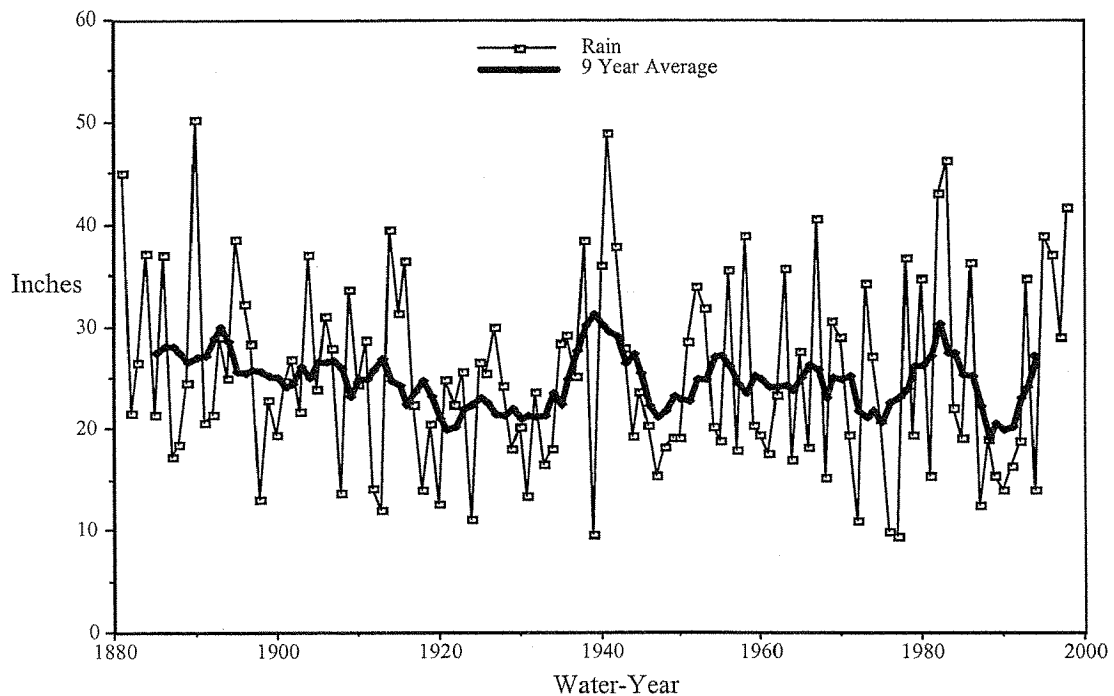


# Design Rainfall for Solano County

## Vacaville Rain for 118 Years from 1881 to 1998



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**APPENDIX A. Rainfall Depth Duration Frequency Tabulations (omitted)**

**APPENDIX B. Summary of 1,000-Year Rainfalls for California (omitted)**

# DESIGN RAINFALL FOR SOLANO COUNTY, CALIFORNIA

This study was prepared at the request of Solano County Water Agency. Its intended use is to select design storm rainfalls for any location in Solano County. The range of return periods is from 2 to 10,000 years and for any storm duration from 5 minutes to 60 days. Annual total rainfall is also included.

Design storms are derived by finding the drainage region and mean annual precipitation (MAP) for a given location, Figure 1, and then looking up the design rainfall on Table 1A for the San Francisco Bay region or Table 1B for the Sacramento River region. Design rainfalls are shown in Tables 1A and 1B for return periods of 2, 5, 10, 15, 25, 50, 100, 200, 500, 1,000, and 10,000 years. The range of MAP in Solano County is from 14 to about 48 inches per year. The data in this study were derived from *Climatological Data for California* and *Hourly Precipitation Data*, both published by the National Climatic Data Center located in Asheville, North Carolina, the California Department of Water Resources, and private observers.

The methods used in this study to analyze rain records are similar to those used in *Rainfall for Drainage Design*, Bulletin 195 of the Department of Water Resources published in October 1976, and in *Historic Rainstorms in California*, also published by the Department of Water Resources in August 1997.

Fifty-nine rain records were examined during this study, with twenty-one records from gages located in Solano County. Thirteen of these gages were recording gages with an analysis of storm durations ranging from 5 minutes to 24 hours. Forty-six were based on once-per-day observations from which extreme rainfalls of one to 60 days were compiled. The records in this study are listed in Table 2. Depth duration frequency tables for these records are contained in Appendix A.

Design rainfalls for this study were calculated as a fraction of the MAP, shown in the isohyetal map of Solano County on Figure 1. Figure 1 was modified from a statewide map prepared in October 1995 for a 1951 to 1980 base period. A design value of the fraction of the MAP occurring in the average wettest one day for this study was adopted as 11.54%. The actual values from the station data of this study varied from 0.10 to 0.14 as shown on Figure 2. The shorter records in general show a larger variation in the ratio of average maximum daily rain to MAP as shown on Figures 3 and 4. This led to the elimination of short records from the regional data analysis.

The non-recording rain gage records were adjusted for "Fixed Interval" correction using a factor of 1.14. This is to make the daily records based on once a day observations comparable with extreme values based on 1,440 consecutive minutes. The "Fixed Interval" correction is reflected in Figure 5 and Table 1.

The shorter records show a wide variation in the coefficient of variation as shown on Figure 4. The coefficient of variation (CV) is the ratio of the sample standard deviation over the sample average. Presented in Table 3 are the Frequency Factors for Pearson's Type III distribution that are used throughout this study.

a and b

are coefficients shown in Table 6. These coefficients are based on the 28 weather records in or near Solano County with 30 or more years of record as summarized in Table 7.

**Table 6. Coefficients a and b for Equation 2**

Days	Coefficient a	Coefficient b
1	0	0.1154
2	0.22	0.1382
3	-0.07	0.1660
4	-0.08	0.1846
5	-0.19	0.2076
6	-0.15	0.2195
8	-0.29	0.2532
10	-0.24	0.2704
15	-0.24	0.3084
20	0.17	0.3379
30	-0.06	0.3930
60	-0.46	0.5927
365	0	1

Frequency factors are a function of the regional skew coefficients. For storms of one day or less a regional skew of 1.1 for the Sacramento River Region was used and a value of 1.3 was used in the San Francisco Bay Region. As an example, in Northeastern Solano County a return period of 1,000 years has a frequency factor of 4.673, meaning that a 1,000 year storm for one day or less in Solano County would be 4.673 standard deviations above the average extreme annual storm for that duration.

The greatest recorded daily rainfall in Solano County was 8.27 inches. This occurred in Pleasants Valley during the storm of December 19 to 27, 1955. This was an extensive storm covering much of Central California, when 165 stations reported the largest ever rainfalls for 8 consecutive days.

Another notable storm for Solano County was the 7 inches at Mt. Vaca and Green Valley on December 12, 1995. Appendix B is a summary of 1,000-year storms for California. The storms that heavily impacted Solano County are highlighted. Maps showing the areas of 100- and 1,000-year rainfalls are shown for these storms.

Notable short duration rainfall events of the region are tabulated in Table 8.

The heaviest short duration rainfalls generally result from thunderstorms and do not cover a broad area.