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TECHNICAL PAPER NO. 29

Rainfall Intensity-Frequency Regime

Part 2—Southeastern United States

(Rainfall intensity-duration-area-frequency regime, with other storm characteristics, for durations of 20 minutes to 24 hours, area from point to 400 square miles, frequency for return periods from 1 to 100 years, for that part of the United States bounded by longitudes 80° and 90° W. and south of latitude 35° N.)

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for

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SOIL CONSERVATION SERVICE

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Rainfall Intensity-Frequency Regime
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INTRODUCTION

1. Authority. This report is the second of a series being prepared on a regional basis for the Soil Conservation Service, Department of Agriculture, to provide material for use in developing planning and design criteria for the Watershed Protection and Flood Prevention program (P. L. 566). Part 1 [1] covered the region bounded by longitudes 80°W and 90°W and latitudes 35°N and 40°N.

2. Background. Heretofore, economic and engineering design requiring rainfall intensity-frequency analysis has been based largely on "Rainfall Intensity-Frequency Data" [2], by David L. Yarnell, which was first printed about 20 years ago. Since that time, besides the additional years of record, the number of recording gages has increased fifteen-fold, and ways have been found for effective use of data from cooperative observers who make observations of daily rainfall. It is, therefore, appropriate now to use maps with a more refined scale, portraying more regional variation than was possible 20 years ago. Instead of burdening the report with many maps, it has seemed expedient to use a small number of maps for significant durations and return periods, and to use diagrams with continuous variables for generalizing and interpolating among these few maps.

3. Scope. The point-rainfall analysis is based largely on routine application of the theory of extreme values, with empirical transformation to include consideration of the high values that are excluded from the annual series. Analysis of areal rainfall is a relatively new feature in frequency analysis and is based on the few dense networks that have several years of record and meet other important requirements. Consideration of additional storm characteristics includes portrayal of the seasonal variation in the intensity-frequency regime, the time distribution of 1- and 7-day rainfalls, discussion of various types of duration-depth curves, average area-depth relationships and a comparison of some of these characteristics for tropical and non-tropical storms. A measure of the quality of each statistic presented in the paper is given in the form of a dispersion factor or the basic data are shown in graphs or tables.

4. Separation of "Analysis" and "Applications". For convenience in practical application of the results of the work reported in this Technical Paper it is divided into two major sections. The first section, entitled "Analysis", describes what was done with the data, gives reasons for the way some things were done, and evaluates the results. The second section, entitled "Applications", gives step-by-step examples for use of the diagrams and maps in solving certain types of hydrologic problems.

5. Relation to Part 1. The general techniques in this Technical Paper are identical to those used in Part 1. Discussions of certain subjects have been abridged or omitted entirely, either because they are of secondary interest or because they are covered adequately in Part 1. For example, the discussion on sampling, analysis, limitations, and reasoning of the area-depth relationship has been reduced substantially. On frequency and duration analysis, too, only brief discussions are presented on methods of construction and degree of reliability. New material includes a comparison of tropical and non-tropical storm characteristics and a 7-day time distribution relationship.

6. Acknowledgments. This investigation was directed by David M. Hershfield, project leader, in the Cooperative Studies Section (Walter T. Wilson, Chief) of Hydrologic Services

Division (William E. Hiatt, Chief). Technical assistance was furnished by Leonard L. Weiss; collection and processing of data were performed by Wayne H. Bartlett, Normalee S. Foat, Robert B. Holleman, Elizabeth C. I'Anson, John W. Keefer, Smith P. Kerr III, Lillian L. Langdon, E. Eloise Marlowe, William E. Miller, Samuel Otlin, Hardy J. Owens, Jr., and John G. Wangler, Jr.; typing was by Pauline J. Fagan, Robert B. Holleman, and Smith P. Kerr III, and drafting by Vivian M. Campbell and Caroll W. Gardner. Coordination with the Soil Conservation Service, Department of Agriculture, was maintained through Harold O. Ogrosky, Staff Hydrologist of the Engineering Division. Max A. Kohler, Chief Research Hydrologist, and A. L. Shands, Assistant Chief, Hydrologic Services Division, acted as consultants. Lillian K. Rubin of the Hydrometeorological Section edited the text.

SECTION I. ANALYSIS

Climate

7. General. The climate in the region covered in this study varies from temperate humid in the north to subtropical in southern Florida. Abundant precipitation, varying from about 50 inches annually in the north to 60 inches along the Gulf coast of Alabama, is distributed rather uniformly throughout the year. Southern Florida is within the belt of the northeast trade winds in the summer which results in a June precipitation peak; the months of September and October bring another and larger peak caused partly by hurricanes. The annual rainfall decreases south of Miami to a minimum of 38 inches at Key West.

8. Because of the heat, water vapor, and proximity to eastward moving frontal systems, this region experiences from 50 thunderstorms in northern Alabama to more than 90 per year in northwest Florida with the peak months being June and July. Thunderstorms during the summer months, when cyclonic movement is weak, frequently result in locally heavy downpours. Most of the extreme summer rainfall values come from thunderstorms although some of this summer rainfall is from tropical storms.

9. Tropical storms. In late summer and autumn Caribbean and Atlantic hurricanes occasionally travel in or near the area, bringing gales and heavy rain. Rainfalls near the centers of tropical cyclones are frequently heavy and falls exceeding 20 inches in 24 consecutive hours are not uncommon. These rainfalls result from one of the following three tropical storm situations: (1) slow-moving hurricanes paralleling the coast, (2) storms that stagnate after crossing the coast, and (3) storms that cross the coast and move into an extratropical trough. The storm of September 20, 1926, is an example of the first situation. A large part of the 18.5 inches recorded during a 48-hour period at Bay Minette, Ala., fell as pre-hurricane rainfall. The second situation is illustrated by the storm of August 7, 1940, when a maximum center of 37.5 inches of rainfall was recorded at Miller Island, La., during an 84-hour period. Heavy rains continued during the post-hurricane period as the storm stagnated in Louisiana. An example of the third situation is the storm of August 28, 1911, which produced two precipitation centers; one of 19.1 inches in 24 hours at St. George, Fla., and another of 14 inches in south-central Georgia. This storm was associated with extratropical systems to the north and west of the hurricane.

10. Not all large 24-hour rainfalls are necessarily associated with tropical disturbances. For example, the 20 inches recorded at Elba, Ala., on March 15, 1929, was associated with a frontal situation; about 21 inches was recorded in the vicinity of West Palm Beach, Fla., on January 21-22, 1957, as a result of local thunderstorm activity that persisted within a small geographical area for about a day.

Point Rainfall

Basic data

11. Station data. The sources of data used in this study are indicated in table 1-1. In order to generalize, and to insure proper relationships, it was necessary to examine data from outside the region of interest. Table 1-1 lists 200 first-order stations, 17 of which are in this region. Long records were analyzed from 148 stations to define the frequency relationships, and relatively short portions of the record from about 720 additional stations were analyzed to define the regional pattern.

12. Station exposures. In refined analysis of mean annual and mean seasonal rainfall data it is necessary to evaluate station exposures by methods such as double-mass curve analysis. Such methods do not apply to extreme values. Except for some subjective selection (particularly for longer records) of stations that have had consistent exposures, no attempt has been made to adjust rainfall values to a standard exposure. The effects of varying exposure are implicitly included in the areal sampling error and are averaged out, if not evaluated, in the process of smoothing the isopluvial lines.

13. Time increments. Some of the hourly data are clock-hour and some are maximum consecutive 60-minute data; correspondingly, some of the 24-hour data are for the maxi-

mum consecutive 1440 minute data, whereas others are for a calendar day. Examination of sufficient data has resulted in reliable empirical conversion factors so that the results refer to maximum consecutive n-minute data for all durations.

14. Rain or snow. The term precipitation has been used in reference to the 24-hour data because snow as well as rain is included in some of the smaller 24-hour amounts. This is particularly true for high-elevation stations in northern Georgia. Comparison of arrays of all ranking precipitation events with those known to have only rain has shown trivial differences in the frequency relations for several high-elevation stations tested. The heavier (rarer-frequency) 24-hour precipitation and all short-duration precipitation, is composed entirely of rain.

Table 1-1

SOURCES OF POINT RAINFALL DATA

Duration	No. of Stations	Av. Length of Rec. (yrs)	Source *
20-min to 24-hr	200 first-order (recording)	40	3, 4, and 5
hourly	196 recording	12	6, 7, and 8
6-hour	196 recording	12	6, 7, and 8
daily	196 recording	12	6, 7, and 8
daily	524 non-recording	12	6 and 9
daily	148 non-recording	53	6 and 9

* These numbers indicate references listed on page 31.

Duration analysis

15. Duration interpolation diagrams. A generalized duration relationship is portrayed in the diagrams of figure 1-1 in which the rainfall rate or depth can be computed for any duration, from 20 minutes to 24 hours, provided the values for 1, 6, and 24 hours for a particular return period are given. This convenient generalization was obtained empirically from data from 200 first-order Weather Bureau stations and is the same relation shown as diagrams A and B of figure 1-1 of Weather Bureau Technical Paper No. 29, Part 1. For example, the 30-minute intensity or 3-hour rainfall depth may be obtained if the 1-hour and 6-hour depths are given, and the 12-hour depth is a simple function of the 6-hour and 24-hour depths. The values are obtained merely by laying a straightedge across the two given values (1 and 6, or 6 and 24 hours) and reading the value for the desired duration. No regional variation is evident in this duration-depth or duration-intensity relationship.

16. The 1-, 6-, and 24-hour values for use in figure 1-1 are obtained from isopluvial maps which will be described later. Two large working copies (figure 2-1) containing diagrams and instructions with examples (table 2-1) for obtaining the desired depth-area-duration-frequency values are furnished in the pocket inside the back cover of this paper.

Frequency analysis

17. Return-period interpolation diagram. Extreme values of rainfall depth or intensity form a frequency distribution which may be defined in terms of its moments. Investigations of hundreds of rainfall distributions have confirmed the view of most authorities that the record

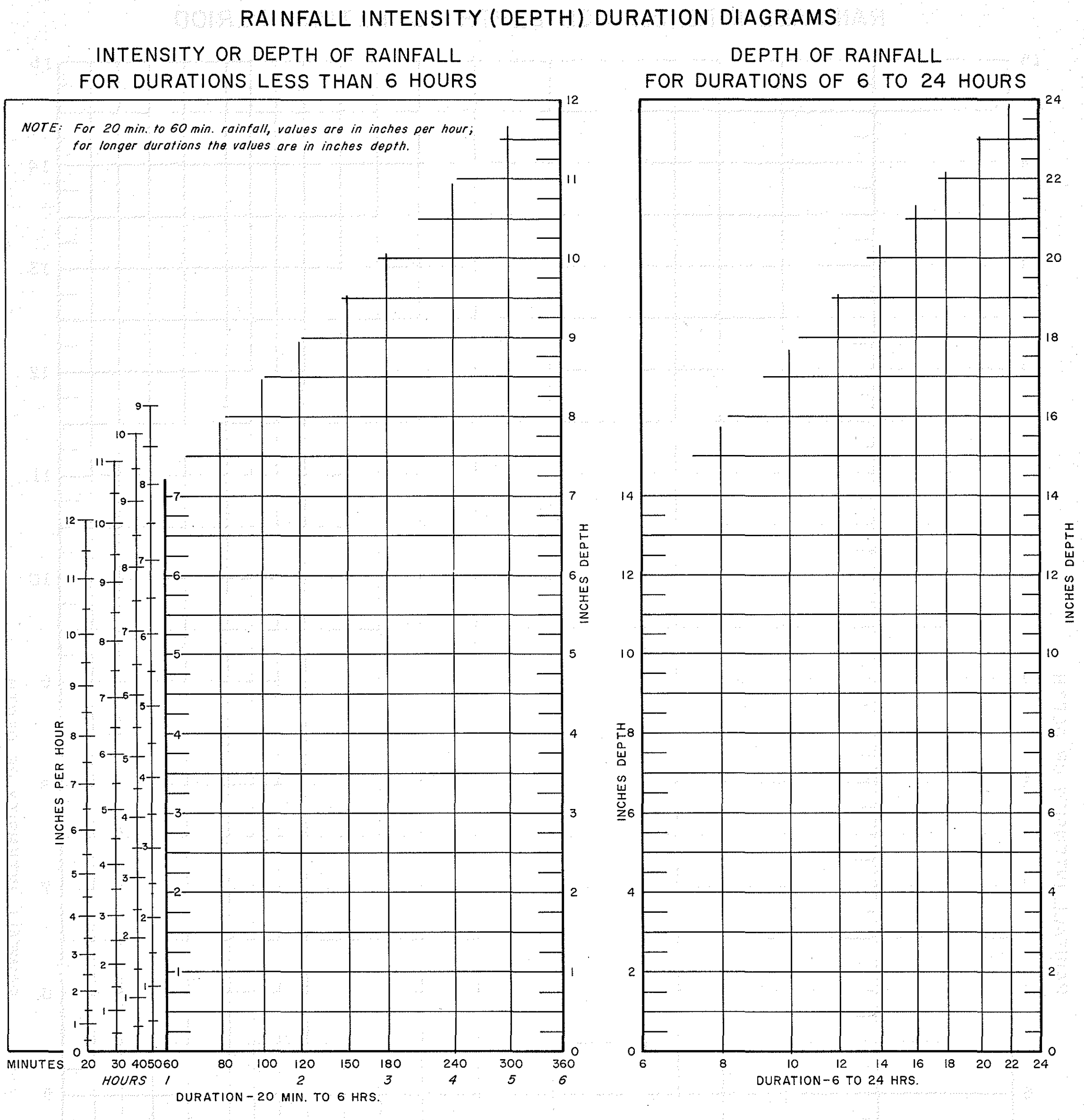

Figure 1-1

length (rarely more than 50 years) is too short to measure beyond the first and second moments. The distribution must therefore be regarded as a function of the first two moments. The 2-year value is a measure of the first moment - the central tendency of the distribution. The relationship of the 2-year to the 100-year value is a measure of the second moment - the dispersion of the distribution. Figure 1-2 illustrates the use of these two parameters, 2-year and 100-year rainfall, for estimating values for other return periods.

18. Two types of series. This discussion requires consideration of two methods of selecting and analyzing intense rainfall data. One method, using the partial-duration series includes all the high values. The other uses the annual series which consists only of the highest value for each year. The highest value of record, of course, is the top value of each series, but at lower frequency levels (shorter return periods) the two series diverge. The partial-duration series, having the highest values regardless of the year in which they occur, recognizes that the second highest of some year ordinarily exceeds the highest of some other year. The

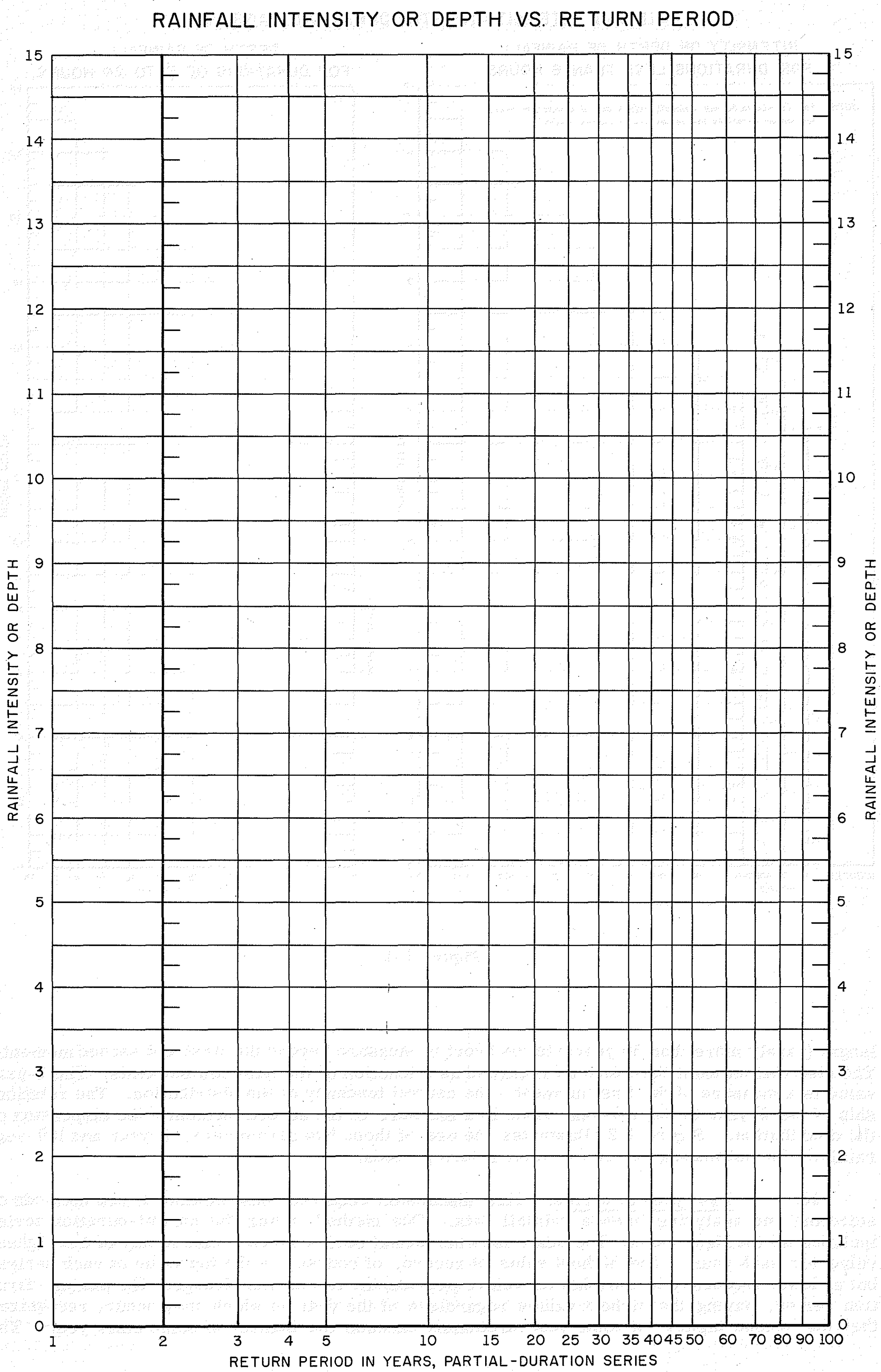
RAINFALL INTENSITY OR DEPTH VS. RETURN PERIOD
RAINFALL INTENSITY OR DEPTH
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2 3 4 5 10 15 20 25 30 35 40 45 50 60 70 80 90 100
RETURN PERIOD IN YEARS, PARTIAL-DURATION SERIES

Figure 1-2

processing of partial-duration data is very laborious, and there is no theoretical basis for extrapolating it beyond the length of record, or even for good definition beyond about the 10-year return period, where there are only 40 or so years of record.

19. Construction of diagram. The return-period diagram of figure 1-2 is based on data from the long-record Weather Bureau stations and is identical with the return-period diagram in Technical Paper No. 29, Part 1. The shape of the diagram — that is, the spacing of the ordinates — is partly empirical and partly theoretical. From one to 10 years it is entirely empirical, based on free-hand curves drawn through plottings of partial-duration series data. For the 20-year and longer return periods, reliance was placed on Gumbel [10] analysis of annual series data. The transition was smoothed subjectively between 10- and 20-year return periods. If values between 2 and 100 years are taken from the return-period diagram of figure 1-2, then converted to annual-series values and plotted on either Gumbel or log-normal paper the points will very nearly define a straight line.

20. Conversion factors for two series. Table 1-2, based on a sample of nearly 50 widely scattered U. S. stations, gives the empirical factors for converting the partial-duration series to the annual series.

Table 1-2

EMPIRICAL FACTORS
FOR CONVERTING PARTIAL-DURATION SERIES TO ANNUAL SERIES

Return Period	Conversion Factor
2-year	0.88
5-year	0.96
10-year	0.99

For example, if the 2-, 5-, and 10-year partial-duration series values estimated from the return-period diagram are 3.00, 3.75, and 4.21 inches, respectively, the annual series values are 2.64, 3.60, and 4.17 inches after multiplying by the conversion factors in table 1-2.

21. Use of diagram. The two intercepts needed for the frequency relation in the diagram of figure 1-2 are the 2-year values obtained from the 2-year maps and the 100-year values obtained by multiplying the 2-year values by those given on the 100-year to 2-year ratio maps. Thus, given the rainfall values for both 2- and 100-year return periods, values for other return periods are functionally related and may be determined from the frequency diagram which is entered with the 2- and 100-year values. The 100-year values for the first-order stations were taken from Gumbel analysis of the annual series.

22. General applicability of diagram. The frequency diagram is independent of the units used as long as the same units (inches, tenths of inches, etc.) are used for any given problem. Tests have shown that within the range of the data and the purpose of this paper, the diagram is also independent of duration. In other words, for one hour, or 24 hours, or any other duration within the scope of this report, the 2-year and 100-year values define the values for other return periods in a consistent manner. Studies have disclosed no regional pattern that would improve the diagram of figure 1-2 which thus far appears to have application over the entire region of interest and perhaps the entire United States.

23. The use of short-record data introduces the question of possible secular trend and biased sample. Routine tests with data of different periods of record showed no significant trend, indicating that the direct use of the relatively recent short-record data was legitimate.

Isopluvial maps

24. General. For generalization over the region of interest, three maps have been prepared which show rainfall depths for one, 6, and 24 hours for return periods of 2 years. Three additional maps show the ratio of 100-year to 2-year rainfall for the same durations.

This set of six maps appears as figures 2-2 to 2-7 in Section II of this report. For interpolation among the durations given on these maps, and for return periods other than 2 years, the diagrams of figures 1-1 and 1-2 are used. In general, the isopluvials were drawn in a straightforward and fairly objective manner. The 2-year 24-hour map is based on about 900 stations. While the 2-year value is well defined even by short records, there was a tendency in drawing the isopluvial lines to give more weight to the longer-record data. The 2-year 1-hour and 2-year 6-hour maps are each based on more than 200 stations. Experience in situations where it has been necessary to estimate short-duration data from daily observations has demonstrated that the ratio of 1-hour or 6-hour values to corresponding 24-hour values for the same return period does not vary greatly over a small region. This knowledge served as a useful guide in smoothing the 1-hour and 6-hour isopluvials.

25. Reason for ratio maps. The decision to use maps of the ratio of the 100-year to 2-year values, instead of 100-year maps, was based largely on the fact that the ratio produces a flatter map and greatly reduces errors that might arise from the practical limitations of correct registration in the printing process and of interpolation in using the maps. If 100-year (or even 10-year) maps had been used, ratio maps would have been required for one of the consistency tests while preparing this paper. One of the reasons for using the 100-year instead of 10-year or other short return-period ratios was to make the use of the frequency diagram less subject to error. Although the ratio maps require an additional multiplying operation, actual tests with alternate methods established the superiority of the ratio maps.

Reliability of results

26. The reliability of results is influenced by sampling error both in time and space and by the manner in which the maps were constructed. Sampling error in space is a result of the chance occurrence of a storm at one station but not at a nearby station. Similarly, sampling error in time is a product of storms occurring during a short period, but not according to their average regime. A short period of record may include some non-representative large storms or may miss some important storms that occurred before or after the period of record at a given station. In evaluating the effects of areal and time sampling errors, it is pertinent to look for and to evaluate bias and dispersion. This is discussed in the two following paragraphs.

27. Areal sampling error. In developing the area-depth relations, which will be described later, it was necessary to examine data from several dense networks. Some of these dense networks were from regions where there could be no conceivable effect of physiography on the rainfall regime. Examination of some of these data showed, for example, that the standard deviation of point rainfall for the 2-year return period for a flat area of 300 square miles is about 20% of the mean value. With no assignable causes for this dispersion it must be regarded as a residual error in sampling the relatively small amount of extreme-value data available for each station.

28. Sampling error in time. Daily data from 158 long-record stations were analyzed for 10- and 45-year records to determine the reliability or level of confidence that should be placed on the results from the short-record data. No bias was found. The average differences, without regard to sign, in the results for selected return periods are given in table 1-3.

Table 1-3

AVERAGE DIFFERENCE OF VARIOUS RETURN-PERIOD AMOUNTS FOR 10- AND 45-YEAR RECORDS

Return Period (yrs)	2	5	10	25	50	100
Average Difference (%)	9	12	15	17	19	20

29. Smoothing of isopluvial lines. The reliability of the isopluvial maps is determined partly by the manner in which they are constructed and partly by any limitations in their

use. The manner of construction involves the question of how much to smooth the data, and an understanding of the problem of data smoothing is necessary to the most effective use of the maps. The drawing of isopluvial lines through a field of data is analogous in some important respects to drawing regression lines through the data of a scatter diagram. Just as isolines can be drawn so as to fit every point on the map, an irregular regression line can be drawn to pass through every point; but the complicated pattern in each case would be unrealistic in most instances. In each case the correlation coefficient could be made 1.00, but too many degrees of freedom would be sacrificed. The maps were deliberately drawn so that the standard error of estimate (the inherent error of interpolation) was commensurate with the sampling and other error in the data and methods of analysis. While this smoothing of the map was necessarily a subjective process, criteria included consistent limitations on spacing and curvature of isopleths.

30. Evaluation. In general, the standard error of estimate ranges from a minimum of about 20%, where a point value can be used directly as taken from a "flat" part of one of the 2-year maps, to at least 50%, where a 100-year value of short-duration rainfall must be estimated for an appreciable area in a more rugged portion of the region. Even though the confidence band is wide, some significant variation in the 2-year values has undoubtedly been masked as a result of smoothing, as in mountainous areas where large local variations have been obscured. For example, Dahlonega and Clermont 3SW, in northern Georgia are about 15 miles apart at elevations of 1519 and 1100 feet, respectively, yet their 2-year 24-hour values of 4.17 and 3.34 inches have been practically merged through smoothing. This problem is discussed in paragraphs 71, 72, and 73.

31. Comparison with Yarnell's maps. Differences between the isopluvial maps of figures 2-2 to 2-7 and earlier maps, such as Yarnell's, come from several sources. The maps in this paper are based on longer records and a vastly greater number of stations. Values shown on the maps of this paper are adjusted to partial-duration series and are for maximum n-minutes—that is, the 24-hour values are the maximum for any successive 1440 minutes, not a calendar day. For example, rainfall values for the 2-year return period for partial-duration series and maximum 1440 minutes are about 30% greater than for annual series and calendar day.

32. Tables of station data. In order to make unsmoothed data available to the user, all the observed 2-year 1-, 6-, and 24-hour values are given in table 2-2. The 100-year values for long-record first-order and cooperative observer data are presented in table 2-3. The station names and locations shown in these two tables are those listed in the climatological publications for the latest year of record used in this study.

Areal Rainfall

Basic data

33. Having made a survey of all available dense networks, 20 were selected for study on the basis of the criteria cited in Technical Paper No. 29, Part 1. The location, number of gages, and length of record for the networks used in this study are shown in figure 1-3 and table 1-4.

Area-depth relationships

34. Determining average depth. The estimation of areal rainfall with sufficient volume of data to derive general regional duration and frequency relationships could become too laborious to serve as a basis for economical design. With limited precedent for this work, it was necessary to test methods for processing the data. It was found that the drawing of isohyets had no practical advantage over the faster and more objective method of taking the arithmetic mean of a sufficient number of station values to estimate areal depth. Where the stations are anywhere near uniformly spaced there is little question that the mean of the stations is as good as the average of an isohyetal map, and in our selection of station networks for defining area-depth relationships, this was one of the criteria. Limited tests show remarkably little difference between reasonable isohyetal averages and means of station data—regardless of the number of stations. It must be remembered that for these computations there are no adjoining data close enough for use in defining the isohyetal patterns outside the small areas concerned.

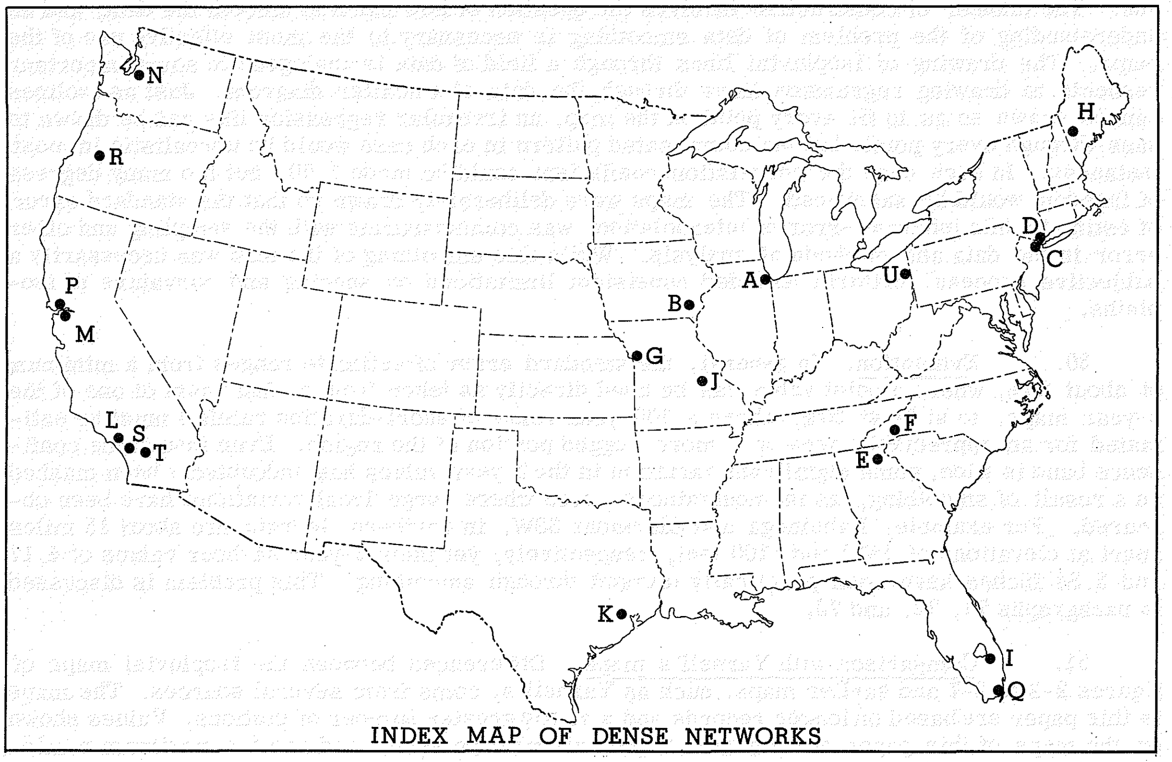

Figure 1-3

35. Shape factor. No attempt was made to evaluate effects of shape of area, though it can be said that there was no apparent difference among the areas studied; these varied in shape from essentially square to twice as long as wide. There were too few dense networks to evaluate the effects of orientation of the axis of a long drainage area.

36. Areal variation of storm rainfall. Ideally the study of areal rainfall patterns for given periods would show two things. One would be the degree of variability: some measure of the extreme range of rainfall depth from place to place within the given area and period. The other would be some indication of where the high and low centers are. To date, the study of this aspect of storm characteristics has been rather limited. Except in regions of rugged terrain it is believed that the location of high and low centers of rainfall over small areas and short durations is random. Accordingly, it may suffice for the present to express merely the degree of variability. A convenient measure of variability is the standard deviation. For plains areas of 200 or 300 square miles the standard deviation of hourly rainfall is about 40% of the mean depth, and for 24-hour rainfall the standard deviation is about 20% of the mean depth. The variability for rugged areas is greater than for plains areas—the more rugged the more variable. In a 200 square mile area in the vicinity of Asheville, N. C., the standard deviation was about twice the values given above for hourly and 24-hour rainfall.

Computations

37. Area-depth computations. As a practical device for saving labor, the data and curves shown in figure 1-4, for the relationship of depth to area for 1- and 24-hour durations, are for the mean of the annual series, which is the 2.3-year return period rather than the 2.0-year return period. The 2.0-year value is almost exactly 6% less than the series mean value. The ordinate of the lower curve of figure 1-4 is conveniently expressed as a fraction whose numerator is, for instance, the 2-year 24-hour rainfall over an area, and whose denominator

Table 1-4

DENSE NETWORK DATA

Dense Network	Total Area	Total No. of Gages	No. of Sub-Networks	Length of Record (yrs)
A	310	13	8	9
B	90	9	6	15
C	150	6	3	15
D	300	5	2	14
E	400	4	0	11
F	200	5	1	7
G	300	5	2	14
H	400	7	0	5
I	400	4	0	15
J	300	7	0	9
K	300	4	0	11
L	200	4	0	10
M	150	5	0	10
N	400	4	0	12
P	400	4	0	6
Q	400	5	0	6
R	400	5	0	13
S	100	5	0	7
T	300	4	0	16
U	100	4	0	12
Total			22	

is the average of the 2-year 24-hour value for points in the area. The numerator is obtained from an annual series of values, each of which is the maximum average depth for a given area during the year—the times of beginning and ending of the 24-hour duration, for example, being the same for each station in the area. The denominator is the mean of the individual station values—each being the 2-year 24-hour rainfall obtained from the annual series of point values without regard to when the 24-hour period occurs among the stations. The element of simultaneity in the numerator restricts the magnitude of the areal depths to values equal to or less than the average of the point rainfall depths.

38. Simplified case of areal-depth relation computation. Table 1-5 illustrates, by an oversimplified hypothetical example, the method of obtaining the maximum annual values of individual stations, and of the areal, or simultaneous combined-station means. In this example, there are three stations, A, B, and C in the network, and there are only five days of rain in this hypothetical year. These five days of rain are designated by dates, from 1 to 5.

39. Determination of area of network. It is fairly easy to determine the area for a watershed and estimate the average depth of rainfall over it from a dense network of gages. It is not so easy, however, to start with a dense network of gages and say to what size or shape of area the mean depth applies. The area "covered" by n gages was taken to be about equal to n circles having diameters equal to the average station spacing. The total areas for most of the dense networks studied were rounded off to the nearest hundred square miles. Most of the area-depth curves are so flat and the scatter of points is so great, as shown in figure 1-4, that precise determination of area would not be worth the effort.

40. The denser networks were subdivided to provide additional points as an aid in defining the position of the curves for the smaller areas. The 1- and 24-hour curves were fitted by eye and represent a compromise between optimum fit for the larger areas and a well established feature of storm rainfall: the average intensity over an area in relation to the maximum point rainfall in that area is some inverse function of the size of that area. These curves are identical to those in Part 1.

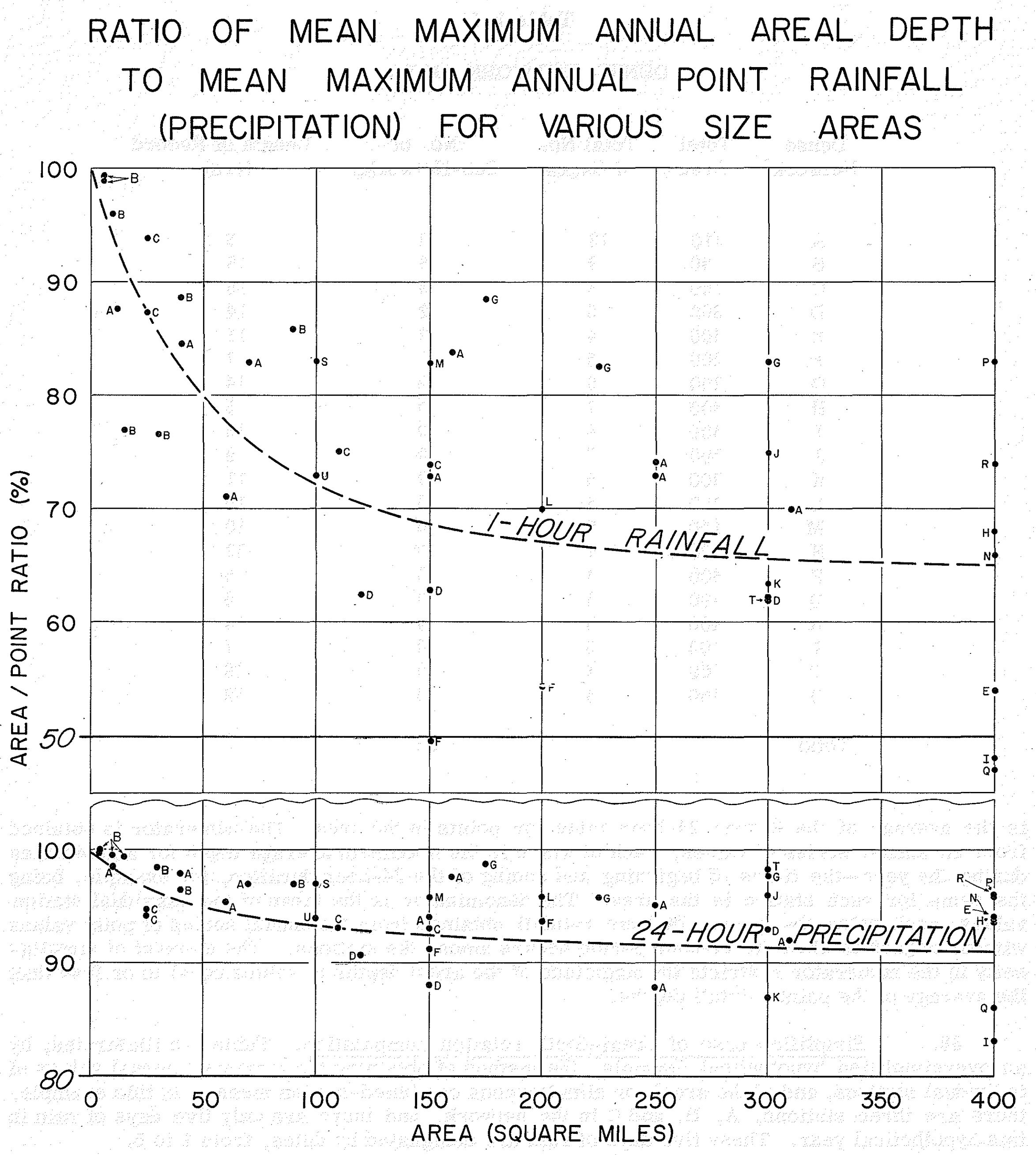

Figure 1-4

Generalization

41. No regional relationship. The large scatter in figure 1-4 exhibits no systematic regional pattern even with the additional networks studied since the preparation of Technical Paper No. 29, Part 1.

42. Duration as a major parameter. From detailed studies of the 20 dense networks and from tests performed on others, it was found that the area-depth relationship varies with duration, as shown in figure 1-4. The 1- and 24-hour curves of figure 1-5 are identical to those in figure 1-4. The 30-minute curve is based on short-record data from the Muskingum, Ohio

Table 1-5

EXAMPLE OF AREA/POINT RATIO COMPUTATION

Date	Station A	Station B	Station C	Areal value (equals the 3-station mean)
1	2	6	4	4
2	5	6	7	6
3	4	8	3	5
4	5	4	3	4
5	9	2	1	4
maximum	9	8	7	6

Maximum areal value is 6
The mean of the individual station maxima is 8: the mean of 9, 8, and 7.
The area-point ratio is then 6 ÷ 8, or 0.75.

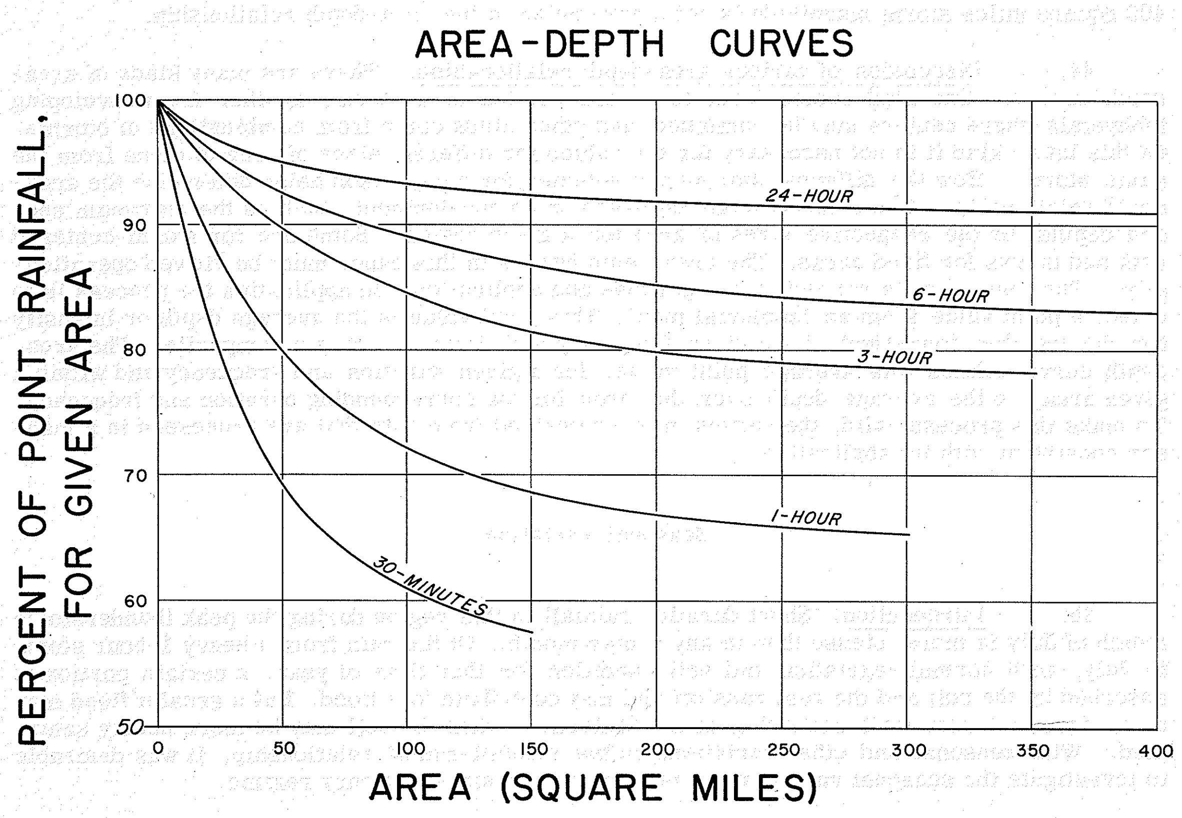

Figure 1-5

network [11] . The points for defining the 3- and 6-hour curves were interpolated between the 1- and 24-hour curves. It may be observed that the curves in figure 1-4 pass below most of the plotted points and possibly should be slightly higher. However it is difficult to say what weight each point should have—perhaps stations L, S, and T should have no greater combined weight than, say, station K, in expressing geographic and other parameters. Until further study identifies and evaluates some additional parameter that would reduce the scatter of these points, there seems to be no justification for making slight adjustments of these lines. There is a slight but not very well defined tendency toward lower ratios for 1-hour rainfall in regions of high thunderstorm incidence. However there is not enough reliable data available to warrant redefining the curves.

43. Depth or return period not a parameter. None of the dense networks has sufficient length of record to evaluate the effect of magnitude (or return period) on the area-depth relationship. An approach to this problem included examination of published area-depth curves from "Storm Rainfall" [12] . These curves required transformation to make them comparable with curves such as those of figure 1-5. The data for "Storm Rainfall" is storm centered, whereas the networks used in this paper are geographically fixed. "Storm Rainfall" data represents profiles of discrete storms, whereas the dense network data are statistical averages in which the point values very seldom, if ever, correspond to areal values of the same storm each year; in fact, the point values for each year are usually from different storms for different stations. The area-depth curves taken from "Storm Rainfall", after transformation to make them comparable with the generalized curves of the dense networks for the 2.3-year return period, showed no significant differences from the curves for lesser storms. This is illustrated by the linear relationship of 10- vs. 500-square mile 24-hour rainfall portrayed in figure 1-6. Additional tests with 10- vs. 100- and 10- vs. 200 square mile areas for 6- and 24-hour rainfall also show a linear relationship. Accordingly, it is tentatively accepted that for areas of less than 400 square miles storm magnitude is not a parameter in the area-depth relationship.

44. Discussion of various area-depth relationships. There are many kinds of area-depth curves. One kind comes from the cross-section of a storm, another from enveloping isohyetals where centers may be combined, and other kinds come from combinations of storms. Of this latter kind it is not necessary for the values for different sizes of area to come from the same storm. How the different storms are selected for comparison helps determine the area-depth relationship. One relation might be based on an envelopment, such as the maximum record depths for the respective sizes of area for a given region. Some are for storm-centered data and others for fixed areas. The area-depth curves in this paper must be viewed operationally. The operation is related to the purpose and application. In application the process is to select a point value from an isopluvial map. This point value is the average depth or intensity for the location concerned, for a given frequency and duration. It is a composite. The area-depth curve relates this average point value, for a given duration and frequency and within a given area, to the average depth over that area for the corresponding duration and frequency. To make this process valid, the curves must be derived from data that are processed in a manner consistent with its application.

Seasonal Variation

45. Introduction. Short duration rainfall in this region during the peak thunderstorm month of July is more intense than in any winter month. Of the rain from a heavy 1-hour storm in July, with normal vegetation and soil condition for that time of year, a certain portion is absorbed by the soil and the rest runs off and may contribute to a flood. But a greater flood may come from a lesser rain occurring in the wintertime when the soil may be more nearly saturated. With seasonal and other variations in the rainfall-runoff relationship, it was desirable to investigate the seasonal variation in the rainfall intensity-frequency regime.

46. Monthly vs. annual series. The frequency analysis so far has followed the conventional precedures of using only the annual maxima or the n-maximum events for n-years of record. Obviously, some months contribute more events to these series than others and, in fact, some months might not contribute at all to these two series. The purpose of the following analysis is to show how often these rainfall events occur during part of the year, or a specific calendar month.

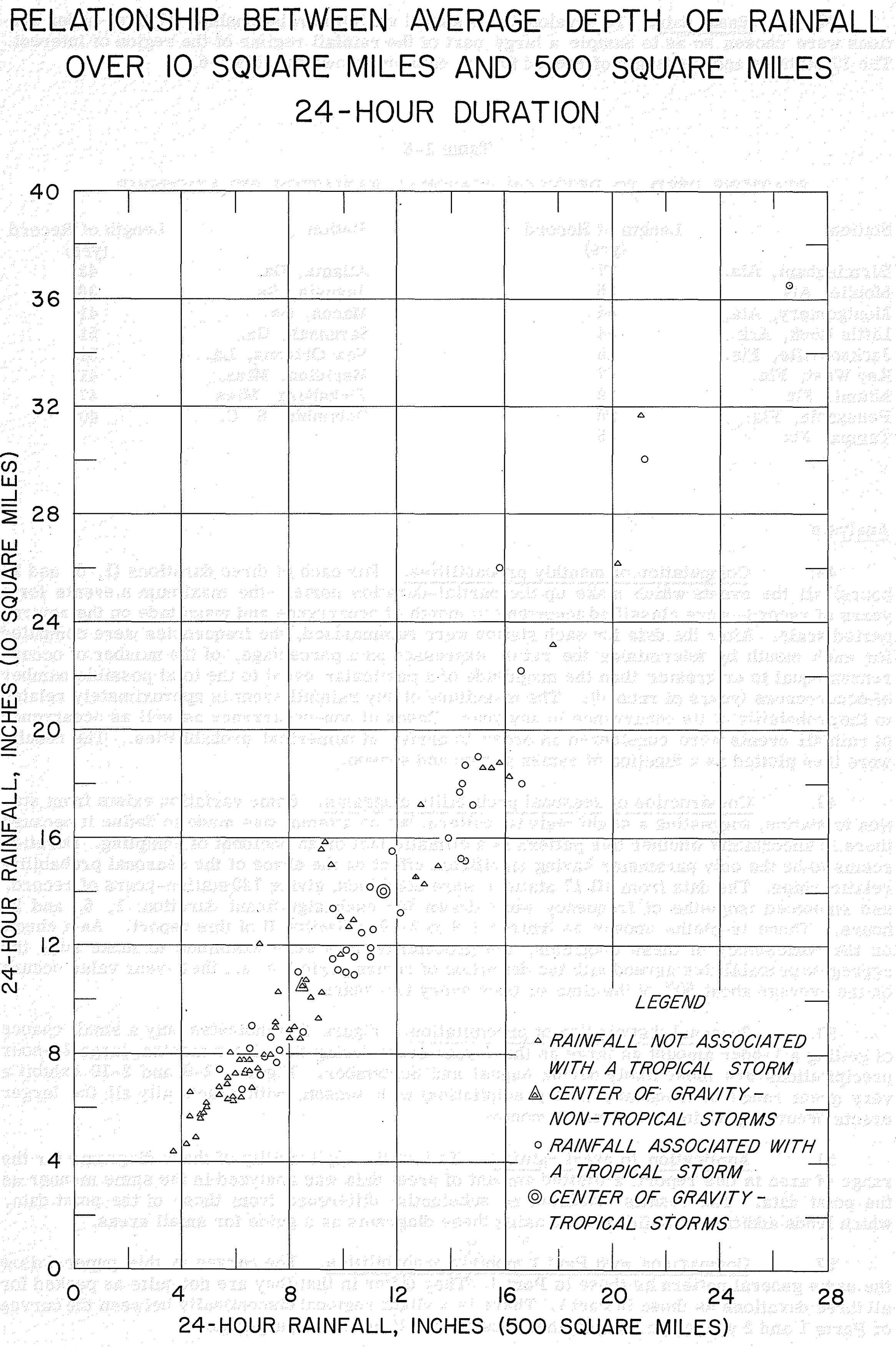
RELATIONSHIP BETWEEN AVERAGE DEPTH OF RAINFALL
OVER 10 SQUARE MILES AND 500 SQUARE MILES
24-HOUR DURATION
24-HOUR RAINFALL, INCHES (10 SQUARE MILES)
0
4
8
12
16
20
24
28
32
36
40
0
4
8
12
16
20
24
28
24-HOUR RAINFALL, INCHES (500 SQUARE MILES)
LEGEND
RAINFALL NOT ASSOCIATED WITH A TROPICAL STORM
CENTER OF GRAVITY - NON-TROPICAL STORMS
RAINFALL ASSOCIATED WITH A TROPICAL STORM
CENTER OF GRAVITY - TROPICAL STORMS

Figure 1-6

47. Basic data. To develop the seasonal variation relationship, 17 first-order stations were chosen so as to sample a large part of the rainfall regime of the region of interest. The 17 stations and the length of record for the data are shown in table 1-6.

Table 1-6

STATIONS USED TO DEVELOP SEASONAL VARIATION RELATIONSHIP

Station	Length of Record (yrs)	Station	Length of Record (yrs)
Birmingham, Ala.	37	Atlanta, Ga.	43
Mobile, Ala.	35	Augusta, Ga.	38
Montgomery, Ala.	44	Macon, Ga.	41
Little Rock, Ark.	44	Savannah, Ga.	51
Jacksonville, Fla.	49	New Orleans, La.	51
Key West, Fla.	47	Meridian, Miss.	41
Miami, Fla.	29	Vicksburg, Miss.	47
Pensacola, Fla.	38	Columbia, S. C.	40
Tampa, Fla.	45		

Analysis

48. Computation of monthly probabilities. For each of three durations (1, 6, and 24 hours) all the events which make up the partial-duration series—the maximum n events for n years of record—were classified according to month of occurrence and magnitude on the return-period scale. After the data for each station were summarized, the frequencies were computed for each month by determining the ratio, expressed as a percentage, of the number of occurrences equal to or greater than the magnitude of a particular event to the total possible number of occurrences (years of record). The magnitude of any rainfall event is approximately related to the probability of its occurrence in any year. Cases of non-occurrence as well as occurrence of rainfall events were considered in order to arrive at numerical probabilities. The results were then plotted as a function of return period and season.

49. Construction of seasonal probability diagrams. Some variation exists from station to station, suggesting a slight regional pattern, but no attempt was made to define it because there is uncertainty whether this pattern is a climatic fact or an accident of sampling. Duration seems to be the only parameter having significant effect on the shape of the seasonal probability relationships. The data from all 17 stations were combined, giving 720 station-years of record, and smoothed isopleths of frequency were drawn for each significant duration: 1, 6, and 24 hours. These isopleths appear as figures 2-8 to 2-10 in Section II of this report. As a check on the consistency of these diagrams, the probability lines were examined to make sure the aggregate probabilities agreed with the definition of return period; e. g., the 2-year value occurs on the average about 50% of the time or once every two years.

50. Seasonal distribution of precipitation. Figure 2-8 indicates only a small chance of getting a 1-hour amount as large as the 1-year event during the winter months; large 24-hour precipitations are most likely during August and September. Figures 2-9 and 2-10 exhibit a very great range of frequency (and precipitation) with season, with practically all the larger events occurring during the summer months.

51. Application to areal rainfall. To test the applicability of these diagrams for the range of area in this report, a limited amount of areal data was analyzed in the same manner as the point data. The results exhibited no substantial difference from those of the point data, which lends additional confidence for using these diagrams as a guide for small areas.

52. Comparison with Part 1 monthly probabilities. The curves in this paper follow the same general pattern as those in Part 1. They differ in that they are not quite as peaked for all three durations as those in Part 1. There is a slight regional discontinuity between the curves of Parts 1 and 2 which can be smoothed locally for all practical purposes.

53. <u>Introduction</u>. The variability of precipitation in time has a marked effect on the resulting runoff. If a 3-inch rain is spread uniformly over a 24-hour period, the resulting streamflow, particularly the peak rate, will be much less than if the rain occurs during one hour of the 24-hour period. It is pertinent to ask what proportion of a 24-hour rain usually does fall in one hour, or in 6 hours. Figure 1-7 presents empirical relations, developed from 15 large 24-hour storms expressing the percentage of 24-hour precipitation as a function of duration. Each point is labeled with the magnitude of the 24-hour precipitation. It is instructive to observe that there is no systematic pattern to these magnitudes. If enough 24-hour storms were used and stratified by 1-inch (per 24-hour) increments, a family of curves could be constructed similar to those presented in Part 1. This was not done here because the differences between the stratum means are small and do not account for much of the variation between the percentage depth-duration observations.

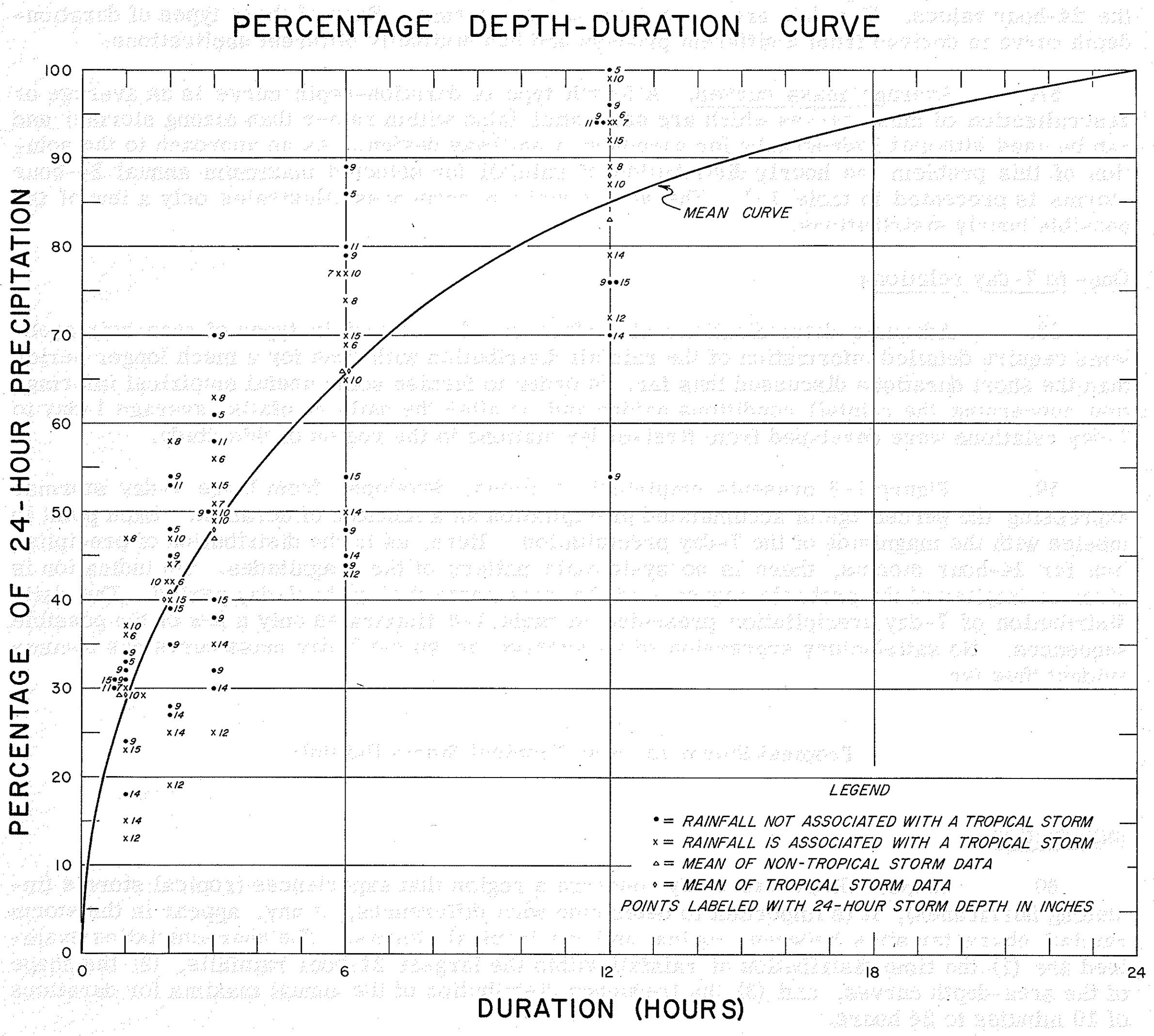

Figure 1-7

Four types of duration-depth curves

54. Mass curves. The first and perhaps simplest duration-depth curve is the mass curve of observed rainfall. This curve merely portrays the increasing depth of rainfall, with passage of time, in the sequence of occurrence during a given period of rainfall.

55. Percentage duration-depth curves. Another kind of duration-depth curve can be prepared from these mass curves by ranking the increments of rainfall in order of decreasing or increasing magnitude. These curves can be generalized by expressing total rainfall for the entire overall duration of 100%, and expressing the summation in a percent scale. These curves are non-sequential but represent data all from the same events, merely rearranged by increments. They represent data from within storms. An average of several such curves appears in figures 1-7 and 1-8.

56. Intensity-duration-frequency curves. The third kind of duration-depth curve is also non-sequential, but includes values not associated with one another on an event basis. Such curves appear in Technical Paper No. 25 [13] . Here the depth for each duration corresponds to a given return period, but the hourly values might occur at a different time of year than, say, the 24-hour values. The data are taken from among storms. Each of these types of duration-depth curve is derived from a different process and has distinctly different applications.

57. Average mass curves. A fourth type of duration-depth curve is an average or generalization of mass curves which are sequential (also within rather than among storms) and can be used with unit hydrographs for purposes of spillway design. As an approach to the solution of this problem the hourly distribution of rainfall for selected maximum annual 24-hour storms is presented in table 1-7. The wide variety of sequences illustrates only a few of the possible hourly distributions.

One- to 7-day relations

58. Adequate determinations of surface runoff and certain types of reservoir problems require detailed information of the rainfall distribution with time for a much longer period than the short durations discussed thus far. In order to furnish some useful empirical information concerning the rainfall conditions before and/or after the daily rainfalls, average 1-day to 7-day relations were developed from first-order stations in the region of this study.

59. Figure 1-8 presents empirical relations, developed from large 7-day storms, expressing the percentage of accumulated precipitation as a function of duration. Each point is labeled with the magnitude of the 7-day precipitation. Here, as in the distribution of precipitation for 24-hour storms, there is no systematic pattern of the magnitudes. No indication is given or implied of the probable sequence of the increments during the 7-day period. The daily distribution of 7-day precipitation presented in table 1-8 illustrates only a few of the possible sequences. No satisfactory expression of an average or typical 7-day mass curve has become evident thus far.

Tropical Storm vs. Non-Tropical Storm Rainfall

Introduction

60. Scope. Since this study concerns a region that experiences tropical storms (including hurricanes), it is important to determine what differences, if any, appear in the storm rainfall characteristics between tropical and non-tropical storms. The characteristics examined are (1) the time distribution of rainfall within the largest 24-hour rainfalls, (2) the shape of the area-depth curves, and (3) the frequency distribution of the annual maxima for durations of 10 minutes to 24 hours.

61. Tropical storms. The term "tropical storm" as used here refers to a cyclone of tropical Atlantic or Caribbean origin. Such a storm is referred to as a hurricane when its maximum wind speed equals or exceeds 75 miles per hour. Tropical storms have circular pressure patterns covering thousands of square miles and move at varying speeds, often for thousands of miles. The intensity of the storm usually diminishes over land areas and the storm finally dissipates or loses its intense tropical character as it moves into northern latitudes. Even with less than hurricane-force winds, these storms often bring very heavy rainfall.

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Table 1-7

HOURLY DISTRIBUTION OF SELECTED 24-HOUR RAINFALLS (Inches)

Station	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
Birmingham, Ala.	12/27/1942	.05							.01	.01		.01	.01	.02	.01	.02	.01	.05	.08	1.99	1.47	.49	1.86	1.40	.21	7.70
Mobile, Ala.	3/14-15/1929	.10	.57	.37	.98	.83	.94	.92	1.28	1.01	.28		T	.04	T	.03	.06	T	.13	.46	.46	2.20	.04	.41	.48	11.59
Montgomery WB AP, Ala.	9/26-27/1953	.01	.03	.07	.12	.10	.16	.24	.30	.35	.71	.85	1.15	.54	.87	.69	.46	.37	.62	.70	.17	.10	.09	.07	.04	8.81
Apalachicola, Fla.	9/13-14/1932	.14	.55	.95	.08	.77	.70	.75	.15	.01	T	T	T	.07	.51	.43	.20	.23	.26	.47	.51	.76	1.37	1.33	1.23	11.47
Jacksonville, Fla.	10/18-19/1944	.10	.10	.15	.03	.07	.16	.14	.27	.19	.36	.54	.58	.71	1.95	2.07	.90	.49	.44	.15	.13	.03	.01	.02	.03	9.62
Key West, Fla.	11/13-14/1954	.01	.05	.05	.06		.58	1.17	3.81	3.86	1.40	.55	1.17	1.68	1.90	.50	.26	1.20	.58	.50	.30	.24	.01			19.88
Miami, Fla.	11/29-30/1925	.20	.44	.70	.92	.32	.72	.12	.34	2.14	2.42	3.48	2.06	.20	.01	T								.08	.92	15.07
Pensacola, Fla.	10/4-5/1934	.06	.09	.07	.06	.07	.13	.06	.10	.06	.19	.19	.33	.46	.88	1.52	2.38	1.62	.85	1.15	1.18	1.39	2.25	1.44	.52	17.05
Tampa, Fla.	6/23-24/1945	.02	.05	.13	.17	.08	.27	.09	.44	.35	.28	.34	.36	1.04	3.54	.51	.23	.89	.60	.43	.01			.06	.52	10.41
Augusta, Ga.	9/30-10/1/1929	.06	.13	.89	.83	T			T	T	T	.06	.31	.23	2.06	.47	T	.52	1.88	.90	.41	.31	.37	.33	.06	9.82
Macon, Ga.	6/10/1923	.11	.76	4.15	1.69	T					.05	.01														6.77
Meridian, Miss.	2/3-4/1936	.09	.21	.07	.21	.22	.25	.18	.05	.01	.01	.01	.23	.25	.20	.32	.23	.27	1.94	1.40	.80	.74	.34	T	.01	8.04
Columbia, S. C.	8/16-17/1949	.47	2.10	.35	.54	.60	.46	.28	.06	.32		.33	.66	1.07	.10		.06									7.40
Greenville, S. C.	10/24-25/1918	.24	.14	.99	.60	.44	.29	.05	.05	.12	.03	.33	.06	.01	.04	.01	.10	.46	.58	.20	.08	1.05	.76	.60	.09	7.32

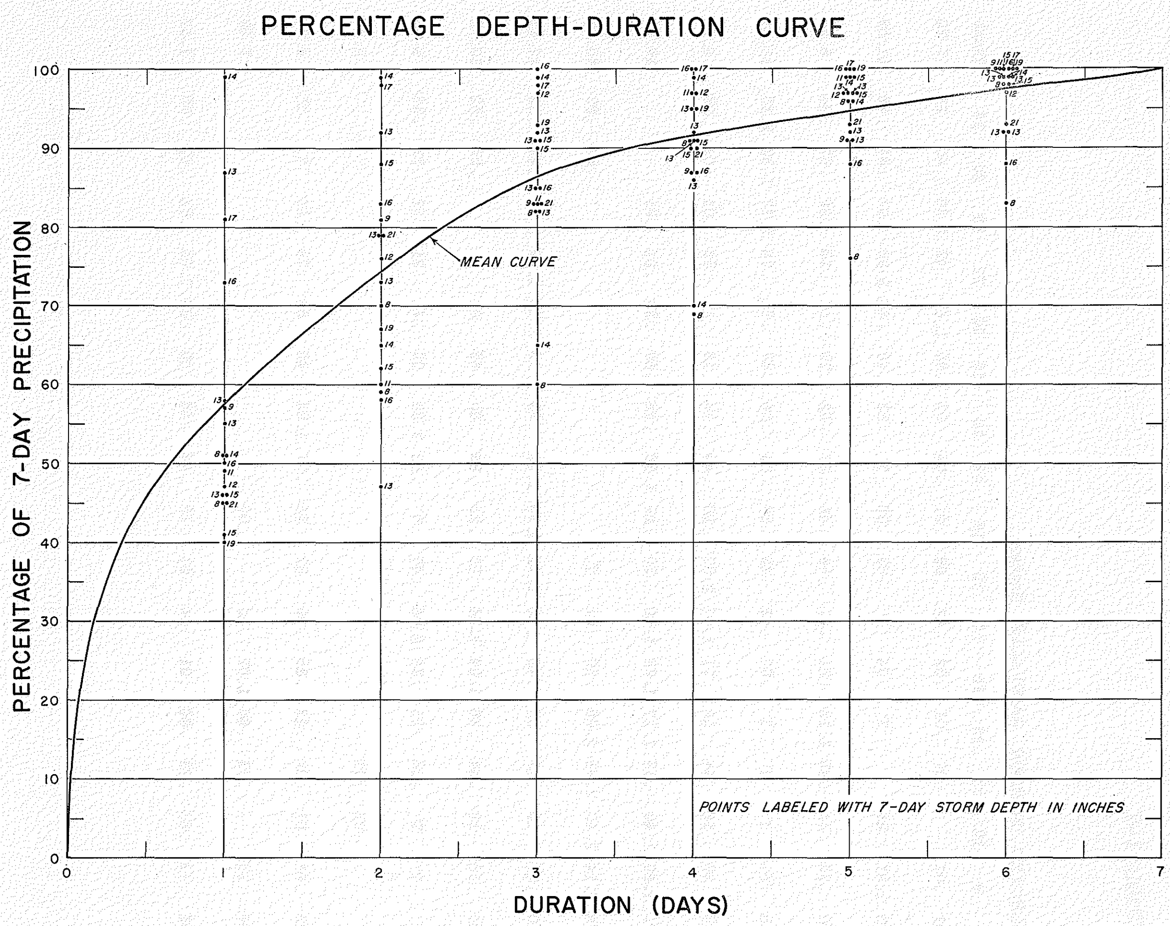


Figure 1-8

Time distribution

62. For each of several first-order stations, four large 24-hour rainfall values were selected for analysis. Two of these values were for tropical and two were for non-tropical storms, each set of two representing the largest values for which pertinent data were conveniently available. The results are shown in figure 1-7, where each observation is identified as tropical or non-tropical. The scatter for each duration is large and appears to be independent of storm type or magnitude, there being no systematic separation.

Area-depth curves

63. A measure of the shape of the area-depth curve is taken here for convenience as the relationship of average depth over 10 square miles to that over 500 square miles. All storms described in the South Atlantic District and selected large storms in the Gulf of Mexico District of "Storm Rainfall" were utilized in preparing the scatter diagram of figure 1-6. This figure shows the relationship between average rainfall depth over 10- and 500-square-mile areas for the 24-hour duration. The distribution of points representing tropical and non-tropical storm rainfall suggests a slight tendency for more uniform distribution of rain from tropical than from non-tropical storms, but the average differences are probably too slight, in view of the total scatter, to be significant for most practical purposes.

Table 1-8

DAILY DISTRIBUTION OF SELECTED MAXIMUM ANNUAL 7-DAY RAINFALLS (Inches)

Station	Date	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	7th Day	Total
Mobile, Ala.	7/4-11/1916	2.00	6.74	4.74	.29	.30		1.97	16.04
	3/12-15/1929	2.81	2.05	10.92					15.78
Montgomery WB AP, Ala.	8/10-17/1939	.18	.23	.49	1.93	1.15	5.01	4.02	13.01
	3/7-14/1909	.09	2.55	3.17	.50	5.24	.16	.87	12.58
Jacksonville, Fla.	9/5-11/1908	.22	1.19	.38	2.40	4.22	6.17		14.58
	6/24-7/1/1919	1.41	.13	.77	.34	.15	7.66	2.74	13.20
Miami, Fla.	5/27-6/2/1930	1.51		1.73	.33	7.25	7.37	2.60	20.79
	5/30-6/3/1940	4.79	5.21	7.29	.35	.91			18.55
Tampa, Fla.	9/3-10/1912	.53		1.04		4.34	3.78	4.96	14.65
	6/27-7/3/1909	.07	1.17	4.58	1.15	2.63	1.58	.05	11.23
Atlanta, Ga.	12/7-14/1919	2.99	3.18	5.57		.08	.02	.31	12.15
	7/4-11/1916	.21	.22	2.51	2.24	2.20	.85	.24	8.47
Savannah, Ga.	8/26-9/1/1898	2.43	2.05	.52	1.11	5.98	2.25		14.34
	9/17-23/1928	5.35	6.33					1.01	12.69
New Orleans, La.	10/1-5/1937	13.62	3.03	.03	.30				16.98
	4/15-21/1927	14.01						.12	14.13
Columbia, S. C.	8/31-9/6/1928	.81	.46	.33	.17	1.83	5.49		9.09
	8/7-14/1905	.75	3.99	.02	.78	.57	.51	1.38	8.00

Frequency analysis

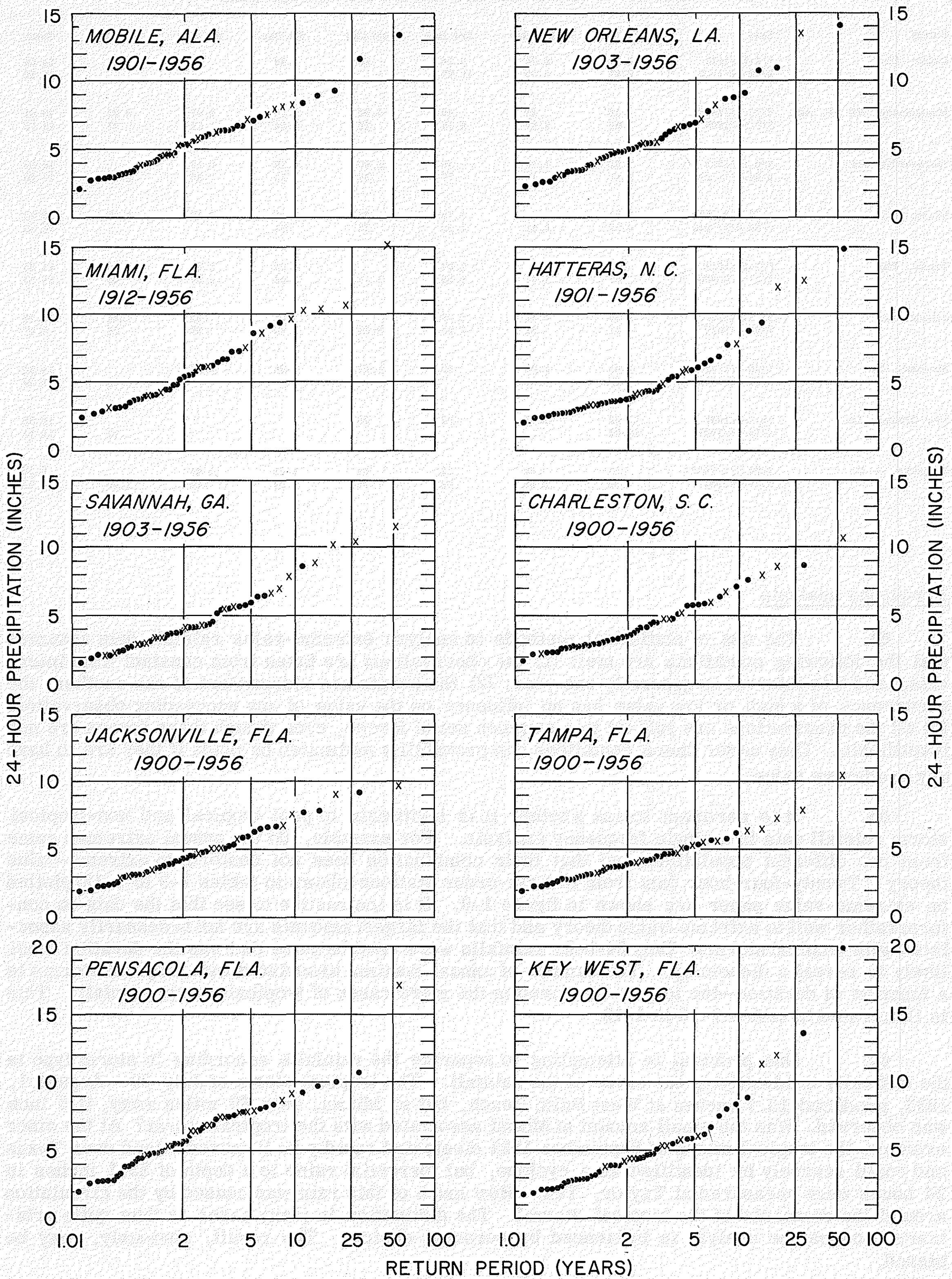
64. The use of statistical methods to analyze extreme-value rainfall data assumes that the following conditions are met: (1) the observations are taken from constant time intervals, and this interval is generally one year; (2) the events are independent of one another: the occurrence of a high or low value has no influence on the value of any succeeding observation; (3) all the observations are subject to a common set of forces, even though these forces are not identifiable. Only under these conditions can probability estimates be made if they are to have any predictive value.

65. It is pertinent to ask whether it is legitimate to pool tropical and non-tropical storm rainfall data in a single frequency analysis. For example, do the annual extremes come from two different populations, so that their combination does not conform to extreme-value theory? Twenty-four-hour data from 10 first-order stations (shown in tables 1-9 to 1-12) plotted on extreme-value paper are shown in figure 1-9. It is instructive to see that the data do conform rather well to extreme-value theory and that the largest amounts are not necessarily associated with tropical storms. Only 24-hour rainfalls were used because that was the duration most likely to reveal a dichotomy. The number of annual maxima associated with tropical storms is a function of duration—the longer the duration the more cases of tropical-storm rainfall. This is illustrated in tables 1-10 to 1-12.

66. One problem in attempting to separate the rainfalls according to storm type is the difficulty in identifying the cause of the rainfall. The tropical storm of July 30 - August 1, 1933, produced 15.7 inches at West Palm Beach, but at Miami, only 60 miles away, 0.5 inch was observed. Was the small amount at Miami associated with the tropical storm? At the other extreme, the tropical storm of September 1921 dissipated rapidly as it moved inland over Texas and could scarcely by identified as a cyclone, but torrential rains to a depth of 23.1 inches in 24 hours were measured at Taylor, Tex. How much of this rain was caused by the circulation around the remnants of the tropical storm? The distinction in many cases is thus quite arbitrary because the analyst is influenced by personal choice. The result, obviously, may be biased.

67. Another difficulty that arises is the effect on the quality of the estimate if extremes are selected from a small sub-sample. Extreme-value theory applies if each extreme

ANNUAL MAXIMUM 24-HOUR PRECIPITATION DATA



LEGEND:

- • ANNUAL MAXIMUM VALUE NOT ASSOCIATED WITH A TROPICAL STORM
- x ANNUAL MAXIMUM VALUE IS ASSOCIATED WITH A TROPICAL STORM

Figure 1-9

represents the extreme of a large number of independent observations of the variate. Rarely is the rainfall at any one station in the United States influenced by a tropical storm more than three times in one year. There is no persistent factor, such as days of rain each year, in which various stations or sectors experience tropical storms. Use of such small sub-samples, contrary to theoretical requirements, will not allow estimation of the reliability of the predicted probabilities of exceeding the extreme value.

68. The forces operating in the production of rain have been established by meteorologists to be convergence, vertical motion and cooling, and condensation. Apparently the frequency distribution of extreme rainfall values is not influenced much by the manner in which the rain started or what source of energy maintains it, whether it be hurricanes, lesser tropical storms, thunderstorms, or some other type of storm. It seems logical, then, to analyze the rainfall amounts without regard to storm type, rather than subjectively try to specify a population from which they came.

Conclusion

69. With respect to frequency distribution of annual maxima for durations of 10 minutes to 24 hours, the shape of the area-depth curve up to 500 square miles, and time distribution within the largest 24-hour rainfalls, rainfall associated with tropical storms does not stand out as being significantly different from the rain associated with other types of storms.

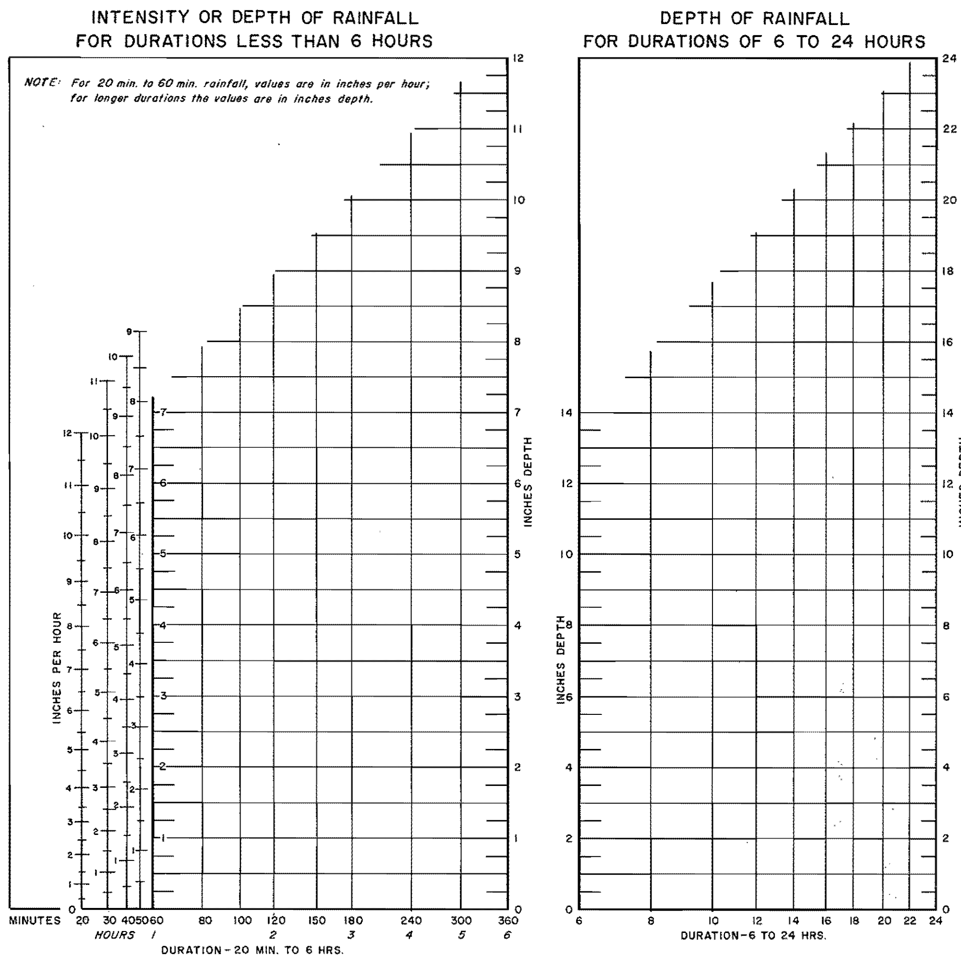


FIGURE 1-1

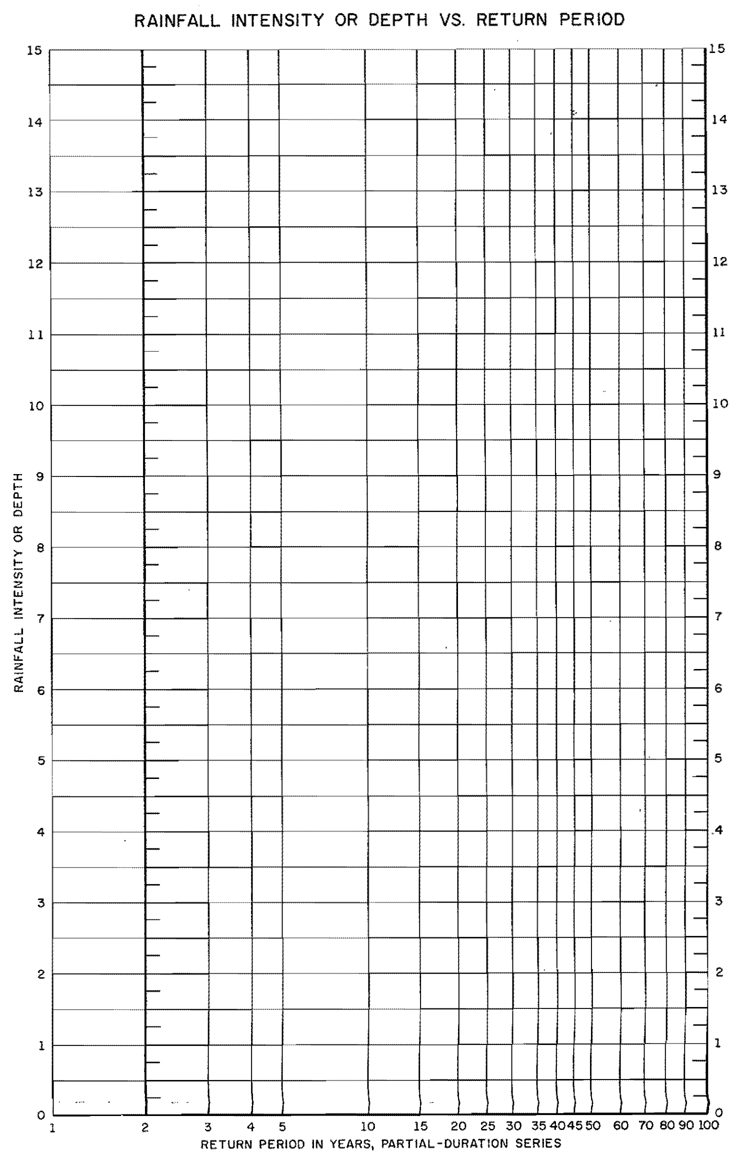


FIGURE 1-2

Table 2-1, with three examples, outlines the steps in the order they should be carried through in solving for the required rainfall intensities or depths.

TABLE 2-1

1.	Location	34° 00' N 86° 00' W	26° 00' N 81° 00' W	32° 00' N 83° 00' W
2.	Required Intensity (Depth) Duration-Frequency-Area	25-Year 3-Hour Rainfall (Inches) for 100 Square Miles	50-Year 12-Hour Rainfall (Inches) for 400 Square Miles	15-Year 30-Min Intensity (In/Hr) for 50 Square Miles
3.	2-Year 1-Hour Rainfall Figure 2-2	1.6 Inches	————	2.0 Inches
4.	2-Year 6-Hour Rainfall Figure 2-3	3.0 Inches	3.4 Inches	3.0 Inches
5.	2-Year 24-Hour Precip. Figure 2-4	————	3.9 Inches	————
6.	Straightedge connecting (3) and (4) or (4) and (5) intersects required duration. Figure 1-1	(2-Year 3-Hour) 2.4 Inches	(2-Year 12-Hour) 3.8 Inches	(2-Year 30-Min) 3.3 In/Hr
7.	100-Year 1-Hour Rainfall / 2-Year 1-Hour Rainfall Figure 2-5	2.1	————	2.1
8.	100-Year 6-Hour Rainfall / 2-Year 6-Hour Rainfall Figure 2-6	1.9	2.0	2.0
9.	100-Year 24-Hour Precip. / 2-Year 24-Hour Precip. Figure 2-7	————	2.5	————
10.	(7) x (3)	(100-Year 1-Hour) 3.4 Inches	————	(100-Year 1-Hour) 4.2 Inches
11.	(8) x (4)	(100-Year 6-Hour) 5.7 Inches	(100-Year 6-Hour) 6.8 Inches	(100-Year 6-Hour) 6.0 Inches
12.	(9) x (5)	————	(100-Year 24-Hour) 9.8 Inches	————
13.	Straightedge connecting (10) and (11) or (11) and (12) intersects required duration. Figure 1-1	(100-Year 3-Hour) 4.7 Inches	(100-Year 12-Hour) 8.2 Inches	(100-Year 30-Min) 6.3 In/Hr
14.	Straightedge connecting (6) and (13) intersects required return period. Figure 1-2	3.8 Inches	7.3 Inches	4.8 In/Hr
15.	Percent of Point Rainfall Figure 1-5	85	87	69
16.	(14) x (15) = (2)	3.2 Inches	6.4 Inches	3.3 In/Hr

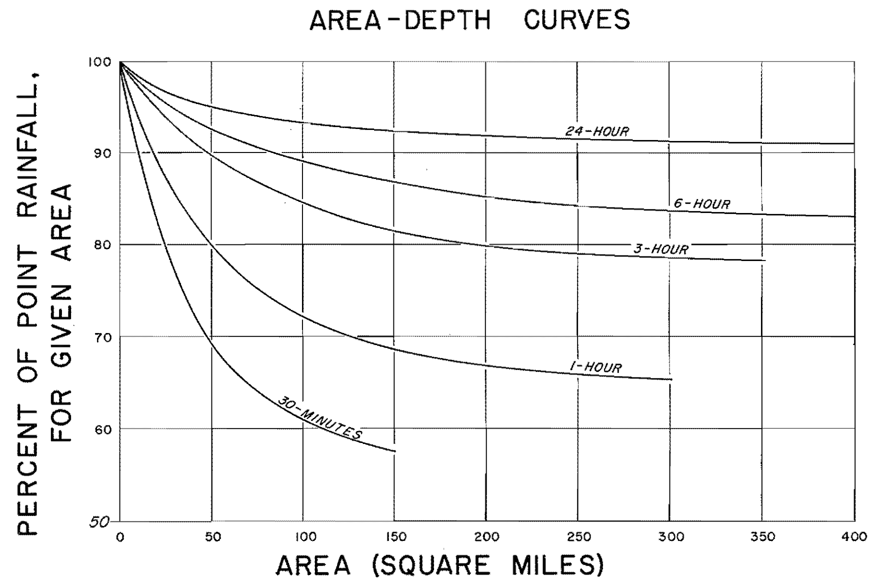


FIGURE 1-5

459250 O - 58 (In pocket)

FIGURE 2-1. DURATION, FREQUENCY, AREA-DEPTH DIAGRAMS, AND EXAMPLES OF COMPUTATION FOR WEATHER BUREAU TECHNICAL PAPER NO. 29, PART 2 (PREPARED DECEMBER, 1957)

Table 1-9

MAXIMUM ANNUAL 24-HOUR RAINFALL (Inches) FOR SELECTED STATIONS

Year	Mobile	Savannah	Jacksonville	Key West	Pensacola	Tampa	Charleston
1900			4.81	5.48	4.61	2.74	4.05
1901	6.49		4.47	2.58	3.96	3.19*	2.17*
1902	3.29		4.22	5.20*	5.47	4.06	2.97
1903	2.90	4.08	9.06	2.29	7.51	5.47*	2.91
1904	2.03	6.43	2.87*	5.83	2.83	3.23	3.91
1905	9.21	2.12	6.18	4.52	3.79	3.81	2.09
1906	6.31*	2.79	7.74	8.86	7.68*	3.05	3.43
1907	6.42	5.48	3.14	5.09	4.53*	3.93	3.42
1908	5.65	4.26	6.69	4.35	2.80	2.25	2.56
1909	4.08	4.04	2.93	11.23*	5.47	5.54*	2.22
1910	5.31	8.56	4.96*	4.12*	2.69	4.47	5.72
1911	8.91	2.95*	2.96*	3.76	5.16	2.82	3.28
1912	5.02	3.30	3.55	3.71	6.58	6.09*	5.95*
1913	7.40	2.56	2.48	3.71	8.32	2.60	4.39
1914	5.33	3.69	2.37	3.09	7.66	3.58	2.88
1915	3.97	5.65	3.20	3.53	5.63	5.04*	5.88
1916	8.06*	2.46	4.97	7.46	4.40	4.18	4.19
1917	3.82*	4.14	3.01	3.42	6.32*	2.76	2.68
1918	4.76	3.74	2.28	2.20	6.00	2.44	2.75
1919	3.35	6.36	7.66	11.95*	9.60	3.57	5.65
1920	5.40*	3.60	5.36	4.67	6.33*	2.96	3.62
1921	2.79	5.18	4.83*	2.86	2.53	6.48*	7.58
1922	5.54	4.28	4.66	2.64	6.43	2.74	2.68
1923	5.21*	1.88	3.85	2.91	7.30*	3.55	5.02
1924	2.99	10.08*	4.10	5.95*	4.55	3.38	4.54*
1925	3.68	3.08	3.44*	2.60	5.47	5.53	2.63
1926	8.12*	5.42*	4.89*	8.32	9.04*	3.98*	2.91
1927	3.97	2.09*	1.98	4.42	2.72	3.08	3.08
1928	2.99	11.44*	4.57*	3.68*	4.94	2.76	7.98*
1929	11.59	2.85*	3.59	3.82	4.84	3.62	2.24
1930	3.13	2.89	3.09	4.21	5.55	5.62	2.39
1931	7.97*	1.52	2.24	2.96	4.97	4.25	1.69
1932	7.60*	5.75	5.85	3.96	8.00	4.54	4.42
1933	5.92*	6.98*	6.48	13.54	3.26	7.27*	10.57*
1934	4.71	4.22	4.78	2.03	17.07*	7.81*	2.81
1935	6.41	3.29*	3.74	5.05	9.91	6.35*	6.32
1936	7.12	3.23*	5.23	4.28	8.16	3.53	4.07
1937	8.37	2.93	3.27	4.53	10.58	5.06	3.55
1938	3.16	2.31	5.79	1.71	3.11	4.54	3.20
1939	4.61*	2.02	2.65	5.56	5.29*	3.53*	7.06
1940	3.47	2.28*	3.42	2.87	4.73	2.26	8.55*
1941	4.16	3.90	5.68*	7.95	3.73	4.00	4.41
1942	6.67	5.37	1.97	3.90	7.42	2.36	2.62
1943	4.53	3.54	3.99	5.68	4.51	4.46	2.99
1944	7.04*	7.85*	9.62*	5.64*	6.77*	5.24*	4.77
1945	3.83	8.82*	6.74*	4.23*	4.46	10.41*	6.69*
1946	5.96	4.23*	3.78	2.81	6.82	4.66	2.80
1947	4.65	6.65*	7.56*	6.10	6.77*	4.04*	4.68*
1948	4.27	5.58*	4.31	5.17*	7.85*	3.01	3.26
1949	6.15	4.01*	4.42	1.79	5.30	5.37	5.76
1950	6.10	10.34*	8.97*	4.26*	7.37*	4.67*	8.56
1951	6.52	4.60	4.33	3.09	7.22	3.90	3.48
1952	6.62	3.20	3.07	2.12	4.03	3.09	3.11
1953	4.46	3.62*	4.09	6.65	7.61*	3.66	3.14
1954	2.89	5.87	4.53	19.88	1.98	3.56	5.17*
1955	13.36	2.72	3.63	3.18	9.16	2.88	4.48
1956	5.79*	3.24*	6.66	2.04	8.51*	1.89	2.51

* Denotes rainfall associated with a tropical storm

Table 1-10

MAXIMUM ANNUAL RAINFALL (Inches) FOR SELECTED DURATIONS

HATTERAS, N. C.

Year	24-Hour	12-Hour	6-Hour	3-Hour	2-Hour	1-Hour	10-Minute
1901	4.17*	3.59*	2.96*	2.24*			
1902	2.75	2.72	1.94	1.67			
1903	3.46	3.11	2.64	1.99			
1904	2.65	2.03	1.42	1.34			
1905	3.08	2.99	1.57	1.55	1.55	1.42	.51
1906	4.88	4.62	3.72	3.21	2.95	2.18	.56
1907	4.34	4.21	3.60	3.01	2.52	1.83	.71
1908	4.72	4.37	3.32	3.07	3.06	1.20	.66
1909	2.98	2.96	2.00	1.88	1.88	1.87	.66
1910	5.21	3.27	2.19	1.79	1.70	1.50	.51
1911	2.36	1.80	1.42	1.38	1.37	1.03	.48
1912	3.25*	3.25*	3.25*	3.14*	3.08*	2.26*	.65
1913	3.49	3.49	2.75	2.13	2.01	1.66	.56
1914	2.64	2.10	1.91	1.37	1.33	.97	.52
1915	3.24	3.15	2.55	2.05	1.84	1.30	.68
1916	2.10	1.87	1.60	1.31	1.26	1.25	.77
1917	6.51	3.61	2.64	2.28	2.10	1.68	.85
1918	3.52	3.52	3.52	3.42	2.83	2.10	.68
1919	6.81	5.64	4.29	3.95	3.66	2.99	.72
1920	2.74	2.30	2.18*	2.11*	1.70*	1.26*	.62
1921	3.53	3.50	3.38	2.97	2.66	2.12	.67
1922	6.12	4.44	3.57	3.16	2.86	2.27	.79
1923	3.24*	3.00	3.00	2.59	2.16	2.01	.83
1924	5.87	5.87	5.86	5.47	5.10	2.67	.97
1925	3.71	2.63	2.56	1.66	1.59	1.19	.54
1926	2.51	2.41	2.32	2.07	1.94	1.77	.69
1927	4.31	3.31	2.34	1.58	1.54	1.09	.51
1928	9.32	7.90	7.73	6.19	5.86	5.35	1.19
1929	7.72	7.14	5.93	4.01	3.27	2.46	.95
1930	3.35	3.34	3.01	2.57	2.47	1.83	.68
1931	3.57	2.46	2.39	2.22	2.03	1.70	.77
1932	3.50	3.28	3.17	2.68	2.61	2.08	.75
1933	11.99*	9.10*	6.59*	4.71*	3.57*	2.65	.77
1934	7.78*	6.22	5.73	4.41	3.84	2.70	.74
1935	4.34	3.77	3.28	2.69	2.53	2.11	.85
1936	4.06*	3.76*	2.93	2.87	2.74	2.52	.91
1937	3.84	3.68	3.39	2.09	1.67	1.13	.55
1938	3.36	4.46	2.57	1.60	1.48	1.15	.55
1939	3.73	2.92	2.11	1.76	1.76	1.75	.98
1940	5.40	5.28	5.10	4.93	4.77	3.47	.85
1941	3.65	3.56	3.23	2.48	2.20	1.57	.57
1942	12.46*	9.03*	5.32*	3.15*	2.40*	1.62*	.77
1943	2.94	2.58	2.53	1.60	1.39	1.25	.58
1944	3.77	3.66	3.60	3.31	2.77	1.80	.51
1945	2.45	2.21	2.11	1.60	1.32	1.29	.71
1946	5.81	5.47	4.03	3.26	2.43	2.08	.90
1947	4.26	4.14	3.65	2.13	1.82	1.49	.58
1948	2.93	2.93	2.93	2.75	2.57	2.13	.57
1949	14.73	11.19	8.00	5.88	5.77	4.57	.96
1950	2.79	2.65	2.65	2.42	2.04	1.91	.93
1951	3.62	3.33	3.10	2.88	2.67	1.85	.60
1952	8.73	4.75	3.87	2.76	2.43	2.13	1.02
1953	6.37	6.37	6.37	6.37	5.19	3.10	.91
1954	5.55*	3.85*	2.58	2.36	2.36	1.82	.66
1955	4.98*	3.96*	3.55*	2.80*	2.18*	1.48*	.56
1956	3.16	2.88	2.62	2.62	2.62	1.86	.62

* Denotes rainfall associated with a tropical storm

Table 1-11

MAXIMUM ANNUAL RAINFALL (Inches) FOR SELECTED DURATIONS

MIAMI, FLA.

Year	24-Hour	12-Hour	6-Hour	3-Hour	2-Hour	1-Hour	10-Minute
1912	7.74	7.55	5.45	3.91	3.48	2.64	.75
1913	3.69	2.95	2.67	2.52	2.48	2.43	.87
1914	4.80	4.80	4.80	4.70	4.59	3.05	1.02
1915	6.08	4.66	3.42	2.93	2.92	2.30	.75
1916	6.12*	6.01*	5.74*	5.32*	4.73*	2.83*	.63*
1917	6.67	6.00	4.72	3.87	2.86	2.25	.89
1918	3.13	2.82	2.82	2.59	2.43	1.84	.70
1919	9.04	6.91	4.38	3.41	3.12	2.82	.96
1920	3.24	2.64	1.99	1.78	1.78	1.52	.78
1921	4.11	3.47	3.16	2.52	2.39	1.66	.61
1922	4.00	3.93	3.45	2.70	2.51	2.45	.97
1923	3.59	3.21	3.14	2.93	2.92	2.14	.89
1924	9.53*	8.96*	6.64*	5.35*	4.66*	2.39*	.98
1925	15.10*	13.86*	10.64*	8.04*	6.11*	3.50*	.85
1926	8.00*	6.43	6.43	4.40	3.07	2.68	.79
1927	2.90	2.65	2.64	2.28	2.24	2.09	.81
1928	8.61*	6.85*	5.84*	5.06*	4.34*	2.77*	.76*
1929	10.58*	7.55*	4.92*	3.97	3.75*	2.69*	.98
1930	9.36	6.32	4.55	3.67	3.13	2.74	.95
1931	10.31*	6.64*	4.76*	4.10*	3.15*	2.13*	1.12
1932	10.24*	10.09*	7.89*	5.17*	4.27*	2.97*	.76*
1933	6.99	5.77	5.17	5.17	5.14	4.53	1.18
1934	4.78	3.79	3.51	3.39	3.25	2.18	.94
1935	4.20*	4.05*	3.87*	3.60*	3.43	2.65	.77
1936	5.50	5.25	4.73	4.04	3.91	3.17	.95
1937	7.19	6.81	5.90	4.06	3.48	2.53	1.01
1938	5.39	3.17	3.17	2.88	2.78	2.51	.87
1939	5.46	4.76	3.31	3.00	2.96	2.39	.93
1940	7.71	6.80	5.98	4.86	4.57	3.30	1.10
1941	3.61	2.46	2.45	2.36	2.17	2.11	.91
1942	8.58	8.08	6.78	4.33	3.88	2.97	.94
1943	4.45	4.42	3.80	3.46	3.06	2.56	.79
1944	2.45	2.32	2.07	1.55	1.50	1.25	.67
1945	3.07*	2.35*	2.00	1.99	1.96	1.69	.55
1946	3.11	3.11	3.03	2.72	2.41	1.36	.64
1947	5.75	4.65*	4.11	4.11	3.77*	3.60*	1.32*
1948	6.02*	5.73*	4.72*	2.77*	2.23*	1.71	.90
1949	4.48	2.68	2.57	2.28	2.28	2.27	.93
1950	5.22	5.17	4.66	3.79	3.38	2.76	.98
1951	3.95*	2.45	2.17	1.67	1.61	1.18	.74
1952	7.16	6.81	5.40	4.77	3.86	2.31	.68
1953	4.03	3.55*	3.25*	2.85*	2.71*	2.22	.85
1954	3.75	2.38	2.25	2.05	2.05	1.95	.66
1955	3.94	2.73	2.35	2.14	1.96	1.76	.78
1956	2.67	2.44	2.44	2.44	2.44	2.40	1.33

* Denotes rainfall associated with a tropical storm

Table 1-12

MAXIMUM ANNUAL RAINFALL (Inches) FOR SELECTED DURATIONS

NEW ORLEANS, LA.

Year	24-Hour	12-Hour	6-Hour	3-Hour	2-Hour	1-Hour	10-Minute
1903	8.66	8.33	7.73	6.05	4.70	2.74	.77
1904	2.92	2.91	2.91	2.59	2.49	2.30	1.06
1905	5.83	4.45	3.41	2.77	2.56*	2.48*	1.20*
1906	4.10*	3.51*	2.42*	2.09*	1.80	1.68	.80
1907	8.76	8.07	4.79	2.90	2.21	2.08	1.18
1908	3.40	3.11	2.58	1.99	1.68	1.58	.69
1909	4.78	4.15	2.90	2.25	2.25	1.98	.76
1910	3.47	3.30	3.30	3.28	3.17	2.15	.82
1911	4.37	4.37	4.37	4.03	3.62	2.56	1.03
1912	6.94	6.80	6.49	4.66	3.59	2.89	1.03
1913	5.04	3.94	3.91	3.13	2.71	1.70	1.18
1914	4.80	4.80	4.72	4.18	5.97	3.01	1.02
1915	8.20*	7.78*	5.33	4.32	3.18	2.17	.85
1916	5.44*	4.06*	3.29	3.29	3.19	2.81	1.14
1917	2.35	2.35	2.35	2.25	2.22	2.08	.94
1918	4.83	4.19	4.14	3.94	3.80	2.73	.75
1919	3.48	2.82	2.26	1.90	1.80	1.54	.94
1920	5.44	5.44	4.97	3.78	3.78	3.66	1.13
1921	3.10	2.03	2.03	2.03	2.03	2.03	1.00
1922	2.54	2.26	2.02	1.63	1.55	1.37	.65
1923	4.45	3.63	3.40	3.23	3.01	2.34	1.00
1924	3.30	2.73	2.10	1.83	1.77	1.52	.78
1925	3.55	3.47	2.45	2.19	2.07	1.62	.77
1926	9.08	6.95	6.57	5.39	3.57	2.67	.88
1927	14.01	12.76	7.95	6.40	5.28	3.39	1.09
1928	5.48	4.26	3.63	2.58	2.56	2.38	.76
1929	10.75	10.10	8.62	6.21	5.71	3.18	.99
1930	5.30	5.26	3.62	3.39	3.27	2.11	.90
1931	5.49*	3.78*	3.27*	2.10*	1.68	1.13	.49
1932	6.17	5.59	4.05	3.80	3.06	2.29	.73
1933	2.27	2.27	2.04	1.98	1.44	1.44	.66
1934	3.49	3.32	3.12	2.93	2.68	1.97	.95
1935	4.85	4.09	3.53	2.16	1.86	1.56	.68
1936	4.24	3.27	2.20	2.20	2.20	2.19	.80
1937	13.68*	10.86*	6.89*	4.75*	3.68	2.75	1.00
1938	3.79	3.67	2.87	2.26	1.96	.97	.68
1939	3.39	2.01	1.75	1.69	1.69	1.69	.91
1940	5.48	4.63	4.02	3.08	2.85	2.29	1.15
1941	5.17	5.09	4.33	4.03	3.70	2.29	.91
1942	6.64	5.25	4.78	4.67	2.42	2.37	1.03
1943	6.61*	6.23*	5.07*	3.38*	2.88*	1.95*	.78*
1944	6.26	3.59	3.54	3.31	3.13	2.26	.90
1945	3.74	3.67	3.49	2.82	2.66	1.75	.81
1946	6.83	4.90	3.56	3.10	3.03	2.86	1.47
1947	3.75	3.56	3.01	2.25	2.00	1.59	.80
1948	10.93	9.32	7.03	3.94	2.63	1.99	.86
1949	6.42	6.42	5.80	3.81	3.25	2.20	.76
1950	2.55	2.18	1.99	1.99	1.99	1.99	.88
1951	5.00	5.00	3.72	2.06	1.80	1.79	.83
1952	4.57	3.64	2.72	2.33	2.24	1.99	.96
1953	7.77	7.32	6.52	5.89	5.87	4.71	1.48
1954	4.62	2.85	2.59	1.88	1.87	1.82	.74
1955	4.67	4.67	4.05	3.68	3.51	2.71	1.36
1956	7.65*	5.92*	5.52	3.82	3.54	3.41	1.00

* Denotes rainfall associated with a tropical storm

SECTION II. APPLICATIONS

Introduction

70. This Technical Paper has the primary purpose of presenting rainfall data in a manner convenient for hydrologic analysis and design criteria. It is no longer adequate for a field engineer to interpolate among a set of maps of point rainfall. The degree of detail presently available, and the introduction of areal and seasonal influences, have complicated his work so that in many instances he must use a combination of maps and diagrams in a rather long series of operations. After having read how these aids were prepared he is ready to use them, and by having them together in one section of this paper he can easily find them for future use, without having to look through the entire paper each time he needs to refer to the maps or diagrams. Hypothetical examples of a few representative problems are included with the maps and diagrams in this section of the Technical Paper.

Use of Maps and Tables

Need for judgment

71. Site location. The tabulated data may be used in conjunction with the isopluvial maps in obtaining the best possible registration of the map with the stations and drainage areas themselves. Where there are steep gradients or complicated patterns in the isopluvials and in the contours of a region, the tabulated station data serve as identifying "bench marks". The station can be located on the ground and tied in with the station as shown on the map. If there are errors of printing registration, or of interpolation in the isopluvial pattern, adjustments can thus be made.

72. Orographic influences. Whether to use the smoothed values from the isopluvial maps, or whether to use the individual station data, or some combination of the two, depends largely upon local physiography. In a plains region there is little question but that the smoothed isopluvials give a better estimate of the rainfall regime of a locality than single station data. In a rugged region, while sampling error exists, much of the variation among nearby stations may be properly ascribed to orographic influences. The assessment of how much of the variation can be ascribed to these influences may have to be made by a person familiar with local conditions who has more information of storm patterns and who has observed them. He may even be able to transfer a local topographic relation from a mountain slope where there are good data to a similar nearby slope which lacks data.

73. Average depth over an area. The three examples given in table 2-1 include reduction for area. If the particular area of interest is large enough and the isopluvial pattern is complicated enough, there may be a question as to what point in the area should be taken as representative. The point value to which the area-reduction factor should be applied is the average point value in the area. For practical purposes the average point value can be determined adequately by inspection of the isopluvial map or maps.

Table 2-1, with three examples, outlines the steps in the order they should be carried through in solving for the required rainfall intensities or depths.

Table 2-1

EXAMPLES OF RAINFALL INTENSITY (DEPTH) DURATION - FREQUENCY - AREA COMPUTATIONS

1.	Location	34° 00' N 86° 00' W	26° 00' N 81° 00' W	32° 00' N 83° 00' W
2.	Required Intensity (Depth) Duration-Frequency-Area	25-Year 3-Hour Rainfall (Inches) for 100 Square Miles	50-Year 12-Hour Rainfall (Inches) for 400 Square Miles	15-Year 30-Min Intensity (In/Hr) for 50 Square Miles
3.	2-Year 1-Hour Rainfall Figure 2-2	1.6 Inches	———	2.0 Inches
4.	2-Year 6-Hour Rainfall Figure 2-3	3.0 Inches	3.4 Inches	3.0 Inches
5.	2-Year 24-Hour Precip. Figure 2-4	———	3.9 Inches	———
6.	Straightedge connecting (3) and (4) or (4) and (5) intersects required duration. Figure 1-1	(2-Year 3-Hour) 2.4 Inches	(2-Year 12-Hour) 3.8 Inches	(2-Year 30-Min) 3.3 In/Hr
7.	100-Year 1-Hour Rainfall / 2-Year 1-Hour Rainfall Figure 2-5	2.1	———	2.1
8.	100-Year 6-Hour Rainfall / 2-Year 6-Hour Rainfall Figure 2-6	1.9	2.0	2.0
9.	100-Year 24-Hour Precip. / 2-Year 24-Hour Precip. Figure 2-7	———	2.5	———
10.	(7) x (3)	(100-Year 1-Hour) 3.4 Inches	———	(100-Year 1-Hour) 4.2 Inches
11.	(8) x (4)	(100-Year 6-Hour) 5.7 Inches	(100-Year 6-Hour) 6.8 Inches	(100-Year 6-Hour) 6.0 Inches
12.	(9) x (5)	———	(100-Year 24-Hour) 9.8 Inches	———
13.	Straightedge connecting (10) and (11) or (11) and (12) intersects required duration. Figure 1-1	(100-Year 3-Hour) 4.7 Inches	(100-Year 12-Hour) 8.2 Inches	(100-Year 30-Min) 6.3 In/Hr
14.	Straightedge connecting (6) and (13) intersects required return period. Figure 1-2	3.8 Inches	7.3 Inches	4.8 In/Hr
15.	Percent of Point Rainfall Figure 1-5	85	87	69
16.	(14) x (15) = (2)	3.2 Inches	6.4 Inches	3.3 In/Hr

74. Examples illustrating use of the seasonal probability diagrams.

Example 1

Determine the probability of occurrence in July of a 1-hour rainfall within the range of magnitude of the 1- and 2-year values. The 1-year 1-hour value of 1.5 inches for Atlanta is estimated from a combination of figures 1-2, 2-2, and 2-5. From figure 2-8, the empirical probability that the 1-year 1-hour rainfall will be equalled or exceeded in July of any one year is 20% or 20 chances out of 100. Similarly, the probability that Atlanta's 2-year 1-hour value of 1.7 inches will be equalled or exceeded in any one July is 11% by interpolation. The difference (20% — 11% = 9%) is the probability of occurrence in any one July of a 1-hour rainfall within the range 1.5 - 1.7 inches, inclusive.

Example 2

Assume the hurricane season to be June through October and determine the probability of getting 4.0 inches or more in 6 hours during this season at a point near Miami, Fla. For a first approximation, determine from the isopluvial map the 2-year 6-hour value near Miami to be 4.7 inches. Referring to the seasonal probability chart for 6 hours for the 2-year return period, it may be seen that for June through October there is about a 29% chance of getting 4.7 inches or more for 6 hours (corresponding to the 2-year 6-hour return period) during the hurricane season. Since the chance of equalling or exceeding 4.0 is obviously greater than for 4.7 inches, use the return period diagram for a second approximation to get a rainfall value for the 1-year return period. At the point of interest near Miami, (referring to the map of figure 2-6) we find that the ratio of 100-year to 2-year rainfall is about 2.1. Multiplying 4.7 inches by the ratio, 2.1, to get the 100-year value, we then enter the return-period diagram of figure 1-2 with the 2-year value, 4.7, and 100-year value, 9.9, and obtain a 1-year value of 3.7 inches. Referring again to the seasonal probability chart for 6 hours, the probability for the hurricane season at the 1-year return period is about 58%. The probability of the 2-year value is about 29% and one can safely interpolate to the conclusion that the probability of 4.0 inches is about 40%. In other words, the probability of 4.0 inches or more rain in 6 hours during the hurricane season is 40%; this depth of rainfall will be equalled or exceeded in four seasons out of ten.

If 50% rather than 40% had been interpolated between the 1- and 2-year return period probabilities, the magnitudes would, for all practical purposes, be the same; for 50% during the hurricane season, the 6 hour value is estimated to be 3.8 inches and for 40% it is 4.0 inches.

Example 3

Consider the problem of what infiltration and other loss is necessary in the 3 summer months for the runoff to equal that in the 3 winter months, assuming 100% runoff in the winter, with a 2-year 6-hour rainfall. From the maps and diagrams it is determined that the 2-year 6-hour rainfall for this watershed is 3.0 inches. For June, July, and August, in the 6-hour seasonal probability chart, at the 2-year return-period level, the percentage values are about 5, 6, and 7, respectively, giving a total of 18% probability of 3.0 inches being equalled or exceeded during the 3-month summer season of any one year. For equal probability in the 3-month winter season, in the 1-year return period, the seasonal probability chart for December, January, and February gives values of 4% for each, which is a little low compared with the total of 18% for summer. However, this is at the limit of the chart. Using the frequency diagram, with 3.0 inches at the 10-year level and the hypothetical value of 1.8 inches (from the isopluvial map) for the 2-year value, read 1.4 inches for the 1-year value. Since there is only a 12% chance of this value being equalled or exceeded in wintertime and the 18% value is a little smaller, it can be inferred that the infiltration and other loss must be at least the difference between 3.0 and 1.4 inches, or 1.6 inches.

Example 4

As an example where interpolation between durations is necessary, consider the first example of table 2-1 where the 25-year 3-hour rainfall is estimated to be 3.8 inches. If the probability of occurrence for July is required, 1.0 and 0.3% are estimated from the 1- and 6-hour seasonal probability charts, respectively. The 3-hour probability is then interpolated to be 0.7% or 7 chances in 1,000 of equalling or exceeding a 3-hour rainfall of 3.8 inches in July of a particular year.

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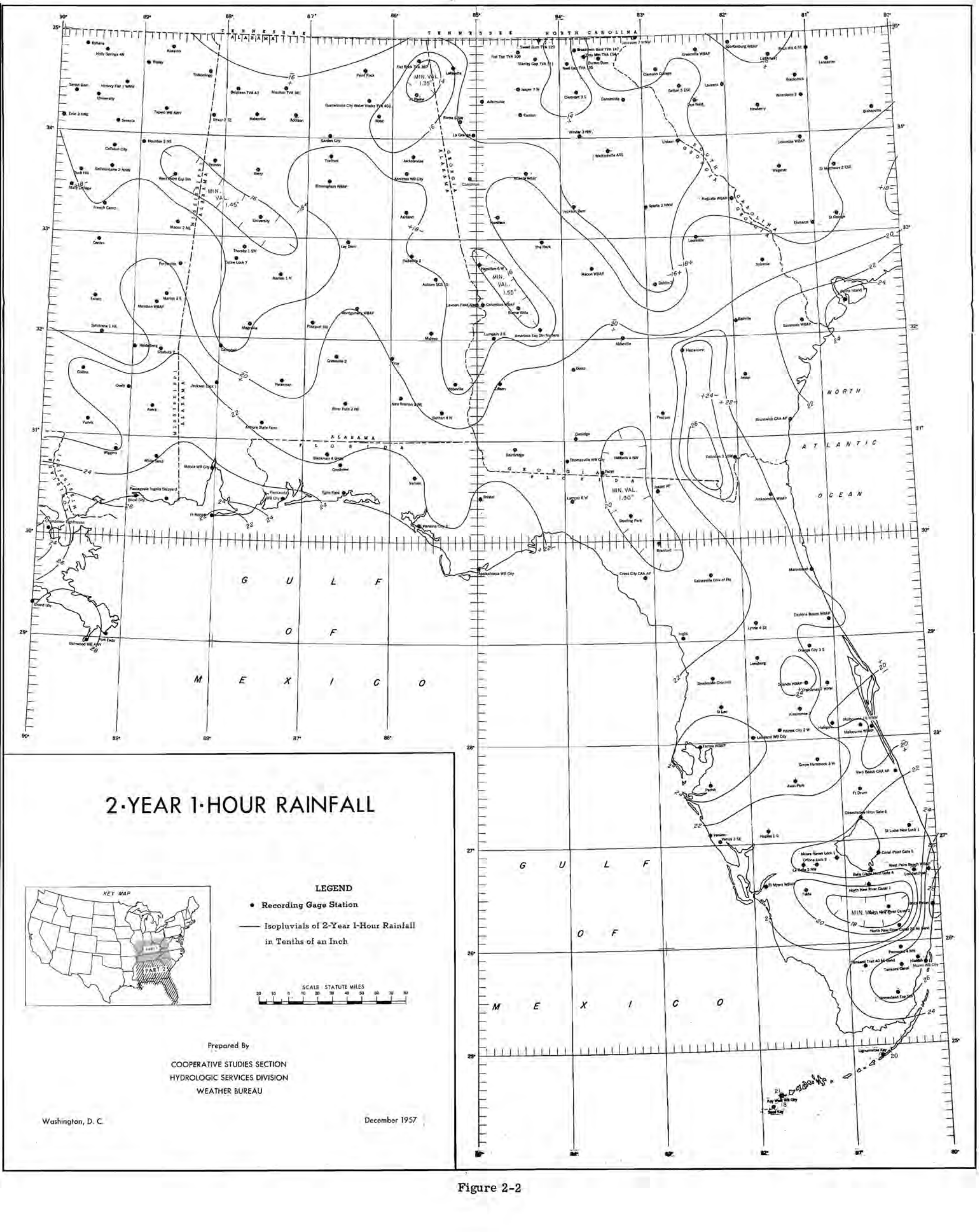
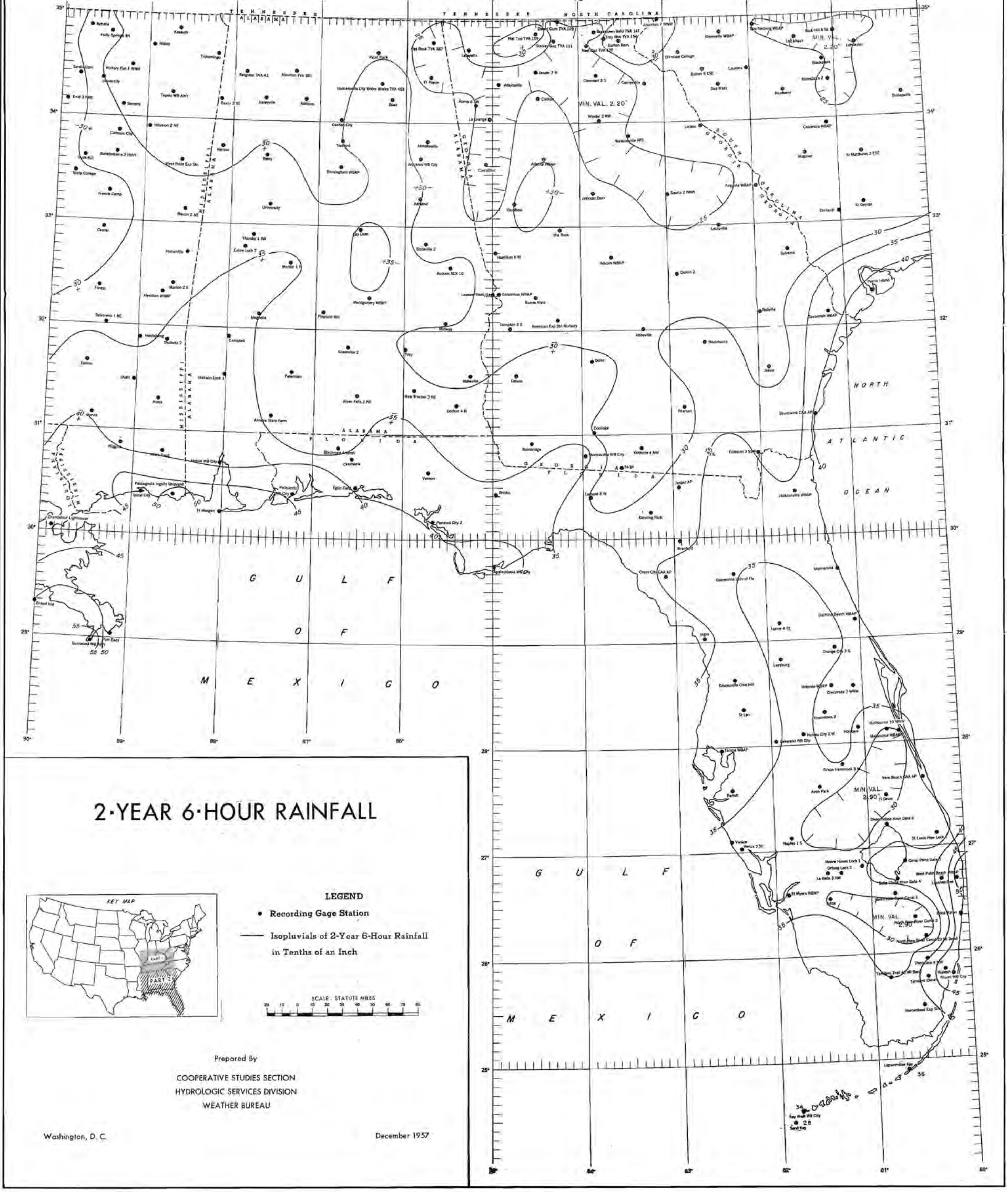

2·YEAR 1·HOUR RAINFALL
LEGEND
Recording Gage Station
Isopluvials of 2-Year 1-Hour Rainfall in Tenths of an Inch
KEY MAP
PART 2
SCALE - STATUTE MILES
Prepared By
COOPERATIVE STUDIES SECTION
HYDROLOGIC SERVICES DIVISION
WEATHER BUREAU
Washington, D. C.
December 1957
G U L F O F M E X I C O
NORTH ATLANTIC OCEAN
TENNESSEE
NORTH CAROLINA
ALABAMA
FLORIDA
GEORGIA
MISSISSIPPI
SOUTH CAROLINA
MIN. VAL. 1.35"
MIN. VAL. 1.45"
MIN. VAL. 1.55"
MIN. VAL. 1.90"

Figure 2-2


2-YEAR 6-HOUR RAINFALL
LEGEND
Recording Gage Station
Isopluvials of 2-Year 6-Hour Rainfall in Tenths of an Inch
KEY MAP
SCALE - STATUTE MILES
Prepared By
COOPERATIVE STUDIES SECTION
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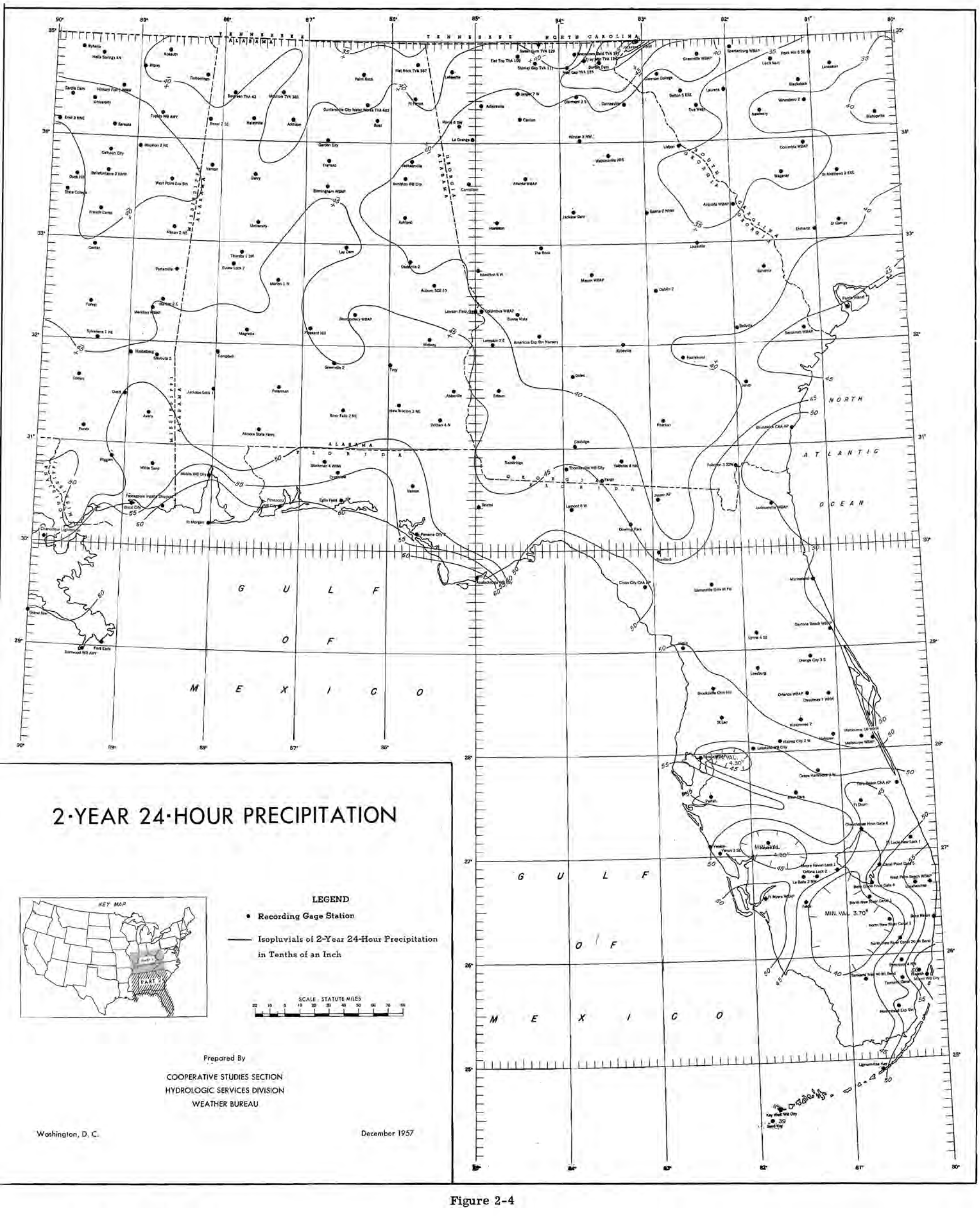
WEATHER BUREAU
Washington, D. C.
December 1957
GULF OF MEXICO
NORTH ATLANTIC OCEAN
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
FLORIDA
MISSISSIPPI
MIN. VAL. 2.20"
MIN. VAL. 2.90"

Figure 2-3


2·YEAR 24·HOUR PRECIPITATION
LEGEND
• Recording Gage Station
Isopluvials of 2-Year 24-Hour Precipitation in Tenths of an Inch
SCALE - STATUTE MILES
KEY MAP
Prepared By
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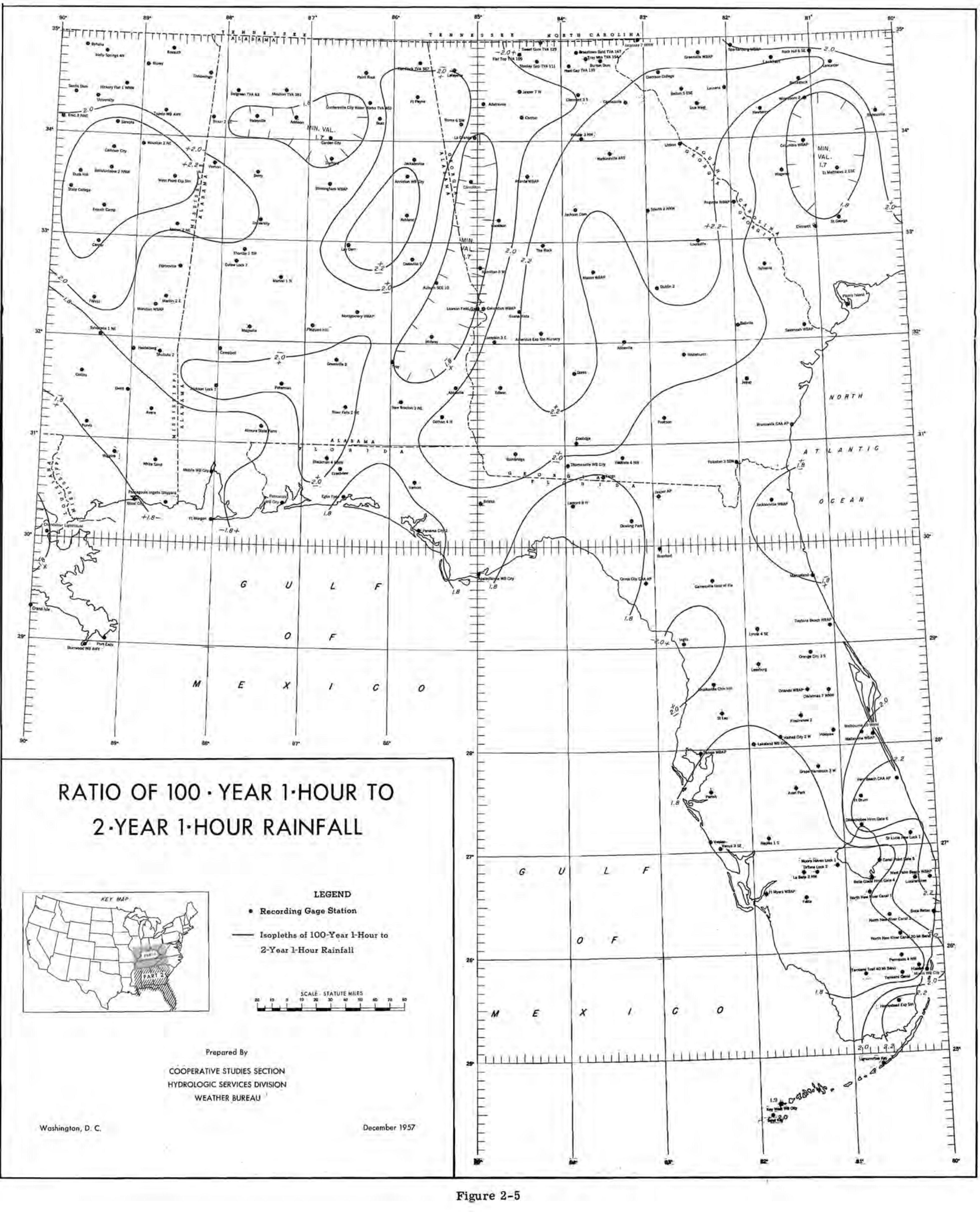
Washington, D. C.
December 1957
G U L F O F M E X I C O
NORTH ATLANTIC OCEAN
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
FLORIDA
MIN. VAL. 4.30"
MIN. VAL. 3.70"

Figure 2-4



RATIO OF 100 · YEAR 1·HOUR TO 2·YEAR 1·HOUR RAINFALL
KEY MAP
PART 2
LEGEND
Recording Gage Station
Isopleths of 100-Year 1-Hour to 2-Year 1-Hour Rainfall
SCALE - STATUTE MILES
Prepared By
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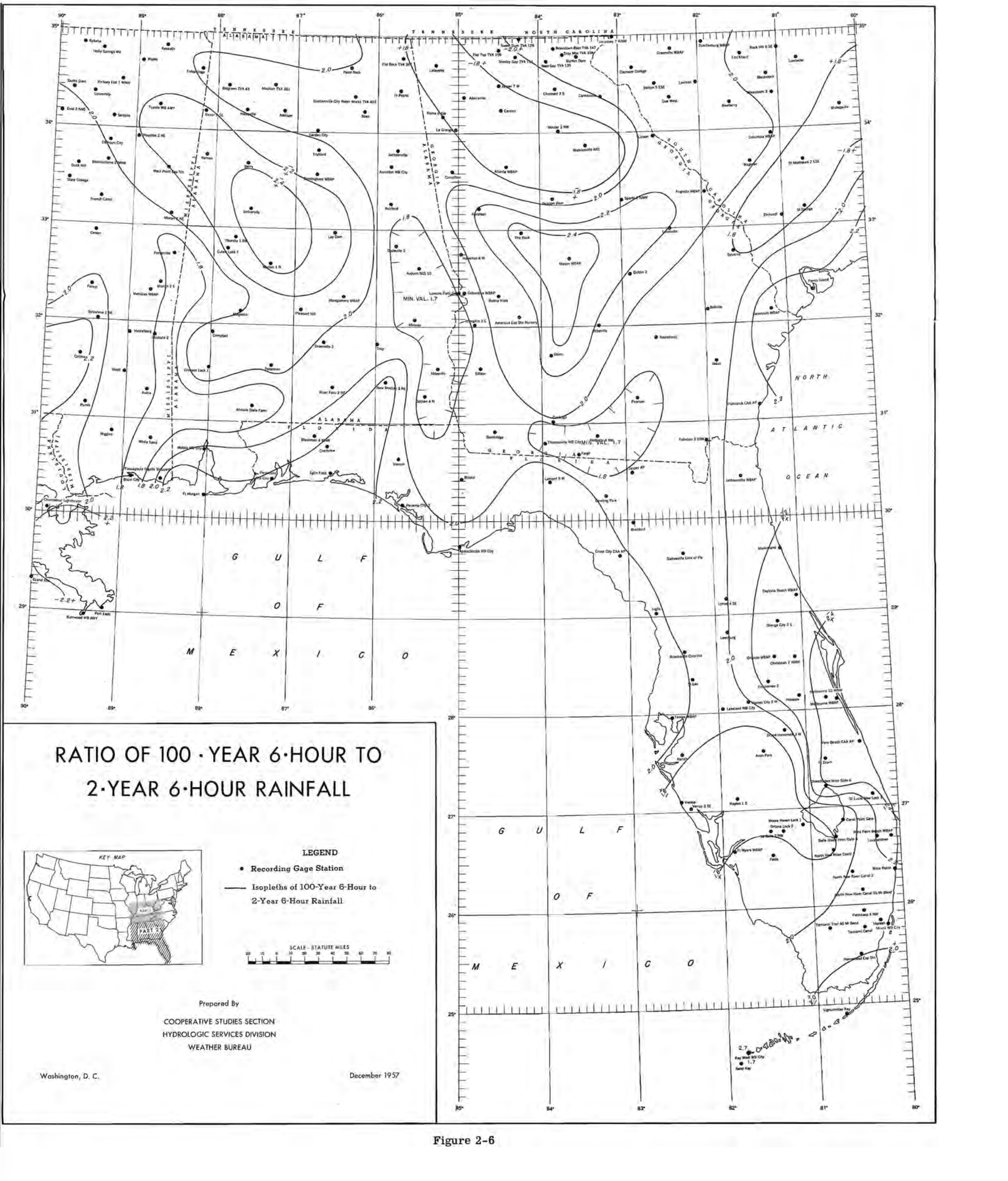
Washington, D. C.
December 1957
GULF OF MEXICO
NORTH ATLANTIC OCEAN
MIN. VAL. 1.7

Figure 2-5



RATIO OF 100 · YEAR 6·HOUR TO
2·YEAR 6·HOUR RAINFALL
KEY MAP
PART 2
LEGEND
• Recording Gage Station
Isopleths of 100-Year 6-Hour to 2-Year 6-Hour Rainfall
SCALE - STATUTE MILES
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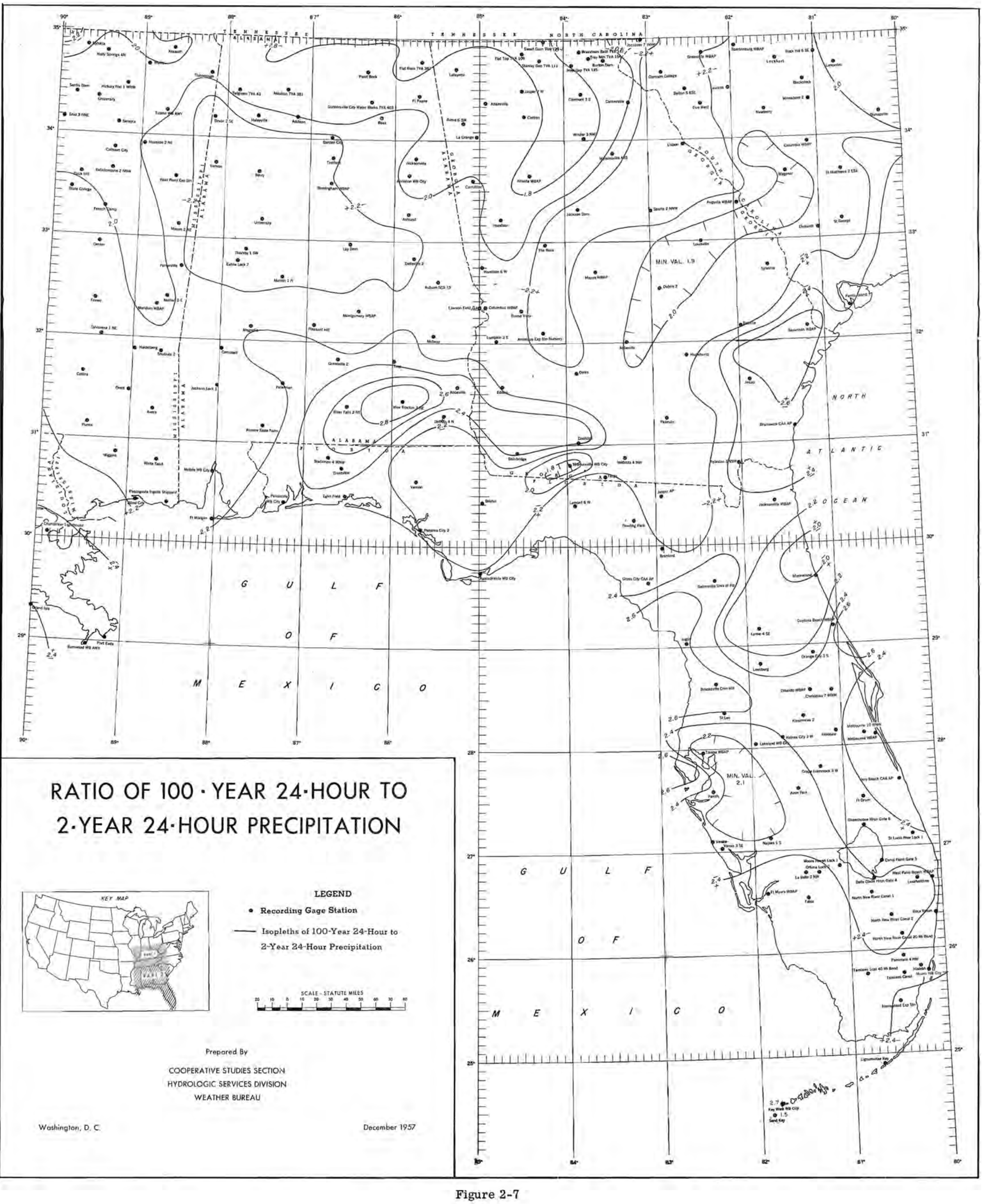
Washington, D. C.
December 1957
TENNESSEE
NORTH CAROLINA
ALABAMA
MISSISSIPPI
GEORGIA
SOUTH CAROLINA
FLORIDA
LOUISIANA
G U L F O F M E X I C O
NORTH ATLANTIC OCEAN
MIN. VAL. 1.7

Figure 2-6


RATIO OF 100 · YEAR 24·HOUR TO
2·YEAR 24·HOUR PRECIPITATION
KEY MAP
LEGEND
Recording Gage Station
Isopleths of 100-Year 24-Hour to
2-Year 24-Hour Precipitation
SCALE - STATUTE MILES
Prepared By
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WEATHER BUREAU
Washington, D. C.
December 1957
TENNESSEE
NORTH CAROLINA
ALABAMA
GEORGIA
MISSISSIPPI
SOUTH CAROLINA
FLORIDA
NORTH
ATLANTIC
OCEAN
GULF
OF
MEXICO
MIN. VAL. 1.9
MIN. VAL. 2.1

Figure 2-7

Table 2-2. Station Data 2-Year 1-, 6-, and 24-Hour

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
ALABAMA							
Abbeville	31-34	85-15	1945-50	6	1.64	2.89	4.40
Addison	34-13	87-10	1941-56	16	1.66	2.62	3.76
Addison Central Tower	34-21	87-20	1939-54	16			3.97
Alberta	32-14	87-25	1940-54	15			4.60
Albertville 1 S	34-15	86-13	1939-54	16			4.15
Alexander City 6 NE	32-59	85-52	1943-54	12			4.14
Aliceville	33-08	88-08	1940-54	15			4.10
Andalusia	31-19	86-30	1939-54	16			4.70
Anniston	33-40	85-50	1939-48	10			3.90
Anniston WB City	33-39	85-50	1906-30	25	1.79	2.85	3.96
Anniston CAA AP	33-35	85-51	1944-54	11			4.19
Arley	34-04	87-13	1939-54	16			3.91
Ashland	33-16	85-50	1940-55	16	1.96	2.98	3.98
Ashville 3 SW	33-49	86-19	1941-54	14			4.80
Athens	34-48	86-59	1941-54	14			3.62
Atmore State Farm	31-10	87-29	1940-54	15			4.58
Atmore State Farm	31-10	87-29	1940-55	16	2.14	3.26	4.48
Auburn 3 SW	32-34	85-31	1939-54	16			4.46
Auburn SCS 10	32-36	85-29	1944-50	7	1.81	3.15	4.91
Autaugaville	32-26	86-39	1941-54	14			4.15
Barton	34-43	87-52	1940-52	13			3.22
Bay Minette	30-53	87-47	1942-54	13			4.80
Beatrice	31-44	87-13	1942-50	9			5.50
Belgreen	34-23	87-52	1939-48	10			4.02
Belgreen TVA 43	34-28	87-52	1941-55	15	1.67	3.11	4.48
Belle Mina 2 N	34-42	86-53	1940-54	15			3.59
Benton	32-20	86-48	1901-33	33			3.64
Berry	33-40	87-36	1945-50	6	2.26	3.26	4.08
Bexar 2 SE	34-12	88-09	1941-56	16	1.91	2.75	3.97
Billingsley	32-40	86-43	1939-54	16			4.08
Birmingham WB AP	33-34	86-45	1939-49	11			3.88
Birmingham WB AP	33-34	86-45	1904-51	48	1.84	2.85	4.17
Birmingham	33-32	86-50	1939-53	15			4.33
Bishop	34-39	88-07	1939-54	16			3.95
Boaz	34-13	86-10	1939-54*	12			3.47
Boaz	34-13	86-10	1941-56	16	1.51	2.99	4.36
Brantley	31-35	86-16	1939-54	16			4.63
Brewton 3 SSE	31-04	87-03	1939-54	16			5.24
Bridgeport 2 W	34-56	85-45	1900-54	55			3.33
Brundage	31-43	85-49	1939-54	16			4.27
Calera	33-06	86-45	1939-54	16			4.81
Camden 3 NNW	32-02	87-19	1950-54	5			3.67
Campbell	31-55	87-59	1941-55	15	1.78	3.54	5.01
Camp Hill 2 NW	32-50	85-41	1901-54*	48			3.83
Carbon Hill	33-54	87-32	1939-54	16			3.83
Center Grove	34-23	86-38	1939-54	16			3.67
Centreville	32-57	87-08	1939-54	16			4.75
Chatom	31-28	88-15	1949-54	6			4.28
Childersburg	33-17	86-21	1939-54	16			3.83
Citronelle	31-05	88-14	1897-54	58			4.96
Clanton	32-51	86-38	1897-54	58			4.51
Clayton	31-53	85-27	1939-54	16			4.06
Coffee Springs 2 NW	31-11	85-56	1939-54	16			4.14
Collinsville	34-15	85-52	1939-54	16			4.52
Columbia	31-18	85-07	1939-54	16			4.18
Cordova	33-46	87-11	1939-54	16			4.14
Cuba	32-26	88-23	1944-54	11			4.13
Dadeville	32-50	85-45	1939-54	16			4.60
Dadeville 2	32-50	85-46	1940-55	16	1.73	2.73	4.06
Dancy	33-00	88-17	1939-54	16			3.31
Danville	34-25	87-04	1941-54	14			3.79
Dayton	32-21	87-39	1940-54	15			4.60
Decatur	34-37	86-58	1897-54	58			3.62
Decatur Substation	34-36	86-58	1939-54	16			3.60
Decatur 4	34-37	86-59	1947-54	8			4.16
Demopolis Lock 4	32-31	87-51	1897-53	57			4.46
Dothan CAA AP	31-14	85-26	1939-54	16			4.21
Dothan 4N	31-17	85-24	1941-55	15	1.96	3.03	4.29
Elba	31-25	86-04	1897-54*	31			4.85
Elrod	33-15	87-48	1940-54	15			3.97
Eufaula	31-53	85-08	1897-54	58			4.66
Eutaw Lock 7	32-47	87-50	1939-54*	13			4.37
Eutaw Lock 7	32-47	87-50	1941-55	15	1.78	3.12	4.24
Evergreen	31-26	86-58	1897-49	53			4.68
Evergreen CAA AP	31-25	87-02	1950-54	5			4.10
Fairhope	30-32	87-55	1939-54	16			6.54
Falco Open Pond Tower	31-06	86-33	1950-54	5			3.95
Falkville	34-22	86-55	1939-54	16			4.58
Falls City Black Pond Tower	34-04	87-20	1948-54	7			3.42
Farley	34-36	86-34	1942-54	13			3.81

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
ALABAMA (continued)							
Fayette	33-41	87-50	1939-54	16			4.25
Flat Rock	34-46	85-41	1943-52	10			3.35
Flat Rock TVA 387	34-46	85-41	1941-55	15	1.36	2.25	3.58
Florence at Lock	34-47	87-40	1897-54	58			3.79
Fort Deposit 1 W	31-59	86-36	1941-54	14			4.42
Fort Morgan	30-14	88-01	1949-54	6			6.05
Fort Morgan	30-14	88-01	1941-55	15	2.19	4.54	6.79
Fort Payne	34-26	85-43	1939-54	16			3.62
Fort Payne	34-26	85-43	1942-56	15	1.36	2.33	3.63
Frisco City	31-26	87-24	1939-54	16			5.21
Gadsden	34-01	86-00	1897-54	58			4.33
Gainesville	32-49	88-09	1939-54	16			4.03
Garden City	34-01	86-45	1939-54*	12			4.94
Garden City	34-01	86-45	1941-55	15	1.65	2.83	4.21
Geneva	31-02	85-52	1939-54	16			5.06
Goodwater	33-04	86-03	1939-53	15			3.82
Gorgas	33-39	87-13	1939-54	16			4.14
Greensboro	32-42	87-36	1897-54	58			4.49
Greenville	31-50	86-38	1901-54	54			4.55
Greenville 2	31-50	86-38	1941-55	15	2.08	3.46	4.88
Gulf Shores 2 SSE	30-16	87-40	1948-54	7			6.05
Gunter Field	32-24	86-14	1939-45	7			3.96
Guntersville	34-21	86-18	1905-48	44			4.00
Guntersville City Water Works TVA 403	34-22	86-17	1941-55	15	1.75	3.09	4.54
Guntersville Dam	34-26	86-24	1939-54	16			3.71
Haleyville	34-14	87-37	1939-54	16			4.27
Haleyville	34-14	87-38	1940-56	17	1.60	2.79	4.35
Hamilton	34-08	87-59	1939-54	16			4.02
Harrisburg Cahaba Tower	32-48	87-11	1949-54	6			3.43
Hayneville	32-11	86-35	1939-54	16			4.69
Headland	31-21	85-20	1950-54	5			3.70
Helena	33-17	86-51	1939-51	13			5.22
Highland Home	31-57	86-19	1897-54	58			4.46
Hightower	33-32	85-24	1941-54	14			3.19
Hodges	34-20	87-56	1939-54	16			4.07
Huntsville Substation	34-43	86-35	1939-54	16			3.66
Huntsville 4 SSE	34-42	86-35	1939-54	16			3.31
Hytop	34-49	86-07	1939-54	16			4.21
Jackson Lock 1	31-33	88-01	1939-54	16			5.53
Jackson Lock 1	31-33	88-01	1941-55	15	2.09	3.62	5.22
Jackson Shoals	33-32	86-12	1939-54	16			3.82
Jacksonville	33-49	85-45	1941-55	15	1.76	2.71	3.46
Jordan Dam	32-37	86-15	1939-54	16			4.91
Lafayette	32-54	85-24	1945-54	10			3.44
Lay Dam	32-58	86-31	1939-54	16			4.61
Lay Dam	32-58	86-31	1940-55	16	2.02	3.51	4.70
Leeds	33-33	86-33	1939-54	16			4.97
Leesburg	34-11	85-46	1939-54	16			4.50
Livingston	32-35	88-11	1939-54	16			4.06
Lockhart	31-01	86-22	1943-54	12			5.60
Lock 2	32-08	88-02	1939-49	11			5.34
Lock 3	32-17	88-01	1939-49	11			4.97
Lock 4	33-38	86-11	1939-49	11			4.13
Lock 17	33-29	87-20	1939-54	16			3.95
Madison	34-42	86-45	1897-54	58			3.76
Magella	33-30	86-51	1939-54	16			4.50
Magnolia	32-08	87-39	1940-55	16	1.92	3.30	4.77
Maple Grove	34-07	85-46	1897-38	42			4.14
Marion 1 N	32-38	87-18	1939-54	16			4.80
Marion 1 N	32-38	87-18	1941-55	15	1.79	3.51	4.58
Marion Junction	32-26	87-14	1939-54	16			4.50
Marion Junction 2 NE	32-28	87-13	1950-54	5			4.08
Martin Dam	32-40	85-55	1939-54	16			4.01
Maxwell Field	32-23	86-21	1939-54	16			4.73
Melvin	31-56	88-27	1940-54	15			4.92
Mertz Pondville Tower	32-53	87-20	1948-54	7			4.27
Midway	32-04	85-32	1940-55	16	1.95	3.13	4.26
Millers Ferry	32-06	87-22	1939-54	16			4.85
Milltown	33-02	85-29	1939-43	5			4.25
Milstead	32-27	85-54	1903-54	52			4.34
Mitchell Dam	32-48	86-27	1939-54	16			4.48
Mobile WB AP	30-41	88-15	1939-54	16			5.29
Mobile WB City	30-42	88-02	1939-48	10			5.16
Mobile WB City	30-42	88-02	1901-56	56	2.40	3.86	5.90
Monte Sano	34-45	86-31	1941-54	14			3.94
Montevallo	33-06	86-52	1941-54	14			4.08
Montgomery WB AP	32-18	86-24	1903-51	49	1.99	3.46	4.68
Montgomery WB City	32-23	86-18	1939-54	16			4.79
Moulton	34-29	87-17	1939-51	13			3.92
Moulton TVA 381	34-29	87-17	1941-56	16	1.67	2.59	3.97
Muscle Shoals CAA AP	34-45	87-37	1941-54	14			3.89

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
ALABAMA (continued)							
New Brocton 3 NE	31-25	85-54	1940-55	16	2.10	3.42	4.39
Newburg	34-29	87-35	1945-54	10			4.48
New Market	34-54	86-26	1943-52	10			3.46
Newton	31-20	85-36	1897-54*	30			4.86
Oneonta	33-57	86-29	1939-54	16			5.21
Orrville	32-18	87-14	1941-54	14			4.80
Ozark	31-28	85-39	1902-54	53			4.97
Paint Rock	34-40	86-20	1939-51	13			4.10
Paint Rock	34-40	86-20	1941-56	16	1.86	2.71	3.96
Palmerdale 2 W	33-44	86-41	1948-54	7			5.10
Parrish	33-43	87-13	1939-43	5			3.53
Pennington Lock 2	32-08	88-02	1950-54	5			3.94
Perryville	32-37	87-08	1940-54	15			4.58
Peterman	31-35	87-16	1940-55	16	1.87	3.37	4.74
Pickensville	33-13	88-16	1948-54	7			4.40
Pine Hill	31-59	87-36	1941-54	14			4.38
Pine Level	32-04	86-04	1941-54	14			4.99
Plantersville	32-39	86-56	1940-54	15			4.18
Pleasant Grove School	34-57	85-55	1949-54	6			3.89
Pleasant Hill	32-10	86-55	1944-50	7	1.82	3.03	3.78
Prattville	32-28	86-28	1902-54	53			4.18
Primrose Farm	32-18	86-15	1939-54	16			4.67
Pushmataha	32-12	88-21	1897-54	58			4.58
Red Bay	34-27	88-09	1941-54	14			3.84
Reform	33-23	88-01	1939-54	16			4.00
River Falls	31-22	86-32	1939-54	16			5.04
River Falls 2 NE	31-22	86-31	1943-55	13	2.11	3.49	4.83
Robertsdale 7 E	30-33	87-36	1939-54	16			5.69
Rock Mills	33-09	85-18	1939-54	16			3.72
St. Bernard	34-12	86-47	1916-54	39			4.19
Samantha	33-25	87-36	1939-43	5			4.66
Sand Mountain State Farm API	34-17	85-58	1941-54	14			4.42
Sayre	33-43	86-58	1939-54	16			4.32
Scottsboro	34-41	86-02	1897-54	58			3.95
Scottsboro Substation	34-41	86-01	1947-54	8			3.76
Seale 6 W	32-18	85-15	1939-54	16			4.34
Selma	32-25	87-00	1897-54	58			4.26
Sheffield TVA Nursery	34-46	87-42	1939-54	16			3.52
Shoemaker Springs	34-51	87-12	1948-54	7			4.74
Slocomb 4 S	31-03	85-36	1948-54	7			4.98
Snow Hill	32-00	87-01	1939-54	16			5.05
Spring Hill	30-42	88-10	1939-51	13			6.54
South Hill	34-24	86-02	1939-54	16			4.14
Suttle	32-32	87-11	1950-54	5			4.34
Swaim	34-53	86-13	1939-54	16			4.14
Sylacauga 2 W	33-10	86-17	1939-54	16			4.16
Sylvania	34-34	85-49	1939-54	16			3.72
Talladega	33-27	86-06	1939-54	16			3.65
Talladega Horn Mountain Tower	33-18	86-04	1949-54	6			2.40
Thomasville	31-55	87-44	1897-54	58			4.70
Thorsby 1 SW	32-54	86-44	1943-55	13	1.73	2.69	3.88
Thurlow Dam	32-32	85-54	1939-54	16			4.16
Tibbie 2 S	31-20	88-15	1943-49	7			5.71
Trafford	33-49	86-44	1948-54	7			5.41
Trafford	33-49	86-44	1942-55	14	1.87	3.27	5.04
Troy	31-49	85-59	1939-54	16			4.52
Troy	31-49	85-59	1944-50	7	1.97	2.71	4.09
Tuscaloosa CAA AP	33-14	87-37	1939-54	16			4.16
Tuscaloosa Lock and Dam	33-13	87-35	1946-54	9			3.73
Tuskegee	32-26	85-42	1900-54	55			4.22
Union Springs 6 W	32-08	85-50	1897-54	58			4.66
Uniontown	32-27	87-31	1897-54*	46			4.24
University	33-12	87-33	1939-53*	13			4.02
University	33-12	87-33	1940-55*	14	1.45	3.16	4.56
Valley Head	34-34	85-36	1897-54	58			3.70
Vance	33-10	87-13	1948-54	7			5.18
Vernon	33-45	88-07	1942-55	14	1.72	2.85	4.22
Wadley	33-08	85-34	1939-54*	15			3.64
Wallace 3 SW	31-11	87-16	1941-54	14			4.20
Walnut Grove	34-04	86-19	1941-54*	12			5.87
Waterloo	34-55	88-04	1939-54	16			3.90
West Blocton	33-07	87-07	1940-54*	14			4.34
Wetumpka	32-32	86-12	1897-54	58			4.33
Whatley	31-39	87-43	1940-54	15			4.88
Wheeler Dam	34-47	87-21	1939-54	16			4.06
Whitfield Lock 3	32-17	88-01	1950-54	5			3.41
Wilson Dam	34-48	87-37	1940-54	15			3.71
Winfield 2 SW	33-55	87-50	1939-54	16			4.34
Yates Hydro. Plant	32-34	85-54	1897-54	58			4.37
Youngs Store	34-57	87-53	1945-54	10			4.06

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
FLORIDA							
Apalachicola WB City	29-44	84-59	1923-51*	25	2.27	4.34	6.36
Arcadia	27-13	81-51	1907-54*	46			4.36
Avon Park	27-36	81-30	1902-54*	52			4.72
Avon Park	27-36	81-30	1940-55	16	2.29	3.27	4.68
Bartow	27-54	81-50	1897-54	58			4.68
Belle Glade Experiment Station	26-40	80-38	1924-55	32			5.42
Belle Glade Hurricane Gate 4	26-42	80-43	1942-56	15	2.39	3.54	4.51
Belle Glade Hurricane Gate 4	26-42	80-43	1948-54	7			4.80
Big Pine Key Inn	24-40	81-21	1950-54	5			4.66
Blackman 4 WNW	30-53	86-43	1943-50	8	1.93	3.36	4.16
Blountstown 2 SE	30-26	85-02	1939-54	16			4.60
Boca Raton	26-21	80-05	1942-55	14	2.88	4.77	5.89
Bonita Springs 2 ESE	26-20	81-45	1943-54	12			4.82
Bradenton Experiment Station	27-29	82-33	1911-55	45			5.17
Branford	29-58	82-56	1945-50	6	1.82	3.09	4.19
Bristol	30-26	84-58	1940-50	11	2.23	3.52	5.02
Brooksville Chin Hill	28-38	82-22	1945-50	6	2.38	4.23	6.86
Brooksville Nursery 1	28-38	82-19	1948-52	5			5.57
Bushnell 2 E	28-40	82-05	1939-54	16			4.82
Camp Blanding	29-59	81-59	1941-54*	13			3.54
Canal Point Gate 5	26-52	80-38	1940-55	16	2.36	3.53	4.89
Canal Point USDA	26-52	80-38	1940-54*	14			4.21
Captiva	26-32	82-11	1939-54	16			5.03
Carrabelle	29-51	84-40	1897-55*	58			4.97
Caryville	30-46	85-49	1939-54	16			4.82
Cedar Key	29-08	83-02	1908-55	48			4.67
Chattahoochee 1 W	30-42	84-52	1939-54*	15			3.38
Chipley 3 E	30-47	85-29	1939-54	16			5.02
Christmas 7 WNW	28-33	81-06	1944-50	7	2.17	3.63	5.55
Clearwater	27-59	82-50	1939-54	16			5.47
Clermont 6 S	28-29	81-46	1897-54	58			4.82
Clewiston	26-45	80-55	1940-54*	12			3.92
Clewiston US Engineers	26-45	80-55	1948-54	7			5.48
Coconut Grove 7 S	25-39	80-17	1940-54	15			5.27
Compass Lake	30-36	85-24	1939-54	16			4.80
Crescent City 2 SW	29-25	81-31	1939-54	16			4.92
Crestview	30-46	86-34	1942-55	14	2.21	3.90	5.36
Crestview CAA AP	30-48	86-34	1943-52	10			4.76
Cross City CAA AP	29-38	83-06	1941-50	10	2.08	3.52	4.94
Cross City CAA AP	29-38	83-06	1950-54	5			5.32
Dania 4 WNW	26-04	80-12	1942-54	13			5.14
Davenport	28-09	81-36	1939-46	8			5.36
Daytona Beach	29-13	81-02	1939-54*	11			5.40
Daytona Beach CAA AP	29-11	81-03	1941-50	10	2.26	3.78	4.67
Daytona Beach CAA AP	29-11	81-03	1939-54	16			4.86
De Funiak Springs	30-43	86-07	1897-54	58			5.71
De Land	29-02	81-18	1909-55	47			4.74
Dowling Part	30-15	83-15	1944-50	7	1.97	3.07	4.13
Dry Tortugas	24-38	82-52	1950-54	5			4.14
Eglin Field	30-29	86-31	1940-50	11	2.28	3.98	5.94
Eustis 2 S	28-50	81-41	1897-54	58			4.10
Everglades	25-51	81-23	1939-54	16			4.03
Federal Point	29-44	81-32	1897-54	58			4.44
Felda	26-32	81-26	1940-55	16	1.84	2.96	4.48
Felda	26-33	81-26	1940-51	12			3.70
Fellsmere	27-46	80-36	1913-55	43			5.00
Fernandina Beach	30-40	81-27	1902-54	53			5.10
Fort Drum	27-30	80-48	1942-50	9	1.76	2.76	4.08
Fort Lauderdale	26-06	80-09	1913-54*	41			5.54
Fort Myers WB AP	26-35	81-52	1942-50	9	2.11	3.32	5.26
Fort Myers WB AP	26-35	81-52	1897-55	59			4.69
Fort Pierce	27-25	80-19	1901-54	54			4.67
Gainesville University of Florida	29-39	82-21	1940-55	16	2.11	3.51	4.97
Gainesville University of Florida	29-39	82-21	1897-55	59			4.35
Glen St. Mary Nursery	30-15	82-10	1939-54	16			4.96
Graceville	30-59	85-30	1941-55*	14	1.68	3.15	4.55
Grape Hammock 3 W	27-48	81-15	1941-50	10	2.42	3.62	5.56
Grape Hammock CP Ranch	27-48	81-15	1940-53*	13			4.40
Haines City 2 W	28-06	81-39	1942-49	8	2.17	3.12	5.32
Hart Lake	28-23	81-14	1942-54	13			4.88
Hastings	29-43	81-30	1939-44	6			3.80
Hialeah	25-50	80-17	1940-50	11	2.75	4.92	6.26
Hialeah	25-50	80-17	1941-54	14			4.70
High Springs	29-50	82-36	1944-54	11			4.88
Hillard	30-42	81-56	1940-54	15			5.28
Hillsborough River State Park	28-09	82-14	1943-54*	11			5.09
Holopaw	28-09	81-04	1941-50	10	1.97	3.30	4.93
Homestead Experiment Station	25-30	80-30	1940-55	16	2.64	3.79	4.64
Homestead Experiment Station	25-30	80-30	1910-54*	42			5.45
Hypoluxo	26-33	80-03	1900-55	56			5.60
Immokalee	26-26	81-26	1941-45	5			4.12

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
FLORIDA (continued)							
Inglis	29-02	82-41	1941-55	15	2.14	3.44	5.14
Inverness	28-50	82-20	1899-54*	53			4.40
Isleworth	28-28	81-33	1939-54	16			4.56
Jacksonville Beach	30-17	81-24	1944-54	11			5.14
Jacksonville WB AP	30-25	81-39	1900-56	57	2.21	3.53	4.86
Jacksonville WB City	30-20	81-39	1939-54	16			5.24
Jasper AP	30-29	82-56	1942-48	7	2.09	3.30	4.78
Jasper 9 ESE	30-30	82-48	1942-54	13			3.67
Kendall 2 E	25-41	80-17	1942-54	13			4.99
Key West WB AP	24-35	81-42	1941-53	13			4.34
Key West WB City	24-33	81-48	1900-56	57	2.09	3.39	4.92
Key West WB City	24-33	81-48	1939-54	16			5.83
Kissimmee 2	28-18	81-25	1940-55	16	2.29	3.67	5.00
Kissimmee	28-18	81-25	1895-55*	58			4.60
La Belle 2 NW	26-46	81-27	1940-50	11	2.41	3.85	5.69
La Belle	26-46	81-26	1939-54	16			4.26
Lake Alfred Experiment Station	28-06	81-43	1939-54	16			5.23
Lake City 2 E	30-12	82-35	1897-54	58			3.97
Lake Hiawasse	28-32	81-28	1941-54	14			4.14
Lakeland WB City	28-02	81-57	1943-50	8	2.40	3.76	5.57
Lakeland WB City	28-02	81-57	1939-54	16			4.50
Lake Placid 2 SW	27-17	81-23	1939-54	16			5.38
Lake Trafford	26-26	81-29	1948-54	7			4.04
Lamont 8 W	30-24	83-55	1941-55	15	2.03	2.96	3.53
Lamont 8 W	30-24	83-55	1939-51*	7			3.34
Leesburg	28-49	81-52	1942-55	14	2.24	3.30	4.78
Lignumvitae Key	24-54	80-42	1942-50	9	2.04	3.61	5.03
Loxahatchee	26-41	80-16	1941-54	14			5.95
Loxahatchee	26-41	80-16	1940-55	16	2.30	4.31	5.79
Lynne 4 SE	29-10	81-52	1941-50	10	2.21	3.31	4.55
Madison	30-28	83-25	1903-55	53			4.49
Marathon Vaca Key	24-43	81-06	1950-54	5			4.38
Marianna Industrial School	30-45	85-17	1900-54	55			4.79
Marianna CAA AP	30-50	85-11	1950-54	5			3.68
Marineland	29-40	81-13	1941-50	10	1.93	3.83	5.53
Mayo 5 NW	30-06	83-14	1949-54	6			4.70
Melbourne	28-05	80-36	1939-54	16			4.48
Melbourne WB AP	28-06	80-38	1941-50	10	1.94	2.93	4.80
Melbourne 10 WNW	28-07	80-45	1942-50	9	2.04	3.02	4.33
Merritt Island	28-21	80-42	1896-55*	58			4.88
Miami Beach	25-47	80-08	1941-54	14			4.61
Miami WB AP	25-49	80-17	1939-54	16			5.98
Miami WB City	25-47	80-11	1911-56	46	2.66	4.75	6.32
Miami WB City	25-47	80-11	1939-54	16			5.33
Milton Experiment Station	30-47	87-09	1948-54	7			4.51
Monticello 2 S	30-32	83-52	1904-55*	51			4.70
Moore Haven Lock 1	26-50	81-05	1940-55	16	2.38	3.41	4.63
Moore Haven Lock 1	26-50	81-05	1939-54	16			4.60
Mountain Lake	27-56	81-36	1939-54	16			4.86
Mount Pleasant	30-40	84-42	1905-55*	50			4.26
Myakka River State Park	27-15	82-19	1943-54	12			5.29
Naples	26-09	81-47	1942-54*	12			5.90
Naples 1 S	26-07	81-49	1943-48	6	2.20	3.87	6.00
New Smyrna Beach 4 N	29-05	80-57	1897-55	59			5.02
Niceville	30-31	86-30	1939-54	16			5.68
Nittaw 1 S	27-56	81-00	1942-54	13			5.50
North New River Canal 1	26-34	80-45	1941-56	16	2.13	3.29	4.35
North New River Canal 1	26-33	80-43	1941-51	11			3.96
North New River Canal 2	26-20	80-33	1941-50	10	1.67	2.87	3.74
North New River Canal 2	26-20	80-33	1941-51	11			3.26
North New River Canal 20 Mi. Bend	26-09	80-27	1940-45	6	1.77	2.90	4.29
Ocala	29-11	82-08	1948-54	7			5.11
Ocala 2 NE	29-13	82-07	1896-55*	59			4.31
Okeechobee Hurricane Gate 6	27-13	80-48	1940-55	16	2.22	3.34	4.53
Okeechobee Hurricane Gate 6	27-13	80-48	1939-54	16			4.60
Okeechobee	27-14	80-59	1948-54	7			5.36
Orange City 3 S	28-55	81-17	1944-50	7	2.18	3.38	5.35
Orange Springs 1 E	29-30	81-55	1944-52	9			4.90
Orlando WB AP	28-33	81-20	1942-50	9	2.62	3.79	5.85
Orlando WB AP	28-33	81-20	1943-54	12			4.99
Orlando Water Plant	28-33	81-21	1939-54*	10			3.77
Ortona Lock 2	26-47	81-18	1940-50	11	2.28	3.74	4.85
Ortona Lock 2	26-47	81-18	1940-51	12			4.64
Palatka	29-39	81-38	1923-55*	32			4.54
Panama City 2	30-10	85-40	1940-55	16	2.14	3.64	5.05
Panama City	30-10	85-42	1914-55*	31			5.18
Parish	27-35	82-26	1945-50	6	2.58	4.03	6.39
Pennsuco 4 NW	25-56	80-27	1940-55	16	2.44	3.89	5.14
Pennsuco 4 NW	25-56	80-27	1941-51	11			4.85
Pensacola CAA AP	30-28	87-12	1944-54	11			5.53
Pensacola WB City	30-25	87-13	1900-56	57	2.51	4.54	6.47

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
<u>FLORIDA</u> (continued)							
Pensacola WB City	30-25	87-13	1939-54	16			5.63
Perry 3 S	30-05	83-34	1939-48	10			4.58
Peters	25-36	80-21	1942-54	13			4.64
Plant City	28-01	82-08	1895-55*	55			4.27
Pompano Beach	26-14	80-09	1941-54	14			6.92
Port Mayaca SL Canal	26-59	80-37	1940-54	15			4.06
Punta Gorda	26-56	82-03	1914-55	42			4.52
Quincy Experiment Station	30-35	84-35	1902-55*	42			4.49
Raiford State Prison	30-04	82-11	1939-54	16			4.58
Royal Palm Ranger Station	25-22	80-35	1949-54	6			4.06
St. Augustine	29-54	81-19	1896-55*	59			4.56
St. Augustine Beach	29-50	81-16	1949-53	5			4.27
St. Leo	28-21	82-17	1944-50	7	2.39	3.94	5.43
St. Leo	28-21	82-16	1902-55	54			5.27
St. Lucie New Lock 1	27-07	80-17	1941-50	10	2.36	3.10	4.48
St. Lucie New Lock 1	27-07	80-17	1940-51	12			5.63
St. Marks 6 SE	30-05	84-10	1942-54	13			5.33
St. Petersburg	27-47	82-38	1915-55	41			5.81
Sand Key	24-27	81-52	1903-24*	19	1.81	2.78	3.94
Sanford	28-48	81-16	1939-54	16			4.73
Sarasota	27-21	82-32	1948-54	7			4.85
Sarasota 5 E	27-20	82-28	1939-50	12			5.23
Secotan	30-12	83-39	1948-54	7			4.08
Stuart	27-12	80-15	1939-54	16			4.30
Tallahassee WB AP	30-26	84-20	1941-54	14			4.46
Tamiami Canal	25-46	80-27	1943-50	8	2.89	4.49	5.67
Tamiami Trail 40 Mi. Bend	25-46	80-50	1941-54	14			4.63
Tamiami Trail 40 Mi. Bend	25-46	80-50	1940-55	16	2.57	3.48	4.39
Tampa WB AP	27-58	82-32	1897-56*	59	2.46	3.73	4.52
Tampa WB AP	27-58	82-32	1939-54	16			4.39
Tarpon Springs	28-09	82-45	1897-54*	57			5.21
Tavernier	25-01	80-30	1939-54	16			5.64
Titusville 2 W	28-37	80-50	1901-55*	54			4.96
Venice	27-06	82-27	1942-50	9	2.02	3.11	5.00
Venus 3 SE	27-02	81-21	1941-50	10	2.05	2.94	4.69
Venus 3 SE	27-02	81-21	1940-51	12			3.68
Vernon	30-38	85-43	1942-55	14	2.20	3.78	5.35
Vernon	30-38	85-43	1939-51*	9			5.26
Vero Beach CAA AP	27-39	80-24	1941-56	16	2.16	3.48	4.59
Vero Beach CAA AP	27-39	80-25	1943-54	12			4.80
Wauchula 2 NW	27-34	81-49	1939-54	16			5.95
West Palm Beach	26-43	80-03	1930-55	26			5.55
West Palm Beach WB AP	26-41	80-06	1942-50	9	2.75	5.25	7.50
West Palm Beach WB AP	26-41	80-06	1939-54	16			5.11
Winter Haven	28-01	81-44	1941-54	14			4.66
<u>GEORGIA</u>							
Abbeville	32-00	83-18	1939-54	16			3.59
Abbeville	32-00	83-18	1942-55	14	2.03	2.94	3.36
Adairsville	34-22	84-56	1897-54*	44			3.68
Adairsville	34-22	84-56	1941-56	16	1.51	2.47	3.71
Adel	31-08	83-25	1949-54	6			4.20
Ailey	32-11	82-34	1949-54	6			3.94
Alapaha Experiment Station	31-21	83-13	1897-54*	57			3.53
Albany	31-34	84-09	1897-54	58			4.19
Albany WB AP	31-32	84-11	1948-54	7			3.52
Allatoona Dam 2	34-10	84-44	1948-54	7			3.38
Alma CAA AP	31-32	82-31	1939-54	16			3.78
Americus 4 ENE	32-06	84-10	1939-54	16			4.34
Americus Experiment Station Nursery	32-06	84-16	1941-55	15	1.77	2.77	3.79
Athens	33-58	83-23	1897-54	58			3.46
Athens College of Agriculture	33-55	83-22	1939-54*	13			3.61
Athens WB AP	33-57	83-19	1945-54	10			3.46
Atlanta WB AP	33-39	84-25	1939-49	11			3.84
Atlanta WB AP	33-39	84-25	1903-51	49	1.77	2.95	3.77
Atlanta WB City	33-45	84-23	1940-49	10			3.58
Augusta	33-28	81-58	1939-54*	15			3.32
Augusta WB AP	33-22	81-58	1903-51	49	1.75	2.52	3.46
Bainbridge	30-55	84-34	1897-54	58			4.14
Bainbridge	30-55	84-34	1941-55	15	2.03	3.29	4.30
Ball Ground	34-20	84-23	1949-54	6			4.10
Beaverdale	34-55	84-51	1948-54	7			4.12
Bellville	32-09	81-58	1941-55	15	2.18	2.96	3.89
Blackbeard Island	31-29	81-13	1941-54*	7			3.67
Blairsville Experiment Station	34-51	83-56	1939-54	16			3.44
Blakely	31-23	84-56	1897-54*	55			4.73
Blue Ridge Reservoir Dam	34-53	84-17	1939-54	16			3.89
Brasstown Bald TVA 147	34-52	83-49	1944-50	7	1.28	1.91	3.54
Brooklet 1 W	32-23	81-41	1939-54	16			3.92
Brunswick	31-09	81-29	1906-54*	45			5.05
Brunswick CAA AP	31-09	81-23	1948-54	7			5.20
Brunswick CAA AP	31-09	81-23	1941-55	15	2.17	4.04	6.00

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
GEORGIA (continued)							
Buena Vista	32-19	84-31	1945-50	6	1.56	2.44	3.67
Burton Dam	34-47	83-32	1941-50	10	1.70	3.16	5.00
Butler	32-33	84-14	1949-54	6			3.07
Butler Creek	33-22	81-57	1949-54	6			3.46
Cairo 2 NNW	30-54	84-13	1939-54	16			4.40
Camilla	31-14	84-13	1939-54	16			3.94
Camp Stewart	31-52	81-37	1942-54*	9			4.69
Canton	34-14	84-29	1897-54	58			3.60
Canton	34-14	84-29	1940-56	17	1.56	2.57	3.76
Carlton Bridge	34-04	82-59	1939-54	16			3.96
Carnesville	34-22	83-14	1941-56	16	1.55	2.58	3.69
Carrollton	33-36	85-05	1940-54	15			3.11
Carrollton	33-36	85-05	1941-55	15	1.65	2.28	3.08
Carters	34-36	84-42	1948-54	7			4.12
Cartersville	34-09	84-48	1948-54	7			3.28
Cartersville 3 SW	34-09	84-50	1939-54	16			3.13
Cedartown	34-01	85-15	1939-54	16			3.65
Chatsworth 1 W	34-46	84-47	1939-54*	9			3.76
Chickamauga Park	34-55	85-16	1941-54	14			3.83
Choestoe	34-48	83-54	1942-54	13			3.83
Clayton	34-53	83-24	1897-54*	56			4.72
Clermont 3 S	34-27	83-48	1941-56	16	1.26	2.15	3.34
Cleveland	34-36	83-46	1948-54	7			5.51
Columbus	32-28	84-59	1939-54*	15			3.89
Columbus WB AP	32-21	84-56	1946-50	5	1.78	2.43	3.75
Concord	33-05	84-27	1939-54	16			3.72
Coolidge	31-01	83-52	1941-55	15	2.10	2.99	3.79
Cordele	31-58	83-47	1939-54	16			3.92
Cornelia	34-31	83-32	1939-54*	14			4.32
Covington	33-36	83-52	1897-54*	57			3.71
Cumming 1 N	34-13	84-08	1939-54*	8			3.48
Curryville 2 W	34-27	85-06	1948-54*	6			4.98
Cuthbert	31-46	84-47	1946-54	9			4.18
Dahlonega	34-32	83-59	1897-54	58			4.17
Dallas	33-55	84-50	1949-54	6			4.20
Dalton	34-46	84-58	1939-54	16			3.84
Dawson	31-46	84-27	1948-54	7			3.74
Dawsonville	34-25	84-07	1948-54	7			4.08
Dial Post Office	34-46	84-13	1943-54	12			4.04
Doctortown 1 WSW	31-39	81-51	1939-54	16			3.98
Doles	31-42	83-53	1941-55	15	2.10	3.07	3.99
Donalsonville 3 W	31-02	84-55	1948-54	7			4.49
Douglas	31-30	82-51	1939-54*	15			3.91
Douglasville	33-45	84-45	1948-54	7			4.38
Dover	32-35	81-43	1939-54*	9			3.48
Dublin	32-33	82-55	1899-54	56			3.82
Dublin 2	32-32	82-54	1942-55	14	1.49	2.53	3.20
Eastman	32-12	83-11	1897-54*	56			3.79
Edison	31-34	84-44	1941-55	15	2.10	3.27	4.08
Ellijay	34-42	84-29	1939-54*	15			4.28
Embry	33-52	84-59	1948-54	7			3.61
Experiment	33-16	84-17	1939-54	16			4.07
Fairmount	34-26	84-42	1939-54*	10			3.19
Fairview	33-00	84-07	1939-53	15			3.79
Fargo	30-41	82-34	1939-44	6			3.73
Fargo	30-41	82-34	1941-50*	9	2.75	3.68	4.68
Fitzgerald	31-43	83-15	1898-54*	39			3.79
Flat Top TVA 109	34-51	84-30	1941-55	15	1.73	3.49	5.64
Fleming Experiment Station	31-53	81-25	1950-54	5			4.88
Flintstone	34-56	85-21	1943-54	12			4.36
Folkston 3 SSW	30-48	82-02	1945-54*	8			4.18
Folkston 3 SSW	30-48	82-02	1941-55	15	2.34	3.48	4.28
Folkston 9 SW	30-44	82-08	1949-54	6			3.92
Fort Gaines	31-36	85-03	1897-54	58			4.34
Fort Valley 3 E	32-34	83-51	1939-54	16			3.74
Franklin	33-17	85-06	1948-54	7			3.28
Gainesville	34-19	83-50	1897-54	58			3.52
Glennville	31-56	81-55	1905-54	50			4.49
Goat Rock	32-36	85-05	1939-54	16			3.44
Greensboro	33-34	83-11	1939-54	16			4.55
Griffin	33-15	84-16	1897-54	58			4.02
Hamilton 6 W	32-45	84-58	1945-50	6	1.57	2.64	4.17
Haralson	33-14	84-35	1944-50	7	1.87	3.09	4.64
Hartwell	34-21	82-56	1939-54	16			3.67
Hawkinsville	32-17	83-28	1898-54	57			3.96
Hazlehurst	31-52	82-36	1942-50	9	2.50	3.75	5.11
Hemptown Gap	34-52	84-06	1939-54	16			3.47
Hoggards Mill	31-12	84-27	1941-54	14			4.27
Ivylog	34-58	84-03	1939-44	6			2.73
Jackson Dam	33-19	83-51	1942-55	14	1.51	2.64	3.40
Jasper 1 NNW	34-29	84-27	1939-54	16			3.73

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
GEORGIA (continued)							
Jasper 7 W	34-29	84-30	1943-56	14	1.42	2.40	3.10
Jesup	31-37	81-53	1941-50	10	1.81	2.86	4.07
Jonesboro	33-31	84-21	1948-54	7			3.78
Kingston	34-14	84-56	1948-54	7			3.79
La Fayette	34-42	85-17	1939-54	16			3.98
La Fayette	34-42	85-17	1940-56	17	1.63	2.80	4.22
La Grange	33-02	85-02	1939-54	16			4.38
La Grange	33-02	85-02	1942-55	14	1.70	2.52	3.88
Lawson Field	32-21	85-00	1941-45	5	1.70	3.14	4.54
Lincolnton	33-47	82-28	1948-54	7			3.10
Lisbon	33-57	82-35	1941-50	10	1.58	2.80	3.99
Little Hightower	34-56	83-39	1939-54	16			4.62
Louisville	33-00	82-24	1897-54*	52			3.53
Louisville	33-00	82-24	1941-55	15	1.90	2.81	3.73
Lumber City	31-55	82-41	1939-54	16			4.28
Lumpkin 3 E	32-01	84-48	1944-50	7	1.80	2.81	4.06
Macon	32-50	83-38	1939-53	15			3.26
Macon WB AP	32-42	83-39	1903-51	49	1.85	3.32	3.84
Margret	34-46	84-07	1939-44	6			3.21
Maysville	34-15	83-34	1948-54	7			4.69
Midville	32-50	82-14	1948-54	7			3.56
Milledgeville	33-05	83-13	1897-54*	55			3.66
Millen	32-48	81-56	1897-54	58			3.59
Montezuma 1 NE	32-19	84-01	1939-54	16			3.80
Monticello	33-18	83-41	1939-54	16			3.78
Moultrie 2 ESE	31-10	83-45	1939-54	16			4.16
Mount Vernon 3 WNW	32-12	82-38	1949-54	6			3.49
Mulky Gap	34-48	84-01	1939-44	6			3.24
Neel Gap TVA 135	34-44	83-55	1941-50	10	1.40	2.51	4.28
Newnan	33-22	84-49	1897-54	58			3.56
Noontootla Creek	34-42	84-13	1939-54	16			4.18
Norcross 4 N	34-00	84-12	1939-54	16			3.89
Nottely Dam	34-58	84-05	1949-54	6			3.11
Pearson	31-18	82-51	1941-55	15	2.15	2.98	3.92
Pine Mountain Valley	32-47	84-51	1948-54	7			4.09
Quitman	30-47	83-33	1897-54	58			4.48
Resaca	34-35	84-57	1898-54	57			4.03
Rising Fawn	34-45	85-32	1946-54	9			3.68
Rome	34-15	85-10	1897-54	58			3.72
Rome 6 SW	34-10	85-12	1941-56	16	1.57	2.50	3.53
Savannah USDA Plant Garden	32-00	81-16	1939-54	16			6.17
Savannah WB AP	32-08	81-12	1903-56	54	2.26	3.66	4.75
Savannah WB City	32-05	81-05	1939-45	7			4.86
Savannah Beach 2 N	32-01	80-51	1939-54	16			4.55
Sparta 2 NNW	33-18	82-59	1939-54	16			2.95
Sparta 2 NNW	33-18	82-59	1941-55	15	1.52	2.41	3.22
Stanley Gap TVA 111	34-47	84-18	1944-50	7	1.50	2.45	4.43
Stillmore	32-23	82-13	1939-45	7			3.76
Suches	34-41	84-01	1939-54	16			5.54
Summerville	34-29	85-22	1939-54	16			4.24
Swainsboro	32-36	82-20	1947-54*	7			3.19
Sweet Gum TVA 129	34-58	84-15	1944-56	13	1.28	2.30	3.79
Sylvania	32-45	81-38	1941-55	15	1.90	2.72	3.64
Talbotton	32-40	84-32	1897-54	58			3.73
Tallapoosa 2 NNW	33-46	85-18	1897-54*	57			3.53
Taylorsville	34-05	84-59	1939-54*	9			3.84
The Rock	32-58	84-14	1941-55	15	2.07	2.65	3.58
Thomasville	30-51	83-59	1939-54	16			4.15
Thomasville WB City	30-48	83-58	1906-32*	25	2.16	3.86	4.64
Tifton 2 N	31-28	83-32	1939-54	16			3.97
Titus	34-57	83-38	1942-54	13			4.87
Toccoa	34-35	83-19	1897-54	58			4.62
Tray Mountain TVA 154	34-48	83-42	1944-56	13	1.98	3.55	5.79
Tunnel Hill	34-52	85-02	1939-54	16			4.06
Valdosta 4 NW	30-52	83-20	1941-55	15	1.93	2.65	3.65
Valdosta WB AP	30-47	83-17	1949-54	6			3.19
Waleska	34-19	84-33	1948-54	7			3.67
Warrenton	33-24	82-40	1939-54	16			3.73
Washington	33-44	82-44	1897-54	58			3.48
Watkinsville ARS	33-52	83-26	1941-55	15	1.78	2.60	3.82
Waycross	31-13	82-22	1897-54	58			3.54
Waynesboro 3 NE	33-07	81-58	1940-54*	11			4.14
West Point	32-52	85-11	1897-54	58			4.14
Winder 3 NW	34-01	83-46	1941-50	10	1.55	2.24	3.52
Woodbury	32-59	84-35	1901-54	54			3.86
Woodstock	34-06	84-31	1939-54*	9			3.08
Young Harris	34-56	83-51	1939-54	16			3.26
LOUISIANA							
Bogalusa	30-47	89-52	1939-55	17			4.97
Bogalusa 2 E	30-48	89-50	1948-55	8			5.04

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
LOUISIANA (continued)							
Buras 2 NNW	29-22	89-34	1946-55	10			5.47
Burrwood WB AWY	28-58	89-22	1939-55	17			5.81
Burrwood WB AWY	28-58	89-22	1941-50	10	2.95	5.96	7.15
Chandeleur Lighthouse	30-03	88-52	1940-49	10	2.63	4.30	6.29
Grand Isle	29-14	90-00	1950-55	6			6.48
Grand Isle	29-14	90-00	1940-50	11	2.82	5.16	6.65
Naval AMM Depot	29-53	89-59	1946-55	10			5.58
Pearl River	30-23	89-45	1939-55	17			5.77
Pearl River Lock 1	30-27	89-47	1948-55*	6			6.13
Port Eads	29-02	89-10	1928-37	10	2.09	3.60	5.20
Port Sulphur	29-29	89-42	1939-55	17			5.93
MISSISSIPPI							
Abbeville	34-30	89-30	1943-54	12			4.08
Aberdeen	33-50	88-33	1939-54	16			3.90
Ackerman	33-19	89-10	1948-54	7			4.10
Acton	34-58	88-26	1940-54	15			3.68
Ashland	34-50	89-10	1943-54	12			4.50
Avera	31-18	88-45	1940-55	16	2.35	3.79	5.32
Baldwyn	34-31	88-38	1948-54*	6			4.14
Batesville	34-19	89-57	1897-54	58			3.85
Bay St. Louis	30-18	89-21	1897-54	58			5.60
Bay Springs	31-59	89-17	1939-54	16			4.33
Beaumont	31-11	88-55	1943-54	12			5.21
Bellefontaine 2 NNW	33-40	89-20	1943-50	8	1.98	3.11	4.55
Belmont	34-33	88-13	1943-54	12			3.77
Biloxi City	30-24	88-54	1940-55	16	2.41	4.72	6.44
Biloxi City	30-24	88-54	1939-54	16			5.21
Biloxi Display	30-24	88-55	1948-53	6			4.52
Bluff Lake	33-17	88-47	1948-54	7			5.30
Booneville	34-39	88-34	1898-54	57			3.76
Brooklyn 2 SE	31-02	89-10	1950-54	5			5.16
Brooksville Experiment Station	33-15	88-34	1948-54	7			4.87
Bruce	34-00	89-21	1947-54	8			4.40
Buckatunna	31-33	88-32	1948-54	7			5.05
Burnsville Substation	34-50	88-18	1939-54	16			4.03
Byhalia	34-52	89-41	1940-56	17	1.64	3.08	4.14
Byhalia	34-52	89-41	1943-54	12			3.74
Calhoun City	33-52	89-19	1940-55	16	1.68	3.10	4.61
Calhoun City	33-52	89-19	1948-54	7			3.97
Carrollton	33-30	89-56	1948-54	7			4.63
Center	32-56	89-27	1943-48	6	2.05	2.83	3.49
Coffeeville	33-59	89-40	1948-54	7			4.81
Collins	31-39	89-34	1941-55	15	2.26	3.80	5.26
Collins	31-39	89-34	1939-54	16			4.67
Columbia	31-15	89-50	1905-54	50			4.79
Columbus	33-29	88-26	1897-54	58			3.91
Corinth	34-57	88-31	1897-54	58			3.77
Crandall 12 N	32-05	88-28	1949-54	6			4.40
Crawford 5 WSW	33-17	88-42	1948-54	7			4.82
Dancy	33-40	89-03	1948-54	7			4.38
D'Lo	31-59	89-54	1939-54	16			4.64
Duck Hill	33-37	89-42	1941-52	12	1.63	3.03	4.62
Duck Hill	33-37	89-42	1939-52	14			4.51
Durant	33-04	89-51	1939-46	8			4.07
Edinburg	32-48	89-20	1939-54	16			3.95
Enid 3 NNE	34-09	89-56	1941-56	16	1.74	2.84	4.00
Enid Dam	34-09	89-55	1948-54	7			4.40
Enterprise	32-11	88-49	1939-54	16			4.12
Eupora	33-33	89-16	1939-54	16			3.97
Forest	32-22	89-28	1940-55	16	1.82	3.35	4.42
Forest	32-22	89-28	1939-54	16			4.25
French Camp	33-17	89-24	1940-47	8	1.76	2.81	3.54
Fruitland Park	30-55	89-10	1939-43	5			4.99
Fulton	34-16	88-24	1909-54	46			4.20
Gholson 8 W	32-55	88-52	1948-54	7			4.37
Goshen Springs 2 N	32-31	89-56	1948-54	7			4.20
Grenada	33-47	89-48	1939-54	16			4.61
Gulfport AP	30-25	89-04	1948-54	7			4.56
Hattiesburg	31-21	89-17	1897-54*	57			4.67
Heidelberg	31-53	88-59	1941-55	15	1.88	3.42	4.69
Hernando	34-50	90-00	1897-54*	55			4.11
Hickory	32-19	89-01	1939-54	16			4.24
Hickory Flat 1 WNW	34-37	89-12	1943-56	14	1.61	2.60	4.08
Hickory Flat 1 WNW	34-37	89-12	1943-54	12			3.60
Holcomb	33-46	89-59	1948-54	7			5.38
Holly Springs 4 N	34-49	89-27	1943-56	14	1.88	2.96	4.43
Holly Springs 2 N	34-48	89-26	1897-54	58			4.20
Houston 2 NE	33-55	88-58	1941-56*	15	1.68	2.72	4.08
Houston 2 NE	33-55	88-58	1942-54*	12			3.96
Kipling	32-41	88-38	1939-54	16			3.71

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
MISSISSIPPI (continued)							
Kosciusko	33-04	89-35	1898-54	57			3.86
Kossuth	34-52	88-39	1943-48	6	1.79	2.73	4.49
Lafayette Springs	34-19	89-15	1948-54	7			4.30
Laurel	31-41	89-07	1902-54*	52			4.79
Leakesville	31-09	88-33	1897-54	58			5.16
Louisville	33-07	89-03	1897-54	58			4.25
Macon 2 NE	33-08	88-32	1940-55	16	1.86	3.22	4.18
Macon 2 NE	33-08	88-32	1939-54	16			3.96
Marion 2 E	32-25	88-38	1942-51	10	2.10	3.32	4.12
McHenry 5 ESE	30-41	89-04	1948-54	7			4.16
Meridian WB AP	32-20	88-45	1903-48*	44	2.15	3.29	4.57
Meridian WB AP	32-20	88-45	1944-49	6			4.43
Meridian WB City	32-21	88-40	1939-48	10			4.36
Merrill	30-59	88-43	1939-54	16			5.30
Midway	34-44	88-15	1939-54	16			4.10
Mize	31-52	89-33	1948-54	7			4.45
Montrose	32-07	89-14	1948-54	7			4.20
Mount Pleasant	34-57	89-31	1943-54	12			3.73
New Albany 1 SE	34-28	89-00	1943-54	12			4.03
Newton Experiment Station	32-19	89-07	1949-54	6			4.07
Ofahoma	32-43	89-42	1948-54	7			4.24
Okolona	34-00	88-45	1948-54	7			4.90
Ovett	31-29	89-02	1941-55	15	2.26	3.82	5.32
Pascagoula Ingall Shipyard	30-23	88-33	1941-55	15	2.57	5.05	7.56
Pascagoula High School	30-23	88-33	1947-54	8			4.92
Paulding	32-02	89-02	1948-54	7			4.21
Pearlington	30-13	89-35	1897-54	58			4.87
Pelahatchie	32-19	89-47	1939-54	16			3.98
Philadelphia 1 WSW	32-46	89-08	1949-54	6			4.06
Philadelphia 5 SW	32-44	89-11	1939-51	13			3.46
Picayune	30-28	89-40	1948-54	7			4.56
Pickens	32-53	89-59	1948-54	7			5.29
Pleasant Hill	34-55	89-53	1948-54	7			3.53
Pontotoc	34-15	89-00	1897-54	58			3.65
Poplarville Experiment Station	30-51	89-33	1939-54	16			4.22
Porterville	32-43	88-29	1941-55	15	1.91	3.05	4.21
Prentiss 2 NNE	31-37	89-52	1948-54	7			4.40
Purvis	31-09	89-25	1940-49	10	1.84	3.23	4.48
Purvis	31-09	89-24	1947-54	8			4.96
Richton 12 NE	31-27	88-48	1947-54	8			5.02
Rio 5 S	32-30	88-50	1943-52	10			3.71
Ripley	34-42	88-57	1941-50*	8	1.57	2.26	3.82
Ripley	34-44	88-57	1948-54	7			4.22
Russell 2 W	32-25	88-37	1948-54	7			3.98
Sardis Dam	34-24	89-48	1941-56	16	1.69	2.88	4.11
Sardis Dam	34-24	89-48	1950-54	5			3.72
Sarepta	34-07	89-17	1941-56	16	1.67	3.28	4.85
Senatobia	34-37	89-58	1943-54	12			3.47
Shubuta	31-52	88-42	1939-54	16			4.79
Shubuta 2	31-52	88-42	1940-55	16	2.15	3.78	5.10
Shuqualak	32-59	88-34	1948-54	7			4.19
Smithville	34-04	88-23	1949-54	6			4.08
Standard	30-32	89-22	1947-54	8			4.26
State College	33-28	88-48	1942-55	14	1.76	3.06	4.19
State College	33-27	88-47	1939-54	16			4.32
Sumrall	31-25	89-32	1948-54	7			4.15
Sylvarena 1 NE	32-01	89-22	1941-55*	14	1.86	3.01	4.10
Thyatira	34-38	89-45	1948-54	7			3.37
Tishomingo	34-38	88-12	1942-56	15	1.66	2.59	4.25
Tishomingo	34-38	88-12	1948-54	7			4.13
Tupelo WB AWY	34-15	88-43	1940-50	11	1.68	2.64	4.00
Tupelo	34-15	88-43	1939-54	16			4.31
Tupelo	34-15	88-43	1900-54*	50			4.11
Union	32-34	89-07	1948-54	7			4.58
University	34-22	89-32	1940-56	17	1.70	2.81	4.10
University	34-22	89-33	1899-54*	53			3.96
Vaiden	33-20	89-45	1948-54	7			4.68
Vancleave	30-33	88-42	1948-54	7			4.36
Van Vleet	33-58	88-54	1948-54	7			4.55
Walnut Grove	32-35	89-28	1939-54	16			4.45
Water Valley	34-11	89-38	1897-54	58			3.98
Waynesboro 3 WNW	31-41	88-41	1897-54	58			4.55
West Point Experiment Station	33-36	88-35	1941-50*	9	1.38	2.56	4.04
West Point 3 NNW	33-39	88-40	1939-54*	12			3.20
White Oak	32-06	89-42	1948-54*	6			3.72
White Sand	30-48	89-41	1940-55	16	2.24	4.21	5.48
Wiggins	30-52	89-09	1944-55	12	2.20	3.94	5.38
Wiggins	30-52	89-09	1946-54	9			5.36

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
NORTH CAROLINA							
Monroe 4 SE	34-57	80-31	1939-54	16			3.86
Wadesboro	34-57	80-04	1941-54	14			3.90
SOUTH CAROLINA							
Aiken	33-34	81-44	1902-54*	52			3.53
Anderson	34-31	82-39	1899-54*	55			3.89
Anderson CAA AP	34-30	82-43	1943-54	12			3.95
Batesburg	33-54	81-33	1947-54	8			3.25
Beaufort 7 SW	32-23	80-43	1899-54*	47			4.37
Belton 5 ESE	34-30	82-33	1941-55	15	1.54	2.30	3.28
Bishopville	34-13	80-15	1939-53	15			3.84
Bishopville	34-13	80-15	1941-56	16	1.78	2.85	3.77
Blackstock	34-34	81-09	1941-45	5	2.11	3.45	4.53
Blackville 3 W	33-22	81-19	1899-54	56			3.59
Blairs	34-25	81-24	1939-54	16			4.46
Branchville	33-16	80-49	1947-54	8			4.18
Calhoun Falls	34-05	82-35	1899-54	56			3.74
Camden 2 WSW	34-15	80-39	1899-54	56			4.06
Catawba	34-51	80-55	1939-54	16			3.30
Chappells	34-11	81-52	1939-54	16			3.43
Charleston WB AP	32-54	80-02	1941-54	14			4.19
Chester 2 SW	34-42	81-15	1939-54	16			3.67
Clemson College	34-40	82-50	1940-50	11	1.81	2.70	3.83
Clemson College	34-40	82-50	1939-54	16			3.49
Columbia WB AP	33-57	81-07	1941-54	14			3.30
Columbia WB AP	33-57	81-07	1903-51	49	1.74	2.58	3.37
Crescent	34-46	82-07	1939-54*	15			4.33
Due West	34-21	82-22	1921-31	11	1.68	2.88	4.30
Eau Claire	34-01	81-04	1942-46	5			5.48
Edgefield 1 ENE	33-47	81-55	1913-54	42			3.43
Ehrhardt	33-06	81-01	1941-49	9	1.74	2.74	3.98
Eutawville	33-24	80-21	1939-54	16			4.44
Fort Mill 4 NW	35-00	81-00	1949-54	6			2.68
Givhans Ferry	33-02	80-23	1947-54	8			3.73
Great Falls	34-33	80-53	1942-54	13			3.50
Greenville WB AP	34-51	82-21	1918-48*	26	1.70	2.78	4.11
Greenwood	34-12	82-09	1899-54	56			3.52
Hartsville 3 S	34-22	80-02	1948-54	7			4.49
Heath Springs	34-36	80-40	1902-54*	51			3.63
Jocassee 7 WNW	34-59	83-04	1941-56	16	1.96	3.21	5.78
Kershaw	34-33	80-35	1939-54	16			3.85
Lancaster	34-43	80-46	1941-56*	15	1.69	2.57	3.30
Laurens	34-30	82-02	1939-54*	15			3.34
Laurens	34-30	82-02	1942-50	9	1.62	2.64	3.39
Little Mountain	34-12	81-25	1899-54	56			3.85
Lockhart	34-47	81-28	1951-56	6	1.63	1.77	2.76
Long Creek 1 N	34-47	83-15	1939-54*	15			4.82
McCormick 9 E	33-55	82-09	1943-54	12			3.07
Miley	32-57	81-02	1939-49	11			5.20
Newberry	34-17	81-37	1939-54	16			3.67
Newberry	34-17	81-37	1941-56	16	1.70	2.68	3.72
Orangeburg 2 SE	33-29	80-50	1939-52	14			4.34
Orangeburg 2	33-29	80-52	1947-54	8			4.62
Paris Mountain Fire Tower	34-57	82-25	1948-54*	5			4.61
Parr	34-16	81-20	1946-54	9			2.68
Parris Island	32-19	80-41	1942-46	5	2.46	4.72	5.85
Pelion	33-46	81-15	1947-54	8			2.87
Pelzer	34-39	82-27	1939-54	16			4.43
Pickens 5 SE	34-51	82-38	1942-54*	12			4.30
Pinopolis	33-18	80-03	1899-43	45			4.22
Pinopolis Dam	33-14	80-00	1944-54	11			4.09
Ridgeland 2 SE	32-28	80-58	1942-54	13			4.73
Rimini	33-40	80-30	1914-54	41			3.90
Rock Hill 5 NE	34-59	80-58	1949-54	6			3.25
Rock Hill 6 SE	34-50	81-00	1944-50*	6	1.62	2.16	3.28
St. George	33-11	80-34	1946-55	10	1.81	2.74	3.67
St. Matthews 2 ESE	33-40	80-44	1941-55*	12	1.85	2.82	4.06
St. Paul 5 S	33-30	80-22	1943-53	11			3.70
Saluda	34-00	81-47	1902-54*	52			3.37
Santuck 4 SE	34-36	81-29	1939-54	16			3.18
Spartanburg WB AP	34-55	81-57	1939-43	5			3.74
Spartanburg WB AP	34-55	81-57	1942-56	15	1.55	2.46	3.58
Springfield	33-30	81-17	1947-54	8			3.61
Summerville 2 WNW	33-02	80-12	1899-54	56			4.38
Sumter	33-56	80-19	1939-54	16			4.46
Trenton 1 NNE	33-45	81-50	1899-54*	53			3.34
Union 7 SW	34-38	81-40	1949-54	6			3.08
Wagener	33-40	81-23	1941-54*	13	1.69	2.51	3.06
Walhalla	34-45	83-05	1899-54*	49			4.68
Walterboro	32-54	80-40	1903-54*	34			4.19
Ware Shoals	34-24	82-14	1939-54	16			3.36

*Breaks in Record

Table 2-2, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	2-Year 1-Hour Rainfall (inches)	2-Year 6-Hour Rainfall (inches)	2-Year 24-Hour Precipitation (inches)
SOUTH CAROLINA (continued)							
Wateree Dam	34-20	80-40	1942-54	13			3.52
Wedgefield	33-54	80-30	1923-51*	27			3.85
Wedgefield 6 S	33-49	80-30	1943-54*	10			4.51
Whitmire 2 NE	34-32	81-35	1942-54	13			3.12
Winnsboro	34-23	81-05	1899-54*	53			3.74
Winnsboro 2	34-22	81-05	1946-56	11	1.56	2.03	2.99
Winthrop College	34-57	81-03	1900-54	55			3.42
Yemassee 4 W	32-42	80-55	1899-54	56			4.44

*Breaks in Record

Table 2-3. Station Data 100-Year 1-, 6-, and 24-Hour

STATION	Lat.	Long.	Period of Record	Length of Record (years)	100-Year 1-Hour Rainfall (inches)	100-Year 6-Hour Rainfall (inches)	100-Year 24-Hour Precipitation (inches)
ALABAMA							
Addison	34-13	87-10	1941-56	16	2.79	5.04	8.20
Anniston WB City	33-39	85-50	1906-30	25	4.09	5.46	7.50
Ashland	33-16	85-50	1940-55	16	4.65	5.78	8.32
Atmore State Farm	31-10	87-29	1940-55	16	3.23	5.48	7.75
Belgreen TVA 43	34-28	87-52	1941-55	15	3.27	5.63	7.57
Benton	32-20	86-48	1901-33	33			7.39
Bexar 2 SE	34-12	88-09	1941-56	16	3.54	6.24	9.13
Birmingham WB AP	33-34	86-45	1904-51	48	3.56	5.78	9.14
Boaz	34-13	86-10	1941-56	16	3.05	5.50	9.38
Bridgeport 2 W	34-56	85-45	1900-54	55			5.60
Campbell	31-55	87-59	1941-55	15	3.44	8.21	12.07
Camp Hill 2 NW	32-50	85-41	1901-54*	48			9.73
Citronelle	31-05	88-14	1897-54	58			10.27
Clanton	32-51	86-38	1897-54	58			10.33
Dadeville 2	32-50	85-46	1940-55	16	3.70	4.72	7.27
Decatur	34-37	86-58	1897-54	58			7.03
Demopolis Lock 4	32-31	87-51	1897-53	57			9.68
Dothan 4 N	31-17	85-24	1941-55	15	4.27	4.70	7.68
Elba	31-25	86-04	1897-54*	31			19.30
Eufaula	31-53	85-08	1897-54	58			10.16
Eutaw Lock 7	32-47	87-50	1941-55	15	3.49	7.14	9.41
Evergreen	31-26	86-58	1897-49	53			10.66
Flat Rock TVA 387	34-46	85-41	1941-55	15	2.69	3.92	7.02
Florence at Lock	34-47	87-40	1897-54	58			6.75
Fort Morgan	30-14	88-01	1941-55	15	3.81	10.12	13.92
Fort Payne	34-26	85-43	1942-56	15	2.52	4.36	7.81
Gadsden	34-01	86-00	1897-54	58			9.05
Garden City	34-01	86-45	1941-55	15	2.82	5.60	9.64
Greensboro	32-42	87-36	1897-54	58			10.23
Greenville	31-50	86-38	1901-54	54			10.33
Greenville 2	31-50	86-38	1941-55	15	4.76	6.64	10.74
Guntersville	34-21	86-18	1905-48	44			7.20
Guntersville City Water Works TVA 403	34-22	86-17	1941-55	15	3.20	6.52	9.12
Haleyville	34-14	87-38	1940-56	17	2.45	3.52	9.39
Highland Home	31-57	86-19	1897-54	58			9.10
Jackson Lock 1	31-33	88-01	1941-55	15	4.46	7.35	11.07
Jacksonville	33-49	85-45	1941-55	15	3.75	6.02	6.78
Lay Dam	32-58	86-31	1940-55	16	4.53	11.44	12.78
Madison	34-42	86-45	1897-54	58			7.10
Magnolia	32-08	87-39	1940-55	16	3.26	6.37	8.15
Maple Grove	34-07	85-46	1897-38	42			9.03
Marion 1 N	32-38	87-18	1941-55	15	3.40	9.41	11.68
Midway	32-04	85-32	1940-55	16	3.34	5.23	7.41
Milstead	32-27	85-54	1903-54	52			9.07
Mobile WB City	30-42	88-02	1901-56	56	4.31	7.68	11.93
Montgomery WB AP	32-18	86-24	1903-51	49	3.68	7.08	9.41
Moulton TVA 381	34-29	87-17	1941-56	16	3.61	4.76	9.20
New Brocton 3 NE	31-25	85-54	1940-55	16	3.87	7.80	10.46
Newton	31-20	85-36	1897-54*	30			14.39
Ozark	31-28	85-39	1902-54	53			14.07
Paint Rock	34-40	86-20	1941-56	16	3.65	5.40	8.12
Peterman	31-35	87-16	1940-55	16	3.74	7.25	10.34
Prattville	32-28	86-28	1902-54	53			9.03
Pushmataha	32-12	88-21	1897-54	58			9.25
St. Bernard	34-12	86-47	1916-54	39			8.04
Scottsboro	34-41	86-02	1897-54	58			6.79
Selma	32-25	87-00	1897-54	58			8.78
Thomasville	31-55	87-44	1897-54	58			11.24
Tuskegee	32-26	85-42	1900-54	55			8.86
Union Springs 6 W	32-08	85-50	1897-54	58			10.25
Uniontown	32-27	87-31	1897-54*	46			8.40
Valley Head	34-34	85-36	1897-54	58			7.55
Wetumpka	32-32	86-12	1897-54	58			9.48
Yates Hydro. Plant	32-34	85-54	1897-54	58			9.83
FLORIDA							
Apalachicola WB City	29-44	84-59	1923-51*	25	4.15	9.00	14.10
Arcadia	27-13	81-51	1907-54*	46			9.50
Avon Park	27-36	81-30	1902-54*	52			11.14
Avon Park	27-36	81-30	1940-55	16	3.76	5.56	8.85
Bartow	27-54	81-50	1897-54	58			10.86
Belle Glade Experiment Station	26-40	80-38	1924-55	32			13.08
Belle Glade Hurricane Gate 4	26-42	80-43	1942-56	15	4.12	8.67	11.05
Bradenton Experiment Station	27-29	82-33	1911-55	45			11.68
Canal Point Gate 5	26-52	80-38	1940-55	16	3.94	6.99	9.73
Carrabelle	29-51	84-40	1897-55*	58			11.42
Cedar Key	29-08	83-02	1908-55	48			12.32
Clermont 6 S	28-29	81-46	1897-54	58			11.76
De Funiak Springs	30-43	86-07	1897-54	58			12.68
De Land	29-02	81-18	1909-55	47			10.52
Eustis 2 S	28-50	81-41	1897-54	58			9.35

*Breaks in Record

Table 2-3, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	100-Year 1-Hour Rainfall (inches)	100-Year 6-Hour Rainfall (inches)	100-Year 24-Hour Precipitation (inches)
FLORIDA (continued)							
Federal Point	29-44	81-32	1897-54	58			8.48
Felda	26-32	81-26	1940-55	16	3.04	5.54	12.28
Fellsmere	27-46	80-36	1913-55	43			10.65
Fernandina Beach	30-40	81-27	1902-54	53			12.34
Fort Lauderdale	26-06	80-09	1913-54*	41			14.07
Fort Myers WB AP	26-35	81-52	1897-55	59			11.81
Fort Pierce	27-25	80-19	1901-54	54			10.37
Gainesville University of Florida	29-39	82-21	1940-55	16	4.03	6.39	13.22
Gainesville University of Florida	29-39	82-21	1897-55	59			10.05
Homestead Experiment Station	25-30	80-30	1940-55	16	5.96	8.27	11.53
Homestead Experiment Station	25-30	80-30	1910-54*	42			12.92
Hypoluxo	26-33	80-03	1900-55	56			12.60
Inglis	29-02	82-41	1941-55	15	4.75	6.88	12.64
Inverness	28-50	82-20	1899-54*	53			11.22
Jacksonville WB AP	30-25	81-39	1900-56	57	3.97	7.50	11.25
Key West WB City	24-33	81-48	1900-56	57	4.04	9.00	13.49
Kissimmee 2	28-18	81-25	1940-55	16	4.26	8.15	12.65
Kissimmee	28-18	81-25	1895-55*	58			11.18
Lake City 2 E	30-12	82-35	1897-54	58			8.18
Lamont 8 W	30-24	83-55	1941-55	15	3.15	6.04	7.10
Loxahatchee	26-41	80-16	1940-55	16	5.04	10.34	12.85
Madison	30-28	83-25	1903-55	53			10.51
Marianna Industrial School	30-45	85-17	1900-54	55			10.11
Merritt Island	28-21	80-42	1896-55*	58			11.90
Miami WB City	25-47	80-11	1911-56	46	4.79	9.90	15.79
Monticello 2 S	30-32	83-52	1904-55*	51			11.80
Moore Haven Lock 1	26-50	81-05	1940-55	16	4.14	5.39	10.37
Mount Pleasant	30-40	84-42	1905-55*	50			9.00
New Smyrna Beach 4 N	29-05	80-57	1897-55	59			15.70
North New River Canal 1	26-34	80-45	1941-56	16	3.86	5.56	8.57
Ocala 2 NE	29-13	82-07	1896-55*	59			8.92
Okeechobee Hurricane Gate 6	27-13	80-48	1940-55	16	5.04	9.02	11.51
Palatka	29-39	81-38	1923-55*	32			9.72
Panama City 2	30-10	85-40	1940-55	16	3.64	7.35	13.03
Panama City	30-10	85-42	1914-55*	31			11.40
Pennsuco 4 NW	25-56	80-27	1940-55	16	4.34	8.17	12.23
Pensacola WB City	30-25	87-13	1900-56	57	4.92	9.90	14.98
Plant City	28-01	82-08	1895-55*	55			9.14
Punta Gorda	26-56	82-03	1914-55	42			10.49
Quincy Experiment Station	30-35	84-35	1902-55*	42			9.40
St. Augustine	29-54	81-19	1896-55*	59			8.62
St. Leo	28-21	82-16	1902-55	54			14.40
St. Petersburg	27-47	82-38	1915-55	41			15.40
Sand Key	24-27	81-52	1903-24*	19	3.59	4.74	5.81
Tamiami Trail 40 Mi. Bend	25-46	80-50	1940-55	16	4.55	7.31	11.37
Tampa WB AP	27-58	82-32	1897-56*	59	4.50	7.20	9.66
Tarpon Springs	28-09	82-45	1897-54*	57			12.24
Titusville 2 W	28-37	80-50	1901-55*	54			11.96
Vero Beach CAA AP	27-39	80-24	1941-56	16	4.75	7.90	9.55
West Palm Beach	26-43	80-03	1930-55	26			13.94
GEORGIA							
Adairsville	34-22	84-56	1897-54*	44			7.03
Adairsville	34-22	84-56	1941-56	16	2.75	5.04	7.49
Alapaha Experiment Station	31-21	83-13	1897-54*	57			7.77
Albany	31-34	84-09	1897-54	58			8.76
Americus Experiment Station Nursery	32-06	84-16	1941-55	15	3.93	5.79	11.67
Athens	33-58	83-23	1897-54	58			7.30
Atlanta WB AP	33-39	84-25	1903-51	49	3.63	5.24	6.54
Augusta WB AP	33-22	81-58	1903-51	49	3.62	5.40	7.39
Bainbridge	30-55	84-34	1897-54	58			9.73
Bainbridge	30-55	84-34	1941-55	15	4.18	6.81	11.78
Bellville	32-09	81-58	1941-55	15	4.58	5.59	8.05
Blakely	31-23	84-56	1897-54*	55			11.35
Brunswick	31-09	81-29	1906-54*	45			12.52
Brunswick CAA AP	31-09	81-23	1941-55	15	4.08	8.56	16.14
Canton	34-14	84-29	1897-54	58			7.09
Canton	34-14	84-29	1940-56	17	3.03	4.02	7.18
Carnesville	34-22	83-14	1941-56	16	3.80	7.54	8.42
Carrollton	33-36	85-05	1941-55	15	2.64	4.40	6.41
Clayton	34-53	83-24	1897-54*	56			9.11
Clermont 3 S	34-27	83-48	1941-56	16	2.48	4.17	5.88
Coolidge	31-01	83-52	1941-55	15	5.08	5.95	10.12
Covington	33-36	83-52	1897-54*	57			7.38
Dahlonega	34-32	83-59	1897-54	58			6.88
Doles	31-42	83-53	1941-55	15	4.98	7.49	10.53
Dublin	32-33	82-55	1899-54	56			7.45
Eastman	32-12	83-11	1897-54*	56			7.50
Edison	31-34	84-44	1941-55	15	4.47	6.41	8.94
Fitzgerald	31-43	83-15	1898-54*	39			7.54
Flat Top TVA 109	34-51	84-30	1941-55	15	3.27	5.86	10.15
Folkston 3 SSW	30-48	82-02	1941-55	15	5.03	6.54	10.74

*Breaks in Record

Table 2-3, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	100-Year 1-Hour Rainfall (inches)	100-Year 6-Hour Rainfall (inches)	100-Year 24-Hour Precipitation (inches)
GEORGIA (continued)							
Fort Gaines	31-36	85-03	1897-54	58			10.68
Gainesville	34-19	83-50	1897-54	58			6.30
Glennville	31-56	81-55	1905-54	50			13.65
Griffin	33-15	84-16	1897-54	58			8.52
Hawkinsville	32-17	83-28	1898-54	57			8.32
La Fayette	34-42	85-17	1940-56	17	3.26	5.38	8.57
Louisville	33-00	82-24	1897-54*	52			6.60
Louisville	33-00	82-24	1941-55	15	4.41	6.13	7.68
Macon WB AP	32-42	83-39	1903-51	49	3.87	6.60	8.08
Milledgeville	33-05	83-13	1897-54*	55			7.43
Millen	32-48	81-56	1897-54	58			8.04
Newnan	33-22	84-49	1897-54	58			6.87
Pearson	31-18	82-51	1941-55	15	3.91	4.89	10.00
Quitman	30-47	83-33	1897-54	58			9.54
Resaca	34-35	84-57	1898-54	57			7.70
Rome	34-15	85-10	1897-54	58			7.07
Rome 6 SW	34-10	85-12	1941-56	16	3.39	4.68	7.98
Savannah WB AP	32-08	81-12	1903-56	54	4.22	8.40	12.67
Sparta 2 NNW	33-18	82-59	1941-55	15	3.54	5.23	7.57
Sylvania	32-45	81-38	1941-55	15	3.71	4.90	6.84
Talbotton	32-40	84-32	1897-54	58			7.57
Tallapoosa 2 NNW	33-46	85-18	1897-54*	57			6.35
The Rock	32-58	84-14	1941-55	15	5.82	6.41	7.98
Thomasville WB City	30-48	83-58	1906-32*	25	4.07	6.60	8.24
Toccoa	34-35	83-19	1897-54	58			8.92
Valdosta 4 NW	30-52	83-20	1941-55	15	3.53	4.72	7.63
Washington	33-44	82-44	1897-54	58			8.18
Watkinsville ARS	33-52	83-26	1941-55	15	4.04	4.45	7.83
Waycross	31-13	82-22	1897-54	58			7.04
West Point	32-52	85-11	1897-54	58			8.82
Woodbury	32-59	84-35	1901-54	54			7.22
MISSISSIPPI							
Avera	31-18	88-45	1940-55	16	3.64	6.86	9.95
Batesville	34-19	89-57	1897-54	58			7.58
Bay St. Louis	30-18	89-21	1897-54	58			12.60
Biloxi City	30-24	88-54	1940-55	16	4.34	8.31	10.43
Booneville	34-39	88-34	1898-54	57			7.03
Byhalia	34-52	89-41	1940-56	17	2.98	6.40	7.85
Calhoun City	33-52	89-19	1940-55	16	3.90	6.26	8.67
Collins	31-39	89-34	1941-55	15	3.89	8.59	10.73
Columbia	31-15	89-50	1905-54	50			9.82
Columbus	33-29	88-26	1897-54	58			8.56
Corinth	34-57	88-31	1897-54	58			7.54
Enid 3 NNE	34-09	89-56	1941-56	16	3.53	4.97	8.10
Forest	32-22	89-28	1940-55	16	3.77	6.90	10.08
Fulton	34-16	88-24	1909-54	46			9.32
Hattiesburg	31-21	89-17	1897-54*	57			9.90
Heidelberg	31-53	88-59	1941-55	15	3.42	6.57	13.46
Hernando	34-50	90-00	1897-54*	55			9.04
Holly Springs 2 N	34-48	89-26	1897-54	58			7.85
Houston 2 NE	33-55	88-58	1941-56*	15	4.23	6.20	8.40
Kosciusko	33-04	89-35	1898-54	57			8.03
Laurel	31-41	89-07	1902-54*	52			10.01
Leakesville	31-09	88-33	1897-54	58			10.99
Louisville	33-07	89-03	1897-54	58			8.08
Macon 2 NE	33-08	88-32	1940-55	16	3.81	6.60	8.44
Meridian WB AP	32-20	88-45	1903-48*	44	3.96	6.06	8.40
Ovett	31-29	89-02	1941-55	15	3.86	7.30	10.53
Pascagoula Ingall Shipyard	30-23	88-33	1941-55	15	4.37	11.11	17.46
Pearlington	30-13	89-35	1897-54	58			10.76
Pontotoc	34-15	89-00	1897-54	58			7.04
Porterville	32-43	88-29	1941-55	15	3.27	5.28	10.02
Sardis Dam	34-24	89-48	1941-56	16	3.08	5.35	8.16
Sarepta	34-07	89-17	1941-56	16	4.04	7.81	12.95
Shubuta 2	31-52	88-42	1940-55	16	4.15	6.73	9.69
Tishomingo	34-38	88-12	1942-56	15	3.24	4.74	8.91
Tupelo	34-15	88-43	1900-54*	50			7.27
University	34-22	89-32	1940-56	17	3.33	4.58	8.49
University	34-22	89-33	1899-54*	53			7.64
Water Valley	34-11	89-38	1897-54	58			7.60
Waynesboro 3 WNW	31-41	88-41	1897-54	58			9.56
White Sand	30-48	89-41	1940-55	16	4.17	8.67	11.73
SOUTH CAROLINA							
Aiken	33-34	81-44	1902-54*	52			7.91
Anderson	34-31	82-39	1899-54*	55			9.84
Beaufort 7 SW	32-23	80-43	1899-54*	47			9.88
Belton 5 ESE	34-30	82-33	1941-55	15	3.68	6.35	7.35
Bishopville	34-13	80-15	1941-56	16	4.00	6.81	9.05
Blackville 3 W	33-22	81-19	1899-54	56			7.07

*Breaks in Record

Table 2-3, cont.

STATION	Lat.	Long.	Period of Record	Length of Record (years)	100-Year 1-Hour Rainfall (inches)	100-Year 6-Hour Rainfall (inches)	100-Year 24-Hour Precipitation (inches)
SOUTH CAROLINA (continued)							
Calhoun Falls	34-05	82-35	1899-54	56			8.42
Camden 2 WSW	34-15	80-39	1899-54	56			8.65
Columbia WB AP	33-57	81-07	1903-51	49	3.03	5.16	7.22
Edgefield 1 ENE	33-47	81-55	1913-54	42			6.62
Greenville WB AP	34-51	82-21	1918-48*	26	3.52	5.76	9.06
Greenwood	34-12	82-09	1899-54	56			7.53
Heath Springs	34-36	80-40	1902-54*	51			7.66
Jocassee 7 WNW	34-59	83-04	1941-56	16	3.82	6.55	14.93
Lancaster	34-43	80-46	1941-56*	15	3.72	4.86	6.10
Little Mountain	34-12	81-25	1899-54	56			8.74
Newberry	34-17	81-37	1941-56	16	3.82	5.71	6.62
Pinopolis	33-18	80-03	1899-43	45			10.21
Rimini	33-40	80-30	1914-54	41			8.00
Saluda	34-00	81-47	1902-54*	52			6.17
Spartanburg WB AP	34-55	81-57	1942-56	15	3.18	7.30	7.50
Summerville 2 WNW	33-02	80-12	1899-54	56			10.82
Trenton 1 NNE	33-45	81-50	1899-54*	53			6.11
Walhalla	34-45	83-05	1899-54*	49			10.72
Walterboro	32-54	80-40	1903-54*	34			8.88
Wedgefield	33-54	80-30	1923-51*	27			8.39
Winnsboro	34-23	81-05	1899-54*	53			6.99
Winthrop College	34-57	81-03	1900-54	55			6.46
Yemassee 4 W	32-42	80-55	1899-54	56			10.39

*Breaks in Record

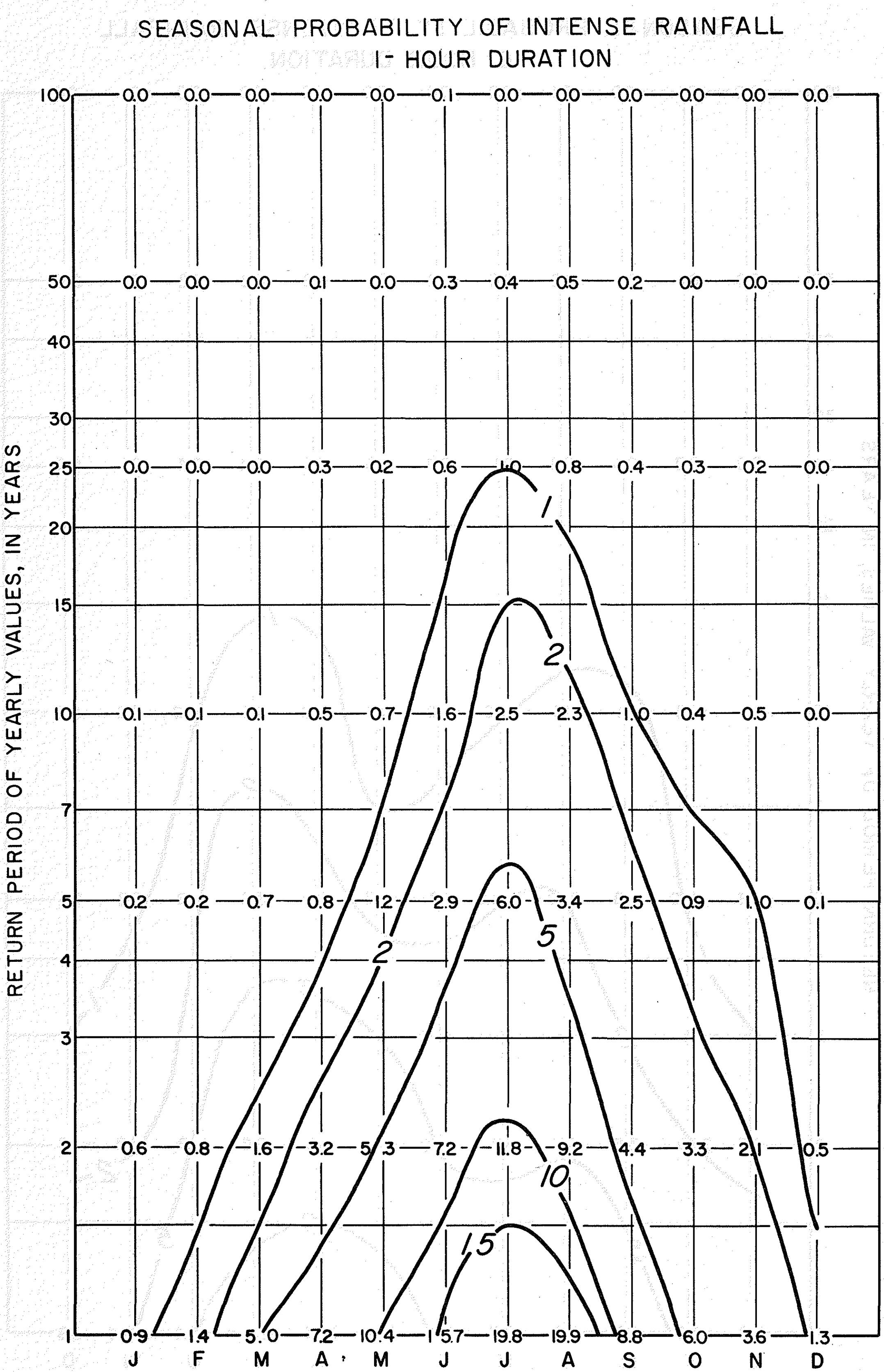

FIGURE 2-8 Probability in percent of obtaining a rainfall in any month of a particular year equal to or exceeding the yearly return period values taken from the isopluvial maps and diagrams.

SEASONAL PROBABILITY OF INTENSE RAINFALL
6- HOUR DURATION

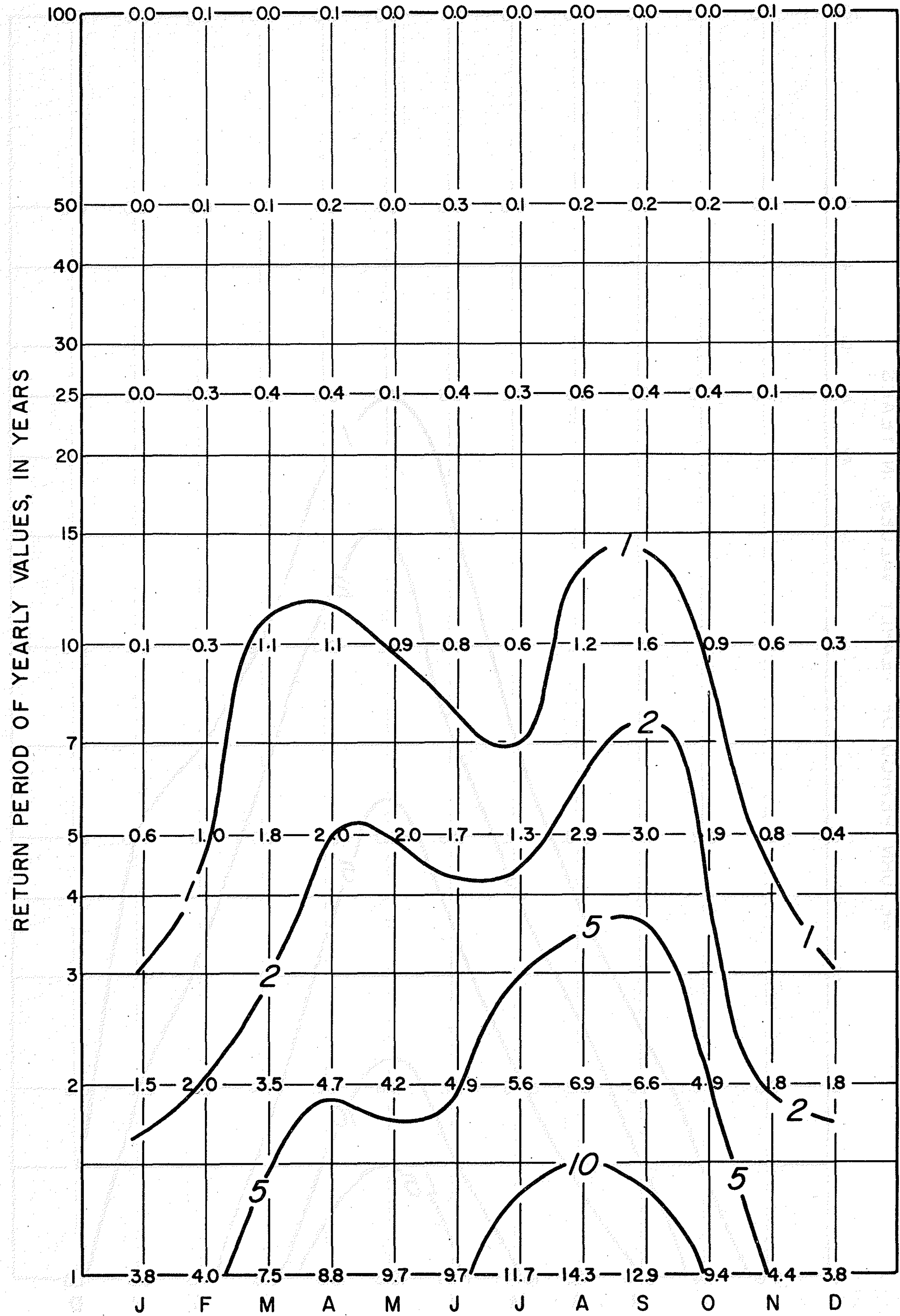

FIGURE 2- 9 Probability in percent of obtaining a rainfall in any month of a particular year equal to or exceeding the yearly return period values taken from the isopluvial maps and diagrams.

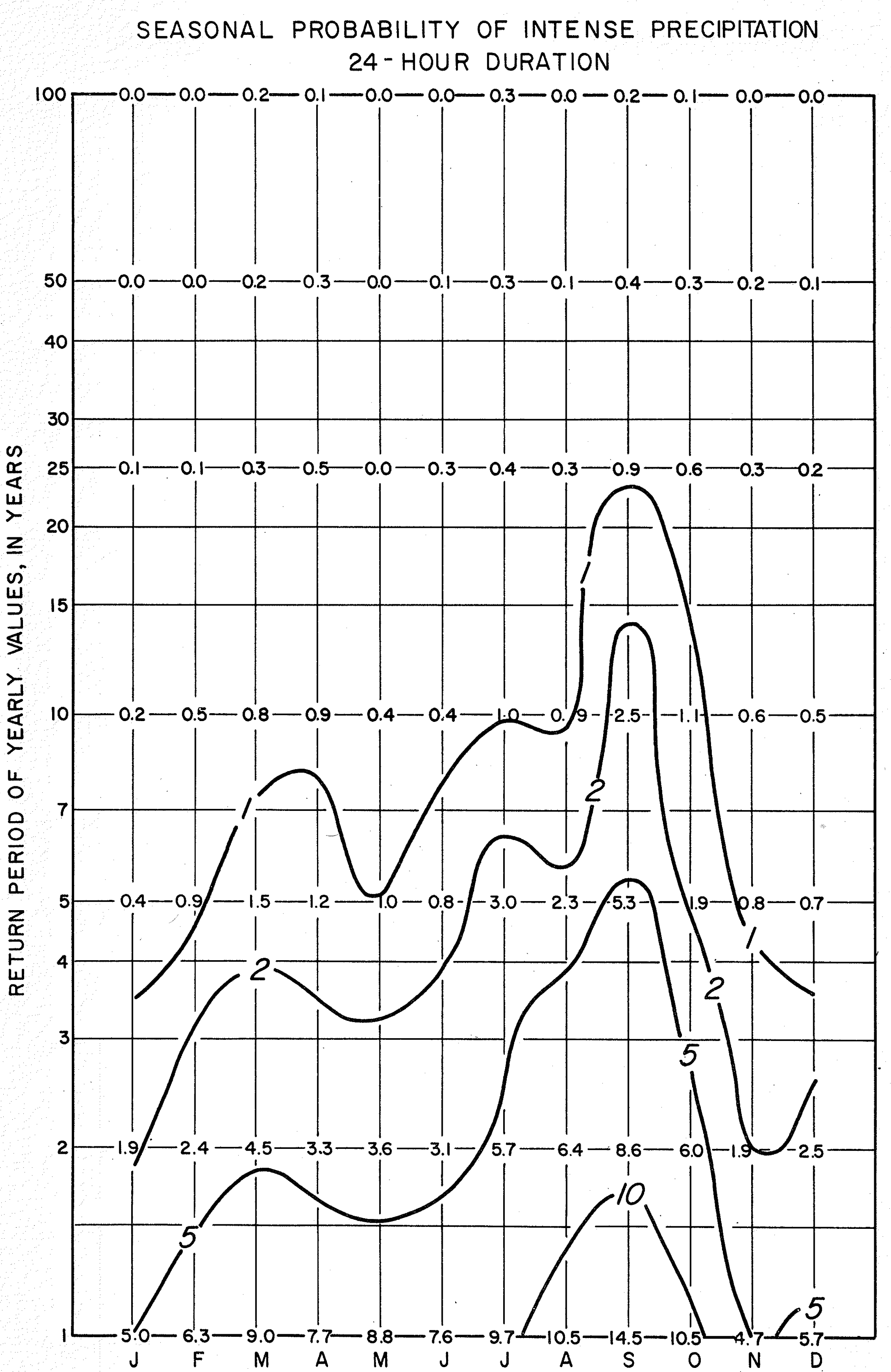

FIGURE 2-10 Probability in percent of obtaining a rainfall in any month of a particular year equal to or exceeding the yearly return period values taken from the isopluvial maps and diagrams.

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