Western Region Technical Attachment
No. 90-04
January 23, 1990

SPECIAL CLIMATE SUMMARY

CLIMATE ANALYSIS CENTER,NMC
NATIONAL WEATHER SERVICE, NOAA

EXTREMELY DRY WEATHER THE PAST TWO MONTHS HAVE RAISED CONCERNS OF ANOTHER SUBNORMAL RAINY SEASON IN THE FAR WEST

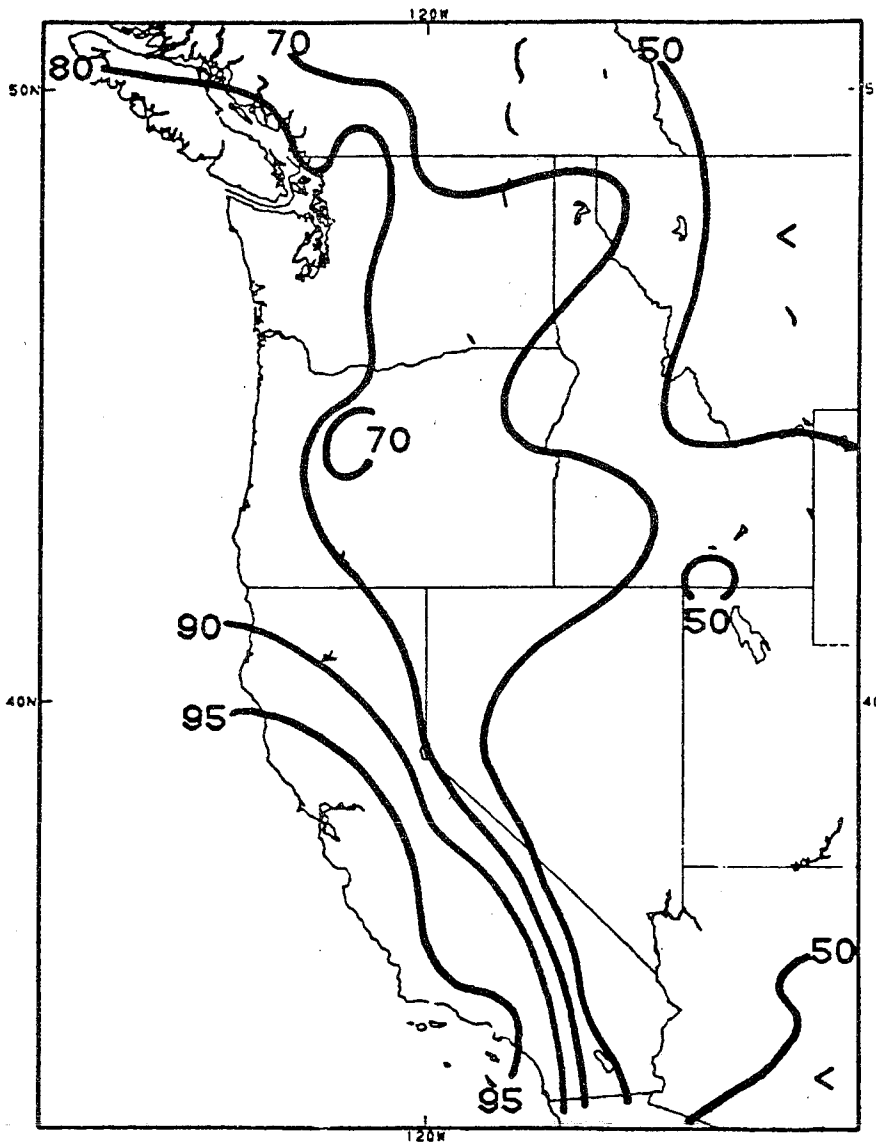

Figure 1. Percent of the normal annual precipitation received during the seven-month period of October-April. Isopleths are only analyzed for 50, 70, 80, 90, and 95%. The Pacific Coast usually receives over 80% of its yearly precipitation during the late fall, winter, and early spring months, and western sections of California observes nearly all of their January-December precipitation during this 7-month period. The three wettest months of the year (December-February) normally supply between 45% and 65% of the annual precipitation along the West Coast (figure not shown).

The vast majority of the annual precipitation in the Far West normally occurs during the winter months of December–February, although significant precipitation may also fall during the transitional months of autumn (October and November) and spring (March and April). Between 45% and 65% of the January–December precipitation is usually received during the three winter months along the West Coast, while more than 80% of the yearly precipitation normally falls during October–April along the Pacific Coast and in the Cascades and Sierra Nevada Mountains (see Figure 1).

By the late spring and continuing into the early fall, most of these areas usually record little or no precipitation. As a result, most locales heavily depend upon adequate winter precipitation to replenish reservoirs and the mountain snowpack, which in turn supply irrigation, drinking water, and hydroelectrical power.

A long–term October–March precipitation index for the western U.S. and extreme southwestern Canada (regions bounded by Figures 3–4, between 32°N–51°N and 110°W–129°W) since 1881 is depicted by Figure 2. The numerical values are arbitrary and intended only for comparison purposes. The zero line represents the mean value for the period of record, and positive (negative) values represent above (below) normal areally–averaged total precipitation. The year refers to the first month of the six–month period (e.g. 1981 represents October 1981–March 1982). The number of stations with complete historical data during each six–month period varies, ranging from 11 (in 1883–84) up to 50 (many different years).

Based upon the index, subnormal precipitation has now afflicted the Far West, especially California, the past three seasons, and were it not for torrential precipitation during February 1986, the past 5 years would have been drier than normal. For a review of the last three winter seasons in the Far West, refer to the Weekly Climate Bulletins #87/18, #88/16 and 20, and #89/17.

Since October 1, 1989, most of the Far West has observed less than half the normal precipitation, while much of southern California and Nevada have recorded well under 25% of normal (see front cover). Only parts of the northern Cascades and Rockies have reported surplus precipitation. A persistent ridge of high pressure anchored over the West Coast has veered most Pacific storm systems northward into western Canada and kept much of the Far West dry.

Precipitation totals during the past 13 weeks have ranged from under an inch in the normally drier southern sections to more than 30 inches in the normally wetter northern Cascades and along the Washington coast (see Figure 3). The greatest accumulated deficits (more than 8 inches) were found along the Pacific Northwest Coast and on Vancouver Island (see Figure 4). Furthermore, much of the precipitation that has fallen since Oct. 1 occurred early in the season, particularly during late October and mid–November, and the past several weeks have been exceptionally dry throughout the Far West.

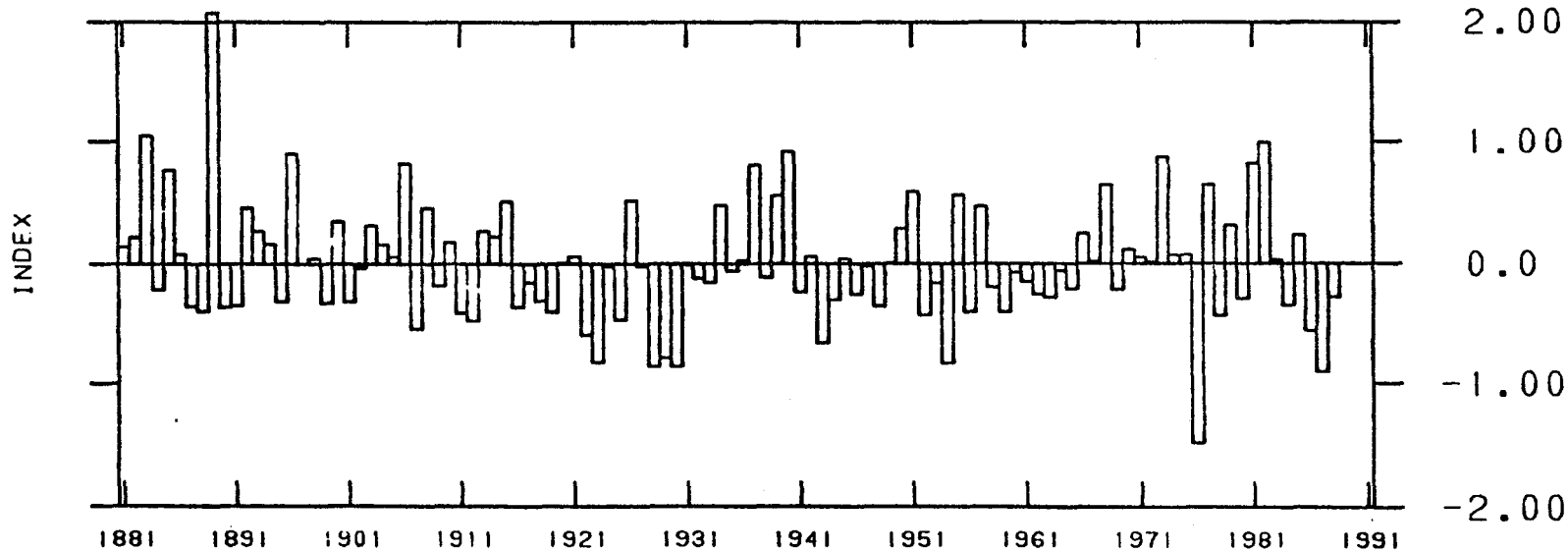

Figure 2. Precipitation index for the Far West and extreme southwestern Canada (as depicted in Figures 1, 3, and 4; between 32°N-51°N and 110°W-129°W) for the six-month period of October-March since 1881. The numerical values are arbitrary and are intended only for comparison purposes. The zero line represents the mean value for the period of record. The year refers to the first of the six-month period (e.g. 1981 represents Oct. 1981-March 1982). The number of stations with complete historical data for each six-month period varied, ranging from a minimum of 11 (in 1883-84) up to a maximum of 50 (many different years). Based upon the index, the October-March precipitation has been below normal during the last three and in four of the past five years in the Far West, especially in California.

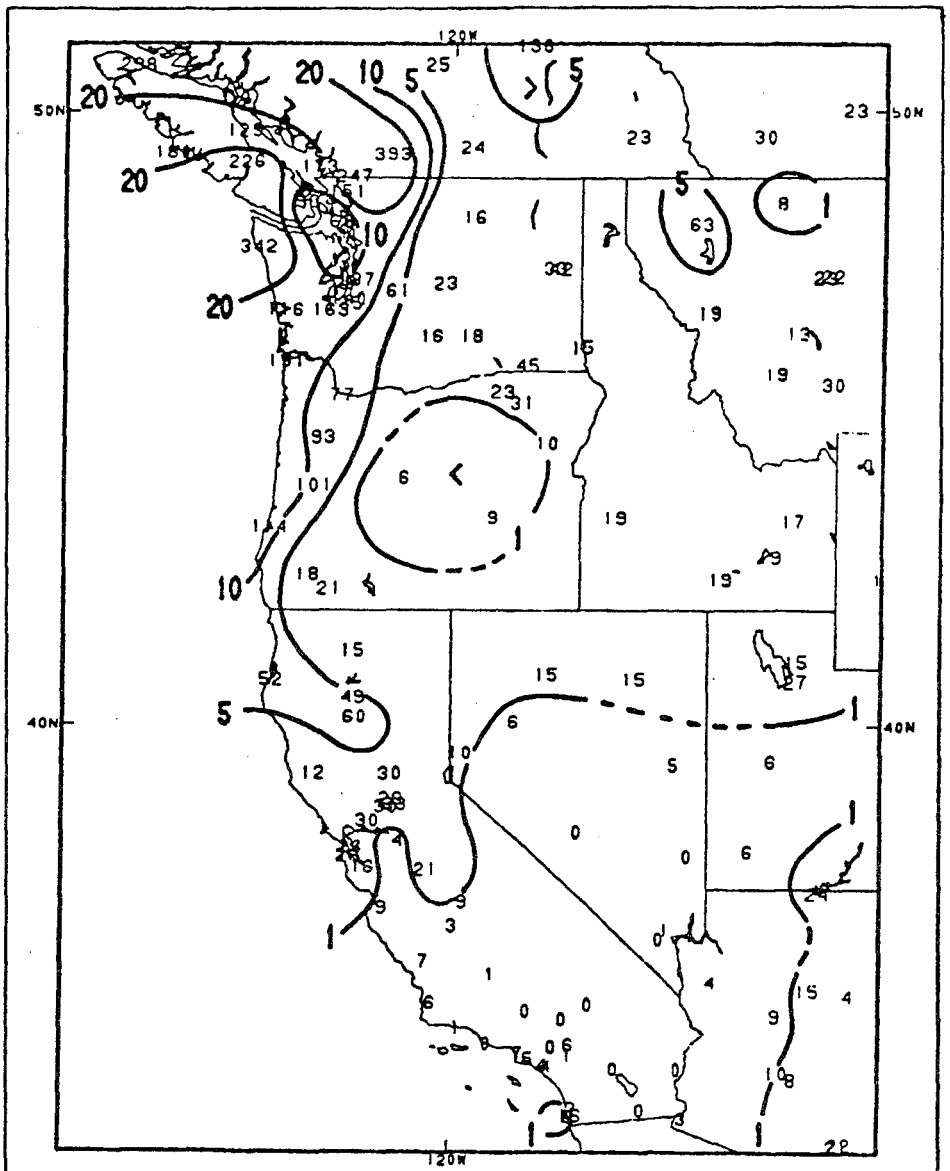

Figure 3. Total precipitation (inches) during October 1-December 30, 1989 (91 days). A station required 90% (81 days) or more of the days for inclusion. Isohyets are only drawn for 1, 5, 10, and 20 inches, and plotted station values are in tenths of inches (e.g. 15=1.5 inches). Very little precipitation has fallen on the southern portions of the Far West since October 1, and totals along the usually wet Pacific Northwest Coast and in the Sierra Nevada and Cascade Mountains are also well below normal.

On a state by state basis, the percent of normal precipitation and snowpack data during Oct. 1, 1989–Jan. 1, 1990 from the 560 station Soil Conservation Service network are summarized in Table 1. In addition to this information, the Western Regional Climate Center has also supplied the percent of normal precipitation and snowpack for several major river basins for the same time period in Table 2. Through Jan. 1, almost every western state and major river basin, with a few exceptions, were well below the long–term averages.

Tables 1, 2 not shown

On a local basis, the snowpack at Mt. Hood, OR on Jan. 1 had 9.4 inches of water–equivalence (normally 27.6 inches), while the snowpack at Mt. Olallie, WA in the northern Cascades had only 5.7 inches of water–equivalence (normally 29.2 inches) even though the station had measured 96% of its normal precipitation since Oct. 1. Unfortunately, much of its precipitation had fallen as rain and not in the more desirable form of slowly melting snow. Many ski resorts, with the lack of natural snow, have been forced to make their own. This has not only caused delays in openings, but has also forced the resorts to operate at partial capacity.

As a result of the current conditions, there are concerns about a fourth consecutive subnormal rainy season in the Far West which would have detrimental impacts later in the year. With nearly half of the 1989–1990 rainy season gone, it appears that the West must depend upon timely and plentiful January–April precipitation to assure itself of sufficient moisture reserves during the upcoming dry summer and early autumn seasons.

Table 1. State-by-state averages of the percentages from normal precipitation and mountain snowpack during Oct. 1, 1989 – Jan. 1, 1990.

State	Percent of Normal Snowpack	Precipitation
Arizona	25	34
California (Great Basin area only)	39	45
Colorado	56	65
Idaho	43	65
Montana	82	114
Nevada	43	48
New Mexico	26	60
Oregon	25	50
Utah	44	51
Washington	34	73
Wyoming	87	102
Region (except rest of California)	51	67

WESTERN REGIONAL CLIMATE CENTER

SOIL CONSERVATION SERVICE

Table 2. Selected major river basin averages of the percentages from normal precipitation and mountain snowpack during Oct. 1, 1989 – Jan. 1, 1990.

River Basin	Percent of Normal Snowpack	Precipitation
Arkansas River	80	80
Colorado River	53	59
Missouri River	97	114
Columbia River	42	65
Rio Grande River	19	53
Great Basin	41	48

Of the 69 river basins:
- 13 had <25% snowpack
- 43 had <50% snowpack
- 54 had <75% snowpack
- 63 had <100% snowpack

only 6 had above normal snowpack.

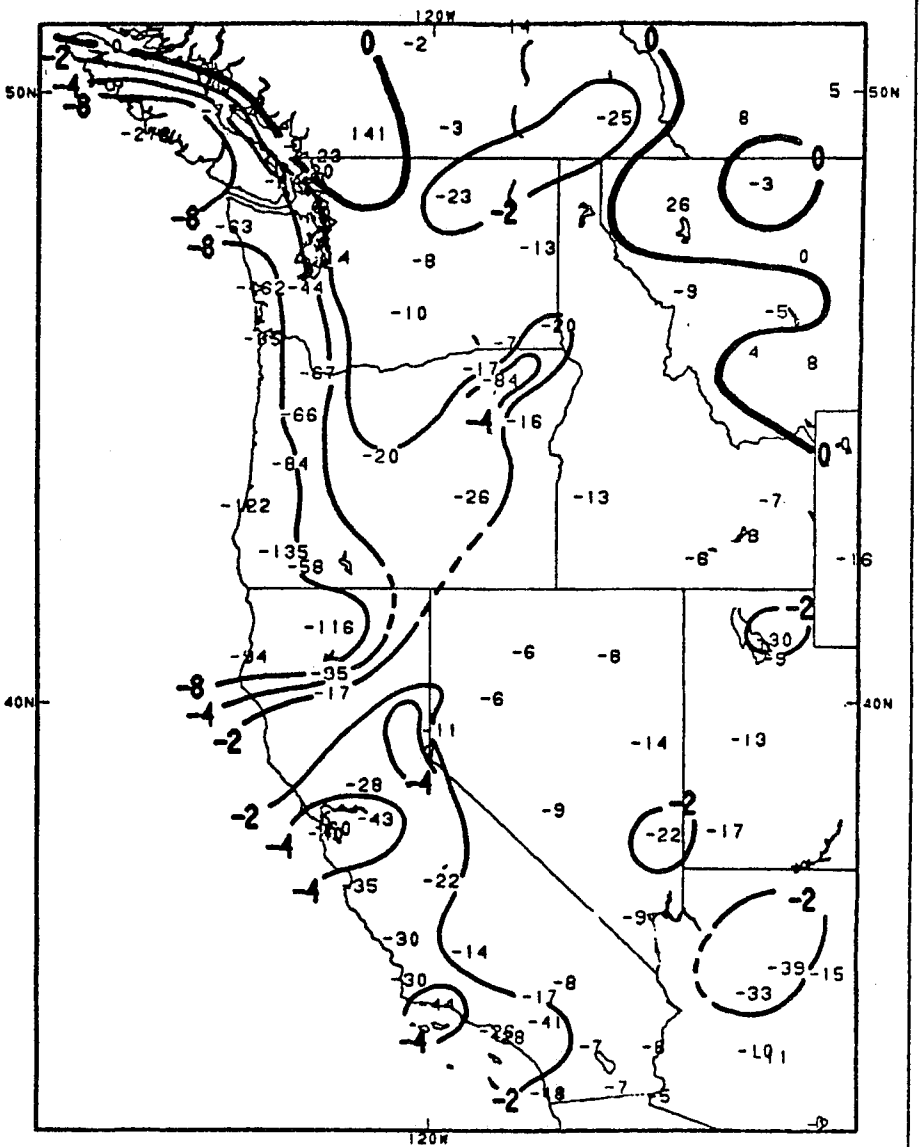

Figure 4. Departure from normal precipitation (inches) during October 1-December 30, 1989 (91 days). A station required 90% (81 days) or more of the days for inclusion. Isopleths are only drawn for 0, -2, -4, and -8 inches, and plotted station values are in tenths of inches (e.g. -135=-13.5 inches). The greatest deficits were located along the normally rainy Pacific Northwest Coast and in Vancouver Island (more than 8 inches), and along coastal California (between 2 and 4 inches) as meager rainfall has occurred at the latter region during the past 13 weeks.