WATER RESOURCES PLANNING STUDY
FOR ARKANSAS AND OKLAHOMA

by

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WATER RESOURCES RESEARCH CENTER

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PREFACE

This investigative study was initiated on October 1, 1966, with an estimated completion date of September 30, 1969, Subsequently, the termination date was extended until June 30, 1970, in order to permit stream quality data collection and to encourage further investigation of stream storage potential within the basin. The primary goal of the study was to review, analyze and correlate previously collected hydrologic data for use by the Arkansas-Oklahoma Compact Committee (the Compact) in apportioning the joint water resource of the respective states.

The information requested by the Arkansas-Oklahoma Compact Committee is listed in order of priority:

1. Stream discharge throughout the base period of study (water years 1938-1965, inclusive) for all major watercourses flowing between Arkansas and Oklahoma.

2. Statistical review of the stream flows derived in (1) above in order to provide usable flow data based on various recurrence intervals.

3. Particular attention must be given to low flow investigations in the river basins under study because the water yield under drought conditions is of major consideration in subsequent apportionment.

4. Conservation storage feasibility must be considered at: (1) the state line between Arkansas and Oklahoma, and (2) at potential reservoir sites wherever valley configuration permits feasible reservoir storage.

5. Water quality investigations of the major streams must be reviewed and predictions of the effect of reservoir storage and anticipated future use of these streams must be made.

Most data used in the study consisted of previously collected information. Field investigations were a minimum, except where previous data was insufficient.

SUMMARY OF ACCOMPLISHMENTS

The following accomplishments are reported at the end of the investigation.

1. Mean monthly flows from actual gaging and by derivation were established at all gaging stations and at the sites where major streams cross the Arkansas-Oklahoma state line. These stream flows have been established throughout the study period of record, 1938-1965, for the following sub-basins of the Arkansas River within the Compact area of interest:

   a. Spavinaw Creek Sub-basin
   b. Illinois River Sub-basin
   c. Lee Creek Sub-basin
   d. Poteau River Sbu-basin
   e. Arkansas River (main stem sub-basin)

2. Flow frequency studies are complete for all gage stations within the Compact area of interest. In the case of flood frequency investigations, the Pearson Type III frequency distribution is most applicable. For minimum flow occurrences, the Pearson Type I frequency distribution is more characteristic of flow variations.

3. Reservoir storage procedures have been developed which permit the sizing of reservoirs at a chosen stream location providing chronological flow data is available for the stream at point of consideration. The basis for one operation is ΣInflow - ΣOutflow = change in storage. This "book-keeping equation" can be maintained over the whole period of inflow records employing either a graphical solution or a computerized analytical approach. In Appendix C the graphical procedure as applied to each major stream at the state line for three specific storage yield conditions were determined at each location. These three different theoretical storage conditions considered applicable to this study were: (1) the maximum storage reservoir -- which represents the volume required to sustain the mean annual flow rate of the stream 90% of the time; (2) the maximum withdrawal rate (yield) which could be sustained 99% of the time using a storage reservoir with 70% of the average annual flow 99% of the time.

A second procedure given initial development by Dr. H. M. Jeffus employs a ststistical process for storage reservoir sizing with application reduced to basic equations. Initially reliance was based on a mathematical model developed by Moran and subsequent study is being continued under WRRC Project B-015 ARK which commenced July 1, 1970.

4. An experimental multiple correlation involving rainfall, antecedent moisture, season and runoff was made on the Illinois River Sub-basin using stream gage station readings as the controlling variable. The correlation on the attempted graphical procedure was so low that attempts at synthesizing monthly stream flow records based on precipitation and estimated "water loses" were discontinued.

5. Land use patterns for the entire basin within the State of Arkansas were examined particularly for potential irrigation demands. While the annual rainfall over the basin averages in excess of 40 inches, supplemental irrigation is commonly needed to bring crops to their ultimate fruition. An inventory of the agriculture use of lands was made using reports and aerial photographs of the U.S. Department of Agriculture. Most of the region is covered with timber and the soil is not of the quality to support crops. The survey of tillable land subject to irrigation was not based on proximity to a watercourse, elevation, or previous irrigation practice but rather upon feasibility of the soil type to support irrigated crops ---- termed potential irrigable land.

PROJECT RELATED PUBLICATION

1. Jeffus, H.M., Proctor, J.A. and Heiple, L.R., Interim Progress Report, WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA, Arkansas Water Resources Research Center, University of Arkansas, Fayetteville, Arkansas, October, 1967.

2. Jeffus, H.M., Proctor, J.A. and Heiple, L.R., "WATER QUALITY STUDIES FOR ARKANSAS STREAMS", Research Report Series No. 11, Engineering Experiment Station, University of Arkansas, Fayetteville, Arkansas, November, 1967.

3. Jeffus, H.M., Proctor, J.A. and Heiple, L.R., Second Interim Progress Report - WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA, Arkansas Water Resources Research Center, University of Arkansas, Fayetteville, Arkansas, August, 1968.

4. Jeffus, Hugh Milton, AN APPLICATION AND EVALUATION OF OPERATIONS RESEARCH TO WATER SUPPLY RESERVOIR DESIGN, Doctoral Dissertation presented at the University of Oklahoma, 1969.

5. Bechir, M. Hamdy and Gaudy, Anthony F., Jul, WATER RESOURCES PLANNING STUDY OKLAHOMA AND ARKANSAS, Oklahoma Water Resources Board, 1968.

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for

ARKANSAS AND OKLAHOMA

INTRODUCTION

The purpose of this study is to make an appraisal of the local water resources in the Arkansas River Basin common to the two States of Arkansas and Oklahoma as defined by the Arkansas-Oklahoma Compact Committee (hereinafter referred to as "the Compact Committee"). A review, analysis, and correlation has been made of hydrologic data previously collected by others. Consideration is given to the evaluation at selected sites of the storage and potential use of existing water sources.

The investigation includes those interstate waters of the Arkansas River and its tributaries indicated in the Site Map of Figure 1. The sub-basins of the Arkansas River which intersect the Arkansas-Oklahoma State line from north to south are: (1) Spavinaw Creek (2) Illinois River (3) Lee Creek (4) Arkansas River and (5) Poteau River.

Base Period of Study

The base period of record for this study was arbitrarily selected by the Compact Committee to include water years 1938 to 1965, inclusive. Included in this interval of time was one major, prolonged drought from May, 1953 until January, 1955. A short, intensive dry period was experienced from June, 1963 through February, 1964.

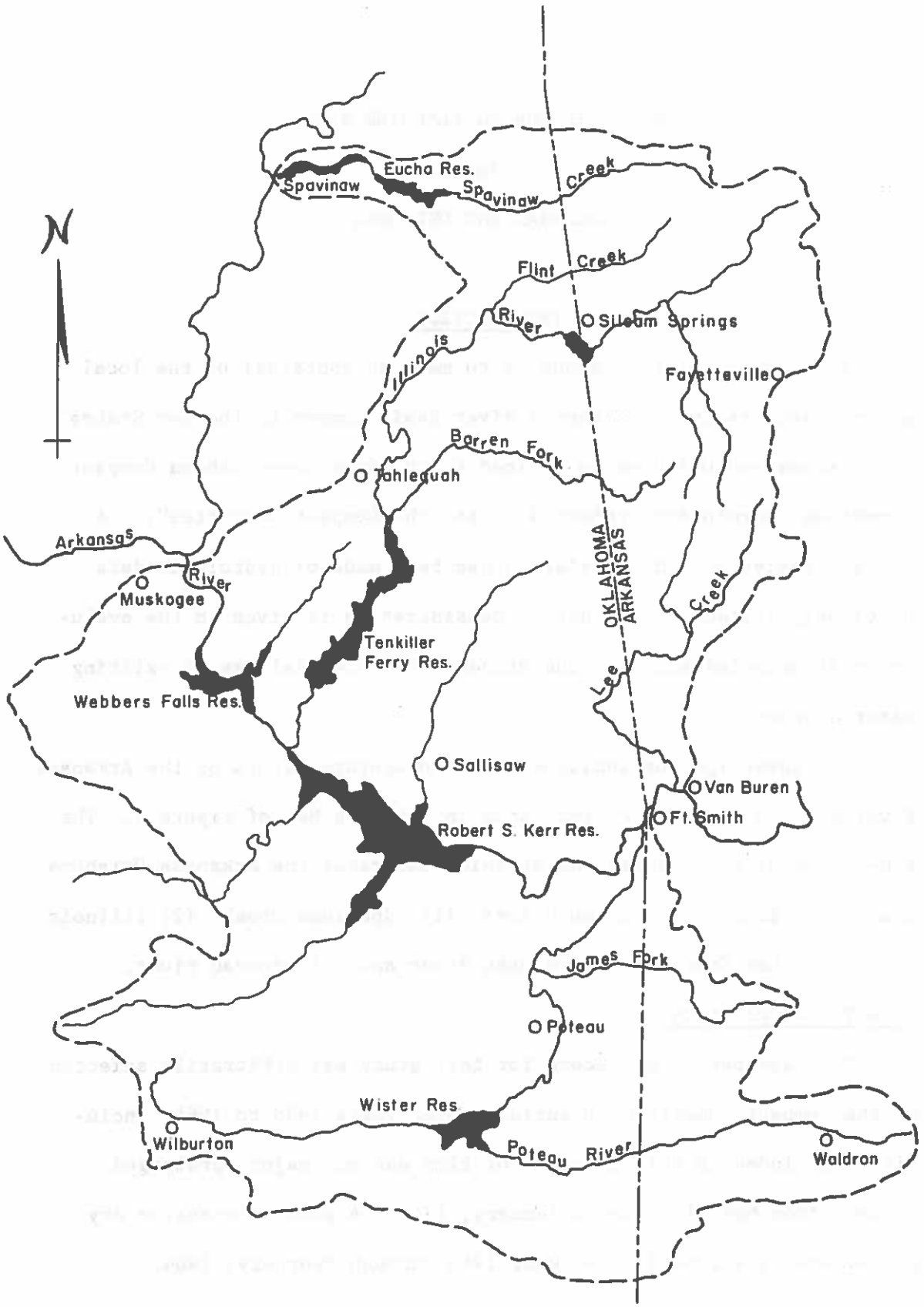


Figure 1

Site Map of Arkansas River Compact Area

TABLE I

Gaging Stations & Their Period of Record

Sub-basin	Station Number	Location	Drainage Area Sq. Mi.	Period of Record
Spavinaw Creek	1912	Spavinaw Creek, Sycamore, Okla.	127	10/59-9/61*
	1912.2	Spavinaw Creek, Sycamore, Okla. (1 mile D.S.)	133	10/61-9/65
Illinois River	1950	Osage Creek, Elm Spring, Ark.	129	10/50-9/65
	1955	Illinois River, Watts, Okla.	635	8/55-9/65
	1958	Flint Creek, Springtown, Ark.	14	6/61-9/65
	1960	Flint Creek, Kansas, Okla.	110	8/55-9/65
	1965	Illinois River, Tahlequah, Okla.	959	10/35-9/65
	1969	Barren Fork, Dutch Mill, Ark.	43	4/58-9/65
	1970	Barren Fork, Eldon, Okla.	307	10/48-9/65
	1980	Illinois River, Gore, Okla.	1626	4/39-9/65
Lee Creek	2495	Cove Creek, Ark.	36.9	5/50-9/65
	2500	Lee Creek, Van Buren, Ark.	427	9/30-6/37
Arkansas River (Mainstream)	1945	Arkansas River, Muskogee, Okla.	96,674	10/25-9/65
	2450	Canadian River, Whitefield, Okla.	47,576	7/38-9/65
	2455	Sallisaw Creek, Sallisaw, Okla.	182	10/42-9/65
	2465	Arkansas River, Sallisaw, Okla.	147,757	10/47-9/65
	2505	Arkansas River, Van Buren, Ark.	150,483	10/27-9/65
Poteau River	2470	Poteau River, Cauthron, Ark.	200	2/39-9/65
	2475	Fourche Maline, Red Oak, Okla.	122	10/38-9/65
	2485	Poteau River, Wister, Okla.	993	5/38-9/65
	2494	James Fork, Hackett, Ark.	148	4/58-9/65

*Station records unreliable

Source of Records

Stream Flow

Stream Flow records at the various United States Geological Survey (U.S.G.S.) gage stations indicated on subsequent sub-basin maps were obtained from the various U.S.G.S. Water Supply Papers. Listed in Table I are the stream gaging stations according to identifying number, location, drainage area and term of stream flow records. Published data for each station includes the mean daily flow rate, mean monthly flow rate, and extreme discharge values. The only stream gaging stations with continuous records throughout the entire base period of record (1938 to 1965, inclusive) were Numbers 1965, 2505, and 2485. All other stations with shorter term records were extended by synthesizing discharges for the remainder of the base period. The methods used in synthesizing flow data are discussed on page 6.

Precipitation

Precipitation records are published by the United States Weather Bureau (U.S.W.B.) at Ashville, N.C., and are known as "Climatological Data for the United States by Sections". The locations of these precipitation stations are found on subsequent sub-basin maps. Monthly precipitation for all U.S.W.B. stations are tabulated in Appendix B.

Evaporation

Two sources of evaporation information were used in this study. One of these, U.S. Weather Bureau Technical Paper No. 37, "Evaporation Maps for the United States" provides very general and rather widely used annual lake evaporation data. The other reference is the Review Report of "Lee Creek and Pine Mountain Dam in Crawford County, Arkansas"

prepared in 1965 by the Little Rock District, Corps of Engineers. The latter report gives detailed monthly pan evaporation values at several sites in, or near, the Compact study area. Evaporation studies indicate the regional mean annual lake evaporation is substantially equal to the mean annual precipitation.

INVESTIGATIVE PROCEDURES

Basic hydrologic investigations have been completed on all subbasins except for the Arkansas River portion. The systematic hydrologic development includes: (1) a listing of stream flow records giving mean monthly discharge rates; (2) the analytical development of mean monthly discharge flow rates for unrecorded intervals during the base period of study (1938 through 1965); (3) where no border station exists, a translation of records including derivation of mean monthly discharge values to the Arkansas-Oklahoma line; (4) stream flow investigations of extreme droughts during the base period of record; (5) flood frequency analyses at critical basin locations based upon instantaneous peak discharge; and (6) simulated water storage determinations on major streams at border locations.

Stream Flow Analysis

Mean monthly discharge records have been compiled for the complete base period of record (1938 through 1965) at all gaging stations as well as at State Line locations in the area under study. Because stream gagings were continuous throughout the base period of record at only a few stations, it was necessary to develop missing events through synthesis of flows using statistical procedures.

Graphical correlations between a graphical gaged and a partial gaged station have been developed by the U. S. Geological Survey and are described in detail on pp. 80-85 of U.S.G.S. Water Supply Paper 1541-C. The correlations defined the simultaneous flow events between two stations and are used to determine the ungaged flows most likely to have occurred based upon the corresponding gaged flow at a nearby station. Figure 2 is an illustrative example of this correlative procedure for a gaged and ungaged station in this study.

All derived discharges for gaging stations in Spavinaw Creek Sub-basin, Illinois River Sub-basin, and in Lee Creek Sub-basin were either directly or indirectly dependent upon the Tahlequah gage (Station 1965).

There was no need to synthesize data on the discharge values of the Arkansas River because all stations records were complete for the total base period of record. Developed discharge values for gage stations on the Poteau River were based on the gaged discharges at Wister, Oklahoma. (Station 2485).

For some stations, such as Spavinaw Creek near Sycamore, Oklahoma, a series, or step, correlation utilizing an intermediate station, in turn based upon the Tahlequah gage, was developed. The step method was used only when a larger coefficient of correlation was indicated than by a direct correlation with the Tahlequah gage.

Discharge records for ungaged state line sites were computed by a ratio of drainage areas utilizing, where possible, the records from a nearby gage on the same stream. Where no gage existed on a particular stream, the ratio of drainage areas was established with a gaging station on a nearby stream.

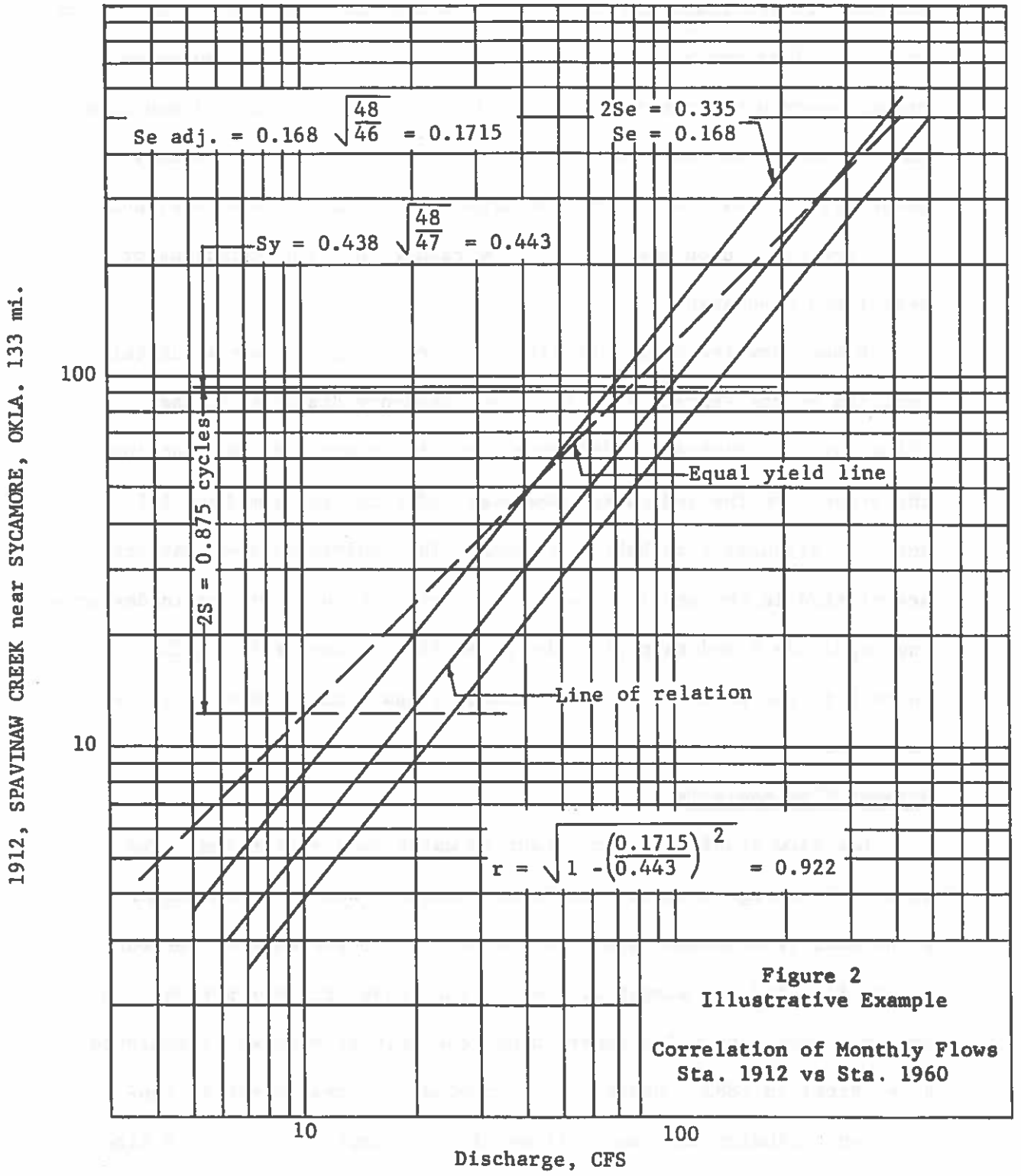


Figure 2 - 1960, FLINT CREEK near KANSAS, OKLA. 110 mi.

Flood Frequency Analyses

The primary value of flood frequency analyses is to determine the size of spillways and other outlet works for reservoirs. A portion of flood flows may be used to restore storage depletions caused by normal reservoir operations. The major portion of a large flood flow must be passed on downstream. Therefore, flood flows are of only secondary interest in stream discharge apportionment because allocations are based upon mean annual flow rather than instantaneous or peak flood discharge rates.

Flood flow frequency distributions in this study are accurately typified by the Pearson Type III skew frequency distribution as illustrated in Figure 3. The type curve is constructed by plotting the areas, for the indicated skewness, under the Pearson Type III curve on arithmetic probability paper. The individual observations are plotted in the usual manner, i.e., rank the observations in descending magnitude M and then plot the given flow volume at $P = \frac{M}{N + 1}$ where P is the probability of exceedance, and N the number of years of record.

Drought Flow Analysis

Low flow studies are important in water supply planning. The amount of storage necessary to insure adequate water for subsequent withdrawal is dependent upon the frequency of occurrence of periods of low flow and the amount of flow during these critical periods. A commonly used method for determining reservoir storage was formulated by W. Rippl in 1883. Under Rippl's procedure a mass curve is constructed including the lowest flows of chronological record. A line with a slope equal to the desired draft rate is then superimposed on

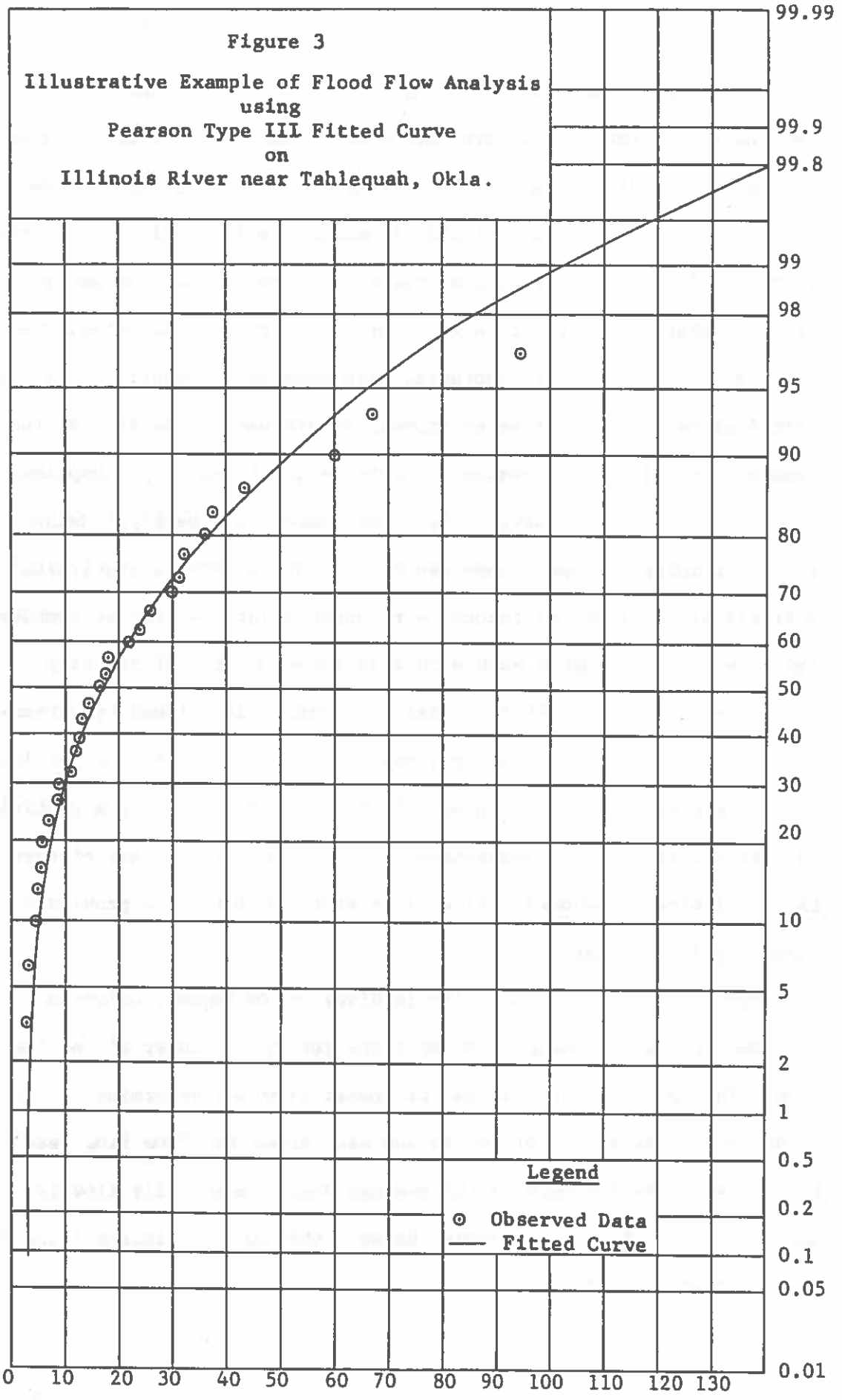


Figure 3
Illustrative Example of Flood Flow Analysis using
Pearson Type III Fitted Curve
on
Illinois River near Tahlequah, Okla.
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Legend
Observed Data
Fitted Curve
Per Cent of Years in Which Flood Runoff Was Equal To or Less Than Stated Magnitude
Discharge, CSM

the mass diagram tangent to the first point of significant decrease in flow rate. The maximum ordinate value between this draft line and the mass curve indicates the required storage. This is illustrated in Figure 4. Shortcomings of this procedure include: (1) the recurrence interval of the worst drought of record is unknown and more severe droughts than those of record will surely occur; (2) the actual draft rate is not constant but fluctuates with seasonal demands; (3) a reservoir designed solely for water storage is presumed to be full at the commencement of the dry season --- often a questionable presumption.

Some of the previously listed shortcomings of the Rippl Method for determining storage volume can be corrected. From a statistical analysis of low flows of record, a recurrence interval can be computed for a series of droughts each with a different degree of severity. Also, the effect of draft rate variation can be diminished by extending the mass diagram over several years of record. Lastly, a portion of the reservoir capacity can be allotted to compensate for a partially full reservoir at the commencement of a drought period. All of these factors increase the design size of reservoir required to provide a given supply of water.

Drought studies of the Illinois River at Tahlequah, Oklahoma included several approaches to determine recurrence intervals of low flow. The twleve month interval of lowest flow was determined for the established base period of record and was termed the "low flow year" in Figure 5. An analysis of the average annual mean daily flow is shown on Figure 6. The agreement between the data of Figures 5 and 6 is indicated in Table II.

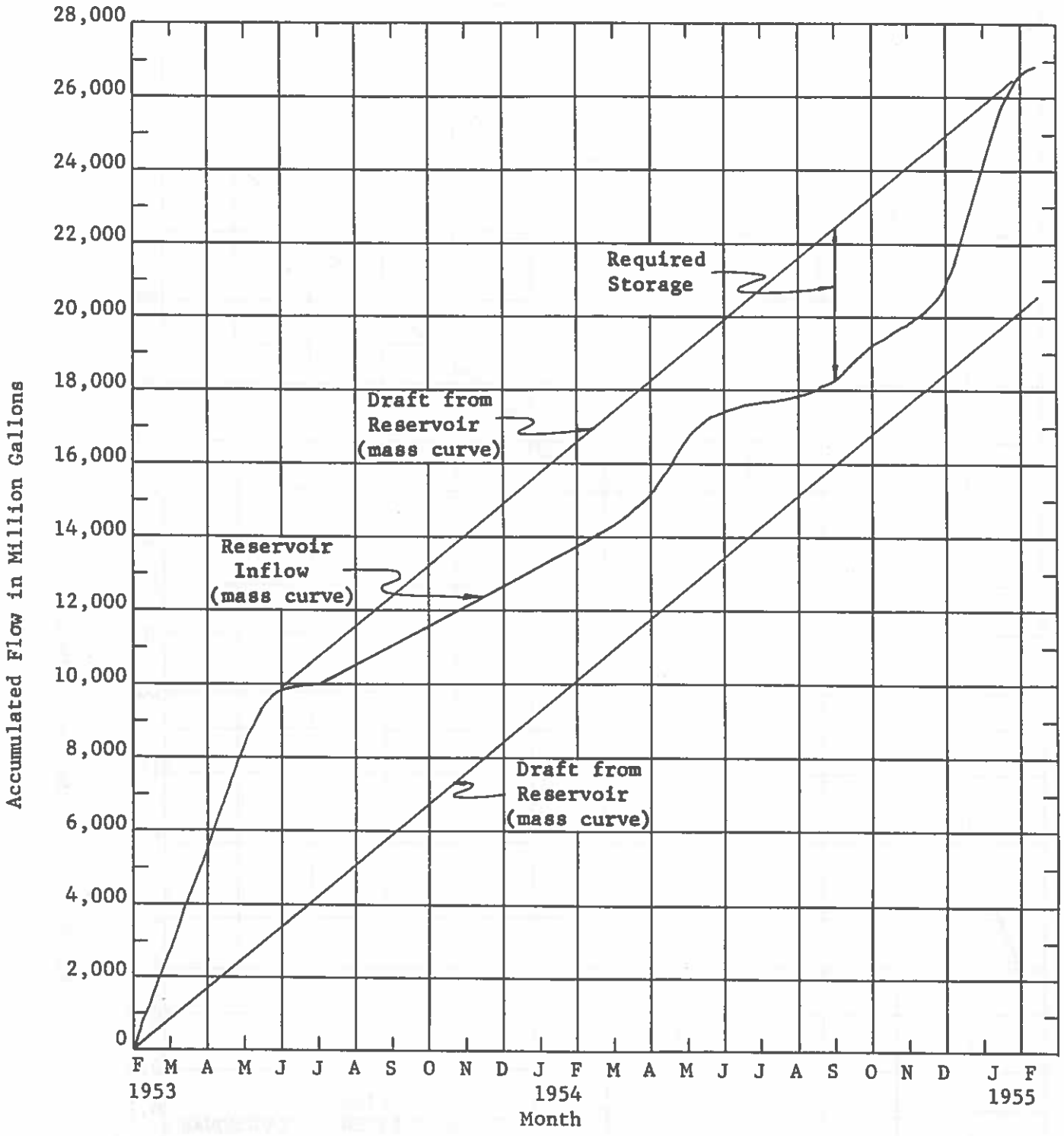


Figure 4 - Illustrative Example of Mass Storage Diagram at Gage Station 7-1950 on Osage Creek near Elm Springs

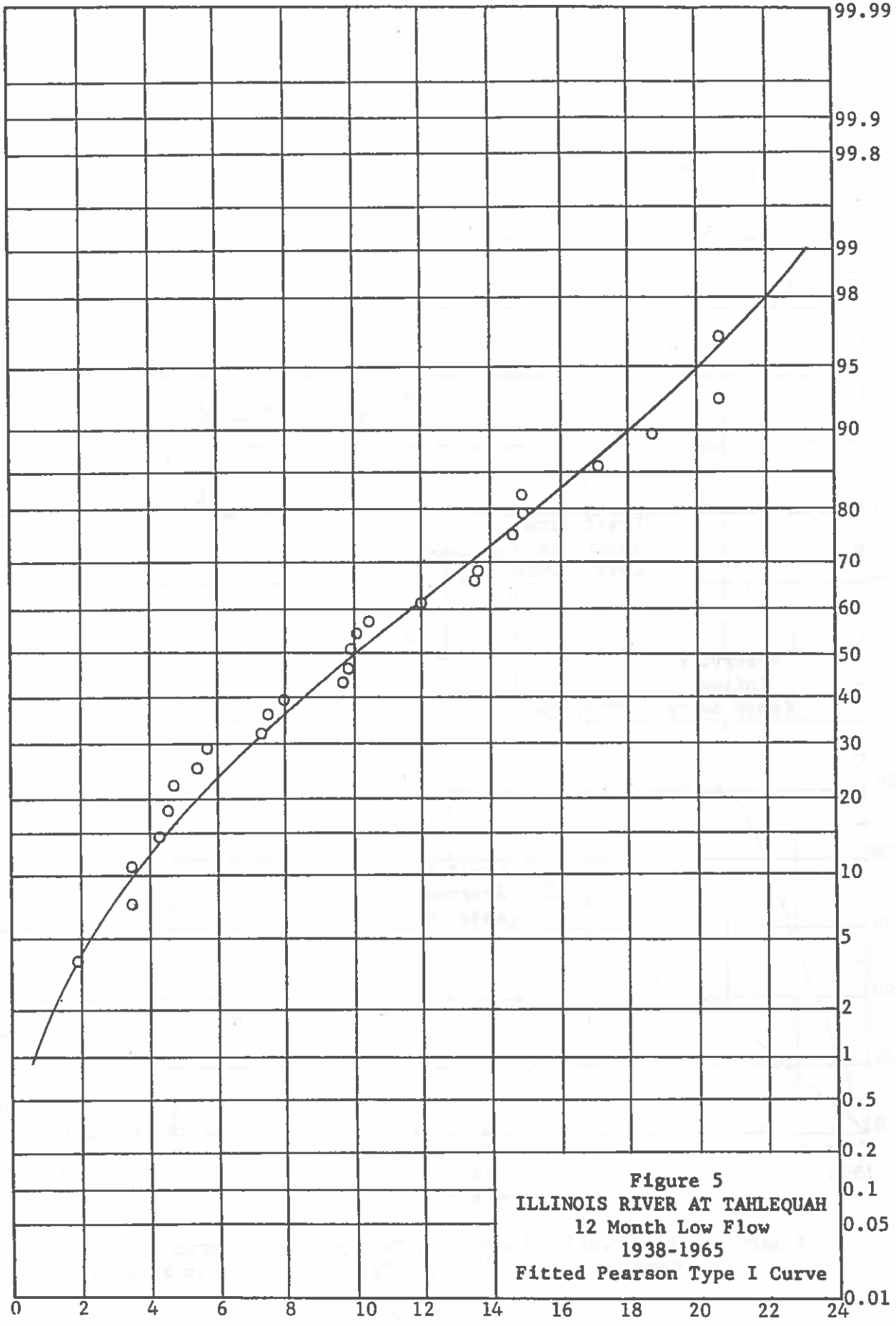


Figure 5
ILLINOIS RIVER AT TAHLEQUAH
12 Month Low Flow
1938-1965
Fitted Pearson Type I Curve

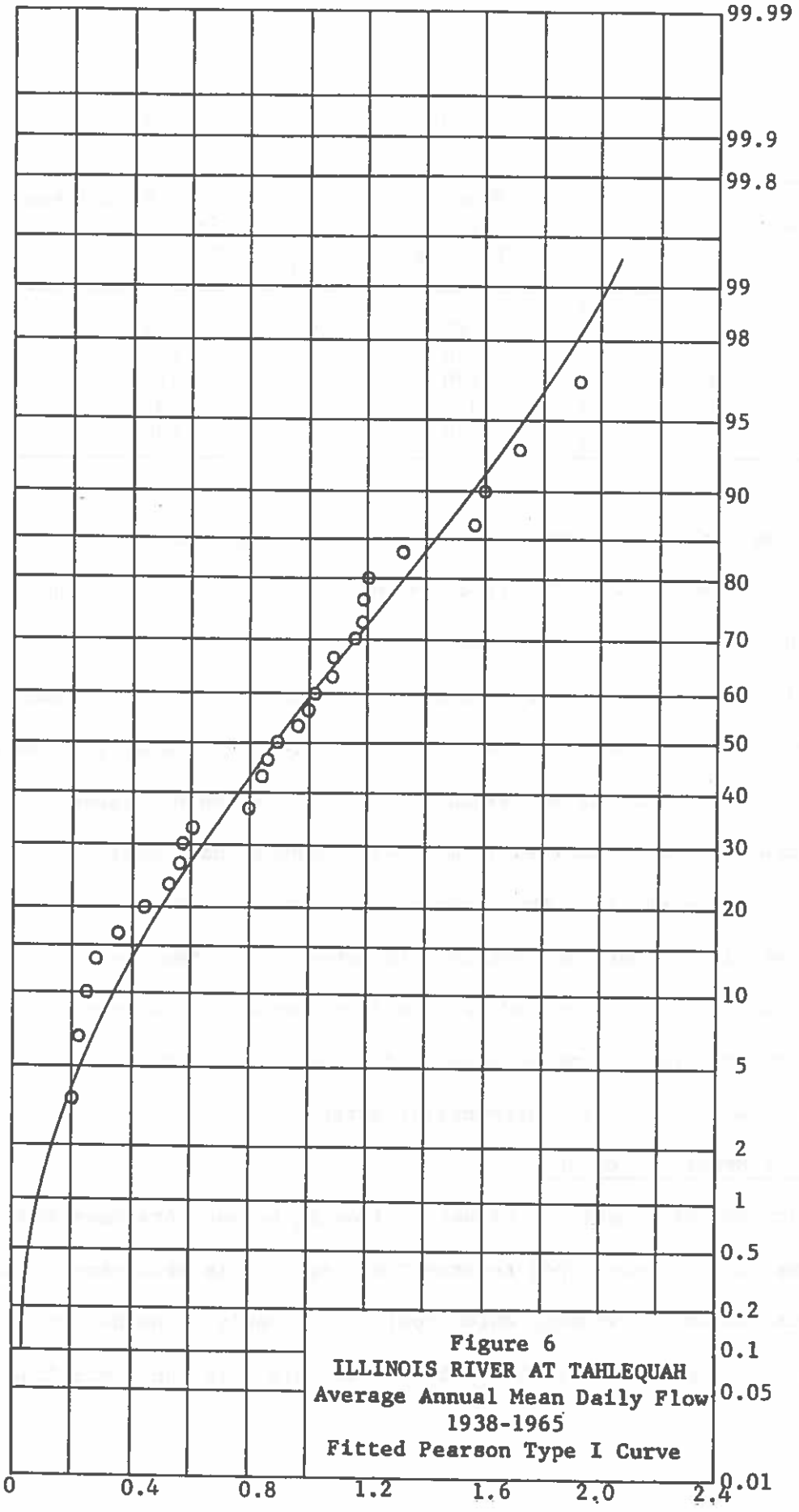


Figure 6
ILLINOIS RIVER AT TAHLEQUAH
Average Annual Mean Daily Flow
1938-1965
Fitted Pearson Type I Curve

Table II - Annual Drought Recurrence Interval

Return Interval	12 Month Low Flow in cfs (From Fig. 5)	Average Annual Mean Flow in cfs (From Fig. 6)
100	80	77
50	120	115
20	230	211
10	350	307
5	520	480

From Table II it can be seen that the average annual mean flow compares favorably with the twelve month low flow for drought predictions, especially at lower return intervals.

Flow Duration curves were not prepared for this report because of the misleading nature of the resultant curves. Because flow data at state line locations was synthesized only for monthly flows the flow duration curves derived from arrayed monthly data would be considerably different than that from recorded daily flow data at stream gaging stations. Because hydrologists generally prefer, and accept, flow duration curves prepared from daily records, flow duration curves prepared from prepared monthly derived flows were omitted from this report because of their controversial nature.

Reservoir Storage Procedure

Because the compacting of waters flowing between Arkansas and Oklahoma will be based upon reservoir storage, it is necessary to know the total amount of storage which could conceivably be needed on a stream at the point of consideration -- in this case the state line.

Since the maximum water removal rate from the stream cannot exceed the long-term mean annual flow rate of the stream, the maximum reservoir storage allottment should not exceed that volume necessary to assure a removal rate equal to, or less than, the stream's mean annual flow rate. The reservoir removal should include all withdrawals from the reservoir -- that removed by man for productive use, evaporation, transpiration, seepage, wastage and that spilled over the dam in time of floods.

It is impractical to construct reservoirs large enough to completely control the stream flow at all times, but it is possible to provide enough storage for control during a large percentage of the time.

Early in the investigation a graphical solution was developed which considered three different reservoir storage conditions with variables: storage volume in acre feet; percentage of time the reservoirs would be depleted of water; and maximum draft rate of permissable withdrawal from the reservoir. A modified Rippl procedure for reservoir sizing employed the mass curve of reservoir inflow for the total base period (1938 through 1965). Three different theoretical storage conditions were considered in this study: (1) the maxumum storage volume -- that which would be sufficient to sustain the mean annual flow rate 90% of the time; (2) a storage volume equal to 70% of the maximum storage; and (3) the reservoir size capable of sustaining 70% of the average annual flow 99% of the time. In cases (1) and (3) the minimum storage volume was

determined after fixing the withdrawal rate and the percentage of allowable time the reservoir could be empty. In case (2) the withdrawal rate was maximized while storage volume and percentage of time for an empty reservoir were fixed.

The method of graphical solution for the three critical conditions previously described involved successive adjustments of the independent variable until all limits were satisfied. The principle employed in this solution satisfies the following equation: cumulative stream inflow minus cumulative withdrawal equals the change in storage for each monthly increment. In order to follow this storage determination step-by-step, reference is made to Figure 7 Operation Curve No. 1, on Spavinaw Creek using the graphical solution is listed in Table III. A description of the procedure follows with specific reference to Figure 7 and Table III.

> "While the storage investigations began with water year 1938 (October, 1937) There was no storage available until January 1938 because demands had exceeded inflow until the fourth month. The reservoir theoretically contained 61,895 acre feet of water. From that peak volume the reservoir continued to become depleted until it became dry during October, 1939. From the end of October, 1939 until December, 1940 the reservoir was dry because in every month the total withdrawal exceeded the cumulative inflow. During the interval December, 1940 until January, 1955, the reservoir was never dry and it reached the maximum storage value (110,000 acre feet) several times during this interval. Water was spilled for the first time during March, 1943. In January, 1955 the reservoir again dried and remained in this state until March, 1957. These two dry intervals were the sole instances of reservoir depletion in the study but they totalled slightly over 10% of the whole base period."

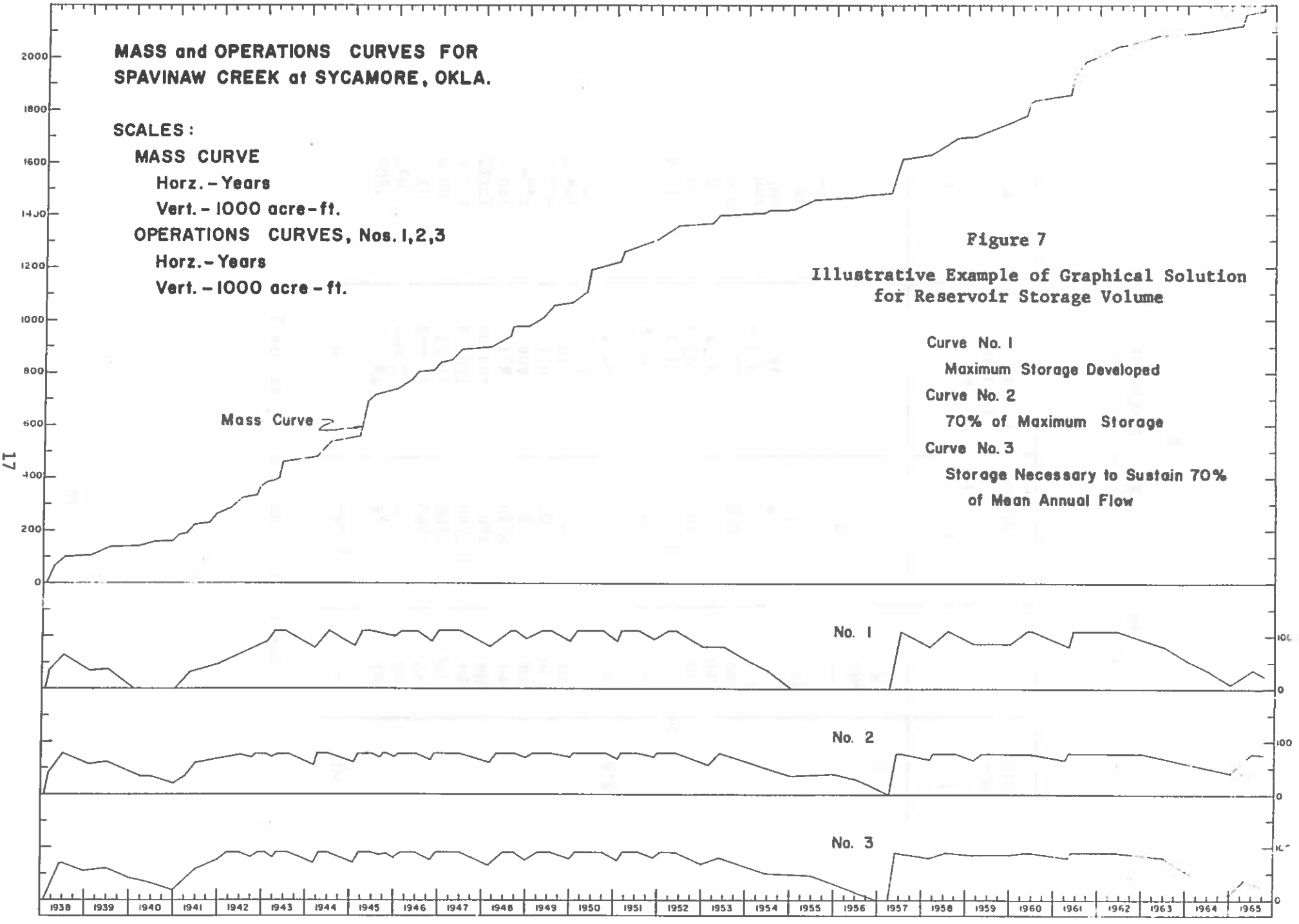


Figure 7

Illustrative Example of Graphical Solution for Reservoir Storage Volume

Curve No. 1
Maximum Storage Developed

Curve No. 2
70% of Maximum Storage

Curve No. 3
Storage Necessary to Sustain 70% of Mean Annual Flow

Table III

ANALYTICAL STORAGE PROCEDURE
(to accompany and explain Figure 7)

Water Year (1)	Month (2)	Cumulative Inflow in Acre Feet (3)	Cumulative Withdrawal in Acre Feet (4)	Storage in Acre Feet (3) - (4)
1938	Oct	879	6474	-
	Nov	1649	6474	-
	Dec	4960	6474	-
	Jan	9235	6474	2761
	Feb	49870	12948	36922
	Mar	65522	19422	46100
	Apr	79849	25896	53953
	May	92852	32370	60482
	Jun	100739	38844	61895
	Jul	102165	45318	56847
	Aug	103141	51792	51349
	Sep	103821	58266	45555
1939	Oct	104254	64740	39514
	Nov	105374	71214	34160
	Dec	106012	77688	28324
	Jan	106903	84162	22741
	Feb	113585	90636	22949
	Mar	119726	97110	22616
	Apr	125806	103584	22222
	May	132789	110058	22731
	Jun	135366	116532	18834
	Jul	136540	123006	13534
	Aug	136955	129480	7475
	Sep	137154	135954	1200
1940	Oct	137695	142428	

Continued on Curve No. 1, Figure 7

The second procedure was an analysis of storage requirements by Jeffus using the Rippl method, the sequent peak method, Hazen's method and Moran's model.[1] These algorithms were applied to ten streams in Northwest Arkansas and Eastern Oklahoma. Some of the ten streams were outside of the study area but were included to get a better statistical basis for comparison. Moran's model is apparently the better algorithm for determining the design size of a water supply reservoir.

Moran's model may be described as follows:

Let: X_t be the streamflow during time t. X_t is independent or without serial correlation and is equal to 0, 1, 2,... with probabilities p_o, p_1, p_2,..., respectively. Z_t be the reservoir contents and equal to 0, 1, 2, ..., K at time t with probabilities P_0, P_1, P_2, ... P_k, where:

K is the size of the reservoir and,

M, X_t, K and Z_t are integral multiples of some unit also,

M is the draft from the reservoir.

---

[1]Jeffus, Hugh Milton, An Application and Evaluation of Operations Research to Water Supply Reservoir Design, Doctoral Dissertation presented at the University of Oklahoma.

After the reservoir has been in operation for a period of time, the probability distribution of reservoir contents, Z_t, will have achieved a stable distribution so that:

$$P_i \text{ at } t = P_i \text{ at } t+1$$

From a recurrence relationship, Z_t will then be defined by the system of equations:

$$P_o = P_o\,(p_o + \ldots + p_M) + P_1\,(p_o + \ldots p_{M-1}) + \ldots P_M p_o,$$

$$P_1 = P_o p_{M+1} \qquad P_1 p_M \qquad P_M p_1 + P_{M+1} p_o,$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

$$P_{K-M} = P_o\,(p_K + \ldots) + \ldots \qquad + P_{K-M}(p_M + \ldots),$$

and $P_{K-M+1} = P_K = 0$.

In this case $0 \leqq Z_t \leqq K-M$, and the distribution of Z_t can be found by solving the above equations.

The probabilities of streamflow, p_i, were determined as follows: (1) Each stream was analyzed for the parameters of a Pearson type III frequency distribution. (2) The Pearson type III curve for each stream was plotted on probability paper. (3) Probabilities of streamflow in increments of 0.1 cubic feet per second per square mile were taken from the Pearson type III curve. The other variables in Moran's model are the reservoir size, K, and the draft or release from the reservoir, M. For a given K and M, the output of Moran's model is the probabilities of the contents of the reservoir totaling 0, 0.1, 0.2,---K volumes. The probability of the reservoir being dry, containing zero

volume of water, is the item of primary interest.

It was observed that at high draft rates M, i.e., draft rates greater than 50 percent of the mean annual flow, the relationship between reservoir size, K, and the probability of the reservoir being dry, P_o, was linear when plotted on semi-logarithmic paper. Equations developed by Jeffus expressing this relationship are:

$$\ln P_o = N - SK \qquad (1)$$

where P_o is the probability of the reservoir being dry,

$$\ln S = 0.159 - 3.30 \ln (\% \text{ draft }) \qquad (2)$$

where S is the slope of the plotted relationship between P_o and K,

$$\ln N = -0.868 - 4.34 \ln (\% \text{ draft }) \qquad (3)$$

where N is the intercept of the above relationship

Note: % draft is expressed as a decimal value of mean annual flow.

The coefficients of determination, R^2, for equations (2) and (3) above are 0.966 and 0.931, respectively, for ten streams studied in Northwest Arkansas and Eastern Oklahoma.

An example of storage requirement calculations using Lee Creek near Van Buren, Arkansas, is as follows.

Example Solution

Given:

Mean Annual Flow = 0.95 cubic feet per second per square mile

Probability of reservoir going dry = 0.05 = P_o

Draft rate = 80% of mean annual flow = .8

Drainage area = 427 square miles

Solution:

Solving for S:

$$\ln S = 0.159 - 3.30 \ln (\% \text{ draft})$$

$$\ln S = 0.159 - 3.30 \ln 0.8$$

$$= 0.159 - 0.736 + 0.895$$

Solving for N:

$$\ln N = -0.868 - 4.34 \ln 0.8$$

$$= -0.868 + 0.968 = 0.100$$

$$N = 1.105$$

Solving for K;

$$\ln P_o = \ln (0.05) = -3.00 = 1.105 - 2.44K$$

$$K = 1.68 \text{ units}$$

Converting K to acre-feet:

$$\text{Storage} = 1.68\ (427)\ (1.9835)\ (365)\ (0.95)$$

$$= 492{,}320 \text{ acre-feet}$$

Note: in above conversion

K = 1.68 units
427 = drainage area in square miles
1.9835 = conversion of sfd to acre-feet
365 = days in one year
0.95 = mean annual flow in csm

The following tabulation shows the results of such analysis for determing reservoir size necessary to maintain a draft rate of 80 percent of mean annual flow compared with calculations made using the sequent peak method and Hazen's method.

Storage Requirements (acre-ft)

Stream	Sequent Peak	Hazen's	Equations
Poteau	100,500 (.20)*	324,920**	248,200**
Lee	174,500 (.34)	675,460	495,000
Fourche Maline	84,200 (.29)	209,900	144,000
Illinois	436,000 (16)	1,224,040	1,008,000
Barren Fork	128,200 (.29)	447,400	306,000

* The probability of reservoir going dry is shown in parentheses.
** The probability of reservoir going dry in Hazen's method and in Jeffus equations is 0.05 in all cases.

Evaporation Studies

As previously mentioned on page 4 of this report, evaporation information was wholly derived from the reports of other agencies who have collected field data within the geographical limits of this study. A generalized map in J. S. Weather Bureau Technical Paper No. 37 gives a regional variation of annual lake evaporation rate within the Compact study area of 47 to 52 inches per year. This annual evaporation range is verified by the value of 50.14 inches calculated on Table IV based upon pan evaporation data collected by the Corps of Engineers. The values for monthly pan evaporation at two reservoirs within the Arkansas River Basin were taken directly from the "Lee Creek - Pine Mountain Dam" Review Report of the Corps of Engineers. The monthly pan evaporation values in Table II were averaged and then converted to equivalent lake evaporation by multiplying by an accepted "pan coefficient" of 0.78.

The values in the last column entitled "Average Equivalent Lake Evaporation" are recommended for subsequent use as required. Another

Table IV

EVAPORATION DATA

Wister Dam and Fort Gibson Dam, Oklahoma
(Based Upon Table 4 of Corps of Engineer's Lee Creek Report, 1965)

Month	Average Monthly Pan Evaporation			Average Equivalent Lake Evaporation in Inches
	Wister Dam in Inches	Fort Gibson Dam in Inches	Average in Inches	
January	2.03	2.01	2.02	1.58
February	2.54	2.49	2.51	1.96
March	4.55	4.29	4.42	3.45
April	6.05	5.91	5.98	4.66
May	6.98	7.15	7.06	5.51
June	8.25	8.48	8.37	6.53
July	8.76	8.92	8.84	6.90
August	8.15	8.89	8.52	6.65
September	6.26	7.03	6.65	5.18
October	4.31	5.06	4.69	3.66
November	2.99	3.26	3.12	2.44
December	2.05	2.08	2.07	1.62
Annual Total	62.92	65.57	64.25	50.14

*Based on lake evaporation equivalent to 0.78 times pan evaporation.

useful curve also developed in the Corps of Engineers report is found in Figure 8, which relates the net annual lake evaporation(annual evaporation minus annual precipitation) to the annual precipitation. This relationship applies to any point of application within the Compact area of investigation.

Precipitation Analysis

Precipitation records were obtained solely from published data furnished by the U. S. Weather Bureau as "Climatological Data" for each of the respective states -- Arkansas and Oklahoma. Daily precipitation as well as monthly and annual summaries are available for both recording and non-recording stations. Annual snowfall ranges from an average of 4 inches so that snow melt within the Basin seldom makes any significant contribution to peak flood flows on any Basin streams. Details on precipitation amounts are found in each of subsequent sub-basin summaries and in Appendix B.

Land Use Patterns

An inventory of the agriculture use of lands within the Compact area was made using reports and aerial photos of the U. S. Department of Agriculture. The major portion of the total area is presently covered with timber. Details concerning land use are tabulated for each separate sub-basin. This tabulation contains one catagory entitled maximum potential irrigable land. Such land is capable of being irrigated and is not based on proximity to a watercourse, relative elevation, elevation, or previous irrigation practice, but upon feasibility of the soil type to support irrigated crops.

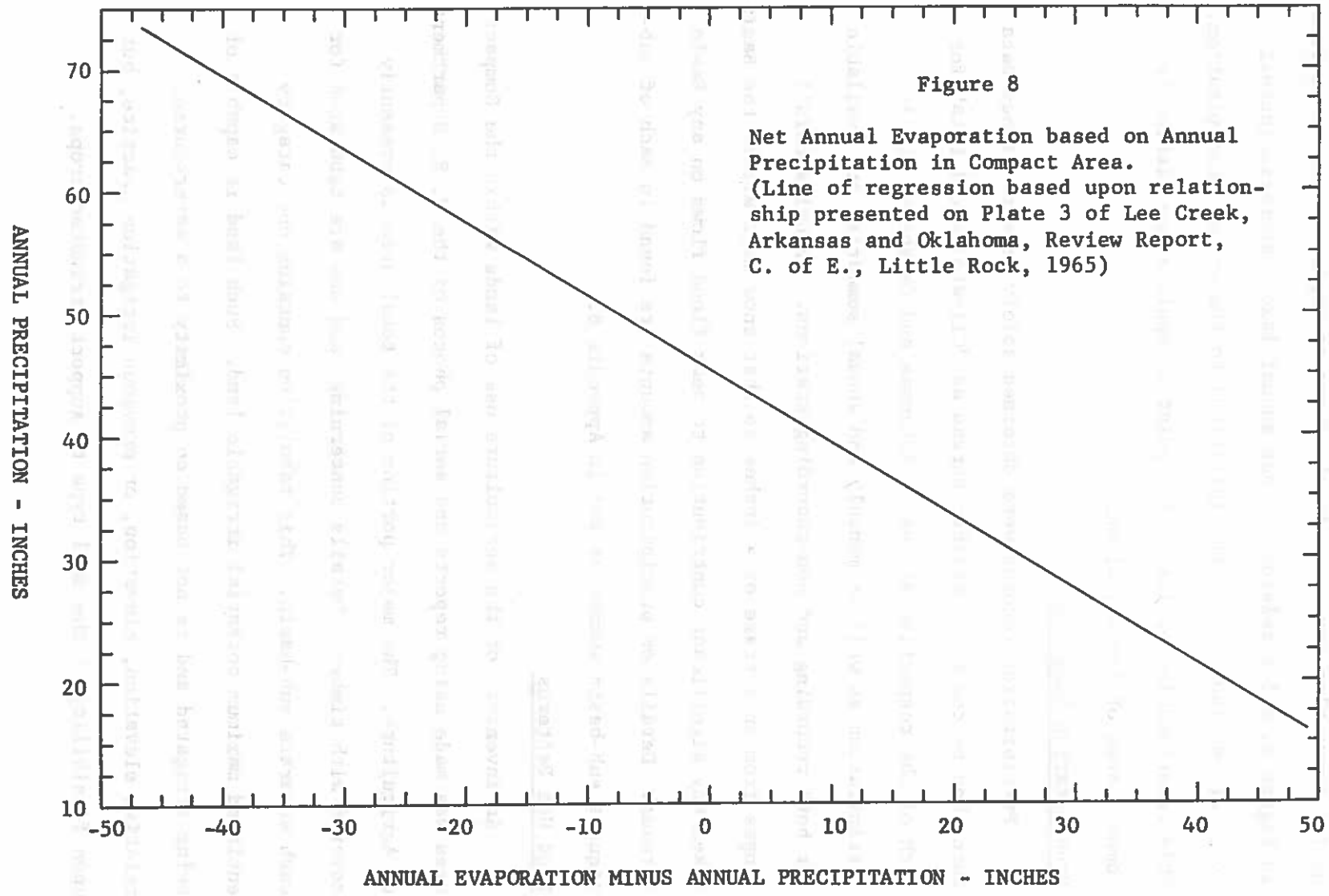


Figure 8

Net Annual Evaporation based on Annual Precipitation in Compact Area.
(Line of regression based upon relationship presented on Plate 3 of Lee Creek, Arkansas and Oklahoma, Review Report, C. of E., Little Rock, 1965)

Water Quality Investigations

The chemical character of the streams, except for the main stem of the Arkansas, is of excellent quality and suitable for municipal, industrial, and agriculture use. Within the total area of investigation, the U. S. Geological Survey maintains continuous water quality sampling stations only on the Illinois River below Tenkiller Ferry reservoir near Gore, Oklahoma, and on the Arkansas River near Van Buren, Arkansas. Spot sampling has been conducted occasionally by the U.S.G.S. at other locations within the Compact area, but the overall information on stream quality is generally inadequate for planning purposes.

Because of the lack of stream quality information on stream quality information, field data collection was commenced in February, 1969, on the Illinois River, within the State of Arkansas. This stream is of major potential importance to the water resource development of Northwest Arkansas and permitted a thorough study over one and one-half years within the limitations of a restrictive budget.

Stream quality analyses were made at approximately monthly intervals. These analyses included detailed chemical, physical, and biological examination of stream samples at six selected field locations. Chemical examination included: orthophosphates, iron, nitrates, ammonia, carbondioxide, alkalinity, dissolved oxygen, pH, and 5 day B.O.D. Physical tests measured temperature and turbidity. Biological examination included counts of coliform bacteria and plankton.

Daily stream flows were extimated at four of the six sampling

stations on date of sampling by calculation from U.S.G.S. stream quality discharge records.

All stream quality data is tabulated in Appendix D of this report.

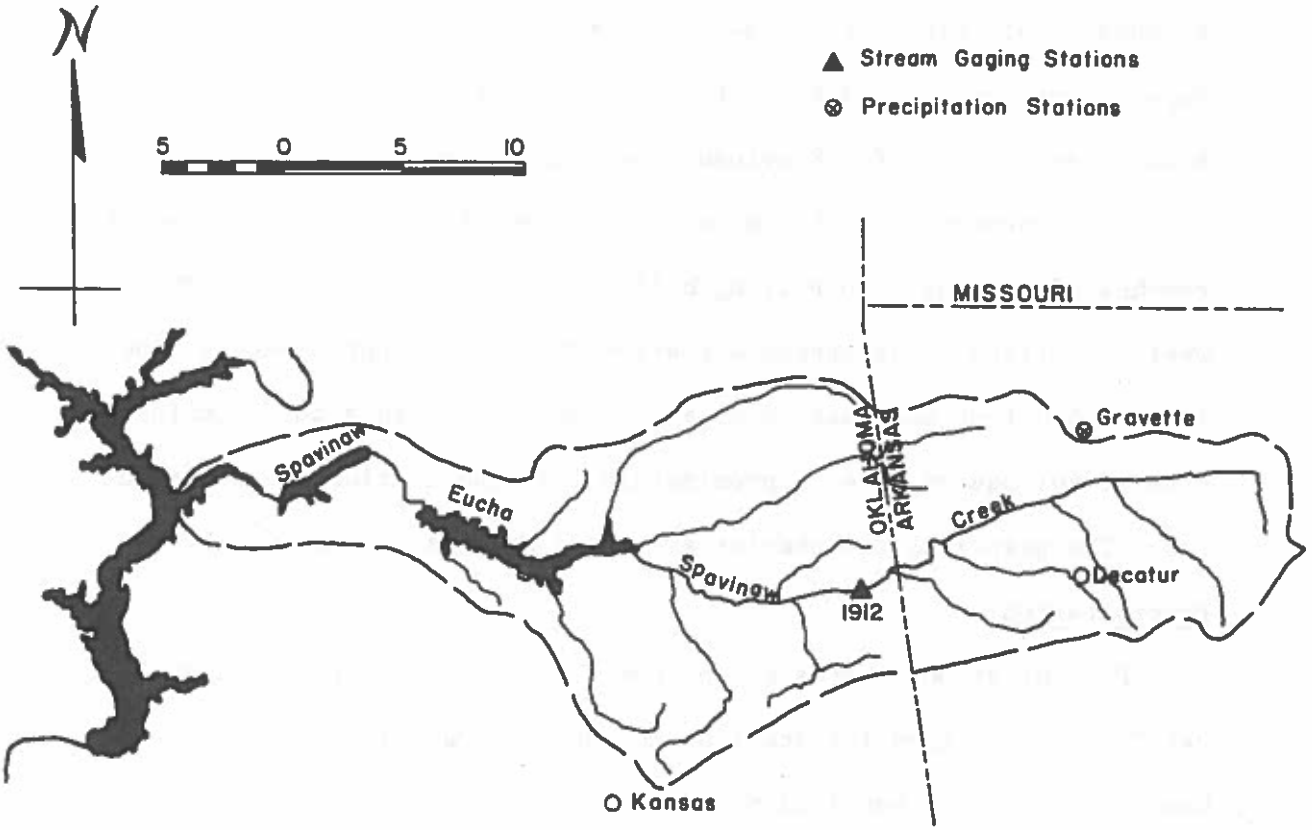


Figure 9

Spavinaw Creek Sub-Basin

SPAVINAW CREEK SUB-BASIN

Spavinaw Creek has its source in Benton County, Arkansas, near Bentonville. It flows in a westerly direction crossing the Oklahoma-Arkansas State Line into Delaware County, Oklahoma and thence into Mayes County where it flows into the Grand River near Spavinaw, Oklahoma. See Figure 9 for Spavinaw Creek Sub-basin map.

The topography of the basin varies from steep hills in the upper reaches of the basin to rolling hills of moderate elevation in the western portion. The stream elevation drops from approximately 1200 feet to 600 feet mean sea level at the mouth. With a total drainage area of 401 square miles approximately 127 square miles lie in Arkansas. The principal tributaries are Cloud Creek and Beaty Creek.

Precipitation

Precipitation records taken from U.S. Weather Bureau "Climatological Data" are summarized for stations in, or near, Spavinaw Creek Sub-basin in Table V. Detailed precipitation information is found in Appendix B.

Table V

PRECIPITATION STATIONS IN OR NEAR SPAVINAW CREEK SUB-BASIN

Station	Years of Record	Annual Precipitation in Inches		
		Average	Maximum	Minimum
Spavinaw, Okla.	42	43.79	66.48	28.27
Gravette, Ark.	63	44.89	63.98	23.91
Bentonville, Ark.	55	44.52	68.67	34.56
Jay, Okla.	26	41.62	57.48	26.00
Grand River Dam, Okla.	24	42.23	59.13	24.89

Stream Discharge

Records are available at one gaging station (1912.2) operated since October, 1961, by the U.S. Geological Survey near Sycamore, Oklahoma. Several stations on near-by streams have hydrological conditions similar to those in the Spavinaw Creek Sub-basin. Table VI summarizes information at station 1912.2 and other near-by stations. Station 1912.2 located a short distance downstream from the border, records essentially the state line flows. Records for station 1912.2 were synthesized for the record deficient portions of the base period and a summary of the complete flows is tabulated in Appendix A.

Table VI

GAGING STATIONS ON OR NEAR SPAVINAW CREEK[1/]

Station No.	Location	Drainage Area Sq. Mi.	Average [3/] Annual Discharge Acre-Feet	Minimum Flow cfs	Maximum Flow cfs
1912.2[2/]	Spavinaw Creek near Sycamore, Okla.	133	43,800	1.2	4,240
1965	Illinois River near Tahlequah, Okla.	959	613,200	0.1	150,000
1960	Flint Creek near Kansas, Okla.	110	64,430	0.6	23,600

1/ Detailed monthly flow is tabulated in Appendix A.
2/ Records too short to determine flood frequency or flow duration.
3/ For base period of study, 1938 through 1965.

Flood Frequency Analysis

The flood frequency curve of Figure 10 showing maximum daily discharge at Spavinaw Creek near Sycamore, Oklahoma, was based upon the discharge data on the Illinois River near Tahlequah, Oklahoma.

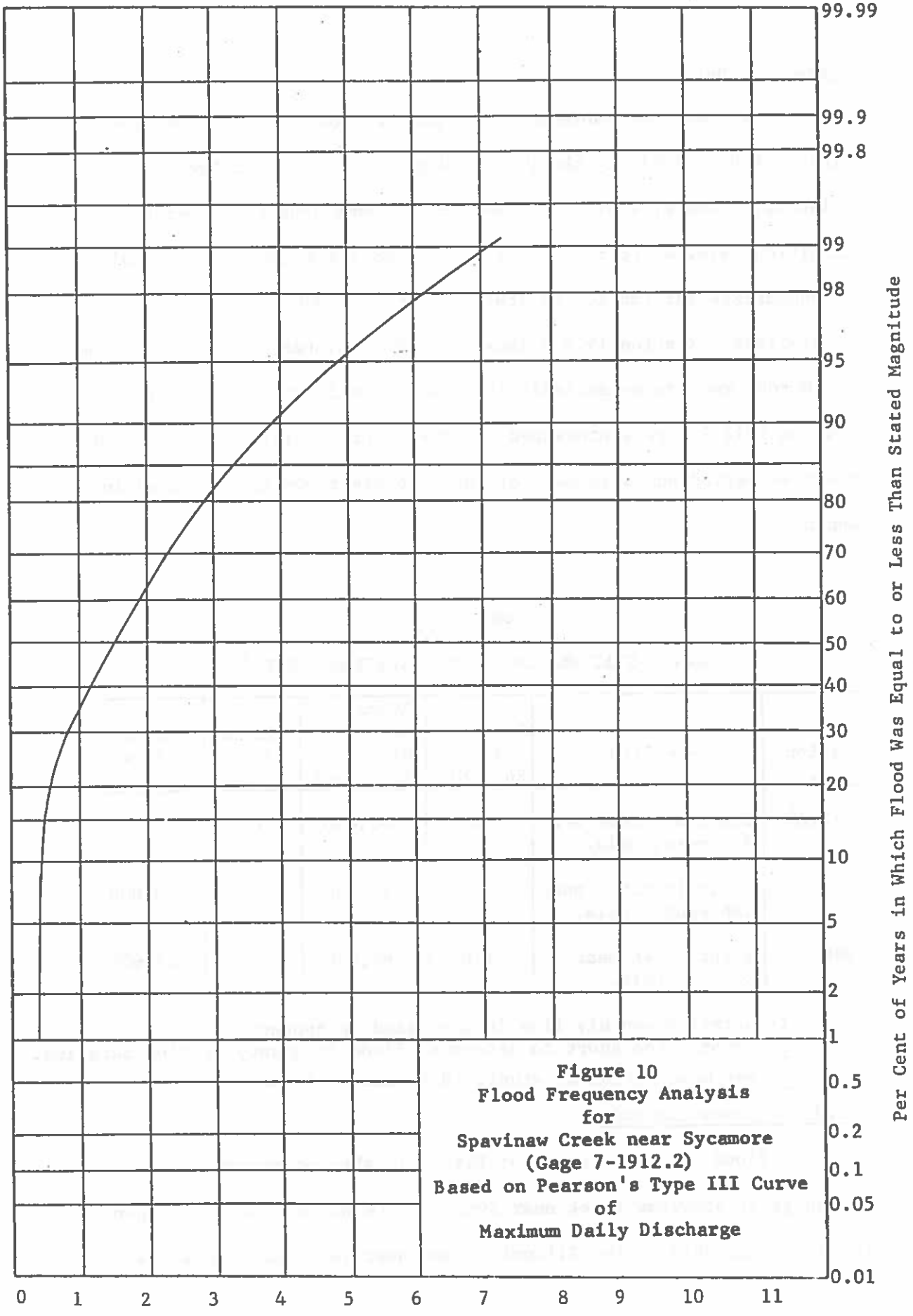


Figure 10
Flood Frequency Analysis
for
Spavinaw Creek near Sycamore
(Gage 7-1912.2)
Based on Pearson's Type III Curve
of
Maximum Daily Discharge

This indirect curve derivation was used because records on Spavinaw Creek were too short to permit development of a fitted flood frequency curve.

Reservoir Storage

In 1922 Tulsa, Oklahoma constructed the Spavinaw Reservoir on Spavinaw Creek for a water supply for the city. It has a capacity of 30,600 acre-feet. In 1938, Tulsa obtained the Oklahoma water rights of Spavinaw Creek. Later Tulsa constructed the Upper Spavinaw or Eucha Reservoir with a capacity of 79,600 acre-feet. In 1965 Tulsa reported 67,500 acre-feet of water diverted from Spavinaw Creek at Spavinaw Reservoir.

Arkansas has no major water developments within the basin. The Arkansas Game and Fish Commission has a recreation lake of approximately 40 acres surface area, Crystal Lake, on the Dry Fork Creek, tributary to Spavinaw Creek.

The procedure for reservoir storage analysis described on pp. 14-18 and detailed in Appendix C gives the following on Spavinaw Creek at Sycamore: (1) the maximum storage -- that which would be sufficient to sustain the mean annual flow rate 90% of the time is 110,000 acre feet; (2) the maximum flow rate for 70% of the maximum storage (70% of 110,000 acre feet or 77,000 acre feet) is 4350 acre feet per month sustained for 99% of the time; and (3) the reservoir size capable of sustaining 70% of the mean annual flow 99% of the time contains 91,000 acre feet.

Land Use Patterns

Table VII provides information on present land use within the Spavinaw Creek Sub-basin for Arkansas only. It also estimates maximum potential acreage which may be developed using supplemental irrigation.

Table VII
AGRICULTURE
LAND USE IN ARKANSAS PORTION OF SPAVINAW CREEK SUB-BASIN[1/]
(all areas in acres)

PRESENTLY DEVELOPED						POTENTIAL IRRIGATION DEVELOPMENT
Row Crops	Close Growing Crops	Orchards and Vineyards	Hayland	Rotation Hay and Pasture	Pasture and Range	Maximum Irrigable Land
2800	905	776	258	14,870	15,172	16,430

1/ Compiled from 1965 USDA Annual Report

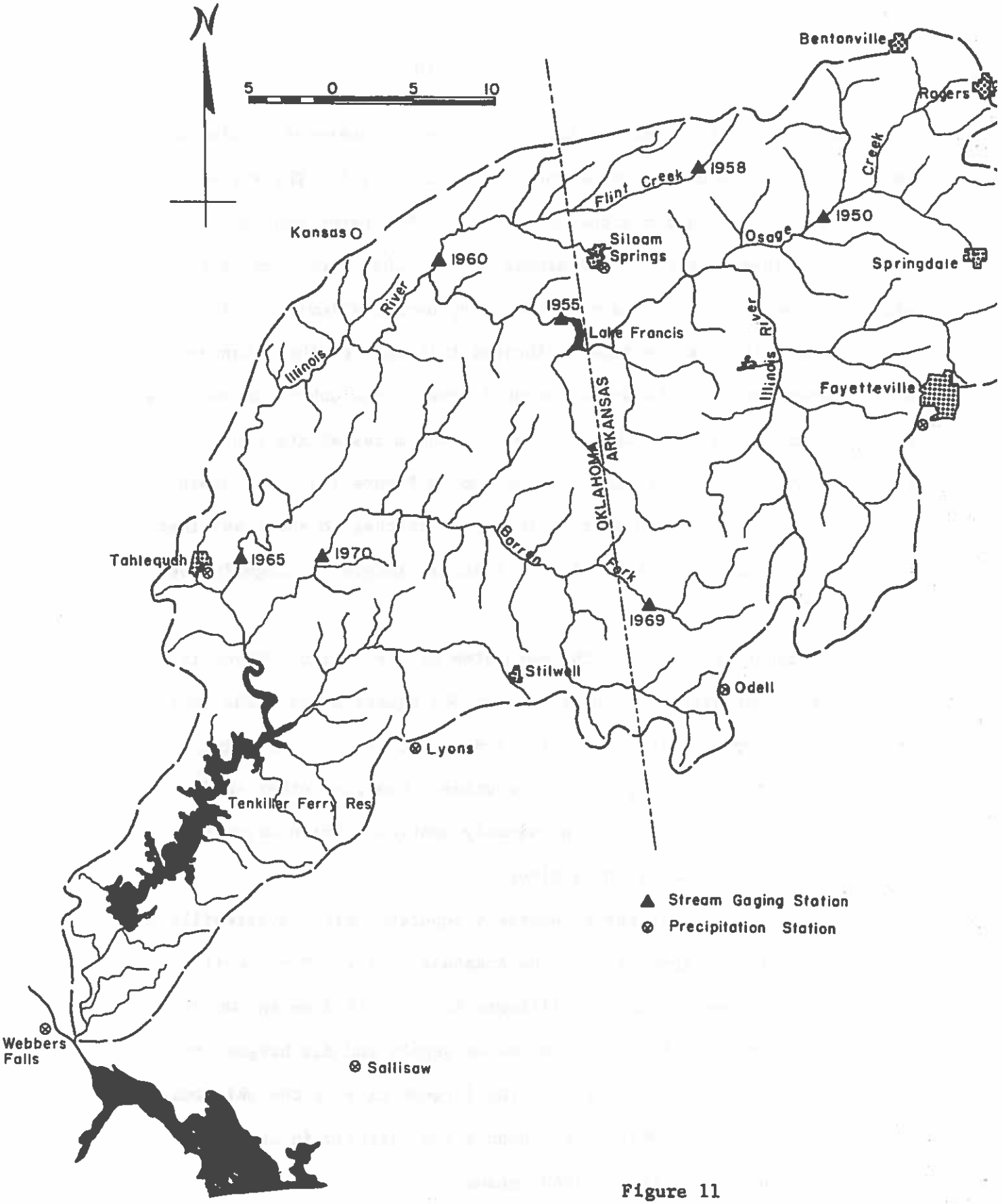


Figure 11

Illinois River Sub—Basin

ILLINOIS RIVER SUB-BASIN

The Illinois River basin lies in a rather mountainous section of western Arkansas and eastern Oklahoma (see Figure 11). The stream originates on the western slope of the Boston Mountains and empties into the Arkansas River. The drainage area of 1660 square miles consists of steep, rugged terrain separated by narrow alluvial valleys. The Illinois River is the first principal tributary of the Arkansas River downstream from the Grand (Neosho) River. The sub-basin averages nearly twenty miles in width reducing to seven miles at its confluence with the Arkansas River. (See map on Figure 11). The basin elevation varies from 2000 feet in the upper reaches to about 445 feet above mean sea level at the outlet in a stream length of slightly over 150 miles.

The largest tributary to the main stem of the Illinois River is Barren Fork Creek with a drainage area of 341 square miles. The next largest tributary is Flint Creek with a drainage area at the point of confluence of approximately 326 square miles. Numerous other smaller creeks contribute either to the previously mentioned tributaries or to the main stem of the Illinois River.

The drainage area is rather sparsely populated with Fayetteville (pop. 29,452) the largest city in the Arkansas sector. Fayetteville lies on the ridge separating the Illinois River basin from the White River basin, and draws its municipal water supply and discharges its wastes into the White River system. The largest city in the Oklahoma watershed is Tahlequah, which has a population slightly in excess of 5,000 persons according to the 1960 census.

Precipitation

The annual precipitation on the Illinois River basin averages about 45 inches. The weather bureau records for Fayetteville, Arkansas indicate a maximum annual rainfall of 64.23 inches and a minimum of 26.95 inches during the base period of study, 1938 to 1965, inclusive.

Precipitation records taken from U.S. Weather Bureau "Climatological Data" are summarized for a number of stations in, or near, Illinois River Sub-basin in TableVIII. Detailed precipitation information is found in Appendix B.

Table VIII

PRECIPITATION STATIONS IN OR NEAR THE ILLINOIS RIVER SUB-BASIN[1/]

Station	Years of Record	Annual Precipitation in Inches		
		Average	Maximum	Minimum
Tahlequah, Okla.	64	43.10	65.40	25.11
Lyons, Okla.	26	41.20	75.86	25.66
Sallisaw, Okla.	46	42.76	69.39	26.26
Fayetteville Experiment Station, Ark.	78	45.21	64.23	26.95
Webbers Falls, Okla.	66	43.92	72.00	22.33
Siloam Springs, Ark.	24	43.55	58.50	23.44
Bentonville, Ark.	59	44.52	68.67	34.56
Stillwell, Okla.	13	43.03	62.75	30.03
Gravette, Ark.	63	44.89	63.98	23.91

1/ Detailed precipitation data for the above stations is listed in Appendix B.

Stream Discharge

The U.S. Geological Survey operates a number of stream gaging stations within the basin. Table IX lists the pertinent data concerning these gage stations. All synthesized monthly discharge records for non-gaged periods of stream discharge stations were based either directly or indirectly on the Tahlequah gage. Through a series of graphical correlations following the procedure of Figure 2 it was possible to derive the missing values of short term stations for the whole base period. Detailed monthly stream flows are tabulated in Appendix A.

Table IX

GAGING STATIONS - ILLINOIS RIVER SUB-BASIN 1/

Station No.	Location	Drainage Area Sq. Mi.	Average 2/ Annual Discharge Acre-Feet	Minimum Flow cfs	Maximum Flow cfs
1955	Illinois River near Watts, Okla.	635	368,500	8.6	68,000
1960	Flint Creek near Kansas, Okla.	110	64,430	0.6	23,600
1965	Illinois River near Tahlequah, Okla.	959	613,200	0.1	150,000
1969	Barren Fork near Dutch Mills, Ark.	43	21,720	0.0	14,800
1970	Barren Fork near Eldon, Okla.	307	190,400	1.7	37,600
1980	Illinois River near Gore, Okla.	1,626	1,064,000	2.0	180,000

1/ Detailed monthly flows tabulated in Appendix A.

2/ For base period of study, 1938 through 1965.

Flood Frequency Analysis

The flood frequency curves of instantaneous peak discharge at critical sites in the Sub-basin are found as follows:

Figure 12 - Station 1965 - Illinois River near Tahlequah, Okla.

Figure 13 - Station 1955 - Illinois River near Watts, Okla.

Figure 14 - Station 1969 - Barren Fork Ck. near Dutch Mills, Ark.

Figure 15 - State Line - Flint Creek at Ark.-Okla. Border.

All the above flood frequency curves are based upon the Tahlequah gage because discharge records of other Illinois River Sub-basin stations were of insufficient duration to permit flood frequency estimates.

Reservoir Storage

There are two developed reservoirs on the main channel of the Illinois River. Lake Francis is a small reservoir just inside Oklahoma, and is the water supply impoundment for the City of Siloam Springs, Arkansas. Tenkiller Ferry Reservoir near Gore, Oklahoma, was completed by the Corps of Engineers in 1952 and provides conservation storage of 630,000 acre feet. The listing of developed water storage projects on the Illinois River Sub-basin is made in Table X .

The procedure for reservoir storage analysis as described on pp. 14-18 and detailed in Appendix C gives the following values:

(1) the maximum storage -- that which would be sufficient to sustain the mean annual flow rate 90% of the time:

(a) Flint Creek at State Line . . . . . 80,000 acre feet

(b) Illinois River at Watts, Okla.. . . . . .640,000 acre feet

(c) Barren Fork Creek at Dutch Mills, Ark.. . 54,000 acre feet

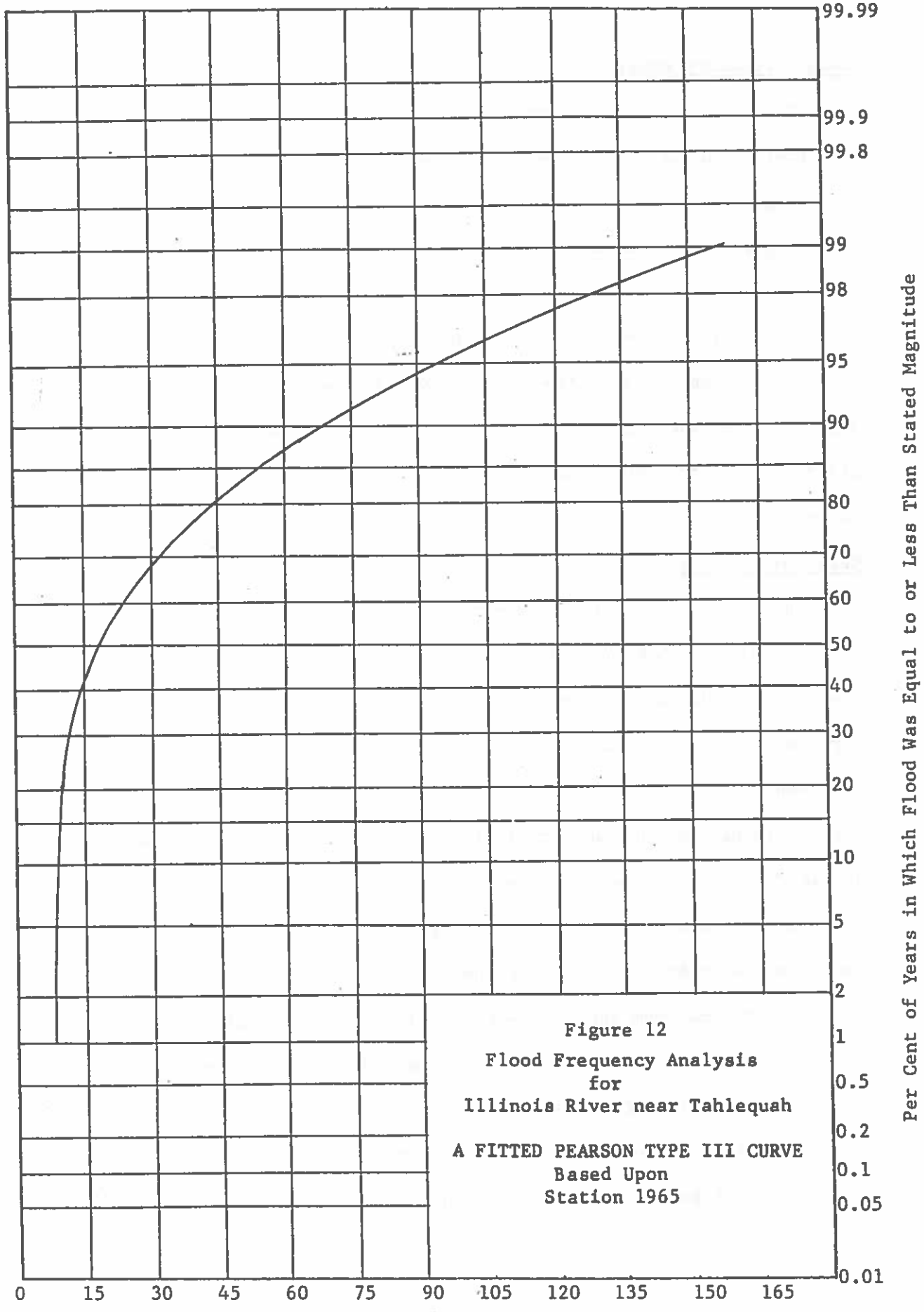


Figure 12
Flood Frequency Analysis
for
Illinois River near Tahlequah

A FITTED PEARSON TYPE III CURVE
Based Upon
Station 1965

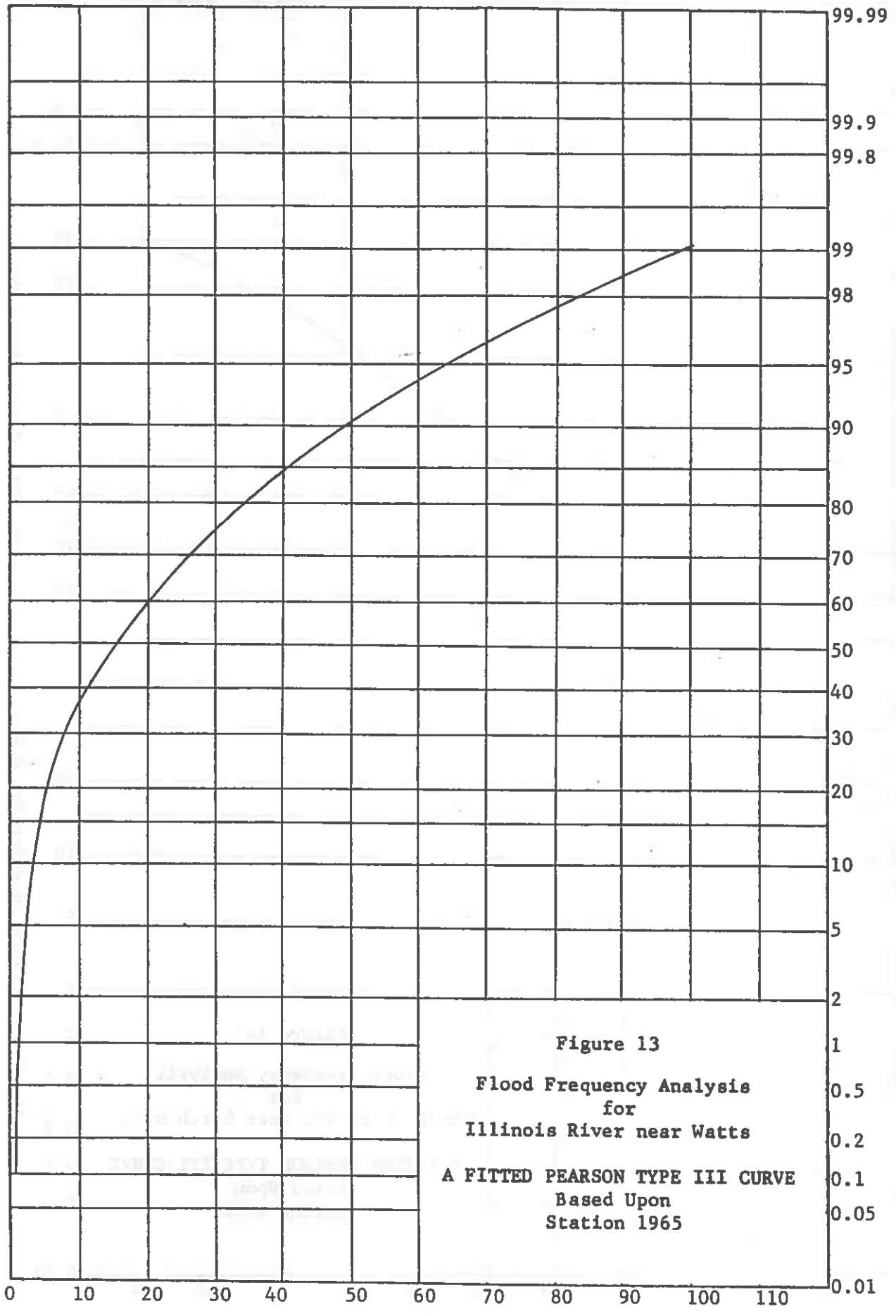


Figure 13

Flood Frequency Analysis
for
Illinois River near Watts

A FITTED PEARSON TYPE III CURVE
Based Upon
Station 1965

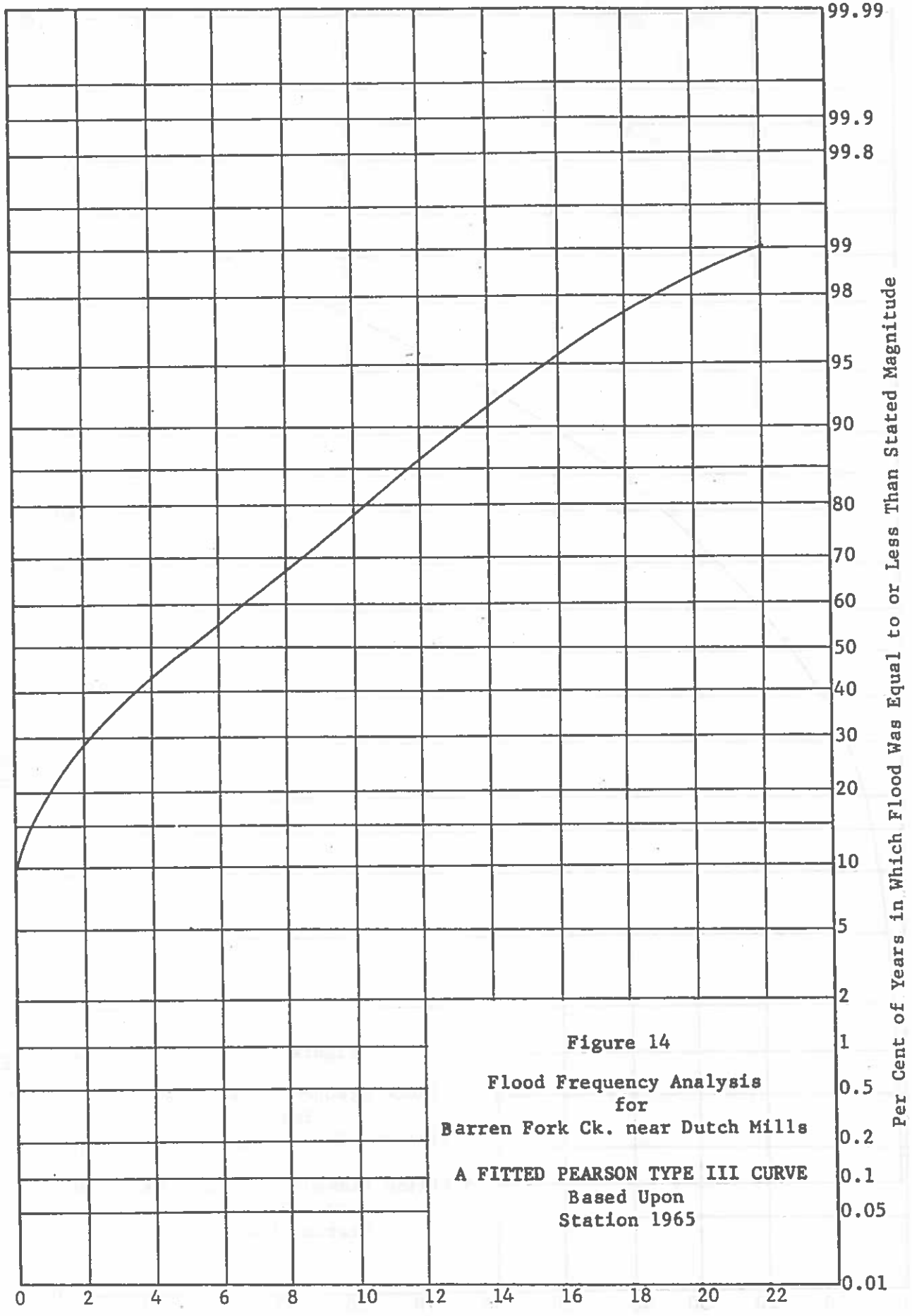


Figure 14

Flood Frequency Analysis
for
Barren Fork Ck. near Dutch Mills

A FITTED PEARSON TYPE III CURVE
Based Upon
Station 1965

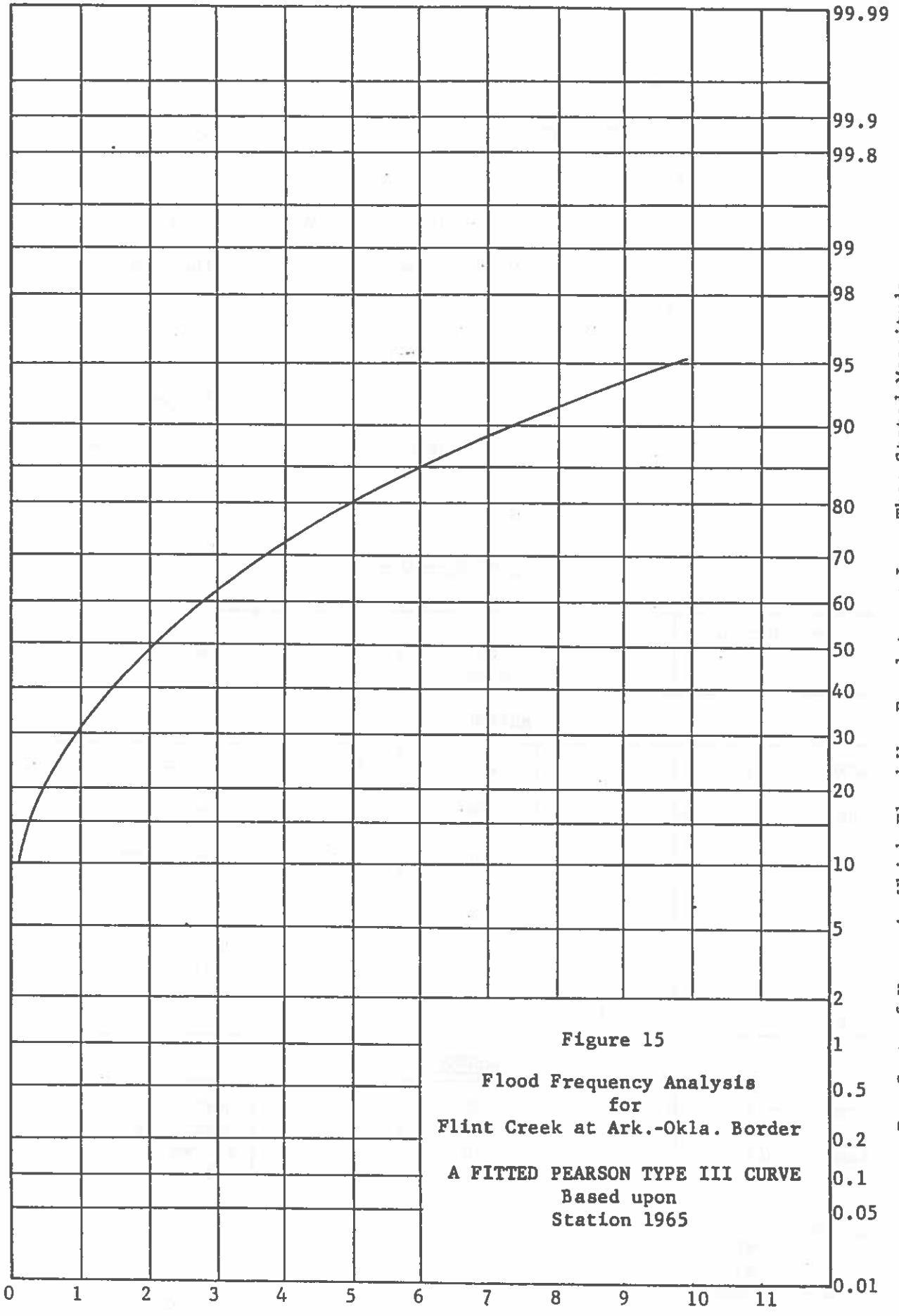


Figure 15

Flood Frequency Analysis
for
Flint Creek at Ark.-Okla. Border

A FITTED PEARSON TYPE III CURVE
Based upon
Station 1965

(2) the maximum flow rate for 70% of the maximum storage is:

(a) Flint Creek at State Line . . . . . 1,884 ac ft/mo.

(b) Illinois River at Watts, Okla.. . . . . .24,382 ac ft/mo.

(c) Barren Fork Creek at Dutch Mills, Ark.. . 1,747 ac ft/mo.

(3) the reservoir size capable of sustaining 70% of the mean annual flow 99% of the time:

(a) Flint Creek at State Line . . . . . 44,000 acre feet

(b) Illinois River at Watts, Okla. . . . . 448,000 acre feet

(c) Barren Fork Creek at Dutch Mills, Ark.. . 39,000 acre feet

Table X

DEVELOPED WATER STORAGE

Impoundment	Total Storage Acre-Feet	Surface Area Acres	Use[1/]	Owner
ARKANSAS				
Lake Elmdale	3,000	200	Rec.	Game and Fish Commission
Lake Fayetteville	4,000	196	W.S.	Fayetteville, Ark.
Lake Wedington	1,600	80	Rec.	Forest Service
City of Lincoln	1,800	90	W.S.	Lincoln, Ark.
City of Prairie Grove	1,840	92	W.S.	Prairie Grove, Ark.
Total	9,240			
OKLAHOMA				
Tenkiller Ferry	1,230,000	12,500	F.C.,H.P. & W.S.	Corps of Engineers
Lake Francis	1,930	630	W.S.	Siloam Springs, Ark.

1/ Rec. - Recreation
W.S. - Water Supply
F.C. - Flood Control
H.P. - Hydro-Power

Land Use Patterns

Table XI provides information on present land use with the Illinois River Sub-basin for Arkansas only. It also estimates maximum potential acreage subject to full development with supplemental irrigation.

Table XI
ARKANSAS
LAND USE IN ARKANSAS PORTION OF ILLINOIS RIVER SUB-BASIN[1/]
(all areas in acres)

PRESENTLY DEVELOPED						POTENTIAL IRRIGATION DEVELOPMENT
Row Crops	Close Growing Crops	Orchards and Vineyards	Hayland	Rotation Hay and Pasture	Pasture and Range	Irrigable Land
20976	8483	7420	1035	87615	123690	120200

1/ Compiled from 1965 USDA Annual Report.

Water Quality

In spite of the fact that the slopes are steep within the Illinois River basin the nature of the soil is such that washing is not prevalent. While there are clay outcroppings the general terrain is rocky and the quality of the surface run-off is high The turbidity is high shortly after heavy rains, but the water soon clears and most of the time the streams are clear. The mineral content is low and the water is suitable for municipal, agricultural and most industrial uses. Dissolved mineral matter averages 105 milligrams per liter (mg/l) and the mean hardness value averages 85 mg/l. This water has a slightly alkaline reaction with pH varying from 7.2 to 8.0.

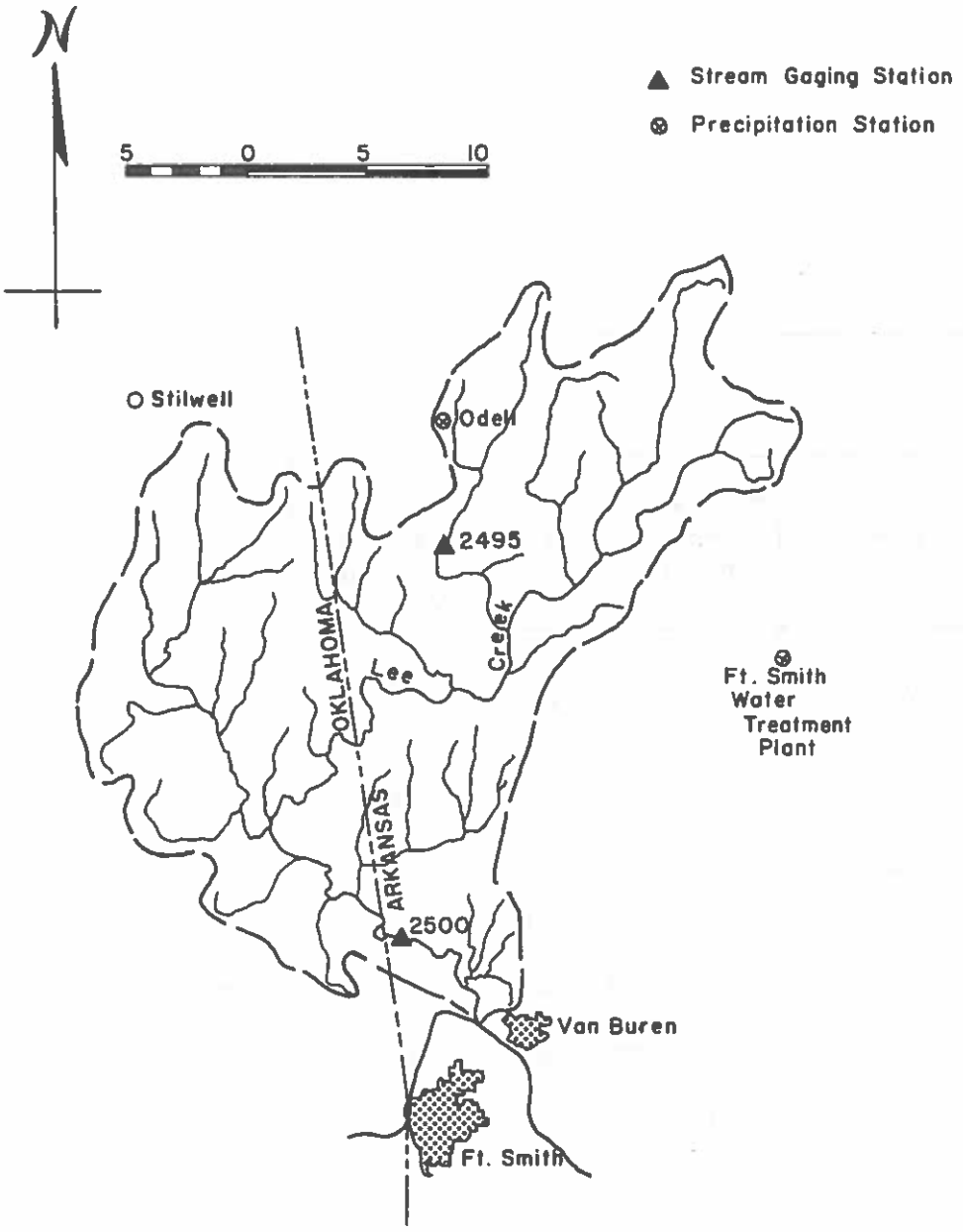


Figure 16

Lee Creek Sub-Basin

LEE CREEK SUB-BASIN

Lee Creek has its source in Washington and Crawford Counties, Arkansas near Fayetteville. It flows southwesterly, crossing the Oklahoma-Arkansas state line subsequently flowing southeasterly, re-crossing the Border entering the Arkansas River in Arkansas below Van Buren. (See Figure 16 for sub-basin map.)

The topography of the watershed varies from the steep rocky highlands of the Boston Mountains in the extreme northeastern part of the sub-basin to moderate elevations in the southern portion. From an elevation near the source of approximately 2,000 feet above mean sea level the stream drops to 390 feet at the confluence with the Arkansas River. It has a drainage area of 450 square miles, with 267 square miles located in Arkansas and 183 square miles in Oklahoma. Total stream length is about 60 miles. Little Lee Creek, the largest tributary, is located entirely in Oklahoma.

Precipitation

Precipitation records are available at a number of stations in or near the Lee Creek Sub-Basin. Precipitation over the basin averages about 43 inches per year. All records are taken from U.S. Weather Bureau "Climatological Data". Table XII gives selected precipitation summaries at selected station in, or near, the sub-basin.

Stream Discharge

There are two stream gages within the sub-basin, both with continuous recordings since 1950. Table XIII summarizes recorded stream flow data. During the period (1938-1950), prior to stream gage establishment, data were synthesized and are tabulated along with recorded monthly stream discharges in Appendix A.

Table XII

PRECIPITATION STATIONS IN OR NEAR LEE CREEK SUB-BASIN[1/]

Station	Years of Record	Annual Precipitation in Inches		
		Average	Maximum	Minimum
OKLAHOMA				
Tahlequah	64	43.10	65.40	25.11
Lyons	26	41.20	75.86	25.66
Sallisaw	46	42.76	69.39	26.26
ARKANSAS				
Lee Creek	20	--	--	--
Ft. Smith Airport	84	42.22	--	--
Ft. Smith Water Plant	28	46.88	76.66	35.39
Fayetteville Experiment Station	78	45.21	64.23	21.56

1/ Detailed precipitation data for the above stations is listed in Appendix B.

Table XIII

GAGING STATIONS IN OR NEAR LEE CREEK SUB-BASIN [1/]

Station No.	Location	Drainage Area Sq. Mi.	Average [2/] Annual Discharge Acre-Feet	Minimum Flow cfs	Maximum Flow cfs
2495	Cove Creek near Lee Creek, Ark.	36.9	26,640	No Flow Most Years	33,600
2500	Lee Creek near Van Buren Ark.	427	328,000	No Flow Most Years	112,000

1/ Detailed monthly records are tabulated in Appendix A.

2/ For base period of study, 1938 through 1965.

Flood Frequency Analysis

The flood frequency curve of maximum daily discharge at the Lee Creek gage near Van Buren is found in Figure 17. This curve is based upon flood frequency estimates made from statistical parameters derived from the relatively short term of 16 years of continuous stream flow records.

Reservoir Storage

There are no major water projects developed in the Lee Creek Basin. Two private stockwater ponds in Arkansas on small tributaries to Lee Creek are the only developments known to exist. These two ponds are 600 and 105 acre feet in volume. Pine Mountain Dam, proposed for construction by the Corps of Engineers in Crawford County, Arkansas is still in the planning stage.

The procedure for reservoir storage analysis as described on pp. 14-18 and detailed in Appendix C yields the following: (1) the maximum storage -- that which would be sufficient to sustain the mean annual flow rate 90% of the time is 450,000 acre feet; (2) the maximum flow rate for 70% of the maximum storage (70% of 450,000 acre feet or 315,000 acre feet) is 12,195 acre feet per month sustained for 99% of the time; and (3) the reservoir size capable of sustaining 70% of the mean annual flow 99% of the time contains 200,000 acre feet.

Land Use Patterns

Table XIV provides information on present land use within the Lee Creek Sub-basin for Arkansas only. It also estimates maximum potential acreage capable of receiving beneficial supplemental irrigation.

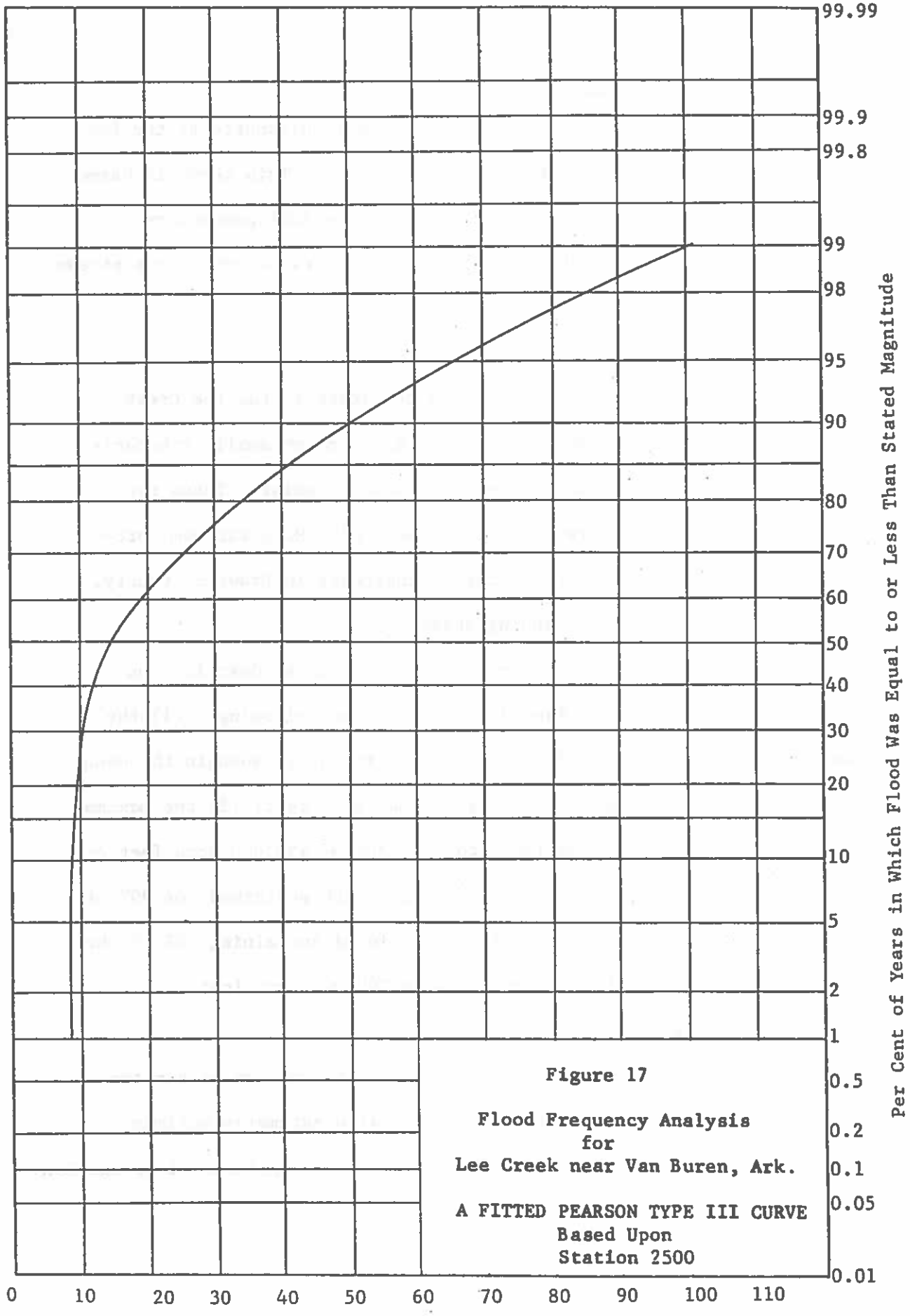


Figure 17

Flood Frequency Analysis
for
Lee Creek near Van Buren, Ark.

A FITTED PEARSON TYPE III CURVE
Based Upon
Station 2500

Table XIV
AGRICULTURE
LAND USE IN ARKANSAS PORTION OF LEE CREEK SUB-BASIN 1/
(all areas in acres)

PRESENTLY DEVELOPED						POTENTIAL IRRIGATION DEVELOPMENT
Row Crops	Close Growing Crops	Orchards and Vineyards	Hayland	Rotation Hay and Pasture	Pasture and Range	Maximum Irrigable Land
1250	4050	200	0	7816	34132	7290

1/ Compile from 1965 USDA Annual Report

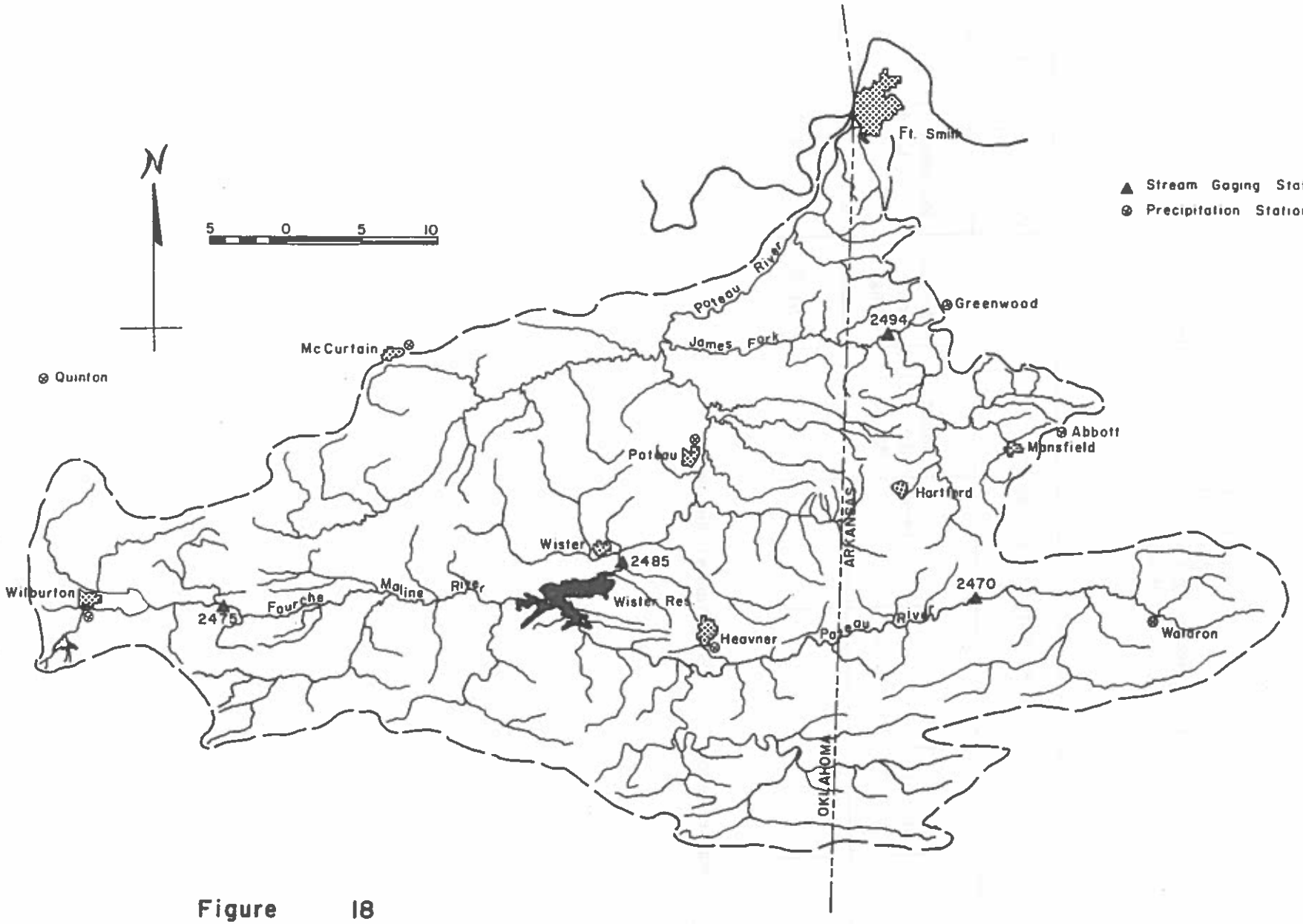


Figure 18
Poteau River Sub-Basin

POTEAU RIVER SUB-BASIN

The Poteau River Sub-basin, roughly triangular in shape, consists of approximately 1888 square miles of generally mountainous woodlands interspersed with crop and pasture lands. The basin's topography consists chiefly of mountains less than 750 feet in elevation with higher peaks occurring over scattered areas. Very few peaks exceed 2000 feet. The valleys of the basin subside to elevations of approximately 400 feet at the confluence of the Poteau River with the Arkansas River.

The Poteau River, (see Figure 18), originates in the eastern extremity of the basin near Waldron, Arkansas, and flows westerly to Wister Reservoir from whence it flows through Oklahoma on a generally northern course to its confluence with the Arkansas River at Fort Smith, Arkansas. The Fourche Maline and Brazil Creek, two of the larger streams in the basin, are confined entirely to Oklahoma and flow in generally eastern directions to the Poteau River. James Fork and Black Fork Creeks are fairly large creeks which originate in Arkansas and flow westerly into Oklahoma to a confluence with the Poteau.

The geology of the region consists of two broad catagories: the southern section -- predominately of sandstone, while the north-central and eastern portions are composed primarily of shales.

Land use within the basin varies from a very small percentage of cropland at the mouth of the Poteau to forest land along the Southern sector. Grazed woodlands constitute the major land use within the central portion of the basin.

Precipitation

Precipitation records taken from U. S. Weather Bureau publications (see page 4) are summarized for a number of stations in, or near, Poteau River Sub-basin in Table XV. Detailed precipitation information is given in Appendix B.

Table XV

PRECIPITATION STATIONS IN, OR NEAR, POTEAU RIVER SUB-BASIN 1/

Station	Years of Record	Annual Precipitation in Inches		
		Average	Maximum	Minimum
Heavener, Okla.	15	45.34	70.08	31.94
Poteau , Okla.	52	44.59	71.89	27.78
Wilburton, Okla.	30	44.72	74.81	29.21
McCurtain, Okla.	19	43.65	61.87	29.54
Sallisaw, Okla.	46	42.76	69.39	23.31
Abbott, Ark.	21	43.59	71.35	20.31
Ft. Smith (WBA),Ark.	84	42.22	58.11	30.57
Greenwood, Ark.	25	46.61	68.25	32.95
Waldron, Ark.	45	45.83	70.78	21.36

1/ Detailed precipitation data for the above stations is listed in Appendix B.

Stream Discharge

Four stream-flow gaging stations are located within the Poteau Basin (see Table XVI). Two of these are on the Poteau River with the other two being on the Fourche Maline and James Fork Creek. Mean monthly flow data as recorded for these stations from U. S. Geological Survey Water Supply Papers are tabulated in Appendix A. Because the

U.S.G.S. records omit portions of the base period (1938-1965), monthly data were synthesized to complete the discharge records and these also are included in Appendix A. Stream gage information for those stations in the sub-basin is listed in Table XVI.

Table XVI

STREAM GAGING STATIONS IN POTEAU RIVER SUB-BASIN[1/]

Station No.	Location	Drainage Area Sq. Mi.	Average Annual Discharge Acre-Feet	Minimum Flow cfs	Maximum Flow cfs
2470	Poteau River near Cauthron, Ark.	200	150,600	0	32,200
2475	Fourche Maline near Red Oak, Okla.	122	86,880	0	41,500
2485	Poteau River near Wister, Okla.	993	794,900	0	78,600
2494	James Fork near Hackett, Ark.	148	78,190	0	13,600

1/ Detailed monthly flows tabulated in Appendix A.

Flood Frequency Analysis

The flood frequency curves of maximum daily discharge have been prepared for Station 2494, James Fork near Hackett, Arkansas (see Figure 19) and for Station 2470, Poteau River near Cauthron, Arkansas (see Figure 20). Both flood frequency curves were based on Station 2470, Poteau River near Cauthron, Arkansas.

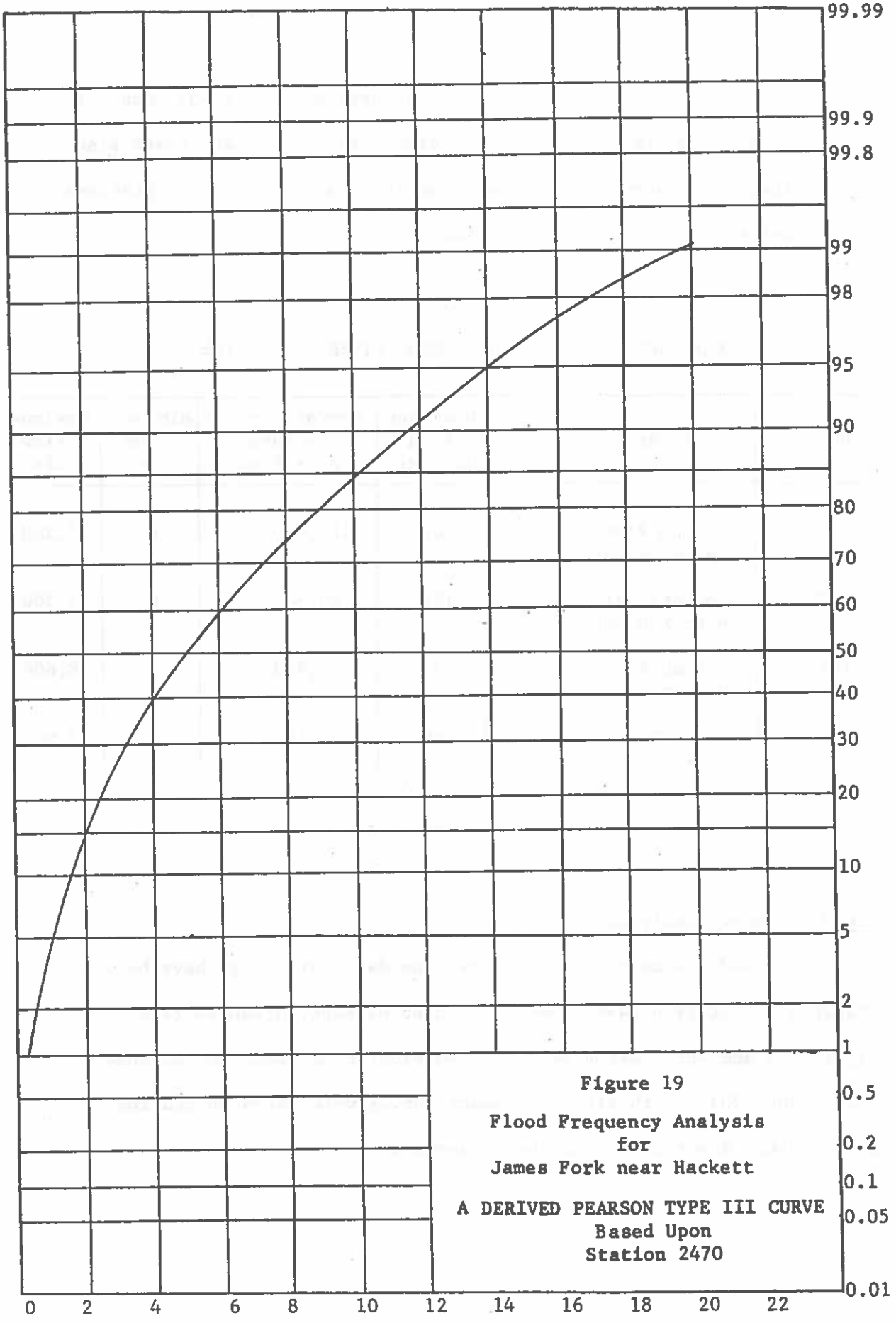


Figure 19

Flood Frequency Analysis
for
James Fork near Hackett

A DERIVED PEARSON TYPE III CURVE
Based Upon
Station 2470

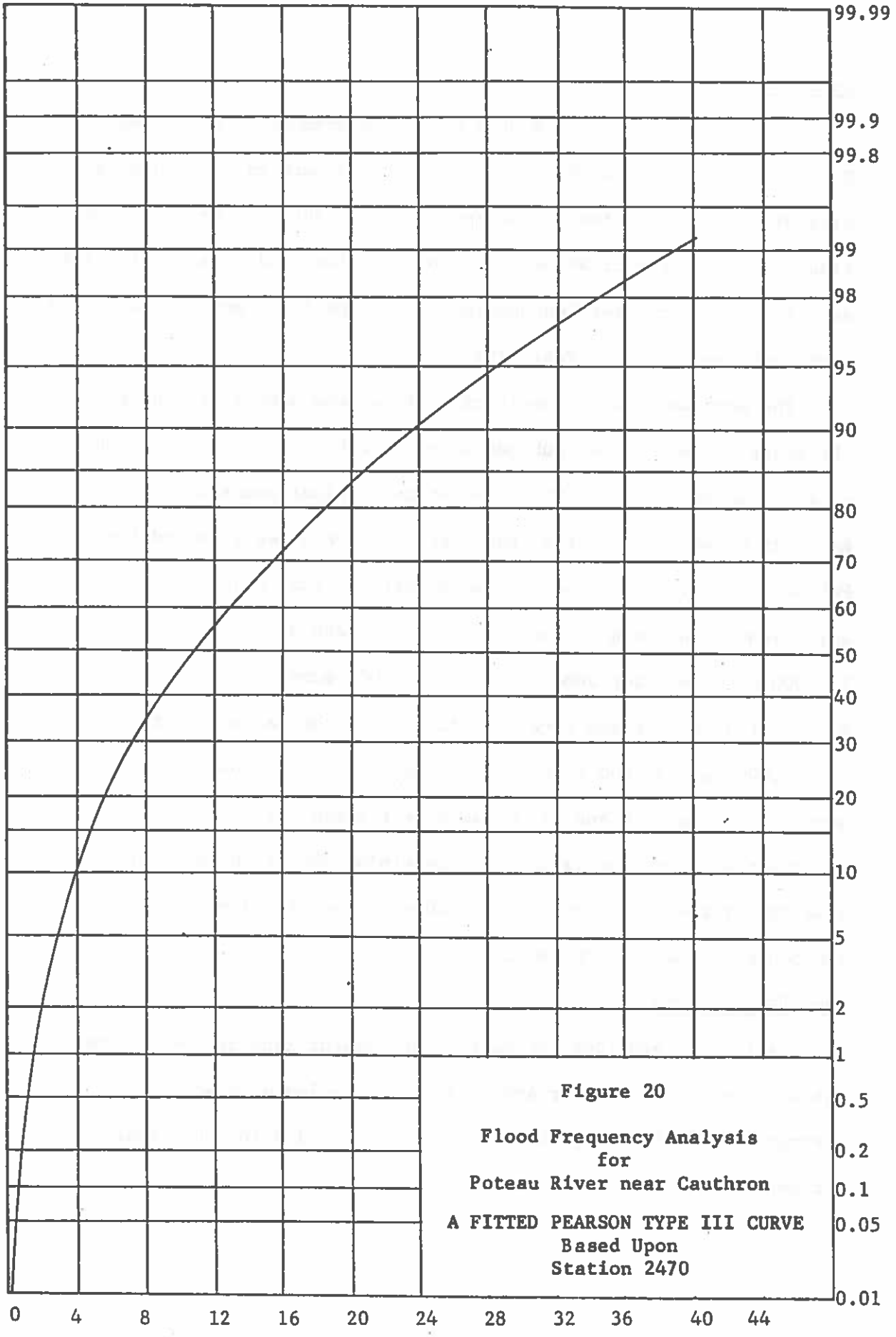


Figure 20

Flood Frequency Analysis
for
Poteau River near Cauthron

A FITTED PEARSON TYPE III CURVE
Based Upon
Station 2470

Reservoir Storage

Wister Reservoir is the only major impoundment in the Poteau River Sub-basin with a drainage area of 993 square miles, and a capacity of 429,950 acre feet. The reservoir was designed primarily for flood control and recreation. The conservation pool capacity is 29,950 acre feet. Other water impoundments with capacities greater than 1000 acre feet are listed in Table XVI.

The procedure for determination of maximum usable storage for the major streams in the Sub-basin is described on pages 14-18 and detailed in Appendix C. The three storage values summarized from Appendix C and applicable at the State Line on James Fork and the Poteau River are: (1) the maximum storage -- that which would be sufficient to sustain the mean annual flow rate 90% of the time is 230,000 acre feet for James Fork and 350,000 acre feet for Poteau River; (2) the maximum flow rate for 70% of the maximum storage (70% of 230,000 and 350,000 acre feet, respectively) is 9166 acre feet/month for James Fork and 11,666 acre feet/month for Poteau River; and the reservoir size capable of sustaining 70% of the mean annual flow 99% of the time contains 120,000 acre feet for James Fork and 220,000 acre feet for the Poteau River.

Land Use Patterns

Table XVIII provides information on present land use within the Poteau River Sub-basin for Arkansas only. Included, also is the maximum potential acreage which may be developed using supplemental irrigation.

Table XVII

DEVELOPED WATER STORAGE-POTEAU RIVER SUB-BASIN

Impoundment	Total Storage Acre Feet	Location		Use[1/]	Owner
		Stream	Nearest City		
ARKANSAS					
Sugarloaf Lake	3,780	Johnson Br.	Midland	Rec.	Game & Fish Commission
		James Ck.	Cauthron	F.C. & Rec.	Game & Fish Commission
		E. Fork Poteau River	Waldron	F.C. & W.S.	City of Waldron
OKLAHOMA					
Cedar Lake	1,488			Rec.	
New Spiro Lake	3.115			W.S.	City of Spiro
Lloyd E. Church Lake	3,000			W.S.	
Muldrow City Lake	1,500			W.S.	City of Muldrow

1/ Rec. - Recreation
W.S. - Water Supply
F.C. - Flood Control

Table XVIII
AGRICULTURE
LAND USE IN ARKANSAS PORTION OF POTEAU RIVER SUB-BASIN[1/]
(all areas in acres)

PRESENTLY DEVELOPED						POTENTIAL IRRIGATION DEVELOPMENT
Row Crops	Close Growing Crops	Orchards and Vineyards	Hayland	Rotation Hay and Pasture	Pasture and Range	Maximum Irrigable Land
2,425	960	97	2,414	3,734	59,335	44,950

1/ Compiled from 1965 USDA Annual Report.

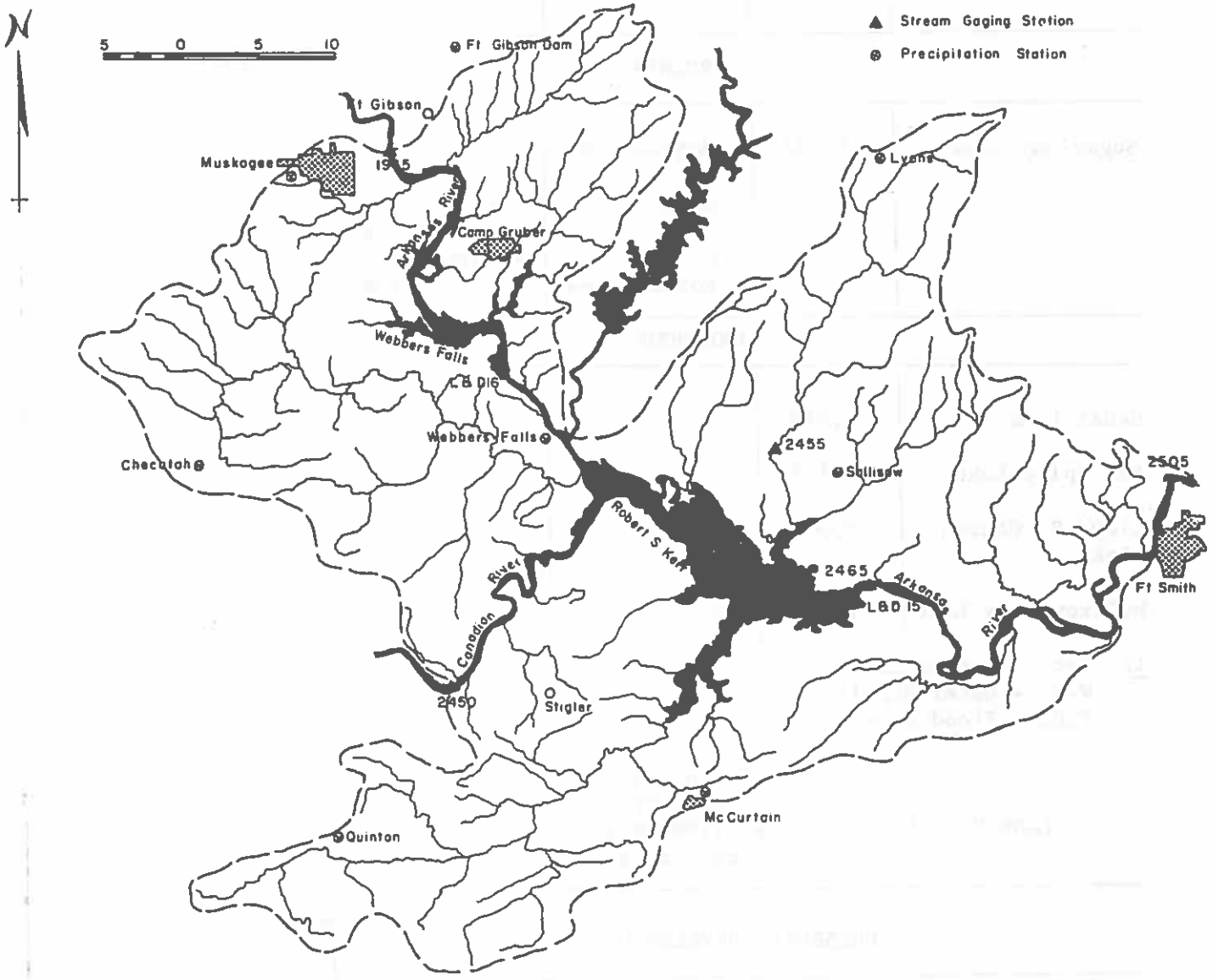


Figure 21
Arkansas River Sub-Basin

ARKANSAS RIVER SUB-BASIN

The Arkansas River rises in the Rocky Mountain region of Colorado and flows through the States of Colorado, Kansas, Oklahoma, and Arkansas before flowing into the White River just before the White joins the Mississippi River. The portion of the Arkansas River within the purview of the Compact Committee begins immediately below the confluence of the Grand-Neosho River near Muskogee, Oklahoma and continues to a point immediately below the confluence of Lee Creek with the Arkansas River near Van Buren, Arkansas. The Arkansas River Sub-basin includes the tributaries to the Arkansas River between the Grand-Neosho River and Lee Creek with the exception of Illinois River, Poteau River and Canadian River above Station 2450 near Whitefield, Oklahoma. (See Figure 21 for map details of this sub-basin).

Precipitation

Precipitation records are available at a number of stations within the Arkansas River Sub-basin. Table XIX gives selected precipitation summaries for sub-basin stations.

Table XIX

PRECIPITATION STATIONS WITHIN ARKANSAS RIVER SUB-BASIN

Station	Years of Record	Annual Precipitation in Inches		
		Average	Maximum	Minimum
Muskogee, Okla.				
Checotah, Okla.				
Quinton, Okla.	21	41.66	62.05	19.92
McCurtain, Okla.	18	41.69	61.87	18.54
Webbers Falls, Okla.	66	43.92	72.00	22.33
Lyons, Okla.	25	41.20	75.86	25.66
Sallisaw, Okla.	45	42.76	69.39	26.26

Stream Discharge

Five stream discharge gage stations are located within this sub-basin. Three stations, one on the Arkansas River, one on the Canadian, and one on Sallisaw Creek. The Arkansas River gage located near Van Buren, Arkansas (Station No. 2505) is a critical gage because it is near the State Line and can be readily adjusted to State Line flow by deducting the Lee Creek contribution which has also been determined at the Arkansas-Oklahoma border (See map of Figure 21 for detailed locations.

Table XIX

GAGING STATIONS ON OR NEAR ARKANSAS RIVER 1/

Station No.	Location	Drainage Area Sq. Mi.	Average 2/ Annual Discharge Acre-Feet	Minimum Flow cfs	Maximum Flow cfs
2205	Arkansas River near Van Buren, Ark.	150,483	22,240,000	300	850,000
1945	Arkansas River near Muskogee, Okla.	96,674	14,410,000	66	700,000
2450	Canadian River near Whitefield, Okla.	47,576	4,183,000	0.4	281,000
2455	Sallisaw Creek near Sallisaw, Okla.	182	138,300	0.0	110,000

1/ Detailed monthly flows tabulated in Appendix A.
2/ For base period of study, 1938 through 1965.

Flood Frequency Analysis

The fitted flood frequency curve of Figure 22 showing maximum daily discharge on the Arkansas River at the Van Buren gage was based on discharge data collected at that gage station.

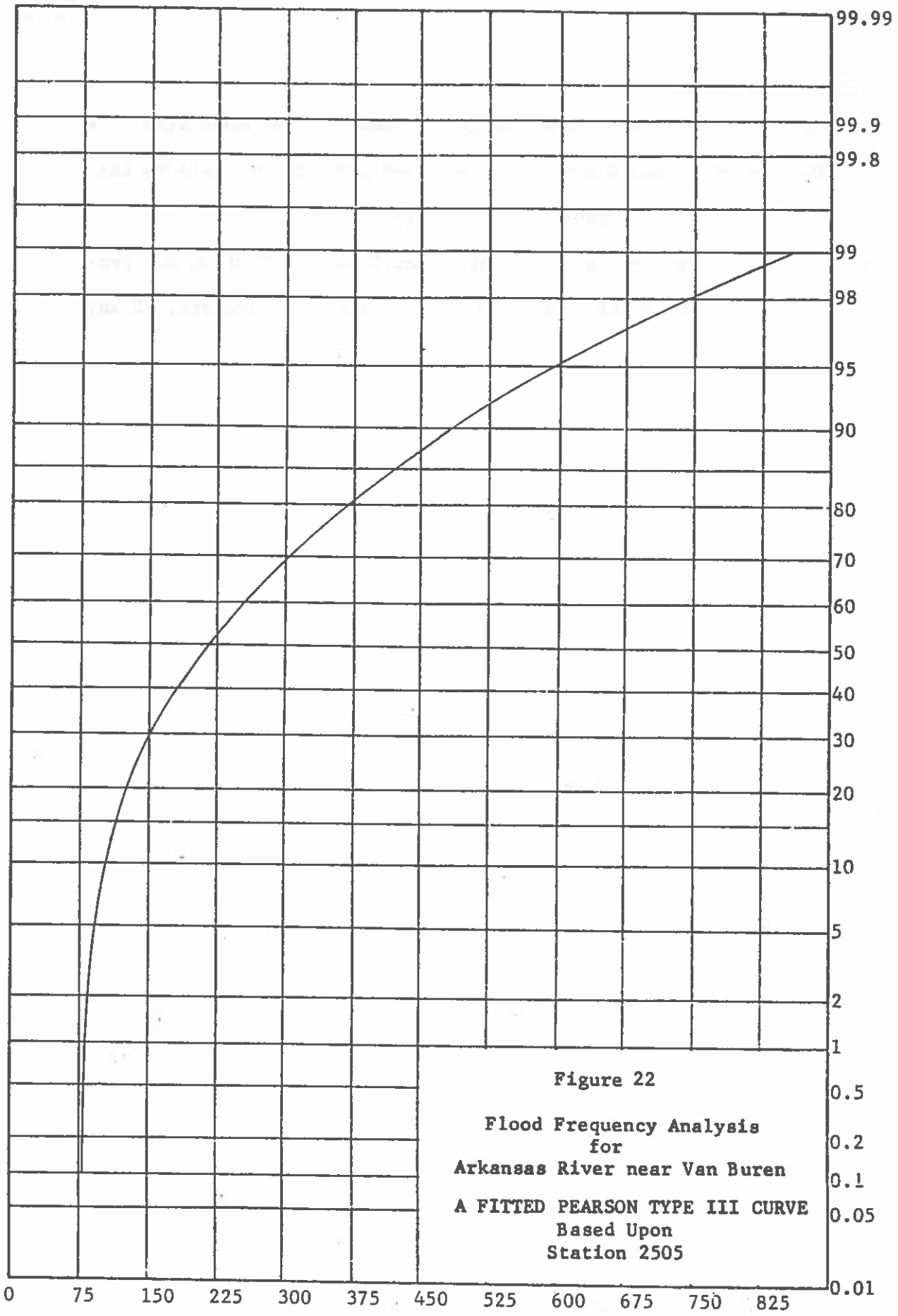


Figure 22

Flood Frequency Analysis for Arkansas River near Van Buren

A FITTED PEARSON TYPE III CURVE Based Upon Station 2505

Reservoir Storage

Two major reservoirs are now in the construction phase with Lock and Dam Number 15 and Number 16. The respective impoundments on the main channel of the Arkansas River, Robert S. Kerr Reservoir and Webbers Falls Reservoir are created primarily for navigation and recreation uses. Information is lacking on conservation storage, if any, in these reservoirs.

APPENDIX A

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	12.5	36.5	23.9	25.4	37.6	72.0	503	81.0	57.0	24.9	12.3	42.2
1964	4.8	8.6	10.5	9.8	12.4	22.3	75.9	33.1	87.1	13.5	26.0	35.0
1963	167	55.8	61.6	58.8	37.2	110	54.5	36.7	20.9	12.1	7.9	5.8
1962	63.2	99.9	136	93.3	83.2	122	166	94.0	83.6	72.7	45.4	60.8
1961	15.0	16.6	44.5	17.6	31.3	64.0	63.0	1190	193	238	480	85.0
1960	265	27.0	50.0	78.0	46.2	171	252	660	65.0	85.0	39.3	13.2
1959	20.0	39.0	22.6	20.4	30.0	100	158	105	47.5	120	22.8	26.8
1958	17.0	35.0	27.0	28.5	82.0	264	135	188	45.5	312	48.0	22.7
1957	*0.2	5.4	14.0	17.5	56.0	75.0	568	1020	582	54.5	17.5	29.0
1956	8.2	5.3	6.4	8.8	10.2	6.5	7.6	97.0	47.0	10.4	2.2	0.4
1955	24.3	10.6	32.3	49.0	162	172	75.0	79.0	104	17.1	3.8	1.7
1954	5.2	6.8	8.6	9.5	9.0	12.1	12.2	161	7.2	1.4	0.5	0.1
1953	7.2	11.6	12.3	11.7	11.4	168	240	186	19.5	17.1	8.5	4.4
1952	30.2	154	90.0	80.0	113	212	205	88.0	30.0	12.5	22.5	9.3
1951	55.0	22.6	18.5	27.5	585	222	97.0	63.0	115	138	25.0	20.4
1950	40.0	21.1	37.5	310	219	110	116	1300	87.0	152	122	72.0
1949	17.9	18.1	38.0	185	30.3	158	90.0	385	238	138	26.2	55.0
1948	7.0	17.5	14.6	35.2	67.0	323	85.0	78.0	127	85.0	540	37.5
1947	9.3	192	305	62.0	26.3	29.2	220	302	128	28.5	9.0	9.2
1946	145	42.0	23.8	152	265	87.0	52.0	392	117	76.0	15.3	9.4
1945	33.0	12.8	21.2	16.5	264	975	1020	250	260	72.0	26.5	80.0
1944	16.1	12.7	14.0	21.6	67.0	442	188	205	150	26.4	33.0	17.0
1943	87.0	510	182	106	38.0	54.0	142	1030	134	29.0	11.3	9.5
1942	203	370	107	54.5	120	67.0	385	188	152	33.5	22.0	22.3
1941	8.6	39.0	73.0	270	115	43.5	500	43.0	48.5	9.5	12.1	9.4
1940	9.0	9.5	9.8	9.0	11.4	11.9	106	55.5	31.0	19.3	13.2	36.0
1939	7.2	18.6	10.6	14.8	111	102	101	116	42.8	19.5	6.9	3.3
1938	14.6	12.8	55.0	71.0	675	260	238	216	131	23.7	16.2	11.3
1937												

Remarks: Derived data obtained by two step technique, or by going from station 1960 (Flint Creek) to station 1912 with Curve No.11-M . The coefficient of correlation for step technique is (.922)(.971) or 0.895 Observed flows 1967 to 1965, synthesized flows 1938 to 1961

Location: Spavinaw Creek;Sycamore,Okla.

Station Number: 1912

Area: 133 mi.^{2}

Basin: Spavinaw Creek

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	3.6	6.1	4.0	6.1	8.4	9.8	60.5	8.6	6.9	3.5	2.8	3.8
1964	2.7	3.3	3.6	3.3	4.3	5.3	9.1	3.8	5.3	1.8	5.5	5.3
1963	16.8	7.9	9.5	8.9	6.8	9.8	7.6	5.7	3.1	3.8	2.2	2.2
1962	7.2	16.9	18.5	10.7	9.5	14.0	22.5	10.9	9.1	9.4	8.1	9.1
1961	3.5	3.6	9.2	5.6	7.6	13.7	13.9	72.0	17.1	40.9	61.5	11.6
1960	24.5	26.5	8.5	12.4	9.0	17.6	15.0	46.0	10.4	25.5	7.3	3.4
1959	4.7	6.6	4.7	4.2	5.7	16.2	17.0	19.4	10.8	13.2	4.7	3.4
1958	4.6	16.1	6.6	6.4	14.4	31.0	17.1	27.5	9.8	34.7	16.9	6.2
1957	0.3	2.6	3.3	8.1	14.0	13.8	62.0	76.0	45.5	8.5	6.9	7.2
1956	3.3	2.1	2.0	1.9	5.3	3.4	3.4	15.8	9.0	3.5	1.3	0.3
1955	5.4	3.1	6.4	8.7	20.6	22.0	12.0	13.8	15.0	4.2	2.1	1.3
1954	1.9	2.2	2.6	2.8	2.7	3.3	3.4	20.5	2.4	0.8	0.4	0.2
1953	2.3	3.2	3.2	3.3	3.2	21.1	28.5	23.0	4.6	4.3	2.6	1.7
1952	6.2	20.2	13.4	12.4	15.9	25.5	25.0	13.2	6.1	3.4	5.1	2.8
1951	9.5	5.1	4.4	5.9	54.5	26.5	14.2	10.5	16.1	18.3	5.4	4.7
1950	7.3	4.9	7.1	34.0	26.2	15.2	18.5	98.0	13.2	19.5	17.1	11.2
1949	4.2	4.5	7.2	23.2	33.0	20.2	13.8	40.0	28.1	18.6	5.6	9.5
1948	2.3	4.4	3.7	6.7	11.3	35.0	13.0	12.2	17.3	12.6	51.5	7.1
1947	2.8	30.0	42.2	10.0	5.6	5.9	26.2	33.0	17.5	5.9	2.7	27.6
1946	18.9	7.8	5.3	19.8	30.5	13.2	9.0	40.5	16.2	11.8	3.9	27.6
1945	6.4	3.4	4.8	4.1	30.0	82.0	84.0	28.9	30.0	11.3	5.6	12.2
1944	4.0	3.5	3.7	4.9	11.0	44.0	23.3	25.1	19.4	5.5	6.4	4.2
1943	13.1	49.0	29.2	14.9	7.2	9.2	19.0	85.0	18.3	5.9	3.2	2.8
1942	37.0	38.5	15.1	9.3	16.5	11.1	40.0	23.6	19.6	6.5	5.1	5.1
1941	2.7	7.2	11.5	30.5	16.2	7.9	48.5	7.8	8.4	2.8	3.3	27.4
1940	2.7	2.9	2.9	2.6	3.2	3.3	15.0	9.5	6.3	4.5	3.5	6.8
1939	2.3	4.4	3.0	3.8	16.0	14.6	14.5	16.1	7.7	4.5	2.3	1.4
1938	3.7	3.4	9.5	11.2	60.0	30.0	28.0	26.2	18.0	5.3	4.1	3.2
1937												

Remarks: Synthesized data obtained from Curve No.5-M of monthly flow correlations relating station 1958 to Tahlequah with a coefficient of correlation 0.879.

Observed flows 1962 to 1965 synthesized flows 1938 to 1961.

Location: Flint Creek near Springtown, Ark.

Station Number: 1958

Area: 14 mi.^{2}

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	25.6	40.1	26.5	41.0	52.3	63.7	409	84.4	113	55.0	39.7	41.5
1964	19.6	20.1	24.2	23.0	23.8	41.3	52.2	40.2	31.8	19.0	48.6	42.5
1963	190	92.3	70.8	65.3	50.6	60.6	48.3	42.0	28.4	25.8	28.9	23.3
1962	80.2	112	154	133	104	137	172	124	90.7	75.5	63.7	89.1
1961	38.4	38.7	49.3	34.0	35.3	65.8	74.0	972	156	247	244	103
1960	187	171	73.7	80.0	88.6	139	111	271	146	110	60.7	36.4
1959	53.1	57.4	42.1	37.3	46.8	104	93.6	98.8	120	122	45.9	43.2
1958	48.7	105	60.4	51.6	87.0	236	167	275	106	222	143	76.1
1957	13.2	31.6	31.2	96.6	131	119	533	665	538	141	92.8	77.9
1956	29.5	23.3	20.9	20.4	35.3	24.5	20.8	67.0	51.5	29.0	14.5	12.5
1955	53.5	25.1	61.9	53.6	172	123	67.0	57.1	67.7	47.1	24.7	29.5
1954	26.0	26.0	28.4	27.7	26.5	29.6	34.6	105	25.0	14.2	11.3	13.7
1953	34.9	39.0	35.6	35.0	32.1	152	134	124	52.8	43.5	30.7	25.0
1952	82.9	202	143	121	147	198	186	106	65.9	46.0	89.9	43.6
1951	100	70.0	58.1	57.1	457	255	141	107	287	189	75.7	68.6
1950	62.0	45.0	60.0	272	202	112	140	930	97.0	147	127	82.0
1949	41.5	43.0	61.0	175	265	154	100	325	220	140	50.5	72.0
1948	26.8	42.0	38.0	58.0	82.0	282	94.0	87.0	130	92.0	435	59.5
1947	31.0	238	370	75.0	50.0	52.0	202	266	132	52.0	30.0	30.5
1946	142	63.0	48.5	150	290	96.0	70.0	317	123	86.0	38.5	30.7
1945	56.0	35.0	45.0	40.5	238	740	750	228	236	83.0	50.0	88.0
1944	39.5	36.0	37.5	46.0	80.0	370	180	192	145	50.5	56.0	41.0
1943	95.0	420	230	112	60.0	71.0	141	760	138	52.2	33.5	30.6
1942	300	315	113	72.0	123	81.0	330	180	148	56.0	46.5	47.0
1941	30.0	60.0	83.0	242	120	64.0	410	64.0	67.0	31.0	34.0	30.5
1940	30.0	31.0	31.5	30.0	34.0	34.5	112	72.0	54.5	43.0	35.5	58.0
1939	27.0	43.0	32.8	38.0	118	108	108	120	63.0	43.5	26.5	18.6
1938	38.0	36.0	72.0	82.0	515	237	215	202	134	48.5	40.0	34.0
1937												

Remarks: Observed flows from 1951 to 1965 synthesized flows from 1938 to 1950. Flows synthesized by Curve No. 4-M which correlates Osage Creek (station 1950) to Tahlequah (station 1965) with a coefficient of correlation of 0.924.

Location: Osage Creek, Elm Springs, Ark.

Station Number: 1950

Area: 129 $mi.^2$

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	20.2	46.9	28.5	48.2	64.8	78.9	522	69.6	43.1	19.3	18.5	33.4
1964	9.9	14.0	18.0	16.5	18.5	43.4	88.9	37.5	53.2	12.1	53.3	49.2
1963	109	56.5	66.5	60.0	38.1	69.1	55.9	55.9	30.3	21.2	14.7	14.7
1962	72.8	155	168	92.5	75.8	103	193	88.9	61.9	46.3	101	87.8
1961	22.6	24.7	54.6	26.0	41.2	72.8	71.8	783	179	210	369	91.5
1960	230	236	60.2	86.3	56.0	161	220	483	72.9	90.8	49.3	20.7
1959	28.7	48.4	31.7	29.1	39.5	103	150	108	57.5	120	31.9	36.1
1958	25.2	44.8	36.6	38.0	88.8	230	134	174	55.1	262	58.1	31.7
1957	0.7	9.9	21.5	25.8	74.0	82.8	423	690	434	64.8	25.8	38.3
1956	13.8	9.9	11.4	10.3	16.4	11.5	13.0	101	57.0	16.7	4.8	1.3
1955	34.0	17.2	42.0	59.0	153	162	83.0	87.0	107	25.2	7.5	3.9
1954	9.5	11.8	14.4	15.6	15.0	19.0	19.2	152	12.5	3.3	1.6	0.5
1953	12.3	18.5	19.2	18.4	18.2	158	212	172	28.0	25.3	14.3	8.3
1952	40.0	148	96.0	87.0	115	192	187	94.0	39.5	19.7	31.8	15.5
1951	65.0	31.5	27.0	37.0	435	200	102	72.0	116	136	34.0	29.0
1950	50.0	30.0	47.5	260	196	112	117	830	94.0	146	123	80.0
1949	26.0	26.5	48.0	172	255	150	97.0	310	212	136	35.5	65.0
1948	12.2	25.9	22.2	45.0	77.0	272	92.0	86.0	126	92.0	410	47.0
1947	15.4	230	335	70.0	35.5	38.5	198	255	127	38.0	15.0	15.3
1946	140	52.0	33.0	147	230	93.0	62.0	316	118	83.0	22.8	15.5
1945	42.5	19.8	30.0	24.5	229	670	690	220	227	80.0	35.5	87.0
1944	24.0	20.0	21.6	30.5	76.0	345	175	186	145	35.5	43.0	25.0
1943	93.0	390	222	108	48.0	63.0	138	700	132	38.5	18.0	15.6
1942	184	300	110	64.0	120	76.0	310	177	147	43.0	31.0	31.5
1941	14.5	48.5	82.0	233	117	54.0	385	53.0	58.0	15.6	18.8	15.4
1940	15.0	15.6	16.2	15.0	18.2	18.8	108	66.0	41.0	27.8	20.5	46.0
1939	12.3	27.0	17.2	22.5	113	105	105	117	53.0	28.0	12.2	6.7
1938	22.0	20.0	65.0	78.0	490	227	210	195	130	33.0	24.2	18.0
1937												

Remarks: Observed flows from 1956 to 1965, synthesized flows from 1930 to 1955. Flows synthesized by Curve No.2-M which correlates Flint Creek (station 1960) to Tahlequah (station 1965) with a coefficient of correlation equal to 0.971.

Location: Flint Creek; Kansas, Okla.

Station Number: 1960

Area: 110 $mi.^2$

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	163	225	115	376	340	487	1592	338	286	119	132	197
1964	44.2	65.6	73.3	64.6	75.1	184	294	323	191	50.7	193	255
1963	730	347	244	255	172	232	176	198	113	91.3	97.6	56.3
1962	450	882	1047	635	479	654	1155	507	313	217	535	343
1961	122	113	323	185	255	540	516	4286	629	723	1172	436
1960	952	1029	321	508	384	764	549	2013	409	1526	281	118
1959	186	293	173	155	229	828	700	836	347	567	150	116
1958	175	928	289	250	626	1482	750	1371	428	1807	876	276
1957	20.9	96.8	102	453	741	596	3347	3936	2021	340	329	312
1956	108	67.2	60.4	61.4	254	114	214	715	333	114	33.2	14.9
1955	186	100	232	340	900	975	480	500	625	140	69.5	80.2
1954	58.0	70.0	85.0	93.0	78.0	108	111	800	77.0	22.0	11.3	4.2
1953	73.0	106	110	105	104	930	1280	1010	156	140	850	52.0
1952	220	875	555	512	670	1150	1120	545	220	113	175	905
1951	370	178	150	212	2700	1200	600	410	700	800	186	160
1950	282	165	268	1590	1185	650	800	5400	540	850	730	455
1949	145	154	272	1020	1530	880	570	1920	1280	800	198	370
1948	73.0	152	125	250	457	1640	535	490	725	520	255	268
1947	90.0	1370	2060	400	195	215	1180	1530	750	210	875	87.0
1946	810	265	182	860	1400	540	350	1940	680	485	130	90.0
1945	235	112	164	136	1360	4260	4450	1320	1370	460	198	495
1944	135	116	123	166	440	2250	1050	1120	840	197	237	132
1943	540	2400	1320	625	272	360	810	4450	780	210	103	90.0
1942	1720	1185	640	365	700	442	1920	1050	860	236	172	176
1941	85.0	273	468	1400	680	305	2400	300	325	92.0	108	88.0
1940	85.0	93.0	84.0	88.0	103	107	635	370	227	153	115	257
1939	74.0	150	100	118	670	620	610	675	297	155	65.0	42.0
1938	124	116	370	445	2700	1370	1250	1180	775	182	125	104
1937												

Remarks: Observed flows from 1956 to 1965, synthesized flows from 1938 to 1955. Flows synthesized from Curve No.1-M which correlates Watts (station 1955) to Tahlequah (station 1965) with a correlation coefficient of 0.991.

Location: Illinois River near Watts, Okla.

Station Number: 1955

Area: 635 mi.^{2}

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	1.67	9.81	3.35	49.1	40.2	55.2	88.1	11.0	11.2	1.65	1.12	2.98
1964	0.09	0.51	0.55	0.53	2.16	12.3	11.5	29.8	5.12	0.85	8.12	6.71
1963	3.80	5.17	7.80	5.37	3.18	8.32	6.71	4.36	0.35	0.22	2.37	0.08
1962	39.1	93.6	97.1	49.1	27.9	41.8	51.3	16.7	15.9	3.47	2.54	1.97
1961	2.06	3.63	32.9	15.5	22.9	56.7	41.7	186	26.1	74.1	31.3	41.4
1960	73.1	69.6	38.9	51.4	33.1	55	45	163	22	127	8.89	2.98
1959	5.36	21	8.35	7.96	13.4	87.7	106	87.4	11.6	40.6	3.36	2.34
1958	4.45	58.5	12.3	9.8	48	105	46.2	124	38.6	131	57.1	12.6
1957	0.015	0.58	1.1	14.5	53	37	310	390	233	13	13.4	20.5
1956	1.95	0.57	0.49	0.48	9.6	4.5	19.7	67	44.5	3.25	0.225	0.032
1955	0.83	0.70	11.2	14.7	68	106	42	47	97	4.0	0.71	0.50
1954	0.44	0.53	1.2	2.85	2.4	3.45	6.3	108	1.12	0.17	0.044	0.033
1953	0.23	1.22	1.6	1.6	1.25	87	88	106	4.1	4.8	0.73	0.215
1952	1.54	19.5	15.3	16.5	30.8	79	94	58	10.7	1.41	1.42	0.273
1951	4.6	2.52	1.85	6.7	212	64	42	30	18.5	34.8	2.15	1.4
1950	6.7	3.45	13.7	123	105	42	59	320	17.5	36	30	11.8
1949	2.93	8.4	25	122	145	83	42	183	127	58.8	5.6	10.4
1948	0.51	3.7	2.25	10.5	29.3	135	36.5	33	54	35.2	222	12
1947	0.92	110	177	24.8	6.8	77	94	124	56	7.5	0.84	0.92
1946	62	13.8	5.7	65	110	37	19.2	162	49	32	2.46	0.92
1945	9.2	1.67	4.65	3.9	110	390	415	103	108	30.5	6.7	32.8
1944	2.85	1.7	2.15	4.95	28	122	82	87	64	6.7	9.5	3.1
1943	37	210	6.2	45	12.5	20.5	62	420	57	8.1	1.32	0.93
1942	145	153	45	20.5	50.5	28.5	160	85	64	9.8	5.2	5.4
1941	0.80	12	30	113	50	14.6	205	14.6	16.5	0.95	1.46	0.90
1940	0.83	1.0	1.05	0.85	1.38	1.46	45	21	8.5	3.9	1.77	11.3
1939	0.54	3.7	1.2	2.4	49	42.7	43	50	14.2	4.0	0.51	0.117
1938	2.23	1.8	21	29	272	108	100	93	56.5	5.7	2.75	1.33
1937												

Remarks: Derived Data Obtained By Two Step Technique, or by Going From Station 1970 (Barren Fork at Eldon) to 1969 with Curve No. 7-M Until Actual Data at Eldon Terminated, The Synthesized Eldon Data Was Used To Complete Records at Dutch Mills; Combined Correlation is 0.929.

Observed Flow 1959 to 1966, Synthesized 1938 to 1959.

Location: Barren Fork @ Dutch Mills, Ark

Station Number: 1969

Area: 43 mi^2

Basin: Illinois

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	61.6	89.1	48.9	260	258	368	950	171	86.1	29.4	12.8	44.9
1964	6.6	10.4	14.0	14.6	24.6	112	172	269	67.9	31.2	80.5	192
1963	59.4	81.1	74.0	68.4	40.8	72.8	84.3	86.0	41.6	14.8	31.0	12.4
1962	203	532	526	273	204	403	608	297	127	89.2	91.4	44.0
1961	40.3	43.6	250	108	150	328	335	1505	165	588	178	174
1960	413	549	208	306	188	344	335	1164	201	476	114	39.7
1959	56.8	111	67.4	54.6	81.9	438	592	787	158	350	70.6	33.4
1958	64.9	395	122	116	327	707	356	766	227	903	331	89.3
1957	2.0	18.4	27.8	134	359	259	2105	2605	1575	127	129	165
1956	39.1	18.2	16.8	16.4	104	65.0	163	453	306	53.2	10.5	3.1
1955	22.9	20.7	115	135	462	720	291	328	656	60.8	20.8	17.0
1954	15.7	17.5	29.1	49.1	44.4	55.8	81.0	732	28.0	8.8	3.8	3.2
1953	10.5	29.6	34.5	34.5	29.5	589	602	727	62.0	68.4	21.3	10.2
1952	33.6	101	138	146	221	537	648	393	111	32.1	32.4	11.7
1951	67.3	45.4	38.0	84.2	1441	433	290	218	157	245	41.6	32.0
1950	82.6	55.5	129	833	714	292	404	2178	151	254	217	118
1949	50.0	96.3	189	828	984	563	290	1233	859	401	73.9	108
1948	17.0	58.0	43.0	110	212	910	255	235	370	250	1500	120
1947	24.4	750	1180	188	83.0	92.0	630	840	380	90.0	23.5	24.5
1946	420	130	76.0	440	750	260	160	1100	340	230	45.0	24.6
1945	102	35.5	67.0	60.0	745	2640	2800	700	740	218	84.0	235
1944	49.0	36.0	41.5	68.0	206	1220	550	595	435	83.0	103	52.0
1943	260	1400	78.0	310	122	166	425	2820	390	93.0	31.0	24.8
1942	975	1030	310	166	350	208	1080	575	438	106	72.0	73.0
1941	22.5	120	216	770	340	136	1380	135	147	25.0	33.0	24.3
1940	23.0	26.0	26.8	23.4	31.5	33.0	310	170	97.0	60.0	37.0	114
1939	17.6	58.0	29.2	44.0	335	297	300	345	132	62.0	17.0	6.8
1938	42.5	37.0	170	210	1820	745	675	625	385	76.0	48.5	31.0
1937												

Remarks: Observed flows 1949 to 1965 synthesized flows 1938 to 1948. Flows synthesized from Curve No.3-M which correlates station 1970 to station 1965 at Tahlequah with a correlation coefficient of 0.967.

Location: Barren Fork at Eldon, Okla.

Station Number: 1970

Area: 307 $mi.^2$

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	6.55	71.0	10.9	27.6	174	111	38.2	329	42.6	3.69	4.1	12.6
1964	0	0	0	0	1.84	77.3	235	109	1.71	0.09	189	46.8
1963	174	150	77.2	49.5	7.58	24.6	134	24.4	0.91	0.06	0	0
1962	36.2	328	217	143	154	128	365	32.9	18.1	96.8	1.98	18.4
1961	6.03	4.32	150	64.8	100	303	87.1	109	21.3	117	3.5	29.9
1960	216	52.4	188	258	151	139	37	1377	31.5	464	110	4.43
1959	3.39	56.4	14.1	18.3	24.6	343	143	371	8.34	147	11.2	21.7
1958	7.01	196	76.4	90.9	47.5	320	119	369	144	81.8	143	34
1957	0	0	1.71	51.2	133	278	1224	589	379	3.43	0.03	95.8
1956	21.3	5.26	0.41	0.52	112	10	26	44.9	2.81	6.16	0.14	0
1955	2.65	0.61	61.5	51	171	328	162	49.4	5.43	0.04	5.61	14.3
1954	2.81	2.4	13.3	81.5	31.2	9.84	35.4	127	3.2	0.55	0	0
1953	0.09	22.1	14.9	12.1	50	606	789	305	2.37	193	7.77	0.84
1952	23.3	152	42.3	24.5	39	218	480	44.2	31.4	0.95	0.08	1.62
1951	8.09	1.76	2.95	28.7	542	109	114	138	387	50.5	11.9	13.6
1950	9.29	2.67	25.9	314	296	23.5	18.6	432	24.4	847	96.4	547
1949	0	2.23	0.56	196	439	172	187	140	165	1.71	14	4.71
1948	3.82	5.82	83.4	147	310	256	48.8	91.5	35.8	6.39	3.47	0
1947	0	352	584	31.2	8.12	42.1	596	448	115	1.73	0.02	1.12
1946	75.7	13.5	4.84	177	460	36.2	114	426	122	9.12	0.98	0
1945	0	0.22	1.67	3.87	715	1100	482	627	695	100	7.66	106
1944	108	11.8	64.5	151	501	233	158	308	81.3	0.87	0.11	0.10
1943	3.23	125	461	28.7	18.6	154	235	678	27	0.45	0	5.23
1942	391	167	118	106	236	121	799	59.8	38	167	17	18.9
1941	0.43	29.8	84	224	317	41.5	283	91.8	24.8	4.26	3.66	15.5
1940	2.29	2.26	3.63	2.11	23.4	5.95	357	67.5	24.3	49.8	19.8	13.3
1939	12	27.3	17.1	22.7	129	116	233	24.2	9.7	2.90	0.40	0
1938	22	20.2	70	85	594	265	242	225	0.50	34	25	18
1937												

Remarks: Synthesized Data From 1938 to April, 1939. Correlation By Ratio of Areas With the Illinois River At Tahlequah.

Location: Fouche Maline near Red Oak

Station Number: 2475

Area: 122 mi^2

Basin: Poteau

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	16	99.6	48.7	426	59.2	524	1319	665	143	38.4	9.85	51.6
1964	0.75	0.22	3.17	3.67	48	397	971	898	58.9	8.68	85.8	53.6
1963	212	181	260	170	52.1	169	450	245	28	2.52	5.59	10.7
1962	268	1057	1095	708	369	584	686	206	62.5	22.1	46.6	40.9
1961	4.75	6.32	214	117	212	911	672	1836	119	731	141	323
1960	566	5.67	647	743	502	571	485	2746	207	232	47.4	6.49
1959	74.6	760	168	133	308	1306	1516	1252	317	181	35.8	18.3
1958	51.9	928	228	223	470	1615	737	1413	437	1909	583	187
1957	0	0.13	25	180	985	527	3657	3516	2121	64.5	393	278
1956	3.82	1.85	3.56	3.31	181	88.1	462	503	253	17.8	0.76	0
1955	188	47.3	639	526	1231	1147	590	602	402	29.6	11.7	6.13
1954	0.36	1.18	17.6	154	117	105	94.6	594	19	1.25	0	0
1953	0.12	31.3	59.6	133	140	1777	1726	1234	29.2	39.5	9.21	1.36
1952	126	813	371	356	427	1136	1525	499	91.9	7.44	20.5	0.81
1951	34.4	11.6	10.8	71.6	2424	611	573	309	600	862	27.7	34.7
1950	252	100	235	1720	1250	650	825	6600	540	870	740	448
1949	56	73	240	1000	1680	940	565	2140	1380	820	145	355
1948	2.5	67	36	215	440	1310	525	485	750	515	2920	240
1947	6.5	1500	2300	390	143	166	1270	1680	770	163	6.1	6.6
1946	890	265	122	900	1500	540	330	2160	690	445	34	6.7
1945	191	17.7	95	73	1480	5000	5300	1400	1490	450	145	485
1944	43	18.5	30	100	425	2410	1100	1190	880	142	197	50
1943	530	2750	130	630	247	342	860	5390	770	172	12.5	6.8
1942	1920	2050	630	344	710	416	3500	1150	880	204	112	114
1941	5.3	240	445	1530	690	280	2700	275	305	7.0	14.8	6.6
1940	5.6	7.7	8.5	5.9	13	14.7	630	355	179	74	20	224
1939	2.75	67.5	10.8	32	680	610	620	705	270	77	2.5	0
1938	29.5	19.5	355	440	3600	1500	1350	1240	780	122	41	12.4
1937												

Remarks:

Synthesized data obtained from curve 14-M of monthly flow correlations relating station 2500 to Barren Fork at Eldon with a coefficient of correlation 0.90.

Observed flow - 1951 to 1965, synthesized 1938 to 1951

Location: Lee Creek @ Van Buren

Station Number: 2500

Area: 427 mi^2

Basin: Lee Creek

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Thousand cfs)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	3.594	27.49	17.93	13.18	10.53	14.61	58.47	21.17	48.76	27.53	10.31	32.51
1964	3.264	2.302	1.78	1.816	2.485	5.13	15.83	13.89	21.71	7.301	5.892	11.77
1963	32.15	16.41	15.29	11.13	6.723	16.37	11.68	9.783	7.806	11.64	6.938	9.227
1962	46.78	75.14	49.81	27.35	35.04	29.20	33.84.	10.83	41.73	18.43	11.56	30.77
1961	11.38	18.62	20.43	9.596	13.59	29.49	47.61	159.7	52.11	56.43	30.62	71.77
1960	164.3	37.58	34.44	38.36	39.6	42.97	40.54	100.7	64.17	38.4	23.56	15.18
1959	8.266	9.547	6.252	5.799	9.921	30.18	22.24	44.34	19.29	63.09	21.43	18.91
1958	7.85	19.51	10.04	12.03	13.36	67.86	61.31	52.02	37.89	83.54	38.08	19.70
1957	.492	1.262	2.127	3.137	11.76	12.3	97.66	195.4	218.8	82.41	14.49	21.39
1956	24.51	4.101	3.988	3.044	6.633	3.223	3.185	8.915	7.123	3.509	2.365	.742
1955	2.686	2.618	4.445	8.892	11.41	20.81	13.59	35.05	28.61	14.54	5.434	5.883
1954	4.428	5.087	5.235	7.519	5.362	3.535	4.846	47.44	10.36	4.083	2.211	.869
1953	1.72	2.479	3.904	3.555	4.388	23.75	43.65	39.01	5.353	16.47	6.491	3.749
1952	23.71	48.98	25.01	18.0	22.66	57.39	63.55	30.66	18.50	5.495	4.277	3.384
1951	13.83	11.24	7.446	17.28	5.201	10.09	32.87	17.41	5.751	1.585	.818	25.2
1950	14.02	8.13	8.364	32.74	33.06	16.42	13.02	89.57	37.0	79.24	97.36	68.33
1949	6.138	9.746	9.264	41.99	111.7	49.72	36.5	128.3	90.03	34.39	12.72	17.22
1948	5.042	5.283	7.42	11.98	17.63	53.91	20.04	25.61	70.35	124.2	65.25	9.974
1947	8.91	38.22	56.17	9.847	6.294	14.17	120.1	116.1	57.93	21.45	7.379	6.395
1946	95.57	10.34	6.94	47.59	51.61	29.17	28.16	71.0	35.42	18.53	4.939	6.165
1945	36.51	10.33	33.6	13.16	36.35	141.7	219.2	75.74	93.44	51.39	14.65	29.94
1944	11.71	6.887	6.271	10.38	21.4	67.24	101.3	91.79	47.2	14.16	11.76	12.46
1943	28.95	45.09	40.55	29.89	15.82	18.93	28.28	302.1	64.38	16.88	5.895	3.67
1942	144.4	146.4	31.45	16.04	28.66	23.5	140.8	74.29	83.88	32.1	20.21	42.75
1941	2.096	11.75	15.33	36.60	34.74	11.32	76.24	43.80	83.34	19.19	10.70	39.49
1940	1.042	1.384	1.421	1.194	2.328	2.401	14.44	15.97	9.965	11.62	10.75	17.86
1939	3.325	4.498	2.439	3.21	12.01	9.513	27.76	26.42	15.76	15.32	5.453	1.867
1938	4.467	6.253	8.691	12.67	85.89	30.19	56.26	75.75	80.94	13.67	14.69	7.234
1937												

Remarks:

Location: Ark. River @ Van Buren

Station Number: 2505

Area: 150,218 mi^2

Basin: Arkansas

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	17.0	202	49.9	154	395	302	123	349	65.5	6.6	1.8	9.0
1964	0	0	0.76	0.50	22.3	188	122	151	4.13	1.69	23.4	70.0
1963	112	146	67.5	45.9	15.6	77.9	45.9	38.6	11.2	2.65	1.01	0
1962	54.7	370	348	324	244	241	142	21.9	15.1	16.9	10.7	60.6
1961	23.4	8.01	107	52.5	115	331	218	473	106	430	36.1	31.6
1960	136	263	298	230	199	213	41.6	834	21	99.1	9.13	4.65
1959	6.05	42.5	30.5	52.9	45.1	312	175	66.5	35.7	36.5	9.76	20.8
1958	15.2	288	100	208	118	490	311	669	272	84.9	15.9	17.9
1957	0	6.8	94	235	275	318	1020	690	305	4.2	220	152
1956	0	0	0	0	300	69	26.4	37	2.66	1.02	0	0
1955	61	13.8	178	105	265	510	137	17.3	9	2.15	0.83	0.1
1954	0.3	3.5	5.6	200	140	19.6	88	335	5.3	1.9	0	0
1953	0	340	205	210	138	580	700	460	6.2	6.1	1.6	0.1
1952	64	270	172	268	96	370	910	76	9.4	2.3	0.3	0
1951	25.3	7.7	5.9	35	510	131	147	66	200	108	11	13.8
1950	43	11.4	76	830	780	78	138	520	105	240	218	235
1949	7.9	26.2	79	1020	510	285	128	208	173	8.6	0.62	10
1948	2.4	21.2	310	355	480	300	245	137	19.8	29.5	52	4
1947	1.85	480	670	550	25.5	105	266	220	12.8	1.5	8.5	43
1946	135	40	31	420	420	145	300	710	98	16.8	2.5	0.1
1945	0.53	39	205	93	950	1320	230	660	590	53	13.4	140
1944	8.9	16.4	55	158	540	390	270	345	170	5.9	19.8	9.4
1943	11.5	69	140	39	18.5	175	122	750	74	4.4	0.1	0
1942	405	235	215	245	180	265	365	265	96	9.5	14.8	19.2
1941	0.98	102	164	185	265	135	178	112	103	9.3	12.3	43
1940	12.6	2.6	8.6	8.2	47	20.5	225	66	17.8	7.6	86	15.8
1939	21.4	43.5	28.8	37	800	197	750	128	45	5.5	2.2	0.7
1938	36	33.2	100	118	650	320	295	275	190	53	39	30
1937												

Remarks: Synthesized Data From 1938 to April, 1958. Correlation Based on Flows at Poteau River at Cauthorn.

Location: James Fork @ Hackett

Station Number: 2494

Area: 148 mi^2

Basin: Poteau

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	685	1,490	593	877	2,272	1,558	1,632	1,298	963	40.6	6.76	54.6
1964	5.46	1.12	0.51	0.14	18.9	1,089	1,186	770	21.4	6.54	193	633
1963	626	640	456	271	67.1	971	241	644	19.9	11.1	23.4	11.0
1962	713	1,129	3,153	1,554	998	1,660	1,693	523	102	162	20.7	78.4
1961	38.7	28.6	1,769	780	1,401	1,209	2,053	1,007	1,542	1,160	204	224
1960	994	437	1,946	1,967	1,289	1,440	228	3,300	5,524	984	1,177	20.9
1959	42.3	572	193	337	366	1,929	1,376	912	58.2	523	108	28.1
1958	423	2,109	735	1,199	675	2,942	2,226	4,291	1,049	967	445	119
1957	4.22	0.53	354	973	2,420	2,057	2,841	4,070	2,929	5,704	1,980	1,326
1956	42.4	1.84	0.96	8.45	1,658	275	135	301	44.7	0.84	6.5	0.4
1955	32.4	55.1	514	1,033	1,452	2,287	2,463	368	64.3	3.27	2.48	34.8
1954	3.38	15.7	0.17	1,636	543	93.2	693	2,072	28.3	1.33	9.08	4.26
1953	4.85	531	880	675	847	3,506	4,053	5,940	11.4	696	119	9.86
1952	303	2,354	1,095	791	578	2,315	3,637	1,903	236	11.3	8.85	7.14
1951	1,104	6.64	37.2	319	1,393	3,476	875	545	1,587	525	269	226
1950	41.7	11.3	310	4,753	4,876	478	264	2,692	265	546	3,652	1,709
1949	32.7	85.8	330	4,075	6,999	1,894	1,062	1,785	1,483	88.3	44.4	71.2
1948	70.4	159	1,436	2,482	3,141	2,564	1,073	1,241	85.5	71.7	251	17.4
1947	1.26	4,522	5,687	516	146	675	3,585	3,537	465	17	163	417
1946	1,458	244	137	2,876	3,616	540	2,184	5,543	2,119	237	27.5	0.34
1945	13.5	71.3	613	374	6,657	10,860	3,661	6,226	7,115	790	317	1,648
1944	190	95.7	308	1,076	3,443	3,547	1,744	3,024	1,314	35.5	64.6	43.2
1943	24.6	884	2,158	319	169	1,221	1,243	6,830	708	42.9	1.01	1.53
1942	1,358	2,032	1,154	893	1,589	1,709	4,726	1,465	528	265	64	173
1941	4.82	326	993	1,699	2,479	766	2,151	864	402	52.2	28.9	143
1940	2.4	13.6	30	35.3	238	114	1,728	492	192	109	247	48
1939	0	48.7	52.3	138	2,736	682	6,939	385	260	71.1	29.9	0.9
1938	179	164	570	694	4,830	2,150	1,970	1,830	351	40.4	57.6	11.8
1937												

Remarks: Synthesized Data From October, 1937 to June, 1938. Correlation by Ratio of Areas Method With Illinois River at Tahlequah.

Location: Poteau River @ Wister

Station Number: 2485

Area: 993 mi^2

Basin: Poteau

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	15.8	268	87.2	202	741	481	122	300	200	24.9	4.87	269
1964	0	0	0	0.12	12.4	331	145	189	1.62	0	20.0	120
1963	120.	115	62.1	41.3	12.6	305	54.0	50.2	10.8	1.4	0.07	0.15
1962	17.5	351	380	435	346	299	174	18.5	34.1	41.5	9.87	60.9
1961	2.32	8.05	380	148	309	469	213	431	94.9	442	448	28.2
1960	139	51.8	554	407	247	301	46.1	1480	12.7	55.3	4.31	0.58
1959	24.2	178	50.8	69.1	97	394	315	22	8.31	11.9	6.06	1.95
1958	12.8	387	115	266	140	720	488	923	316	143	26	9.27
1957	0	4.67	106	304	366	433	1629	1061	407	2.51	283	188
1956	0	0	0	0	403	75.5	25.4	37.1	1.38	0.42	0	0
1955	0	11.5	222	120	347	736	165	25.3	6.57	1.07	0.32	0.02
1954	0.08	1.98	3.61	256	172	18	98.3	454	3.38	0.94	0	0
1953	0	460	256	269	167	856	1009	662	4.17	4.08	0.75	0
1952	69.3	352	214	357	109	507	1207	86	6.89	1.16	0.09	0
1951	24.2	5.41	3.83	35.3	736	159	178	71.8	251	126	8.65	11.5
1950	43.6	8.91	84.1	1303	1223	873	166	766	120	316	280	300
1949	5.59	25.2	89.0	1650	733	384	154	263	215	6.15	0.22	7.52
1948	1.22	19.6	418	492	680	397	323	165	18.1	28.6	54.5	2.34
1947	0.94	693	996	81.9	24.1	121	357	281	10.4	0.70	7.24	43.7
1946	162	40.5	29.8	594	590	178	400	1081	112	14.8	1.29	0.01
1945	0.18	39.4	260	105	1514	2212	299	980	878	56	11	171
1944	6.51	14.2	58.6	196	788	538	348	467	210	3.85	18.1	7.08
1943	9.02	75.1	170	39.7	16.7	216	145	1166	81.2	2.68	0	0
1942	567	303	276	319	225	346	497	351	110	7.02	12.6	17.4
1941	0.40	117	204	235	352	160	222	132	157	6.90	9.97	44.1
1940	10.3	1.37	6.21	5.87	49	18.4	290	70.8	15.6	5.32	117	13.2
1939	19.8	44.7	28	37.1	1252	249	1162	153	47.0	3.52	1.11	0.28
1938	36.1	33	115	140	972	433	397	368	240	56	40	30
1937												

Remarks: Synthesized Data From 1938 to February, 1939. Correlation by Ratio of Areas Method With Illinois River at Tahlequah.

Location: Poteau River @ Cauthron

Station Number: 2470

Area: 200 mi^2

Basin: Poteau

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	2.34	17.1	5.91	71	61.6	44.5	139	37	10.6	19	2.32	3.47
1964	0.13	0.04	0.16	0.34	3.09	25.2	44.3	55.1	10.1	1.15	21.6	8.72
1963	17.8	12.4	17.4	11.9	4.62	14.9	31.8	28.5	1.00	0.16	4.48	0.72
1962	42.5	103	94.1	60.6	30.5	59.9	64.5	13.9	7.91	12.8	9.87	2.02
1961	0.21	1.4	24.7	14	24.2	87.6	48.1	142	6.41	46	18.8	42.6
1960	42.3	52.6	41.7	51.9	33.9	49.9	62.6	247	8.04	52.6	3.93	0.60
1959	3.81	38	9.23	11.5	26.1	106	119	93.4	10.8	10.4	1.24	1.25
1958	5.12	118	21.9	17.2	40.2	137	48.4	113	37.9	102	45.9	15.5
1957	0	0.69	3.21	15.8	80.1	47.1	290	349	112	3.68	77.1	44.3
1956	1.1	0.16	0.34	0.53	15.8	9.64	68.3	63.3	18.9	1.11	0.05	0
1955	40.7	3.48	72.9	50.6	114	98.8	57.6	68.7	85.2	1.45	0.53	0.25
1954	0.05	0.10	3.56	22.2	9.32	7.86	7.82	37.2	1.11	0.08	0	3.71
1953	0.10	3.74	4.45	8.73	5.70	142	119	96.1	1.48	6.47	0.68	0.15
1952	5.53	38.1	18.4	22.5	39.0	84.4	118	51.7	5.73	0.58	3.00	0.42
1951	3.78	2.07	1.50	15.6	216	56.3	50.2	22.8	40.1	86	1.66	1.03
1950	9.7	4.32	17.9	114	100	46	61	250	22	40	34.5	16.0
1949	3.3	12.0	29.8	113	130	82	46	159	117	61	8.0	14.3
1948	0.10	4.8	2.0	14.4	34.2	122	41	38	57	39.7	185	16.2
1947	0.34	103	154	29.8	10.0	76	90	114	58	10.8	0.28	0.32
1946	63	18.1	8.3	66	103	41.5	1.47	142	52	36.5	2.41	0.32
1945	13.0	1.10	6.5	5.1	103	280	310	98	101	35	9.7	37.5
1944	3.15	1.13	1.83	7.0	32.7	113	80	84	65	6.7	13.2	3.65
1943	4.17	176	8.9	48.5	16.8	25.2	63	325	59	11.7	0.70	0.34
1942	130	137	48.5	25.2	53.3	33.0	141	82	65	13.7	7.4	7.7
1941	0.25	16.1	34.5	105	53	19.0	173	19	21	0.36	0.85	0.32
1940	0.27	0.4	0.42	0.28	0.75	0.84	48.3	25.9	12.1	5.1	1.24	15.4
1939	0.115	4.8	5.67	2.31	52.3	46.2	46.5	53	18.6	5.3	0.10	0
1938	2.0	1.3	25.9	32.1	218	102	95	89	59	8.3	3.0	0.71
1937												

Remarks: Synthesized data obtained from curve 13-M of monthly flow correlations relating station 2495 to Barren Fork at Dutch Mills with a coefficient of correlation 0.915.

Observed flow 1951 to 1965, synthesized 1938 to 1950.

Location: Cove Creek Near Lee Creek

Station Number: 2495

Area: 36.9 mi^2

Basin: Lee Creek

Water Year	Recorded Mean Monthly Discharges - 1938 to 1966 (CFS)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	231	315	186	487	487	807	3035	561	447	176	124	270
1964	45.7	75.3	95.6	91.4	113	302	580	483	306	89.7	252	445
1963	984	533	397	388	254	412	332	338	189	112	123	78.0
1962	587	1234	1531	875	657	963	1750	774	451	309	739	527
1961	162	165	533	292	433	837	856	5780	1104	1502	1565	572
1960	1661	1792	489	764	524	1124	942	3441	615	1713	408	154
1959	236	361	235	198	297	1018	1086	1259	641	820	235	152
1958	224	1026	366	350	891	2161	1097	1891	573	2491	1070	327
1957	7.05	112	145	461	871	859	4756	6222	3403	490	380	402
1956	148	79.2	77.5	74.0	270	155	156	988	522	160	44.2	5.4
1955	274	134	342	502	1366	1450	713	745	926	203	84.4	45.6
1954	72.1	88.6	111	122	117	149	151	1349	97.6	22.9	10.5	3.15
1953	94.1	145	151	144	142	1399	1941	1525	227	204	112	62.5
1952	327	1310	826	765	1003	1713	1689	813	322	155	259	121
1951	545	258	215	306	4139	1800	877	615	1038	1194	277	237
1950	415	242	397	2408	1777	963	1201	8397	810	1272	1098	678
1949	207	222	401	1538	2322	1330	849	2911	1936	1207	290	550
1948	93.5	217	175	372	674	2508	793	732	1114	771	3907	393
1947	119	2077	3116	590	288	314	1781	2328	1128	312	117	118
1946	1214	436	268	1269	2103	805	520	2954	1042	716	181	120
1945	345	155	240	194	2085	6695	6864	1999	2065	684	291	744
1944	191	158	171	246	654	3285	1557	1692	1265	289	351	200
1943	802	3690	2019	934	403	536	1222	6979	1172	314	141	121
1942	2643	2786	950	538	1049	661	2927	1579	1288	356	255	259
1941	113	401	681	2120	1031	447	3648	446	482	121	147	118
1940	115	123	126	116	142	147	945	550	335	222	158	378
1939	95.3	214	134	178	1011	911	911	1036	439	227	93.5	49.6
1938	173	158	551	670	4661	2079	1902	1765	1151	268	192	142
1937												

Remarks:

Location: Tahlequah, Oklahoma

Station Number: 1965

Area: 959 mi^2

Basin: Illinois River

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	777	2,227	1,192	2,318	3,311	4,274	43,344	3,612	1,987	734	692	1,463
1964	325	500	692	614	704	2,017	4,936	1,686	2,589	415	2,589	2,348
1963	6,441	2,817	3,401	3,010	1,722	3,672	2,769	2,769	1,294	831	524	530
1962	3,913	9,873	10,836	5,177	4,033	6,020	13,063	4,997	3,118	2,215	5,779	4,936
1961	903	999	2,679	1,060	1,884	3,853	3,793	71,638	11,619	14,328	28,896	5,117
1960	15,953	1,625	3,010	4,696	2,781	10,294	15,170	39,732	3,913	5,117	2,366	795
1959	1,204	2,348	1,361	1,228	1,806	6,020	9,512	6,321	2,859	7,224	1,373	1,613
1958	1,023	2,107	1,625	1,716	4,936	15,893	8,127	11,318	2,739	18,782	2,890	1,367
1957	14	322	843	1,053	3,973	4,515	34,194	61,404	35,036	3,281	1,053	1,746
1956	494	318	385	530	614	391	458	5,839	2,829	626	132	25
1955	1,493	638	1,944	2,950	9,752	10,354	4,515	4,756	6,261	1,029	229	102
1954	313	406	518	572	542	728	734	9,692	433	81	33	8
1953	433	698	740	704	686	10,114	14,448	11,197	1,174	1,029	512	265
1952	1,818	9,271	5,418	4,816	6,803	12,762	12,341	5,298	1,806	752	1,354	560
1951	3,311	1,361	1,114	1,655	35,217	13,364	5,839	3,793	6,923	8,308	1,505	1,228
1950	2,408	1,270	2,257	18,662	13,184	6,622	6,983	78,260	5,237	9,150	7,344	4,334
1949	1,078	1,090	2,288	11,137	1,824	9,512	5,418	23,177	14,328	8,308	1,577	3,311
1948	421	1,053	879	2,119	4,033	19,445	5,117	4,696	7,645	5,117	32,508	2,257
1947	560	11,558	18,361	3,732	1,583	1,758	13,244	18,180	7,706	1,716	542	554
1946	8,729	2,528	1,433	9,150	15,953	5,237	3,130	23,598	7,043	4,575	921	566
1945	1,987	771	1,276	993	15,893	58,695	61,404	15,050	15,652	4,334	1,595	4,816
1944	969	765	843	1,300	4,033	26,608	11,318	12,341	9,030	1,589	1,987	1,023
1943	5,237	30,702	10,956	6,381	2,288	3,251	8,548	62,006	8,067	1,746	680	572
1942	12,221	22,274	6,441	3,281	7,224	4,033	23,177	11,318	9,150	2,017	1,324	1,342
1941	518	2,348	4,395	16,254	6,923	2,619	30,100	2,589	2,920	572	728	566
1940	542	572	590	542	686	716	6,381	3,341	1,866	1,162	795	2,167
1939	433	1,120	638	891	6,682	6,140	6,080	6,983	2,577	1,174	415	199
1938	879	771	3,311	4,274	40,635	15,652	14,328	13,003	7,886	1,427	975	680
1937												

Remarks:

Location: Spavinaw Creek @ Sycamore

Station Number: 1912

Area: 133 mi^2

Basin: Spavinaw

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	560	1,294	789	1,330	1,794	2,179	14,448	1,926	1,192	536	512	927
1964	271	385	500	458	512	1,198	2,456	1,035	1,469	337	1,475	1,361
1963	3,010	1,559	1,836	1,655	1,053	1,908	1,541	1,547	837	584	403	403
1962	2,011	4,286	4,647	2,558	2,095	2,552	5,340	2,456	1,710	1,276	2,793	2,432
1961	626	680	1,511	716	1,138	2,017	1,987	21,612	4,954	5,809	10,234	2,534
1960	9,331	6,514	1,662	2,384	1,547	4,455	6,080	13,364	2,017	2,510	1,361	572
1959	795	1,336	873	807	1,090	2,853	4,148	2,986	1,589	3,323	885	999
1958	698	1,240	1,011	1,047	2,450	6,363	3,708	4,816	1,523	7,224	1,607	879
1957	20	277	596	710	2,047	2,294	11,709	19,083	11,980	1,794	710	1,060
1956	379	271	313	283	451	319	361	2,793	1,577	464	132	35
1955	939	476	1,162	1,631	4,232	4,485	2,294	2,426	2,962	698	205	108
1954	265	319	397	433	415	524	530	4,202	343	90	43	14
1953	337	512	530	506	506	4,371	5,863	4,756	777	698	397	229
1952	1,102	4,088	2,649	2,408	3,167	5,015	5,171	2,601	1,090	545	879	427
1951	1,794	873	746	1,023	11,980	5,532	2,823	1,993	3,209	3,762	939	801
1950	1,385	831	1,312	7,170	5,418	3,094	3,233	22,936	2,601	4,045	3,401	2,209
1949	662	734	1,324	4,756	7,043	4,154	2,685	8,548	5,869	3,762	981	1,800
1948	337	716	614	1,240	2,125	7,525	2,546	2,378	3,480	2,546	11,318	1,300
1947	427	6,351	9,247	1,932	981	1,066	5,478	7,043	3,516	1,053	415	424
1946	3,871	1,439	915	4,063	6,351	2,577	1,716.	8,729	3,269	2,294	632	430
1945	1,174	548	831	674	6,321	18,542	1,908	6,080	6,261	2,209	981	2,432
1944	682	554	596	843	2,101	9,542	4,846	5,147	4,009	981	1,192	692
1943	2,571	10,776	6,128	2,986	1,324	1,740	3,817	19,384	3,654	1,066	500	433
1942	5,087	8,284	3,040	1,770	3,323	2,101	8,560	4,900	4,063	1,192	855	873
1941	403	1,336	2,264	6,435	3,239	1,493	10,643	1,469	1,601	433	518	427
1940	415	433	445	415	500	518	2,992	1,830	1,132	771	566	1,270
1939	343	746	476	620	3,118	2,908	2,908	3,233	1,463	777	337	187
1938	608	554	1,794	2,155	13,545	6,279	5,809	5,400	3,594	915	668	500
1937												

Remarks: Data Synthesized by Ratio of Areas Method With Flint Creek Near Kansas.

Location: Flint Creek @ Arkansas Border

Station Number:

Area: 50.5 mi^2

Basin: Illinois

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	9,512	12,943	7,946	19,986	19,986	32,628	120,400	22,876	18,060	7,525	5,599	11,077
1964	2,348	3,672	4,455	4,274	5,177	12,281	23,478	19,866	12,341	4,214	10,234	18,542
1963	40,334	21,672	16,254	15,833	10,354	16,856	13,364	13,846	8,067	5,117	5,599	3,793
1962	24,080	49,665	61,404	35,518	26,608	38,829	70,434	31,304	18,542	12,642	30,100	21,371
1961	7,043	7,224	21,672	12,040	17,639	34,013	34,314	223,944	43,946	60,200	62,006	23,177
1960	66,220	71,638	19,866	30,822	21,190	45,150	37,625	136,654	24,682	67,424	16,555	6,742
1959	9,933	14,869	9,632	8,428	12,160	40,635	43,645	49,966	26,187	33,110	9,632	6,682
1958	9,271	40,936	14,869	14,448	36,120	87,290	44,247	75,250	23,478	59,598	43,645	13,244
1957	482	5,177	6,321	18,782	34,916	34,916	186,620	234,780	133,042	20,167	15,351	16,374
1956	6,502	3,853	3,732	3,612	11,137	6,742	6,863	40,334	21,070	6,923	2,288	391
1955	11,197	6,020	13,966	20,468	54,180	58,695	28,896	30,100	37,625	8,428	4,033	2,348
1954	3,492	4,214	5,117	5,599	4,696	6,502	6,682	48,160	4,635	1,324	680	253
1953	4,395	6,381	6,622	6,321	6,261	55,986	77,056	60,802	9,391	8,428	51,170	3,130
1952	13,244	52,675	33,411	30,822	40,334	69,230	67,424	32,809	13,244	6,803	10,535	54,481
1951	22,274	10,716	9,030	12,762	162,540	72,240	36,120	24,682	42,140	48,160	11,197	9,632
1950	16,976	9,933	16,134	95,718	71,337	39,130	48,160	325,080	32,508	51,170	43,946	27,391
1949	8,729	9,271	16,374	61,404	92,106	52,976	34,314	115,584	77,056	48,160	11,920	22,274
1948	4,395	9,150	7,525	15,050	27,511	98,728	32,207	29,498	43,645	31,304	15,351	16,134
1947	5,418	82,474	124,012	24,080	11,739	12,943	71,036	92,106	45,150	12,642	52,675	5,237
1946	48,762	15,953	10,956	51,772	84,280	32,508	21,070	116,788	40,936	29,197	7,826	5,418
1945	14,147	6,742	9,873	8,187	81,872	256,452	267,890	79,464	82,474	27,692	11,920	29,799
1944	8,127	6,983	7,405	9,993	26,488	135,450	63,210	67,424	50,568	11,859	14,267	7,946
1943	32,508	144,480	79,464	37,625	16,374	21,672	48,762	267,890	46,956	12,642	6,201	5,418
1942	103,544	76,337	38,528	21,973	42,140	26,608	115,584	63,210	51,772	14,207	10,354	10,595
1941	5,117	16,435	28,174	84,280	40,936	18,361	144,480	18,160	19,565	5,538	6,502	5,298
1940	5,117	5,599	5,057	5,298	6,201	6,441	38,227	22,274	13,665	9,211	6,923	15,471
1939	4,458	9,030	6,020	7,104	40,334	37,324	36,722	40,635	17,879	9,331	3,913	2,528
1938	7,465	6,983	22,274	26,789	162,540	82,474	75,250	71,036	46,655	10,956	7,525	6,261
1937												

Remarks:

Location: Illinois River @ Watts

Station Number: 1955

Area: 635 mi^2

Basin: Illinois

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	244	445	172	2,227	2,227	3,281	8,428	1,264	427	74	19	144
1964	7	14	22	24	55	644	1,294	2,288	289	81	379	1,535
1963	232	379	331	289	126	328	409	415	135	24	80	18
1962	1,655	4,635	4,575	2,378	1,686	3,552	5,358	2,571	795	445	464	141
1961	123	141	2,107	632	1,035	2,890	2,950	13,545	1,216	5,237	1,354	1,324
1960	3,672	4,876	1,716	2,679	1,505	3,010	2,950	10,234	1,643	4,154	668	119
1959	212	638	286	193	379	3,853	5,327	7,043	1,144	3,040	307	90
1958	268	3,522	740	590	2,890	6,321	3,160	6,742	1,884	8,127	2,920	445
1957	1	35	66	873	3,191	2,227	18,662	23,478	14,027	783	807	1,234
1956	117	34	29	29	578	271	1,186	4,033	2,679	196	13	2
1955	50	42	674	885	4,094	6,381	2,528	2,829	5,839	241	43	30
1954	26	32	72	172	144	208	379	6,502	67	10	2	2
1953	14	73	96	96	75	5,237	5,298	6,381	247	289	44	13
1952	93	1,174	921	993	1,854	4,756	5,659	3,492	644	85	85	16
1951	277	152	111	403	12,762	3,853	2,528	1,806	1,114	2,095	129	84
1950	403	208	825	7,405	6,321	2,528	3,552	19,264	1,053	2,167	1,806	710
1949	176	506	1,505	7,344	8,729	4,997	2,528	11,017	7,645	3,540	337	626
1948	31	223	135	632	1,764	8,127	2,197	1,987	3,251	2,119	13,364	722
1947	55	6,622	10,655	1,493	409	4,635	5,659	7,465	3,371	451	51	55
1946	3,732	831	343	3,913	6,622	2,227	1,156	9,752	2,950	1,926	148	55
1945	554	101	280	235	6,622	23,478	24,983	6,201	6,502	1,836	403	1,975
1944	172	102	129	298	1,686	7,344	4,936	5,237	3,853	403	572	187
1943	2,227	12,642	373	2,709	752	1,234	3,732	25,284	3,431	488	79	56
1942	8,729	9,211	2,709	1,234	3,040	1,716	9,632	5,117	3,853	590	313	325
1941	48	722	1,806	6,803	3,010	829	12,341	879	993	57	88	54
1940	50	60	63	51	83	88	2,709	1,264	512	235	107	680
1939	33	223	72	144	2,950	2,571	2,589	3,010	855	241	31	7
1938	134	108	1,264	1,764	16,374	6,502	6,020	5,599	3,401	343	166	80
1937												

Remarks: Derived data obtained by two step technique, or by going from Station 1970 (Barren Fork at Eldon) to 1969 With curve No.7-M Until Actual Data at Eldon terminated, The synthesized Eldon Data was used to complete records at Dutch Mills; Combined correlation is 0.929.

Observed Flow 1959 to 1966, Synthesized 1938 to 1959.

Location: Barren Fork @ Dutch Mills

Station Number: 1969

Area: 43 mi^2

Basin: Illinois

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	146	266	102	1,331	1,331	1,960	5,035	755	255	44	12	86
1964	4	8	13	14	33	385	773	1,367	173	49	227	917
1963	138	227	198	173	76	196	245	248	81	14	48	11
1962	989	2,769	2,733	1,421	1,007	2,122	3,201	1,536	475	266	277	85
1961	74	85	1,259	328	619	1,726	1,762	8,092	726	3,129	809	791
1960	2,194	2,913	1,025	1,600	899	1,798	1,762	6,114	982	2,481	399	71
1959	127	381	171	115	227	2,302	3,129	4,208	683	1,816	183	54
1958	160	2,104	442	352	1,726	1,726	8,092	726	1,126	4,855	1,744	266
1957	1	21	40	521	1,906	1,331	11,149	14,026	8,379	468	482	737
1956	70	20	18	17	345	162	708	2,410	1,600	117	8	1
1955	30	25	403	529	2,446	3,812	1,510	1,690	3,488	144	26	18
1954	16	19	43	102	86	124	227	3,884	40	6	1	1
1953	8	44	58	58	45	3,129	3,165	3,812	147	173	26	8
1952	55	701	550	593	1,108	2,841	3,381	2,086	385	51	51	10
1951	165	91	67	241	7,624	2,302	1,510	1,079	665	1,252	77	50
1950	241	124	493	4,424	3,776	1,510	2,122	11,508	629	1,295	1,079	424
1949	105	302	899	4,388	5,215	2,985	1,510	6,581	4,567	2,115	201	374
1948	18	133	81	378	1,054	4,855	1,313	1,187	1,942	1,266	7,984	432
1947	33	3,956	6,366	892	245	2,769	3,381	4,459	2,014	270	30	33
1946	2,230	496	205	2,338	3,956	1,331	690	5,826	1,762	1,151	88	33
1945	331	60	167	140	3,956	14,026	14,925	3,704	3,884	1,097	241	1,180
1944	102	61	77	178	1,007	4,388	2,949	3,129	2,302	241	342	111
1943	1,331	7,552	223	1,618	450	737	2,230	15,105	2,050	291	47	33
1942	5,215	5,502	1,618	737	1,816	1,025	5,754	3,057	2,302	352	187	194
1941	29	432	1,079	4,064	1,798	525	7,373	525	593	34	53	32
1940	30	36	38	31	50	53	1,618	755	306	140	64	406
1939	19	133	43	86	1,762	1,536	1,546	1,798	511	144	18	4
1938	80	65	755	1,043	9,782	3,884	3,596	3,345	2,032	205	99	48
1937												

Remarks:

Flows determined by ratio of areas with Barren Fork at Dutch Mills.

$$\frac{25.7}{43} = 0.5974$$

Location: Evansville Creek @ State Line

Station Number:

Area: 25.7 mi^2

Basin: Barren Fork

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	490	667	409	1,029	1,029	1,680	6,201	1,178	930	388	288	570
1964	121	189	229	220	267	632	1,209	1,023	636	217	527	955
1963	2,077	1,116	837	815	533	868	688	713	415	264	288	195
1962	1,240	2,558	3,162	1,829	1,370	2,000	3,627	1,612	955	651	3,550	1,101
1961	363	372	1,116	620	908	1,752	1,767	11,533	2,263	3,100	3,193	1,194
1960	3,410	3,689	1,023	1,587	1,091	2,325	1,938	7,038	1,271	3,472	853	347
1959	512	766	496	434	626	2,093	2,248	2,573	1,349	1,705	496	344
1958	477	2,108	766	744	1,860	4,495	2,279	3,875	1,209	3,069	2,248	682
1957	25	267	326	967	1,798	1,798	9,611	12,091	6,852	1,039	791	843
1956	335	198	192	186	574	347	353	2,077	1,085	357	118	20
1955	577	310	719	1,054	2,790	3,023	1,488	1,550	1,938	434	208	121
1954	180	217	264	288	242	335	344	2,480	239	68	35	13
1953	226	329	341	326	322	2,883	3,968	3,131	484	434	2,635	161
1952	682	2,713	1,721	1,587	2,077	3,565	3,472	1,690	682	350	543	2,806
1951	1,147	552	465	657	8,371	3,720	1,860	1,271	2,170	2,480	577	496
1950	874	512	831	4,929	3,674	2,015	2,480	16,742	1,674	2,635	2,263	1,411
1949	450	477	843	3,165	4,743	2,728	1,767	5,953	3,968	2,480	614	1,147
1948	226	471	388	775	1,417	5,084	1,659	1,519	2,248	1,612	791	831
1947	279	4,247	6,387	1,240	605	667	3,658	4,743	2,325	651	2,713	270
1946	2,511	822	564	2,666	4,340	1,674	1,085	6,015	2,108	1,504	403	279
1945	729	347	508	422	4,216	13,207	13,796	4,092	4,247	1,426	614	1,535
1944	419	360	381	515	1,364	6,976	3,255	3,472	2,604	611	735	409
1943	1,674	7,441	4,092	1,938	843	1,116	2,511	13,796	2,418	651	319	279
1942	5,333	3,674	1,984	1,132	2,170	1,370	5,953	3,255	2,666	732	533	546
1941	264	846	1,451	4,340	2,108	946	7,441	930	1,008	285	335	273
1940	264	288	260	273	319	332	1,969	1,147	704	474	357	797
1939	229	465	310	366	2,077	1,922	1,891	2,093	921	481	202	130
1938	384	360	1,147	1,380	8,371	4,247	3,875	3,658	2,403	564	388	322
1937												

Remarks: Flows determined by ratio of areas with the Illinois River at Watts, Oklahoma.

$$\frac{26.2}{635} = 0.0515$$

Location: Ballard Creek @ State Line

Station Number:

Area: 26.2 mi^2

Basin: Illinois

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	488	3,046	1,487	13,003	18,120	16,013	40,334	20,248	4,371	1,174	301	1,577
1964	23	7	97	112	1,469	12,160	29,679	27,451	1,800	265	2,625	1,637
1963	6,502	5,520	7,946	5,201	1,589	5,171	13,786	7,465	855	77	171	327
1962	8,187	32,207	33,471	21,672	11,257	17,879	20,950	6,321	1,914	674	1,427	1,252
1961	144	194	6,562	3,576	6,502	27,873	20,528	56,167	3,642	22,334	4,310	9,873
1960	17,338	17,338	19,806	22,695	15,351	17,485	14,809	83,979	6,321	7,104	1,451	199
1959	2,282	23,237	5,135	4,070	9,391	39,913	46,354	38,287	9,692	5,532	1,096	560
1958	1,589	28,354	6,983	6,803	14,388	49,364	22,515	43,224	13,364	58,394	17,819	5,719
1957	0	4	765	5,502	30,100	16,134	111,852	107,517	64,835	1,975	12,040	8,488
1956	117	57	109	101	5,532	2,697	14,147	15,411	7,766	544	23	0
1955	5,737	2,974	19,565	16,073	37,625	35,092	18,060	18,421	12,281	903	358	187
1954	11	36	538	4,696	3,576	3,209	2,896	18,180	581	38	0	0
1953	4	957	1,824	4,070	4,280	54,361	52,795	37,745	891	1,210	282	42
1952	3,847	24,863	11,318	10,896	13,063	34,735	46,655	15,231	2,811	228	626	25
1951	1,053	354	330	2,191	74,106	18,662	17,518	9,451	18,361	26,368	849	1,060
1950	7,706	3,058	7,188	52,615	38,227	19,866	25,224	201,851	16,495	26,608	22,635	13,726
1949	1,710	2,233	7,338	30,582	51,351	28,776	17,277	65,437	42,200	25,103	4,437	10,836
1948	76	2,053	1,102	6,562	13,485	40,033	16,073	14,809	22,936	15,772	89,277	7,344
1947	199	45,752	70,314	11,920	4,371	5,075	38,829	51,351	23,538	4,985	187	202
1946	27,271	8,127	3,732	27,511	45,872	16,796	10,114	66,039	21,130	13,605	1,041	205
1945	5,827	542	2,908	2,233	45,270	152,908	162,058	42,802	45,571	13,786	4,437	14,809
1944	1,312	566	915	3,058	13,003	73,685	33,652	36,421	26,909	4,340	6,020	1,529
1943	16,254	84,220	3,973	19,264	7,525	10,475	26,307	164,828	23,538	5,261	382	208
1942	58,635	62,608	19,264	10,535	21,732	12,702	107,036	35,157	26,608	6,261	3,425	3,486
1941	163	7,344	13,605	46,775	21,130	8,548	82,594	8,428	5,331	214	453	202
1940	171	236	260	180	397	450	19,264	10,836	5,472	2,264	614	6,863
1939	96	2,065	330	981	20,769	18,662	18,963	21,552	8,247	2,354	76	0
1938	903	596	10,836	14,087	110,106	45,872	41,297	37,926	23,839	3,732	1,252	379
1937												

Remarks: Data Synthesized by Ratio of Areas Method With Lee Creek at Van Buren.

Location: Lee Creek @ State Line

Station Number:

Area: 217 mi^2

Basin: Lee Creek

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	76	474	231	2,023	2,820	2,492	6,276	3,166	680	183	47	245
1964	4	1	15	17	229	1,892	4,618	4,271	280	41	408	255
1963	1,012	859	1,236	809	247	805	2,145	1,162	133	12	27	51
1962	1,274	5,011	5,208	3,372	1,752	2,782	3,260	984	298	105	222	195
1961	22	30	1,021	556	1,012	4,337	3,194	8,740	567	3,475	671	1,536
1960	2,698	2,698	3,082	3,531	2,389	2,716	2,304	13,067	984	1,105	226	31
1959	355	3,616	799	633	1,461	6,210	7,213	5,957	1,508	861	170	87
1958	247	4,412	1,087	1,058	2,239	7,681	3,503	6,726	2,080	9,086	2,773	890
1957	0	1	119	856	4,684	2,510	17,404	16,730	10,088	307	1,873	1,321
1956	18	9	17	16	861	420	2,201	2,398	1,208	85	4	0
1955	893	463	3,044	2,501	5,854	5,461	2,810	2,866	1,911	141	56	29
1954	2	6	84	731	556	499	451	2,829	90	6	0	0
1953	1	149	284	633	666	8,459	8,215	5,873	139	188	44	6
1952	599	3,869	1,761	1,695	2,033	5,405	7,260	2,370	437	35	97	14
1951	164	55	51	341	11,531	2,904	2,726	1,471	2,857	4,103	132	165
1950	1,199	476	1,118	8,187	5,948	3,091	3,925	31,408	2,567	4,140	3,522	2,136
1949	266	348	1,142	4,758	7,990	4,477	2,688	10,182	6,566	3,906	690	1,686
1948	12	319	171	1,021	2,098	6,229	2,501	2,304	3,569	2,454	13,891	1,143
1947	31	7,119	10,941	1,855	680	790	6,042	7,990	3,663	776	29	31
1946	4,243	1,265	581	4,281	7,138	2,613	1,574	10,276	3,288	2,117	162	32
1945	907	84	452	348	7,044	23,792	25,216	6,660	7,091	2,145	690	2,304
1944	204	88	142	476	2,023	11,465	5,236	5,667	4,187	675	937	238
1943	2,529	13,105	618	2,997	1,171	1,630	4,093	25,647	3,663	819	59	32
1942	9,124	9,742	2,997	1,639	3,382	1,976	16,655	5,470	4,140	974	533	542
1941	25	1,143	2,117	7,278	3,288	1,330	12,852	1,311	1,452	33	70	31
1940	27	37	40	28	62	70	2,997	1,686	851	352	96	1,068
1939	15	321	51	153	3,232	2,904	2,951	3,353	1,283	366	12	0
1938	141	93	1,686	2,192	17,132	7,138	6,426	5,901	3,709	581	195	59
1937												

Remarks: Flows determined by ratio of areas with Lee Creek at the State Line.

$$\frac{33.8}{217} = 0.1556$$

Location: Weber Creek @ State Line

Station Number:

Area: 33.8 mi^2

Basin: Lee Creek

Water Year	ACTUAL AND SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. Per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	1,210	19,720	6,640	15,400	51,000	36,600	8,980	22,850	14,750	1,896	371	19,820
1964	0	0	0.22	9.14	853	25,200	10,680	14,400	119	0.23	1,520	8,840
1963	9,130	8,460	4,730	3,150	866	23,200	3,975	3,820	795	107	5.3	11
1962	1,330	25,850	28,900	33,200	23,800	22,800	12,810.	1,410	2,510	3,155	750	4,480
1961	176	593	28,900	11,280	21,250	35,700	15,700	32,850	6,980	33,600	3,410	2,080
1960	10,580	3,820	42,200	31,000	16,980	22,900	3,395	112,800	135	4,210	328	42.7
1959	1,840	13,100	3,870	5,270	6,670	30,000	23,200	1,675	612	905	462	144
1958	973	28,500	8,760	20,250	9,620	54,800	35,900	7,030	23,300	10,900	1,980	682
1957	0	344	8,070	23,150	25,200	33,000	120,000	80,900	29,900	191	21,600	13,860
1956	0	0	0	0	27,700	5,750	1,870	2,830	83.7	32	0	0
1955	5,040	846	16,900	9,140	23,850	56,100	12,150	1,925	484	81.5	24.4	1.5
1954	6.1	146	276	19,500	11,820	1,370	7,240	34,500	249	71.5	0	0
1953	0	33,900	19,480	20,500	11,490	65,200	74,250	50,400	307	311	57	0.22
1952	5,280	25,900	16,300	27,200	7,490	38,600	88,800	6,550	507	88.4	6.8	0
1951	1,840	398	292	2,690	50,600	12,110	13,100	5,470	18,550	9,590	658	853
1950	3,320	656	6,410	99,300	84,200	6.640	12,220	58,400	8,840	24,090	21,300	22,200
1949	425	1,855	6,770	125,800	50,400	29,250	11,330	20,000	15,830	468	16.7	557
1948	93	1,445	31,850	37,500	46,750	30,100	23,800	12,560	1,333	2,180	4,150	174
1947	72	51,000	75,800	6,240	1,658	9,220	26,300	21,400	766	53.4	552	3,240
1946	12,320	2,980	2,270	45,250	40,600	13,570	29,450	82,400	8,250	1,128	98.2	7.4
1945	137	2,900	19,800	8,000	104,000	168,500	22,000	74,700	64,700	4,260	837	12,700
1944	495	1,045	4,460	14,920	54,200	40,900	25,600	35,500	15,460	293	1,380	526
1943	686	5,530	12,950	3,025	1,150	16,460	10,680	88,800	5,980	204	0.46	0
1942	43,200	22,300	21,000	24,300	15,500	26,350	36,600	26,700	8,100	534	958	1,290
1941	30.4	8,620	15,550	17,900	24,200	12,200	16,350	10,050	11,560	525	758	3,270
1940	784	101	473	447	3,370	1,420	21,400	5,400	1,148	405	8,900	1,017
1939	1,500	3,290	2,130	2,825	86,100	18,960	85,700	11,650	3,460	268	84.4	20.8
1938	1,990	9,490	14,055	22,068	31,005	31,065	27,950	30,535	9,400	3,705	2,615	3,500
1937												

Remarks: Flows were computed by the Ratio of areas method from completed records of Poteau at Cauthorn.

Location: Poteau River @ State Line

Station Number:

Area: 250 mi^2

Basin: Poteau

Water Year	SYNTHESIZED DATA FROM 1938 to 1966 (Acre-Ft. per Month)											
	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
1966												
1965	1,100	12,700	3,240	10,000	23,200	19,700	7,750	22,700	4,130	429	117	566
1964	0	0	494	33	1,310	12,250	7,680	9,830	259	110	1,520	4,400
1963	7,280	9,200	4,380	2,980	917	5,060	2,890	2,510	705	173	66	0
1962	3,560	23,300	22,600	21,100	14,350	15,700	8,940	1,430	950	1,100	696	3,810
1961	1,520	505	6,970	3,410	6,750	21,500	13,700	30,800	6,660	28,000	2,350	1,990
1960	8,840	16,600	19,420	15,000	11,700	13,850	2,620	54,2000	1,320	6,500	594	293
1959	395	2,670	1,990	3,440	2,650	20,300	11,000	4,330	2,250	2,380	635	1,310
1958	9,880	18,150	6,500	13,520	6,930	31,900	19,600	43,500	17,100	5,520	1,030	1,130
1957	0	428	6,120	15,300	16,200	20,700	64,300	45,000	19,200	273	29,600	9,880
1956	0	0	0	0	17,600	4,480	1,660	2,410	168	66	0	0
1955	3,970	870	11,600	6,830	15,600	33,200	8,620	1,130	567	140	53	7
1954	19.5	220	364	13,000	8,230	1,280	5,240	21,900	334	123	0	0
1953	0	21,400	13,350	13,650	8,120	37,700	44,000	30,000	390	397	104	7
1952	4,160	17,000	11,200	16,800	5,640	24,100	57,300	4,950	592	150	19	0
1951	1,650	485	384	2,280	30,000	8,540	9,250	4,300	12,600	7,030	715	897
1950	2,800	718	4,950	54,000	45,800	5,080	8,700	33,900	6,620	15,600	14,200	15,300
1949	514	1,650	5,130	66,400	30,000	18,580	8,060	13,600	10,900	560	39	650
1948	156	1,330	20,200	23,100	28,200	19,550	15,400	8,940	1,250	1,920	3,380	260
1947	120	30,200	43,600	35,800	1,500	6,850	16,750	14,400	805	98	553	2,800
1946	8,800	2,520	2,020	27,300	24,700	9,450	18,900	46,300	6,170	1,100	163	7
1945	34	2,450	13,350	6,050	55,700	86,000	14,500	43,000	37,100	3,450	872	9,100
1944	578	1,030	3,580	10,300	31,800	25,400	17,000	22,500	10,700	384	1,290	612
1943	748	4,340	9,100	2,540	1,090	11,420	7,680	48,900	4,650	286	7	0
1942	26,400	14,800	14,000	15,950	10,600	17,300	23,000	17,300	6,040	620	964	1,250
1941	64	6,430	10,700	12,030	15,600	8,800	11,200	7,300	6,480	605	800	2,800
1940	820	164	560	533	2,760	1,340	14,200	4,300	1,120	495	5,580	1,030
1939	1,395	2,740	1,870	2,400	47,000	12,850	47,200	8,350	2,830	358	1,430	46
1938	2,340	2,090	6,500	7,670	38,200	20,900	18,600	17,950	11,950	3,450	2,540	1,950
1937												

Remarks: Flows were computed by the ratio-of-areas method from completer records of James Fork at Hackett.

Location: James Fork @ State Line

Station Number:

Area: 157 mi^2

Basin: Poteau

APPENDIX B

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.74	4.77	3.94	1.30	9.47	3.03	.25	2.61	6.09	.46	1.34	.75
1964	1.23	2.32	5.23	3.37	4.53	.51	1.72	7.23	7.61	.00	5.60	1.20
1963	.34	.30	2.38	3.36	3.04	1.89	1.88	.24	2.22	.27	1.19	3.20
1962	4.47	2.86	3.79	1.93	1.04	3.36	4.53	5.59	4.90	6.25	2.84	.80
1961	0.16	2.28	5.72	1.68	8.99	2.38	12.73	2.25	5.22	2.14	5.86	3.62
1960	2.28	1.52	2.19	1.94	7.67	1.95	5.14	1.21	1.41	1.27	1.12	6.28
1959	.24	1.44	3.79	2.84	2.15	5.10	5.16	2.48	1.90	7.28	3.70	4.82
1958	1.48	1.36	4.66	4.22	8.81	10.00	4.50	2.94	3.58	2.69	2.73	1.45
1957	3.82	3.74	5.28	11.54	9.37	6.21	2.62	14.19	6.13	1.02	5.89	1.54
1956	1.96	5.91	1.56	2.31	2.69	1.79	3.00	2.27	.56	1.48	3.92	2.59
1955	1.80	3.00	7.61	2.99	2.39	2.50	1.32	3.95	2.75	.53	1.45	.43
1954	4.72	1.31	.98	5.06	3.01	.86	.54	3.00	1.53	5.61	.73	4.98
1953	3.04	1.71	9.46	9.35	4.62	.23	4.00	3.05	.55	1.09	2.17	1.58
1952	1.05	.87	5.90	7.16	4.37	.69	3.34	2.92	1.57	1.34	7.32	1.46
1951	2.63	7.67	1.17	3.29	1.72	6.53	4.08	3.39	5.19	4.97	2.51	
1950	6.72	4.93	1.22	3.08	6.74	2.38	8.57	3.17	5.73	1.48	.73	.10
1949	10.91	4.00	3.71	2.24	3.99	6.29	.00	1.33	4.18	4.58	.12	1.72
1948	5.34	4.69	3.33	4.15	5.20	2.21	5.02	4.90	.90	2.29	1.80	2.53
1947	.37	.14	2.31	6.22	4.68	2.22	.23	1.29	5.21	2.18	3.10	3.05
1946	4.71	3.55	3.05	12.14	7.04	1.30	1.42	1.38	1.46	1.21	11.04	5.30
1945	1.24	9.59	12.34	6.42	7.50	10.53	3.93	1.95	9.05	2.50	1.31	.78
1944		4.97				2.77	3.12	7.91	.66	1.61	3.07	4.35
1943	.14	1.11	3.69	3.05	14.09	3.43	.03	.29	2.10	5.61	.49	
1942	2.56	2.80	1.68	5.42	5.64	5.29	1.47	2.48	2.17	2.50	4.20	4.05
1941							1.17	4.94	5.57	6.37	1.26	1.86
1940												
1939												
1938												
1937												

Remarks:

Location: Abbott, Arkansas

Station Number: 0006

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.04	2.47	2.14	5.24	3.79	7.10	1.72	6.43	3.05	1.12	0.87	3.81
1964	0.80	1.85	2.73	3.33	3.49	5.29	0.50	9.60	4.01	0.31	3.69	0.90
1963	0.67	0.48	1.77	1.66	3.79	2.40	2.80	4.11	1.22	0.04	1.63	0.99
1962	2.14	1.65	1.67	4.54	5.70	6.20	3.32	5.82	8.06	6.85	0.89	1.36
1961	0.66	2.59	3.62	2.07	14.25	4.34	7.37	6.32	5.57	2.72	3.85	3.43
1960	1.23	1.77	1.77	3.23	8.14	1.96	13.97	1.29	1.95	2.03	2.11	3.36
1959	0.69	1.80	3.22	3.68	4.19	3.28	6.62	2.25	3.47	4.54	2.88	2.28
1958	1.10	2.30	4.45	2.81	3.97	6.19	12.32	2.63	4.34	0.89	4.21	0.58
1957	3.70	3.28	3.05	11.24	11.64	6.68	1.94	5.26	6.25	2.32	5.84	1.31
1956	1.21	4.29	1.89	4.15	6.75	5.43	3.90	2.28	0.61	1.91	3.78	2.51
1955	1.13	4.49	4.05	2.85	6.51	6.25	2.11	3.55	4.14	0.70	1.43	0.54
1954	2.69	0.85	2.47	4.10	3.75	2.73	0.50	1.76	4.23	6.33	0.50	5.42
1953	1.74	1.08	7.04	7.11	5.02	0.10	2.54	3.34	1.23	2.68	1.54	2.21
1952	2.35	2.16	3.39	4.62	4.74	0.56	2.85	7.48	0.29	0.54	4.57	1.28
1951	2.39	7.75	2.03	2.96	2.55	10.95	1.69	1.93	4.51	6.59	3.99	0.79
1950	5.66	3.06	1.56	4.49	14.17	4.24	7.51	4.93	3.02	1.17	0.46	0.45
1949	5.48	3.54	2.59	1.77	9.23	4.82	4.25	1.02	6.68	3.68	0.57	3.40
1948	1.33	3.47	5.49	1.62	5.13	8.27	4.54	10.36	0.32	1.45	2.47	3.83
1947	1.06	0.23	1.55	6.98	7.08	6.51	2.18	0.90	4.18	3.92	2.35	3.07
1946	2.91	3.70	2.31	3.68	10.22	5.31	3.28	0.70	1.51	1.96	12.19	4.85
1945	0.97	8.67	9.83	11.39	4.55	6.66	6.17	2.43	9.56	2.73	1.30	0.46
1944	1.30	4.23	5.95	5.25	5.49	7.25	2.21	6.37	1.99	3.63	1.58	2.72
1943	0.12	0.82	3.45	2.92	15.01	4.86	0.34	0.91	3.81	4.74	0.65	3.11
1942	2.15	2.43	1.38	7.11	5.99	6.80	2.10	6.97	4.40	6.52	5.56	5.47
1941	5.46	2.57	0.47	8.57	0.75	3.64	2.19	4.17	3.80	13.04	2.82	2.46
1940	0.79	1.57	1.80	6.57	1.55	6.01	0.90	5.71	7.76	1.83	3.24	2.75
1939	3.51	4.75	1.52	4.47	6.23	5.27	0.83	0.89	0.87	3.60	3.30	1.17
1938	3.33	6.51	5.64	4.46	8.44	6.37	1.80	2.44	0.87	2.20	5.03	1.23
1937	6.76	0.94	2.49	3.76	3.17	2.66	4.51	5.75	3.77	1.30	3.06	4.26

Remarks:

Location: Fayetteville Exp. Sta.,Ark.

Station Number: 2444

Area:

Basin: Illinois River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	3.24	3.53	2.85	4.42	7.48	5.46	0.92	2.23	4.85	0.72	2.55	3.75
1964	0.73	2.95	6.11	6.75	5.53	1.44	1.27	8.12	2.71	0.32	3.87	1.67
1963	0.88	0.21	2.19	4.19	2.66	1.23	4.77	1.06	2.47	0.15	1.90	1.84
1962	3.64	1.84	2.93	2.80	1.64	2.40	6.39	5.33	8.69	6.59	1.78	1.49
1961	1.07	2.73	5.42	1.71	9.49	2.64	7.69	4.63	5.13	3.86	5.86	3.02
1960	2.39	2.40	1.50	4.14	10.76	2.48	6.31	1.33	2.97	1.79	2.32	5.53
1959	0.45	1.92	5.43	4.92	6.72	4.91	7.77	4.27	3.55	6.56	2.74	4.39
1958	0.92	2.13	5.81	3.26	6.76	7.05	13.58	3.23	3.92	1.29	4.64	0.92
1957	3.67	3.86	2.93	11.69	15.45	7.16	2.14	10.77	6.73	2.02	6.59	1.86
1956	1.40	5.01	2.08	4.06	5.92	3.99	2.54	1.10	0.43	2.93	4.45	1.48
1955	1.65	5.06	3.85	3.17	6.59	2.08	3.60	7.16	3.80	1.06	1.03	0.68
1954	3.47	1.02	2.47	4.33	5.45	2.05	0.88	0.93	3.54	8.81	0.54	6.54
1953	1.92	1.33	8.62	8.09	4.66	0.34	6.48	1.94	1.09	1.79	2.44	3.39
1952	2.25	1.46	5.20	7.22	4.76	0.69	1.30	3.60	1.49	0.91	6.58	1.99
1951	2.84	8.83	1.82	5.19	2.71	6.03	5.42	2.69	5.50	7.24	6.22	1.66
1950	6.65	4.25	2.07	3.73	7.05	2.55	10.85	5.28	4.45	0.93	0.87	0.41
1949	9.38	5.73	2.56	2.89	8.63	11.06	3.63	1.53	4.80	5.27	0.70	3.77
1948	1.16	4.10	5.09	2.46	5.02	5.44	4.09	5.32	0.43	2.06	2.41	3.87
1947	0.66	0.01	2.46	6.75	7.05	9.24	0.83	0.17	6.66	2.21	3.33	6.13
1946	5.27	5.37	4.05	7.06	8.92	3.64	3.63	1.85	1.58	4.01	13.94	6.42
1945	0.98	9.50	12.61	8.68	6.49	13.58	2.77	2.13	14.24	2.64	2.49	0.55
1944	1.45	4.33	3.89	6.51	7.09	7.38	3.20	6.60	0.90	2.72	4.26	3.36
1943	0.15	1.04	2.65	2.55	11.01	6.13	0.16	0.22	5.11	5.65	0.10	2.87
1942	1.52	2.13	1.46	7.63	5.10	3.42	3.17	2.87	3.73	5.26	5.18	6.31
1941	2.47	2.94	0.64	4.67	0.82	4.35	3.74	4.78	4.26	11.01	1.45	3.14
1940	0.72	1.46	1.12	7.72	1.46	3.00	0.90	6.43	2.46	2.48	4.47	4.69
1939	2.22	5.42	2.25	4.11	2.99	2.30	3.78	2.14	2.70	3.80	2.55	2.49
1938	2.69	7.18	0.83	3.20	3.73	3.41	5.91	4.13	1.11	0.63	4.60	1.00
1937	3.17	9.50	4.71	4.24	3.41	3.64	4.45	3.75	5.96	2.20	3.68	4.69

Remarks: Actual Data From September, 1938 through 1965, Synthesized Data from 1937 through August, 1938.

Location: Fort Smith Water Plant

Station Number: 2578

Area:

Basin: Lee Creek

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	1.57	2.06	1.86	8.91	3.97	6.06	2.15	4.95	5.07	0.42	1.20	4.14
1964	0.69	1.83	3.78	5.34	1.87	7.83	0.39	8.30	2.90	1.95	4.01	0.97
1963	0.79	0.29	4.82	1.86	2.50	2.53	2.78	2.44	1.13	0.17	1.65	1.32
1962	1.78	1.92	1.95	3.49	4.16	5.76	2.90	3.37	9.66	5.39	1.38	1.63
1961	0.25	3.22	3.57	1.63	14.02	5.09	8.53	5.60	7.00	2.58	2.83	2.19
1960	1.51	2.18	1.75	4.43	7.88	2.60	7.08	1.40	0.05	3.00	2.53	3.66
1959	0.99	1.87	2.83	3.64	5.76	3.26	5.50	0.94	7.02	5.23	3.15	2.12
1958	1.11	1.85	5.78	3.71	5.69	6.08	9.81	1.72	5.57	0.85	5.38	0.94
1957	3.27	2.98	3.99	7.07	12.65	11.99	1.80	1.44	3.97	1.24	3.48	2.28
1956	1.45	2.49	0.97	3.81	11.63	4.81	3.85	1.19	0.85	1.82	3.99	3.93
1955	0.91	4.24	3.26	2.73	5.91	4.02	2.34	3.67	3.30	2.50	0.36	0.42
1954	1.47	0.83	2.14	5.00	4.70	1.54	0.55	3.72	3.05	4.44	0.42	5.10
1953	1.44	1.03	7.50	5.37	3.08	0.70	3.09	2.50	1.23	2.63	1.24	1.76
1952	1.83	2.77	3.30	3.78	3.35	0.98	2.76	9.13	0.01	0.38	3.88	1.46
1951	2.93	7.72	3.61	3.60	2.63	10.58	3.26	1.15	4.71	6.12	4.62	0.83
1950	5.07	2.66	2.05	3.64	12.16	3.18	10.09	4.25	6.50	3.22	0.22	0.45
1949	4.18	2.75	2.71	2.49	8.83	5.36	5.00	0.61	7.10	2.93	0.08	2.86
1948	0.81	3.04	6.13	1.80	4.45	9.72	5.27	6.64	0.88	2.07	3.79	3.35
1947	1.04	0.26	2.03	6.01	6.06	6.87	0.96	1.82	5.24	1.09	2.73	2.47
1946	4.08	4.34	1.96	3.81	7.64	2.19	0.14	1.29	2.54	1.32	8.51	7.06
1945	0.65	6.06	10.37	9.89	5.61	6.32	3.57	2.47	10.96	2.52	0.64	0.54
1944	0.79	5.60	4.17	6.19	4.83	4.59	1.36	4.36	3.11	2.58	2.03	2.36
1943	0.01	0.82	2.21	4.11	16.48	5.10	0.38	1.92	4.54	4.96	0.60	3.05
1942	1.54	3.72	1.39	7.66	3.28	9.63	0.78	4.18	5.15	5.47	5.77	3.67
1941	4.05	2.31	1.44	10.49	1.33	6.06	1.00	3.58	5.46	15.18	2.64	1.94
1940	2.85	1.95	1.18	7.53	4.04	4.10	1.27	8.42	3.44	2.52	4.78	2.69
1939	2.91	4.22	2.65	4.87	9.42	8.40	0.34	4.79	0.68	3.25	2.76	2.21
1938	3.24	9.87	5.55	2.25	6.19	4.87	1.08	2.76	2.06	1.04	4.24	1.20
1937	7.00	2.12	3.07	3.30	3.54	5.43	7.95	2.51	11.32	2.36	1.54	2.51

Remarks:

Location: Gravette, Arkansas

Station Number: 2930

Area:

Basin: Spavinaw Creek

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.49	4.19	3.04	1.68	6.83	4.04	1.34	2.55	4.34	.52	1.12	1.23
1964	1.22	3.50	5.90	5.55	7.05	.67	2.09	7.62	3.80	.00	4.95	1.76
1963	.62	.28	1.83	3.06	2.51	2.44	5.95	.68	1.38	.24	2.72	2.39
1962	3.16	2.76	3.47	3.41	1.47	2.91	6.14	.60	4.20	9.72	3.86	1.27
1961	1.37	3.28	4.13	1.24	6.73	3.14	9.71	5.28	4.73	2.72	6.94	3.48
1960	2.17	2.54	1.90	1.52	10.39	1.93	4.44	.94	.86	3.50	.45	4.67
1959	.54	2.02	5.62	3.66	3.67	4.44	7.07	3.35	3.42	4.74	5.20	5.09
1958	1.42	1.97	4.84	4.41	5.46	8.64	4.68	3.03	5.33	1.29	4.44	1.27
1957	3.37	4.14	3.95	13.45	10.17	4.72	1.30	5.63	5.27	.60	7.55	1.61
1956	1.49	7.75	1.85	2.74	3.05	3.07	2.86	.84	1.00	2.55	4.17	2.12
1955	1.30	3.48	6.35	2.58	4.06	1.40	1.01	4.81	5.69	.36	1.26	.65
1954	5.45	.90	1.17	5.57	4.29	.55	1.12	2.38	1.22	4.54	.75	5.18
1953	3.06	2.51	8.27	10.05	5.13	.33	5.12	2.45	.47	1.00	2.50	2.96
1952	1.55	2.64	6.52	7.65	4.31	1.29	.69	3.49	1.55	1.28	6.76	1.72
1951	2.52	5.87	1.49	3.33	1.90	7.08	6.45	3.38	6.29	8.20	4.78	1.73
1950	8.18	3.31	1.56	4.11	5.19	3.38	13.32	2.69	8.12	1.75	.55	.25
1949	10.73	4.57	3.13	2.22	4.53	5.52	3.08	1.60	4.60	4.36	.55	2.49
1948	.77			5.21	6.40	3.06	6.68	3.23	.67	2.11	1.75	2.87
1947	2.00	.67	1.87	7.40	10.37	1.92	.23	1.22	6.03	4.73	4.47	7.94
1946	4.59	3.96	4.54	11.59	11.94	2.86	.97	.31	3.16	4.11	12.74	7.48
1945	1.31	9.77	11.78	4.49	7.65	9.77	5.30	4.52	10.46	2.40		.98
1944	2.02	5.33	4.58	3.90	5.16	5.48	3.35	8.04	1.05	.66	4.18	4.05
1943	.16	1.25	2.35	4.60	12.99	2.02	5.53	.56	3.16	4.82	.30	2.61
1942	2.74	2.29	1.95	5.94	3.89	7.76	2.22	5.48	4.46	3.03	3.52	4.43
1941	4.08	3.73	.84	4.06	1.74	5.56		2.58	4.27	8.23	1.70	3.05
1940	8.06	2.02	1.41	6.56	3.41	2.24	1.71	5.66	.90	2.62	4.96	3.24
1939										3.89	2.90	1.93
1938												
1937												

Remarks:

Location: Greenwood, Arkansas

Station Number: 2976

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.49	4.24	6.05	1.83	7.01	2.88	3.09	2.22	6.34	0.53	1.19	0.99
1964	0.88	2.84	4.67	3.38	4.50	0.51	3.15	6.09	8.89	0.09	6.71	1.76
1963	0.65	0.33	2.58	3.60	3.50	2.58	2.77	0.43	0.69	0.12	1.81	2.82
1962	3.56	3,01	3.77	3.13	1.55	4.31	4.82	2.44	5.01	7.69	3.09	1.91
1961	1.27	4.03	4.86	1.67	8.80	3.55	8.57	3.38	5.66	2.44	6.12	3.30
1960	2.70	3.15	2.13	2.59	13.78	4.60	5.11	5.62	1.27	2.70	0.86	5.11
1959	1.56	0.83	4.44	3.10	3.48	2.76	6.09	2.92	3.55	5.55	3.25	4.28
1958	2.13	2.06	4.61	4.92	6.51	9.47	5.03	6.68	5.09	1.90	4.30	1.58
1957	3.81	3.52	5.01	12.46	11.77	6.43	1.65	9.20	7.87	0.96	5.62	1.78
1956	1.64	6.68	2.07	2.75	4.88	1.13	1.68	1.66	1.10	0.84	4.49	2.98
1955	2.03	2.63	7.28	3.08	2.51	2.91	3.08	4.57	3.49	0.79	1.88	1.43
1954	6.32	0.44	0.80	5.64	4.32	1.11	0.32	2.81	1.64	6.08	0.74	4.57
1953	2.00	2.48	6.32	9.18	5.19	0.32	10.16	0.59	1.97	1.30	2.63	2.98
1952	0.90	2.64	5.14	7.36	3.88	2.28	2.31	2.27	3.78	1.12	7.64	1.72
1951	3.24	6.85	1.87	3.16	1.67	9.14	4.73	4.15	7.00	4.25	9.20	1.97
1950	7.49	3.73	1.10	2.45	4.46	1.99	10.00	3.10	4.80	1.01	1.10	0.35
1949	11.39	4.20	2.57	3.15	5.04	7.64	0.88	1.54	2.77	4.36	0.53	2.49
1948	0.50	4.22	3.28	6.18	8.18	1.83	7.54	5.20	0.03	3.90	0.94	3.97
1947												
1946												
1945												
1944												
1943												
1942												
1941												
1940												
1939												
1938												
1937												

Remarks:

Location: Heavener, Oklahoma

Station Number: 4010

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	3.06	4.60	3.16	1.47	8.07	8.36	3.09	2.29	6.51	1.58	1.33	1.74
1964	.55	3.14	7.45	5.67	2.26	1.06	2.22	6.54	6.17	.08	5.93	2.07
1963	.99	.64	5.06	4.37	2.36	3.39	3.77	2.43	2.57	.04	1.88	2.49
1962	4.02	4.44	4.10	3.14	1.94	2.62	3.85	2.31	8.30	7.24	2.40	1.45
1961	1.66	4.45	7.87	1.78	4.40	5.08	7.43	3.96	5.84	3.84	5.99	4.52
1960	3.99	3.78	2.15	3.10	14.47	6.92	7.14	3.03	1.39	3.44	2.82	9.95
1959	1.25	2.68	6.75	3.60	2.54	3.29	5.13	3.23	1.91	6.39	1.62	5.66
1958	2.48	1.88	5.90	6.74	7.47	7.81	3.47	2.95	4.65	4.63	9.75	.98
1957	6.60	3.15	6.72	13.58	8.83	7.64	1.71	3.57	5.79	1.69	4.45	2.25
1956	3.37	6.90	2.73	4.06	2.25	1.39	6.46	4.13	.69	1.71	4.91	3.49
1955	1.36	4.20	4.51	5.42	4.52	1.79	3.93	4.78	3.38	3.01	1.64	.94
1954	6.43	2.99	1.95	6.00	5.26	.15	1.01	1.75	5.31	9.10	.71	3.35
1953	4.77	1.65	6.05	8.75	6.84	.28	14.84	1.09	1.57	1.52	3.29	2.84
1952	2.99	3.68	5.68	13.97	4.32	1.05	2.55	1.79	2.85	.72	9.60	3.77
1951	2.67	6.16	4.83	4.62	1.97	8.81	1.19	6.85	4.61	5.45	2.98	58.32
1950	10.78	9.22	3.42	3.62	9.25	3.76	11.02	4.20	8.13	2.55	1.47	.04
1949	14.45	4.89	5.95	5.27	7.17	8.51	2.78	3.23	4.07	6.61	.62	5.33
1948	7.69	6.21	3.48	2.66	9.53	1.90	6.02	7.15	1.70	5.62	2.82	3.87
1947	1.64	.46	2.42	5.94	8.74	2.52	.21	7.19	5.96	2.99	3.75	5.16
1946	7.03	6.61	5.18	6.92	16.19	1.69	3.34	3.90	1.82	1.19	11.44	5.94
1945	1.24	10.26	18.01	3.61	6.65	11.47	2.63	4.92	12.29	5.50	2.17	1.62
1944	3.46	8.40	7.05	6.37	8.58	6.88	1.86	7.60	.40	.73	4.34	7.82
1943	.25	.64	3.90	3.66	5.81	4.66	.85	.56	3.30	6.51	1.41	5.58
1942	3.99	2.33	3.25	8.09	5.10	7.04	3.33	5.95	8.49	2.68	3.74	3.74
1941	4.00	4.64	1.75	7.13	2.97	6.64	5.68	5.82	6.01	11.47	2.20	3.41
1940	1.33	2.59	1.47	6.80	7.79	7.78	7.00	6.42	1.16	1.55	6.21	3.30
1939	3.08	7.58	3.15	8.93	4.75	2.70	2.32	4.97	2.42	2.72	3.04	2.39
1938	10.05	7.34	5.71	4.97	5.92	2.76	2.13	3.76	.75	.27	4.68	3.74
1937												

Remarks:

Location: Mena, Arkansas

Station Number: 4756

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	4.24	3.27	2.04	5.88	4.55	4.50	6,57	3.24	5.06	0.65	0.91	3.82
1964	0.75	2.68	4.35	3.38	5.49	5.50	0.35	9.57	4.32	0.39	4.25	1.34
1963	0.90	0.28	1.68	4.27	3.89	1.15	3.75	4.61	3.40	0.04	2.09	1.45
1962	2.62	1.37	2.57	2.92	1.88	5.12	7.51	3.00	3.15	5.64	2.05	1.78
1961	1.10	1.79	5.24	1.47	8.06	1.33	8.37	5.24	7.37	3.08	4.83	3.44
1960	1.73	2.18	1.69	4.23	10.09	2.10	9.66	3.47	1.53	3.05	2.01	5.82
1959	0.42	1.46	4.94	5.33	7.30	2.89	7.38	2.05	3.31	7.19	4.41	3.33
1958	0.96	2.65	5.26	2.69	6.05	7.41	10.02	5.69	2.69	1.34	4.68	0.80
1957	3.81	4.91	3.50	12.56	15.27	7.22	2.26	9.41	8.20	2.60	7.08	1.74
1956	4.97	3.95	2.99	4.94	6.12	4.93	2.02	0.71	0.77	1.92	3.83	2.32
1955	1.75	4.85	4.22	3.70	6.21	8.25	1.29	4.20	3.50	0.88	0.63	0.70
1954	4.85	1.11	1.53	2.34	5.77	1.18	2.41	1.80	5.17	8.37	0.50	5.89
1953	1.58	0.97	8.29	6.40	4.46	0.46	7.88	1.68	1.58	3.22	2.28	2.98
1952	1.76	2.51	3.22	4.34	5.88	1.45	4.64	5.36	0.81	0.59	5.33	1.67
1951	2.77	8.64	2.09	3.76	2.29	8.53	5.94	1.72	3.65	5.01	4.92	0.96
1950	7.55	4.02	1.41	3.96	9.83	1.61	10.32	3.46	3.35	1.56	1.65	0.41
1949	7.48	5.38	3.65	2.81	10.35	7.52	4.64	2.68	5.24	4.99	4.42	4.88
1948	3.09	4.66	6.01	2.23	5.94	8.34	2.65	9.46	1.14	1.89	3.32	5.00
1947	0.83	0.08	1.82	7.08	5.39	11.34	0.58	1.23	7.88	2.29	3.09	3.06
1946	4.52	4.84	4.28	5.04	8.65	8.63	2.30	1.48	1.78	2.92	16.12	6.11
1945	3.25	9.37	11.56	16.34	4.34	14.51	5.34	3.14	11.29	2.46	1.69	0.68
1944	1.57	4.38	4.80	5.86	5.15	7.32	2.97	11.12	1.61	3.49	3.35	2.29
1943	0.29	1.06	3.74	3.32	15.60	5.72	0.30	1.36	4.16	4.32	0.28	3.51
1942	1.60	1.81	1.86	10.00	5.50	4.87	2.22	4.01	4.55	6.60	6.44	5.26
1941	6.73	3.25	0.46	8.05	1.04	5.32	3.12	5.52	3.71	12.01	2.82	2.70
1940	1.01	1.57	0.78	7.52	2.57	3.48	0.20	6.04	3.94	1.75	3.18	3.77
1939	3.68	5.54	2.04	4.09	6.58	6.06	1.41	1.47	1.50	4.39	3.33	1.25
1938	3.37	10.08	5.02	4.50	8.93	6.28	2.23	4.38	1.28	1.78	5.80	1.41
1937	7.62	0.88	3.39	3.97	3.86	3.63	4.72	4.00	6.32	2.33	3.90	4.98

Remarks: Actual Data From July, 1939 through 1965, Synthesized data from 1937 through June, 1939.

Location: Odell, Arkansas

Station Number: 5354

Area:

Basin: Lee Creek

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.90	2.25	3.17	3.63	3.72	4.68	1.24	2.30	3.38	0.01	0.42	5.02
1964	0.30	2.15	3.45	2.60	5.25	2.73	0.01	8.03	2.43	0.83	3.48	1.20
1963	0.70	0.50	1.30	4.18	3.81	1.65	4.97	1.45	4.35	0.10	1.50	1.15
1962	2.11	1.10	2.75	3.06	2.50	3.50	4.20	2.00	4.72	3.85	0.70	1.10
1961	0.85	1.77	5.13	1.87	10.60	3.09	10.63	3.18	5.66	2.85	4.13	3.20
1960	1.65	1.94	1.24	2.66	6.18	2.09	6.30	3.58	1.00	1.85	0.50	6.25
1959	0.22	1.02	4.20	4.32	6.56	2.60	6.43	2.09	3.88	5.02	2.85	2.35
1958	0.85	3.23	5.33	3.25	5.01	5.10	8.93	2.22	4.50	1.55	3.85	0.54
1957	3.82	3.19	2.50	11.71	10.23	5.85	0.82	3.70	6.85	1.79	4.50	1.75
1956	1.31	3.38	2.87	3.05	7.78	5.71	2.20	0.01	1.25	1.96	3.50	2.00
1955	1.63	2.67	3.98	3.38	5.65	3.91	2.33	2.89	4.86	0.65	0.61	0.80
1954	2.48	0.96	1.54	4.14	5.26	1.59	0.59	0.87	1.39	3.33	0.60	5.88
1953	0.90	0.46	6.07	5.86	4.09	0.85	5.11	1.39	1.77	3.07	1.71	2.59
1952	1.96	1.74	3.36	4.04	6.32	1.35	1.46	4.74	0.55	0.45	3.91	1.00
1951	3.04	6.90	1.67	2.12	2.47	10.30	1.30	2.30	5.60	4.57	2.72	0.84
1950	3.90	3.38	1.40	3.80	8.43	1.65	6.51	4.95	2.18	1.20	1.63	0.34
1949	6.96	4.15	2.48	3.97	10.04	7.05	2.60	0.01	4.95	2.25	0.00	3.50
1948	0.14	4.40	5.40	3.20	4.82	9.82	3.88	8.89	0.10	0.97	3.44	4.97
1947	0.01	0.01	1.44	5.20	6.18	9.62	0.01	0.64	4.65	1.10	4.32	3.54
1946	3.28	4.70	2.65	5.73	9.50	7.32	0.36	1.98	2.04	1.32	11.33	6.32
1945	0.83	8.89	11.92	12.15	3.00	15.27	6.14	1.86	11.52	2.68	1.35	0.25
1944	1.39	3.06	5.78	5.14	4.38	6.75	2.27	8.77	2.03	2.76	2.67	1.73
1943	0.01	0.79	2.97	2.47	14.65	2.93	2.01	0.52	2.07	5.01	0.01	2.25
1942	1.34	1.47	1.47	7.98	3.57	7.52	4.11	4.01	5.13	5.23	5.98	5.04
1941	5.59	1.42	0.00	7.45	0.56	4.08	2.85	8.58	3.20	10.20	1.99	1.90
1940	1.25	1.05	0.56	6.48	2.40	5.90	2.58	7.90	2.86	2.50	2.48	2.84
1939	2.40	4.02	1.53	2.27	5.51	4.65	1.44	2.02	0.77	3.73	2.76	1.29
1938	2.46	8.99	4.52	3.01	6.89	4.69	2.54	3.67	1.72	0.63	3.91	0.90
1937	5.71	0.76	2.95	3.28	3.62	3.73	3.42	1.33	5.98	2.18	2.77	3.38

Remarks: Actual data from 1940 through 1965, synthesized data from 1937 through 1939.

$$P_{LYONS} = P_{TAHLEQUAH}\ (0.93) + P_{SALLISAW}\ (0.94)$$

Location: Lyons, Oklahoma

Station Number: 5437

Area:

Basin: Illinois River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.28	3.75	1.98	1.96	8.92	2.07	4.02	2.85	5.12	0.32	1.59	1.56
1964	0.64	2.62	4.17	6.46	6.24	0.42	0.60	5.22	4.03	0.00	4.13	0.82
1963	0.53	0.19	1.82	4.03	1.13	1.72	3.52	0.23	1.16	0.16	1.96	2.09
1962	3.56	1.96	2.56	3.06	1.29	5.07	5.09	1.96	4.92	5.89	2.67	1.05
1961	1.26	2.60	5.22	1.09	11.20	2.34	7.32	3.93	7.37	2.74	6.08	3.18
1960	2.39	2.52	1.25	1.44	14.35	2.39	13.74	2.67	2.58	2.25	0.78	4.57
1959	0.48	1.02	7.00	2.62	5.55	4.23	7.62	3.01	4.64	5.44	1.45	3.36
1958	1.75	1.86	4.26	3.33	6.14	7.71	4.11	7.39	3.39	0.45	4.30	1.20
1957	3.06	2.84	3.94	12.94	9.85	5.01	2.45	5.07	8.68	1.53	5.26	1.24
1956	1.41	4.91	1.25	2.93	4.72	1.97	1.54	1.43	1.15	1.04	3.92	1.90
1955	1.60	3.38	4.65	3.45	4.77	2.00	1.36	9.10	3.81	0.43	0.73	0.40
1954	3.38	1.00	1.35	3.69	5.13	0.88	0.33	1.10	0.95	6.32	0.60	4.81
1953	1.71	1.79	7.32	7.05	5.26	1.06	12.08	0.98	1.36	2.32	1.85	3.40
1952	1.15	1.85	5.08	7.18	3.75	1.20	3.42	2.41	1.65	0.90	5.32	1.98
1951	2.75	7.20	1.90	4.02	2.02	9.67	3.22	4.80	10.08	5.50	3.62	1.03
1950	3.76	3.36	1.42	2.68	6.84	2.01	11.24	3.47	8.91	0.30	2.56	0.50
1949	5.75	4.44	3.20	3.18	6.43	3.21	0.28	2.65	5.08	4.51	0.35	4.06
1948		4.12										
1947												
1946												
1945												
1944												
1943												
1942												
1941												
1940												
1939												
1938												
1937												

Remarks:

Location: McCurtain, Oklahoma

Station Number: 5693

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.52	2.50	2.84	8.92	4.71	6.06	2.74	7.42	3.38	0.75	1.12	5.14
1964	0.83	0.67	4.10	3.01	3.01	2.52	2.97	0.14	8.60	3.53	1.26	3.94
1963	0.51	0.23	2.98	1.86	2.79	1.11	2.12	2.99	2.69	T	1.69	1.44
1962	2.43	1.64	3.33	4.00	1.84	2.77	1.27	1.81	8.51	6.18	1.64	1.85
1961	0.47	1.75	4.25	1.58	11.92	3.66	8.38	4.63	3.78	1.80	3.67	2.76
1960	1.32	2.47	0.99	4.10	5.66	4.29	5.76	1.36	0.28	2.86	1.30	3.68
1959	0.81	1.99	3.25	3.68	5.21	3.44	3.89	0.71	6.18	5.21	2.35	1.65
1958	0.98	2.01	4.85	4.10	5.18	6.56	9.17	1.39	4.21	0.63	4.80	0.93
1957	5.34	4.39	3.59	9.81	9.17	7.80	4.94	3.01	5.86	2.04	4.97	1.07
1956	1.55	3.19	0.87	2.57	7.95	5.17	2.64	1.29	1.03	2.37	4.81	2.79
1955	0.83	5.16	3.36	3.46	6.90	7.54	0.31	1.36	3.43	1.88	1.28	0.40
1954	2.53	0.96	2.55	5.14	5.55	2.89	3.12	2.51	2.57	7.10	1.22	6.02
1953	1.63	1.15	7.18	5.29	3.45	0.04	5.84	3.50	0.91	2.72	1.52	2.11
1952	2.06	2.47	3.36	3.68	3.46	2.87	2.94	10.83	T	0.63	5.27	1.67
1951	3.18	7.57	3.43	3.14	3.64	14.27	4.12	1.02	8.33	7.47	3.17	0.50
1950	5.11	3.29	2.18	6.25	14.88	2.64	11.08	10.82	5.75	2.16	0.44	0.40
1949	5.04	3.77	3.80	2.42	9.40	6.32	6.77	1.58	9.06	5.10	0.80	3.72
1948	1.22	3.90	5.92	1.79	5.77	9.14	7.07	7.80	T	1.99	2.71	5.07
1947	1.06	0.29	1.95	6.72	6.52	6.23	1.10	2.45	5.77	1.05	3.15	2.97
1946	4.39	4.02	2.56	5.30	11.12	3.70	4.04	0.89	2.60	2.02	12.84	5.55
1945	0.90	7.97	10.03	8.24	5.68	10.23	3.52	3.00	11.66	3.91	0.38	0.56
1944	1.34	5.47	4.51	4.81	5.00	4.76	3.23	6.69	2.83	2.55	2.34	2.88
1943	0.05	1.06	2.62	3.56	19.03	5.61	0.30	2.09	6.24	3.97	0.45	2.84
1942	1.54	4.07	1.28	7.90	3.64	8.26	1.22	5.96	6.90	9.97	7.03	3.03
1941	4.45	1.90	0.75	8.29	0.41	5.62	0.80	5.45	4.06	13.95	2.69	2.30
1940	1.39	1.54	2.56	5.32	1.68	5.04	2.27	3.85	3.15	1.77	3.27	3.16
1939	3.41	4.21	1.63	4.27	7.65	5.98	1.21	1.01	0.30	5.87	2.70	1.28
1938	3.20	6.12	5.04	3.85	8.91	4.86	2.42	2.77	0.92	0.83	5.00	0.89
1937	6.03	0.62	3.30	3.50	2.74	3.29	7.55	5.31	11.12	2.20	2.22	3.70

Remarks:

Location: Rogers, Arkansas

Station Number: 6248

Area:

Basin: Illinois River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.58	2.25	1.91	7.71	4.37	3.18	0.72	5.46	3.83	0.51	0.49	3.64
1964	0.59	1.57	4.46	3.87	3.49	6.31	0.63	10.95	3.65	1.22	3.38	0.86
1963	0.67	0.16	2.66	1.93	4.79	0.99	1.62	5.23	1.88	0.13	1.96	1.42
1962	2.00	2.11	1.77	4.21	4.54	5.28	4.21	6.95	8.27	5.58	1.22	1.54
1961	0.83	2.00	2.50	1.49	14.64	6.24	5.07	8.80	5.43	3.17	3.55	2.67
1960	1.65	2.03	2.27	5.26	9.26	2.89	6.47	3.53	0.41	3.00	1.36	3.82
1959	0.58	1.53	2.53	4.55	6.35	2.51	5.87	0.56	5.73	5.95	4.23	2.07
1958	1.06	2.45	5.23	3.59	4.15	5.72	7.85	2.74	3.05	0.66	4.10	0.64
1957	2.60	2.33	2.54	9.69	13.12	8.71	1.42	2.26	5.89	1.71	4.06	1.98
1956	1.17	2.50	1.01	4.30	8.31	4.34	2.64	0.49	1.14	2.03	4.82	2.84
1955	0.95	4.46	3.29	2.44	6.72	4.56	1.04	2.84	3.52	1.50	0.79	0.39
1954	1.50	0.86	2.05	5.27	3.53	2.58	3.33	1.62	2.87	7.36	0.33	5.79
1953	1.01	0.92	7.21	6.20	3.38	0.81	5.60	2.55	1.39	4.08	0.82	1.71
1952	1.54	2.18	3.34	4.45	3.28	0.90	1.88	7.74	0.08	0.21	5.60	1.35
1951	2.69	9.26	3.13	3.85	2.26	10.65	5.73	1.93	5.33	6.81	3.93	0.80
1950	4.38	3.39	1.39	5.98	13.33	1.62	9.84	3.77	2.36	3.19	0.57	0.34
1949	4.90	2.86	2.90	2.16	10.18	8.80	5.50	1.66	5.91	4.14	0.20	2.88
1948	1.00	3.37	5.86	2.53	3.07	8.47	2.85	11.15	0.72	1.19	4.67	2.91
1947	0.62	0.27	1.75	6.73	6.68	6.61	0.98	1.13	3.63	1.79	3.15	2.56
1946	3.40	3.83	2.80	4.60	10.07	7.46	0.06	0.86	2.28	1.73	9.94	5.50
1945	0.82	6.53	11.58	10.05	4.39	7.35	2.99	2.32	8.53	2.89	0.41	0.64
1944	1.01	5.31	6.83	4.85	4.35	3.97	2.94	4.98	2.72	2.21	2.28	2.36
1943	0.00	0.83	2.15	2.63	18.51	4.02	1.35	0.53	4.33	5.88	0.98	3.03
1942	1.43	3.11	1.93	7.66	3.06	5.89	0.30	3.08	5.57	5.78	6.77	3.58
1941	4.42	2.38	0.83	8.53	0.99	4.92	0.64	3.73	5.13	15.42	2.54	1.85
1940	2.20	1.75	1.36	7.59	3.28	3.90	1.09	6.98	4.79	2.58	5.02	2.41
1939	2.60	3.98	1.92	3.51	7.92	6.46	1.08	3.74	0.74	4.08	2.62	1.70
1938	2.98	9.04	6.06	2.71	6.99	5.21	2.26	2.74	2.17	0.75	3.80	0.96
1937	6.36	1.53	2.98	3.61	3.87	4.83	5.67	2.11	8.28	2.12	1.93	2.72

Remarks: Actual Data from February, 1942 through 1965, Synthesized Data from 1937 through January, 1942.

$P_{ss} = \frac{1}{2}((1.01) (TAHL.) + (0.94) (GRAV.))$

Location: Siloam Springs, Arkansas

Station Number: 6624

Area:

Basin: Illinois River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	1.91	3.35	2.47	1.71	7.49	2.79	1.40	2.56	3.94	0.62	2.17	1.25
1964	0.60	2.88	4.59	5.65	5.99	0.44	0.82	6.49	4.72	T	5.43	0.99
1963	0.81	0.24	2.93	4.46	1.87	1.50	3.03	0.58	1.87	T	1.58	2.09
1962	2.51	3.09	2.78	2.73	1.24	5.63	5.29	2.30	3.87	8.17	3.41	0.85
1961	1.69	3.08	4.92	1.70	12.24	3.26	8.16	2.56	5.81	3.11	6.17	3.76
1960	2.41	3.04	1.98	2.13	12.73	2.65	8.18	3.26	1.19	2.71	1.17	7.00
1959	0.40	0.93	5.59	2.48	4.01	3.26	6.47	3.59	3.21	5.72	2.90	4.41
1958	1.68	1.98	5.00	2.66	7.25	6.43	7.21	8.31	2.34	1.14	4.50	1.35
1957	3.24	3.89	4.79	10.68	12.39	5.66	0.76	7.33	7.36	1.56	6.41	1.70
1956	1.31	6.41	1.99	2.67	4.33	1.32	2.78	1.17	0.97	1.22	5.67	2.08
1955	1.48	4.18	6.89	2.53	6.21	1.68	2.53	4.91	2.85	0.38	1.52	0.59
1954	5.39	0.53	0.94	4.28	4.52	1.50	0.36	1.78	1.58	4.90	0.60	4.91
1953	1.98	2.23	8.17	9.47	5.76	0.52	6.72	2.56	2.02	1.99	2.54	3.34
1952	1.75	2.15	6.81	6.88	4.79	0.73	1.17	2.38	2.77	1.35	5.84	1.45
1951	3.18	6.74	1.84	3.10	1.64	8.97	4.65	4.07	6.88	4.17	9.04	1.62
1950	7.02	2.55	1.82	2.97	5.48	1.73	10.80	2.15	5.91	0.57	1.49	0.73
1949	11.18	4.81	4.16	2.95	4.36	5.64	0.04	2.17	3.23	5.41	0.45	2.90
1948	3.15	5.91	4.24	3.11	4.81	3.83	5.51	5.99	T	4.30	0.55	3.09
1947	1.46	0.54	2.29	7.75	7.70	2.18	0.46	2.83	4.57	3.23	2.39	3.80
1946	4.70	4.93	0.63	6.31	10.97	3.86	3.26	1.22	1.55	1.60	14.33	4.08
1945	1.31	9.90	12.03	4.13	9.64	8.99	4.99	5.32	10.03	3.55	1.42	0.58
1944	2.57	6.37	4.79	4.05	5.06	4.78	4.45	4.12	0.37	2.59	3.51	3.78
1943	0.13	1.23	3.16	4.06	15.54	2.71	0.08	0.10	3.66	5.23	0.83	2.71
1942	2.27	2.81	2.16	8.15	4.01	4.61	2.71	3.74	6.56	2.94	3.88	3.92
1941	4.71	3.77	1.10	5.12	3.31	4.20	3.09	6.01	5.13	7.77	1.82	2.14
1940	0.69	2.62	1.53	6.22	2.82	4.98	1.10	5.65	1.41	2.02	4.71	3.16
1939	2.21	5.64	1.50	9.07	5.17	2.76	2.82	3.03	0.16	3.10	4.03	1.16
1938	4.57	7.34	3.28	2.28	3.70	2.98	2.77	3.40	0.56	1.19	3.54	2.24
1937												

Remarks:

Location: Poteau, Oklahoma

Station Number: 7246

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	1.90	2.95	1.63	2.06	7.35	3.30	2.23	3.81	4.36	0.28	1.01	1.75
1964	0.49	2.19	4.14	2.39	7.72	2.29	4.70	8.90	5.19	0.23	4.86	0.74
1963	0.61	0.06	1.82	3.64	1.59	2.04	4.80	0.36	1.52	0.17	1.15	2.16
1962	2.34	1.34	2.81	4.13	2.14	4.29	4.18	1.35	6.11	5.66	3.74	2.15
1961	0.79	1.65	6.05	1.00	8.42	2.87	9.56	4.64	6.49	2.02	5.25	2.43
1960	1.48	2.26	1.13	1.50	13.07	5.74	10.10	3.44	2.31	3.27	0.25	4.72
1959	0.38	1.21	7.28	3.61	5.49	1.41	11.47	2.22	7.97	7.08	2.42	3.60
1958	1.78	1.21	4.33	3.20	5.63	6.73	3.49	6.23	5.03	0.27	4.55	1.12
1957	2.85	2.54	4.40	13.31	8.63	6.01	0.65	1.78	8.96	0.85	4.59	2.24
1956	1.05	3.60	1.60	2.95	6.38	1.84	1.49	0.40	0.04	2.41	3.35	1.66
1955	1.41	2.75	4.41	6.47	5.47	0.77	1.73	5.01	3.19	1.22	0.53	0.42
1954	2.70	1.15	1.61	3.47	5.45	2.37	0.81	0.63	1.84	4.92	0.47	4.99
1953	1.06	1.27	6.80	6.29	5.65	1.30	11.49	2.20	2.44	4.56	2.33	2.39
1952	0.97	1.31	2.17	5.88	2.36	1.38	3.58	2.97	2.05	0.75	3.90	1.50
1951	1.88	4.95	1.21	2.18	1.14	9.11	1.63	3.03	7.92	4.85	2.57	0.90
1950	4.12	2.80	1.20	2.84	6.54	1.99	11.89	3.55	5.88	1.50	1.45	0.31
1949	6.27		2.76	2.77	6.81	3.52	0.71	2.73	2.94	4.29	0.40	3.84
1948	1.26	4.50	1.69	2.43	6.22	6.27	3.55	3.43	0.18	1.99	0.49	3.45
1947	0.55	0.03	2.26	6.27	9.88	4.30	0.92	1.23	3.77	6.25	2.38	4.31
1946	3.51	4.02			10.60	3.30				1.07	11.29	9.49
1945	1.37	6.65	10.41	8.30	6.07	9.58	5.53	3.00	6.69	2.24	1.48	0.73
1944	2.64	5.15	3.03	3.43	5.17	3.97	2.59	3.16	0.38	1.63	1.67	2.37
1943	0.29	0.94	2.26	4.62	15.38	3.65	0.60	0.31	4.69	11.61	0.09	3.20
1942	0.76	1.61	1.31	10.66	3.11	7.38	4.63	3.20	5.02	4.29	2.56	5.43
1941									3.75	10.95	1.97	1.98
1940												
1939												
1938												
1937												

Remarks:

Location: Quinton, Oklahoma

Station Number: 7372

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.35	5.22	4.16	1.31	7.50	5.58	2.42	1.49	8.30	1.97	1.63	1.53
1964	.26	3.59	5.43	3.56	4.19	.63	1.70	7.04	5.76	T	5.57	1.75
1963	.47	.42	4.72	3.35	4.21	3.53	2.16	.67	2.57	.10	2.31	2.23
1962	3.88	2.94	3.41	2.28	1.43	8.77	8.04	2.48	6.71	5.97	2.59	1.23
1961	0.47	3.59	4.76	1.58	6.11	3.25	8.40	4.62	3.57	1.38	6.09	3.66
1960	2.97	2.58	2.14	2.20	11.96	3.37	4.80	1.78	1.90	2.85	3.10	8.14
1959	.91	2.05	4.52	3.97	2.50	2.91	4.06	3.78	2.98	5.55	1.71	5.61
1958	2.94	1.84	6.64	5.62	7.57	9.04	5.22	3.89	2.19	3.48	5.11	1.15
1957	4.53	2.79	4.88	12.85	10.06	3.69	4.07	6.16	5.62	1.78	5.14	1.91
1956	1.65	6.55	1.77	2.50	3.39	2.73	3.49	2.31	.60	1.42	6.08	4.30
1955	.92	3.40	4.00	1.55	1.48	1.87	.60	1.81	2.07	.20	2.24	.32
1954	4.41	1.81	.44	3.17	5.88	1.01	1.72	2.00	3.00	6.46	.40	4.68
1953	2.81	1.40	6.91	6.91	4.80	T	4.11	1.48	.87	2.77	2.60	1.58
1952	3.39	1.30	4.26	7.74	2.82	.10	2.58	1.57	2.30	1.10	9.58	7.18
1951	2.50	5.99	1.82	3.71	1.72	6.64	4.96	4.24	3.64	6.62	2.43	1.46
1950	10.84	5.95	1.52	3.11	7.46	2.39	8.34	4.94	6.18	1.80	.79	.05
1949	11.20	4.95	3.70	2.10	5.12	7.75	.73	3.04	4.15	5.88	.38	2.53
1948	1.40	5.22	2.93	3.98	4.61	3.67	6.60	4.20	.63	4.37	2.83	2.83
1947	.77	.65	2.10	4.82	4.10	2.40	.30	2.65	5.72	2.47	3.01	7.58
1946	4.78	3.45	3.05	4.95	9.91	1.93	4.18	1.08	2.75	2.45	11.18	6.05
1945	1.30	10.68	15.43	2.38	7.06	10.29	3.16	3.19	7.72	2.97	.78	.83
1944	2.68	6.47	4.59	4.78	6.20	4.79	2.75	3.77	.62	1.35	4.70	5.01
1943	.10	.89	4.48	2.76	12.16	2.53	.00	.29	3.29	5.12	.80	2.42
1942	2.84	1.16	1.46	5.35	3.29	4.13	2.61	5.30	1.93	2.27	3.32	2.62
1941	2.69	3.19	.91	3.83	2.05	5.80	1.83	4.09	4.78	9.00	2.54	2.81
1940	.93	2.90	1.26	6.21	3.74	1.28	.92	7.03	1.47	1.28	5.45	3.00
1939	1.78	7.04	3.33	9.64	4.17	6.28	.58	3.44	1.02	4.93	2.08	1.51
1938	7.40	7.15	3.28	4.02	4.21	2.65	3.20	3.50	.73	.19	4.12	2.98
1937												

Remarks:

Location: Waldron, Arkansas

Station Number: 7488

Area:

Basin: Poteau River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.39	3.49	2.16	2.45	5.24	3.68	2.28	3.26	6.03	2.30	1.32	2.05
1964	0.83	3.18	3.84	7.44	6.45	1.79	1.01	5.51	3.63	0.22	3.54	0.88
1963	0.79	0.25	1.46	4.03	3.05	5.02	3.52	1.63	2.17	0.55	1.64	2.15
1962	2.58	1.38	2.76	2.64	1.83	2.86	3.90	1.46	5.75	7.05	2.21	2.39
1961	1.50	2.30	5.20	0.97	8.81	2.30	13.13	3.05	7.64	2.14	4.16	2.48
1960	1.59	2.14	0.52	2.30	8.76	6.01	8.07	1.61	1.75	2.73	0.91	4.55
1959	0.23	1.36	5.37	4.05	9.32	4.61	8.72	2.40	4.10	6.15	2.17	2.83
1958	1.38	2.88	4.40	5.37	5.69	11.21	8.25	6.65	4.25	2.30	4.80	0.74
1957	4.06	3.72	2.67	12.11	12.62	8.55	2.00	3.25	8.49	2.74	5.89	2.26
1956	1.28	4.49	1.63	3.57	5.92	4.95	1.32	0.18	1.16	1.70	4.26	1.57
1955	1.24	4.52	3.55	1.75	4.16	2.98	3.60	4.69	2.04	0.27	0.88	0.57
1954	2.34	1.20	2.18	1.81	4.91	1.96	1.18	2.29	2.15	5.80	0.45	5.28
1953	1.46	1.42	9.15	6.91	3.99	0.82	5.30	2.00	2.47	2.39	1.69	2.75
1952	1.64	1.82	4.16	6.41	3.07	2.92	2.37	4.74	1.64	1.09	4.67	0.69
1951	2.35	7.00	1.60	3.47	1.86	10.75	3.85	2.89	8.49	5.43	4.36	0.68
1950	6.45	3.87	1.82	3.55	8.98	3.16	7.05	3.52	5.27	0.18	0.74	0.35
1949	6.90	4.39	3.12	2.97	7.18	6.47	1.17	1.29	3.00	3.87	0.32	4.09
1948	3.10	4.22	5.14	1.57	5.53	9.14	3.41	5.98	0.01	0.64	1.05	3.99
1947	0.69	0.04	1.54	6.02	6.06	5.24	0.46	0.81	4.05	2.14	2.77	3.20
1946	3.80	4.24	3.04	7.93	9.75	2.03	0.81	1.84	1.66	2.87	12.57	7.17
1945	1.10	8.27	13.11	10.75	5.36	11.42	3.21	2.84	9.68	1.94	1.08	0.63
1944	1.47	4.35	4.05	5.38	4.59	3.06	3.41	7.73	0.91	3.07	1.46	2.57
1943	0.30	0.98	2.20	2.45	12.60	3.14	0.97	0.74	3.07	4.55	0.17	2.67
1942	1.46	1.75	1.82	8.59	4.16	3.89	1.98	2.80	5.91	3.32	2.79	5.55
1941	6.32	2.91	0.52	4.41	0.48	2.98	2.28	5.09	2.72	7.72	1.66	1.39
1940	0.70	2.07	0.72	5.83	2.84	6.77	2.80	9.58	1.63	2.36	3.17	3.33
1939	2.71	4.63	1.93	2.45	4.90	4.98	1.28	1.39	0.80	3.01	3.29	1.47
1938	2.38	10.54	2.85	3.16	6.67	4.25	1.98	4.97	1.30	0.82	4.78	1.15
1937	6.13	0.55	3.25	2.95	3.36	3.49	3.48	1.01	6.93	2.65	3.54	4.16

Remarks:

Location: Sallisaw, Oklahoma

Station Number: 7862

Area:

Basin: Lee Creek

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.79	2.13	2.17	6.82	3.54	6.61	4.58	2.82	3.46	0.12	0.53	4.34
1964	0.57	2.04	5.09	4.03	4.08	4.86	0.40	9.31	4.17	0.64	3.75	0.61
1963	0.68	0.21	3.14	4.33	2.86	3.25	3.44	2.91	3.54	0.30	0.82	1.47
1962	1.78	2.90	2.03	3.74	2.10	3.20	4.98	2.72	5.36	4.30	1.21	1.53
1961	1.02	3.35	4.35	1.78	8.45	3.40	13.44	2.63	4.85	2.53	5.17	2.73
1960	1.90	1.78	1.78	3.95	12.08	2.94	8.92	2.08	0.89	2.65	1.56	4.27
1959	0.43	1.54	3.37	4.86	9.11	3.89	6.30	1.61	4.80	6.17	3.82	2.71
1958	1.18	2.97	4.57	3.92	4.97	5.87	10.04	2.01	4.10	1.53	4.62	0.77
1957	3.14	2.78	2.70	9.69	12.92	8.50	0.93	3.97	6.49	1.04	4.03	2.41
1956	1.07	2.33	1.37	4.32	5.02	6.53	2.02	0.85	0.60	2.11	4.03	2.63
1955	1.24	4.22	4.37	2.57	8.65	1.87	2.32	5.35	3.47	1.53	0.83	0.49
1954	1.95	0.61	1.73	3.35	5.19	0.99	0.16	1.11	1.18	3.53	0.33	4.98
1953	1.32	0.58	7.29	6.30	3.53	1.43	4.72	1.41	3.47	3.90	1.47	1.96
1952	2.28	2.56	3.84	6.25	2.78	1.18	1.12	4.34	0.64	0.36	4.16	1.29
1951	2.12	8.68	2.17	3.05	2.25	10.30	2.29	2.56	3.52	4.52	4.75	0.62
1950	5.32	3.29	1.47	3.43	11.65	3.44	9.98	4.21	3.09	0.10	0.62	0.47
1949	7.25	4.46	3.07	2.25	9.64	8.61	4.19	3.05	5.78	2.31	0.05	3.32
1948	1.64	4.51	5.52	3.53	5.96	7.86	4.78	11.08	0.00	0.99	1.17	4.70
1947	0.63	0.13	1.69	6.74	7.04	9.44	0.49	0.15	5.72	2.12	3.66	3.21
1946	5.37	4.54	2.03	5.06	7.83	6.36	0.20	1.31	2.52	3.62	7.95	6.75
1945	0.91	7.07	10.82	11.28	4.32	8.32	5.76	4.09	8.87	2.62	0.82	0.52
1944	1.35	3.78	5.55	4.13	4.77	10.05	2.28	6.31	3.10	3.41	2.03	1.93
1943	0.01	0.83	2.12	3.55	17.35	4.14	0.13	2.30	4.27	5.19	0.53	3.10
1942	1.40	1.88	1.32	10.19	4.84	6.55	2.23	4.22	6.18	5.64	6.96	3.45
1941	4.70	2.55	0.30	7.12	0.72	4.10	0.34	4.07	5.09	16.45	2.57	1.87
1940	0.83	1.74	1.59	8.01	2.74	3.89	0.97	5.97	6.29	2.78	5.48	2.29
1939	2.44	3.96	1.33	2.42	6.91	4.97	1.81	2.95	0.83	4.98	2.61	1.30
1938	2.89	8.68	6.84	3.26	8.09	5.78	3.47	2.85	2.38	0.52	3.58	0.78
1937	6.09	1.07	3.05	4.06	4.38	4.51	3.82	1.85	5.86	2.00	2.39	3.06

Remarks:

Location: Tahlequah, Oklahoma

Station Number: 8677

Area:

Basin: Illinois River

Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	2.46	2.67	2.03	2.81	5.17	4.31	1.99	5.00	4.39	0.14	0.68	2.46
1964	0.71	2.80	3.34	3.75	6.97	2.23	0.55	5.42	7.31	0.62	4.13	0.99
1963	0.95	0.23	2.17	4.83	2.27	1.94	3.15	0.68	3.11	0.29	1.15	1.56
1962	1.83	1.53	2.23	2.44	1.45	4.67	2.70	2.50	3.69	5.93	2.10	1.90
1961	0.93	1.93	5.11	1.12	8.51	3.07	9.25	1.19	7.22	2.33	3.75	3.03
1960	1.70	2.01	1.27	2.82	7.84	5.16	12.30	5.27	2.05	3.10	1.24	4.82
1959	0.25	1.23	4.66	3.83	6.28	3.72	6.85	2.93	3.30	6.73	2.19	3.87
1958	1.24	2.29	5.00	4.36	5.49	10.55	9.42	5.97	1.94	1.55	3.88	1.09
1957	2.88	3.34	3.08	13.01	9.70	6.66	1.12	2.10	8.66	0.90	4.86	2.09
1956	1.46	4.35	1.23	3.13	8.58	2.39	2.67	0.18	0.26	1.55	3.67	1.64
1955	1.67	4.15	3.68	2.65	4.21	1.62	4.31	4.94	2.55	0.67	0.97	0.38
1954	1.94	1.08	0.98	3.49	8.65	3.29	0.00	1.08	1.35	4.64	0.47	5.44
1953	1.78	0.83	7.70	6.39	3.88	1.09	4.94	2.74	2.92	4.96	1.67	2.74
1952	1.64	2.57	3.53	7.90	4.59	3.86	1.96	3.09	2.46	0.87	4.67	1.17
1951	2.63	5.47	1.48	2.80	2.83	8.34	1.76	1.40	9.15	6.53	3.18	0.76
1950	4.19	2.96	1.42	2.96	7.93	1.00	8.45	3.43	6.13	0.18	0.91	0.31
1949	5.06	3.66	3.06	3.07	10.18	8.13	0.97	3.49	2.30	5.77	0.31	3.69
1948	2.51	3.96	4.58	0.49	5.51	8.13	4.13	5.25	0.00	0.71	0.79	3.96
1947	0.93	0.01	1.41	4.72	7.34	5.29	0.78	0.83	5.76	3.44	3.74	3.24
1946	4.67	3.75	2.13	6.14	11.50	6.53	0.69	1.06	1.05	1.83	10.50	7.24
1945	1.33	7.65	10.65	12.46	5.27	15.28	4.53	2.88	8.81	1.68	1.08	0.38
1944	1.97	3.48	5.65	3.11	4.39	6.51	4.87	6.79	0.81	2.19	1.73	2.11
1943	0.22	1.37	3.23	4.07	17.59	4.97	0.00	0.28	2.45	5.60	0.06	2.34
1942	0.66	1.73	1.54	7.67	4.17	6.30	2.44	2.61	5.56	7.20	3.74	4.58
1941	6.01	2.95	0.39	8.06	0.94	4.04	3.47	5.88	4.18	11.42	1.44	2.81
1940	0.69	2.29	0.66	5.71	3.34	4.60	5.08	8.34	1.78	1.91	3.99	2.81
1939	2.57	4.30	1.63	2.44	5.90	4.98	1.54	2.17	0.81	3.99	2.95	1.39
1938	2.64	9.62	4.84	3.21	7.39	5.02	2.73	3.92	1.84	.67	4.18	0.97
1937	6.11	.81	3.15	3.50	3.87	4.01	3.65	1.43	6.41		2.98	3.61

Remarks: Actual data from 1940 through 1965, synthesized data from 1937 through 1939.

Location: Webbers Falls, Oklahoma

Station Number: 9445

Area:

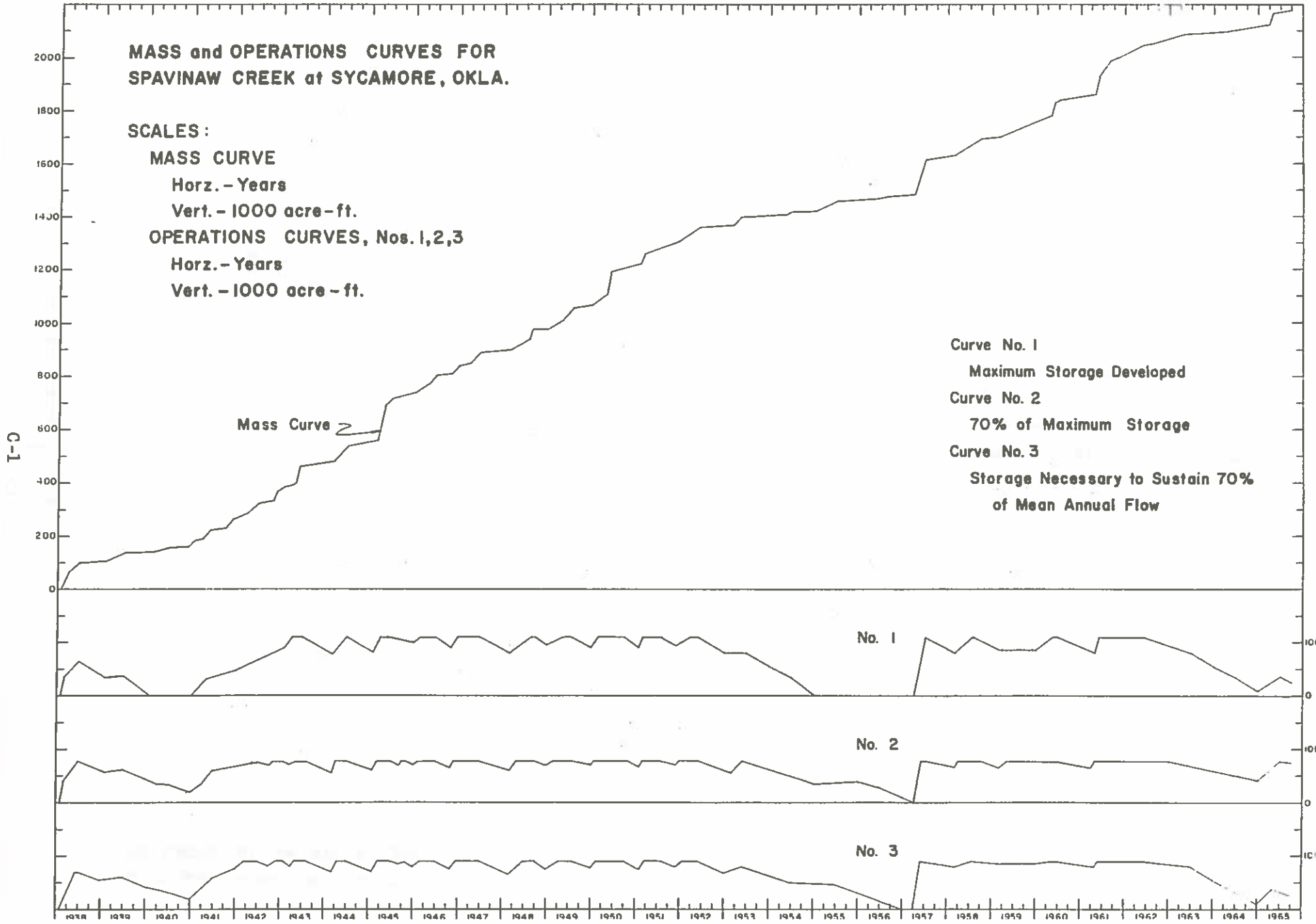
Basin: Illinois River

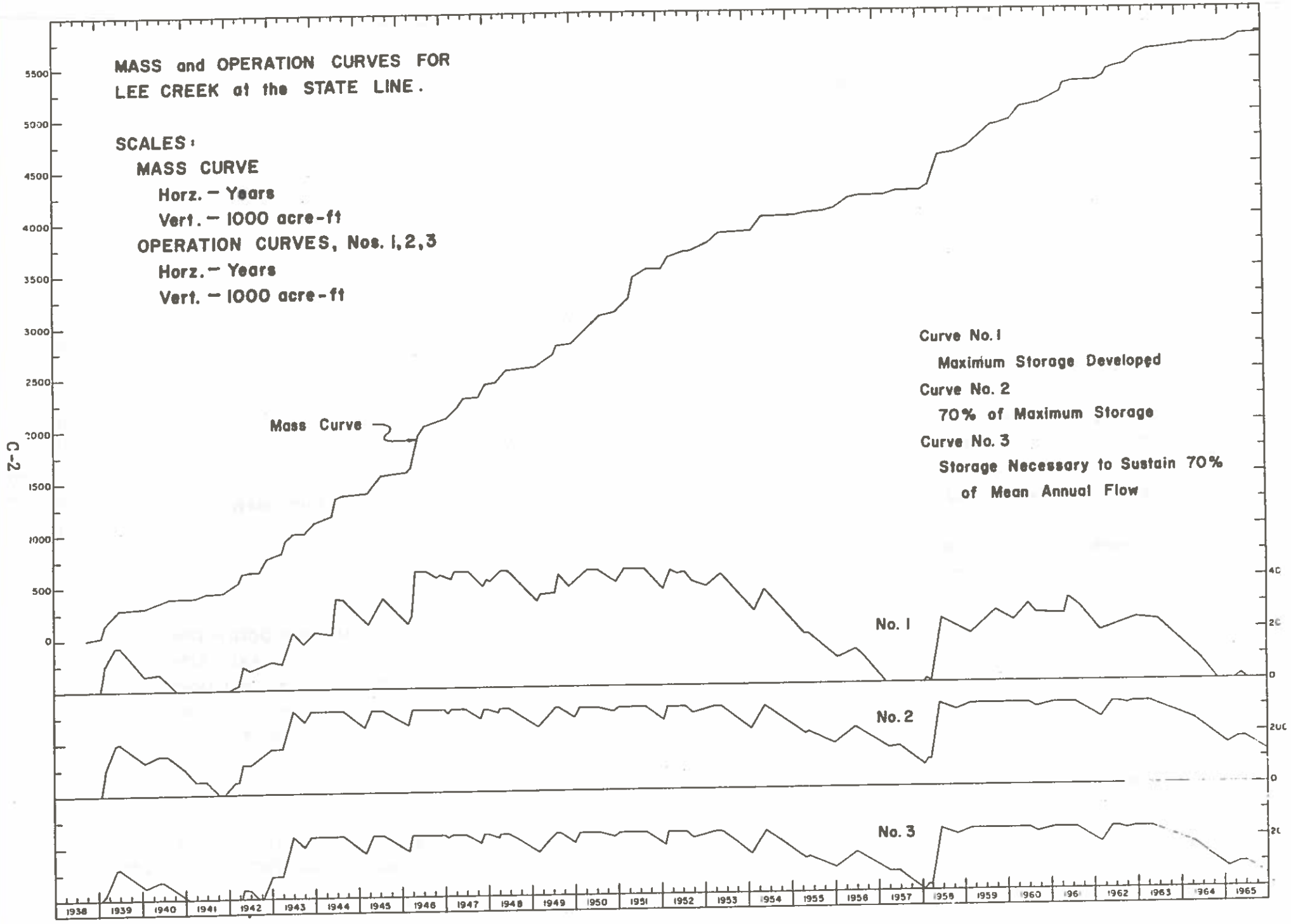
Year	MONTHLY RAINFALL (INCHES)											
	January	February	March	April	May	June	July	August	September	October	November	December
1966												
1965	1.82	3.97	2.79	1.00	9.12	2.95	1.98	3.61	4.30	0.96	1.72	1.52
1964	0.62	2.68	4.78	5.22	4.11	1.61	1.41	11.28	5.29	0.07	4.01	0.84
1963	0.68	0.11	2.42	4.23	1.21	1.78	2.47	2.25	2.18	0.06	1.47	1.86
1962	0.27	2.54	2.88	5.88	3.34	3.31	5.34	1.50	7.25	7.08	2.91	1.41
1961	0.61	2.56	5.23	0.78	4.21	3.16	6.75	3.94	5.39	2.78	5.67	3.19
1960	2.99	2.61	2.12	1.51	16.52	1.95	11.33	4.30	2.12	2.59	0.60	5.54
1959	0.65	0.88	5.41	3.75	7.82	2.27	7.50	3.05	4.33	4.36	2.03	4.00
1958	1.87	1.38	4.90	2.80	6.95	7.49	2.51	4.46	3.62	.20	4.22	1.27
1957	4.72	3.24	6.05	13.95	8.30	6.77	1.21	1.30	11.24	1.30	5.66	2.51
1956	1.50	4.65	1.30	2.80	4.45	1.00	4.59	0.51	0.83	1.52	3.50	2.56
1955	1.43	3.64	5.05	4.92	4.94	1.15	1.61	5.87	5.02	1.78	0.71	0.00
1954	3.39	1.44	0.88	2.92	4.96	1.16	1.51	1.63	0.72	6.49	0.66	4.84
1953	1.31	1.76	8.57	10.38	4.35	1.07	12.64	3.78	1.13	4.33	2.59	3.29
1952	1.11	1.88	3.36	6.57	4.61	1.27	3.05	2.78	3.30	0.76	7.74	1.83
1951	2.22	6.22	1.55	4.39	2.72	8.89	5.13	3.44	7.07	2.90	4.21	1.16
1950	4.72	3.73	0.62	2.65	9.60	2.25	14.92	4.62	10.06	0.57	0.72	0.52
1949	6.40	4.92	5.60	3.78	4.70	5.58	0.52	2.81	4.34	4.01	0.44	3.54
1948	0.85	4.46	2.95	0.71	5.41	4.43		1.97	0.06	1.79	0.74	2.14
1947	0.90	0.18	2.18	9.22	7.38	5.05	0.86	0.98	4.11	3.13	2.64	5.88
1946	3.53	4.26	1.35	4.60	9.16	2.60	0.53	2.31	0.59	1.44	11.60	6.50
1945	1.23	11.03	11.37	7.25	7.60	13.19	6.81	4.00	7.70	2.03	2.30	0.30
1944	1.72	6.89	2.83	4.93	5.46	2.97	0.68	2.88	0.76	1.59	1.81	2.96
1943	0.16	0.59	3.26	4.80	9.90	3.26	0.78	0.76	4.97	5.75	0.43	3.47
1942	1.45	0.39	0.82							2.62	2.67	5.50
1941	2.50	5.09	0.53	4.86	2.70					12.07		
1940	0.83	2,51	0.40	8.75	4.70	4.48	4.92	4.30	1.91	2.45	3.68	3.92
1939	2.33	5.63	1.92	4.90	2.60	5.66	1.06	3.45	0.26	4.22	2.96	1.08
1938					8.51	3.44	2.22	3.91	1.57	0.68	4.41	1.34
1937												

Remarks:

Location: Wilburton, Oklahoma
Station Number: 9634
Area:
Basin: Poteau River

APPENDIX C


MASS and OPERATIONS CURVES FOR
SPAVINAW CREEK at SYCAMORE, OKLA.
SCALES:
MASS CURVE
Horz. - Years
Vert. - 1000 acre-ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. - Years
Vert. - 1000 acre-ft.
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
C-1
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965


MASS and OPERATION CURVES FOR
LEE CREEK at the STATE LINE.
SCALES:
MASS CURVE
Horz. – Years
Vert. – 1000 acre-ft
OPERATION CURVES, Nos. 1,2,3
Horz. – Years
Vert. – 1000 acre-ft
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
C-2
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
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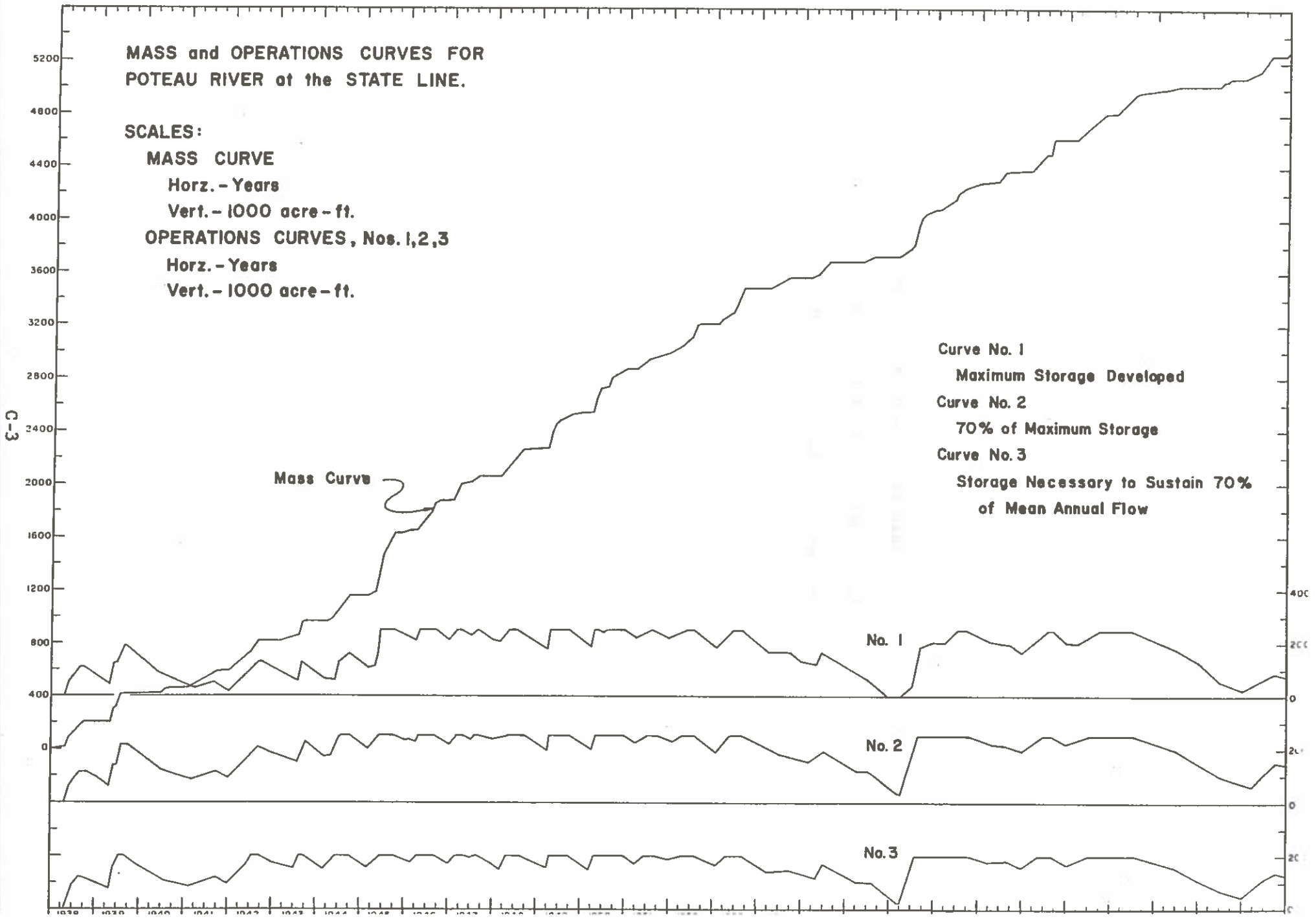
1959
1960
1962
1963
1964
1965


MASS and OPERATIONS CURVES FOR
POTEAU RIVER at the STATE LINE.
SCALES:
MASS CURVE
Horz. - Years
Vert. - 1000 acre - ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. - Years
Vert. - 1000 acre - ft.
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
5200
4800
4400
4000
3600
3200
2800
2400
2000
1600
1200
800
400
0
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948

C-3

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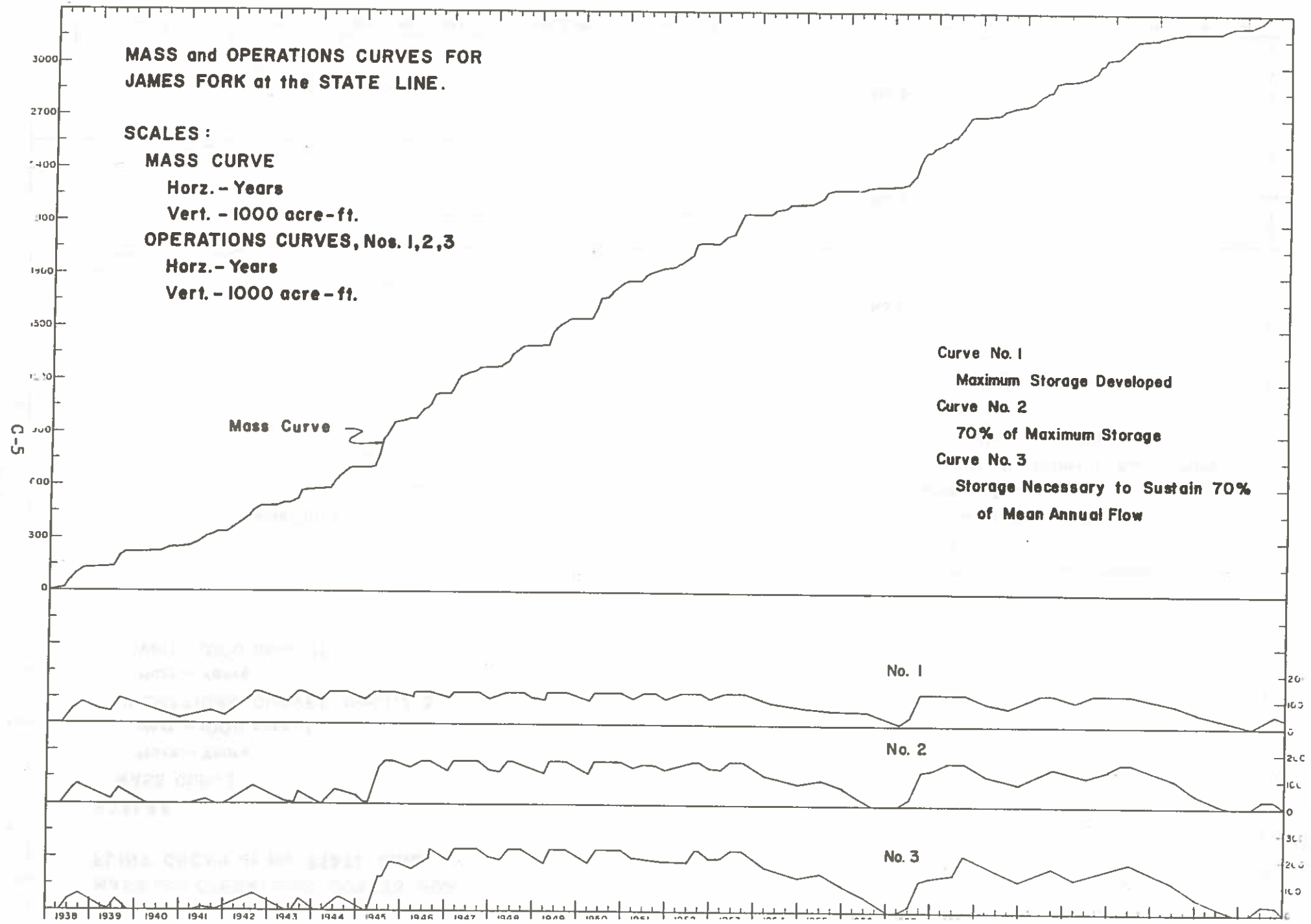
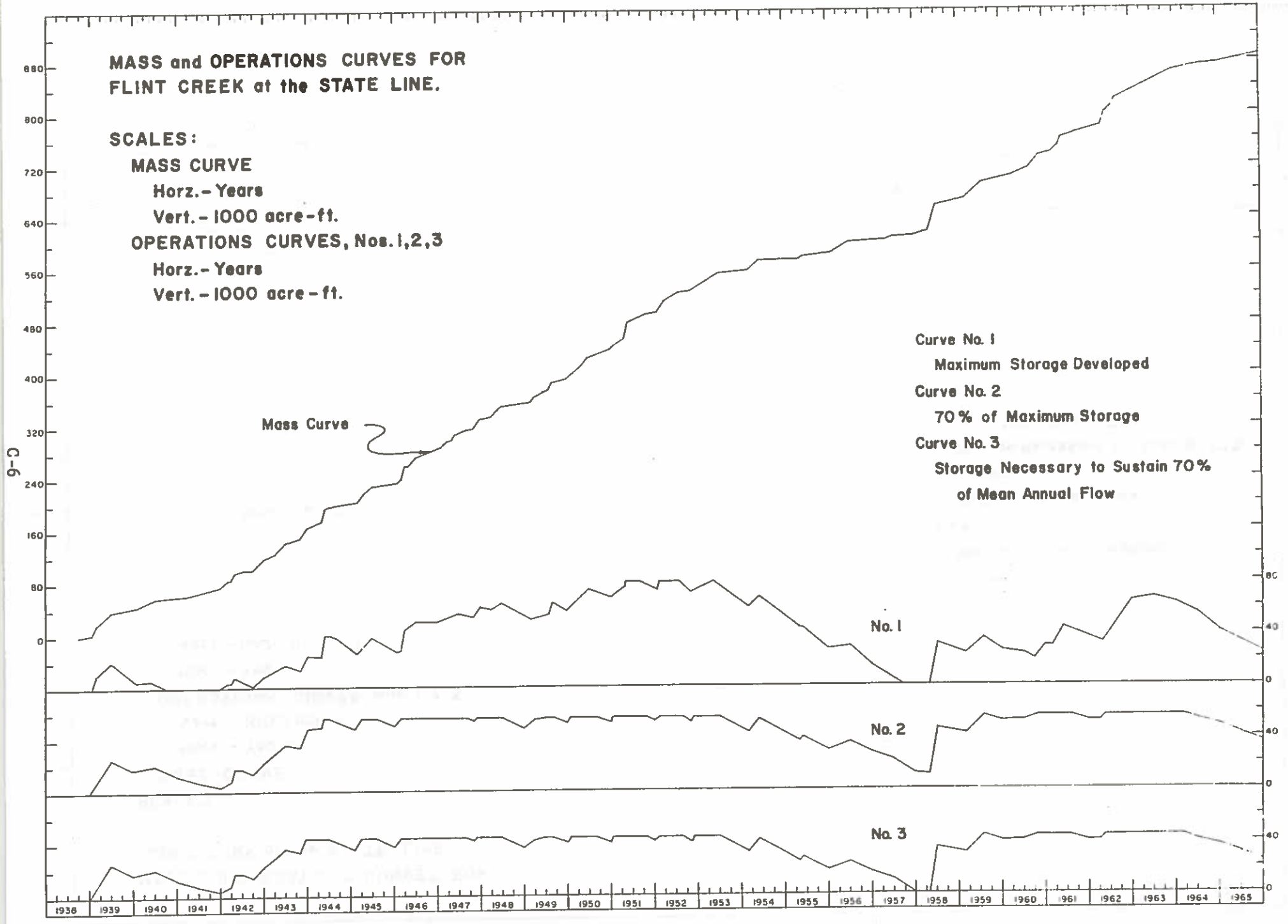

MASS and OPERATIONS CURVES FOR
JAMES FORK at the STATE LINE.
SCALES :
MASS CURVE
Horz. - Years
Vert. - 1000 acre-ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. - Years
Vert. - 1000 acre-ft.
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
C-5
3000
2700
300
0
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948


MASS and OPERATIONS CURVES FOR
FLINT CREEK at the STATE LINE.
SCALES:
MASS CURVE
Horz. - Years
Vert. - 1000 acre-ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. - Years
Vert. - 1000 acre-ft.
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
C-6
880
800
720
640
560
480
400
320
240
160
80
0
60
40
0
1938
1939
1940
1941
1942
1943
1944
1945
1946
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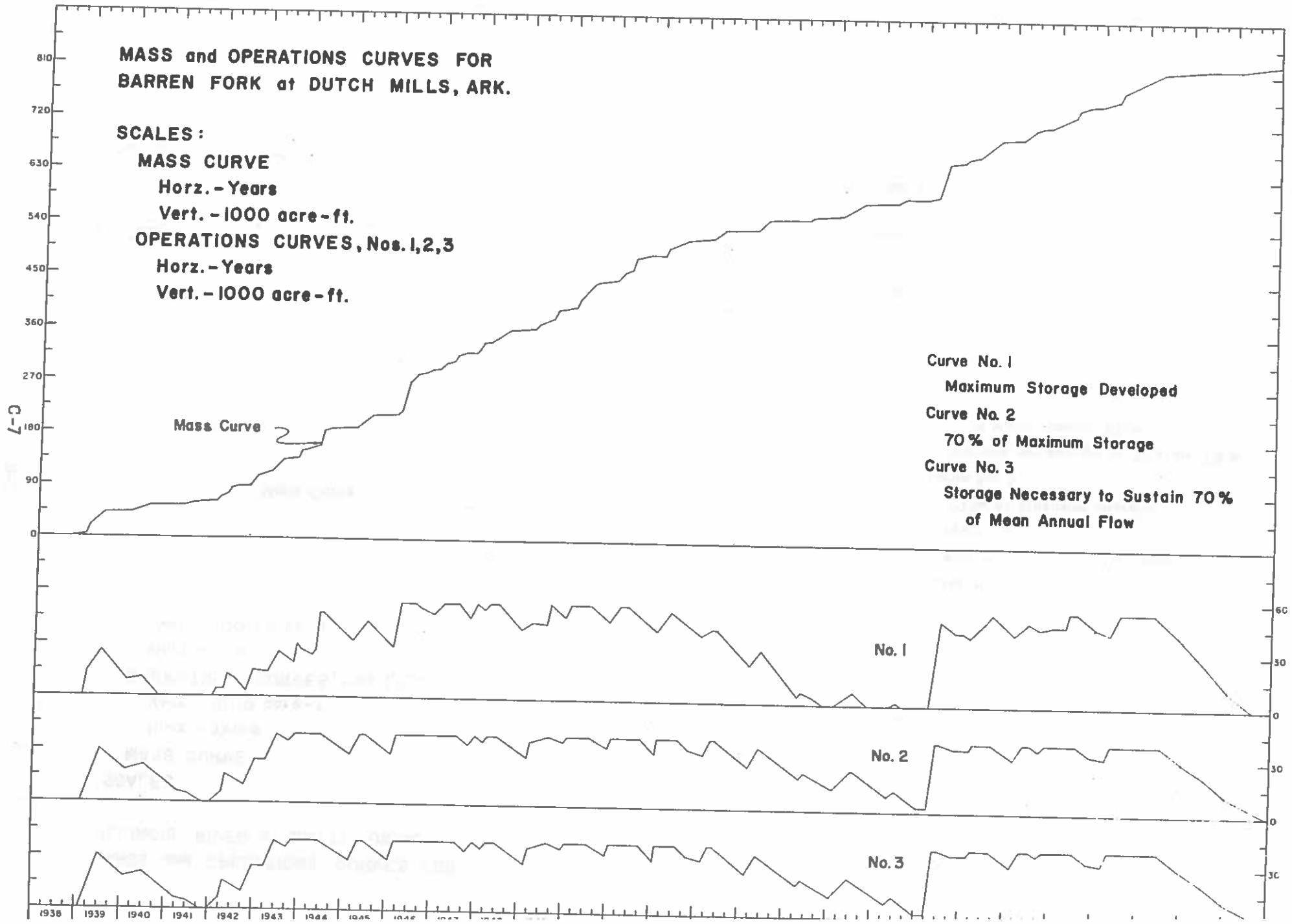
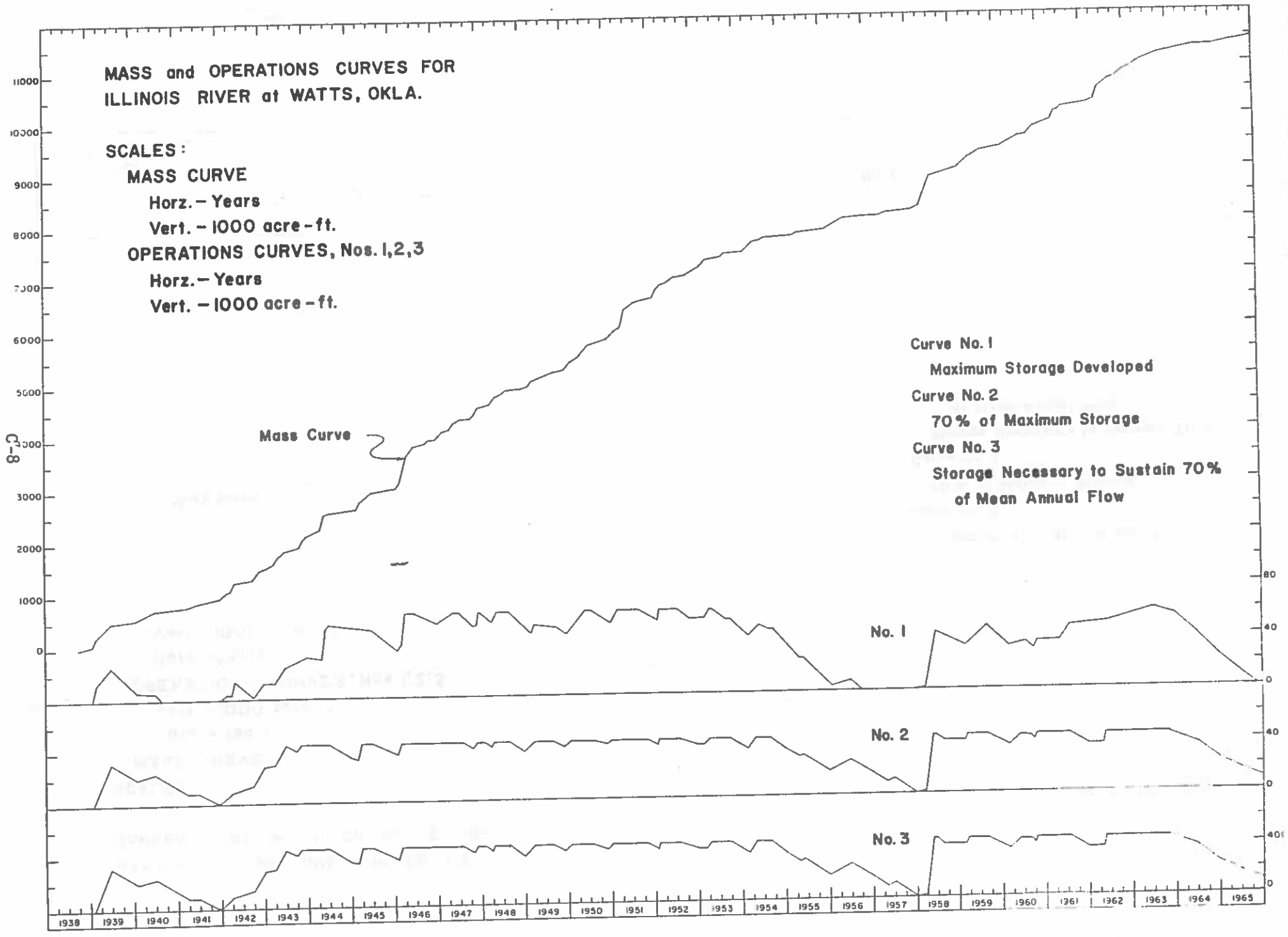
1965


MASS and OPERATIONS CURVES FOR
BARREN FORK at DUTCH MILLS, ARK.
SCALES:
MASS CURVE
Horz. - Years
Vert. - 1000 acre-ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. - Years
Vert. - 1000 acre-ft.
Mass Curve
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
No. 1
No. 2
No. 3
810
720
630
540
450
360
270
180
90
0
60
30
0
30
0
30
1938
1939
1940
1941
1942
1943
1944

C-7


MASS and OPERATIONS CURVES FOR
ILLINOIS RIVER at WATTS, OKLA.
SCALES:
MASS CURVE
Horz. – Years
Vert. – 1000 acre-ft.
OPERATIONS CURVES, Nos. 1,2,3
Horz. – Years
Vert. – 1000 acre-ft.
Curve No. 1
Maximum Storage Developed
Curve No. 2
70% of Maximum Storage
Curve No. 3
Storage Necessary to Sustain 70%
of Mean Annual Flow
Mass Curve
No. 1
No. 2
No. 3
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
80
40
0
40
0
40
0
1938
1939
1940
1941
1942
1943
1944
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APPENDIX D

WATER QUALITY ANALYSES

An essential element of water management studies is water supply data. Much more comprehensive stream flow data is needed to ascertain the proper allocation and utilization of the waters. Arkansas stream flow data, however, is more complete than is water quality information. Chemical analyses of surface waters are currently made at only ten different locations in Arkansas, and there is little published information on organic wastes and industrial pollutants.

The following tabulated water quality data has been collected at six selected sampling stations on the headwaters of the Illinois River in the Counties of Washington and Benton in Northwest Arkansas. These data were gained from a routine sampling program made during the interval February, 1969, through May, 1970.

Care was taken in the selection of the six sampling sites to provide a representative overview of surface water quality on the Upper Illinois River Basin. Provided at these quality sampling sites were: (1) streams carrying the treated wastes of the major municipal discharges, (2) streams with representative agriculture runoff from various portions of the basin, and (3) a sampling point on the Illinois River just prior to transit from Arkansas into Oklahoma.

Sampling sites are completely described in the following paragraphs with reference to Figure D-1, Map showing Water Quality Sampling Sites on the Upper Illinois River in Arkansas.

DESCRIPTION OF SAMPLING SITES

Site #1 - Spring Creek

Location: In SE¼SW¼ sec. 12, T. 18 N., R. 31 W., at the highway 112 bridge on Spring Creek, about 0.3 mile upstream from its confluence with Osage Creek in Benton County near Cave Springs, Arkansas. Spring Creek carries treated sewage effluent from the city of Springdale which is located approximately 6.9 miles upstream from Site #1.

Site #2 - Osage Creek

Location: In NE¼SW¼ sec. 1, T. 18 N., R. 31 W., at a county road bridge on Osage Creek in Benton County at the west corporate limits of Cave Springs, Arkansas. Osage Creek carries the treated sewage effluent from the city of Rogers which is located approximately 7 miles upstream from Site #2.

Site #3 - Little Osage Creek

Location: In SW¼SE¼ sec. 3, T. 18 N., R. 31 W., at a county road bridge on Little Osage Creek, about 2.0 miles upstream from its confluence with Osage Creek in Benton County. Although there are a few small communities located along the Little Osage, the main contribution of nutrients to the stream comes from drainage from farm and pasture lands having heavy livestock populations.

Site #4 - Illinois River Near Siloam Springs

Location: NE¼SE¼ sec. 29, T. 17 N., R. 33 W., at the highway

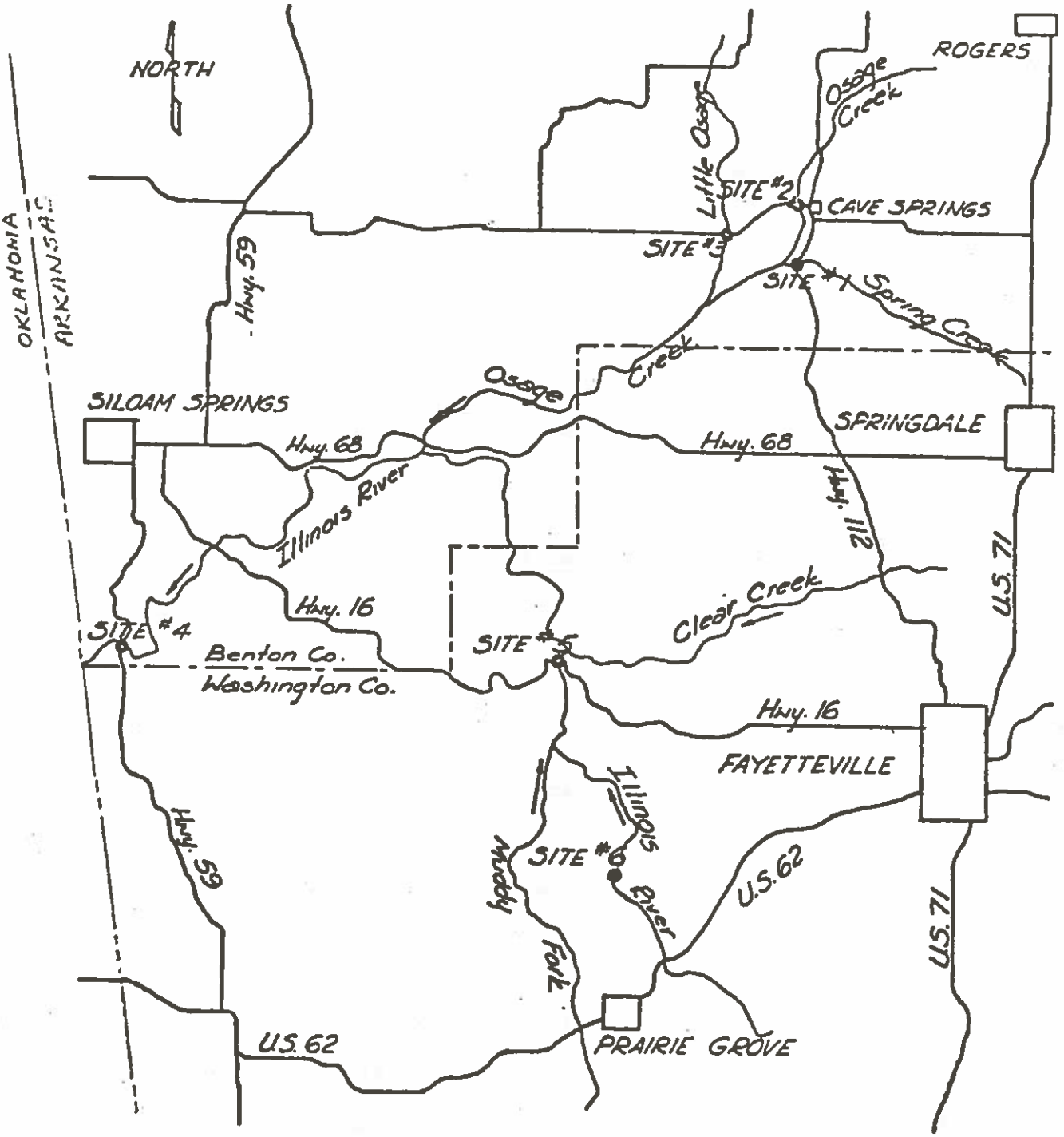

Figure D-1 - Map Showing Water Quality Sampling Sites on Upper Illionois River in Arkansas.

59 bridge on the Illinois River about 1.4 miles upstream from Lake Francis and approximately 3.8 miles south of Siloam Springs, Arkansas. Siloam Springs uses Lake Francis as its source of water supply. This site is downstream from the other 5 sampling stations and is just upstream of the Arkansas-Oklahoma border.

Site #5 - Illinois River at Clear Creek

Location: In NW¼SE¼ sec. 36, T. 17 N., R. 32 W., at the highway 16 bridge on the Illinois River about 0.3 mile upstream from its confluence with Clear Creek in Washington County. The drainage area consists mainly of pasture and farm lands.

Site #6 - Illinois River Near Prairie Grove

Location: In SW¼NE¼ sec. 31, T. 16 N., R. 31 W., at a county road bridge on the Illinois River about 2.7 miles north of Prairie Grove in Washington County. The drainage area for this site also consists mainly of pasture and farm lands.

SAMPLING METHODS AND WATER TESTING PROCEDURES

Field Methods

Samples were collected during the period from February 1969 through April 1970. Sampling during the first three months was at approximately bi-weekly intervals and thereafter were collected monthly.

Field tests performed at the time of collection included pH, carbon dioxide, alkalinity, dissolved oxygen, and temperature. Field

test specimens were collected with a Kemmerer Water Sampler at a representative position in the stream.

A one liter plankton sample was reduced to 10 ml with a Foerst centrifuge. A microscope equipped with a Whipple ocular micrometer and a Sedgwick-Rafter counting cell was used for the plankton counts. Ten random fields were counted at a magnification of 100X and the results corrected to yield the total number of cells per ml of the original sample.

The coliform analysis was performed by use of a membrane filter as recommended in the A.P.H.A. publication, "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes", 12th Ed. and Millipore Corporation Catalog No. 40.

Samples for the plankton counts and laboratory analyses were collected in polyethylene containers for transportation to the laboratory.

Laboratory Methods

The samples were analyzed in accordance with the 12th edition of "Standard Methods" (see reference above) supplemented by the procedures found in Hach DR-EL Manual and in Hach Catalog No. 9. Iron, ammonia-nitrogen, nitrate-nitrogen, and orthophosphate were determined colorimetrically, while carbon dioxide, alkalinity, hardness, dissolved oxygen, and B.O.D. were measured by titration. Turbidity was measured with the Hellige turbidimeter. pH was determined with a Hach disc type color comparator.

EXPLANATION OF TABLES FOUND IN APPENDIX D

Tables D 1-13 -- Chemical Analyses

Phenolphthalein alkalinity is not listed since it was not found in any of the tests.

Table D 14 -- Coliform Bacteria

The coliform bacteria were enumerated by the "Membrane Filter Technique", as given in the A.P.H.A. publication, "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes" and the Millipore Corporation Catalog No. 40.

Tables D 15-20 -- Plankton Count

Individual cells of all diatoms, including Melosira, were counted as one regardless of how they were grouped or connected.

The blue-green algae were counted by number of trichomes for Anabaena, Oscillatoria, and Phormidium. Agemenellum and Anacystis were counted as one by groups or masses of cells as they occurred.

Green algae were counted as individual cells except Actinastrum, Coelastrum, Dictyosphaerium, Pediastrum, and Tetraspora, which were counted as one for each cell mass as they normally occur. Westella, Scenedesums, and Tetrastrum colonies which consist of a normal grouping of four cells were counted as one.

The flagellates were counted by individual cells except for the colonial forms, Eudorina, Gonium, Pandorina, Uroglenopsis, and Volvox, where each colony was counted as one cell.

Included in the Others category are all those organisms which

had a total count of less than 30 over the entire period of study.

Table D 21 -- Stream Flow

Estimates of stream flows at sampling sites 1, 2, 3, and 4 that appear in Table 21 are based upon discharge records of U.S. Geological Survey gaging station number 1950. Station number 1950 is located in sec. 21, T. 18 N., R. 31 W., on the left bank 1 mile downstream from Little Osage Creek and 3½ miles northwest of Elm Springs (Figure 11, p. 35). The flows for sampling sitesl, 2, 3, and 4 were estimated by using a ratio of drainage basin areas and assuming that the mean annual discharge per square mile for these sites was the same as for station 1950. These drainage area ratios are listed in the Factor column of Table D -21. The drainage areas for station 1950 and sampling site 3 were taken from Geological Survey Water-Supply Paper 1859-G. Drainage areas for sampling sites 1,2, and 4 were determined by planimeter measurement of areas outlined on U.S.G.S. topographic quadrangle maps. Sampling site 6, just upstream from U.S.G.S. gaging station 1955, are readily correlated with discharges from that gaging station. Discharges for the sampling site appear in Table D - 22. Sampling site 5, on the Clear Fork of the Illinois River near the City of Prairie Grove, drains a region where sandstone deposits prevail in contrast to predominate limestone deposits found upstream of the other sampling sites. No basin ocrrelation was made flow estimation at Sampling site 6 because limestone deposits favor development of springs giving a pronounced difference in dry weather flow characteristics over that in sandstone regions.

Table D-1
ORTHOPHOSPHATE
(p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	2.00	1.10	0.11	--	--	--
20	--	--	--	1.17	0.30	0.10
Mar. 4	2.30	1.16	0.11	--	--	--
11	--	--	--	0.25	0.11	0.05
Apr. 1	1.88	0.68	0.04	--	--	--
Apr. 8	--	--	--	0.25	0.11	0.02
15	14.80	5.80	0.11	--	--	--
23	--	--	--	0.44	0.13	0.03
May 12	11.60	3.70	0.15	--	--	--
23	--	--	--	0.43	0.09	0.04
June 18	10.00	3.40	0.18	--	--	--
21	--	--	--	0.43	--	0.80
July 17	22.00	4.05	0.22	1.20	0.12	0.22
Aug. 14	23.60	10.00	0.43	1.22	0.17	0.13
Sept. 9	30.00	7.90	0.72	1.68	0.25	0.20
Oct. 17	5.40	2.70	0.30	0.66	0.22	0.22
Nov. 14	6.20	3.60	0.36	--	--	--
17	--	--	--	0.54	0.25	0.27
Dec. 15	4.80	3.30	0.36	--	--	--
20	--	--	--	0.54	0.23	0.22
Jan. 23	0.90	5.00	0.34	--	0.25	0.17
24	--	--	--	1.52	--	--
Feb. 10	12.00	3.90	0.17	--	--	--
12	--	--	--	1.04	0.17	0.19
Mar. 5	10.00	9.00	0.58	--	--	--
Mar. 6	--	--	--	0.68	0.27	0.15
Apr. 6	3.05	1.90	0.40	--	--	--
7	--	--	--	0.50	0.17	0.11
May 16	4.10	2.10	0.15	0.52	0.17	0.11

Table D-2
NITROGEN
Nitrate as N. (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	4.00	3.16	3.03	--	--	--
20	--	--	--	2.20	1.10	0.82
Mar. 4	4.70	3.50	3.50	--	--	--
11	--	--	--	1.72	0.74	0.54
Apr. 1	3.80	3.23	3.80	--	--	--
Apr. 8	--	--	--	1.43	0.60	0.40
15	5.60	3.20	2.84	--	--	--
23	--	--	--	3.60	1.47	0.62
May 12	5.05	3.25	3.05	--	--	--
23	--	--	--	1.70	0.80	0.78
June 18	--	5.25	6.05	--	--	--
21	--	--	--	2.13	3.40	2.70
July 17	4.30	5.10	5.30	2.70	1.40	1.40
Aug. 14	2.60	3.80	2.30	1.20	0.60	0.25
Sept. 9	1.05	2.45	1.65	1.00	0.40	0.40
Oct. 17	1.85	2.60	2.30	1.55	1.32	1.24
Nov. 14	2.30	3.20	2.45	--	--	--
17	--	--	--	1.70	1.00	1.05
Dec. 15	2.00	3.50	2.70	--	--	--
20	--	--	--	1.45	0.75	0.45
Jan. 23	2.70	2.15	2.20	--	1.35	2.15
24	--	--	--	1.55	--	--
Feb. 10	4.55	6.00	6.00	--	--	--
12	--	--	--	3.40	2.70	2.50
Mar. 5	4.90	4.10	4.90	--	--	--
Mar. 6	--	--	--	2.30	2.00	1.25
Apr. 6	4.60	3.50	2.40	--	--	--
7	--	--	--	1.85	1.30	0.90
May 16	3.80	3.40	3.10	1.65	1.25	0.95

Table D-3
NITROGEN
Ammonia as N (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	--	--	--	--	--	--
20	--	--	--	0.23	0.35	0.25
Mar. 4	0.16	0.25	0.06	--	--	--
11	--	--	--	0.10	0.51	0.35
Apr. 1	0.22	0.13	0.06	--	--	--
Apr. 8	--	--	--	0.10	0.25	0.26
15	0.10	0.16	0.06	--	--	--
23	--	--	--	0.31	0.34	0.36
May 12	0.12	0.22	0.16	--	--	--
23	--	--	--	0.22	0.22	0.25
June 18	0.34	0.22	0.29	--	--	--
21	--	--	--	0.34	3.50	9.95
July 17	1.00	0.00	0.13	0.13	0.05	0.16
Aug. 14	1.33	0.10	0.02	0.05	0.16	0.16
Sept. 9	4.40	0.13	0.06	0.13	0.13	0.13
Oct. 17	1.90	0.13	0.06	0.13	0.20	0.20
Nov. 14	3.50	0.19	0.00	--	--	--
17	--	--	--	0.02	0.06	0.13
Dec. 15	3.20	0.26	0.10	--	--	--
20	--	--	--	0.10	0.06	0.06
Jan. 23	3.20	0.40	0.00	--	0.00	0.06
24	--	--	--	0.00	--	--
Feb. 10	8.25	0.65	0.06	--	--	--
12	--	--	--	0.16	0.10	0.20
Mar. 5	3.00	1.65	0.20	--	--	--
Mar. 6	--	--	--	0.31	0.31	0.31
Apr. 6	0.52	0.40	0.26	--	--	--
7	--	--	--	0.28	0.28	0.31
May 16	0.43	0.68	0.22	0.13	0.16	0.34

Table D-4
TEMPERATURE
(°C)

DATE 1969-70		1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb.	11	8.0	10.0	11.0	--	--	--
	20	--	--	--	6.8	6.0	6.0
Mar.	4	6.0	7.0	9.0	--	--	--
	11	--	--	--	4.0	3.5	4.0
Apr.	1	10.5	11.3	12.0	--	--	--
Apr.	8	--	--	--	15.5	16.0	16.0
	15	13.0	14.0	14.0	--	--	--
	23	--	--	--	15.0	16.0	16.8
May	12	15.2	15.4	15.5	--	--	--
	23	--	--	--	19.0	20.5	20.8
June	18	24.5	22.1	21.9	--	--	--
	21	--	--	--	22.1	24.8	24.0
July	17	24.1	24.1	22.2	28.0	29.0	28.2
Aug.	14	22.0	22.0	20.5	24.5	22.0	23.0
Sept.	9	18.5	19.0	18.3	22.0	21.5	22.0
Oct.	17	13.0	13.0	14.0	15.0	15.0	15.0
Nov.	14	5.0	6.0	6.0	--	--	--
	17	--	--	--	13.0	13.0	13.0
Dec.	15	6.0	6.0	7.0	--	--	--
	20	--	--	--	6.0	5.0	6.0
Jan.	23	5.0	5.0	6.0	--	3.0	2.0
	24	--	--	--	6.0	--	--
Feb.	10	3.0	5.0	6.0	--	--	--
	12	--	--	--	8.0	7.5	7.0
Mar.	5	8.0	9.0	9.0	--	--	--
Mar.	6	--	--	--	11.0	11.5	11.0
Apr.	6	19.0	17.0	16.0	--	--	--
	7	--	--	--	11.3	12.5	13.5
May	16	13.0	14.0	14.0	17.0	19.0	19.0

Table D-5
DISSOLVED OXYGEN
(p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	9.9	9.5	10.3	--	--	--
20	--	--	--	10.2	10.7	10.9
Mar. 4	9.6	9.5	11.1	--	--	--
11	--	--	--	11.3	12.7	13.2
Apr. 1	4.5	9.2	10.2	--	--	--
Apr. 8	--	--	--	8.5	9.0	9.2
15	7.9	8.3	9.3	--	--	--
23	--	--	--	7.2	8.7	8.6
May 12	5.0	7.1	8.8	--	--	--
23	--	--	--	6.2	7.1	6.5
June 18	7.5	7.9	9.5	--	--	--
21	--	--	--	5.1	5.7	4.6
July 17	4.5	5.0	7.8	5.5	6.6	6.9
Aug. 14	2.5	5.0	7.4	5.7	5.6	3.6
Sept. 9	1.6	6.0	7.9	6.0	5.8	4.6
Oct. 17	5.9	8.0	9.5	8.4	9.1	8.8
Nov. 14	7.2	9.9	11.9	--	--	--
17	--	--	--	8.6	10.5	8.5
Dec. 15	10.7	14.4	16.0	--	--	--
20	--	--	--	13.1	16.0	15.0
Jan. 23	7.6	10.6	15.9	--	--	--
24	--	--	--	12.0	--	--
Feb. 10	7.5	8.0	11.7	--	--	--
12	--	--	--	11.7	12.8	12.8
Mar. 5	6.6	5.7	10.4	--	--	--
Mar. 6	--	--	--	10.0	10.5	10.5
Apr. 6	12.9	10.7	11.0	--	--	--
7	--	--	--	8.8	9.2	9.2
May 16	4.0	6.7	8.5	7.6	8.2	7.6

Table D-6
5-DAY, 20 C., B.O.D.
(p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	1.1	2.2	0.8	--	--	--
20	--	--	--	1.5	1.3	1.1
Mar. 4	2.0	1.7	0.6	--	--	--
11	--	--	--	3.4	1.9	2.2
Apr. 1	3.2	1.1	0.5	--	--	--
Apr. 8	--	--	--	1.0	1.3	1.2
15	2.0	1.7	0.6	--	--	--
23	--	--	--	0.8	0.8	1.0
May 12	2.5	1.2	1.5	--	--	--
23	--	--	--	--	--	--
June 18	2.6	1.7	2.1	--	--	--
21	--	--	--	1.3	2.1	2.2
July 17	1.7	1.1	0.3	0.8	1.2	5.2
Aug. 14	3.6	1.2	0.5	1.0	1.9	1.2
Sept. 9	4.7	0.8	1.1	1.3	2.1	2.3
Oct. 17	4.8	1.4	1.1	1.0	1.1	0.9
Nov. 14	9.7	1.8	1.2	--	--	--
17	--	--	--	2.1	3.0	2.0
Dec. 15	10.4	3.4	2.0	--	--	--
20	--	--	--	10.8	3.6	2.6
Jan. 23	14.0	3.1	2.6	--	2.4	2.7
24	--	--	--	2.5	--	--
Feb. 10	15.0	3.3	1.7	--	--	--
12	--	--	--	2.5	2.3	2.2
Mar. 5	12.0	5.4	2.1	--	--	--
Mar. 6	--	--	--	1.8	1.8	2.0
Apr. 6	37.0	2.5	2.0	--	--	--
7	--	--	--	2.6	2.2	1.7
May 16	6.4	3.2	1.4	1.5	1.1	1.0

Table D-7
CARBON DIOXIDE
as CO_2 (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	4.0	4.0	6.0	--	--	--
20	--	--	--	8.0	6.0	5.0
Mar. 4	9.0	7.0	8.6	--	--	--
11	--	--	--	8.0	7.0	8.0
Apr. 1	5.0	8.0	7.6	--	--	--
Apr. 8	--	--	--	10.0	9.0	5.0
15	12.0	10.0	9.0	--	--	--
23	--	--	--	10.0	9.0	8.0
May 12	14.0	12.0	13.0	--	--	--
23	--	--	--	10.0	13.2	14.0
June 18	12.0	14.4	8.0	--	--	--
21	--	--	--	9.4	6.2	10.0
July 17	16.0	14.0	10.0	11.0	14.0	10.0
Aug. 14	12.0	10.0	6.0	10.0	12.0	10.0
Sept. 9	25.0	18.0	7.0	8.0	14.0	13.0
Oct. 17	12.0	8.0	8.0	8.0	8.0	8.0
Nov. 14	10.0	8.0	7.0	--	--	--
17	--	--	--	8.0	8.0	10.0
Dec. 15	14.0	8.0	8.0	--	--	--
20	--	--	--	8.0	8.0	6.0
Jan. 23	10.0	8.0	8.0	--	10.0	6.0
24	--	--	--	8.0	--	--
Feb. 10	14.0	10.0	8.0	--	--	--
12	--	--	--	6.0	7.0	8.0
Mar. 5	10.0	20.0	8.0	--	--	--
Mar. 6	--	--	--	6.0	8.0	6.0
Apr. 6	6.0	8.0	6.0	--	--	--
7	--	--	--	8.0	10.0	8.0
May 16	12.0	10.0	8.0	8.0	6.0	8.0

Table D-8
ALKALINITY as $CaCO_3$
TOTAL (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	80	96	84	--	--	--
20	--	--	--	86	80	76
Mar. 4	94	96	88	--	--	--
11	--	--	--	92	74	62
Apr. 1	91	87	80	--	--	--
Apr. 8	--	--	--	88	79	74
15	102	100	94	--	--	--
23	--	--	--	94	83	76
May 12	103	97	93	--	--	--
23	--	--	--	63	99	103
June 18	98	68	96	--	--	--
21	--	--	--	120	88	98
July 17	128	128	120	122	136	146
Aug. 14	156	140	126	126	138	152
Sept. 9	212	132	124	130	132	152
Oct. 17	132	94	96	96	88	76
Nov. 14	166	122	116	--	--	--
17	--	--	--	120	118	112
Dec. 15	132	110	116	--	--	--
20	--	--	--	114	110	90
Jan. 23	110	96	102	--	80	66
24	--	--	--	92	--	--
Feb. 10	130	98	104	--	--	--
12	--	--	--	94	86	68
Mar. 5	120	112	106	--	--	--
Mar. 6	--	--	--	78	62	50
Apr. 6	102	90	86	--	--	--
7	--	--	--	80	66	58
May 16	90	84	74	82	84	78

Table D-9
pH

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	7.2	7.6	7.8	--	--	--
20	--	--	--	7.6	8.1	8.1
Mar. 4	7.5	7.5	8.2	--	--	--
11	--	--	--	8.0	8.0	8.0
Apr. 1	7.7	7.5	8.2	--	--	--
Apr. 8	--	--	--	7.6	7.8	7.8
15	7.6	7.7	8.0	--	--	--
23	--	--	--	7.8	8.2	7.6
May 12	7.6	7.5	8.2	--	--	--
23	--	--	--	7.4	7.5	7.4
June 18	7.4	7.3	7.5	--	--	--
21	--	--	--	7.4	7.3	7.4
July 17	7.2	7.5	7.7	7.6	7.6	7.7
Aug. 14	7.3	7.4	7.5	7.7	7.5	7.3
Sept. 9	7.4	7.6	7.7	7.6	7.4	7.6
Oct. 17	7.3	7.3	7.6	7.4	7.6	7.7
Nov. 14	7.5	7.4	7.8	--	--	--
17	--	--	--	7.7	7.8	7.5
Dec. 15	7.2	7.2	7.8	--	--	--
20	--	--	--	7.6	7.7	7.3
Jan. 23	7.2	7.1	7.6	--	7.4	7.3
24	--	--	--	7.5	--	--
Feb. 10	7.2	7.1	7.6	--	--	--
12	--	--	--	7.7	7.8	7.6
Mar. 5	7.3	7.o	7.6	--	--	--
Mar. 6	--	--	--	7.4	7.4	7.4
Apr. 6	8.5	7.5	7.9	--	--	--
7	--	--	--	7.4	7.4	7.5
May 16	7.3	7.3	7.6	7.5	7.7	7.5

Table D-10
HARDNESS as $CaCO_3$
TOTAL (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	120	100	90	--	--	--
20	--	--	--	92	86	78
Mar. 4	111	98	92	--	--	--
11	--	--	--	89	78	70
Apr. 1	107	93	86	--	--	--
Apr. 8	--	--	--	89	79	68
15	114	96	96	--	--	--
23	--	--	--	92	81	75
May 12	116	98	94	--	--	--
23	--	--	--	94	92	90
June 18	116	104	100	--	--	--
21	--	--	--	100	66	82
July 17	122	114	116	114	116	132
Aug. 14	120	124	118	116	112	134
Sept. 9	136	130	122	112	122	146
Oct. 17	116	98	102	98	92	90
Nov. 14	128	126	116	--	--	--
17	--	--	--	118	130	122
Dec. 15	120	128	118	--	--	--
20	--	--	--	120	128	124
Jan. 23	124	112	108	--	90	76
24	--	--	--	102	--	--
Feb. 10	120	114	110	--	--	--
12	--	--	--	106	88	88
Mar. 5	132	124	120	--	--	--
Mar. 6	--	--	--	92	88	60
Apr. 6	110	90	94	--	--	--
7	--	--	--	88	78	74
May 16	104	96	92	88	84	72

Table D-11
HARDNESS as $CaCO_3$
Calcium (p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	110	100	90	--	--	--
20	--	--	--	85	80	72
Mar. 4	104	93	86	--	--	--
11	--	--	--	88	73	63
Apr. 1	99	87	81	--	--	--
Apr. 8	--	--	--	76	63	68
15	107	94	90	--	--	--
23	--	--	--	86	76	68
May 12	108	92	90	--	--	--
23	--	--	--	88	90	90
June 18	107	90	95	--	--	--
21	--	--	--	96	62	76
July 17	100	110	108	106	112	124
Aug. 14	104	118	114	106	110	128
Sept. 9	92	114	114	106	114	140
Oct. 17	104	96	98	90	86	74
Nov. 14	104	116	116	--	--	--
17	--	--	--	114	122	112
Dec. 15	112	120	104	--	--	--
20	--	--	--	112	120	114
Jan. 23	106	100	100	--	84	68
24	--	--	--	94	--	--
Feb. 10	104	104	100	--	--	--
12	--	--	--	100	82	82
Mar. 5	120	116	114	--	--	--
Mar. 6	--	--	--	88	80	56
Apr. 6	104	84	86	--	--	--
7	--	--	--	84	66	66
May 16	100	84	80	82	78	64

Table D-12
IRON
(p.p.m.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	0.05	0.07	0.08	--	--	--
20	--	--	--	0.13	0.24	0.19
Mar. 4	0.08	0.08	0.06	--	--	--
11	--	--	--	0.17	0.33	0.31
Apr. 1	0.09	0.11	0.09	--	--	--
Apr. 8	--	--	--	0.26	0.43	0.43
15	0.06	0.11	0.06	--	--	--
23	--	--	--	0.38	0.65	0.65
May 12	0.06	0.11	0.11	--	--	--
23	--	--	--	0.24	0.40	0.44
June 18	0.5	0.29	0.38	--	--	--
21	--	--	--	0.44	0.55	0.65
July 17	0.11	0.15	0.13	0.26	0.22	0.38
Aug. 14	0.29	0.29	0.22	0.24	0.41	0.31
Sept. 9	0.52	0.22	0.15	0.26	0.46	0.33
Oct. 17	0.49	0.24	0.44	0.44	0.74	0.79
Nov. 14	0.80	0.15	0.06	--	--	--
17	--	--	--	0.22	0.36	0.31
Dec. 15	0.24	0.09	0.04	--	--	--
20	--	--	--	0.20	0.36	0.28
Jan. 23	0.15	0.13	0.09	--	0.38	0.38
24	--	--	--	0.20	--	--
Feb. 10	0.41	0.17	0.09	--	--	--
12	--	--	--	0.41	0.46	0.52
Mar. 5	0.65	0.44	0.26	--	--	--
Mar. 6	--	--	--	0.80	0.80	0.80
Apr. 6	0.31	0.26	0.36	--	--	--
7	--	--	--	0.55	0.62	0.65
May 16	0.33	0.31	0.36	0.41	0.49	0.74

Table D-13
TURBIDITY
J.T.U.

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Feb. 11	2.7	3.7	5.1	--	--	--
20	--	--	--	5.2	7.0	6.0
Mar. 4	1.6	1.9	1.6	--	--	--
11	--	--	--	7.5	10.0	9.5
Apr. 1	3.5	3.5	3.5	--	--	--
Apr. 8	--	--	--	26.5	26.5	20.0
15	1.6	2.7	2.3	--	--	--
23	--	--	--	10.0	9.0	10.0
May 12	2.7	3.5	7.0	--	--	--
23	--	--	--	15.7	10.0	11.1
June 18	6.1	11.1	10.0	--	--	--
21	--	--	--	12.0	30.0	36.0
July 17	3.1	3.5	3.1	8.0	4.3	11.1
Aug. 14	5.6	6.5	8.0	4.7	7.5	6.1
Sept. 9	9.0	6.5	3.9	7.5	7.5	3.9
Oct. 17	7.5	6.0	3.1	5.2	3.5	6.5
Nov. 14	5.6	2.7	3.5	--	--	--
17	--	--	--	3.1	4.3	3.9
Dec. 15	5.2	3.5	4.3	--	--	--
20	--	--	--	3.9	3.1	4.7
Jan. 23	4.3	1.9	0.9	--	3.5	3.5
24	--	--	--	3.1	--	--
Feb. 10	5.2	2.3	1.9	--	--	--
12	--	--	--	4.3	3.5	3.1
Mar. 5	9.5	3.5	2.3	--	--	--
Mar. 6	--	--	--	7.5	5.2	5.6
Apr. 6	10.0	2.0	4.3	--	--	--
7	--	--	--	5.2	3.9	3.1
May 16	3.5	2.7	3.1	5.6	3.5	4.3

Table D-14
COLIFORM BACTERIA
(Number of coliform bacteria per 100 ml.)

DATE 1969-70	1 Spring Creek	2 Osage Creek	3 Little Osage Creek	4 Illinois R. near Siloam Springs	5 Illinois R. at Clear Creek	6 Illinois R. near Prairie Grove
Apr. 8	--	--	--	200	2100	580
15	150	600	425	--	--	--
23	--	--	--	120	370	650
May 12	670	770	2500	--	--	--
23	--	--	---	--	--	--
June 18	910	1070	2150	--	--	--
21	--	--	--	940	80000	90000
July 17	13000	7000	1010	1400	480	300
Aug. 14	1500	600	780	320	110	50
Sept. 9	2000	1700	2200	830	460	1700
Oct. 17	5000	930	4000	5800	2700	2700
Nov. 14	5300	590	410	--	--	--
17	--	--	--	470	120	140
Dec. 15	225	90	310	--	--	--
20	--	--	--	90	80	430
Jan. 23	625	325	20	--	160	--
24	--	--	--	10	--	--
Feb. 10	10500	2700	120	--	--	--
12	--	--	--	10	10	20
Mar. 5	27700	2900	380	--	--	--
Mar. 6	--	--	--	--	--	--
Apr. 6	40	510	270	--	--	--
7	--	--	--	130	80	70
May 16	1800	50	0	0	550	200

TABLE D-15 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #1

SPRING CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Green Algae																	
Ankistrodesmus			2	2	2	10	1	4				2	6	3		2	52
Chlorella		10	10	19	12	122	19				96	34		17	116	100	860
Coelastrum				1	6	26	30	6									24
Oocystis					4	6	3				1	2					20
Scenedesmus			1		2	4	33	18	3			3					
Westella					6	2	13	4			1						
Others		1		2	2	4	10	22	5		1	1		1	6	1	
Blue-Green Algae																	
Anacystis																	
Oscillatoria		2	2	2	6	2	2	4	7	18	11	8	18	6	22	2	12
Phormidium																	
Others	1							7	2					1			
Flagellates																	
Chlamydomonas		2	5	12	28	4	2			92	13	12	24	11	16	10	344
Chrysococcus																	
Eudorina																	
Euglena	2					26					1	1	4	2	26	250	100
Pandorina			1														16
Synura									1					1			
Trachelomonas			1				1			1		1		1			4
Others											102				6		

TABLE D-15 - SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site #1

SPRING CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Diatoms																	
Asterionella													2		4		84
Cyclotella	1	2		2	116	190	102	169	80	17	213	58	74	20	26	6	96
Cocconeis			1			6	1				1						32
Cymbella		1	1	3	8	3	3	2	3		2				4	2	20
Diatoma				20	6	2			1	18		9	1		20	70	16
Fragilaria	7	68	27	11	14	12	18	6	17	4	13	221	250	153		380	60
Gomphoneam	68	42	27	7	12	2	1	2			26	8		23	46	54	20
Melosira				2	8	18	2	9				10	12			4	92
Meridion	4	28	4	13	10	8	1	7	1		2		14	3	32		88
Navicula	15	95	107	324	446	144	62	118	95	28	235	175	202	173	516	564	448
Nitzschia	2	18	39	164	34	24	1	2			8	23	16	15	56	10	108
Pinnularia					2									5		122	12
Stauroneis			16	1							1	1					40
Stephanodiscus									1		2						24
Synedra		9	11	2	12		12	13	17	10	12	18	30	49	40	216	24
Tabellaria	3	3	4	5		16		2			1	4		5	62	2	36
Others	2			6	46		1	2	2		1	1		2		2	56
Miscellaneous																	
Ciliate				1										4	6		
Others				1				2			2			2			
Totals																	

TABLE D-16 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #2

OSAGE CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Green Algae																	
Ankistrodesmus	2			3	32	2	4	24	5	39	2	14	1			5	36
Chlorella	1		2	22	16	166		124		315	448		1	4	136	8	236
Coelastrum					10	6		14		2	2						16
Oocystis					4		2	10	4								8
Scenedesmus	3	2	1	73	50	18	48	28	26	12	4	6	3	1	4	3	38
Westella				2	14	2	4	14	2	3	2						14
Others	1			4	6		4	4	5	5				1		1	
Blue-Green Algae																	
Anacystis					20	2	4										6
Oscillatoria				10		12	2	6	6	3	4	5	3	6	10	5	10
Phormidium																	
Others							20	6	6	3	5						20
Flagellates																	
Chlamydomonas	1		2	41		2			5		37	85	5	9	14	4	86
Chrysococcus											1						
Eudorina							2	20									4
Euglena	1	4	2	21		22	2		6	9	3	31	3	2	24	5	
Pandorina							90	14		2							22
Synura				2			6			38	11			5			14
Trachelomonas						2	2		1		1		1		4		2
Others							6			2	1				6		

TABLE D-16 - SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site #2

OSAGE CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Diatoms																	
Asterionella																	
Cyclotella	5	47	35	51	86	64	28	347	66	56	15	261	108	216	166	29	344
Cocconeis				3				4	4	2				4	2		4
Cymbella			2			4	4		5	1	1	9	5	5	12	2	
Diatoma			3	7	10	4			1			28	2	2	8	11	10
Fragilaria	15	106	17	15	10	16		14		80	22	11	19	48	60	130	18
Gomphoneam		3	8	3	2					1	6		4	7	2	4	
Melosira			12	24	68	78	26	18	14	23	2	3		2	4	6	26
Meridion	54	83	49	43	36	26	12	3	9	4	10	2	19	9	6	6	26
Navicula	31	177	80	121	176	152	72	274	128	36	59	17	139	103	440	259	282
Nitzschia	3	9	5	6		8	4	6		2	2		4	21	68	3	16
Pinnularia						4							2	1	6	3	
Stauroneis			1	4				2	3							2	
Stephanodiscus				7		2		12	1				6	5			24
Synedra	4	15	6		16	16		4	3	1		1	2	8	24	36	
Tabellaria	4		13	6	24		4	2		1		4	6	30	76	1	
Others		1	4	1	4	2			1				3	1	14	2	
Miscellaneous																	
Ciliate		2		2				2	1				1				
Others								2									
Totals																	

TABLE D-17 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #3

LITTLE OSAGE CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Green Algae																	
Ankistrodesmus	2			2	8	6	3	2	5	3	9		1			68	
Chlorella	3	2	5	3	16	68	2	20		52			2		11		2
Coelastrum						2				2							
Oocystis	6	1	1		2	2	2	1						1			
Scenedesmus						8		4		10					3		4
Westella						6	1			4							6
Others	4	1			2			1		2			1	1	2		
Blue-Green Algae																	
Anacystis																	
Oscillatoria			4	2	4	4	1	1	2	3	4	1		2	4	22	
Phormidium													1				
Others																	
Flagellates																	
Chlamydomonas		3	13	9	2		1		7	8	17	5	3	5	3	42	8
Chrysococcus										2							
Eudorina											20					32	
Euglena			1	5							1						
Pandorina															4		
Synura				1						4							
Trachelomonas					2				5	2						2	2
Others										1							

TABLE D-17 - SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site #3

LITTLE OSAGE CREEK

Micro-organisms	Feb. 11	Mar. 4	Apr. 1	Apr. 15	May 12	June 18	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 14	Dec. 15	Jan. 23	Feb. 10	Mar. 5	Apr. 6	May 16
Diatoms																	
Asterionella						1											
Cyclotella	4	13	13	12	22	18	48	29	7	25	2	31	77	76	21	26	28
Cocconeis		5	3	4	8	10		12	11	1		2	3	2	9	28	
Cymbella		10	11	14	36	8	19	49	13	3	32	25	18	16	25	26	8
Diatoma				3					2			2		2			
Fragilaria	4	13	9	10	24	14	117	108	13	6	4	26	24	20	34	22	38
Gomphonema	2	11	15	7	8			5	1			3		7	1	6	
Melosira	3	2		5	8			5		4			7			14	
Meridion	3	15	6	8	14	12	.1	15	3	3	36	5	6	1		8	
Navicula	10	39	93	49	138	40	57	58	65	32	27	39	66	42	106	120	42
Nitzschia	1	14		4	14	4		3	1	6			13	15	11		
Pinnularia					2							1					
Stauroneis	2		5									4			5		
Stephanodiscus							1										
Synedra		4	1	1	2	2	3	1	4	2			1	3	1	32	8
Tabellaria		1	2					1				1		5	7	14	2
Others			2										2		9	6	
Miscellaneous																	
Ciliate				2	6				1	1			1				
Others														1		4	2
Totals																	

TABLE D-18 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #4

ILLINOIS RIVER NEAR SILOAM SPRINGS

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 24	Feb. 12	Mar. 6	Apr. 7	
Green Algae																	
Ankistrodesmus			1		4		10	2	6	4		1	6		36		8
Chlorella	25	4		12	34	14	116	96	2768	96	112			36			
Coelastrum			1			2				2					6		
Oocystis										4		1					
Scenedesmus				6	6	2	12	6	26			1				2	1
Westella					2		2			2							
Others	1	1	1				8	8				2			6		
Blue-Green Algae																	
Anacystis			1									1					
Oscillatoria	1	1	1	2	6	4	8	2	4	12		1	4	1	8		
Phormidium											1						
Others																	
Flagellates																	
Chlamydomonas	4	3	6		10	8	6	8	28	2	24	10	12	3	28	10	
Chrysococcus	1											1					
Eudorina																	
Euglena		1					2	8		2	3		6		4		
Pandorina								2									
Synura	1	2			4					12				4			
Trachelomonas						2	4	8	14			1	2	1		2	
Others							2	4		10	2	1					

TABLE D-18 - SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site #4

ILLINOIS RIVER NEAR SILOAM SPRINGS

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 24	Feb. 12	Mar. 6	Apr. 7	May 16
Diatoms																	
Asterionella					2					50	24	13	136	3	34	354	
Cyclotella	36	58	30	72	10	24	52	66	170	128	248	1116	198	47	40	48	24
Cocconeis					4		10	2	14			1		6		28	
Cymbella	1	4	2	20	24	24	12	4	10	4	5	8	12	4	14	14	
Diatoma		3		8	14			2			4	17			4		4
Fragilaria	10	12	12	38	8		78	20	14	12	42	19	29	6	24	32	122
Gomphonema	17	63	56	18	22			2	4		4						12
Melosira			16	58	10	34	6	10	18		7	12	19	2	18	28	109
Meridion	6	13	7		10	6		2		2	2			5	8	8	
Navicula	8	12	24	130	132	86	52	26	62	20	53	113	82	53	32	62	26
Nitzschia	3	6	8	2	8		2	4	4	2	3			3	6	2	4
Pinnularia											3			1			
Stauroneis						2				2		1					
Stephanodiscus		1									34			5		6	
Synedra	2	4	6	2	8	2	2	4			5	1	3	9	2	12	2
Tabellaria	2	2	8	6	12	10		2			6			3	10	16	
Others			2		2							22		2	12		2
Miscellaneous																	
Ciliate			6		2			6									
Others			1		2					2							
Totals																	

TABLE D-19 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #5

ILLINOIS RIVER AT CLEAR CREEK

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 23	Feb. 12	Mar. 6	Apr. 7	May 16
Green Algae																	
Ankistrodesmus		3	1	4	4	20	12	4			2	1	1	9	40		
Chlorella	18	21			26	40	320	10192	10752		46	52					
Coelastrum			2														
Oocystis				2	2											4	
Scenedesmus		1	2		2	10	18			2						4	2
Westella		1	2	2		20	8	4									
Others	4			8			6	20	4				13				
Blue-Green Algae																	
Anacystis																	
Oscillatoria		1	3		10	30	6		10		2	1	3	7	14		
Phormidium						30				6							
Others						10	12										
Flagellates																	
Chlamydomonas	11		14		38	20	40	32	34			18	7	9	8	10	
Chrysococcus								20				1					
Eudorina									12			3					
Euglena			1			10	28	4	8		2	3			12	2	
Pandorina								8	2			1					
Synura	39										4880	18	16			8	
Trachelomonas	1		9		4	20	6	56	150		2	2	1	2	4	2	
Others						10		8									

TABLE D-19 SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site 5

ILLINOIS RIVER AT CLEAR CREEK

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 23	Feb. 12	Mar. 6	Apr. 7	May 16
Diatoms																	
Asterionella													2	4	56	508	
Cyclotella	46	142	39	38	10	100	144	48	166	22	64	481	13	25	28	30	30
Cocconeis			2	14	4	10		8	4	2	2	3	2			46	
Cymbella	2	4	9	12	28	20	6	4	2				1	5		22	8
Diatoma		1	1	6	2	20			2						14		
Fragilaria	15	27	22	44	42	10	16	4	2	2	38	25	1	11	14	12	80
Gomphonema	80	129	180	56	34			4	2				1				
Melosira				2	4	70			36	6		10	16	13		4	140
Meridion	28	13	10	2	16		4	40	2	6	2		12	14	36	42	6
Navicula	3	14	32	130	74	50	42	40	20	8	28	25	17	16	24	72	56
Nitzschia		6	13	10	2		2		2			18	1		4	2	
Pinnularia						10	2										
Stauroneis			1	8							2						
Stephanodiscus											16					16	
Synedra	5	5	38	6	6	10			2		2	12	5				6
Tabellaria	1	11	9	8	10		4					14				8	
Others		1	2		4								1				
Miscellaneous																	
Ciliate						10	2						1			2	
Others			1								2	1					
Totals																	

TABLE D-20 - SHEET 1

Micro-organisms In Number Per Milliliter At Sample Site #6

ILLINOIS RIVER NEAR PRAIRIE GROVE

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 23	Feb. 12	Mar. 6	Apr. 7	May 16
Green Algae																	
Ankistrodesmus		2	8	4	4	10				2					44	58	6
Chlorella	65			6	10	110	7120	1088	7496	32	124	18					20
Coelastrum										2							
Oocystis					2				2		1						
Scenedesmus					4		12			6						2	
Westella					2	10											2
Others							4	8	2			1	2				
Blue-Green Algae																	
Anacystis								4				1					
Oscillatoria		1		2	4	10	4	8	4	18	4	1		4	8	12	
Phormidium																	
Others						20		4									
Flagellates																	
Chlamydomonas	19	1	6		30	80	2416	24	38	6	585	17	4	13	10	24	40
Chrysococcus								104		8		2					
Eudorina								20									
Euglena				2	2	40	256	4	8						2	96	
Pandorina										6	1						
Synura											30	4				2	
Trachelomonas			2		6	10	44	96	100	8	2						
Others							8	12	2		3						4

TABLE D-20 - SHEET 2

Micro-organisms In Number Per Milliliter At Sample Site #6

ILLINOIS RIVER NEAR PRAIRIE GROVE

Micro-organisms	Feb. 20	Mar. 11	Apr. 8	Apr. 23	May 23	June 21	July 17	Aug. 14	Sept. 9	Oct. 17	Nov. 17	Dec. 20	Jan. 24	Feb. 12	Mar. 6	Apr. 7	May 16
Diatoms																	
Asterionella														6	22	40	
Cyclotella	82	23	28	28	16	50	156	36		20	126	118	5	55	52	46	16
Cocconeis			6	6	2								1				10
Cymbella		4	10	10	10	10		4					1	5	22	26	16
Diatoma				4									3		4	16	
Fragilaria	22	16	12	64	44	40	4	4	20	2	17	25	5	11		8	62
Gomphonema	8	61	268	104	38	30			4	2	1		2		6		6
Melosira			10	12	22			16	2	18			3		8	16	
Meridion	9	26	58	12	6	10	4	8		4	1		3	10	44	42	14
Navicula	17		26	72	44	20	40	28	4	8	3	11	13	17	44	86	24
Nitzschia		3	12	16	2				6	4		4	1				6
Pinnularia					2												
Stauroneis																	
Stephanodiscus									2		8						
Synedra	2	6	12	4			4			2	2	55	2	8	2	40	8
Tabellaria				2	4							1			6	40	4
Others	5				2												
Miscellaneous																	
Ciliate			2			10	8		6	2			1				1
Others																4	
Totals																	