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COLORADO CLIMATE SUMMARY

WATER-YEAR SERIES

(October 1980 - September 1981)

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NOLAN J. DOESKEN

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Climatology Report No. 81-3

DEPARTMENT OF ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY
FORT COLLINS, COLORADO

COLORADO CLIMATE SUMMARY

WATER-YEAR SERIES

(October 1980-September 1981)

by

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I. INTRODUCTION

This is the fourth in an ongoing series of water-year climate summaries prepared by the Colorado Climate Center. The annual summary is simply a collection of the monthly reports for the water-year period.

The Colorado Climate Center has been preparing monthly summaries of temperature and precipitation in the state since January 1977. These monthly summaries were initiated to help monitor the status of Colorado's water supplies during the severe winter drought of 1976-77. Since that time, the summaries have evolved into brief but comprehensive monthly climate descriptions. The narrative and map presentations are designed to display and describe as much climatic data as possible in a convenient and easy to read form.

The water year is defined as the 12-month period from October 1 through September 30. That period is much more practical than the calendar year for discussing water in Colorado because it is well correlated with the state's water storage -- water usage cycle. In October, snow usually begins to accumulate in the high mountains. As winter progresses, the snowpack normally continues to build up. This snow is the frozen reservoir which not only supports the booming ski industry but, more importantly, eventually supplies much of the water for human consumption, for extensive irrigation, for industry, and to satisfy long-standing stream flow compacts with neighboring states. Irrigated agriculture still accounts for the vast majority of water used in Colorado. Therefore demand for water peaks during the summer and tapers

off as temperatures drop, crops are harvested, and autumn arrives. September marks an appropriate end to the water year.

Because of the crucial importance of water to Colorado this publication emphasizes precipitation and water-year accumulated precipitation. Comparisons with long-term averages are made to help determine which parts of the state are wetter or drier than average. This makes it possible to document the availability of water resources and to assess potential drought situations.

Monthly average temperature information is also presented for several locations. This is supplemented by heating degree day information for parts of the state (an introduction to heating degree days is given in Section II which follows). Comparisons are made with long-term averages as well as with the previous year's data. This provides a simple way of comparing energy consumption for space heating with actual climatic conditions.

Specific daily temperature and precipitation data are not presented here, However, important weather events such as severe storms and temperature extremes are included within the general narrative of each monthly summary.

Most temperature and precipitation data used in the monthly summaries were obtained from the National Weather Service cooperative observer network. Data from the major National Weather Service stations such as Denver and Grand Junction are also used extensively. Snowpack data collected by the Soil Conservation Service are added during winter and early spring to provide some information for the data-sparse mountainous areas.

Not all of the data collected in Colorado are presented in these monthly summaries. In general, only the weather stations which have been in existence at or very near to their present locations since at least 1951 are included. Averages for both temperatures and precipitation based on 1951-1970 data have been calculated and are used in most instances. Heating degree day normals are based on 1941-1970 data. This allows representative comparisons with long-term climatic averages using consistent standards.

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, are displayed on maps. Occasionally, additional figures are also included. For each month during the winter, maps are shown which contain heating degree days and the departure from average and heating degree days compared with the previous year. A table of heating degree day information is presented each month. The accuracy of all of these maps and tables is 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, temperature, and heating degree day values may differ slightly from what was later published by the National Climatic Center.

II. EXPLANATION OF HEATING DEGREE DAYS

Many climatic factors affect fuel consumption for heating. Wind, solar radiation and humidity all play a part, but temperature is by far the most important element. Very simply, the colder it gets, the more energy is needed to stay warm.

A simple index, given the name heating degree days, was devised several years ago to relate air temperatures to energy consumption (for heating). The number of heating degrees for a given day is calculated by subtracting the mean daily temperature (the average of the daily high and low temperature) from 65° F. Sixty-five degrees is used as the base temperature because at that temperature a typical building will not require any heating to maintain comfortable indoor temperatures. That difference (65° F minus the mean daily temperature) is the number of heating degrees for that day. The daily values are accumulated throughout the heating season to give heating degree day totals.

The heating degree day total for a month or for an entire heating season is approximately proportional to the quantity of fuel consumed for heating. Therefore, the colder it gets and the longer it stays cold, the more heating degree days are accumulated and the more energy is required to heat buildings to a comfortable temperature.

So why is this important? Very simply, if you know how much energy you have used for heating your home or business during a certain period of time, and if you also know the heating degree day total for that same period, you can then establish an energy consumption ratio. With that information you can then make reasonable estimates of your future

energy consumption and costs. Also, you can easily check the success and calculate the savings resulting from energy conservation measures such as new insulation, storm windows, or lowering the thermostat.

III. 1981 WATER YEAR

This is a complete month-by-month summarization of the climate in Colorado during the 1981 water year.

It was an unusually warm year particularly during the mid-winter period. A lack of much winter snowfall, even in the mountains, and record-breaking warm temperatures caused many people to call 1981 the year without a winter. Serious drought concerns developed as mountain snows failed to fall and poorly snow-covered ski slopes discouraged many skiers. The low snowpack conditions, occurring just 4 years after the worst winter drought ever measured in Colorado, spurred the State to develop and implement a progressive State Drought Response Plan. With the help of good carry-over reservoir storage from the previous wet winters, with careful water consumption, and with good summer precipitation, Colorado managed to come through this major drought situation with very few problems. The State was most fortunate, indeed.

The year began with few indications of what was ahead. A major winter storm in mid-October covered the mountains with good early-season snowpack, and temperatures for the month were cooler than average statewide. Severe thunderstorms along the Front Range on the 15th added a peculiar dimension to the month's weather.

The pattern of dry and warm weather began to establish itself in early November. Although a few storm systems crossed the state during the month, they dropped little precipitation.

By December the drought was becoming well established. Almost no precipitation fell east of the mountains in December, and precipitation

was scant in the mountains as well. Record warm temperatures occurred over much of the state with many daytime high temperatures in the 60's and 70's at lower elevations.

Dry and very warm conditions prevailed through January and February although February temperatures were somewhat more seasonal. A brief blast of severely cold weather in February was one of the few tastes of real winter weather experienced. Late in the month the mountains still looked nearly snowfree and it was about as easy to hike through the minimal snow as it was to ski.

Finally in March a change came. Several storms brought good moisture to the state. The mountains fared better than they had been, but the real benefit came on the Eastern Plains where several very wet storms quickly made up for the previous 6 dry months. Winter wheat got off to an excellent spring start.

April reverted back to the dry and very warm weather pattern although moisture continued to be good in northeastern Colorado. The warm weather prompted premature melting of the mountain snowpack, and by the end of the month snow remained on the ground only at elevations above about 11,000 feet.

It came too late to help the ski industry, but the mountains were blessed with abundant May precipitation, and temperatures were below average across the state for only the second month in the past year. This one wet, cool month may have been the biggest factor in avoiding major drought impacts across the state. Precipitation was most abundant in exactly those areas which had been the driest during the winter.

The weather made a rapid transition in June to summer conditions. While temperatures were quite warm and precipitation highly variable,

the most important weather item for the month turned out to be "tornado." The Denver metropolitan area was struck by an outbreak of tornadoes and severe weather on June 3 which injured dozens of people and damaged millions of dollars worth of property.

Above average precipitation fell in July, again helping to offset the very low streamflows in the state's major rivers and minimizing impacts of the winter drought. Precipitation was especially heavy in the San Juan Mountains and near Trinidad where some flooding occurred from locally heavy downpours.

The Trinidad area was soaked again with flooding rains in August. This time the heavy rains were more widespread acorss southeastern Colorado. Precipitation was about average over most of the remainder of the state, but abundant cloud cover and high humidity made it seem wetter than usual.

The year ended quietly with a warm and rather dry September, particularly east of the mountains.

Assessing the 1981 water year in its entirity, Colorado successfully averted a potentially serious drought situation. Despite near record low streamflows in parts of the state, water supplies were generally adequate for the year and agricultural production statewide was excellent. Reservoir storage was significantly depleted through the year but was still only about 10 percent below average state-averaged at the end of September.

The only segment of the economy significantly affected by the snow drought was the ski industry. This second severe winter drought in 5 years caused a rapid push during the summer to install snow-making

facilities or expand existing facilities at most of Colorado's major ski resorts, thus helping to insulate them from the effects of climate's natural variations.

Tornado damage was great in 1981 due mostly to the Denver tornado outbreak early in June. Other storm damage was scattered across the state during the year with flooding in the Trinidad area causing major problems. Hail damage was not particularly great for the year, and the dry, warm winter meant that snow removal was not much of a problem. The unusual warmth also meant that Coloradans didn't need to burn as much fuel to keep warm. This helped soften the impact of escalating fuel costs.

COLORADO CLIMATE -- OCTOBER 1980

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Department of Atmospheric Science
Colorado State University

October 1 marked the beginning of the new 1981 water year. Lovely warm and dry autumn weather covered all of Colorado during most of the first two weeks of the month. Daytime temperatures rose into the 70's and 80's everywhere except at high elevations in the mountains. The state's highest temperature in October occurred at Las Animas on the 2nd when the mercury reached 93° F. The weather station at Climax (11,350 feet above sea level) recorded a high of 73° F on the afternoon of the 7th which was the warmest October temperature ever recorded there.

Clouds and precipitation began to move into western Colorado late on the 12th as the first major winter storm system of the season began to take shape over the western United States. Rain and some thunderstorms continued to dampen the western part of the state on the 13th and 14th and clouds and a few trace showers spilled across to the eastern slope of the Rockies.

By the 15th, colder temperatures began to move into Colorado. More thunderstorms rumbled across the Western Slope and the rains changed to heavy snows at higher elevations. Precipitation skirted eastern Colorado except for an area along the Front Range. Thunderstorms developed over the foothills on the afternoon of the 15th from Denver northward to Wyoming and then rolled out over the northeastern plains during the evening. Brilliant lightning displays and severe weather conditions were reported in several locations close to the mountains. Many areas along the Front Range received hail, and 4 inches of small stones accumulated

at one location north of Fort Collins. A small tornado apparently touched down in Boulder causing some property damage.

Temperatures plummetted, and by the morning of the 16th the first snowflakes of the season greeted residents of northeastern Colorado. Meanwhile, heavy snows continued to fall over Wyoming and in the Northern and Central Mountains of Colorado. By the time the storm finally ended in the mountains on the 18th, more than 2 feet of snow had fallen in some locations. Berthoud Pass measured 30.5 inches from the storm. After a dry summer this moisture was very welcome, but it did present some problems as several high-country hunters were stranded and had to be rescued.

Warmer and drier weather gradually returned, but a cold front moved down across the state from the northwest on the 22nd and 23rd. Little or no precipitation accompanied this cold front, but a week of unseasonably cold weather followed. On the morning of the 24th many areas of the state recorded their coldest temperatures so far this fall. Temperatures of 20° F or below were common across eastern Colorado.

A weak storm system on the 26th and 27th brought more precipitation to the mountains and the Western Slope. Upslope conditions developed east of the mountains on the 27th bringing low clouds and a little light snow to most Front Range cities. But once again the Eastern Plains failed to receive any appreciable moisture. With the help of fresh snowcover, mountain locations recorded very cold nighttime temperatures on the 28th and 29th. Taylor Park Dam, Colorado's traditional cold spot, observed a low of -5° on the 29th, the state's coldest temperature for the month.

As October came to an end, sunshine and warm temperatures moved back into Colorado.

Precipitation totals and percents of average for October are shown in Figures 1 and 2, respectively. West of the Continental Divide, precipitation was generally near or above average. The 1.80 inch total at Palisade near Grand Junction was 184 percent of average. The wettest reporting station in October was Bonham Reservoir atop Grand Mesa where 3.65 inches was measured. East of the Divide precipitation was considerably below average. Widespread areas across the Eastern Plains received no more than a trace of precipitation for the month. For portions of the winter wheat growing areas of northeastern and southeastern Colorado this was the second consecutive very dry month, and the young plants are getting off to a poor start.

Temperatures for the month and departures from average are shown in Figure 3. Compared to average, there was little difference noted across the state with most locations ending up about one degree cooler than usual. The exceptions were the San Luis Valley, the upper Arkansas Valley, and extreme northeast Colorado where temperatures averaged about three degrees cooler than normal. Denver was the state's warm spot in October, 0.7 degrees warmer than average.

A detailed tabulation of monthly heating degree day totals for many Colorado cities is shown in Table 1 with additional information appearing in Figures 4 and 5. The cooler than average temperatures meant that most areas of the state received more heating degree days than usual (Figure 4), but most locations were within 10 percent of their long-term averages. Totals ranged from 313 heating degree days at Canon City to

890 at Dillon. Both locations received 10 percent more than average.

A comparison with last year's data (Figure 5) shows much larger differences. Heating degree day totals this year compared to October 1979 ranged from 5 percent more at Burlington and 8 percent more at Steamboat Springs, to 41% more at Fort Morgan and 72% more at Grand Junction. This means that more energy (substantially more in some areas) was required this year for heating homes, schools, and businesses than what was needed in October 1979.

Figure 1. October 1980 precipitation amounts (inches).

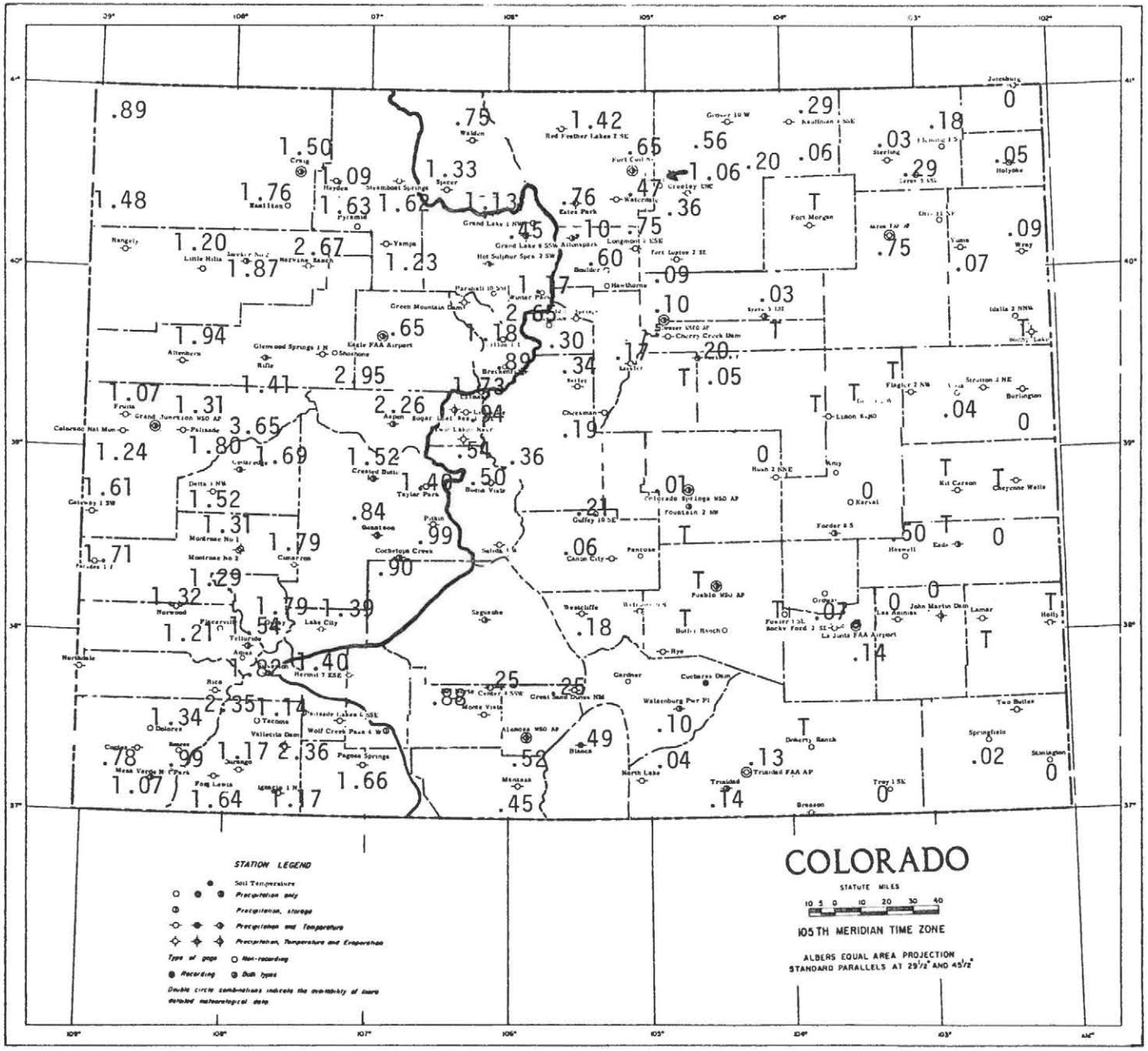


Figure 2. Precipitation for October 1980 as a percent of the 1951-1970 average.

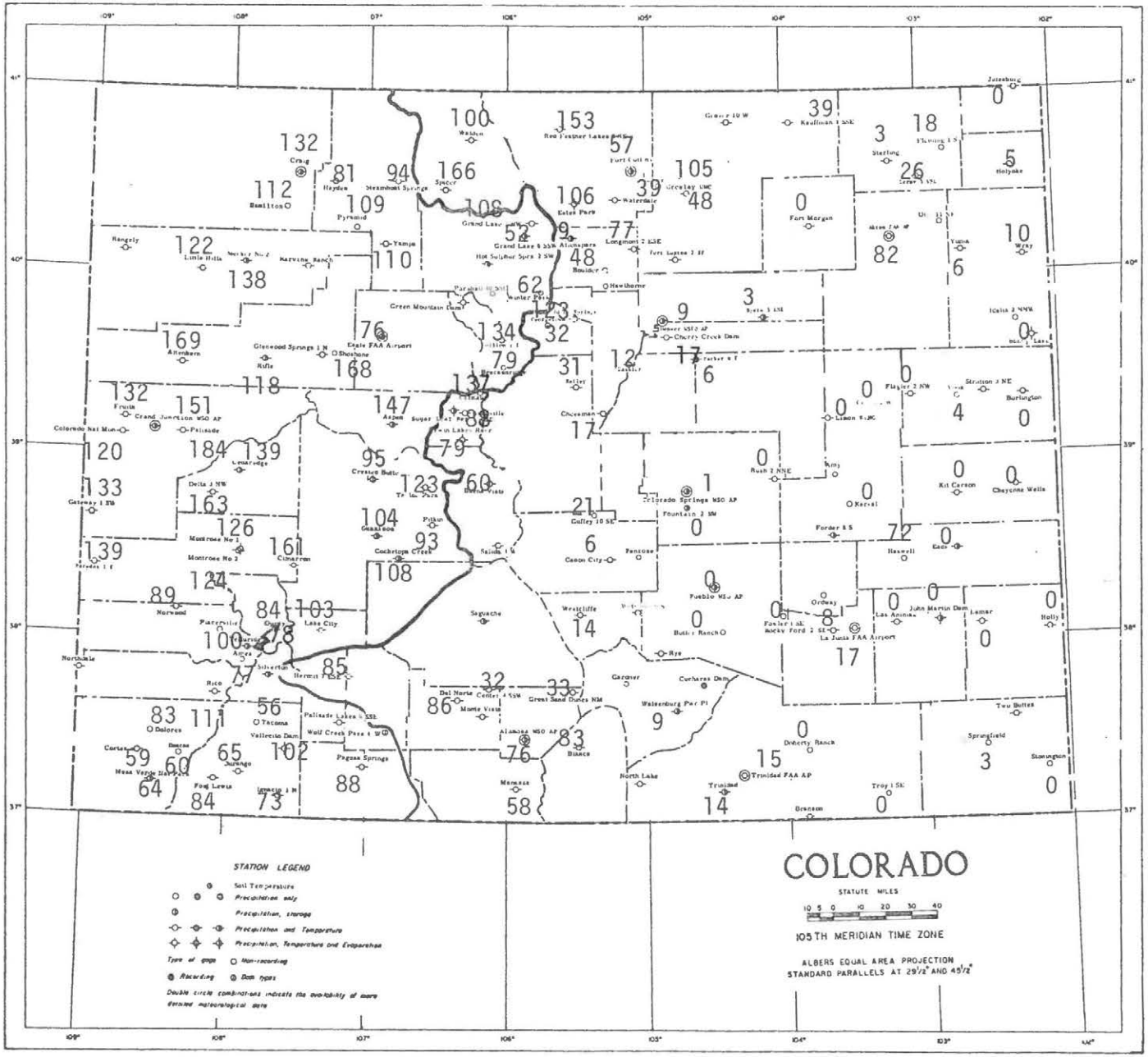


Figure 3. Temperatures for October 1980 in degrees Fahrenheit (in parentheses) and the departure from the 1951-1970 average.

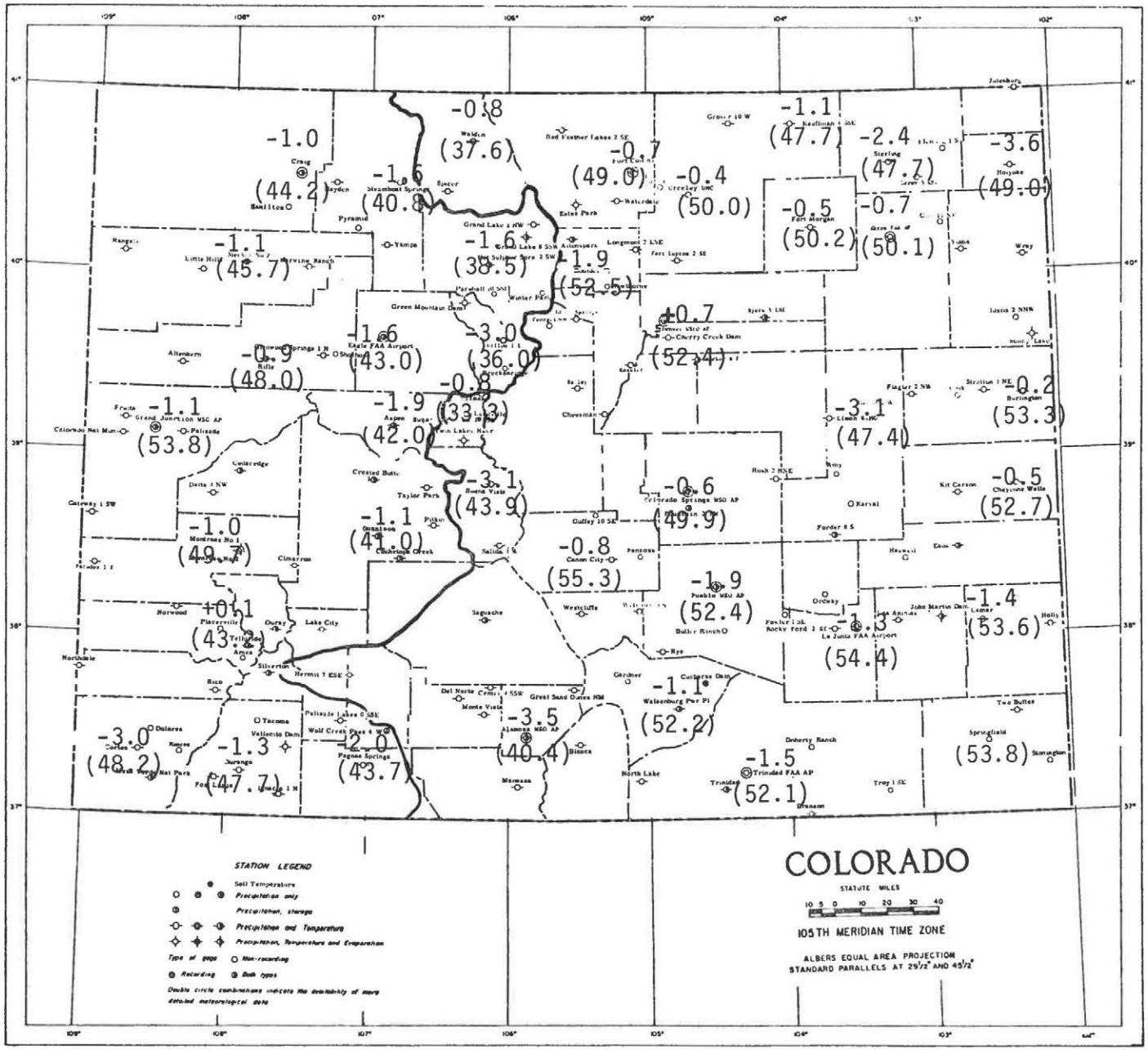


Figure 4. October 1980 Heating Degree Days (in parentheses) and percents above or below the 1941-1970 average.

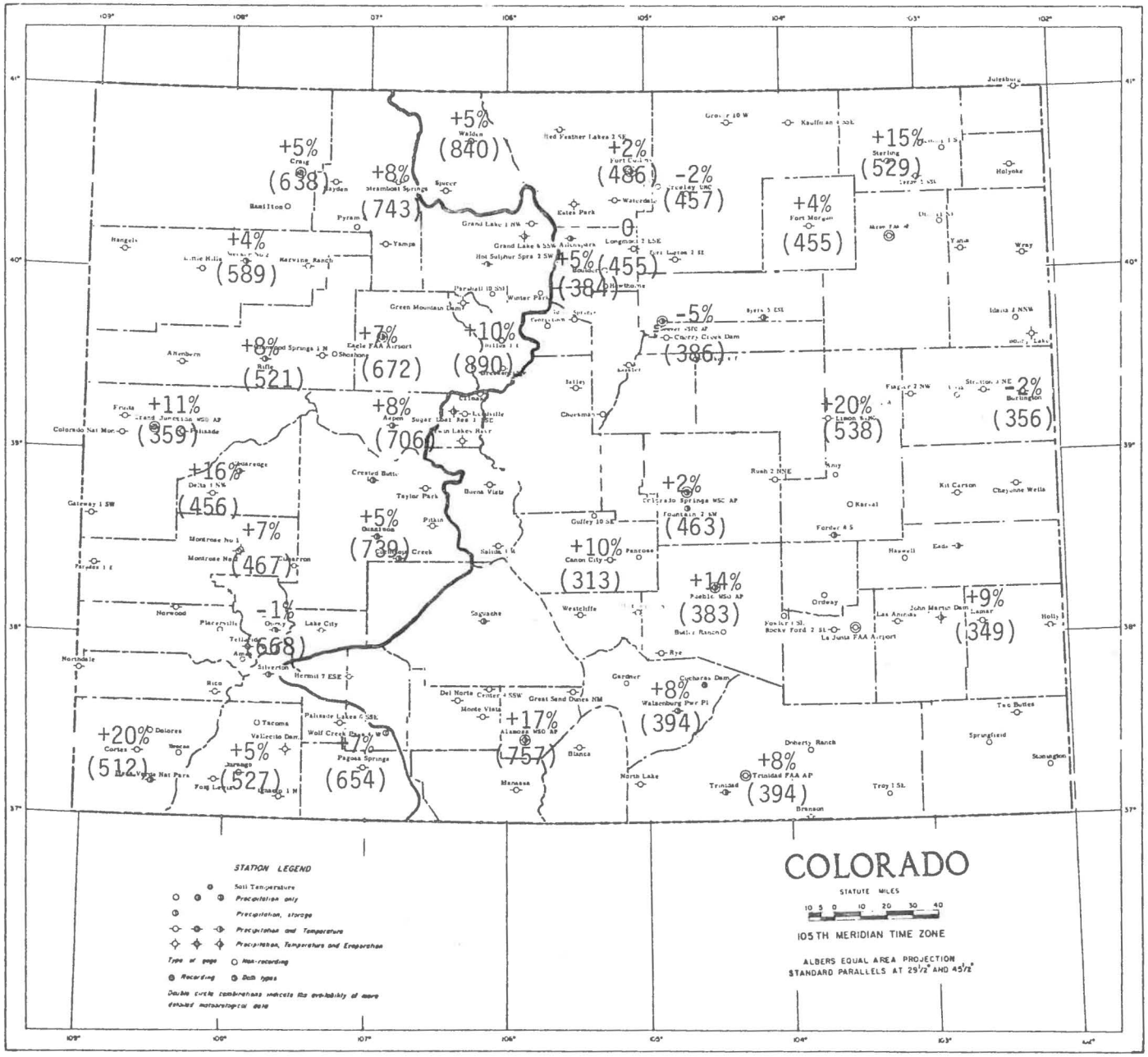


Figure 5. October 1980 Heating Degree Days as a percent above or below October 1979.

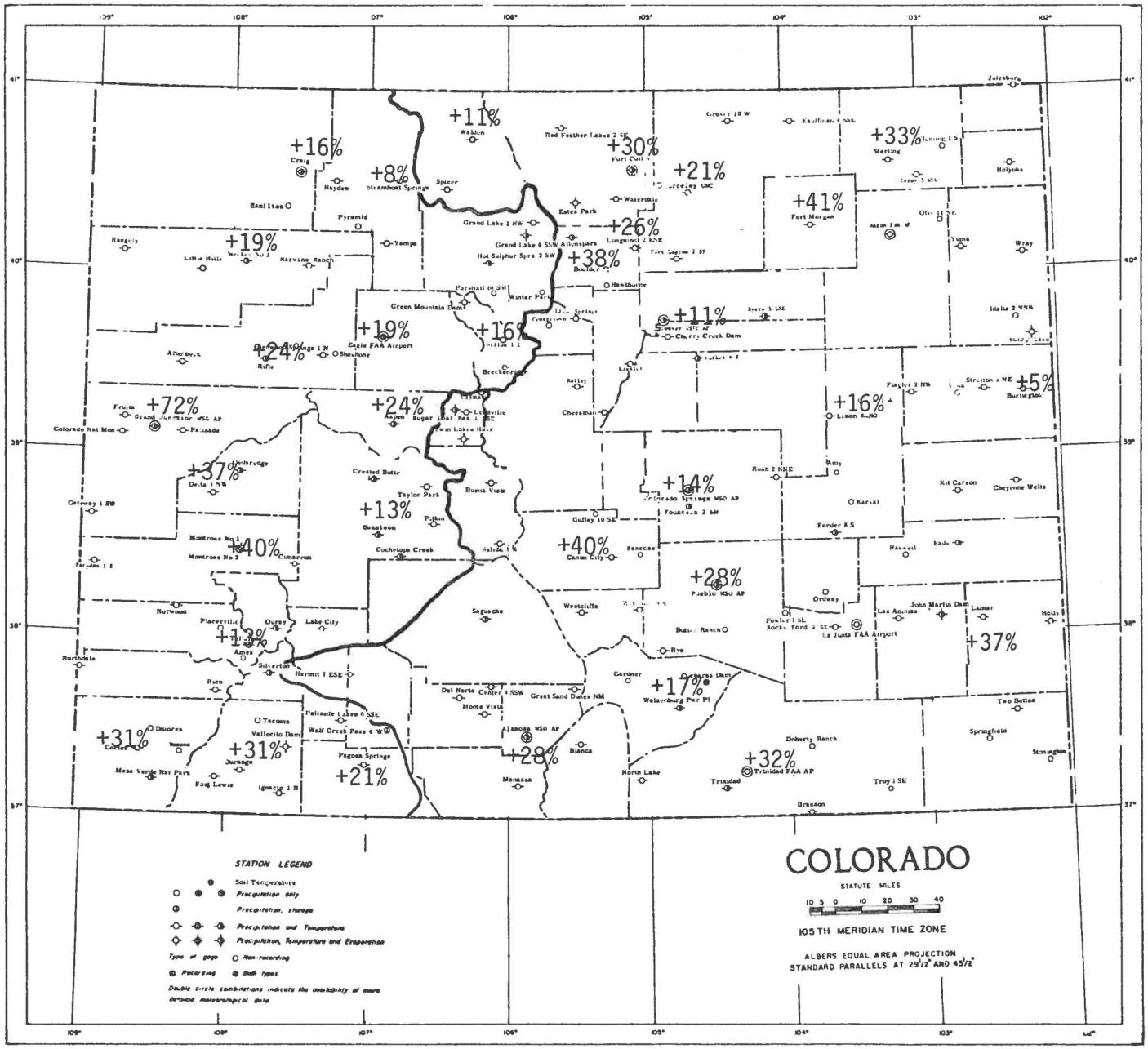


Table 1. Colorado Heating Degree Day Data

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8509
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8553
	1980-81	5	102	263	757									
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	706									
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384									
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356									
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4560
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313									
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	5	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463									
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	512									
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	638									
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456									
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386									
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10354
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	890									
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	527									
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	672									
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486									
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	53	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455									
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359									

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457									
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	739									
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349									
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7220
	1980-81	0	12	139	538									
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455									
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7493
	1980-81	5	60	211	589									
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467									
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654									
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383									
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521									
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200										
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743									
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529									
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	668									
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394									
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10222
	1980-81	142	294	439	840									
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5450
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5513
	1980-81	0	0	52	394									

COLORADO CLIMATE -- NOVEMBER 1980

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

November was both warmer and drier than average across most of Colorado.

During the first 12 days of the month there was no precipitation anywhere in the state and temperatures were unusually warm. A few daytime temperatures climbed into the 60's (Fahrenheit) as high in the mountains as Grand Lake (elevation 8680 feet) and Dillon (elevation 9065 feet). At lower elevations, readings in the 70's were common and many new records were set. Several examples of new daily records included 55° F at Climax on the 10th, 69° F at Craig on the 10th, 71° F at Alamosa on the 9th and 10th, 76° F at Denver on the 1st and 7th, 77° F at Colorado Springs and Fort Collins on the 7th, and 84° F at Pueblo, also on the 7th. The state's warmest reading for the month was reported the afternoon of the 9th when Holly reached 86° F.

A major change in the weather occurred on the 13 and 14th as clouds, precipitation, and much colder temperatures pushed into the state. Precipitation from this storm was not excessive and parts of the Eastern Plains and the San Luis Valley were missed entirely. However, the easterly "upslope" winds along the Front Range resulted in from 6 to 8 inches of snowfall from the 13th through the 15th from Red Feather Lakes and Estes Park southward to Boulder, Lakewood, Cheesman, and on to Walsenburg. Berthoud Pass totalled a foot of new snow from the storm.

Except for a brief warm up east of the mountains on the 21st and 22nd, the two week period from the 13th through the 27th was colder than average across most of the state. After the fresh snowfall, many parts of Colorado reported their coldest temperatures of the month on the morning of the 17th. Aspen, for example, dropped to -3° F and Greeley had a 9° F reading. There were many sub-zero temperatures recorded in the mountains during the last half of November. The state's coldest temperature occurred at Antero Reservoir on the 20th, -28° F.

The second storm system of the month moved into Colorado on the 23rd. The entire state was affected by the storm, but in many areas

precipitation was light. The heaviest precipitation was noted in the San Juan mountains and across southern portions of the state. Vallecito Dam measured 1.19 inches of precipitation (13.5 inches of snow) on the 24th and 25th. East of the mountains, fog and freezing drizzle accompanied the snow. Pueblo totalled .59 inches of precipitation (5 inches of snow) on the 24th, and Lamar and Las Animas each received about 6 inches of snow. Las Animas followed with a low temperature of -4° F on the 26th.

Much warmer weather returned to the state as November came to an end. Strong downslope winds, which quickly warmed the air, began to blow on the 29th along portions of the Front Range. Boulder reported a low temperature on the 30th of only 57° F.

Precipitation totals and percents of average for November are shown in Figures 1 and 2, respectively. Monthly totals were less than one inch except near the San Juan Mountains, in scattered areas of the Central and Northern Mountains, and in a few locations along the Front Range from Walsenburg to Loveland. Precipitation was well below average across the northeast and east central plains, in the San Luis Valley, and west of the Continental Divide. Manassa, just south of Alamosa had no precipitation in November. The high mountains were also very dry. Berthoud Pass totalled 1.27 inches, 39 percent of average. Climax received just .53 inches, 32 percent of average. Areas with near or above average precipitation included the Arkansas Valley and southeastern Colorado, the Front Range from Trinidad to Fort Collins, and a small area near Grand Junction in west central Colorado. Waterdale, near Loveland, measured 1.25 inches, 227 percent of average.

Precipitation as a percent of average for the first two months of the 1981 water year is shown in Figure 3. Most of the state is getting off to a dry start. Conditions are particularly dry across the Eastern Plains. Many areas have received less than 25 percent of their average fall precipitation. The western half of the state is also fairly dry. Since October, the only area with above average precipitation runs from Aspen and Glenwood Springs west to the Utah border. However, the mountains are below average and several locations have had 6 consecutive dry

months. Ouray, Winter Park and Steamboat Springs have each received less than 6 inches of precipitation since the end of May 1980, only about 50 percent of average.

Temperatures for the month and departures from average are shown in Figure 4. Temperatures were above average everywhere in the state except for portions of the Arkansas Valley and extreme eastern Colorado. Compared to average, Buena Vista was nearly 3 degrees cooler than usual. The warmest areas, compared to average, were noted in northwestern Colorado and in much of the Platte Valley. Steamboat Springs, Telluride, and Denver were all about 3 degrees warmer than average, while Greeley's monthly temperature of 39.4° F was more than 4 degrees above average.

A detailed tabulation of monthly heating degree days for many Colorado cities is shown in Table 1 with additional information appearing in Figures 5 and 6. The warm temperatures in November resulted in fewer heating degree days than normal across most of the state. Totals ranged from 3 percent above average at Burlington to 12 percent below average at Greeley.

A comparison with November 1979, which was a very cold month, is presented in Figure 6. Heating degree day totals were much less than last November all across the state indicating that much less energy was probably needed this year to heat our homes, schools, and businesses. Heating degree day totals this year ranged from 10 percent fewer than November 1979 at Lamar to 29 percent fewer than last year at Grand Junction and Boulder, and 30 percent fewer at Longmont.

Figure 1. November 1980 precipitation amounts (inches).

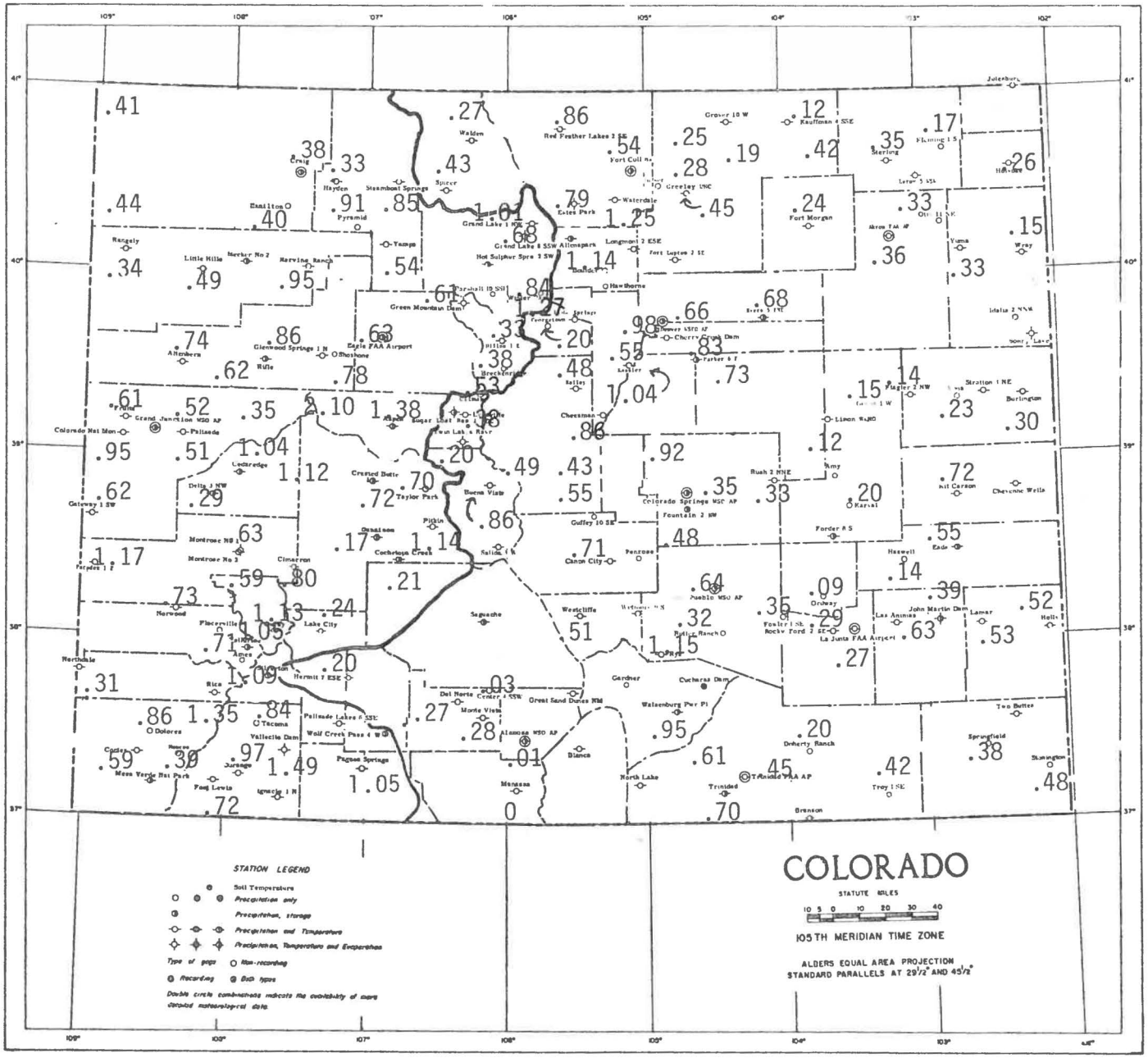


Figure 2. Precipitation for November 1980 as a percent of the 1951-1970 average.

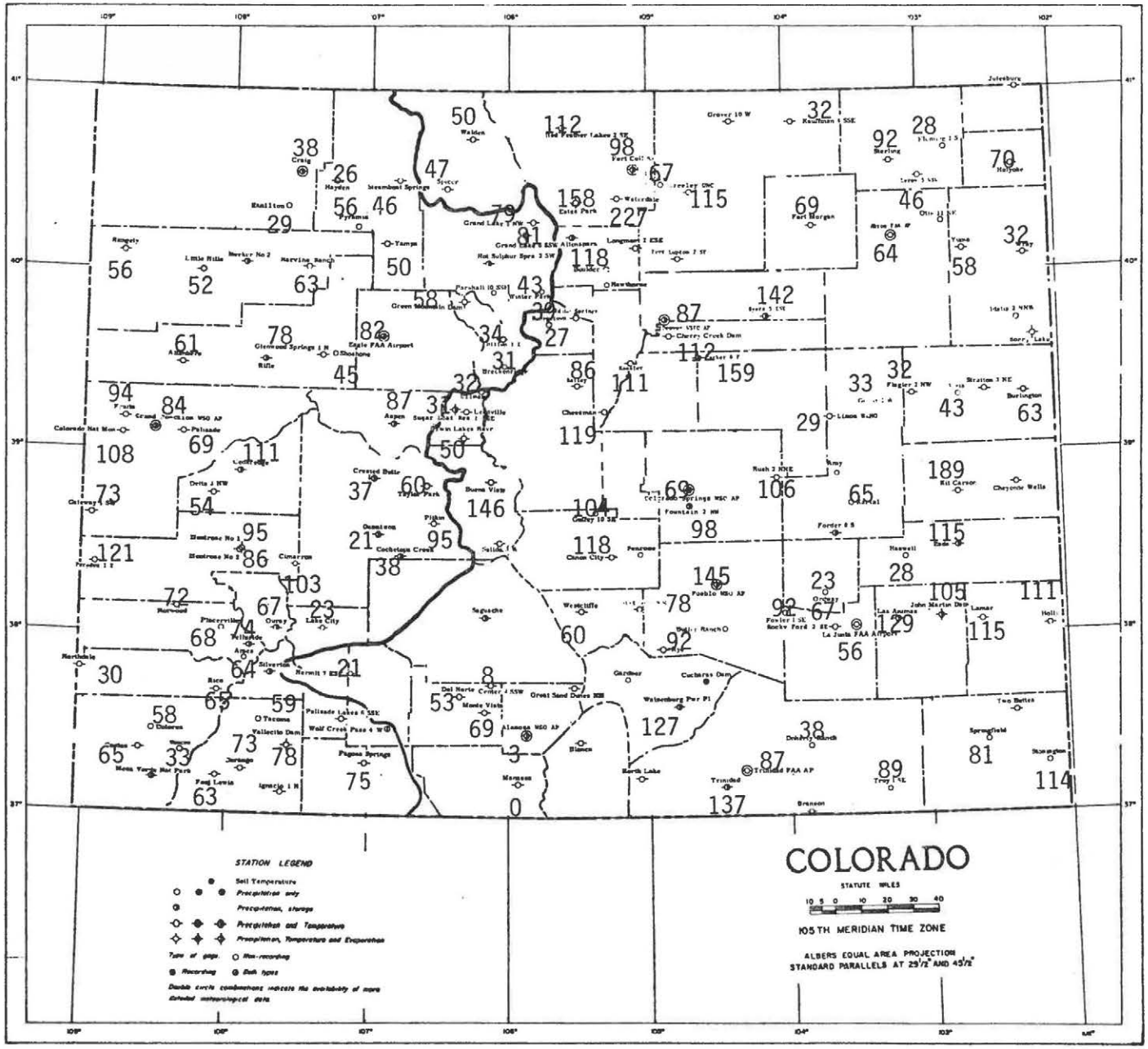


Figure 3. Precipitation for October and November 1980 as a percent of average (1951-1970).

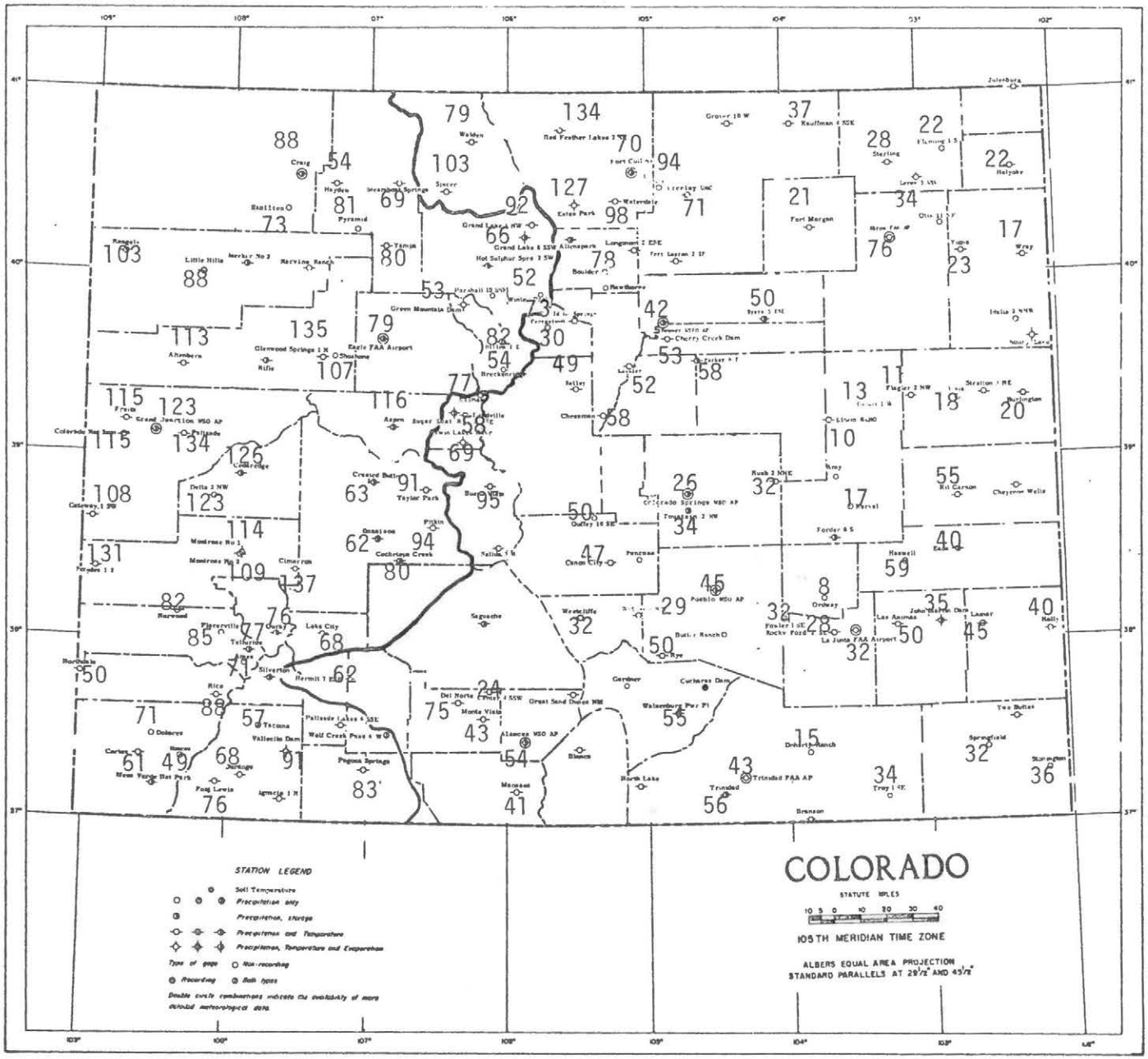


Figure 4. Temperatures for November 1980 in degrees Fahrenheit (in parentheses) and the departure from the 1951-1970 average.

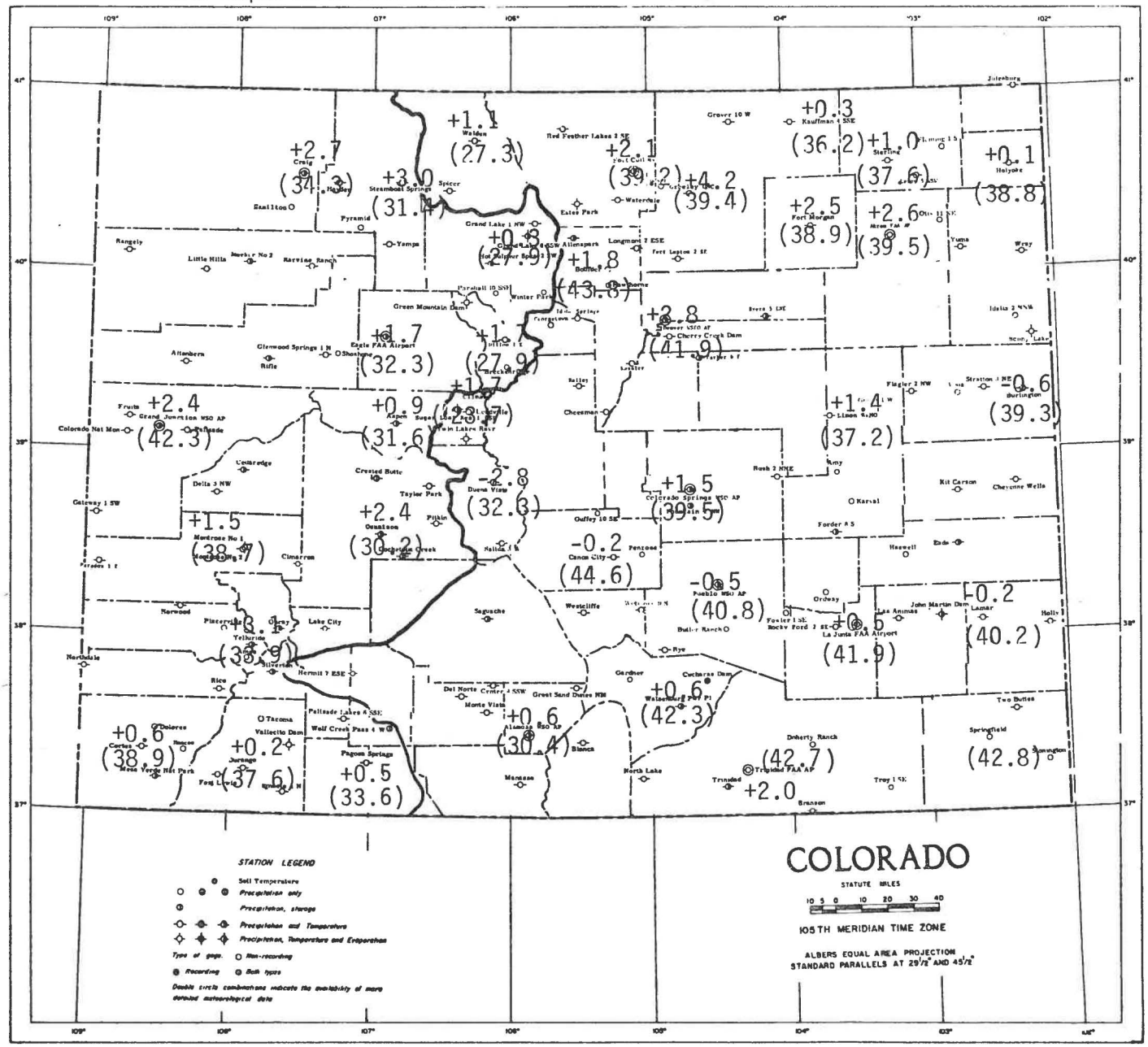


Figure 5. November 1980 Heating Degree Days (in parentheses) and percents above or below the 1941-1970 average.

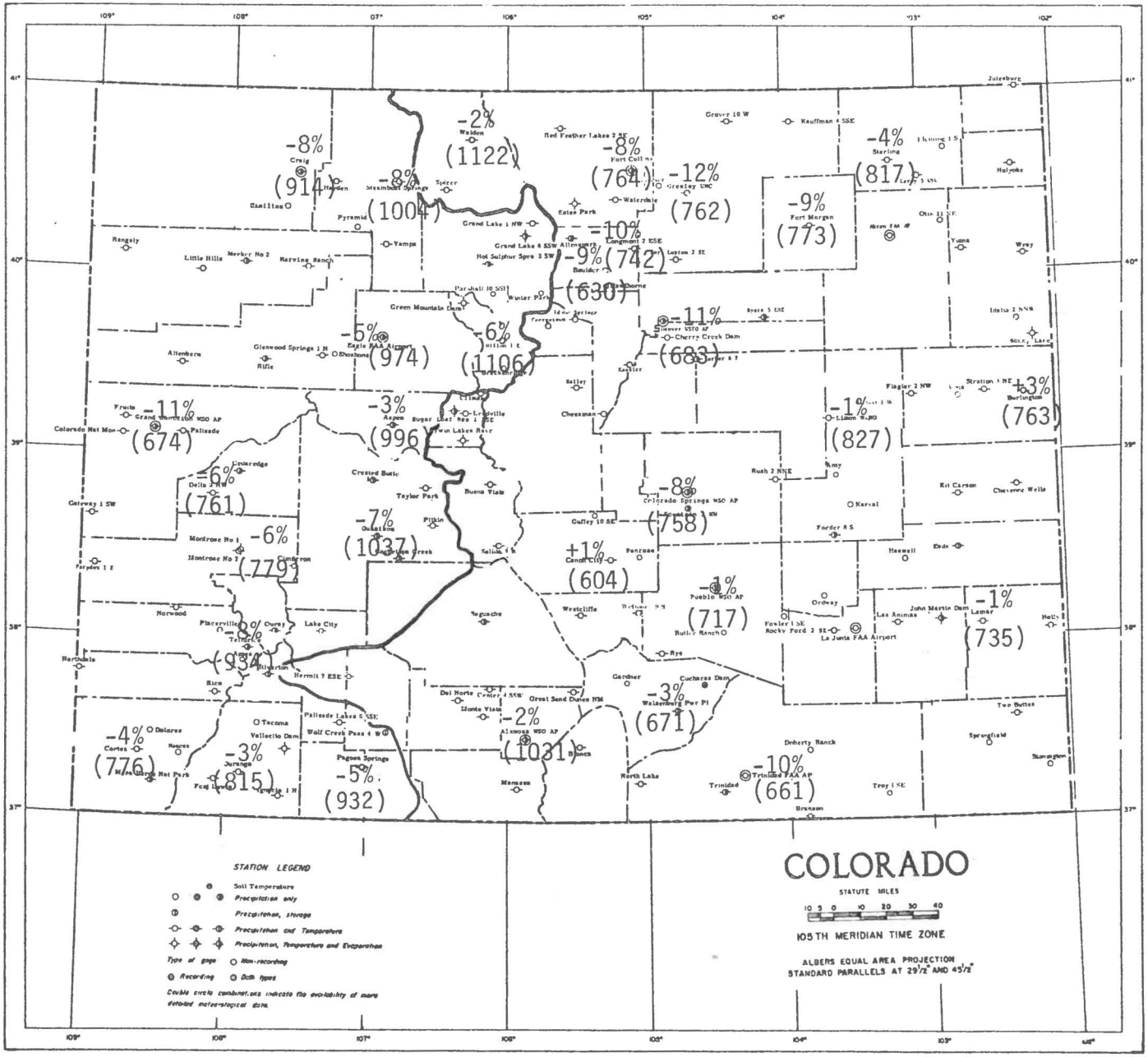


Figure 6. November 1980 Heating Degree Days as a percent above or below November 1979.

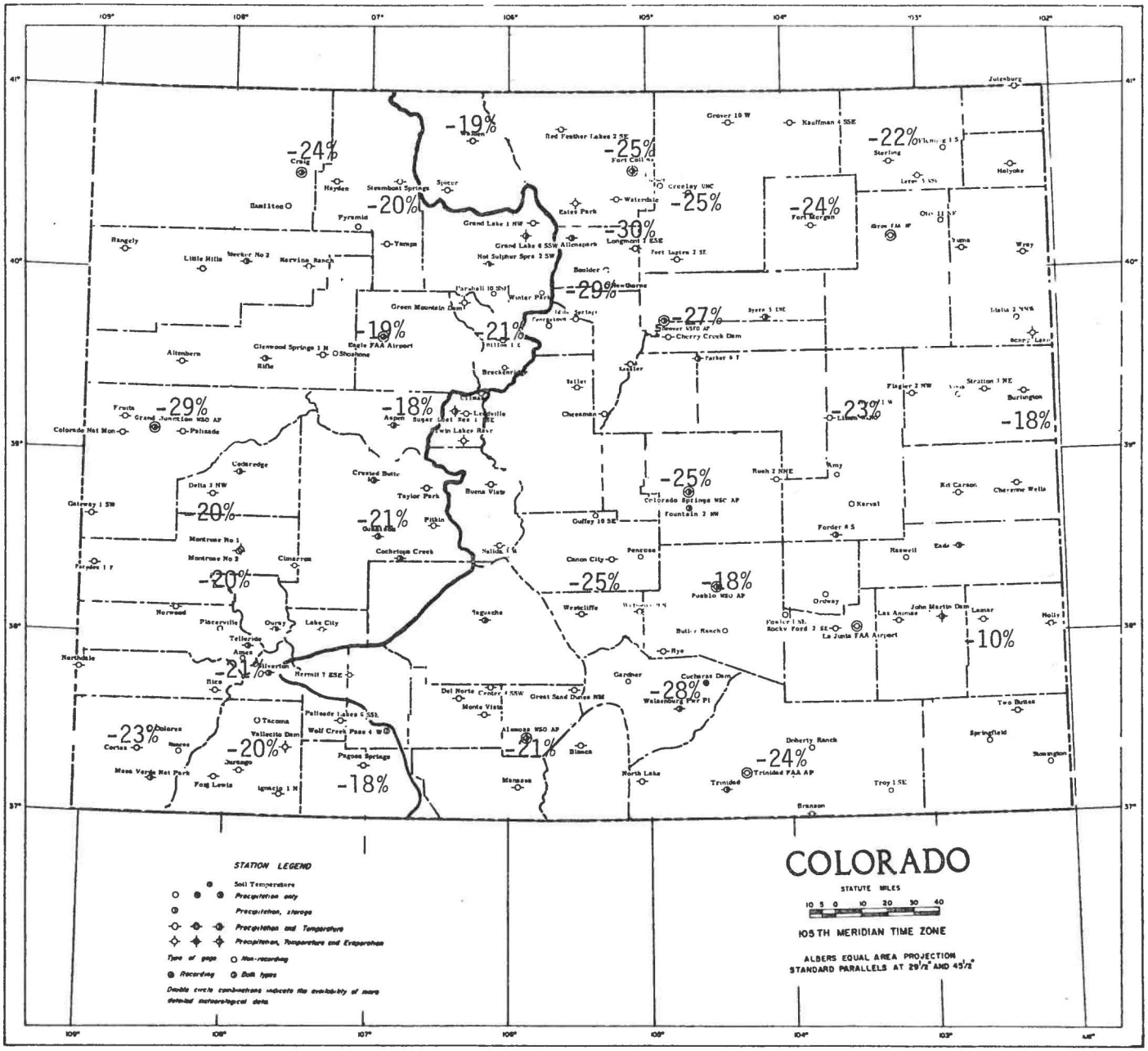


Table 1. Colorado Heating Degree Day Data Through November 1980

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031								
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	996								
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630								
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763								
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	604								
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	758								
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	776								
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8375
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914								
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761								
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683								
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106								
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815								
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	974								
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764								
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773								
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674								

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762								
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037								
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735								
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	827								
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	742								
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589									
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779								
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932								
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717								
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521									
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581									
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004								
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	817								
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	934								
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5542
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	661								
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1122								
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5450
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	671								

COLORADO CLIMATE -- DECEMBER 1980

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

December was dry across Colorado with little mountain snowfall. Record-breaking warm temperatures, which accompanied the dry weather, resulted in statewide concern about developing drought conditions.

Warm and dry conditions were already established over western Colorado as the month began. But east of the mountains a chilly polar air mass slipped down across the plains on the 1st. A little light snow developed as this cold air pushed up against the Front Range. A rapid warming took place on the 3rd as the cold air retreated eastward. Many areas in the western half of the state recorded their highest temperatures during the month on the 3rd. Examples included 55° F at Steamboat Springs, 60° F at Alamosa and Craig, and 68° F at Palisade. By the 4th, the warmth spilled over into eastern Colorado and temperatures climbed into the 70's in some areas. Sterling reached a high of 74° F equalling their previous all time high for December.

Precipitation began to fall in parts of western Colorado early on the 5th as a large but diffuse storm system formed over the western United States. At the same time, a cold high pressure area in southern Canada began pushing southward bringing colder air down from the northeast into eastern Colorado. Precipitation fell across much of the state on the 6th and 7th as the storm system moved eastward, but precipitation amounts were relatively light. Significant precipitation amounts were limited mostly to portions of the San Juan and Central Mountains and some western valley locations. Montrose, for example, measured .65 inches of precipitation from the storm, much of it falling as rain. The greatest snowfall from the storm was 12 inches reported at both Telluride and Silverton.

A little snow also fell east of the mountains and continued on the 7th and 8th. Generally only trace amounts were measured on the plains with up to 3 inches of dry snow recorded along the base of the Front Range. The storm system continued to develop as it moved eastward and

left a narrow strip of heavier snow across extreme southeastern Colorado. Both Trinidad and Stonington measured 5 inches of snowfall on the 8th.

Seasonably cold weather settled over the mountains and western valleys of the state for the week following this storm. This was western Colorado's only cold weather during the month. Many areas recorded their coldest temperatures on the 10th and 11th. Taylor Park Dam, the traditional icebox, recorded -26° F on the morning of the 10th, the coldest temperature in the state in December.

Warm and dry weather returned to eastern Colorado on the 10th. By the 15th, the western half of the state had also reverted to unseasonably warm conditions. Daytime temperatures in the 60's were common east of the mountains from the 11th to the 16th. With brisk westerly "downslope" winds on the 17th helping to warm the air even more, many daily records were shattered. Examples of new records set on the 17th included: Fort Collins, 73° F; Limon, 74° F; Greeley and Colorado Springs, 75° F; Burlington, 78° F; LaJunta and Trinidad, 81° F; and Pueblo, 82° F. Pueblo's reading equalled the warmest December temperature ever recorded in Colorado.

Above average temperatures continued for the rest of the month in and west of the mountains. However, two brief cold waves affecting areas east of the mountains on the 19th and 20th and again on the 24th, were convincing reminders that it was still winter. Although precipitation amounts were very light, the fog, freezing drizzle, and light snow, which began along the Front Range and across the Eastern Plains late on the 18th and continued till the 20th, made travel very hazardous in many areas.

A small storm system moved into western Colorado on the 21st bringing much needed snow to the mountains on the 22nd and 23rd. Snowfall amounts were not great, and the snow changed to light rain at lower elevations. Still it was of great benefit for the holiday downhill ski season and produced enough snow to allow several ski areas to open for the first time this season.

As the snow ended in the mountains another surge of cold air moved in across the plains late on the 23rd again bringing fog, glaze and a dusting of snow on Christmas Eve day to areas east of the mountains.

Temperatures dropped into the teens and single digits--the coldest readings for the month in some places.

Christmas day dawned cold and wintry, but a strong chinook wind (westerly "downslope" warm wind east of the mountains) quickly raised temperatures into the 60's from the Front Range eastward. Just a touch of new snow fell on parts of the Northern and Central Mountains, but even in the high country, temperatures climbed above freezing during the day.

The remainder of the month was dry and very warm across all of the state. Temperatures again climbed into the 70's on the 27th and 30th east of the mountains setting more new records. Denver, for example, reached 75° F on the 27th. Temperatures in the 40's and 50's were reported high in the mountains, causing some of the limited snowpack to melt and helping to give the mountains an unusually dry and barren appearance for midwinter.

Precipitation totals and percents of average for December are shown in Figures 1 and 2, respectively. It was a very dry month across Colorado with most areas receiving less than 50 percent of average. The San Luis Valley and most of eastern Colorado, received little or no precipitation in December. Areas along and west of the Continental Divide generally received from 20 to 50 percent of average. Berthoud Pass was the wettest reporting station with a total of 1.18 inches for the month, 35 percent of average. Only two small regions received near or above average precipitation. The Montrose-Delta area in western Colorado and the extreme southeast corner of the state were both relatively wet.

The extremely warm temperatures in December accentuated the dry conditions. (Temperatures for the month and departures from average are shown in Figure 3). Temperatures were far above average ranging from about 5 degrees warmer than usual at Burlington and Holyoke to nearly 13 degrees above average at Walden, Eagle, and Gunnison.

Along the Front Range this was the warmest December on record at Greeley, Fort Collins, Boulder, Canon City and Trinidad. At Colorado Springs, Denver, and Pueblo this was the warmest December since 1933. For most of the mountains and western valleys this was by far the warmest December ever recorded. For example, at Gunnison where data have been

collected for over 80 years, the monthly temperature was 27.1° F, 12.9 degrees above average and one degree warmer than the previous record set in 1939. Other locations including Climax, Dillon, Eagle, Grand Junction, Steamboat Springs, and Walden surpassed their old records by more than 3 degrees. The warm temperatures melted most of the snow below about 9,000 feet leaving very little snowcover. That, in turn, helped to maintain warmer than average temperatures, particularly in the normally snowcovered mountain valleys.

The unusual warmth meant that heating degree day totals for December were much lower than average across the state (see Table 1 and Figures 4 and 5 for detailed heating degree day information). Totals ranged from only 592 at Canon City, Colorado's typical winter warm spot, to a high of 1167 at Gunnison. Compared to average, totals varied from 15% fewer than normal at Burlington to 31% below average at Grand Junction.

A comparison with December 1979 is shown in Figure 5. Heating degree day totals were much less than last year across all of Colorado especially from along the Front Range westward. This means, all other factors being equal, that less energy should have been required to heat homes, businesses, and schools in the state. Heating degree day totals this month ranged from just 1% fewer than December 1979 at Burlington to 22% fewer than last year at Denver, and more than 30 percent less at Eagle and Grand Junction.

Precipitation as a percent of average for the first three months of the 1981 water year is shown in Figure 6. With the exception of a small area in west central Colorado, the state is considerably drier than average. The mountainous areas near the Continental Divide have received about 60 percent of their average October-December precipitation.

Many comparisons are being made between this year and the drought year of 1976-77. However, the data show that precipitation so far this year in the western half of the state is well ahead of the 1976 October-December totals. For example, much of the San Juans have already received more precipitation than they did during the entire 1976-77 winter. The only mountain area which is drier this year is the region just west of Denver including the Berthoud Pass-Winter Park area. Surprisingly, mountain precipitation so far this year is not much less than it was as of the end of December of 1979, a winter that ended up wetter than average.

The comparison is much different in eastern Colorado. Little precipitation of any kind has fallen on much of the Eastern Plains since September, and some locations have had 7 consecutive drier than average months. However, midwinter typically does not contribute significantly to the water year totals. Adequate late winter snows and spring rains can quickly improve the dry soil conditions. The abnormally warm, dry conditions should still be cause for concern, though. Should the strong winds common to the area in late winter and spring arrive ahead of the spring precipitation, the plains areas could be vulnerable to severe dust storms.

Figure 1. December 1980 precipitation amounts (inches).

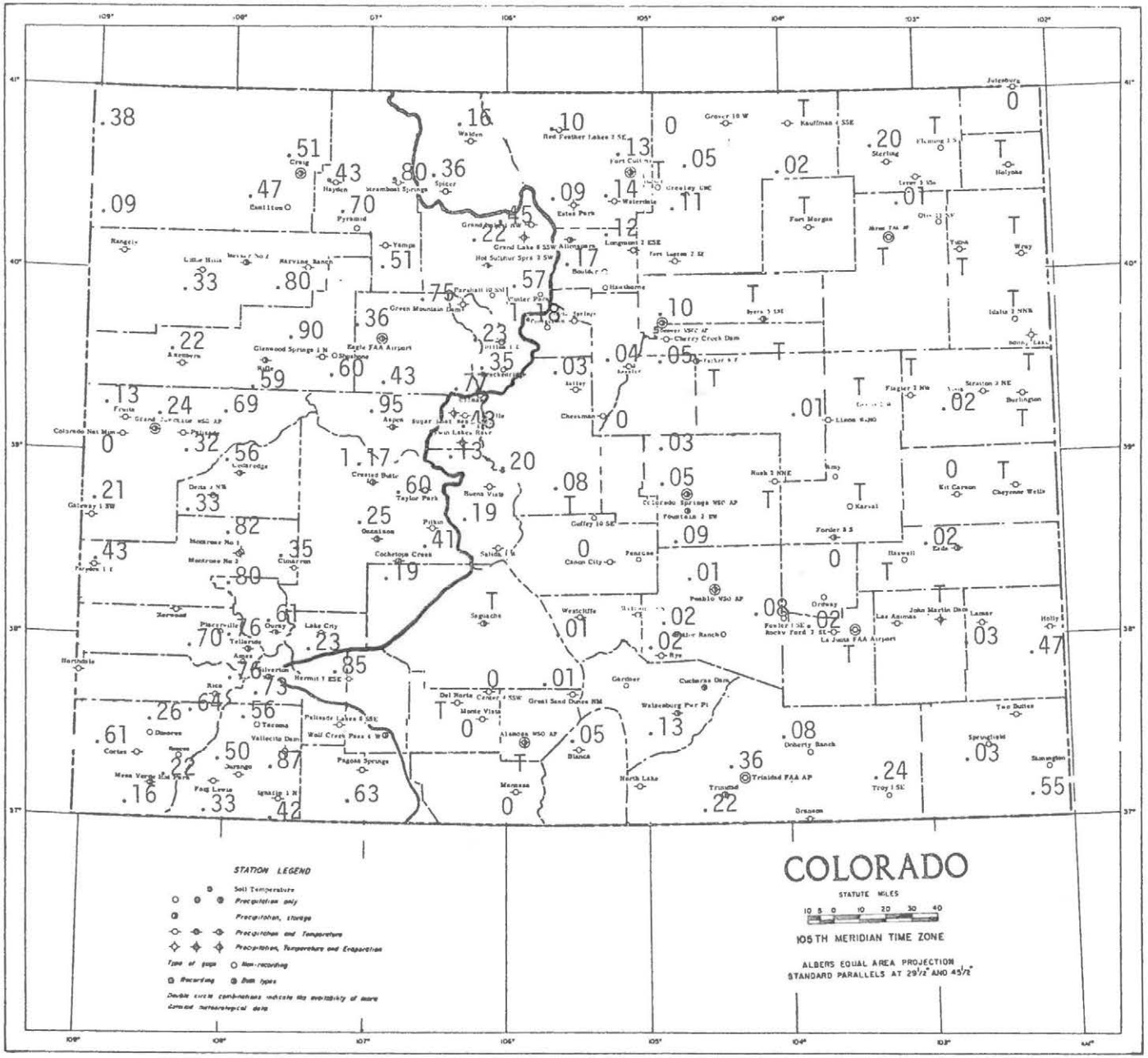


Figure 2. Precipitation for December 1980 as a percent of the 1951-1970 average.

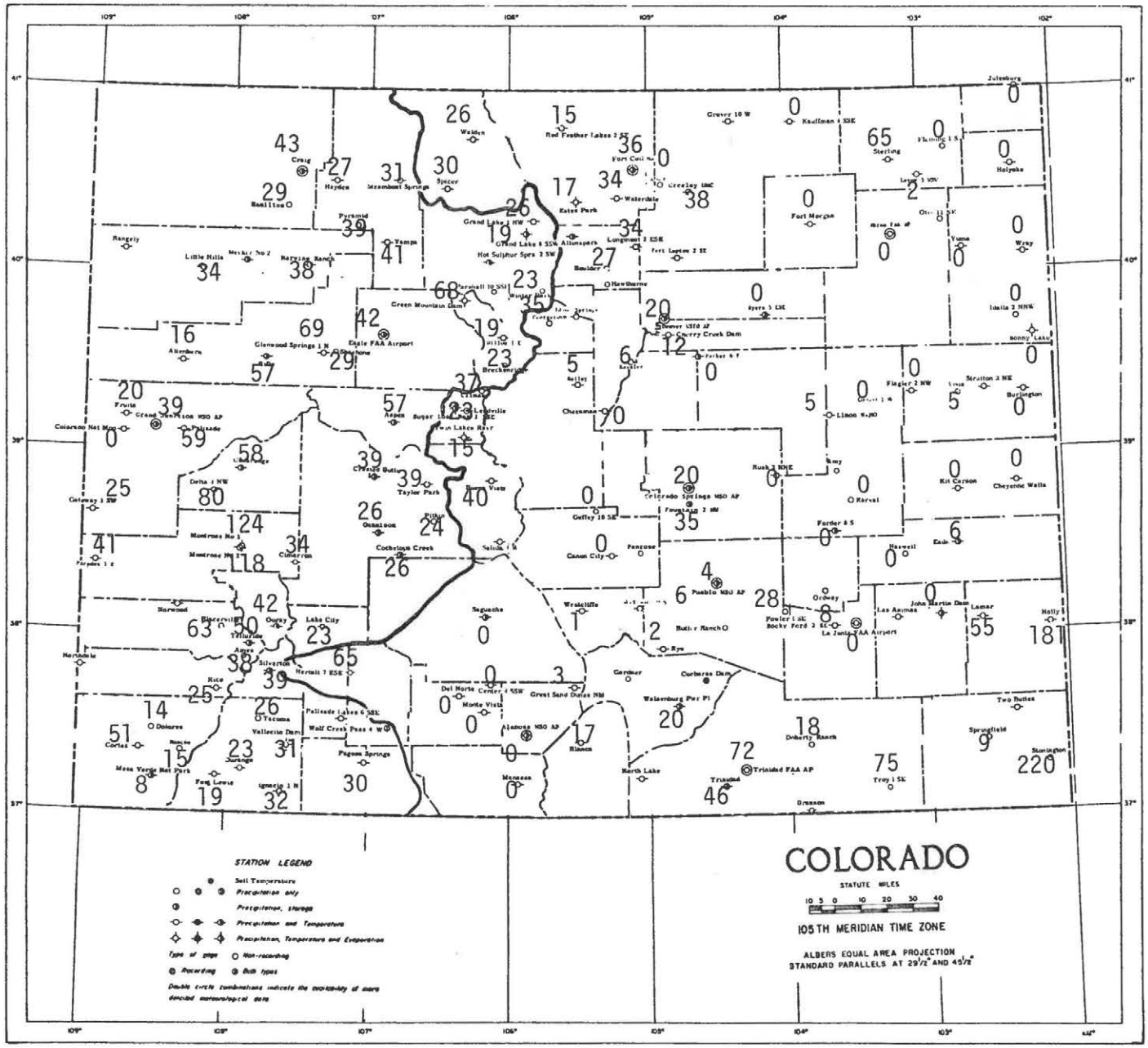


Figure 3. Temperatures for December 1980 in degrees Fahrenheit (in parentheses) and the departure from the 1951-1970 average.

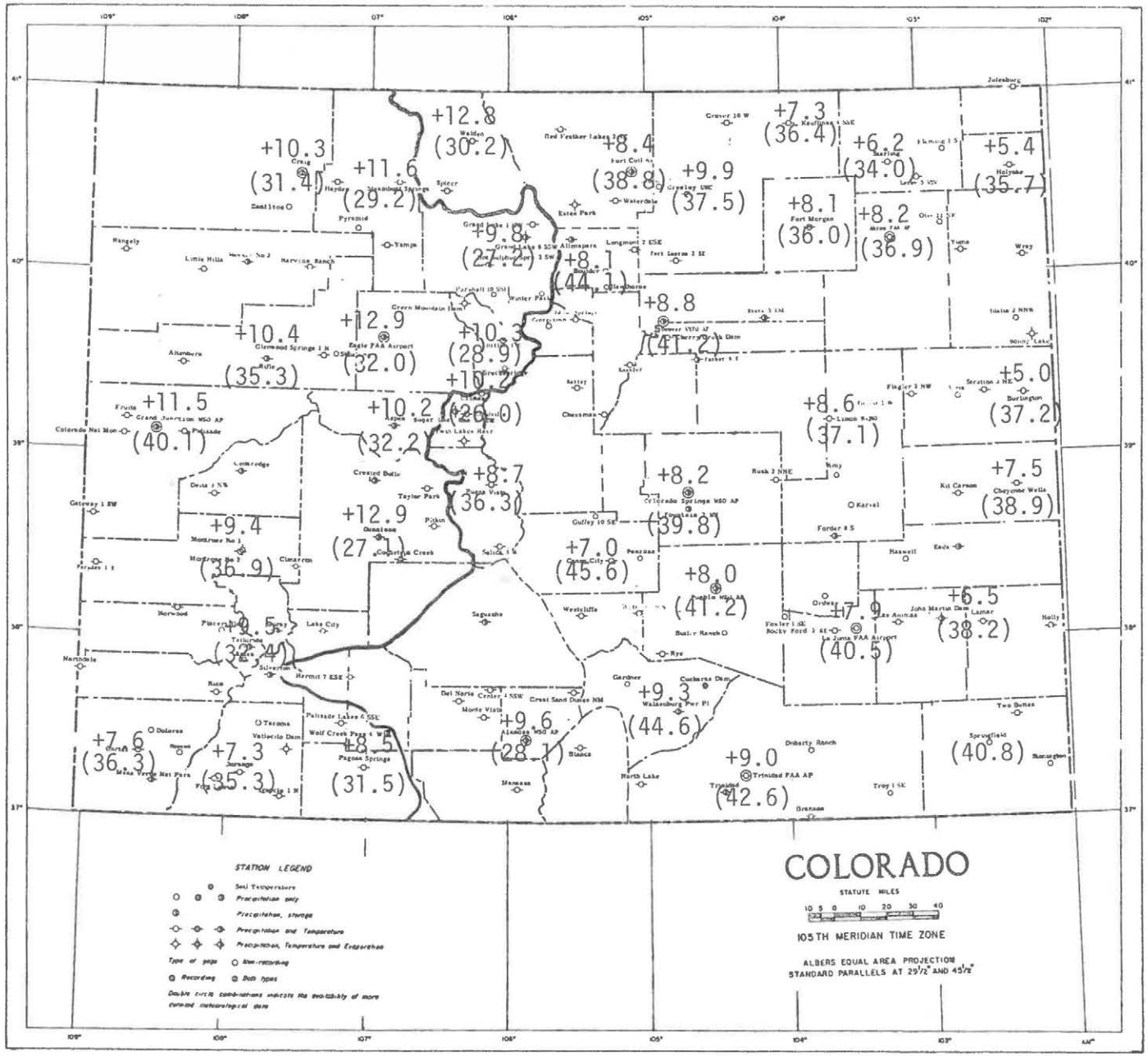


Figure 4. December 1980 Heating Degree Days (in parentheses) and percents above or below the 1941-1970 average.

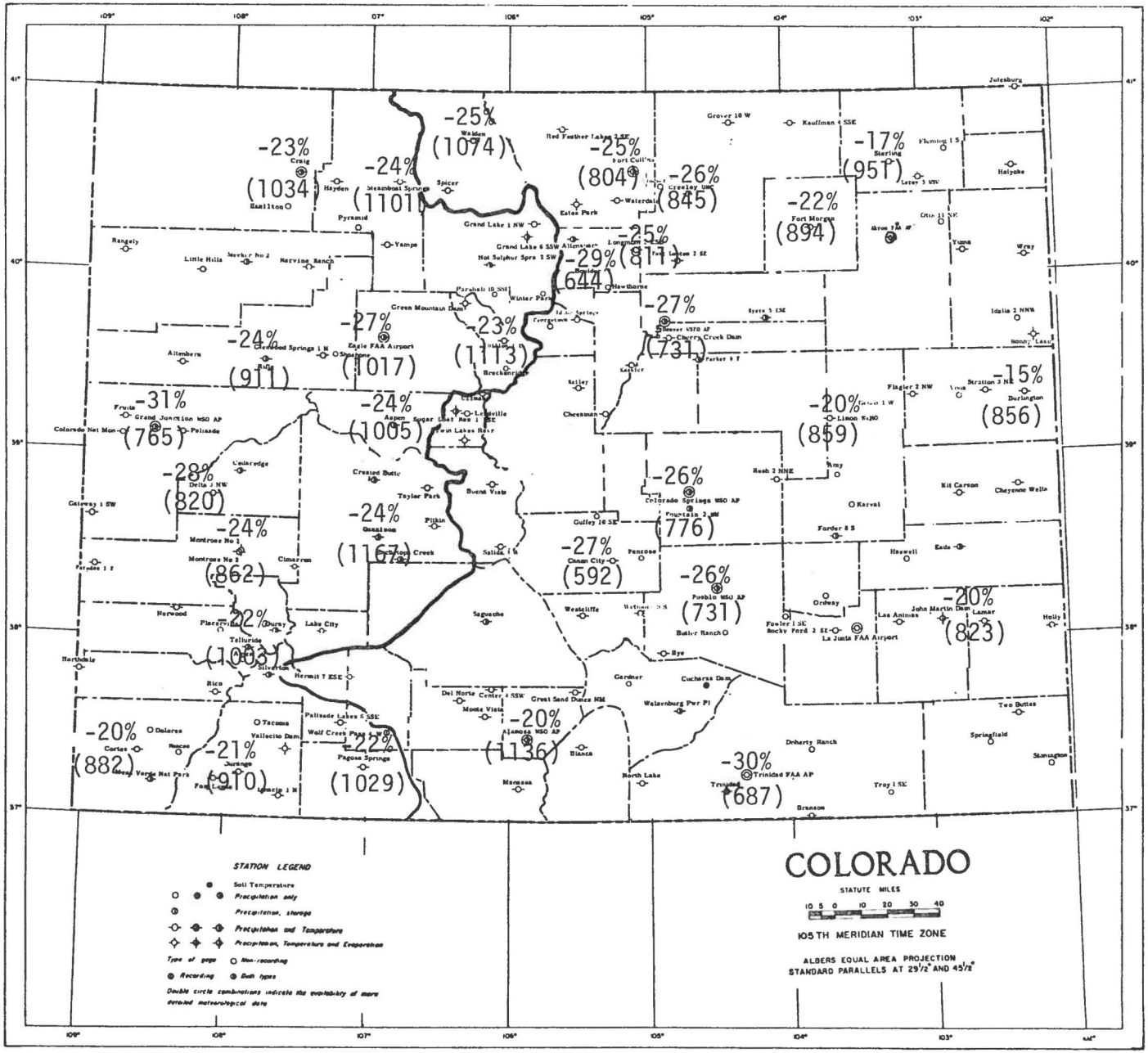


Figure 5. December 1980 Heating Degree Days as a percent above or below December 1979.

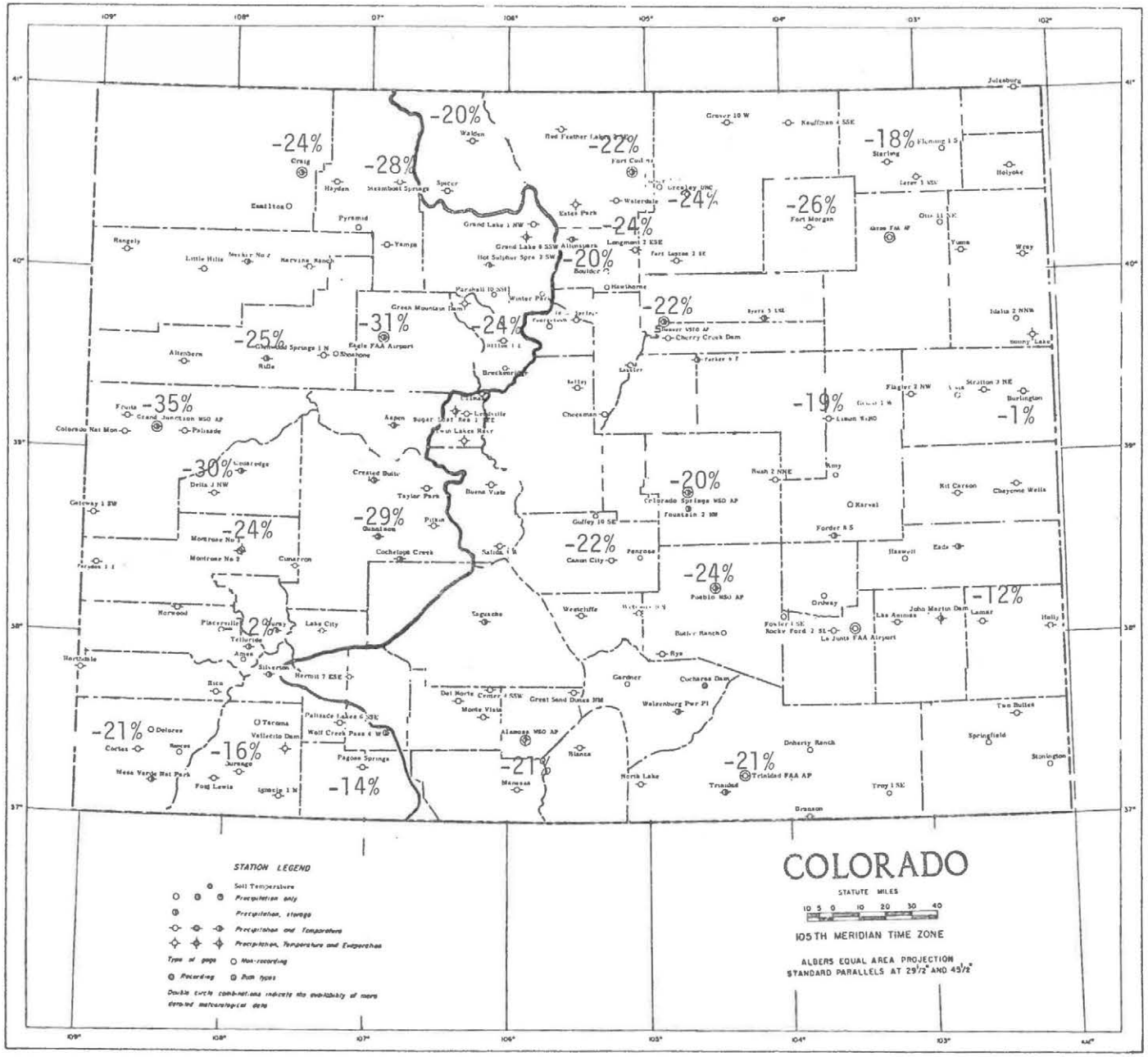


Figure 6. Precipitation for October through December 1980 as a percent of the 1951-1970 average.

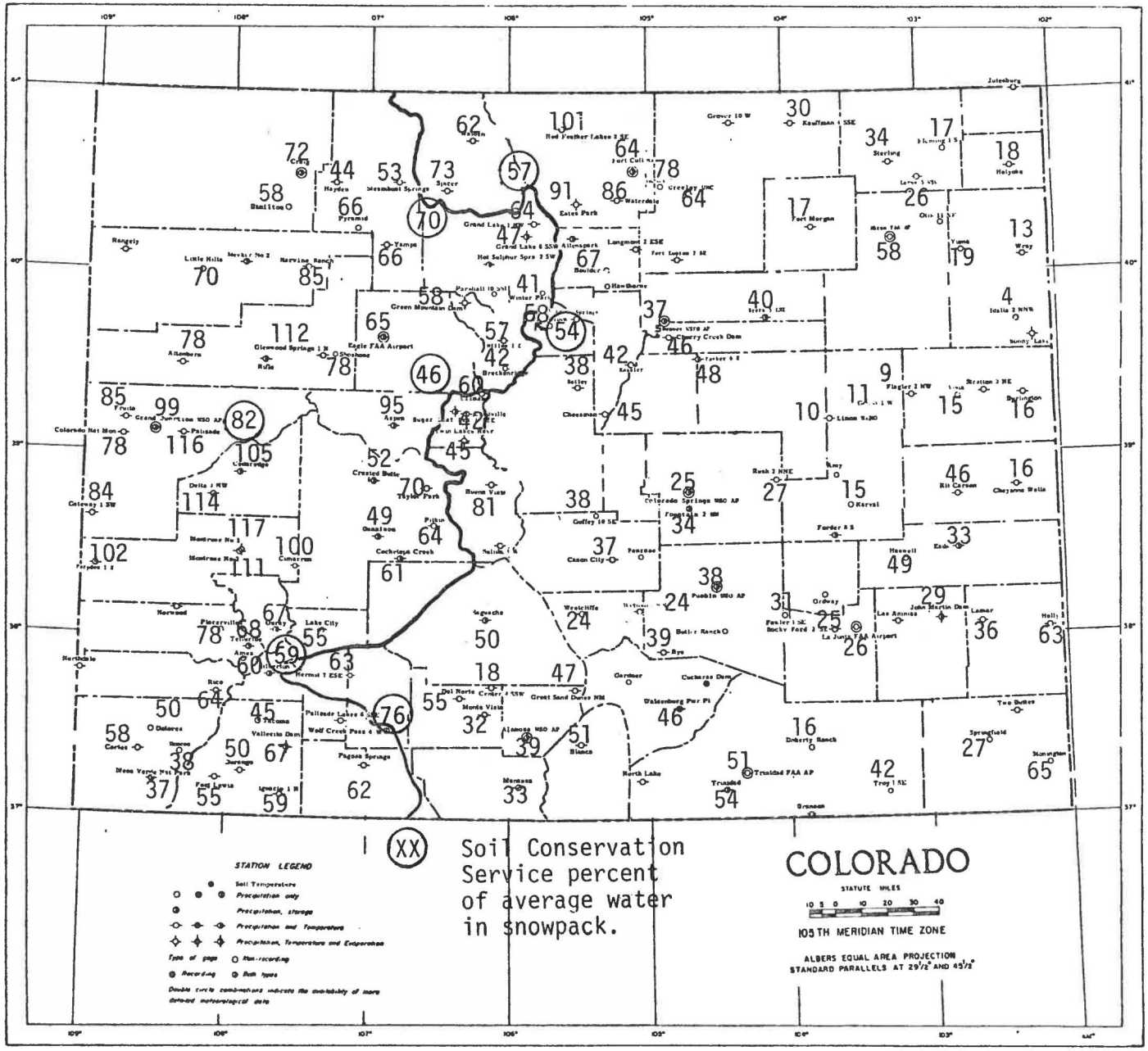


Table 1. Colorado Heating Degree Day Data Through December 1980

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136							
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	996	1005							
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630	644							
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	856							
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	604	592							
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	758	776							
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	776	882							
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034							
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820							
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731							
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113							
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910							
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	974	1017							
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	804							
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894							
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765							

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845							
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1167							
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823							
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	827	859							
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	742	811							
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861								
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862							
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029							
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731							
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521		911							
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	849								
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101							
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	817	951							
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	934	1003							
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	661	687							
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1122	1074							
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	671	627							

COLORADO CLIMATE -- JANUARY 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

A high pressure area over the West held its position during most of January and continued to discourage major storm systems from crossing Colorado and the Central and Southern Rockies. As a result, drought conditions worsened across Colorado and many other regions of the United States. In Colorado, the dry weather was accompanied by a second consecutive month of exceptionally warm temperatures.

The first 4 days of January were partly cloudy and unseasonably warm across the state. Temperatures in the 50's and 60's Fahrenheit were common east of the mountains and on the Western Slope. Even in the mountains daytime temperatures rose into the 40's.

A fairly localized storm system moved into Colorado late on the 4th dropping several inches of snow on some of the western valleys. Rifle, for example, received a welcome 6.5 inches of snow on the 5th. Unfortunately, the storm system weakened rapidly as it travelled eastward. Only one inch of snow fell at Berthoud Pass, and little precipitation was observed east of the mountains.

Dry but somewhat cooler weather followed this minor winter storm. There were some day to day variations in temperature and cloud cover east of the mountains, but conditions remained quite stagnant on the Western Slope. The calm and undisturbed weather pattern allowed cold air to settle into the mountain valleys at night, and on the 13th many mountain valley locations reported their coldest temperature for the month. Gunnison and Walden, for example, dropped to -8°F that morning, while Taylor Park Dam, Colorado's regular cold spot, recorded the state's coldest temperature, -34°F.

A temporary change in the winds aloft over Colorado allowed a cold front and an associated upper air disturbance to drop down over the northeastern portion of the state late on the 15th. As the cold front plunged southward, snow developed across much of eastern Colorado. Am inch or two of snow was common across the northeastern plains extending

southward to Lamar on the 16th as temperatures stayed below freezing during the day. The mountains and Western Slope were barely affected by this storm as only scattered snowshowers occurred. The storm contributed little moisture to the state to help alleviate the very dry conditions except in a small area along the Front Range north of Denver. Denver measured only 1.8 inches of snow but Greeley picked up 5 inches and Fort Collins was surprised to discover 10 inches on the ground on the morning of the 16th with a water equivalent of more than 0.50 inches.

Sunny and mild weather promptly returned by the 18th, and the thin snowcover across the plains quickly melted. By the 22nd, springlike temperatures were noted all across the state. Durango reached 61°F, a new record for the month. Several more new daily and monthly records were tied or broken on the 23rd including 42°F at Berthoud Pass, 55°F at Steamboat Springs and 73°F at Pueblo.

Warm weather continued on the 24th as La Junta reported the state's warmest temperature for the month, 75°F. The large high pressure area over the West began to break down, however, finally allowing Pacific moisture to move eastward into Colorado. Several periods of snow, with some rain at lower elevations, occurred during the last week of January along and west of the Continental Divide. Unfortunately no major storm system developed and precipitation amounts were rather light. The greatest precipitation total during the last week was 1.21 inches (20.5 inches of snow) measured at Berthoud Pass.

Arctic air again slipped into northeast Colorado on the 29th. The extreme northeast corner of the state received as much as 5 inches of snow as the cold air moved in. On the 31st, a secondary surge of cold air chilled the entire state. Snowshowers fell across much of the Eastern Plains and a small area in extreme eastern Colorado received significant and greatly appreciated snowfall.

Precipitation totals and percents of average for January are shown in Figures 1 and 2, respectively. Only a small handful of stations in the entire state received more than one inch of water-equivalent precipitation. Large areas of the state, including most of the mountains received less than 40 percent of the average January precipitation.

Only about 20 percent of average fell over the southern San Juan Mountains. Precipitation was also sparse over most of the plains, and little or no precipitation was noted throughout the month in the San Luis Valley. Only two areas received above average precipitation in January. The Greeley-Fort Collins area, which was hit by a single snowstorm in mid-month, and extreme eastern Colorado from Eads north to Julesburg were wetter than usual. However, the total precipitation in those areas was still only about one half inch -- hardly enough to significantly improve soil moisture conditions.

For the second month in a row, very warm temperatures accompanied the dry weather. For several areas, this December-January period has been by far the warmest midwinter period since weather records have been taken. Temperatures for the month and departures from average are shown in Figure 3. East of the mountains most locations were from 4 to 7 degrees warmer than usual. Greeley, however, ended up with a monthly temperature of 33.7°F, 9.2 degrees above average. This was the warmest January in Greeley since 1893. In the western half of the state, temperatures ranged from about 6 to 12 degrees above average. Many locations set new monthly records including Grand Junction, Eagle, Gunnison, and Steamboat Springs. Steamboat Springs surpassed its previous warmest January, 23.6° in 1911, by nearly 4 degrees.

Drought conditions steadily worsened across the state during January as prospects for below average streamflow for spring and summer look more certain with each passing day. Many areas have now had 8 consecutive drier than average months, and winter snowpack as measured by the Soil Conservation Service neared record minimum values for this time of year.

Precipitation as a percent of average for the first 4 months of the 1981 water year is shown in Figure 4. Except for a small area in west-central Colorado, the entire state is much drier than average. Many of the mountain areas are now near or below 50 percent of average. Conditions in the mountains as a whole still are not as dry as they were at this time in 1977, but conditions continue to deteriorate.

Unlike 1977, the Eastern Plains are also very dry. Limon, for example has received only 0.15 inches of precipitation since September.

Concern is increasing about possible severe wind erosion and loss of the dryland winter wheat crop if precipitation fails to arrive before the likely strong winds of spring.

The unusual warmth and lack of snow has adversely affected skiing and is causing considerable concern over possible future water shortages. But every cloud has a silver lining. The warm temperatures have resulted in lower energy consumption for space heating. This has helped, in part, to offset the effects of rapidly increasing fuel costs so far this winter.

Heating degree day information, which makes it possible to compare temperatures to fuel consumption, are presented in Figures 5 and 6 and also in Table 1. January heating degree day totals were considerably below average statewide. Totals ranged from 684 at Canon City to 1331 at Gunnison. As a percent of average, totals varied from 14% below average at Dillon and Alamosa and 15% below average at Sterling and Cortez to 23% fewer than average at Greeley, 26% fewer than average at Craig, and 27% less than usual at Grand Juntion.

A comparison with January 1980 is shown in Figure 6. January 1980 was also a mild month in western Colorado. Even so, heating degree day totals this year were lower. Totals ranged from 5% fewer than last year at Eagle, Gunnison and Rifle to 14% less than January 1980 at Durango and 18% below last year at Craig and Steamboat Springs. Differences were much larger east of the mountains where January 1980 had been cold. Totals ranged from 17% below last year at Trinidad to 29% fewer at Denver and 35% less at Canon City. This means, all other factors being equal, that considerably less energy should have been required this year to heat homes, businesses, and schools in the state.

Figure 1. January 1981 precipitation amounts (inches).

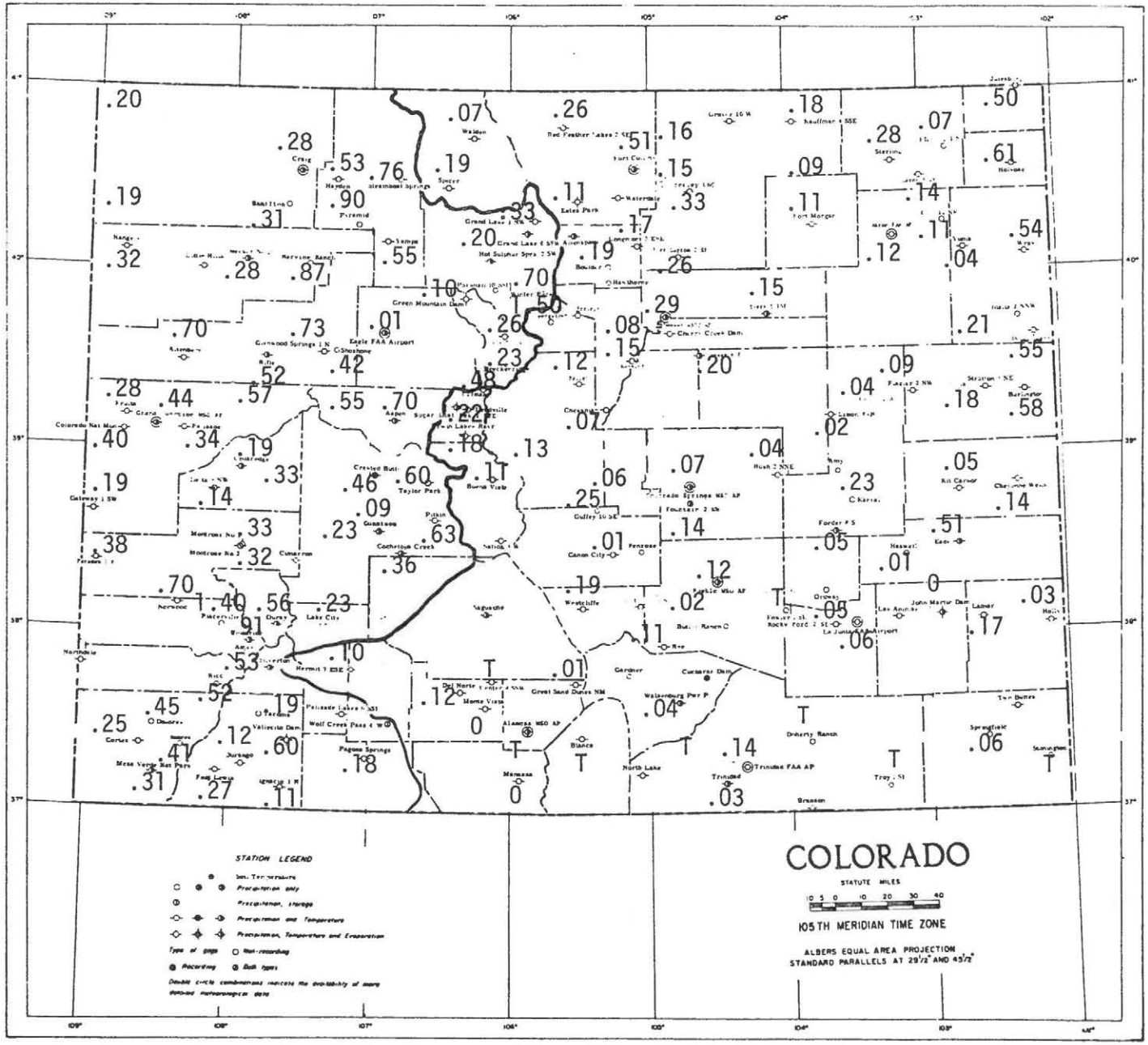
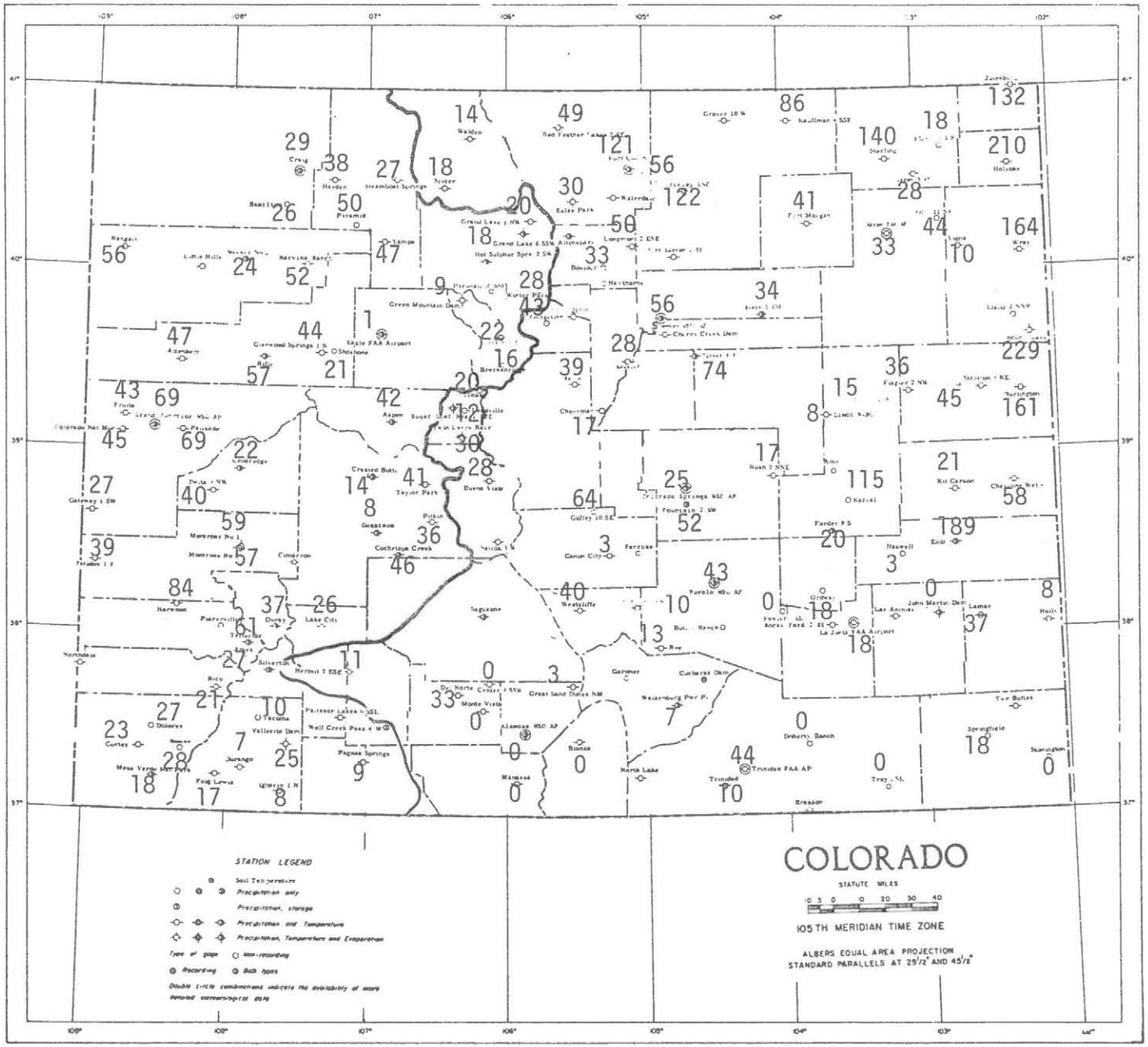


Figure 2. Precipitation for January 1981 as a percent of the 1951-1970 average.



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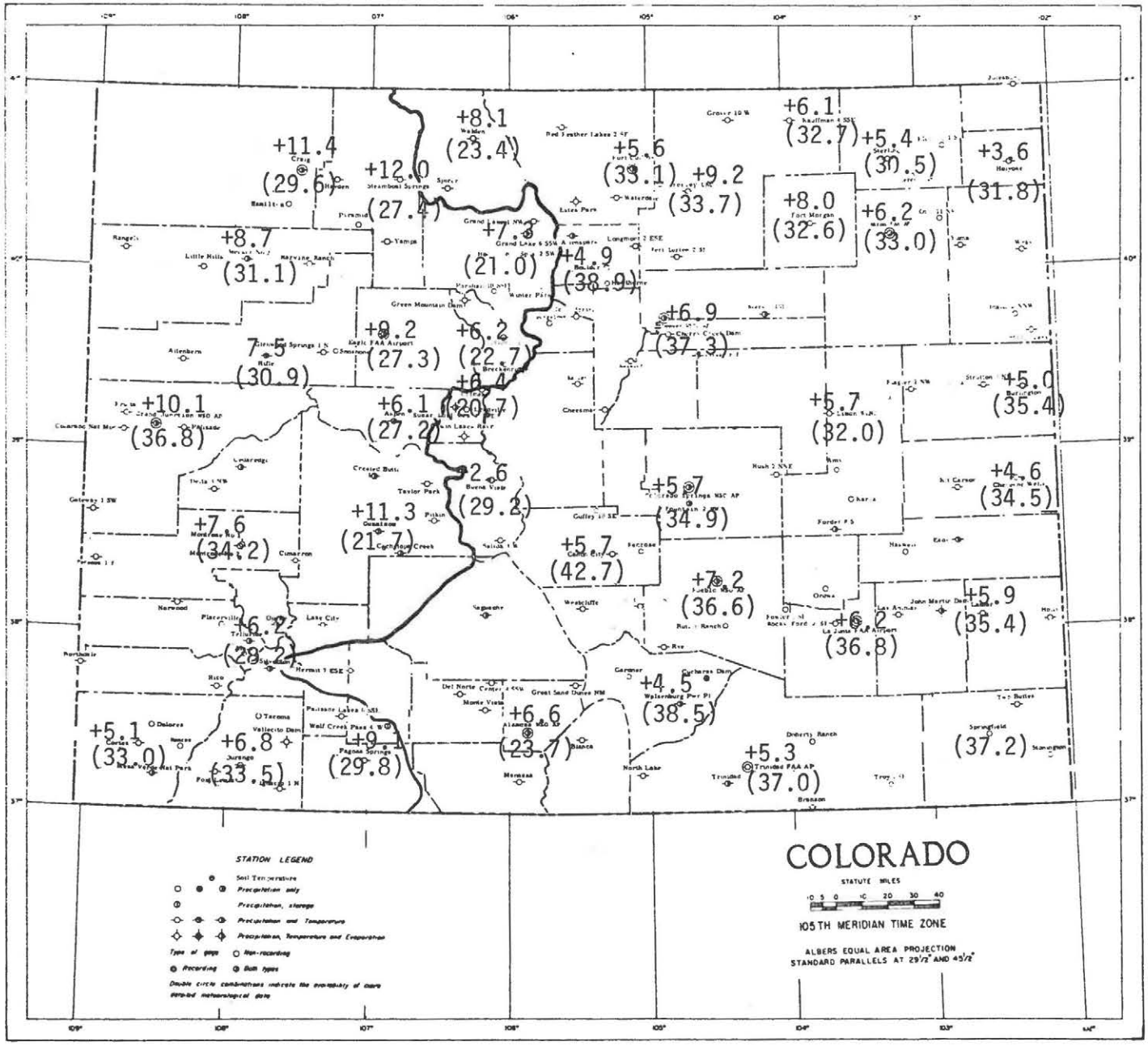
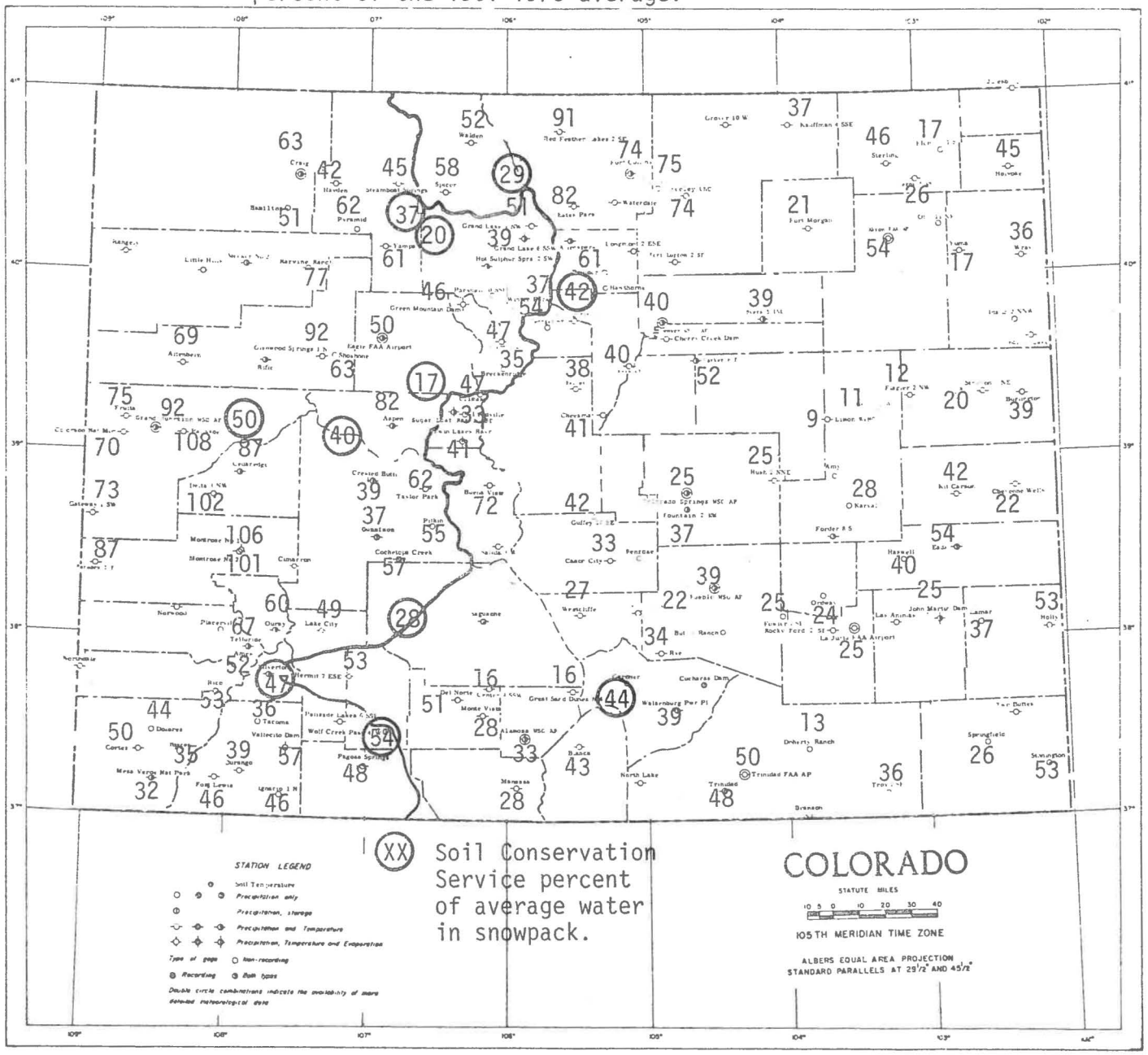


Figure 4. Precipitation for October 1980 through January 1981 as a percent of the 1951-1970 average.



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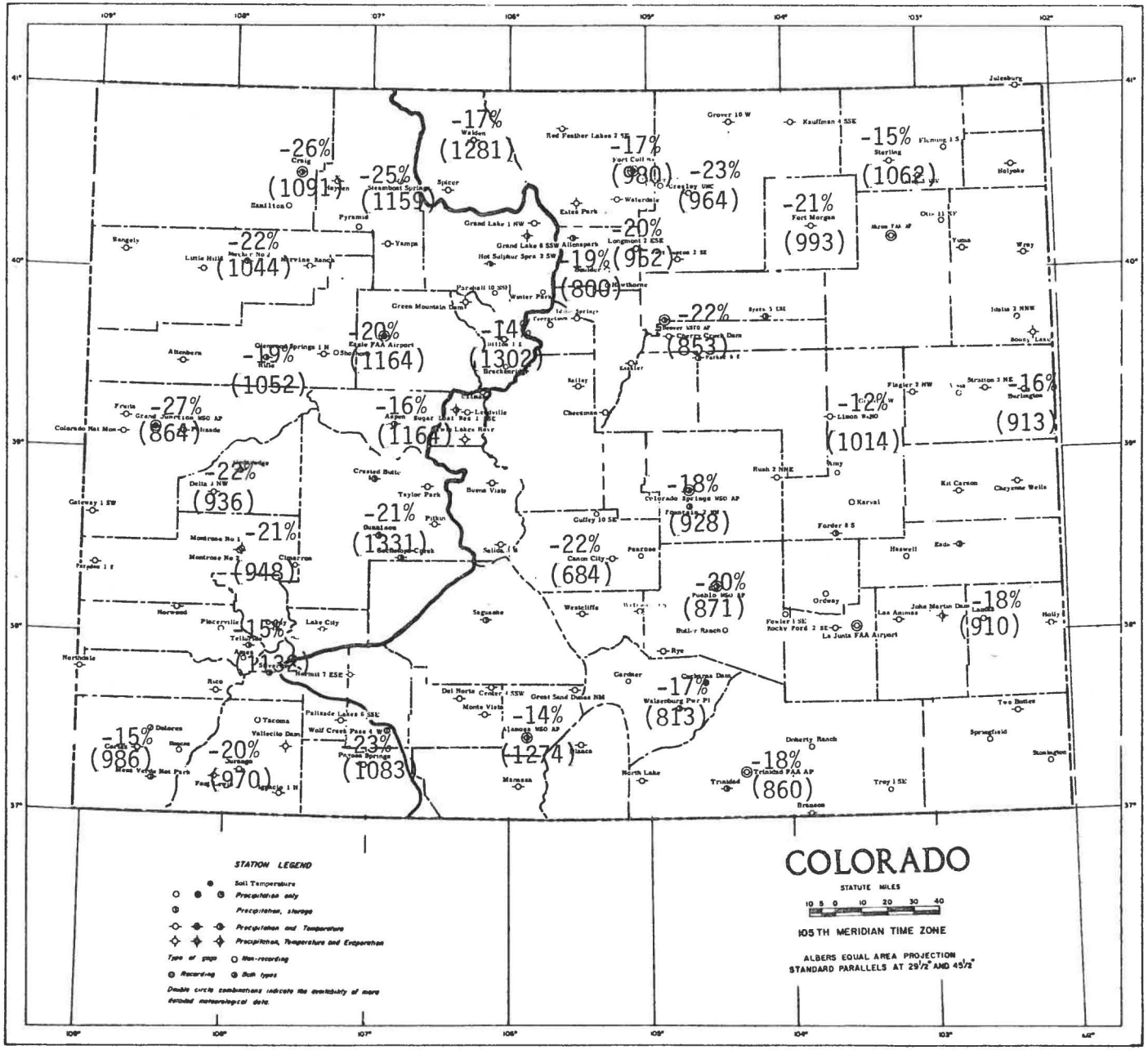

Figure 6. January 1981 Heating Degree Days as a percent above or below January 1980.

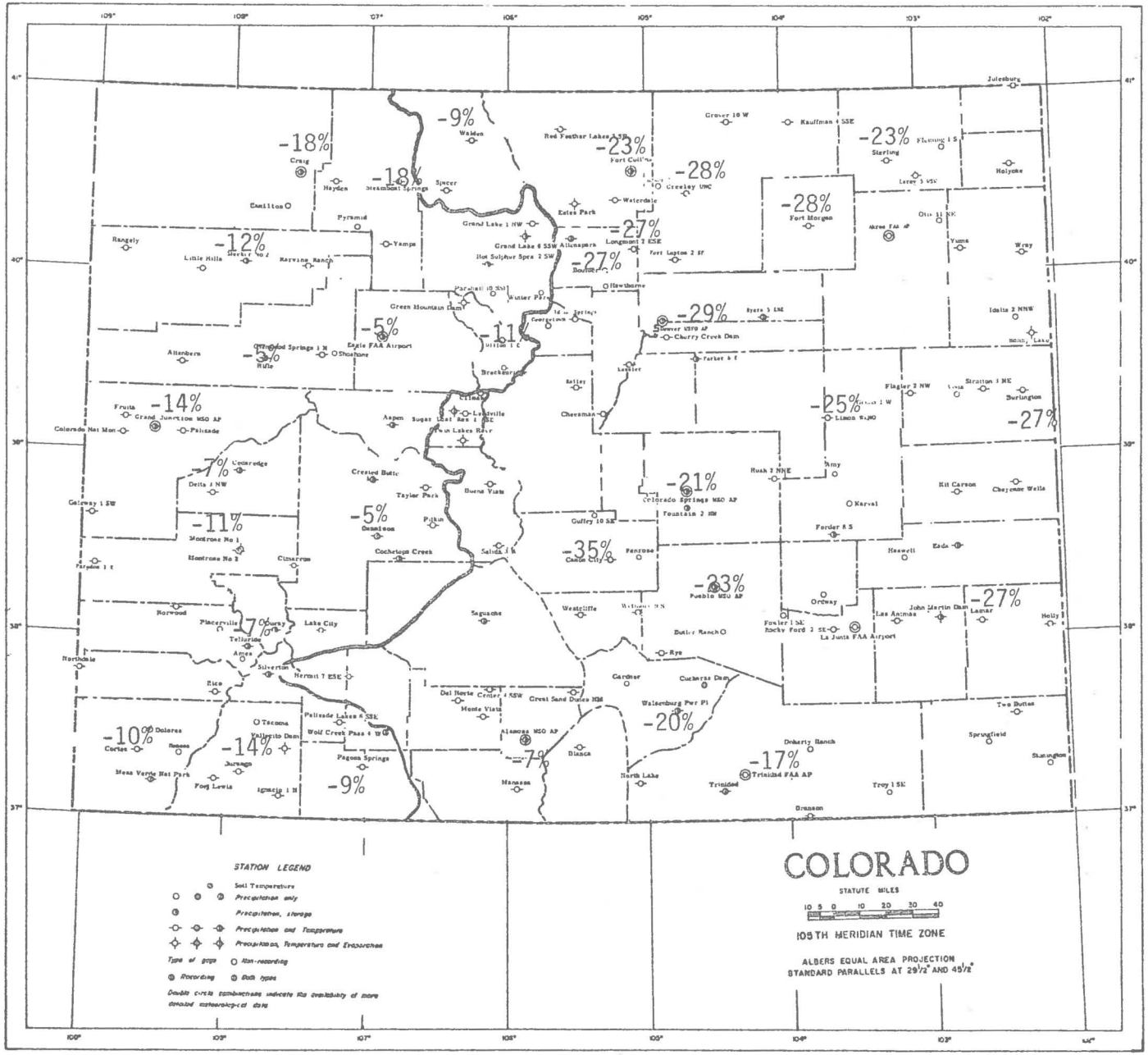

Table 1. Colorado heating degree day data through January 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
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	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136	1274						
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	1004	1005	1164						
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630	644	800						
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	856	913						
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	684						
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928						
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986						
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091						
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	936						
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	603	731	853						
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302						
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	970						
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	967	1014	1164						
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	804	980						
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993						
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864						

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964						
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331						
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910						
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014						
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	744	811	952						
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044						
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948						
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1083						
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871						
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052						
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	838	780							
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159						
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1062						
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	925	1003	1132						
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860						
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281						
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	813						

COLORADO CLIMATE -- FEBRUARY 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Below average precipitation and above average temperatures again characterized Colorado's climate in February. For nine months now, Colorado has been firmly in the grasp of this dry and warm weather pattern.

After the extremely unusual warmth of December and January, early February seemed just plain cold. Light snow lingered in the mountains on the 1st and 2nd following a January 31 storm which had dropped some significant moisture on parts of extreme eastern Colorado. As the skies cleared, temperatures dropped both in the mountains and on the plains. Byers, for example, recorded -14° F on the morning of the 2nd while Sterling dropped to -8° F. Seasonably cold temperatures with no precipitation (except for a few high-elevation snowshowers on the 7th) persisted from the 3rd through the 8th. For the first time all winter there were several consecutive nights with below zero temperatures in the mountains. Taylor Park Dam shivered with -32° F the morning of the 3rd, the state's coldest temperature for the month.

A strong, fast-moving polar cold front reached Colorado late on the 9th. Snow and blustery winds developed over most of the state and temperatures plummeted, particularly in the Northern and Central Mountains and across the Eastern Plains. Some snow continued to fall on the 10th and temperatures in the northeastern half of the state struggled to stay above 0° F during the day. Snowfall amounts ranged from less than an inch in parts of extreme eastern Colorado to 1 to 5 inches along the Front Range. All of the western half of the state also received some precipitation with some mountain areas receiving 8 inches or more. Temperatures dropped well below zero across much of the state on the night of the 10th. Some examples of low temperatures included -12° F at Denver, -17° F at Springfield, -19° F at Limon, -23° F at Kauffman, -25° F at Climax, and -31° F at the traditional cold spot--Taylor Park Dam.

The biting cold promptly moved eastward, and suddenly Colorado was back into springlike weather conditions which have been so common all

winter. From the 13th to the 20th, daytime high temperatures were at least in the 50's and 60's both east and west of the mountains. Many new daily records were broken all across the state on the 19th and 20th including 71° F at Fort Collins and Denver on the 19th and 63° F at Alamosa, 70° F at Colorado Springs, 81° F at Pueblo, and 84° F at Lamar (the state's warmest temperature in February) on the 20th.

A storm system crossed the state on the 20th and 21st and developed into a strong low pressure center east of the mountains. Strong winds caused some blowing dust across the dry Eastern Plains. Scattered snows developed the night of the 20th. From 4 to 6 inches of snow fell near the eastern foothills from south of Denver on to the Trinidad area, and a few inches also fell on the Northern and Central Mountains. Unfortunately, only a few flurries dusted the windblown plains.

Sunny and warm weather returned by the 22nd. Temperatures on the Western Slope soared to near record levels on the 24th and 25th. Grand Junction, for example, reached 68° F on the 24th, while Delta and Palisade hit 70° F and 71° F, respectively.

A storm, which looked like it had potential to bring much-needed heavy snows to most of the Colorado Rockies, took shape over California on the 24th and 25th. It then raced eastward moving too quickly to produce widespread heavy precipitation. Rain showers and even a few thunderstorms were noted, however, on the Western Slope, and as much as a foot of new snow fell in portions of the San Juan Mountains. Little was left of the storm as it passed east of the mountains.

As February came to an end, delightfully warm weather continued over most of the state. Cooler air began slipping down over northeastern Colorado on the 28th as another Pacific storm system developed west of the state.

Precipitation totals and percents of average for February are shown in Figures 1 and 2, respectively. Precipitation totals were somewhat higher than in recent months at many locations near the mountains. Still, most areas were significantly drier than average. For the mountains and western half of the state, February precipitation was about 50 percent of average. The Eastern Plains were also very dry with several stations

such as Kit Carson and Yuma reporting no measurable precipitation. Near average precipitation was limited to Walden and scattered areas along the Front Range from Denver to Walsenburg.

Temperatures for February 1981 and departures from average are shown in Figure 3. The entire state was again warmer than average, although not as warm as December or January. While there were many local variations, temperatures generally ranged from 1 to 6 degrees above average. Departures from average were similar on both sides of the Continental Divide.

Heating degree day information is presented in Figures 4 and 5 and in Table 1. The warm temperatures meant that heating degree day totals were again less than usual. Totals ranged from 4 percent fewer than normal at Limon and Sterling to 14 percent less than average at Boulder, Eagle, and Grand Junction and to 18 percent less than average at Pueblo.

Heating degree day totals were also lower than in February 1980 over most of the state. The only exception was the San Luis Valley and parts of west-central Colorado which experienced a very warm February last year. For the remainder of the state, heating degree day totals in February ranged from 3 percent less than last year at Steamboat Springs and 4 percent fewer at Colorado Springs to 19 percent less than a year ago at Greeley. This means, all other factors being equal, that less energy should have been required this year to heat homes, businesses, and schools.

With another dry month added to the list, the drought in Colorado continued to worsen. Figure 6 shows precipitation as a percent of average for the first 5 months of the 1981 water year. Mountain precipitation and snowpack are generally only about 50 percent of average. This is not quite as bad for the mountains as a whole as it was at the same time in the record drought winter of 1977. However, several areas, particularly in the Central Mountains, are drier than in 1977. Also, this year the Eastern Plains are very dry. Limon, for example, has received only 0.19 inches of precipitation in the past 5 months.

As of the end of February there is very little chance that spring precipitation will be heavy enough to bring mountain runoff close to average. There is reason for optimism east of the mountains, however. Spring is typically the wettest season of the year there. Even in the

driest areas, such as Limon, the winter precipitation deficit is only about 2 inches. Most of that deficit could be made up by having only slightly above average precipitation in the months to come.

It should be noted that in the agricultural areas of the state the amount of precipitation which falls is not the only thing to be concerned with. When the precipitation occurs and how well it soaks into the ground are even more important. Winter wheat can do well in a dry year if precipitation falls at the right times. In the mountains it is not so important when precipitation occurs. What is important is that enough snow accumulate throughout the winter to supply adequate water for reservoir storage, irrigation, and the many related uses.

Correction: Last month's report contained the statement, "Durango reached 61° F, a new record for the month." The statement should have read, "Durango reached 61° F, and Steamboat Springs hit 55° F, a new record for the month."

Figure 1. February 1981 precipitation amounts (inches).

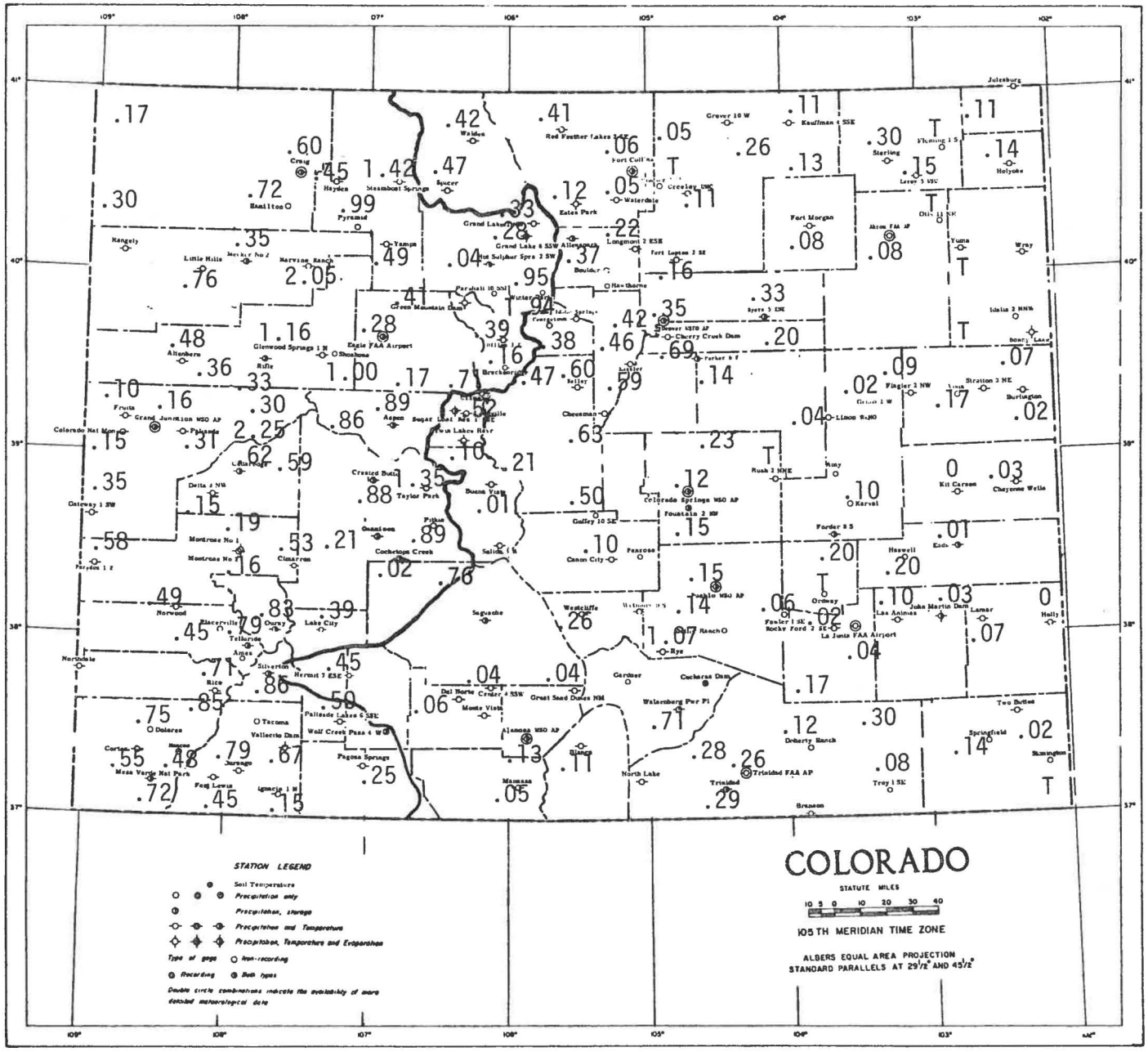

Figure 2. Precipitation for February 1981 as a percent of the 1951-1970 average.

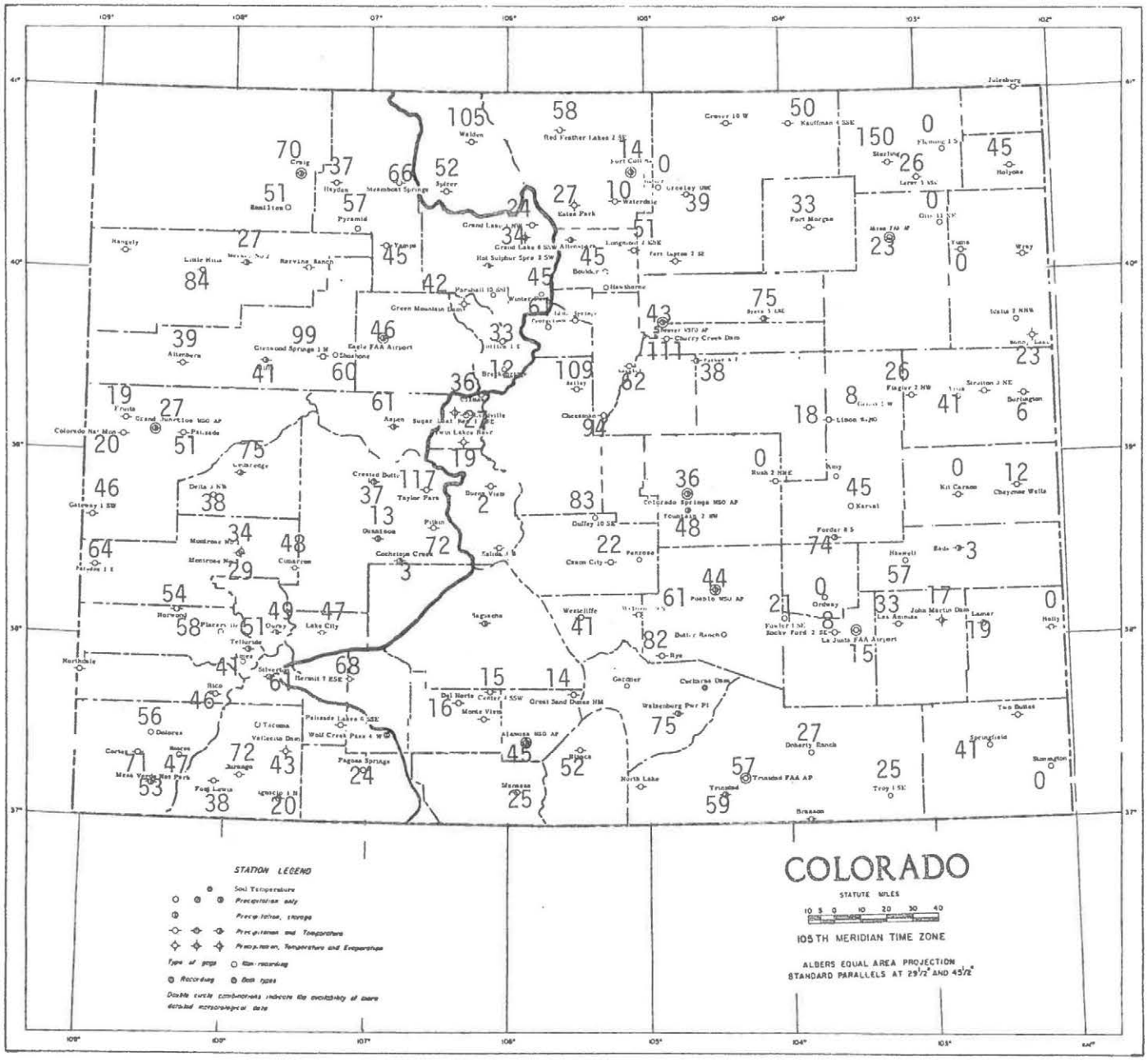

Figure 3. Temperatures for February 1981 in degrees Fahrenheit (in parentheses) and the departure from the 1951-1970 average.

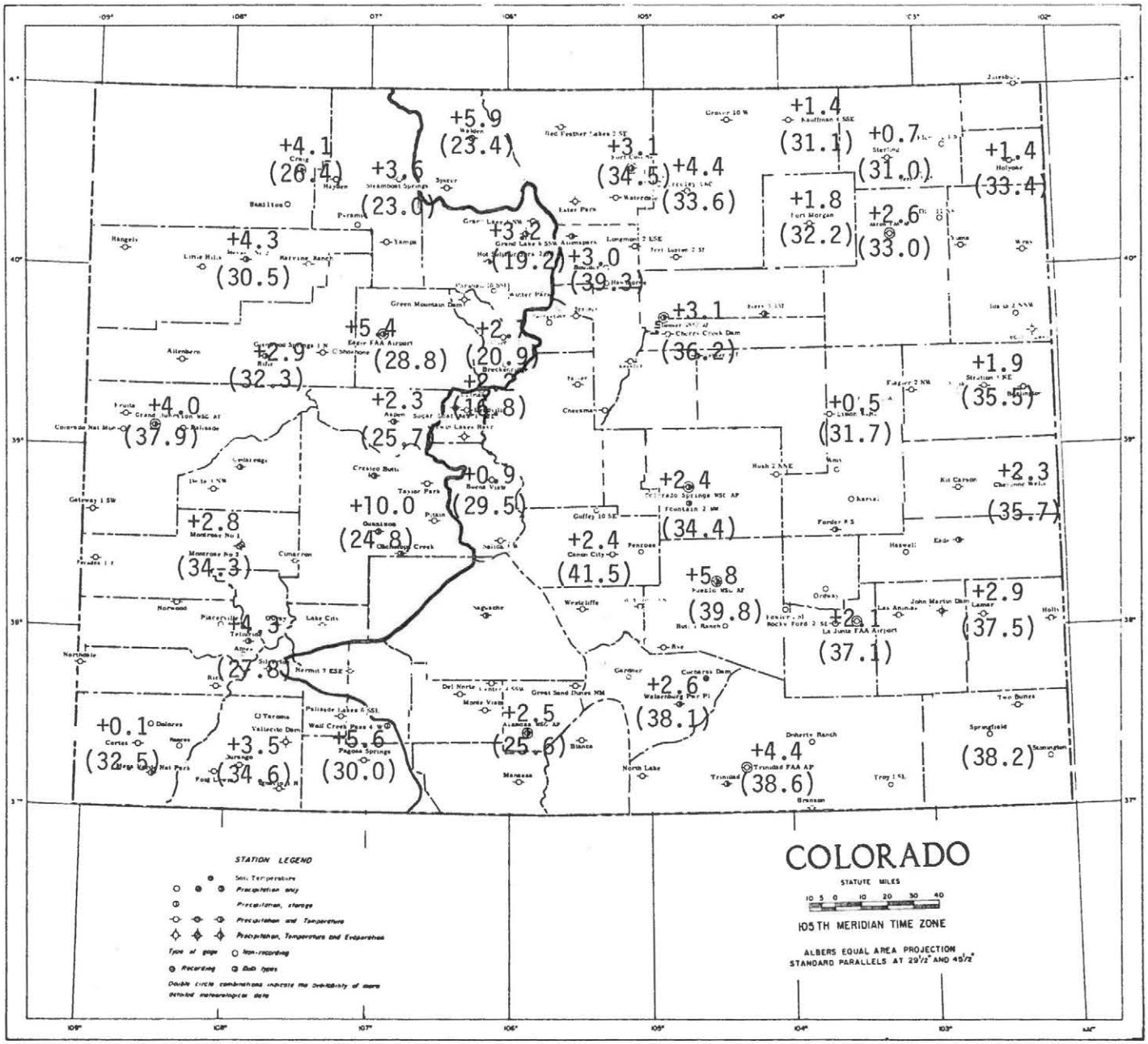

Figure 4. February 1981 Heating Degree Days (in parentheses) and percents above or below the 1941-1970 average.

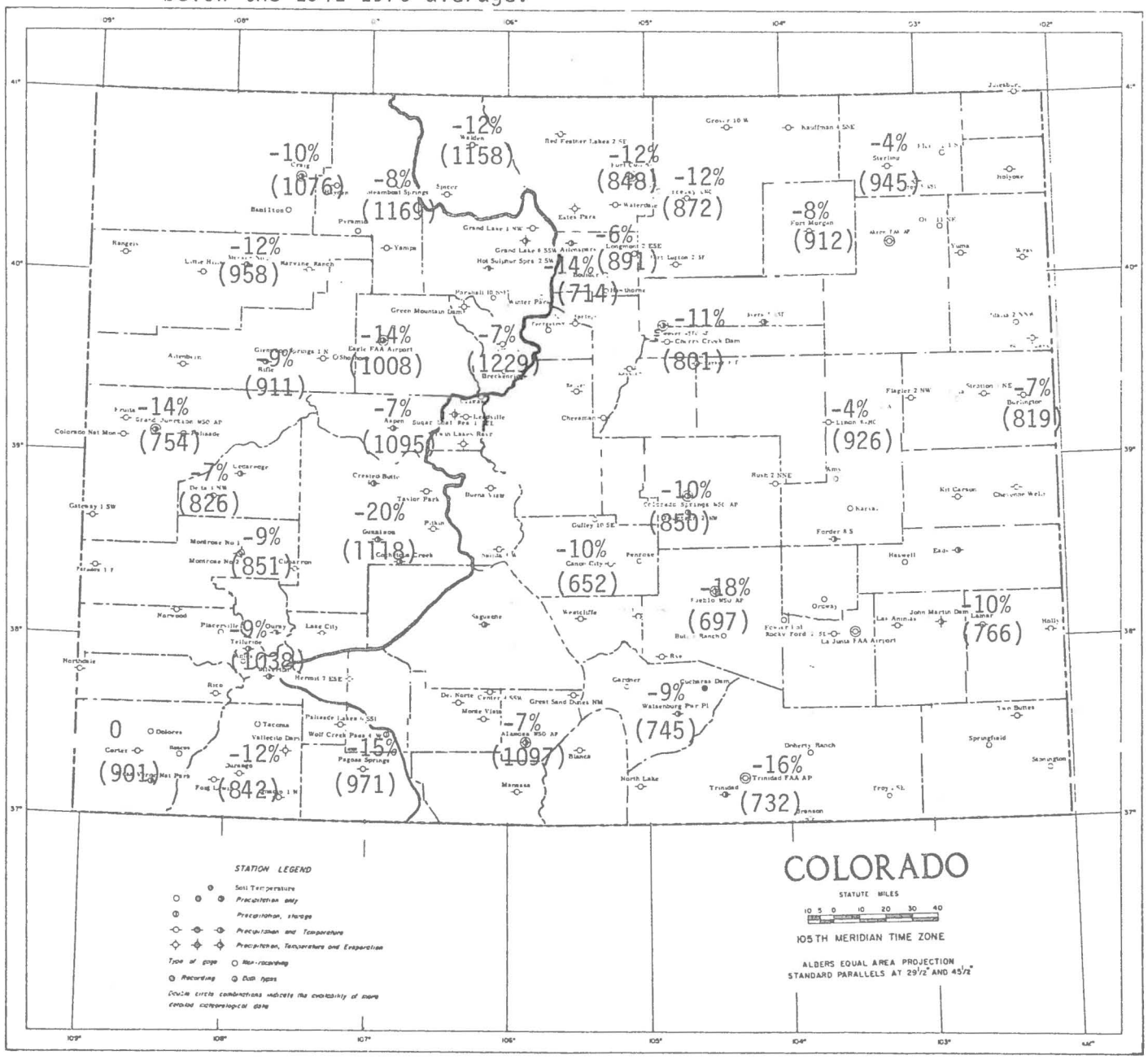

Figure 5. February 1981 Heating Degree Days as a percent above or below February 1980.

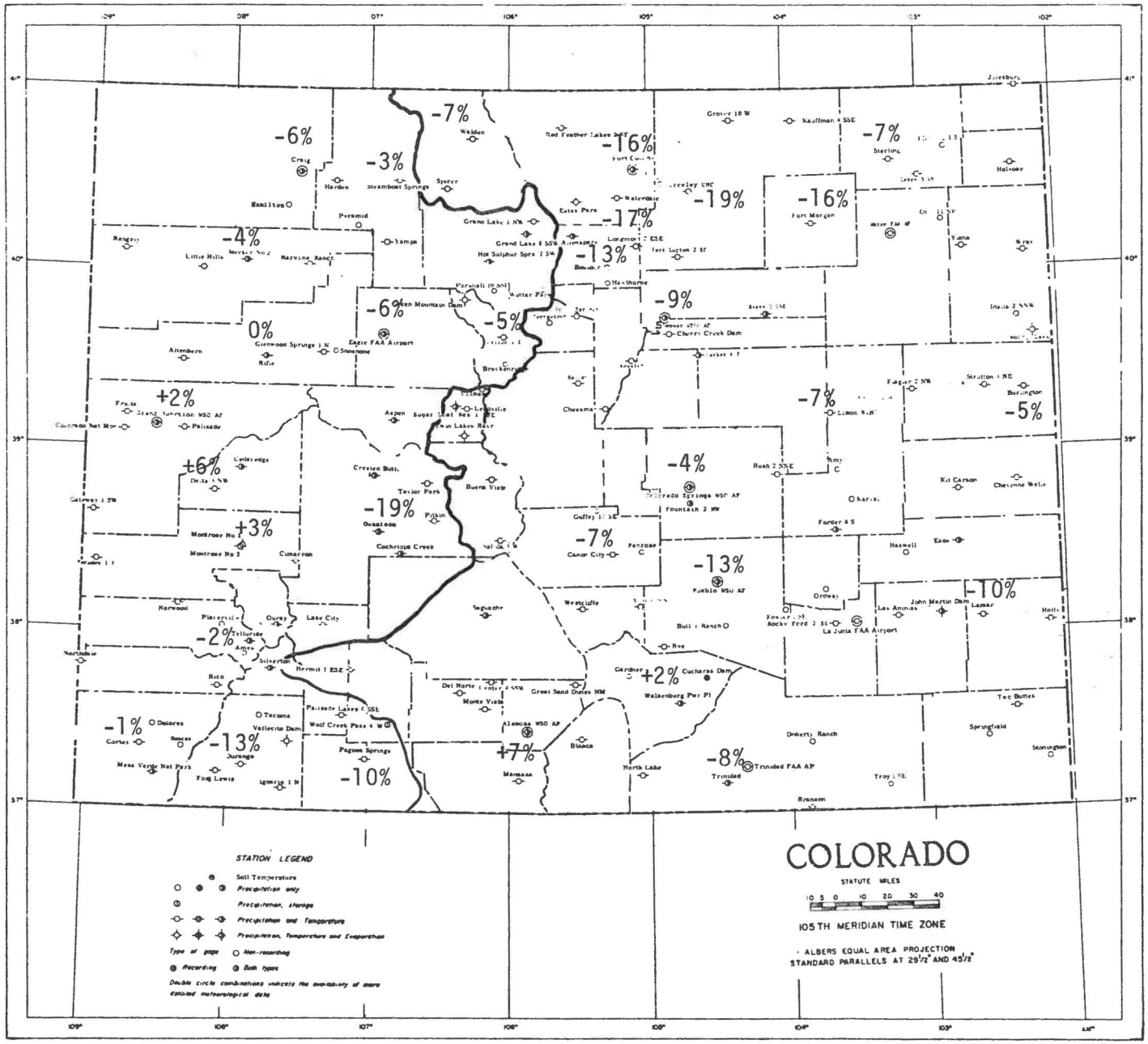

Figure 6. Precipitation for October 1980 through February 1981 as a percent of the 1951-1970 average.

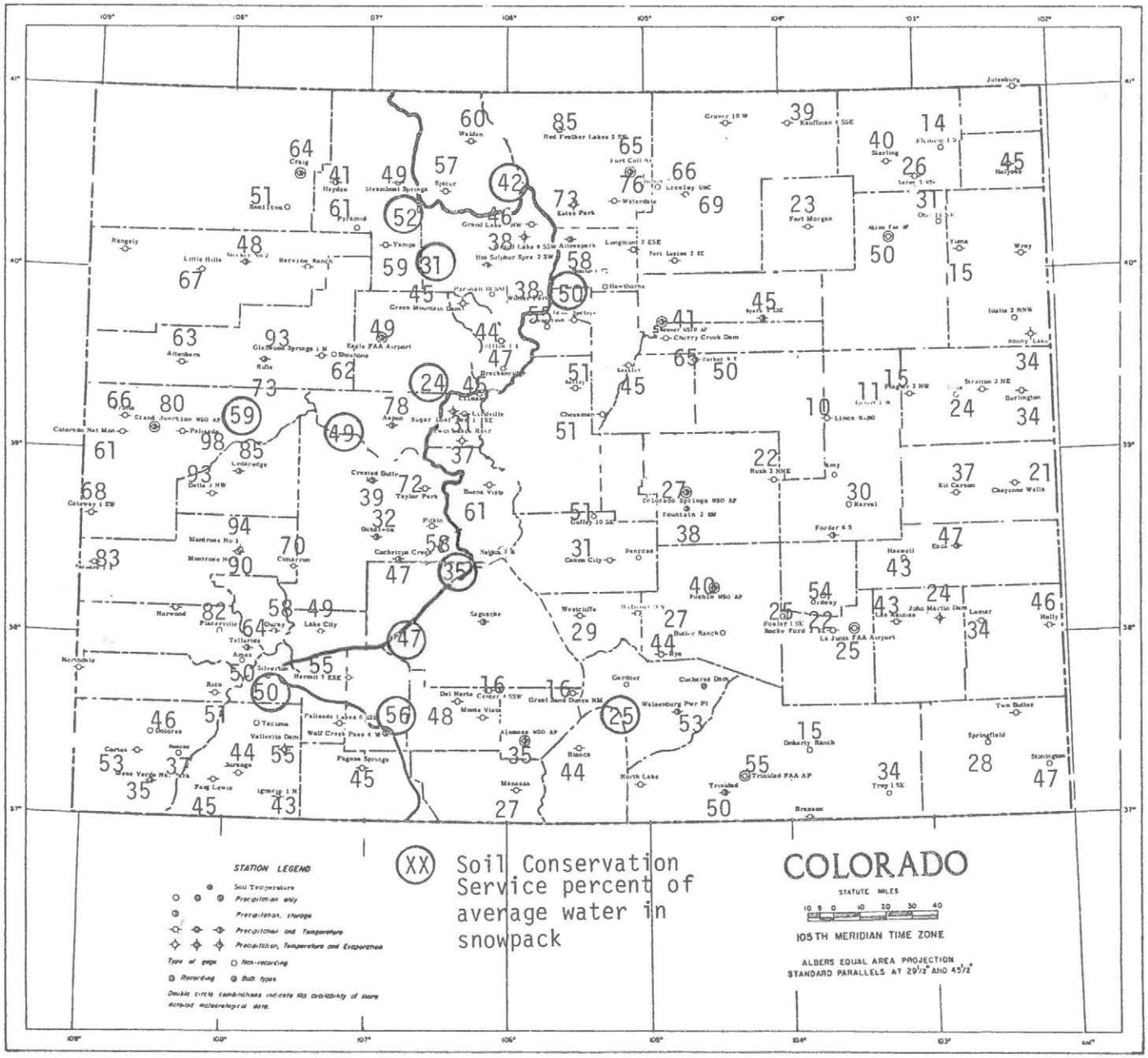

Table 1. Colorado heating degree day data through February 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136	1274	1097					
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	1004	1005	1164	1095					
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630	644	800	714					
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	866	907	819					
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	679	652					
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928	850					
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986	901					
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091	1076					
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	936	826					
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731	853	801					
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	756	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302	1229					
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	968	842					
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	957	1014	1165	1008					
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	810	980	848					
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993	912					
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864	754					

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964	872					
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331	1118					
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910	766					
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014	926					
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	744	806	952	891					
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044	958					
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948	851					
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1088	971					
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871	697					
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052	911					
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	838	780	1067						
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159	1169					
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1038	945					
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8679
	1980-81	78	162	301	662	925	1003	1132	1038					
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860	732					
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281	1158					
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	818	745					

COLORADO CLIMATE -- MARCH 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Colorado received substantially above average precipitation in March. This was the first wetter than average month across most of the state since May 1980. Temperatures, however, continued above average for the fifth consecutive month and the ninth month out of the past ten.

Several major storm systems crossed the Central Rockies during March bringing significant moisture into Colorado and temporarily quieting the cries of "severe drought". As the month began, a storm system moved inland across California spreading rain and snow across large portions of the southwestern United States. Scattered areas of Colorado, particularly the southern half, began receiving precipitation on March 1. Precipitation intensified and became more widespread by the 3rd as a strong low pressure center formed over southeastern Colorado. By the 4th, many mountain locations had received as much as a foot of new snow. Precipitation amounts were especially heavy from the Front Range eastward across the plains. Precipitation fell as a mixture of rain and snow accompanied by strong wind over most lower elevation areas. Precipitation amounts from the storm generally ranged from 0.50 to 1.50 inches. Denver, for example, totalled 0.81 inches of precipitation (9.8 inches of snow) and Burlington recorded 1.63 inches. The storm was welcomed with sighs of relief across the Eastern Plains where no significant precipitation had fallen in some areas since last summer.

After a very brief respite, another major winter storm approached the state on the 6th. The storm broke up as it crossed the mountains resulting in extremely variable snowfall amounts. Breckenridge, for example, received only 1 inch of new snow while Berthoud Pass measured 11. Conditions were equally variable across the Eastern Plains. A foot of snow with more than an inch of water equivalent precipitation fell on portions of east central Colorado on the 7th. At the same time, many other areas were completely missed by the storm.

Cold temperatures accompanied this stormy period in the eastern half of the state. The weather station near Byers recorded a low of -4°F on the 8th with 10 inches of snow on the ground. Antero Reservoir in South Park shivered with -31°F on the morning of the 4th, the state's coldest temperature for the month. Not all areas were affected, however, Pueblo, which missed the heavy snow, never dropped below 25°F the entire month.

Mild but unsettled weather was observed throughout the middle of March. There was little day to day variations in temperatures from the 9th to the 16th, and scattered but mostly light precipitation occurred frequently. The exception was the southwest side of the San Juan Mountains where weak disturbances in the upper atmosphere set off moderate precipitation on the 11th and again on the 14th. Durango, for example, received 0.73 inches of precipitation on the 11th and 0.61 inches on the 14th with a total of 15.5 inches of snow. Because of warm temperatures, the snow melted quickly except high in the mountains.

Another storm system crossed the state on the 17th and 18th bringing cooler temperatures. Precipitation totals were mostly light except in parts of the Northern and Central Mountains where more than 6 inches of new snow was recorded.

The next in the succession of storms hit on the 21st. Significant snows occurred in parts of the mountains, but again the Eastern Plains were hardest hit. Six inch snowfalls were common from near Denver to the Kansas border. The heaviest precipitation fell in a localized area near Kim in southeastern Colorado. One weather station there totalled 1.42 inches of precipitation and 11 inches of wet snow in 24 hours.

A minor upper air disturbance triggered more rain and snow showers on the 24th. Berthoud Pass picked up 8 more inches of snow to add to their monthly total.

Yet another significant storm system headed toward Colorado on the 26th. Ahead of the storm, strong southerly winds brought the warmest temperatures of the month to the entire state. On the afternoon of the 26th, Dillon and Buena Vista recorded temperatures of 53°F and 57°F, respectively. Grand Junction, Colorado Springs, and Denver all reached 71°F that day. Lamar and Holly shared honors with the state's highest temperature for March, 83°F on the 27th.

Showers and much colder temperatures spread into western Colorado early on the 27th. By the 28th, moderate to heavy precipitation developed along the Front Range and across the northeastern plains. Temperatures remained near or above freezing except in the mountains, which helped to reduce snowfall accumulations. Byers still managed to total 10 inches of snow from the storm, and Flagler measured 12 inches. Akron received 10.2 inches of snow with a water equivalent of 1.86 inches.

More precipitation continued to fall in the Northern and Central Mountains as the month came to an end. Mountain snowpack reached its greatest depth so far this winter. Cold temperatures were also observed. Most areas west of the Continental Divide and in the San Luis Valley recorded their coldest temperatures for the month on the 31st. Meeker, for example, dropped to 6°F.

Precipitation totals and percents of average for March are shown in Figures 1 and 2, respectively. Three small areas were drier than average in March: 1) the Montrose-Gunnison area, 2) a small portion of the San Luis Valley, and 3) mountain valleys near the Continental Divide from near Leadville northward to Grand Lake. The remainder of the state was wet, and several areas received more than double the March average. Exceptionally wet areas included portions of the Yampa and White River Valleys, the southwestern slopes of the San Juan Mountains, the southern and eastern portion of the San Luis Valley, the Buena Vista area, and large portions of eastern Colorado. In east central Colorado this was the wettest March ever recorded. Burlington, Cheyenne Wells, Flagler, Vona, and Wray all received more than 500 percent of their March average.

The abundant March precipitation has had a significant effect on the water year precipitation situation (Figure 3). The mountains as a whole are now about 65 to 70 percent of average compared to 50 percent of average one month ago. While this is a substantial improvement, it will take a lot more wet weather to get back to average for the year.

On the Eastern Plains, one exceptionally wet month was all it took to make up the deficits from the very dry winter. Along the Front Range, precipitation totals are still somewhat below average. The Arkansas Valley also continues to be dry. However, the rest of the area made a remarkable recovery and is now wetter than average. Flagler, for example, had

received just 0.32 inches of precipitation from October through February, 15 percent of average. But with 4.18 inches in March, the water year total is now 157 percent of average. The abundant moisture on the Eastern Plains came just in time to help get the winter wheat crop back in good shape and to reduce the potential for severe wind erosion.

Temperatures for March 1981 and departures from average are shown in Figure 4. While the precipitation pattern made an abrupt change in March, the tendency toward above average temperatures persisted. Most locations both east and west of the Divide were about 2 to 7 degrees warmer than average. Gunnison's monthly mean temperature of 32.6°F was 8 degrees warmer than usual. Only extreme southwestern Colorado experienced slightly below average temperatures. Durango averaged 36°F for the month, 1 degree below normal.

Persistently warm nighttime temperatures, particularly in the mountains, contributed to the above average temperatures. Abundant nighttime cloud cover with little snow on the ground in the mountain valleys resulted in very few really cold nights. At Steamboat Springs, for example, nighttime lows were about 10 degrees warmer than usual while daytime highs were only about 4 degrees above average.

Heating degree day information, which makes it easy to compare temperatures with heating energy consumption, is presented in Figure 5 and 6 and in Table 1. The warm temperatures meant that heating degree days were again less than usual (less energy needed to heat buildings). Totals ranged from 584 at Pueblo to 1219 at Dillon. Compared to average, totals varied from 2% more than average at Cortez and 1% above average at Durango to 20% fewer than average at Gunnison, 21% fewer at Lamar and 25% less than usual at Pueblo.

Heating degree day totals were also lower this year than in March 1980. Totals this year ranged from 3% fewer than last year at Walsenburg and 5% less at Canon City to 22% less at Lamar and Pueblo and 24 percent less at Gunnison. This means, all other factors being equal, that less energy should have been required this March to heat homes, businesses, and schools.

Figure 1. March 1981 precipitation amounts (inches).

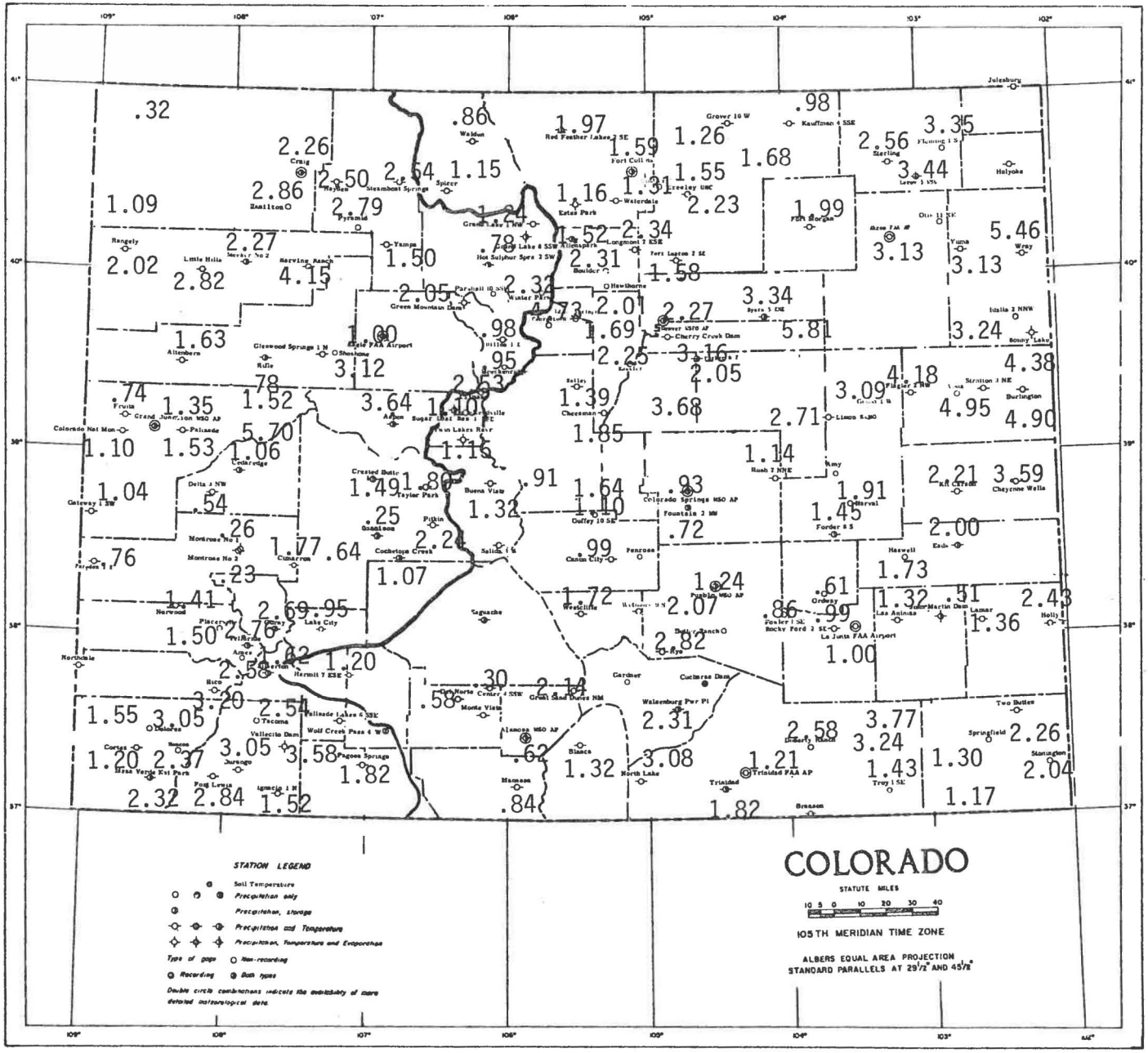

Figure 2. Precipitation for March 1981 as a percent of the 1951-1970 average.

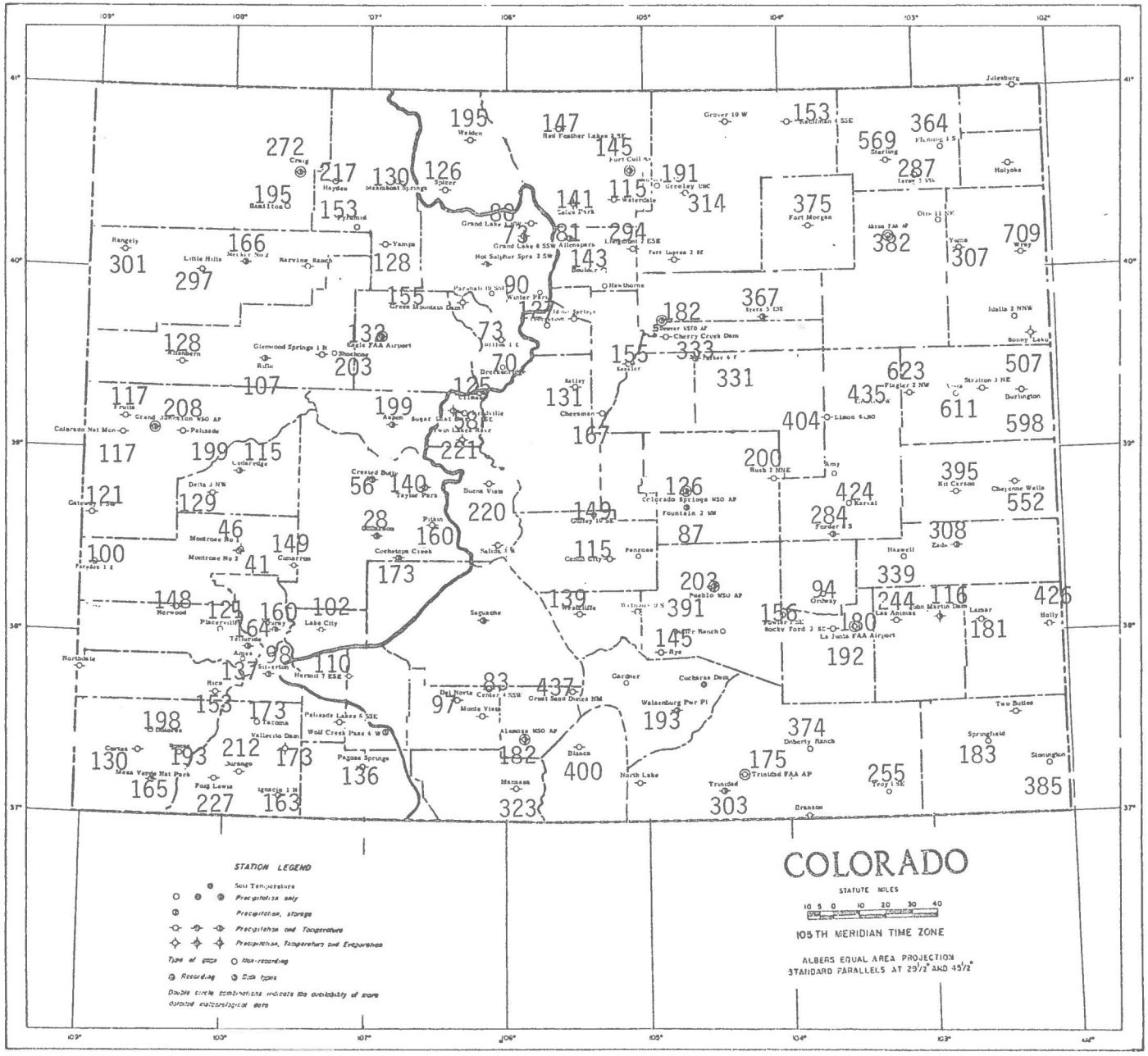

Figure 3. Precipitation for October 1980 through March 1981 as a percent of the 1951-1970 average.

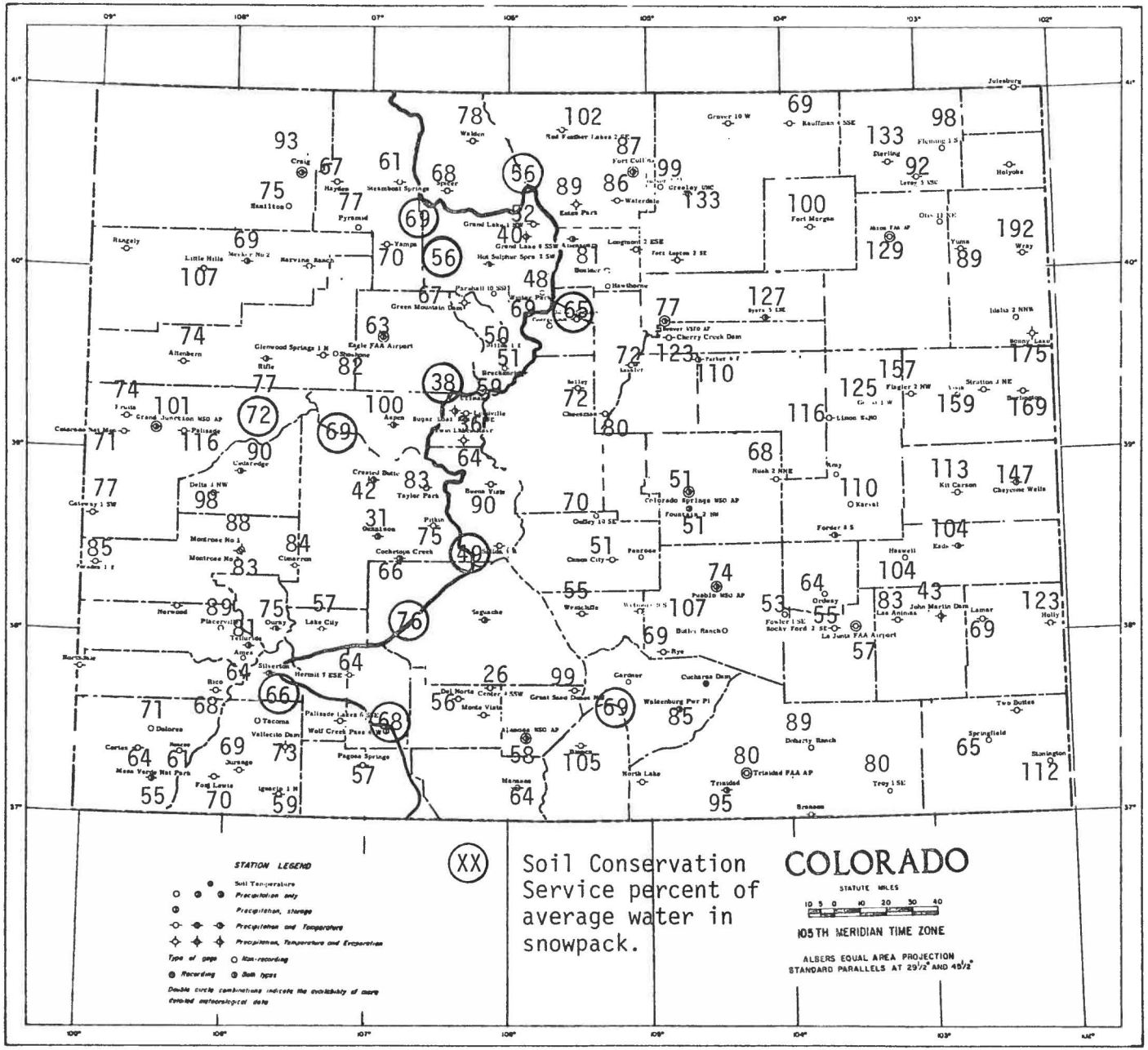

Figure 4. Temperatures for March 1981 in degrees Fahrenheit (in parentheses) and the departure from the 1951-1970 average.

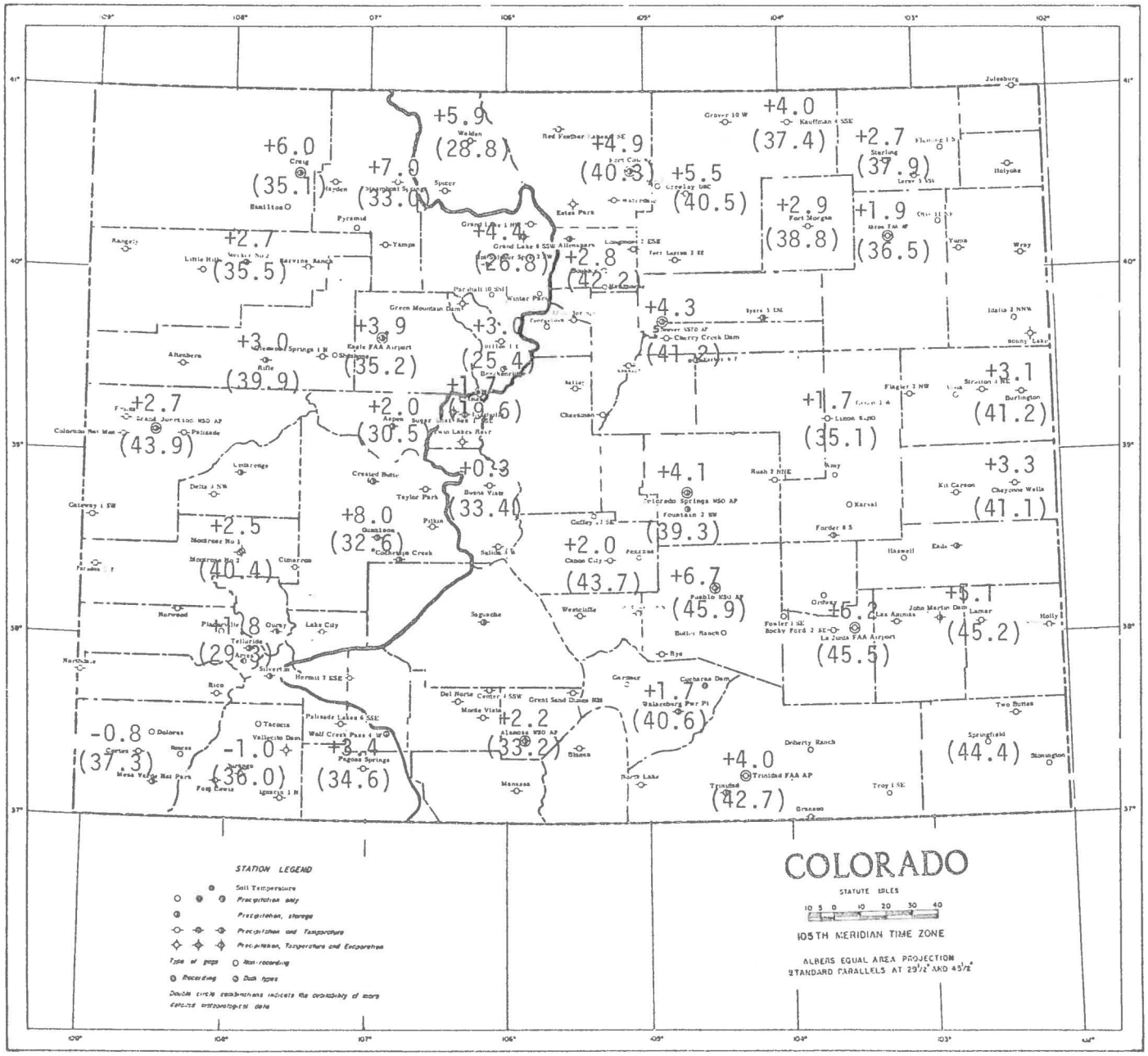

Figure 5. March 1981 Heating Degree Days (in parentheses) and percents above or below the 1941-1970 average.

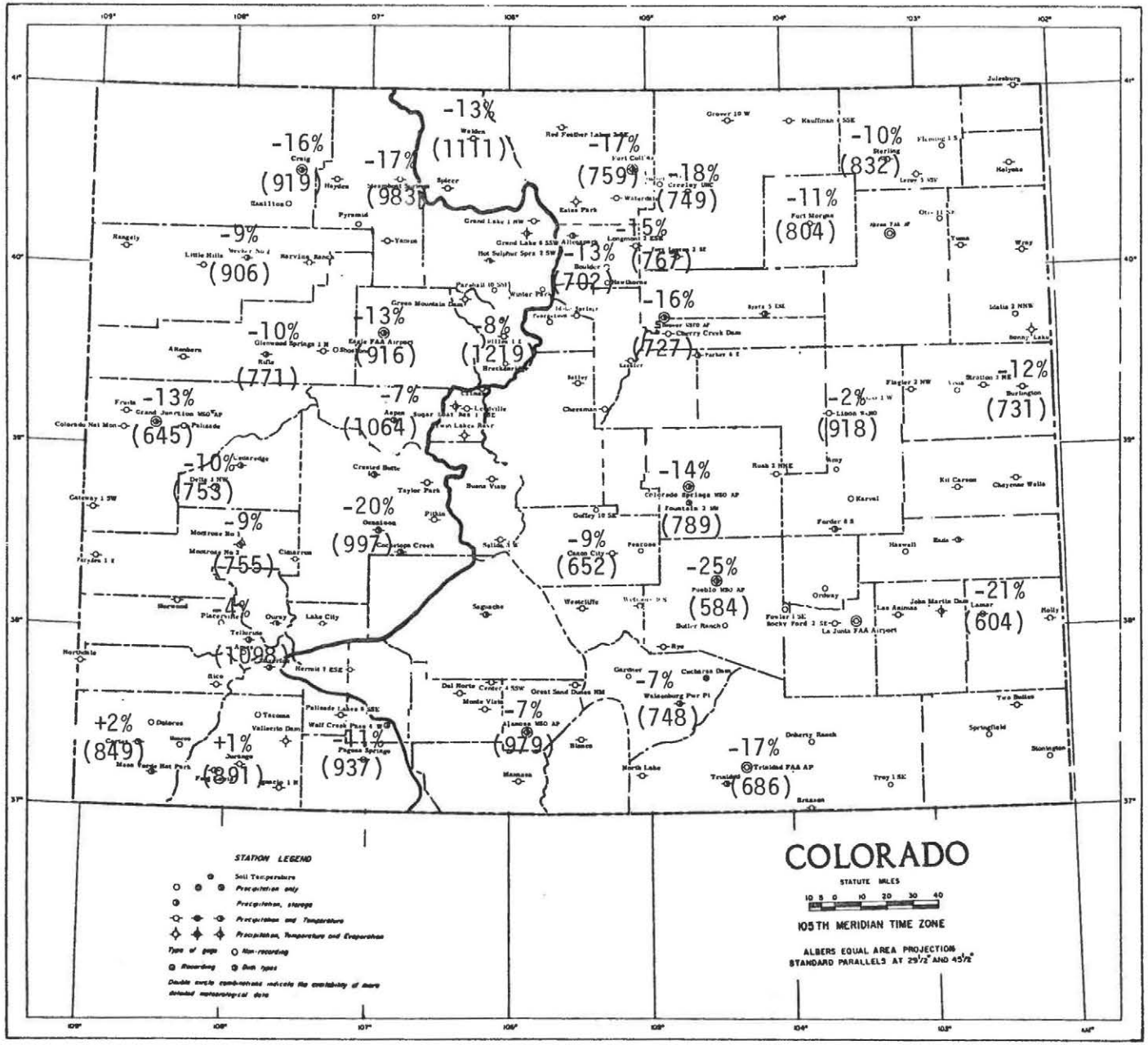

Figure 6. March 1981 Heating Degree Days as a percent above or below March 1980.

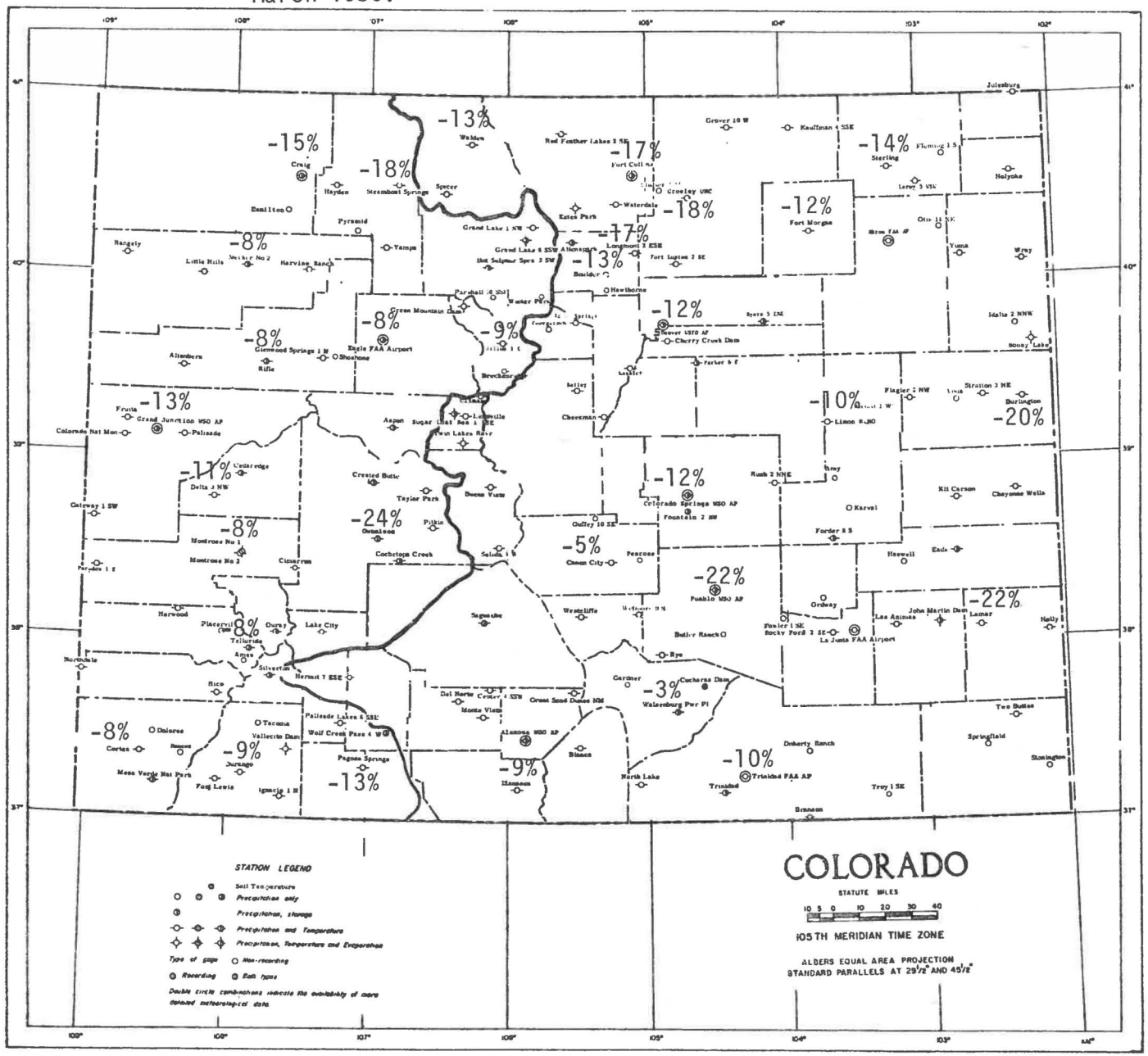

Table 1. Colorado heating degree day data through March 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136	1274	1097	979				
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	1004	1005	1164	1095	1064				
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630	644	800	714	702				
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	866	907	819	731				
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	679	652	652				
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928	850	789				
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986	901	849				
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8375
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091	1076	919				
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	934	826	677				
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731	853	801	727				
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302	1229	1219				
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	968	842	891				
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	957	1014	1165	1008	916				
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	810	980	848	759				
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993	912	804				
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864	754	645				

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964	872	749				
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331	1118	997				
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910	766	604				
Limon	average	8	6	144	448	834	1070	1156	960	935	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014	926	918				
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	744	806	952	891	767				
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044	959	906				
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948	851	755				
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1098	971	937				
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871	697	584				
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052	911	771				
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	838	780	1067	852					
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	739	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1136	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159	1169	963				
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1038	945	832				
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	925	1003	1132	1038	1098				
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860	732	686				
Walden	average	197	270	489	803	1149	1438	1538	1313	1250	891	526	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281	1159	1113				
Walsenberg	average	6	12	93	364	690	911	977	820	926	439	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	818	745	743				

COLORADO CLIMATE -- APRIL 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Light precipitation and unusually warm temperatures occurred once again across most of Colorado in April. In the past 11 months there has been only one cooler than average month (October) and only one wetter than average month (March). The 6-month November through April period will go down in the record books as the warmest ever observed for large portions of Colorado.

Chilly temperatures were noted in parts of the state as the month began. The weather station near Granby recorded a low of -3° F on the 1st. However, temperatures quickly warmed into the 70's at lower elevations both east and west of the mountains on the 1st and 2nd as a major storm system approached rapidly from the West Coast.

Precipitation developed across most of the state on the 3rd as a deep low pressure area formed over eastern Colorado. Snow, some of it quite heavy, fell in the mountains and also east from the Front Range across the northeastern plains. Fort Collins was especially hard hit, receiving 6 inches of snow in just a few hours with a water equivalent of .88 inches. Heavy, wet snow also fell on parts of northwest Colorado. Dinosaur National Monument and Rangely both received about 8 inches of snow.

Temperatures remained cold statewide on the 4th and 5th as the storm headed eastward. Most locations recorded their coldest readings for the month on the morning of the 5th. Low twenties were common east of the mountains, and Trinidad reported 14° F. A hard freeze occurred on the Western Slope resulting in some damage to early blossoming fruit orchards. Even a few sub-zero temperatures were noted in the mountains. Taylor Park's -15° F was the state's coldest temperature for the month.

The snow melted rapidly, and temperatures climbed back well above average on the 6th and 7th. However, another storm system spread scattered precipitation across the state on the 7th and 8th. Totals were mostly light except in the Central Mountains and some of the western valleys.

Aspen, for example, measured nearly 11 inches of snow from the storm, and Berthoud Pass totalled 9.5 inches.

A minor storm system affected southwestern Colorado on the 14th and 15th. Durango, for example, received .70 inches of rain and Vallecito Dam totalled .98 inches. Otherwise, the period from the 9th to the 18th was dry and very warm across the state. The first 90° F temperature for the year occurred at Lamar on the 10th.

The last organized storm system of the month approached Colorado from the southwest on the 18th and 19th. The mountains were hardly affected by the storm, but significant rains fell across some of the Eastern Plains. The same areas which received excessive precipitation in March were again soaked. Bonny Reservoir, Yuma, and Wray recorded 1.91, 2.06, and 2.58 inches of rain, respectively, from the 19th through the 21st.

With the exception of some mountain snowshowers on the 22nd, and some widely scattered trace showers across the plains late in the month, the rest of April was dry and exceptionally warm. By the time the month was over, La Junta had recorded 15 days with maximum temperatures above 80° F. During the last week of April, daytime temperatures were consistently in the 70's and 80's everywhere in the state below about 8,000 feet. Many new records were set. The 83° F reading at Colorado Springs and 90° F at Pueblo on the 26th, both established new all-time record highs for April. La Junta and Lamar shared honors for the warmest temperature in the state, 95° F on the 26th. In the mountains, near-record temperatures in the 50's and 60's were common, accelerating the melting of the limited snowpack. When the month ended, little or no snow remained on the ground at elevations below 11,000 feet.

Temperatures for April and departures from average are shown in Figure 1. Temperatures ranged from 3 to 7 degrees above average in the western half of the state to 6 to 9 degrees warmer than usual east of the Continental Divide. New records for the month as a whole were set at several cities. Examples include 53.8° F at Colorado Springs, 54.9° F at Greeley, 56.7 F at Burlington, 59.6° F at Pueblo, and 60.1° F at Lamar. Denver's April mean of 56.4° F equalled their previous record set in 1946. At Fort Collins, the 54.2° F monthly mean was the warmest in April since 1888.

Precipitation totals and percents of average for April are shown in Figures 2 and 3, respectively. For most of the state, dry conditions accompanied the unusual warmth. Precipitation totals in the Northern and Central Mountains and the north slopes of the San Juans were generally only 30 to 50 percent of average. The southern San Juans fared somewhat better. Durango's April total of 1.21 inches of precipitation was 94 percent of average. Precipitation on the Western Slope was quite variable ranging from just 15 percent of average at the Altenbern ranch (northeast of Grand Junction) to 208 percent of average at Rangely.

The San Luis Valley and most of the Arkansas River drainage were the driest parts of the state. A number of stations including Center, Canon City, and Karval recorded just a trace of precipitation. The Front Range area north from Colorado Springs was better off, but still drier than average. The only substantial region with more April precipitation than normal was the northeast section. Wray, Bonny Reservoir, and Sterling all received more than double their April average.

The accumulated water year precipitation continues to be substantially below average across most of the state (Figure 4). The mountains are running from about 40 to 70 percent of average. However, snowpack measurements indicate only 28 percent of the average May 1 water content. This discrepancy is a result of the unusual temperatures all winter which have helped to already melt much of the snowpack.

For the first 7 months of the 1981 water year, the San Luis Valley and most of southeastern Colorado continue to be very dry. Center has totalled only 0.62 inches since October 1, 21 percent of average. The only relatively wet area of the state is the northeast where spring rains and snows have been very beneficial for agriculture.

The continuing drought has and will continue to be a great concern to all Colorado water users. However, the accompanying warm temperatures have been beneficial in their own way. Heating degree day totals (which are proportional to energy demands for heating) were again much less than usual in April and less than last year (Figures 5 and 6). This means that considerably less energy should have been needed in April to heat homes, schools and businesses. For the winter as a whole, totals have been typically 10 to 20 percent less than last year. While this has

been helpful this winter, the trend is not likely to continue. Heating degree day totals next winter are likely to be 12 to 25 percent more than this winter and conceivably even higher. This, in combination with predictions for much higher natural gas and electricity rates next winter, spells real trouble. We should all be thinking and planning ahead now for the inevitable increases to come.

Figure 1. Temperatures for April 1981 in degrees Fahrenheit (in parentheses) and departure from the 1951-1970 average.

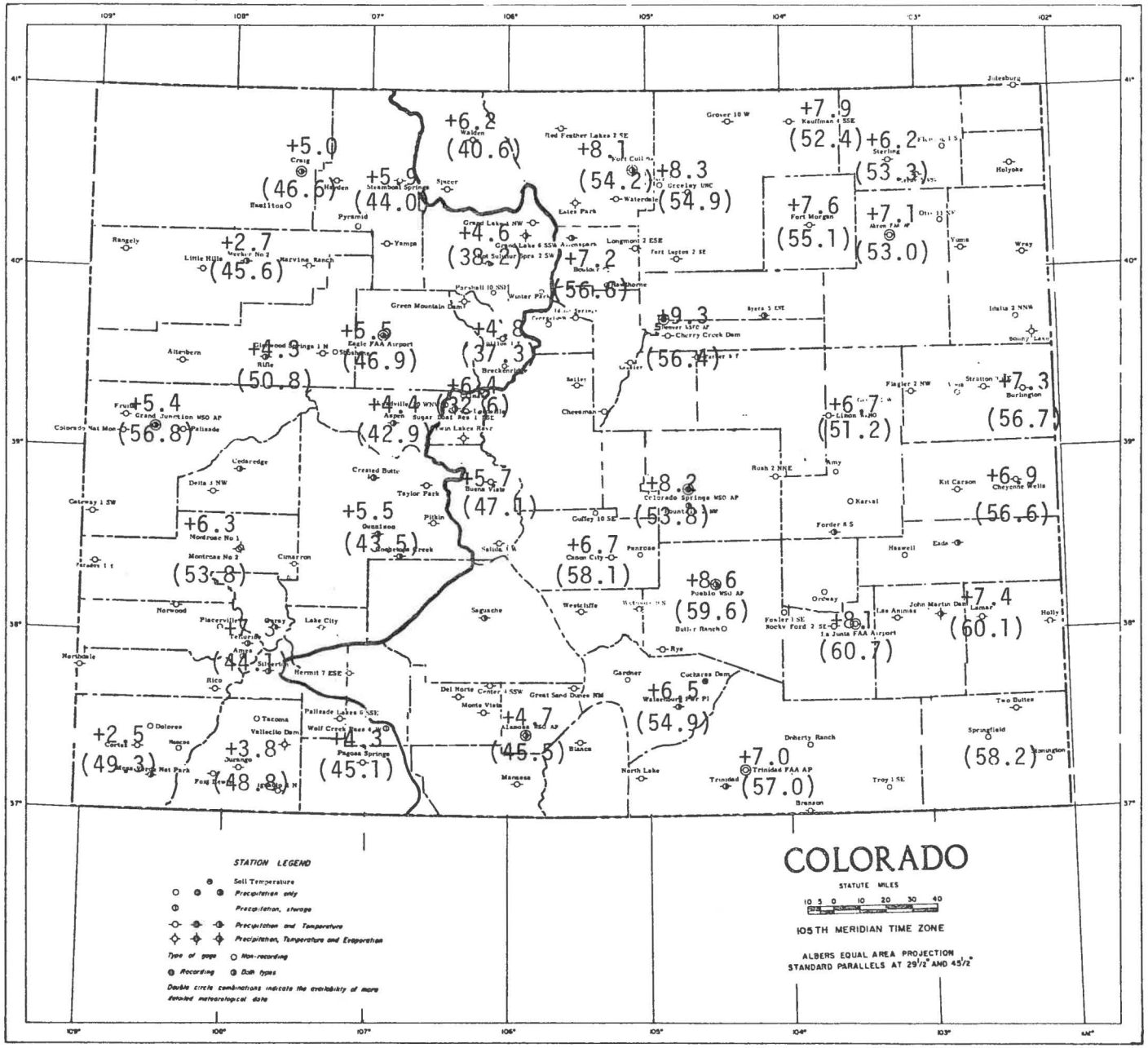

Figure 2. April 1981 precipitation amounts (inches).

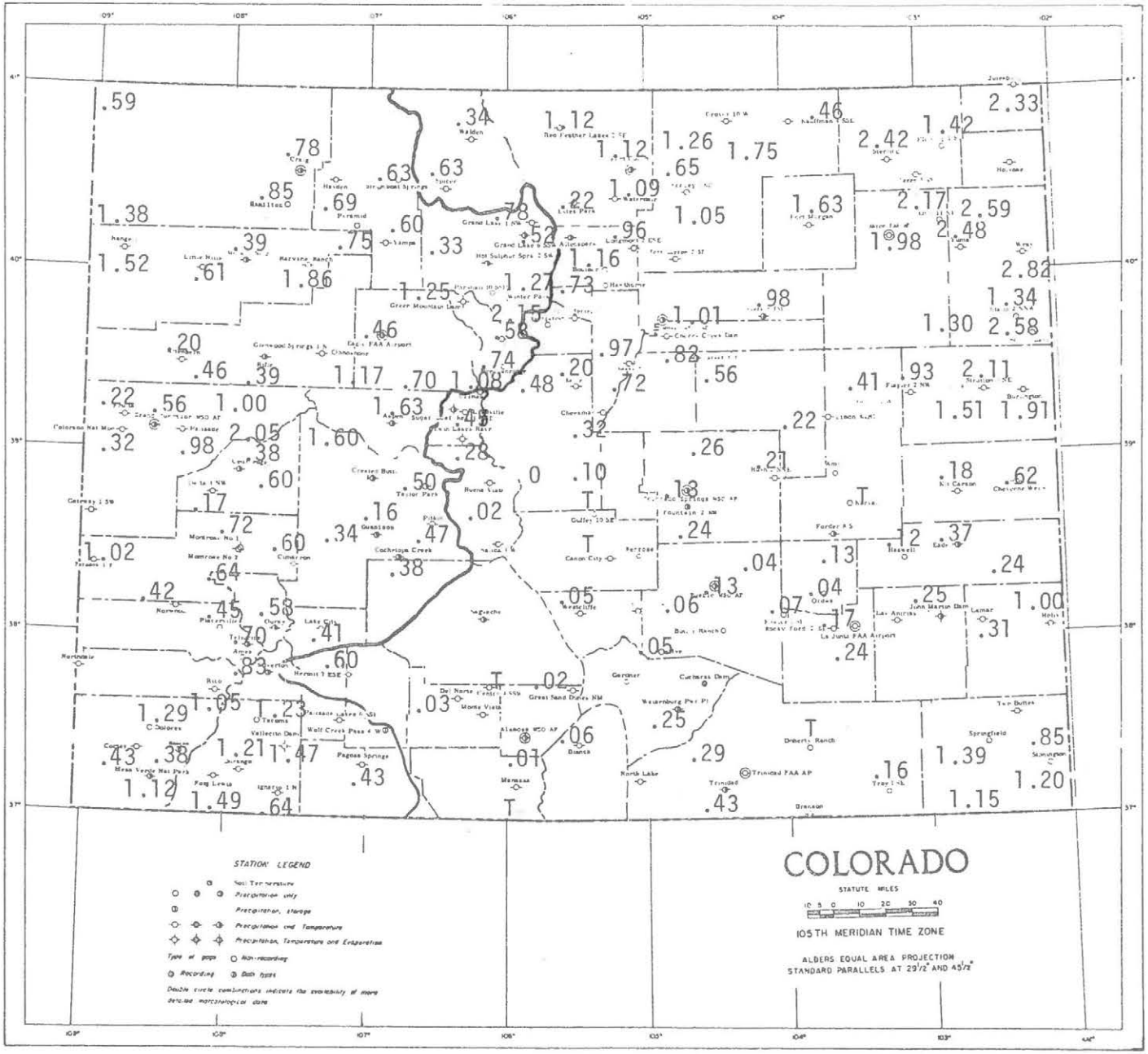

Figure 3. Precipitation for April 1981 as a percent of the 1951-1970 average.

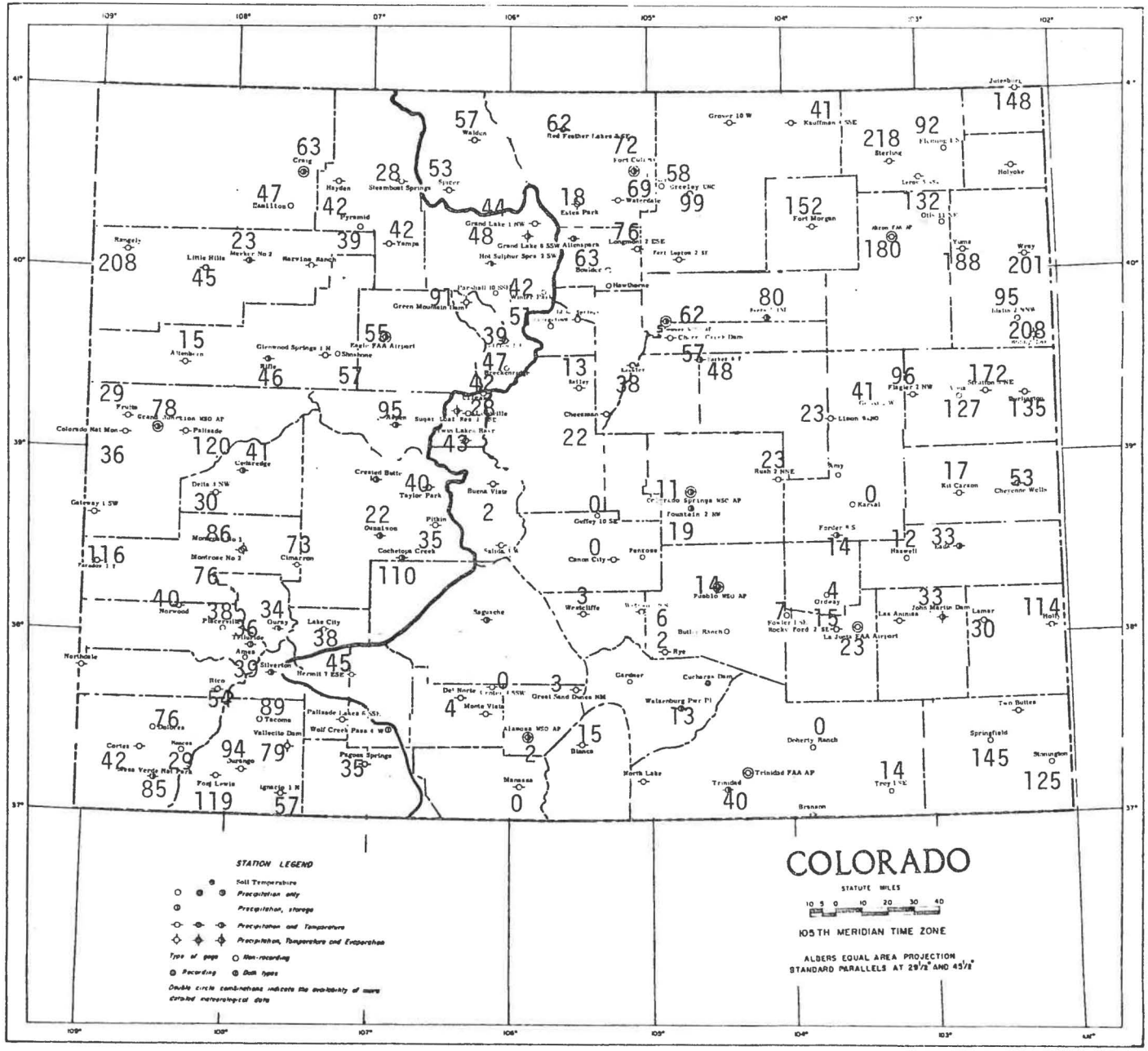

Figure 4. Precipitation for October 1980 through April 1981 as a percent of the 1951-1970 average.

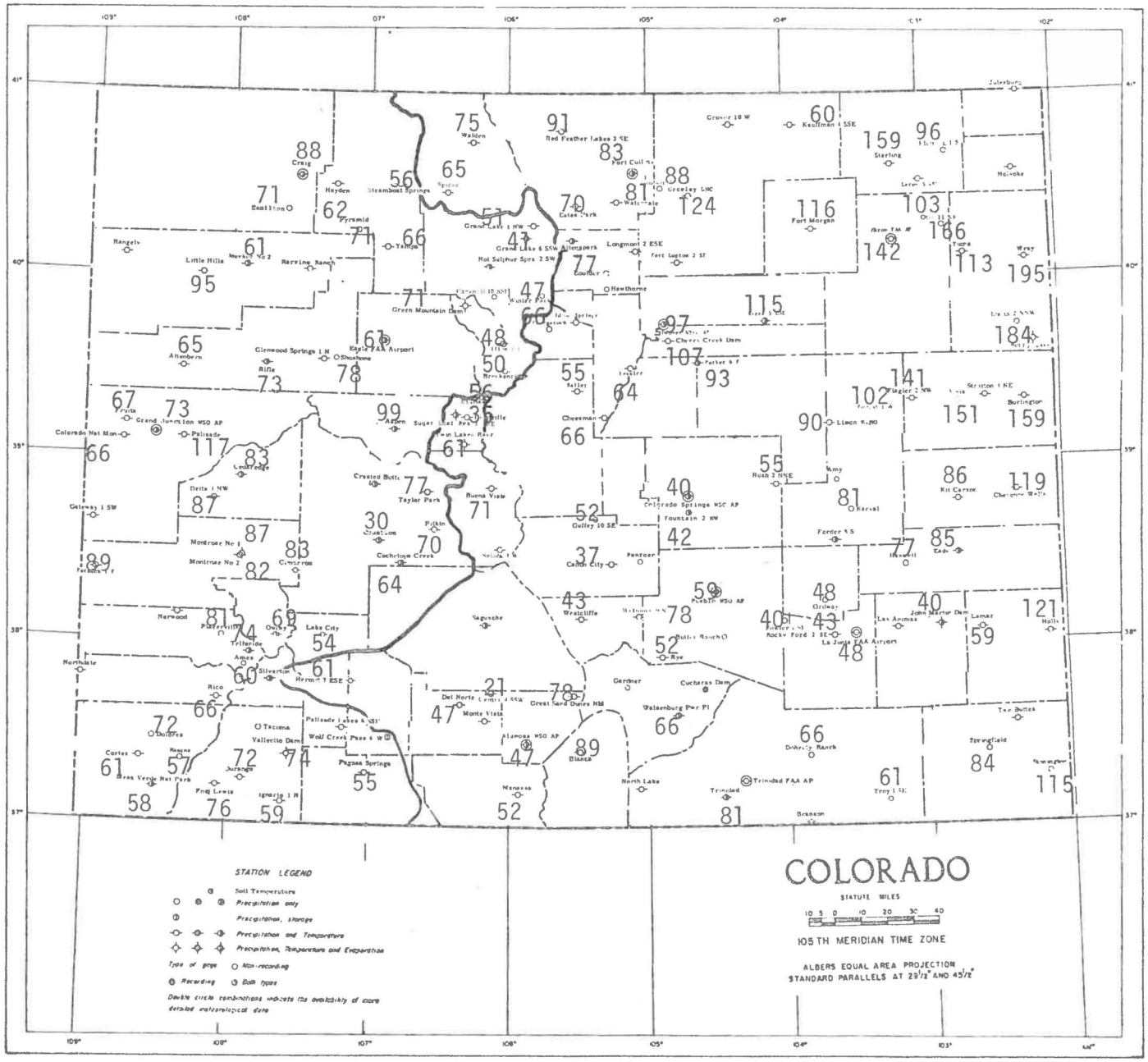

Figure 5. April 1981 heating degree days (in parentheses) and percents above or below the 1941-1970 average.

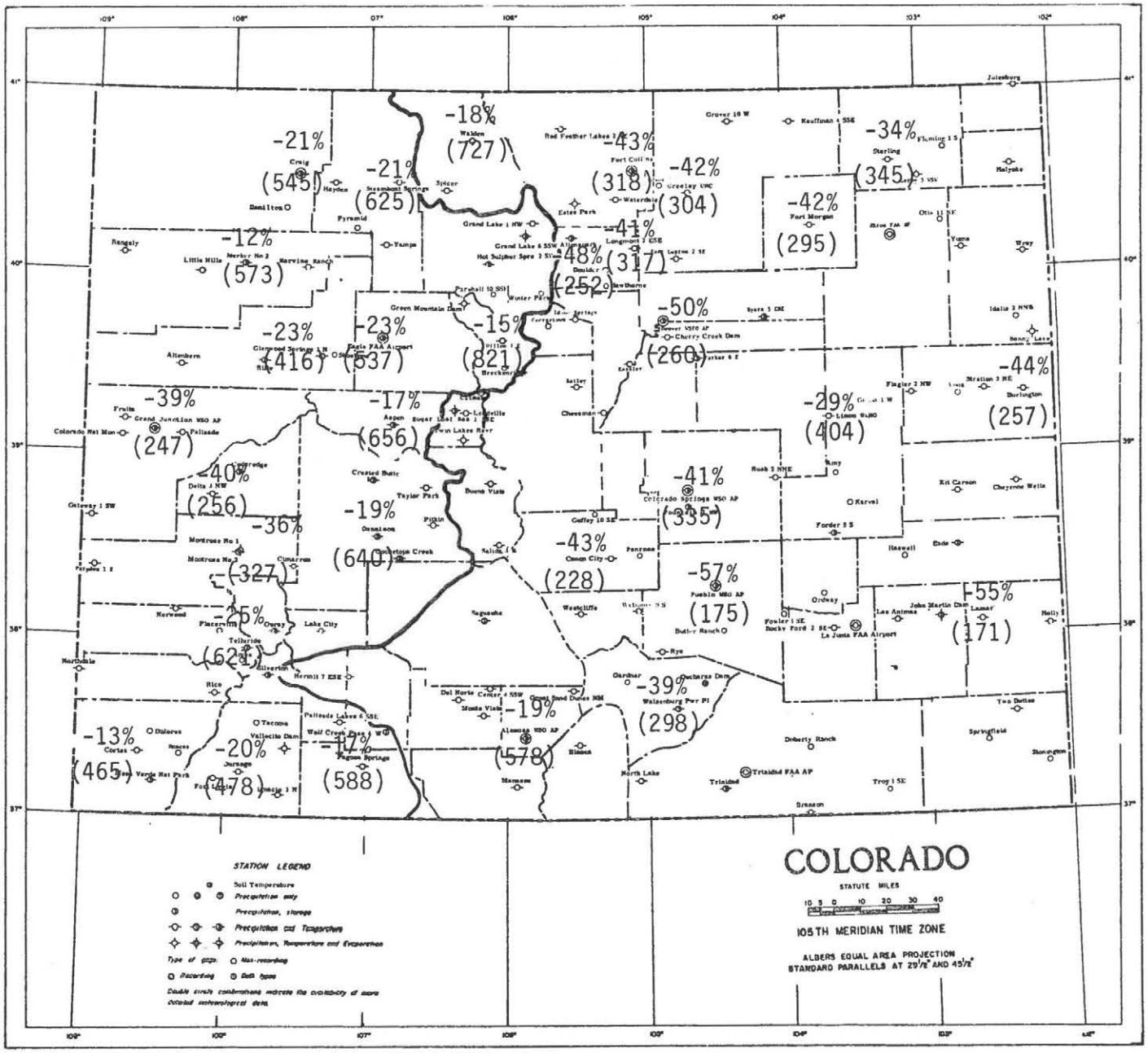

Figure 6. April 1981 heating degree days as a percent above or below April 1980.

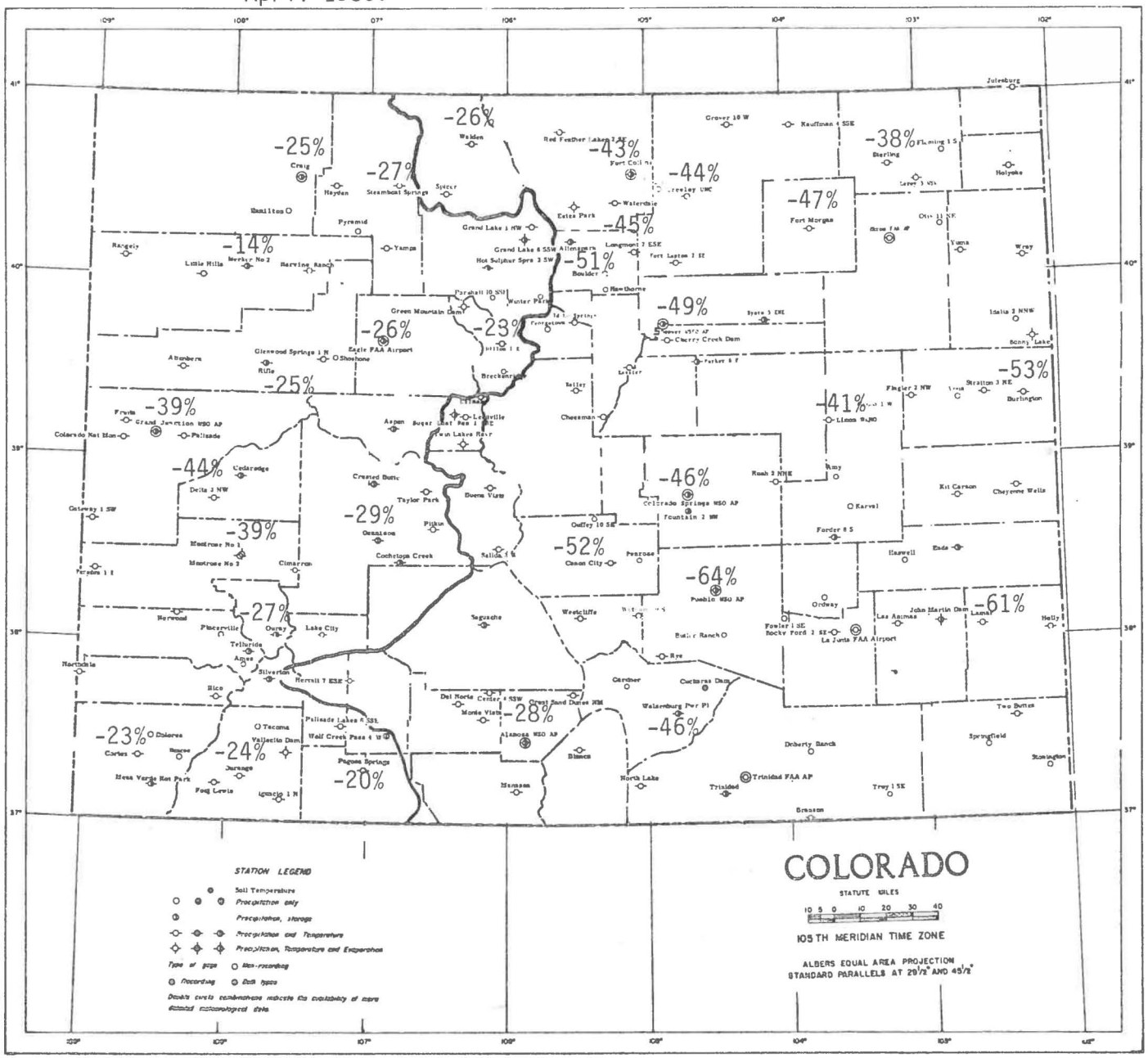

Table 1. Colorado heating degree day data through April 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8509
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136	1274	1097	979	578			
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
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	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	866	907	804	731	257			
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	679	652	652	228			
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928	850	789	335			
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986	901	849	465			
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8375
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091	1076	919	545			
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	934	826	677	256			
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731	853	801	727	260			
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	821			
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	968	842	891	478			
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	957	1014	1165	1008	916	537			
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	810	980	848	759	318			
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993	912	804	295			
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864	754	645	247			

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964	872	749	304			
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331	1117	997	640			
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910	766	604	171			
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014	927	918	404			
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1020	923	574	301	15	6792
	1980-81	0	4	77	455	744	806	952	902	767	317			
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044	958	906	573			
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948	851	755	327			
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1088	971	937	588			
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871	697	584	175			
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052	910	771	416			
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	838	780	1067	852	892				
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159	1152	933	625			
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1038	963	832	345			
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	925	1003	1132	1038	1098	621			
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860	720	712				
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727			
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	818	745	748	298			

COLORADO CLIMATE -- MAY 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

For the first time in one year, most of Colorado experienced cooler, cloudier, and wetter than average weather conditions in May. Field work and crop development were slowed by the cool, damp weather, but the extra water reduced irrigation demands. Despite the dry winter, many areas of the state enjoyed a beautiful green and flowery spring. At this time, agriculture crop production prospects look good.

May began where April left off with unusually warm, dry weather. Most areas of the state, except for the southeast, reported their warmest temperatures for the entire month on the 1st and 2nd. Examples included highs of 79° F at Craig and 82° F at Eagle on the 1st, and 86° F at Boulder and 92° F at Sterling on the 2nd. La Junta also hit 92° F to share honors for the state's highest temperature for the month.

The warm weather ended abruptly by the 3rd as a Pacific cold front crossed the state and an upper air disturbance triggered widespread precipitation. Northwestern Colorado and many mountain locations reported heavy precipitation on the 2nd and 3rd. Hamilton, near Craig, totalled 1.82 inches of rain from the storm. The high mountains received several inches of new snow.

Throughout the remainder of the month, a succession of major storm systems tracked eastward across the western U.S. bringing significant moisture to broad areas of the country. Some precipitation fell somewhere in Colorado on all but one day of the month. Precipitation did not fall as frequently across the southern half of the state, but only a few areas in southeastern Colorado remained drier than average.

From the 4th through the 8th, temperatures were near average and scattered showers with some high elevation snows were noted. However, late on the 8th a surge of cold air dropped southward from Canada. Up to a foot of snow fell in the Northern and Central Mountains as the cold pushed in. Chilly temperatures affected all but extreme western portions of the state. On the morning of the 10th, many areas recorded their

coldest readings for the month. Examples included 36° F at Canon City, 28° F at Trinidad, and 19° F at Gunnison and Estes Park.

A low pressure area moved southeastward across Colorado on the 11th and 12th. Cool, "upslope" conditions developed east of the mountains. Akron totalled more than one inch of precipitation on the 12th and 13th. More snow fell in the mountains. Berthoud Pass added 9 more inches of snow to their winter total. As the skies cleared on the 13th, Climax reported a low temperature of 9° F, the state's coldest reading for the month.

Temperatures warmed a bit on the 14th and 15th as a new and extensive storm system moved in from the Pacific Northwest. In advance of the storm, plenty of moist air moved northward from the Gulf of Mexico into eastern Colorado. Widespread precipitation, some of it quite heavy, fell across much of the state on the 16th and 17th, and temperatures remained unseasonably cold. Precipitation totals from the 16th through the 18th were especially great in the Northern and Central Mountains and across the northeastern plains. Many areas there received more than one inch of precipitation. Berthoud Pass totalled 19.5 inches of new snow from the storm, and Fleming (northeast Colorado) received 2.27 inches of rain.

The eastern half of the state enjoyed some sunshine and milder temperatures for the next few days. However, the mountains and western valleys experienced frequent showers beginning already on the 20th. Ouray, for example, received nearly an inch of rain on the 20th. From the 23rd to the 27th scattered, mostly light showers and thundershowers spread over the remainder of the state. Finally, as the month ended, another round of widespread precipitation affected Colorado. This time the dry southern areas of the state received the brunt of the storm. Precipitation totals from the 28th through the 31st were mostly less than .50 in the San Luis Valley and southwestern Colorado. But along the Front Range and across the southeast, many totals exceeded one inch. Trinidad and Troy each received more than two inches.

Precipitation totals and percents of average for May are shown in Figures 1 and 2, respectively. Except for a small area of southeast Colorado from Buena Vista to Las Animas, most of the state enjoyed a wetter than average month. The wettest regions of the state, compared to average, were the mountains and western valleys. Many stations received more than double their average May totals. Steamboat Springs' 5.42 inch total and Spicer's 4.05 set new records for the month. Berthoud Pass was able to offset some of the previous dry months with a May total of 6.32 inches, 221 percent of average. The weather station there recorded measurable precipitation on 25 days in May. Large precipitation totals were also observed in northeast Colorado. For example, Greeley measured 5.36 inches and the Leroy station near Sterling had 6.03 inches. The wet weather unfortunately skipped some of the parched areas of the Arkansas Valley. Pueblo, Las Animas, and Rocky Ford, for example, received only three-quarters of an inch of precipitation, 50 percent or less of average.

Precipitation as a percent of average for the first 8 months of the 1981 water year is shown in Figure 3. While much of the state continues below average, significant improvements have occurred since last month. More areas of eastern Colorado are now near or above average for the year. Some areas west of the Continental Divide, such as Craig, are now wetter than average for the first time this year. Winter Park improved from just 47 percent of average on May 1 to 66 percent of average on June 1. Despite this improvement, the high elevation snowpack remains minimal, and very low streamflows are still expected this summer on most major rivers in the state.

May was the first cooler than average month across most of Colorado since last October (Figure 4). Nighttime temperatures were actually warmer than average over most of the state, but heavy cloud cover and frequent rain helped to hold down daytime temperatures. At Steamboat Springs, for example, May minimum temperatures were 3 degrees warmer than usual, but daily maximums were more than 5 degrees cooler than usual. Most areas ended up about one or two degrees cooler than average, but departures ranged from about one degree above average at Pueblo and La Junta to more than 4 degrees cooler than usual at Boulder, Cheyenne Wells, and Sterling.

From now until October no detailed description and maps of heating degree days will be presented. However, Table 1 with monthly heating degree day totals and comparisons with average and with last year will continue to be published.

Figure 1. May 1981 precipitation amounts (inches).

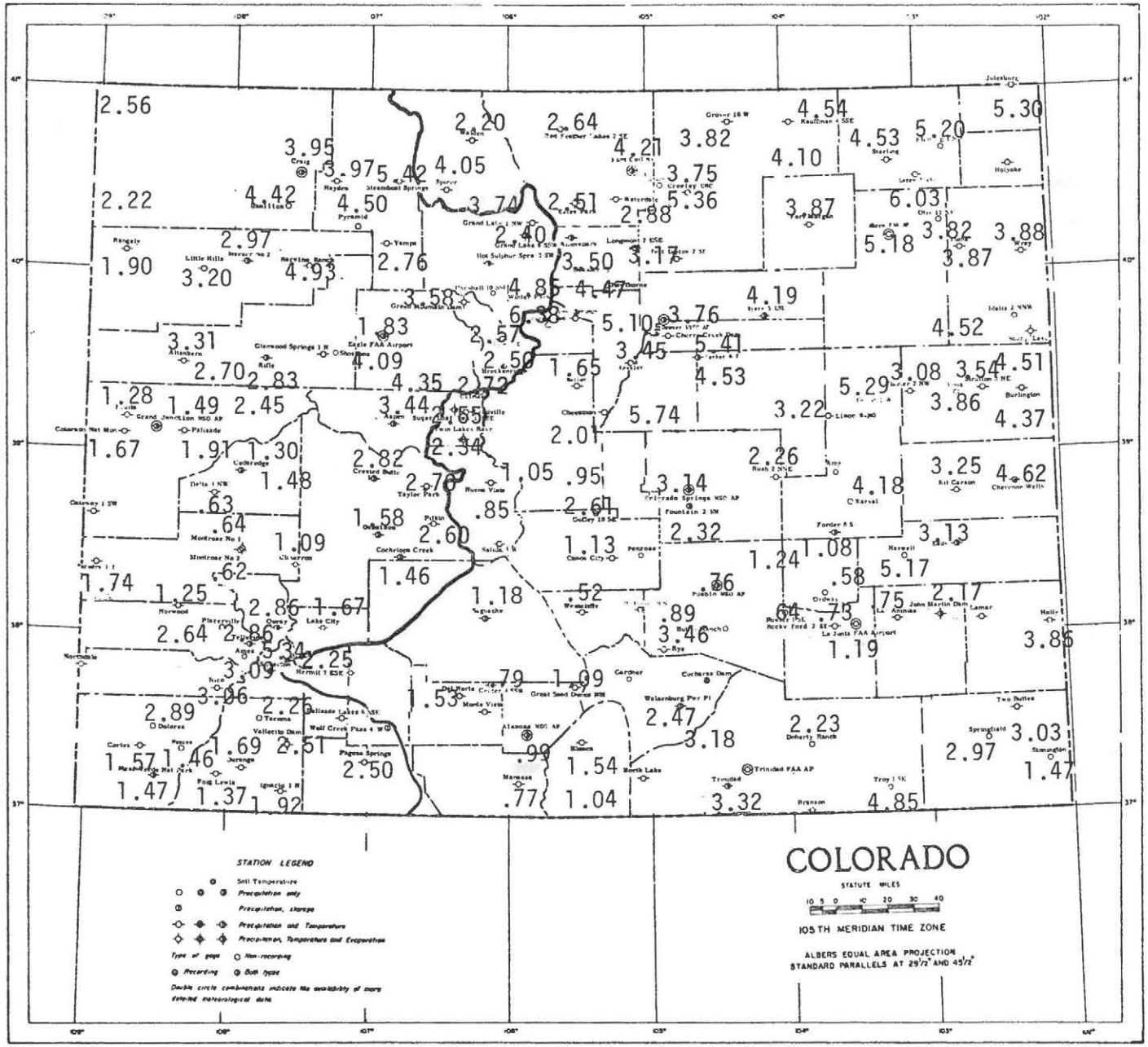
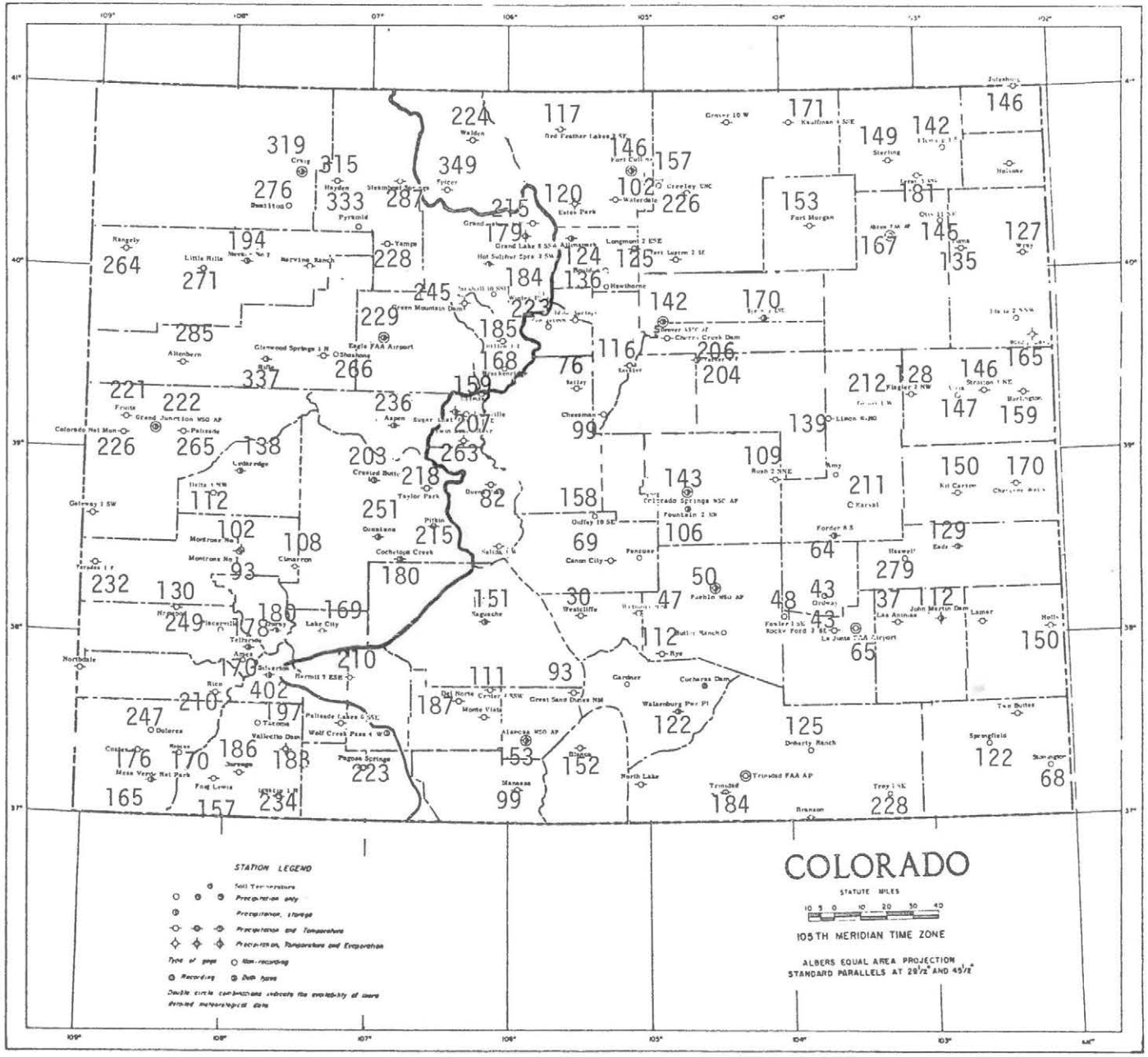


Figure 2. Precipitation for May 1981 as a percent of the 1951-1970 average.



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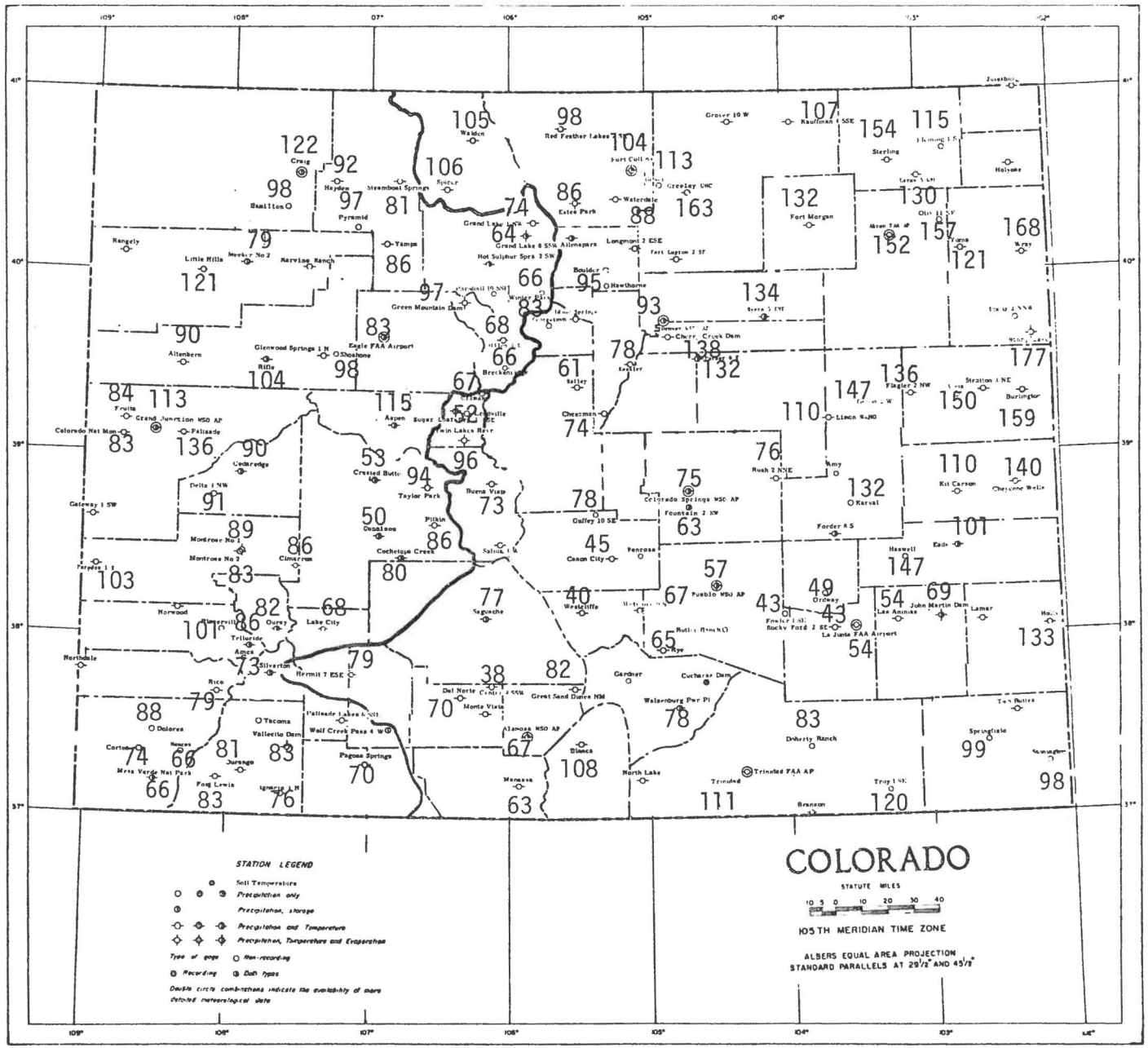

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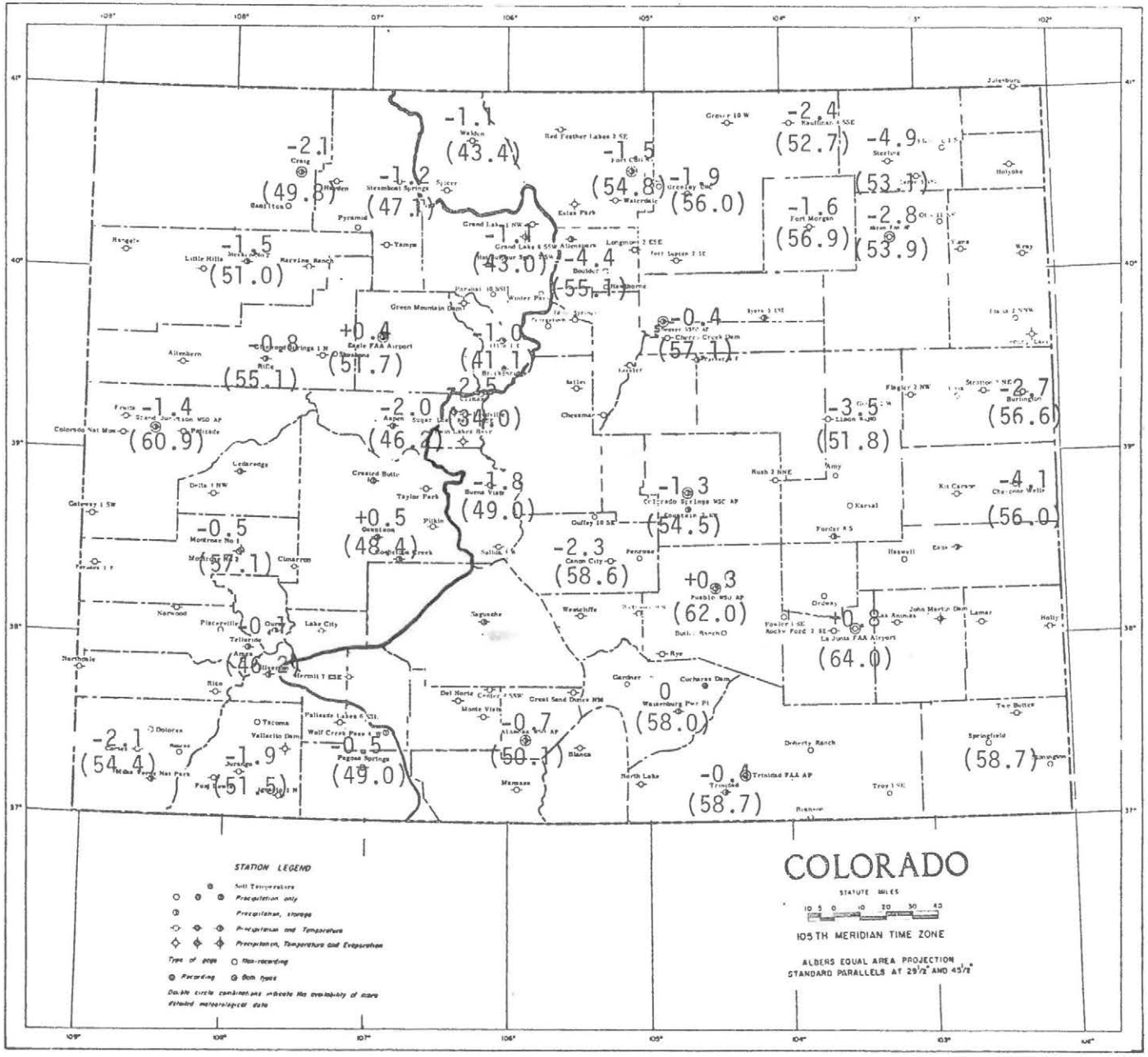

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	1980-81	0	0	49	356	763	866	907	804	731	257	271		
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	679	652	652	228	196		
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928	850	789	335	321		
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986	901	849	465	321		
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091	1076	919	545			
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	934	826	677	256	177		
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731	853	801	727	260	243		
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	821	714		
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	968	842	891	478	409		
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	967	1014	1165	1008	916	537	407		
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	810	980	848	759	318	304		
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993	912	804	295	259		
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864	754	645	247	153		

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964	872	749	304	273		
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331	1117	997	640	509		
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910	766	604	171			
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014	927	918	404	402		
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	744	806	952	902	767	317	277		
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044	958	906	573	427		
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948	851	755	327	247		
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1049	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1088	971	937	588	489		
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871	697	584	175	119		
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052	910	771	416	301		
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	750	435	65	7298
	1980-81	0	39	200	581	838	780	1067	852	892	457			
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159	1152	903	625	545		
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1038	963	832	345	378		
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9159
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	925	1003	1132	1038	1093	621	576		
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860	720	712	240	200		
Walden	average	197	270	489	803	1149	1438	1538	1313	1230	891	625	362	10257
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	935	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727	663		
Walsenberg	average	6	12	93	364	690	911	977	820	805	439	220	62	5450
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	813	745	748	298	220		

COLORADO CLIMATE -- JUNE 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

June was characterized by consistently warmer than average temperatures along with extremely variable precipitation. June 1981 will be remembered, however, because of the fierce outbreak of tornadoes which struck the Denver metropolitan area on June 3 injuring dozens of people and causing millions of dollars of damage.

The month began with seasonal temperatures and a few light showers scattered across the state. A well pronounced disturbance in the upper atmosphere over the West Coast early on the 2nd was the only indication of the severe weather soon to hit parts of Colorado. Late on the 2nd an unexpected thunderstorm dropped rain and hail on parts of Denver.

On the morning of the 3rd the upper air disturbance and an associated weak cold front began to move into western Colorado. The approaching disturbance played a major role in magnifying the strength of convection which began explosively along the Front Range by noon on the 3rd. By 2:20 PM the first tornado touched down in west Denver. Thornton was hit a few minutes later doing considerable damage. Tornadoes were spotted as far north as Fort Lupton. Finally the intense system of severe thunderstorms with hail, high winds and very heavy rains spread northward and eastward from Denver and gradually died out. Much of the worst weather missed major weather stations. Denver Stapleton, for example, received only 0.12 inches of rain. The weather station at Wheat Ridge was closest to the heart of the storm. A total of 3.63 inches of rain fell there, much of it in just a few minutes. Other hard hit areas included Sterling and Windsor where 1.93 and 2.00 inches of rain fell, respectively.

The weather throughout the remainder of the month seemed almost anticlimactic. A few heavy thunderstorms brought isolated areas of the Eastern Plains significant rains and some hail. Genoa, Vona, and Stratton all received more than an inch of rain late on the 11th. Otherwise, precipitation was very sparse across the state from the 5th to the 24th. Hot temperatures also prevailed which helped mature the winter wheat crop

but greatly increased the demand for water to irrigate crops and water yards. Several new record high temperatures were set across the state on the 8th and 9th. Colorado Springs, for example, hit 95° F on the 9th. La Junta recorded a high of 108° F on the 9th, the hottest temperature in the state in June.

A brief respite from the heat occurred from the 14th through the 18th as a large cool high pressure area settled over the West. As it moved in, a little snow fell in the mountains. Unusually chilly temperatures were noted on the morning of both the 15th and 16th. Boulder and Limon each recorded minimums of 39° F on the 16th. Near-freezing temperatures were noted in parts of northeast Colorado and below freezing temperatures were common in the mountains. Aspen dropped to 22° F on the 15th and Paonia dipped to 32° F.

Temperatures promptly climbed back above average for most of the rest of the month. Daytime readings in the 90's and 100's were common at elevations below 6,500 feet. Temperatures reached 70° F as high as Berthoud Pass. Las Animas recorded highs of 100° F or above on 16 days during the month.

During the last week of June, surface winds and winds aloft became more favorable for allowing moisture from the Gulf of Mexico to move northward into Colorado. With the moisture came frequent afternoon and evening thunderstorms. The western half of the state, particularly the Northern and San Juan Mountains, received significant moisture. Yampa totalled 1.20 inches of rain on the 27th and 28th. Precipitation was spotty east of the mountains, but some heavy storms were noted. Aguilar, south of Walsenburg received 2.10 inches of rain on the evening of the 25th. A late-night storm on the 29th and 30th dumped 3.39 inches of rain on Holly.

Temperatures for the month of June and departures from average are shown in Figure 1. The entire state experienced warmer than average conditions with most areas ending up 2 to 5 degrees warmer than usual. This is the 11th month out of the past 13 that most of the state has been warmer than average. This is especially significant since evapotranspiration rates are directly related to temperature. Prolonged warmer than normal temperatures mean that both soil moisture and surface water

resources are needed and, if available, are used at a faster than normal pace. Thus, our reservoirs may be drawn down more rapidly than normal. As reservoir levels drop, the state becomes increasingly vulnerable to severe water shortages if winter drought in the mountains occurs again next winter.

June precipitation was extremely variable across the state (Figure 2 and 3). Exceptionally heavy rainfall amounts were associated with some of the thunderstorms, but these storms were not widespread. Monthly totals ranged from 0.07 inches at Kit Carson to 4.16 at Holly. On the Western Slope, Grand Junction and Palisade, 10 miles apart, received 33 and 361 percent of their June average, respectively. Generally, the majority of the state was drier than average, particularly areas east of the mountains which usually receive significant June rainfall. The San Juan Mountains, the San Luis Valley, and parts of northwest Colorado were wetter than usual, but rainfall totals were almost all less than 2 inches.

Precipitation as a percent of average for the first 9 months of the 1981 water year is shown in Figure 4. Areas of northeast and east-central Colorado continue wetter than average. Scattered areas west of the mountains, such as Craig, remain wetter than usual. Most of the mountains, however, have only received 60 to 80 percent of average. The driest area, compared to average, continues to be the Arkansas Valley from Salida to Lamar where less than half of the average precipitation has fallen.

Figure 1. Temperatures for June 1981 in degrees Fahrenheit (in parentheses) and departures from the 1951-1970 average.

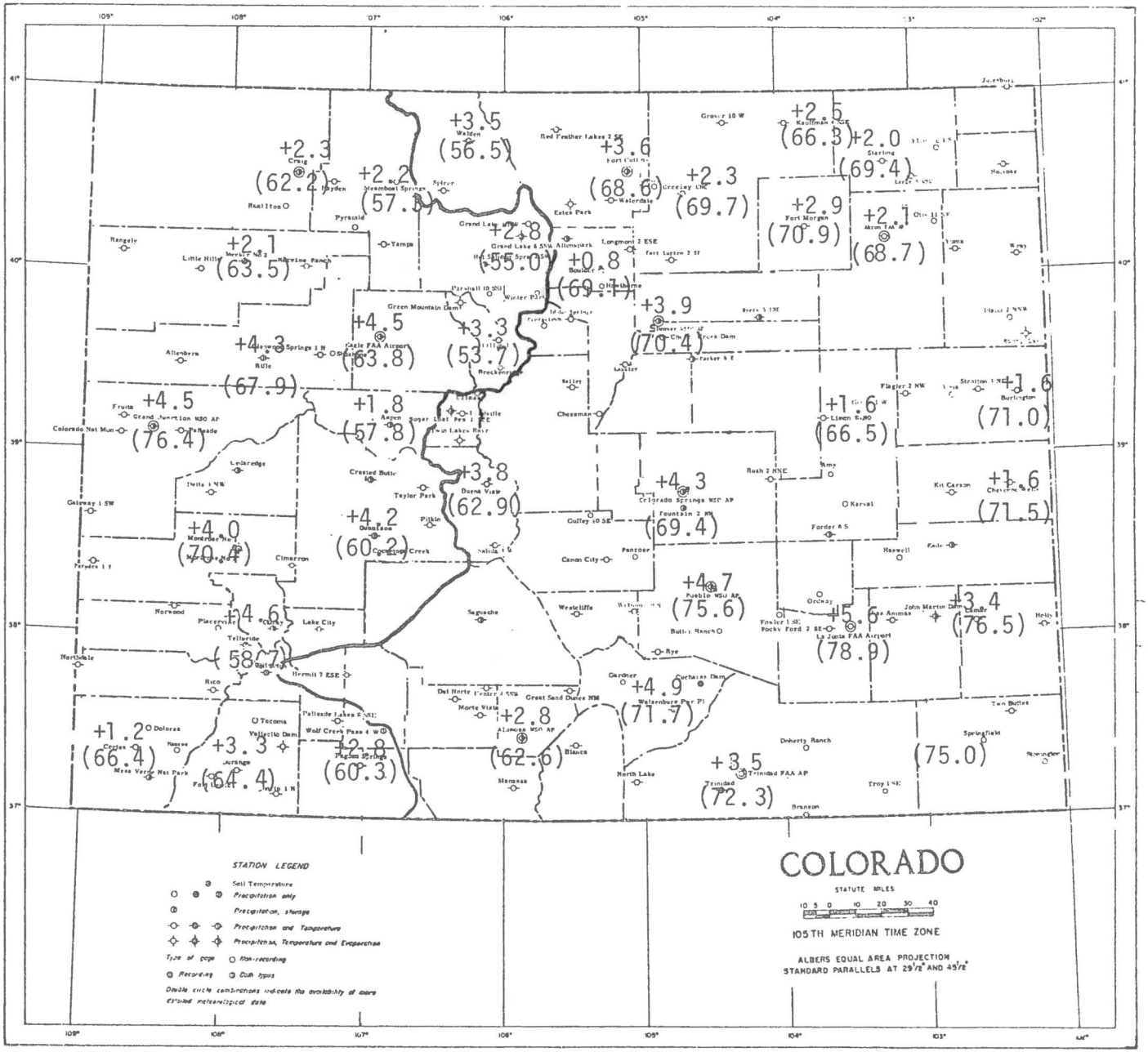

Figure 2. June 1981 precipitation amounts (inches).

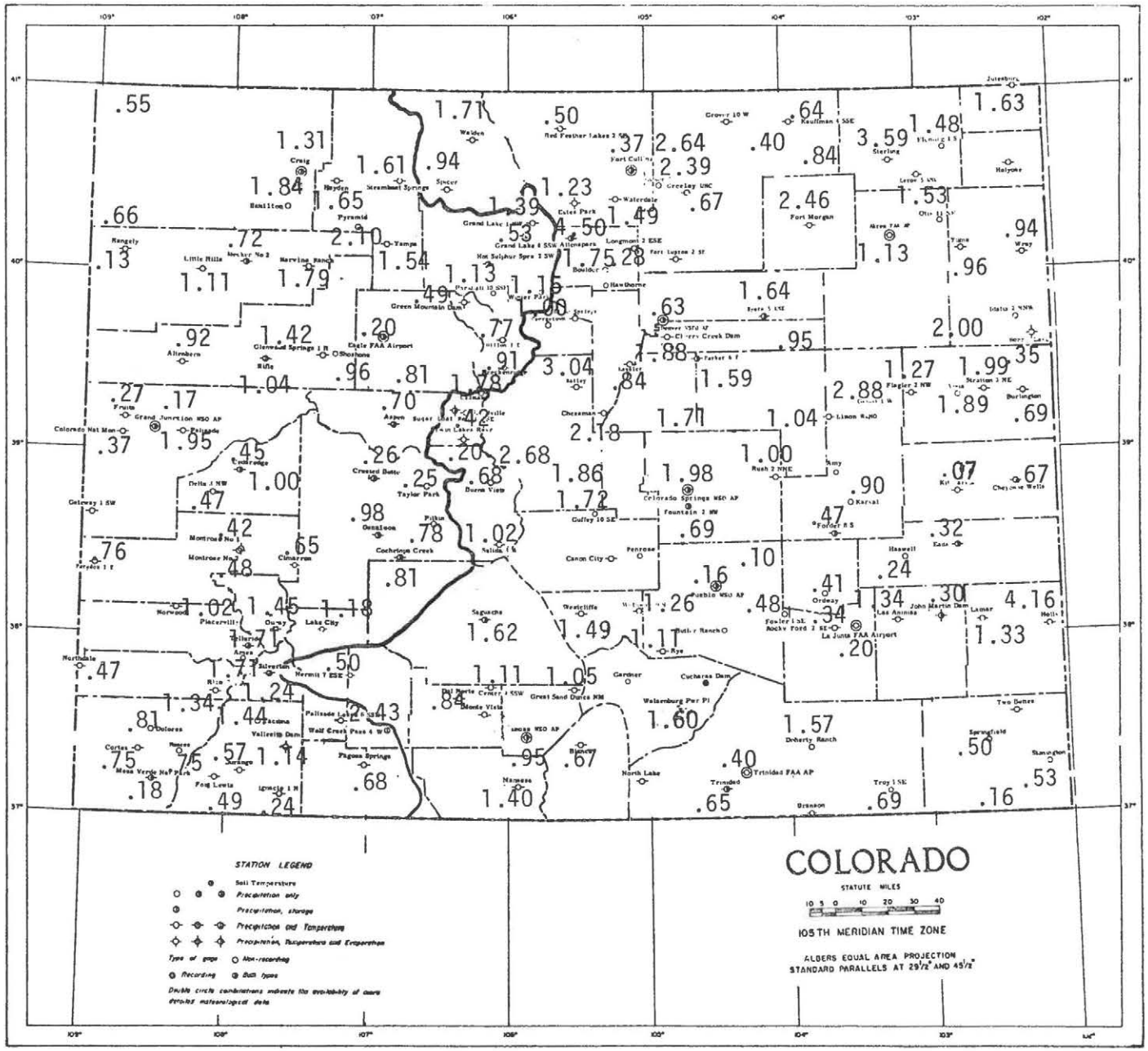

Figure 3. Precipitation for June 1981 as a percent of the 1951-1970 average.

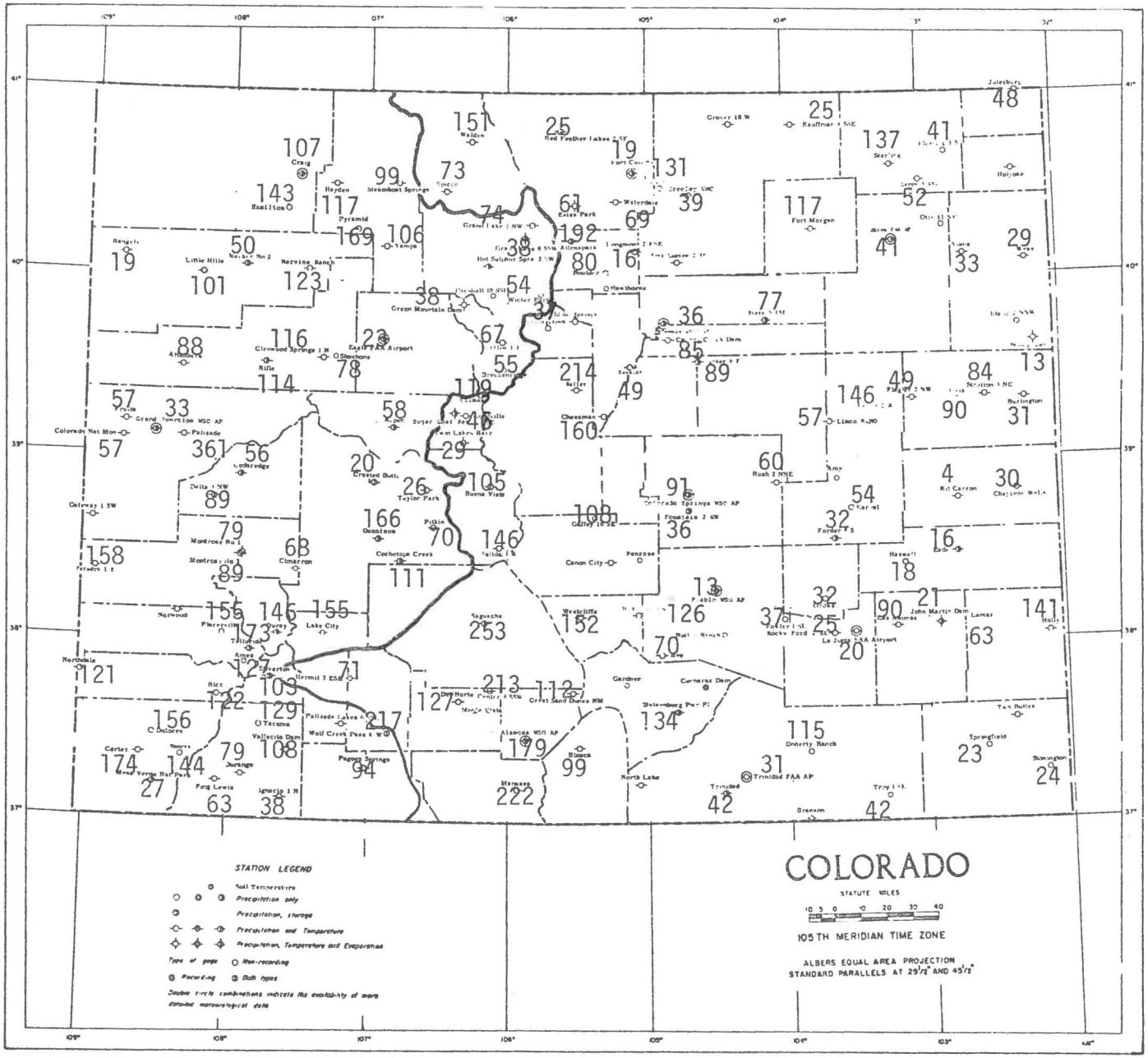

Figure 4. Precipitation for October 1980 through June 1981 as a percent of the 1951-1970 average.

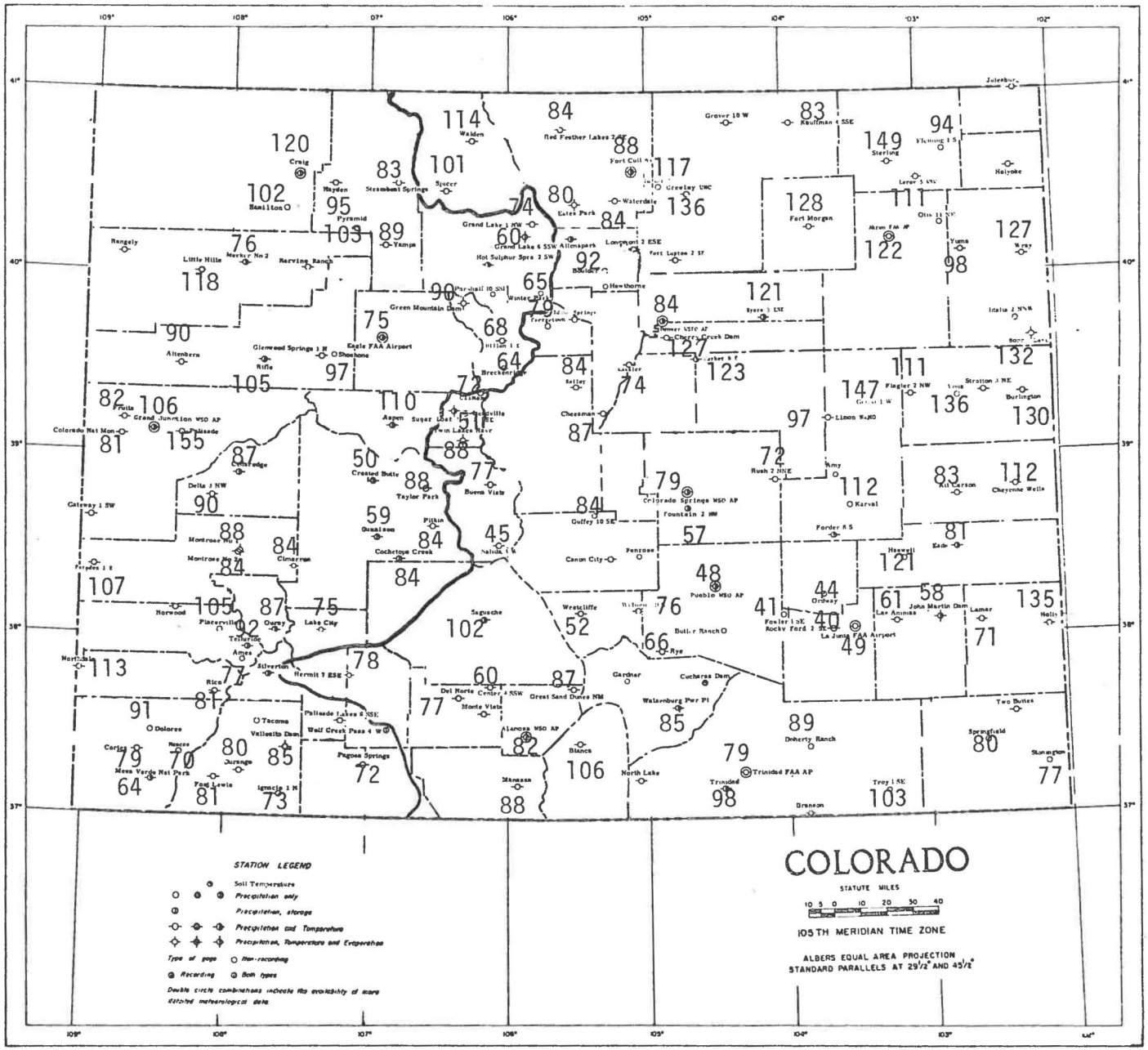

Table 1. Colorado heating degree day data through June 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1979-80	0	26	70	379	1011	1118	1344	1082	918	539	280	14	6781
	1980-81	0	4	57	457	762	845	964	872	749	304	273	23	5310
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1979-80	137	203	343	652	1306	1648	1404	1382	1320	897	577	247	10116
	1980-81	106	191	358	738	1037	1159	1331	1117	994	640	509	158	8338
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1979-80	0	3	26	254	820	933	1241	850	774	438	205	7	5541
	1980-81	0	0	28	349	735	823	910	766	604	171	166	3	4555
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1979-80	3	55	116	464	1072	1054	1353	997	1021	683	404	58	7280
	1980-81	0	12	139	542	831	859	1014	927	917	403	400	60	6104
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1979-80	0	36	70	361	1054	1066	1312	1080	923	574	301	15	6792
	1980-81	0	4	77	455	744	806	952	902	767	317	277	21	5333
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1979-80	6	69	137	496	1138	1276	1182	994	987	663	444	106	7498
	1980-81	5	60	211	589	861	912	1044	958	901	573	427	86	6627
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1979-80	3	27	42	334	979	1136	1065	826	821	536	303	15	6087
	1980-81	0	17	82	467	779	862	948	851	755	327	247	45	5380
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1979-80	77	111	243	541	1136	1192	1186	1077	1080	735	518	203	8099
	1980-81	24	109	294	654	932	1029	1088	971	932	588	489	163	7273
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1979-80	0	8	45	299	870	959	1135	797	751	492	214	6	5576
	1980-81	0	0	46	383	717	731	871	697	584	175	119	3	4326
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	6795
	1979-80				420	1040	1222	1106	912	834	553	325	49	
	1980-81		27	139	521	836	910	1052	910	771	416	302	49	5933
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1979-80	39	106	197	508	1107	1065	1145	917	954	760	435	65	7298
	1980-81	0	39	200	581	838	780	1067	837	892	457	421		
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1979-80	131	189	316	685	1248	1520	1411	1209	1196	859	529	266	9559
	1980-81	61	165	343	743	1004	1101	1159	1152	983	625	546	227	8109
Sterling	average	0	5	158	459	849	1150	1249	986	927	522	256	76	6638
	1979-80	0	41	91	398	1053	1163	1375	1020	968	554	240	18	6921
	1980-81	0	5	106	529	814	931	1038	963	835	359	391	33	6004
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1979-80	121	217	273	589	1187	1142	1214	1061	1192	858	626	198	8678
	1980-81	78	162	301	662	925	1003	1132	1038	1098	621	576	187	7783
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1979-80	0	21	63	299	873	871	1041	792	765	551	260	15	5551
	1980-81	0	0	57	394	679	689	860	720	712	240	212	14	4615
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1979-80	188	260	407	757	1393	1340	1413	1247	1274	985	651	317	10232
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727	663	248	9089
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1979-80	0	26	82	336	929	880	1020	732	774	547	287	6	5619
	1980-81	0	0	52	391	678	628	818	745	746	298	220	16	4592

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1979-80	57	127	267	590	1312	1438	1363	1029	1071	798	504	107	8663
	1980-81	5	102	263	757	1031	1136	1274	1097	979	576	458	102	7780
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1979-80	49	141	243	569	1211								
	1980-81	59	159	305	705	1004	1005	1164	1094	1066	656	574	208	7999
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1979-80	2	44	85	279	890	802	1094	820	803	513	287	8	5627
	1980-81		1	61	384	630	644	800	714	702	252	306	27	4521
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1979-80	0	21	49	340	928	864	1257	866	910	547	242	7	6028
	1980-81	0	0	49	356	763	866	907	804	734	256	265	18	5018
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1979-80	0	13	50	223	804	762	1051	703	684	475	246	10	5021
	1980-81	0	0	50	313	603	590	679	651	652	228	203	2	3971
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1979-80	6	41	88	407	1005	969	1180	883	901	615	351	32	6478
	1980-81	0	7	113	463	759	776	928	850	789	335	321	38	5379
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1979-80	10	50	77	391	1014	1118	1095	912	922	606	407	61	6663
	1980-81	2	29	131	514	780	882	986	901	849	465	326	68	5933
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1979-80	8	82	129	552	1199	1364	1326	1144	1078	730	446	111	8169
	1980-81	7	68	228	626	914	1034	1091	1076	919	545	460	110	7078
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1979-80	0	22	44	333	956	1164	1005	781	762	458	228	11	5764
	1980-81	0	1	48	456	761	820	934	825	686	256	177	26	4991
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1979-80	0	20	58	347	941	939	1204	876	828	514	247	9	5983
	1980-81	0	4	56	386	683	731	853	801	727	260	243	26	4770
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1979-80	250	325	441	766	1394	1467	1470	1300	1335	1065	729	392	10934
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	819	713	331	9748
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1979-80	16	63		402	1022	1078	1134	968	981	633	452	66	
	1980-81	3	39	150	516	815	910	968	842	891	478	409	81	6102
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1979-80	32	101	211	566	1206	1476	1221	1071	999	724	437	132	8176
	1980-81	8	89	230	674	957	1014	1165	1008	916	541	412	84	7108
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1979-80	1	33	86	375	1013	1030	1273	1011	911	555	324	22	6634
	1980-81	0	14	88	486	764	810	980	848	760	318	314	39	5421
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1979-80	0	19	63	322	1011	1211	1388	1084	913	563	266	10	6845
	1980-81	0	8	74	455	773	894	993	912	813	291	259	15	5487
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5605
	1979-80	0	3	0	209	945	1175	999	741	740	405	195	4	5416
	1980-81	0	2	21	359	674	765	864	754	645	247	153	15	4499

COLORADO CLIMATE -- JULY 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Showers and thunderstorms, some of them quite heavy, occurred somewhere in Colorado almost every day of July. Many locations across the state received some precipitation on at least half the days of the month. Placerville, in southwestern Colorado, recorded a trace or more of precipitation on each of the first 25 days of July. Warm summer temperatures accompanied the showery weather.

The first four days of the month were warm and unusually humid across the state. Some heavy storms developed, especially in southern Colorado. In the vicinity of Trinidad, a very heavy thunderstorm on the 3rd produced severe flooding which caused a train wreck. The Trinidad airport measured 4.67 inches of rain from that storm.

On the 5th and 6th weather conditions were hot and considerably drier. Many mountain areas recorded their warmest temperature readings for the month. Examples included 69° F at Berthoud Pass, 81° F at Dillon and 91° F at Pagosa Springs on the afternoon of the 6th.

Following more shower activity on the 7th, a brief change to cooler temperatures occurred on the 8th as a Pacific cold front swept across the state. But warming temperatures statewide and an increase in humidity west of the mountains began promptly as a large low pressure system aloft developed over the West Coast on the 9th.

A flow of moist air from the southwest into Colorado produced more than a week of heavy rains in the central and southern mountains of the state from the 9th through the 18th. Rico totalled 6.12 inches of rain during that 10-day period, one or more days with precipitation amounts in excess of an inch were common as far east as Dillon and Berthoud Pass. Mud slides and flash flooding were reported on several days in the San Juan Mountains. At the same time, areas east of the mountains were very warm from the 10th to the 13th, and there were only a few scattered storms. The hottest day of the month in northeast Colorado occurred on the 11th. Sterling, for example, reached 102° F and Julesburg soared to 108° F.

From the 16th to the 19th thunderstorm activity occurred over most of the state with more local heavy rains. Nearly 4 inches of rain fell on the 17th east of Akron. Stonington, in southeast Colorado, measured 2.69 inches that same day.

Hot summer weather with just a few widely scattered showers took place from the 20th to the 23rd. Several new records were set for hot temperatures on the 21st. Greeley and Denver hit the 100° F mark, Pueblo reached 106° F, and Las Animas sizzled with 112° F.

Much cooler temperatures and considerable precipitation affected Colorado from the 24th through the 27th. An easterly "upslope" flow of moist, cool air on the 26th kept temperatures below 70° F from parts of the Front Range eastward across the northeast plains. Rainfall amounts were moderate to heavy on both sides of the mountains. Steamboat Springs received an inch of rain on the 25th and 26th, and Redstone got 1.22 inches. The heaviest rains, however, fell east of the mountains. The Trinidad city weather station measured 2.06 inches on the 26th. Sterling recorded more than 3.50 inches on the 24th and 25th. Some of the storms in northeast Colorado produced large hail and high winds.

July ended with very normal summer weather--seasonably warm with just a few scattered and fairly light thundershowers.

Precipitation amounts and percents of average for July are shown in Figures 1 and 2, respectively. Much of the state was wetter than average with several locations receiving more than 200 percent of average. Most mountain areas were considerably wetter than usual. Dillon's 3.20 inch total was 186 percent of average. Parts of the San Juan Mountains were especially wet. Ouray totalled 4.95 inches in July, and Rico's 7.81 inch total was 273 percent of average. Many areas east of the mountains were also quite wet. Trinidad airport accumulated 6.69 inches of rain in July (347 percent of average), and the wettest station in Colorado was Stonington with 8.69 inches. Not all of Colorado got drenched, however. An area of eastern Colorado from Denver eastward to Limon and Stratton received only about half the July average. Much of the immediate Arkansas valley from Pueblo to Lamar was also dry. The driest weather station in the state was Brown's Park wildlife refuge in extreme northwest Colorado where only 0.15 inches of rain fell.

Temperatures for the month of July and departures from average are shown in Figure 3. Most of the state was warmer than average once again for the 12th month out of the past 14. Temperatures in the western half of the state ranged from 0.5 degrees cooler than average at Buena Vista to 2.3 degrees above average at Rifle. East of the mountains the range was from 2.8 degrees warmer than usual at La Junta to 0.8 degrees cooler than normal at Burlington. (The Boulder data looked suspect).

Precipitation as a percent of average for October 1980 through July 1981 is shown in Figure 4. After a very dry start to the 1981 water year, spring and summer precipitation has been adequate. As a result, much of the state is now close to average, including many mountain areas. The only area remaining consistently below average is the Arkansas valley from the mountains eastward to Lamar. Good summer precipitation has reduced the possible effects of last winter's drought. However, reservoirs are being drawn down at an above average rate. As always, we must hope for sufficient winter precipitation in the season to come in order to assure adequate water supplies for the state.

Note: Table 1 contains heating degree day information for the new 1981-82 heating season (July-June). Narrative descriptions of heating degree day information will begin in October, but the data tabulation will be published every month.

Figure 1. July 1981 precipitation amounts (inches).

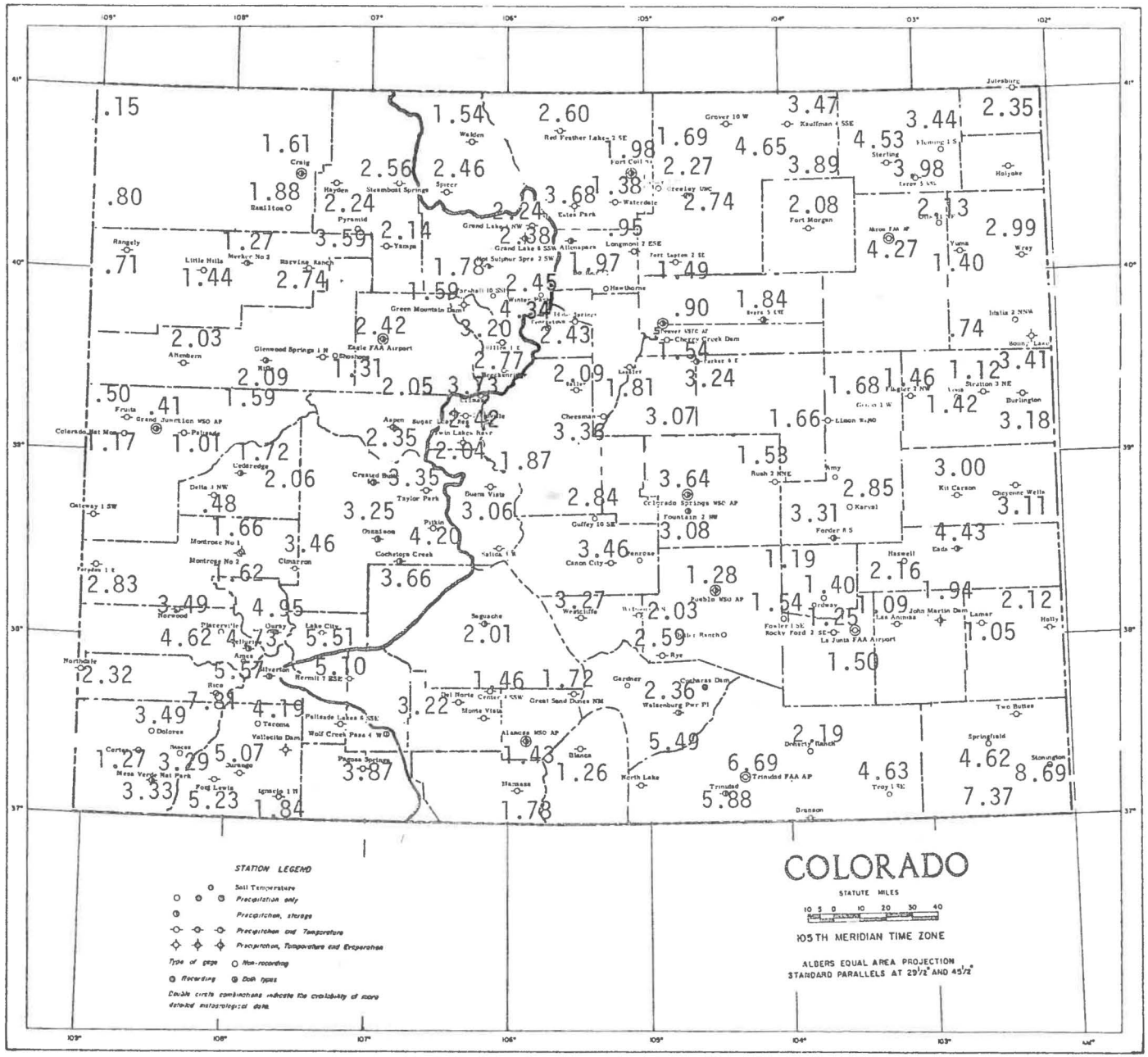

Figure 2. Precipitation for July 1981 as a percent of the 1951-1970 average.

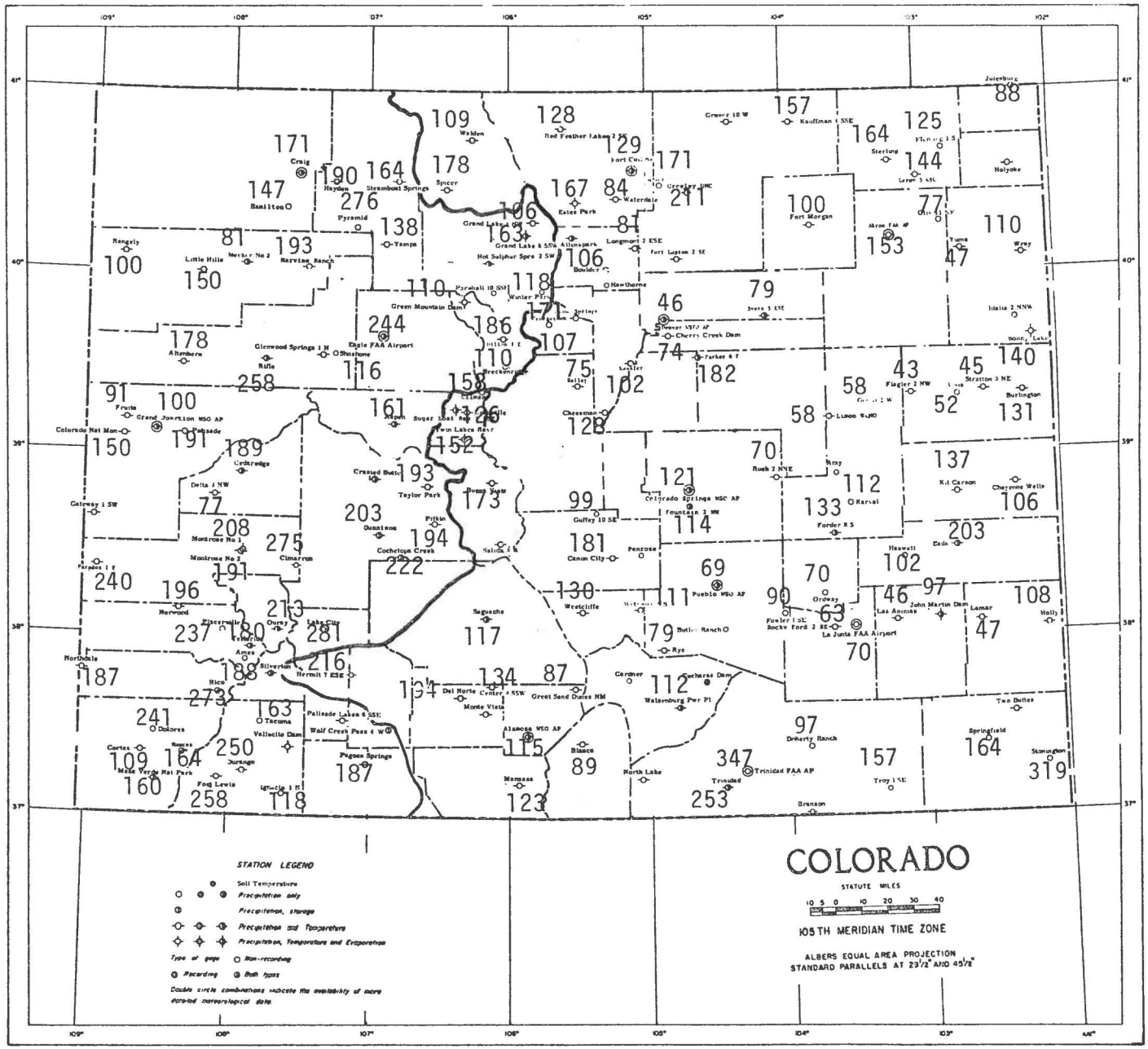

Figure 3. Temperatures for July 1981 in degrees Fahrenheit (in parentheses) and departures from the 1951-1970 average.

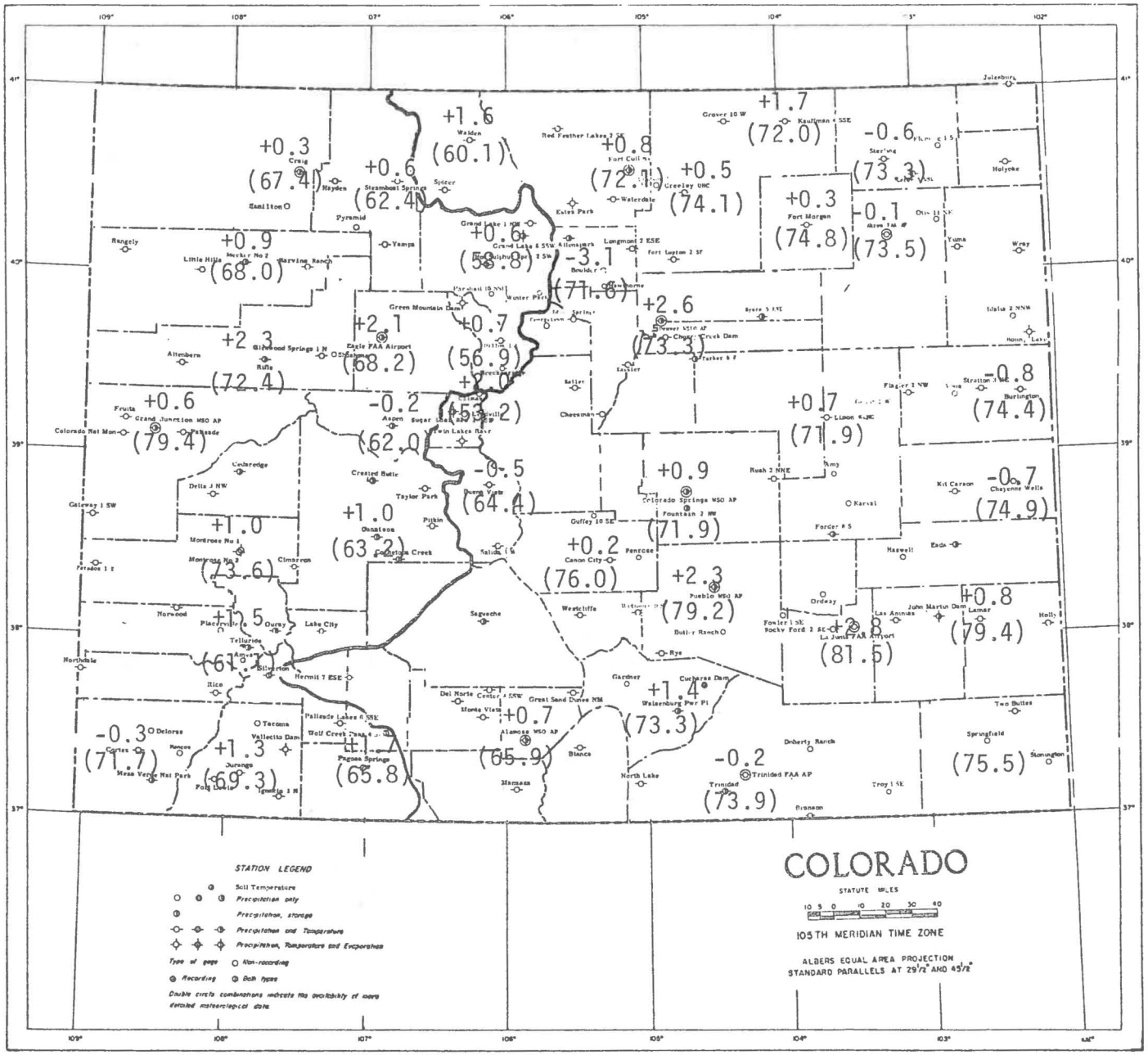

Figure 4. Precipitation for October 1980 through July 1981 as a percent of the 1951-1970 average.

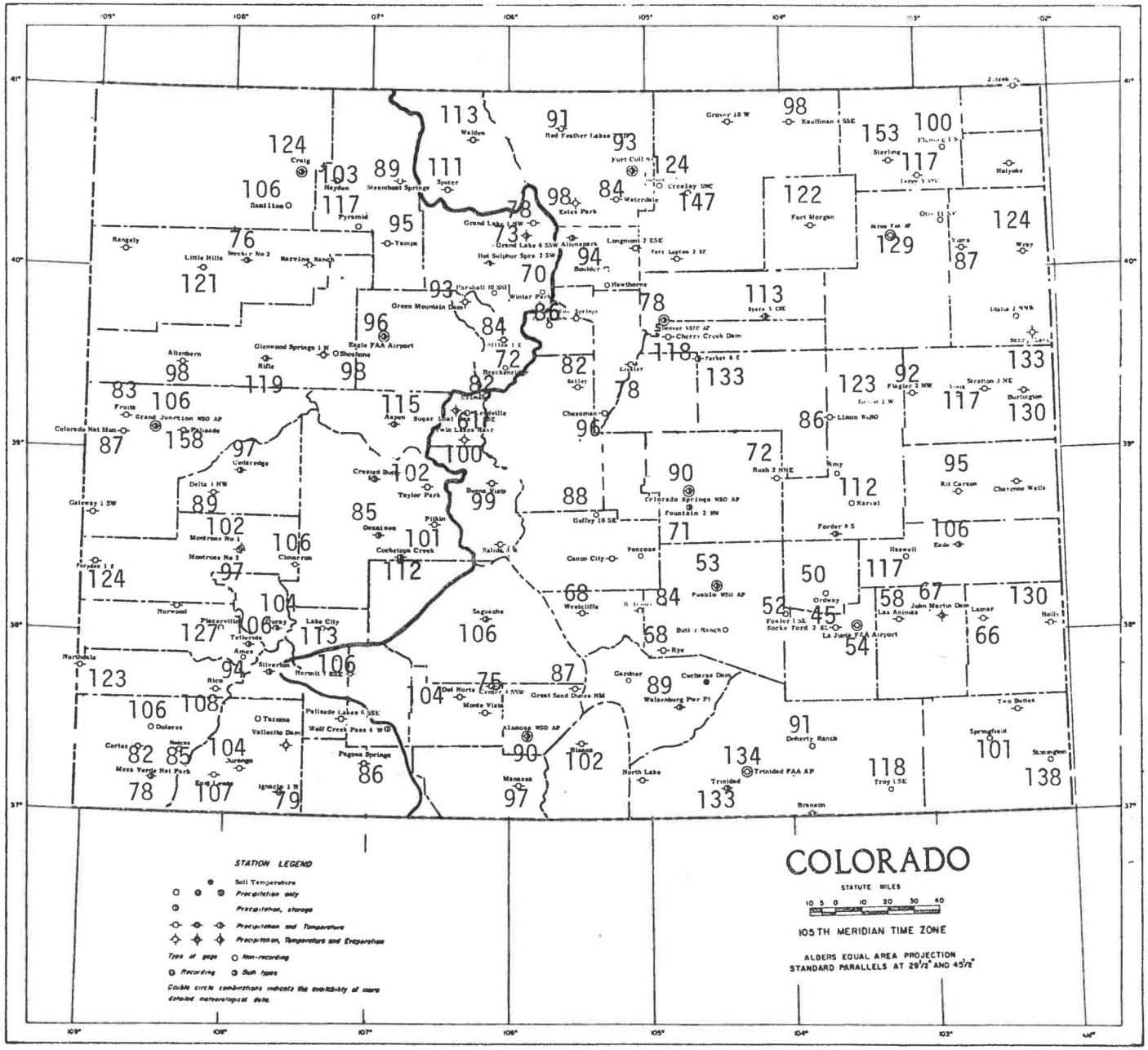

Table 1. Colorado heating degree day data through July 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1980-81	5	102	263	757	1031	1136	1274	1097	979	576	458	102	7780
	1981-82	14												
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1980-81	59	159	305	705	1004	1005	1164	1094	1066	656	574	208	7999
	1981-82	98												
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1980-81		1	61	384	630	644	800	714	702	252	306	27	4521
	1981-82	4												
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1980-81	0	0	49	356	763	866	907	804	734	256	265	18	5018
	1981-82	10												
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1980-81	0	0	50	313	603	590	679	651	652	228	203	2	3971
	1981-82	2												
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1980-81	0	7	113	463	759	776	928	850	789	335	321	38	5379
	1981-82	5												
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1980-81	2	29	131	514	780	882	986	901	849	465	326	68	5933
	1981-82	2												
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1980-81	7	68	228	626	914	1034	1091	1076	919	545	460	110	7078
	1981-82	19												
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1980-81	0	1	48	456	761	820	934	826	686	256	177	26	4991
	1981-82	0												
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1980-81	0	4	56	386	683	731	853	801	727	260	243	26	4770
	1981-82	0												
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	819	713	331	9748
	1981-82	243												
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1980-81	3	39	150	516	815	910	968	842	891	478	409	81	6102
	1981-82	9												
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1980-81	8	89	230	674	967	1014	1165	1008	916	541	412	84	7108
	1981-82	6												
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1980-81	1	14	88	486	764	810	980	848	760	318	314	39	5421
	1981-82	8												
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1980-81	0	8	74	455	773	894	993	912	813	291	259	15	5487
	1981-82	3												
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5606
	1980-81	0	2	21	359	674	765	864	754	645	247	153	15	4499
	1981-82	0												

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1980-81	0	4	57	457	762	845	964	872	749	304	273	23	5310
	1981-82	5												
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1980-81	106	191	358	738	1037	1159	1331	1117	994	640	509	158	8338
	1981-82	63												
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1980-81	0	0	28	349	735	823	910	766	604	171	166	3	4555
	1981-82	0												
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1980-81	0	12	139	542	831	859	1014	927	917	403	400	60	6104
	1981-82	6												
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1980-81	0	4	77	455	744	806	952	902	767	317	277	21	5333
	1981-82	5												
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1980-81	5	60	211	589	861	912	1044	958	901	573	427	86	6627
	1981-82	8												
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1980-81	0	17	82	467	779	862	948	851	755	327	247	45	5380
	1981-82	0												
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1980-81	24	109	294	654	932	1029	1088	971	932	588	489	163	7273
	1981-82	19												
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1980-81	0	0	46	383	717	731	871	697	584	175	119	3	4326
	1981-82	0												
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	5394
	1980-81		27	139	521	836	910	1052	910	771	416	302	49	5933
	1981-82	0												
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1980-81	0	39	200	581	838	780	1067	837	892	457	421		
	1981-82													
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1980-81	61	165	343	743	1004	1101	1159	1152	983	625	546	227	8109
	1981-82	83												
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1980-81	0	5	106	529	814	931	1038	963	835	359	391	33	6004
	1981-82	8												
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1980-81	78	162	301	662	925	1003	1132	1038	1098	621	576	187	7783
	1981-82	117												
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1980-81	0	0	57	394	679	689	860	720	712	240	212	14	4615
	1981-82	0												
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727	663	248	9089
	1981-82	143												
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1980-81	0	0	52	391	678	628	818	745	746	298	220	16	4592
	1981-82	0												

COLORADO CLIMATE -- AUGUST 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Extremely heavy rains fell on portions of southeastern and south central Colorado in mid-August causing local flooding. Otherwise August was a typical summer month across most of the state. Temperatures remained near average with few extremes of hot or cold. Cloudiness and humidity were greater than usual east of the mountains, but most of the state received close to average precipitation.

The first week of August was warm and mostly dry across the state. A few scattered showers and thunderstorms were noted, particularly in and near the mountains. The Colorado Springs area was surprised by an isolated severe storm which dropped heavy rains and hail late on the 5th. Most areas of the state recorded their warmest temperature for the month on the 4th, 5th, or 6th. Denver's 98° F on the 4th tied the previous record for that day. LaJunta reached 103° F on the 4th, the warmest temperature in the state. Palisade, near Grand Junction, was a close second with 102° F on both the 5th and 6th.

By the 7th, temperatures began to cool as a large cool air mass moved down from Canada and settled over the northern states. A cool but moist upslope flow developed east of the mountains. At the same time, a weak low pressure area aloft developed over southwestern Colorado. As a result, thunderstorms rumbled across the state from the 7th to the 13th, and most areas received significant precipitation. Heavy clouds, cool temperatures and some thick fog persisted--more typical of May than August. Heaviest rainfall amounts were noted along the southern Front Range. From the 7th through the 12th Trinidad totalled 7.10 inches, of which 4.20 inches fell in a 24-hour period ending at 5 p.m. on the 11th. Other nearby areas received almost as much, and considerable flooding occurred throughout that region.

Warmer temperatures and drier air moved in east of the mountains on the 13th, but showers and chilly weather continued in the mountains. For example, at Berthoud Pass from the 9th to the 17th some rain fell every day, and the temperature never surpassed a chilly 54° F. The Western

Slope was warm and dry, but more heavy storms developed over and east of the mountains on the 16th. Several locations including Denver, Fort Collins, and Estes Park received hail that day. The Trinidad area received another inch of rain, while farther east, Cheyenne Wells totalled 4.60 inches on the 16th and 17th.

From the 18th to the 20th, the entire state enjoyed mild and dry weather. But from the 21st on to the end of the month shower activity increased again, especially close to the mountains. Precipitation totals were mostly quite light except in parts of southwestern Colorado. Temperatures were variable throughout the period but stayed close to the seasonal average.

Precipitation amounts and percents of average for August are shown in Figures 1 and 2, respectively. Monthly totals were extremely variable ranging from only 0.19 inches at Craig to more than 8 inches at Trinidad and Westcliffe. Rye, southwest of Pueblo, received 9.23 inches of rain, the greatest monthly total observed anywhere in the state this year and 1.44 inches more than their previous August record. Statewide, above average precipitation occurred in the Gunnison valley, in parts of the San Juans, across much of the San Luis Valley, along parts of the northern Front Range, and in much of the Arkansas drainage (where totals were as much as 380 percent of average). Drier than average conditions were noted in parts of northeast and east central Colorado, in the extreme southwest, and across the entire northwest quarter of the state.

Temperatures for the month (Figure 3) were close to the seasonal averages across the state. Except for Denver which was slightly warmer than average in August, most areas east of the Continental Divide were a bit cooler than usual. Sterling, for example, ended up 2.7 degrees cooler than average. West of the Divide temperatures were very typical for August ranging from 1 degree below average at Cortez to 1.7 degrees above average at Grand Junction.

With only one month remaining in the 1981 water year, accumulated precipitation totals are surprisingly close to average across much of the state. The western half of Colorado has received near average precipitation since October 1980 except for the mountains from Crested Butte northward to Berthoud Pass and Steamboat Springs. Their totals are still only about 80 percent of average.

Most areas east of the mountains are now near or somewhat above average for the past 11 months with the help of August's heavy rains in the southeast. The exception is still the immediate Arkansas Valley from Pueblo to Lamar where totals are only about 65 percent of average. The greatest change in recent months has occurred at Trinidad. The Trinidad city weather station has received 14.42 inches of rain since July 1 which shattered previous monthly records for both July and August. In just 2 months they received an inch more than their entire annual average.

Note: Table 1 contains heating degree day information for the 1981-82 heating season. This tabulation will be published each month although narrative descriptions will not begin until October.

Figure 1. August 1981 precipitation amounts (inches).

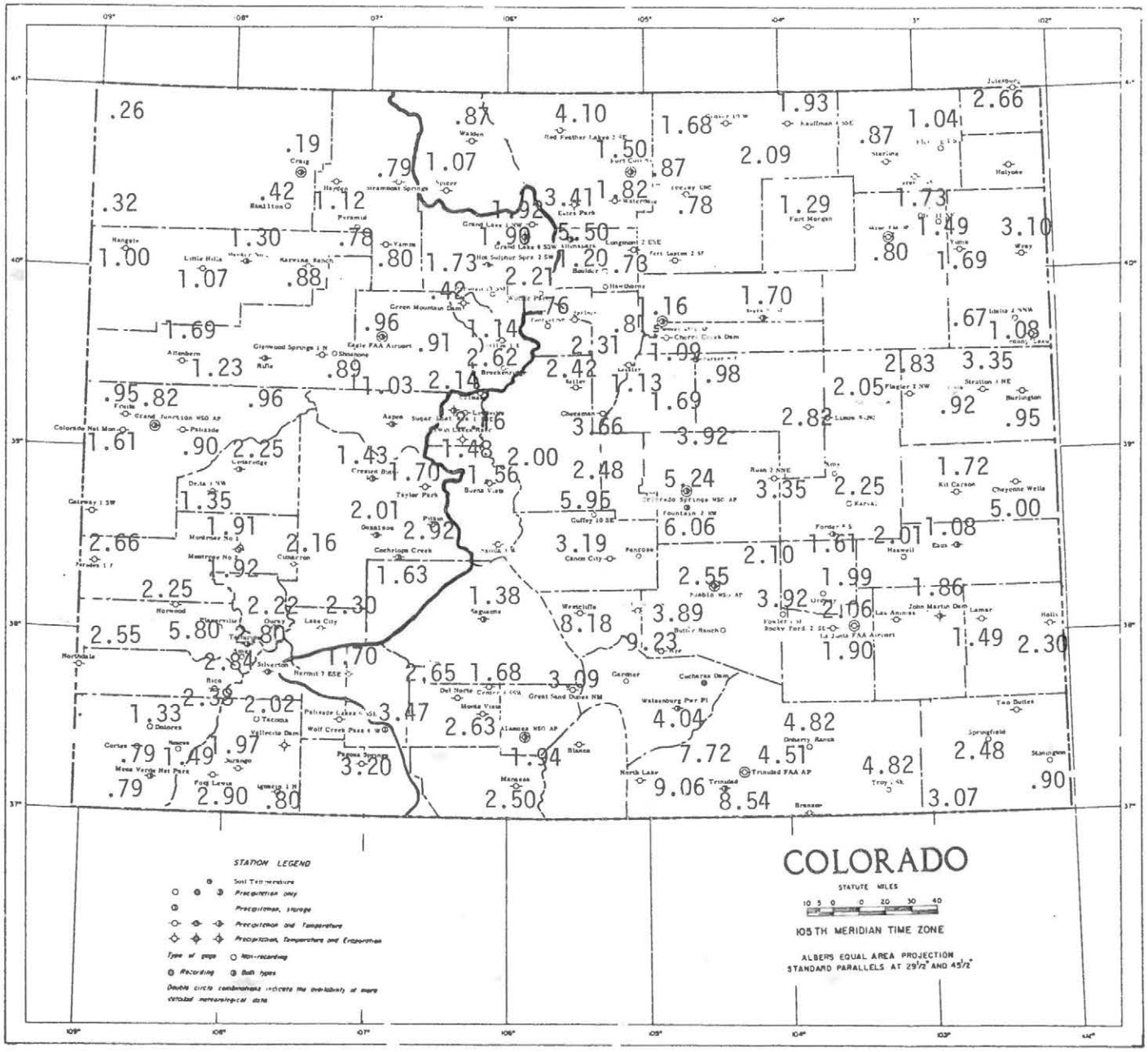

Figure 2. Precipitation for August 1981 as a percent of the 1951-1970 average.

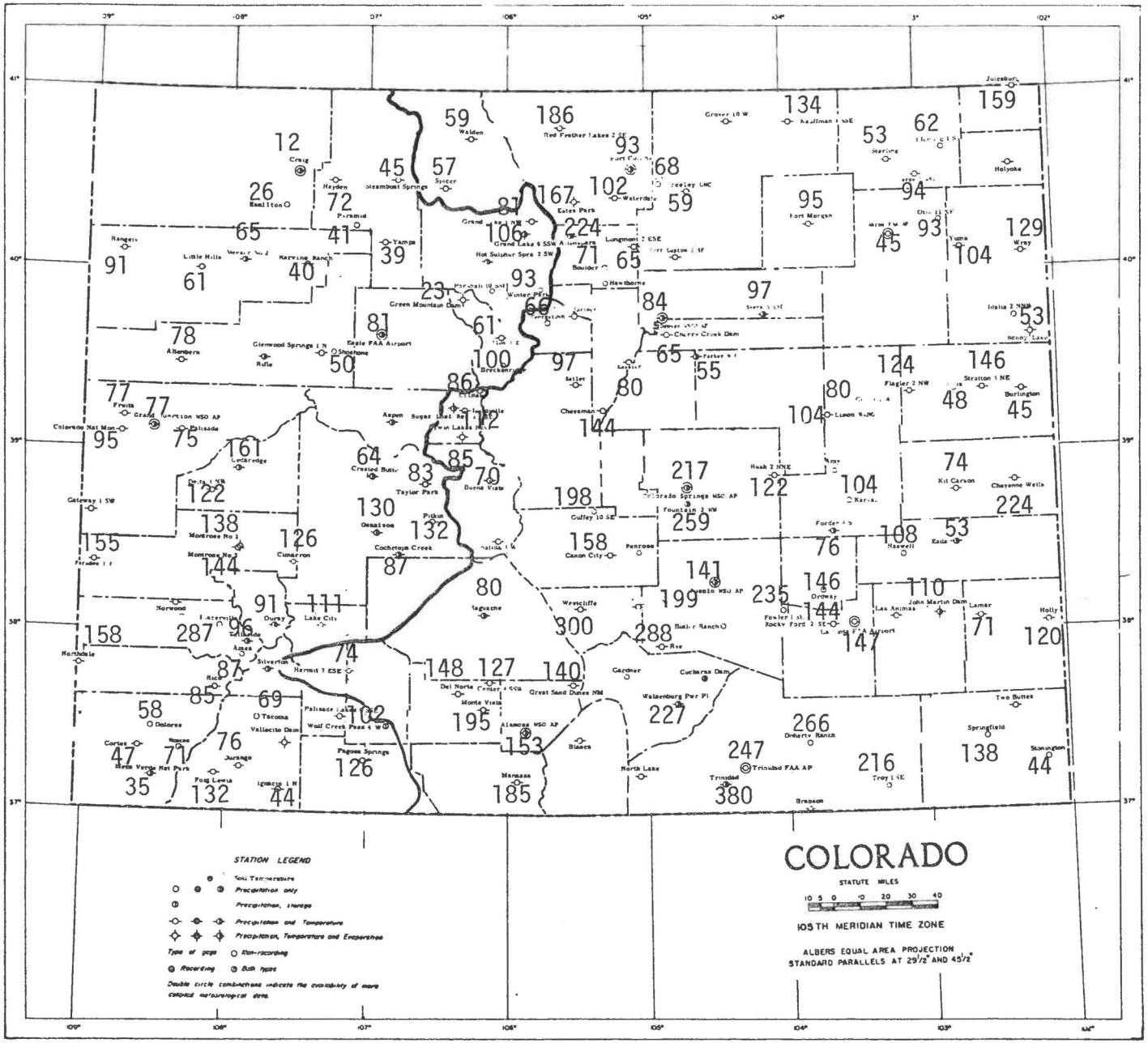

Figure 3. Temperatures for August 1981 in degrees Fahrenheit (in parentheses) and departures from the 1951-1970 average.

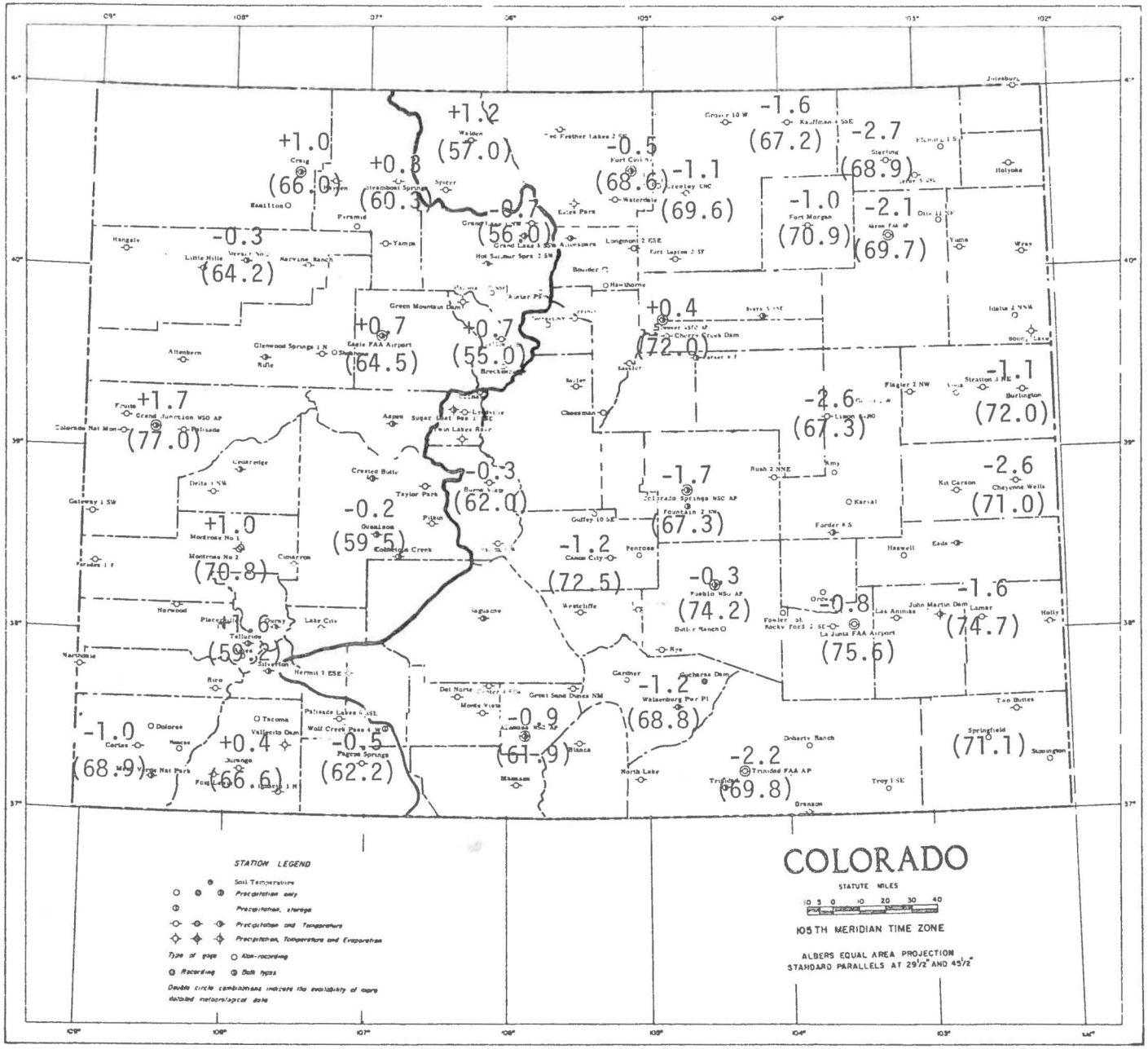

Figure 4. Precipitation for October 1980 through August 1981 as a percent of the 1951-1970 average.

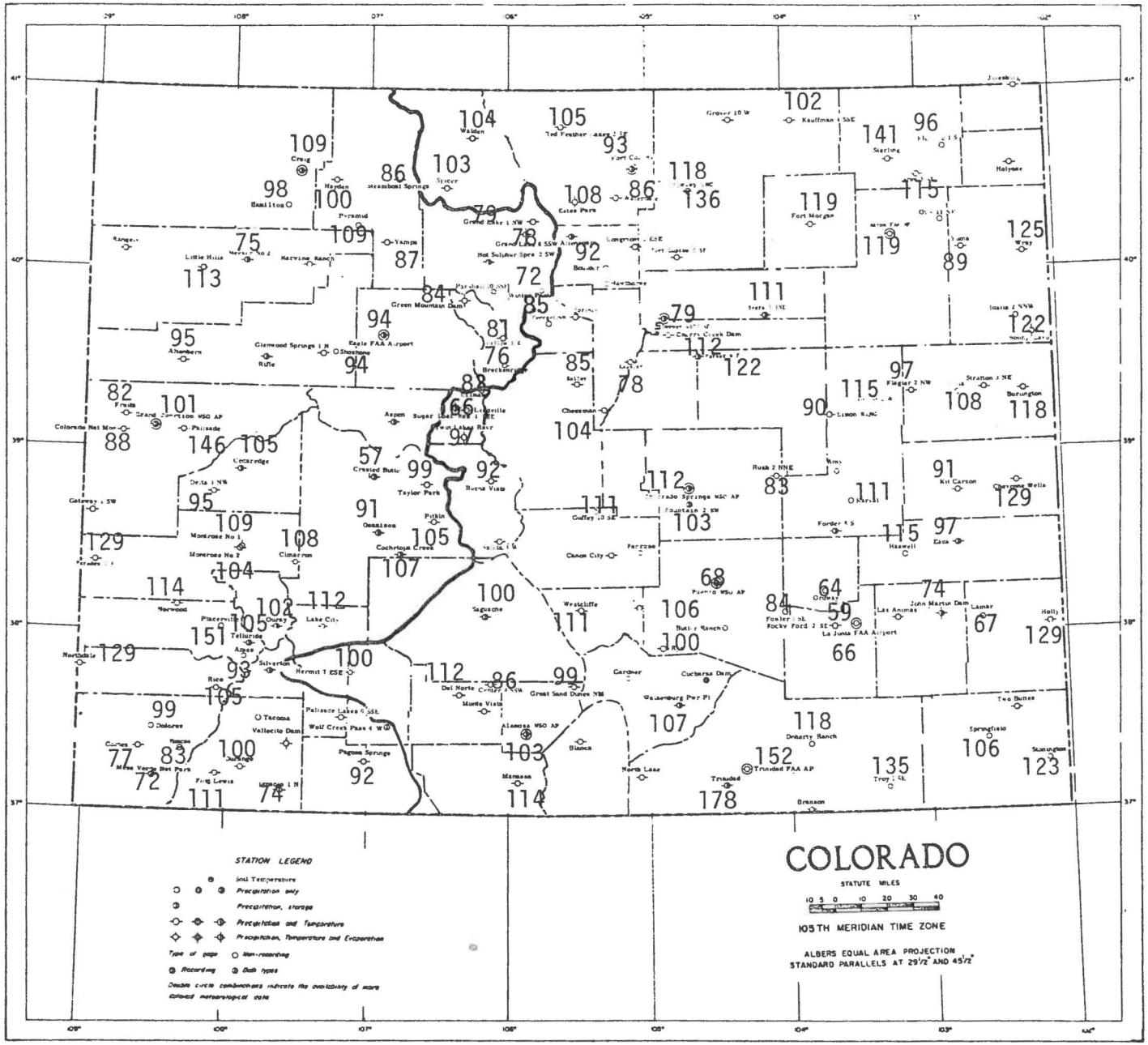

Table 1. Colorado heating degree day data through August 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1980-81	5	102	263	757	1031	1136	1274	1097	979	576	458	102	7780
	1981-82	14	108											
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1980-81	59	159	305	705	1004	1005	1164	1094	1066	656	574	208	7999
	1981-82	98												
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1980-81		1	61	384	630	644	800	714	702	252	306	27	4521
	1981-82	4	14											
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1980-81	0	0	49	356	763	866	907	804	734	256	265	18	5018
	1981-82	10	7											
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1980-81	0	0	50	313	603	590	679	651	652	228	203	2	3971
	1981-82	2	9											
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1980-81	0	7	113	463	759	776	928	850	789	335	321	38	5379
	1981-82	5	30											
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1980-81	2	29	131	514	780	882	986	901	849	465	326	68	5933
	1981-82	2	7											
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1980-81	7	68	228	626	914	1034	1091	1076	919	545	460	110	7078
	1981-82	19	35											
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1980-81	0	1	48	456	761	820	934	826	686	256	177	26	4991
	1981-82	0	1											
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1980-81	0	4	56	386	683	731	853	801	727	260	243	26	4770
	1981-82	0	12											
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	819	713	331	9748
	1981-82	243	302											
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1980-81	3	39	150	516	815	910	968	842	891	478	409	81	6102
	1981-82	9	22											
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1980-81	8	89	230	674	967	1014	1165	1008	916	541	412	84	7108
	1981-82	6	54											
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1980-81	1	14	88	486	764	810	980	848	760	318	314	39	5421
	1981-82	8	8											
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1980-81	0	8	74	455	773	894	993	912	813	291	259	15	5487
	1981-82	3	11											
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5606
	1980-81	0	2	21	359	674	765	864	754	645	247	153	15	4499
	1981-82	0	0											

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1980-81	0	4	57	457	762	845	964	872	749	304	273	23	5310
	1981-82	5	9											
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1980-81	106	191	358	738	1037	1159	1331	1117	994	640	509	158	8338
	1981-82	63	165											
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1980-81	0	0	28	349	735	823	910	766	604	171	166	3	4555
	1981-82	0	0											
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1980-81	0	12	139	542	831	859	1014	927	917	403	400	60	6104
	1981-82	6	26											
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1980-81	0	4	77	455	744	806	952	902	767	317	277	21	5333
	1981-82	5	12											
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1980-81	5	60	211	589	861	912	1044	958	901	573	427	86	6627
	1981-82	8	72											
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1980-81	0	17	82	467	779	862	948	851	755	327	247	45	5380
	1981-82	0	8											
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1980-81	24	109	294	654	932	1029	1088	971	932	588	489	163	7273
	1981-82	19	102											
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1980-81	0	0	46	383	717	731	871	697	584	175	119	3	4326
	1981-82	0	0											
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	5394
	1980-81		27	139	521	836	910	1052	910	771	416	302	49	5933
	1981-82	0												
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1980-81	0	39	200	581	838	780	1067	837	892	457	421		
	1981-82	22												
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1980-81	61	165	343	743	1004	1101	1159	1152	983	625	546	227	8109
	1981-82	83	141											
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1980-81	0	5	106	529	814	931	1038	963	835	359	391	33	6004
	1981-82	8	20											
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1980-81	78	162	301	662	925	1003	1132	1038	1098	621	576	187	7783
	1981-82	117	177											
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1980-81	0	0	57	394	679	689	860	720	712	240	212	14	4615
	1981-82	0	15											
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727	663	248	9089
	1981-82	143	241											
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1980-81	0	0	52	391	678	628	818	745	746	298	220	16	4592
	1981-82	0	15											

COLORADO CLIMATE -- SEPTEMBER 1981

Colorado Climate Center
Department of Atmospheric Science
Colorado State University

Pleasant late summer weather continued throughout September in Colorado. Generally light and scattered precipitation accompanied the warmer than average temperatures.

During the first two weeks of September, winds aloft over Colorado were quite light, moisture drifted into the state from the southwest, and afternoon thundershowers occurred frequently in and near the mountains. For the most part, the shower activity was light, but some heavier amounts were reported. Examples of heavier rains included 1.39 inches at Norwood on the 4th, 0.97 inches at Antero Reservoir late on the 5th, 1.20 inches at Trinidad on the 6th and 7th, and 1.30 inches at Mancos on the 12th and 13th. Norwood recorded 4 inches of hail on the ground and 1.35 inches of precipitation from a severe thunderstorm on the 13th. Some shower activity was noted on the Eastern Plains on the 3rd and 4th, but for the most part the plains remained dry. Temperatures were variable throughout the period as 3 or 4 Pacific cold fronts crossed the state. Many locations recorded their highest temperatures for the month on the 2nd. Denver, for example, reached 94° F and Sterling hit 97° F. Lamar recorded the state's warmest temperature--98° F on the 14th.

From the 14th to the 19th a large high pressure ridge aloft sat over the Rockies. Dry and mild weather was associated with this ridge in the mountains and on the Western Slope. But east of the mountains some showers fell on the 14th, 15th, and 16th, and temperatures turned cool and fallish. High temperatures only reached into the 50's and low 60's on the 16th, and many areas recorded the lowest temperatures of the month on the mornings of the 17th and 18th. The temperatures at Akron and Lamar fell to 37° and 38° F, respectively. Fortunately, most lower elevation locations escaped without a frost. Walden recorded the state's lowest temperature for the month--21° F on the 18th.

Warm summerlike weather returned by the 19th, and most of the remainder of September was unseasonably warm across the state. Some mountain

showers were reported from the 21st to the 25th, but amounts were light. A strong localized storm dropped 1.48 inches of rain on Flagler in eastern Colorado on the 24th, but few other locations were affected. Briefly cooler weather was observed on the 26th and 27th as a cold front, associated with a strong low pressure area moving northeastward from Montana, crossed Colorado. The last 3 days of the month were warm again with temperatures in the 80's and 90's east of the mountains.

Telluride and Walden experienced an interesting meteorological occurrence in September. They each (on separate days) recorded both their warmest and coldest temperatures for the month on the same day. Walden on the 18th had a high of 79° F following a morning low of 21° F. On the 27th, Telluride rose from a morning low of 29° F to a high of 78° F. This is a rare occurrence anywhere in the country, but it is most likely to occur at higher elevations on very clear, calm days during the autumn.

Summarizing the month as a whole, temperatures were well above average across all of Colorado (Figure 1). Across the southern half of the state temperatures were mostly 1 to 3 degrees Fahrenheit warmer than usual. Locations in the northern half of the state were even warmer, compared to average, ranging from 2 to 5.5 degrees warmer than usual. For the state as a whole, 13 of the past 16 months have now been warmer than average.

Precipitation totals and percents of average for September are shown in Figures 2 and 3, respectively. Precipitation totals were quite variable ranging from only 0.07 inches at Akron and Fort Morgan to 4.03 inches at Norwood. In general, precipitation was near or above average in the Central Mountains, in the San Juans, across extreme northwest Colorado, in the San Luis Valley, and along parts of the southern Front Range (Trinidad totalled 271 percent of average). Below average precipitation was observed in some of the western valleys, in the Northern Mountains, and across most of the Eastern Plains. Dry and warm weather on the plains meant unfavorable conditions for optimal germination and growth of the new winter wheat plants.

Heating degree day information for the state is shown in Table 1. September totals were less than average and less than September 1980 (indicating less energy needed for space heating in homes and businesses). Beginning next month, more detailed information on heating degree days will be presented in each monthly report.

1981 Water-Year Summary

September was the final month in the 1981 Water Year. Above average precipitation over most of the state during May and scattered heavy precipitation during the rest of the summer helped to offset the winter drought in the mountains.

Summer (June-September) precipitation (Figure 4) was near average at most locations in the Northern and Central mountains and across northwest and west central Colorado. A few locations such as Meeker and Grand Junction were considerably drier than average. Above average precipitation occurred in the San Juans, the San Luis Valley, the Gunnison Valley, and across parts of southeast Colorado from Colorado Springs to Trinidad. The Trinidad area experienced their wettest summer on record with a 4-month total of 17.40 inches. The summer was drier than usual across the rest of the state including most of the Eastern Plains.

Total water-year precipitation ended up fairly close to average across much of the state (Figure 5). The only areas significantly drier than average were the Arkansas Valley from Pueblo to Lamar and the Northern and Central Mountains from Crested Butte to Grand Lake and Steamboat Springs.

Colorado once again escaped almost unscathed from a serious drought situation this year. But that does not mean we're in the clear. Unusually warm temperatures throughout the past 16 months have meant increased evaporative water losses. Reservoir storage, particularly in the South Platte drainage, has been significantly depleted, and available water resources are considerably less than last year at this time. Once again we must wait and see what the new year will bring. Our problems are not critical at this time, but another drier than average winter could spell trouble for next summer.

Figure 1. Temperatures for September 1981 in degrees Fahrenheit (in parentheses) and departures from the 1951-1970 average.

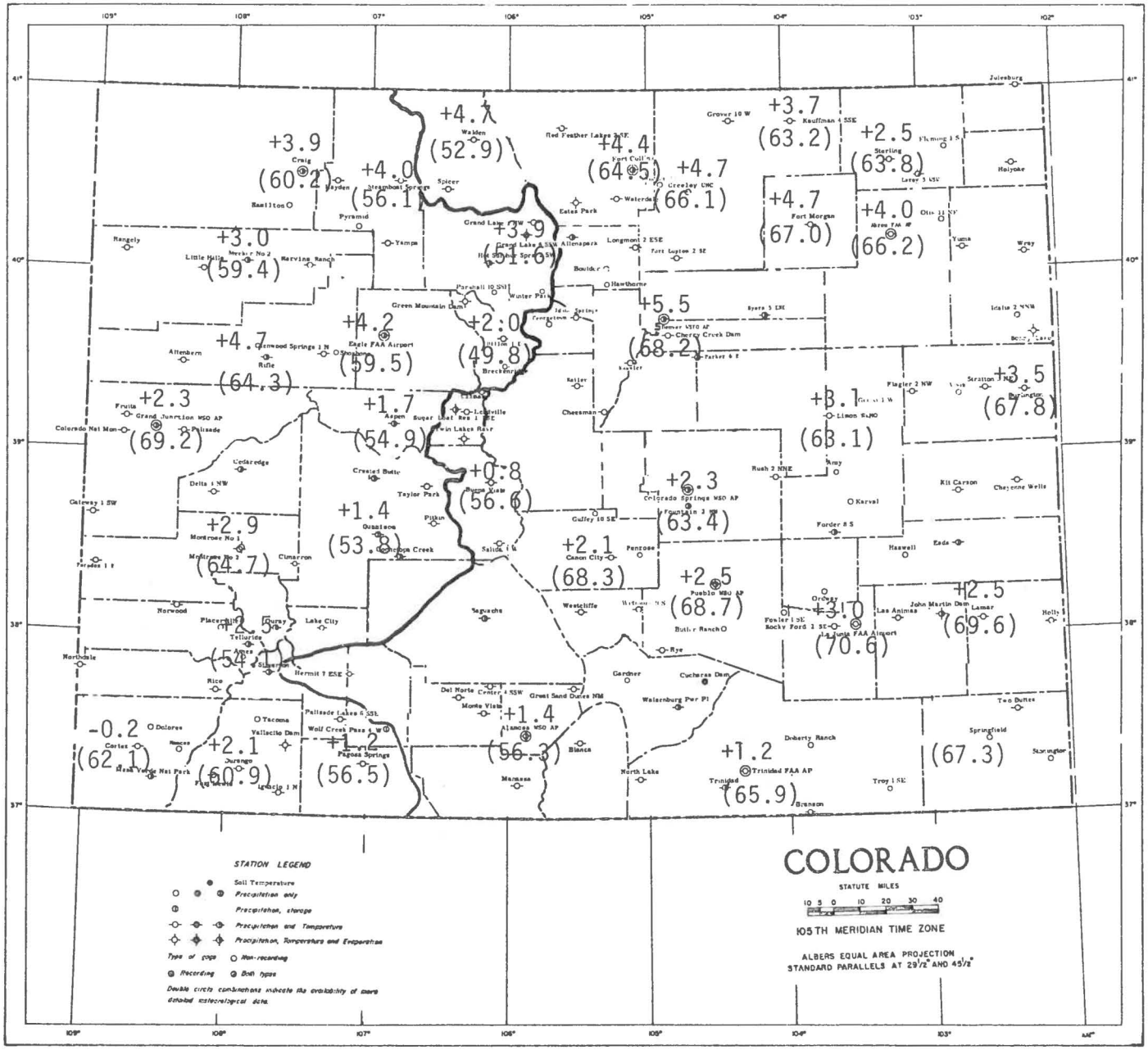

Figure 2. September 1981 precipitation amounts (inches).

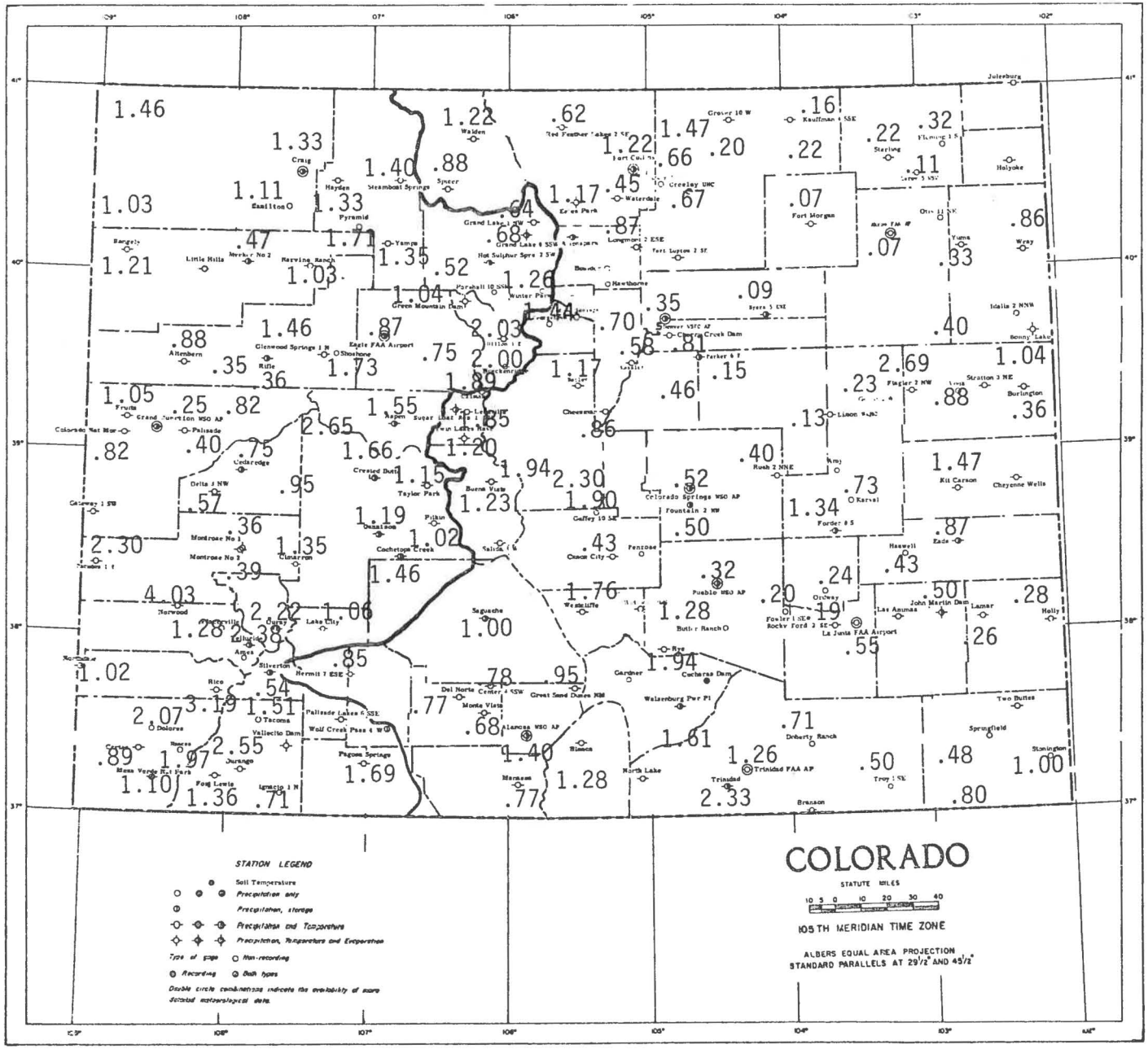

Figure 3. Precipitation for September 1981 as a percent of the 1951-1970 averages.

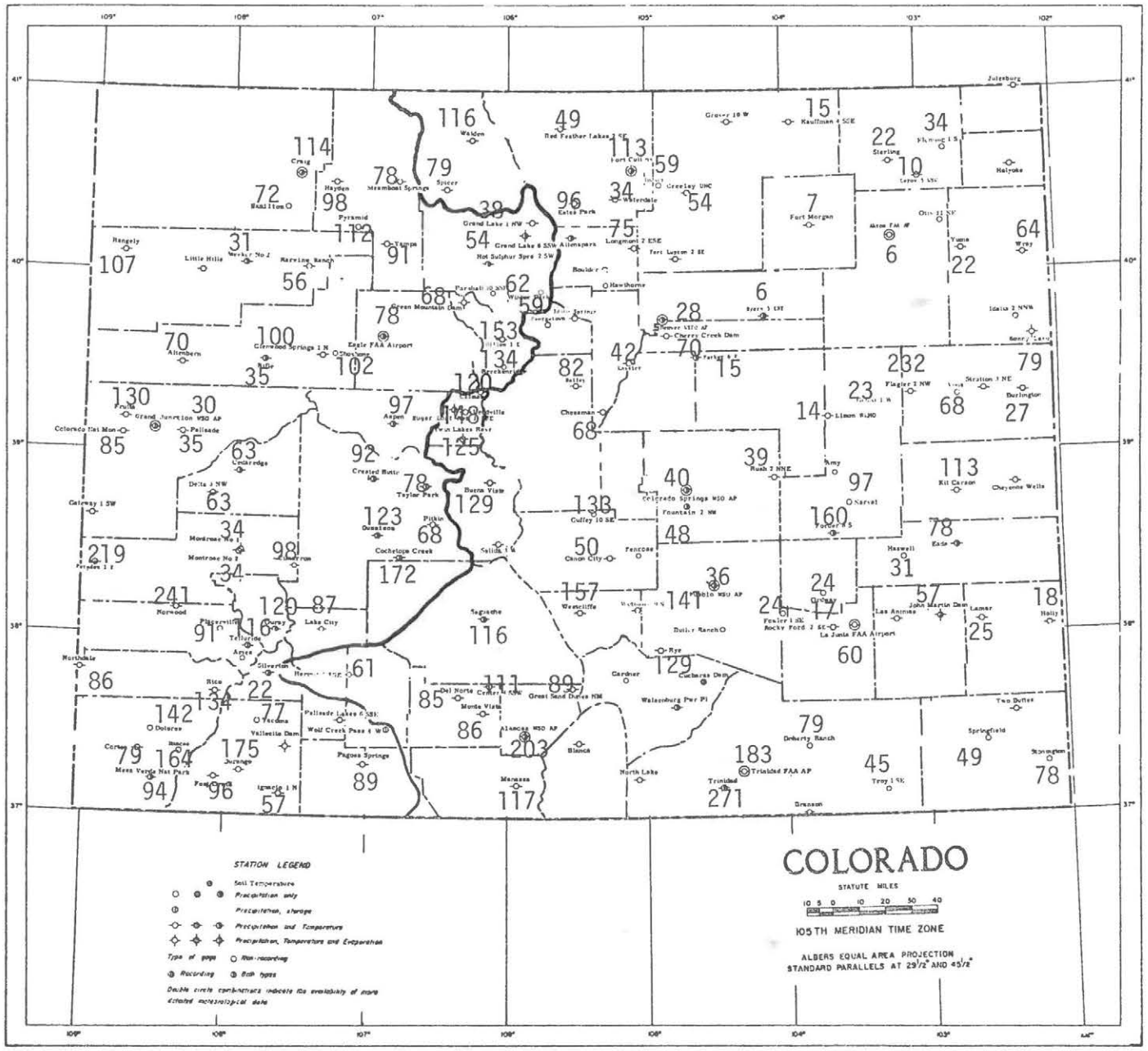

Figure 4. 1981 summer precipitation (June through September) as a percent of the 1951-1970 average.

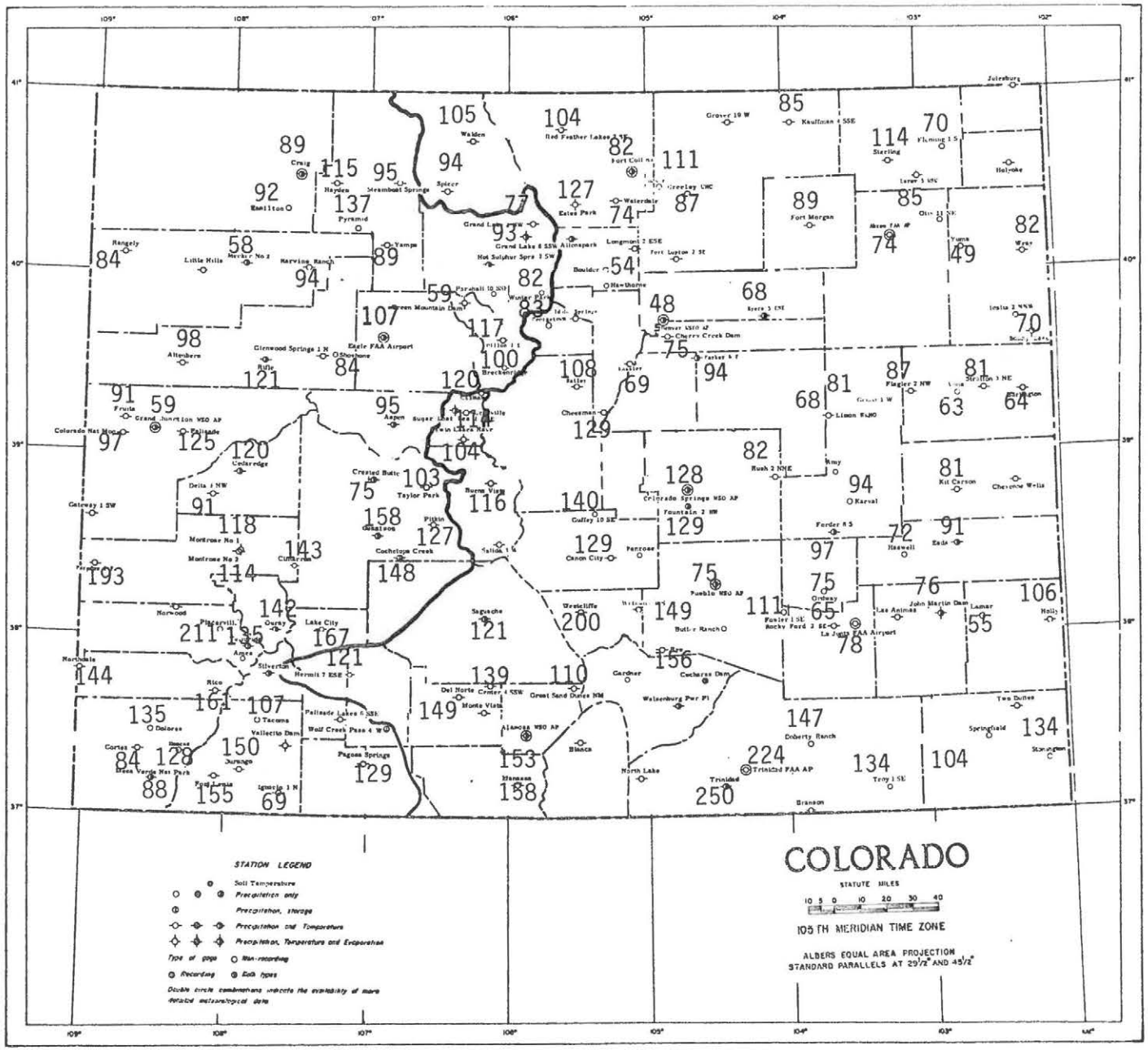

Figure 5. Total 1981 water-year precipitation (October 1980 through September 1981) as a percent of the 1951-1970 average.

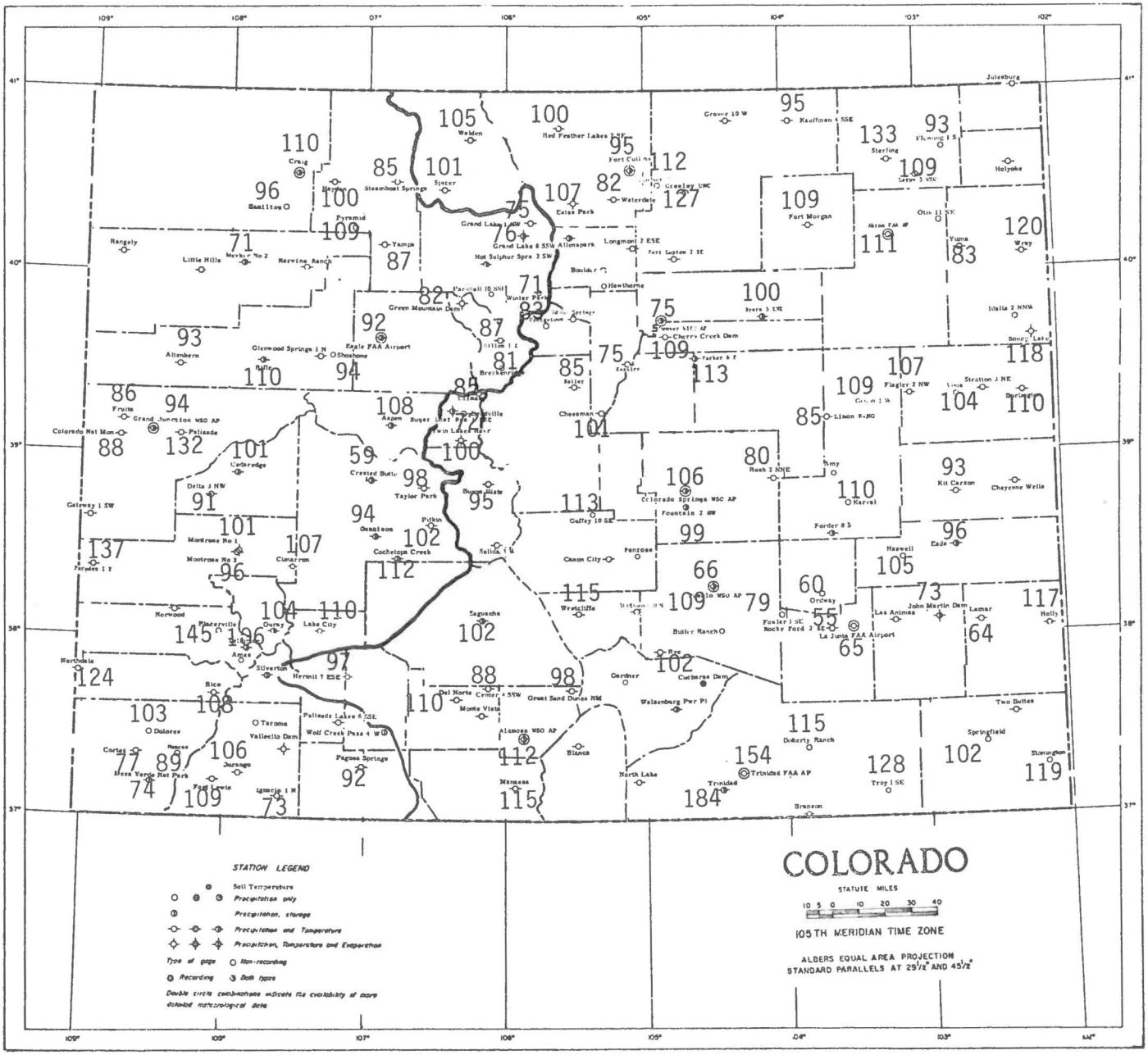

Table 1. Colorado heating degree day data through September 1981.

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Alamosa	average	55	96	294	648	1053	1420	1482	1182	1054	714	440	171	8609
	1980-81	5	102	263	757	1031	1136	1274	1097	979	576	458	102	7780
	1981-82	14	108	254										
Aspen	average	113	161	345	654	1026	1324	1392	1176	1144	792	530	291	8948
	1980-81	59	159	305	705	1004	1005	1164	1094	1066	656	574	208	7999
	1981-82	98	147	298										
Boulder	average	6	0	139	367	690	905	992	826	809	482	236	88	5540
	1980-81		1	61	384	630	644	800	714	702	252	306	27	4521
	1981-82	4	14											
Burlington	average	0	0	102	363	741	1011	1085	882	828	462	210	54	5738
	1980-81	0	0	49	356	763	866	907	804	734	256	265	18	5018
	1981-82	10	7	25										
Canon City	average	0	0	57	285	600	806	877	728	713	402	158	34	4660
	1980-81	0	0	50	313	603	590	679	651	652	228	203	2	3971
	1981-82	2	9	35										
Colorado Springs	average	9	13	155	456	825	1054	1128	944	921	564	301	103	6473
	1980-81	0	7	113	463	759	776	928	850	789	335	321	38	5379
	1981-82	5	30	70										
Cortez	average	0	10	110	425	807	1104	1156	904	834	534	274	81	6239
	1980-81	2	29	131	514	780	882	986	901	849	465	326	68	5933
	1981-82	2	7	83										
Craig	average	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	1980-81	7	68	228	626	914	1034	1091	1076	919	545	460	110	7078
	1981-82	19	35	149										
Delta	average	0	0	94	394	813	1135	1197	890	753	429	167	31	5903
	1980-81	0	1	48	456	761	820	934	826	686	256	177	26	4991
	1981-82	0	1	17										
Denver	average	0	0	120	408	768	1004	1088	902	868	525	253	80	6016
	1980-81	0	4	56	386	683	731	853	801	727	260	243	26	4770
	1981-82	0	12	19										
Dillon	average	291	341	519	809	1173	1442	1519	1319	1321	966	701	453	10854
	1980-81	227	315	480	893	1106	1113	1302	1230	1219	819	713	331	9748
	1981-82	243	302	448										
Durango	average	20	37	198	502	843	1147	1212	958	880	597	375	161	6930
	1980-81	3	39	150	516	815	910	968	842	891	478	409	81	6102
	1981-82	9	22	125										
Eagle	average	43	79	285	626	1023	1386	1457	1168	1051	693	425	190	8426
	1980-81	8	89	230	674	967	1014	1165	1008	916	541	412	84	7108
	1981-82	6	54	155										
Fort Collins	average	7	12	175	477	834	1076	1184	960	918	558	297	101	6599
	1980-81	1	14	88	486	764	810	980	848	760	318	314	39	5421
	1981-82	8	8	42										
Fort Morgan	average	0	0	132	439	849	1141	1262	986	899	509	233	61	6511
	1980-81	0	8	74	455	773	894	993	912	813	291	259	15	5487
	1981-82	3	11	37										
Grand Junction	average	0	0	60	324	756	1101	1190	879	738	404	133	20	5606
	1980-81	0	2	21	359	674	765	864	754	645	247	153	15	4499
	1981-82	0	0	12										

		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Greeley	average	0	5	153	465	870	1147	1256	991	911	528	253	60	6639
	1980-81	0	4	57	457	762	845	964	872	749	304	273	23	5310
	1981-82	5	9	31										
Gunnison	average	103	169	384	704	1110	1538	1686	1397	1246	789	533	282	9941
	1980-81	106	191	358	738	1037	1159	1331	1117	994	640	509	158	8338
	1981-82	63	165	328										
Lamar	average	0	0	57	320	741	1032	1107	854	766	377	129	19	5402
	1980-81	0	0	28	349	735	823	910	766	604	171	166	3	4555
	1981-82	0	0	27										
Limon	average	8	6	144	448	834	1070	1156	960	936	570	299	100	6531
	1980-81	0	12	139	542	831	859	1014	927	917	403	400	60	6104
	1981-82	6	26	83										
Longmont	average	0	7	155	457	828	1076	1184	952	902	537	269	92	6459
	1980-81	0	4	77	455	744	806	952	902	767	317	277	21	5333
	1981-82	5	12	38										
Meeker	average	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	1980-81	5	60	211	589	861	912	1044	958	901	573	427	86	6627
	1981-82	8	72	160										
Montrose	average	0	9	129	435	828	1132	1197	935	834	510	245	71	6325
	1980-81	0	17	82	467	779	862	948	851	755	327	247	45	5380
	1981-82	0	8	38										
Pagosa Springs	average	95	114	291	611	981	1311	1401	1140	1048	711	481	233	8417
	1980-81	24	109	294	654	932	1029	1088	971	932	588	489	163	7273
	1981-82	19	102	244										
Pueblo	average	0	0	55	335	726	992	1082	848	775	405	148	28	5394
	1980-81	0	0	46	383	717	731	871	697	584	175	119	3	4326
	1981-82	0	0	22										
Rifle	average	7	22	167	481	861	1200	1296	997	859	537	283	85	5394
	1980-81		27	139	521	836	910	1052	910	771	416	302	49	5933
	1981-82	0		42										
Salida	average	28	69	240	536	854	1094	1132	958	905	588	369	139	6910
	1980-81	0	39	200	581	838	780	1067	837	892	457	421		
	1981-82	22	67											
Steamboat Springs	average	116	159	384	691	1086	1451	1553	1277	1190	789	521	306	9523
	1980-81	61	165	343	743	1004	1101	1159	1152	983	625	546	227	8109
	1981-82	83	141	257										
Sterling	average	0	6	158	459	849	1150	1249	986	927	522	256	76	6638
	1980-81	0	5	106	529	814	931	1038	963	835	359	391	33	6004
	1981-82	8	20	79										
Telluride	average	185	229	399	676	1017	1290	1333	1140	1147	825	583	345	9169
	1980-81	78	162	301	662	925	1003	1132	1038	1098	621	576	187	7783
	1981-82	117	177	320										
Trinidad	average	0	0	81	364	732	980	1054	868	822	471	212	58	5642
	1980-81	0	0	57	394	679	689	860	720	712	240	212	14	4615
	1981-82	0	15	39										
Walden	average	197	270	489	803	1149	1438	1538	1313	1280	891	626	363	10357
	1980-81	142	284	439	840	1123	1073	1281	1158	1111	727	663	248	9089
	1981-82	143	241	357										
Walsenberg	average	6	12	93	364	690	911	977	820	806	489	230	62	5460
	1980-81	0	0	52	391	678	628	818	745	746	298	220	16	4592
	1981-82	0	15											