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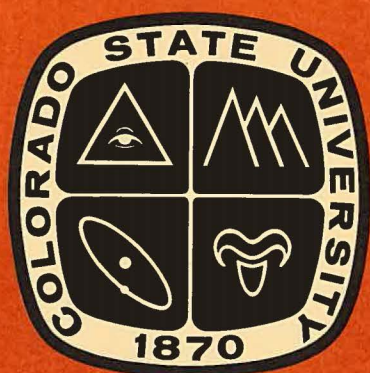
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CLIMATOLOGY REPORT NO. 78-3

**DEPARTMENT OF ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY
FORT COLLINS, COLORADO**

7302

COLORADO CLIMATE SUMMARY

WATER-YEAR SERIES

January 1977-September 1977

October 1977-September 1978

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by

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December 1978

Climatology Report No. 78-3



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I. INTRODUCTION

A severe drought situation developed in Colorado during the winter of 1976-77. As the drought worsened, the need increased to constantly monitor the status of the state's water supplies. To help respond to this need, the Colorado Climatology Office began to issue a special monthly precipitation summary for the state. This summary quickly evolved into a brief but comprehensive description of monthly temperature and precipitation characteristics. Important weather events such as severe storms were also noted. However, special emphasis was placed on accumulated precipitation statistics since they were closely related to Colorado's actual water supplies. The usefulness of this type of up-to-date summary soon became apparent, and the interest shown by many people in the state prompted the Climatology Office to continue to prepare these climatic summaries even after the severe winter drought of 1977 had ended.

This publication is a collection of these monthly summaries beginning with the first issue, January 1977, and continuing through September 1978. They are divided into two sections; the 1977 water year ending with September 1977, and the 1978 water year ending with September 1978. The water year, defined as the period from October 1 through September 30, is a practical period for discussing moisture in Colorado. Beginning in October, snow usually begins to accumulate in the mountains and continues to build up until spring. The mountain snowpack forms the backbone of the state's water supplies which are then used extensively for summer irrigation. Therefore, the water year represents the water storage--water usage cycle.

The data used in the monthly summaries were obtained from the National Weather Service and the Soil Conservation Service. Data from the main National Weather Service stations such as Denver and Grand Junction were included, but most of the information was obtained from the extensive cooperative observer network, also maintained by the National Weather Service. Because of the importance of knowing how precipitation and temperature patterns compared with long-term averages, only the stations which have been in existence since at least 1951 were used. Averages based on the 1951-1970 period were used for all comparisons.

The written descriptions give a good general accounting of each month's weather, but the majority of information is contained on the maps which accompany each report. For most months, actual precipitation amounts, monthly precipitation compared to average, water-year accumulated precipitation compared to average, and temperatures compared to average, were displayed on maps. Occasionally, additional figures were also included. The accuracy of these data was usually quite good. However, these reports were initially prepared as soon after the end of a month as possible. Sometimes preliminary information had to be used which was not always exactly correct. Therefore, some of the precipitation and temperature values may differ slightly from what was later published by the National Climatic Center.

II. The 1977 Water Year

This section is a month-by-month summarization of the 1977 water year. This does not represent the complete year since the initial monthly report was not written until January 1977. However, a tabulation of accumulated water-year precipitation is discussed in each report, so the total water-year precipitation is accounted for.

The outstanding feature of the 1977 water year was the unprecedented winter precipitation drought in all the Colorado mountains and everywhere west of the Continental Divide. Fortunately, there was good reservoir storage prior to the winter drought. In addition, timely spring and summer rains helped minimize the effects of the drought on summer agriculture. However, by the end of the water year, water supplies were dangerously low.

COLORADO CLIMATE -- JANUARY 1977

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Drought conditions continued through the end of January throughout Colorado. January 1977 precipitation is shown as a percent of average in Figure 1. The period used for the average was 1951 through 1970. Most of the area west of the continental divide improved in January compared with previous months. Accumulated precipitation through January for the current water year beginning October 1, 1976 is shown in Figure 2 as percent of average. All of Colorado west of the continental divide remains below 50 percent of average for the October through January period and much of the region is better described as 25 percent of average. Examination of our historical records indicate that the current water year is the driest since extensive records were available for the area west of the divide. Extensive records were available in 1931.

Precipitation for October through January is below average for most of Colorado east of the continental divide. The exception is the area in southern Colorado near Walsenburg and Trinidad which received precipitation in October. The plains regions have experienced drier winters than the present one. Average precipitation rises rapidly along the front range and in eastern Colorado in the spring months starting in March. Consequently the spring months play an important role in the impact of continued drought conditions.

Precipitation at higher elevations contributing to the snowpack for spring runoff are not well represented by the stations on Figure 1 and Figure 2. The best source of data for snowpack water content is from the Soil Conservation Service Snow Survey Unit, Denver, CO. Data published for the end of January 1977 show good agreement with the data in Figures 1 and 2 in terms of percent of average conditions.

Figure 1. - Precipitation for January 1977 as percent of average (1951-1970).

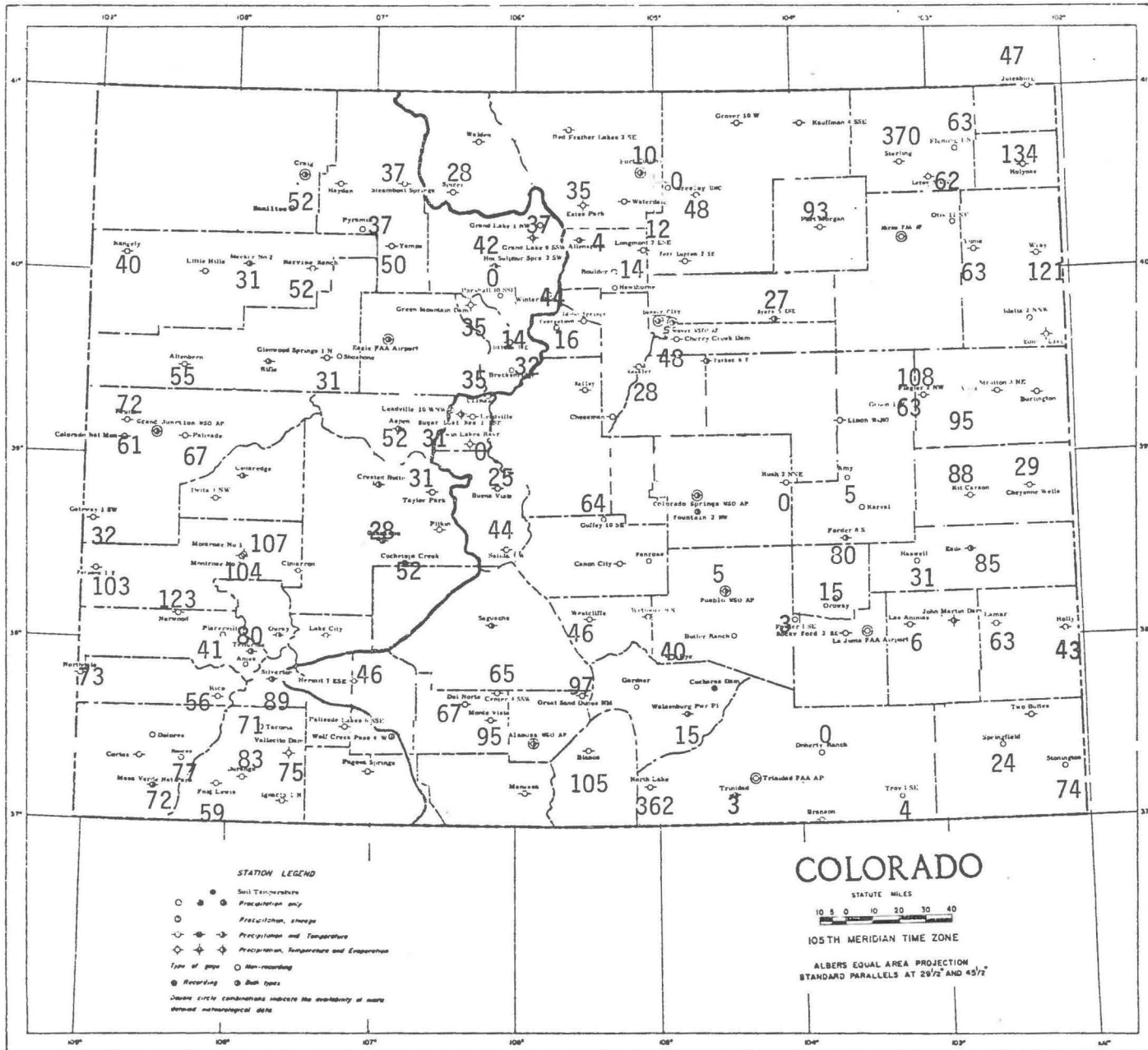
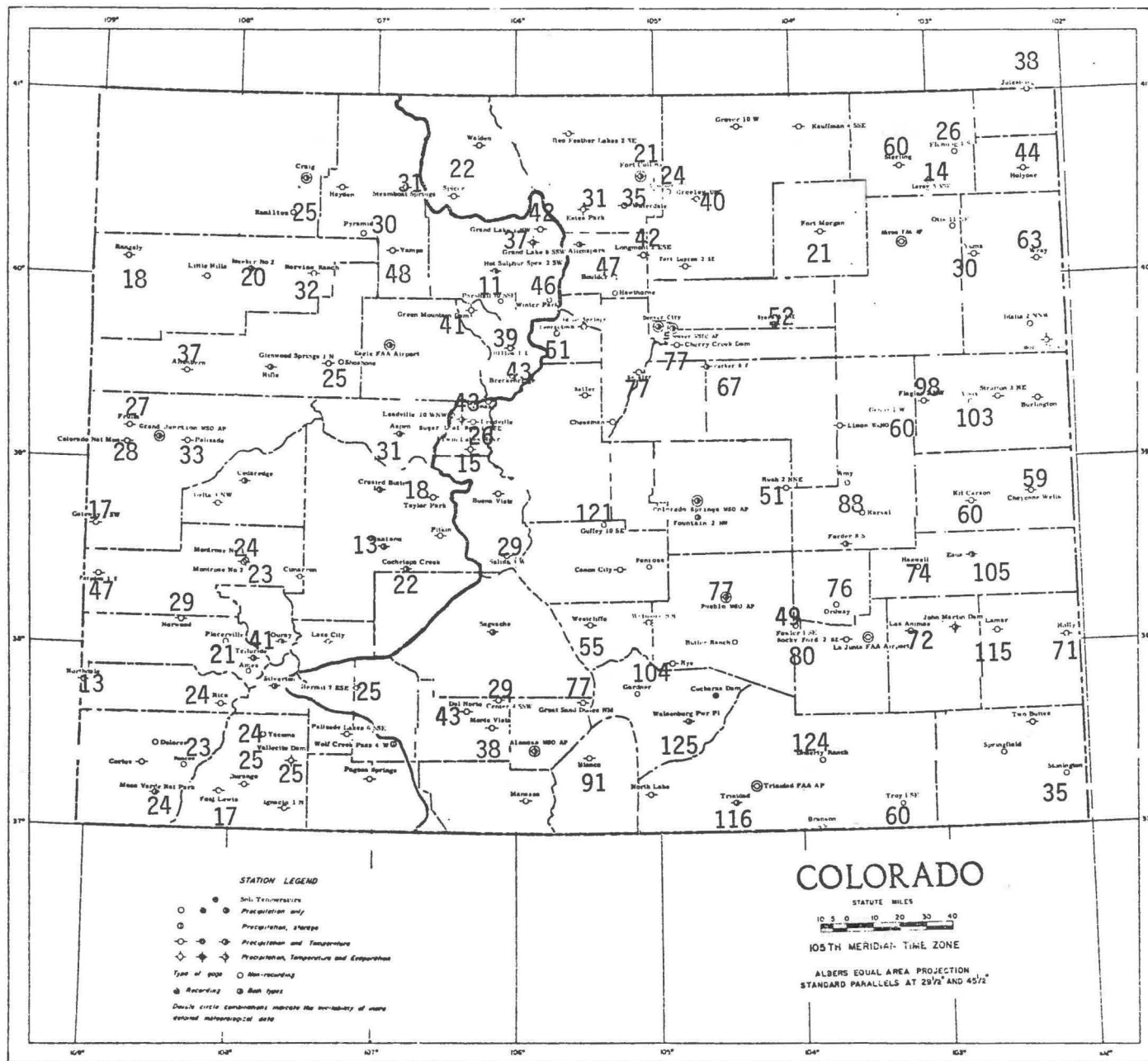


Figure 2. - Precipitation for period October 1976 through January 1977 as percent of average (1951-1970).



COLORADO CLIMATE -- FEBRUARY 1977

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Although a series of weather systems moved across the state during the latter part of February, precipitation from these storms did little to alleviate the drought conditions throughout most of Colorado. If anything the accompanying high winds in Eastern Colorado aggravated the drought situation with dust storms and crop damage. February precipitation is shown as a percent of average 1951-1970 precipitation in Figure 1. The central mountains and the area east of the continental divide and south of the Arkansas received above average precipitation during February. However, the remainder of Colorado did not fare as well especially Montezuma County and North-eastern Colorado which received less than 25% of average.

Average temperatures for the month of February were 2-8 degrees above the 1951-1970 average for most of the state as shown in Figure 2. The exception is the San Luis Valley which was almost 3° Fahrenheit below average.

Accumulated precipitation during the winter season, October through February, for the area west of the continental divide remained less than 50% of average as shown in Figure 3. The area east of the continental divide is also below average except for the area near Walsenburg and Trinidad which received above average precipitation in February and continues to remain above average for the winter season. Circled values in Figure 3 represent precipitation as percent of

average (1958-1972) water in snowpack for higher elevation Soil Conservation Snow Survey sites. These values show good agreement with the data presented in Figure 3. Our historical records continue to indicate that the current water year is the driest since 1931 for the area west of the divide. Conditions in Northeastern Colorado continued to deteriorate in February with winter season precipitation approaching the low values during the drought of 1934-35. Figure 4 shows the percent of average precipitation for the period October through February for the driest year since 1931. No one year was the driest in all locations so a variety of years are represented by the data. A comparison of Figure 4 with Figure 3 indicates many locations are currently setting records.

Figure 2. - Temperature for February 1977 in degrees Fahrenheit above or below average (1951-1970).

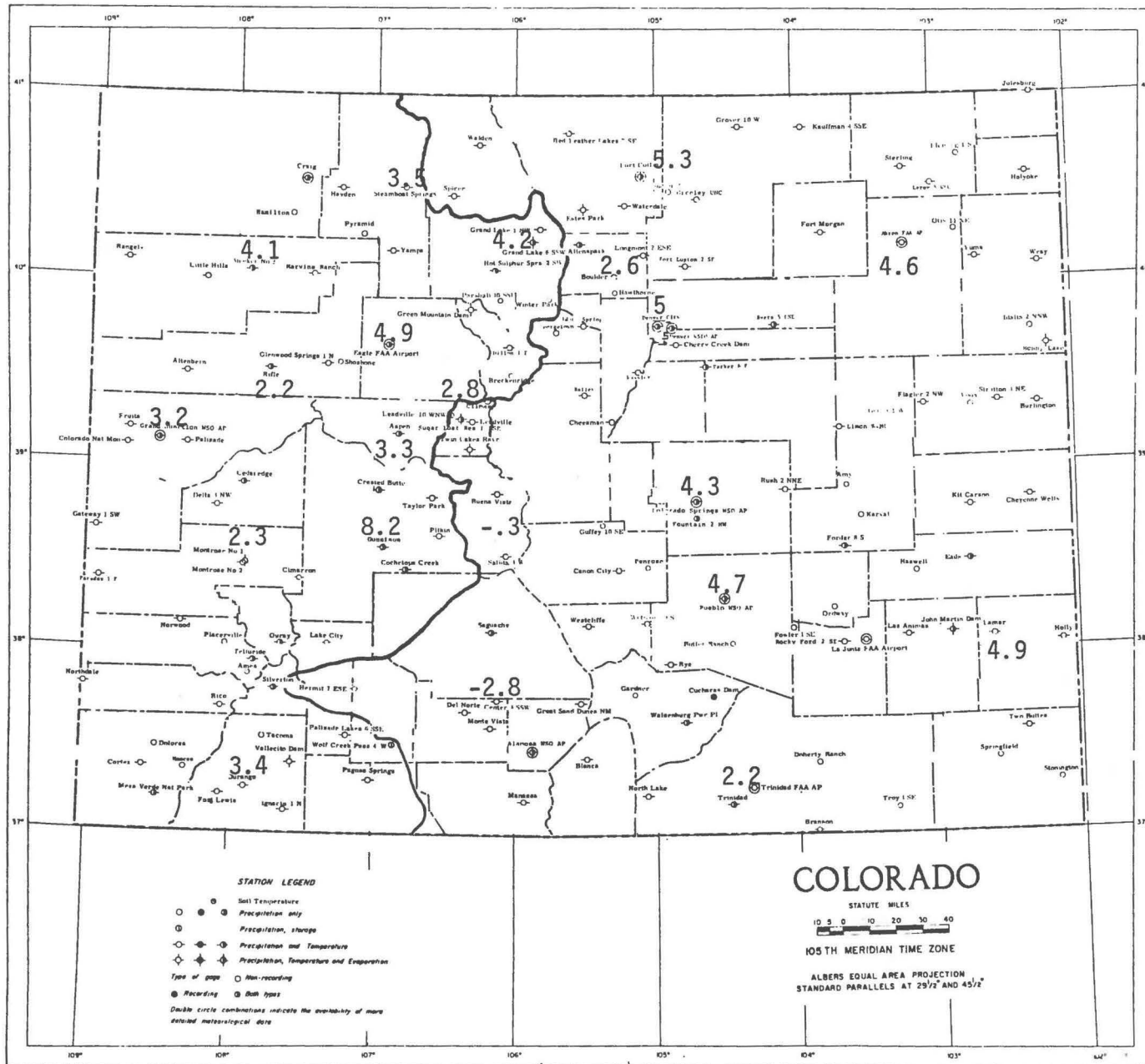


Figure 3. Precipitation for period October 1976 through February 1977 as percent of average (1951-1970).

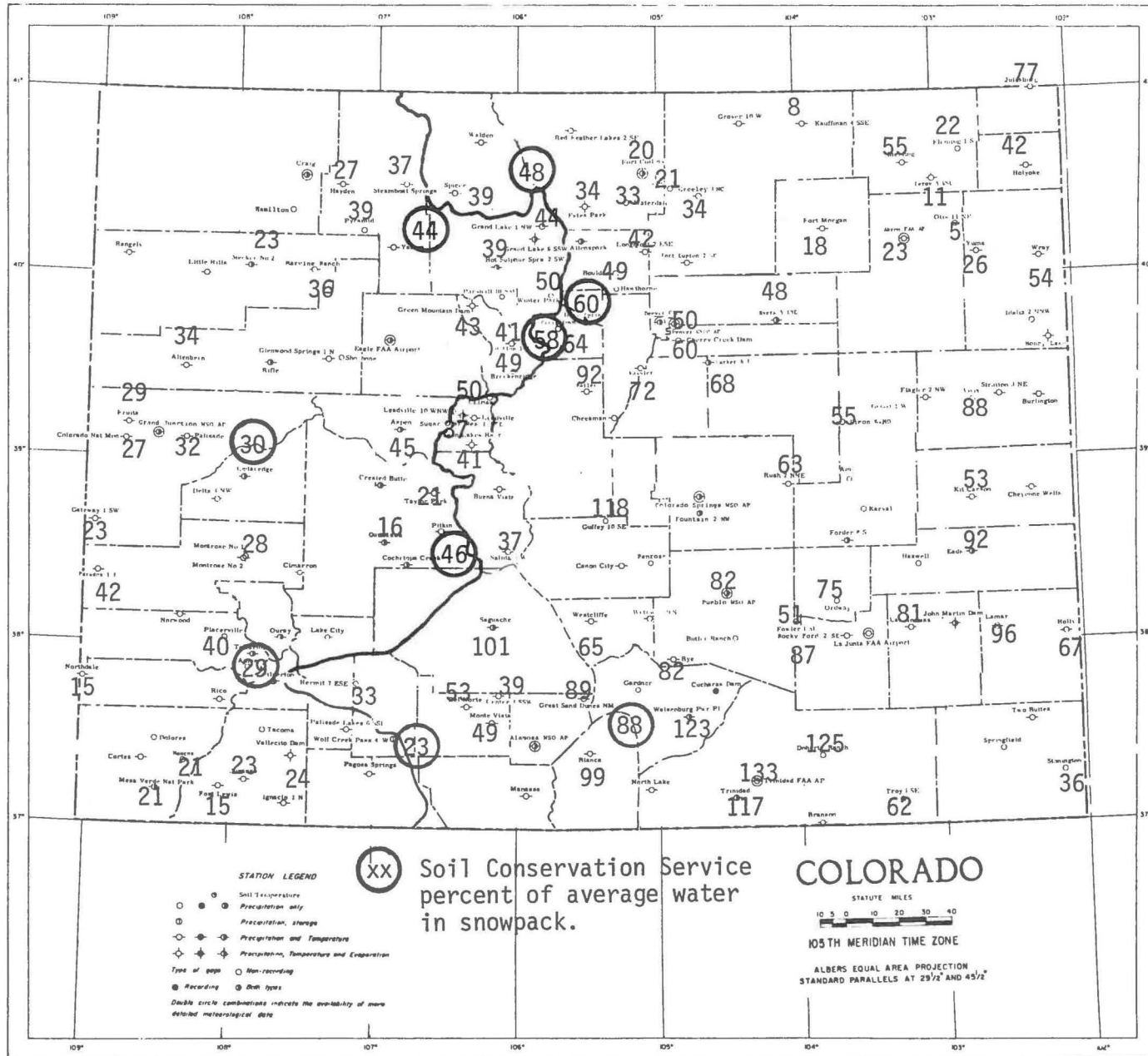
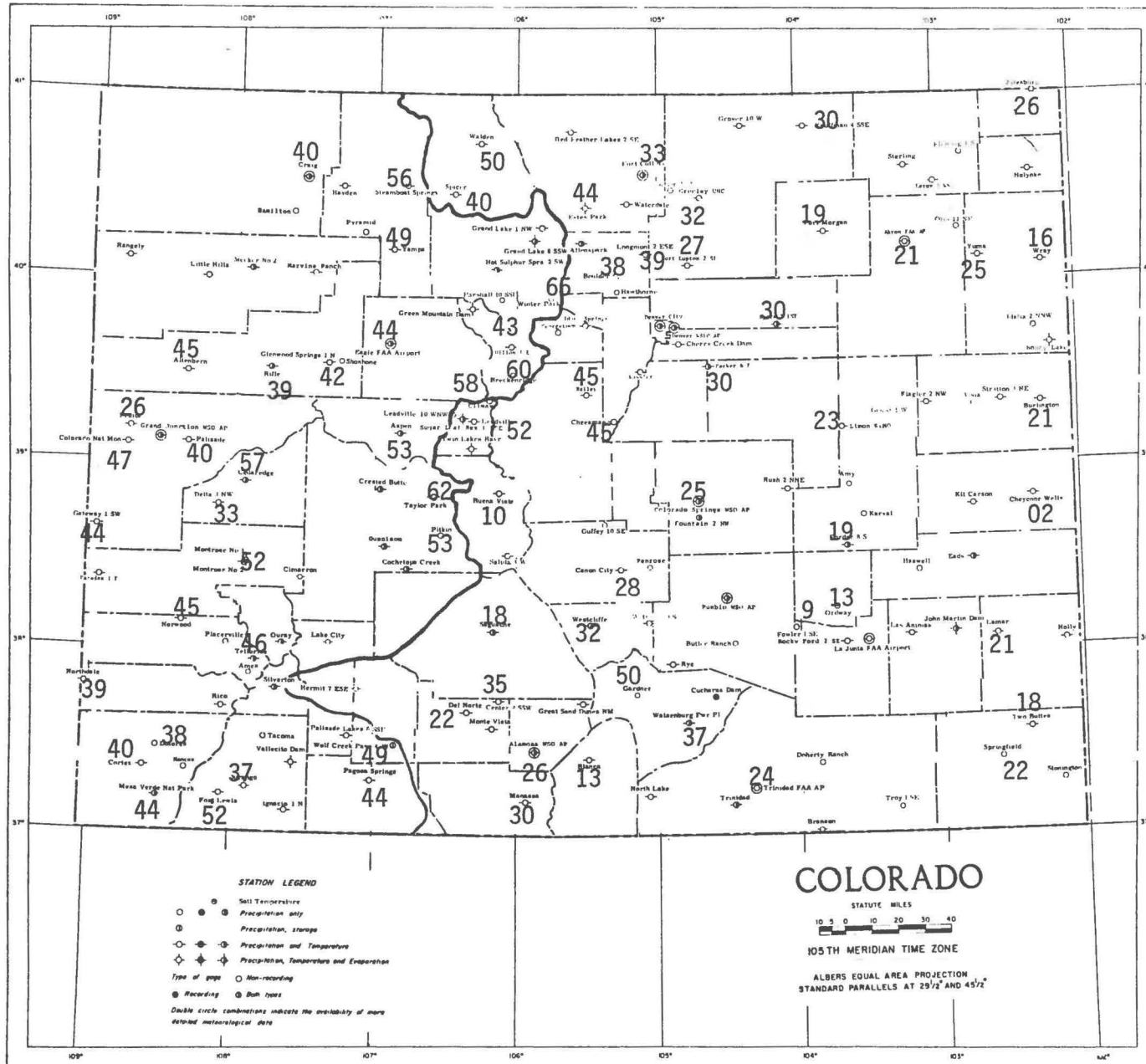


Figure 4. - Percent of average for driest October through February period since 1931.



COLORADO CLIMATE -- MARCH 1977

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The month of March will be remembered for the severe snow blizzard that occurred on the eastern plains on the 10th and 11th. The National Weather Service summary reports 9 people killed, 60 MPH to 80 MPH winds on the plains, snow drifts up to 25 feet deep, extensive power outages, severe wind erosion to crops, and an estimate of thousands of livestock deaths. Heaviest snowfall on the plains was estimated from 4 in. to 20 in. in the northeast. Heavy snow also fell in the high mountains near the Continental Divide.

Drought conditions in Eastern Colorado were not alleviated by the blizzard due to excessive winds and drifting. Precipitation for March is shown in Figure 1. Several stations in the east show greater than average precipitation due to the blizzard with Holyoke and Wray at 375% and 291%. The area west of the Continental Divide remained below average. Temperatures shown in Figure 2 indicate the eastern portion of the state was above normal while the western portion was near normal or below normal. Accumulated precipitation for the period October through March in Figure 3 shows that the drought is still very real in Colorado. Most areas west of the Continental Divide remain less than 50% of average even though some improvement has occurred in comparison with a month earlier. Snowpack data in circles is a record low in most of the state. Data for the eastern area show increases over the previous month except for the extreme southeast and a small area near Fort Collins.

The driest year on record since 1931 is shown in Figure 4. Records are being set for many stations west of the divide and a few along the northern part of the front range.

Figure 1. Precipitation for March 1977 as percent of average (1951-1970).

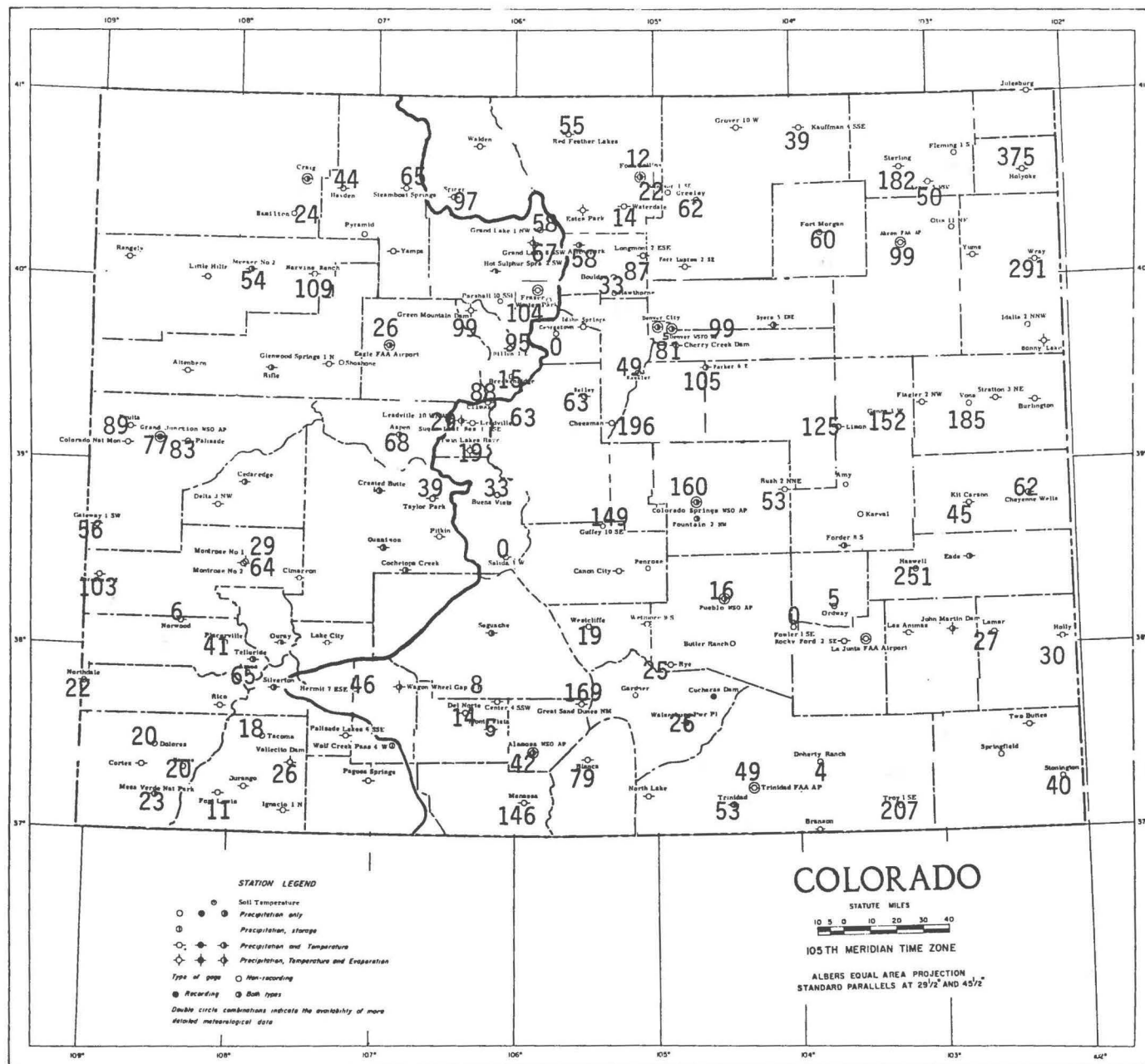


Figure 2. Temperature for March 1977 in degrees Fahrenheit above or below average (1951-1970).

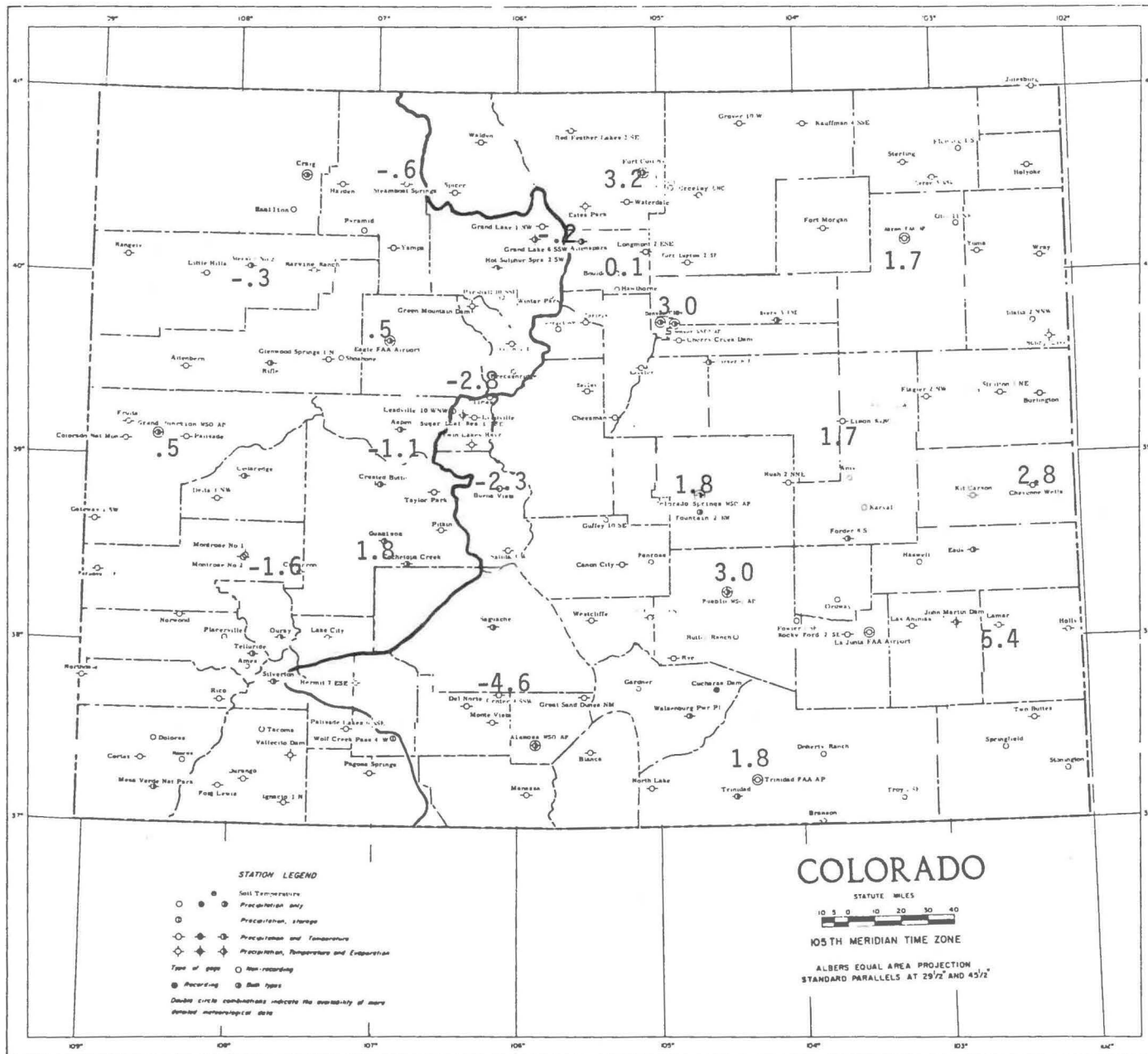


Figure 3. Precipitation for period October 1976 through March 1977 as percent of average (1951-1970).

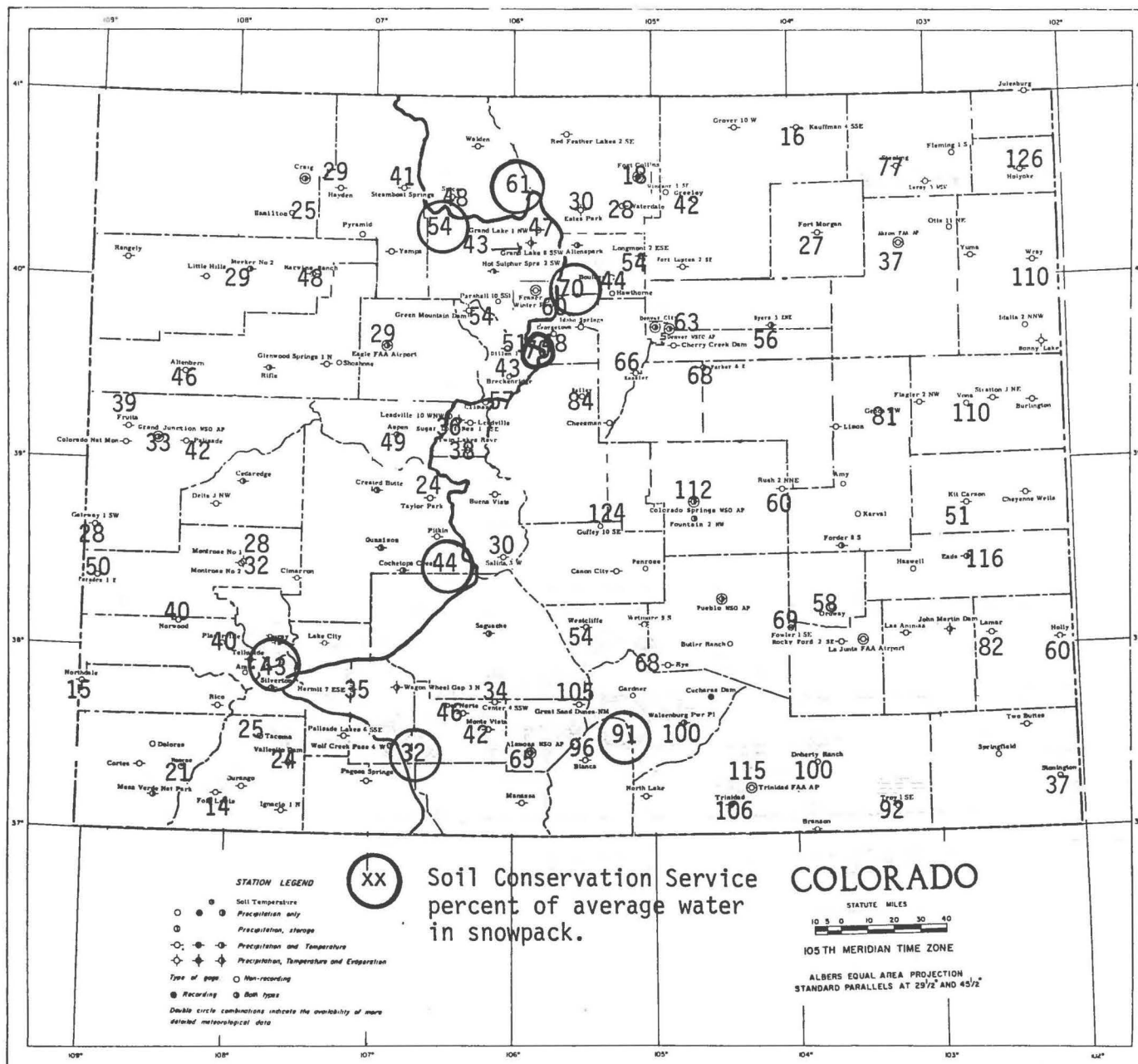
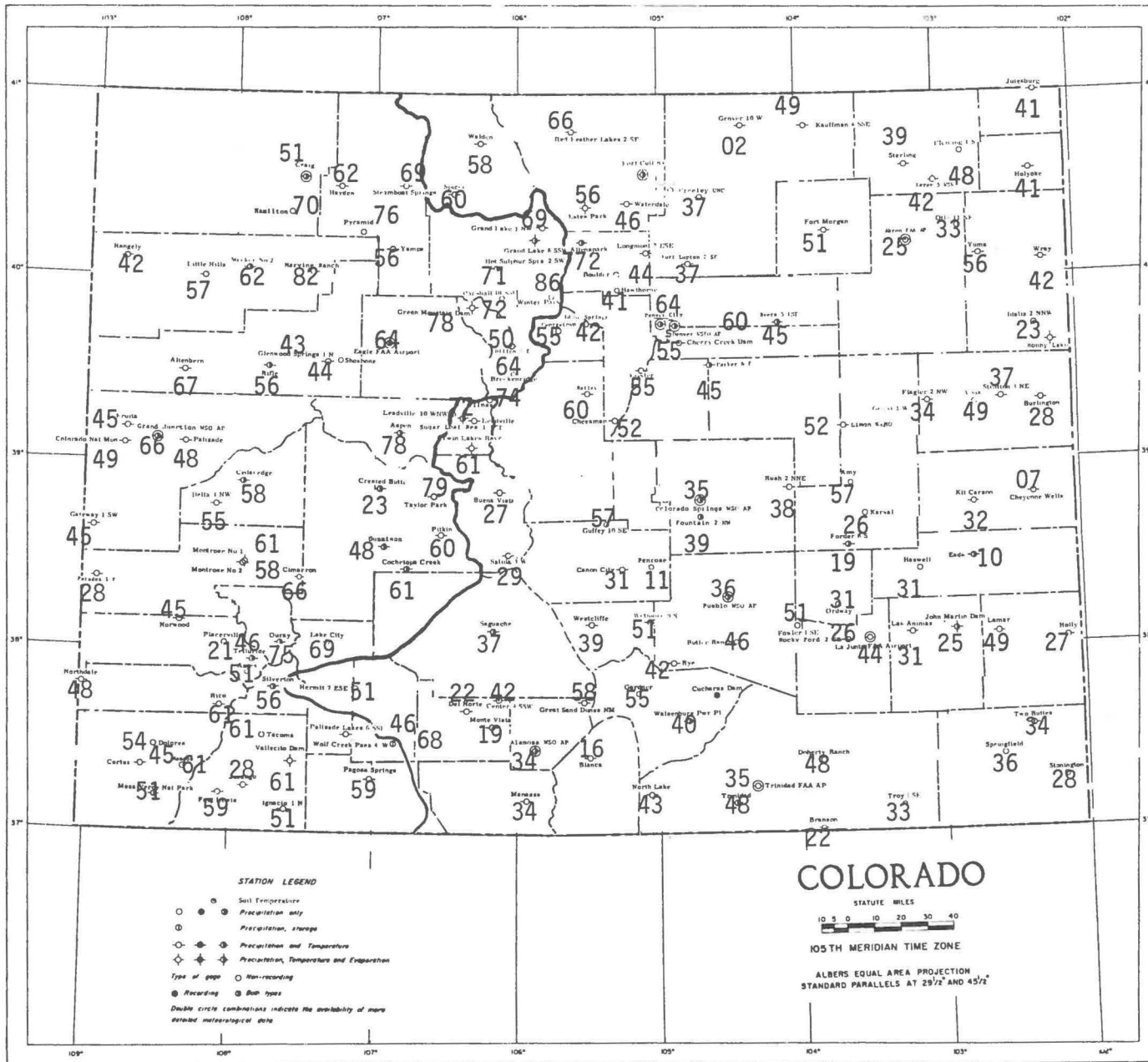


Figure 4. - Percent of average for driest October through March period since 1931.



COLORADO CLIMATE -- APRIL 1977

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A series of storm systems moved through the state in April. Snow, winds, and thunderstorms were all included in Colorado weather in April. A snow storm occurred on the 2nd and 3rd. Gusty winds and thunderstorms appeared later in the month. Precipitation for the month is shown in Figure 1 and the percent of average in Figure 2. The eastern part of Colorado received up to nearly 5 inches. Nearly all of eastern Colorado was above normal for the month which was a real help for agriculture. The region west of the continental divide remained very dry with monthly values well below average. Figure 2 shows that precipitation was less than 50% of average for the western portion and from 150% to 200% of average for the east.

Figure 3 shows the accumulated precipitation for the period October through April. The drought has not ended although the wet month has helped the eastern portion of the state. The western part of the state remained the driest on record as the drought continued. Incredibly, the southwest corner had less than 30% accumulated precipitation. The snow pack data in Figure 3 has changed relative to the accumulated precipitation numbers due to melting. An important feature of Colorado precipitation is apparent in Figure 3. The region west of the divide receives on the average between 40% and 50% of annual precipitation from October through March. Consequently, the values in Figure 3 which are less than 50% will not change easily and are indicative of a record low year. The region east of the divide on the plains receives on the average between 20% and 30% of annual precipitation for October through March. Precipitation increases strongly in April. Consequently, the accumulated values in Figure 3 have changed dramatically with only one wet month.

Average April temperatures are shown in Figure 4. April was a warm month both east and west of the divide.

Figure 1. - April 1977 precipitation amount (inches).

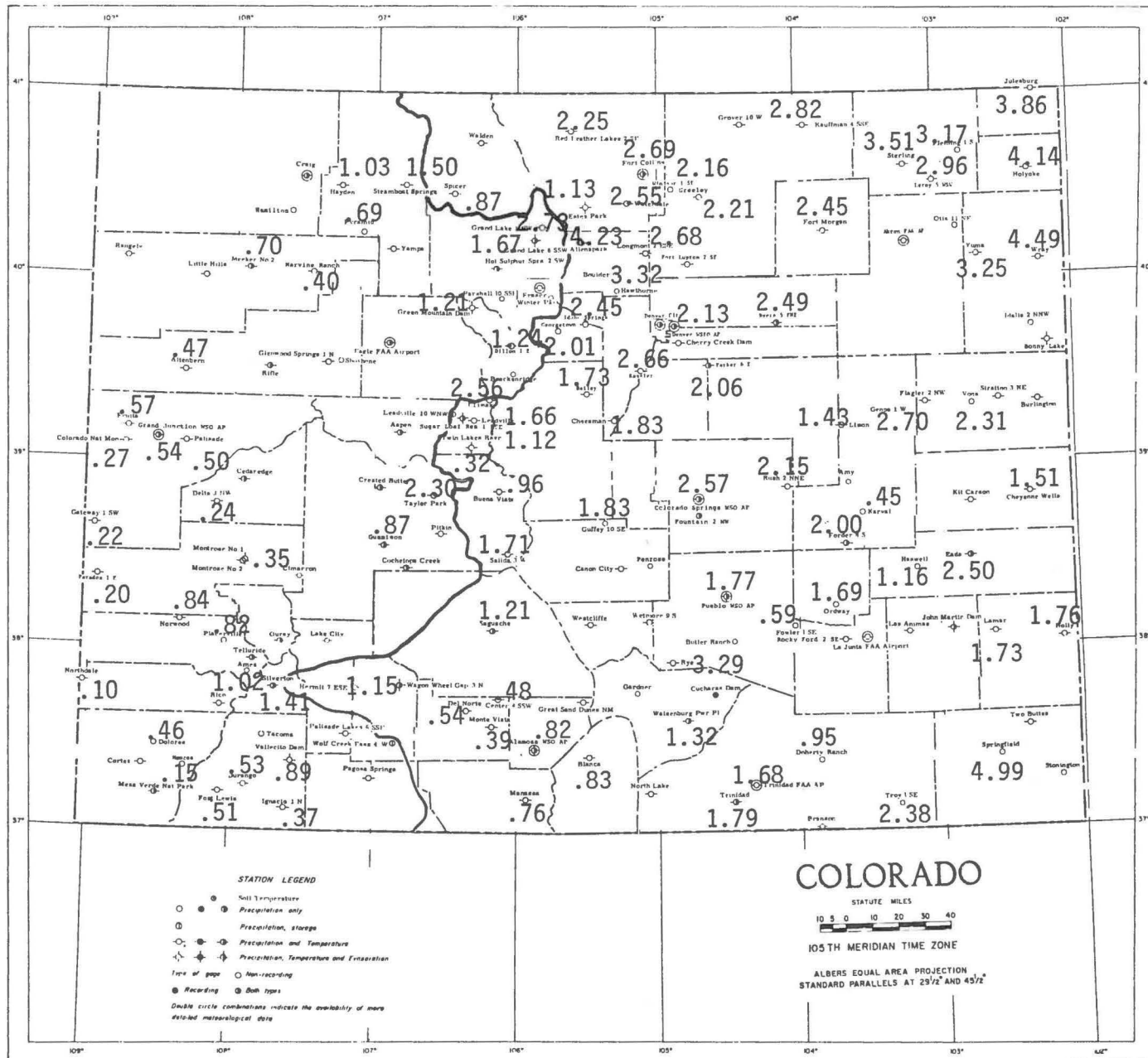


Figure 2. - Precipitation for April 1977 as percent of average (1951-1970).

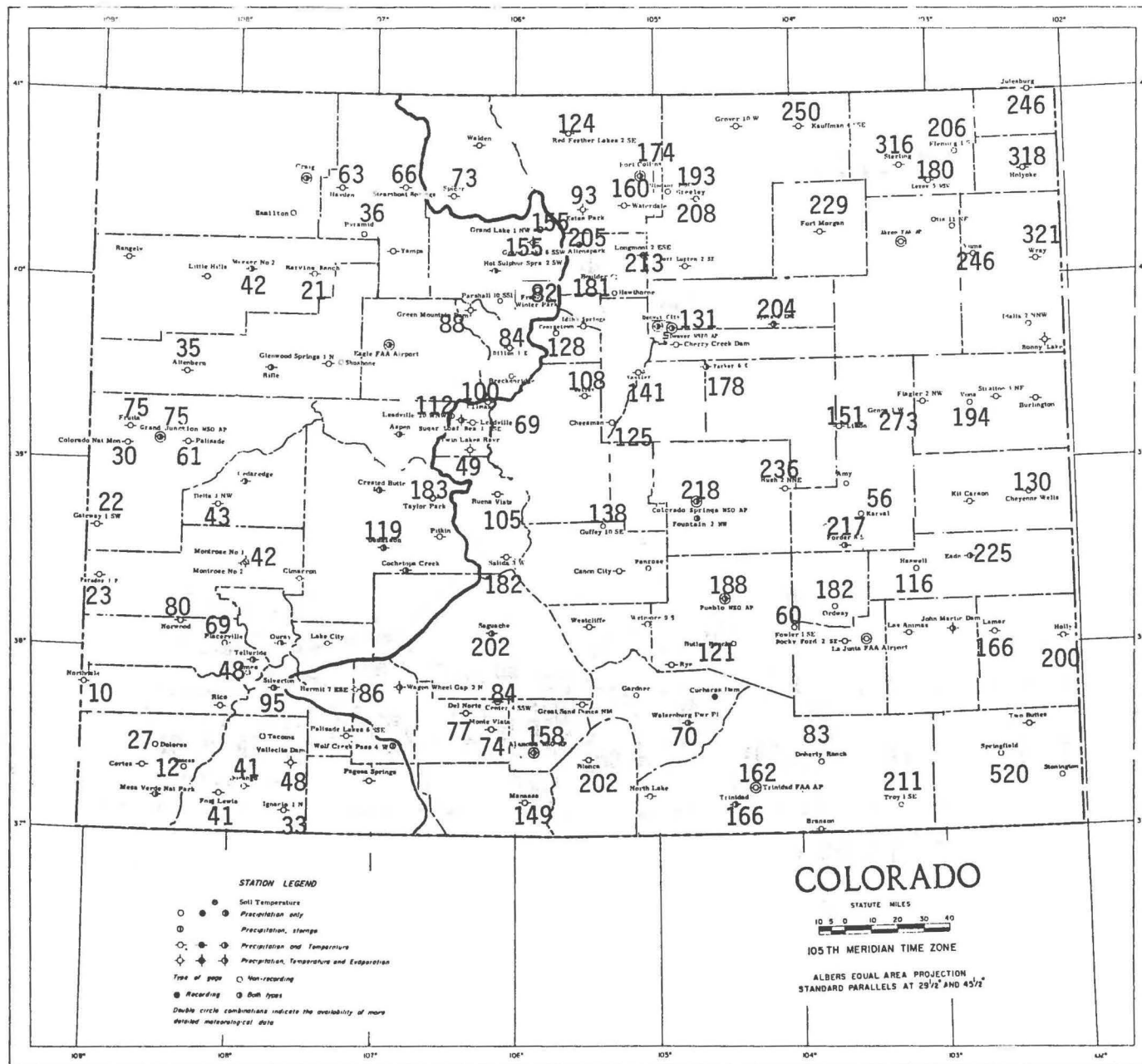
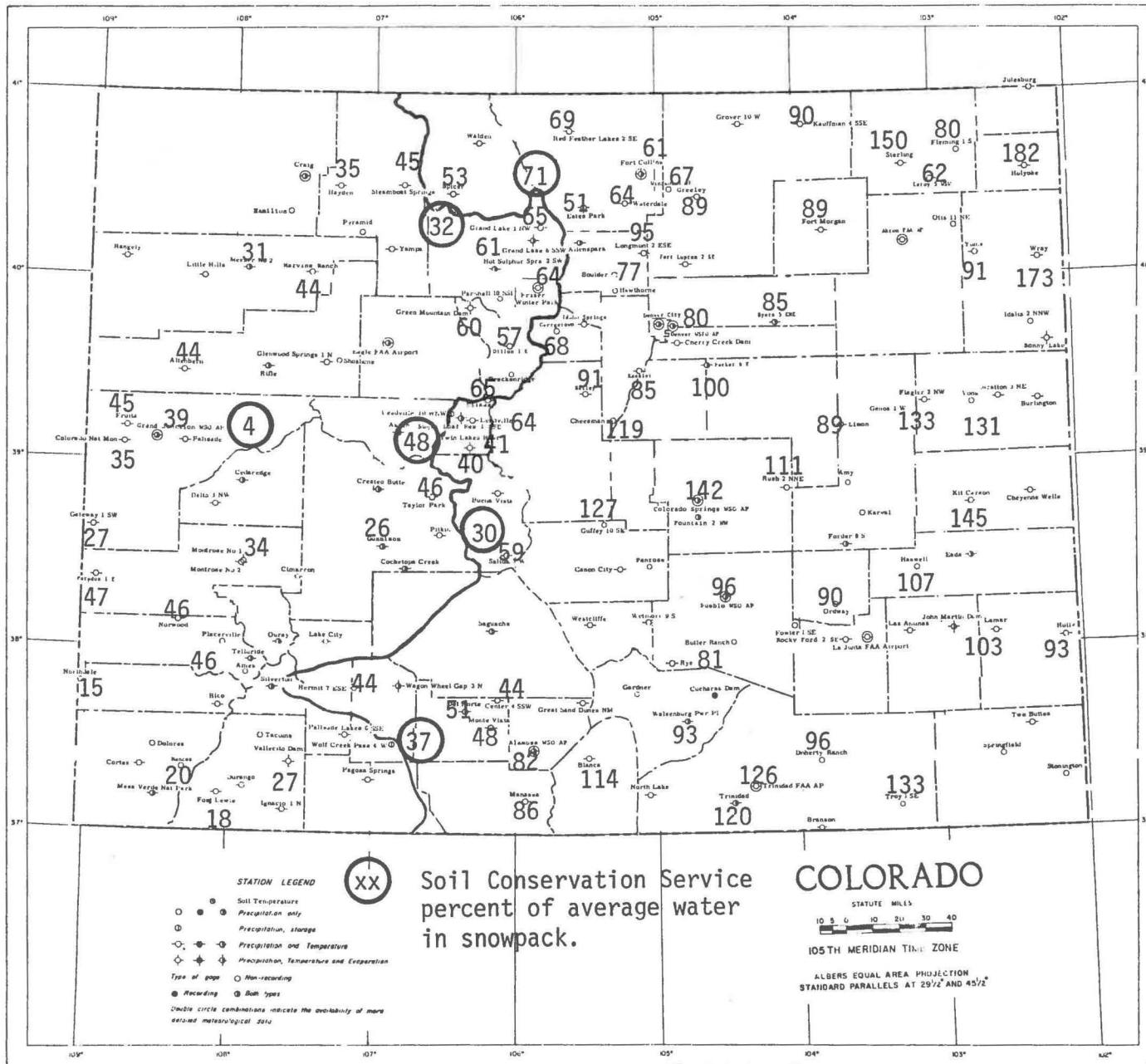


Figure 3. - Precipitation for period October 1976 through April 1977 as percent of average (1951-1970).



COLORADO CLIMATE -- MAY 1977

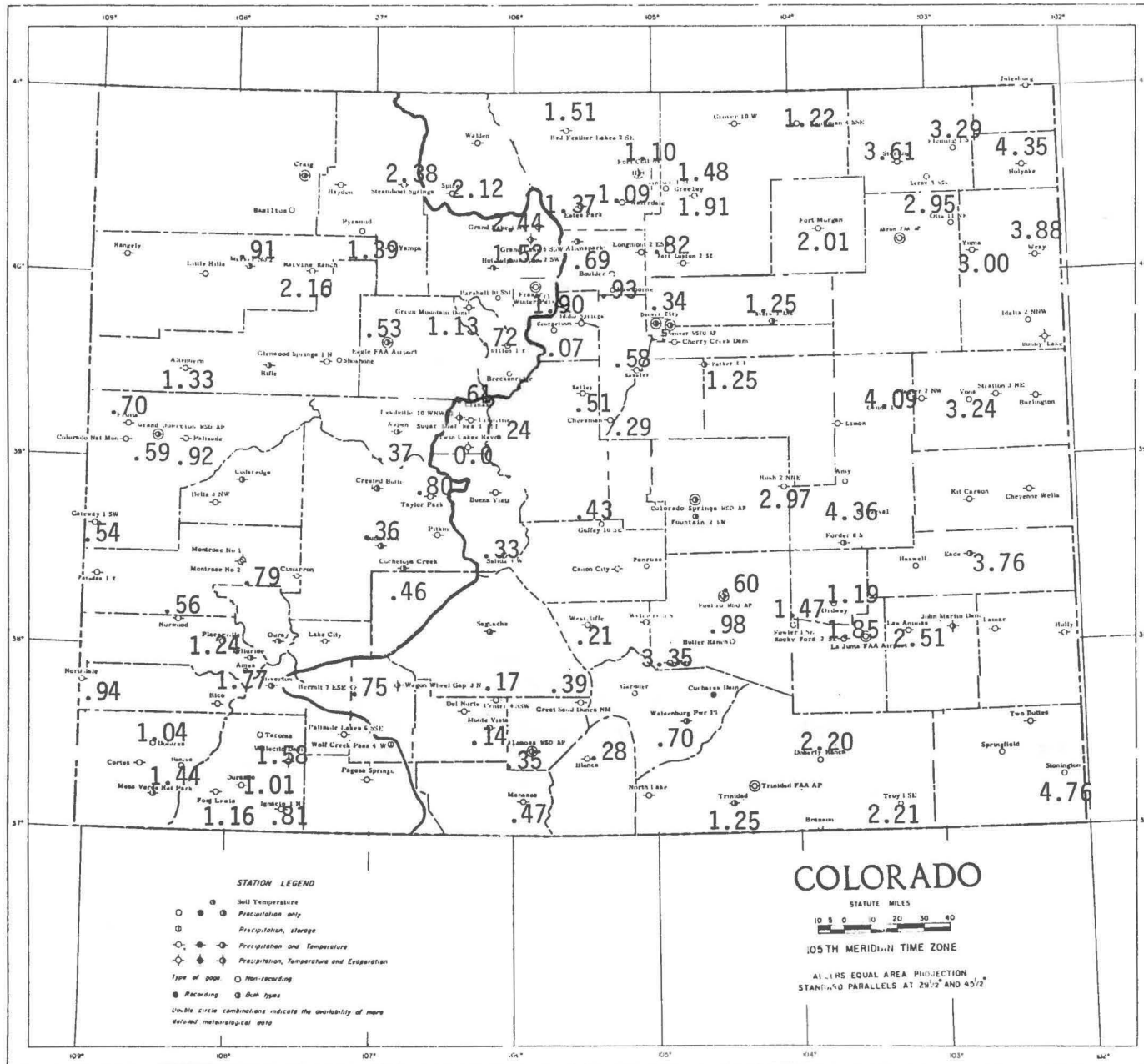
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Colorado's weather in May was highly variable. Severe thunderstorms and tornados were reported at several locations on the eastern plains. Other areas in the state received light to moderate showers.

Precipitation for the month of May is illustrated in Figure 1. As shown in Figure 2 these amounts were greater than normal for a large portion of the state except for a band of stations along the front range, in the San Luis Valley, and in the central mountains. Figure 3 shows the accumulated precipitation for the period October through May. The drought is still very real for much of the state with the southwest corner of the state remaining extremely dry with values less than 35% of normal. The plains of Colorado east of a line from Sterling to Trinidad are above normal. Typically eastern Colorado receives most of its precipitation during the months May through July and therefore the potential for a good water year is still possible. The remainder of the state west of the line from Sterling to Trinidad continues to suffer from the drought.

Average May temperature departures are shown in Figure 4. The area along the front range and eastern Colorado appear to be above average while the remainder of the state appears as below average.

Figure 1. - May 1977 precipitation amount (inches).



COLORADO CLIMATE -- JUNE 1977

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Colorado's weather for the month of June was warm and dry as the drought intensified for the western and central part of the state. Precipitation is shown for June in Figure 1 and the percentage of average is given in Figure 2. Stations reporting more than average were few and scattered in the southern and southeastern areas. Most of the state has been dry with rain resulting from showers. No widespread precipitation event occurred in the state in June. Figure 3 shows the accumulated precipitation as percentage of normal for the period October through June. No significant changes have occurred during the month of June. The region west of the Continental Divide is the worst with the northern part of the front range nearly as dry.

Figure 4 illustrates the temperature deviation for June. Temperatures were above average throughout the state. The warm temperatures produce an even greater demand on the limited water available.

Figure 3. Precipitation for period October 1976 through June 1977 as percent of average (1951-1970).

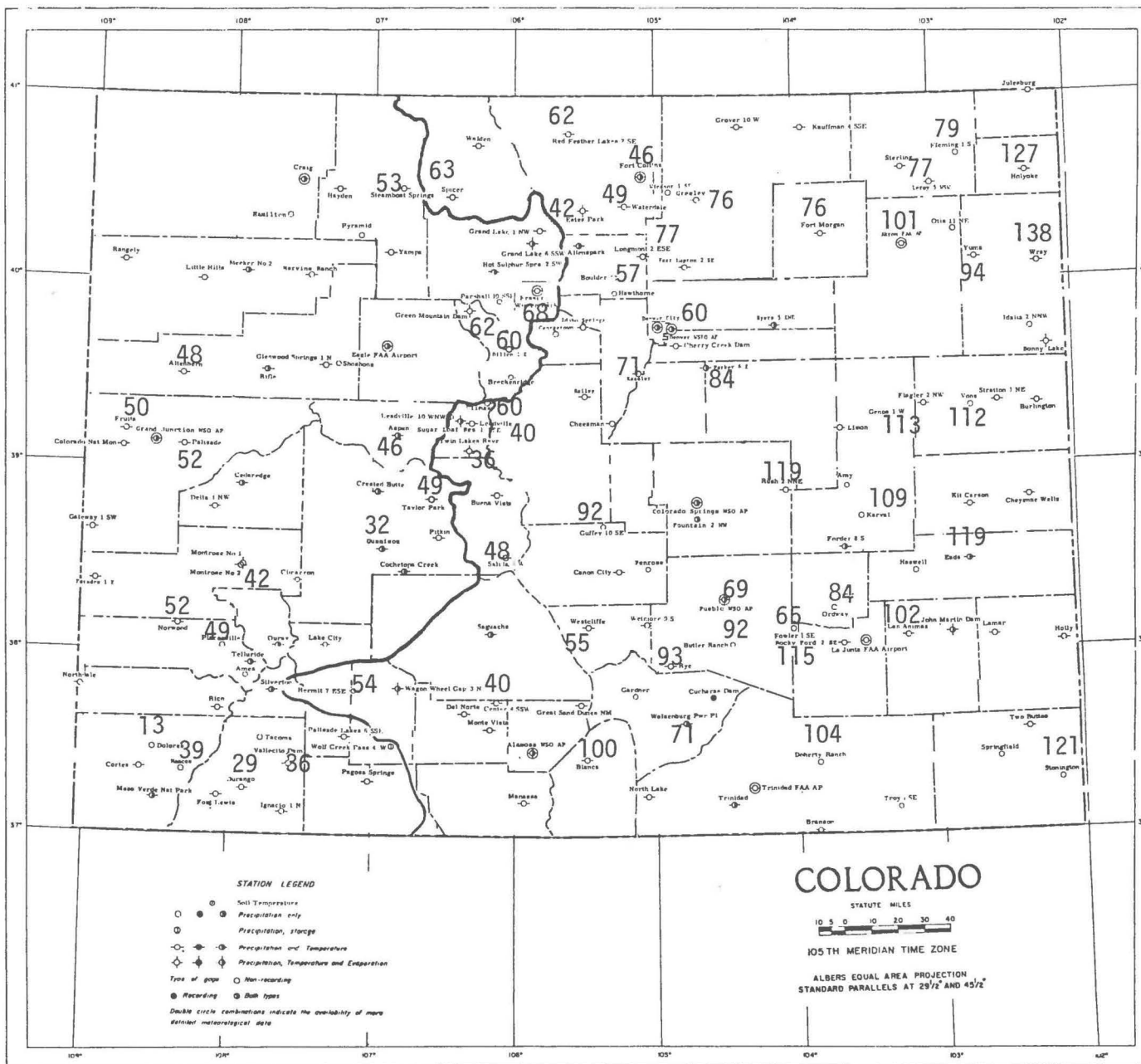


Figure 4. Temperature for June 1977 in degrees Fahrenheit above or below average (1951-1970).

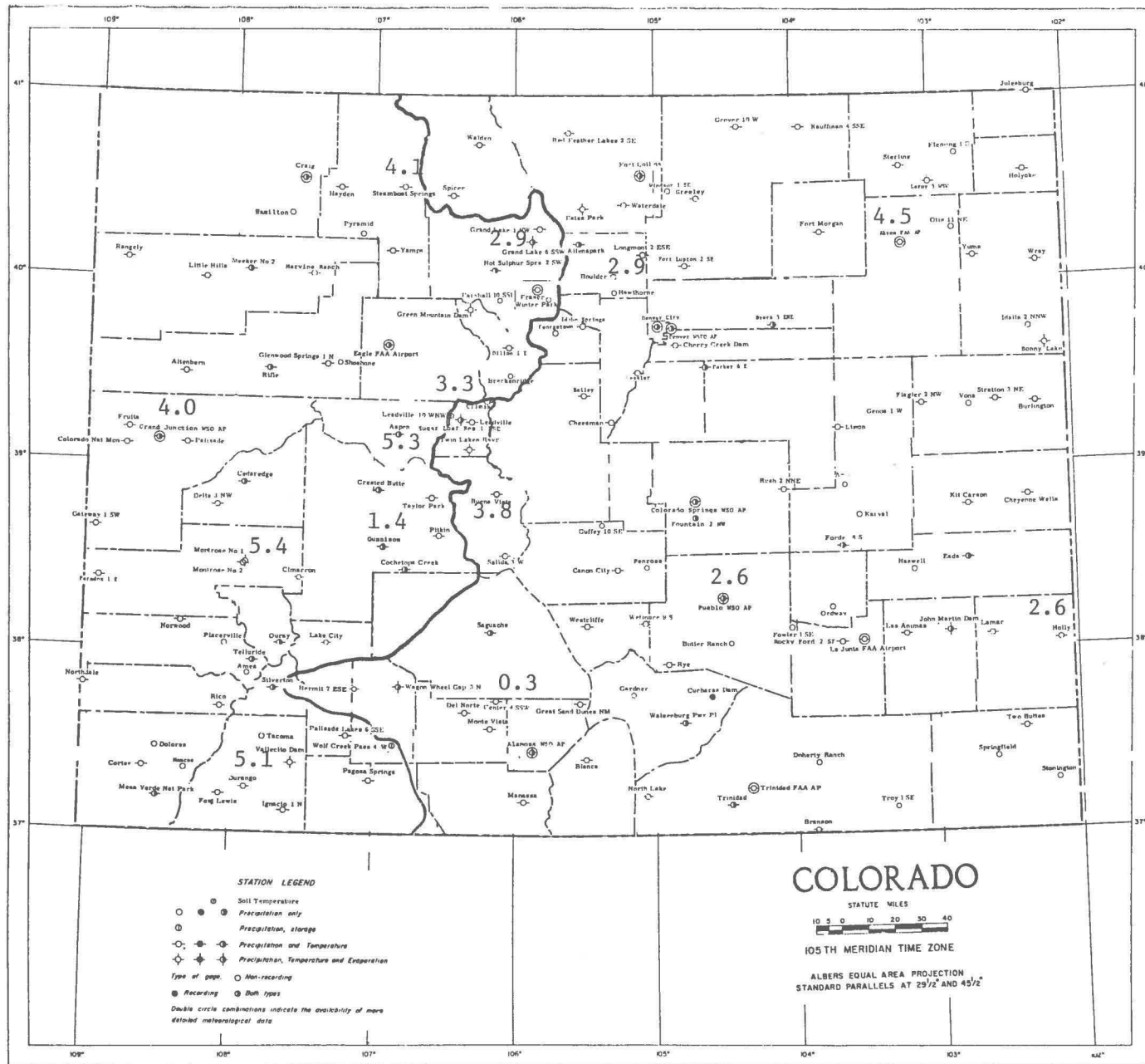
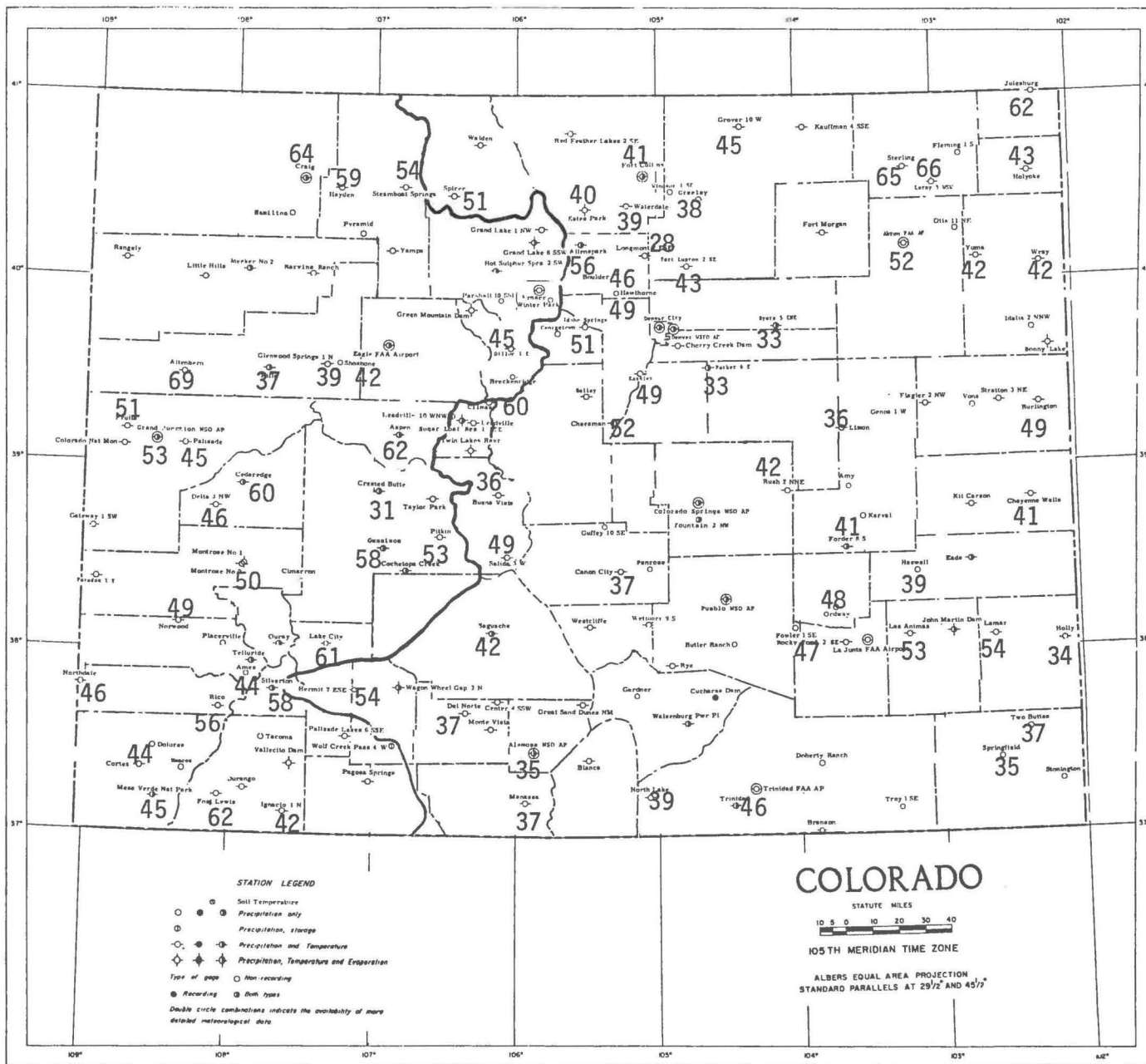


Fig. 5 - Percent of average for driest October through June period since 1931.



COLORADO CLIMATE -- JULY 1977

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Colorado's weather in the month of July provided some badly needed moisture for most of the state as shown in Figures 1 and 2. Precipitation is shown for July in Figure 1 and the percentage of average is given in Figure 2. Heavy rains were concentrated in eastern Larimer County with several unofficial reports indicating precipitation amounts of over 6 inches in 24 hours in areas north of Fort Collins. For the first time in months precipitation over the state was widespread and slightly above average. Southwestern Colorado is entering a period of normally heavier precipitation and July was a good month.

Significant changes in the accumulated precipitation as a percent of average have resulted from the July rains as shown in Figure 3. Conditions for the water year improved for nearly all stations with the northern part of the front range and the southwest corner of the state seeing the largest increases. Prior to July these areas were the driest in the state. However, the region west of the continental divide still remains extremely dry with values as low as 41% of average for the period October - July.

Figure 4 illustrates the temperature deviations for July. Except for a few stations along the continental divide, July temperatures were above average.

Figure 2 - Precipitation for July 1977 as percent of average (1951-1970).

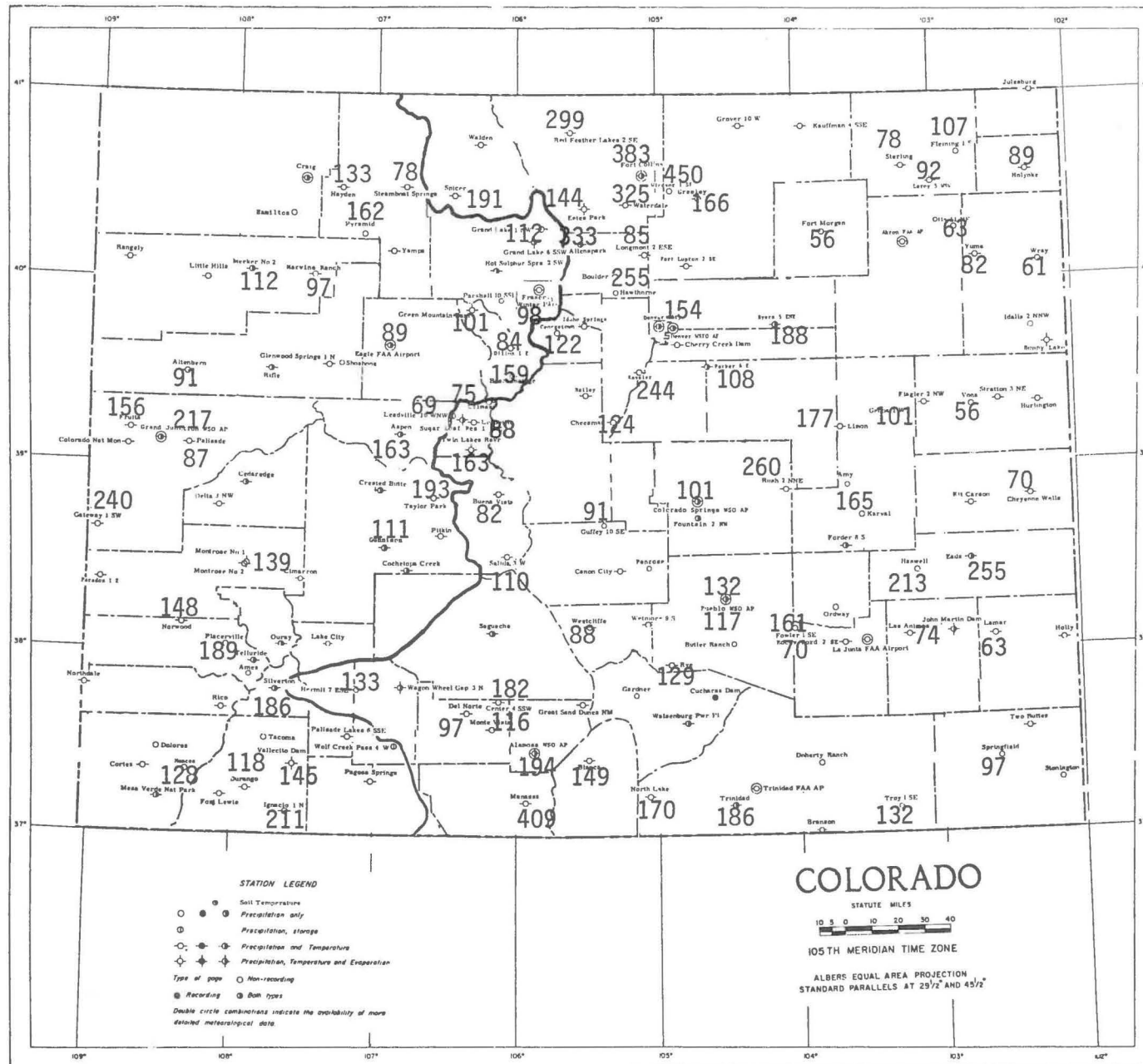


Figure 3. Precipitation for period October 1976 through July 1977 as percent of average (1951-1970).

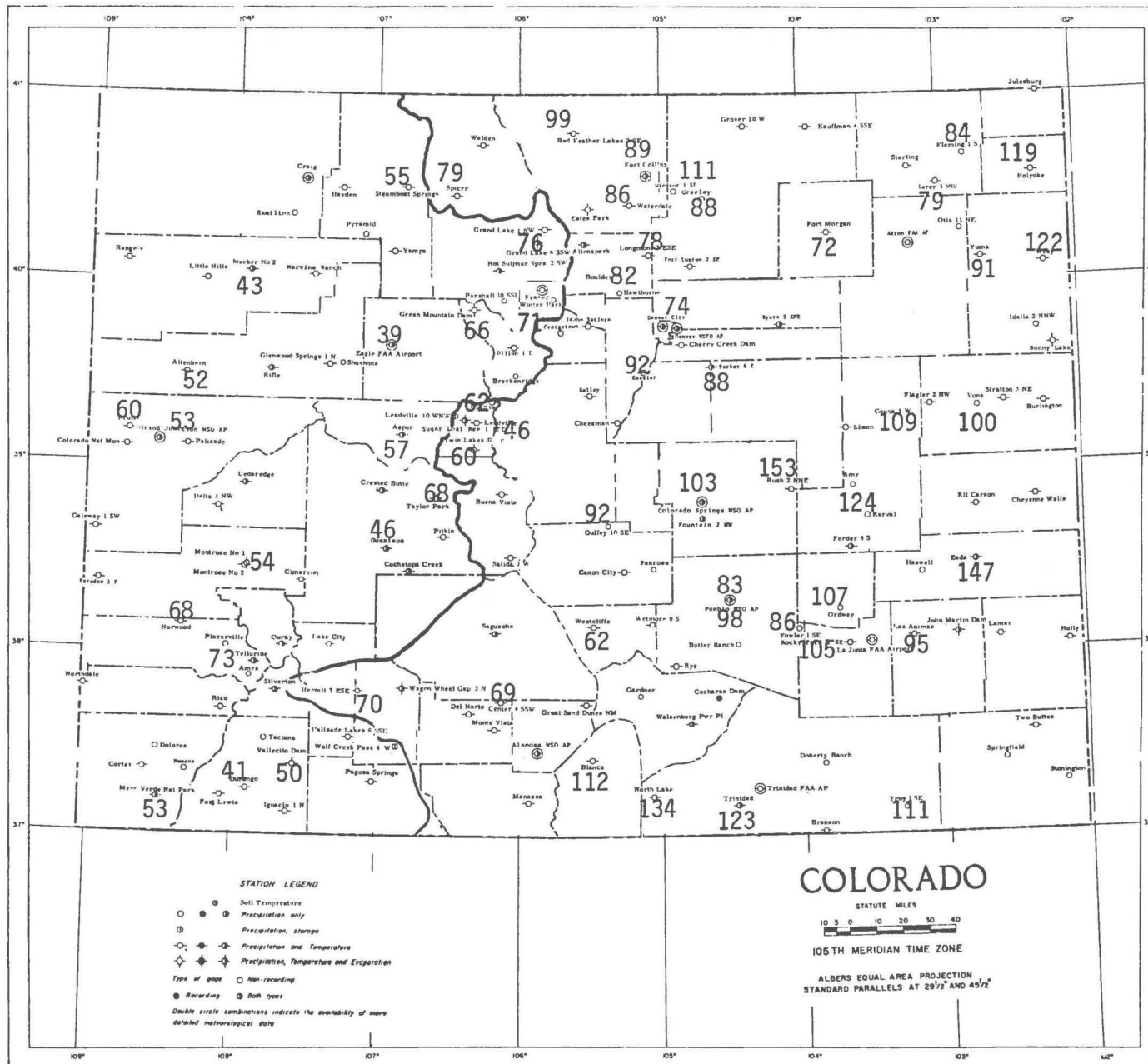
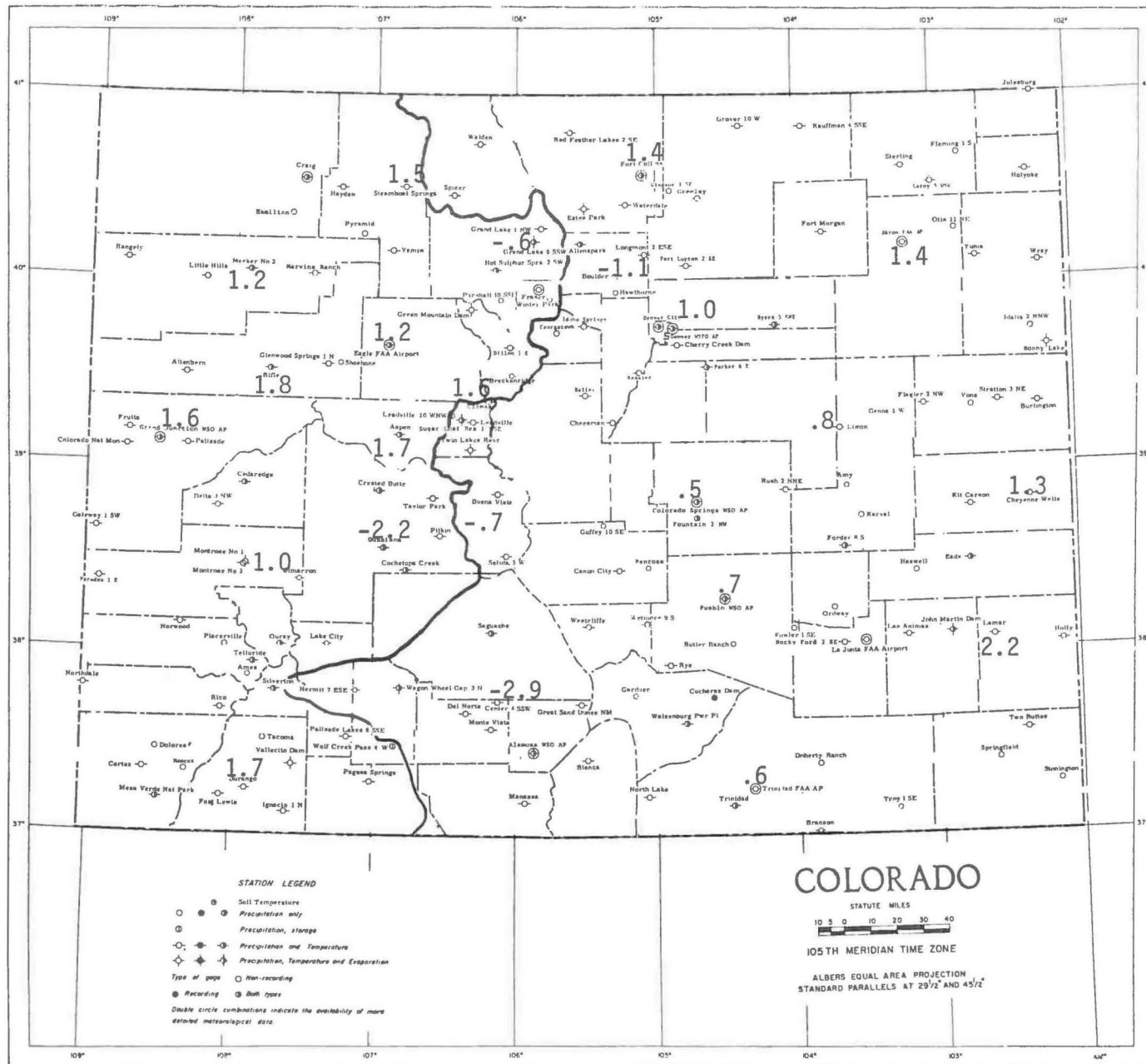


Figure 4 - Temperature for July 1977 in degrees Fahrenheit above or below average (1951-1970).



COLORADO CLIMATE -- AUGUST 1977

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Precipitation in Colorado in August was variable as part of the state was above average and part was below average. August precipitation is shown in Fig. 1 in inches and in percent of average in Fig. 2. Areas below average include the northeast except the extreme northeast corner which was wet, the San Luis Valley, the central mountains, and the Colorado River area below Glenwood Springs. The wet areas include the southeast, the northern mountains, and the southwest. The large variation with small distance such as from Green Mountain Dam to Dillon or from Fort Lewis to Durango, or from Leroy to Akron, are features associated with convective rain in the summer months. August marks the second consecutive month with above average precipitation for the drought stricken areas in the northern mountains and the southwest including the San Juans. The southeast received the most precipitation with a large area greater than 2 inches and over 5 inches at Colorado Springs and Rye. An indication of the wet month is that Steamboat Springs in the northern mountains, Vallecito Dam in the San Juan Mountains, and Pueblo in the southeast received rain on 14, 14 and 15 days of the month.

The accumulated precipitation for the period October through August is shown as percent of average in Fig. 3. Most of eastern Colorado is above average. No widespread drought has occurred in the east this summer. Isolated locations including Fort Morgan, Denver and Estes Park are far below average. A severe winter drought did occur and effects on irrigation and soil moisture are likely still present. The drought continues on the western slope with most of the area between 50% and 70% of average. The past two wet months have increased the accumulated values in the southwest corner by about 15 percent.

Temperature for August is shown in Fig. 4. The area west of the divide was warmer than average while east of the divide was cooler than average. The pattern is a reminder that generalized statements about Colorado are often not appropriate.

Figure 1. August 1977 precipitation amount (inches).

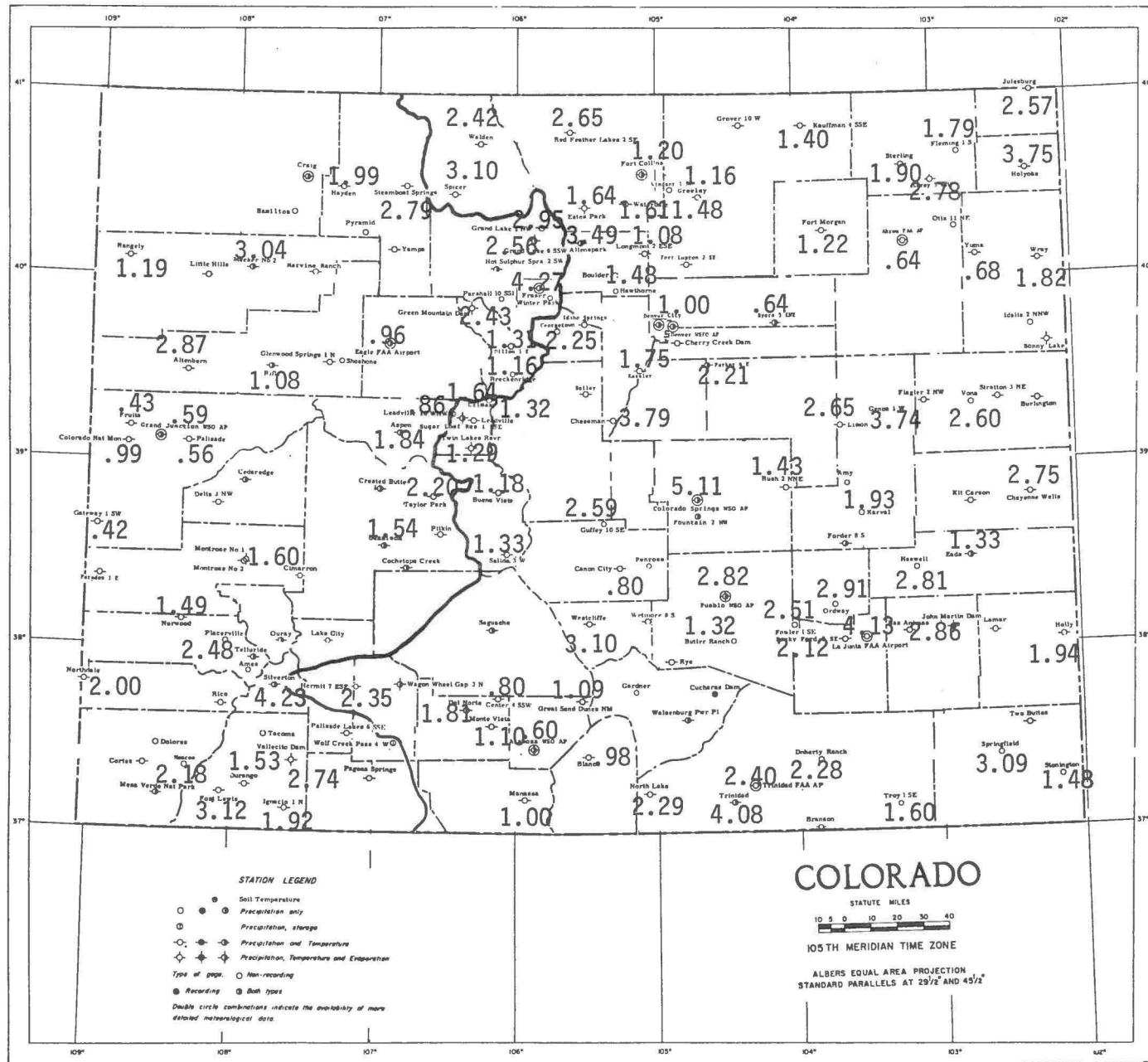


Figure 2. Precipitation for August 1977 as percent of average (1951-1970).

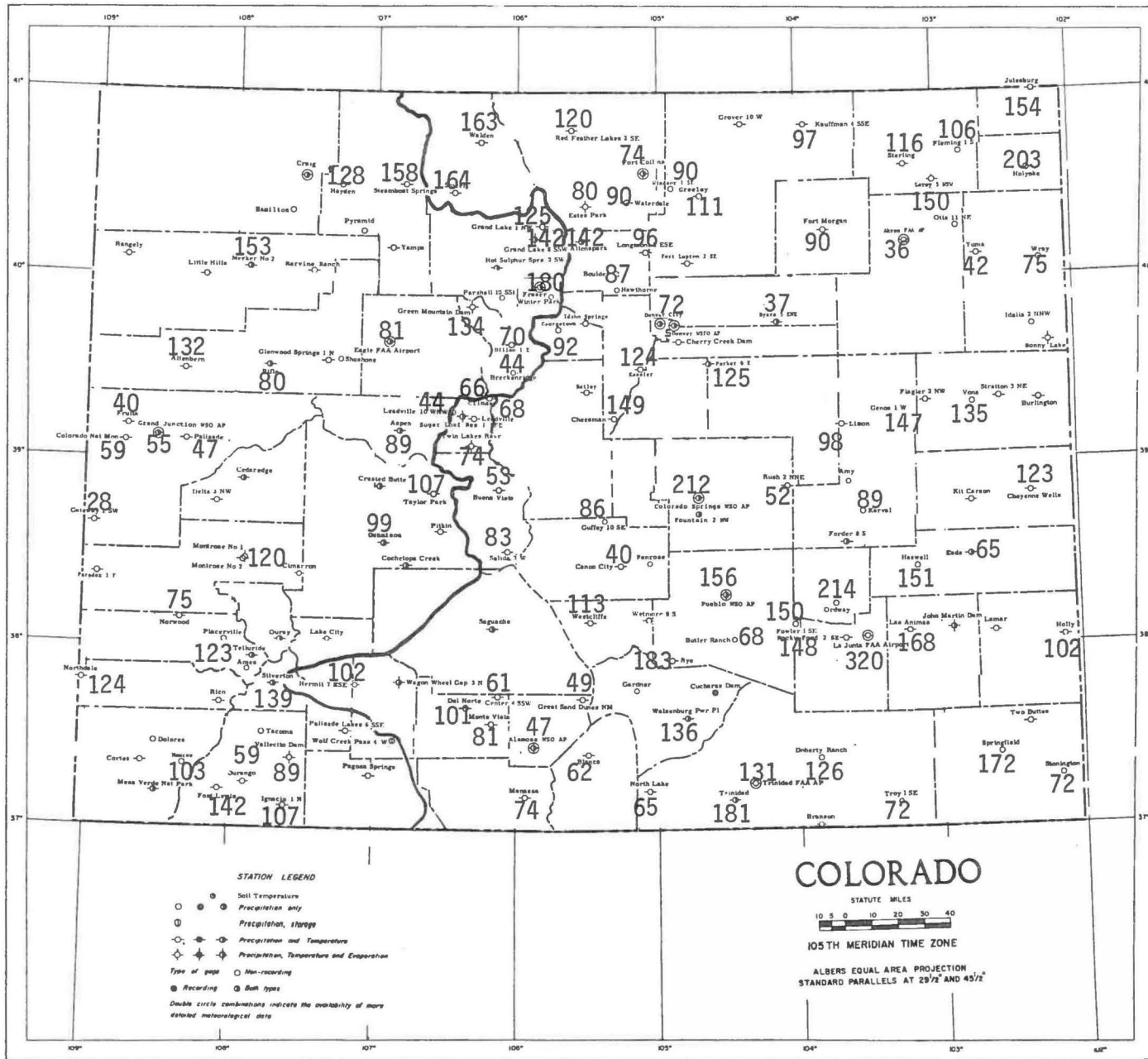


Figure 3. Precipitation for period October 1976 through August 1977 as percent of average (1951-1970).

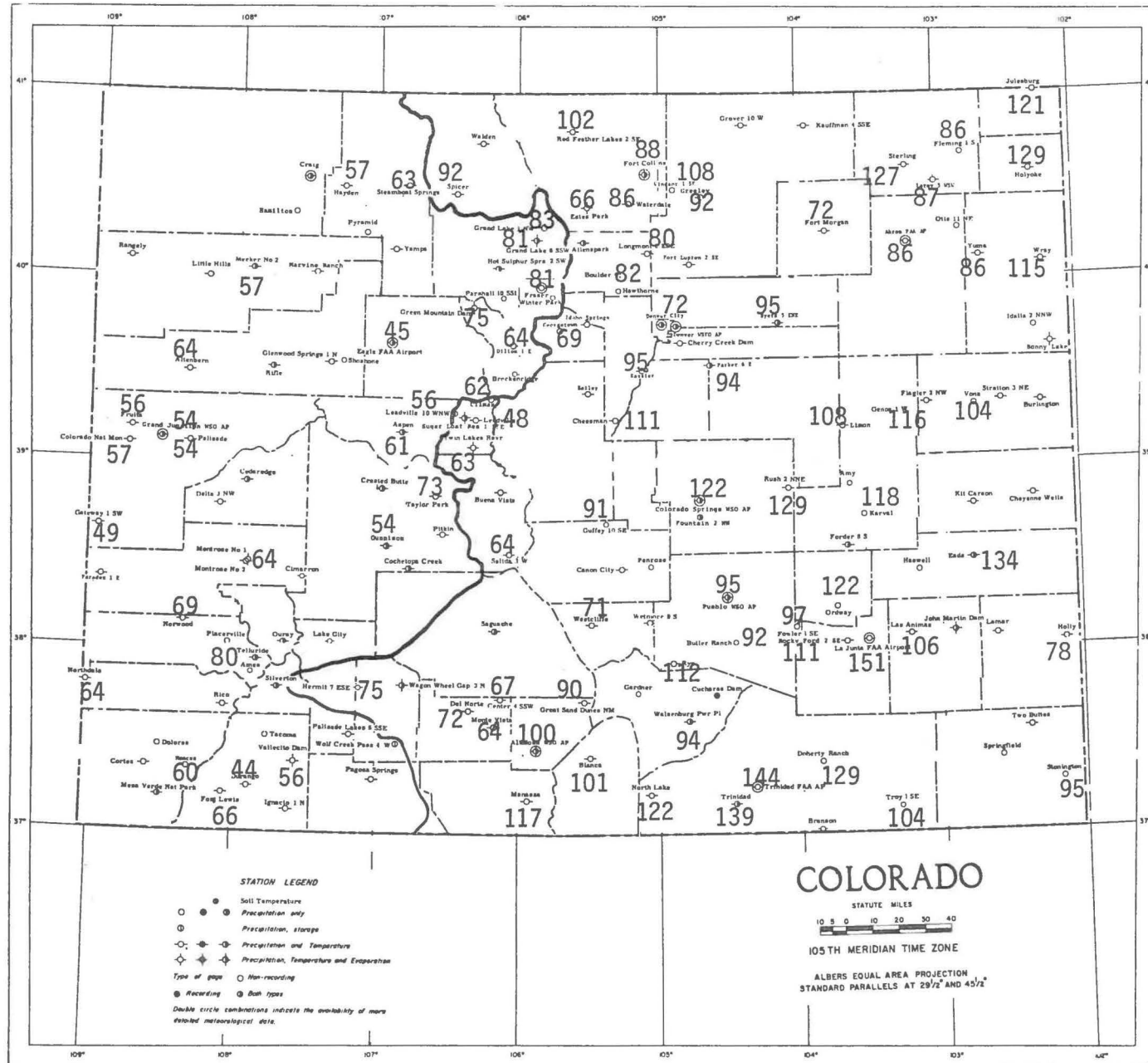
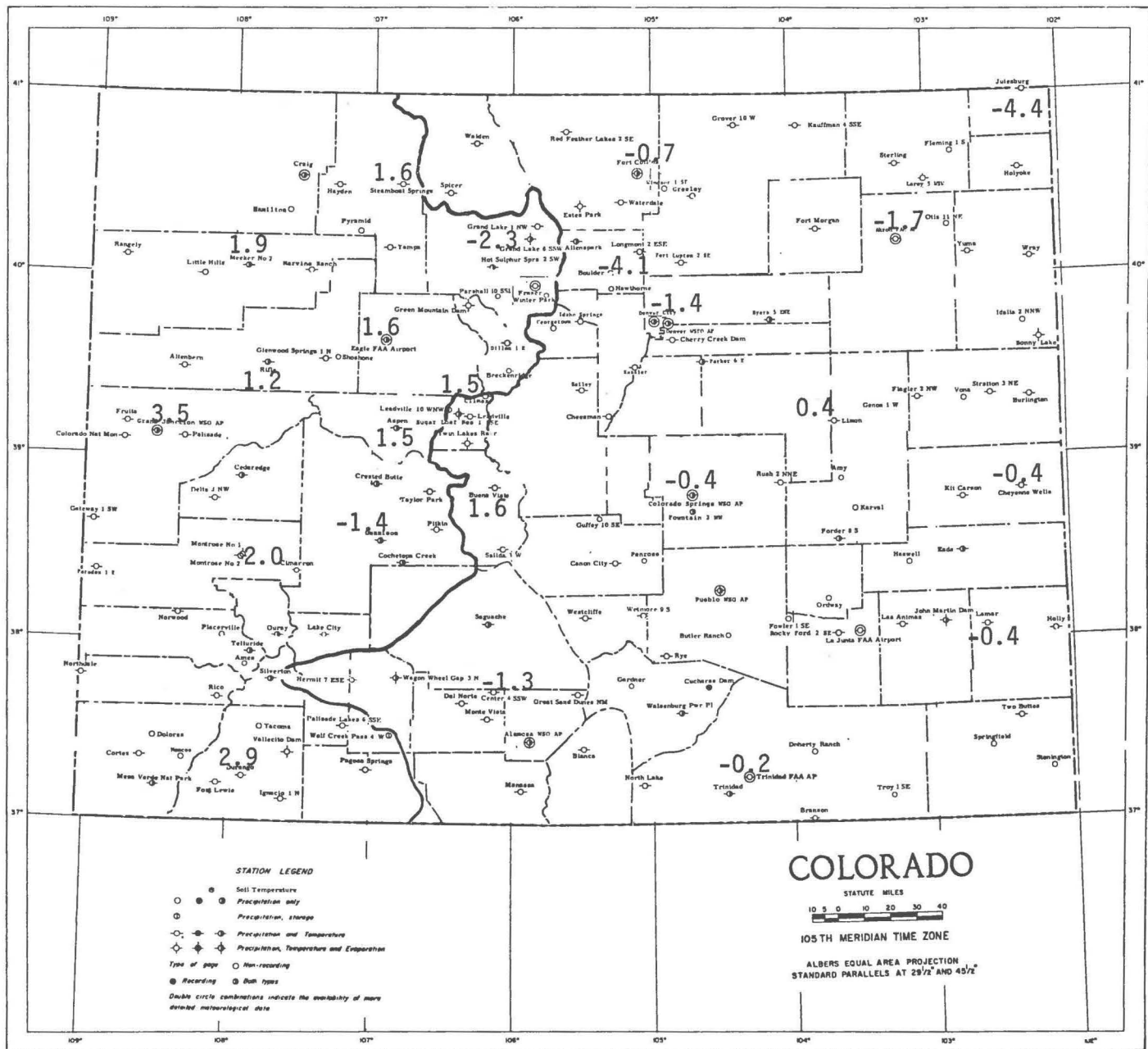


Figure 4. Temperature for August 1977 in degrees Fahrenheit above or below average (1951-1970).



COLORADO CLIMATE -- SEPTEMBER 1977

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

The current water year which began in October 1976 has been completed with the month of September. Consequently, this climate summary includes September and the past water year. Precipitation for September and the precipitation as a percent of average are shown in Figures 1 and 2. Most of the state was below average. Only the southwest area has several stations reporting above average. The eastern portion of Colorado was far below average with 11 stations reporting less than 10 percent of average. The month was also warm as shown in Figure 4 with temperatures up to 4.4°F above average.

A summary of the current water year is presented in Figures 3, 5, and 6. In Figure 3 the area west of the Continental Divide was far below average and the area east of the Continental Divide was mixed with low values in the San Luis Valley and the north and north central portions of the state. Even though a severe drought existed in Colorado this year only a few stations including Aspen, Durango, and Leadville set new minimum precipitation records. The past year is better viewed in terms of two time periods which are October through April (Figure 5) and May through September (Figure 6). The period October through April is really a measure of the winter season and many records were set this year. The summer season as a whole was not unusually dry and it contributed to a water year total which is somewhat misleading. Much of the rain in the summer period arrived too late to help the western part of Colorado in terms of the drought as it was received in the last two or three months. The winter

period was incredibly dry and a few examples of new unofficial records for the October through April period are listed in Table 1.

Table 1. Record low precipitation amounts for October 1976 through April 1977 period.

Location	Precipitation, inches 1977	Previous record and year	
Aspen	5.95	7.50	1954
Durango	2.52	3.45	1931
Grand Junction	1.84	1.97	1902
Meeker	2.95	4.33	1946
Montrose #2	1.66	2.40	1902
Steamboat Springs	6.86	8.11	1966

Overall, this past winter was the driest winter since the turn of the century for western Colorado.

Figure 1. September 1977 precipitation amount (inches).

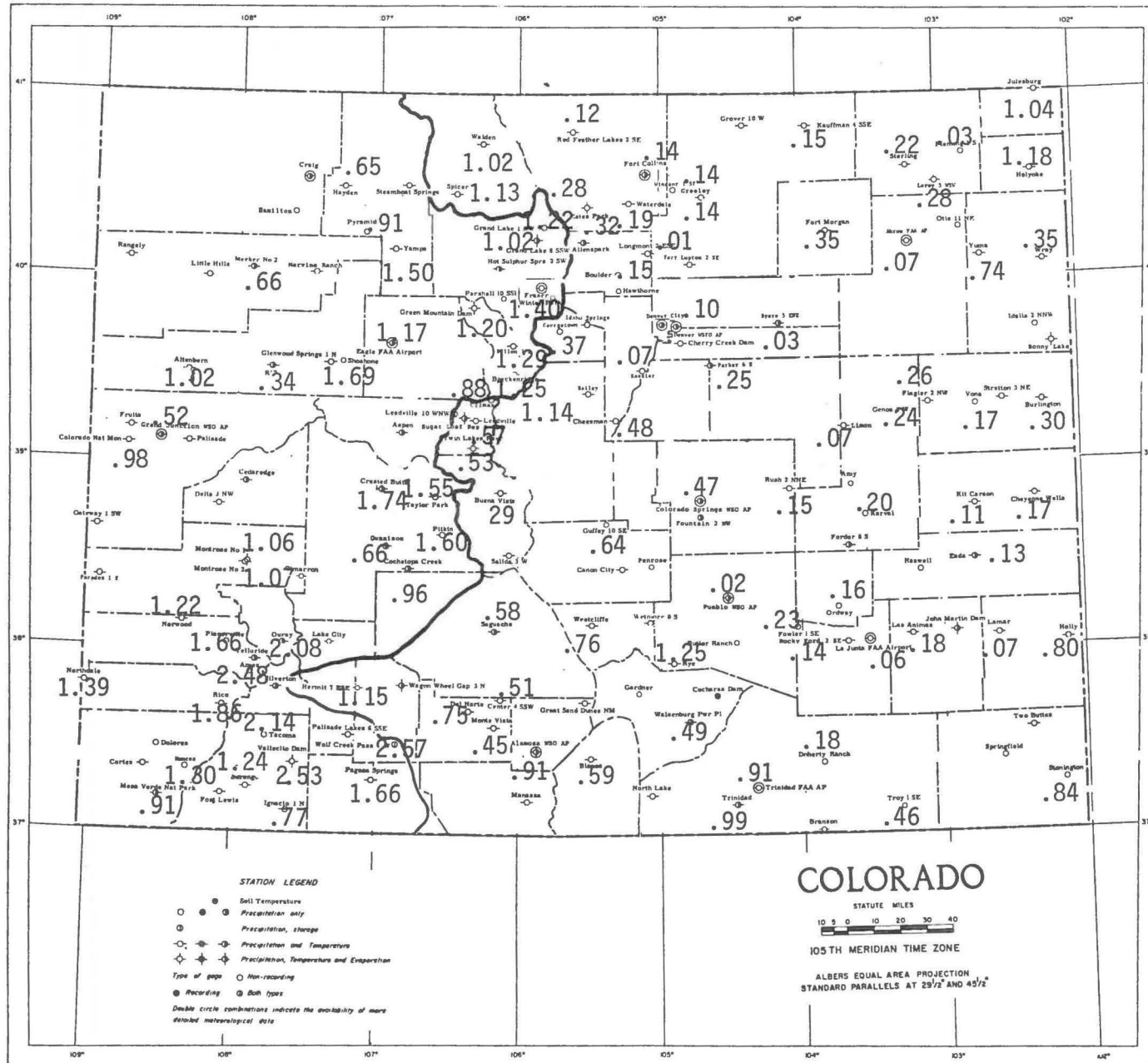


Figure 2. Precipitation for September 1977 as percent of average (1951-1970).

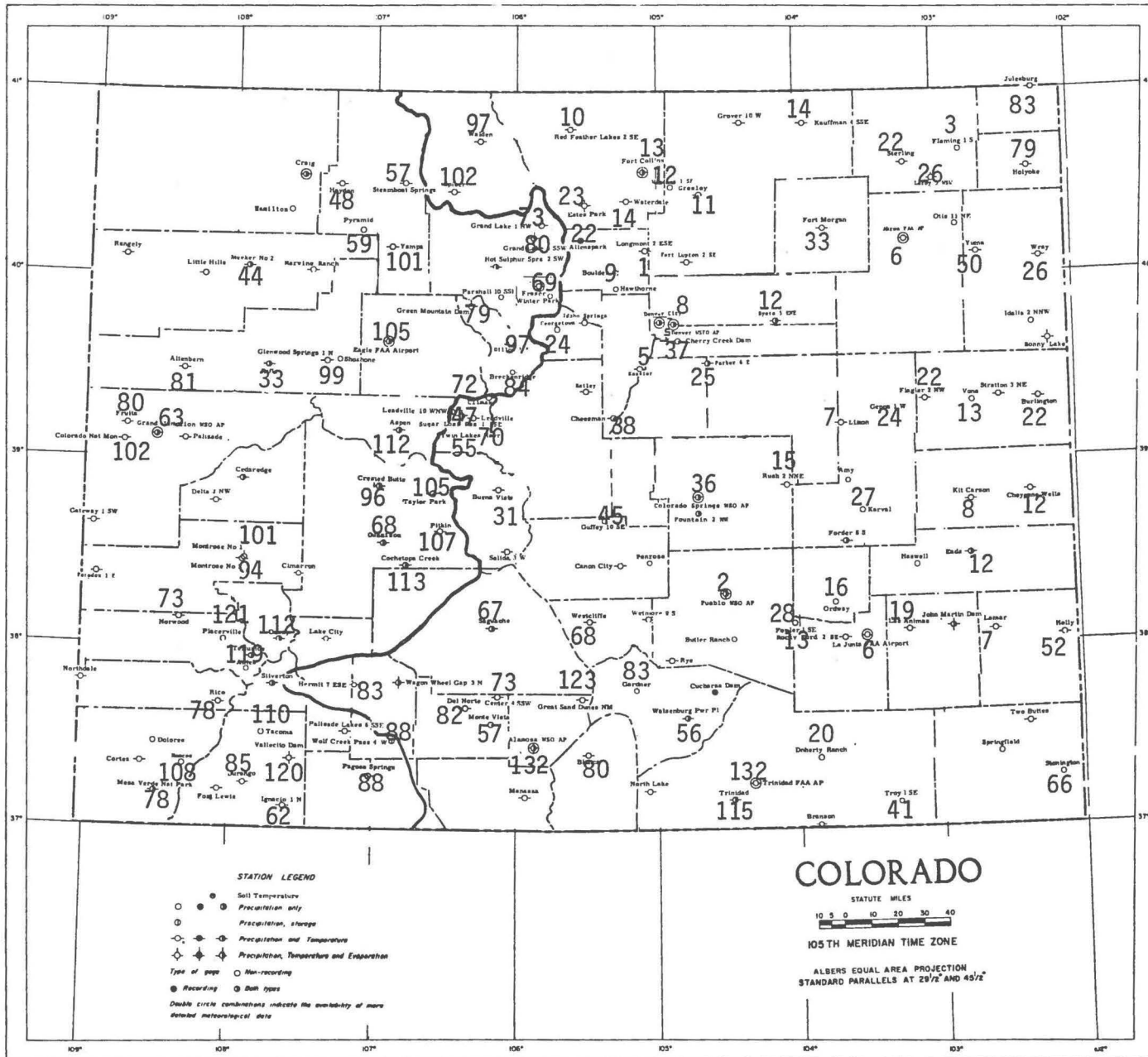


Figure 3. Precipitation for period October 1976 through September 1977 as percent of average (1951-1970).

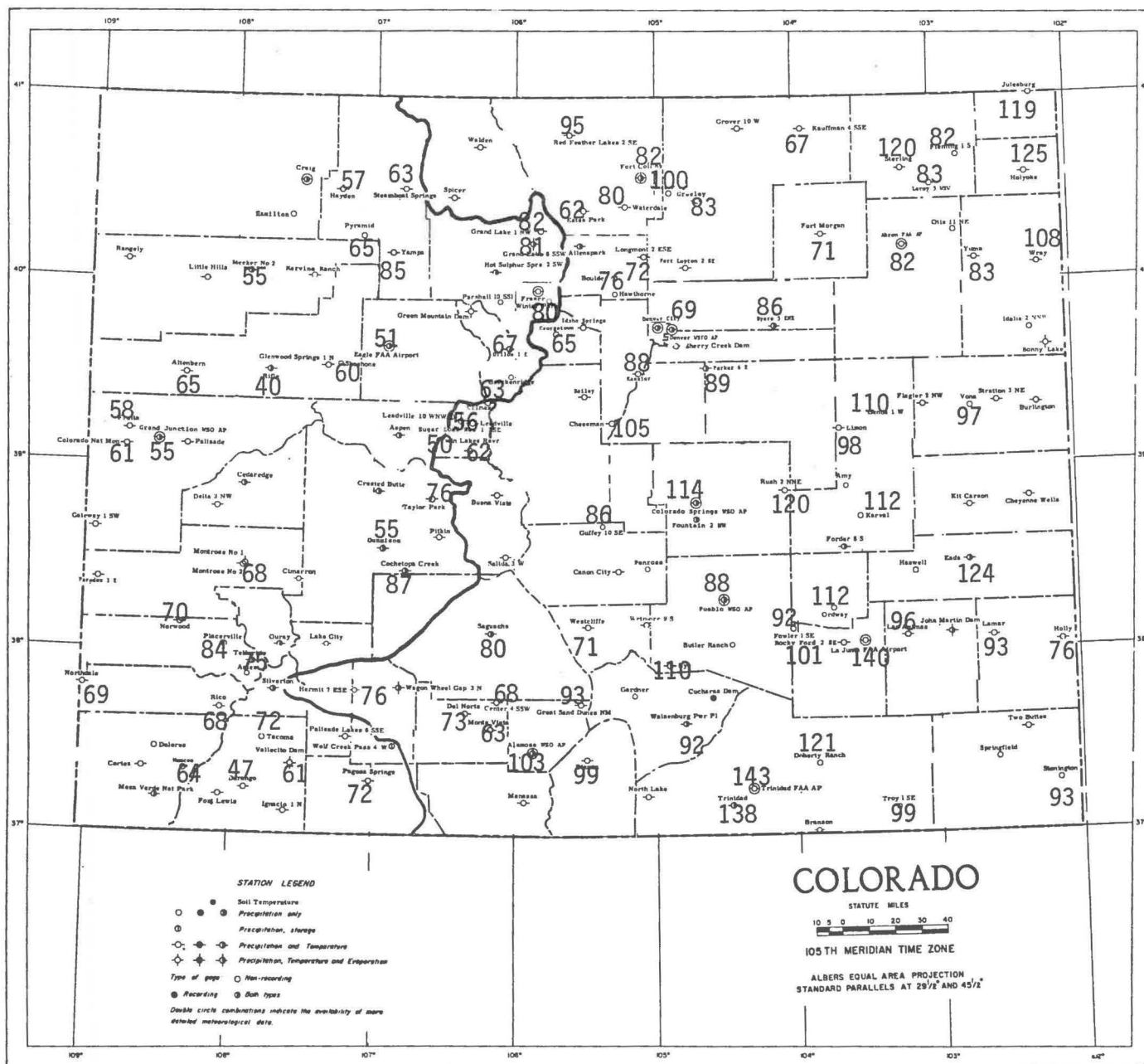


Figure 4. Temperature for September 1977 in degrees Fahrenheit above or below average (1951-1970).

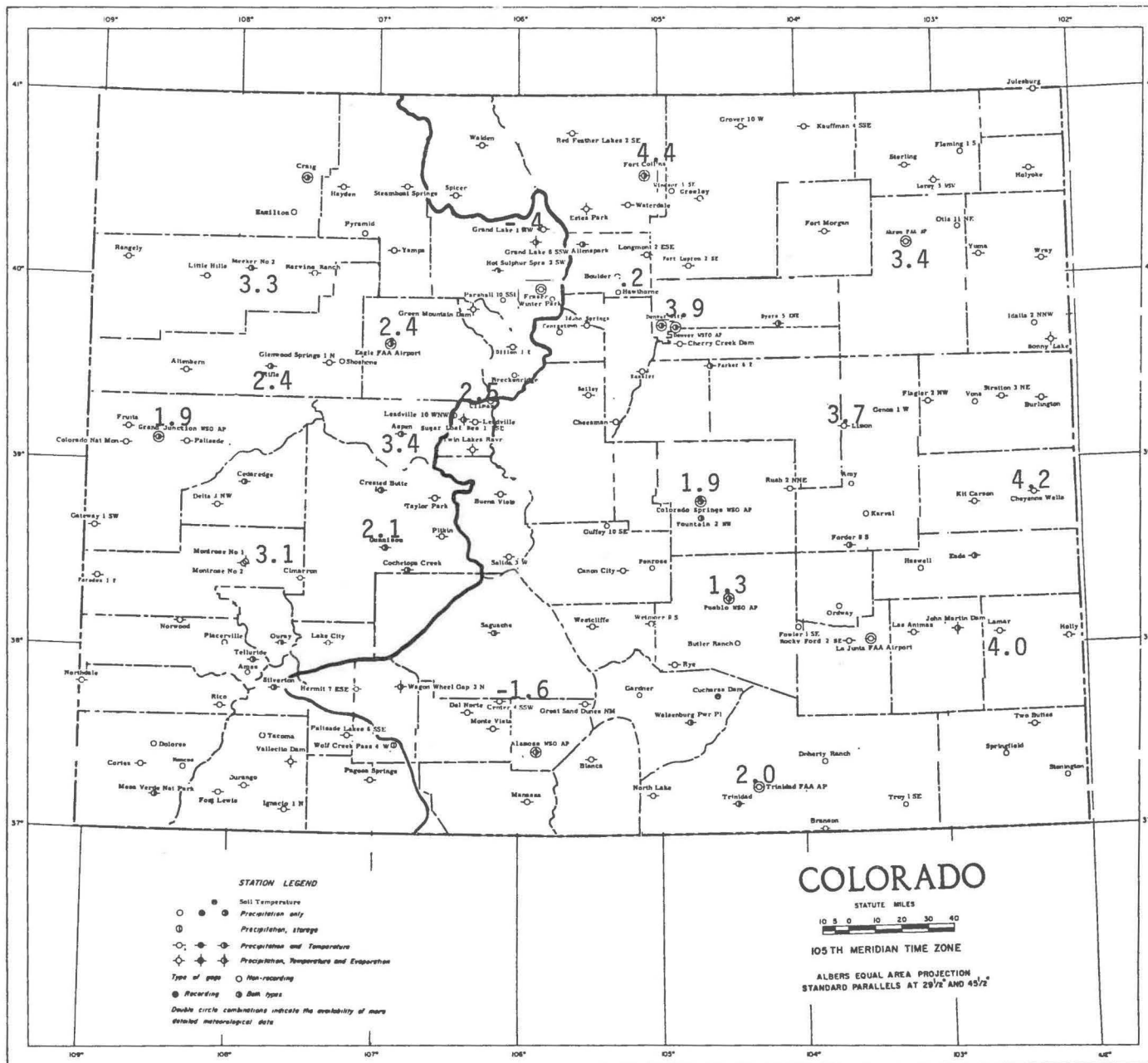


Figure 5. - Precipitation for period October 1976 through April 1977 as percent of average (1951-1970).

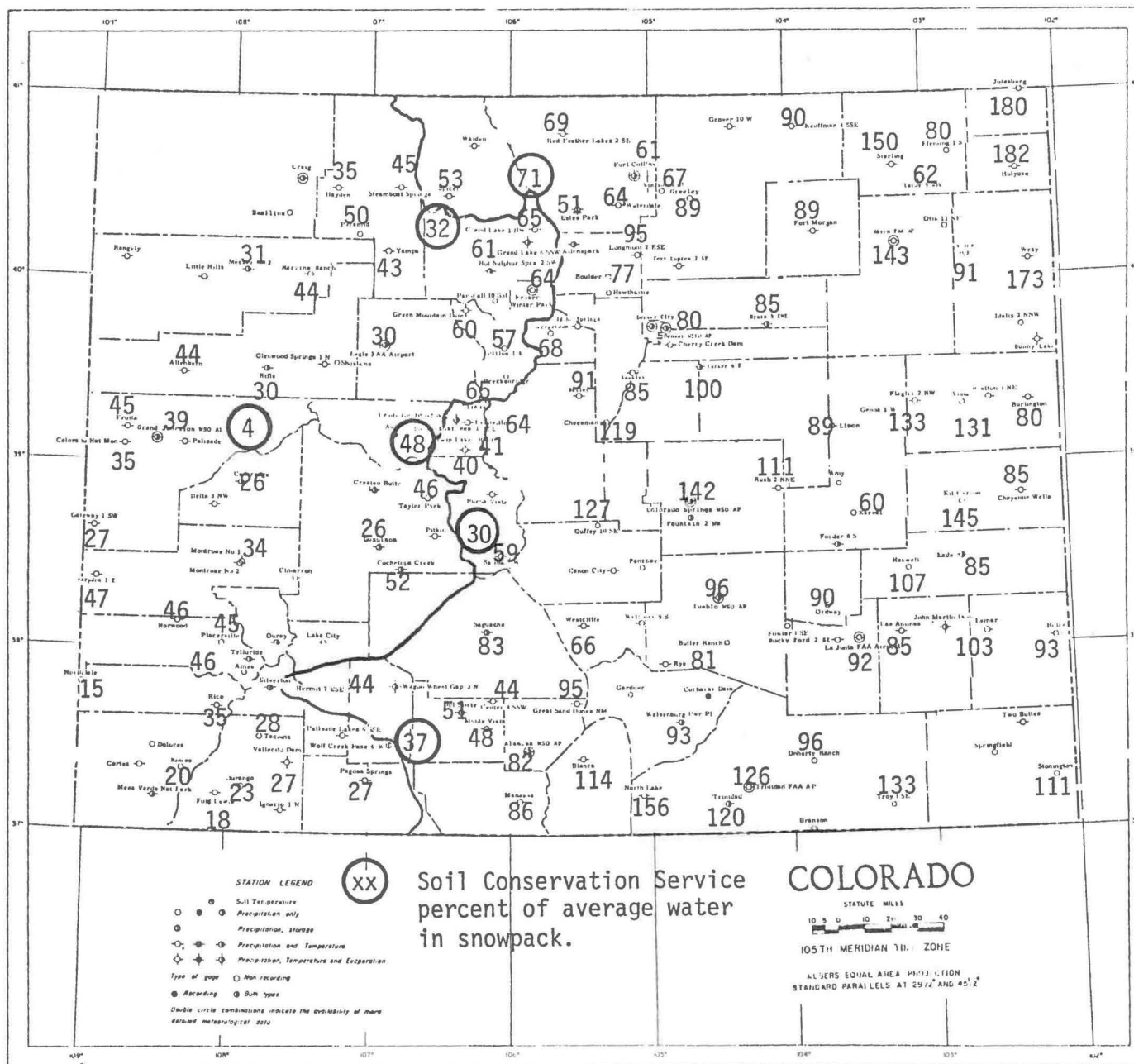
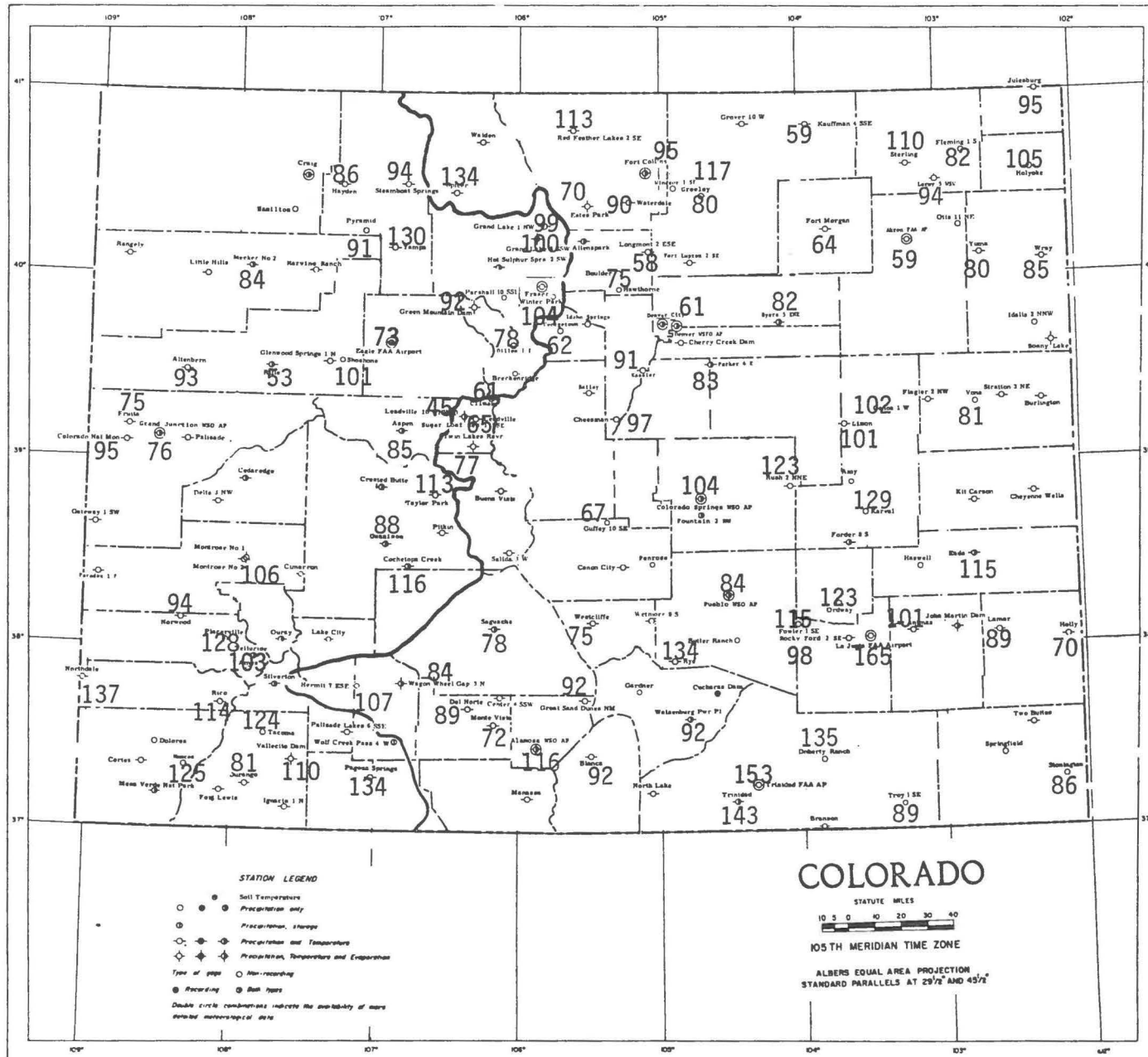


Figure 6. Precipitation for period May 1977 through September 1977 as percent of average (1951-1970).



III. The 1978 Water Year

This section is a complete month-by-month summarization of the 1978 water year.

There were several outstanding features of the 1978 water year. Very heavy snowfall occurred in parts of the mountains during the winter and generally ended the fears of widespread critical water shortages. But at the same time, parts of the eastern plains had one of their driest winters on record. Winter-like weather continued well into May as heavy precipitation finally fell statewide, with record-breaking snowfalls in some areas. This was followed by a very dry summer across all but the eastern one-third of Colorado, and again raised fears of drought.

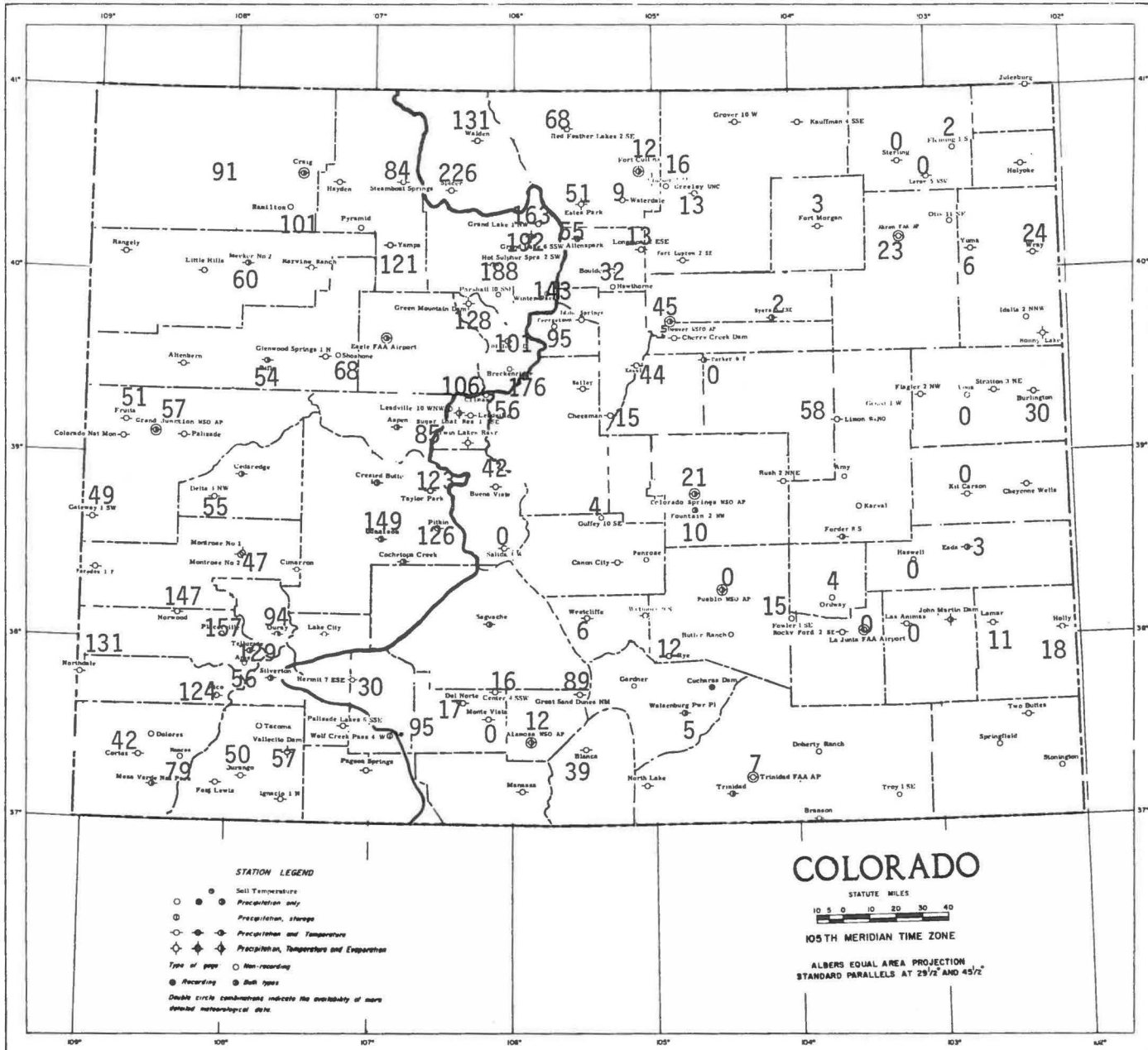
COLORADO CLIMATE -- OCTOBER 1977

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

October is the first month of a new water year and is a transition month as summer has ended and winter is approaching. Large variations in precipitation and temperature are not unusual for October. Precipitation during October was primarily received from three storms which occurred during the first week from the 4th through the 8th, in the middle of the month on the 21st and 22nd, and at the end of the month on the 30th and 31st. The precipitation and precipitation-as-a-percent-of-average are shown in Figures 1 and 2. The area east of the Continental Divide was extremely dry with much of the area receiving little or no precipitation. The mountains are an entirely different story as the northern, central, and southern mountains received above average precipitation. The southwest corner of the state and the west slope at lower elevations received about 50% of average precipitation. An example of the importance of the storm events when they occur is at Taylor Park in October when 1.30 inches out of a total of 1.40 inches were received in the period October 4 through October 7. October 1977 was much wetter in the mountains than October 1976 when the mountains west of the Continental Divide received 50% of average or less.

The month of October was unusually warm for the entire state. Temperature deviations from average are given in Figure 3. The warm temperatures produce many effects including delightful weather, low heating costs, rapid melting of snow in the mountains, and increased loss of water through evaporation.

Figure 2. Precipitation for October 1977 as percent of average (1951-1970).



COLORADO CLIMATE -- NOVEMBER 1977

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

Strong winds and mountain snows occurred during much of the last half of November 1977 in Colorado. Mine's Peak, west of Denver near Berthoud Pass, recorded an average wind speed for the month of 35.2 mph. That made it the windiest November there since records began in 1968. A wind gust at Boulder on the 26th was clocked at 92 mph. Higher elevation stations in the central mountains recorded snowfall nearly every day for the last two weeks of the month. An example of heavy snowfall in the mountains is the 70.5 inches received at Berthoud Pass for the month.

The winds and snow were an indication that the general weather pattern was significantly different from one year ago when little snow fell in November. Most major storm systems continued to stay north of Colorado, but moisture brought in by generally westerly winds aloft blowing stronger and steadier than one year ago contributed to a generally favorable precipitation pattern in the central and northern mountains. Figure 1 shows precipitation amounts for November 1977.

Precipitation as a percent of average is shown in Figure 2. Locations along and west of the Continental Divide received near average or above average precipitation with the exception of some lower elevation valleys. More than twice the average precipitation fell in the San Luis Valley, but most of this fell from a single storm on November 7. The precipitation pattern over the eastern plains was very disorganized. Some areas such as Fowler and Burlington received little precipitation, while other locations such as Fort Morgan and Lamar received more than the average. This type of pattern should not be considered unusual, though, because fall and winter precipitation on the plains is usually light. When showery precipitation does occur, such as the rain and snow which fell on the 1st, 8th and 19th, erratic patterns often result.

Precipitation as a percent of average for the combined period October through November 1977, the first two months of the new water year, is shown in Figure 3. Dry conditions persisted across the eastern plains. However,

along and west of the Continental Divide above average precipitation was observed, especially at higher elevations. This above average mountain snow should be viewed as good news for the entire state since it is providing early season skiing and an excellent start on winter snowpack.

Above average temperatures accompanied the mountain snows west of the Continental Divide in November. Figure 4 shows temperature deviations from the average. Temperatures across the eastern plains ranged from below average in the northeast to above average in the southern portion. Several warm periods occurred across the state. Temperatures in the 60's and 70's were observed statewide from the 3rd to the 6th. The 11th through the 16th was another warm and dry period. It warmed up again November 25 - 26. The coldest days of the month were the 20th and 21st when minimum temperatures dropped below 10°F in many areas and below zero readings were reported at higher elevations.

Figure 1 - November 1977 precipitation amount (inches).

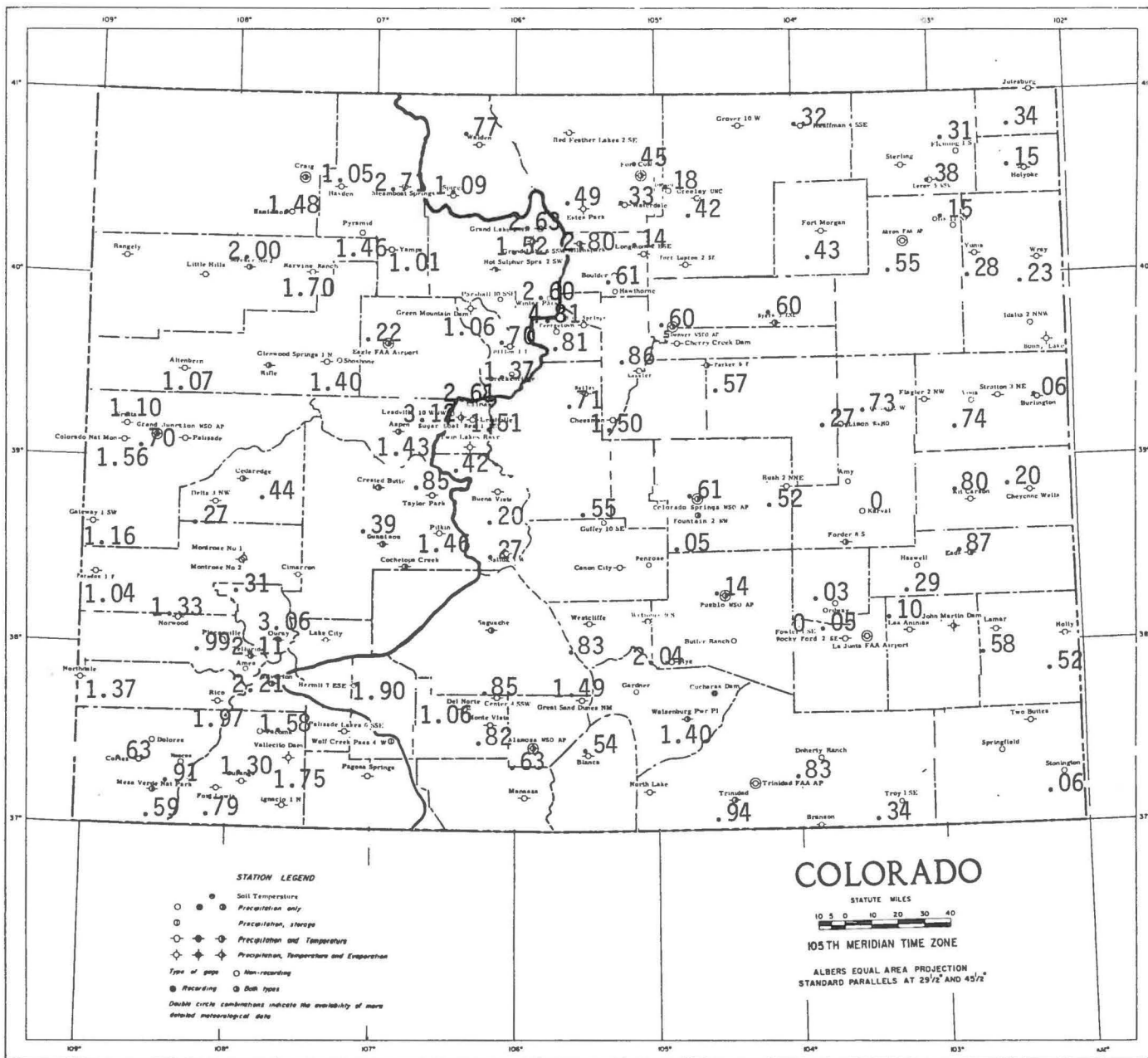


Figure 2 - Precipitation for November 1977 as percent of average (1951-1970).

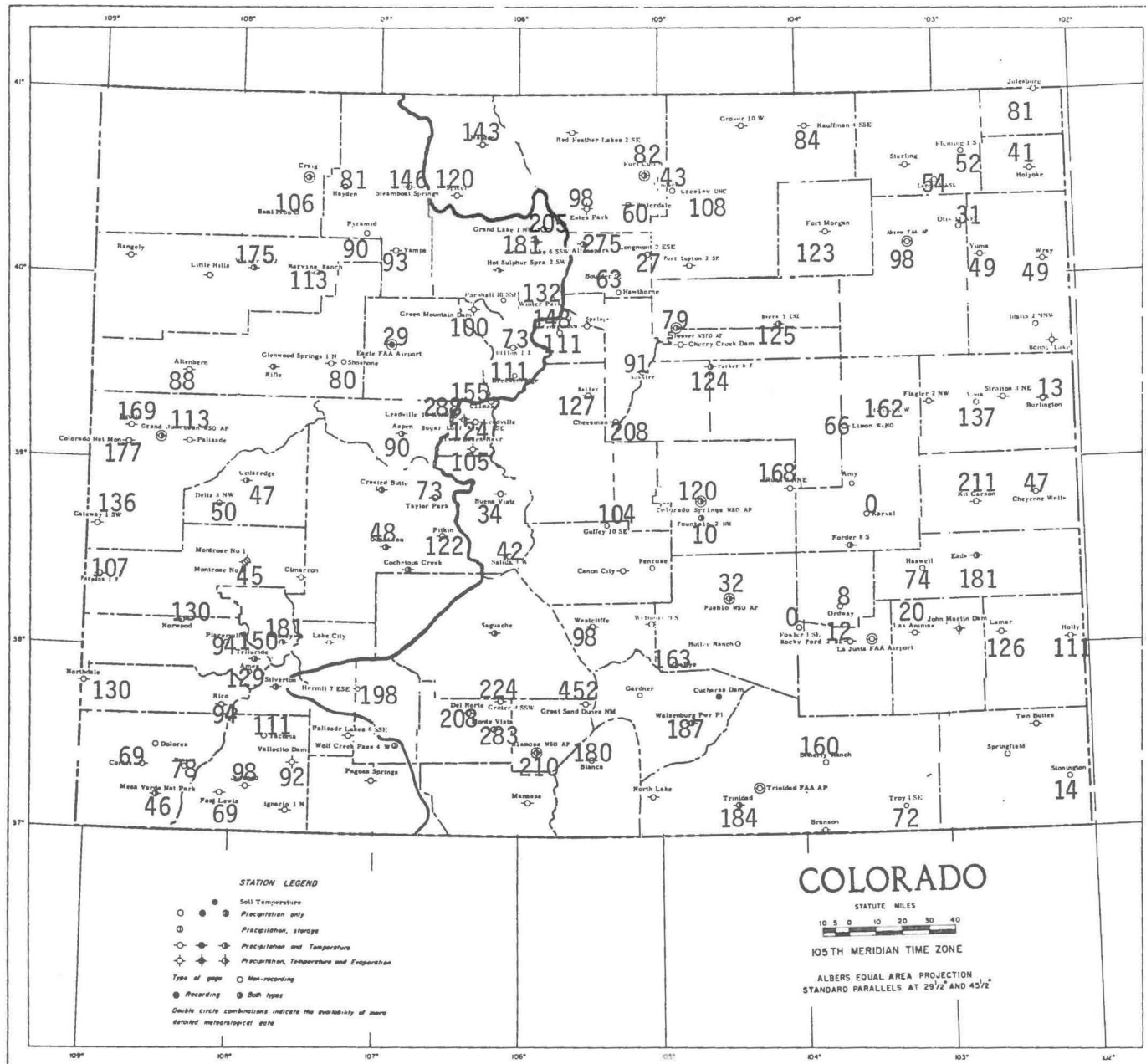


Figure 3 - Precipitation for period October through November 1977 as percent of average (1951-1970).

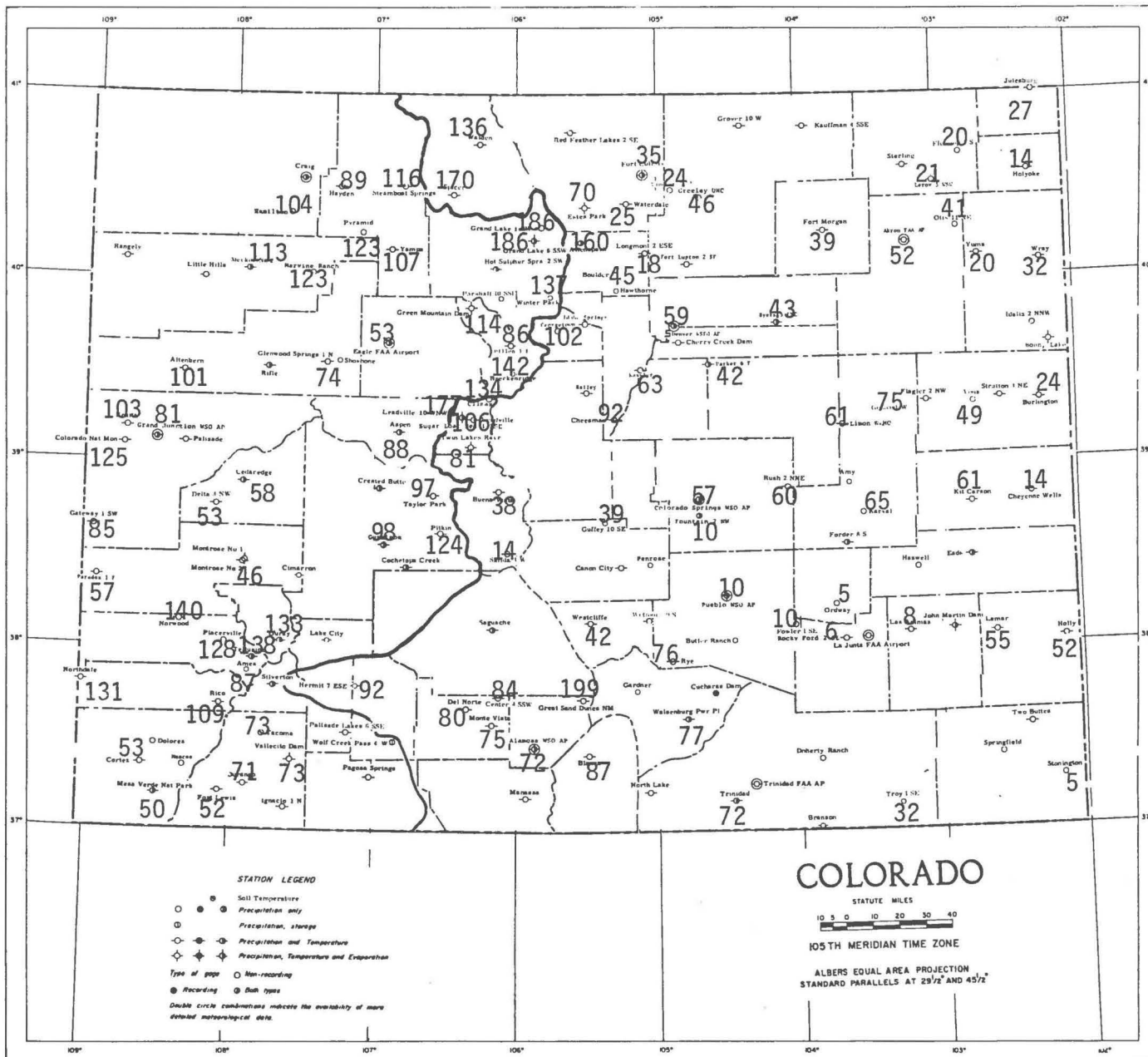
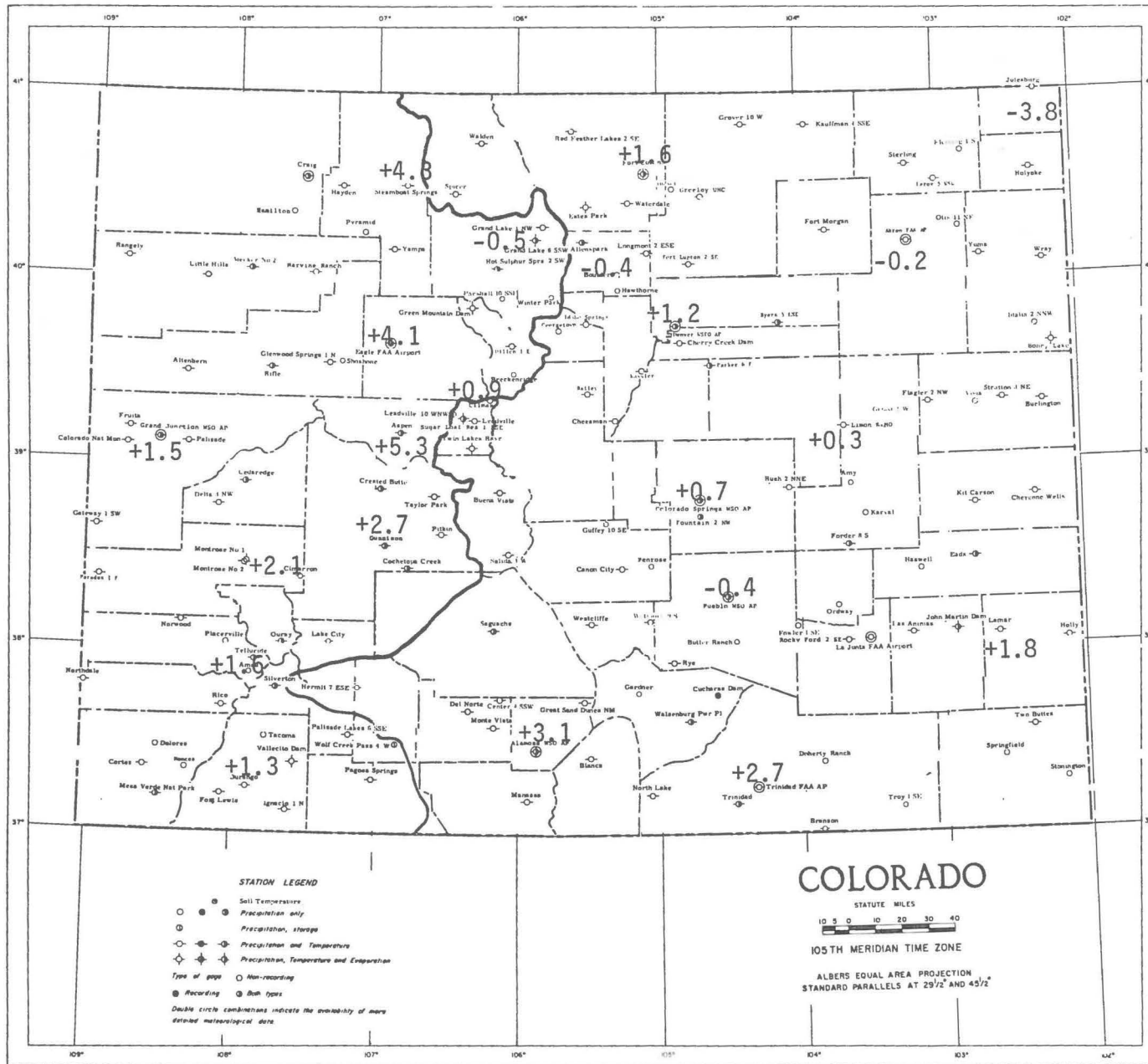


Figure 4 - Temperature for November 1977 in degrees Fahrenheit above or below average (1951-1970).



COLORADO CLIMATE -- DECEMBER 1977

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

The weather pattern during the last half of November, which had brought windy and mild conditions to Colorado with heavy mountain snows, continued to produce the same type of weather in December.

Strong winds occurred on several different days throughout the month. Boulder, Fort Collins, and other locations along the foothills received damaging winds the 22nd and 23rd of December with some gusts in excess of 80 mph. Boulder reported 10 days with peak wind gusts greater than 65 mph. The highest reported wind speed in the state was recorded on December 5th at Berthoud Pass when a 138 mph gust was measured. That was the strongest wind ever recorded at the station.

During December, major storm systems over the Pacific Ocean pumped a steady flow of mild, moist air into the western portions of Colorado. As this air was forced to rise up over the mountains, heavy snows were produced. Snow fell almost daily in the high country. For example, Climax reported measurable snowfall on 21 days. Precipitation amounts for December are shown in Figure 1. Many stations along and west of the Continental Divide received more than one inch of water equivalent precipitation. In general, the higher elevation stations received the most precipitation. Berthoud Pass measured 6.97 inches of water from 96 inches of snow which fell.

December precipitation as a percent of average is displayed in Figure 2. Several stations along the Continental Divide received about 200% of their average. However, above average precipitation was limited to the central and northern mountains and the northwest slopes of the San Juans. The rest of the San Juans, some of the western valleys, particularly in the southwest corner of the state, and the entire eastern plains region stayed well below average. The plains were exceptionally dry and received no significant precipitation during December. The small amounts noted in Figure 1 resulted from a few light snow and rain showers on the 5th and 8th of the month.

Figure 3, showing October through December precipitation as a percent of average, looks very much the same as Figure 2. This simply means that

since October the same general weather pattern has persisted. Until it changes significantly, heavy snows will continue in the mountains while the plains and lower valleys will stay dry. Water in the snowpack as a percent of average is also shown in Figure 3. Values are comparable to actual precipitation measurements. After a prolonged drought it is good to see above normal snowpack. However, it is important to realize that on the average only about 40 percent of the total winter precipitation has accumulated by the end of December. There is still a long way to go.

Figure 4 shows the temperature deviations from the average. The entire state was warmer than average in December 1977. The eastern plains were generally 1 to 3 degrees above average while the western half of the state was more than 4 degrees above average. Daily maximum temperatures west of the Continental Divide were only slightly above average, but daily minimums were very much warmer than average. For example, at Steamboat Springs the December maximum temperature averaged 32.2°F compared to a long-term average of 31.1°F. Their minimum averaged 13.2°F compared to a long-term average of 4.1°F. Cloudy skies at night usually keep temperatures from dropping very much, so above average cloudiness at night accompanying the above average precipitation was probably the major cause of the observed temperature deviations.

Figure 2 - Precipitation for December 1977 as percent of average (1951-1970).

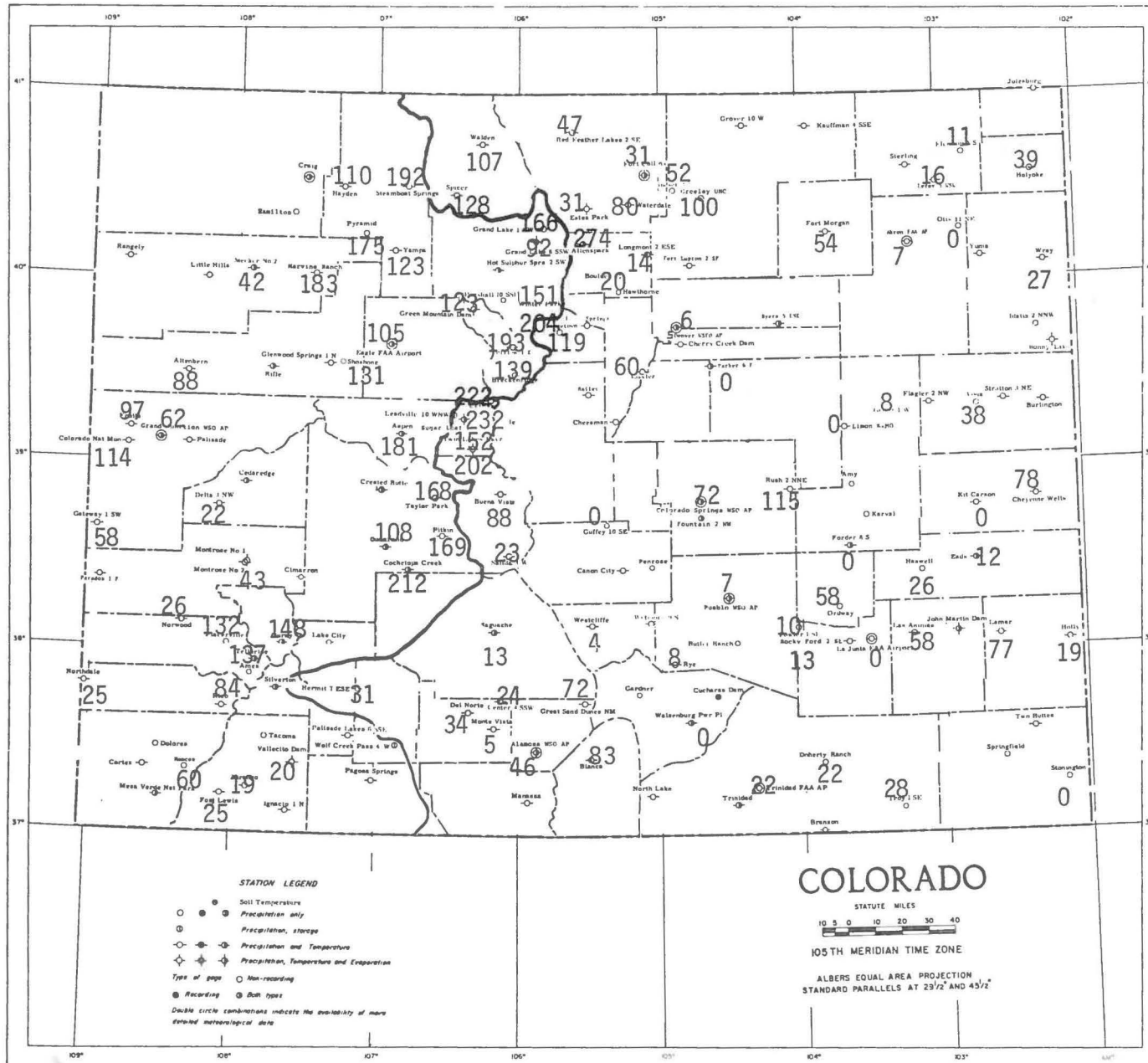


Figure 3 - Precipitation for period October through December 1977 as percent of average (1951-1970).

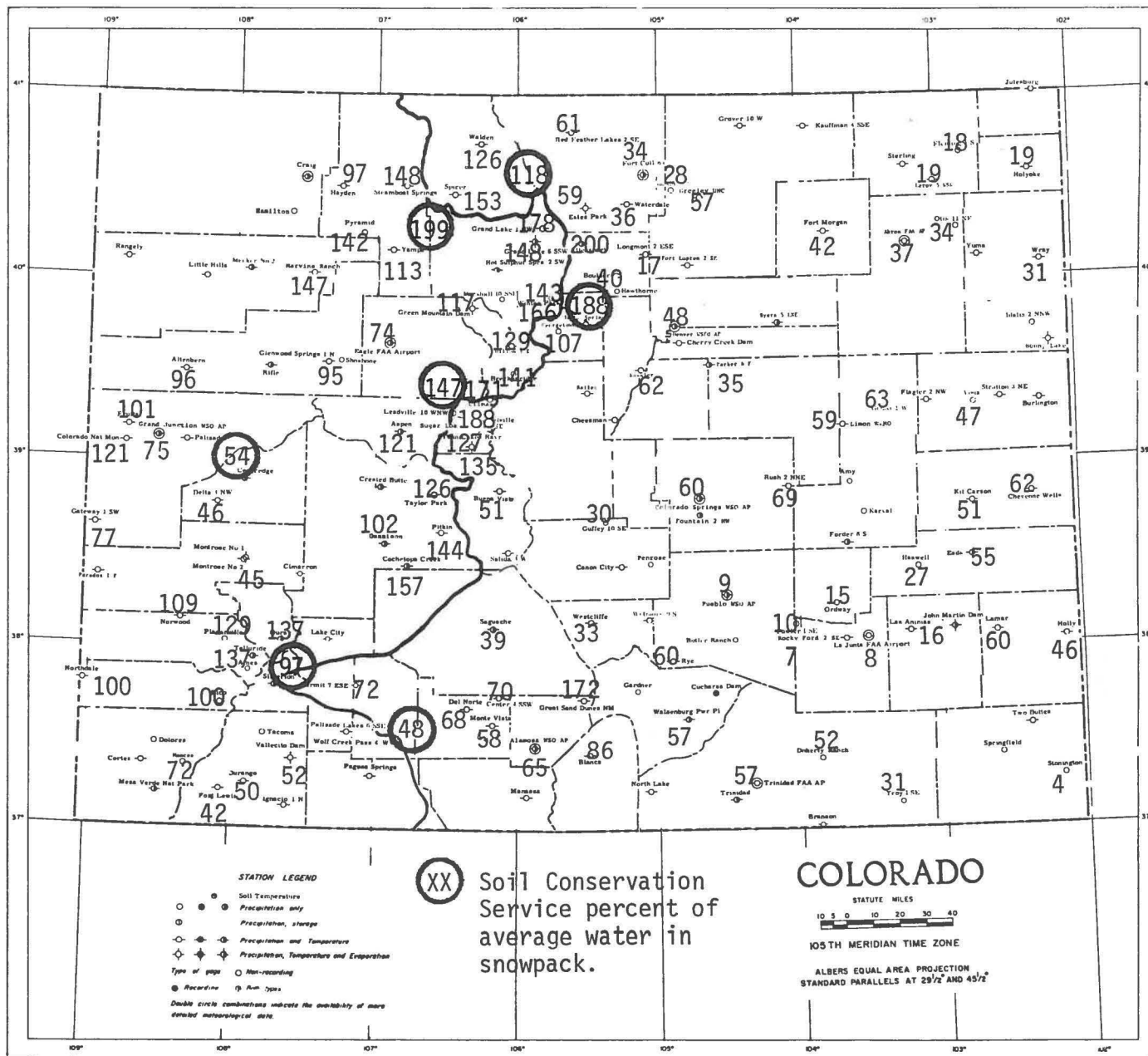
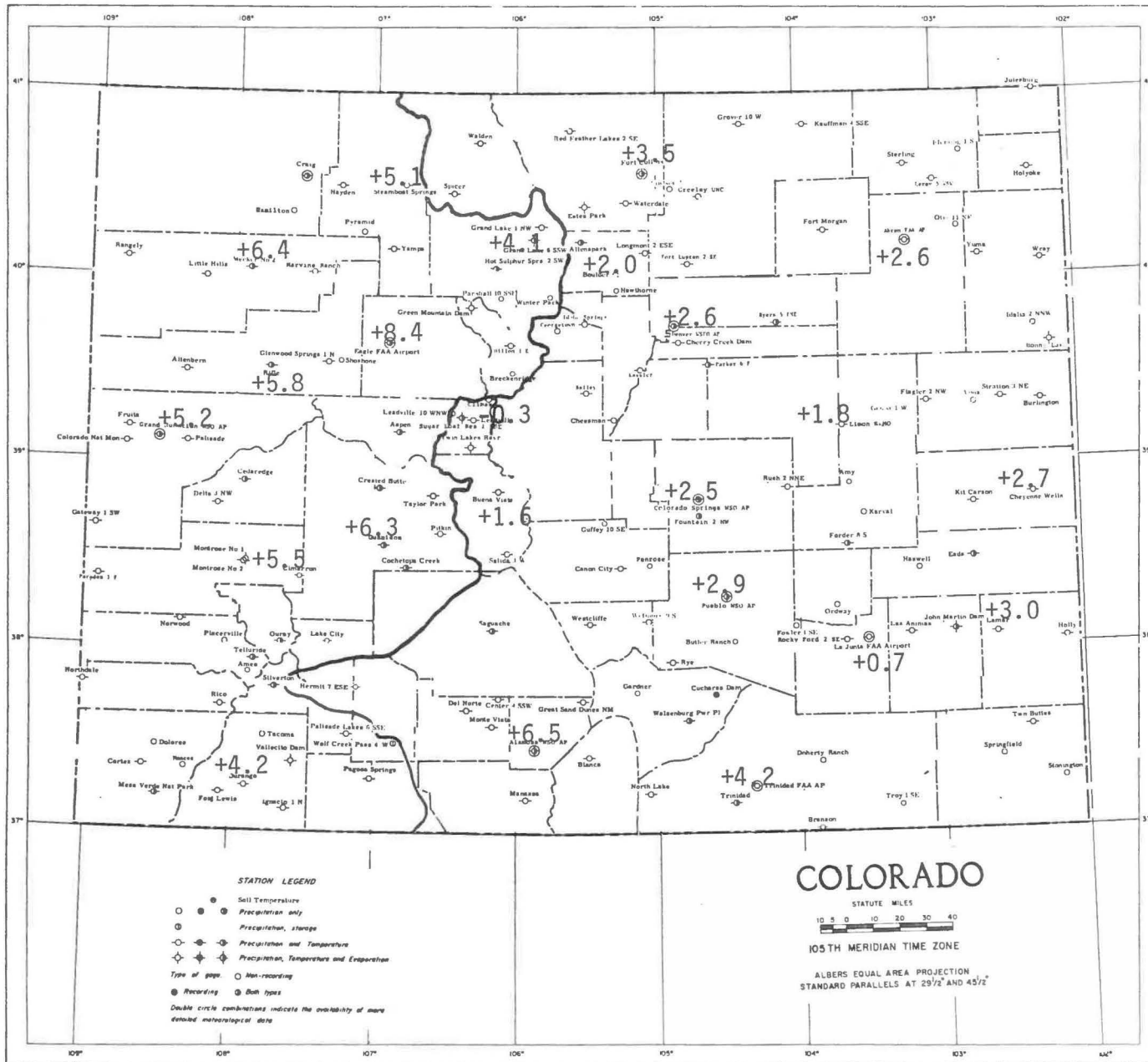


Figure 4 - Temperature for December 1977 in degrees Fahrenheit above or below average (1951-1970).



COLORADO CLIMATE -- JANUARY 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

A very persistent flow of mild westerly winds across the Pacific Ocean brought a continuous string of storm systems to the West Coast throughout most of January 1978. Many of these storms brought precipitation to the western half of Colorado. Durango and surrounding locations in the San Juan Mountains received measurable precipitation on 14 days. Farther north, Climax, Winter Park, and Steamboat Springs all recorded 18 days with measurable precipitation. Meanwhile, the Front Range and the eastern plains region were dominated by a nearly stationary cold high pressure area over southern Canada. Clockwise circulation around the high channeled a shallow layer of cold, damp, stable air into the eastern half of the state. This resulted in cloudy, foggy and generally uncomfortable conditions and enhanced the air pollution problems along the Front Range, especially during the last half of the month.

January precipitation amounts are shown in Figure 1. The eastern plains received the majority of their precipitation from three storm systems on the 15th, 18th, and 23rd but totals were generally less than .50 inches of liquid precipitation. Slightly heavier amounts were measured north of Denver along the Front Range, and Boulder recorded 19.5 inches of snow for the month. Both the valleys and the high country west of the Continental Divide received substantial amounts of precipitation. Mesa Verde National Park in the southwest corner of the state, received 5.04 inches, much of which fell on the 15th and 16th. Rico received 20.5 inches of snow in one day from the same storm.

January precipitation as a percent of average is shown in Figure 2. Nearly everywhere west of the Divide recorded above average precipitation with the San Juans and the far western portion of the state showing the greatest departures from average. Precipitation well above average continued in the northern mountains, but the central mountains returned to near average after several months of excessive snowfall. The eastern plains received more precipitation than in recent months but continued their below average trend.

The abundant January precipitation in the San Juans and in the western valleys significantly improved the water situation in those parts of the state. Figure 3, showing this winter's precipitation as a percent of average, indicates that most areas west of the Divide, including the valleys, are now near or above average. The southern portions of the San Juans have still received only about 80 percent of average, but they are gaining rapidly. The situation in the San Luis Valley, the Front Range area, and the eastern plains is not as good. Despite widespread precipitation in January, accumulated amounts are still well below average.

The temperature pattern, shown in Figure 4, clearly shows the two distinctly different air masses which affected Colorado weather in January. Where the moist flow from the Pacific reached into the state, temperatures were well above average. However, all areas east of the mountains were under the influence of the arctic airmass originating in Canada, and temperatures were therefore well below average. Cloudiness again played an important part in determining the observed temperatures. In the Pacific airmass west of the Divide, the effect of persistent cloudiness was to keep nighttime temperatures fairly warm. For example, Steamboat Springs recorded an average maximum temperature of 30.0°F, only 0.8° above average. However, minimum temperatures averaged 9.8°F, 8.3° above average. Fog and low clouds in the cold airmass on the eastern plains held maximum temperatures well below average. At La Junta, January maximum temperatures were 11.3° below average. At Denver, maximum temperatures averaged 37.5°F, 6.5° below average, while the average minimum of 14.1°F was only 2.7° below average. The overall effect of cloudiness was to reduce the day to night variation (diurnal range) in temperatures.

Figure 1 - January 1978 precipitation amount (inches).

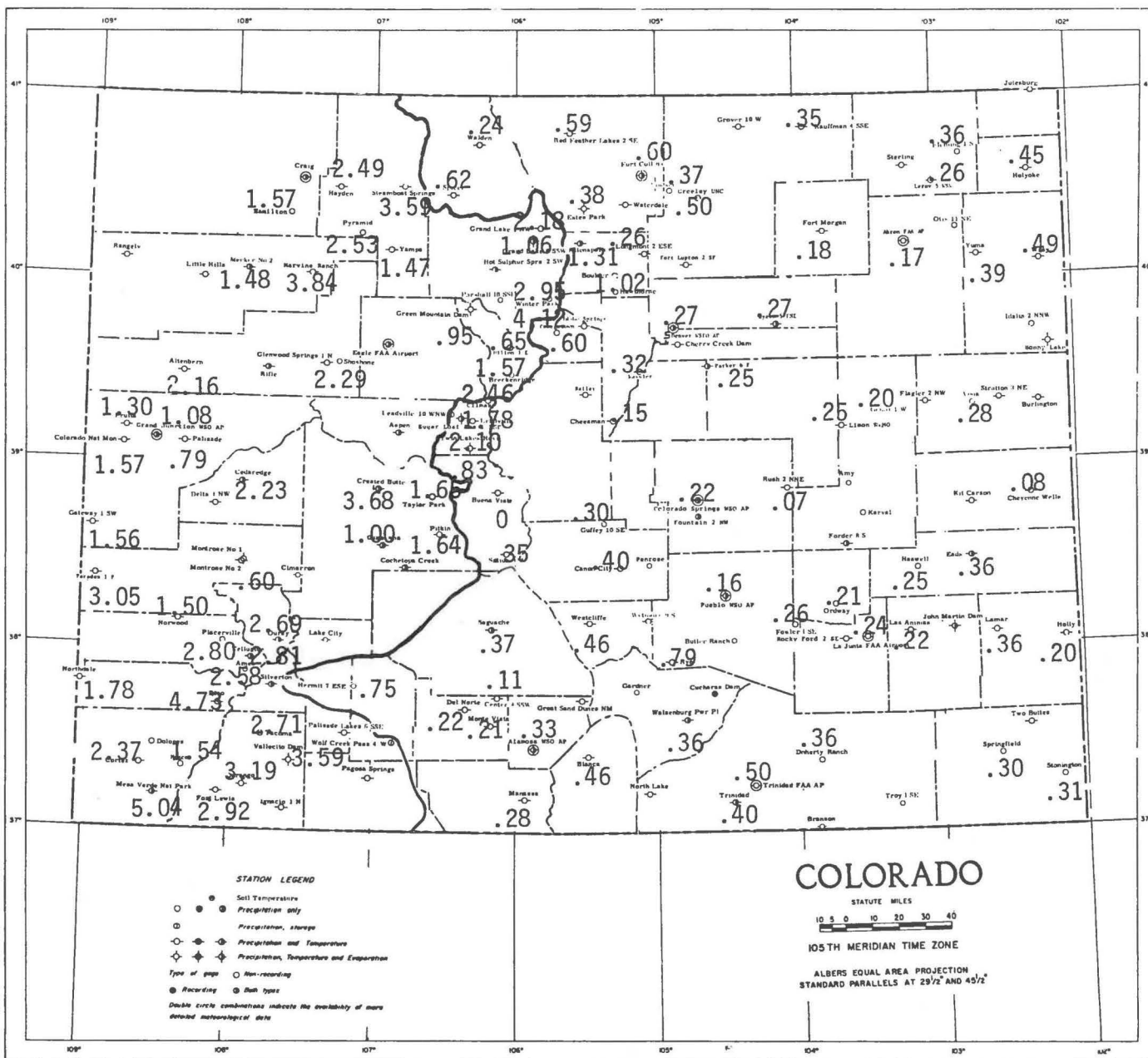


Figure 2 - Precipitation for January 1978 as percent of average (1951-1970).

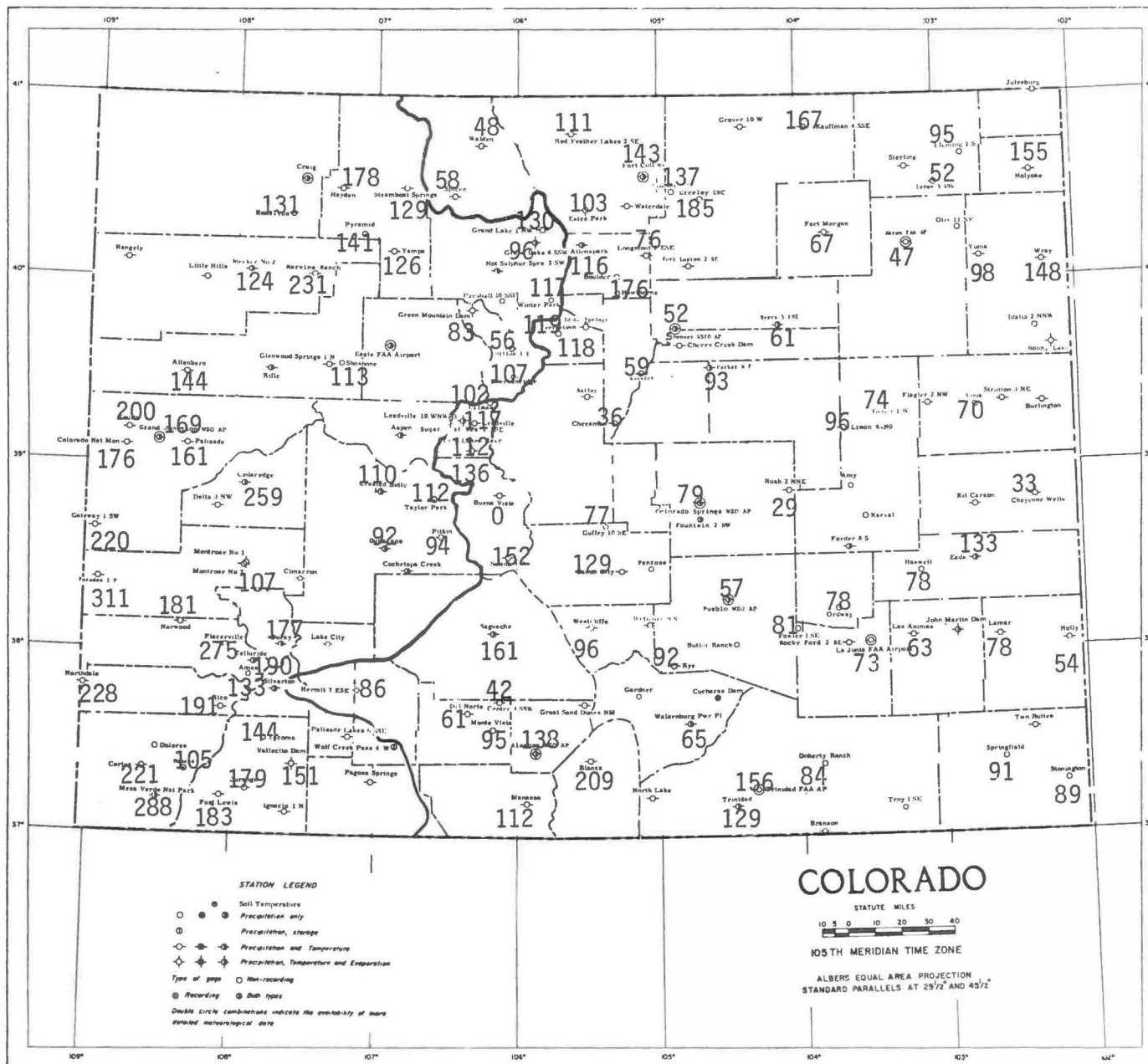


Figure 3 - Precipitation for period October 1977 through January 1978 as percent of average (1951-70).

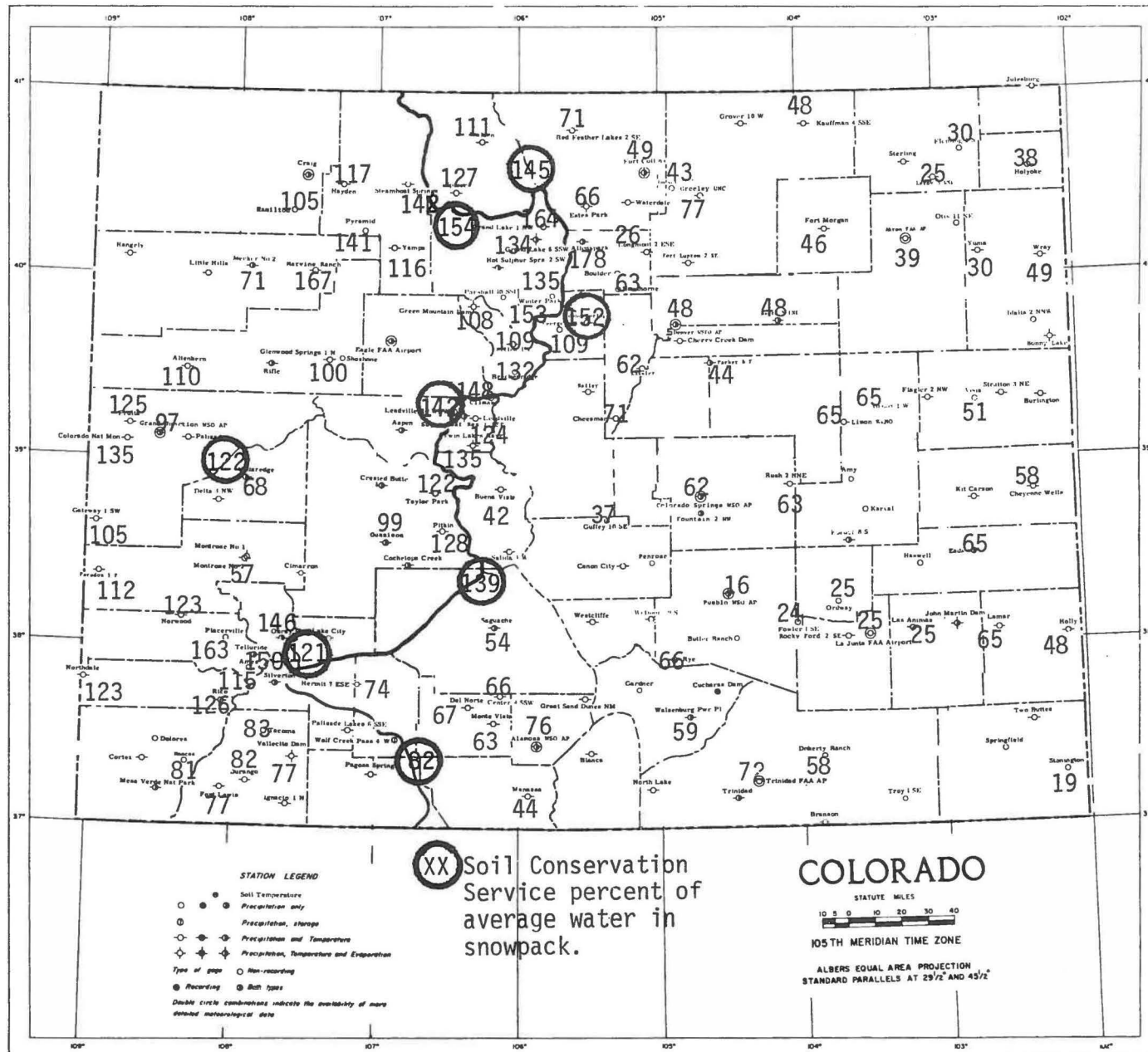
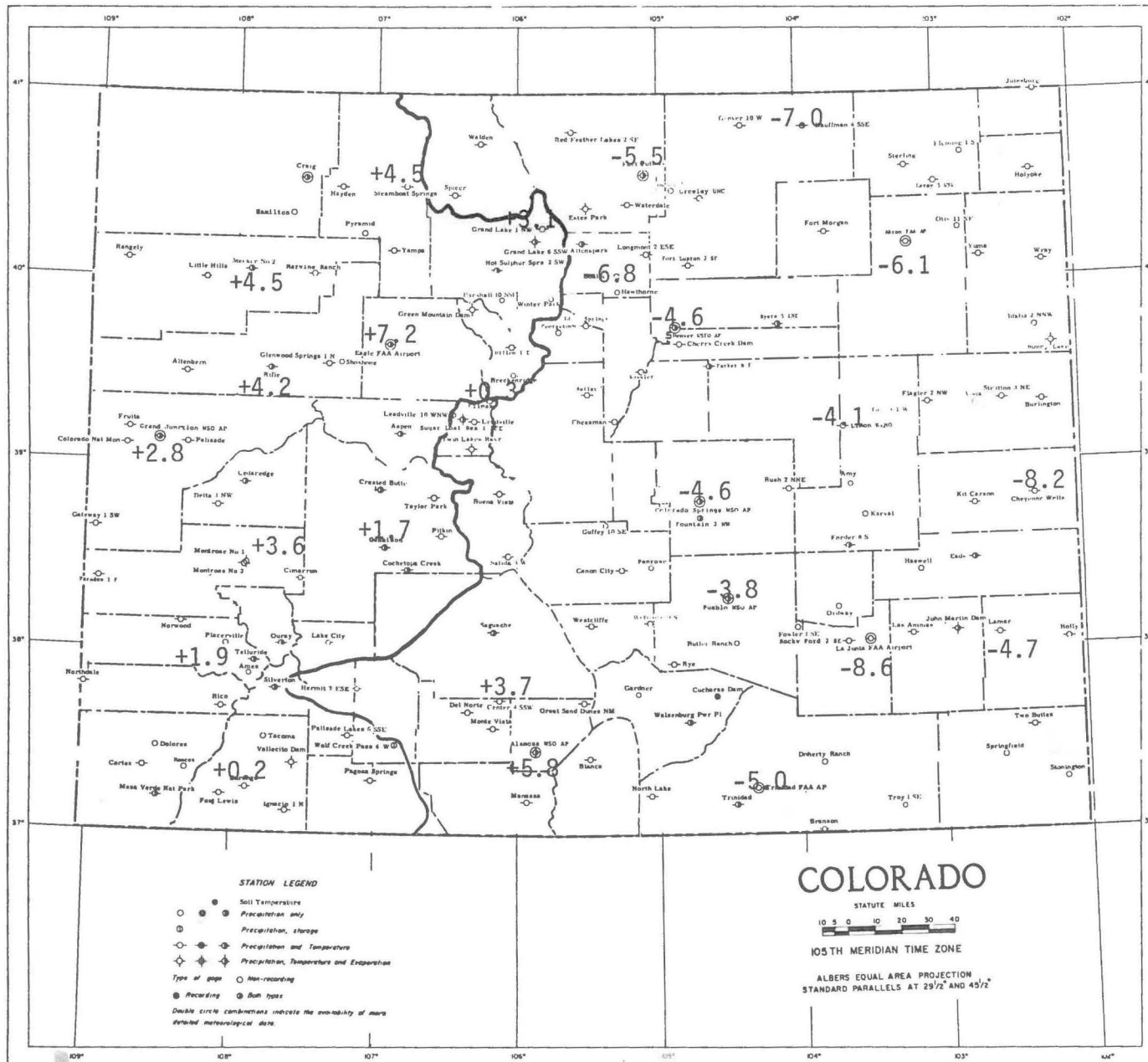


Figure 4 - Temperature for January 1978 in degrees Fahrenheit above or below average (1951-70).



COLORADO CLIMATE -- FEBRUARY 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

Residents of the eastern plains and Front Range areas will remember February 1978 as one of the foggiest months ever recorded. Several locations reported fog on 18 days. The fog-producing weather pattern also brought below average temperatures to the eastern half of the state. Just like in January, the clockwise circulation around a huge cold air mass over southern Canada was responsible for blowing this cold, damp air into the state. Fog formed as the air was forced to gradually rise up the sloping terrain. The period from the 5th to the 15th was particularly treacherous. Dense fog deposited ice called rime on trees and powerlines. Temperatures stayed below freezing, and the ice gradually built up to the point where many tree limbs, power poles, and power lines were broken. The greatest damage occurred in the Limon area, where some locations were without electricity for over a week.

The cold temperatures that accompanied the fog on the eastern plains were well below the February averages. Figure 1 shows mean temperatures for February 1978 and their departures from the 1951-1970 averages. This was the second consecutive month that the entire eastern plains region was much below average. At Fort Collins, Boulder, Cheyenne Wells, and Holyoke, this was the coldest February since 1960. In the rest of the state, near average temperatures were observed.

Precipitation amounts and precipitation as a percent of average for February are shown in Figures 2 and 3, respectively. Along with the fog, much of the eastern plains received several inches of snow on the 8th, 12th, and 16th of the month. Several stations, especially in the extreme east, recorded above average precipitation. However, amounts were still light with only Holyoke, in the northeast corner of the state, reporting more than one inch of liquid water. The Front Range area, the San Luis Valley, and the upper Arkansas Valley all showed well below average precipitation. Buena Vista, Salida, and Monte Vista all reported no measurable precipitation in February. However, west of the Continental Divide, snow continued to fall

reliably. Near average precipitation occurred over the central and northern mountains except in the Steamboat Springs and Grand Lake areas where snowfall totals continued to be well above average. For the second month in a row, precipitation in the western valleys and parts of the San Juans was much above average. Durango measured 2.68 inches of liquid water, 244 percent of average. Most of this fell during a stormy period which lasted from the 5th to the 11th of February.

In Figure 4, October through February precipitation is shown as a percent of average. With few exceptions, the Continental Divide separates the state into two regimes. West of the Divide, most locations are now above average for this winter. Grand Lake, at 163 percent of average, has the largest percentage departure. Noteworthy exceptions are Montrose and Meeker who have only 58 and 72 percent of average, respectively. The southern San Juans continue to gain and by the end of February have received about 90 percent of average. Meanwhile, east of the Divide, including the eastern slopes of the San Juans and the Sangre de Cristos, accumulated winter precipitation continues to be significantly below average.

At the end of February, 71 percent of the October through April winter season has been completed. In the Colorado Rockies, from 66 to 75 percent of the average winter precipitation has usually fallen by the end of February. This year, many locations in the mountains are ahead of average. In fact, Steamboat Springs and Grand Lake have already received more precipitation than they usually do in an entire winter season. But east of the Continental Divide, early spring precipitation will have to be heavy to make up for the winter deficiencies.

Figure 1. Temperatures for February 1978 in degrees Fahrenheit (in parentheses) and the departure from average (1951-1970).

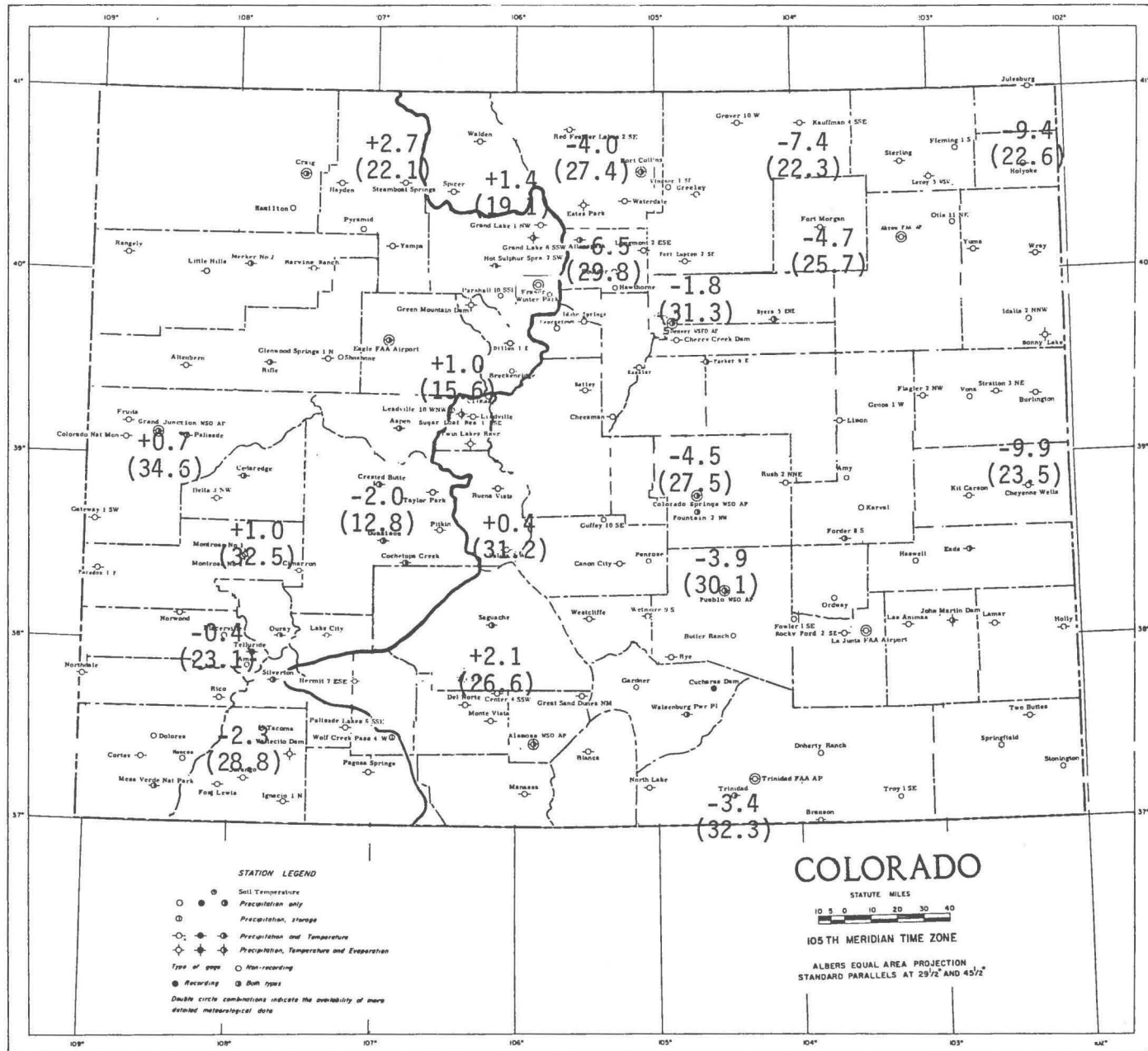


Figure 2. February 1978 precipitation amounts (inches).

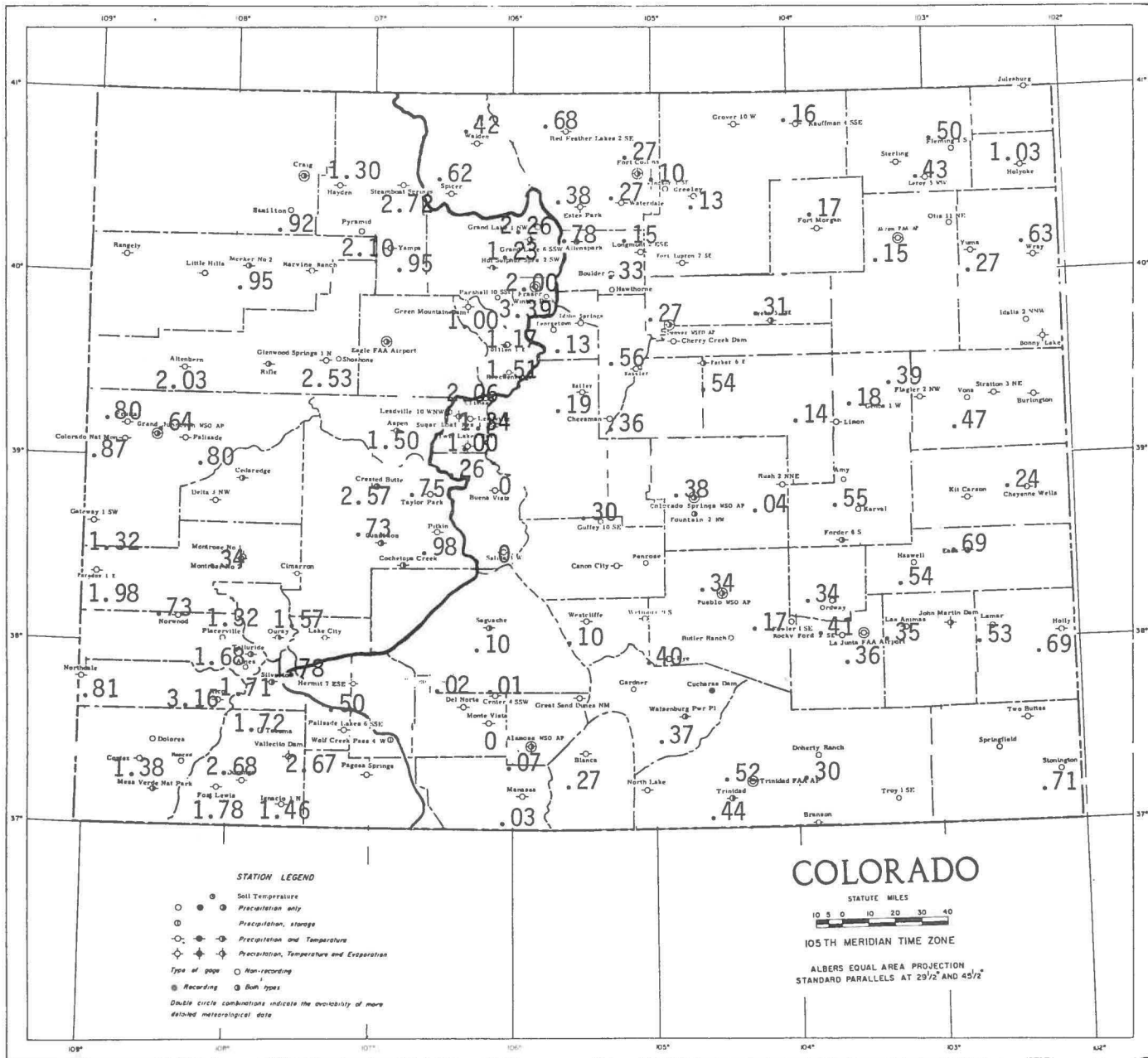


Figure 3 - Precipitation for period February 1978 as a percent of average (1951-1970).

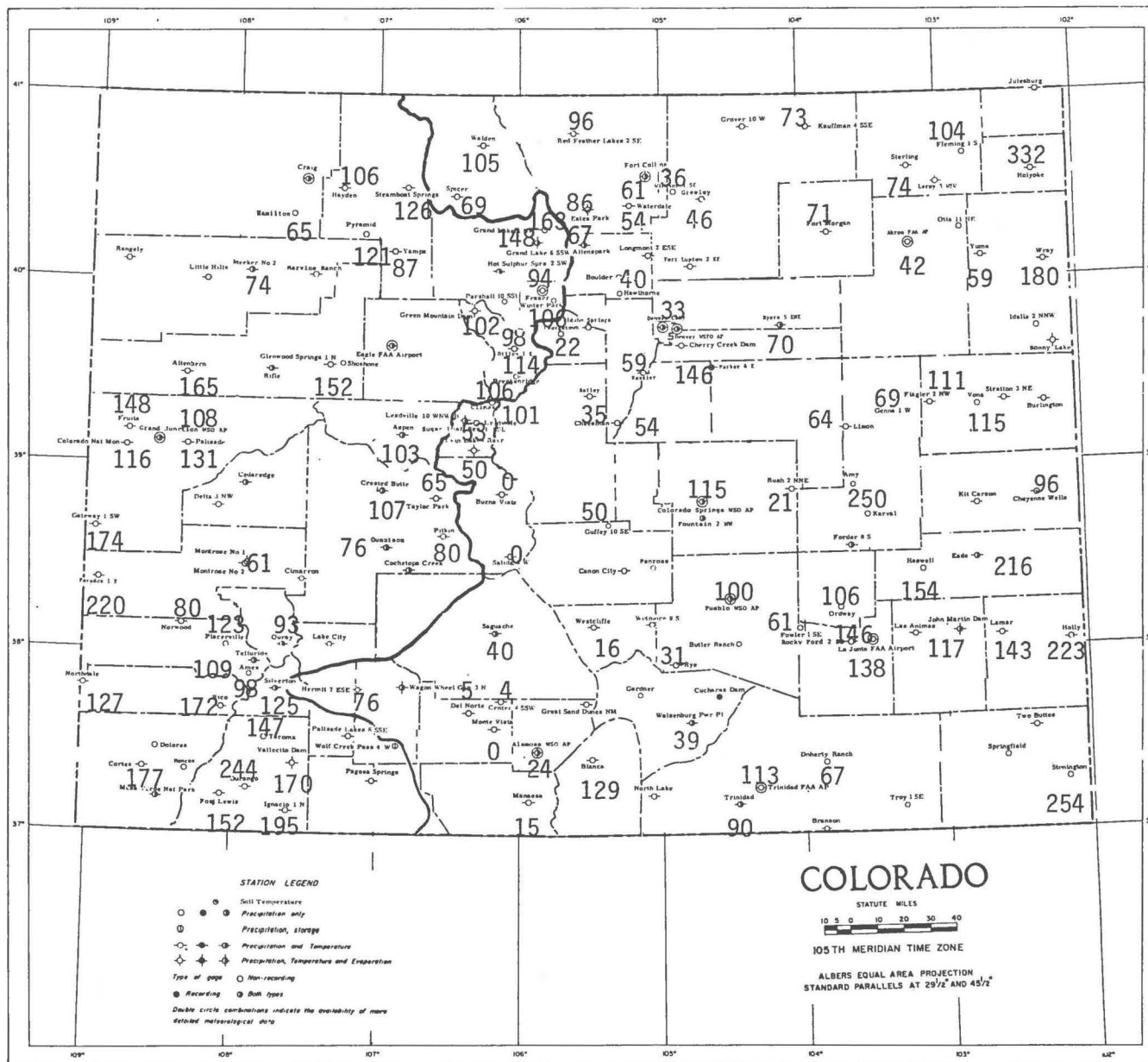
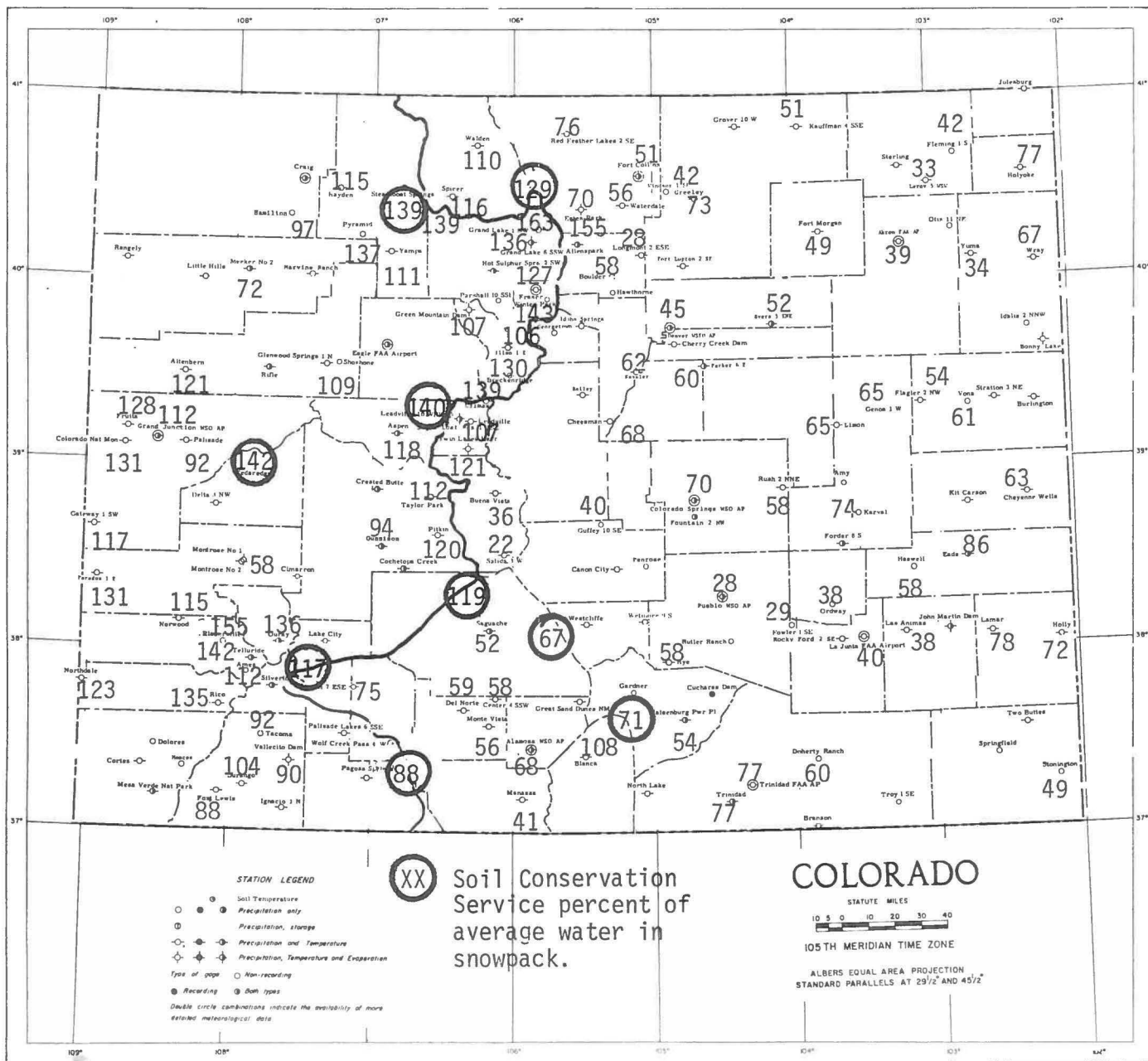


Figure 4 - Precipitation for period October 1977 through February 1978 as percent of average (1951-1970).



COLORADO CLIMATE -- MARCH 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

March 1978 brought a combination of stormy winter weather and mild summer-like conditions to Colorado. During the first few days of the month a major storm system dumped heavy precipitation on most areas along and west of the Continental Divide. In the San Juans, Rico received more than 4 inches of liquid water in the first 5 days of the month. During that same 5-day period, Wolf Creek Pass measured nearly 100 inches of new snow. Meanwhile, the eastern plains were blasted by a bitter cold wave which dropped temperatures to near zero on the 3rd and 4th. At Denver, a low temperature of -3°F was recorded on the morning of March 3 and the high temperature reached only 14° . The cold weather quickly gave way to spring-like temperatures, and by the last week of the month the whole state experienced sunny and warm weather. During the last 5 days of March, temperatures soared into the 70's and 80's across the eastern plains and in the western valleys. Even in the mountains spring was arriving as temperatures reached into the upper 50's from Telluride and Crested Butte to Grand Lake and Steamboat Springs.

The major storm in early March and lesser storms from the 11th to the 16th and from the 22nd to the 24th contributed to the heavy precipitation along and west of the Continental Divide shown in Figure 1. The 3.55 inches at Altenbern was the most precipitation ever received there in March since the station was established in 1947. Cortez received 4.05 inches making this their wettest March since 1938, and the 6.32 inches recorded at Rico was just short of the record of 6.40 inches set back in March 1897. But once again, the heavy precipitation did not cross over the Divide. Figure 2 shows March precipitation as a percent of average. The San Luis Valley, the upper Arkansas Valley, and the entire eastern plains region were far below average with many locations receiving less than 25 percent of average. Only two areas east of the Divide received above average precipitation for March. The area from Rye to Trinidad and North Lake received heavy rain and snow on the 10th and 11th as a cold front moved in from the northeast. Later in the

month on the 22nd, a small low pressure area formed in eastern Colorado which produced an area of moderate rain and snow along the Front Range from Boulder to Cheesman.

Winter precipitation as a percent of average is shown in Figure 3. For the sixth month in a row this figure looks about the same. West of the Divide continues above average while east of the Divide stays dry. Since early winter, the only significant change in this picture has been steadily increasing moisture in the San Juans and the lower elevation valleys of the western part of the state. This is the first month that the southwest portions of the San Juans were all above average for the winter season. Comparing October through March precipitation this year with the same period last year, we find that the northern and central mountains have had about 3 times more precipitation than a year ago. The San Juans and western valleys have had as much or 4 times more. But the San Luis Valley and eastern plains are still at least as dry as they were at this time last year.

March 1978 was a particularly warm month across the entire state of Colorado. Figure 4 shows mean temperatures for the month and their departures from average. Several sunny and warm days during the last half of March sent daily temperatures more than 20 degrees above average. Las Animas recorded 17 days with a maximum daily temperature of 65° or above. The above average temperatures on the eastern plains and San Luis Valley accompanied by below average precipitation was causing shortages in soil moisture as the new growing season began. The warm weather was also getting the snow melt off to an early start in the lower elevations of the mountains. In mid-March, Steamboat Springs still had more than 30 inches of snow on the ground, but by the last day of the month only 4 inches remained.

Figure 1. March 1978 precipitation amounts (inches).

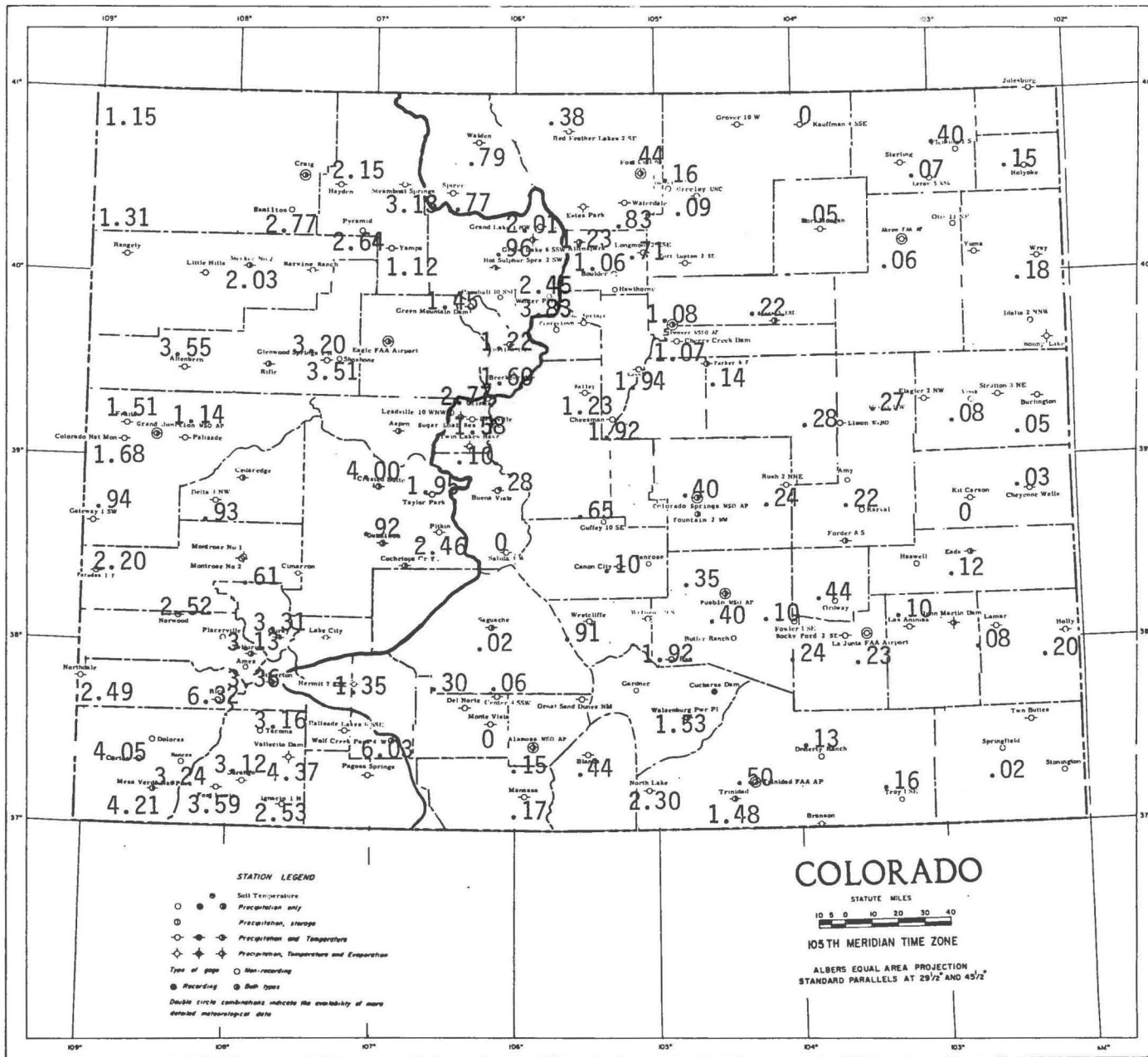


Figure 2. Precipitation for March 1978 as percent of average (1951-1970).

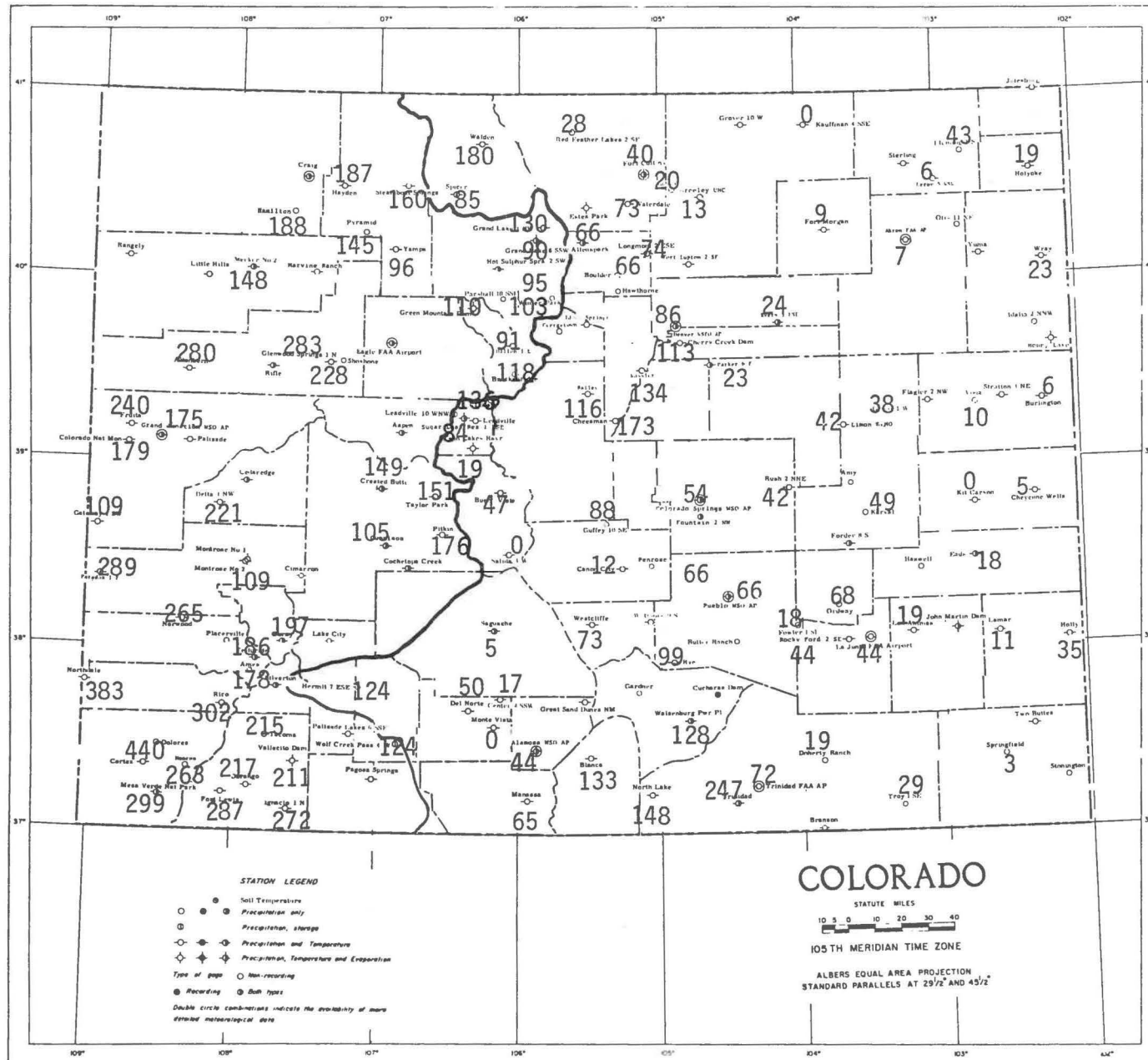


Figure 3. Winter precipitation October 1977 through March 1978 as percent of average (1951-1970).

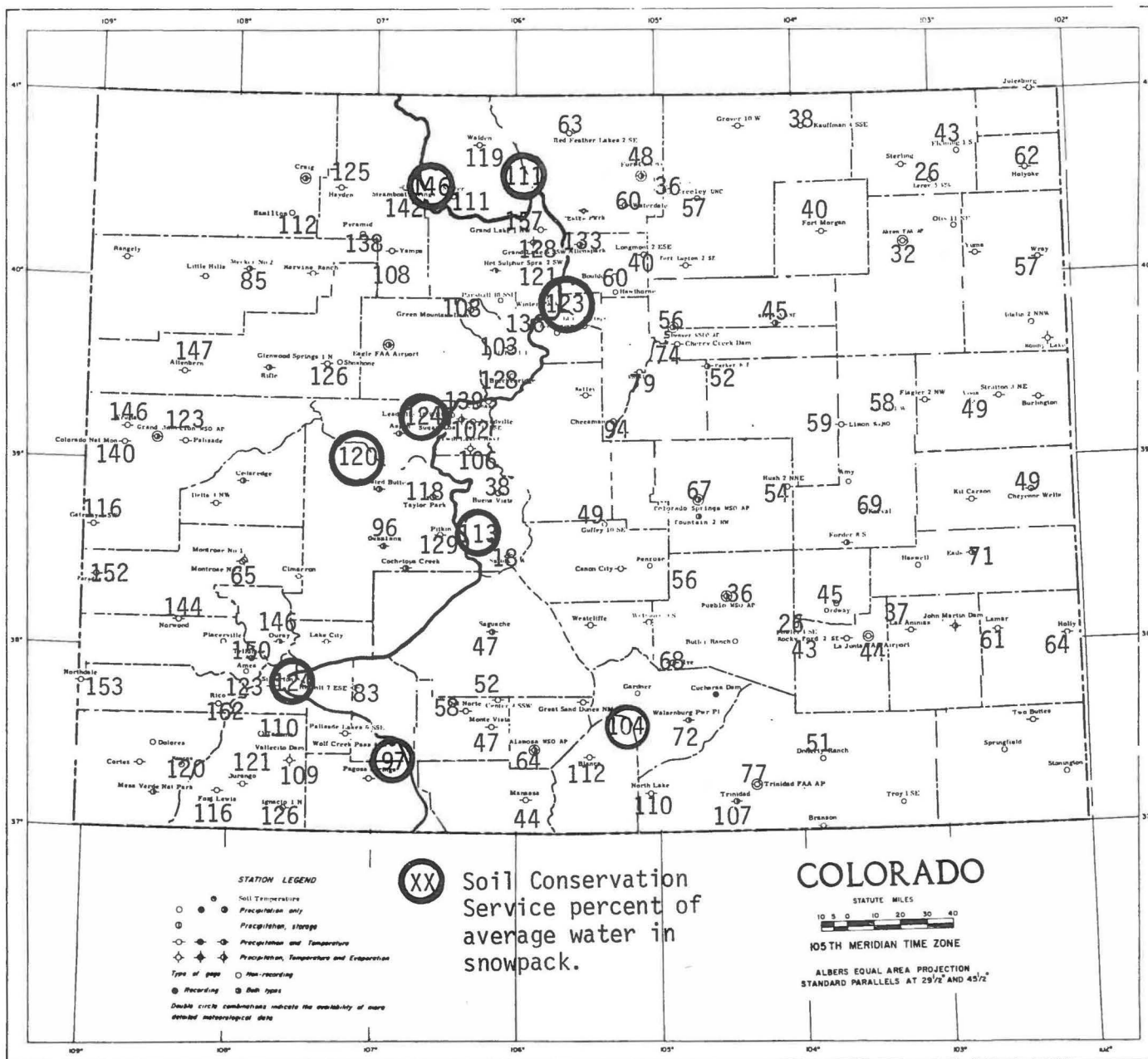
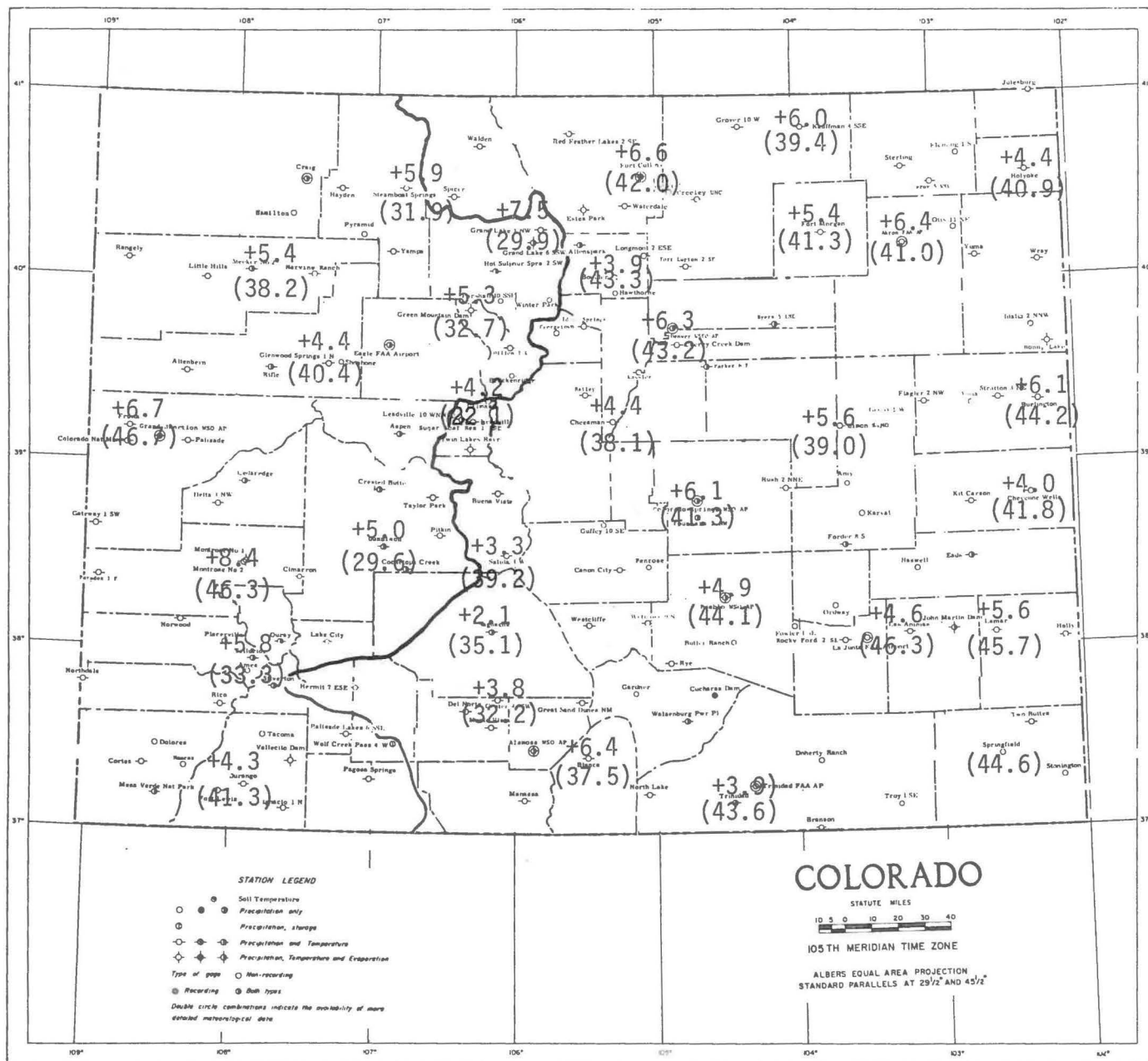


Figure 4. Temperatures for March 1978 in degrees Fahrenheit (in parentheses) and the departure from average (1951-1970).



COLORADO CLIMATE -- APRIL 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

Colorado experienced mild, dry weekdays and cool, damp weekends throughout the month of April 1978. The month got off to a wet start with heavy precipitation on the 1st and 2nd in parts of western Colorado. Glenwood Springs recorded 3.22 inches of precipitation on those two days. Most of the state received some precipitation from that storm system except for areas on the southeastern plains. Another major precipitation period began on the following weekend when a surge of cold air moved into the state. All of Colorado received precipitation from that storm except for the northwest corner and the already very dry southeastern plains. The heaviest precipitation fell on a small area along the Front Range from Boulder to just southwest of Denver. Boulder measured 2.05 inches of precipitation on the 9th including more than 5 inches of snow. The next two weeks were windy and quite dry with only a few periods of snow in the mountains and some scattered light thundershowers on the plains of northeastern Colorado and over the western valleys. High winds from the 16th to the 18th produced dust-storm conditions over parts of the eastern plains and did some damage to winter wheat. Wind gusts as high as 80 mph were reported. By April 29, a large low pressure area south of Colorado caused moist air from near the Gulf of Mexico to flow northwestward into Colorado. As the month ended, precipitation was beginning to fall over most of the state including the dry areas of the eastern plains.

Precipitation for the month is shown in Figure 1. Figure 2 shows April precipitation as a percent of average. Most areas west of the Continental Divide were above average once again although amounts were not excessive. A few parts of the central and northern mountains were well below average. For example, Dillon received only .47 inches of precipitation, 32 percent of average. Grand Lake was also significantly below average.

A portion of the Front Range area from north of Colorado Springs to Fort Collins was above average. Boulder received 3.77 inches, more than double its average. Most of that fell on the 9th and the 30th. Meanwhile,

the eastern plains and San Luis Valley continued below average, and the chances for a good winter wheat crop continued to diminish. Parts of southeastern Colorado received no precipitation through the first 29 days of April. Even those places on the eastern plains which did receive precipitation also experienced warm temperatures and strong winds which quickly evaporated the new moisture. Beneficial rains finally began to fall on the last two days of the month. The entire monthly total of 1.54 inches at Lamar fell on April 30th.

Precipitation as a percent of average for the seven month period ending in April 1978 is shown in Figure 3. This figure clearly points out the above average precipitation west of the Divide accompanied by below average precipitation to the east. This has been a remarkably persistent feature each month of the winter of 1977-78. Burlington, which has been taking measurements since 1891, experienced its driest October-April period on record. Akron and La Junta each had their second driest winters. The dry winter extended into the upper Arkansas and the San Luis Valley. Meanwhile, west of the Divide 20.94 inches of precipitation fell at Steamboat Springs making this the third wettest winter period on record. This total was last exceeded in 1951-52 when 21.51 inches were recorded. Several other stations including Rico, Telluride, Paradox, and Fruita also had one of their wettest winter season on record.

The water contained in the snowpack at higher elevations (shown in Figure 3) is well above average and is welcome in contrast to the widespread drought of one year ago. However, at lower and middle elevations the snowpack is already melting rapidly. East of the Continental Divide there are some areas where the remaining snowpack may not be sufficient to avoid some water shortages.

Temperatures for April are shown in Figure 4. Most of the state was above average with the southeastern plains more than 4°F above average. The warmest temperatures occurred early in the month, and Lamar recorded 93° on April 7. A cool period from the 17th to the 23rd brought frosts to the fruit-growing areas of the western slopes.

Perhaps the most striking aspect of last month's weather was the regularity of weekend precipitation. Typically only about 30 percent of the total precipitation falls on weekends, but as Figure 5 shows, most stations received the majority of their April precipitation on Saturdays and Sundays. Many areas, especially the more heavily populated regions, received more than 90 percent of their total monthly precipitation on weekends.

Figure 2. Precipitation for April 1978 as percent of average (1951-1970).

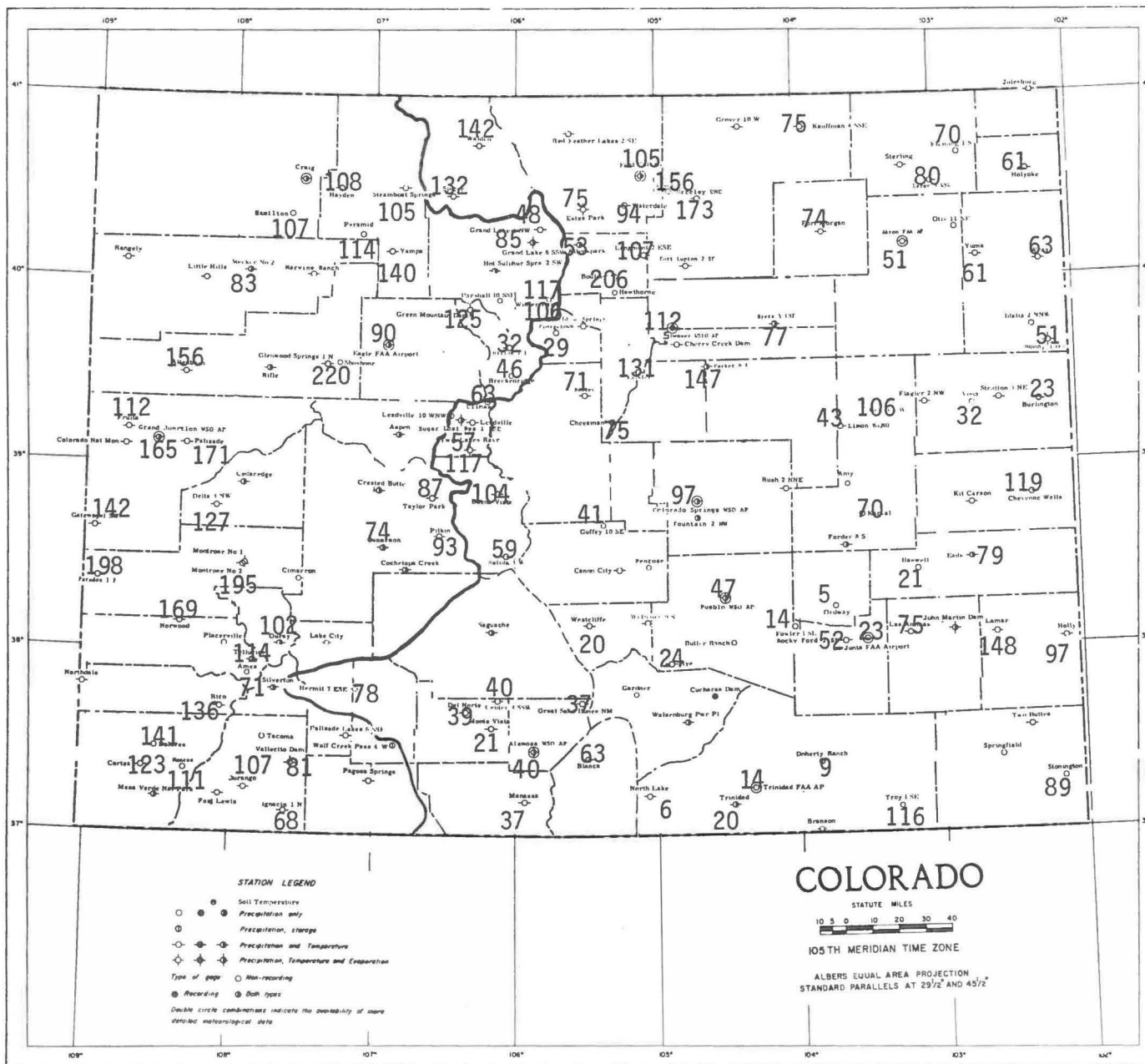


Figure 4. Temperatures for April 1978 in degrees Fahrenheit (in parentheses) and the departure from average (1951-1970).

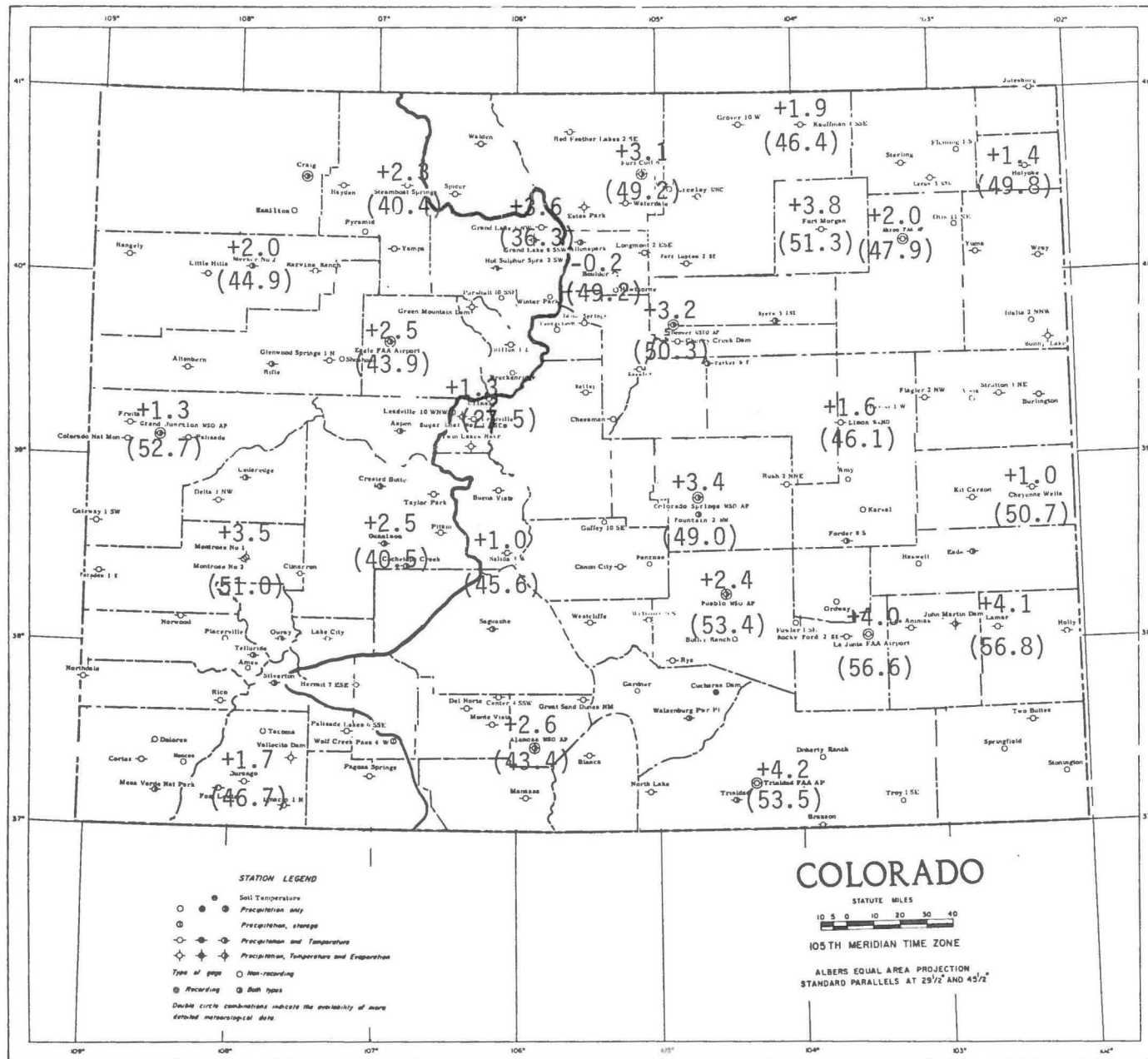
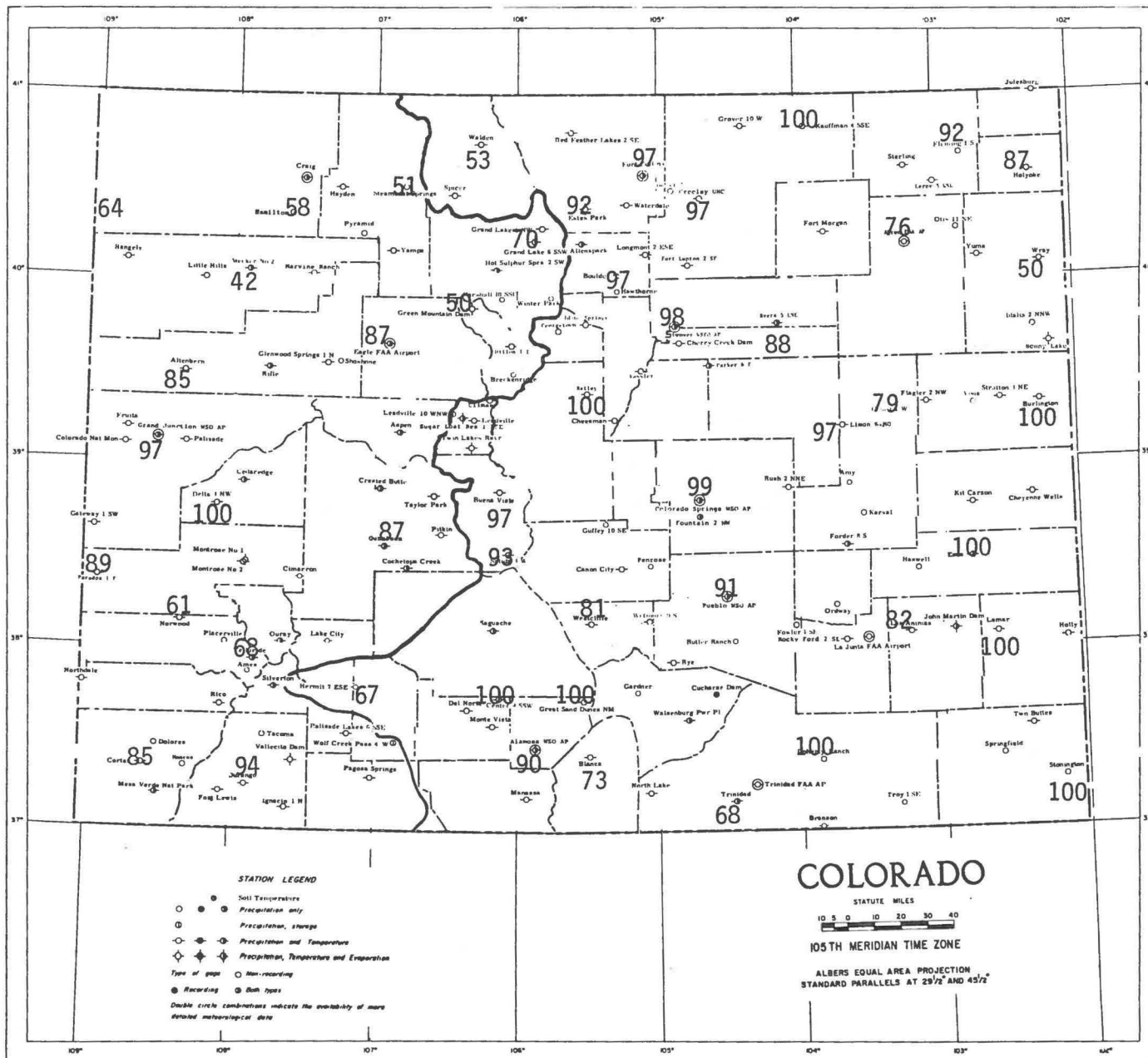


Figure 5. Percentage of April precipitation which fell on weekends.



COLORADO CLIMATE -- MAY 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

A record-breaking late spring snowstorm along with scattered heavy thunderstorms contributed to the abundant May precipitation in Colorado.

The long dry spell on the eastern plains came to an abrupt halt as precipitation fell almost constantly for the first 6 days of the month. During the first week of May, many locations received more than two inches of precipitation, and even in the dry San Luis Valley, more than one inch had fallen by the 7th. The heaviest first-week precipitation occurred in the southeast corner of the state (3.45 and 3.83 inches at Springfield and Holly, respectively) and along the Front Range from Denver northward. By May 7th, both Longmont and Fort Collins had totalled 4.87 inches of precipitation, and Waterdale had recorded 6.36 inches. It was this area that was hardest hit by the heavy snowstorm on the 5th and 6th which will be described in greater detail at the end of this summary.

Severe thunderstorms also made the news in May. A major system of thunderstorms developed over the mountains west of Fort Collins during the morning of May 17th. For a few hours the system resembled those storms which produced the Big Thompson flash flood in 1976. But by afternoon, the storms began to move out of the foothills and across the plains. More than an inch and a half of rain fell in a short time in Longmont. Many areas from north of Fort Collins to Denver received hail, and even some tornadoes were spotted. One tornado touched down in Aurora causing considerable property damage.

Actual May precipitation amounts and precipitation as a percent of average are shown in Figures 1 and 2, respectively. Only a very few scattered locations such as Altenbern and Salida were significantly below average, while the rest of the state was generally well above average. The southwest corner of the state, which usually has rather dry Mays, had another exceptionally wet month. For the first time since last summer, nearly everywhere east of the Continental Divide was above average, and many stations including Fort Morgan, Limon, and Springfield received more precipitation in May than they had accumulated in the previous 8 months. The 3.16 inches of precipitation, measured at Walden, set a record for the wettest May ever recorded there. The mountains also continued to receive above average precipitation and snowfall. Measurable snow fell at Berthoud Pass on 15 days and totalled 55.5 inches making a total of 489 inches for the 1977-78 winter season thus far.

Figure 3 shows the precipitation for the October 1977 through May 1978 period as a percent of average. Even with the abundant May precipitation, many areas on the eastern plains are still below average. However, the rains came in time to greatly benefit the winter wheat crop. West of the Continental Divide, the moisture situation remained excellent. Information on the winter snowpack can no longer be included with the precipitation data due to melting. However, at elevations above 10,000 feet, water in the snowpack diminished only slightly during May, leaving tremendous amounts of water available for summer runoff. By the same time last year most of the snowpack had already melted.

Below average temperatures along with the above average precipitation assisted in maintaining the snowpack throughout May. Figure 4 shows that temperatures across the state ended up being about 3° Fahrenheit below average for the month. The first 9 days of the month were especially cold with morning low temperatures on the 7th and 9th approaching or setting records in some locations. A temperature of 0° F was observed at Platoro Dam east of Wolf Creek Pass on the morning of the 9th, and Dillon experienced +3° F at the same time. Denver's low of 23° F on the 7th set a new record for that date. For the remainder of the month, temperatures across the state were generally near or above average.

Summary of May 5-6

Precipitation had been falling across the state during the first few days of May, but late in the day on May 4, a well organized winter-type storm system began to develop in southern Utah. This storm center strengthened and remained nearly stationary during the 5th and the early part of the 6th as a pool of cold air settled over the state. As indicated on Figure 5, the entire state was affected by this storm, but maximum precipitation was limited to the area from Denver westward to the Continental Divide and northward to Wyoming. By the evening of the 6th, Fort Collins and Longmont had received a water equivalent of 2.81 and 2.66 inches, respectively; all of that precipitation falling as snow. East of the foothills, maximum snowdepths of 17 inches were common, but depths increased steadily towards the west. Snowdepths in the foothills from just west of Boulder up to Red Feather Lakes ranged from two to four feet with water equivalents from 3 to 4 inches. This storm shattered May snowfall records in Colorado Springs, Fort Collins and other Front Range cities.

Figure 2. Precipitation for May 1978 as a percent of average (1951-1970).

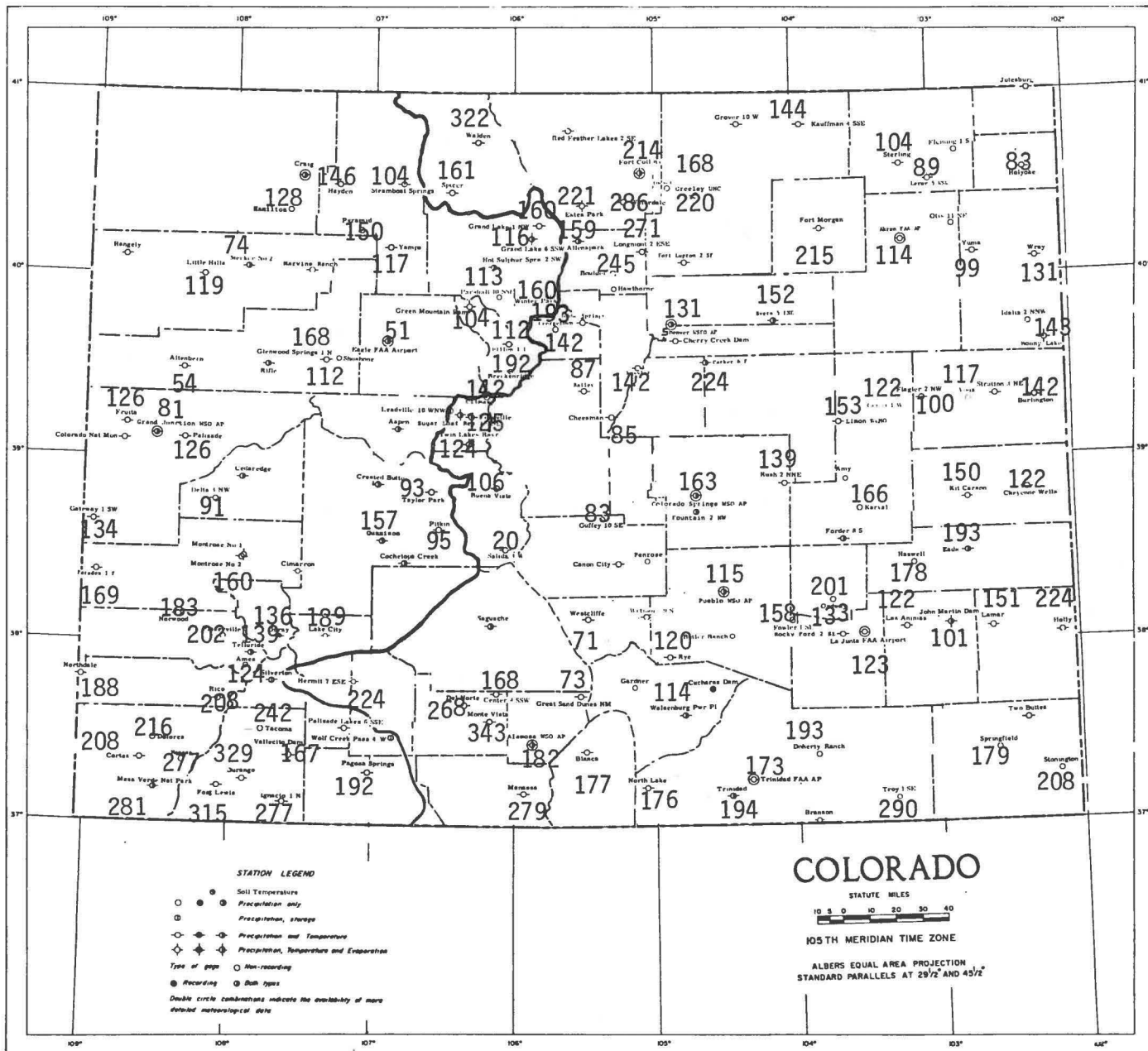


Figure 3. Precipitation for period October 1977 through May 1978 as percent of average (1951-1970).

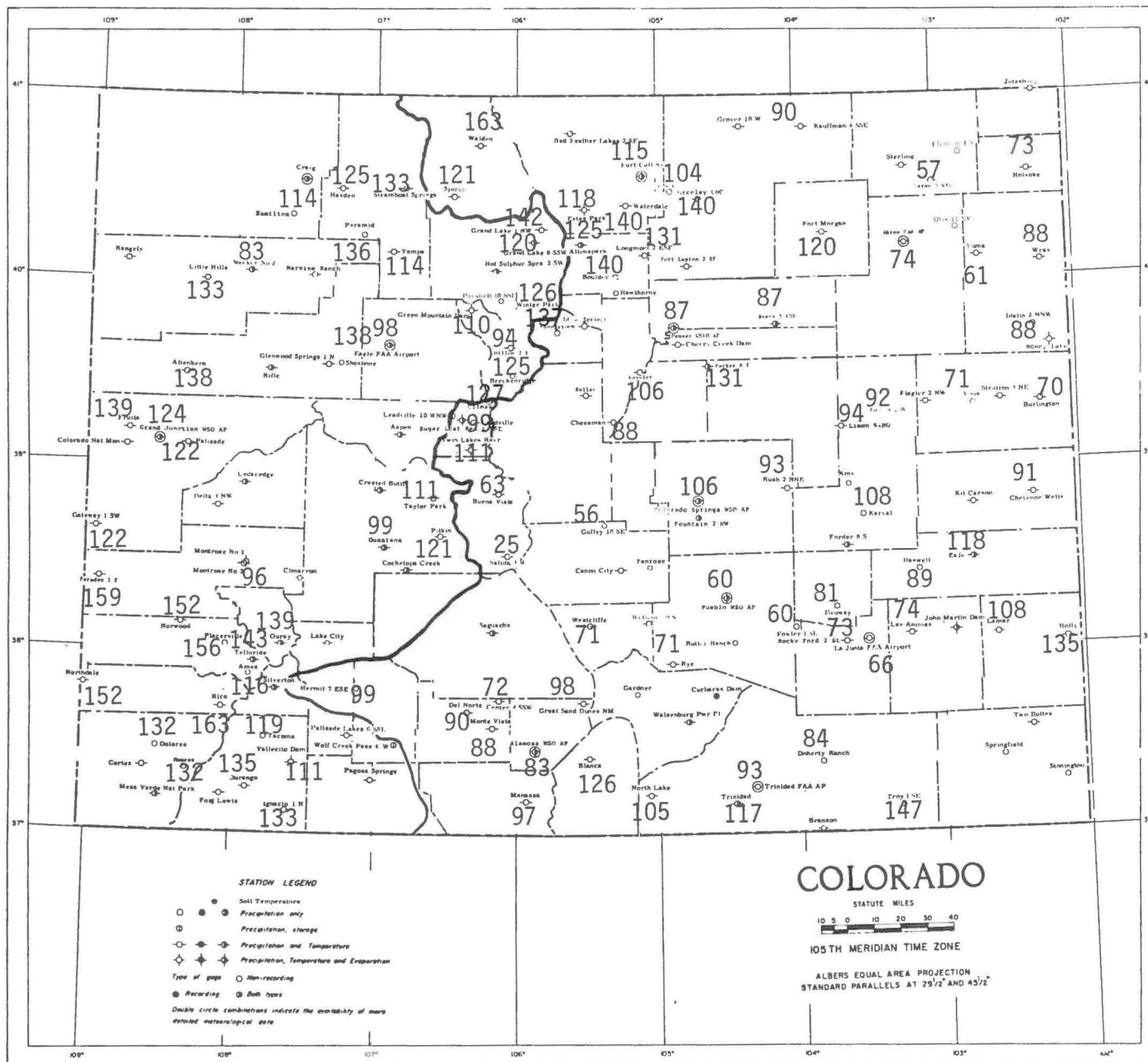
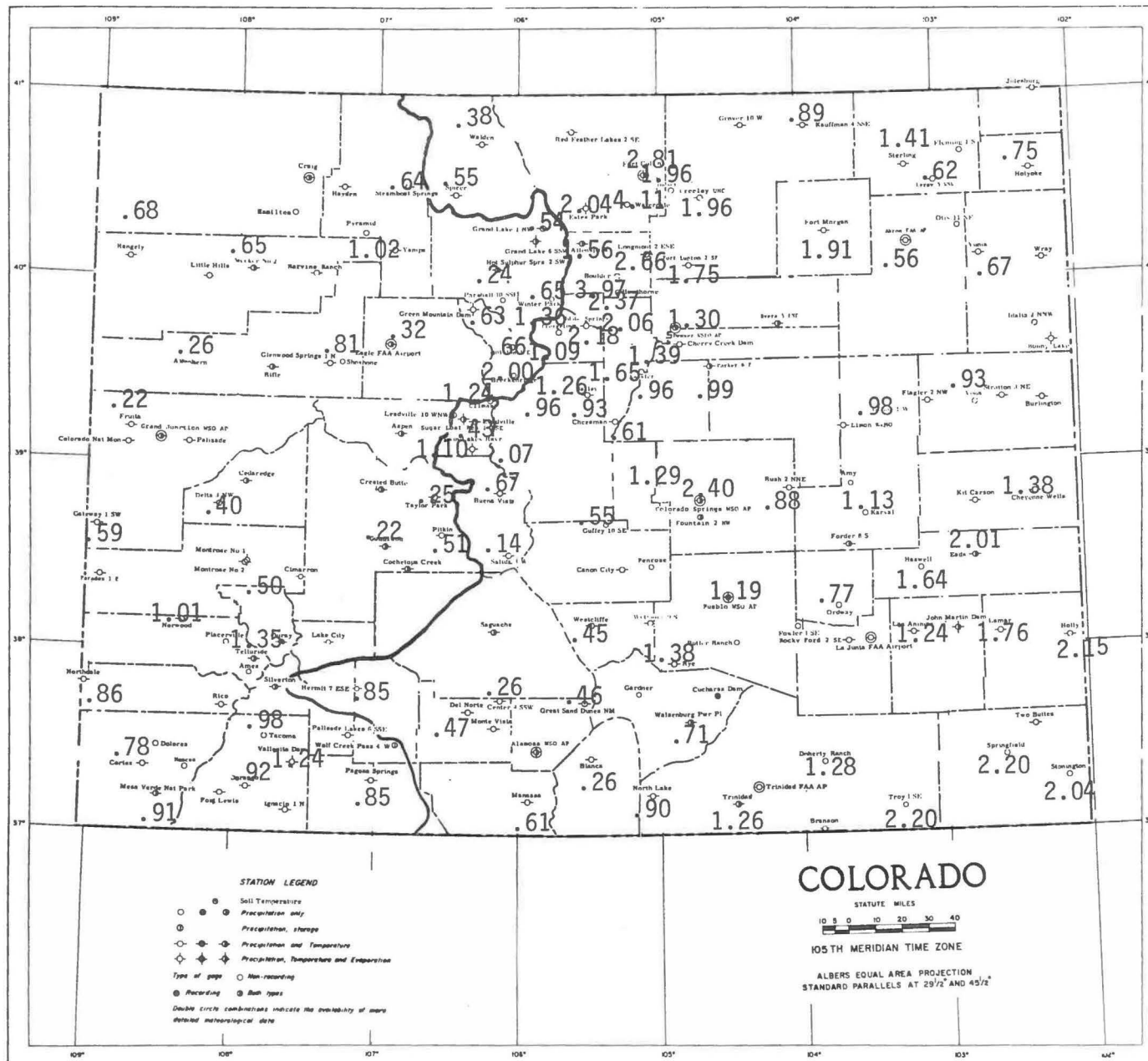


Figure 5. Precipitation totals for May 5 through May 7, 1978.



COLORADO CLIMATE -- JUNE 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

June finally brought an end to one of the snowiest winters in the Colorado mountains in recent years. Some snow still managed to accumulate in the higher mountains during the first week of the month, but warm weather quickly moved in to continue the process of melting the mountain snowpack. Berthoud Pass measured another 7 inches of snow in June to bring the winter total to 496 inches, the greatest total since complete 12-month records began in 1961. Winter snowfall totals for several other locations include Dillon with 144", Steamboat Springs with 216", Rico with 245", Telluride with 287", Mesa Lakes Resort with 292" and Climax with 370".

June got off to a dismal start across the eastern half of the state. While western Colorado experienced delightful weather on June 1 and 2, high temperatures barely reached into the 50's east of the mountains. The drizzly showers made it feel more like a winter along the Pacific Coast than like summer in Colorado, but this cool, damp weather gradually gave way to more summer-like conditions. As the cool air slowly retreated, heavy thunderstorms developed. Several locations in the eastern half of the state reported high winds, hail, and severe lightning from the 3rd to the 7th of June with the heaviest storms striking east-central and southeast Colorado on the 3rd, 4th and 5th. Areas from Burlington and Vona southward to Lamar totalled more than two inches of precipitation for those three days, most of which fell in a few hours.

When the storms finally moved out, the hot weather moved in. The entire state experienced clear, dry weather from the 9th all the way to the 26th. High temperatures in the 80's and 90's were common across the state with 70's in the mountains. Las Animas recorded ten days with temperatures of

100 degrees or more and La Junta recorded the highest temperature: 108° on June 25. The warm temperatures across the state accelerated the snow melt in the high country. There were no reports of major flooding, but many rivers and streams flowing out of the mountains were barely staying within their banks. Because of the high water and strong currents, several rivers had to be closed to recreational activity.

The last few days of the month brought the return of slightly cooler temperatures to Colorado along with more thunderstorm activity. Most of the state felt at least a few sprinkles from the 27th through the 30th, but the heaviest storms hit the southeastern plains and the San Luis Valley.

Figures 1 and 2 show precipitation amounts and percents of average for June. Precipitation generally increased from west to east across the state with amounts ranging from no measurable rain at Fruita and Northdale near the western border to 5.23 at Lamar in the southeast. West of the Continental Divide, this was the driest month since last June, and practically every station was well below average. The Front Range area from Pueblo north to the Wyoming border was also quite dry. The end-of-the-month storms produced above average precipitation across the typically dry San Luis Valley. The 1.38 inches measured at Monte Vista was 288 percent of average. The thunderstorms on the eastern plains resulted in above average rainfall everywhere except the northeast corner of the state.

Figure 3 shows the October through June precipitation as a percent of average. Now that we are well into the 1978 water year, this figure is not changing much from month to month. The above average June precipitation has helped to bring the San Luis Valley and parts of the eastern plains to near average. Dominated by the heavy winter snowfall, the areas west of the Divide are still well above average in spite of the dry June.

The hot weather in mid-month offset June's cool first week and resulted in slightly above average temperatures across the state (Figure 4).

Figure 1. June 1978 precipitation amounts (inches).

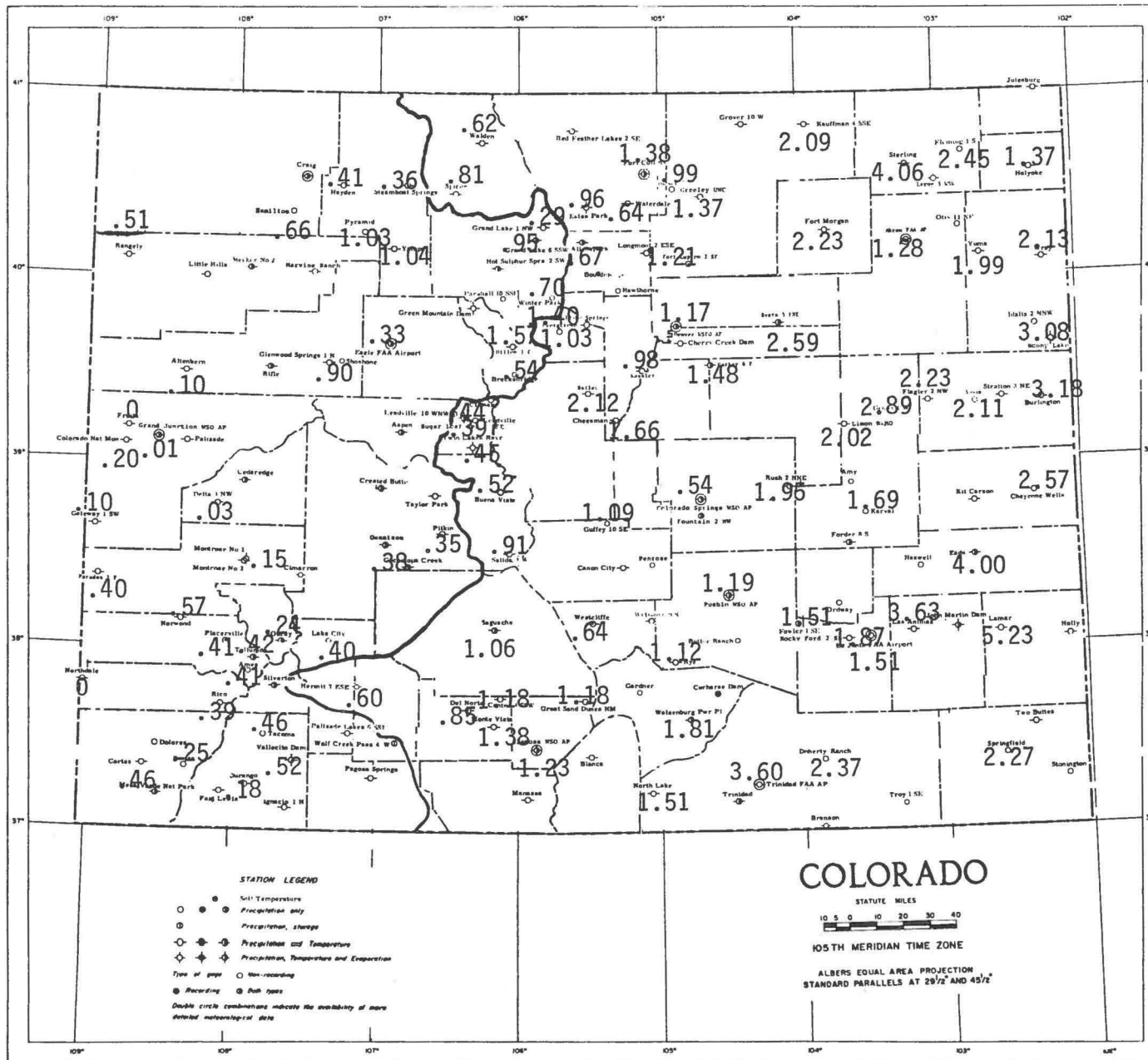
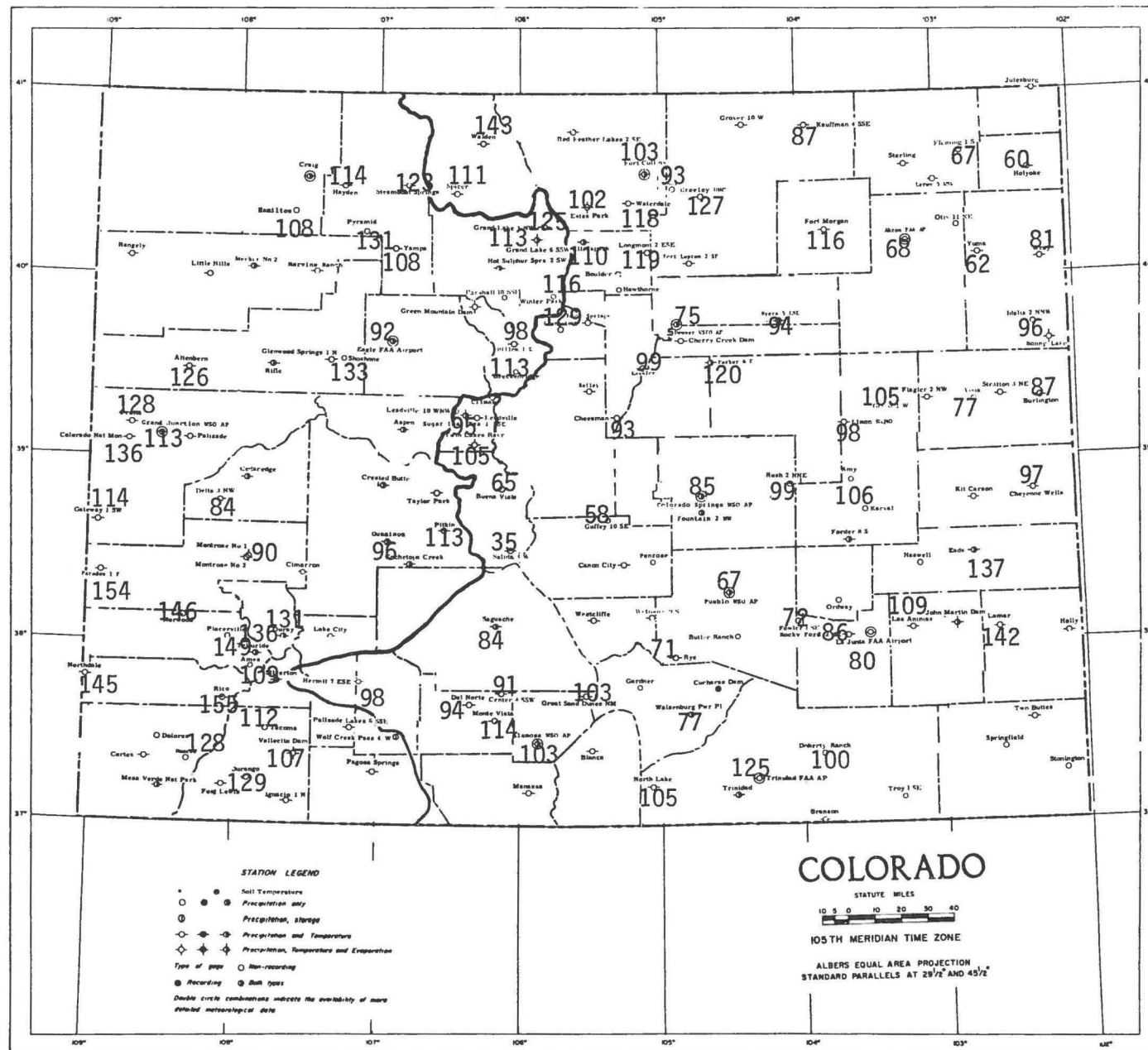


Figure 3. Precipitation for period October 1977 through June 1978 as a percent of average (1951-1970).



COLORADO CLIMATE -- JULY 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

Colorado experienced nearly typical summer weather during the month of July. Hot temperatures persisted across the eastern plains and western valleys, while warm days and cool nights were a delightful combination at higher elevations. Scattered afternoon and evening thundershowers occurred regularly over all but the westernmost portions of the state, but little rain reached the ground from most of these showers.

The thunderstorms were generally light in intensity, but a few of the storms were locally severe. Spotty heavy rains and some hail were reported in northeastern Colorado on the 5th and 6th. Kauffman received 1.22 inches on the night of the 5th from one of these storms. A very bad storm struck the Colorado Springs area on July 9th. Colorado Springs picked up 1.06 inches of rain from this storm, but many areas received even more. Walsenberg received 1.71 inches, Avondale, east of Pueblo, measured 2.10 inches and Timpas, southwest of LaJunta, recorded 2.25 from this major storm. These heavy rains resulted in some flooding in parts of the Arkansas River Basin. This same storm was responsible for causing an estimated 30 million dollars of hail damage in the Colorado Springs area. Hail accumulations as deep as 12 inches were reported north of the city. More heavy storms occurred later in the month in other parts of the state. Frequent lightning, strong winds, and hail accompanied the storms which struck the area from Glenwood Springs to Steamboat Springs on the 16th. Yampa recorded 1.20 inches of rain from one of these storms. The heaviest single-day rainfall amount for the month of July fell at Eads in east-central Colorado. In two hours on the evening of the 21st, they received 3.50 inches resulting in local flash

flooding. Again on the 29th and 30th heavy storms developed particularly in the southeastern portion of the state.

In spite of the many storms which hit the state, July precipitation remained below average in most areas. Figures 1 and 2 show the July precipitation amounts and percents of average. Many locations including Denver totalled less than one inch of precipitation; well below their July average. Those few areas that were hardest hit by the scattered thunderstorms such as Yampa, Walsenburg and Eads were above average for July, and the San Luis Valley received near-average precipitation. Otherwise the remainder of the state was dry, and some local areas missed almost all the scattered storms. Allenspark received only .05 inches of rain, 2 percent of average.

This was the second consecutive drier than average month west of the Continental Divide and along the Front Range from Denver northward, and it is now beginning to have an effect on the accumulated water-year precipitation as a percent of average (Figure 3). Many areas that have been well above average since winter have now fallen to near or only slightly above average. This again points out how important the abundant winter precipitation was in obtaining our average water-year precipitation.

Temperatures were above average across most of Colorado in July (Figure 4). LaJunta recorded 15 days with temperatures of 100°F or above, and its average daily maximum temperature was 98.5°F; nearly five degrees above average. Daily maximum temperatures were above average statewide, but minimum temperatures were actually cooler than usual in many areas of the state, especially along and west of the Divide. The cool night-time temperatures partially offset the above average daytime temperatures and resulted in average monthly temperatures that were generally only a degree or two warmer than usual.

Figure 1. July 1978 precipitation amounts (inches).

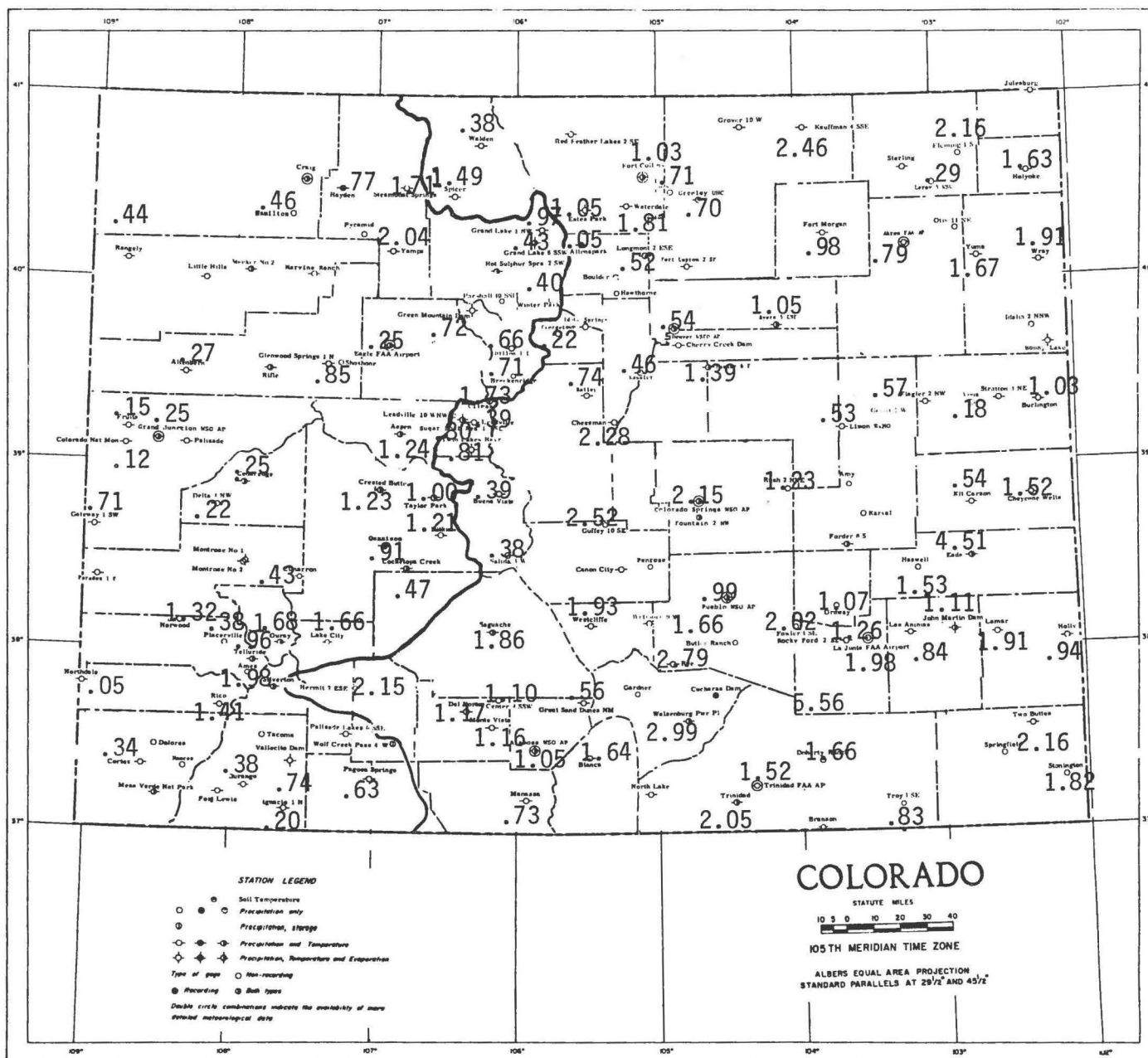


Figure 2. Precipitation for July 1978 as a percent of average (1951-1970).

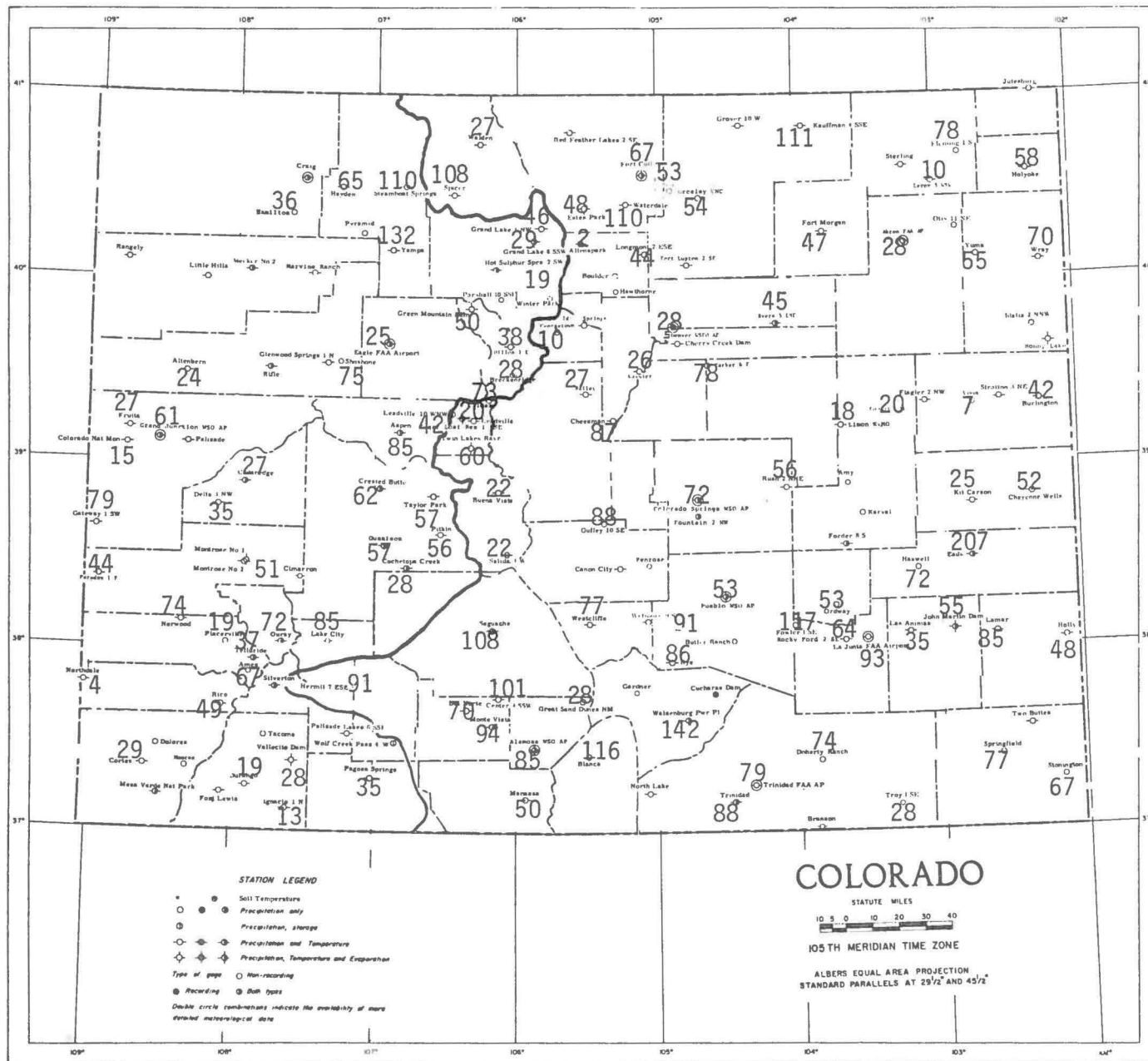
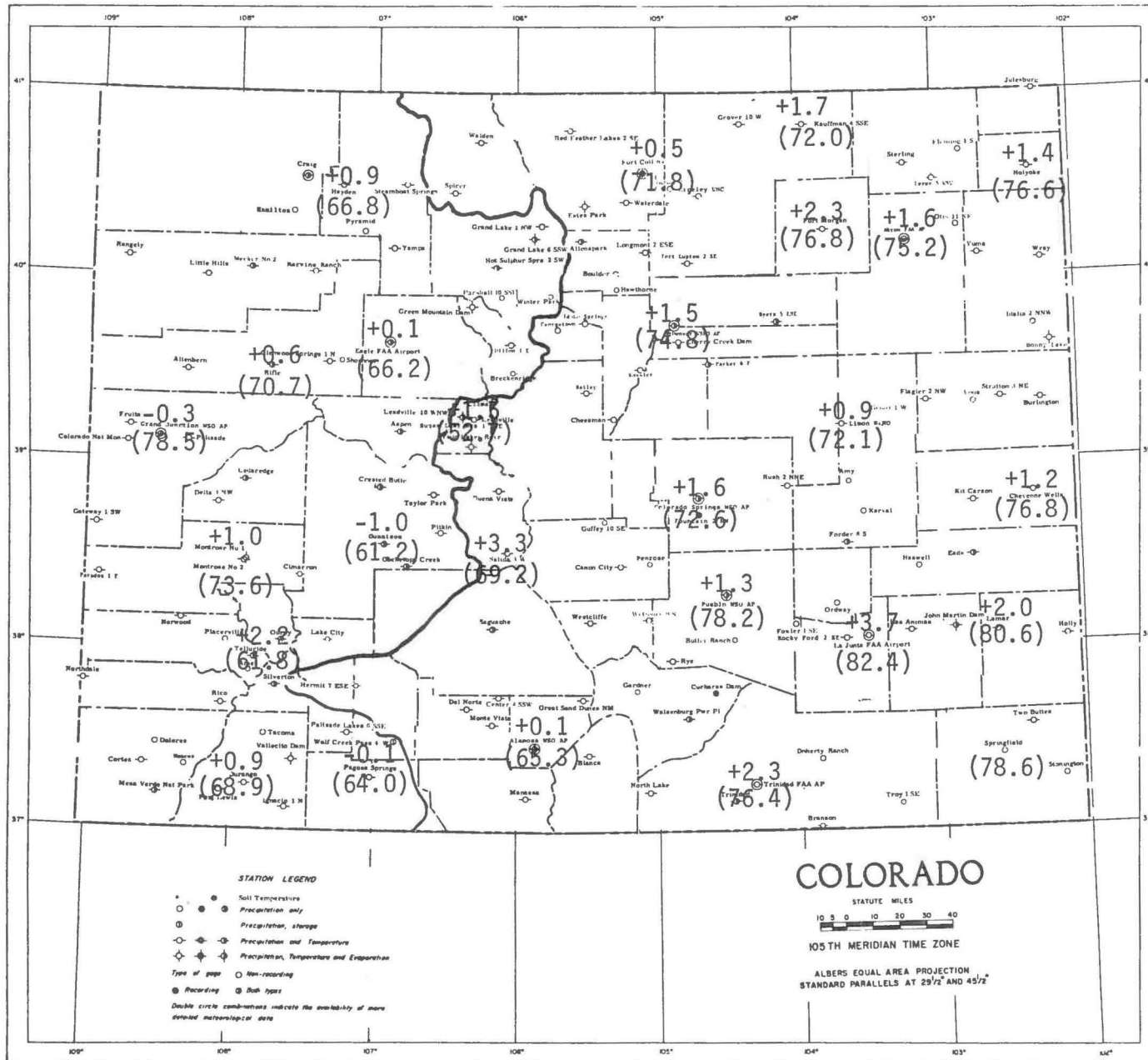


Figure 4. Temperatures for July 1978 in degrees Fahrenheit (in parentheses) and the departure from average (1951-1970).



COLORADO CLIMATE -- AUGUST 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

Most of Colorado experienced very dry weather in August. However, rain fell somewhere in the state on 30 of the 31 days in the month. Severe thunderstorm with heavy rain and some damaging hail moved across parts of the Front Range area and the eastern plains on several occasions. On the 28th, the Colorado Springs area was struck with its second major hailstorm of the summer. Akron recorded 2.59 inches of rain on the 29th.

Parts of August were quite warm with temperatures reaching into the 90's and above across the eastern plains and western valleys. However, temperatures varied drastically as surges of cold air interrupted the warm summer weather. Denver set several record low temperatures such as 44°F on the 15th. Freezing temperatures were observed in many of the mountain valleys, and early snows fell at higher elevations of the Central and Northern mountains. Walden recorded a low temperature of 19°F on the 19th.

Strong downslope winds developed along the Front Range as a sharp cold front crossed the state on the 14th. Wind gusts over 60mph occurred near the foothills, and dust storm conditions were produced as the winds swept across the eastern plains.

Average temperatures for the month are shown in Figure 1. Nearly the entire state enjoyed a cooler than average August. Daytime highs were generally near or slightly above average, but the mean minimum temperatures were much cooler than usually. For example, at Alamosa minimum temperatures averaged 40.3°F, 6° below average, while their mean maximum temperature of 80.4° was 1° above average.

August precipitation totals and percents of average are shown in Figures 2 and 3, respectively. Several locations in east-central and southeast Colorado recorded above average rainfall with a few stations totalling over 4 inches. The 4.66 inch total at Akron was 265 percent of average. But most areas in the western two-thirds of the state were well below average. The .10 inches measured at Bailey (southwest of Denver) was only 4 percent of average. Norwood, in southwest Colorado recorded only a trace of precipitation in August.

East of the Continental Divide, scattered heavy rains, especially in east-central Colorado have brought the accumulated precipitation since last October to near average (Figure 4). However the upper Arkansas valley, the San Luis Valley, and the northeast corner of the state remain dry. Since October 1, 1977, Salida has totalled only 3.82 inches of precipitation which is 37 percent of average. From the Front Range to the western border of the state this was the third consecutive drier than average month. This very dry summer (generally less than 50 percent of average everywhere west of the Divide since June 1) is an indication that the drought in Colorado has not really ended.

Figure 3. Precipitation for August 1978 as a percent of average (1951-1970).

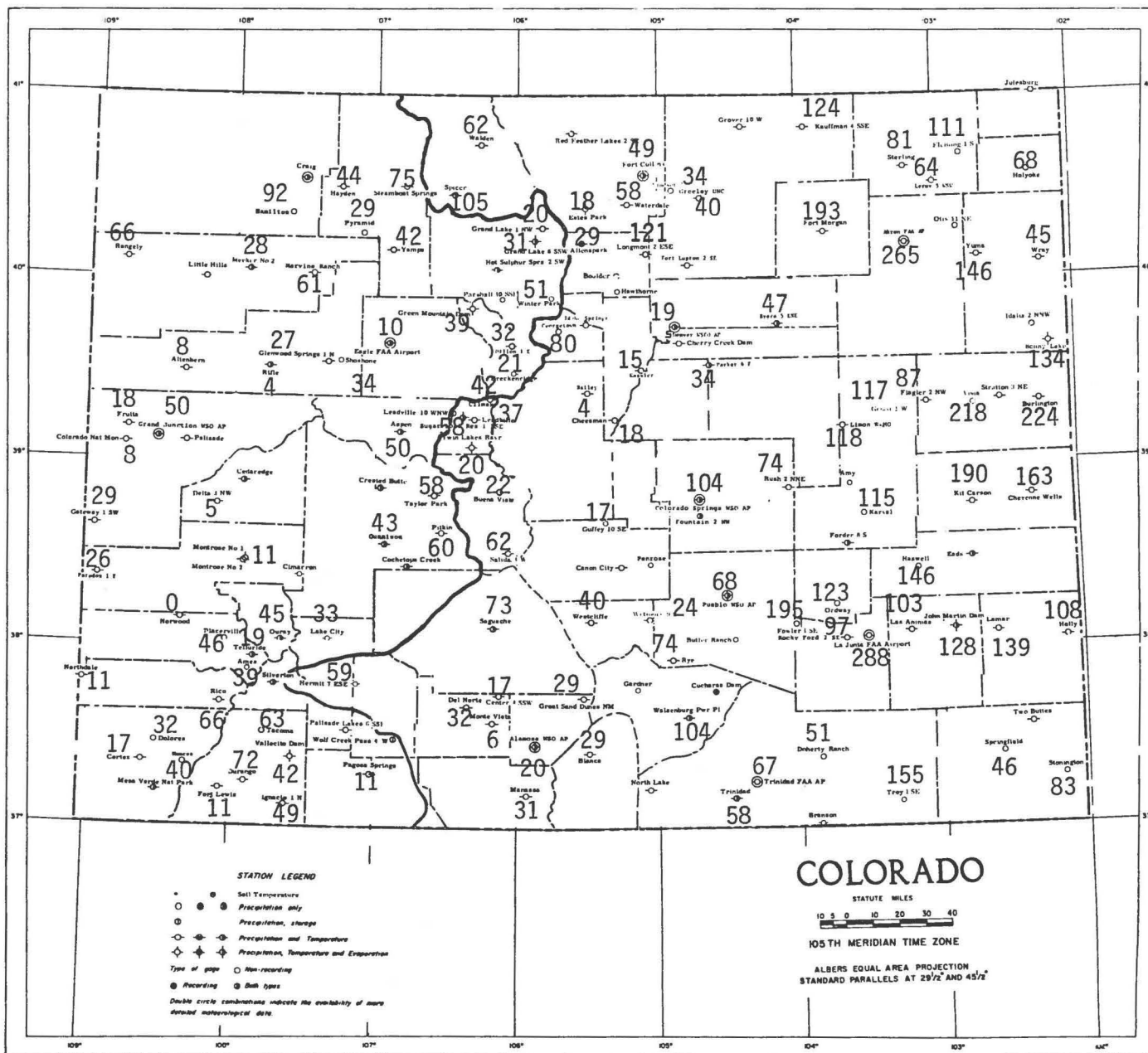
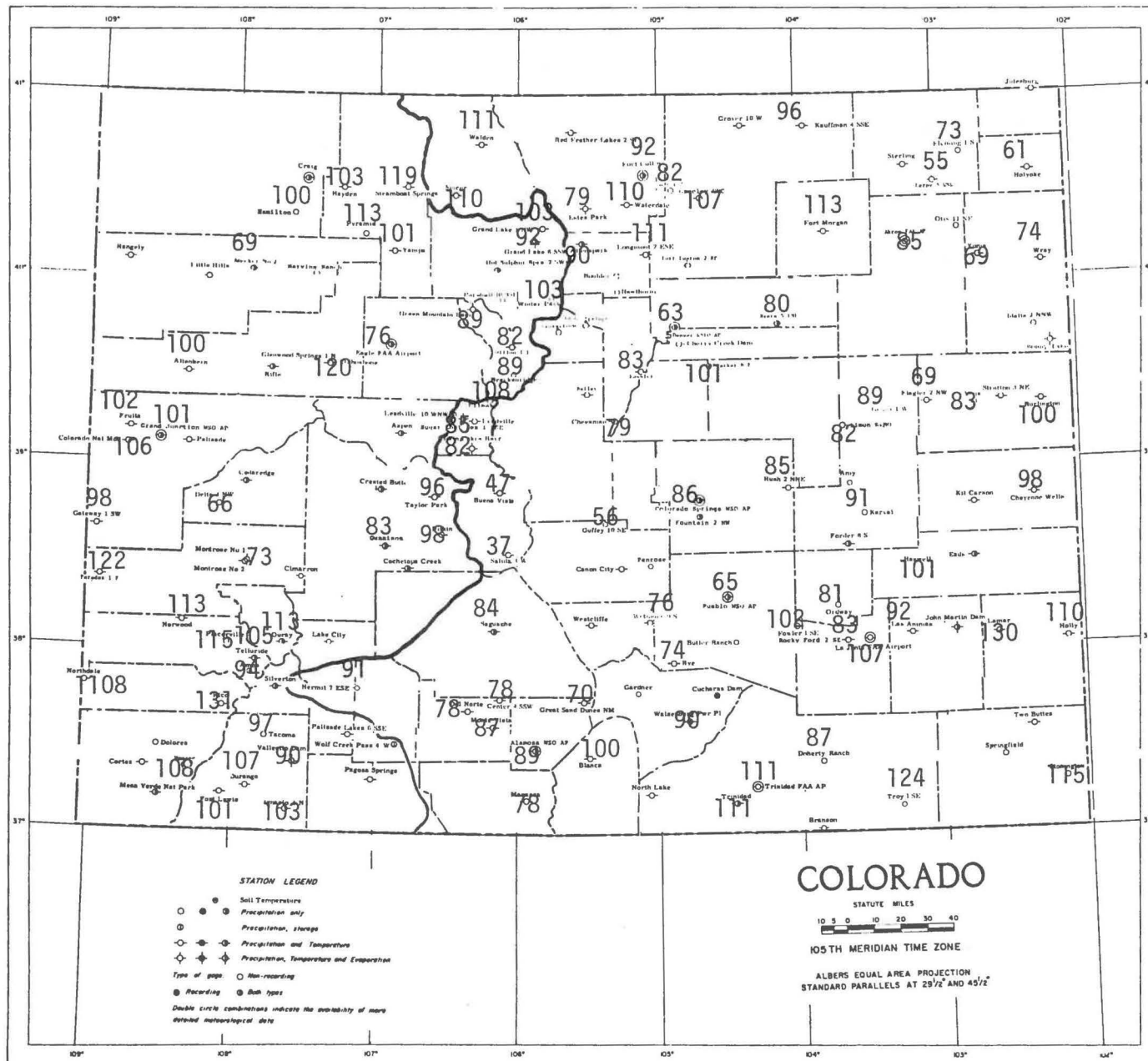


Figure 4. Precipitation for period October 1977 through August 1978 as a percent of average (1951-1970).



COLORADO CLIMATE -- SEPTEMBER 1978

Colorado Climatology Office
Department of Atmospheric Science
Colorado State University

September was a very dry and warm month across most of Colorado. These weather conditions were ideal for viewing the colorful aspen trees, but combined to increase the danger of forest fires in the Colorado mountains. The dry weather also caused some problems on the eastern plains where insufficient soil moisture forced the delay of winter wheat seeding in a few areas.

Temperatures for September were above average, especially east of the Continental Divide (Figure 1). The mean monthly temperature at Fort Morgan was 66.3° F, 4.0 degrees above average. A brief cold spell in mid-September dropped temperatures below freezing across much of the state, and several inches of snow fell on parts of the mountains and lower foothills on the 19th and 20th. But the cold weather was short-lived, and most of the month felt more like summer.

Precipitation was scarce across Colorado in September. One severe storm was reported near Grand Junction on the 7th, and a resulting flash flood damaged parts of the southwestern edge of that city. Otherwise, no heavy precipitation occurred in the state. Figures 2 and 3 show the September precipitation and percent of average. Little precipitation of any kind fell east of the Continental Divide. Much of the western part of the State was also very dry. From the Front Range westward to the Utah border, this was the fourth consecutive drier than average month. Only a small area in southwestern Colorado received above average precipitation.

September was the last month of the 1978 water year, and a final summary of this year's precipitation is shown in Figure 4. Despite the heavy snowfall during the winter, precipitation west of the Continental Divide ended up near average for the year. This was due to the exceptionally dry summer. For example, from June through September, Delta received only .35 inches of rain, 11 percent of average. At higher elevations the situation was similar. By the end of May, Berthoud Pass had received 36.00 inches of precipitation, 10 inches more than average. But during the summer only 3.84 inches fell, 7 inches less than average.

East of the Divide precipitation was more variable. A very dry winter was followed by a stormy, wet May. During the summer, heavy storms drenched some areas while completely missing others. For example, Eads received 11.12 inches of rain during the summer while Denver managed to get only 2.04 inches. Final analysis showed that much of eastern Colorado was drier than average for the 1978 water year, except for the southeastern corner of the state. By far the driest areas were the northeastern corner of the state and the upper Arkansas valley. Salida and Buena Vista totalled only 3.82 and 4.94 inches of precipitation, respectively, for the year.

As a new water year begins, Colorado is again facing a possible drought situation. Precipitation over the past five years has generally fallen short of the long-term averages. Although abundant mountain snowfall this past winter spared the state from a serious water crisis, the dry summer has again put us in a vulnerable position. But drought and rumors of drought are a part of life here in Colorado, as well as in other semiarid regions. We must realize that there will be dry years and water shortages. The most important thing we can do is to use the water resources that we have as wisely and efficiently as possible.

Figure 3. Precipitation for September 1978 as a percent of average (1951-1970).

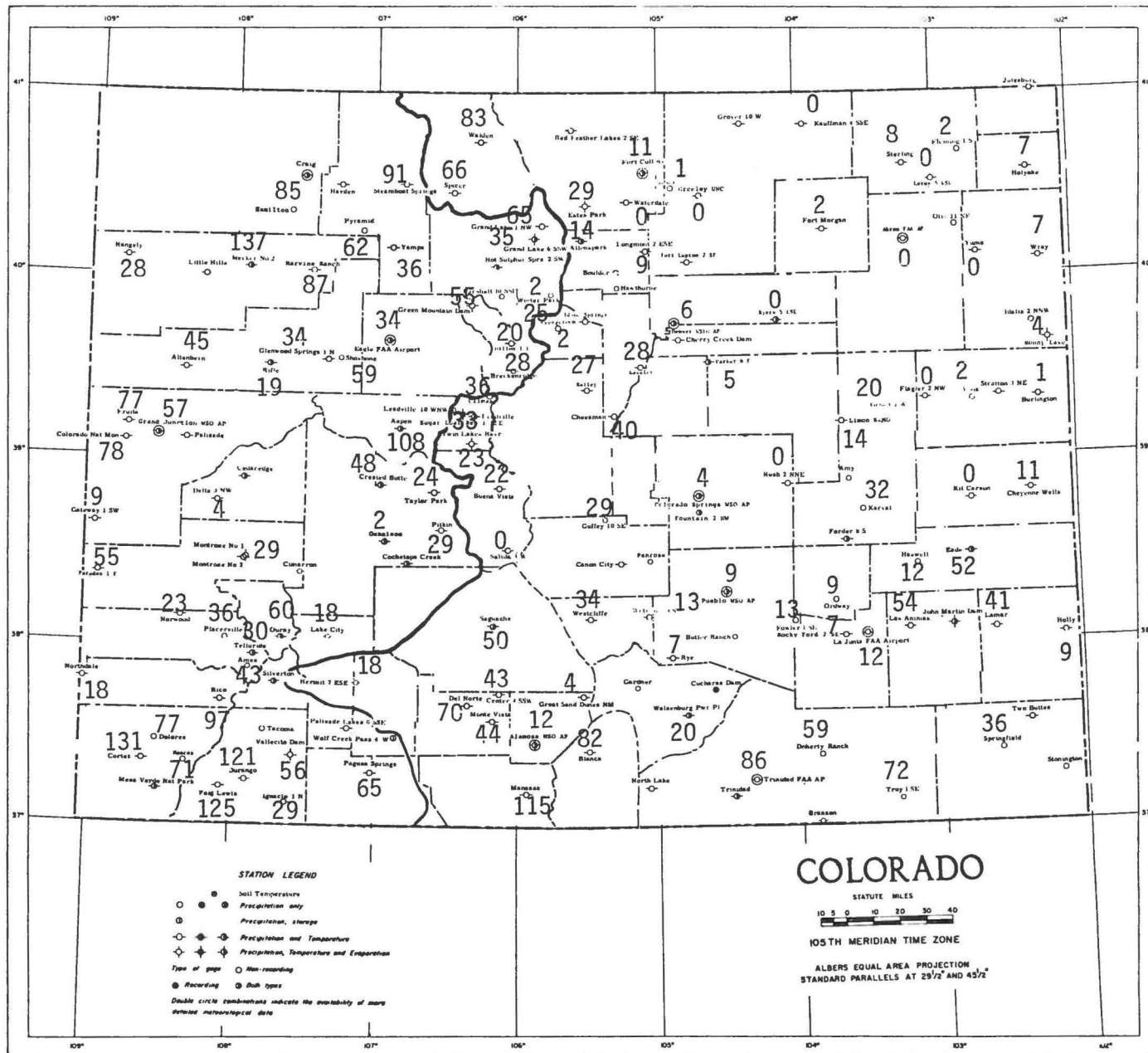


Figure 4. Precipitation for the 1978 water year (October 1977 through September 1978) as a percent of average (1951-1970).

