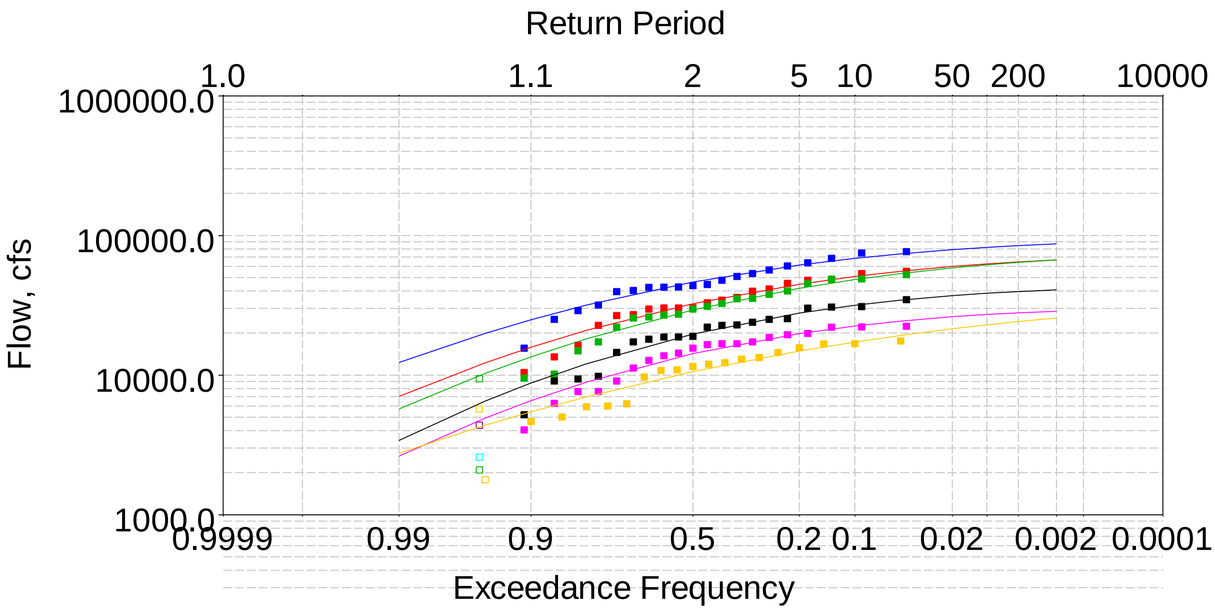
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.450	3.250	3.200	2.909	2.730	2.608
Standard Dev.	0.580	0.545	0.483	0.547	0.571	0.469
Station Skew	-0.302	-0.876	-0.555	-1.385	-1.333	-0.778



Maximum Volume-Duration Frequency Analysis for Davidson Creek near Lyons B22

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	27,106	6,452	4,490	1,754	1,053	790
0.5	21,147	5,496	3,865	1,556	951	712
1.0	17,225	4,781	3,391	1,397	867	646
2.0	13,761	4,075	2,917	1,230	774	575
5.0	9,819	3,161	2,291	995	638	469
10.0	7,270	2,483	1,819	806	525	381
20.0	5,048	1,818	1,347	607	400	286
50.0	2,505	940	710	322	214	146
80.0	1,239	446	342	150	98	62
90.0	856	292	225	95	61	37
95.0	631	202	156	64	40	23
99.0	355	96	74	28	16	9

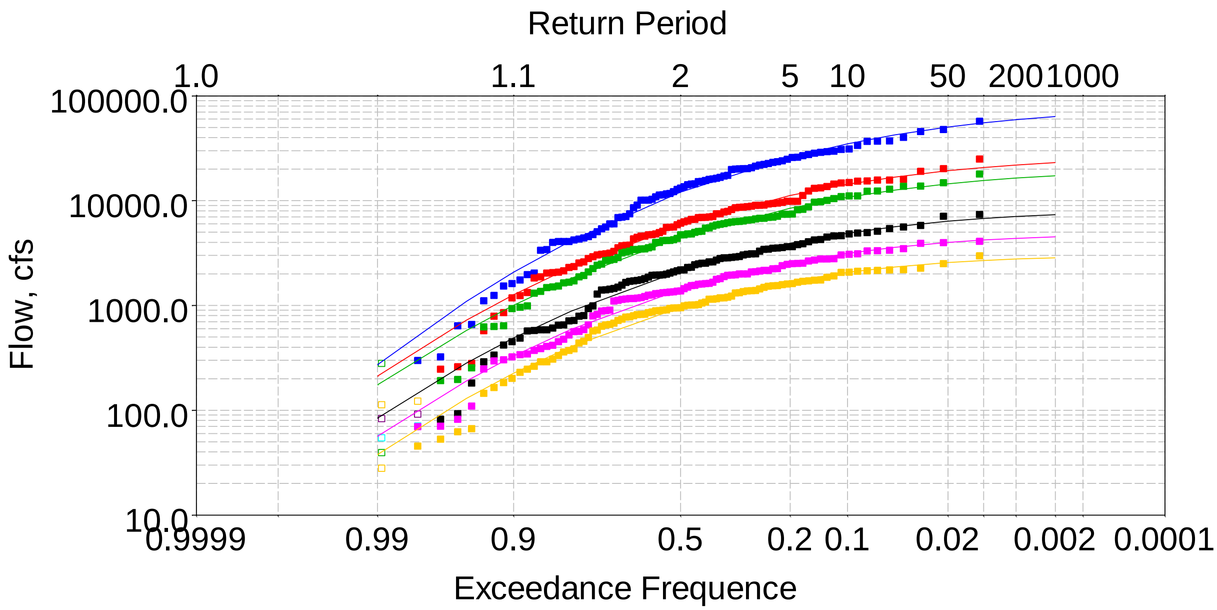
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.398	2.947	2.824	2.468	2.283	2.110
Standard Dev.	0.362	0.365	0.357	0.368	0.373	0.405
Station Skew	-0.018	-0.433	-0.469	-0.654	-0.769	-0.800



Maximum Volume-Duration Frequency Analysis for Brazos River at Washington B23

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	86,973	66,921	66,792	40,770	28,659	25,674
0.5	84,492	64,718	64,089	39,663	27,917	24,180
1.0	82,089	62,595	61,552	38,540	27,162	22,894
2.0	79,086	59,957	58,475	37,079	26,178	21,446
5.0	73,850	55,398	53,313	34,425	24,382	19,220
10.0	68,515	50,807	48,275	31,624	22,477	17,224
20.0	61,341	44,722	41,802	27,768	19,841	14,837
50.0	46,377	32,402	29,278	19,673	14,249	10,573
80.0	31,716	20,918	18,225	12,064	8,903	6,989
90.0	24,893	15,828	13,519	8,769	6,549	5,453
95.0	19,901	12,234	10,275	6,507	4,915	4,368
99.0	12,314	7,041	5,725	3,405	2,634	2,759

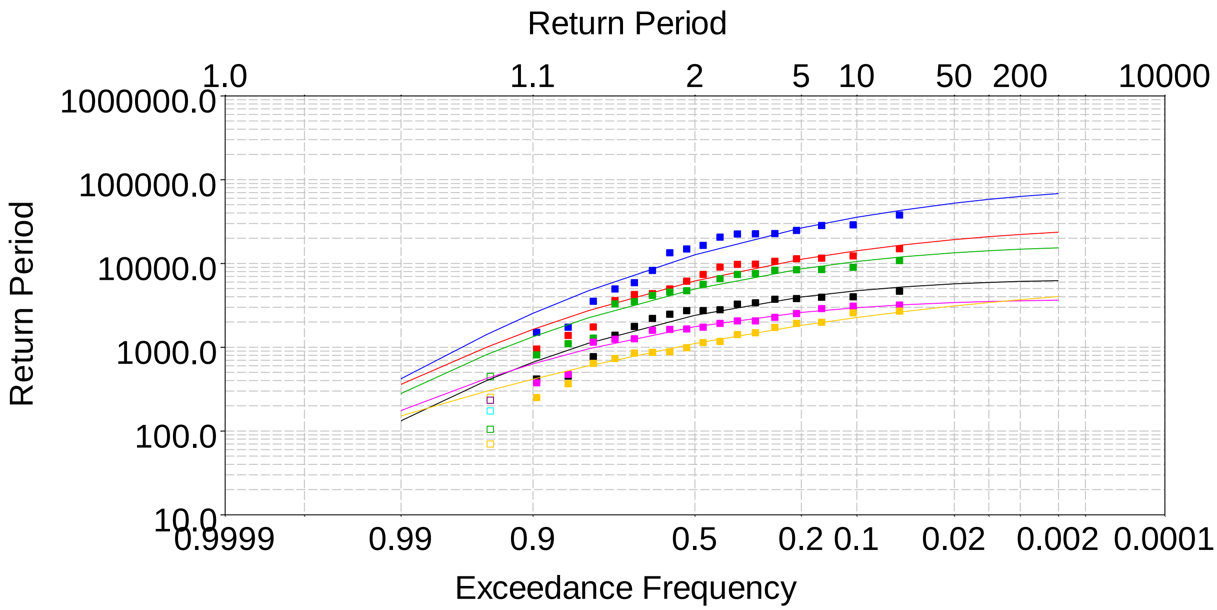
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.636	4.475	4.431	4.250	4.112	4.001
Standard Dev.	0.179	0.206	0.224	0.229	0.220	0.198
Station Skew	-1.043	-1.041	-0.979	-1.176	-1.179	-0.700



Maximum Volume-Duration Frequency Analysis for Navasota River at Easterly B24

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	63,479	23,060	17,307	7,354	4,527	2,851
0.5	59,308	21,901	16,442	7,061	4,374	2,772
1.0	55,318	20,751	15,586	6,758	4,210	2,685
2.0	50,451	19,299	14,506	6,361	3,990	2,564
5.0	42,399	16,783	12,637	5,641	3,578	2,328
10.0	34,877	14,304	10,795	4,898	3,139	2,065
20.0	25,976	11,195	8,482	3,922	2,545	1,697
50.0	12,071	5,842	4,479	2,136	1,415	963
80.0	4,145	2,319	1,812	881	592	406
90.0	2,077	1,269	1,004	490	330	226
95.0	1,092	722	578	282	190	130
99.0	272	212	175	84	57	38

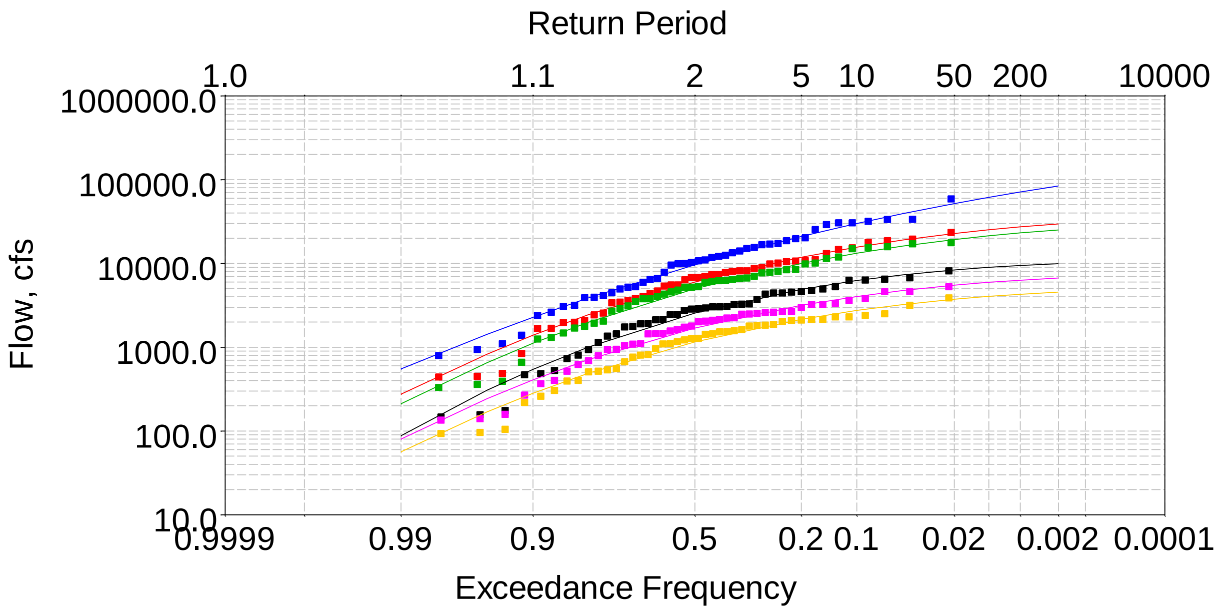
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.99	3.683	3.57	3.245	3.064	2.893
Standard Dev.	0.501	0.433	0.424	0.414	0.408	0.403
Station Skew	-1.124	-1.179	-1.173	-1.258	-1.313	-1.385



Maximum Volume-Duration Frequency Analysis for Navasota River
at Old Spanish Road near Bryan B25

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	68,117	23,511	15,344	6,232	3,640	4,026
0.5	62,783	22,123	14,759	6,088	3,580	3,693
1.0	57,936	20,818	14,160	5,926	3,511	3,413
2.0	52,279	19,241	13,380	5,696	3,411	3,105
5.0	43,383	16,641	11,969	5,240	3,206	2,649
10.0	35,455	14,191	10,512	4,720	2,962	2,258
20.0	26,408	11,212	8,586	3,972	2,596	1,815
50.0	12,666	6,170	4,965	2,406	1,757	1,104
80.0	4,727	2,734	2,249	1,113	957	600
90.0	2,534	1,626	1,334	660	631	416
95.0	1,427	1,006	817	401	424	299
99.0	418	359	280	133	175	151

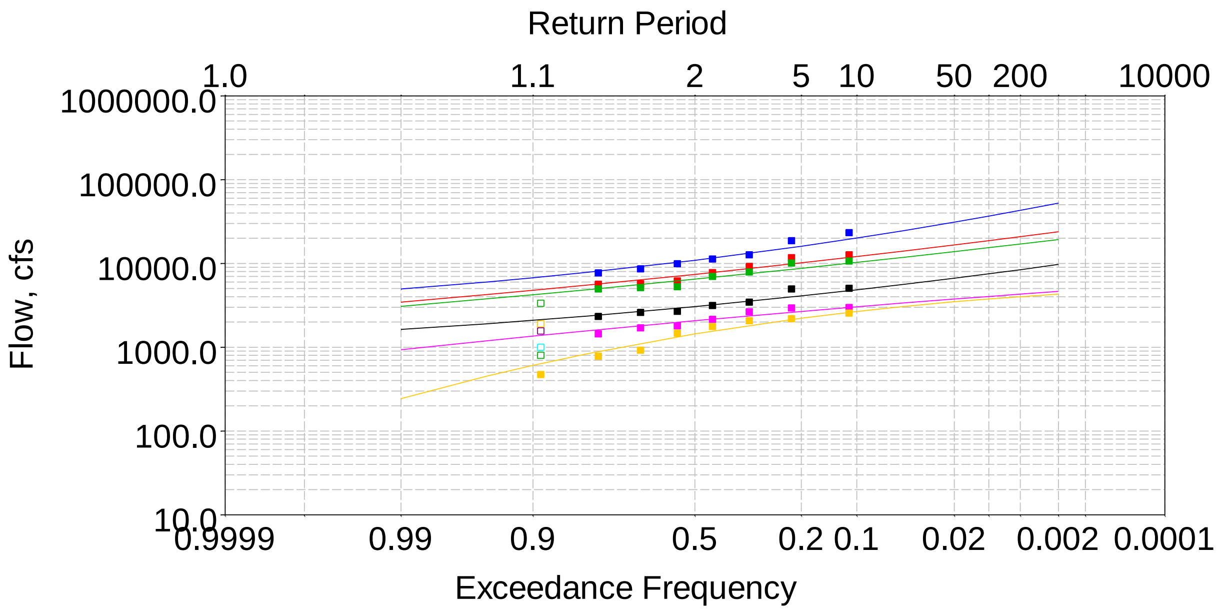
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.026	3.724	3.622	3.300	3.179	3.008
Standard Dev.	0.464	0.383	0.371	0.360	0.284	0.292
Station Skew	-1.003	-1.052	-1.232	-1.405	-1.443	-0.716



Maximum Volume-Duration Frequency Analysis for Navasota River near Bryan B26

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	83,819	29,544	25,056	9,892	6,692	4,543
0.5	71,069	27,212	23,086	9,425	6,308	4,282
1.0	61,401	25,124	21,316	8,954	5,940	4,033
2.0	51,774	22,716	19,267	8,352	5,491	3,729
5.0	39,222	18,967	16,068	7,293	4,742	3,222
10.0	29,955	15,647	13,228	6,235	4,028	2,740
20.0	20,975	11,855	9,984	4,892	3,156	2,150
50.0	9,636	5,998	4,989	2,551	1,685	1,154
80.0	3,875	2,437	1,987	1,003	709	490
90.0	2,277	1,385	1,113	543	406	282
95.0	1,424	825	654	306	243	169
99.0	549	274	211	88	80	56

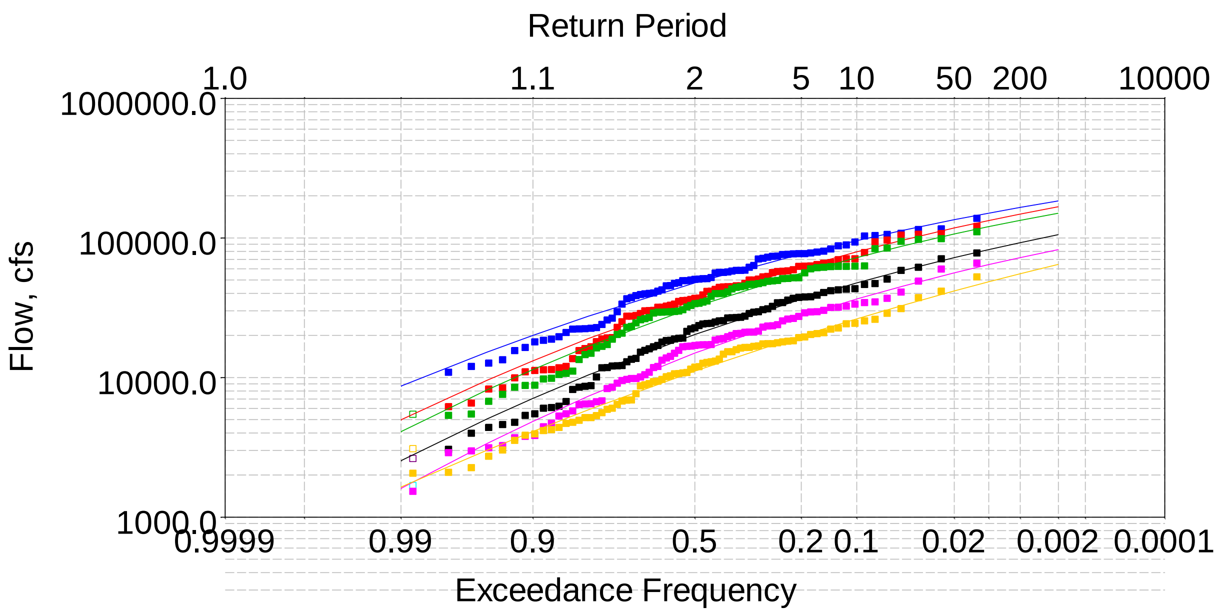
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.943	3.711	3.629	3.321	3.154	2.991
Standard Dev.	0.442	0.425	0.435	0.437	0.407	0.403
Station Skew	-0.556	-0.956	-0.969	-1.208	-1.092	-1.088



Maximum Volume-Duration Frequency Analysis for Navasota River near College Station B27

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	52,447	23,805	19,261	9,703	4,629	4,289
0.5	42,962	20,799	17,025	8,412	4,291	4,005
1.0	36,672	18,647	15,401	7,506	4,025	3,759
2.0	31,046	16,588	13,826	6,654	3,747	3,481
5.0	24,486	13,978	11,797	5,596	3,355	3,052
10.0	20,076	12,059	10,279	4,835	3,031	2,669
20.0	16,026	10,140	8,734	4,089	2,670	2,217
50.0	10,892	7,398	6,473	3,052	2,068	1,441
80.0	7,831	5,513	4,872	2,359	1,574	841
90.0	6,732	4,766	4,226	2,091	1,356	606
95.0	6,004	4,244	3,768	1,905	1,194	451
99.0	4,963	3,448	3,062	1,624	932	243

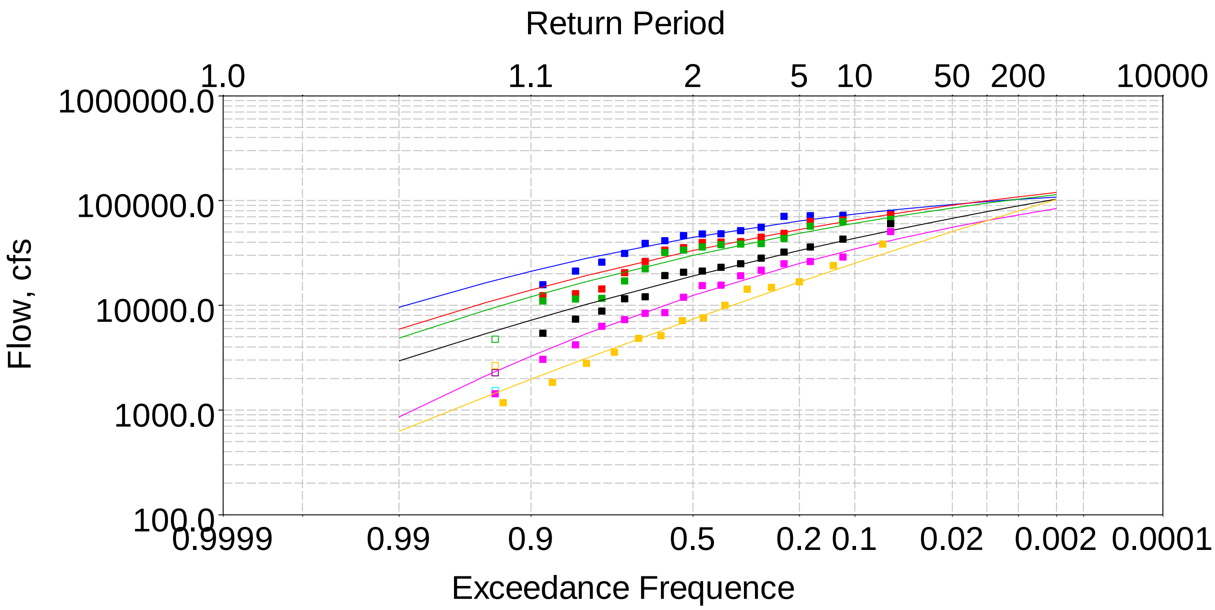
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.054	3.876	3.816	3.495	3.310	3.126
Standard Dev.	0.187	0.158	0.151	0.143	0.137	0.257
Station Skew	0.554	0.246	0.189	0.455	-0.231	-0.779



Maximum Volume-Duration Frequency Analysis for Brazos River near Hempstead B28

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	184,270	167,138	149,993	105,425	82,345	64,692
0.5	165,396	148,069	133,466	92,553	72,208	55,346
1.0	150,435	133,092	120,329	82,545	64,290	48,422
2.0	134,821	117,613	106,613	72,305	56,161	41,628
5.0	113,012	96,308	87,515	58,394	45,089	32,843
10.0	95,408	79,439	72,227	47,550	36,452	26,327
20.0	76,457	61,697	56,011	36,330	27,536	19,870
50.0	47,514	35,738	32,111	20,348	14,960	11,117
80.0	27,482	18,990	16,707	10,422	7,340	5,871
90.0	20,037	13,164	11,401	7,078	4,849	4,107
95.0	15,192	9,543	8,138	5,042	3,366	3,019
99.0	8,687	4,975	4,095	2,539	1,603	1,644

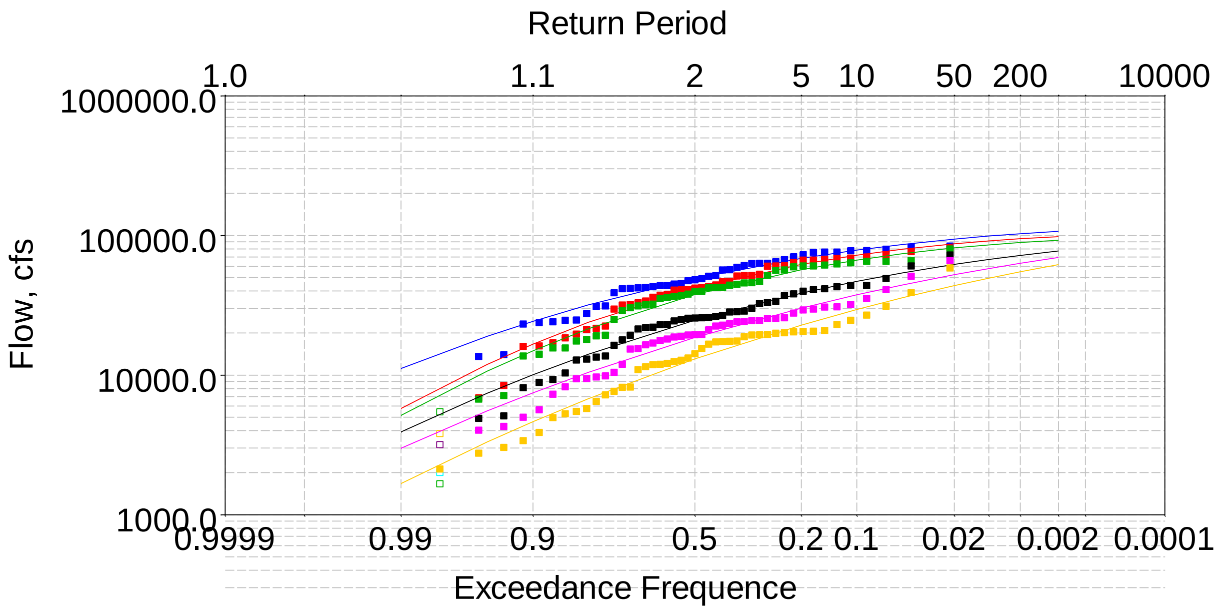
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.655	4.527	4.477	4.281	4.144	4.028
Standard Dev.	0.267	0.308	0.317	0.326	0.346	0.316
Station Skew	-0.496	-0.517	-0.566	-0.506	-0.544	-0.336



Maximum Volume-Duration Frequency Analysis for Brazos River near Richmond B29

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	107,848	119,430	113,703	103,057	83,750	102,612
0.5	102,376	108,495	102,915	88,872	72,875	79,438
1.0	97,477	99,614	94,171	78,259	64,338	64,081
2.0	91,772	90,141	84,867	67,751	55,558	50,485
5.0	82,654	76,558	71,579	54,005	43,631	35,043
10.0	74,167	65,290	60,616	43,679	34,410	25,145
20.0	63,705	52,855	48,599	33,316	25,050	16,663
50.0	44,436	33,245	29,897	19,000	12,391	7,362
80.0	28,061	19,253	16,845	10,213	5,356	3,128
90.0	21,150	13,980	12,030	7,206	3,265	1,967
95.0	16,364	10,536	8,933	5,334	2,105	1,331
99.0	9,544	5,919	4,866	2,939	856	626

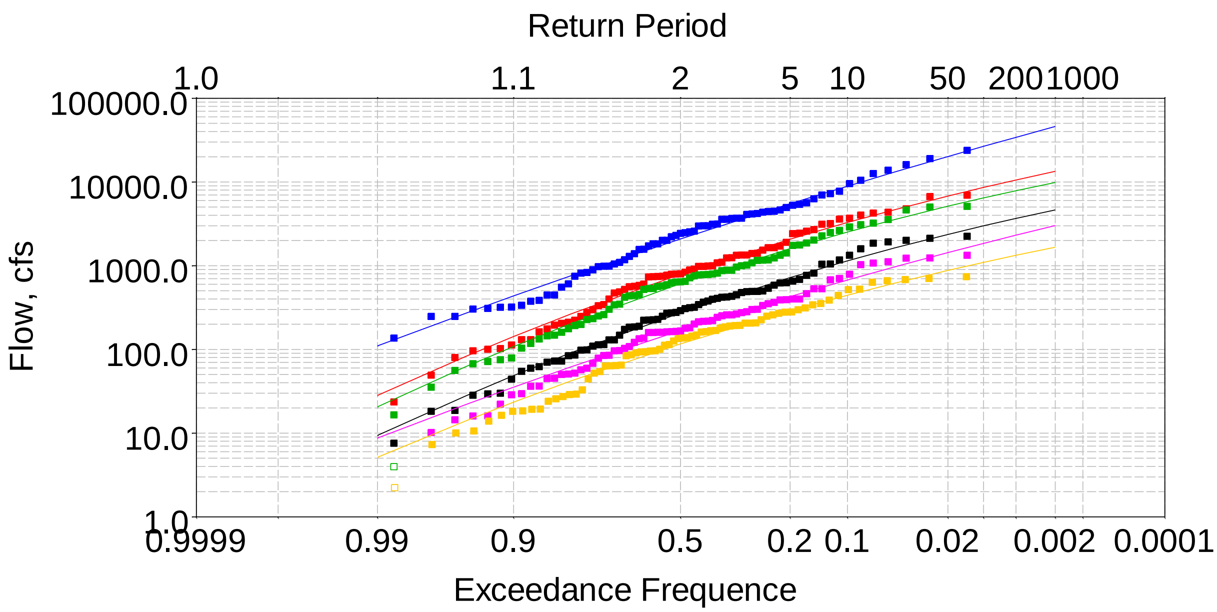
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.617	4.496	4.449	4.261	4.052	3.855
Standard Dev.	0.218	0.264	0.278	0.307	0.405	0.432
Station Skew	-0.843	-0.576	-0.584	-0.355	-0.615	-0.168



Maximum Volume-Duration Frequency Analysis for Brazos River near Rosharon B30

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	107,151	97,968	92,423	77,458	69,567	61,801
0.5	102,888	94,661	88,989	72,015	63,139	54,877
1.0	98,924	91,373	85,627	67,327	57,897	49,394
2.0	94,149	87,185	81,403	62,060	52,289	43,690
5.0	86,196	79,766	74,042	54,027	44,229	35,781
10.0	78,473	72,152	66,617	46,932	37,536	29,479
20.0	68,563	61,984	56,861	38,652	30,157	22,820
50.0	49,280	41,678	37,796	24,668	18,590	13,056
80.0	31,899	23,904	21,477	14,098	10,466	6,791
90.0	24,291	16,673	14,926	10,041	7,462	4,638
95.0	18,927	11,920	10,646	7,398	5,530	3,314
99.0	11,140	5,766	5,137	3,914	2,996	1,673

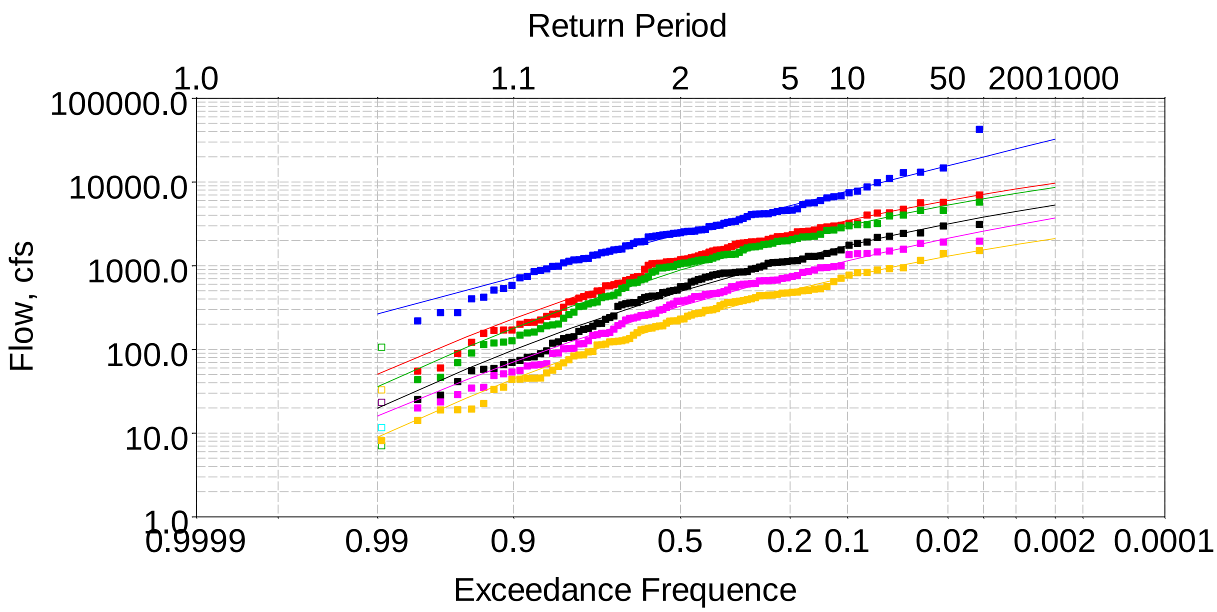
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.661	4.572	4.530	4.358	4.242	4.087
Standard Dev.	0.206	0.261	0.265	0.267	0.277	0.317
Station Skew	-0.945	-1.137	-1.100	-0.765	-0.603	-0.554



Maximum Volume-Duration Frequency Analysis for Big Sandy Creek near Bridgeport T1

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	45,888	13,360	9,828	4,624	3,019	1,660
0.5	34,092	10,541	7,837	3,658	2,315	1,328
1.0	26,553	8,582	6,431	2,983	1,848	1,095
2.0	20,107	6,782	5,123	2,362	1,434	877
5.0	13,121	4,664	3,559	1,627	968	617
10.0	8,891	3,272	2,514	1,142	673	442
20.0	5,480	2,070	1,600	722	426	288
50.0	2,087	787	610	273	168	116
80.0	755	265	203	91	62	42
90.0	434	142	108	49	35	23
95.0	272	83	62	28	22	14
99.0	110	28	21	9	9	5

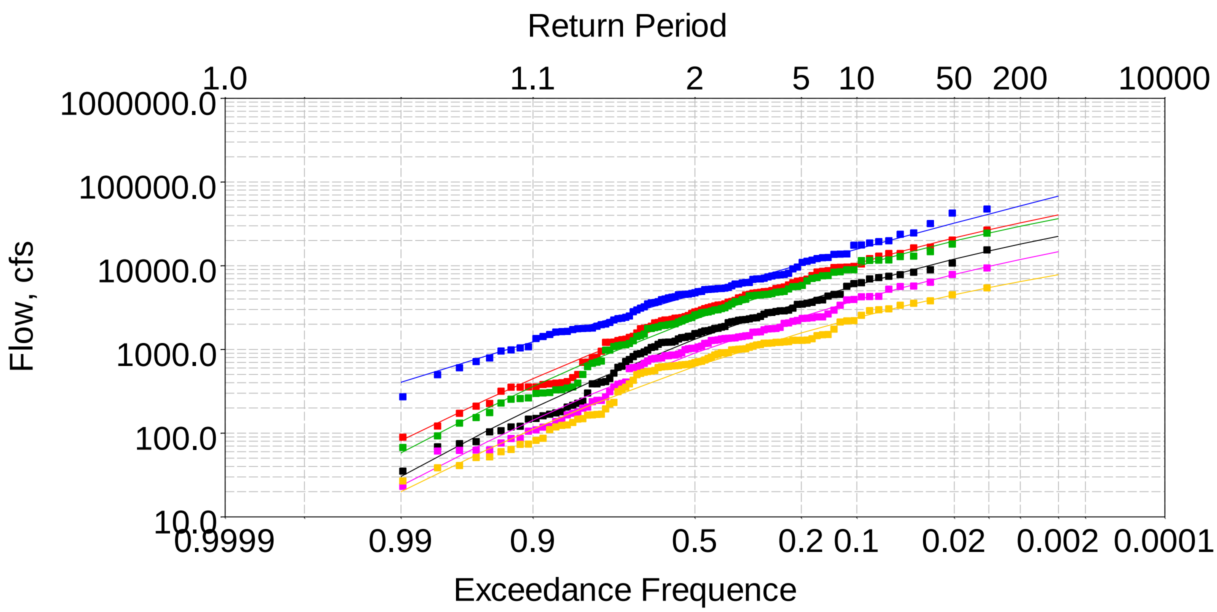
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.304	2.858	2.744	2.397	2.203	2.030
Standard Dev.	0.512	0.535	0.537	0.539	0.500	0.502
Station Skew	-0.188	-0.426	-0.466	-0.441	-0.272	-0.423



Maximum Volume-Duration Frequency Analysis for Clear Fork Trinity River at Fort Worth T2

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	32,464	9,667	8,589	5,309	3,708	2,111
0.5	24,821	8,221	7,289	4,443	3,053	1,790
1.0	19,869	7,113	6,291	3,792	2,575	1,544
2.0	15,565	5,999	5,288	3,149	2,116	1,298
5.0	10,770	4,536	3,970	2,325	1,542	974
10.0	7,748	3,448	2,994	1,730	1,139	734
20.0	5,187	2,392	2,051	1,168	767	503
50.0	2,388	1,066	885	493	328	218
80.0	1,088	408	324	178	124	80
90.0	718	232	179	98	71	44
95.0	509	141	106	58	43	26
99.0	265	51	36	20	16	9

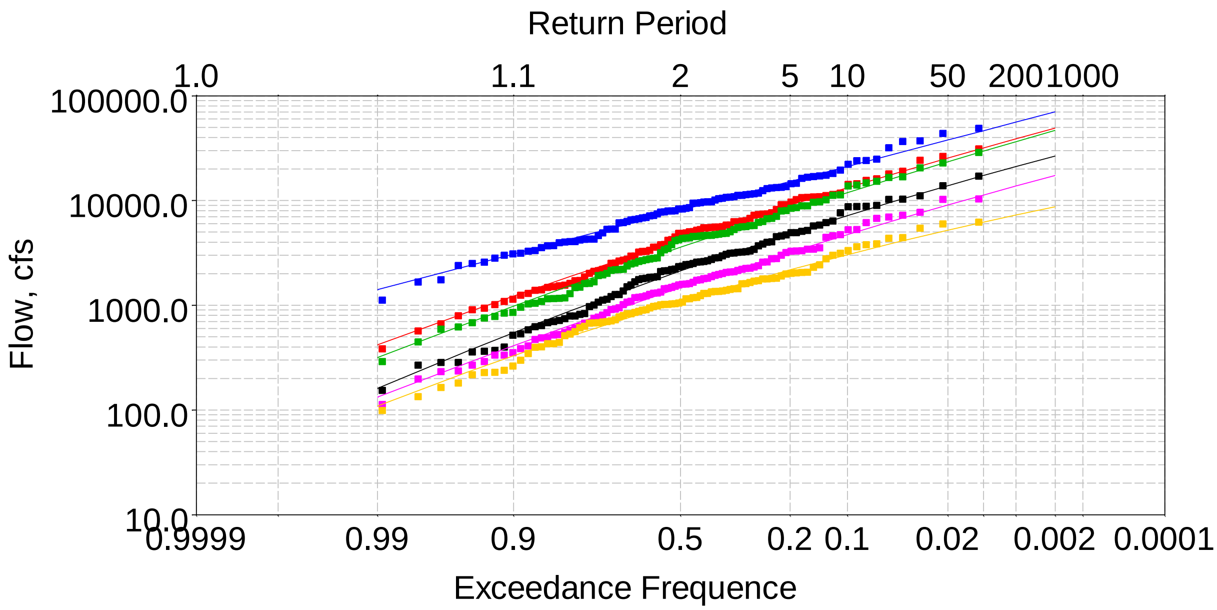
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.375	2.982	2.897	2.646	2.478	2.288
Standard Dev.	0.403	0.463	0.484	0.492	0.475	0.483
Station Skew	-0.048	-0.603	-0.625	-0.579	-0.489	-0.619



Maximum Volume-Duration Frequency Analysis for West Fork Trinity River at Fort Worth T3

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	67,708	40,410	36,414	22,435	14,654	7,795
0.5	51,701	32,462	29,488	18,088	11,822	6,463
1.0	41,281	26,785	24,459	14,943	9,777	5,469
2.0	32,196	21,447	19,665	11,957	7,838	4,496
5.0	22,063	14,993	13,784	8,314	5,474	3,261
10.0	15,688	10,633	9,762	5,841	3,866	2,383
20.0	10,313	6,783	6,185	3,661	2,444	1,570
50.0	4,529	2,581	2,283	1,319	901	626
80.0	1,936	848	710	398	281	211
90.0	1,228	446	359	198	143	111
95.0	839	254	197	107	79	63
99.0	404	82	58	30	23	20

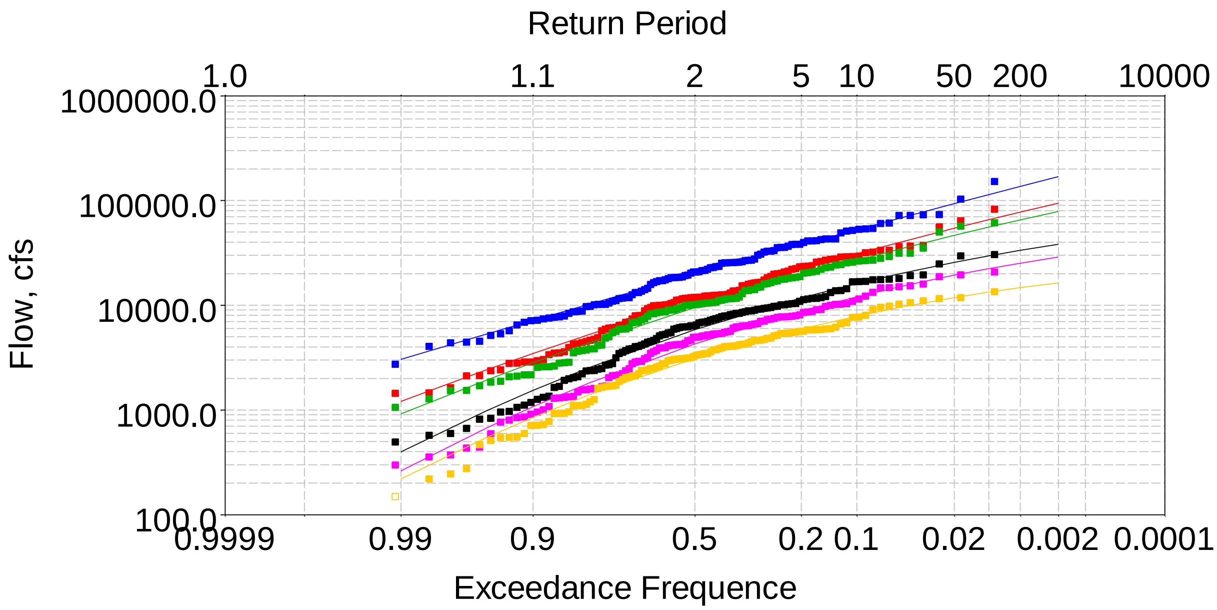
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.648	3.367	3.306	3.066	2.904	2.745
Standard Dev.	0.432	0.542	0.566	0.581	0.565	0.526
Station Skew	-0.115	-0.498	-0.558	-0.561	-0.544	-0.589



Maximum Volume-Duration Frequency Analysis for West Fork Trinity River at Grand Prairie T4

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	70,362	49,274	46,719	26,586	17,375	8,733
0.5	56,040	38,814	36,456	21,085	13,753	7,281
1.0	46,447	31,768	29,598	17,315	11,290	6,228
2.0	37,834	25,433	23,478	13,880	9,060	5,217
5.0	27,817	18,090	16,458	9,846	6,453	3,948
10.0	21,167	13,270	11,910	7,170	4,731	3,041
20.0	15,206	9,036	7,970	4,810	3,210	2,179
50.0	8,079	4,212	3,583	2,136	1,474	1,091
80.0	4,294	1,891	1,546	889	645	508
90.0	3,086	1,226	979	548	410	330
95.0	2,350	850	666	362	279	228
99.0	1,409	419	316	161	133	109

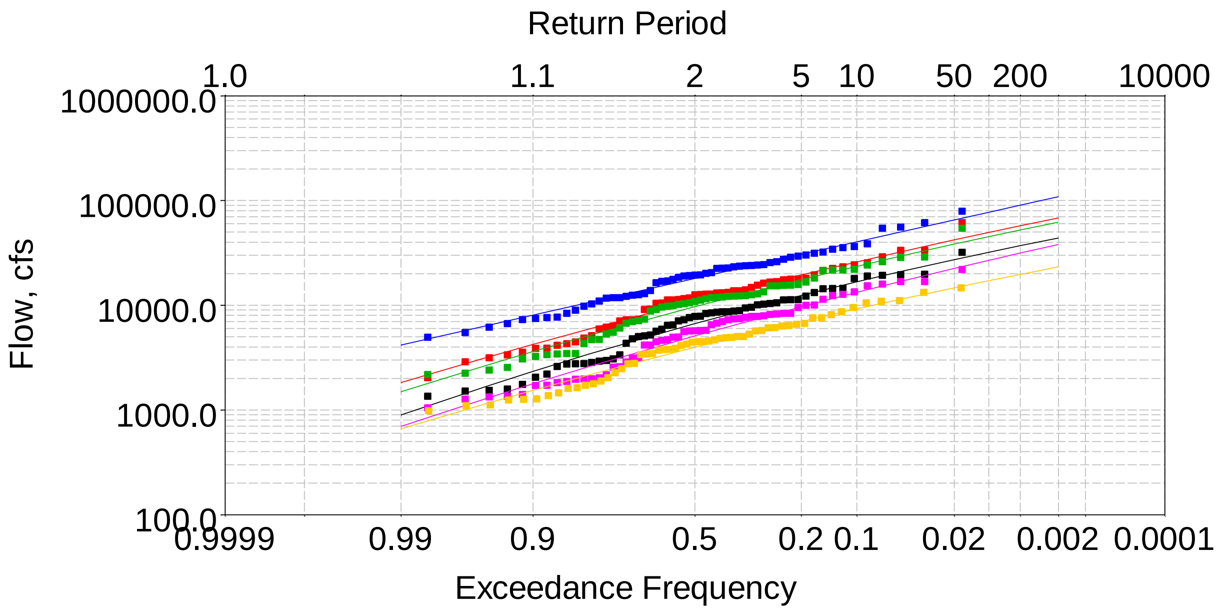
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.907	3.613	3.542	3.310	3.154	3.015
Standard Dev.	0.326	0.404	0.424	0.437	0.415	0.378
Station Skew	0.002	-0.171	-0.180	-0.272	-0.216	-0.358



Maximum Volume-Duration Frequency Analysis for Trinity River at Dallas T5

Exceedance Frequency (percent)	**1 Day Cfs**	**7 Day Cfs**	**10 Day Cfs**	**30 Day Cfs**	**60 Day Cfs**	**120 Day Cfs**
0.2	169,658	94,283	78,540	38,196	28,828	16,382
0.5	136,514	77,502	65,292	33,414	25,229	14,717
1.0	113,931	65,602	55,710	29,624	22,364	13,334
2.0	93,359	54,396	46,533	25,693	19,382	11,835
5.0	69,042	40,650	35,058	20,298	15,275	9,668
10.0	52,645	31,052	26,894	16,083	12,060	7,877
20.0	37,764	22,109	19,172	11,763	8,765	5,943
50.0	19,764	11,068	9,499	5,851	4,280	3,104
80.0	10,182	5,235	4,369	2,530	1,799	1,386
90.0	7,154	3,458	2,823	1,539	1,074	851
95.0	5,327	2,426	1,937	989	678	549
99.0	3,039	1,210	918	399	263	220

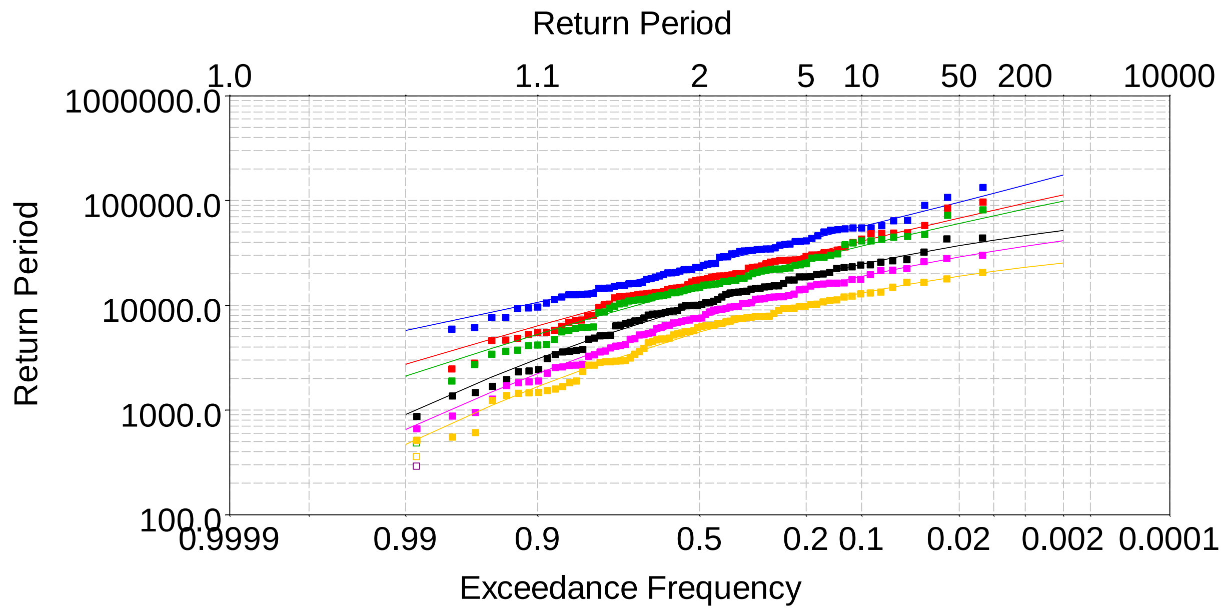
Simple Statistics	**1 Day**	**7 Day**	**10 Day**	**30 Day**	**60 Day**	**120 Day**
Mean	4.291	4.027	3.955	3.724	3.586	3.444
Standard Dev.	0.338	0.373	0.384	0.404	0.417	0.385
Station Skew	-0.086	-0.280	-0.357	-0.640	-0.663	-0.753



Maximum Volume-Duration Frequency Analysis for Trinity River below Dallas T6

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	108,907	68,358	62,277	43,818	38,003	23,244
0.5	90,238	57,448	52,377	37,044	31,489	19,733
1.0	77,258	49,609	45,231	32,090	26,858	17,174
2.0	65,190	42,119	38,380	27,288	22,482	14,698
5.0	50,515	32,730	29,762	21,175	17,079	11,546
10.0	40,261	25,983	23,553	16,723	13,270	9,244
20.0	30,578	19,476	17,559	12,394	9,673	6,990
50.0	18,045	10,923	9,694	6,693	5,113	3,967
80.0	10,633	5,909	5,126	3,410	2,587	2,157
90.0	8,060	4,224	3,610	2,340	1,780	1,542
95.0	6,410	3,176	2,677	1,693	1,295	1,158
99.0	4,167	1,826	1,494	895	697	661

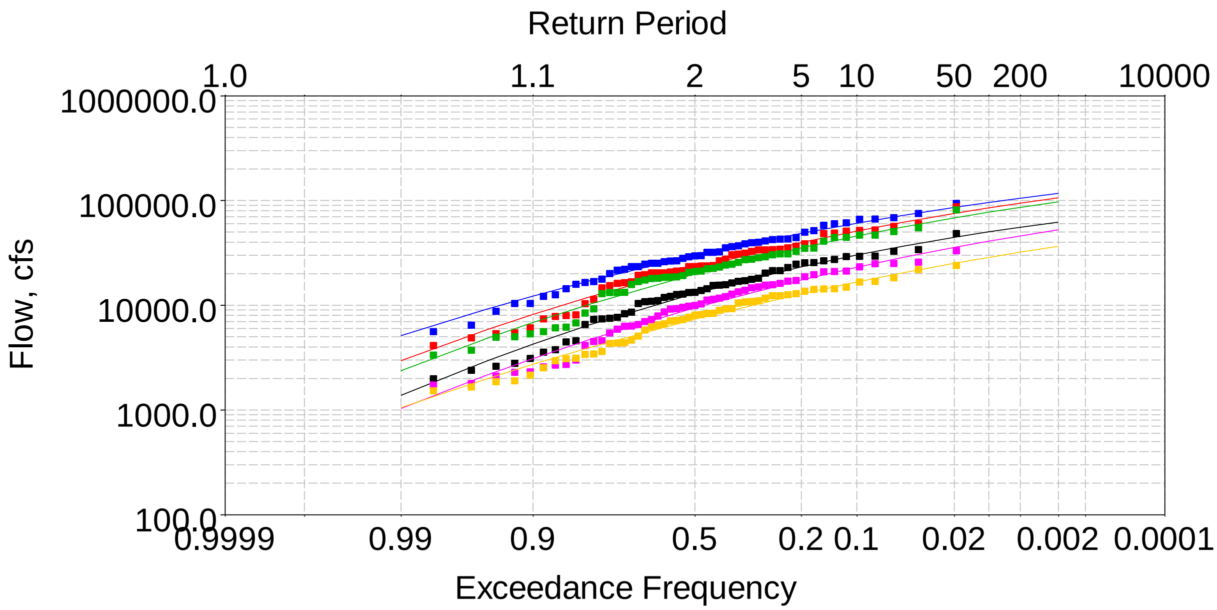
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.256	4.027	3.973	3.808	3.695	3.585
Standard Dev.	0.273	0.308	0.319	0.335	0.341	0.304
Station Skew	-0.010	-0.215	-0.250	-0.321	-0.237	-0.259



Maximum Volume-Duration Frequency Analysis for Trinity River near Rosser T7

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	175,081	113,195	98,733	51,826	41,316	25,273
0.5	140,364	94,183	82,905	46,315	36,604	23,002
1.0	117,215	80,691	71,469	41,824	32,822	21,076
2.0	96,473	67,944	60,499	37,043	28,848	18,951
5.0	72,344	52,185	46,703	30,249	23,295	15,801
10.0	56,259	41,030	36,776	24,722	18,857	13,125
20.0	41,713	30,428	27,218	18,812	14,192	10,150
50.0	23,920	16,770	14,761	10,155	7,519	5,580
80.0	14,007	8,954	7,625	4,805	3,504	2,636
90.0	10,676	6,367	5,293	3,073	2,228	1,670
95.0	8,568	4,772	3,874	2,062	1,489	1,106
99.0	5,729	2,733	2,103	905	650	468

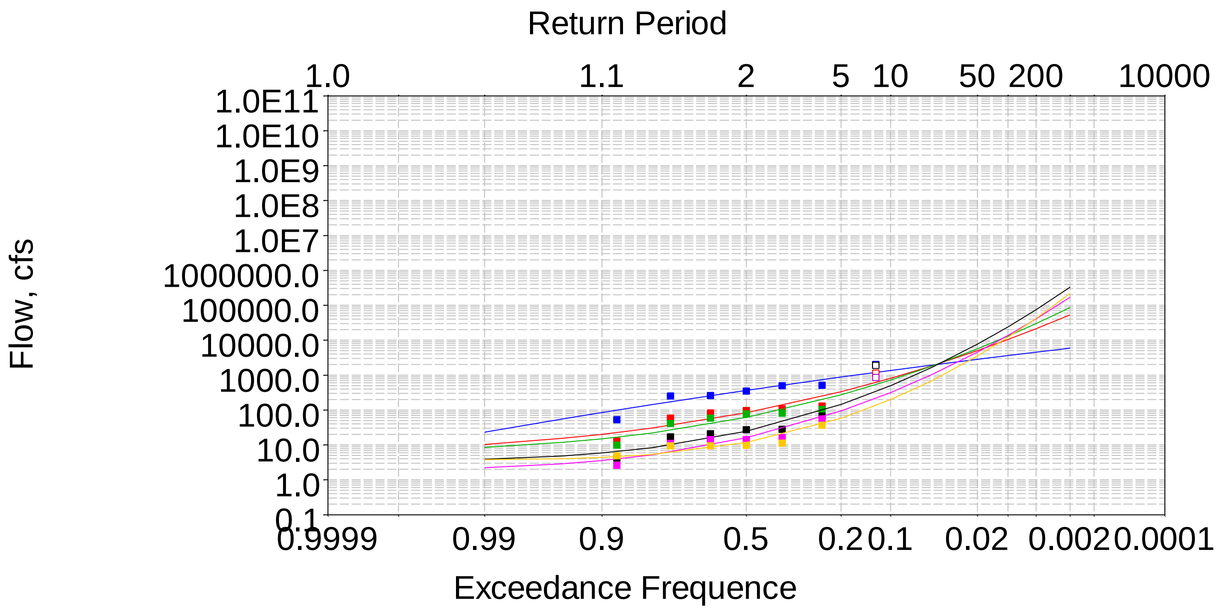
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.385	4.215	4.154	3.966	3.837	3.700
Standard Dev.	0.282	0.316	0.329	0.359	0.368	0.358
Station Skew	0.137	-0.185	-0.272	-0.678	-0.644	-0.785



Maximum Volume-Duration Frequency Analysis for Trinity River at Trinidad T8

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	117,307	106,030	96,991	62,042	52,499	36,649
0.5	105,421	94,364	86,096	55,511	45,961	32,150
1.0	95,946	85,094	77,444	50,221	40,871	28,679
2.0	86,011	75,418	68,423	44,609	35,662	25,147
5.0	72,063	61,948	55,890	36,660	28,592	20,378
10.0	60,753	51,166	45,893	30,197	23,096	16,676
20.0	48,540	39,725	35,337	23,266	17,439	12,850
50.0	29,862	22,845	19,923	12,993	9,484	7,377
80.0	16,992	11,937	10,148	6,452	4,670	3,920
90.0	12,250	8,169	6,837	4,260	3,095	2,728
95.0	9,189	5,845	4,823	2,944	2,155	1,987
99.0	5,131	2,958	2,368	1,378	1,034	1,052

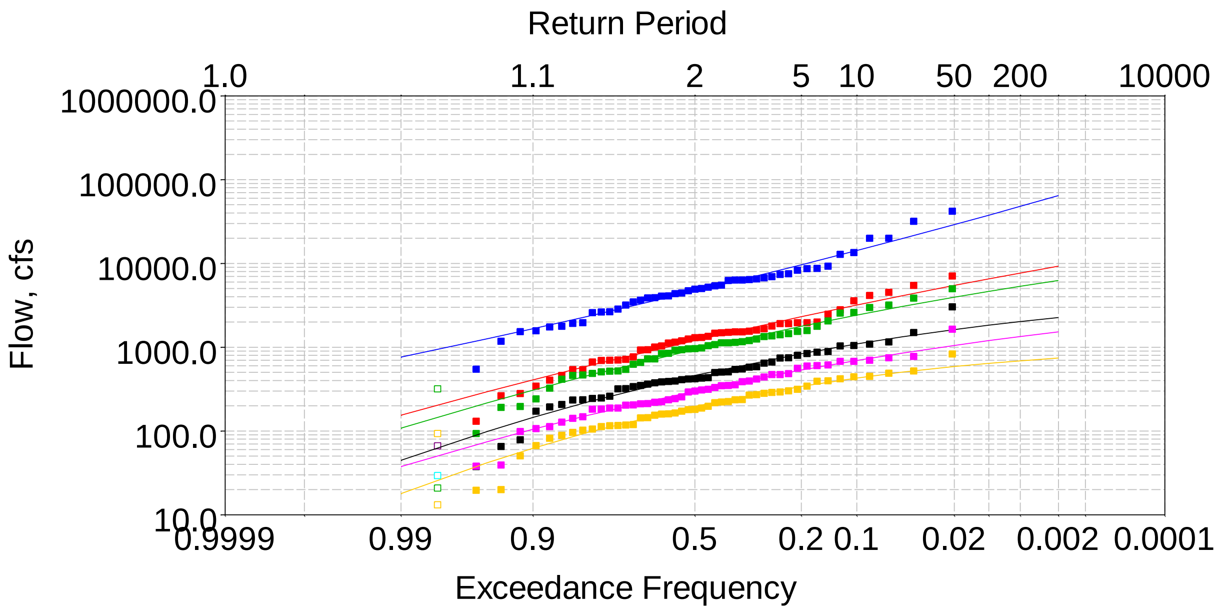
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.451	4.329	4.268	4.078	3.947	3.844
Standard Dev.	0.274	0.315	0.327	0.337	0.344	0.309
Station Skew	-0.525	-0.562	-0.573	-0.643	-0.531	-0.462



Maximum Volume-Duration Frequency Analysis for Cedar Creek at Trinidad T9

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	5,910	53,343	86,407	328,627	170,441	219,515
0.5	4,543	21,310	29,788	74,617	40,948	42,226
1.0	3,638	10,448	13,091	24,035	13,734	12,158
2.0	2,839	5,017	5,647	7,644	4,537	3,508
5.0	1,936	1,821	1,787	1,637	1,016	682
10.0	1,363	806	717	495	316	198
20.0	878	334	271	144	94	58
50.0	363	84	62	25	16	12
80.0	142	30	22	8	5	5
90.0	85	20	15	6	4	4
95.0	55	15	12	5	3	4
99.0	23	10	9	4	2	4

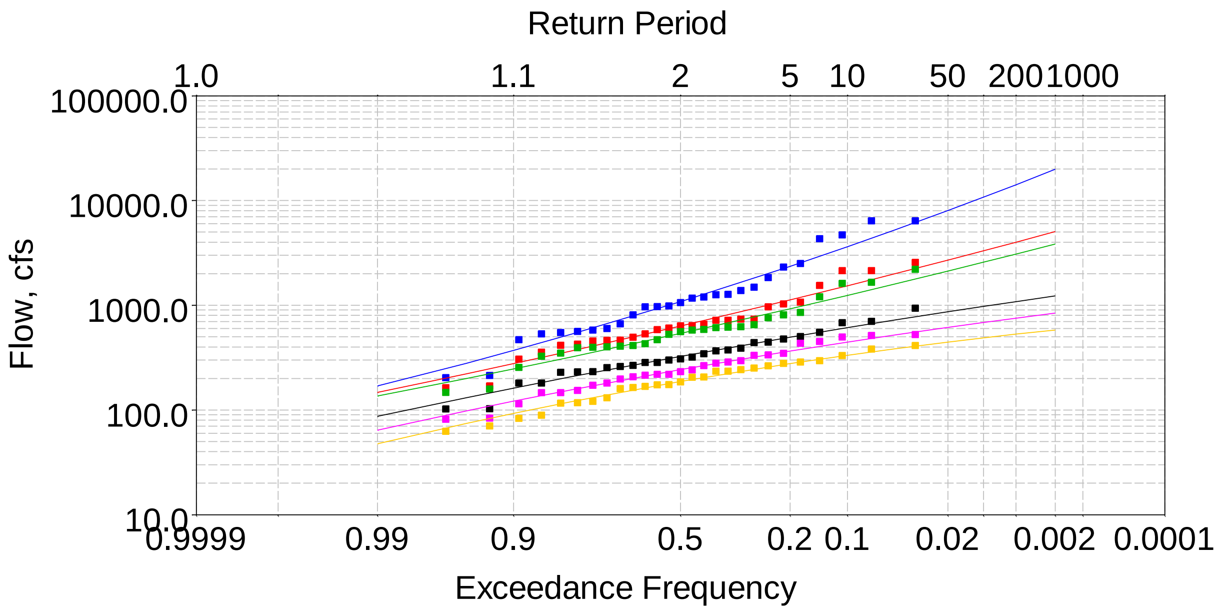
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	2.542	2.032	1.926	1.595	1.398	1.310
Standard Dev.	0.472	0.652	0.693	0.826	0.826	0.762
Station Skew	-0.227	1.038	1.216	1.570	1.478	2.073



Maximum Volume-Duration Frequency Analysis for Tehuacana Creek near Streetman T10

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	64,399	9,279	6,258	2,254	1,521	740
0.5	47,881	7,671	5,318	2,018	1,339	687
1.0	37,632	6,528	4,621	1,826	1,196	640
2.0	29,034	5,450	3,938	1,621	1,050	587
5.0	19,823	4,121	3,058	1,329	851	503
10.0	14,227	3,187	2,410	1,092	694	428
20.0	9,610	2,308	1,775	837	532	340
50.0	4,665	1,202	937	460	299	197
80.0	2,347	597	460	223	154	97
90.0	1,663	407	307	145	105	62
95.0	1,260	293	217	99	75	42
99.0	761	155	108	45	38	18

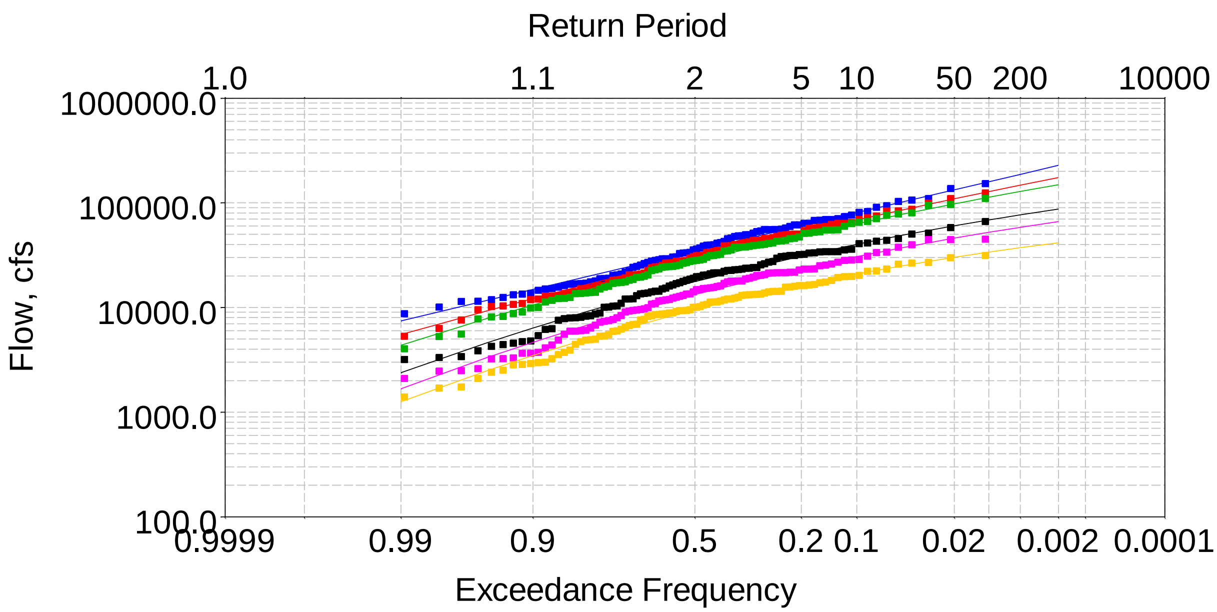
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.680	3.066	2.949	2.624	2.448	2.244
Standard Dev.	0.364	0.350	0.351	0.348	0.324	0.337
Station Skew	0.182	-0.248	-0.388	-0.667	-0.516	-0.886



Maximum Volume-Duration Frequency Analysis for Catfish Creek near Tennessee Colony T11

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	19,869	5,055	3,849	1,227	841	581
0.5	14,150	4,004	3,085	1,083	753	530
1.0	10,759	3,313	2,576	975	684	489
2.0	8,025	2,700	2,122	866	615	445
5.0	5,233	1,998	1,594	722	520	384
10.0	3,623	1,536	1,243	611	445	333
20.0	2,356	1,126	926	496	365	277
50.0	1,083	633	537	325	243	188
80.0	527	366	320	207	156	120
90.0	370	277	246	162	121	93
95.0	279	222	199	131	98	74
99.0	170	147	136	87	64	48

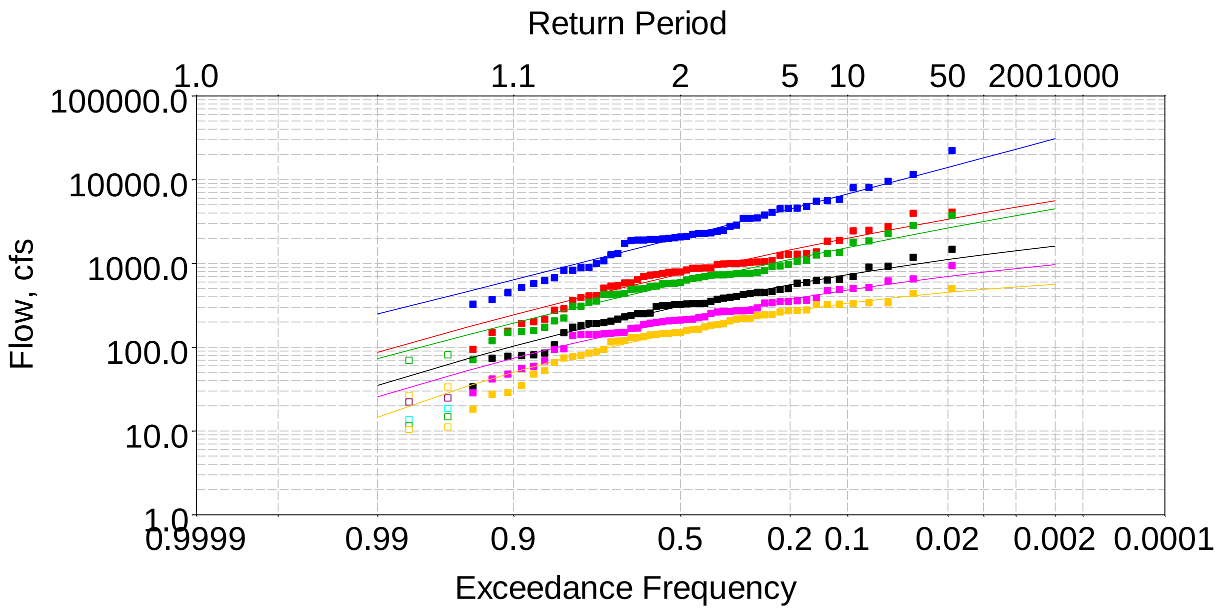
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.052	2.809	2.738	2.503	2.374	2.256
Standard Dev.	0.388	0.291	0.275	0.226	0.221	0.218
Station Skew	0.275	0.164	0.170	-0.233	-0.321	-0.463



Maximum Volume-Duration Frequency Analysis for Trinity River near Oakwood T12

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	227,969	174,552	149,322	87,325	66,214	41,535
0.5	187,298	147,511	128,624	76,875	58,408	37,295
1.0	159,227	128,012	113,182	68,742	52,293	33,872
2.0	133,311	109,312	97,926	60,408	45,994	30,248
5.0	102,082	85,745	78,024	49,059	37,364	25,116
10.0	80,494	68,689	63,108	40,178	30,575	20,931
20.0	60,335	52,108	48,166	30,944	23,489	16,412
50.0	34,698	29,992	27,555	17,659	13,274	9,588
80.0	19,909	16,722	14,898	9,260	6,843	5,064
90.0	14,877	12,163	10,556	6,379	4,659	3,478
95.0	11,691	9,288	7,845	4,603	3,323	2,493
99.0	7,429	5,508	4,361	2,382	1,675	1,261

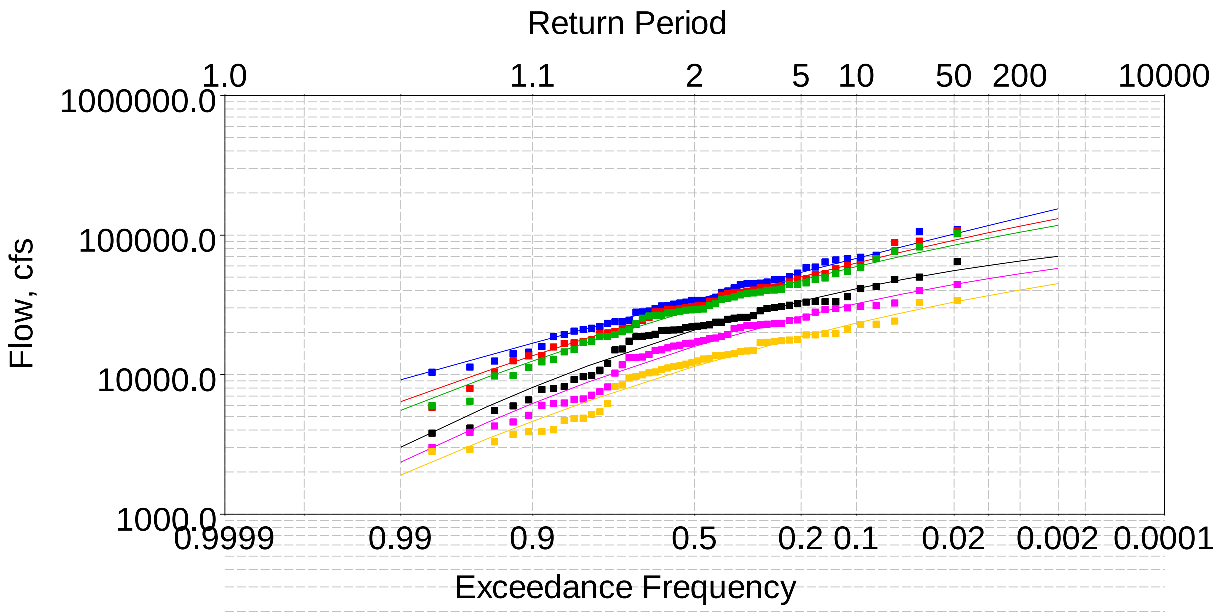
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.540	4.467	4.423	4.221	4.095	3.951
Standard Dev.	0.286	0.294	0.304	0.315	0.322	0.308
Station Skew	-0.015	-0.200	-0.342	-0.496	-0.526	-0.603



Maximum Volume-Duration Frequency Analysis for Upper Keechi Creek near Oakwood T13

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	30,811	5,594	4,499	1,605	964	562
0.5	23,045	4,674	3,720	1,414	865	524
1.0	18,152	4,009	3,166	1,265	784	490
2.0	14,000	3,371	2,642	1,110	699	451
5.0	9,501	2,570	1,997	898	577	389
10.0	6,747	1,996	1,543	731	479	333
20.0	4,468	1,449	1,116	558	373	267
50.0	2,047	749	579	308	213	156
80.0	947	364	286	154	110	78
90.0	635	243	194	103	74	50
95.0	458	172	139	72	52	34
99.0	249	87	73	35	25	15

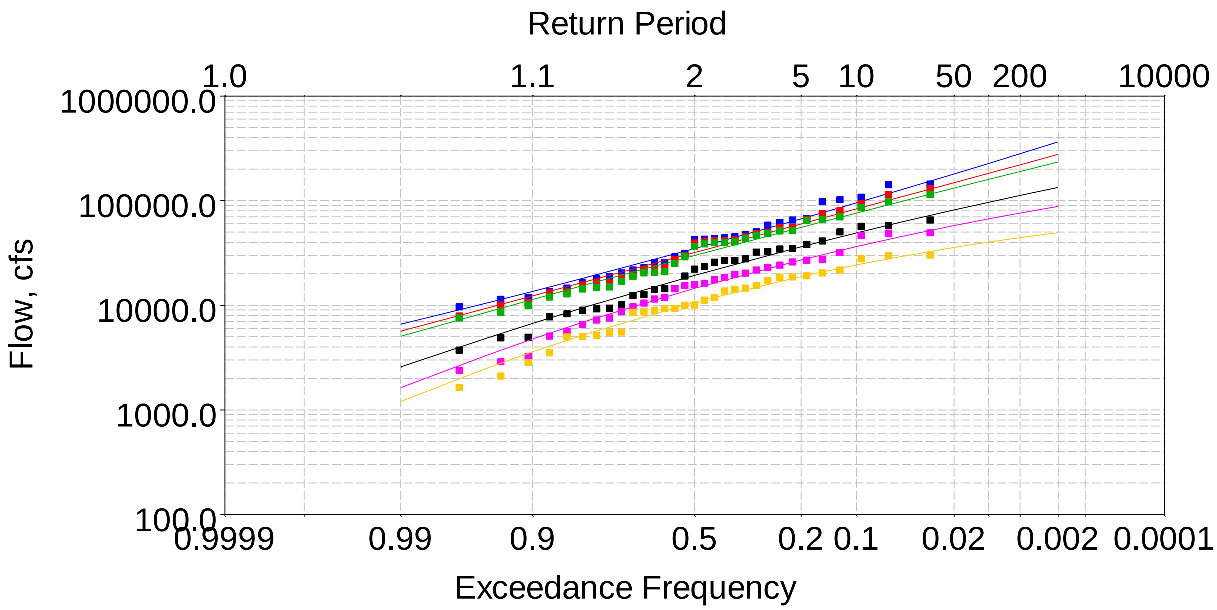
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	3.314	2.855	2.748	2.458	2.296	2.144
Standard Dev.	0.400	0.358	0.352	0.336	0.321	0.331
Station Skew	0.046	-0.322	-0.255	-0.553	-0.623	-0.913



Maximum Volume-Duration Frequency Analysis for Trinity River near Crockett T14

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	154,143	131,328	117,388	70,368	57,640	44,798
0.5	132,479	115,695	104,753	65,076	52,776	40,337
1.0	116,781	103,774	94,859	60,550	48,716	36,762
2.0	101,627	91,744	84,645	55,503	44,284	32,996
5.0	82,310	75,600	70,557	47,879	37,760	27,681
10.0	68,089	63,086	59,332	41,223	32,212	23,349
20.0	53,955	50,090	47,386	33,552	25,970	18,651
50.0	34,256	31,067	29,391	20,867	15,961	11,437
80.0	21,487	18,341	17,079	11,569	8,830	6,459
90.0	16,756	13,646	12,518	8,095	6,199	4,630
95.0	13,610	10,576	9,547	5,872	4,520	3,453
99.0	9,158	6,384	5,541	3,009	2,354	1,903

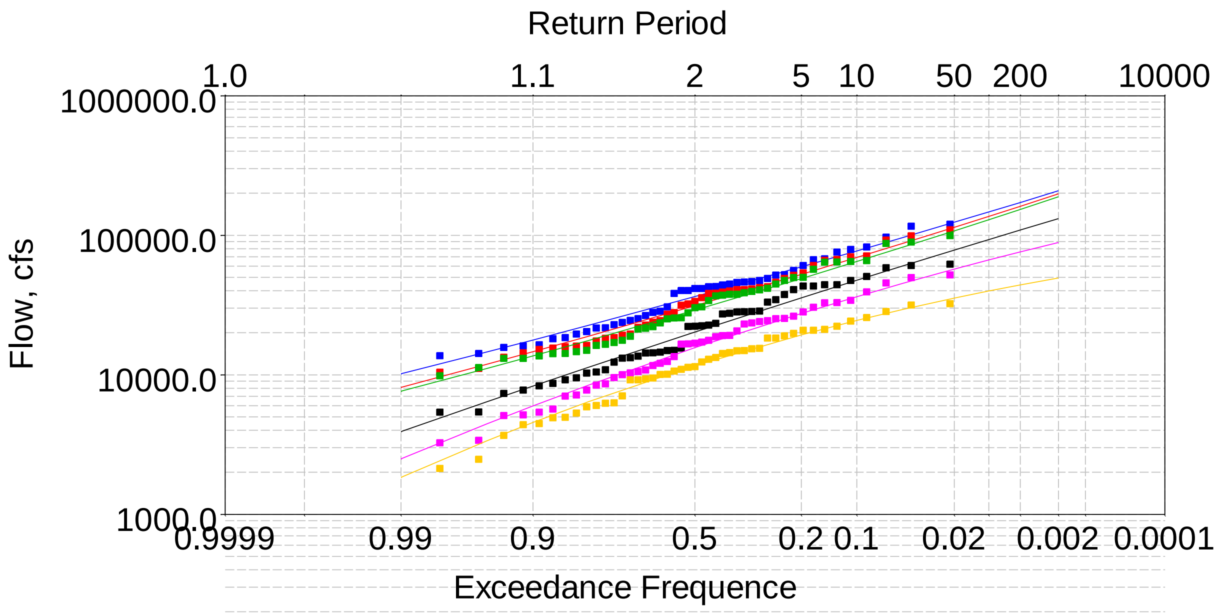
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.531	4.477	4.448	4.284	4.171	4.033
Standard Dev.	0.238	0.261	0.266	0.282	0.284	0.277
Station Skew	-0.094	-0.349	-0.452	-0.754	-0.683	-0.547



Maximum Volume-Duration Frequency Analysis for Trinity River near Midway T15

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	364,124	276,348	234,221	133,733	88,054	49,433
0.5	280,321	220,101	190,042	112,113	76,005	44,270
1.0	226,516	182,448	159,735	96,488	66,849	40,093
2.0	179,960	148,654	131,945	81,500	57,674	35,665
5.0	128,131	109,365	98,804	62,665	45,539	29,393
10.0	95,266	83,289	76,215	49,134	36,355	24,291
20.0	66,993	59,914	55,476	36,141	27,129	18,809
50.0	34,868	31,944	29,912	19,312	14,546	10,640
80.0	18,635	17,059	15,915	9,789	7,149	5,379
90.0	13,571	12,298	11,383	6,716	4,757	3,592
95.0	10,501	9,389	8,606	4,865	3,334	2,509
99.0	6,574	5,664	5,059	2,583	1,632	1,201

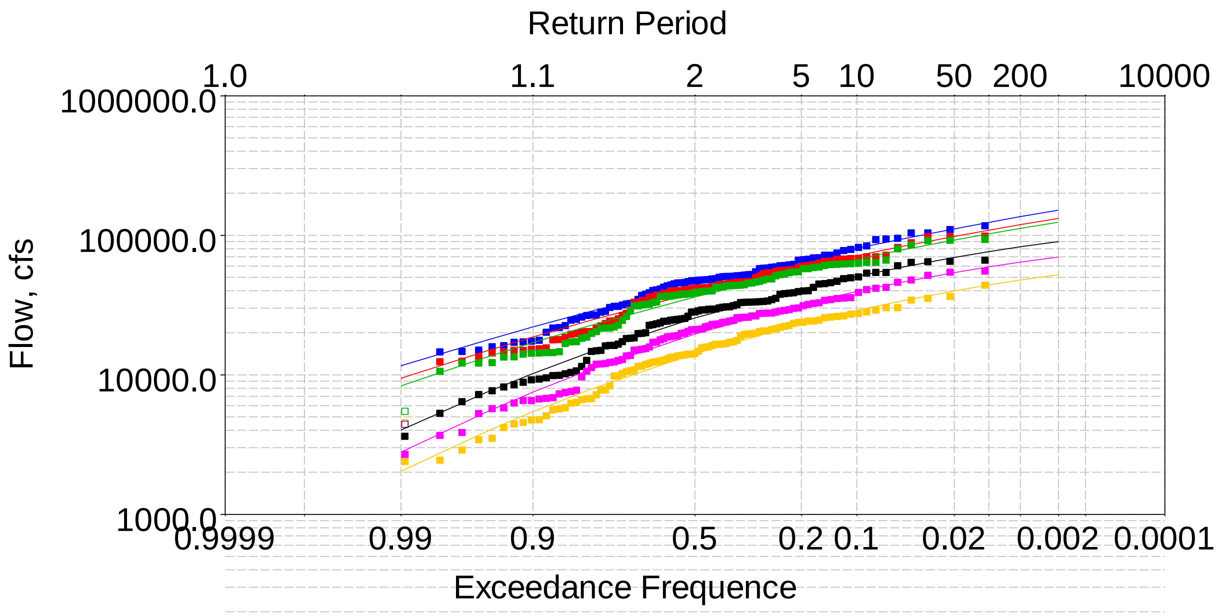
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.551	4.505	4.472	4.270	4.136	3.993
Standard Dev.	0.330	0.324	0.322	0.338	0.347	0.329
Station Skew	0.148	0.009	-0.076	-0.287	-0.461	-0.632



Maximum Volume-Duration Frequency Analysis for Trinity River at Riverside T16

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	208,305	197,854	188,641	131,530	88,859	49,420
0.5	171,834	161,399	153,163	108,920	75,961	44,076
1.0	146,837	136,670	129,241	93,090	66,448	39,856
2.0	123,868	114,163	107,584	78,296	57,148	35,471
5.0	96,285	87,462	82,053	60,222	45,166	29,386
10.0	77,226	69,266	64,771	47,557	36,305	24,519
20.0	59,365	52,451	48,897	35,600	27,536	19,337
50.0	36,338	31,223	29,014	20,228	15,629	11,589
80.0	22,601	18,906	17,572	11,323	8,433	6,414
90.0	17,744	14,644	13,630	8,311	5,983	4,554
95.0	14,577	11,900	11,096	6,417	4,458	3,372
99.0	10,161	8,130	7,620	3,921	2,498	1,837

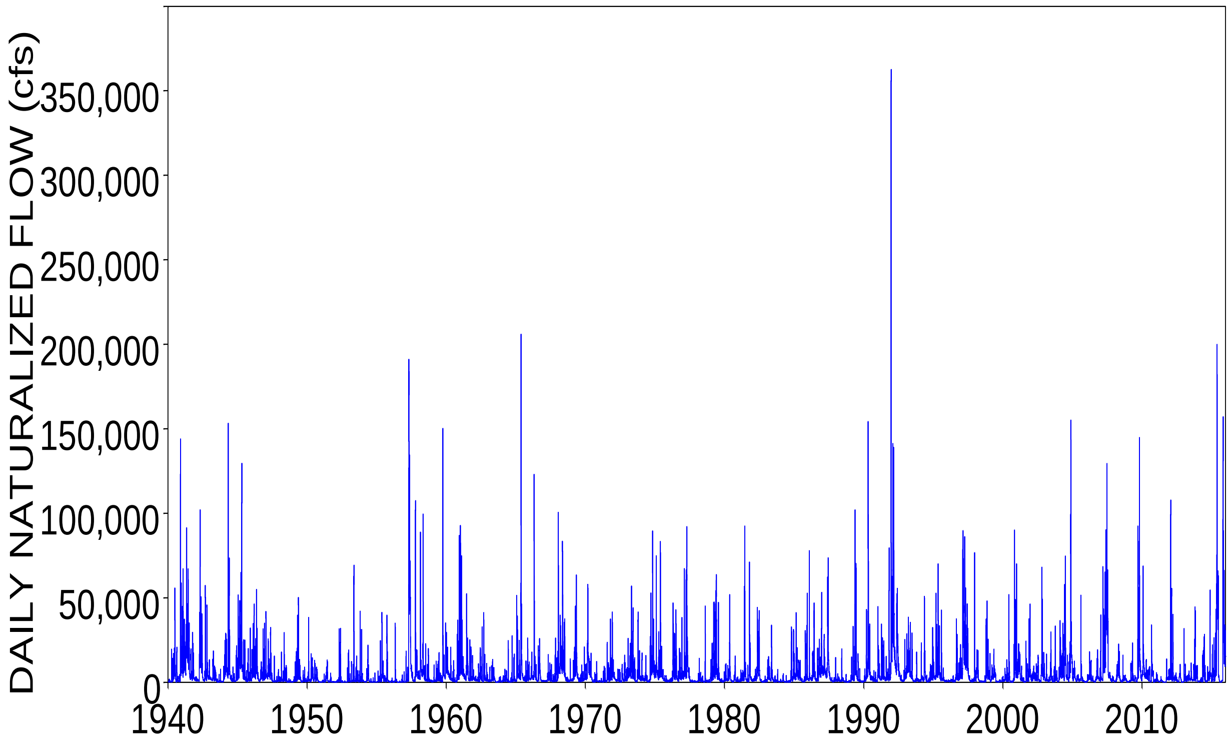
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.565	4.500	4.469	4.301	4.178	4.040
Standard Dev.	0.249	0.263	0.264	0.296	0.307	0.288
Station Skew	0.118	0.120	0.143	-0.093	-0.304	-0.510



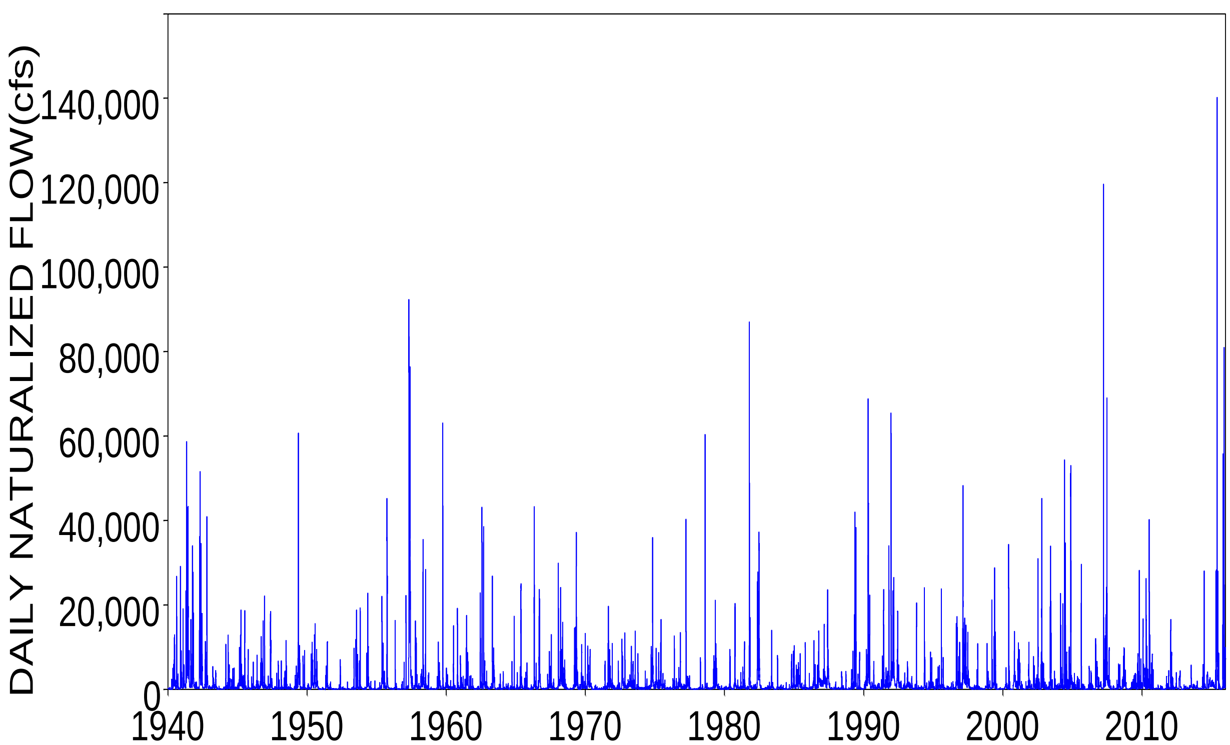
Maximum Volume-Duration Frequency Analysis for Trinity River at Romayor T17

Exceedance Frequency (percent)	1 Day Cfs	7 Day Cfs	10 Day Cfs	30 Day Cfs	60 Day Cfs	120 Day Cfs
0.2	151,521	132,192	124,055	90,173	69,707	52,256
0.5	135,782	119,071	111,988	82,569	64,055	47,764
1.0	123,615	108,784	102,455	76,244	59,289	44,023
2.0	111,168	98,132	92,521	69,359	54,041	39,947
5.0	94,140	83,354	78,637	59,251	46,235	33,966
10.0	80,624	71,461	67,386	50,672	39,530	28,898
20.0	66,207	58,628	55,177	41,024	31,921	23,217
50.0	44,108	38,713	36,137	25,515	19,599	14,163
80.0	28,242	24,327	22,378	14,366	10,768	7,770
90.0	22,011	18,697	17,021	10,204	7,512	5,428
95.0	17,762	14,882	13,413	7,522	5,441	3,941
99.0	11,629	9,441	8,320	4,012	2,788	2,035

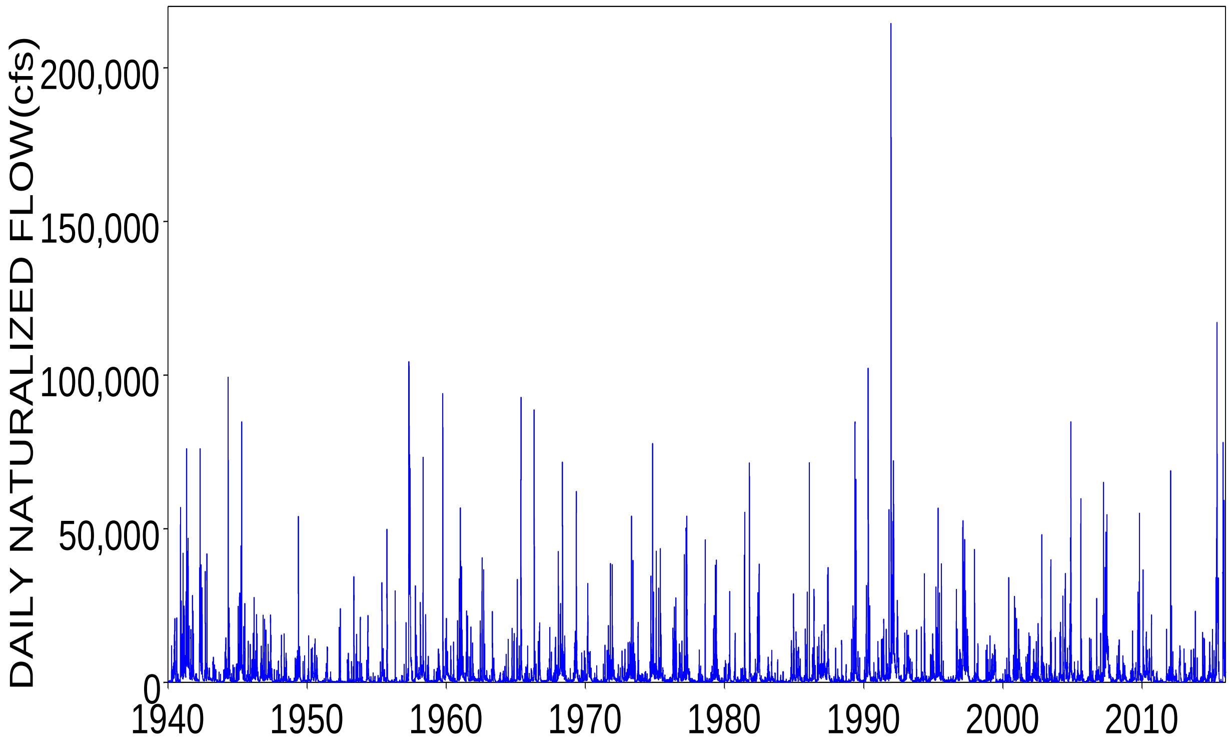
Simple Statistics	1 Day	7 Day	10 Day	30 Day	60 Day	120 Day
Mean	4.632	4.573	4.541	4.376	4.258	4.119
Standard Dev.	0.221	0.229	0.235	0.276	0.287	0.288
Station Skew	-0.331	-0.399	-0.439	-0.665	-0.716	-0.680



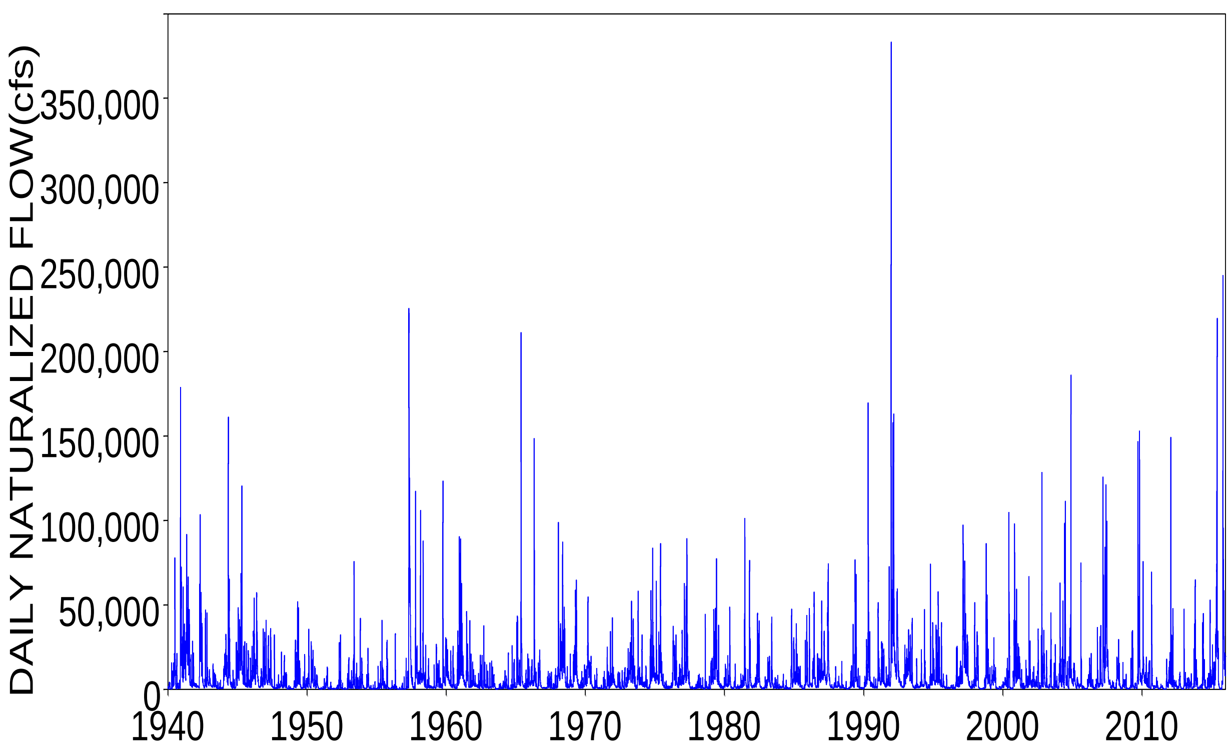
Daily Naturalized Flow Rate (cfs) at control Point BRBR59



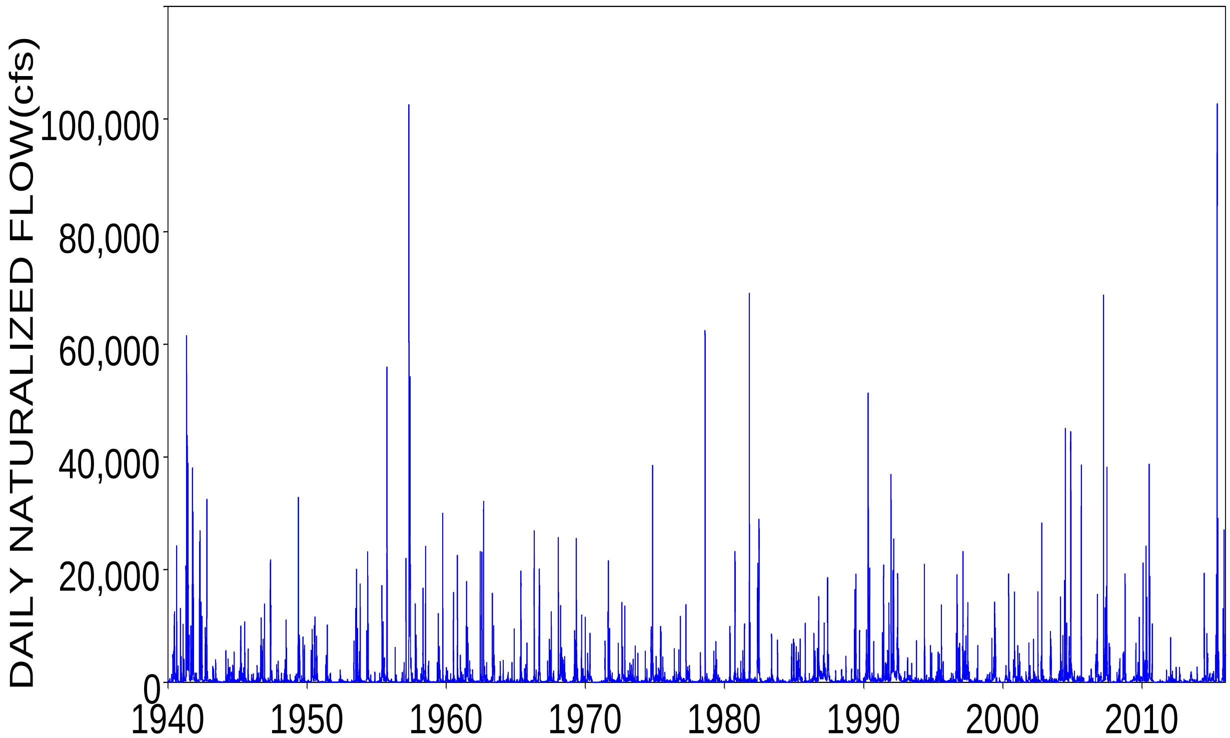
Daily Naturalized Flow Rate (cfs) at control Point BRGR30



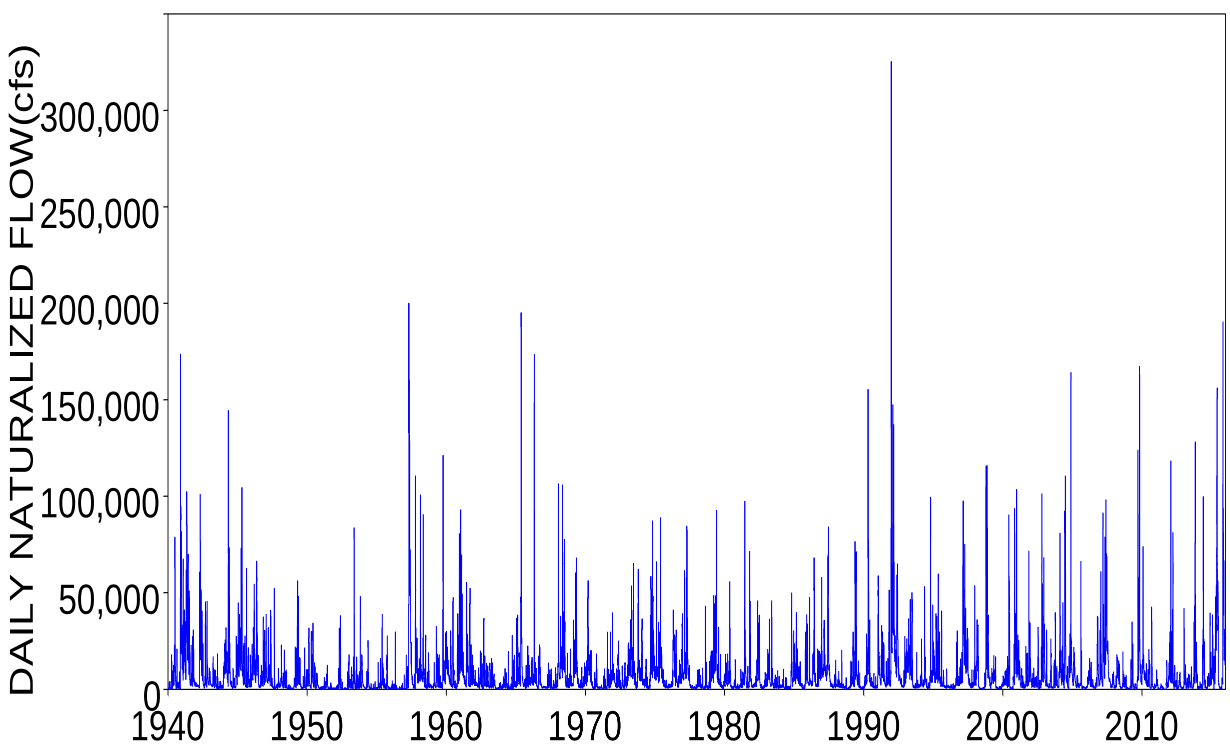
Daily Naturalized Flow Rate (cfs) at control Point BRHB42



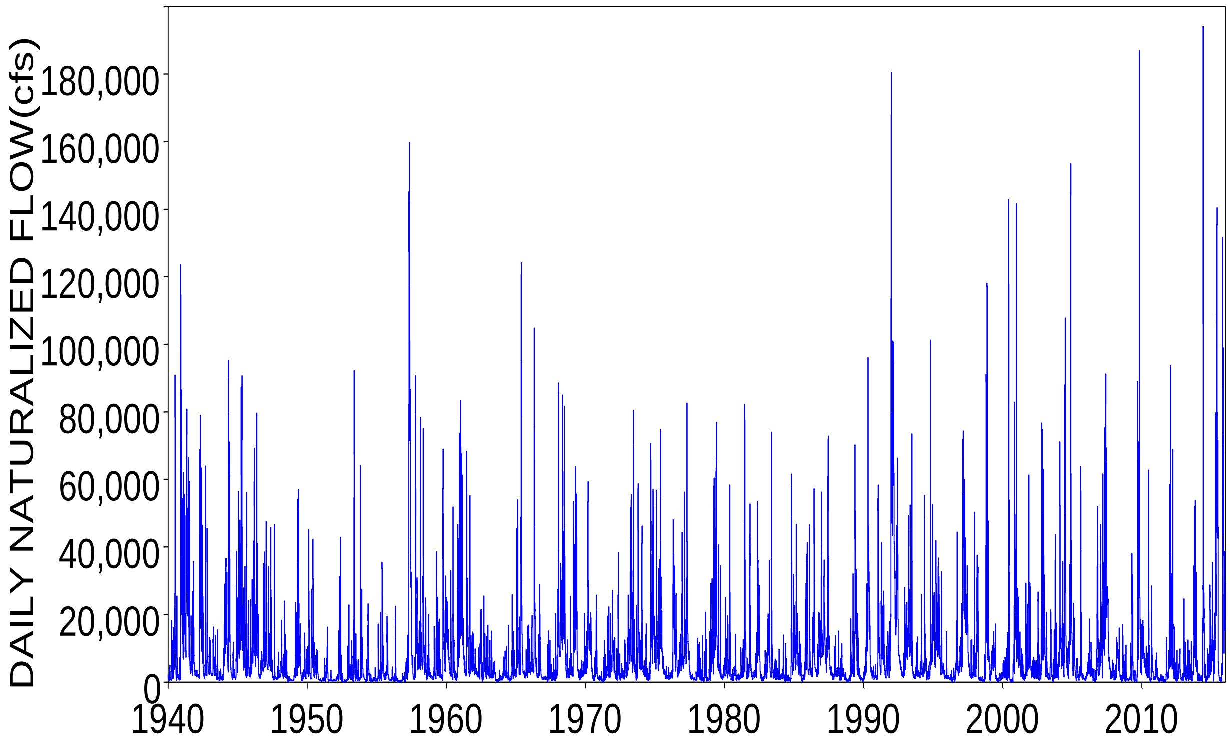
Daily Naturalized Flow Rate (cfs) at control Point BRHE68



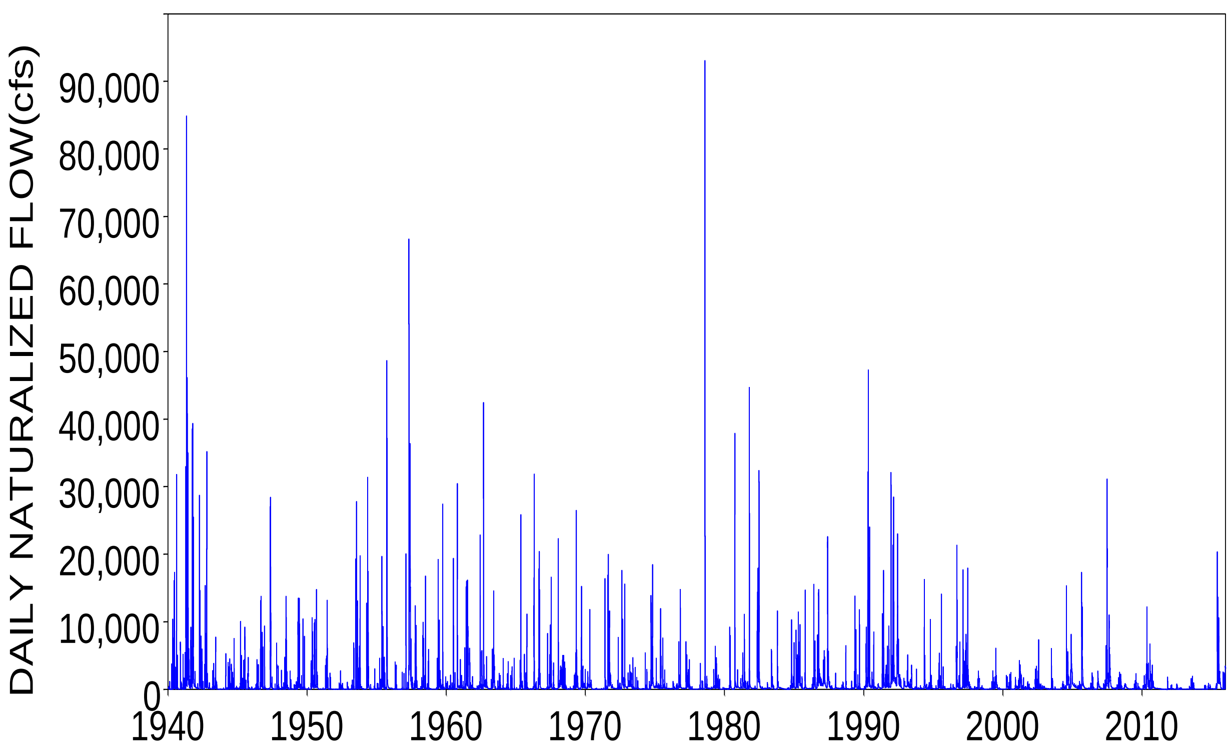
Daily Naturalized Flow Rate (cfs) at control Point BRPP27



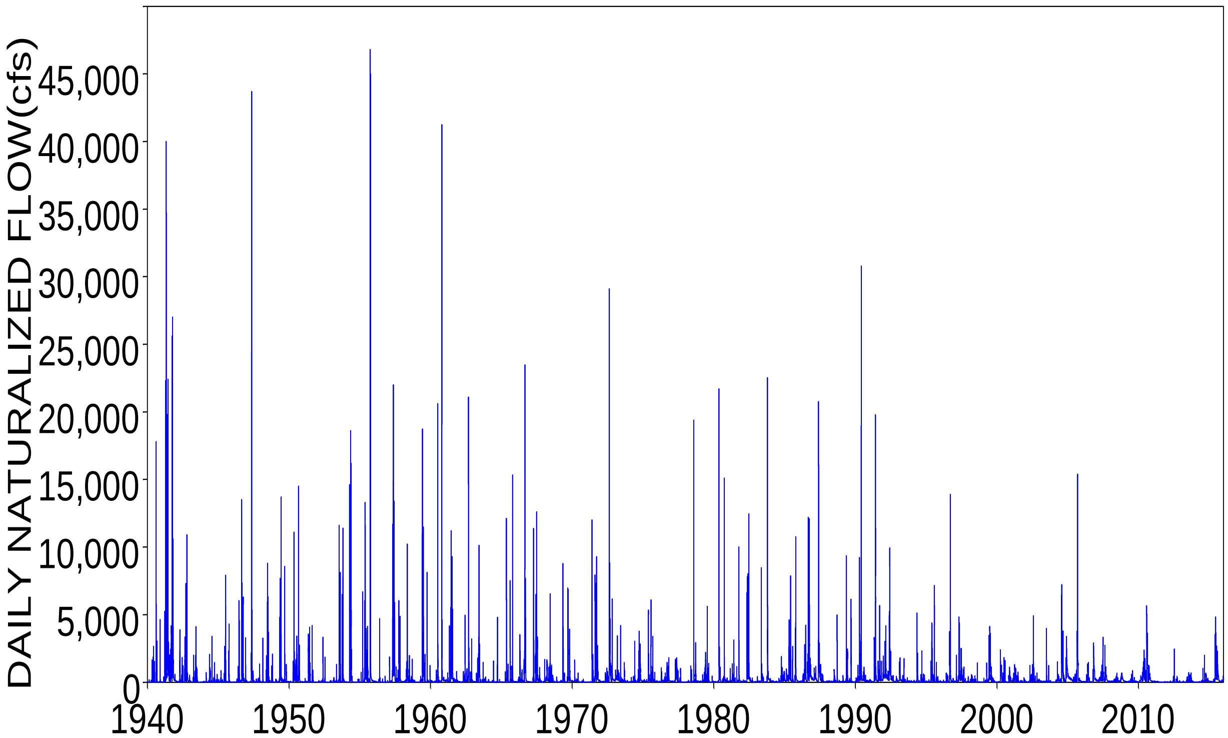
Daily Naturalized Flow Rate (cfs) at control Point BRRI70



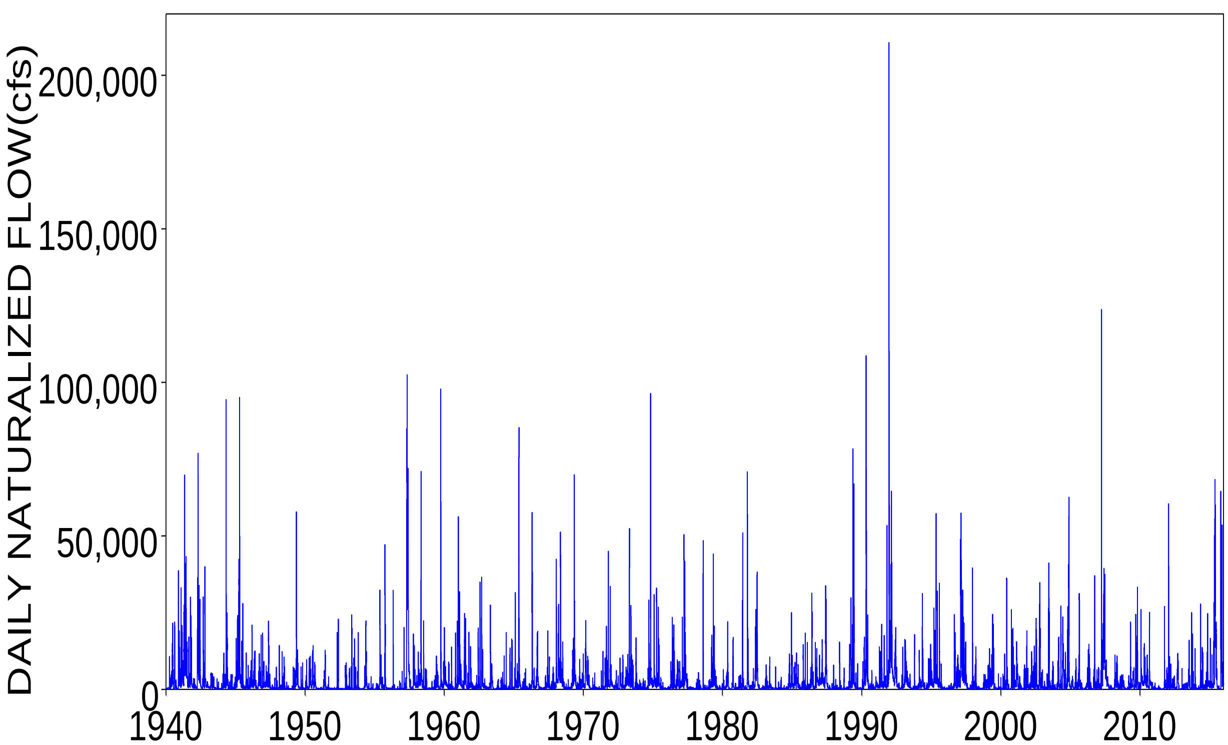
Daily Naturalized Flow Rate (cfs) at control Point BRRO72



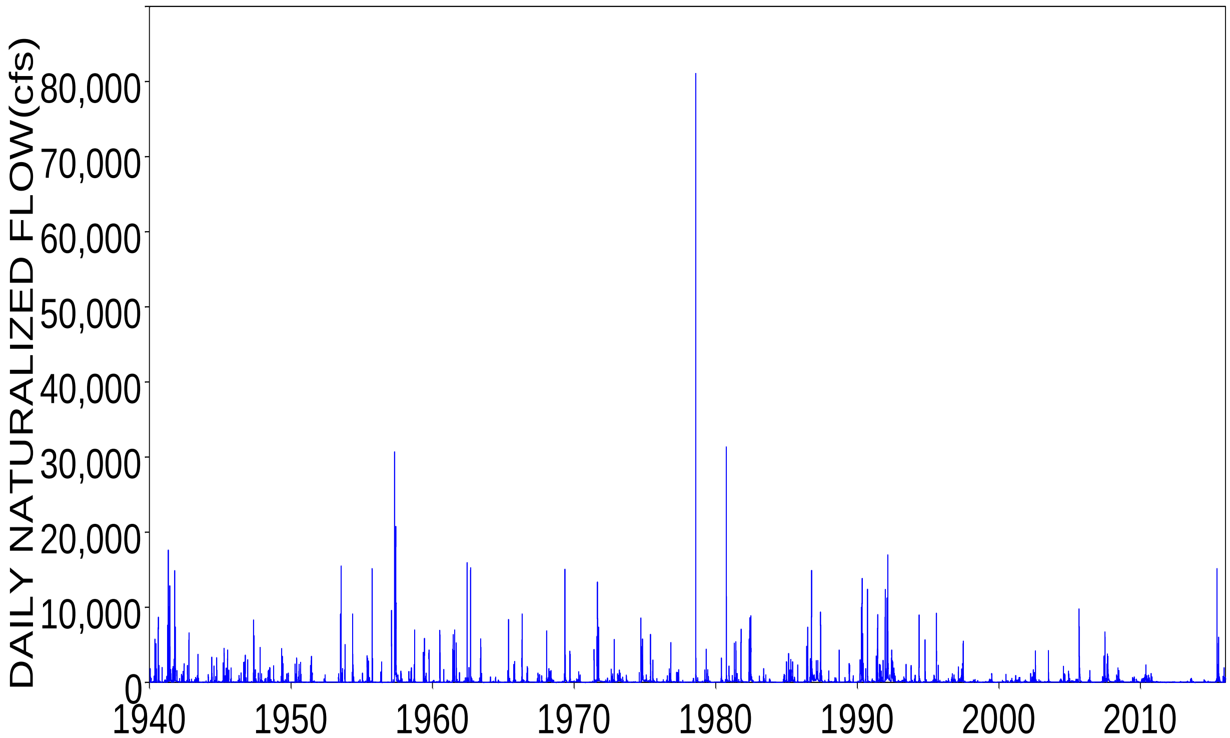
Daily Naturalized Flow Rate (cfs) at control Point BRSB23



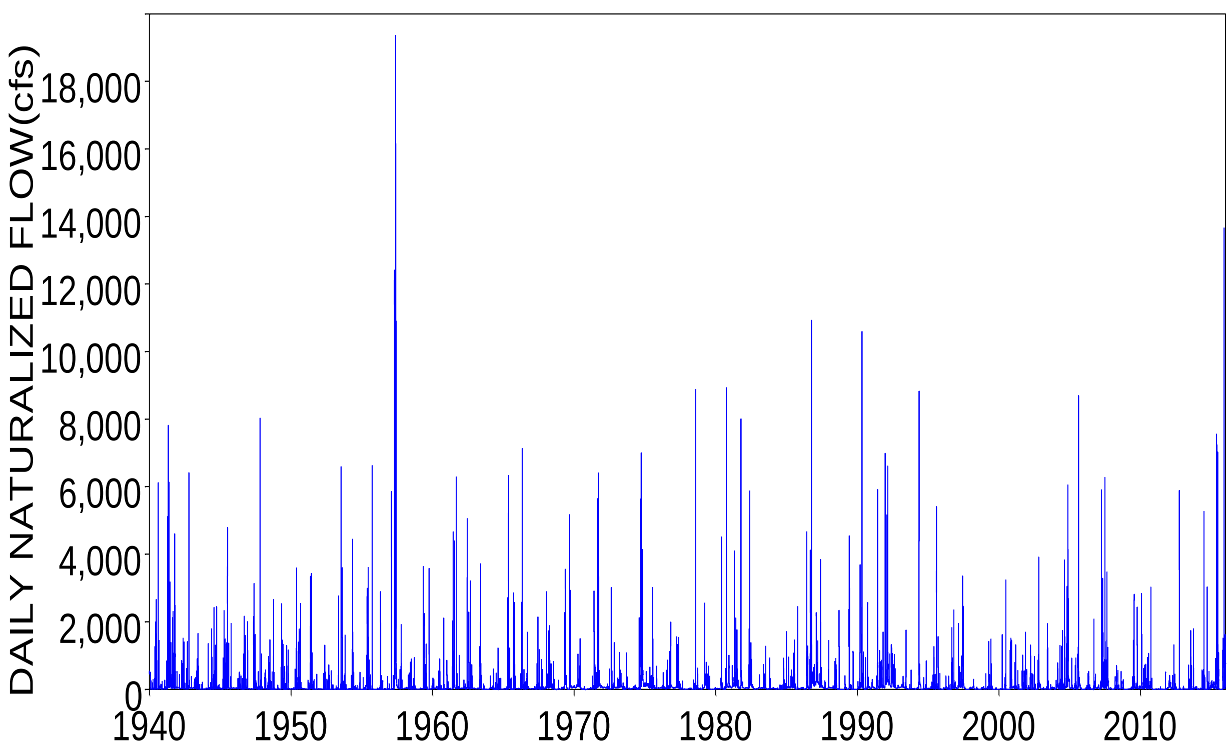
Daily Naturalized Flow Rate (cfs) at control Point BRSE11



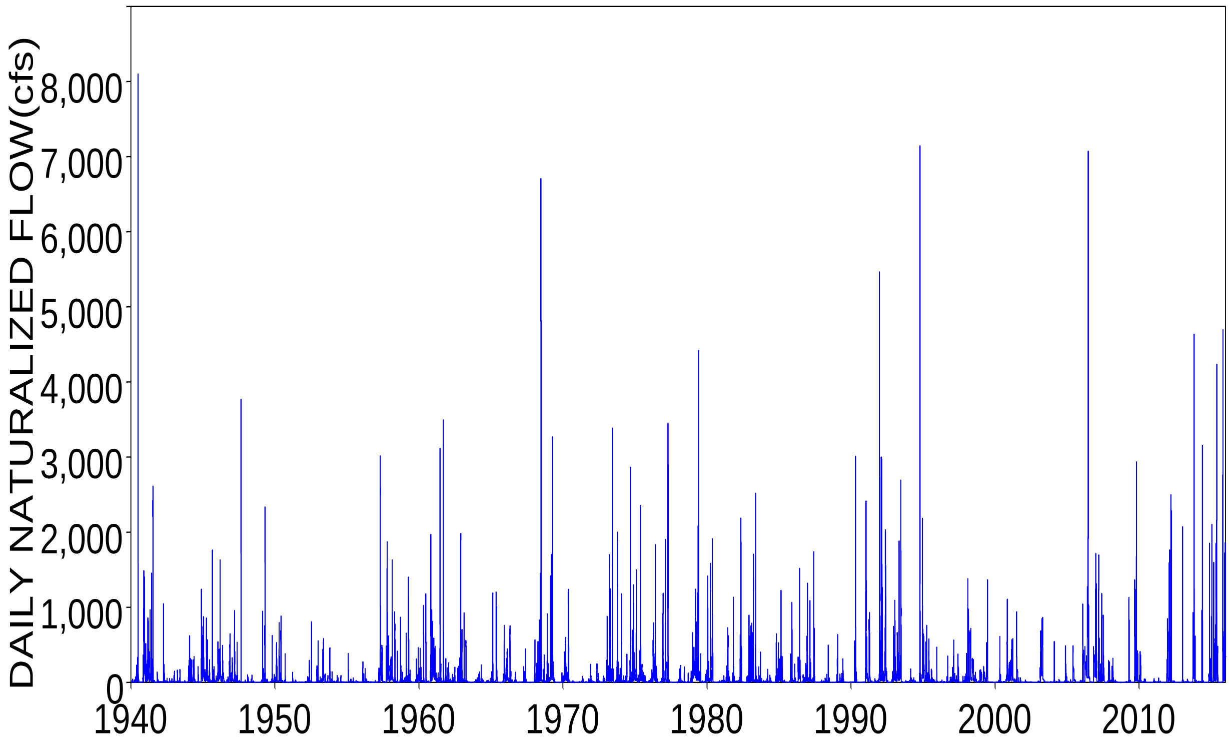
Daily Naturalized Flow Rate (cfs) at control Point BRWA41



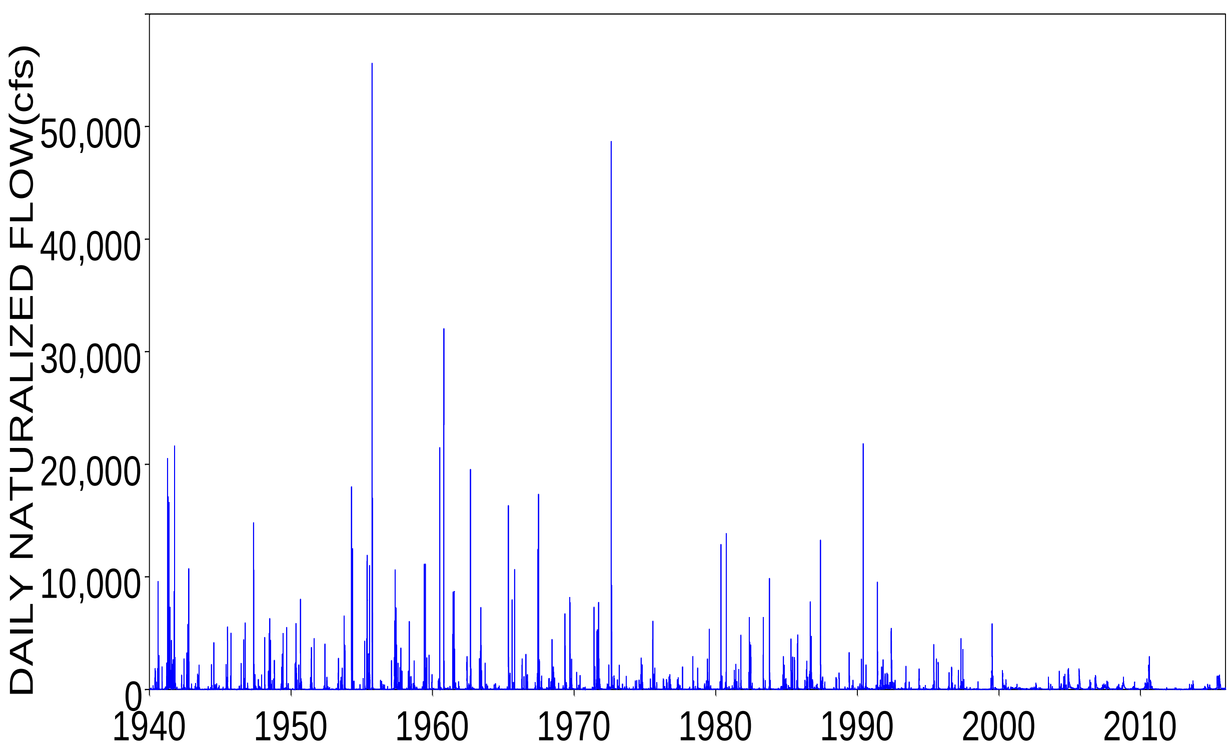
Daily Naturalized Flow Rate (cfs) at control Point CFFG18



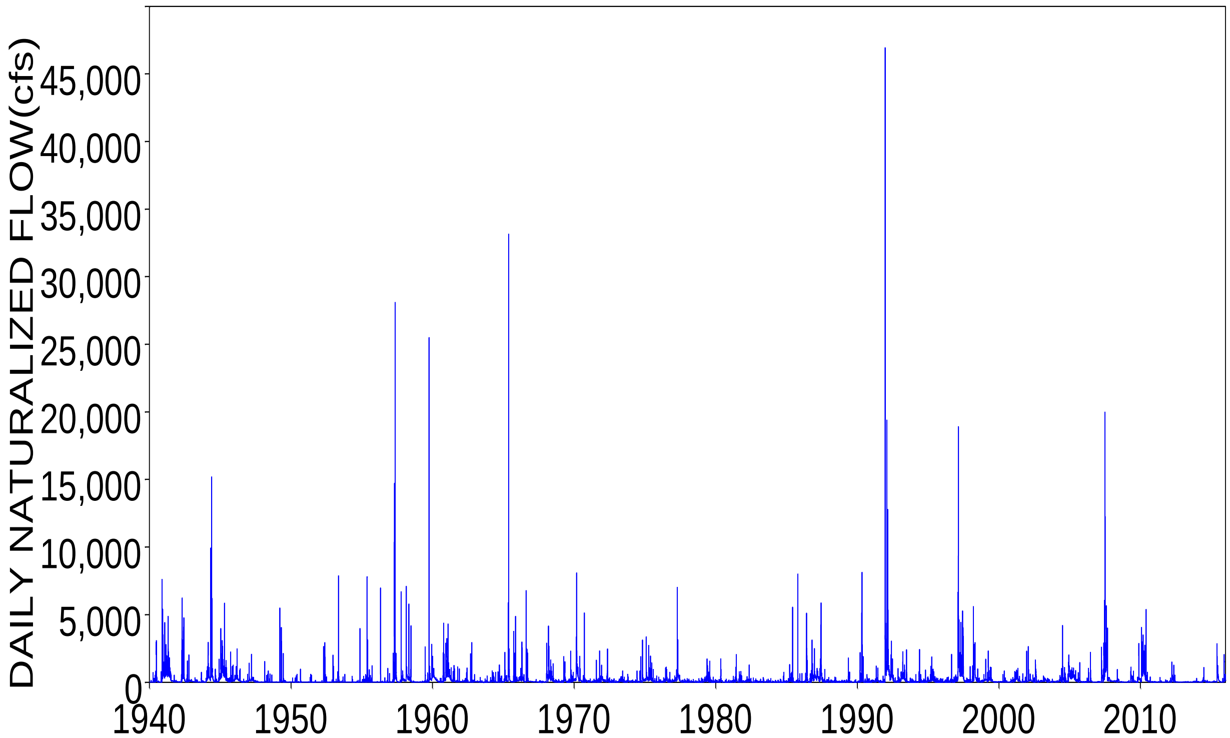
Daily Naturalized Flow Rate (cfs) at control Point CFNU16



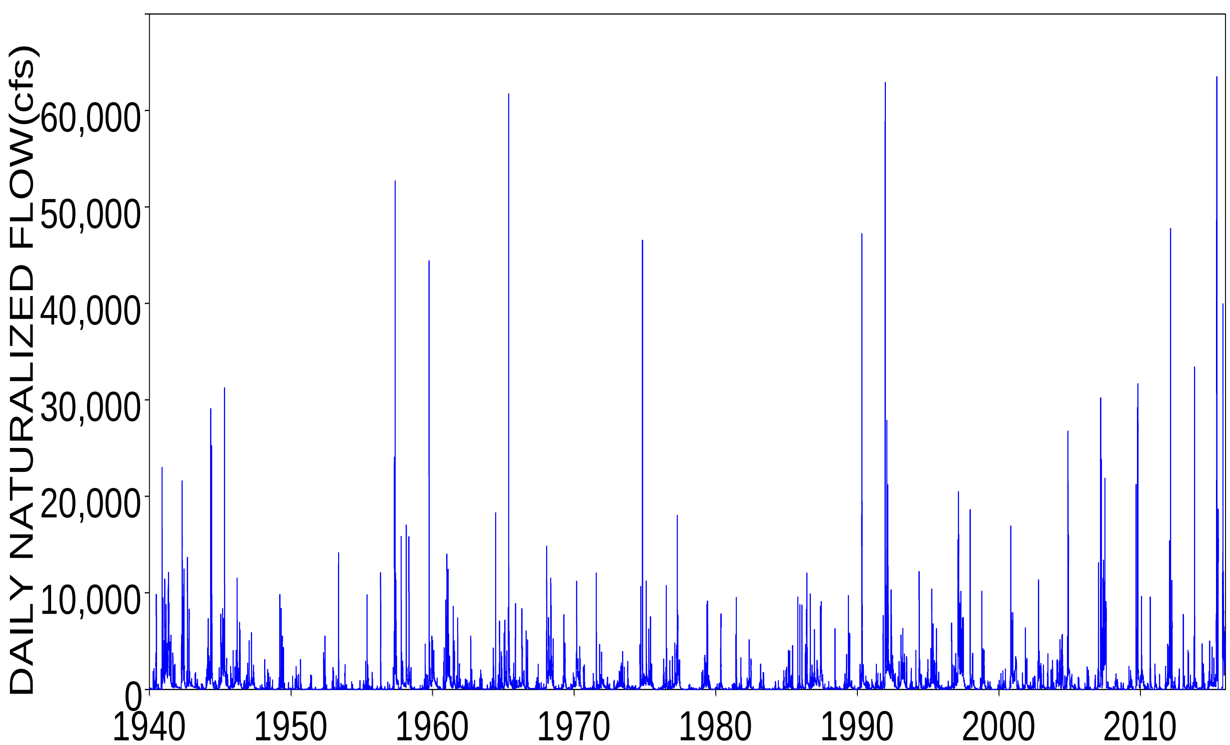
Daily Naturalized Flow Rate (cfs) at control Point DCLY63



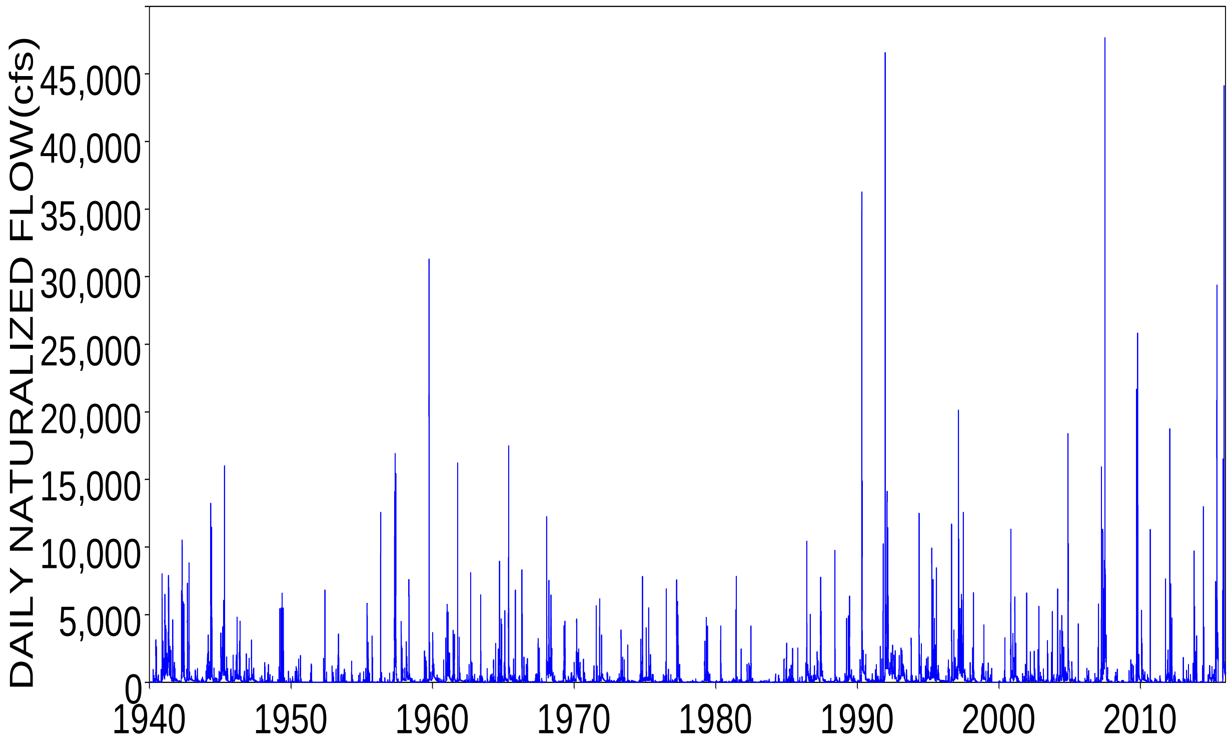
Daily Naturalized Flow Rate (cfs) at control Point DMAS09



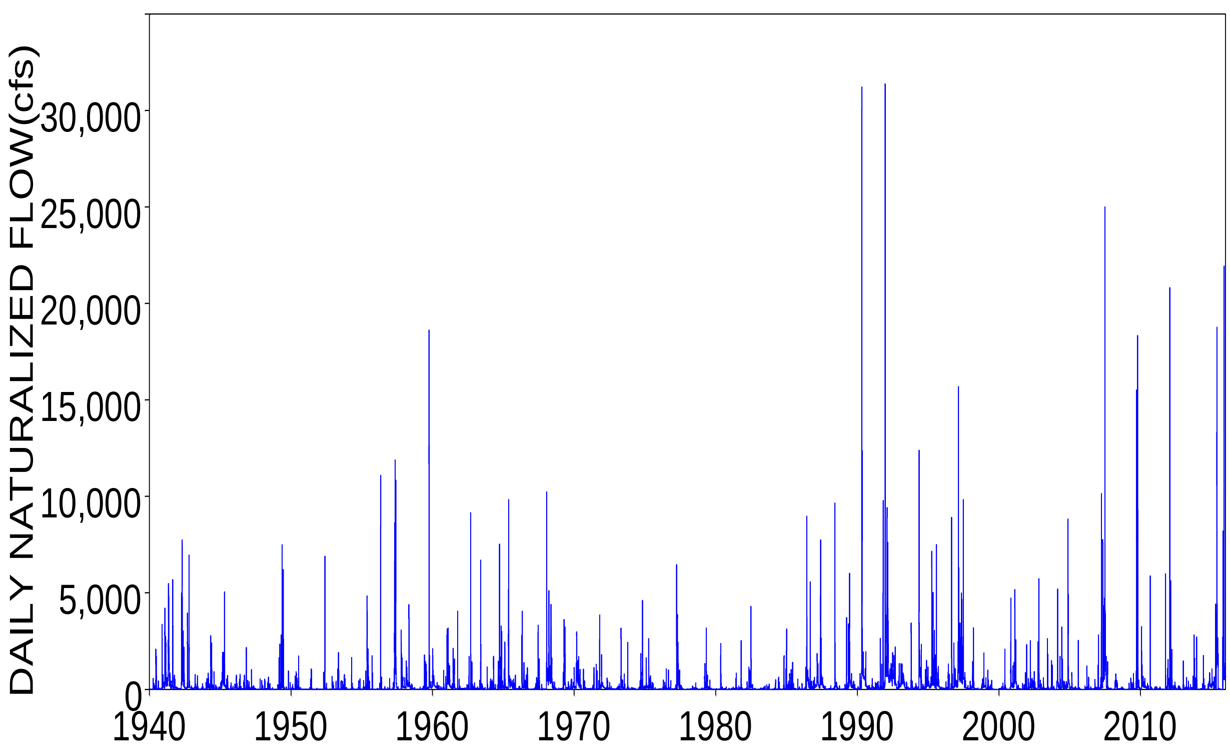
Daily Naturalized Flow Rate (cfs) at control Point LAKE50



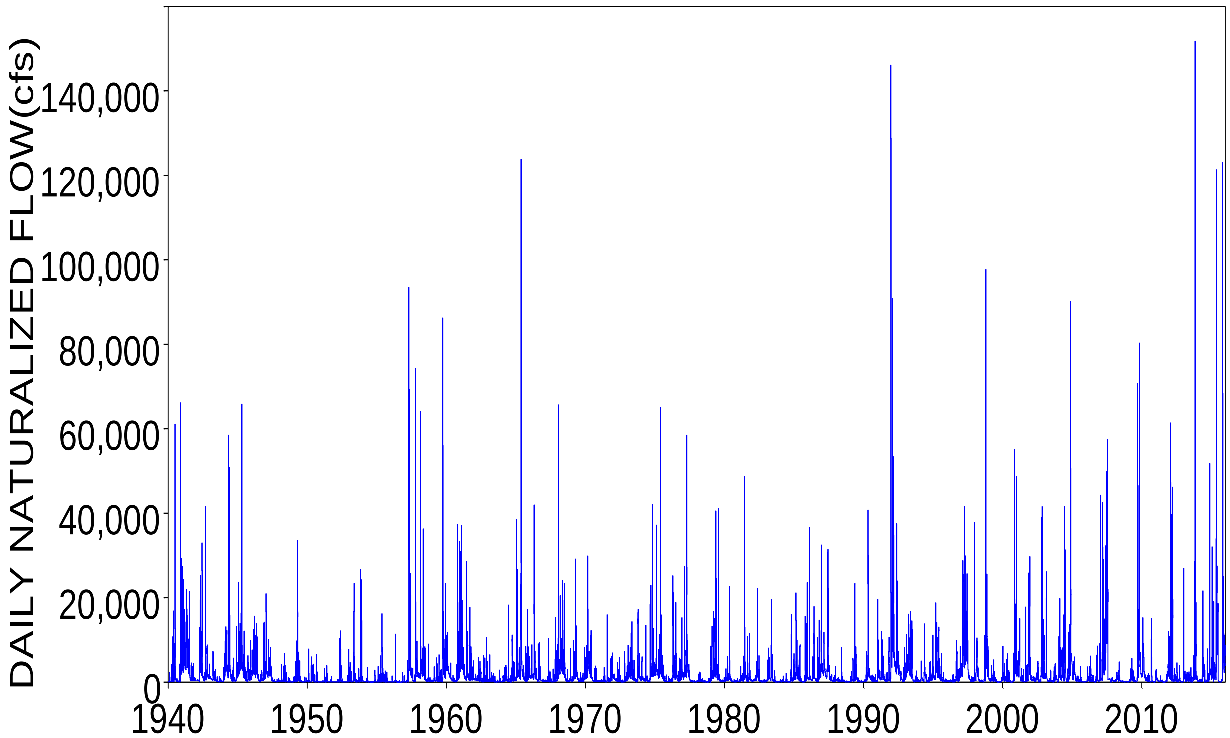
Daily Naturalized Flow Rate (cfs) at control Point LEBE49



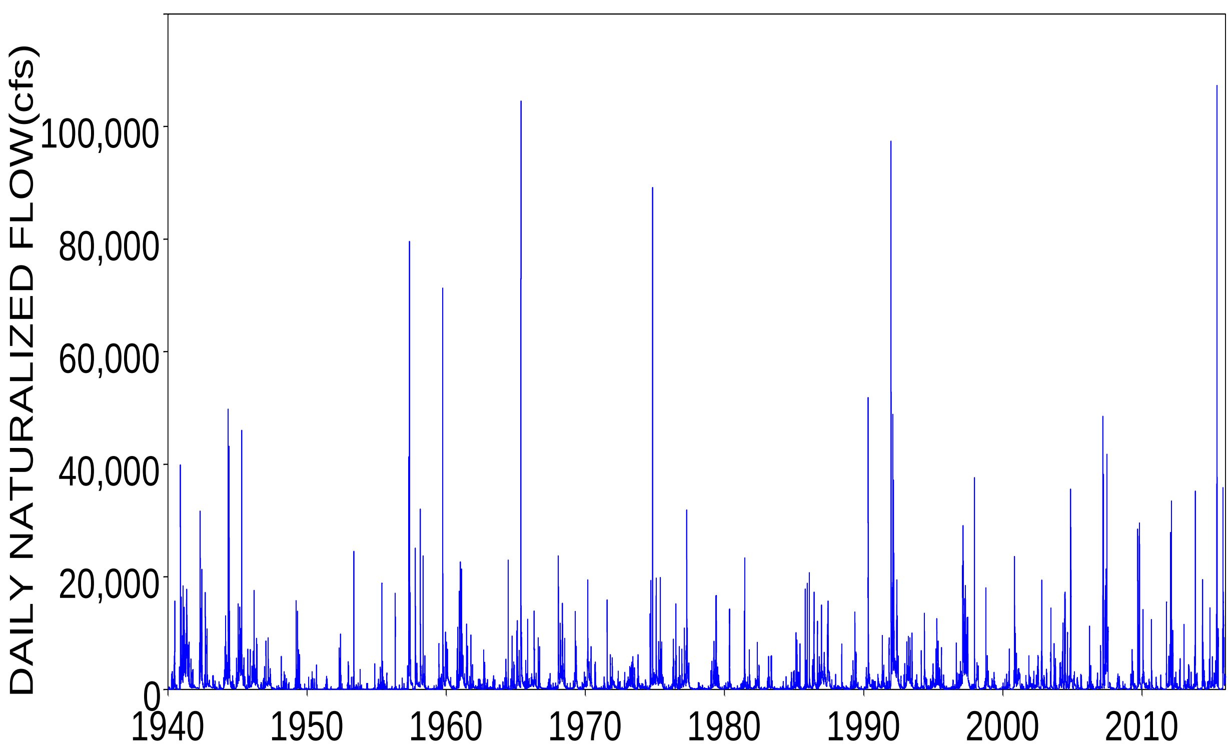
Daily Naturalized Flow Rate (cfs) at control Point LEGT47



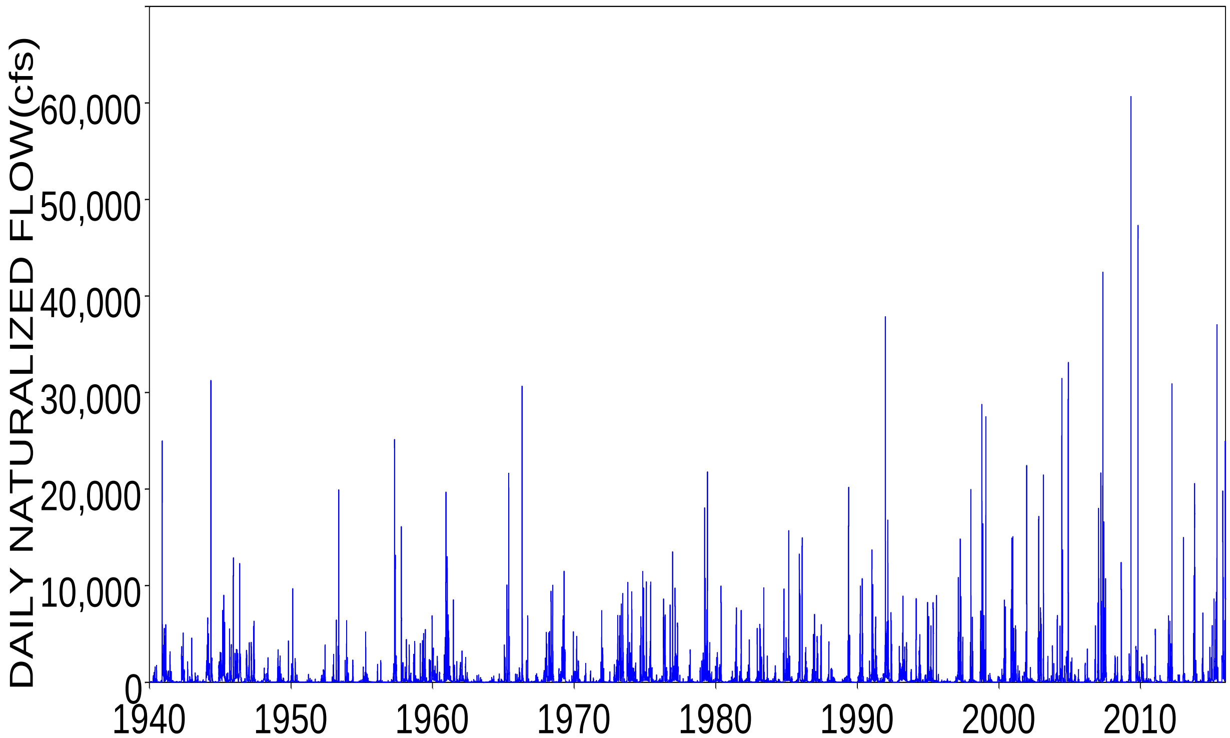
Daily Naturalized Flow Rate (cfs) at control Point LEHM46



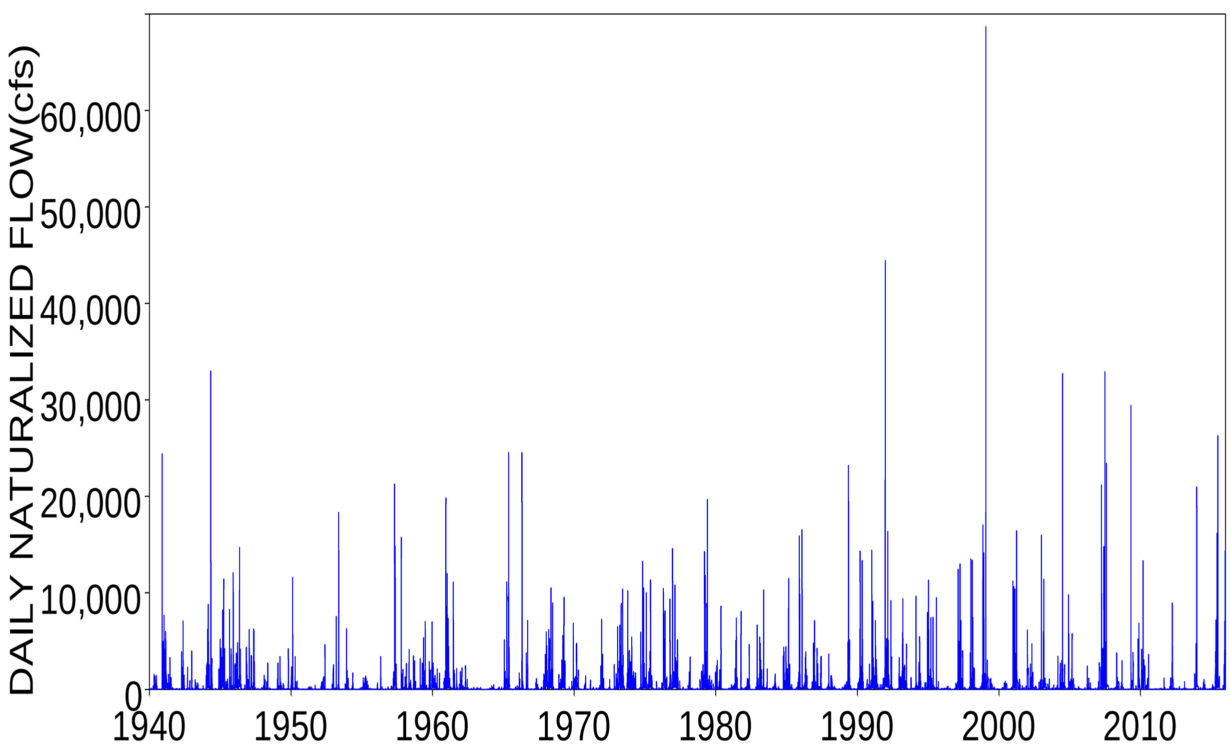
Daily Naturalized Flow Rate (cfs) at control Point LRCA58



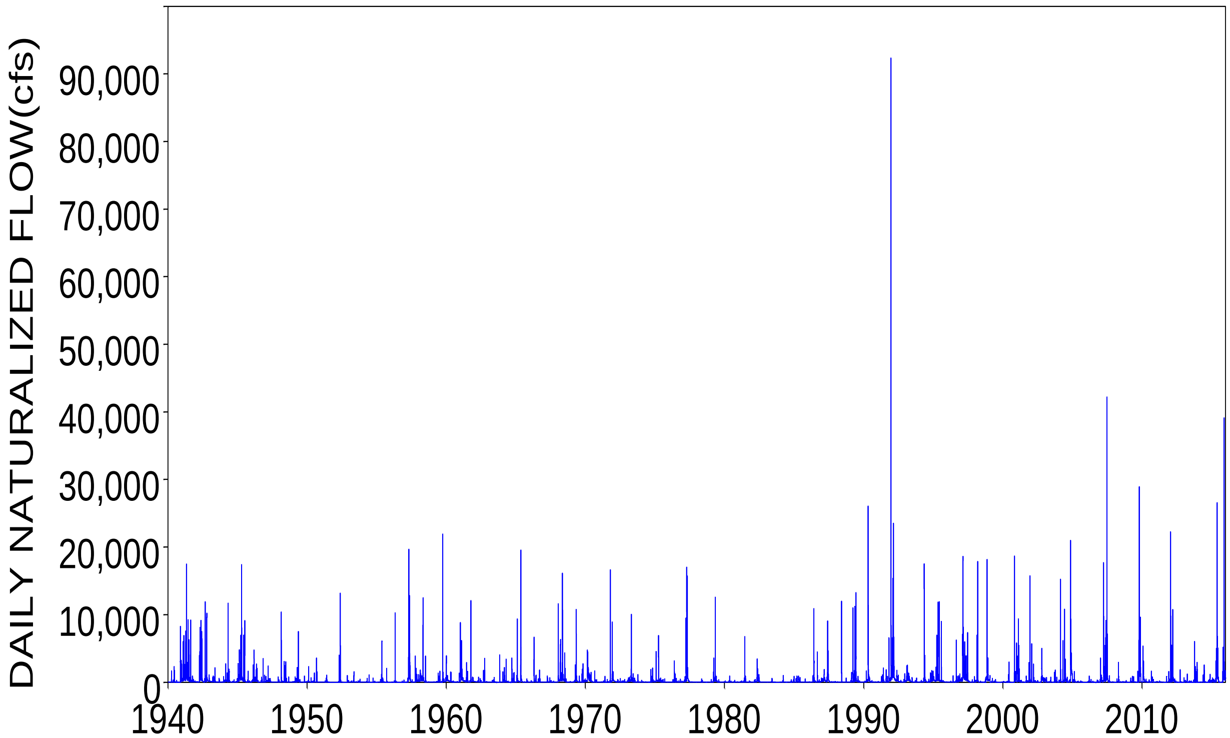
Daily Naturalized Flow Rate (cfs) at control Point LRLR53



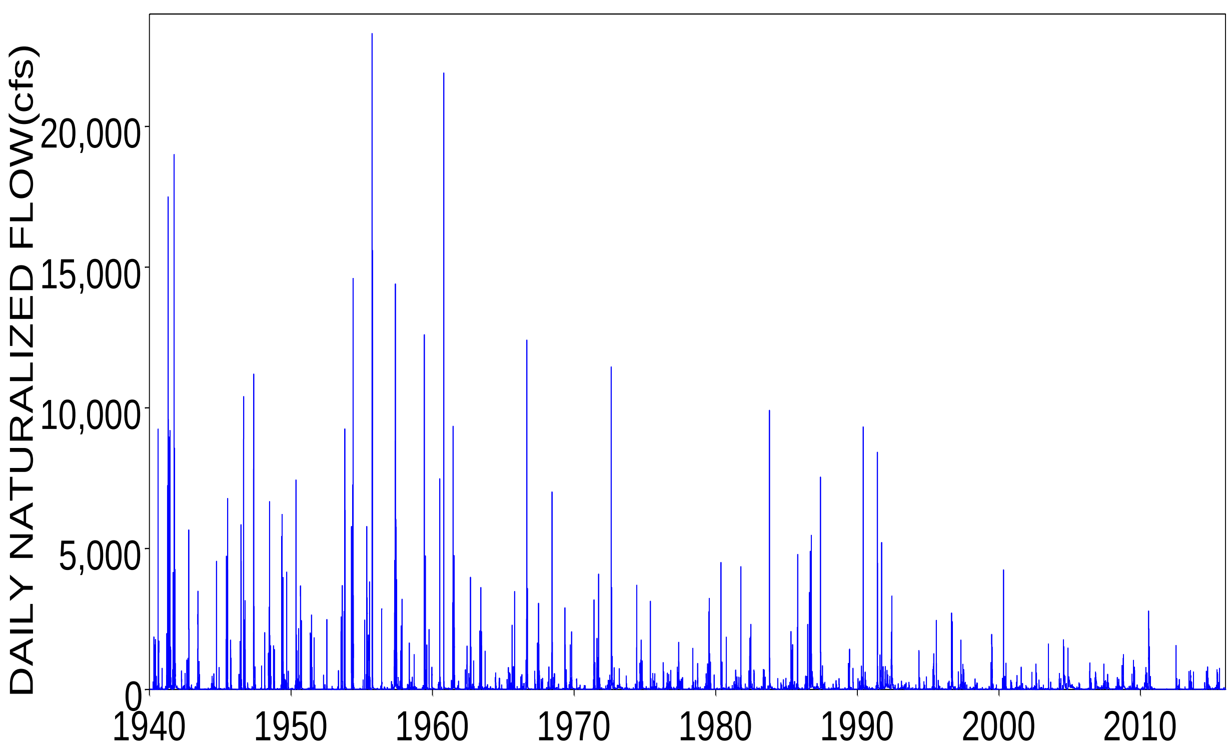
Daily Naturalized Flow Rate (cfs) at control Point NABR67



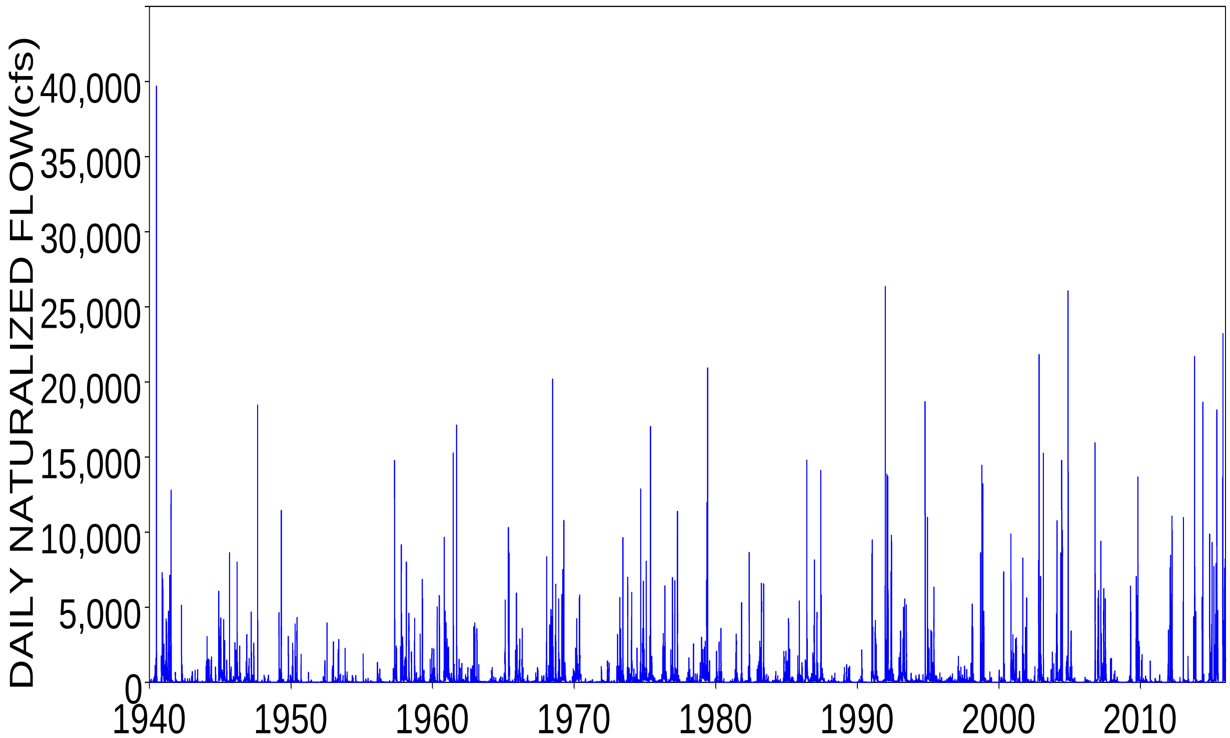
Daily Naturalized Flow Rate (cfs) at control Point NAEA66



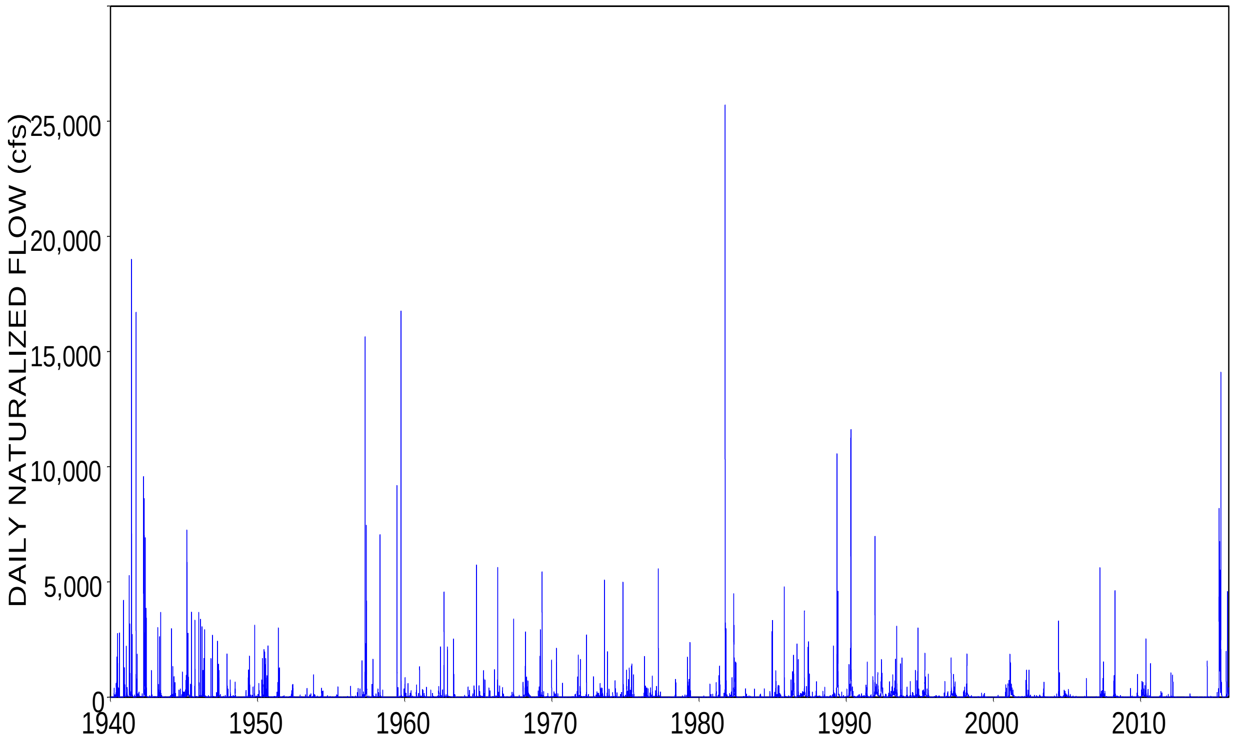
Daily Naturalized Flow Rate (cfs) at control Point NBCL36



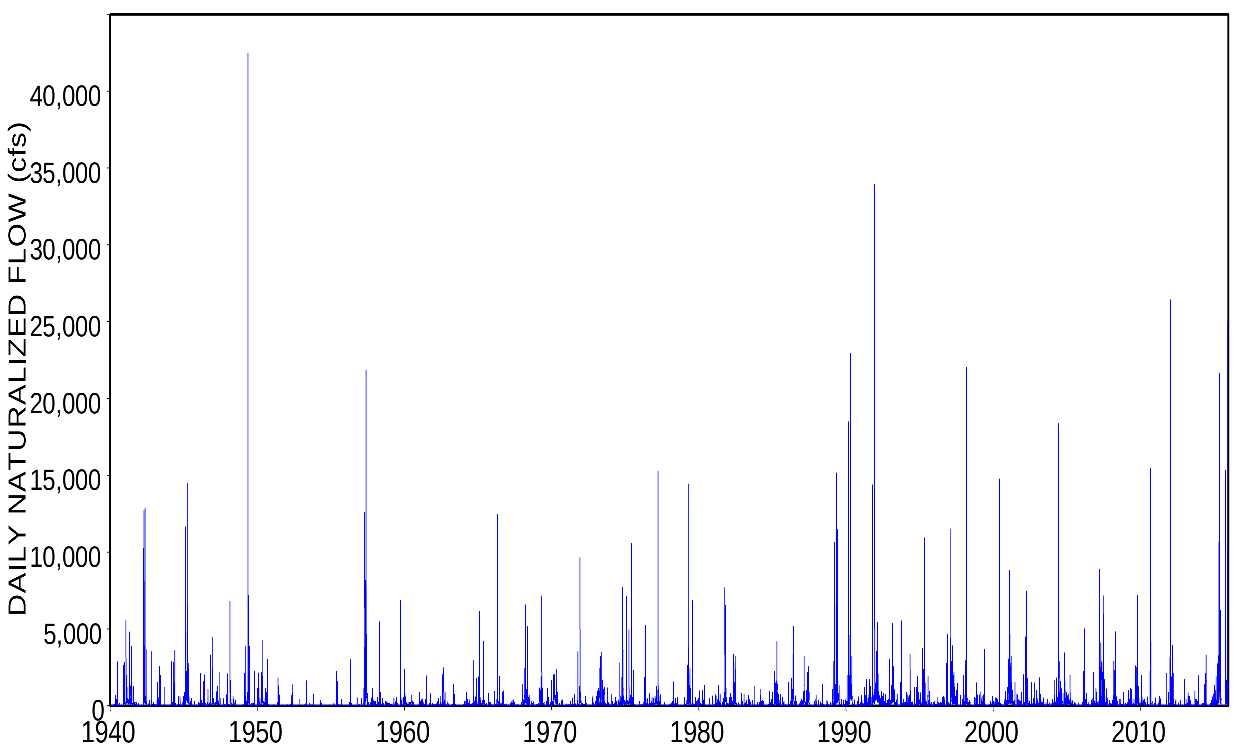
Daily Naturalized Flow Rate (cfs) at control Point SFAS06



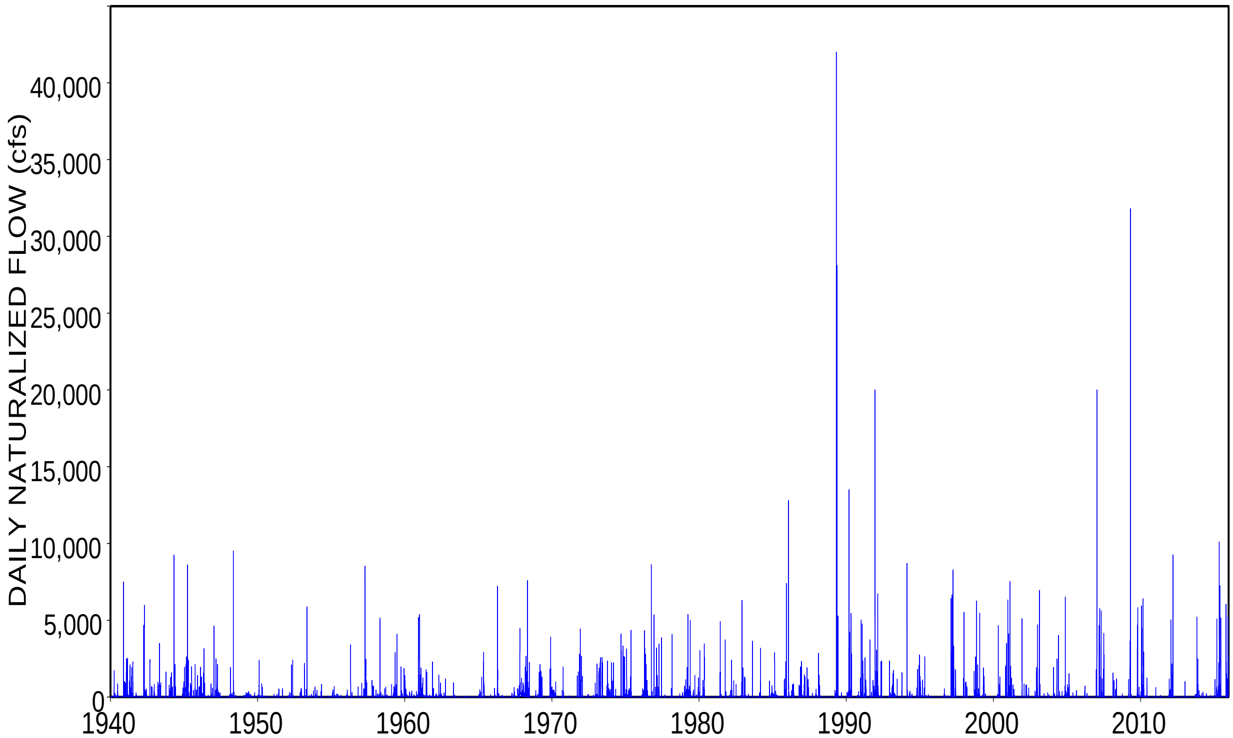
Daily Naturalized Flow Rate (cfs) at control Point YCSO62



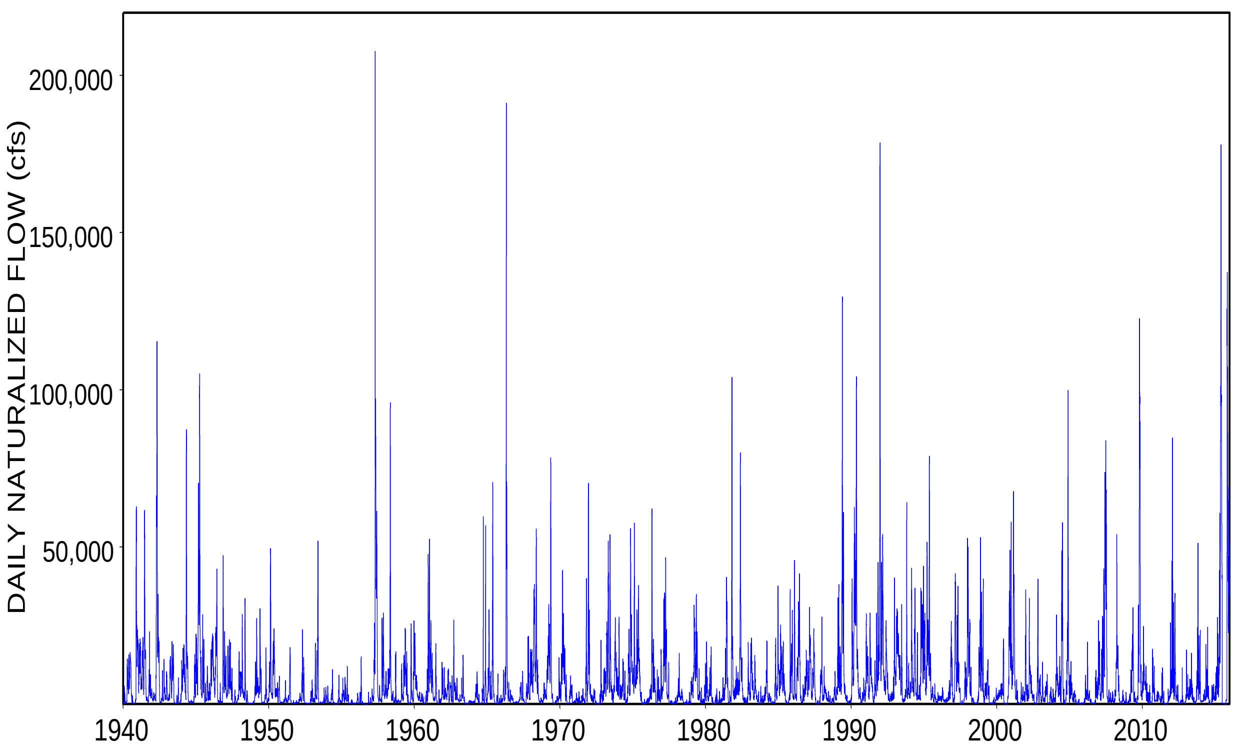
Daily Naturalized Flow Rate (cfs) at Control Point 8BSBR



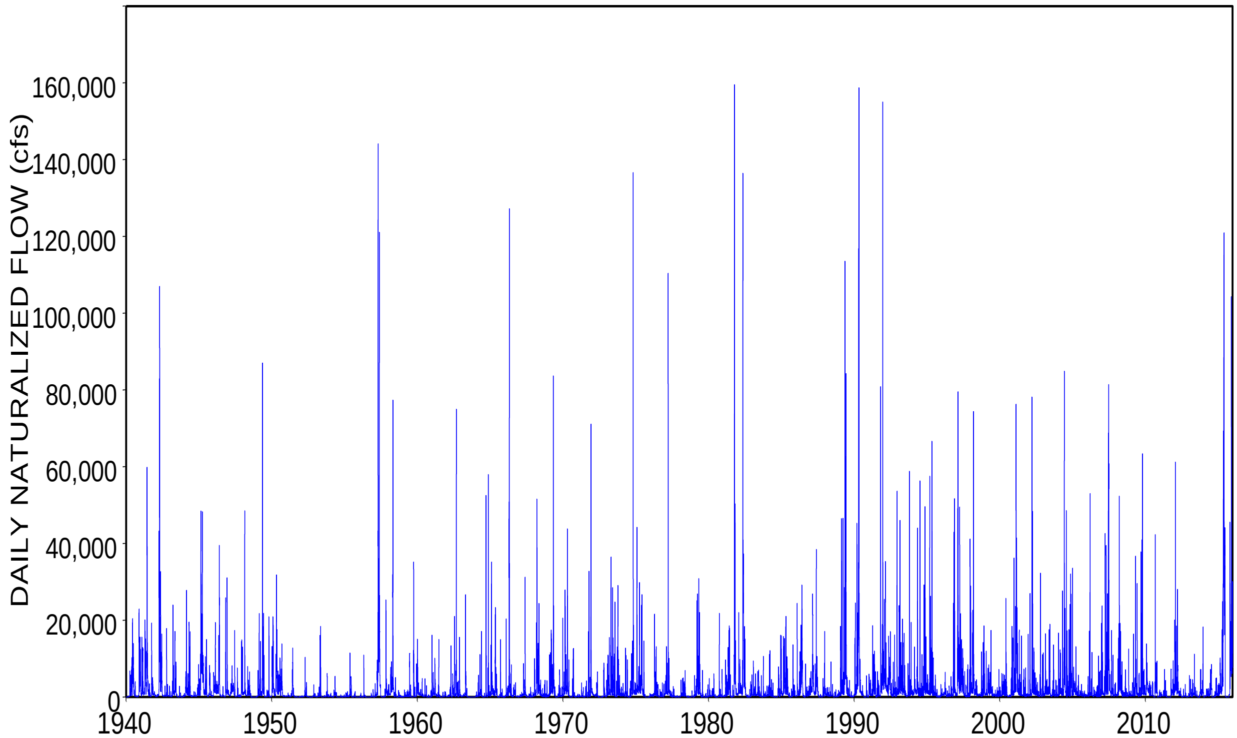
Daily Naturalized Flow Rate (cfs) at Control Point 8CTFW



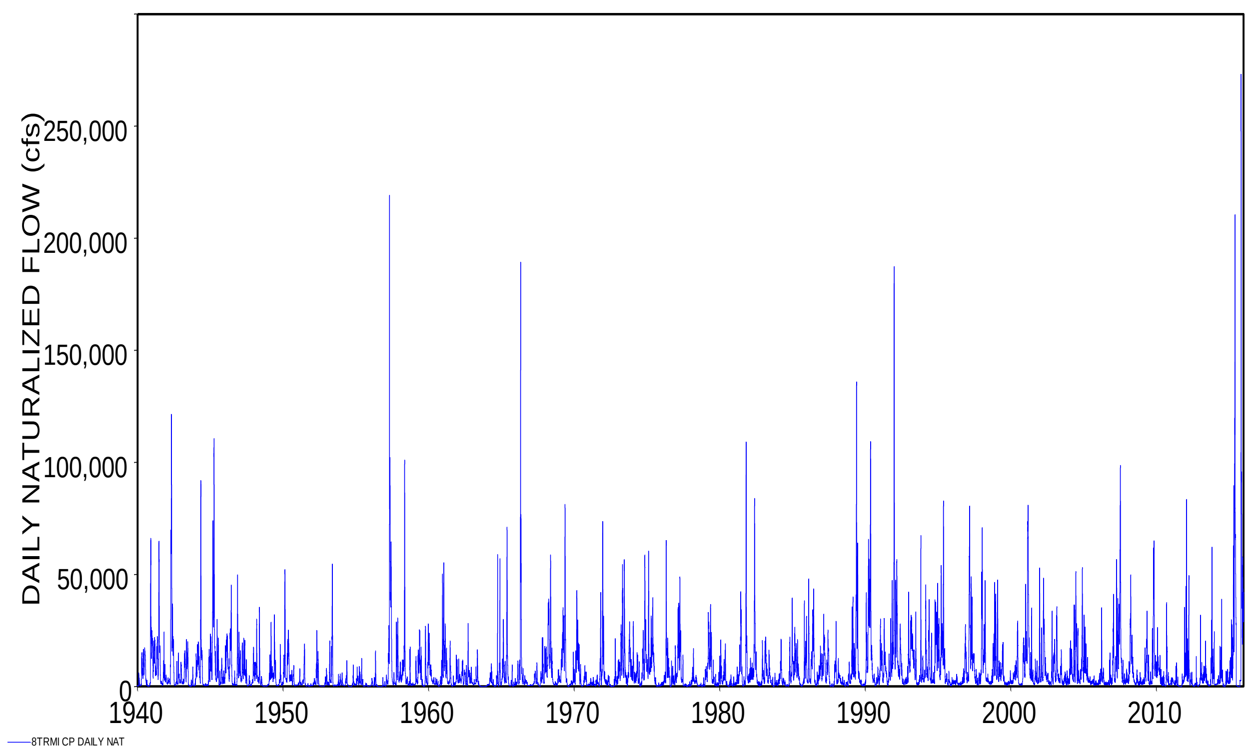
Daily Naturalized Flow Rate (cfs) at Control Point 8TEST



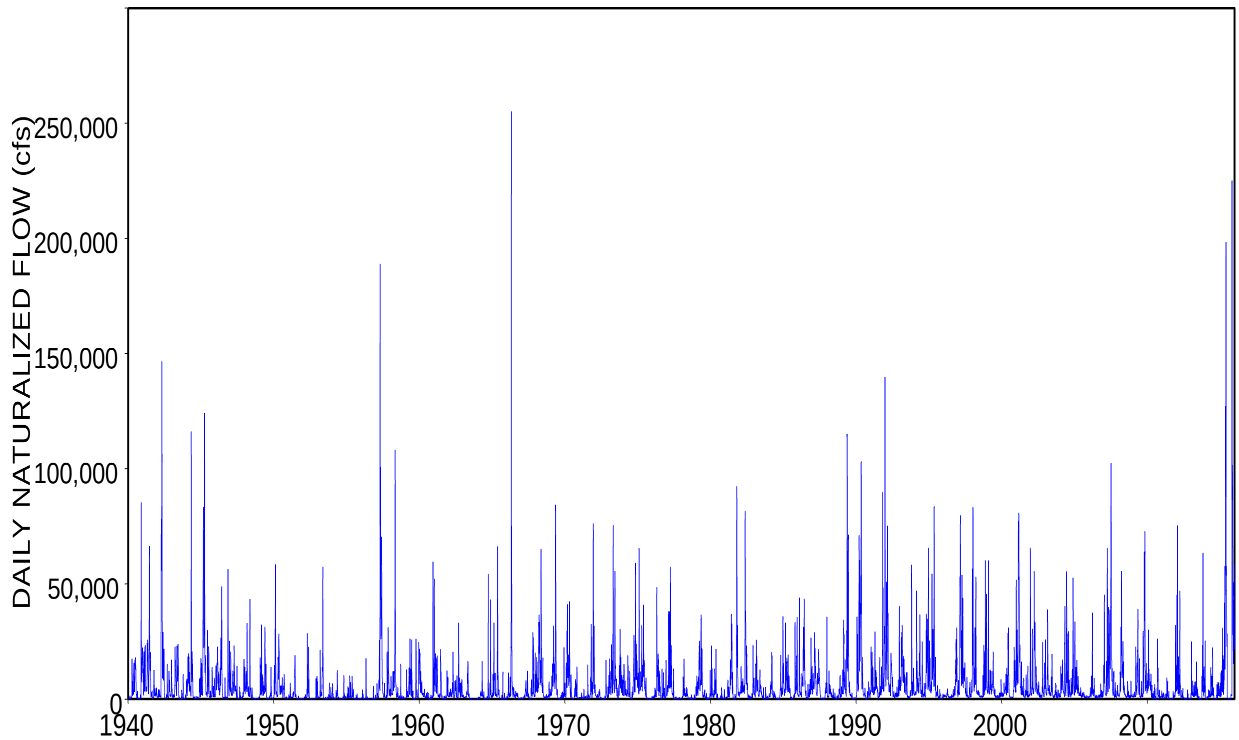
Daily Naturalized Flow Rate (cfs) at Control Point 8TRCR



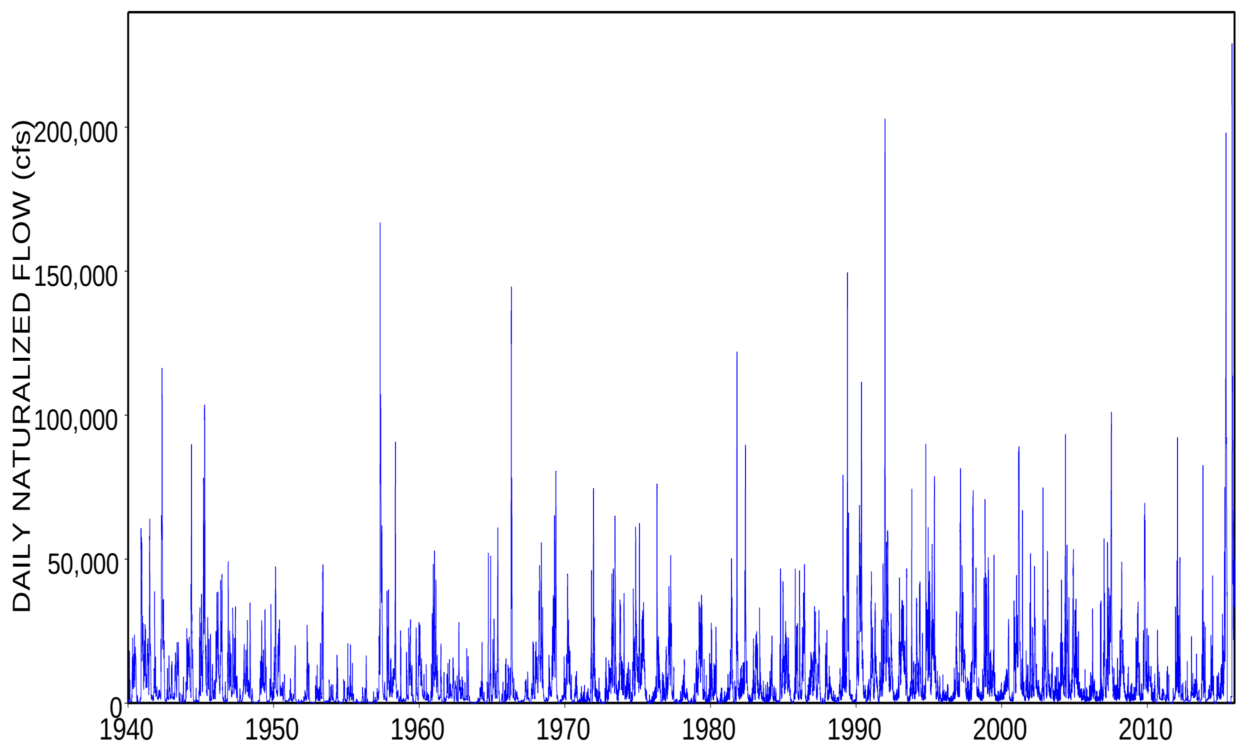
Daily Naturalized Flow Rate (cfs) at Control Point 8TRDA



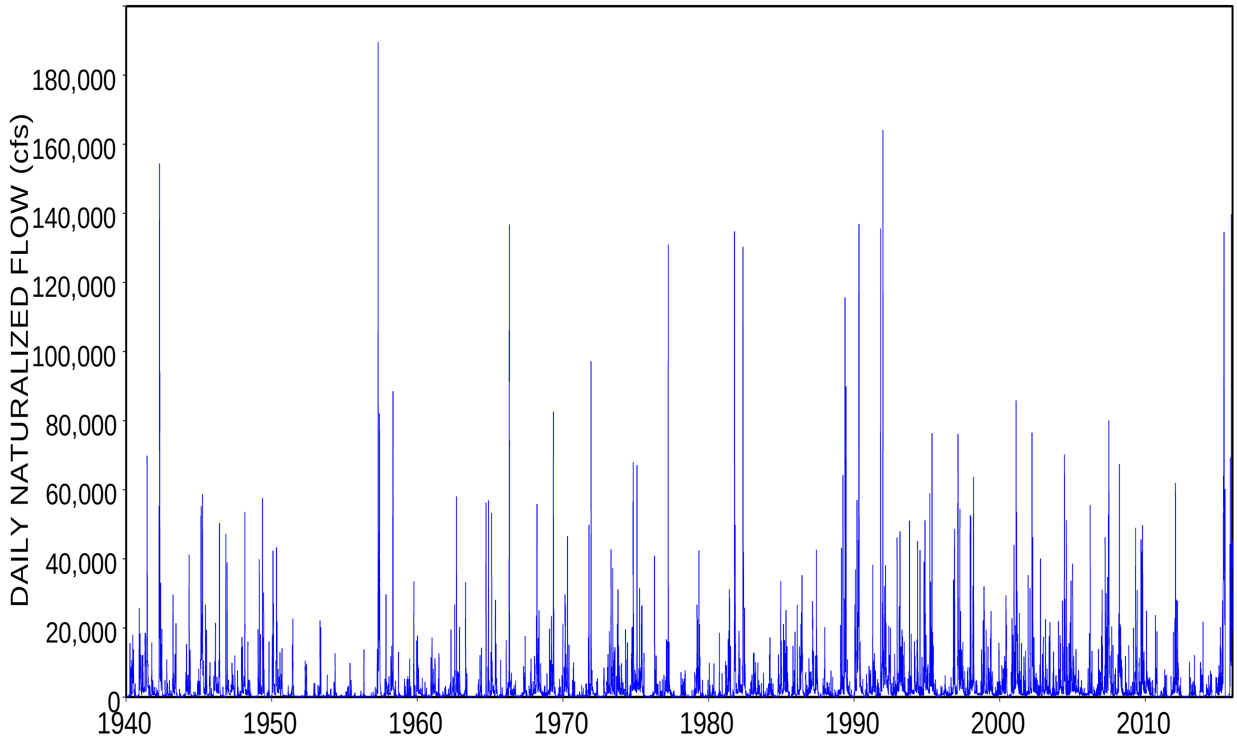
Daily Naturalized Flow Rate (cfs) at Control Point 8TRMI



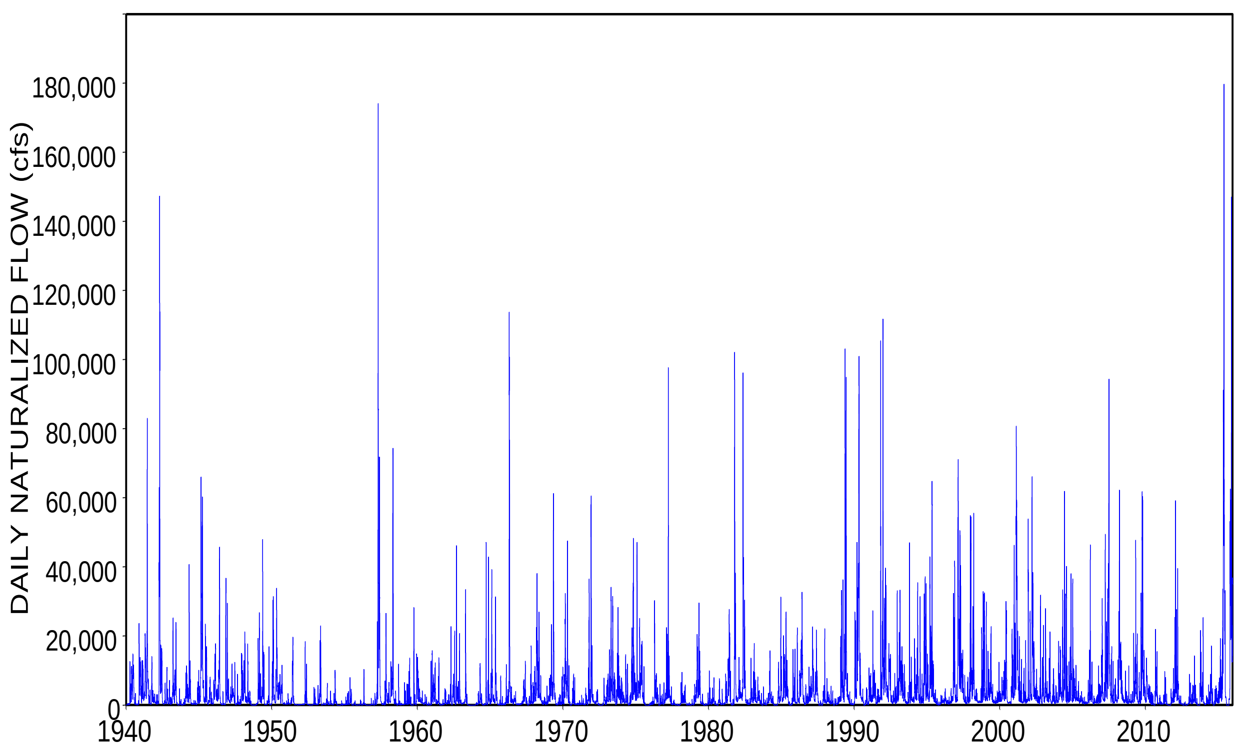
Daily Naturalized Flow Rate (cfs) at Control Point 8TROA



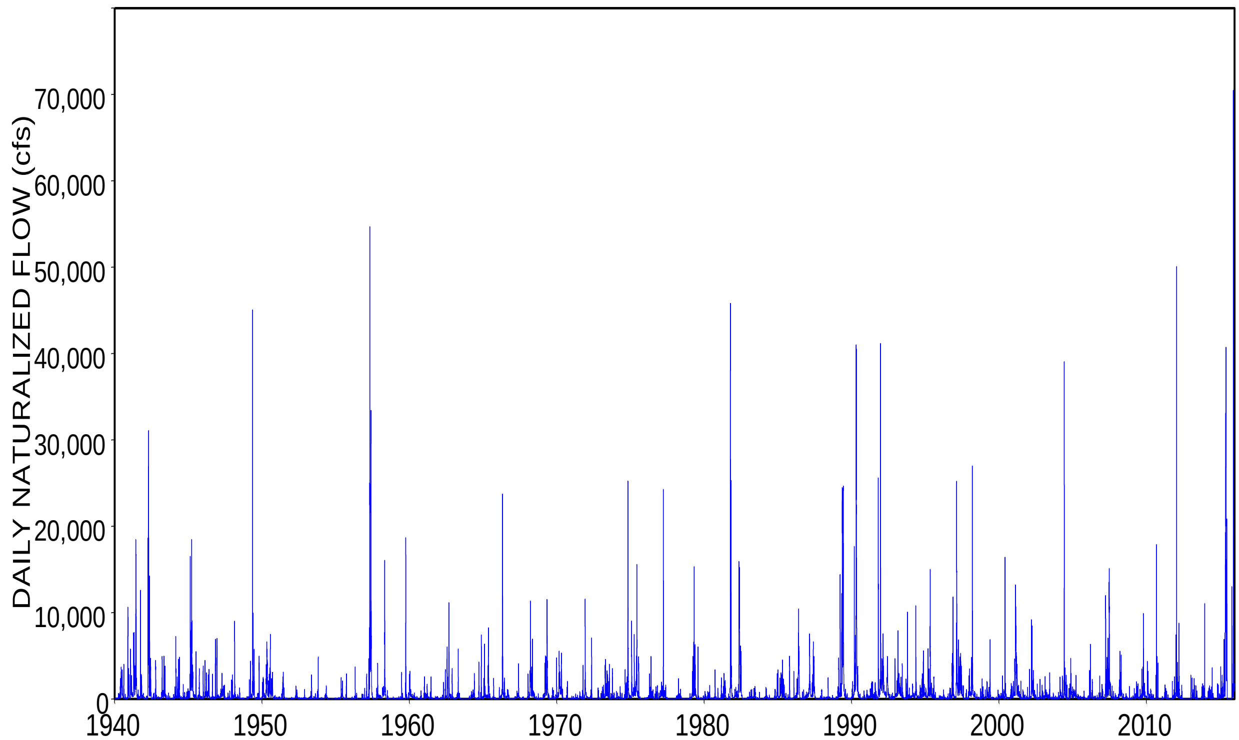
Daily Naturalized Flow Rate (cfs) at Control Point 8TRRI



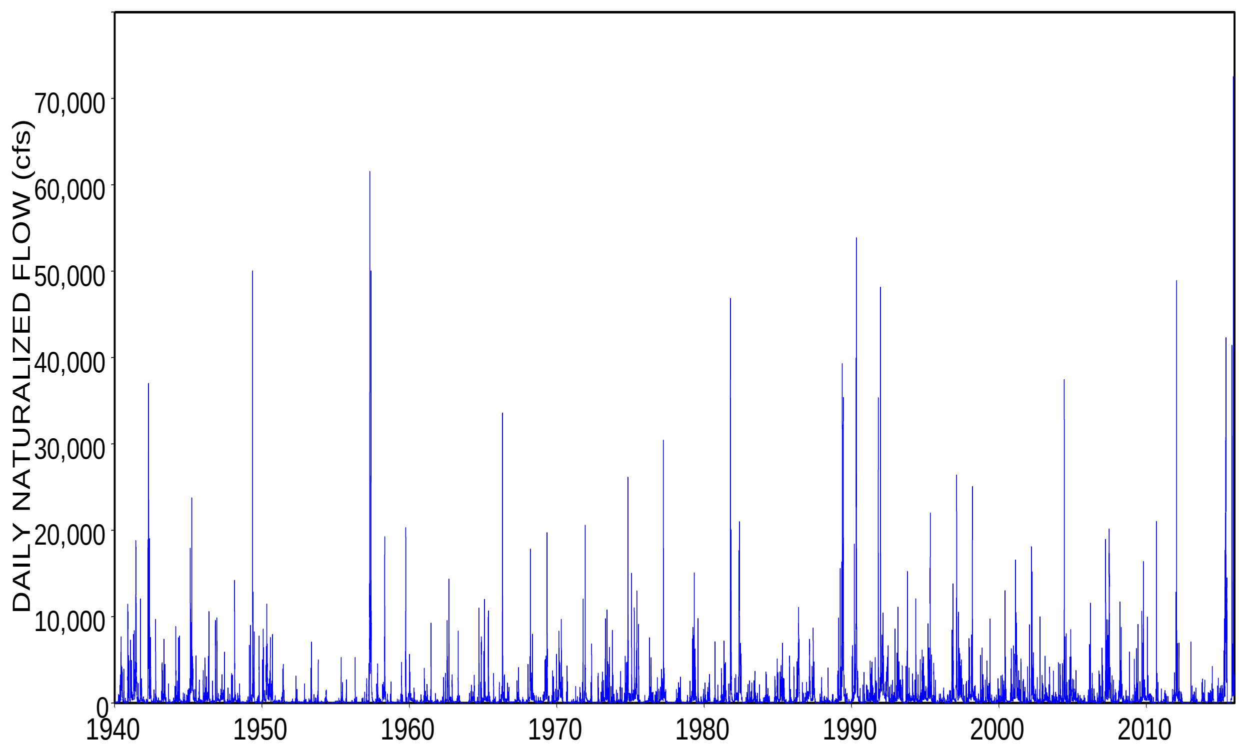
Daily Naturalized Flow Rate (cfs) at Control Point 8TRRS



Daily Naturalized Flow Rate (cfs) at Control Point 8TRTR



Daily Naturalized Flow Rate (cfs) at Control Point 8WTFW



Daily Naturalized Flow Rate (cfs) at Control Point 8WTGP

Annual Flow Volume of Salt Fork of Brazos River near Aspermont (SFA06)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	76,497	75,022	76,523	99.97%	98.04%	98.07%
2	1941	472,766	458,092	472,795	99.99%	96.89%	96.90%
3	1942	67,763	65,444	67,771	99.99%	96.57%	96.58%
4	1943	34,069	31,725	34,089	99.94%	93.06%	93.12%
5	1944	27,366	27,137	27,362	100.01%	99.18%	99.16%
6	1945	79,225	74,146	79,260	99.96%	93.55%	93.59%
7	1946	126,202	121,357	126,238	99.97%	96.13%	96.16%
8	1947	101,749	89,830	101,785	99.96%	88.25%	88.29%
9	1948	71,005	70,099	71,007	100.00%	98.72%	98.72%
10	1949	109,912	109,754	109,914	100.00%	99.85%	99.86%
11	1950	119,556	113,374	119,579	99.98%	94.81%	94.83%
12	1951	43,309	43,054	43,352	99.90%	99.31%	99.41%
13	1952	10,937	10,904	10,966	99.74%	99.43%	99.70%
14	1953	99,335	98,702	99,338	100.00%	99.36%	99.36%
15	1954	128,867	127,333	128,878	99.99%	98.80%	98.81%
16	1955	280,354	278,673	280,367	100.00%	99.40%	99.40%
17	1956	14,948	14,859	14,982	99.78%	99.18%	99.40%
18	1957	241,656	217,633	241,665	100.00%	90.06%	90.06%
19	1958	26,821	24,829	26,833	99.96%	92.53%	92.57%
20	1959	106,206	102,547	106,177	100.03%	96.58%	96.55%
21	1960	124,398	123,808	124,436	99.97%	99.50%	99.53%
22	1961	105,115	92,829	105,130	99.99%	88.30%	88.31%
23	1962	50,230	48,909	50,285	99.89%	97.26%	97.37%
24	1963	53,961	52,839	52,989	101.83%	99.72%	97.92%
25	1964	13,705	13,453	12,119	113.09%	111.01%	98.16%
26	1965	34,782	34,523	31,578	110.15%	109.32%	99.25%
27	1966	119,674	118,772	109,751	109.04%	108.22%	99.25%
28	1967	41,707	41,535	37,746	110.49%	110.04%	99.59%
29	1968	57,987	50,552	48,248	120.19%	104.78%	87.18%
30	1969	65,930	60,140	58,778	112.17%	102.32%	91.22%
31	1970	11,221	10,476	9,796	114.55%	106.94%	93.36%
32	1971	68,110	67,562	59,643	114.20%	113.28%	99.20%
33	1972	102,378	102,072	97,238	105.29%	104.97%	99.70%
34	1973	26,148	25,265	24,670	105.99%	102.41%	96.62%
35	1974	61,756	60,298	48,995	126.04%	123.07%	97.64%
36	1975	41,004	38,978	38,184	107.39%	102.08%	95.06%
37	1976	39,437	38,722	33,833	116.56%	114.45%	98.19%
38	1977	45,917	40,968	39,643	115.83%	103.34%	89.22%
39	1978	25,333	24,974	20,897	121.23%	119.51%	98.58%
40	1979	49,203	48,390	25,359	194.03%	190.82%	98.35%
41	1980	41,078	40,701	36,827	111.54%	110.52%	99.08%
42	1981	48,677	47,853	40,880	119.07%	117.06%	98.31%
43	1982	73,073	63,618	62,988	116.01%	101.00%	87.06%
44	1983	80,218	79,499	73,197	109.59%	108.61%	99.10%
45	1984	13,260	13,172	11,972	110.76%	110.03%	99.34%
46	1985	69,518	65,194	59,609	116.62%	109.37%	93.78%
47	1986	132,390	115,345	126,076	105.01%	91.49%	87.12%
48	1987	91,002	82,226	87,552	103.94%	93.92%	90.36%
49	1988	10,725	10,424	9,403	114.06%	110.85%	97.19%
50	1989	25,102	21,158	18,963	132.37%	111.57%	84.29%
51	1990	91,569	88,153	89,798	101.97%	98.17%	96.27%

52	1991	129,023	127,372	122,692	105.16%	103.81%	98.72%
53	1992	113,775	104,986	106,359	106.97%	98.71%	92.28%
54	1993	14,856	13,956	13,367	111.14%	104.41%	93.94%
55	1994	21,103	20,042	18,402	114.68%	108.91%	94.97%
56	1995	38,606	37,809	37,337	103.40%	101.26%	97.94%
57	1996	45,631	44,562	44,321	102.95%	100.54%	97.66%
58	1997	52,892	48,633	47,720	110.84%	101.91%	91.95%
59	1998	7,810	7,671	7,703	101.38%	99.58%	98.23%
60	1999	40,276	39,410	40,265	100.03%	97.88%	97.85%
61	2000	25,615	24,508	26,149	97.96%	93.73%	95.68%
62	2001	14,895	14,109	14,925	99.80%	94.53%	94.72%
63	2002	14,612	14,114	16,216	90.11%	87.04%	96.59%
64	2003	15,958	14,877	13,796	115.67%	107.83%	93.22%
65	2004	88,696	76,074	95,333	93.04%	79.80%	85.77%
66	2005	29,323	27,897	22,836	128.41%	122.16%	95.14%
67	2006	38,342	35,681	40,424	94.85%	88.27%	93.06%
68	2007	37,354	34,550	35,955	103.89%	96.09%	92.49%
69	2008	35,501	33,672	35,362	100.39%	95.22%	94.85%
70	2009	21,679	21,483	21,274	101.91%	100.98%	99.09%
71	2010	77,245	64,178	77,500	99.67%	82.81%	83.08%
72	2011	1,757	1,668	1,261	139.37%	132.28%	94.92%
73	2012	13,066	12,942	13,023	100.33%	99.37%	99.05%
74	2013	16,857	16,617	16,983	99.26%	97.84%	98.58%
75	2014	19,411	16,888	19,613	98.97%	86.11%	87.00%
76	2015	27,897	26,667	28,591	97.57%	93.27%	95.59%
	Mean	70,322	67,105	67,489	104.20%	99.43%	95.43%

Annual Flow Volume of Double Mountain Fork of Brazos River near Aspermont (DMAS09)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	80,147	76,419	80,144	100.00%	95.35%	95.35%
2	1941	507,856	444,533	507,855	100.00%	87.53%	87.53%
3	1942	101,194	95,340	101,193	100.00%	94.22%	94.21%
4	1943	30,293	27,960	30,293	100.00%	92.30%	92.30%
5	1944	34,852	34,449	34,852	100.00%	98.84%	98.84%
6	1945	70,779	62,712	70,779	100.00%	88.60%	88.60%
7	1946	73,244	60,915	73,245	100.00%	83.17%	83.17%
8	1947	129,814	99,273	129,812	100.00%	76.47%	76.47%
9	1948	93,611	91,773	93,612	100.00%	98.04%	98.04%
10	1949	89,013	88,347	89,177	99.82%	99.07%	99.25%
11	1950	120,928	110,346	121,081	99.87%	91.13%	91.25%
12	1951	44,622	43,700	44,747	99.72%	97.66%	97.93%
13	1952	20,423	20,295	20,545	99.40%	98.78%	99.38%
14	1953	87,678	86,635	87,854	99.80%	98.61%	98.81%
15	1954	118,358	117,435	118,500	99.88%	99.10%	99.22%
16	1955	454,393	441,377	454,594	99.96%	97.09%	97.14%
17	1956	18,478	18,396	18,681	98.92%	98.48%	99.56%
18	1957	283,559	229,677	283,762	99.93%	80.94%	81.00%
19	1958	68,389	57,117	66,569	102.73%	85.80%	83.52%
20	1959	183,966	177,198	181,230	101.51%	97.77%	96.32%
21	1960	228,751	227,103	226,854	100.84%	100.11%	99.28%
22	1961	151,615	128,625	150,415	100.80%	85.51%	84.84%

23	1962	125,361	118,986	123,873	101.20%	96.06%	94.91%
24	1963	120,517	118,824	118,949	101.32%	99.89%	98.60%
25	1964	10,391	9,925	8,889	116.90%	111.65%	95.51%
26	1965	135,765	134,866	134,418	101.00%	100.33%	99.34%
27	1966	75,978	74,252	74,629	101.81%	99.49%	97.73%
28	1967	144,250	143,287	141,949	101.62%	100.94%	99.33%
29	1968	67,858	56,198	65,488	103.62%	85.81%	82.82%
30	1969	145,370	121,419	142,296	102.16%	85.33%	83.52%
31	1970	32,999	25,635	28,874	114.29%	88.78%	77.68%
32	1971	178,448	173,391	173,852	102.64%	99.73%	97.17%
33	1972	230,506	229,727	225,048	102.43%	102.08%	99.66%
34	1973	45,556	44,368	40,122	113.54%	110.58%	97.39%
35	1974	64,831	62,990	59,760	108.49%	105.41%	97.16%
36	1975	81,680	79,057	77,259	105.72%	102.33%	96.79%
37	1976	51,033	49,979	47,199	108.12%	105.89%	97.93%
38	1977	30,359	29,303	27,775	109.30%	105.50%	96.52%
39	1978	44,006	43,542	41,588	105.81%	104.70%	98.95%
40	1979	71,442	66,353	70,422	101.45%	94.22%	92.88%
41	1980	134,435	133,222	133,201	100.93%	100.02%	99.10%
42	1981	79,770	78,488	78,707	101.35%	99.72%	98.39%
43	1982	132,185	122,289	131,017	100.89%	93.34%	92.51%
44	1983	98,467	96,420	97,427	101.07%	98.97%	97.92%
45	1984	50,355	49,742	48,935	102.90%	101.65%	98.78%
46	1985	140,619	133,193	139,509	100.80%	95.47%	94.72%
47	1986	170,306	159,596	169,618	100.41%	94.09%	93.71%
48	1987	108,358	92,978	107,588	100.72%	86.42%	85.81%
49	1988	33,123	32,854	33,034	100.27%	99.45%	99.19%
50	1989	39,651	35,001	38,616	102.68%	90.64%	88.27%
51	1990	118,338	102,280	118,368	99.97%	86.41%	86.43%
52	1991	139,498	133,786	138,403	100.79%	96.66%	95.90%
53	1992	173,312	128,482	172,189	100.65%	74.62%	74.13%
54	1993	22,528	18,236	20,679	108.94%	88.19%	80.95%
55	1994	19,527	18,161	11,948	163.43%	152.00%	93.00%
56	1995	59,101	54,053	45,703	129.32%	118.27%	91.46%
57	1996	35,668	29,788	25,629	139.17%	116.23%	83.51%
58	1997	81,732	68,615	58,857	138.87%	116.58%	83.95%
59	1998	4,648	4,449	4,648	100.00%	95.72%	95.72%
60	1999	93,814	93,405	93,814	100.00%	99.56%	99.56%
61	2000	76,397	72,668	80,721	94.64%	90.02%	95.12%
62	2001	32,300	31,522	29,432	109.75%	107.10%	97.59%
63	2002	24,383	22,962	25,123	97.05%	91.40%	94.17%
64	2003	25,942	25,647	23,821	108.91%	107.67%	98.86%
65	2004	126,237	122,024	138,912	90.88%	87.84%	96.66%
66	2005	104,222	101,058	92,478	112.70%	109.28%	96.96%
67	2006	71,956	65,347	73,851	97.43%	88.48%	90.81%
68	2007	73,640	70,009	72,369	101.76%	96.74%	95.07%
69	2008	73,158	70,847	74,049	98.80%	95.68%	96.84%
70	2009	22,434	21,163	20,324	110.38%	104.13%	94.34%
71	2010	150,046	141,857	151,255	99.20%	93.79%	94.54%
72	2011	7,250	7,025	5,903	122.82%	119.01%	96.90%
73	2012	3,639	3,451	3,367	108.06%	102.49%	94.84%
74	2013	18,141	16,892	18,390	98.64%	91.85%	93.12%
75	2014	27,132	25,594	28,883	93.94%	88.61%	94.33%
76	2015	110,064	107,946	110,766	99.37%	97.45%	98.08%
	Mean	101,747	94,382	99,894	101.86%	94.48%	92.76%

Annual Flow Volume of Brazos River near Seymour (BRSE11)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	183,336	179,345	183,350	99.99%	97.82%	97.82%
2	1941	1,292,906	1,245,142	1,292,925	100.00%	96.30%	96.31%
3	1942	259,827	252,759	259,815	100.00%	97.28%	97.28%
4	1943	93,889	90,718	93,899	99.99%	96.61%	96.62%
5	1944	76,357	75,879	76,348	100.01%	99.39%	99.37%
6	1945	147,176	139,266	147,186	99.99%	94.62%	94.63%
7	1946	255,090	243,304	255,115	99.99%	95.37%	95.38%
8	1947	359,394	331,672	359,405	100.00%	92.28%	92.29%
9	1948	172,620	170,952	172,598	100.01%	99.05%	99.03%
10	1949	268,247	267,018	268,315	99.97%	99.52%	99.54%
11	1950	327,327	315,660	327,393	99.98%	96.42%	96.44%
12	1951	110,317	109,558	110,366	99.96%	99.27%	99.31%
13	1952	35,029	34,901	35,072	99.88%	99.51%	99.64%
14	1953	231,042	229,792	231,120	99.97%	99.43%	99.46%
15	1954	274,525	272,825	274,558	99.99%	99.37%	99.38%
16	1955	785,695	777,279	785,771	99.99%	98.92%	98.93%
17	1956	39,405	39,252	39,521	99.71%	99.32%	99.61%
18	1957	595,635	547,705	595,741	99.98%	91.94%	91.95%
19	1958	132,235	123,234	131,313	100.70%	93.85%	93.19%
20	1959	293,926	286,805	290,582	101.15%	98.70%	97.58%
21	1960	421,341	419,162	417,449	100.93%	100.41%	99.48%
22	1961	321,140	298,425	319,143	100.63%	93.51%	92.93%
23	1962	247,064	241,519	244,634	100.99%	98.73%	97.76%
24	1963	191,853	189,923	189,470	101.26%	100.24%	98.99%
25	1964	59,675	59,166	56,656	105.33%	104.43%	99.15%
26	1965	206,160	205,144	199,967	103.10%	102.59%	99.51%
27	1966	314,657	312,283	303,945	103.52%	102.74%	99.25%
28	1967	253,701	252,655	247,308	102.59%	102.16%	99.59%
29	1968	177,732	164,624	170,202	104.42%	96.72%	92.62%
30	1969	243,374	225,567	235,478	103.35%	95.79%	92.68%
31	1970	57,841	52,603	53,774	107.56%	97.82%	90.94%
32	1971	299,167	295,463	290,199	103.09%	101.81%	98.76%
33	1972	403,511	402,552	394,466	102.29%	102.05%	99.76%
34	1973	150,710	147,967	145,519	103.57%	101.68%	98.18%
35	1974	134,610	132,217	123,322	109.15%	107.21%	98.22%
36	1975	190,820	186,753	183,568	103.95%	101.74%	97.87%
37	1976	111,499	110,079	104,880	106.31%	104.96%	98.73%
38	1977	110,327	105,889	103,853	106.23%	101.96%	95.98%
39	1978	138,543	137,652	133,624	103.68%	103.01%	99.36%
40	1979	122,901	119,700	108,267	113.52%	110.56%	97.40%
41	1980	254,279	252,662	248,444	102.35%	101.70%	99.36%
42	1981	155,973	153,977	148,532	105.01%	103.67%	98.72%
43	1982	383,259	367,263	373,248	102.68%	98.40%	95.83%
44	1983	267,666	265,649	259,467	103.16%	102.38%	99.25%
45	1984	69,592	69,104	67,115	103.69%	102.96%	99.30%
46	1985	306,262	296,828	297,725	102.87%	99.70%	96.92%
47	1986	416,626	397,405	409,501	101.74%	97.05%	95.39%
48	1987	355,175	337,550	351,816	100.95%	95.95%	95.04%
49	1988	77,398	76,965	75,270	102.83%	102.25%	99.44%
50	1989	158,979	153,592	151,778	104.74%	101.19%	96.61%
51	1990	400,377	383,257	398,095	100.57%	96.27%	95.72%

52	1991	392,690	386,857	386,247	101.67%	100.16%	98.51%
53	1992	464,466	430,894	459,066	101.18%	93.86%	92.77%
54	1993	90,251	85,775	86,851	103.91%	98.76%	95.04%
55	1994	90,556	88,501	83,333	108.67%	106.20%	97.73%
56	1995	194,281	189,332	184,038	105.57%	102.88%	97.45%
57	1996	137,578	133,613	129,324	106.38%	103.32%	97.12%
58	1997	199,567	187,669	183,469	108.77%	102.29%	94.04%
59	1998	37,692	37,404	37,058	101.71%	100.93%	99.24%
60	1999	188,950	187,878	189,118	99.91%	99.34%	99.43%
61	2000	144,896	141,770	148,423	97.62%	95.52%	97.84%
62	2001	101,727	100,575	100,638	101.08%	99.94%	98.87%
63	2002	104,863	103,488	108,737	96.44%	95.17%	98.69%
64	2003	68,742	67,868	62,300	110.34%	108.94%	98.73%
65	2004	319,416	309,155	347,153	92.01%	89.05%	96.79%
66	2005	260,325	256,930	234,996	110.78%	109.33%	98.70%
67	2006	162,096	156,398	166,376	97.43%	94.00%	96.48%
68	2007	202,261	197,548	199,442	101.41%	99.05%	97.67%
69	2008	95,124	92,815	94,779	100.36%	97.93%	97.57%
70	2009	45,403	44,398	42,950	105.71%	103.37%	97.79%
71	2010	327,175	315,271	329,367	99.33%	95.72%	96.36%
72	2011	14,542	14,412	11,579	125.58%	124.46%	99.11%
73	2012	25,946	25,647	25,459	101.91%	100.74%	98.85%
74	2013	38,411	37,535	38,549	99.64%	97.37%	97.72%
75	2014	52,437	50,201	55,216	94.97%	90.92%	95.73%
76	2015	216,713	213,857	224,869	96.37%	95.10%	98.68%
	Mean	236,714	229,534	232,995	101.60%	98.51%	96.97%

Annual Flow Volume of Clear Fork of Brazos River near Nugent (CFNU16)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	112,114	64,313	62,489	179.41%	102.92%	57.36%
2	1941	281,841	203,957	214,786	131.22%	94.96%	72.37%
3	1942	98,680	40,673	76,033	129.79%	53.49%	41.22%
4	1943	33,966	16,454	28,534	119.04%	57.67%	48.44%
5	1944	74,836	43,663	48,044	155.77%	90.88%	58.35%
6	1945	122,600	37,330	92,655	132.32%	40.29%	30.45%
7	1946	61,293	29,087	34,778	176.24%	83.64%	47.46%
8	1947	83,211	35,212	57,357	145.08%	61.39%	42.32%
9	1948	48,414	26,543	34,646	139.74%	76.61%	54.83%
10	1949	58,772	27,343	34,190	171.90%	79.97%	46.52%
11	1950	71,438	36,975	42,656	167.47%	86.68%	51.76%
12	1951	65,791	31,868	32,566	202.02%	97.85%	48.44%
13	1952	21,921	18,634	7,168	305.81%	259.95%	85.01%
14	1953	53,989	35,900	10,044	537.53%	357.43%	66.50%
15	1954	47,436	27,577	16,002	296.44%	172.33%	58.14%
16	1955	124,366	71,384	60,013	207.23%	118.95%	57.40%
17	1956	27,468	16,709	13,256	207.21%	126.05%	60.83%
18	1957	553,639	420,972	483,635	114.47%	87.04%	76.04%
19	1958	31,091	17,489	18,974	163.86%	92.17%	56.25%
20	1959	83,323	41,273	57,539	144.81%	71.73%	49.53%
21	1960	32,961	20,371	14,861	221.79%	137.07%	61.80%
22	1961	139,065	46,762	91,542	151.91%	51.08%	33.63%

23	1962	102,156	28,845	76,316	133.86%	37.80%	28.24%
24	1963	41,747	17,069	23,067	180.98%	74.00%	40.89%
25	1964	26,896	17,652	6,698	401.53%	263.53%	65.63%
26	1965	128,598	69,083	71,302	180.36%	96.89%	53.72%
27	1966	89,132	30,910	51,626	172.65%	59.87%	34.68%
28	1967	40,056	27,585	16,776	238.76%	164.43%	68.87%
29	1968	83,775	24,372	37,700	222.21%	64.65%	29.09%
30	1969	123,505	46,725	79,415	155.52%	58.84%	37.83%
31	1970	42,726	19,838	19,544	218.62%	101.51%	46.43%
32	1971	153,242	88,482	91,880	166.79%	96.30%	57.74%
33	1972	52,396	27,453	32,196	162.74%	85.27%	52.40%
34	1973	45,486	21,853	32,705	139.08%	66.82%	48.04%
35	1974	192,835	84,735	118,302	163.00%	71.63%	43.94%
36	1975	86,214	46,630	61,728	139.67%	75.54%	54.09%
37	1976	62,045	32,576	27,970	221.83%	116.47%	52.50%
38	1977	43,244	17,170	27,149	159.29%	63.24%	39.70%
39	1978	47,184	16,466	18,110	260.54%	90.92%	34.90%
40	1979	51,102	22,252	19,905	256.73%	111.79%	43.54%
41	1980	113,253	63,944	70,184	161.37%	91.11%	56.46%
42	1981	168,268	60,390	84,024	200.26%	71.87%	35.89%
43	1982	115,333	75,776	86,785	132.90%	87.31%	65.70%
44	1983	39,158	21,704	20,364	192.29%	106.58%	55.43%
45	1984	26,125	15,646	13,301	196.42%	117.63%	59.89%
46	1985	76,688	42,184	25,257	303.64%	167.02%	55.01%
47	1986	221,305	113,957	151,464	146.11%	75.24%	51.49%
48	1987	149,118	99,911	123,602	120.64%	80.83%	67.00%
49	1988	40,797	26,553	24,578	165.99%	108.03%	65.09%
50	1989	57,269	17,802	15,984	358.30%	111.38%	31.09%
51	1990	145,027	52,831	74,087	195.75%	71.31%	36.43%
52	1991	189,827	110,967	135,166	140.44%	82.10%	58.46%
53	1992	212,605	160,288	186,948	113.72%	85.74%	75.39%
54	1993	39,866	17,095	27,451	145.23%	62.27%	42.88%
55	1994	86,373	27,481	35,217	245.26%	78.04%	31.82%
56	1995	78,956	28,386	36,201	218.11%	78.41%	35.95%
57	1996	56,016	32,234	17,237	324.97%	187.00%	57.54%
58	1997	92,178	32,788	51,290	179.72%	63.93%	35.57%
59	1998	17,753	11,781	3,467	512.06%	339.81%	66.36%
60	1999	27,383	17,121	6,122	447.28%	279.66%	62.53%
61	2000	52,738	34,755	22,477	234.63%	154.62%	65.90%
62	2001	54,956	35,927	11,136	493.48%	322.61%	65.37%
63	2002	61,412	44,092	13,352	459.93%	330.22%	71.80%
64	2003	30,891	26,076	7,834	394.34%	332.88%	84.41%
65	2004	192,205	100,861	12,724	1510.53%	792.66%	52.48%
66	2005	104,896	59,719	11,087	946.16%	538.67%	56.93%
67	2006	34,935	25,266	13,956	250.33%	181.04%	72.32%
68	2007	188,239	100,139	102,796	183.12%	97.42%	53.20%
69	2008	25,485	16,062	21,092	120.83%	76.15%	63.03%
70	2009	58,858	44,943	8,234	714.78%	545.80%	76.36%
71	2010	79,825	43,543	26,275	303.81%	165.72%	54.55%
72	2011	7,937	6,528	3,930	201.96%	166.10%	82.24%
73	2012	58,488	47,528	2,991	1955.60%	1589.14%	81.26%
74	2013	35,246	27,895	3,281	1074.29%	850.22%	79.14%
75	2014	51,792	37,758	1,477	3505.55%	2555.64%	72.90%
76	2015	247,532	151,186	17,940	1379.77%	842.73%	61.08%
	Mean	92,855	50,086	54,827	169.36%	91.35%	53.94%

Annual Flow Volume of Clear Fork of Brazos River near Fort Griffin (CFFG18)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	201,814	154,867	173,517	116.31%	89.25%	76.74%
2	1941	731,389	658,622	693,306	105.49%	95.00%	90.05%
3	1942	143,472	89,981	130,507	109.93%	68.95%	62.72%
4	1943	45,808	29,961	42,148	108.68%	71.08%	65.40%
5	1944	83,927	65,184	68,650	122.25%	94.95%	77.67%
6	1945	176,478	103,137	159,460	110.67%	64.68%	58.44%
7	1946	110,869	70,817	95,718	115.83%	73.99%	63.87%
8	1947	166,824	110,048	151,999	109.75%	72.40%	65.97%
9	1948	76,442	61,457	68,408	111.74%	89.84%	80.40%
10	1949	89,806	57,107	75,672	118.68%	75.47%	63.59%
11	1950	101,435	68,845	84,959	119.39%	81.03%	67.87%
12	1951	84,147	60,983	64,070	131.34%	95.18%	72.47%
13	1952	14,818	12,048	6,372	232.57%	189.09%	81.30%
14	1953	161,386	125,799	120,511	133.92%	104.39%	77.95%
15	1954	94,921	79,179	59,702	158.99%	132.62%	83.42%
16	1955	214,118	175,098	168,506	127.07%	103.91%	81.78%
17	1956	14,947	11,590	9,728	153.65%	119.14%	77.54%
18	1957	922,276	790,245	862,053	106.99%	91.67%	85.68%
19	1958	82,357	65,831	71,404	115.34%	92.20%	79.93%
20	1959	109,597	80,301	98,741	110.99%	81.32%	73.27%
21	1960	86,213	66,455	68,013	126.76%	97.71%	77.08%
22	1961	248,088	163,549	217,821	113.90%	75.08%	65.92%
23	1962	285,752	219,951	271,366	105.30%	81.05%	76.97%
24	1963	74,168	48,768	65,652	112.97%	74.28%	65.75%
25	1964	20,716	15,412	10,764	192.46%	143.18%	74.40%
26	1965	148,166	111,984	119,790	123.69%	93.48%	75.58%
27	1966	147,329	85,725	109,295	134.80%	78.43%	58.19%
28	1967	27,842	19,729	22,175	125.55%	88.97%	70.86%
29	1968	126,439	68,217	98,424	128.46%	69.31%	53.95%
30	1969	207,669	129,115	175,346	118.43%	73.63%	62.17%
31	1970	44,799	26,891	38,573	116.14%	69.71%	60.03%
32	1971	277,455	219,052	232,009	119.59%	94.41%	78.95%
33	1972	93,716	78,908	86,063	108.89%	91.69%	84.20%
34	1973	90,404	60,162	88,670	101.96%	67.85%	66.55%
35	1974	233,546	152,699	196,975	118.57%	77.52%	65.38%
36	1975	123,987	82,334	107,351	115.50%	76.70%	66.41%
37	1976	79,620	59,147	62,405	127.59%	94.78%	74.29%
38	1977	52,957	30,345	50,150	105.60%	60.51%	57.30%
39	1978	439,287	386,811	400,365	109.72%	96.61%	88.05%
40	1979	85,816	66,469	67,667	126.82%	98.23%	77.46%
41	1980	289,853	228,604	254,837	113.74%	89.71%	78.87%
42	1981	201,150	118,885	160,112	125.63%	74.25%	59.10%
43	1982	304,737	268,965	286,762	106.27%	93.79%	88.26%
44	1983	54,164	41,071	47,751	113.43%	86.01%	75.83%
45	1984	32,111	24,082	29,643	108.33%	81.24%	75.00%
46	1985	176,157	138,770	140,676	125.22%	98.64%	78.78%
47	1986	324,275	224,104	281,419	115.23%	79.63%	69.11%
48	1987	263,448	225,146	259,085	101.68%	86.90%	85.46%
49	1988	61,817	52,701	49,182	125.69%	107.16%	85.25%
50	1989	64,928	36,052	45,096	143.98%	79.94%	55.53%
51	1990	341,641	244,789	291,783	117.09%	83.89%	71.65%

52	1991	399,540	329,339	356,309	112.13%	92.43%	82.43%
53	1992	592,624	548,211	579,116	102.33%	94.66%	92.51%
54	1993	82,760	56,004	79,388	104.25%	70.55%	67.67%
55	1994	132,784	87,125	101,808	130.43%	85.58%	65.61%
56	1995	105,180	64,964	87,666	119.98%	74.10%	61.76%
57	1996	54,981	38,963	41,215	133.40%	94.54%	70.87%
58	1997	145,523	88,960	120,464	120.80%	73.85%	61.13%
59	1998	23,501	20,069	20,772	113.14%	96.62%	85.40%
60	1999	29,765	22,531	29,317	101.53%	76.85%	75.70%
61	2000	38,527	26,181	39,450	97.66%	66.37%	67.96%
62	2001	43,205	30,751	43,691	98.89%	70.38%	71.17%
63	2002	85,871	72,978	85,879	99.99%	84.98%	84.99%
64	2003	48,955	45,697	47,213	103.69%	96.79%	93.35%
65	2004	85,350	23,412	91,375	93.41%	25.62%	27.43%
66	2005	204,132	169,734	199,063	102.55%	85.27%	83.15%
67	2006	28,095	23,896	27,365	102.67%	87.33%	85.06%
68	2007	284,819	202,416	288,030	98.89%	70.28%	71.07%
69	2008	71,087	63,632	68,269	104.13%	93.21%	89.51%
70	2009	27,176	18,423	27,267	99.67%	67.56%	67.79%
71	2010	119,272	86,514	120,718	98.80%	71.67%	72.54%
72	2011	8,699	8,129	6,946	125.23%	117.03%	93.45%
73	2012	4,752	9	4,474	106.21%	0.20%	0.19%
74	2013	13,089	7,022	13,691	95.60%	51.29%	53.65%
75	2014	11,106	2,158	11,044	100.56%	19.54%	19.43%
76	2015	178,530	100,917	206,274	86.55%	48.92%	56.53%
	Mean	162,069	123,783	143,805	112.70%	86.08%	76.38%

Annual Flow Volume of Brazos River near South Bend (BRSE23)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	700,385	606,266	682,208	102.66%	88.87%	86.56%
2	1941	3,225,217	3,009,682	3,196,803	100.89%	94.15%	93.32%
3	1942	1,004,432	861,988	996,195	100.83%	86.53%	85.82%
4	1943	176,421	153,436	174,703	100.98%	87.83%	86.97%
5	1944	244,200	229,761	234,349	104.20%	98.04%	94.09%
6	1945	414,201	337,378	402,496	102.91%	83.82%	81.45%
7	1946	497,419	420,634	487,523	102.03%	86.28%	84.56%
8	1947	630,217	543,349	620,064	101.64%	87.63%	86.22%
9	1948	359,094	346,550	349,548	102.73%	99.14%	96.51%
10	1949	553,968	502,792	537,976	102.97%	93.46%	90.76%
11	1950	669,396	577,757	656,035	102.04%	88.07%	86.31%
12	1951	280,419	263,846	265,805	105.50%	99.26%	94.09%
13	1952	54,510	51,246	48,980	111.29%	104.63%	94.01%
14	1953	683,302	654,834	651,950	104.81%	100.44%	95.83%
15	1954	561,705	547,707	535,628	104.87%	102.26%	97.51%
16	1955	1,250,342	1,215,705	1,213,532	103.03%	100.18%	97.23%
17	1956	84,143	80,267	80,643	104.34%	99.53%	95.39%
18	1957	2,688,087	2,356,549	2,637,991	101.90%	89.33%	87.67%
19	1958	413,493	347,330	403,960	102.36%	85.98%	84.00%
20	1959	541,296	498,036	529,123	102.30%	94.12%	92.01%
21	1960	607,488	577,516	590,479	102.88%	97.80%	95.07%
22	1961	819,798	675,684	796,084	102.98%	84.88%	82.42%

23	1962	840,653	752,263	818,711	102.68%	91.88%	89.49%
24	1963	446,413	409,441	424,173	105.24%	96.53%	91.72%
25	1964	173,047	166,483	128,539	134.63%	129.52%	96.21%
26	1965	506,814	479,447	411,032	123.30%	116.64%	94.60%
27	1966	853,300	770,681	747,074	114.22%	103.16%	90.32%
28	1967	401,046	391,996	361,501	110.94%	108.44%	97.74%
29	1968	607,326	465,828	489,656	124.03%	95.13%	76.70%
30	1969	807,922	659,443	729,750	110.71%	90.37%	81.62%
31	1970	215,978	180,848	201,704	107.08%	89.66%	83.73%
32	1971	738,316	696,300	679,405	108.67%	102.49%	94.31%
33	1972	612,343	600,310	586,368	104.43%	102.38%	98.03%
34	1973	302,343	262,905	271,329	111.43%	96.90%	86.96%
35	1974	650,468	529,598	471,448	137.97%	112.33%	81.42%
36	1975	401,311	338,030	376,602	106.56%	89.76%	84.23%
37	1976	285,631	265,528	252,071	113.31%	105.34%	92.96%
38	1977	208,326	180,040	178,452	116.74%	100.89%	86.42%
39	1978	832,206	793,015	679,137	122.54%	116.77%	95.29%
40	1979	293,278	277,309	233,617	125.54%	118.70%	94.56%
41	1980	645,429	600,391	580,861	111.12%	103.36%	93.02%
42	1981	881,337	644,037	767,974	114.76%	83.86%	73.07%
43	1982	1,143,793	1,031,064	1,108,877	103.15%	92.98%	90.14%
44	1983	318,315	305,321	304,016	104.70%	100.43%	95.92%
45	1984	188,209	180,249	139,899	134.53%	128.84%	95.77%
46	1985	691,134	621,072	603,435	114.53%	102.92%	89.86%
47	1986	845,369	717,442	753,876	112.14%	95.17%	84.87%
48	1987	775,494	684,403	692,212	112.03%	98.87%	88.25%
49	1988	153,680	146,558	131,962	116.46%	111.06%	95.37%
50	1989	395,677	355,210	335,937	117.78%	105.74%	89.77%
51	1990	1,394,808	1,185,861	1,266,484	110.13%	93.63%	85.02%
52	1991	1,213,922	1,042,795	1,108,711	109.49%	94.05%	85.90%
53	1992	1,772,830	1,565,869	1,735,148	102.17%	90.24%	88.33%
54	1993	273,196	239,911	252,008	108.41%	95.20%	87.82%
55	1994	337,311	286,417	264,164	127.69%	108.42%	84.91%
56	1995	351,799	306,571	295,878	118.90%	103.61%	87.14%
57	1996	379,108	354,283	266,026	142.51%	133.18%	93.45%
58	1997	665,405	511,063	611,871	108.75%	83.52%	76.80%
59	1998	127,937	123,483	126,595	101.06%	97.54%	96.52%
60	1999	202,705	191,482	201,586	100.56%	94.99%	94.46%
61	2000	164,593	150,956	173,395	94.92%	87.06%	91.71%
62	2001	273,985	260,096	268,614	102.00%	96.83%	94.93%
63	2002	230,720	203,349	237,218	97.26%	85.72%	88.14%
64	2003	127,647	118,656	117,396	108.73%	101.07%	92.96%
65	2004	657,065	519,029	707,786	92.83%	73.33%	78.99%
66	2005	666,940	624,282	622,614	107.12%	100.27%	93.60%
67	2006	221,933	211,286	223,109	99.47%	94.70%	95.20%
68	2007	913,644	731,522	914,826	99.87%	79.96%	80.07%
69	2008	209,648	200,345	205,919	101.81%	97.29%	95.56%
70	2009	88,547	80,501	84,911	104.28%	94.81%	90.91%
71	2010	597,360	553,583	602,751	99.11%	91.84%	92.67%
72	2011	41,212	38,329	35,052	117.58%	109.35%	93.00%
73	2012	45,994	39,820	45,313	101.50%	87.88%	86.58%
74	2013	70,405	64,151	70,589	99.74%	90.88%	91.12%
75	2014	54,106	45,913	58,234	92.91%	78.84%	84.86%
76	2015	691,704	596,738	754,588	91.67%	79.08%	86.27%
	Mean	612,503	543,977	572,722	106.95%	94.98%	88.81%

Annual Flow Volume of Brazos River near Palo Pinto (BRPP27)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	924,759	663,885	903,243	102.38%	73.50%	71.79%
2	1941	3,578,071	3,231,884	2,853,822	125.38%	113.25%	90.32%
3	1942	1,407,511	1,067,406	1,292,303	108.91%	82.60%	75.84%
4	1943	222,465	176,403	461,740	48.18%	38.20%	79.29%
5	1944	348,470	109,081	177,455	196.37%	61.47%	31.30%
6	1945	589,664	285,055	355,511	165.86%	80.18%	48.34%
7	1946	706,611	432,323	632,118	111.78%	68.39%	61.18%
8	1947	688,178	506,827	718,532	95.78%	70.54%	73.65%
9	1948	375,391	275,455	321,053	116.93%	85.80%	73.38%
10	1949	748,191	412,799	635,078	117.81%	65.00%	55.17%
11	1950	761,197	532,981	623,135	122.16%	85.53%	70.02%
12	1951	352,748	305,852	390,254	90.39%	78.37%	86.71%
13	1952	74,490	177,828	179,076	41.60%	99.30%	238.73%
14	1953	758,855	529,347	280,817	270.23%	188.50%	69.76%
15	1954	595,869	408,156	644,862	92.40%	63.29%	68.50%
16	1955	1,432,181	975,540	1,188,323	120.52%	82.09%	68.12%
17	1956	126,535	233,230	350,826	36.07%	66.48%	184.32%
18	1957	3,561,394	2,771,765	3,237,437	110.01%	85.62%	77.83%
19	1958	662,255	485,579	697,625	94.93%	69.60%	73.32%
20	1959	635,713	453,294	472,151	134.64%	96.01%	71.30%
21	1960	675,083	508,187	625,267	107.97%	81.28%	75.28%
22	1961	823,868	569,734	791,667	104.07%	71.97%	69.15%
23	1962	1,025,894	799,628	907,041	113.10%	88.16%	77.94%
24	1963	502,218	449,020	489,388	102.62%	91.75%	89.41%
25	1964	250,145	234,643	181,220	138.03%	129.48%	93.80%
26	1965	652,511	286,994	398,773	163.63%	71.97%	43.98%
27	1966	1,084,587	827,281	932,180	116.35%	88.75%	76.28%
28	1967	451,468	339,132	351,372	128.49%	96.52%	75.12%
29	1968	832,856	561,611	713,810	116.68%	78.68%	67.43%
30	1969	1,012,152	670,969	991,999	102.03%	67.64%	66.29%
31	1970	336,709	261,049	297,191	113.30%	87.84%	77.53%
32	1971	706,652	506,819	343,506	205.72%	147.54%	71.72%
33	1972	652,375	422,344	585,189	111.48%	72.17%	64.74%
34	1973	403,458	260,289	395,264	102.07%	65.85%	64.51%
35	1974	767,260	466,375	462,836	165.77%	100.76%	60.78%
36	1975	571,228	372,568	510,599	111.87%	72.97%	65.22%
37	1976	382,278	199,719	300,843	127.07%	66.39%	52.24%
38	1977	329,731	275,664	286,197	115.21%	96.32%	83.60%
39	1978	837,076	712,700	574,315	145.75%	124.10%	85.14%
40	1979	354,779	94,362	281,566	126.00%	33.51%	26.60%
41	1980	760,118	508,202	566,646	134.14%	89.69%	66.86%
42	1981	1,246,631	829,100	1,103,155	113.01%	75.16%	66.51%
43	1982	1,402,274	1,222,046	1,354,199	103.55%	90.24%	87.15%
44	1983	314,299	164,748	252,672	124.39%	65.20%	52.42%
45	1984	280,430	213,523	113,292	247.53%	188.47%	76.14%
46	1985	694,923	385,717	569,772	121.97%	67.70%	55.51%
47	1986	1,008,130	694,751	839,984	120.02%	82.71%	68.91%
48	1987	983,939	783,274	1,028,949	95.63%	76.12%	79.61%
49	1988	177,665	191,912	66,966	265.31%	286.58%	108.02%
50	1989	648,857	318,096	441,900	146.83%	71.98%	49.02%
51	1990	1,802,479	1,411,179	1,600,796	112.60%	88.15%	78.29%

52	1991	1,663,466	1,316,216	1,471,448	113.05%	89.45%	79.12%
53	1992	1,890,662	1,552,188	1,836,520	102.95%	84.52%	82.10%
54	1993	376,751	262,476	316,631	118.99%	82.90%	69.67%
55	1994	528,442	277,370	324,609	162.79%	85.45%	52.49%
56	1995	476,931	337,899	401,492	118.79%	84.16%	70.85%
57	1996	628,894	444,207	422,418	148.88%	105.16%	70.63%
58	1997	914,283	632,613	867,535	105.39%	72.92%	69.19%
59	1998	166,107	148,645	246,014	67.52%	60.42%	89.49%
60	1999	568,355	401,181	143,120	397.12%	280.31%	70.59%
61	2000	553,291	375,888	86,912	636.61%	432.49%	67.94%
62	2001	392,478	185,526	378,569	103.67%	49.01%	47.27%
63	2002	518,903	288,650	208,883	248.42%	138.19%	55.63%
64	2003	327,896	275,200	143,250	228.90%	192.11%	83.93%
65	2004	1,953,648	1,501,504	470,813	414.95%	318.92%	76.86%
66	2005	675,847	540,795	579,648	116.60%	93.30%	80.02%
67	2006	541,219	468,358	162,411	333.24%	288.38%	86.54%
68	2007	1,402,223	949,966	1,247,829	112.37%	76.13%	67.75%
69	2008	479,303	367,918	233,764	205.04%	157.39%	76.76%
70	2009	401,878	283,287	90,438	444.37%	313.24%	70.49%
71	2010	1,395,906	1,134,871	683,324	204.28%	166.08%	81.30%
72	2011	88,701	162,609	121,619	72.93%	133.70%	183.32%
73	2012	205,416	54,581	92,793	221.37%	58.82%	26.57%
74	2013	226,551	145,244	55,293	409.73%	262.68%	64.11%
75	2014	583,195	373,037	28,255	2064.08%	1320.27%	63.96%
76	2015	2,160,432	1,659,027	868,070	248.88%	191.12%	76.79%
	Mean	795,618	581,397	648,265	122.73%	89.69%	73.07%

Annual Flow Volume of Brazos River near Glen Rose (BRGR30)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	1,274,237	879,783	1,252,076	101.77%	70.27%	69.04%
2	1941	4,081,798	3,599,575	3,385,053	120.58%	106.34%	88.19%
3	1942	2,409,301	1,924,833	2,295,301	104.97%	83.86%	79.89%
4	1943	325,330	218,240	554,680	58.65%	39.35%	67.08%
5	1944	610,594	294,264	445,202	137.15%	66.10%	48.19%
6	1945	1,130,201	578,924	903,931	125.03%	64.05%	51.22%
7	1946	1,082,555	640,561	1,009,295	107.26%	63.47%	59.17%
8	1947	799,397	551,235	824,527	96.95%	66.85%	68.96%
9	1948	511,212	371,767	456,954	111.87%	81.36%	72.72%
10	1949	1,233,156	876,828	1,121,847	109.92%	78.16%	71.10%
11	1950	1,048,057	694,055	913,305	114.75%	75.99%	66.22%
12	1951	426,573	365,996	453,870	93.99%	80.64%	85.80%
13	1952	140,143	229,924	240,551	58.26%	95.58%	164.06%
14	1953	822,572	588,572	350,327	234.80%	168.01%	71.55%
15	1954	654,125	466,573	697,940	93.72%	66.85%	71.33%
16	1955	1,553,236	1,071,874	1,324,201	117.30%	80.94%	69.01%
17	1956	248,524	324,634	463,067	53.67%	70.11%	130.62%
18	1957	4,643,132	3,579,679	4,323,348	107.40%	82.80%	77.10%
19	1958	1,097,445	866,305	1,131,721	96.97%	76.55%	78.94%
20	1959	987,330	619,008	827,345	119.34%	74.82%	62.70%
21	1960	762,984	541,451	715,141	106.69%	75.71%	70.96%
22	1961	945,994	513,256	914,013	103.50%	56.15%	54.26%

23	1962	1,413,653	1,078,650	1,296,912	109.00%	83.17%	76.30%
24	1963	608,885	537,874	596,533	102.07%	90.17%	88.34%
25	1964	396,447	337,045	285,687	138.77%	117.98%	85.02%
26	1965	918,034	454,453	662,592	138.55%	68.59%	49.50%
27	1966	1,563,733	1,210,129	1,392,655	112.28%	86.89%	77.39%
28	1967	548,869	425,172	441,233	124.39%	96.36%	77.46%
29	1968	1,359,286	815,422	1,240,673	109.56%	65.72%	59.99%
30	1969	1,469,825	1,029,509	1,283,070	114.56%	80.24%	70.04%
31	1970	613,916	419,752	549,974	111.63%	76.32%	68.37%
32	1971	875,916	601,558	472,332	185.44%	127.36%	68.68%
33	1972	748,389	516,835	650,938	114.97%	79.40%	69.06%
34	1973	760,381	373,646	722,906	105.18%	51.69%	49.14%
35	1974	1,048,169	613,958	707,579	148.13%	86.77%	58.57%
36	1975	891,337	601,660	809,534	110.10%	74.32%	67.50%
37	1976	564,485	323,931	450,958	125.17%	71.83%	57.39%
38	1977	570,271	348,562	456,165	125.01%	76.41%	61.12%
39	1978	868,466	733,738	514,062	168.94%	142.73%	84.49%
40	1979	686,723	287,291	552,258	124.35%	52.02%	41.84%
41	1980	740,715	481,593	501,759	147.62%	95.98%	65.02%
42	1981	1,800,646	1,298,592	1,608,313	111.96%	80.74%	72.12%
43	1982	2,020,646	1,608,654	1,951,234	103.56%	82.44%	79.61%
44	1983	417,637	266,313	329,548	126.73%	80.81%	63.77%
45	1984	403,236	315,982	161,478	249.72%	195.68%	78.36%
46	1985	964,245	513,103	810,845	118.92%	63.28%	53.21%
47	1986	1,148,213	599,814	942,512	121.82%	63.64%	52.24%
48	1987	1,221,927	923,856	1,233,273	99.08%	74.91%	75.61%
49	1988	203,345	203,330	67,973	299.15%	299.13%	99.99%
50	1989	1,315,942	765,246	1,070,993	122.87%	71.45%	58.15%
51	1990	2,614,909	2,099,974	2,383,020	109.73%	88.12%	80.31%
52	1991	2,397,580	1,864,364	2,164,879	110.75%	86.12%	77.76%
53	1992	2,184,281	1,773,117	2,097,608	104.13%	84.53%	81.18%
54	1993	577,353	356,724	464,942	124.18%	76.72%	61.79%
55	1994	774,441	397,928	545,602	141.94%	72.93%	51.38%
56	1995	701,233	414,184	577,129	121.50%	71.77%	59.07%
57	1996	892,714	646,352	631,653	141.33%	102.33%	72.40%
58	1997	1,826,988	1,391,717	1,735,256	105.29%	80.20%	76.18%
59	1998	308,332	277,423	447,883	68.84%	61.94%	89.98%
60	1999	738,864	539,659	127,894	577.71%	421.96%	73.04%
61	2000	748,167	556,612	95,568	782.86%	582.43%	74.40%
62	2001	691,289	474,036	770,481	89.72%	61.52%	68.57%
63	2002	966,402	683,795	270,899	356.74%	252.42%	70.76%
64	2003	734,678	620,890	107,313	684.61%	578.58%	84.51%
65	2004	2,388,761	1,700,818	592,614	403.09%	287.00%	71.20%
66	2005	642,024	465,056	465,981	137.78%	99.80%	72.44%
67	2006	577,010	490,410	138,858	415.54%	353.17%	84.99%
68	2007	2,436,340	1,871,590	2,110,963	115.41%	88.66%	76.82%
69	2008	637,023	472,890	295,267	215.74%	160.16%	74.23%
70	2009	736,225	581,517	132,503	555.63%	438.87%	78.99%
71	2010	1,645,648	1,279,393	912,391	180.37%	140.22%	77.74%
72	2011	200,599	250,626	87,387	229.55%	286.80%	124.94%
73	2012	536,133	316,385	314,237	170.61%	100.68%	59.01%
74	2013	349,189	260,463	20,269	1722.76%	1285.03%	74.59%
75	2014	697,678	465,995	25,729	2711.68%	1811.20%	66.79%
76	2015	3,495,630	2,918,489	1,657,553	210.89%	176.07%	83.49%
	Mean	1,104,891	795,701	913,180	120.99%	87.14%	72.02%

Annual Flow Volume of North Fork of Bosque River near Clifton (NBCL36)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	129,065	120,000	129,709	99.50%	92.52%	92.98%
2	1941	502,378	492,370	503,048	99.87%	97.88%	98.01%
3	1942	438,965	425,842	439,611	99.85%	96.87%	97.01%
4	1943	54,477	49,078	55,119	98.84%	89.04%	90.09%
5	1944	141,327	131,266	142,106	99.45%	92.37%	92.88%
6	1945	390,717	377,757	391,384	99.83%	96.52%	96.68%
7	1946	159,611	150,231	160,352	99.54%	93.69%	94.12%
8	1947	62,568	54,772	63,333	98.79%	86.48%	87.54%
9	1948	96,708	92,952	97,493	99.19%	95.34%	96.12%
10	1949	84,735	80,577	85,553	99.04%	94.18%	95.09%
11	1950	65,029	61,251	65,874	98.72%	92.98%	94.19%
12	1951	15,526	12,867	16,190	95.90%	79.47%	82.87%
13	1952	65,676	62,285	66,323	99.02%	93.91%	94.84%
14	1953	26,005	22,413	26,931	96.56%	83.22%	86.19%
15	1954	10,843	7,654	11,544	93.93%	66.30%	70.59%
16	1955	52,286	48,894	52,942	98.76%	92.36%	93.51%
17	1956	55,116	52,653	55,628	99.08%	94.65%	95.53%
18	1957	458,613	444,014	459,434	99.82%	96.64%	96.82%
19	1958	198,125	192,321	199,140	99.49%	96.58%	97.07%
20	1959	136,436	127,381	137,458	99.26%	92.67%	93.36%
21	1960	119,577	113,068	120,619	99.14%	93.74%	94.56%
22	1961	295,890	282,539	296,959	99.64%	95.14%	95.49%
23	1962	57,228	52,629	58,192	98.34%	90.44%	91.96%
24	1963	25,253	21,879	25,943	97.34%	84.34%	86.64%
25	1964	95,052	91,256	95,913	99.10%	95.14%	96.01%
26	1965	212,993	201,432	213,618	99.71%	94.30%	94.57%
27	1966	116,250	106,356	116,895	99.45%	90.98%	91.49%
28	1967	18,409	14,916	18,994	96.92%	78.53%	81.03%
29	1968	407,985	394,971	408,700	99.83%	96.64%	96.81%
30	1969	146,788	138,867	146,892	99.93%	94.54%	94.60%
31	1970	193,141	184,060	192,980	100.08%	95.38%	95.30%
32	1971	158,546	151,285	157,961	100.37%	95.77%	95.42%
33	1972	59,345	53,688	58,001	102.32%	92.56%	90.47%
34	1973	143,308	131,727	143,148	100.11%	92.02%	91.92%
35	1974	53,534	46,234	53,657	99.77%	86.17%	86.36%
36	1975	123,002	116,261	122,815	100.15%	94.66%	94.52%
37	1976	51,100	44,426	51,069	100.06%	86.99%	86.94%
38	1977	285,554	275,919	284,804	100.26%	96.88%	96.63%
39	1978	9,732	7,720	9,859	98.71%	78.31%	79.33%
40	1979	137,492	127,084	137,885	99.72%	92.17%	92.43%
41	1980	21,911	17,680	22,133	99.00%	79.88%	80.69%
42	1981	50,264	45,169	50,830	98.89%	88.86%	89.86%
43	1982	84,510	74,490	85,117	99.29%	87.51%	88.14%
44	1983	9,419	6,898	10,010	94.10%	68.92%	73.24%
45	1984	16,452	12,391	17,175	95.79%	72.14%	75.31%
46	1985	40,667	35,813	41,333	98.39%	86.65%	88.06%
47	1986	150,791	137,842	151,686	99.41%	90.87%	91.41%
48	1987	190,888	183,736	191,509	99.68%	95.94%	96.25%
49	1988	61,533	57,196	62,246	98.85%	91.89%	92.95%
50	1989	262,687	250,002	263,902	99.54%	94.73%	95.17%
51	1990	269,821	262,633	271,018	99.56%	96.91%	97.34%

52	1991	594,831	584,244	596,394	99.74%	97.96%	98.22%
53	1992	480,272	474,049	482,047	99.63%	98.34%	98.70%
54	1993	137,077	128,325	138,268	99.14%	92.81%	93.62%
55	1994	234,248	222,338	235,285	99.56%	94.50%	94.92%
56	1995	373,459	363,530	374,660	99.68%	97.03%	97.34%
57	1996	107,324	101,562	108,450	98.96%	93.65%	94.63%
58	1997	508,791	498,390	510,280	99.71%	97.67%	97.96%
59	1998	258,779	249,684	235,473	109.90%	106.04%	96.49%
60	1999	41,506	37,041	15,137	274.20%	244.70%	89.24%
61	2000	186,719	178,691	39,706	470.25%	450.04%	95.70%
62	2001	198,519	190,799	162,576	122.11%	117.36%	96.11%
63	2002	124,542	116,647	116,251	107.13%	100.34%	93.66%
64	2003	62,743	56,587	64,907	96.67%	87.18%	90.19%
65	2004	456,466	444,853	342,982	133.09%	129.70%	97.46%
66	2005	37,230	32,979	142,632	26.10%	23.12%	88.58%
67	2006	24,248	20,533	16,432	147.56%	124.96%	84.68%
68	2007	654,916	642,240	649,058	100.90%	98.95%	98.06%
69	2008	31,943	26,154	62,754	50.90%	41.68%	81.88%
70	2009	319,848	309,546	102,236	312.85%	302.77%	96.78%
71	2010	121,076	114,758	244,044	49.61%	47.02%	94.78%
72	2011	32,261	27,359	15,549	207.48%	175.95%	84.80%
73	2012	203,169	195,568	136,919	148.39%	142.84%	96.26%
74	2013	127,219	121,744	5,913	2151.54%	2058.94%	95.70%
75	2014	54,627	50,636	11,178	488.69%	452.99%	92.69%
76	2015	668,686	654,577	485,855	137.63%	134.73%	97.89%
	Mean	169,044	161,606	165,758	101.98%	97.50%	95.60%

Annual Flow Volume of Brazos River at Waco (BRWA41)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	2,034,539	1,398,365	2,003,480	101.55%	69.80%	68.73%
2	1941	5,647,660	4,886,822	4,965,539	113.74%	98.41%	86.53%
3	1942	3,952,184	3,231,815	3,831,735	103.14%	84.34%	81.77%
4	1943	530,337	530,871	738,922	71.77%	71.84%	100.10%
5	1944	1,643,253	1,099,845	1,472,099	111.63%	74.71%	66.93%
6	1945	3,054,936	2,053,219	2,825,026	108.14%	72.68%	67.21%
7	1946	1,890,929	1,202,548	1,808,220	104.57%	66.50%	63.60%
8	1947	1,349,834	929,373	1,361,750	99.12%	68.25%	68.85%
9	1948	803,997	577,157	737,578	109.01%	78.25%	71.79%
10	1949	1,663,146	1,105,955	1,540,300	107.98%	71.80%	66.50%
11	1950	1,343,758	846,306	1,197,328	112.23%	70.68%	62.98%
12	1951	604,241	485,311	610,707	98.94%	79.47%	80.32%
13	1952	474,625	457,836	412,651	115.02%	110.95%	96.46%
14	1953	1,177,981	820,316	432,476	272.38%	189.68%	69.64%
15	1954	786,410	550,747	761,411	103.28%	72.33%	70.03%
16	1955	1,732,494	1,170,566	1,424,596	121.61%	82.17%	67.57%
17	1956	465,716	490,347	649,262	71.73%	75.52%	105.29%
18	1957	6,613,670	4,449,176	6,152,095	107.50%	72.32%	67.27%
19	1958	1,861,937	1,578,089	1,864,572	99.86%	84.64%	84.76%
20	1959	1,784,617	1,272,863	1,572,803	113.47%	80.93%	71.32%
21	1960	1,563,712	1,072,072	1,459,410	107.15%	73.46%	68.56%
22	1961	2,713,791	1,871,723	2,639,716	102.81%	70.91%	68.97%

23	1962	1,802,003	1,340,160	1,627,212	110.74%	82.36%	74.37%
24	1963	668,431	657,331	670,733	99.66%	98.00%	98.34%
25	1964	832,905	629,055	582,268	143.05%	108.04%	75.53%
26	1965	2,106,619	1,357,085	1,680,258	125.37%	80.77%	64.42%
27	1966	2,370,887	1,639,407	2,139,316	110.82%	76.63%	69.15%
28	1967	805,654	705,362	626,771	128.54%	112.54%	87.55%
29	1968	3,195,781	2,046,654	3,006,607	106.29%	68.07%	64.04%
30	1969	2,369,829	1,644,895	1,936,163	122.40%	84.96%	69.41%
31	1970	1,399,606	1,049,217	1,311,164	106.75%	80.02%	74.97%
32	1971	1,625,753	1,156,479	1,042,893	155.89%	110.89%	71.13%
33	1972	1,044,318	722,198	802,899	130.07%	89.95%	69.16%
34	1973	2,093,291	1,361,041	1,911,426	109.51%	71.21%	65.02%
35	1974	1,780,668	1,097,683	1,339,045	132.98%	81.98%	61.64%
36	1975	1,777,613	1,237,409	1,721,718	103.25%	71.87%	69.61%
37	1976	1,344,485	894,466	1,057,071	127.19%	84.62%	66.53%
38	1977	1,894,519	1,545,535	1,861,492	101.77%	83.03%	81.58%
39	1978	884,057	720,732	340,862	259.36%	211.44%	81.53%
40	1979	1,669,579	944,422	1,479,814	112.82%	63.82%	56.57%
41	1980	1,054,753	700,019	563,463	187.19%	124.24%	66.37%
42	1981	2,257,380	1,351,254	1,974,536	114.32%	68.43%	59.86%
43	1982	2,410,785	1,637,804	2,369,919	101.72%	69.11%	67.94%
44	1983	583,860	490,667	406,173	143.75%	120.80%	84.04%
45	1984	723,947	499,918	357,240	202.65%	139.94%	69.05%
46	1985	1,540,374	897,752	1,160,144	132.77%	77.38%	58.28%
47	1986	2,044,984	1,122,774	1,677,779	121.89%	66.92%	54.90%
48	1987	2,040,554	1,390,975	2,131,183	95.75%	65.27%	68.17%
49	1988	445,383	467,047	343,752	129.57%	135.87%	104.86%
50	1989	2,538,832	1,649,746	1,983,374	128.01%	83.18%	64.98%
51	1990	3,863,113	2,921,941	3,502,821	110.29%	83.42%	75.64%
52	1991	4,356,073	2,998,894	2,788,842	156.20%	107.53%	68.84%
53	1992	4,455,004	4,275,607	5,553,556	80.22%	76.99%	95.97%
54	1993	1,329,271	953,262	1,162,465	114.35%	82.00%	71.71%
55	1994	1,746,770	1,186,167	1,259,084	138.73%	94.21%	67.91%
56	1995	2,811,341	2,101,194	2,718,044	103.43%	77.31%	74.74%
57	1996	1,218,348	828,734	780,179	156.16%	106.22%	68.02%
58	1997	3,874,236	3,099,642	3,777,156	102.57%	82.06%	80.01%
59	1998	802,497	777,123	1,652,374	48.57%	47.03%	96.84%
60	1999	1,083,670	777,764	302,747	357.95%	256.90%	71.77%
61	2000	1,371,909	969,585	398,048	344.66%	243.58%	70.67%
62	2001	1,348,106	957,242	2,070,940	65.10%	46.22%	71.01%
63	2002	2,056,794	1,555,761	868,187	236.91%	179.20%	75.64%
64	2003	1,321,596	1,102,125	475,361	278.02%	231.85%	83.39%
65	2004	3,624,039	2,485,521	2,102,160	172.40%	118.24%	68.58%
66	2005	1,556,447	1,336,059	1,103,191	141.09%	121.11%	85.84%
67	2006	883,322	753,349	224,601	393.28%	335.42%	85.29%
68	2007	4,246,653	2,874,246	4,539,081	93.56%	63.32%	67.68%
69	2008	988,158	826,906	665,677	148.44%	124.22%	83.68%
70	2009	1,711,069	1,364,219	804,177	212.77%	169.64%	79.73%
71	2010	2,052,719	1,463,055	2,146,838	95.62%	68.15%	71.27%
72	2011	461,230	430,964	225,880	204.19%	190.79%	93.44%
73	2012	1,304,616	929,128	789,156	165.32%	117.74%	71.22%
74	2013	895,783	677,705	154,329	580.44%	439.13%	75.65%
75	2014	970,356	651,878	145,708	665.96%	447.39%	67.18%
76	2015	5,489,099	3,979,641	3,890,860	141.08%	102.28%	72.50%
	Mean	1,925,732	1,396,950	1,674,203	115.02%	83.44%	72.54%

Annual Flow Volume of Brazos River near Highbank (BRHB42)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	2,571,206	1,884,034	2,272,487	113.15%	82.91%	73.27%
2	1941	6,466,065	5,642,739	5,404,507	119.64%	104.41%	87.27%
3	1942	4,470,021	3,685,720	4,230,599	105.66%	87.12%	82.45%
4	1943	677,185	627,725	905,927	74.75%	69.29%	92.70%
5	1944	2,449,951	1,837,780	2,160,302	113.41%	85.07%	75.01%
6	1945	3,770,316	2,706,306	3,355,849	112.35%	80.64%	71.78%
7	1946	2,471,052	1,723,693	2,092,493	118.09%	82.38%	69.76%
8	1947	1,640,448	1,164,492	1,562,713	104.97%	74.52%	70.99%
9	1948	882,990	623,063	869,345	101.57%	71.67%	70.56%
10	1949	1,831,890	1,225,453	1,621,180	113.00%	75.59%	66.90%
11	1950	1,476,711	935,576	1,297,638	113.80%	72.10%	63.36%
12	1951	637,411	490,642				76.97%
13	1952	567,456	509,956				89.87%
14	1953	1,478,061	1,075,031				72.73%
15	1954	811,783	550,132				67.77%
16	1955	1,848,409	1,246,058				67.41%
17	1956	515,957	514,506				99.72%
18	1957	7,505,479	5,273,016				70.26%
19	1958	2,313,149	1,967,593				85.06%
20	1959	2,169,229	1,604,991				73.99%
21	1960	2,104,038	1,547,835				73.56%
22	1961	3,344,307	2,441,604				73.01%
23	1962	1,927,623	1,419,795				73.66%
24	1963	724,280	675,684				93.29%
25	1964	961,726	719,639				74.83%
26	1965	2,862,441	2,045,525				71.46%
27	1966	2,907,811	2,111,587				72.62%
28	1967	1,011,989	867,045				85.68%
29	1968	3,804,330	2,592,712				68.15%
30	1969	2,576,113	1,803,095				69.99%
31	1970	1,675,044	1,268,493				75.73%
32	1971	1,836,114	1,327,878				72.32%
33	1972	1,183,121	818,577				69.19%
34	1973	2,968,773	2,156,141				72.63%
35	1974	2,460,548	1,712,519				69.60%
36	1975	2,365,358	1,766,357				74.68%
37	1976	1,997,293	1,484,068				74.30%
38	1977	2,328,378	1,927,259				82.77%
39	1978	954,838	762,879				79.90%
40	1979	2,377,967	1,574,971				66.23%
41	1980	1,309,402	912,619				69.70%
42	1981	2,653,201	1,696,674				63.95%
43	1982	2,629,534	1,810,360				68.85%
44	1983	763,376	624,789				81.85%
45	1984	918,653	655,497				71.35%
46	1985	1,917,881	1,221,505				63.69%
47	1986	2,619,354	1,637,063				62.50%
48	1987	2,489,500	1,778,180				71.43%
49	1988	519,215	503,824				97.04%
50	1989	2,962,144	2,010,411				67.87%
51	1990	4,210,267	3,216,264				76.39%

52	1991	4,961,959	3,544,432				71.43%
53	1992	5,566,939	5,310,647				95.40%
54	1993	1,826,207	1,394,104				76.34%
55	1994	1,881,585	1,278,977				67.97%
56	1995	3,019,369	2,256,984				74.75%
57	1996	1,398,486	966,841				69.13%
58	1997	4,632,134	3,783,675				81.68%
59	1998	964,308	896,218				92.94%
60	1999	1,205,423	857,718				71.15%
61	2000	1,600,190	1,154,982				72.18%
62	2001	1,693,389	1,252,872				73.99%
63	2002	2,267,017	1,720,846				75.91%
64	2003	1,254,109	988,978				78.86%
65	2004	4,474,012	3,267,840				73.04%
66	2005	1,431,620	1,168,830				81.64%
67	2006	1,044,808	869,678				83.24%
68	2007	5,276,403	3,820,341				72.40%
69	2008	1,219,871	1,010,519				82.84%
70	2009	2,202,858	1,800,895				81.75%
71	2010	2,368,412	1,728,419				72.98%
72	2011	488,801	427,746				87.51%
73	2012	1,517,431	1,096,792				72.28%
74	2013	1,084,920	820,778				75.65%
75	2014	1,091,848	732,549				67.09%
76	2015	6,760,087	5,174,106				76.54%
	Mean	2,300,255	1,719,313	2,343,004	98.18%	73.38%	74.74%

Annual Flow Volume of Leon River near Hamilton (LEHM46)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	113,759	74,310				65.32%
2	1941	433,594	390,891				90.15%
3	1942	371,782	325,890				87.66%
4	1943	38,930	26,443				67.92%
5	1944	106,878	66,716				62.42%
6	1945	160,145	105,641				65.97%
7	1946	94,118	65,140				69.21%
8	1947	40,580	26,752				65.92%
9	1948	24,238	17,989				74.22%
10	1949	199,513	157,450				78.92%
11	1950	64,468	45,176				70.07%
12	1951	23,765	16,787				70.64%
13	1952	64,027	54,613				85.30%
14	1953	56,931	46,998				82.55%
15	1954	23,938	21,081				88.07%
16	1955	95,078	78,111				82.15%
17	1956	99,126	79,868				80.57%
18	1957	445,667	355,038				79.66%
19	1958	126,643	105,281				83.13%
20	1959	204,555	156,385				76.45%
21	1960	100,034	87,361	13,240	755.53%	659.81%	87.33%
22	1961	221,552	178,394	218,401	101.44%	81.68%	80.52%

23	1962	122,440	97,380	119,194	102.72%	81.70%	79.53%
24	1963	86,251	68,040	57,080	151.11%	119.20%	78.89%
25	1964	175,699	144,780	163,884	107.21%	88.34%	82.40%
26	1965	249,118	195,927	242,080	102.91%	80.93%	78.65%
27	1966	120,300	93,792	109,684	109.68%	85.51%	77.96%
28	1967	67,263	53,078	54,608	123.17%	97.20%	78.91%
29	1968	389,119	322,847	361,573	107.62%	89.29%	82.97%
30	1969	146,035	112,135	118,910	122.81%	94.30%	76.79%
31	1970	177,889	144,741	172,692	103.01%	83.81%	81.37%
32	1971	95,866	76,567	69,053	138.83%	110.88%	79.87%
33	1972	41,162	32,970	33,960	121.21%	97.08%	80.10%
34	1973	83,467	57,280	56,969	146.51%	100.55%	68.63%
35	1974	64,785	40,594	37,727	171.72%	107.60%	62.66%
36	1975	87,536	62,292	81,979	106.78%	75.99%	71.16%
37	1976	26,970	17,150	6,459	417.56%	265.52%	63.59%
38	1977	155,537	123,755	137,444	113.16%	90.04%	79.57%
39	1978	10,414	9,601	4,144	251.30%	231.69%	92.20%
40	1979	65,089	47,096	31,482	206.75%	149.59%	72.36%
41	1980	36,830	26,352	21,840	168.63%	120.66%	71.55%
42	1981	40,818	25,013	7,476	546.02%	334.59%	61.28%
43	1982	100,857	70,128	92,656	108.85%	75.69%	69.53%
44	1983	13,003	9,835	6,353	204.66%	154.80%	75.64%
45	1984	44,502	32,557	8,014	555.30%	406.25%	73.16%
46	1985	88,044	58,947	72,301	121.77%	81.53%	66.95%
47	1986	267,042	188,876	246,363	108.39%	76.67%	70.73%
48	1987	272,157	238,796	256,793	105.98%	92.99%	87.74%
49	1988	105,758	91,474	89,077	118.73%	102.69%	86.49%
50	1989	200,349	157,696	173,630	115.39%	90.82%	78.71%
51	1990	564,102	501,028	542,501	103.98%	92.36%	88.82%
52	1991	399,269	226,472	282,845	141.16%	80.07%	56.72%
53	1992	602,964	696,168	685,379	87.98%	101.57%	115.46%
54	1993	168,084	145,322	150,282	111.85%	96.70%	86.46%
55	1994	290,516	248,636	277,815	104.57%	89.50%	85.58%
56	1995	393,638	356,280	384,417	102.40%	92.68%	90.51%
57	1996	155,275	128,856	84,856	182.99%	151.85%	82.99%
58	1997	637,756	597,788				93.73%
59	1998	98,345	74,793				76.05%
60	1999	35,870	28,733				80.10%
61	2000	88,813	53,003				59.68%
62	2001	149,828	114,456				76.39%
63	2002	186,712	135,200				72.41%
64	2003	68,674	48,698				70.91%
65	2004	292,400	231,921				79.32%
66	2005	39,614	36,624				92.45%
67	2006	37,758	29,751				78.79%
68	2007	591,574	512,897	12,664	4671.13%	4049.89%	86.70%
69	2008	43,373	35,379	79,543	54.53%	44.48%	81.57%
70	2009	197,205	148,755	20,674	953.89%	719.54%	75.43%
71	2010	114,533	99,756	72,786	157.36%	137.05%	87.10%
72	2011	61,932	48,149	8,661	715.07%	555.93%	77.74%
73	2012	200,140	158,586	107,557	186.08%	147.44%	79.24%
74	2013	69,006	55,386	12,169	567.05%	455.13%	80.26%
75	2014	49,662	33,165	1,895	2621.23%	1750.52%	66.78%
76	2015	671,394	581,552	470,622	142.66%	123.57%	86.62%
	Mean	165,365	136,009	80,674	204.98%	168.59%	82.25%

Annual Flow Volume of near River near Gatesville (LEGT47)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	274,063	233,124				85.06%
2	1941	780,738	735,663				94.23%
3	1942	641,595	593,578				92.52%
4	1943	73,536	59,853				81.39%
5	1944	443,235	401,235				90.52%
6	1945	484,955	427,966				88.25%
7	1946	274,665	243,900				88.80%
8	1947	133,292	117,806				88.38%
9	1948	52,071	45,012				86.44%
10	1949	219,124	176,539				80.57%
11	1950	89,341	69,128	238	37599%	29092%	77.38%
12	1951	29,948	22,643	30,484	98.24%	74.28%	75.61%
13	1952	76,120	66,381	76,592	99.38%	86.67%	87.21%
14	1953	91,864	81,479	92,714	99.08%	87.88%	88.70%
15	1954	26,389	23,418	26,791	98.50%	87.41%	88.74%
16	1955	130,590	113,164	122,121	106.94%	92.67%	86.66%
17	1956	112,930	93,793	107,419	105.13%	87.32%	83.05%
18	1957	675,393	583,763	671,313	100.61%	86.96%	86.43%
19	1958	213,598	190,933	213,284	100.15%	89.52%	89.39%
20	1959	333,838	284,527	331,613	100.67%	85.80%	85.23%
21	1960	192,938	178,881	192,748	100.10%	92.81%	92.71%
22	1961	456,601	411,070	454,528	100.46%	90.44%	90.03%
23	1962	137,905	111,822	135,728	101.60%	82.39%	81.09%
24	1963	89,547	70,985	61,699	145.14%	115.05%	79.27%
25	1964	217,137	185,163	206,464	105.17%	89.68%	85.27%
26	1965	451,573	396,139	445,589	101.34%	88.90%	87.72%
27	1966	194,085	165,615	184,544	105.17%	89.74%	85.33%
28	1967	80,086	65,255	68,557	116.82%	95.18%	81.48%
29	1968	547,240	479,212	521,439	104.95%	91.90%	87.57%
30	1969	186,881	151,914	160,802	116.22%	94.47%	81.29%
31	1970	269,279	234,422	264,507	101.80%	88.63%	87.06%
32	1971	163,233	142,539	137,508	118.71%	103.66%	87.32%
33	1972	64,752	55,725	58,211	111.24%	95.73%	86.06%
34	1973	130,984	103,314	105,806	123.80%	97.64%	78.88%
35	1974	111,763	86,595	85,815	130.24%	100.91%	77.48%
36	1975	193,276	166,302	188,466	102.55%	88.24%	86.04%
37	1976	56,694	45,309	37,641	150.62%	120.37%	79.92%
38	1977	240,400	207,068	223,960	107.34%	92.46%	86.13%
39	1978	9,608	8,564	3,867	248.43%	221.45%	89.14%
40	1979	137,241	117,913	106,025	129.44%	111.21%	85.92%
41	1980	61,789	51,000	48,473	127.47%	105.21%	82.54%
42	1981	96,953	80,173	65,858	147.22%	121.74%	82.69%
43	1982	112,530	81,101	105,791	106.37%	76.66%	72.07%
44	1983	12,411	8,821	7,086	175.16%	124.49%	71.07%
45	1984	41,850	29,757	7,100	589.43%	419.11%	71.10%
46	1985	103,138	73,522	89,162	115.68%	82.46%	71.28%
47	1986	308,660	230,337	290,054	106.41%	79.41%	74.62%
48	1987	376,219	340,681	362,620	103.75%	93.95%	90.55%
49	1988	114,409	99,295	98,131	116.59%	101.19%	86.79%
50	1989	244,444	200,222	218,468	111.89%	91.65%	81.91%
51	1990	676,198	611,140	655,761	103.12%	93.20%	90.38%

52	1991	555,486	381,496	441,471	125.83%	86.41%	68.68%
53	1992	876,550	966,763	956,291	91.66%	101.10%	110.29%
54	1993	255,078	230,949	235,753	108.20%	97.96%	90.54%
55	1994	325,768	282,554	312,885	104.12%	90.31%	86.73%
56	1995	551,619	511,730	541,966	101.78%	94.42%	92.77%
57	1996	246,719	218,712	233,121	105.83%	93.82%	88.65%
58	1997	903,669	861,972	898,374	100.59%	95.95%	95.39%
59	1998	231,186	206,538	252,674	91.50%	81.74%	89.34%
60	1999	55,206	47,461	32,011	172.46%	148.27%	85.97%
61	2000	208,780	171,784	74,440	280.47%	230.77%	82.28%
62	2001	210,914	174,498	199,025	105.97%	87.68%	82.73%
63	2002	224,996	172,836	134,623	167.13%	128.38%	76.82%
64	2003	128,195	107,170	99,200	129.23%	108.03%	83.60%
65	2004	632,344	570,353	433,603	145.83%	131.54%	90.20%
66	2005	71,802	67,790	304,607	23.57%	22.25%	94.41%
67	2006	58,796	50,068	14,182	414.57%	353.03%	85.16%
68	2007	1,080,945	1,000,231	976,005	110.75%	102.48%	92.53%
69	2008	47,749	39,355	109,014	43.80%	36.10%	82.42%
70	2009	340,228	290,741	102,919	330.58%	282.50%	85.45%
71	2010	200,682	184,415	254,926	78.72%	72.34%	91.89%
72	2011	104,768	90,349	14,943	701.11%	604.62%	86.24%
73	2012	248,026	205,714	150,715	164.57%	136.49%	82.94%
74	2013	150,434	135,701	31,213	481.96%	434.76%	90.21%
75	2014	126,135	108,293	10,942	1152.77%	989.71%	85.85%
76	2015	1,084,571	993,977	600,031	180.75%	165.65%	91.65%
	Mean	262,576	232,010	231,124	113.61%	100.38%	88.36%

Annual Flow Volume of near River near Belton (LEBE49)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	595,145	399,406	596,465	99.78%	66.96%	67.11%
2	1941	1,529,345	1,399,306	1,530,704	99.91%	91.42%	91.50%
3	1942	1,233,334	1,055,179	1,234,227	99.93%	85.49%	85.55%
4	1943	146,944	106,010	147,685	99.50%	71.78%	72.14%
5	1944	1,079,431	850,910	1,080,524	99.90%	78.75%	78.83%
6	1945	1,115,511	895,864	1,116,563	99.91%	80.23%	80.31%
7	1946	626,618	498,578	627,491	99.86%	79.46%	79.57%
8	1947	311,816	219,204	312,578	99.76%	70.13%	70.30%
9	1948	109,094	105,422	109,576	99.56%	96.21%	96.63%
10	1949	311,224	227,498	312,124	99.71%	72.89%	73.10%
11	1950	152,296	119,946	153,050	99.51%	78.37%	78.76%
12	1951	50,375	49,017	51,183	98.42%	95.77%	97.30%
13	1952	134,356	107,647	134,958	99.55%	79.76%	80.12%
14	1953	245,643	115,742	246,896	99.49%	46.88%	47.12%
15	1954	23,634	29,863	3,681	642.07%	811.28%	126.35%
16	1955	181,309	132,262	3,988	4547%	3317%	72.95%
17	1956	153,321	117,651	162,962	94.08%	72.20%	76.74%
18	1957	1,375,697	740,201	1,262,190	108.99%	58.64%	53.81%
19	1958	515,526	460,354	502,600	102.57%	91.59%	89.30%
20	1959	604,987	365,615	584,184	103.56%	62.59%	60.43%
21	1960	518,033	381,135	498,966	103.82%	76.38%	73.57%
22	1961	998,165	849,005	980,401	101.81%	86.60%	85.06%

23	1962	184,661	136,597	149,438	123.57%	91.41%	73.97%
24	1963	99,203	96,445	61,601	161.04%	156.56%	97.22%
25	1964	420,760	308,533	371,644	113.22%	83.02%	73.33%
26	1965	1,090,451	681,388	1,062,197	102.66%	64.15%	62.49%
27	1966	460,421	341,960	424,262	108.52%	80.60%	74.27%
28	1967	102,522	103,136	92,592	110.72%	111.39%	100.60%
29	1968	996,422	732,422	925,001	107.72%	79.18%	73.51%
30	1969	337,292	188,878	284,855	118.41%	66.31%	56.00%
31	1970	552,204	422,272	518,890	106.42%	81.38%	76.47%
32	1971	347,779	260,729	196,542	176.95%	132.66%	74.97%
33	1972	138,655	88,517	77,156	179.71%	114.72%	63.84%
34	1973	334,417	158,851	149,358	223.90%	106.36%	47.50%
35	1974	448,618	190,969	270,545	165.82%	70.59%	42.57%
36	1975	527,356	451,773	618,858	85.21%	73.00%	85.67%
37	1976	307,487	167,120	241,672	127.23%	69.15%	54.35%
38	1977	610,897	513,845	572,015	106.80%	89.83%	84.11%
39	1978	25,979	51,050	66,754	38.92%	76.48%	196.51%
40	1979	429,184	181,664	266,354	161.13%	68.20%	42.33%
41	1980	196,118	89,949	166,051	118.11%	54.17%	45.86%
42	1981	236,556	94,074	119,403	198.12%	78.79%	39.77%
43	1982	189,251	113,136	154,793	122.26%	73.09%	59.78%
44	1983	85,403	71,726	49,817	171.43%	143.98%	83.99%
45	1984	93,522	85,095	57,162	163.61%	148.87%	90.99%
46	1985	318,591	203,548	145,852	218.44%	139.56%	63.89%
47	1986	704,113	288,691	645,837	109.02%	44.70%	41.00%
48	1987	645,092	447,352	635,851	101.45%	70.35%	69.35%
49	1988	119,299	104,593	117,487	101.54%	89.03%	87.67%
50	1989	358,252	226,839	233,755	153.26%	97.04%	63.32%
51	1990	783,076	487,469	695,835	112.54%	70.06%	62.25%
52	1991	841,787	210,402	274,074	307.14%	76.77%	24.99%
53	1992	1,658,040	1,948,917	2,090,246	79.32%	93.24%	117.54%
54	1993	557,804	480,883	520,951	107.07%	92.31%	86.21%
55	1994	436,073	252,268	354,087	123.15%	71.24%	57.85%
56	1995	735,896	576,540	698,350	105.38%	82.56%	78.35%
57	1996	303,148	195,852	221,676	136.75%	88.35%	64.61%
58	1997	1,616,768	1,426,926	1,514,698	106.74%	94.21%	88.26%
59	1998	473,535	320,330	569,500	83.15%	56.25%	67.65%
60	1999	91,098	74,991	93,515	97.42%	80.19%	82.32%
61	2000	488,556	219,725	34,663	1409.45%	633.89%	44.97%
62	2001	568,131	424,531	470,738	120.69%	90.18%	74.72%
63	2002	447,794	286,705	213,662	209.58%	134.19%	64.03%
64	2003	251,965	163,518	214,430	117.50%	76.26%	64.90%
65	2004	1,177,955	698,867	845,790	139.27%	82.63%	59.33%
66	2005	177,321	427,728	609,221	29.11%	70.21%	241.22%
67	2006	89,496	82,410	18,242	490.61%	451.77%	92.08%
68	2007	1,943,666	1,541,423	1,576,572	123.28%	97.77%	79.30%
69	2008	124,772	97,290	123,316	101.18%	78.90%	77.97%
70	2009	816,673	525,731	281,084	290.54%	187.04%	64.37%
71	2010	398,500	338,287	646,790	61.61%	52.30%	84.89%
72	2011	192,433	135,403	35,556	541.21%	380.82%	70.36%
73	2012	599,296	459,427	174,971	342.51%	262.57%	76.66%
74	2013	378,398	219,383	53,082	712.85%	413.29%	57.98%
75	2014	193,573	133,488	16,859	1148.22%	791.81%	68.96%
76	2015	2,049,848	1,404,784	765,345	267.83%	183.55%	68.53%
	Mean	514,918	380,095	460,956	111.71%	82.46%	73.82%

Annual Flow Volume of Lampasas River near Kempner (LAKE50)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	161,801	158,573				98.00%
2	1941	318,267	313,208				98.41%
3	1942	181,156	176,720				97.55%
4	1943	26,150	23,632				90.37%
5	1944	335,194	330,096				98.48%
6	1945	301,053	295,922				98.30%
7	1946	104,105	100,171				96.22%
8	1947	71,643	68,433				95.52%
9	1948	25,594	23,924				93.48%
10	1949	50,451	48,531				96.19%
11	1950	17,218	15,578				90.48%
12	1951	8,076	7,235				89.58%
13	1952	46,426	45,182				97.32%
14	1953	64,908	63,512				97.85%
15	1954	16,867	16,069				95.27%
16	1955	64,863	63,008				97.14%
17	1956	26,568	25,819				97.18%
18	1957	279,558	276,109				98.77%
19	1958	154,113	150,685				97.78%
20	1959	148,469	145,768				98.18%
21	1960	189,778	185,511				97.75%
22	1961	220,054	215,164				97.78%
23	1962	48,044	45,220	6,143	782.12%	736.15%	94.12%
24	1963	18,844	16,823	17,855	105.54%	94.22%	89.27%
25	1964	48,257	45,623	47,127	102.40%	96.81%	94.54%
26	1965	291,912	287,351	290,850	100.37%	98.80%	98.44%
27	1966	143,401	138,656	142,594	100.57%	97.24%	96.69%
28	1967	16,950	14,954	15,958	106.22%	93.71%	88.22%
29	1968	203,769	199,448	203,096	100.33%	98.20%	97.88%
30	1969	87,930	84,349	86,979	101.09%	96.98%	95.93%
31	1970	215,944	211,347	214,249	100.79%	98.65%	97.87%
32	1971	71,604	68,646	70,193	102.01%	97.80%	95.87%
33	1972	60,782	58,137	59,299	102.50%	98.04%	95.65%
34	1973	54,266	50,628	52,699	102.97%	96.07%	93.30%
35	1974	62,700	59,296	60,682	103.33%	97.72%	94.57%
36	1975	163,518	159,165	161,701	101.12%	98.43%	97.34%
37	1976	61,018	56,917	59,740	102.14%	95.27%	93.28%
38	1977	145,138	141,265	143,649	101.04%	98.34%	97.33%
39	1978	13,797	12,304	12,131	113.74%	101.43%	89.18%
40	1979	72,818	69,523	71,518	101.82%	97.21%	95.48%
41	1980	32,462	30,239	31,063	104.50%	97.35%	93.15%
42	1981	54,581	51,371	53,232	102.53%	96.50%	94.12%
43	1982	33,979	31,340	32,702	103.91%	95.83%	92.23%
44	1983	15,283	13,420	14,125	108.20%	95.01%	87.81%
45	1984	15,683	14,386	14,121	111.06%	101.88%	91.73%
46	1985	90,442	87,563	88,786	101.87%	98.62%	96.82%
47	1986	162,041	158,581	160,550	100.93%	98.77%	97.86%
48	1987	242,875	238,291	242,519	100.15%	98.26%	98.11%
49	1988	23,350	21,083	23,393	99.82%	90.12%	90.29%
50	1989	26,590	24,482	26,538	100.19%	92.25%	92.07%
51	1990	102,975	100,573	103,043	99.93%	97.60%	97.67%

52	1991	250,468	246,769	250,504	99.99%	98.51%	98.52%
53	1992	497,924	492,992	498,075	99.97%	98.98%	99.01%
54	1993	134,638	130,795	134,592	100.03%	97.18%	97.15%
55	1994	48,565	45,836	48,621	99.89%	94.27%	94.38%
56	1995	85,687	82,149	85,677	100.01%	95.88%	95.87%
57	1996	46,766	43,661	46,648	100.25%	93.60%	93.36%
58	1997	489,704	484,957	489,679	100.01%	99.04%	99.03%
59	1998	182,656	178,642	194,089	94.11%	92.04%	97.80%
60	1999	100,554	97,017	87,939	114.34%	110.32%	96.48%
61	2000	31,956	29,469	32,686	97.77%	90.16%	92.22%
62	2001	100,627	97,012	105,850	95.07%	91.65%	96.41%
63	2002	103,728	99,872	101,548	102.15%	98.35%	96.28%
64	2003	58,060	55,427	54,341	106.84%	102.00%	95.46%
65	2004	172,265	167,963	197,101	87.40%	85.22%	97.50%
66	2005	174,121	170,113	149,101	116.78%	114.09%	97.70%
67	2006	30,218	27,642	30,085	100.44%	91.88%	91.48%
68	2007	592,213	587,098	595,410	99.46%	98.60%	99.14%
69	2008	35,729	33,068	32,245	110.80%	102.55%	92.55%
70	2009	84,325	81,451	96,914	87.01%	84.04%	96.59%
71	2010	243,191	238,972	230,868	105.34%	103.51%	98.26%
72	2011	16,673	14,978	16,073	103.73%	93.19%	89.83%
73	2012	40,353	38,345	40,580	99.44%	94.49%	95.02%
74	2013	12,300	10,605	13,623	90.29%	77.85%	86.22%
75	2014	25,786	23,138	24,625	104.71%	93.96%	89.73%
76	2015	91,015	87,304	109,953	82.78%	79.40%	95.92%
	Mean	124,903	121,724	121,924	102.44%	99.84%	97.45%

Annual Flow Volume of Little River near Little River (LRLR53)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	1,020,211	719,181	0			70.49%
2	1941	2,422,134	2,190,194	0			90.42%
3	1942	1,798,836	1,504,880	0			83.66%
4	1943	223,660	119,549	0			53.45%
5	1944	1,935,766	1,548,267	0			79.98%
6	1945	1,907,698	1,573,815	0			82.50%
7	1946	938,611	730,066	0			77.78%
8	1947	507,658	321,459	0			63.32%
9	1948	178,694	119,930	0			67.11%
10	1949	463,616	310,546	0			66.98%
11	1950	211,587	125,254	0			59.20%
12	1951	74,862	51,458	0			68.74%
13	1952	250,566	196,865	0			78.57%
14	1953	417,256	181,747	0			43.56%
15	1954	61,878	50,691	0			81.92%
16	1955	342,664	247,863	0			72.33%
17	1956	231,901	178,821	0			77.11%
18	1957	2,165,017	1,206,341	0			55.72%
19	1958	912,285	786,354	0			86.20%
20	1959	1,004,330	641,978	0			63.92%
21	1960	988,159	742,913	0			75.18%
22	1961	1,606,093	1,361,893	0			84.80%

23	1962	303,914	188,792	148,296	204.94%	127.31%	62.12%
24	1963	154,054	104,420	117,264	131.37%	89.05%	67.78%
25	1964	567,216	381,600	519,187	109.25%	73.50%	67.28%
26	1965	1,876,360	1,254,742	1,849,402	101.46%	67.85%	66.87%
27	1966	795,648	578,229	760,151	104.67%	76.07%	72.67%
28	1967	162,715	120,882	153,729	105.85%	78.63%	74.29%
29	1968	1,499,144	1,085,672	1,204,554	124.46%	90.13%	72.42%
30	1969	617,406	362,618	536,513	115.08%	67.59%	58.73%
31	1970	966,373	748,610	914,251	105.70%	81.88%	77.47%
32	1971	493,628	340,686	330,311	149.44%	103.14%	69.02%
33	1972	274,984	131,499	204,042	134.77%	64.45%	47.82%
34	1973	672,946	325,898	487,099	138.15%	66.91%	48.43%
35	1974	938,963	581,907	684,899	137.10%	84.96%	61.97%
36	1975	1,111,886	950,163	1,272,665	87.37%	74.66%	85.46%
37	1976	646,439	400,343	573,798	112.66%	69.77%	61.93%
38	1977	1,073,068	912,318	1,039,738	103.21%	87.75%	85.02%
39	1978	82,472	67,507	151,944	54.28%	44.43%	81.85%
40	1979	885,184	472,250	687,626	128.73%	68.68%	53.35%
41	1980	394,483	219,468	386,836	101.98%	56.73%	55.63%
42	1981	634,324	363,885	487,097	130.23%	74.70%	57.37%
43	1982	314,477	169,561	284,192	110.66%	59.66%	53.92%
44	1983	270,244	156,126	226,854	119.13%	68.82%	57.77%
45	1984	176,164	123,940	155,823	113.05%	79.54%	70.35%
46	1985	666,432	414,759	423,652	157.31%	97.90%	62.24%
47	1986	1,223,156	677,015	1,139,381	107.35%	59.42%	55.35%
48	1987	1,249,300	963,473	1,265,871	98.69%	76.11%	77.12%
49	1988	211,533	145,439	255,261	82.87%	56.98%	68.75%
50	1989	484,690	286,444	306,296	158.24%	93.52%	59.10%
51	1990	929,203	500,835	801,239	115.97%	62.51%	53.90%
52	1991	1,428,010	414,782	655,144	217.97%	63.31%	29.05%
53	1992	2,815,089	3,252,061	3,448,828	81.62%	94.29%	115.52%
54	1993	988,070	825,415	947,992	104.23%	87.07%	83.54%
55	1994	575,672	284,819	482,932	119.20%	58.98%	49.48%
56	1995	967,040	690,438	922,138	104.87%	74.87%	71.40%
57	1996	403,807	209,815	322,298	125.29%	65.10%	51.96%
58	1997	2,582,565	2,279,562	2,439,735	105.85%	93.43%	88.27%
59	1998	742,043	492,789	1,259,915	58.90%	39.11%	66.41%
60	1999	254,038	183,245	300,555	84.52%	60.97%	72.13%
61	2000	693,419	278,531	176,513	392.84%	157.80%	40.17%
62	2001	634,740	418,288	1,020,724	62.19%	40.98%	65.90%
63	2002	858,779	582,293	474,052	181.16%	122.83%	67.80%
64	2003	592,659	415,638	429,197	138.09%	96.84%	70.13%
65	2004	2,051,791	1,475,045	1,372,501	149.49%	107.47%	71.89%
66	2005	387,811	589,021	1,112,299	34.87%	52.96%	151.88%
67	2006	276,386	196,677	116,612	237.01%	168.66%	71.16%
68	2007	2,907,203	2,322,023	2,996,600	97.02%	77.49%	79.87%
69	2008	238,503	161,173	231,521	103.02%	69.61%	67.58%
70	2009	979,154	537,679	602,104	162.62%	89.30%	54.91%
71	2010	605,252	484,643	1,378,362	43.91%	35.16%	80.07%
72	2011	313,396	193,360	156,260	200.56%	123.74%	61.70%
73	2012	731,633	505,285	275,524	265.54%	183.39%	69.06%
74	2013	576,719	276,941	127,339	452.90%	217.48%	48.02%
75	2014	460,529	314,951	72,639	634.00%	433.59%	68.39%
76	2015	2,388,179	1,583,796	1,225,369	194.89%	129.25%	66.32%
	Mean	860,280	630,141	527,147	163.20%	119.54%	73.25%

Annual Flow Volume of Little River near Cameron (LRCA58)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	2,053,698	1,661,346	2,054,347	99.97%	80.87%	80.90%
2	1941	3,280,172	2,953,447	3,280,758	99.98%	90.02%	90.04%
3	1942	2,149,685	1,790,555	2,150,202	99.98%	83.27%	83.29%
4	1943	389,762	249,113	389,425	100.09%	63.97%	63.91%
5	1944	2,585,087	2,070,576	2,584,159	100.04%	80.13%	80.10%
6	1945	2,444,495	2,009,864	2,443,277	100.05%	82.26%	82.22%
7	1946	1,690,748	1,389,732	1,689,122	100.10%	82.28%	82.20%
8	1947	999,834	742,816	998,481	100.14%	74.39%	74.29%
9	1948	263,134	177,310	261,031	100.81%	67.93%	67.38%
10	1949	714,337	522,524	712,818	100.21%	73.30%	73.15%
11	1950	362,915	246,414	363,356	99.88%	67.82%	67.90%
12	1951	132,148	96,273	133,235	99.18%	72.26%	72.85%
13	1952	327,475	246,554	328,010	99.84%	75.17%	75.29%
14	1953	851,217	578,571	835,623	101.87%	69.24%	67.97%
15	1954	95,386	65,076	73,092	130.50%	89.03%	68.22%
16	1955	454,168	332,692	274,771	165.29%	121.08%	73.25%
17	1956	211,606	145,300	216,234	97.86%	67.20%	68.67%
18	1957	3,360,434	2,241,870	3,244,806	103.56%	69.09%	66.71%
19	1958	1,627,243	1,410,241	1,614,125	100.81%	87.37%	86.66%
20	1959	1,477,691	1,047,138	1,450,669	101.86%	72.18%	70.86%
21	1960	1,761,436	1,424,218	1,740,595	101.20%	81.82%	80.86%
22	1961	2,403,600	2,054,300	2,385,382	100.76%	86.12%	85.47%
23	1962	584,044	428,963	547,414	106.69%	78.36%	73.45%
24	1963	242,974	167,313	201,015	120.87%	83.23%	68.86%
25	1964	703,134	480,119	647,730	108.55%	74.12%	68.28%
26	1965	2,938,979	2,168,503	2,905,773	101.14%	74.63%	73.78%
27	1966	1,372,707	1,078,408	1,331,542	103.09%	80.99%	78.56%
28	1967	395,024	319,028	379,369	104.13%	84.09%	80.76%
29	1968	2,573,868	2,039,509	2,284,100	112.69%	89.29%	79.24%
30	1969	1,097,181	766,317	1,012,697	108.34%	75.67%	69.84%
31	1970	1,479,782	1,159,427	1,424,321	103.89%	81.40%	78.35%
32	1971	596,915	418,171	427,872	139.51%	97.73%	70.06%
33	1972	455,853	260,491	378,956	120.29%	68.74%	57.14%
34	1973	1,329,373	877,622	1,142,424	116.36%	76.82%	66.02%
35	1974	1,440,097	991,989	1,188,012	121.22%	83.50%	68.88%
36	1975	1,903,734	1,623,641	2,061,299	92.36%	78.77%	85.29%
37	1976	1,266,407	944,193	1,195,075	105.97%	79.01%	74.56%
38	1977	1,541,864	1,298,815	1,507,700	102.27%	86.15%	84.24%
39	1978	130,169	94,980	192,962	67.46%	49.22%	72.97%
40	1979	1,786,547	1,253,893	1,594,572	112.04%	78.64%	70.19%
41	1980	584,289	373,786	505,515	115.58%	73.94%	63.97%
42	1981	1,365,655	963,617	1,171,769	116.55%	82.24%	70.56%
43	1982	549,584	363,187	506,694	108.46%	71.68%	66.08%
44	1983	632,909	443,501	579,461	109.22%	76.54%	70.07%
45	1984	365,878	265,842	322,760	113.36%	82.37%	72.66%
46	1985	1,121,864	776,930	870,774	128.84%	89.22%	69.25%
47	1986	1,792,262	1,172,055	1,656,131	108.22%	70.77%	65.40%
48	1987	2,009,869	1,607,204	2,056,838	97.72%	78.14%	79.97%
49	1988	275,047	185,860	302,069	91.05%	61.53%	67.57%
50	1989	625,018	380,879	434,172	143.96%	87.73%	60.94%
51	1990	1,120,348	663,456	987,658	113.43%	67.17%	59.22%

52	1991	2,337,733	1,130,060	1,438,889	162.47%	78.54%	48.34%
53	1992	4,345,021	4,754,136	5,099,207	85.21%	93.23%	109.42%
54	1993	1,500,613	1,266,335	1,458,847	102.86%	86.80%	84.39%
55	1994	818,168	485,332	711,687	114.96%	68.19%	59.32%
56	1995	1,351,564	1,022,504	1,298,067	104.12%	78.77%	75.65%
57	1996	566,776	325,951	460,568	123.06%	70.77%	57.51%
58	1997	3,623,957	3,188,937	3,440,587	105.33%	92.69%	88.00%
59	1998	1,994,437	1,643,327	2,164,764	92.13%	75.91%	82.40%
60	1999	319,899	223,349	499,178	64.09%	44.74%	69.82%
61	2000	1,635,614	1,121,664	481,997	339.34%	232.71%	68.58%
62	2001	1,559,306	1,241,847	1,933,392	80.65%	64.23%	79.64%
63	2002	1,383,305	1,055,984	981,586	140.93%	107.58%	76.34%
64	2003	715,006	500,994	812,840	87.96%	61.64%	70.07%
65	2004	3,530,806	2,723,134	2,451,203	144.04%	111.09%	77.12%
66	2005	577,399	843,138	1,594,411	36.21%	52.88%	146.02%
67	2006	460,007	311,697	249,886	184.09%	124.74%	67.76%
68	2007	4,515,970	3,798,035	4,519,524	99.92%	84.04%	84.10%
69	2008	281,162	180,225	418,808	67.13%	43.03%	64.10%
70	2009	2,167,760	1,616,499	953,621	227.32%	169.51%	74.57%
71	2010	1,071,613	899,427	1,910,648	56.09%	47.07%	83.93%
72	2011	569,747	397,921	178,344	319.47%	223.12%	69.84%
73	2012	1,449,470	1,200,027	536,101	270.37%	223.84%	82.79%
74	2013	1,565,540	1,178,592	337,263	464.19%	349.46%	75.28%
75	2014	836,760	619,569	247,047	338.70%	250.79%	74.04%
76	2015	4,606,049	3,670,763	2,517,019	183.00%	145.84%	79.69%
	Mean	1,369,900	1,068,530	1,303,483	105.10%	81.98%	78.00%

Annual Flow Volume of Brazos River near Bryan (BRBR59)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	4,946,601	3,879,357	4,928,581	100.37%	78.71%	78.42%
2	1941	10,208,049	9,048,972	9,560,898	106.77%	94.65%	88.65%
3	1942	6,855,512	5,712,807	6,752,458	101.53%	84.60%	83.33%
4	1943	1,325,922	1,122,177	1,540,846	86.05%	72.83%	84.63%
5	1944	5,954,070	4,832,770	5,802,879	102.61%	83.28%	81.17%
6	1945	6,952,843	5,457,016	6,744,913	103.08%	80.91%	78.49%
7	1946	5,024,309	3,976,365	4,958,051	101.34%	80.20%	79.14%
8	1947	2,938,410	2,200,157	2,964,363	99.12%	74.22%	74.88%
9	1948	1,256,338	903,197	1,205,705	104.20%	74.91%	71.89%
10	1949	2,626,874	1,825,437	2,522,785	104.13%	72.36%	69.49%
11	1950	2,104,652	1,434,753	1,979,673	106.31%	72.47%	68.17%
12	1951	806,706	618,708	829,636	97.24%	74.58%	76.70%
13	1952	984,107	843,440	933,523	105.42%	90.35%	85.71%
14	1953	2,808,171	2,122,103	2,084,652	134.71%	101.80%	75.57%
15	1954	956,510	661,844	924,157	103.50%	71.62%	69.19%
16	1955	2,422,214	1,695,786	1,965,808	123.22%	86.26%	70.01%
17	1956	751,258	682,541	936,766	80.20%	72.86%	90.85%
18	1957	11,604,682	8,294,973	11,060,981	104.92%	74.99%	71.48%
19	1958	4,317,410	3,743,813	4,322,249	99.89%	86.62%	86.71%
20	1959	3,886,928	2,898,384	3,671,839	105.86%	78.94%	74.57%
21	1960	4,472,852	3,579,483	4,368,853	102.38%	81.93%	80.03%
22	1961	6,150,288	4,896,088	6,077,693	101.19%	80.56%	79.61%

23	1962	2,545,923	1,878,958	2,357,165	108.01%	79.71%	73.80%
24	1963	992,934	859,098	966,992	102.68%	88.84%	86.52%
25	1964	1,548,098	1,087,061	1,263,368	122.54%	86.04%	70.22%
26	1965	6,286,482	4,705,600	5,855,177	107.37%	80.37%	74.85%
27	1966	4,585,105	3,493,480	4,334,388	105.78%	80.60%	76.19%
28	1967	1,493,328	1,263,577	1,318,409	113.27%	95.84%	84.61%
29	1968	6,943,487	5,207,497	6,491,580	106.96%	80.22%	75.00%
30	1969	4,045,321	2,944,821	3,541,101	114.24%	83.16%	72.80%
31	1970	3,475,909	2,742,957	3,332,146	104.31%	82.32%	78.91%
32	1971	2,517,230	1,832,508	1,777,125	141.65%	103.12%	72.80%
33	1972	1,811,566	1,241,962	1,494,216	121.24%	83.12%	68.56%
34	1973	4,843,617	3,580,655	4,485,436	107.99%	79.83%	73.93%
35	1974	4,309,744	3,124,546	3,633,336	118.62%	86.00%	72.50%
36	1975	4,596,458	3,709,285	4,692,195	97.96%	79.05%	80.70%
37	1976	3,952,963	3,115,266	3,608,648	109.54%	86.33%	78.81%
38	1977	4,366,978	3,716,034	4,299,273	101.57%	86.43%	85.09%
39	1978	1,187,958	954,299	719,542	165.10%	132.63%	80.33%
40	1979	5,305,910	3,971,147	4,947,563	107.24%	80.26%	74.84%
41	1980	2,188,078	1,579,383	1,634,339	133.88%	96.64%	72.18%
42	1981	4,318,068	2,962,937	3,860,083	111.86%	76.76%	68.62%
43	1982	3,246,613	2,240,701	3,168,441	102.47%	70.72%	69.02%
44	1983	1,664,627	1,325,487	1,448,432	114.93%	91.51%	79.63%
45	1984	1,463,583	1,100,047	1,072,312	136.49%	102.59%	75.16%
46	1985	3,472,798	2,429,140	2,872,685	120.89%	84.56%	69.95%
47	1986	4,962,005	3,381,177	4,491,684	110.47%	75.28%	68.14%
48	1987	5,044,494	3,924,692	5,186,642	97.26%	75.67%	77.80%
49	1988	904,292	788,154	832,741	108.59%	94.65%	87.16%
50	1989	3,813,681	2,612,424	3,105,368	122.81%	84.13%	68.50%
51	1990	5,687,210	4,242,727	5,223,067	108.89%	81.23%	74.60%
52	1991	8,118,343	5,558,655	5,741,887	141.39%	96.81%	68.47%
53	1992	11,546,884	11,638,008	13,355,010	86.46%	87.14%	100.79%
54	1993	4,023,462	3,348,145				83.22%
55	1994	2,967,028	2,034,107				68.56%
56	1995	4,803,657	3,706,219				77.15%
57	1996	2,159,823	1,487,273				68.86%
58	1997	9,073,444	7,790,550				85.86%
59	1998	2,758,201	2,336,858				84.72%
60	1999	1,529,714	1,079,419				70.56%
61	2000	3,857,451	2,904,637				75.30%
62	2001	3,451,356	2,698,423				78.18%
63	2002	3,597,043	2,724,809				75.75%
64	2003	2,037,463	1,549,682				76.06%
65	2004	9,235,448	7,238,128				78.37%
66	2005	1,855,492	1,845,225				99.45%
67	2006	1,697,453	1,366,593				80.51%
68	2007	11,262,023	9,103,671				80.84%
69	2008	1,754,998	1,436,043				81.83%
70	2009	4,884,132	3,938,296				80.63%
71	2010	3,597,730	2,780,117				77.27%
72	2011	886,117	656,204				74.05%
73	2012	2,872,612	2,198,171				76.52%
74	2013	2,386,185	1,737,578				72.82%
75	2014	2,120,116	1,537,383				72.51%
76	2015	13,236,463	10,734,413				81.10%
	Mean	4,042,698	3,159,650	3,721,654	108.63%	84.90%	78.16%

Annual Flow Volume of Yequa Creek near Bryan (YCSO62)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	502,823	425,825	502,844	100.00%	84.68%	84.69%
2	1941	465,426	507,411	465,449	100.00%	109.02%	109.02%
3	1942	72,759	58,519	72,780	99.97%	80.41%	80.43%
4	1943	34,304	40,453	34,329	99.93%	117.84%	117.93%
5	1944	289,715	235,233	289,740	99.99%	81.19%	81.19%
6	1945	294,487	282,529	294,511	99.99%	95.93%	95.94%
7	1946	281,140	269,978	281,168	99.99%	96.02%	96.03%
8	1947	238,780	233,678	238,810	99.99%	97.85%	97.86%
9	1948	15,190	12,225	15,206	99.89%	80.39%	80.48%
10	1949	218,666	159,376	218,691	99.99%	72.88%	72.89%
11	1950	216,184	203,946	216,434	99.88%	94.23%	94.34%
12	1951	9,793	14,020	9,998	97.95%	140.23%	143.17%
13	1952	66,596	76,008	66,855	99.61%	113.69%	114.13%
14	1953	146,603	114,328	148,040	99.03%	77.23%	77.98%
15	1954	16,726	17,732	13,787	121.31%	128.61%	106.02%
16	1955	29,084	9,626	27,322	106.45%	35.23%	33.10%
17	1956	28,652	16,476	25,762	111.22%	63.95%	57.50%
18	1957	504,920	371,903	504,705	100.04%	73.69%	73.66%
19	1958	286,245	270,327	285,429	100.29%	94.71%	94.44%
20	1959	195,815	175,926	195,295	100.27%	90.08%	89.84%
21	1960	336,981	320,012	336,478	100.15%	95.11%	94.96%
22	1961	456,377	437,735	455,630	100.16%	96.07%	95.92%
23	1962	161,761	120,969	160,181	100.99%	75.52%	74.78%
24	1963	76,101	76,941	73,632	103.35%	104.49%	101.10%
25	1964	39,147	44,886	37,929	103.21%	118.34%	114.66%
26	1965	416,770	337,122	416,212	100.13%	81.00%	80.89%
27	1966	175,582	166,886	172,135	102.00%	96.95%	95.05%
28	1967	26,612	15,287	208			57.45%
29	1968	519,812	487,237	385,984	134.67%	126.23%	93.73%
30	1969	296,690	281,239	285,294	103.99%	98.58%	94.79%
31	1970	264,006	248,503	250,829	105.25%	99.07%	94.13%
32	1971	20,103	18,604	437			92.55%
33	1972	41,600	15,060	2,453		613.83%	36.20%
34	1973	356,787	309,125	351,699	101.45%	87.89%	86.64%
35	1974	403,729	380,988	391,852	103.03%	97.23%	94.37%
36	1975	338,456	322,383	320,797	105.50%	100.49%	95.25%
37	1976	351,094	303,808	289,514	121.27%	104.94%	86.53%
38	1977	235,226	254,810	266,900	88.13%	95.47%	108.33%
39	1978	89,155	85,295	88,764	100.44%	96.09%	95.67%
40	1979	420,090	362,578	364,696	115.19%	99.42%	86.31%
41	1980	113,946	102,138	126,445	90.11%	80.78%	89.64%
42	1981	134,325	97,182	73,201	183.50%	132.76%	72.35%
43	1982	120,541	117,876	106,788	112.88%	110.38%	97.79%
44	1983	249,341	232,551	222,954	111.84%	104.30%	93.27%
45	1984	122,181	80,417	83,473	146.37%	96.34%	65.82%
46	1985	237,372	208,937	209,287	113.42%	99.83%	88.02%
47	1986	381,113	325,135	289,917	131.46%	112.15%	85.31%
48	1987	337,269	354,691	415,546	81.16%	85.36%	105.17%
49	1988	18,774	19,891	28,720	65.37%	69.26%	105.95%
50	1989	53,697	40,321	10,886	493.28%	370.41%	75.09%
51	1990	37,456	1,549	15,084	248.31%	10.27%	4.14%

52	1991	535,597	433,822	320,431	167.15%	135.39%	81.00%
53	1992	654,604	681,449	0			104.10%
54	1993	347,019	341,092	0			98.29%
55	1994	305,426	246,551	0			80.72%
56	1995	248,030	262,820	0			105.96%
57	1996	29,203	31,668	0			108.44%
58	1997	91,285	62,702	0			68.69%
59	1998	464,698	432,812	0			93.14%
60	1999	25,854	29,606	0			114.51%
61	2000	264,600	198,557	0			75.04%
62	2001	278,540	270,322	0			97.05%
63	2002	381,628	317,765	0			83.27%
64	2003	142,512	168,942	0			118.55%
65	2004	610,414	591,031	0			96.82%
66	2005	82,001	83,477	0			101.80%
67	2006	167,979	116,895	0			69.59%
68	2007	429,048	421,255	0			98.18%
69	2008	26,082	24,924	299			95.56%
70	2009	343,399	283,525	91,820	373.99%	308.78%	82.56%
71	2010	59,387	50,110	130,326	45.57%	38.45%	84.38%
72	2011	49,859	28,696	33,574	148.50%	85.47%	57.55%
73	2012	259,930	249,918	77,717	334.46%	321.58%	96.15%
74	2013	270,756	191,726	34,873	776.40%	549.78%	70.81%
75	2014	202,794	180,544	20,662	981.47%	873.79%	89.03%
76	2015	814,659	780,484	740,765	109.98%	105.36%	95.80%
	Mean	232,418	211,124	153,846	151.07%	137.23%	90.84%

Annual Flow Volume of Davidson Creek near Lyons (DCLY63)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	102,577	102,508				99.93%
2	1941	94,946	94,868				99.92%
3	1942	14,842	14,728				99.23%
4	1943	6,998	6,939				99.15%
5	1944	59,101	58,964				99.77%
6	1945	60,074	59,986				99.85%
7	1946	57,353	57,336				99.97%
8	1947	48,712	48,622				99.82%
9	1948	3,099	3,036				97.96%
10	1949	44,607	44,358				99.44%
11	1950	44,102	44,012				99.80%
12	1951	1,997	1,921				96.19%
13	1952	13,585	13,216				97.28%
14	1953	29,906	29,672				99.22%
15	1954	3,412	3,369				98.74%
16	1955	5,933	5,701				96.08%
17	1956	5,848	5,688				97.26%
18	1957	103,003	102,698				99.70%
19	1958	58,394	58,284				99.81%
20	1959	39,947	39,877				99.82%

21	1960	68,745	68,700				99.93%
22	1961	93,103	93,007				99.90%
23	1962	40,546	40,351	23,581	171.94%	171.11%	99.52%
24	1963	20,956	20,864	21,129	99.18%	98.74%	99.56%
25	1964	7,737	7,533	7,937	97.48%	94.91%	97.36%
26	1965	53,562	53,414	53,733	99.68%	99.41%	99.72%
27	1966	39,685	39,598	39,913	99.43%	99.21%	99.78%
28	1967	4,487	4,413	4,606	97.41%	95.80%	98.35%
29	1968	92,630	92,507	92,873	99.74%	99.61%	99.87%
30	1969	69,792	69,691	69,958	99.76%	99.62%	99.85%
31	1970	43,325	43,267	43,485	99.63%	99.50%	99.87%
32	1971	5,173	4,975	5,337	96.93%	93.21%	96.17%
33	1972	6,546	6,411	6,756	96.89%	94.89%	97.94%
34	1973	101,335	101,274	101,558	99.78%	99.72%	99.94%
35	1974	76,474	76,386	76,689	99.72%	99.60%	99.88%
36	1975	51,914	51,816	52,144	99.56%	99.37%	99.81%
37	1976	64,462	64,400	64,692	99.64%	99.55%	99.90%
38	1977	63,149	63,093	63,312	99.74%	99.65%	99.91%
39	1978	9,356	9,092	9,546	98.01%	95.24%	97.17%
40	1979	103,964	103,852	104,195	99.78%	99.67%	99.89%
41	1980	57,380	57,324	57,623	99.58%	99.48%	99.90%
42	1981	33,419	33,181	33,786	98.91%	98.21%	99.29%
43	1982	39,799	39,649	40,086	99.28%	98.91%	99.62%
44	1983	80,856	80,741	81,225	99.55%	99.40%	99.86%
45	1984	29,147	28,980	29,402	99.13%	98.56%	99.43%
46	1985	43,897	43,747	44,176	99.37%	99.03%	99.66%
47	1986	51,711	51,613	52,031	99.38%	99.20%	99.81%
48	1987	45,782	45,702	46,180	99.14%	98.96%	99.82%
49	1988	6,374	6,227	6,582	96.85%	94.61%	97.69%
50	1989	13,060	12,864	13,453	97.08%	95.62%	98.50%
51	1990	37,606	37,436	37,993	98.98%	98.53%	99.55%
52	1991	109,778	109,548	110,334	99.50%	99.29%	99.79%
53	1992	141,300	141,222	141,820	99.63%	99.58%	99.94%
54	1993	90,570	90,519	91,114	99.40%	99.35%	99.94%
55	1994	84,911	84,632	85,309	99.53%	99.21%	99.67%
56	1995	46,392	46,241	46,946	98.82%	98.50%	99.68%
57	1996	6,095	5,930	6,571	92.76%	90.25%	97.29%
58	1997	20,689	20,589	21,182	97.67%	97.20%	99.52%
59	1998	70,498	70,340	120,970	58.28%	58.15%	99.78%
60	1999	23,372	23,283	12,637	184.94%	184.24%	99.62%
61	2000	27,010	26,729	23,919	112.92%	111.75%	98.96%
62	2001	46,223	46,139	69,924	66.10%	65.98%	99.82%
63	2002	586	564	65,284	0.90%	0.86%	96.23%
64	2003	53,360	53,183	64,250	83.05%	82.77%	99.67%
65	2004	14,403	14,382	134,063	10.74%	10.73%	99.85%
66	2005	15,612	15,468	38,936	40.10%	39.73%	99.08%
67	2006	164,445	164,132	21,819	753.66%	752.23%	99.81%
68	2007	74,829	74,791	72,313	103.48%	103.43%	99.95%
69	2008	6,136	6,105	19,418	31.60%	31.44%	99.49%
70	2009	65,863	65,504	31,862	206.71%	205.59%	99.46%
71	2010	8,661	8,641	41,371	20.93%	20.89%	99.78%
72	2011	10,714	10,304	807	1328.47%	1277.58%	96.17%
73	2012	54,224	54,169	53,197	101.93%	101.83%	99.90%
74	2013	46,255	45,881	14,469	319.69%	317.11%	99.19%
75	2014	33,129	32,969	15,986	207.24%	206.23%	99.52%
76	2015	164,472	164,418	194,357	84.62%	84.60%	99.97%

	Mean	47,713	47,582	52,421	91.02%	90.77%	99.73%

Annual Flow Volume of Navasota River at Easterly (NAEA66)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	388,041	316,094	388,370	99.92%	81.39%	81.46%
2	1941	320,994	276,657	321,336	99.89%	86.10%	86.19%
3	1942	238,007	135,583	238,344	99.86%	56.89%	56.97%
4	1943	51,773	27,669	51,938	99.68%	53.27%	53.44%
5	1944	660,800	508,079	661,027	99.97%	76.86%	76.89%
6	1945	656,991	579,101	657,091	99.98%	88.13%	88.14%
7	1946	547,980	468,331	548,073	99.98%	85.45%	85.46%
8	1947	339,819	303,400	339,875	99.98%	89.27%	89.28%
9	1948	96,439	48,956	96,440	100.00%	50.76%	50.76%
10	1949	153,664	72,967	153,763	99.94%	47.45%	47.48%
11	1950	207,983	95,068	207,947	100.02%	45.72%	45.71%
12	1951	16,951	17,650	16,877	100.44%	104.58%	104.13%
13	1952	113,451	74,222	113,378	100.06%	65.46%	65.42%
14	1953	401,597	233,338	401,450	100.04%	58.12%	58.10%
15	1954	48,080	47,844	47,705	100.79%	100.29%	99.51%
16	1955	68,144	46,781	67,739	100.60%	69.06%	68.65%
17	1956	53,307	39,955	52,938	100.70%	75.48%	74.95%
18	1957	724,164	427,014	724,065	100.01%	58.97%	58.97%
19	1958	206,903	139,768	206,822	100.04%	67.58%	67.55%
20	1959	380,304	297,045	380,270	100.01%	78.11%	78.11%
21	1960	379,573	301,284	379,452	100.03%	79.40%	79.37%
22	1961	531,149	449,779	525,398	101.09%	85.61%	84.68%
23	1962	94,015	67,737	92,054	102.13%	73.58%	72.05%
24	1963	8,377	10,428	7,962	105.21%	130.96%	124.48%
25	1964	25,029	18,346	20,121	124.39%	91.18%	73.30%
26	1965	553,050	307,397	545,631	101.36%	56.34%	55.58%
27	1966	442,069	330,988	438,922	100.72%	75.41%	74.87%
28	1967	94,187	67,853	88,764	106.11%	76.44%	72.04%
29	1968	593,458	461,389	590,890	100.43%	78.08%	77.75%
30	1969	455,082	368,912	451,024	100.90%	81.79%	81.07%
31	1970	221,167	175,525	218,180	101.37%	80.45%	79.36%
32	1971	128,273	57,871	123,081	104.22%	47.02%	45.12%
33	1972	100,461	45,707	96,302	104.32%	47.46%	45.50%
34	1973	841,512	681,182	832,613	101.07%	81.81%	80.95%
35	1974	562,211	477,381	558,249	100.71%	85.51%	84.91%
36	1975	385,070	332,096	382,104	100.78%	86.91%	86.24%
37	1976	673,730	564,239	669,405	100.65%	84.29%	83.75%
38	1977	318,233	282,430	317,787	100.14%	88.87%	88.75%
39	1978	80,800	48,873	63,336	127.57%	77.16%	60.49%
40	1979	580,401	408,937	349,618	166.01%	116.97%	70.46%
41	1980	219,442	179,896	208,436	105.28%	86.31%	81.98%
42	1981	254,053	114,790	201,107	126.33%	57.08%	45.18%
43	1982	148,507	78,529	113,790	130.51%	69.01%	52.88%
44	1983	279,558	214,212	261,469	106.92%	81.93%	76.63%
45	1984	238,711	116,591	188,160	126.87%	61.96%	48.84%
46	1985	441,107	355,850	415,861	106.07%	85.57%	80.67%
47	1986	428,975	349,604	395,598	108.44%	88.37%	81.50%

48	1987	250,735	183,341	205,389	122.08%	89.27%	73.12%
49	1988	64,457	41,370	51,716	124.64%	79.99%	64.18%
50	1989	340,827	218,110	268,065	127.14%	81.36%	63.99%
51	1990	412,873	314,592	337,310	122.40%	93.26%	76.20%
52	1991	807,881	698,351	749,833	107.74%	93.13%	86.44%
53	1992	551,299	486,874	529,401	104.14%	91.97%	88.31%
54	1993	357,466	290,455	316,537	112.93%	91.76%	81.25%
55	1994	312,006	181,752	235,688	132.38%	77.12%	58.25%
56	1995	339,298	276,254	315,917	107.40%	87.44%	81.42%
57	1996	25,205	22,126	22,070	114.20%	100.25%	87.78%
58	1997	493,892	330,092	381,970	129.30%	86.42%	66.83%
59	1998	569,966	454,890	575,788	98.99%	79.00%	79.81%
60	1999	381,786	345,090	288,987	132.11%	119.41%	90.39%
61	2000	106,001	69,785	208,234	50.90%	33.51%	65.83%
62	2001	416,281	283,330	451,026	92.30%	62.82%	68.06%
63	2002	265,258	190,381	240,542	110.27%	79.15%	71.77%
64	2003	353,522	279,976	242,210	145.96%	115.59%	79.20%
65	2004	444,165	371,652	463,460	95.84%	80.19%	83.67%
66	2005	181,505	105,751	161,405	112.45%	65.52%	58.26%
67	2006	43,809	21,897	47,367	92.49%	46.23%	49.98%
68	2007	876,401	687,399	874,145	100.26%	78.64%	78.43%
69	2008	110,598	64,346	109,326	101.16%	58.86%	58.18%
70	2009	312,970	250,389	325,438	96.17%	76.94%	80.00%
71	2010	327,297	211,907	314,652	104.02%	67.35%	64.74%
72	2011	22,213	22,075	23,379	95.01%	94.42%	99.38%
73	2012	195,525	168,440	194,571	100.49%	86.57%	86.15%
74	2013	191,252	104,694	208,890	91.56%	50.12%	54.74%
75	2014	56,313	41,625	39,213	143.61%	106.15%	73.92%
76	2015	655,517	492,028	895,230	73.22%	54.96%	75.06%
	Mean	328,650	248,188	311,439	105.53%	79.69%	75.52%

Annual Flow Volume of Navasota River near Bryan (NABR67)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	476,513	389,361				81.71%
2	1941	394,180	335,444				85.10%
3	1942	292,271	177,955				60.89%
4	1943	63,577	29,313				46.11%
5	1944	811,462	636,957				78.50%
6	1945	806,786	705,792				87.48%
7	1946	672,922	574,170				85.32%
8	1947	417,298	365,744				87.65%
9	1948	118,427	60,775				51.32%
10	1949	188,698	96,164				50.96%
11	1950	255,404	130,674				51.16%
12	1951	33,425	24,332	32,651	102.37%	74.52%	72.80%
13	1952	130,573	80,639	125,812	103.78%	64.10%	61.76%
14	1953	526,257	340,233	523,227	100.58%	65.03%	64.65%
15	1954	75,844	62,537	74,607	101.66%	83.82%	82.45%
16	1955	137,143	100,957	134,116	102.26%	75.28%	73.61%
17	1956	68,728	51,177	66,198	103.82%	77.31%	74.46%
18	1957	881,390	561,610	878,368	100.34%	63.94%	63.72%

19	1958	303,626	218,016	301,987	100.54%	72.19%	71.80%
20	1959	519,822	413,939	518,742	100.21%	79.80%	79.63%
21	1960	588,097	482,518	586,603	100.25%	82.26%	82.05%
22	1961	707,400	600,407	700,104	101.04%	85.76%	84.88%
23	1962	149,220	109,212	146,428	101.91%	74.58%	73.19%
24	1963	29,720	21,083	28,703	103.54%	73.45%	70.94%
25	1964	50,211	31,978	44,114	113.82%	72.49%	63.69%
26	1965	638,327	375,747	627,382	101.74%	59.89%	58.86%
27	1966	562,025	430,908	556,928	100.92%	77.37%	76.67%
28	1967	102,124	67,555	94,276	108.32%	71.66%	66.15%
29	1968	709,265	557,911	705,301	100.56%	79.10%	78.66%
30	1969	627,046	518,238	621,603	100.88%	83.37%	82.65%
31	1970	272,855	209,186	268,861	101.49%	77.80%	76.67%
32	1971	167,584	88,888	160,191	104.62%	55.49%	53.04%
33	1972	142,961	72,420	136,849	104.47%	52.92%	50.66%
34	1973	1,075,946	885,097	1,072,464	100.32%	82.53%	82.26%
35	1974	775,638	662,396	770,091	100.72%	86.02%	85.40%
36	1975	497,018	424,986	492,885	100.84%	86.22%	85.51%
37	1976	770,126	641,606	764,308	100.76%	83.95%	83.31%
38	1977	412,558	359,433	410,510	100.50%	87.56%	87.12%
39	1978	111,245	67,760	91,412	121.70%	74.13%	60.91%
40	1979	896,871	685,288	666,839	134.50%	102.77%	76.41%
41	1980	307,423	251,164	295,609	104.00%	84.96%	81.70%
42	1981	368,399	209,376	303,081	121.55%	69.08%	56.83%
43	1982	220,496	137,692	176,112	125.20%	78.18%	62.45%
44	1983	481,001	386,114	450,050	106.88%	85.79%	80.27%
45	1984	416,170	269,935	352,325	118.12%	76.62%	64.86%
46	1985	629,197	517,868	593,187	106.07%	87.30%	82.31%
47	1986	545,354	446,989	504,655	108.06%	88.57%	81.96%
48	1987	401,633	312,884	346,503	115.91%	90.30%	77.90%
49	1988	79,150	44,763	60,623	130.56%	73.84%	56.55%
50	1989	363,081	232,137	272,953	133.02%	85.05%	63.94%
51	1990	402,135	292,555	313,581	128.24%	93.29%	72.75%
52	1991	1,026,011	886,250	959,951	106.88%	92.32%	86.38%
53	1992	756,136	664,899	720,986	104.88%	92.22%	87.93%
54	1993	528,487	435,189	478,582	110.43%	90.93%	82.35%
55	1994	396,247	250,246	285,687	138.70%	87.59%	63.15%
56	1995	416,658	339,022	302,834	137.59%	111.95%	81.37%
57	1996	30,952	19,939				64.42%
58	1997	606,499	425,359				70.13%
59	1998	869,495	704,259				81.00%
60	1999	197,536	149,290				75.58%
61	2000	578,898	499,190				86.23%
62	2001	533,521	376,957				70.65%
63	2002	486,041	385,311				79.28%
64	2003	284,175	193,046				67.93%
65	2004	1,016,428	917,749				90.29%
66	2005	129,197	38,912				30.12%
67	2006	195,540	144,313				73.80%
68	2007	1,077,441	875,413				81.25%
69	2008	220,505	131,027				59.42%
70	2009	729,568	626,895				85.93%
71	2010	141,379	31,445				22.24%
72	2011	202,499	155,350				76.72%
73	2012	367,008	310,888				84.71%
74	2013	621,844	528,623				85.01%

75	2014	178,024	106,139				59.62%
76	2015	1,396,840	1,206,890				86.40%
	Mean	438,292	339,047	391,702	111.89%	86.56%	77.36%

Annual Flow Volume of Brazos River near Hempstead (BRHE68)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	7,170,241	5,952,794	7,154,829	100.22%	83.20%	83.02%
2	1941	12,064,169	10,881,221	11,435,504	105.50%	95.15%	90.19%
3	1942	8,083,873	6,815,851	7,985,306	101.23%	85.35%	84.31%
4	1943	1,751,645	1,498,728	1,961,925	89.28%	76.39%	85.56%
5	1944	8,375,878	7,038,409	8,229,211	101.78%	85.53%	84.03%
6	1945	9,637,853	8,028,372	9,435,213	102.15%	85.09%	83.30%
7	1946	7,817,139	6,663,699	7,753,676	100.82%	85.94%	85.24%
8	1947	4,570,363	3,762,355	4,596,597	99.43%	81.85%	82.32%
9	1948	1,667,179	1,251,507	1,620,569	102.88%	77.23%	75.07%
10	1949	4,142,030	3,173,030	4,037,508	102.59%	78.59%	76.61%
11	1950	3,662,541	2,849,204	3,541,460	103.42%	80.45%	77.79%
12	1951	927,895	732,931	953,548	97.31%	76.86%	78.99%
13	1952	1,459,278	1,259,847	1,410,526	103.46%	89.32%	86.33%
14	1953	4,230,388	3,315,698	3,529,698	119.85%	93.94%	78.38%
15	1954	1,180,487	871,756	1,150,130	102.64%	75.80%	73.85%
16	1955	2,712,318	1,925,916	2,269,101	119.53%	84.88%	71.01%
17	1956	896,823	794,806	1,077,828	83.21%	73.74%	88.62%
18	1957	13,741,597	10,019,817	13,214,059	103.99%	75.83%	72.92%
19	1958	5,430,431	4,742,105	5,438,997	99.84%	87.19%	87.32%
20	1959	5,199,537	4,094,314	4,995,067	104.09%	81.97%	78.74%
21	1960	6,179,028	5,164,944	6,082,749	101.58%	84.91%	83.59%
22	1961	8,418,180	7,040,124	8,346,308	100.86%	84.35%	83.63%
23	1962	3,006,563	2,252,972	2,825,990	106.39%	79.72%	74.94%
24	1963	1,401,564	1,243,672	1,374,498	101.97%	90.48%	88.73%
25	1964	1,914,937	1,427,662	1,633,761	117.21%	87.38%	74.55%
26	1965	7,852,680	5,950,963	7,424,004	105.77%	80.16%	75.78%
27	1966	5,649,585	4,420,549	5,400,714	104.61%	81.85%	78.25%
28	1967	1,598,261	1,322,273	1,397,954	114.33%	94.59%	82.73%
29	1968	10,027,579	8,113,046	9,461,296	105.99%	85.75%	80.91%
30	1969	5,656,397	4,443,073	5,151,168	109.81%	86.25%	78.55%
31	1970	4,547,380	3,719,570	4,394,749	103.47%	84.64%	81.80%
32	1971	2,789,692	2,028,660	2,042,711	136.57%	99.31%	72.72%
33	1972	2,237,221	1,560,090	1,888,685	118.45%	82.60%	69.73%
34	1973	7,788,791	6,294,987	7,438,457	104.71%	84.63%	80.82%
35	1974	6,439,932	5,131,107	5,771,996	111.57%	88.90%	79.68%
36	1975	6,280,926	5,295,483	6,365,252	98.68%	83.19%	84.31%
37	1976	5,635,648	4,626,633	5,248,416	107.38%	88.15%	82.10%
38	1977	5,798,092	5,101,796	5,770,632	100.48%	88.41%	87.99%
39	1978	1,680,847	1,388,859	1,214,670	138.38%	114.34%	82.63%
40	1979	7,763,266	6,167,281	7,138,897	108.75%	86.39%	79.44%
41	1980	3,088,001	2,410,021	2,550,988	121.05%	94.47%	78.04%
42	1981	5,483,805	3,936,229	4,919,439	111.47%	80.01%	71.78%
43	1982	3,917,720	2,830,232	3,792,456	103.30%	74.63%	72.24%
44	1983	3,397,673	2,926,105	3,135,166	108.37%	93.33%	86.12%
45	1984	2,788,740	2,233,620	2,315,748	120.43%	96.45%	80.09%

46	1985	5,126,399	3,945,696	4,490,162	114.17%	87.87%	76.97%
47	1986	6,473,233	4,759,643	5,899,002	109.73%	80.69%	73.53%
48	1987	6,630,168	5,433,361	6,802,917	97.46%	79.87%	81.95%
49	1988	1,186,138	1,020,991	1,123,799	105.55%	90.85%	86.08%
50	1989	4,485,308	3,132,166	3,682,774	121.79%	85.05%	69.83%
51	1990	6,402,781	4,824,842	5,858,722	109.29%	82.35%	75.36%
52	1991	10,343,511	7,607,673	7,788,675	132.80%	97.68%	73.55%
53	1992	14,828,370	14,803,151	16,708,958	88.75%	88.59%	99.83%
54	1993	6,240,506	5,449,920	6,046,096	103.22%	90.14%	87.33%
55	1994	5,044,976	3,914,343	4,312,431	116.99%	90.77%	77.59%
56	1995	5,765,771	4,594,796	5,723,633	100.74%	80.28%	79.69%
57	1996	2,171,280	1,496,613	1,670,202	130.00%	89.61%	68.93%
58	1997	10,056,076	8,564,681	9,701,300	103.66%	88.28%	85.17%
59	1998	5,400,478	4,771,577	7,783,270	69.39%	61.31%	88.35%
60	1999	2,386,328	1,879,366	2,017,006	118.31%	93.18%	78.76%
61	2000	6,346,267	5,248,162	1,968,159	322.45%	266.65%	82.70%
62	2001	4,796,705	3,877,609	7,246,991	66.19%	53.51%	80.84%
63	2002	5,103,957	4,063,504	4,491,196	113.64%	90.48%	79.61%
64	2003	2,968,155	2,405,556	3,942,321	75.29%	61.02%	81.05%
65	2004	11,507,956	9,415,350	9,922,312	115.98%	94.89%	81.82%
66	2005	2,939,919	2,818,333	4,646,706	63.27%	60.65%	95.86%
67	2006	2,734,505	2,292,819	1,214,126	225.22%	188.85%	83.85%
68	2007	12,631,805	10,277,864	14,052,787	89.89%	73.14%	81.36%
69	2008	2,419,270	2,016,101	1,901,708	127.22%	106.02%	83.34%
70	2009	6,584,995	5,478,070	3,460,731	190.28%	158.29%	83.19%
71	2010	5,014,783	4,048,690	5,978,315	83.88%	67.72%	80.74%
72	2011	1,461,023	1,167,295	627,463	232.85%	186.03%	79.90%
73	2012	4,033,928	3,286,430	2,974,140	135.63%	110.50%	81.47%
74	2013	3,807,558	2,946,505	1,663,252	228.92%	177.15%	77.39%
75	2014	3,202,887	2,551,499	1,114,391	287.41%	228.96%	79.66%
76	2015	15,257,722	12,575,268	12,015,304	126.99%	104.66%	82.42%
	Mean	5,406,394	4,401,475	5,176,044	104.45%	85.04%	81.41%

Annual Flow Volume of Brazos River near Richmond (BRRI70)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	7,841,680	6,404,821	7,782,155	100.76%	82.30%	81.68%
2	1941	13,684,805	12,258,071	12,987,153	105.37%	94.39%	89.57%
3	1942	8,469,721	6,972,548	8,300,985	102.03%	84.00%	82.32%
4	1943	2,011,176	1,521,412	2,103,497	95.61%	72.33%	75.65%
5	1944	8,834,957	7,267,353	8,622,290	102.47%	84.29%	82.26%
6	1945	9,991,619	8,156,918	9,673,339	103.29%	84.32%	81.64%
7	1946	8,366,899	6,993,290	8,229,489	101.67%	84.98%	83.58%
8	1947	4,863,707	3,813,024	4,778,003	101.79%	79.80%	78.40%
9	1948	1,859,931	1,250,039	1,696,897	109.61%	73.67%	67.21%
10	1949	4,243,071	2,996,189	4,025,588	105.40%	74.43%	70.61%
11	1950	3,908,155	2,873,776	3,669,015	106.52%	78.33%	73.53%
12	1951	986,470	624,276	891,604	110.64%	70.02%	63.28%
13	1952	1,628,778	1,106,663	1,472,791	110.59%	75.14%	67.94%
14	1953	4,456,996	3,272,252	3,667,508	121.53%	89.22%	73.42%
15	1954	1,281,563	794,699	1,123,387	114.08%	70.74%	62.01%
16	1955	2,755,168	1,674,357	2,236,601	123.19%	74.86%	60.77%

17	1956	883,332	623,084	960,083	92.01%	64.90%	70.54%
18	1957	14,772,683	10,777,381	14,219,646	103.89%	75.79%	72.95%
19	1958	5,827,879	4,897,931	5,747,274	101.40%	85.22%	84.04%
20	1959	5,721,406	4,397,265	5,458,850	104.81%	80.55%	76.86%
21	1960	7,041,316	5,795,769	6,865,266	102.56%	84.42%	82.31%
22	1961	9,854,993	8,241,141	9,676,998	101.84%	85.16%	83.62%
23	1962	3,235,419	2,244,510	2,946,686	109.80%	76.17%	69.37%
24	1963	1,504,835	1,144,079	1,343,512	112.01%	85.16%	76.03%
25	1964	2,032,605	1,250,476	1,660,165	122.43%	75.32%	61.52%
26	1965	8,379,349	6,262,289	7,862,321	106.58%	79.65%	74.73%
27	1966	6,148,245	4,699,605	5,820,764	105.63%	80.74%	76.44%
28	1967	1,701,876	1,169,145	1,383,188	123.04%	84.53%	68.70%
29	1968	10,657,393	8,536,968	10,010,916	106.46%	85.28%	80.10%
30	1969	6,103,360	4,662,300	5,523,773	110.49%	84.40%	76.39%
31	1970	4,936,341	3,873,433	4,709,603	104.81%	82.25%	78.47%
32	1971	2,879,222	1,887,798	2,080,982	138.36%	90.72%	65.57%
33	1972	2,786,808	1,862,682	2,363,709	117.90%	78.80%	66.84%
34	1973	8,969,173	7,256,618	8,570,281	104.65%	84.67%	80.91%
35	1974	7,362,953	5,826,993	6,603,485	111.50%	88.24%	79.14%
36	1975	7,078,170	5,850,014	7,078,691	99.99%	82.64%	82.65%
37	1976	6,143,274	4,904,867	5,705,970	107.66%	85.96%	79.84%
38	1977	6,280,123	5,349,240	6,160,313	101.94%	86.83%	85.18%
39	1978	2,087,555	1,567,198	1,523,224	137.05%	102.89%	75.07%
40	1979	9,061,563	7,213,234	8,387,266	108.04%	86.00%	79.60%
41	1980	3,552,621	2,672,251	2,907,239	122.20%	91.92%	75.22%
42	1981	6,053,657	4,239,013	5,405,729	111.99%	78.42%	70.02%
43	1982	4,348,172	3,023,907	4,135,238	105.15%	73.13%	69.54%
44	1983	4,084,160	3,367,070	3,769,929	108.34%	89.31%	82.44%
45	1984	2,990,548	2,193,082	2,420,863	123.53%	90.59%	73.33%
46	1985	5,758,660	4,342,643	5,043,192	114.19%	86.11%	75.41%
47	1986	7,138,265	5,210,367	6,507,600	109.69%	80.07%	72.99%
48	1987	7,814,200	6,369,975	7,883,959	99.12%	80.80%	81.52%
49	1988	1,442,051	1,072,655	1,257,869	114.64%	85.28%	74.38%
50	1989	4,873,756	3,262,292	4,004,423	121.71%	81.47%	66.94%
51	1990	6,334,270	4,508,637	5,703,305	111.06%	79.05%	71.18%
52	1991	10,498,568	7,602,741	8,034,413	130.67%	94.63%	72.42%
53	1992	15,849,416	15,539,764	17,448,678	90.83%	89.06%	98.05%
54	1993	7,076,105	6,041,302	6,759,332	104.69%	89.38%	85.38%
55	1994	5,605,638	4,251,309	4,805,786	116.64%	88.46%	75.84%
56	1995	6,481,162	5,062,212	6,317,885	102.58%	80.13%	78.11%
57	1996	2,403,022	1,490,397	1,838,575	130.70%	81.06%	62.02%
58	1997	10,374,194	8,666,285	9,984,654	103.90%	86.80%	83.54%
59	1998	7,775,101	6,877,607	8,472,976	91.76%	81.17%	88.46%
60	1999	2,237,476	1,496,225	2,214,149	101.05%	67.58%	66.87%
61	2000	7,438,685	6,096,703	1,985,576	374.64%	307.05%	81.96%
62	2001	5,562,214	4,412,646	7,482,591	74.34%	58.97%	79.33%
63	2002	6,336,855	5,067,933	5,015,437	126.35%	101.05%	79.98%
64	2003	3,367,961	2,576,365	4,036,197	83.44%	63.83%	76.50%
65	2004	12,914,864	10,609,135	10,151,107	127.23%	104.51%	82.15%
66	2005	3,191,468	2,850,884	4,889,943	65.27%	58.30%	89.33%
67	2006	3,370,960	2,668,500	1,227,467	274.63%	217.40%	79.16%
68	2007	12,593,056	10,055,269	15,256,651	82.54%	65.91%	79.85%
69	2008	2,449,476	1,820,543	2,122,956	115.38%	85.76%	74.32%
70	2009	7,078,569	5,740,537	3,577,441	197.87%	160.46%	81.10%
71	2010	4,680,697	3,489,759	6,079,821	76.99%	57.40%	74.56%
72	2011	1,566,154	1,031,678	521,972	300.05%	197.65%	65.87%

73	2012	5,146,948	4,172,705	3,172,060	162.26%	131.55%	81.07%
74	2013	4,946,795	3,821,939	1,784,825	277.16%	214.14%	77.26%
75	2014	3,788,743	2,902,972	1,357,531	279.09%	213.84%	76.62%
76	2015	17,698,326	14,805,789	13,118,610	134.91%	112.86%	83.66%
	Mean	5,942,672	4,704,425	5,571,824	106.66%	84.43%	79.16%

Annual Flow Volume of Brazos River near Rosharon (BRRO72)

	Year	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Observed Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	8,123,976	6,307,747				77.64%
2	1941	14,177,457	12,314,721				86.86%
3	1942	8,774,630	6,857,790				78.15%
4	1943	2,083,577	1,186,097				56.93%
5	1944	9,153,012	7,185,276				78.50%
6	1945	10,351,318	8,091,335				78.17%
7	1946	8,668,107	6,876,578				79.33%
8	1947	5,038,799	3,573,919				70.93%
9	1948	1,926,890	976,380				50.67%
10	1949	4,395,820	2,756,279				62.70%
11	1950	4,048,847	2,619,527				64.70%
12	1951	1,021,983	373,936				36.59%
13	1952	1,687,413	890,607				52.78%
14	1953	4,617,448	3,093,108				66.99%
15	1954	1,327,700	565,330				42.58%
16	1955	2,854,354	1,404,231				49.20%
17	1956	915,134	410,814				44.89%
18	1957	15,304,504	10,933,142				71.44%
19	1958	6,037,684	4,688,119				77.65%
20	1959	5,927,377	4,200,327				70.86%
21	1960	7,294,802	5,645,682				77.39%
22	1961	10,209,773	8,175,925				80.08%
23	1962	3,351,894	1,958,213				58.42%
24	1963	1,559,009	843,274				54.09%
25	1964	2,105,779	980,356				46.56%
26	1965	8,681,006	6,161,255				70.97%
27	1966	6,369,583	4,507,556				70.77%
28	1967	1,712,262	820,973	939,185	182.31%	87.41%	47.95%
29	1968	11,228,136	8,680,960	10,383,074	108.14%	83.61%	77.31%
30	1969	6,602,309	4,744,926	5,828,981	113.27%	81.40%	71.87%
31	1970	5,439,859	3,946,380	5,025,896	108.24%	78.52%	72.55%
32	1971	3,050,992	1,700,680	1,995,580	152.89%	85.22%	55.74%
33	1972	2,844,682	1,531,612	2,268,276	125.41%	67.52%	53.84%
34	1973	9,712,324	7,576,618	9,139,162	106.27%	82.90%	78.01%
35	1974	7,463,210	5,547,582	6,511,520	114.62%	85.20%	74.33%
36	1975	7,309,822	5,653,284	7,141,587	102.36%	79.16%	77.34%
37	1976	6,248,985	4,593,088	5,650,889	110.58%	81.28%	73.50%
38	1977	6,200,382	4,852,515	5,911,833	104.88%	82.08%	78.26%
39	1978	2,145,993	1,279,547	1,288,600	166.54%	99.30%	59.62%
40	1979	9,310,110	7,045,848	8,459,363	110.06%	83.29%	75.68%
41	1980	3,638,085	2,397,821	2,577,947	141.12%	93.01%	65.91%
42	1981	6,271,590	4,053,869				64.64%
43	1982	4,504,705	2,777,002				61.65%

44	1983	4,231,191	3,100,406				73.28%
45	1984	3,251,548	2,125,640	2,066,073	157.38%	102.88%	65.37%
46	1985	6,241,865	4,444,575	5,338,405	116.92%	83.26%	71.21%
47	1986	7,255,669	4,928,554	6,453,283	112.43%	76.37%	67.93%
48	1987	7,600,343	5,736,974	7,494,321	101.41%	76.55%	75.48%
49	1988	1,568,642	817,293	1,089,035	144.04%	75.05%	52.10%
50	1989	5,013,086	3,005,779	3,973,160	126.17%	75.65%	59.96%
51	1990	6,397,127	4,164,430	5,630,226	113.62%	73.97%	65.10%
52	1991	10,461,538	7,197,419	7,764,397	134.74%	92.70%	68.80%
53	1992	18,089,256	17,289,308	19,591,240	92.33%	88.25%	95.58%
54	1993	7,512,918	6,044,906	7,056,417	106.47%	85.67%	80.46%
55	1994	6,167,636	4,403,974	5,168,089	119.34%	85.21%	71.40%
56	1995	7,400,930	5,534,280	7,085,336	104.45%	78.11%	74.78%
57	1996	2,441,800	1,173,913	1,715,322	142.35%	68.44%	48.08%
58	1997	11,187,262	9,048,854	10,641,918	105.12%	85.03%	80.89%
59	1998	8,050,618	6,809,430	9,198,371	87.52%	74.03%	84.58%
60	1999	2,387,199	1,295,776	2,118,091	112.71%	61.18%	54.28%
61	2000	7,663,003	5,978,795	1,798,810	426.00%	332.37%	78.02%
62	2001	5,719,916	4,175,449	7,439,879	76.88%	56.12%	73.00%
63	2002	6,263,318	4,639,556	5,054,212	123.92%	91.80%	74.08%
64	2003	3,620,082	2,456,676	4,206,038	86.07%	58.41%	67.86%
65	2004	14,446,181	11,711,362	10,739,826	134.51%	109.05%	81.07%
66	2005	3,064,547	2,359,990	4,721,516	64.91%	49.98%	77.01%
67	2006	3,541,313	2,477,755	1,547,736	228.81%	160.09%	69.97%
68	2007	12,827,600	9,874,665	15,057,441	85.19%	65.58%	76.98%
69	2008	2,506,220	1,499,739	2,320,419	108.01%	64.63%	59.84%
70	2009	7,788,677	6,109,611	3,618,621	215.24%	168.84%	78.44%
71	2010	4,317,840	2,760,180	6,112,392	70.64%	45.16%	63.93%
72	2011	1,449,073	673,017	461,472	314.01%	145.84%	46.44%
73	2012	5,120,586	3,760,443	3,323,171	154.09%	113.16%	73.44%
74	2013	4,958,841	3,476,177	1,778,517	278.82%	195.45%	70.10%
75	2014	4,475,980	3,224,939	1,440,460	310.73%	223.88%	72.05%
76	2015	18,450,670	15,168,790	13,680,668	134.87%	110.88%	82.21%
	Mean	6,207,293	4,582,000	5,513,928	112.57%	83.10%	73.82%

Annual Flow Volume of Big Sandy Creek near Bridgeport (8BSBR)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	79,062	79,281	72,142	100.28%	91.25%	91.00%
2	1941	265,749	265,746	255,549	100.00%	96.16%	96.16%
3	1942	168,508	168,511	160,450	100.00%	95.22%	95.22%
4	1943	50,417	50,417	48,210	100.00%	95.62%	95.62%
5	1944	41,260	41,376	40,546	100.28%	98.27%	97.99%
6	1945	141,384	141,387	127,733	100.00%	90.34%	90.34%
7	1946	108,808	108,809	98,446	100.00%	90.48%	90.48%
8	1947	41,127	41,125	38,425	100.00%	93.43%	93.43%
9	1948	12,329	12,365	12,020	100.29%	97.49%	97.21%
10	1949	39,372	39,375	38,727	100.01%	98.36%	98.35%
11	1950	94,017	94,017	89,184	100.00%	94.86%	94.86%
12	1951	34,564	34,564	33,677	100.00%	97.44%	97.43%
13	1952	6,834	6,854	6,481	100.30%	94.83%	94.55%
14	1953	8,819	8,820	8,598	100.01%	97.50%	97.49%
15	1954	6,258	6,257	5,532	99.99%	88.41%	88.42%
16	1955	4,390	4,388	4,251	99.96%	96.84%	96.88%
17	1956	2,944	7,374	6,833	250.50%	232.12%	92.66%
18	1957	176,941	190,110	169,192	107.44%	95.62%	89.00%
19	1958	46,165	46,627	35,312	101.00%	76.49%	75.73%
20	1959	95,995	100,220	96,262	104.40%	100.28%	96.05%
21	1960	26,418	27,015	25,838	102.26%	97.81%	95.64%
22	1961	21,120	23,738	21,277	112.39%	100.74%	89.63%
23	1962	71,854	73,458	70,701	102.23%	98.40%	96.25%
24	1963	19,520	19,424	19,146	99.51%	98.09%	98.57%
25	1964	29,550	35,568	29,252	120.37%	98.99%	82.24%
26	1965	24,658	25,490	24,888	103.37%	100.93%	97.64%
27	1966	46,894	51,695	51,012	110.24%	108.78%	98.68%
28	1967	17,226	19,568	19,133	113.60%	111.07%	97.78%
29	1968	47,249	51,743	51,005	109.51%	107.95%	98.57%
30	1969	70,925	74,284	69,989	104.74%	98.68%	94.22%
31	1970	26,121	27,514	26,872	105.33%	102.88%	97.67%
32	1971	25,761	29,204	27,514	113.37%	106.81%	94.21%
33	1972	17,638	22,268	21,828	126.25%	123.76%	98.02%
34	1973	58,787	66,419	63,120	112.98%	107.37%	95.03%
35	1974	38,285	38,070	37,754	99.44%	98.61%	99.17%
36	1975	50,637	53,954	51,397	106.55%	101.50%	95.26%
37	1976	25,857	32,734	29,781	126.59%	115.18%	90.98%
38	1977	47,962	50,128	49,417	104.52%	103.03%	98.58%
39	1978	7,754	8,850	8,515	114.14%	109.82%	96.21%
40	1979	30,605	36,388	33,181	118.90%	108.42%	91.19%
41	1980	2,879	3,569	3,490	123.97%	121.22%	97.78%
42	1981	144,559	157,661	150,252	109.06%	103.94%	95.30%
43	1982	106,741	107,533	83,942	100.74%	78.64%	78.06%
44	1983	5,948	7,787	7,195	130.93%	120.98%	92.40%
45	1984	4,645	25,315	20,974	544.99%	451.54%	82.85%
46	1985	53,731	59,872	54,849	111.43%	102.08%	91.61%
47	1986	83,055	87,436	83,793	105.27%	100.89%	95.83%
48	1987	93,606	98,084	85,332	104.78%	91.16%	87.00%
49	1988	6,903	9,327	8,699	135.12%	126.02%	93.26%
50	1989	163,163	170,095	145,264	104.25%	89.03%	85.40%
51	1990	172,824	176,743	167,971	102.27%	97.19%	95.04%

52	1991	70,960	81,878	69,496	115.39%	97.94%	84.88%
53	1992	98,157	95,742	91,241	97.54%	92.95%	95.30%
54	1993	85,653	95,954	87,497	112.03%	102.15%	91.19%
55	1994	38,615	42,350	39,341	109.67%	101.88%	92.90%
56	1995	63,124	48,752	40,341	77.23%	63.91%	82.75%
57	1996		11,591	10,763			92.86%
58	1997		47,534	39,283			82.64%
59	1998		33,133	28,932			87.32%
60	1999		2,906	2,833			97.49%
61	2000		6,763	6,422			94.96%
62	2001		61,519	55,083			89.54%
63	2002		24,025	23,107			96.18%
64	2003		9,009	8,539			94.78%
65	2004	44,844	37,702	35,593	84.07%	79.37%	94.41%
66	2005	7,251	7,250	6,845	99.99%	94.41%	94.42%
67	2006	4,394	4,394	4,002	100.00%	91.08%	91.07%
68	2007	52,097	52,098	48,681	100.00%	93.44%	93.44%
69	2008	21,472	21,533	20,886	100.29%	97.27%	97.00%
70	2009	6,748	6,750	6,658	100.02%	98.65%	98.63%
71	2010	51,961	51,961	50,620	100.00%	97.42%	97.42%
72	2011	2,711	2,712	2,580	100.04%	95.19%	95.15%
73	2012	10,525	10,555	10,469	100.28%	99.47%	99.19%
74	2013	547	547	533	99.95%	97.45%	97.50%
75	2014	6,896	6,895	6,893	99.98%	99.95%	99.97%
76	2015	324,081	324,083	298,261	100.00%	92.03%	92.03%
	Mean	56,733	55,345	51,130	97.55%	90.12%	92.38%

Annual Flow Volume of Clear Fork Trinity River at Fort Worth (8 CTFW)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	66,243	68,626	40,811	103.60%	61.61%	59.47%
2	1941	162,248	162,392	147,381	100.09%	90.84%	90.76%
3	1942	235,942	235,969	198,830	100.01%	84.27%	84.26%
4	1943	50,851	50,871	38,343	100.04%	75.40%	75.37%
5	1944	62,969	63,185	40,069	100.34%	63.63%	63.41%
6	1945	230,319	230,375	190,506	100.02%	82.71%	82.69%
7	1946	101,519	101,562	66,964	100.04%	65.96%	65.93%
8	1947	61,439	61,525	44,984	100.14%	73.22%	73.11%
9	1948	77,170	77,471	54,631	100.39%	70.79%	70.52%
10	1949	221,689	221,720	172,772	100.01%	77.93%	77.92%
11	1950	148,924	148,946	118,961	100.01%	79.88%	79.87%
12	1951	24,503	24,510	16,047	100.03%	65.49%	65.47%
13	1952	15,474	16,602	13,990	107.29%	90.41%	84.27%
14	1953	7,074	17,339	13,074	245.12%	184.83%	75.40%
15	1954	1,869	3,928	6,037	210.12%	322.93%	153.69%
16	1955	4,780	17,669	13,924	369.68%	291.32%	78.80%
17	1956	6,012	12,886	10,484	214.32%	174.36%	81.36%
18	1957	230,971	332,094	211,523	143.78%	91.58%	63.69%
19	1958	97,870	101,780	88,216	103.99%	90.14%	86.67%
20	1959	39,879	56,544	32,397	141.79%	81.24%	57.30%
21	1960	53,344	53,772	44,472	100.80%	83.37%	82.70%
22	1961	32,637	40,854	27,506	125.18%	84.28%	67.33%

23	1962	33,398	55,783	28,372	167.02%	84.95%	50.86%
24	1963	21,932	21,598	14,340	98.48%	65.38%	66.39%
25	1964	25,916	47,495	32,611	183.26%	125.83%	68.66%
26	1965	105,088	115,194	83,956	109.62%	79.89%	72.88%
27	1966	111,890	130,352	104,752	116.50%	93.62%	80.36%
28	1967	11,357	17,201	15,514	151.46%	136.61%	90.19%
29	1968	116,632	131,720	96,812	112.94%	83.01%	73.50%
30	1969	93,014	112,903	78,083	121.38%	83.95%	69.16%
31	1970	132,276	129,803	114,199	98.13%	86.33%	87.98%
32	1971	61,264	87,475	42,423	142.78%	69.25%	48.50%
33	1972	30,792	28,910	37,676	93.89%	122.36%	130.32%
34	1973	106,778	128,378	95,402	120.23%	89.35%	74.31%
35	1974	111,245	125,458	93,296	112.78%	83.87%	74.36%
36	1975	180,571	182,724	168,757	101.19%	93.46%	92.36%
37	1976	39,696	66,090	44,688	166.49%	112.58%	67.62%
38	1977	119,434	123,756	110,121	103.62%	92.20%	88.98%
39	1978	6,708	23,347	20,333	348.03%	303.10%	87.09%
40	1979	136,715	171,654	122,667	125.56%	89.72%	71.46%
41	1980	37,101	47,056	33,863	126.83%	91.27%	71.96%
42	1981	104,228	142,055	105,214	136.29%	100.95%	74.07%
43	1982	151,605	160,044	134,276	105.57%	88.57%	83.90%
44	1983	19,276	29,973	21,088	155.49%	109.40%	70.36%
45	1984	20,476	33,232	24,617	162.30%	120.22%	74.08%
46	1985	58,775	96,118	61,626	163.53%	104.85%	64.12%
47	1986	78,450	110,727	79,310	141.14%	101.10%	71.63%
48	1987	112,648	117,084	95,416	103.94%	84.70%	81.49%
49	1988	21,031	21,199	18,943	100.80%	90.07%	89.36%
50	1989	298,598	345,818	291,056	115.81%	97.47%	84.16%
51	1990	353,736	363,426	336,366	102.74%	95.09%	92.55%
52	1991	223,328	338,698	230,505	151.66%	103.21%	68.06%
53	1992	311,936	232,905	287,832	74.66%	92.27%	123.58%
54	1993	154,076	175,607	144,269	113.97%	93.63%	82.15%
55	1994	114,471	130,229	106,732	113.77%	93.24%	81.96%
56	1995	155,579	165,306	151,774	106.25%	97.55%	91.81%
57	1996	65,180	85,894	61,354	131.78%	94.13%	71.43%
58	1997	263,191	266,176	241,097	101.13%	91.61%	90.58%
59	1998	160,153	166,972	155,411	104.26%	97.04%	93.08%
60	1999	27,539	54,157	36,860	196.66%	133.85%	68.06%
61	2000	49,298	113,495	76,233	230.22%	154.64%	67.17%
62	2001	145,631	204,905	178,964	140.70%	122.89%	87.34%
63	2002	104,866	163,213	137,072	155.64%	130.71%	83.98%
64	2003	44,308	58,166	48,974	131.28%	110.53%	84.20%
65	2004	161,559	219,231	192,391	135.70%	119.08%	87.76%
66	2005	31,420	74,560	62,671	237.30%	199.46%	84.05%
67	2006	37,244	52,076	32,556	139.82%	87.41%	62.52%
68	2007	195,847	272,180	234,903	138.98%	119.94%	86.30%
69	2008	71,347	107,752	94,964	151.02%	133.10%	88.13%
70	2009	96,234	156,804	147,327	162.94%	153.09%	93.96%
71	2010	130,639	111,785	84,780	85.57%	64.90%	75.84%
72	2011	24,915	24,457	24,581	98.16%	98.66%	100.50%
73	2012	83,600	171,642	143,155	205.31%	171.24%	83.40%
74	2013	26,592	44,144	37,487	166.00%	140.97%	84.92%
75	2014	15,949	40,159	39,101	251.79%	245.15%	97.37%
76	2015	233,124	634,208	508,502	272.05%	218.12%	80.18%
	Mean	99,505	122,788	99,437	123.40%	99.93%	80.98%

Annual Flow Volume of Tehuacana Creek near Streetman (8 TEST)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940		75,697	75,674			99.97%
2	1941		112,661	112,635			99.98%
3	1942		95,017	94,983			99.96%
4	1943		54,649	54,627			99.96%
5	1944		108,199	108,170			99.97%
6	1945		156,927	156,888			99.98%
7	1946		89,922	89,897			99.97%
8	1947		61,483	61,463			99.97%
9	1948		46,495	46,479			99.96%
10	1949		12,594	12,589			99.96%
11	1950		30,541	30,527			99.95%
12	1951		8,794	8,791			99.96%
13	1952		29,326	29,320			99.98%
14	1953		69,059	69,037			99.97%
15	1954		7,830	7,828			99.97%
16	1955		9,837	9,835			99.98%
17	1956		21,419	21,413			99.97%
18	1957		158,196	158,162			99.98%
19	1958		61,848	61,838			99.98%
20	1959		82,447	82,414			99.96%
21	1960		66,487	66,463			99.96%
22	1961		114,955	114,929			99.98%
23	1962		29,106	29,098			99.97%
24	1963		5,070	5,069			99.98%
25	1964		868	868			99.96%
26	1965		56,976	56,956			99.96%
27	1966		79,903	79,883			99.97%
28	1967		74,097	74,076			99.97%
29	1968	192,829	102,993	102,974	53.41%	53.40%	99.98%
30	1969	65,560	65,569	65,547	100.01%	99.98%	99.97%
31	1970	18,804	18,809	18,801	100.03%	99.99%	99.96%
32	1971	38,217	38,220	38,205	100.01%	99.97%	99.96%
33	1972	22,831	22,900	22,895	100.30%	100.28%	99.98%
34	1973	92,747	92,747	92,709	100.00%	99.96%	99.96%
35	1974	88,820	88,822	88,796	100.00%	99.97%	99.97%
36	1975	49,258	49,258	49,248	100.00%	99.98%	99.98%
37	1976	107,404	107,696	107,660	100.27%	100.24%	99.97%
38	1977	48,299	48,303	48,287	100.01%	99.97%	99.97%
39	1978	15,039	15,035	15,032	99.98%	99.95%	99.98%
40	1979	74,079	74,080	74,053	100.00%	99.96%	99.96%
41	1980	38,142	38,246	38,229	100.27%	100.23%	99.95%
42	1981	34,744	34,745	34,729	100.00%	99.96%	99.95%
43	1982	42,524	42,525	42,506	100.00%	99.96%	99.96%
44	1983	30,510	30,510	30,497	100.00%	99.96%	99.96%
45	1984	25,022	25,094	25,082	100.29%	100.24%	99.95%
46	1985	59,860	59,860	59,838	100.00%	99.96%	99.96%
47	1986	94,157	94,161	94,136	100.00%	99.98%	99.97%
48	1987	35,856	35,855	35,841	100.00%	99.96%	99.96%
49	1988	17,754	17,802	17,796	100.27%	100.24%	99.97%
50	1989	198,417	198,415	198,377	100.00%	99.98%	99.98%
51	1990	114,570	114,570	114,541	100.00%	99.97%	99.97%

52	1991	152,519	152,519	152,477	100.00%	99.97%	99.97%
53	1992	82,346	82,570	82,553	100.27%	100.25%	99.98%
54	1993	32,177	32,176	32,160	100.00%	99.95%	99.95%
55	1994	59,798	59,797	59,770	100.00%	99.95%	99.95%
56	1995	29,857	29,855	29,844	99.99%	99.96%	99.96%
57	1996	3,419	3,428	3,427	100.25%	100.21%	99.96%
58	1997	115,493	115,492	115,463	100.00%	99.97%	99.97%
59	1998	92,434	92,434	92,403	100.00%	99.97%	99.97%
60	1999	76,508	76,509	76,496	100.00%	99.98%	99.98%
61	2000	70,648	70,843	70,818	100.28%	100.24%	99.96%
62	2001	91,300	91,300	91,287	100.00%	99.99%	99.99%
63	2002	35,596	35,595	35,583	100.00%	99.97%	99.97%
64	2003	48,612	48,612	48,599	100.00%	99.97%	99.97%
65	2004	76,859	77,069	77,038	100.27%	100.23%	99.96%
66	2005	20,772	20,771	20,768	100.00%	99.98%	99.98%
67	2006	8,624	8,624	8,622	100.00%	99.97%	99.97%
68	2007	161,579	161,579	161,547	100.00%	99.98%	99.98%
69	2008	22,706	22,769	22,758	100.28%	100.23%	99.95%
70	2009	141,656	141,656	141,620	100.00%	99.97%	99.97%
71	2010	73,695	73,695	73,686	100.00%	99.99%	99.99%
72	2011	6,992	6,993	6,991	100.01%	99.99%	99.97%
73	2012	59,760	59,923	59,911	100.27%	100.25%	99.98%
74	2013	32,551	32,551	32,545	100.00%	99.98%	99.98%
75	2014	4,612	4,612	4,611	99.99%	99.97%	99.97%
76	2015	226,723	226,724	226,681	100.00%	99.98%	99.98%
	Mean	67,347	64,009	63,991	95.04%	95.02%	99.97%

Annual Flow Volume of Trinity River at Dallas (8 TRDA)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	1,132,205	1,578,893	573,922	139.45%	50.69%	36.35%
2	1941	2,783,790	2,874,390	1,380,093	103.25%	49.58%	48.01%
3	1942	3,266,696	3,305,080	1,636,469	101.18%	50.10%	49.51%
4	1943	694,340	812,242	232,801	116.98%	33.53%	28.66%
5	1944	998,016	1,214,334	370,324	121.67%	37.11%	30.50%
6	1945	2,881,869	3,032,822	1,014,724	105.24%	35.21%	33.46%
7	1946	2,063,530	2,258,435	695,830	109.45%	33.72%	30.81%
8	1947	834,950	948,175	337,318	113.56%	40.40%	35.58%
9	1948	875,070	920,461	351,085	105.19%	40.12%	38.14%
10	1949	1,332,837	1,681,737	771,078	126.18%	57.85%	45.85%
11	1950	2,020,998	2,172,721	733,111	107.51%	36.27%	33.74%
12	1951	346,298	435,504	177,344	125.76%	51.21%	40.72%
13	1952	179,848	260,053	80,351	144.60%	44.68%	30.90%
14	1953	232,088	488,504	158,825	210.48%	68.43%	32.51%
15	1954	115,133	221,448	84,861	192.34%	73.71%	38.32%
16	1955	98,624	313,144	133,583	317.51%	135.45%	42.66%
17	1956	90,545	164,814	55,840	182.02%	61.67%	33.88%
18	1957	3,093,664	4,437,091	1,699,691	143.43%	54.94%	38.31%
19	1958	1,600,243	1,654,628	566,245	103.40%	35.38%	34.22%
20	1959	538,356	912,890	293,180	169.57%	54.46%	32.12%
21	1960	519,341	609,918	189,362	117.44%	36.46%	31.05%
22	1961	471,517	691,815	228,166	146.72%	48.39%	32.98%

23	1962	1,097,768	1,484,644	470,247	135.24%	42.84%	31.67%
24	1963	318,541	352,096	108,561	110.53%	34.08%	30.83%
25	1964	889,027	1,447,735	498,900	162.84%	56.12%	34.46%
26	1965	1,062,274	1,241,218	498,138	116.85%	46.89%	40.13%
27	1966	1,649,792	1,962,748	650,367	118.97%	39.42%	33.14%
28	1967	384,625	533,516	185,906	138.71%	48.33%	34.85%
29	1968	1,398,277	1,722,906	496,593	123.22%	35.51%	28.82%
30	1969	1,688,408	1,999,242	633,728	118.41%	37.53%	31.70%
31	1970	1,431,735	1,694,141	566,077	118.33%	39.54%	33.41%
32	1971	906,351	1,407,301	473,303	155.27%	52.22%	33.63%
33	1972	507,529	505,727	199,674	99.65%	39.34%	39.48%
34	1973	1,820,715	2,236,697	895,743	122.85%	49.20%	40.05%
35	1974	1,511,601	1,848,488	665,929	122.29%	44.05%	36.03%
36	1975	1,716,942	1,951,711	799,264	113.67%	46.55%	40.95%
37	1976	487,501	801,258	322,716	164.36%	66.20%	40.28%
38	1977	1,184,366	1,407,805	531,132	118.87%	44.85%	37.73%
39	1978	251,034	311,225	122,906	123.98%	48.96%	39.49%
40	1979	943,214	1,393,900	576,871	147.78%	61.16%	41.39%
41	1980	377,155	493,336	229,807	130.80%	60.93%	46.58%
42	1981	2,469,106	3,593,373	1,339,694	145.53%	54.26%	37.28%
43	1982	3,408,756	3,285,742	1,719,199	96.39%	50.43%	52.32%
44	1983	581,891	676,241	304,290	116.21%	52.29%	45.00%
45	1984	641,385	836,942	394,211	130.49%	61.46%	47.10%
46	1985	1,094,773	1,661,863	484,966	151.80%	44.30%	29.18%
47	1986	1,431,602	1,875,759	548,348	131.03%	38.30%	29.23%
48	1987	1,602,801	1,880,486	608,589	117.32%	37.97%	32.36%
49	1988	394,687	428,816	214,813	108.65%	54.43%	50.09%
50	1989	2,858,846	4,177,114	1,725,328	146.11%	60.35%	41.30%
51	1990	3,907,597	4,295,169	2,044,394	109.92%	52.32%	47.60%
52	1991	2,246,819	3,436,060	1,474,280	152.93%	65.62%	42.91%
53	1992	3,186,600	2,687,111	1,560,927	84.33%	48.98%	58.09%
54	1993	2,503,172	2,538,529	893,563	101.41%	35.70%	35.20%
55	1994	2,292,151	2,818,622	1,052,826	122.97%	45.93%	37.35%
56	1995	2,012,009	2,013,731	1,146,729	100.09%	56.99%	56.95%
57	1996	832,040	1,386,326	558,190	166.62%	67.09%	40.26%
58	1997	2,929,886	3,323,468	1,841,861	113.43%	62.86%	55.42%
59	1998	1,771,811	2,119,555	901,690	119.63%	50.89%	42.54%
60	1999	662,676	926,224	462,398	139.77%	69.78%	49.92%
61	2000	781,445	1,374,039	397,762	175.83%	50.90%	28.95%
62	2001	1,662,549	2,657,642	1,322,466	159.85%	79.54%	49.76%
63	2002	1,612,699	2,272,732	1,113,561	140.93%	69.05%	49.00%
64	2003	794,598	1,119,802	709,745	140.93%	89.32%	63.38%
65	2004	2,412,098	3,315,951	1,565,235	137.47%	64.89%	47.20%
66	2005	825,775	994,917	628,671	120.48%	76.13%	63.19%
67	2006	765,662	1,071,905	581,813	140.00%	75.99%	54.28%
68	2007	2,797,446	3,946,705	1,784,225	141.08%	63.78%	45.21%
69	2008	1,218,553	1,559,611	821,268	127.99%	67.40%	52.66%
70	2009	1,737,330	2,500,716	579,480	143.94%	33.35%	23.17%
71	2010	2,055,493	1,303,462	720,410	63.41%	35.05%	55.27%
72	2011	618,119	444,414	191,786	71.90%	31.03%	43.15%
73	2012	1,058,628	1,266,349	640,108	119.62%	60.47%	50.55%
74	2013	592,385	677,127	330,114	114.31%	55.73%	48.75%
75	2014	452,005	487,153	260,151	107.78%	57.55%	53.40%
76	2015	4,961,374	8,045,801	3,726,402	162.17%	75.11%	46.31%
	Mean	1,407,521	1,747,161	728,152	124.13%	51.73%	41.68%

Annual Flow Volume of Trinity River near Crockett (8TRCR)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940		4,793,537	3,117,801			65.04%
2	1941		7,480,172	5,313,704			71.04%
3	1942		7,717,559	5,150,199			66.73%
4	1943		2,965,596	1,689,617			56.97%
5	1944		5,745,652	4,159,389			72.39%
6	1945		9,742,724	6,515,670			66.88%
7	1946		7,025,694	4,455,668			63.42%
8	1947		3,580,679	2,406,055			67.20%
9	1948		2,762,054	1,468,712			53.17%
10	1949		3,383,502	1,758,681			51.98%
11	1950		4,836,910	2,451,114			50.68%
12	1951		1,235,625	571,537			46.25%
13	1952		1,603,349	815,758			50.88%
14	1953		2,766,204	1,545,635			55.88%
15	1954		943,973	509,026			53.92%
16	1955		1,082,454	674,109			62.28%
17	1956		685,357	349,881			51.05%
18	1957		10,261,433	4,964,769			48.38%
19	1958		4,671,041	2,454,228			52.54%
20	1959		4,057,328	2,594,721			63.95%
21	1960		3,492,330	2,069,216			59.25%
22	1961		4,632,252	3,365,786			72.66%
23	1962		3,088,098	1,485,426			48.10%
24	1963		1,073,122	565,899			52.73%
25	1964	1,651,958	2,157,370	1,026,632	130.59%	62.15%	47.59%
26	1965	3,877,470	4,029,191	2,280,016	103.91%	58.80%	56.59%
27	1966	4,875,707	5,578,104	3,243,649	114.41%	66.53%	58.15%
28	1967	1,867,307	2,436,758	1,162,064	130.50%	62.23%	47.69%
29	1968	6,068,170	6,365,843	4,005,959	104.91%	66.02%	62.93%
30	1969	5,625,144	5,942,197	3,882,349	105.64%	69.02%	65.34%
31	1970	3,719,177	4,326,367	2,364,327	116.33%	63.57%	54.65%
32	1971	2,913,100	3,686,703	1,861,355	126.56%	63.90%	50.49%
33	1972	2,070,581	1,906,377	1,276,823	92.07%	61.66%	66.98%
34	1973	7,624,312	8,132,280	5,209,101	106.66%	68.32%	64.05%
35	1974	5,447,455	5,964,499	3,846,334	109.49%	70.61%	64.49%
36	1975	5,530,338	5,553,676	3,976,328	100.42%	71.90%	71.60%
37	1976	3,783,297	4,193,056	2,728,784	110.83%	72.13%	65.08%
38	1977	4,046,622	4,497,578	2,983,598	111.14%	73.73%	66.34%
39	1978	1,093,928	1,203,450	745,344	110.01%	68.13%	61.93%
40	1979	4,224,855	5,030,140	2,890,594	119.06%	68.42%	57.47%
41	1980	2,154,712	2,256,836	1,385,905	104.74%	64.32%	61.41%
42	1981	4,876,013	6,347,622	3,039,710	130.18%	62.34%	47.89%
43	1982	5,466,197	5,392,982	3,327,853	98.66%	60.88%	61.71%
44	1983	2,958,567	3,024,965	1,886,955	102.24%	63.78%	62.38%
45	1984	2,532,848	3,181,458	1,918,362	125.61%	75.74%	60.30%
46	1985	4,939,577	5,538,292	3,098,372	112.12%	62.73%	55.94%
47	1986	5,464,880	6,051,117	3,791,482	110.73%	69.38%	62.66%
48	1987	4,247,350	4,693,862	2,963,373	110.51%	69.77%	63.13%
49	1988	1,473,213	1,804,327	1,061,272	122.48%	72.04%	58.82%
50	1989	6,218,105	8,633,935	5,052,732	138.85%	81.26%	58.52%
51	1990	10,071,313	10,733,955	7,556,018	106.58%	75.03%	70.39%

52	1991	7,623,333	9,583,194	6,373,430	125.71%	83.60%	66.51%
53	1992	9,274,859	8,639,187	6,775,673	93.15%	73.05%	78.43%
54	1993	6,920,701	7,287,341	4,843,891	105.30%	69.99%	66.47%
55	1994	7,438,249	8,305,054	5,571,446	111.65%	74.90%	67.09%
56	1995	7,339,319	7,217,625	5,948,606	98.34%	81.05%	82.42%
57	1996	1,632,945	2,532,947	1,276,176	155.12%	78.15%	50.38%
58	1997	7,380,748	5,611,498	2,832,924	76.03%	38.38%	50.48%
59	1998	7,188,829	6,690,918	4,231,606	93.07%	58.86%	63.24%
60	1999	3,013,508	2,189,860	1,375,036	72.67%	45.63%	62.79%
61	2000	2,535,576	5,175,306	3,226,784	204.11%	127.26%	62.35%
62	2001	7,635,497	5,170,143	2,643,971	67.71%	34.63%	51.14%
63	2002	4,221,154	4,032,157	2,302,190	95.52%	54.54%	57.10%
64	2003	2,760,197	1,638,766	609,712	59.37%	22.09%	37.21%
65	2004	5,360,402	7,992,419	5,158,930	149.10%	96.24%	64.55%
66	2005	2,612,694	1,147,018	501,669	43.90%	19.20%	43.74%
67	2006	1,457,342	1,904,009	1,028,518	130.65%	70.57%	54.02%
68	2007	8,341,805	9,914,033	5,959,339	118.85%	71.44%	60.11%
69	2008	3,516,992	2,903,286	1,679,849	82.55%	47.76%	57.86%
70	2009	5,260,618	8,765,330	5,485,484	166.62%	104.27%	62.58%
71	2010	5,661,231	2,881,446	1,984,212	50.90%	35.05%	68.86%
72	2011	1,230,389	1,386,282	886,566	112.67%	72.06%	63.95%
73	2012	2,858,404	3,832,188	2,669,915	134.07%	93.41%	69.67%
74	2013	1,874,051	3,001,219	2,032,156	160.15%	108.44%	67.71%
75	2014	1,134,639	1,537,350	970,845	135.49%	85.56%	63.15%
76	2015	13,158,782	19,638,376	12,365,548	149.24%	93.97%	62.97%
	Mean	4,658,739	4,832,454	2,996,742	103.73%	64.33%	62.01%

Annual Flow Volume of Trinity River near Midway (8TRMI)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	4,637,030	5,044,415	3,368,101	108.79%	72.63%	66.77%
2	1941	7,823,039	7,871,527	5,704,225	100.62%	72.92%	72.47%
3	1942	8,102,350	8,121,358	5,553,190	100.23%	68.54%	68.38%
4	1943	3,035,018	3,120,831	1,844,187	102.83%	60.76%	59.09%
5	1944	5,854,024	6,046,399	4,459,400	103.29%	76.18%	73.75%
6	1945	10,132,126	10,252,399	7,024,551	101.19%	69.33%	68.52%
7	1946	7,240,562	7,393,275	4,822,546	102.11%	66.60%	65.23%
8	1947	3,680,355	3,768,157	2,592,867	102.39%	70.45%	68.81%
9	1948	2,906,652	2,906,605	1,612,833	100.00%	55.49%	55.49%
10	1949	3,284,226	3,560,683	1,935,015	108.42%	58.92%	54.34%
11	1950	4,982,487	5,090,009	2,703,602	102.16%	54.26%	53.12%
12	1951	1,248,373	1,300,340	635,698	104.16%	50.92%	48.89%
13	1952	1,641,207	1,687,373	899,161	102.81%	54.79%	53.29%
14	1953	2,691,426	2,911,070	1,689,573	108.16%	62.78%	58.04%
15	1954	836,432	995,673	560,195	119.04%	66.97%	56.26%
16	1955	949,212	1,139,995	731,126	120.10%	77.02%	64.13%
17	1956	679,130	721,667	385,809	106.26%	56.81%	53.46%
18	1957	9,563,813	10,800,212	5,502,110	112.93%	57.53%	50.94%
19	1958	4,916,785	4,915,768	2,698,330	99.98%	54.88%	54.89%
20	1959	3,945,029	4,270,846	2,807,596	108.26%	71.17%	65.74%
21	1960	3,664,707	3,674,935	2,251,150	100.28%	61.43%	61.26%
22	1961	4,733,296	4,875,037	3,607,853	102.99%	76.22%	74.01%

23	1962	2,947,218	3,250,057	1,646,709	110.28%	55.87%	50.67%
24	1963	1,059,761	1,010,003	502,451	95.30%	47.41%	49.75%
25	1964	1,705,623	2,211,230	1,080,108	129.64%	63.33%	48.85%
26	1965	4,092,270	4,244,081	2,493,886	103.71%	60.94%	58.76%
27	1966	5,168,454	5,870,954	3,535,826	113.59%	68.41%	60.23%
28	1967	1,917,219	2,486,498	1,211,311	129.69%	63.18%	48.72%
29	1968	6,567,781	6,865,904	4,505,100	104.54%	68.59%	65.62%
30	1969	6,149,411	6,465,009	4,404,648	105.13%	71.63%	68.13%
31	1970		4,480,307	2,517,711			56.20%
32	1971		3,868,456	2,042,458			52.80%
33	1972		2,000,364	1,370,147			68.49%
34	1973		8,533,202	5,609,349			65.74%
35	1974		6,258,548	4,139,636			66.14%
36	1975		5,827,472	4,249,522			72.92%
37	1976		4,399,773	2,934,704			66.70%
38	1977		4,719,307	3,204,821			67.91%
39	1978		1,262,780	804,060			63.67%
40	1979		5,278,128	3,137,631			59.45%
41	1980		2,368,099	1,496,625			63.20%
42	1981		6,660,561	3,351,697			50.32%
43	1982		5,658,855	3,592,976			63.49%
44	1983		3,174,095	2,035,434			64.13%
45	1984		3,338,304	2,074,394			62.14%
46	1985		5,811,328	3,370,747			58.00%
47	1986		6,349,437	4,089,074			64.40%
48	1987		4,925,267	3,194,082			64.85%
49	1988		1,893,280	1,149,725			60.73%
50	1989		9,059,588	5,477,363			60.46%
51	1990		11,263,137	8,084,318			71.78%
52	1991		10,055,644	6,845,087			68.07%
53	1992		9,065,098	7,200,842			79.43%
54	1993		7,646,606	5,202,391			68.04%
55	1994		8,714,493	5,980,119			68.62%
56	1995		7,573,453	6,303,866			83.24%
57	1996		2,657,821	1,400,362			52.69%
58	1997		8,810,085	6,030,758			68.45%
59	1998		9,219,297	6,759,252			73.32%
60	1999		4,053,515	3,237,838			79.88%
61	2000		4,352,824	2,403,705			55.22%
62	2001		10,219,600	7,692,562			75.27%
63	2002		6,066,383	4,335,657			71.47%
64	2003		4,004,883	2,975,063			74.29%
65	2004		8,077,481	5,243,427			64.91%
66	2005		3,239,327	2,549,613			78.71%
67	2006		2,399,184	1,566,447			65.29%
68	2007		11,512,176	7,556,803			65.64%
69	2008		4,665,891	3,437,011			73.66%
70	2009		7,217,581	3,941,541			54.61%
71	2010		3,375,125	2,477,255			73.40%
72	2011		1,544,137	1,034,830			67.02%
73	2012		3,633,683	2,479,539			68.24%
74	2013		3,348,469	2,377,947			71.02%
75	2014		1,865,177	1,298,569			69.62%
76	2015		20,266,666	12,993,370			64.11%
	Mean	4,205,167	5,310,358	3,473,940	126.28%	82.61%	65.42%

Annual Flow Volume of Trinity River near Oakwood (8TROA)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	3,729,160	4,134,000	2,430,322	110.86%	65.17%	58.79%
2	1941	6,781,466	6,830,422	4,697,203	100.72%	69.27%	68.77%
3	1942	7,547,562	7,565,797	4,979,294	100.24%	65.97%	65.81%
4	1943	2,851,416	2,937,176	1,698,925	103.01%	59.58%	57.84%
5	1944	4,713,130	4,902,340	3,303,545	104.01%	70.09%	67.39%
6	1945	8,803,458	8,923,378	5,726,693	101.36%	65.05%	64.18%
7	1946	6,209,411	6,362,120	3,776,954	102.46%	60.83%	59.37%
8	1947	2,979,846	3,067,592	1,898,258	102.94%	63.70%	61.88%
9	1948	2,759,139	2,758,774	1,495,074	99.99%	54.19%	54.19%
10	1949	3,067,624	3,343,933	1,729,282	109.01%	56.37%	51.71%
11	1950	4,720,725	4,827,989	2,448,106	102.27%	51.86%	50.71%
12	1951	1,198,350	1,250,280	590,498	104.33%	49.28%	47.23%
13	1952	1,425,521	1,471,213	681,330	103.21%	47.80%	46.31%
14	1953	2,169,729	2,389,750	1,194,482	110.14%	55.05%	49.98%
15	1954	726,159	886,421	455,294	122.07%	62.70%	51.36%
16	1955	723,806	914,555	515,122	126.35%	71.17%	56.32%
17	1956	560,337	613,242	275,029	109.44%	49.08%	44.85%
18	1957	8,432,568	9,668,058	4,387,785	114.65%	52.03%	45.38%
19	1958	4,279,456	4,278,259	2,077,225	99.97%	48.54%	48.55%
20	1959	3,058,497	3,384,306	1,904,329	110.65%	62.26%	56.27%
21	1960	2,959,532	2,967,975	1,577,409	100.29%	53.30%	53.15%
22	1961	3,626,120	3,768,368	2,501,317	103.92%	68.98%	66.38%
23	1962	2,546,267	2,848,977	1,254,536	111.89%	49.27%	44.03%
24	1963	923,090	880,762	386,291	95.41%	41.85%	43.86%
25	1964	1,592,302	2,096,960	968,023	131.69%	60.79%	46.16%
26	1965	3,200,327	3,350,931	1,617,658	104.71%	50.55%	48.27%
27	1966	4,378,037	5,078,321	2,752,528	116.00%	62.87%	54.20%
28	1967	1,786,153	2,348,086	1,062,409	131.46%	59.48%	45.25%
29	1968	5,450,658	5,732,597	3,391,094	105.17%	62.21%	59.15%
30	1969	4,963,510	5,277,370	3,227,384	106.32%	65.02%	61.16%
31	1970	3,500,150	4,104,031	2,152,371	117.25%	61.49%	52.45%
32	1971	2,692,756	3,462,939	1,630,059	128.60%	60.53%	47.07%
33	1972	1,670,123	1,501,310	897,782	89.89%	53.76%	59.80%
34	1973	6,677,643	7,185,237	4,246,726	107.60%	63.60%	59.10%
35	1974	4,765,179	5,278,881	3,186,727	110.78%	66.88%	60.37%
36	1975	4,917,947	4,939,006	3,372,766	100.43%	68.58%	68.29%
37	1976	3,123,047	3,528,793	2,068,887	112.99%	66.25%	58.63%
38	1977	3,531,463	3,979,037	2,476,282	112.67%	70.12%	62.23%
39	1978	924,559	1,030,651	579,310	111.47%	62.66%	56.21%
40	1979	3,260,569	4,063,273	1,898,611	124.62%	58.23%	46.73%
41	1980	1,705,373	1,804,150	972,857	105.79%	57.05%	53.92%
42	1981	4,316,009	5,782,285	2,481,971	133.97%	57.51%	42.92%
43	1982	5,132,073	5,056,732	2,979,733	98.53%	58.06%	58.93%
44	1983	2,414,289	2,477,954	1,373,201	102.64%	56.88%	55.42%
45	1984	1,964,055	2,608,407	1,300,434	132.81%	66.21%	49.86%
46	1985	4,074,258	4,669,903	2,282,366	114.62%	56.02%	48.87%
47	1986	4,887,527	5,469,888	3,209,554	111.92%	65.67%	58.68%
48	1987	3,596,341	4,039,463	2,279,312	112.32%	63.38%	56.43%
49	1988	1,102,234	1,427,322	740,165	129.49%	67.15%	51.86%
50	1989	5,468,853	7,880,909	4,315,710	144.11%	78.91%	54.76%
51	1990	8,897,355	9,559,395	6,387,710	107.44%	71.79%	66.82%

52	1991	6,266,136	8,230,095	4,792,797	131.34%	76.49%	58.24%
53	1992	8,281,389	7,647,147	6,019,930	92.34%	72.69%	78.72%
54	1993	5,663,923	6,032,362	3,601,013	106.51%	63.58%	59.69%
55	1994	6,350,983	7,219,810	4,510,449	113.68%	71.02%	62.47%
56	1995	6,534,649	6,413,587	5,145,220	98.15%	78.74%	80.22%
57	1996	1,479,697	2,377,946	1,123,120	160.70%	75.90%	47.23%
58	1997	6,960,268	8,297,879	5,328,778	119.22%	76.56%	64.22%
59	1998	7,198,662	8,287,731	6,058,751	115.13%	84.16%	73.11%
60	1999	2,734,618	3,417,695	2,591,933	124.98%	94.78%	75.84%
61	2000	2,333,023	4,041,092	1,978,023	173.21%	84.78%	48.95%
62	2001	7,408,157	9,225,324	6,834,516	124.53%	92.26%	74.08%
63	2002	4,071,057	5,359,313	3,599,973	131.64%	88.43%	67.17%
64	2003	2,413,202	3,254,518	2,267,387	134.86%	93.96%	69.67%
65	2004	4,871,507	6,911,593	4,083,303	141.88%	83.82%	59.08%
66	2005	2,346,984	2,675,011	1,995,590	113.98%	85.03%	74.60%
67	2006	1,259,941	2,013,757	1,179,224	159.83%	93.59%	58.56%
68	2007	7,837,770	10,499,780	6,564,200	133.96%	83.75%	62.52%
69	2008	3,300,595	4,203,735	2,985,586	127.36%	90.46%	71.02%
70	2009	4,951,901	6,740,382	3,481,913	136.12%	70.31%	51.66%
71	2010	5,326,370	2,797,282	1,903,911	52.52%	35.75%	68.06%
72	2011	1,155,832	1,122,500	603,368	97.12%	52.20%	53.75%
73	2012	2,643,947	3,141,643	2,020,840	118.82%	76.43%	64.32%
74	2013	1,465,186	2,477,090	1,486,437	169.06%	101.45%	60.01%
75	2014	949,010	1,296,863	760,565	136.65%	80.14%	58.65%
76	2015	12,388,773	17,267,704	9,986,008	139.38%	80.61%	57.83%
	Mean	3,986,562	4,548,176	2,720,247	114.09%	68.24%	59.81%

Annual Flow Volume of Trinity River at Riverside (8 TRRI)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	5,659,477	6,068,771	4,410,739	107.23%	77.94%	72.68%
2	1941	8,761,178	8,809,540	6,620,791	100.55%	75.57%	75.15%
3	1942	8,422,947	8,440,164	5,872,709	100.20%	69.72%	69.58%
4	1943	3,452,263	3,537,573	2,249,252	102.47%	65.15%	63.58%
5	1944	7,052,515	7,229,095	5,639,497	102.50%	79.96%	78.01%
6	1945	11,051,611	11,170,101	7,938,322	101.07%	71.83%	71.07%
7	1946	8,613,753	8,765,811	6,199,425	101.77%	71.97%	70.72%
8	1947	4,535,701	4,622,739	3,458,772	101.92%	76.26%	74.82%
9	1948	3,261,576	3,261,799	1,941,358	100.01%	59.52%	59.52%
10	1949	4,153,024	4,428,755	2,799,490	106.64%	67.41%	63.21%
11	1950	5,502,048	5,608,353	3,218,309	101.93%	58.49%	57.38%
12	1951	1,320,676	1,373,515	706,084	104.00%	53.46%	51.41%
13	1952	2,006,259	2,054,163	1,271,244	102.39%	63.36%	61.89%
14	1953	3,260,150	3,480,310	2,247,555	106.75%	68.94%	64.58%
15	1954	1,035,176	1,194,935	756,413	115.43%	73.07%	63.30%
16	1955	1,352,912	1,543,616	1,131,574	114.10%	83.64%	73.31%
17	1956	784,972	836,990	500,672	106.63%	63.78%	59.82%
18	1957	10,525,932	11,763,653	6,461,423	111.76%	61.39%	54.93%
19	1958	5,315,635	5,314,835	3,092,044	99.98%	58.17%	58.18%
20	1959	4,271,159	4,597,864	3,150,908	107.65%	73.77%	68.53%
21	1960	4,656,267	4,669,966	3,223,429	100.29%	69.23%	69.02%
22	1961	5,295,017	5,425,649	4,160,882	102.47%	78.58%	76.69%

23	1962	3,203,550	3,507,908	1,897,052	109.50%	59.22%	54.08%
24	1963	1,212,932	1,161,762	649,514	95.78%	53.55%	55.91%
25	1964	1,969,422	2,477,014	1,343,293	125.77%	68.21%	54.23%
26	1965	4,257,785	4,408,485	2,655,719	103.54%	62.37%	60.24%
27	1966	5,523,221	6,224,758	3,885,639	112.70%	70.35%	62.42%
28	1967	2,021,455	2,590,178	1,324,352	128.13%	65.51%	51.13%
29	1968		7,514,472	5,140,775			68.41%
30	1969		7,324,165	5,258,706			71.80%
31	1970		4,876,481	2,910,481			59.68%
32	1971		3,958,287	2,133,021			53.89%
33	1972		2,132,726	1,497,330			70.21%
34	1973		9,783,730	6,866,736			70.19%
35	1974		7,072,416	4,940,878			69.86%
36	1975		6,322,977	4,739,146			74.95%
37	1976		4,801,478	3,335,029			69.46%
38	1977		5,093,192	3,573,481			70.16%
39	1978		1,449,047	987,665			68.16%
40	1979		6,278,956	4,151,137			66.11%
41	1980		2,839,742	1,949,428			68.65%
42	1981		7,150,353	3,838,389			53.68%
43	1982		6,067,327	3,998,769			65.91%
44	1983		3,749,496	2,604,526			69.46%
45	1984		4,168,448	2,951,034			70.79%
46	1985		6,300,794	3,811,477			60.49%
47	1986		6,605,089	4,349,448			65.85%
48	1987		5,300,096	3,571,582			67.39%
49	1988		1,941,458	1,178,939			60.72%
50	1989		9,406,717	5,819,895			61.87%
51	1990		11,515,769	8,333,650			72.37%
52	1991		10,961,365	7,839,656			71.52%
53	1992		9,873,091	7,921,347			80.23%
54	1993		8,507,370	6,053,261			71.15%
55	1994		9,363,792	6,620,813			70.71%
56	1995		8,030,338	6,760,708			84.19%
57	1996		2,715,747	1,456,132			53.62%
58	1997		9,570,639	6,879,475			71.88%
59	1998		10,597,304	8,037,494			75.84%
60	1999		4,742,595	3,924,886			82.76%
61	2000		4,964,361	3,019,297			60.82%
62	2001		11,493,228	8,958,879			77.95%
63	2002		6,959,108	5,236,326			75.24%
64	2003		4,723,533	3,670,784			77.71%
65	2004		9,508,803	6,671,613			70.16%
66	2005		3,859,038	3,164,467			82.00%
67	2006		2,849,984	2,019,563			70.86%
68	2007		12,494,957	8,530,220			68.27%
69	2008		5,167,444	3,933,164			76.11%
70	2009		7,694,370	4,414,341			57.37%
71	2010		3,299,435	2,398,622			72.70%
72	2011		1,669,599	1,165,762			69.82%
73	2012		4,440,121	3,273,958			73.74%
74	2013		3,801,522	2,834,471			74.56%
75	2014		2,330,119	1,755,375			75.33%
76	2015		21,380,712	14,108,298			65.99%
	Mean	4,588,522	5,884,475	4,044,696	128.24%	88.15%	68.74%

Annual Flow Volume of Trinity River at Romayor (8TRRO)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	6,482,321	6,893,279	4,875,978	106.34%	75.22%	70.74%
2	1941	10,335,392	10,384,382	7,774,521	100.47%	75.22%	74.87%
3	1942	9,204,772	9,222,938	6,238,167	100.20%	67.77%	67.64%
4	1943	3,854,311	3,939,277	2,579,771	102.20%	66.93%	65.49%
5	1944	8,118,647	8,316,366	6,000,717	102.44%	73.91%	72.16%
6	1945	12,277,111	12,395,522	8,774,512	100.96%	71.47%	70.79%
7	1946	9,864,577	10,017,085	7,098,969	101.55%	71.96%	70.87%
8	1947	5,286,778	5,373,727	3,928,823	101.64%	74.31%	73.11%
9	1948	3,789,210	3,790,799	2,632,333	100.04%	69.47%	69.44%
10	1949	5,303,461	5,579,106	2,769,319	105.20%	52.22%	49.64%
11	1950	6,961,309	7,068,244	4,634,375	101.54%	66.57%	65.57%
12	1951	1,504,217	1,556,800	1,161,712	103.50%	77.23%	74.62%
13	1952	2,296,532	2,345,051	1,152,953	102.11%	50.20%	49.17%
14	1953	3,975,540	4,195,131	1,835,990	105.52%	46.18%	43.76%
15	1954	1,270,284	1,424,950	1,129,389	112.18%	88.91%	79.26%
16	1955	1,783,384	1,973,191	1,167,080	110.64%	65.44%	59.15%
17	1956	914,768	956,155	796,743	104.52%	87.10%	83.33%
18	1957	11,886,224	13,120,183	5,716,780	110.38%	48.10%	43.57%
19	1958	5,929,750	5,928,406	3,448,328	99.98%	58.15%	58.17%
20	1959	4,733,455	5,058,635	3,134,528	106.87%	66.22%	61.96%
21	1960	5,398,228	5,414,121	3,586,397	100.29%	66.44%	66.24%
22	1961	6,251,012	6,393,087	4,730,379	102.27%	75.67%	73.99%
23	1962	3,603,199	3,906,700	1,834,730	108.42%	50.92%	46.96%
24	1963	1,522,217	1,469,681	1,343,561	96.55%	88.26%	91.42%
25	1964	2,193,066	2,699,189	1,176,534	123.08%	53.65%	43.59%
26	1965	4,673,584	4,822,559	2,107,266	103.19%	45.09%	43.70%
27	1966	6,171,947	6,864,785	4,103,239	111.23%	66.48%	59.77%
28	1967	2,065,746	2,624,197	1,125,328	127.03%	54.48%	42.88%
29	1968	7,883,773	8,351,217	5,019,137	105.93%	63.66%	60.10%
30	1969	7,422,447	7,776,603	5,634,390	104.77%	75.91%	72.45%
31	1970	3,029,173	4,861,249	2,576,574	160.48%	85.06%	53.00%
32	1971	2,258,085	3,583,540	1,258,928	158.70%	55.75%	35.13%
33	1972	2,479,427	2,333,294	1,342,321	94.11%	54.14%	57.53%
34	1973	11,038,562	11,524,404	7,793,521	104.40%	70.60%	67.63%
35	1974	7,580,450	8,158,989	5,602,428	107.63%	73.91%	68.67%
36	1975	7,221,218	7,295,884	5,599,425	101.03%	77.54%	76.75%
37	1976	4,664,776	5,109,829	2,924,287	109.54%	62.69%	57.23%
38	1977	4,859,750	5,413,353	4,015,569	111.39%	82.63%	74.18%
39	1978	1,792,391	1,825,196	1,017,782	101.83%	56.78%	55.76%
40	1979	7,668,339	8,679,896	5,447,007	113.19%	71.03%	62.75%
41	1980	3,610,708	3,604,997	2,928,324	99.84%	81.10%	81.23%
42	1981	5,574,145	7,499,013	3,060,584	134.53%	54.91%	40.81%
43	1982	6,728,325	6,744,455	4,253,945	100.24%	63.22%	63.07%
44	1983	4,522,001	4,581,341	3,000,263	101.31%	66.35%	65.49%
45	1984	3,877,874	4,675,805	3,033,638	120.58%	78.23%	64.88%
46	1985	6,165,975	6,805,716	3,818,344	110.38%	61.93%	56.10%
47	1986	7,040,668	7,701,638	5,018,335	109.39%	71.28%	65.16%
48	1987	5,223,846	5,778,852	3,613,009	110.62%	69.16%	62.52%
49	1988	1,987,606	2,037,098	1,455,340	102.49%	73.22%	71.44%
50	1989	7,258,673	10,042,018	5,583,046	138.35%	76.92%	55.60%
51	1990	10,914,877	11,686,908	7,887,066	107.07%	72.26%	67.49%

52	1991	9,130,790	11,259,273	7,788,630	123.31%	85.30%	69.18%
53	1992	12,749,220	12,031,774	9,511,642	94.37%	74.61%	79.05%
54	1993	9,013,686	9,472,096	6,542,781	105.09%	72.59%	69.07%
55	1994	9,594,010	10,518,407	7,334,408	109.64%	76.45%	69.73%
56	1995	8,541,394	8,393,979	6,921,777	98.27%	81.04%	82.46%
57	1996	1,775,327	2,790,516	1,164,920	157.18%	65.62%	41.75%
58	1997	8,596,431	10,267,632	6,887,687	119.44%	80.12%	67.08%
59	1998	10,454,182	12,337,219	9,257,104	118.01%	88.55%	75.03%
60	1999	4,399,615	5,689,441	4,594,248	129.32%	104.42%	80.75%
61	2000	3,488,532	5,620,365	2,968,737	161.11%	85.10%	52.82%
62	2001	10,970,123	13,183,113	10,310,472	120.17%	93.99%	78.21%
63	2002	6,844,852	8,661,573	6,497,713	126.54%	94.93%	75.02%
64	2003	4,491,053	5,855,587	4,351,185	130.38%	96.89%	74.31%
65	2004	9,078,684	11,555,559	8,383,643	127.28%	92.34%	72.55%
66	2005	4,045,416	4,542,312	3,767,798	112.28%	93.14%	82.95%
67	2006	1,902,968	3,535,385	1,842,883	185.78%	96.84%	52.13%
68	2007	10,320,585	13,500,331	9,116,266	130.81%	88.33%	67.53%
69	2008	4,157,404	5,685,102	3,981,232	136.75%	95.76%	70.03%
70	2009	5,939,661	8,196,679	4,458,239	138.00%	75.06%	54.39%
71	2010	5,898,488	3,590,539	2,506,110	60.87%	42.49%	69.80%
72	2011	1,299,560	1,812,654	1,209,504	139.48%	93.07%	66.73%
73	2012	3,772,702	4,923,417	2,991,006	130.50%	79.28%	60.75%
74	2013	2,258,132	4,449,816	2,493,085	197.06%	110.40%	56.03%
75	2014	1,723,357	3,250,743	2,295,295	188.63%	133.19%	70.61%
76	2015	16,622,637	20,609,166	12,929,378	123.98%	77.78%	62.74%
	Mean	5,862,144	6,599,178	4,326,940	112.57%	73.81%	65.57%

Annual Flow Volume of Trinity River near Rosser (8TRRS)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	1,843,483	2,256,827	1,033,946	122.42%	56.09%	45.81%
2	1941	4,069,246	4,119,968	2,438,897	101.25%	59.93%	59.20%
3	1942	4,658,725	4,673,797	2,779,520	100.32%	59.66%	59.47%
4	1943	1,324,641	1,412,332	660,891	106.62%	49.89%	46.79%
5	1944	1,639,635	1,824,930	779,636	111.30%	47.55%	42.72%
6	1945	4,294,659	4,415,471	2,001,951	102.81%	46.61%	45.34%
7	1946	3,460,009	3,616,831	1,562,504	104.53%	45.16%	43.20%
8	1947	1,493,336	1,581,107	942,308	105.88%	63.10%	59.60%
9	1948	1,500,125	1,493,378	729,666	99.55%	48.64%	48.86%
10	1949	2,233,627	2,520,814	1,308,994	112.86%	58.60%	51.93%
11	1950	3,208,517	3,314,347	1,536,840	103.30%	47.90%	46.37%
12	1951	843,029	890,452	404,580	105.63%	47.99%	45.44%
13	1952	490,043	528,747	248,751	107.90%	50.76%	47.05%
14	1953	670,810	892,619	393,836	133.07%	58.71%	44.12%
15	1954	252,478	414,543	161,934	164.19%	64.14%	39.06%
16	1955	216,363	410,362	191,389	189.66%	88.46%	46.64%
17	1956	207,877	251,564	96,288	121.02%	46.32%	38.28%
18	1957	4,732,419	5,988,087	2,514,755	126.53%	53.14%	42.00%
19	1958	2,605,724	2,598,047	1,182,542	99.71%	45.38%	45.52%
20	1959	1,018,598	1,360,782	602,237	133.59%	59.12%	44.26%
21	1960	1,123,094	1,118,746	443,897	99.61%	39.52%	39.68%
22	1961	1,089,203	1,227,805	499,586	112.73%	45.87%	40.69%

23	1962	1,881,285	2,179,523	925,056	115.85%	49.17%	42.44%
24	1963	679,043	634,829	262,895	93.49%	38.72%	41.41%
25	1964	1,547,315	2,046,084	916,475	132.23%	59.23%	44.79%
26	1965	1,964,007	2,040,532	978,033	103.90%	49.80%	47.93%
27	1966	2,741,239	2,996,008	1,310,969	109.29%	47.82%	43.76%
28	1967	916,699	1,040,111	477,116	113.46%	52.05%	45.87%
29	1968	2,573,703	2,812,645	1,182,294	109.28%	45.94%	42.03%
30	1969	2,770,604	2,988,183	1,493,387	107.85%	53.90%	49.98%
31	1970	2,046,002	2,564,630	1,170,748	125.35%	57.22%	45.65%
32	1971	1,664,091	2,325,219	910,504	139.73%	54.71%	39.16%
33	1972	957,100	711,919	405,394	74.38%	42.36%	56.94%
34	1973	3,338,414	3,713,582	1,905,277	111.24%	57.07%	51.31%
35	1974	2,674,552	3,076,837	1,625,960	115.04%	60.79%	52.85%
36	1975	2,990,674	3,008,816	1,760,401	100.61%	58.86%	58.51%
37	1976	1,113,604	1,345,698	737,609	120.84%	66.24%	54.81%
38	1977	1,813,216	2,232,409	1,038,012	123.12%	57.25%	46.50%
39	1978	562,413	536,387	258,848	95.37%	46.02%	48.26%
40	1979	1,592,107	2,221,898	955,607	139.56%	60.02%	43.01%
41	1980	745,184	770,818	411,342	103.44%	55.20%	53.36%
42	1981	3,440,716	4,822,051	1,997,146	140.15%	58.04%	41.42%
43	1982	4,346,148	4,128,718	2,370,917	95.00%	54.55%	57.43%
44	1983	1,231,529	1,185,503	636,693	96.26%	51.70%	53.71%
45	1984	1,358,308	1,682,560	886,721	123.87%	65.28%	52.70%
46	1985	2,288,160	2,738,273	1,311,357	119.67%	57.31%	47.89%
47	1986	2,493,360	2,889,490	1,332,362	115.89%	53.44%	46.11%
48	1987	2,420,021	2,676,730	1,205,467	110.61%	49.81%	45.04%
49	1988	775,197	753,226	405,622	97.17%	52.32%	53.85%
50	1989	4,658,811	5,968,073	3,191,343	128.10%	68.50%	53.47%
51	1990	6,260,157	6,547,042	4,134,796	104.58%	66.05%	63.16%
52	1991	3,912,498	5,348,803	2,893,691	136.71%	73.96%	54.10%
53	1992	4,962,335	4,166,524	3,064,249	83.96%	61.75%	73.54%
54	1993	3,848,208	3,906,871	2,001,562	101.52%	52.01%	51.23%
55	1994	3,867,666	4,415,007	2,423,071	114.15%	62.65%	54.88%
56	1995	3,929,633	3,613,087	2,657,118	91.94%	67.62%	73.54%
57	1996	1,347,649	2,093,451	960,387	155.34%	71.26%	45.88%
58	1997	4,371,206	5,039,939	3,230,039	115.30%	73.89%	64.09%
59	1998	3,135,088	3,752,352	2,325,987	119.69%	74.19%	61.99%
60	1999	1,504,493	1,912,473	1,340,182	127.12%	89.08%	70.08%
61	2000	1,700,492	2,809,864	1,370,511	165.24%	80.59%	48.77%
62	2001	3,621,682	4,820,785	3,336,244	133.11%	92.12%	69.21%
63	2002	3,084,556	4,106,665	2,742,492	133.14%	88.91%	66.78%
64	2003	1,377,253	1,924,112	1,360,235	139.71%	98.76%	70.69%
65	2004	3,543,421	4,930,567	2,883,563	139.15%	81.38%	58.48%
66	2005	1,724,888	1,883,707	1,451,436	109.21%	84.15%	77.05%
67	2006	1,298,259	1,756,775	1,096,357	135.32%	84.45%	62.41%
68	2007	4,666,126	6,412,892	3,806,489	137.44%	81.58%	59.36%
69	2008	2,397,955	2,976,975	2,104,369	124.15%	87.76%	70.69%
70	2009	3,057,309	4,260,956	1,882,509	139.37%	61.57%	44.18%
71	2010	3,274,828	1,835,224	1,201,498	56.04%	36.69%	65.47%
72	2011	1,036,826	713,489	339,643	68.81%	32.76%	47.60%
73	2012	1,870,385	1,884,097	1,022,414	100.73%	54.66%	54.27%
74	2013	1,026,032	990,566	424,451	96.54%	41.37%	42.85%
75	2014	738,831	651,868	358,928	88.23%	48.58%	55.06%
76	2015	7,952,476	11,189,332	6,003,880	140.70%	75.50%	53.66%
	Mean	2,369,334	2,722,970	1,460,455	114.93%	61.64%	53.63%

Annual Flow Volume of Trinity River at Trinidad (8 TRTR)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940		2,493,415	1,310,866			52.57%
2	1941		4,412,173	2,730,655			61.89%
3	1942		5,066,756	3,203,025			63.22%
4	1943		1,563,524	816,317			52.21%
5	1944		2,081,669	1,065,888			51.20%
6	1945		4,823,137	2,428,283			50.35%
7	1946		3,808,334	1,784,119			46.85%
8	1947		1,715,304	1,083,575			63.17%
9	1948		1,606,123	849,721			52.91%
10	1949		2,622,884	1,425,489			54.35%
11	1950		3,441,393	1,689,677			49.10%
12	1951		924,220	441,048			47.72%
13	1952		631,172	350,566			55.54%
14	1953		967,209	471,564			48.76%
15	1954		427,799	174,679			40.83%
16	1955		436,964	216,053			49.44%
17	1956		272,785	115,443			42.32%
18	1957		6,353,208	2,936,697			46.22%
19	1958		2,859,432	1,461,155			51.10%
20	1959		1,590,913	843,732			53.03%
21	1960		1,259,505	586,989			46.60%
22	1961		1,471,962	749,943			50.95%
23	1962		2,255,565	1,017,479			45.11%
24	1963		659,847	289,156			43.82%
25	1964	7,375,957	2,065,336	951,202	28.00%	12.90%	46.06%
26	1965	2,057,887	2,135,832	1,085,677	103.79%	52.76%	50.83%
27	1966	3,381,838	3,440,295	1,779,040	101.73%	52.61%	51.71%
28	1967	1,050,782	1,160,307	601,969	110.42%	57.29%	51.88%
29	1968	3,459,397	3,108,972	1,502,936	89.87%	43.45%	48.34%
30	1969	3,626,021	3,300,642	1,849,177	91.03%	51.00%	56.02%
31	1970	2,854,239	2,938,963	1,539,421	102.97%	53.93%	52.38%
32	1971	2,463,041	2,461,467	1,068,458	99.94%	43.38%	43.41%
33	1972	1,241,580	822,858	513,887	66.28%	41.39%	62.45%
34	1973	4,689,826	4,099,295	2,317,096	87.41%	49.41%	56.52%
35	1974	3,454,997	3,272,707	1,842,430	94.72%	53.33%	56.30%
36	1975	3,612,994	3,214,628	1,981,221	88.97%	54.84%	61.63%
37	1976	1,682,934	1,442,920	839,172	85.74%	49.86%	58.16%
38	1977	2,443,724	2,419,458	1,240,362	99.01%	50.76%	51.27%
39	1978	633,834	586,569	308,627	92.54%	48.69%	52.62%
40	1979	2,036,114	2,367,058	1,116,908	116.25%	54.85%	47.19%
41	1980	974,028	825,866	467,017	84.79%	47.95%	56.55%
42	1981	3,846,444	5,029,873	2,249,231	130.77%	58.48%	44.72%
43	1982	4,930,043	4,564,307	2,843,488	92.58%	57.68%	62.30%
44	1983	1,613,887	1,362,081	804,261	84.40%	49.83%	59.05%
45	1984	1,427,710	1,741,221	959,476	121.96%	67.20%	55.10%
46	1985	2,990,507	3,104,415	1,691,304	103.81%	56.56%	54.48%
47	1986	3,175,763	3,130,195	1,595,249	98.57%	50.23%	50.96%
48	1987	2,550,912	2,603,678	1,163,078	102.07%	45.59%	44.67%
49	1988	879,772	790,441	434,046	89.85%	49.34%	54.91%
50	1989	5,208,318	6,247,734	3,512,866	119.96%	67.45%	56.23%
51	1990	7,239,441	6,689,487	4,313,996	92.40%	59.59%	64.49%

52	1991	4,449,219	5,334,137	2,934,617	119.89%	65.96%	55.02%
53	1992	6,192,548	4,808,967	3,704,057	77.66%	59.81%	77.02%
54	1993	4,519,089	4,067,614	2,188,241	90.01%	48.42%	53.80%
55	1994	4,988,097	4,819,213	2,856,654	96.61%	57.27%	59.28%
56	1995	4,751,423	3,879,213	2,934,350	81.64%	61.76%	75.64%
57	1996	1,409,170	2,143,249	1,023,911	152.09%	72.66%	47.77%
58	1997	5,806,400	6,658,977	4,874,045	114.68%	83.94%	73.20%
59	1998	4,589,562	5,322,771	3,912,369	115.98%	85.24%	73.50%
60	1999	1,878,962	2,380,758	1,814,763	126.71%	96.58%	76.23%
61	2000	2,099,192	3,394,829	2,021,024	161.72%	96.28%	59.53%
62	2001	5,362,084	6,710,146	5,199,199	125.14%	96.96%	77.48%
63	2002	3,608,565	4,712,187	3,372,924	130.58%	93.47%	71.58%
64	2003	1,812,202	2,415,648	1,847,800	133.30%	101.96%	76.49%
65	2004	4,167,587	5,750,452	3,733,999	137.98%	89.60%	64.93%
66	2005	1,752,181	1,964,841	1,533,449	112.14%	87.52%	78.04%
67	2006	1,331,764	1,939,032	1,305,429	145.60%	98.02%	67.32%
68	2007	5,416,640	7,380,021	4,791,895	136.25%	88.47%	64.93%
69	2008	2,819,978	3,501,228	2,637,294	124.16%	93.52%	75.32%
70	2009	4,045,906	5,415,810	3,070,610	133.86%	75.89%	56.70%
71	2010	4,232,926	1,988,861	1,357,148	46.99%	32.06%	68.24%
72	2011	1,142,801	679,950	315,293	59.50%	27.59%	46.37%
73	2012	2,303,362	2,455,863	1,589,178	106.62%	68.99%	64.71%
74	2013	1,202,777	1,439,572	890,241	119.69%	74.02%	61.84%
75	2014	852,744	895,104	601,626	104.97%	70.55%	67.21%
76	2015	9,185,986	12,710,860	7,648,309	138.37%	83.26%	60.17%
	Mean	3,285,061	3,045,279	1,799,633	92.70%	54.78%	59.10%

Annual Flow Volume of West Fork Trinity River at Fort Worth (8WTFW)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	194,122	511,947	202,746	263.72%	104.44%	39.60%
2	1941	1,111,442	1,136,532	749,161	102.26%	67.40%	65.92%
3	1942	1,105,545	1,157,670	851,508	104.71%	77.02%	73.55%
4	1943	172,420	261,832	74,528	151.86%	43.22%	28.46%
5	1944	216,067	329,795	116,303	152.64%	53.83%	35.27%
6	1945	742,215	838,773	371,288	113.01%	50.02%	44.27%
7	1946	380,819	504,212	219,511	132.40%	57.64%	43.54%
8	1947	201,513	251,084	79,840	124.60%	39.62%	31.80%
9	1948	170,364	211,426	127,118	124.10%	74.62%	60.12%
10	1949	373,980	547,931	263,150	146.51%	70.36%	48.03%
11	1950	549,911	692,739	240,075	125.97%	43.66%	34.66%
12	1951	98,045	155,766	60,118	158.87%	61.32%	38.60%
13	1952	48,537	81,178	28,674	167.25%	59.08%	35.32%
14	1953	27,167	156,991	52,009	577.88%	191.44%	33.13%
15	1954	7,867	67,472	20,276	857.63%	257.72%	30.05%
16	1955	14,136	118,925	50,980	841.30%	360.64%	42.87%
17	1956	13,925	86,543	28,898	621.47%	207.52%	33.39%
18	1957	855,153	1,439,530	722,263	168.34%	84.46%	50.17%
19	1958	350,441	395,197	175,946	112.77%	50.21%	44.52%
20	1959	167,252	324,389	85,405	193.95%	51.06%	26.33%
21	1960	132,603	182,412	65,621	137.56%	49.49%	35.97%
22	1961	51,872	170,485	45,790	328.66%	88.27%	26.86%

23	1962	264,694	421,225	167,145	159.14%	63.15%	39.68%
24	1963	51,501	102,684	30,219	199.38%	58.68%	29.43%
25	1964	65,968	255,953	111,266	388.00%	168.67%	43.47%
26	1965	174,360	305,263	126,159	175.08%	72.36%	41.33%
27	1966	326,895	500,682	221,087	153.16%	67.63%	44.16%
28	1967	23,063	124,459	56,357	539.64%	244.36%	45.28%
29	1968	316,093	443,932	148,124	140.44%	46.86%	33.37%
30	1969	319,539	511,945	173,989	160.21%	54.45%	33.99%
31	1970	309,654	404,506	202,257	130.63%	65.32%	50.00%
32	1971	106,057	225,309	69,810	212.44%	65.82%	30.98%
33	1972	48,596	168,010	80,803	345.73%	166.28%	48.09%
34	1973	187,934	396,861	171,421	211.17%	91.21%	43.19%
35	1974	265,849	439,811	230,172	165.44%	86.58%	52.33%
36	1975	382,110	629,700	271,397	164.80%	71.03%	43.10%
37	1976	59,711	247,071	73,625	413.78%	123.30%	29.80%
38	1977	256,633	373,029	166,902	145.35%	65.04%	44.74%
39	1978	18,077	78,239	27,175	432.81%	150.33%	34.73%
40	1979	212,751	405,620	176,644	190.65%	83.03%	43.55%
41	1980	57,401	144,062	61,460	250.97%	107.07%	42.66%
42	1981	554,152	1,059,517	544,324	191.20%	98.23%	51.37%
43	1982	777,495	864,148	437,473	111.15%	56.27%	50.62%
44	1983	40,304	134,556	36,691	333.85%	91.04%	27.27%
45	1984	42,209	145,744	41,562	345.29%	98.47%	28.52%
46	1985	85,046	410,006	114,138	482.10%	134.21%	27.84%
47	1986	193,778	452,415	126,073	233.47%	65.06%	27.87%
48	1987	413,984	528,307	262,169	127.62%	63.33%	49.62%
49	1988	38,786	84,748	28,851	218.50%	74.39%	34.04%
50	1989	1,116,811	1,432,957	721,627	128.31%	64.61%	50.36%
51	1990	1,323,634	1,480,542	1,024,724	111.85%	77.42%	69.21%
52	1991	673,033	997,140	489,583	148.16%	72.74%	49.10%
53	1992	732,783	743,418	520,690	101.45%	71.06%	70.04%
54	1993	390,468	605,350	283,800	155.03%	72.68%	46.88%
55	1994	354,014	543,857	250,715	153.63%	70.82%	46.10%
56	1995	370,425	445,162	251,449	120.18%	67.88%	56.48%
57	1996	150,627	319,602	127,495	212.18%	84.64%	39.89%
58	1997	808,912	928,775	521,757	114.82%	64.50%	56.18%
59	1998	374,594	492,594	264,786	131.50%	70.69%	53.75%
60	1999	54,550	196,659	81,722	360.51%	149.81%	41.56%
61	2000	84,238	284,664	132,410	337.93%	157.19%	46.51%
62	2001	323,955	658,404	268,165	203.24%	82.78%	40.73%
63	2002	167,409	351,721	186,452	210.10%	111.38%	53.01%
64	2003	66,071	191,551	72,060	289.92%	109.06%	37.62%
65	2004	347,922	679,696	301,265	195.36%	86.59%	44.32%
66	2005	47,033	183,877	86,249	390.96%	183.38%	46.91%
67	2006	59,060	162,903	59,002	275.83%	99.90%	36.22%
68	2007	461,948	845,901	393,304	183.12%	85.14%	46.50%
69	2008	99,656	273,858	121,849	274.80%	122.27%	44.49%
70	2009	130,036	368,268	229,735	283.20%	176.67%	62.38%
71	2010	350,747	272,283	140,077	77.63%	39.94%	51.45%
72	2011	43,361	89,416	48,207	206.22%	111.18%	53.91%
73	2012	146,366	378,732	264,179	258.76%	180.49%	69.75%
74	2013	44,166	152,934	74,050	346.27%	167.66%	48.42%
75	2014	30,218	107,512	66,618	355.79%	220.46%	61.96%
76	2015	1,100,583	2,401,547	1,707,557	218.21%	155.15%	71.10%
	Mean	295,140	461,447	229,974	156.35%	77.92%	49.84%

Annual Flow Volume of West Fork Trinity River at Grand Prairie (8WTGP)

	Year	Observed Annual Flow (acre-feet)	Naturalized Annual Flow (acre-feet)	Regulated Annual Flow (acre-feet)	Naturalized (Percent of Observed)	Regulated (Percent of Observed)	Regulated (Percent of Naturalized)
1	1940	347,959	653,906	312,971	187.93%	89.94%	47.86%
2	1941	1,351,505	1,356,735	941,144	100.39%	69.64%	69.37%
3	1942	1,358,729	1,396,976	1,050,136	102.81%	77.29%	75.17%
4	1943	247,156	321,427	116,236	130.05%	47.03%	36.16%
5	1944	316,292	415,925	177,129	131.50%	56.00%	42.59%
6	1945	967,847	1,047,625	534,205	108.24%	55.20%	50.99%
7	1946	583,458	691,220	358,395	118.47%	61.43%	51.85%
8	1947	310,717	349,883	152,606	112.61%	49.11%	43.62%
9	1948	267,348	289,116	188,601	108.14%	70.55%	65.23%
10	1949	643,018	797,884	466,320	124.08%	72.52%	58.44%
11	1950	748,903	873,215	385,410	116.60%	51.46%	44.14%
12	1951	163,325	199,070	90,486	121.89%	55.40%	45.45%
13	1952	106,732	115,806	51,925	108.50%	48.65%	44.84%
14	1953	99,727	205,052	86,660	205.61%	86.90%	42.26%
15	1954	50,775	82,417	27,088	162.32%	53.35%	32.87%
16	1955	74,170	151,041	78,007	203.64%	105.17%	51.65%
17	1956	60,497	103,865	40,335	171.69%	66.67%	38.83%
18	1957	1,164,335	1,767,633	976,366	151.81%	83.86%	55.24%
19	1958	506,097	523,474	281,883	103.43%	55.70%	53.85%
20	1959	289,305	418,781	148,956	144.75%	51.49%	35.57%
21	1960	218,931	233,354	98,290	106.59%	44.90%	42.12%
22	1961	173,526	267,033	109,988	153.89%	63.38%	41.19%
23	1962	393,777	522,986	245,466	132.81%	62.34%	46.94%
24	1963	124,643	132,662	49,804	106.43%	39.96%	37.54%
25	1964	210,427	382,486	222,718	181.77%	105.84%	58.23%
26	1965	381,707	474,417	243,008	124.29%	63.66%	51.22%
27	1966	518,890	665,016	344,623	128.16%	66.42%	51.82%
28	1967	128,509	182,500	96,274	142.01%	74.92%	52.75%
29	1968	491,562	578,324	241,827	117.65%	49.20%	41.82%
30	1969	526,475	683,167	301,027	129.76%	57.18%	44.06%
31	1970	516,686	562,400	334,425	108.85%	64.73%	59.46%
32	1971	305,887	402,370	204,144	131.54%	66.74%	50.74%
33	1972	179,378	233,293	126,095	130.06%	70.30%	54.05%
34	1973	456,698	624,352	356,133	136.71%	77.98%	57.04%
35	1974	451,557	574,675	331,036	127.27%	73.31%	57.60%
36	1975	616,374	784,283	409,252	127.24%	66.40%	52.18%
37	1976	221,421	351,673	145,115	158.83%	65.54%	41.26%
38	1977	495,463	544,456	314,834	109.89%	63.54%	57.83%
39	1978	137,929	131,248	61,891	95.16%	44.87%	47.16%
40	1979	472,986	598,168	316,206	126.47%	66.85%	52.86%
41	1980	215,987	236,560	125,932	109.52%	58.31%	53.23%
42	1981	851,544	1,282,659	718,423	150.63%	84.37%	56.01%
43	1982	1,074,115	1,068,255	613,513	99.45%	57.12%	57.43%
44	1983	232,245	254,889	124,717	109.75%	53.70%	48.93%
45	1984	230,204	269,478	128,039	117.06%	55.62%	47.51%
46	1985	289,831	509,962	185,809	175.95%	64.11%	36.44%
47	1986	453,483	609,366	246,853	134.37%	54.43%	40.51%
48	1987	607,466	623,119	336,385	102.58%	55.38%	53.98%
49	1988	173,206	149,886	73,902	86.54%	42.67%	49.31%

50	1989	1,621,428	1,813,497	1,052,192	111.85%	64.89%	58.02%
51	1990	1,664,765	1,678,091	1,189,734	100.80%	71.47%	70.90%
52	1991	1,195,434	1,366,945	819,970	114.35%	68.59%	59.99%
53	1992	1,341,489	1,035,741	781,581	77.21%	58.26%	75.46%
54	1993	877,450	806,751	451,021	91.94%	51.40%	55.91%
55	1994	793,811	704,529	380,352	88.75%	47.91%	53.99%
56	1995	859,230	694,439	474,711	80.82%	55.25%	68.36%
57	1996	373,341	454,133	224,856	121.64%	60.23%	49.51%
58	1997	1,078,378	1,056,366	621,164	97.96%	57.60%	58.80%
59	1998	711,364	695,037	429,774	97.70%	60.42%	61.83%
60	1999	295,936	319,554	180,653	107.98%	61.04%	56.53%
61	2000	403,155	487,994	291,780	121.04%	72.37%	59.79%
62	2001	695,526	911,804	488,286	131.10%	70.20%	53.55%
63	2002	594,343	657,762	460,836	110.67%	77.54%	70.06%
64	2003	290,473	311,835	162,162	107.35%	55.83%	52.00%
65	2004	766,683	967,686	556,312	126.22%	72.56%	57.49%
66	2005	232,163	257,471	143,668	110.90%	61.88%	55.80%
67	2006	290,049	285,932	142,003	98.58%	48.96%	49.66%
68	2007	981,828	1,231,874	737,471	125.47%	75.11%	59.87%
69	2008	370,778	426,527	250,429	115.04%	67.54%	58.71%
70	2009	568,126	684,314	504,473	120.45%	88.80%	73.72%
71	2010	786,377	378,864	232,840	48.18%	29.61%	61.46%
72	2011	261,769	169,641	112,479	64.81%	42.97%	66.30%
73	2012	450,895	542,496	408,906	120.32%	90.69%	75.37%
74	2013	263,147	214,275	106,469	81.43%	40.46%	49.69%
75	2014	204,732	185,028	126,872	90.38%	61.97%	68.57%
76	2015	1,969,567	2,722,127	1,959,434	138.21%	99.49%	71.98%
	Mean	536,198	615,195	353,434	114.73%	65.91%	57.45%