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FREQUENCY ANALYSIS OF SFWMD RAINFALL

by

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EXECUTIVE SUMMARY

The 71-year (1915-1985) regional average annual rainfall for the SFWMD is 53 inches, with amounts that range from a minimum of 39 inches in 1956 to a maximum of 77 inches that fell in 1947. The annual amounts are averages of basin rainfall amounts over the entire District area and do not reflect the spatial variability. Between 1915 and 1985, the District received between 45 and 55 inches 55% of the time, and between 40 and 60 inches 80% of the time. Annual rainfall between 1940 and 1960 was extremal. The frequency diagram of District annual rainfall shows the distribution to be asymmetric. Statistical goodness-of-fit tests supported the hypothesis that District annual rainfall followed a logarithmic-normal distribution. The parameters of the distribution were estimated from the data by the method of maximum likelihood, allowing rainfall amounts of stated frequencies to be determined. The 1-in-10-year "dry" and "wet" rainfalls are 44.3 and 62.5 inches, respectively. Based on the results of this study, the 1956 rainfall was between the 1-in-50 and 1-in-100-year event, and the 77 inches recorded in 1947 exceeded the 1-in-200-year event. Several of the basins' wet season rainfall has been consistently below the respective historical averages during the past 10 to 15 years. This trend is evident in annual rainfall to a lesser extent as wet season precipitation accounts for approximately two-thirds of annual rainfall District-wide. Graphic information that relates District-wide and individual basin rainfall magnitude and frequency appears in this report. Also, a mainframe computer procedure has been developed by the author which will compute rainfall magnitude and frequency for any sequence of months, for any basin. Annotated examples of the interactive procedure appear in the Appendix.

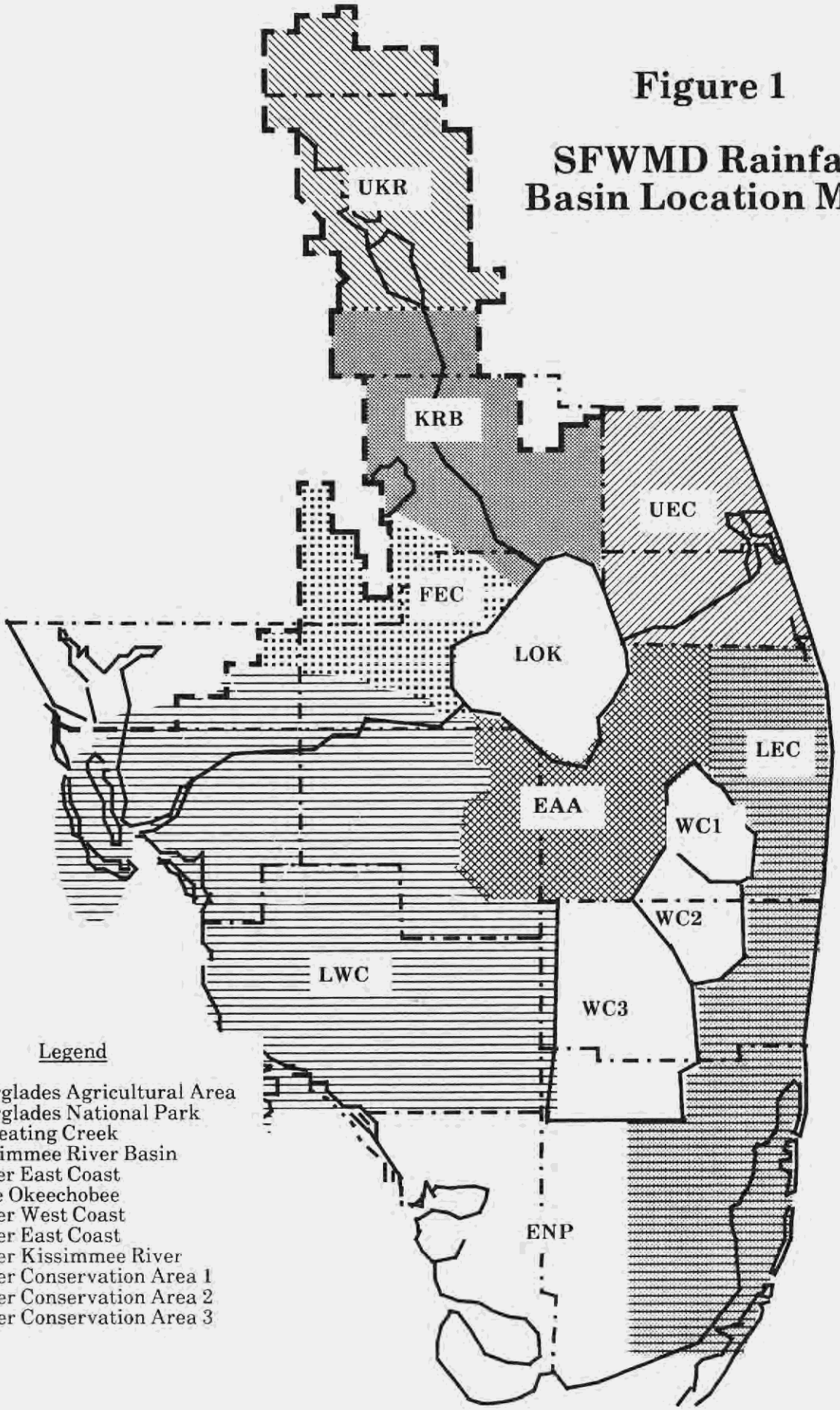
INTRODUCTION

The objective of this study is to present historical wet season, dry season, and annual rainfall data from the hydrologic basins which comprise the South Florida Water Management District in an informative manner, and to characterize each distribution by statistical inferences in order to determine the functional relationships between rainfall magnitude and frequency. Data from a network of rainfall gaging stations were used in this analysis to determine wet season (June through October), dry season (November through May), and calendar year annual rainfall amounts from twelve hydrologic basins. Annual basin values were area-weighted to compute estimates of District annual rainfall from 1963 to 1985. Estimates prior to 1963 could not be computed in this manner because of missing data in the WCA system and other basins. Statistical techniques were used to provide estimates of missing basin values which were then combined with the historical data to estimate District annual rainfall from 1915 to 1962. A goodness-of-fit procedure was used to test the hypothesis that District annual rainfall is a random variable with an underlying probability distribution. If true, a useful relationship between District annual rainfall magnitude and frequency can be established.

The South Florida Water Management District contains twelve basins whose boundaries are primarily hydrologic in nature. Figure 1 shows the location of each of these basins within the SFWMD. Upper Kissimmee River is the northernmost basin. It contains the Upper Kissimmee chain of lakes and extends southward to the primary outlet structure of Lake Kissimmee, S-65. The Kissimmee River basin extends from S-65 south to Lake Okeechobee and is bounded by Martin County to the east. The Upper East Coast basin is comprised of Martin and St. Lucie Counties. Similarly, the Lower East Coast basin consists of Palm Beach, Broward, and Dade Counties, except for the Everglades National Park, Everglades Agricultural Area, and the Water Conservation Area system, each of which are basins in their own right. Fisheating Creek is one of the true hydrologic basins, lying northwest of Lake Okeechobee and between the Kissimmee and Caloosahatchee River systems. The Lower West Coast forms the largest of the twelve basins. It includes most of Lee, Collier, and Hendry Counties, and, in area, accounts for almost one third of the SFWMD. Although technically not a basin by definition, Lake Okeechobee is so considered because of its unique rainfall characteristics. Rainfall data for all basins have been compiled through 1985, although the basins' periods of record vary from 23 to 71 years. Table 1 shows basic data for each basin, and Figure 2 illustrates the relative size of each basin. Appendix A contains a listing by basin of the raingages used in this report and an accompanying location map. Appendix B contains rainfall data used in this report; period-of-record monthly, wet season, and dry season totals are given for each basin.

Figure 1

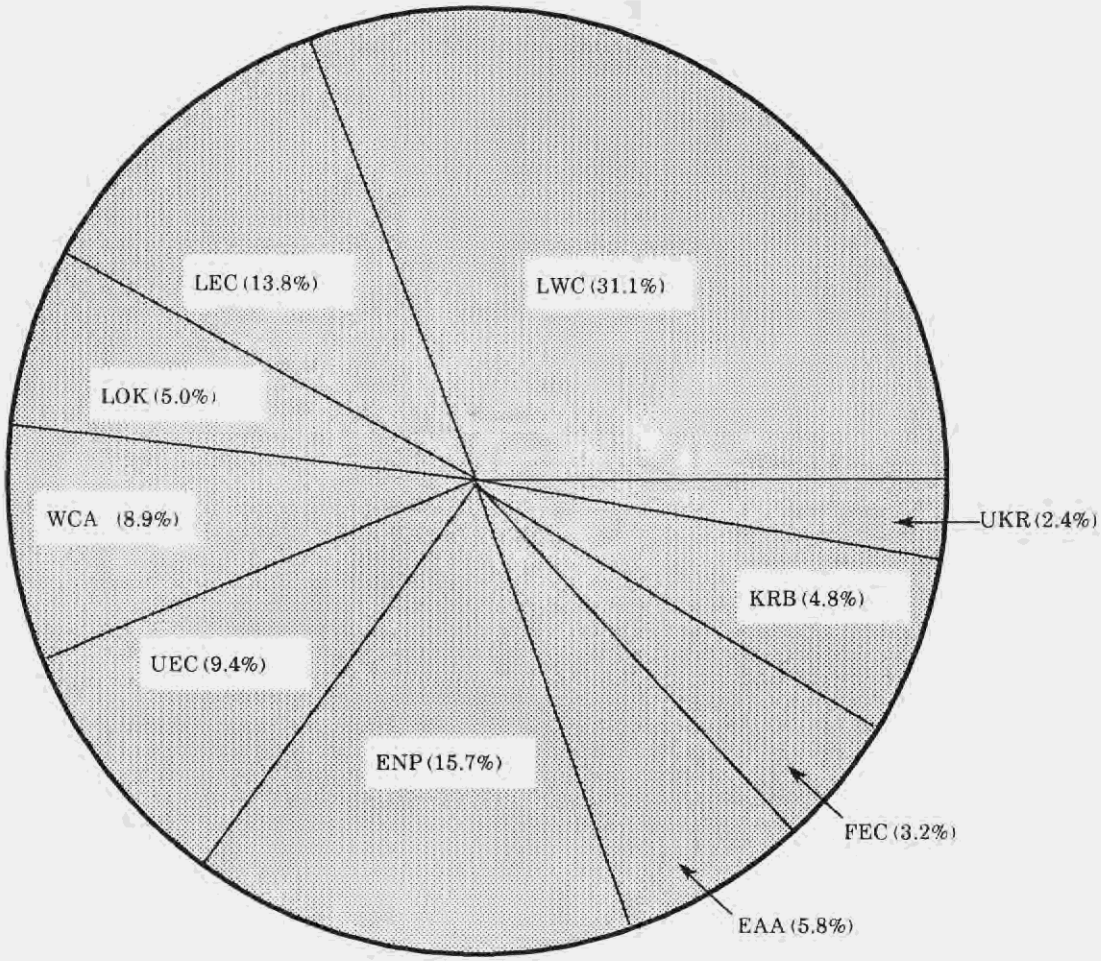
SFWMD Rainfall Basin Location Map



Legend

EAA Everglades Agricultural Area
ENP Everglades National Park
FEC Fisheating Creek
KRB Kissimmee River Basin
LEC Lower East Coast
LOK Lake Okeechobee
LWC Lower West Coast
UEC Upper East Coast
UKR Upper Kissimmee River
WC1 Water Conservation Area 1
WC2 Water Conservation Area 2
WC3 Water Conservation Area 3

Figure 2. SFWMD Rainfall Basins
(Percent of Total Area)



Legend:

EAA	Everglades Agricultural Area	ENP	Everglades National Park
FEC	Fisheating Creek	KRB	Kissimmee River Basin
LEC	Lower East Coast	LOK	Lake Okeechobee
LWC	Lower West Coast	UEC	Upper East Coast
UKR	Upper Kissimmee River	WCA	Water Conservation Area System

Table 1. Basin Data

Basin	Number of Years of Rainfall Data	Area, square miles
Everglades Agricultural Area	57	800
Everglades National Park	45	2185
Fisheating Creek	54	440
Kissimmee River	71	674
Lake Okeechobee	34	697
Lower East Coast	71	1920
Lower West Coast	59	4318
Upper East Coast	71	1304
Upper Kissimmee River	71	335
Water Conservation Area 1	23	221
Water Conservation Area 2A & 2B	23	210
Water Conservation Area 3A & 3B	23	800

HISTORICAL RAINFALL

A. Basin Wet- and Dry-Season Rainfall.

It is worthy to analyze seasonal rainfall in addition to annual rainfall; the effects of two distinct meteorologic regimes (wet season precipitation resulting predominantly from convective and tropical storms, and dry season rainfall coming primarily from frontal systems) can be studied separately. Typically, the months from June to September are classified as "wet" months, and November through April are "dry" months. May and October are transitional months, having precipitation resulting from both wet and dry season regimes. For the purpose of analysis, the wet season in this report begins June 1 and continues through October 30. The dry season begins November 1 and ends May 31 of the following year. A dry season is referred to by the year that contains the months of January through May. For example, dry season 1987 begins November 1, 1986 and ends May 31, 1987.

A *histogram* of rainfall data gives a graphical description of its central value and variability. It is constructed by first partitioning, or discretizing, the range of values into intervals, then counting the number of observations within each interval. A series of vertical bars is then constructed with the bar heights being proportional to the number of observations in the corresponding intervals. As the number of intervals increases (meaning narrower interval widths), the number of observations within each interval decreases, and vice versa. A histogram with interval widths either too wide or too narrow will not effectively display the previously mentioned characteristics of the data. An empirical formula has been developed by Sturges to aid in the selection of an optimal interval width for a given sample of observations:

$$w = \frac{r}{[1 + 3.32 log(n)]}$$

where w equals the optimal interval width, r equals the range of the data (the difference between the maximum and minimum value), and n equals the number of observations (sample size). For example, for Upper East Coast wet season rainfall, the maximum and minimum amounts are 44.8 and 18.6 inches, respectively. For a period of 71 years, the interval width computed from equation (1) is (44.8-18.6)/[1+3.32log(71)] or 3.7 inches. Here, a convenient interval width of 5 inches was selected. Similar calculations were made for all basins and, in order to present more uniform results, an interval width of 5 inches was chosen for all histograms in this report. Regardless of interval width, however, some information is lost by discretizing a continuous variable.

Wet- and dry-season rainfall histograms for each basin are presented in Figures 3 through 14. The horizontal axes are identical to facilitate comparison of seasonal rainfall among basins as well as to show the comparison between a basin's wet- and dry-season precipitation. The vertical scales are not uniform, however, as the magnitude of individual bars is not as important as their relative size when making inferences from histograms.

Most of the basins' wet-season histograms (with the exception of Water Conservation Area 1) exhibit a "tighter" distribution than their dry-season counterparts. For wet-season histograms, the interval containing the greatest number of observations is markedly higher than its neighbors, whereas the dry-season histogram peaks are flatter (and wider), indicating a greater variance about the central values.

On the average, the Lower East Coast basin receives the greatest amount of rainfall. From its wet-season histogram (Figure 8a), the LEC basin receives between 30 and 40 inches of rainfall over half of the time during the wet season, and less than 30 inches only 15 percent of the time. The outlier in the interval marked "greater than 60 inches" occurred in 1947 when 69 inches was recorded. This was due in part to the September hurricane that crossed the Florida coast near Ft. Lauderdale. Most of the histograms do not appear to be symmetric about their central values. This asymmetry or skewness will be reflected in the later selection of probability distributions.

Figures 15 through 26 show, in bar-graph form, historical wet- and dry-season rainfall from each basin expressed as a deviation from the corresponding mean rainfall. These graphs are not histograms, and have a time scale on the horizontal axis. Mean dry-season rainfall does not vary from basin to basin as much as mean wet season rainfall. Average dry-season rainfall is about 18 inches except for Water Conservation Area 1 (15 inches) and the Lower West Coast Basin (22 inches). Mean wet season rainfall from four basins (EAA, ENP, LEC, and LWC) is centered around 38 inches, while the remaining eight basins' mean wet-season rainfall centers around 32 inches.

There appears to be little correlation between successive wet- and dry-season rainfall. In other words, a particular wet-season rainfall amount gives little or no indication of what the subsequent dry-season rainfall may be, and vice versa. This observation supports the idea that the wet- and dry-season rainfall processes or "driving-forces" are somewhat independent.

Since the early 1970's, most of the basins have consistently received wet season rainfall amounts well below their respective period of record averages, with exceptions to the Everglades National Park, Lower West Coast, and Upper East Coast basins. The Fisheating Creek and Kissimmee River basins each received below-normal wet season amounts in eleven consecutive years beginning in 1975. The Lower East Coast basin has received below-normal rainfall in thirteen of the past sixteen wet seasons. No similar trends are evident with dry season rainfall. All of these graphs have the same range of rainfall values on the vertical axis (10 - 60 inches) in order to facilitate comparisons. The few observations that exceeded the maximum value on the vertical axis are denoted by an asterisk (*) and the actual rainfall amount. Values that could not be computed because of missing data are denoted with the symbol I about the horizontal axis.

Figure 3a.

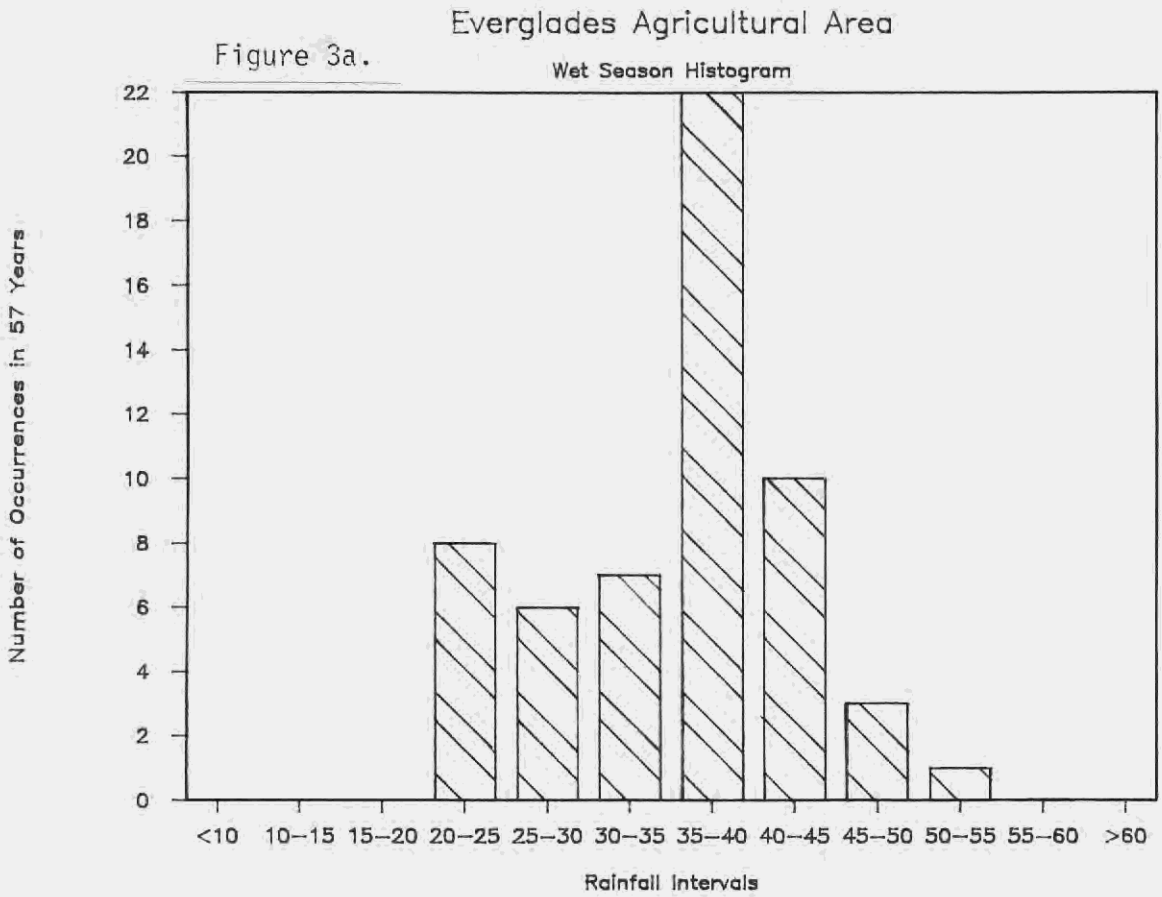


Figure 3b.

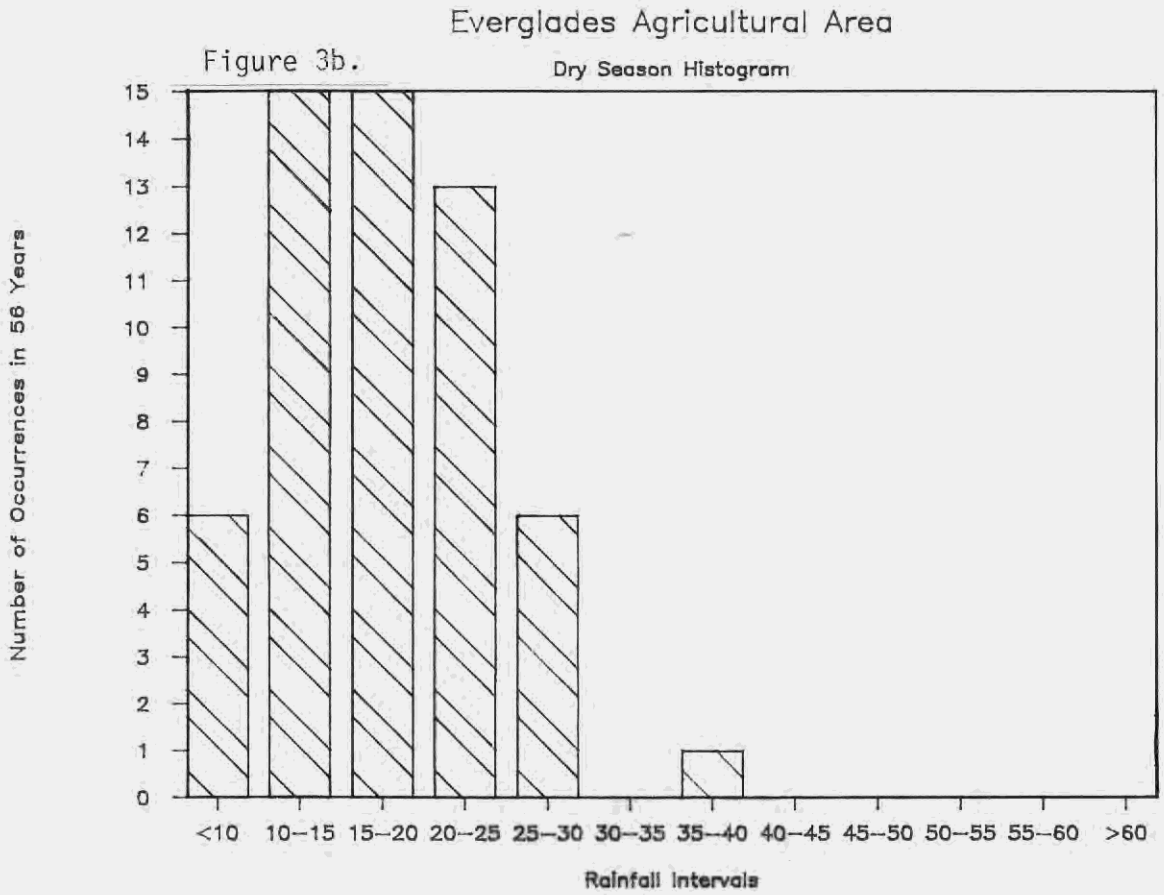
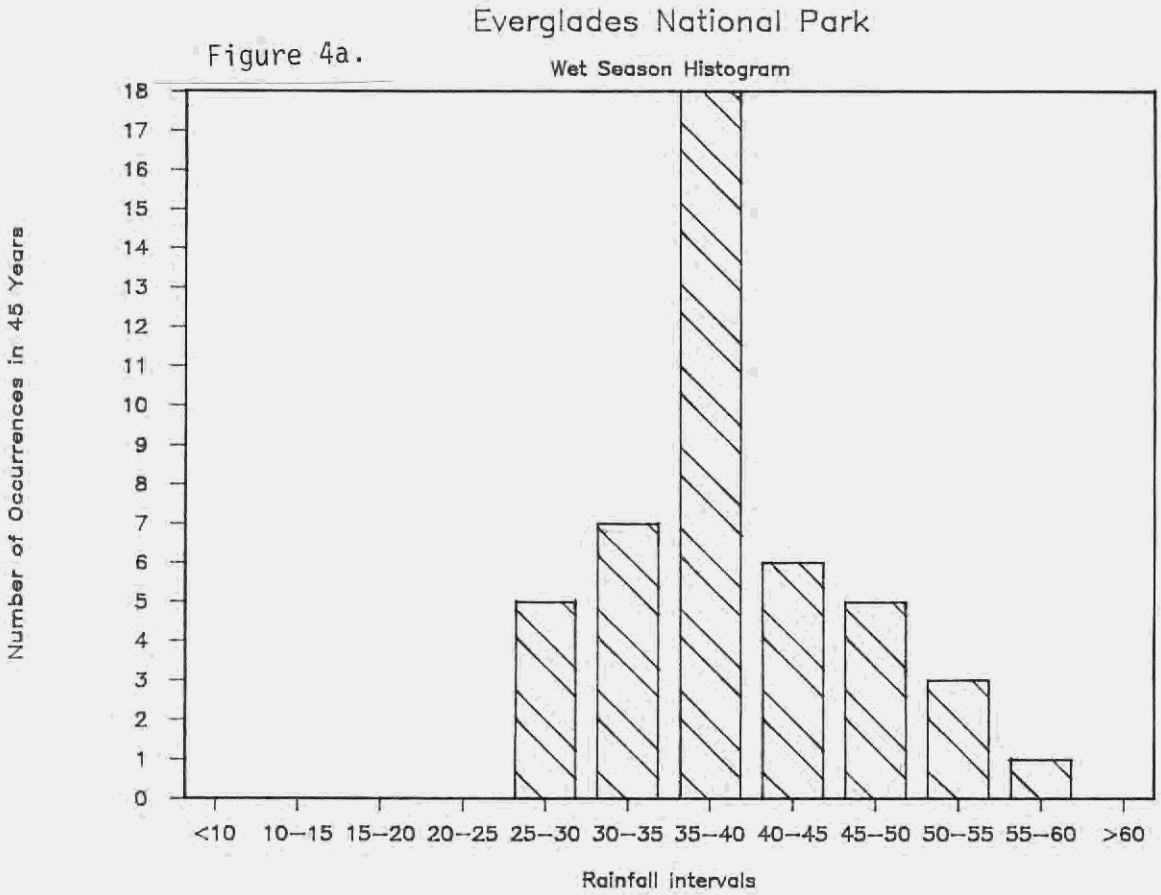


Figure 4a.



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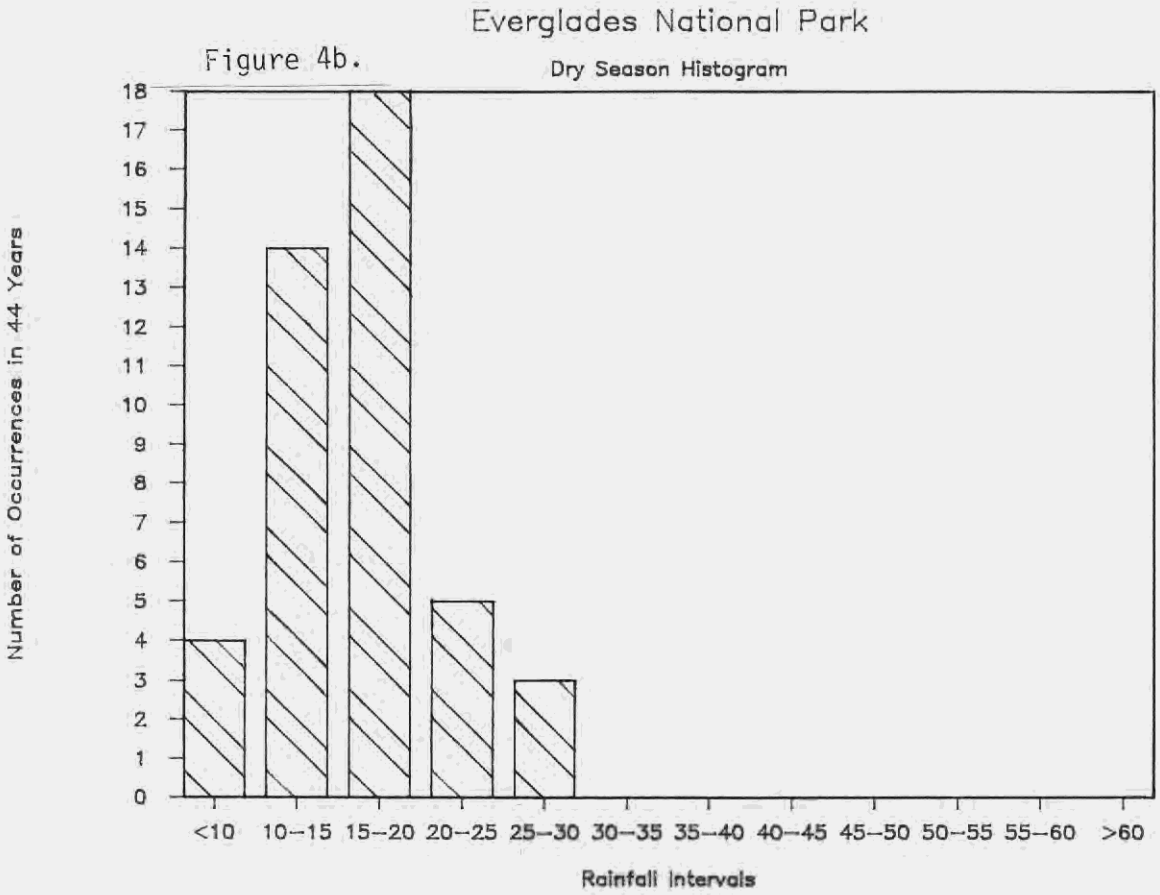

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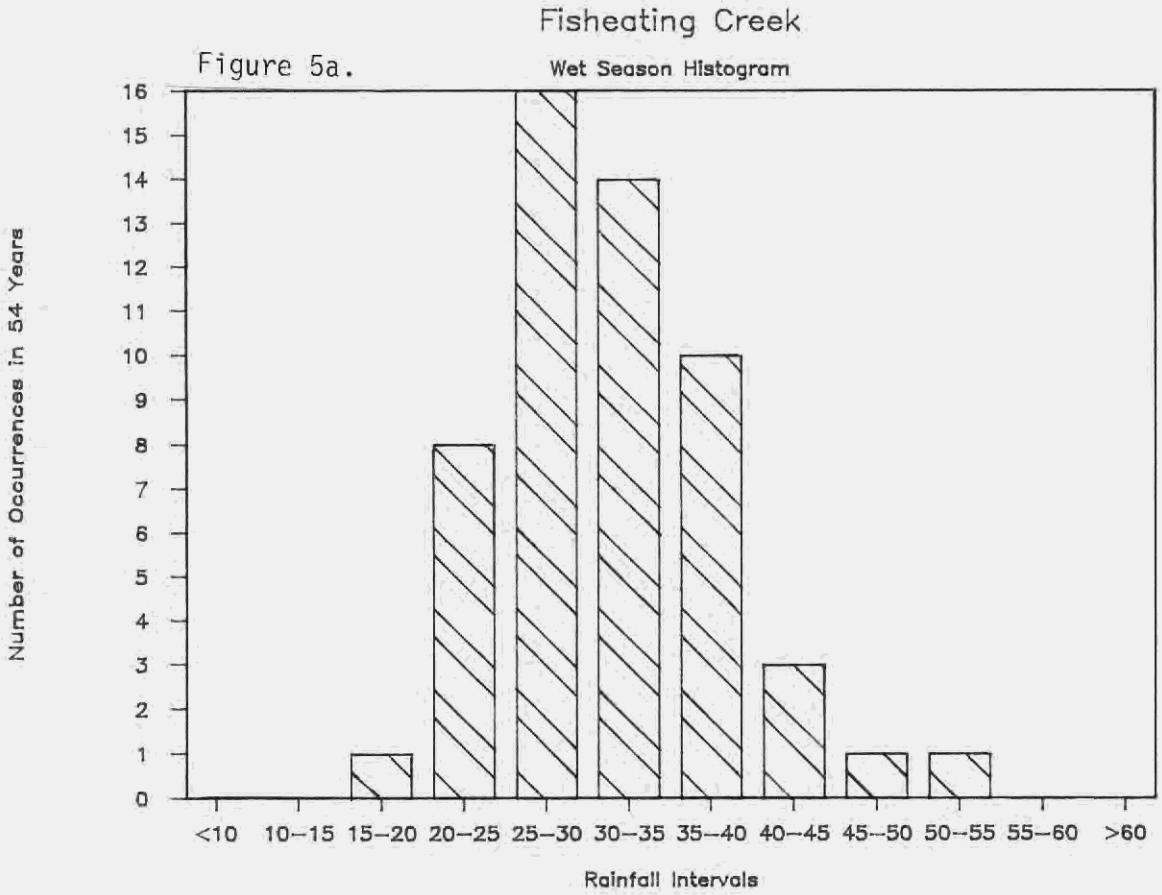

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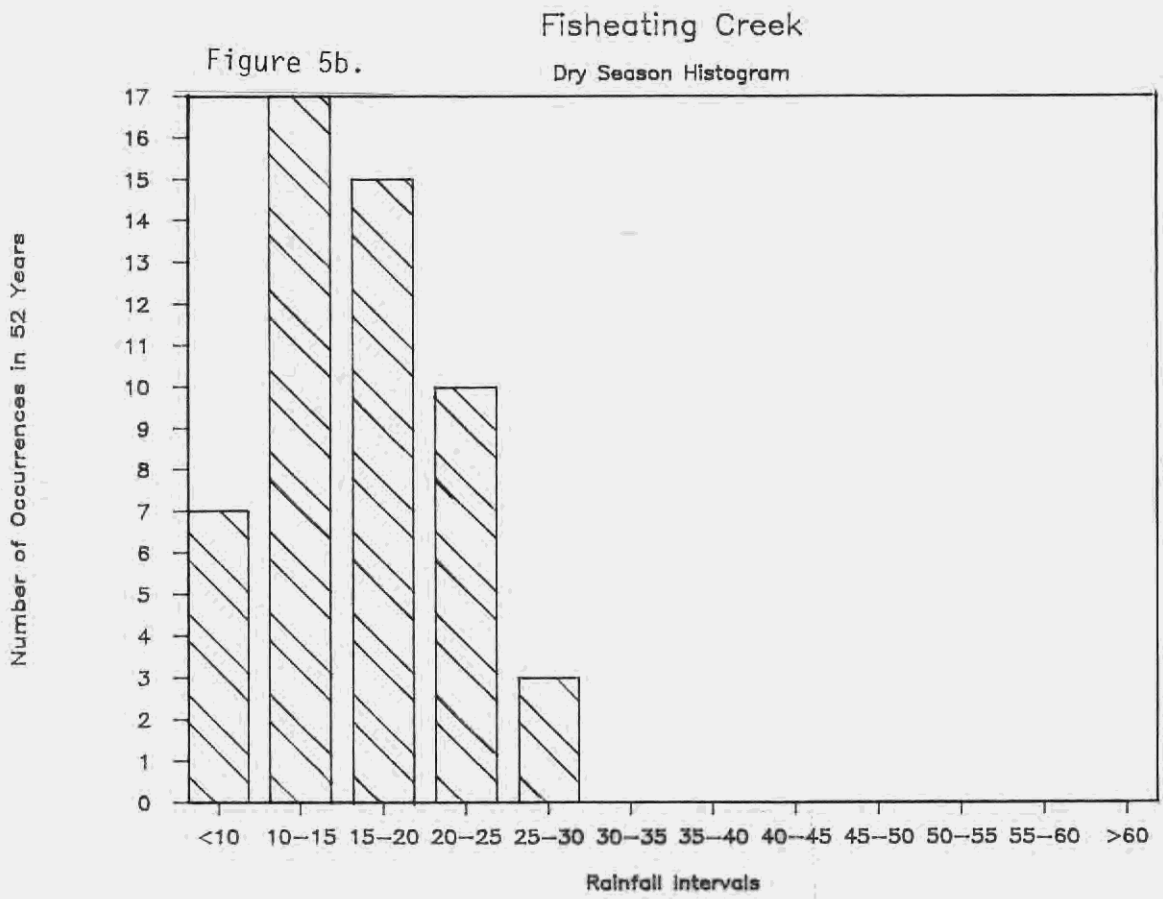

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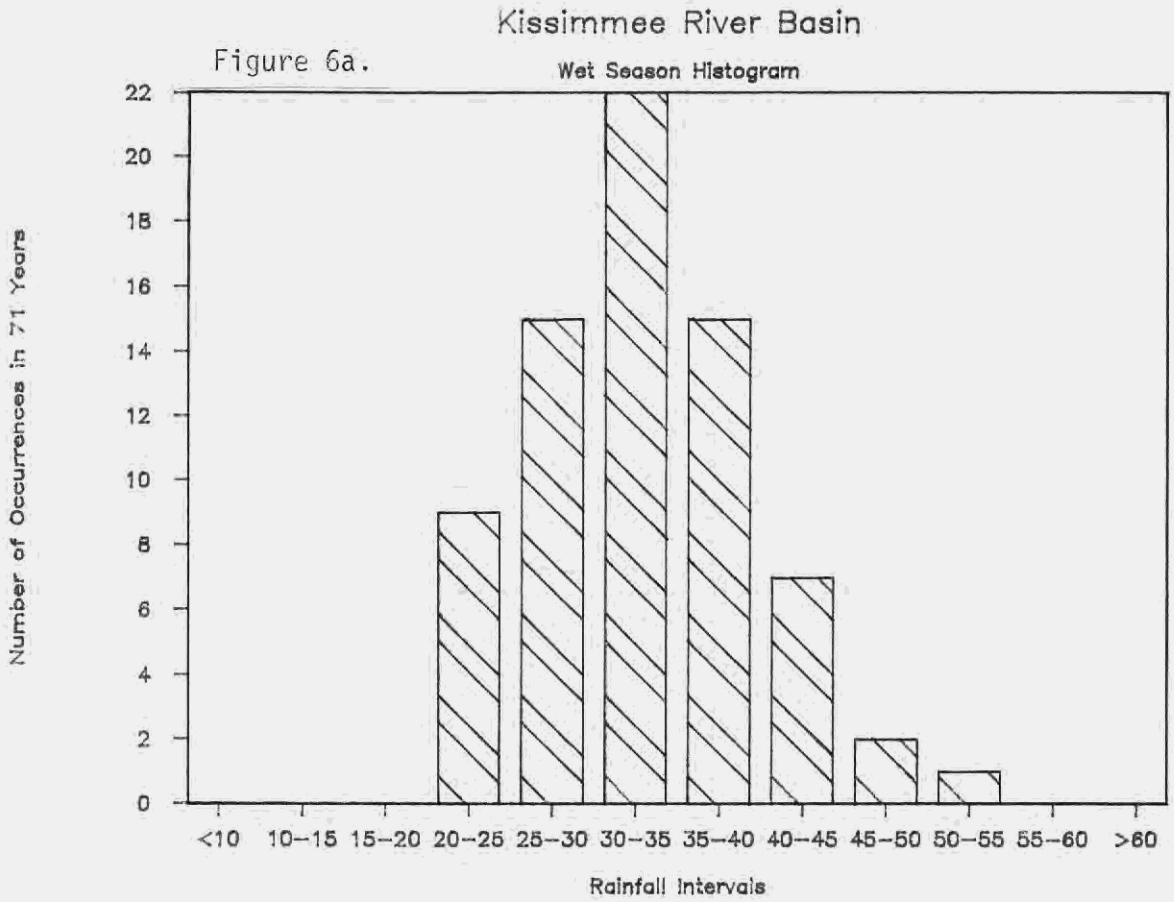
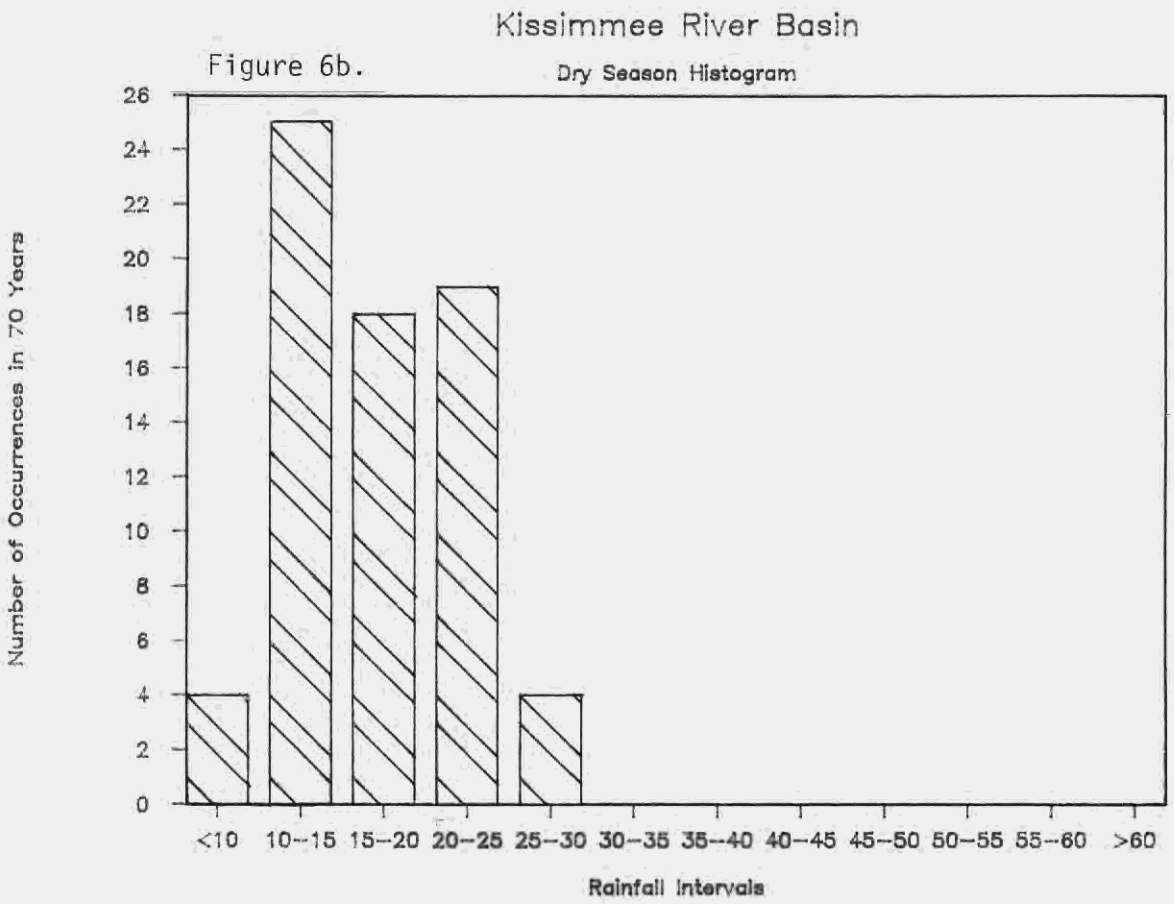


Figure 6b.



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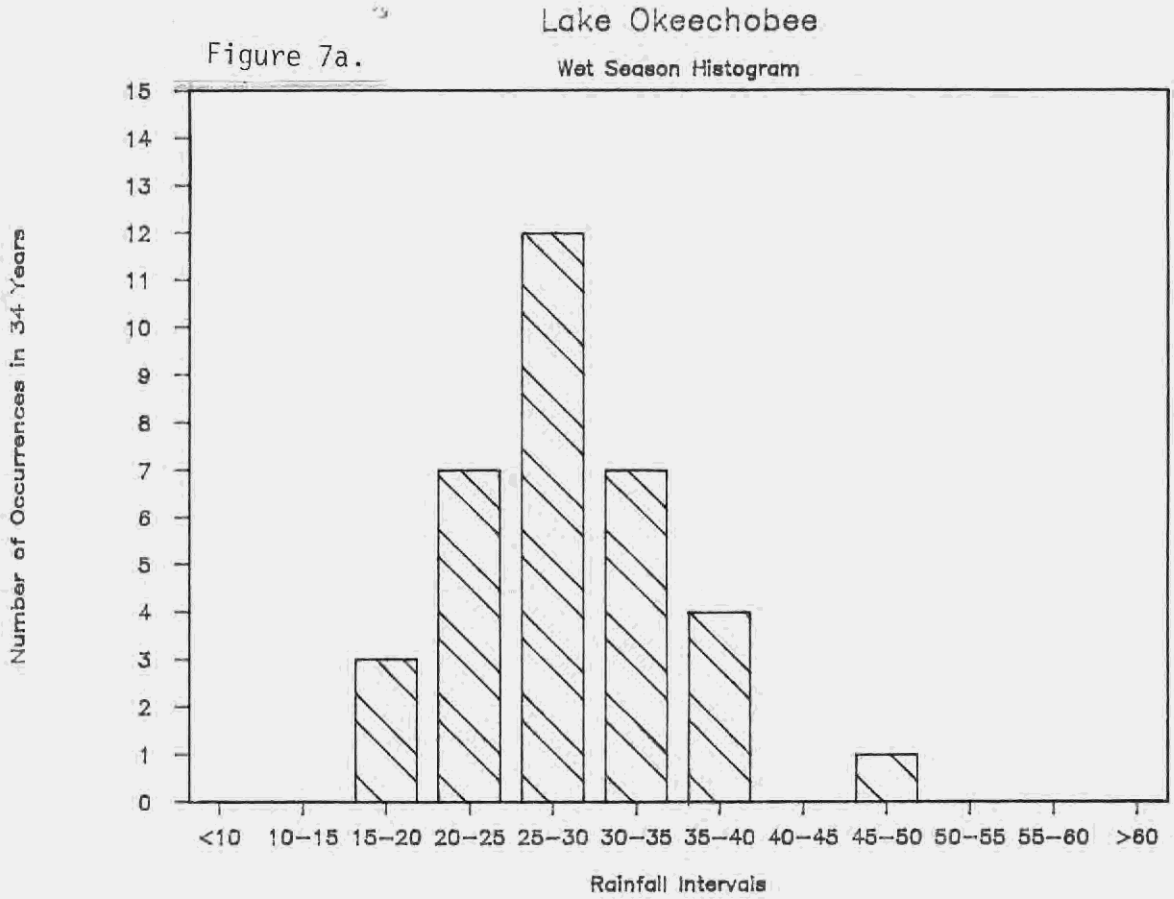


Figure 7b.

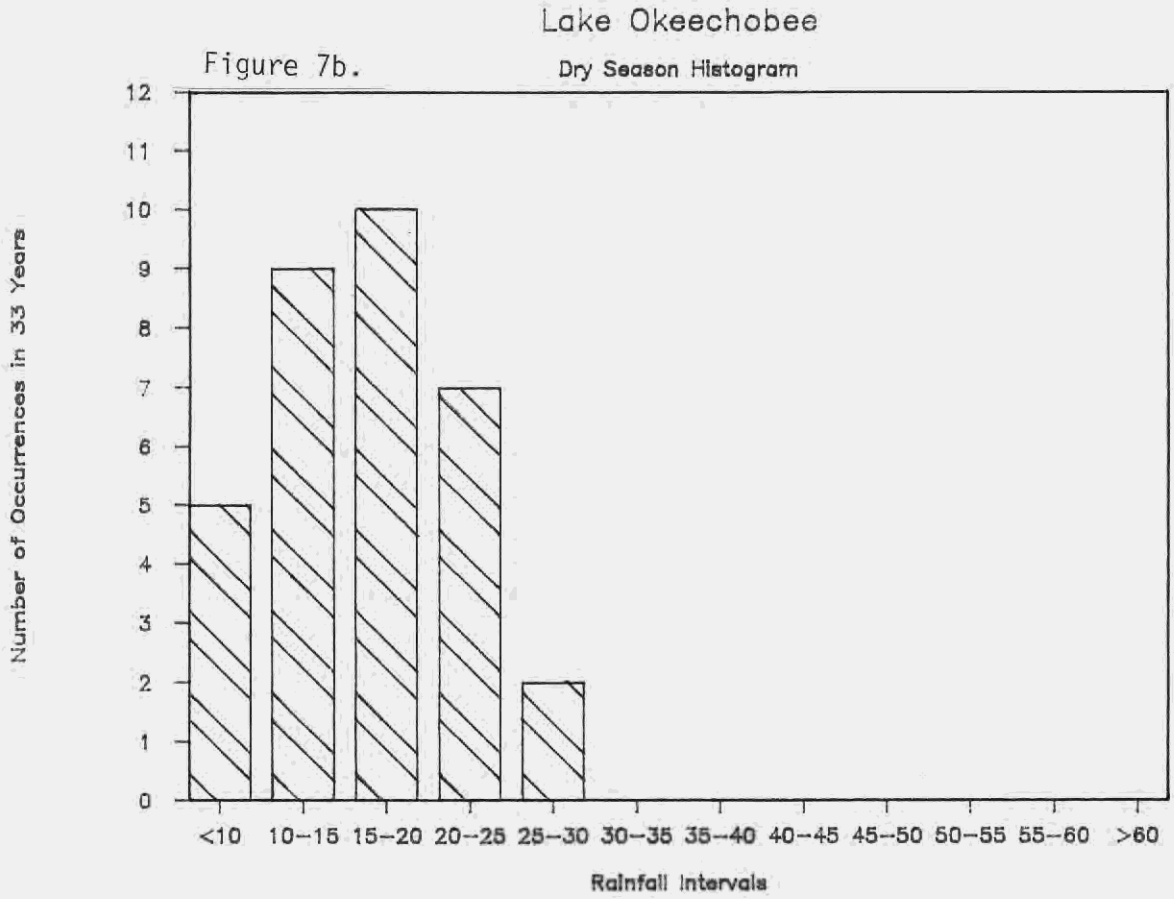
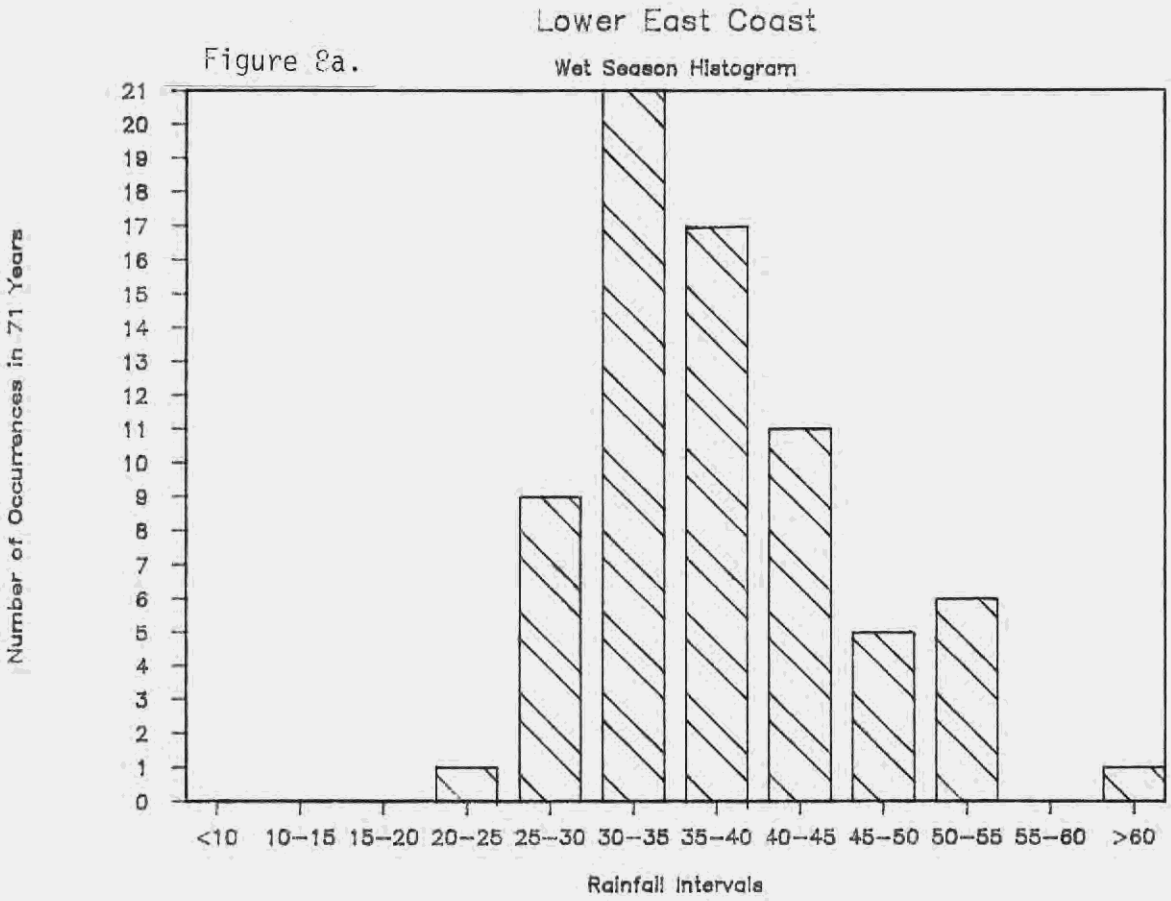


Figure 8a.



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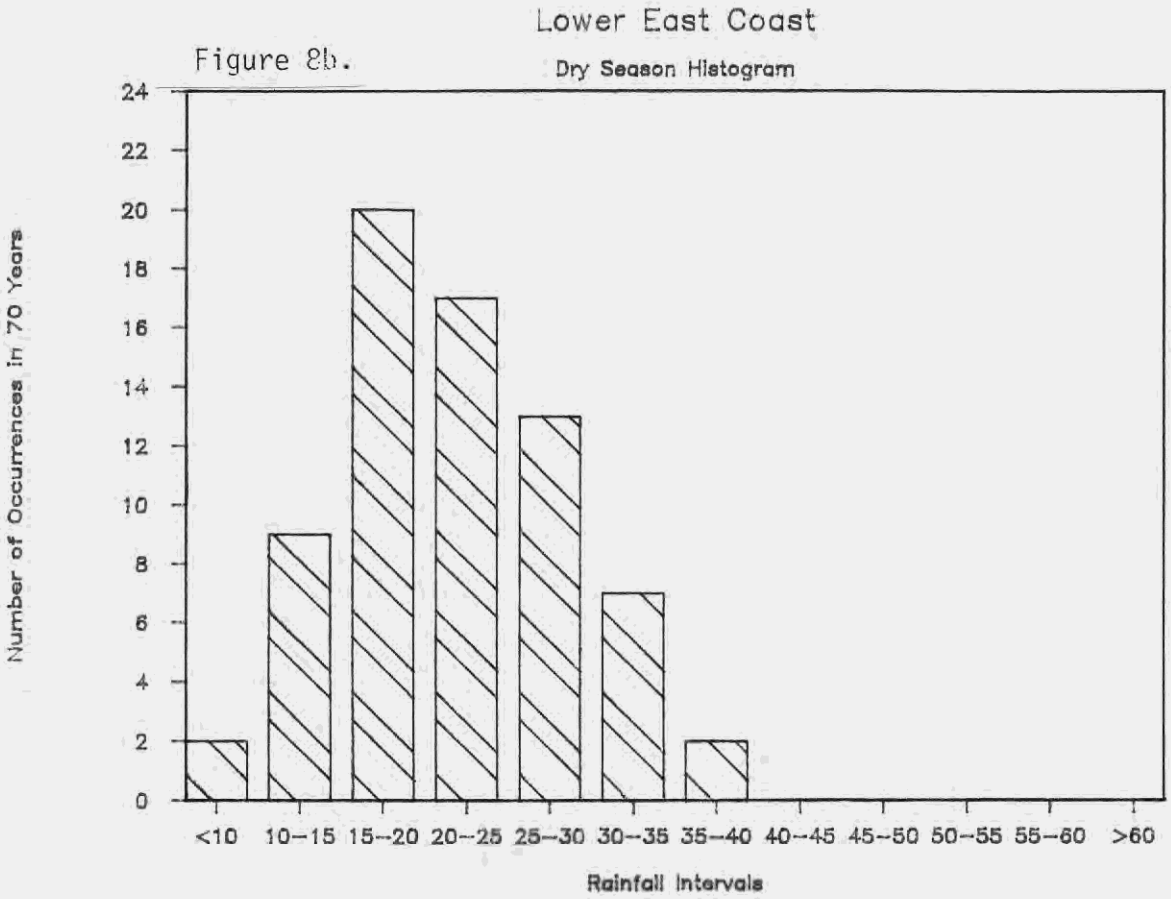

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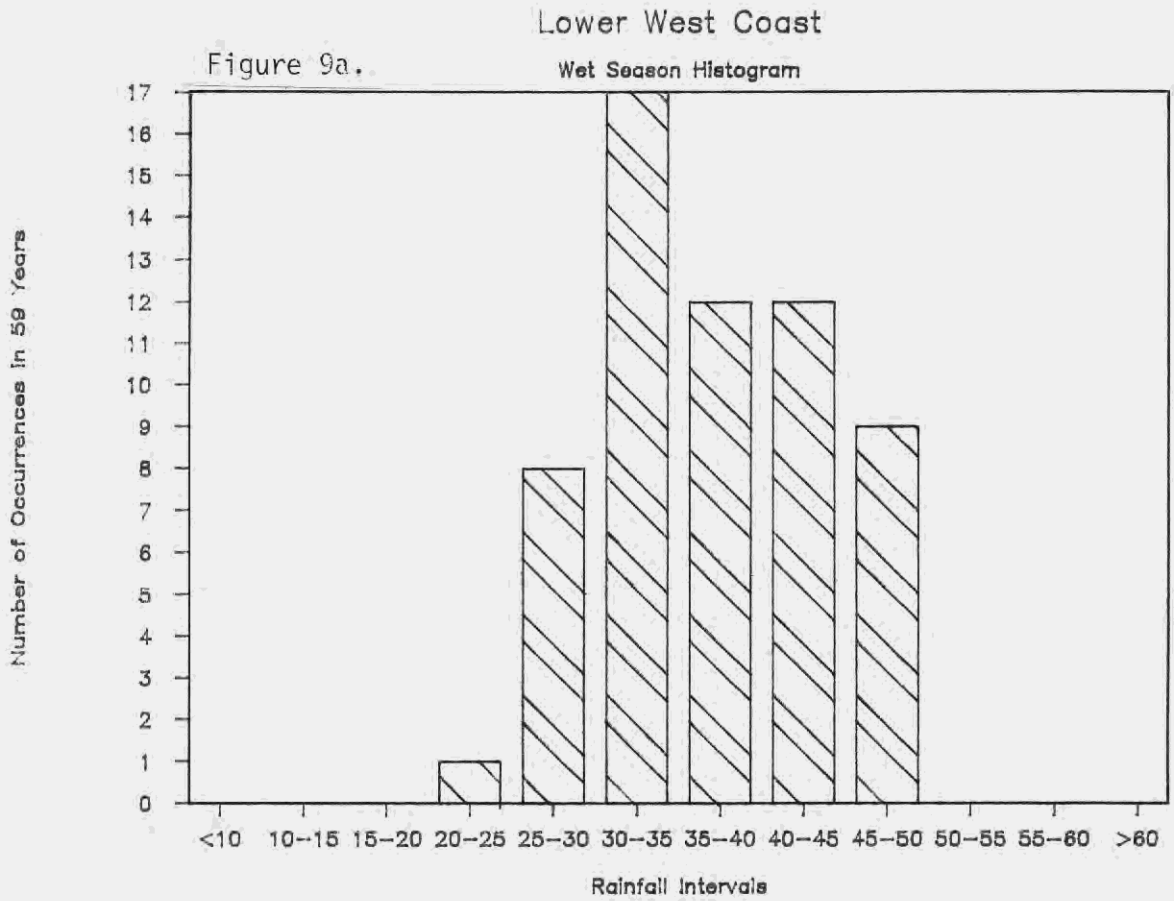

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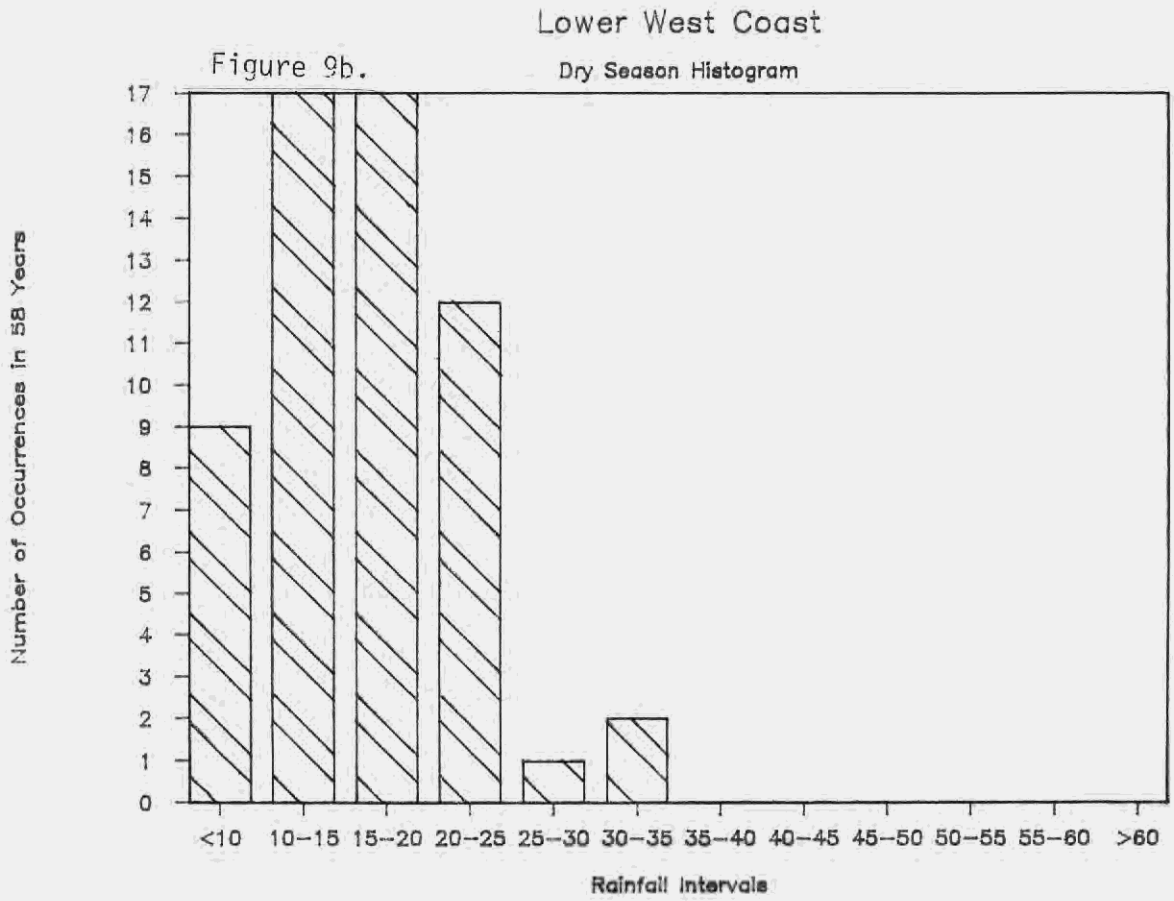

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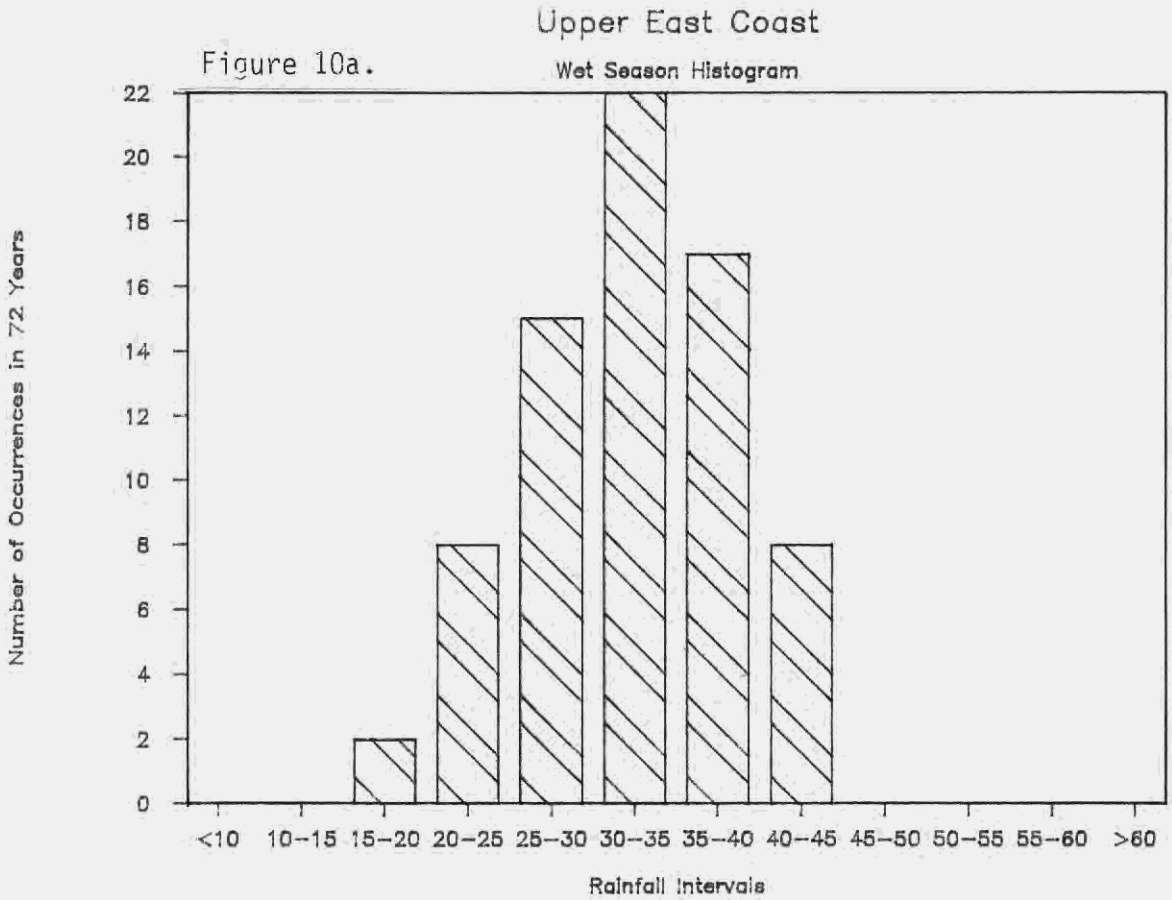

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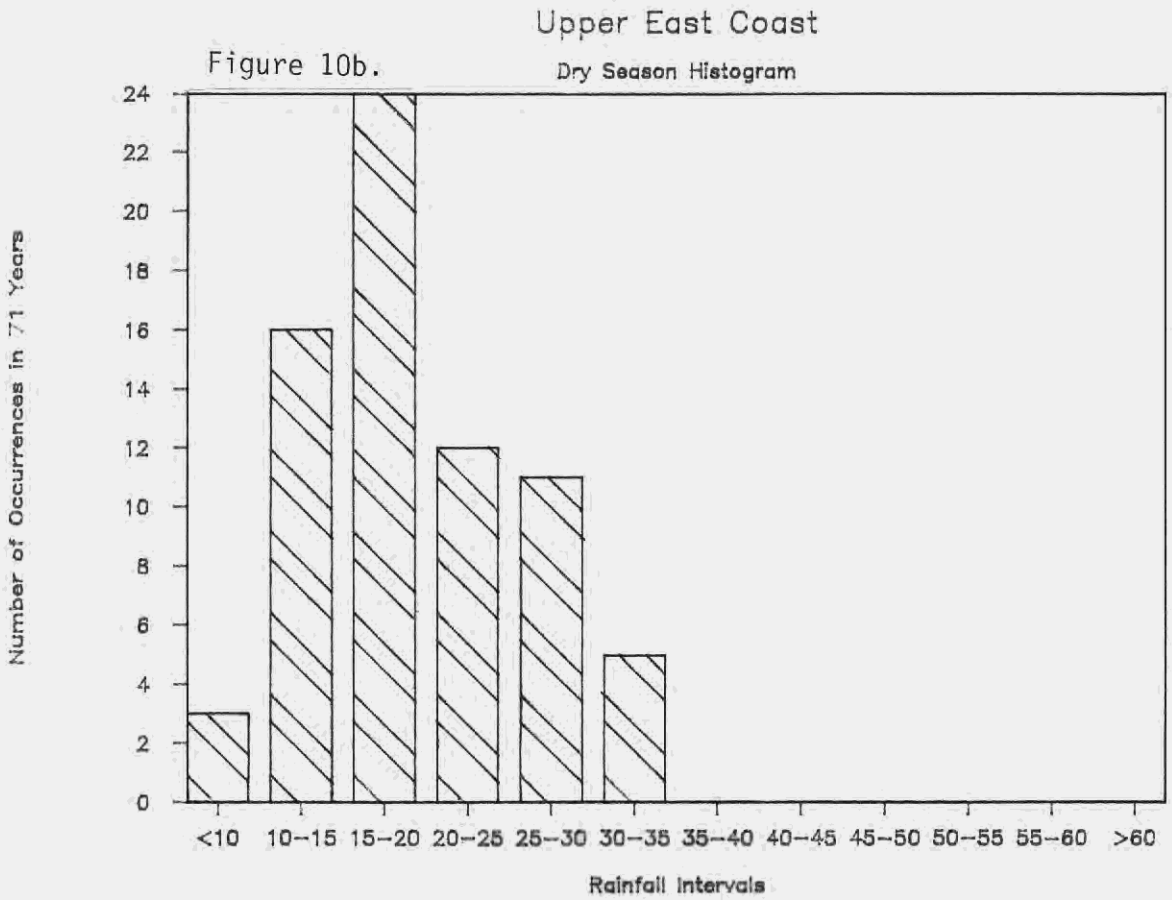

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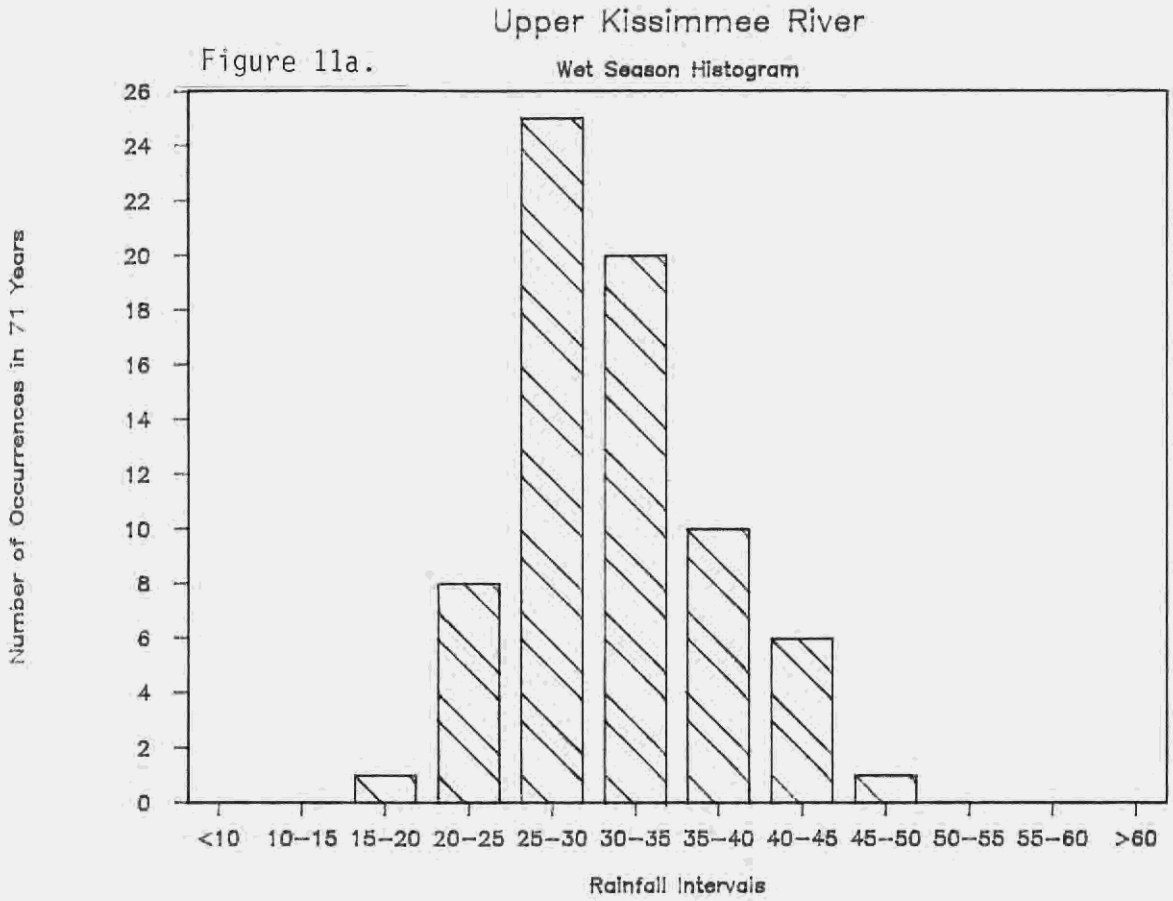

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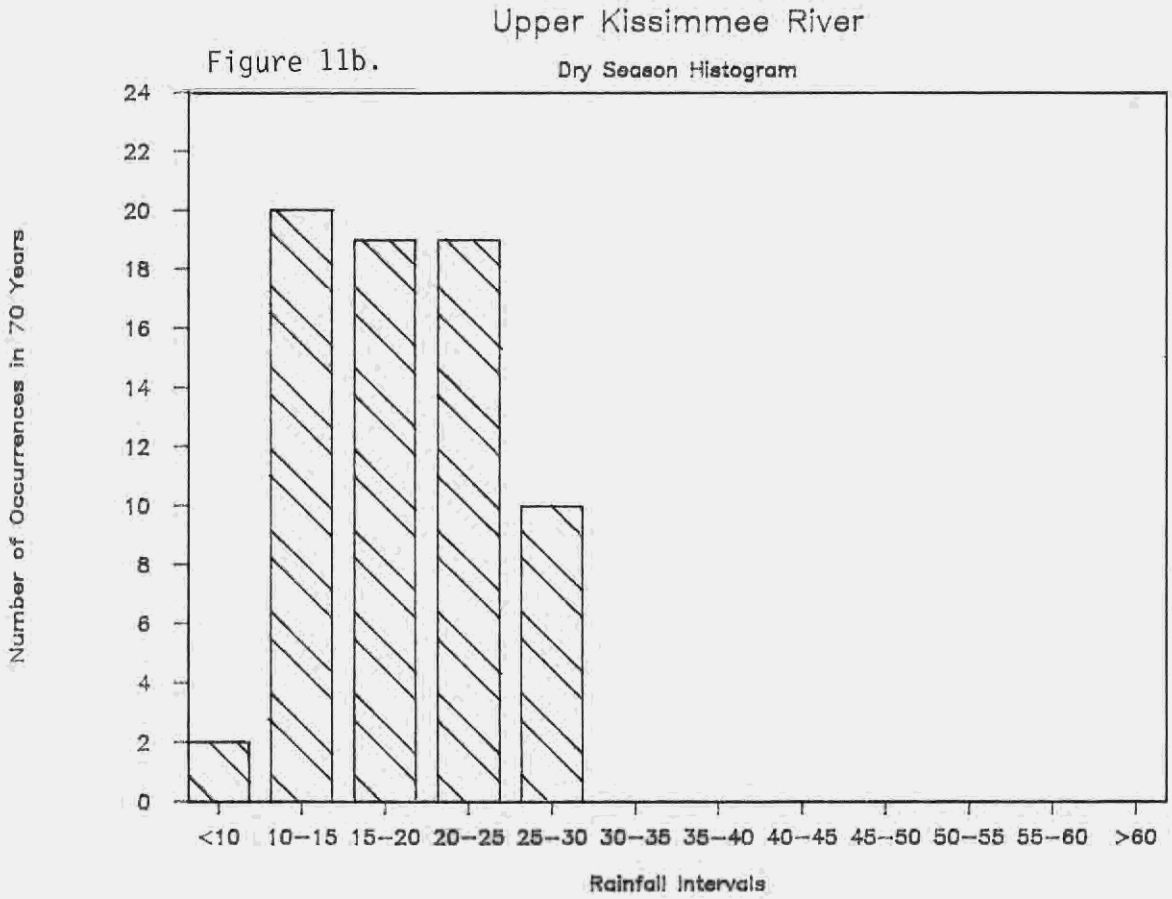
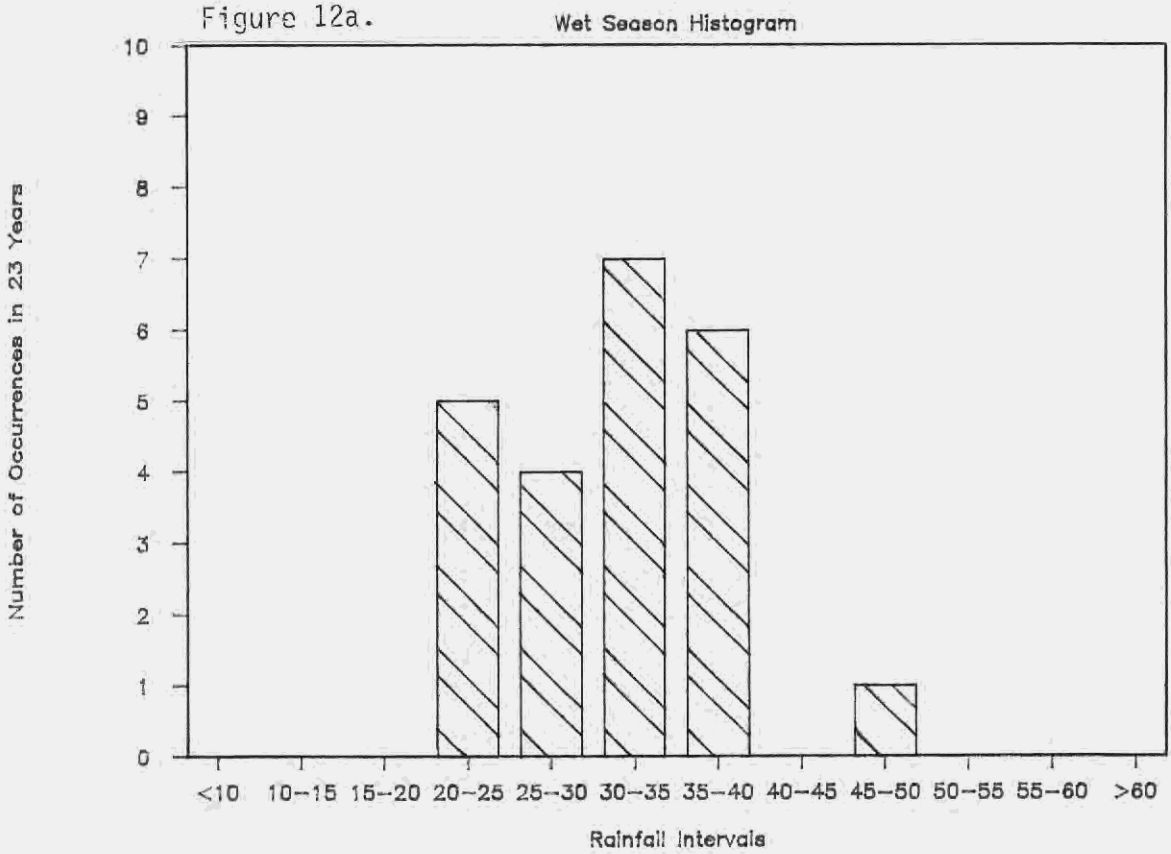


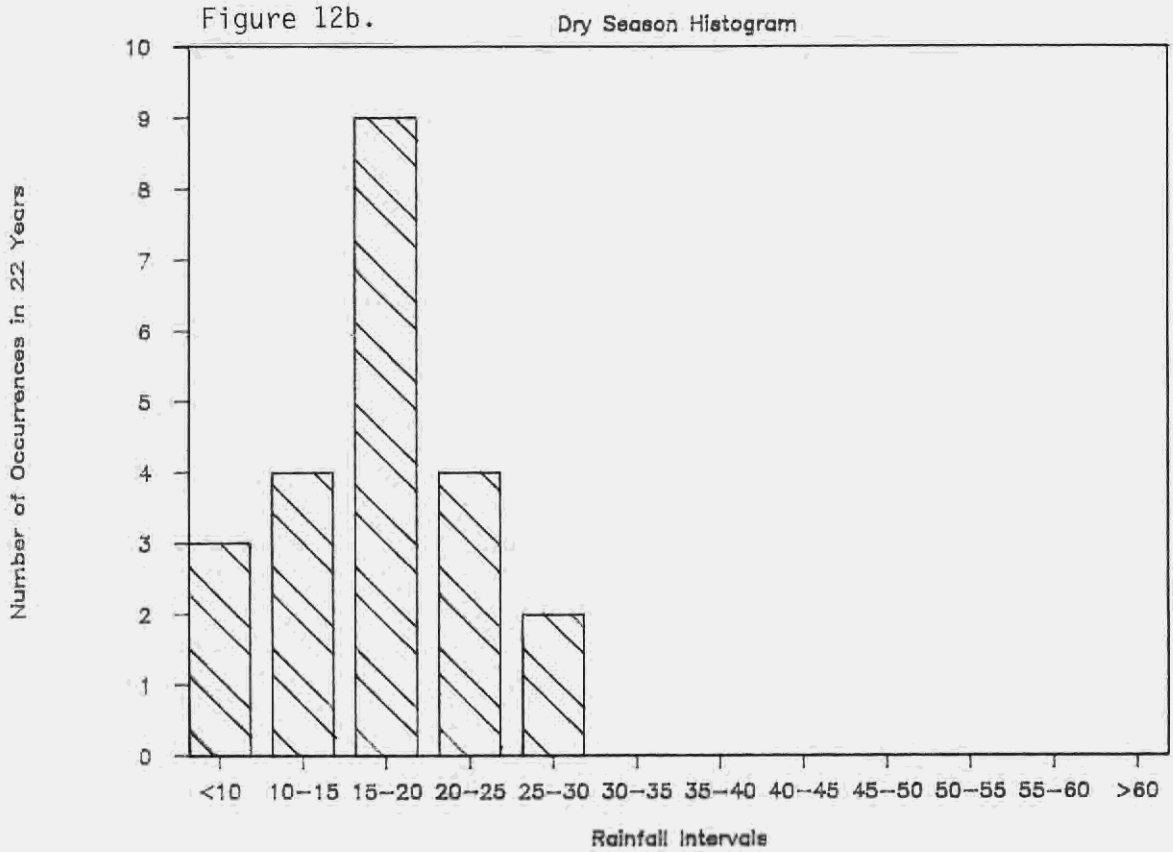
Water Conservation Area 1

Figure 12a.



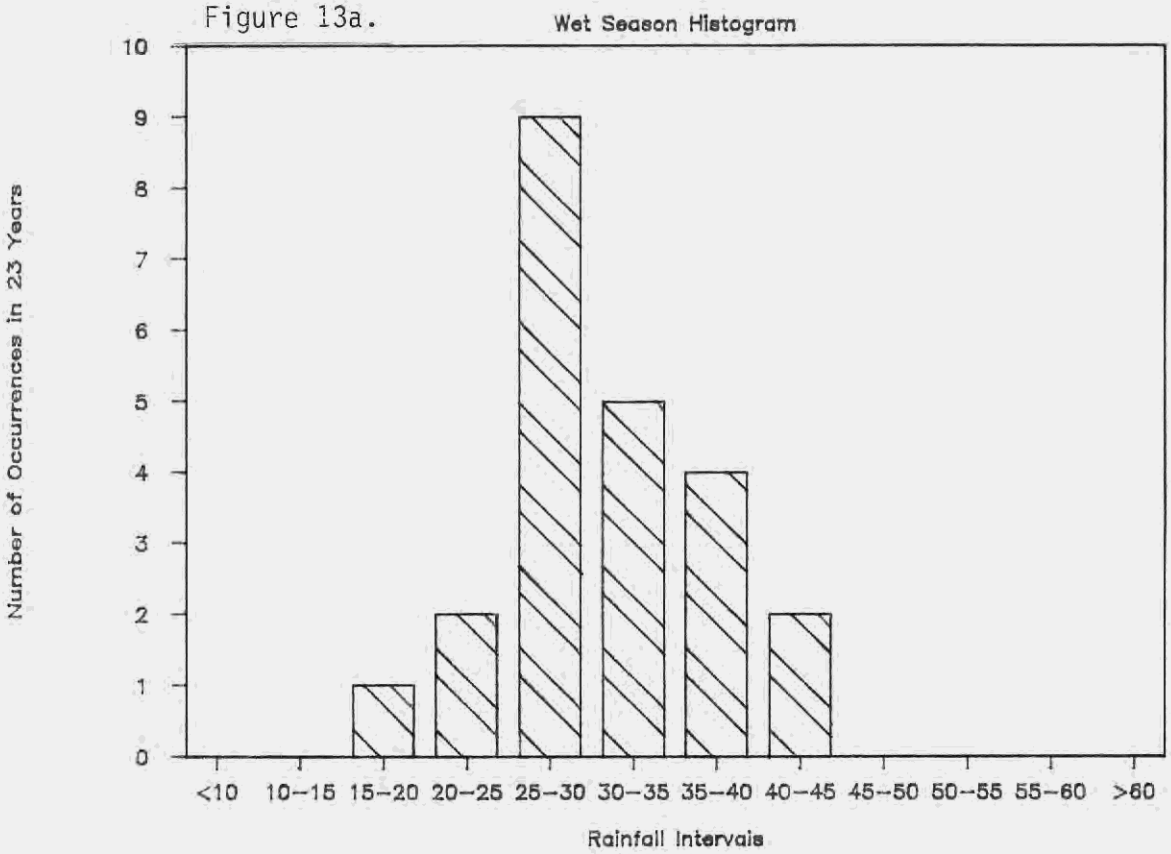
Water Conservation Area 1

Figure 12b.



Water Conservation Area 2

Figure 13a.



Water Conservation Area 2

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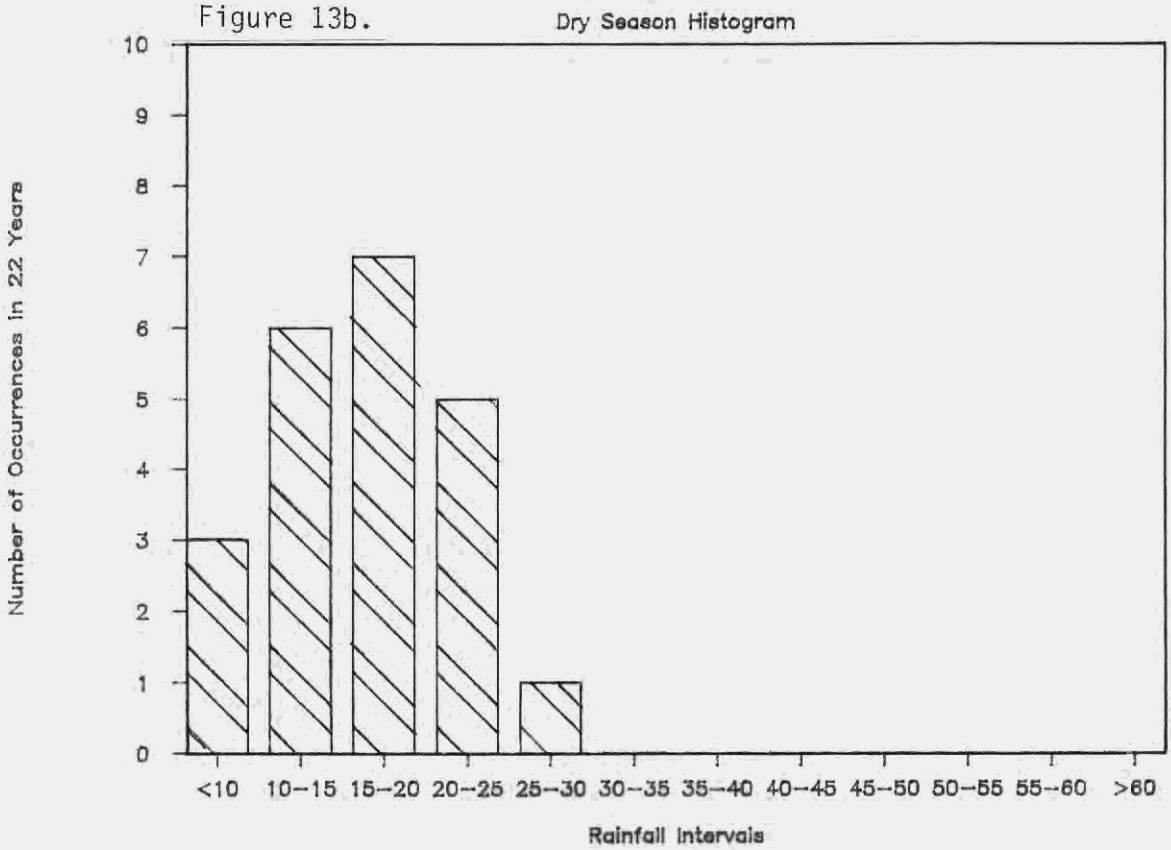

Water Conservation Area 3

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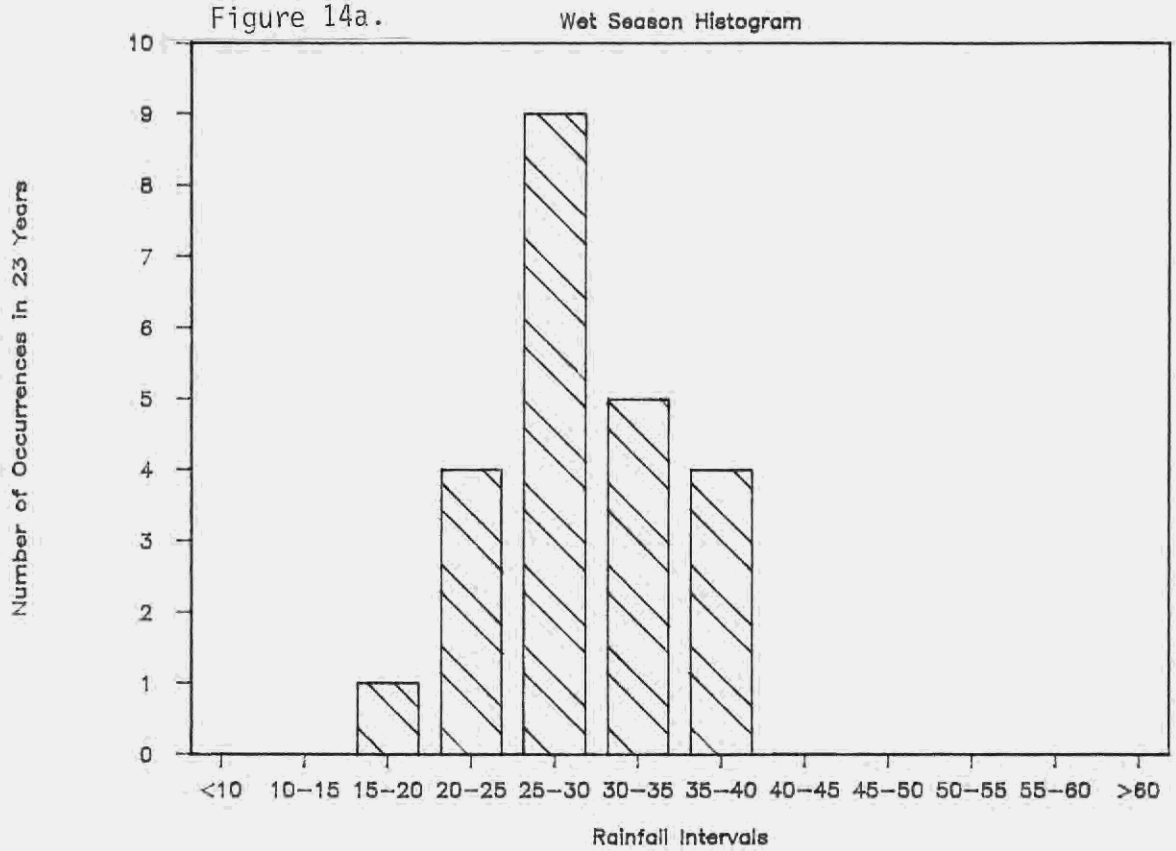

Water Conservation Area 3

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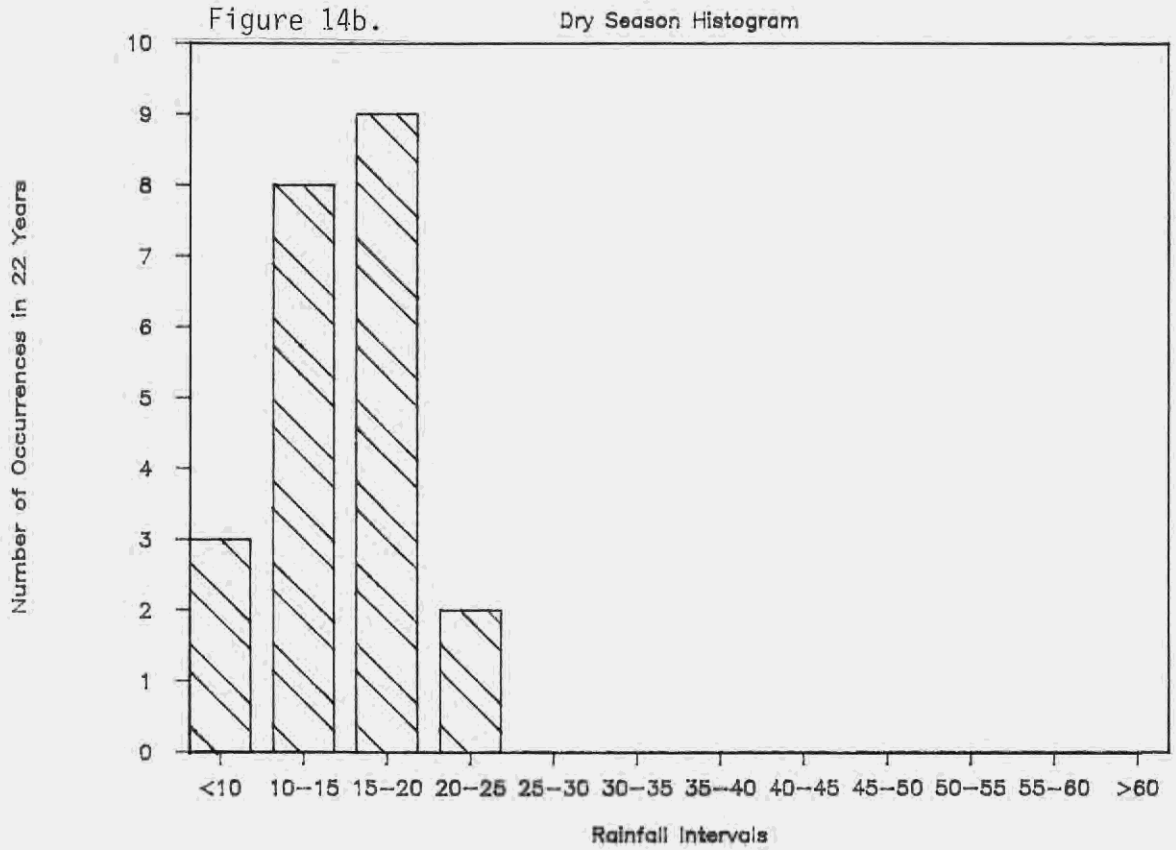

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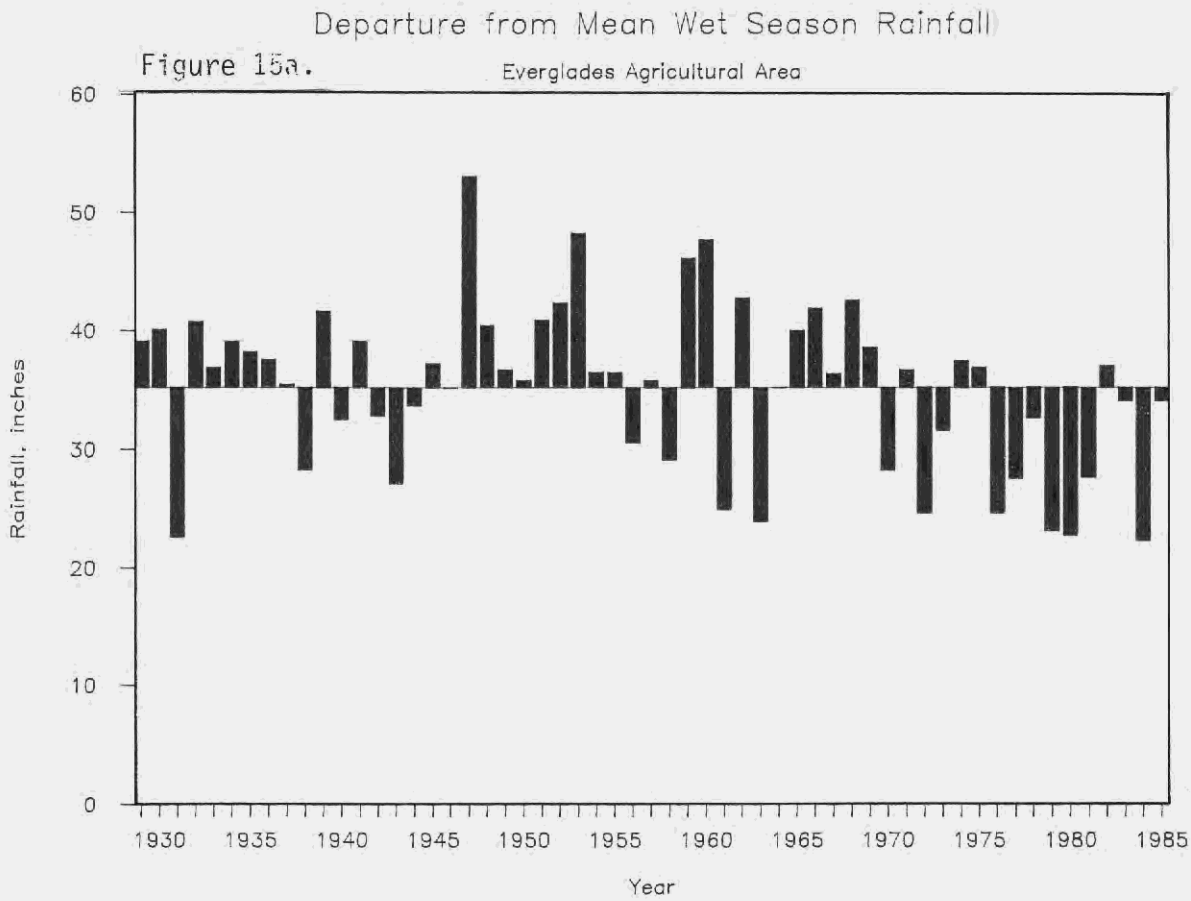

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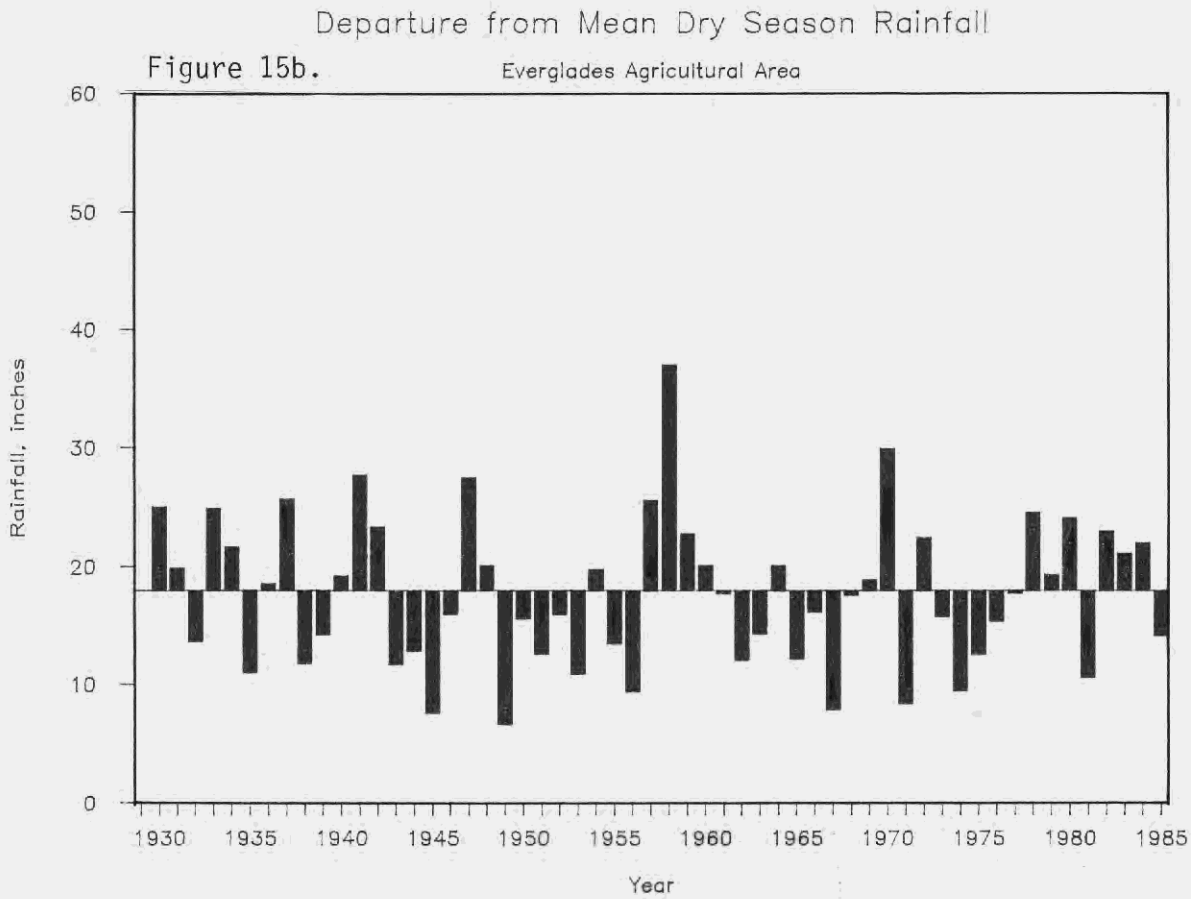

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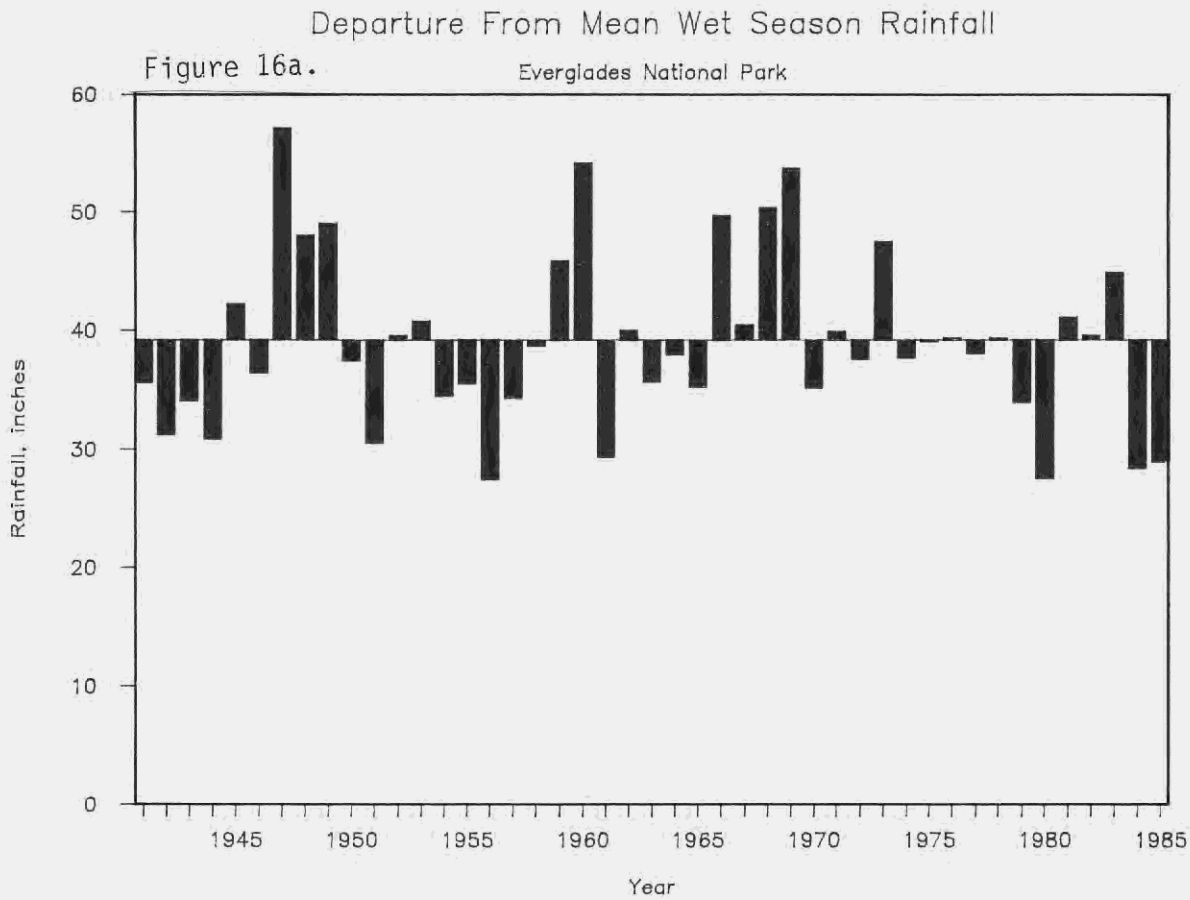

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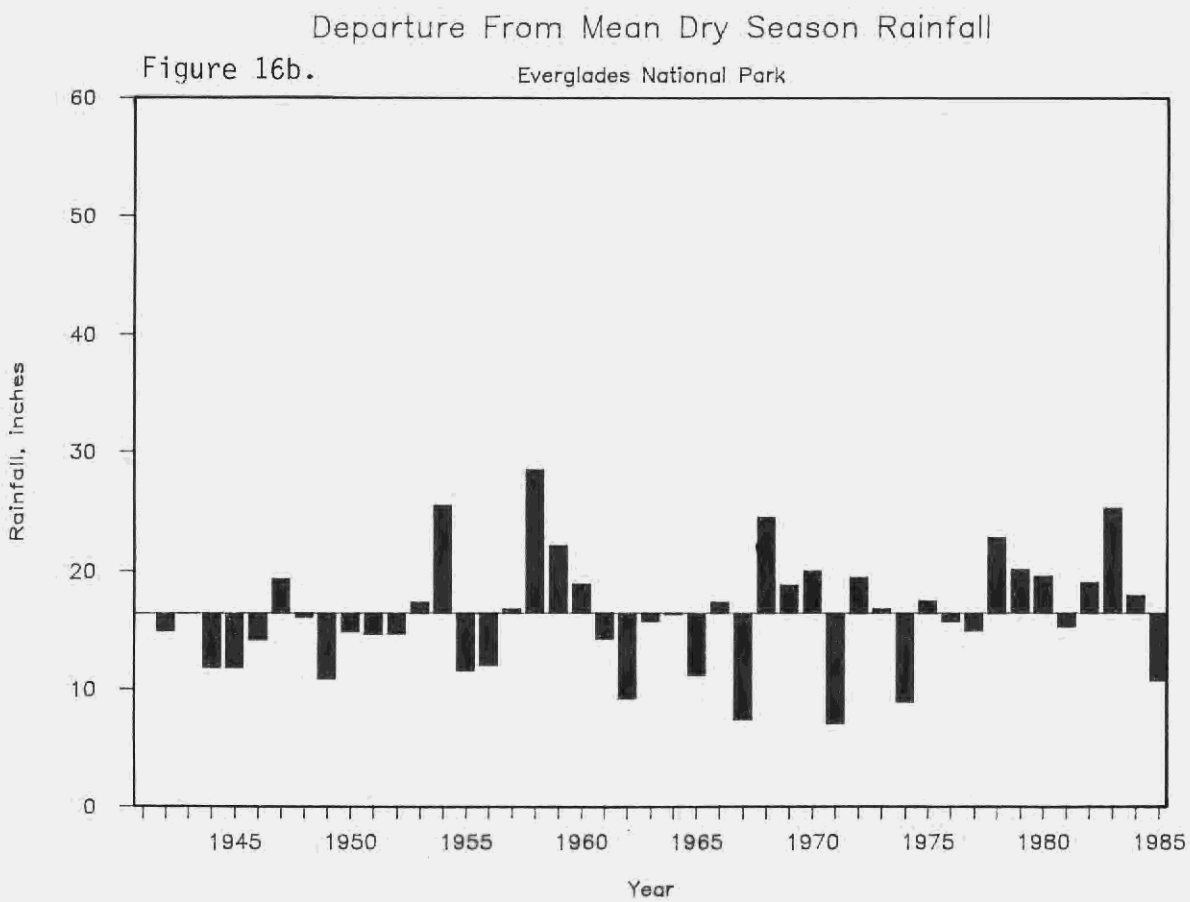
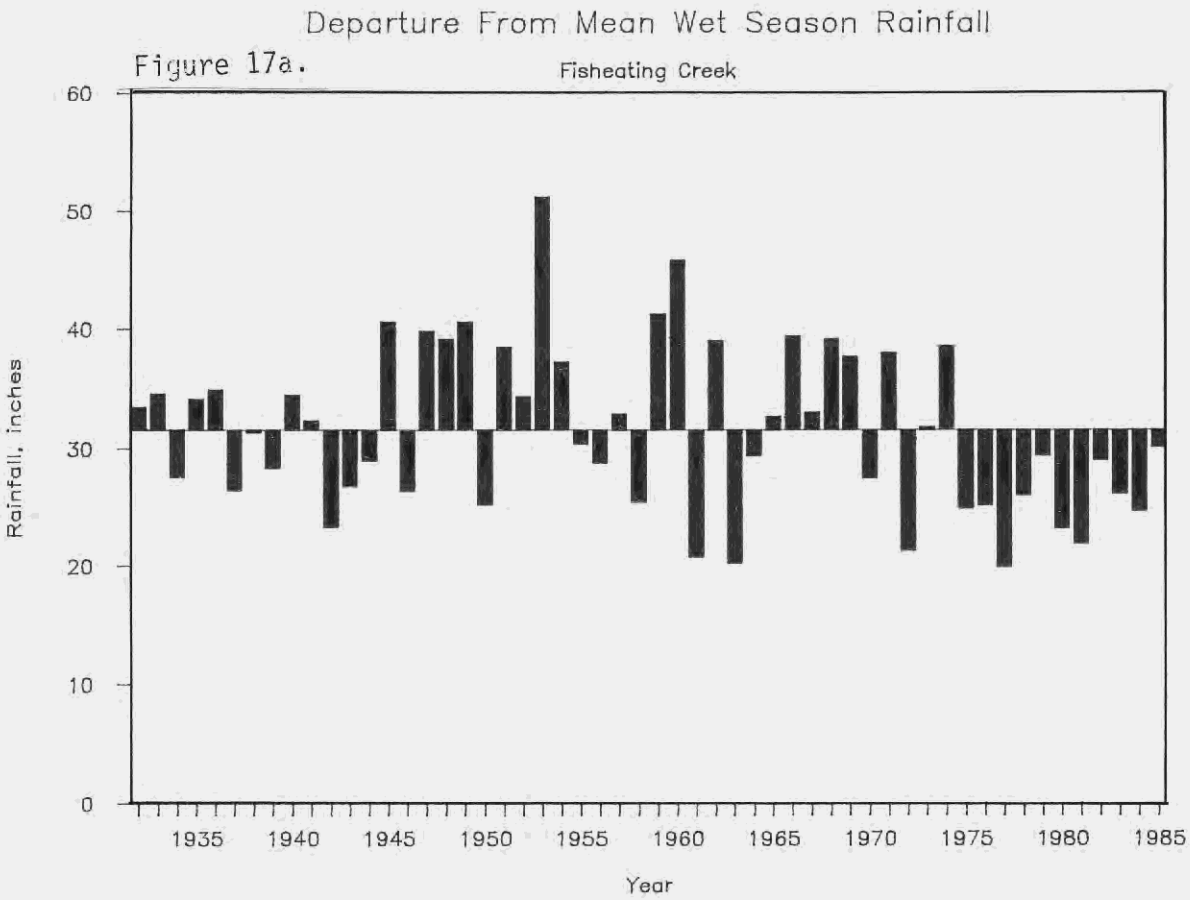


Figure 17a.



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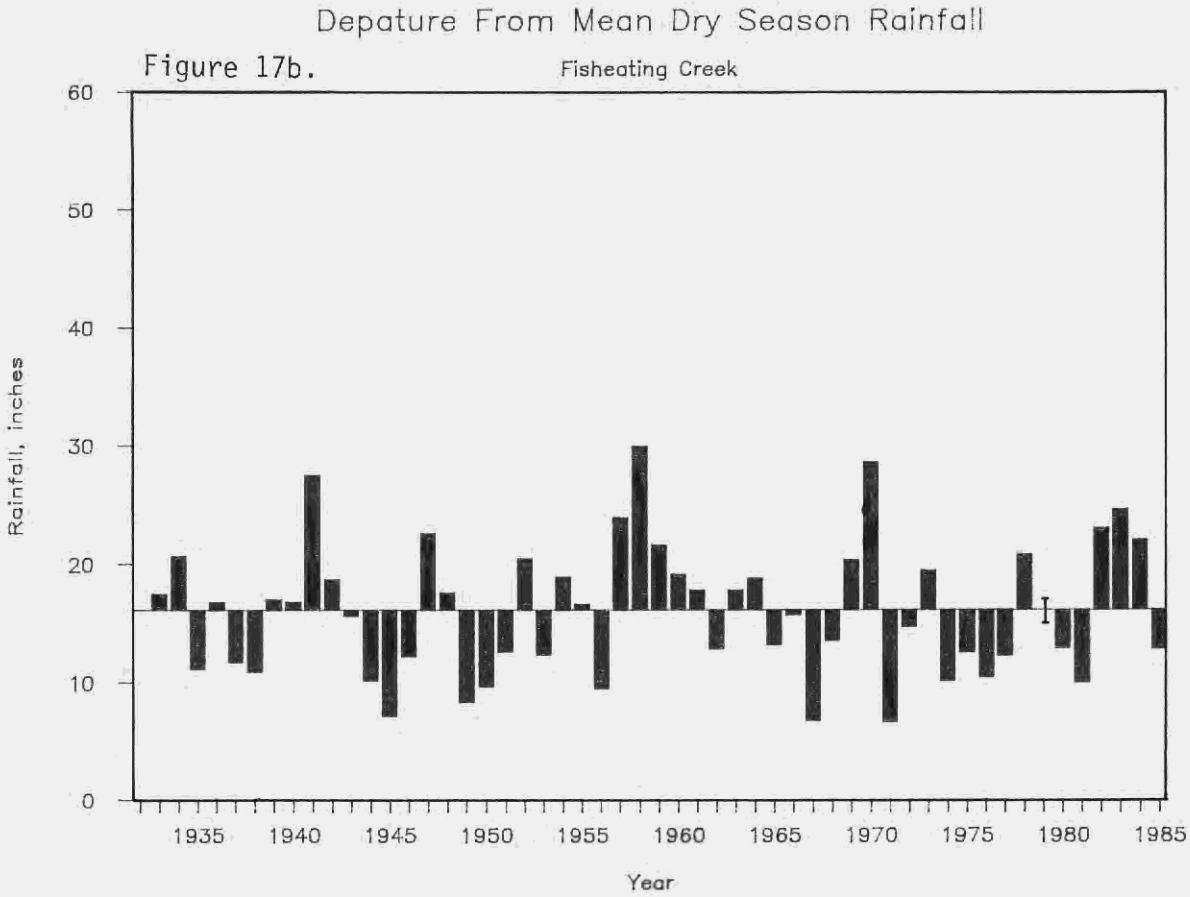

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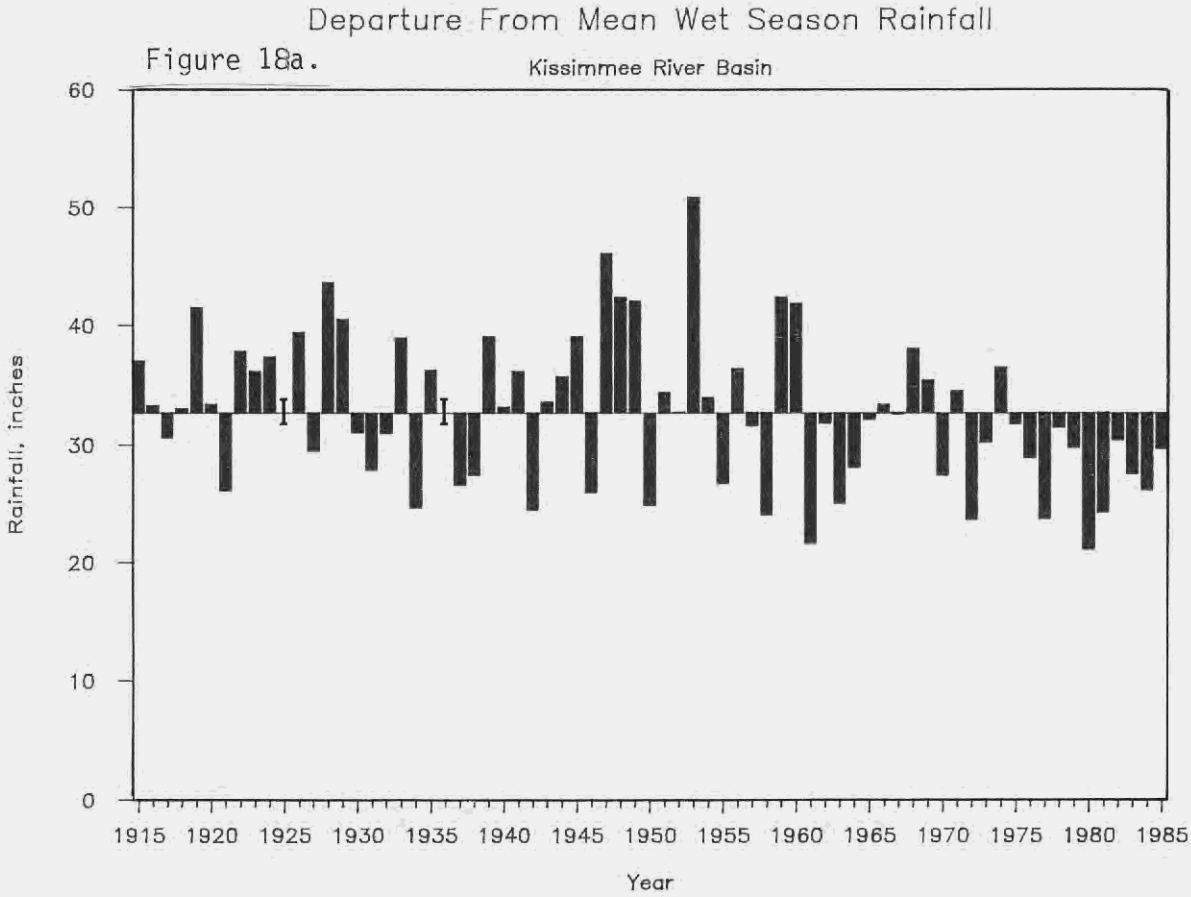

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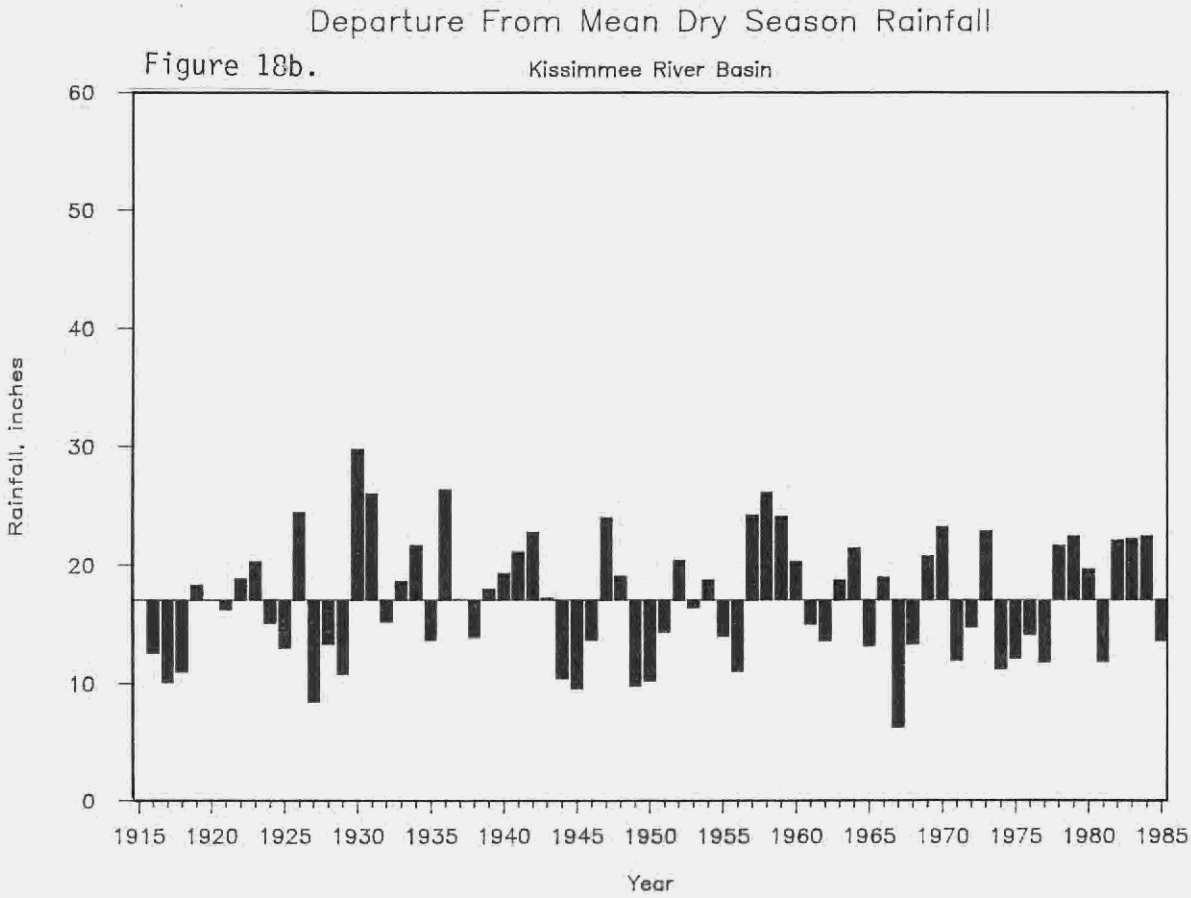

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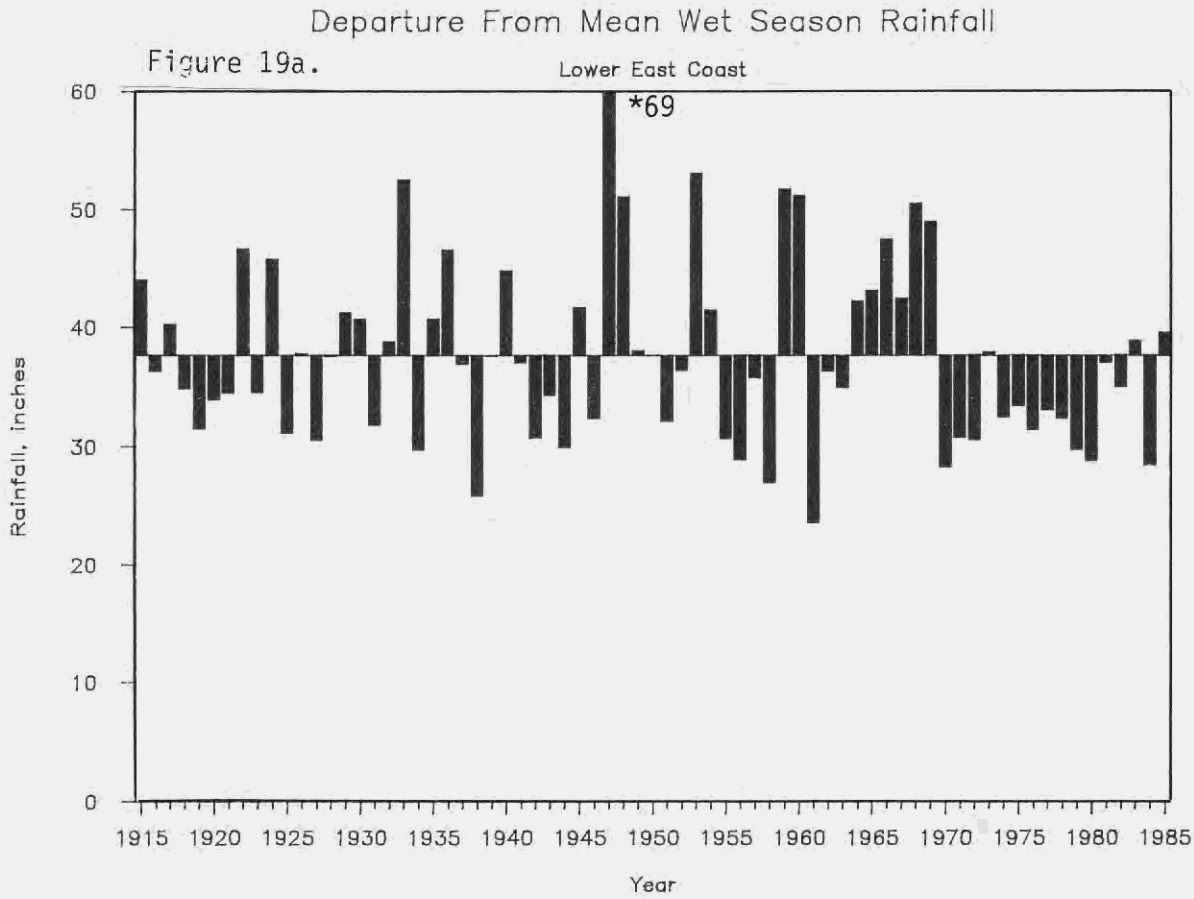

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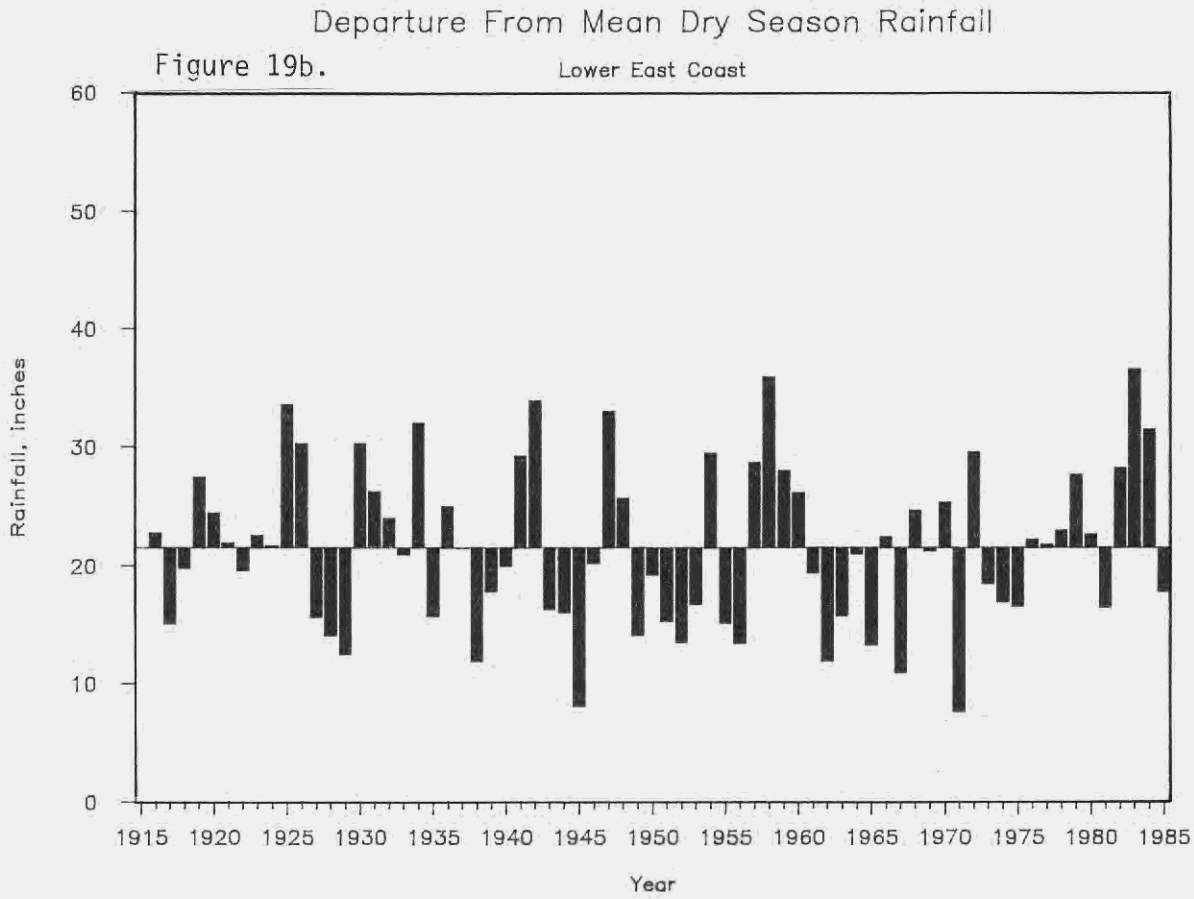


Figure 20a.

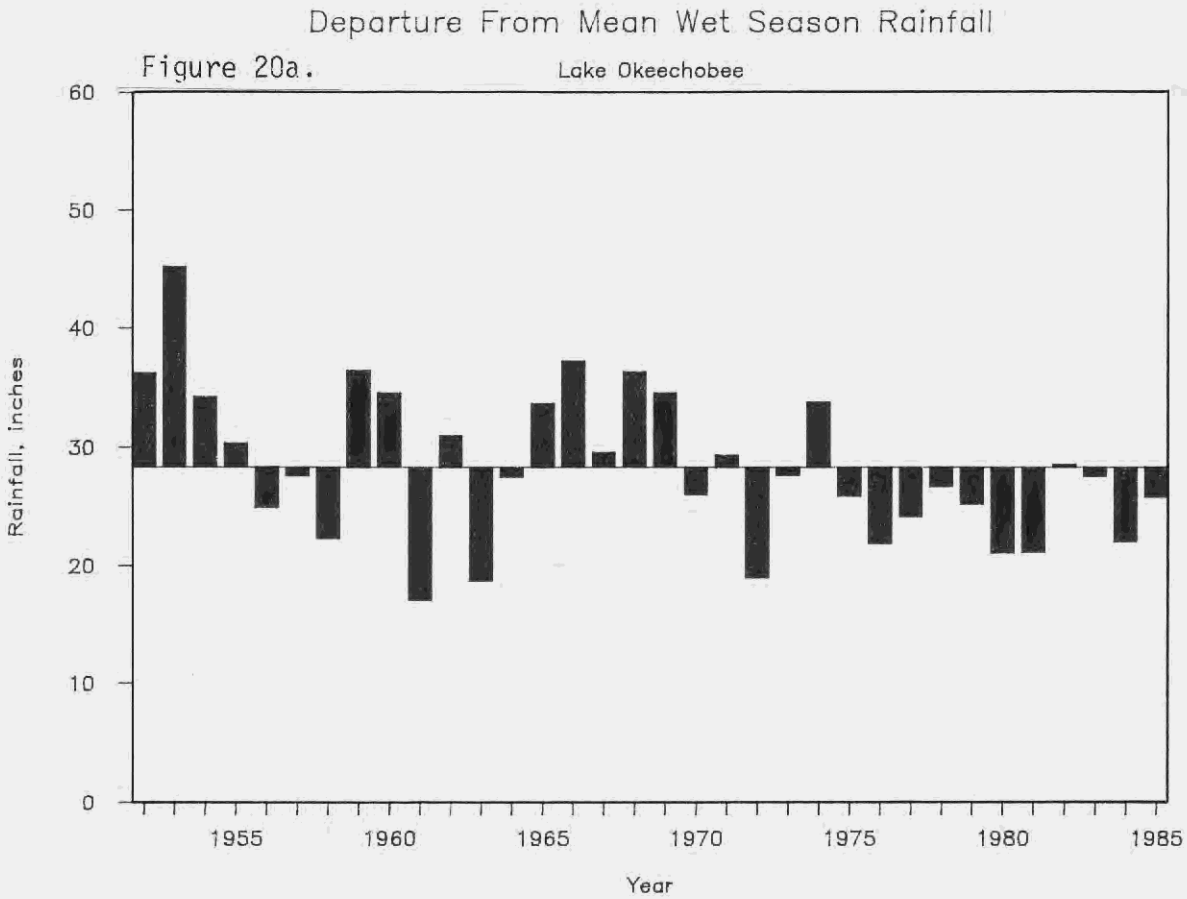
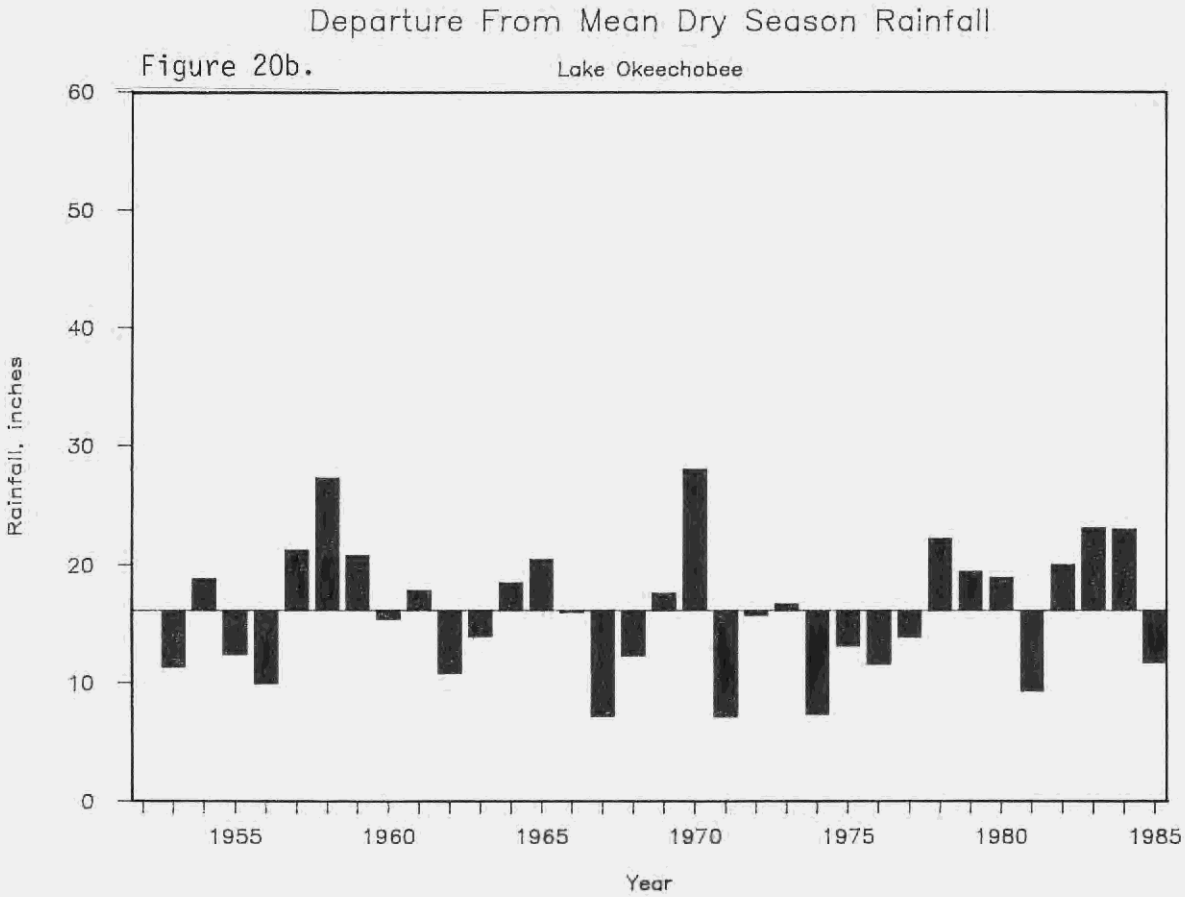


Figure 20b.



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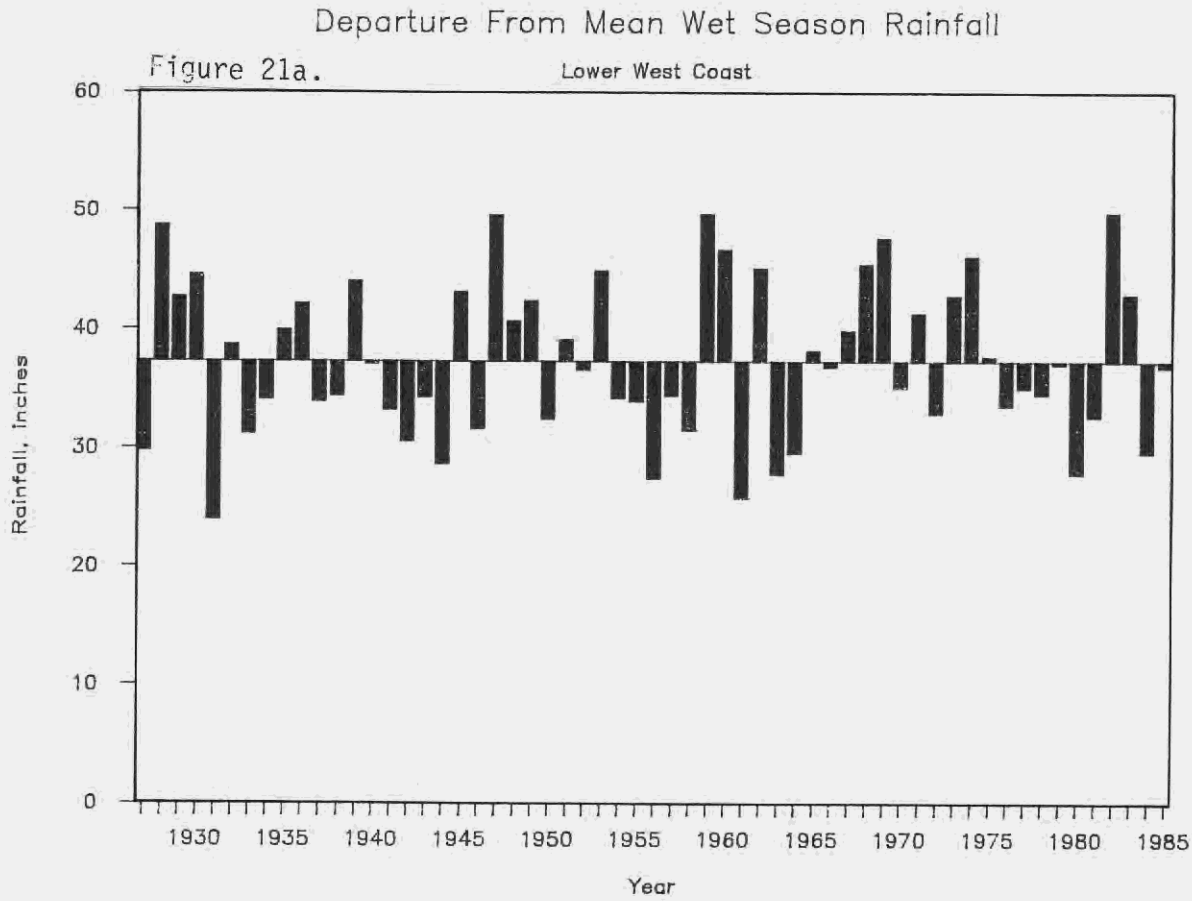

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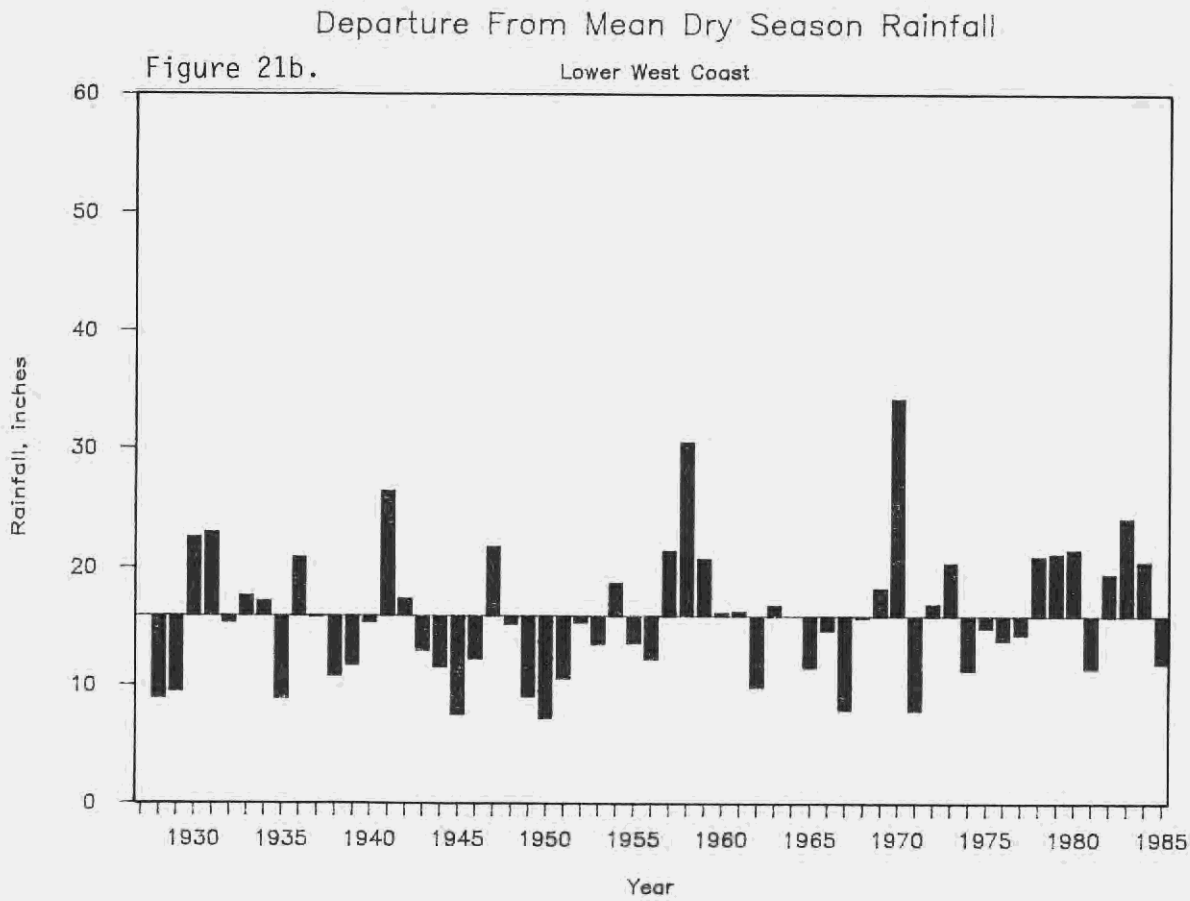

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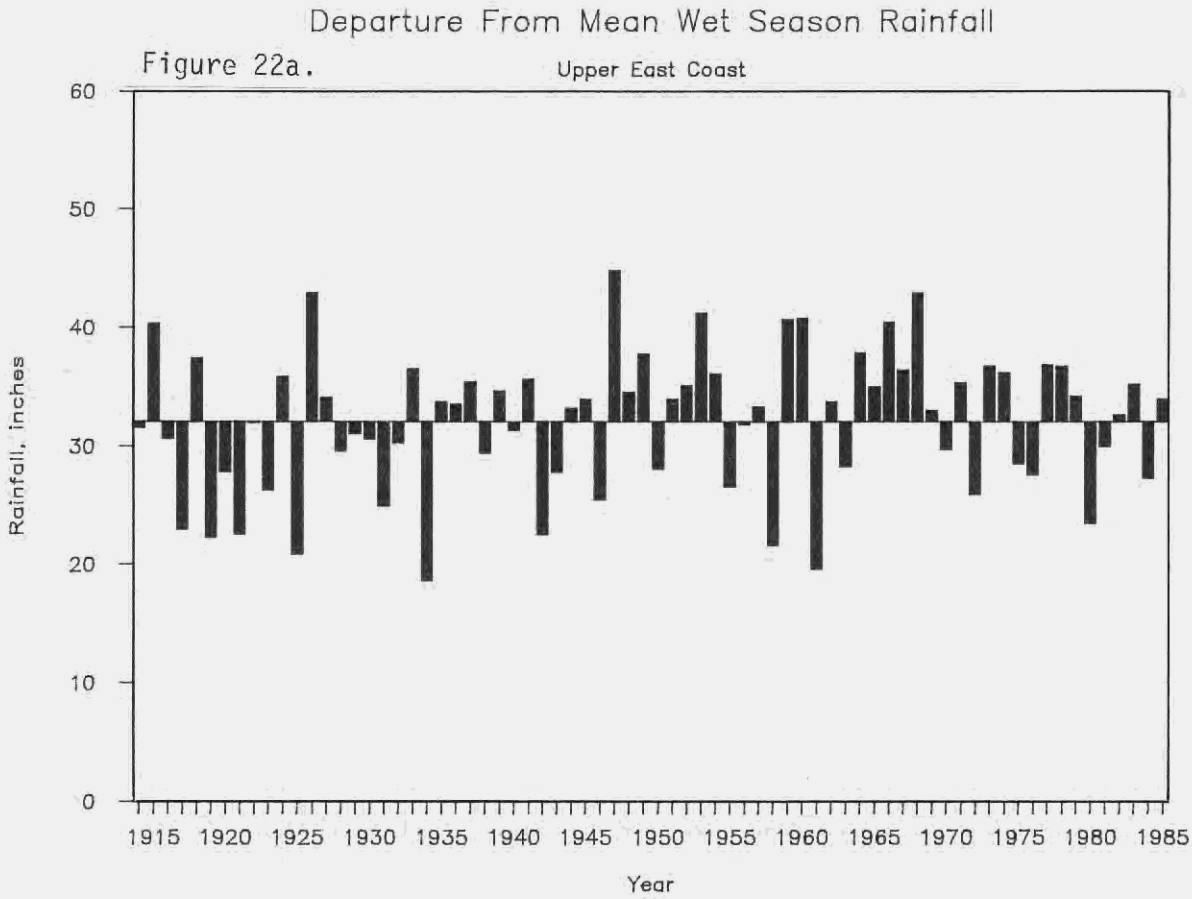

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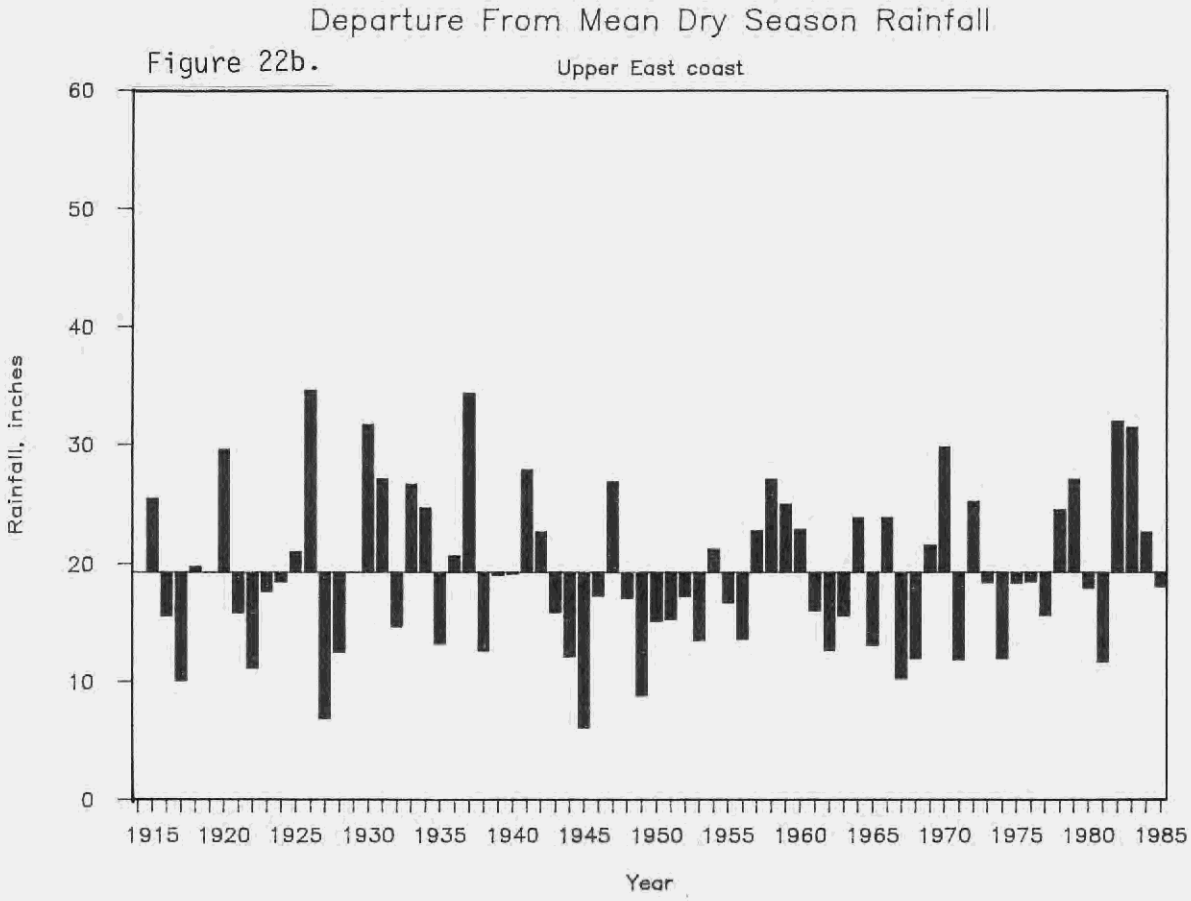

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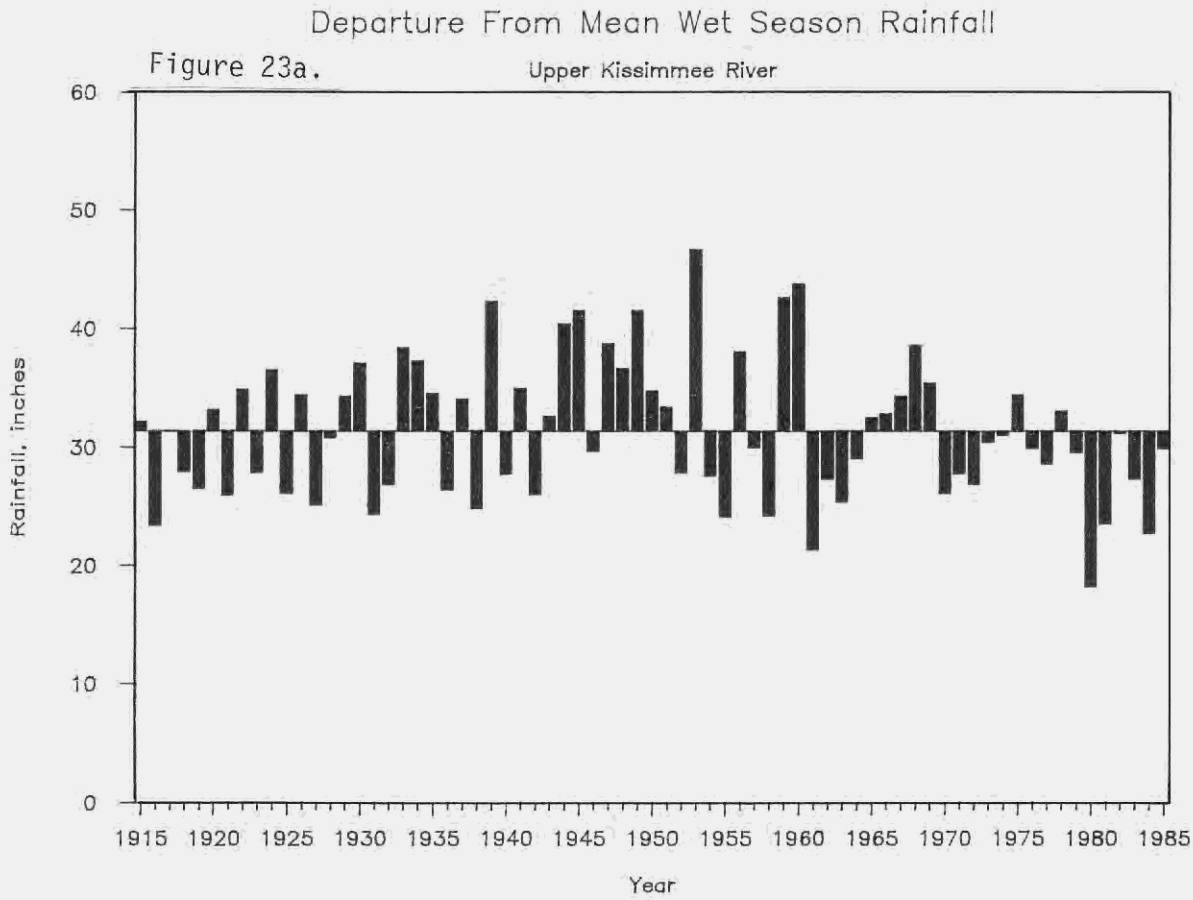

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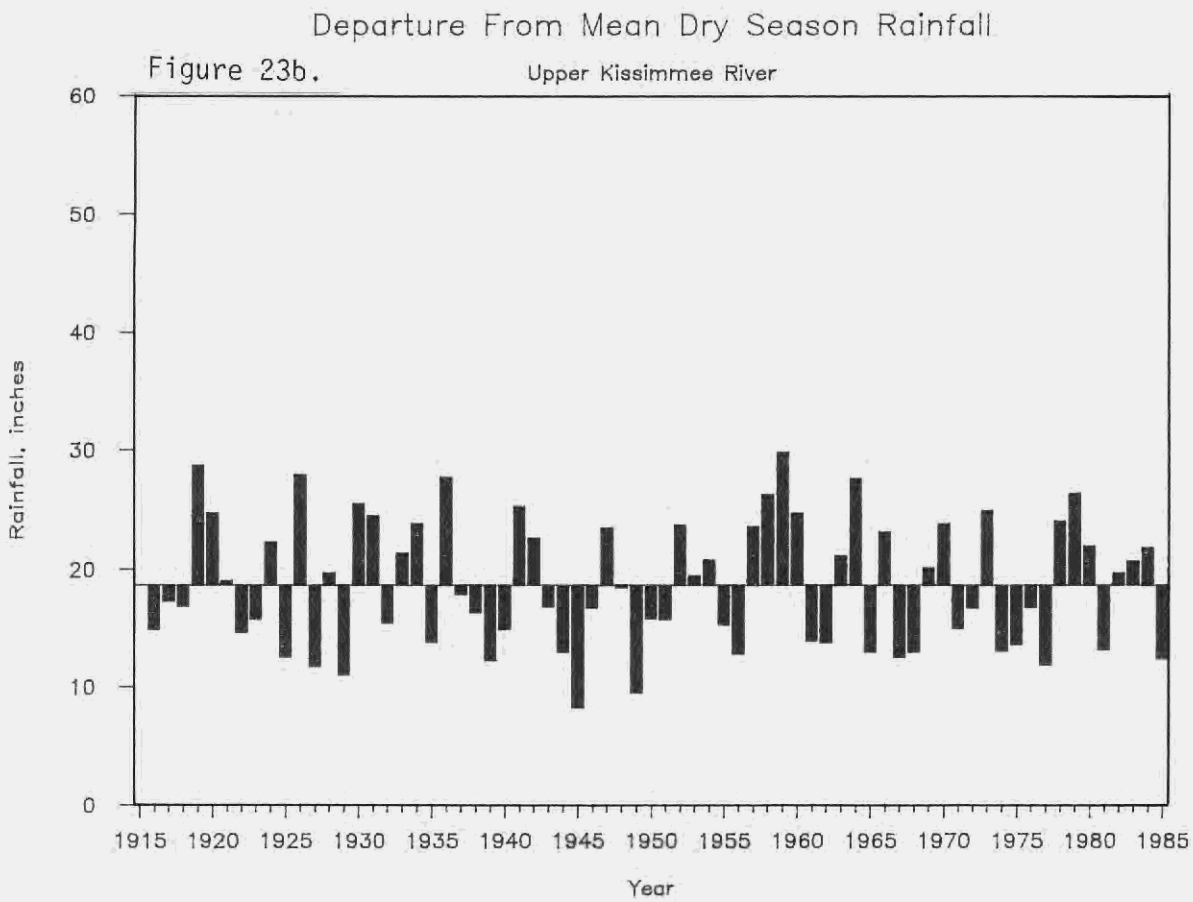

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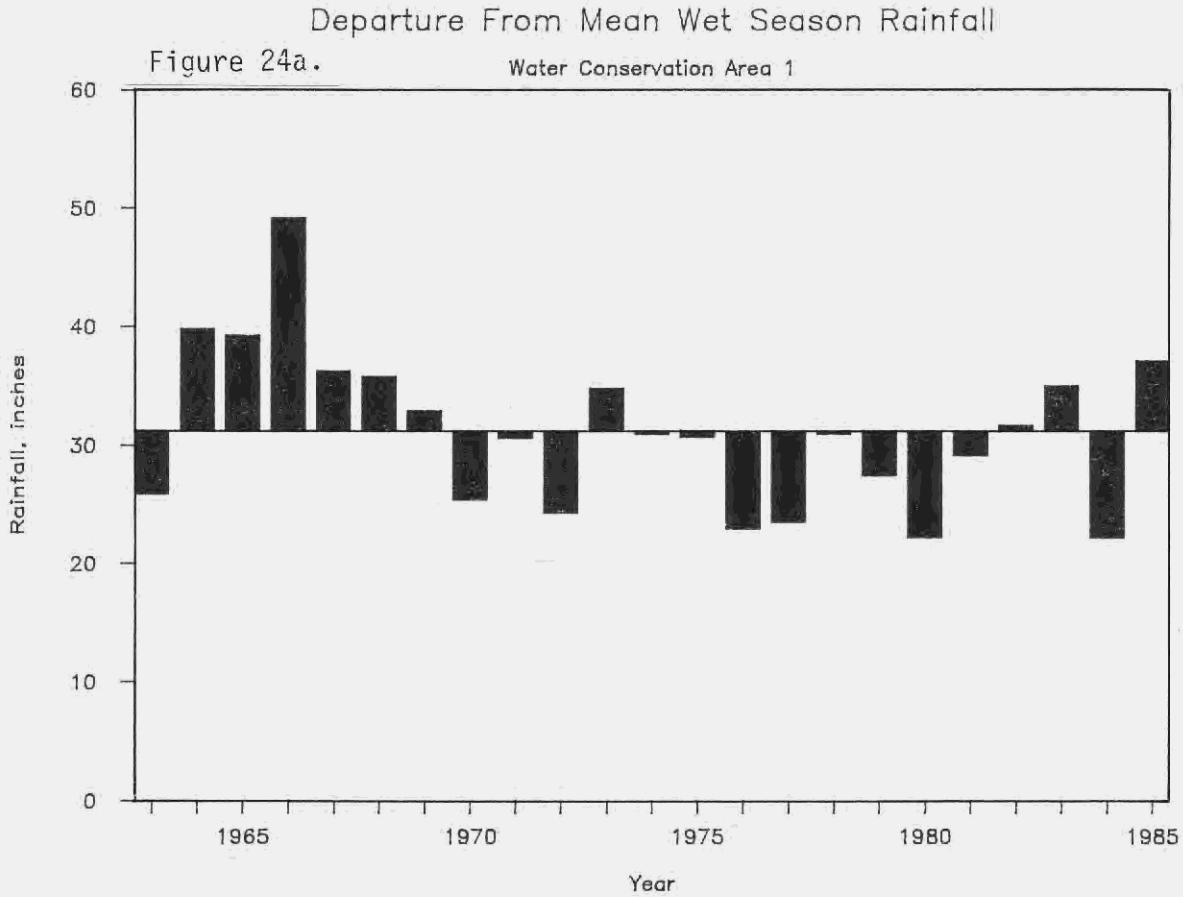

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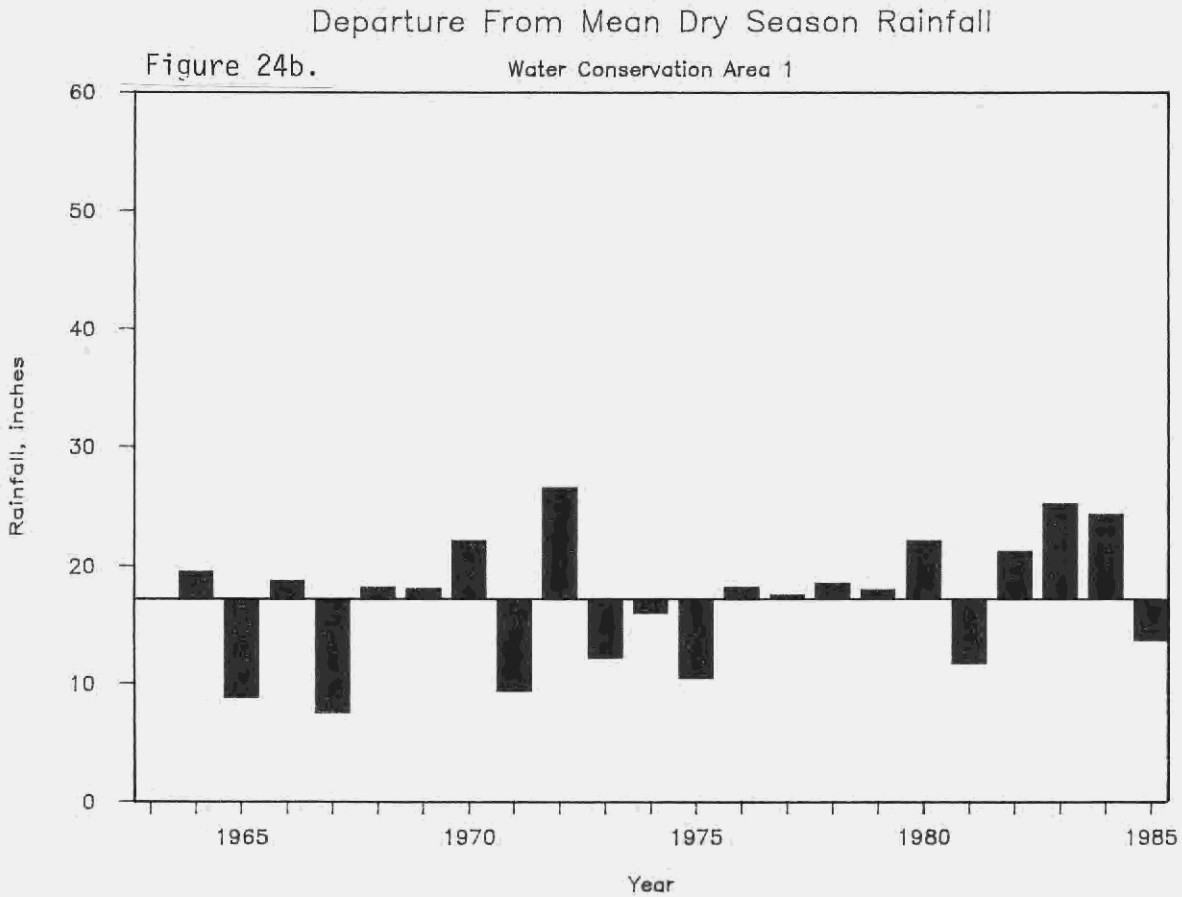

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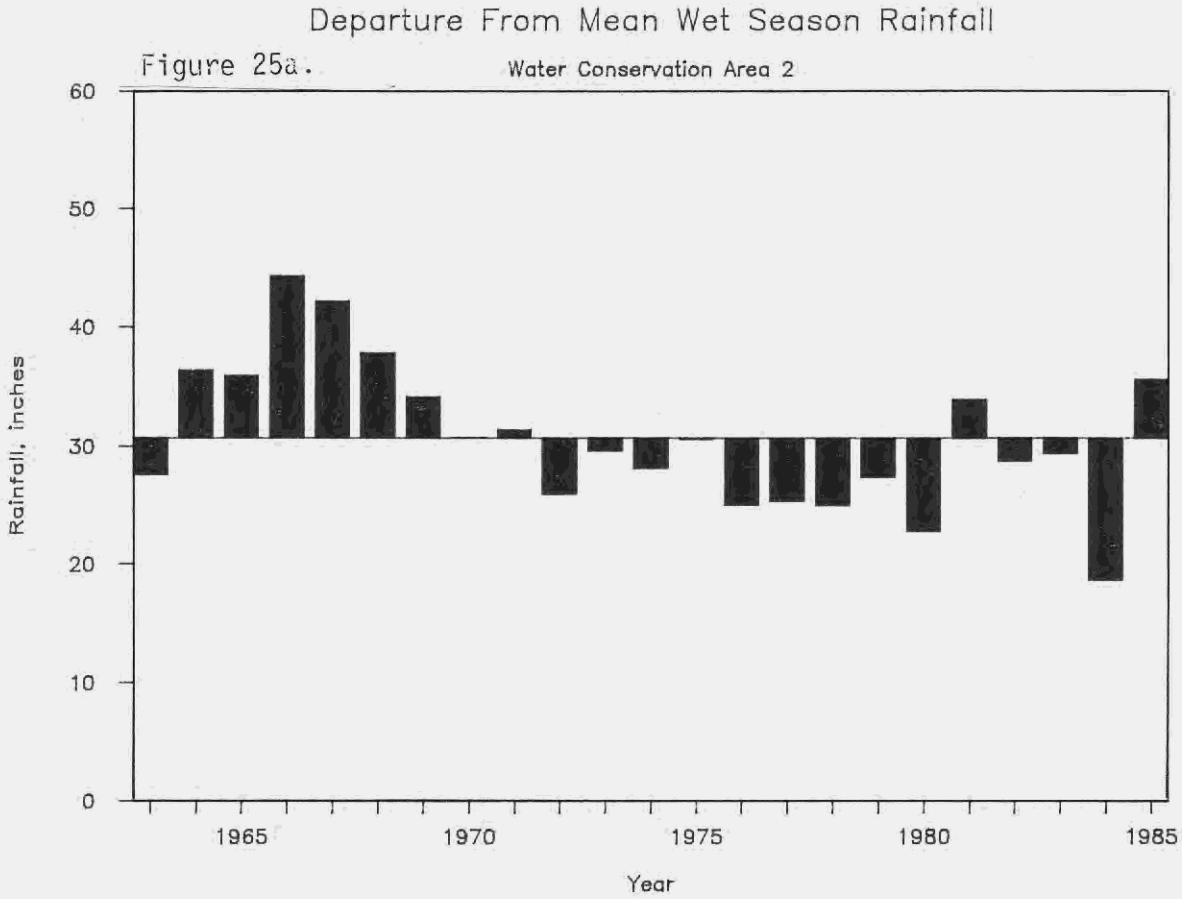


Figure 25b.

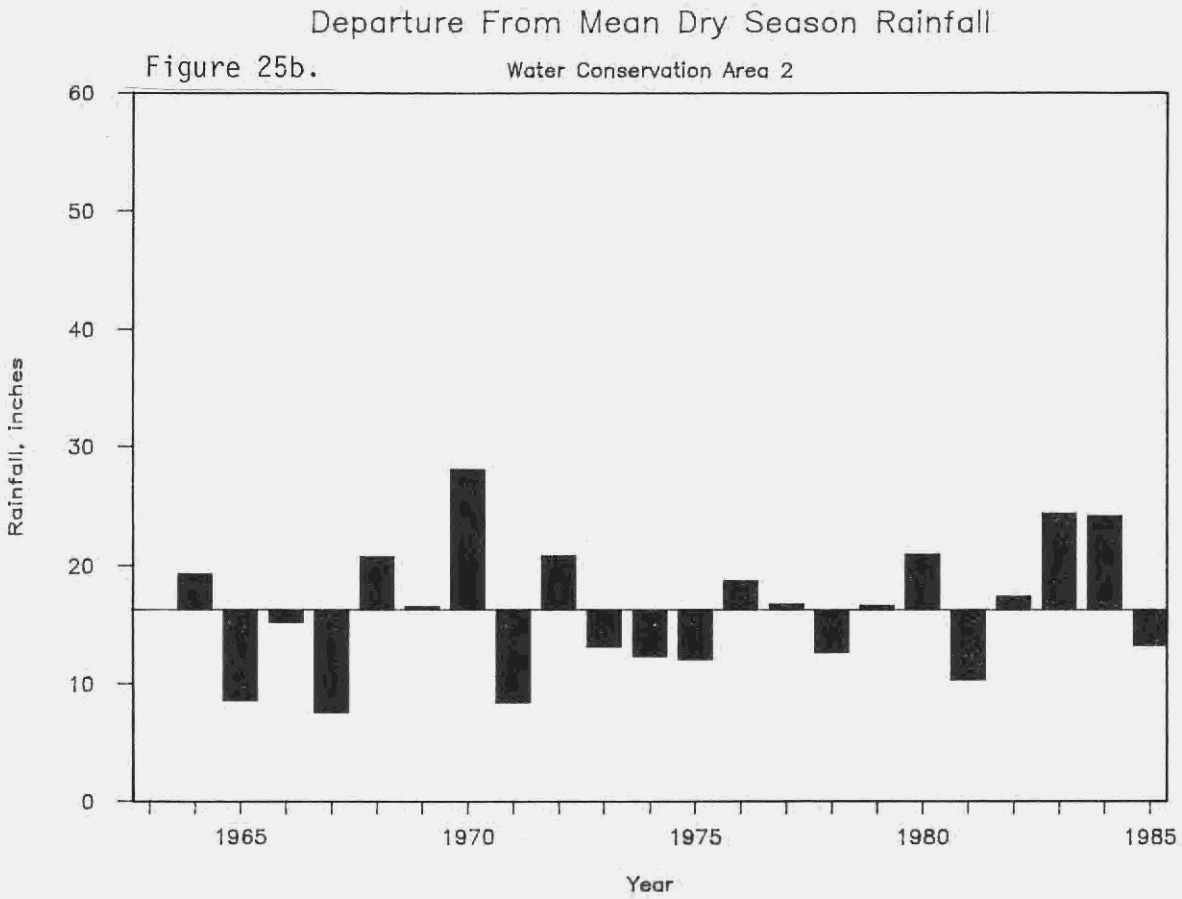
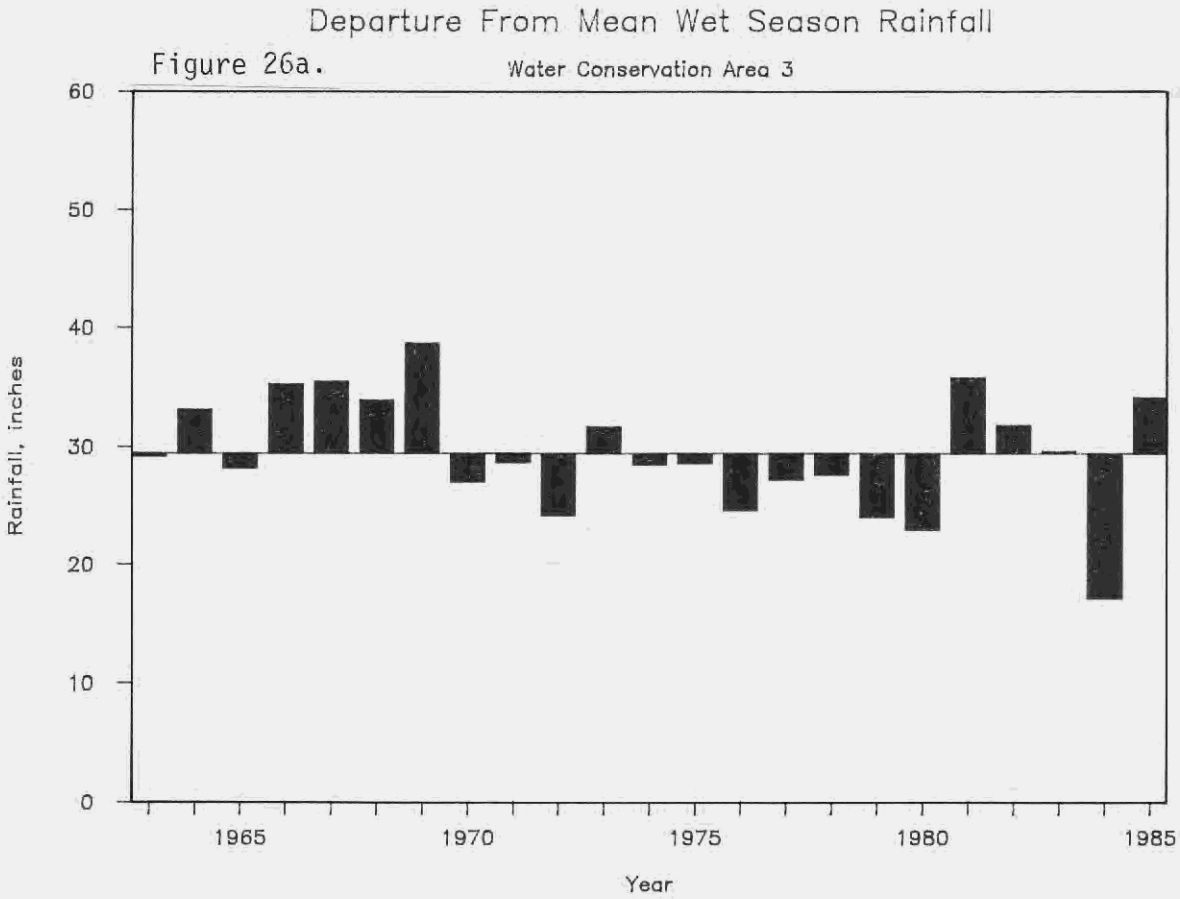


Figure 26a.



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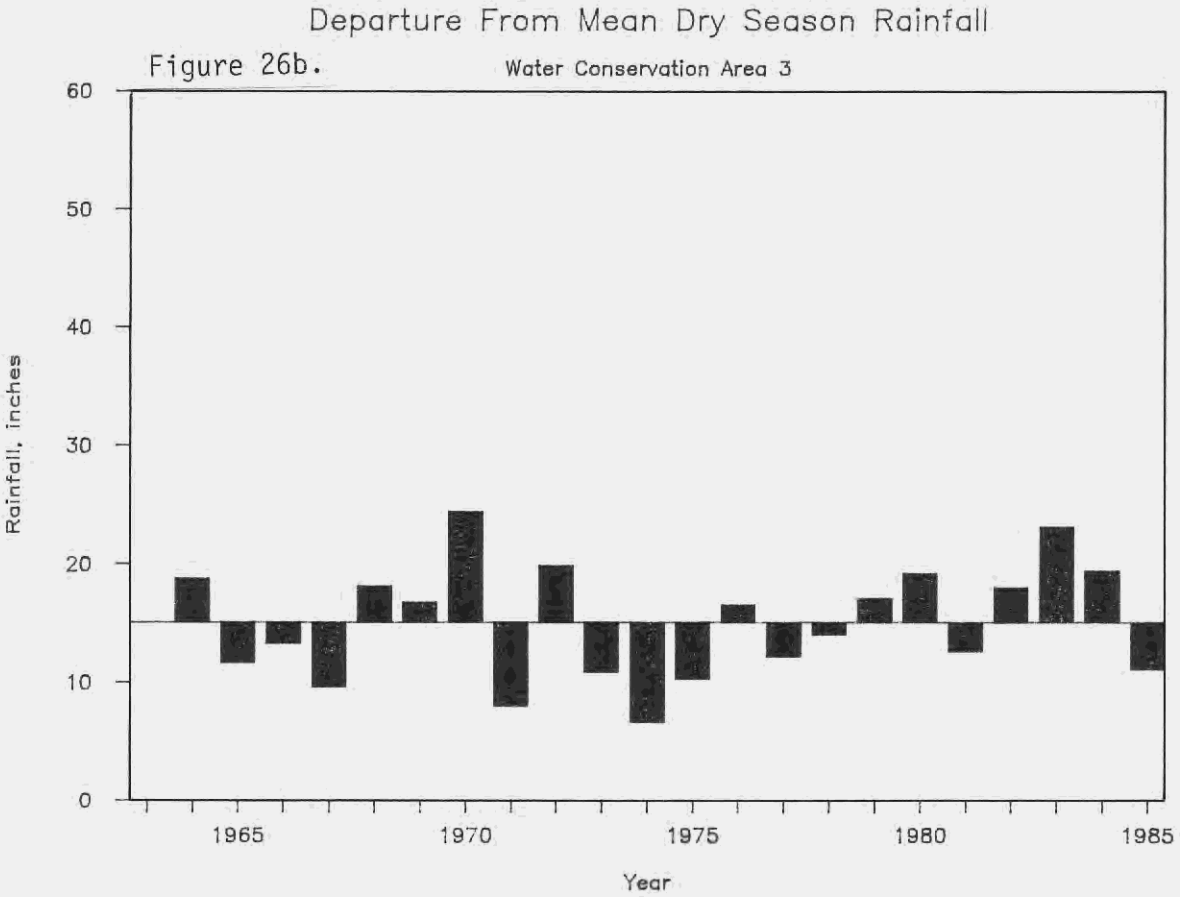


B. Basin Annual Rainfall

Calendar-year annual rainfall from each of the basins was analyzed in a similar manner. The histogram ordinates were re-scaled by dividing each bar by the total number of observations for each basin. Thus, the frequency of rainfall within a particular interval is expressed as a percentage of time rather than a number of occurrences. The basins' rainfall characteristics are more easily compared in this manner, and this transformation represents the next step toward fitting probability distributions to the data, a technique to be presented later. Figures 27 through 38 on the following pages show the histograms for all basins.

Most of the basins' annual rainfall appear to be asymmetric about their respective central values. In Figure 27, the Everglades Agricultural Area interval with the highest relative frequency (the mode) is that between 55 and 60 inches. The observations are not distributed symmetrically about this interval; amounts less than 55 inches are received about 60% of the time while amounts greater than 60 inches occur only 15% of the time. The Everglades National Park (Figure 28) has the opposite appearance; annual rainfall less than 50 inches occurs roughly 20% of the time and amounts greater than 55 inches occur more than half of the time. Distributions which have this asymmetry about their central value exhibit *skewness*. Those having greater variability and frequency below the central value (like the ENP) have positive skewness. Conversely, negative skewness is characterized by a distribution with greater variability and frequency above the central value (like the EAA and Fisheating Creek basins). Annual rainfall over Lake Okeechobee possesses a distribution unique to, and is significantly less than, those from the surrounding basins. Annual rainfall amounts ranging from 35 to 55 inches appear to be equally likely, but amounts outside of this range occur only 10% of the time.

These figures present historical rainfall data in an informative and useful way. Rainfall characteristics are effectively displayed and are easily compared with those from other basins. They also serve as the first step in the statistical analysis of rainfall as a random variable. However, due to the subjective manner in which histograms are constructed, only qualitative inferences should be made from them. Upon successful completion of the analysis more quantitative information may be extracted from the historical data.

Figures 39 through 50 illustrate annual rainfall amounts with respect to the basin means. They indicate that for the past fifteen years, most basins have generally received below-normal annual rainfall. This is most evident in the Upper Kissimmee, Kissimmee River, Fisheating Creek, and Lower East Coast basins. Exceptions occurred in 1982 and in 1983. Trends in annual rainfall are somewhat similar to those evidenced in the wet season figures, since approximately two-thirds of annual precipitation is received during the wet season months. All twelve basins received above-normal rainfall in calendar year 1983, and all but the Upper Kissimmee and Water Conservation Area 2 basins received above-normal rainfall in 1982.

Figure 27.

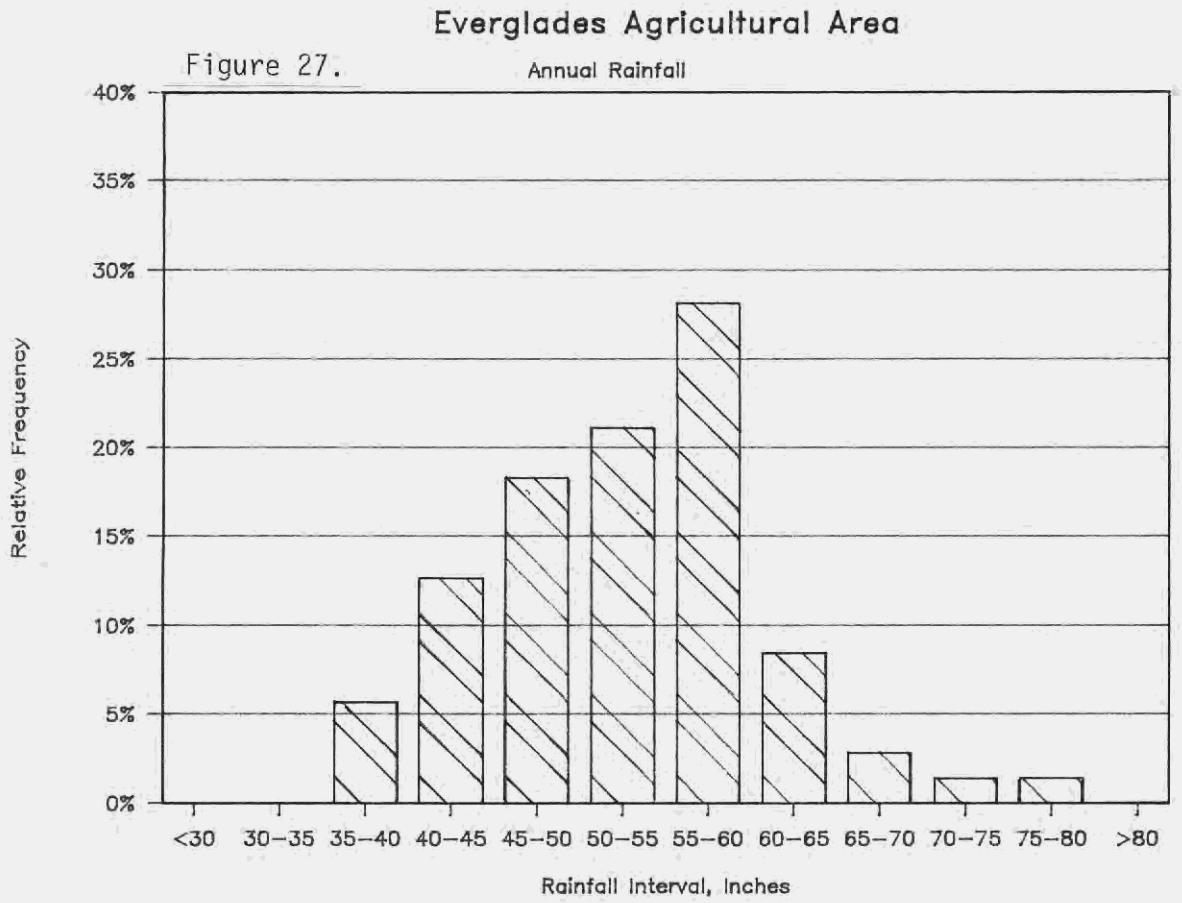
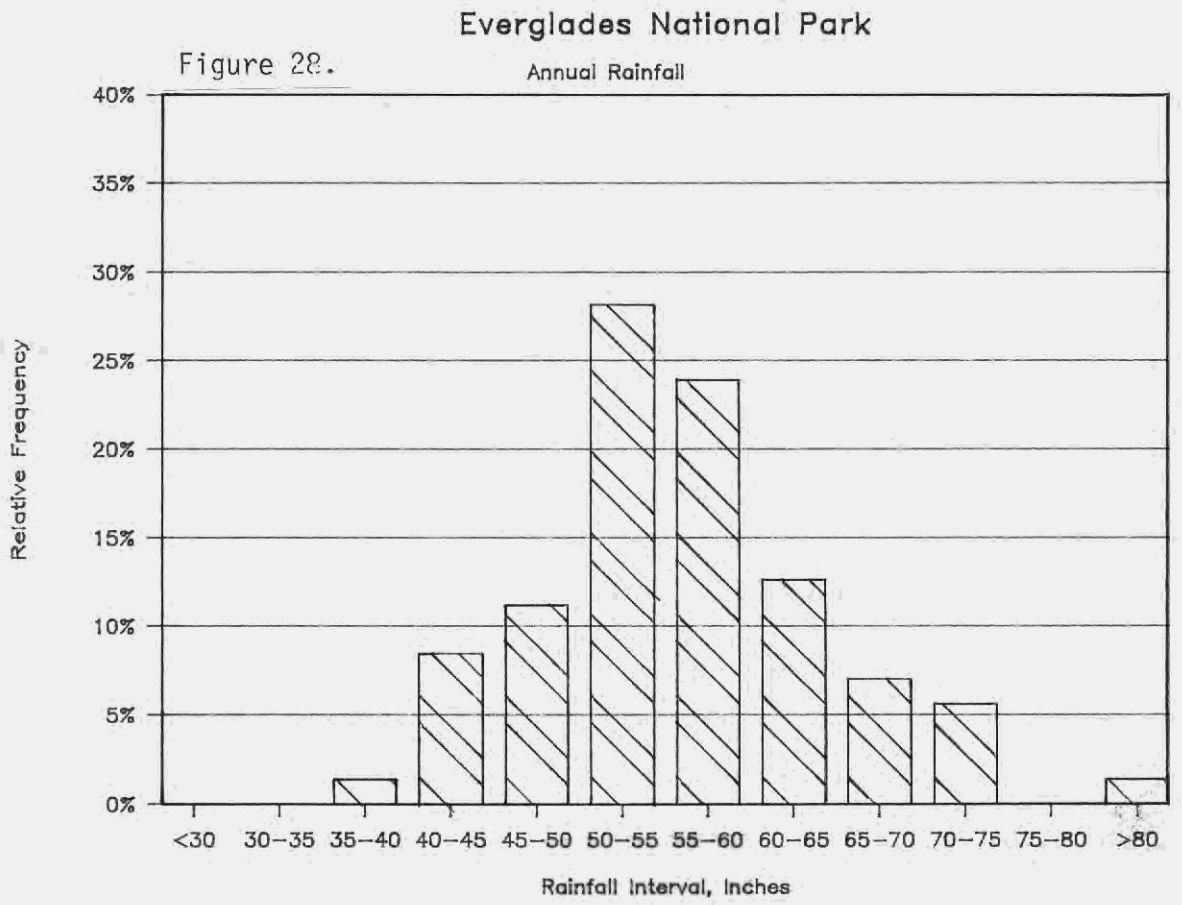


Figure 28.



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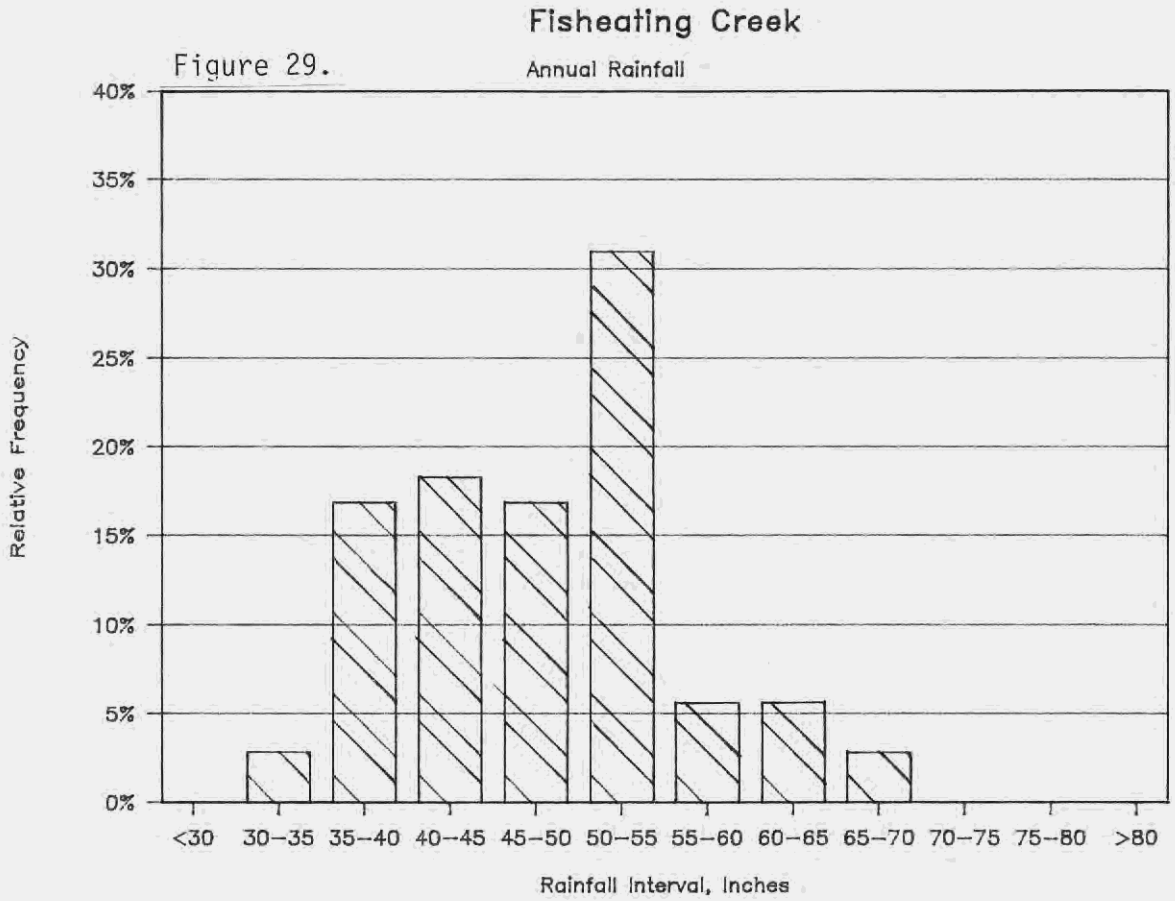

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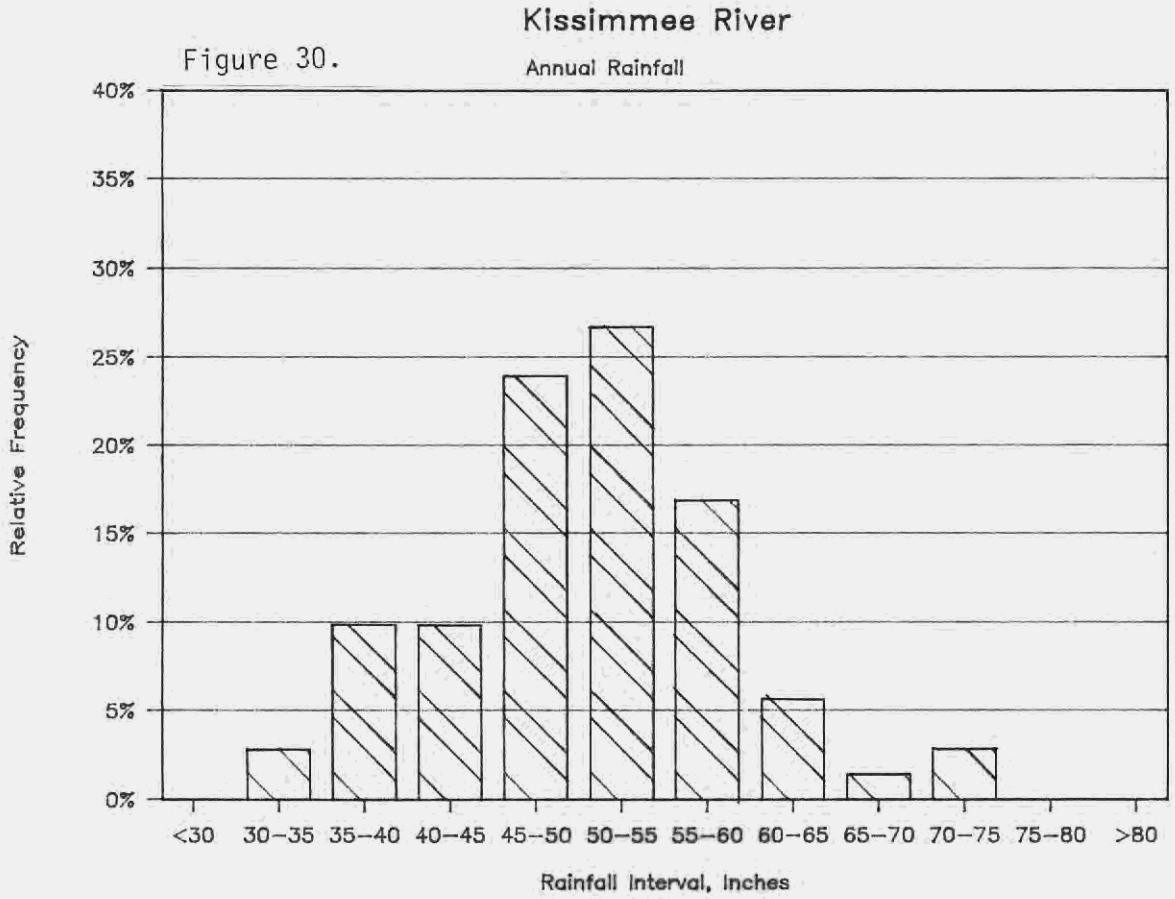

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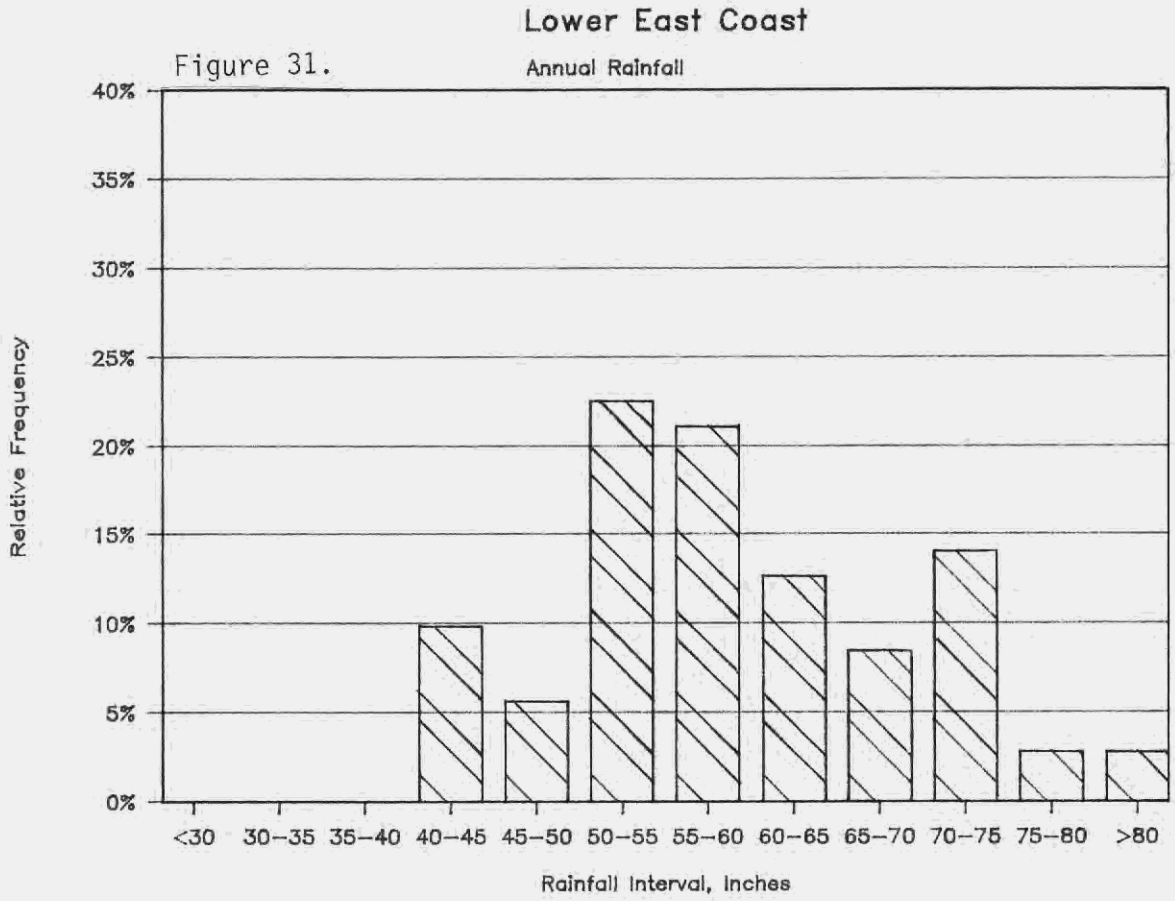

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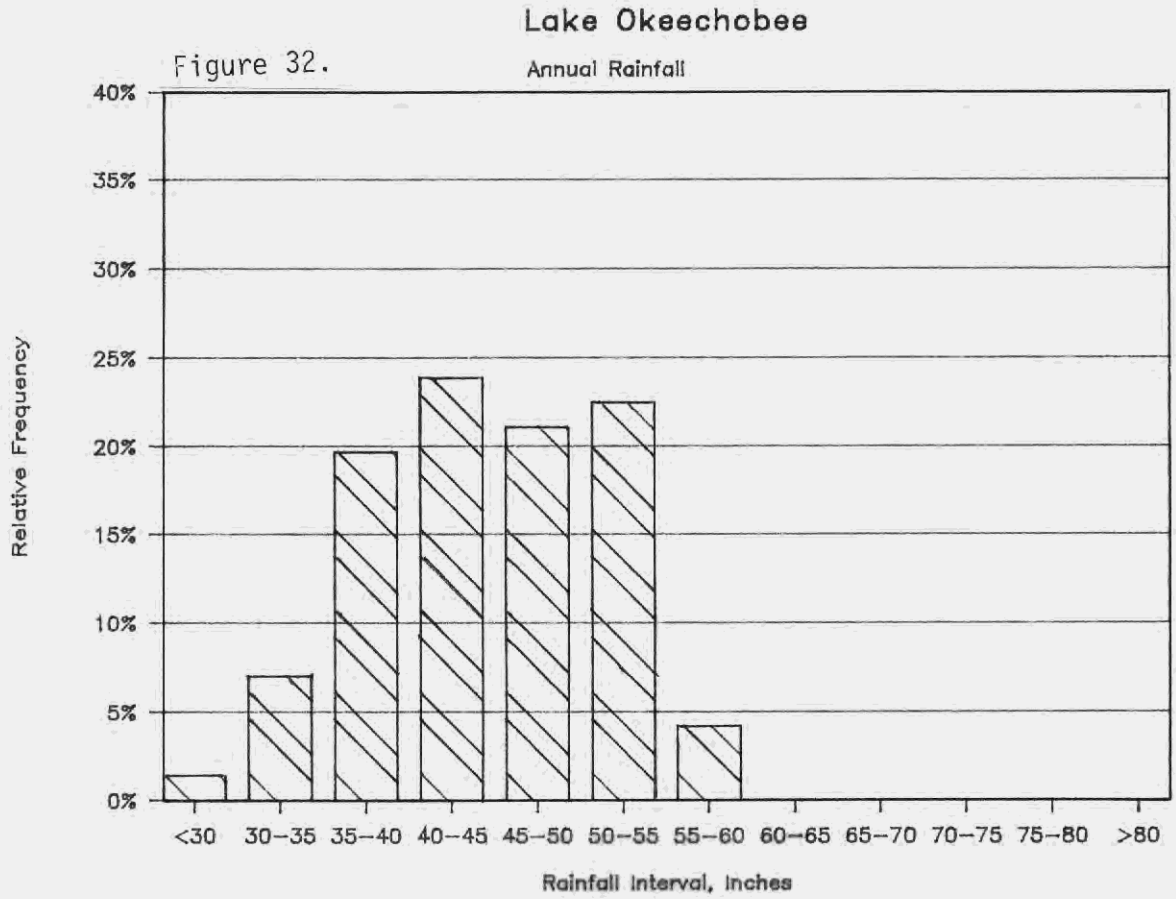

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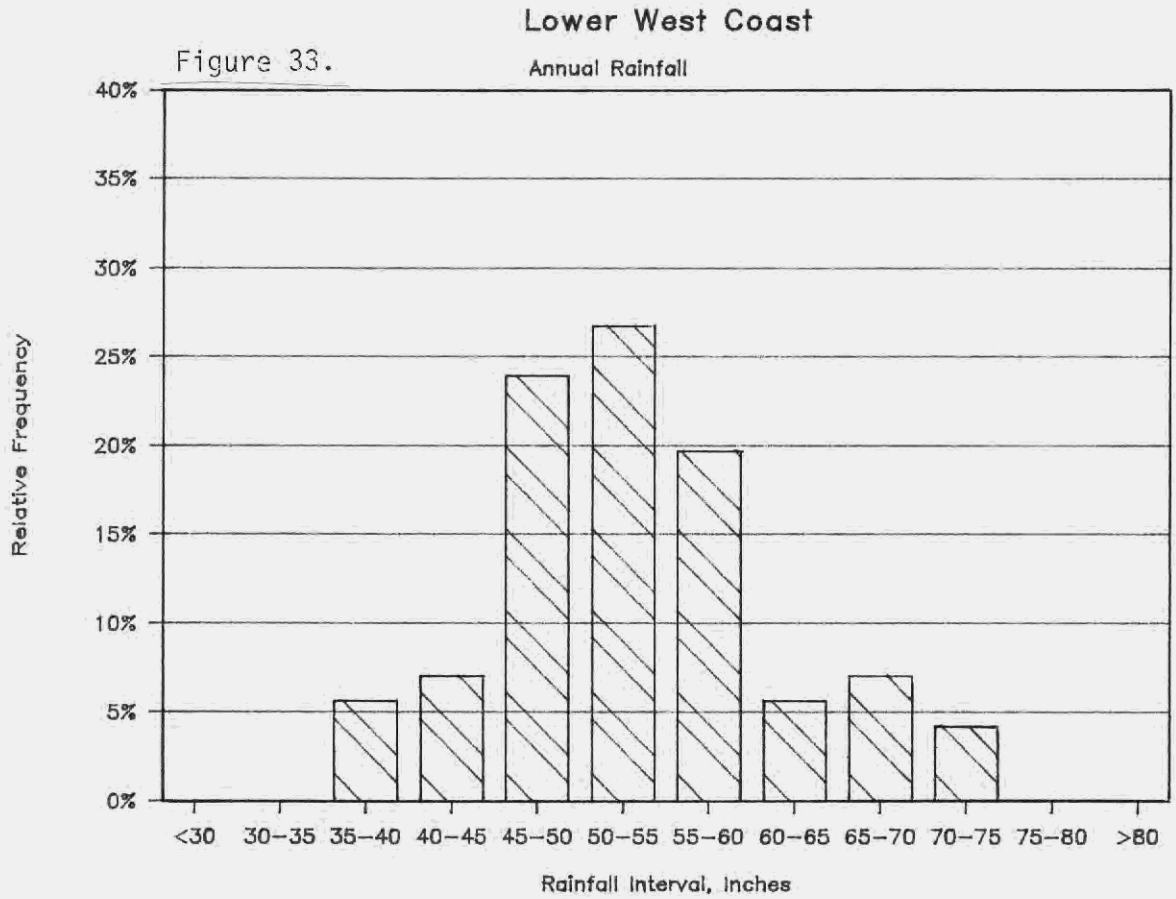

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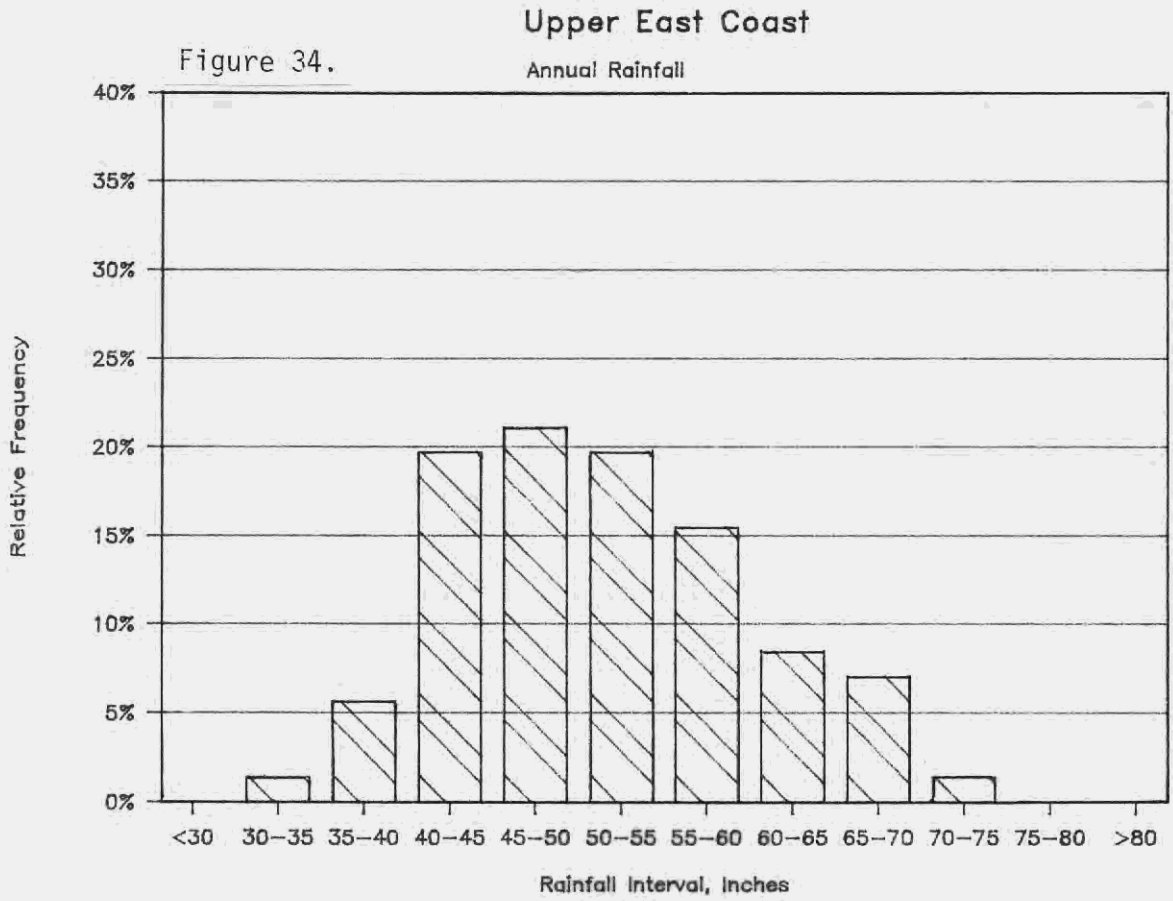

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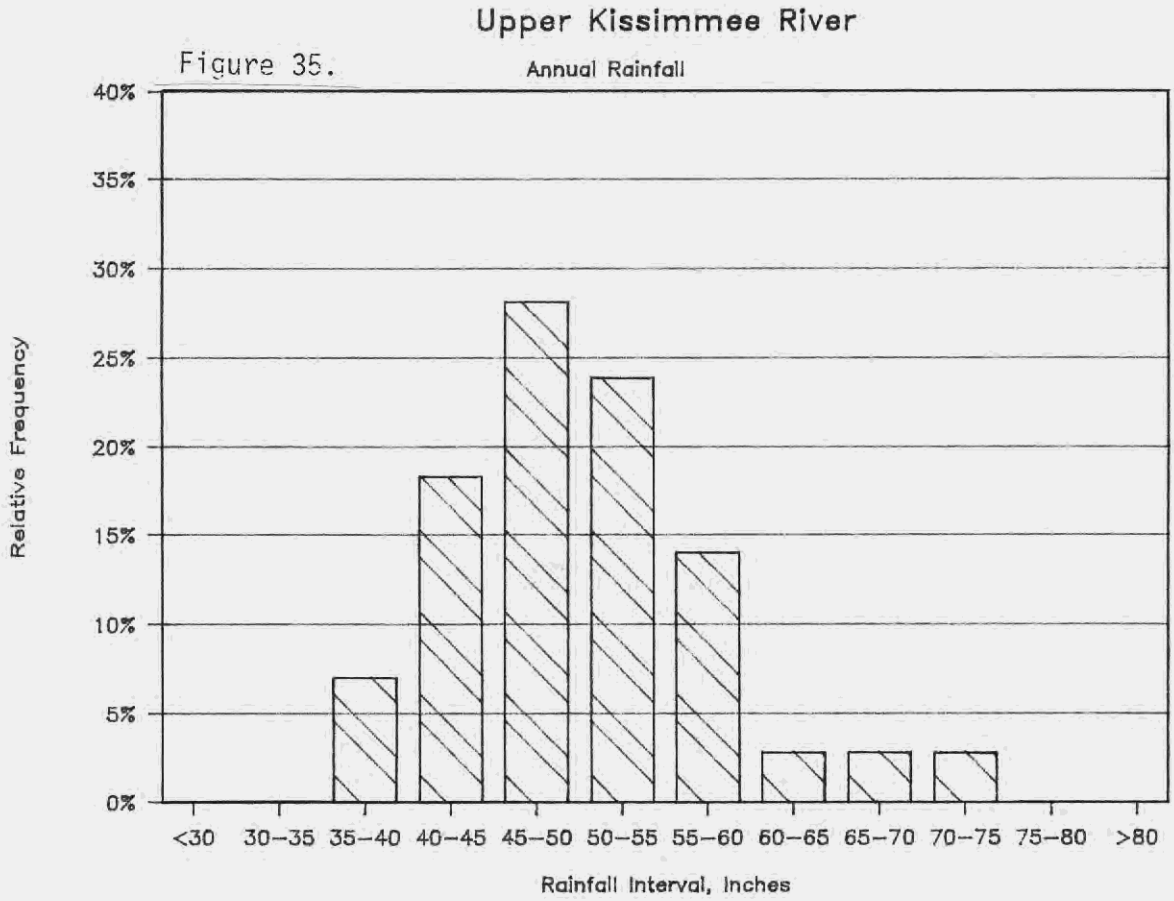

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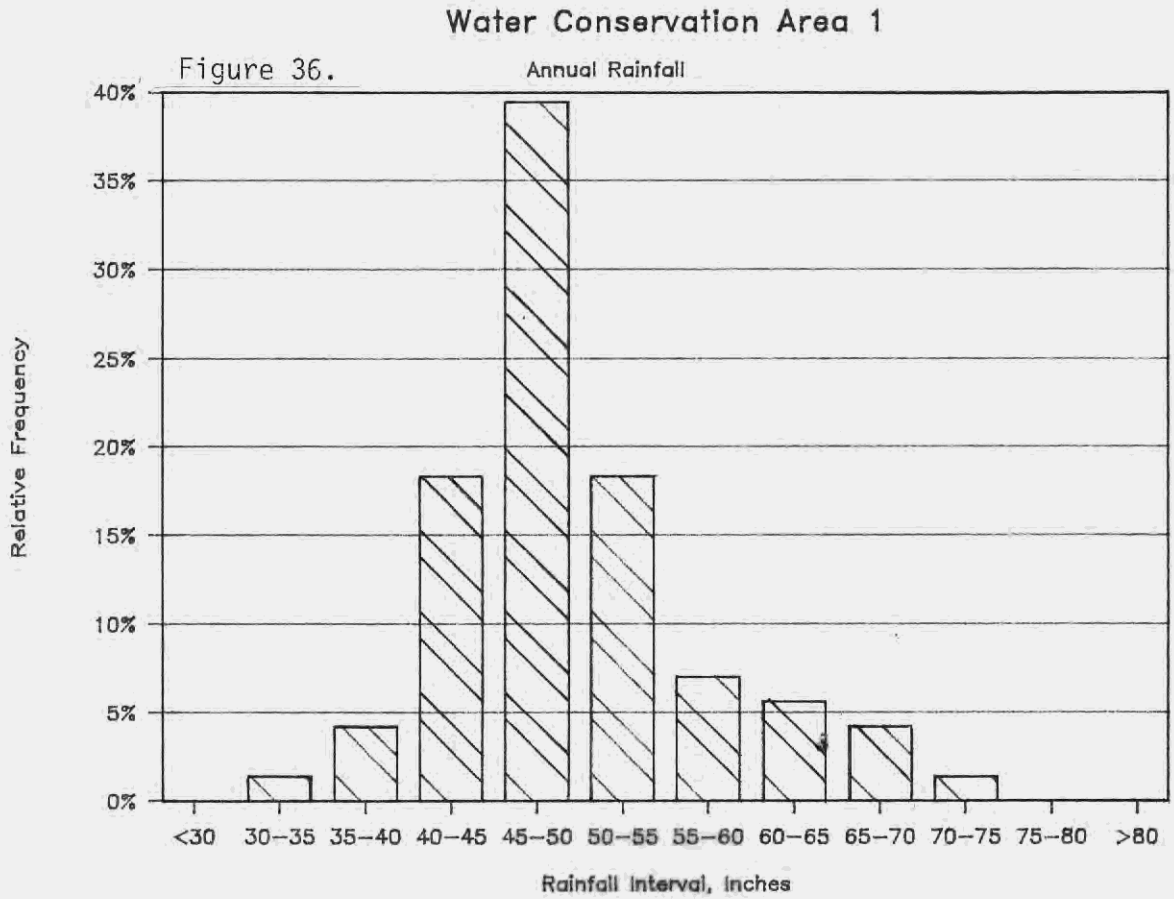

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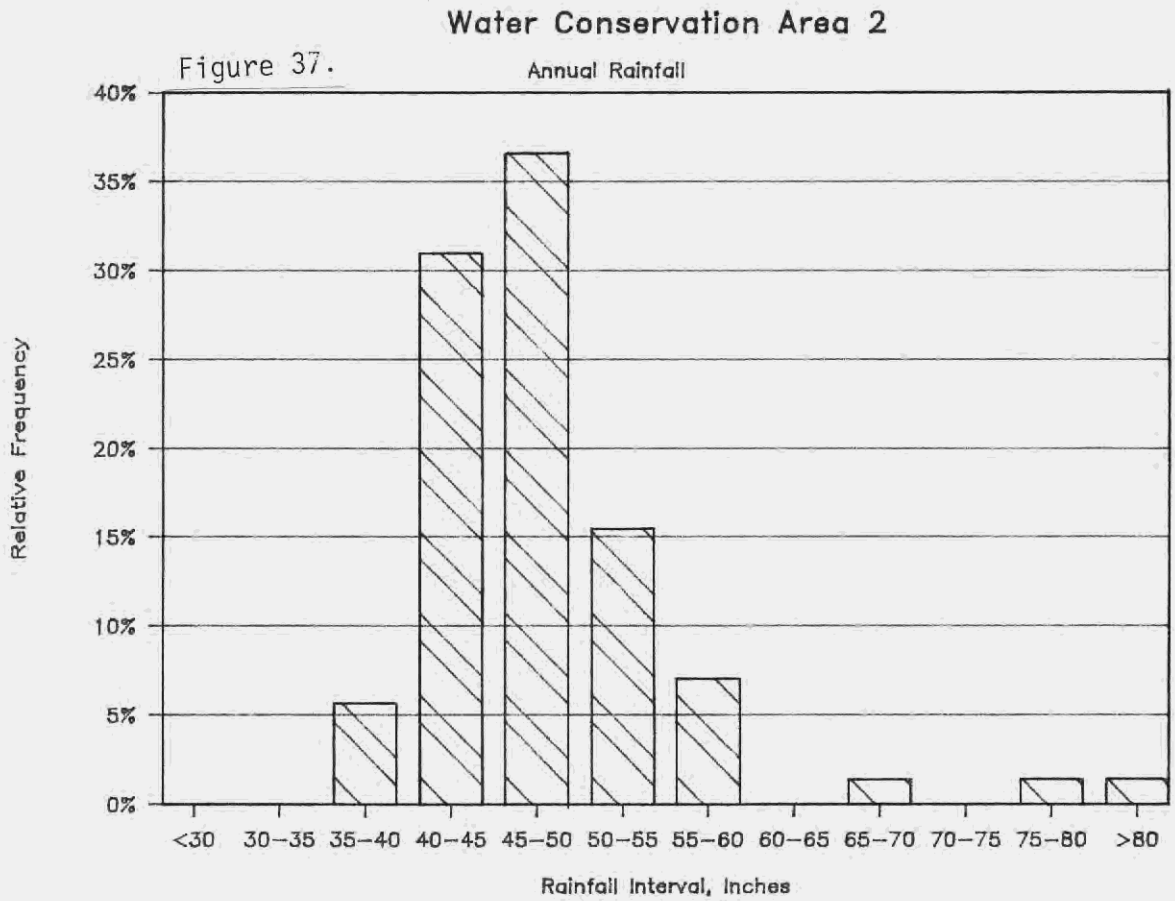

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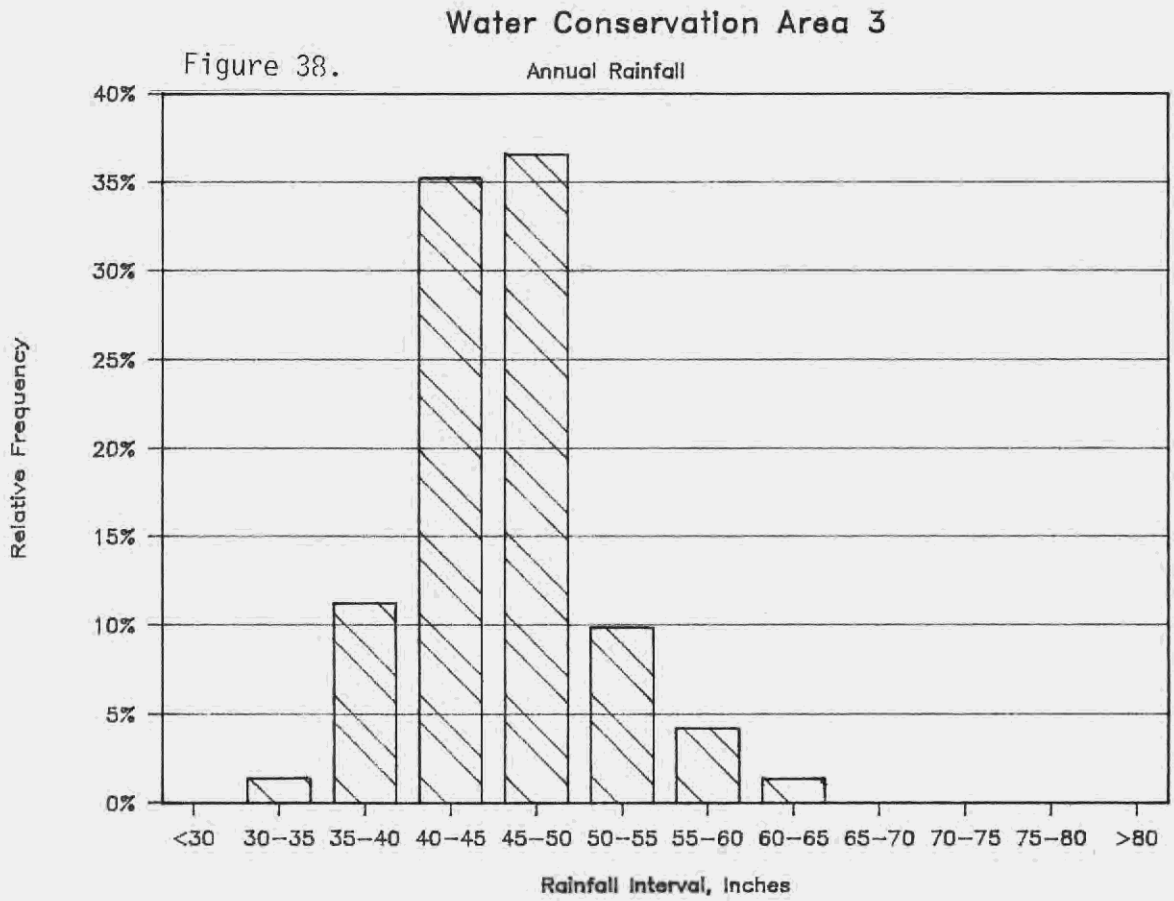

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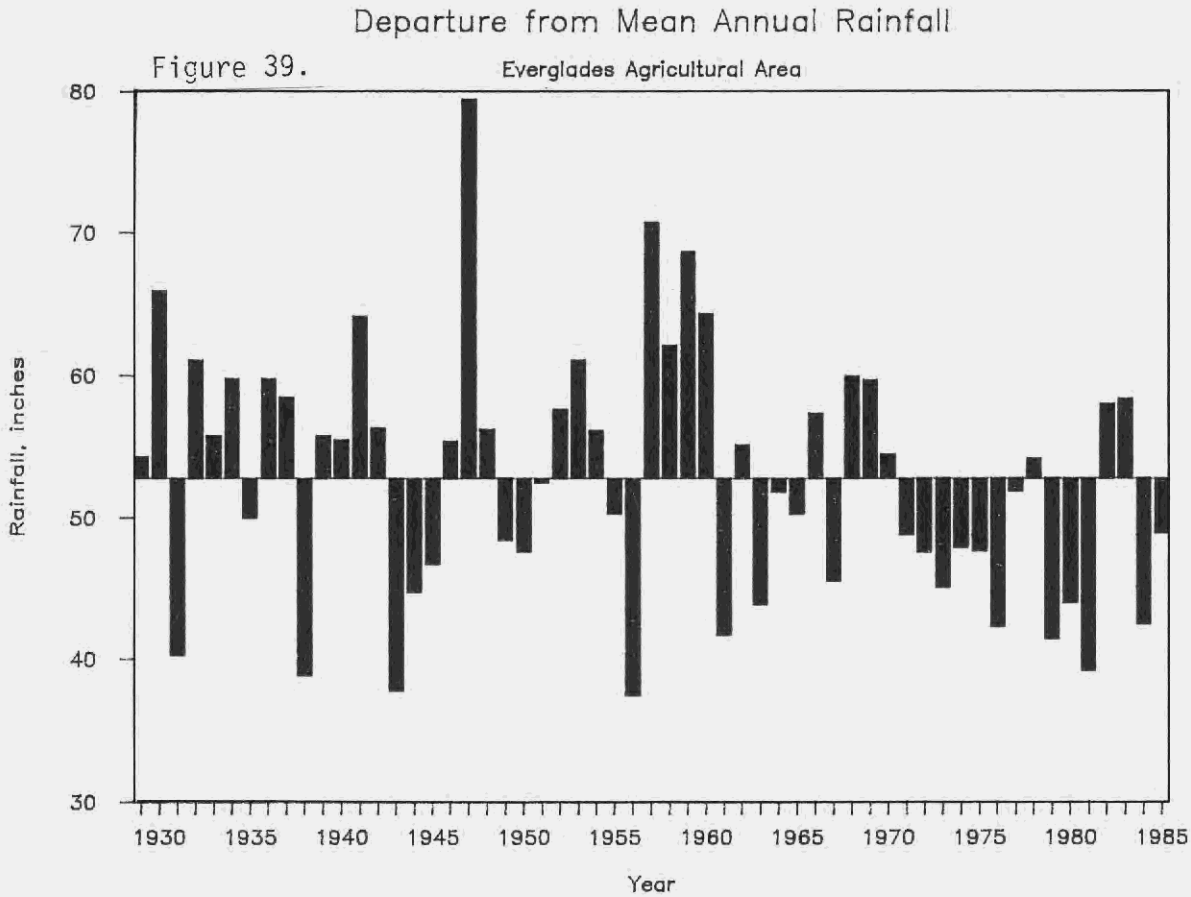

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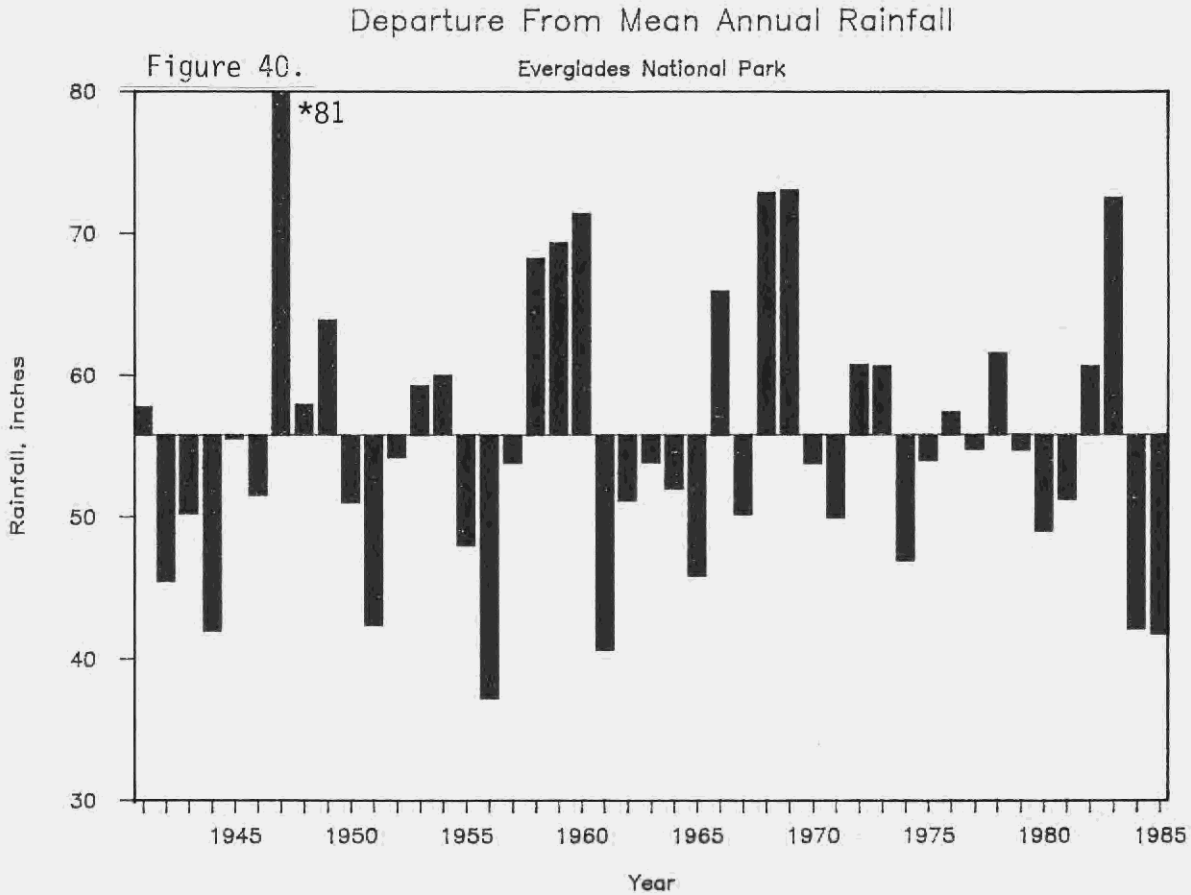

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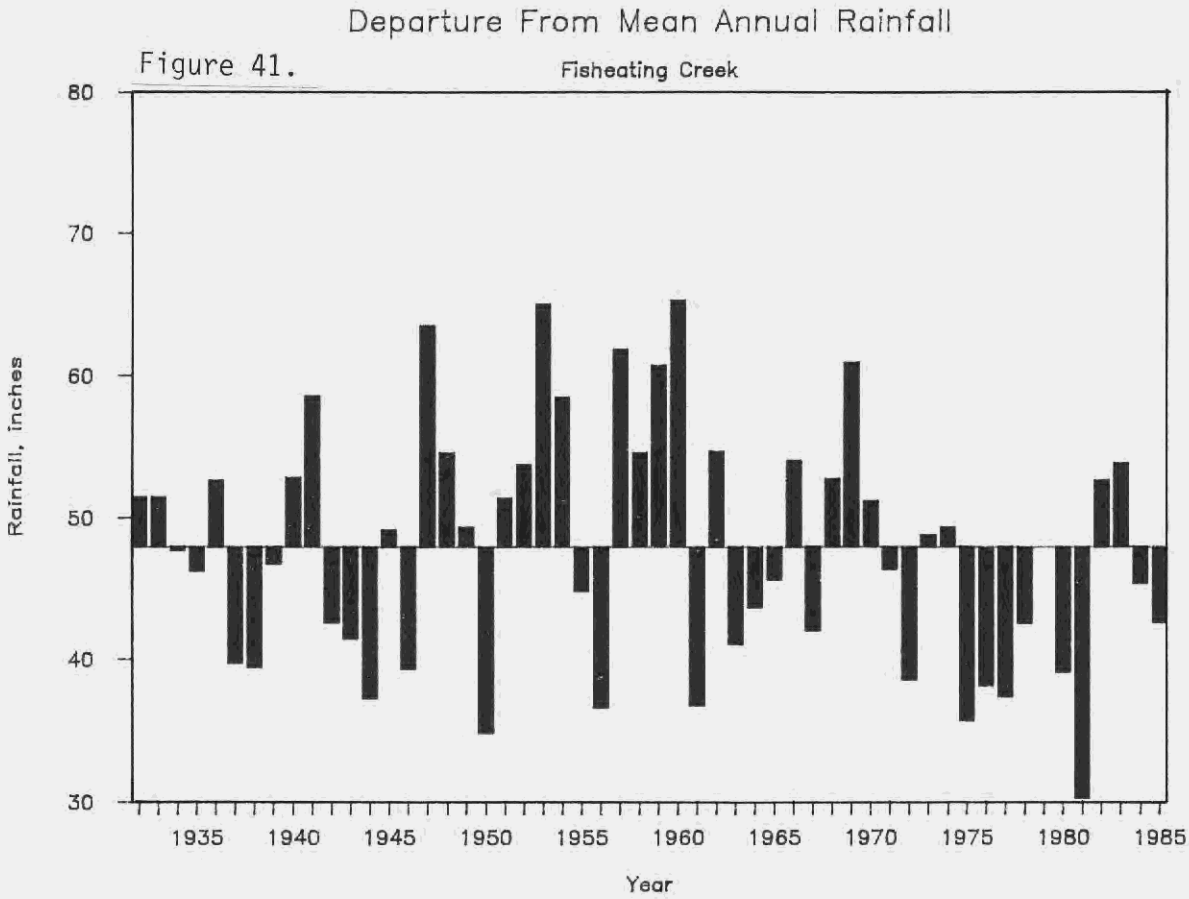

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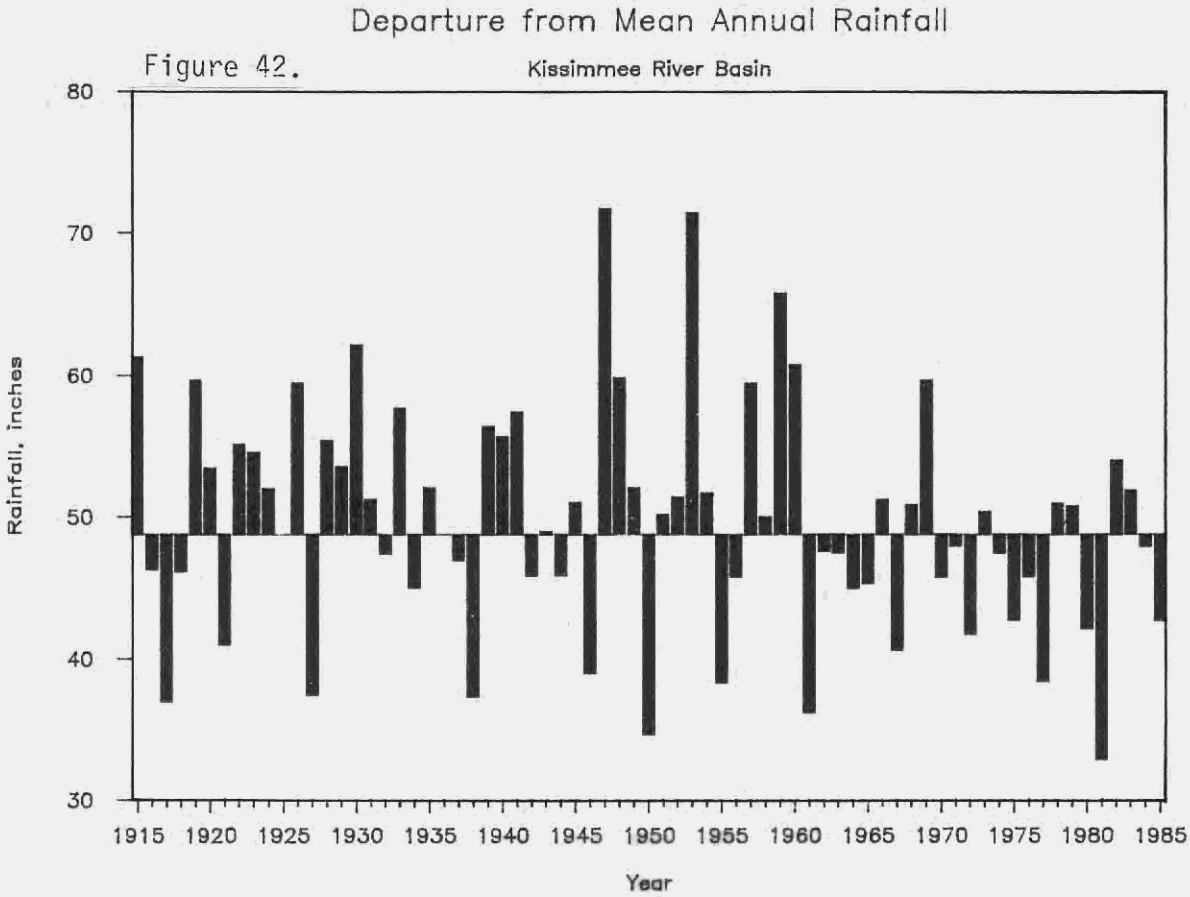

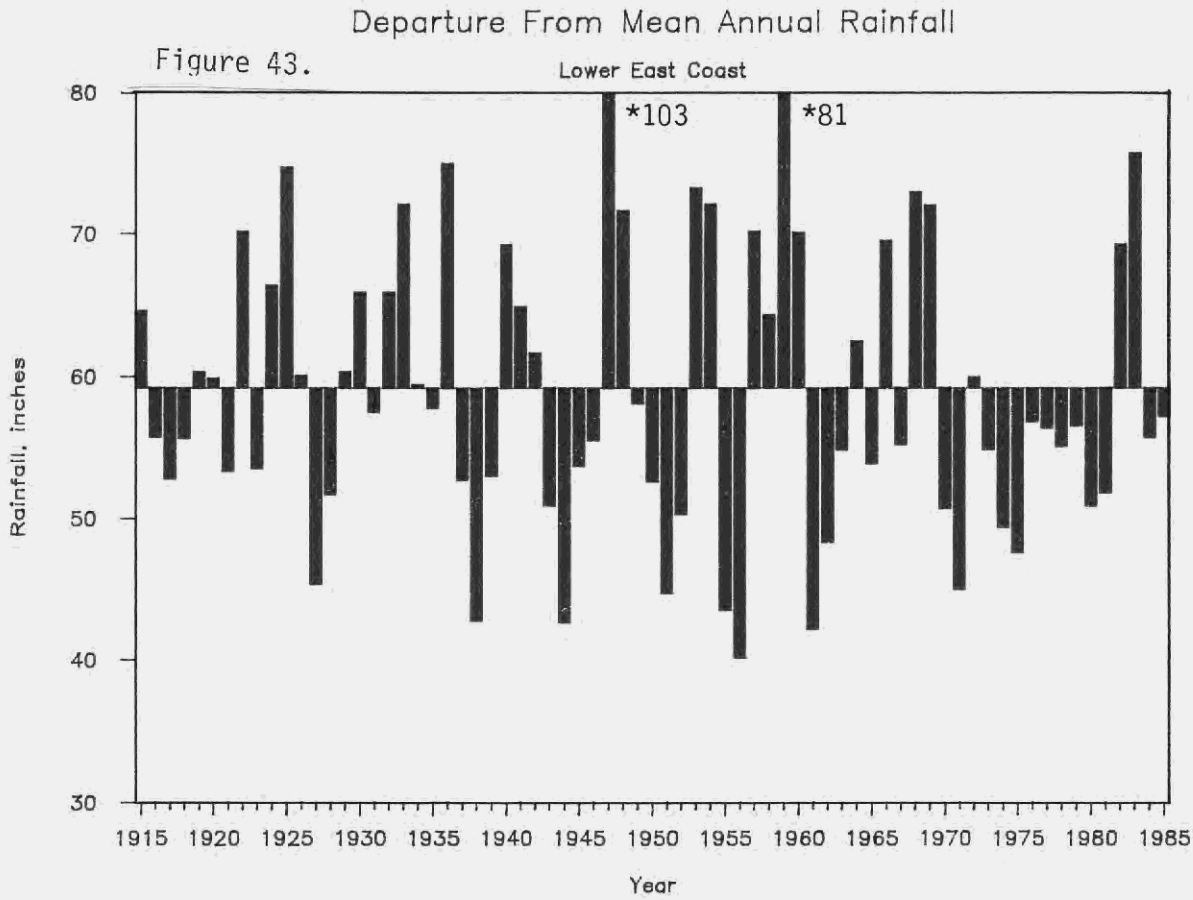

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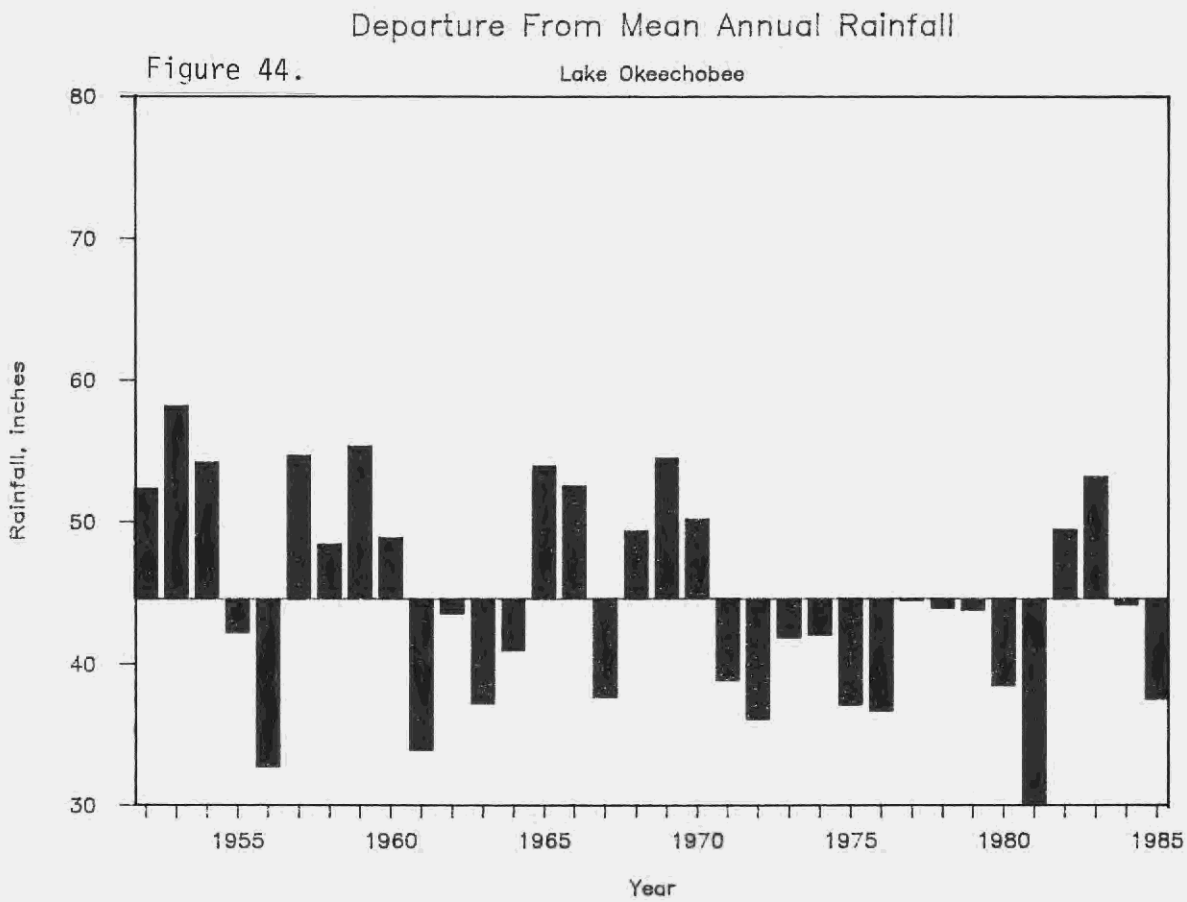
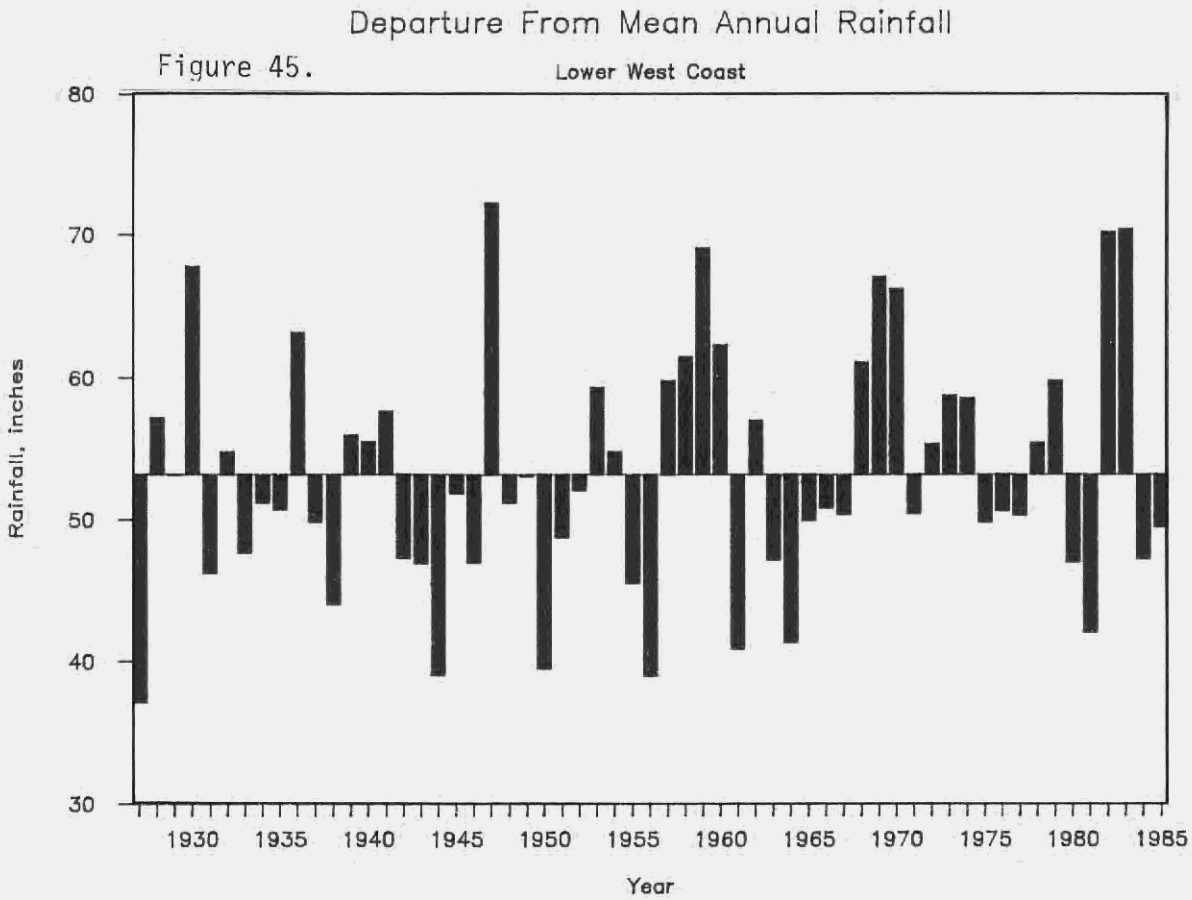


Figure 44.

Figure 45.



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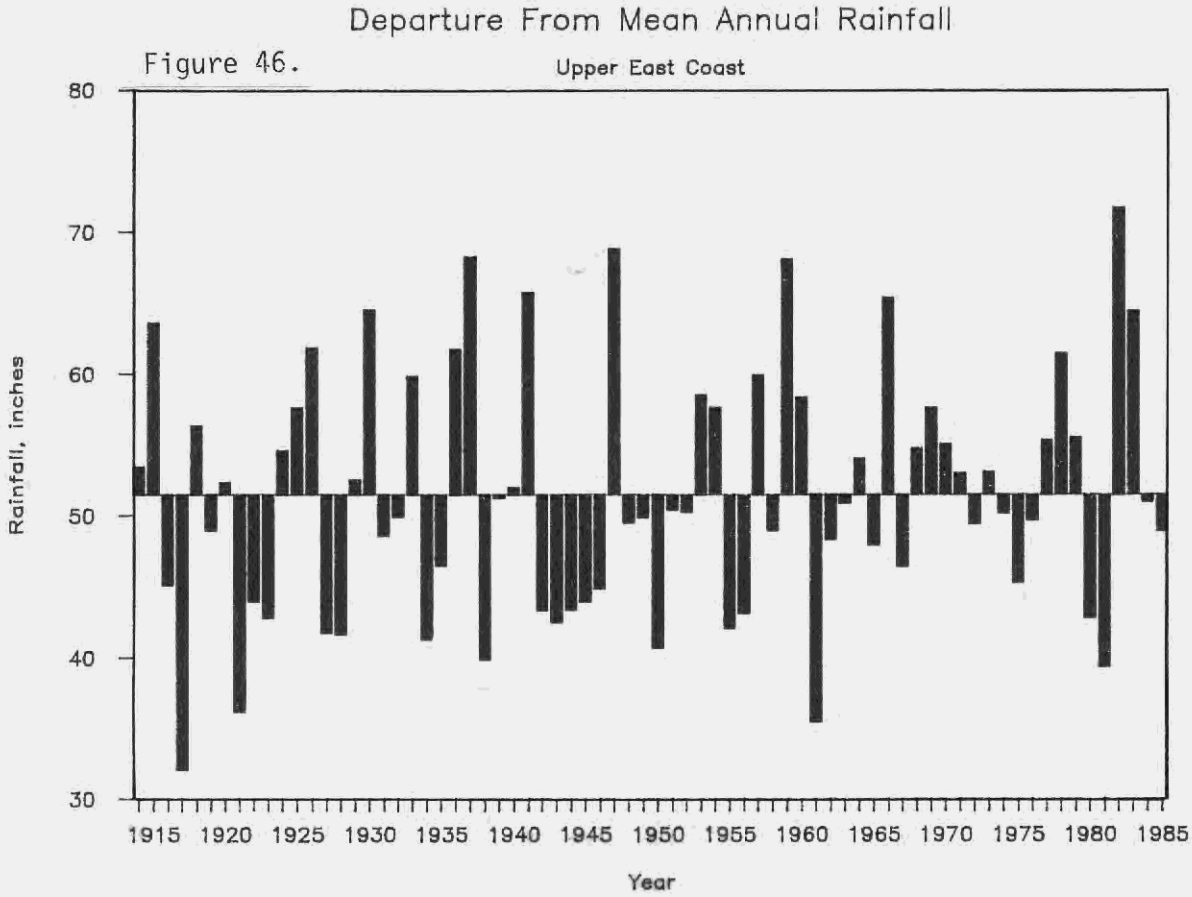
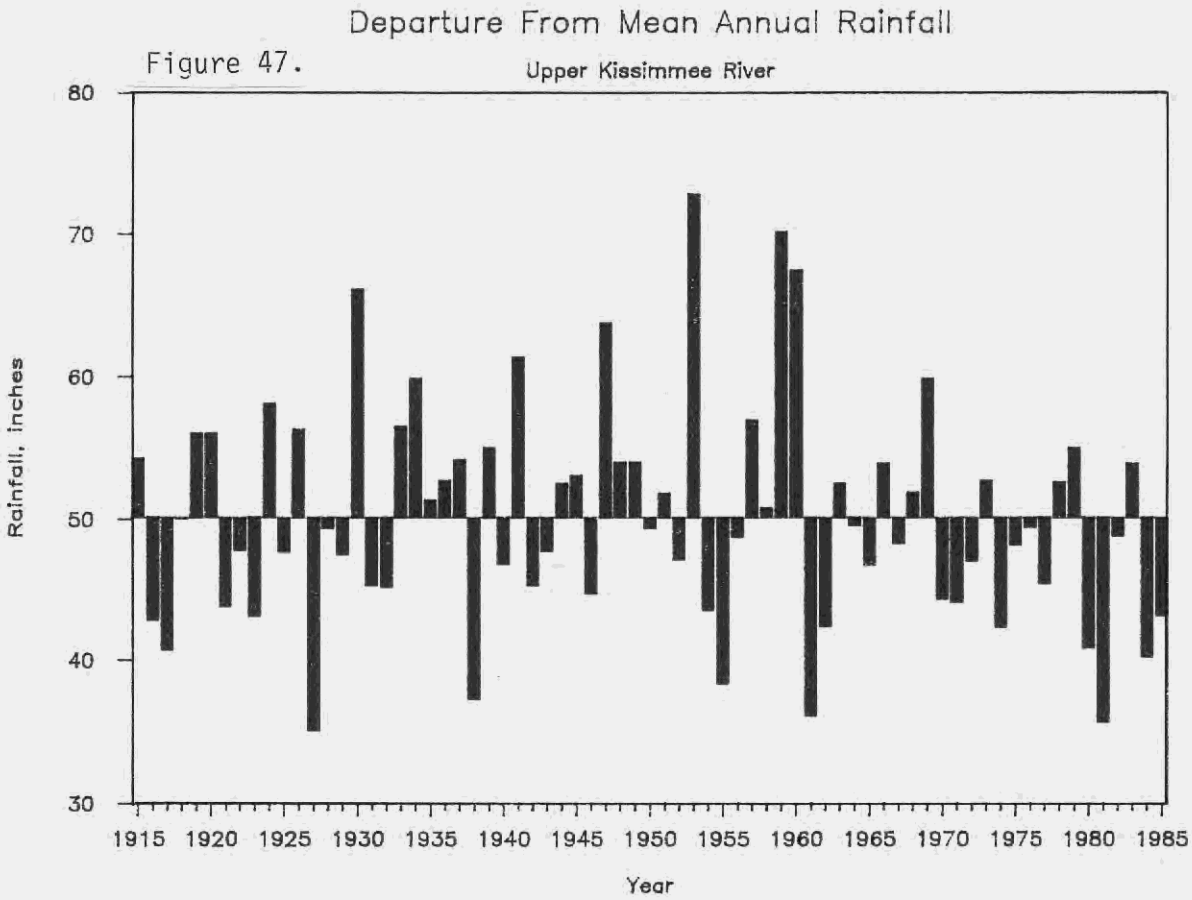


Figure 47.



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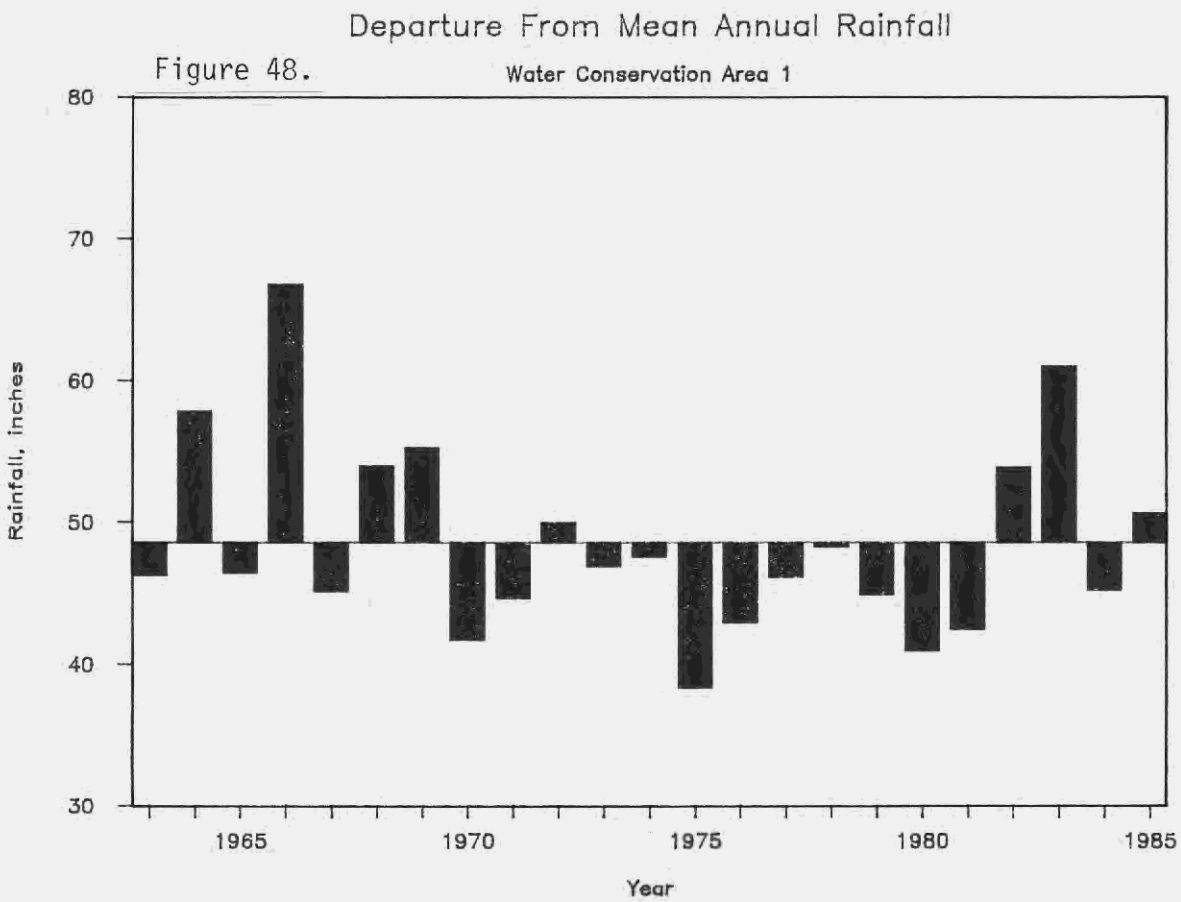

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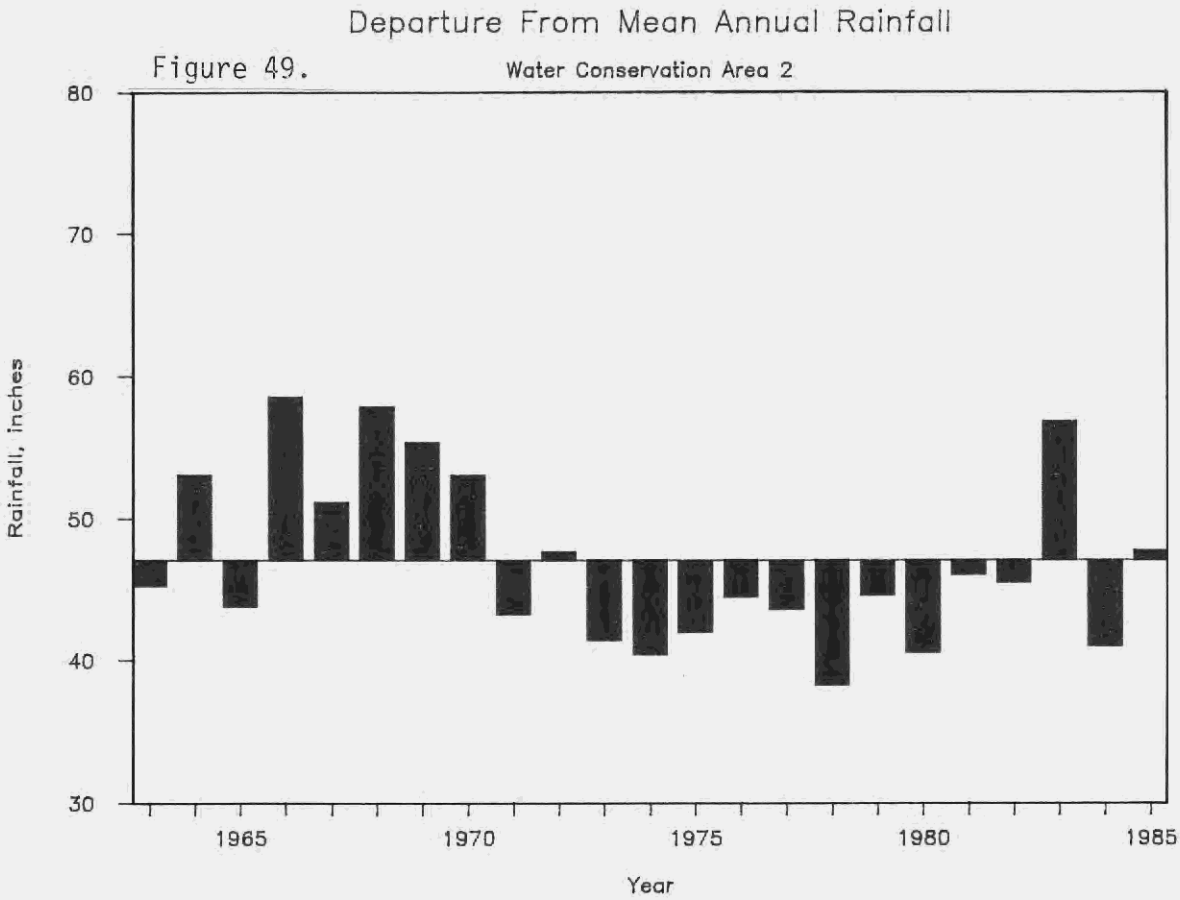

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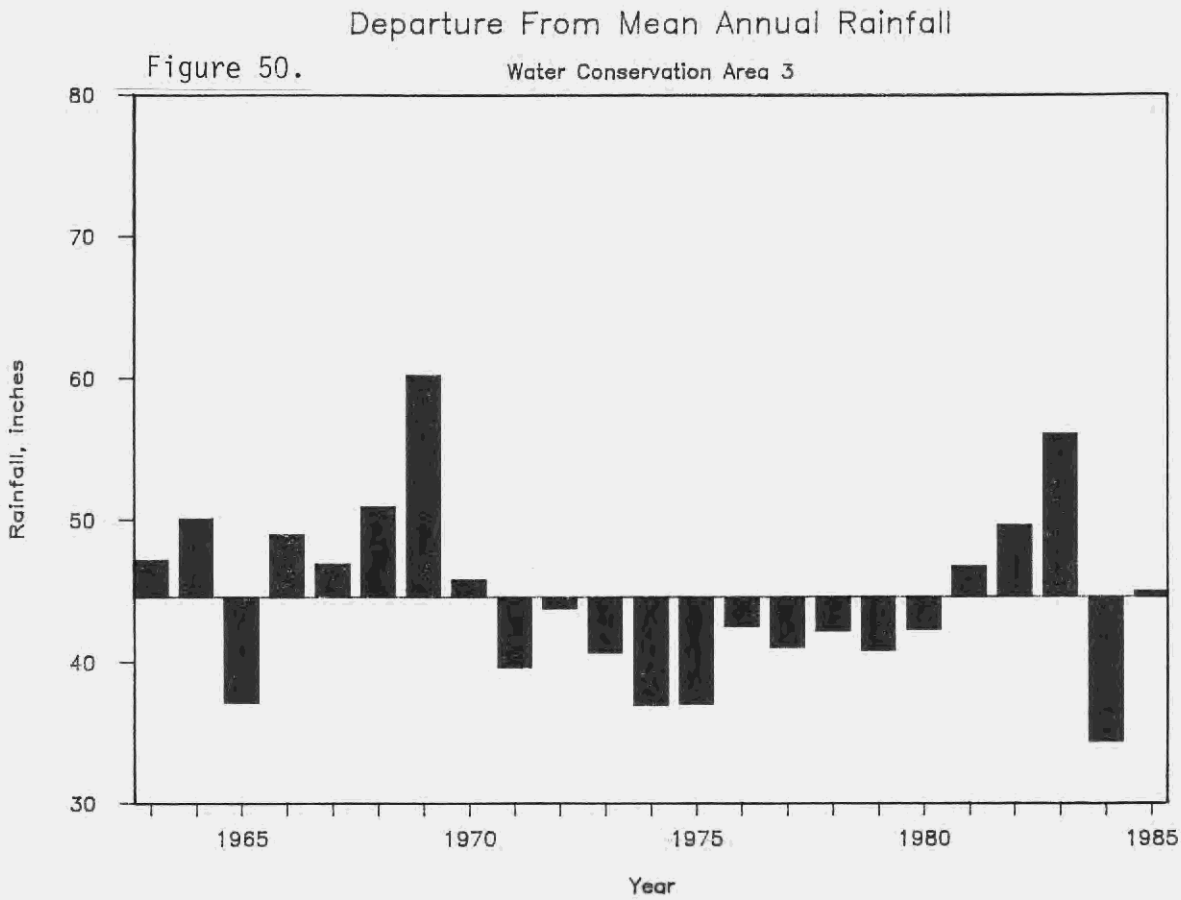


Table 2 (continued)

YEAR	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3	DAR
1952	50	47	51	50	52	58	54	54	52				
1953	59	73	71	73	59	61	**65**	59	**58**				
1954	58	44	52	72	55	56	59	60	54				
1955	42	38	38	44	46	50	45	48	42				
1956	43	49	46	40	39	**37**	37	37	33				
1957	60	57	59	70	60	71	62	54	55				
1958	49	51	50	64	62	62	55	68	48				
1959	68	70	66	81	69	69	61	69	55				
1960	58	**68**	61	70	62	64	**65**	71	49				
1961	35	36	36	42	41	42	37	**41**	34				
1962	48	42	48	48	57	55	55	51	44				
1963	51	53	47	55	47	44	41	54	37	46	45	47	49
1964	54	50	45	62	41	52	44	52	41	58	53	50	49
1965	48	47	45	54	50	50	46	46	54	46	44	37	49
1966	65	54	51	70	51	57	54	66	53	**67**	**59**	49	58
1967	46	48	41	55	50	45	42	50	38	45	51	47	49
1968	55	52	51	73	61	60	53	73	49	54	58	51	62
1969	58	60	60	72	67	60	61	73	54	55	55	**60**	66
1970	55	44	46	51	66	55	51	54	50	42	53	46	56
1971	53	44	48	45	50	49	46	50	39	45	43	40	48
1972	49	47	42	60	55	48	39	61	36	50	48	44	53
1973	53	53	50	55	59	45	49	61	42	47	41	41	54
1974	50	42	47	49	59	48	49	47	42	48	40	37	51
1975	45	48	43	48	50	48	36	54	37	**38**	42	37	47
1976	50	49	46	57	51	42	38	57	37	43	44	43	50
1977	55	45	38	56	50	52	37	55	45	46	44	41	51
1978	61	53	51	55	55	54	43	62	44	48	**38**	42	55
1979	56	55	51	57	60	41	50	55	44	45	45	41	54
1980	43	41	42	51	47	44	39	49	39	41	41	42	46
1981	39	36	*33*	52	42	39	30	51	**29**	42	46	47	**43**
1982	72	49	54	69	70	58	53	61	49	54	45	50	64
1983	64	54	52	76	70	58	54	73	53	61	57	56	**67**
1984	51	40	48	56	47	42	45	42	44	45	41	**34**	47
1985	49	43	43	57	49	52	43	42	38	51	48	45	48

Table 2. Basin and District Annual Rainfall (Period of Record)

YEAR	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3	DAR
1915	64	54	61	65									
1916	45	43	46	56									
1917	**32**	41	37	53									
1918	56	50	46	56									
1919	49	56	60	60									
1920	52	56	53	60									
1921	36	44	41	53									
1922	44	48	55	70									
1923	43	43	55	54									
1924	55	58	52	66									
1925	58	48	57	75									
1926	62	56	59	60									
1927	42	**35**	37	45	**37**								
1928	42	49	55	52	57								
1929	53	47	54	60	53	54							
1930	65	66	62	66	68	66							
1931	49	45	51	58	46	40							
1932	50	45	47	66	55	61	52						
1933	60	57	58	72	48	56	52						
1934	41	60	45	59	51	60	48						
1935	46	51	52	58	51	50	46						
1936	62	53	64	75	63	60	53						
1937	68	54	47	53	50	59	40						
1938	40	37	37	**43**	44	39	39						
1939	51	55	56	53	56	56	47						
1940	52	47	56	69	56	56	53						
1941	66	61	57	65	58	64	59	58					
1942	43	45	46	62	47	56	43	45					
1943	43	48	49	51	47	38	41	50					
1944	43	53	46	*43*	39	45	37	42					
1945	44	53	51	54	52	47	49	56					
1946	45	45	39	56	47	55	39	52					
1947	**69**	64	**72**	**103**	**72**	**79**	64	**81**					
1948	49	54	60	72	51	56	55	58					
1949	50	54	52	58	53	48	49	64					
1950	41	49	35	53	40	48	*35*	51					
1951	50	52	50	45	49	53	51	42					

bold numerals indicate basin maximum and minimum values.

C. District Annual Rainfall

An index of regional rainfall is often more useful than a set of individual basin values. Although it does not reflect the variance within the region, it is a single measure which can be analyzed in a similar manner. District Annual Rainfall (DAR) is computed as an area-weighted average of the twelve basins' annual rainfall. It can be expressed as:

$$DAR = \frac{\sum_{i=1}^{12} R_i A_i}{\sum_{i=1}^{12} A_i} \qquad (2)$$

where R and A are rainfall-depth (inches) and area values (square miles), respectively. The subscript refers to the values being basin-specific. DAR has the same units as R. Conceptually, DAR is the single value of rainfall depth that, when multiplied by the area of the entire District, will yield the same volume of rainfall (rainfall depth x area = rainfall volume) as the sum of the 12 individual basin rainfall volumes. This can be expressed by multiplying both sides of equation (2) by the total area:

$$Volume\,of\,Rainfall =$$

$$DAR \cdot \left(\sum_{i=1}^{12} A_i\right) = \sum_{i=1}^{12} (R_i A_i) \qquad (3)$$

DAR is a characteristic rainfall depth of the District as a whole, and does not give information about the variability of rainfall from basin to basin. It is possible for several basins to receive abnormally high or low rainfall for a given year when DAR is near normal. DAR can be thought of as a linear combination of the basins' annual rainfall. The general expression for a linear combination is:

$$Y = a_1 X_1 + a_2 X_2 + \ldots + a_n X_n \qquad (4)$$

Equation 2 can be written in this form:

$$DAR = \frac{A_1}{\sum_{i=1}^{12} A_i} R_1 + \frac{A_2}{\sum_{i=1}^{12} A_i} R_2 + \ldots + \frac{A_{12}}{\sum_{i=1}^{12} A_i} R_{12} \qquad (5)$$

From the percentages given in Figure 2, DAR is computed as:

$$(.058)R_{EAA} + (.157)R_{ENP} + \ldots + (.058)R_{WC3} \qquad (6)$$

1. Historical Data.

Table 2 lists period-of-record annual rainfall for all 12 basins as well as DAR for years in which annual rainfall data from all 12 basins was available (1963-1985). A record is defined as the set of basin annual rainfall values for a given year. A complete record is one for which values for all 12 basins are available. Thus, DAR may be computed from complete records only, for the period of 1963 to 1985. The histogram of DAR values from 1963 to 1985 is shown in Figure 51. It shows that eight observations were between 45 and 50 inches of rainfall, more than any other interval. Seventy percent of the observations were between 45 and 55 inches. Six observations were greater than 55 inches, while only one year received less than 45 inches. This indicates that the distribution of DAR may be asymmetric about its central value.

The inferences made from this sample of DAR values are limited because of the small sample size (23 years). Estimates of missing basin annual rainfall data via correlation and regression can be used to extend all basins' period of record to seventy-one years (1915-1985), allowing DAR to be computed for this entire period. A histogram similar to Figure 51 can then be constructed, and inferences from this histogram can be made with greater confidence.

2. Extended Period of Record.

This approach uses estimates of missing basin annual rainfall values from linear regression in order that DAR values may be computed for the 71 year period 1915 to 1985. The basin rainfall values are computed as weighted averages of amounts recorded at raingages, using available historical data. Several combinations of raingages may have been used to estimate monthly rainfall values for a particular basin. This is because raingages occasionally malfunction, they frequently are discontinued, and new ones are often added. A raingage network was established in 1981 in order to compute basin rainfall values in a more consistent manner. Missing values in Table 2 are a result of insufficient historical raingage data. Consequently, estimates of District annual rainfall could not be made in years which contained missing basin values. Annual rainfall from basins with missing values was correlated with annual rainfall from a long-term raingage station in order to determine the strength of a linear relationship. If they were highly correlated, values

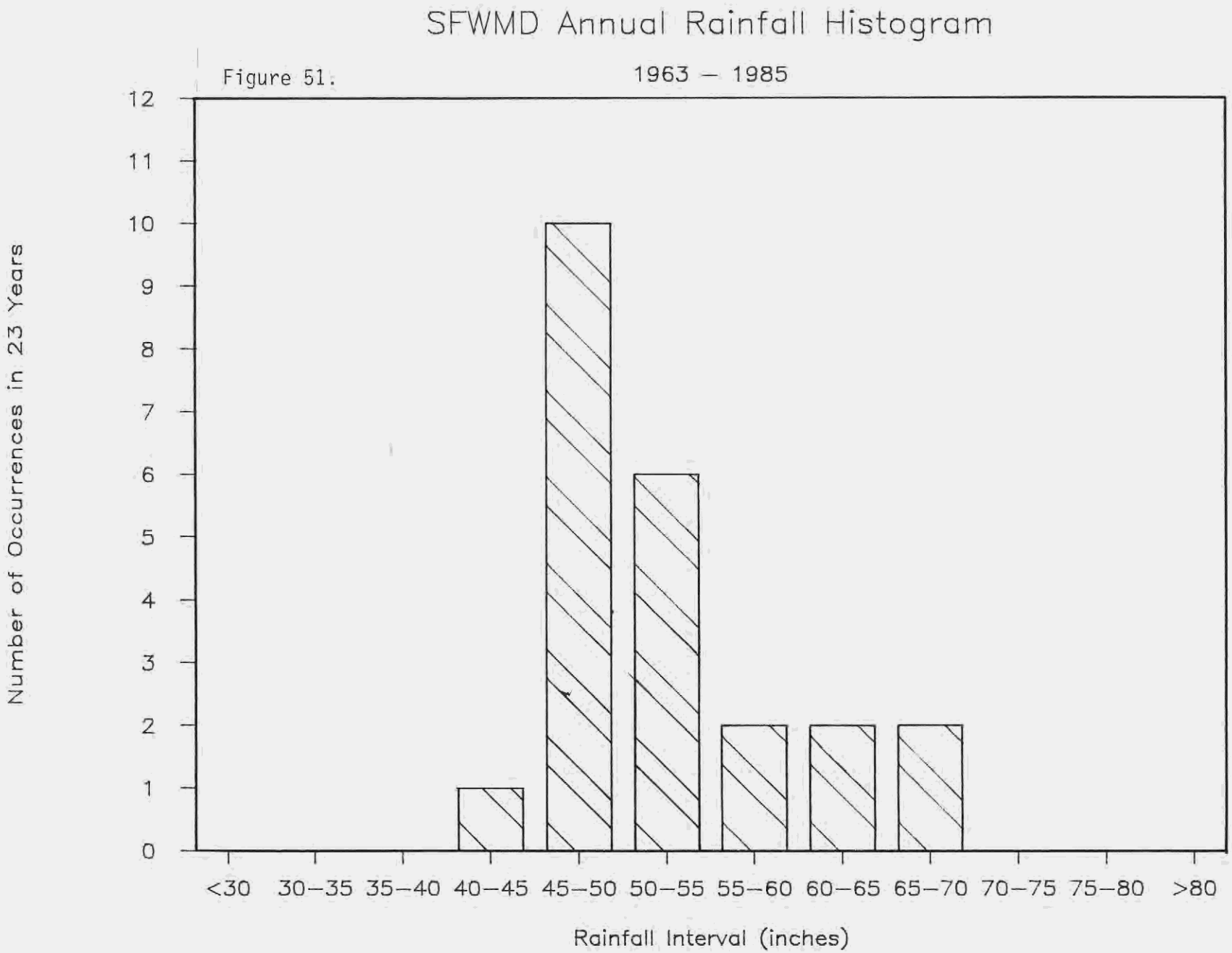

SFWMD Annual Rainfall Histogram
1963 — 1985
Number of Occurrences in 23 Years
0
1
2
3
4
5
6
7
8
9
10
11
12
<30
30–35
35–40
40–45
45–50
50–55
55–60
60–65
65–70
70–75
75–80
>80
Rainfall Interval (inches)

Figure 51.

Table 3. Complete Basin and District Annual Rainfall

YEAR	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3	DAR
1915	64	54	61	65	51	56	58	56	53	51	49	47	56
1916	45	43	46	56	53	51	45	57	42	47	45	43	51
1917	*32*	41	37	53	48	49	37	53	36	45	44	42	46
1918	56	50	46	56	44	51	45	51	42	47	45	43	49
1919	49	56	60	60	49	54	56	52	51	49	47	45	52
1920	52	56	53	60	53	53	51	58	47	49	47	45	54
1921	36	44	41	53	52	49	40	46	39	45	44	42	47
1922	44	48	55	70	70	60	52	64	48	54	52	50	62
1923	43	43	55	54	47	49	52	52	48	45	44	42	49
1924	55	58	52	66	59	57	50	61	46	52	50	48	58
1925	58	48	57	75	51	51	54	67	50	57	54	52	58
1926	62	56	59	60	56	57	51	56	51	49	47	45	56
1927	42	*35*	37	45	*37*	52	42	46	36	41	41	38	41
1928	42	49	55	52	57	42	52	50	49	44	44	41	51
1929	53	47	54	60	53	54	48	57	47	49	47	45	54
1930	65	66	62	66	68	66	55	61	53	52	50	48	63
1931	49	45	51	58	46	40	43	51	46	48	46	44	49
1932	50	45	47	66	55	61	52	59	43	52	50	48	56
1933	60	57	58	72	48	56	52	60	50	55	52	51	56
1934	41	60	45	59	51	60	48	57	41	49	47	45	52
1935	46	51	52	58	51	50	46	59	46	48	46	44	52
1936	62	53	64	75	63	60	53	65	55	57	54	52	63
1937	68	54	47	53	50	59	40	57	43	45	44	42	52
1938	40	37	37	43	44	39	39	43	*32*	40	40	37	41
1939	51	55	56	53	56	56	47	56	47	45	44	42	53
1940	52	47	56	69	56	56	53	60	45	54	51	49	57
1941	66	61	57	65	58	64	59	58	53	51	49	47	59
1942	43	45	46	62	47	56	43	45	34	52	48	46	49
1943	43	48	49	51	47	38	41	50	34	45	43	46	46
1944	43	53	46	43	39	45	37	42	38	40	40	37	41
1945	44	53	51	54	52	47	49	56	42	46	45	42	51
1946	45	45	39	56	47	55	39	52	38	50	45	42	48
1947	69	64	**72**	**103**	**72**	**79**	64	**81**	58	**74**	65	56	**77**
1948	49	54	60	72	51	56	55	58	44	47	52	46	56
1949	50	54	52	58	53	48	49	64	51	55	46	53	55
1950	41	49	35	53	40	48	35	51	37	47	44	48	44
1951	50	52	50	45	49	53	51	42	46	53	41	38	47

from the long-term raingage(s) would be used to estimate basin annual rainfall for missing years by using the regression equation. If no raingage values were available for a missing year, or had no valid relationship between raingage- and basin-annual rainfall been found, a regression estimate using an adjacent hydrologic basin as the next-best predictor was used.

Table 3 includes the results of the correlation and regression analyses for the eight basins with missing values. The stair-step line separates the non-missing basin annual rainfall values from those that used a surrogate measure. The shaded values were estimated by raingage regression equations, and values not shaded are estimates from adjacent basin regression equations, as previously stated. The computed DAR values for the 71-year period of record (1915-1985) are also shown. A histogram of these data is shown in Figure 52. The histogram from Figure 51 is superimposed to illustrate the frequency distribution enhancement made by increasing the sample size from 23 to 71. The 71-year histogram is also slightly skewed, and the right half of the histogram has more definition. The maximum value of 77 inches occurred in 1947. During this year, the Lower East Coast basin received 103 inches, more than 40 inches above its normal. Figure 53 shows, for each year between 1915 and 1985, DAR with respect to the 71-year average (mean). It shows that annual rainfall between 1940 and 1960 was extremal, and that a cyclical trend was evident after 1940, with wetter- and drier-than-normal annual rainfall occurring consecutively (on the average in 2 and 3 years, respectively).

The mathematical model used to describe the relationship between basin and predictor (gage or adjacent basin) annual rainfall is written as:

$$Y_i = \alpha + \beta X_i + \varepsilon \qquad (7)$$

where α (intercept) and β (slope) are parameters to be estimated by linear regression, X_i is the predictor annual rainfall, (assumed independent variable) ε is a random component or residual, and Y_i is the observed basin annual rainfall. The regression parameters are estimated from paired observations of basin and gage rainfall (years in which both basin and gage rainfall data are available). Values of gage rainfall from years in which the basin value is missing are used *after* the regression model has been developed, and do not contribute to the estimation of the least-squares linear regression parameters. Equation 8 below is used to compute the estimates of missing basin annual rainfall:

$$\hat{Y} = \alpha + \beta X \qquad (8)$$

The basic assumptions of linear regression are:

(1) the independent variable (X) is treated as errorless, and
(2) the residuals (ε) are independent, normally distributedwith zero mean, and have variance that does not dependon X (constant variance).

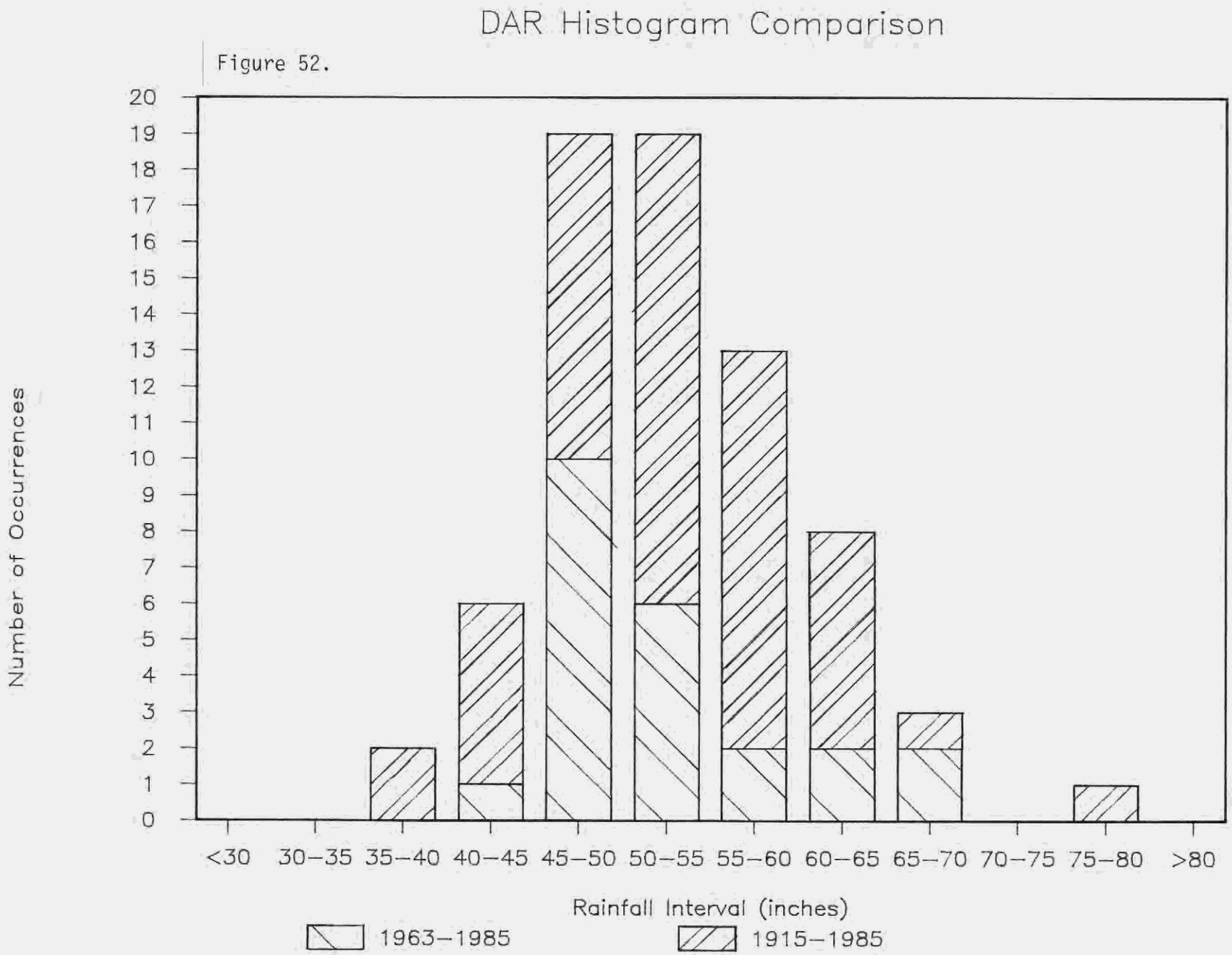
The degree of accuracy of these estimates is determined a) by how seriously the inherent regression assumptions are violated and b) by the descriptive statistics such as the coefficient of determination and the standard error of the estimates. Serious departures from the assumptions stated in (2) are detected by examining scatterplots of residuals versus the independent variable and predicted values. Also, a check for residual autocorrelation (time-dependence) is made by examining the sequential plot of residuals. The coefficient of determination, or r-squared (r^2), is a measure of the strength of a linear relationship. Values of r^2 range from 0 to 1, indicating the percentage of the total variation in Y that is explained by X. An r^2 value of 1 indicates a perfect linear relationship. The standard error of the estimate is used to evaluate the accuracy of prediction and is the "average" error in predicting Y from X. It has units of inches. Without a predictor variable and regression model, missing values are best estimated by the mean. The corresponding average error from using the mean as an estimate is its standard deviation. The standard error of the estimate is lower than the standard deviation because some of the variability has been explained by the predictor variable. Good regression models have a standard error much lower than the standard deviation, while poor models exhibit little reduction in uncertainty.

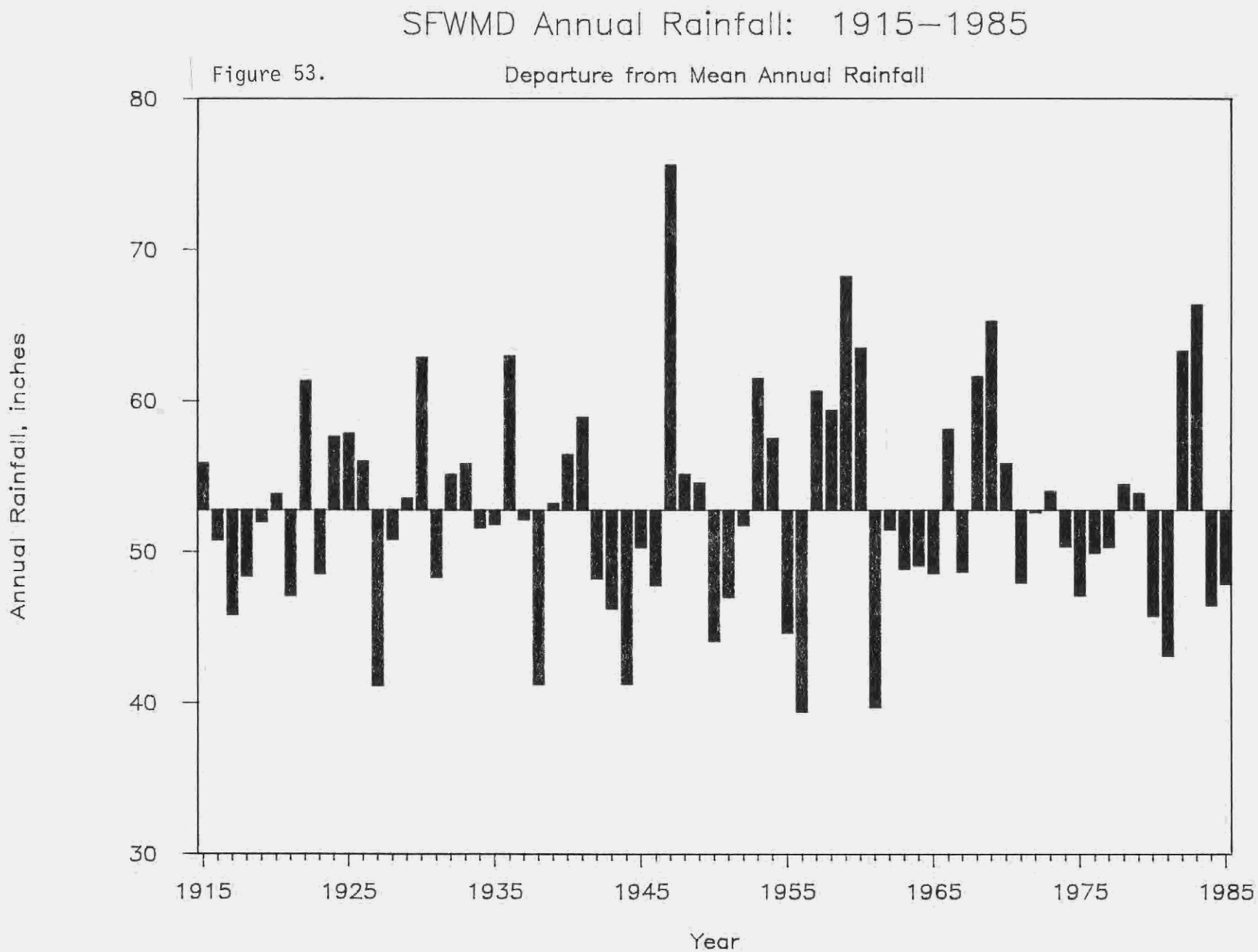
Coefficients of determination ranged from a high of 80% for Lake Okeechobee to 17% for Fisheating Creek. Similarly, the average error in prediction of Lake Okeechobee annual rainfall was reduced to 3.5 inches (the standard error) from 7.7 inches (the standard deviation) by using the regression model in lieu of the mean; that for Fisheating Creek was only reduced to 8.1 inches from 8.8 inches.

Table 3 (continued)

YEAR	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3	DAR
1952	50	47	51	50	52	58	54	54	52	50	45	47	52
1953	59	**73**	71	73	59	61	65	59	**58**	63	43	48	62
1954	58	44	52	72	55	56	59	60	54	61	54	44	58
1955	42	38	38	44	46	50	45	48	42	41	48	42	45
1956	43	49	46	*40*	39	*37*	37	*37*	33	39	39	40	*39*
1957	60	57	59	70	60	71	62	54	55	69	88	50	61
1958	49	51	50	64	62	62	55	68	48	48	75	49	60
1959	68	70	66	81	69	69	61	69	55	65	56	51	69
1960	58	68	61	70	62	64	**65**	71	49	61	52	56	64
1961	35	36	36	42	41	42	37	41	*34*	34	46	41	40
1962	48	42	48	48	57	55	55	51	44	47	47	46	52
1963	51	53	47	55	47	44	41	54	37	46	45	47	49
1964	54	50	45	62	41	52	44	52	41	58	53	50	49
1965	48	47	45	54	50	50	46	46	54	46	44	37	49
1966	65	54	51	70	51	57	54	66	53	67	59	49	58
1967	46	48	41	55	50	45	42	50	38	45	51	47	49
1968	55	52	51	73	61	60	53	73	49	54	58	51	62
1969	58	60	60	72	67	60	61	73	54	55	55	**60**	66
1970	55	44	46	51	66	55	51	54	50	42	53	46	56
1971	53	44	48	45	50	49	46	50	39	45	43	40	48
1972	49	47	42	60	55	48	39	61	36	50	48	44	53
1973	53	53	50	55	59	45	49	61	42	47	41	41	54
1974	50	42	47	49	59	48	49	47	42	48	40	37	51
1975	45	48	43	48	50	48	36	54	37	38	42	37	47
1976	50	49	46	57	51	42	38	57	37	43	44	43	50
1977	55	45	38	56	50	52	37	55	45	46	44	41	51
1978	61	53	51	55	55	54	43	62	44	48	*38*	42	55
1979	56	55	51	57	60	41	50	55	44	45	45	41	54
1980	43	41	42	51	47	44	39	49	39	41	41	42	46
1981	39	36	*33*	52	42	39	30	51	29	42	46	47	43
1982	**72**	49	54	69	70	58	53	61	49	54	45	50	64
1983	64	54	52	76	70	58	54	73	53	61	57	56	67
1984	51	40	48	56	47	42	45	42	44	45	41	*34*	47
1985	49	43	43	57	49	52	43	42	38	51	48	45	48

Figure 52.


DAR Histogram Comparison
Number of Occurrences
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
<30
30–35
35–40
40–45
45–50
50–55
55–60
60–65
65–70
70–75
75–80
>80
Rainfall Interval (inches)
1963–1985
1915–1985


SFWMD Annual Rainfall: 1915–1985
Figure 53.
Departure from Mean Annual Rainfall
Annual Rainfall, inches
80
70
60
50
40
30
1915
1925
1935
1945
1955
1965
1975
1985
Year

ESTIMATON OF DISTRICT ANNUAL RAINFALL PROBABILITY DISTRIBUTION

As mentioned previously, there are limitations to the discretization of DAR. Until now, no assumptions have been made regarding DAR having an underlying theoretical probability distribution. If this assumption can be validated, DAR is treated as a continuous random variable rather than a discrete one. Many hydrologic phenomena are assumed to follow a theoretical probability distribution. The Water Resources Council recommends the Log-Pearson Type III distribution for defining annual flood series[1] and the Gumbel (double negative exponential) distribution has been considered appropriate for defining drought events. The normal, or Gaussian distribution describes many hydrologic processes that are subject to random and independent variations. It has a wide application in dealing with transformed data that subsequently follow the normal distribution. In the log-normal distribution, for example, frequencies will not follow the normal distribution, but their logarithms follow a normal distribution[2]. The logarithmic normal distribution is useful in defining many hydrologic random variables where the values of the variate are the result of underlying multiplicative factors, and are known to be strictly positive[3], and has been previously used to define rainfall. In this analysis, the data were fitted to two distributions: normal and log-normal.

A Kolmogorov-Smirnov (K-S) goodness of fit test was performed on each basin's wet season, dry season, and annual rainfall, as well as the 23 years of DAR, to determine the relative appropriateness of the two distributions. Appendix E lists the K-S significance levels with a brief interpretation of the results. Eight of the 12 basins' annual rainfall were judged to be more log-normally distributed than normally distributed, as was District annual rainfall[4]. The acceptance of an underlying distribution assumes the observations are random and independent. Though the assumption of independence theoretically may be more reasonable for seasonal rainfall than for annual rainfall because the observations do not form a continuum, both wet season and annual rainfall plotted versus time (Figures 15 through 26 and 39 through 50) show cyclical trends and characteristics of time-dependence. This analysis, however, is robust, in that small departures from the basic assumptions will not seriously affect the validity of the results.

The log-normal distribution is described by two parameters, the mean λ (lambda) and the variance ζ^2 (zeta squared). These population parameters must be estimated by sample statistics calculated from the historical data. Estimates of these parameters are denoted as $\hat{\lambda}$ ("lambda hat") and $\hat{\zeta}^2$, respectively. There are two commonly used methods of parameter estimation: the method of maximum likelihood and the method of moments. The method of maximum likelihood computes the statistics as follows:

$$\hat{\lambda} = \frac{1}{n} \sum_{i=1}^{n} ln(x_i) \quad (9)$$

$$\hat{\zeta}^2 = \frac{1}{(n-1)} \sum_{i=1}^{n} [ln(x_i) - \hat{\lambda}]^2 \quad (10)$$

where n is the sample size and ln (x_i) is the natural logarithm (base e) of the ith observation. The method of moments relates the distribution parameter estimates to the sample moments (in this instance, the first two moments, the mean and the variance). The log-normal parameters are estimated by:

$$\hat{\lambda} = ln(\bar{X}) - \frac{1}{2}s^2 \quad (11) \quad and \quad \hat{\zeta}^2 = ln(1 + \frac{s^2}{\bar{X}^2}) \quad (12)$$

A study comparing the methods of the log-normal distribution parameter estimation[5] favors the use of the method of maximum likelihood based on superior performance for sample sizes greater than twenty; the method of maximum likelihood is used in this report.

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[1] Guidelines for Determining Flood Flow Frequency, Bulletin 17B. (Reston: Water Resources Council, Hydrology Subcommittee, March, 1982), p. 3.

[2] Warren Viessman, Jr. and others. Introduction to Hydrology. (New York: Harper & Row, 1977), p. 174.

[3] Alfredo H-S Ang and W. H. Tang, Probability Concepts in Engineering Planning and Design. (New York: Wiley and Sons, 1975), p. 104.

[4] Ibid., p. 4. "...when two or more distributions appear to be plausible probability distribution models, such tests can be used to delineate the relative degree validity of the different distributions."

[5] J. R. Stedinger, "Fitting Log-Normal Distributions to Hydrologic Data," Water Resources Research, Vol. 16, No. 3, pp. 481-490, June 1980.

Log-normal distribution parameters were estimated for DAR based on the 71-year period, 1915-1985.Parameter estimates from the better-fitting distribution were made for wet season, dry season, and annual rainfall from each of the basins. Though the use of estimates of missing basin values was acceptable for computing additional DAR values, their use is not warranted in the analysis of basin rainfall *per se*. Table 4 lists the median and mean annual rainfalls for each basin and the District. The parameter λ is related to the median annual rainfall, X_m (defined as the rainfall having 50% probability of exceedance in any given year) by: $X_m = e^{\lambda}$.

Table 4. Basin Rainfall and DAR Statistics

Basin	Median Xm (inches)	Mean $\bar{X}$ (inches)
EAA	52.2	52.9
ENP	54.6	55.5
FEC	47.1	47.9
KRB	49.4	50.1
LEC	58.3	59.2
LOK	44.0	44.6
LWC	52.6	53.2
UEC	50.7	51.5
UKR	49.6	50.2
WCA-1	48.2	48.6
WCA-2	46.7	47.0
WCA-3	44.2	44.6
DAR	52.6	52.8

The sample statistics $\hat{\lambda}$ and $\hat{\zeta}$ are sufficient to describe the log-normally distributed random variable, District annual rainfall. That is, no information is lost from the sample by summarizing the data in terms of $\hat{\lambda}$ and $\hat{\zeta}$. These statistics also define the probability distribution of DAR. This is represented by its *probability density function* (PDF), and is shown in Figure 54. The histograms in Figures 51 and 52 are similar to, and in fact, a discrete approximation of, the PDF in Figure 54. In order to make a direct comparison to the PDF (giving a visual goodness of fit of the data to the theoretical distribution), the vertical axis on the histogram is rescaled to produce a *frequency diagram*. This is accomplished by dividing each ordinate by the total area of the histogram. For example, the frequency diagram ordinate for 45 to 50 inches is obtained by taking the corresponding histogram ordinate (19 occurrences), and dividing by the total histogram area (71 occurrences x 5 inches). The resultant frequency, 0.054/inch may be compared with the PDF evaluated at 47.5 inches (the interval midpoint), which is approximately 0.048/inch. Probabilities of occurrence are associated with intervals, and not specific values. For example, the probability of DAR being between 60 and 65 inches in any given year is defined as the area under the PDF between 60 and 65 inches. From this definition and by making the interval width smaller and smaller, it follows that the probability of receiving exactly 62.5 inches (or any other single value) of rainfall is zero.

An easier graphical tool to determine probabilities is the cumulative distribution function (CDF). The CDF of District annual rainfall is shown in Figure 55. Mathematically, the CDF is the integral of the PDF. The CDF yields the probability that DAR will be less than the stated rainfall in any year. This can be written as:

$$F(X) = P(X < x)$$

Similarly,

$$1 - F(X) = P(X \geq x),$$

and this gives the probability that DAR will equal or exceed the stated rainfall in any given year. Both graphs appear in Figure 55. The examples to follow illustrate the utility of Figure 55 in determining DAR magnitude and frequency.

Q: What is the probability of the District receiving between 55 and 60 inches of rainfall in any one year?

A: This probability statement is written $P(55 \leq x < 60)$, and is computed as the difference between the CDF values for 55 and 60 inches: F(60) - F(55). Since F(60) = 0.85 and F(55) = 0.68, $P(55 < X < 60) = 0.17$ or 17%.

Q: What is the 1-in-10-year "dry" or below-normal annual rainfall?

A: The 1-in-10-year dry annual rainfall is defined as having probability of 1/10 receiving that amount of rainfall or less in any year. That is, the 1-in-10-year dry rainfall is experienced on the average once in ten years. It is determined by locating F(X) = 0.10 and reading the corresponding CDF value. From Figure 55, the 10-year dry annual rainfall is approximately 44 inches.

Figure 54.

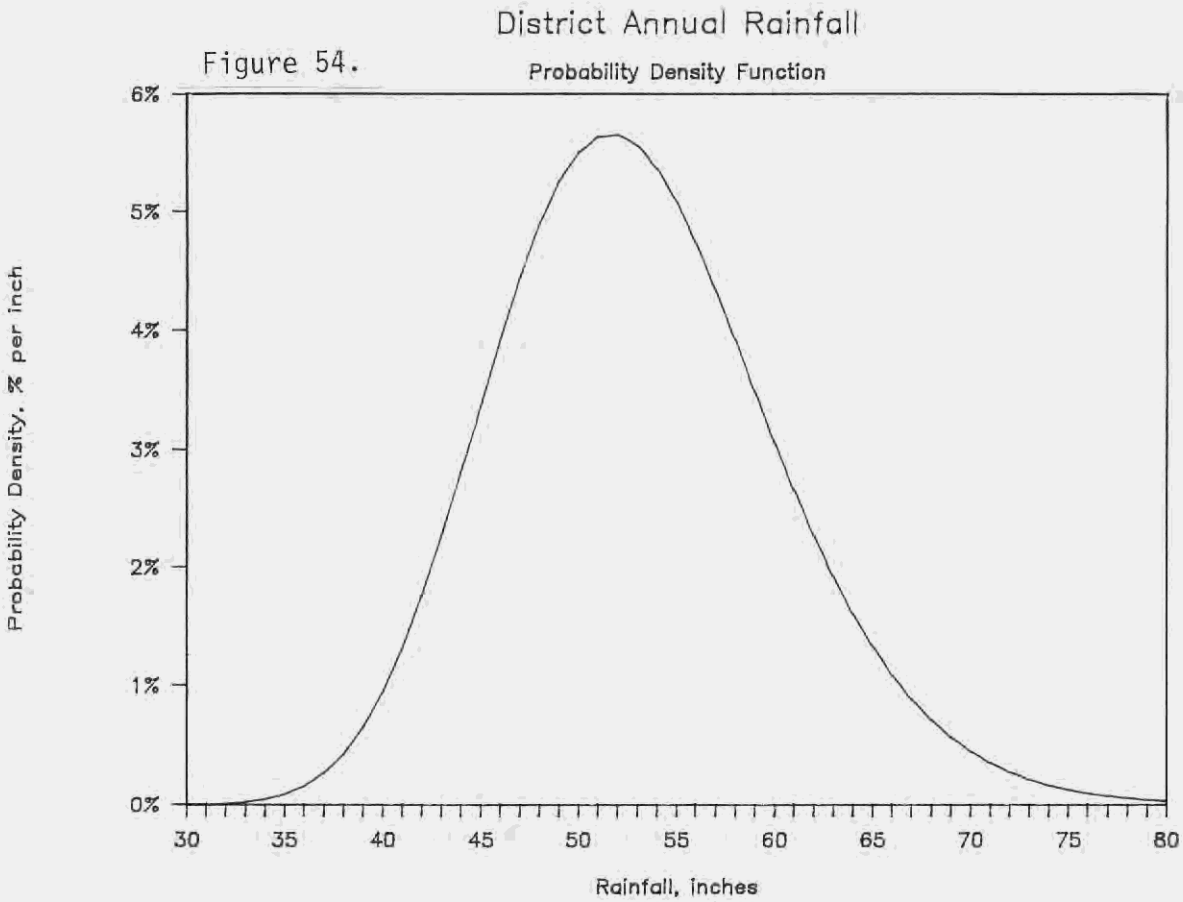
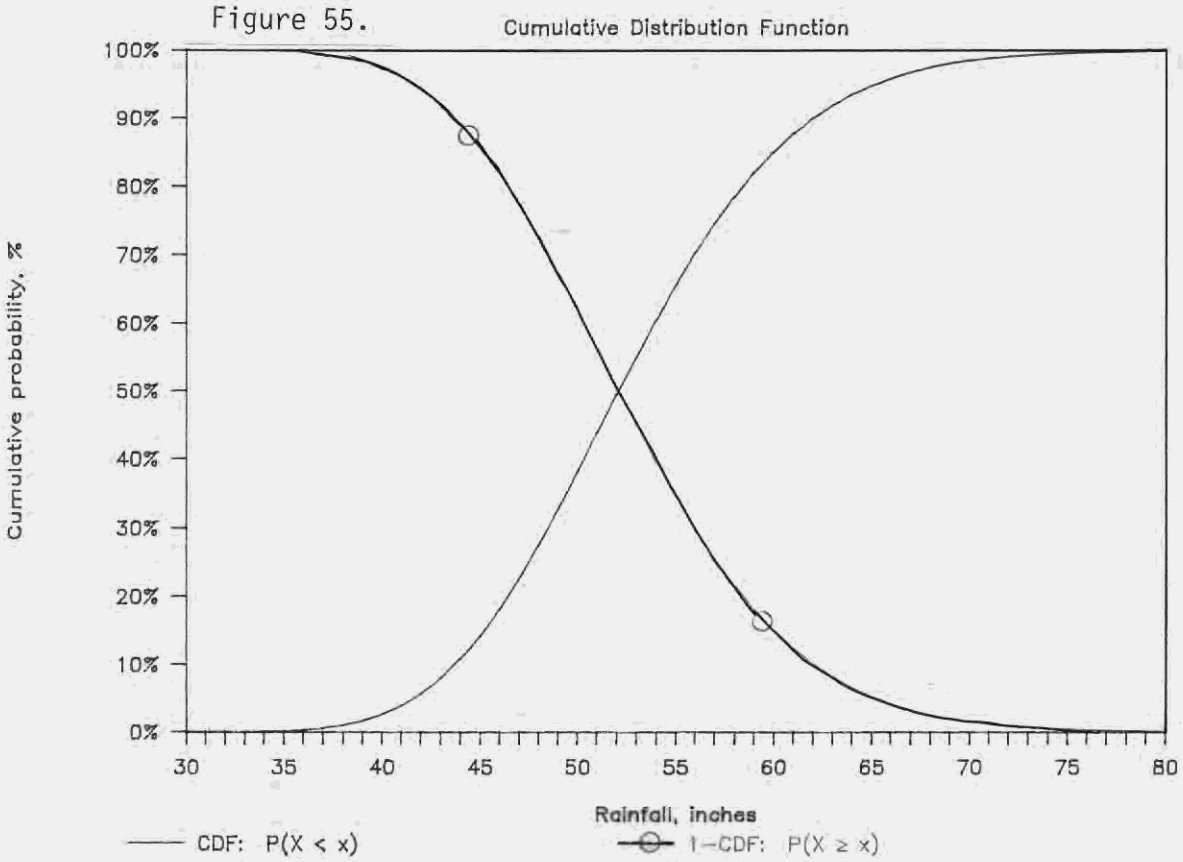


Figure 55.



Q: What is the 1-in-10-year "wet" annual rainfall?

A: This is similarly defined as the rainfall having probability of exceedance of 10% in any given year. The "1-CDF" curve is read as 62.5 inches.

Note that where the two curves in Figure 55 intersect is the District median annual rainfall (X_m), 52.6 inches.

Table 5. Historical versus Log-Normal DAR Frequency

Rainfall Interval (inches)	Number of Occurrences in 71 Years	
	Historical	Log-Normal
<30	0	0
30-35	0	0
35-40	2	2
40-45	6	7
45-50	19	18
50-55	19	20
55-60	13	14
60-65	8	8
65-70	3	3
70-75	0	0
75-80	1	0
>80	0	0
Totals	71	71

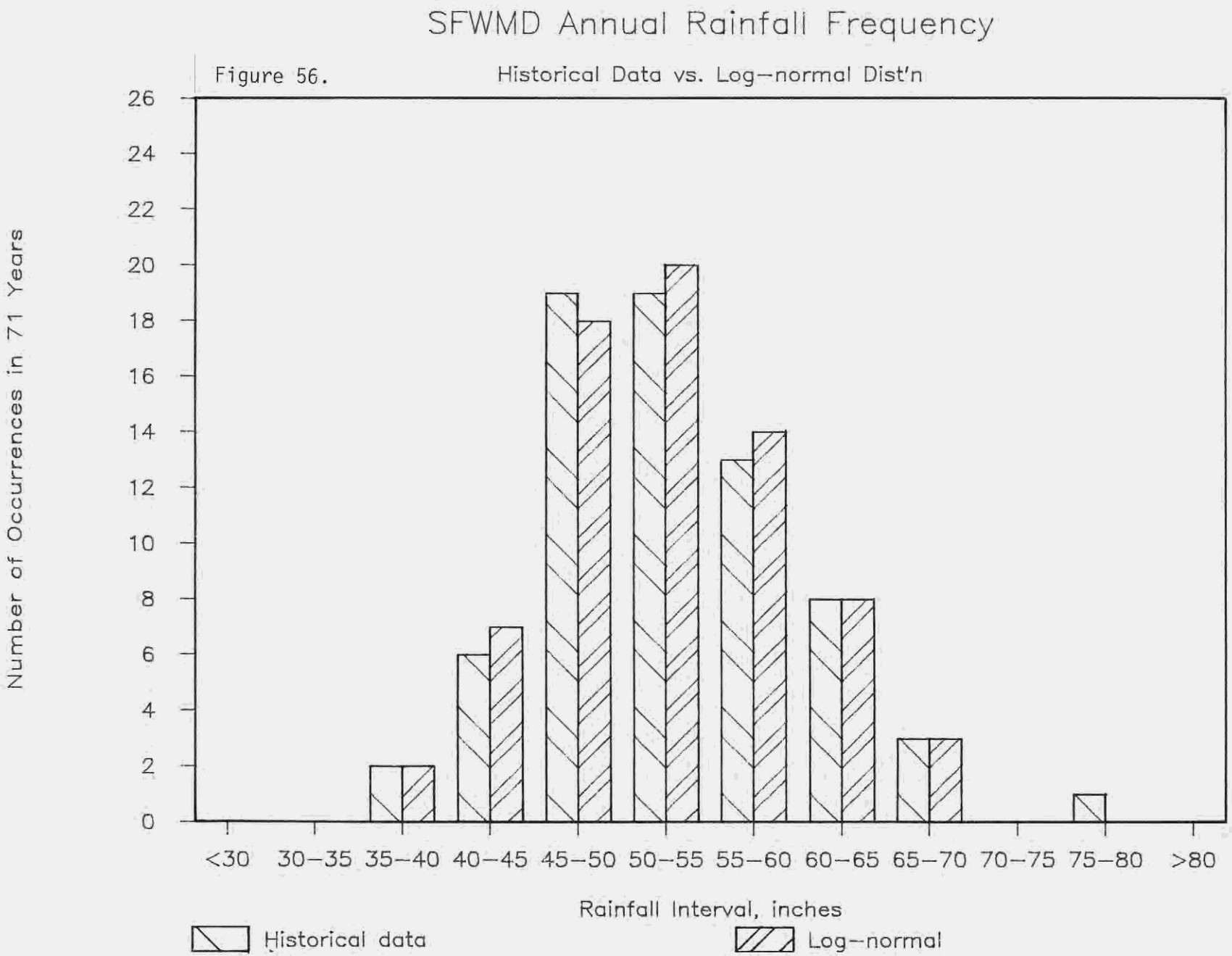
The procedure in the above examples were used to construct a log-normal histogram to compare the theoretical distribution with the historical data. Table 5 lists the ordinates of both histograms as they appear in Figure 56. Histograms were compared in lieu of frequency diagrams because the ordinate units are more easily interpreted. Figure 56 shows how well the log-normal distribution reproduced the historical data. As stated previously, the K-S test was used to assess the validity of the assumed underlying distribution. Similar PDF and CDF graphs were developed for the 12 hydrologic basins (wet season, dry season, and annual rainfall) and are in Appendix C.

Table 6 lists DAR for selected return periods. A return period (in years) is defined as the reciprocal of the exceedance frequency. Thus the 1-in-50-year DAR has probability of exceedance of 1/50 or 0.02. It is also referred to as the "2%-chance" DAR. These values were computed because the extreme values are not easily read from Figure 55. The term "exceedance" is used loosely here because of the dual meaning of an "n-year" annual rainfall. "Exceedance" is used here to mean to experience a more extreme event (high or low).The degree of certainty or confidence associated with an estimate obtained from a probability distribution is dependent on both the associated exceedance frequency and the sample size. For a given sample, there is less certainty about extreme events than frequently occurring ones. More intuitively, the degree of confidence associated with an estimate of any event increases with more observations (larger sample size). Confidence intervals are often reported in lieu of point estimates, especially with unusually small sample sizes and/or rare events.

Table 6. District Annual Rainfall Magnitude and Frequency

Return Period (years)	Exceedance Frequency (years-1)	DAR (inches)	
		Dry	Wet
2	0.5	52.6	52.6
5	0.2	47.0	58.9
10	0.1	44.3	62.5
25	0.04	41.5	66.6
50	0.02	39.9	69.4
100	0.01	38.4	72.1
200	0.005	37.2	74.5

Often, the CDF is plotted on probability paper with axes scaled such that it appears as a straight line. Since the DAR values are log-normally distributed (their logarithms are normally distributed), the rainfall scale on the vertical axis is logarithmic and the frequency scale is linear in the transformed standard normal variate, z (the number of standard


SFWMD Annual Rainfall Frequency
Figure 56.
Historical Data vs. Log-normal Dist'n
Number of Occurrences in 71 Years
0
2
4
6
8
10
12
14
16
18
20
22
24
26
<30
30-35
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
>80
Rainfall Interval, inches
Historical data
Log-normal

deviations away from the mean a particular value lies). It is computed by:

$$z = \frac{[ln(x_i) - \hat{\lambda}]}{\hat{\zeta}} \quad (13)$$

and is dimensionless. This transformation form ln x_i to z allows a table of standard normal probability to be used to determine exceedance probabilities. Figure 57 shows this plot with exceedance and non-exceedance probabilities (expressed as percentages) on the upper and lower horizontal axis, respectively. Appendix D contains the wet season, dry season, and annual rainfall magnitude and frequency graphs for each basin. Table 7 lists the 2-, 10-, and 100-year wet (above-average) and dry (below-average) basin amounts for the wet season, dry season, and annual rainfall. Note that as in Table 6, the 2-year wet and dry amounts are equivalent; the 2-year rainfall is average rainfall.

A computer procedure has been developed on the SFWMD's CDC mainframe that analyzes sequential monthly rainfall from any of the basins. Results from the procedure include rainfall magnitude and frequency computed from the basin and span of months specified by the user. The K-S goodness of fit test is used to select the better of the two distributions (normal or log-normal). Simple statistics are reported (means and standard deviations), as are rainfall amounts above and below normal having return periods of 2, 5, 10, 20, 50, and 100 years. Examples of the interactive procedure appear in Appendix F, along with a listing of the programs which comprise the procedure.

Figure 57 District Annual Rainfall Log-Probability Plot

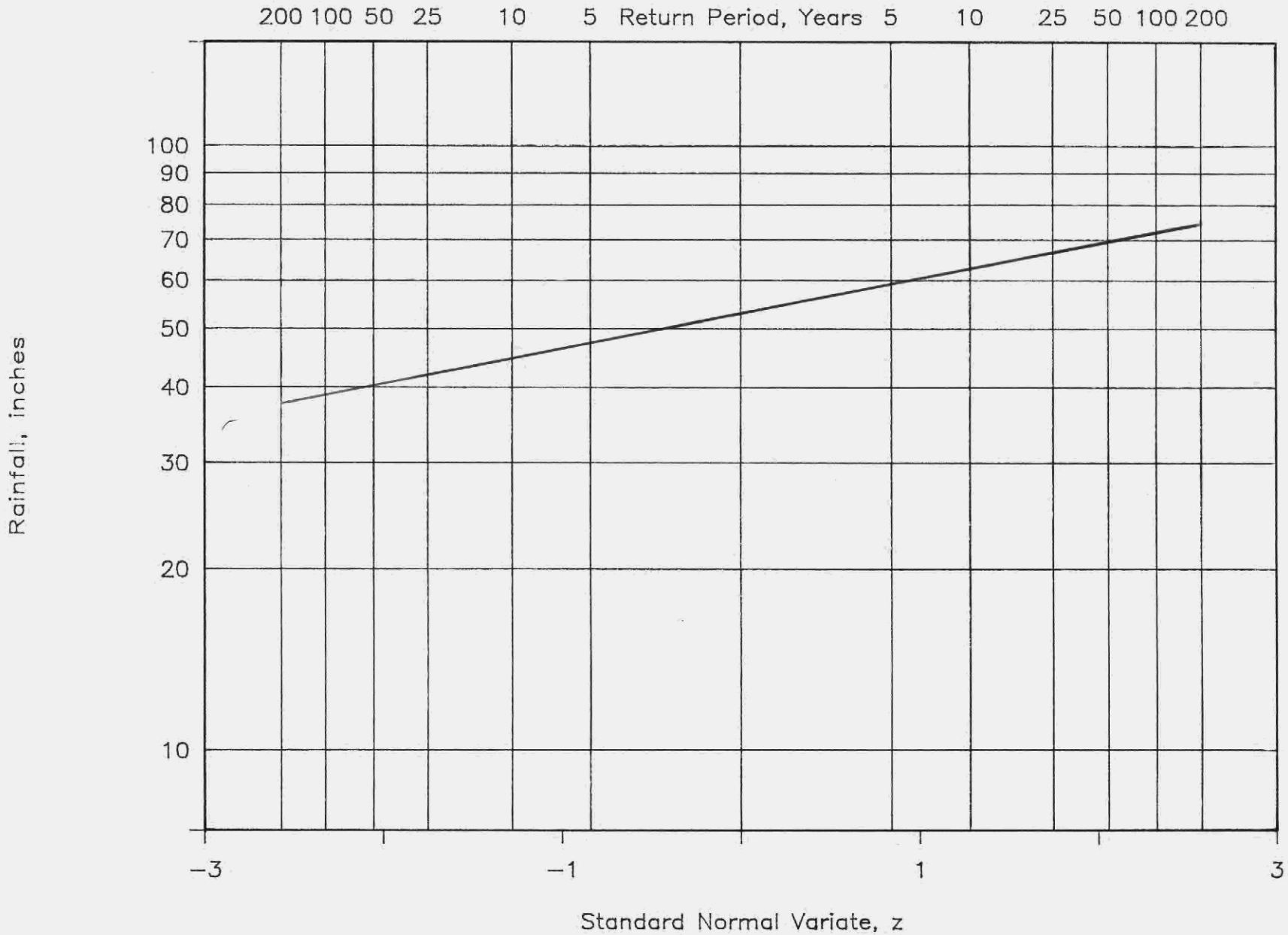


Table 7. Basin Rainfall Magnitude and Frequency

Rainfall Period	EAA		ENP		FEC		KRB		LEC		LOK		Return Period (Years)
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	
Wet Season	35.2	35.2	38.6	38.6	30.9	30.9	32.1	32.1	36.9	36.9	28.4	28.4	2
	44.2	26.2	48.6	30.7	41.1	23.2	41.1	25.1	47.8	28.5	36.7	20.2	10
	51.6	18.9	58.7	25.4	51.9	18.4	50.2	20.6	59.0	23.1	43.5	13.4	100
Dry Season	17.7	17.7	16.6	16.6	16.3	16.3	17.2	17.2	20.4	20.4	16.4	16.4	2
	25.9	9.5	22.7	10.4	23.6	9.0	24.0	10.5	31.7	13.2	23.5	9.3	10
	32.5	2.9	27.8	5.4	29.6	3.1	29.5	5.0	45.4	9.2	29.3	3.5	100
Calendar Year Annual	52.9	52.9	55.0	55.0	47.9	47.9	50.0	50.0	58.3	58.3	44.8	44.8	2
	64.3	41.5	68.7	44.0	58.9	37.0	60.4	39.5	73.4	46.4	54.7	35.0	10
	73.7	32.2	82.4	36.7	67.8	28.0	68.9	31.0	88.5	38.4	62.7	27.0	100

Rainfall Period	LWC		UEC		UKR		WC1		WC2		WC3		Return Period (Years)
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	
Wet Season	36.8	36.8	32.1	32.1	29.5	29.5	31.0	31.0	29.9	29.9	29.3	29.3	2
	46.4	29.2	39.8	24.4	38.2	22.9	39.7	22.3	38.9	23.0	35.8	22.8	10
	56.2	24.1	46.1	18.1	47.1	18.5	46.8	15.3	48.1	18.6	41.1	17.5	100
Dry Season	15.9	15.9	18.1	18.1	18.1	18.1	17.5	17.5	16.5	16.5	15.3	15.3	2
	23.2	8.6	29.3	11.2	26.4	12.3	24.5	10.5	23.6	9.4	21.4	9.2	10
	29.2	2.6	43.4	7.6	36.0	9.0	30.1	4.8	29.3	3.6	26.4	4.2	100
Calendar Year Annual	52.6	52.6	50.7	50.7	48.4	48.4	48.0	48.0	46.6	46.6	44.2	44.2	2
	64.7	42.8	40.7	63.3	58.9	39.7	57.3	40.3	55.1	39.5	52.9	36.9	10
	76.5	36.2	34.0	75.8	69.2	33.8	66.1	34.9	63.1	34.5	61.4	31.8	100

RAINFALL ANALYSIS OF HYDROLOGIC BASINS PRESENTED IN MONTHLY OPERATIONS REPORT

The Department of Resource Operations in their monthly summary of meteorologic, hydrologic, and hydraulic conditions has subdivided most of the SFWMD into reporting areas that are somewhat different from the planning area basins that were analyzed. Figure 58 identifies the nine basins which comprise the entire District except for the Everglades National Park. The Upper Kissimmee, Lower Kissimmee, Ft. Pierce area (Upper East Coast), Everglades Agricultural Area, and Lower East Coast basins are similar to the corresponding planning area basins. The Lake Okeechobee reporting area includes the Taylor Creek/Nubbin Slough, and Indian Prairie watersheds. The conservation areas have been combined with a portion of Hendry County to form one reporting area. The Caloosahatchee and Collier County basins complete the reporting areas. These reporting areas were chosen in most cases on the basis of drainage patterns and coincide with the District hydrologic basins.

The purpose of analyzing reporting-area rainfall is to be able to provide information about basins defined in this manner. The same basic rainfall data are used regardless of how the SFWMD is subdivided. That is the analysis of, and conclusions drawn, about SFWMD total rainfall is independent of how basins are defined. For this reason, results from these reporting areas will not be combined for further analyses. Because of the noted similarities between many of the reporting- and planning-areas, only the rainfall from the Water Conservation Areas, Collier County, Caloosahatchee, and Lake Okeechobee reporting areas will be analyzed.

Figures 59-62 show the historical wet- and dry-season rainfalls with respect to the period-of-record means. Because of the lack of an adequate raingage network in Hendry County that is part of the water conservation reporting area, many annual and seasonal values were unable to be estimated. Statistical rainfall analysis is not warranted in this case for a lack of sufficient data (see Figure 62). Figures 63-66 show similar historical annual rainfall for the same reporting areas. The wet-season, dry-season, and annual rainfall magnitude and frequency plots for the Collier County, Caloosahatchee, and Lake Okeechobee reporting areas are in Appendix G.

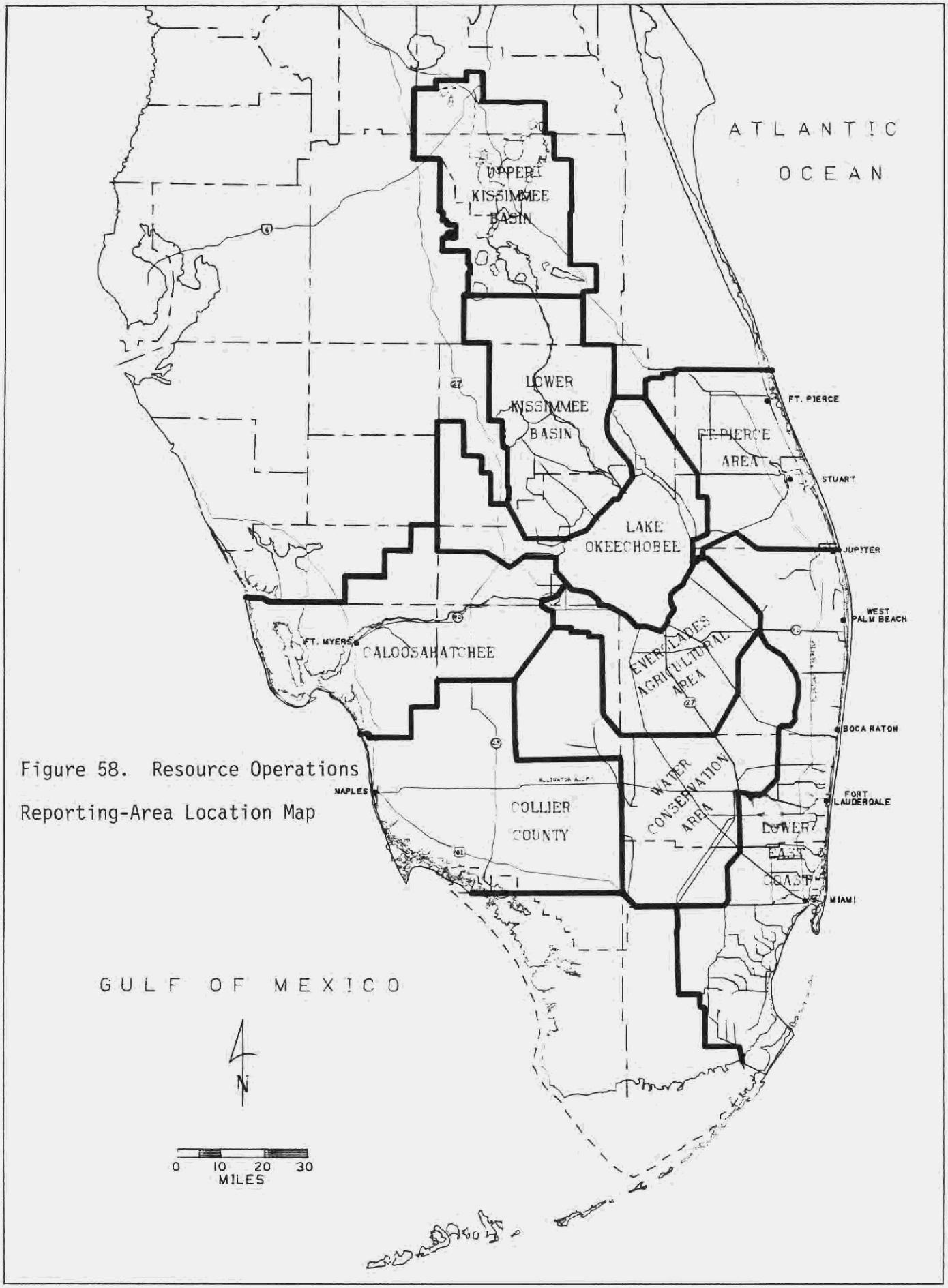
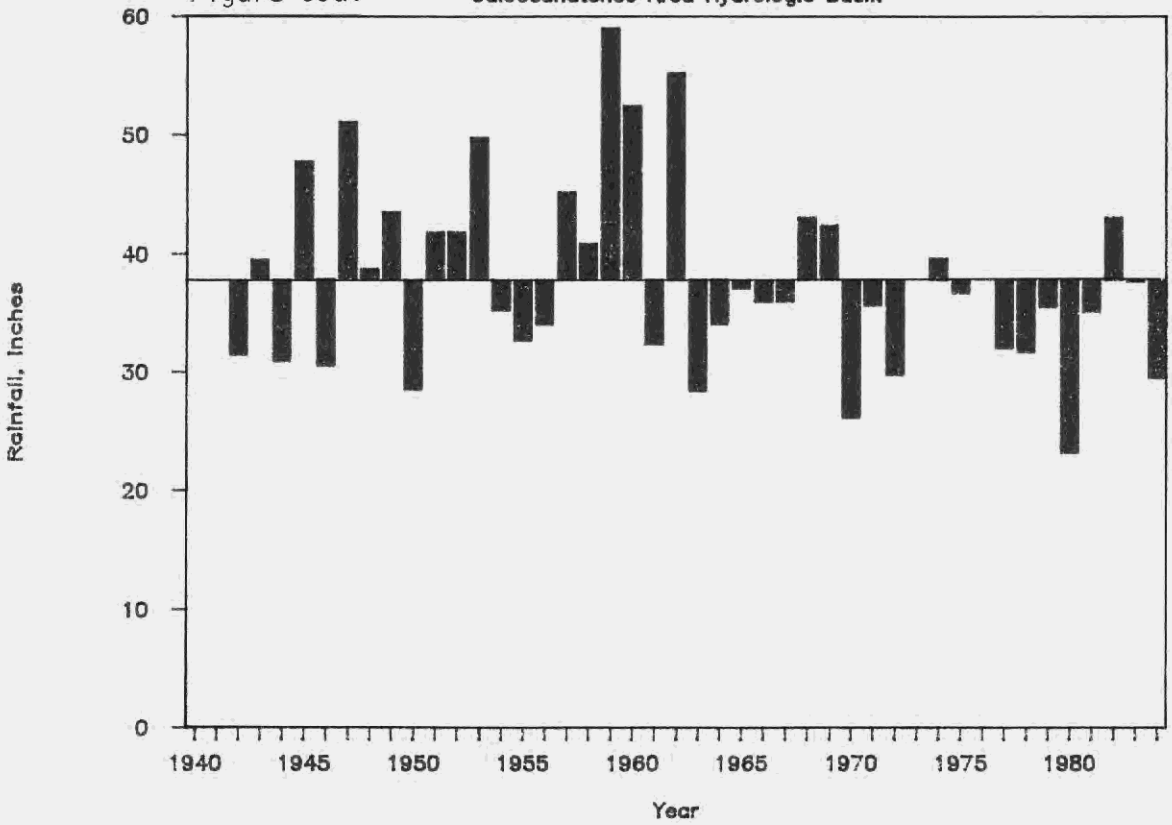


Figure 58. Resource Operations Reporting-Area Location Map

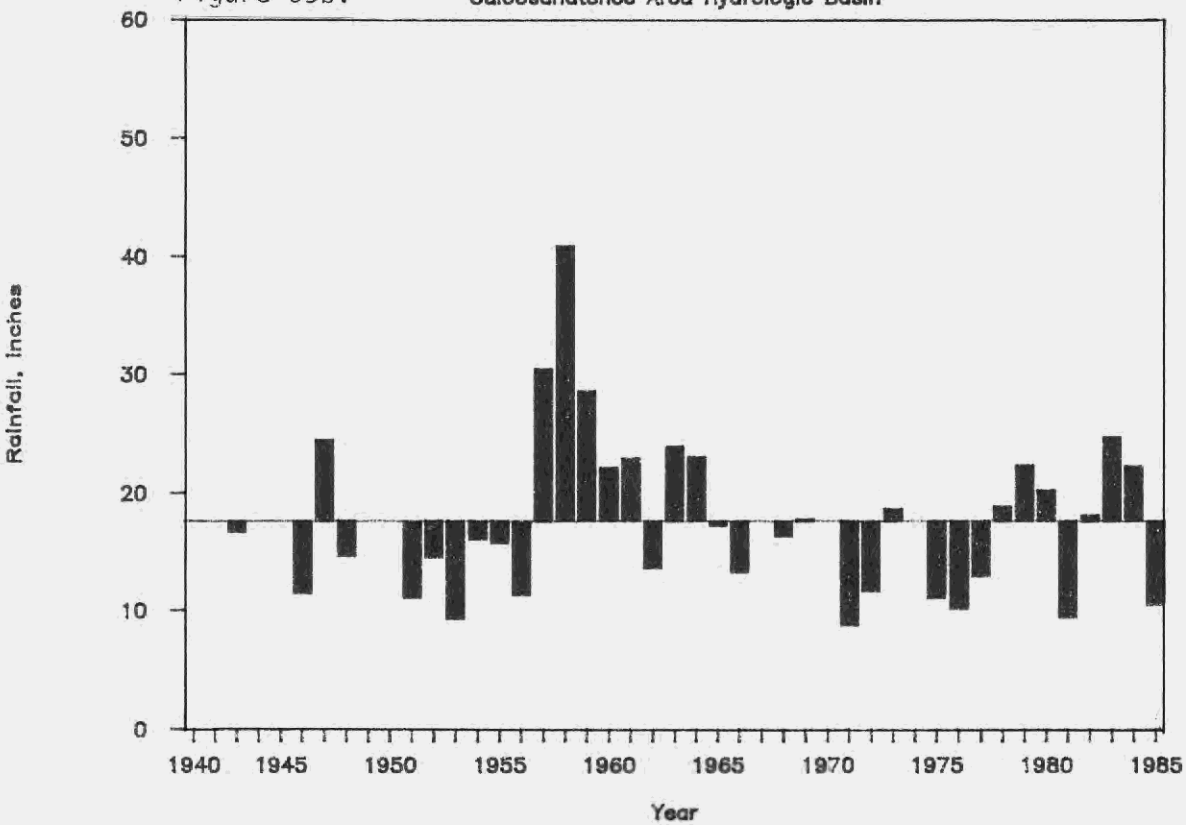
Departure from Mean Wet Season Rainfall

Figure 59a. Caloosahatchee Area Hydrologic Basin



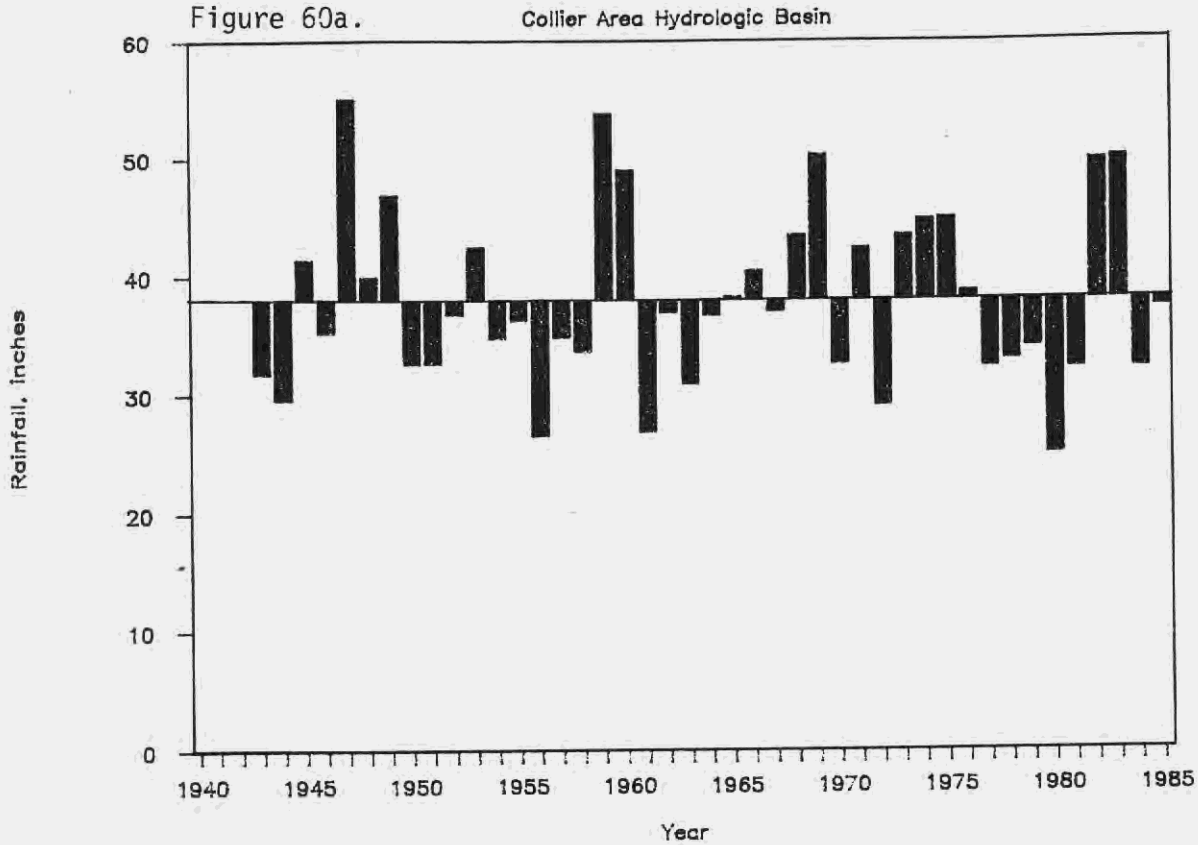
Departure from Mean Dry Season Rainfall

Figure 59b. Caloosahatchee Area Hydrologic Basin



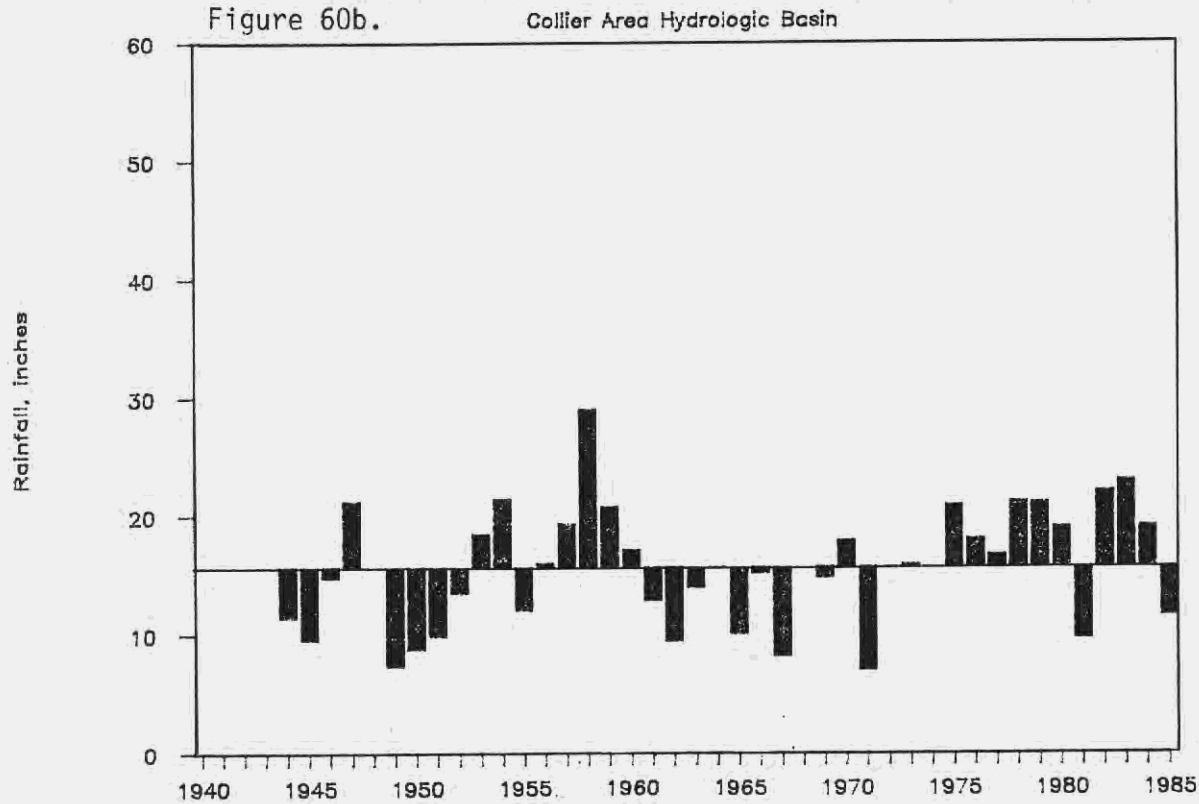
Departure from Mean Wet Season Rainfall

Figure 60a.



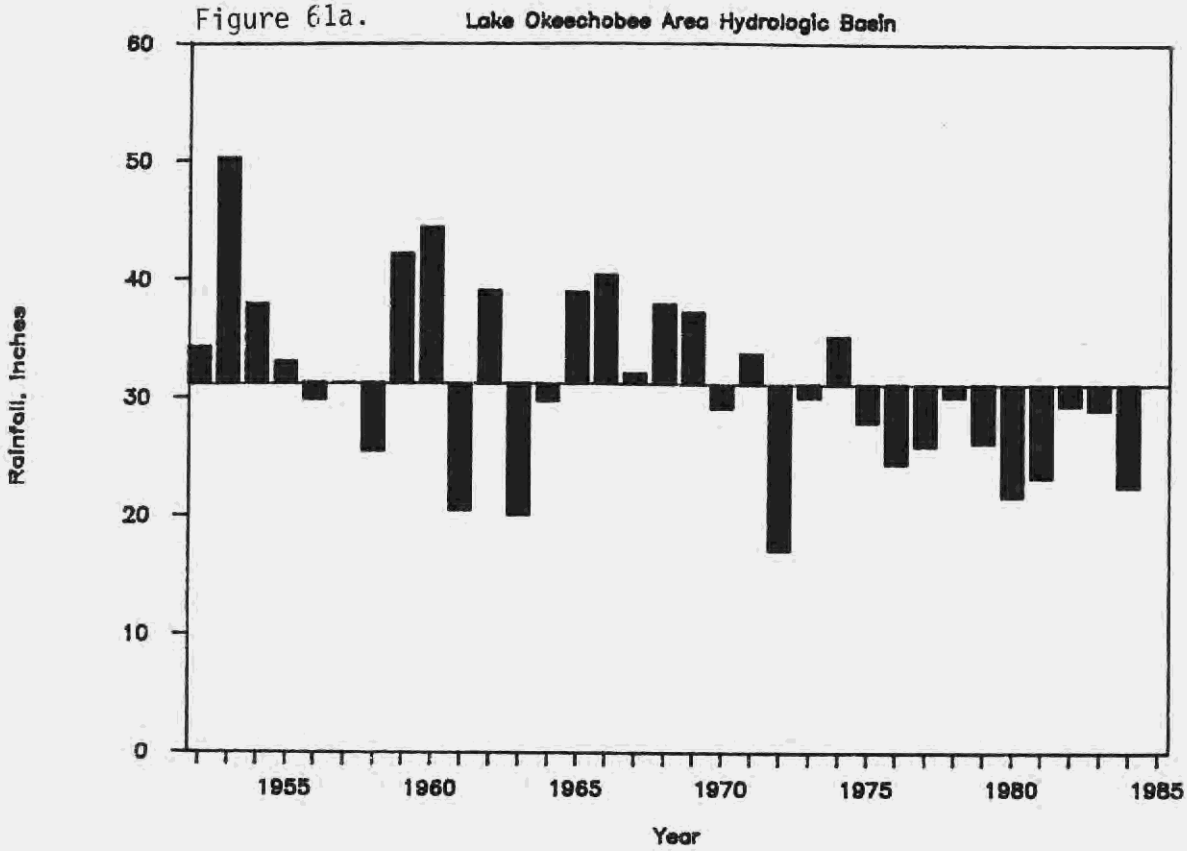
Departure from Mean Dry Season Rainfall

Figure 60b.



Departure from Mean Wet Season Rainfall

Figure 61a.



Departure from Mean Dry Season Rainfall

Figure 61b.

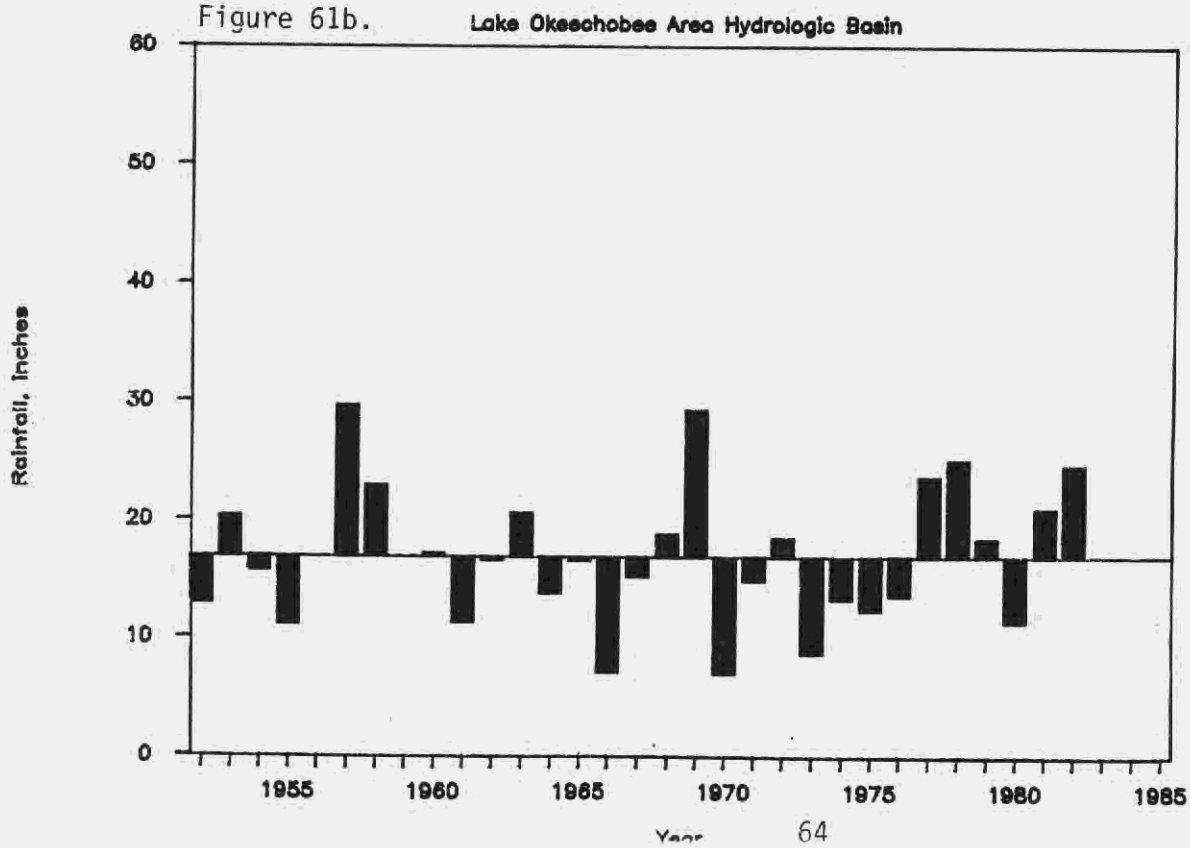


Figure 62a.

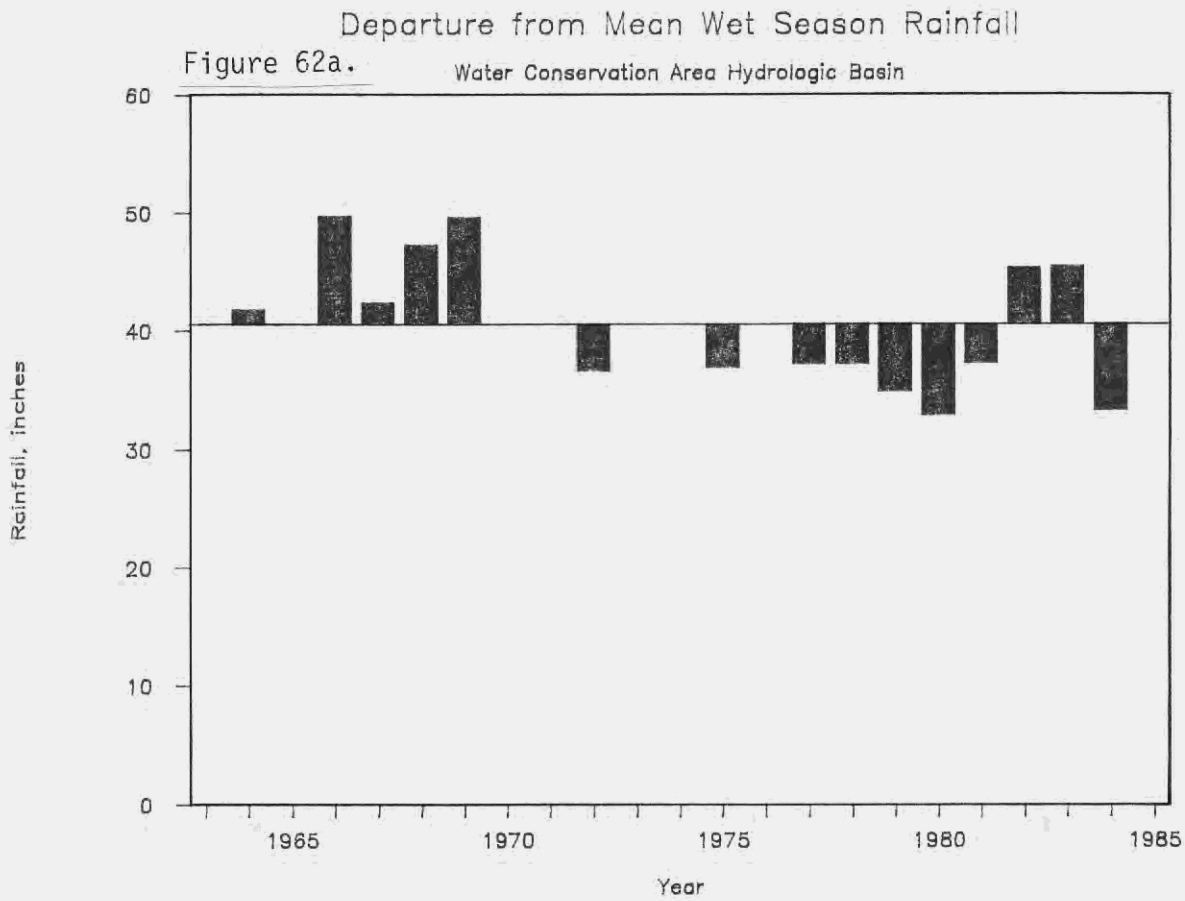
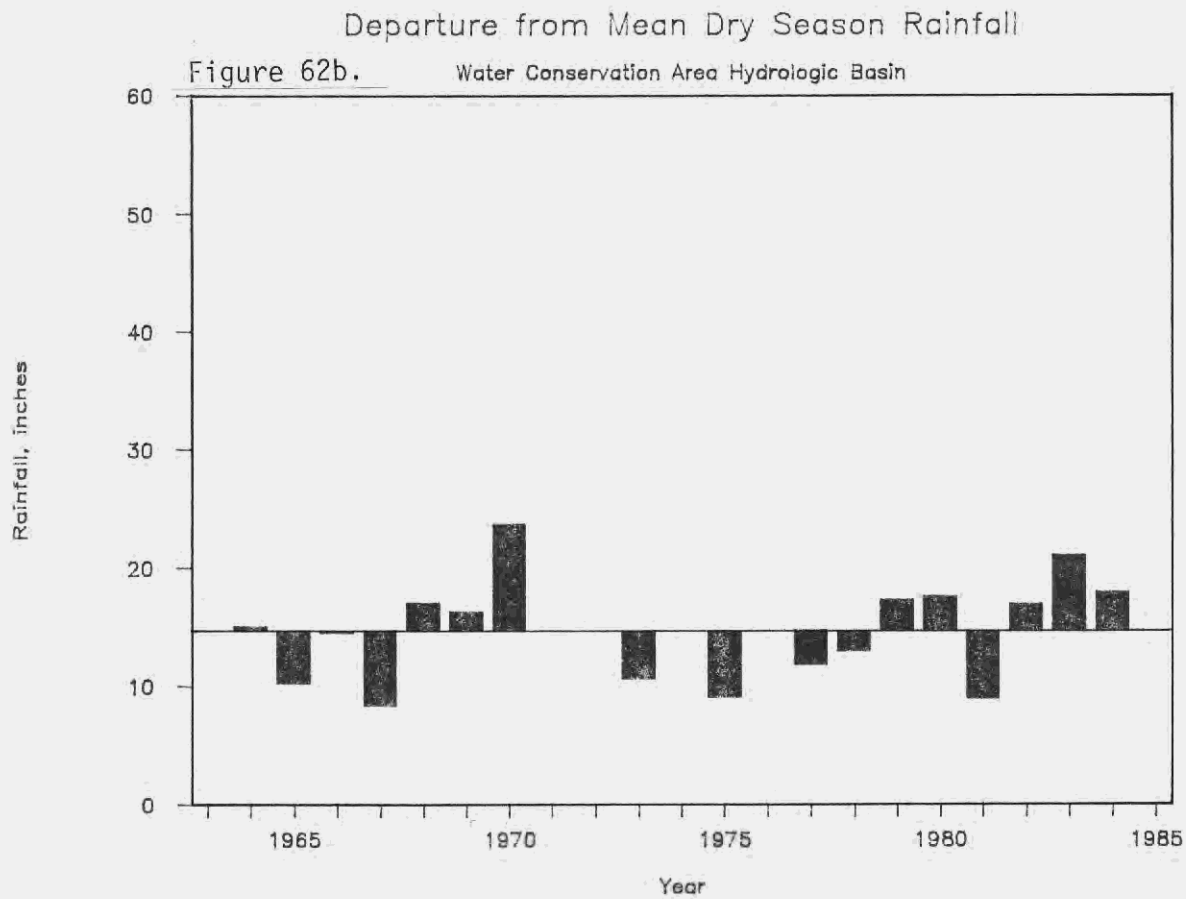


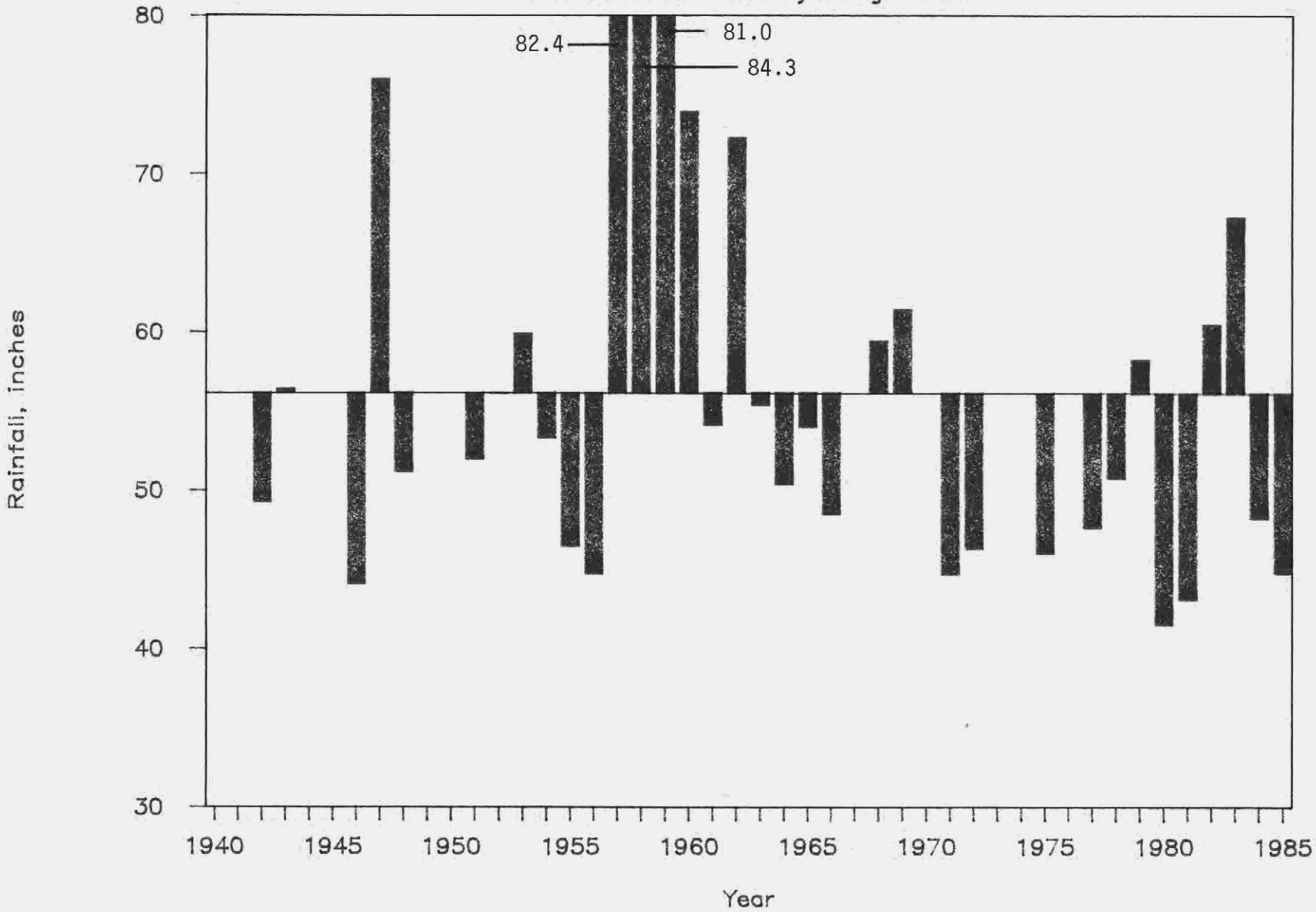
Figure 62b.



Departure from Mean Annual Rainfall

Figure 63.

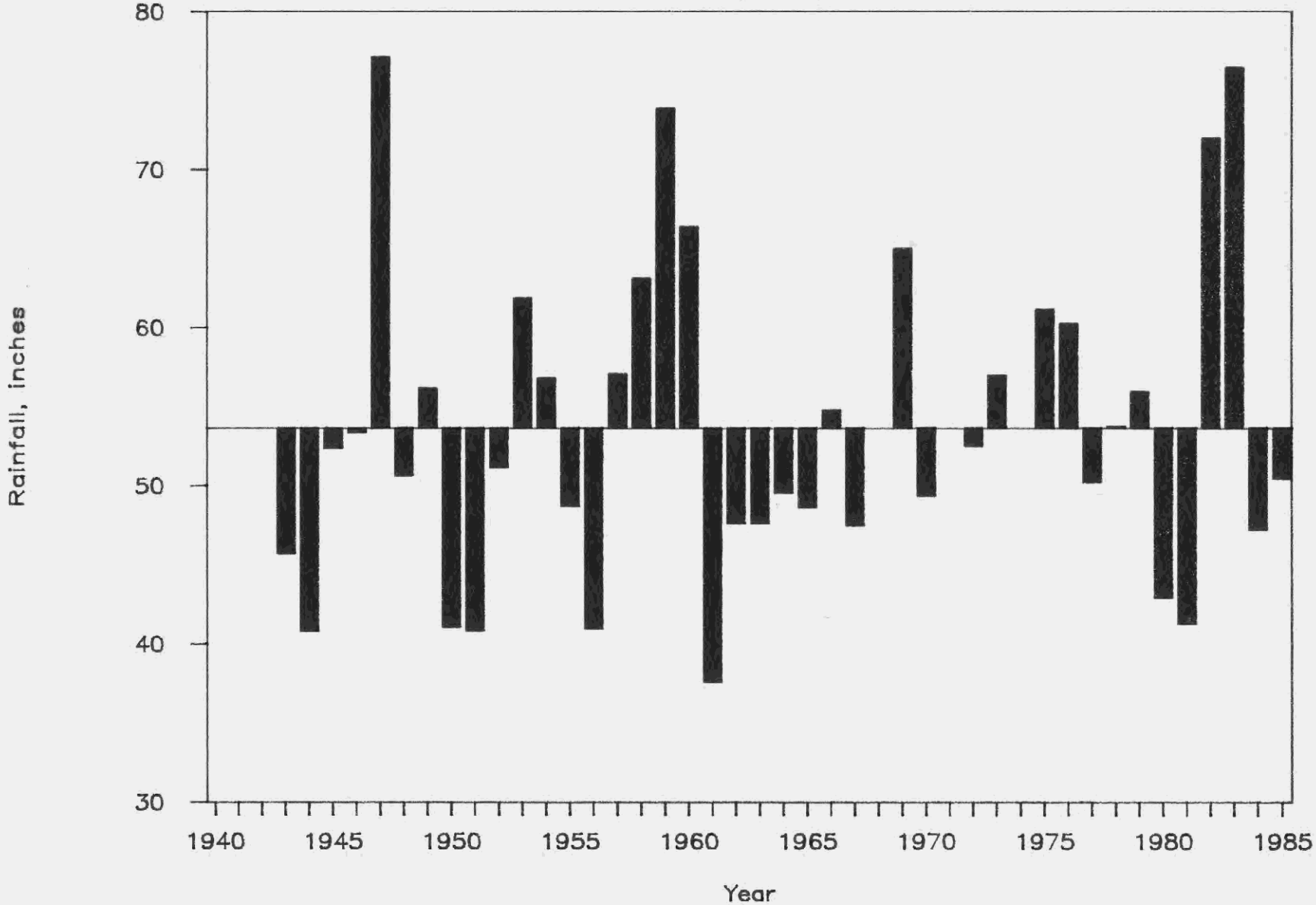
Caloosahatchee Area Hydrologic Basin



Departure from Mean Annual Rainfall

Figure 64.

Collier Area Hydrologic Basin



Departure from Mean Annual Rainfall

Figure 65.

Lake Okeechobee Area Hydrologic Basin

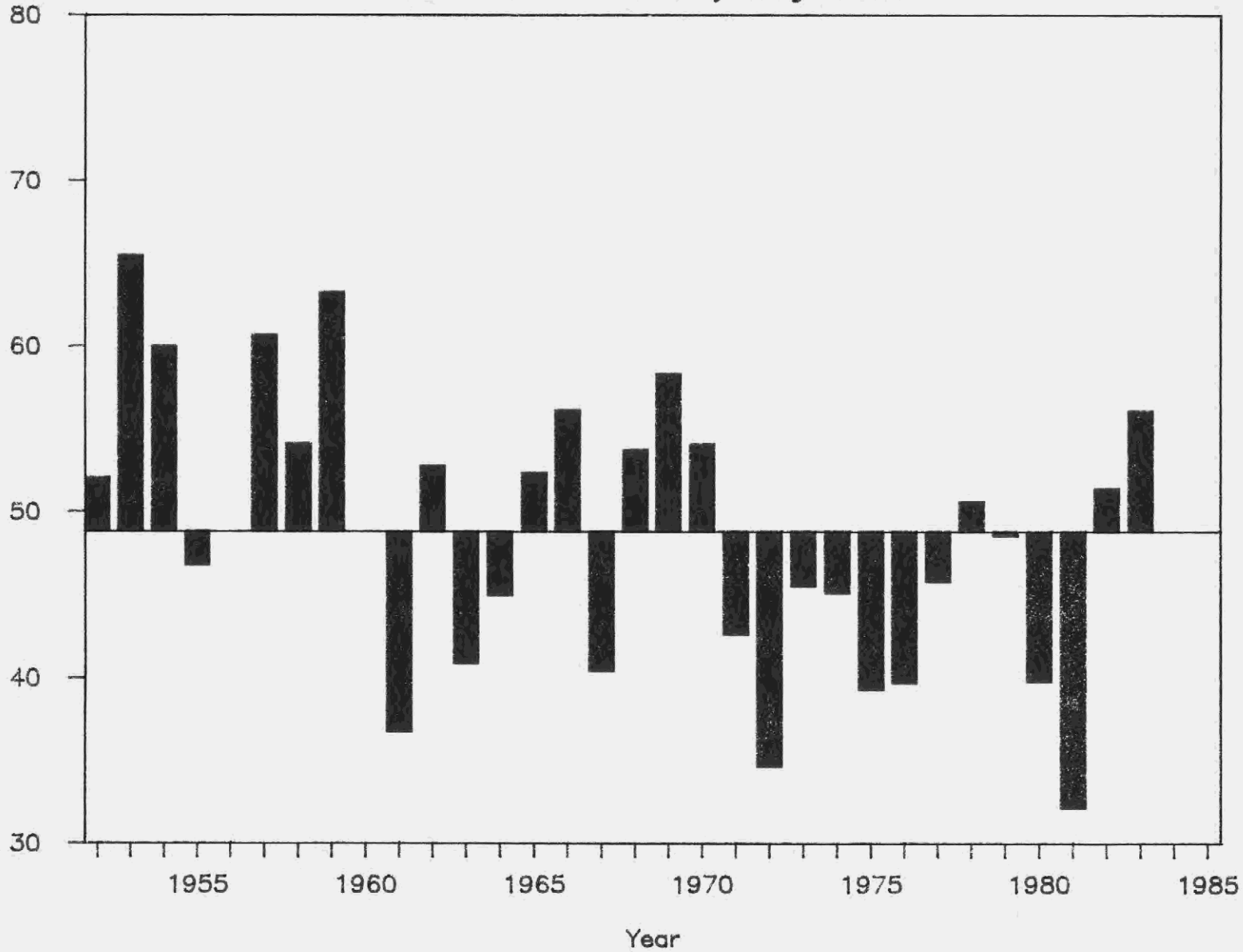
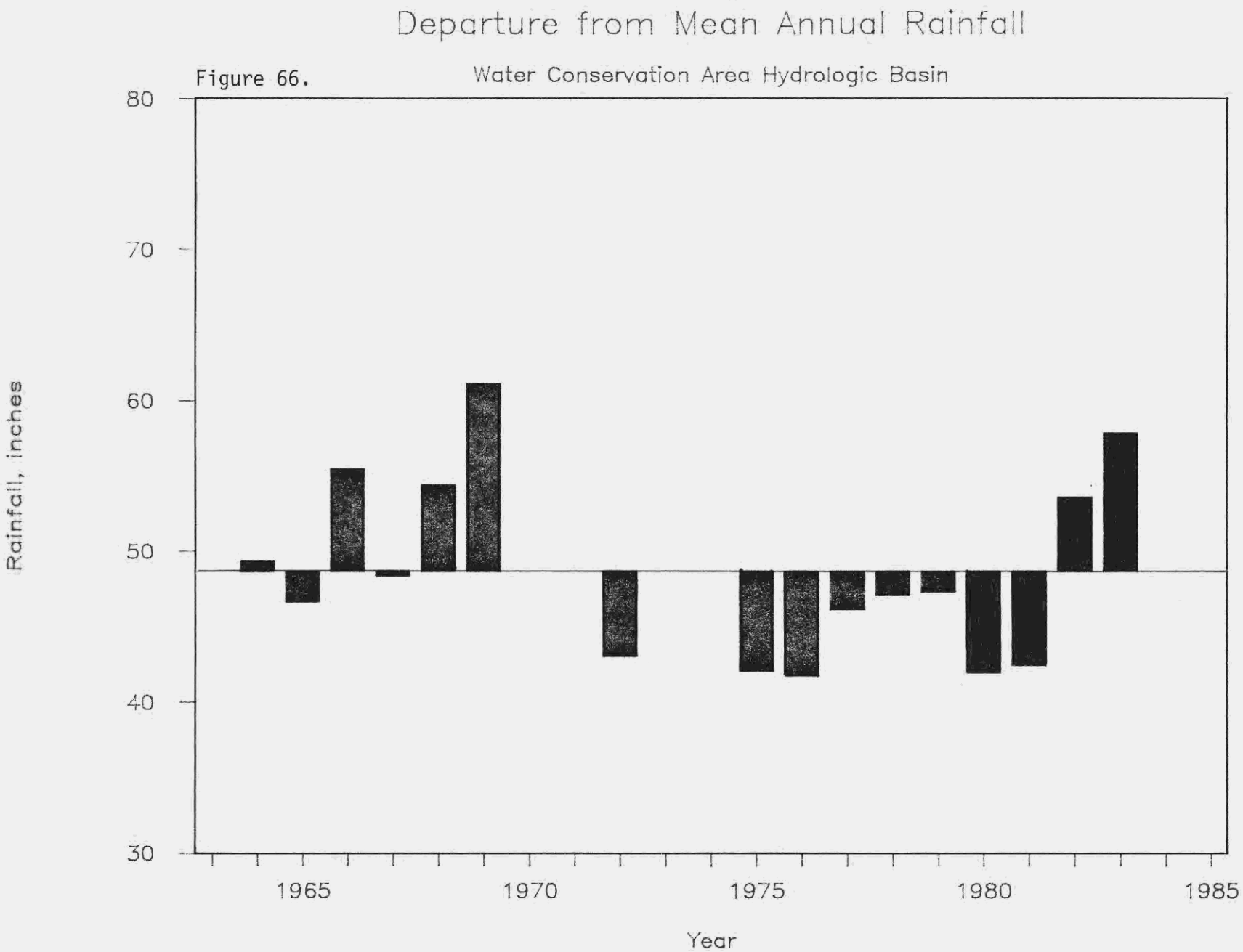
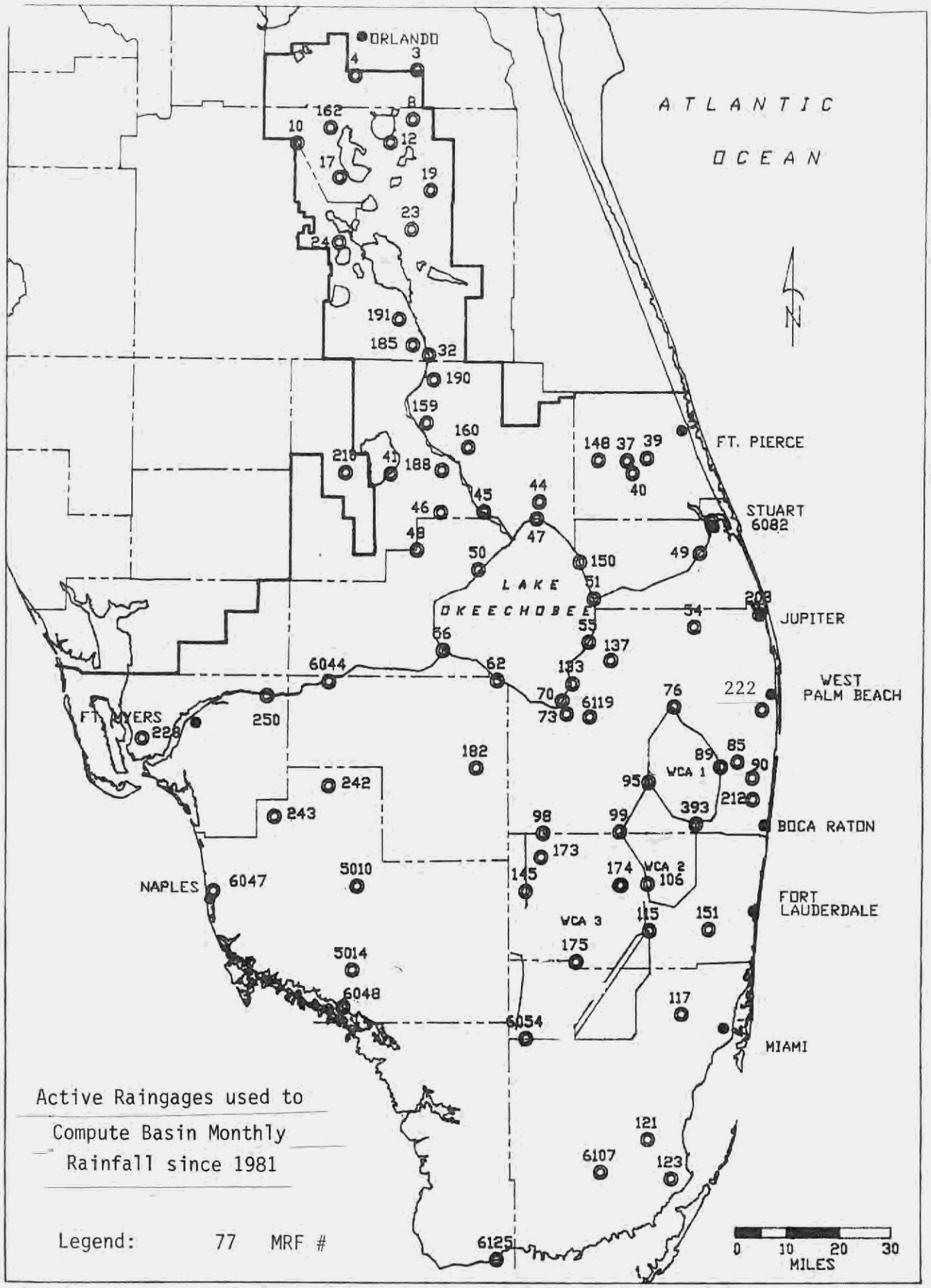


Figure 66.


Departure from Mean Annual Rainfall
Water Conservation Area Hydrologic Basin
80
70
60
50
40
30
Rainfall, inches
1965
1970
1975
1980
1985
Year

Appendix A

Raingage Network and Location Map


ORLANDO
ATLANTIC
OCEAN
N
FT. PIERCE
STUART
6082
LAKE
OKEECHOBEE
JUPITER
WEST
PALM BEACH
222
FT. MYERS
228
WCA 1
BOCA RATON
NAPLES
6047
WCA 2
FORT
LAUDERDALE
WCA 3
MIAMI
Active Raingages used to
Compute Basin Monthly
Rainfall since 1981
Legend: 77 MRF #
0 10 20 30
MILES

Listed below are raingage stations that were used in this report. The active raingage network established in 1981 is represented by those in **boldface** type.

MRF	Location	Period
10	**Reedy Creek**	**1968-86**
100	S-39/Loxahatchee Rec. Area	1963-84
101	Boca Raton Rd & Rangeline (LWDD)	1940-86
102	Boca Raton Rd & Powerline (LWDD)	1928-86
103	WCA 2-19	1960-82
105	S-36	1960-86
106	**WCA3A 3-36**	**1960-86**
107	Key Groves	1957-80
108	Dixie Water Plant	1957-86
109	Sewell's Lock	1957-86
110	Carroll Ranch	1957-81
112	Wunderlich	1957-72
113	S-13	1960-86
114	Gill Realty	1957-86
115	**S-9**	**1960-86**
117	**Miami Field Station**	**1965-86**
118	Railing Property	1957-76
119	Dade Nursery	1957-74
12	**Brooks Property**	**1962-86**
120	S-194	1966-80
121	**Homestead Field Station**	**1968-86**
122	S-20F	1969-86
123	**S-20**	**1968-86**
124	S-18C	1967-86
125	Townsite	1974-84
125a	Townsite	1984-86
129	Bourne - US Sugar	1965-73
131	Pelican Lake	1974-86
133	**East Shore**	**1970-86**
137	**Pahokee 1**	**1957-86**
138	Pahokee 2	1957-86
141	Deerfield Lock	1957-86
142	3R Ranch	1970-86
145	**S-140**	**1971-86**
148	**Cow Creek Ranch**	**1970-86**
150	**S-135**	**1971-86**
151	**Ft. Lauderdale Field Station**	**1971-86**
159	**Micco Bluff**	**1972-86**
160	**Bassinger**	**1972-86**
162	**Kissimmee Field Station**	**1972-86**
168	Kenansville Tower	1972-85
17	**Kirchoff Property**	**1969-86**
173	**WCA3A NW**	**1971-86**
174	**WCA3A NE**	**1971-86**
175	**WCA3A S**	**1971-86**
18	S-61	1965-86
182	**Alico Property**	**1972-86**

MRF	Location	Period
185	**Maxcey North**	**1974-86**
189	Griffith Ranch	1974-86
19	**Pine Island**	**1965-86**
190	**Maxcey South**	**1974-86**
191	**G.A.C. Property near S-65**	**1974-86**
206	Lehigh Acres 1	1960-86
208	**Jupiter Fire Station**	**1976-86**
210	**Lake Francis**	**1977-86**
212	**Military Trail & Lateral 38 (LWDD)**	**1974-86**
222	**West Palm Beach Field Station**	**1969-86**
227	S-79/Franklin Lock near Olga	1965-85
23	**Chapman's Canoe Creek**	**1968-86**
24	**Snively's Ranch**	**1966-86**
241	Bluegoose	1979-86
242	**S. Fla. Field Lab USDA Immokalee**	**1959-86**
243	**Corkscrew Sanctuary**	**1959-86**
246	Crooks	1979-85
247	Broward Co.Girl Scout Camp	1979-86
250	**Alva Farms/Yoder Bros.**	**1968-86**
252	WCA 1-7	1951-84
253	WCA 1-9	1952-84
254	WCA 2-17	1951-84
282C	Paige Ranch	1982-86
284	Bay West Nursery	1980-85
288	Conservation Area 3-3	1962-83
289	Conservation Area 3-4	1962-83
290	Conservation Area 3-L-67A	1962-79
291	Conservation Area 3-S-12D	1962-77
292	Conservation Area 3-L28	1963-73
3	**Beeline Highway**	**1965-86**
301	Plant Intake - City of WPB	1944-86
32	**S-65A**	**1965-86**
37	**Ft. Pierce Field Station**	**1965-86**
38	S-65C	1966-86
39	**Scotto Groves**	**1960-86**
393	**S-39**	**1984-86**
4	**Taft**	**1968-86**
40	**Hayes Property**	**1971-86**
4002	Taylor Crk.-Bassett 2	1955-83
4003	Taylor Crk.-Raulerson 3	1955-83
4005	Taylor Crk.-Dixie 5	1955-83
4013	Monreve Ranch 1	1958-73
4017	Monreve Ranch 5	1958-73
41	**S-68**	**1965-86**
44	**Okeechobee Field Station**	**1960-86**
45	**S-65E**	**1964-86**
46	**Brighton**	**1960-86**
47	**S-193 (HGS-6) C of E**	**1938-86**
48	**S-70**	**1965-86**
49	**St. Lucie Lock (C of E)**	**1958-86**
50	**Indian Prairie Canal @SR78**	**1956-86**
5001	Corkscrew Tower	1969-86
5003	Estero Tower	1969-82

MRF	Location	Period
5004	Ft. Myers-Lee County Tower	1969-86
5005	Immokalee Tower	1963-86
5006	Keri Tower	1969-86
5008	Monroe Tower	1969-82
5009	Marco Tower	1969-82
5010	**Miles City Tower**	**1969-86**
5014	**Copeland Tower**	**1969-86**
5022	Palmdale Tower	1963-86
51	**Port Mayaca Lock (C of E)**	**1951-86**
53	Jupiter Near S-46	1960-75
54	**Pratt and Whitney**	**1957-86**
55	**HGS-5 (C of E)**	**1951-86**
56	**HGS-1 (C of E)**	**1951-86**
57	Pelican Lake Drainage District #2	1957-86
60	Benbow - US Sugar	1929-73
6003	Clermont	1901-86
6009	Lake Alfred	1924-86
6010	Mountain Lake	1935-86
6011	Babson Park	1947-86
6013	Avon Park	1902-86
6014	Desoto City 8SW	1925-86
6017	Punta Gorda 4	1965-86
6019	Nittaw 1S	1942-72
6020	Fort Drum 5NW	1956-86
6021	Fellsmere 4W	1914-79
6023	Vero Beach FAA Airport	1943-84
6024	Isleworth	1916-83
6025	Hart Lake	1942-79
6026	Kissimmee	1901-59
6027	Kissimmee 2	1948-86
6030	Cornwell 4NW	1955-75
6031	Lake Placid 2SW	1933-68
6032	Fort Pierce	1901-86
6033	Okeechobee 9W	1930-74
6038	Moore Haven Lock 1	1918-86
6044	**LaBelle**	**1929-86**
6046	Lake Trafford	1942-68
6047	**Naples**	**1942-86**
6048	**Everglades**	**1924-86**
6054	**Tamiami Canal @40 Mi. Bend**	**1941-86**
6056	Perrine	1958-72
6058	Coconut Grove 7S	1923-58
6059	Miami 12S SW	1958-86
6060	South Miami 5W	1954-74
6061	Kendall 2E	1942-74
6063	Miami Beach	1927-86
6064	Miami Bayfront Park	1954-73
6068	Lauderdale Exp. Station	1953-81
6069	Fort Lauderdale	1912-86
6070	Dania 4WNW	1942-73
6071	Pompano Beach	1941-86
6073	Hypoluxo	1890-59
6074	Loxahatchee	1941-86

MRF	Location	Period
6075	West Palm Beach Airport	1939-86
6077	Lake Hiawassee	1939-64
6082	**Stuart 1N**	**1935-86**
6085	Bonita Springs 2ESE	1943-54
6087	Big Cypress	1941-69
6091	West Palm Beach	1929-60
6092	Vero Beach 4W	1965-86
6093	Ft. Myers	1851-86
6098	Immokalee 3NNW	1941-86
61	Liberty Point - US Sugar	1929-73
6106	Peters	1942-58
6107	**Royal Palm Ranger**	**1949-86**
6118	Devil's Garden	1956-86
6119	**Belle Glade Experiment Station**	**1924-86**
6121	Miles City Tower	1956-69
6125	**Flamingo**	**1962-86**
6126	Homestead Exp. Station	1914-86
62	HGS-2 (C of E)	1951-85
64	Ortona Lock (S-78) (C of E)	1978-85
66	M and M Ranch	1957-72
67	Runyon - US Sugar	1942-73
68	Ritta - US Sugar	1913-73
68C	Ritta	1974-86
70	**HGS-4 (C of E)**	**1951-86**
7034	Okeechobee HGS-6	1937-81
7035	St. Lucie New Lock 1	1940-85
7037	Port Mayaca St. Lucie Canal	1940-85
7039	Clewiston Corps of Engineers (HGS-2	1936-85
7043	Ortona Lock 2	1936-85
7045	Felda	1941-72
7055	North New River Canal 1	1940-66
7057	Miami WB City	1901-83
7065	Miami WB Airport	1939-85
7066	Hialeah	1940-69
7067	Pennsucco 5NW	1941-85
7072	Boca Raton	1948-85
7079	Orlando WB Airport	1940-85
7086	North New River Canal 2	1940-81
7088	Tamiami Canal @ Dade-Broward Levee	1941-66
71	Miami Lock	1974-86
7126	Homestead Exp. Station	1940-85
72	South Shore - US Sugar	1940-72
73	**South Bay**	**1959-86**
74	Senter Farms	1957-71
75	Talisman Sugar - US Sugar	1957-72
76	**S-5A**	**1956-86**
77	West Palm Beach F/S	1955-84
78	Greenacres (LWDD)	1928-86
79	Manatee Plantation @ 6 Mi Bend	1957-82
8	**Lake Myrtle**	**1953-86**
80	L-1 Ranch	1957-82
81	Lake Worth Road & E1 (LWDD)	1940-86

MRF	Location	Period
82	Shawano Pump 5	1958-85
84	Boynton Rd. & Military Tr. (LWDD)	1940-86
85	**Boynton Rd & E2 (LWDD)**	**1928-86**
86	Shawano Pump 6	1957-85
87	Sawyer Ranch	1957-74
88	Lateral 28 & Rangeline (LWDD)	1940-86
89	**WCA 1-8**	**1960-86**
90	**Lake Worth Rd D.D. Office (LWDD)**	**1955-86**
9004	Carol City S.T.P.	1969-81
9008	Wheller Frye	1960-85
9018	Stonebraker	1953-79
9069	Opalocka Water Plant	1964-77
9073	Miami 58 St. Yard	1965-82
9086	Richard Young	1968-84
9095	Ira Ebersole	1969-84
9097	Homestead Airport	1969-85
9098	Tamiami Airport	1969-85
9099	Palm Springs North	1972-81
92	Delray Rd and E2	1928-86
93	Lateral 32 & Rangeline (LWDD)	1955-86
95	**S-6**	**1960-86**
96	Big B Ranch	1967-82
98	**S-8**	**1962-86**
99	**S-7**	**1973-86**

Appendix B

Rainfall Data

Appendix B. Basin Monthly Rainfall

Everglades Agricultural Area

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1929	1.29	0.02	1.02	1.90	7.32	5.47	9.88	4.63	14.73	4.42	2.81	0.87
1930	1.74	2.73	5.80	6.00	5.11	16.43	4.39	7.39	6.76	5.16	0.33	4.11
1931	1.44	1.41	4.12	4.48	4.00	1.09	2.81	5.95	9.31	3.47	0.36	1.82
1932	1.12	2.23	1.73	1.29	5.07	12.97	3.93	12.56	8.07	3.26	8.74	0.16
1933	0.50	2.61	3.99	6.03	2.92	9.53	7.30	7.38	7.81	4.89	2.79	0.11
1934	0.35	2.17	5.18	2.85	8.30	9.32	7.85	10.58	8.40	3.02	1.24	0.57
1935	0.63	1.57	0.18	5.50	1.29	8.14	5.78	6.37	12.87	5.12	0.63	1.92
1936	2.24	4.58	2.63	1.41	5.25	19.60	5.54	4.50	5.74	2.22	4.79	1.37
1937	3.33	1.46	5.09	5.74	3.96	8.80	7.94	6.64	6.39	5.70	3.04	0.41
1938	0.37	1.14	1.77	0.34	4.66	6.00	8.22	3.33	8.52	2.22	2.11	0.16
1939	0.26	0.12	0.86	5.30	5.40	7.09	10.80	11.81	6.12	5.89	0.37	1.86
1940	2.76	3.21	4.18	1.29	5.60	7.09	6.06	8.59	9.35	1.42	0.33	5.68
1941	4.79	4.79	3.69	5.98	2.44	10.00	13.33	4.07	7.06	4.76	1.80	1.45
1942	2.14	2.37	4.94	4.61	6.13	15.23	5.89	4.54	6.15	1.02	0.94	2.42
1943	0.86	0.47	1.18	1.59	4.21	6.12	8.50	5.88	3.80	2.86	2.15	0.17
1944	0.86	0.11	2.24	2.63	4.65	5.43	6.35	10.14	5.53	6.21	0.28	0.26
1945	1.66	0.62	0.38	1.73	2.66	6.30	10.56	6.20	10.70	3.49	1.37	1.02
1946	0.80	1.13	4.32	0.14	7.19	8.30	8.75	7.38	9.11	1.62	4.72	2.00
1947	0.93	1.97	8.73	2.84	6.36	13.17	10.92	7.73	12.81	8.44	3.85	1.72
1948	3.99	0.14	1.20	6.52	2.75	3.68	7.60	7.89	17.71	3.62	0.70	0.52
1949	0.16	0.40	0.36	1.82	2.65	9.77	7.31	9.21	8.78	1.57	0.88	5.48
1950	0.09	0.66	1.34	2.60	4.57	5.47	7.30	9.32	3.52	10.24	1.42	1.04
1951	0.11	1.55	0.63	3.48	4.33	6.49	10.30	8.21	6.78	9.15	1.33	0.16
1952	1.03	5.30	1.09	1.73	5.29	5.48	6.71	10.01	8.95	11.23	0.23	0.64
1953	2.43	1.90	1.10	2.50	2.08	6.24	10.14	12.22	11.58	8.07	1.29	1.60
1954	0.33	2.27	2.46	5.20	6.72	12.15	7.83	7.15	6.38	3.02	1.49	1.18
1955	1.22	0.86	1.92	2.42	4.34	16.10	7.16	6.15	5.09	2.00	0.62	2.43
1956	1.00	1.19	0.73	1.48	1.92	5.09	5.50	6.89	6.36	6.73	0.36	0.22
1957	4.83	4.08	3.74	5.16	7.26	6.53	7.27	8.75	9.21	4.06	1.00	8.88
1958	7.82	0.71	8.12	3.20	7.33	5.61	6.25	6.04	6.86	4.40	0.94	4.86
1959	1.36	0.67	5.89	2.27	6.82	12.85	8.78	7.12	8.49	8.95	4.31	1.22
1960	0.25	2.94	2.03	5.55	3.83	8.10	9.60	9.01	16.31	4.72	1.63	0.45
1961	2.90	0.97	1.83	1.27	8.68	6.58	5.64	7.65	2.20	2.88	0.82	0.27
1962	1.33	0.85	3.10	2.82	2.83	11.26	8.60	8.26	11.46	3.26	1.17	0.27
1963	1.05	3.60	0.81	0.40	6.95	6.14	2.50	7.86	6.00	1.43	2.26	4.82
1964	2.07	2.37	2.35	3.15	3.11	7.87	6.75	7.47	5.12	8.05	0.88	2.63
1965	0.33	3.15	2.78	0.99	1.38	9.81	9.95	6.74	5.77	7.74	0.45	1.19
1966	4.43	2.37	0.94	2.72	4.06	15.63	7.68	8.13	6.10	4.43	0.26	0.65
1967	1.08	3.53	0.81	0.02	1.48	11.84	8.13	5.28	6.70	4.47	0.14	2.00
1968	0.58	3.06	1.30	1.55	8.98	14.53	8.95	4.98	7.33	6.84	1.82	0.09
1969	1.84	1.70	5.20	2.84	5.51	10.92	6.10	7.47	6.75	7.32	2.42	1.63
1970	3.19	2.19	13.14	0.20	7.21	6.87	7.47	6.33	4.62	2.97	0.12	0.23
1971	0.65	1.57	0.46	0.19	5.14	9.63	8.07	6.11	6.87	5.98	2.74	1.40
1972	1.42	1.64	3.65	5.05	6.57	9.44	4.89	5.88	2.86	1.55	2.86	1.73
1973	2.38	1.31	2.40	0.61	4.45	6.64	8.88	7.58	6.15	2.37	0.18	2.10
1974	1.13	0.15	0.52	1.24	4.12	12.59	10.00	6.74	6.88	1.27	2.07	1.16
1975	0.14	0.81	0.80	1.47	6.08	8.76	9.47	4.89	10.04	3.84	1.04	0.27
1976	1.10	2.12	1.00	1.50	8.35	5.65	4.90	6.44	6.94	0.68	1.83	1.76
1977	3.21	0.77	0.61	0.49	9.10	5.81	5.38	6.76	8.81	0.82	5.54	4.61
1978	2.46	1.72	2.12	1.53	6.63	6.71	9.03	8.34	4.60	3.96	2.92	4.25

Everglades Agricultural Area (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1979	3.53	0.29	2.02	2.44	3.88	3.60	4.80	4.12	8.68	1.94	3.93	2.19
1980	3.93	1.41	2.49	5.31	4.95	3.44	6.20	5.47	6.05	1.60	2.27	0.81
1981	0.50	2.10	1.61	0.15	3.14	4.76	4.66	12.77	4.42	1.05	3.81	0.22
1982	0.66	2.55	4.69	2.44	8.69	11.61	5.83	6.76	9.98	2.91	1.17	0.78
1983	3.89	7.45	4.52	1.76	1.56	9.71	4.07	7.23	6.76	6.30	1.17	4.06
1984	0.22	1.76	4.17	3.29	7.36	4.16	6.86	3.54	7.25	0.53	3.05	0.28
1985	0.71	0.11	1.85	5.33	2.54	7.09	9.60	6.19	9.09	5.55	1.79	2.15

Everglades National Park

1941	3.58	4.58	4.80	5.72	0.35	6.61	9.98	4.60	7.67	6.74	2.98	0.20
1942	1.75	1.90	2.08	1.41	4.61	16.73	3.67	5.55	4.85	0.44	1.33	1.17
1943	1.75	0.86	0.45	3.72	7.21	9.77	8.83	5.52	6.30	3.67	1.75	0.38
1944	0.87	0.02	1.11	1.19	6.47	6.34	7.15	8.01	4.54	4.83	0.12	1.31
1945	2.47	0.73	0.70	4.15	2.31	5.72	10.65	8.15	13.35	4.42	1.58	1.30
1946	1.01	0.91	1.76	0.57	7.02	8.47	10.26	7.83	8.32	1.59	1.55	2.21
1947	0.75	1.69	4.56	5.22	3.46	12.98	10.28	7.26	11.97	14.69	6.20	1.44
1948	1.68	0.42	0.12	3.20	3.03	2.85	9.16	9.85	19.10	7.17	0.89	0.53
1949	0.08	0.70	0.14	2.31	6.21	10.35	11.50	8.40	12.42	6.38	2.81	2.57
1950	0.13	1.03	1.35	2.61	4.34	3.39	10.04	8.27	6.72	9.07	1.39	2.63
1951	0.62	1.58	0.62	5.68	2.15	2.40	10.10	7.63	5.32	5.06	0.84	0.38
1952	0.81	3.54	3.03	1.49	4.61	6.21	8.23	6.98	9.40	8.80	0.60	0.48
1953	3.59	2.16	3.12	5.36	2.14	9.55	6.78	7.95	11.37	5.16	1.25	0.84
1954	0.66	2.19	4.14	6.22	10.23	9.01	7.66	6.18	9.59	2.10	1.36	0.71
1955	0.56	0.38	0.48	2.24	5.80	11.81	6.95	4.88	9.30	2.64	0.76	2.18
1956	1.14	0.77	0.33	3.02	3.80	4.08	5.33	7.56	4.88	5.58	0.46	0.25
1957	0.28	4.23	1.48	2.93	7.26	5.00	7.28	6.75	8.61	6.72	1.03	2.24
1958	6.24	1.18	5.79	0.69	11.35	10.21	8.23	9.01	6.53	4.74	0.90	3.39
1959	1.66	0.95	4.17	1.12	10.05	14.45	7.35	7.67	7.06	9.43	4.68	0.80
1960	0.18	1.94	1.59	5.75	4.06	9.90	13.56	7.16	17.19	6.36	3.12	0.63
1961	1.87	0.91	0.81	0.20	6.69	5.60	6.71	7.68	5.30	4.06	0.69	0.12
1962	1.24	0.46	2.59	1.34	2.70	14.05	6.50	6.29	10.57	2.61	2.16	0.61
1963	1.03	4.83	0.41	0.36	6.34	5.35	3.85	8.83	14.77	2.90	2.86	2.29
1964	0.88	1.51	1.13	3.07	4.58	11.05	5.97	6.80	8.34	5.84	1.74	1.04
1965	0.85	2.89	0.91	1.58	2.14	6.10	5.88	5.45	9.24	8.62	1.73	0.47
1966	3.62	1.59	0.90	2.43	6.69	19.16	10.93	4.56	10.29	4.80	0.46	0.55
1967	1.60	1.35	1.40	0.31	1.68	14.36	5.59	4.92	9.63	5.98	1.65	1.67
1968	1.24	2.32	1.36	0.47	15.78	16.09	6.33	6.92	11.71	9.31	1.32	0.08
1969	3.60	1.93	2.25	2.75	6.90	21.99	5.70	8.16	8.35	9.58	0.89	0.99
1970	2.88	1.93	7.22	0.02	6.11	7.95	8.91	6.26	5.96	6.10	0.29	0.11
1971	0.78	1.02	0.31	0.11	4.39	9.46	5.22	9.41	8.48	7.39	1.41	1.95
1972	1.20	3.37	1.49	3.98	6.06	12.76	6.86	6.97	8.37	2.66	5.38	1.62
1973	2.96	1.79	2.71	0.71	1.67	11.69	9.63	12.76	10.43	2.95	0.32	3.02
1974	0.51	0.07	0.03	2.48	2.43	11.35	10.19	7.98	5.96	2.21	1.95	1.76
1975	0.46	0.84	1.36	0.63	10.51	9.24	8.16	6.94	11.09	3.64	0.66	0.43
1976	0.54	1.98	0.48	2.77	8.88	10.15	5.25	12.56	7.65	3.74	1.73	1.73
1977	2.07	1.19	0.22	1.23	6.79	10.12	8.37	7.76	10.79	1.04	2.08	3.07
1978	2.49	3.73	3.63	3.46	4.35	10.20	8.05	7.69	8.24	5.15	2.03	2.58
1979	2.57	0.51	0.64	4.83	7.01	5.68	7.51	7.17	9.71	3.93	1.54	3.57

Everglades National Park (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	2.25	1.38	1.31	4.75	4.82	4.65	7.02	8.46	5.95	1.47	5.86	1.05
1981	0.51	3.54	1.62	0.11	2.60	6.46	7.20	16.55	9.13	1.80	1.29	0.36
1982	0.56	1.03	2.84	5.43	7.55	13.78	7.95	7.48	5.96	4.48	2.83	0.75
1983	7.33	7.90	3.94	1.88	0.68	12.24	7.56	7.51	11.57	6.08	2.43	3.41
1984	0.29	1.45	2.95	0.75	6.61	4.28	7.88	7.58	6.74	1.91	1.43	0.23
1985	0.60	0.30	2.07	1.86	4.23	4.75	10.95	4.30	4.41	4.54	2.29	1.43

Fisheating Creek

1932	0.49	0.94	3.54	4.31	6.26	5.40	3.82	13.93	6.84	3.54	2.48	0.02
1933	0.67	2.35	2.64	6.84	2.57	4.42	12.16	5.54	8.40	4.13	1.62	0.19
1934	1.75	3.14	2.40	2.31	9.41	6.26	6.40	5.69	6.48	2.77	0.70	0.37
1935	1.41	1.37	1.08	3.71	2.46	6.54	5.95	8.56	12.06	1.06	0.92	1.10
1936	1.79	5.46	3.18	0.65	3.72	14.93	5.66	6.33	5.08	2.96	1.48	1.43
1937	0.92	1.50	4.38	1.28	0.69	8.39	6.16	5.50	3.91	2.51	4.14	0.35
1938	0.55	0.70	0.75	1.70	2.69	7.20	12.45	2.96	4.27	4.49	1.58	0.08
1939	0.67	0.89	1.11	6.53	6.20	5.90	6.66	6.98	6.48	2.33	1.75	1.24
1940	2.67	3.40	4.43	1.97	1.45	6.47	7.03	6.58	13.62	0.88	0.17	4.23
1941	4.42	3.09	4.26	7.59	3.76	8.52	8.46	4.98	7.88	2.61	2.11	0.96
1942	3.03	4.57	3.04	2.57	2.44	8.51	4.90	4.48	5.15	0.27	0.87	2.77
1943	0.86	0.40	4.08	2.92	3.75	4.44	8.04	6.49	4.05	3.81	1.56	1.04
1944	1.01	0.16	2.01	2.39	1.99	5.80	8.47	7.18	4.03	3.50	0.41	0.33
1945	1.34	0.33	0.55	2.61	1.59	8.43	8.94	7.64	10.53	5.13	0.77	1.33
1946	1.30	1.66	1.21	0.42	5.51	7.70	5.71	4.10	6.59	2.29	2.05	0.79
1947	0.55	2.02	8.44	3.98	4.86	10.06	7.42	6.47	11.92	4.03	2.37	1.44
1948	4.49	0.22	0.82	3.23	5.05	2.83	7.92	6.80	17.50	4.16	1.03	0.65
1949	0.03	0.17	0.80	4.05	1.61	8.37	9.77	12.25	9.41	0.88	1.17	0.90
1950	0.01	1.05	2.78	1.79	1.96	4.87	4.98	5.81	3.53	6.05	1.22	0.80
1951	0.26	2.04	1.04	5.35	1.87	4.69	10.49	4.95	7.18	11.20	2.18	0.14
1952	0.93	5.45	2.40	1.54	7.95	3.91	7.52	9.26	3.96	9.81	0.51	0.59
1953	1.88	2.17	1.94	3.35	1.89	13.85	7.31	9.94	11.67	8.44	1.22	1.36
1954	0.21	2.21	2.00	5.43	6.58	11.84	11.30	5.35	6.19	2.71	2.53	2.20
1955	2.93	1.42	1.15	1.38	5.07	11.66	5.29	5.00	5.87	2.56	0.29	2.20
1956	0.91	1.07	1.35	1.96	1.74	5.11	5.04	5.38	4.14	9.12	0.33	0.47
1957	1.93	4.07	5.57	4.63	6.98	6.33	7.48	6.66	11.18	1.30	0.89	4.85
1958	6.15	1.37	7.30	4.12	5.29	5.37	5.36	6.21	4.06	4.44	0.65	4.34
1959	1.32	2.24	5.92	1.83	5.42	10.66	4.79	8.31	7.87	9.70	1.40	1.36
1960	0.35	5.01	3.51	4.17	3.46	7.17	10.94	9.30	13.81	4.72	0.95	1.93
1961	3.22	1.32	3.25	1.66	5.58	4.95	5.11	6.68	2.47	1.54	0.85	0.15
1962	0.78	0.63	4.32	1.48	4.62	15.11	7.36	6.39	8.75	1.50	3.48	0.33
1963	1.01	4.22	0.68	0.42	7.73	5.99	3.58	4.51	5.19	0.95	3.14	3.65
1964	2.36	4.51	0.82	1.56	2.89	5.37	5.25	10.60	6.03	2.17	0.25	1.83
1965	0.48	3.75	3.76	1.76	1.35	9.76	7.04	6.04	5.03	4.93	0.29	1.41
1966	3.67	3.17	0.70	2.67	3.79	11.09	8.61	9.88	7.55	2.30	0.13	0.55
1967	1.08	2.94	0.47	0.46	1.12	10.62	6.12	6.85	6.29	3.21	0.56	2.30
1968	0.59	1.76	0.96	0.64	6.74	13.30	8.97	4.61	5.98	6.33	2.82	0.14
1969	1.80	1.80	6.49	1.15	6.22	8.07	6.02	8.07	6.17	9.43	2.41	3.35
1970	5.12	2.82	10.84	0.10	4.09	7.29	6.55	4.77	4.74	4.18	0.11	0.67
1971	0.31	1.03	0.86	0.25	3.43	10.68	7.06	7.28	8.04	5.00	1.08	1.33

Fisheating Creek (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1972	0.75	2.40	1.93	2.69	4.52	10.83	2.97	5.25	1.53	0.72	3.52	1.45
1973	3.21	2.26	2.84	1.72	4.54	5.97	9.60	6.49	6.01	3.75	0.68	1.74
1974	0.46	1.21	0.01	1.49	4.54	13.40	11.27	6.91	6.06	1.08	1.16	1.75
1975	0.28	1.51	0.77	1.78	5.28	5.74	7.12	4.06	4.19	3.80	0.39	0.79
1976	0.25	1.12	0.92	1.59	5.37	4.57	7.20	7.31	4.64	1.45	2.01	1.70
1977	3.11	0.89	0.99	0.57	3.00	3.81	4.45	5.97	4.35	1.33	5.09	3.83
1978	1.83	1.22	2.88	1.71	4.28	5.53	7.15	4.73	6.01	2.60	1.70	2.89
1979	5.02	0.53	1.93	1.85	8.66	1.90	3.49	7.80	14.98	1.26	M	M
1980	2.37	1.61	2.20	3.92	2.77	4.77	7.43	4.96	3.40	2.65	2.14	0.87
1981	0.54	2.15	0.79	0.15	3.35	4.21	5.35	6.72	4.83	0.78	1.22	0.21
1982	0.87	1.74	6.66	3.59	8.87	9.71	7.25	4.01	5.38	2.70	0.98	0.93
1983	3.97	10.09	5.45	1.60	1.65	7.17	5.36	4.56	5.07	4.00	1.85	3.17
1984	0.48	3.56	4.72	3.03	5.28	5.06	11.53	2.97	4.54	0.59	2.95	0.65
1985	0.44	0.36	2.63	3.40	2.38	6.99	8.69	5.45	6.96	2.03	1.28	1.98

Kissimmee River

1915	6.73	4.06	1.79	2.86	4.38	4.32	7.11	13.62	6.04	6.05	1.66	2.70
1916	0.20	0.12	0.26	4.37	3.25	8.83	8.02	8.38	5.36	2.72	2.94	1.87
1917	0.78	1.14	0.51	1.07	1.78	7.83	4.38	3.73	10.64	4.03	0.64	0.47
1918	4.09	0.23	2.29	2.64	0.61	5.95	5.77	9.50	8.11	3.82	2.01	1.16
1919	2.44	4.22	1.62	0.87	6.04	8.46	18.71	6.50	7.01	0.85	1.46	1.51
1920	1.73	2.44	0.76	7.57	1.58	7.40	13.65	2.03	8.01	2.36	3.67	2.25
1921	0.65	2.65	0.22	1.12	5.66	3.12	6.84	5.46	3.52	7.19	3.63	0.92
1922	2.17	2.62	0.83	0.14	8.56	6.87	6.67	7.47	7.54	9.35	1.52	1.37
1923	0.92	1.37	1.09	2.44	11.61	9.04	7.63	12.68	4.63	2.28	0.41	0.44
1924	3.53	3.48	4.18	1.32	1.71	7.47	12.17	7.94	3.40	6.52	0.17	0.11
1925	3.17	3.22	1.08	0.45	4.79	8.37	5.71	13.29	M	2.63	2.35	4.98
1926	2.98	0.71	2.75	5.92	4.83	10.31	9.30	9.14	9.43	1.32	2.55	0.20
1927	0.10	2.11	2.05	1.05	0.40	8.32	6.42	6.27	5.37	3.13	0.46	1.79
1928	0.20	1.04	3.21	3.61	3.00	6.86	13.50	9.09	12.54	1.68	0.54	0.18
1929	1.43	0.00	1.34	2.48	4.83	8.69	8.17	8.78	12.58	2.40	0.56	2.29
1930	3.28	3.62	6.94	4.34	8.73	3.87	3.43	6.38	15.40	1.96	1.25	2.97
1931	3.92	2.42	4.91	6.12	4.45	2.89	7.46	6.37	8.22	2.97	0.14	1.35
1932	0.62	0.09	2.77	2.31	7.92	8.35	4.33	7.33	6.15	4.87	2.08	0.59
1933	2.13	2.04	2.40	6.05	3.41	4.74	13.85	6.29	11.82	2.30	2.56	0.15
1934	1.58	2.71	3.27	3.34	8.08	10.05	6.08	5.23	3.17	0.11	0.67	0.75
1935	0.49	1.50	1.48	6.03	2.72	6.76	5.47	9.82	11.35	2.99	1.05	2.39
1936	4.83	8.35	4.66	1.67	3.41	10.70	M	7.35	8.49	3.87	1.07	2.14
1937	2.63	5.13	3.31	2.03	0.88	6.35	6.14	5.14	4.80	4.18	5.75	0.59
1938	0.77	1.11	1.09	1.67	2.91	5.60	10.45	2.55	3.50	5.37	2.20	0.14
1939	1.14	1.16	1.37	5.00	7.00	6.32	8.22	14.17	7.03	3.43	0.94	0.68
1940	3.33	3.57	3.94	1.54	5.30	7.43	9.99	5.80	9.44	0.55	0.05	4.74
1941	4.01	3.02	2.92	5.02	1.40	10.82	13.37	3.45	4.89	3.71	2.82	1.98
1942	3.39	5.10	3.24	2.23	4.01	7.22	5.97	5.43	5.67	0.20	0.29	3.12
1943	1.54	0.45	4.39	2.17	5.25	5.57	8.23	9.06	6.37	4.51	1.01	0.40
1944	0.91	0.14	2.70	3.92	1.35	6.15	12.17	9.26	4.16	4.05	0.38	0.72
1945	2.23	0.12	0.36	3.37	2.39	11.69	9.58	2.98	9.55	5.36	1.34	2.04
1946	1.29	1.91	0.97	0.17	5.92	5.95	6.25	5.12	5.71	2.94	1.98	0.80

Kissimmee River (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1947	1.11	4.20	6.88	4.76	4.27	12.51	9.64	6.48	12.89	4.68	3.02	1.27
1948	5.01	0.55	1.42	4.25	3.62	4.01	12.30	6.53	15.21	4.47	1.34	1.16
1949	0.22	0.33	0.92	3.89	1.94	8.96	8.70	14.30	8.78	1.38	1.19	1.49
1950	0.04	0.65	1.88	2.22	2.76	3.24	3.63	5.67	4.44	7.92	1.02	1.21
1951	0.15	2.46	0.80	7.30	1.40	3.89	9.12	5.05	6.70	9.74	3.05	0.51
1952	0.99	4.15	4.32	1.29	6.16	3.19	9.18	8.08	4.11	8.28	0.85	0.83
1953	2.30	2.31	4.16	4.47	1.47	15.44	6.59	10.82	10.43	7.69	3.95	1.78
1954	0.65	1.67	1.58	3.84	5.32	12.48	7.51	6.06	5.49	2.47	3.25	1.40
1955	2.53	1.14	1.48	1.28	2.93	7.85	5.43	4.14	7.04	2.30	0.41	1.81
1956	0.44	0.90	1.26	2.98	3.21	6.58	4.73	7.80	6.52	10.79	0.31	0.29
1957	1.63	3.74	4.91	5.31	8.11	5.94	8.51	7.36	7.81	2.02	0.76	3.38
1958	7.04	2.52	5.68	2.66	4.06	5.03	6.91	4.57	4.17	3.40	0.97	3.04
1959	2.47	2.21	7.25	2.77	5.38	9.64	6.62	6.85	8.02	11.32	1.49	1.76
1960	0.43	5.18	5.45	3.19	2.86	7.89	11.42	5.96	13.13	3.54	0.89	0.88
1961	2.69	1.51	2.42	2.47	4.17	5.16	4.51	7.20	2.13	2.65	1.06	0.23
1962	0.84	0.88	4.22	2.15	4.20	11.23	5.34	8.00	5.97	1.35	2.80	0.59
1963	1.38	5.00	1.15	0.97	6.92	6.88	4.71	4.62	8.05	0.79	3.95	3.04
1964	2.66	3.90	1.75	2.73	3.44	5.00	6.48	7.89	6.76	2.00	0.65	1.73
1965	0.64	3.56	3.59	1.98	1.00	7.99	8.36	4.72	6.42	4.74	0.68	1.64
1966	4.86	4.52	1.14	1.87	4.28	8.67	6.64	8.06	6.50	3.62	0.38	0.70
1967	0.66	3.19	0.91	0.13	0.29	10.68	6.63	6.90	5.92	2.50	0.46	2.36
1968	0.56	1.78	0.98	0.32	6.86	14.70	7.91	4.57	5.54	5.41	1.96	0.31
1969	1.90	1.77	8.06	2.44	4.33	7.35	5.90	8.01	5.77	8.41	3.03	2.74
1970	4.36	2.46	6.07	0.31	4.28	5.22	8.36	5.33	4.70	3.84	0.25	0.60
1971	0.19	3.77	1.61	0.71	4.82	10.56	7.34	5.43	6.27	4.95	0.82	1.46
1972	0.99	3.35	3.25	1.50	3.38	9.39	4.45	7.11	1.17	1.55	3.62	2.00
1973	4.71	1.68	2.91	3.36	4.60	4.20	8.22	8.49	5.67	3.66	1.15	1.78
1974	0.83	1.19	0.22	1.62	4.41	12.99	11.10	6.53	4.96	1.03	0.80	1.74
1975	0.41	2.15	1.31	0.87	4.81	6.06	7.75	7.37	6.77	3.85	0.81	0.56
1976	0.28	0.84	1.58	1.80	8.23	7.46	6.96	7.43	6.26	0.80	2.01	2.18
1977	1.68	1.15	0.81	0.43	3.51	4.72	5.74	5.15	6.34	1.80	3.93	3.17
1978	2.09	2.72	2.90	0.45	6.47	8.25	9.34	6.52	5.91	1.49	0.83	4.01
1979	4.84	0.99	1.66	2.22	7.92	4.12	4.38	7.01	13.29	1.00	1.53	1.79
1980	2.73	3.27	2.56	3.96	3.79	4.80	6.08	5.12	3.61	1.50	3.42	1.31
1981	0.38	3.00	1.69	0.30	1.74	5.50	4.42	7.55	5.75	1.08	1.04	0.41
1982	1.62	2.06	6.26	5.02	5.75	9.59	6.47	5.00	6.79	2.57	1.77	1.12
1983	3.25	8.32	4.49	1.68	1.63	7.94	6.84	4.33	4.26	4.22	1.38	3.55
1984	0.53	3.77	3.15	2.85	7.20	6.00	9.88	5.22	4.28	0.77	3.45	0.81
1985	0.43	0.38	3.01	2.87	2.62	7.59	6.92	5.44	7.78	1.97	1.89	1.80

Lower East Coast

1915	2.04	1.94	1.53	1.60	5.08	11.95	8.58	5.53	8.46	9.62	6.32	1.99
1916	2.17	2.42	0.58	3.20	6.18	8.77	5.15	5.26	6.22	10.92	4.38	0.51
1917	0.25	1.18	3.29	2.43	3.05	6.93	5.95	6.99	14.22	6.22	0.70	1.61
1918	1.03	0.62	4.33	7.47	4.09	6.93	6.16	3.78	8.79	9.22	1.02	2.23
1919	1.61	3.36	7.16	4.02	8.16	8.41	5.49	7.74	5.12	4.79	3.67	0.89
1920	1.84	3.38	1.63	4.51	8.56	4.05	8.58	3.99	10.52	6.84	4.57	1.41
1921	0.59	3.61	6.97	0.67	4.13	1.98	4.12	4.04	2.41	21.98	2.12	0.77

Lower East Coast (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1922	2.41	1.20	0.07	2.32	10.76	8.97	7.56	6.19	6.74	17.37	5.61	0.98
1923	0.32	1.47	1.79	3.97	8.50	9.62	6.98	7.03	7.14	3.78	1.05	1.89
1924	3.57	2.36	0.93	5.99	5.98	3.39	7.60	4.28	8.39	22.26	0.62	1.02
1925	8.26	1.39	4.47	3.95	13.95	7.39	4.69	13.30	3.40	2.39	6.21	5.35
1926	7.20	0.75	0.16	5.65	5.00	8.10	10.81	9.21	5.90	3.82	2.92	0.58
1927	1.48	2.50	1.29	5.90	0.98	3.20	3.54	5.80	9.85	8.18	1.57	1.06
1928	0.90	1.13	1.87	2.09	5.43	6.14	4.69	12.29	9.83	4.66	1.35	1.31
1929	0.98	0.63	2.00	2.61	3.61	6.17	7.21	5.58	11.27	11.13	4.23	5.00
1930	3.30	3.72	5.07	5.83	3.19	19.31	2.73	5.70	5.53	7.54	2.06	1.95
1931	3.71	2.39	5.03	7.58	3.57	1.42	3.21	5.31	13.57	8.35	2.48	0.92
1932	2.45	1.89	2.33	1.74	12.26	10.79	1.97	10.59	7.08	8.48	5.55	0.85
1933	1.96	0.45	3.45	6.02	2.68	4.86	14.20	11.19	5.75	16.57	4.48	0.53
1934	1.43	3.85	3.13	4.81	13.83	7.90	5.82	4.02	8.45	3.58	1.55	1.08
1935	2.76	1.14	0.56	7.13	1.48	8.97	6.39	3.47	12.72	9.28	2.85	1.07
1936	2.83	4.17	4.81	2.06	7.27	19.77	6.58	9.26	5.36	5.70	4.22	3.00
1937	1.34	2.47	5.58	2.43	2.43	8.09	3.93	6.74	10.84	7.34	0.98	0.53
1938	1.91	1.75	0.65	0.55	5.54	7.17	7.43	1.34	5.74	4.19	4.20	2.33
1939	1.17	1.18	1.24	1.38	6.29	5.70	7.72	7.58	5.72	10.92	2.30	1.83
1940	2.59	2.69	5.28	2.15	3.16	8.92	4.60	9.67	16.49	5.16	1.05	7.49
1941	4.34	4.61	4.41	6.01	1.44	5.63	11.17	4.28	11.24	4.76	5.63	1.45
1942	4.94	2.51	3.39	10.83	5.22	12.83	1.89	3.83	7.06	5.14	1.43	2.63
1943	1.31	0.71	2.99	2.26	4.98	4.63	7.34	8.41	7.90	6.09	3.25	1.02
1944	1.49	0.07	2.96	1.30	5.94	2.46	8.27	5.25	4.96	9.04	0.21	0.71
1945	2.57	0.96	0.64	1.67	1.34	5.95	7.66	7.41	11.81	8.91	2.28	2.54
1946	1.41	1.25	2.11	0.70	9.95	6.82	8.12	6.02	7.34	4.14	4.82	2.86
1947	8.32	2.69	4.13	4.73	5.55	16.57	13.09	8.39	13.63	17.68	5.42	2.48
1948	4.34	0.54	2.09	5.56	5.29	4.04	6.35	9.52	17.96	13.25	0.76	2.03
1949	0.29	0.61	2.04	3.75	4.61	8.05	5.77	8.26	9.59	6.44	2.02	6.70
1950	0.78	1.31	2.08	2.56	3.84	2.64	6.02	10.03	7.53	11.45	2.82	1.56
1951	0.14	2.20	0.88	4.41	3.27	4.04	7.39	5.55	5.67	9.55	1.03	0.60
1952	0.99	3.03	3.13	1.76	2.98	1.74	6.04	9.36	6.76	12.54	0.46	1.50
1953	4.57	2.15	1.31	3.79	2.93	8.98	8.08	7.86	13.77	14.39	3.22	2.20
1954	1.06	2.23	3.15	7.01	10.66	12.27	10.21	4.10	9.72	5.23	5.91	0.65
1955	1.07	1.07	1.38	1.87	3.21	10.38	4.87	5.16	5.68	4.63	0.81	3.40
1956	1.28	0.74	0.41	2.29	4.51	3.87	3.76	7.10	7.55	6.65	1.21	0.79
1957	2.35	6.27	2.52	8.64	6.93	5.21	7.24	10.08	6.32	6.95	2.54	5.17
1958	7.46	0.79	6.28	1.44	12.27	4.91	5.98	5.16	6.23	4.72	2.43	6.73
1959	2.43	1.51	6.31	2.63	6.05	14.91	8.28	7.66	10.28	10.68	7.84	2.23
1960	0.30	2.78	1.36	6.95	4.78	8.40	7.83	7.36	20.38	7.22	2.25	0.52
1961	4.64	0.63	1.90	1.25	8.21	5.61	2.56	7.27	3.04	5.12	1.60	0.35
1962	1.31	0.55	2.88	3.32	1.90	10.62	7.82	7.17	8.41	2.35	1.54	0.43
1963	1.13	4.10	0.92	0.55	7.06	6.83	2.86	6.27	12.59	6.44	1.89	4.22
1964	1.05	3.12	0.98	4.85	4.91	9.32	5.07	8.78	6.71	12.46	2.63	2.60
1965	0.92	4.17	1.33	0.89	0.73	8.33	8.30	3.61	7.84	15.13	1.98	0.67
1966	4.57	4.13	2.35	2.88	5.93	17.81	6.94	7.16	7.17	8.51	1.26	0.85
1967	2.54	2.16	2.59	0.10	1.41	14.58	5.67	5.42	6.79	10.06	2.23	1.70
1968	1.12	2.83	1.34	0.80	14.68	16.50	6.71	7.60	10.94	8.85	1.57	0.07
1969	3.75	1.87	3.91	2.99	7.12	12.40	7.36	6.56	8.63	14.11	2.56	0.82
1970	3.44	2.58	8.42	0.87	6.69	8.22	5.04	4.31	6.13	4.61	0.19	0.22
1971	0.73	1.27	0.44	0.56	4.19	6.98	4.93	5.14	7.44	6.29	4.32	2.71

Lower East Coast (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1972	1.87	2.49	3.76	5.75	8.75	9.65	8.09	5.07	4.65	3.12	4.64	2.17
1973	2.59	2.17	2.15	1.12	3.65	7.98	8.56	9.93	6.91	4.59	2.71	2.53
1974	5.14	0.15	1.32	1.11	3.95	7.32	7.81	6.20	6.03	5.16	3.45	1.72
1975	0.63	1.31	0.56	0.66	8.22	7.76	7.44	3.99	8.47	5.81	1.99	0.73
1976	0.98	4.63	1.19	1.54	11.27	8.40	3.73	9.63	7.20	2.48	3.35	2.48
1977	2.50	1.31	0.41	1.87	9.87	7.88	4.99	8.35	10.52	1.38	3.72	3.63
1978	2.80	2.72	2.97	2.37	4.84	8.70	5.76	6.42	4.99	6.56	4.07	2.92
1979	2.34	0.87	0.63	10.63	6.24	3.60	4.02	4.47	11.90	5.78	3.40	2.71
1980	2.90	2.11	2.13	5.21	4.26	5.54	7.31	5.69	5.43	4.86	4.23	1.21
1981	0.61	3.85	1.28	0.17	5.12	5.19	4.30	14.09	10.52	2.99	3.08	0.61
1982	0.71	2.30	8.40	6.04	7.15	12.42	5.17	5.95	7.42	4.08	7.94	1.67
1983	7.91	8.64	3.90	3.58	3.04	9.69	5.04	7.86	9.58	6.78	2.53	7.27
1984	1.27	1.83	4.74	2.87	10.99	6.50	5.99	4.24	10.17	1.57	4.56	1.02
1985	0.62	0.27	2.31	4.47	4.54	6.08	10.87	6.63	10.73	5.39	2.33	3.00

Lake Okeechobee

1952	0.97	5.86	1.68	1.97	5.05	4.42	7.21	7.46	6.41	10.85	0.17	0.26
1953	1.40	2.09	1.69	3.56	2.13	8.21	10.04	9.43	10.13	7.47	0.83	1.18
1954	0.17	1.79	2.15	5.78	6.94	10.68	7.54	5.59	7.64	2.85	1.65	1.41
1955	1.80	1.08	1.56	2.34	2.56	10.86	6.21	5.59	5.70	2.08	0.33	2.10
1956	0.83	1.10	0.35	2.35	2.83	3.80	3.86	5.06	4.73	7.46	0.25	0.09
1957	2.88	2.62	3.83	4.38	7.30	5.67	6.28	5.42	8.56	1.68	0.74	5.31
1958	6.23	0.59	6.11	3.43	4.92	4.18	4.95	4.62	5.03	3.54	0.30	4.54
1959	1.19	1.18	4.40	1.83	7.41	10.41	6.12	5.48	5.93	8.60	1.90	0.88
1960	0.12	4.28	1.70	4.07	2.42	5.28	7.74	6.63	11.19	3.78	1.00	0.69
1961	2.24	3.33	2.75	1.46	6.35	3.91	4.25	4.83	2.22	1.85	0.60	0.11
1962	1.07	0.57	3.24	2.64	2.57	7.94	7.07	6.40	7.95	1.70	2.21	0.18
1963	0.68	3.88	0.54	0.45	5.99	5.02	3.86	4.11	4.89	0.83	2.23	4.74
1964	1.99	2.82	0.91	3.08	2.82	6.19	6.43	6.53	4.28	4.12	0.17	1.62
1965	0.21	4.15	3.17	5.37	5.90	9.41	6.75	5.49	4.82	7.25	0.23	1.21
1966	3.91	2.89	0.74	2.81	4.19	10.39	8.25	8.27	5.91	4.51	0.16	0.47
1967	0.83	2.59	1.08	0.02	2.01	8.65	5.46	5.90	6.03	3.62	0.13	1.33
1968	0.30	2.09	0.63	0.65	7.17	13.88	7.28	2.84	7.35	5.03	2.14	0.06
1969	1.81	1.74	5.33	0.66	5.97	7.99	4.32	7.78	5.50	9.10	1.57	2.70
1970	3.62	2.42	12.44	0.01	5.34	6.17	6.37	6.52	2.63	4.31	0.07	0.30
1971	0.22	1.10	0.89	0.17	4.35	6.12	6.80	5.42	6.11	4.92	1.76	0.99
1972	0.91	1.74	2.91	2.22	5.21	8.30	4.29	4.22	1.38	0.81	2.52	1.58
1973	2.26	1.79	2.88	1.12	4.57	6.14	8.02	5.61	4.39	3.47	0.27	1.35
1974	0.56	0.53	0.14	1.40	3.07	10.88	9.60	6.82	5.48	1.05	1.47	1.05
1975	0.36	1.96	1.01	1.14	6.12	4.99	7.57	3.29	6.88	3.13	0.39	0.27
1976	0.27	1.80	0.37	1.41	7.06	5.68	4.63	6.67	3.52	1.41	2.28	1.56
1977	3.28	0.84	1.12	0.53	4.26	4.33	4.62	6.63	7.00	1.57	6.13	4.20
1978	2.06	1.16	2.44	1.47	4.86	6.76	6.61	5.98	4.62	2.72	2.26	3.00
1979	4.49	0.16	2.29	1.79	5.56	1.85	2.98	5.61	13.16	1.57	2.88	1.47
1980	3.34	1.32	1.62	4.68	3.66	3.38	5.02	6.09	5.48	1.12	2.14	0.66
1981	0.79	1.58	1.18	0.17	2.78	3.03	4.37	9.35	3.70	0.71	1.13	0.10
1982	0.49	2.13	6.56	1.74	7.98	8.11	5.32	6.43	5.89	2.90	1.15	0.76
1983	4.13	8.96	4.50	1.72	1.99	6.85	6.18	4.51	3.65	6.39	1.46	2.80

Lake Okeechobee (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1984	1.09	3.49	4.64	3.44	6.21	4.59	8.32	3.31	5.41	0.39	3.03	0.25
1985	0.46	0.21	2.32	3.30	2.14	5.46	6.44	3.73	7.05	3.12	0.89	2.40

Lower West Coast

1927	0.24	1.27	1.87	1.25	1.39	6.14	8.19	6.05	6.05	3.34	0.86	0.49
1928	0.18	1.13	1.15	2.01	3.08	9.17	9.93	13.22	14.14	2.31	0.45	0.52
1929	1.07	0.15	0.89	0.95	5.45	9.84	6.82	6.60	15.24	4.25	0.69	1.23
1930	1.44	2.87	5.48	3.62	7.24	13.05	6.16	8.60	12.59	4.28	0.26	2.19
1931	4.51	2.45	6.77	3.78	3.02	4.03	6.07	6.68	5.94	1.26	0.32	1.38
1932	1.13	0.73	2.10	1.21	8.51	7.04	4.85	14.93	7.08	4.87	2.13	0.22
1933	0.37	1.32	3.71	4.92	4.98	6.35	9.80	6.29	5.01	3.77	1.05	0.09
1934	0.78	3.18	1.57	1.34	9.22	8.76	7.15	6.50	9.87	1.81	0.77	0.24
1935	0.29	1.27	0.01	3.40	2.88	6.10	10.44	6.83	15.17	1.42	0.62	2.27
1936	2.54	5.29	2.93	0.82	6.43	20.30	6.94	5.58	5.30	4.13	2.01	0.92
1937	1.54	2.84	3.46	1.80	3.26	9.38	6.97	7.65	4.65	5.29	2.46	0.53
1938	1.28	0.52	1.07	0.28	4.67	7.52	13.00	4.60	5.21	4.11	1.68	0.09
1939	0.79	0.43	0.44	4.72	3.58	10.58	8.92	9.49	9.18	5.91	1.21	0.78
1940	3.19	3.32	3.24	1.46	2.21	9.72	4.41	8.00	14.54	0.46	0.10	4.91
1941	4.32	3.74	5.03	6.87	1.50	6.74	10.76	5.61	7.04	3.09	2.15	0.86
1942	2.27	2.93	2.77	3.80	2.62	11.66	6.54	6.80	5.29	0.28	0.55	1.78
1943	0.75	0.60	1.31	3.13	4.88	10.68	8.16	6.69	5.46	3.29	1.66	0.29
1944	1.11	0.06	2.25	2.70	3.49	5.30	6.19	6.94	5.07	5.17	0.14	0.64
1945	2.26	0.68	0.13	2.33	1.33	9.37	11.67	10.60	7.10	4.48	0.38	1.52
1946	0.71	1.81	0.70	0.18	6.96	8.75	7.41	5.92	8.05	1.51	3.77	1.21
1947	0.87	2.29	7.36	2.06	4.22	13.87	8.68	9.44	13.74	3.94	4.07	1.74
1948	3.70	0.19	0.88	2.25	2.42	5.43	10.13	6.53	15.46	3.25	0.55	0.42
1949	0.01	0.19	0.44	3.19	4.26	7.58	11.24	9.43	11.09	3.13	1.25	1.28
1950	0.02	0.48	0.58	0.78	2.80	5.76	9.66	6.79	6.27	3.98	0.64	1.76
1951	0.62	1.12	0.83	3.36	2.25	4.84	10.42	6.81	5.95	11.23	1.09	0.23
1952	0.99	5.34	1.72	1.14	4.94	5.42	7.93	6.46	8.20	8.60	0.71	0.66
1953	2.33	2.16	1.94	4.21	1.53	8.73	7.49	8.82	12.41	7.50	0.71	1.53
1954	0.35	2.26	2.30	4.86	6.75	6.92	9.20	6.17	10.00	1.94	2.24	1.86
1955	2.03	1.03	0.74	1.82	3.92	9.83	8.08	4.86	8.74	2.45	0.70	1.33
1956	0.98	0.96	0.96	3.00	4.32	4.15	4.99	6.66	5.70	5.95	0.84	0.49
1957	0.93	4.35	4.91	3.43	6.53	5.76	8.31	7.91	9.52	2.97	0.80	4.42
1958	6.51	1.37	7.50	2.66	7.31	6.76	8.88	5.57	6.03	4.26	0.70	3.98
1959	1.47	1.57	5.15	1.41	6.47	13.56	8.57	8.48	8.61	10.57	1.97	1.28
1960	0.40	3.13	1.99	4.05	3.39	6.67	13.37	7.40	14.86	4.53	1.74	0.86
1961	3.24	1.54	2.22	1.53	5.27	6.20	6.80	7.56	3.15	2.06	0.95	0.36
1962	0.88	0.45	3.33	1.37	2.54	13.67	5.59	9.55	13.48	2.94	2.86	0.43
1963	0.87	4.42	0.63	0.39	7.36	7.26	3.98	6.62	9.14	0.80	3.04	2.64
1964	2.48	3.01	1.74	1.38	1.68	7.26	4.94	8.44	6.10	2.86	0.53	0.91
1965	0.74	2.95	2.74	1.64	2.03	8.91	10.07	7.87	6.25	5.22	0.63	0.93
1966	3.57	2.10	0.51	3.18	3.79	12.15	7.69	6.97	7.47	2.59	0.20	0.64
1967	2.09	2.76	0.87	0.01	1.37	11.09	7.88	8.47	7.73	4.84	0.76	2.50
1968	0.40	2.40	0.92	0.50	8.32	15.14	10.07	7.25	6.83	6.21	2.75	0.32
1969	2.02	2.22	4.57	1.34	5.13	12.02	7.08	8.38	10.01	10.30	1.07	2.97
1970	4.24	2.58	16.78	0.05	6.62	9.01	8.58	5.91	8.05	3.58	0.46	0.36

Lower West Coast (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1971	1.03	1.58	0.43	0.68	3.32	7.98	7.90	8.67	10.34	6.60	1.03	0.87
1972	0.97	2.94	4.23	1.36	5.60	11.68	5.60	9.49	4.58	1.60	5.79	1.53
1973	3.39	2.74	3.95	1.47	1.59	8.37	12.22	12.38	8.26	1.61	0.42	2.41
1974	0.21	0.89	0.51	0.82	6.06	17.89	12.35	9.00	6.56	0.41	2.44	1.54
1975	0.43	0.71	1.34	2.13	6.39	8.35	9.42	6.63	9.63	3.78	0.53	0.48
1976	0.38	1.64	1.26	1.89	7.72	9.25	6.95	7.78	7.52	2.09	2.15	1.99
1977	4.05	0.88	0.20	0.65	4.47	8.69	9.06	8.81	7.85	0.68	2.06	2.90
1978	2.58	3.05	3.59	2.28	4.52	9.26	9.99	7.28	5.70	2.32	1.03	3.88
1979	5.89	1.28	1.21	2.48	5.52	5.64	5.77	10.52	13.02	2.16	2.07	4.30
1980	3.34	1.43	2.82	3.24	4.39	2.78	7.67	9.55	6.39	1.49	3.20	0.70
1981	0.71	1.86	1.59	0.26	3.17	7.76	7.00	12.52	4.24	1.18	1.42	0.33
1982	0.75	1.91	3.31	5.06	6.75	17.71	9.51	8.67	9.40	4.61	1.36	1.17
1983	4.73	8.65	5.27	1.57	1.49	12.33	7.75	8.09	8.62	6.17	1.98	3.79
1984	0.32	2.70	4.54	0.94	6.25	5.68	9.53	5.44	7.51	1.47	2.49	0.33
1985	0.86	0.48	1.47	3.53	2.79	7.48	13.85	5.79	6.39	3.38	2.18	1.28

Upper East Coast

1915	9.36	2.24	2.74	1.36	2.25	5.41	8.81	7.91	7.44	10.88	3.35	1.89
1916	1.83	2.05	0.60	1.84	4.04	5.75	3.53	2.98	8.06	10.34	2.94	1.19
1917	0.90	3.23	0.19	0.44	1.18	4.66	5.09	3.18	6.67	3.37	0.49	2.65
1918	3.51	0.69	4.38	6.74	1.35	6.30	8.21	2.74	14.22	6.02	0.89	1.31
1919	2.16	4.30	5.64	2.15	2.94	4.13	9.43	5.33	2.82	0.60	7.32	2.14
1920	7.38	1.97	2.13	4.22	4.50	2.83	5.91	5.32	9.67	4.14	3.50	0.78
1921	0.43	1.99	1.56	1.36	6.26	1.96	6.90	1.63	0.75	11.31	0.98	1.02
1922	2.18	3.19	0.60	0.65	2.54	2.94	4.34	5.88	8.44	10.46	2.10	0.67
1923	1.28	0.30	0.79	4.84	7.72	8.40	5.39	1.09	8.50	2.93	0.46	1.12
1924	5.16	1.47	3.63	2.22	4.42	0.69	7.38	1.41	7.19	19.31	0.38	1.28
1925	4.99	2.15	3.31	1.75	7.16	5.21	6.44	5.49	1.91	1.79	10.65	6.77
1926	7.48	1.84	2.40	4.75	0.72	9.52	12.74	7.74	11.07	1.88	0.71	1.03
1927	0.65	0.78	1.56	1.21	0.92	2.00	4.93	5.13	11.81	10.27	1.95	0.56
1928	1.04	1.27	3.56	0.25	3.88	3.98	2.84	14.57	4.72	3.50	1.70	0.35
1929	1.89	0.59	2.32	1.46	11.09	6.85	5.45	3.04	6.97	8.76	1.60	2.51
1930	1.78	5.28	5.43	7.72	7.41	11.88	2.78	3.84	7.34	4.78	2.90	3.49
1931	3.27	0.79	3.76	11.16	1.80	1.17	6.39	4.12	6.89	6.37	1.48	1.37
1932	1.45	1.44	3.04	1.74	4.16	12.90	1.48	6.41	5.44	4.05	6.86	0.94
1933	1.98	1.18	4.23	9.86	1.65	5.45	2.98	8.87	6.36	12.97	3.62	0.75
1934	1.49	5.54	2.12	5.44	5.72	4.97	2.89	4.00	3.68	3.09	1.06	1.32
1935	0.22	1.61	0.27	5.31	3.44	9.15	4.00	3.57	6.53	10.63	0.77	0.99
1936	1.85	5.22	3.80	2.43	5.74	9.63	4.65	3.42	8.36	7.56	4.66	4.49
1937	1.63	3.22	7.37	6.68	6.42	3.84	3.65	3.87	8.59	15.64	6.43	1.00
1938	0.73	1.22	0.44	0.24	2.60	6.68	4.80	1.63	7.54	8.80	3.55	1.66
1939	0.41	0.32	1.22	5.16	6.80	4.55	5.58	7.68	6.16	10.73	1.22	1.40
1940	2.59	3.01	5.89	1.84	3.29	6.73	4.91	7.07	10.54	2.13	0.18	3.83
1941	5.16	4.81	3.24	8.00	2.72	7.36	9.38	4.40	9.70	4.91	3.39	2.71
1942	1.97	3.86	4.15	1.82	4.82	8.51	2.34	3.61	6.45	1.60	1.33	2.91
1943	0.29	0.78	4.34	2.40	3.86	4.92	7.96	4.77	7.50	2.70	2.51	0.49
1944	1.33	0.15	1.46	3.55	2.65	3.79	8.40	4.07	6.95	10.03	0.62	0.38
1945	1.03	1.05	0.27	1.54	1.18	4.60	6.95	4.64	11.75	6.10	2.77	2.09

Upper East Coast (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1946	1.50	1.29	2.37	0.05	7.28	5.83	6.44	5.89	5.08	2.25	4.77	2.15
1947	1.04	2.79	6.92	4.48	4.81	6.95	7.07	5.87	15.35	9.57	3.03	0.96
1948	3.25	0.40	2.33	4.03	3.15	2.92	7.16	7.46	13.74	3.36	0.92	0.77
1949	0.34	0.91	0.24	2.23	3.40	9.72	4.55	11.11	7.74	4.73	0.77	4.13
1950	0.45	0.82	3.77	1.73	3.50	2.80	4.84	5.50	4.99	9.98	1.58	0.76
1951	0.30	2.36	0.62	6.19	3.52	5.64	5.87	6.70	5.75	10.15	2.59	0.68
1952	1.45	5.65	2.67	1.56	2.71	2.30	7.58	6.43	6.37	12.52	0.35	0.64
1953	1.80	1.94	3.74	3.75	1.33	5.01	8.47	7.86	10.81	9.14	2.39	2.35
1954	0.62	2.48	2.66	5.73	5.07	9.91	6.20	5.29	9.80	5.04	3.81	1.03
1955	2.16	1.64	2.23	3.38	2.50	8.05	5.21	5.81	3.78	3.73	0.13	3.49
1956	1.15	1.74	0.57	3.30	3.27	3.87	4.92	6.08	6.20	10.79	0.46	0.79
1957	2.23	3.12	4.47	5.89	5.88	5.08	8.28	6.97	8.22	4.90	1.16	3.76
1958	7.87	0.98	4.68	2.54	6.23	4.49	3.24	4.57	4.28	5.02	0.89	4.14
1959	2.78	0.82	6.73	3.73	5.96	11.47	5.97	5.66	8.08	9.59	4.63	2.66
1960	0.17	4.28	2.73	4.85	3.68	7.69	7.58	4.82	17.21	3.57	0.99	0.85
1961	2.88	0.67	2.99	1.24	6.45	4.40	1.93	6.83	2.48	3.97	1.45	0.15
1962	0.82	0.78	3.46	3.59	2.45	6.86	7.76	9.76	8.23	1.22	3.01	0.36
1963	0.93	4.23	1.32	0.75	5.05	5.57	4.86	3.40	9.30	5.17	3.49	6.80
1964	2.28	4.07	0.82	3.46	3.03	3.58	7.70	10.91	6.84	8.95	0.96	1.41
1965	0.39	5.42	2.84	1.10	0.99	7.17	7.44	5.01	5.99	9.50	1.11	0.97
1966	6.55	4.75	1.98	3.44	5.20	13.80	6.78	5.23	6.79	7.92	1.78	1.19
1967	1.06	3.07	2.03	0.26	0.87	8.96	8.72	6.09	4.56	8.23	1.14	1.47
1968	1.03	1.88	0.66	0.31	5.52	16.27	6.89	5.07	7.50	7.26	2.20	0.17
1969	1.94	1.35	5.65	1.66	8.66	4.35	4.37	7.75	5.58	11.01	2.93	2.37
1970	4.71	3.53	11.20	0.22	4.94	6.36	6.87	3.78	7.07	5.67	0.29	0.42
1971	0.26	2.87	1.41	0.71	5.94	6.67	9.62	6.33	6.34	6.46	3.58	2.80
1972	1.24	2.61	3.35	4.29	7.42	11.45	4.84	4.29	1.94	3.41	2.84	1.73
1973	3.69	2.17	1.91	1.76	4.36	7.86	8.85	7.09	6.78	6.28	0.89	1.48
1974	2.34	0.97	0.90	2.43	2.98	10.00	10.84	6.93	5.61	2.93	2.34	1.88
1975	0.42	2.89	1.29	1.32	8.30	6.38	8.35	3.69	6.91	3.18	1.51	1.05
1976	0.31	2.35	0.26	2.00	11.08	7.85	3.94	7.22	7.29	1.32	3.15	2.91
1977	2.83	1.14	0.56	1.18	3.90	4.77	7.83	7.38	11.57	5.39	4.03	4.77
1978	3.23	2.20	3.07	2.24	5.07	8.58	9.49	6.55	5.92	6.33	3.07	5.74
1979	5.74	0.41	1.56	1.99	8.67	3.87	7.04	5.58	14.19	3.64	2.18	0.68
1980	2.97	2.56	2.47	3.33	3.82	4.02	7.90	4.68	4.66	2.21	2.79	1.43
1981	0.59	2.23	1.02	0.39	3.24	3.62	4.79	12.49	7.12	1.98	1.40	0.49
1982	1.16	3.90	10.24	6.81	8.08	9.19	7.70	7.54	5.86	2.46	7.49	1.32
1983	4.11	9.15	4.63	2.42	2.39	6.04	5.31	7.80	7.84	8.37	2.10	4.32
1984	0.64	3.37	4.12	1.72	6.44	5.35	5.82	4.16	11.21	0.78	6.81	0.50
1985	0.72	0.24	3.57	4.64	1.64	5.05	8.23	5.86	12.24	2.68	2.16	1.89

Upper Kissimmee River

1915	3.07	4.52	1.52	1.80	6.81	3.65	0.50	5.55	3.51	9.06	2.99	1.43
1916	0.58	0.33	0.73	2.71	6.11	5.91	6.41	4.11	4.82	2.20	3.53	5.40
1917	1.01	1.06	1.96	1.28	3.07	4.02	6.69	7.49	9.06	4.23	0.05	0.82
1918	3.30	0.14	2.59	7.32	2.65	4.02	8.16	5.15	6.56	4.10	3.80	2.29
1919	2.84	5.14	4.61	1.89	8.23	7.79	5.76	8.58	3.64	0.76	2.53	4.37
1920	1.71	4.24	0.44	6.89	4.53	7.74	7.73	7.25	10.34	0.17	3.11	1.96

Upper Kissimmee River (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1921	0.78	2.09	0.93	2.03	8.23	5.23	7.88	4.03	1.28	7.56	0.97	2.80
1922	0.73	1.28	0.57	0.31	7.98	6.74	5.39	9.47	7.21	6.09	0.69	1.32
1923	0.69	0.29	1.98	1.31	9.50	7.42	7.14	6.19	3.78	3.36	0.05	1.41
1924	2.65	4.15	7.23	2.99	3.83	7.93	9.04	4.37	6.88	8.39	0.17	0.57
1925	4.40	1.67	1.47	0.45	3.80	6.46	6.84	8.29	2.81	1.74	4.59	5.17
1926	5.17	1.61	4.97	5.68	0.85	10.51	0.27	8.62	4.00	1.03	3.34	0.38
1927	0.12	2.50	3.09	0.84	1.46	3.82	7.20	8.47	3.30	2.37	0.80	1.15
1928	0.80	1.23	3.62	8.75	3.45	6.12	6.26	9.45	8.32	0.66	0.08	0.62
1929	1.81	0.64	0.97	1.58	5.31	9.65	8.49	4.39	8.94	2.88	1.14	1.69
1930	1.58	3.86	10.09	3.43	3.76	15.42	4.72	5.44	9.25	2.27	1.45	4.89
1931	2.78	1.39	6.63	4.09	3.31	2.13	8.16	7.92	5.21	0.94	0.22	2.52
1932	0.92	0.51	3.25	1.00	7.04	9.62	1.88	10.95	3.26	1.19	5.52	0.04
1933	2.17	3.47	2.32	3.63	4.26	6.50	8.65	8.04	12.72	2.62	1.87	0.37
1934	0.97	4.30	3.38	5.22	7.80	15.57	8.65	5.67	3.93	3.51	0.39	0.54
1935	1.15	3.06	1.32	3.50	3.89	6.92	9.17	4.24	10.77	3.47	0.68	3.27
1936	3.44	8.54	3.66	0.88	7.30	8.46	5.12	4.84	4.15	3.86	1.49	1.10
1937	0.45	5.00	3.66	2.94	3.26	5.59	7.68	10.24	4.33	6.31	3.73	1.07
1938	0.98	0.61	2.26	0.18	7.52	4.24	8.25	3.89	4.50	3.96	0.68	0.23
1939	1.16	0.45	1.03	5.13	3.57	12.72	9.99	13.63	4.79	1.23	0.37	1.07
1940	2.19	3.51	3.71	2.20	1.89	7.00	9.34	6.25	4.90	0.27	0.17	5.39
1941	4.93	3.88	3.63	5.16	2.16	10.36	3.71	3.42	4.65	2.92	3.85	2.76
1942	2.43	2.98	6.23	2.45	2.00	11.59	4.56	5.50	4.13	0.24	0.16	3.03
1943	1.56	0.58	4.39	2.14	4.99	5.80	0.36	7.44	7.03	2.03	0.60	0.82
1944	1.48	0.20	5.58	2.59	1.73	7.51	2.32	7.94	5.77	6.92	0.37	0.25
1945	3.64	0.15	0.45	2.07	1.30	15.37	8.85	4.62	9.88	2.87	1.34	2.59
1946	1.37	3.07	1.54	0.59	6.29	5.41	8.88	7.35	5.54	2.51	1.27	0.92
1947	1.15	4.64	5.37	5.11	5.07	10.27	8.43	5.16	11.12	3.86	2.62	1.07
1948	6.16	0.67	3.63	2.46	1.89	3.60	8.75	9.77	11.77	2.84	0.95	1.59
1949	0.36	0.72	1.71	2.59	1.59	9.76	8.67	12.99	7.97	2.15	1.36	4.25
1950	0.10	0.42	3.24	3.97	2.49	4.49	5.79	5.34	9.42	9.75	0.46	3.91
1951	0.41	2.34	1.41	5.02	2.19	6.12	0.24	5.82	8.42	2.89	5.28	1.68
1952	0.80	4.67	5.08	1.64	4.59	4.08	6.32	7.24	4.83	5.40	1.45	1.03
1953	2.33	2.86	3.74	6.46	1.66	8.74	8.57	12.44	11.95	5.02	4.99	4.17
1954	0.99	1.31	1.32	3.54	4.56	7.81	7.97	4.34	4.25	3.28	2.87	1.28
1955	2.02	1.41	2.10	2.25	3.39	6.02	6.48	3.68	5.93	2.01	1.65	1.41
1956	1.69	0.73	0.41	3.05	3.87	5.40	4.96	7.92	7.05	12.86	0.54	0.27
1957	1.45	3.62	3.76	5.24	8.78	6.59	7.76	6.74	7.23	1.67	0.93	3.34
1958	5.73	3.36	5.82	3.95	3.17	4.72	6.23	4.63	4.54	4.10	1.50	3.13
1959	3.61	3.35	9.40	4.56	4.36	9.67	7.96	7.47	9.46	8.09	0.74	1.61
1960	1.11	4.55	11.01	2.87	2.87	7.64	2.02	6.01	15.13	2.96	0.24	1.13
1961	2.18	2.81	2.70	1.93	2.95	4.90	5.07	6.90	2.28	2.19	1.11	1.11
1962	1.34	1.46	3.20	1.73	3.86	7.13	6.15	6.65	6.32	1.10	2.62	0.85
1963	2.28	6.34	2.50	0.80	5.79	6.32	6.75	5.54	5.95	0.86	7.13	2.34
1964	4.93	4.05	3.25	2.18	3.75	4.48	6.62	9.31	7.10	1.57	0.78	1.57
1965	1.80	4.13	2.83	1.44	0.45	8.57	9.34	5.65	5.18	3.84	0.94	2.57
1966	5.26	6.02	1.74	1.72	4.98	8.91	6.77	8.92	6.19	2.10	0.16	1.25
1967	0.88	4.07	0.92	4.00	1.25	10.02	8.71	9.57	5.42	0.61	0.14	2.68
1968	0.49	2.32	1.27	0.39	5.68	14.62	8.38	5.24	5.72	4.75	2.69	0.44
1969	2.67	2.03	7.08	2.68	2.59	5.50	6.82	7.82	8.91	6.44	2.46	4.93
1970	3.40	3.24	5.40	0.82	3.69	5.59	7.97	6.18	4.00	2.38	0.63	1.04

Upper Kissimmee River (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1971	0.74	4.77	2.09	1.33	4.43	5.95	7.24	5.49	3.74	5.37	1.64	1.32
1972	1.58	4.78	2.56	1.47	3.42	8.98	6.01	8.10	0.98	2.82	3.79	2.53
1973	5.32	2.34	4.68	2.29	4.09	3.73	0.32	7.37	7.80	1.19	1.18	2.51
1974	0.28	1.54	2.62	0.84	4.10	13.05	3.55	5.31	8.91	0.22	0.21	1.72
1975	1.64	1.86	1.50	1.13	5.59	5.91	7.33	9.48	7.26	4.55	1.23	0.72
1976	0.28	0.94	2.46	1.90	9.28	8.38	5.46	9.06	6.23	0.80	2.63	2.02
1977	1.45	2.10	1.24	0.23	2.20	5.31	6.56	8.58	6.25	1.91	4.26	5.35
1978	2.77	4.21	2.22	0.68	4.59	9.00	2.14	5.50	3.80	2.69	0.82	4.28
1979	6.19	1.36	2.45	2.76	8.56	4.03	3.87	7.82	13.11	0.79	2.44	1.79
1980	3.79	2.53	1.93	2.88	6.64	4.42	5.65	4.30	2.86	0.99	4.19	0.69
1981	0.34	3.82	1.26	0.11	2.77	4.88	4.02	8.22	4.90	1.56	1.54	2.25
1982	1.17	1.00	4.68	4.00	5.16	10.43	7.28	4.91	6.67	1.91	0.72	0.90
1983	1.83	8.25	5.04	2.63	1.45	8.85	5.85	4.47	4.27	3.90	2.11	5.35
1984	1.24	3.06	1.06	4.33	4.71	5.04	8.38	4.55	4.13	0.67	2.82	0.25
1985	0.56	0.83	3.38	1.55	3.05	6.23	7.58	7.50	6.08	2.51	1.39	2.50

Water Conservation Area 1

1963	1.42	3.11	0.57	0.43	9.45	5.78	3.49	4.74	8.19	3.68	1.70	3.71
1964	1.45	2.71	2.85	3.69	3.54	8.06	6.21	9.21	4.03	12.41	2.24	1.52
1965	0.09	2.47	0.99	0.81	0.67	8.20	8.62	3.58	6.38	12.55	0.90	1.19
1966	4.05	5.37	0.83	2.23	4.29	19.13	4.24	7.49	8.73	9.68	0.47	0.24
1967	1.25	3.92	0.48	0.00	1.10	13.28	5.96	4.67	6.26	6.17	0.54	1.52
1968	0.45	2.62	1.63	0.76	10.78	11.17	6.95	6.90	4.84	5.97	1.91	0.02
1969	1.58	1.43	3.88	3.09	6.21	7.50	4.75	6.78	7.05	6.91	5.36	0.75
1970	1.65	2.05	7.99	0.40	3.93	7.97	5.66	2.42	4.93	4.46	0.04	0.22
1971	0.80	1.13	0.34	1.08	5.73	8.33	6.78	4.95	5.01	5.54	2.71	2.24
1972	1.75	1.14	3.59	8.45	6.79	8.97	5.79	4.29	2.45	2.83	2.30	1.65
1973	1.42	1.41	1.60	0.90	2.86	6.53	8.20	10.04	7.24	2.83	2.50	1.38
1974	4.31	0.09	3.61	0.95	3.17	6.56	7.01	5.68	9.01	2.74	2.98	1.43
1975	0.06	0.34	0.37	0.30	4.94	6.07	6.85	3.59	10.24	3.98	1.35	0.23
1976	0.33	5.37	0.83	0.87	9.26	5.09	4.86	7.80	4.86	0.37	1.30	2.00
1977	2.79	1.83	0.11	0.88	8.72	4.87	2.22	5.29	10.44	0.73	3.78	4.50
1978	2.66	2.15	1.82	0.79	2.91	8.57	8.16	3.83	7.42	3.05	4.94	1.94
1979	2.52	0.48	1.48	3.37	3.29	3.27	4.05	5.66	11.44	3.05	3.52	2.76
1980	3.30	1.29	2.78	3.12	5.42	3.79	6.28	4.94	4.54	2.69	2.40	0.38
1981	0.40	2.65	0.83	0.19	4.83	3.83	4.89	13.24	5.71	1.50	3.84	0.56
1982	0.40	3.18	5.87	1.84	5.60	11.76	4.49	4.25	8.68	2.61	4.11	1.11
1983	4.57	7.19	4.50	2.01	1.81	7.24	5.00	9.51	6.79	6.58	1.21	4.60
1984	0.63	1.31	4.29	4.23	8.08	5.53	4.19	4.66	6.77	1.05	4.22	0.27
1985	0.27	0.05	1.34	4.28	3.25	4.58	9.32	5.62	11.06	6.67	2.54	1.64

Water Conservation Area 2

1963	1.05	4.40	0.33	0.75	5.92	6.13	3.18	4.90	9.63	3.72	2.00	3.24
1964	1.57	2.11	2.42	2.77	5.20	7.18	4.77	8.07	5.30	11.21	0.97	1.57
1965	0.97	2.11	1.11	0.86	0.97	8.42	9.00	3.69	7.53	7.38	0.86	0.87
1966	3.26	3.44	1.13	1.81	3.83	18.64	5.93	5.31	6.12	8.33	0.50	0.27

Water Conservation Area 2 (continued)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1967	1.63	3.33	0.51	0.01	1.28	17.91	5.75	4.96	6.61	7.04	0.34	1.86
1968	0.60	2.47	0.95	0.91	13.69	14.25	7.85	5.21	4.59	6.03	1.40	0.04
1969	1.98	1.67	3.42	3.30	4.81	7.85	6.40	5.01	5.77	9.17	4.92	1.14
1970	2.44	3.14	9.67	0.05	6.78	9.65	6.47	4.04	6.04	4.58	0.11	0.18
1971	0.58	1.07	0.31	0.86	5.29	8.03	6.79	4.30	6.15	6.13	1.84	1.88
1972	1.58	1.75	3.75	3.97	6.13	8.16	6.34	5.07	3.45	2.90	2.61	1.97
1973	1.65	1.06	2.60	0.71	2.55	6.08	9.25	7.79	4.10	2.43	1.74	1.46
1974	2.08	0.04	1.47	1.24	4.30	9.84	7.13	4.27	4.58	2.35	1.82	1.28
1975	0.17	0.38	0.17	0.30	7.93	6.33	7.51	4.20	8.84	3.75	2.09	0.32
1976	0.29	2.59	0.75	0.88	11.82	5.29	4.26	7.63	7.56	0.27	1.43	1.72
1977	3.55	0.48	0.09	0.75	8.72	6.18	4.12	5.90	8.90	0.24	1.74	2.92
1978	1.23	2.04	2.53	0.71	1.50	3.91	8.79	4.79	3.54	3.94	2.16	3.12
1979	1.42	0.32	1.00	4.34	4.30	3.83	5.47	5.03	8.96	4.09	2.54	3.30
1980	3.68	1.38	2.59	3.15	4.40	5.24	7.51	5.20	2.85	1.99	2.17	0.40
1981	0.54	1.71	0.63	0.24	4.66	1.26	6.39	21.99	3.41	1.03	4.05	0.14
1982	0.24	1.96	4.20	1.72	5.12	12.69	3.86	3.79	5.09	3.33	2.29	1.20
1983	4.70	7.55	3.93	2.66	2.09	6.15	5.91	8.07	4.68	4.60	1.15	5.47
1984	0.44	1.37	4.62	3.61	7.56	5.78	2.53	5.82	4.08	0.44	4.09	0.63
1985	0.28	0.05	1.20	5.29	1.70	6.30	9.16	6.46	10.06	3.68	2.05	1.55

Water Conservation Area 3

1963	0.87	4.81	0.79	1.37	4.55	6.00	4.38	7.35	9.56	1.93	2.33	3.31
1964	1.15	1.75	1.68	3.51	5.09	8.57	4.75	7.89	4.99	7.09	1.43	2.22
1965	0.73	2.41	1.62	1.28	1.96	4.81	4.69	5.98	6.05	6.71	0.16	0.76
1966	2.97	1.72	1.05	2.62	4.00	11.04	9.83	3.52	5.60	5.34	0.75	0.61
1967	1.41	2.22	1.67	0.64	2.30	12.92	5.52	3.94	7.34	5.82	1.57	1.60
1968	1.36	2.40	1.38	1.00	8.86	13.42	4.99	4.12	4.90	6.61	1.54	0.37
1969	2.35	1.86	2.78	4.14	3.78	12.26	5.29	5.31	6.64	9.28	5.42	1.13
1970	2.48	1.84	7.44	0.76	5.39	8.95	4.68	4.76	4.10	4.60	0.44	0.45
1971	0.75	0.99	0.27	0.10	4.96	7.39	5.11	4.95	5.84	5.44	1.65	2.19
1972	0.73	2.18	3.21	2.69	7.25	8.29	4.54	6.26	2.78	2.32	2.11	1.43
1973	1.49	0.83	2.52	0.50	2.02	7.94	8.02	7.72	6.17	2.00	0.35	1.11
1974	0.64	0.10	0.17	1.04	3.21	10.61	6.83	4.87	5.48	0.75	2.50	0.77
1975	0.22	0.59	0.26	0.59	5.36	8.46	5.34	4.03	8.89	1.93	1.08	0.30
1976	0.50	1.66	1.46	1.53	10.09	6.91	4.22	6.97	5.93	0.62	1.33	1.30
1977	1.94	0.43	0.05	0.56	6.57	8.43	4.85	5.81	7.87	0.30	2.28	1.96
1978	2.06	2.35	2.50	0.78	2.10	4.65	9.05	5.42	4.85	3.72	3.00	1.70
1979	2.58	0.46	1.04	4.66	3.73	2.76	6.69	4.86	7.89	1.85	3.07	1.22
1980	2.80	1.01	2.21	5.04	3.97	4.14	4.12	8.95	4.48	1.31	3.33	0.92
1981	0.67	3.86	1.03	0.53	2.26	5.13	6.15	16.01	4.35	4.28	2.38	0.14
1982	0.36	1.27	2.65	3.75	7.46	12.55	6.21	5.01	5.56	2.61	1.60	0.63
1983	5.50	7.85	4.13	1.99	1.42	8.92	5.31	5.90	6.41	3.17	1.16	4.29
1984	0.10	1.44	3.81	1.61	7.11	3.94	4.58	4.12	3.79	0.67	2.76	0.45
1985	0.50	0.08	2.07	2.71	2.54	7.10	11.17	5.64	5.93	4.39	1.58	1.33

Appendix B. Basin Wet Season (June through October) Rainfall

Year	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3
1915	40.45	32.27	37.14	44.14								
1916	30.66	23.45	33.31	36.32								
1917	22.97	31.49	30.61	40.31								
1918	37.49	27.99	33.15	34.88								
1919	22.31	26.53	41.53	31.55								
1920	27.87	33.23	33.45	33.98								
1921	22.55	25.98	26.13	34.53								
1922	32.06	34.90	37.90	46.83								
1923	26.31	27.89	36.26	34.55								
1924	35.98	36.61	37.50	45.92								
1925	20.84	26.14		31.17								
1926	42.95	34.43	39.50	37.84								
1927	34.14	25.16	29.51	30.57	29.77							
1928	29.61	30.81	43.67	37.61	48.77							
1929	31.07	34.35	40.62	41.36	42.75	39.13						
1930	30.62	37.10	31.04	40.81	44.68	40.13						
1931	24.94	24.36	27.91	31.86	23.98	22.63						
1932	30.28	26.90	31.03	38.91	38.77	40.79	33.53					
1933	36.63	38.53	39.00	52.57	31.22	36.91	34.65					
1934	18.63	37.33	24.64	29.77	34.09	39.17	27.60					
1935	33.88	34.57	36.39	40.83	39.96	38.28	34.17					
1936	33.62	26.43		46.67	42.25	37.60	34.96					
1937	35.59	34.15	26.61	36.94	33.94	35.47	26.47					
1938	29.45	24.84	27.47	25.87	34.44	28.29	31.37					
1939	34.70	42.36	39.17	37.64	44.08	41.71	28.35					
1940	31.38	27.76	33.21	44.84	37.13	32.51	34.58					
1941	35.75	35.06	36.24	37.08	33.24	39.22	32.45	35.60				
1942	22.51	26.02	24.49	30.75	30.57	32.83	23.31	31.24				
1943	27.85	32.66	33.74	34.37	34.28	27.16	26.83	34.09				
1944	33.24	40.46	35.79	29.98	28.67	33.66	28.98	30.87				
1945	34.04	41.59	39.16	41.74	43.22	37.25	40.67	42.29				
1946	25.49	29.69	25.97	32.44	31.64	35.16	26.39	36.47				
1947	44.81	38.84	46.20	69.36	49.67	53.07	39.90	57.18				
1948	34.64	36.73	42.52	51.12	40.80	40.50	39.21	48.13				
1949	37.85	41.54	42.12	38.11	42.47	36.64	40.68	49.05				
1950	28.11	34.79	24.90	37.67	32.46	35.85	25.24	37.49				
1951	34.11	33.49	34.50	32.20	39.25	40.93	38.51	30.51				
1952	35.20	27.87	32.84	36.44	36.61	42.38	34.46	39.62	36.35			
1953	41.29	46.72	50.97	53.08	44.95	48.25	51.21	40.81	45.28			
1954	36.24	27.65	34.01	41.53	34.23	36.53	37.39	34.54	34.30			
1955	26.58	24.12	26.76	30.72	33.96	36.50	30.38	35.58	30.44			

Appendix B. Basin Wet Season (June through October) Rainfall
(continued)

Year	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3
1956	31.86	38.19	36.42	28.93	27.45	30.57	28.79	27.43	24.91			
1957	33.45	29.99	31.64	35.80	34.47	35.82	32.95	34.36	27.61			
1958	21.60	24.22	24.08	27.00	31.50	29.16	25.44	38.72	22.32			
1959	40.77	42.65	42.45	51.81	49.79	46.19	41.33	45.96	36.54			
1960	40.87	43.76	41.94	51.19	46.83	47.74	45.94	54.17	34.62			
1961	19.61	21.34	21.65	23.60	25.77	24.95	20.75	29.35	17.06			
1962	33.83	27.35	31.89	36.37	45.23	42.84	39.11	40.02	31.06			
1963	28.30	25.42	25.05	34.99	27.80	23.93	20.22	35.70	18.71	25.88	27.56	29.22
1964	37.98	29.08	28.13	42.34	29.60	35.26	29.42	38.00	27.55	39.92	36.53	33.29
1965	35.11	32.58	32.23	43.21	38.32	40.01	32.80	35.29	33.72	39.33	36.02	28.24
1966	40.52	32.89	33.49	47.59	36.87	41.97	39.43	49.74	37.33	49.27	44.33	35.33
1967	36.56	34.33	32.63	42.52	40.01	36.42	33.09	40.48	29.66	36.34	42.27	35.54
1968	42.99	38.71	38.13	50.60	45.50	42.63	39.19	50.36	36.38	35.83	37.93	34.04
1969	33.06	35.49	35.44	49.06	47.79	38.56	37.76	53.78	34.69	32.99	34.20	38.78
1970	29.75	26.12	27.45	28.31	35.13	28.26	27.53	35.18	26.00	25.44	30.78	27.09
1971	35.42	27.79	34.55	30.78	41.49	36.66	38.06	39.96	29.37	30.61	31.40	28.73
1972	25.93	26.89	23.67	30.58	32.95	24.62	21.30	37.62	19.00	24.33	25.92	24.19
1973	36.86	30.41	30.24	37.97	42.84	31.62	31.82	47.46	27.63	34.84	29.65	31.85
1974	36.31	31.04	36.61	32.52	46.21	37.48	38.72	37.69	33.83	31.00	28.17	28.54
1975	28.51	34.53	31.80	33.47	37.81	37.00	24.91	39.07	25.86	30.73	30.63	28.65
1976	27.62	29.93	28.91	31.44	33.59	24.61	25.17	39.35	21.91	22.98	25.01	24.65
1977	36.94	28.61	23.75	33.12	35.09	27.58	19.91	38.08	24.15	23.55	25.34	27.26
1978	36.87	33.13	31.51	32.43	34.55	32.64	26.02	39.33	26.69	31.03	24.97	27.69
1979	34.32	29.62	29.80	29.77	37.11	23.14	29.43	34.00	25.17	27.47	27.38	24.05
1980	23.47	18.22	21.11	28.83	27.88	22.76	23.21	27.55	21.09	22.24	22.79	23.00
1981	30.00	23.58	24.30	37.09	32.70	27.66	21.89	41.14	21.16	29.17	34.08	35.92
1982	32.75	31.20	30.42	35.04	49.90	37.09	29.05	39.65	28.65	31.79	28.76	31.94
1983	35.36	27.34	27.59	38.95	42.96	34.07	26.16	44.96	27.58	35.12	29.41	29.71
1984	27.32	22.77	26.15	28.47	29.63	22.34	24.69	28.39	22.02	22.20	18.65	17.10
1985	34.06	29.90	29.70	39.70	36.89	37.52	30.12	28.95	25.80	37.25	35.66	34.23

Appendix B. Basin Dry Season (November through May) Rainfall

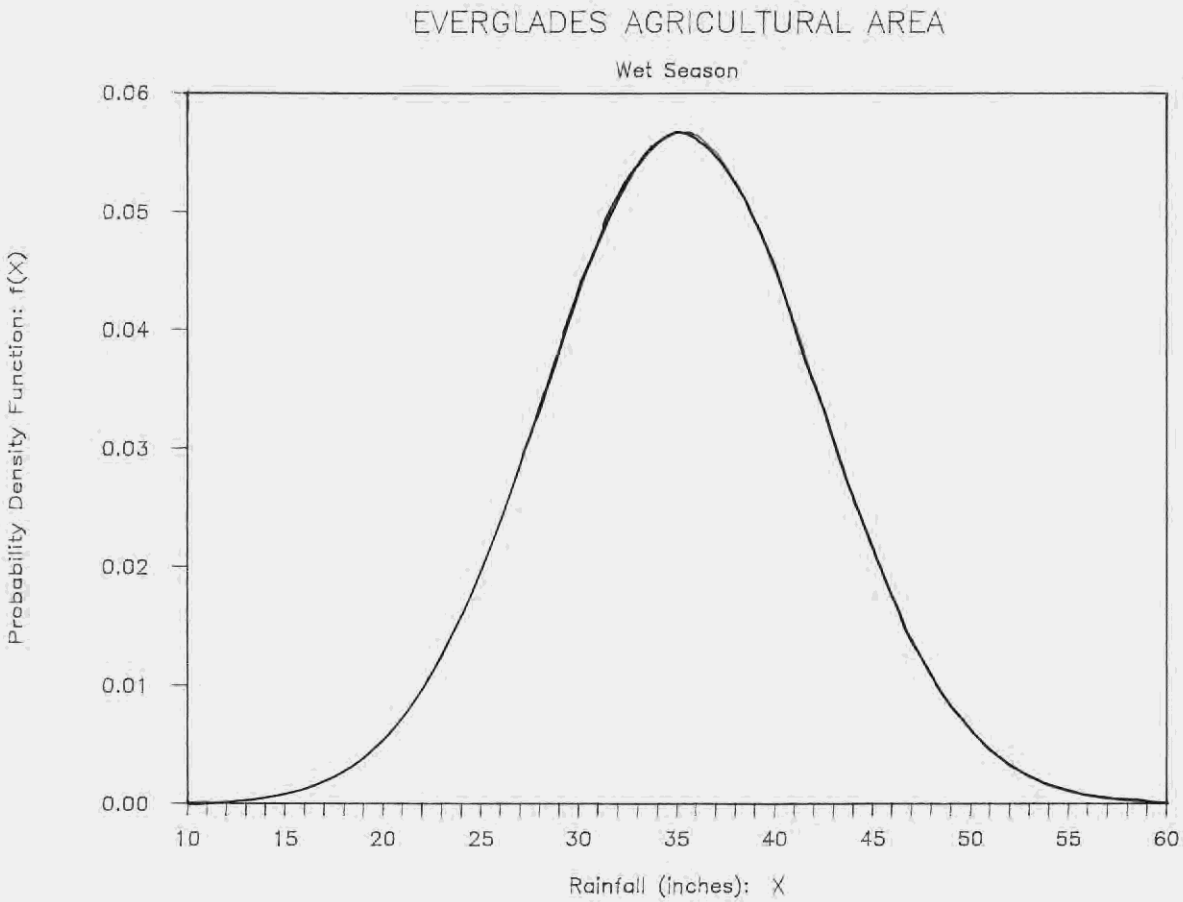
Year	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3
1916	15.60	14.88	12.56	22.86								
1917	10.07	17.31	10.09	15.09								
1918	19.81	16.87	10.97	19.85								
1919	19.39	28.80	18.36	27.56								
1920	29.66	24.71	17.05	24.48								
1921	15.88	19.13	16.22	21.95								
1922	11.16	14.64	18.87	19.65								
1923	17.70	15.78	20.32	22.64								
1924	18.48	22.31	15.07	21.77								
1925	21.02	12.53	12.99	33.66								
1926	34.61	28.04	24.52	30.32								
1927	6.86	11.73	8.46	15.65								
1928	12.51	19.80	13.31	14.05	8.90							
1929	19.40	11.01	10.80	12.49	9.48							
1930	31.73	25.55	29.76	30.34	22.57	25.06						
1931	27.17	24.54	26.04	26.29	22.98	19.89						
1932	14.68	15.46	15.20	24.07	15.38	13.62						
1933	26.70	21.41	18.70	20.96	17.65	24.95	17.57					
1934	24.68	23.91	21.69	32.06	17.23	21.75	20.82					
1935	13.23	13.85	13.64	15.70	8.86	10.98	11.10					
1936	20.80	27.77	26.36	25.06	20.90	18.66	16.82					
1937	34.47	17.90	17.19	21.47	15.83	25.74	11.68					
1938	12.66	16.35	13.89	11.91	10.81	11.73	10.88					
1939	19.12	12.25	18.01	17.79	11.73	14.21	17.06					
1940	19.24	14.94	19.30	20.00	15.41	19.27	16.91					
1941	27.94	25.32	21.16	29.35	26.47	27.70	27.52					
1942	22.72	22.70	22.77	33.97	17.40	23.44	18.72	14.93				
1943	15.91	16.85	17.21	16.31	13.00	11.67	15.65	16.49				
1944	12.14	13.00	10.43	16.03	11.56	12.81	10.16	11.79				
1945	6.07	8.23	9.57	8.10	7.51	7.59	7.16	11.79				
1946	17.35	16.79	13.64	20.24	12.26	15.97	12.20	14.15				
1947	26.96	23.53	24.00	33.10	21.78	27.55	22.69	19.44				
1948	17.15	18.50	19.14	25.72	15.25	20.17	17.62	16.09				
1949	8.81	9.51	9.80	14.09	9.06	6.61	8.34	10.86				
1950	15.17	15.83	10.23	19.29	7.19	15.62	9.66	14.84				
1951	15.33	15.74	14.34	15.28	10.58	12.56	12.58	14.67				
1952	17.31	23.74	20.47	13.52	15.45	15.93	20.59	14.70				
1953	13.55	19.53	16.39	16.71	13.54	10.88	12.33	17.45	11.30			
1954	21.30	20.88	18.79	29.53	18.76	19.87	19.01	25.53	18.84			
1955	16.75	15.32	14.01	15.16	13.64	13.43	16.68	11.53	12.40			
1956	13.65	12.81	11.01	13.44	12.25	9.37	9.52	12.00	9.89			

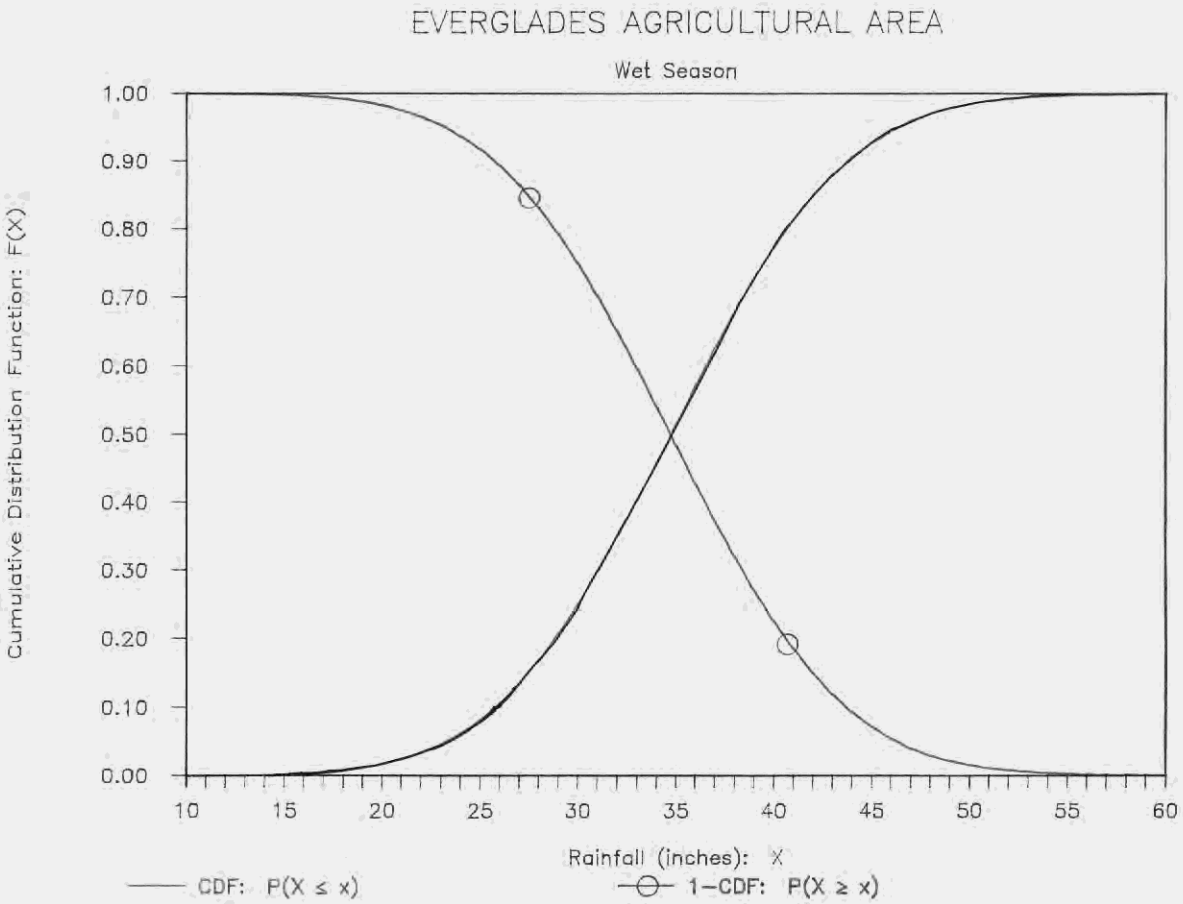
Appendix B. Basin Dry Season (November through May) Rainfall
(continued)

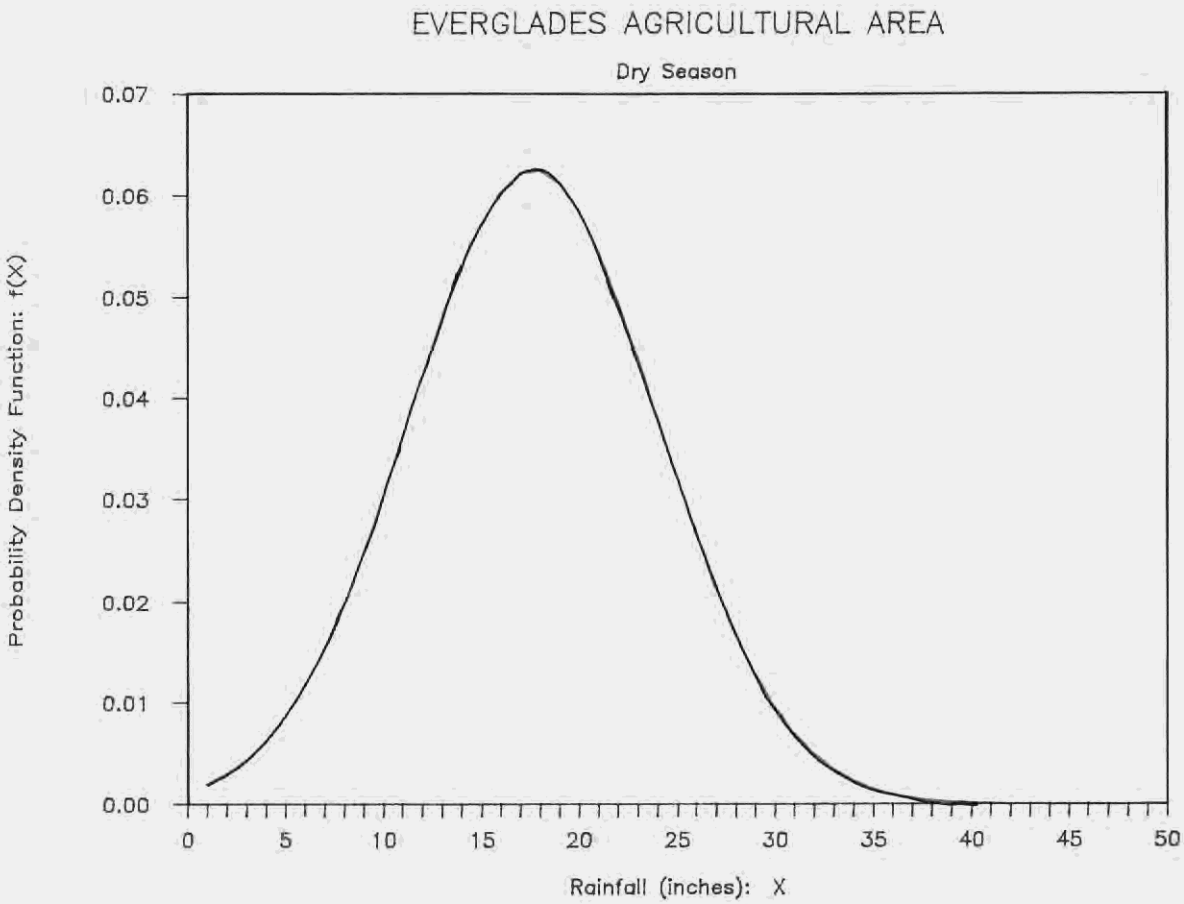
Year	UEC	UKR	KRB	LEC	LWC	EAA	FEC	ENP	LOK	WC1	WC2	WC3
1957	22.84	23.66	24.30	28.71	21.48	25.65	23.98	16.89	21.35			
1958	27.22	26.30	26.10	35.95	30.57	37.06	29.97	28.52	27.33			
1959	25.05	29.91	24.09	28.09	20.75	22.81	21.72	22.24	20.85			
1960	23.00	24.76	20.36	26.24	16.21	20.13	19.26	19.00	15.37			
1961	16.07	13.94	15.03	19.40	16.40	17.73	17.91	14.23	17.82			
1962	12.70	13.81	13.58	11.91	9.88	12.02	12.83	9.14	10.80			
1963	15.65	21.18	18.81	15.73	16.96	14.25	17.87	15.74	13.93			
1964	23.95	27.63	21.47	21.02	15.97	20.13	18.93	16.32	18.59	19.65	19.31	18.82
1965	13.11	13.00	13.15	13.27	11.54	12.14	13.18	11.15	20.59	8.79	8.56	11.65
1966	24.00	23.23	18.99	22.51	14.71	16.16	15.70	17.43	15.98	18.86	15.20	13.28
1967	10.26	12.53	6.26	10.91	7.94	7.83	6.75	7.35	7.16	7.46	7.53	9.60
1968	12.01	12.97	13.32	24.70	15.80	17.61	13.55	24.49	12.30	18.30	20.82	18.17
1969	21.63	20.18	20.77	21.28	18.35	19.00	20.42	18.83	17.71	18.12	16.62	16.82
1970	29.90	23.94	23.25	25.38	34.31	29.98	28.73	20.04	28.10	22.13	28.14	24.46
1971	11.90	15.03	11.95	7.60	7.86	8.36	6.66	7.01	7.10	9.34	8.40	7.96
1972	25.29	16.77	14.75	29.65	17.00	22.47	14.70	19.46	15.74	26.67	20.90	19.90
1973	18.46	25.04	22.88	18.49	20.46	15.74	19.54	16.84	16.72	12.14	13.15	10.90
1974	11.99	13.07	11.20	16.91	11.32	9.44	10.13	8.86	7.32	16.01	12.33	6.62
1975	18.44	13.65	12.09	16.55	14.98	12.53	12.53	17.51	13.11	10.42	12.05	10.29
1976	18.56	16.81	14.10	22.33	13.90	15.38	10.43	15.74	11.57	18.24	18.74	16.62
1977	15.67	11.87	11.77	21.79	14.39	17.77	12.27	14.96	13.87	17.63	16.74	12.18
1978	24.61	24.08	21.73	23.05	20.98	24.61	20.84	22.81	22.32	18.61	12.67	14.03
1979	27.18	26.42	22.47	27.70	21.29	19.33		20.17	19.55	18.02	16.66	17.17
1980	18.01	22.00	19.63	22.72	21.59	24.21	12.87	19.62	18.97	22.19	21.04	19.32
1981	11.69	13.18	11.84	16.47	11.49	10.58	9.99	15.29	9.30	11.68	10.35	12.60
1982	32.08	19.80	22.16	28.29	19.53	23.06	23.16	19.06	20.13	21.29	17.43	18.01
1983	31.51	20.82	22.26	36.68	24.24	21.13	24.67	25.31	23.21	25.30	24.42	23.12
1984	22.71	21.86	22.43	31.50	20.52	22.03	22.09	17.89	23.13	24.35	24.22	19.52
1985	18.12	12.44	13.57	17.79	11.95	13.87	12.81	10.72	11.71	13.68	13.24	11.11

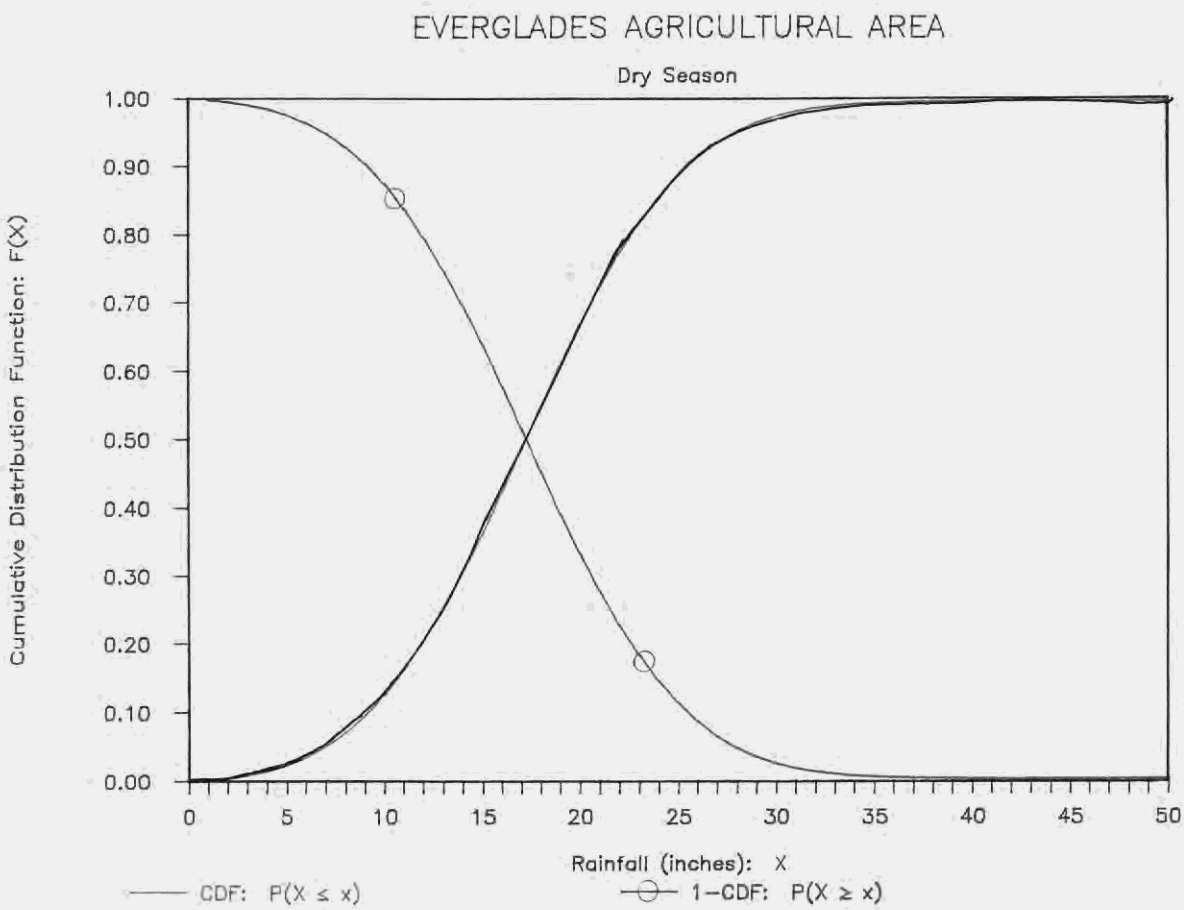
Appendix C

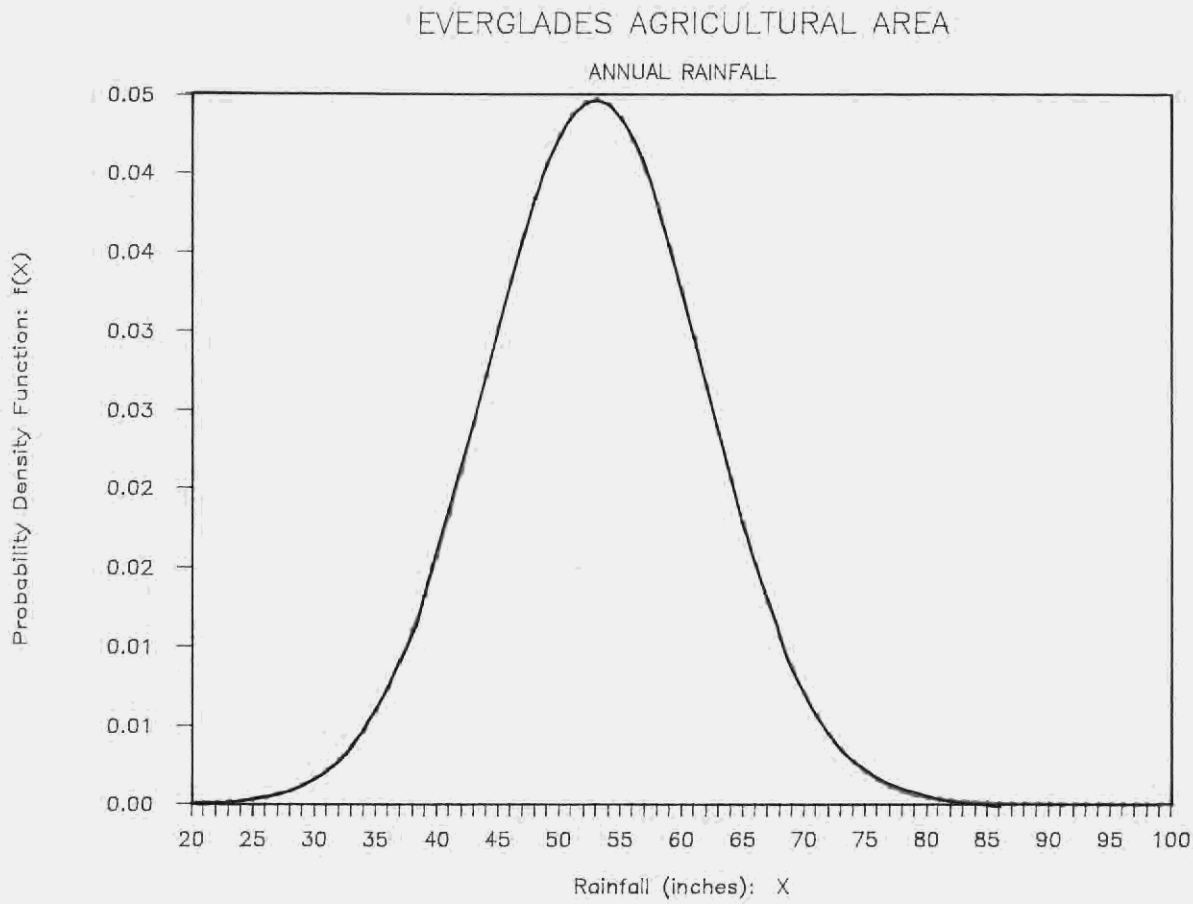
Probability Density and Cumulative Distribution Function Graphs

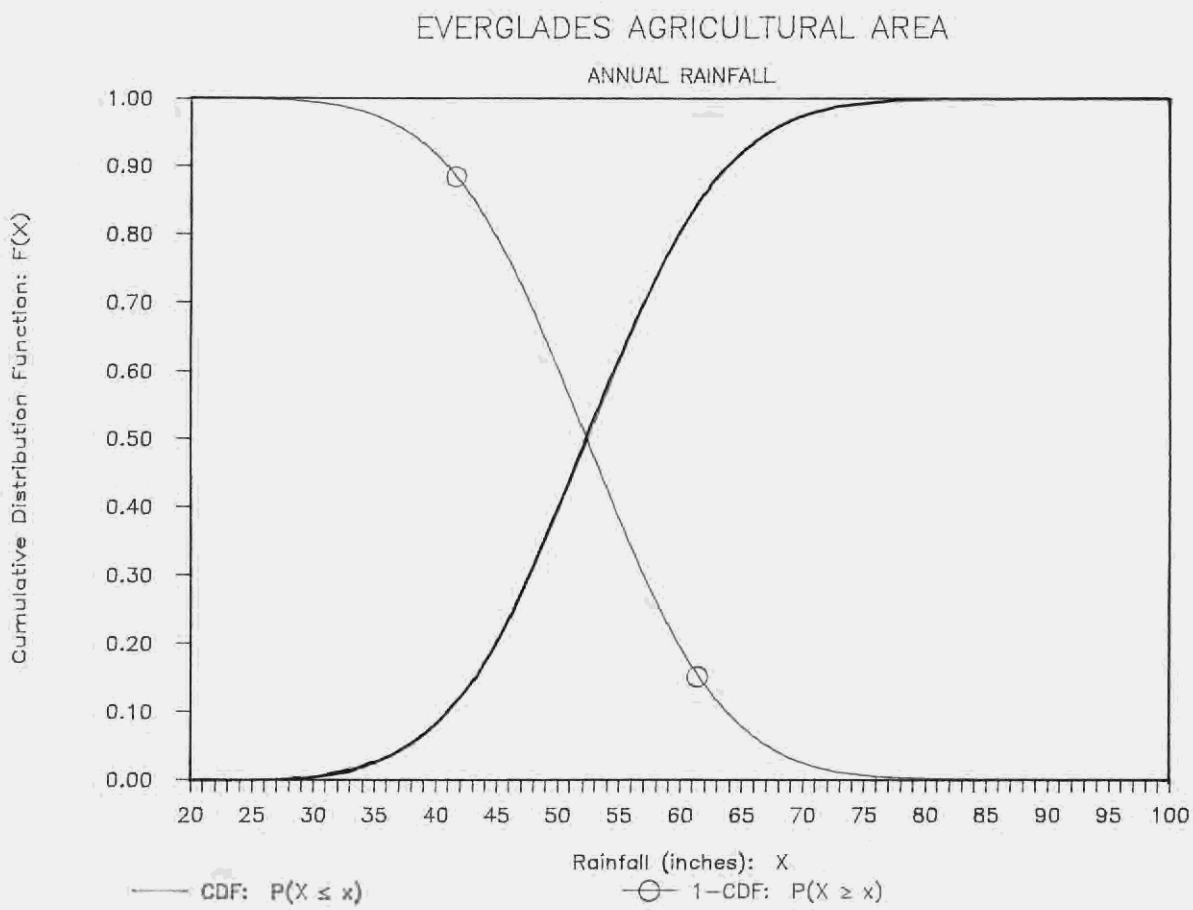

EVERGLADES AGRICULTURAL AREA
Wet Season
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

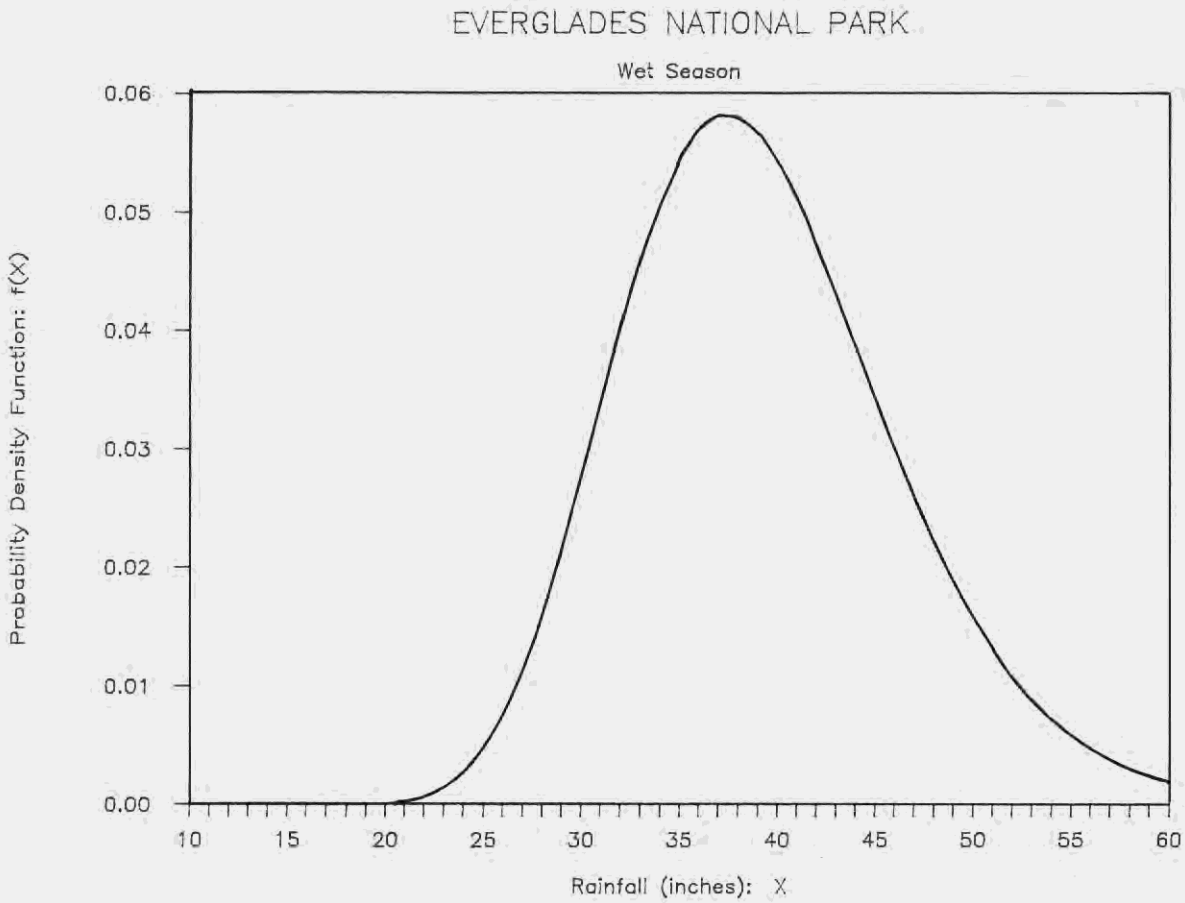

EVERGLADES AGRICULTURAL AREA
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

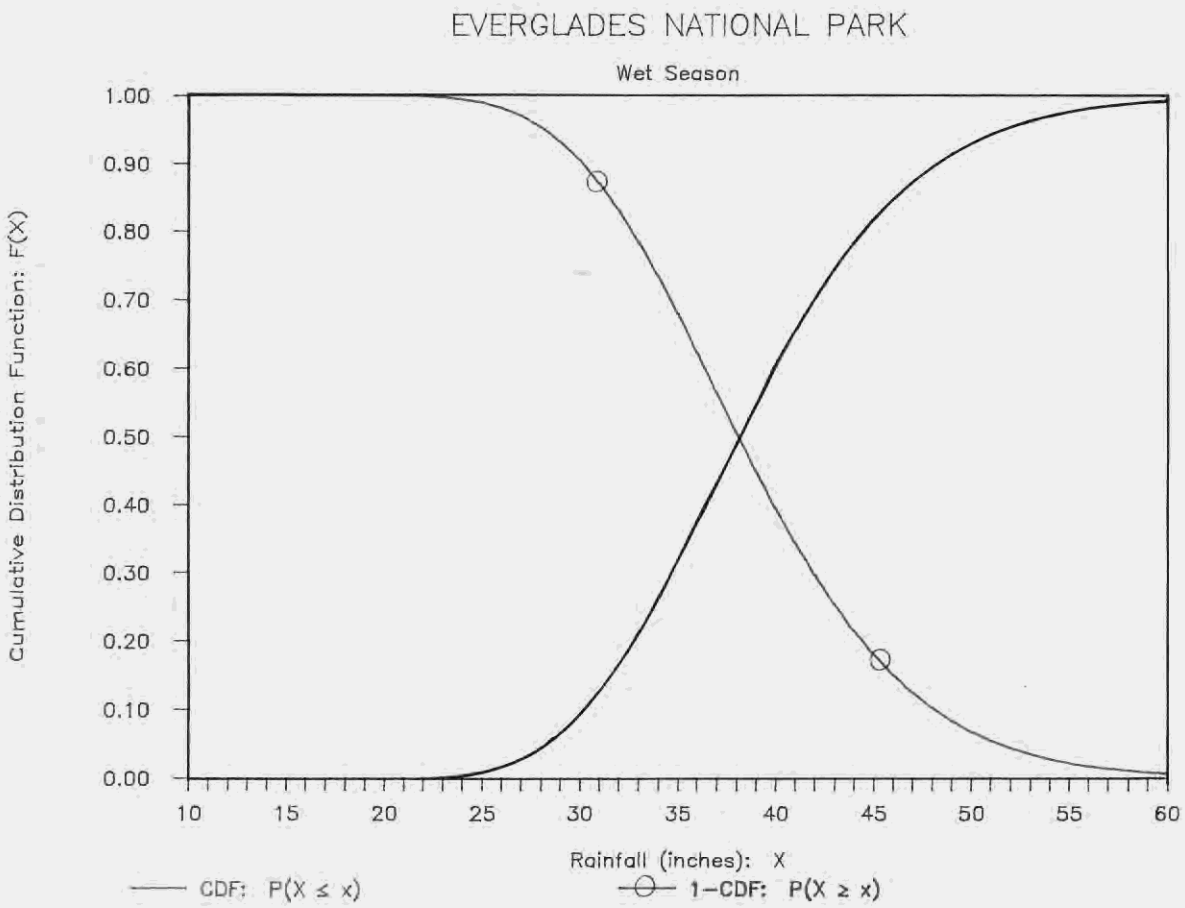

EVERGLADES AGRICULTURAL AREA
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

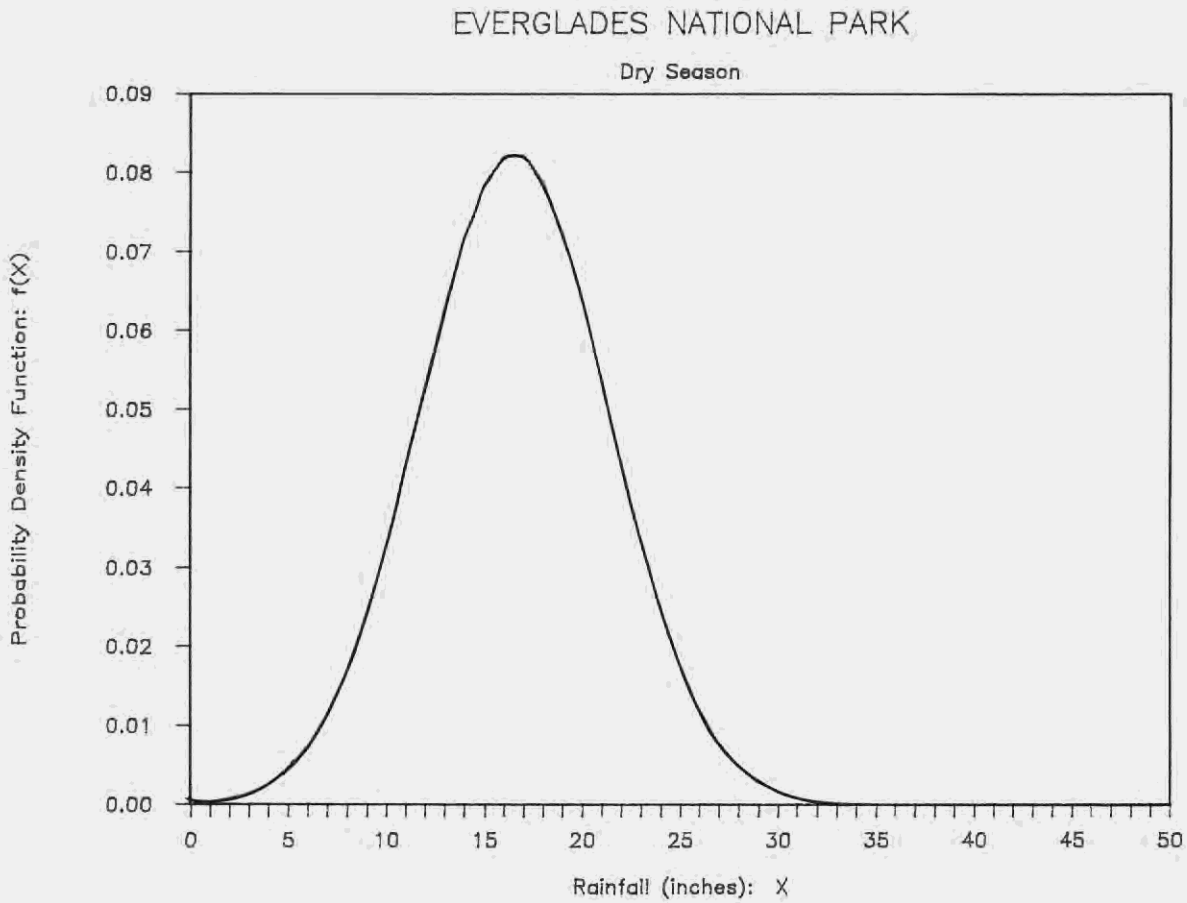

EVERGLADES AGRICULTURAL AREA
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

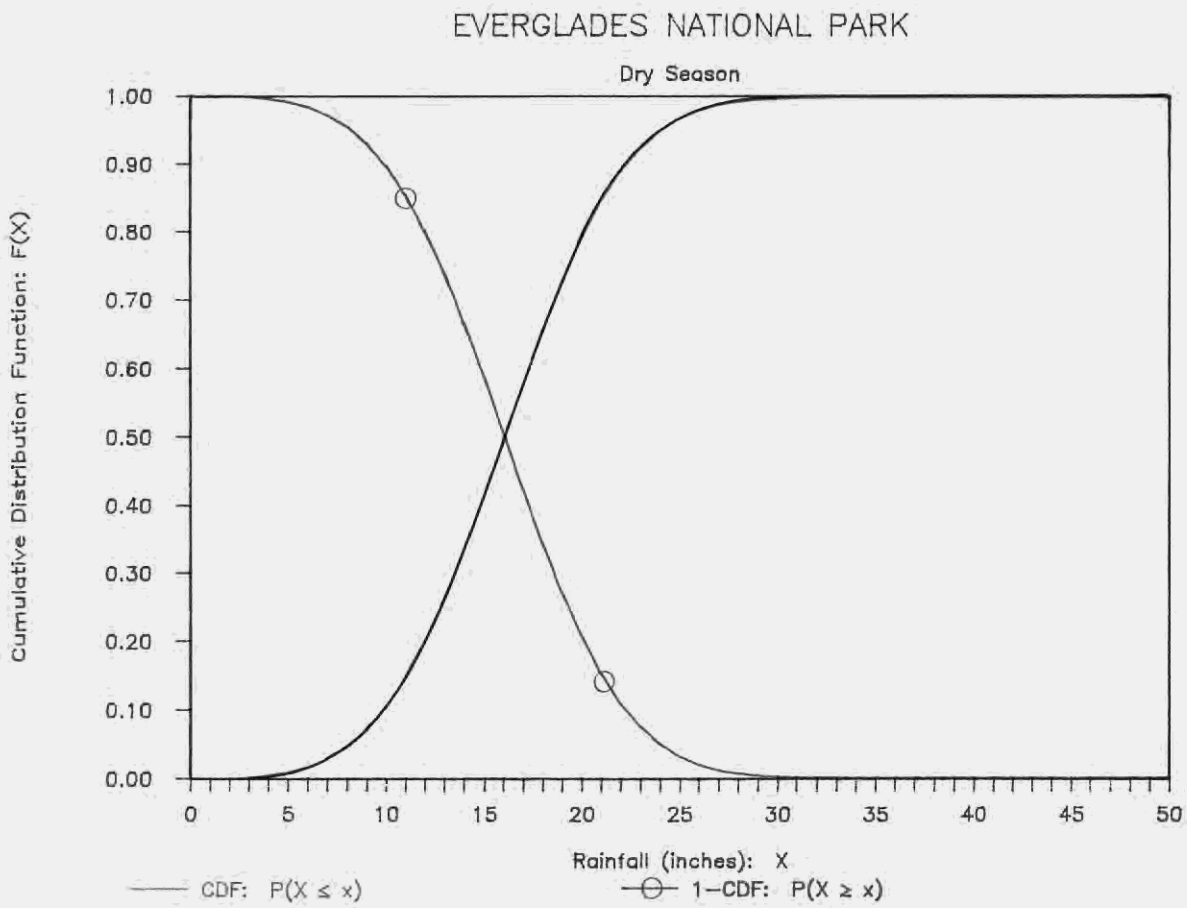

EVERGLADES AGRICULTURAL AREA
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

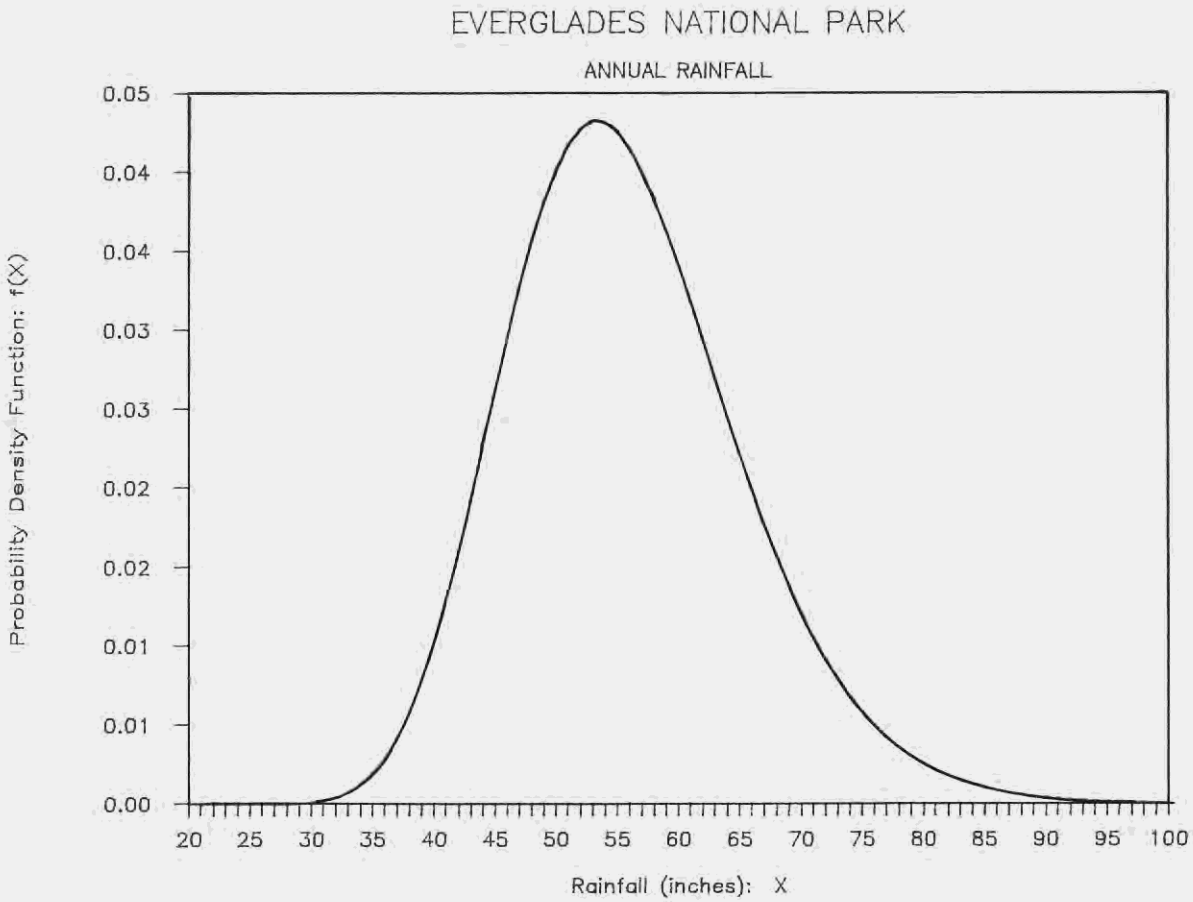

EVERGLADES AGRICULTURAL AREA
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

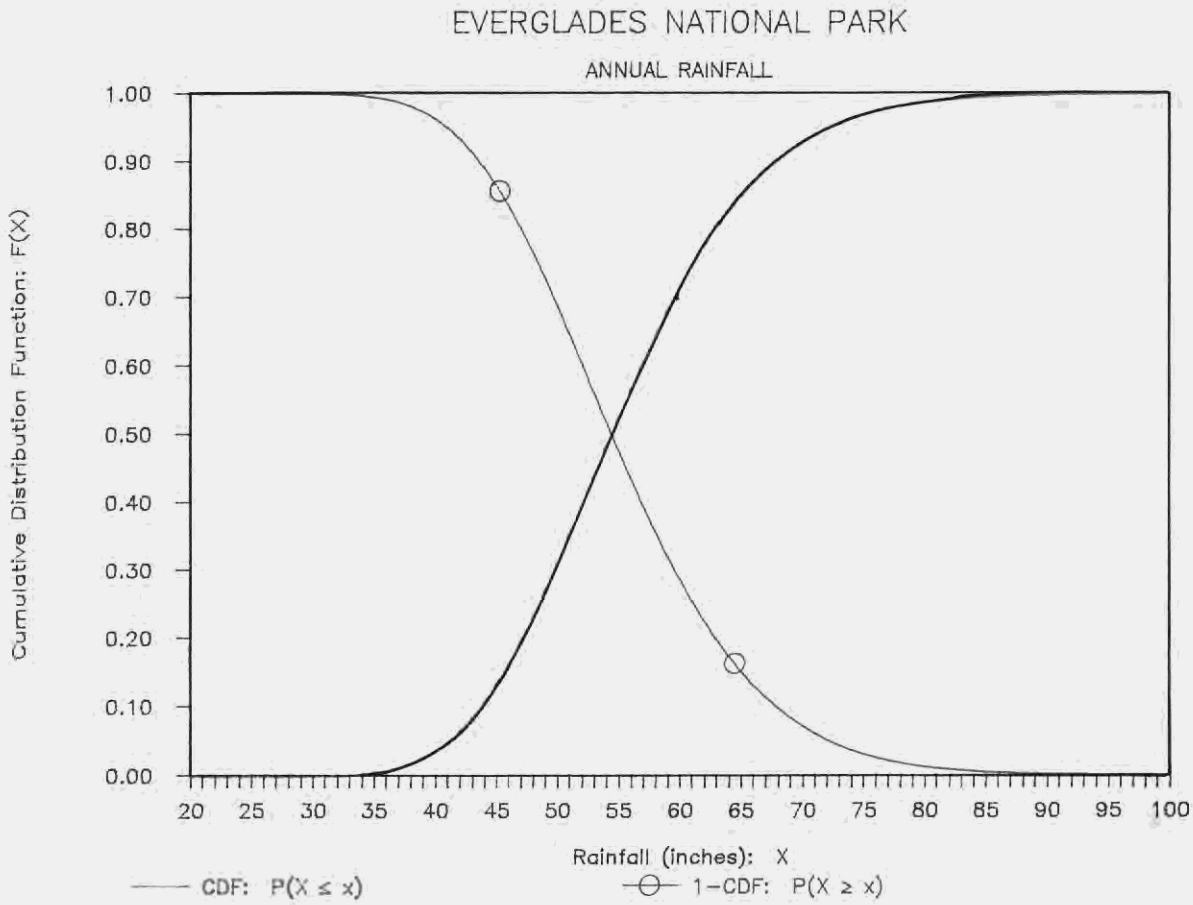

EVERGLADES NATIONAL PARK
Wet Season
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

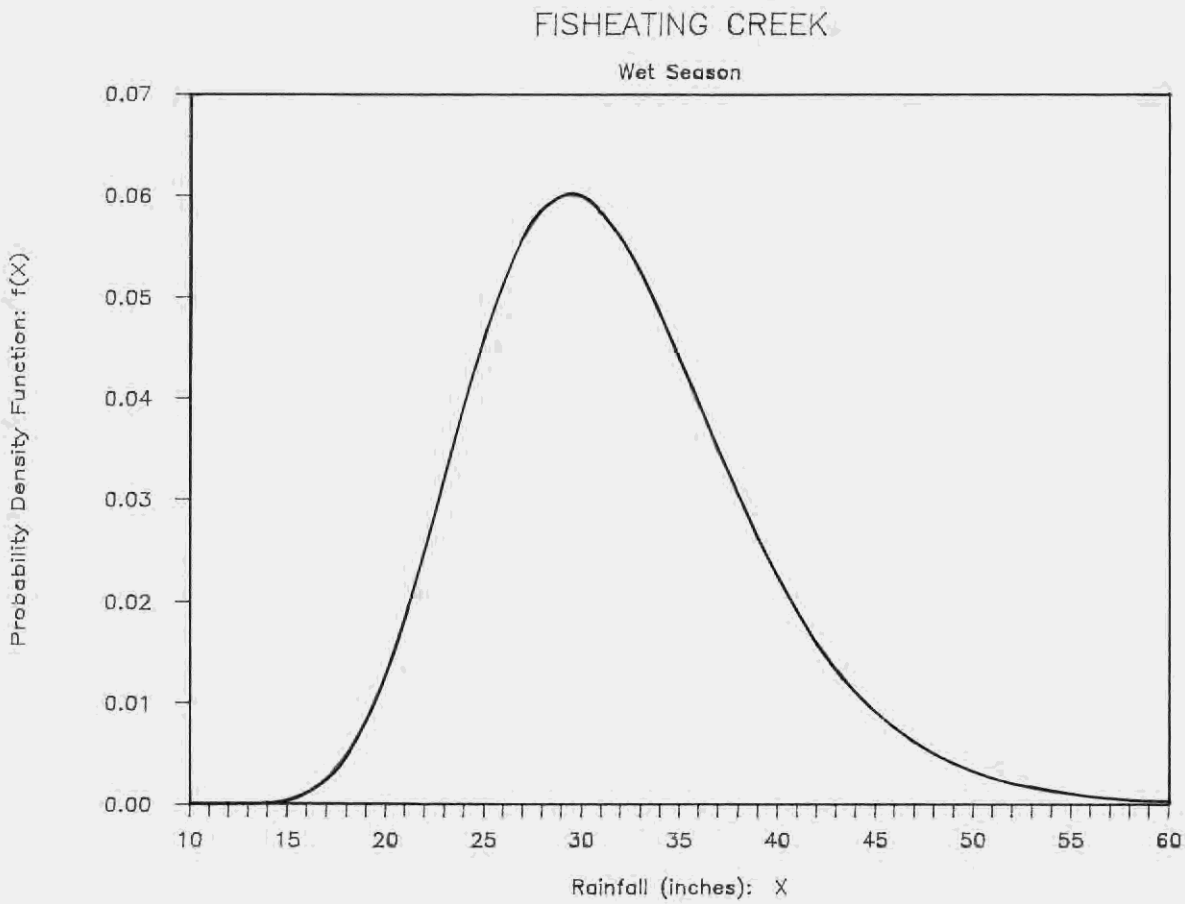

EVERGLADES NATIONAL PARK
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

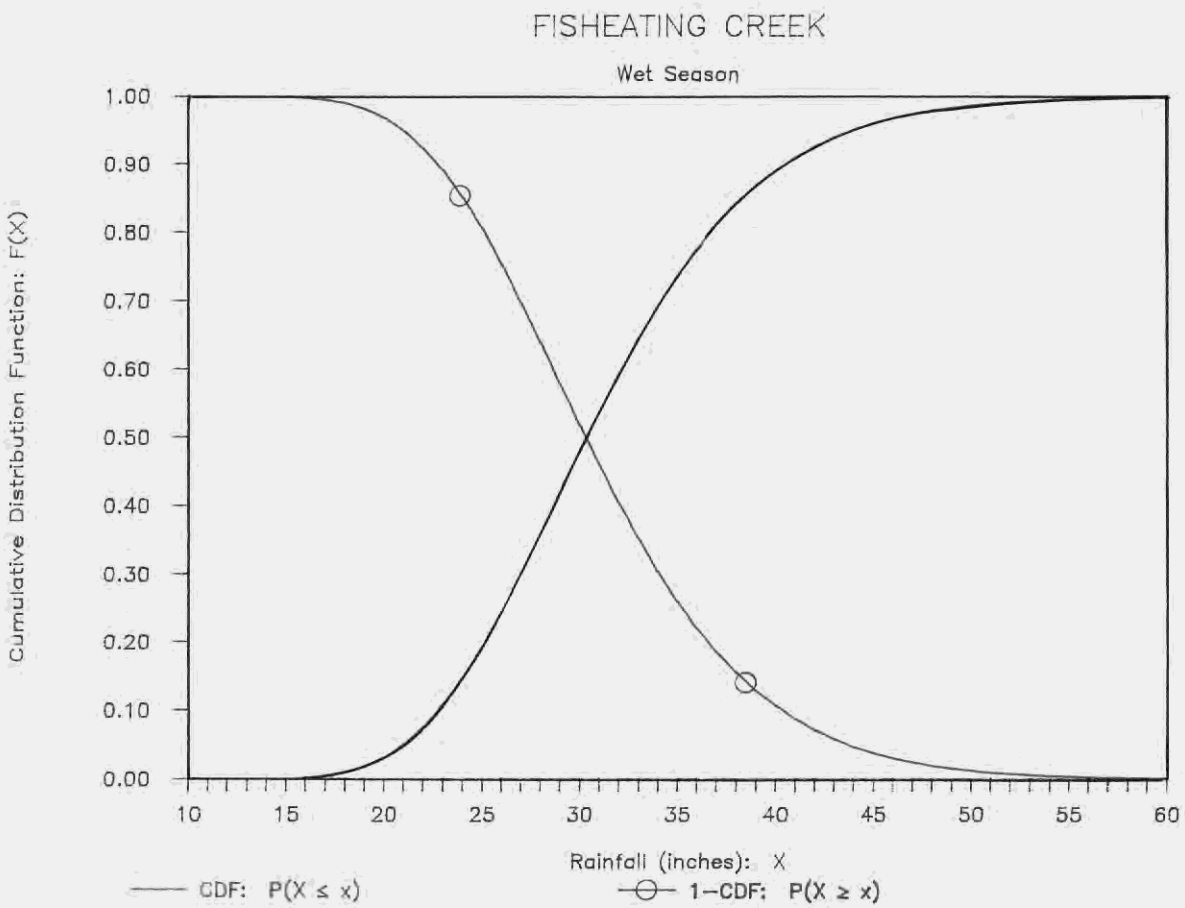

EVERGLADES NATIONAL PARK
Dry Season
Probability Density Function: f(X)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

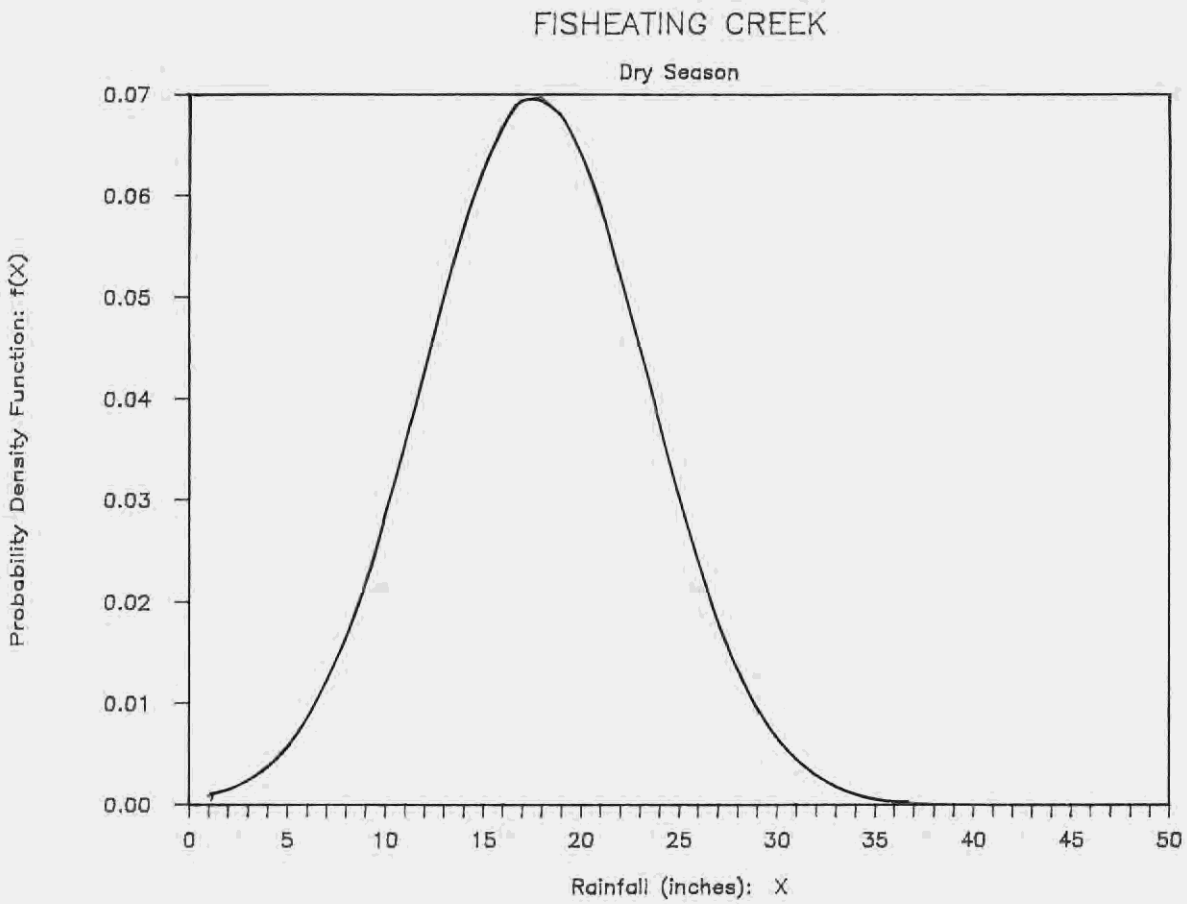

EVERGLADES NATIONAL PARK
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

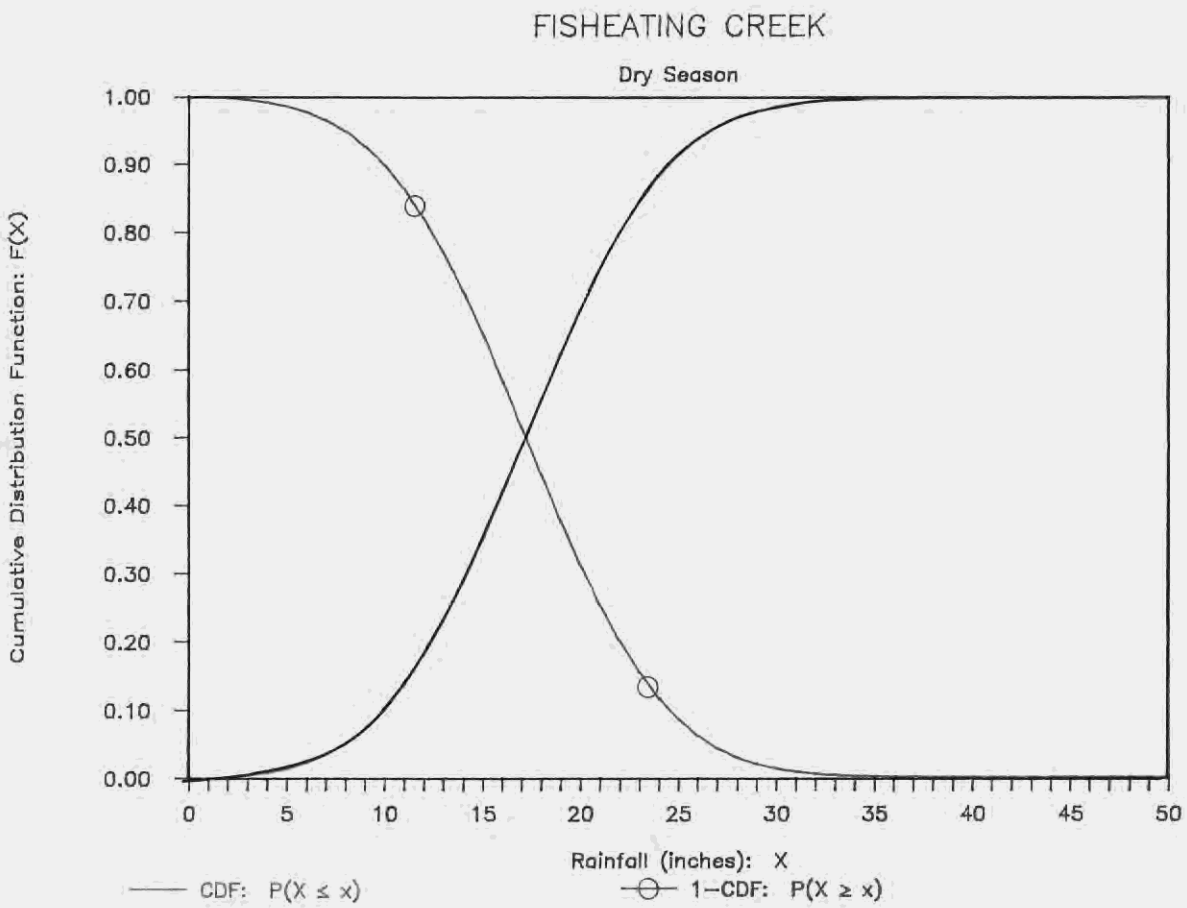

EVERGLADES NATIONAL PARK
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

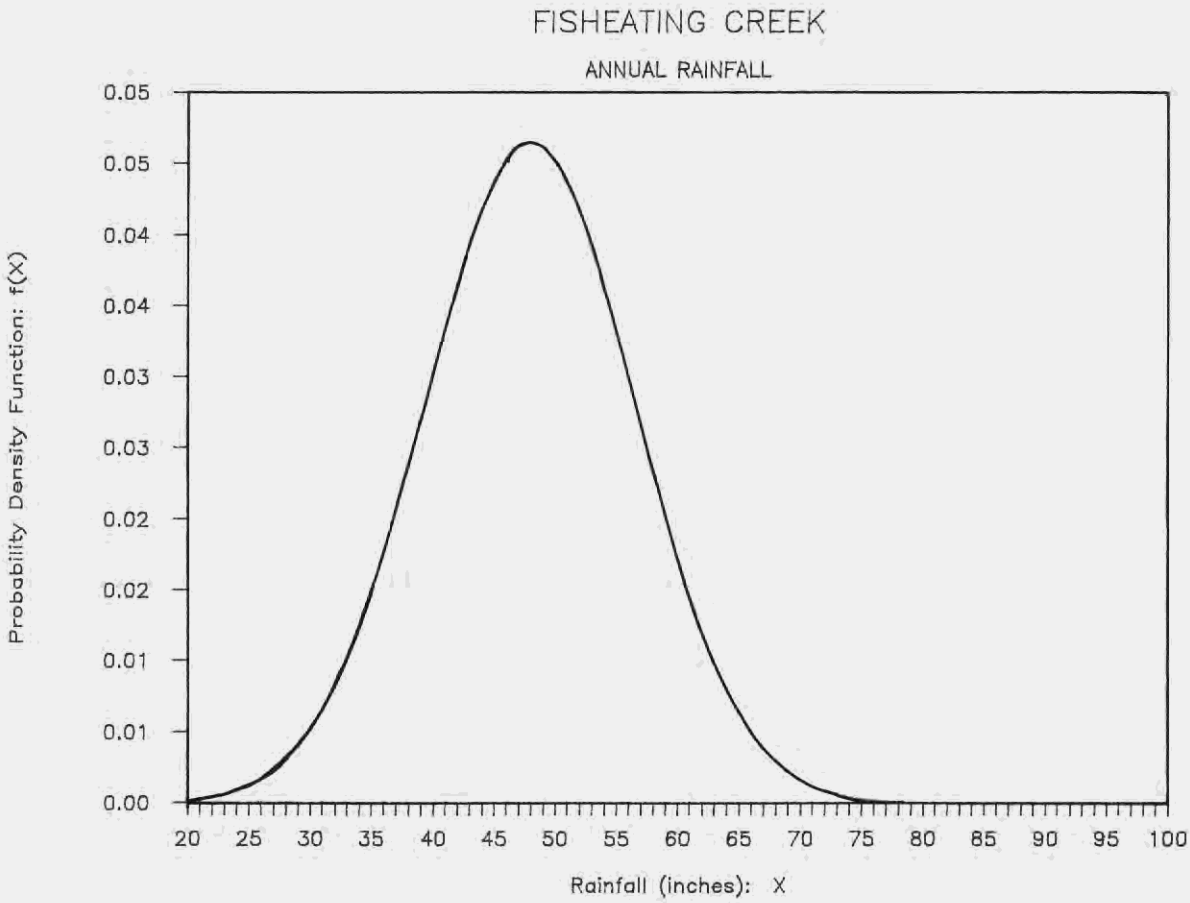

EVERGLADES NATIONAL PARK
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

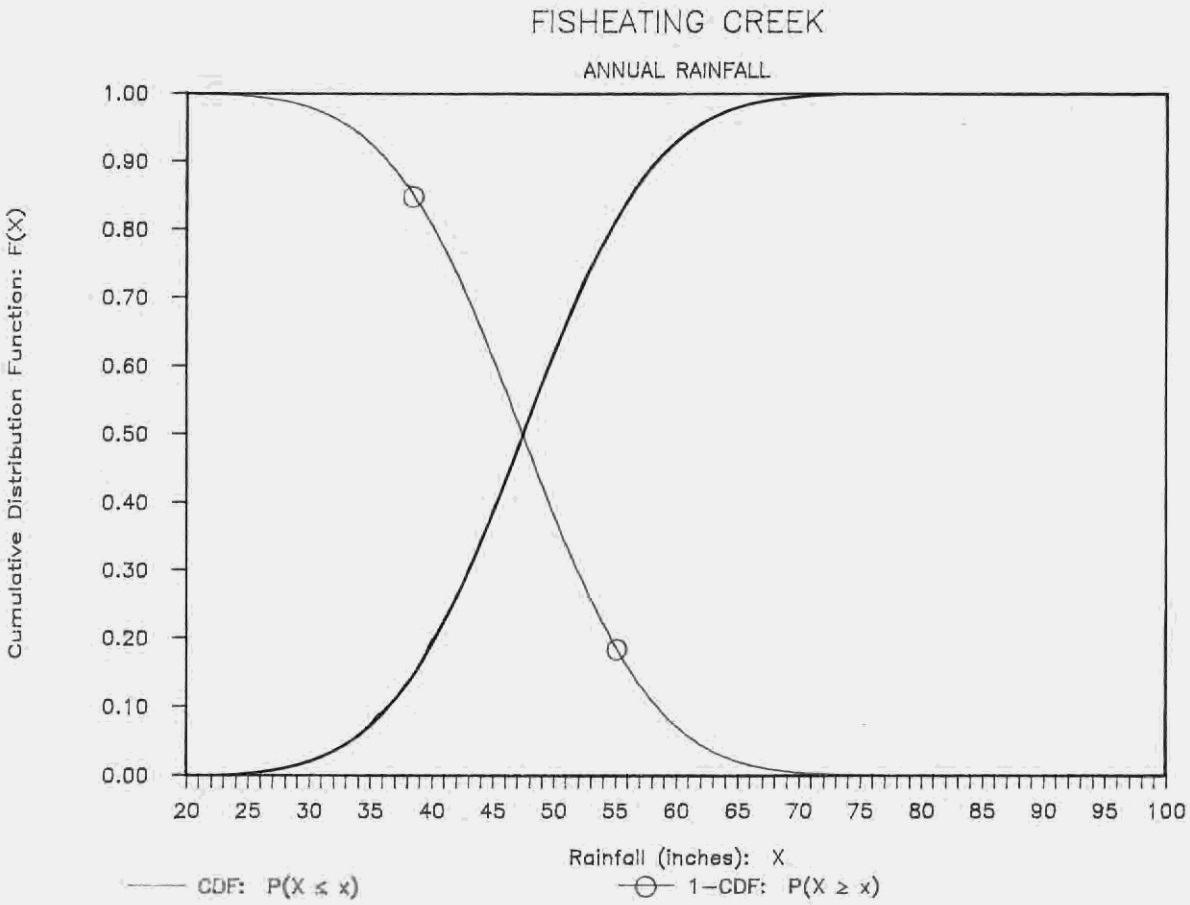

FISHEATING CREEK
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

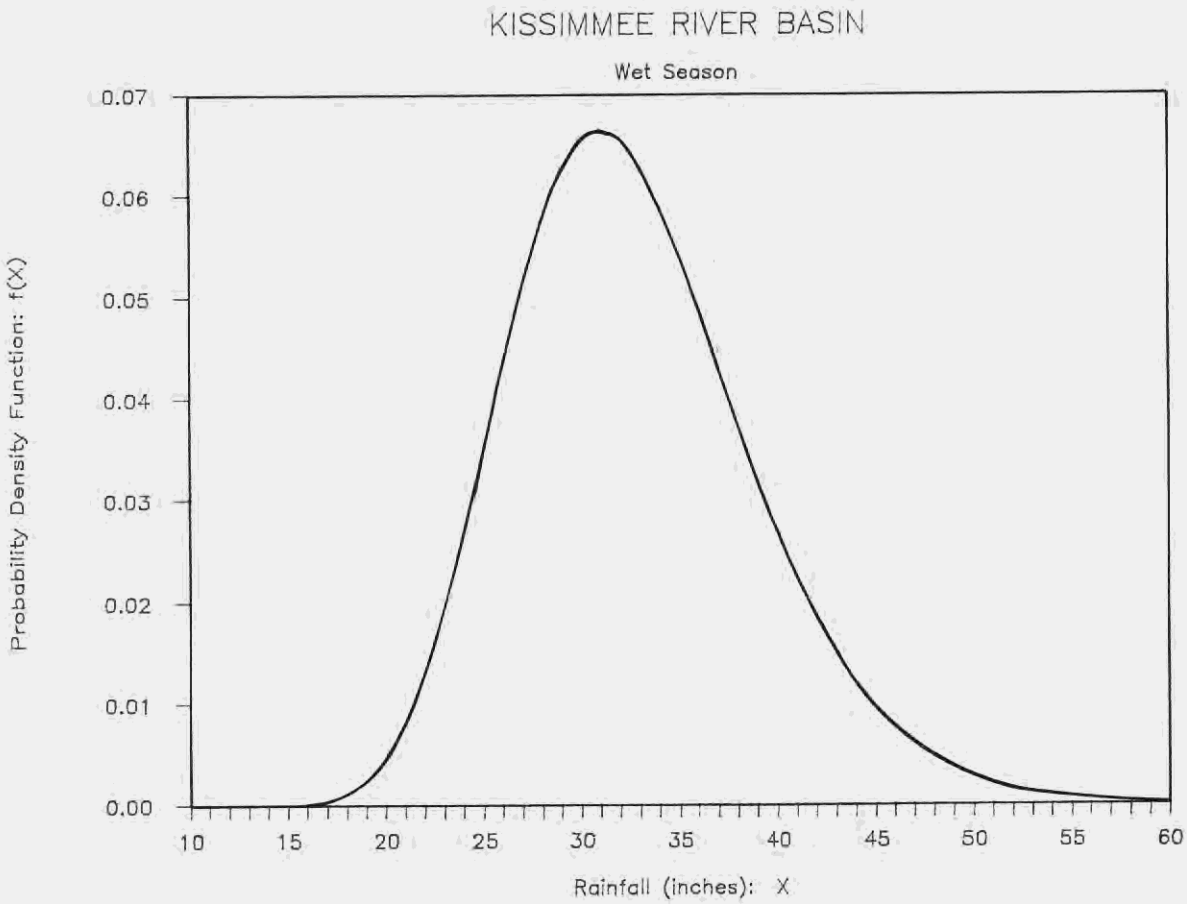

FISHEATING CREEK
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

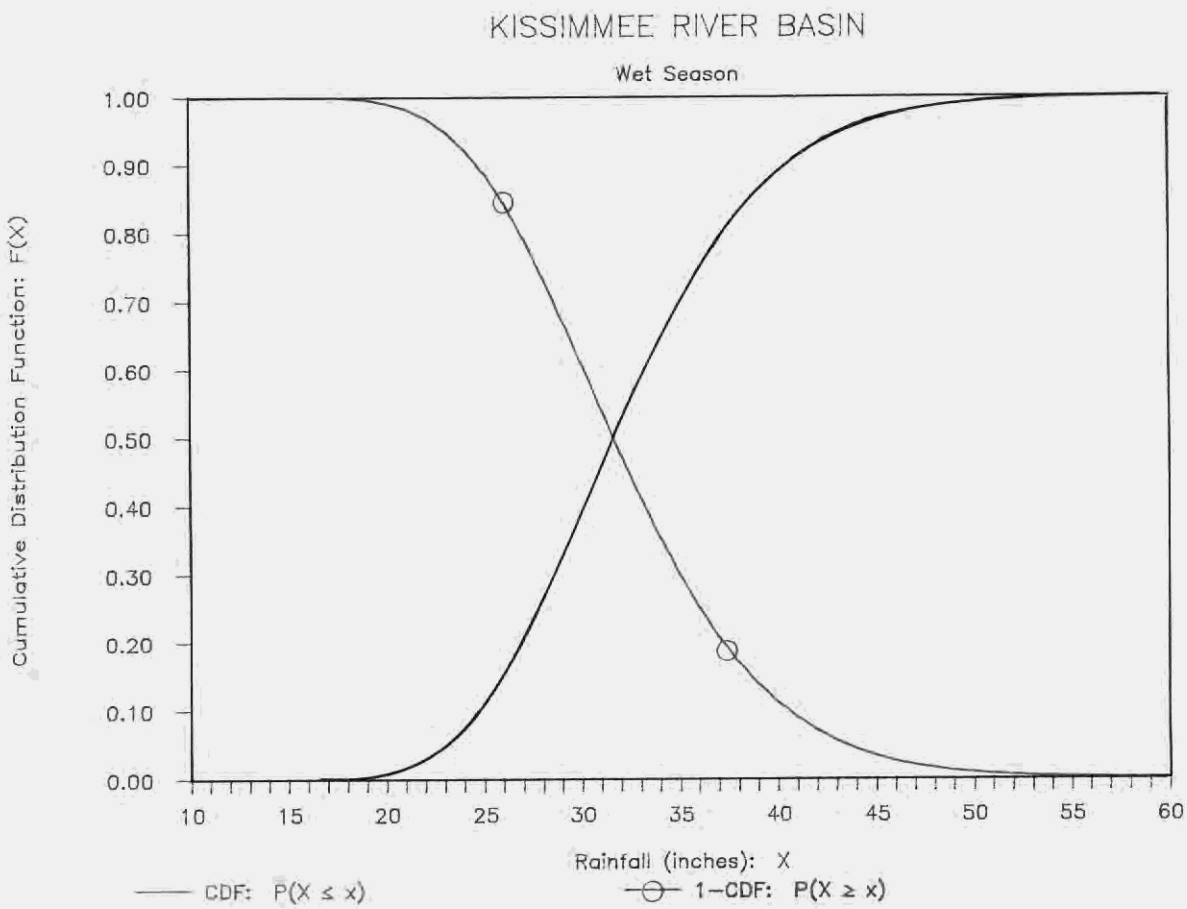

FISHEATING CREEK
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

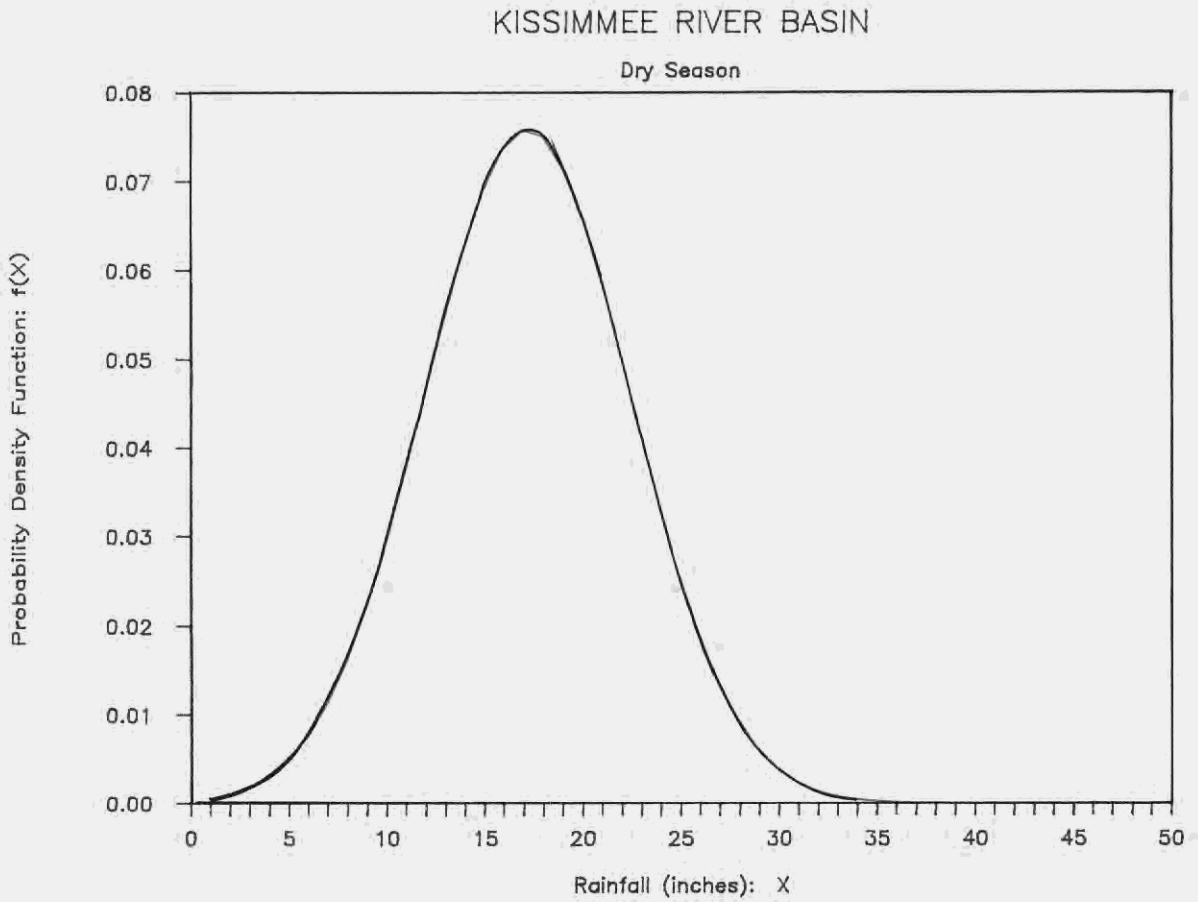

FISHEATING CREEK
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

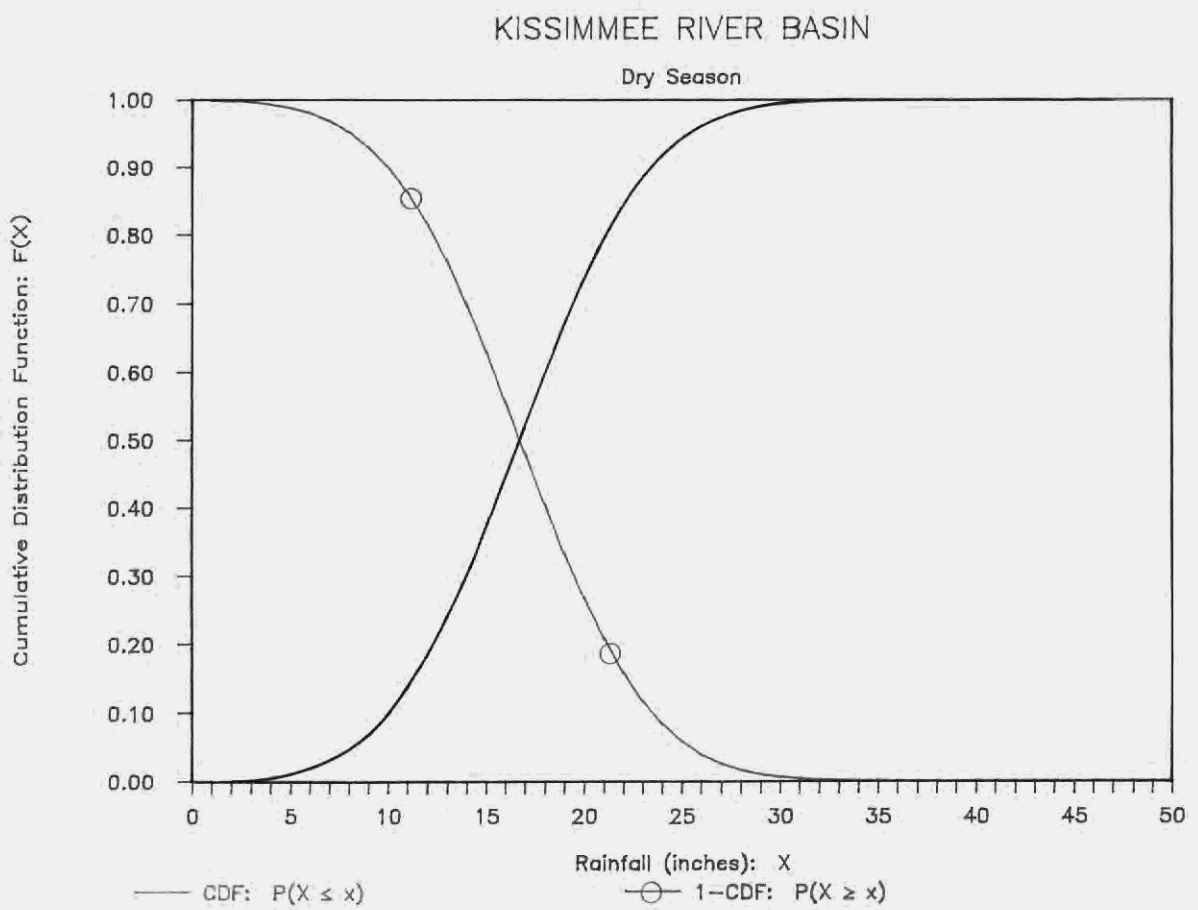

FISHEATING CREEK
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

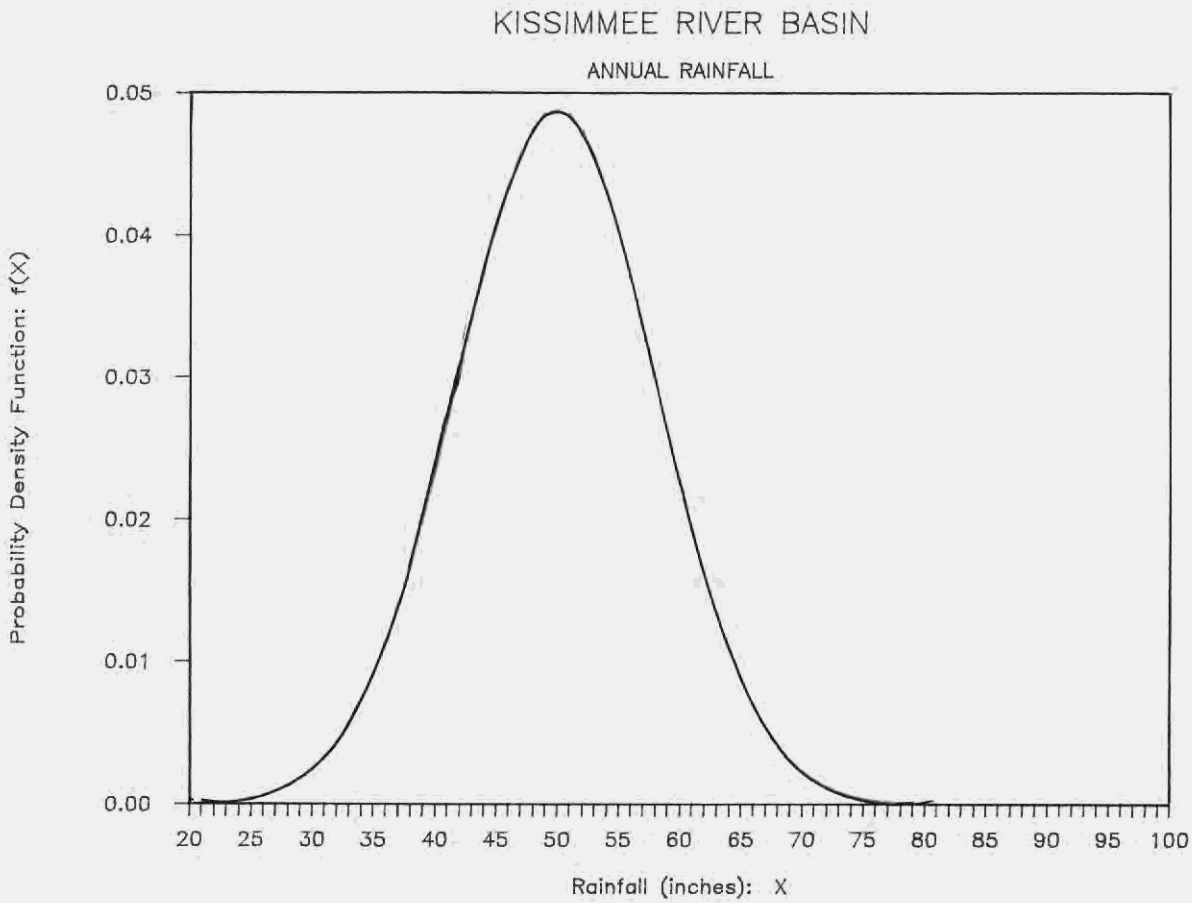

FISHEATING CREEK
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1−CDF: P(X ≥ x)

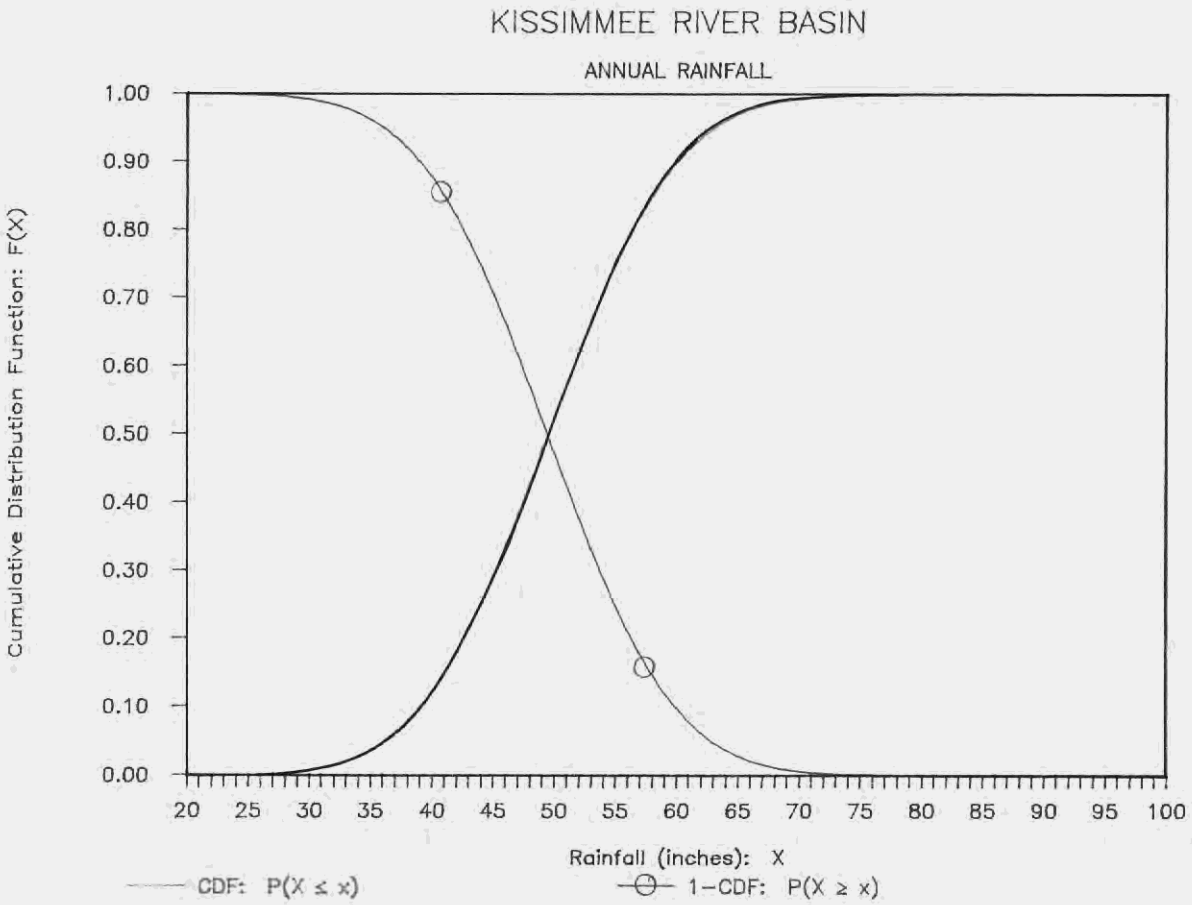

KISSIMMEE RIVER BASIN
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

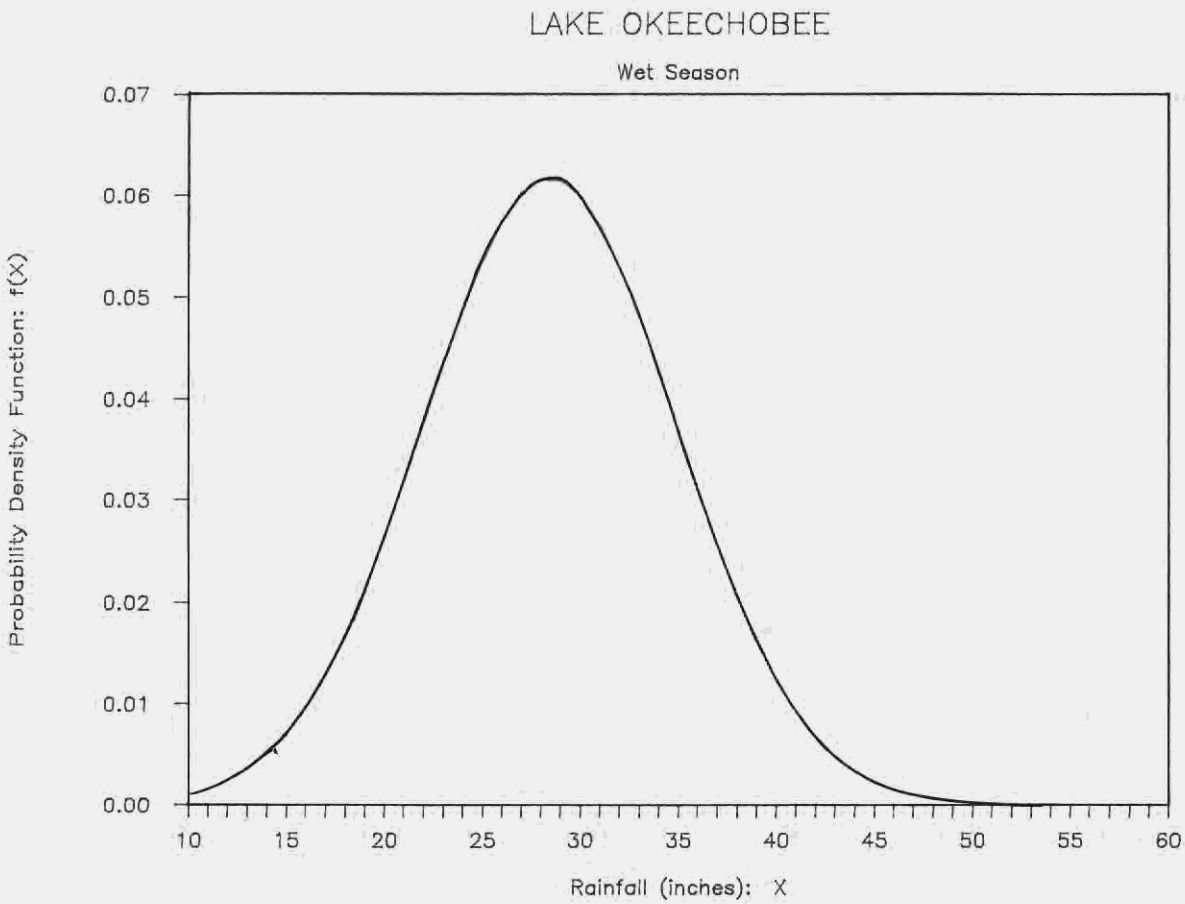

KISSIMMEE RIVER BASIN
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

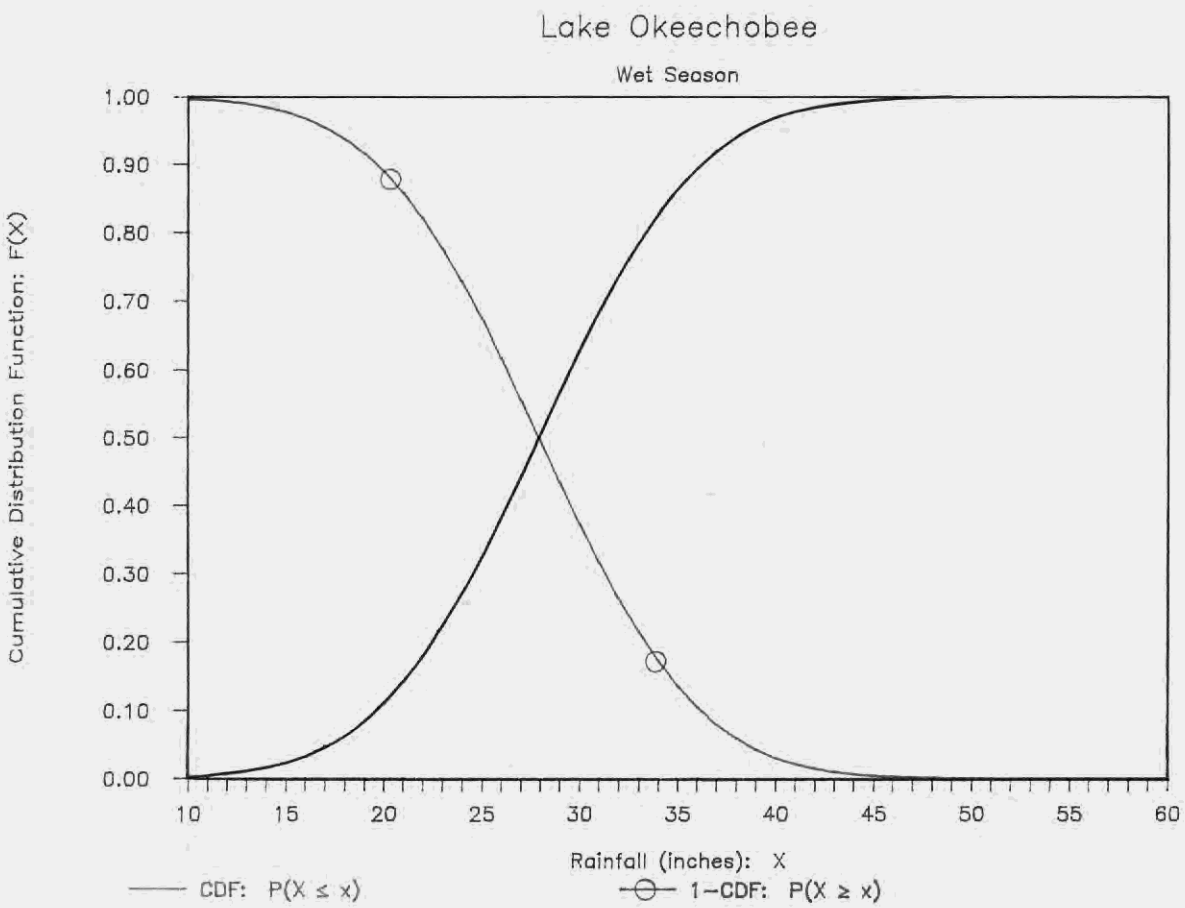

KISSIMMEE RIVER BASIN
Dry Season
Probability Density Function: f(X)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

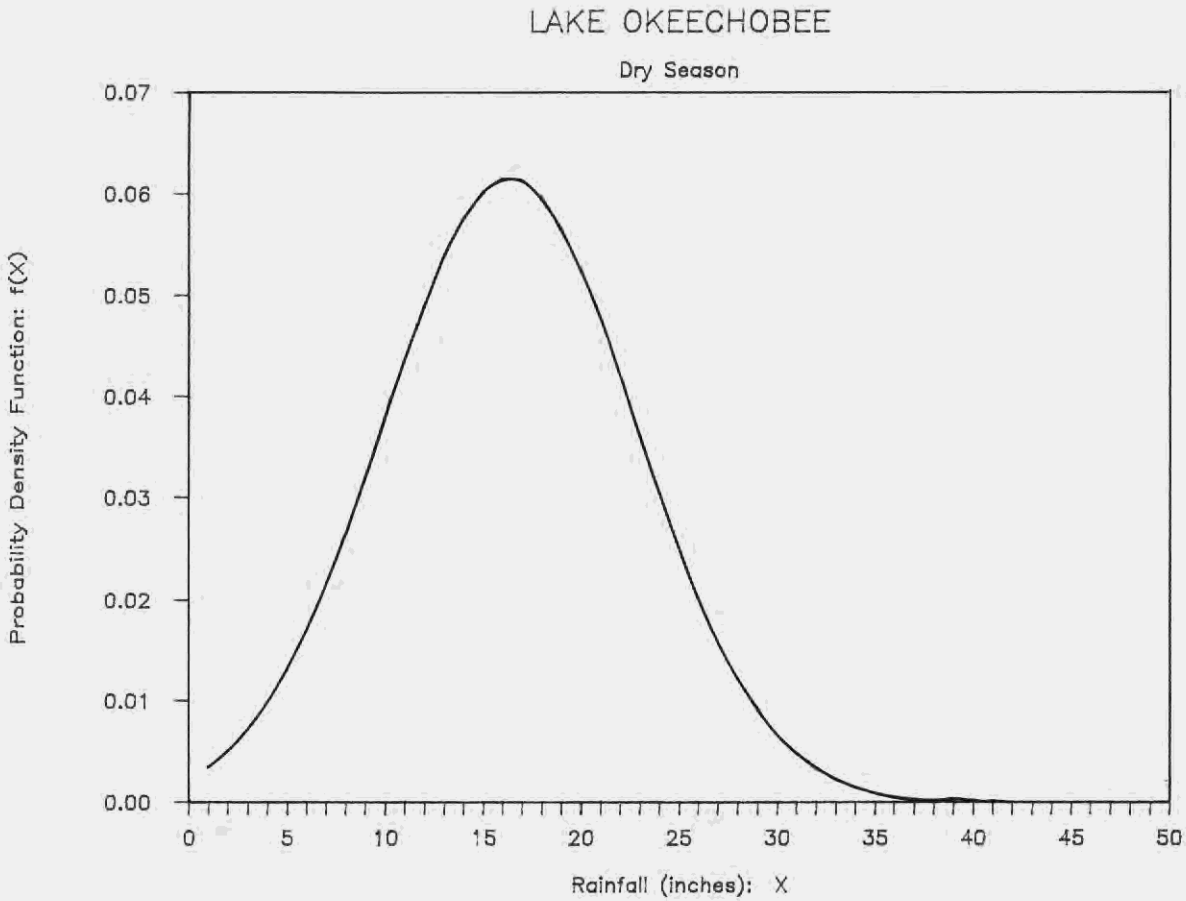

KISSIMMEE RIVER BASIN
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

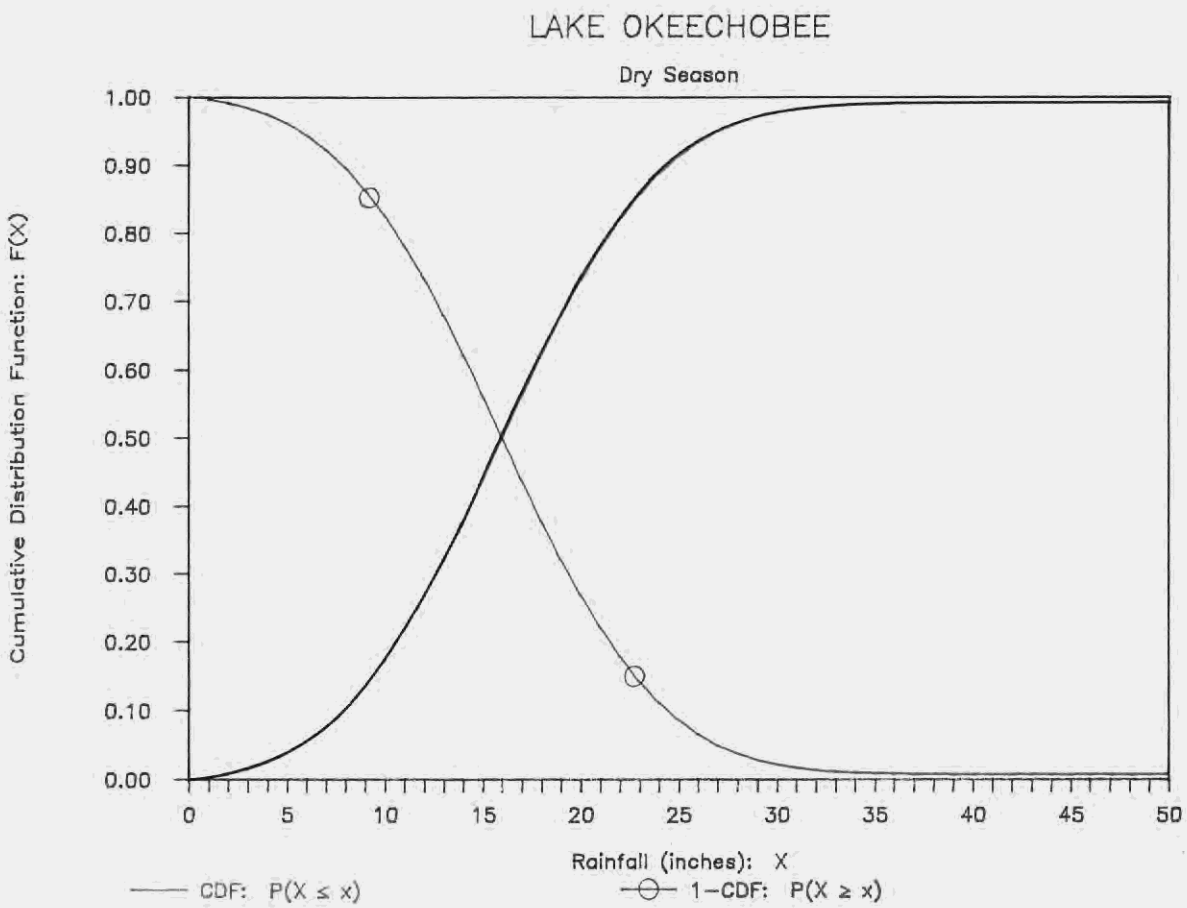

KISSIMMEE RIVER BASIN
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

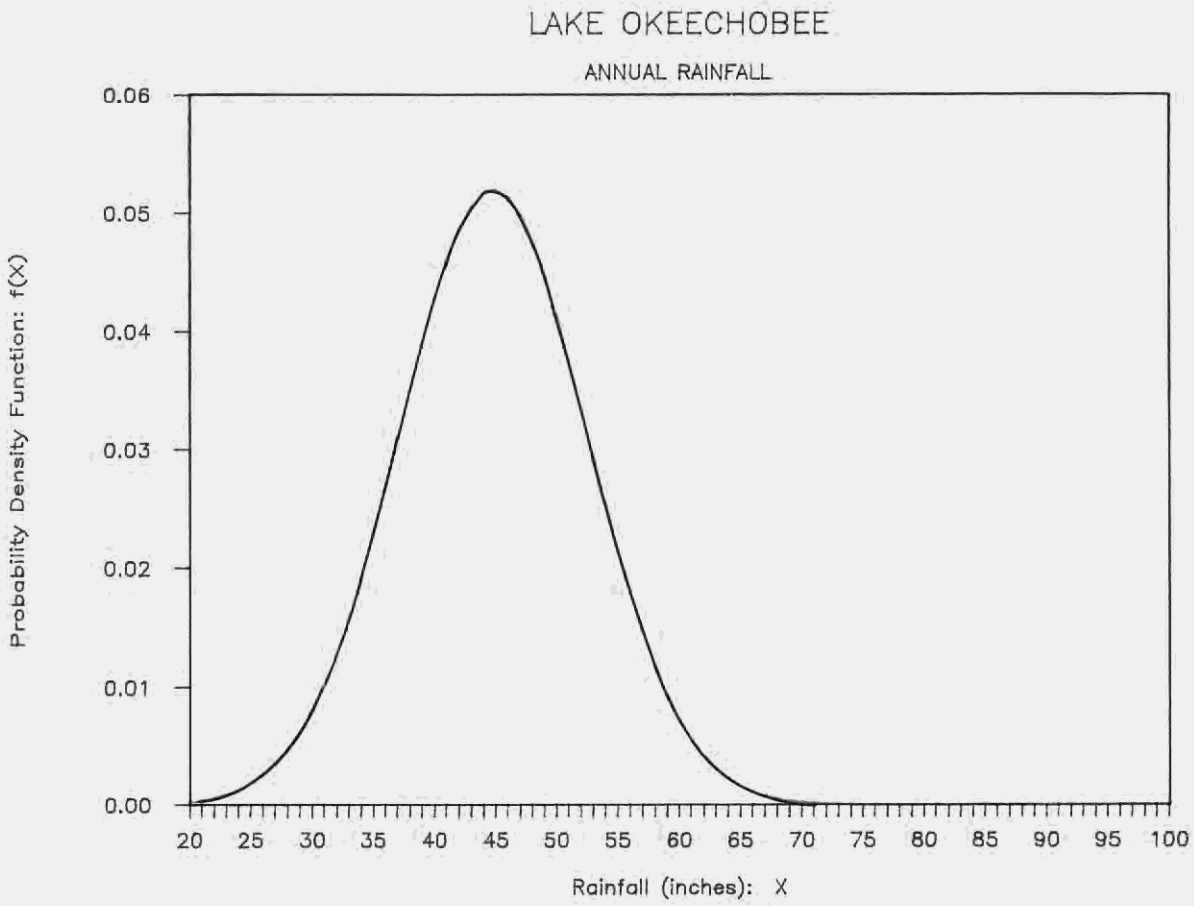

KISSIMMEE RIVER BASIN
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

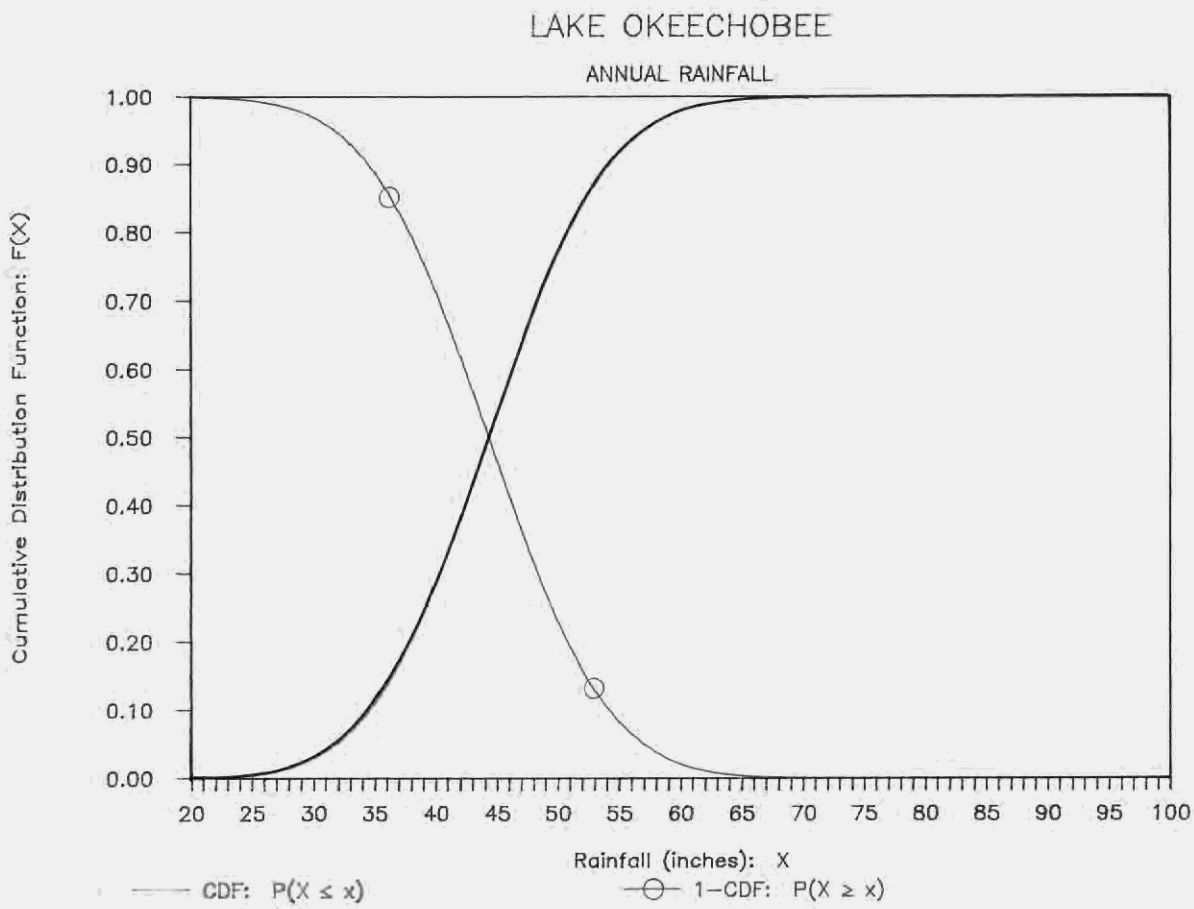

LAKE OKEECHOBEE
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

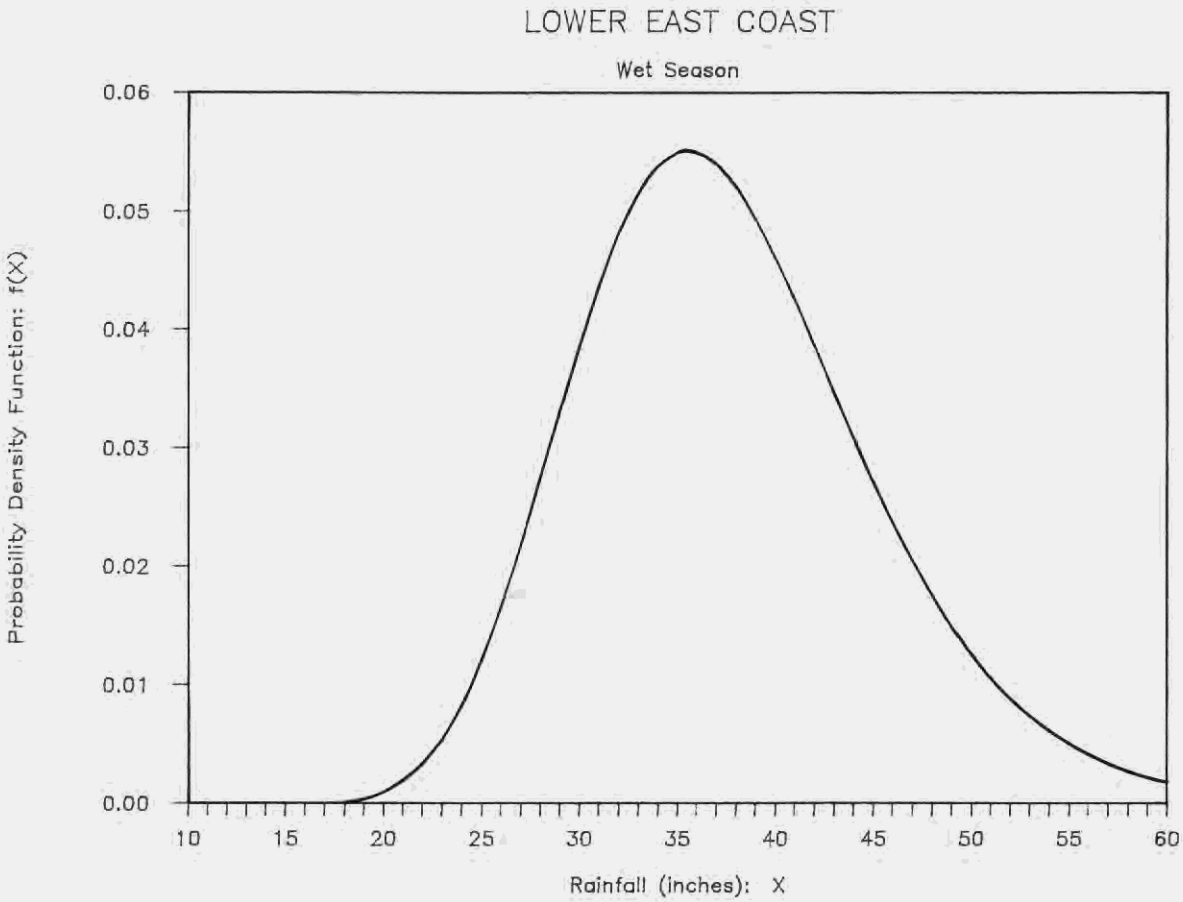

Lake Okeechobee
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

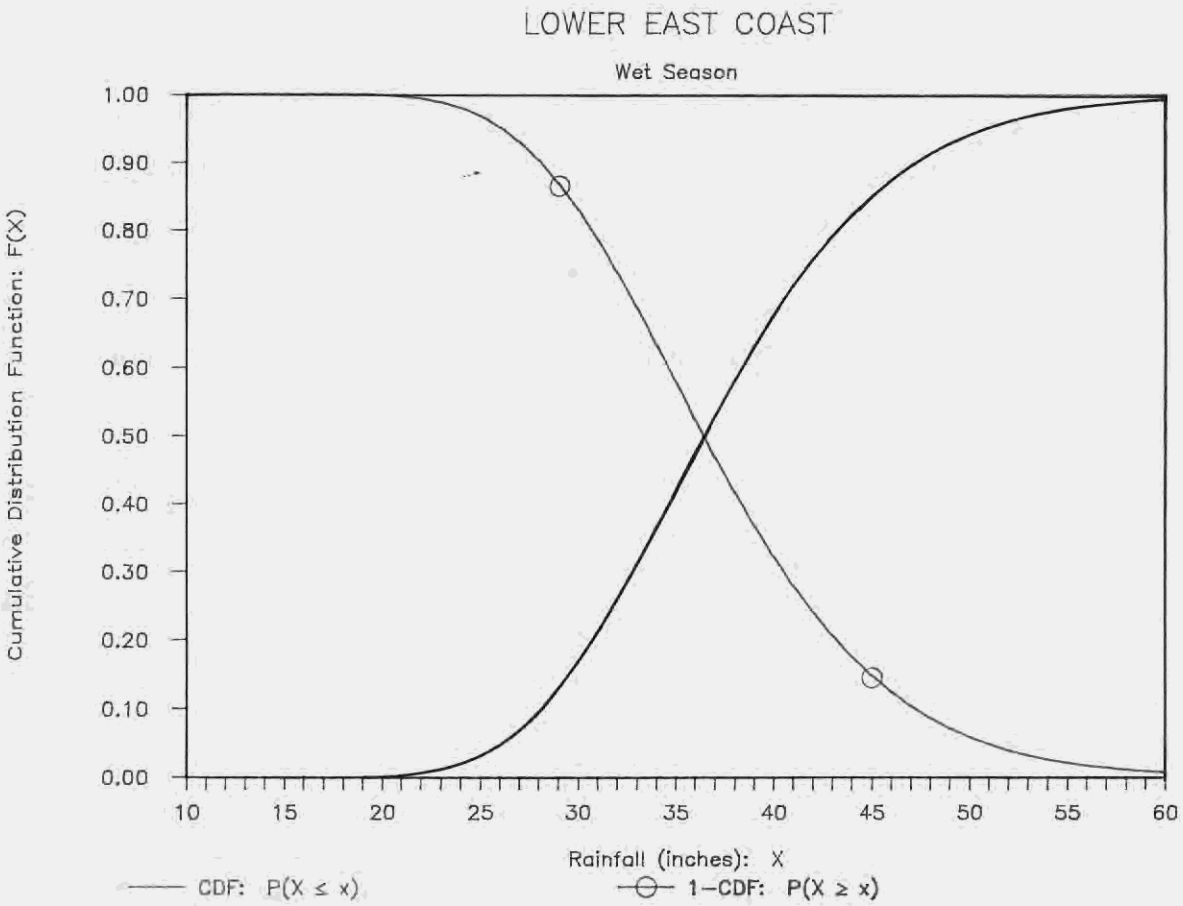

LAKE OKEECHOBEE
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

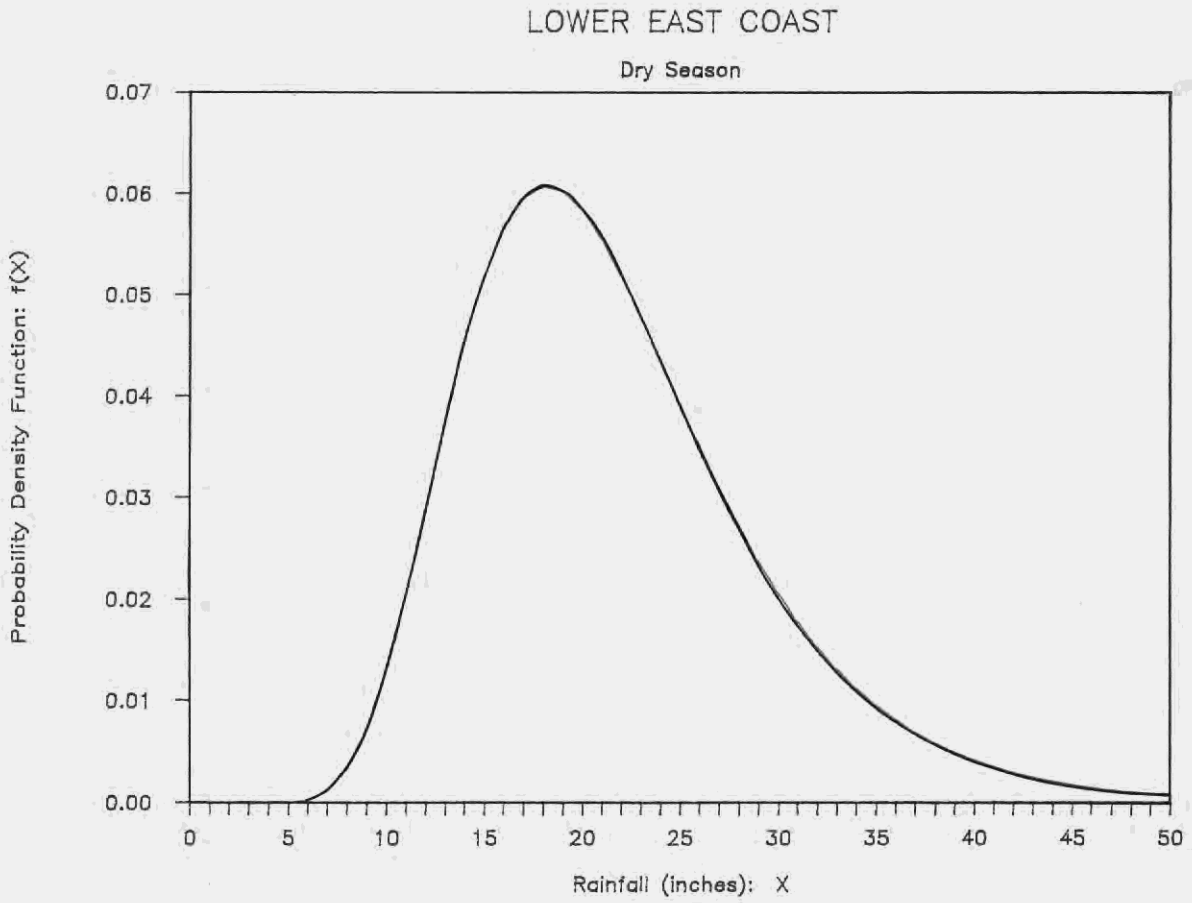

LAKE OKEECHOBEE
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

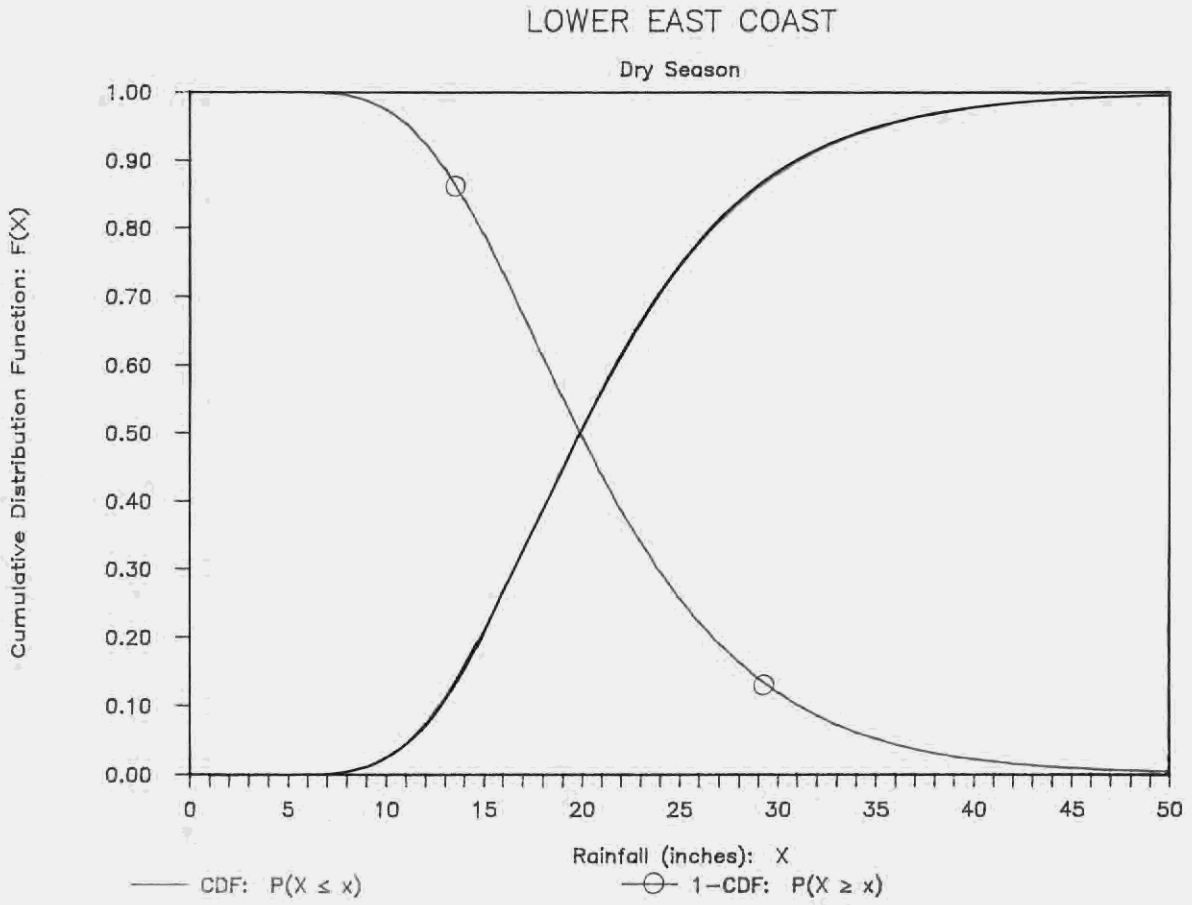

LAKE OKEECHOBEE
ANNUAL RAINFALL
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

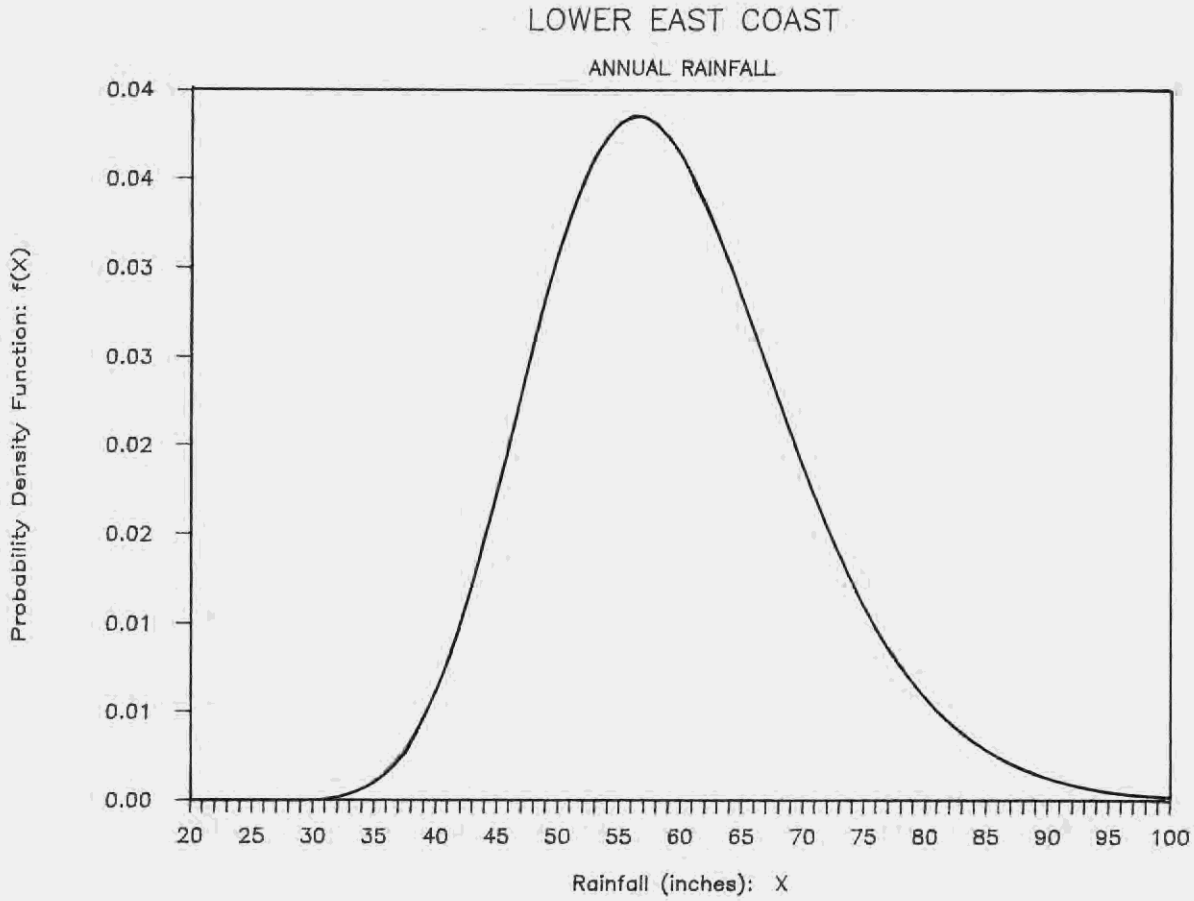

LAKE OKEECHOBEE
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

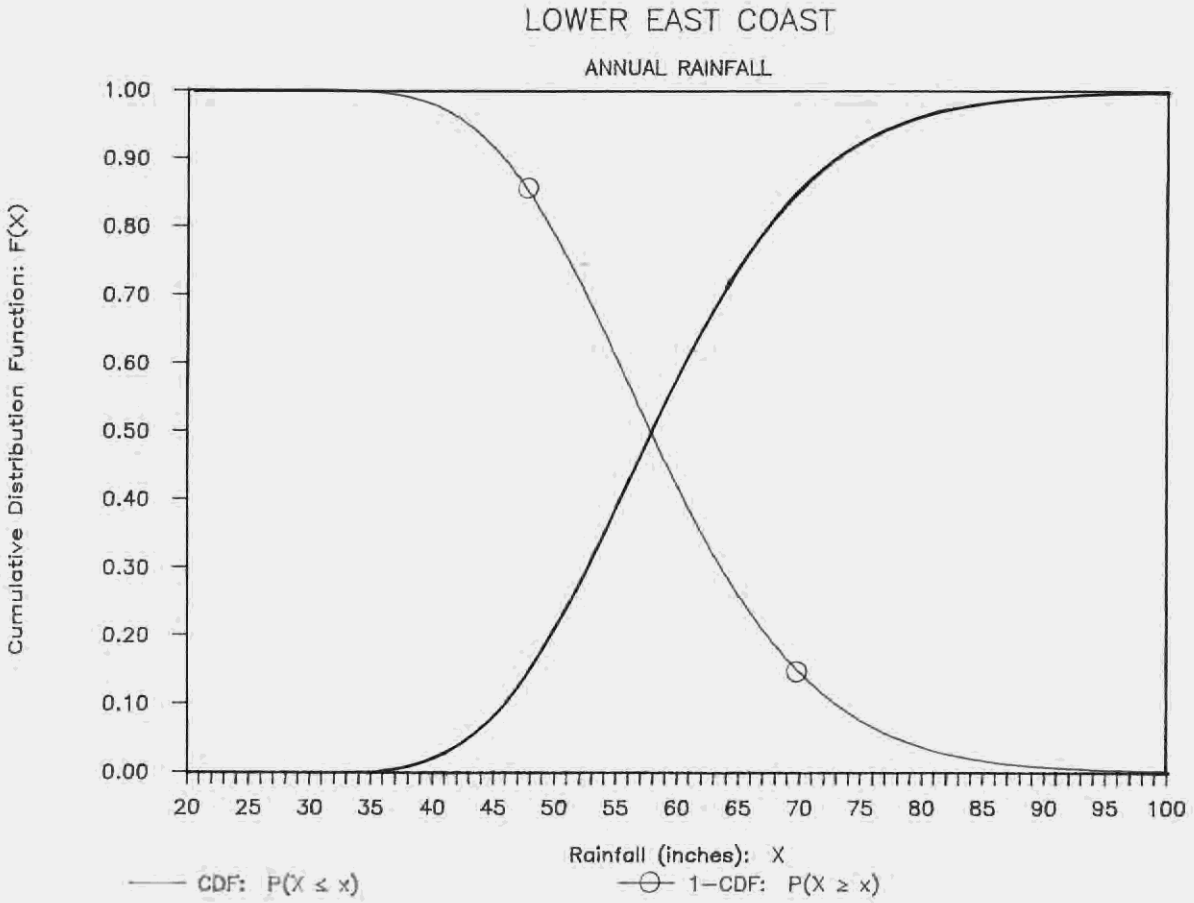

LOWER EAST COAST
Wet Season
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

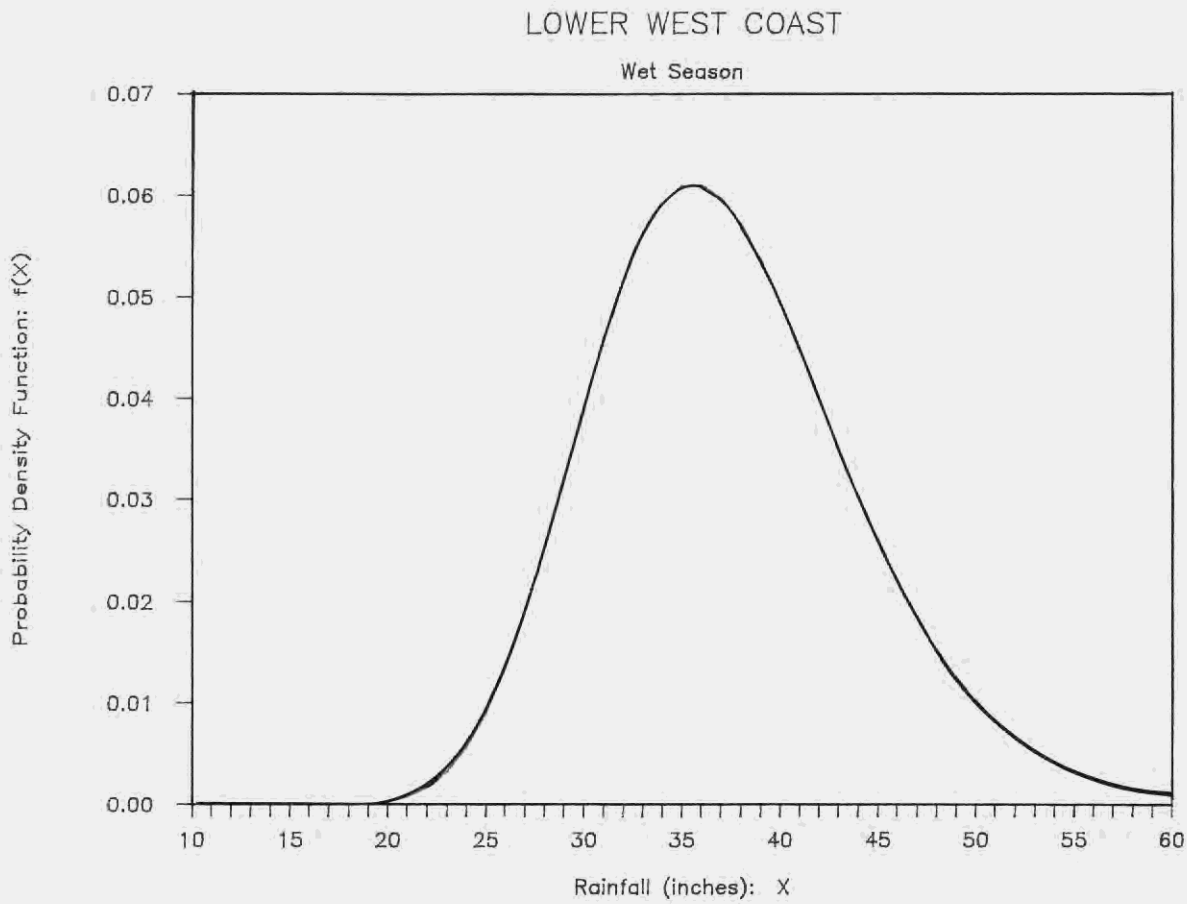

LOWER EAST COAST
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

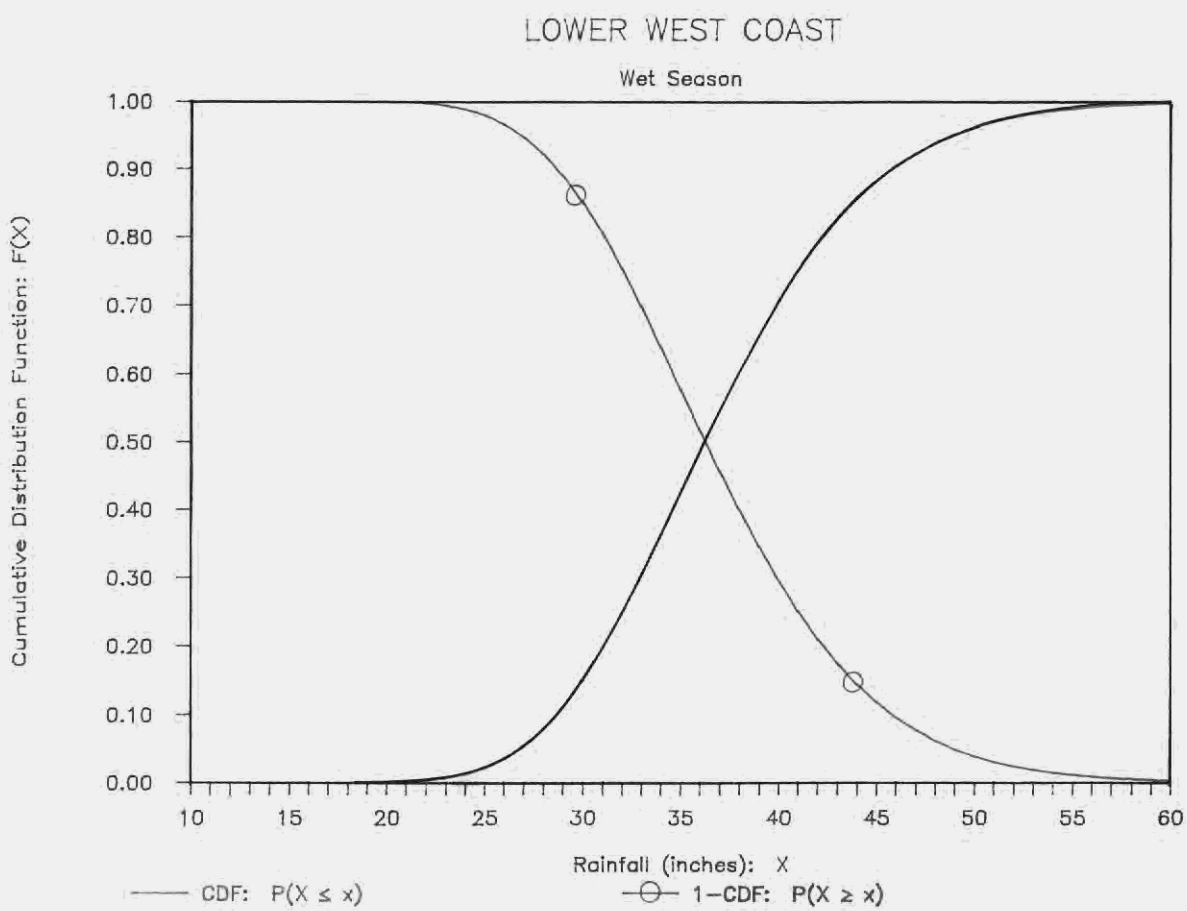

LOWER EAST COAST
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

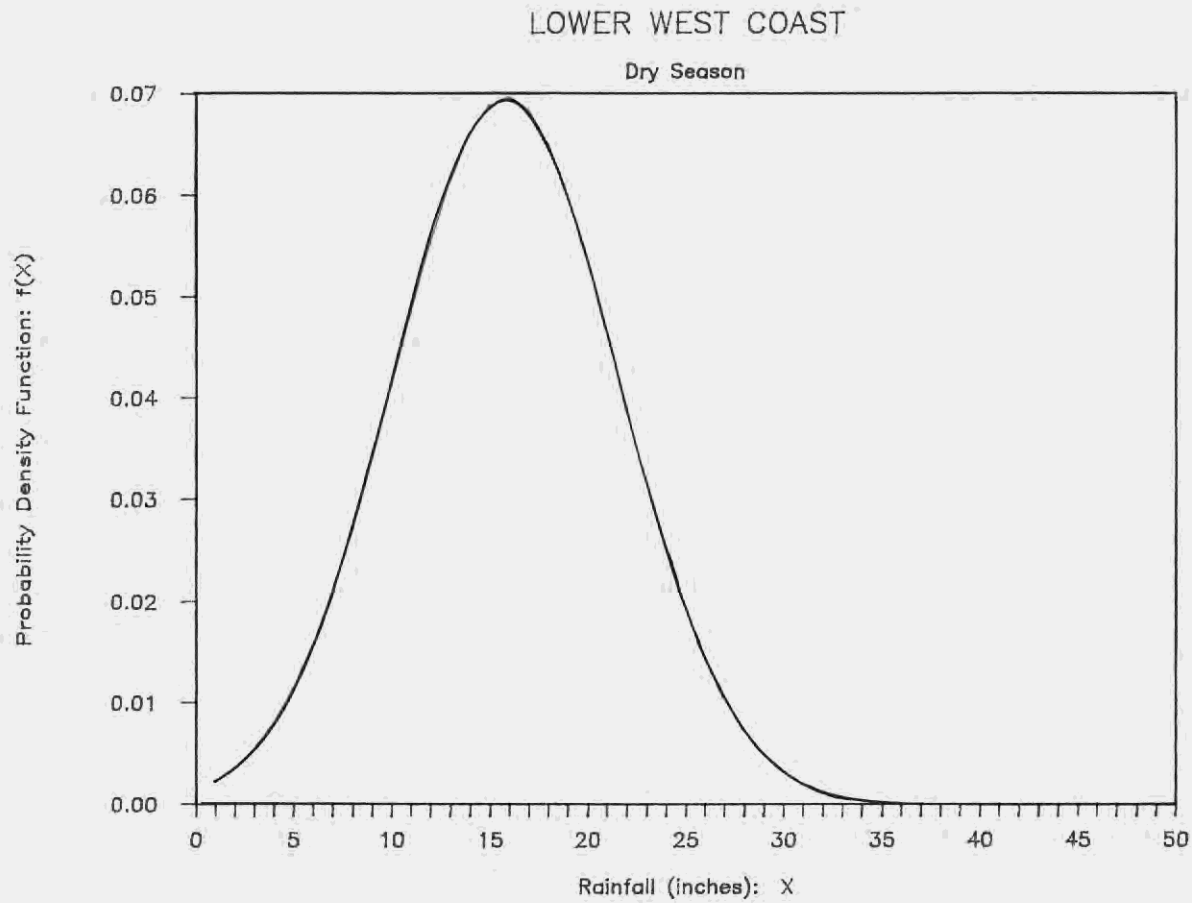

LOWER EAST COAST
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

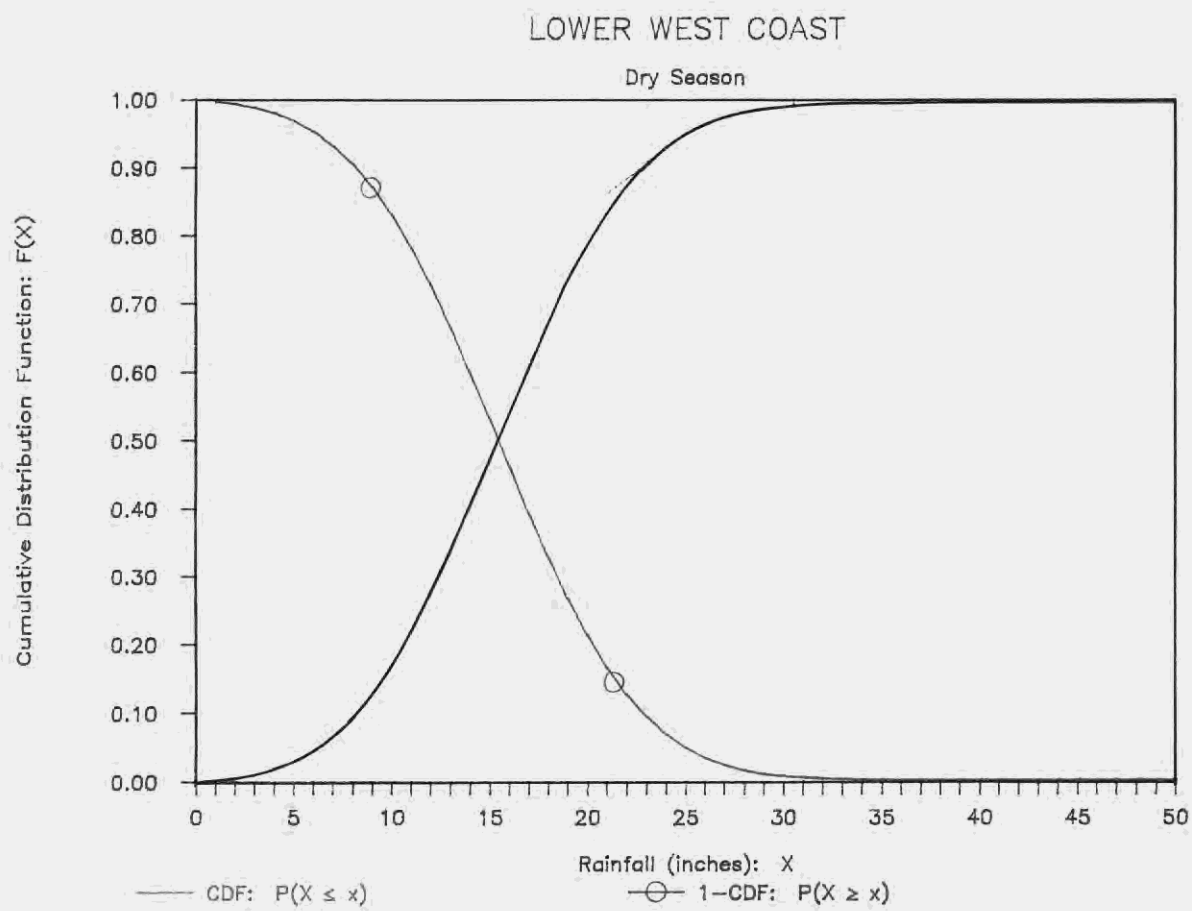

LOWER EAST COAST
ANNUAL RAINFALL
Probability Density Function: f(X)
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

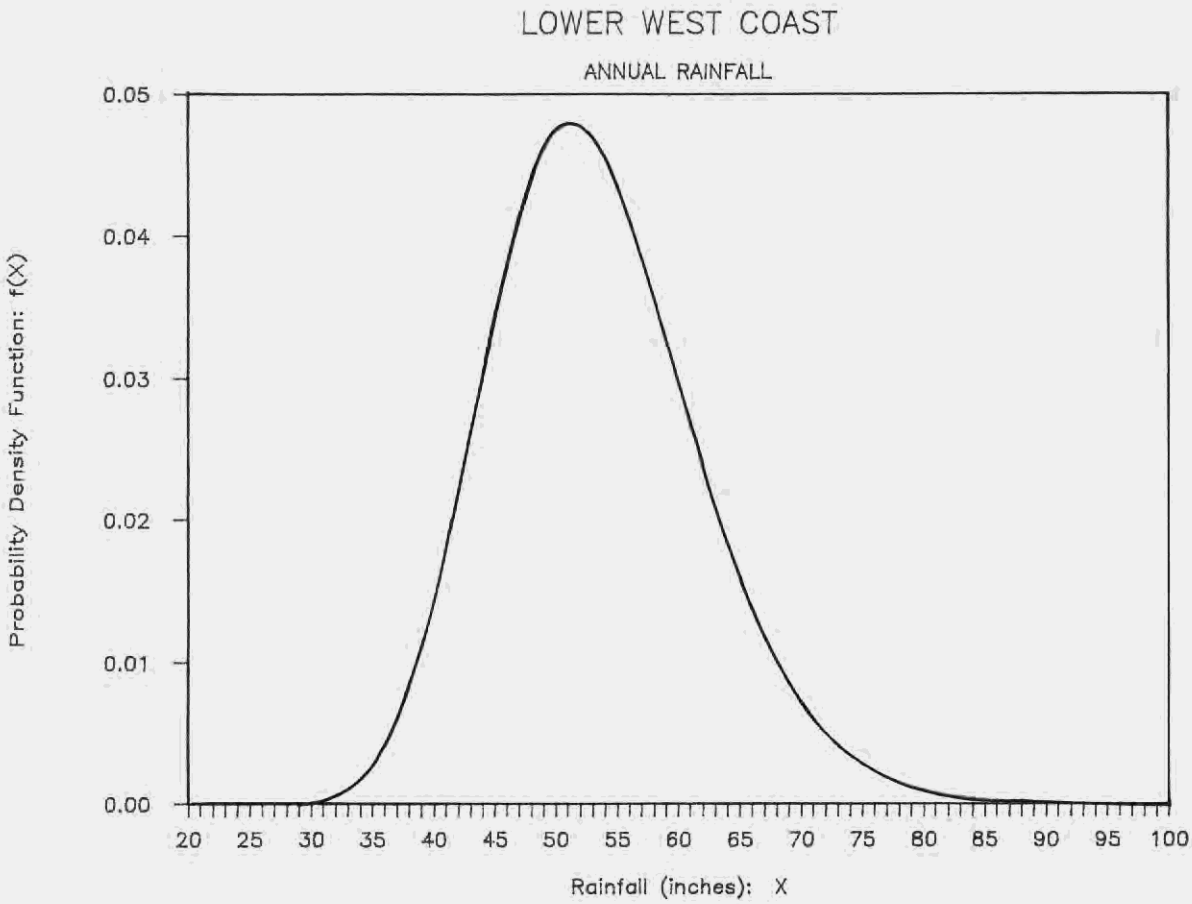

LOWER EAST COAST
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

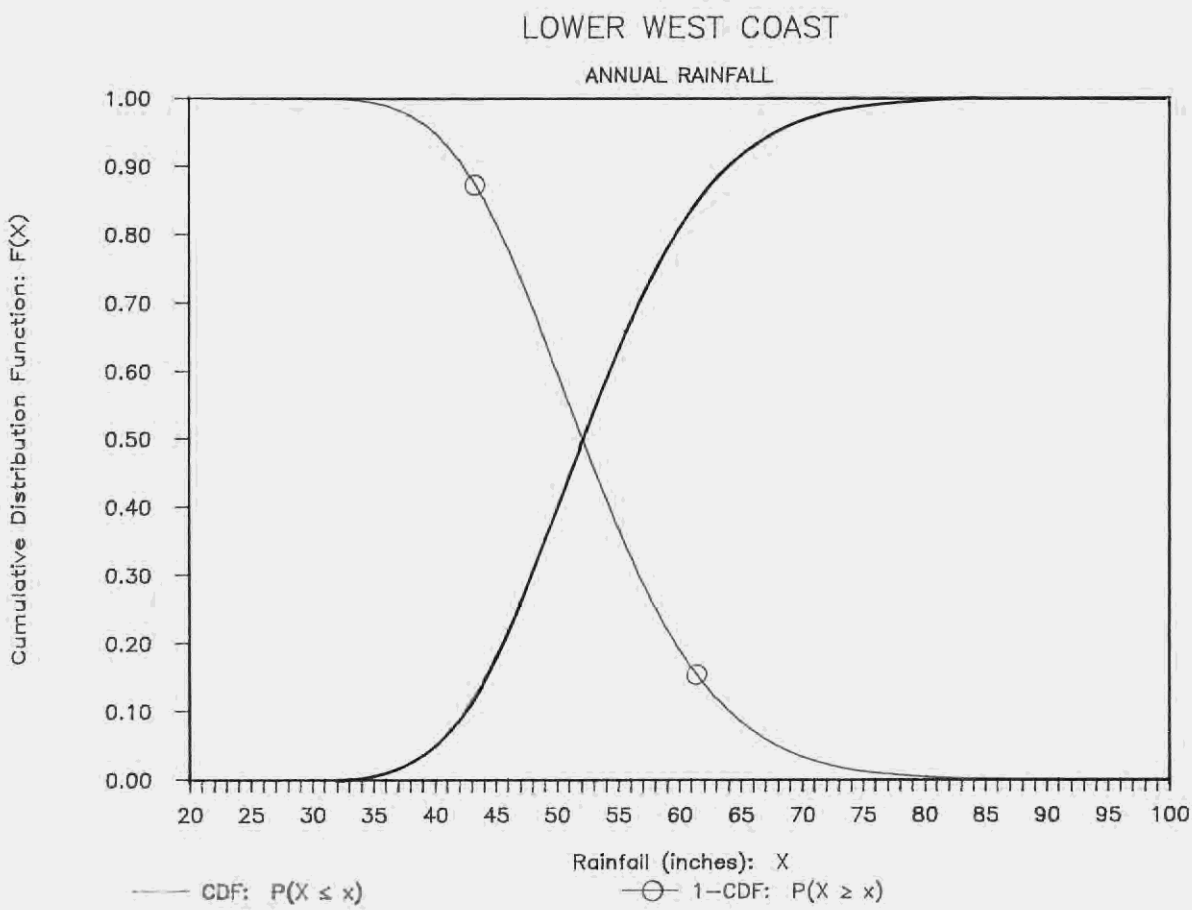

LOWER WEST COAST
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

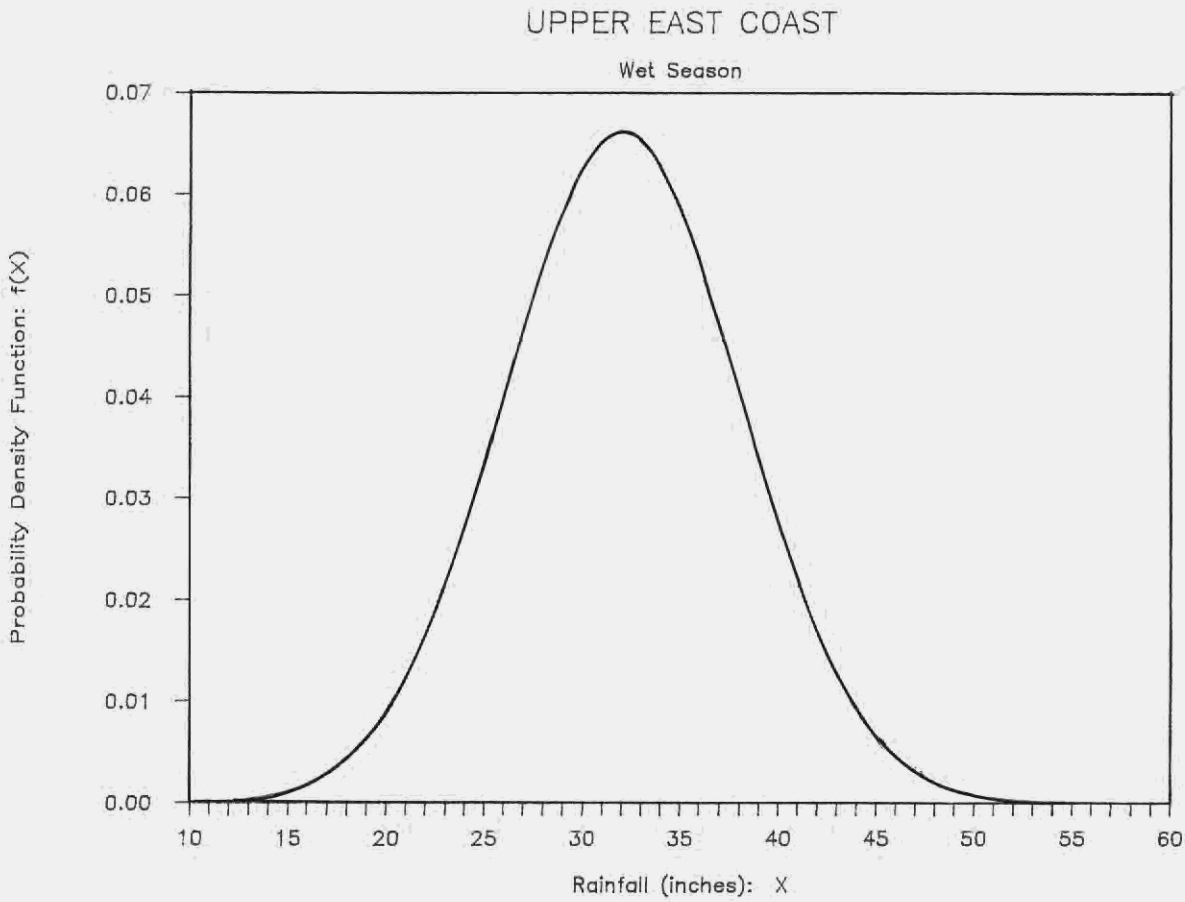

LOWER WEST COAST
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

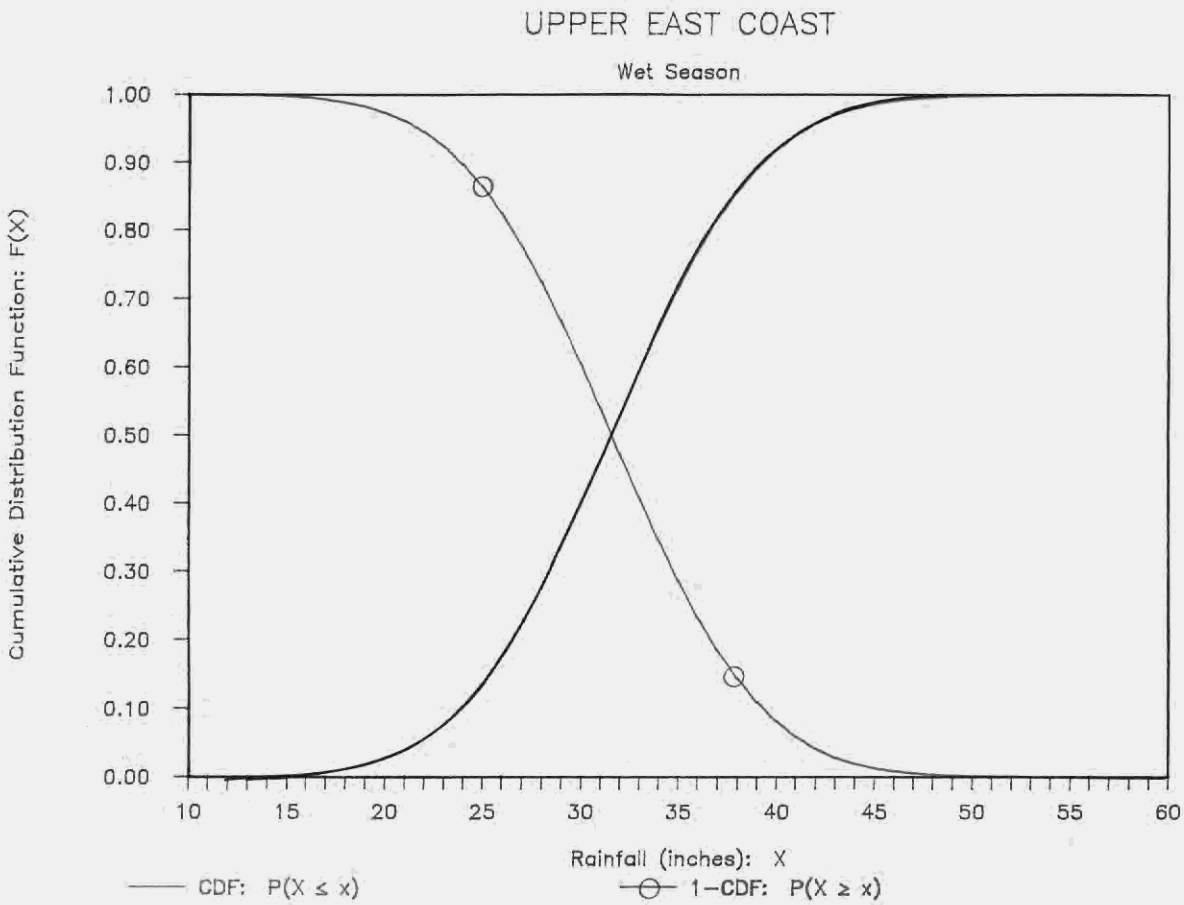

LOWER WEST COAST
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

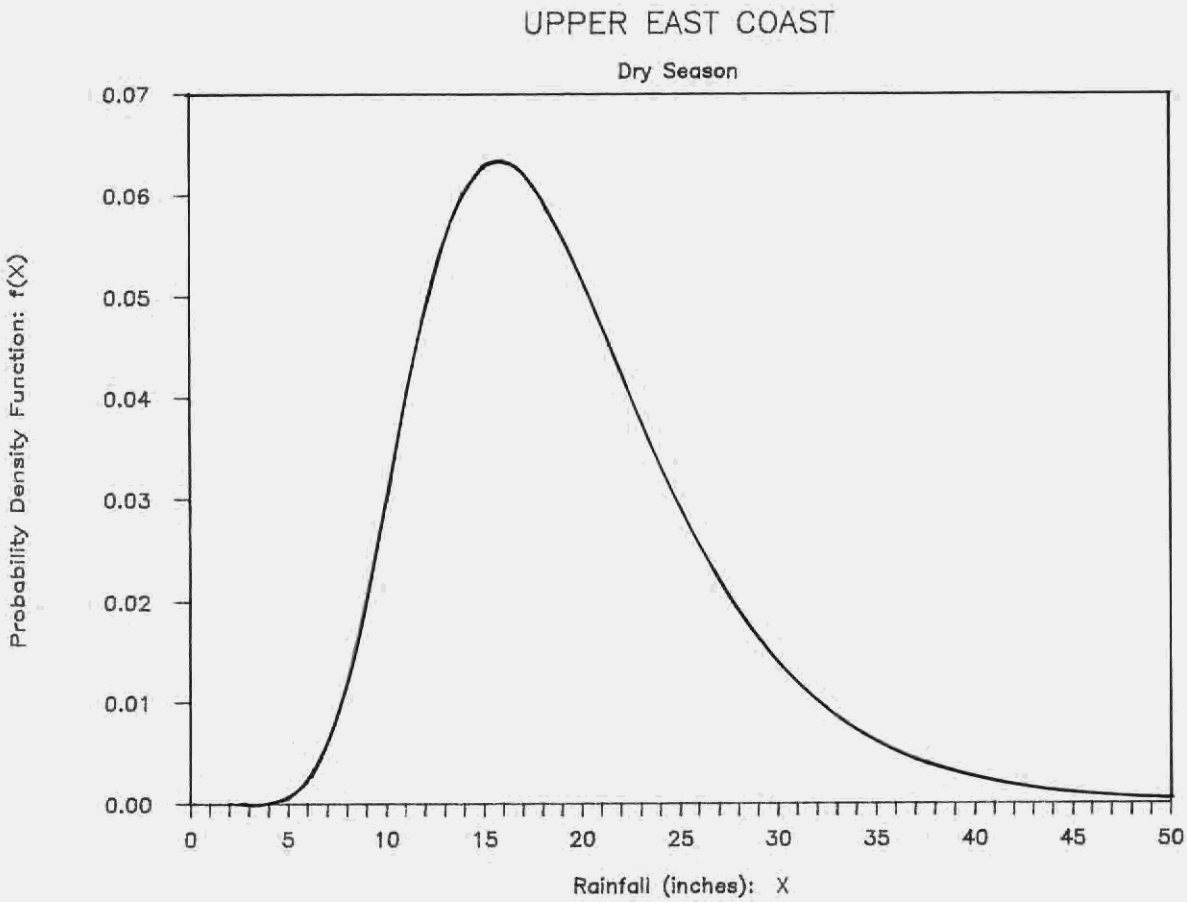

LOWER WEST COAST
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

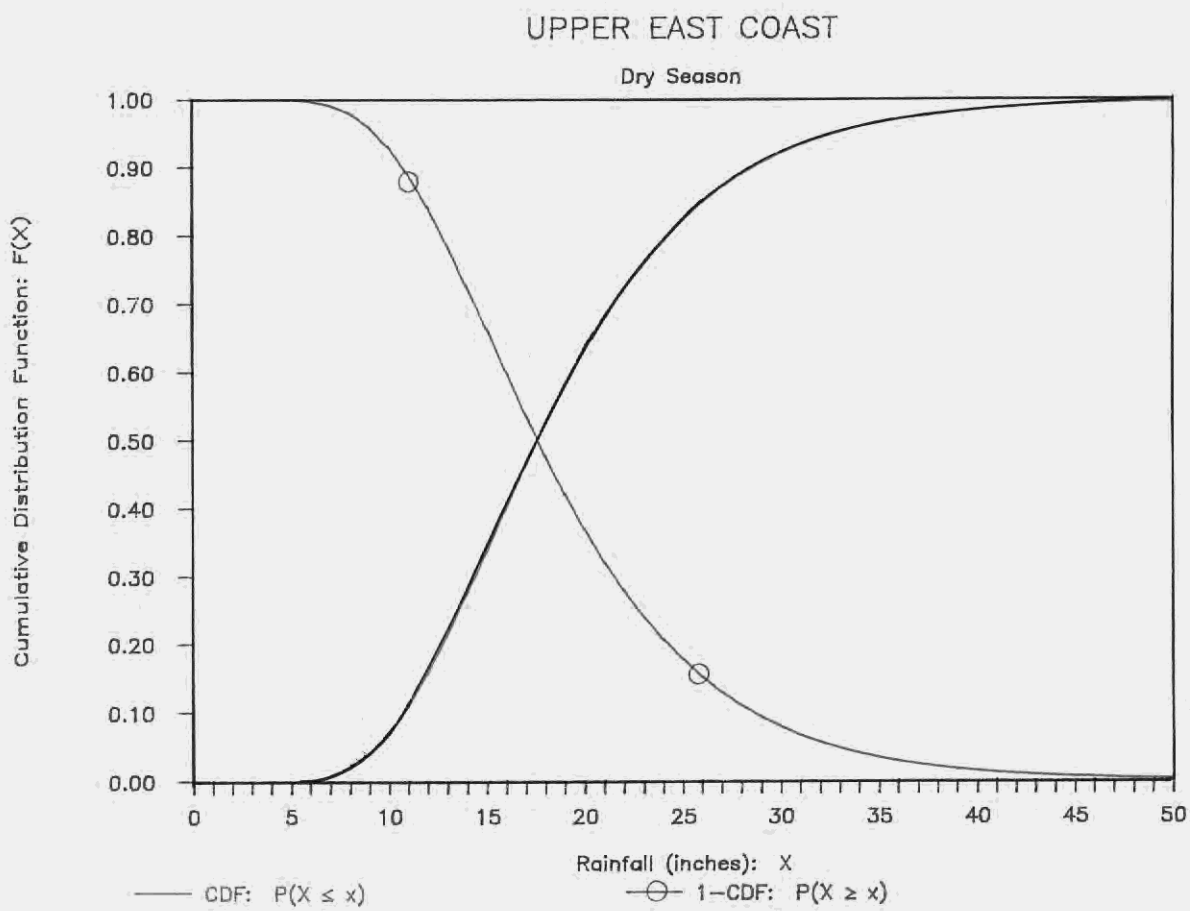

LOWER WEST COAST
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

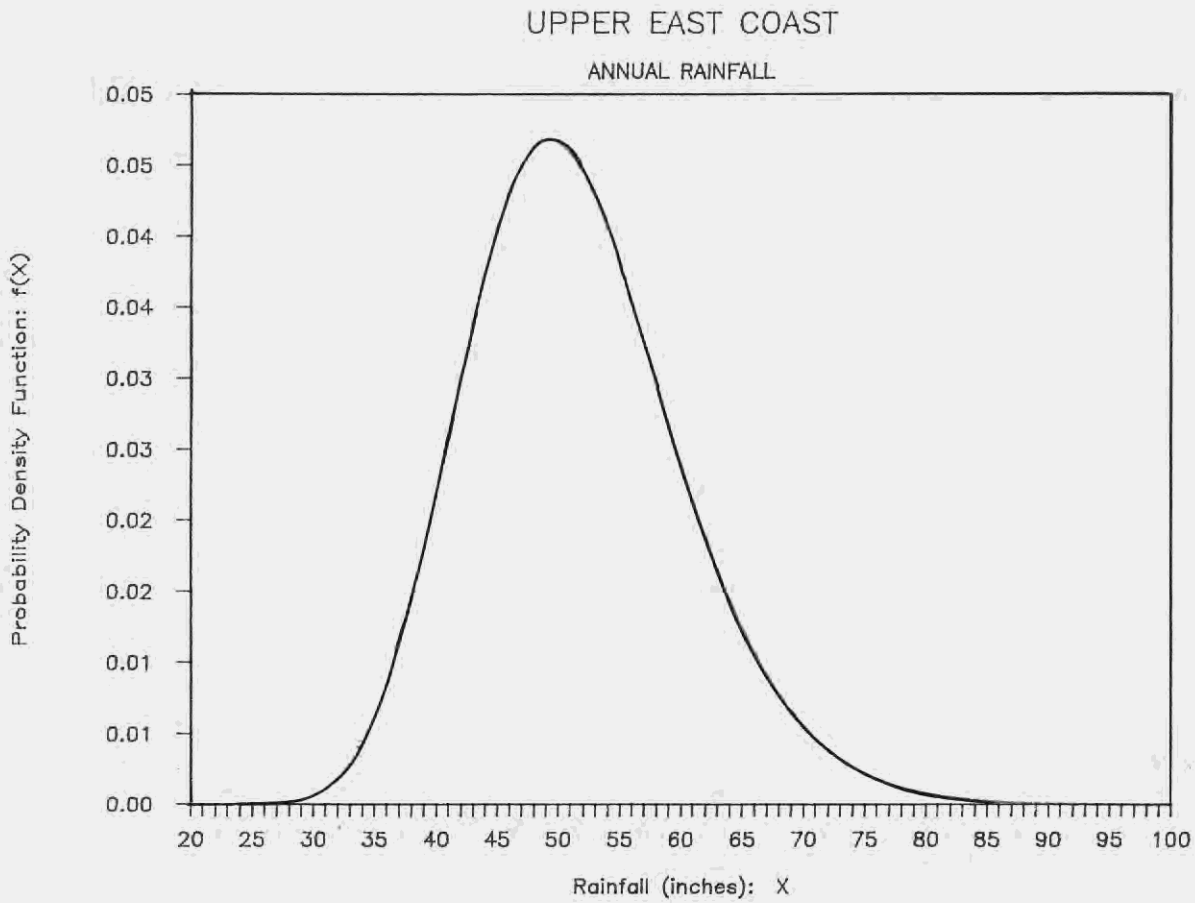

LOWER WEST COAST
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

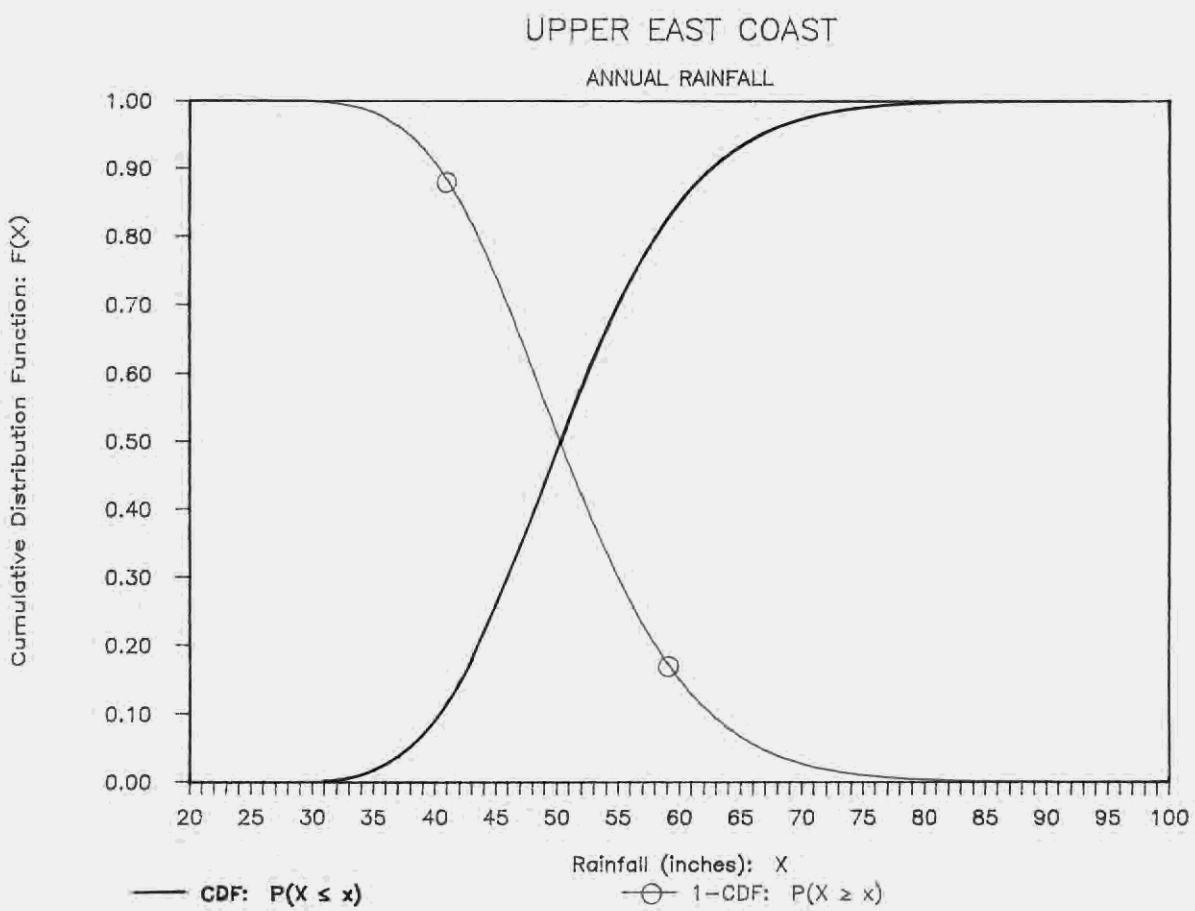

UPPER EAST COAST
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

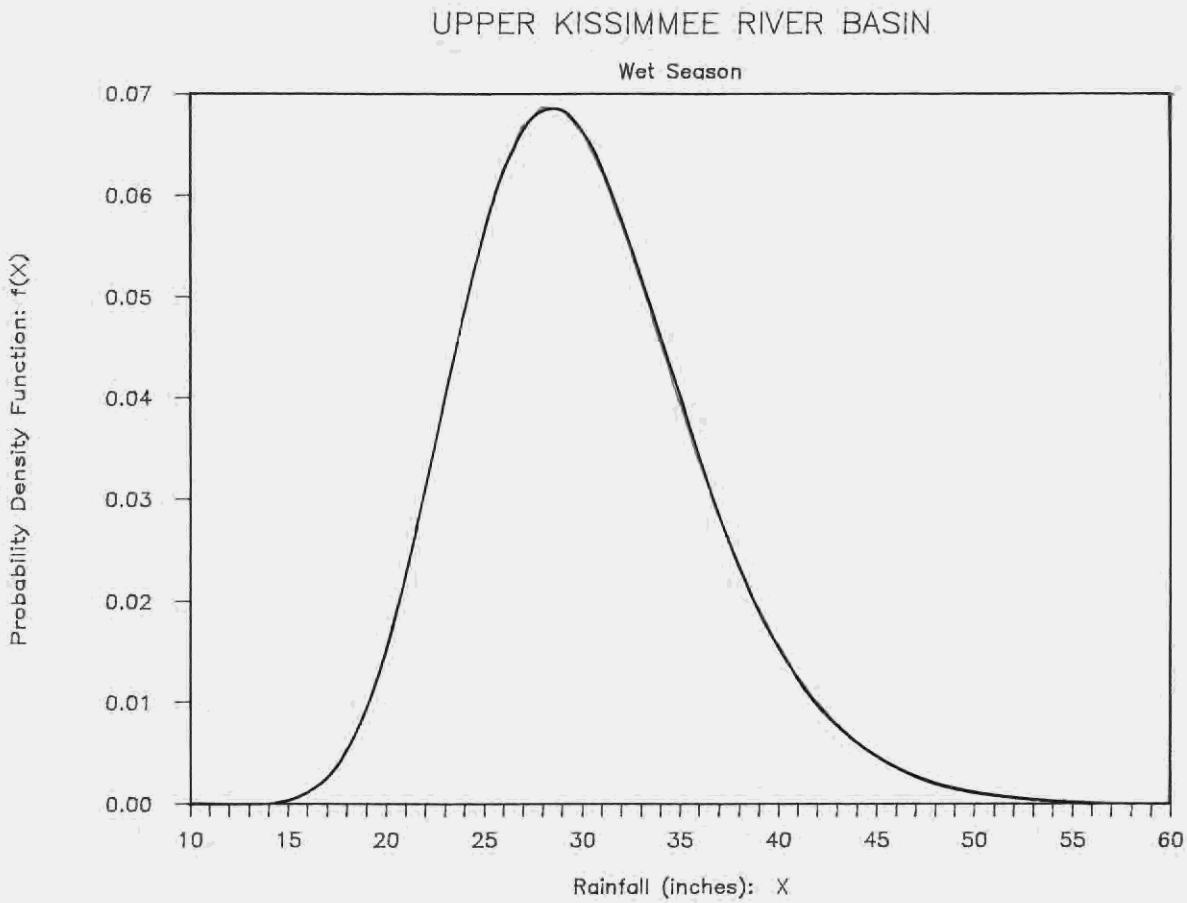

UPPER EAST COAST
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

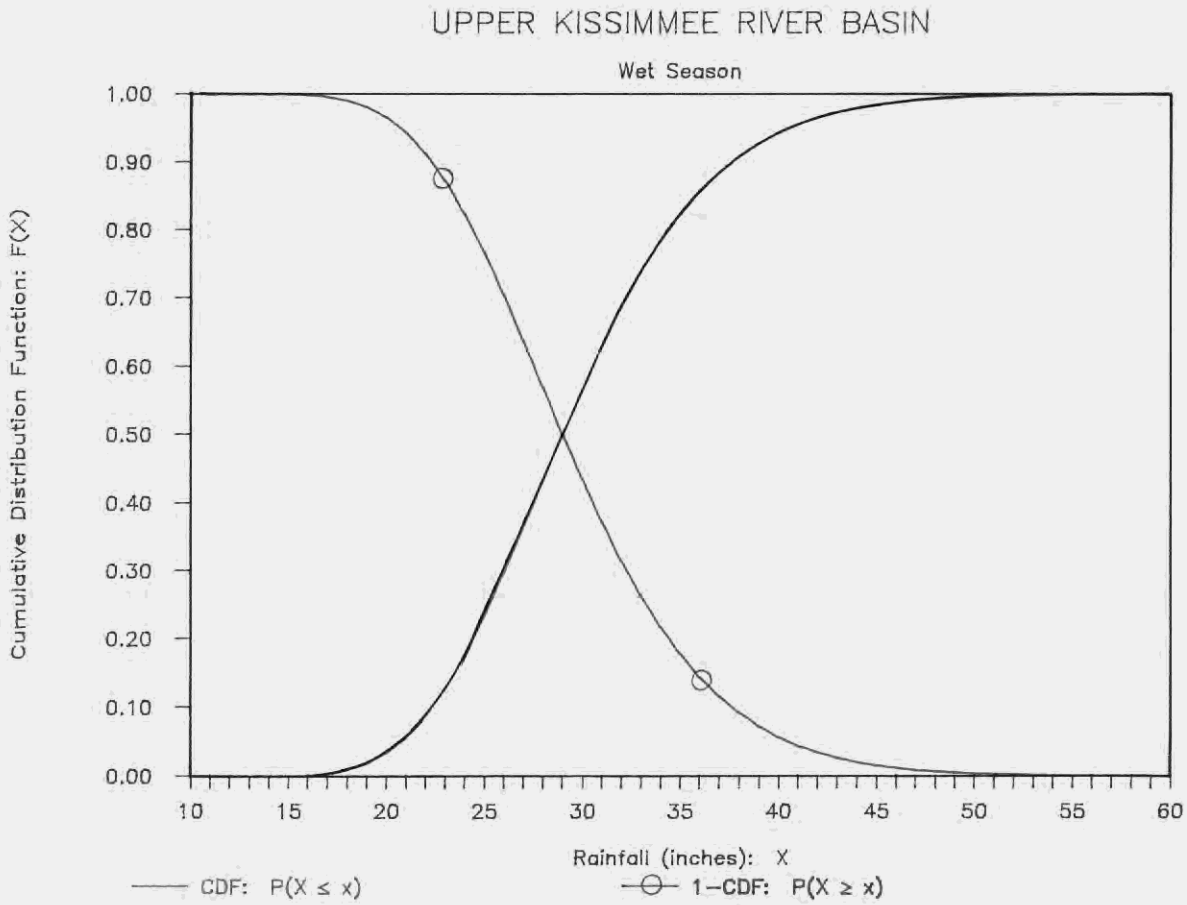

UPPER EAST COAST
Dry Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

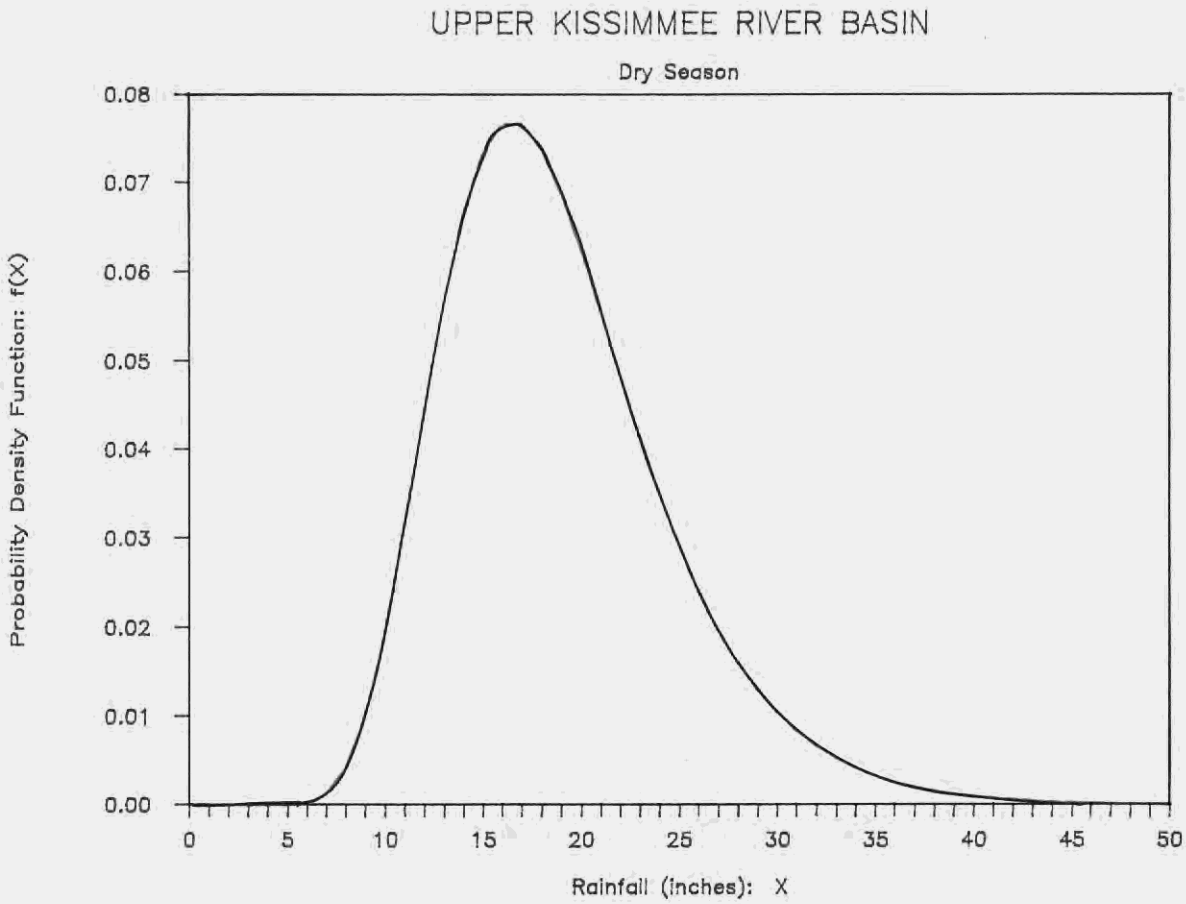

UPPER EAST COAST
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

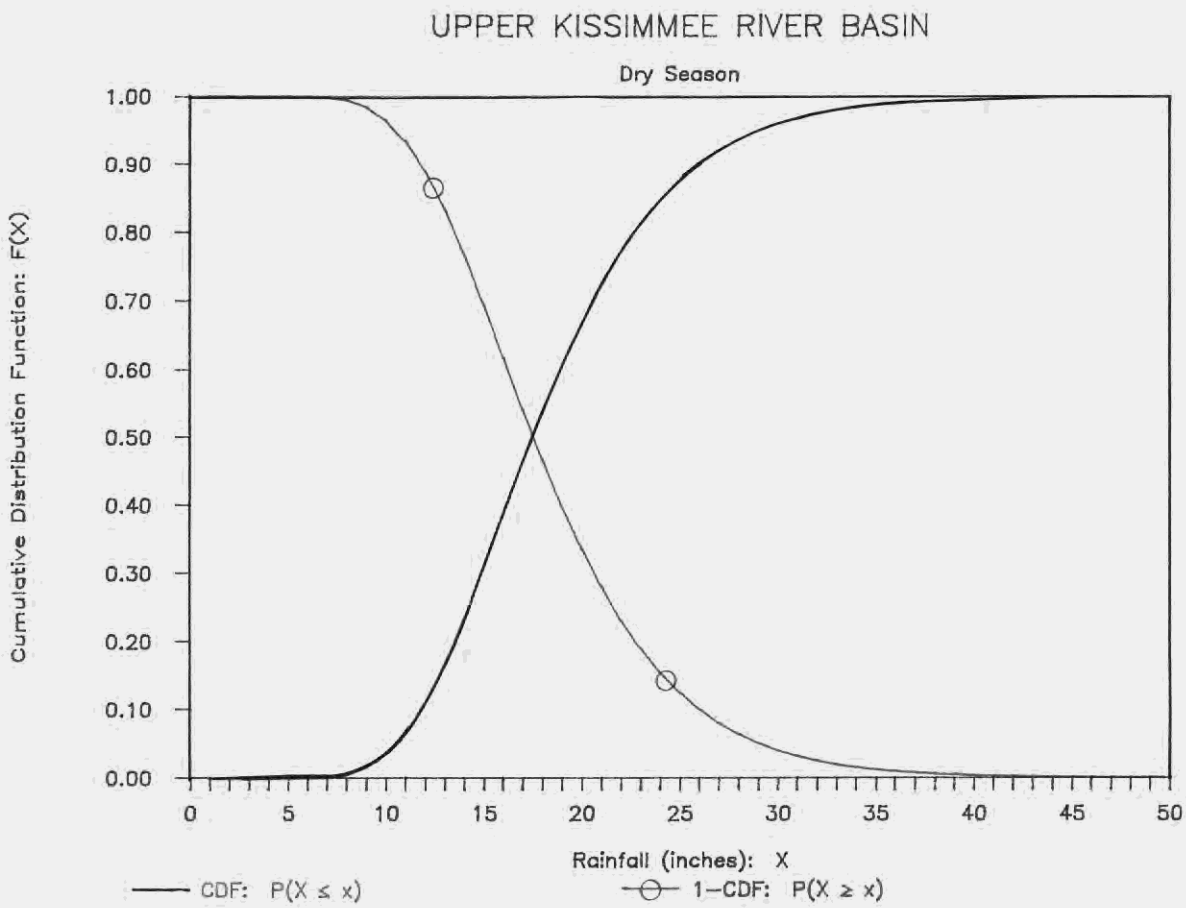

UPPER EAST COAST
ANNUAL RAINFALL
Probability Density Function: f(X)
0.05
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

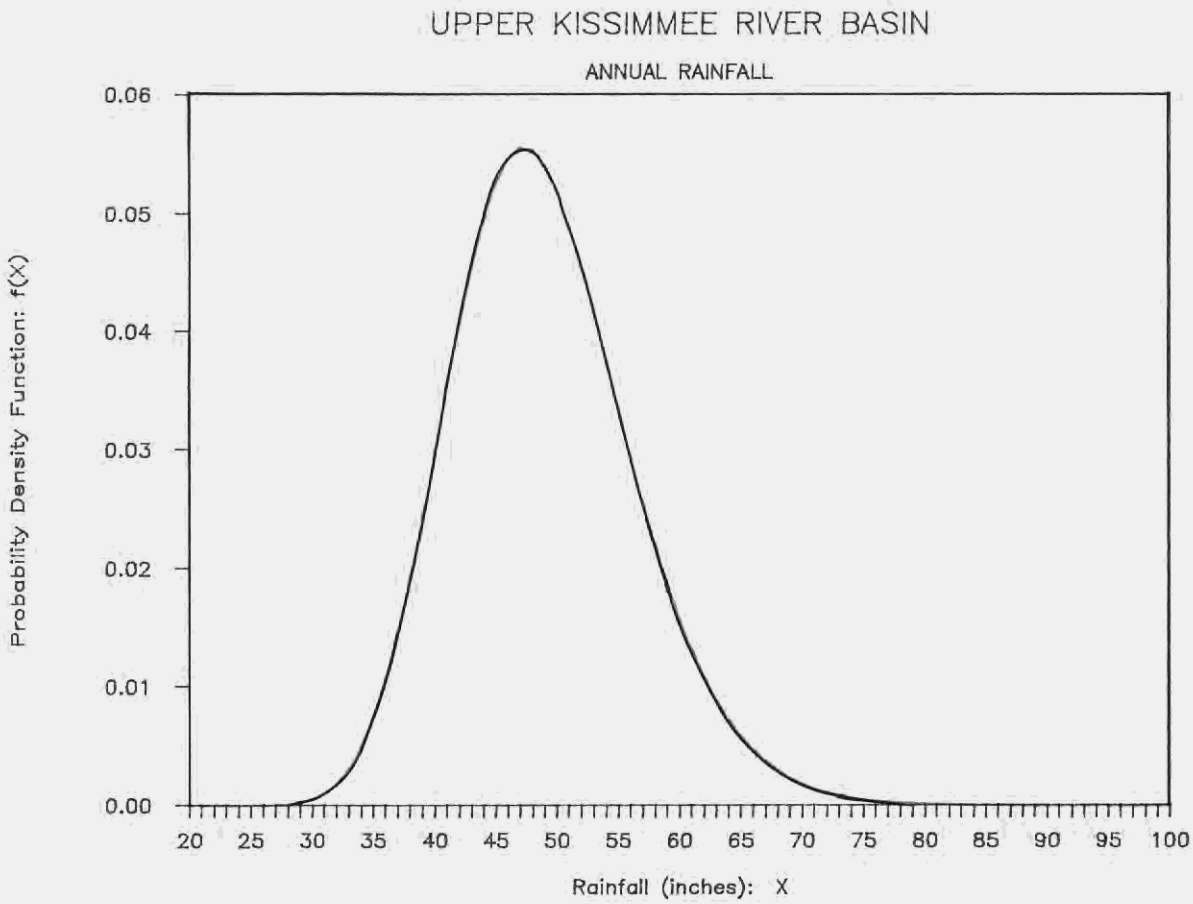

UPPER EAST COAST
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

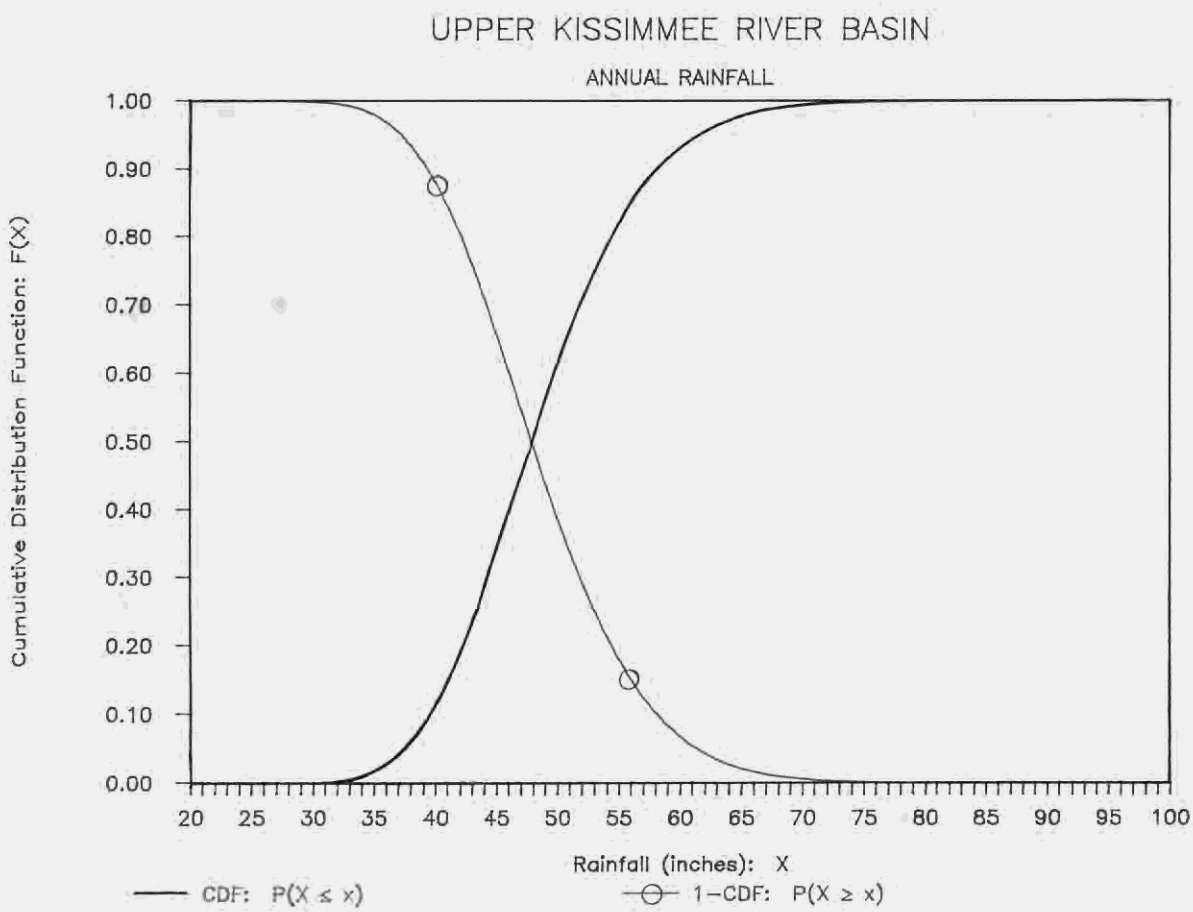

UPPER KISSIMMEE RIVER BASIN
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

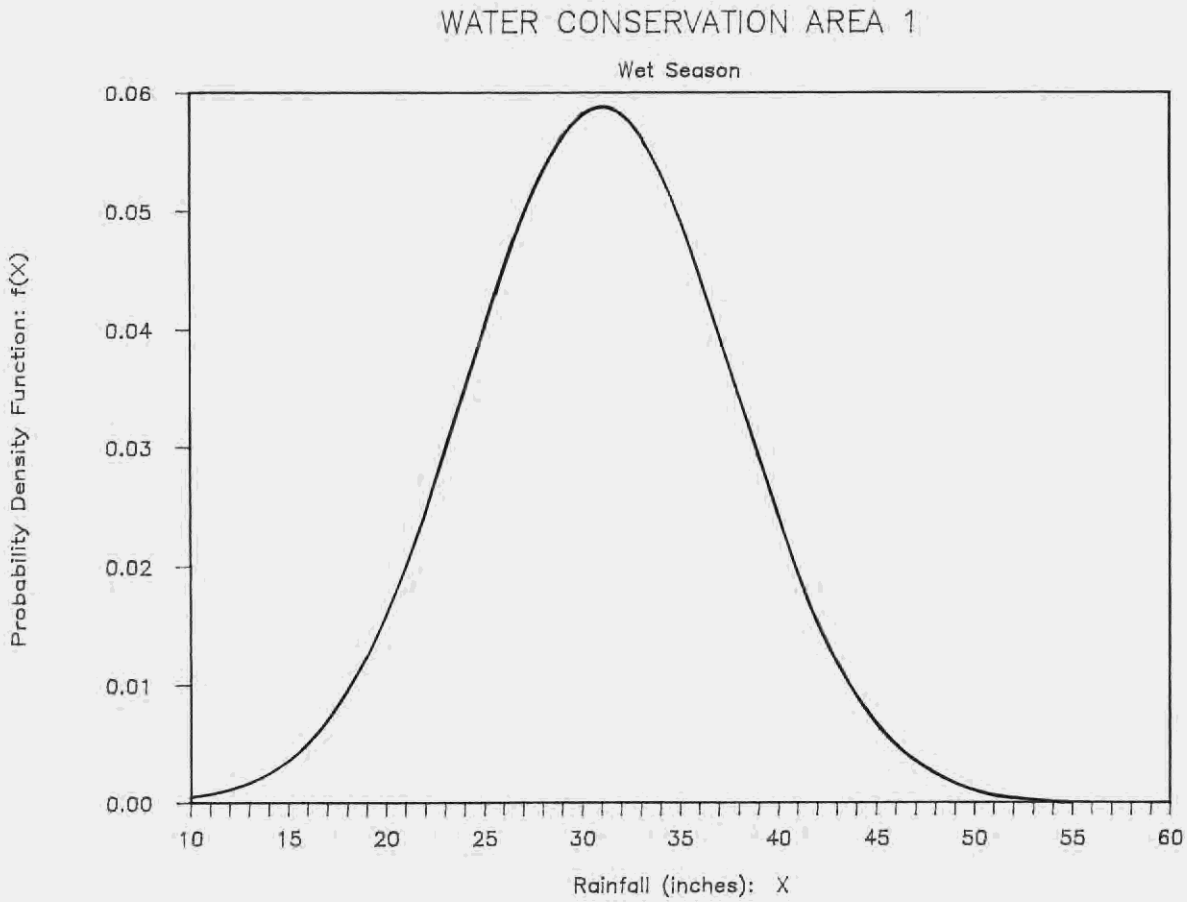

UPPER KISSIMMEE RIVER BASIN
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

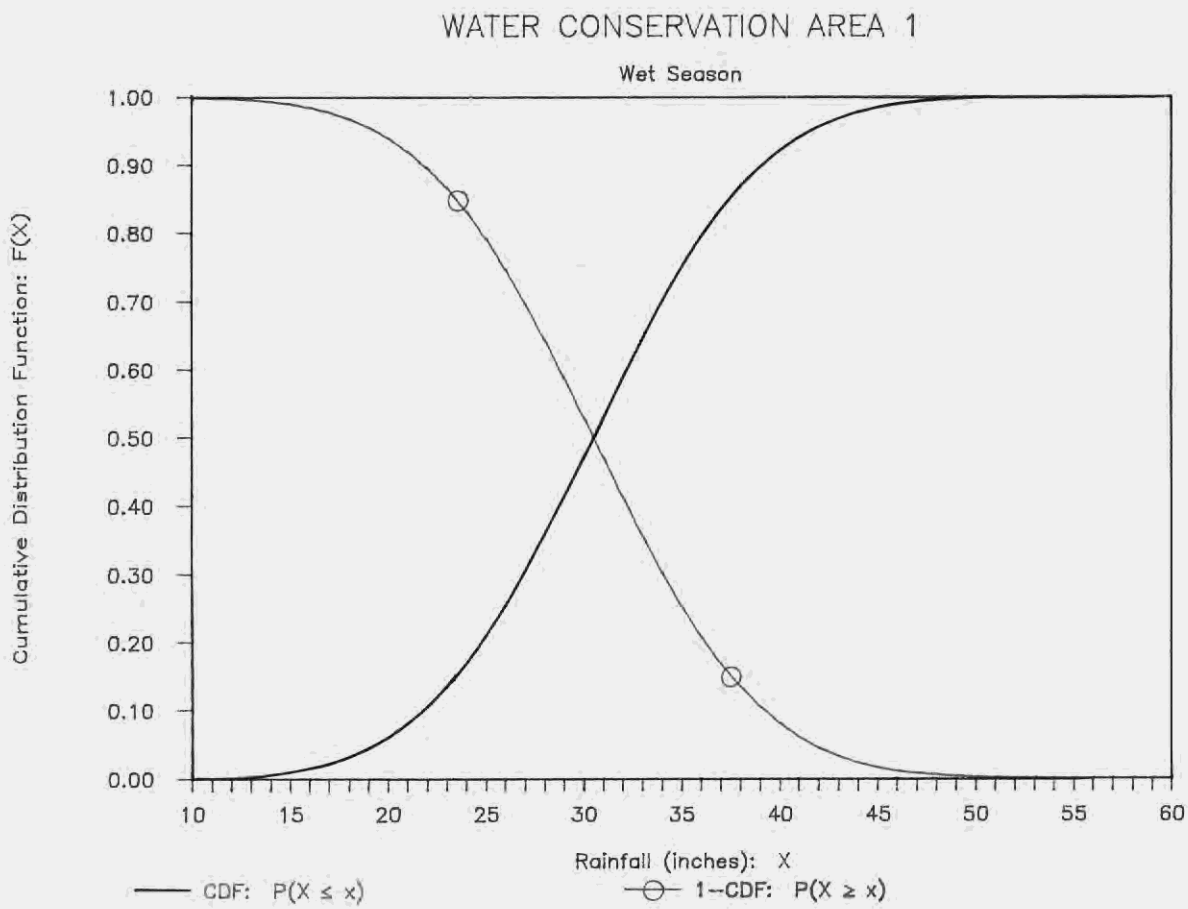

UPPER KISSIMMEE RIVER BASIN
Dry Season
Probability Density Function: f(X)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

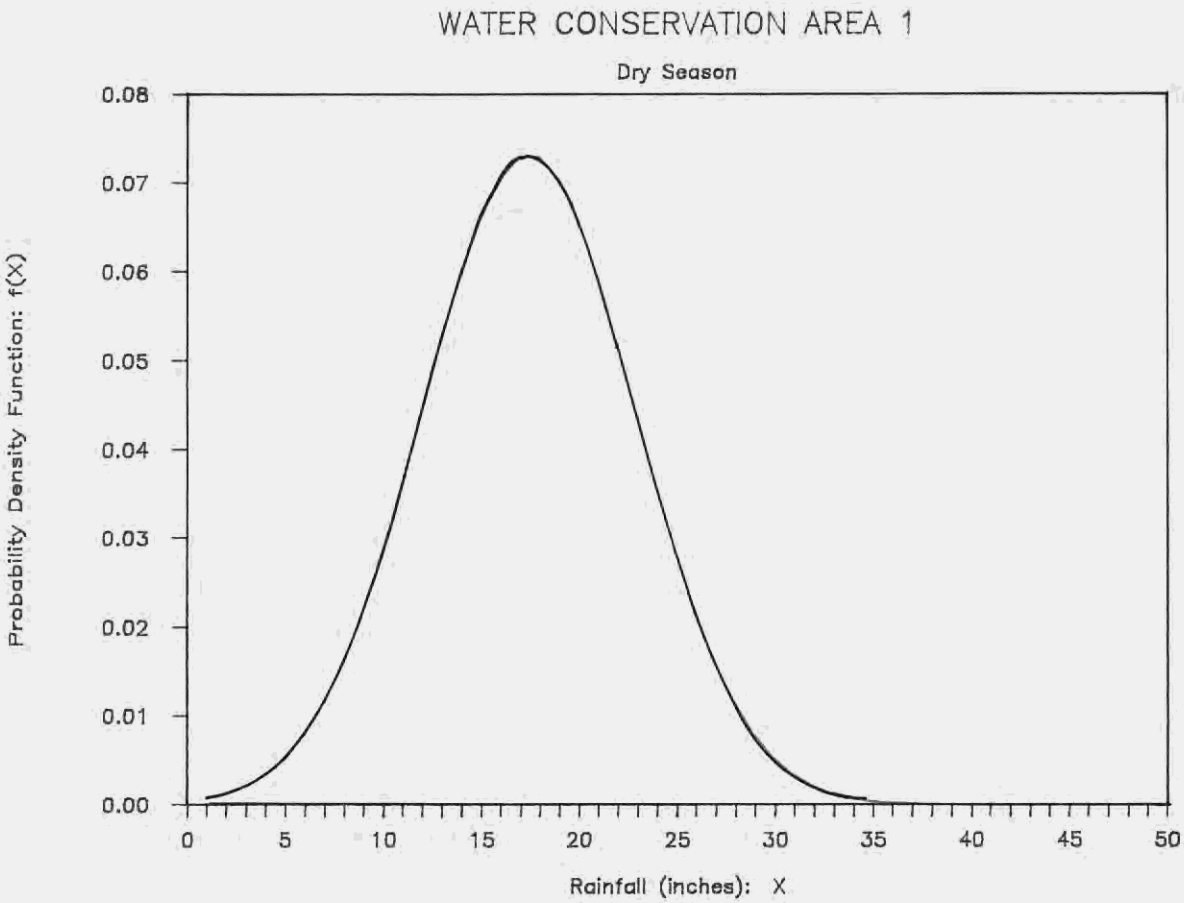

UPPER KISSIMMEE RIVER BASIN
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

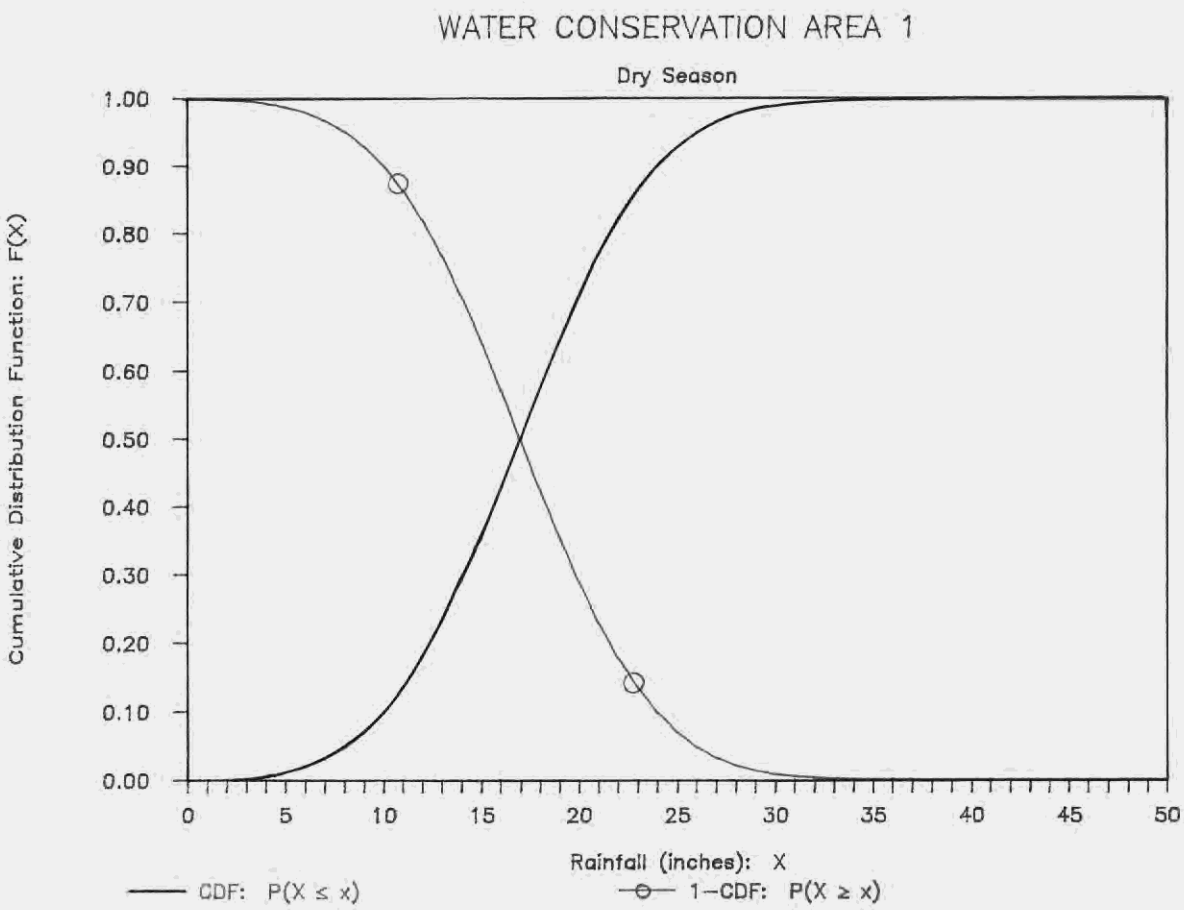

UPPER KISSIMMEE RIVER BASIN
ANNUAL RAINFALL
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

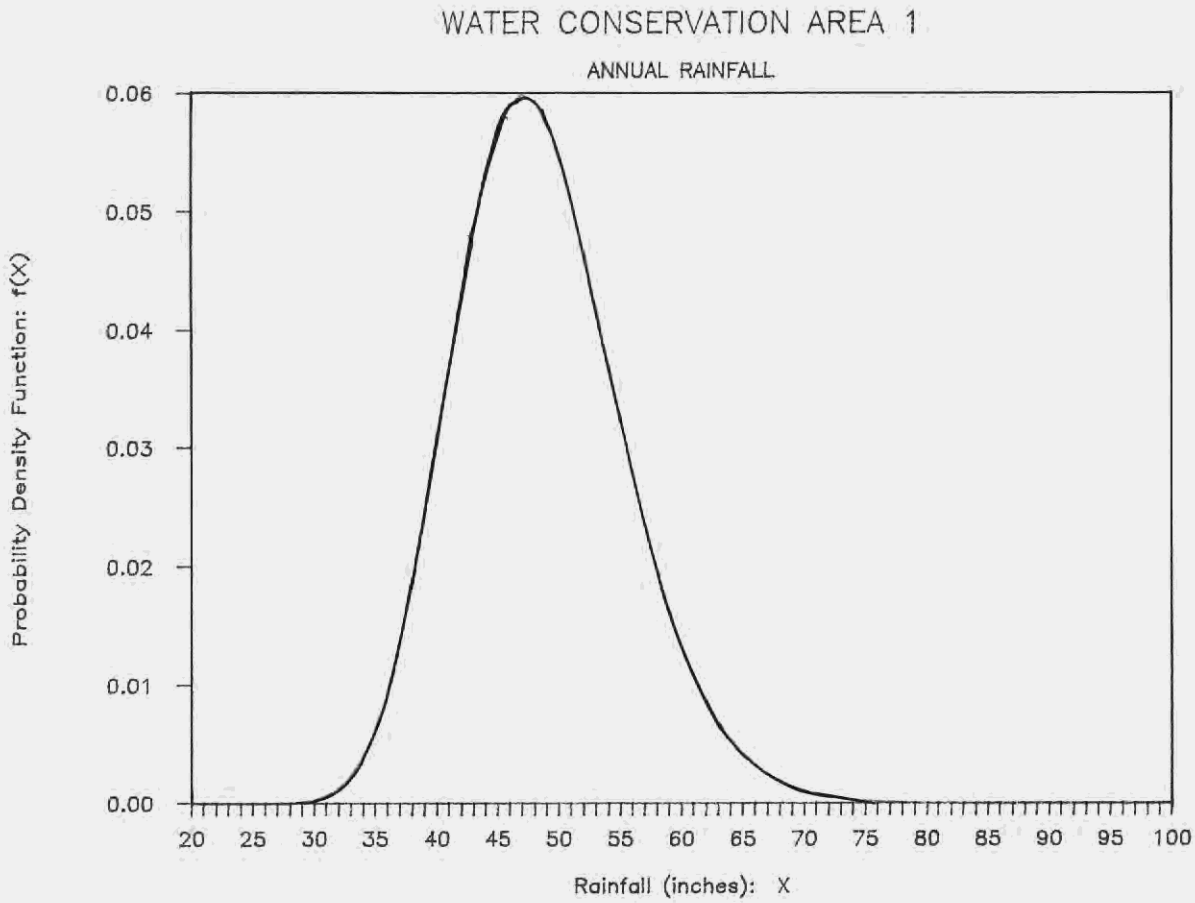

UPPER KISSIMMEE RIVER BASIN
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

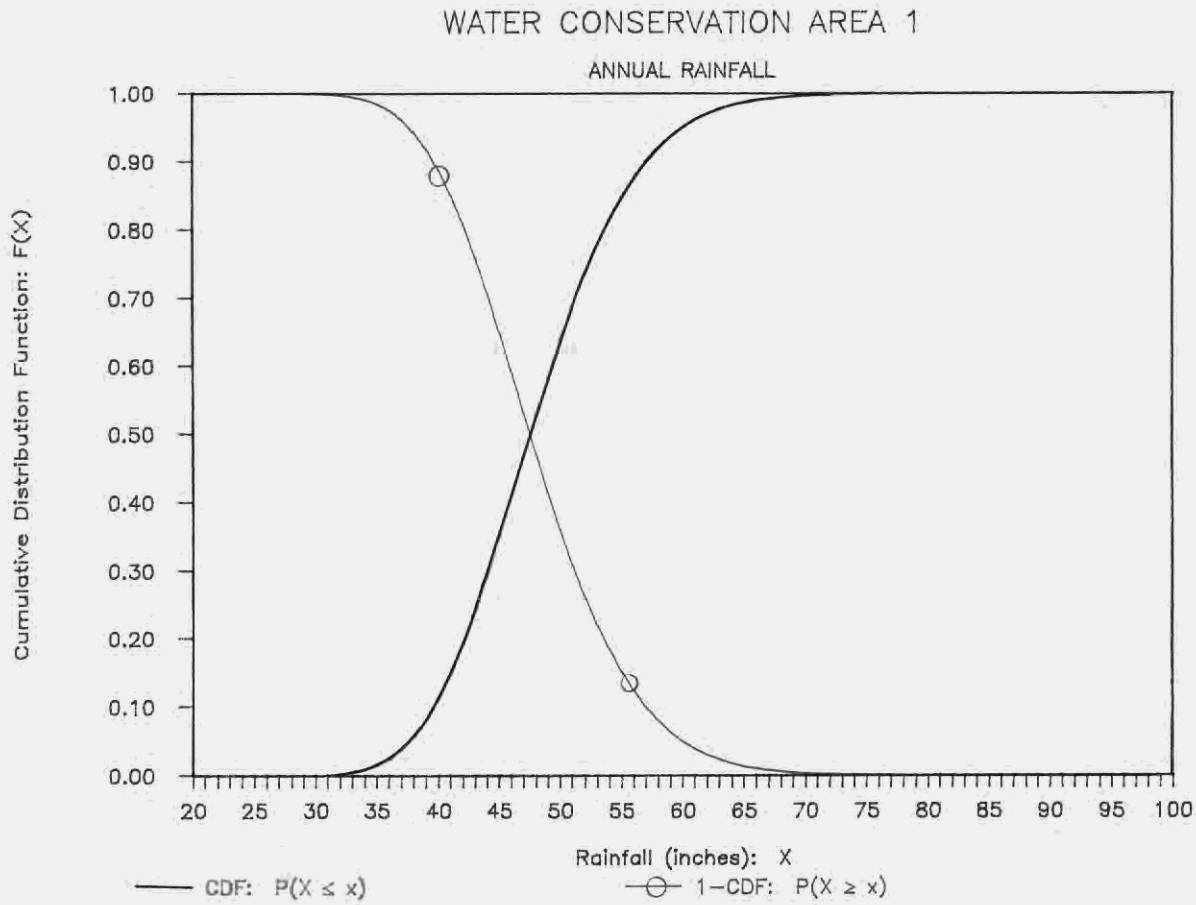

WATER CONSERVATION AREA 1
Wet Season
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

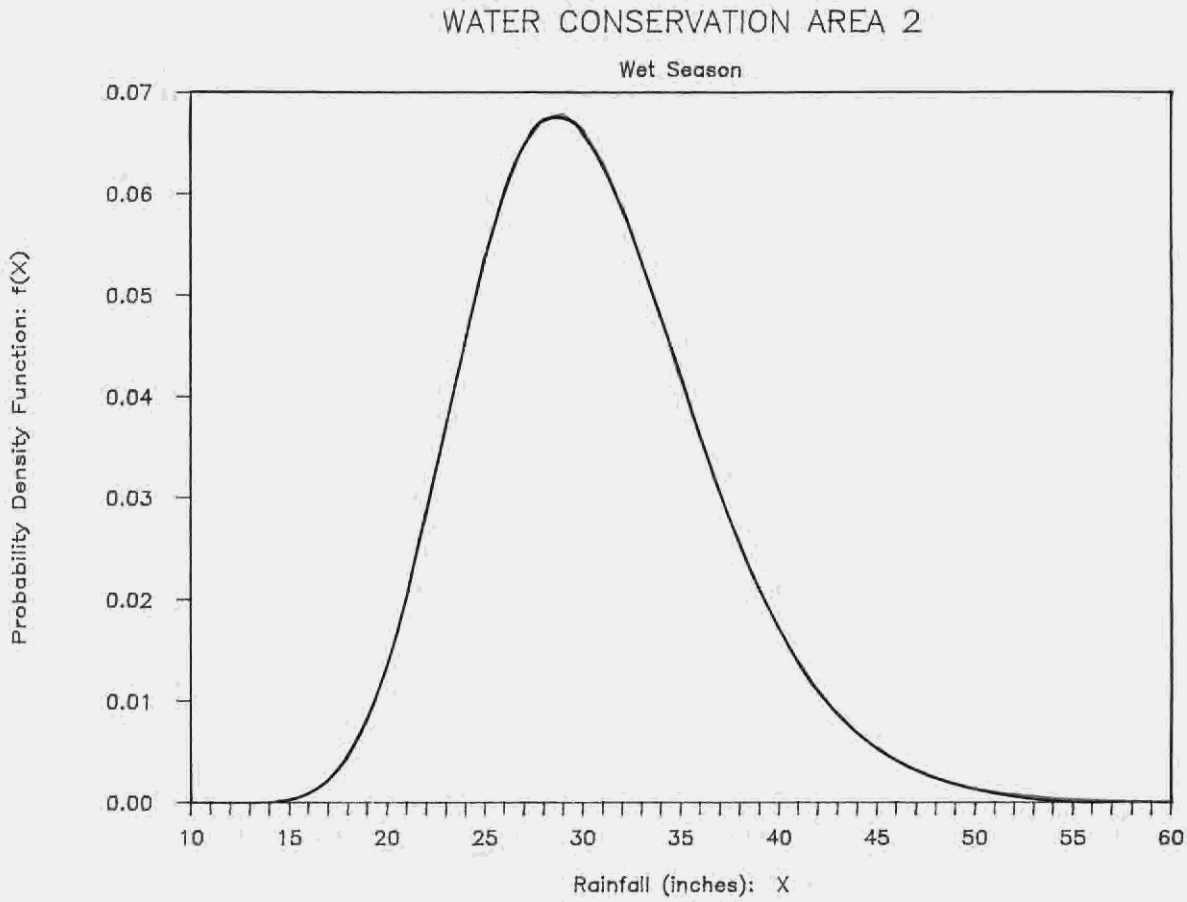

WATER CONSERVATION AREA 1
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

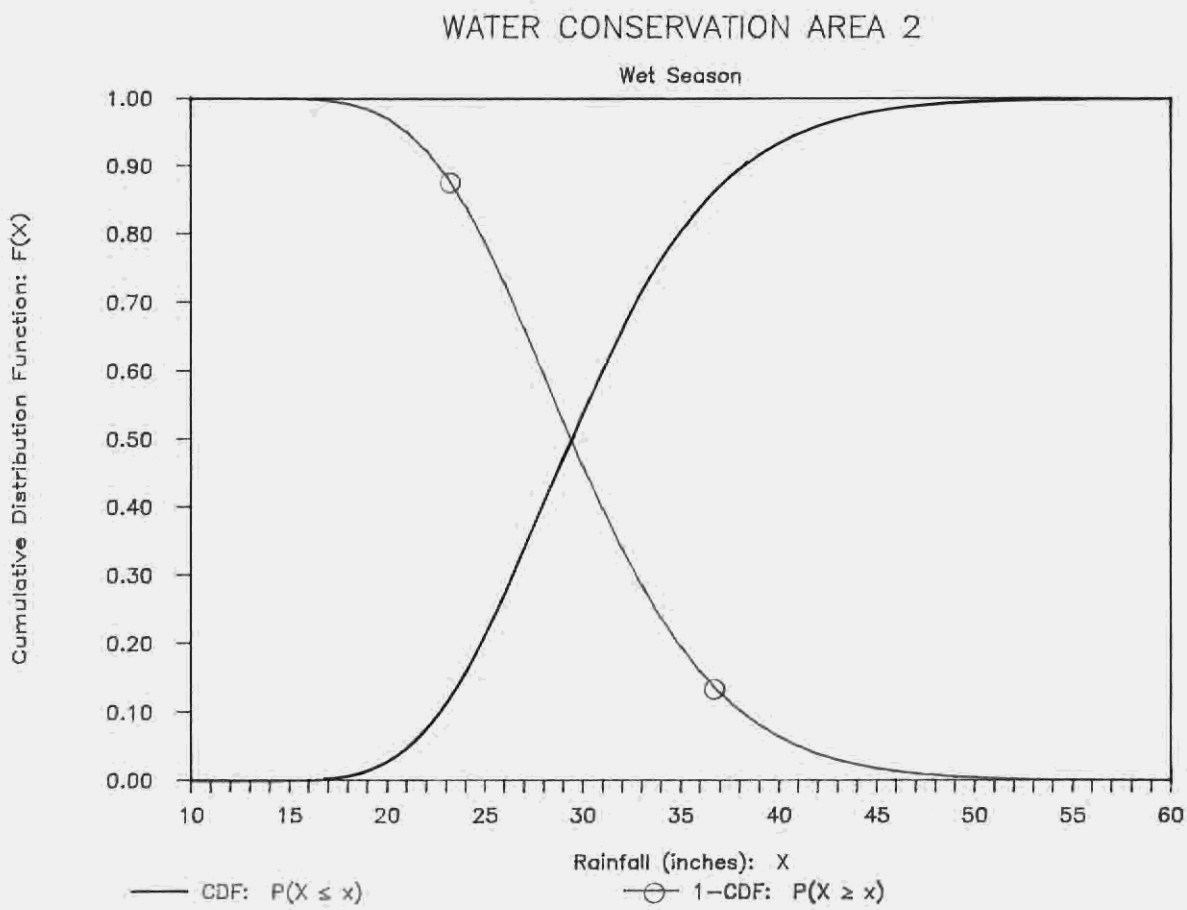

WATER CONSERVATION AREA 1
Dry Season
Probability Density Function: f(X)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

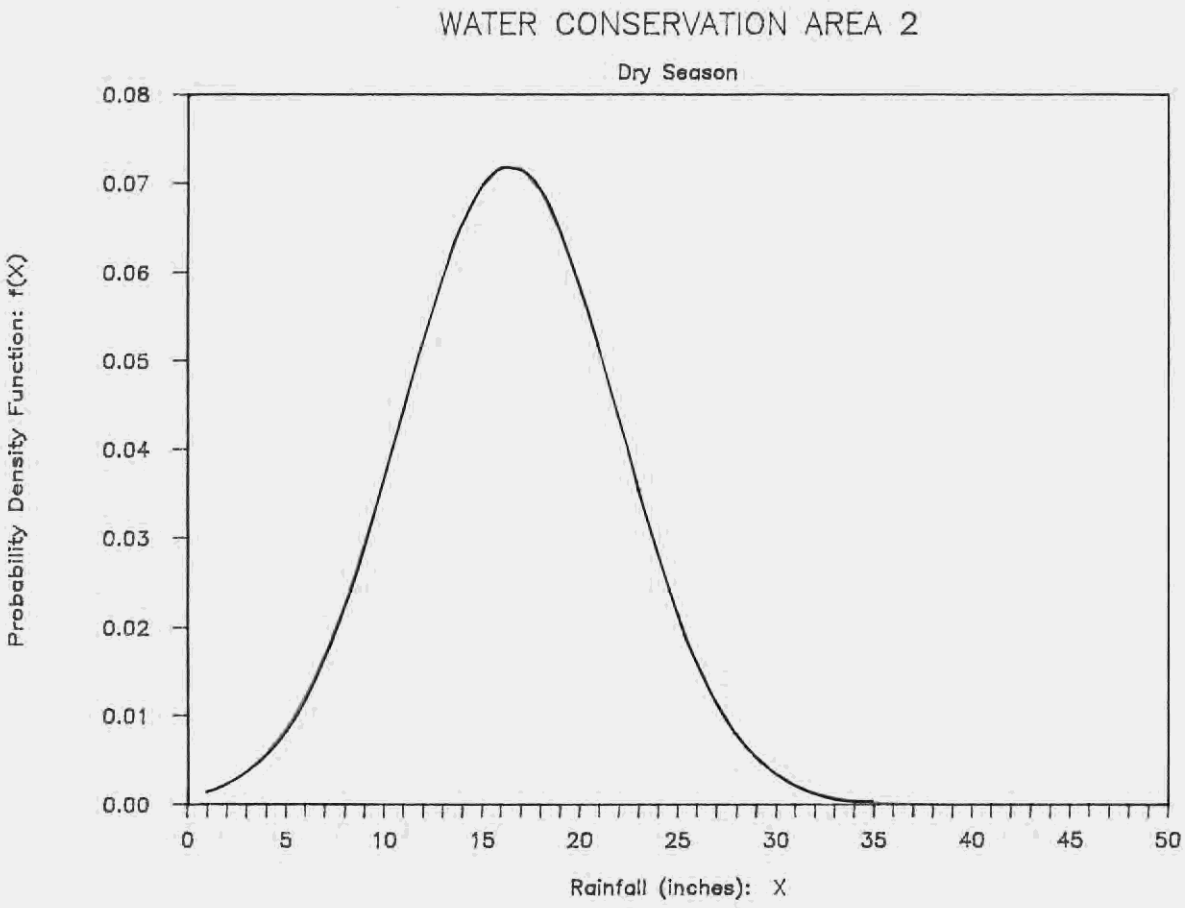

WATER CONSERVATION AREA 1
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

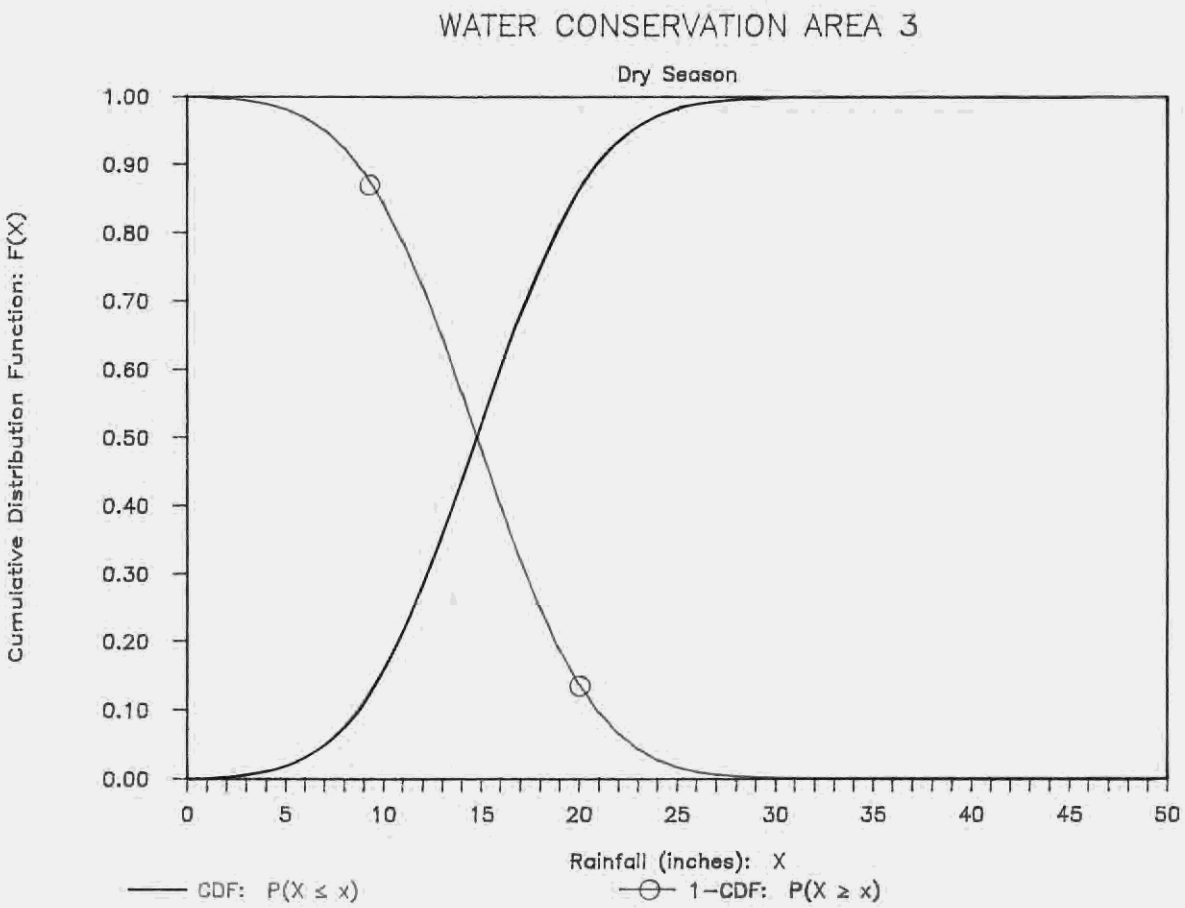

WATER CONSERVATION AREA 1
ANNUAL RAINFALL
Probability Density Function: f(X)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

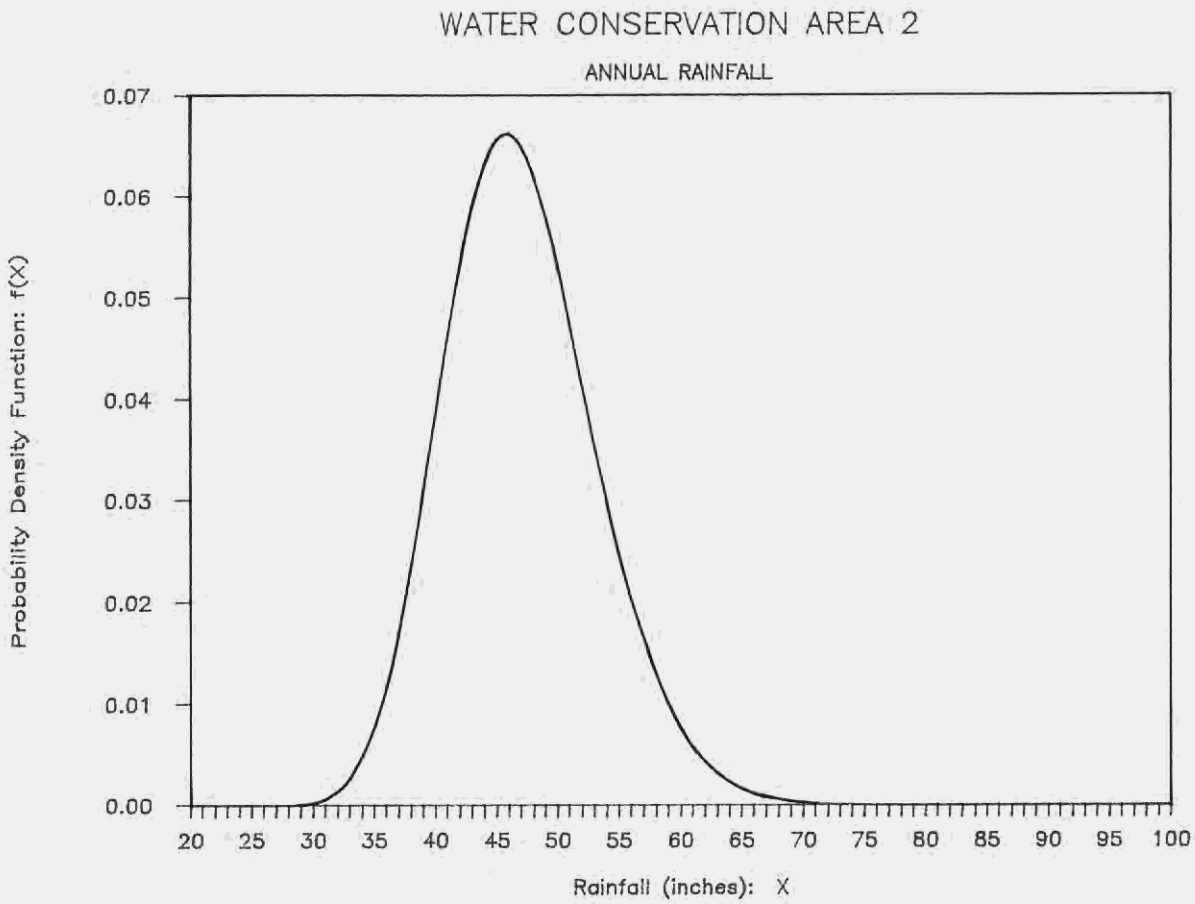

WATER CONSERVATION AREA 1
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

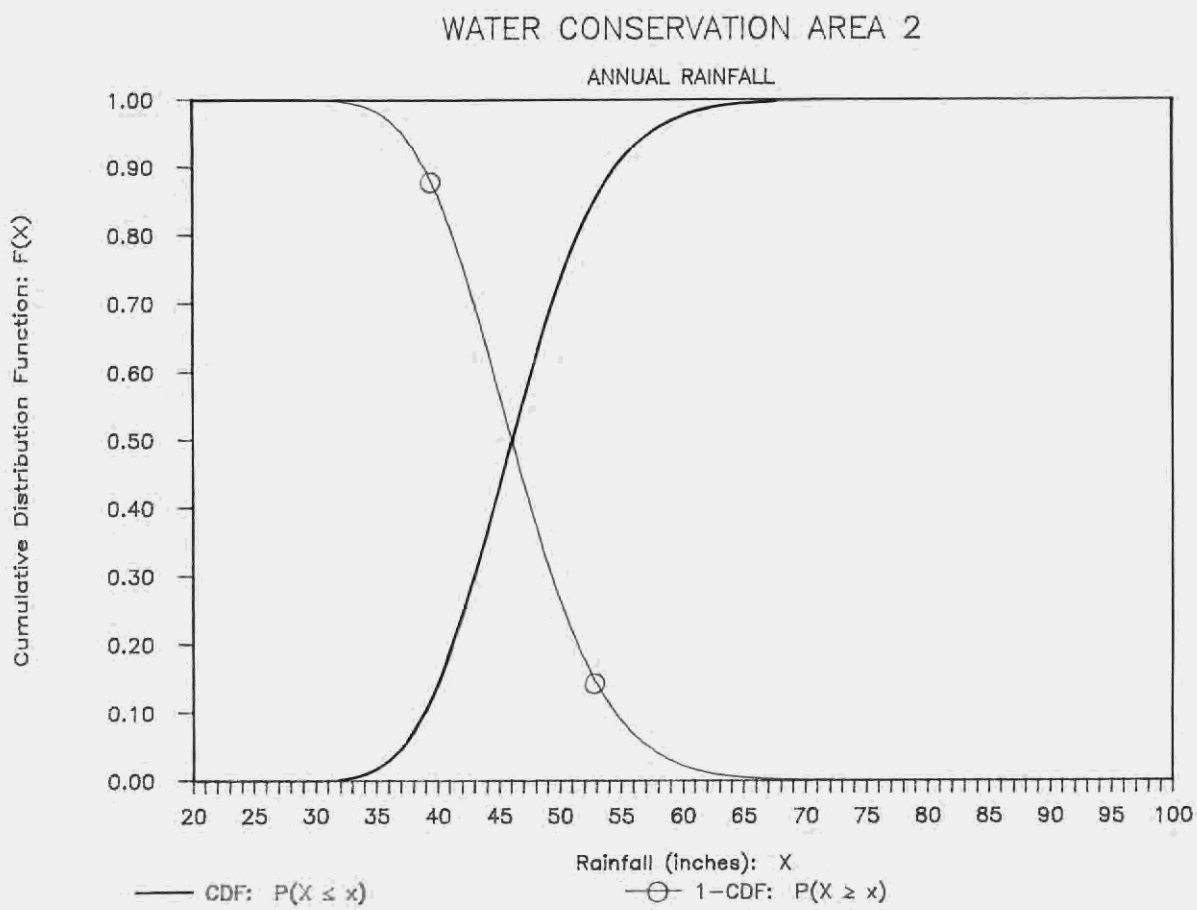

WATER CONSERVATION AREA 2
Wet Season
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X

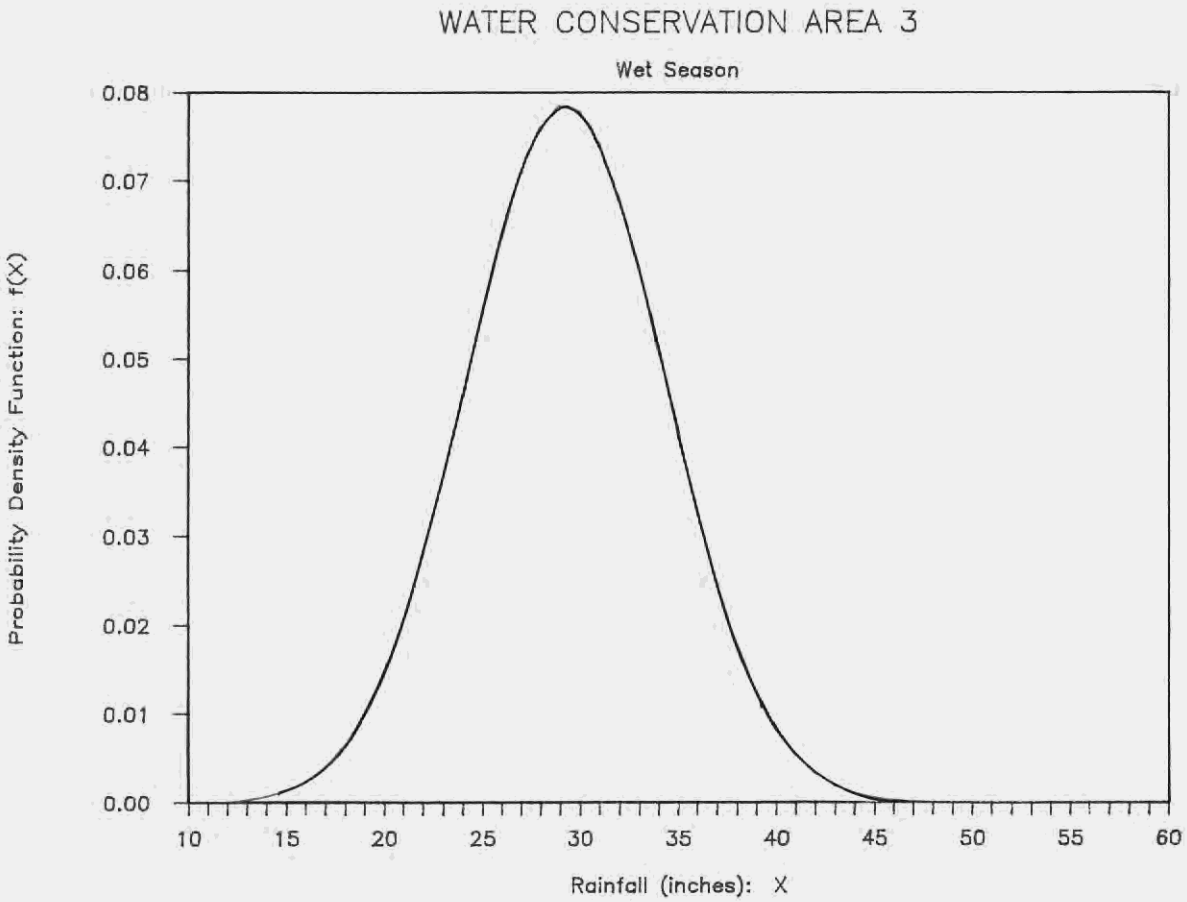

WATER CONSERVATION AREA 2
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

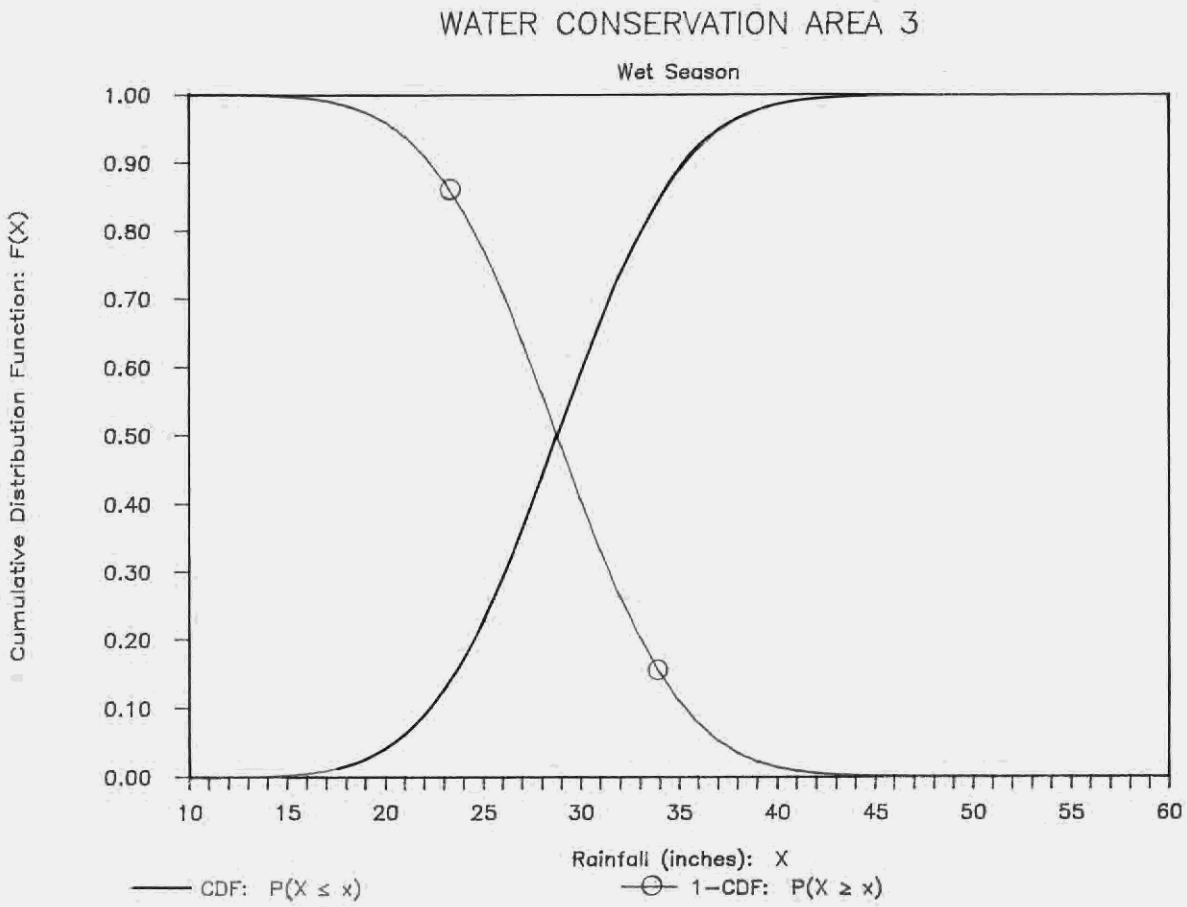

WATER CONSERVATION AREA 2
Dry Season
Probability Density Function: f(X)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

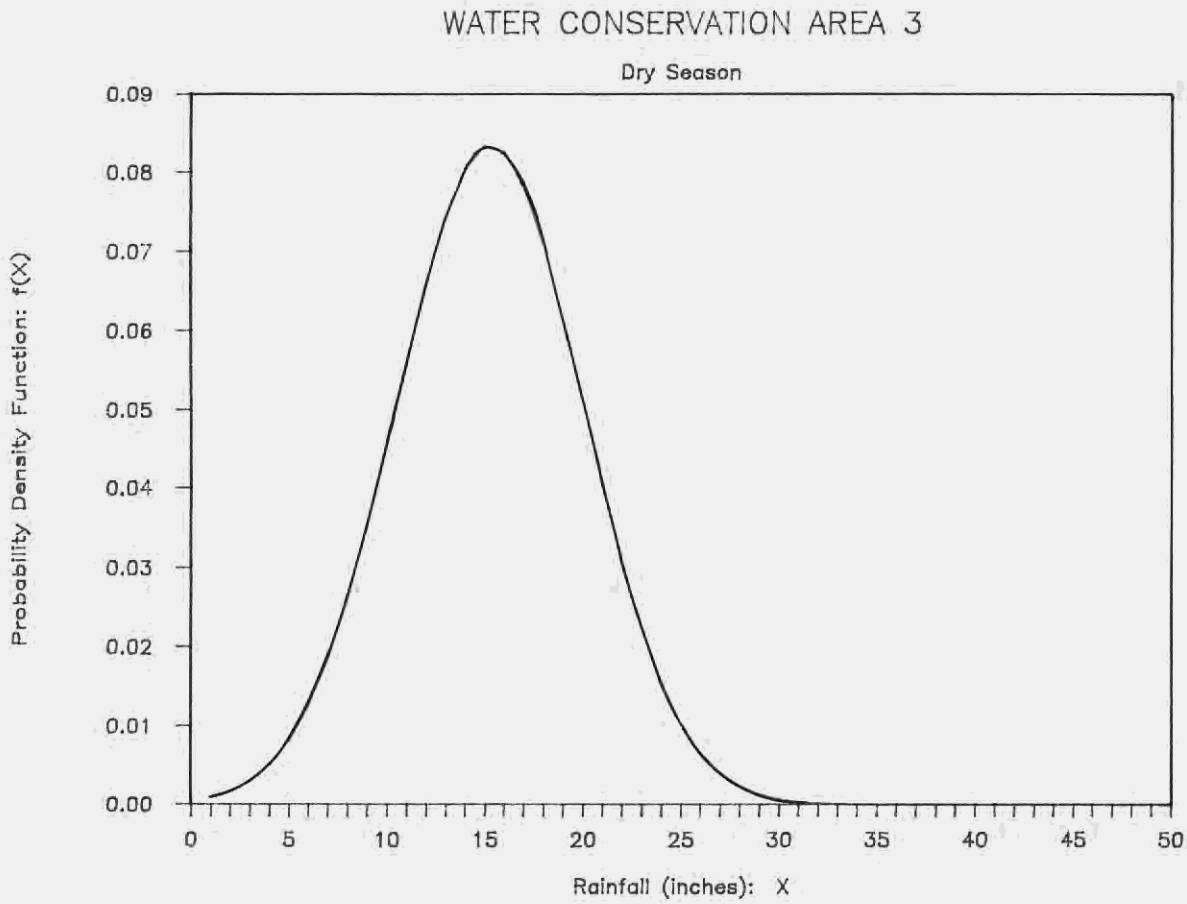

WATER CONSERVATION AREA 3
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

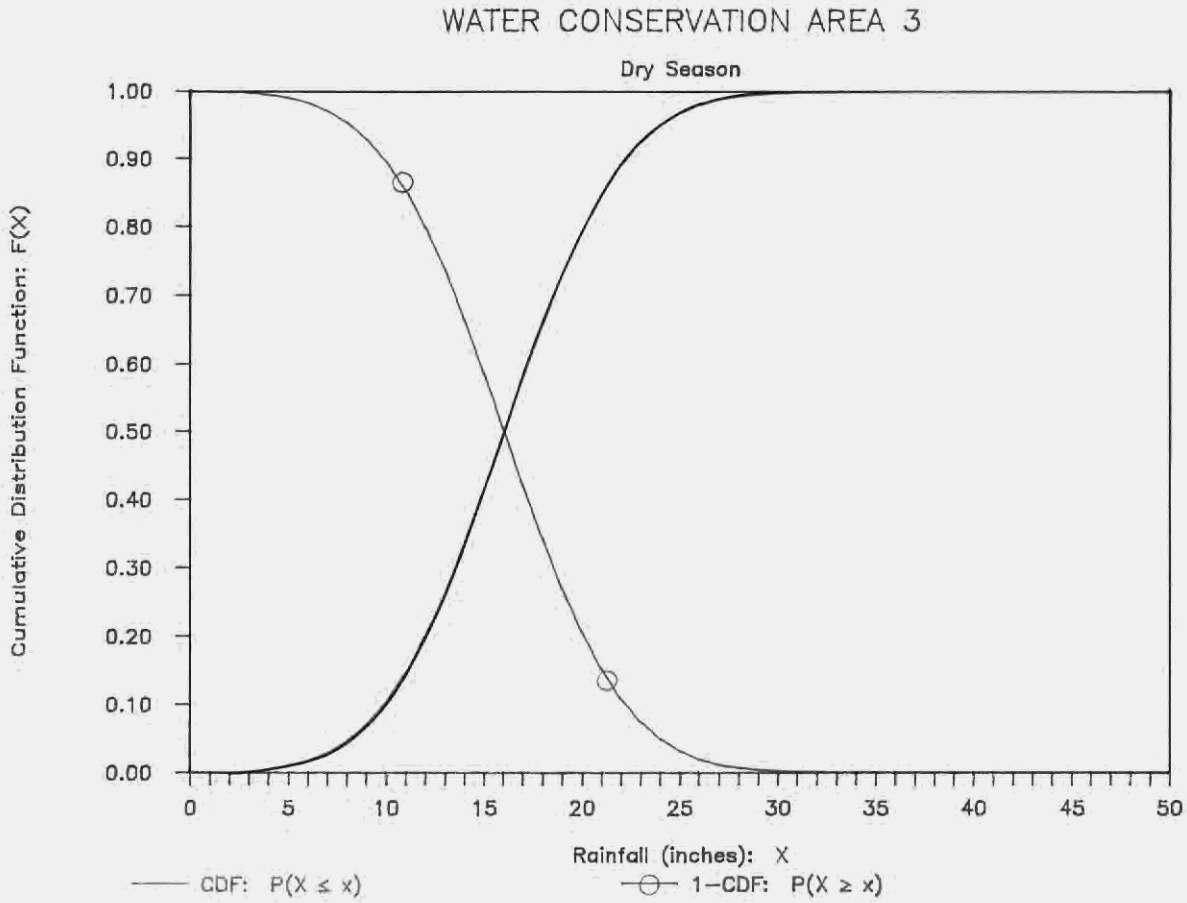

WATER CONSERVATION AREA 2
ANNUAL RAINFALL
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X

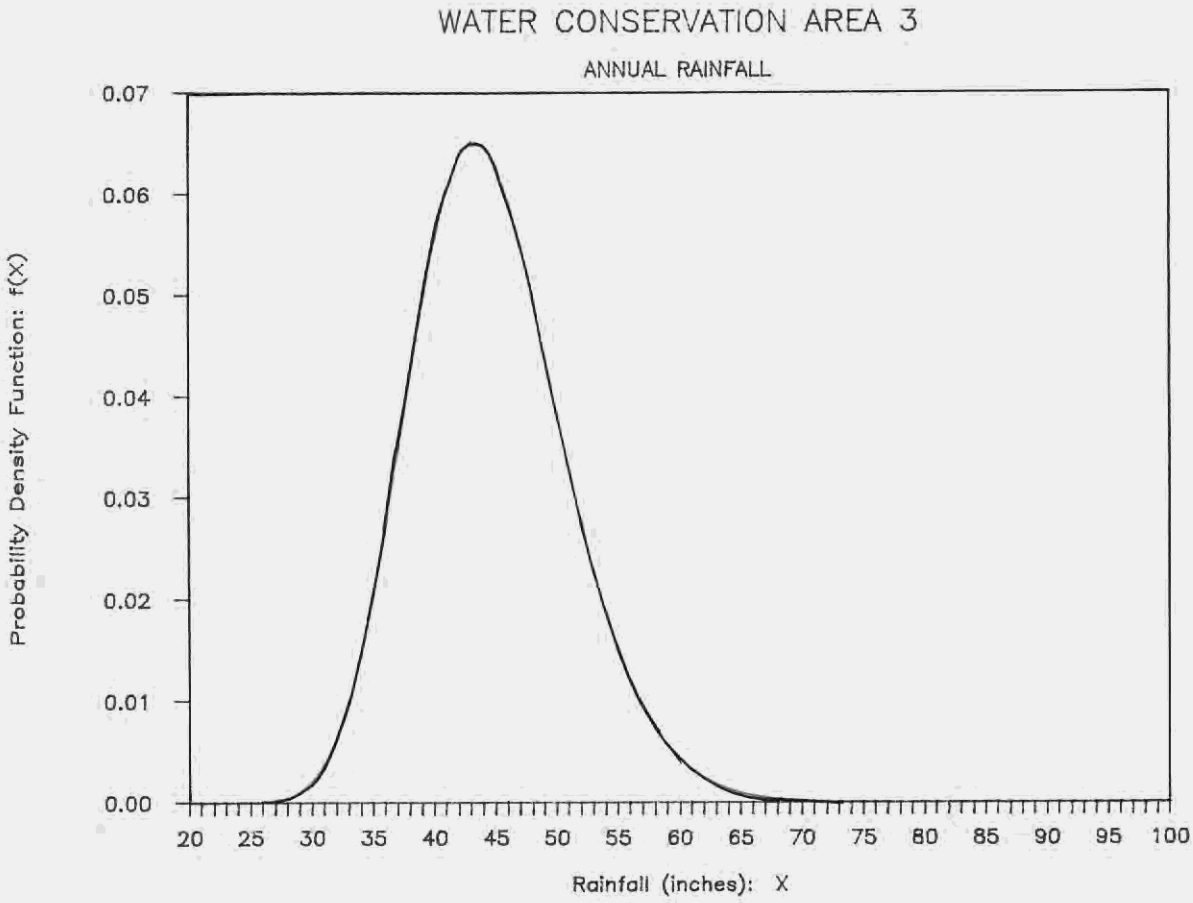

WATER CONSERVATION AREA 2
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

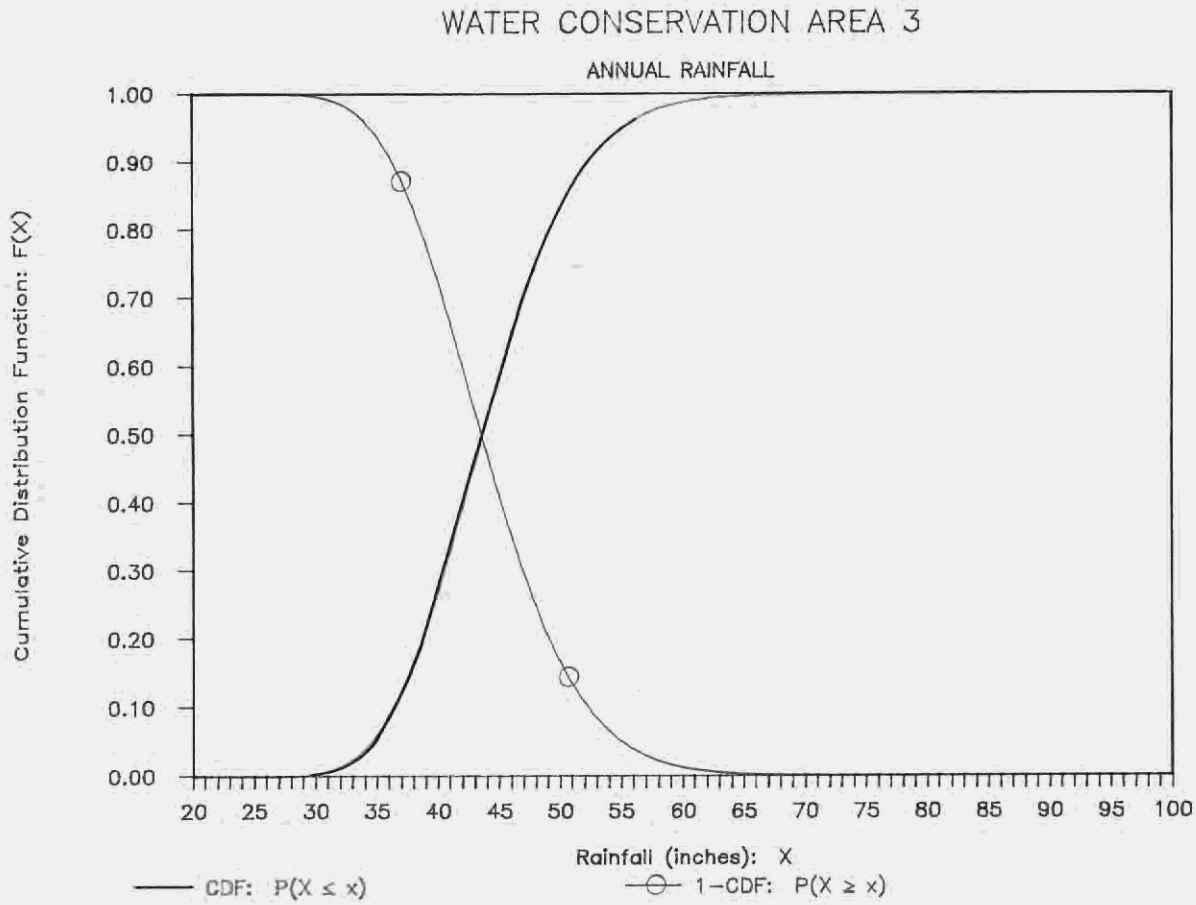

WATER CONSERVATION AREA 3
Wet Season
Probability Density Function: f(X)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X


WATER CONSERVATION AREA 3
Wet Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10
15
20
25
30
35
40
45
50
55
60
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)


WATER CONSERVATION AREA 3
Dry Season
Probability Density Function: f(X)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X

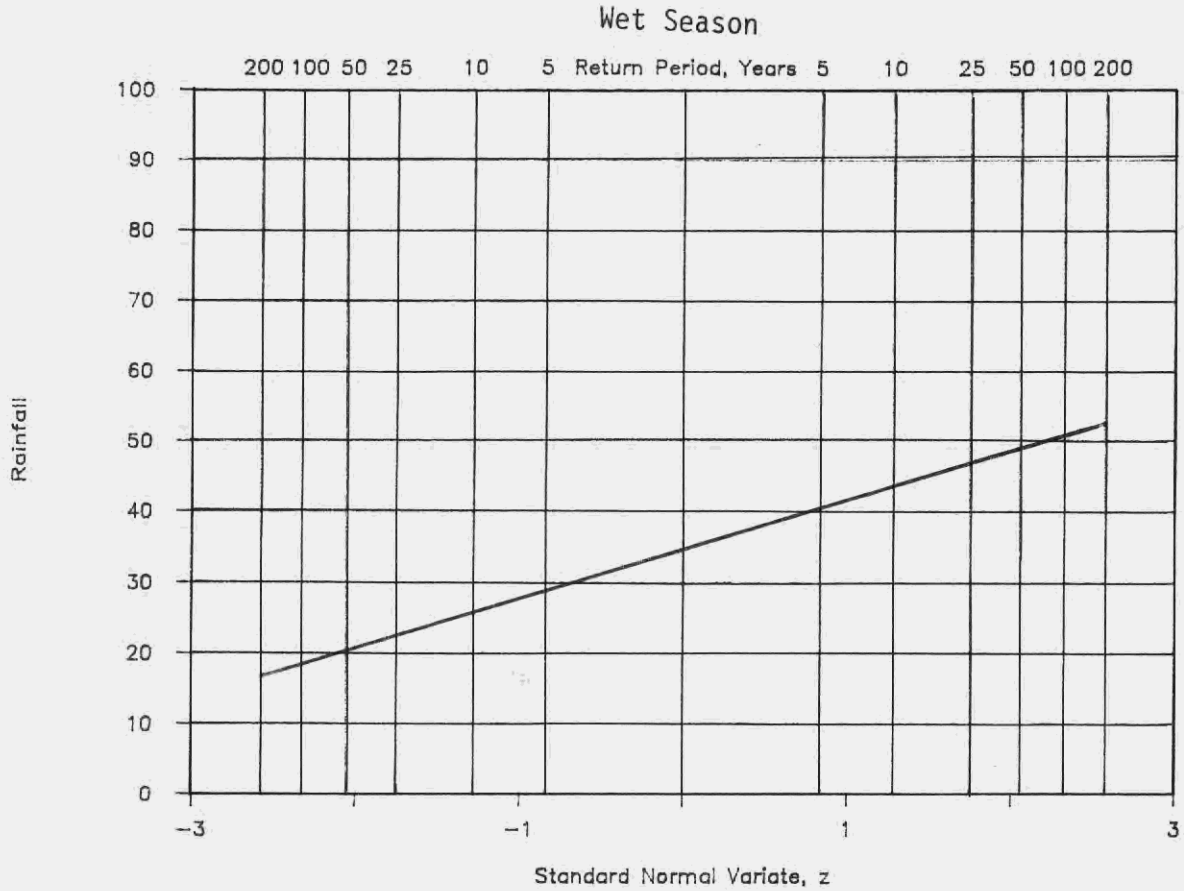

WATER CONSERVATION AREA 3
Dry Season
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

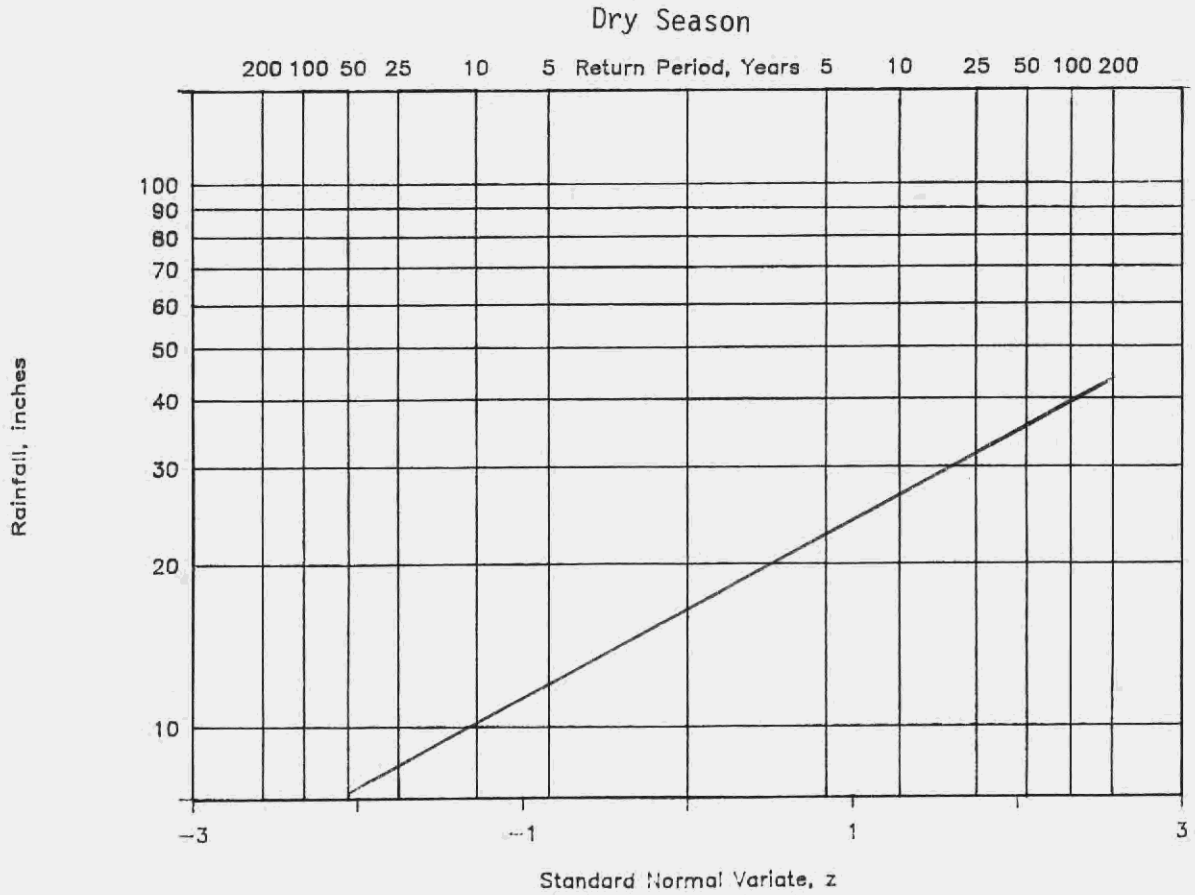

WATER CONSERVATION AREA 3
ANNUAL RAINFALL
Probability Density Function: f(X)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X


WATER CONSERVATION AREA 3
ANNUAL RAINFALL
Cumulative Distribution Function: F(X)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Rainfall (inches): X
CDF: P(X ≤ x)
1-CDF: P(X ≥ x)

Appendix D

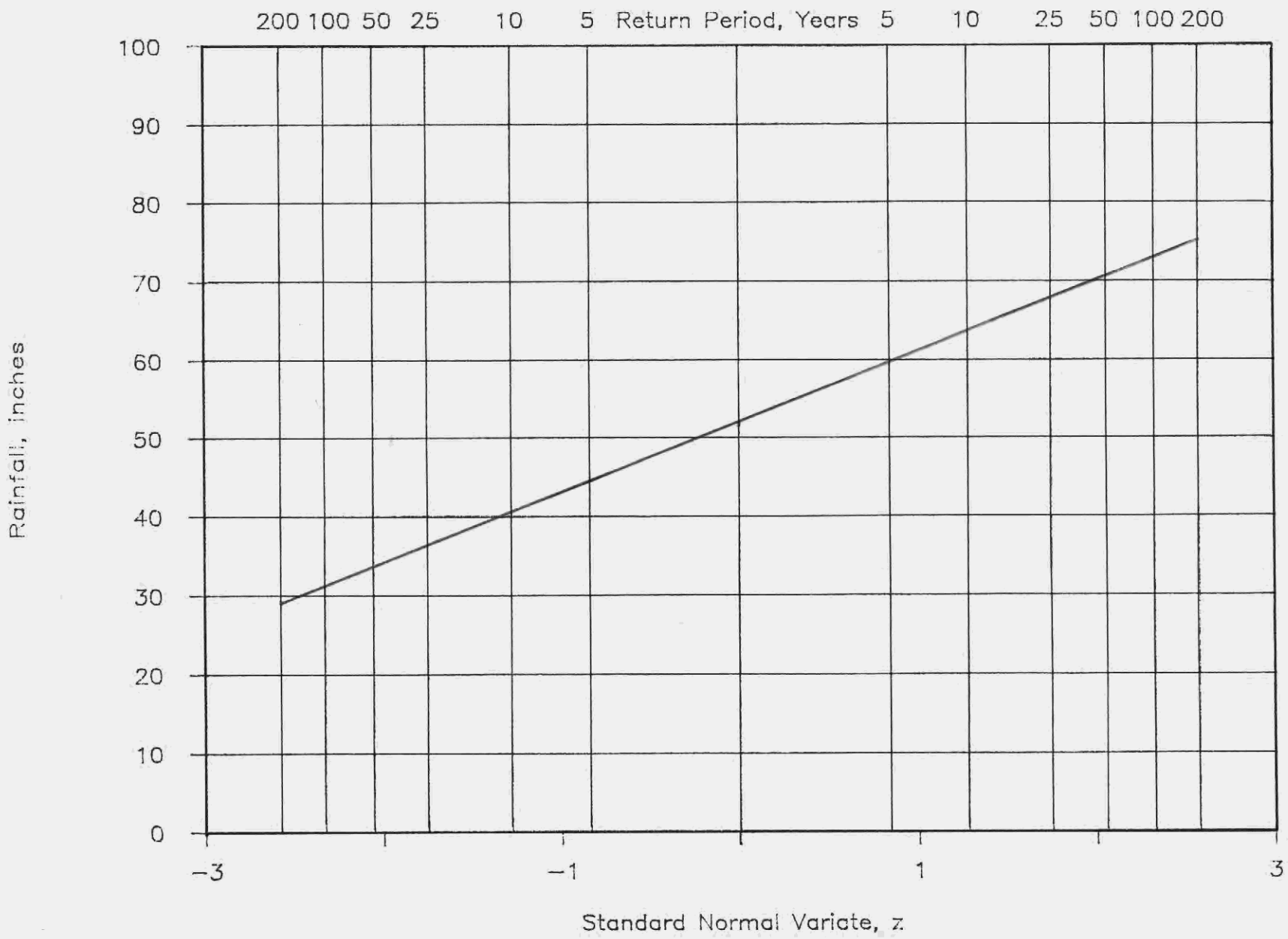
Rainfall Magnitude and Frequency Plots



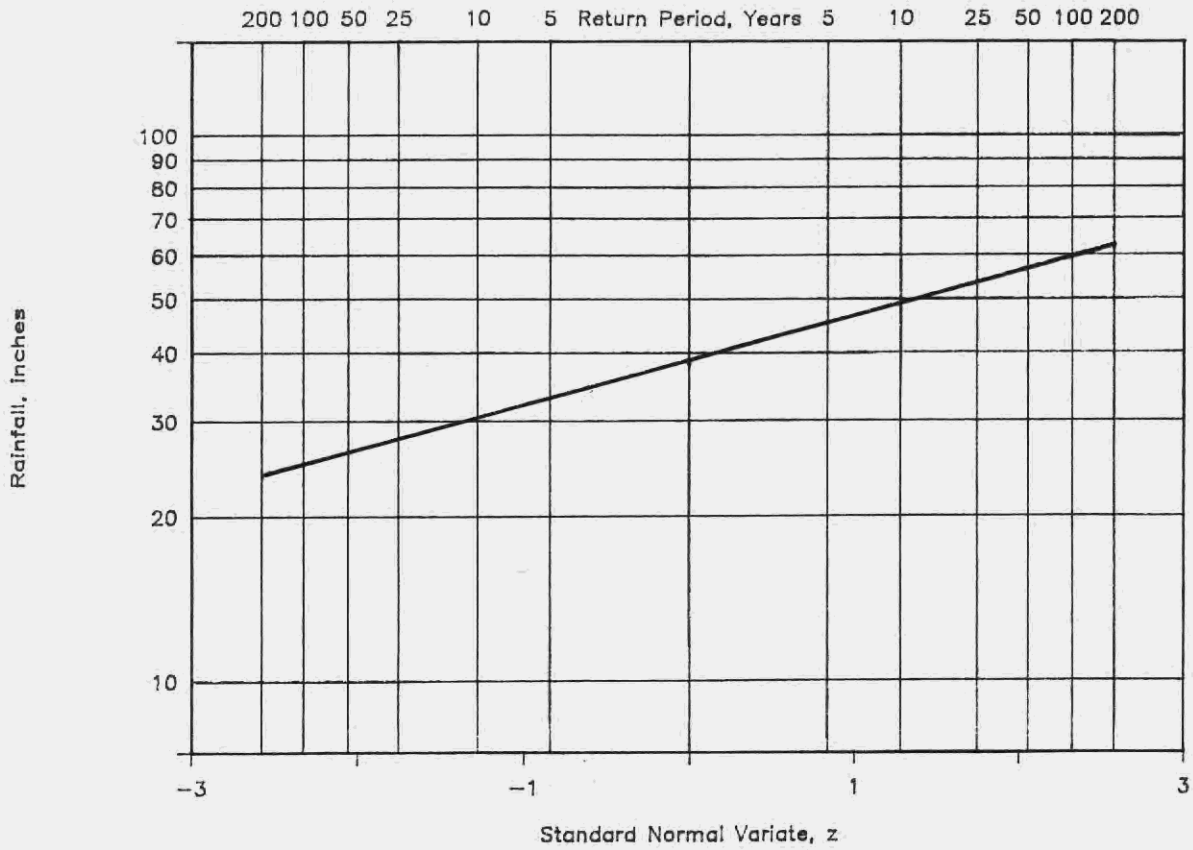


Everglades Agricultural Area

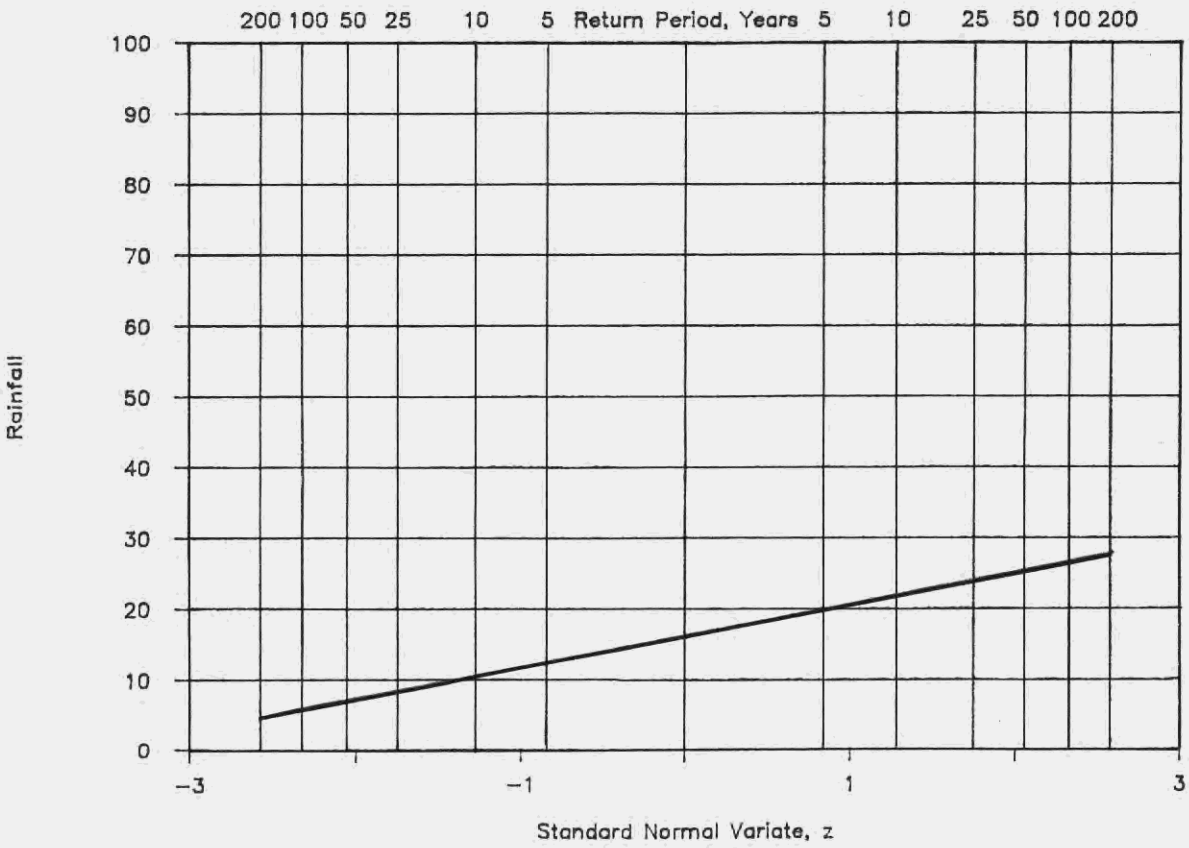
Everglades Agricultural Area



Wet Season

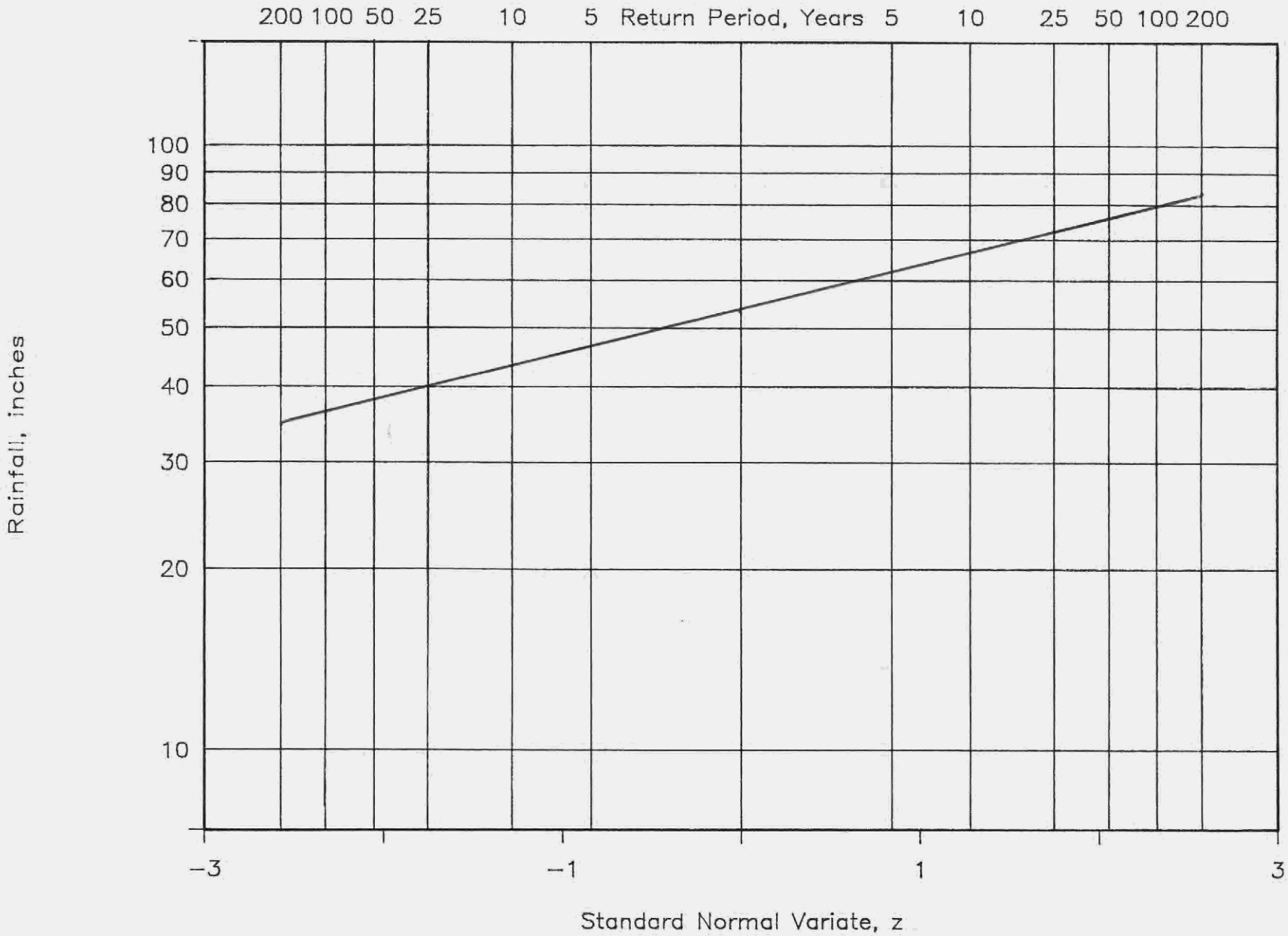


Dry Season

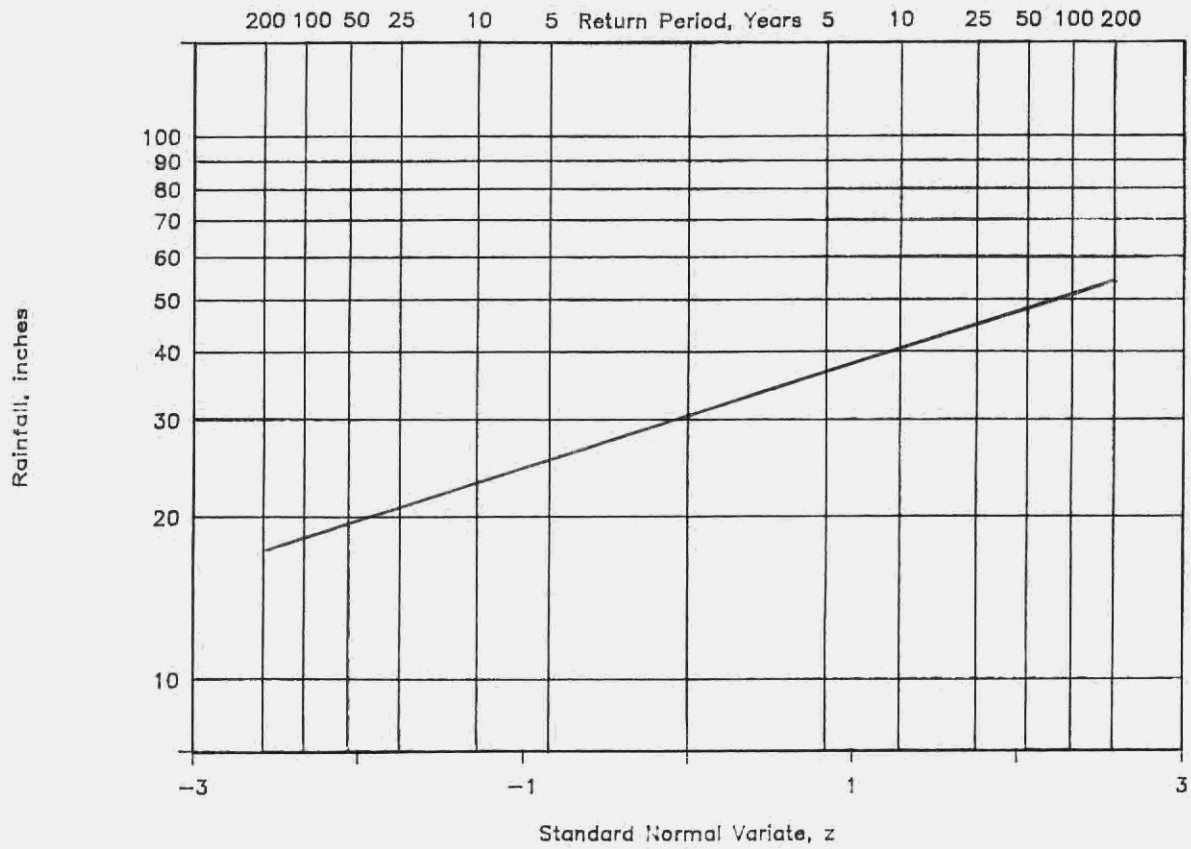


Everglades National Park

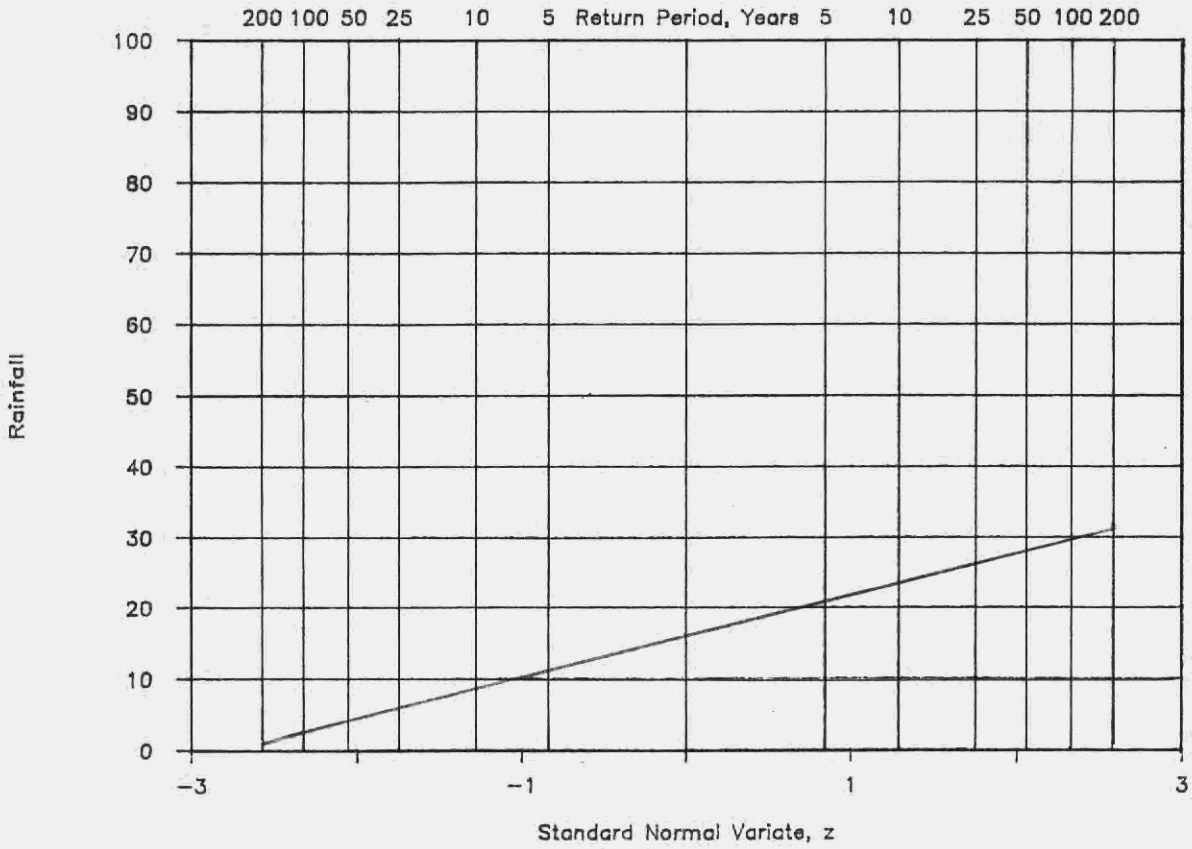
Everglades National Park



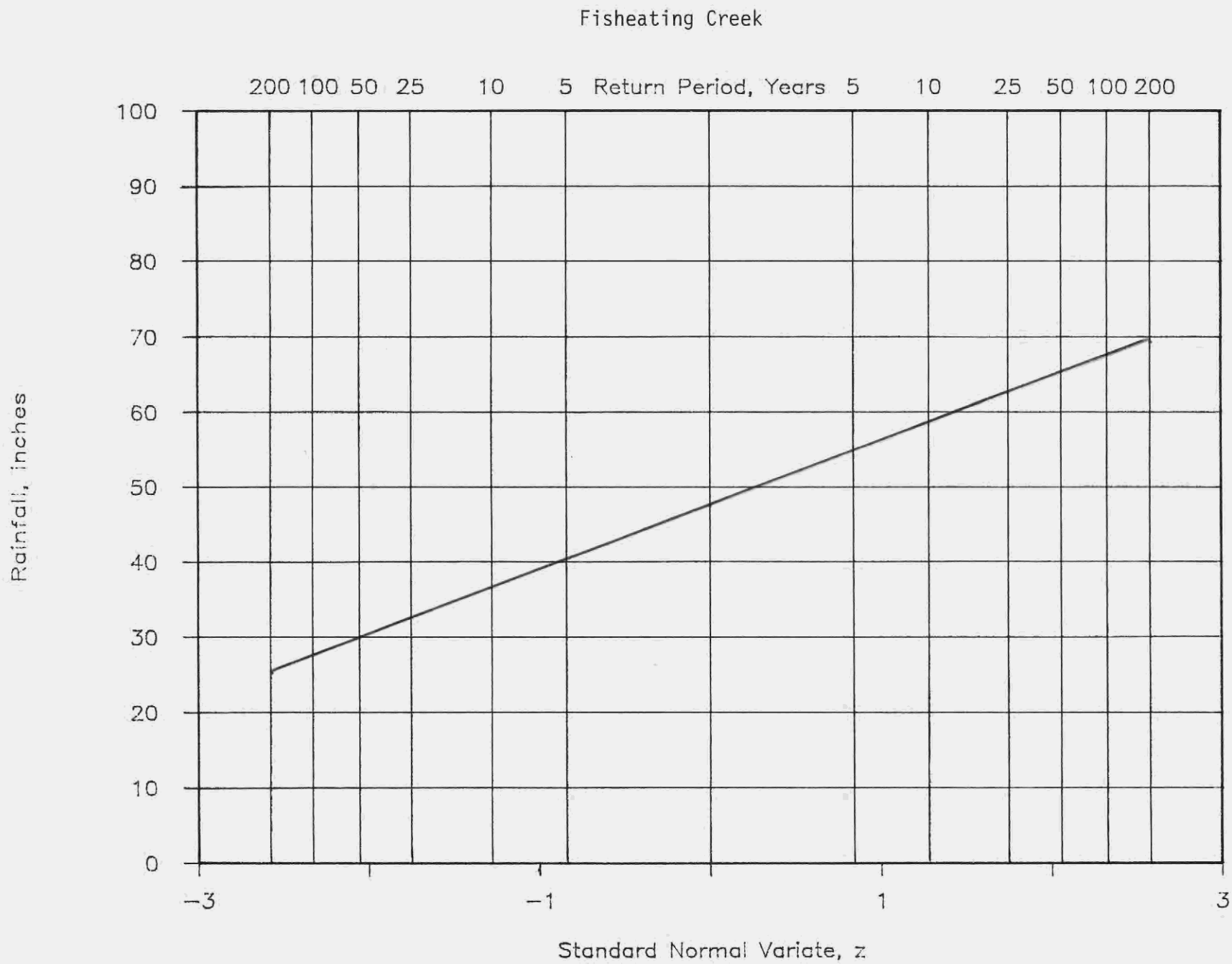
Wet Season



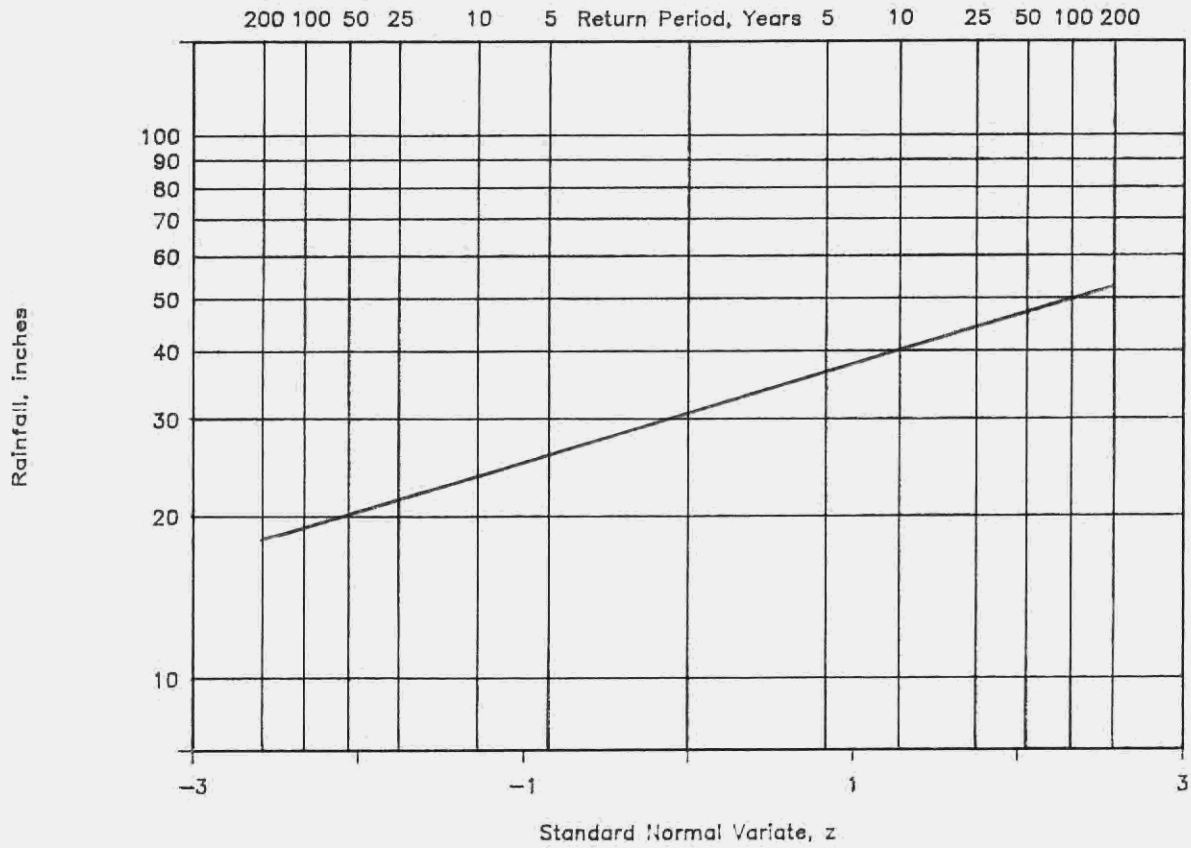
Dry Season



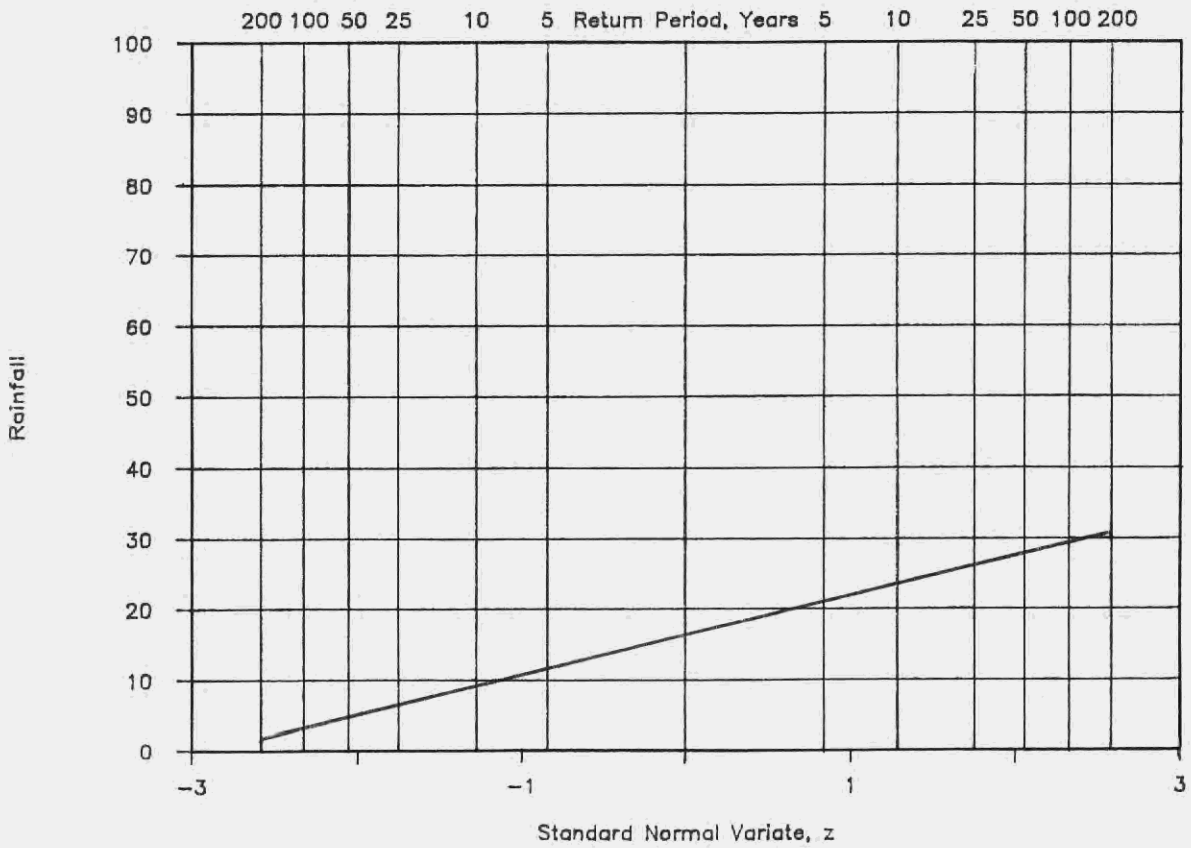
Fisheating Creek


Fisheating Creek
200 100 50 25 10 5 Return Period, Years 5 10 25 50 100 200
100
90
80
70
60
50
40
30
20
10
0
Rainfall, inches
−3
−1
1
3
Standard Normal Variate, z

Wet Season

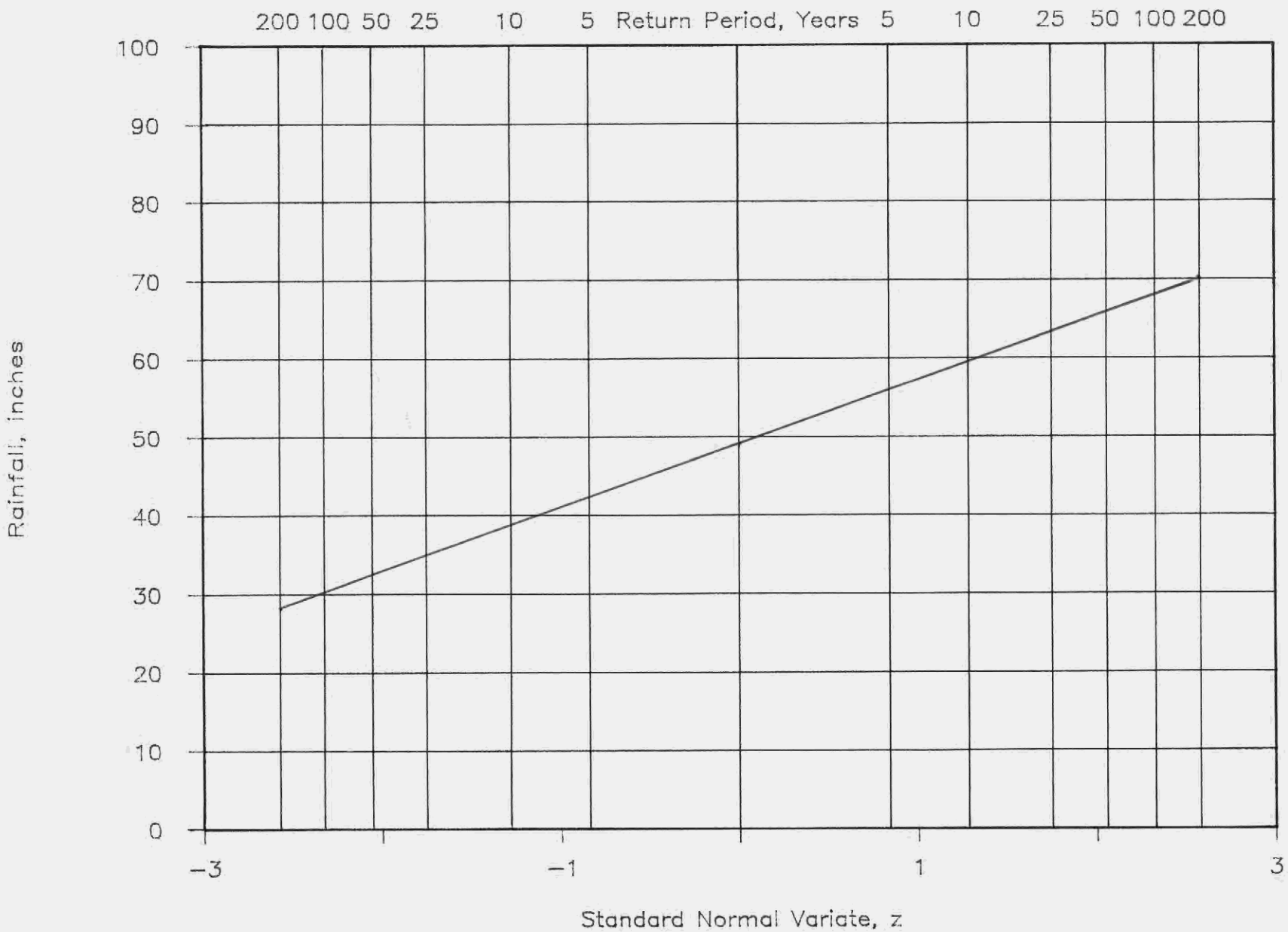


Dry Season

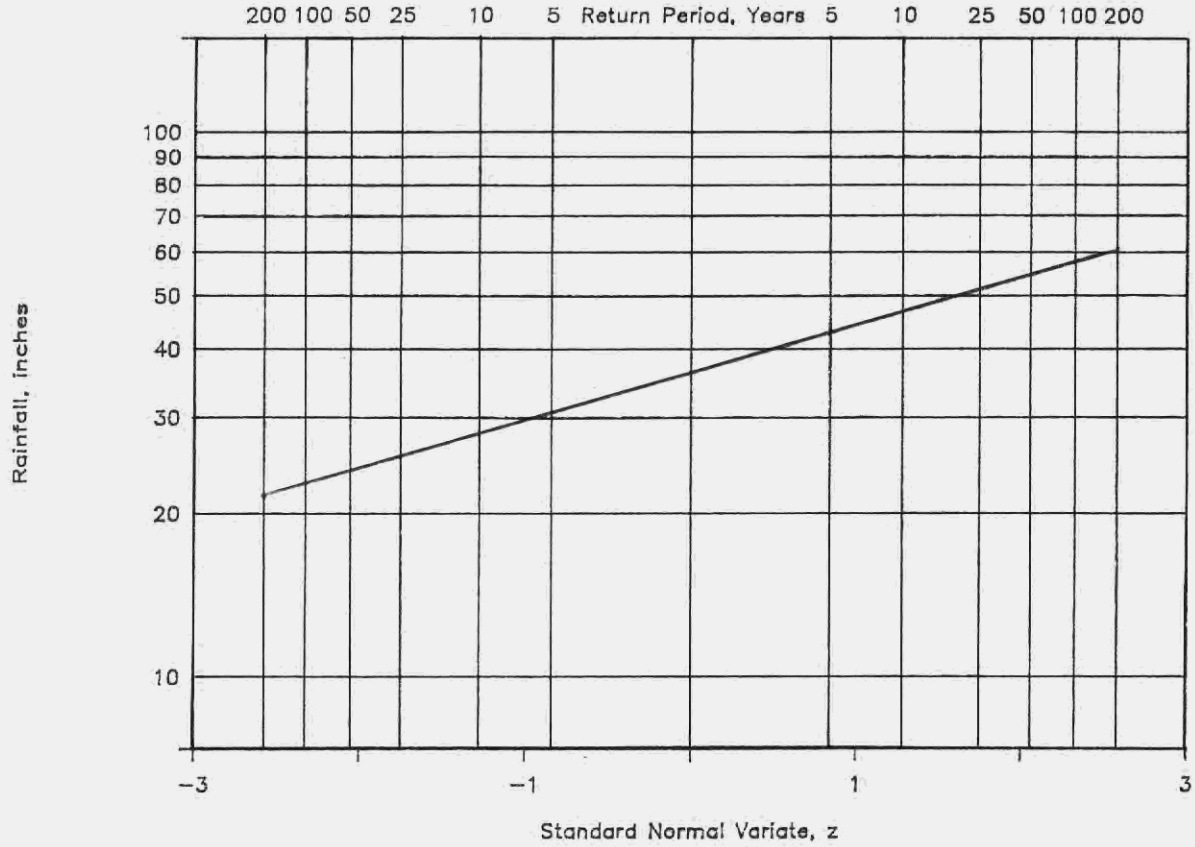


Kissimmee River Basin

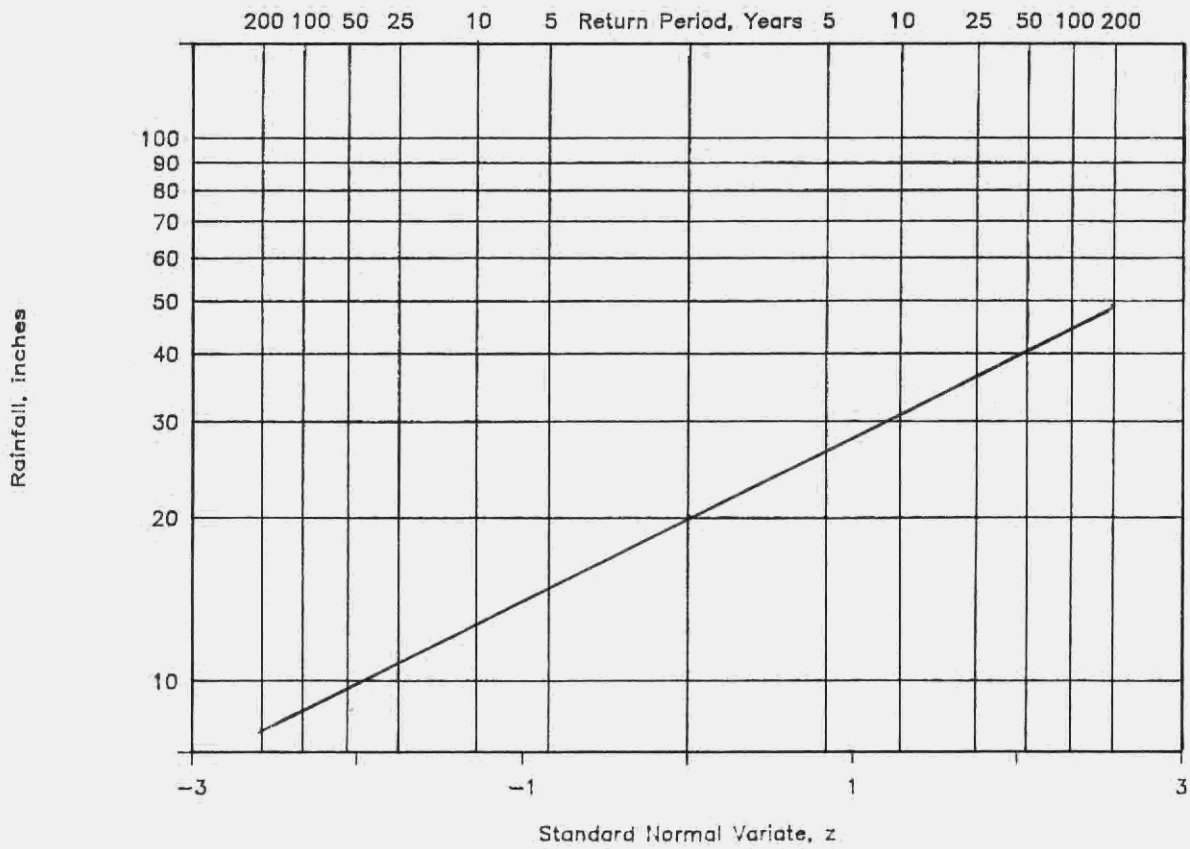
Kissimmee River Basin



Wet Season

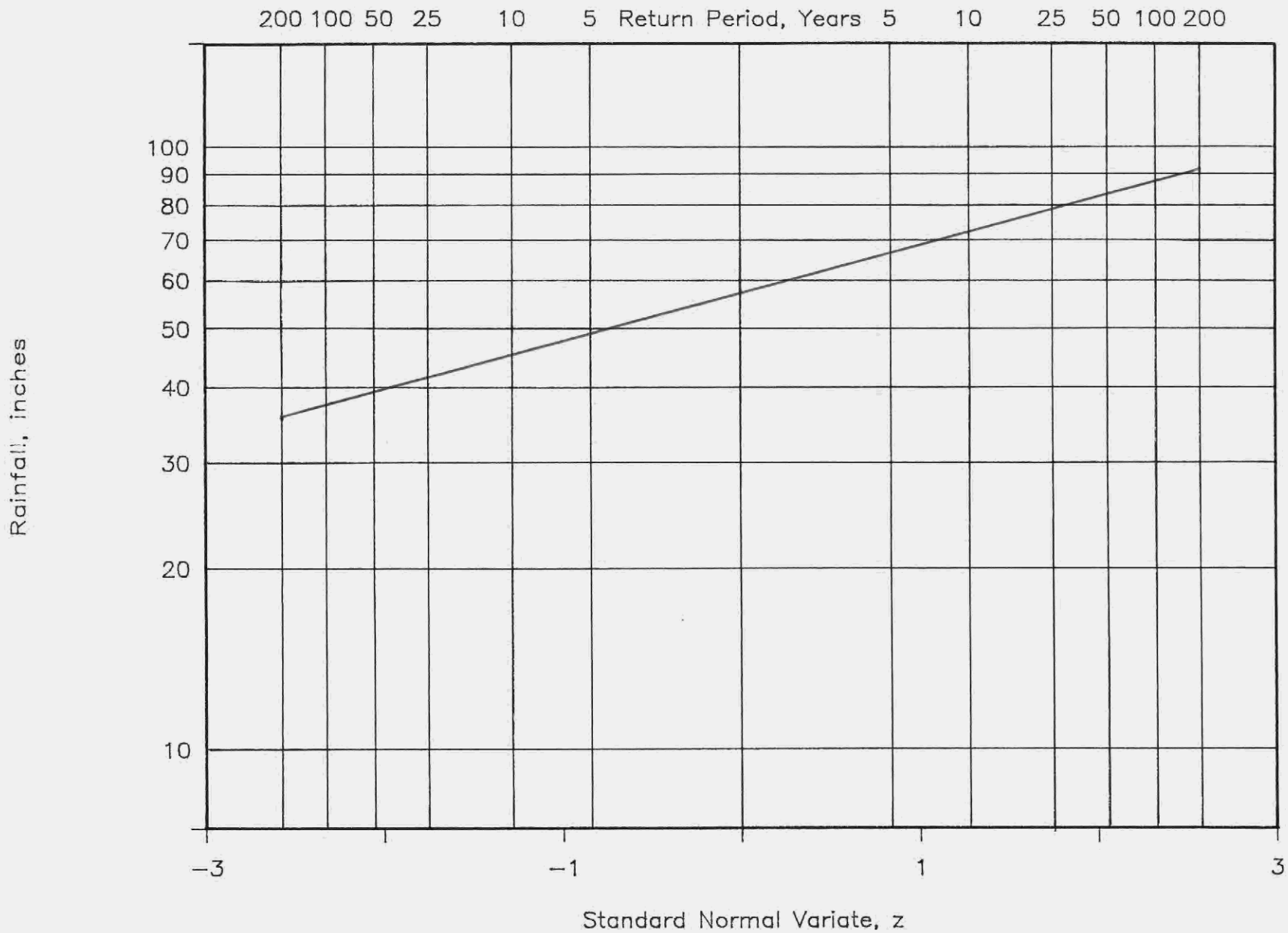


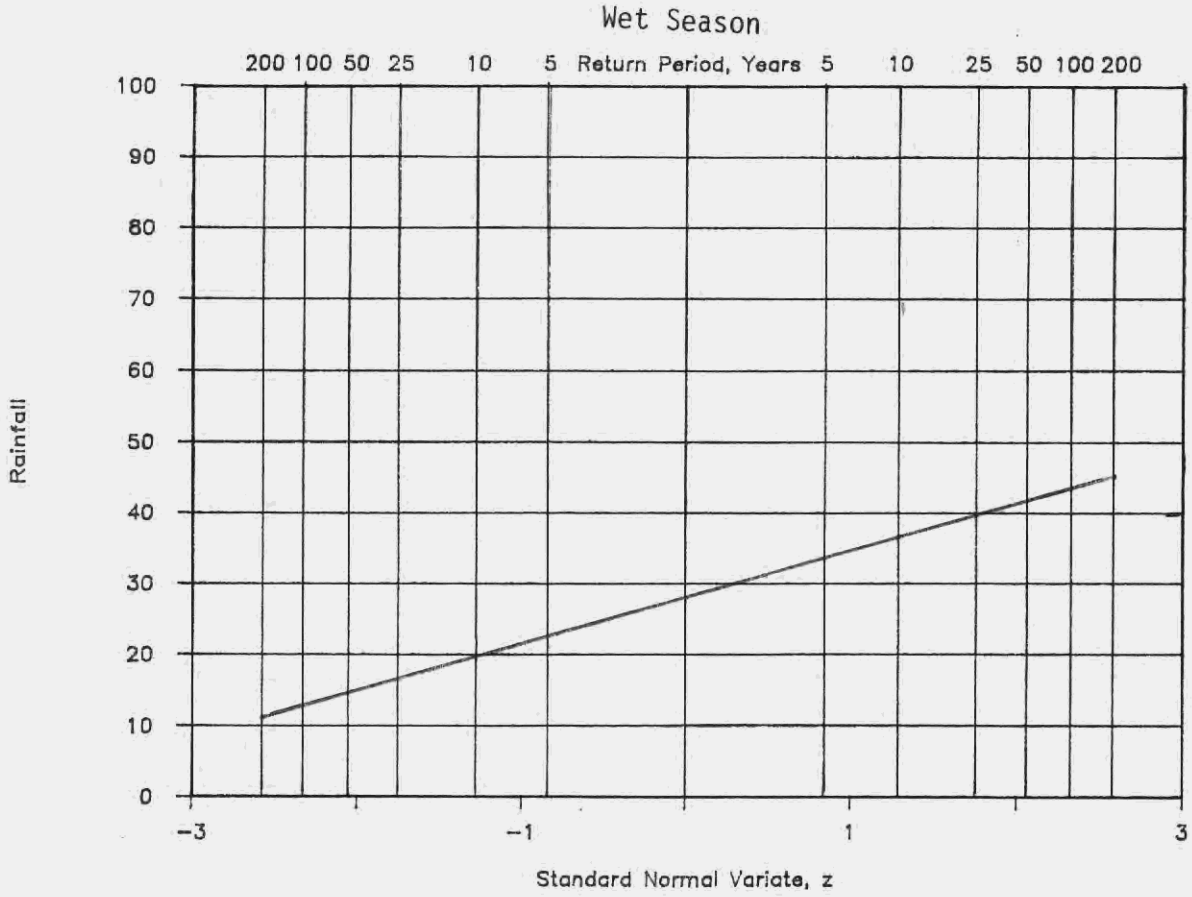
Dry Season

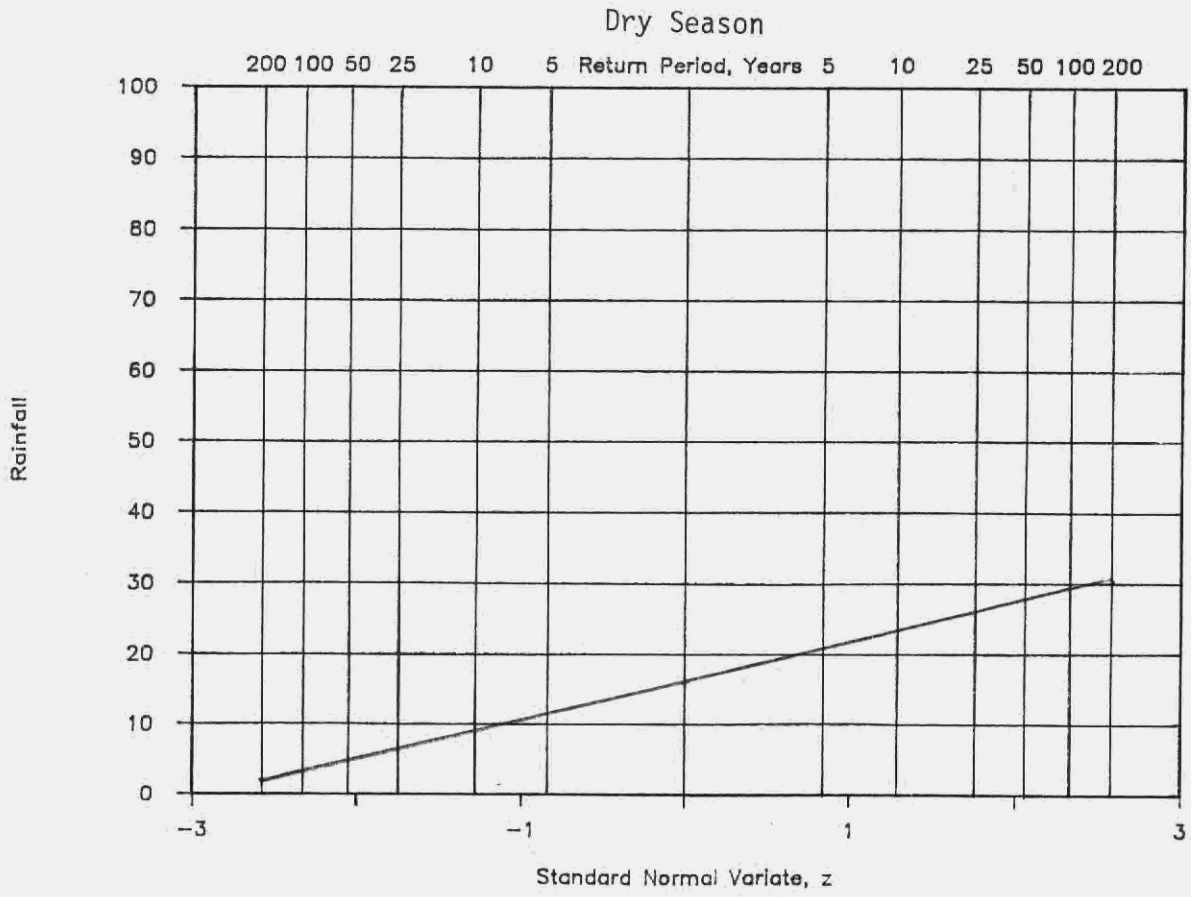


Lower East Coast

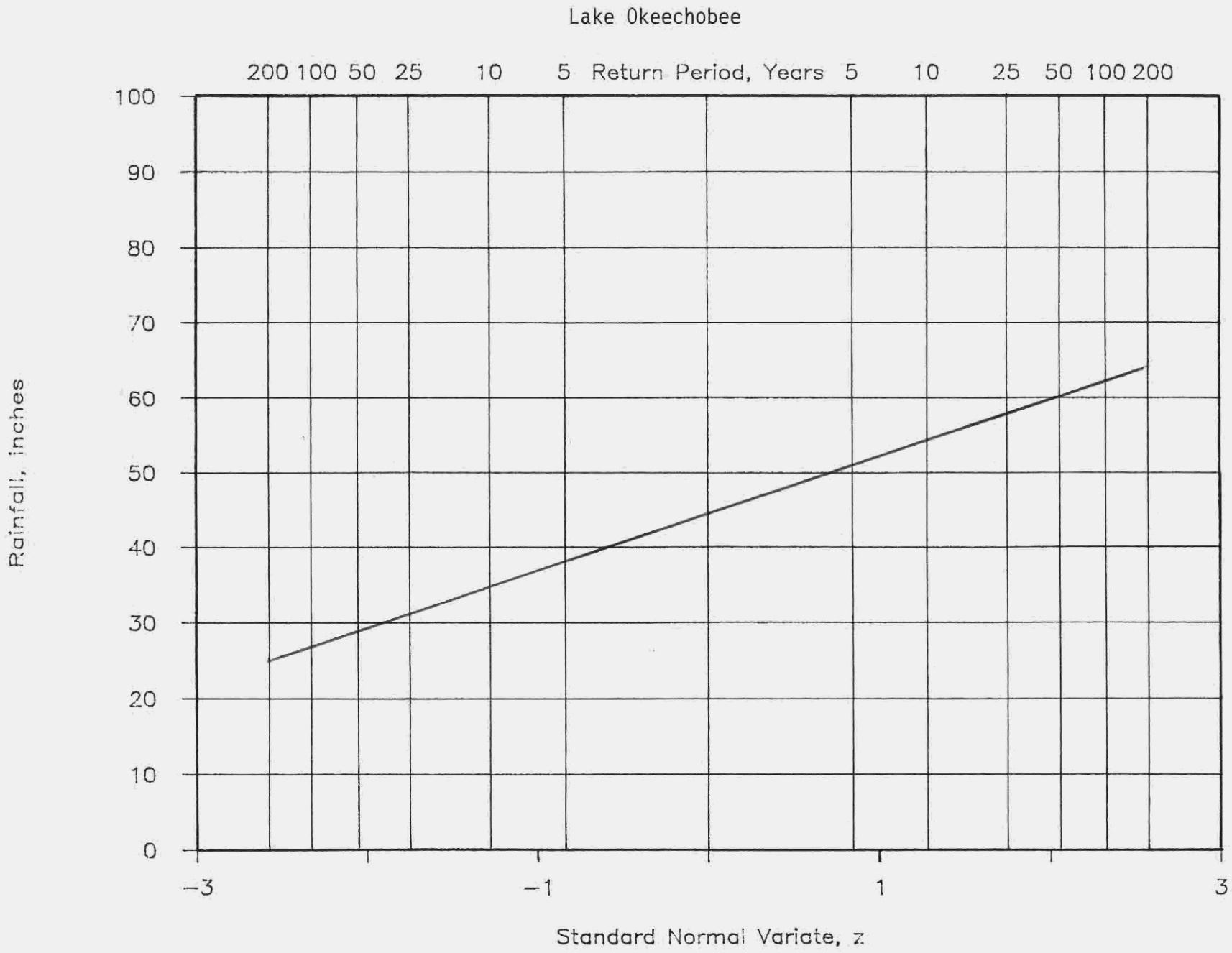
Lower East Coast



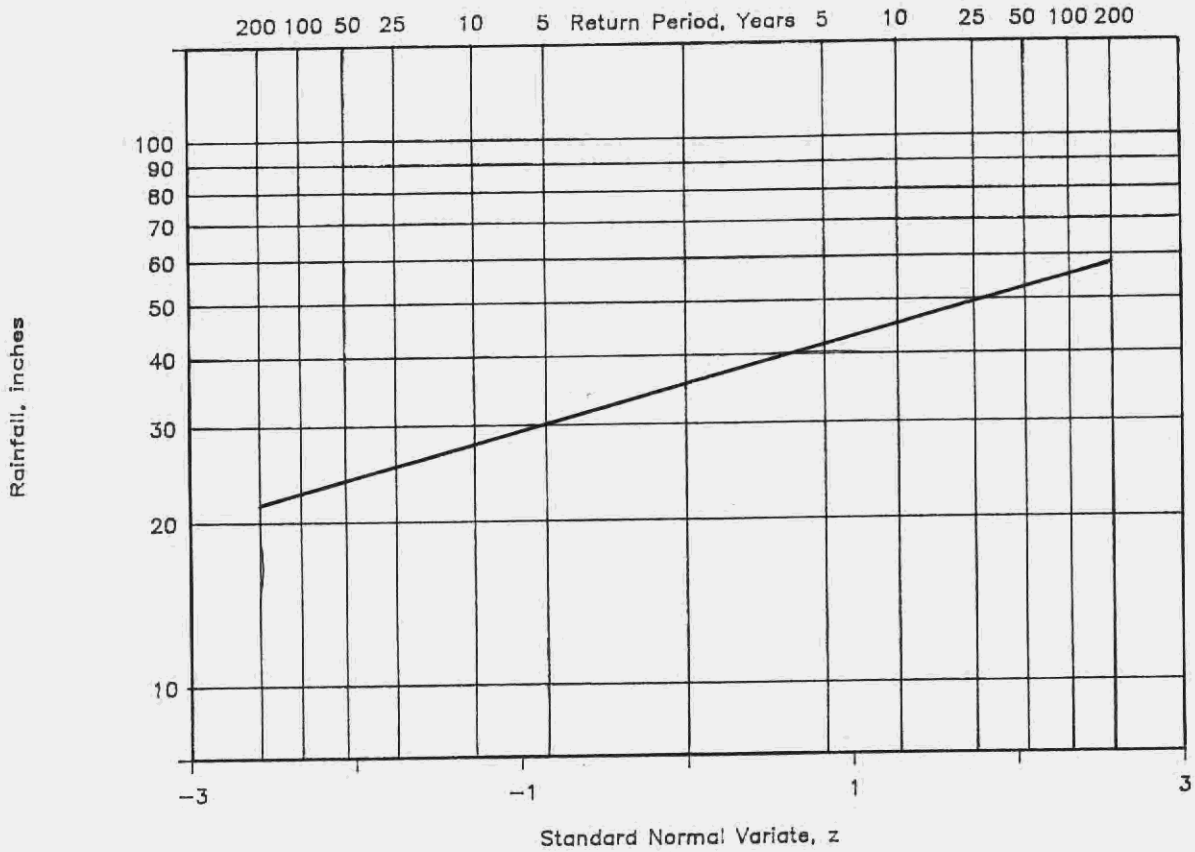




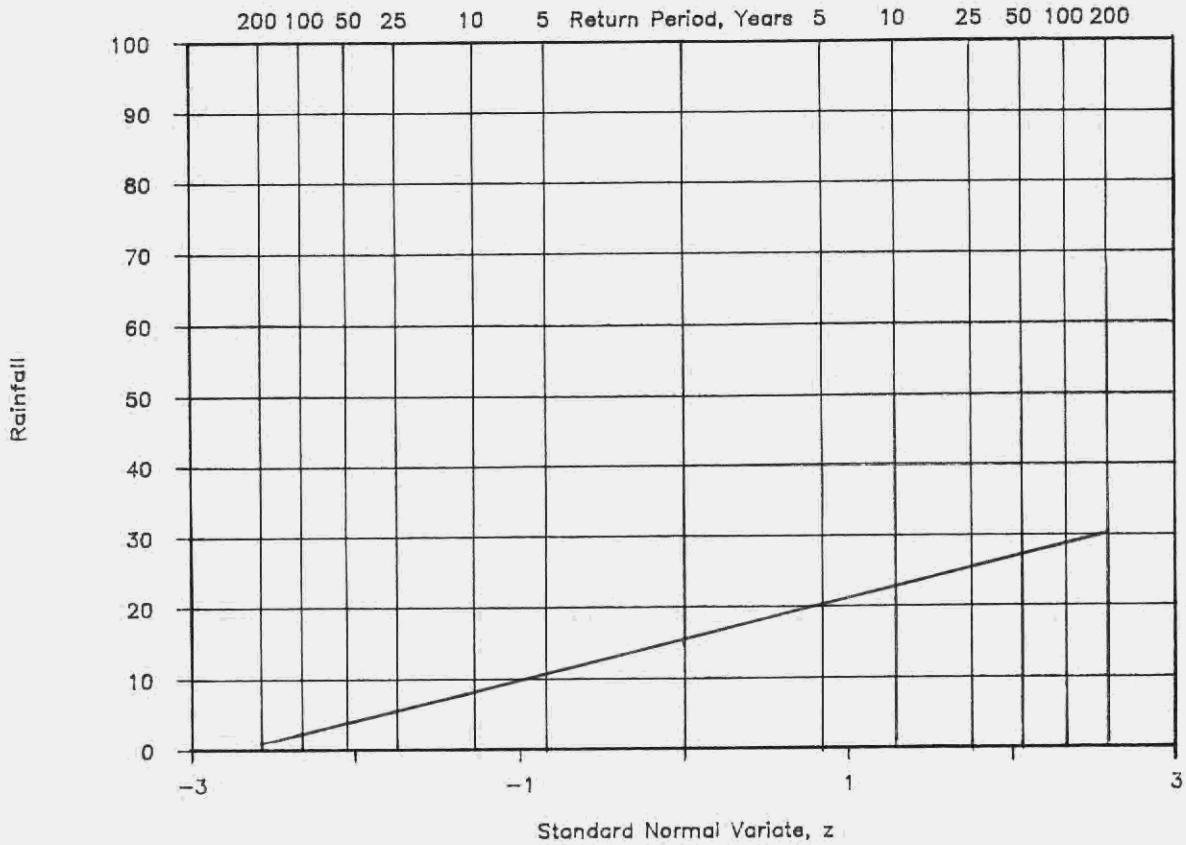
Lake Okeechobee


Lake Okeechobee
200 100 50 25 10 5 Return Period, Years 5 10 25 50 100 200
100
90
80
70
60
50
40
30
20
10
0
Rainfall, inches
−3
−1
1
3
Standard Normal Variate, z

Wet Season

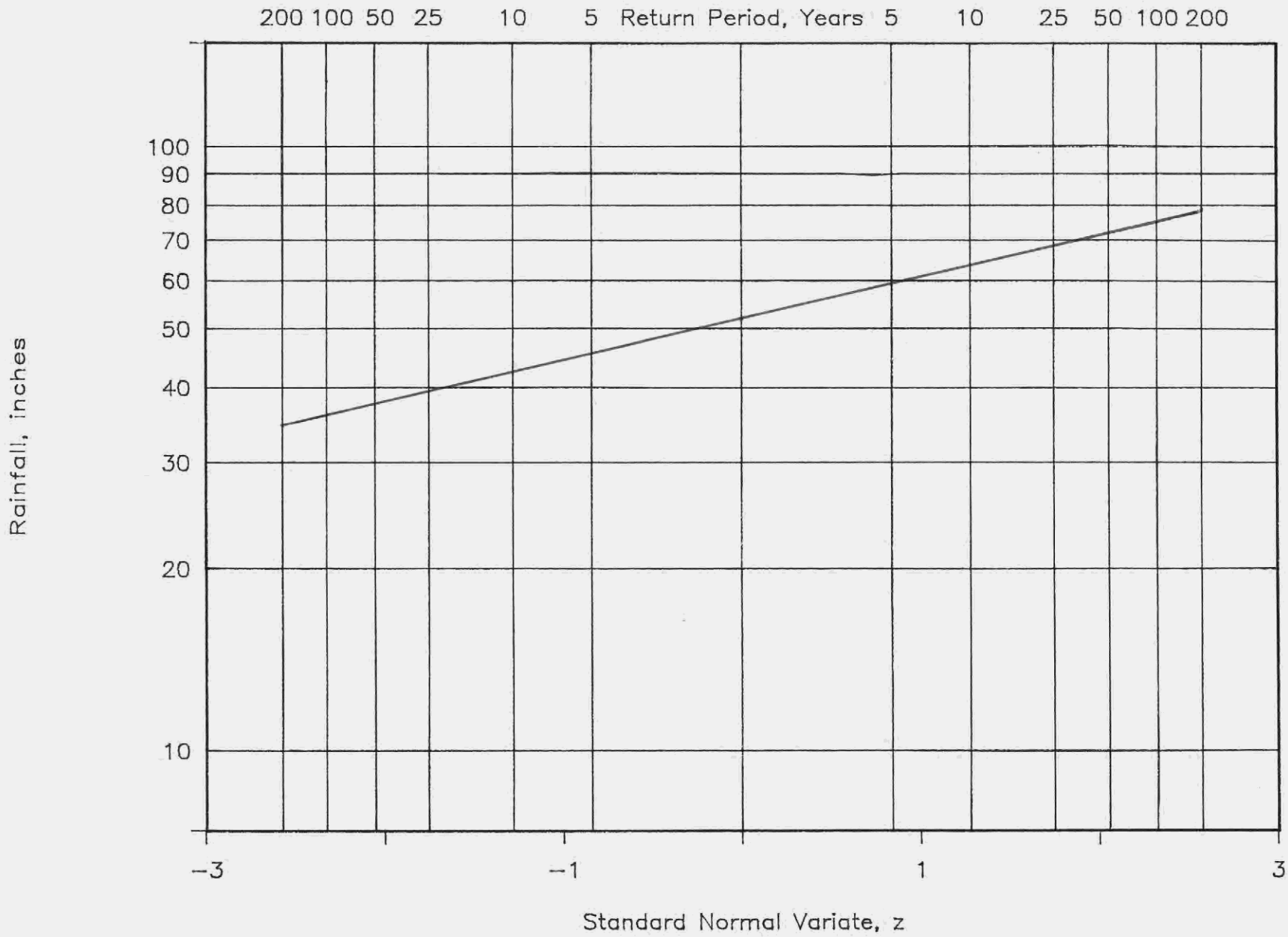


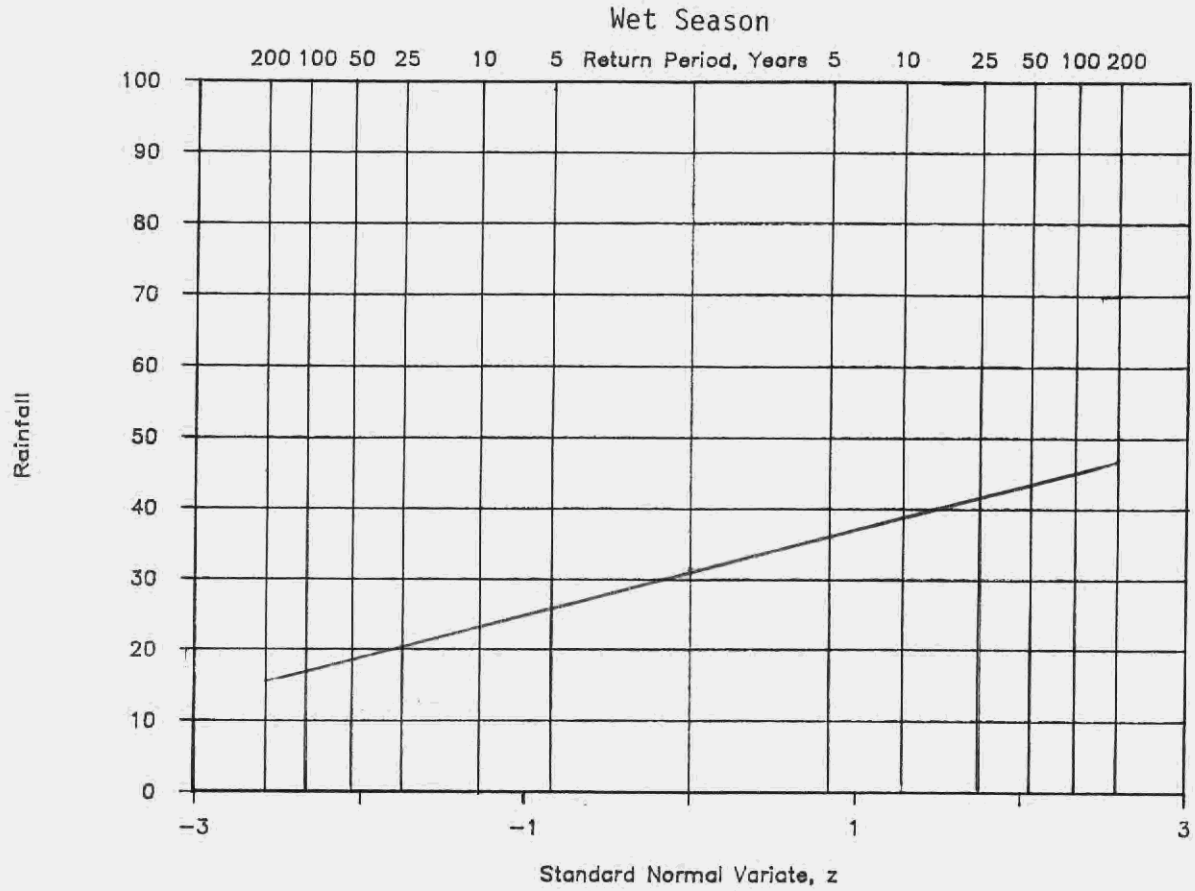
Dry Season

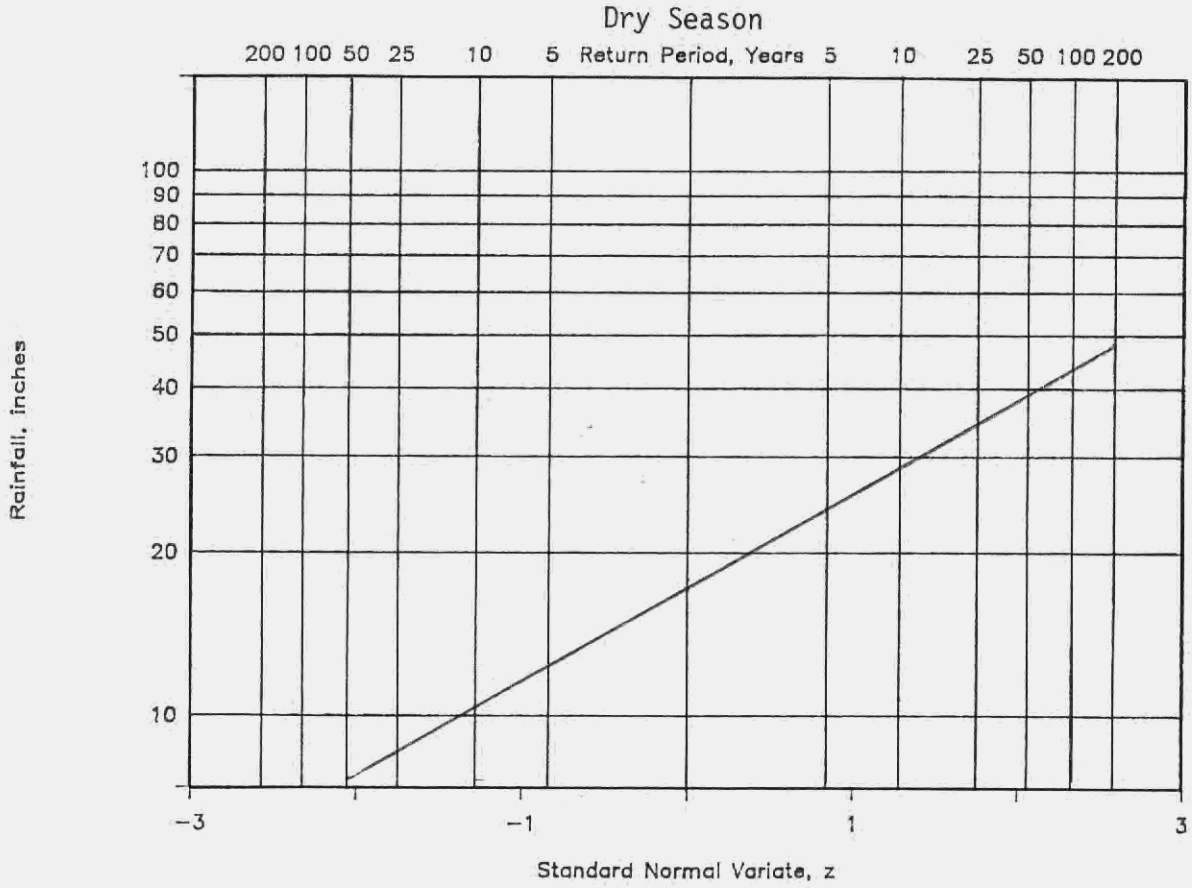


Lower West Coast

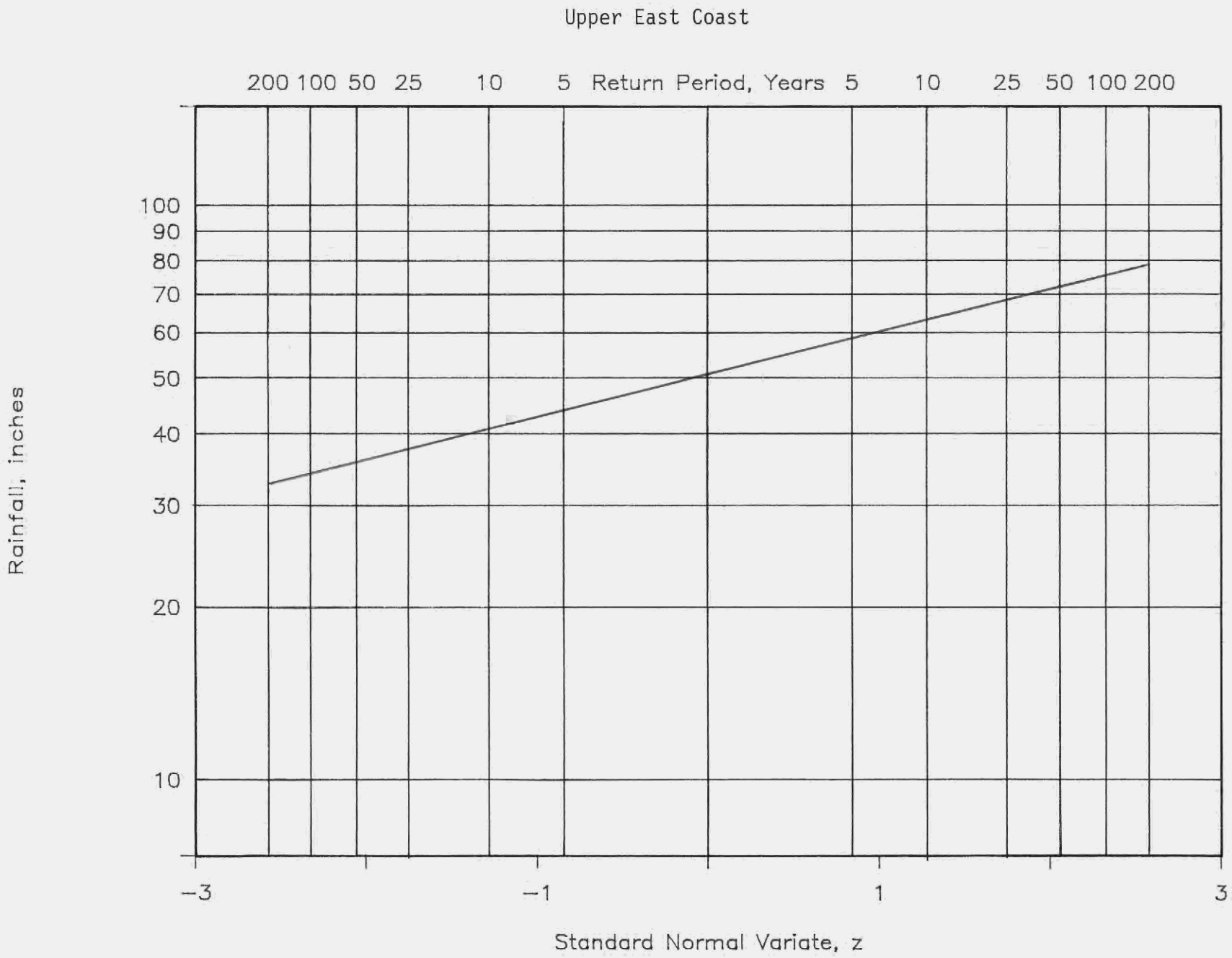
Lower West Coast

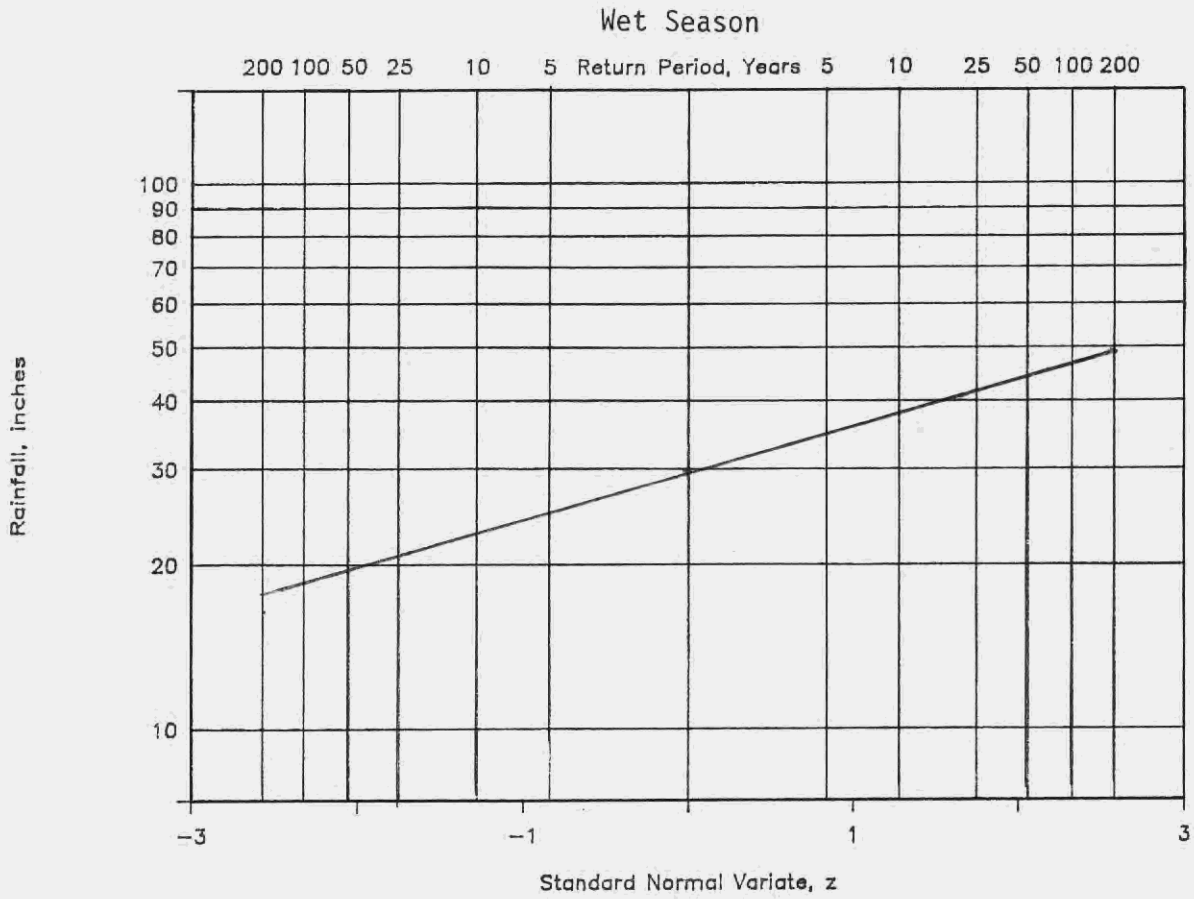


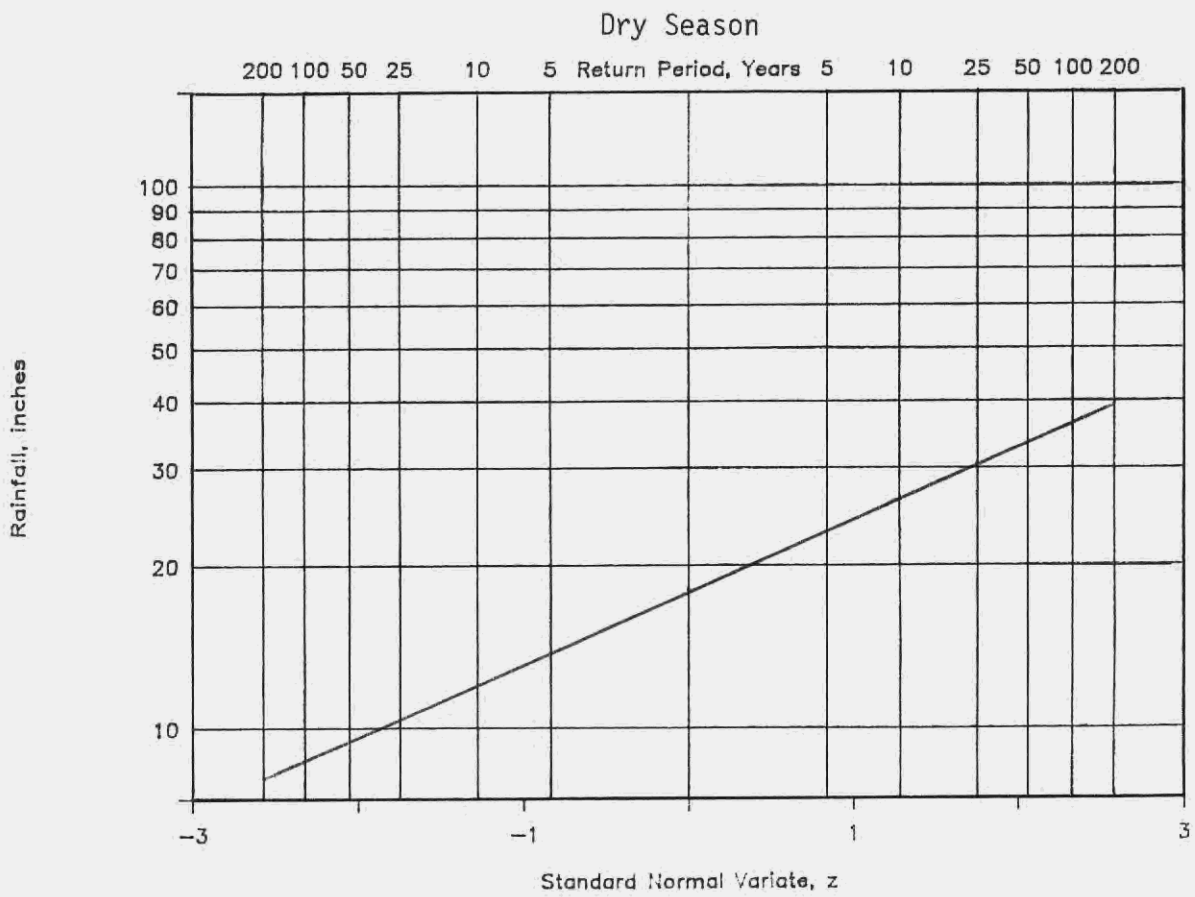




Upper East Coast

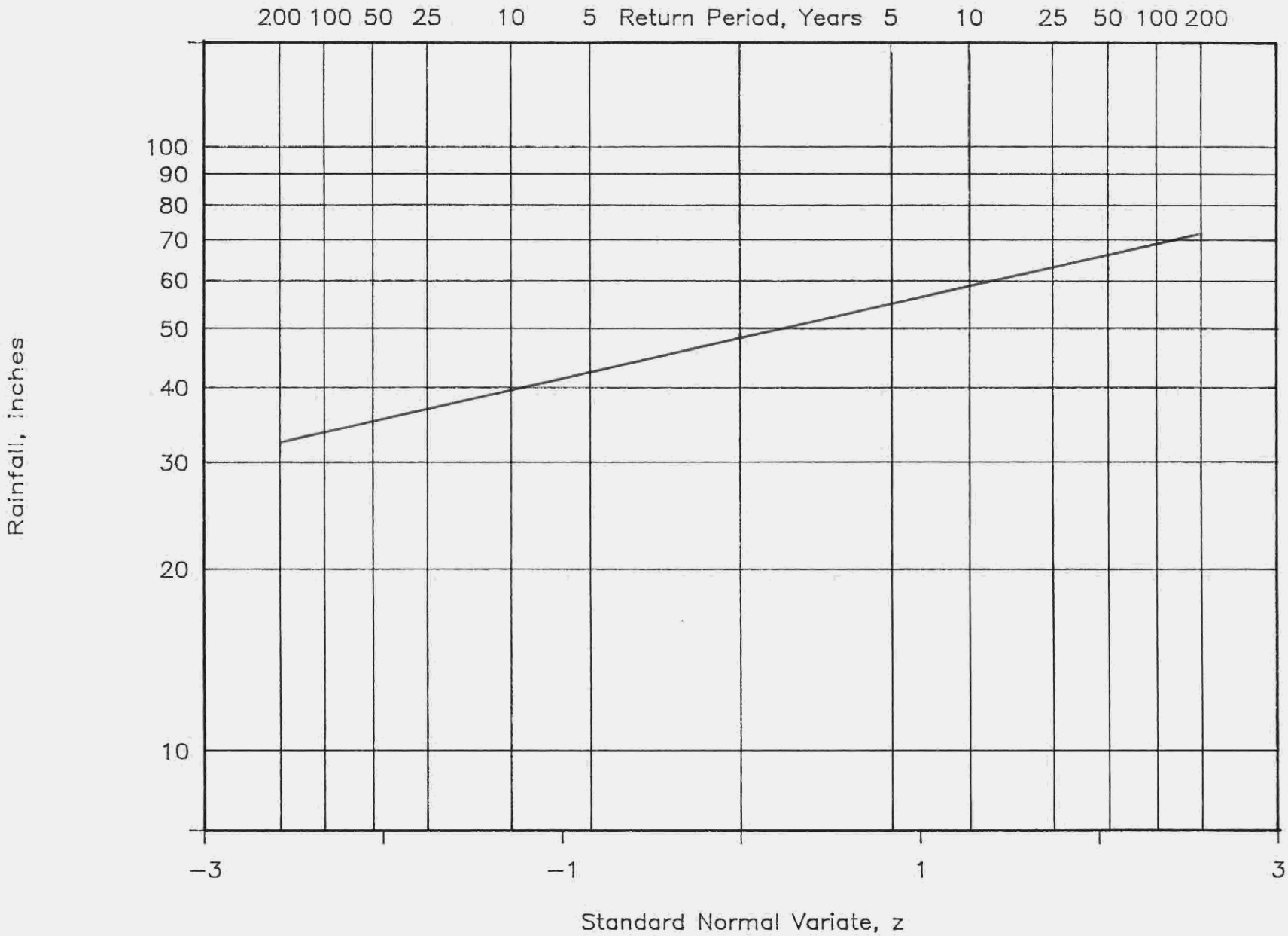

Upper East Coast
200 100 50 25 10 5 Return Period, Years 5 10 25 50 100 200
100
90
80
70
60
50
40
30
20
10
Rainfall, inches
−3
−1
1
3
Standard Normal Variate, z

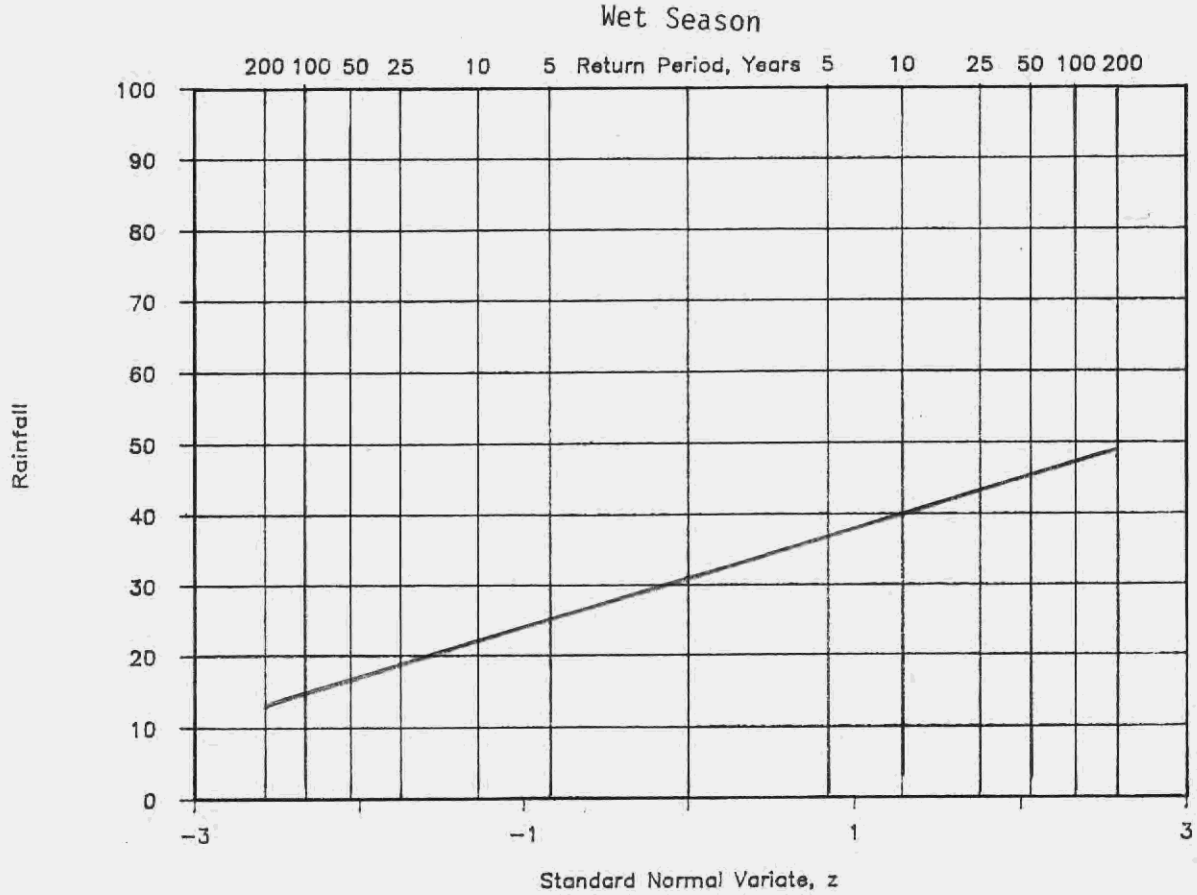


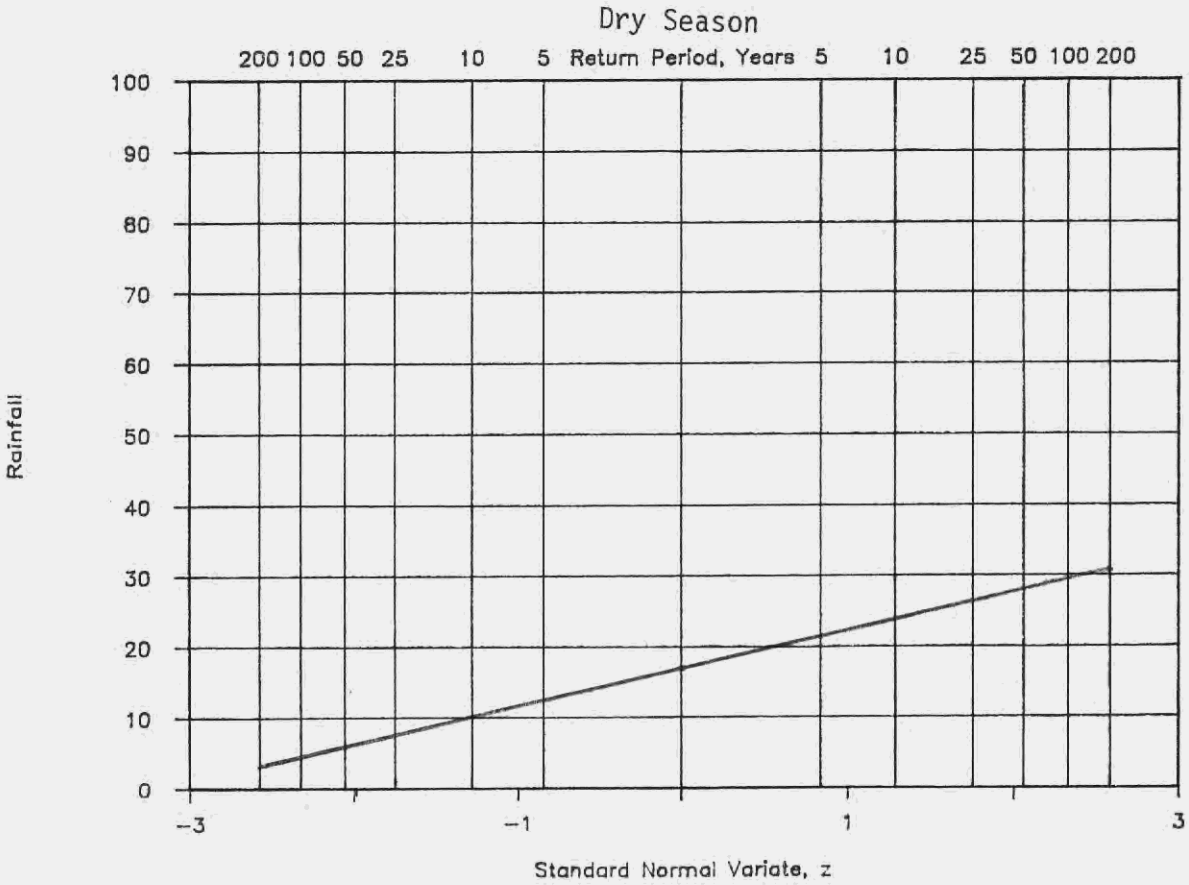


Upper Kissimmee River Basin

Upper Kissimmee River Basin

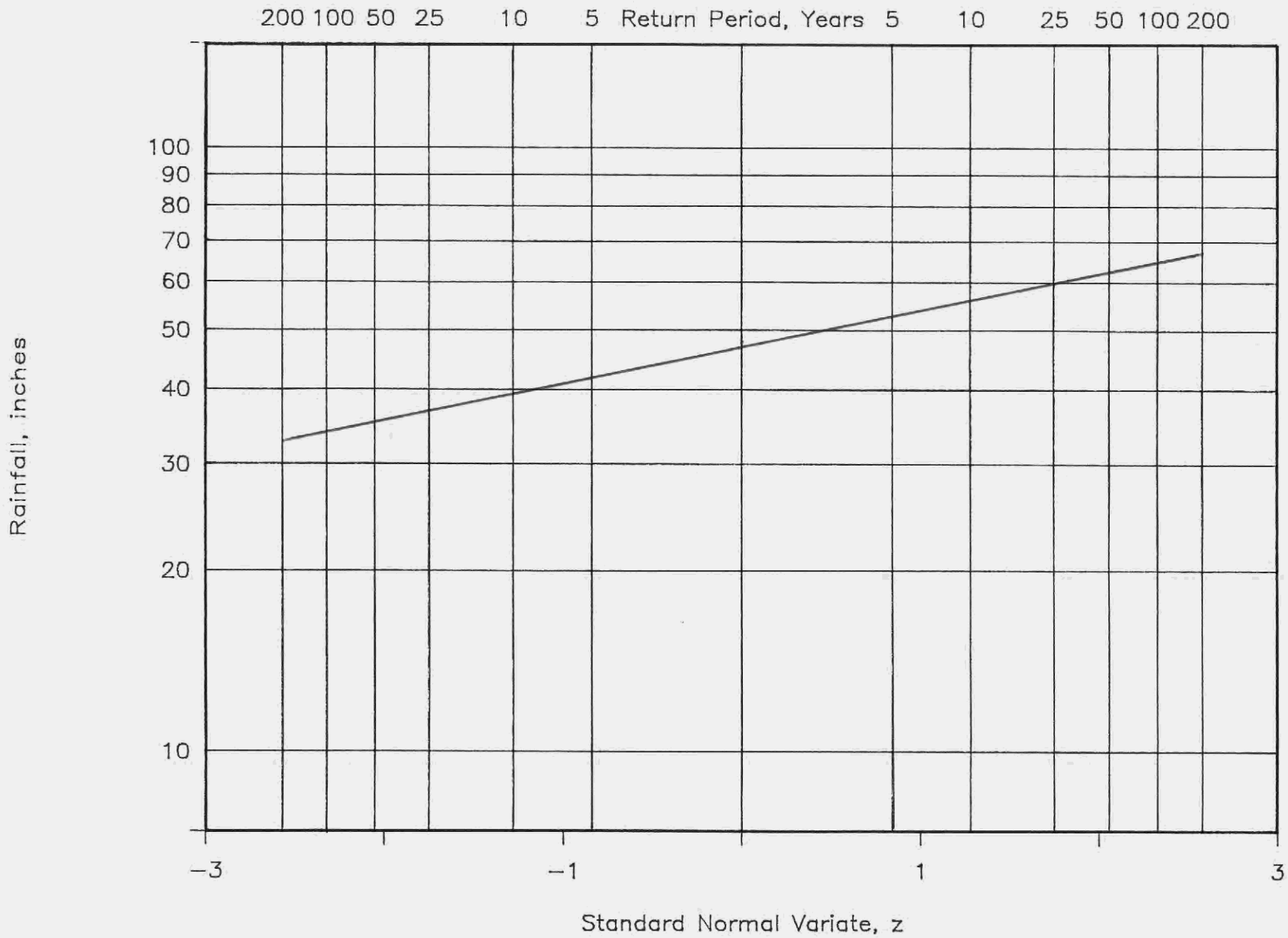


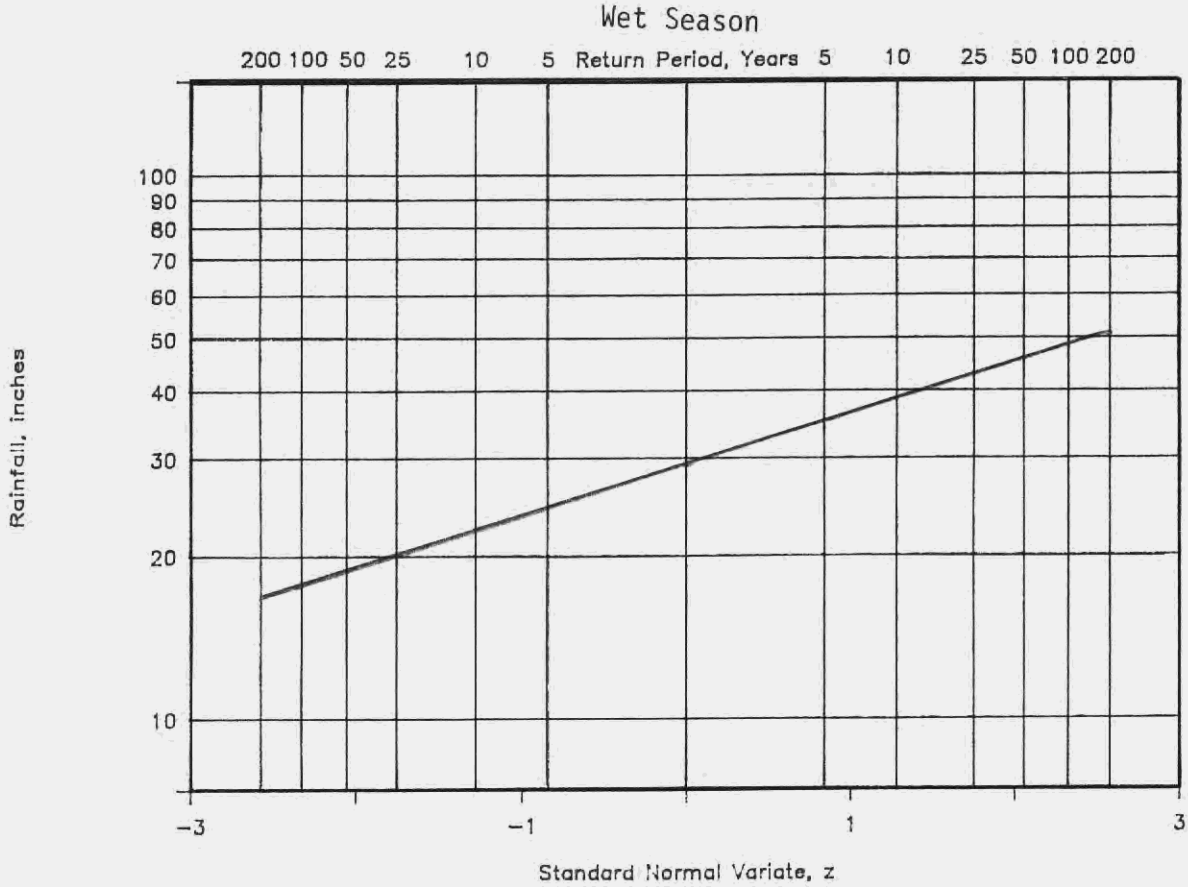


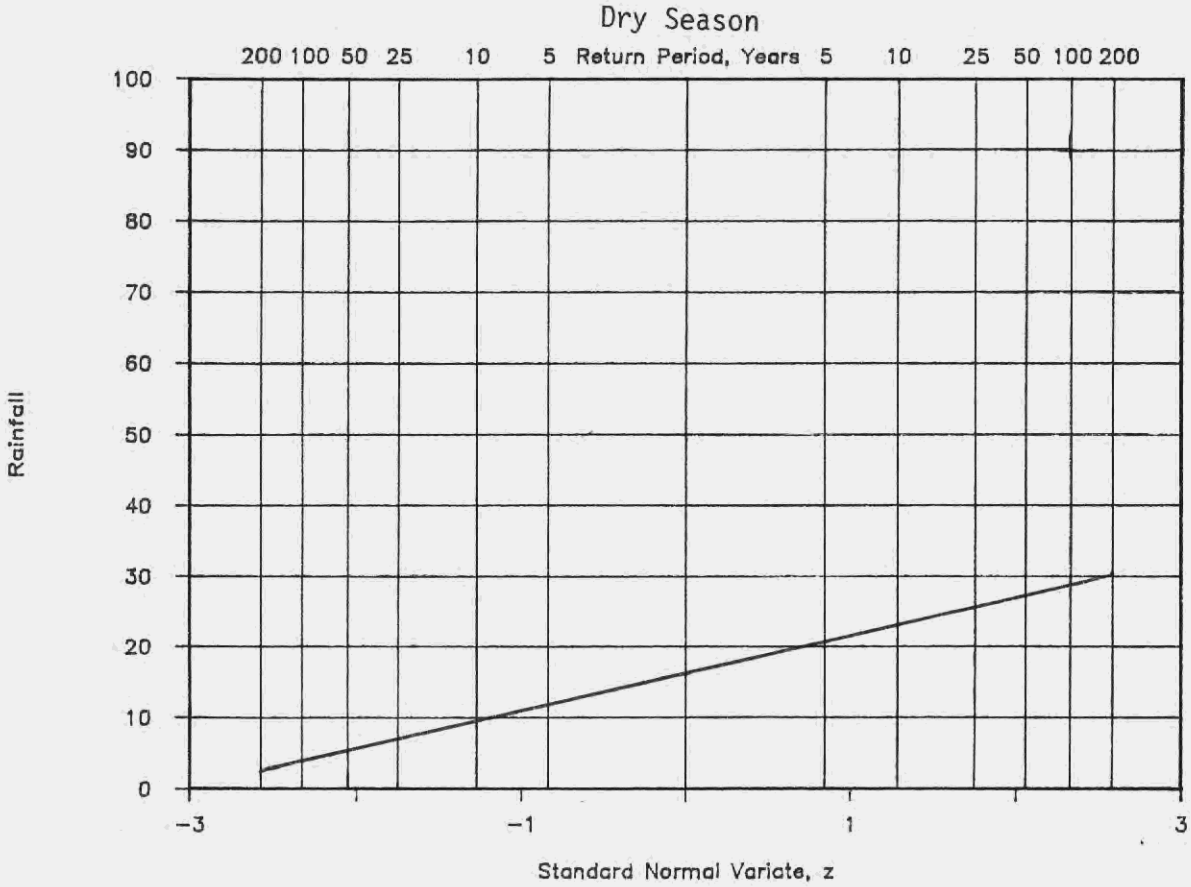


Water Conservation Area 1

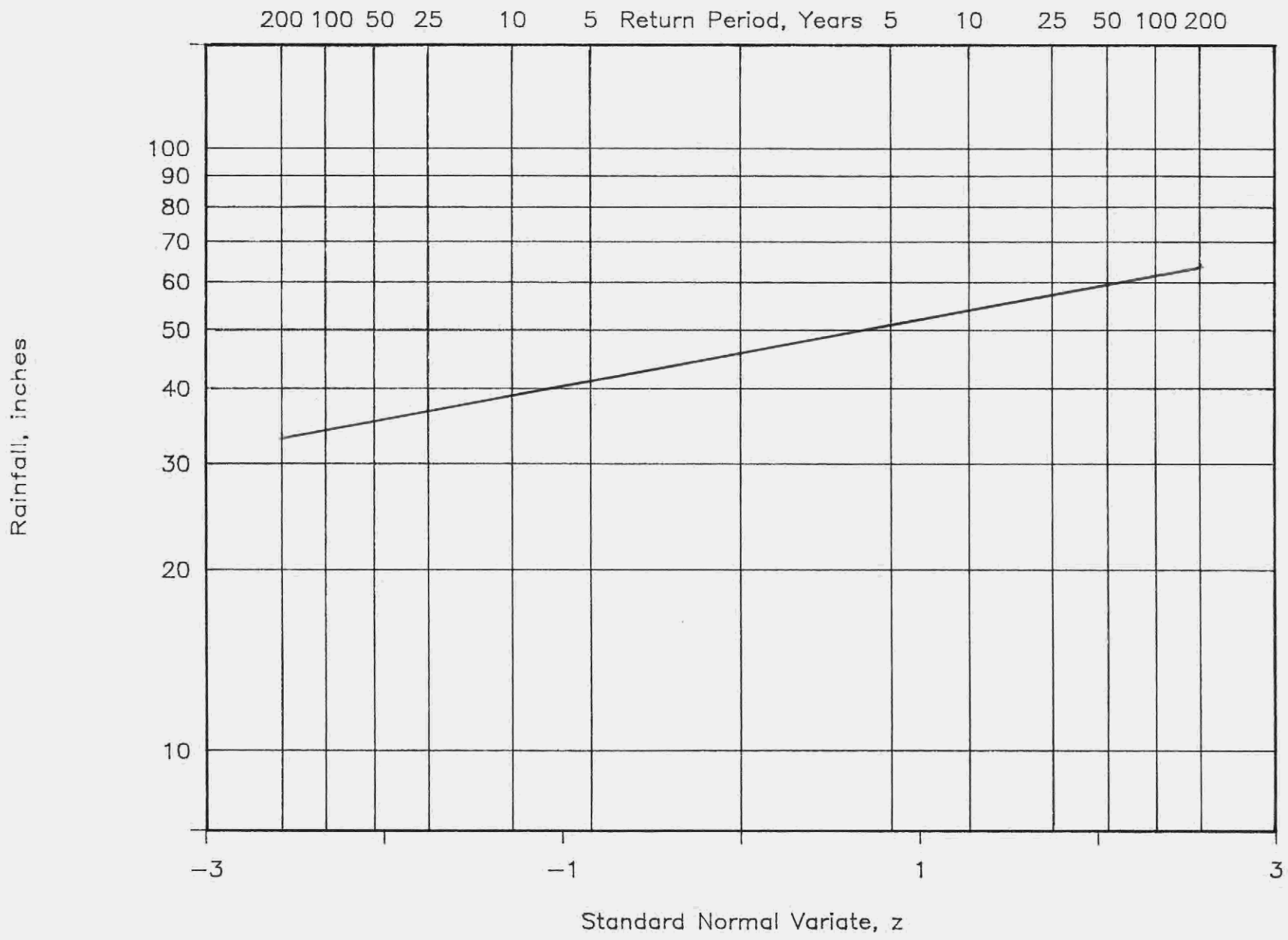
Water Conservation Area 1

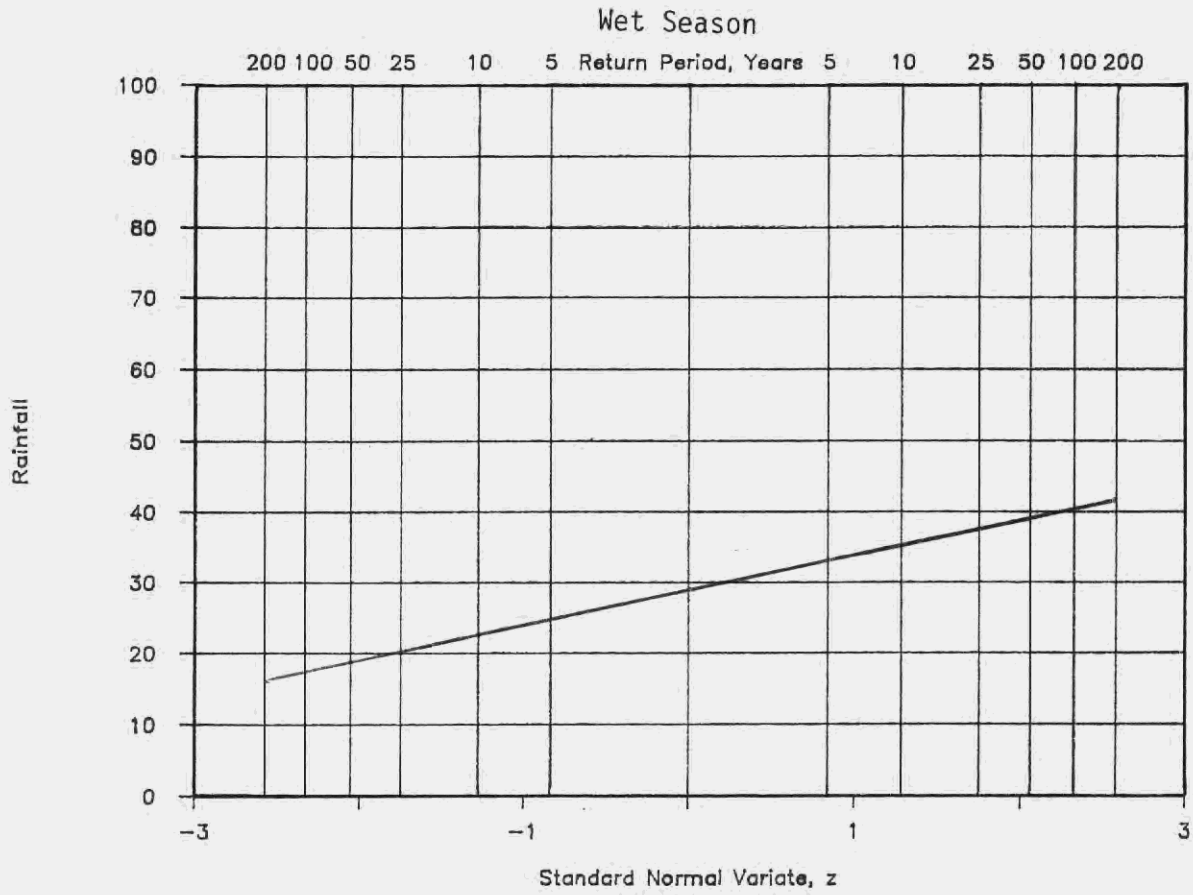


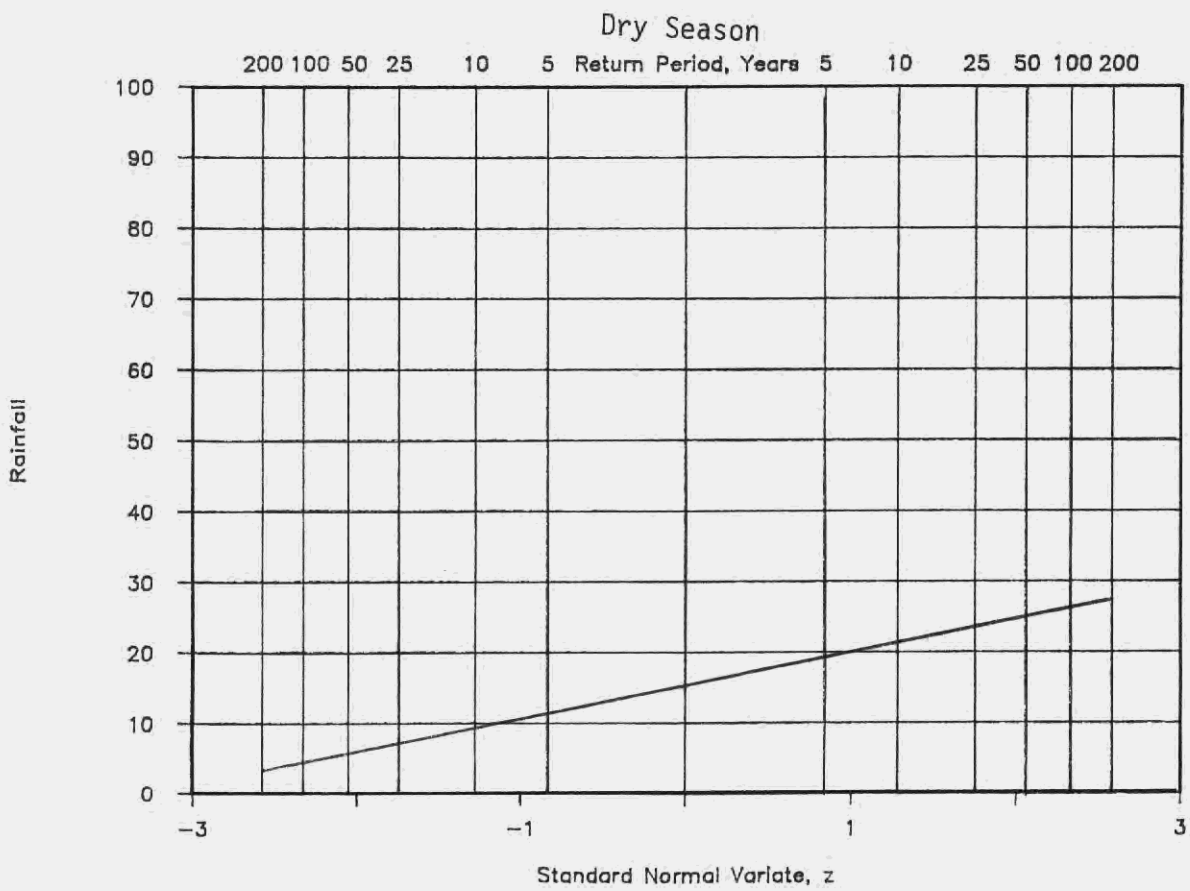

Wet Season
200 100 50 25 10 5 Return Period, Years 5 10 25 50 100 200
100
90
80
70
60
50
40
30
20
10
Rainfall, inches
−3
−1
1
3
Standard Normal Variate, z


Dry Season
200 100 50 25 10 5 Return Period, Years 5 10 25 50 100 200
100
90
80
70
60
50
40
30
20
10
0
Rainfall
−3
−1
1
3
Standard Normal Variate, z

Water Conservation Area 2

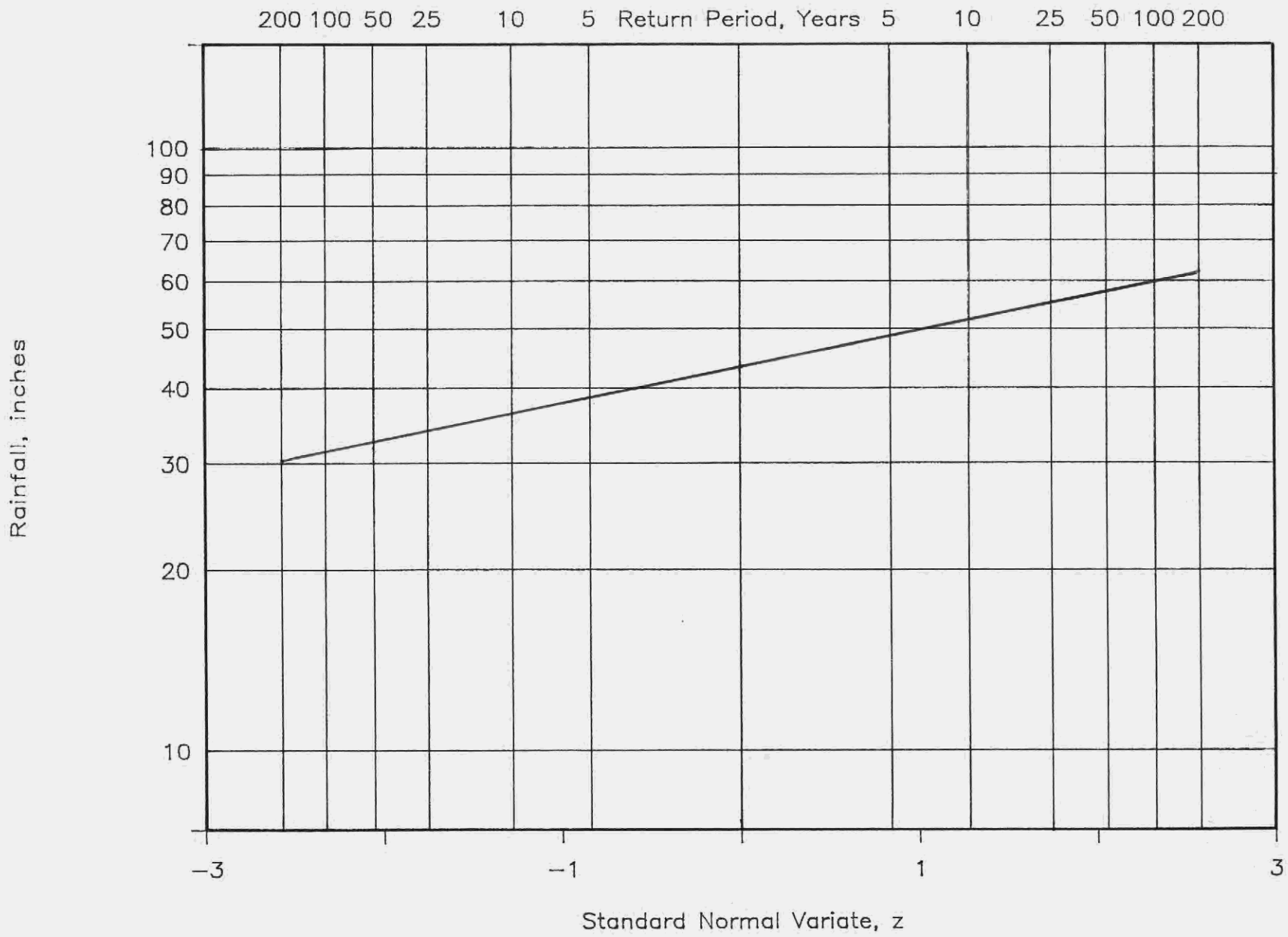






Water Conservation Area 3

Water Conservation Area 3



Appendix E

Kolmogorov-Smirnov Goodness of Fit Test Statistics

Appendix E. Kolmogorov-Smirnov Significance Levels

Basin	Wet Season		Dry Season		Annual	
	Normal	Log Normal	Normal	Log Normal	Normal	Log Normal
Everglades Agricultural Area	**.38**	.11	**.89**	.77	**.88**	.51
Everglades National Park	.31	**.64**	**.94**	.42	.64	**.95**
Fisheating Creek	.74	**.80**	**.59**	.44	**.91**	.76
Kissimmee River	.99	**.996**	**.53**	.33	**.73**	.63
Lower East Coast	.25	**.76**	.77	**.85**	.47	**.84**
Lake Okeechobee	**.92**	.86	**.99**	.63	**.84**	.70
Lower West Coast	.43	**.77**	**.94**	.90	.66	**.95**
Upper East Coast	**.32**	.11	.71	**.90**	.90	**.99**
Upper Kissimmee River	.24	**.59**	.32	**.53**	.73	**.99**
Water Conservation Area 1	**.99**	.96	**.39**	.12	.37	**.55**
Water Conservation Area 2	.87	**.99**	**.98**	.59	.36	**.51**
Water Conservation Area 3	**.97**	.80	**.96**	.68	.88	**.96**

For a significance level of $\alpha = .95$, this means there is a $100(1-\alpha)\%$ or 5% chance that the population does not follow the specified distribution. This does *not* mean that there is a 95% chance that population is normally distributed; there may be other distributions that yield equally high or higher significance levels.

Appendix F

SFWMD Basin Rainfall Frequency Computer Procedure Examples and Program Listings

EXAMPLES OF SFWMD BASIN RAINFALL FREQUENCY COMPUTER RUNS

Run number 1: Typical Run

```
begin,rain,rain      (This executes the SFWMD Basin Rainfall
                      Frequency procedure file.)
 SELECT BASIN:  1=UEC, 2=UKB, 3=KRB, 4=LEC, 5=LWC
                6=EAA, 7=FEC, 8=ENP, 9=LOK, 10=WCA-1
                11=WCA-2, 12=WCA-3, 13=SFWMD
? 1                  (The user has selected the UEC Basin...)
 INPUT BEGINNING AND ENDING MONTH OF PERIOD OF INTEREST
 IE.:  MAY-DECEMBER RAINFALL= 5,12
? 1,12               (...and January-to-December or calendar-year
    STOP              annual rainfall to be analyzed.)

DUMP    IS A LOCAL FILE
    STOP

 ********DISTRIBUTION IS MORE LOG-NORMAL********
 NORMAL AND LOG-NORMAL STATISTICS
MEAN       51.487        3.927
STD DEV     8.82           .17
K-S S.L.    .895          .989


 RETURN PERIOD    NORMAL          LOG-NORMAL
                WET    DRY         WET    DRY
    (YEARS)        (IN)              (IN)
        2       51.5    51.5       50.7    50.7
        5       58.9    44.1       58.7    43.9
       10       62.8    40.2       63.3    40.7
       20       66.0    37.0       67.4    38.2
       50       69.6    33.4       72.3    35.6
      100       72.0    31.0       75.8    34.0
^*^*END OF FILE
TAPE55  IS A LOCAL FILE
$REVERT.CCL          (Indicates successful completion of program.)
```

Run number 2: Rainfall Analysis of an individual month

```
/begin,rain,rain
 SELECT BASIN:  1=UEC, 2=UKB, 3=KRB, 4=LEC, 5=LWC
                6=EAA, 7=FEC, 8=ENP, 9=LOK, 10=WCA-1
                11=WCA-2, 12=WCA-3, 13=SFWMD
? 10
 INPUT BEGINNING AND ENDING MONTH OF PERIOD OF INTEREST
IE.:  MAY-DECEMBER RAINFALL= 5,12
? 6,6                (All runs require a beginning and ending
    STOP              month.)

DUMP    IS A LOCAL FILE
    STOP

 ********DISTRIBUTION IS MORE LOG-NORMAL********
 NORMAL AND LOG-NORMAL STATISTICS
MEAN        7.796        1.965
STD DEV      3.60          .42
K-S S.L.     .403         .941


 RETURN PERIOD    NORMAL          LOG-NORMAL
                 WET    DRY       WET    DRY
    (YEARS)        (IN)             (IN)
        2        7.8     7.8       7.1     7.1
        5       10.8     4.8      10.2     5.0
       10       12.4     3.2      12.3     4.1
       20       13.7     1.9      14.3     3.6
       50       15.2      .4      17.0     3.0
      100       16.2      .0      19.1     2.7
^*^*END OF FILE
TAPE55  IS A LOCAL FILE
$REVERT.CCL
```

Run number 3: Monthly sequences that involve 2 calendar years.

```
/begin,rain,rain
 SELECT BASIN:  1=UEC, 2=UKB, 3=KRB, 4=LEC, 5=LWC
                6=EAA, 7=FEC, 8=ENP, 9=LOK, 10=WCA-1
                11=WCA-2, 12=WCA-3, 13=SFWMD
? 13
 INPUT BEGINNING AND ENDING MONTH OF PERIOD OF INTEREST
IE.:  MAY-DECEMBER RAINFALL= 5,12
? 11,3                (In this case, November-to-March rainfall for
    STOP               the SFWMD.)

DUMP    IS A LOCAL FILE
    STOP

 ********DISTRIBUTION IS MORE LOG-NORMAL********
 NORMAL AND LOG-NORMAL STATISTICS
MEAN       10.821        2.293
STD DEV     4.73           .44
K-S S.L.    .910          .953


 RETURN PERIOD    NORMAL          LOG-NORMAL
                 WET    DRY        WET    DRY
    (YEARS)        (IN)              (IN)
        2       10.8    10.8       9.9     9.9
        5       14.8     6.8      14.3     6.9
       10       16.9     4.8      17.3     5.7
       20       18.6     3.0      20.3     4.8
       50       20.5     1.1      24.3     4.0
      100       21.8      .0      27.4     3.6
^*^*END OF FILE
TAPE55  IS A LOCAL FILE
$REVERT.CCL
```

```
      PROGRAM MONTHLY(TAPE13)
      DIMENSION RAIN(12,70,13), NYR(13), BSUM(70,12)
      REAL  COEF(12), DAR(70,12)
      OPEN(UNIT=1,FILE='RUEC1')
      OPEN(UNIT=2,FILE='RUKB')
      OPEN(UNIT=3,FILE='RKRB')
      OPEN(UNIT=4,FILE='RLEC')
      OPEN(UNIT=5,FILE='RLWC')
      OPEN(UNIT=6,FILE='REAA')
      OPEN(UNIT=7,FILE='RFEC')
      OPEN(UNIT=8,FILE='RENP')
      OPEN(UNIT=9,FILE='RLOK')
      OPEN(UNIT=10,FILE='RWC1')
      OPEN(UNIT=11,FILE='RWC2')
      OPEN(UNIT=12,FILE='RWC3')
      DATA NYR/70,70,70,70,58,56,53,44,33,22,22,22,22/
      DATA COEF/.094,.024,.047,.138,.311,.058,.032,.157,.050,
     *,016,.015,.058/
      PRINT*,'SELECT BASIN:  1=UEC, 2=UKB, 3=KRB, 4=LEC, 5=LWC'
      PRINT*,'               6=EAA, 7=FEC, 8=ENP, 9=LOK, 10=WCA-1'
      PRINT*,'               11=WCA-2, 12=WCA-3, 13=SFWMD'
      READ*,NBASIN
      WRITE(*,87) NYR(NBASIN)
87    FORMAT('THIS SAMPLE CONTAINS',I3,' YEARS OF RECORD.')
      IF(NBASIN .LE. 12) THEN
         READ(NBASIN,'(4X,12F5.2)')((DAR(I,J),J=1,12),I=1,NYR(NBASIN))
      ELSE
      DO 10, I=1,12
         DO 20, J=71-NYR(I),70
            READ(I,5)(RAIN(I,J,K),K=1,13)
   5        FORMAT(4X,12F5.2,F6.2)
20       CONTINUE
10    CONTINUE
      DO 30,I=49,70
        DO 60,L=1,12
         DAR(I-48,L)=0.
         DO 40,J=1,12
            DAR(I-48,L)=DAR(I-48,L)+(RAIN(J,I,L)*COEF(J))
40       CONTINUE
60     CONTINUE
30    CONTINUE
      ENDIF
51    FORMAT(12F6.2)
      PRINT*,'BEGINNING, ENDING MONTH? (IE:  MARCH-JUNE=3,6)'
      READ*,IEYR,IBYR
      CALL BACKSUM(NYR(NBASIN),12,IBYR,DAR,BSUM)
      WRITE(13,55)((BSUM(I,J),J=1,12),I=1,NYR(NBASIN))
      WRITE(14,56)(BSUM(I,IEYR),I=1,NYR(NBASIN))
56    FORMAT(F6.2)
55    FORMAT(12F6.2)
      STOP
      END
```

```
C
C
      SUBROUTINE BACKSUM(N,M,MBSS,X,BSX)
C
C   THIS SUBROUTINE RETURNS A N-ROW BY M-COLUMN ARRAY (BSX)
C   CONTAINING THE BACK-SUMS OF A N-ROW BY M-COLUMN INPUT
C   ARRAY (X).  THE CALLING PROGRAM MUST SUPPLY N,M AND
C   THE COLUMN THAT THE BACK-SUMMING IS TO BEGIN WITH (MBSS).
C   THIS ROUTINE WAS WRITTEN BY C.J. NEIDRAUER OF THE WATER
C   RESOURCES DIVISION OF THE SOUTH FLORIDA WATER MANAGEMENT
C   DISTRICT ON 3/4/86.
C
      REAL X(70,12),BSX(70,12)
      DO 5 I=1,N
      DO 5 J=1,M
    5 BSX(I,J)=0.
      DO 10 I=1,N
      FBSX=0.
      DO 10 J=MBSS,1,-1
      BSX(I,J)=FBSX+X(I,J)
   10 FBSX=BSX(I,J)
      DO 20 I=1,N
      NROW=I+1
      IF(NROW.GT.N) NROW=1
      FBSX=BSX(NROW,1)
      DO 20 J=M,MBSS+1,-1
      BSX(I,J)=FBSX+X(I,J)
   20 FBSX=BSX(I,J)
      RETURN
      END
```

```
      PROGRAM XAMINE(TAPE54,TAPE55)
      REAL STAT(2,3),X,WET(6,2),DRY(6,2),COEF(6)
      INTEGER I,J,L,RTN(6)
      DATA RTN/2,5,10,20,50,100/
C
      DO 50,I=1,6
         RF=1.-(1./RTN(I))
         CALL NCDF(2,0.,1.,COEF(I),RF,COUNT)
 50   CONTINUE
C
C
      READ (54,5)((STAT(I,J),J=1,3),I=1,2)
      M=1
      IF (STAT(1,3) .LT. STAT(2,3)) M=2
      DO 10, I=1,6
      DO 90, L=1,2
         WET(I,L)=STAT(L,1)+COEF(I)*STAT(L,2)
         DRY(I,L)=STAT(L,1)-COEF(I)*STAT(L,2)
         IF (DRY(I,1).LT.0.) DRY(I,1)=0.
 90   CONTINUE
 10   CONTINUE
      IF (M .EQ. 2) THEN
      WRITE(55,*) '********DISTRIBUTION IS MORE LOG-NORMAL********'
        ELSE
      WRITE(55,*)'********DISTRIBUTION IS MORE NORMAL********'
      ENDIF
      DO 85, I=1,6
         WET(I,2)=EXP(WET(I,2))
         DRY(I,2)=EXP(DRY(I,2))
 85   CONTINUE
      WRITE(55,*)'           NORMAL AND LOG-NORMAL STATISTICS'
      WRITE(55,16) STAT(1,1),STAT(2,1)
 16   FORMAT('MEAN',T11,F6.3,T24,F6.3)
      WRITE(55,17) STAT(1,2),STAT(2,2)
 17   FORMAT('STD DEV',T12,F5.2,T25,F5.2)
      WRITE(55,18) STAT(1,3),STAT(2,3)
 18   FORMAT('K-S S.L.',T12,F5.3,T25,F5.3,//)
      WRITE(55,*)'RETURN PERIOD    NORMAL           LOG-NORMAL'
      WRITE(55,*)'                WET    DRY         WET    DRY'
      WRITE(55,*)'   (YEARS)        (IN)               (IN)   '
      WRITE(55,19)(RTN(I),WET(I,1),DRY(I,1),WET(I,2),DRY(I,2),I=1,6)
 19   FORMAT(T7,I3,T15,F5.1,T23,F5.1,T33,F5.1,T41,F5.1)
 5    FORMAT(2(T35,F7.4,T60,F7.4,//////,T29,F5.3,///////))
      STOP
      END
```

```
C
C
      SUBROUTINE NCDF(IOPT,XMEAN,XSTD,X,F,COUNT)
      IF(IOPT.EQ.1)THEN
      Z=(X-XMEAN)/XSTD
      F=0.5*ERFC(-Z*.7071068)
      RETURN
      ELSE
      COUNT=0.
      FLAG=0.
      FF=F
      IF(F.GT..50) THEN
      FF=1.-F
      FLAG=1.
      ENDIF
      Z2=0.
   10 Z1=Z2
      E1=0.5*ERFC(-Z1*.7071068)-FF
      DE1=(2.718281828**(-0.5*Z1**2))/2.506628275
      Z2=Z1-E1/DE1
      COUNT=COUNT+1.
      IF(ABS(E1/DE1).GT..00001)GO TO 10
      IF(FLAG.EQ.1.) Z2=-Z2
      X=XMEAN+Z2*XSTD
      ENDIF
      RETURN
      END
```

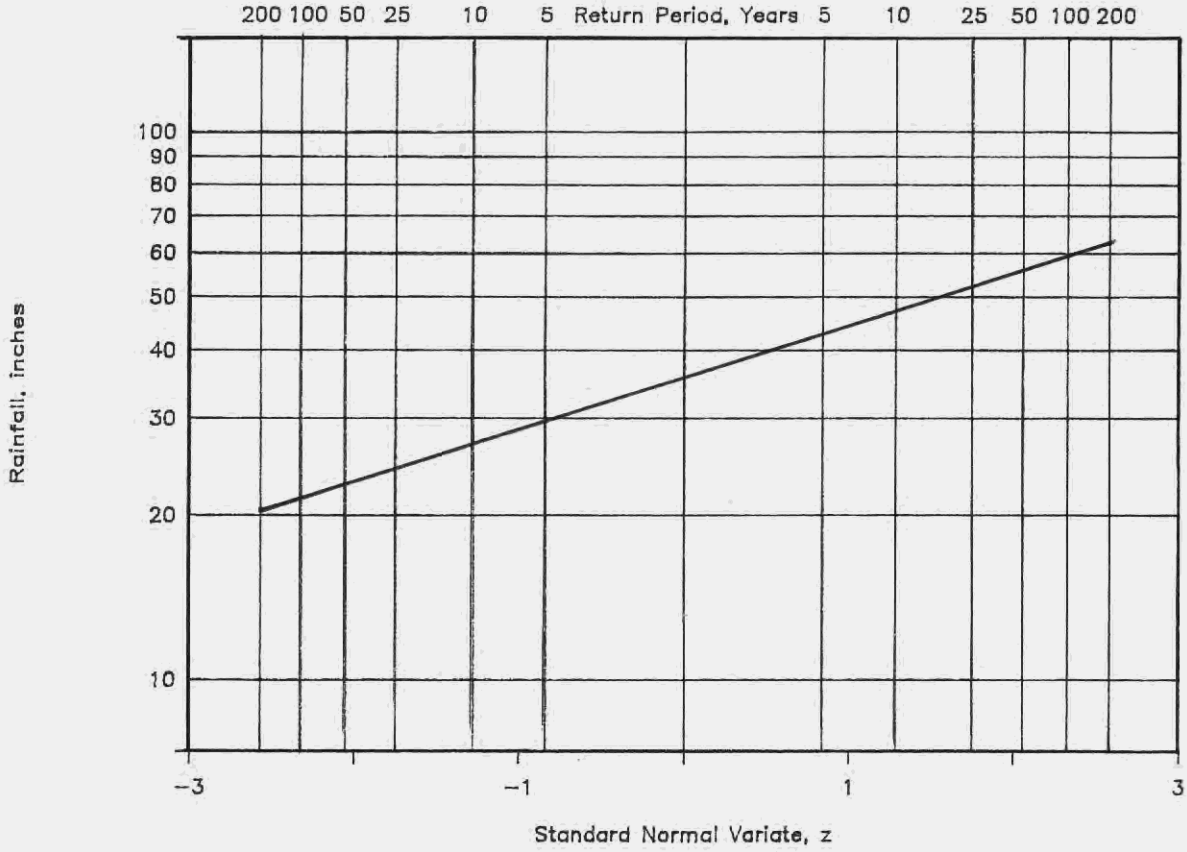
```
.PROC,RAIN.
CLEAR.
GET,MONTH.
GET,RUEC1,RLEC,RENP,REAA,RLWC,RLOK,RFEC,RUKB,RKRB,RWC1,RWC2,RWC3.
FTN5,L=P,REW,EL=F,LO,I=MONTH.
LGO.
REWIND,TAPE14.
RETURN,LGO,MONTH.
ATTACH,SPSS/UN=LIBRARY.
GET,KSTEST.
SPSS(I=KSTEST,L=DUMP,D=TAPE14).
XEDIT,DUMP,NH.Y$XD61$E
GET,XAMINE.
FTN5,L=P,REW,EL=F,LO,I=XAMINE.
LGO,DUMP.
XEDIT,TAPE55,NH.Y$P*$E
^*^*END OF FILE
```

```
RUN NAME        SKELETON K-S TEST:  SHAWN P. SCULLEY
VARIABLE LIST   MONTH
N OF CASES      UNKNOWN
INPUT FORMAT    FIXED (F6.2)
COMPUTE         LOGMON=LN(MONTH)
NPAR TESTS      K-S (NORMAL)=MONTH/K-S (NORMAL)=LOGMON
```

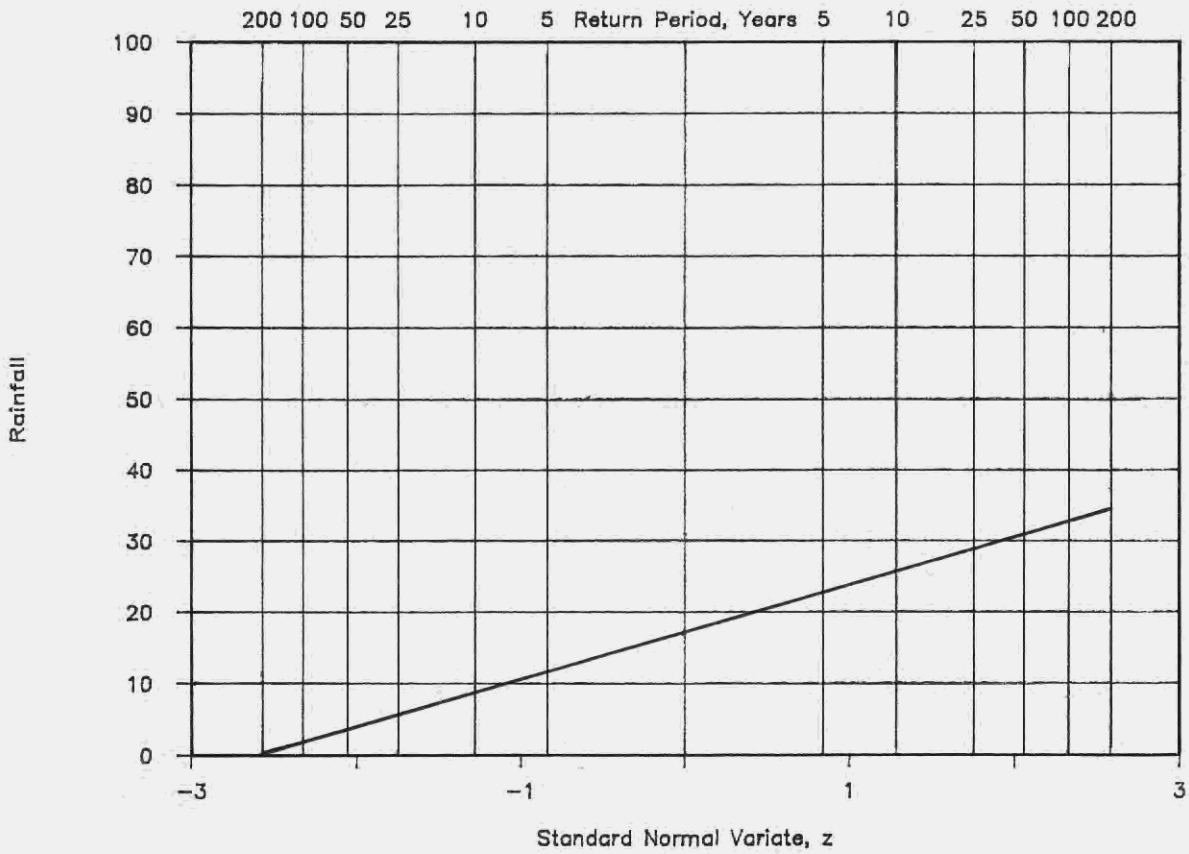
Appendix G

Reporting Area Magnitude and Frequency Plots

Wet Season

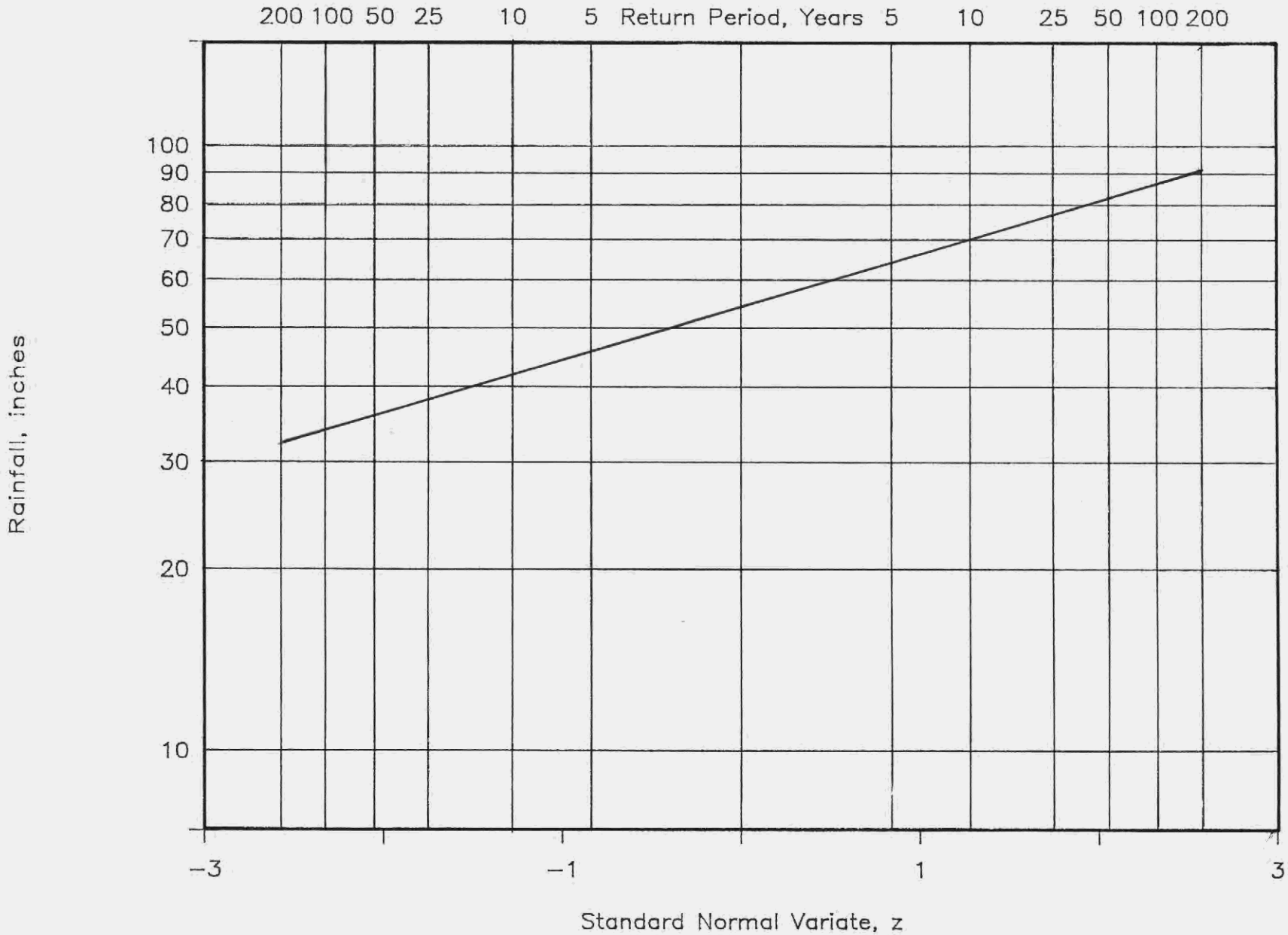


Dry Season



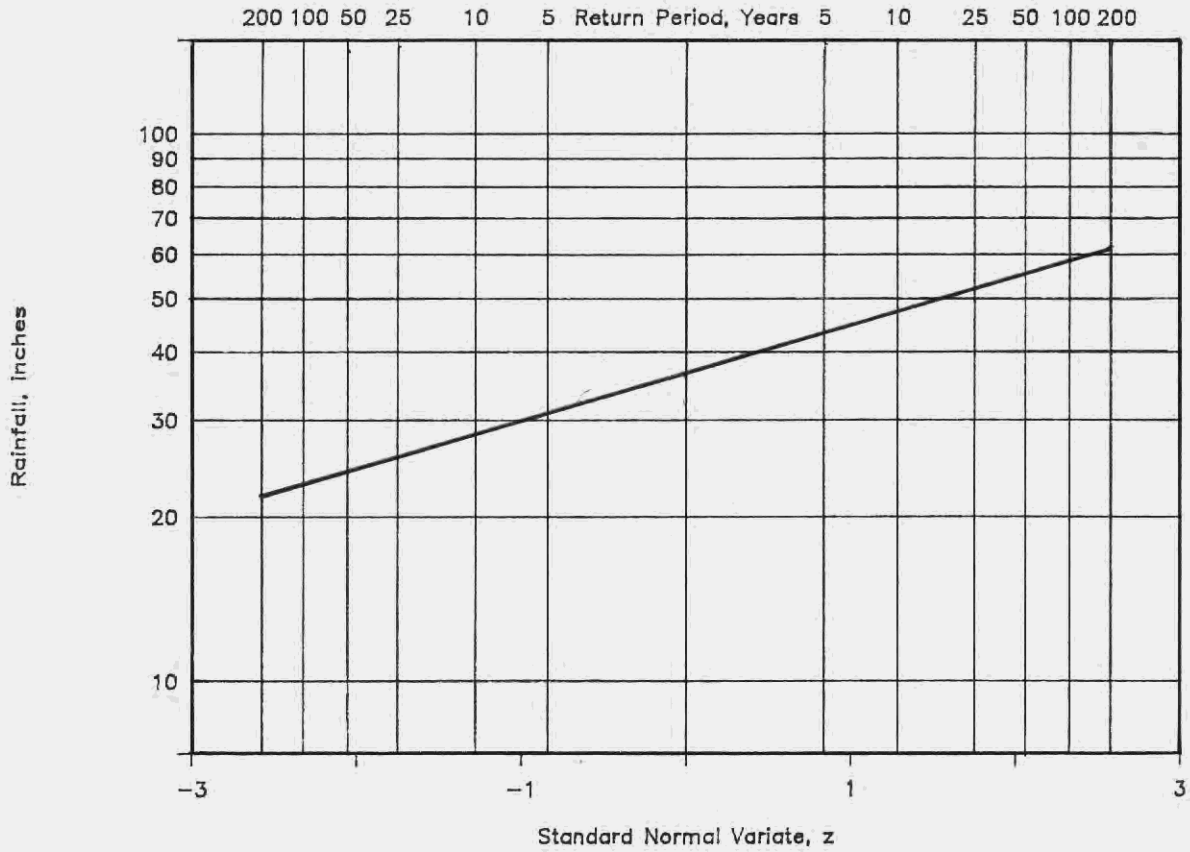
Caloosahatchee

Annual Rainfall

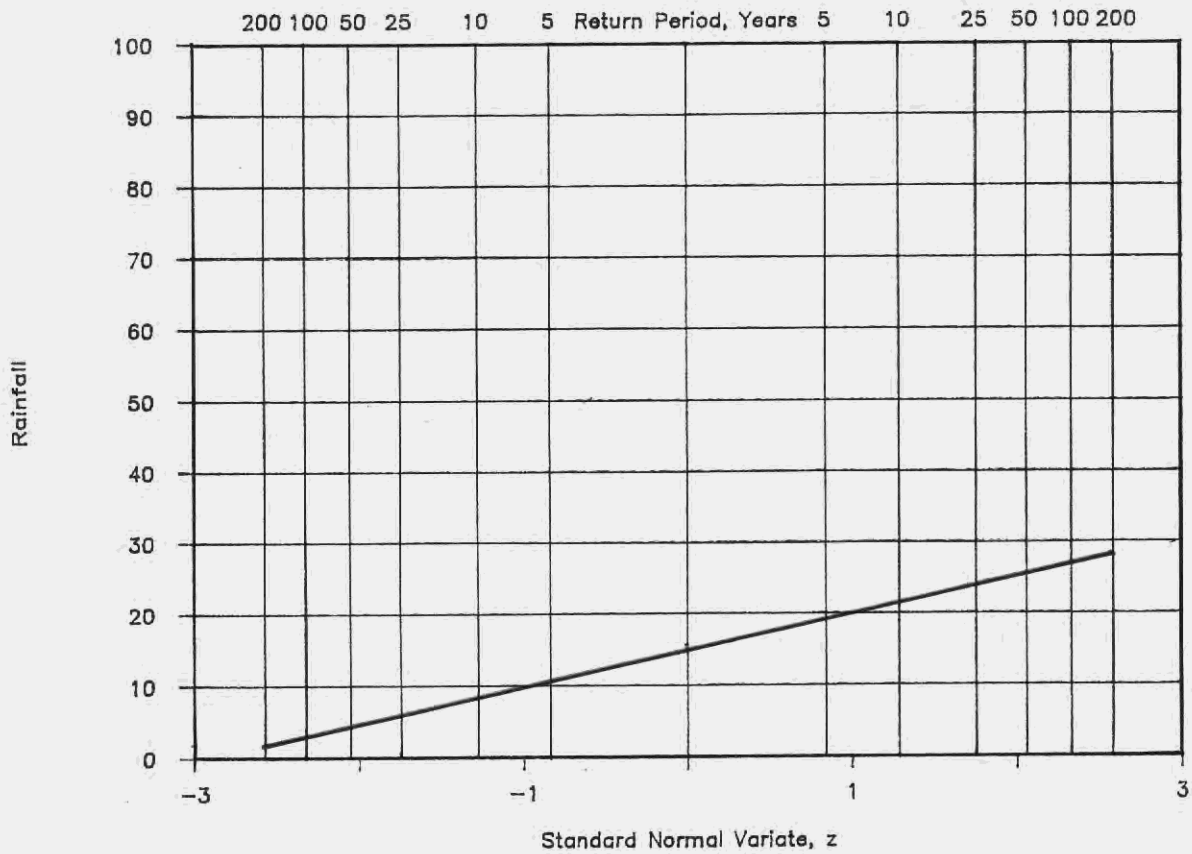


Caloosahatchee

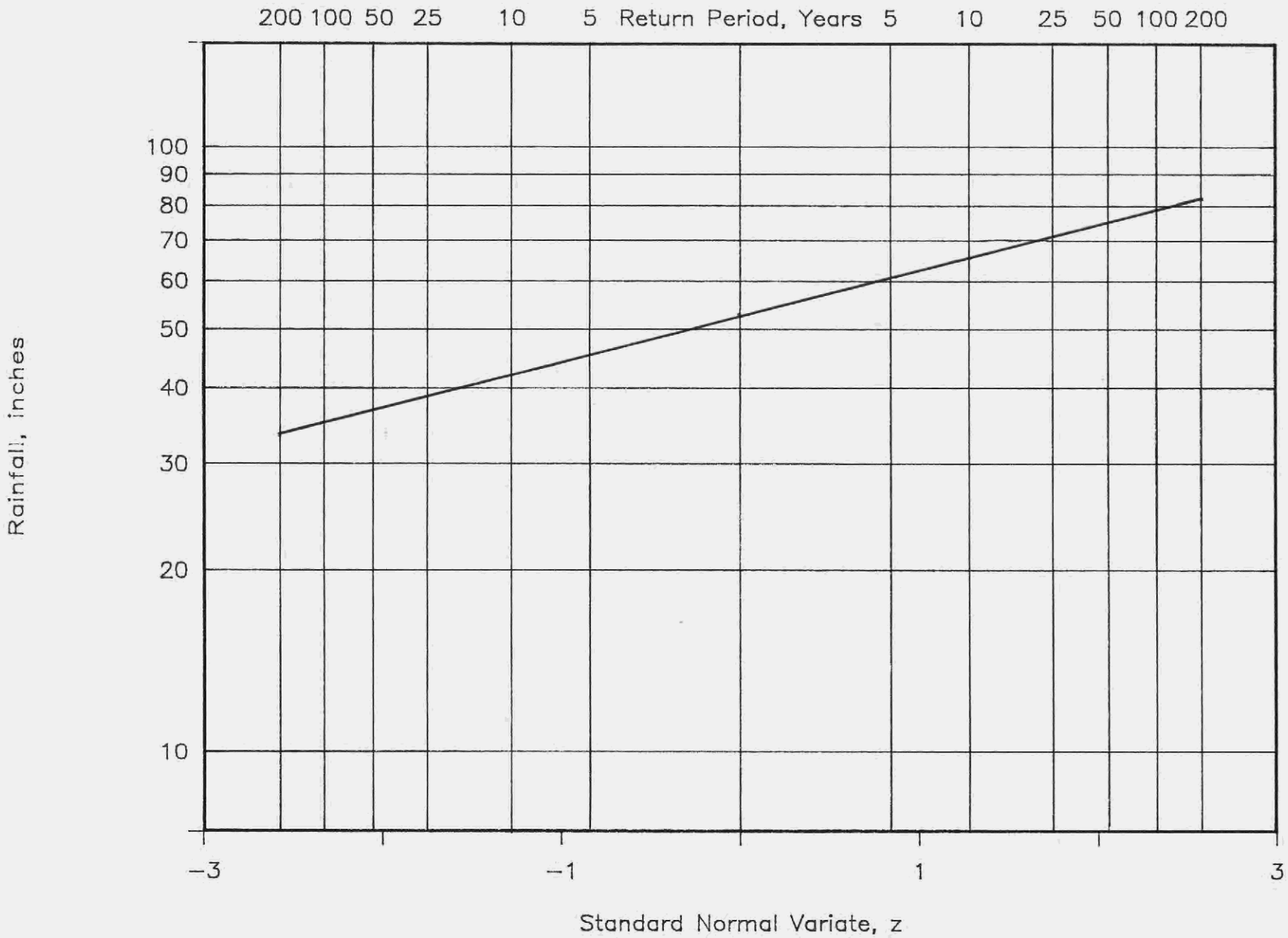
Wet Season



Dry Season

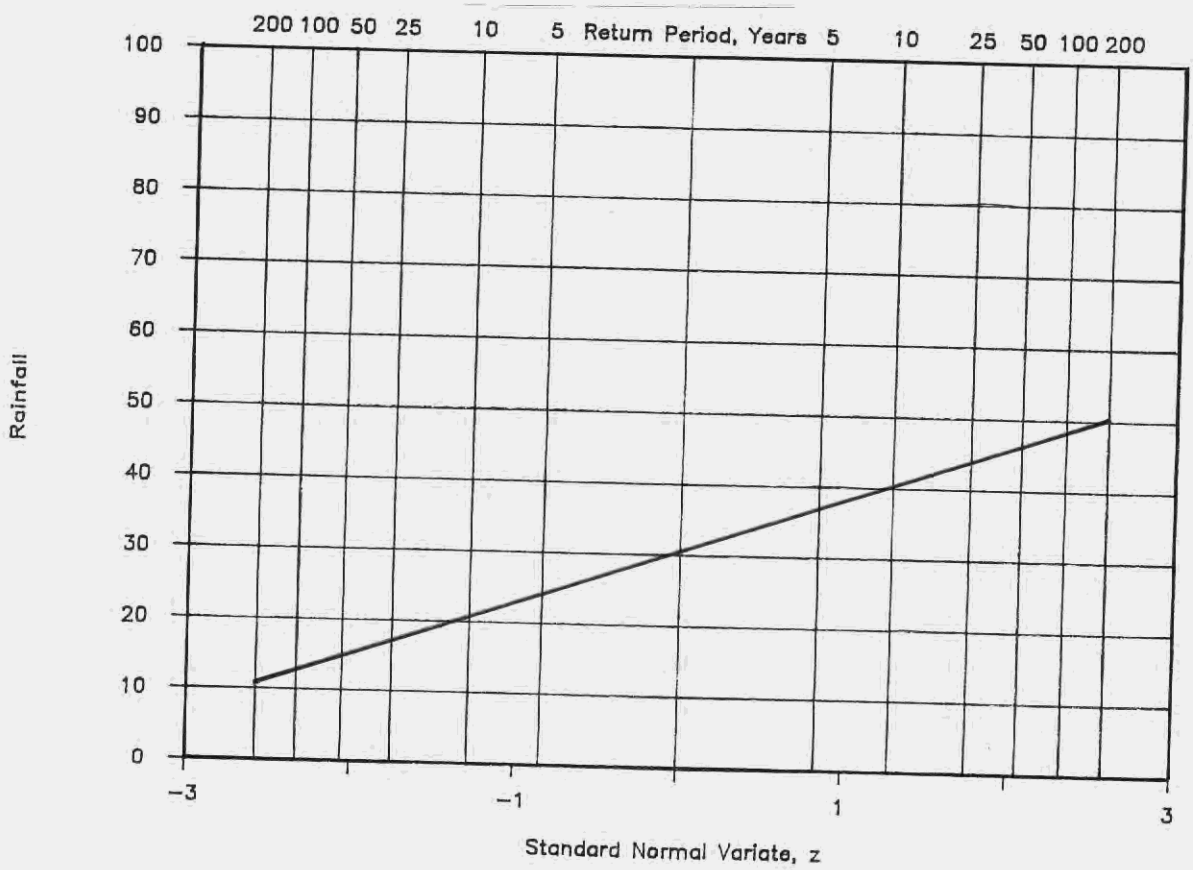


Annual Rainfall

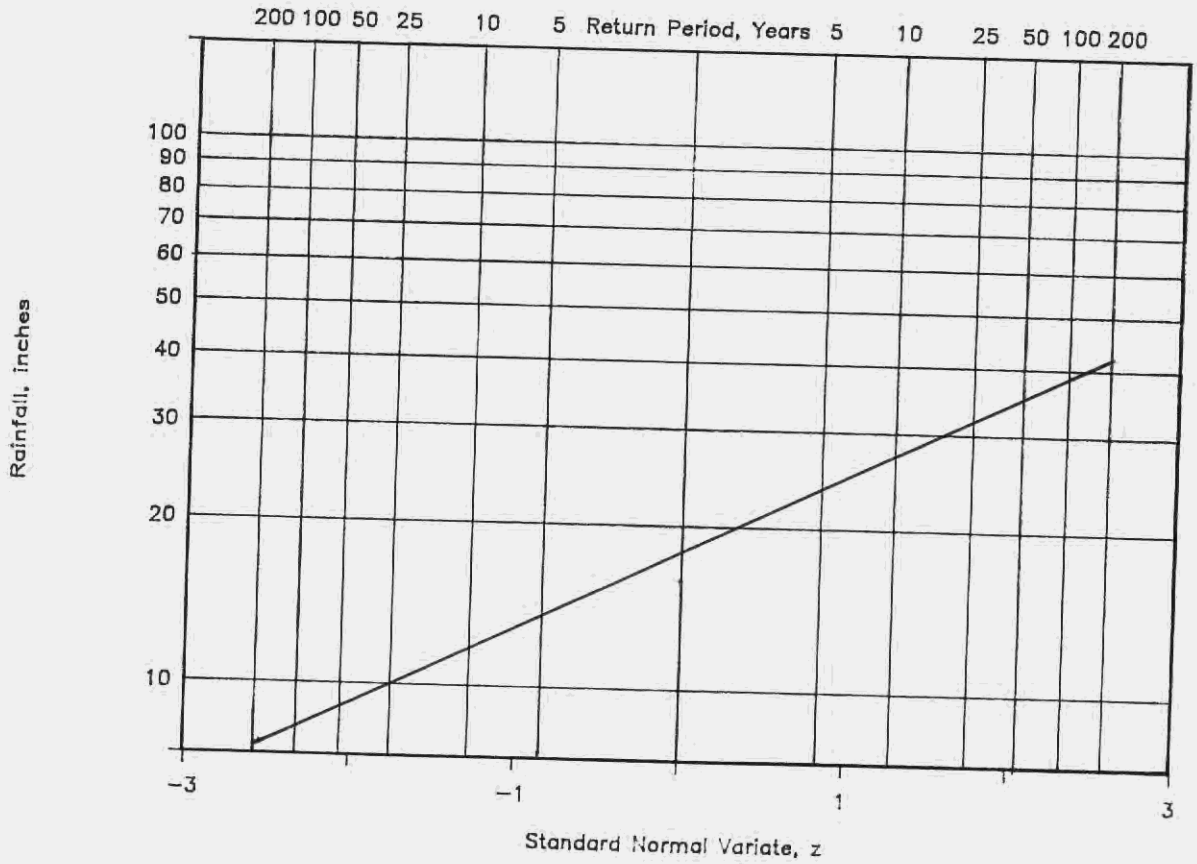


Collier County

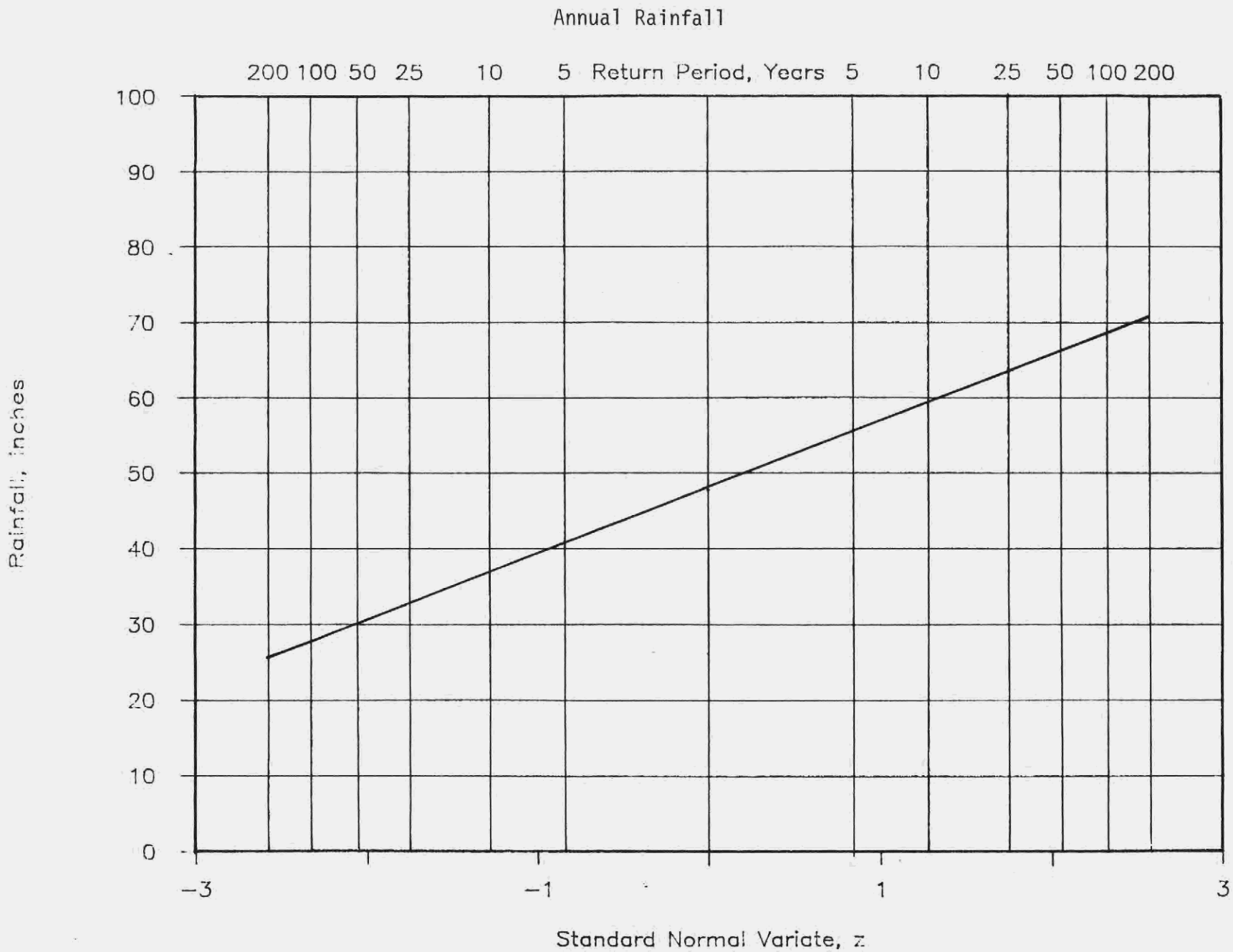
Wet Season



Dry Season



Lake Okeechobee



Lake Okeechobee