CLIMATIC FLUCTUATIONS OF THE WESTERN UNITED STATES DURING THE PERIOD OF INSTRUMENTAL RECORDS

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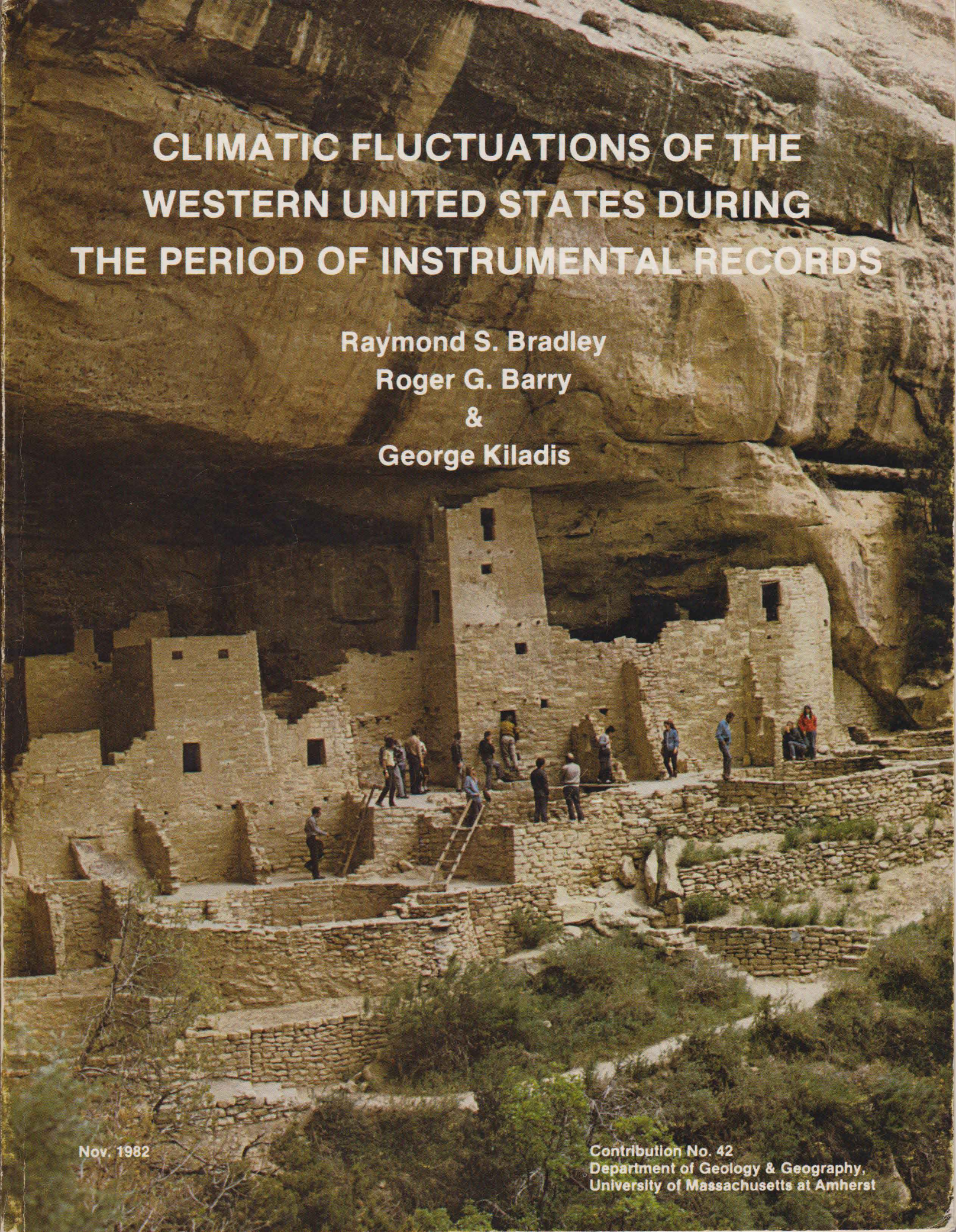

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Department of Geology & Geography,
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CHAPTER 1

CLIMATIC FLUCTUATIONS OF THE WESTERN UNITED STATES DURING THE PERIOD OF INSTRUMENTAL RECORDS

RAYMOND S. BRADLEY

Introduction

Although meteorological observations in the United States have been taken, in some locations, for 150 years or more, it is extremely difficult to locate reliable long-term climatic data sets. Station histories are inadequate and out of date, making the selection of those records which are likely to be homogenous a tedious, time-consuming and generally unrewarding exercise. Long-term monthly precipitation data have been published in U.S. Weather Bureau Bulletin W, and subsequent supplements, but tables of long-term monthly temperature data have never been published apart from one or two 'representative' station records per state climatic division in the original Bulletin W ("from the establishment of stations to 1930"). Long-term records of other climatic parameters (pressure, wind speed, direction, solar radiation) are only available for a few individual stations in obscure publications, or in original logs at the National Climatic Center. There has been no systematic attempt to locate, check and digitize reliable long-term climatic records as a first step towards a more comprehensive understanding of modern climate and climatic variability over the last 100-150 years. To this end, a project was initiated to create a data bank of long-term climatic data for the western U.S., initially for arid and semi-arid areas; this was subsequently extended to the entire 11 state area (Washington, Idaho, Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, California and Oregon). Based on earlier work (Bradley, 1976) it was apparent that there are a large number of long-term records from predominantly non-urban locations which could provide a useful perspective on studies of climatic variations which commonly rely on data from first-order stations (generally in large urban centers). Furthermore, explosive population growth and the development of natural resources in the western states (particularly developments involving water) make it imperative that we obtain a better understanding of climatic variations in the area.

In this chapter, the climate data bank produced in this study is described and some preliminary analyses of the data are presented. Further studies are in progress and will be reported elsewhere.

Data Selection

In order to obtain as many high quality long-term records as possible, an initial survey of all sub-station histories was undertaken. Quality was judged to be highest when stations were maintained close to one location (i.e. having been moved very infrequently) and when there were very few missing values in the published records. An attempt was made to adhere to the following criteria:

a) fewer than 5% of missing values, preferably distributed at random throughout the record

b) station still operating in the mid-1970s

c) fewer than an average of one station move per 15 years

d) changes in location less than one mile and little change in elevation.

Not all of these criteria could be met, for various reasons; documentation of station relocations is often incomplete or ambiguous (see Bradley, 1976c, section 2); many useful long-term records were terminated in the 1960s or 1970s (and a few in the 1950s) but were included in the data bank for other reasons, such as location or value of the early period of record. On the whole, however, the station records are of high quality in terms of the above criteria.

Precipitation data were obtained from:

a) U.S. Weather Bureau Bulletin W for data prior to 1930

b) digitized data from the National Climatic Center, generally only available for the period after 1930 or after 1948

c) Climatological Data, published monthly by NOAA for recent data and for data not available on magnetic tape

d) Local Climatological Data, published by NOAA, for selected stations, containing data for 1931-60 or for 30 years prior to the publication date

Temperature data were much more difficult to locate. Data sources used were:

a) Tabulations from State Climatologists when available; these were generally hand-written summaries (often without details of station location or elevation) compiled by observers and/or state climatologists prior to the closure of their offices in the early 1970s. Unfortunately, many valuable records were lost or destroyed at that time which only compounds the problems

of piecing together long-term data. For example, many otherwise useful Californian records have data for the period 1918-28 missing; these data were not published and have not yet been located by the author or the current State Climatologist.

b) Climatological Data, published monthly by NOAA for data back to the early 20th century.

c) Monthly Weather Review, for late nineteenth century data

d) Climate and Crop Service Reports of the U.S. Dept. of Agriculture, prior to 1914

e) digitized data from the National Climatic Center, generally only available for the period after 1930 or after 1948

f) U.S. Weather Bureau Climatography of the U.S. N° 86-8: (Decennial Census of U.S. Climate) Climatic Summary of the U.S. - Supplement for 1951 through 1960, for data from the period 1951-60 only

g) Local Climatological Data, published by NOAA for selected stations, generally including tabulations of data from 1931-60 for 30 years prior to the publication date

h) "Washington Tabulations", hand-written compilations archived at the National Climatic Center (see Figure for example); generally late 19th and early 20th century data with minimal documentation of station location and elevation.

Homogeneity of the Records

Previous studies of long-term climatic data for the Rocky Mountain States led the author to conclude that "in future work, in which the focus of interest is regional variations of climate, not changes at specific stations, the tests of homogeneity are unnecessary, provided a dense station network is utilized and reasonable precautions are taken in the initial data selection procedure" (Bradley, 1980). Since the scale of this study is indeed regional, no homogeneity tests were carried out on individual records. This would be necessary if individual records were to be analyzed in detail.

Missing Data

As noted earlier, stations were selected to minimize the problem of missing values in a record. Missing values were interpolated using the method of differences (temperature) or ratios (precipitation) with respect to nearby records (cf. Conrad and Pollack, 1950, p. 241). Whenever possible,

nearby stations were selected to be at similar elevations and to avoid major topographic barriers which would, for example, place one station in a rain-shadow zone compared to another. This was considered to be less of a problem in the interpolation of the more spatially-coherent temperature data. For temperature data, series of differences were computed between monthly values at the station with missing data and a number of reference stations (generally 2 or 3, occasionally only 1). The mean difference was computed for the maximum period of record available for the station pair and estimates of the missing value then obtained. The final value interpolated was the mean of each estimate. For precipitation data, the same procedure was followed, but infinite values were set to zero. In this way, the majority of missing values were interpolated and 'best estimates' substituted in the data bank. Subsequent analyses involved seasonal data, generally regionally averaged, so any individual errors introduced by this procedure are likely to be trivial.

The Data Banks

Long-term monthly mean temperature and total precipitation data from a large number of stations were examined and the best records were selected for the final data banks using the criteria described above.

Tables 1 and 2 summarize the station records, in the temperature and precipitation data banks, respectively. The temperature data set contains 310,000 station months from 358 individual stations; the precipitation data set contains 450,000 station months from 406 individual stations. The station locations and first years of record are shown in Figures 1 to 10 (pages 11 to 20). A complete station inventory is given in Tables 3 and 4 (pages 21 to 38). Finally, a summary of data coverage through time is given in Table 5 (page 39). Clearly, there are many more long-term precipitation than temperature records with very few of the latter (only 14) before 1880. Furthermore, temperature data from before about 1896 pose particular problems as a result of un-standardized observation times in the early years of meteorological data collection (see Roden, 1966 for discussion). Providing the authority responsible for collecting the data is known (Army, Signal Service, Smithsonian Institution, etc.) adjustments may be made to bring early data into line with the later convention [(max + min)/2]. Unfortunately,

because of poor documentation, this important fact is often not known. In the analyses reported in this chapter no adjustments have been made in the early temperature data. An analysis of this problem is in progress and will be reported elsewhere. The very earliest parts of the temperature records shown in subsequent graphs should therefore be viewed with caution.

Data Analysis

To illustrate the principal characteristics of long-term temperature and precipitation records in each state, the following procedures were followed:

> at each station, monthly temperature values were expressed as departures from the 1941-70 monthly means ('reference period') at the same station. For precipitation data, the values were expressed as percentages of the mean for 1941-70.* All data, regardless of the station elevation were thus standardized with respect to a common reference period. These deviations could then be averaged together to produce mean departures on a state-by-state basis. The results are illustrated in Figures 11 to 32 (pages 40 to 61). Note that temperatures are in °C. On each graph the numbers printed above the abcissa indicate the number of station records available, and used in the calculation of the state averages, at five year intervals. No data are plotted unless at least four values are available to average. The upper half of each figure shows the raw data; in the lower half, the raw data have been smoothed by a Gaussian normal filter which eliminates high frequency information with a period of less than 15 months (see Mitchell, et al., 1966). Seasonal departure values have also been computed for each state and are shown in Figures 33 to 54. The dark line in each case shows the data smoothed, as above.

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*In some analyses, a reference period of 1940-69 was used (see graphs). The differences between 1941-70 and 1940-69 means are extremely small.

In Figures 55 and 56 (pages 84 and 85) all records have been combined to produce a composite seasonal diagram (based on all the individual departure values, averaged for the entire western U.S.). Note that because the individual station departures have not been normalized with respect to standard deviation, the records are biased by the more variable records. This is more of a problem with the composite precipitation diagram and tends to weight the final diagram towards the southern part of the region. Furthermore, it should be recognized that the western U.S. is by no means a homogeneous climatic unit. Nevertheless the two diagrams provide an interesting summary of the overall data set, the above remarks notwithstanding. Of particular note is the extent to which the period 1921-35 stands out as anomalously warm in the context of the last 100 years. This is the dominant feature of the temperature record in all seasons; there is little evidence of any long-term trend in Spring and Summer, though in Fall and Winter months temperatures appear to have risen by 0.5-1.0°C from the late 19th and early 20th centuries to recent decades. The increase in temperature from 1871 to 1900 in Winter and Fall may be underemphasized because of the observation time problem mentioned above.

Long-term precipitation data suggest there has been a decline in Spring precipitation since the late 19th century, but an increase in Summer rainfall. Fall and Winter precipitation show no long-term trends. Correlation coefficients indicate no statistically significant relationship between the regional temperature and precipitation averages for the four seasons and the anomalously warm period 1921-35 did not exhibit any unusual region-wide precipitation anomalies. However, it is clear from a comparison of monthly and seasonal temperature and precipitation data on a state-by-state basis (Figures 11-54) that there is generally an inverse relationship between temperature and precipitation fluctuations which is obscured in the regional (11-state) analysis. This inverse relationship was noted earlier in a study of data from the Rocky Mountain states (Bradley, 1980).

Finally, it should be noted that averaging data by state may obscure intra-state variations which can best be viewed by mapping the data. To this end, a decade by decade seasonal precipitation analysis is presented in Figures 57-66 (pages 86 to 95). Seasonal precipitation values as a percentage of the 1941-70 averages at each station are mapped. Some of the small-scale

variations may be due to anomalous data at individual stations. However, in general spatially coherent patterns are observed over fairly large areas, reflecting synoptic-scale circulation anomalies. Similar temperature anomaly maps are in preparation.

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Table 1

TEMPERATURE DATA BANK SUMMARY

State	$\bar{x}$ start years	No. of stations	No. of records	Position of 1st record
Arizona	1907	29	1833	1
California	1894	56	4643	1834
Colorado	1904	17	1251	6477
Idaho	1908	27	1887	7728
Montana	1900	22	1704	9615
Nevada	1901	17	1184	11319
New Mexico	1905	44	2886	12503
Oregon	1900	35	2576	15389
Utah	1908	39	2731	17965
Washington	1905	46	3253	20696
Wyoming	1904	26	1915	23949
TOTAL		358	25,863	

Average beginning year: 1904

Average ending year: 1974

Average record length: 70 years

Table 2

PRECIPITATION DATA BANK SUMMARY

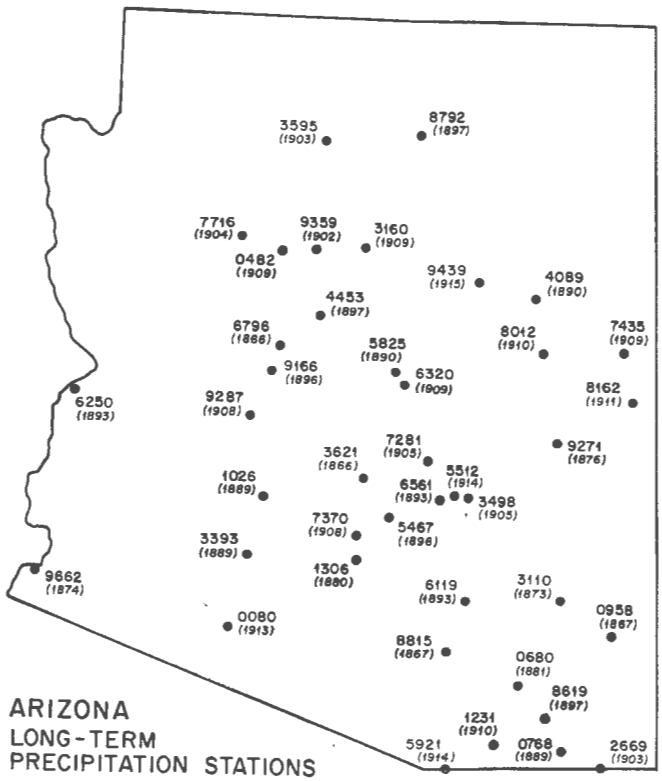
State	$\bar{x}$ start Year	No. of Stations	No. of Records	Position of 1st record
ARIZONA	1896	41	3,081	1
CALIFORNIA	1891	120	10,075	3082
W. COLORADO	1904	19	1,432	13157
IDAHO	1908	37	2,635	14589
MONTANA	1905	36	2,642	17224
NEVADA	1890	19	1,531	19866
NEW MEXICO	1903	62	4,198	21397
OREGON	1895	39	3,043	25595
UTAH	1906	38	2,790	28638
WASHINGTON	1901	52	3,878	31428
WYOMING	1907	33	2,346	35306
TOTAL		496	37,651	

Average beginning year: 1899

Average ending year: 1975

Average record length: 76 years

(-as of Oct. 1, 1981)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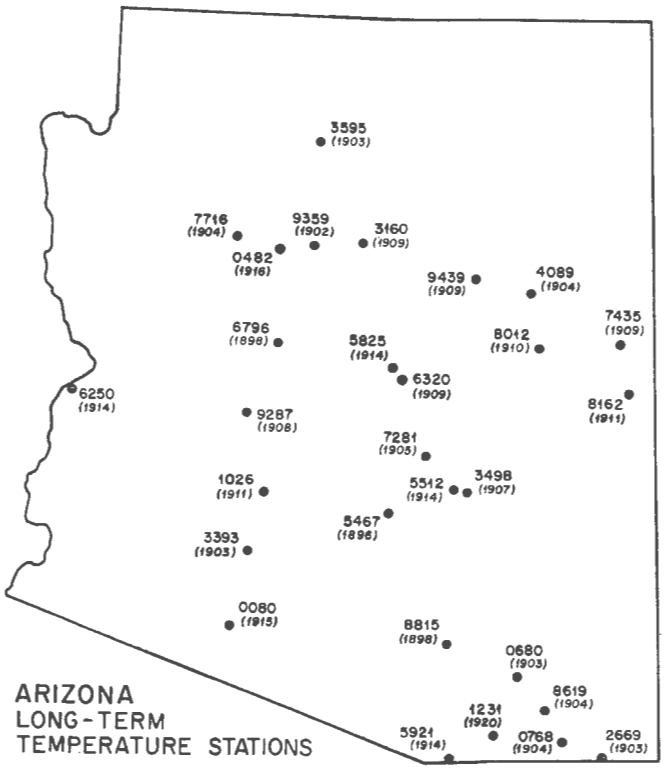
ARIZONA
LONG-TERM
PRECIPITATION STATIONS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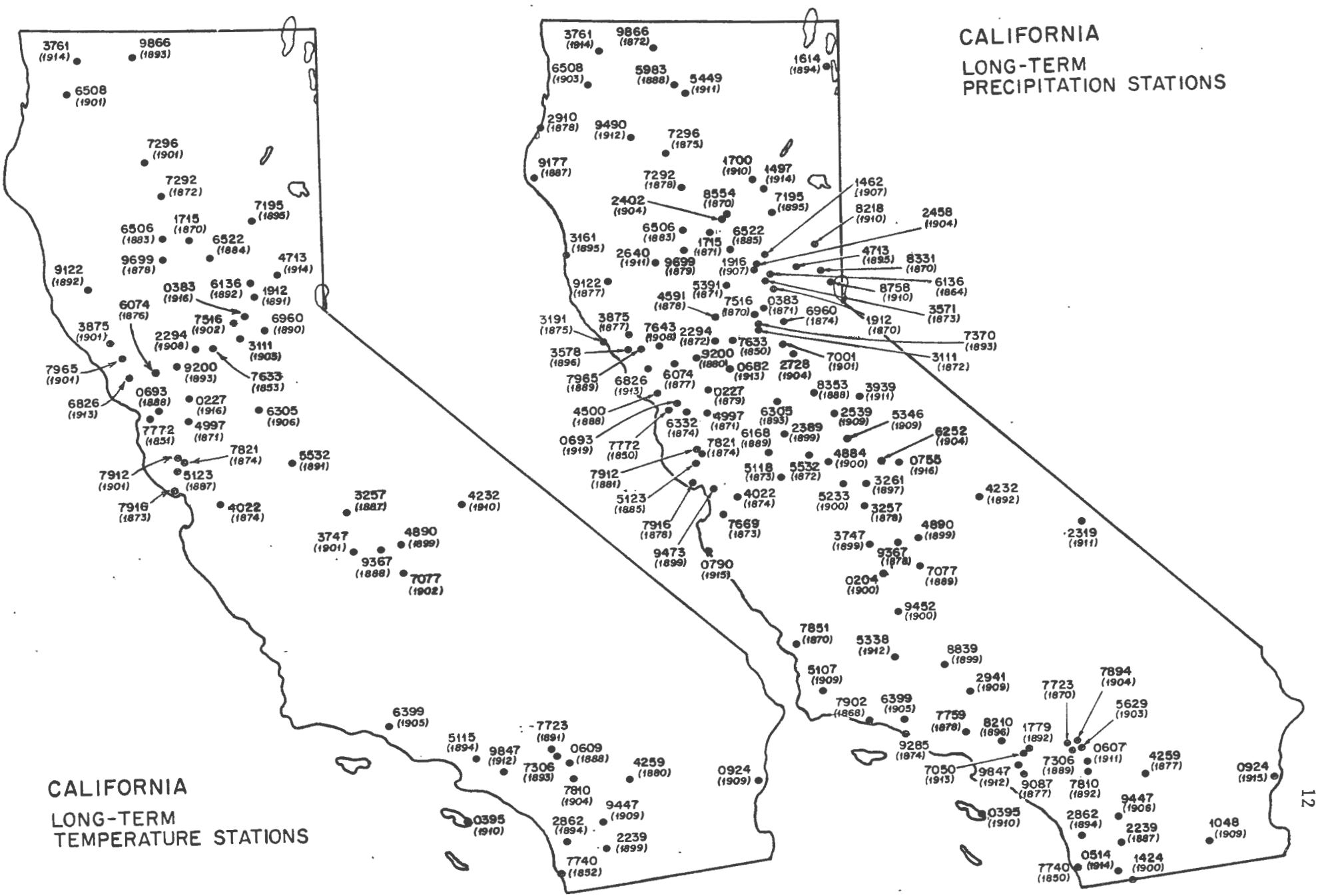
ARIZONA
LONG-TERM
TEMPERATURE STATIONS

Figure 1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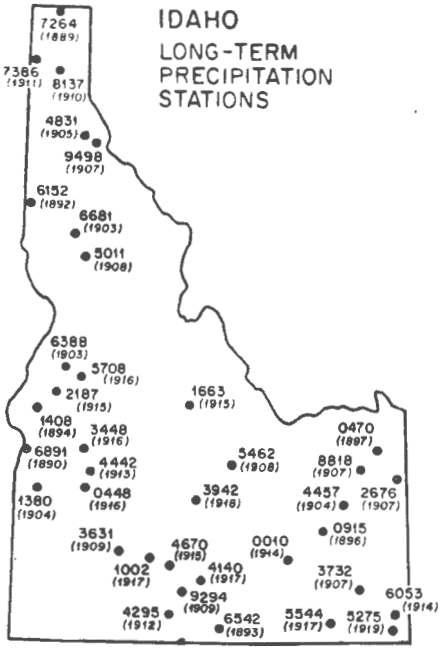
CALIFORNIA
LONG-TERM
TEMPERATURE STATIONS

Figure 2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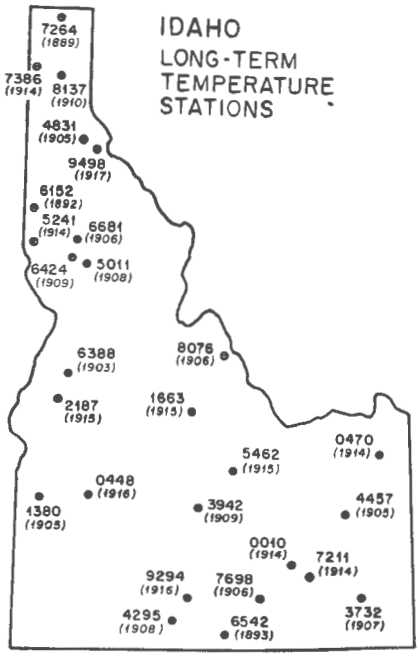
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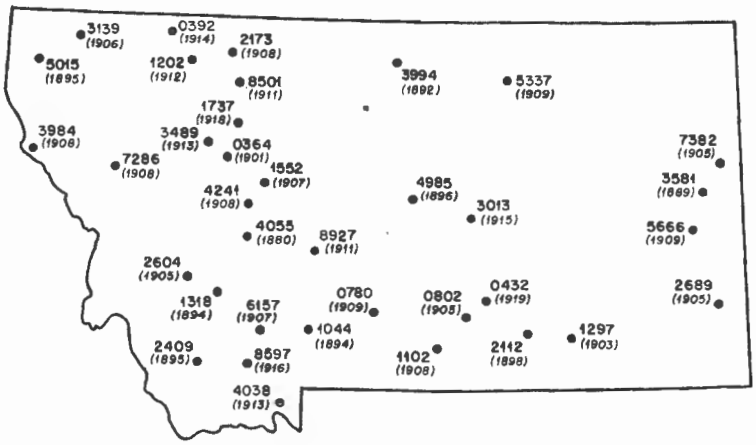

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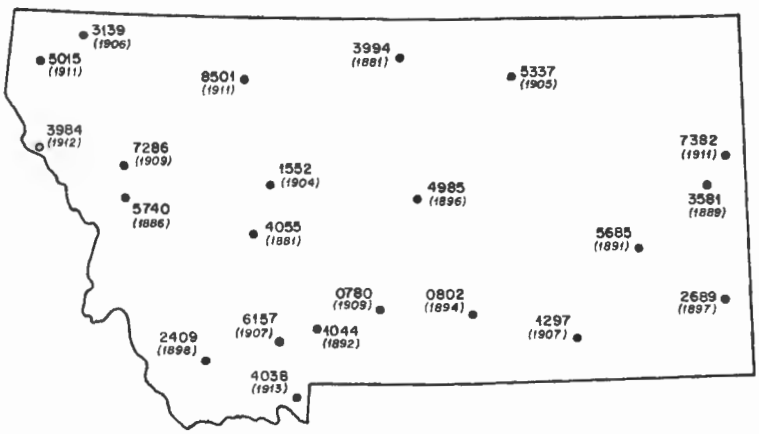
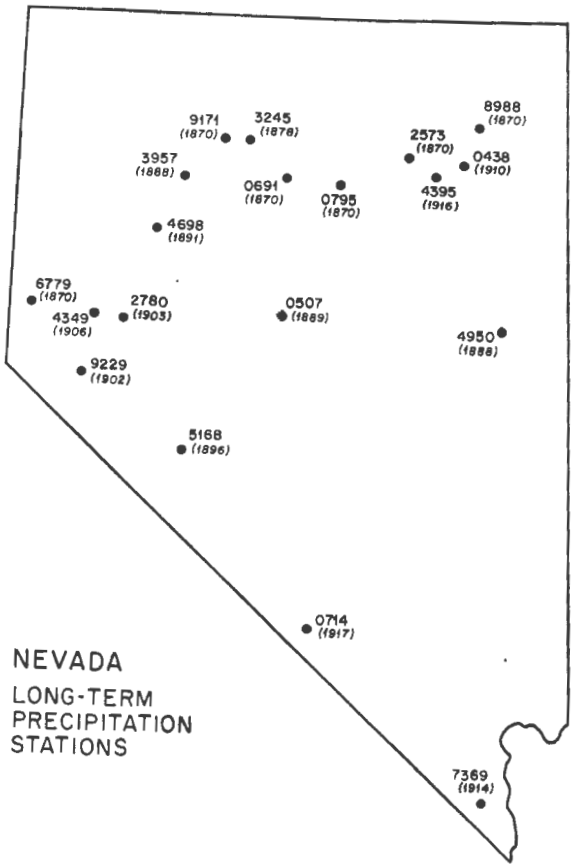


MONTANA
LONG-TERM TEMPERATURE STATIONS

Figure 4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LONG-TERM
PRECIPITATION
STATIONS
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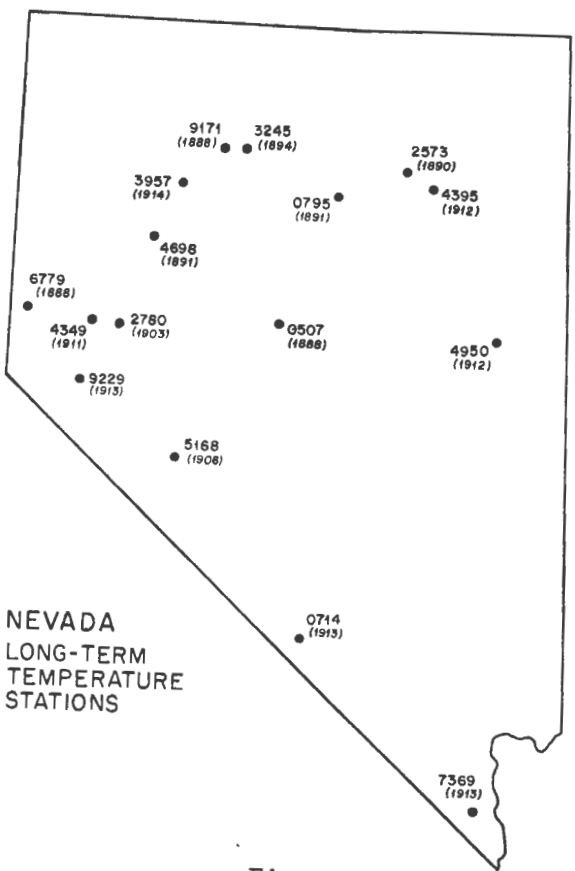
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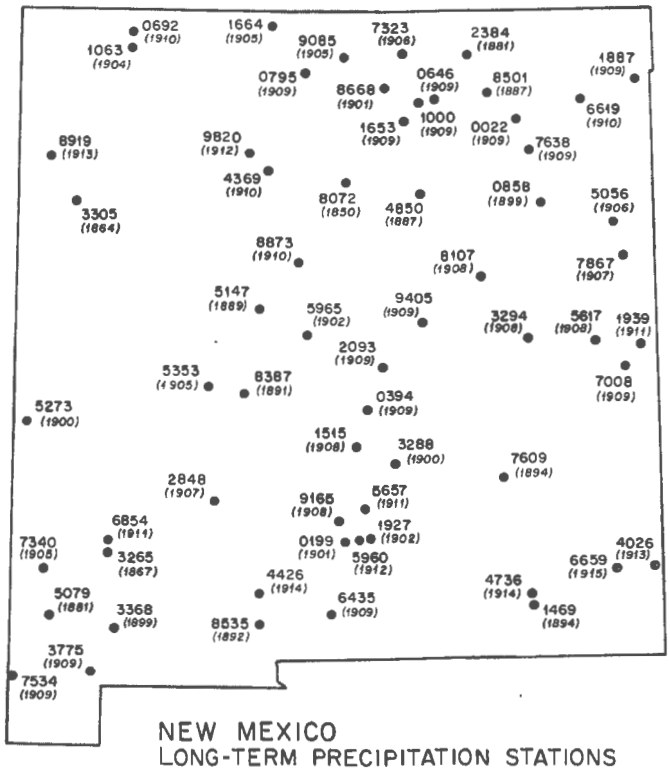
Figure 5



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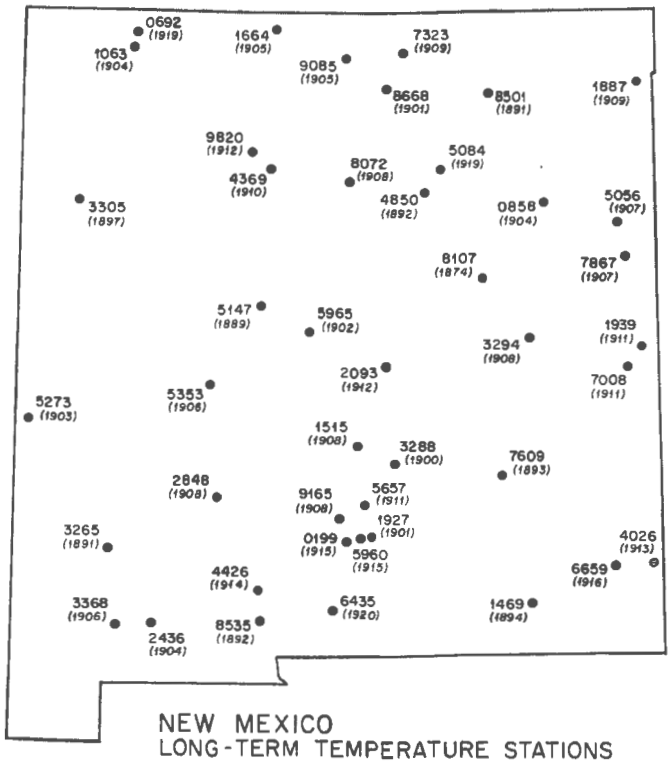
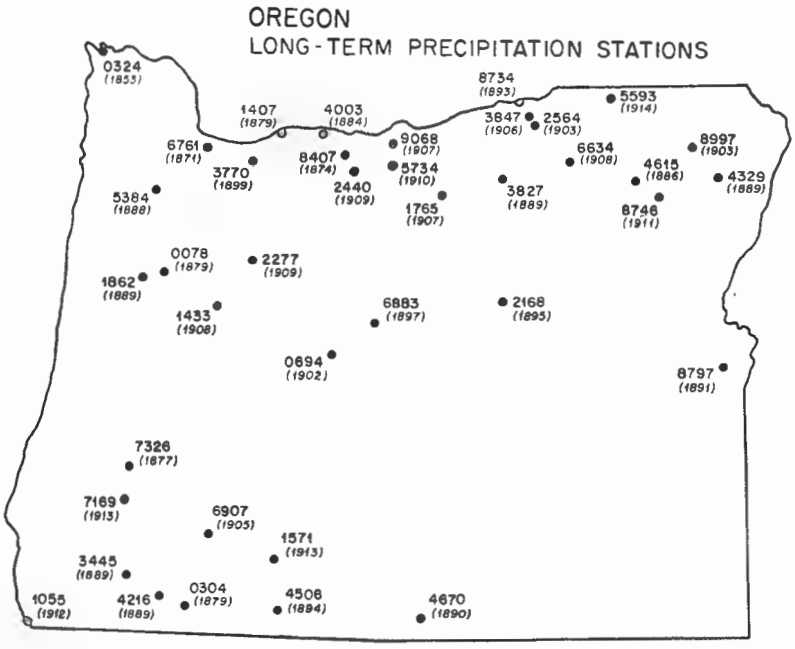


NEW MEXICO
LONG-TERM TEMPERATURE STATIONS

Figure 6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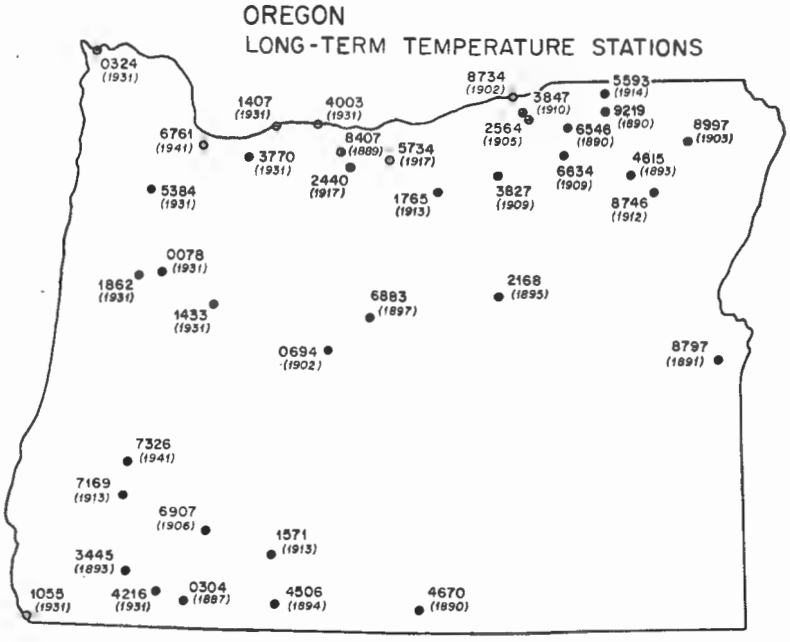
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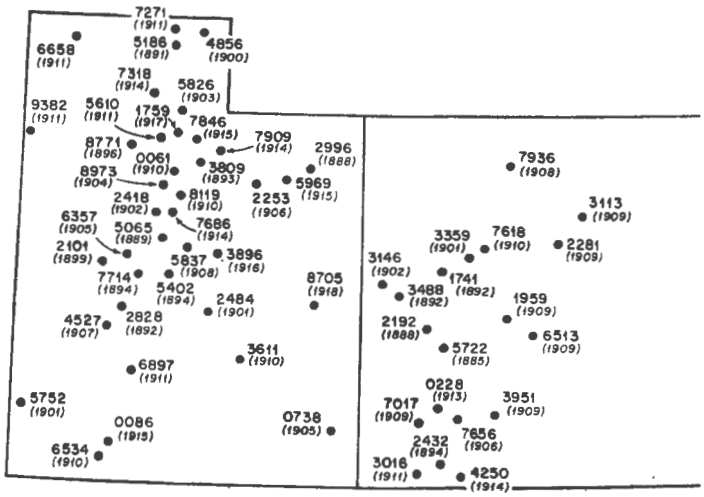
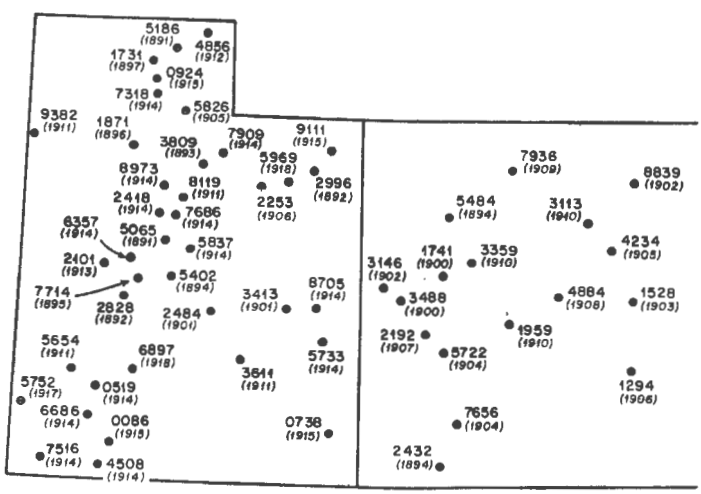
8746 (1912)
0078 (1931)
1862 (1931)
2168 (1895)
6883 (1897)
1433 (1931)
0694 (1902)
8797 (1891)
7326 (1941)
7169 (1913)
6907 (1906)
1571 (1913)
3445 (1893)
1055 (1931)
4216 (1931)
0304 (1887)
4506 (1894)
4670 (1890)

Figure 7

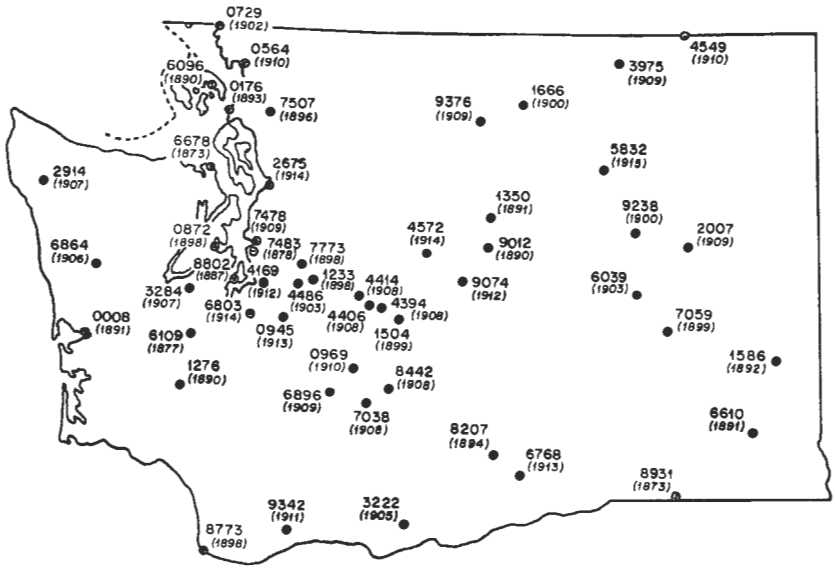


UTAH AND WESTERN COLORADO
LONG-TERM PRECIPITATION STATIONS

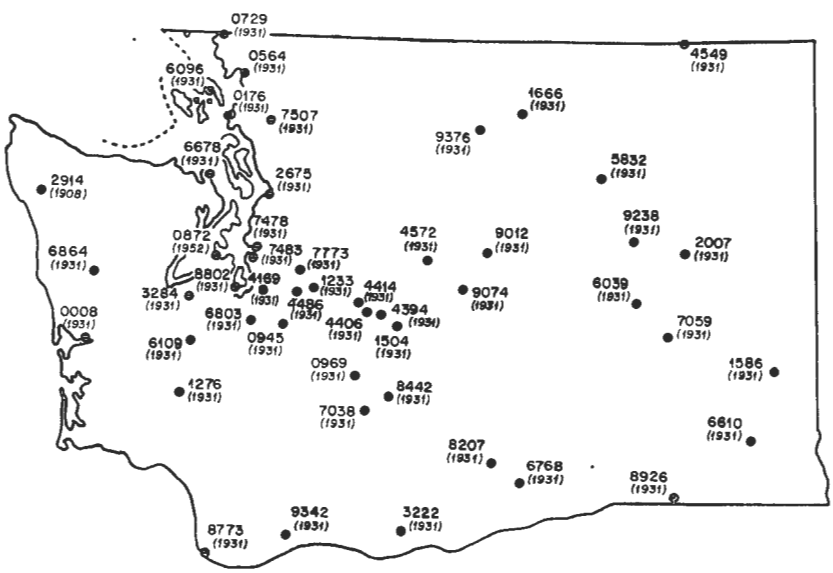


UTAH AND WESTERN COLORADO
LONG-TERM TEMPERATURE STATIONS

Figure 8

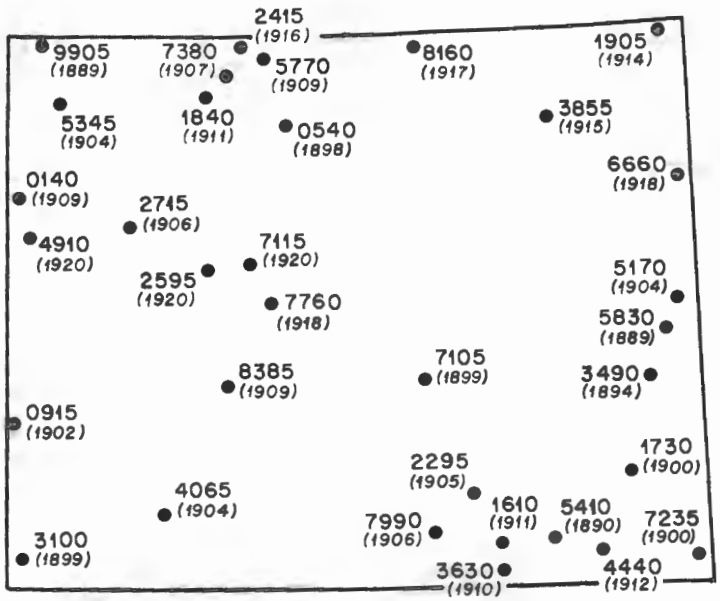


WASHINGTON
LONG-TERM PRECIPITATION STATIONS

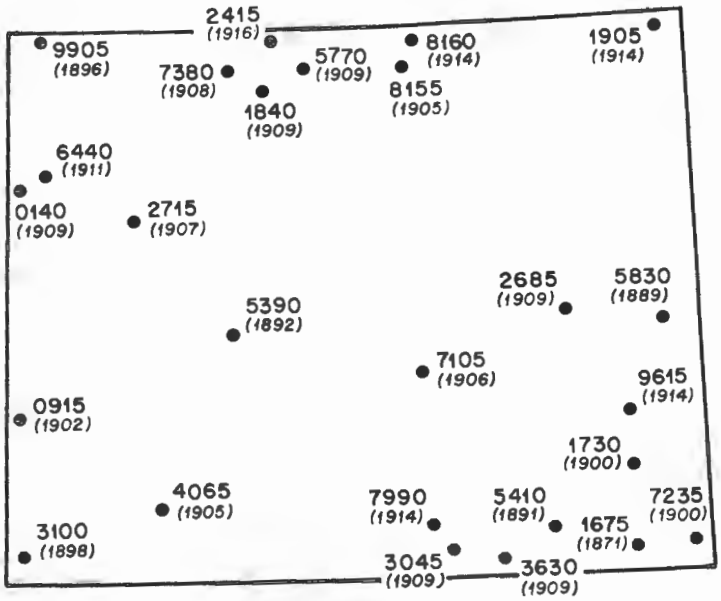


WASHINGTON
LONG-TERM TEMPERATURE STATIONS

Figure 9



WYOMING
LONG-TERM PRECIPITATION STATIONS



WYOMING
LONG-TERM TEMPERATURE STATIONS

Figure 10

Table 3

LONG-TERM TEMPERATURE STATIONS IN THE WESTERN UNITED STATES CLIMATE DATA BANK

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
ARIZONA					
0080ARI	AJO	3222	11252	01763	1915 - 1970
0482ARI	ASHFORK	3513	11229	05210	1916 - 1970
0680ARI	BENSON	3158	11018	03600	1903 - 1970
0768ARI	BISBEE	3127	10955	05350	1904 - 1961
1026ARI	BUCKEYE	3323	11235	00888	1911 - 1970
1231ARI	CANELO	3133	11032	04985	1920 - 1970
2669ARI	DOUGLAS	3121	10935	03937	1903 - 1970
3160ARI	FORT VALLEY	3516	11144	07347	1909 - 1970
3393ARI	GILA BEND	3257	11243	00737	1903 - 1970
3498ARI	GLOBE	3323	11047	03550	1907 - 1970
3595ARI	GRAND CANYON	3603	11208	06950	1903 - 1970
4089ARI	HOLBROOK	3454	11010	05069	1904 - 1970
5467ARI	MESA	3325	11152	01230	1896 - 1970
5512ARI	MIAMI	3324	11053	03560	1914 - 1970
5825ARI	NATURAL BRIDGE	3419	11127	04607	1914 - 1970
5921ARI	NOGALES	3121	11055	03800	1914 - 1970
6250ARI	PARKER	3410	11417	00425	1914 - 1970
6320ARI	PAYSON R. S.	3414	11120	04848	1909 - 1970
6796ARI	PRESCOTT	3434	11238	05510	1898 - 1970
7281ARI	ROOSEVELT	3340	11109	02205	1905 - 1970
7435ARI	ST. JOHNS	3430	10922	05730	1909 - 1970
7716ARI	SELIGMAN	3519	11253	05250	1904 - 1970
8012ARI	SNOWFLAKE	3430	11005	05642	1910 - 1970
8162ARI	SPRINGERVILLE	3408	10917	07060	1911 - 1970
8619ARI	TOMBSTONE	3142	11003	04610	1904 - 1970
8815ARI	TUCSON UNIV.	3215	11050	02526	1898 - 1970
9287ARI	WICKENBURG	3358	11244	02095	1908 - 1970
9359ARI	WILLIAMS	3515	11211	06750	1902 - 1970
9439ARI	WINSLOW	3501	11044	04895	1909 - 1970
CALIFORNIA					
0227CAL	ANTIOCH	3801	12146	00030	1916 - 1975
0383CAL	AUBURN	3854	12104	01360	1916 - 1976
0395CAL	AVALON PLEASURE PIER	3321	11820	00000	1910 - 1976
0609CAL	BEAUMONT	3356	11657	02600	1888 - 1976
0693CAL	BERKELEY	3752	12215	00345	1889 - 1976
0924CAL	BLYTHE	3336	11436	00268	1909 - 1976
1715CAL	CHICO EXP. STA.	3942	12147	00230	1870 - 1976
912CAL	COLFAX	3906	12057	02418	1891 - 1976
2239CAL	CUYAMACA	3259	11635	04670	1899 - 1976
2294CAL	DAVIS AGRI. COLLEGE	3852	12145	03700	1908 - 1976
2862CAL	ESCONDIDO	3307	11705	00657	1895 - 1976
3111CAL	FOLSOM	3839	12110	00252	1905 - 1955
3257CAL	FRESNO	3646	11943	00328	1887 - 1976
3747CAL	HANFORD	3620	11939	249	1901 - 1976
3761CAL	HAPPY CAMP	4148	12323	01090	1914 - 1976
3875CAL	HEALDSBURG	3836	12252	00115	1901 - 1976
4022CAL	HOLLISTER	3650	12125	00280	1874 - 1974
4232CAL	INDEPENDENCE	3648	11812	03943	1910 - 1976
4259CAL	INDIO	3343	11615	00011	1880 - 1976

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
4713CAL	LAKE SPAULDING	3919	12038	05156	1914 - 1976
4890CAL	LEMON COVE	3623	11902	00513	1899 - 1976
4997CAL	LIVERMORE	3740	12146	00490	1871 - 1976
5115CAL	LOS ANGELES	3403	11814	00312	1894 - 1976
5123CAL	LOS GATOS	3714	12158	00365	1887 - 1976
5532CAL	MERCED	3717	12031	00153	1891 - 1976
6074CAL	NAPA STATE HOSP.	3817	12216	00060	1876 - 1976
6136CAL	NEVADA CITY	3916	12101	02570	1895 - 1976
6305CAL	OAKDALE	3752	12052	00220	1908 - 1967
6399CAL	OJAI	3427	11915	00750	1909 - 1976
6506CAL	ORLAND	3945	12212	00254	1883 - 1976
6508CAL	ORLEANS	4118	12332	00401	1904 - 1976
6522CAL	OROVILLE	3931	12134	00250	1884 - 1976
6826CAL	PETALUMA	3814	12238	00010	1913 - 1976
6960CAL	PLACERVILLE	3844	12048	01890	1890 - 1976
7077CAL	PORTERVILLE	3604	11901	00393	1902 - 1976
7195CAL	QUINCEY	3956	12057	03409	1897 - 1976
7292CAL	RED BLUFF	4009	12215	00340	1872 - 1976
7296CAL	REDDING	4035	12224	00577	1901 - 1976
7306CAL	REDLANDS	3403	11711	01352	1893 - 1976
7516CAL	ROCKLIN	3848	12115	00239	1902 - 1976
7633CAL	SACRAMENTO CITY	3835	12130	00020	1853 - 1976
7723CAL	SAN BERNARDINO	3408	11716	01172	1891 - 1976
7740CAL	SAN DIEGO	3244	11710	00010	1852 - 1976
7772CAL	SAN FRANCISCO	3747	12225	00130	1851 - 1976
7810CAL	SAN JACINTO	3347	11658	01561	1904 - 1976
7821CAL	SAN JOSE	3721	12154	00067	1874 - 1976
7912CAL	SANTA CLARA	3721	12150	00090	1901 - 1976
7916CAL	SANTA CRUZ	3659	12201	00130	1873 - 1976
7965CAL	SANTA ROSA	3827	12243	00167	1901 - 1976
9122CAL	UKIAH	3909	12312	00623	1892 - 1976
9200CAL	VACAVILLE	3822	12200	00175	1893 - 1976
9367CAL	VISALIA	3620	11918	00325	1888 - 1976
9447CAL	WARNER SPRINGS	3317	11638	03180	1909 - 1976
9699CAL	WILLOWS	3931	12211	00136	1878 - 1976
9847CAL	YORBA LINDA	3353	11749	00385	1914 - 1976
9866CAL	YREKA	4143	12238	02631	1914 - 1976
COLORADO					
1294COL	CANON CITY	3826	10516	05343	1906 - 1978
1528COL	CHEESMAN	3913	10517	06875	1903 - 1978
1741COL	COLLBRAN	3914	10758	06137	1900 - 1978
1959COL	CRESTED BUTTE	3852	10658	08855	1910 - 1978
2192COL	DELTA	3846	10807	05055	1907 - 1970
2432COL	DURANGO	3717	10753	06550	1894 - 1978
3113COL	FRASER	3957	10550	08560	1910 - 1970
3146COL	FRUITA	3910	10844	04507	1902 - 1978
3359COL	GLENWOOD SPRINGS	3934	10720	05823	1910 - 1978
3488COL	GRAND JUNCTION	3907	10832	04855	1900 - 1978
4234COL	IDAHO SPRINGS	3945	10531	07555	1905 - 1970
4884COL	LEADVILLE	3914	10618	10046	1908 - 1978
5484COL	MEEKER	4002	10754	06242	1894 - 1978

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
5722COL	MONTROSE NO. 2	3829	10753	05830	1904 - 1978
7656COL	SILVERTON	3748	10740	09322	1904 - 1978
7936COL	STEAMBOAT SPRINGS	4030	10650	06770	1909 - 1978
8839COL	WATERDALE	4025	10512	05260	1902 - 1978
IDAHO					
0010IDA	ABERDEEN	4257	11250	04405	1914 - 1978
0448IDA	ARROWROCK	4336	11555	03275	1916 - 1978
0470IDA	ASHTON	4404	11127	05220	1914 - 1978
1380IDA	CALDWELL	4340	11641	02370	1905 - 1978
1663IDA	CHALLIS	4430	11414	05175	1915 - 1978
2187IDA	COUNCIL	4444	11626	02950	1915 - 1978
3732IDA	GRACE	4235	11144	05550	1907 - 1978
3942IDA	HAILEY	4331	11418	05328	1909 - 1978
4295IDA	HOLLISTER	4221	11434	04525	1908 - 1978
4457IDA	IDAHO FALLS	4331	11204	04730	1905 - 1978
4831IDA	KELLOGG	4733	11610	02312	1905 - 1978
5011IDA	KOOSKIA	4609	11559	01260	1908 - 1978
5241IDA	LEWISTON	4623	11701	01436	1914 - 1978
5462IDA	MACKEY	4405	11534	03980	1915 - 1978
6152IDA	MOSCOW UNIV.	4644	11658	02660	1892 - 1978
6388IDA	NEW MEADOWS	4458	11617	03870	1903 - 1978
6424IDA	NEZ PERCE	4615	11615	03145	1909 - 1978
6542IDA	OAKLEY	4215	11353	04600	1893 - 1978
6681IDA	OROFINO	4629	11615	01027	1906 - 1978
7211IDA	POCATELLO	4255	11236	04454	1914 - 1978
7264IDA	PORTHILL	4900	11630	01800	1889 - 1978
7386IDA	PRIEST RIVER	4821	11650	02380	1914 - 1978
7698IDA	RUPERT	4237	11341	04204	1906 - 1965
8076IDA	SALMON	4511	11353	03945	1906 - 1978
8137IDA	SANDPOINT	4817	11634	02100	1910 - 1978
9294IDA	TWIN FALLS	4235	11428	03690	1916 - 1970
9498IDA	WALLACE WOODLAND PARK	4730	11553	02935	1917 - 1978
MONTANA					
0780MON	BIG TIMBER	4550	10957	04100	1909 - 1978
0802MON	BILLINGS	4546	10829	03097	1894 - 1978
1044MON	BOZEMAN AGRI. COLLEGE	4540	11103	04856	1892 - 1978
1297MON	BUSBY	4532	10657	03440	1907 - 1978
1552MON	CASCADE	4713	11143	03390	1904 - 1978
2409MON	DILLON	4512	11238	05228	1898 - 1978
2689MON	EKALAKA	4553	10432	03425	1897 - 1978
3139MON	FORTINE	4847	11454	03000	1906 - 1978
3581MON	GLENDIVE	4706	10443	02076	1889 - 1978
3984MON	HAUGAN	4723	11521	03100	1912 - 1978
3994MON	HAVRE	4834	10940	02488	1881 - 1970
4038MON	HEBGEN DAM	4452	11120	06489	1913 - 1978
4055MON	HELENA	4636	11200	03828	1881 - 1978
4985MON	LEWISTOWN	4703	10927	04145	1896 - 1978
5015MON	LIBBY	4824	11532	02080	1911 - 1978
5337MON	MALTA	4821	10752	02255	1905 - 1970
5685MON	MILES CITY	4624	10549	02360	1891 - 1978

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
5740MON	MISSOULA	4653	11402	03172	1886 - 1970
6157MON	NORRIS DAM	4529	11138	04745	1907 - 1978
7286MON	SAINT IGNATIUS	4719	11406	02900	1909 - 1978
7382MON	SAVAGE	4727	10421	01985	1911 - 1978
8501MON	VALIER	4819	11215	03805	1911 - 1978
NEVADA					
0507NEV	AUSTIN	3930	11705	06605	1888 - 1970
0714NEV	BEATTY	3655	11645	03300	1913 - 1970
0795NEV	BEOWAWE	4036	11629	04695	1891 - 1970
2573NEV	ELKO	4050	11547	05075	1890 - 1970
2780NEV	FALLON	3927	11847	03965	1903 - 1970
3245NEV	GOLCONDA	4057	11729	04392	1894 - 1970
3957NEV	IMLAY	4039	11809	04260	1914 - 1970
4349NEV	LAHONTAN	3928	11904	04158	1911 - 1970
4395NEV	LAMOILLE	4041	11528	06290	1912 - 1970
4698NEV	LOVELOCK	4011	11828	03975	1891 - 1970
4950NEV	MC GILL	3924	11446	06340	1912 - 1970
5168NEV	MINA	3823	11806	04552	1906 - 1970
6779NEV	RENO	3930	11947	04404	1888 - 1970
7369NEV	SEARCHLIGHT	3528	11455	03540	1913 - 1970
8988NEV	WELLS	4107	11458	05650	1896 - 1970
9171NEV	WINNEMUCCA	4054	11748	04301	1888 - 1970
9229NEV	YERINGTON	3859	11910	04375	1913 - 1970
NEW MEXICO					
0199NME	ALAMOGORDO	3253	10557	04350	1915 - 1970
0692NME	AZTEC	3650	10800	05640	1919 - 1970
0858NME	BELL	3532	10406	04500	1904 - 1970
1063NME	BLOOMFIELD	3640	10758	05764	1904 - 1970
1469NME	CARLSBAD	3225	10414	03120	1894 - 1970
1515NME	CARRIZIZO	3339	10553	05438	1908 - 1970
1664NME	CHAMA	3655	10635	07850	1905 - 1970
1887NME	CLAYTON	3627	10309	04970	1909 - 1970
1927NME	CLOUDCROFT	3258	10545	08827	1901 - 1970
1939NME	CLOVIS	3426	10312	04280	1911 - 1970
2093NME	CORONA	3415	10536	06664	1912 - 1970
2436NME	DEMING	3216	10745	04331	1904 - 1970
2848NME	ELEPHANT BUTTE	3309	10711	04576	1908 - 1970
3265NME	FORT BAYARD	3248	10809	06142	1891 - 1970
3288NME	FORT STANTON	3329	10532	06220	1900 - 1970
3294NME	FORT SUMNER	3428	10415	04030	1908 - 1970
3305NME	FORT WINGATE	3528	10832	07000	1897 - 1966
3368NME	GAGE	3213	10801	04410	1906 - 1970
4026NME	HOBBS	3242	10308	03615	1913 - 1970
4369NME	JEMEZ SPRINGS	3547	10641	06250	1910 - 1970
4426NME	JORNADA	3237	10644	04275	1914 - 1970
4850NME	LAS VEGAS	3536	10512	06470	1892 - 1970
5056NME	LOGAN	3522	10325	03830	1907 - 1960
5084NME	LOS ALAMOS	3552	10618	07410	1919 - 1970
5147NME	LOS LUNAS	3448	10644	04885	1889 - 1970
5273NME	LUNA R S	3350	10856	07050	1903 - 1970

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
5353NME	MAGDELENA	3407	10714	06540	1906 - 1970
5657NME	MESCALERO	3310	10548	06785	1911 - 1970
5960NME	MT. PARK	3527	10551	06780	1915 - 1970
5965NME	MOUNTAIN AIR	3431	10615	06520	1902 - 1970
6435NME	OROGRANDE	3223	10606	4200	1920 - 1970
6659NME	PEARL	3239	10323	03800	1916 - 1970
7008NME	PORTALES	3411	10321	04010	1911 - 1970
7323NME	RED RIVER	3642	10524	08676	1909 - 1970
7609NME	ROSWELL	3318	10432	03649	1893 - 1970
7867NME	SAN JON	3507	10320	04230	1907 - 1970
8072NME	SANTE FE	3541	10554	07200	1908 - 1970
8107NME	SANTA ROSA	3457	10441	04620	1874 - 1970
8501NME	SPRINGER	3623	10436	05857	1891 - 1970
8535NME	STATE UNIV.	3217	10645	03881	1892 - 1970
8668NME	TAOS	3622	10537	06945	1901 - 1970
9085NME	TRES PIEDRAS	3640	10559	08120	1905 - 1970
9165NME	TULAROSA	3304	10602	04555	1908 - 1970
9820NME	WOLF CANYON	3558	10646	08150	1912 - 1970
OREGON					
00780RE	ALBANY	4438	12304	00213	1887 - 1963
03040RE	ASHLAND	4213	12243	01780	1889 - 1976
03240RE	ASTORIA	4611	12350	00012	1885 - 1960
06940RE	BEND	4404	12119	03599	1902 - 1976
10550RE	BROOKINGS	4203	12417	00080	1913 - 1976
14070RE	CASCADE LOCKS	4540	12154	00100	1891 - 1954
15710RE	CHILOQUIN	4235	12151	04220	1913 - 1976
17650RE	CONDON	4514	12011	02830	1913 - 1976
18620RE	CORVALLIS	4438	12312	00225	1890 - 1976
21680RE	DAYVILLE	4428	11932	02364	1895 - 1976
24400RE	DUFUR	4527	12108	01330	1917 - 1976
25640RE	ECHO	4545	11911	00660	1905 - 1971
34450RE	GRANTS PASS	4226	12319	00925	1893 - 1976
37700RE	HEADWORKS PORTLAND	4527	12209	00748	1909 - 1976
38270RE	HEPPNER	4521	11933	01950	1909 - 1976
38470RE	HERMISTON	4549	11917	00624	1910 - 1976
45060RE	KLAMATH FALLS	4212	12147	04098	1897 - 1976
46150RE	LA GRANDE	4520	11807	02805	1893 - 1965
46700RE	LAKEVIEW	4211	12021	04774	1890 - 1976
53840RE	MCMINNVILLE	4514	12311	00148	1888 - 1976
55930RE	MILTON	4558	11826	00839	1914 - 1976
57340RE	MORO	4529	12043	01868	1917 - 1976
65460RE	PENDLETON	4541	11851	01492	1890 - 1976
66340RE	PILOT ROCK	4529	11849	01697	1909 - 1976
67610RE	PORTLAND CITY	4532	12240	00030	1885 - 1973
68830RE	PRINEVILLE	4421	12054	02840	1897 - 1976
69070RE	PROSPECT	4244	12231	02482	1908 - 1976
71690RE	RIDDLE	4258	12321	00663	1913 - 1976
73260RE	ROSEBURG CITY	4313	12320	00479	1885 - 1965
84070RE	THE DALLES	4536	12110	00096	1889 - 1967
87340RE	UMATILLA	4555	11921	00285	1902 - 1965
87460RE	UNION	4513	11753	02765	1912 - 1976

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
8797ORE	VALE	4359	11715	02240	1892 - 1976
8997ORE	WALLOWA	4534	11732	02923	1903 - 1976
9219ORE	WESTON	4547	11819	03230	1891 - 1954
UTAH					
0086UTA	ALTON	3726	11229	07040	1915 - 1978
0519UTA	BEAVER	3817	11238	05920	1914 - 1978
0738UTA	BLANDING	3737	10928	06036	1915 - 1978
0924UTA	BRIGHAM CITY	4129	11202	04335	1915 - 1970
1731UTA	CORINNE	4133	11207	04230	1897 - 1978
2101UTA	DESERET	3917	11139	04585	1913 - 1978
2253UTA	DUCHESNE	4010	11024	05510	1906 - 1970
2418UTA	ELBERTA	3957	11157	04690	1914 - 1978
2484UTA	EMERY	3855	11115	06200	1901 - 1978
2828UTA	FILLMORE	3857	11219	05160	1892 - 1978
2996UTA	FORT DUCHESNE	4017	10952	04990	1892 - 1978
3413UTA	GREEN RIVER	3900	11009	04058	1901 - 1970
3611UTA	HANKSVILLE	3822	11043	04308	1911 - 1978
3809UTA	HEBER	4031	11125	05580	1893 - 1978
4508UTA	KANAB	3703	11232	04985	1914 - 1978
4856UTA	LAKETOWN	4149	11119	05988	1912 - 1978
5065UTA	LEVAN	3933	11152	05300	1891 - 1978
5186UTA	LOGAN UTAH STATE UNIV.	4145	11149	04785	1891 - 1978
5402UTA	MANTI	3915	11138	05740	1894 - 1978
5654UTA	MILFORD	3826	11301	05028	1911 - 1978
5733UTA	MOAB	3836	10936	03965	1914 - 1978
5752UTA	MODENA	3748	11355	05460	1917 - 1978
5826UTA	MORGAN	4102	11141	05070	1905 - 1978
5837UTA	MORONI	3932	11135	05525	1914 - 1978
5969UTA	MYTON	4012	11004	05030	1918 - 1978
6357UTA	OAK CITY	3923	11220	05075	1914 - 1978
6686UTA	PAROWAN	3751	11250	05930	1914 - 1978
6897UTA	PIUTE DAM	3819	11211	05900	1918 - 1970
7318UTA	RIVERDALE	4109	11200	04390	1914 - 1978
7516UTA	SAINT GEORGE	3707	11334	02760	1914 - 1978
7686UTA	SANTAQUIN	3958	11147	05120	1914 - 1978
7714UTA	SCIPIO	3915	11206	05306	1895 - 1978
7909UTA	SNAKE CREEK	4033	11130	05950	1914 - 1978
8119UTA	SPANISH FORK POWER HOUSE	4005	11136	04720	1911 - 1978
8705UTA	THOMPSONS	3858	10943	05150	1914 - 1978
8771UTA	TOOELE	4032	11218	04820	1896 - 1978
8973UTA	UTAH LAKE LEHI	4022	11154	04497	1914 - 1978
9111UTA	VERNAL	4027	10931	05280	1915 - 1978
9382UTA	WENDOVER	4044	11402	04237	1911 - 1978
WASHINGTON					
0008WAS	ABERDEEN	4658	12349	00010	1891 - 1976
0176WAS	ANACORTEZ	4831	12237	00030	1905 - 1976
0564WAS	BELLINGHAM	4847	12229	00140	1914 - 1976
0729WAS	BLAINE	4900	12244	00080	1893 - 1976
0945WAS	BUCKLEY	4710	12200	00685	1914 - 1976
0969WAS	BUMPING LAKE	4652	12118	03440	1914 - 1966

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
1233WAS	CEDAR LAKE	4725	12144	01560	1914 - 1976
1276WAS	CENTRALIA	4643	12257	00185	1902 - 1976
1504WAS	CLE ELUM	4711	12057	01930	1899 - 1976
1586WAS	COLFAX	4653	11723	01955	1892 - 1976
1666WAS	CONCONULLY	4834	11946	02275	1900 - 1976
2007WAS	DAVENPORT	4739	11809	02460	1909 - 1976
2675WAS	EVERETT	4759	12211	00060	1914 - 1976
2914WAS	FORKS	4757	12422	00350	1914 - 1976
3222WAS	GOLDENDALE	4545	12050	01650	1909 - 1972
4169WAS	KENT	4723	12214	00040	1914 - 1976
4394WAS	LAKE CLE ELUM	4715	12104	02255	1914 - 1976
4406WAS	LAKE KACHESS	4716	12112	02270	1909 - 1976
4414WAS	LAKE KEECHELUS	4719	12120	02475	1914 - 1976
4486WAS	LANDSBURG	4716	12112	02270	1916 - 1976
4549WAS	LAURIER	4900	11814	01644	1910 - 1976
4572WAS	LEAVENWORTH	4736	12039	01163	1914 - 1976
5832WAS	NESPELEM	4808	11859	01890	1915 - 1976
6039WAS	ODESSA	4720	11840	01540	1903 - 1976
6096WAS	OLGA	4837	12248	00080	1911 - 1976
6109WAS	OLYMPIA	4703	12254	00069	1890 - 1955
6610WAS	POMEROY	4628	11737	01810	1891 - 1976
6678WAS	PORT TOWNSEND	4807	12326	00099	1890 - 1976
6768WAS	PROSSER 4	4615	11945	00903	1913 - 1976
6803WAS	PUYALLUP	4712	12220	00050	1914 - 1976
7038WAS	RIMROCK	4639	12108	02730	1917 - 1976
7059WAS	RITZVILLE	4707	11822	01830	1916 - 1976
7478WAS	SEATTLE UNIV.	4739	12217	00096	1909 - 1976
7483WAS	SEATTLE AIRPORT	4732	12216	00014	1890 - 1965
7507WAS	SEDRO WOOLEY	4830	12214	00050	1897 - 1976
7773WAS	SNOQUALMIE FALLS	4733	12151	00440	1899 - 1976
8207WAS	SUNNYSIDE	4619	12000	00747	1894 - 1976
8442WAS	TIETON INTAKE	4640	12100	02280	1909 - 1971
8773WAS	VANCOUVER	4541	12239	00210	1898 - 1976
8802WAS	VASHON ISLAND	4727	12230	00231	1887 - 1955
8926WAS	WALLA WALLA	4603	11824	800	1872 - 1976
9012WAS	WATERVILLE	4739	12004	02620	1890 - 1976
9074WAS	WENATCHEE	4725	12019	00634	1912 - 1976
9238WAS	WILBUR	4745	11842	02160	1900 - 1976
9342WAS	WIND RIVER	4548	12156	01150	1914 - 1976
9376WAS	WINTHROP	4828	12011	01755	1911 - 1976
WYOMING					
0140WYO	ALTA	4346	11102	06431	1909 - 1978
0915WYO	BORDER	4215	11102	06120	1902 - 1978
1675WYO	CHEYENNE	4109	10449	06126	1871 - 1978
1730WYO	CHUGWATER	4145	10449	05282	1900 - 1978
1840WYO	CODY	4433	10904	04990	1909 - 1978
1905WYO	COLONY	4456	10412	03553	1914 - 1978
2415WYO	DEAVER	4453	10836	04105	1916 - 1978
2685WYO	DOUGLAS	4245	10522	04853	1909 - 1970
2715WYO	DUBOIS	4333	10937	06917	1907 - 1978
3045WYO	ENCAMPMENT	4111	10637	07387	1909 - 1978

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
3100WYO	EVANSTON	4116	11057	06780	1898 - 1978
3630WYO	FOXPARK	4105	10609	09045	1909 - 1970
4065WYO	GREEN RIVER	4132	10929	06089	1905 - 1978
5390WYO	LANDER	4249	10844	05563	1892 - 1978
5410WYO	LARAMIE	4119	10535	07200	1891 - 1970
5770WYO	LOVELL	4450	10824	03837	1909 - 1978
5830WYO	LUSK	4246	10426	05000	1889 - 1978
6440WYO	MORAN	4351	11035	06789	1911 - 1978
7105WYO	PATHFINDER DAM	4228	10651	05930	1906 - 1978
7235WYO	PINE BLUFFS	4111	10404	05045	1900 - 1970
7380WYO	POWELL	4445	10846	04378	1908 - 1978
7990WYO	SARATOGA	4127	10648	06790	1914 - 1978
8155WYO	SHERIDAN	4446	10658	03964	1905 - 1978
8160WYO	SHERIDAN FIELD STATION	4451	10652	03800	1914 - 1978
9615WYO	WHEATLAND	4207	10457	04638	1914 - 1978
9905WYO	YELLOWSTONE PARK	4458	11042	06230	1896 - 1978
9905WYO	YELLOWSTONE PARK	4458	11042	06230	1896 - 1978

Table 4

LONG-TERM PRECIPITATION STATIONS IN THE WESTERN UNITED STATES CLIMATE DATA BANK

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
ARIZONA					
0080ARI	AJO	3222	11252	1763	1913 - 1970
0482ARI	ASHFORK	3513	11229	5210	1909 - 1970
0680ARI	BENSON	3158	11018	3600	1881 - 1970
0768ARI	BISBEE	3127	10955	5350	1889 - 1961
0958ARI	BOWIE	3220	10929	3756	1867 - 1970
1026ARI	BUCKEYE	3323	11235	888	1889 - 1970
1231ARI	CANELO	3133	11032	4985	1910 - 1970
1306ARI	CASA GRANDE	3253	11145	1405	1880 - 1970
2669ARI	DOUGLAS	3121	10935	3937	1903 - 1970
3110ARI	FORT GRANT	3237	10957	4875	1873 - 1970
3160ARI	FORT VALLEY	3516	11144	7347	1909 - 1970
3393ARI	GILA BEND	3257	11243	737	1889 - 1970
3498ARI	GLOBE	3323	11047	3550	1905 - 1970
3595ARI	GRAND CANYON	3603	11208	6950	1903 - 1970
3621ARI	GRANITE REEF	3331	11142	1325	1866 - 1970
4089ARI	HOLBROOK	3454	11010	5069	1890 - 1970
4453ARI	JEROME	3445	11207	5245	1897 - 1970
5467ARI	MESA	3325	11152	1230	1896 - 1970
5512ARI	MIAMI	3324	11053	3560	1914 - 1970
5825ARI	NATURAL BRIDGE	3419	11127	4607	1890 - 1970
5921ARI	NOGALES	3121	11055	3800	1914 - 1970
6119ARI	ORACLE	3234	11043	4450	1893 - 1970
6250ARI	PARKER	3410	11417	425	1893 - 1970
6320ARI	PAYSON R. S.	3414	11120	4848	1909 - 1970
6561ARI	PINAL RANCH	3321	11059	4520	1893 - 1970
6796ARI	PRESCOTT	3434	11238	5510	1866 - 1970
7281ARI	ROOSEVELT	3340	11109	2205	1905 - 1970
7370ARI	SACATON	3304	11145	1285	1908 - 1970
7435ARI	ST. JOHNS	3430	10922	5730	1909 - 1970
7716ARI	SELIGMAN	3519	11253	5250	1904 - 1970
8012ARI	SNOWFLAKE	3430	11005	5642	1910 - 1970
8162ARI	SPRINGERVILLE	3408	10917	7060	1911 - 1970
8619ARI	TOMBSTONE	3142	11003	4610	1897 - 1970
8792ARI	TUBA CITY	3608	11115	4936	1897 - 1970
8815ARI	TUCSON UNIV.	3215	11050	2526	1867 - 1970
9166ARI	WALNUT GROVE	3418	11233	3764	1896 - 1970
9271ARI	WHITE RIVER (FORT APACHE)	3350	10958	5280	1876 - 1970
9287ARI	WICKENBURG	3358	11244	2095	1908 - 1970
9359ARI	WILLIAMS	3515	11211	6750	1903 - 1970
9439ARI	WINSLOW	3501	11044	4895	1915 - 1970
9662ARI	YUMA	3237	11439	191	1874 - 1970
CALIFORNIA					
0204CAL	ANGIOLA	3559	11929	205	1900 - 1976
0227CAL	ANTIOCH	3801	12146	30	1879 - 1975
0383CAL	AUBURN	3854	12104	1360	1871 - 1976
0395CAL	AVALON PLEASURE PIER	3321	11820	0	1910 - 1976
0514CAL	BURRETT DAM	3241	11640	1623	1914 - 1976
0607CAL	BEAUMONT	3359	11658	3045	1911 - 1975
0682CAL	BENSONS FERRY	3814	12129	17	1913 - 1958

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
0693CAL	BERKELEY	3752	12215	345	1919 - 1976
0755CAL	BIG CREEK	3712	11915	4900	1916 - 1962
0790CAL	BIG SUR	3615	12147	300	1915 - 1976
0924CAL	BLYTHE	3336	11436	268	1909 - 1976
1048CAL	BRAWLEY	3259	11531	119	1909 - 1976
1424CAL	CAMPO	3237	11628	2635	1900 - 1976
1462CAL	CAMPTONVILLE	3928	12104	3500	1907 - 1972
1497CAL	CANYON DAM	4010	12105	4555	1914 - 1976
1614CAL	CEDARVILLE	4132	12010	4675	1894 - 1976
1700CAL	CHESTER	4018	12113	4550	1910 - 1976
1715CAL	CHICO EXP. STA.	3942	12147	230	1871 - 1976
1779CAL	CLAREMONT	3406	11743	1196	1892 - 1976
COLORADO					
1912CAL	COLFAX	3906	12057	2418	1870 - 1976
1916CAL	COLGATE	3920	12111	572	1907 - 1976
2239CAL	CUYAMACA	3259	11635	4670	1887 - 1976
2294CAL	DAVIS AGRI. COLLEGE	3852	12145	3700	1872 - 1976
2319CAL	DEATH VALLEY	3627	11652	170	1911 - 1976
2389CAL	DENAIR	3734	12048	140	1899 - 1976
2402CAL	DE SABLA	3952	12137	2700	1904 - 1976
2458CAL	DOBBINS	3921	12111	1650	1904 - 1970
2539CAL	DUDLEYS	3745	12006	3000	1909 - 1976
2640CAL	EAST PARK	3922	12231	1205	1911 - 1976
2728CAL	ELECTRA	3820	12040	725	1904 - 1976
2862CAL	ESCONDIDO	3307	11705	657	1894 - 1976
2910CAL	EUREKA	4048	12810	40	1878 - 1976
2941CAL	FAIRMONT	3442	11826	3036	1909 - 1976
3111CAL	FOLSOM	3839	12110	252	1872 - 1955
3161CAL	FORT BRAGG	3927	12348	74	1895 - 1976
3191CAL	FORT ROSS	3831	12315	114	1875 - 1976
3257CAL	FRESNO	3646	11943	328	1878 - 1976
3261CAL	FRIANT	3659	11943	306	1897 - 1976
3571CAL	GRASS VALLEY	3912	12102	2693	1873 - 1966
3578CAL	GRATON	3826	12253	190	1896 - 1976
3747CAL	HANFORD	3620	11939	249	1899 - 1976
3761CAL	HAPPY CAMP	4148	12323	1090	1914 - 1976
3875CAL	HEALDSBURG	3836	12252	115	1877 - 1976
3939CAL	HETCH HETCHY	3757	11947	3870	1911 - 1976
4022CAL	HOLLISTER	3650	12125	280	1874 - 1974
4232CAL	INDEPENDENCE	3648	11812	3943	1892 - 1976
4259CAL	INDIO	3343	11615	11	1877 - 1976
4500CAL	KENTFIELD	3757	12233	65	1888 - 1976
4591CAL	KNIGHTS LANDING	3848	12143	35	1878 - 1958
4713CAL	LAKE SPAULDING	3919	12038	5156	1895 - 1976
4884CAL	LE GRAND	3714	12015	255	1900 - 1976
4890CAL	LEMON COVE	3623	11902	513	1899 - 1976
4997CAL	LIVERMORE	3740	12146	490	1871 - 1976
5107CAL	LOS ALAMOS	3445	12017	565	1909 - 1976
5118CAL	LOS BANOS	3704	12051	115	1873 - 1976
5123CAL	LOS GATOS	3714	12158	365	1885 - 1976
5233CAL	MADERA	3657	12002	270	1900 - 1976

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
5338CAL	MARICOPA	3505	11923	675	1912 - 1976
5346CAL	MARIPOSA	3729	11958	2011	1909 - 1976
5391CAL	MARYSVILLE	3908	12136	60	1871 - 1950
5449CAL	MC CLOUD	4115	12208	3252	1911 - 1976
5532CAL	MERCED	3717	12031	153	1872 - 1976
5629CAL	MILL CREEK	3405	11702	2950	1903 - 1967
5983CAL	MOUNT SHASTA	4119	12219	3540	1888 - 1976
6074CAL	NAPA STATE HOSP.	3817	12216	60	1877 - 1976
6136CAL	NEVADA CITY	3916	12101	2570	1864 - 1976
6168CAL	NEWMAN	3718	12102	90	1889 - 1976
6252CAL	NORTH FORK	3713	11930	2700	1904 - 1976
6305CAL	OAKDALE	3752	12052	220	1893 - 1967
6332CAL	OAKLAND	3747	12210	440	1874 - 1958
6399CAL	OJAI	3427	11915	750	1905 - 1976
6506CAL	ORLAND	3945	12212	254	1883 - 1976
6508CAL	ORLEANS	4118	12332	401	1903 - 1976
6522CAL	OROVILLE	3931	12134	250	1885 - 1953
6826CAL	PETALUMA	3814	12238	10	1913 - 1976
6960CAL	PLACERVILLE	3844	12048	1890	1874 - 1976
7001CAL	PLYMOUTH	3829	12051	1096	1901 - 1960
7050CAL	POMONA	3404	11746	855	1913 - 1976
7077CAL	PORTERVILLE	3604	11901	393	1889 - 1976
7195CAL	QUINCEY	3956	12057	3409	1895 - 1976
7292CAL	RED BLUFF	4009	12215	340	1878 - 1976
7296CAL	REDDING	4035	12224	577	1875 - 1976
7306CAL	REDLANDS	3403	11711	1352	1889 - 1976
7370CAL	REPRESA	3842	12110	305	1893 - 1976
7516CAL	ROCKLIN	3848	12115	239	1870 - 1976
7633CAL	SACRAMENTO CITY	3835	12130	20	1850 - 1976
7643CAL	ST. HELENA	3830	12228	255	1908 - 1976
7669CAL	SALINAS	3640	12139	56	1873 - 1976
7723CAL	SAN BERNARDINO	3408	11716	1172	1870 - 1976
7740CAL	SAN DIEGO	3244	11710	10	1850 - 1976
7759CAL	SAN FERNANDO	3416	11828	950	1878 - 1974
7772CAL	SAN FRANCISCO	3747	12225	130	1850 - 1976
7810CAL	SAN JACINTO	3347	11658	1561	1892 - 1976
7821CAL	SAN JOSE	3721	12154	67	1874 - 1976
7851CAL	SAN LUIS OBISPO	3818	12040	300	1870 - 1976
7894CAL	SANTA ANA	3409	11704	2765	1904 - 1967
7902CAL	SANTA BARBARA	3425	11941	5	1868 - 1976
7912CAL	SANTA CLARA	3721	12150	90	1881 - 1976
7916CAL	SANTA CRUZ	3659	12201	130	1878 - 1976
7965CAL	SANTA ROSA	3827	12243	167	1889 - 1976
8210CAL	SIERRA MADRE	3410	11804	1220	1896 - 1958
8218CAL	SIERRAVILLE	3935	12022	4975	1910 - 1976
8331CAL	SODA SPRINGS	3919	12023	6750	1870 - 1958
8353CAL	SONORA	3759	12023	1749	1888 - 1976
8554CAL	STIRLING CITY	3954	12132	3518	1870 - 1960
8758CAL	TAHOE CITY	3910	12009	6228	1910 - 1976
8839CAL	TEJON RANCHO	3502	11845	1425	1899 - 1976
9087CAL	TUSTIN	3344	11747	118	1877 - 1976
9122CAL	UKIAH	3909	12312	623	1877 - 1976

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
9177CAL	UPPER MATTOLE	4015	12411	255	1887 - 1976
9200CAL	VACAVILLE	3822	12200	175	1880 - 1976
9285CAL	VENTURA	3417	11918	45	1874 - 1976
9367CAL	VISALIA	3620	11918	325	1878 - 1976
9447CAL	WARNER SPRINGS	3317	11638	3180	1906 - 1975
9452CAL	WASCO	3536	11920	333	1900 - 1976
9473CAL	WATSONVILLE	3656	12146	95	1899 - 1976
9490CAL	WEAVERVILLE	4044	12256	2050	1912 - 1976
9699CAL	WILLOWS	3931	12211	136	1879 - 1976
9847CAL	YORBA LINDA	3353	11749	385	1912 - 1976
9866CAL	YREKA	4143	12238	2631	1872 - 1976
0228COL	AMES	3754	10755	8701	1913 - 1978
1741COL	COLLBRAN	3914	10758	6137	1892 - 1978
1959COL	CRESTED BUTTE	3852	10658	8855	1909 - 1978
2192COL	DELTA	3846	10807	5055	1888 - 1978
2281COL	DILLON	3938	10602	9065	1909 - 1978
2432COL	DURANGO	3717	10753	6550	1894 - 1978
3016COL	FORT LEWIS	3714	10803	7595	1911 - 1978
3113COL	FRASER	3957	10550	8560	1909 - 1978
3146COL	FRUITA	3910	10844	4507	1902 - 1978
3359COL	GLENWOOD SPRINGS	3934	10720	5823	1901 - 1978
3488COL	GRAND JUNCTION	3907	10832	4855	1892 - 1978
3951COL	HERMIT	3746	10708	9001	1909 - 1978
4250COL	IGNACIO	3708	10738	6424	1914 - 1978
5722COL	MONTROSE NO. 2	3829	10753	5830	1885 - 1978
6513COL	PITKIN	3836	10632	9200	1909 - 1978
7017COL	RICO	3741	10802	8842	1909 - 1978
7618COL	SHOSHONE	3934	10714	5933	1910 - 1978
7656COL	SILVERTON	3748	10740	9322	1906 - 1978
7936COL	STEAMBOAT SPRINGS	4030	10650	6770	1908 - 1978
IDAHO					
0010IDA	ABERDEEN	4257	11250	4405	1914 - 1978
0448IDA	ARROWROCK	4336	11555	3275	1916 - 1978
0470IDA	ASHTON	4404	11127	5220	1897 - 1978
0915IDA	BLACKFOOT	4310	11221	4487	1896 - 1978
1002IDA	BLISS	4256	11457	3265	1917 - 1978
1380IDA	CALDWELL	4340	11641	2370	1904 - 1978
1408IDA	CAMBRIDGE	4434	11641	2650	1894 - 1978
1663IDA	CHALLIS	4430	11414	5175	1915 - 1978
2187IDA	COUNCIL	4444	11626	2950	1915 - 1978
2676IDA	DRIGGS	4344	11107	6116	1907 - 1978
3448IDA	GARDEN VALLEY	4404	11555	3212	1916 - 1978
3631IDA	GLENNS FERRY	4257	11518	2570	1909 - 1978
3732IDA	GRACE	4235	11144	5550	1907 - 1978
3942IDA	HAILEY	4331	11418	5328	1918 - 1978
4140IDA	HAZELTON	4236	11408	4060	1917 - 1978
4295IDA	HOLLISTER	4221	11434	4525	1912 - 1978
4442IDA	IDAHO CITY	4350	11550	4730	1913 - 1978
4457IDA	IDAHO FALLS	4331	11204	4730	1904 - 1978
4670IDA	JEROME	4244	11431	3740	1915 - 1978
4831IDA	KELLOGG	4733	11610	2312	1905 - 1978

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
5011IDA	KOOSKIA	4609	11559	1260	1908 - 1978
5275IDA	LIFTON	4207	11118	5926	1919 - 1978
5462IDA	MACKEY	4405	11534	3980	1908 - 1978
5544IDA	MALAD	4212	11215	4600	1917 - 1978
5708IDA	MC CALL	4454	11607	5025	1916 - 1978
6053IDA	MONTPELIOR	4219	11118	5960	1914 - 1978
6152IDA	MOSCOW UNIV.	4644	11658	2660	1892 - 1978
6388IDA	NEW MEADOWS	4458	11617	3870	1903 - 1978
6542IDA	OAKLEY	4215	11353	4600	1893 - 1978
6681IDA	OROFINO	4629	11615	1027	1903 - 1978
6891IDA	PAYETTE	4405	11656	2150	1890 - 1978
7264IDA	PORTHILL	4900	11630	1800	1889 - 1978
7386IDA	PRIEST RIVER	4821	11650	2380	1911 - 1978
8137IDA	SANDPOINT	4817	11634	2100	1910 - 1978
8818IDA	SUGAR	4353	11145	4890	1907 - 1978
9294IDA	TWIN FALLS	4235	11428	3690	1909 - 1978
9498IDA	WALLACE WOODLAND PARK	4730	11553	2935	1907 - 1978
MONTANA					
0364MON	AUGUSTA	4729	11223	4070	1901 - 1978
0392MON	BABB	4856	11322	4300	1914 - 1978
0432MON	BALLANTINE	4557	10808	3000	1919 - 1978
0780MON	BIG TIMBER	4550	10957	4100	1909 - 1978
0802MON	BILLINGS	4546	10829	3097	1905 - 1978
1044MON	BOZEMAN AGRI. COLLEGE	4540	11103	4856	1894 - 1978
1102MON	BRIDGER	4518	10855	3680	1908 - 1978
1202MON	BROWNING	4834	11301	4355	1912 - 1978
1297MON	BUSBY	4532	10657	3440	1903 - 1978
1318MON	BUTTE	4557	11230	5526	1894 - 1978
1552MON	CASCADE	4713	11143	3390	1907 - 1978
1737MON	CHOTEAU	4749	11210	3945	1918 - 1978
2112MON	CROW AGENCY	4536	10727	3030	1898 - 1978
2173MON	CUT BANK	4836	11222	3838	1908 - 1978
2409MON	DILLON	4512	11238	5228	1895 - 1978
2604MON	EAST ANACONDA	4606	11255	5511	1905 - 1978
2689MON	EKALAKA	4553	10432	3425	1905 - 1978
3013MON	FLATWILLOW	4651	10819	3138	1915 - 1978
3139MON	FORTINE	4847	11454	3000	1906 - 1978
3489MON	GIBSON DAM	4736	11246	4590	1913 - 1978
3581MON	GLENDIVE	4706	10443	2076	1889 - 1978
3984MON	HAUGAN	4723	11521	3100	1908 - 1978
3994MON	HAVRE	4834	10940	2488	1892 - 1960
4038MON	HEBGEN DAM	4452	11120	6489	1913 - 1978
4055MON	HELENA	4636	11200	3828	1880 - 1978
4241MON	HOLTER DAM	4700	11201	3487	1908 - 1978
4985MON	LEWISTOWN	4703	10927	4145	1896 - 1978
5015MON	LIBBY	4824	11532	2080	1895 - 1978
5337MON	MALTA	4821	10752	2255	1909 - 1978
5666MON	MILDRED	4641	10457	2407	1909 - 1978
6157MON	NORRIS DAM	4529	11138	4745	1907 - 1978
7286MON	SAINT IGNATIUS	4719	11406	2900	1908 - 1978
7382MON	SAVAGE	4727	10421	1985	1905 - 1978

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
8501MON	VALIER	4819	11215	3805	1911 - 1978
8597MON	VIRGINIA CITY	4518	11157	5776	1916 - 1978
8927MON	WHITE SULPHUR SPRINGS	4633	11055	5157	1911 - 1978
NEVADA					
0438NEV	ARTHUR	4047	11511	6280	1910 - 1970
0507NEV	AUSTIN	3930	11705	6605	1889 - 1970
0691NEV	BATTLE MOUNTAIN AIRPORT	4037	11652	4530	1870 - 1970
0714NEV	BEATTY	3655	11645	3300	1917 - 1970
0795NEV	BEOWAWE	4036	11629	4695	1870 - 1970
2573NEV	ELKO	4050	11547	5075	1870 - 1970
2780NEV	FALLON	3927	11847	3965	1903 - 1970
3245NEV	GOLCONDA	4057	11729	4392	1878 - 1970
3957NEV	IMLAY	4039	11809	4260	1888 - 1970
4349NEV	LAHONTAN	3928	11904	4158	1906 - 1970
4395NEV	LAMOILLE	4041	11528	6290	1916 - 1970
4698NEV	LOVELOCK	4011	11828	3975	1891 - 1970
4950NEV	MC GILL	3924	11446	6340	1888 - 1970
5168NEV	MINA	3823	11806	4552	1896 - 1970
6779NEV	RENO	3930	11947	4404	1870 - 1970
7369NEV	SEARCHLIGHT	3528	11455	3540	1914 - 1970
8988NEV	WELLS	4107	11458	5650	1870 - 1970
9171NEV	WINNEMUCCA	4054	11748	4301	1870 - 1970
9229NEV	YERINGTON	3859	11910	4375	1902 - 1970
NEW MEXICO					
0022NME	ABBOTT	3617	10414	6010	1909 - 1970
0199NME	ALAMOGORDO	3253	10557	4350	1901 - 1970
0394NME	ANCHO	3356	10545	6115	1909 - 1970
0646NME	AURORA	3616	10503	8130	1909 - 1960
0692NME	AZTEC	3650	10800	5640	1910 - 1970
0795NME	BATEMAN	3631	10619	8900	1909 - 1970
0858NME	BELL	3532	10406	4500	1899 - 1970
1000NME	BLACK LAKE	3618	10517	8358	1909 - 1970
1063NME	BLOOMFIELD	3640	10758	5764	1904 - 1970
1469NME	CARLSBAD	3225	10414	3120	1894 - 1970
1515NME	CARRIZIZO	3339	10553	5438	1908 - 1970
1653NME	CHACON	3610	10523	8500	1909 - 1970
1664NME	CHAMA	3655	10635	7850	1905 - 1970
1887NME	CLAYTON	3627	10309	4970	1909 - 1970
1927NME	CLOUDCROFT	3258	10545	8827	1902 - 1970
1939NME	CLOVIS	3426	10312	4280	1911 - 1970
2093NME	CORONA	3415	10536	6664	1909 - 1970
2384NME	DAWSON	3640	10447	6400	1881 - 1961
2848NME	ELEPHANT BUTTE	3309	10711	4576	1907 - 1970
3265NME	FORT BAYARD	3248	10809	6142	1867 - 1970
3288NME	FORT STANTON	3329	10532	6220	1900 - 1970
3294NME	FORT SUMNER	3428	10415	4030	1908 - 1970
3305NME	FORT WINGATE	3528	10832	7000	1864 - 1966
3368NME	GAGE	3213	10801	4410	1899 - 1970
3775NME	HACHITA	3156	10820	4495	1909 - 1970
4026NME	HOBBS	3242	10308	3615	1913 - 1970

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
4369NME	JEMEZ SPRINGS	3547	10641	6250	1910 - 1970
4426NME	JORNADA	3237	10644	4275	1914 - 1970
4736NME	LAKE AVALON	3229	10415	3208	1914 - 1970
4850NME	LAS VEGAS	3536	10512	6470	1887 - 1970
5056NME	LOGAN	3522	10325	3830	1906 - 1960
5079NME	LORDSBURG	3218	10839	4250	1881 - 1970
5147NME	LOS LUNAS	3448	10644	4885	1889 - 1970
5273NME	LUNA R S	3350	10856	7050	1900 - 1970
5353NME	MAGDELENA	3407	10714	6540	1905 - 1970
5617NME	MELROSE	3426	10337	4599	1908 - 1970
5657NME	MESCALERO	3310	10548	6785	1911 - 1970
5960NME	MT. PARK	3527	10551	6780	1912 - 1970
5965NME	MOUNTAIN AIR	3431	10615	6520	1902 - 1970
6435NME	OROGRANDE	3223	10606	4200	1909 - 1970
6619NME	PASAMONTE	3618	10344	5650	1910 - 1970
6659NME	PEARL	3239	10323	3800	1915 - 1970
6854NME	PINOS ALTOS	3252	10813	7000	1911 - 1970
7008NME	PORTALES	3411	10321	4010	1909 - 1970
7323NME	RED RIVER	3642	10524	8676	1906 - 1970
7340NME	RED ROCK	3242	10844	4150	1905 - 1970
7534NME	RODEO	3151	10902	4118	1909 - 1970
7609NME	ROSWELL	3318	10432	3649	1894 - 1970
7638NME	ROY	3557	10412	5890	1909 - 1970
7867NME	SAN JON	3507	10320	4230	1907 - 1970
8072NME	SANTE FE	3541	10554	7200	1850 - 1970
8107NME	SANTA ROSA	3457	10441	4620	1908 - 1970
8387NME	SOCORRO	3405	10653	4585	1891 - 1970
8501NME	SPRINGER	3623	10436	5857	1887 - 1970
8535NME	STATE UNIV.	3217	10645	3881	1892 - 1970
8668NME	TAOS	3622	10537	6945	1901 - 1970
8873NME	TIJERAS R S	3504	10623	6300	1910 - 1962
8919NME	TOHATCHI	3551	10844	6420	1913 - 1970
9085NME	TRES PIEDRAS	3640	10559	8120	1905 - 1970
9165NME	TULAROSA	3304	10602	4555	1908 - 1970
9405NME	VAUGHN	3436	10513	5950	1909 - 1970
9820NME	WOLF CANYON	3558	10646	8150	1912 - 1970
OREGON					
0078ORE	ALBANY	4438	12304	213	1879 - 1963
0304ORE	ASHLAND	4213	12243	1780	1879 - 1976
0324ORE	ASTORIA	4611	12350	12	1853 - 1960
0694ORE	BEND	4404	12119	3599	1902 - 1976
1055ORE	BROOKINGS	4203	12417	80	1912 - 1976
1407ORE	CASCADE LOCKS	4540	12154	100	1879 - 1954
1433ORE	CASCADIA	4424	12229	850	1908 - 1976
1571ORE	CHILOQUIN	4235	12151	4220	1913 - 1976
1765ORE	CONDON	4514	12011	2830	1907 - 1976
1862ORE	CORVALLIS	4438	12312	225	1889 - 1976
2168ORE	DAYVILLE	4428	11932	2364	1895 - 1976
2277ORE	DETROIT	4444	12209	1586	1909 - 1972
2440ORE	DUFUR	4527	12108	1330	1909 - 1976
2564ORE	ECHO	4545	11911	660	1903 - 1971

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
3445ORE	GRANTS PASS	4226	12319	925	1889 - 1976
3770ORE	HEADWORKS PORTLAND	4527	12209	748	1899 - 1976
3827ORE	HEPPNER	4521	11933	1950	1889 - 1976
3847ORE	HERMISTON	4549	11917	624	1906 - 1976
4003ORE	HOOD RIVER	4541	12131	500	1884 - 1976
4216ORE	JACKSONVILLE	4218	12259	1640	1889 - 1948
4329ORE	JOSEPH	4521	11715	4175	1889 - 1954
4506ORE	KLAMATH FALLS	4212	12147	4098	1894 - 1976
4615ORE	LA GRANDE	4520	11807	2805	1886 - 1965
4670ORE	LAKEVIEW	4211	12021	4774	1890 - 1976
5384ORE	MCMINNVILLE	4514	12311	148	1888 - 1976
5593ORE	MILTON	4558	11826	839	1914 - 1976
5734ORE	MORO	4529	12043	1868	1910 - 1976
6634ORE	PILOT ROCK	4529	11849	1697	1908 - 1976
6761ORE	PORTLAND CITY	4532	12240	30	1871 - 1973
6883ORE	PRINEVILLE	4421	12054	2840	1897 - 1976
6907ORE	PROSPECT	4244	12231	2482	1905 - 1976
7169ORE	RIDDLE	4258	12321	663	1913 - 1976
7326ORE	ROSEBURG CITY	4313	12320	479	1877 - 1965
8407ORE	THE DALLES	4536	12110	96	1874 - 1976
8734ORE	UMATILLA	4555	11921	285	1893 - 1965
8746ORE	UNION	4513	11753	2765	1911 - 1976
8797ORE	VALE	4359	11715	2240	1891 - 1976
8997ORE	WALLOWA	4534	11732	2923	1903 - 1976
9068ORE	WASCO	4535	12042	1264	1907 - 1976
UTAH					
0061UTA	ALPINE	4027	11147	4935	1910 - 1978
0086UTA	ALTON	3726	11229	7040	1915 - 1978
0738UTA	BLANDING	3737	10928	6036	1905 - 1978
1759UTA	COTTONWOOD WEIR	4037	11147	4950	1917 - 1978
2101UTA	DESERET	3917	11139	4585	1899 - 1978
2253UTA	DUCHESNE	4010	11024	5510	1906 - 1978
2418UTA	ELBERTA	3957	11157	4690	1902 - 1978
2484UTA	EMERY	3855	11115	6200	1901 - 1978
2828UTA	FILLMORE	3857	11219	5160	1892 - 1978
2996UTA	FORT DUCHESNE	4017	10952	4990	1888 - 1978
3611UTA	HANKSVILLE	3822	11043	4308	1910 - 1978
3809UTA	HEBER	4031	11125	5580	1893 - 1978
3896UTA	HIAWATHA	3929	11101	7230	1916 - 1978
4527UTA	KANOSH	3848	11226	5015	1907 - 1978
4856UTA	LAKETOWN	4149	11119	5988	1900 - 1978
5065UTA	LEVAN	3933	11152	5300	1889 - 1978
5186UTA	LOGAN UTAH STATE UNIV.	4145	11149	4785	1891 - 1978
5402UTA	MANTI	3915	11138	5740	1894 - 1978
5610UTA	MIDVALE	4036	11155	4342	1911 - 1978
5752UTA	MODENA	3748	11355	5460	1901 - 1978
5826UTA	MORGAN	4102	11141	5070	1903 - 1978
5837UTA	MORONI	3932	11135	5525	1908 - 1978
5969UTA	MYTON	4012	11004	5030	1915 - 1978
6357UTA	OAK CITY	3923	11220	5075	1905 - 1978
6534UTA	ORDERVILLE	3716	11238	5460	1910 - 1977

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
6658UTA	PARK VALLEY	4149	11319	5520	1911 - 1978
6897UTA	PIUTE DAM	3819	11211	5900	1911 - 1969
7271UTA	RICHMOND	4154	11149	4680	1911 - 1978
7318UTA	RIVERDALE	4109	11200	4390	1914 - 1978
7686UTA	SANTAQUIN	3958	11147	5120	1914 - 1978
7714UTA	SCIPIO	3915	11206	5306	1894 - 1978
7846UTA	SILVER LAKE BRIGHTON	4036	11135	8740	1915 - 1978
7909UTA	SNAKE CREEK	4033	11130	5950	1914 - 1978
8119UTA	SPANISH FORK POWER HOUSE	4005	11136	4720	1910 - 1978
8705UTA	THOMPSONS	3858	10943	5150	1918 - 1978
8771UTA	TOOELE	4032	11218	4820	1896 - 1978
8973UTA	UTAH LAKE LEHI	4022	11154	4497	1904 - 1978
9382UTA	WENDOVER	4044	11402	4237	1911 - 1978
WASHINGTON					
0008WAS	ABERDEEN	4658	12349	10	1891 - 1976
0176WAS	ANACORTEZ	4831	12237	30	1893 - 1976
0564WAS	BELLINGHAM	4847	12229	140	1910 - 1976
0729WAS	BLAINE	4900	12244	80	1902 - 1976
0872WAS	BREMERTON	4734	12240	162	1898 - 1976
0945WAS	BUCKLEY	4710	12200	685	1913 - 1976
0969WAS	BUMPING LAKE	4652	12118	3440	1910 - 1967
1233WAS	CEDAR LAKE	4725	12144	1560	1898 - 1976
1276WAS	CENTRALIA	4643	12257	185	1890 - 1976
1350WAS	CHELAN	4750	12002	1120	1891 - 1978
1504WAS	CLE ELUM	4711	12057	1930	1899 - 1976
1586WAS	COLFAX	4653	11723	1955	1892 - 1976
1666WAS	CONCONULLY	4834	11946	2275	1900 - 1976
2007WAS	DAVENPORT	4739	11809	2460	1909 - 1976
2675WAS	EVERETT	4759	12211	60	1914 - 1976
2914WAS	FORKS	4757	12422	350	1907 - 1976
3222WAS	GOLDENDALE	4545	12050	1650	1905 - 1972
3284WAS	GRAPEVIEW	4718	12252	30	1907 - 1978
3975WAS	IRENE MT.	4849	11854	2700	1909 - 1976
4169WAS	KENT	4723	12214	40	1912 - 1976
4394WAS	LAKE CLE ELUM	4715	12104	2255	1908 - 1976
4406WAS	LAKE KACHESS	4716	12112	2270	1908 - 1976
4414WAS	LAKE KEECHELUS	4719	12120	2475	1908 - 1976
4486WAS	LANDSBURG	4716	12112	2270	1903 - 1976
4549WAS	LAURIER	4900	11814	1644	1910 - 1976
4572WAS	LEAVENWORTH	4736	12039	1163	1914 - 1976
5832WAS	NESPELEM	4808	11859	1890	1915 - 1976
6039WAS	ODESSA	4720	11840	1540	1903 - 1976
6096WAS	OLGA	4837	12248	80	1890 - 1976
6109WAS	OLYMPIA	4703	12254	69	1877 - 1955
6610WAS	POMEROY	4628	11737	1810	1891 - 1976
6678WAS	PORT TOWNSEND	4807	12326	99	1873 - 1976
6768WAS	PROSSER 4	4615	11945	903	1913 - 1976
6803WAS	PUYALLUP	4712	12220	50	1914 - 1976
6864WAS	QUINAULT	4728	12351	220	1906 - 1976
6896WAS	RAINIER OHANAPECOSH	4644	12134	1925	1909 - 1976
7038WAS	RIMROCK	4639	12108	2730	1908 - 1976

ID#	Station Name	Lat.	Long.	Elevn. (ft.)	Record Length
7059WAS	RITZVILLE	4707	11822	1830	1899 - 1977
7478WAS	SEATTLE UNIV.	4739	12217	96	1909 - 1976
7483WAS	SEATTLE AIRPORT	4732	12216	14	1878 - 1965
7507WAS	SEDRO WOOLEY	4830	12214	50	1896 - 1976
7773WAS	SNOQUALMIE FALLS	4733	12151	440	1898 - 1976
8207WAS	SUNNYSIDE	4619	12000	747	1894 - 1976
8442WAS	TIETON INTAKE	4640	12100	2280	1908 - 1971
8773WAS	VANCOUVER	4541	12239	210	1898 - 1976
8802WAS	VASHON ISLAND	4727	12230	231	1887 - 1955
8931WAS	WALLA WALLA	4603	11824	800	1873 - 1978
9012WAS	WATERVILLE	4739	12004	2620	1890 - 1976
9074WAS	WENATCHEE	4725	12019	634	1912 - 1976
9238WAS	WILBUR	4745	11842	2160	1900 - 1976
9342WAS	WIND RIVER	4548	12156	1150	1911 - 1976
9376WAS	WINTHROP	4828	12011	1755	1909 - 1976
WYOMING					
0140WYO	ALTA	4346	11102	6431	1909 - 1978
0540WYO	BASIN	4423	10803	3837	1898 - 1977
0915WYO	BORDER	4215	11102	6120	1902 - 1978
1610WYO	CENTENNIAL	4118	10609	8074	1911 - 1968
1730WYO	CHUGWATER	4145	10449	5282	1900 - 1978
1840WYO	CODY	4433	10904	4990	1911 - 1978
1905WYO	COLONY	4456	10412	3553	1914 - 1978
2415WYO	DEAVER	4453	10836	4105	1916 - 1978
2595WYO	DIVERSION DAM	4314	10856	5574	1920 - 1978
2715WYO	DUBOIS	4333	10937	6917	1906 - 1978
2995WYO	ELK MOUNTAIN	4141	10625	7265	1905 - 1978
3100WYO	EVANSTON	4116	11057	6780	1899 - 1978
3490WYO	FORT LARAMIE	4223	10432	4760	1894 - 1978
3630WYO	FOXPARK	4105	10609	9045	1910 - 1978
3855WYO	GILLETTE	4417	10528	4556	1915 - 1978
4065WYO	GREEN RIVER	4132	10929	6089	1904 - 1978
4440WYO	HECLA	4109	10511	6800	1912 - 1978
4910WYO	JACKSON	4328	11046	6244	1920 - 1978
5170WYO	KIRTLEY	4250	10407	5200	1904 - 1964
5345WYO	LAKE YELLOWSTONE	4433	11024	7762	1904 - 1978
5410WYO	LARAMIE	4119	10535	7200	1890 - 1961
5770WYO	LOVELL	4450	10824	3837	1909 - 1978
5830WYO	LUSK	4246	10426	5000	1889 - 1978
6660WYO	NEWCASTLE	4351	10413	4265	1918 - 1978
7105WYO	PATHFINDER DAM	4228	10651	5930	1899 - 1978
7115WYO	PAVILLION	4315	10841	5440	1920 - 1978
7235WYO	PINE BLUFFS	4111	10404	5045	1900 - 1978
7380WYO	POWELL	4445	10846	4378	1907 - 1978
7760WYO	RIVERTON	4301	10823	4954	1918 - 1978
7990WYO	SARATOGA	4127	10648	6790	1906 - 1978
8160WYO	SHERIDAN FIELD STATION	4451	10652	3800	1917 - 1978
8385WYO	SOUTH PASS CITY	4228	10848	7875	1909 - 1978
9905WYO	YELLOWSTONE PARK	4458	11042	6230	1889 - 1978

Table 5

WESTERN UNITED STATES LONG-TERM TEMPERATURE DATA

DATA BANK SUMMARY

Starting dates	No. of stations	Starting dates	Cumulative
1910-1920	122	< 1920	358
1900-1909	121	< 1910	236
1890-1899	75	< 1900	115
1880-1889	26	< 1890	40
1870-1879	11	< 1880	14
1860-1869	0	< 1870	3
1850-1859	3	< 1860	3

WESTERN UNITED STATES LONG-TERM PRECIPITATION DATA

DATA BANK SUMMARY

Starting dates	No. of stations	Starting dates	Cummulative
1910 - 1919	126	< 1920	496
1900 - 1909	167	< 1910	370
1890 - 1899	87	< 1900	203
1880 - 1889	45	< 1890	116
1870 - 1879	58	< 1880	71
1860 - 1869	8	< 1870	13
1850 - 1859	5	< 1860	5

Figure 11

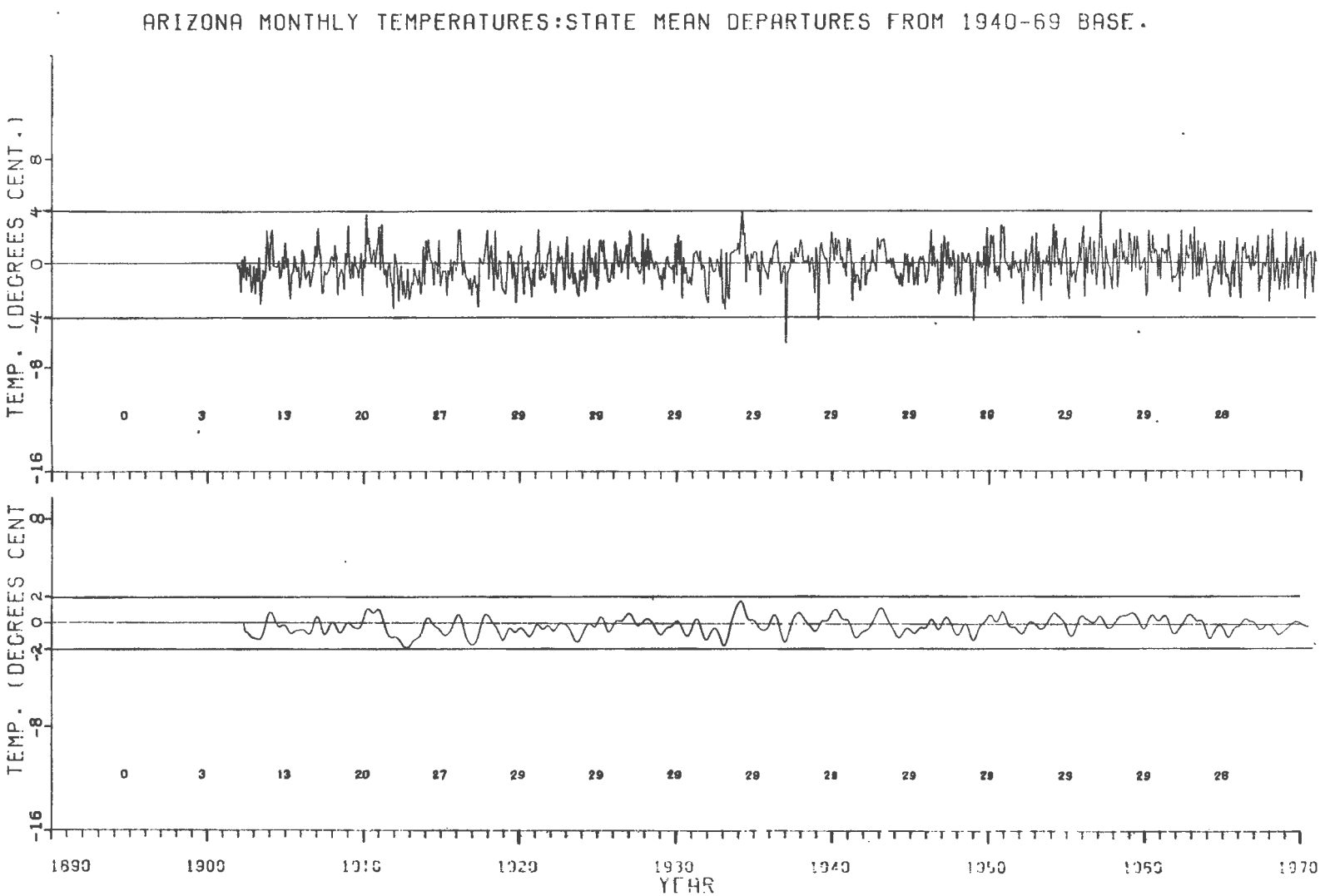


Figure 11

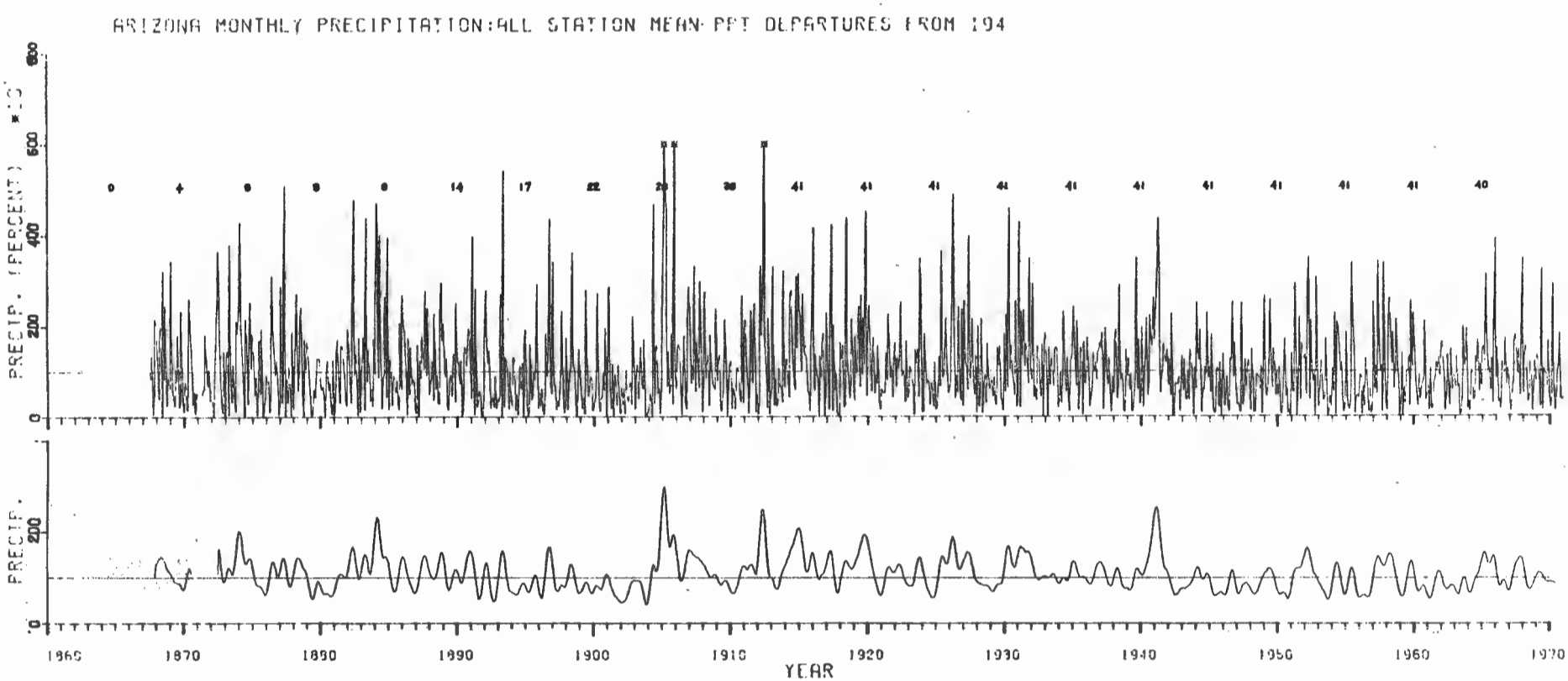

ARIZONA MONTHLY PRECIPITATION:ALL STATION MEAN PCT DEPARTURES FROM 194
PRECIP. (PERCENT)
PRECIP. (PERCENT)
0
200
400
600
800
1869
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEAR

Figure 12

Figure 13

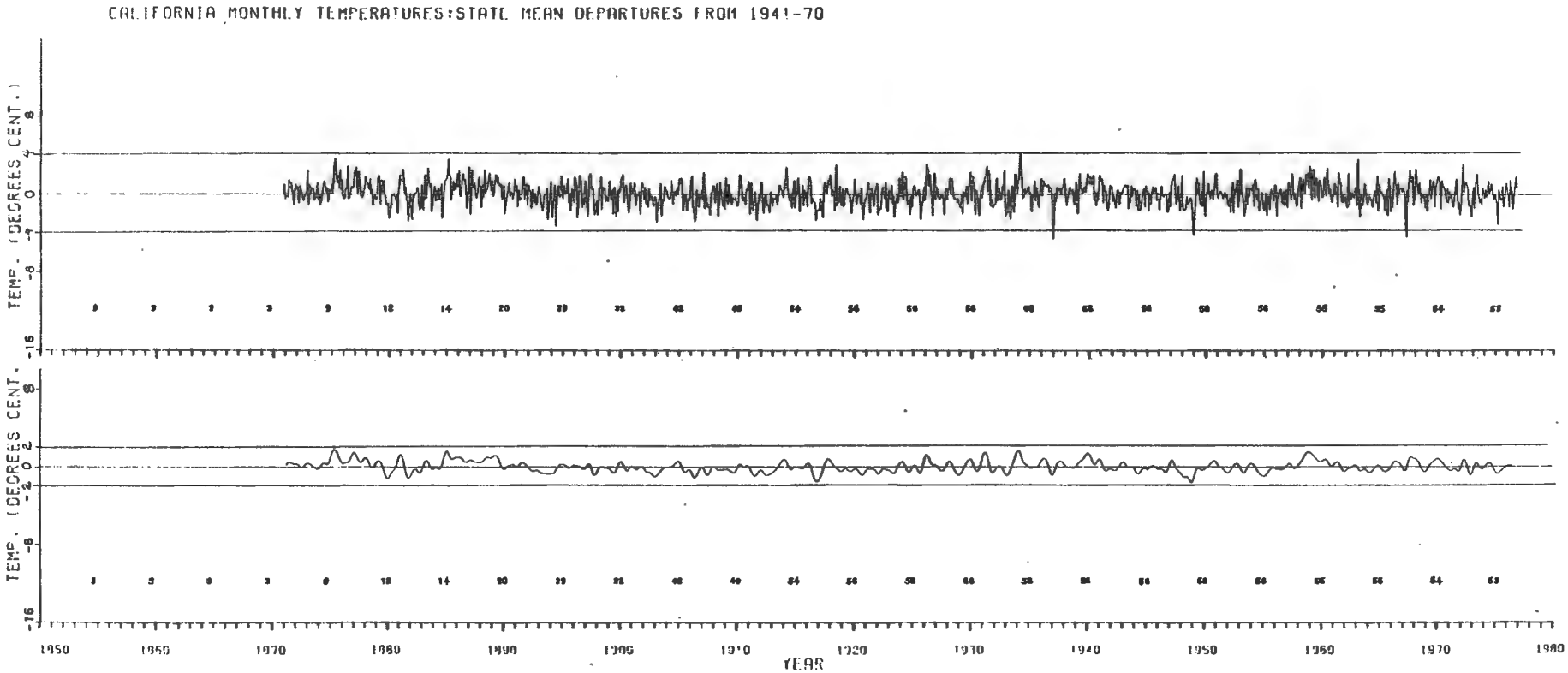


Figure 13

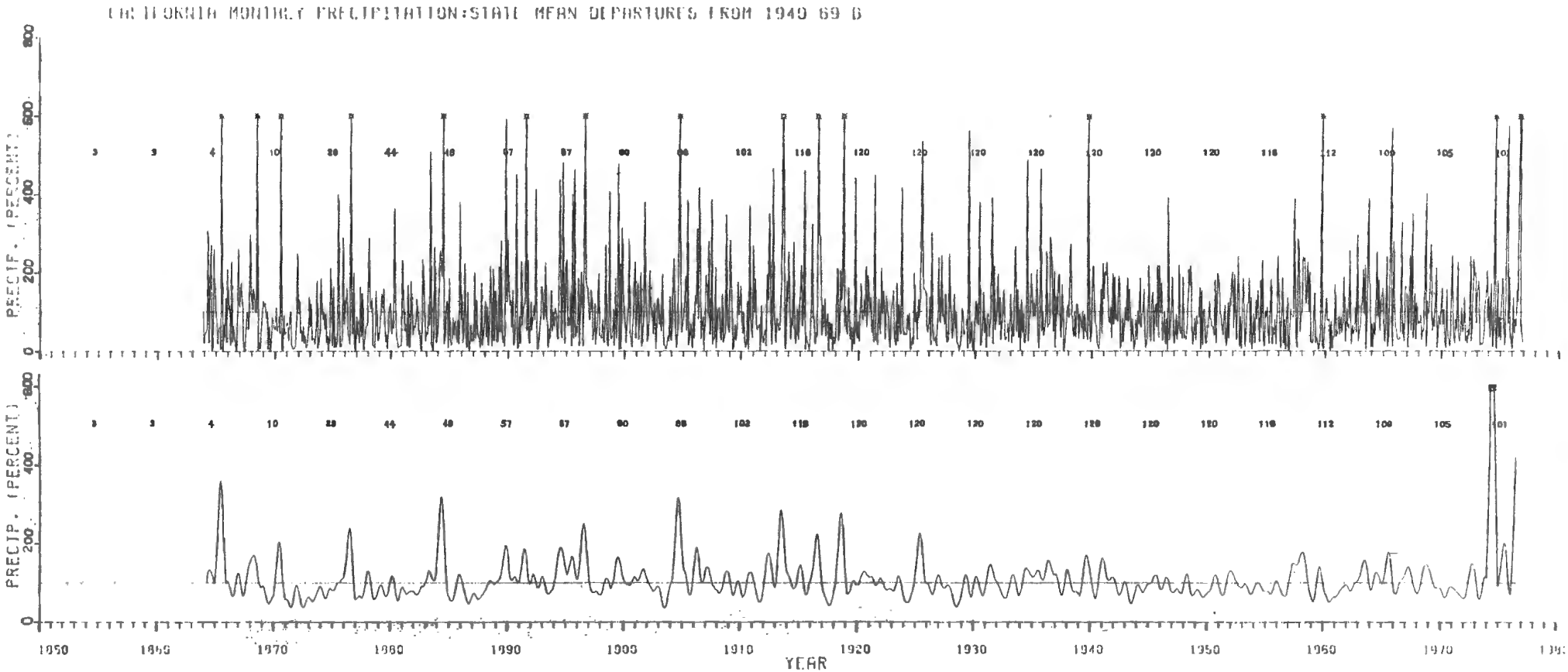

CALIFORNIA MONTHLY PRECIPITATION:STATE MEAN DEPARTURES FROM 1949 69 G
PRECIP. (PERCENT)
0
200
400
600
800
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEAR

Figure 14

Figure 15

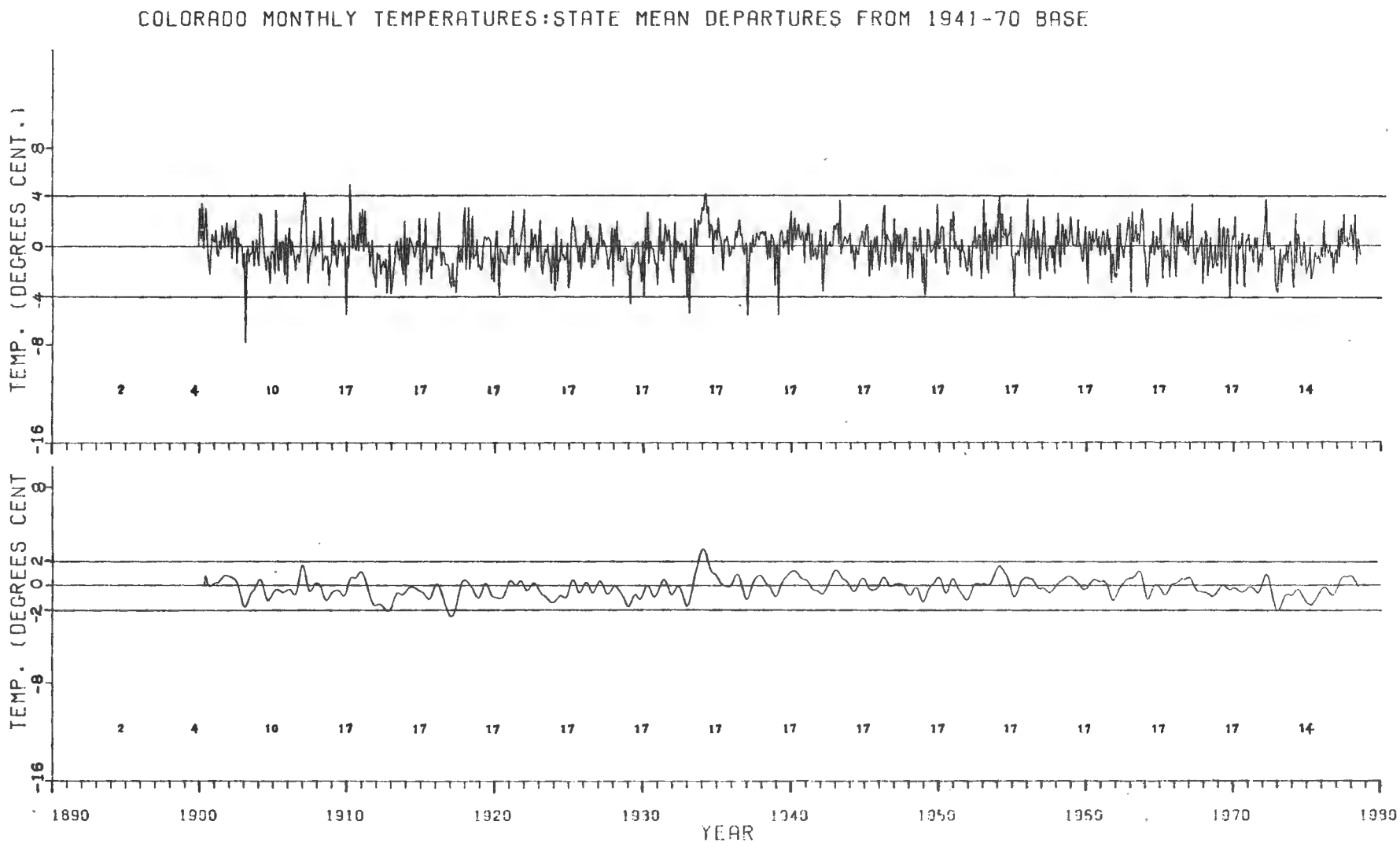


Figure 15

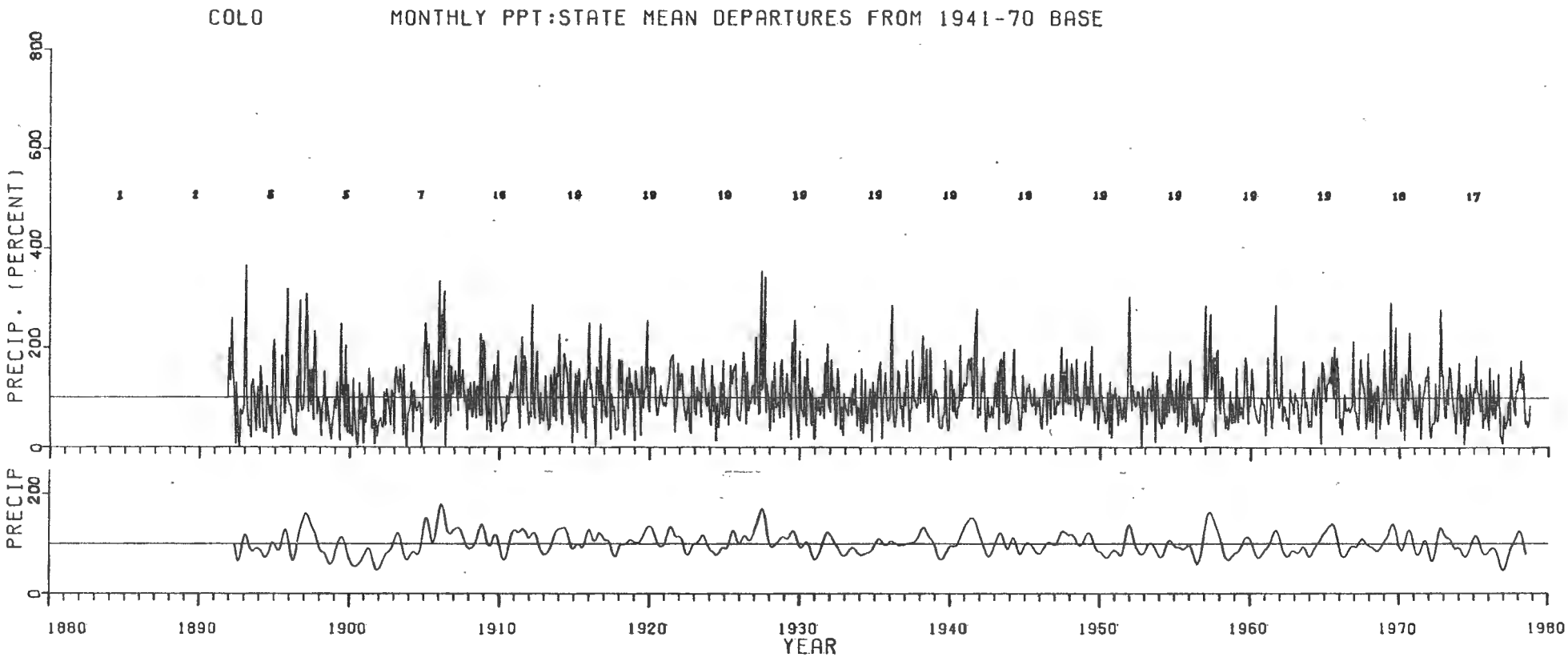

COLO
MONTHLY PPT:STATE MEAN DEPARTURES FROM 1941-70 BASE
PRECIP. (PERCENT)
800
600
400
200
0
PRECIP
200
0
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
YEAR

Figure 16

Figure 17

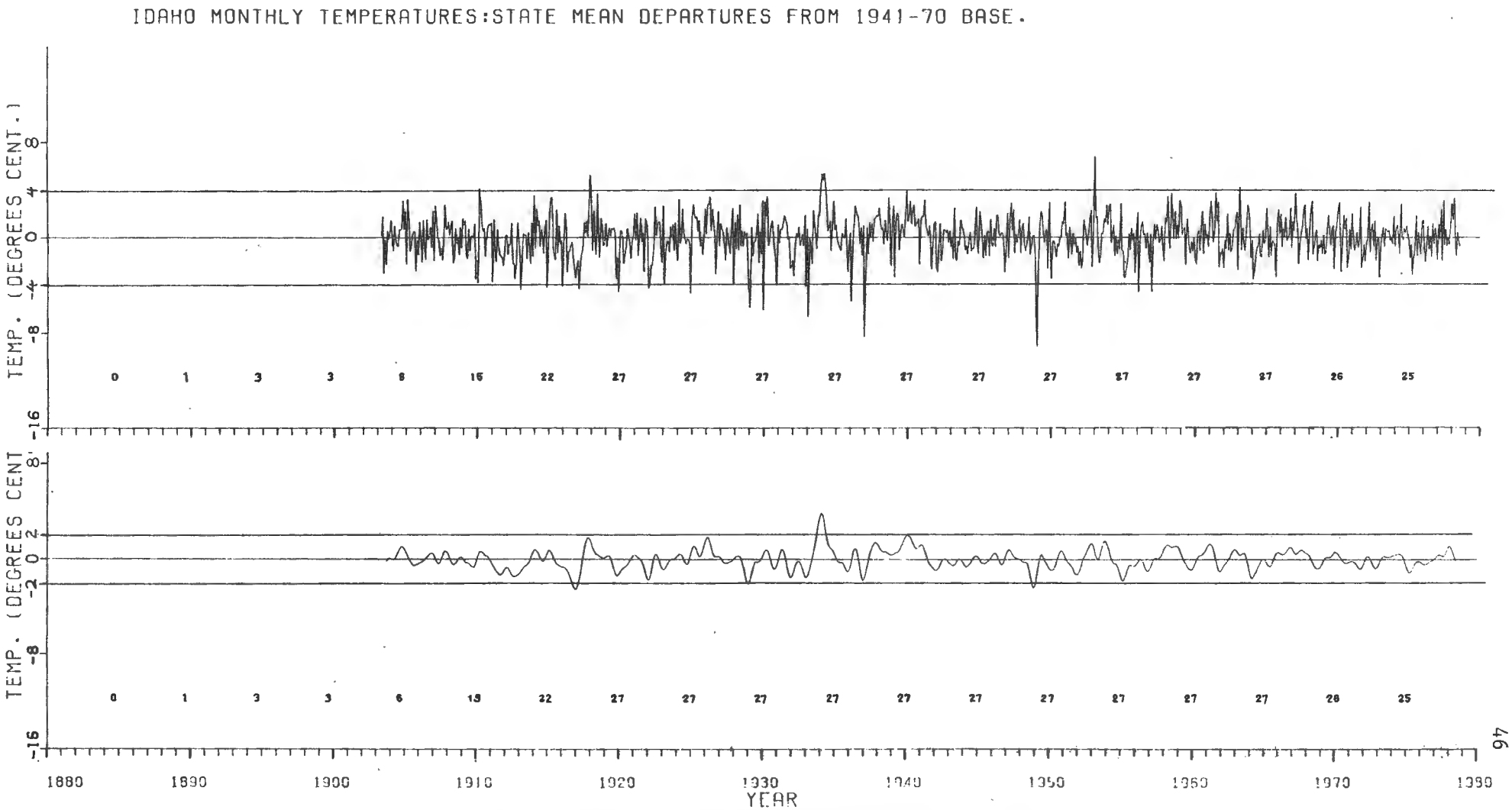


Figure 17

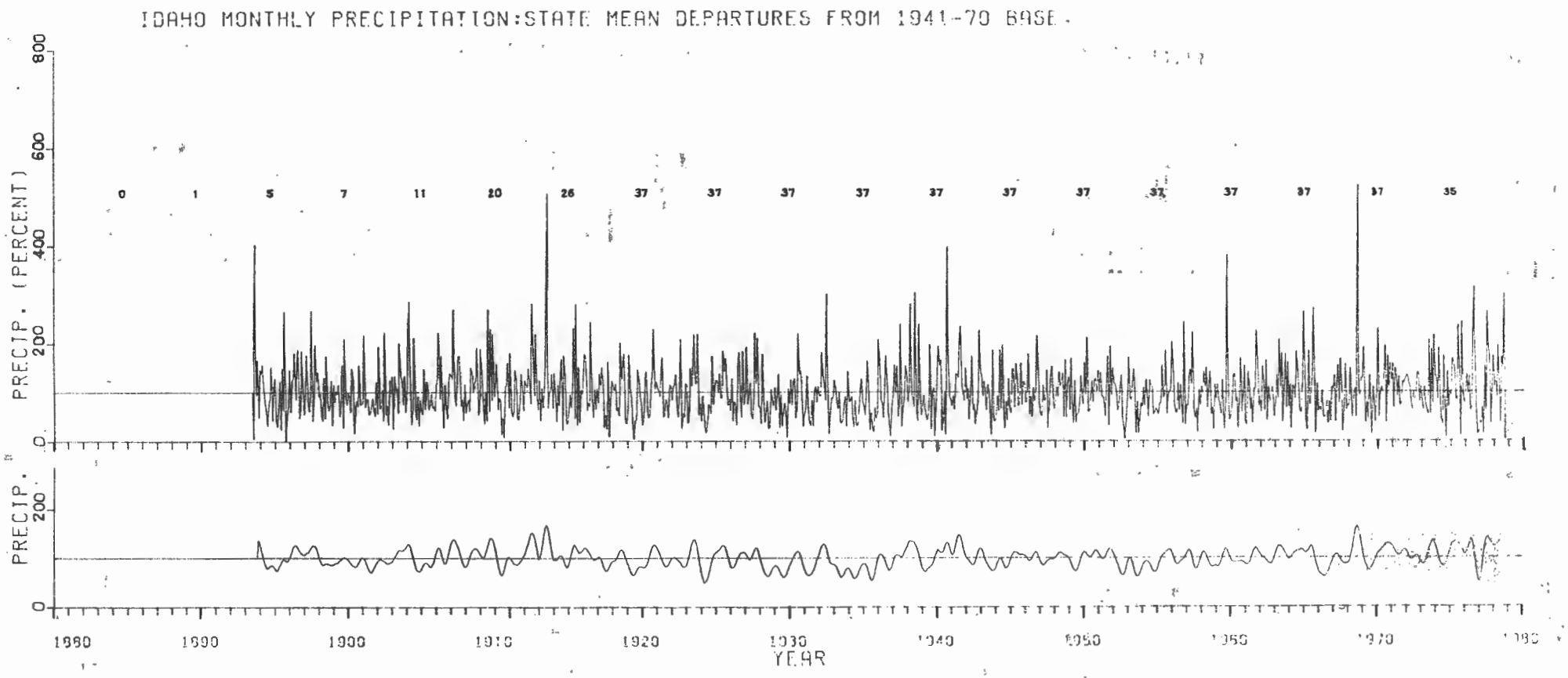

IDAHO MONTHLY PRECIPITATION:STATE MEAN DEPARTURES FROM 1941-70 BASE.
PRECIP. (PERCENT)
800
600
400
200
0
0 1 5 7 11 20 26 37 37 37 37 37 37 37 37 37 37 37 35
PRECIP.
200
0
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
YEAR

Figure 18

Figure 19

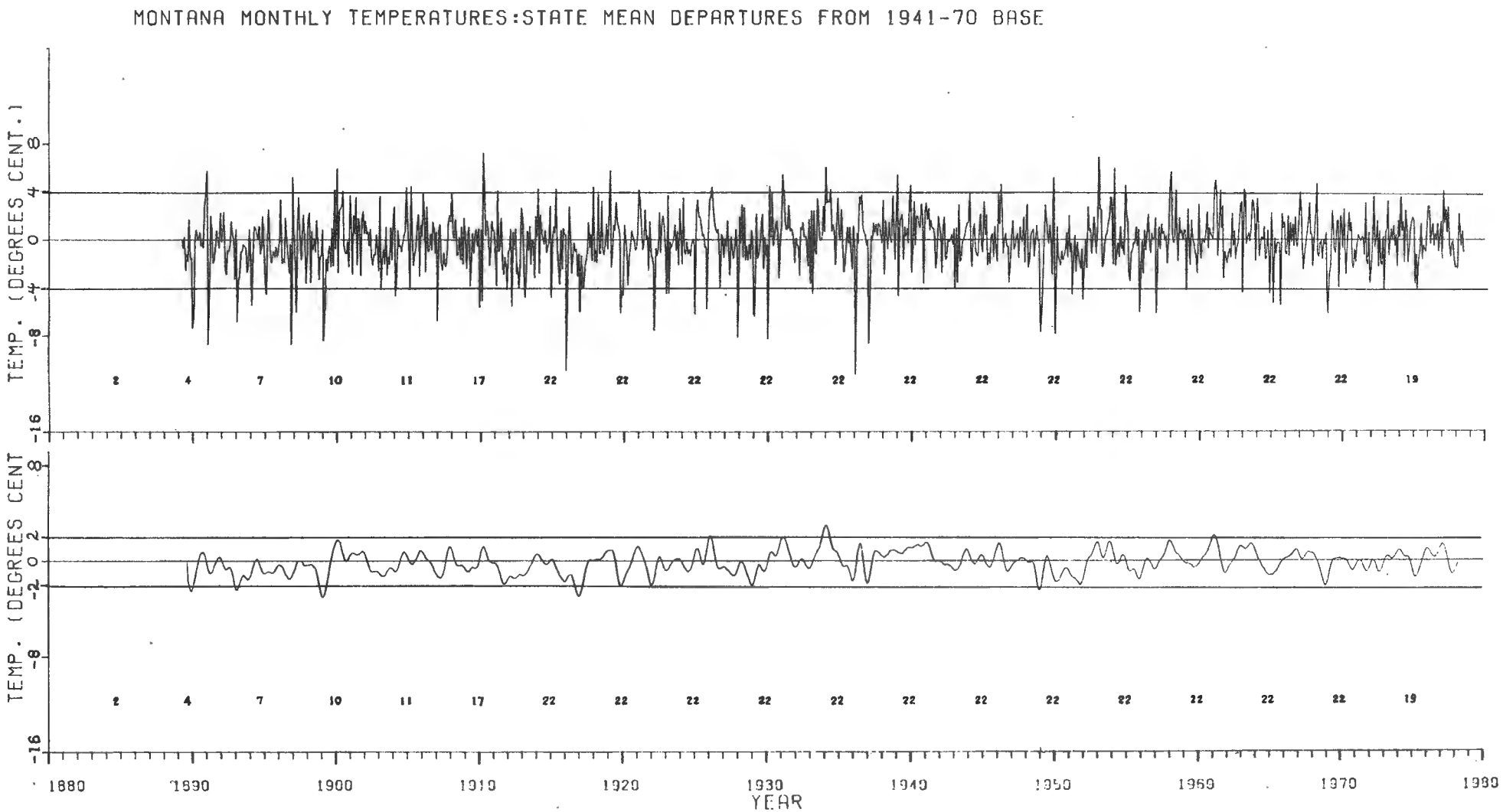


Figure 19

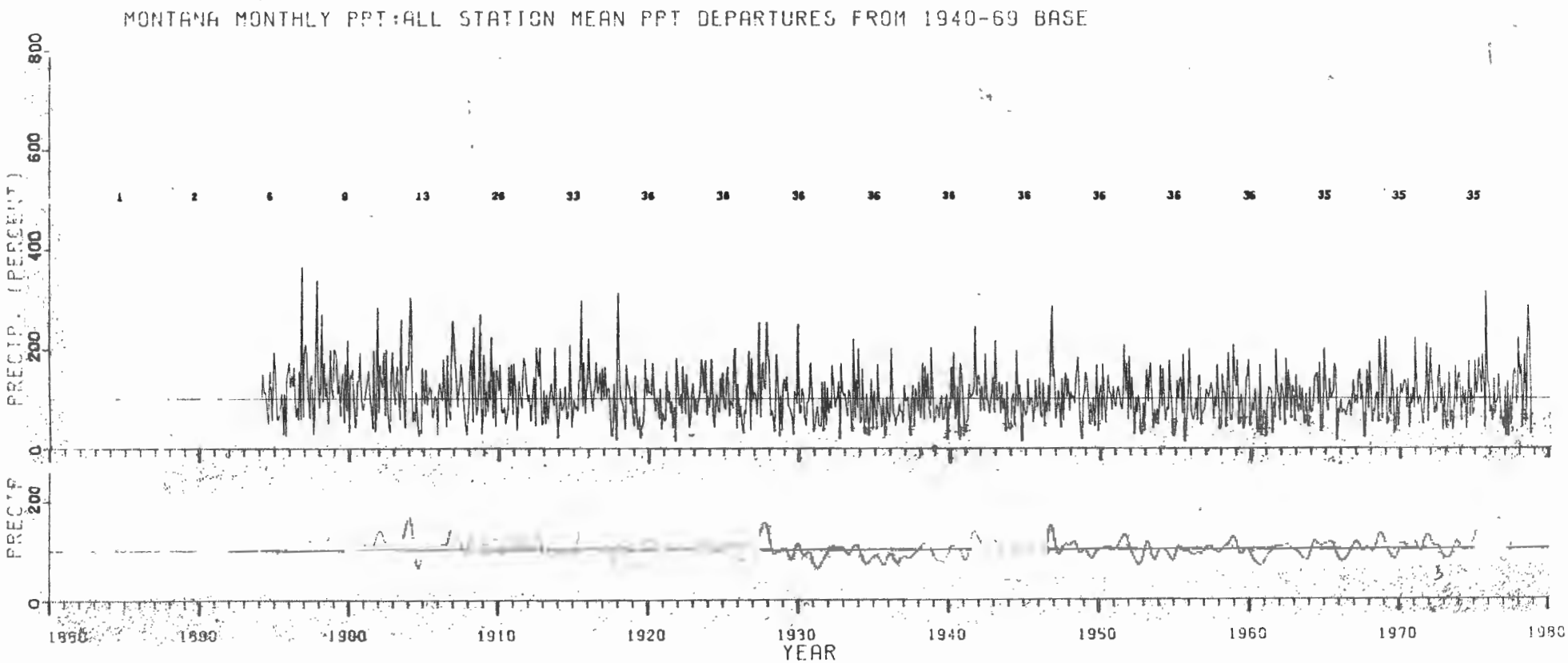

MONTANA MONTHLY PPT:ALL STATION MEAN PPT DEPARTURES FROM 1940-69 BASE
PRECIP. (PERCENT)
800
600
400
200
0
1 2 6 9 13 26 33 36 36 36 36 36 36 36 36 36 35 35 35
PRECIP
200
0
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
YEAR

Figure 20

Figure 21

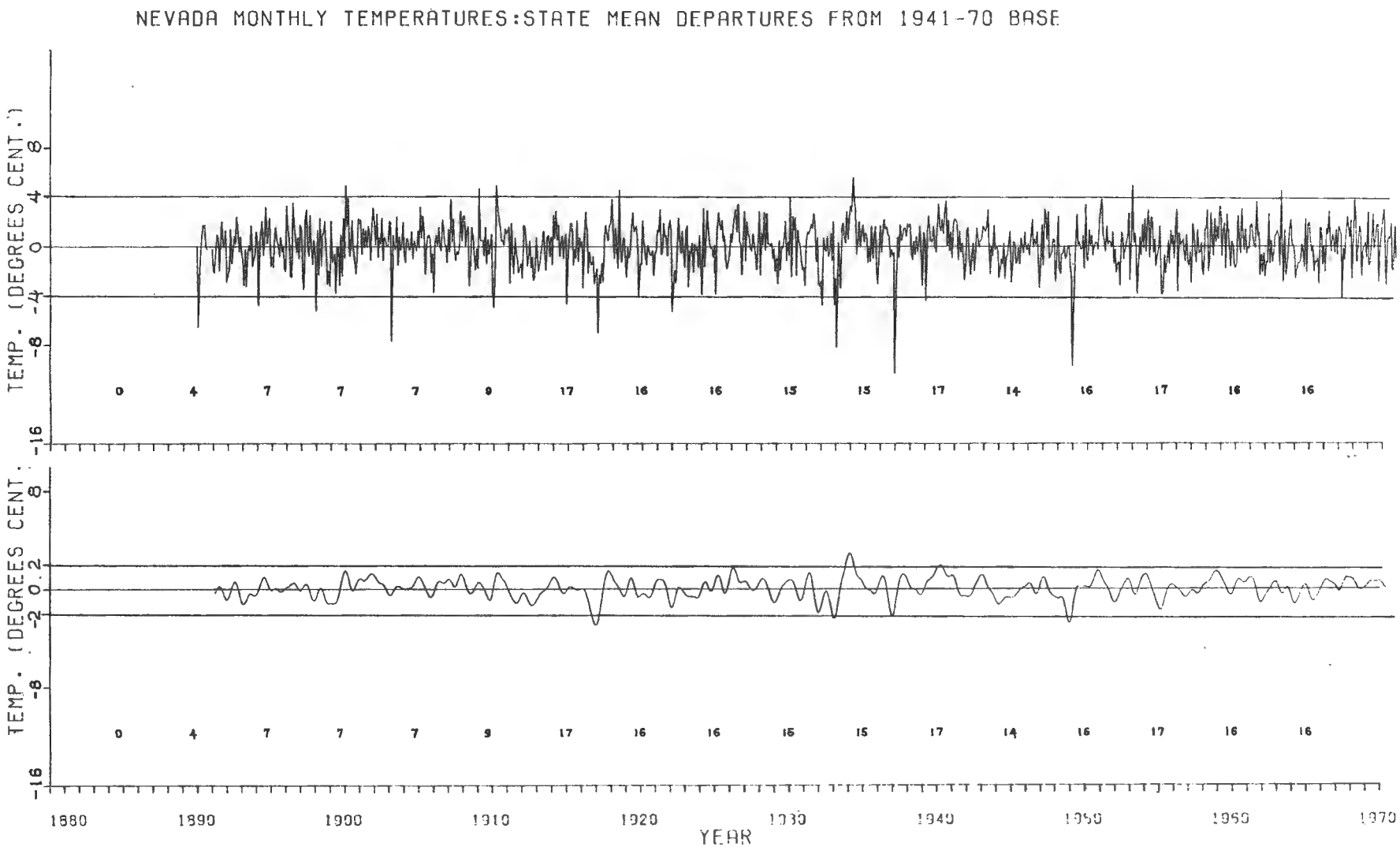


Figure 21

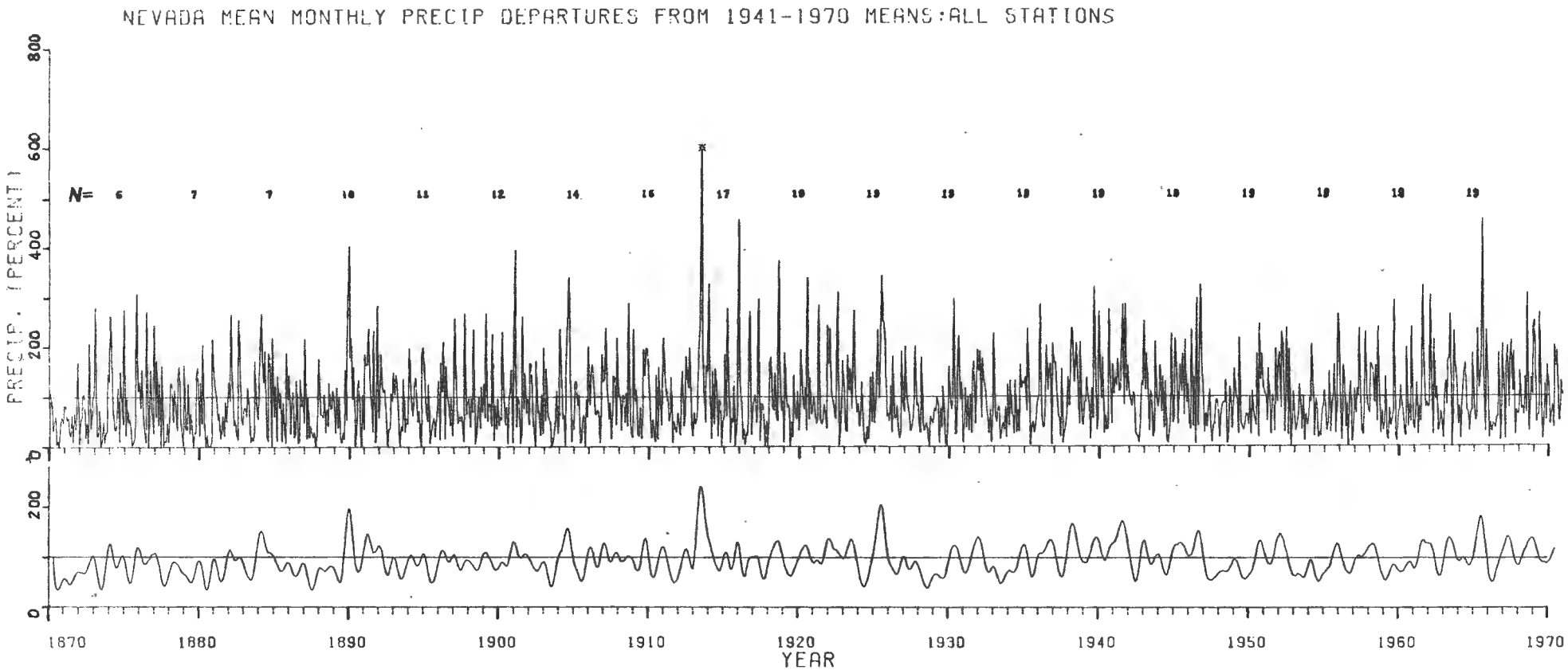

NEVADA MEAN MONTHLY PRECIP DEPARTURES FROM 1941-1970 MEANS:ALL STATIONS
PRECIP. (PERCENT)
800
600
400
200
0
N=
6
7
7
10
11
12
14
16
17
19
19
19
19
19
19
19
19
19
19
200
0
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEAR

Figure 22

Figure 23

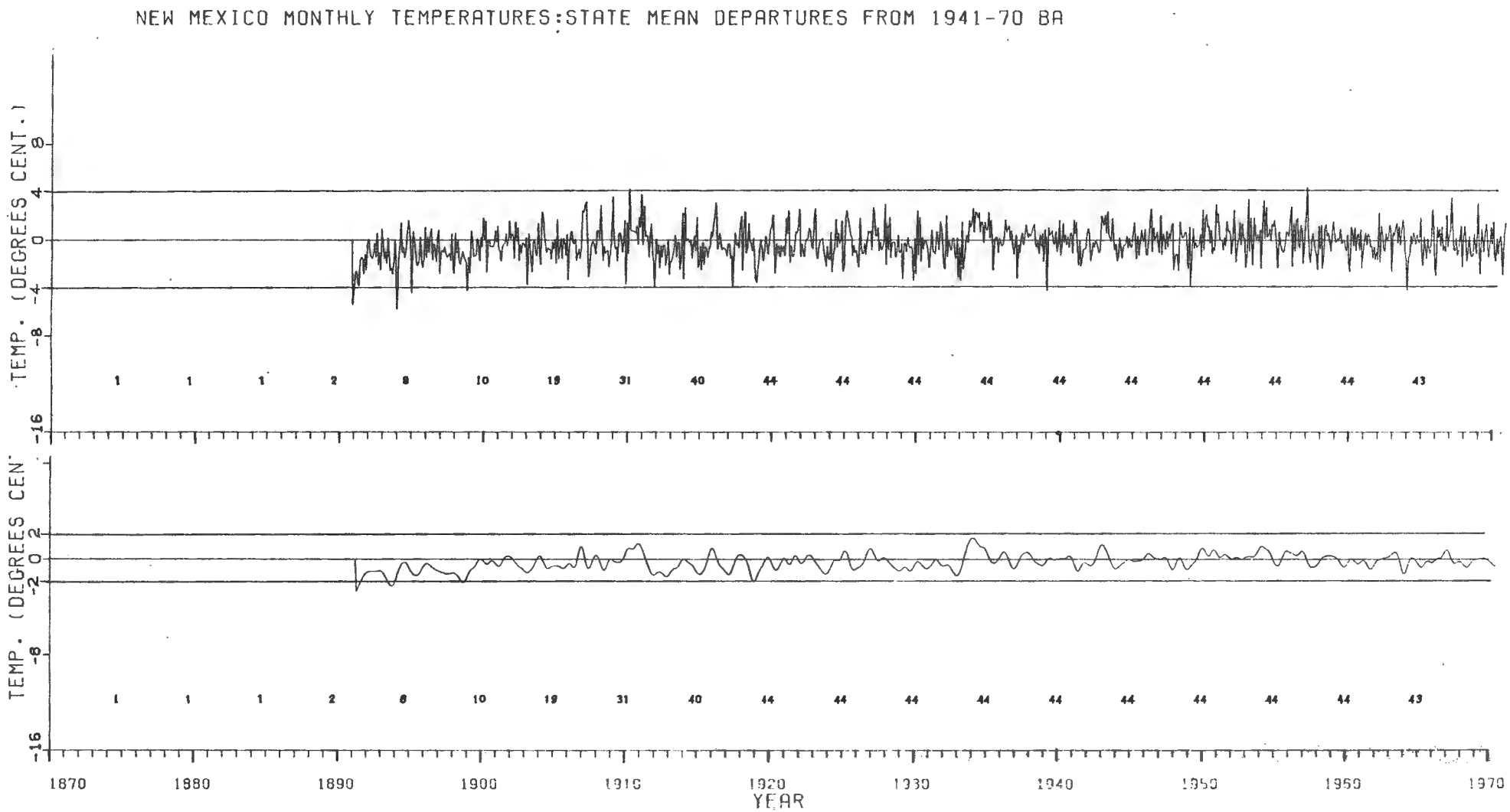


Figure 23

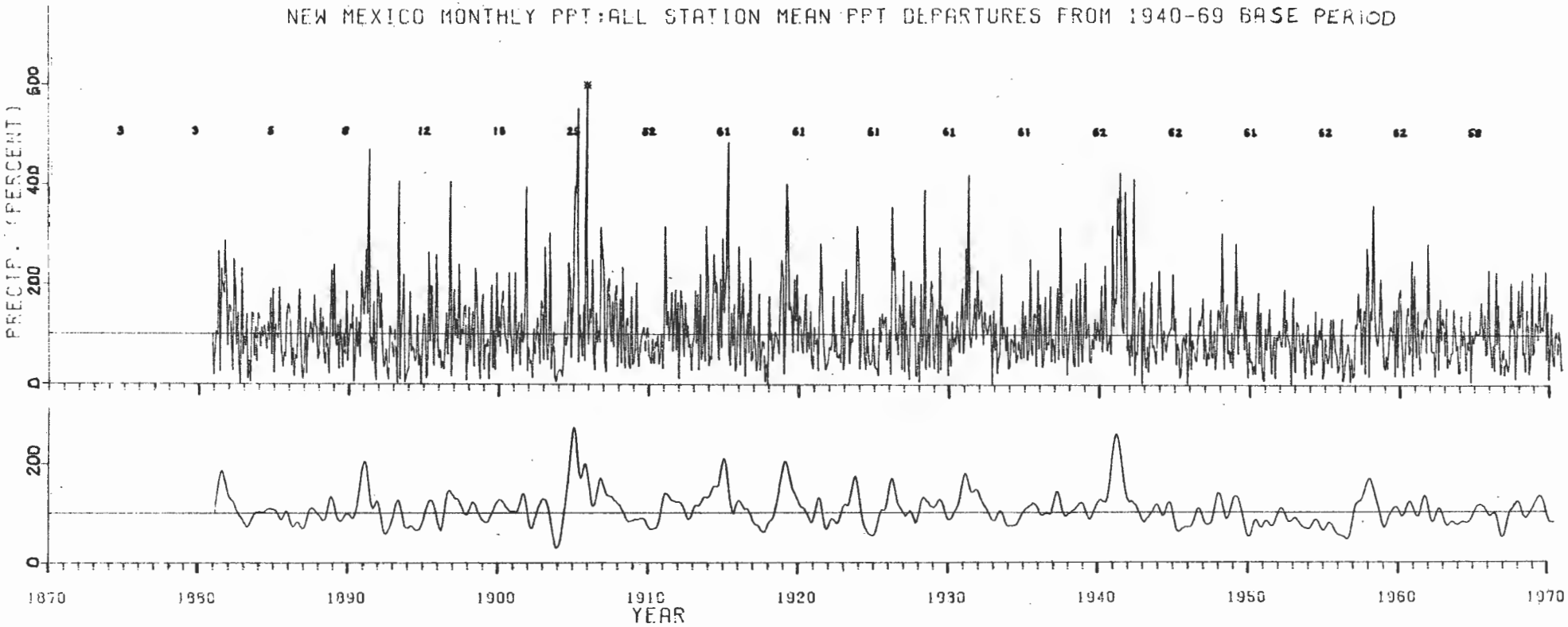
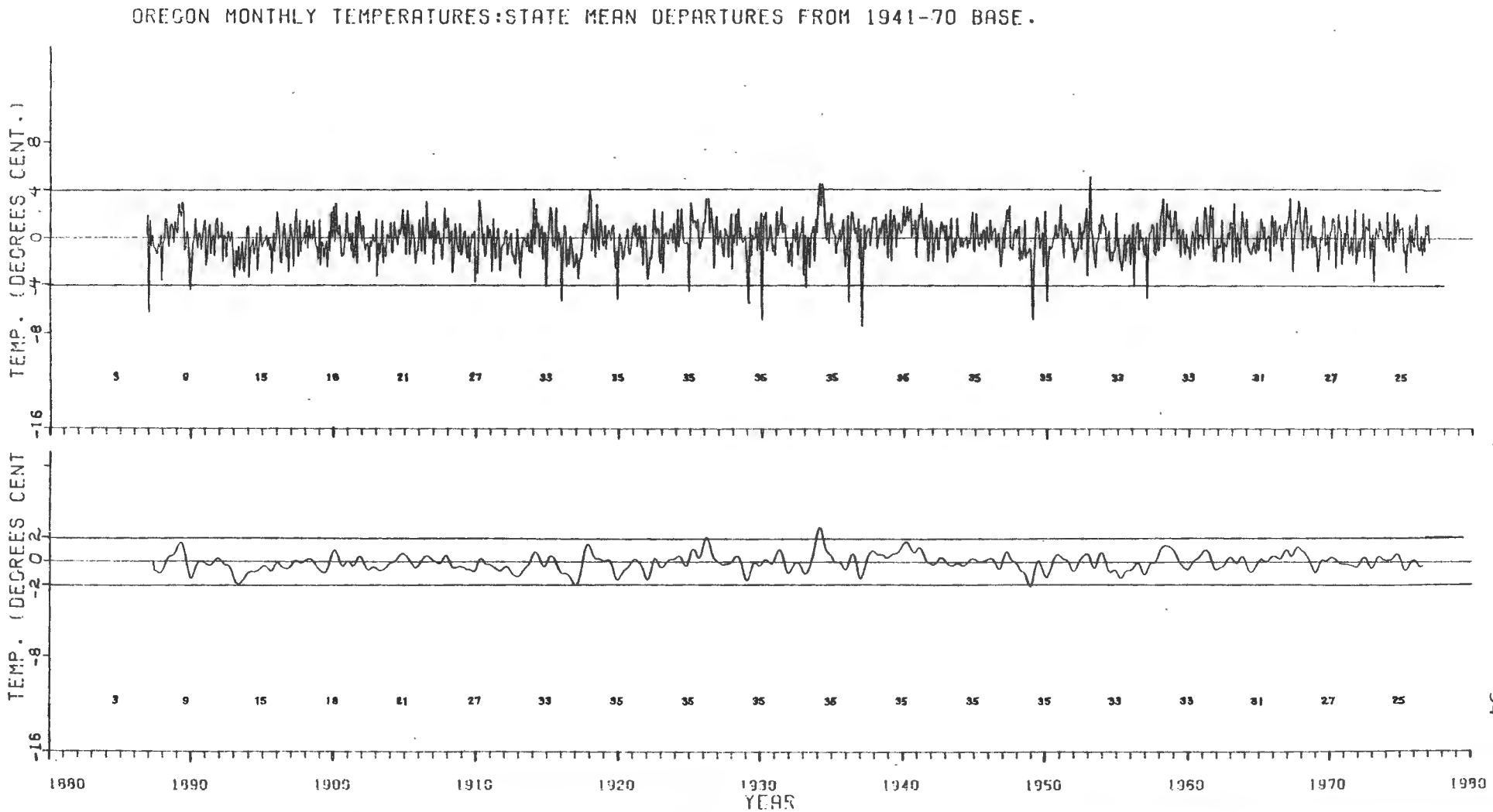

NEW MEXICO MONTHLY PPT:ALL STATION MEAN PPT DEPARTURES FROM 1940-69 BASE PERIOD
PRECIP. (PERCENT)
600
400
200
0
3 3 5 8 12 16 25 82 61 61 61 61 61 62 62 61 62 62 58
200
0
1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970
YEAR

Figure 24

Figure 25



Fi 25

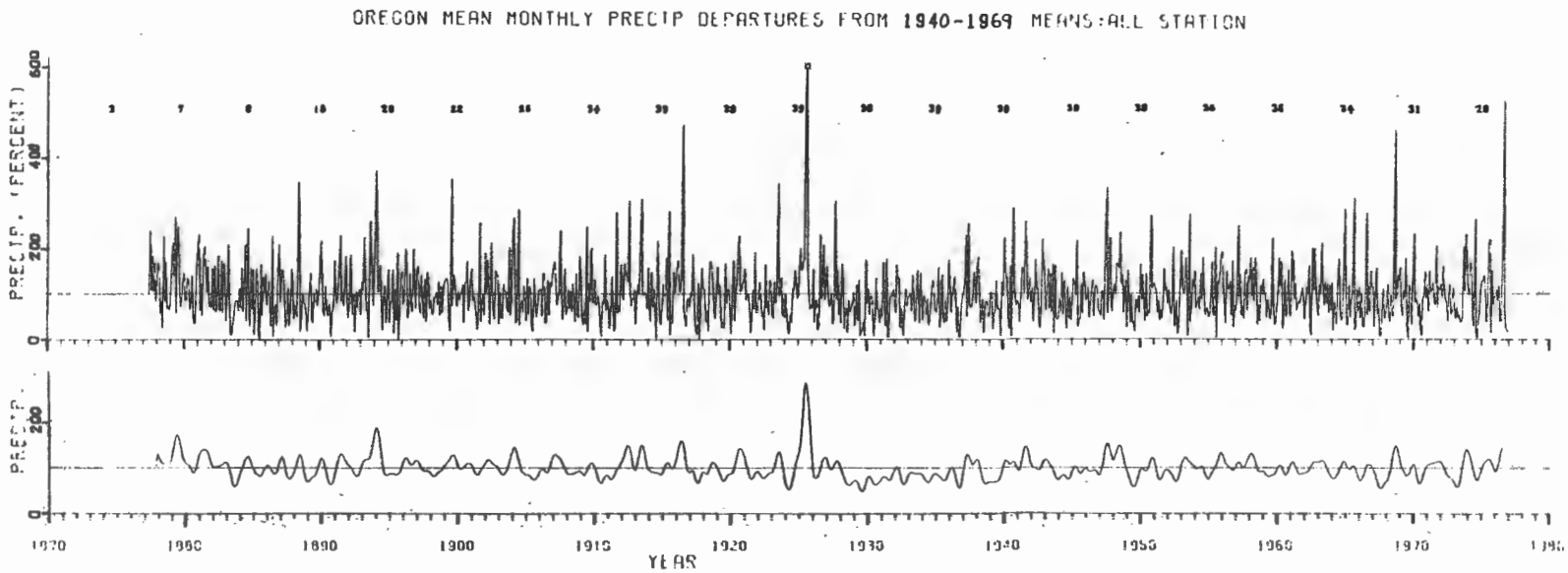

OREGON MEAN MONTHLY PRECIP DEPARTURES FROM 1940-1969 MEANS:ALL STATION
PRECIP. (PERCENT)
600
400
200
0
PRECIP.
200
0
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEAR

Figure 26

Figure 27

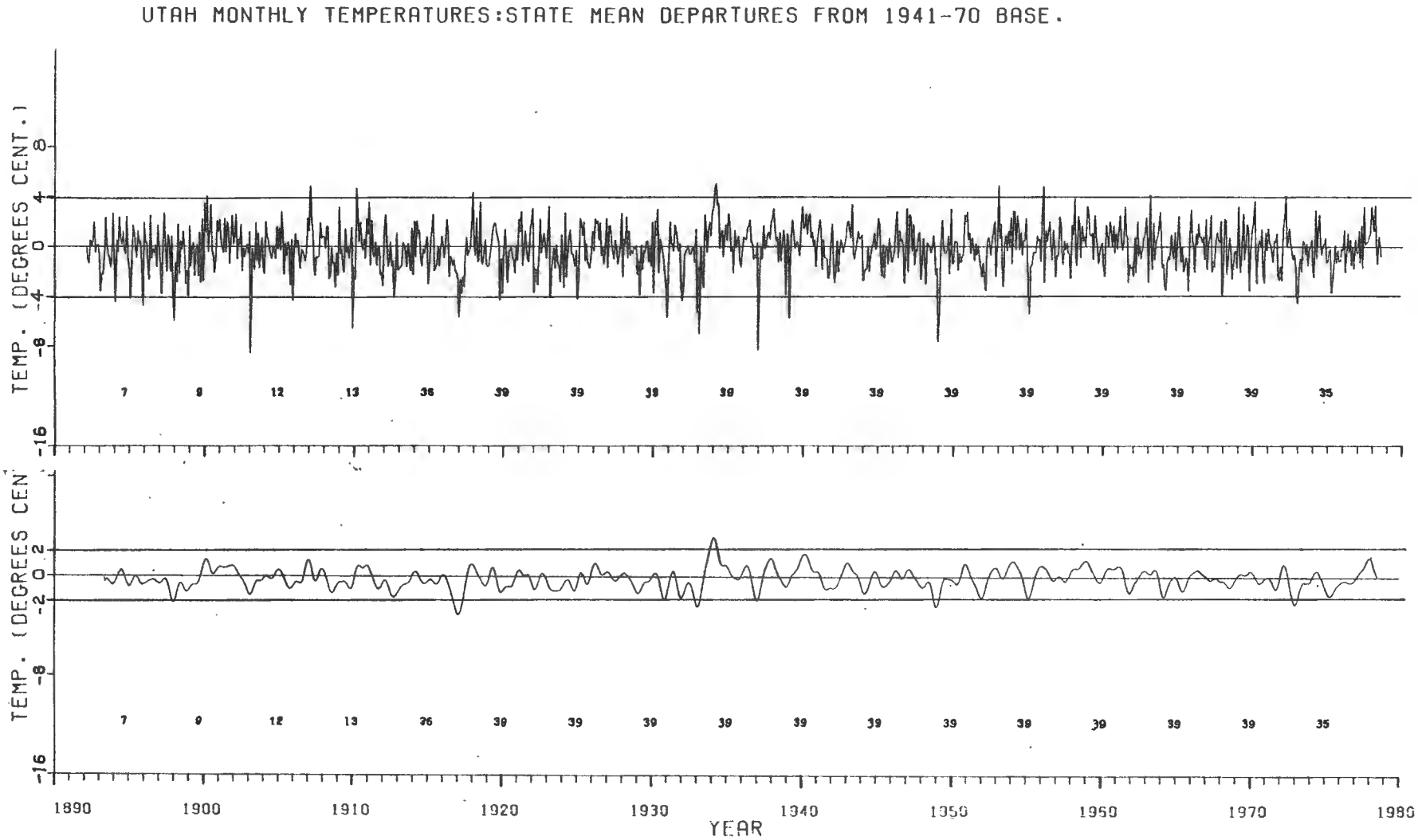


Figure 27

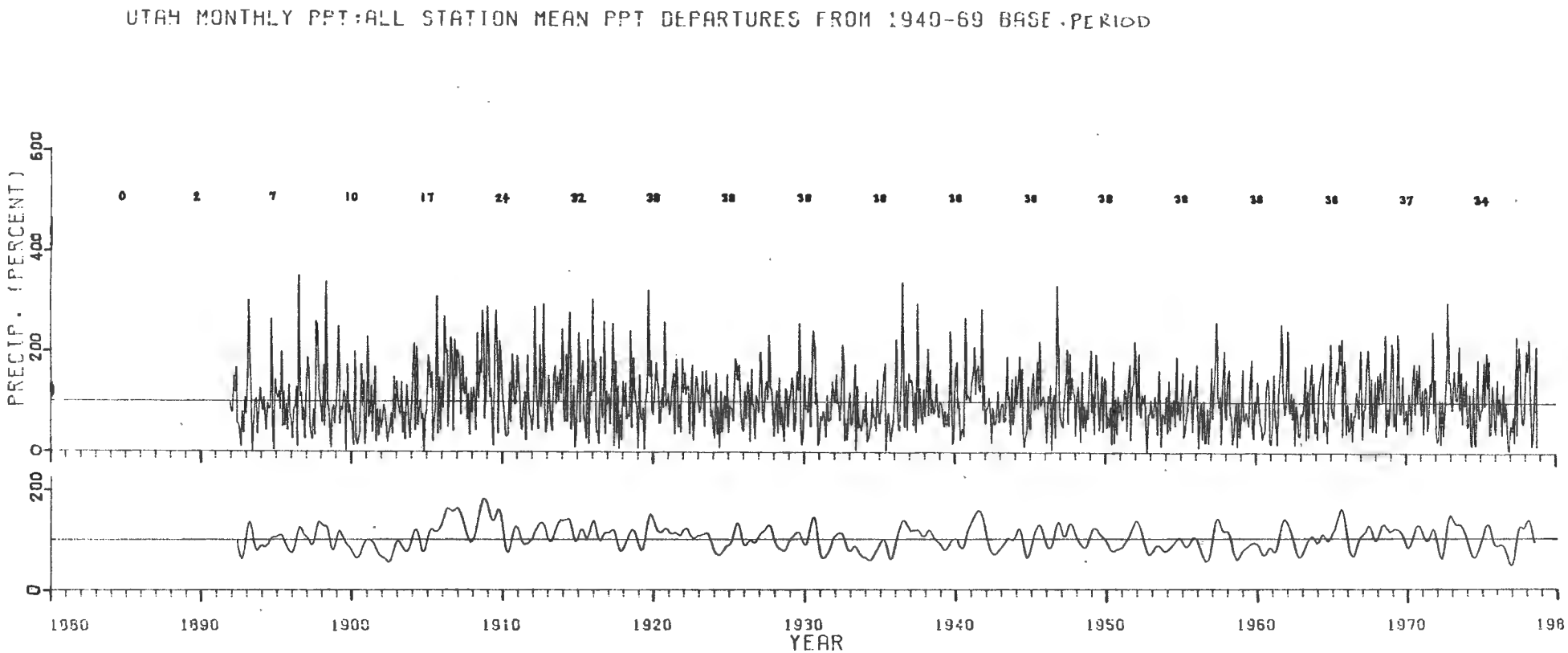

UTAH MONTHLY PPT:ALL STATION MEAN PPT DEPARTURES FROM 1940-69 BASE PERIOD
PRECIP. (PERCENT)
600
400
200
0
0 2 7 10 17 24 32 38 38 38 38 38 38 38 38 38 38 37 34
200
0
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 198
YEAR

Figure 28

Figure 29

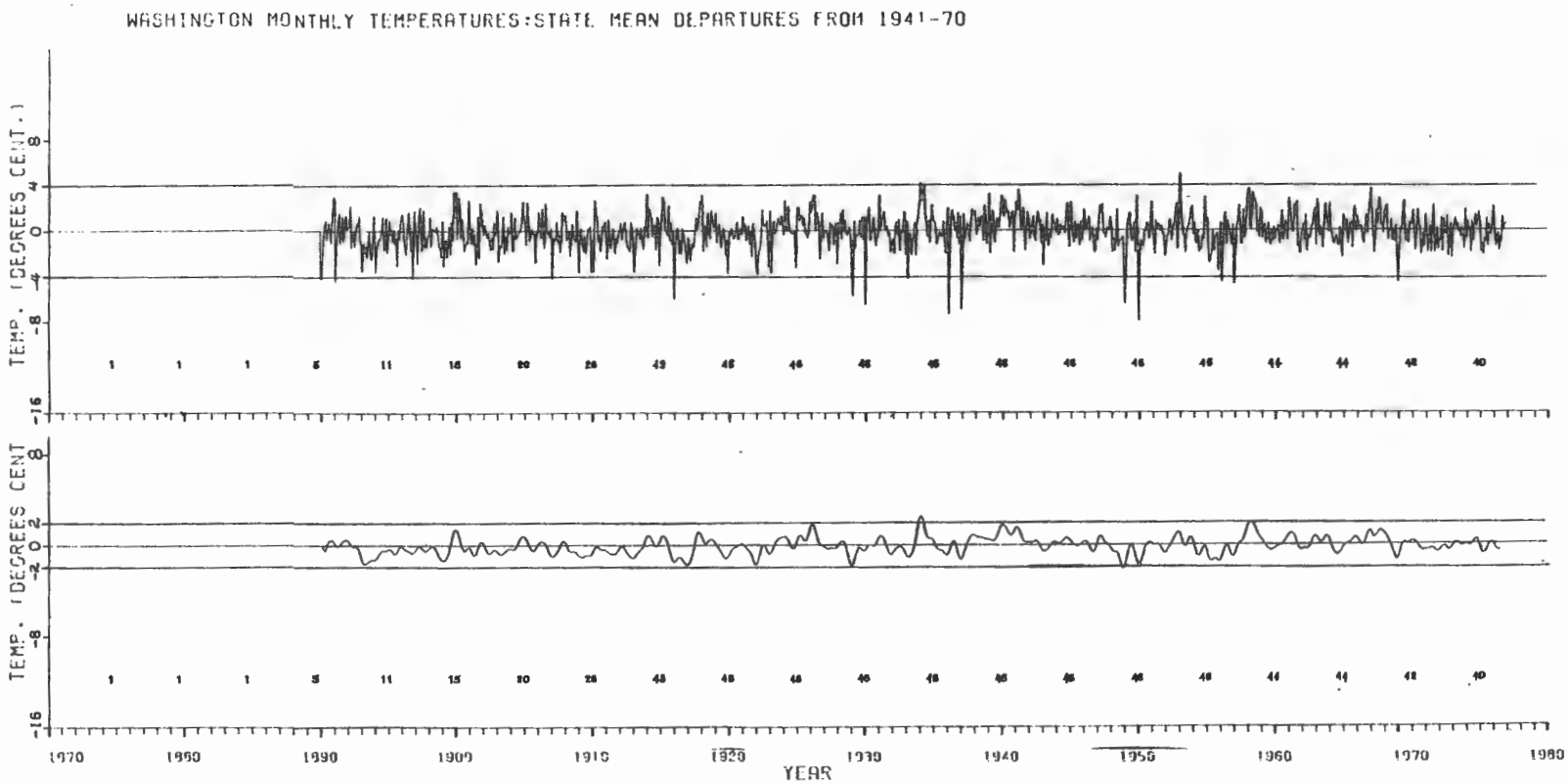


Figure 29

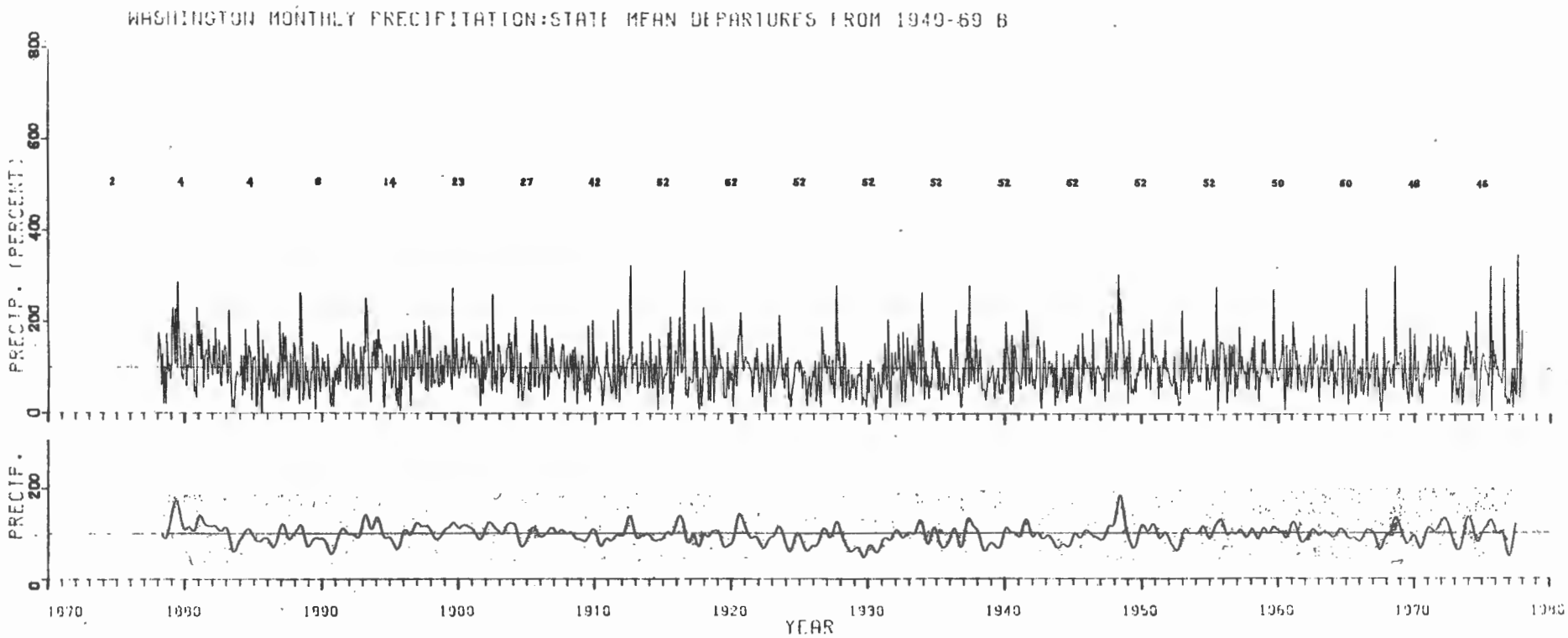

WASHINGTON MONTHLY PRECIPITATION:STATE MEAN DEPARTURES FROM 1949-69 B
PRECIP. (PERCENT)
PRECIP.
YEAR

Figure 30

Figure 31

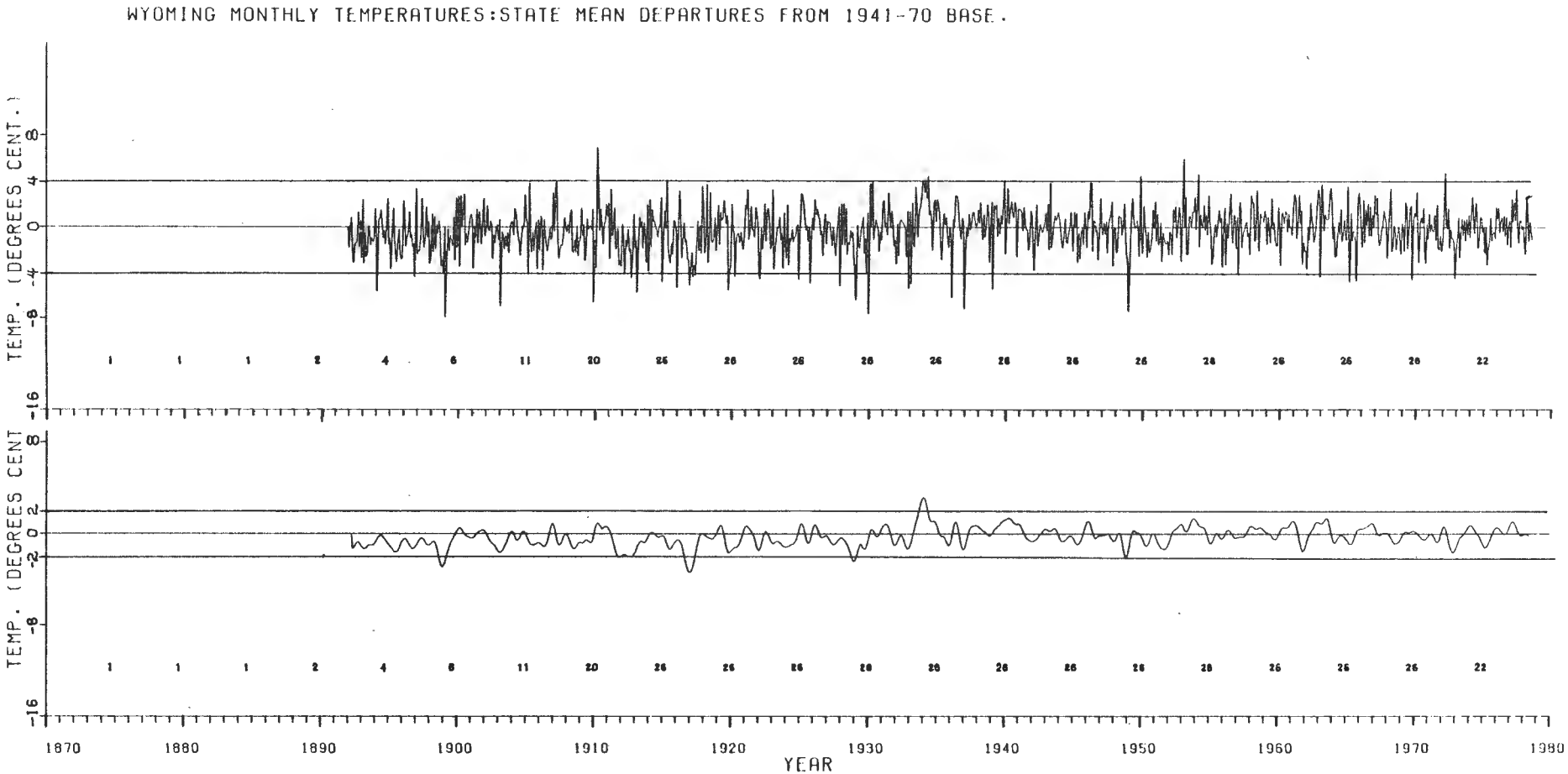


Figure 31

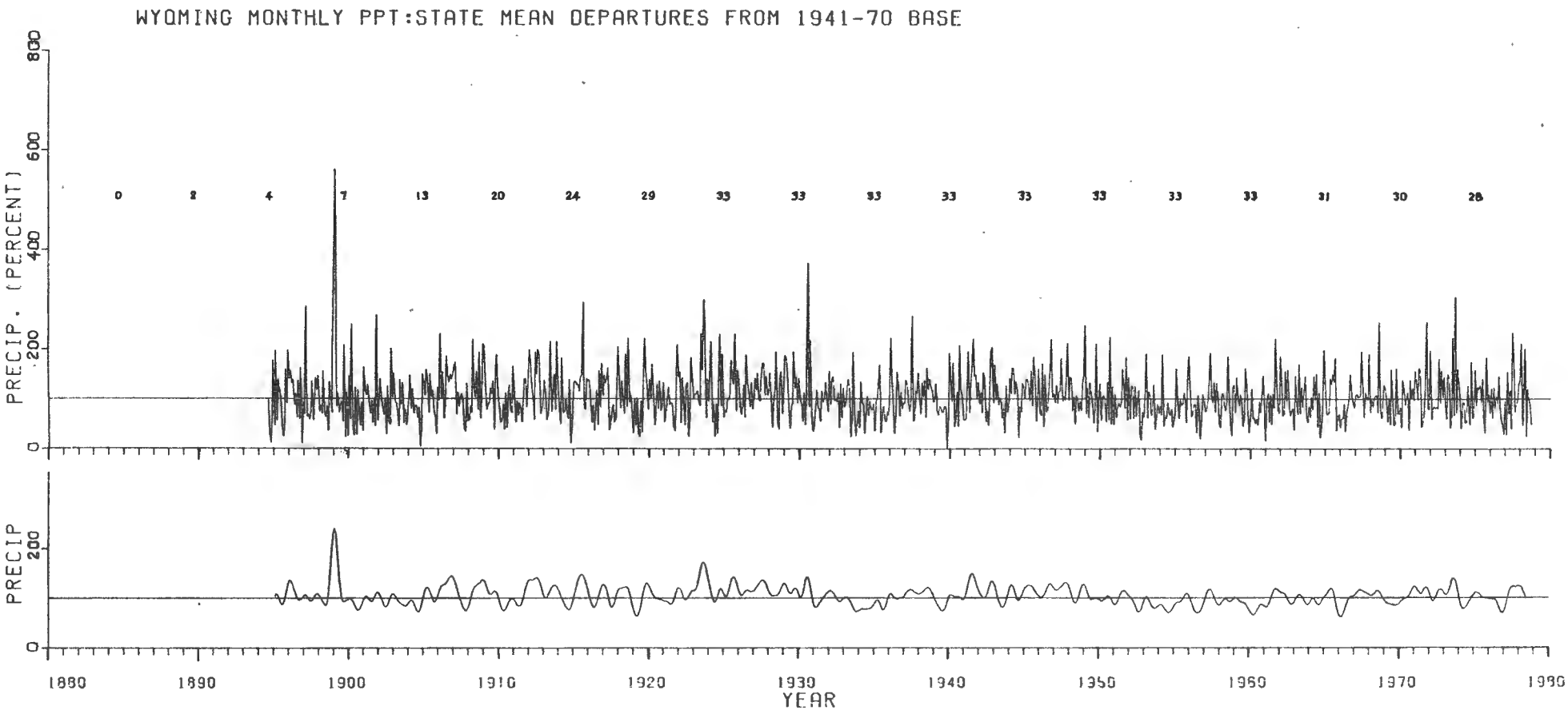

WYOMING MONTHLY PPT:STATE MEAN DEPARTURES FROM 1941-70 BASE
PRECIP. (PERCENT)
800
600
400
200
0
0 2 4 7 13 20 24 29 33 33 33 33 33 33 33 33 31 30 28
PRECIP
200
0
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
YEAR

Figure 32

ARIZONA TEMPERATURE
AVERAGE DEPARTURES FROM 1940-1969 MEANS

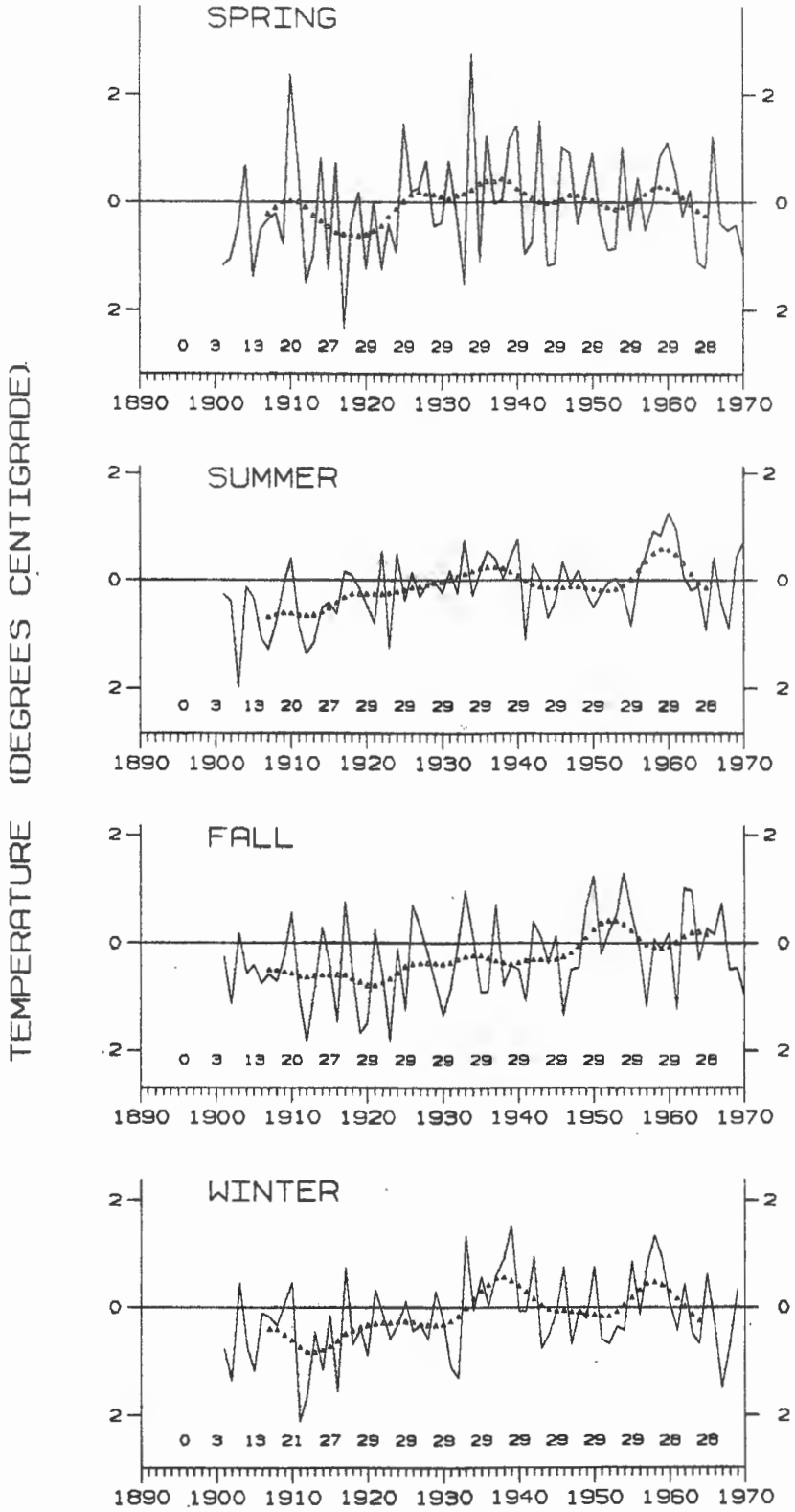


Figure 33

ARIZONA PRECIPITATION
PERCENT DEPARTURES FROM 1941-1970 MEANS

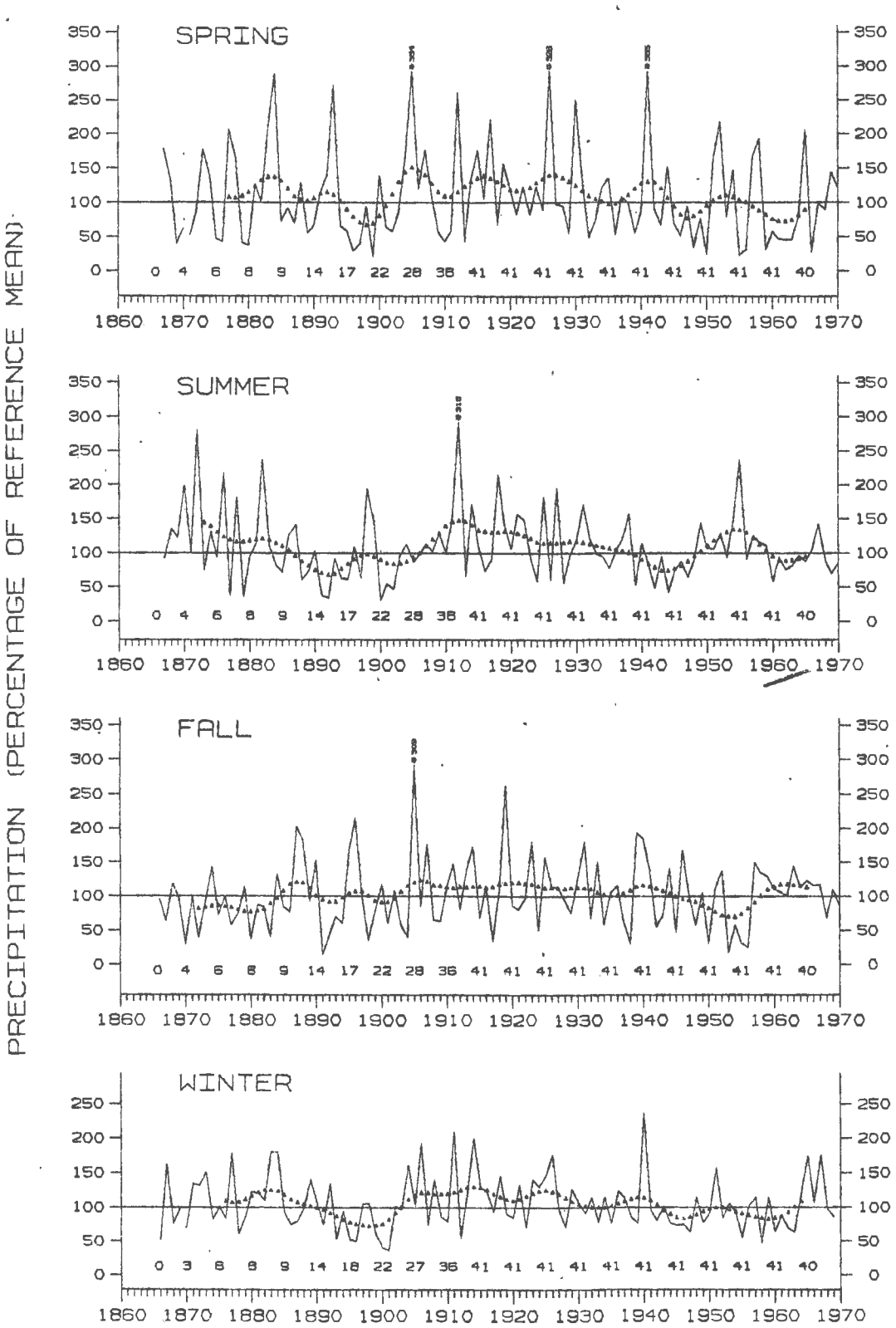


Figure 34

CALIFORNIA TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS

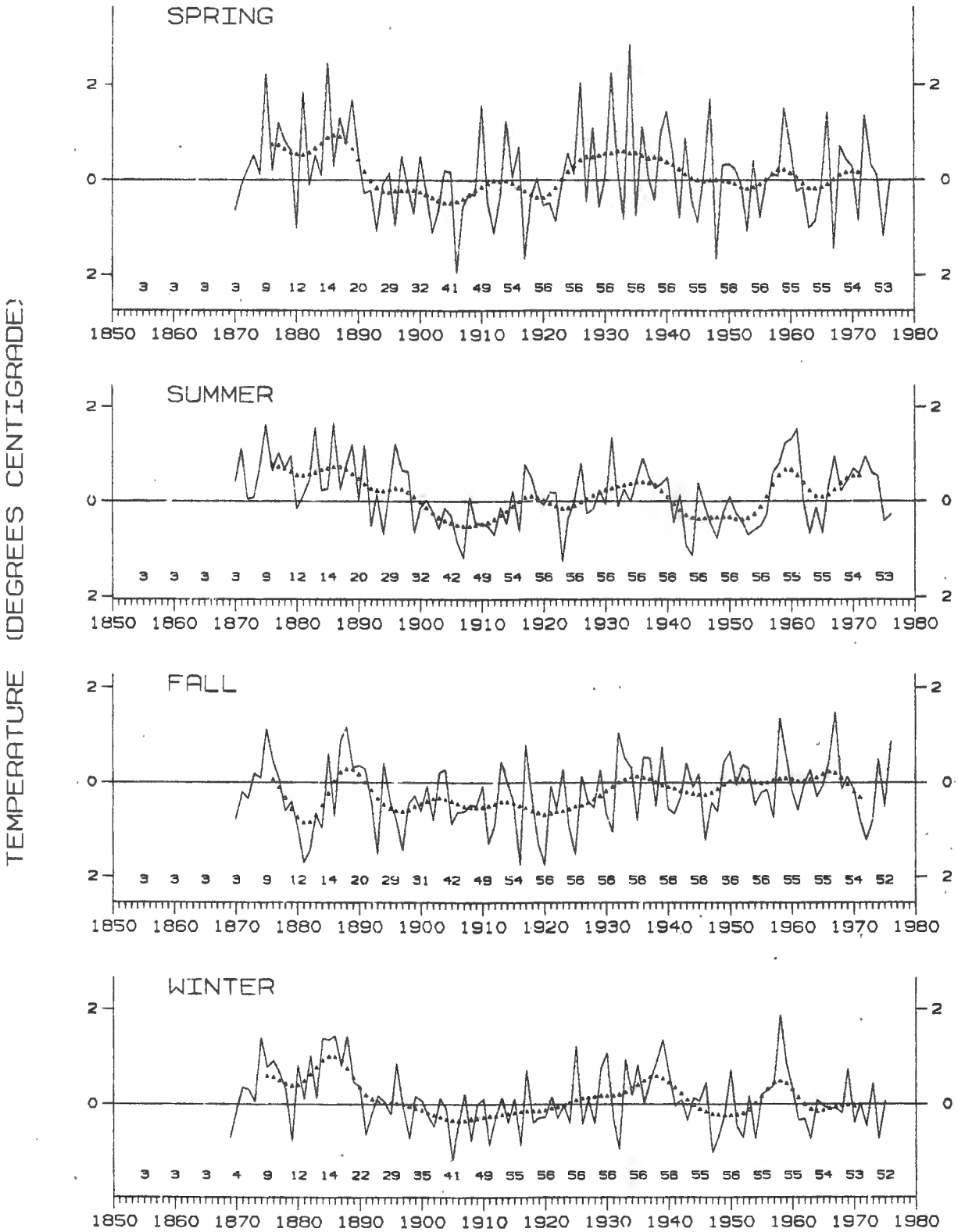


Figure 35

CALIFORNIA PRECIPITATION
PERCENT DEPARTURES FROM 1941–1970 MEANS

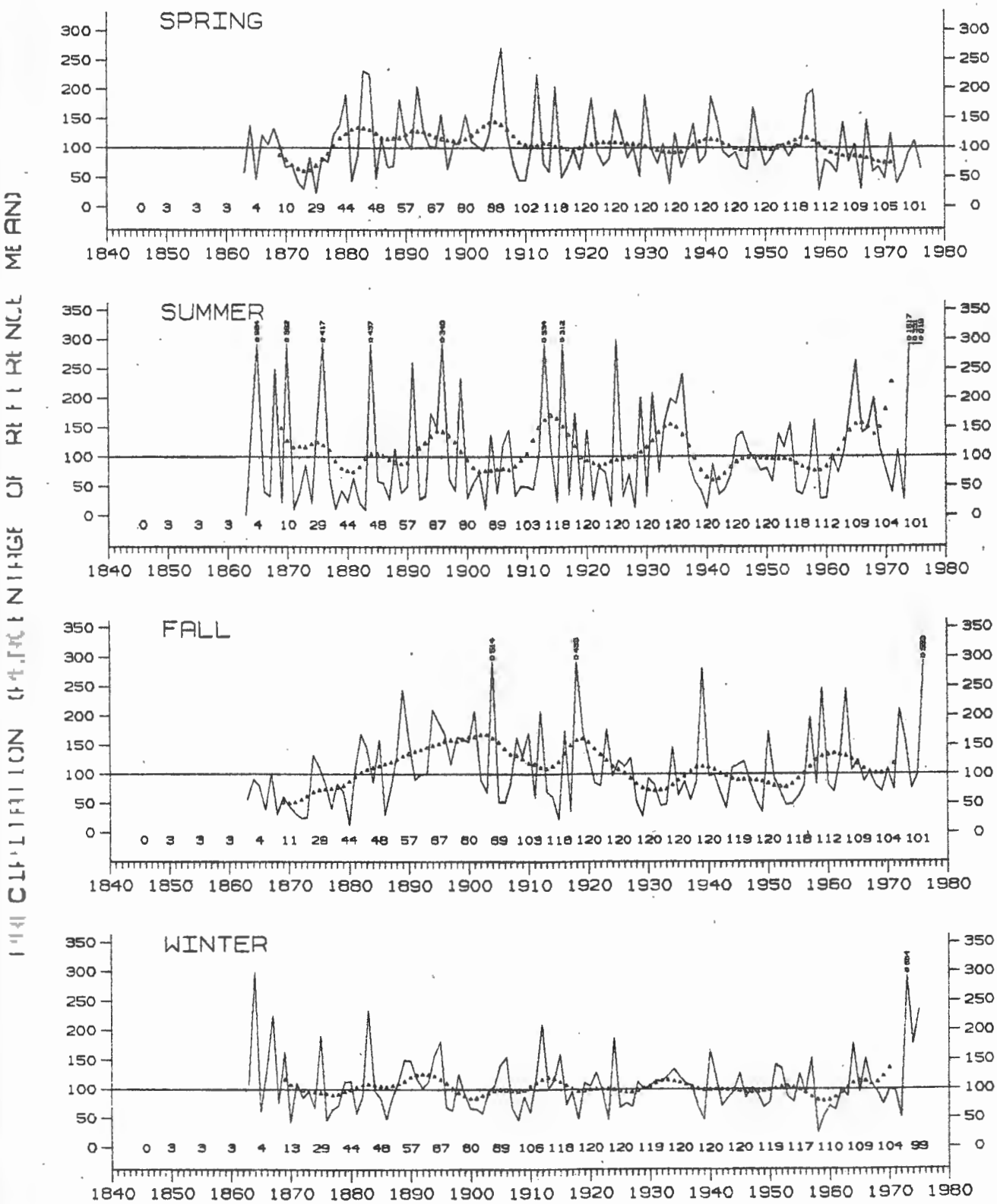


Figure 36

COLORADO TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS

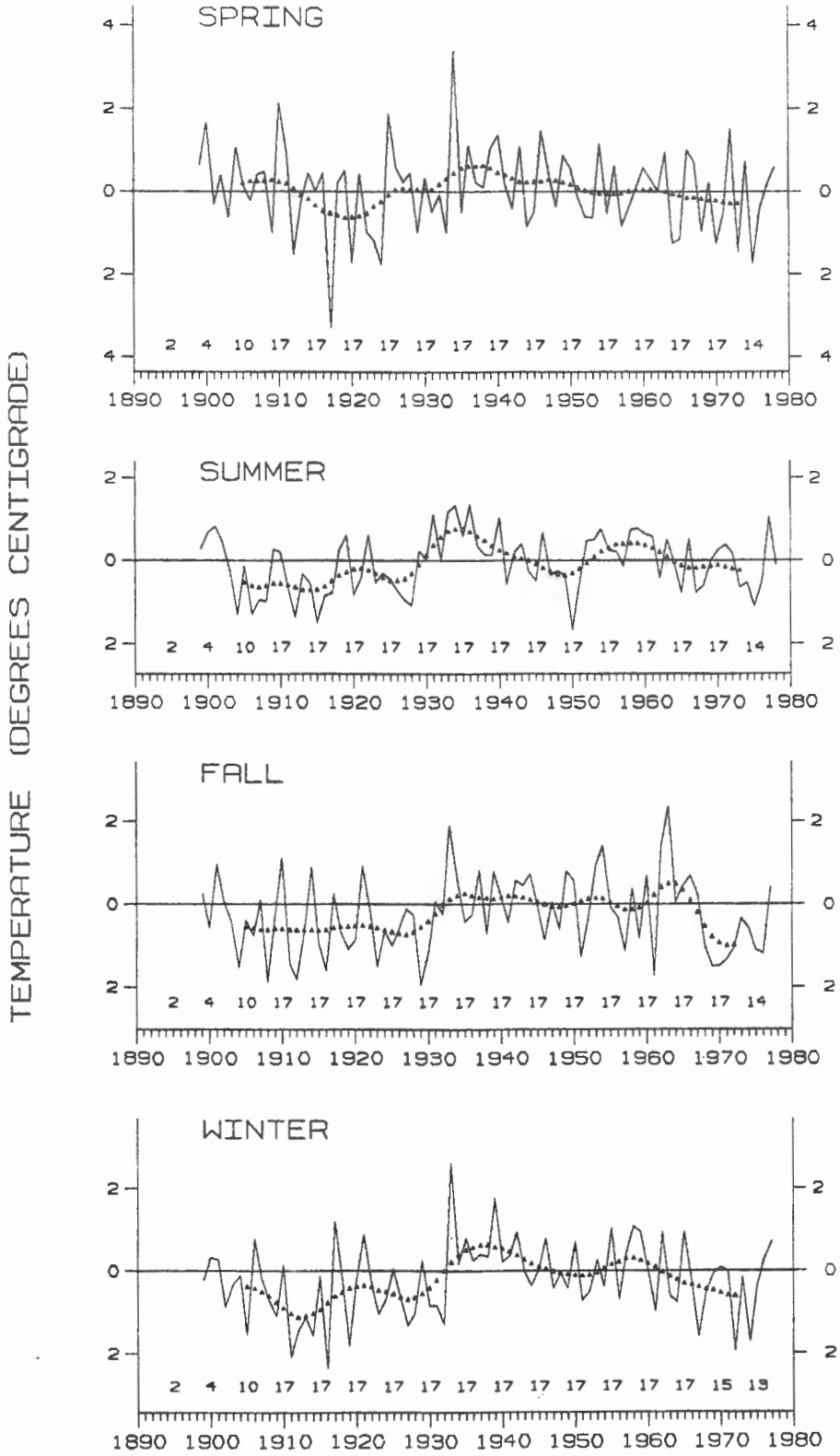


Figure 37

COLORADO PRECIPITATION
PERCENT DEPARTURES FROM 1941-1970 MEANS

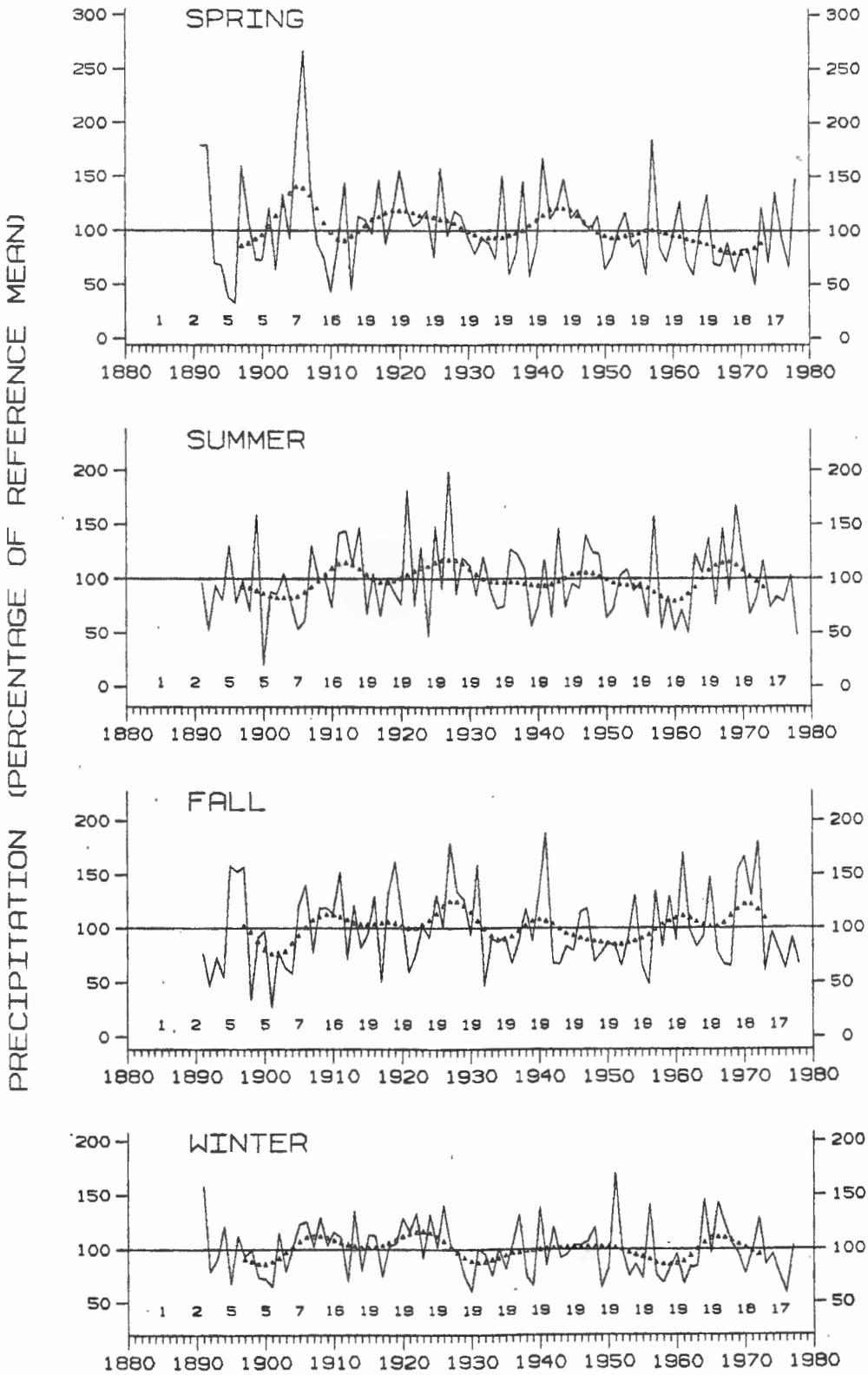


Figure 38

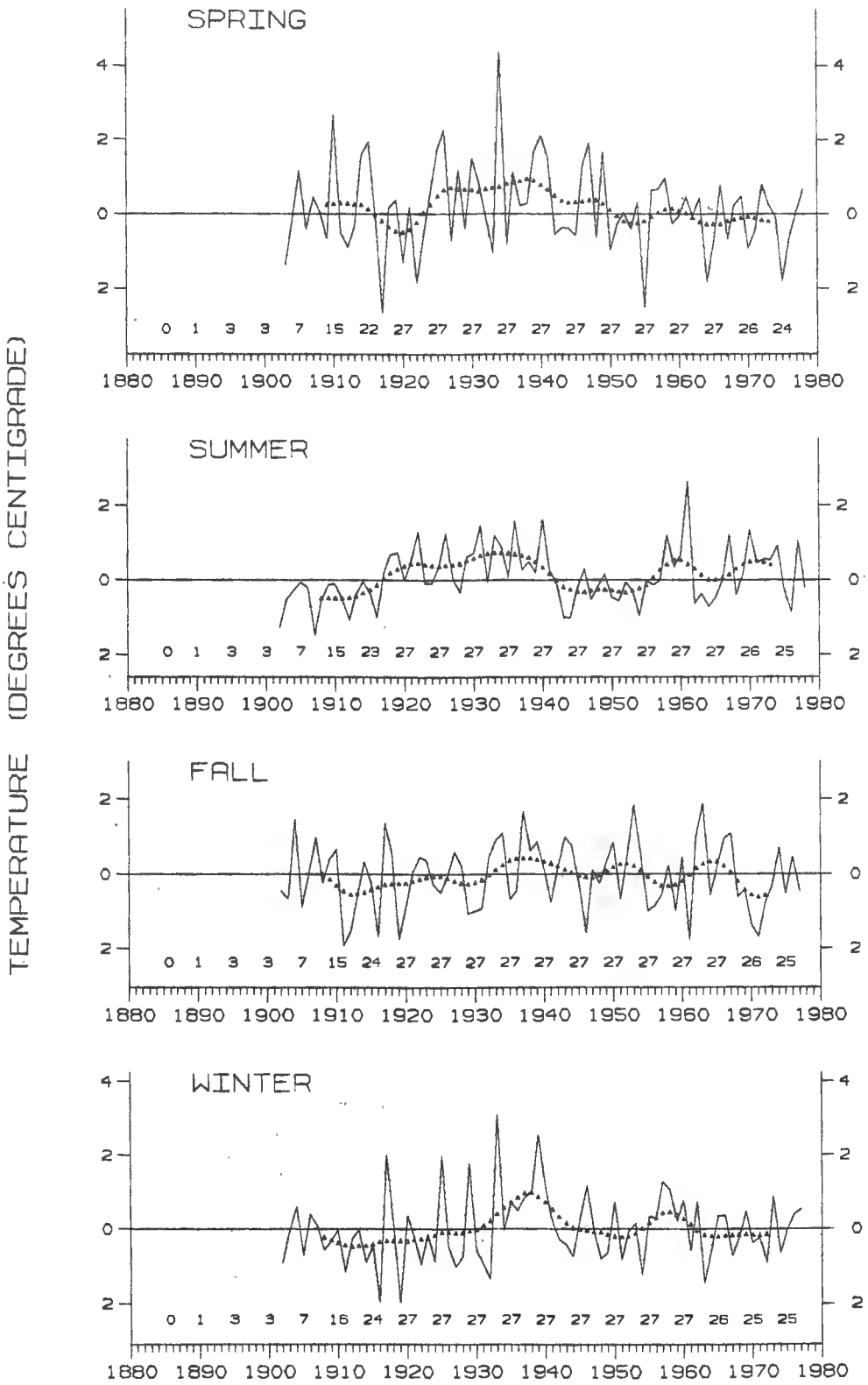

IDAHO TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS
SPRING
0 1 3 3 7 15 22 27 27 27 27 27 27 27 27 27 27 26 24
SUMMER
0 1 3 3 7 15 23 27 27 27 27 27 27 27 27 27 27 26 25
FALL
0 1 3 3 7 15 24 27 27 27 27 27 27 27 27 27 27 26 25
WINTER
0 1 3 3 7 16 24 27 27 27 27 27 27 27 27 27 26 25 25
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
TEMPERATURE (DEGREES CENTIGRADE)
YEAR

Figure 39

IDAHO PRECIPITATION
PERCENT DEPARTURES FROM 1941-1970 MEANS

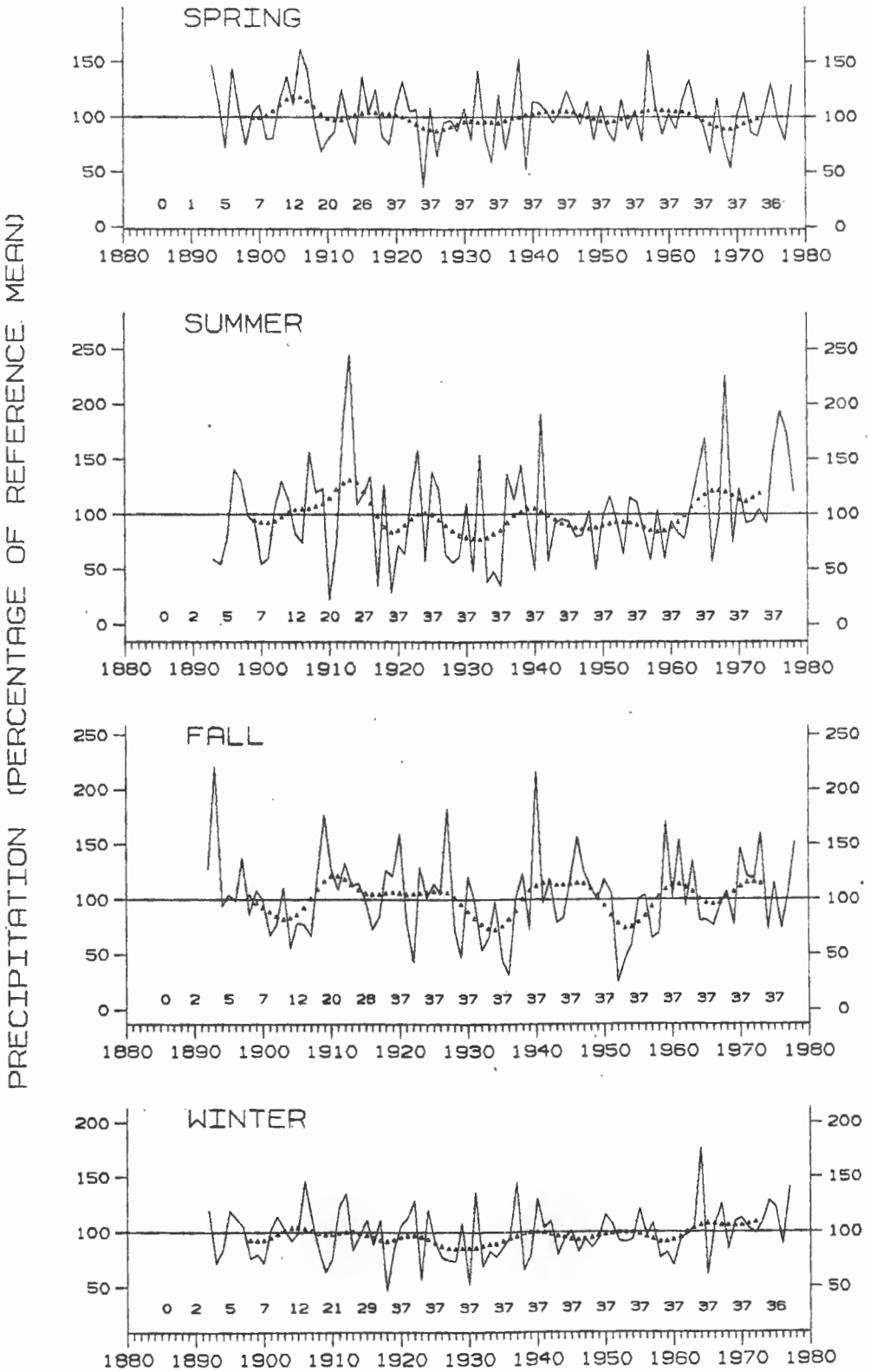


Figure 40

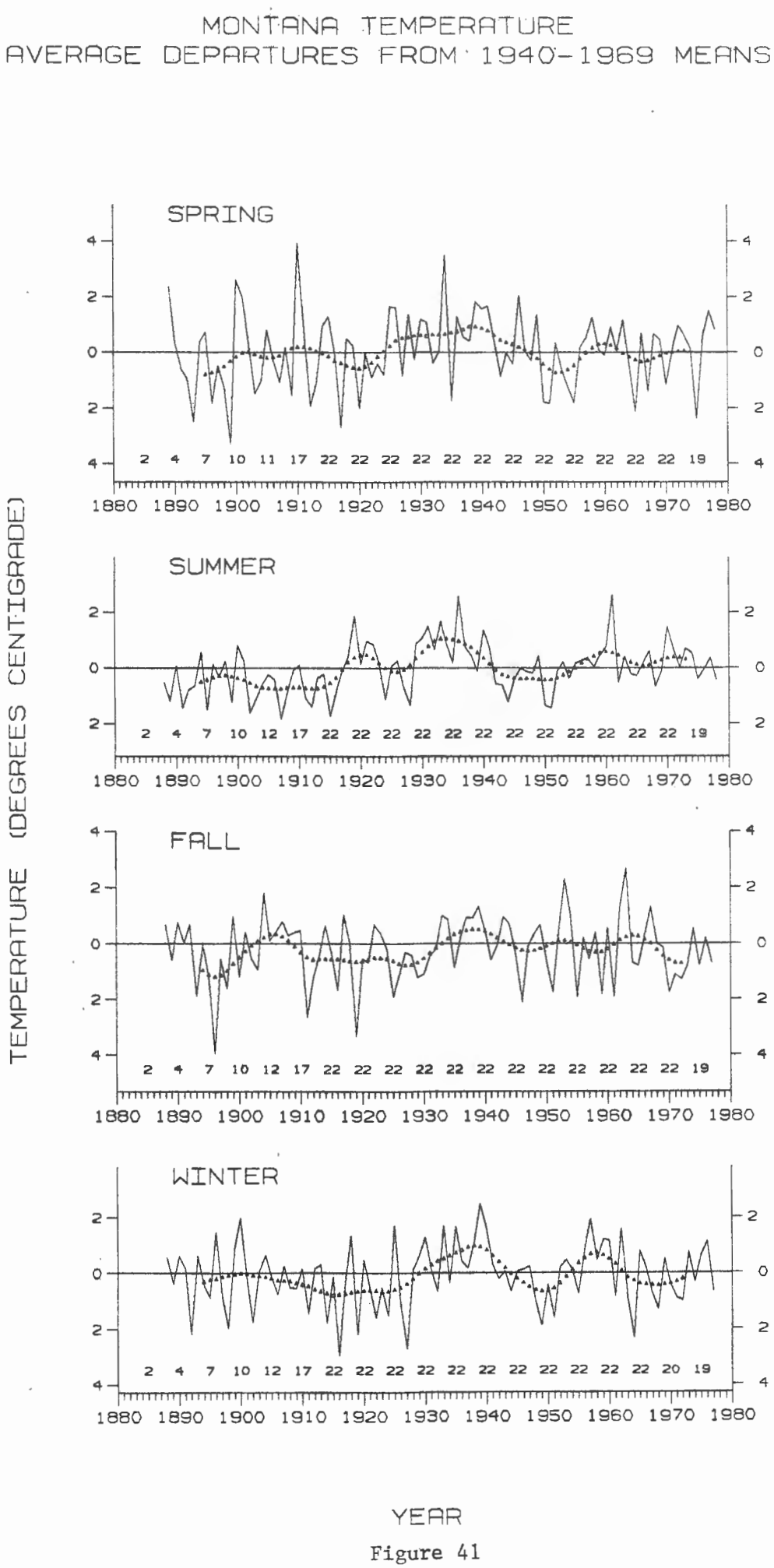

MONTANA TEMPERATURE
AVERAGE DEPARTURES FROM 1940-1969 MEANS
SPRING
2 4 7 10 11 17 22 22 22 22 22 22 22 22 22 22 22 19
SUMMER
2 4 7 10 12 17 22 22 22 22 22 22 22 22 22 22 22 19
FALL
2 4 7 10 12 17 22 22 22 22 22 22 22 22 22 22 22 19
WINTER
2 4 7 10 12 17 22 22 22 22 22 22 22 22 22 22 22 20 19
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
TEMPERATURE (DEGREES CENTIGRADE)
YEAR

Figure 41

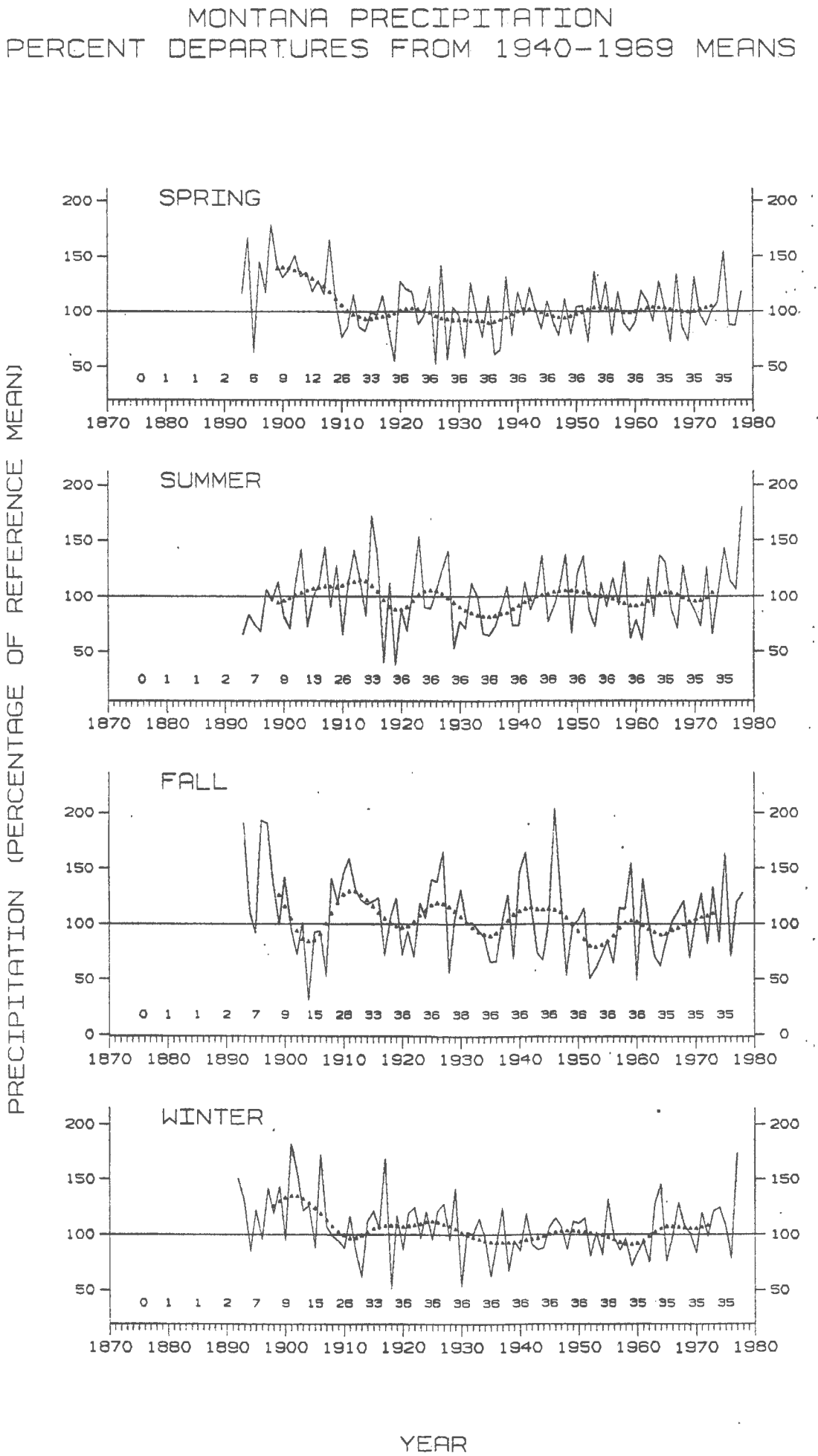

MONTANA PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS
SPRING
0 1 1 2 6 9 12 26 33 36 36 36 36 36 36 36 36 36 35 35 35
SUMMER
0 1 1 2 7 9 19 26 33 36 36 36 36 36 36 36 36 36 35 35 35
FALL
0 1 1 2 7 9 15 28 33 36 36 36 36 36 36 36 36 36 35 35 35
WINTER
0 1 1 2 7 9 15 26 33 36 36 36 36 36 36 36 36 35 35 35 35
200
150
100
50
0
1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
PRECIPITATION (PERCENTAGE OF REFERENCE MEAN)
YEAR

Figure 42

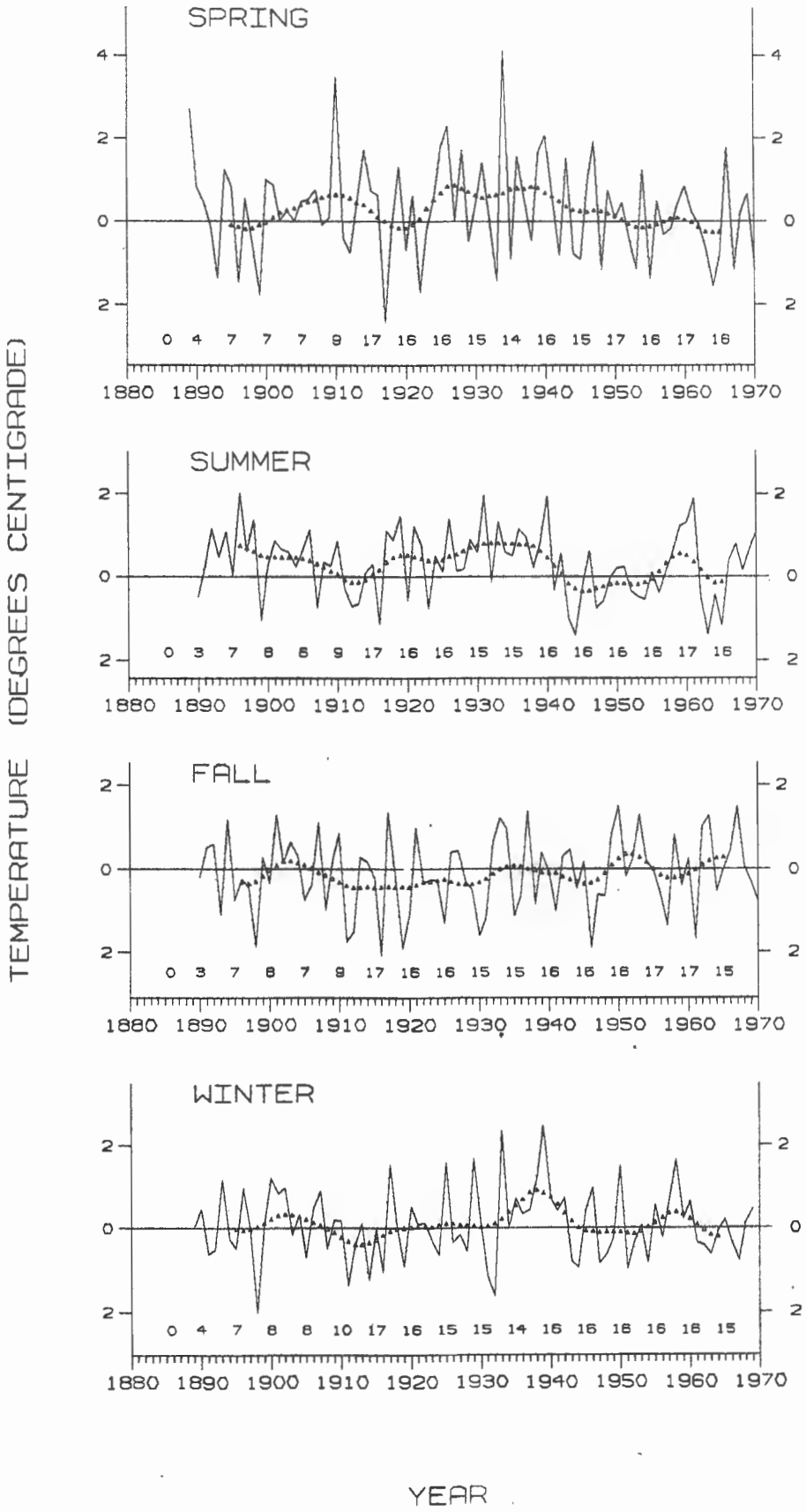

NEVADA TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS
SPRING
0 4 7 7 7 9 17 16 16 15 14 16 15 17 16 17 16
SUMMER
0 3 7 8 6 9 17 16 16 15 15 16 16 16 16 17 16
FALL
0 3 7 8 7 9 17 16 16 15 15 16 16 16 17 17 15
WINTER
0 4 7 8 8 10 17 16 15 15 14 16 16 16 16 16 15
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970
TEMPERATURE (DEGREES CENTIGRADE)
YEAR

Figure 43

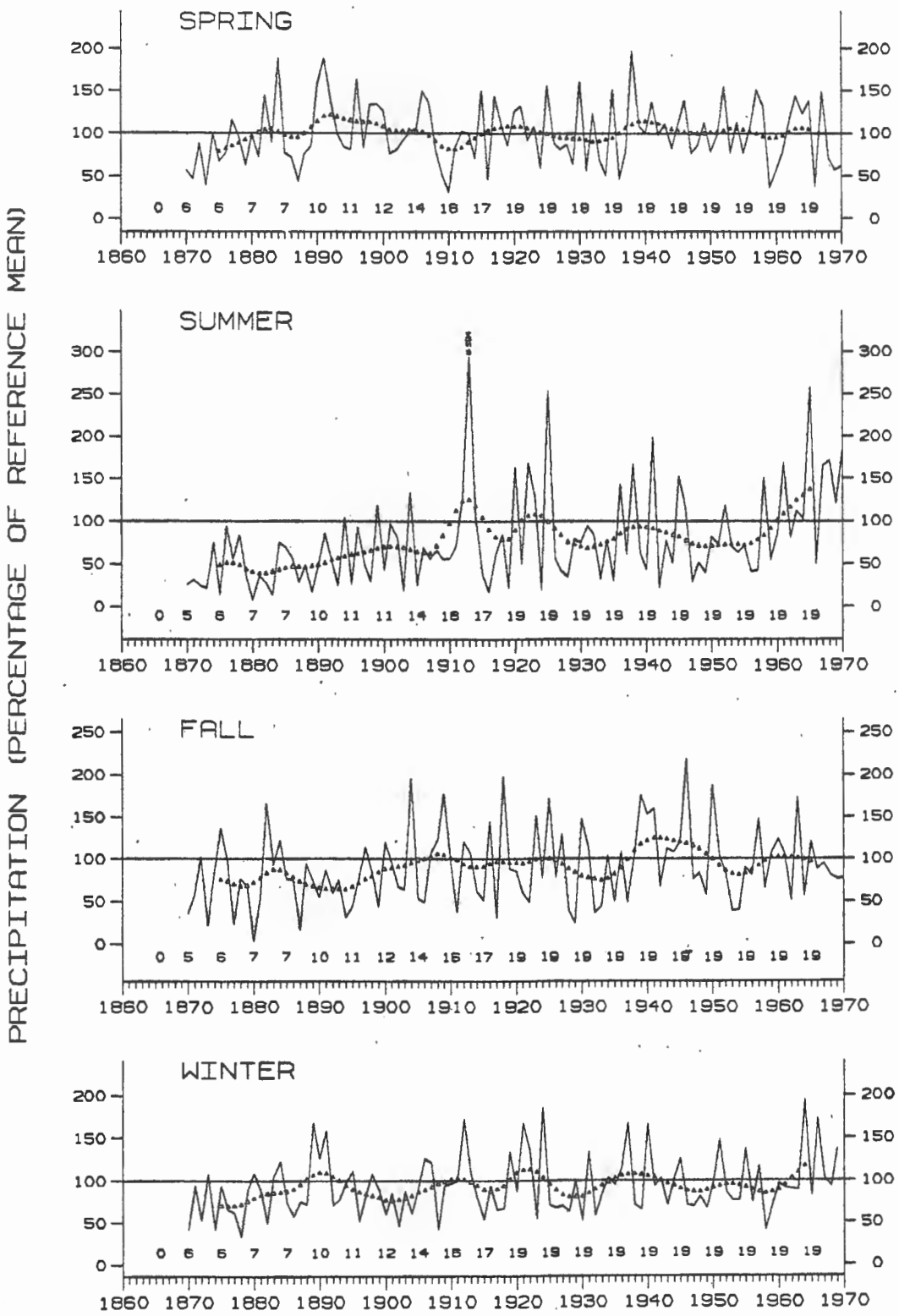

NEVADA PRECIPITATION
PERCENT DEPARTURES FROM 1941-1970 MEANS
SPRING
SUMMER
FALL
WINTER
PRECIPITATION (PERCENTAGE OF REFERENCE MEAN)
YEAR
1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970

Figure 44

NEW MEXICO TEMPERATURE
AVERAGE DEPARTURES FROM 1940-1969 MEANS

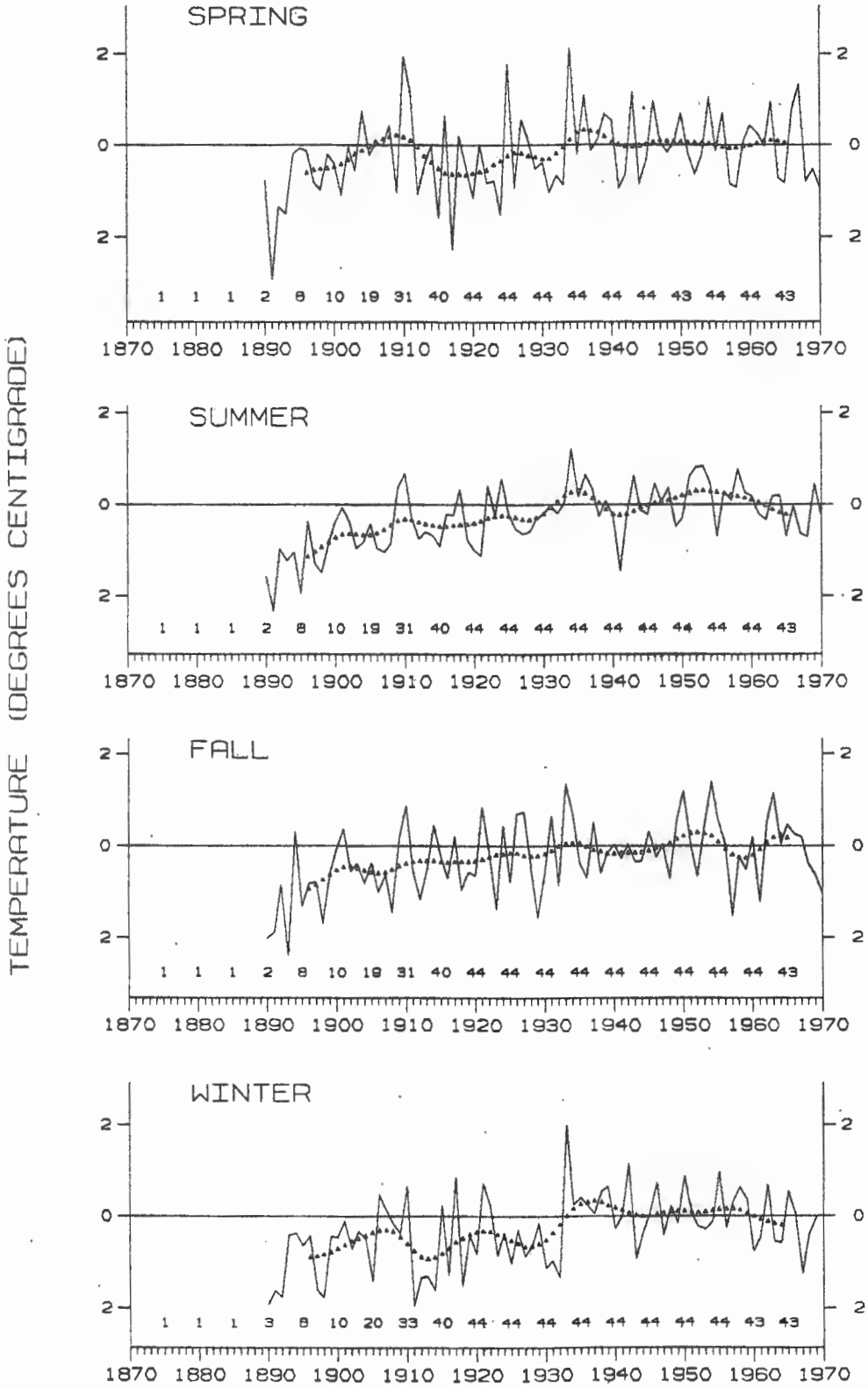


Figure 45

NEW MEXICO PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS

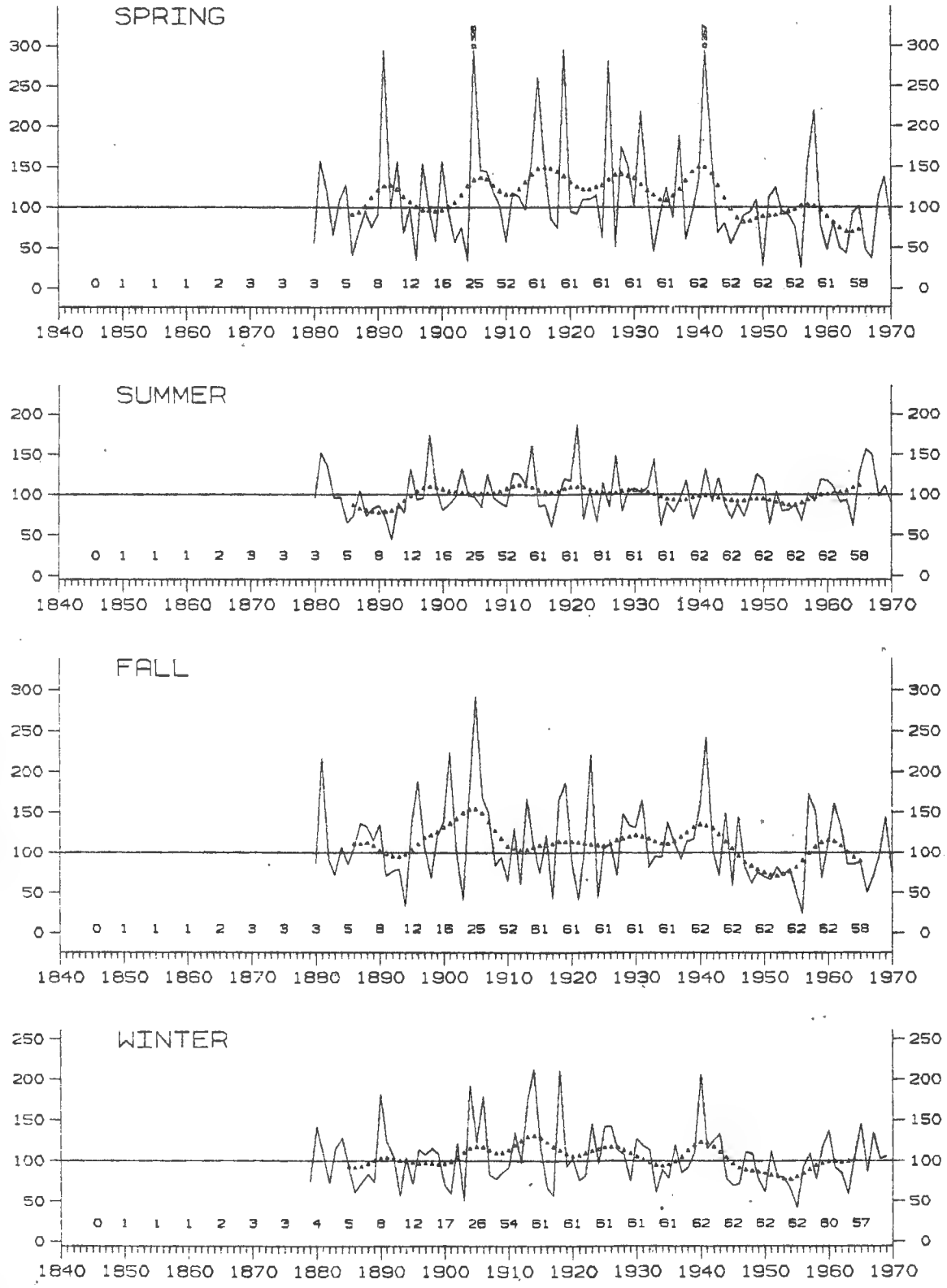


Figure 46

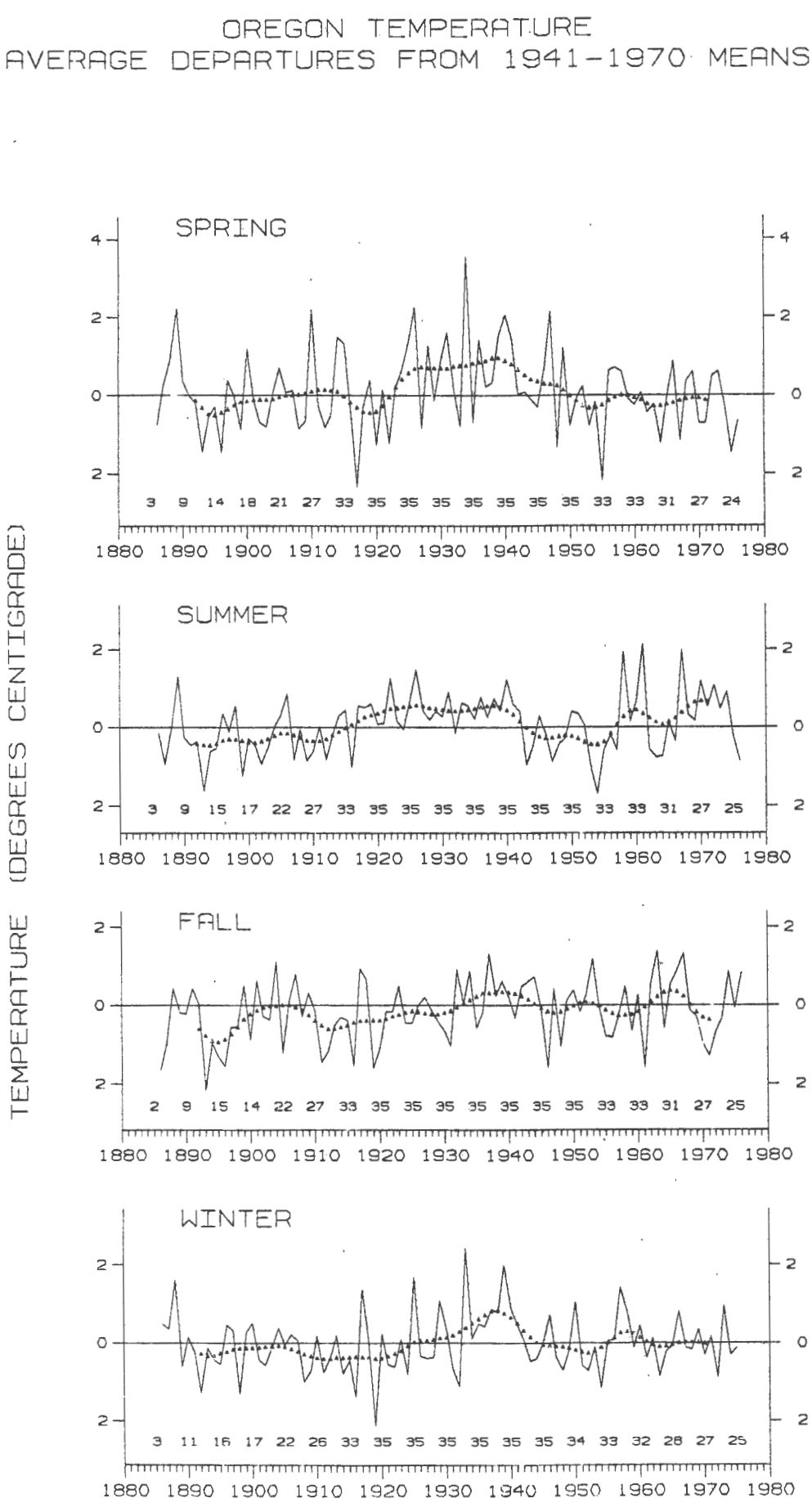

OREGON TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS
SPRING
3 9 14 18 21 27 33 35 35 35 35 35 35 35 33 33 31 27 24
SUMMER
3 9 15 17 22 27 33 35 35 35 35 35 35 35 33 33 31 27 25
FALL
2 9 15 14 22 27 33 35 35 35 35 35 35 35 33 33 31 27 25
WINTER
3 11 16 17 22 26 33 35 35 35 35 35 35 34 33 32 28 27 25
1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980
TEMPERATURE (DEGREES CENTIGRADE)
YEAR

Figure 47

OREGON PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS

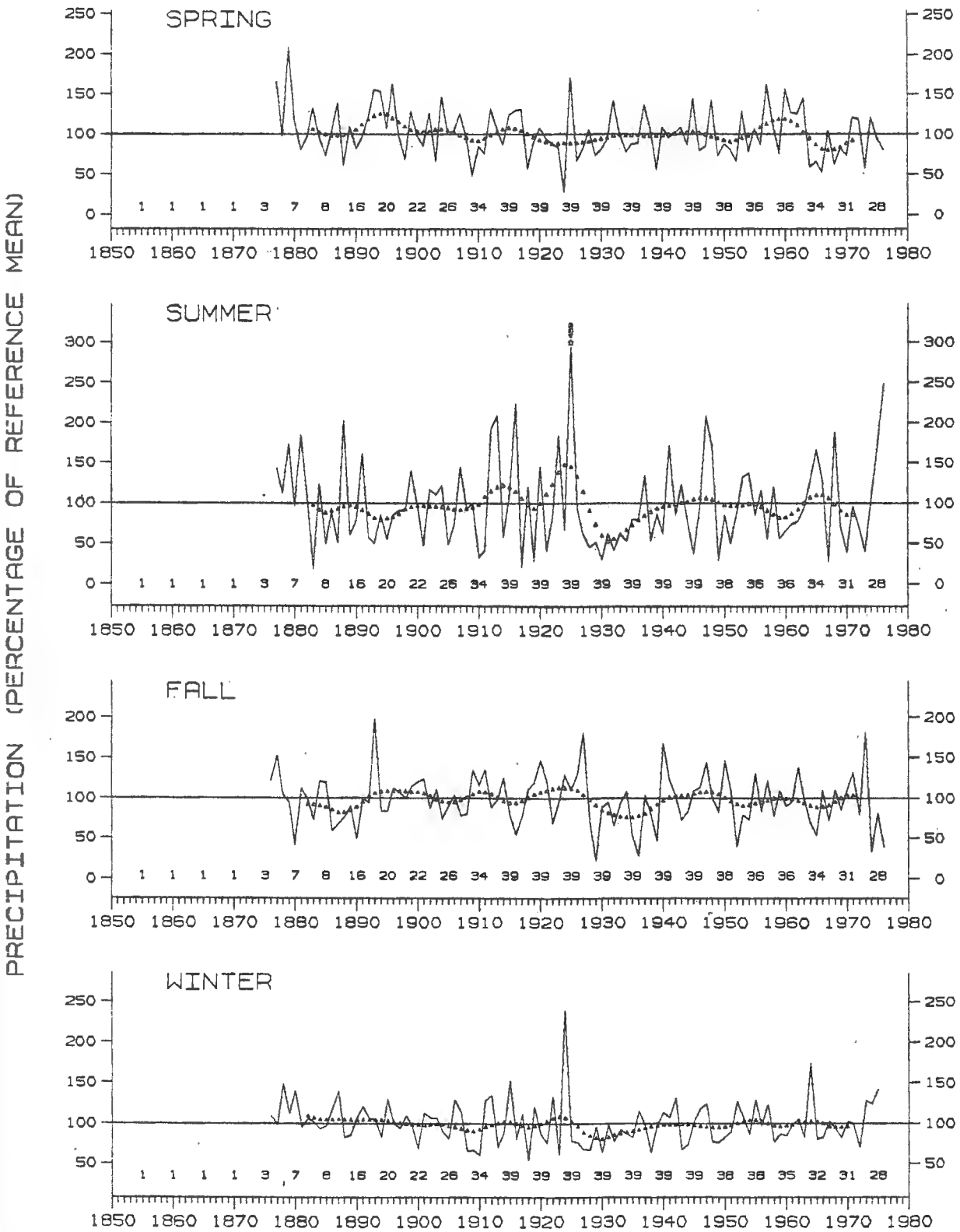


Figure 48

UTAH TEMPERATURE
AVERAGE DEPARTURES FROM 1940-1969 MEANS

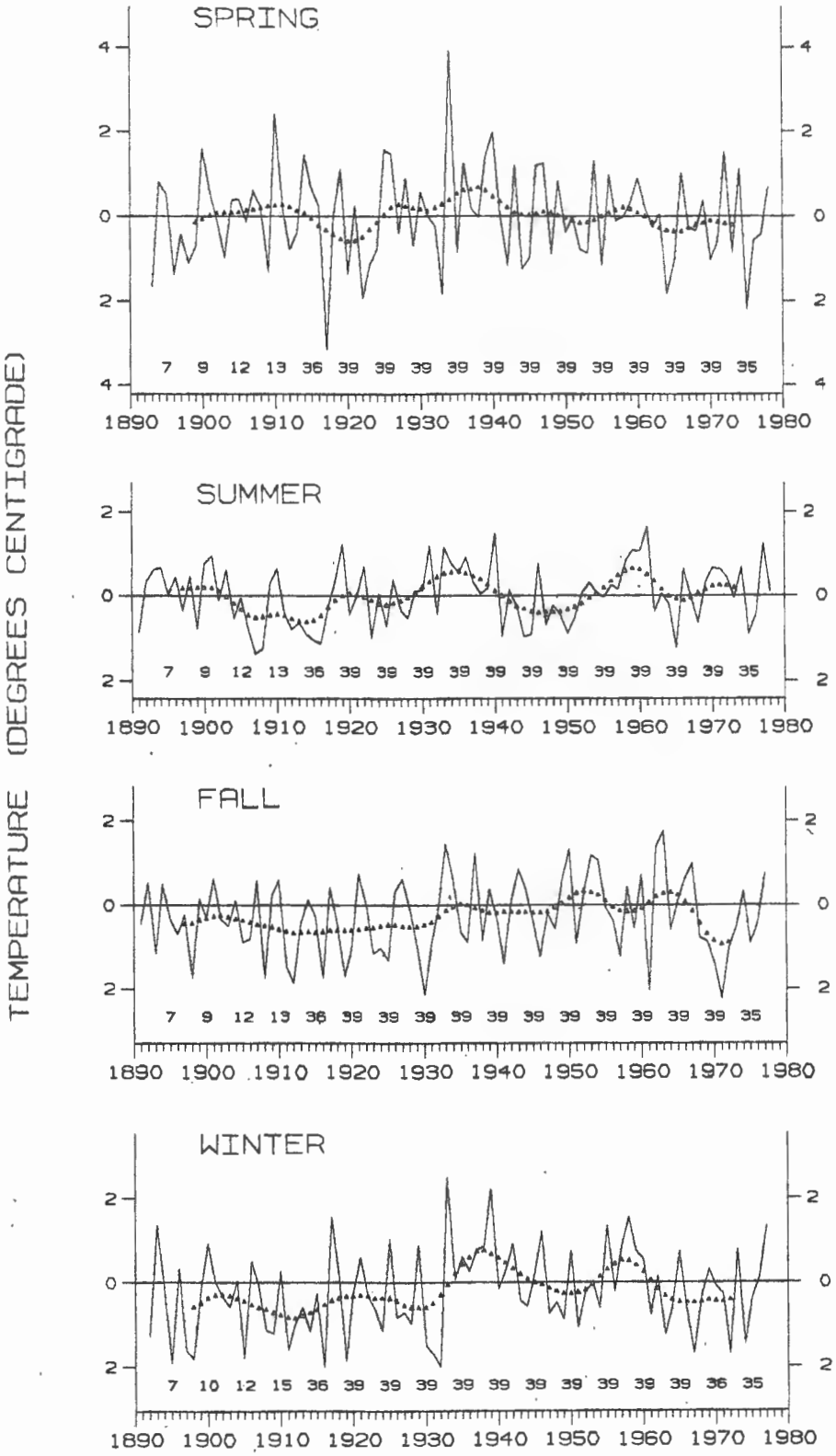


Figure 49

UTAH PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS

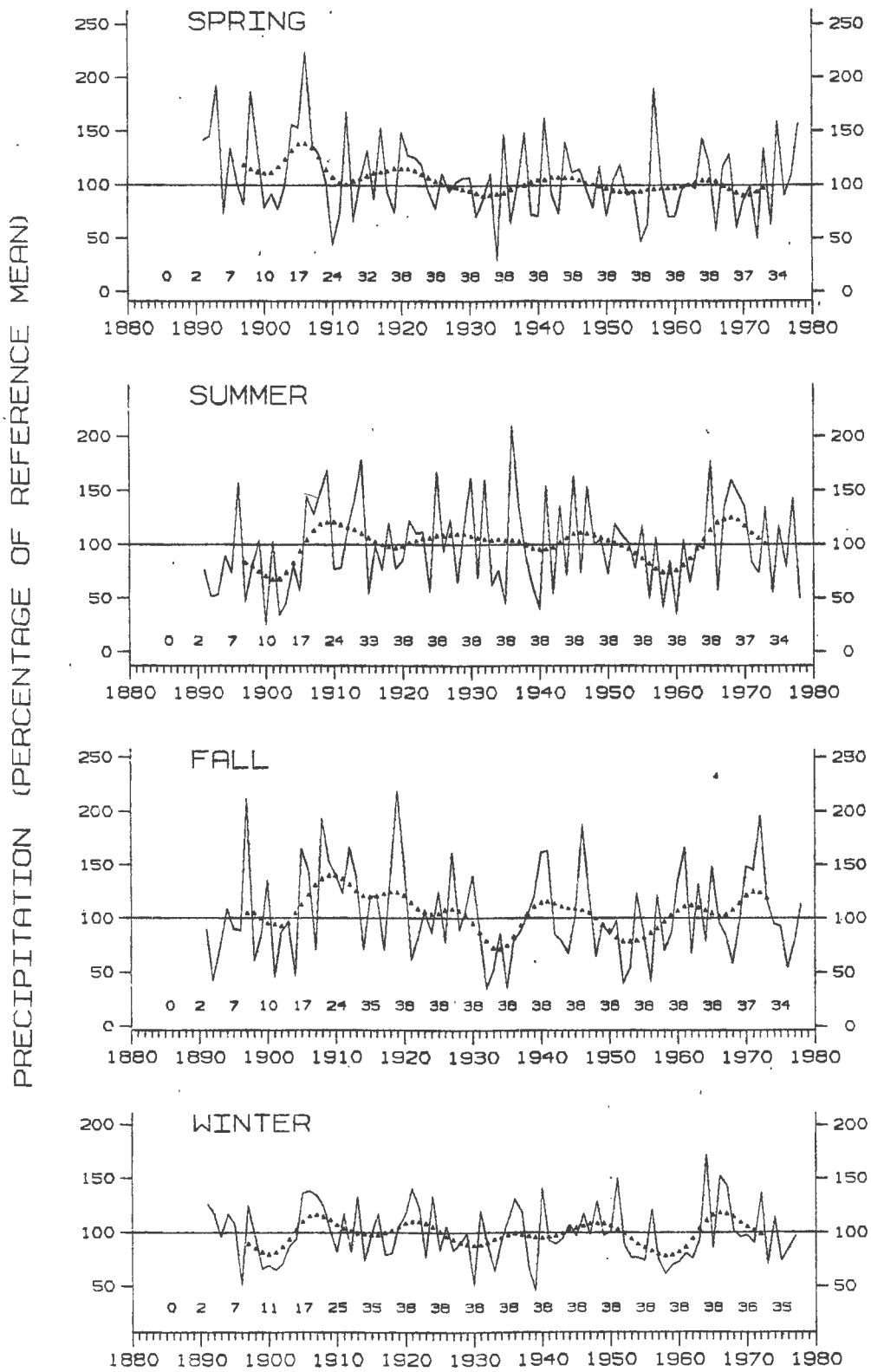


Figure 4

WASHINGTON TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS

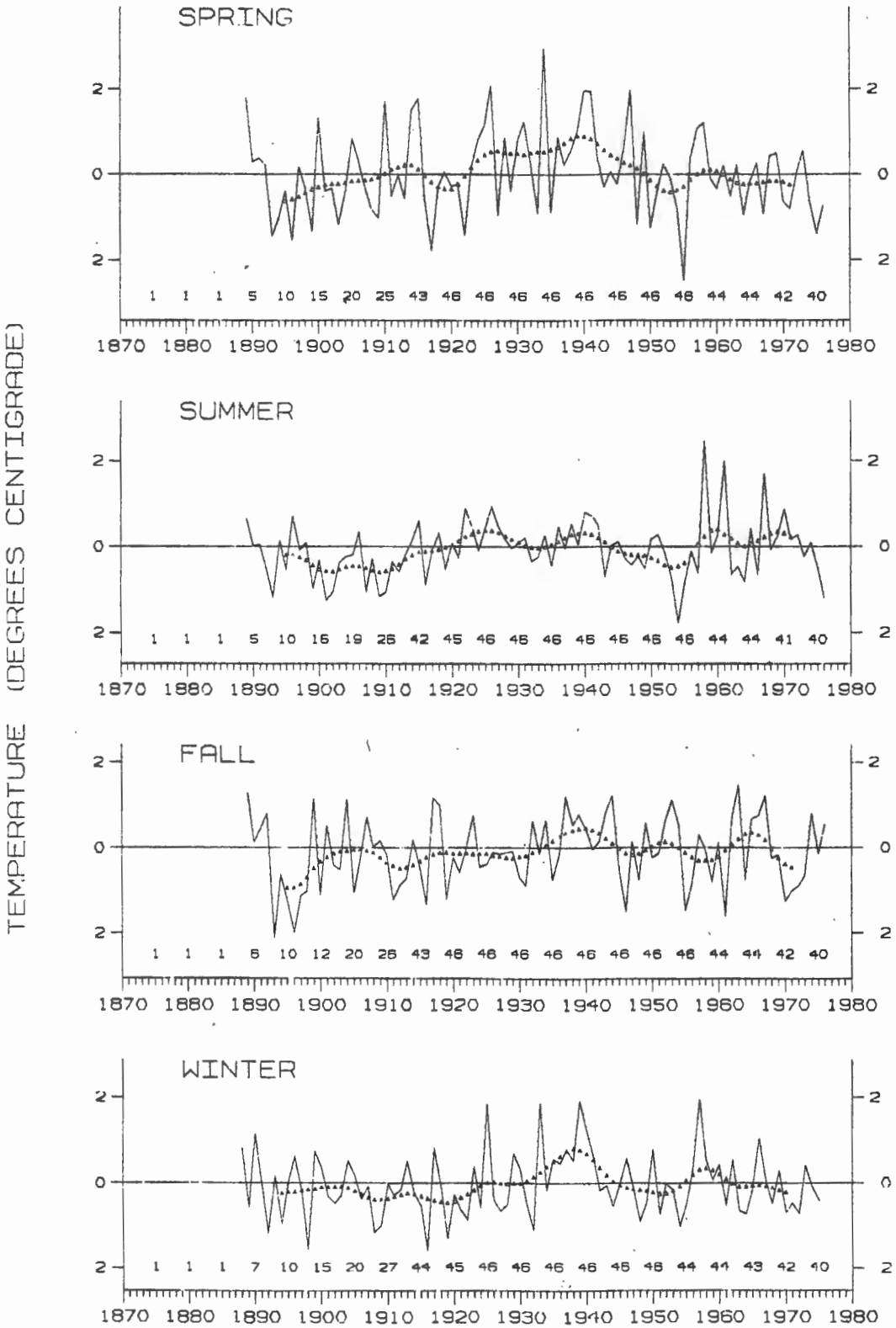


Figure 51

WASHINGTON PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS

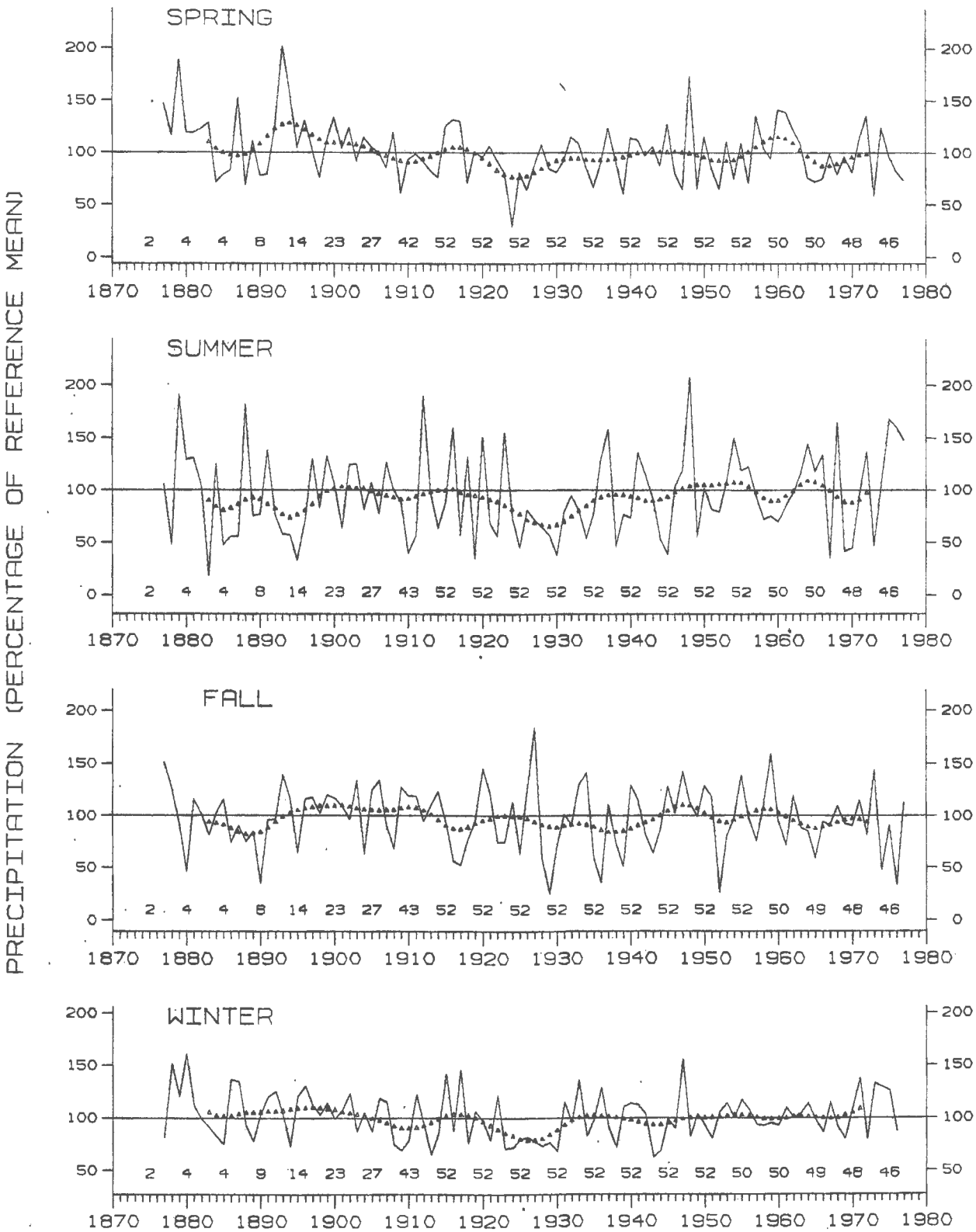


Figure 52

WYOMING TEMPERATURE
AVERAGE DEPARTURES FROM 1941-1970 MEANS

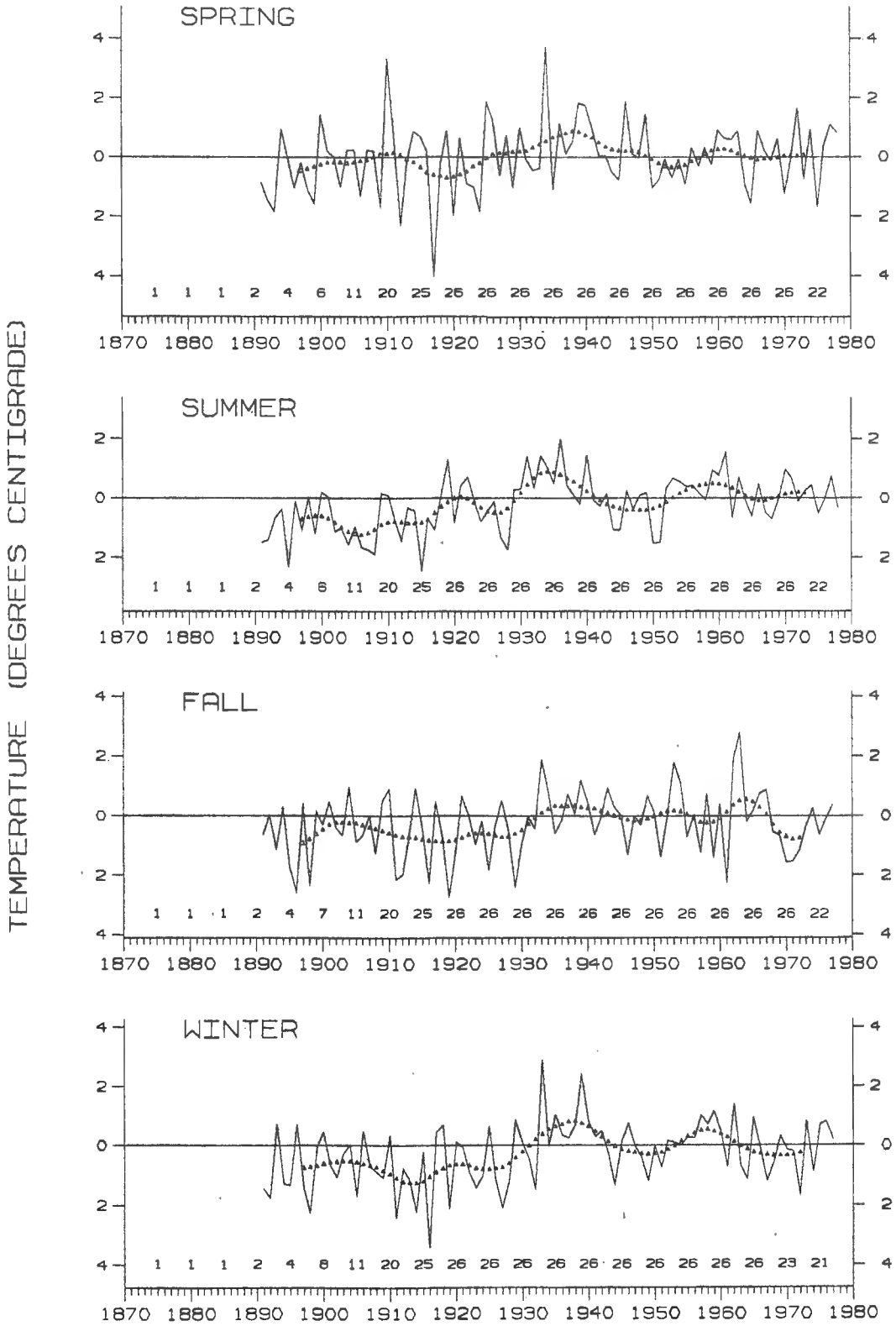


Figure 53

WYOMING PRECIPITATION
PERCENT DEPARTURES FROM 1940-1969 MEANS

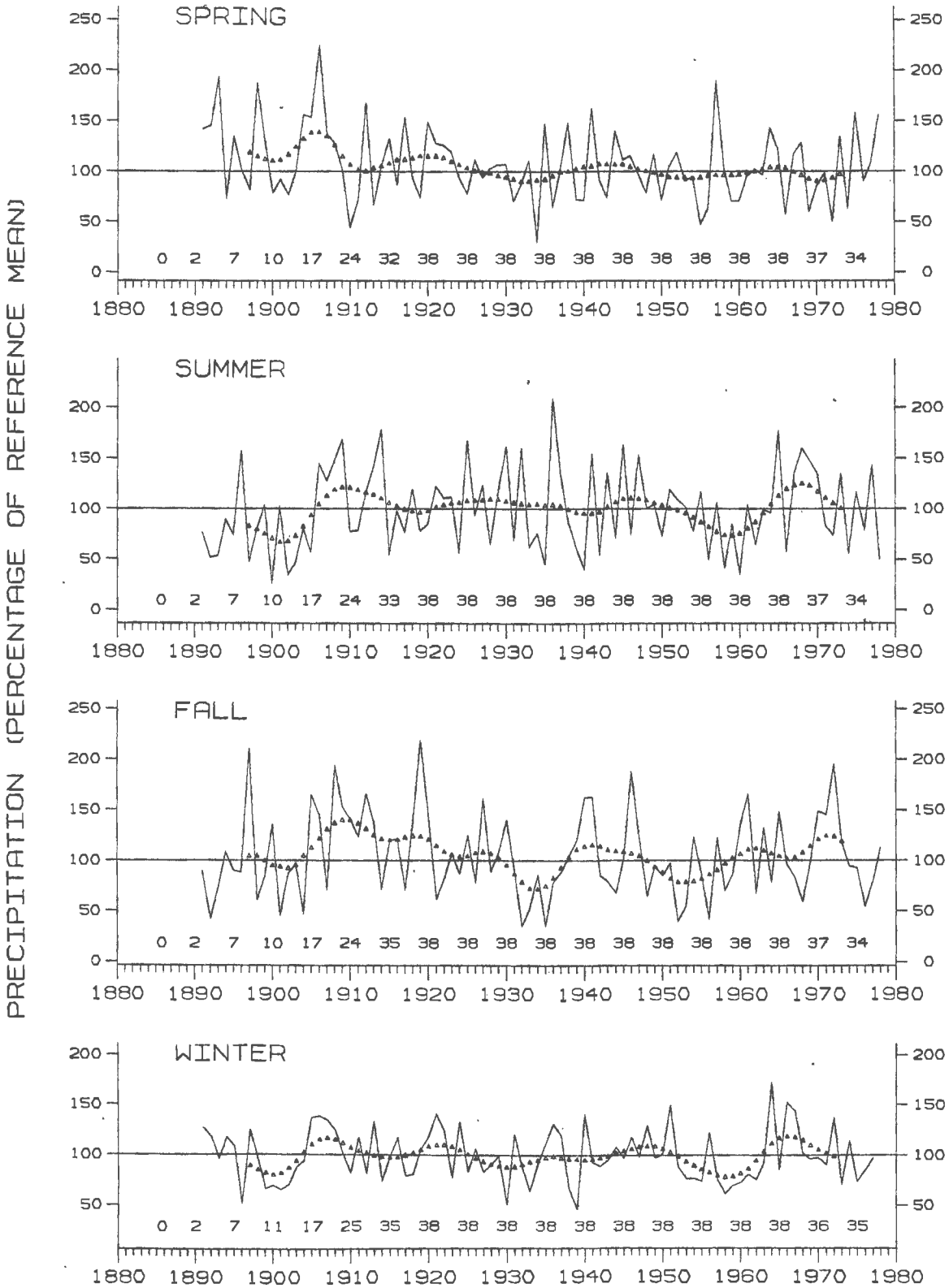


Figure 54

WESTERN U.S.: 5 YEAR MEAN TEMPERATURE AS DEPARTURES (°C) FROM 1941-1970 PERIOD AVERAGES

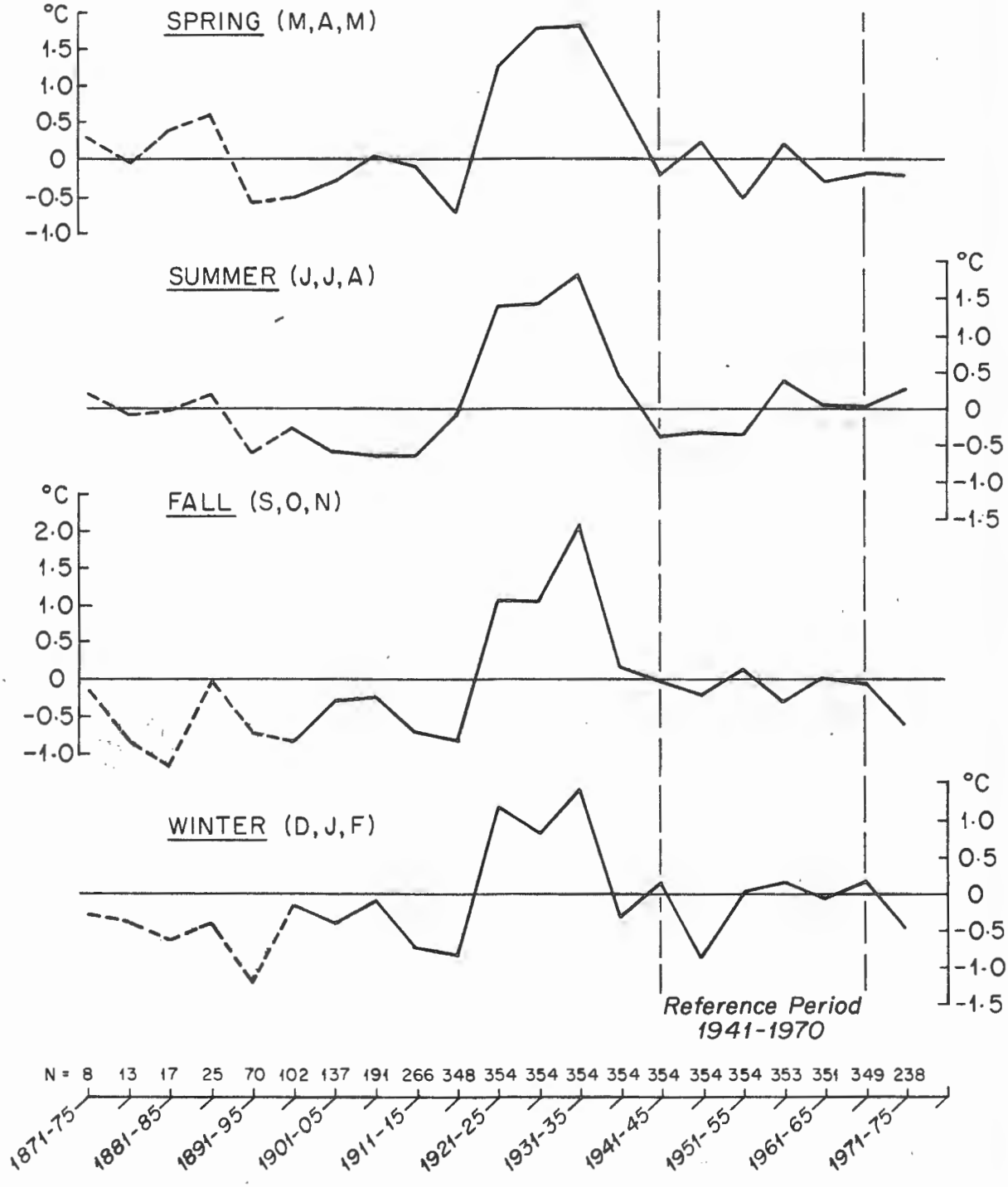


Figure 55

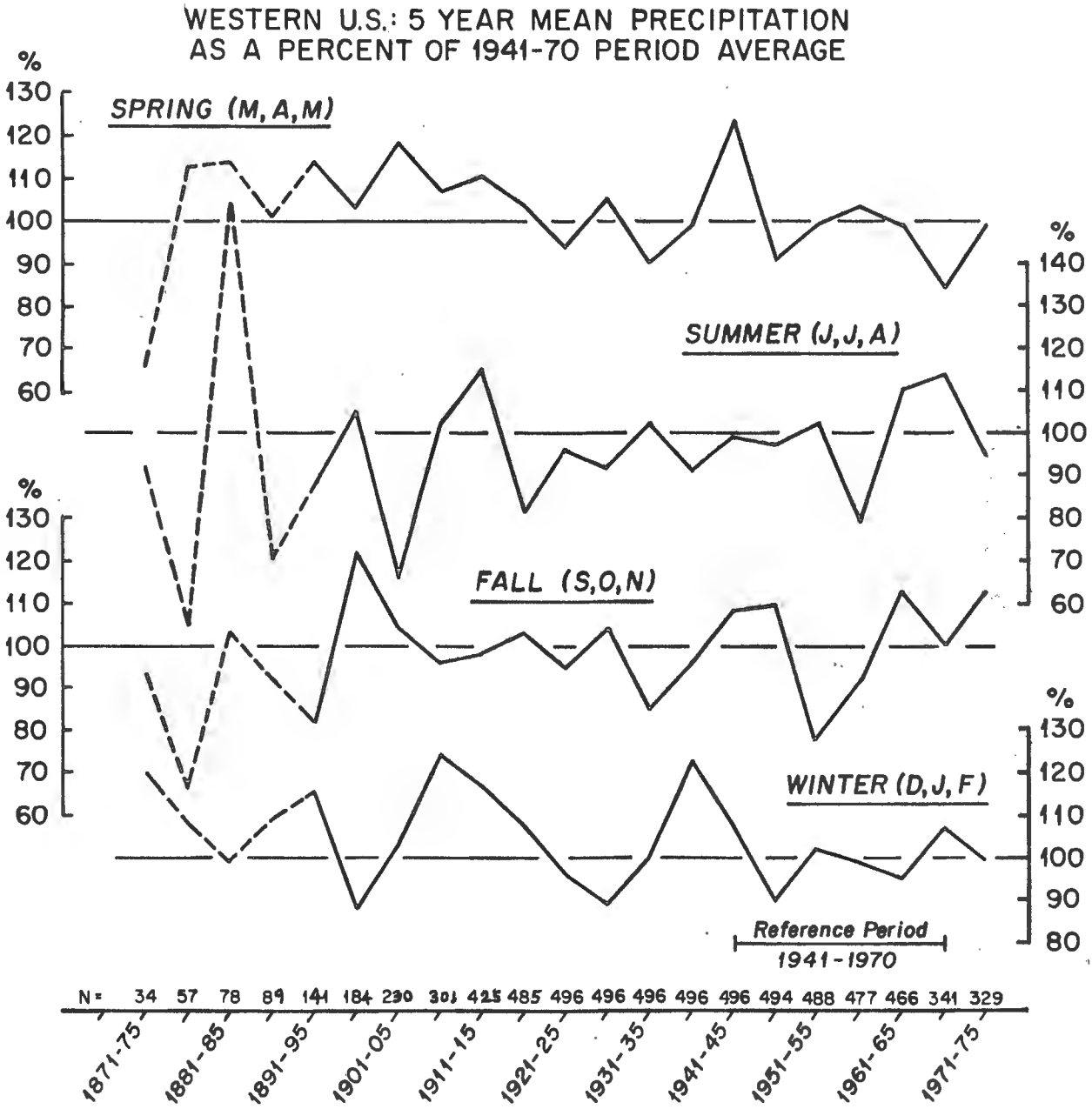

WESTERN U.S.: 5 YEAR MEAN PRECIPITATION
AS A PERCENT OF 1941-70 PERIOD AVERAGE
%
SPRING (M,A,M)
SUMMER (J,J,A)
FALL (S,O,N)
WINTER (D,J,F)
Reference Period
1941-1970
N= 34 57 78 89 141 184 230 301 425 485 496 496 496 496 496 494 488 477 466 341 329
1871-75
1881-85
1891-95
1901-05
1911-15
1921-25
1931-35
1941-45
1951-55
1961-65
1971-75

Figure 56

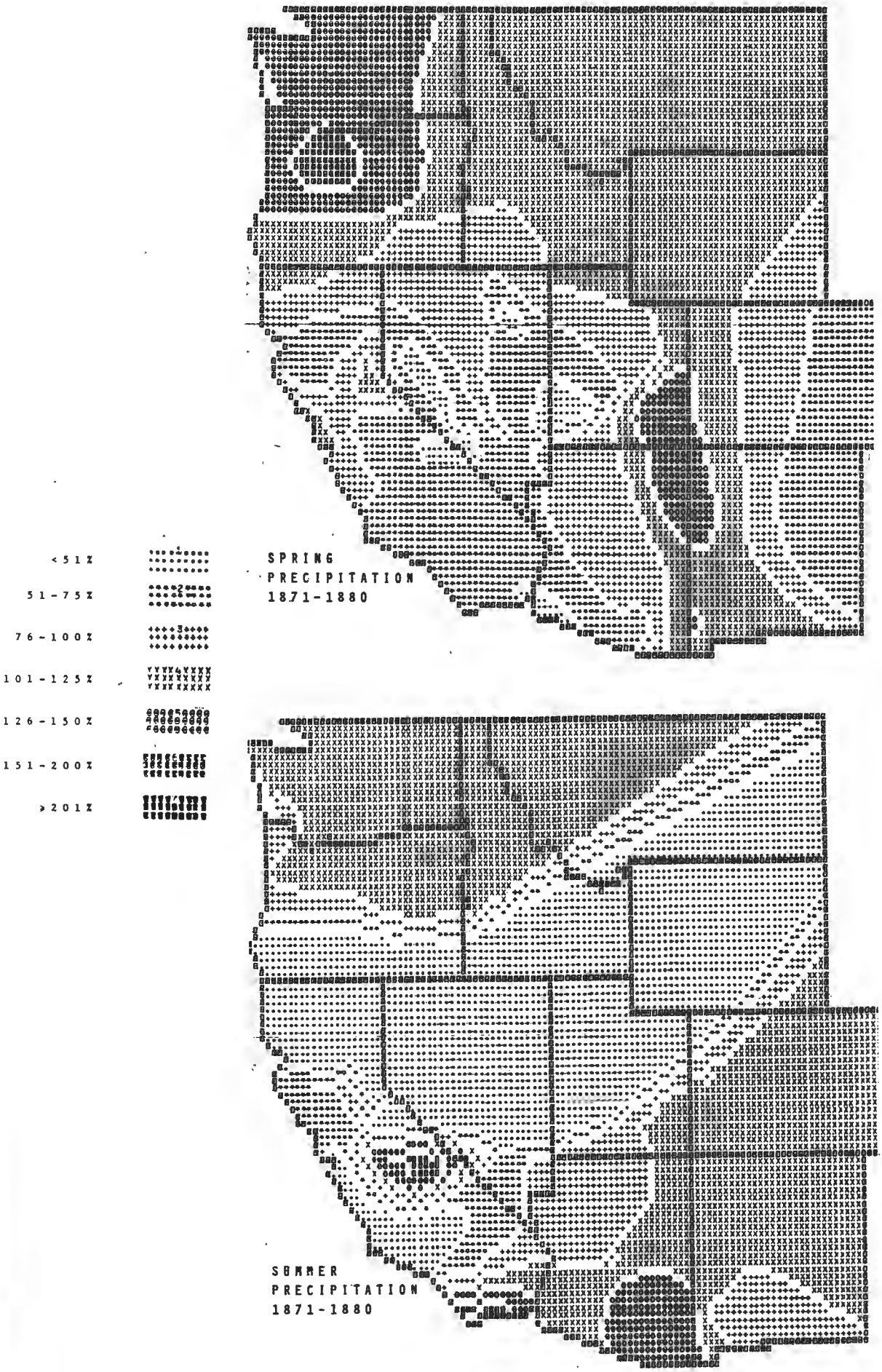

SPRING
PRECIPITATION
1871-1880
SUMMER
PRECIPITATION
1871-1880
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 57

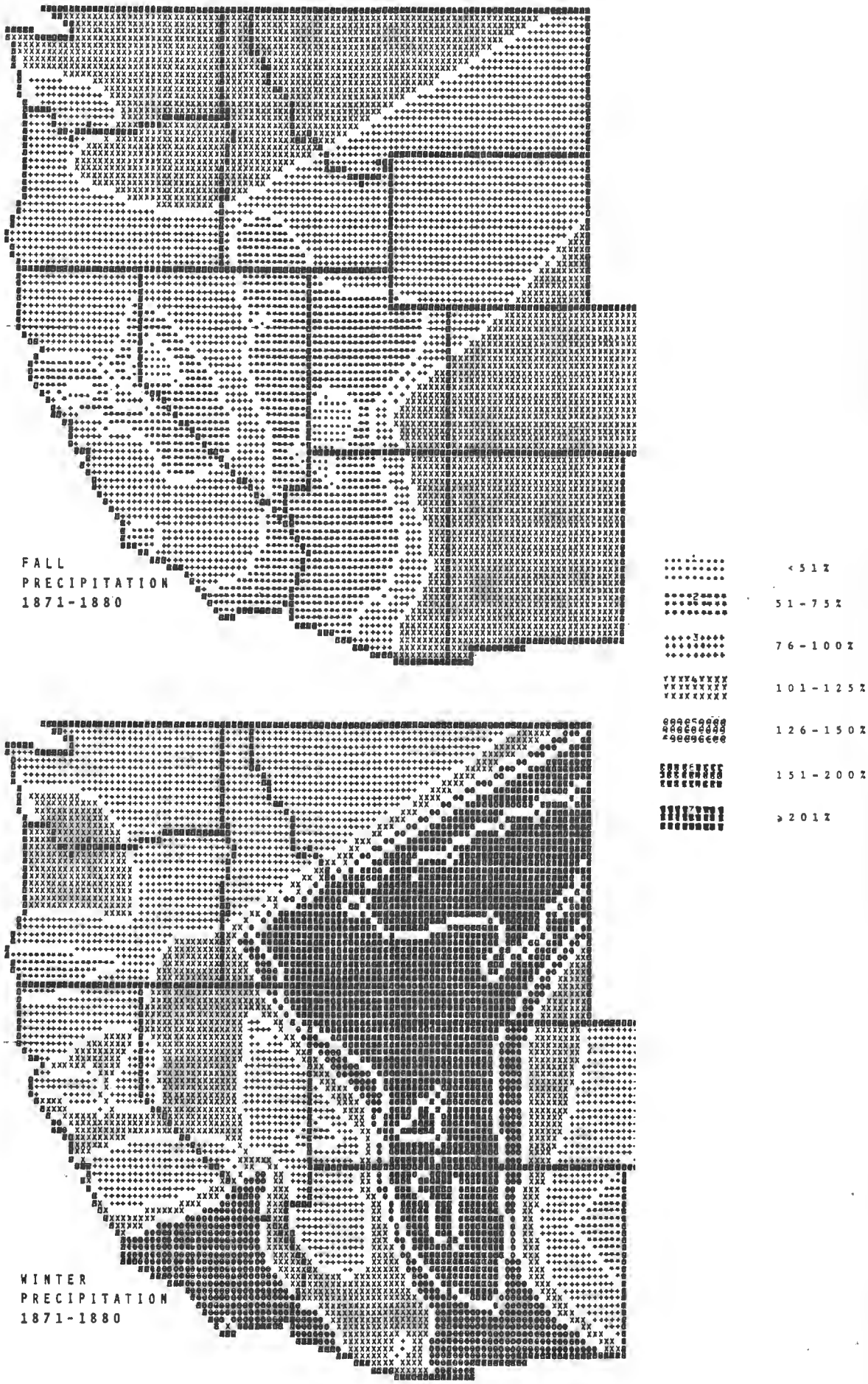

FALL
PRECIPITATION
1871-1880
WINTER
PRECIPITATION
1871-1880
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 58

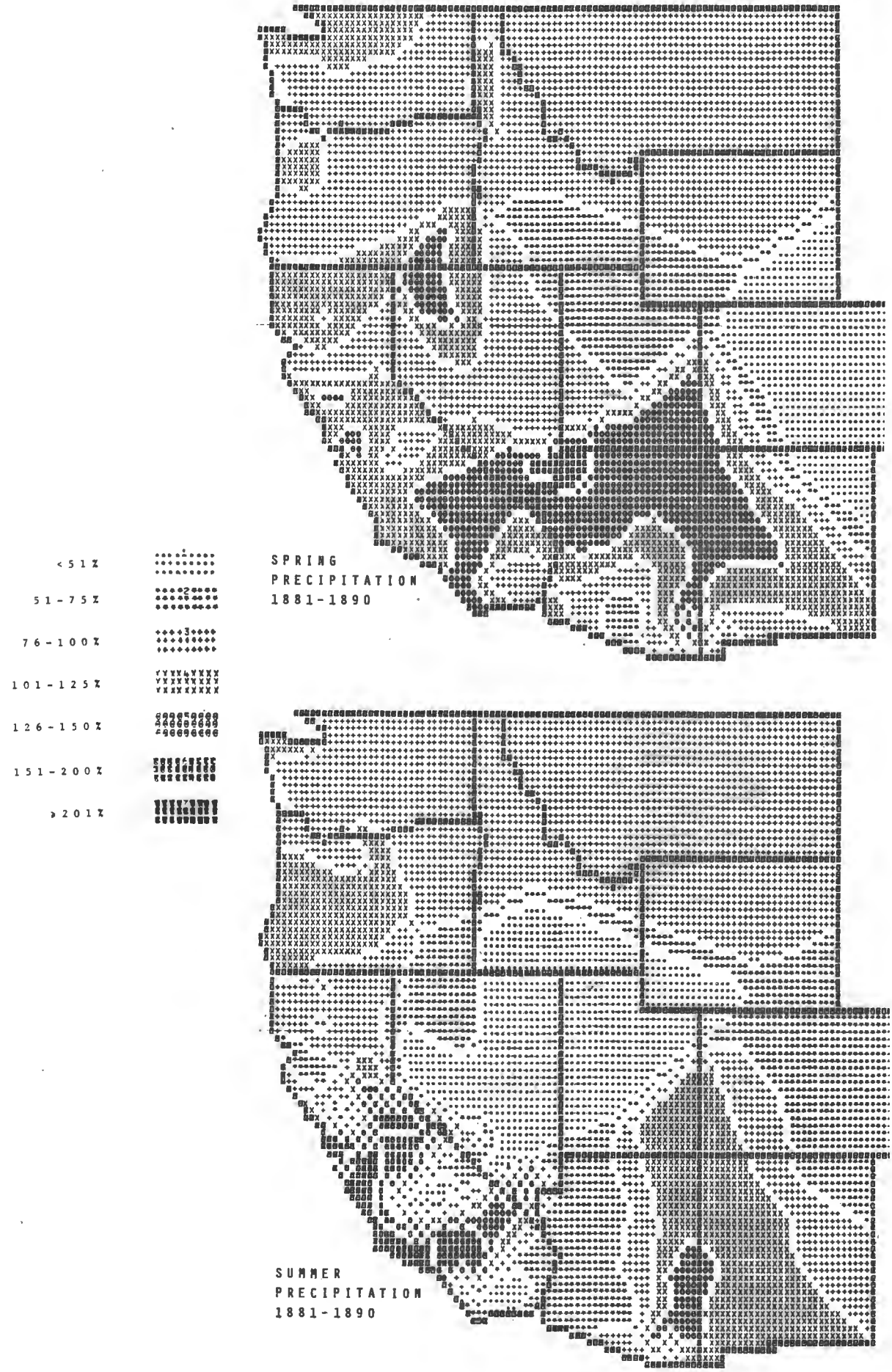

SPRING
PRECIPITATION
1881-1890
SUMMER
PRECIPITATION
1881-1890
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 59

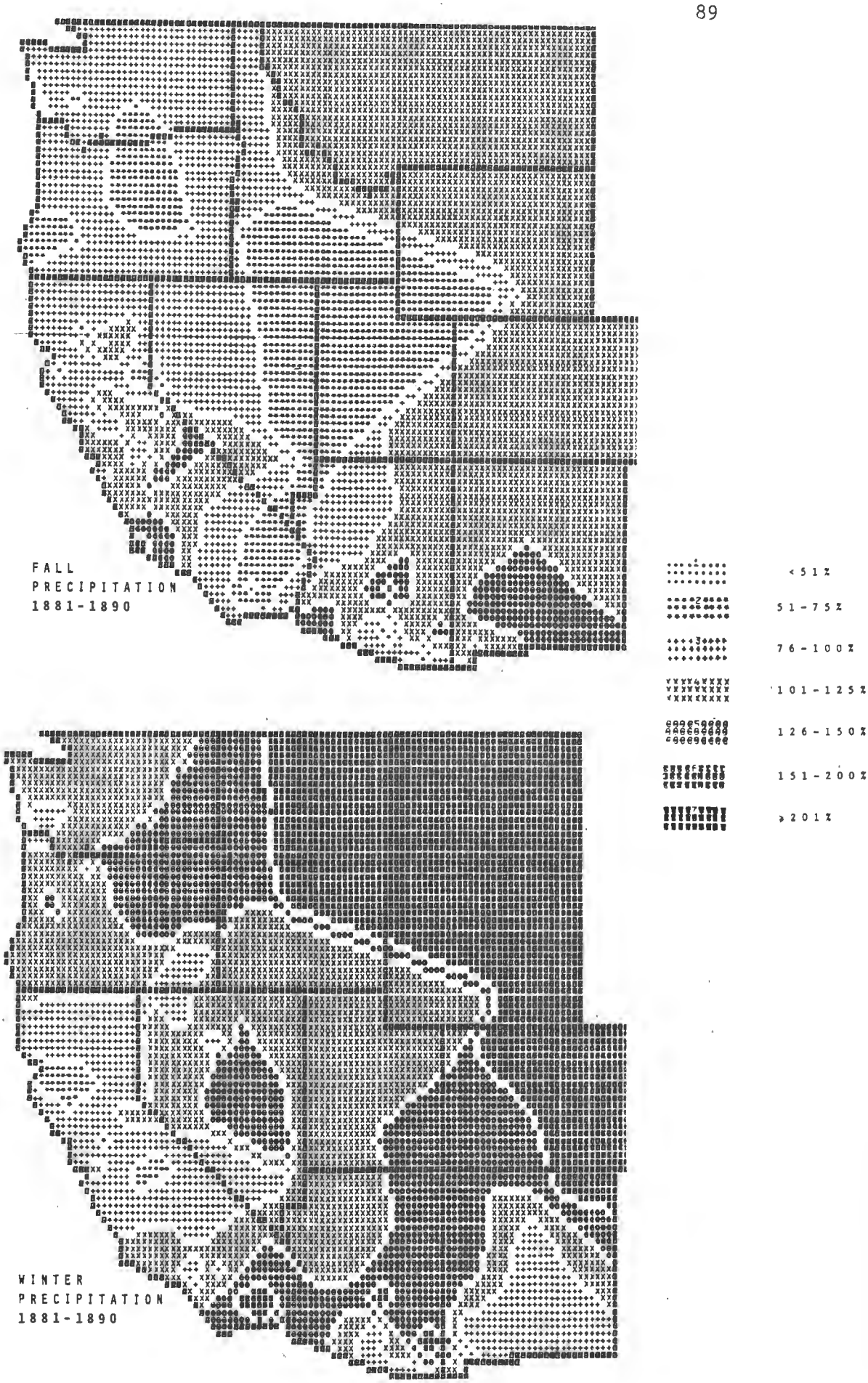

FALL
PRECIPITATION
1881-1890
WINTER
PRECIPITATION
1881-1890
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 60

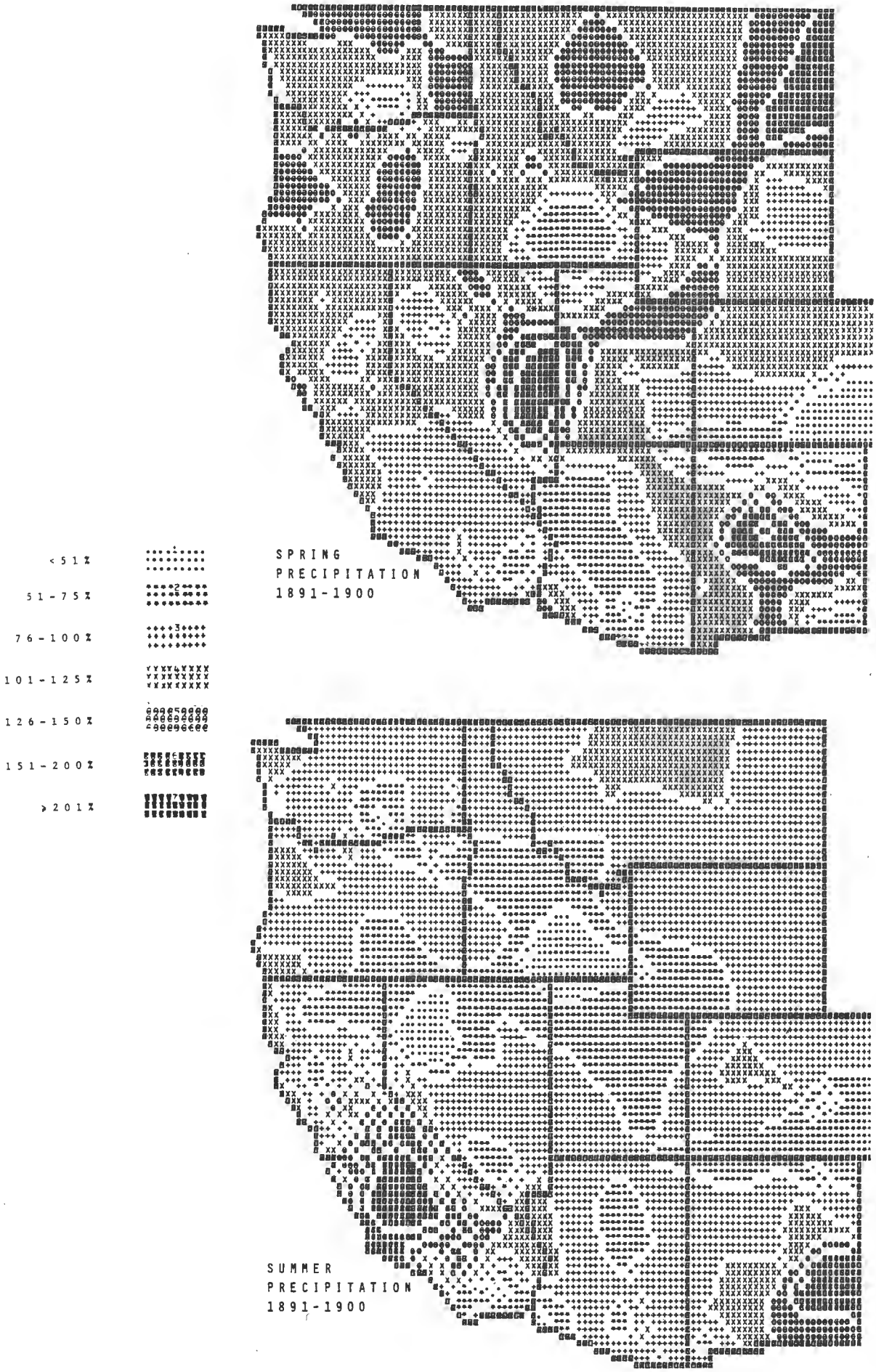

SPRING
PRECIPITATION
1891-1900
SUMMER
PRECIPITATION
1891-1900
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 61

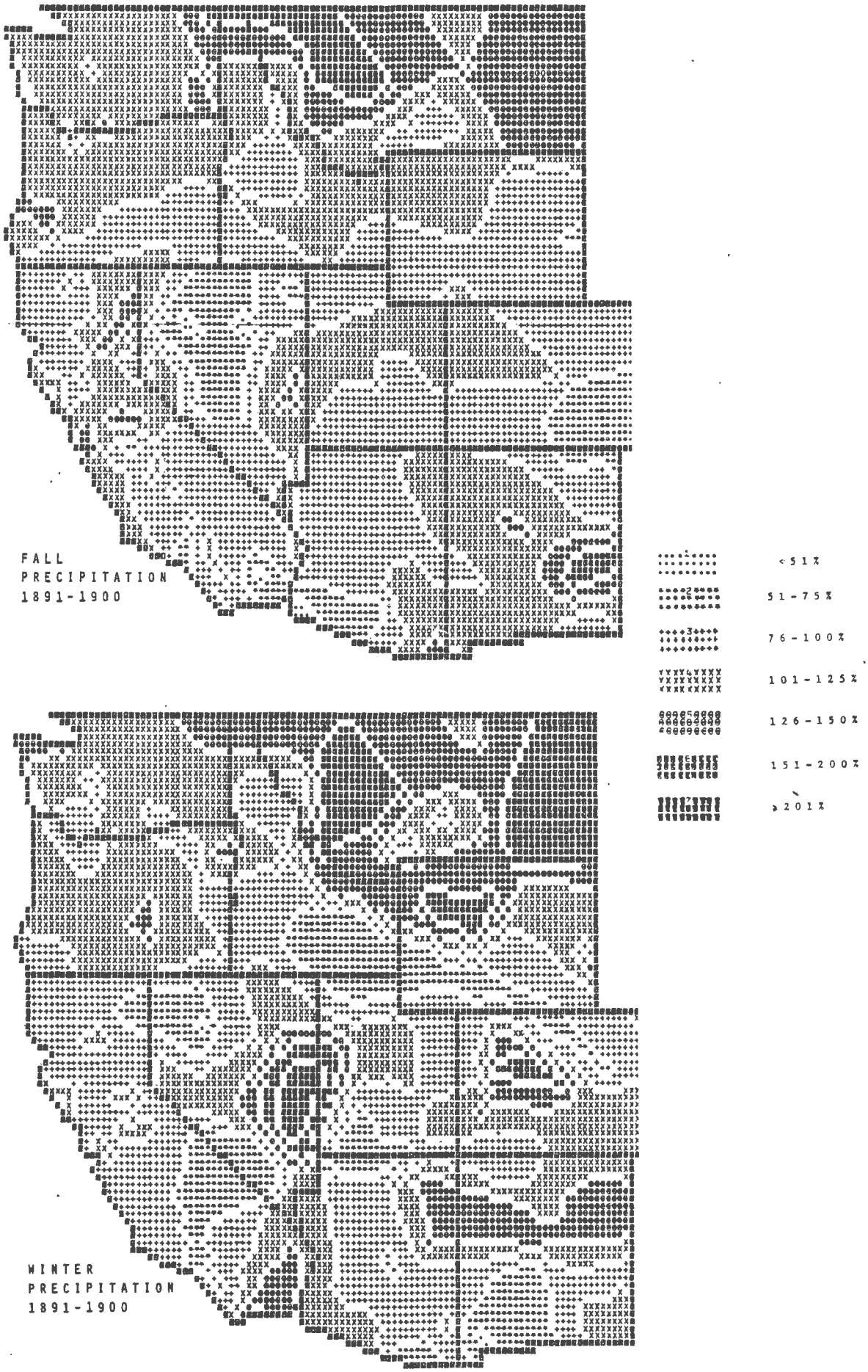

FALL
PRECIPITATION
1891-1900
WINTER
PRECIPITATION
1891-1900
<51%
51-75%
76-100%
101-125%
126-150%
151-200%
>201%

Figure 62

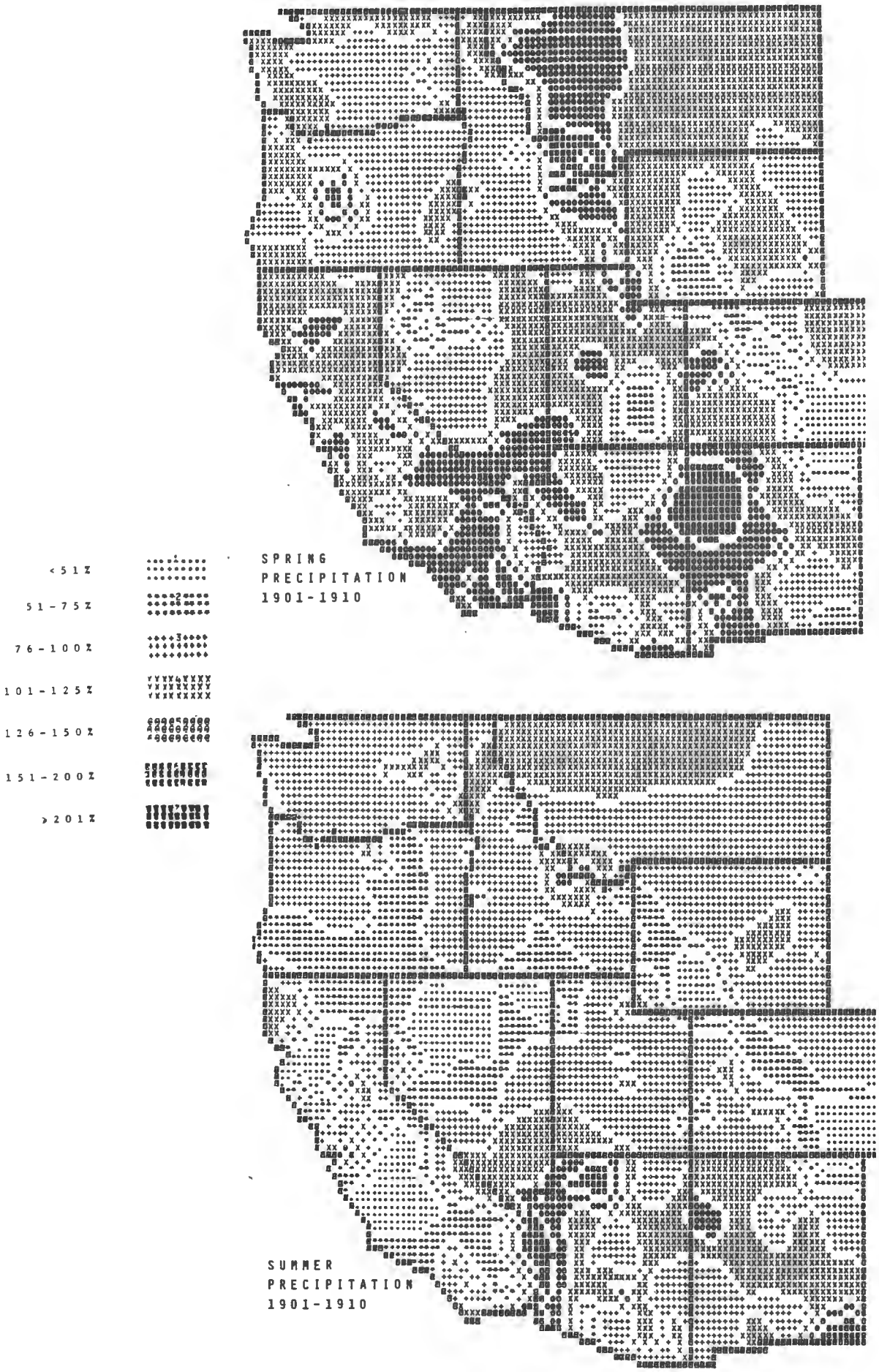

SPRING
PRECIPITATION
1901-1910
SUMMER
PRECIPITATION
1901-1910
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 63

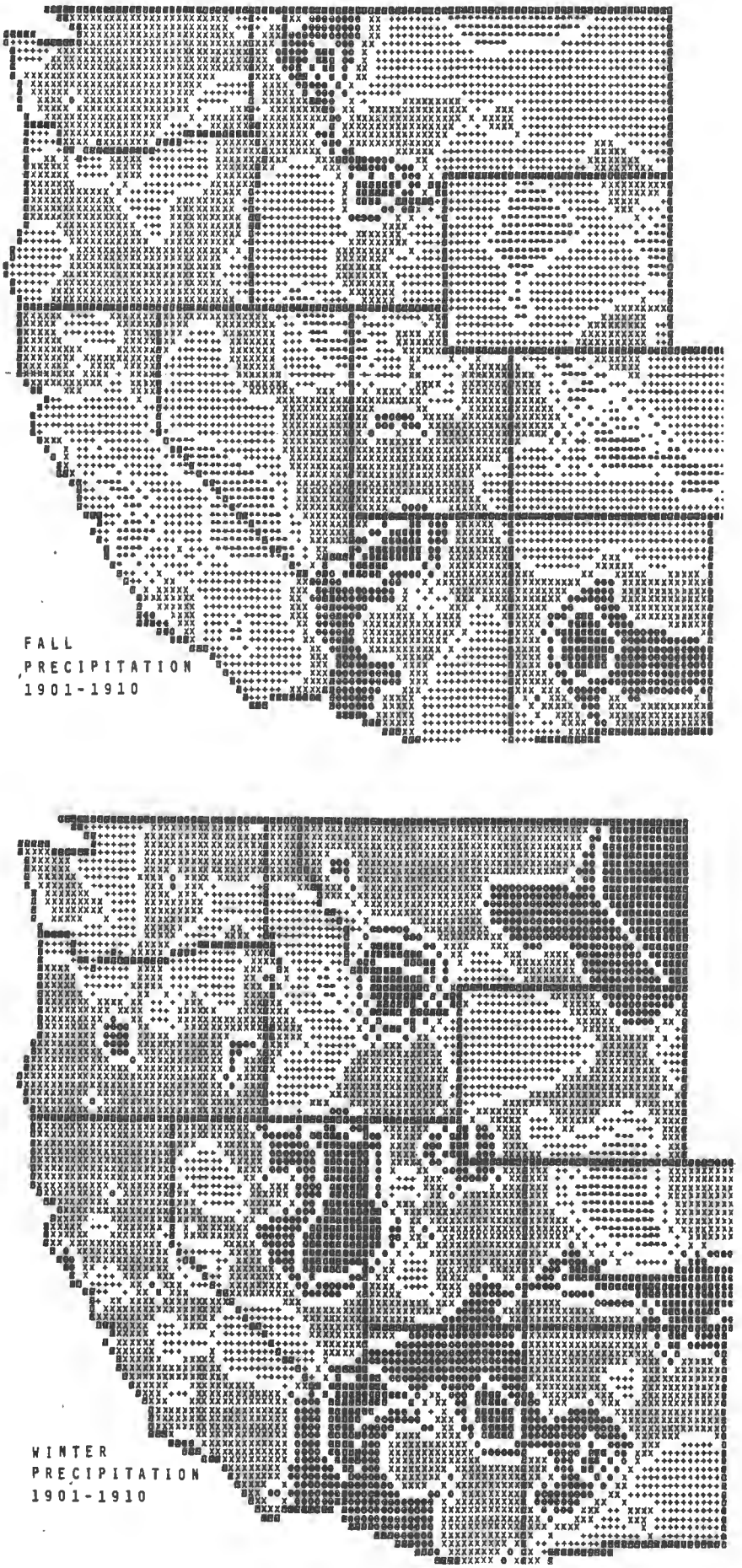
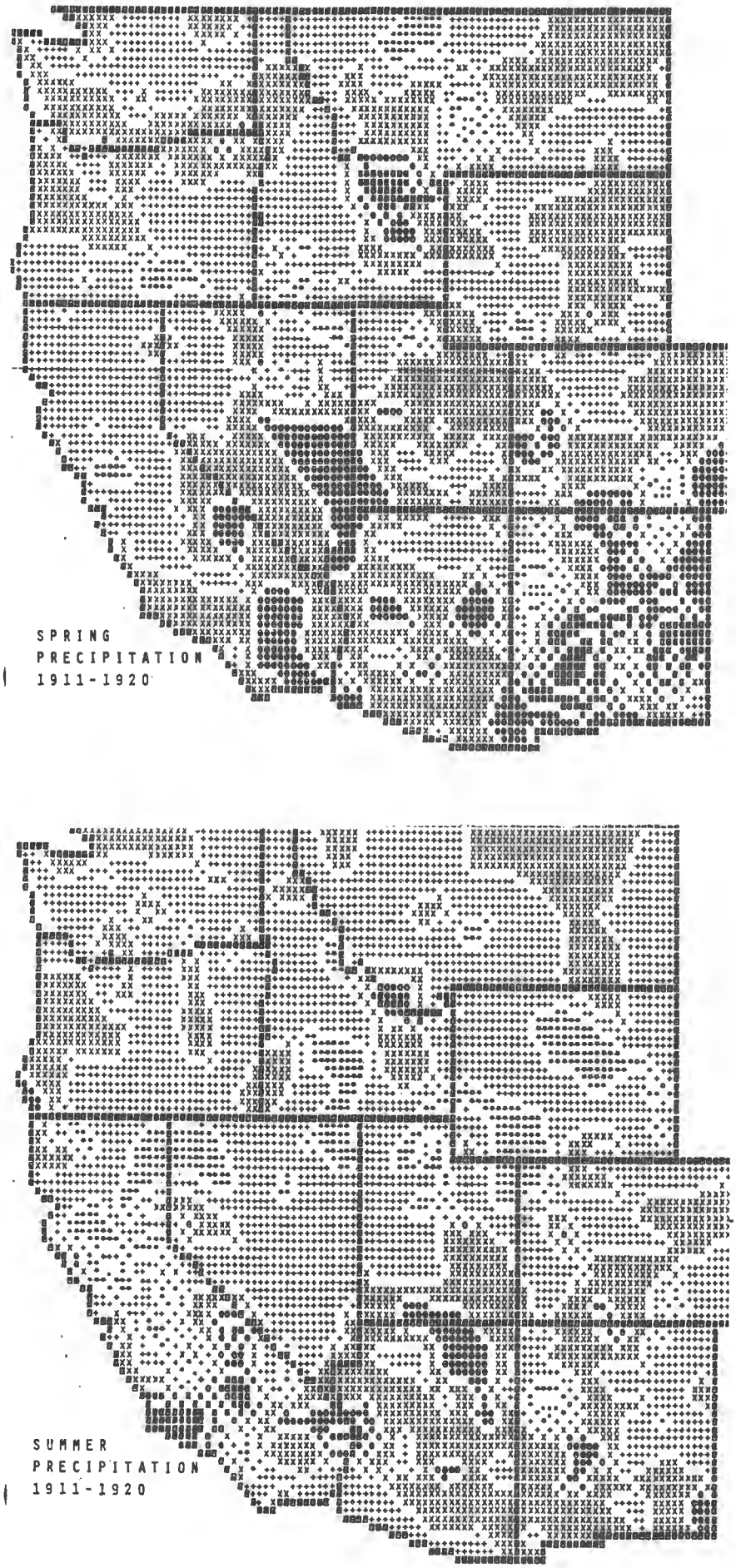

FALL
PRECIPITATION
1901-1910
WINTER
PRECIPITATION
1901-1910
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 64



< 51 %	1
51 - 75 %	2
76 - 100 %	3
101 - 125 %	4
126 - 150 %	5
151 - 200 %	6
> 201 %	7

Figure 65

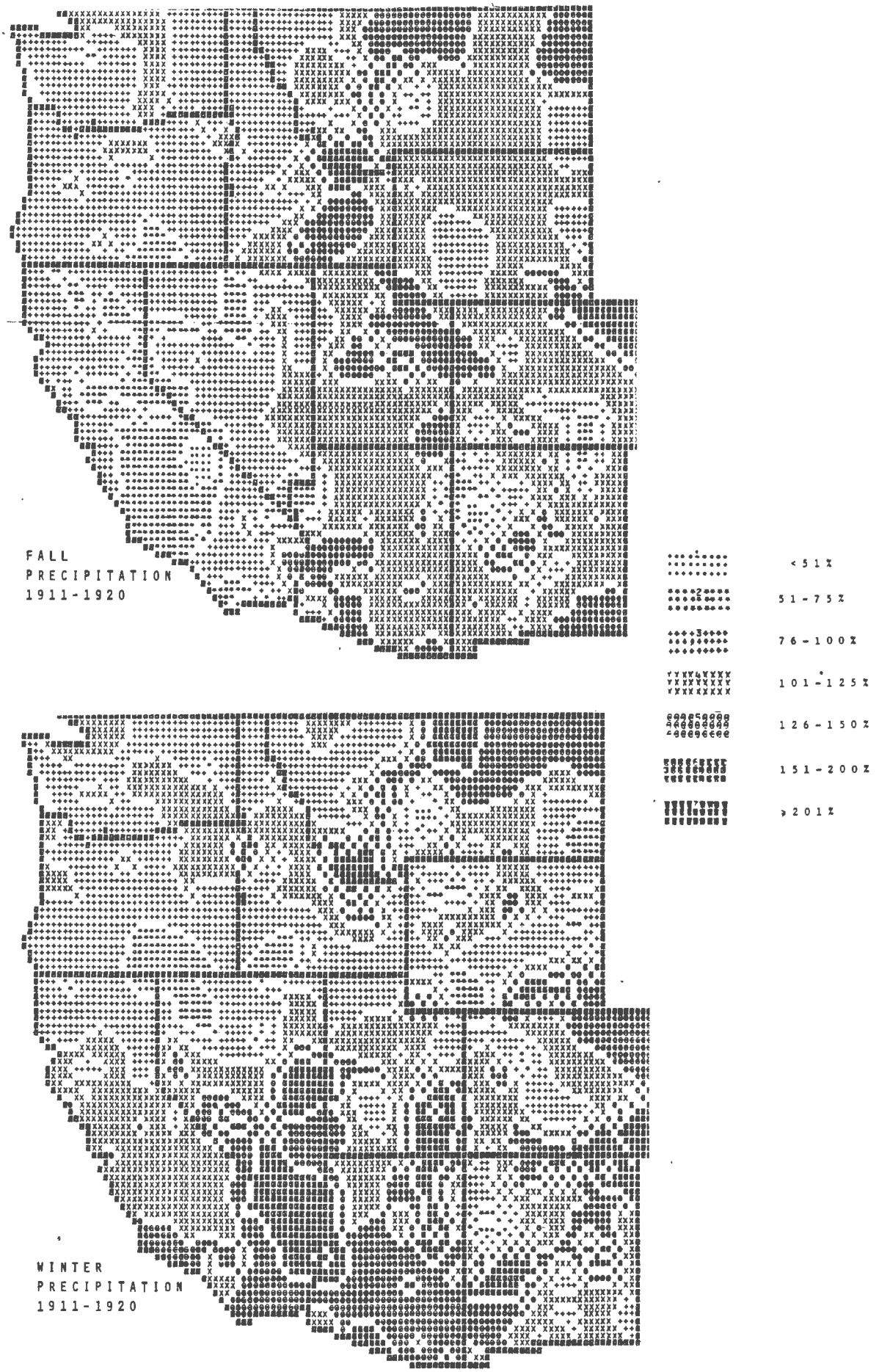

FALL
PRECIPITATION
1911-1920
WINTER
PRECIPITATION
1911-1920
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 66

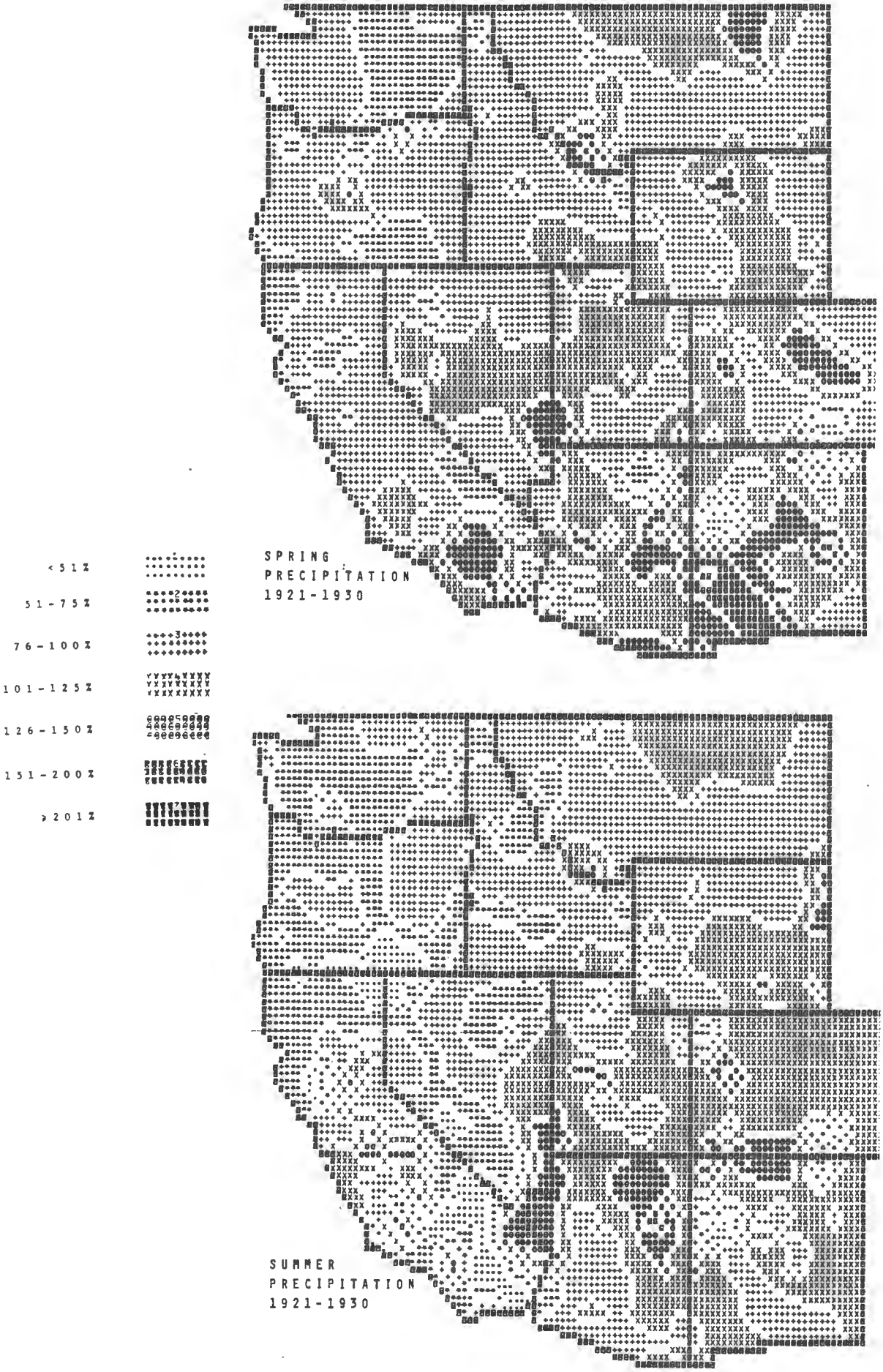
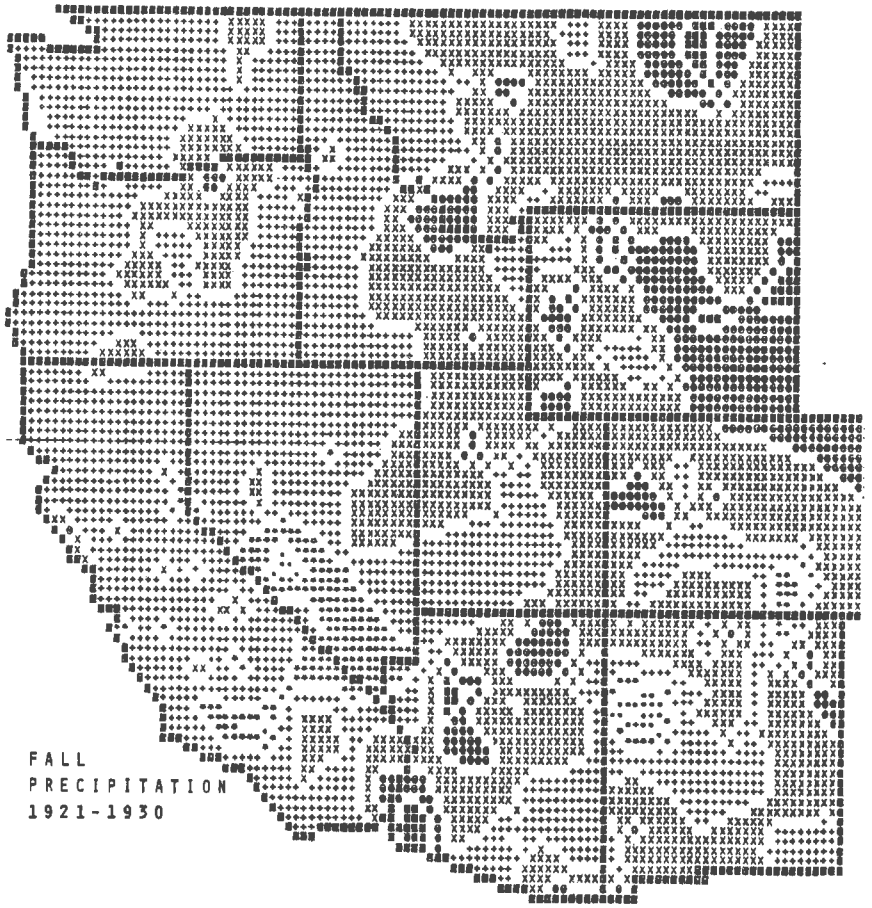
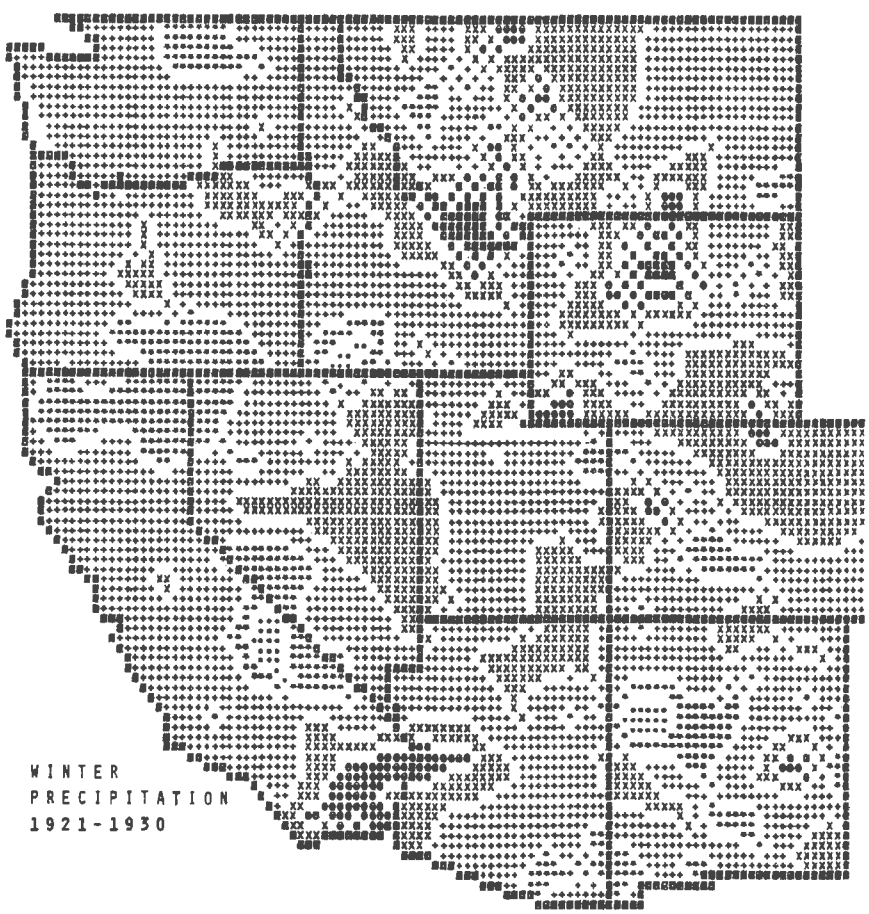

SPRING
PRECIPITATION
1921-1930
SUMMER
PRECIPITATION
1921-1930
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 67


FALL
PRECIPITATION
1921-1930


WINTER
PRECIPITATION
1921-1930

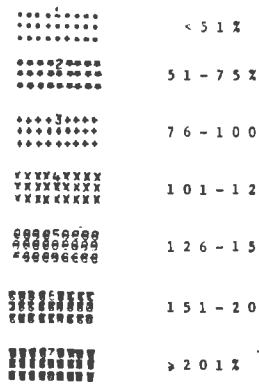

< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
≥ 201 %

Figure 68

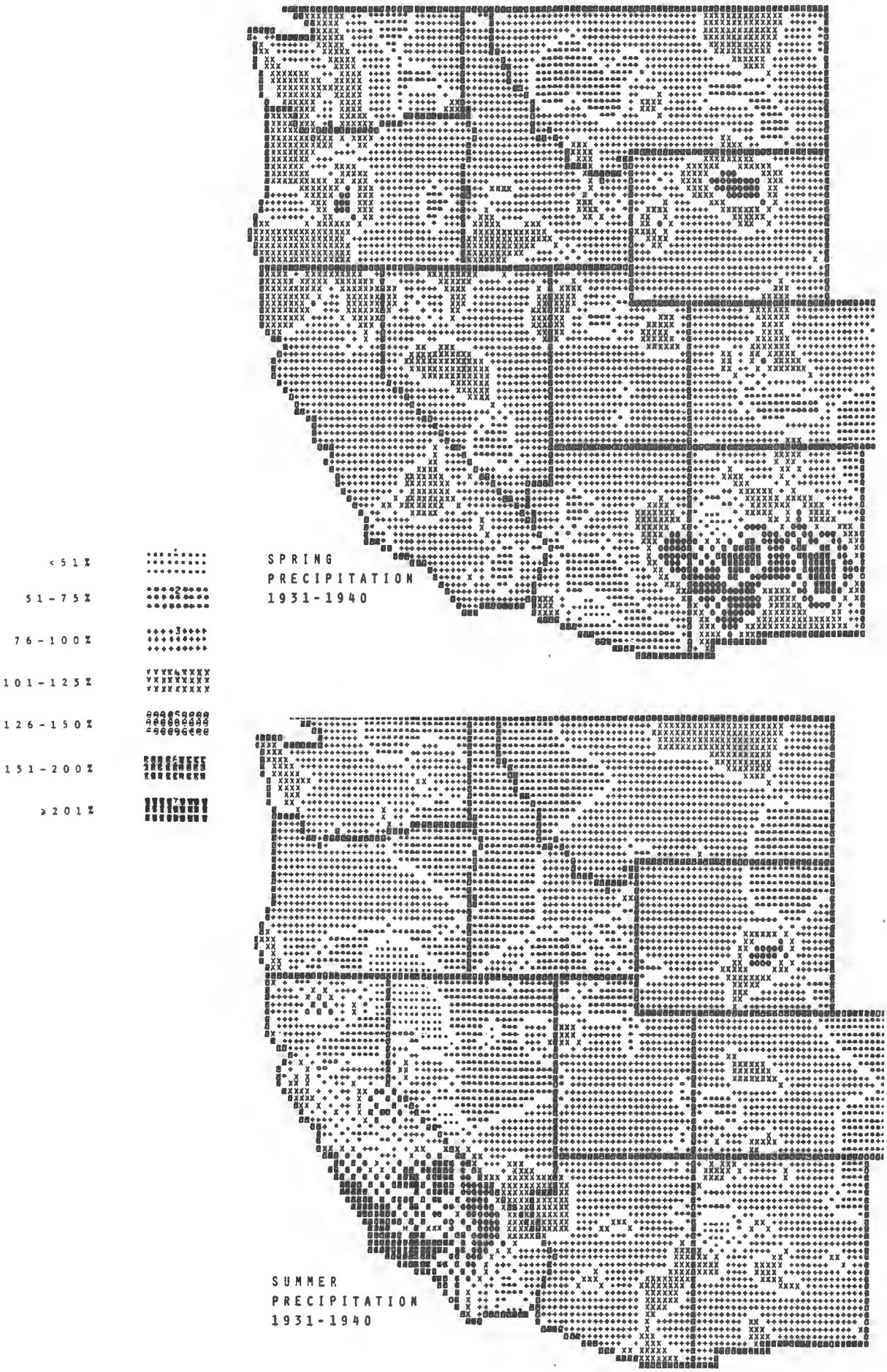

SPRING
PRECIPITATION
1931-1940
SUMMER
PRECIPITATION
1931-1940
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 69

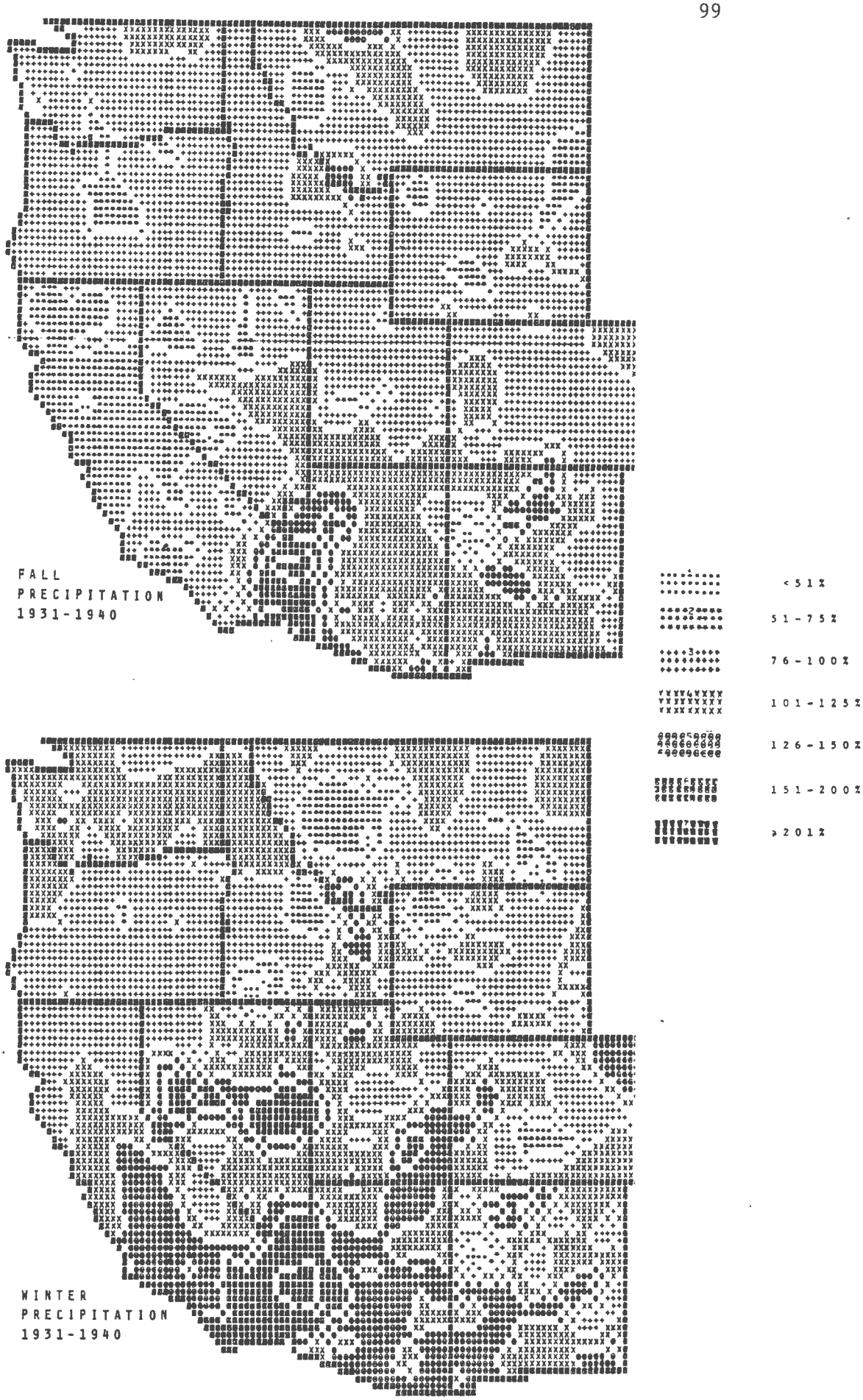

FALL
PRECIPITATION
1931-1940
WINTER
PRECIPITATION
1931-1940
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 70

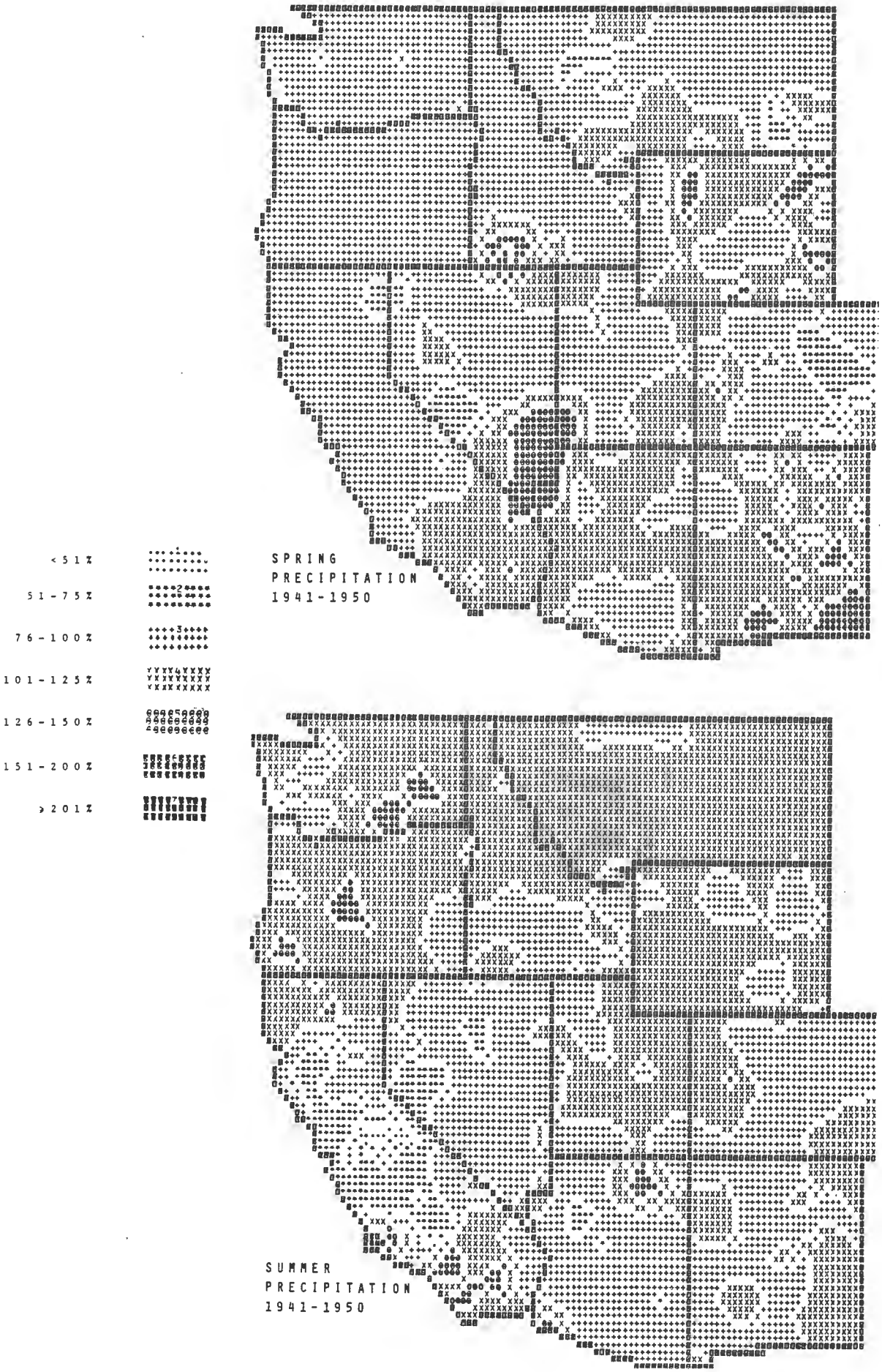

< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %
SPRING
PRECIPITATION
1941-1950
SUMMER
PRECIPITATION
1941-1950

Figure 71

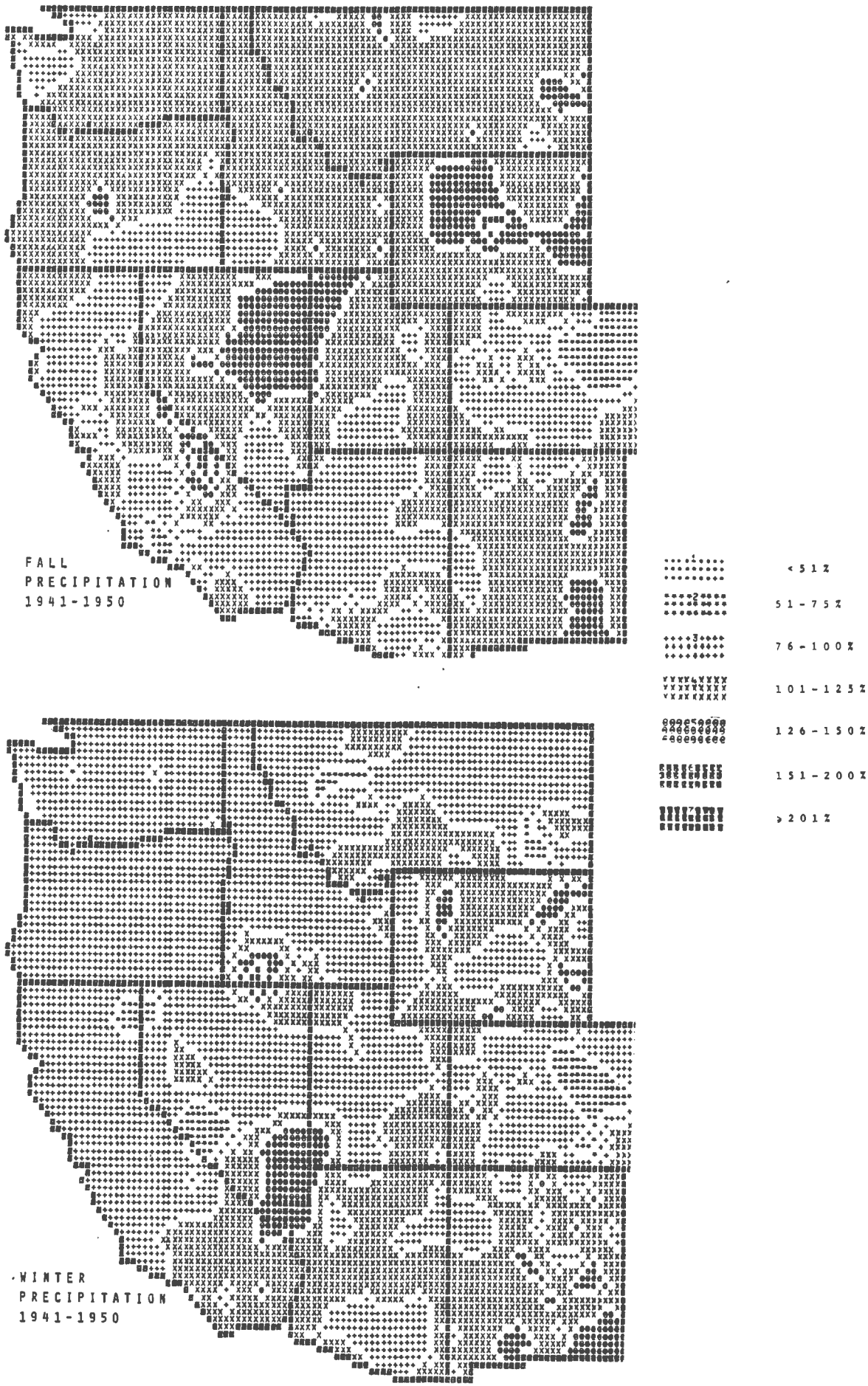

FALL
PRECIPITATION
1941-1950
WINTER
PRECIPITATION
1941-1950
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 72

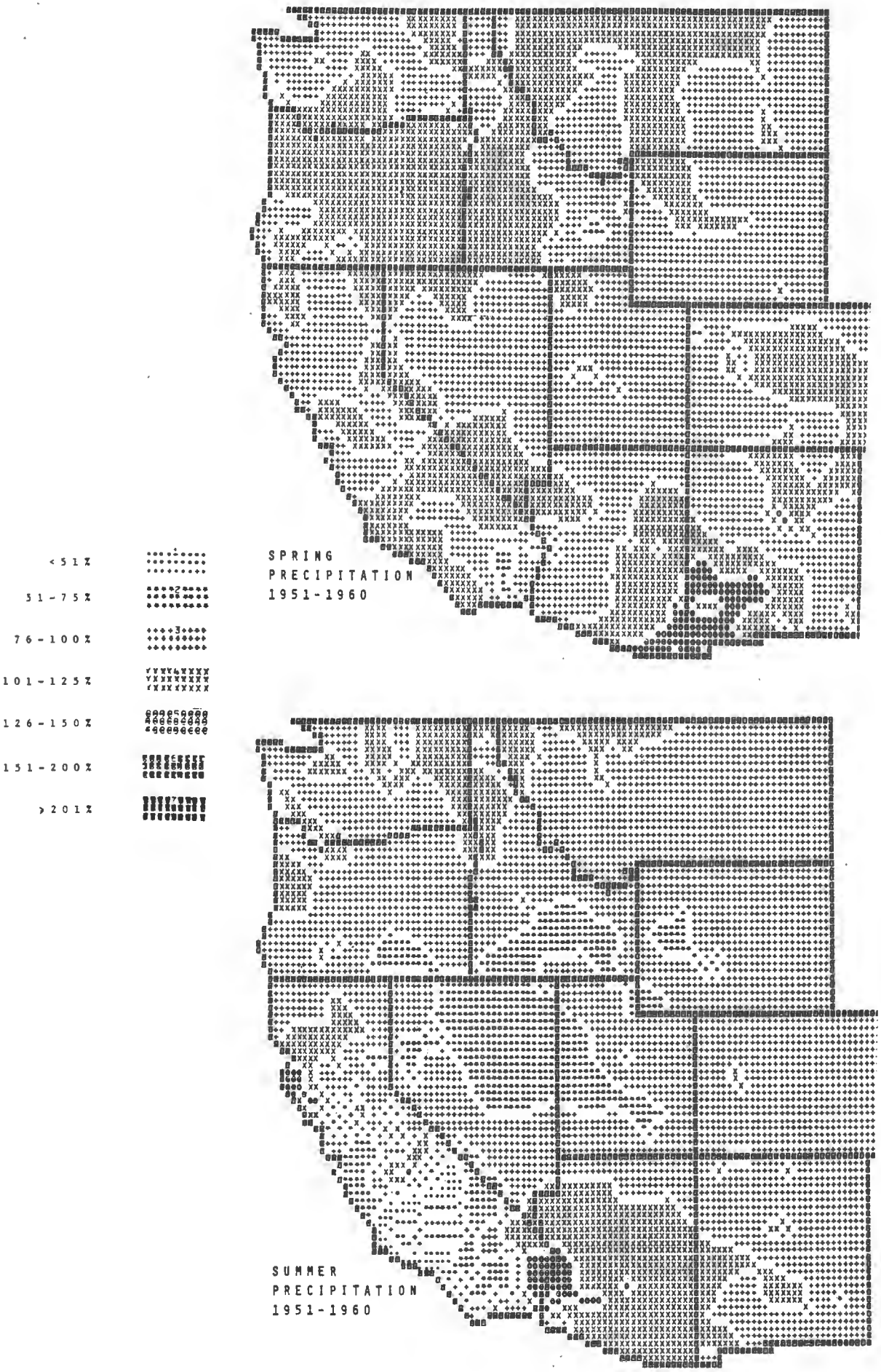

SPRING
PRECIPITATION
1951-1960
SUMMER
PRECIPITATION
1951-1960
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 73

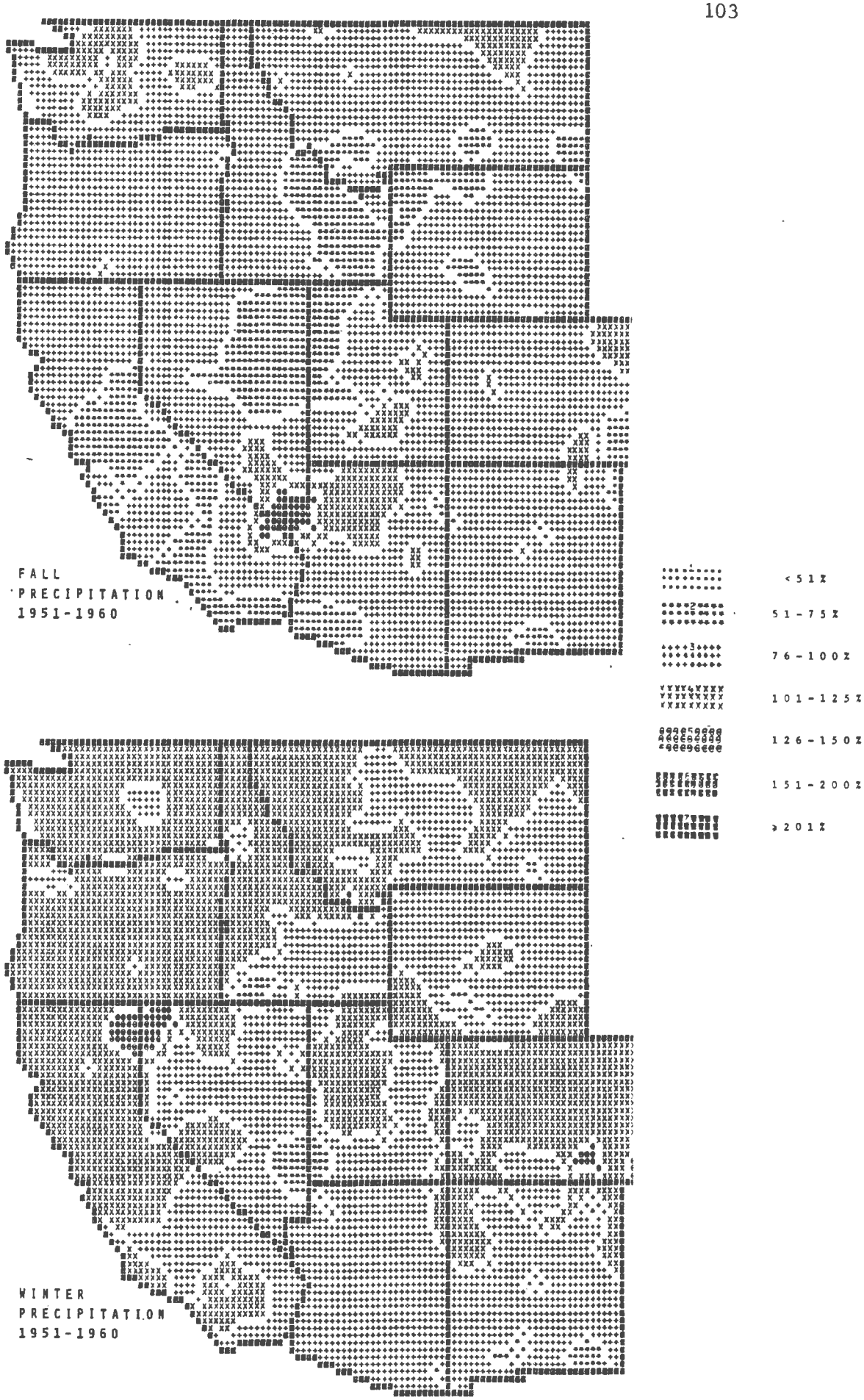

FALL
PRECIPITATION
1951-1960
WINTER
PRECIPITATION
1951-1960
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 74

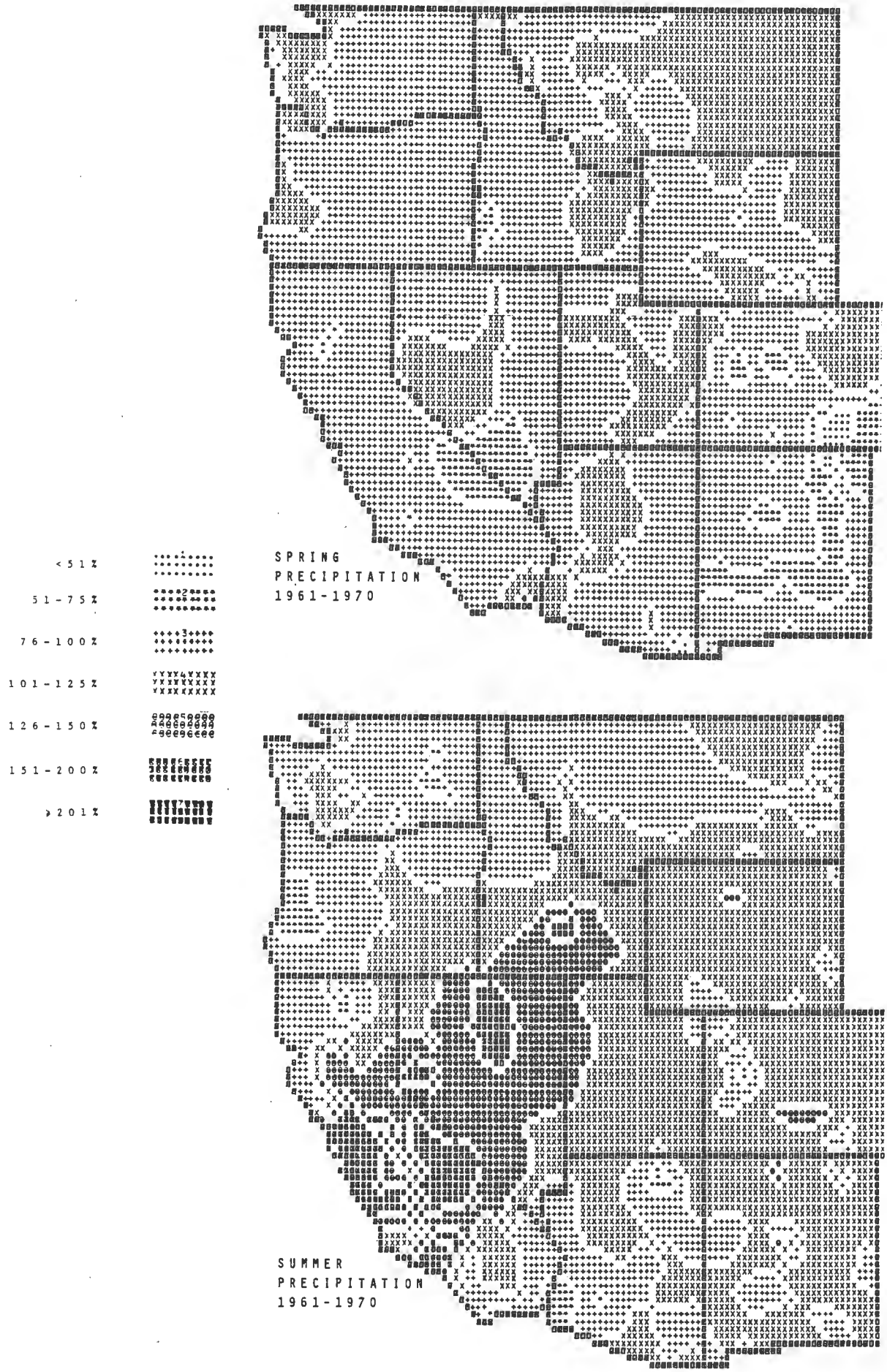

SPRING
PRECIPITATION
1961-1970
SUMMER
PRECIPITATION
1961-1970
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 75

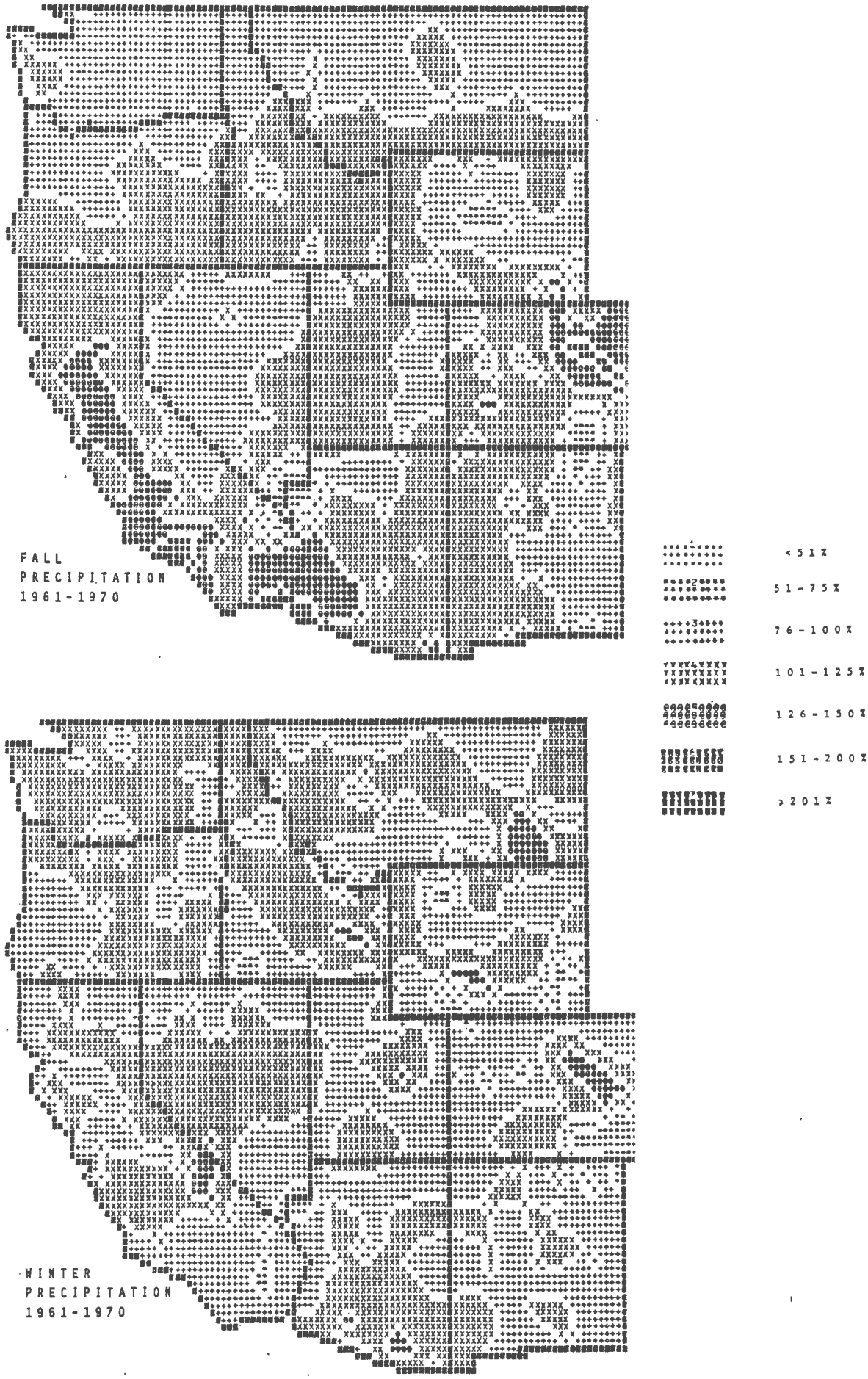

FALL
PRECIPITATION
1961-1970
WINTER
PRECIPITATION
1961-1970
< 51 %
51 - 75 %
76 - 100 %
101 - 125 %
126 - 150 %
151 - 200 %
> 201 %

Figure 76

CHAPTER 2

A SYNOPTIC TYPE CLASSIFICATION AND CATALOG FOR THE WESTERN UNITED STATES

Roger G. Barry

Raymond S. Bradley

&

L. F. Tarleton

Introduction

The method of stratifying synoptic weather maps into types as a basis for climatic analysis, or for analog forecasting, has a long history (see Barry and Perry, 1973). For the United States, Krick (1943) and Elliott (1943, 1949) prepared a catalog of 3-day and 6-day weather sequences in the 1930's, for example. Based on patterns of surface and upper airflow, it was intended to provide a means of long range forecasting. With the advent of computer facilities, various objective typing methods have developed such as the correlation technique of Lund (1963), but the applications have been rather limited. Some examples of this approach applied to regions of North America include studies by Augulis (1969), Barry (1972), Hartranft et. al., (1970), and Paegle and Kierulff (1973). These studies, including the present one, all approach the problem of map similarity based on the spatial pattern of the isobars. Blasing (1975, p. 99), notes that the natural modes of atmospheric behaviors show distinct recurring patterns rather than necessarily being constrained to be orthogonal. Hence a synoptic typing scheme has some advantages over techniques which use principal component analyses.

The use of synoptic catalogs to examine spatial aspects of climatic fluctuations has rarely been attempted in North America, although in Europe and the Soviet Union this approach has been common (Dzerdzeevski, 1968; Perry and Barry, 1973). We have therefore developed a scheme for classifying surface pressure types for the western United States with a view to understanding long-term precipitation and temperature fluctuations of the region. In this chapter, we outline the methods used in the classification and provide a summary of the main characteristics of the synoptic type patterns. The complete catalog 1899-1980 is included in tabular form. An initial attempt at using the catalog in an analysis of climatic fluctuations of the Rocky Mountain states has been presented elsewhere and will not be repeated here (Barry et. al., 1981). Further studies along these lines are currently underway.

Methods

Mean sea-level pressure data are used because they constitute the longest record of airflow patterns over western North America. The analysis is based on daily values at 35 points on a diamond grid covering the sector 20°-60°N 95°-130°W (see Figure 1A) for the period of Historical Weather Map Series and subsequent NMC analyses, i.e. January 1899-December 1980. The data set was made available by the National Center for Atmospheric Research, Boulder. The series has the period December 1944 through December 1945, and 60 other days missing.

The catalog of pressure patterns was developed using an objective technique of Kirchhofer (1973), with slight modifications. Kirchhofer's method, which he used to classify patterns of 500 mb heights over Europe, has the following steps:

1. Pressure data at grid points are normalized for each daily map.
2. Each day is compared with every other day on the basis of the sum of squares of differences between the grid points.
3. Grid points are grouped into 12 zones for comparisons and, using an empirically derived threshold value for the sum of squares, patterns are separated into "similar" and "dissimilar" ones.

Our approach was very similar to that of Kirchhofer. To reduce computational expense, the classification was done in two stages:

1. A sample of 60 months (5 Januaries, 5 Februaries, etc.) was selected to include an extreme zonal circulation pattern, an extreme meridional pattern and intermediate cases (Table 1). The daily mean sea level pressure patterns were then classified into 31 types. Each type is identified by a "key day", to which other days in the group are most similar.
2. Each day of the entire 81 years (1899-1980) was then compared to the key days and grouped with the appropriate type.

Classification Procedure

Initially each daily sea-level pressure data set was normalized as follows:

$$Z_i = (X_i - \overline{X})/s$$

where Z_i = normalized value of the ith grid point

X_i = original value of the ith grid point

$\overline{X}$ = mean of the 35-point grid

s = standard deviation of the 35-point grid

The normalization retains the spatial pattern but removes the effects of pressure magnitude and thereby circumvents the problem of seasonal changes of intensity of synoptic features. This essentially makes it possible to classify an entire data set using a common criterion.

The similarity measure for any pair of pressure patterns is the sum of squares of pressure differences at the grid points. This score, S, is

$$S = \sum_{i=1}^{N} (Z_{ai} - Z_{bi})^2$$

where Z_{ai} = normalized grid value at point i on day a.

Z_{bi} = normalized grid value at point i on day b.

& N = number of grid points, as follows:

N = 35 for whole pattern;

N = 4 for latitudinal zones (other than at 20°N where N=3)

N = 9 for meridional zones (except the westernmost where N=8)

The similarity measure between a pair of patterns is computed for all 35 grid points, as well as for 9 latitudinal and 4 meridional zones shown in Figure 1B (p. 136). The overall score is compared with an arbitrary threshold value of N, where N = 35, unless data are missing at some points. In the case of the zone scores, a threshold value of 1.8N (where N = 3 to 9) is used. The overall score and the score for each zone must not exceed their

respective threshold values in order for the patterns to be accepted as similar. These threshold values were determined empirically by inspection of the results using several different values, initially based on those of Kirchhofer. As in the case of correlation coefficients, if too stringent a criterion is adopted, numerous well-defined but infrequently occurring types are obtained. Conversely, if the threshold value is too high, then few types with considerable internal variability are defined. To illustrate the general approach, some examples of the classification procedure are given in figures 2 to 5 (p. 137-140).

When all pairs of patterns have been compared, the pattern-day to which most other pattern-days are similar is designated the key day for Type 1. All Type 1 days are then extracted from the data set. The pattern-day with the next highest frequency of similar pattern-days is designated the key day for Type 2 and these days are then removed. This process is continued until all days are grouped into clusters of 5 or more. Pattern-days which are similar to fewer than 4 other days are considered "unclassified". This process gave 31 key days for the 60 month sample period given in Table 1. The pressure patterns on these 31 days are considered to be the principal synoptic types for the purposes of subsequent computations. They are shown in Figures 6 to 9 (p. 141-144).

Obviously, many pattern-days score below the threshold value for more than one key day. These could be misclassified if they were entered in a large group and thus removed from the total data set before the type group to which they were most similar was processed. Therefore, the screening comparison was repeated, comparing each pattern-day against the 31 key days. A pattern-day was grouped with the key day with which it had the lowest overall score below the threshold value, with no zone score exceeding its appropriate threshold value.

For the sample period, 95.6 per cent of the 1,827 were classified into one of the 31 types, leaving 65 days unclassified. To classify the entire period 1899-1980 the days had only to be compared (using the similarity measure), with the key days, instead of with every day of the 81 years. This greatly reduced the necessary computer time and costs.[1]

---

[1]The time taken on University of Colorado CDC 6400 for the 60 month sample was approximately 122 min. compared with only 60 min. for classification of 75 years (1899-1974).

The steps were as for the 60-month subset. After normalization, scores were calculated. Each day was classified with the key day against which its score was the lowest and below the threshold value. Finally, the 31 types were renumbered according to frequency rank in the total such that type 1 has the highest frequency, etc. Ninety-three percent of all days with data were classified. The frequencies range from a maximum of 2163 (8.0 percent of all days) in Type 1, decreasing almost linearly to the minimum of 51 occurrences (0.2 percent of all days) of Type 31 (Table 2) (p. 115).

The overall mean scores of all types range from about 15 to 25 (Table 3). The mean score broadly increases with type ranking, indicating decreasing within-group similarity (although the lowest score, 15.3, occurs with Type 7). A complete listing of the catalog is given in Table 4 (p. 117-133). followed by a summary of the type frequencies (Table 5) (p. 134).

Seasonal Distribution and Persistence

Monthly occurrence of the types for the period 1899-1974, is shown in Figures 10 to 15 and summarised in Table 6 Most types show a distinct seasonal distribution. For example, types 1 and 3 have a fall-winter maximum whereas types 4, 5 and 6 have summer maxima. Types 1 and 3 both have predominantly high pressure over the southern two-thirds of the region with lows to the north over Canada. Types 4, 5 and 6 all have a central high between 40° - 45°N off the west coast of the United States and a low over Mexico and/or the southwestern United States, although they differ in the intensity of the pressure gradients. The low in the south is primarily a summer heat low although on occasion, especially when it is farther south, it may be a tropical disturbance. Type 2 which occurs all year, but with an early winter minimum, has a weak trough extending northward from Baja California and a high over western Canada.

The types show a rather low degree of day-to-day persistence, typically 20-30 percent, in contrast with the values often in excess of 50 percent obtained by Moritz (1979) using an identical technique for Alaska. This represents a latitudinal contrast in synoptic pattern variability and persistence.

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Table 1

MONTHS SELECTED FOR THE SAMPLE PERIOD ANALYSIS

January	1953, 1958, 1963, 1969, 1970
February	1955, 1965, 1968, 1970, 1972
March	1955, 1957, 1968, 1969, 1971
April	1954, 1960, 1962, 1968, 1972
May	1963, 1966, 1968, 1970, 1972
June	1954, 1961, 1963, 1970, 1973
July	1952, 1958, 1964, 1969, 1973
August	1953, 1957, 1961, 1968, 1972
September	1954, 1958, 1963, 1967, 1973
October	1953, 1960, 1964, 1969, 1972
November	1952, 1958, 1966, 1970, 1972
December	1961, 1963, 1967, 1971, 1972

Note: These were selected from the period for which geopotential height data are also available so that upper air patterns can be analyzed, if necessary, in the future.

TABLE 2 Summary of Types, Keydays, and Frequency *

Type	Key Day			Frequency (Total)	Frequency (Average Annual)	Standard Deviation
1	30	January	1970	2163	28.9	9.5
2	19	July	1969	2126	28.4	8.6
3	10	March	1971	1974	26.4	8.4
4	25	April	1968	1615	21.6	6.4
5	4	September	1954	1572	21.0	5.6
6	26	September	1958	1356	18.1	4.9
7	29	March	1969	1344	18.0	8.4
8	10	May	1970	1293	17.3	6.2
9	4	July	1964	1210	16.1	5.4
10	13	November	1958	1166	15.6	5.3
11	6	October	1953	1147	15.4	5.0
12	14	April	1962	1033	13.9	5.5
13	17	July	1973	931	12.5	4.3
14	15	January	1970	847	11.4	5.6
15	2	February	1968	716	9.7	4.4
16	8	April	1968	606	8.1	2.8
17	24	June	1970	547	7.4	3.3
18	29	December	1963	522	7.0	3.4
19	12	October	1972	503	6.8	3.1
20	28	March	1971	397	5.3	2.4
21	28	July	1958	378	5.1	2.9
22	22	December	1972	329	4.4	2.3
23	17	April	1962	273	3.7	2.3
24	4	August	1968	257	3.4	2.4
25	26	May	1966	200	2.7	2.0
26	4	January	1953	154	2.1	1.5
27	2	January	1963	152	2.0	1.4
28	7	December	1961	141	1.9	1.3
29	6	September	1954	114	1.6	1.4
30	26	December	1971	80	1.1	1.2
31	7	October	1964	51	0.7	0.8

*based on the period 1899-1974.

Table 3

Mean Scores and Standard Deviations of Scores for Each Synoptic Type

TYPE	MEAN	SD	N
1	16.2	5.2	2163
2	16.9	5.3	2126
3	17.2	5.5	1974
4	18.6	4.8	1615
5	18.8	4.9	1572
6	17.9	4.8	1356
7	15.3	5.8	1344
8	18.7	5.4	1293
9	19.0	4.9	1209
10	17.6	5.2	1166
11	18.5	5.4	1147
12	18.2	6.0	1032
13	18.5	4.6	931
14	17.4	5.4	847
15	18.0	5.5	716
16	18.5	4.8	606
17	20.2	5.2	547
18	18.7	5.5	522
19	18.1	5.2	511
20	21.6	5.5	397
21	20.9	5.5	378
22	19.6	5.6	329
23	22.0	5.2	278
24	21.6	5.3	257
25	21.3	5.3	200
26	22.5	5.7	154
27	21.7	5.2	152
28	23.2	5.9	141
29	23.1	5.1	116
30	22.3	6.2	80
31	25.5	6.3	51

Table 4. Catalog of synoptic types in the western United States.*

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1899 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	7		14	16	6			8	12	12	3	3	27	3	3	12	11	1	1	1	1	16	20	4	16	2	28	2	2	2	7
FEB	7	7	2	6	6	6	18	7	7	7	18	11	1	1	1	4	10	4	1	10	14	2	12			20	10		.	.	.
MAR	22	22		20	18	11	15	22	8	8	8	12	12	14	7	12	12		7	12		20	3		14	2	18		8	2	7
APR	7	12	12	11	18	11	18	11	1	1	1	10	16	20	23	10	29	12		12	17		2	30	3	3	10	13	4	22	.
MAY	8	8	29	10	25	9	4	3	13	13	10	5	2	2		4		8	8	8	8	19	12	9	3	3	10	10	10	10	22
JUN	8	8	8	10	10	5	5	6	6	1	10	10	5	29	6	19	1	5	25	8	5	13	25		3	3	4	9	9	13	.
JUL	5	13	5	5	9	5	9	9	25	17	9	9	4	13	5	9			5	5	4	5	5	13	5	5	13			9	5
AUG	5	5	5		17	17	8	10	1	10	13	2		9	4	10	1	4	4	13	8		1	1	10	13	17	6	6	2	7
SEP	10		12	10		4	6	4	1	1	21		9		13	6	6	2	19		17	17	1	16	11	21	5	2	11	3	.
OCT	9	6	6	11	11	1	4	1	5	5	14	14	14	9	4	1	1	15	15	15	3	22	4	4	11	11	11	1	1	1	18
NOV	11	11	11	11	1		11		15	12	12	15	12	1	12	10	16	3	3	3	15	3	11	11	3	3	3	1	10	20	.
DEC	3	26	18	11	1	1	3	3	4	3	12	14	7	7	12		3	3	1	1	1	1	1	3		28	7	7	12	12	7

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1900 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	7	15	15			27	12	10	12	3	3	3	10	3		3	3	1	1	3	1				18		18	19	31	18	11
FEB	23	23		30	4	10	2	20	11	4	10	5	14	7	23	18	18	15		12	3	10	20	3	3	17	20	11	.	.	.
MAR		12	7	7	7	23	3	15	12	3	3	6	2	18	7	7		13	5	2	1	25	17	4	20		8	2	12	11	11
APR	11	3	3	9	3	3	3	8	2	7	7	12	3	17	2	2	4	1	1	9		17	4	17	8	4	9	2	2	19	.
MAY		18	19	3	3	3	20	12	11			10	10		3	17	4	9	17	11	4	1	1	25	3	3	4	4	4	6	9
JUN	2	9	3	3	4	16	16	24		25	9	6		3	17	4	4	3	3	3	3	4		8	4	4			8	17	.
JUL	8	4	4	4	4	16	16	1	4	29	3	9	4	21	9	9	1	13	19	1	21	21	9		3	9	13	16	9	1	3
AUG	3	4	6	9	9	4	4	9	4		4	4	4	4	4	9	4	1	1	25	4	4	4	4	10	4		9	4	3	1
SEP	1	16	1	9		9	13	2	2	2	16	21		8	2	12	2	4	4	4	6	1	24	5	13	2	19	1	6	2	.
OCT	14	12	12	22	3	16	1	19	1		1	1	10	3	11	11	1	3	3	10	1	1	16	9	3	1	3	12	4	3	3
NOV	1		1	1	1	19	12	11	6	18	1		6	7	7	7	7	7	7	7		20	11	11	3	3	1	1	1	3	.
DEC	1	3	1	1	1	26	1	31	11	18	11	3	3	12	3	3	1		3	3	10		29	3	1	1	2	1	10	6	6

*The complete catalog is available in machine-readable form from the first author for a nominal charge.

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1901 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	15	7	7	30	7		21	9	3	3	3	3	10	10	26	11	12			19	1	16	11	1	4	16		2	6	6
FEB	6	8	7	7	19	19	14	2	7	28	11	11	3	1	23		13	14	7	7	14	7	23	13	20	3	1	1	.	.	.
MAR	1	4	26	6	6	1	3	4		15	22	10	20	3	1	23	10	5	18	19	1	10	4	20	3	8	17	17	9	6	6
APR	3	3	10	10		8	9	2	11	9	4	13	2	2	2	2	17	4	11	3	3		3	4		5	12	12	12		.
MAY	25	17	13	20	5	2	12	4	13			17	3	3	3	3	3	4	8	2	8	8	8	2	19	11	9	3	9	9	6
JUN	25	5	10	10	20	20	9	9	13	5	8	8	8	8	4	13	21	9	25	4	4	13	13	8	17	4	1	13	13	13	.
JUL		9	10	4	16	6	9	4		9	3	9	1	4			8	9	9	13		8	8	5	2	5	5	5	21	1	9
AUG	13	6	6	9	13	21		4	4	1	4	4	9	6	1	21	9	21	9	13	13	21		9	9	1	6	4			9
SEP	9	9	9	13	5	2	12	9	9	25	20	3	4	4	13	6	19	11		15	15	22	12	12	15	23	16	6	19	19	.
OCT	6	23	11	13	9	4	4	16	29	4	6	6	19	21	6	23	1	1	3	3	1	11	11				3	3	1	1	13
NOV	25	5	23	18	3	16	3	21	11	10	4	1	23	12	12	3	1	23	7		12	3	3	3	11	11	11		3	27	.
DEC	20	3	11	3	11	3	4	1	3	5	6	2	6	19	1	26	18	5	18	1	1	1	1	4	1	1	16	1	1	21	12

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1902 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN		12	11	1	3	1	1	10		18	18	3	1	16	18	1	29	3		4	1	29	14	7	2	2	18	2	11		5
FEB	20	15	12	15	22	12	12	12	12	11	3		7	12	15	15	3			3				15		10	20	8	.	.	.
MAR		22	8	15	15	22	15	15	10	4	16	3	10	8	8	20	11	3	17	8	17	8		9	9	4	13	13	5	26	7
APR	12	12	12	24	10	12	3	3	4	6	12	8	2	12	7	20	10	15	8	8	8	5			4	13	10	22	15	8	.
MAY	8	8	8	2	18			7	12	12			12	12		3	10	10	8	8	10	10	10	5	2	11	11	3	10	24	13
JUN	8	8	5	9	13	5	23	1	1	4	5	13	5	5	5	2	5		2	7	7	11	7	20	8	8	8	2		17	.
JUL	24	13	10	10	10	13	13	6	6	9	1	13	1	21	10	5	5	2	11	11	1	9	1	6	21	13	24	9	13	4	3
AUG	1	13	9	6	6	21	13	24	13	6	24	10	4	3	4	9	4	5	8	17		9	9	9	9	9	4	4	1	4	16
SEP	6	21	12	24	1	1	1	16	1	13	2	19	1	1	24	13	6	1		5	6	4	11	24	10	4	24	6	6	6	.
OCT	6	18	19	1	21	21	21	28	6	5	14		19	1	16	9	4	1	23	15	15	15	22	8	17		15	3	1	1	1
NOV	20	15	10	5	14	15	15	14	7	12	8	8	15	15	3	3	3	1	9	4	6	19	1	4	4	1	10	1	4	1	.
DEC	10	14	7	15	6	14	7	15	22		12	11	11	3	3	1	1	1		26		15		7	12	11	10	20	1	1	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1903 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	3	3	4	1		26	23		23	6	1	6	1	1	26	20	3	10	3	10	3	3	3	10		12	8	20	3	22
FEB	8			6	6	4	3	3	3	10	5	14	2	2	2	6	26	19	19		1	31	23	2	6	6	14	19	.	.	.
MAR		14	7	19	9	10	27	15	15	15	15	14	7	30	30	14	14	14	18	19	13	2	11	7	14	7	7	15	15	22	
APR	13	4	4	24	17	3	1	10	8	8	5	20		15	7		9	10		12	12	6	8	2		24	5	14	7	28	.
MAY	5	6	1	24	8	12	24	4	13	8	2	3	3		1	13	8	8	10	10	8	8	5	5	4	4	4	4	17	11	11
JUN	12	12	11	9	6	6	21	23	2	11			8	5	8	11	10		5	5		6	10	20	17	9	1	4	10	10	.
JUL	10	5	6	1	13	13	13	13	13	13	9	9	9	4	9	13	16	17	9	1	24		8	5	2	2		13	5	2	9
AUG	8	2	9	4	5	23	21	16	5	2	9	9	24				6	23	11	10	13	8	8	8	12	8	29		11	9	9
SEP	21	21	21	23	11	10	10	13	1	13	2	14	2	2	2	19	19	1	1	21	28	31	11	3	13	6	11	3	1		.
OCT		24	10	1	3	10	16	1	15	22	4	4	4	6	6	26	11	1	1	1	6	18	11	1	12	11	1	1	1	1	1
NOV	3	1	7	12	3	3	1	4	3	10	10	13	13	7	14	14		7	15	15	15		12	11	11	1	1		12	3	.
DEC	3	13	26	18	1	1	6	6	16	26	5		23	23	3	12	1	3	3	1	1	1	16	16	3	1	6		11	15	14

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1904 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	12	2	11	1	4	1	1	3	10	10	10		27	22		15	7	22	14			5		2	18	6	6	19	1	5	
FEB	10		15	15	22	8	7	7	7	7	7	15	14	7	12	12		7	15	7	7	15	22	7	7	15	22	12	15	.	.	
MAR		14	7	15	3	10		8	8	15	12	8	7	7	8		15	22		8	22		14	14	14	18	23	15		10	16
APR	18	11	9		12	5	2					7	12	14	7	23	7	12	12	8	8	8		20	11			10	5		.	
MAY	8	8		17	4	1	13	6	11	24	5	2	12	9	4	20	12	9	9	9	13	13	13	5		6	1	13	4			
JUN	8	8	5	16	16	9	9	4	17	9	6	6	23	25	9	1	4	4	5	25	9	9	13	5	6	19	1	1	13	25	.
JUL	9	9	21	5	9	9	9	13	21	13	13	9	10	13	3	10	1	4	6	2	12	11	1	1	21	23	17	9	4	13	5
AUG	4	9	13	21	21	2	2	13	9	13	9	21	21	6	6	21	30	24	13	5	16	1	21	16	6	1	21	12		6	5
SEP	5	6	6	23	2	11	11		13	13	6	2	2	19	21	13	5	8	14	2	11	15	31	30	1	4	4	4	6	23	.
OCT	28	8	14	14	7				3	3	3	3	3	11	3	10	16	4	4	1	16	18	1	2	23	11	1	1	12	15	3
NOV	3	3	3	3	1	1		26	18	7	1	1	3	3	15	3	1	1	3	3	1	1		7	7	11	3	10		15	.
DEC	20	7	19	23	6	1	1	3	15	10	12	15	3	1	10	3	1	20	1	31	3	8	12	22	8	2	12	3	3	1	10

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1905 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	20	11	1	26	6	21	7		7	7	2	7	7	19		23		23		14	7	7	7	12	15	15	7	7	7	7	7
FEB	7	7	7	7	7	12		5	2	7	7	6	6	6	21	21	7	11	15	3	15	3	1	20	1	18	3	1	.	.	.
MAR	3	27	31		2	2	2		14	7	7	7	7	15	12	11	22	8	3	3	3	10	3	3	3	10	10		22	8	12
APR	4	6	26	18	3	3	1	13	5	2	2	14	14	14	7	7	7	7		14	7	12		19	3	4	10	5	8	7	.
MAY		14	8	5		15	12	8	8	8	5	16	4	3	16		17	9	2	17	8	12		5	2		2	2	2	21	21
JUN	9	9	10	8	8	5		13	5	4		13	5	5	5	2	2	5	5	5	2		2	14	2	8	3	4	6	21	.
JUL	9	6	16	16	16	6	6	6	11	1	9	13	9	9	1	4	4	13	2	6	2	2	2	2	9	2	5		9	2	9
AUG	9	9	3	1	16	23	6	16	13	13	9	17	9	4	4	4	4	4	1	1	1	13	13	9	9	1	1	24	5	2	4
SEP	2	2	2	9	24	6	21		6	13	21	7	9	6	5	25	4	16	1	1	1	25		12	3	1	1	1	4	4	.
OCT	1	1	3	1	3	3	25	4	6	6	1	1	5	2	5	5	14	2	6	5	6	1	12	3	1	6	7	7	7	21	6
NOV	1	1	1	5	2	6	6	18	11	1	1	1	29	1	1	1	3	3	3	9	9	1	13		1	22	14	8	12	11	.
DEC	20	18	11	1	3	1	28	18	18	1	27	18	11	11	1	3	27	15		3	16	16	1	3	1	3	10	4	10	15	5

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1906 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	17	4	4	1	10	21	18	11	1			15	22	22	14	15	22	22	14	8		7	15	11	11	1	18	3	27	20	26
FEB	7		26	7	7	7		7	7	7	14	7	7	12	15	12	3	3	10	22	22	22	22	12	8	12	11		.	.	.
MAR	8	12	12	12	11	11	6	26	14	14	7	7	7	7	7			7	7		31	12	12	12			18	6	18	12	
APR	9	5		6	29	1	10	10	1	20	8	14	20		3	1	1	6	11		12	11	10	10	10	5	8	5	2	2	.
MAY	4	4	13	13	5	28	5	7	11	1	10	10	8	8	10	5	26		7	8	5	8	8	8	12	12	7	12	8	16	5
JUN	6	1	3	3	10	10	10	26	21	2	12	3	9	9		4	5	16	5	6	5	5	2	2	17	8	9	10	10	1	.
JUL	6	2	2	2	2	2	11	25	9	4	13	21	5	2	2	5	9	4	25	1	13	2	28	6	13	9	13	6	9	5	8
AUG	9	6	2	18	2	2		5	8	2	11	11	3	3	4	13	2		14	14	14	14	2	.	6	6	6	13	16		11
SEP	1	6	24	10	3	1	1	3	13	6	6	20			13	6	6	18	6	14	14	7	11	10	4		11	6	7	11	.
OCT	11		10	5	6	1	1	26	18	11	3	10	20	4	3	3	10	5	5	2	2	2	18	1	1	16	18	1		11	23
NOV		7	15	15	15	15	27		15	12	12	3	10	10	22	8	14	2	18	11	8	2	19	1	4	6	23	11	10	2	.
DEC	11	27		14	14	7	15	14	12	7	15	14	14	2	15	7	12	1	1		12	12	11	14	14			10	8	14	14	

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1907 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	14	15	22	14	14	14	18	18		8	14	14	7	7	7	7	8	14	7	18	7		14	7	14	7	7	7	7	15
FEB	5	7	7	7	7	12	11	1	6		1	1	16	1	1		1	4	16	14	7	12	24	15	14	14	2	7	.	.	.
MAR	8	5		2	7		5	14	7		14	5	6	5			7	14		1	22	22	22	22	14	14	10	10		7	11
APR		8	8	12	3	3	10	20	12	24	14	7	12	8	5	12	8	14	2	18	1	5	14	14	7	14	7	2	2		.
MAY	14	7	2	5		2	17	8	12	12	3		8	2	6	5	14	14	7	12	14	8	8	8	14	2	2	8	8	8	2
JUN		13	13		17	8	8	4	4	10	15	3	4	4	4	4	6	6	2	24	13	5	5	5	2	11	1	25	10	5	.
JUL	17		12	1	6	6	5	5	2	4	6	21	13	13	13	6	6	5	5			4	4	4	16	9	4	13	6	5	6
AUG	5	17	9	4	13	10		5	4	13	16		12	24	16	13	5	5	6	2	11	1	13		24	5	5	17	9	13	21
SEP	7	2	2	2	9	13	6	2	2	14	14	14	14		7	7	24	5	13	6	6	16	13	2	12	2	12	2	17	11	.
OCT	10	5		6	1	13	17	6	6		18	11		19	19		7	11	18	19	1	19		7	11	21	11	3	12	3	3
NOV	20	4	4	1	16	24	5	6		7	7	23	7	6	6	1	5	11	3	10	3	3	1	1	1	1	1	11	27	11	.
DEC		18	11	3	1		22	14	20	3	3	3	3			14	18	23	1	3	1	1	10	10	3	10	3	15		7	15

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1908 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	15	27	3	27	1	1	3	1	20		14	11	24	2	1			1	10	26	2	11	21			10	2	12	2	2
FEB	21		7	22	8	15	12	12	7		10	5		20	26	7	14	20		21	6	23	17	10	20	12	8	14	8	.	.
MAR	14	7	7	7	2	16	5	18	11	27	1	5	15	8	12	8	8	2	18	1	4	4	10	12	14	8	8	2	1	8	8
APR	2	11	3	10	1	25	2	4	1	16	1	21	24	13	12	11	3	3			14	3	3	10	16	26	5	5	6	23	.
MAY	12	12	8	8	17	11	8	9	5	4	5	8	8	8	8	8	20	10	10	8	8	5	2	17	24	13	5	20	8	8	8
JUN	8	8	8	8	24	5	5	8			24		5	2	9	8	10	10	10	10	10	4	6	7		10	4	6	6	23	.
JUL	12	11	1	10	5	19	19	1	1	6	21	2	7	7			6	6	6	21	21	11	11	9	24	5	9	.	6	2	2
AUG		5	13	21	13	2	2	2		21	5	2	2	2	9	6	28	21	.		5	7	2	11	4	4	1	10	10	5	6
SEP	1		1	1	1	1	3	1	1	1	11	11	11	11	24	13		3	10	3	1	6	5	2	5	2	18	18	1	18	.
OCT	24		2	12	10	6	11			23	11	3	1	10	10		29	17	8	10	16	23	11		26		26	7	12	12	11
NOV	11	3		11	1	16	6	5	13	14	23	7	18	21		3	1	1	3	3	1	3	22	8	14	16	23	6	13		.
DEC	7		14		14	7		15	24		1	1	10	10	20	12	14	6	6	26	27	12	3	10	3	10	27		5	7	7

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1909 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN		15	22	14	7	7	7	7	14	2	18		14	7	12		12	22	15		15	22	22	15	15	.	24	14	12	12	15
FEB	15	15	15	10	22	22	7	14			14	14	14	7	12	12	3	3	10	10		8	8	15	10	20	3	3	.	.	.
MAR	3	10	12	15	10		8		14	2	2	12	20	2	12	12	3		17	9					1	16	13	8		12	3
APR	1	16	10			13	2	18		24	13	16	17	5		8	13	5	2	8		5	8	4	4	5	8	8	14	2	.
MAY	16	3	3	10	10	16	5	14	7	8	8	29	24	5	14	14	8	8	8	8	8	8	8	8	8	12	3	3	10	16	5
JUN	2		13	8	5	2	2	2	2	2	12	5	8	12	15	5	17	9	10	5	10	13	13	13		22	17	9	14	2	.
JUL	2	2	8	8	8	8	4	4	13	4	4	16	6	5	25	17	9	9	9	10	5	23			5	8	8	10	25	4	10
AUG	9	4	4	9	13	13	2	2	19	17	17	4	4	1	1	4	16	2		9	13	25	4	4	1	1	5	2	11	11	2
SEP	7		5	2		12	3	4	1	3	13	6	6	18	19	11	24	6	1	10	13	16	11	11	11		11	15	.	3	.
OCT	1		11	3	3	1	13	6		26		25	25	16	6	2	7	7	15	15	15	18	11	1	1	16	11	3	10	3	3
NOV	3	3	1		12		7	11	15	10	5	2	2	2	23	6	11	3	10	10	7	12	3	10	12	8	20	3	3	10	.
DEC		14	2	7	7	7	7	7	15	12	12	3	5	2	6	26	18	6	18		7	11	23	20		26		6	11	27	24

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1910 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	2	2	2	16	1	3	3	11	3	12	12	12	15		3	3	3	10		11	1	12	3	3	10	3	4	20	3	1
FEB	5	18	1	3	11			23	12	6	2	23	15	14	14	2	23	7	14	14	7	7	7	12	22	20	3	10	.	.	.
MAR	3	27	1		8	20	17	20	2	1	3	1	7	7	7						1	3	10	1	4	3	10	4	4	16	1
APR	11	3	10	16	1	24	3	1	17	8	12	20	4		20	16	26		11	10	5	2	11	11	11		8	8	5	13	.
MAY	2	2	12	12	8	6	6	13	14	12	2	18	2	5	5	18	6	24	5	13		5	5	12	8	3	3		6	6	2
JUN	8	8	2	17	8	8	8	8	4	12	3	4	3		10	25	10	13	22	10	4	9	8	4	6	9	9	9	13	13	.
JUL	13	9	9	9	4	1	13	13	5	21	2	11	1	1	4	9	17	19	6	21		3	10	16	4	9	5	5	2	2	9
AUG	9	4	16	9	9	13	5	21	25	9	13	5	2	9	6	5	2	7	11	1	13	16	5	2	19	23		8	8	6	2
SEP	2	2	24	13	13	13	14	7	2	21	14	7	2	11	11	1	5	17	21	13	8	5		5	2	17	1	3	3	1	.
OCT	3	10	3	10	4	1	1	3		2		12	4	1	1	10	10	5	18	11	1	3	1	6	13	5	18	11	1	21	14
NOV	2	12	24	5	11	1	15	10	20	12	12	12	12		2	18	11		20	3	3	1	10	13	14	14		15	14	7	.
DEC	7	15	12	12	7	7	15	11	1	18	12	11	11	1	11	29	6	6	16	1	4	16	3	3	4	1	8	5	20		13

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1911 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	18	1	1	4	27	10	22	15	22	7	7	7			12	15	22	15	10		1	1	15	12	7	7				14
FEB	12	7	4	12	12	3	4		11	15	3	3	22	5	2	18	18	2	2	7	30	11	19	1	5	2	2	19	.	.	.
MAR	21	1		12	15	15	15	10	4	3	10	11	1	6	18	1	17	1	1	1	5	12	3	1	13	20	17	4	16	13	2
APR	8	14	14	8		4	4	11	15	3	10	4	16	6	1	1	4	3	4	2	17	17	2	12	9	24		5	2	2	.
MAY	12	12	12	15		24	1	10	8	5	16	7	8	8	12	3	3	10	5	6	6	5	5	8	8	5	16	19	19	4	13
JUN	25	8	9	4	16	9		4	4	6	16	17	9	9	4	4	4	9	9	13	8	8	8	8		20	9	9	24	24	.
JUL	4	25	9	13	16	11	9	13	13	1	6	6	2	21	5	2	14	14		25	25	4	29		11	24	13	13	13	5	6
AUG	5	5	5	5	5		5	5	9	2	2	9	9	13	5	2	2	9	24	24	5	2	2	6	21	5		11	11	4	9
SEP	21	2	7	14	8	2	2	11	9	9	2		4	4	1	4	5	6	28		21	14	2	2	11		2	4	17	13	.
OCT	8	8	4	11	3	3	11	11	3	10	18	12	15	3	4	6	5	6	2	2	19	31	21	2	7	2	7	19	7	7	2
NOV	18	11		4	10	10	22	14	13			15	15	22	3	3	4	4	4	15	4	20	11	1	1	13	18	11	1	1	.
DEC	1	1	11	1	1	1	4	1	4	16	16	6	6	3	3	3	12	11	11	4	20	4	10	13	4	20	15	12	7	7	14

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1912 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	2	5		7	7	13			7	12	11	3	12	11	10	14	7	23	11		3	12	3	3	8	8	20	3	1	28
FEB	18	26	7	7	18	23		12	3	3	3	3	3	3	3	10	10	10	5	18	4	4	10	2	2		5	2	7	.	.
MAR	7	7	7	7	7	7	7	2	19	7	14	7	7	20	15		3	10	14	2	2	19	2	1	13	9	4	4	8	2	4
APR	4	3	1	1	10		11		24	22	8	8			2	2	2	8	8	8	8	6	23		10	5	12	12	15	10	.
MAY	22	8	8	8	5	16	4	1	5		6	2	18	21	4	1	5	12	12	12	8		4		1	3	10	16	9	4	16
JUN	6	6	6	6	2	7	11	9	9	9	11	11	3	4	16	6	2	11	23		9	9	1	1	29	4	9	9	2	5	.
JUL	13	25	4	4	4	24	9	13	16	9	9	4	24	6	19	21	2	11	9	2	3	3	10	13		4	4	4	6	6	2
AUG	9	9	9	9	1	1	6	29	3	3	4	13	6	7	12	9	9	9	16	6	21	16	25	10	13			16	4	3	3
SEP	10	22	10	6	22	1	25	4	2	2	18	6	6	2	18		6	6	5	2	6	21	5	2	6	18	19	7	11	1	.
OCT	3	1	1	13	5	6	4	13	2	4	6	6	1	1	11	1	10	16		16	3	3	3	1	11	11		14	16	23	2
NOV	11	1	10	15	3	3	10		22	10	3	3	11	11	18	11	1	1	1	4	1	27	4	6	6	2	11	1	15	24	.
DEC	20	3	10	5	6	6	16	19	1			1	3	10	22	3	20	3	16	6	29	1	1	10	4	1	1	1	3	10	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1913 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10	1	10	5	2	18	3	15		14	7	15	15	15	22	22	22	22	5	20	3	3	3	3	10	16	1	1	4	2	2
FEB	2	28	7	7	6	7	23	19			18	11	1	1	4	1	24	5	2	2	2	7	7		14	14	14	13	.	.	.
MAR		1		1	2	6	19	1	6	24	9	8	14		6	15	15	14	14		7		14	2	2	18	3	1	3	10	1
APR	13	8	20	11	3		8	12	12	12	15	11	11	1	10	10	16	12	11	12	3	10	16	6		11		.	8		.
MAY	9	4	4	13	6	7	14	12	12	11	10	5	8	8	10	13	2	2	9	17	20	19	1	17	3	3	25	10	4	4	13
JUN	6	5	8	9	5	2	12	12	11	9	13	3	10	1	1	2	2	7	8	17	11	3	10	10	13		8	4	10	13	.
JUL	5	9	13	4	6	11	4	16	17	4	5	5	8	4	9	16	6	2	2	2		13	2		24	5		1	10	16	1
AUG	23	28	17	2	20	9	13	13	5	12	17	24	10	10	4		2	17	2	5	2	2	11			4		2	6	5	24
SEP	10	15	3	3	4	6	2	11	4	6	18	11	11	13	6	18	11	24	13	23	11	24	2	2	18	18	3	3	4	2	.
OCT	6	28	5	5	5	8		4	4	16	1	3	10	16	2	9	6	6	2	17		4	10	5	2	11	5	2	7	11	11
NOV	1			3	1	10	26	11	11	11		21	19	11	3	3	13		3	10	10	3	1	3	3	3	3	20	3	4	.
DEC	2	11	11		20	20	11	1	1	1	1	1	15	11	1	23	1	5	14	11	12	15	22	7	15	12	11	1	23	3	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1914 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	22	3	3	11	3	1	1	10	8	3	12	11	3	1	3	15	15	22	22	14	12	22	22	12	15	22	8	8	1	1	1
FEB	24	5	11	14	2	2	2		12	12	12	12	12	18	31	11	12	7	7	12	12	12	11	3	1	1	1	20	.	.	.
MAR	3	4	4	10	16	2	18		14	7	11	11	1	1	1	16	2	2	7	7	7			8	14	7	12	12	12	12	
APR	7	7	7	12		14	7	7		5	4	11	3	3	3	4	5	16	11	24		12		10	4	20	17	17	2	19	.
MAY	9	4	10	13	5	14	12	11	10	8	2	2	2	12	9	9	9	9	6	21	2	7	3	3	1	1	4	4	6	19	2
JUN	11	24	10	8	4	22	10	10	16	6	5	2	9	6	2	2	9	17	9	10	10	4	13		8	26	16	6	6	2	.
JUL	17	1	25	24		16	17	4	9	3	29	16	4	4	13	16	6	21	1	1	4	6	1	1	24	24	4	9	9	9	28
AUG	4	6	4	6	16	25	9	13	5	2	19	21		24	5	5	5	2	17	9	9	13	5	2	2	11	9	9	1	13	13
SEP	16	6	17	4	4	8	12	12	17	4	9		10	10		11	15	1	9	16	6	6	12	11	3	3	1	11	11		.
OCT	1	10		5	10		8		20	20	20	12	11	1	11	3	3	3	3	1	12	14	18	18	7	7	21		.	3	1
NOV	3	3	1	1	7	10		11	1	1		14		5	2	7	11	18	11	1	3	3	1	1	1	21	11	3	10	22	.
DEC	12	11	15	12	7	7	7	7	7	7	7	2	6	18	18	19	1	6	23	2	6	6	28	18	12	3	1	10	20	3	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1915 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	3	3	10	20		3	3	3	20	3	10	10	22	8	17	16	26	26	7	7	2	7	7		12	12	12	12	12	20
FEB	12		10	8	20	15	12	12	12		8		4	16	11	15	15	21	7	7	12	12	12	12	7	12	7	2	.	.	.
MAR	7	12	12	12	12	2	2	11	11	11	11	11	15	12	12	18	12	17	2	18	6	6	13	5	7	7		7	12	12	12
APR	11	11	10	10		12	12	4	26	16		12	10	8	2	12	13		14			5	17	8	9	4	10		8	24	.
MAY	8	14		2	8		10		3	3	1		8	8	14	7	12	12	8	17	0		15	22	8	8		17	8	2	2
JUN	8	5	2	5	5	2	4	17	24	5	8	5	6	28	28	17	8	8	17	4	16	9	25	3	9	4	6	6	6	5	.
JUL	5	5	5		3	10	4	8	10	4	10	10	5	8	5	5	2	2	2	7	11	6	5	2	2	2	9	5	5	5	2
AUG	4	17	11		2	25	4	4	1	11	9	1	13	9	1	2	2	2	2	5	2	5	2	12	12	12		2	12	1	1
SEP			2	17	13	4	5	16	13	14	2	2		16	1	6	6	2	5	2	11	24	2	2	8	12	17	29	11	11	.
OCT	3	10	5	2	24	5	18	11	24	5	4	4	3	9	6	11	3	27	27	3	3	12	12	10	16	3	1	3		3	3
NOV	16	7	11	3	4	5				10	10		20	4	3	3	3	26	4	16	3	3	3	10	3	10	5	23	3	27	.
DEC	11	3	12	3	3	3	26	15	8		15	7	12		8		3	3	3	3	3	10	16	20	10	5	4	10	5	2	1

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1916 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	7	7	13	6	15	15	15	22	14	14	7	7	7	7			21		3	22	15	15	14	7	7	7	7	7	13	6
FEB	23	21	21	7	7	7	7	22	7	12	2	18	11	1	1	1	26	11	29		21	17		17	26	7	2	8	8	.	.
MAR	7		15		3	10	20	10	27	17	28	10	8	2	12	12		7	11	3		12	8	8	20	3	10	5	2	2	6
APR	2	2	2	8	2	6	2	11	1	1	25	4	4	1	10	20	3	3	8	20		10	7	7	7	12	1	10	5	2	.
MAY			4	10	3	3	10	3	10	16	5	2	2	2	5		23		9	4	4	16	13	8	8	5	13	13	5	8	13
JUN	5	4	16	4	5	5	16	16	5	5	5		6	6	16	5	5	8	8	8	8	8	16	1	13	8	9	3	9	3	.
JUL	13	4	4	4	13	8	14	12	9	4	16	4	4	4	23	8	4	4	1	1	4	4	6	2	5	8	9	5	6	2	11
AUG	1	9	13	5	9	6	19	24	5	5	2	18	9	1	1	13	13		1	6	2	6	6	6	2	2	19	1	23	1	
SEP		12	10		13	4	3	17	4	16	6	6	2	2	23	23	19	1	13	16	28	17		4	10	4	5	18	1		.
OCT	13	14	8	5	19	21	14	2	19	19	1	16	11	25	4	16		2	2	1	5	2	19	6	16	1	17	4	3	3	3
NOV	20	3	3	3	3	10	13	4	13	5	2	2	6	6	1	1	1	1	16	19	11	1	16	11	3	10	3	10	3	1	.
DEC	1	3	3	10	1		20	27	5	2	17	5	6	6	1	26	18	3	8	8	21	22		12	14	8	31	2	11	11	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1917 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	3	10	10	3	3	4	1	10	20		2	6	2	2	6	6	1	26	2		1	4	4	4		3	22	22	14	2
FEB	18	15	28	20	1	6	26	20	7	7	11	21	6	6	16	10	14		7	22		14	14	7		4	6	6	.	.	.
MAR	6	2	18	1	10	4			8	8	17	12	12	2	2	2	28	11	10	4	4	4	3	10	4	4	3	10	3	10	13
APR	20	10		20		8	12	11	8		3	8	12	8	8	8	8	8	29		10	8	8	14	2	14	2	2	8	8	.
MAY	8	8	17	2	2	12	2	11	17	17	12	12	12	2	10	10	10	4	8	8	8	2	5	8	8	8	4	13	5	8	4
JUN	4	4	8	4	4	4	4	4	10	13	5	6	21	19	19	1	1	5	5	7	17	17	29	9	6	9	9	25	9	16	.
JUL	6	17	17	10	4	4	13	2	17	6	6	6	5	6	19	19	9	4	9	4	1	4	9	13	9	9	4	10	1	1	13
AUG	16	19		13	6	24	5	2	19	6	6	6	4	13	17	19	6	4	4	17	4	16	6	6		5		9	9	13	13
SEP	21	7	2	2	21			2	12	11	3	3	17	4	18	19	6	2		11	11	1	9	13	16	3	1	1	6	11	.
OCT	1	3	4	6	11	5	2	19	29	13	2	11	1	16	5	8	5	6	6	18	5	18	11	4		5	5	6	11	1	
NOV	11	3	3	1	3	11	11	11	1	15	11	11	11	19	19	1	20	11	1	1	16	6		12	9	4	3	3	10	15	.
DEC	22	14	7	7	2		2	2	7	7	7	2	7	12	15	15	3	3	10	29	18		14	7	7	7	7	7	11	12	11

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1918 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	27	11	3		8	12	24	8	14	2	12	15	25		20		20	25	2	6	28	3	1	10	8	2		20	14	2	19
FEB	27	20	12	3	10	15	10	4	27	1	10	10	22	14	7	7	7	14	14	18	19	1	1		4	10	2	11	.	.	.
MAR	1	11	22	14	2	19	13	14	12	7		3		18	11	1	3	3	10	3	20	3	1	15		8	10	20	18	1	13
APR	5	2	9	19	24	14	12	11	11	1	12	12	10	8	8	4	5	2	2	6	13	5	9	13	5	2	6	5	16	28	.
MAY	28	11	3	1	5	5	24	5	5	9	6	6	13	9	24	13	25	10	16	8	8	28	8	5	14	5	2	9	9	4	13
JUN	16	6	2	2	2	2	23		3	1	6	2	3	17	13	2	11	17	9	13	2	9	10	8	17	4	13	13	2	19	.
JUL	21	9	5	6	28	2	2	2	11	9	9			7	7	11	2	23	8	10	6	9	13	2	4	9	4	29	2	2	
AUG	17	3	13	13	5	16	4	4	10	25	9	5	6			3	17	9	9	6	4	16	4	1	1	9	13	6	6	6	
SEP	14	2	2	2	23	19		5	11	11	19	19	14	14	2	2	11	17	17	11					2	19	21	21	7	23	.
OCT		11	11	3	3	4	4	1	1	3	3	1	11	19		2	17	9	6	23	10	5	2	12	2	11	3	10	16	20	11
NOV	3	3	3	24		4	4	16	3	3	1	23	3	3	3	10			14	2	7	11	11	25	6	1	4	16	20	3	.
DEC	4	1	10	15		3	3	3	3	20	3	15	3	15		12	11	11	1		2	2	2	19	6	3	1	1	8	2	2

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1919 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	18	1	29	1	1	1	27	1	3	12	3	20	1	1	3	10	3	3	22	3	3	3	10	3	4		1	21		8
FEB	14		2	15	15	12	12	12	3	3	25	20	20		11	3	8	2	9	2	14	8		2	7	12	14	14	.	.	.
MAR		15		20	17	9	9	9	5	20	15	7	12	8	22	10	15	22	5	11	19	18	17	13	14	7	7	12	12	12	11
APR	6	2	3	3	10	8		2	2	3	4		8	5	2	7	12	1	15	3	6	2	7	12	9	9	17	9	6	5	.
MAY	5	8	14	2	2	2	9		17	4	3	9			3	17	11	12	17	9			4	3	3	1	1	9		13	5
JUN	6	18		2			6	8	2	8	9	13	4	17	9	9	6	6	2	17	11	4	4	13	5	8	8	9	9	9	.
JUL	9	5	5		17	17	4	21	21	9	13	4	4	6	19	9	13	13	6	6	6	13	21	9	13	13	13	24	5	2	2
AUG	9	24	10	13	10	5	2	2	9	9	1	1	1	1	6	21	25	1	1	16	1	13	21	7	7	12	9	9	6	19	
SEP	13	7	12	11	3	22	8		4	6	11	4	29	2	23	11	4	4	1	13	6	19	6	21		13	14		19	3	.
OCT	10	5	6	6	6	28	11		5	23	4	11	6	5	6	6	28	2	9	28	28	8	14	2		2	17	1	8	2	17
NOV	15	8	12	12	8	7		2	4		21	6	23	11	1	3	1	11	3	23	1	1	20	14	2	2	19		22	15	.
DEC	7	19	19	21	30	16	14	14	7	7	30	2	6	18	18	12	3	3	1	3	1	3	11	3	1		1	1	26	22	6

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1920 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	4	11	11	19	10	5	2	6	6	6	1	10		12	17	26	12			2	7	7	7	7	12	14	7	12	12	12	11
FEB		18	11	11	1	3	1	6	6	6	6	5	14	2	19	1	4	1	14	14	30	21	2	2	2		14	19	21	.	.
MAR	5	14	14	7	2	18	1	3	3	3	4	3	3	10	5		11		3		15	22	8	3		3	10	16	10	10	8
APR	8	5	2	2	25		15	7	7	8	2	12	17	8	8	8	8	2	17	8	8	16		2	2	2		5	14	2	.
MAY	14	8	8	17	2	2	11	11		8	8	2	2	2	9	9	3	4	13	13	25	13	25	10	6	20	11		13	5	5
JUN	2	2	2	2	17	10	3	3	4	9	8	16	25	3	8	8	12	2	6	6	29	17	9	9	9	6	21	21	9	1	.
JUL	1	13	24	5	5	6	6	2	2	9	13	5	5	21	2	19	6	6	6	19	9	4	16	9	6	6	6	21	21		17
AUG	9	9	4	4	4	19	19	13	5	2	2	19	19	21	5	7		9	6	6	11	1	1	24		4	3	4		5	2
SEP	2	2	2	19	9	9	9	4	3	3	3	3	10	10	20	11	7	17	11	3	3	3	8	10	10	1	1	6	18	11	.
OCT	3	3	1	11	12	15	10	1	1	3	3	10	4	4	1	1	15	8		4	4	4	6	6	6	18	11	19	5	2	2
NOV	18	1	1	1	2	2	7	14	18	14	7	7	23	18	11	3	15	15	15			3	20	11	3	3	10	3	11	1	.
DEC	15	3	3	3	20	12	11	3	3	3	3	10	3	16	1			12	12	8	2	14	7	15	8	2	11	1	10	3	10

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1921 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	3	10	22	15	10	4	1	13	6	11	3	10	10	10	14	12	12	10	10	4	1	12	12	7	15	15	8	12	12	12
FEB		3	10	8	8	4	3	1	3	3	1	1	31		8	26	7	7	7	3	9		1	29	1	3	1	3	.	.	.
MAR	10			14	8	4	5		13	14	14	7	7	8	3	3	15	10	8	20	12	11		4	10	14	2	11	13	16	1
APR	1	1	8	8	5	2	10	26	18	11	3	3	9	8	8	18	11	1	3	8	3	10	10	4	20	4	6	2	28	8	.
MAY	12	12	17	11			8	8	8	10	16	5	2	2	7		9	3	10	10	9	24	4	9	5	5	5	2	2	2	9
JUN	14	2	7	12	11	3	17	9	4	1	9	1	3	10	4	10	4	4	16	16	4	16	17	17	4		4	9	3	3	.
JUL	4	13	13	1	6	19	19	1	6	6	2	2	9	17	9	4	13	5	2	9	1	1	13	13	9	4	16	9	13	5	
AUG	9	4	9	1	5	6	21	1	5	5	2	2	2	9	9	13	25	4	5	11		1	9	11	9	6	6	6	4	11	1
SEP	10	4	4	4	1	6	9	5	14	14	2	2	2	2	9	4		3	10	10	1	1	4		1	1	1	13	16	1	.
OCT	6	4	1	1	21	2	19	1	16	6	19	11	3	3	3	3	3	1	29	1	13		11	3	3	3	3	3	4	8	12
NOV	1	1	1	12	27	7	7	18	6	16	11	4	4		8	14	14	14	11	14	7	12	15	15	3	3	3	1	3	10	.
DEC	10	4	4	1	1	29	18	1	1	1	3	3	4	6		6		14	7	30	19	14	12	11	19	19	11	16	1	26	18

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1922 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	11		8	3	3	1	1	1	1	6	6	6	1		6	28	14	2	6	16	26	7	11	11	1	1		14	7	7	
FEB		16	4	10	4	15	15	15	15	14	14	2	19	6	7	15	22	3		7	14	14	7	7	23	14	2	19	.	.	.
MAR	19	1	1	10	8	16	1	4	3	22	8	3	10	20	7	12	8	20	20	2	12		14	14	26	7		12	12	20	
APR		17	3	8	5	4	10	8	8		10	8	8	22	5		16	16	1	1	11	9	6	2	2	2	2	2	9	9	.
MAY	4	1	3	1	10	13	10	8	10	10	5	16	5	2	2	1	13		4	3	3	4		11	8	4	6	7	2	2	19
JUN	11		1	1	13	5	5	9	9	4	4	9	13	9	5	16	6	13	12	12	9	1	6	2	19	6	13	5	24	13	.
JUL	8		1	13	13		24	13	13	13	4	9	1	1	16	5	19	9	24	4	4	13	6	6	21	5	9	6	6	6	9
AUG	9	9	4	9	5	5	2	23	12	3	1	4	9	9			6	6	17	4	9	4	1	6	6	6	21	2		11	4
SEP	1	21	1	10	10	10	13	6	6	6		2		2	2	11	2	19	11	1	1	3	1	11	11	1	1	1	1	1	.
OCT		7			12		19	19	19	7	2	9	5		6	2	19	1	11	6	29		1	1	3	3	8	8	2	3	3
NOV		5		4	4	31	7		19	22	2	6	19	6	1	3	10	10		11	19	23	18	11	1	1	4	10	.	31	.
DEC	25	27	22	14	7	7	30		7	15	14		30		13	7	23	15	27	1	1	27	3	3	10	3	15	3	10	20	15

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1923 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	8	15	27	12	12	3	3	16	27	15	10	4	3	3	15	12	10		19	4	6			19	4	4	3	14	14	2	2
FEB		2	2	28	26	19	13	13	13	13	15	14	14	7	7	7	18	19	26	2	7	12	11	4	4	6	6	1	.	.	.
MAR	1	5	2	1	10	3	17	8	2	4	10	8	14	2		10	14	11	1	5	5	28	20		2	28	2	18	7	12	7
APR	12	12			14	12	20			7	17	4	17	29	12	11	3	3	10	10	13	2	2	2	2	4	9	4	5	8	.
MAY	10	4	18		13	14	2	2	28	8	8	8	13	5	2	9	13	8	8		17	9	9	9		10	4	4	10	8	8
JUN	8	17	5	5	2	2	12	3	2	2	9	9	4	9	9	9	10	13	5	8	8	10	10	13	16		5	2	19	13	.
JUL	9		17	9	9	24		5	5	9	17	9	6	6	24	9		25		9			5		8	5	6	13	13	24	13
AUG	6	1	13	6	9	5	2	2	2	17	1	1	1	5	2	2	23	7	8		7	23	28	6	5	6	5	5	25		3
SEP	1	25	1	6	9	6	6			5	2	2	11	9	9	6	2	19	22				3	3	10	10			2	2	.
OCT	12	11	12	12	11	3	9	9	11	28	5	18	18	1	1	10	16	6	18	11	1	24	5	18	18	6	6	7	7	19	11
NOV	1	1	4	19	19	18	11	19	1	1	3	10	31	18	6	19	1	1	27	26	20	27	3	10	16	16	4	1	10	14	.
DEC		1	3	3	1	3	10	10	4	11	1	16	3	3	1	11	11	3	1	4	11	1	1	6	22	8	3	22	14	14	30

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1924 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	9	20	23	18	1	27	15	22	20	4	5	6	19	28	5				18	19	1	27	7	14	23	12	3	1	3	1	3
FEB	3	10	20	12	3	12	15		1	1	3	1	26	7	12	7	7	7	7	12	11	3	4	19	1	3	3	10	20	.	.
MAR	21	21	13	16	16	16	2	2	11	2	2	2	17		2	2	2	9	8	8	8	8	12	12		10		8	8	8	11
APR	11	3	10	4	16	1	5	5	2	2		4	10	10	8	16	16	1	16	1	4	24	5	5	2	11	12	12	14	2	.
MAY	23	25	8	8	8		2	2	2		7	7	12	17	6	13	5		2		25	5			25	5	4	5	2	19	6
JUN	13	6	13	13	5	9	5	14		25	28	8	2	8	4	4	4	10	16	13	21	13	13	13	9	4	4	5	2	19	.
JUL	11	9	9	13	25	1	1	1	1	1	13	5	4	21	10	5	9	9	4	9	13	13	6	6	19	21	25	24	5	2	9
AUG	9	13	13	5	6	6	13	13	2	21	17	9	9	13	5	17	3	10	4	4	4	1	1	1	1	1	9	13	5	16	13
SEP	19	1	25	2	11	13		12	9	9	6	23	18	19		9	9	24	13	4	1	3	3	10	5	5	18	18	11	3	.
OCT	10	16		14	2	11	3	10	5	9	9	10	1	15	15	3	1	18	18	11	11	11	3	1	1	3	3	3	3	10	1
NOV	21	11	21			20	15	15	22	5	5	6	11	1	16	1	1	1	3	1	1	4	16	1	1	6		1	1	11	.
DEC	3	10	20	15	8	8	8		3	1	1	27	26		14	7	30	2	18	7	19	21		6	1	26	23	23	15		12

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1925 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	4	1	3	3	10	4	25	3	3	5		15	7	2	11	3	3	10	3	27	15	24		7	12	15	12	15	15	12
FEB	12	3	3	3	3	10	3	15		7	7	14	13	5	14	23			15	15	15	15	15	8	20	12		2	.	.	.
MAR		1	4	3	13	14	2	8	14	5		2	2	11	1	1	5	17	3	5	11	9	1	3	1	16		22			
APR	14	14	7	11	9	4	2	18	18		21	4	16	13	7	12	3	3	10	24	25	8	10	10	1	6	6	18	11	11	.
MAY	3	4	5	2	7	12	2			7				24	14	7	19	19	1		4	10	8	2	2		3	3	3	9	10
JUN	8	10	24	8	5	8	8	5	25	9	4	10	13	5	9	4	16	4	6	6	22	5	5	6	21	28	9	17	9	1	.
JUL	13	6	6	9	13	5	5	4	1	1	3	1	1	16	6	6	9	13	13	5	2				2	5	2	2	2	2	2
AUG	17	9	9	9	21	13	6	6	21	5	9	4	17	4		5	13	5	2	19	1	25	10	5	12	11	1	1	1	1	11
SEP		1	1	14	14	2	11	1	16	16	2	2	2	11	1	22			5	16	19	19	6		21	14	14	7	2	2	.
OCT	18	2			7	7	2	2	19	21	5	9	21		13	20		18	11	19	1	13	5		5	23	7	23	19	1	1
NOV	23		13	6	6	23		1	3	3	3	3	4	4	3	1	1	1	1	1	6	1	1	10		14	7		19	1	.
DEC	3	10	4		4	4	6	18	1	1	3	25	2	18	20	11	15	15	14	20	7	11	27	18	18	7	7	11	19	19	19

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1926 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	3	4	4	20	4	6	6	1	26	19	1	1	1	10	3	22	8	2	20	2	23	27	11	27	26	31	3	3		12
FEB	12		15	3	3	3	3		3	1		14	14	20	15	10	20		15	3	3	3	3	10	16	1	1	26	.	.	.
MAR	18	12	12		14	2	1	21	12	12	2	11	23	7	23	3	10	3	3	1	4	4	13	5	2	7	7	2	2	2	8
APR	8	7	7	7	30		7	12			2	5	2	11	1	3	12	11	1	1	1	4	6		19	5	18	1	1	4	.
MAY	5	12	3	3	10	10	10	8	5	14	2	2		1	1	1	10	13	3	3	4	3	25	9	3	3	9	4	13	13	16
JUN	16	6	11	3	1	13	5	8	8	5	5	5	2	8		8	2	7	8	5	16	13	13	13	23	3	1	1	6	21	.
JUL	9	8	2	2	25	24	24	5	5			20	4	4	1	13	9	21	5	5	6	25	3	3	9	9	9	4	4	4	4
AUG	9	6	9	9	5	5	2	9	5	2	9	28	2	2	6	25	25	3	4	10	13	21	19	19	1	1	4	23	12	9	4
SEP	4	2	2	19	6	13	5	5	6	5	2	11	9	5	8	22	21	6	2	24	14	2	5	2	6	23	11		8	3	.
OCT		3	4	16	1	3	3			15	20	6	21	15	27	3	4	4	6	6	13	20	20	3	1	1	13	6	6	6	6
NOV	6	6	19	1	1	10	5	7	11	11	3	3	3		16	26	18	7	7	7	23	15	15	15	22	15	22		15	12	.
DEC	12		8	2	11	1	4	6	1	1	10	14	14	23	23	3	11	3	1	3	3	10	20	3	10	3	3	3	1	3	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1927 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	3	1	1				26	18	19	14	14	7	11	1	22	7	30		7	19	11	27	23	11	11	3	10	10	20	15
FEB	15	3	3	3		21	2	18	19	21	5	30			22	22		15	3	3	10	10	10			2	2	12	.	.	.
MAR	11	11	11	25	1	1	3	3	10	25	20	3	1	10	5	20	10	5	2	11	4	5	4	9	17	9	19		16	8	14
APR	12	3	10		16	12		8	5	2	2	2		20	4	10	10	13	5	6	23	11	11	11	1	10	3	4			.
MAY	22	5	20	8	2	2	8	8	8	4	1	4	16		11	10	8	8	8	8	8	8	4	16	5	17	5	8	8	2	2
JUN	2	9	16		19	21	21	24	5	5	2	2	2	11	9	1	9	9	13	5	5		24	10		9	1	4	13	16	.
JUL	21	2		9		13	6	9	4	4	1	4	16	13	5	8	6	2	9	6	6	19	21	9	9	13	13	21	21	13	5
AUG		9		1	13	13	13	6	19	25	4	9				5	2	7	7	28	21	2	11	11	1	1	1	1		4	1
SEP	1	1	3	3	1	9	4	6	19	11	24	24	8	5	6	1	21	6	21	23	23	21		5	2	11	3	3	10	4	.
OCT	4	16	13	13	5	4	6	11	1	10	16		3	3	3	11	3	1	1	23	1	1	1	1		30		3	3	1	13
NOV	4	1	1	6	7	12	12	7		10	26	23	7	12	7	7	18	7	15	15		4	1	3	10	25	3	10	5	7	.
DEC	28	12	2	1	28	14	2		21	19	1	10			4	5	18	11	11	11	18	12	15	7		15	22	22	14	14	7

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1928 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	7	23		1	1	1	1	1	1	1	1	10	22	8	11	1	1	1	26	19	1	22	13	20	16	6	18		7	23	23
FEB		11		12	3	4	20	4	19	1	1	16	4	16	6	6	6		21	23	14		2	23	1	6	21			.	.
MAR	19		21	7	7	7	7	14	12	3	3	8	8	2	18	19	23	12	1	3	1	3	10	10	8		12	8	17	3	3
APR	10	22	8	5	8	2	2	18	1	10	8	8	2	2	15	22	22	20	20	4	4	20	12	12	12	11	3	1	4	1	.
MAY	10	4	20	11	11	11	1	1	13	5	2	2			2	4	4	16	13	4	1	17	1	6	12	17	8	20	10	4	2
JUN	2	8	2	4	17	5	5	5	2	9	9	10	13	9	4	8	5	8	8	8	17	8	2	2	9	9	9	5		24	.
JUL	10	10	10	3	4	4	17	4	1	4		17	9	24	13	13		9	4	9	1	1	21	2		2		2	9	13	13
AUG	13	4	4	9	4	1	1	1	23	11	1	1	9	5	5	6	6	13	5	5	19	13	6	21	21	21		6	6	2	19
SEP	6	6	1	21	11	24	5		9	17	3	3	3	1	6	23	11	1	13	6	6	7	7	7	7	21	19	1	1	10	.
OCT	16	25	10	3	1	11	1	1	1	5	2	2	11	4	4	20	24	1	1	1	4	1	1	23	11	13	7	7	7	7	7
NOV	18	11	3	3	1	1	3	3	3	3	15	3	3	22	4	4	6	20	4	1	1	1	21	18	11	15	5	6	4	1	.
DEC	22	14	7	19	19	18	11	1	1	3	3	3	11	9	6	6	6	26	6	1	1	1	1	3	3	1	1	22	15	20	2

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1929 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	12			6	6	26	11	1	6	26	6	26	28	2	7	2	10	22	13	19	28	5	2	2		14	14	7	30	7	7
FEB	7	7		21	14	2	2	6	6	18	28	19	6	6	16	5	14	23	4	10	5		4	4	4	16	4	16	.	.	.
MAR	1	10	4	4	10		12	7	15	3	10	4	4	20	4	29	1	13	15	10	4	8	8	4	4	3	20	3	10	5	
APR		1		22	8	5	10		8			3	12	3	3	12	4			8	8	8	2	5	16	13	10	17	10	5	.
MAY	2	15	5	2	5	2	2	2	9	9	6	2		5		24	5	2	11	9	21	25	25	3	24	5	5	25	4		12
JUN	8	8	2	7		8	9	24	10	10		4	25	1	15	10	10	1	1	1	13	6	28	2	28	4	16	9	13	13	.
JUL	23	4	13	16	9	13	5	6	13	24		21	19	9	1	1	16	12	9	1	1	25	4	25	1	1	1	21	13	13	17
AUG	24	5	2		5	2	19	21	13	21	21	13		9	1	1	11	11	1	1	1	1	10	13	23	12	7	12	1	1	25
SEP	13	5	5		5	2		2	2	19	1	1	16	1	13	21	7	11	9	9	24	24	5	5	2	2	2	2	19	9	.
OCT	9	11	3	1	1	6	2	12	11	11	11	1	11	1	1	3	1	1	4	18	2	2	18	1	1	16	9	8	2	17	16
NOV	1	6	6	1	31	2	6	1	1	10	4	6	1	1	1	6	5	2	2	2	19	1	6	1	1	1	16	26	2	24	.
DEC	2	19	19	1	26		13	22	7	7	12	15	7	15	7	7	7	7	2	23	11	1	3	3	3	16	1	3	1	1	10

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1930 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	4	20	15	15	22	30	2	2	2	30	30	30	14	14	7	7	21	13	7	30	6	21	6	6					27	23	25
FEB	3	3	20	3	3	1	3	1	20	3	10		7	2	11	3	3	3	3	3	11	11		3	8	14	14	14	.	.	.
MAR	18	19			24		3	1	4	4	16	5	7	7			17		10		3	3	16	2	2	2	2	2	28	2	
APR	1	1	3	1	25		12	3	1	5	7	7	7	8	8	4	13	7	18		7	7	12	12	12	12	12		8	9	.
MAY	1	1	10		25	4	5	5	5	2	5	5	2	5	5	8	9	4	1	10	10	6	23	11	17	8	12	12	12	9	1
JUN	10	13	4	4	29	19	11	1	3	11	24	1	13	13	21		24				5	13	13	1	13	21	25	4	16	6	.
JUL	9	9	9	4	21	9	9	5	9	13	5	5	2	19	1	13	13	13	13	13	6	1	1	1	13	1	13	5	23	19	1
AUG	1	10	1	21	9	21	21	21	12	17	19	9	9	21	4	17	9	2		9	19	23		11	24	5	21	23	1	13	13
SEP	6	21		5	5		14	12		5	8	4	4	4	16	25	1	13	21	1	1	13	10	13	13	3		12	2	11	.
OCT	17		11		6	11	22	24	13	2	8	29	11	24	5	5		7	7	7	11	23	11	11	1	4	16	6	18	11	19
NOV	23	11	1	7	12	11	11	3	3	4	1	21	5	8	3	3	10	4	4	4	16	1	6	19	26	28	11	1	23	18	.
DEC	11	27	11	4	1	1	1	1	3	1	3	15	3	18	11	1	1	16	1	6	18	1	1	1	3	1	1	1	1	1	11

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1931 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	3	3	3	3	3	13	1	4	1	20	12	11	1	1	27	6	6	31	1	15	15	3	10	3	1	3	1	1		12
FEB	1	19	19			9	6	7	19				11	1	3	3	3	3	4	4	17	4	4	6	12	3	3	17	.	.	.
MAR	11	26		5	2	6	2	7	15	14	7	12	8	7	12		14	15	20	10	3	4	5	5	14	2	12	12	12	3	3
APR	10	5	18	11	1	3	3	4	1		3	3	3	3	4	1	1	13	13	2	7	7	7	12	7	7	30				.
MAY	7	12		14	12	17		6	2	2	19		21	24	10		10	5	2	2	7	11	3	3		9	4	5	2	19	13
JUN	13	24	5	2	23	21	1	10	10	8	4	13	23	7	7		10	10	5	2	12	17	9	1	1	3	1	4	13	5	.
JUL	5	5	2	6	13	13	21	23	11	9	4	1	24	5	5	5	6	13	21	23	25	4	9	9	13	21	5	5	21	2	2
AUG	2	1	24	13	5	2	2	5	2	11	1	24	9	1	9	2	2	11	17	9	28	6	6	19	1	5	5	6	25	24	4
SEP	4	1	4	1	3	3	10	13		9	4	1	13	5	8	5	7	12	8	16	5		19	11	16	1	11	3	10	1	.
OCT	1	1	4	3	24	5	2	19	1		11	1	3	19	19	11	9	9	1	25	3	3	3	1	1	10		16	26	12	11
NOV	3	1		23	11	3	1	1	4	11	17	1	15	22		22	10	4	3	5	2	19	2	26	7	2	19	6	6	6	.
DEC	11	15	21	17	4	15	15	21	1	10		4		11	1	1	3	27	3	1	3	3	3	3	3	15	15	15	8	12	12

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1932 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	12	2	11	4	20	16	4	3	3	17	3	13	5	3	3	3	3	15	22	9	4	13	4	1	1	1	10	5	2	7	7
FEB	30		14	11	1		8	12	3	10	16	5	2	19	9	5	19	16	11	10	20	12	15	3	1	3	3	16	8	.	.
MAR	8	8	14	7	7	14	7	7	7	7	7	7	12	12	8	20	22	20	3	9		12	3	3	10	4	27	22	5	20	
APR	3	3	3	3	17	20	20	6	2	18	11	15	15	12	17	12		4		8	8	8	8	8	8	7	11	8	8		.
MAY	11		8	8	8	4	4	16	11	17	19	3	1	5	5	9	11	1		12	12	8	4	6	5	2	2	30	11	3	10
JUN	10	8	17	9	9	5	5	5	2	2	2	9	13	4	9	4	4	4	4	20	1	2		5	5	5	2		25	16	.
JUL	17		10	4	5	5	5	13	5			1	3	10	1	4	9	9	4	4	25	17	9	10	10	8	8	12	17	9	4
AUG	4	1	1	6	6	2		9	10	8	8	17	9	9	21	5	2	11	28	2	2	9	2	5	2	17	9	9	10	13	1
SEP	1	6	4	25	17	11	1	4	29	19	9	6	4	1	6	23	25	5	4	9	2	11	11	19	9	6	6	18	19	1	.
OCT	4	13	14	19		21	14	14		11	3	1	3	27	20	8	8	2	29	1	1	3	4	6	6	16	24	5	17	9	3
NOV	15	15	3	3	3	10	5	12	5	5	6				7	12	18	28	3		3	16	11	27	18	11	11	3	3	1	.
DEC	10	3	4	1	5	14	14	2	2	2		6	6	2	18	1	21	1	3	3	1	3	3	4	4	1	3	4	4	20	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1933 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10	22	10	3	3	10	3	1	3	5	6	6	1	1	14	2		22		3	10	3	3	3	3	3	3	3	22	22	20
FEB	5	28	2	18	27	14	7	7	6	26	1	13		20	1	4	4	10	15	27	3	3	10	4	3	15	27	7	.	.	.
MAR	7	7	12	2	18	20	10	5	30	7		22	10	18	15	12	8	8	2	17	8	8	7		15	7	12	3	3	3	4
APR	16	16	24	5	2	24	8	8	8	2	16	13	6		1	14	8	8	14	2	2	19	28	8	8	17	9	13	8	8	.
MAY	15	8	8	8	8	8	8	8	8	14	8	4	16	4	10		8	8	29	17	9	9	10	31	20	4	16	16		17	9
JUN	9	1	1	10	4	13	10	10	10	13	2	2	11	11			10	13	5	5	5	8	8	22	8	4	13	8	4	4	.
JUL	3	3	9	6	6	6	17	17	9	4	4	6	13	6		4	9	4	4	6	13	5	2	2	2		5	5	8	5	5
AUG	2	12	12		9	1		9	4	6	6	2	2	21	21	5	25	17	9	9	6	6	5	5	2	2	2	11	2		
SEP	13	13	23			2			25	17	17	2	2	11	9	10	1	10		3	3	3	4	24	10	1	1	3	10	16	.
OCT	19	23	18	19	23	18	19	6	2	5	5	11	1	1	4	16	6		6	8	5	7	7	7			3	3	3	15	8
NOV	8	20	2	2	19	6	19	26		1	4	16	1	26	12	1	16	1	27	10	4	16	16	1	16	3	10	8	4	20	.
DEC	20	15	10	10	3	27	20	7	15	14	7	7	12	22	22	4	15	27	15	15	10	22	14	14	7	7	7	7	15	22	14

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1934 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	7	12	3	4	4	2	19	1	1	1	10	3	3	1	23	11	3	20	3	3	10	16	22		4	1	26	2	11	1	16
FEB	1			7	12	12	12	11		23	1		1				14	7		14	7	7	7	7	7	11	3	1	.	.	.
MAR	1	3	1	13	5		2	28	18	19	1	26	2	1	28	14	2	11			14	7	7	7	7	7	15	7	12	11	10
APR	10	5	2	9	6	6	24		3	4	2	11		14		25	9		7	19	13		8	12		2	19		10	8	.
MAY	8		3	3	3	16	17	4	16	23		5	6	18	3		8	8	8	5	2	7	7	11	9	9	1	1	4	10	10
JUN	5	5	8	8	8	8	8	16	16	6	16	2	5	5	8	8	16	25	4	4	3	4	13	5		10	4	13	6	2	.
JUL	6	5	24	13	13	25	9	9	1	9	4	13	10		3	3	4	21	13	10	8		5	5	2	2	2	2	17	9	4
AUG	10	25	9	3	4	13	9	13	13	2	9	5	2	9	9	4	13	5	25	6	5	13	14	21	21	2	2	11	13	5	2
SEP	6	6	21	31	6	9	1	9		28	22	22	5	2	11	24		5	5	2		14	14	14	2	4	1	16	6	11	.
OCT	31	12		11	1	1	1	3	11	1	11	24	5	19	13	14	11	11	3	3		10	3	10	16	31	7	18	7	23	
NOV	3	10	3	10	3	1	3	11	23	18	11	23	3	23	15		12	12	8	14	2	15	15	12	3	10		20	2	3	.
DEC	4	4	16	6	2	18	19	18	18	19	1	21	23	3	1	11	4	20	10	10	3	10			14	15	30	12	15	22	20

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1935 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	27		12	15	10	3	8				8	14	7	19		22	14	14	2	2	15	7	11	15	15	7	11	12	11	11	11
FEB	1	1	18	31	7	30	19	6	6	4	1			8	20	1	1	6		3		1	5	2	2	23			.	.	.
MAR			8	14	14	7	12	12	8	16	4	3	3	10	13	16	11	25	25	22	25	12	3	3	10	13	5	28	5	2	14
APR	14	7	7	14	14	2	7	12	8		18	19		14	12	3	4	17	4	3	3	3	4	4	6	6		2	12	8	.
MAY	8	2	2	11	4	5	5	5	2	8	8	2	2	12	12	12	8	17	2	2	2	2	9		13	13	5	2	12	8	9
JUN	4	16	6	6	5	2	12	24	4	4	2	12	10	10	8	8	8	12	17	5	2	9	4	4	13	13	25	3	17	4	.
JUL	17	9	9	5	5	5	8	5	9	4	16	6	6	21	1	1	5	2	24	13	13	13	13	9	24	13		4	1	13	13
AUG	5	5	25	9	4	1	1	6	6	9	6	6	1	10	13		2	5	2	2	11	11	9	6	6	6	2	2	2	2	2
SEP	9	6	5		5	2	2	2	28	7	8	12	3	3	3	1	6	19	1	4	1	9	21	21	5	2	19	6	1	16	.
OCT	19		2	2	2	19	21	5	2	11	3	10	10	12	10	4	1	1	21	5	2	6	11	1	1	1	28	14	14	5	5
NOV	23	30	6	6	6	1	16	8	14	2	15		14	7	12	15		14		1	19	23	11	23	11	4	16	1	1	26	.
DEC	11	12	11	23	15	3	3	13	20	3	3	3	4	3	11			18	18	19	6	26	7	7	7	12	15	3	15		12

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1936 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	20	3		22	14	7	11		15	22	15	15	22	15	15	14	2	7	18			17	2	7	7	7	7	7	18	28	7
FEB	7		14	7		7	14	18	2	7	7	7	14	7	7	7	7	7	7	7	30	15	22	22		14	12	12	11		.
MAR	16	1	13	2	11	4	4	1	10	16		17	4	4	16	11	3	4	4	21	24	5	8				22	13	13		2
APR	2					16	1	4	4	1	1	12		17	7	7	11	7	8	14	7	7	7	30	2		10			14	.
MAY	7	7	12	12	10	5	5	2	6	2	2	7	7	15	3	4	6	7	12	17	4	1	6	6	2	12	15	12			5
JUN		14	2	23	13	14	14	20	2	2	11			12	12		3	4	6	2	2	2	19			5		4	4		.
JUL	8	3	3		1	21	9	10	3	3	10	4	17	2	17	9	2	2	2	2	6	5		17	17	13	5	2	2	9	13
AUG	5	5	2	2	19	1	1	1	3	4	13	2	8	5	5	7	9	5	2		10		8	8	5	2	2	2	12	17	3
SEP	8	17	9	13	6	6	6	6	19	21	5	8	8	13	6	6	1	19	1	23	27	10	6	19	5	2	18	2	28	7	.
OCT	7	23		3	16	29	1	6	2	6	25	12	11	1	5	6	1	1	5	14	2	2	19		2	19	19	1	1	24	5
NOV	2	2	6	28	7	2	19	6	29	1	1	1	1	26	11	1	3	11	1	21	11	29	19	6	6	29	1	16		6	.
DEC	17		5	7	14	15	3		5	17	1	1	1	1		3	3	1	1	1	15	3	15	12	8	22	7	7	17	14	14

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1937 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	30	6	1		14	2	2	6	27	19	6	1	22	2	15	9	10		2	2	4	6	24	5	3	15	14	7	30	7	7
FEB	15	15	7	15	10	30	8		1	1	1	10		3	3	1	3	10	13	20	20	5	23	7	7	7	19	1	.	.	.
MAR	23	4	20	3	27	4	2	7	12	7	7	7	12	11		10		8	7	7	7	7	8	8	2	7	2	2	7	15	
APR	17	9	4	20	3	3	18	11	3	3	1	3	3	3	3	4	16	25	17	17	24	5	16	20		12	8	8	20	3	.
MAY	2	7	7	2	9			3	23	3	10	16	11	9	13	23	12	17	9	4	16				8	17	9	9	13	5	6
JUN	6	19	13	5	26	31	14		7	7	12		20		11	15	3	3	1	1	1	3	10	13	6	6		17	11	9	.
JUL	6	1	6	25	9	13	6	2	9		5			5	5	16	9	4	4	1	9	13	6	21	17	9	6	9	9	9	24
AUG	5	4	1	1	1	10	4	17	9	16	6	6	24	13	4	21	9	4		9	9	9	10	9	1	21	9	5	17		
SEP	5		14	7	7	19	11	1	5	6	18	9	6	6	7	19	1	17	9	9	13	13	5	6	19	6	5	7	12	12	.
OCT	12	12		5	5	6	19	6	18	23	7	7	12	11	3	3	3	4	16	16	29	11	3	1	16	1	1	3	1	23	
NOV	31	12	19	23	3	1	4	3	27	7	15	5		7	7	7	7	7	7	12	7	15	3	3	27	5	20	4	6	18	.
DEC	11		26	18	18		14	7	7	15	15	14	2	11	3	1	4	4	2	1	13	14	30	15			22	15	12			

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1938 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	11		6	1	6	2	18	17	4	1	26	15		3			3	3	3	3	3	1	16	26	18	18		14	14	7	7
FEB	7	12	15	15	22	15	15	14	7	12	7	14	7	7	7	7	7	15	12	12	12	29	11	19	1	1		7	.	.	.
MAR	15				14	23		7		1	1		3	3	3	3	10	3	3	10	10	3	3	10	4	17	1	10	5	5	5
APR	2	28	31	12	8	2	18	18	17	10	10	3	9	4	3	3	1	1	16	5	2		14	7	8	8		17	9	21	.
MAY	10	10	4	4	5	2	2	2	12	3	4	1	13	5	5	8	14	2	2	6		2			4	17	24	13	4	4	6
JUN	6	9	6	1	6	5	16	9	5	5	21	9	10	4	17	9	9	4	4	9	13	5	5	2	2	2	2	2	9	4	.
JUL	10	10	4	4	4	16	6	4	4	3	4	4	16	6	13	5	2	9	5	2	28		13	5	2	9	1	4	4	13	4
AUG	4	4	16	1	13	5	5	5	5	6	9	1	1	13	4	4	9	24	13	1	13	21	2	2	6	6	9	5	9	6	2
SEP	7	23	21	17	9	8	2	2	17	6	6	19	6	2	18	17		11	11	11	19	21		3	1	6	1	2		3	.
OCT	19	7	22	2	12	9		11	3	1	1	1	1	21	13	2	2	18	6	6	31	18	23	1	1	3	1	7	11	15	12
NOV	8	10	3	10	5	6	11	1	22	14	8	4	16	4	3	1	16	1	2	5	2	2	18		18	19	19	1		3	.
DEC	3	3	10	20	1	1	1	3	1	13	6	19		19			1	19		3	3	4	4	16			7	14	7	23	15

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1939 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	3	3	3	22	5	3	4	4	16	4	4	4	20	11	17	3	3	3	1		3	10	16	1	23	3	8		14	8
FEB	8	20	15		22	22	14	7	30		27	27	8	20	9	6	1	10	8	2	18	19	5	9	4	5	8	2	.	.	.
MAR	4	10		8	20		12	7	12	3	20	22	14	2	2	2	2	1	3	11	1	1	8	8	5	14	2	9	9	1	16
APR	4	28	8	5	2	6	21	4	5	2	12	9	9	9		2	2	6	13	2	11		10	3	3	3	3	11	17		.
MAY	14	2	8	9	4	4	16		13	14	2	2	19	17	10	8	8	8	8		8	8	8	8	12	17		3	1	4	5
JUN	5	2	21		5	8	4	25	9	2	2	2	7	5	12	8	8	4	16	9	4	18	5	5	5	8	8	2	7	25	.
JUL	9	10	10	1	10	4	4	6	6	25	4	1	21	3	3	4	4	4	4	4	6	6	1	4	6	21	2	9	9	25	17
AUG	6	6	1	4	4	13	5	5	5	9	25	4	1	25	9	4	9	6	6	19	21	1							3	1	17
SEP	9	4	16	17	4	13		6	2	11	24	22		4	4	11	11	1	18	19	2	2	2		2			5	6	1	.
OCT	5	8	17	3	24	13	4	4	4	6	6	28	7	11	5	7	11	3	3	1	16	16			8	20	29	1	6	19	6
NOV	12	11	11	1	1	1	27		10	3	23	11	15	15	23	11	23	11	11	11	3	1	18	11	11	11	11	1	1	3	.
DEC	16	3	3	1	1	1	3	3	3	15	10	20	3	3	3	3	1	20	12	17	6	2	7	18	18	2	23	11			15

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1940 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	12	15	7	12	12	7	7	7	11	1	1	9	4	26	28		7	7	7	7	23	7	7	7	7		11	11	11		7
FEB	7	7	15	15	20	27	10	4	1	10	5	20	3	15	8	7	12	2	2	7	7	7	7	7	7	15	15	15	22	.	.
MAR	20	4	20	3	17	18	12	8	8	12	8	18	18		3	10	16	6	14	7	14	7	7	7	12	12	3		3	15	
APR	8	8	14	2	7	7	14	14	14	14	18	11	1	13	5		4	1		8	14	2	7	12	12	12	9	10	8	8	.
MAY	15				10	8	7	18	18	11	1	16	5	12	17	9	6	4		5	2	2		2	17	9	2	2	7	7	14
JUN	8	4	4	4	9	5	2	5	5	18	11	20	17	16	9		13	5	2	17	9		5	16	4	5	5	6	21	5	.
JUL	12	17	19	9	21	6	6	14	14	8	2	11	28	5	9	13	8		3	9	6	21	6	16	5			4	3	3	4
AUG	4	4	9	6	6	1	1	3	3	4	6		9	9	13	5	2	2	19	2	8	12	17	17	4	3	3	4	16	11	3
SEP	1		3	4	4	6	7	7	2	2	19		17	4	11	1	1	9	29	6	18	18	7	7	11	23		17	19	28	.
OCT		2	17	10		23		3	1	3	1	6		18	11		15	15	20	3	3	1	15	12			8		3	3	3
NOV	27	15	5	14	7	7	7	14	14	14	14	6	18	19	1	1	1	5	6	1	5	2	18	18	2	2	18	27		14	.
DEC	7	18	27	3	3	10	1	1	26	2	7	2	19	19	18	7	15	3		3		15		22	22					8	8

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1941 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	18	26	7	7	12	12	15	7	11	11	27	15	12	12	8	14	7	11	15	7	7	7	7	7	12	.	11	11	1	3	1
FEB	15	11	23	11		12									19	26	2	7	7	7	7	7	7	7	7	7	7	7	.	.	.
MAR	22	8	12	7	12	18	11	1	6	26	12	18	11		5	7	7	3	3	8	12	12	2	2	2	7	7	11			
APR		12	12	12	3	4	3	12	11	12	8	9		16	4	5	5	5	26	5	28	2	11	28	19				12	12	.
MAY	3	8	8	3	10	10	16	2	2	7	7		10	6	3	3	3	4	4	6	6	2	11	24	5	5	17	8	12	7	2
JUN	2	2	2	2	5	9	8	9	4	4	6	29	17	9	9		1	3	10	1	7	7		3	10	4	4	8	5	5	.
JUL	2	2	11	11	6	6	4	6	6	5	9	9		6	19	6	21	4	1	1	1	1	13	5	9	9	24	1	4	6	9
AUG	9		14	6	9	5	14	14		1	5		6	5	2	2	6	6	6	6	5	25	25	5	14	14	7	9			20
SEP	1	8	20	4	16	5	5	2	2	12	11	10	1	10	10	27			5	5	2	2	14	14	28	13		19	9	16	.
OCT	4	2	4	5	2	17	10	4	26	3	3	3	4	1	11	1	3	3	9	9	19	6	18	7		14	7	7	2	11	1
NOV	1	1	15	8	11	6	18	29		23	11	1	3	1	10	12	8	5	5	6	5	18	1	1	1	1	7	7	15	3	.
DEC	1	3	1	4	20	1	26	28	7	12	11	8	3	3	15	3	3	3	3	3	10	4		5	14	2	7	7	7	14	30

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1942 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	6	26	14		21	7	18			1	1	3	1	1	3	1	1	1	1	11			3		3	15	12	8	14	14	7
FEB	12	15	12	15	22	12	12	2	2	11	17	2	2	2	5	14	2	19		14	7	14	7	7	7	12	11	11	.	.	.
MAR	1	1	4	16	1	4	16	26	3	4	3	3	6	8	12	4	3	4	5	17	27	22	14	6	8	2	2	12	2	18	11
APR	1				8	14	7	7	7	12	11	9		22	10	7	12	3	18	12	11	1	13	4	8	10	10	10	3	8	.
MAY	17	8		2	2	18	1	7	12	8	8	5	8			14	2	2	18	19	12	12	17			8	10	13	8	2	17
JUN	17	8	5	2	8	8	17	3	10	4	5	5	6	3	10	4	4	13	5	5	5	2	2	8	8	9	4		6	8	.
JUL	2	1	13		28	25	25	4	4	13	10	13	21	3	3	10	4	5	6	6	19	9	6	5	5	2			5	5	24
AUG	13	6	9	9	13	17		2		9	9	13	5	6	6	9		1	1	10	13	2	11	9	13	5	9	9	9	14	2
SEP	14	7	23		9	4	29	9	10	4	6	19	6	16	24	5	2	2	19	6	6	6	14	2	2	2	12	11	11	3	.
OCT	4	6	1	4	19	3	1	3	11	3	9	9	23	11	17	16	18	19	1	6	6	13	13	13	18	3	6	17	3	4	3
NOV	5	7	24	5	2	18	19		6	6	11	1	11	3	10	22			4		11	11	1	10			14	14	23	10	.
DEC	20	13	8	21	20	15	15	15	15	29	20	3	1	1	26	27	14	7	7	15	10	3	10	3	24	20	15	27	12	12	22

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1943 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	2	18	18	11	17	11	1	1	21	16		1	18	5	14	2	2	7	7	30	22	14	14	30	15	15	12	7	2	16
FEB	3	10	10	3	10	15	22	14	14	20		18	16	18	18		3	1	1	19	21	13	14	2	8	6	13	14	.	.	.
MAR	7	18		14	7	7	11			11	4	8	7	14	8	14		9	1	19	11	1		3	13	7	12	3	22	10	27
APR	12	11	1	23	11	9		6	6	2	6	28	2	17	10	8	12	12	11	3	3	1	1	13	5	14		7	14	2	.
MAY	11	6	21	24	5	5	2	2	28	14	2	2	6		8	16	6	6	18	11	11	1	5	5	5	8	17	17	8	8	8
JUN	22	8	5	2	2	2	2	9		5	13	14	17	4	16	16	1	10	10	10	13	9	4	5	2	5	5	2	19	9	.
JUL	9	1	1	4	29	9	9	9	4	4	9	13	4	13	13	4	1	1	1	4	1	1	4	21	6	6	9	9	13	9	13
AUG	25	4	13	14	12	9	4	4	1	1	4	1	13	13		17	9	9	4		10	6	6	9		11	4	1	4	4	4
SEP	13	1	4	1	16	8	21	23	11	19	9	9	1	13	2	11	1	13	6	11	6	2	19	11	1	3	17	3	1	6	.
OCT	18	11	11	15		19	19	1	17	1	10	5	18	20	11	3	3	24	8	19	1		7	12	12	19	1	1	3	4	5
NOV	29	11	3	3	4	2	18		18	11	1	7	18	18	18	1	1			3	11	19	11	7	18	6	1	1	1	15	.
DEC	10	3	1	1	2	1	1	13	6	16	1	26	18	18	11	19	1	1	23		23	12	1	1	10	20	11	19	1	1	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1944 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	22	5	20	12	12	11	1	1	18	12	19	1	27	20	15	1	1	1	1	1	3	3	10	13				19		11
FEB	11	27	7	22	3	3		14	14	2	11	19	13	5	6	13	17	24	19				1			8	7	7	7	.	.
MAR	7	14	14	30	8	16	29	29	3	1	5	7	2	2	4	16		2	4	9	4	4	10	5	9	8	2	18	17	3	18
APR	14	7	11			8		6	8	12	17		10	8	8	9	9	20	8	8	6	2	8	8	8	12	30	9	4	4	.
MAY	13	5	26	18	19	5	5	17	24		2	29	19	1		4	8		17	4	4	8	8	4	4	6	19	1	1	13	8
JUN		8	8	8	5	2	5	2	30	9	9	24	5	13	5	8	8		9	13	9	24	6	4	4	13	5	6	11	11	.
JUL	9	13	9	9	9	13	13	13	9	6	20	4	4	1	4	9	6	8	2	9	1	1	4	1	13	13	16	16	13	13	5
AUG	9	4	4	5	17	9	13	9	1	1	1	1	13	5	5	5	2	9	1	21	6	2	2	9	4	6	6	6		29	16
SEP	24	4		8	2	11	11	6	5		7	17	3	4	4	1	24	13	4	10	7	18	19	23	2	6	2	23	9	2	.
OCT	2	11	3	3	10	16	18	11	2	2	19	21	29	17	11	19	21	16		7	11	27	3	1	19	11	23	12	15	15	15
NOV	22	8	12	12	12	3		3	15	22	14		8		2	11	11	11	6	18	1	1	3	8	20		8	7	12	11	.
DEC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

DATA NOT AVAILABLE FOR 1945

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1946 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	3	3	3	10	16	3	4	4	10	5	18	27	2	11	1	1	15	8	20	11	1	26	15	5	6	1	15	8	29	4
FEB	3	15	12	8	20	15	10	16	4	5	2		20	3	1	3	17		7	15	15	12	20	15	10	20	3	10	.	.	.
MAR	1	1	13	4	4	10		4	12	11	3	10	10	4	4	8	12	11	11	9	3	3	3	10	3	1	1	15	12	12	
APR	10	13	26	6		9		12	3	3	11	21	5	5	17	1	31	15	12	4	4	4	6	6	12	17	4	3	3		.
MAY	6	2	14	2	5	2			14	2	17	24	5	4	9	17	9	14	2		13	14	8		3		8	8		8	8
JUN	12	12	11	9	13	10	5	23	9	4	4	16	2	24	10	5	2	2	6	21	13			10	4	13	5	8	8	20	.
JUL	9	9	9	4	9	9	9	9	5	5			5	8	9	9	9	6	6	6	9	13	13	2	11	1		4	17	9	4
AUG	1	6	6	13	4	4		5	2	2	2	9	9	4	24		5	21	2	12	17	19	9		2	2	2	7	23	21	13
SEP	7	11	24	13	5	2	2	2	6	23	11	11	3	1	10	13	13	18	29	1	1	16		1	21		5	2	11	11	.
OCT		10	13	13	2	2	11	4	6	6	29	13		14	2	9		4	3	1	3	3	10	4	1	5	2	17	4	1	1
NOV	4	6	6	18	11	1	5	2	4	24	6	19	19	1	5	2	7	22	14	14			22	20	20		15		23	18	.
DEC	12	1	15	15	3	3	3	10	10	4	10	20	23		22	5	6	19	1	6	15			19	28		14	2	2	2	28

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1947 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	18	19	1	1	1	1	6	1	27	4	8	14	5	4	1	27	3	10	16	3	3	1	3	10	10		14	8	14	14
FEB	12	15	26	18		14	14	7	7	7	15	15	15	3	26	13	14	2	2	2	8	12	2	2	7	7	7	7	.	.	.
MAR	7	15	14	14	2	2	12	12	12	15	5	2	2	2	12	31	2	8	2	4	1	10	10		18			21	7	15	8
APR	8	8	8	8	8	16	12		9	20	5	18	6	2	2	23	22	8	17	24	5	5	5	2	6	27	11	3	10	10	.
MAY	16	17	5	2	2	7	12	12	9	5	5	17	4	13	4	4	4	16	6	16	13	2	6	7	14	14	14	2			22
JUN	8	7	8					22	8	5	9	6	17	17	9		8	17	9	9	9	6	5	6	1	10	10	13	4	4	.
JUL	19	9	10	4	20	9	9	9	9	13	3	10	13	9	24	13	2	2	5	5	9	13	8	9	25	9	1	10	16		9
AUG	9	24	1	24	13	21		3	13	16	6	5	5	5	24	10	25	24	14	2	8	5	5	5	2	2	9	17	1	4	6
SEP	1	1	4	4	1		12	8	25	16	4	1	13	6	21	14	14	2	17	6	6	19	21	7	2	11	28	2	12	11	.
OCT	3	3	1	1	13	13	7	12	3	3	10	4	1	1	3	3	3	1	1		8	20	11	11	11	1		3	3	20	7
NOV	11	9	4	5	16	16	16	16	5	4	5	2	25	8	8	2	12	2	2	2	2	6	6	1	16	6	6	28	19	1	.
DEC	5	2	7	2	19	5	8	2	9	20	4	11	1	10		3	3	3			3	3	11	1	1	1	27		5	2	11

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1948 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	3	3	1	1		3		10	18	11	5	6	18	1	26	2	19	2		16	17	8	6	5	2	2	19	1	3	17	1
FEB	7	7	9	14	7		7	7	7	30	6	1	26	15	15	10		8	2	2	11	8	5	20		8	8	14		.	.
MAR	7	2	2	11	18	2	2	14	7	2	1	15	1	22	5	14	11	3	10	4	3	10	22	7	8				24	10	4
APR	14	7	22	22	14	8	14	7	7	10	13	8	7		27	11	10	5	5	7	15	3	10	10	13	5	7	12	12	8	.
MAY	8	8	20	5	2	12	8	8	8	2	2	12	3	10	21	12	12	9	9	29	9	8	8	7	2	14	7	12	12	9	9
JUN	9	13	10	8	9	13	16	24	13	14	7	2	2	8	2	2	2	2	9	9	9	5	5	5	6	9	6	6	6	17	.
JUL	24	4	9	4	13		4	1	6	6	5	2	2	2	5	5	2	2	5	17	17	17	9	4	13	13	4	4	13	6	6
AUG	2	2	2	2	11	17	2	8	9	4	5	9	5	2	2	6	6	9	24	16	21	13		1	1	21	17	18	11	11	1
SEP	1	11	4	9	6	6	2	2	19	19	21	5	7	12		21	9	1	16	3	3	3	9	9	17	11	11	19	6	2	.
OCT	7	11	11	3	4	16	3	6		3	9		19	11	5	6	19	1	11	29	1	18	11	1	16	6	29	9		3	4
NOV		3	3	4	16	16	6	6	6	6	6	4	1	3	3	15	10	18	15	4	20	1	1	10	10	8	20	27	16	15	.
DEC	3	3	22	8	22		15	14	7	3	10	22	14	7			19	4	1	10	16	2	2	12	11	1	1	4	3	1	11

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1949 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10	5	2	4	4	1	10	5	2	2	19	19		1	5	18	1	14	7	11	15	7	14	2	18	6	14	2	1	13	5
FEB	19	11	22	22	8	15	10		20	15	14	14	4	10	10	3	22	14		7	15	15		12	12	7	12	11	.	.	.
MAR					8	17	13	14	7	7	30	14	7	7	7	7	7	7	15	8	8	17	9	4	4	3	10	5	4	17	6
APR	9	9	4		17	1	3	9	6	18	1	5	5	2	11	13	2	9	3	10	4	16	12	4	4	3	3	3	4	4	.
MAY	10	3	10		2	18		2	2	9	2	9		8	5	8	14			8	13	5	6	6	5	12	12	8	8		10
JUN	10	13	6	19	13	2	17	9	3	4		5	9	13	13		5	2	9	4	4	4	4	4	13	10	4	1	10	1	.
JUL	1	13	5	8	17	17	13	6	6	6	2	2	6	6	9	24	10	5	8	ND	16	9	21	10	4	1	13	2	9	19	6
AUG	2	9	9	11	17	9	1	4	9	3	8	17		3	3	3	17	2	2	2	2	2	8	10	1	5	2		5	23	2
SEP	21	5	5	14	7	2	19			5	5	2	2	3	3	3	16	16	11	4	6	18	11			21	2	11	23	17	.
OCT	17	1	6	3	10	13	13	4	3	10	1	1	6	11	1	6	14	2	2	2	4	28	7	6	21	1	1	1	16	18	1
NOV	16	19	1	11	23	19	21	3	3	3	20	27	1	16	6	23	11	1	26	18	11	27	3	3	3	3	3	10	1	27	.
DEC	3	1	1	23	15	26	7	11	1	13	5	16	18	18	28	22	22	14	14	4					4		15	14	15	22	

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1950 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	14	2		3	15	15		22	15	22	14	14	30		7	14	19	7	15	15	14	14	14		7		5		30	6
FEB	6	1		15	15	12	3	20	27	12	12	12	12	12	15	15	14	7	12	12	17		12	15	12	12		26	.	.	.
MAR	7	11	3	1	3	5	26	7	14	14	30	6	1	10			12	12	3	4	3	3	20	22	8	8	8	17	6	28	4
APR	3	10	5	2	7	15	12	12	8	26	12	12	11	9	4	1	4	6	18	11	4	9	8	2	8	8	2	2	2	12	.
MAY	12	8	8	4		5	2	9	16	6	19	17	4	5	8	8		4	4	4	4	13	13	5	17	11	1	9	4	16	6
JUN	13	5	19	1	10	5	8	29	16	19	9	10	4	8	5	2	12	9		16	9	10	10		5	16	6	6	6	5	.
JUL	5	5	2	2	9		9	10	22	5	5	2	6	9	5	13	5	9	4	9	21	2	2	9	19	9	3	10	4	4	6
AUG	29	17	9	9	9	24	13	5	2	2	2	2	9	13	20	6	30	2	2	21	21	13		5	2		17	2	17	13	2
SEP	18	2	2	9	19	9	21	14	2	2	2	2	2	2	2	2	19	25	4	29	6	3	3	1	1	1	13	13	13	14	.
OCT	2	18	18	15	15	10		11	1	3	1	19	2	7	8		7	14	7	2	2	11			3	3	3	3	3	15	
NOV	20	6	11	1	10		5	14	2	6	18	19	1	10	15	15	22	22		15		5	7	11	7	7	7	18	14		.
DEC	14	20		14	18	11	3	31	23	1	20	20		7	15	18	18	7	7	12	27	1	27	12	8	18	1	10	20		5

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1951 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	4		14	7	9	19	11	1	1	3	3	4	3	10	15	10	10	22	14	12	15	10	26	7	7	14	14	2		21	6
FEB	1	3	10	7	14	14	7	12	11	22	14	2	19	11	1	1	3	10	4	20	14	2	19	27	8	14	8	8	.	.	.
MAR	2	8	20	22	14	14	14	7	7	2	7	12	17	6	15	8	2	2	2	7	3	10	4	11	11	4	13		12	8	2
APR	2	11	11	9	9	2		4	5	2	2	12		14	2	7	14	14	14	2	2	6		.	17	3	3	3		10	.
MAY	10		7	7	12	7	23	5	2	2	8	8	10	8	2	17	9	5	5	5		3	3	10	16	16	5	5	5	2	2
JUN	2	2	2	7	14		9	13	16	17	4	9	4	4	6	13	13	6	5	5	2	5	5	2	9	13	5	5	5	2	.
JUL	2	9	17			9	1	13	5	2	23	23	23		8	2	2		9	4	16	6	9	9	5	2	5	5	5	5	2
AUG	9	2	17	9	4	16	13	5	2	2	2	2	2	2	2	9	6	6	5	2	2	9	9	9	6	21	13	14	14	8	2
SEP	2	2	2	2	6	12	11	4	16	4	13	6	6	21	18	21	6			5	6	13	23	7		5	7	12	3	3	.
OCT	3	22	8	8	2	11	11	11	19		12	4	1	27	5	14	7	7	7	5	2	8	15		2	19	6	1	5	5	14
NOV	2	1	31	17	18	11	1	1	1	15	3	10	10	8	2	18	11	11	15	22	13	28	28	11	15	3	1	1	1	3	.
DEC	3	10	3	3	10	5	16	18	1	6	26	26	14	7	23	21	2	15	14		4	10	19	9		7	7	1	22	14	5

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1952 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	4	1	1	1	3	1	3	10	20	15	22	12	15	22	14		1	15	20	15	14	14	7	15	22	7	20	18	3	3	10
FEB	3	10	20	3	4	1	26	1	1	3	3	10	20	18	2	8	14	14	8	2	12	7	7	18	1			2	2	.	.
MAR	14	8	7	12	12	12	2	17	5	8	8	8	12	12	12	12	3	22	2	5	2	2	4	4	4	6	11	3	3	3	10
APR	16	12	20	18	11	11	13	5	2	11	9	20	11	3	4	11	1	1	4	5	2	17	11	18	11	3	3	3		15	.
MAY	17	17	9	5	5	9	5	5	2	18	11	11		5	5	2	2	9	4	4	4	4	6	6	5	5	2	11	17	5	2
JUN	17	29	3	3	1	9	13	13	13	8	8	8	4	9	4	16	5	21	9	4	9	10	5	8	5	2	12	12	17	4	.
JUL	4	6	6	1	1	13	6	19	21	14	14	2	2	19	24	13	13	5	2		13	5	19	1	13	6	5	6	13	9	13
AUG	5	5	2	21	2	9	13		13	5	6	9	1	13		4	4	9	9		11	11	1		10	5	2	19		5	5
SEP	6	19	21		12	11	1	21	2	8	17	8	6	6	19	6	6	6	2	7	7	18	11	28	18	1	1	4	1	16	.
OCT	6	11	21	23	2	18	19	11	2	6	4	6	5	6			19	1	11	11	1	19	23	17	6	21	18	11	1	1	1
NOV	6	29	1	1		18		2	11	1	3	3	3	3	8	29	4	16	1	1	6	6	2	2		26	18	1	11	15	.
DEC	15	3	3	3		3	15	10	20	27	3	12	11	1	1		7	7	11	15	3	4	29	11	27	12		3	3	3	3

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1953 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10	3	1	26	14	7	15	15	15	20	15	22	14	14	20	27	22	10	3	3	10	3		15	22	22	20	15			20
FEB	3	3	3	3	4	4	3	5	2	11	6	16	16	20	10	3	1	5	2	2	1	1	2	9	1	1	5	2	.	.	.
MAR	9	9	4	16	5	11	19		12	22	14	12	8	14	12	3	3	3	3	22	10	10	20	12	17	3	12	17	9	4	4
APR	6	18	17	12	17	8	14	14	ND	5	2		22	8	2	7	7	7	12	11	4	16	4	8		12	12	8	8	8	.
MAY	8	20	18	18	11	3	10	10	4	5	5	2	11		5	5	16	20	10	10	3	20		8	14	2	8	17		10	14
JUN	2	8	5	5	8	3		8	8	17	9	9	4	4	5	2	17	13	5	5	5	2	9	5	16	13	5	2	4	17	.
JUL	4	16	13	13	6	21		11	19	19	23	2	3	3	9	6	19	1	5	5	6	5	2	13	5	2	9	13	6	2	8
AUG	8	8	8	17	29	29	17	9	13	13	6	1	21		12	17	11	2	2	11	9	23	17	3	10	13	25	3	4	4	4
SEP	9	5	5	21	21	25	17	2	18	2	7	12		6		17	4	1	13	6	7	11	1	16	1	4	3	3	13	15	.
OCT	3	4	18	18	18	11	1	11	3	27	17	11	1	3	1	3	3	3	4	4	5	2	19	9	6	11	1		27	20	11
NOV	3	1	18	11	11		7		15	15	11	3			3	1	13	4	20	17	3	3	10	10	3	1	3	1	1	3	.
DEC	10	4	8	10	3	3	10	20	3	10	4	1	16	11	31	7	11	1	3	10	2	18	1	1	1	1	16	10	4	1	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1954 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN		15	10	15	15	15	12	8	2	6	2	2	14	22	14	30	7	30	14	7	7	15	14	14	7	7	7	15	18	11	1
FEB	1		1	16	18	19	1	1	13	14	7	15	22	22	3	15	15	10	20	10	3	4	1	4	4	10		24	.	.	.
MAR	14	2	18	11	19	21	18	3	3	8	8	8	2	2	7	7	8		14	7	7	6	8	14	5	28	14	2	14		13
APR	14	7	12	3	22	8	20	15	10	16	19	3	3	4	16	1	13	13	13	2	2	2	14	14	14	14	14	14	2	2	.
MAY	2	2	12	12	17	2	7	7	7	8	2			13	5	2	2	12	17	9	5	8	5	28	12	8	8	5	2	8	8
JUN	8	2	7	12	8	10	16	10	5	8	8	25	4	4	3	4	4	4	23	4	4	17	1	13	30	12	4	5	2	2	.
JUL	2	2	2	2		31	12	17	3	3	1	6	5	2	2		25	4	4	4	9	4	1	19		28	5	5	5	6	6
AUG	13	5	8	8	2	2	2	5	2	2	2	2	8	25	5	2	9	4		8	9	1	21	5	8	14		18	18		28
SEP		21	5	5	2	29	11	9	2	7	12	12	12	2	14	14	2	4	24	16	11	11	4	6	6	19	13	14	2	2	.
OCT	2	14	14	23	7	7	15	1	3	3	3	1	6	18	18		3	11	3	3	1	1	2	2	2	6	1	26	6	6	5
NOV	11	1	31	3	1	1		7	11	21	7			15	15	10	3	3	3	1	3	1	6	20	3	4	10	5	2	7	.
DEC		1	1	3	11	3	1			1	3	1	1	3	1	16	6	6	1	3	1	1		15	10	2	18	27	13	3	10

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1955 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10		11	3	4	2	17	26	7		8	29	10	16	15		7	12	12	10	16	16	4	20	26	18	28	11	31	11	
FEB	8	2	9	4	10	3	10	10	5	2	12	11	1	11	17	1	13	2	2		28	14	2	7	14	7		22	.	.	.
MAR	22	8	14	2	2	6	1	1		3	10	22	8	5	2	2	2		14	6	20	10	5	14	2	18	11	1	3	10	4
APR	3	10	5	5	2	18	1	1	3	4	4	20		8	10	13		8	8	31		3	4	4		8	5	26			.
MAY	5	10	10	16	25	13	2	9	4	1	25	8	8	2	8	2	4	4	6	6		5	5	8	9	4	16	16	17	24	24
JUN	4	4	4	16	16	16	5	2	2	2	2	9	9	9	4	4	4	4	5	21	23	2	8	8	17	9	9	9	4	10	.
JUL	10	8	5	9	9	9	13	5	2	2	17	9	6	6		9	9	11	9	9	13	5	2	9	13	8	8	4	4	13	23
AUG	11	6	6	2	2	2	11	9	6	6	9	9	9	2	17	9	4	4	4	13	5	2	9	4	9	17	6	6	6	2	11
SEP	1	1	6	6	21	2	2	2	13	23	11	11	3	3	3	10		2	2	14	5	2	2	2	19	9	21	24	16	2	.
OCT	7	11	12	3	4	16	3	3	1	3	10	1	18	1	29	2	18		21		9	13	20	1	1	10	16	4	20		5
NOV	13	23	15	3	16	16	18	1	1	10	13	14	7		2	26	12	15	15	27	8	14	7	15	15	14		7	12	11	.
DEC	22	8	12		15	3	20	12	11	11	11	24	13		18	13	14	7	7	7	15	22	22		7	15	22	5	19	19	1

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1956 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	27	15	15	22	7	12		7	7	7	7	7	14	14	12	12	12	12	12	12	12	3	8	7	7	14	14	14	6	19
FEB	6	6	6	27	4	4	16	4	1	4	10	10	5	14	2	17	10	20	15	15	7	12	22	10	10	4	4	3	3	.	.
MAR	10	10	3	22	8	8	3	10	5	14	2	6	5	2	11	1	1	19	1	13	7	12	12	11	15	8	8		12	15	8
APR	8	4	4	10	5	2	17	4	19	13	7	19	13	16		2	2	2	19	28	7	2	2	14	30		14	2	2	7	.
MAY	7	2	7	30	12	2	2		17	3	10	5	16	6	16	1	19	5	12	3	5	5	2	9	9	25	9	9	5	5	11
JUN	9	5	8	8	4	3	1	3	3	9	4	9	13	2	8	8	4	3	25	4	4	4	16	8	8	16	29	9	5	5	.
JUL	5	2	8	2	9	9	6	6	21	21	5	5	24	10	5	5	2	2	6	11	17	4	6	5	5	5	14	2	2	5	9
AUG	9	9	4	4	4	9	4	6	6	6	9	1	21	6	13	14	14	2	2	11	17	1	6	9	9	4	4	4	4	13	16
SEP	1	5	2	2	2	7	7	7	7		13	5	29	17	1	6	18	2	17	9	4	6	19	6	15		13	4	23	4	.
OCT	1	1	20	11	6		21	23	7	11	1	10	10	1	1	1	3	3	20	1	1	20	12	10	10	13	14	3	3	3	ND
NOV	4	18	17	11		26	6	28	11	1	1	3	10	5	12	1	1	5	6	6	26	1	19	6		19	6	18	6	16	.
DEC	1	13	14	14	14	30	6	20	27	10	22			8	20		11	1	1	1	4	20	20	1	1	1	1	16	3	1	

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1957 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	ND		5	2	19	1	15	14	30	7	14	7		14	2	6	6	1	10	22	14	7	7	7	30	6	6	14	19	1	10
FEB		1	13	21		1	19	3	10	3	1	1		1	6	19	2	7	7	7	14	7	7	15		12	4	6	.	.	.
MAR	2	8	8	14	7	7	11	31	3	10	10	3	8	12	12	12	7	11	19	25	10	8	20			4	2	7	7	8	8
APR	8	2	9	20	5	5	2	28	7	14	7	7	7	15	10		12	9	10	2	12	4		10	16	16	17	11	19	7	.
MAY	12	12	2	2	2			14	30		14	8	8	8	2	2	12	12	8	8	8	16	9	13	5	16	6	2	2		23
JUN	2	23	2	2	14	5	9	5	5	5	4	10	4	4	13	2	29	6	28	13	5	16	11	1	4	16	4	13	5	8	.
JUL	9	13	13	16	1	13	16		11	19	24	5	12	12	4	9	13	5	2	9	17	17	9	6	9	9	4	4	9	5	5
AUG	5	5	14	12	11	3	1		14	14	8	2	6	5	2	2	2	9	9	17	9	21	2	28	5	2	2	2	11	11	29
SEP	29	16	5	2	12	12	11	1	6	6	13	5	19	13	5		14	30	6	6	6	6	19	21	12	12	11	1	1		.
OCT	11	24		14	14	14	14	7	18	19	11	3	3	9	6	6	2	2	2	2	14	14	7	7	18	11	19		1	3	1
NOV	5	2	2	2	19	13	14	16	11		3	10	15	8	8	2	12	4	16	6	6	1	1	1	3	10	4	10	6	1	.
DEC	1	4	1	1	10	3	10	3	1	18	11	1	1			15	3	10	10	10	15	10	3	3	27	3	20	12	12	2	18

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1958 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	12	11	1	1	18	1	1	27	15	10	15	14	12	15	12	17	2	18	11		20	3	10	3	12	20	15	12	22	ND
FEB	7	7	15	7	14	7	7	7	7	7	7	7	14	7	7	12	7	7	7	12	12	3		15	10			2	.	.	.
MAR	2	6	2	2	12	12	12	8	8	2	7	7	7	7	7	7	7	2	7	7	15	12	7	12	12	12	7	12	12	15	3
APR	15	3	22	8			12	8	8	2	2	19	1	1	3	3	3	4	10	10	16	8	14	2	2	2	5	2	6	13	.
MAY	9	10		17	17	9	8	17	4	1	9	10	6	23	19	6	13	23	7	2	14	7	7	2	24	13	2	13	5	8	8
JUN	8		14	2	7	30	13		10	5	2	5	2	17	2	2	6	13	14	2	6		5	8	2	2	28	4	5	5	.
JUL	5	2	2	2	2	2	2	5	2	6	2	9	13	5	2	9	9	25	9	4	4	9	13	13	16	5	21	21	25	4	1
AUG	1	21	4	4	6	25	17	9	6	6	6	16	4	16	9	9	9	13	5	2	2	2	2	2	17	9	13	8	8	4	11
SEP	24	13	6	11	2	6	11	7	12	12	23	12	10	10	16	11	11	1	1	16	1	1		4	1	6	6	6	5	2	.
OCT	6	19	1	16	11	4	4	10	5	28	7	11		18		6	18	3	3	4	16	3	17	18	18	12	18	18	11	23	3
NOV	1	1	1	10	16	3	4	3	1	10	25	3	10	13	14	2	3	1	1		6	28	2	7	14	2	2	6	15	27	.
DEC	12	27	10	5	14	7	7	30	7	7	2	2	2	19	27	3	27	27	7	12	3	1	20	11	3	15	15	20	11	1	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1959 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	13	13	6	23	15	15	12	15	15	15	15	15		14	7	11	18	10	13	6	6	31	15	22	14	20	27	10	14	7	2
FEB	19	1	4	13	16	15	14	12	14	15		3	15	15			14	7	1	19	19		4	4	4	4	4	4	.	.	.
MAR	1	16	4	6	17	4	4	4	4	5	20	1	10		16	4	3	10	5	18	11	1	3	8	12	8	3	3	10	22	20
APR	4	16	25	10	3	9	5	2	18	2	2	19	24		5	8	8	8	2	7		28	14	14		3	4	10	3	15	.
MAY	22	8	8	5	8	2	19	9	4	4	13	23	7	12	17	3	8	8	9	2	2	2	19	24	13	8	8	8	9	5	2
JUN	2	25	4	3	3	4	4	4	10	8		12	17	9	9	5	2	5	2	5	2	2	2	5	5	8	5	5	2	6	.
JUL	21	1	4	16	3	9	1	6	6	6	6	9	9	9	9	6	6	6	6	13	9	5	2	9	6	6	9	13	13	21	2
AUG	9	13	4	4	5	2	19	6	5	13	13	13	9	6	9	10	5	8	14	8	17	4	6	28	1	24	22	8	4	4	9
SEP	5	16	25	3	3	1	1	24	16	11	7	7	7	12	12	2	7	12	3	10	8	5	19	1	10	10	13	5	6	2	.
OCT	19	6	6	28	14	14	14	14	8	14	7	2	18	17		6	11	27	14	12	3	3	16			2	28	2	2	19	ND
NOV	6	24	22	14	18	1	6	19	1	5	14	14	2	7	14	18	1	1	3	3	10	3	10	4	5	6	18	1	1	1	.
DEC	1	1	1	6		1	1	1	3	3	3	3	4	4	1	6	7	12	12	11	11	12	11	11	3		20	26	6	24	14

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1960 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	5	6	6	1	10	10			3	3	25	3		17	8	2	2	18	7	7	7	18		14		15	15	11	3	ND
FEB	11	3			20	3	3	22	8	8	2	11	3	3	10	5	14	7	2	2	17	2	2	2	14	7	7	2	7	.	.
MAR	7	7	7	7	15	12	12	12	8	14	7	7	12	4	4	16	4	16	29	7	7	12	7	2		10	22	22	20	15	10
APR	4	29	16	29		13	14	12	11	1	13	3	3	3	10	5	11	3	3	3	10	5	14	8	8	7	7	14	2	20	.
MAY	5	5	8	5	14	20	3	17	18	12	11	1	10	13	13	4	8	8	16	3	10	8	8	8	20	20	4	6	17	3	4
JUN	4	16	13	5	7		9	9	6	2	17	6	4	5	10	3	4	4	2			5	2	9	9	13	1	5	5	9	.
JUL	13	5	2	2	19	19	25	9	9	9	14	7	2	9	11	29	29	6	2		21	9	9	6	21	21	21	13	21	9	4
AUG	4	5	5	17	5	5	5	2	2	7	6	13	5	9	9	4	1	1	9	5	8	8	10	1	4	1	4	4	1	1	
SEP			29	3	1	1	5	2	19	28	2	6	9			6	9	11	1	5	5	11	4	4	6	6	2	6	2	19	.
OCT	13	11	3	1	1	3	3	24	5	19	3	17	4	6	19	6	7	7	2	11	1	3	3	3	3	3	4	4	5	29	3
NOV	4	16	5	2	6	11	13	5	18	15	3	15	3	3	10	1	3	3	1	3	10	20	15	15	22	14			12	12	.
DEC	11	3	3		5	18	18	19		12	12	11	1	26		26	21	7	14	7	23	19	1	1	26	2	6	6	1	16	

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1961 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN		29	1	1	1	27	7	11	1	15	15	27	3	3	3	1	15	19	18	18	18	18		7	7	7	23	21	23	15	15
FEB	12	3	9	18	11	3	1	1	3	3	22	10	22	8	7	14	14	2	11	20	27	8		3	10	16	3	4	.	.	.
MAR	3	10	8	8	12	22	20	12	15	10	22	12	3		12	3		2	12	3	5		12	8	8	22	8	2	9	5	20
APR	3	4	16	5	2	2	2	4	13	5		3	10	5	2	12	17	3	10	10	21		8		5	5	14	7	7	8	.
MAY	7	8	2	8	8	22	5	14	12	15	10	5	8	5	2	2	2	19		9	4	12	12	8	12	11	17	8	9	9	5
JUN	5	9	9	3	3	3	17	8	4	29	25	8	2	2	19	21	21	23	2	17	6	2	2	9	9	4	13	13	8	4	.
JUL	13	25	9	3	9	2	17	9	6	6	6	14		24	13	5	5	16	16	16	2	9	24	5	5	21	5	5	8	8	12
AUG	9	1	21	2	4	1	6	6	5	2		19	19	21	17	24	5	2	2	11	9	9	1	1	4	4	4	9	13	10	3
SEP	10	13	4	6	11	6	2	9	6	2	2	2	2	23	11	1	1	5	24	24	13	6	6	19	1	5	18		5	16	.
OCT	19	19	1	1	1	10	5	2	3	10	10	12	11	11	1	1	16	19	24	14	2	4	1	4	12	11	3	5	.	6	1
NOV	10	5	10	13	18	1	18	1	3	3	10	16	11	1	6	18	11	1			3	3	10	15		12	11	7	7	15	.
DEC		11	10	3	4	6	28	14	14	2	2	18	27	12	11	10	22	14	12	15		20	11	15	10	13	20	3	3	13	18

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1962 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	1	10	5	11	10	5	14	2	19	1	24	5	20	21	28	30	7	7	30	21	6	1	27	10	20	12	11	26	18	
FEB	3	1	27	14	7	7	15	15	12	15	31	12		14	7	12	8	14	7	7	17	8	14	2	14	2	7	7	.	.	.
MAR	7	7	8	7	7	12			5	8	8	5	2	11		7			10	8	8	22	8	20	3			5	2	6	2
APR	2	9	9	25	5	20	10	8	8	2	2	18	12	12	11	19	23	18	3	10	4	20	11	15	8	8	12	10	4	4	.
MAY	1	4		8	5	2		30	9	8	8	9	8	8	8	9	4	13	8	8	8	5	5	13	5	8	17	8	8	8	8
JUN	2	11	9	3	4	9	17	4	9	8	2	9	2		9	8	8	6	2	6	6	1	9	12	12	9	1	13	5	17	.
JUL	9	4	9		13	5	5	6	9	13	6	9	8	8	2	2	2	8		16	6	6	6	5	2	6	13	5	13	21	6
AUG	9	10	8	3	3	10	3	17	4	4	2	2	17	6	23	12	17	4	4	4	4	13	16	1	1	21	4	13	6	2	4
SEP	6	5	2	2			5	2		3	10	13			17	6	6	7	2	11	2	11	6	18	18	11	11	3	3	18	.
OCT	18	7	3	9	9	4	3	3	3	ND	15	15	15	10	16	6	6	1	4	4	16	6	18	18	11	4	1	19	23	2	6
NOV	2	18	7	12	3	16	29	1	27	12	3	27	15	14	8	2	2	2	3	10	16	1	1	3	1	3	1	29	11	3	.
DEC	3	3	10	16	11	1	6	26	7	7	18	11		3	3	1		14	12	11	24	5	6	21	6	1	1		15	15	

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1963 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	27		29	19	6	1	27	14	14	2	6	26	6	21	6	5	2	6	16	26	14	23	21	14	2	19	14	30	19	
FEB	22	7	15	15	3	12	18	12	7	7	7	7	14	12	18	28	28	3	20	14	2	6	16	10	18	10	5	4	.	.	.
MAR	4	ND	2	6	6	16	16		4	9	10	8	28	15	8	8	12	4	16	12	12		22	31		1	3	22	22	15	ND
APR	8	8	26	11	27	22	22	8	8	8	12	12	11		10	10	25	10	22	14	2	8	17	3	12	12	9	5	12	11	.
MAY	10	10	22	14	7	12	1	10	8	17	9	8	29	9	4	6	5	14	23	2	7	11	9	13	5	5	2	2	4	10	9
JUN	4	9	8	3	17	8	4	4	8	8	17	17	17	9	5	ND	17		17	9	9	24	9	9	4	4	9	9	10	5	.
JUL	6	11	11		3	8	8	8	17	9		1	16	17	24	4	4	4	4	4	3	3	4	9	6	6	6	9	9	9	13
AUG	4	13	9	9	13	9	9	2	2	24	5	5	2	2		5	9	9	4	4	4	5	8	2	2	4	13	5	2	2	2
SEP	25	8	18	11	1		19	18	18	7	31	12	11	1		12	2	17	6	18	11	11	11	6	23	18	7	18	11	1	.
OCT	1	1	11	13	14	6	19	1	1	12	11	3	3		3	11	1	1	23	12	3	1	3	3	1	1	6	11	1	4	20
NOV	11	3	3	3	10		3	3	4	6	7	7	12	15	3	10	24				14	20	15	24	4	1	4	6	6	17	.
DEC	29	19	1	1	1	1	26		14	2	6	5	2	7	7	7	30	7	7	7	7	11	1	1	10	20	7	18	18	11	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1964 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	10	16	1	4	3	13	20	3	8	2	11	1	1	20	3	10	10	10	22	22	22	8			20	11	1	3	1	20
FEB	4	29	1	1	5	6	16	4	1	3	13	4	4	20	3	3	10	16	2	2	6	5	17	5	6	4	16	1	10	.	.
MAR	10	10	20		10	5	2	20	4	ND	15	3	10	3	10	28	17	8	14	7	7	14	14	7	2	4	5	7	18	11	
APR	3	8	2	9	14	5	2	1	ND	4	10	4	16	1	10	5	5	9	9	5	16	8	8	9	4	10	4	16	ND	8	.
MAY	8	8	8	10	10	10	13	4	4	4	5	17	24	1	9		10	16	17	9	10	4	4		6	21	7	14	2	2	7
JUN	7	12	3	15	25	3	9	5	5	9	4	13	4	5	2			8	10	4	9	4	ND	1	1	9	10	4	13	9	.
JUL	9	9	9	9	4	4	23	8	17	29	2	6	21	22	10	10	21	17	9	1	3	4	4	13	6	5	5	2	12	17	3
AUG	3	1	13	17	9	13		17		5	2	2	9	9	9	8	2	17	4	4	5	6	13	6	3	10	10	10	4	5	8
SEP		5	6	6	13	13	14	14	5	5	19	23		12	17	3	10	13	6	4	4	6	6	6		5	19	5	12	3	.
OCT	1	1	6	18	18	19	31	12	11	11	1	11	1	1	1	1	6	18	19	1	26	18	19	1	4	14	31	11	1	10	20
NOV	3	10	20	11	11	1	1		3	3	10	22	8	2	6	19	6	2	6	26	19	27	15	15			8	14	7	15	.
DEC	7	12	12	11	11	11	1	1	1	3	10	16	26	7	14	5	18	23	7	15	15	15	22		4	15	15	22	22	15	12

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1965 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	15	15	15	15	7	15	22	14	23	18	21	23	18	11	18	19	18	1		1		12		22	10	20	10	20		20	14
FEB	14	21	23	11	22	8	16	3	5	5	2	16	1	13	4	27	27	26	27	5	7	14	2	18	11	1	22	8	.	.	.
MAR	2	18	18	18	7	2	21	5	2	2	14	2	19	5	14	14	14	2	2	2	28	14	7	2	7	7	14	14	7	12	12
APR	12			17	9		15	12		8	5	17	24	14	14		13		15	15	12	2	12	4	2	2	19	1	1		.
MAY	10	4	3	3	10	20	5	5	6	4	21	17	5	5	8			5	7	10		9	9	8	5	5	16	6	25	ND	8
JUN	17	4		13	17	24	13	25	25	9	25	17	9	9	8	2	9	24	1	1	1	13		9	24	10	10	5	2	19	.
JUL	21	16	1	16	9	21	ND	5	5	2	24	13	16	9	4	16	17	17	4	9	4	5	5	6		25	7	2	6	6	5
AUG	2	24	4	13	5		6	23	12	19	1		1	21	9		16			2	2	2		8	10	5	2	2		6	6
SEP	1	13	5	5	2	2	19	24	5	2	2	2		5	5	2	2	2	6	6	24	5	2	6	14	7	30	17	4	16	.
OCT	1		11	3	3	1	16	1	1	13	6	17	9	3	17	4	3	3	4	18	ND	28		1	6	23	12	11	1	1	18
NOV	11	1		11	28	7	7	7	23								7	15	15	3	10		14	14	14	8	16	18	11	1	.
DEC	3	1	15	1		11	27	3	12	12	8	5	5	2	17	9	1	3	1	1	1	4	20		14	14	7	15	22	22	ND

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1966 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	20	15	15	7	7	12	18	15	31	15	11	27	15		2	18	18	5	14	2	7	7	7	7	7	7	7	7	12	12	8
FEB	7	7	7	15	3	1	3	4	10	4	1	13	6	5	9	16	28	12	12	12	18	11	11	11	3	3	4	1	.	.	.
MAR	13	5	14	26	12	12	15	15	ND	3	4	23	11	3	3	10	10		3	10	5	2	18	11	31	17	9	4	3	4	16
APR	16	5	2	2	26	5	14	7		8	8	12	18	11	2	5	5	14			17	9	4	5	2	8	14	2	2	2	.
MAY	11	7	11	1		12	8	2	12	8	8	17	17	9	3	4	16	6	16	4	1	10	16	1	1	25	17	8	8	8	8
JUN	5	5	8	5	5		8	2		3	10	16	6	6	2	23	25	4	25	9	1	9	13	13	16	25	1	25	9	9	.
JUL	5	5	8	4	13	5	9	1	1	1	5	5	2	2	9	25	1	5	17	9	13	6	28	5	5	5	6	9	9	13	
AUG	16	9	6	5	5	2	2	2	17	17		6	9	4	1	25	5	2	2	2	2	2	19	19	1	24			17	3	9
SEP	6	6	6	25		11			12	17	9	5	2	2	23	11	3	11	9	19	6	6	7	14	2	20	2	16	5	2	.
OCT	ND	ND	29	ND	1	1	3	ND	16	ND	9	5	ND	ND	6	4	4	20	3	3	10	1	1	11	21	27	5	7	11	1	26
NOV	18	19	6	2	24	14	14	2	4	13	7	15	7	15	15	14	14	18	15	15	22	5	4	3	1	10	15	7	14	7	.
DEC	7	7	15	15	22	22	22	8	7	15	15	15	15	3	1	3	3	3	27		2	18	7	12	17	2	2	4	10	17	4

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1967 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	10	16	3		8		4	1	26	11	1	1	10	6		5	2	23	15	15	22	22	14	14	30	7	15	15	15		
FEB	12	3	1	27	2	11	2	11	10	16		1	22	8	8	8	12	8	2	18	13	16	12	11	11	10	20	3	.	.	.
MAR	1	5	2	5	6	5	6	1	22	14	14	14	14	14	7	7	7		12	15		15	15	10	5	8	28	12	8	22	14
APR	30	5	11	10	8			10	8	12	9	3	8	10	25	8	14	7	14	14		8		2	8	2	7	14	8	8	.
MAY	5	5	2	2	9	4	16	16	8	14	8	2	2	6	6	29		16	2	2	11	1	4	5	5	5	12	3	17	8	2
JUN	12	11	13	5	2	8	9	5	5	8	8	8	5	5	5	2	2	7	2	13	5	13	2	6	25	1	4	4	6	13	.
JUL	5	2	2	9	9	25	4	25	4	13	5	2	2	9	5	2	3	4	4	9	9	13	16	24	21	9	4	25	25	4	9
AUG	16	13	5	21	5	5	5	29	19	11	11	21	6	6	13	5	2	19	6	17	17	9	9	6	6	19	1		2	7	11
SEP	11	1	1	23	12	1	21		17		3	5	6	6	18	18	7	17	1	6	11	1	6	1	5	2	11	1		10	.
OCT	10	15	22		12	12	12	18	2	11	3	1	1	6	6	1	6	11	1	25	3	10	10	3	3		3	3	4	1	1
NOV	6	2	18	18	18	18	11	1	3	3	27	7	18	12	1	1	6		30		6	1	4	10	13	28	7	11	3	22	.
DEC	20	15	3	3	3	3	15	8	3	4	13	5	6	19	19	24	10	13	13	14	20	15	27		6	5		6	28	2	11

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1968 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	14	2	28	11	14	7	7	15	12	15		18	15	12	15	3	1	3	1	27	27	18	11	1	5	14	7	14	7	15	15
FEB	12	15	27	11	28	18	18	18	19	18	7	7	7	7	7	14	7	15	15	12	12	12	3	3	18	18	18	18	1	.	.
MAR	31	11	1	1	3	3	1		14	2	7	7	15	10	1	15	8	8	2	2	18	11	3	1	3	4	1	1	1	5	7
APR	7	14			1	4	16	16	11	1	24	5	4	1	10	5	4	17	4	5	5	2	20	4	4	5	17	1	25	10	.
MAY	10	5	2	2	24	4	5	5	7	2	9		22	10	5	16	5	2	7	12	3	8	8	17	9	5	5	5	5	5	5
JUN	3	3	4	13	8	8	8	8	8	10	5	24	13	6	6	19	1	16	17	9	16	5	5	2	12	3	4	4	13	5	.
JUL	6	23	21	2	19	1	5	5	11	1	8	3	1	1	10	4	5	2	2	24	5	5	5	9	21	21	2	2	24	5	21
AUG	1	13	25	24	5	5	5	14	14	30	1	13			10	29	17	10	10		3	3	3	29	11	11	11	28	6	6	2
SEP	17	5	5	21	21	1		29	11	11	11	9	1	3	10	4	4	24	5	14	5	20	6	6	6	23		9	19	1	.
OCT	13	5	18	3	4	10	5	2	12	15	22	15	1	3	3	16	29	4	3	1	20	3	29	11	3	6	20	3	15	3	13
NOV		23	17	12	2	18	18	11	3	18	11	3	4			14		12	11	1	1	3	4	21	5	20	4	18	ND	1	.
DEC	10	4	1	10	27	2	12	11	15	15	22		12	11	15	3	4	4	14	2	14	14	15	7	15	14	14	14	14	14	18

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1969 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN		18	18	11	10	26	24	8	7	7	7	7	7	12	14	14	14	14	7	14	14	14	2	7	7	7	14	7	7	2	3
FEB	10	20	11	15	12	14	20	15	3	31	12	12	12		15	7	7	7	2	2	12	12	12	7	12	12	7	7	.	.	.
MAR	7	7	2	17	3	8	2	2	2	2	13	5	6	23	3	3	10	20	4	6	1	10	5	2	18	28	28	7	7	7	3
APR	8	12	3	3	15		8	8	16	4	9	3	4	9	5	20	17	3	3	1		17	7	8	5	8	2	11	8		.
MAY	5	5	8	17	4	6	5	2	5	2	25	10	24	13	14	2	19		14	2	2	2	23	12	3	10	10	16	25	8	5
JUN	29	4	1	25	13	14	2	2	8	5	5	14	2	2	2	5	6	16	5	2	9	4	4	10	8	10	5	5	5	6	.
JUL	2	9	4	5	2	2	17	4	1	3	1	1	4	9	13	6	2	2	2	2	9	4	13	25	4	4	15	28	5	6	6
AUG	6	9	9	5	4	4	16	4	4	1	4	4	16	25	25	9	16	17	17	11	19	19	23	7	17	21	4	5	5	6	2
SEP	2	2	8		5	2	2	2	7	2	19		10	5	2	20	12	11			8		12	3	16	2	7		2	3	.
OCT	3	8	5	2	29	6	23	3	10	5	2	2	18	21	7	23	21	5	4	16	2	7		14	7	7	7	11	18	18	6
NOV	18	11	1		3	3	3	11	1	1	6		2	1	27	5	5	18	28	15	1	16	11	1	18	18	19	1	1	1	.
DEC	1	23	11	9	6	20	2	3	3	3	15	3	31	3	11			7	7	15	15		3	10		9	5	2	4	6	6

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1970 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	6	26	14	23	7	7	7	15	24	13	14	7	15	14	7	7	12	15	12	15	3	3	10	10	3	10	4	1	1	3
FEB	10	20	1	4	1	1	18	18	19	7	7	7	7	14	11	15	22		6	13	1	18		7	19	26	14	7	.	.	.
MAR	7	8	8			20		8	7	7	7	7	12	12	9	4	9	2	19	28	5	4	4	5	2	2	2		5	2	2
APR	4	5	2	3	10	3	10	16	3	3	8	8	2	8	8	2	2	9		5	8	4	4	3	10	13	8	8	8	16	.
MAY	16	6	6	12	17	9	10	8	8	8	8	8	8	2	18	1	1	13	8	5	8	17	17	5		17	17	17	9	6	6
JUN	18	11		9	21	28	24	10	3	4	4	5	2	8	4	13	5	17	6	6	2	24		17	4	4	24	10	13	10	.
JUL		6	2	19	9	1	4	9	9	8	8	6	6	6	1	1	8	2	2	19	9	9	9	25	10	13		8	4	16	6
AUG	21	5	9		3	11	4	4	4	19	9	1	4	13		17	1	13	13	9	9	6	6	5	5	8	5	14	5	2	11
SEP	4	10	10	10	4	1	1	21	6	28	14	2	2	9	6	23	1	3	3	10	16	4	24	5	6	18	18	19	1	1	.
OCT	6	21		3	13	5	5	2	17	25	4	5	2	2	19	19	23	11	3	3	3	3	3	3	10	13	6	26	26	12	12
NOV	18	7	7	7	15	31		20	27		12	8	16	18	27	1	6	4		13	5	18	18	15	10	22	14	12	1	22	.
DEC	22	22	15		7	15	15	31	12	12	4		12	3	3	22	14	14	2	7			16	1	1	3	3	3	3	3	1

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1971 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	16	5	2	2	6	19	1	10	22	14	14	7	14	14	15	15	15	12	11	1	1	4	10		8	20	28	28	26		23
FEB	7		8		5	2	6	18	1	3	26	11	1	3	3	1	25	12	8	2		3	3	3	10	16		.	.	.	.
MAR	2	3	1	10	5	20	12	17	3	3	3	3	10	3	16	6	2	6	26	5	14	7	7	7	14	15	10	20	28	22	5
APR	20	17	2	18	11	11	3		15	10			18	11	4	10	9	4	4	8	8	8	8	8	14	2	8	8	8		.
MAY	12	19	9	9	5	14		1	5	2	2	3	3	4	1	10	5	16	16	5	2	8	8	16	17	9	9	13	25	8	8
JUN	9	4	9	24	10	5	8	8	3	3	4	4	10			9	13	25	10	20	21	23	25		8	10	13	13	4	16	.
JUL	17	9	13	13	13	5		21	7	8	8	13	6	6	6	17		5	2	1	13	5	5	5	5	2	5	2	2	21	21
AUG	2	17	11	11		11		9	21	5	9	13		11	9		9	25	3	3	3	3	4	6	9	9		2	2	12	3
SEP	3	10	4	29	3	1	4	19	6	20	4	6	6	6		2	2	19	21	2	2	18	7		8	8	4			8	.
OCT	4	29	16	1	6	11	6	6	6	21	17	6	1	5	14	2	17	3	1	1	3	11	11	3	1	13	5	2	17	4	1
NOV	4	16	27	24	5		11	3	15	15		3	3	4	5	2	2	16	1	26	3	4	27	15	12	15	8	12	8	9	.
DEC	11	11	3	4	10	5	2	11	10	22	13	15	8	8	5	4	1	21	1	10	15	7	14	ND	14	30	19	1	3	4	1

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1972 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	16	5	2	11	1	1	3	3	10	10	10	5	2	2	11	1	10	14		7	10	22	22	14	7	7	30	1	6	6	28
FEB	2	18	7	7	7	7	12	12	7	11	1	1	10	20	3	3	16	7	15	8	14	7	14	9	14	7	15	22	8	.	.
MAR	14	15	8	2	15	10		7	7	3	3	3	3	4	16	16	4	8		17	12	12	8	12	8	8	8	2	2	16	20
APR	24	13	7	23	12	3	8	11	10	2	3	22	4	4	4	13	5	2	17	4	8	8	7	12	9	4	18	11	9	2	.
MAY	26	2	2	2	14	7	7	2	9	9	9	6	16	1	10	8	8	5	2	30	3	4	4	5	5	2	2	7	12	11	25
JUN	4	13	4	9	25	19		8	12	12	4	4	13	5	2	9	9	13	5		9	9	8	17	4	4	4	4	4	6	.
JUL	5	2	2	7	7	5	8		24	4	13	3	4	13	6	13	13	14	5	21	12		5	2	8	2	17	6	6	21	2
AUG	5	5	19	23	2	17	6		9	13	5	8	8	17	9	1	25	17		21	29	6	6	2	6	19	21	19		13	6
SEP	2	19	21	21		5		11	24	13	2	5	6	1	17	10	10	8	8	13			14	5	2	7		16	4	1	.
OCT	1	29	19	6	2	19	1	7	24	13	2	19	13	2	19	5	7	2	19	13	5	2	2	19	1	5	2		2	18	23
NOV	20	8	15	15	8	12	12	3	20	15	12	12	7	12	7	7	7	12	7	18	11	1	1	4	16	4	5	6	1	1	.
DEC		14	14	30	14	7	7	2	6	19	6	2	6	6	18	15	15	15	3	20	27	22	20	3	3	1	27	8	8	29	16

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1973 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	ND	ND	ND	ND	ND	ND	ND	7		23	3	3	3	ND	15	15	3		3	3	4	ND	ND	1	1	5	7	18		3	3
FEB	4			14	14	7	7	7	7	15		14	7	7	12	ND	ND	ND	ND	ND	ND	ND	ND	7	7	7	12	12	.	.	.
MAR	3	4	20	3	3			17	3	10	8	17	10	ND	16	3			12	12		9	2			5	5	8	17	3	
APR	5	2	2	6	16	14	2	2	12	19	31	24	13	5	4	3	10	ND	8	8	5	16	5	2	2	2	17	8	8	2	.
MAY	2	2	11	8		4	4	3	10	16	2	2	2	23	28	4	1	16	4	8	4	3	ND	3	17	8	8	6	2	25	17
JUN	8	8	16	13	1	25	4	4	9	5		15	8	8	10	ND	10	16	16	6	19	1	1	1	10	16	16	2	5	5	.
JUL	4	1	ND	4	4	10	1	13	5	9	9	13	5	2	9	13	13	5		17	9	9	9	6	6	2	5	6	2	2	17
AUG	6	5	5	25	24	10	4	4	16	13	5	9	9	4	13	5			21	2	8	5	9	9	ND	1	25	1	1	24	13
SEP	5	29	17	6	28	17	17	9	19	21	7	5	14	2	2	23	7	11	12	12	4	3	3	ND	13	6	19	6	17	13	.
OCT	5	9	6	6	11	3	3		5	16	17	1	1	21	23	18		1	3	3	15	15	22	10	16	18	11	11	4	4	26
NOV	5	14	7	7	7	7	14	7	7	15	15	3	22	22	15	15			14	20	8	13		4	3	10	20	15	27	7	.
DEC	15	10	20		12	11	1	26	18	11	15	15	12	12	12	11	12	14	18	11	3	10	4	20	10		22	10		2	2

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1974 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	30		21		30		14		7	7	19	15	15	15	15	15	3	15	3	4	20	16	16	4	10	8	10	10	10	10	15
FEB	8	20	12		5	6	2	6	1	1	27	22	12	3	3	3	4	10	10	20	20	8		11	15	22	22	15	.	.	.
MAR	15	22	10	ND	10	13		ND	12	12	ND	7	8	14	7	12	10	5	14		13	14	2		15	15	12	3	10	3	10
APR	22	22	ND	20	15		17	11		8	4	5	2	2	4	1		9	9	8	16	3	11	ND	9	10	5	5	6	ND	.
MAY	24	5	9	4	17	ND	17	17	8	8	8	8	8	4	10	5	2	8	8	5	5	20	8	17	4	17	5	5	5	5	6
JUN	4	4	4	4	10	4	5	2	2	ND	2	6		23	2	17	9	9	13	5	5	2	2	9	9	10	4	4	1	1	.
JUL	13	5	16	4	9	5	5		3	3	4	1	21	14	12	3	3	29		9	6	4	9	6	6	21	13	5	2	2	2
AUG	2	2	2	11	9	9	9	9	6	13	13	5	2		21	21	13	4	13	8	18	2	11	11	1	21	2	2	6	5	7
SEP	7	18	19	21	14	2	5	7	12	5	5	6	19	21	11	6	6	6	2	2	2	11	21	6	1	10	5		5	7	.
OCT	11	11	1	5	2	19	1		1	1	5	11	6	2	ND	ND	6	18	12	11	13	19	19	6	11	11	3		8		
NOV	2	2	19	1	1	1	1	ND	1	4	18		26	6	1	1	23	22	8	15		10	20	12	3	1		2	11	11	.
DEC		ND	15	15		20	2	11	1	1	10	20	3	3	4	3	1	3	4	3		5	6	4	1	1	3	1	3	1	16

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1975 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	1	1	10	20	10	22	22	14	14	5		1	ND	ND	11	1	26	11	1	17	1	3	10	26	5	6	2	2	18	7
FEB	7	7	7	7	30	23	14	7	15	22	14	7	7	2	18	9	4	1	1	10	16		1	1	5	18	31	ND	.	.	.
MAR	7	12	18			14	7	7	14	30	2	17	9	1	3	3	15	10	11	8		8	8	ND	2	8	2	2	28	25	5
APR	ND	12	12	14	12	12	8	8	2	2	2	6	5	14		9	5	4	D	9	19	3	3	3	8	9	8	5	5	2	.
MAY	2	20	22	8	8	8	8	2	7	7	2	6			8	ND	ND	ND	ND	5	8	17	17	13	13	6	ND	2	2	2	5
JUN	2		4	4	4	9	9	5	2	2	13	13	16	4	4	5	5	5	8	10	4	4	25	9	10	4	4	10	9	9	.
JUL	9	9	9	9	13	24	5	2	2	2	2	9	9			10	10	10	25	9	13	9	5	25	9	21	9	24	13	13	5
AUG	5	4	4		17	9	9	4	4	9	9	5	5	2	5		12	8	8	17	17	17	24	13	13	23	11	3	10	9	13
SEP	2	4	6	2	2	2	17	9	9	5	2	2	11		17	9	13	5	5	2	6	28	2	11			5	8	5	2	.
OCT	11	1	3	1	27	ND	8			15			4	4	1	3	3	1	1	1	1	13	5	16	15	22	22	12	15	3	4
NOV	1	3	3	1	3	10	10	4	4		4	3	3	ND	ND	1	4	2	18		7	7	18	2	2	15	14	8	8	3	.
DEC	10	15	15	22		11	11	4	10	14	14	2	14	2	28	2	18	1	1	11		12	3	3	3	3	4	4	1	10	14

Table 4 (continued)

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1976 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	2	2	18	15	22	14	7	23	3	3	3	10	6	15	27	11	11	13	6	1	12	3	4	5	2	11	1	1	1	6	1
FEB	6	4	14	2	19	19	1	1	1	4	3	10	15	3	10	3	10	10	22			11	1	3	27	15	14	14	14	.	.
MAR	14	14	2	2	19	6	2	2	2	8	8	4	10	4	6	11	3	3	10	15	4	27	10	3	10	20	3	4	4	3	1
APR	9	29	19	9		12	12	11	15	12	11		24	1	10	8	8	16	4	4	17	8	12	12	17	2	2	7	7	18	.
MAY	28	12	17	10	8	2	19	1	1	3	4	6	16	13	6	7	17	9	13	8	8	8	17	3	4	4	3	4	4	3	8
JUN		9	9		2	2	2	9	1	10	10	10	13	16	16	13	5	19	1	1	13	5	5	16	16	6	6	2	12	11	.
JUL	9	9	11	11	9	21	3	3	10	5	8	24	10	5	6	9	9	9	13	20	4	1	25	9	13	25	4	13	14	14	2
AUG	7	7	1	5	2	9		4	4	4	16	17	3				3	1	1	1	1	17	24	5	9	10	16	17	19	28	2
SEP	2	1	1	3	1	24	6	6	19	1	22	10	12	11	9	19	24	5	2	2	2	8	12	17		12	11	1	1	1	.
OCT	21	8	10	16	6	2	19	1	1	1	1	6	19	13	2	7	2	18	6	21	23	14	2	12	12	17	11	1	1		3
NOV	1	21	11	1	21	7	11	1	31	7	7	19	1	3	3	1	1	1	4	6	7	18	11	1	13	5	2	6	29	26	.
DEC	19		6	28	2	2		15	8	4	27	18	1	1	1	1	3	13		11	1	16	1	16	27	3	26	18		7	7

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1977 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	11	15		2	19	6	28	2	18	7	23	11	20	14	7	11	12	11	21		11	19	6	6	6	16	26	7	28	18	23	
FEB	9	8	27	20	12	11	19	1	1	3	4	20	16	2	11	1	4	6	18	3	3	3		16	4	4	29	11	.	.	.
MAR	9	9	4	16	4	1	3	3	3	4	20	17	10	10			8	16	5	5	20	15	12	8	8	4	10		5	29	1
APR	5	5	17	18	16	1	12	3	1	4	4	29	4	9	4	4	16	6	6	6		15	7	11		10	10	ND	13	13	.
MAY		3	3	10	10	8	11	19		10	10	3	1	10	5	5	8	8	29	4	4	10	8	8	3	3	10	4		20	20
JUN	8	9	1	3	29	2	17	17	24	13	2	2	2	2		5	5	5	8	17	4	4	4	4	1	1	13	16	13	16	.
JUL	25	10	10	10	10	5	5	2	9	9	5	ND				25	4	10	13		11	9	5	5	2	9	6	5	4	16	16
AUG	6	13	13	5	21	13	25	4	5	6	21	21	5	7	7	7	7		5	5	5	5		ND	ND	13	4	4	24	13	5
SEP	2	7	15	8	2	2	6	16	6	6		6	6	13	8		22	12	12	3	5	17		8		5	2	2	17	4	.
OCT	2	2	2	2	7	12	4	4	13	6	18	3	1	18	11	1	4	1	1		12	11	ND	1	ND	1	3		3	10	1
NOV		1	6	12	12	4	4	16		15	12	3	3	3	ND	16	6	14	14	14	7	30	14		23	10	20	20	1	16	.
DEC	20	10	22	14	ND	7	14	14	7	7	15	10	3	3	3		22	22	26	7		31			6		19		14	14	2

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1978 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN			7	7	15	22	7	7	12	7	ND		7	7	7	7	7	7	12	ND	3	1	16	26	2	2	7	7	7	7	ND
FEB	7	ND	15	7	12	12	12	12	12	12	7	7	7	12	2	7	3	1	4		1	16			7	7	14	7	.	.	.
MAR	7	7	7	7		12	12	3	4	4		8		4	2	18	11	21	11	1	21	14	12	12	12	11	4	17	7		31
APR	8	8	22	12		5	17	9	6	16	4	16	5	14	7	12		26	7	12			26	7	7	12	8	8	8	8	.
MAY	8	17	4	5	5	2	2	16	13	10	10	16	11	15		5	6	2	2	19	9	24	ND	ND	10	3	3	ND	5	5	2
JUN	2	2	6	2	13	5	4	17	3	10	20	12	11	4	4	13	4	13	16	9	9	5		4	4	16	9	9	8	17	.
JUL	16	9	4	4	5	5		5	2	9	9	16	4	4	4	4	16	6	6	6	2	2	11	1	21			5	6	5	6
AUG	13	2	9	1	ND	4	6	6	9	1	10	10	10	4	4	24	5		28		17		22	15	15	4	6	6	2	11	3
SEP	3	ND	ND			ND	8		15		8	8	8	4	4	4	13	5	16	11	11	1	6	18	18		11	ND	29	3	.
OCT	16	6	17	5	2	11	11	1	3	1	16	6	18	19	29	9	2	19	1	1	5	2	11	13	6	ND	29	11	4	ND	11
NOV	1	1	4		6	1	1	1	14	2	2	30	5	6		15	14	14	7	7	7	2	ND	6	2	2	29	ND	10	20	.
DEC	5	4	1	1	5	6	6		1	1	1	16	11	1	1	1	15	12	4	4	1	10	3	4	6	18	14	14	2	2	7

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1979 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	18		7	7	21				7	7	7	14	7	7		11	11	3	4	20			11	1	5	20	9	ND	7	7	7
FEB	7		28	20	27	20	22	7	15	7	7	7	15	14	7	12	15	15	15		14	14	14	7	15	10	20	8	.	.	.
MAR	8		3	3	1		4	5	2	19	27		5	12	11	3	10	ND	2	2		14	2		14	7	7	3		8	2
APR	2	2	2	5		11	3	3	9	8	8	8	10	5		7	8			6	2	7	7	14		14	7	2	2	2	.
MAY	8	8	7	12	15	22	8	8	8	17	6	6	6	2	12	10	16	4	6			7	12	9	8	3	4	4	6	2	2
JUN	6	6	1	4	4	13	5	6	6	28	28	17	1	13	5	8	8	9	4	16	17	2	2	9	21	9	9	6	25	17	.
JUL	10		29	12	2	ND	1	1		15	4	4	5	5	2	2	19	6	ND	13		4	5	2	2	9	9	9	5		9
AUG	1	5	5	5	9	1	6	2	5	2	9	5	12	12	11	1	1	1		2	21	2	14	5	2	2	9	1	4		10
SEP		15	3	10	20	2	7	15	28	2	6	2	2	23	11	1	6	2	6	2		17	6	6	11	1				6	.
OCT	17	8	29	1	16	6	13	5	19	1	16	2	11			20	9	15	22	22	20	15	11		15	3	4	4	6	20	2
NOV	31			14	7	7	30			ND	6	6	19	19	11	1	3	4	16	18		3	3	10	10	5	26	7	18		.
DEC	11	1	1	1	4	1	6	11	27	5	17	10	20	27	14	23	15	3	3	3	3	4		15	3	3	11	11	19		15

LISTING OF SYNOPTIC TYPES BY MONTH FOR 1980 WESTERN U.S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	12			7	14		14	14	30	22	7	15	3	3	3	3	9	2	18	19	6	6	1	5	14	7	7	7	7	18	12
FEB	11	3	3	4	23	3	2	19	21	6	2		7	7	7	7	15	22	22	22	8			12	11		15	12	12	.	.
MAR	7		14	30	30			19	16	12	8	4	15	15	10	20	3	4	4	ND	8	17	9	2	8	3	4	4	4	ND	2
APR	ND	2		23	15	10	16	3	15	8	2	18	19	15	4	1	3	1	3	1	13	29	9	4		12	11	3	4	4	.
MAY	20	ND	6		14	2	2	17	22	8	8		17	9	9	9	4	9	1	1	ND	10	10	5	5		10	16	13	5	17
JUN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	.
JUL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	.
OCT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NOV	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	.
DEC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 5. Summary of Synoptic Type Frequencies

FREQUENCY OF TYPES FOR 1899 - 1980 WESTERN U.S.

TOT	ND*	NT*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN																																	
2511	19	216	236	122	237	66	46	85	253	42	8	122	102	112	18	152	174	35	14	71	40	60	20	83	29	8	5	43	39	15	7	26	6
\	1	9	9	5	9	3	2	3	10	2	0	5	4	4	1	6	7	1	1	3	2	2	1	3	1	0	0	2	2	1	0	1	0
FEB																																	
2288	10	193	151	127	186	87	46	67	305	64	14	100	78	156	23	137	133	38	15	54	50	68	20	54	25	5	2	22	23	12	5	11	7
\	0	8	7	6	8	4	2	3	13	3	1	4	3	7	1	6	6	2	1	2	2	3	1	2	1	0	0	1	1	1	0	0	0
MAR																																	
2511	12	228	116	202	207	137	93	41	230	184	36	145	80	180	35	127	77	49	47	50	24	60	11	55	10	4	8	11	11	19	5	9	8
\	0	9	5	8	8	5	4	2	9	7	1	6	3	7	1	5	3	2	2	2	1	2	0	2	0	0	0	0	0	1	0	0	0
APR																																	
2430	11	225	99	223	170	150	138	47	112	261	80	131	104	159	51	91	31	63	60	38	23	40	6	22	10	25	12	14	3	11	9	7	20
\	0	9	4	9	7	6	6	2	5	11	3	5	4	7	2	4	1	3	2	2	1	2	0	1	0	1	0	1	0	0	0	0	1
MAY																																	
2511	13	176	71	269	116	166	241	87	69	349	129	138	56	115	86	53	11	70	108	19	30	24	10	12	14	29	25	3	0	8	8	5	1
\	1	7	3	11	5	7	10	3	3	14	5	5	2	5	3	2	0	3	4	1	1	1	0	0	1	1	1	0	0	0	0	0	0
JUN																																	
2430	34	119	88	228	74	265	273	121	26	205	246	127	35	38	165	16	6	83	87	3	22	12	26	7	18	32	43	3	0	11	13	3	1
\	1	5	4	9	3	11	11	5	1	8	10	5	1	2	7	1	0	3	4	0	1	0	1	0	1	1	2	0	0	0	1	0	0
JUL																																	
2511	37	125	145	232	55	242	268	226	10	60	359	66	35	15	239	14	1	60	62	0	38	4	89	2	15	47	45	0	0	9	10	0	1
\	1	5	6	9	2	10	11	9	0	2	14	3	1	1	10	1	0	2	2	0	2	0	4	0	1	2	2	0	0	0	0	0	0
AUG																																	
2511	35	162	193	284	54	224	234	191	25	54	295	53	75	30	171	26	2	42	91	6	44	3	86	2	22	42	38	0	0	13	11	3	0
\	1	6	8	11	2	9	9	8	1	2	12	2	3	1	7	1	0	2	4	0	2	0	3	0	1	2	2	0	0	1	0	0	0
SEP																																	
2430	35	183	209	285	108	115	137	235	73	43	78	67	163	62	96	52	13	54	57	52	89	9	68	12	39	40	16	0	2	15	16	3	4
\	1	8	9	12	4	5	6	10	3	2	3	3	7	3	4	2	1	2	2	2	4	0	3	0	2	2	1	0	0	1	1	0	0
OCT																																	
2511	49	153	348	141	292	120	105	162	80	35	38	77	202	61	52	49	48	68	35	89	93	31	33	14	39	18	9	12	11	15	25	1	6
\	2	6	14	6	12	5	4	6	3	1	2	3	8	2	2	2	2	3	1	4	4	1	1	1	2	1	0	0	0	1	1	0	0
NOV																																	
2430	38	176	339	95	283	101	64	121	127	44	6	112	167	76	25	77	124	61	6	95	49	44	15	34	41	12	5	23	32	11	12	5	10
\	2	7	14	4	12	4	3	5	5	2	0	5	7	3	1	3	5	3	0	4	2	2	1	1	2	0	0	1	1	0	0	0	0
DEC																																	
2511	66	185	335	90	316	86	43	81	157	36	7	113	134	98	22	113	151	38	10	77	47	73	14	59	28	7	2	35	42	14	9	15	8
\	3	7	13	4	13	3	2	3	6	1	0	5	5	4	1	5	6	2	0	3	2	3	1	2	1	0	0	1	2	1	0	1	0
	359	2330	2098	1688	1467	1296	1231	983	771	592	549	398	290	210	163	130	72																
	2141	2298	1759	1464	1377	1251	1102	907	661	554	428	356	269	166	153	88																	

* ND=NO DATA NT=NO TYPE

\ = %

Table 6

Summary of Seasonal Dominance

Type	Seasonal Dominance
1	Fall-Winter (O N D)
2	Spring-Summer (A M J J A S)
3	Fall-Winter (O N D)
4	Summer (J J A)
5	Summer (M J J A)
6	Summer (J A S)
7	Winter (D J F M)
8	Spring (M A M J)
9	Summer (J J A)
10	Even (slight Spring (M A))
11	Fall (S O N D)
12	Spring (F M A)
13	Summer (J J A)
14	Winter (D J F M)
15	Winter (N D J F)
16	Even (slight Spring (M J))
17	Summer (M J J A)
18	Fall-Winter (O N D J)
19	Fall (S O)
20	Winter (D J F M)
21	Summer (J A S)
22	Winter (D J F M)
23	Fall (S O N)
24	Summer (J J A S)
25	Summer (M J J A)
26	Winter (N D J F)
27	Winter (N D J F)
28	Even
29	Fall (S O)
30	Winter (D J)
31	Fall-Winter-Spring (O N D J F M)

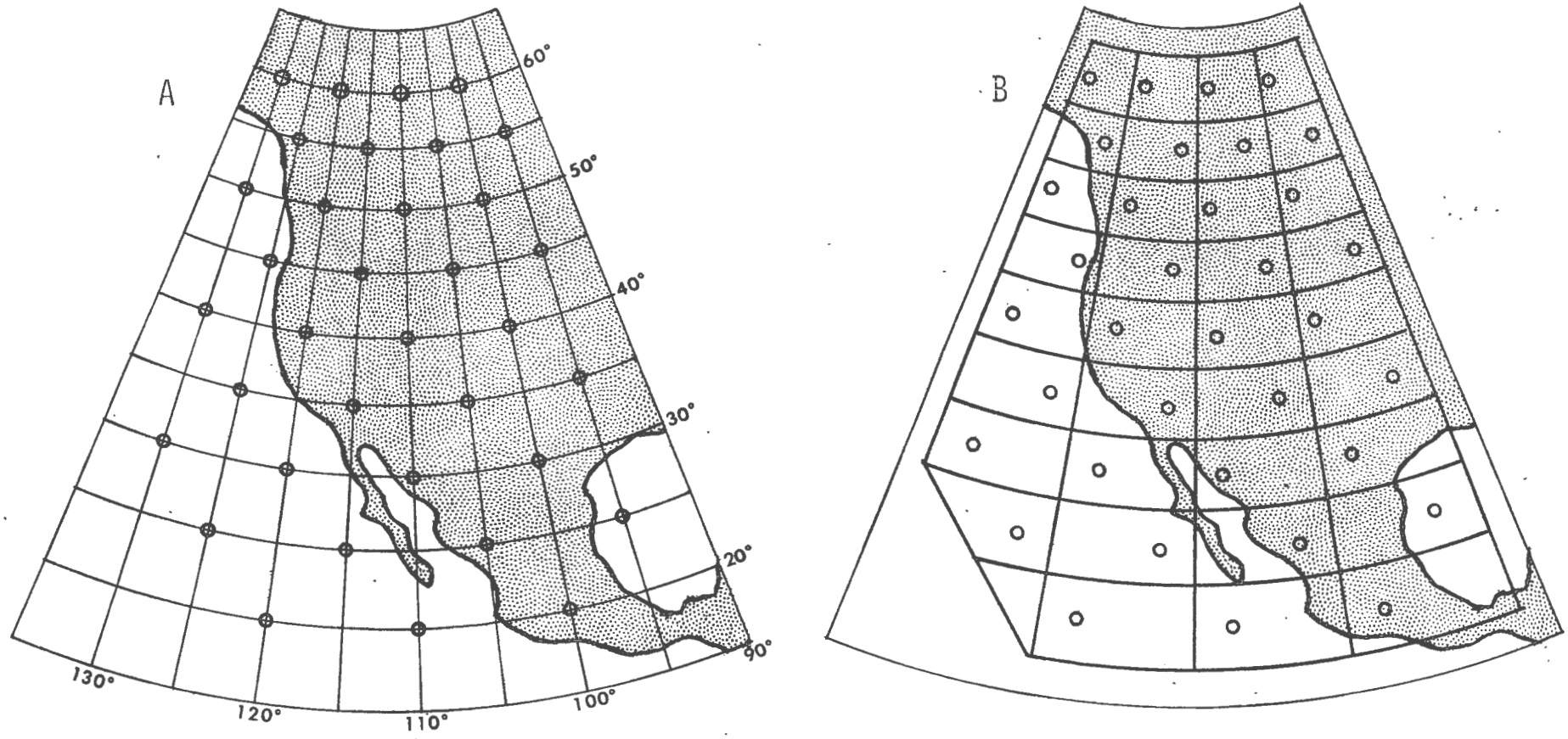
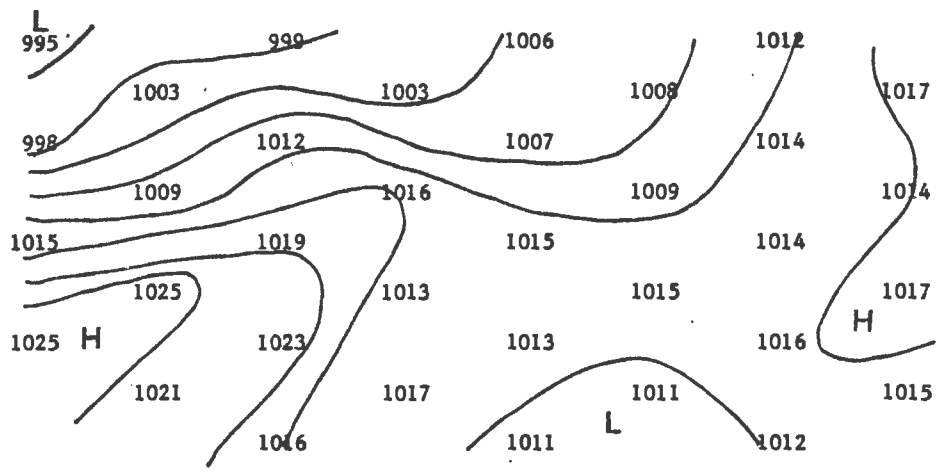


Figure 1. A: sea level pressure grid points used in the synoptic type classification.
B: location of the nine latitudinal and four meridional zones used in the typing procedure.

10 MAR 1971 (KEY DAY - TYPE 3)

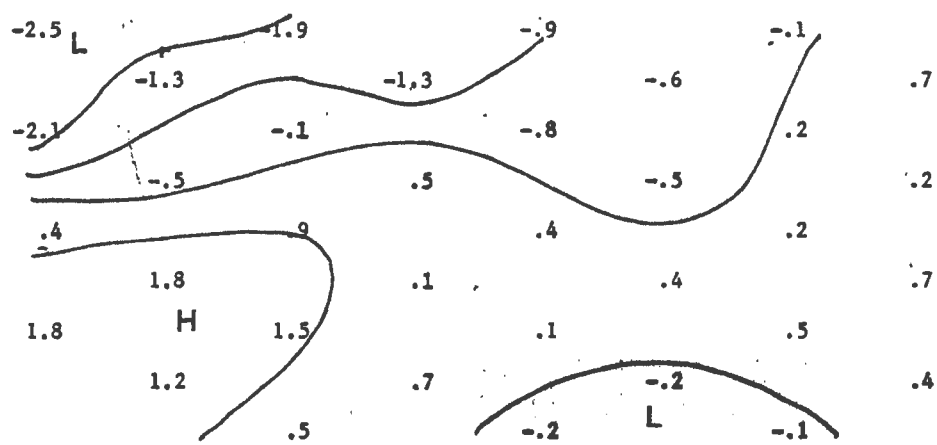
PRESSURE VALUES



MEAN = 1012.4 STD.DEV. = 7.0

10 MAR 1971 (KEY DAY - TYPE 3)

NORMALIZED PRESSURE VALUES



MEAN = 0 STD. DEV. = 1.0

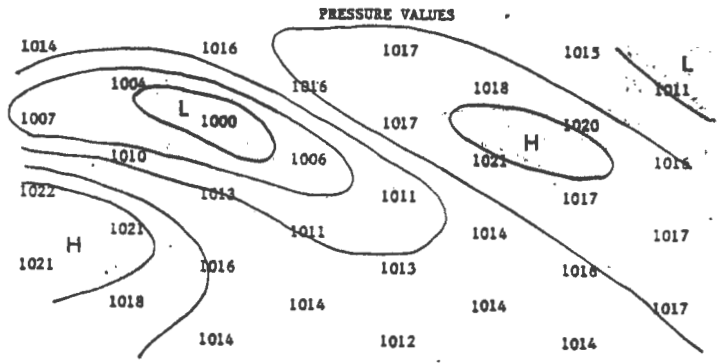
Figure 2: Key Day for Type 3 - pressure values and normalized pressure values. Illustrated in the following figures (3-5) are the pressure patterns of 3 days which have been compared with the Type 3 key day (above). For each comparison, original pressure values, normalized pressure values, and the scores (sum of squares of differences) are shown.

The table of scores shows (1) the difference squared, between each grid point of the day under consideration and the key day, (2) the sum of squares overall, and for each zone, (3) the threshold value for each zone (1.8N).

The overall threshold is equal to N (N = number of grid points), which is nearly always 35. For a day to be classified with a key day it must have an overall score less than N (35) and all zone scores must be less than the respective thresholds.

10 JUL 1932

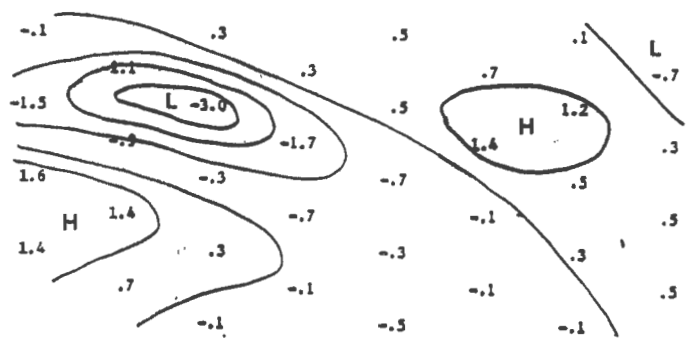
PRESSURE VALUES



MEAN = 1014.4 STD.DEV.= 4.8

10 JUL 1932

NORMALIZED PRESSURE VALUES



MEAN = 0 STD.DEV.= 1.0

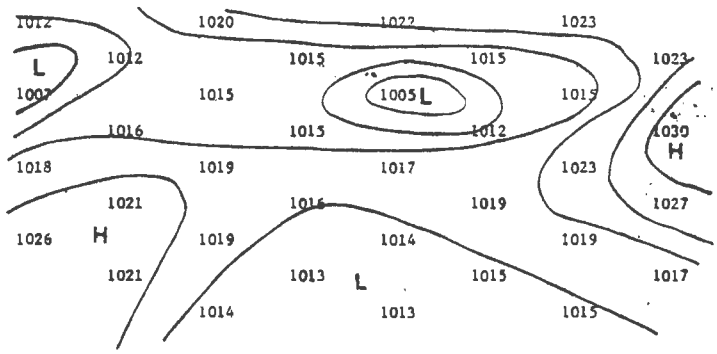
••••••••DIFFERENCES^2•••••••				ROW SCORE	(THRESHOLD)
5.8	5.1	2.1	.0	13.1	(7.2)
.6	2.8	1.9	1.8	7.2	(7.2)
.3	8.4	1.7	.9	11.3	(7.2)
.2	5.0	3.5	.0	8.6	(7.2)
1.5	1.5	1.1	.1	4.2	(7.2)
.2	.6	.2	.0	1.0	(7.2)
.2	1.4	.1	.0	1.7	(7.2)
.2	.5	.0	.0	.8	(7.2)
	.3	.1	.0	.4	(5.4)
COLUMN SCORE	9.3	25.4	10.7	2.9	
(THRESHOLD)	(14.4)	(16.2)	(16.2)	(16.2)	

TOTAL SCORE= 48.4

Figure 3: 10 July 1932 (cf Figure 2). This day cannot be classified with Type 3 as it failed the overall score test, that is, its overall score is 48.4 which is (obviously) greater than the threshold value of 35.

25 OCT 1933

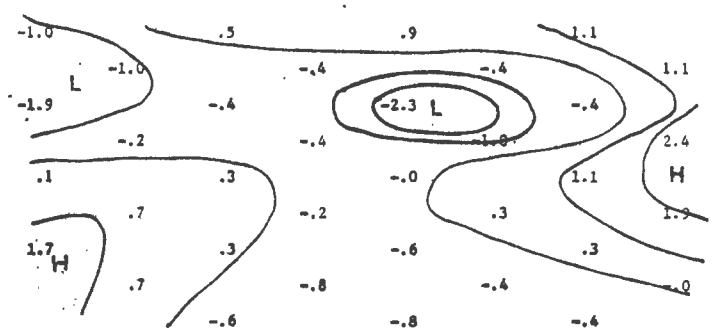
PRESSURE VALUES



MEAN = 1017.2 STD.DEV.= 5.3

25 OCT 1933

NORMALIZED PRESSURE VALUES



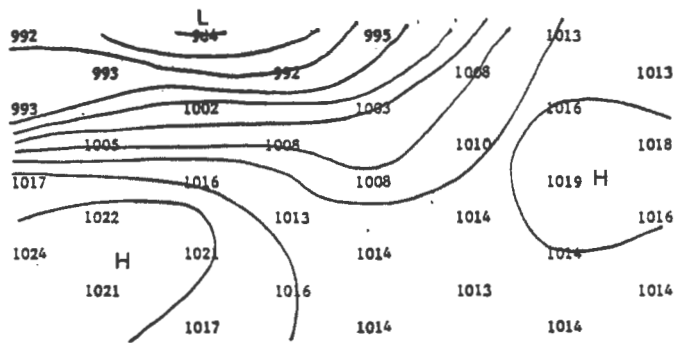
MEAN = 0 STD.DEV.= 1.0

	.....DIFFERENCES^2.....				ROW SCORE	(THRESHOLD)
	2.2	6.0	3.3	1.3	12.9	(7.2)
	.1	.8	.0	.2	1.2	(7.2)
	.0	.1	2.4	.4	3.0	(7.2)
	.1	.9	.3	4.9	6.1	(7.2)
	.0	.4	.2	.8	1.3	(7.2)
	1.2	.1	.0	1.5	2.7	(7.2)
	.0	1.4	.5	.0	1.9	(7.2)
	.3	2.1	.0	.2	2.6	(7.2)
		1.3	.4	.1	1.8	(5.4)
COLUMN SCORE	5.2	12.3	6.7	9.3		
(THRESHOLD)	(14.4)	(16.2)	(16.2)	(16.2)		
TOTAL SCORE=	33.5					

Figure 4: 25 October 1933 (cf Figure 2). This day passed the overall score test with a score of 33.5, but failed 1 zone test (the first row), therefore, cannot be classified with Type 3.

1 NOV 1934

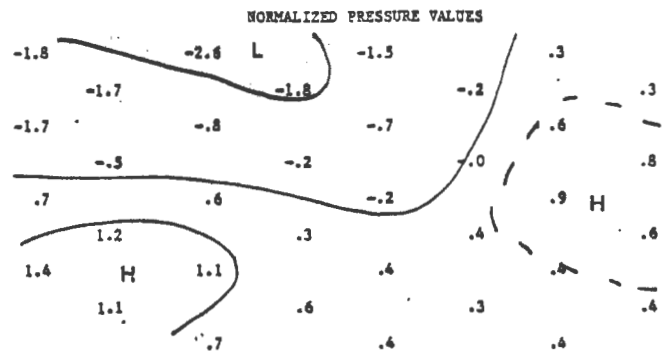
PRESSURE VALUES



MEAN = 1010.1 STD.DEV. = 10.0

1 NOV 1934

NORMALIZED PRESSURE VALUES



MEAN = 0 STC.DEV. = 1.0

	.....DIFFERENCES^2.....				NOW SCORE	(THRESHOLD)
	.5	.5	.4	.1	1.4	(7.2)
	.1	.2	.2	.1	.7	(7.2)
	.1	.6	.0	.1	.8	(7.2)
	.0	.5	.2	.3	1.1	(7.2)
	.1	.1	.3	.5	1.0	(7.2)
	.4	.0	.0	.0	.4	(7.2)
	.2	.2	.1	.0	.4	(7.2)
	.0	.0	.2	.0	.3	(7.2)
		.0	.4	.2	.6	(5.4)
COLUMN SCORE	1.4	2.7	1.4	1.2		
(THRESHOLD)	(14.4)	(16.2)	(16.2)	(16.2)		
TOTAL SCORE=	6.7					

Figure 5: 1 November 1934 (cf Figure 2). This day has an overall score of 6.7 and all zone scores are less than their respective thresholds; therefore, it is classified as Type 3.

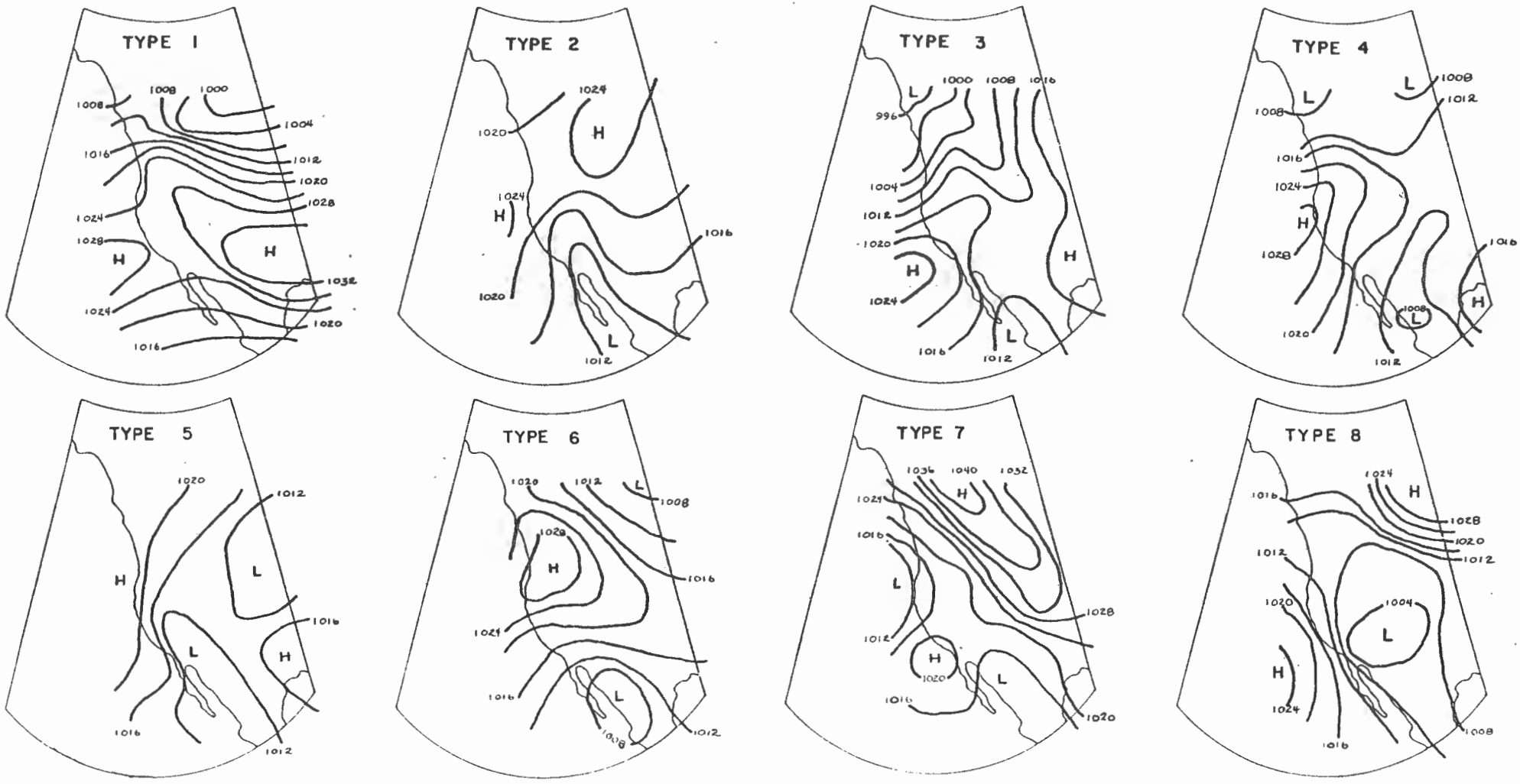


Figure 6. Synoptic types 1 to 8.

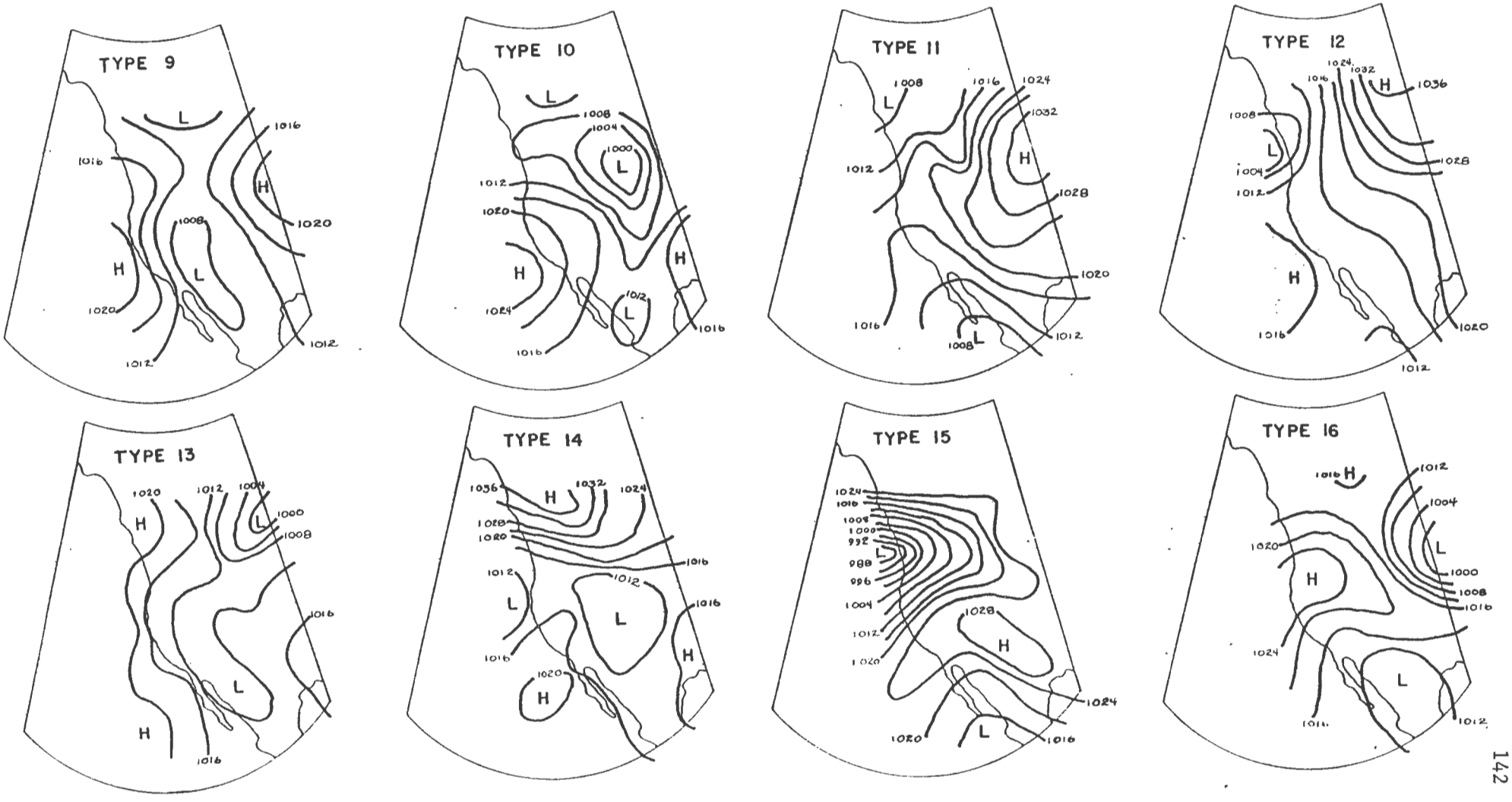


Figure 7. Synoptic types 9 to 16.

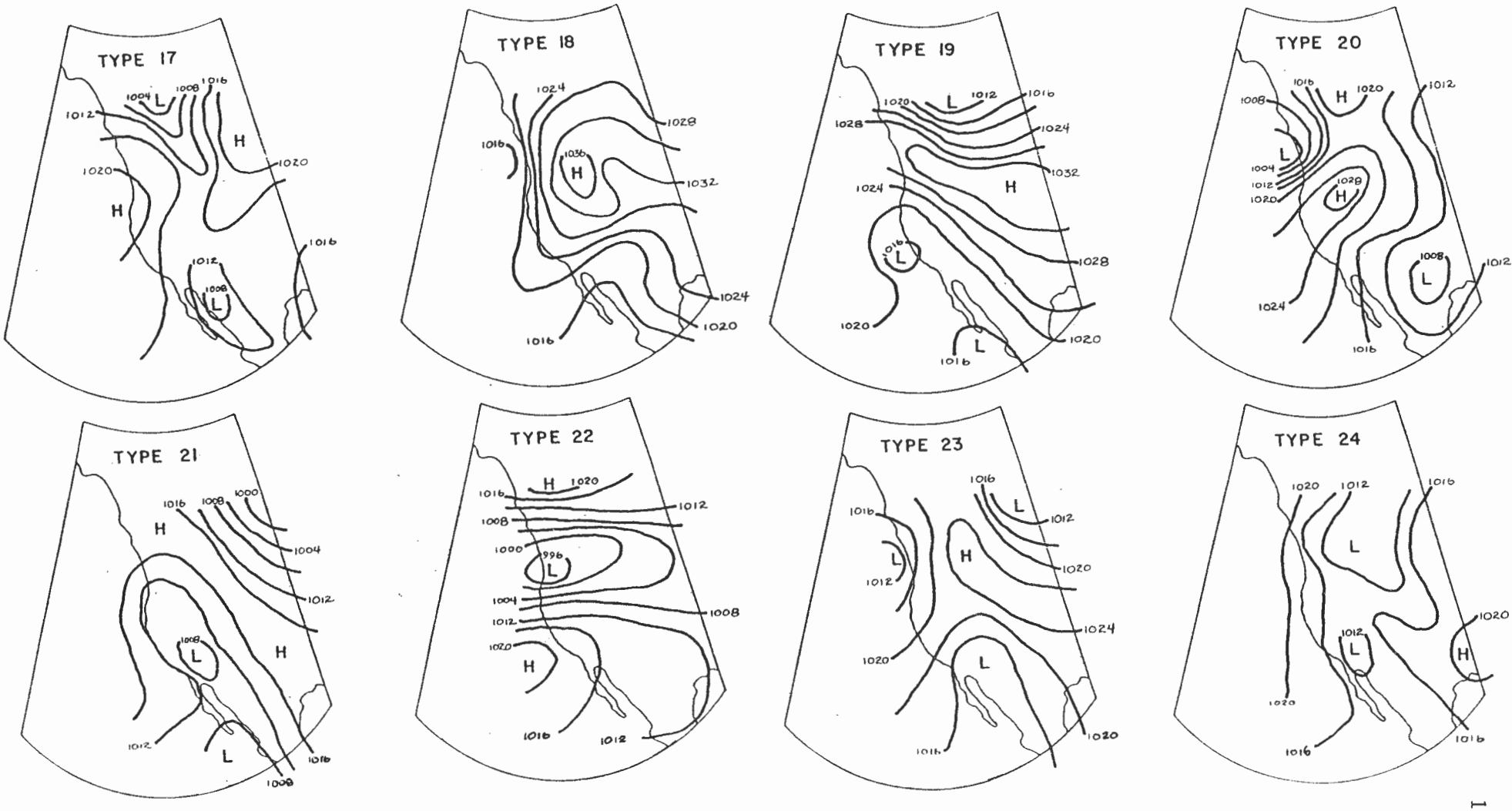


Figure 8. Synoptic types 17 to 24.

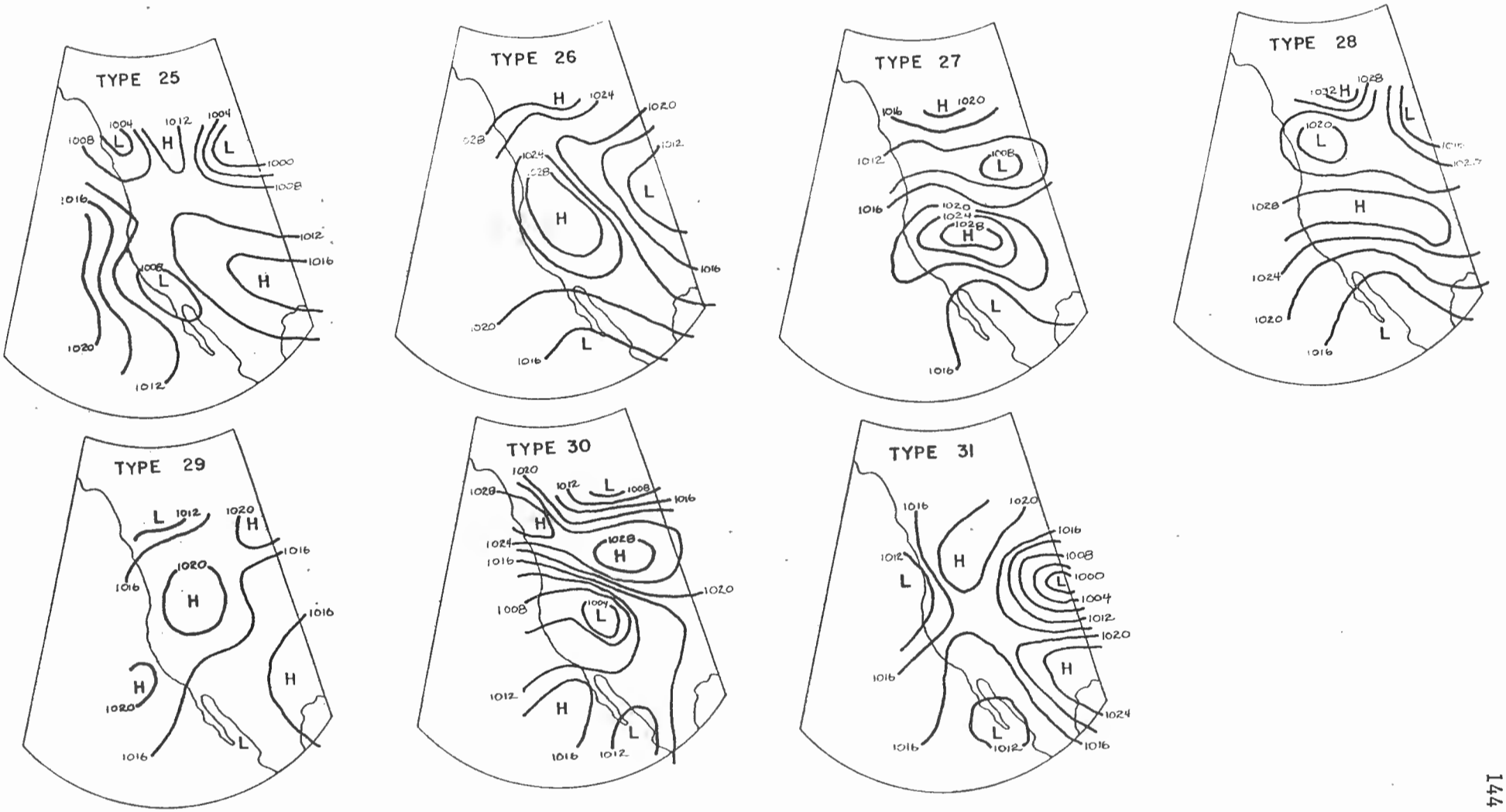


Figure 9. Synoptic types 25 to 31.

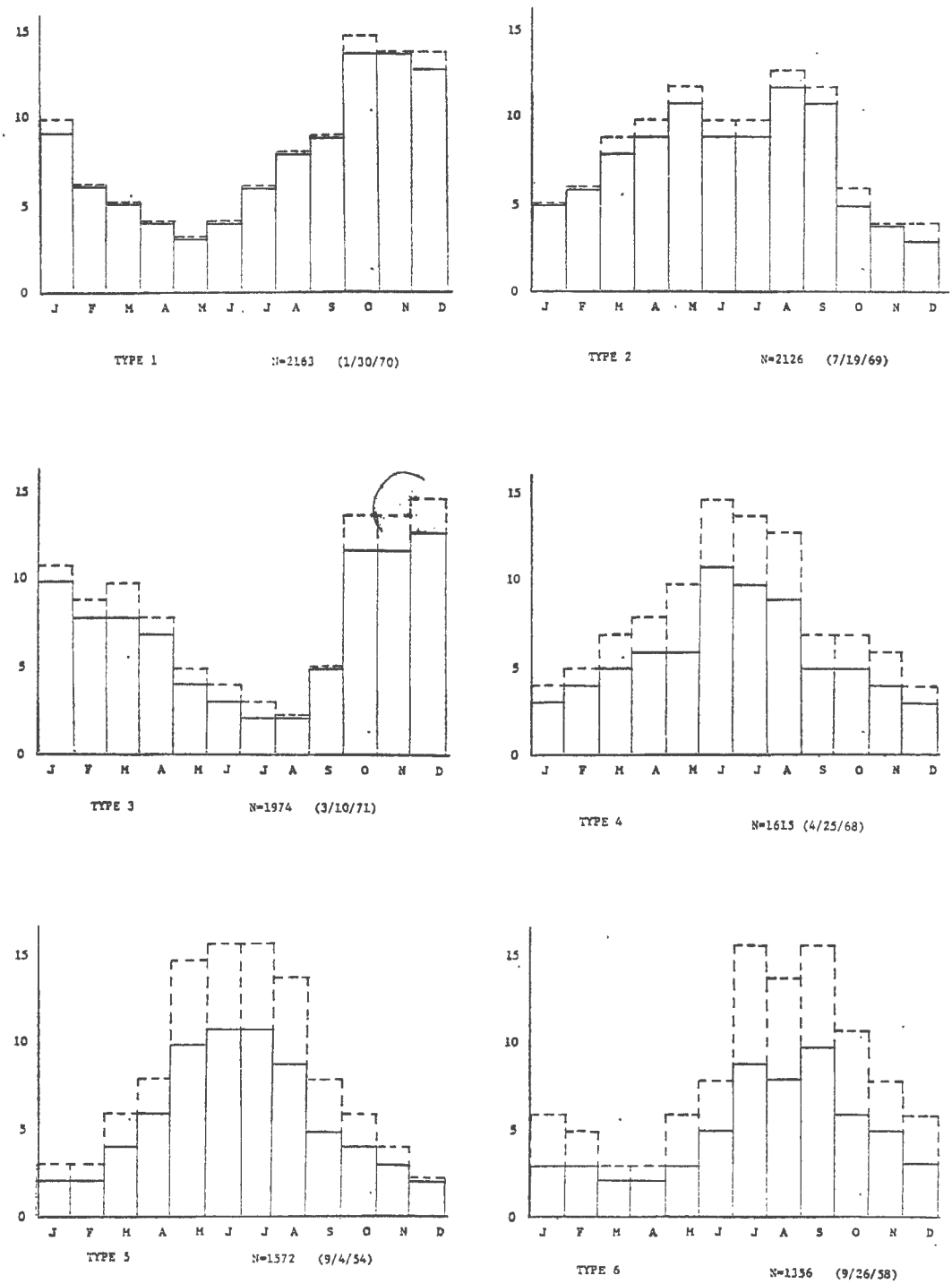


Figure 10 Monthly frequency of synoptic types 1 to 6. Solid line = percentage of days per month on which each synoptic type occurs (based on the monthly type frequency divided by the total number of days classified, 1899-1974). Dashed line = monthly percentage frequency of each type (based on the monthly type frequency divided by the total number of occurrences of that type (N), 1899-1974). Date beneath histograms refer to key days listed in Table 2.

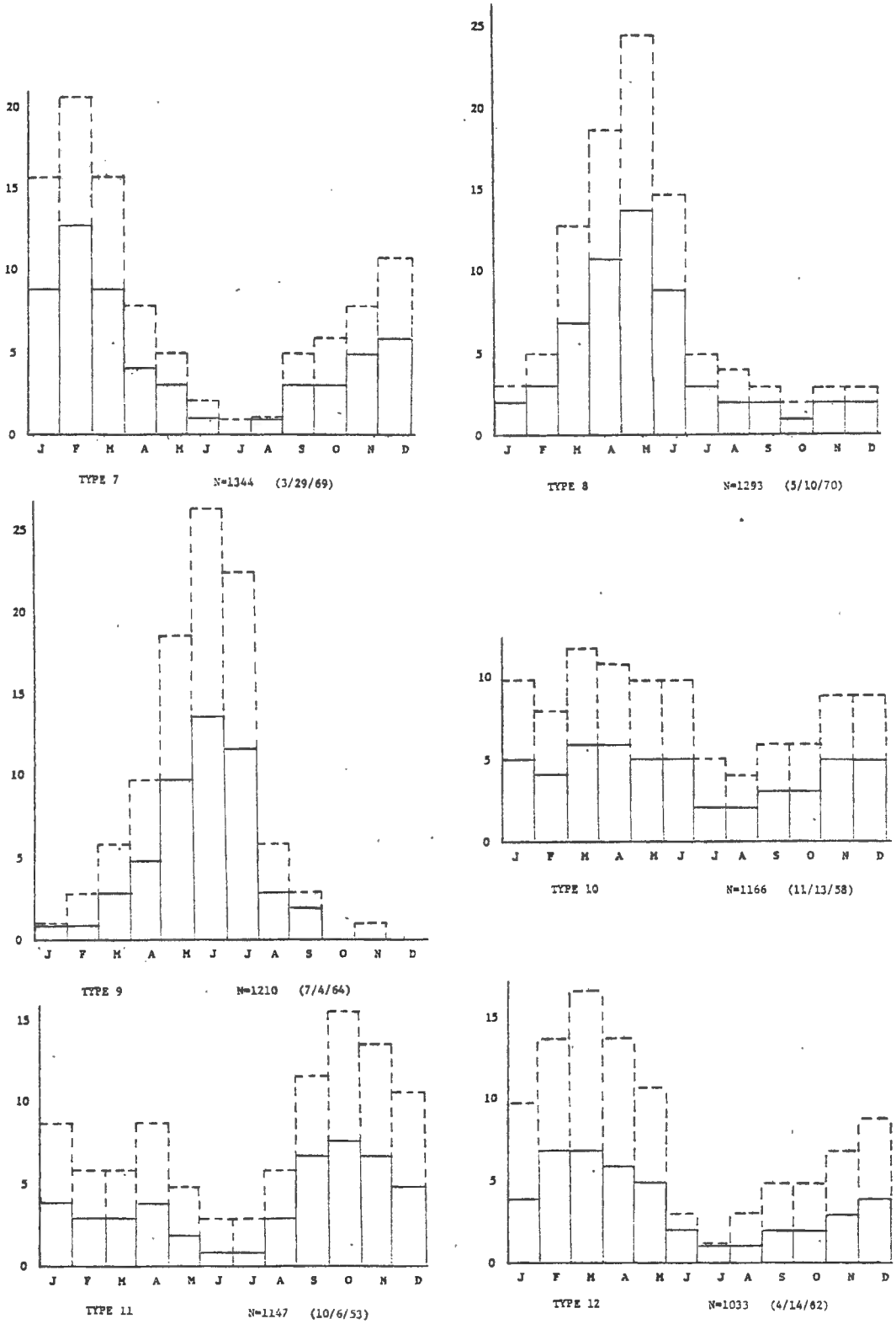


Figure 11 Monthly frequencies of synoptic types 7 to 12 (see caption to figure 10).

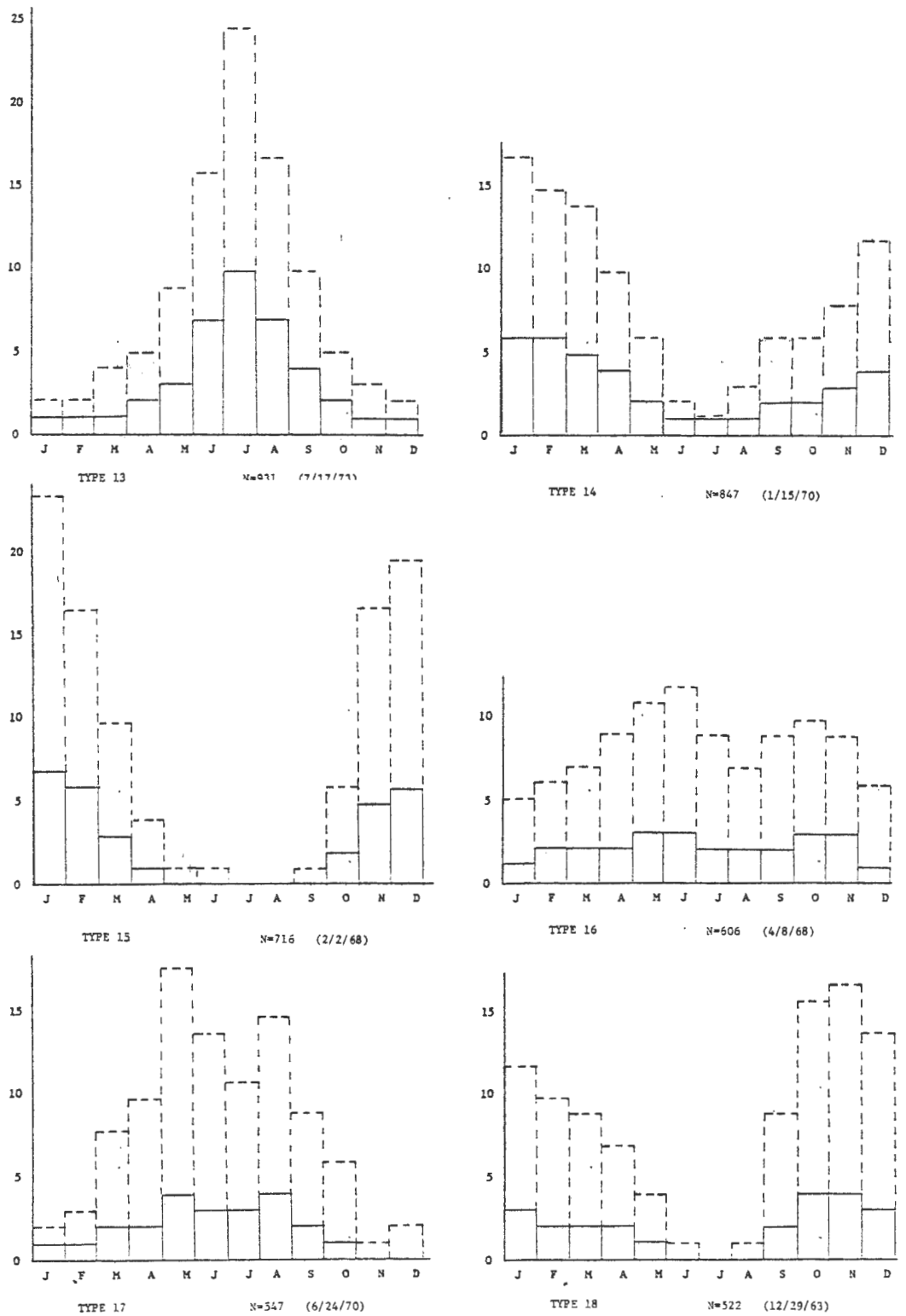


Figure 12 Monthly frequencies of synoptic types 13 to 18 (see caption to figure 10).

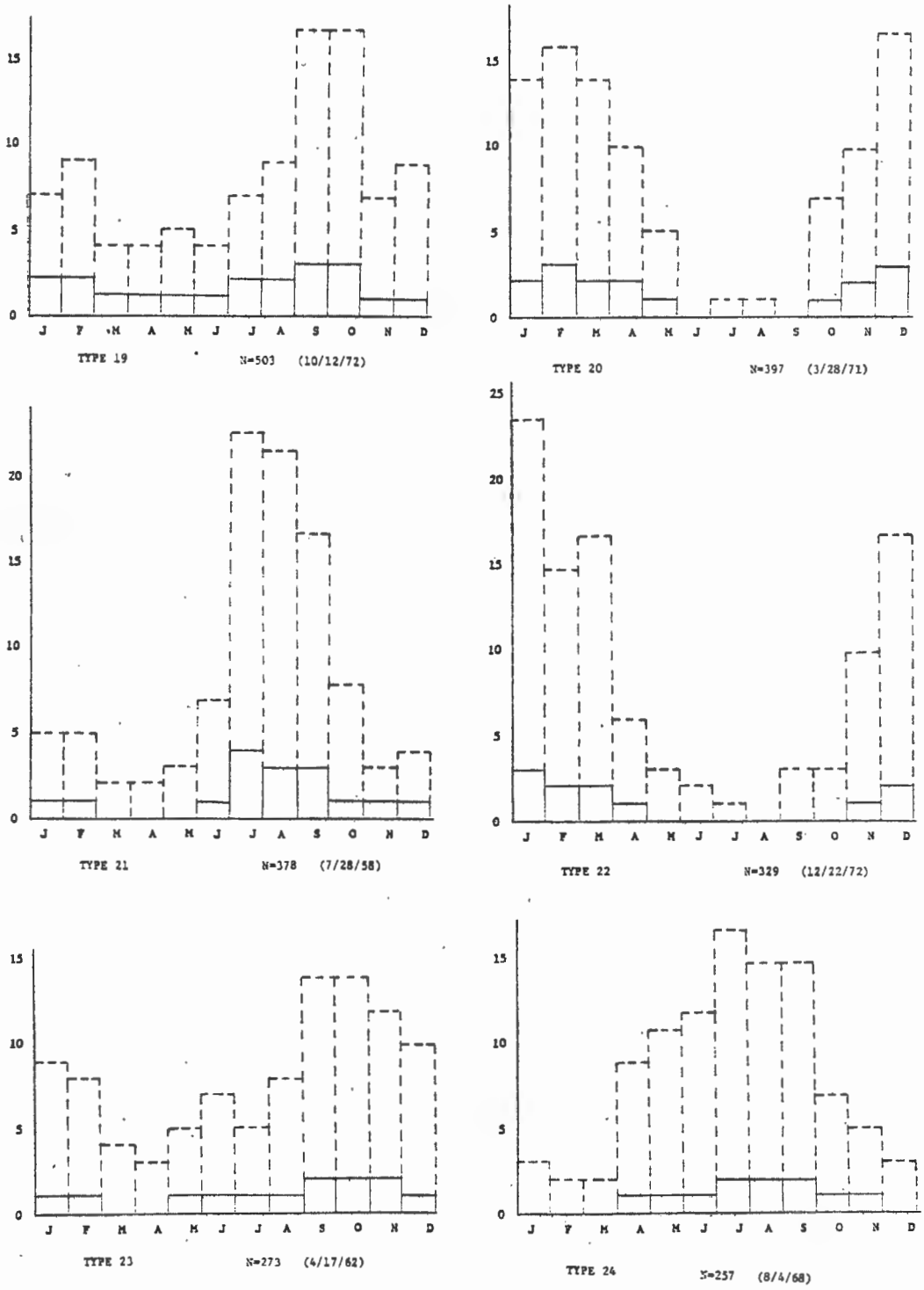


Figure 13 Monthly frequencies of synoptic types 19 to 24 (see caption to figure 10).

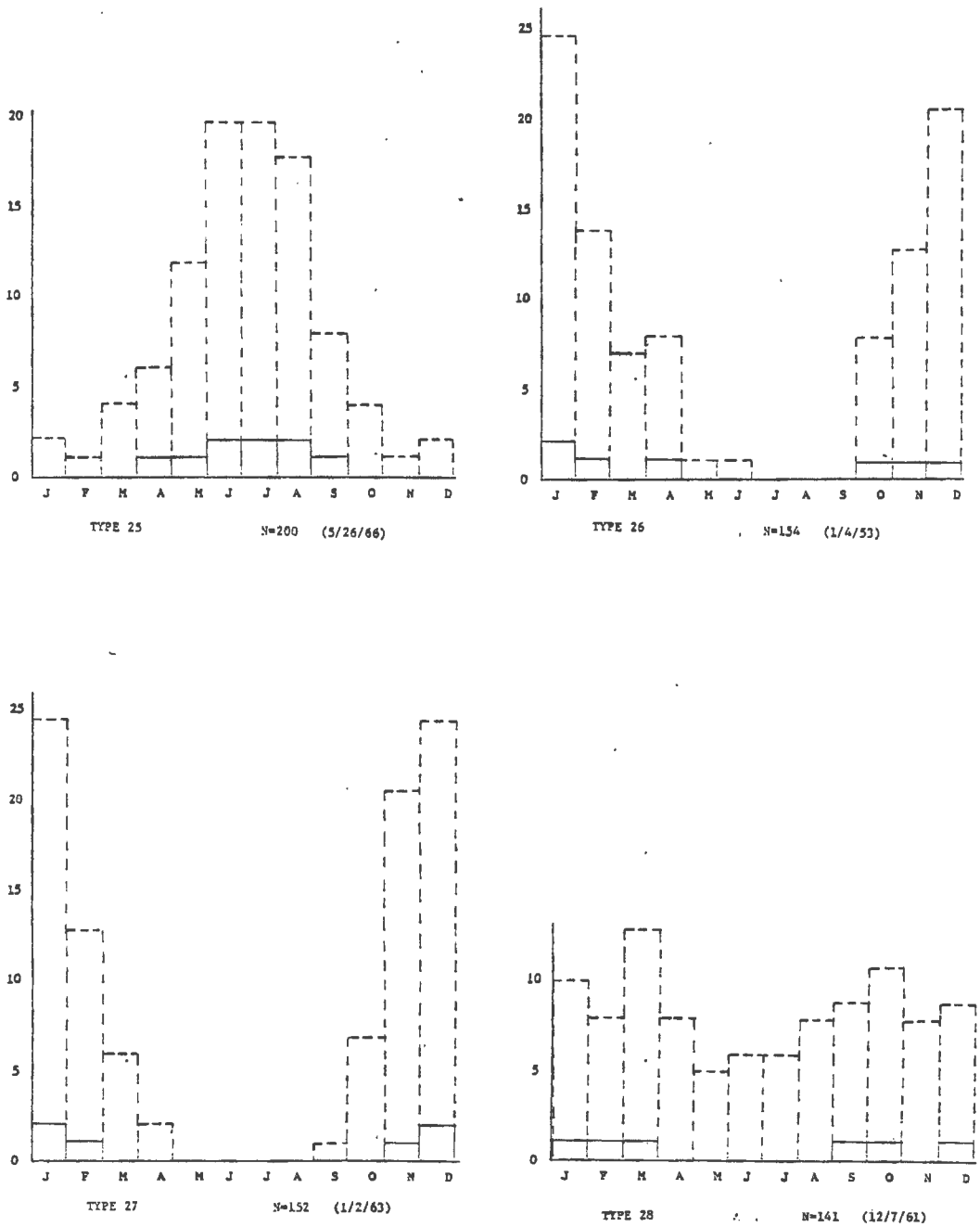


Figure 14 Monthly frequencies of synoptic types 25 to 28 (see caption to figure 10).

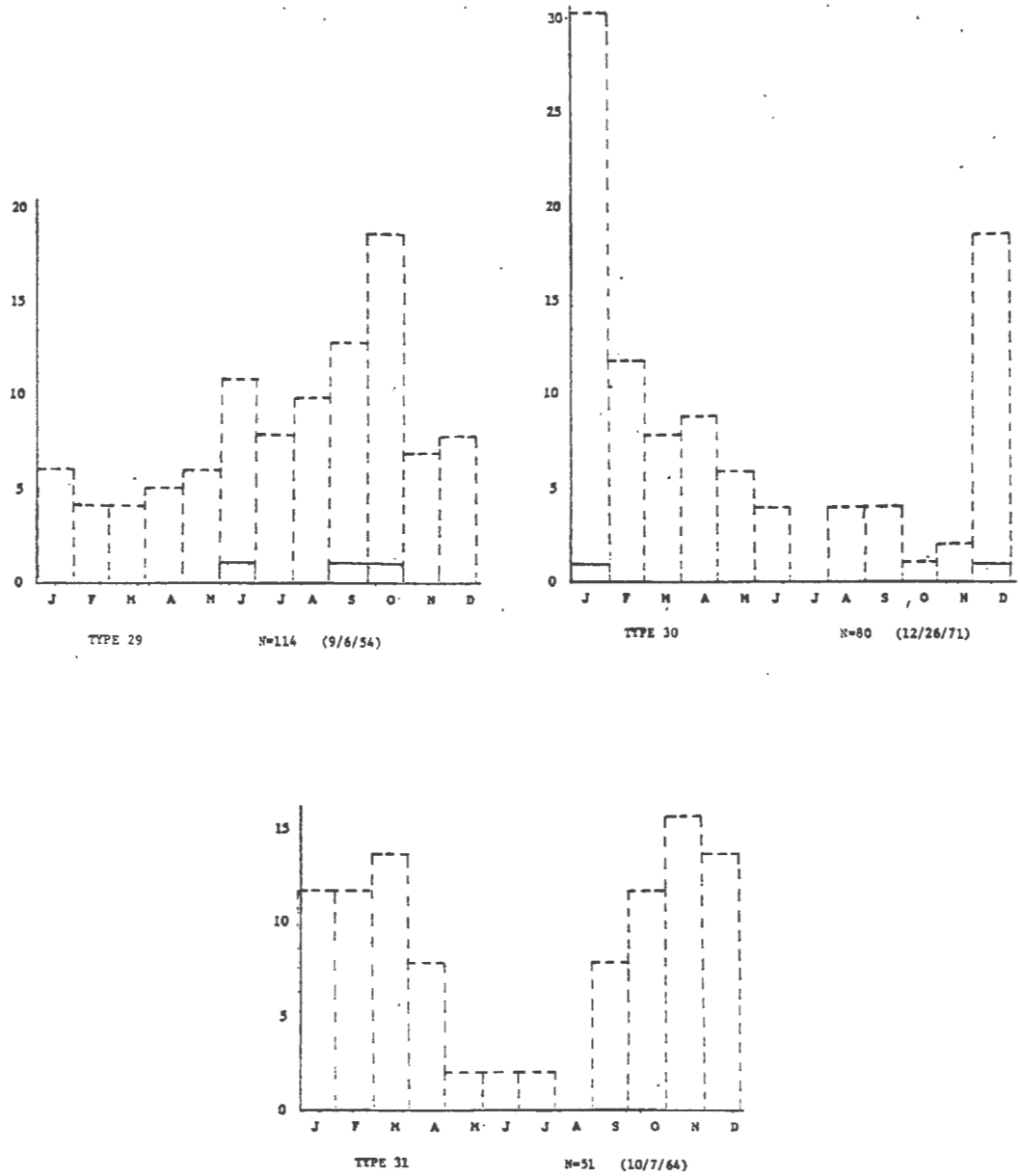


Figure 15 Monthly frequencies of synoptic types 29 to 31 (see caption to figure 10).

CHAPTER 3

NORTH PACIFIC SEA SURFACE TEMPERATURES ASSOCIATED WITH TEMPERATURE ANOMALIES OVER THE UNITED STATES

George A. Kiladis

NORTH PACIFIC SEA SURFACE TEMPERATURES ASSOCIATED WITH TEMPERATURE ANOMALIES OVER THE UNITED STATES

G. Kiladis

Investigations during the 1960's and 70's by Namias showed that there is an apparent correlation between anomalies in atmospheric circulation over the North Pacific and both concurrent and preceding SST anomalies of the underlying ocean. (Namias, 1965, 1969a,b, 1976, 1978, 1979a) These anomalies are, in turn, associated with anomalous circulation patterns downstream over North America, particularly in connection with the highly variable winters of the past two decades. Similar work has been carried out for the Atlantic-European sector (Bjerknes, 1964; Ratcliffe and Murray, 1979; Ratcliffe, 1973; Oerlemans, 1975; Perry, 1975).

The implications of an identifiable ocean-atmosphere forcing in the mid-latitudes are profound. Since SST anomalies tend to have strong temporal coherence out to several months (Namias and Born, 1970), it seems plausible that they may modify the circulation on seasonal or longer time scales. Namias has repeatedly stressed the importance of North Pacific SST anomalies in seasonal and monthly forecasting of winter temperature and precipitation over the United States. A wealth of recent empirical studies for the North Pacific by other investigators have produced generally supportive results. An initial investigation by Davis (1976) using year-round empirical orthogonal functions implied that sea level pressure (SLP) and SST show statistically significant simultaneous fields, and that SST can be predicted by previous SLP with some skill, but not vice-versa. A subsequent study by Davis (1978), where the statistics this time were stratified by season, showed that there was some skill in predicting SLP from prior SST's in fall and winter, although the level of predictability was not very high. Broccoli and Harnack (1981) obtained similar results for a longer time period.

The assumption implicit in all of the above cited empirical work is that anomalous SST gradients produce enhanced (or suppressed) atmospheric baroclinity through differential sensible and latent heat fluxes. This alters the long wave circulation both above and downstream of the SST anomaly, through the redistribution of absolute vorticity, to produce "anomalous" weather.

A statistical study by White and Clark (1975) has indeed shown that blocking ridge activity in the North Pacific during fall and winter is related to anomalous sensible heat transfer between the ocean and atmosphere. Another important result obtained by Harnack and Broccoli (1979) shows a statistically significant relationship between the anomalous SST gradient and concurrent anomalous 700 mb flow over the North Pacific. It appears here that the strongest relationship is due to colder than normal water in the central Pacific and warmer than normal water off

the west coast of North America. This tends to be associated with an enhanced baroclinic zone above the area of maximum SST gradient, which produces anomalous southerly 700 mb flow and a blocking ridge over western North America.

The conclusions of Harnack and Broccoli and the previous case studies of Namias cited above form the impetus for the present study.

Background for the Present Study

The winter of 1976-77 marked the beginning of a string of unusual winters which saw vast areas of North America subjected to severe cold of remarkable duration, with accompanying drought over parts of the western region of the continent. Figure 1A (from Harnack, 1980) shows the departure of this winter's (DJF) temperatures from the long-term mean over the United States. The extreme cold centered on the midwest and warmth in the west was caused by a highly amplified upper level circulation pattern (Figure 1C), with a strong blocking ridge over the west and and deep trough downstream over the east. Notice also the very large area of negative heights associated with the long wave trough over the Pacific Ocean.

Namias (1978) pointed out that the SST's in the North Pacific for this winter showed much colder than normal water in the central and western ocean and a warm pool off the west coast of North America (Figure 1B). His hypothesis was that this SST configuration forced the atmosphere, through sensible and latent heat flux (as described in the previous section), to maintain the anomalous circulation pattern for an extended period of time. There was in fact a strong anomalous southerly flow above the zone of maximum SST gradient at about 150° W longitude during this winter, steering storms into Alaska which would have otherwise tracted into North America.

The winter of 1977-78 had a similar circulation (Figure 2C) and even more extreme temperature pattern than 1976-77. Again the mid-Pacific trough was very deep, although the wave pattern was not quite as amplified as during the previous winter.

The SST anomalies for 1977-78 show a similar but less extreme pattern as 1976-77 (Figure 2B). The pattern correlation between Figures 1B and 1C is 0.70 (Harnack, 1980).

In 1978-79, however, the amplified ridge over the west did not reappear. Instead, there were positive heights over the Pacific and Canadian Arctic and negative heights over the whole United States (Figure 3C), and below normal temperatures completely engulfing all but three states (Figure 3A). SST's for this winter (Figure 3B) now show a warm water pool south of the Aleutians and cold water off the west coast. Namias (1980) suggests that this warm water pool helped to form the eastern Pacific ridge, which in conjunction with blocking over the Arctic maintained a trough over the United States.

The winter of 1979-80 showed less persistent circulation, but 1980-81 saw the re-emergence of the deep Pacific trough and amplified western ridge. This was one of the warmest and driest winters on record over much of the west, accompanied by several severe cold waves in the southeast. Pacific SST's (not shown) again have the characteristic cold pool in the central ocean and warm pool off the coast.

The striking thing about these winters is not only their severity, but that they all occurred within five years (Diaz and Quayle, 1980). The pattern of opposite winter temperature anomaly between east and west has been shown to be the dominant mode of variation (Diaz and Fulbright, 1981), but a subjective examination of previous winters back to 1895-96 (using maps in Diaz, 1980) shows that patterns like 1976-77 (and their counterparts with the opposite anomaly pattern of a cold west and warm east) tend to be usually less extreme, isolated occurrences. This was also shown statistically by Diaz and Quayle (1980).

The question then arises as to whether there has been a recent change in external forcing of the atmosphere. Certainly SST's are a likely candidate here, since their anomalies are so much more persistent than the atmosphere's.

A preliminary look at SST fields and associated 700 mb anomaly patterns (taken from Namias, 1979b) showed that winters like 1976-77 (1962-63, for instance) have similar SST's, while winters with the opposite 700 mb pattern (such as 1948-49 showed an opposite SST pattern, that is, warm water in the central Pacific and cold water off the coast. Upon inspection, spring and fall appeared to show similar ocean-atmosphere interrelationships, but not summer. In addition, there appeared to be a definite tendency, although inconsistent, for the extreme SST pattern to set up during the fall preceding an extreme winter, as was shown by Namias (1978, 1979a) for 1976-77 and 1978-79.

Accordingly, the objectives of this study were to:

1. Examine winters prior to 1976-77 to see if similar SST's prevailed during earlier extreme cases.
2. See if the opposite pattern of a cold west/warm east tended toward an opposite SST pattern.
3. Test the statistical significance of the above SST anomalies.
4. See if months preceding extreme winters show a characteristic SST pattern, and test its statistical significance.
5. Examine extreme springs and falls to see if they are associated with statistically significant SST patterns.

Data

SST data on magnetic tape were provided by NCAR. These data were compiled by the British Meteorological Office and consist of 5° square averages of ship observations from the Pacific, Atlantic, and Indian Oceans. The data run from 1854 to 1967.

Extreme winter seasons were picked out subjectively from maps in Diaz (1980), which shows areally-smoothed departures from mean winter temperatures for each year from 1894-95 to 1978-79 over the contiguous United States.

Extreme falls and springs were identified by inspection of a National Climatic Center data set (kindly provided by Diaz) which gives the seasonal departure from mean temperature areally averaged for each of the forty-eight states from 1895 to 1980.

Methodology

The method used in constructing the SST anomaly maps is the same in each case. First an extreme set of years to be tested is identified. In all cases shown here, another extreme set in the opposite sense was identified to be compared with the first. For instance, the average Pacific SST's for cold west/warm east winters were subtracted from the SST's for warm west/cold east winters. Since it was found that these two sets have basically opposite SST anomaly fields with respect to the long-term mean, this method greatly increases the statistical significance of the anomalies by approximately doubling the sample size. A T-test (WMO, 1966) for the difference between two means was then carried out for each 5° square. The above SST fields were then mapped and contoured by computer.

Results

Figure 4 shows the standard deviation of winter SST's in the North Pacific for the period 1931-60. The area of maximum variability lies in the central ocean, with another local maximum off the coast of Washington and Oregon. SST anomalies in these areas appear to vary inversely over the long-term (Weare et al., 1976) and are shown below to exhibit the best correlations with winter surface temperature conditions over the United States.

Figure 5 shows the difference in SST's between cold east/warm west winters and warm east/cold west winters. The winters used to construct this map are listed in Table 1.

Table 1

Winters which were colder or warmer than the long-term mean over nearly all of the western United States. *indicates years which also had the opposite anomaly over nearly all of the eastern United States. (1894-1967). Year in which January and February occurred is listed.

Cold west

1895	1899	1903	1910	1913*	1915	1917	1929	1932*	1933*	1937*	1942
1944*	1949*	1952*	1955*	1960	1962						

Warm west

1897	1900	1901*	1902*	1904*	1905*	1908	1918*	1934	1935	1937	1938
1940*	1941	1945	1951*	1953*	1954	1958	1959*	1963*	1967		

SST's for winters which are cold in the east and warm in the west average up to 1.2°c colder in the central Pacific and 1.2° warmer off the west coast than winters which are warm in the east and cold in the west. Comparing Figure 5 with Figures 1B and 1C, a close resemblance in the pattern of the anomalies, (especially with Figure 1B for 1976-77) is apparent.

Standard deviations of SST's for cold east/warm west and warm east/cold west winters (not shown) each exhibit lower values than that shown in Figure 4. The SST's are therefore less variable for extreme cases than for the long-term. These standard deviations can be used in a t-test to determine the statistical significance of the SST differences in Figure 5. Derived t-values are shown in Figure 6. Shading indicates that vast areas of the Pacific show significant differences in SST between the two sets of years.

These results imply that Pacific SST's varied in the same way for earlier cases as they did during 1976-77 and 1977-78. Cold pools in the Pacific and warm pools off the coast, or vice-versa, appear as the dominant mode.

Namias (1978) showed that the SST pattern during the 1976-77 winter had begun to set up during the previous fall, and by November was well established. What about falls preceding the winter used in Figure 5? Figure 7 shows the SST difference field for Novembers preceding these cases. Figure 8 shows the same for October. In both these figures it is evident that the central Pacific pool is well developed, although the west coast pool is not as pronounced. Comparing Figures 7 and 8 with Figure 5 we see that a large cold (warm) pool first tends to develop south of the Aleutians in the fall, and is then advected southwestward and enlarged. In the meantime a warm (cold) pool enlarges and intensifies off the coast. Such coherent movement is commonly observed in anomalous pools of Pacific water (Favorite

and McLain, 1973). These movements might be explained by considering the effects of these SST anomalies on the atmospheric circulation.

In the cold central/warm coastal pool case, a zone of enhanced baraoclinic instability would be favored by the strong west-east gradient of SST due west of the Oregon coast. This would set up anomalous southerly upper level flow above this gradient, as discussed by Harnack and Broccoli (1979). The associated increase in the intensity and number of sea level cyclones in this area would produce anomalous southerly flow at the surface over the warm pool, and anomalous northerly flow over the cold pool. This would tend to advect the warm water further northward along the coast, and intensify it, with the cold pool advected to the south and intensified as well. The resulting winter configuration would continued this scenario in a positive feedback fashion.

The warm central/cold coastal pool case would tend to favor a strong Aleutian low in the fall (Namias, 1969b). Since under these conditions anomalous northerly upper level flow would be favored above the SST gradient, a higher than normal frequency of Aleutian storms would tend to be steered towards the California coast during fall and winter. These storms would act to preserve the cold pool off the coast by mixing of the surface layers with deeper water and the decrease of solar radiation to the ocean surface (Namias, 1969a).

These scenarios are two possibilities of how an SST configuration in the fall might set up a positive feedback by which the configuration is intensified and maintained through the following winter. It should be emphasized that such reasoning is still highly speculative at this stage, and will remain so until more empirical work is carried out using the individual case study approach.

One final point to be made about Figures 5, 7, and 8 is to note the contraction and weakening from fall to winter of the large warm pool in the western Pacific. A detailed explanation of how this weakening might come about will not be attempted here, except to note that this represents a large source of anomalous sensible and latent heat given up to the atmosphere above this region, and/or an excess amount of vertical mixing within the upper layers of the ocean due to storminess and cloudiness.

The next experiment looks at the Pacific SST configuration associated with warm versus cold winters in the western United States only. This was done because the eastern United States could be more affected by other factors, such as Atlantic SST's, Arctic circulation, or the subtropical jet (see for e.g. Namias, 1980). Also, removing the restriction of whether the east was cold or warm greatly increases the sample size (see list of winters used in Table 1).

Figure 9 shows the result of this experiment. A cold (warm) pool in the

central ocean and a warm (cold) pool off the coast are associated with warm (cold) western United States winters. This pattern is quite similar to Figure 5 for the cold east/warm west (warm east/cold west) case, although the anomalies are not as large, and the cold pool extends into the western ocean. This pattern is still consistent with previous reasoning for SST forcing of the long waves as in the west/east case.

Figures 10 and 11 for October and November indicate that, as in the west/east case, the SST pattern shows a definite tendency to set up during the fall. Thus there is some usefulness inherent in fall SST's in predicting following winter temperatures in the western United States.

What about seasons other than winter? Fall and spring tend to have similar temperature configurations as winter, although summer does not (Diaz, 1981). It can be verified by looking at maps in Namias (1979b), that as in winter, an anomalous 700 mb trough (ridge) in the east-central Pacific is usually associated with a downstream ridge (trough) and warm (cold) temperatures over the western United States during fall and spring. Tables 2 and 3 list springs and falls which were warm or cold over nearly the whole western United States.

Table 2

Springs which were colder or warmer than the long-term mean over nearly all of the western United States. * indicates years which also had the opposite anomaly over nearly all of the eastern United States. (1894-1967)

Cold west

1909 1912 1913 1917 1920 1922* 1923 1929* 1933 1935 1944 1945*
1948 1953 1955* 1964* 1965

Warm west

1900 1910 1914* 1925 1928* 1934 1936 1939 1940* 1946 1947* 1949
1966

Table 3

Falls which were colder or warmer than the long-term over nearly all of the western United States. * indicates years which also had the opposite anomaly over nearly all of the eastern United States. (1894-1967)

Cold west

1911 1912* 1916 1919 1920 1925 1930 1935 1941* 1946 1957 1961

Warm west

1910 1917* 1933 1934 1937* 1939 1942 1943* 1949 1950 1953 1954
1958 1960 1962 1963 1966* 1967*

Figure 12 shows the difference in average SST's between springs which are warm and springs which are cold in the west. The cold anomaly in the central Pacific in this case is about the same magnitude, although displaced further south than the winter case (Figure 9). The warm pool off the coast is present, but a cold pool now lies south of Alaska.

Figure 13 shows the same for fall. In this case the pattern is quite different, with warm water extending continuously across the whole length of the ocean from 50°N near the Asian coast to North America. A cold pool occupies a large area south of Alaska.

The implications of the differences between these configurations will not be discussed here, since little is known about oceanic forcing of the atmospheric circulation during the transition seasons. However, it suffices to say that these SST patterns are likely related to the long-wave circulation during these times, with the Aleutian low important in the fall and the subtropical jet and associated low-latitude Pacific cyclones (or anticyclones) important in the spring. The SST patterns are of sufficient coherence and magnitude to warrent further investigation.

Conclusions

Winters back to 1895 which were either warmer or colder than normal over almost all of the western United States have distinct Pacific SST patterns associated with them. Colder (warmer) than normal pools in the central Pacific favor a warmer (colder) than normal pool off the west coast and an upper level ridge (trough) over the western United States. When highly amplified, this configuration also favors a trough (ridge) downstream over the eastern United States. Opposite SST anomalies in the central and eastern Pacific appear to the normal mode of variability, and are of the same scale as atmospheric long waves.

The question of whether the ocean forces the atmosphere or vice-versa has not been directly addressed in this study, but evidence that SST anomalies set up during the fall preceding the above anomalous winter cases suggests that some ocean-to-atmosphere control does operate. Much further empirical work using case studies is needed to assess the extent of this link.

Definite SST patterns are associated with anomalous temperatures over the western United States in spring and fall as well. Spring patterns resemble winter somewhat, although results show that the SST's just south of Alaska and in the western ocean are more important during fall. Further work is needed before the significance of the SST patterns on spring and fall circulation modes is determined.

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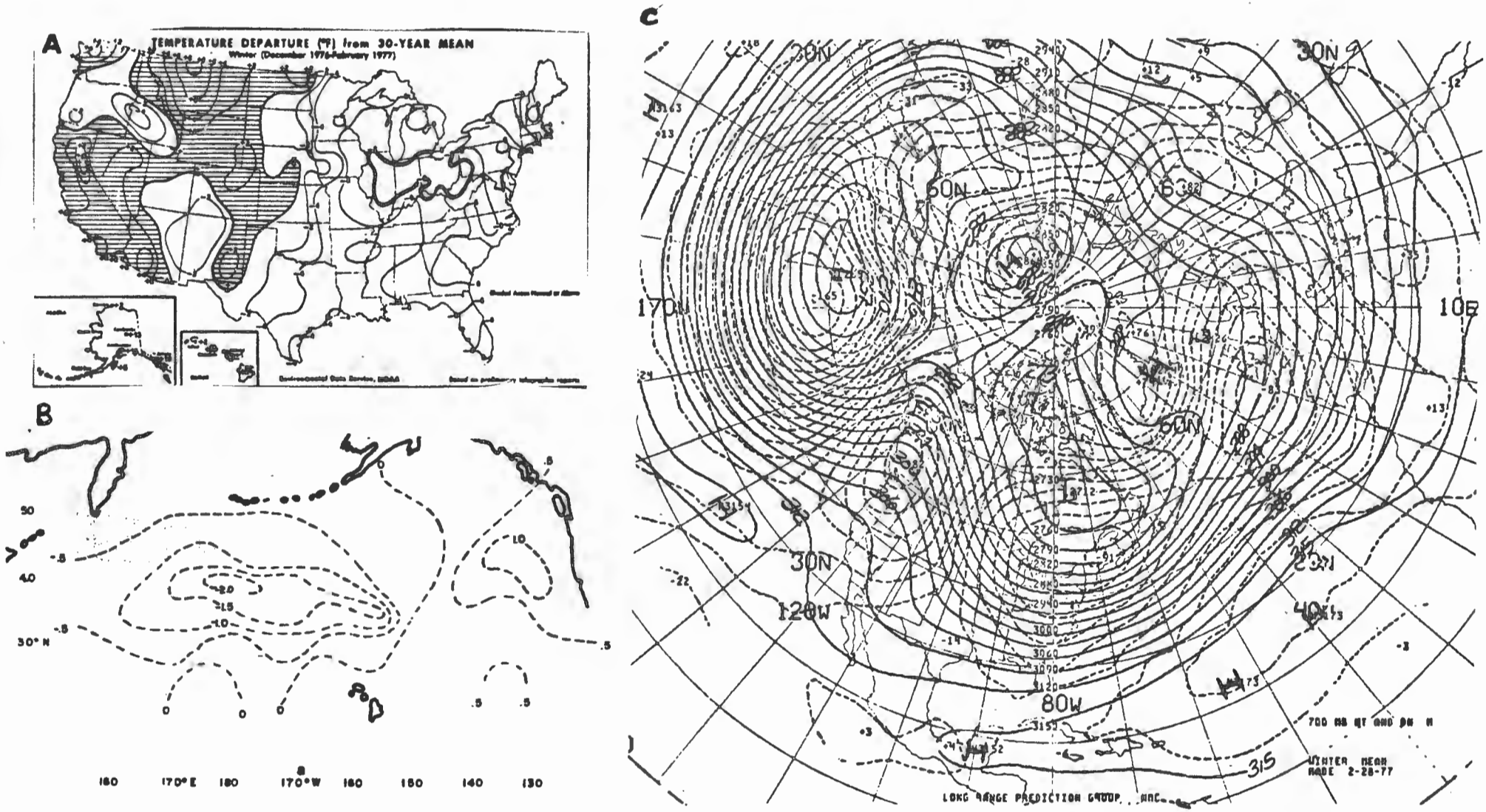

Figure 1 A. Winter temperature departure (°F) from 1941-70 normal in 1976-77 season (D,J,F). (From Weekly Weather & Crop Bulletin, NOAA, Washington, DC)

B. North Pacific sea surface temperature anomaly pattern (°C) for the winter of 1976-77 (D,J,F). (From Harnack,1980)

C. Mean 700mb height (solid) and departure from normal (dashed) fields for the winter of 1976-77 (D,J,F). (From Harnack, 1980)

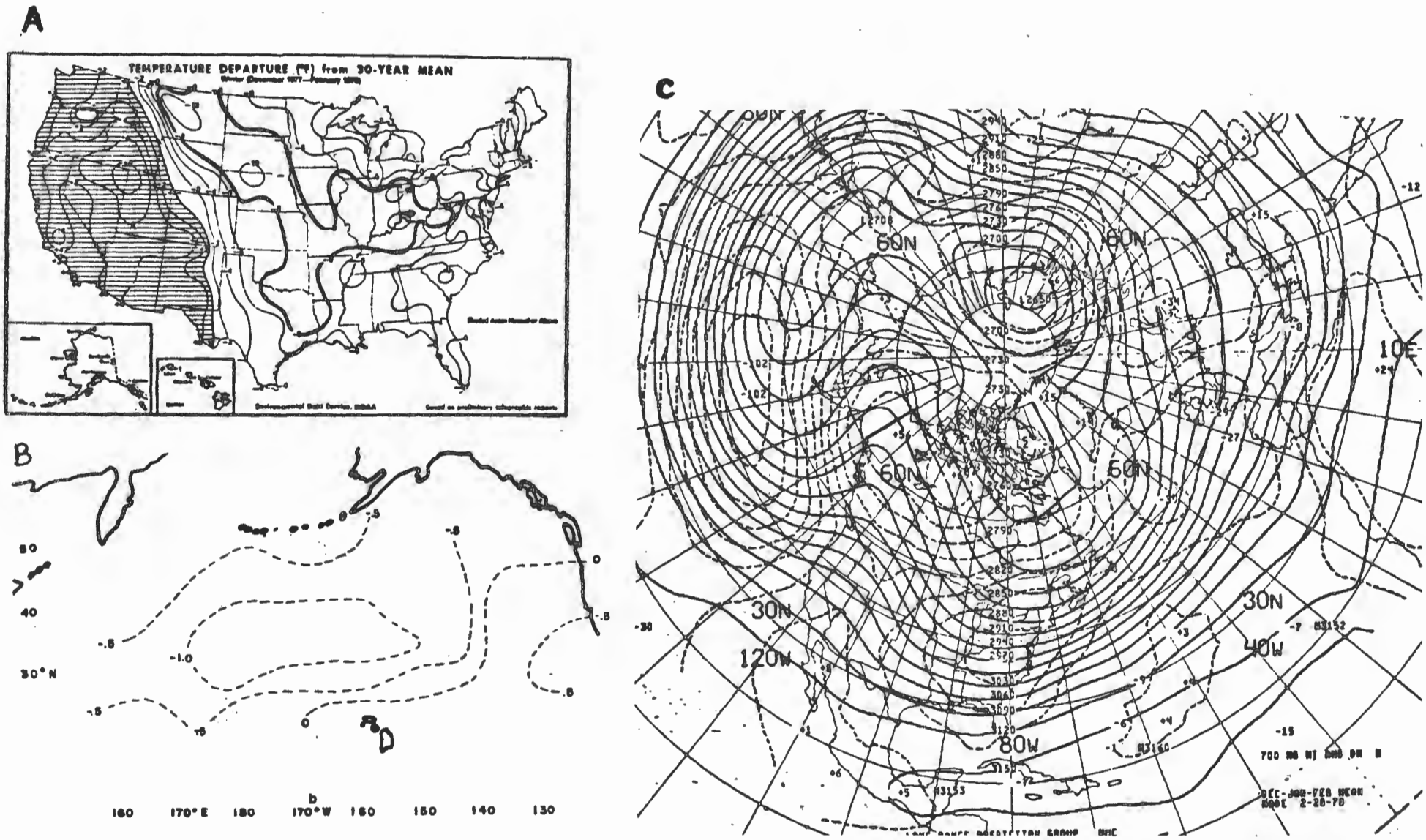

Figure 2 A. Winter temperature departure (°F) from 1941-70 normal in 1977-78 season (D,J,F). (From Weekly Weather & Crop Bulletin, NOAA, Washington, DC)

B. North Pacific sea surface temperature anomaly pattern (°C) for the winter of 1977-78 (D,J,F). (From Harnack,1980)

C. Mean 700mb height (solid) and departure from normal (dashed) fields for the winter of 1977-78 (D,J,F). (From Harnack, 1980)

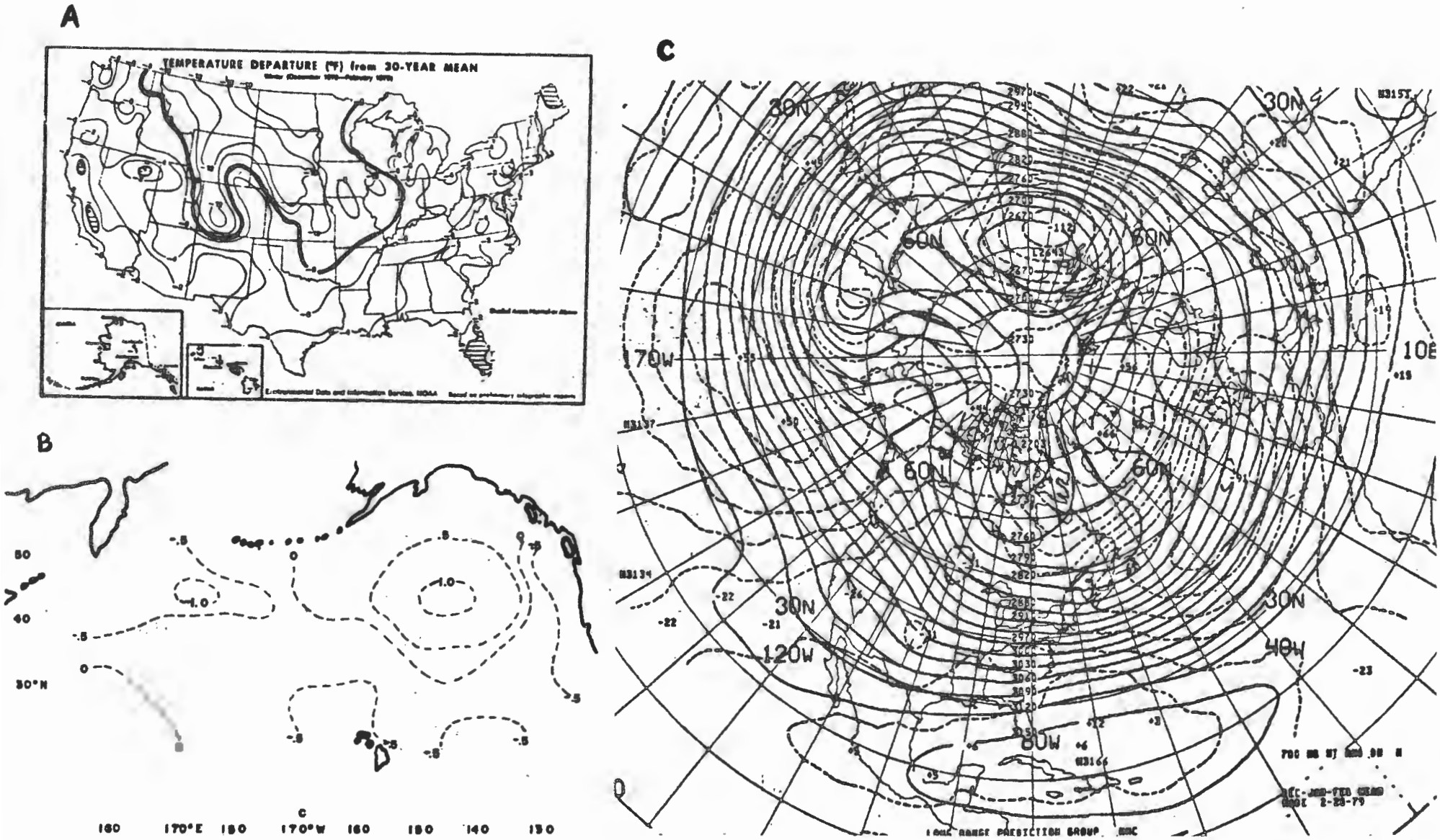

Figure 3 A. Winter temperature departure (°F) from 1941-70 normal in 1978-79 season (D,J,F). (From Weekly Weather & Crop Bulletin, NOAA, Washington, DC)

B. North Pacific sea surface temperature anomaly pattern (°C) for the winter of 1978-79 (D,J,F). (From Harnack,1980)

C. Mean 700mb height (solid) and departure from normal (dashed) fields for the winter of 1978-79 (D,J,F). (From Harnack, 1980)

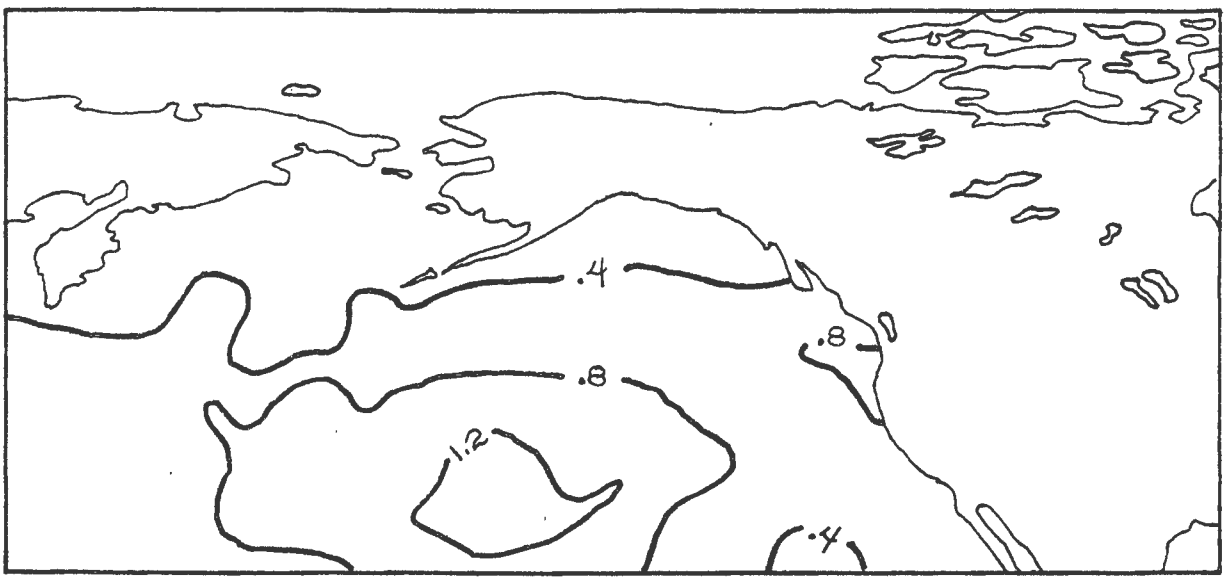

Figure 4 Standard deviation of Pacific winter sea-surface temperatures, 1931-60 (°C).

Figure 5 Difference between average winter (D,J,F) Pacific sea-surface temperatures for "cold west/warm east" winters and "warm west/cold east" winters in the conterminous U.S. Dashed lines indicate negative values.

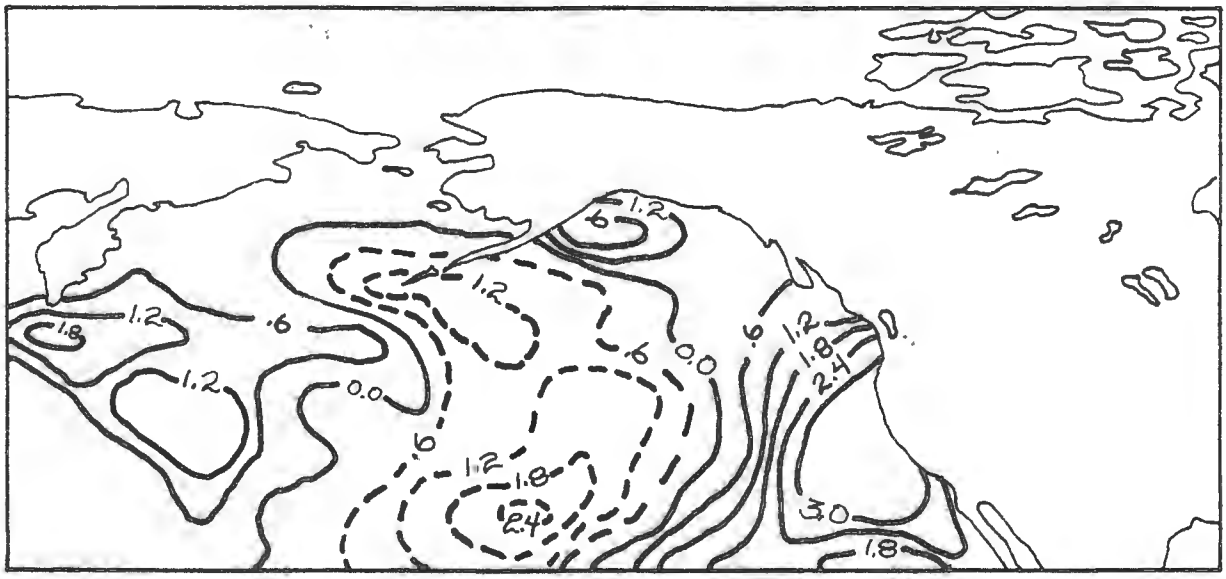

Figure 6 t-values associated with the differences in Figure 5. Values within ±1-2°C isotherms are statistically significant at 95% level. Dashed lines indicate negative values.

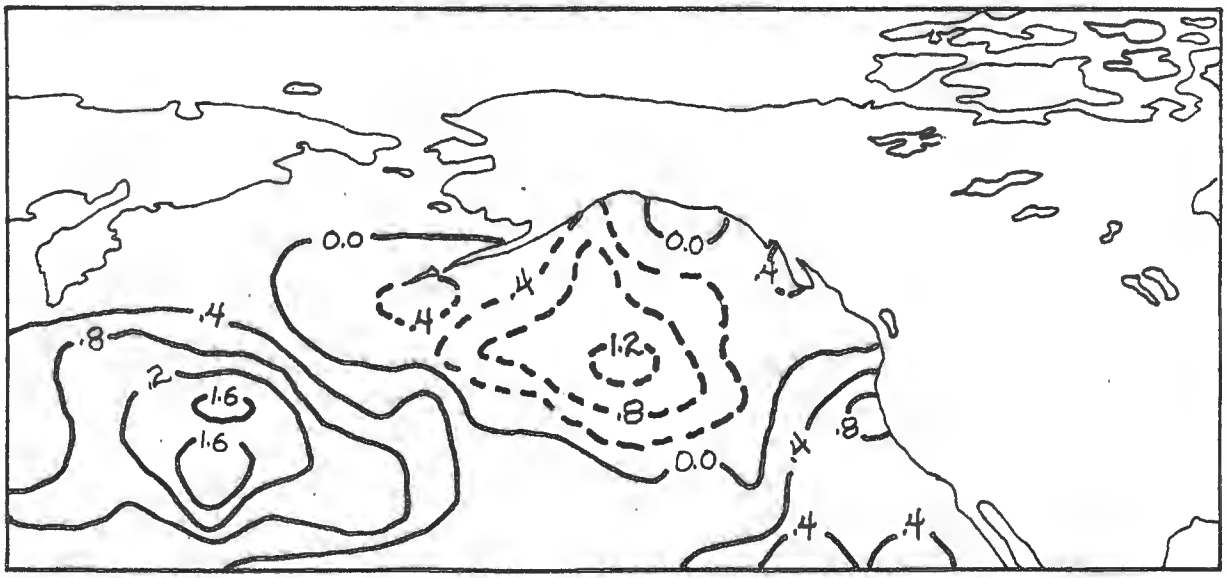

Figure 7 Difference between average Pacific sea-surface temperatures in Novembers preceding "cold west/warm east" winters, and Novembers preceding "warm west/cold east" winters in the conterminous U.S. (cf Figures 5 and 8). Dashed lines indicate negative values.

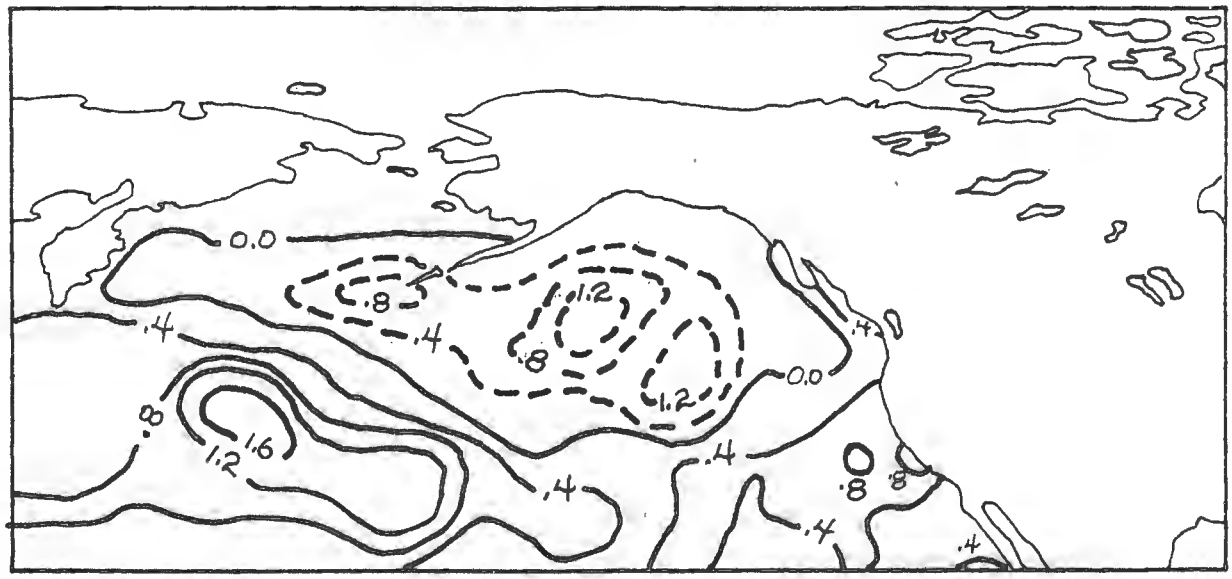

Figure 8 Difference between average Pacific sea-surface temperatures in Octobers preceding "cold west/warm east" winters and Octobers preceding "warm west/cold east" winters in the conterminous U.S. (cf Figures 5 and 7). Dashed lines indicate negative values.

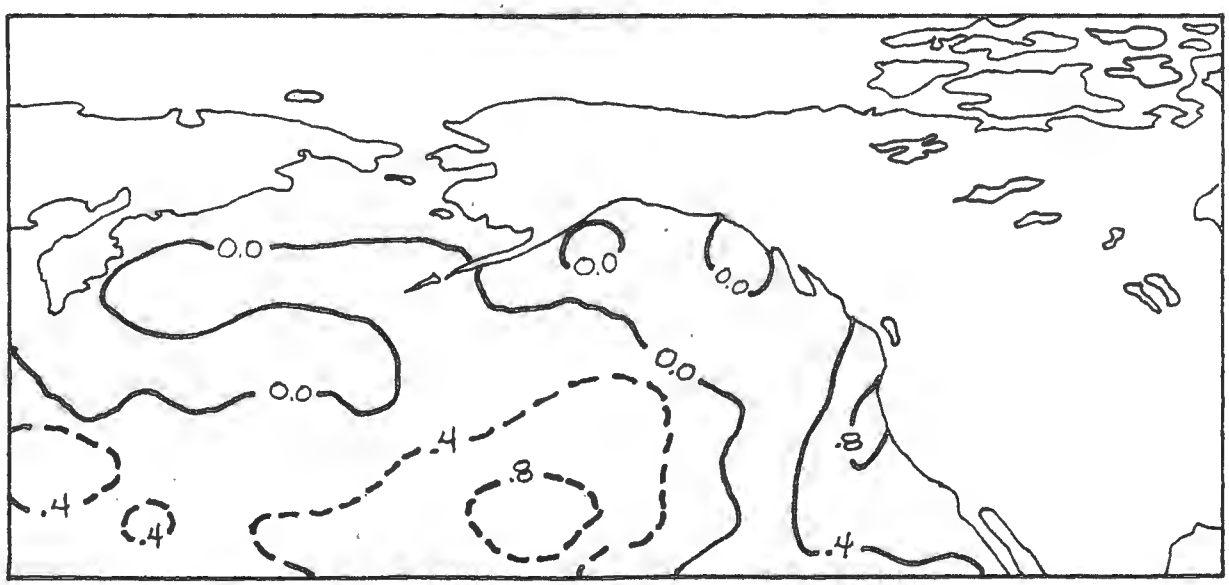

Figure 9 Difference between average winter (D,J,F) Pacific sea-surface temperatures during "warm west" and "cold west" winters in the conterminous U.S. Dashed lines indicate negative values.

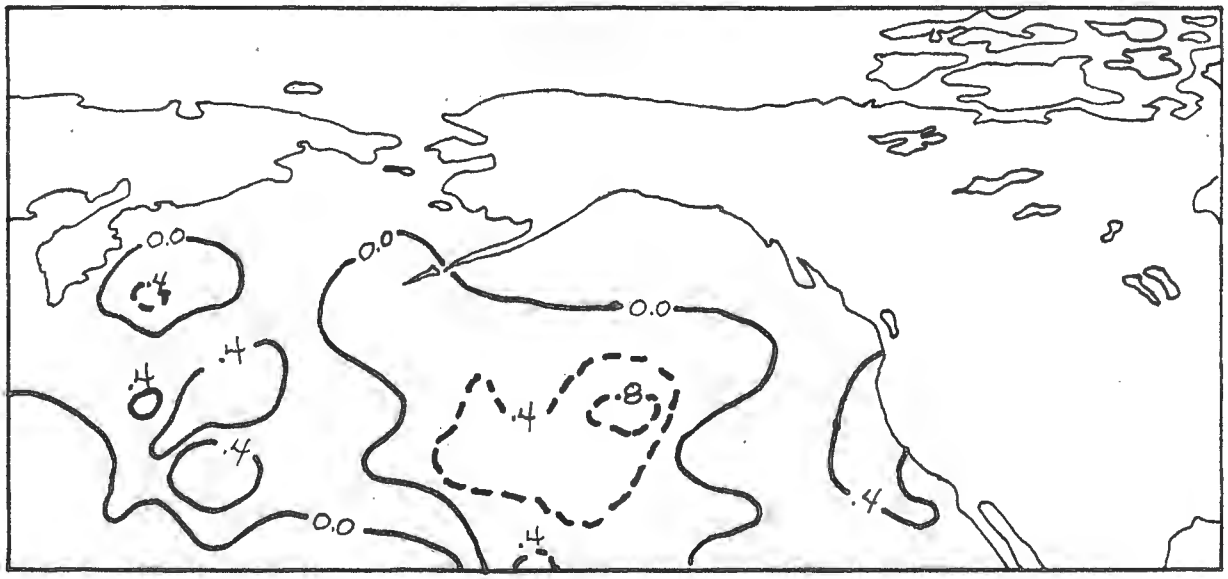

Figure 10 Difference between average Pacific sea-surface temperatures in Novembers preceding "warm west" winters and in Novembers preceding "cold west" winters, in the conterminous U.S. (cf Figures 9 and 11) Dashed lines indicate negative values.

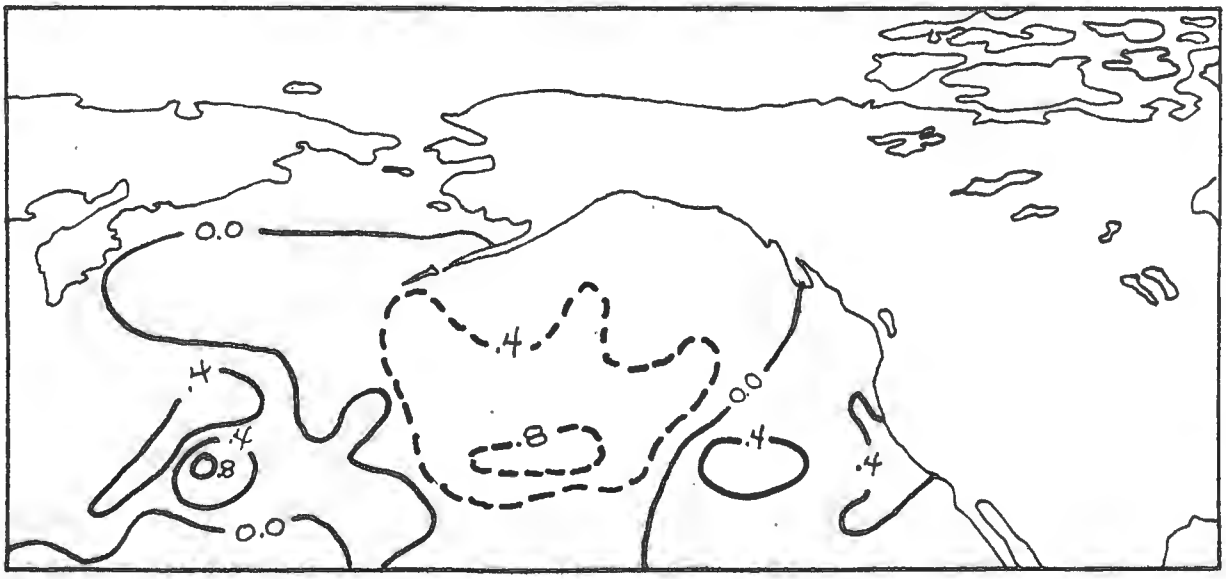

Figure 11 Difference between average Pacific sea-surface temperatures in Octobers preceding "warm west" winters and in Octobers preceding "cold west" winters, in the conterminous U.S. (cf Figures 9 and 10) Dashed lines indicate negative values.

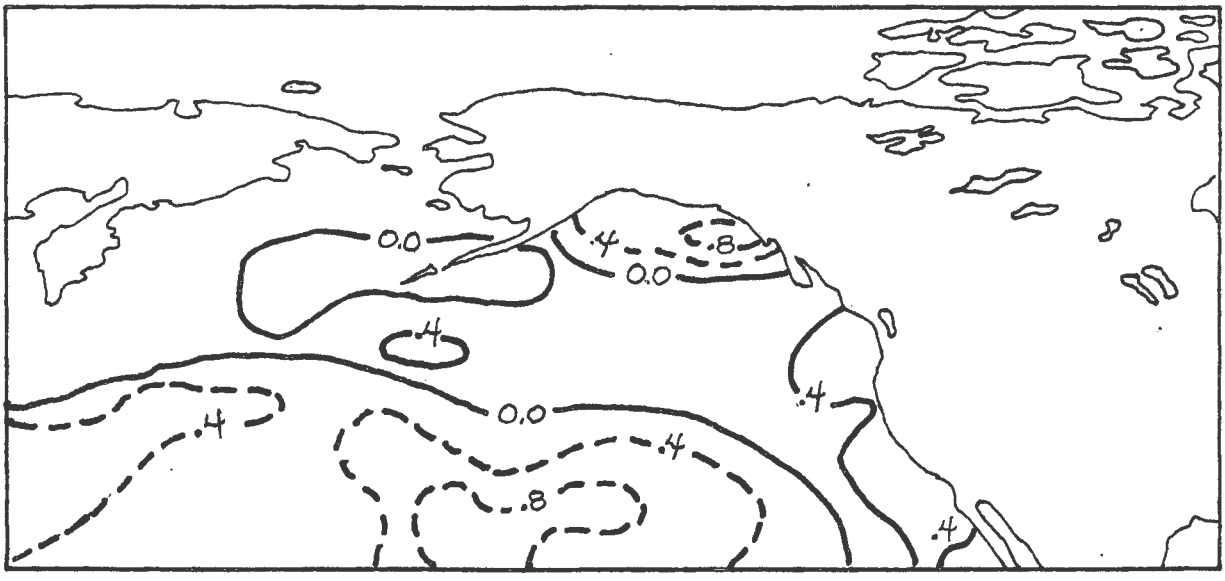

Figure 12 Difference between average spring (M,A,M) Pacific sea-surface temperatures during "warm west" and "cold west" springs in the conterminous U.S. (cf Figures 9 and 13). Dashed lines indicate negative values.

Figure 13 Difference between average fall (S,O,N) Pacific sea-surface temperatures during "warm west" and "cold west" falls in the conterminous U.S. (cf Figures 9 and 12). Dashed lines indicate negative values.

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