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# Colorado Climate Summary Water-Year Series

(October 1994-September 1995)

Nolan J. Doesken  
Thomas B. McKee



Climatology Report No. 95-1

DEPARTMENT OF ATMOSPHERIC SCIENCE  
COLORADO STATE UNIVERSITY  
FORT COLLINS, COLORADO

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Department of Atmospheric Science  
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Fort Collins, CO 80523

December 1995

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## ACKNOWLEDGMENTS

As always we would like to take this opportunity to thank the many cooperative weather observers in Colorado and their National Weather Service supervisors, Jerry Sherlin and Michael Elias, for making it possible to monitor the climate in all parts of Colorado at a very low cost. Again, our sincere thanks are in order.

The authors also wish to express their appreciation to Odilia Bliss and Natalie Tourville for doing a fine job of preparing and processing each month's climate data and assembling this finished product. The work of John Kleist in database management has been very helpful.

These summaries have been made possible by funding for the Colorado Climate Center from the CSU Agricultural Experiment Station through the College of Engineering.

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## INTRODUCTION

The 1995 Water Year marked the 21st year of existence of the Colorado Climate Center (CCC) and the 18th year of closely monitoring the climate of this diverse and interesting state. The first monthly climate summary prepared by the CCC was written in early 1977 in the midst of an unprecedented severe winter drought. Since that time Colorado has experienced a myriad of extremes - record winter cold, incredible snowstorms, disastrous hail storms and tornadoes, some of the snowiest years in the past 60 years and one of the wettest consecutive periods in the state as a whole, (1982-1986). More recently, dry weather has again become more frequent although the 1995 Water Year was anything but dry for most of Colorado. Our monthly descriptions of Colorado climate have expanded to document and describe as much of this information as is practical.

The monthly climate descriptions are intended to accomplish several purposes. They are a written historical record of what our climate has been which we hope will serve as a reference in the future. By tracking monthly departures of temperature and precipitation from long-term averages, these summaries also become tools for operations, planning and policy-making related to agriculture, water resources, recreation, land use and energy. Finally these summaries are used to educate the people of Colorado about our unique climate and its impact on our lives and livelihoods.

In Colorado, the Water Year (October 1 through September 30) is the most appropriate period for monitoring climate. This 12-month period is directly 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. This snow is the frozen reservoir which

supports the huge ski and winter recreation industry. As it melts in the subsequent spring and summer, it supplies much of the water for human consumption, for extensive irrigation, for industry, for replenishing reservoirs, and to satisfy long-standing streamflow compacts with neighboring states. Colorado water use has been changing gradually, but irrigated agriculture still accounts for the majority of water used in this state. 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.

In November 1991, we began a two-column layout for each monthly report. This format was continued throughout the 1995 Water Year. The first page of each monthly report begins with a brief synopsis of the month. A short paragraph and small map describe precipitation patterns for the month. A similar paragraph and map, showing temperature departures from normal, completes the front page. Normal climate, for both temperature and precipitation is defined as the 30-year average for the period 1961-1990.

The second page of each monthly summary gives a day-by-day narrative account of specific weather patterns, air masses and storm systems affecting Colorado. It includes selected examples of temperature values and precipitation totals. This page ends with a tabulation of temperature, precipitation and snowfall extremes for the state as reported by official National Weather Service Cooperative weather stations. This page is designed to give readers a good feel for the timing and



location of significant weather events and general weather patterns without having to dig into detailed data tabulations or other references.

The third page is a graphical display of daily maximum and minimum temperatures for the month for nine selected locations in Colorado. The same nine cities are shown each month along with smoothed 30-year daily averages: Grand Lake, Denver, Akron, Grand Junction, Gunnison, Pueblo, Durango, Alamosa and Lamar. It is important to note that many stations do not use a midnight to midnight reporting period. The time of observation clearly has an impact on reported temperatures. For example, Durango, Gunnison and Lamar all take their observations at about 8 a.m. The maximum temperatures they report each day usually occurred the previous afternoon. It is important to take time of observation differences into consideration when comparing temperatures from different locations.

The fourth page of each monthly summary contains a map of monthly precipitation totals for the state, a brief narrative description of significant precipitation events and a bar graph showing daily precipitation amounts averaged spatially over the entire state of Colorado. This graph also shows the approximate percent area of the state receiving measurable (greater than or equal to 0.01 inches) precipitation each day. Again, it is important to realize that differences in observation time influence these results. A station with an 8 a.m. observation time will report yesterday afternoon's precipitation on today's date.

The fifth page of each monthly report shows a map with monthly precipitation plotted as a percent of the 1961-90 average. Beneath the map is a graph showing the number of stations in each of eleven precipitation categories ranging from less than 25% of average to more than 100% of average. This graphic, accompanied by a brief narrative, allows a quick evaluation of the frequency distribution of monthly precipitation. The lower right hand portion of the page contains monthly precipitation rankings and extremes for six Colorado weather stations with long data records. These rankings are

intended to give readers a long-term perspective on how typical or unusual precipitation was during the month in different parts of the state.

Page six consists of a map, graph and narrative description of water-year accumulated precipitation with respect to average. This page is very helpful for evaluating the cumulative precipitation inputs into state water supplies. This page is omitted from the October summary since total water year precipitation after just one month is the same as the monthly data (fifth page).

Heating degree day data for 36 Colorado cities are published each month on the seventh page of each monthly report in a data table similar to previous years. A description of heating degree days and their use is given in Section II of this report.

The next two pages are tabular climate information for the month for selected Colorado stations. Stations are divided into 4 regions: the Eastern Plains, the Foothills/Adjacent Plains (includes the Front Range urban corridor), the Mountains and High Interior Valleys, and the Western Valleys (includes stations in western Colorado below 7,000 feet). Data presented for each station include the average high (Max), average low (Min) and mean temperature (Mean) for the month and the departure (Dep) from the 1961-1990 average all in degrees Fahrenheit. The extreme highest (High) and lowest (Low) temperature recorded during the month comes next followed by the monthly total of heating (Heat), cooling (Cool) and growing (Grow) degree days (see Section II for definitions), the monthly total precipitation (Total) in inches, the departure from the 1961-1990 average (Dep), the percent of the 1961-1990 average (% Norm) and the total number of days with measurable ( $\geq 0.01$ "") precipitation (# days).

Beneath the data tables is a comparative table of number of clear, partly cloudy and cloudy days and the percent of possible sunshine for several National Weather Service stations. This is followed by a graph of daily total solar radiation data measured at Fort Collins and a graph of daily soil

temperatures at four selected depths (4", 12", 36", and 72"). Beneath the soil temperatures is a brief section, "Hats Off To: \_\_\_\_\_ ", which acknowledges an individual or an institution for their contribution to data collection and climate monitoring in Colorado.

The components of the monthly report described above are provided each and every month. However, there is some flexibility in the final few pages. Almost every month there is an in-depth analysis and discussion of some important aspect of Colorado's climate. These features vary in length from one to seven pages. Under special circumstances there may be two feature stories per month. The September issue always contains a wrap-up of the water year. Here is the index of the feature stories published during the 1995 Water Year:

1. A Funny Thing Happened on the Way to the Drought Report, October 1994, Page 9.
2. Maintaining Continuity in Climate Observations in Colorado, November 1994, Page 22.
3. Why Doesn't Winter Feel Like Winter?, December 1994, page 33.
4. no special feature for the month of January 1995.
5. The Final Word on Winter 1995, February 1995, Page 53.
6. February 8-14 Snowstorm, February 1995, Page 55.
7. And You Thought Measuring Air Temperature Was Easy, March 1995, Page 68.
8. Springtime in Colorado -- More Surprises!!, April 1995, Page 81.
9. The Anatomy of the Spring of 1995, May 1995, Page 94.
10. How Hard Can It Rain?, June 1995, Page 107.
11. Change, Change, Change, July 1995, Page 120.
12. Some Colorado Predictions, August 1995, Page 131.
13. Colorado Climate on the Internet and World Wide Web, August 1995, Page 133.

14. A Review of the 1995 Water Year, September 1995, Page 144.

The final components of each monthly report is a statewide data summary provided to the Colorado Climate Center by the Joint Center for Energy Management (JCEM) at the University of Colorado at Boulder. Back in 1988 they developed a small network of automated weather stations to help gather data useful for heating and cooling design and for energy conservation. A one-page table and graph provides a very compressed summary of statewide temperature, humidity, solar energy and wind based on hourly data. The actual raw data can be obtained on request from JCEM by calling (303) 449-4547.

Except for the JCEM data, 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. A few volunteers who are not affiliated with the National Weather Service's networks are also included based on the Colorado Climate Center's judgment that the data are of good quality. Increasingly, data from automated electronic weather stations are being used. The Alamosa, Colorado Springs, Denver International Airport, and Pueblo NWS weather stations have all become primarily automated stations.

Please note that specific *daily* temperature and precipitation data are not listed here. Daily data can be obtained in digital and/or hard copy form from the Colorado Climate Center, the Western Regional Climate Center (Reno, NV) and the National Climatic Data Center (Asheville, NC). Much of the daily data are published in the government document, *Climatological Data*.

The averages which are used in this report for both temperature, heating degree days and precipitation were calculated using 1961-1990 data. Some adjustments have been applied to a few stations where station moves have resulted in significant differences between current observations and their historic data.



The written descriptions here give a good general accounting of each month's weather, but the majority of information is contained on the maps and tables which accompany each report. The accuracy of all of these maps and tables is quite good. However, these reports were initially prepared soon after the end of each month, and preliminary information was sometimes used. Therefore, some of the precipitation, temperature, and heating, cooling and growing degree day values may differ slightly from what is later published by the National Climatic Data Center.

## EXPLANATION OF DEGREE DAYS

Many climatic factors affect fuel consumption for heating and cooling. 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.

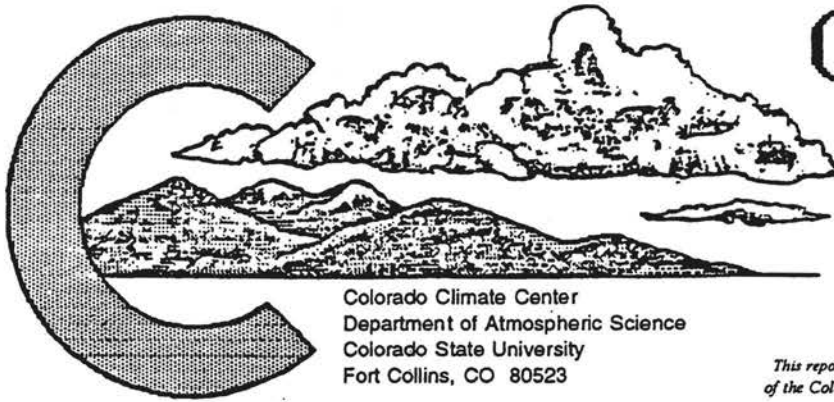
A simple index, given the name, *heating degree days*, was devised many years ago to relate air temperatures to energy consumption (for heating). The number of *heating degrees* for a given *day* is calculated by subtracting the mean daily temperature (the average of the daily high and low temperature) 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. For example, on a day with a maximum temperature of 40°F and a minimum of 10°F the mean daily temperature is 25° and the heating degree total is 40. When the mean daily temperature is 65° or greater, the heating degree day total is defined as 0. The daily values are accumulated throughout the heating season to give heating degree day totals. Different base temperatures can be used to calculate heating degree days, but 65° is the long-standing traditional base.

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 the 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, new windows or lowering the thermostat.

Cooling degree days are calculated in a similar fashion. *Cooling degrees* occur each day the daily mean temperature is *above* 65°F. They are accumulated each day throughout the cooling season and are roughly proportional to the amount of energy required to cool a building to a comfortable inside temperature. Cooling degree days are less useful than heating degree days here in Colorado where air conditioning requirements are minimal in many parts of the state. However, they still offer a means of making general comparisons from site to site, year to year or month to month.

*Growing degree days*, which are sometimes referred to as "heat units" or "crop growth units" are a measure of temperature which has been found to correlate with the rate of development and maturation of crops. Several methods exist for computing growing degree days. In this report the "corn" growing degree day definition was used. The optimum growth occurs at 86°F and essentially no growth occurs at temperatures below 50°F. Therefore, when computing the daily mean temperature any minimum temperature below 50° is set equal to 50° and any maximum above 86° is counted as 86°F. Growing degree day totals are obtained by subtracting the 50° base temperature from each adjusted mean daily temperature and the accumulating daily totals throughout the growing season.



# COLORADO CLIMATE

OCTOBER 1994

Volume 18 Number 1

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

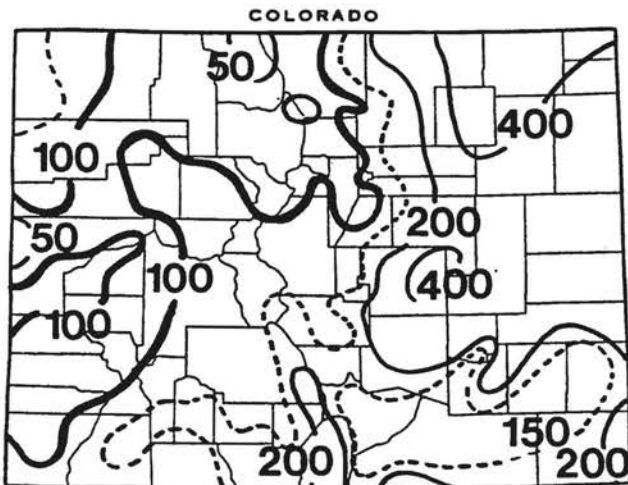
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## October Climate in Perspective – Lively Storms

There was much more lightning, thunder and hail reported in Colorado than is normally expected in October. But there were also prolonged dry and sunny periods. With the help of three major storm episodes, much of Colorado ended up with more precipitation than normal. Temperatures varied greatly through the month, but most areas were near or slightly cooler than average for the month as a whole.

### Precipitation

October got off to a very wet start with back-to-back storms during the first week of the month followed by another large and slow-moving system in the middle of



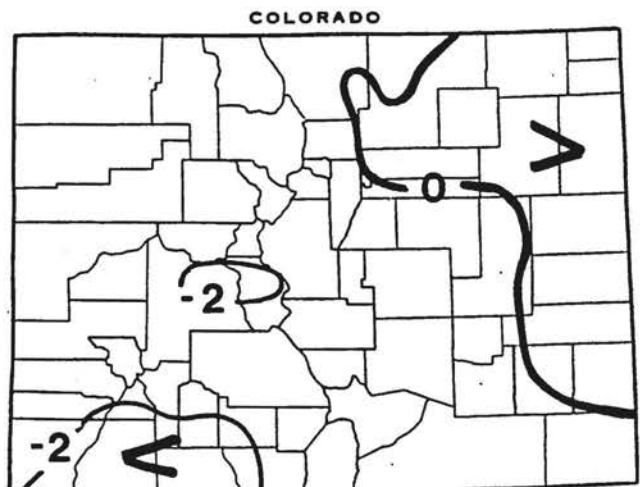
October 1994 precipitation as a percent of the 1961-1990 average.

October. After drought problems much of this summer, Colorado narrowly averted a major flooding situation as a dying hurricane nearly made it up to Colorado from Mexico. Even without the help of hurricane moisture, most of the State ended up wetter than average for October. All areas

from the southern and central mountains eastward across the plains were wetter than average. The Northeast Plains tried to make up for their extremely dry growing season. Several locations near Fort Morgan and Sterling received more than 500% of the October average. A few areas of northern and western Colorado missed the brunt of each storm and ended up drier than average.

### Temperatures

The warmer than average weather that had persisted statewide nearly all spring and summer came to an end in October. There were no severe blasts of polar air, but successive damp and cloudy days helped keep monthly temperatures near or below average. Near record high temperatures late in the month could only partially make up for the cooler weather earlier in October. Temperatures for the month as a whole ended up very near average over eastern Colorado and cooler than average over most of the rest of the State. The coolest area compared to average was the San Juan Mountains due to the early deep snows that fell there.



Departure of October 1994 temperatures from the 1961-90 average.

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## OCTOBER 1994 DAILY WEATHER

- 1-2 Very moist air covered Colorado as a storm system slowly crossed the region. Low clouds and drizzle damped northeastern Colorado on the 1st. Scattered rain showers fell over other parts of Colorado. Significant rains (snow above about 10,000 feet) fell from near Gunnison northward to Glenwood Springs. An area of thunderstorms erupted late afternoon on the 1st from south of Colorado Springs to north of Denver. As these storms moved northeastward, many areas received hail. Parts of Denver were especially hard hit. Hail was unusually large and solid for so late in the season and broke windows and damaged some cars and roofs. Rainfall amounts from 0.50" to 1.00" fell from Colorado Springs to Sterling. The storm center moved northeastward on the 2nd leaving partly cloudy skies and mild temperatures. Some showers and evening thunderstorms again developed mostly over northern Colorado.
- 3-8 A new and stronger storm headed toward Colorado while the abundant moisture from the first system was still present. A large high pressure area east of Colorado helped push cool, moist air up against the Front Range. Dense low clouds, fog and drizzle developed across eastern Colorado 3-4th. Thunderstorms erupted over portions of northern Colorado late on the 3rd. More than 1" of rain fell from Fort Morgan to Sterling. Heavy rains also fell in northwest Colorado (1.98" at Browns Park Refuge). Clouds and showers were widespread on the 4th with some significant rains in southeast Colorado. Temperatures were mild west of the mountains on the 4th. Then the storm system advanced eastward across Colorado on the 5th. Very severe thunderstorms for this time of year rumbled over parts of eastern Colorado with hail and even some tornadoes. Heavy rains continued late into the night with 1.30" at Arapahoe and 1.99" at New Raymer. A burst of mountain snow and wind accompanied the passing cold front. Precipitation diminished but winds increased on the 6th as the surface low moved northeastward into Nebraska. Cool, unsettled weather continued 7-8th until the storm finally left the region. 5" of snow fell near Mt. Evans, and Walsenburg reported 0.47" of cold rain early on the 8th.
- 9-12 Lovely, clear and dry autumn weather was enjoyed statewide with chilly nights but warm days. Highs at lower elevations climbed near 80° on the 10th and 11th. Clouds increased on the 12th as a weather disturbance crossed Wyoming.
- 13-18 A large "cut-off" low in the upper atmosphere developed over the Southwestern states and disturbed Colorado's weather for nearly a week. Low upslope stratus clouds formed east of the mountains on the 13th. Clouds lowered over western Colorado as southerly winds increased. Showers with mountain snows spread into southern Colorado on the 14th. At the same time, strong southerly winds caused blowing dust over parts of the Eastern Plains. Remnants of a Pacific hurricane that crossed Mexico nearly reached Colorado on the 15th, but instead slipped eastward into Texas where major flooding later occurred. Some rains dampened much of Colorado on the 15th, heaviest to the south. Snows became very heavy in the Southwest Mountains and continued until the 17th. Durango received 2.45" of moisture for the entire period including 6" of wet snow. More than 3 feet of snow stranded many hunters in the surrounding mountains. The storm began moving northeastward on the 17th spreading rain (snow above 6,000 feet) across the eastern 2/3 of Colorado. Colorado Springs picked up 0.65" of moisture. The weather began to settle down by the 18th, but a few rain and snow showers still fell.
- 19-24 This was a period of partly cloudy and dry weather for Colorado as winds aloft became stronger and more westerly. Three minor and very fast moving disturbances brought periods of clouds and winds but no precipitation.
- 25-28 A large high pressure ridge built up across the region. Total sunshine bathed Colorado 25-26th. Following a frosty cold morning on the 25th (7° at Hohnholz Ranch), temperatures climbed well above average. Clouds and westerly winds increased on the 27th. Downslope winds on the 28th helped temperatures east of the mountains climb to near-record levels. Denver reached 80°F. The Kim 15 NNE station in southeastern Colorado had the State's highest temperature for the month, 89°F. A cold front then crossed Colorado late on the 28th with some high mountain snowshowers and local wind gusts > 40 mph.
- 29-31 Temperatures were much colder on the 29th. A low pressure area crossed Colorado on the 30th delivering a band of snow to the mountains. Light rain and snow then spread eastward across the Plains. Most totals were very light, but Climax received 7". Skies then cleared. After some morning fog east of the mountains early on the 31st and cold temperatures (-5° up at Climax), very pleasant weather conditions developed for Halloween trick-or-treaters.

Highest Temperature	89°F
Lowest Temperature	-5°F
Greatest Total Precipitation	6.77"
Least Total Precipitation	0.24"
Greatest Total Snowfall	41.5"
Greatest Snow Depth	33"

### Weather Extremes

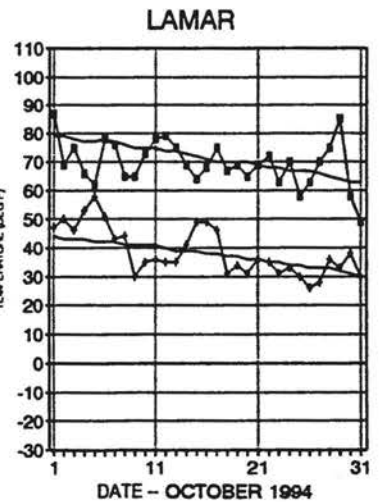
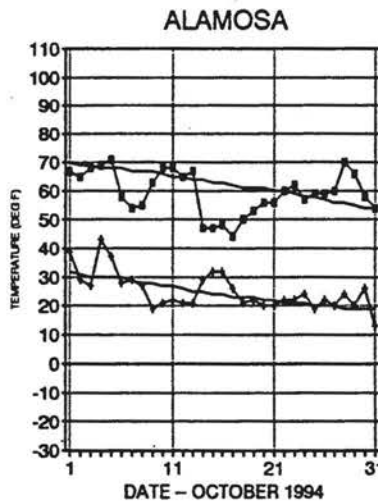
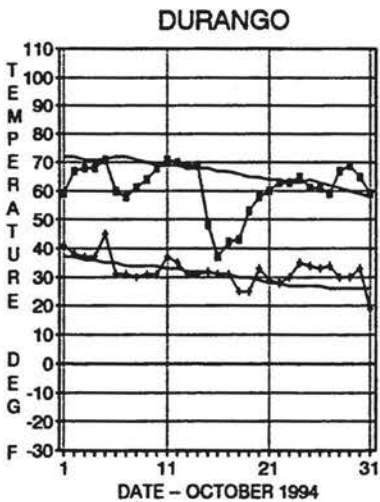
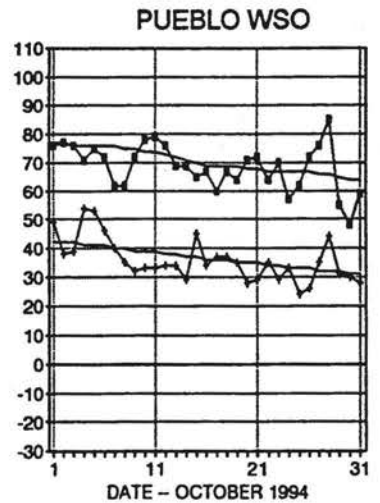
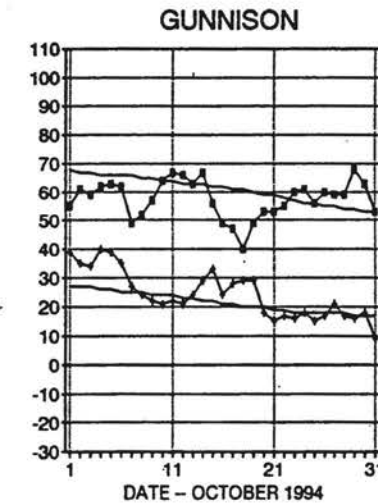
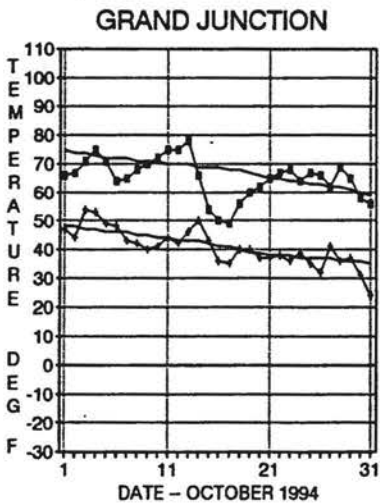
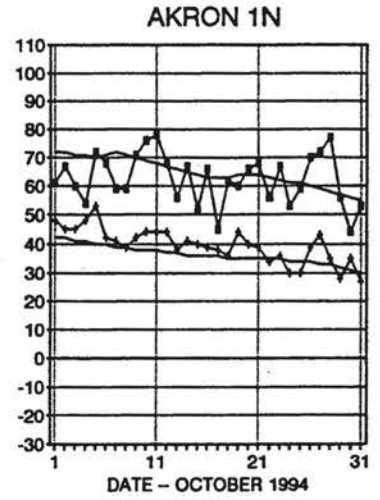
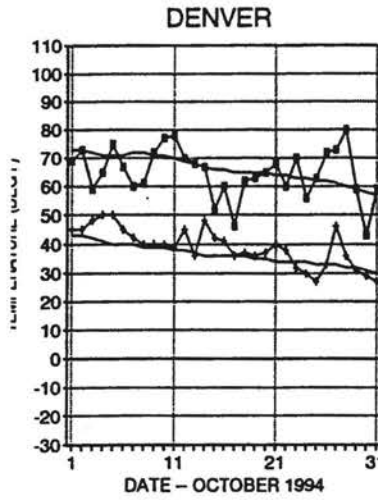
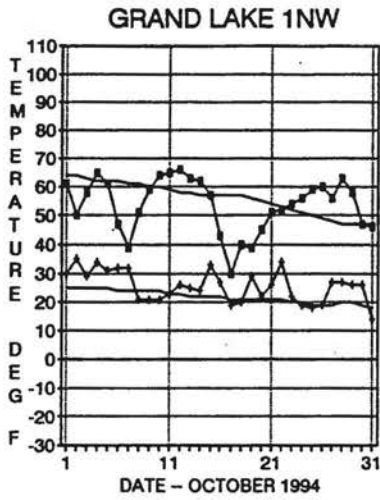
October 28	Kim 15 NNE
October 31	Climax

Wolf Creek Pass 1E
Walden
Wolf Creek Pass 1E
Wolf Creek Pass 1E

## OCTOBER 1994 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

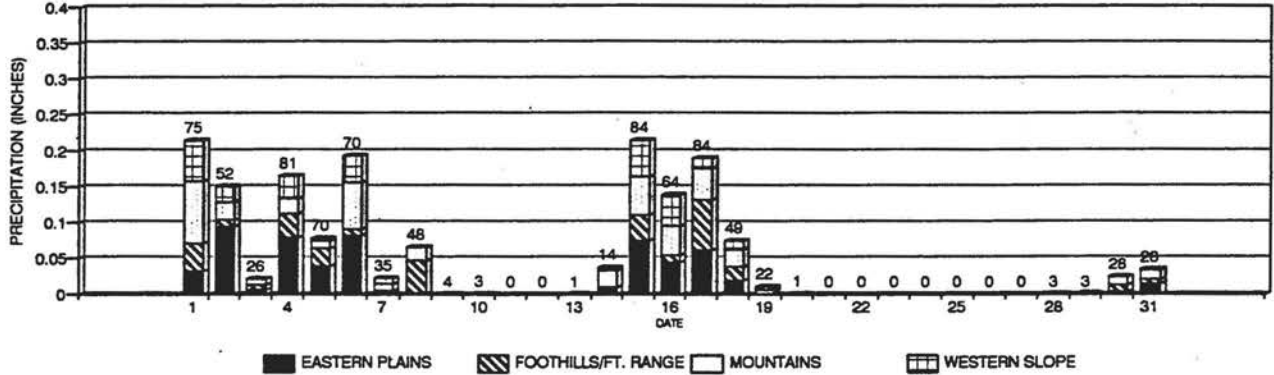


# OCTOBER 1994 PRECIPITATION

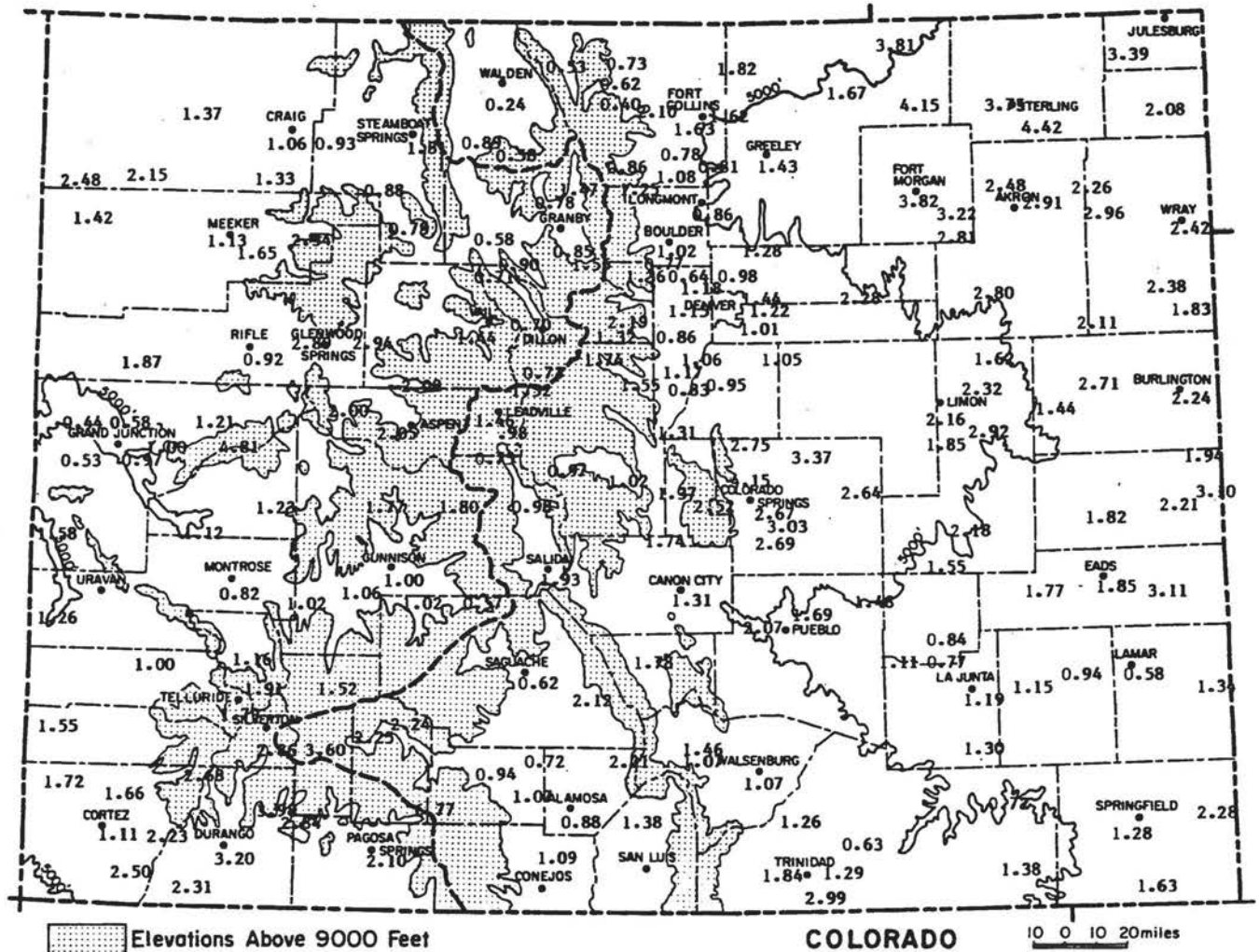
Precipitation episodes, 1-8th, 14-18th, and on the 30th produced all of Colorado's moisture in October. The storms in early and mid October were widespread and slow moving bringing beneficial moisture to most of the State.

For the month as a whole, precipitation averaged over the entire area of the State totalled 1.67" which is more than average. Most weather stations in the State received measurable precipitation on 6 to 12 days during the month.

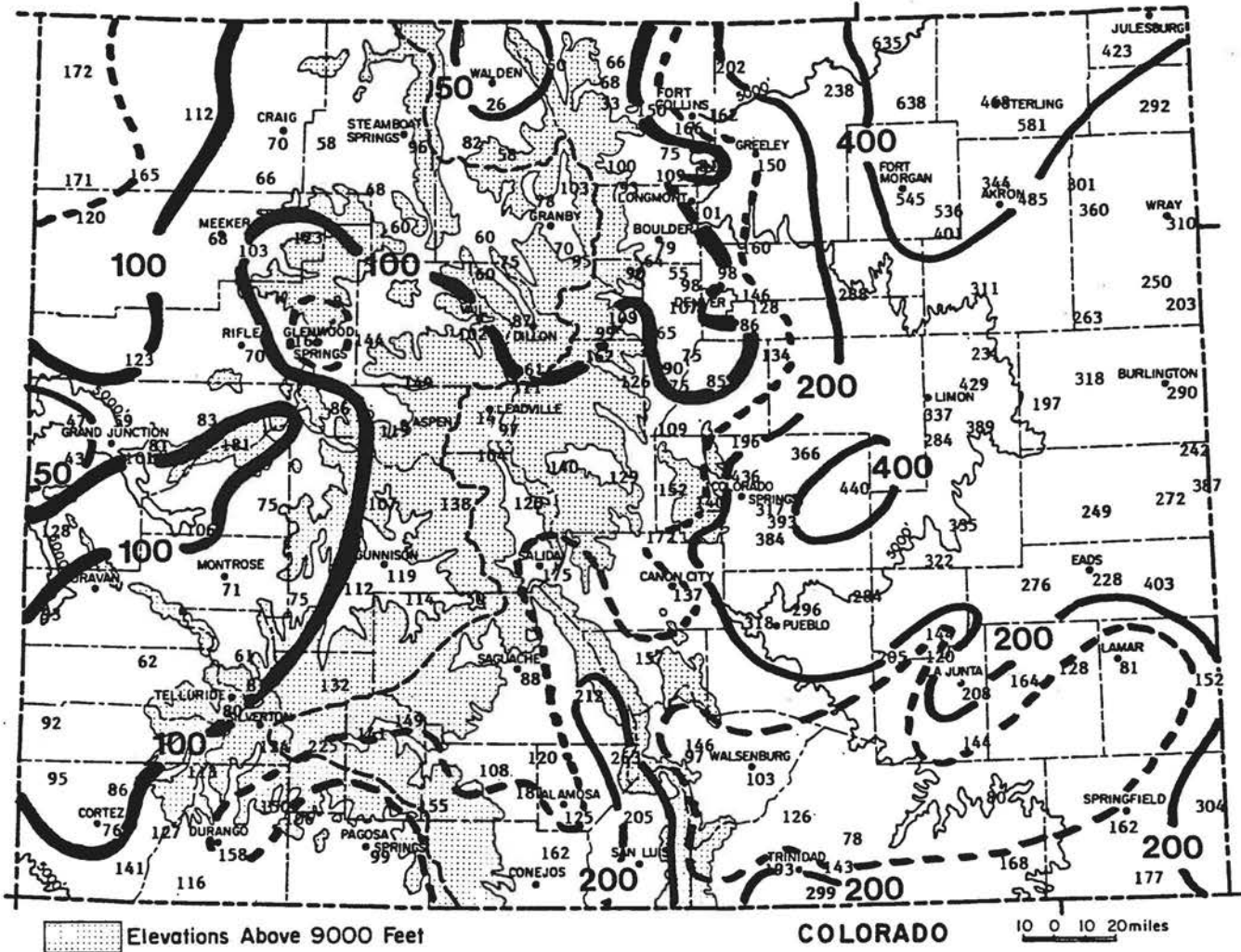
COLORADO DAILY PRECIPITATION - OCT 1994



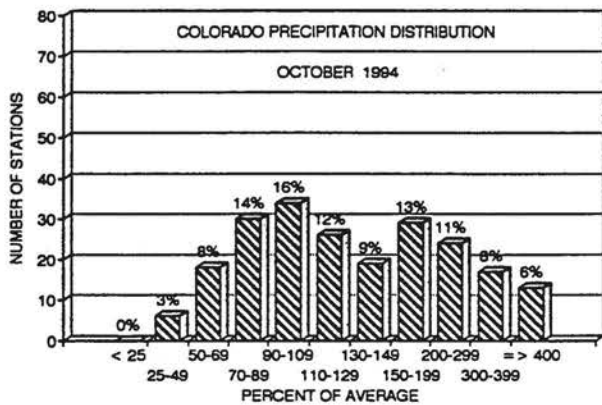
(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)



# OCTOBER 1994 PRECIPITATION COMPARISON



October 1994 Precipitation as a Percent of the 1961-90 average.



October precipitation totals ranged from more than 400% of average at several locations in northeast Colorado (638% of average at New Raymer) to less than 50% of average at a handful of sites in northwest Colorado. Wetter than average conditions dominated, however, with nearly 70% of the stations reporting above average October totals.

### OCTOBER 1994 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	1.44"	30th wettest in 123 years of record (wettest = 4.17" in 1969)
Durango	3.20"	19th wettest in 102 years of record (wettest = 11.79" in 1972)
Grand Junction	0.58"	42nd driest in 103 years of record (driest < 0.01" in 1917, 1950, 1952 and 1964)
Las Animas	1.15"	35th wettest in 128 years (wettest = 3.75" in 1870)
Pueblo	1.69"	10th wettest in 126 years of record (wettest = 4.91" in 1957)
Steamboat Springs	1.81"	43rd wettest in 90 years of record (wettest = 5.97" in 1908)



## COMPARATIVE HEATING DEGREE DAY DATA FOR OCTOBER 1994

HEATING DEGREE DATA		COLORADO CLIMATE CENTER (303) 491-8545												
STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700									434
ASPEN	AVE	95	150	348	651	1029	1339	1378	1162	1116	798	524	262	8850
	93-94	232	221	425	718	1188	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704									526
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5646
	94-95	4	0	77	442									81
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	892	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981
	94-95	50	65	288	674									401
BURLINGTON	AVE	0	9	138	432	822	1132	1175	948	859	519	254	34	6320
	93-94	0	25	189	450	953	978	1060	1068	654	499	144	1	6021
	94-95	4	0	80	370									84
CANON CITY	AVE	0	11	91	325	645	898	933	756	688	408	193	41	4987
	93-94	0	22	153	435	816	864	886	828	609	468	M	0	M
	94-95	0	0	42	381									42
COLORADO SPRINGS	AVE	8	18	164	488	816	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	928	749	576	223	14	6271
	94-95	10	14	98	486									122
CORTEZ	AVE	0	11	148	474	828	1163	1237	958	853	594	322	81	6687
	93-94	10	14	165	508	926	1148	1086	1038	695	528	272	14	6404
	94-95	4	0	111	522									115
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8378
	93-94	87	60	286	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613									223
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	93-94	13	33	232	598	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	87	423									67
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	93-94	1	20	152	488	900	948	948	879	618	485	104	3	5544
	94-95	3	2	57	397									62
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1484	1488	1307	1152	925	630	312	10732
	94-95	265	247	505	845									1017
DURANGO	AVE	6	37	203	512	846	1172	1248	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6638
	94-95	2	2	104	559									108
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1116	M	1258	1080	779	639	330	84	M
	94-95	M	M	M	M									M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7483
	94-95	59	48	286	677									393
FORT COLLINS	AVE	0	12	178	471	825	1113	1156	813	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	669	493	141	6	6002
	94-95	3	3	89	460									95
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1168	704	550	126	6	M
	94-95	9	8	106	435									17
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	69	0	5297
	94-95	0	0	24	368									24

\* = AVES ADJUSTED FOR STATION MOVES M = MISSING E = ESTIMATED

HEATING DEGREE DATA		COLORADO CLIMATE CENTER (303) 491-8545												
STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE	AVE	214	260	468	781	1113	1478	1600	1361	1283	945	660	381	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10462
	94-95	205	188	423	761									818
GREELEY	AVE	0	7	158	446	831	1153	1208	924	806	492	231	52	6306
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957
	94-95	1	3	68	441									72
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	93-94	M	M	M	M	1323	1693	1734	1527	1044	736	460	185	M
	94-95	87	74	343	737									504
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	93-94	0	12	90	389	935	925	994	882	555	400	78	0	5260
	94-95	0	3	40	288									M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	93-94	354	390	591	915	1368	1478	1499	1321	1196	994	682	338	11106
	94-95	310	314	539	895									1163
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	98	6961
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	16	6797
	94-95	12	13	124	513									149
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	718	533	182	8	6430
	94-95	13	0	62	435									75
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	851	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1096	785	594	280	52	7373
	94-95	13	5	170	578									188
MONTROSE	AVE	0	11	143	453	819	1159	1246	933	791	510	248	68	6383
	93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	6296
	94-95	4	2	113	489									119
PAGOSA SPRINGS	AVE	84	115	324	636	984	1330	1423	1131	1029	756	512	244	6548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M									M
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	687	487	143	0	5950
	94-95	0	6	57	388									63
RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881
	93-94	13	7	199	484	975	1171	1132	921	682	488	194	M	M
	94-95	3	0	105	497									108
STEAMBOAT SPRINGS	AVE	113	166	398	725	1122	1525	1608	1318	1169	801	543	297	9779
	93-94	166	144	395	710	1260	1486	1427	1294	965	678	392	133	9050
	94-95	67	49	289	674									405
STERLING	AVE	0	9	149	462	852	1200	1265	963	843	504	238	56	6541
	93-94	0	14	193	45									

## OCTOBER 1994 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	59.6	34.2	46.9	-1.1	75	22	553	0	171	3.81	3.21	635	11
STERLING	66.3	38.4	52.4	2.4	84	26	385	2	267	3.75	2.95	469	10
FORT MORGAN	65.2	35.6	50.2	-0.5	78	23	435	0	237	3.82	3.16	579	8
AKRON 1N	62.6	39.6	51.1	0.4	78	27	424	0	209	2.48	1.76	344	8
AKRON 4E	63.4	36.3	49.8	-0.4	83	25	461	0	228	2.91	2.31	485	12
HOLYOKE	64.7	36.9	50.8	-0.7	80	25	435	1	241	2.08	1.37	293	11
JOES 2SE	67.5	37.2	52.3	0.3	83	25	390	3	279	2.11	1.31	264	8
BURLINGTON	67.4	38.7	53.0	1.0	85	26	370	3	279	2.24	1.47	291	10
LIMON WSMO	61.9	34.5	48.2	-0.1	77	23	513	0	199	2.16	1.52	337	8
CHEYENNE WELLS	68.9	39.0	54.0	0.8	77	30	336	0	301	2.21	1.40	273	7
EADS	67.3	38.4	52.8	-1.0	83	27	368	0	280	1.85	1.04	228	4
ORDWAY 21N	64.9	31.5	48.2	-3.3	81	20	512	0	242	1.55	1.07	323	9
ROCKY FORD 2ESE	71.9	36.5	54.2	-0.0	83	26	331	3	350	0.77	0.13	120	8
LAMAR	69.6	38.7	54.1	-0.6	87	26	330	2	319	0.58	-0.13	82	5
LAS ANIMAS 1N	70.9	40.4	55.6	0.1	87	29	288	4	341	1.15	0.45	164	7
HOLLY	72.4	39.1	55.7	1.6	90	27	282	4	359	1.34	0.46	152	7
SPRINGFIELD 7WSW	69.7	39.2	54.5	-0.6	82	28	319	2	318	1.28	0.49	162	6

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	62.2	37.6	49.9	0.1	77	21	460	0	202	1.63	0.65	166	9
GREELEY UNC	63.3	37.6	50.5	-0.0	79	22	441	0	227	1.43	0.48	151	9
ESTES PARK	52.8	31.3	42.0	-2.9	66	17	705	0	78	0.86	0.00	100	12
LONGMONT 2ESE	65.7	35.6	50.7	0.8	80	20	435	0	257	0.86	0.01	101	4
BOULDER	63.0	38.1	50.5	-3.0	77	25	442	0	220	1.02	-0.27	79	10
DENVER WSO AP	64.9	39.1	52.0	0.6	80	27	397	0	244	1.44	0.46	147	7
EVERGREEN	58.1	27.7	42.9	-1.7	74	16	677	0	137	0.86	-0.45	66	7
CHEESMAN	60.3	18.1	39.2	-7.5	77	9	793	0	178	1.31	0.11	109	8
LAKE GEORGE 8SW	54.8	26.7	40.8	-1.0	65	14	743	0	94	1.02	0.23	129	9
ANTERO RESERVOIR	54.1	23.8	39.0	1.1	66	13	800	0	85	0.97	0.28	141	10
RUXTON PARK	44.5	24.0	34.3	-4.1	55	15	946	0	13	2.52	1.09	176	10
COLORADO SPRINGS WSO	60.9	37.3	49.1	-1.0	77	25	486	0	182	2.67	1.83	318	11
CANON CITY 2SE	67.8	38.4	53.1	-1.1	80	28	361	0	287	1.31	0.36	138	10
PUEBLO WSO AP	68.6	35.8	52.2	-1.4	85	24	388	0	300	1.69	1.12	296	7
WESTCLIFFE	58.8	25.0	41.9	-2.1	70	14	707	0	146	1.78	0.65	158	10
WALSENBURG	68.2	38.3	53.3	0.2	79	26	361	2	294	1.07	0.04	104	6
TRINIDAD AP	68.6	36.6	52.6	-0.9	82	25	376	0	299	0.63	-0.17	79	5

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	53.6	23.5	38.6	-0.1	68	8	813	0	89	0.24	-0.68	26	5
LEADVILLE 2SW	48.5	23.2	35.9	-0.9	59	4	895	0	36	0.74	-0.26	74	8
SALIDA	61.1	29.2	45.1	-1.4	73	18	607	0	183	1.93	0.83	175	8
BUENA VISTA	58.9	27.0	43.0	-2.4	70	17	674	0	146	0.98	0.17	121	9
SAGUACHE	59.8	27.8	43.8	-0.8	69	16	649	0	166	0.62	-0.08	89	8
HERMIT 7ESE	54.6	21.0	37.8	-0.7	67	9	836	0	100	2.25	0.66	142	3
ALAMOSA WSO AP	59.5	25.1	42.3	-1.2	71	13	700	0	160	0.88	0.18	126	8
STEAMBOAT SPRINGS	58.8	27.3	43.1	0.9	72	11	674	0	162	1.81	-0.06	97	12
YAMPA	54.1	27.5	40.8	-1.0	65	8	742	0	100	0.79	-0.51	61	8
GRAND LAKE 1NW	54.1	25.5	39.8	0.9	66	14	773	0	101	1.47	0.05	104	13
GRAND LAKE 6SSW	53.8	26.6	40.2	0.3	64	11	761	0	85	0.68	-0.31	69	11
DILLON 1E	51.4	23.5	37.4	-1.1	63	6	845	0	65	0.70	-0.10	88	9
CLIMAX	41.7	16.0	28.9	-4.5	52	-5	1115	0	2	1.52	0.16	112	14
ASPEN 1SW	55.3	28.9	42.1	-1.4	72	17	704	0	110	2.05	0.34	120	13
CRESTED BUTTE	51.3	22.4	36.8	-2.4	63	8	867	0	62	1.77	0.13	108	12
TAYLOR PARK	47.9	23.2	35.6	-2.2	58	9	906	0	26	1.80	0.50	138	9
TELLURIDE	54.0	25.6	39.8	-3.3	64	12	772	0	91	1.79	-0.43	81	9
SILVERTON	50.3	22.5	36.4	-2.5	63	13	880	0	57	2.86	0.52	122	9
WOLF CREEK PASS 1E	42.3	22.2	32.3	-3.9	54	9	1007	0	9	6.77	2.42	156	10

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	59.6	30.5	45.0	-0.1	72	13	613	0	164	1.06	-0.44	71	9
HAYDEN	59.6	31.1	45.4	0.2	73	12	601	0	165	0.93	-0.67	58	8
MEEKER 3W	61.3	31.0	46.1	0.0	73	16	578	0	188	1.13	-0.64	64	11
RANGELY	62.2	35.1	48.6	-0.3	74	23	499	0	198	1.42	0.24	120	7
GLENWOOD SPRINGS	63.4	33.5	48.5	-0.0	76	21	504	0	218	2.89	1.14	165	11
RIFLE	65.1	32.4	48.8	-0.2	77	15	497	0	243	0.92	-0.39	70	9
GRAND JUNCTION WS	65.2	40.6	52.9	-1.7	78	24	368	0	245	0.58	-0.40	59	7
PAONIA 1SW	65.9	38.2	52.0	0.5	80	28	395	0	254	1.23	-0.41	75	9
DELTA	66.6	35.5	51.1	-0.8	78	22	423	0	266	1.12	0.07	107	6
GUNNISON	57.7	24.3	41.0	-0.2	68	9	737	0	135	1.00	0.16	119	9
COCHETOPA CREEK	58.8	23.2	41.0	0.2	67	10	735	0	149	1.02	0.13	115	5
MONTROSE NO 2	62.6	35.5	49.0	-1.4	74	22	489	0	203	0.82	-0.32	72	8
NORWOOD	59.4	32.4	45.9	-0.3	71	18	585	0	162	1.00	-0.59	63	6
YELLOW JACKET 2W	62.4	35.4	48.9	-0.8	78	22	491	0	206	1.72	-0.09	95	6
CORTEZ	63.6	32.4	48.0	-2.0	74	18	522	0	225	1.11	-0.35	76	6
DURANGO	61.2	32.2	46.7	-2.1	71	19	559	0	197	3.20	1.18	158	6

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

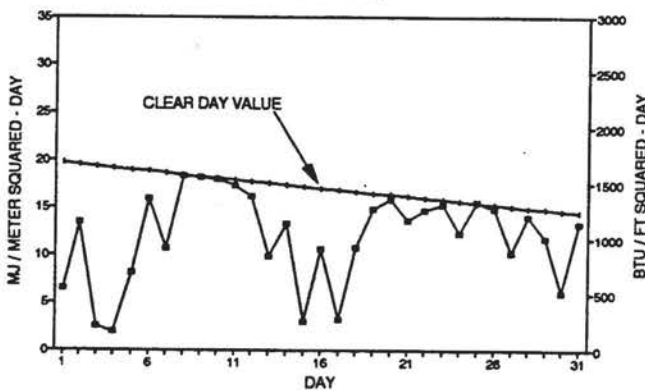
**OCTOBER 1994 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	12	9	10	--	--
Denver	15	7	9	71%	72%
Fort Collins	11	8	12	--	--
Grand Junction	12	6	13	61%	74%
Limon	15	5	11	--	--
Pueblo	NA	NA	NA	94%(?)	78%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Dense cloudcover blanketed much of Colorado in early and mid October, but there were also periods with little or no clouds statewide for several days in a row. The month as a whole ended up with more clouds and less solar energy than average for most areas.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION OCTOBER 1994**

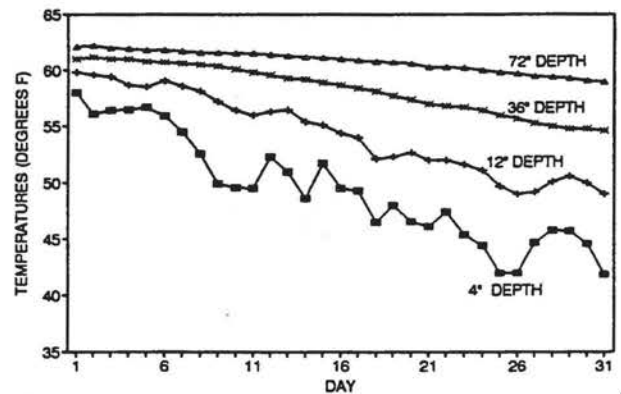


**OCTOBER 1994 SOIL TEMPERATURES**

Soil temperatures began their rapid decline in October, especially near the surface. This happens every year regardless of weather conditions since the rapid decline in solar energy reaching the ground is the dominant control of autumn soil temperatures.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES OCTOBER 1994**



**HATS OFF TO: *The Whole Crew at Browns Park Refuge***

It's more than 50 miles to the nearest Colorado Post Office (Maybell), and there are few neighbors. Were it not for the faithful staff that has reported weather conditions daily for nearly 30 years, we would have no historic climate data for the northwest corner of Colorado. Few ever visit the Wildlife Refuge at Browns Park, but we are certainly thankful for your dedicated weather observing. Keep up the fine work.

## A FUNNY THING HAPPENED ON THE WAY TO THE DROUGHT REPORT

I promised you a comprehensive description of Colorado's drought history. The bad news is, it's not ready yet. The good news is, we're making progress. For reasons that I am about to explain, this particular project is one of the most challenging and frustrating ones that I have ever undertaken. What could be easier than letting the computer zip through all our precipitation records and tell us when it has been dry? I agree. That would be easy, and I could have finished this years ago. But there is a problem which I better sit down and tell you about.

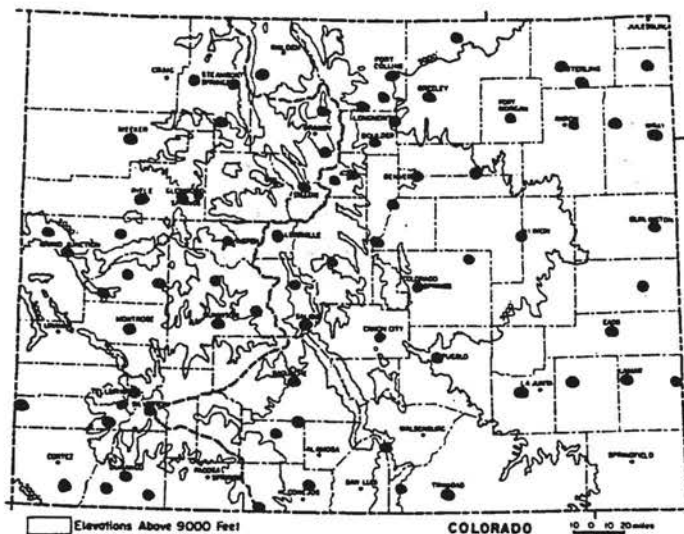
There is something about drought that makes scientists look stupid and makes everyone else appear brilliant. To anyone it is obvious when we're in a drought, especially farmers, ranchers, forest fire fighters and fisherman. Meanwhile, scientists keep fussing about how to define drought. When does it begin? When does it end? When should we care? I don't much like sounding stupid. I like to answer questions with the correct answer. I love sharing useful information that really helps Colorado citizens. But this drought stuff is a real challenge.

In the past year I have looked at more Colorado precipitation data than in the rest of my life put together. What I have learned, few people will ever care about, but I want you to know.

To truly quantify drought we need data. The study of drought is similar to studying climate change in one important way. They both rely on the availability of long, accurate and consistent climate records. In other words, DATA. This, of course, is where our difficulties arise, so this is where my story begins.

Several years ago, as we began our quest to determine Colorado's instrumental drought history, we identified the best long-term precipitation stations in Colorado. Our goal was to be able to show statewide intensity, duration and areal extent of drought for at least the past century. We found about 75 weather stations in Colorado scattered reasonably well around the State that met the following criteria: 1) at least 70 years with precipitation records (fewer if the site is in a remote area distant from other longterm stations), 2) little missing data, 3) measurements taken in the same way (same type of raingage and same procedures) and 4) changes in weather station location have been "minimal." The data for all of these stations were assembled in a special database.

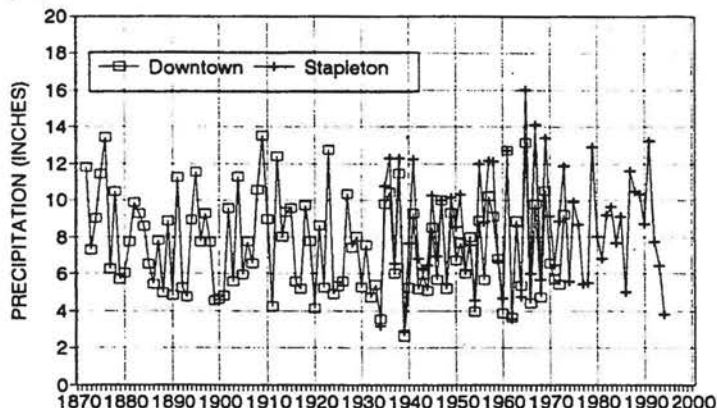
We then set aside some time to examine each station's data. We made an inventory of all missing data, and developed a simple procedure using neighboring weather stations to estimate monthly precipitation totals for each missing month. That seemed simple enough, but when it was all said and done, estimates for more than 1500 missing data months were required. That little activity ended up taking days to complete. In some cases it was impossible to make confident estimates due to a lack of neighboring weather stations.



A few months ago when we finally finished filling in the missing data, we honestly thought we were ready to perform our final analyses and publish our drought results. At first we simply looked at historical time series of annual precipitation for a few sites and computed several drought indexes based on these data. We generated dozens of graphs and spent hours pouring over the results. But things were puzzling. Drought patterns were simply not what we were expecting. It was hard to put a finger on the problem — things just weren't right.

After several days of frustration, we set the drought project aside and attacked some of our other research activities. I also took vacation — how nice. When we got back to the project at the end of the summer, we decided that it was necessary to dig into the data more carefully. So this is what we've been doing in our spare time since August.

Growing Season (May-Sep.) Precipitation  
Denver, Colorado





One by one, we took each station's precipitation records and computed (and graphed) seasonal precipitation totals for winter (October-March), spring (April-June), summer (July-September), growing season (April-September) and water year (October-September). This gave us a lot of neat stuff to look at.

What we saw were the historical ups and downs of Colorado precipitation that define our drought history. Large year-to-year precipitation variations are a natural part of our climate, and all sites showed these variations. *But many of the longterm sites also showed interesting trends and variations that cannot be explained by natural climate processes.* These variations were particularly noticeable in the individual seasonal time series when neighbor stations were directly compared to each other: Time after time, we found examples where a station would experience several consecutive wet years (with respect to historic averages) while surrounding stations were consistently dry – and vice versa. Could this be possible?

Those of us who work closely with precipitation data know that strange things are possible. In Colorado we rarely see all areas wet or dry at the same time for individual months, seasons or years. Over several consecutive years, however, natural local differences tend to average out. When they don't, you begin to see unnatural discontinuities in the precipitation time series when compared to data from surrounding areas. Almost always, these discontinuities or inhomogeneities are related to how and where the data were collected. That is why some of our early results just didn't look right.

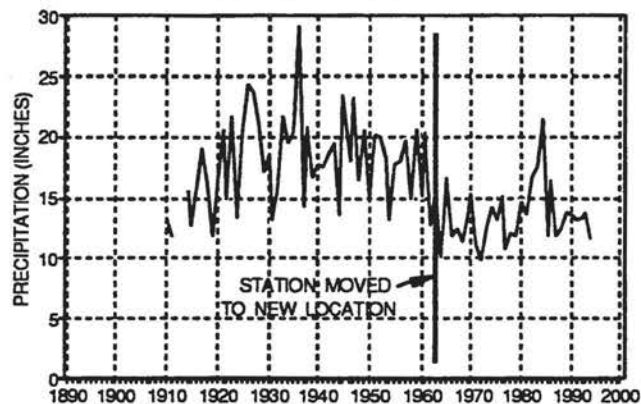
#### What Then?

All was not lost. By carefully studying the precipitation records at each site and investigating documented station history records, we found that many of the data weirdities and discontinuities could be explained. Better yet, they could be "corrected."

The most common problem affecting the consistency of the precipitation data were changing station locations. Historical documentation kept by the National Weather Service identifies most of the changes in weather observers and station locations. What we found was that most of the "unnatural" episodes, trends and variations in the longterm precipitation records were directly associated with changing the location of the weather stations. Interestingly, out on Colorado's Eastern Plains there were instances of stations being moved 10 miles or more without affecting data continuity. In and near the mountains, however, moving weather stations just a few hundred feet could greatly affect measurements. The Dillon example is a good one. Ever since the station was moved when the reservoir was built there, Dillon has been consistently drier, especially in winter. For years people blamed the new reservoir for decreasing snowfall. The real issue, however, was that the station was moved to a slightly drier and much more open location where the precipitation gage was less effective.

Another example was Crested Butte. After struggling for hours with the data we finally gave up and removed it from

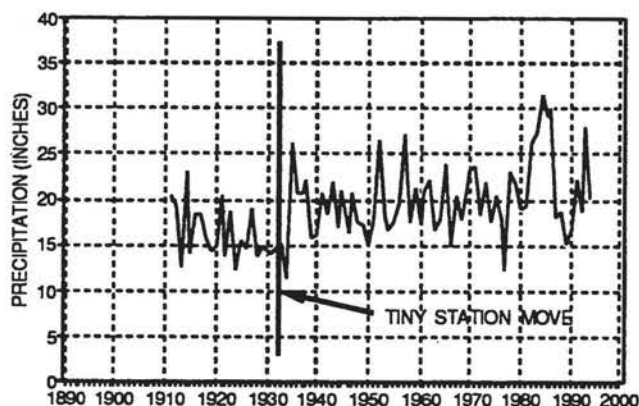
WATER YEAR PRECIPITATION  
DILLON, COLORADO



our study. A combination of about 12 station moves and even more changes in weather observers along with changes in the environment immediately around the rain gage, all combined to make the historic records impossible to interpret.

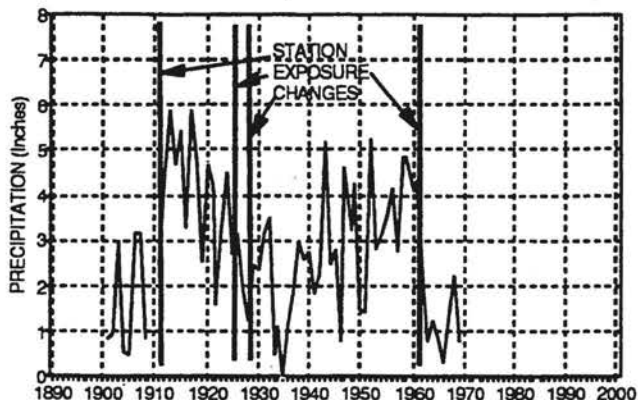
The most amazing discontinuity we discovered was a minor relocation of the raingage at the Shoshone Power Plant. The gage was moved only a few feet, but the result was more than 20% increase in precipitation. You say, "How can that be?" In the bottom of the Glenwood Canyon, that is what happens. If we want historically consistent measurements, we can't move the raingage.

WATER YEAR PRECIPITATION  
SHOSHONE POWER PLANT, COLORADO



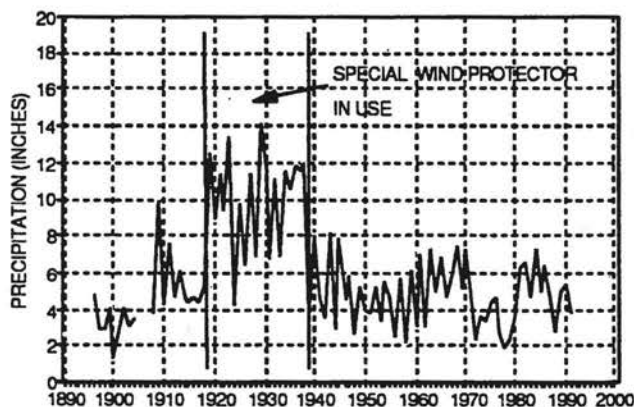
In some ways, Eastern Colorado weather stations are more tolerant of station moves, but in other ways they aren't. The Grover record is a good example. Dramatic changes in winter precipitation occurred each time the station was moved. Why? Most likely because of wind effects. In windy areas, like the Pawnee Grasslands around Grover, gages that are in open areas reliably catch less precipitation than in protected areas. It appears that some of the Grover data were collected behind wind breaks while other periods the gage was in open areas.

**WINTER PRECIPITATION (Oct. - Mar.)  
GROVER, COLORADO**



As a rule of thumb, the greatest problems and hence the most historical precipitation inconsistencies occur in winter. However, the most dramatic discontinuity that we found took place in the summer. Extremely wet summer weather had been observed at the Leadville weather station from 1919 to 1939. But no surrounding weather station experienced this anomaly. Scientists investigating the reports of unusually heavy downpours during those years discovered that a special shield had been built around the gage to help block winter winds so that the gage caught a higher percentage of the snow that fell. It was during those same years that summer rains increased dramatically and "unnaturally." That mystery is still not totally resolved, but it appears that rain could splash and small hail could bounce off the wind shield and be magnified by as much as a factor of 4 or 5 in the gage. Since the magnification was a factor of precipitation type, intensity and perhaps wind speed and direction, a simple seasonal correction is not easily computed.

**SUMMER (July - Sept.) PRECIPITATION  
LEADVILLE, COLORADO**



**What Are We Doing About It**

In order to produce meaningful drought statistics, we have been working diligently to identify all discontinuities and irregularities associated with known and documented station changes. In all, verifiable discontinuities were found in well over half of the stations. Only 20 stations statewide have been identified with at least 70 consecutive years of data and no

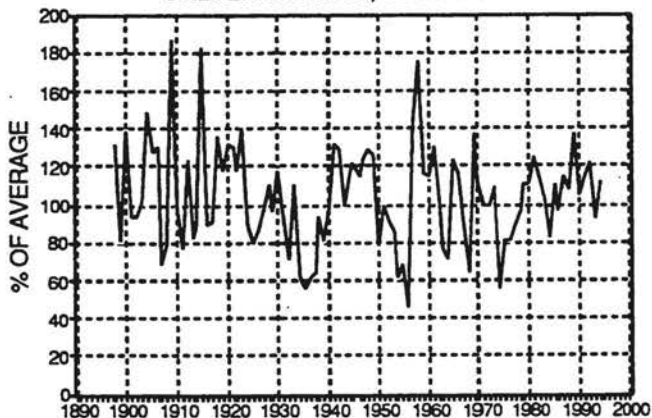
obvious discontinuities. These became the control stations for making adjustments to data records at the other sites. A common base period of 1931-1990 was used for these sites. Seasonal and annual precipitation was expressed as a percent of the 1931-1990 average.

**Colorado's Best Longterm  
Precipitation Stations**

(Based on longevity and historic homogeneity)

<u>Station Name</u>	<u>Period of Record</u>
Akron 4E	1905-present
Ames (near Telluride)	1915-1985
Cheyenne Wells	1897-present
Delta	1888-present
Denver (City/Airport)	1872-present
Fort Collins	1889-present
Fort Lewis (near Durango)	1912-present
Grand Junction	1892-present
Holly	1894-present
Kassler	1899-present
Lamar	1889-present
Las Animas	1867-present
Limon	1908-present
Longmont	1909-present
Montrose	1885-present
Pueblo	1873-present
Rocky Ford	1888-present
Sterling	1910-present
Waterdale (near Loveland)	1893-present
Wray	1890-present

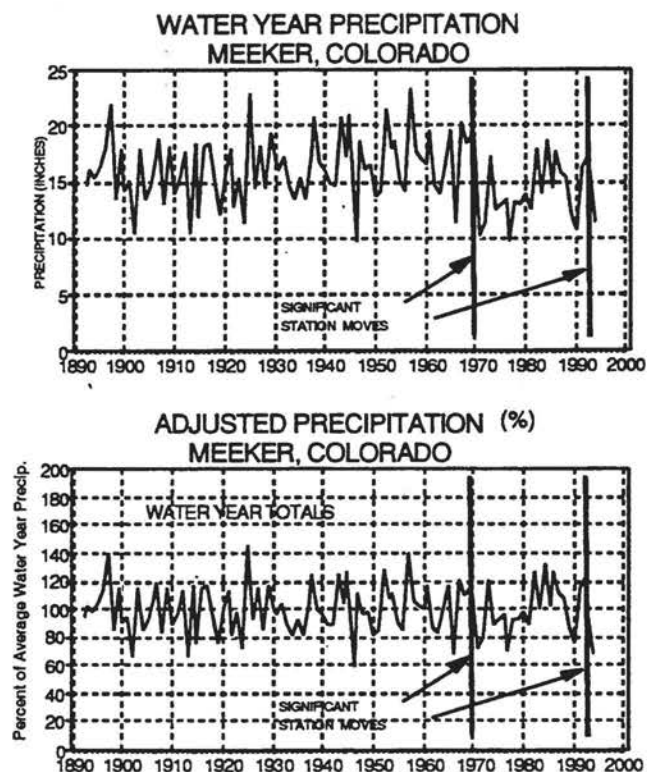
**WATER YEAR PRECIPITATION  
CHEYENNE WELLS, COLORADO**



For the many stations with inhomogeneities, we then identified each period of consecutive years between discontinuities. Monthly average precipitation for each of the internally consistent data collection periods was computed. By comparing monthly averages for the same sets of years from the closest reference stations and computing the ratio of those averages with the 1931-1990 reference averages, adjustment coefficients were computed. It was therefore



possible to compute "adjusted" monthly averages for periods of years that were not consistent with other periods of years. This is hard to explain with words, but I think the following graphs show the idea. We have ended up with time series of longterm precipitation expressed as a percent of average where the averages have been allowed to vary to account for changes in station location, gage exposure or observing procedures.



#### Can We Finally Do the Drought Report Now?

At last I think we are ready to proceed with analyzing Colorado's observed drought history. **VERY SOON** I will share the results with you. Even with nearly 80 longterm stations, some parts of Colorado have not been well represented. High mountain areas, northwestern Colorado and southeastern Colorado are particularly data sparse prior to the 1930s. To improve our results, we are now adding about 25 more stations which have at least 40 consecutive years of data. It will take another month to complete the data checking procedures for those stations. Then we will finally be able to turn the computer loose and blast out everything we ever wanted to know about drought in Colorado.

#### Are We Confident That We Now Know the Truth?

I have always known that measuring precipitation is not precise. A gage measurement of precipitation rarely provides absolute truth but rather provides a quantitative estimate. For steady rains the estimate is quite accurate (perhaps  $\pm 4\%$ ) but under snowy, windy conditions, gage estimates could be off by more than 50%. There is more to measuring precipitation than just sticking a can outside and measuring its contents. Without a doubt, the data that we are

now using is the best and most consistent historical precipitation information available. The National Weather Service's Cooperative network is the only source of consistent precipitation data that covers more than a century. But it is imperfect. For each of the large discontinuities that we have been able to detect and correct, there are probably 10 minor changes that have affected precipitation measurements by a few percent that we can't confirm. Also, problems and discontinuities that only last for a year or two at a site may never be caught since they blend in with the variability in precipitation that is a normal part of climate. Leaks in raingages would be an example.

#### A Plea for Data Continuity

The exercise we have just been through has convinced me more than ever before that we must make every reasonable effort to assure that the data we collect today are as accurate as possible and consistent from day-to-day and from year-to-year. The only way to accomplish this is by treating weather stations as historical landmarks that need to be preserved and maintained. Moving weather stations, changing instrumentation, changing observing procedures must all be avoided if at all possible. We are succeeding in this regard with our Fort Collins weather station which has now been operating without missing a day for 106 years. We were particularly excited during 1994 when the Georgetown Historical Society took on weather observing responsibilities.

What about automation? This still troubles me deeply. Historically, much of our nation's basic climate data have been collected by government agencies using human observers. Justified by the intention to save taxpayer dollars, more and more data collection has been automated. It is difficult to imagine that this trend will change any time in the near future. But those of us who know precipitation data well, know that automated weather stations are often unable to measure year-round precipitation as well as a motivated human observer, even when using very expensive equipment. If 100 years from now we were to set out to update Colorado drought history using the data that we are collecting today from automated weather stations, the results could be painfully disappointing. Most current electronic raingages don't work well in the winter. Sigh! This is another story that I will elaborate on later.

As long as I live, I will work hard to maintain reliable climate data collection in Colorado. Without good data, we're all wasting a lot of time. For all of you weather observers who read this, thanks so much for your efforts. I hope we can all keep working together.

#### Acknowledgements

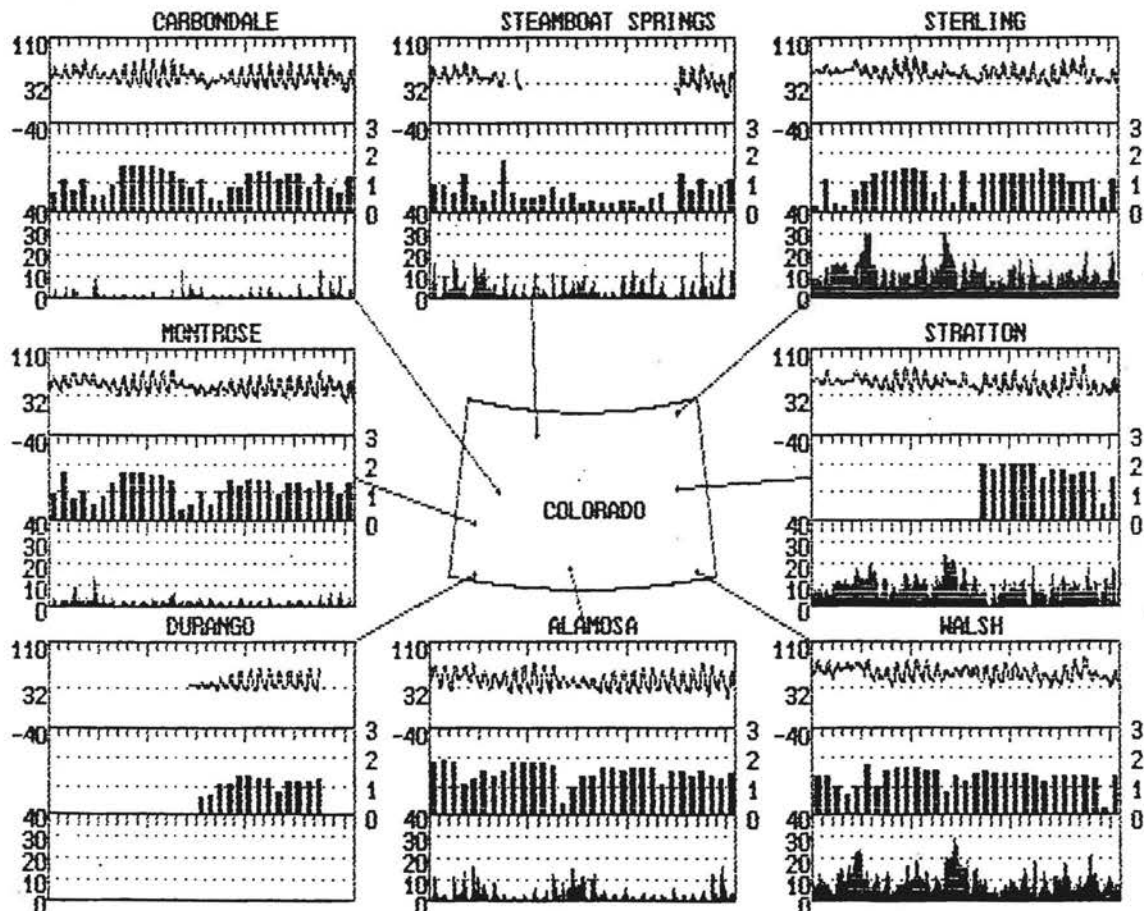
Kim Burchfiel, a senior in the College of Engineering here at CSU, helped a great deal with this project. She is completing a study of Colorado drought as her senior design project. Thanks also to Jim Harrington who has spent scores of hours working with these data.

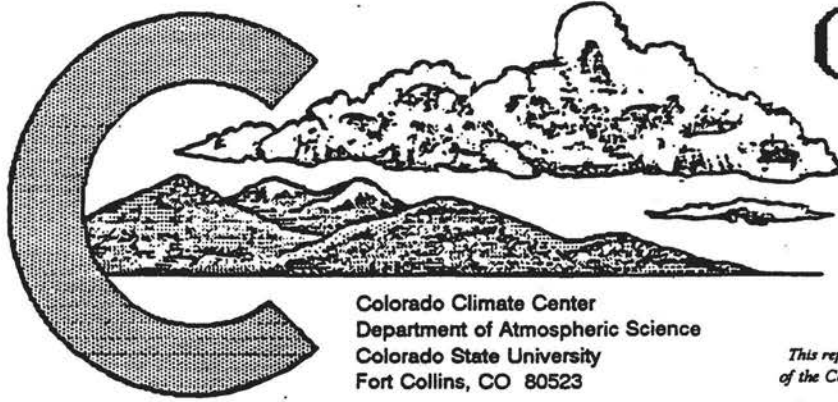
WTHRNET WEATHER DATA      OCTOBER 1994

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh	
monthly average temperature ( °F )	42.0	n/a	43.3	46.2	n/a	49.1	49.9	54.2	
monthly temperature extremes and time of occurrence ( °F day/hour )									
maximum:	71.6 28/15	n/a	73.9 11/15	72.5 13/14	n/a	n/a	76.6 10/15	81.3 28/17	82.9 28/14
minimum:	12.6 31/ 6	n/a	15.1 31/ 7	17.6 31/ 7	n/a	n/a	25.7 25/ 6	25.5 25/ 6	32.2 25/ 6
monthly average relative humidity / dewpoint ( percent / °F )									
5 AM	88 / 26	n/a / n/a	93 / 30	78 / 30	n/a / n/a	60 / 31	80 / 36	84 / 42	
11 AM	36 / 32	n/a / n/a	53 / 39	40 / 36	n/a / n/a	36 / 34	51 / 39	53 / 47	
2 PM	23 / 29	n/a / n/a	39 / 38	30 / 34	n/a / n/a	30 / 33	41 / 41	41 / 46	
5 PM	27 / 28	n/a / n/a	41 / 35	34 / 34	n/a / n/a	31 / 32	44 / 43	44 / 45	
11 PM	61 / 27	n/a / n/a	74 / 32	64 / 31	n/a / n/a	51 / 30	70 / 38	72 / 42	
monthly average wind direction ( degrees clockwise from north )									
day	174	n/a	234	241	215	154	177	159	
night	136	n/a	n/a	132	126	160	185	221	
monthly average wind speed ( miles per hour )	2.48	n/a	0.77	1.38	2.73	9.18	8.25	8.63	
wind speed distribution ( hours per month for hourly average mph range )									
0 to 3	529	n/a	446	630	436	51	88	49	
3 to 12	160	n/a	38	92	185	517	523	534	
12 to 24	23	n/a	0	2	21	158	133	154	
> 24	0	n/a	0	0	0	18	0	7	
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	1474	n/a	1023	1199	655	1002	960	1284	
"clearness" distribution ( hours per month in specified clearness index range )									
60-80%	129	n/a	144	171	50	156	12	205	
40-60%	37	n/a	66	48	39	62	13	68	
20-40%	29	n/a	66	63	96	38	7	36	
0-20%	17	n/a	56	30	106	71	18	26	

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

NOVEMBER 1994

Volume 18 Number 2

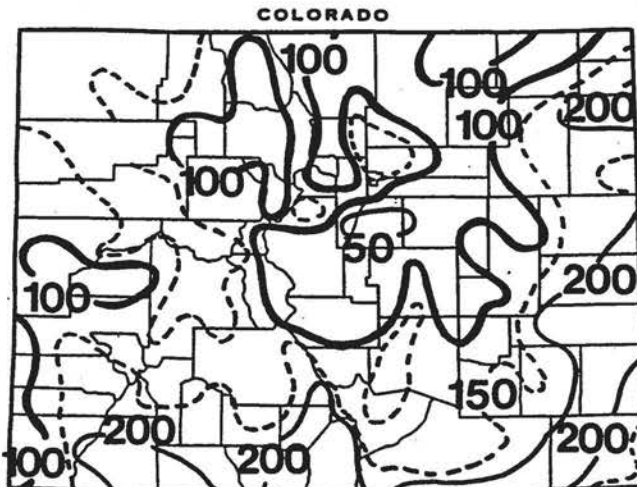
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## November Climate in Perspective – Many Changes

Very strong early winter jet stream winds aloft kept weather systems on the move in November. Numerous storm systems, several accompanied by deep low pressure centers, crossed the region. Heavy precipitation and large variations in temperature were noted. For the month as a whole, most of Colorado ended up with more cloudiness and precipitation than normal and temperatures were generally cooler than average.

### Precipitation

Eight storm systems during November 1994 influenced Colorado's weather. The November 2-4 storm brought precipitation to most areas of the State.



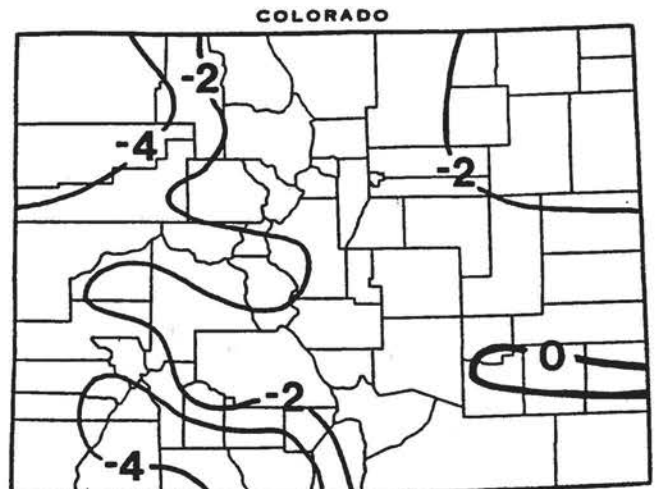
November 1994 precipitation as a percent of the 1961-1990 average.

Precipitation associated with each of the other storms tended to be more localized. Several of the storms produced interesting precipitation patterns with strong local gradients. Overall, November precipitation ended up well above average over much of Colorado and especially in the south. Below

average totals were limited to parts of the Front Range, northeastern plains, the Upper Arkansas River valley, several valleys in the northern mountains and a few small areas in western Colorado. Areas just south of Denver received less than 50% of average while areas just north of Denver were close to 200% of average.

### Temperatures

There were no true polar cold blasts in November 1994 (like the one that hit on Thanksgiving last year). Instead, there was a regular progression of temperature fluctuations that made it difficult to know quite how to dress. For the month as a whole, temperatures ended up cooler than average statewide. The coolest areas with respect to average were found in southwestern Colorado where a few spots in the mountains were as much as 6 degrees cooler than normal. The mildest areas were along the Front Range and in southeastern Colorado where most stations were about 1°F below average. Daytime temperatures were especially cooler than average as a result of frequent cloudcover, while nighttime temperatures were close to normal in most areas.



Departure of November 1994 temperatures from the 1961-90 ave.

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## NOVEMBER 1994 DAILY WEATHER

- 1-4 A deep low pressure area passed well north of Colorado on the 1st bringing warm and windy conditions east of the mountains (86° at La Junta 20S, the warmest in the State). Clouds thickened statewide and much cooler air slipped into northern Colorado during the day on the 2nd as a new storm moved toward Colorado from the west. Precipitation became widespread on the 3rd with fog, light rain, freezing drizzle and mountain snow changing to mostly snow statewide. Some moderate snow totals were reported, and very icy roads developed in many areas. Heaviest snow totals included 5" at Akron, 8" at Steamboat Springs, 14" at Grant and 17" at Wolf Creek Pass. Precipitation tapered off to snow showers on the 4th, but cloudy, foggy and chilly conditions persisted in many areas.
- 5-7 Clearing with some patchy morning fog on the 5th. Then partly cloudy and much warmer with low elevation temperatures in the 70s and low 80s east of the mountains by the 7th. A few sprinkles of rain fell in northeast Colorado early on the 6th. Otherwise, it was a dry period statewide.
- 8-9 A fast moving storm system crossed Colorado on the 8th bringing precipitation and sharply colder temperatures to most of western and northeastern Colorado. As much as 5" of snow whitened northeast Colorado. Glenwood Springs measured 0.44" of cold rain. Skies cleared on the 9th in western Colorado while clouds, local fog and cool temperatures persisted east of the mountains.
- 10-15 Areas of dense fog east early on the 10th gave way to mild, partly cloudy weather. Southwesterly winds aloft heralded the approach of a new storm. By the 12th, a deep low pressure center was over northern Colorado. Strong southerly winds swept across the Eastern Plains and a surge of very moist air rammed into southern Colorado. Durango totalled 2.55" of rain in 24 hours--a record for so late in the season. The San Luis Valley also had rain with nearly 1" reported along the base of the Sangre de Cristo Mountains. 3 feet of snow fell in some of Colorado's southern mountains by late on the 13th. Precipitation was much lighter over the Northern and Central Mountains. Almost nothing fell east of the mountains. Late on the 13th, as the storm system appeared to be leaving the area, a small area of heavy snow developed east of the mountains. By morning on the 14th, a foot or more of unexpected snow had fallen across northern sections of the Denver metropolitan area with 16" reported at Boulder, 12" at Denver Stapleton and 11" at Brighton and Northglenn. Only 1-3" totals were reported elsewhere on the Front Range. Skies cleared on the 14th. Some very cold temperatures were noted early on the 15th including -12° at Leadville and +4° at Longmont. Dense fog and icy roads north of Denver contributed to a major chain reaction collision involving dozens of vehicles on I-25.
- 16-20 Two storms in rapid succession affected Colorado's weather. Clouds lowered on the 16th and snows with low elevation rain moved into western Colorado. Most of western Colorado received a few inches of snow by morning on the 17th, but Crested Butte reported 10" and Hayden was surprised by 13". As the storm pushed eastward, cold winds with 50-70 mph gusts rattled the Front Range. The next storm was already in Utah early on the 18th but moved southward into New Mexico and slowed. Snow developed over southern Colorado on the 19th with 6-12" reported in the Southern Mountains. The storm accelerated eastward on the 20th bringing a period of rain along with some thunder changing to snow across portions of the Eastern Plains. A swath of heavy snow fell from Trinidad to near Burlington with 4-10". Including the rain that fell, Cheyenne Wells, Eads, Lamar and Springfield all received well over 1.00" of moisture from the storm.
- 21-22 Partly cloudy and chilly weather on the 21st with mountain snowshowers. An upper disturbance triggered locally heavy snow early on the 22nd in Eastern Colorado. Folks in Burlington awoke to 5" of new snow.
- 23-25 Dry weather developed for Thanksgiving. Temperatures were crisp and cold in Western Colorado's snowcovered valleys with morning temperatures near or below zero. East of the mountains it was sunny and much warmer on the 23rd, partly cloudy on the 24th, and sunny and still mild on the 25th.
- 26-30 A strong Pacific storm system sprinted across the region on the 26th bringing a few inches of snow to the mountains and western valleys. This was followed by bonechilling cold northwesterly winds 27-28th. Highs in the mountains only reached the teens and single digits with more mountain snow (7" at Steamboat on the 27th). Winds quieted on the 29th. Then warmer downslope winds developed on the 30th with much warmer temperatures east of the mountains.

Highest Temperature	86°F
Lowest Temperature	-23°F
Greatest Total Precipitation	7.74"
Least Total Precipitation	0.16"
Greatest Total Snowfall	89"
Greatest Snow Depth	34"

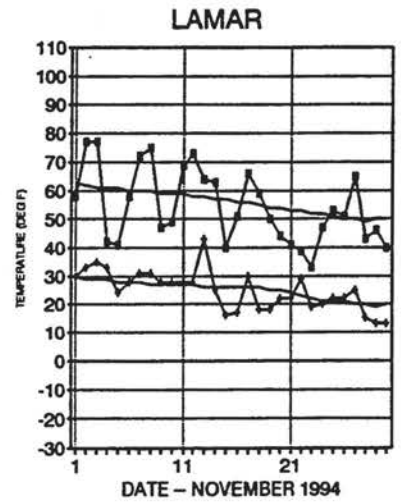
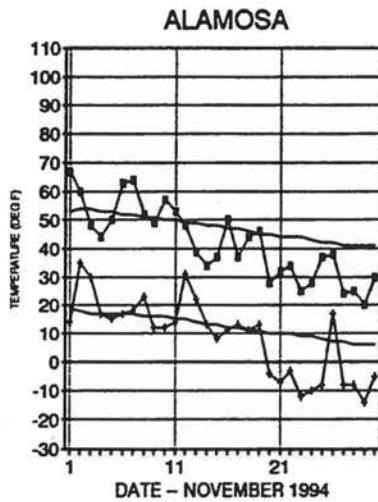
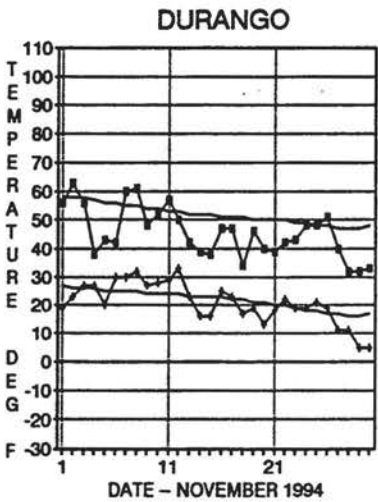
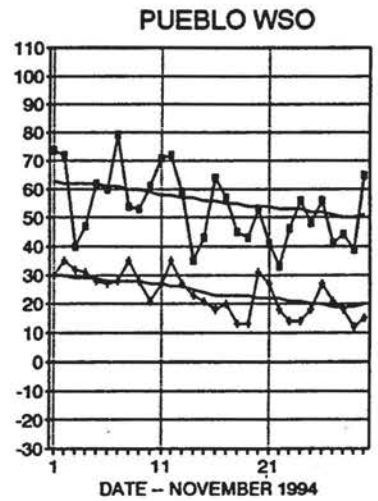
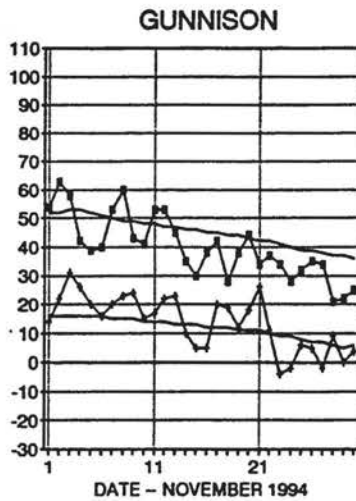
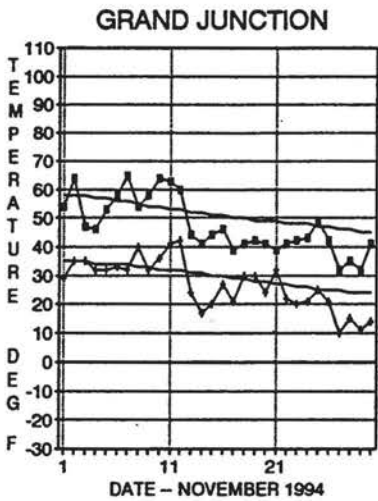
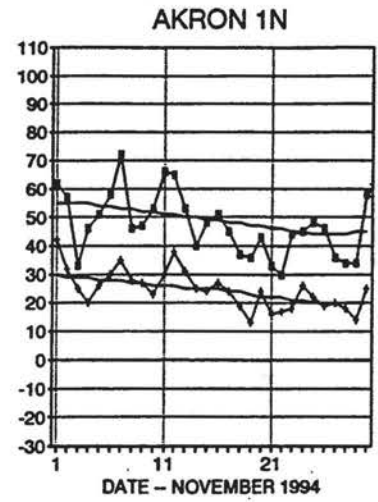
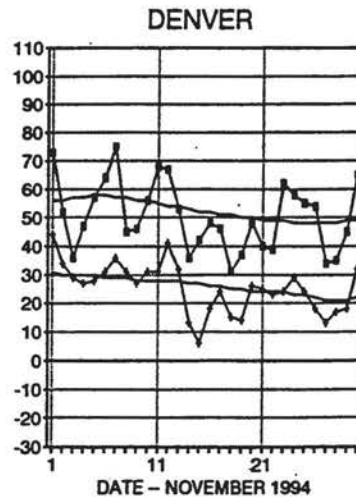
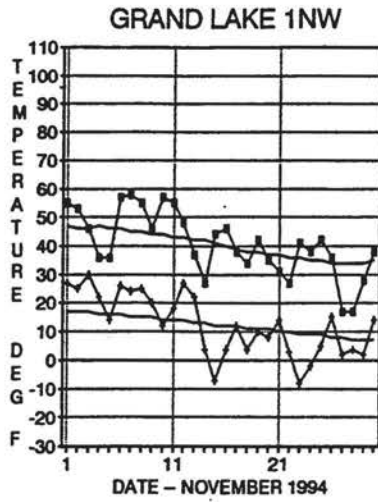
### Weather Extremes

November 1	La Junta 20S
November 30	Wolf Creek Pass 1E
	Wolf Creek Pass 1E
	Rush
	Wolf Creek Pass 1E
	Bonham Reservoir

## NOVEMBER 1994 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

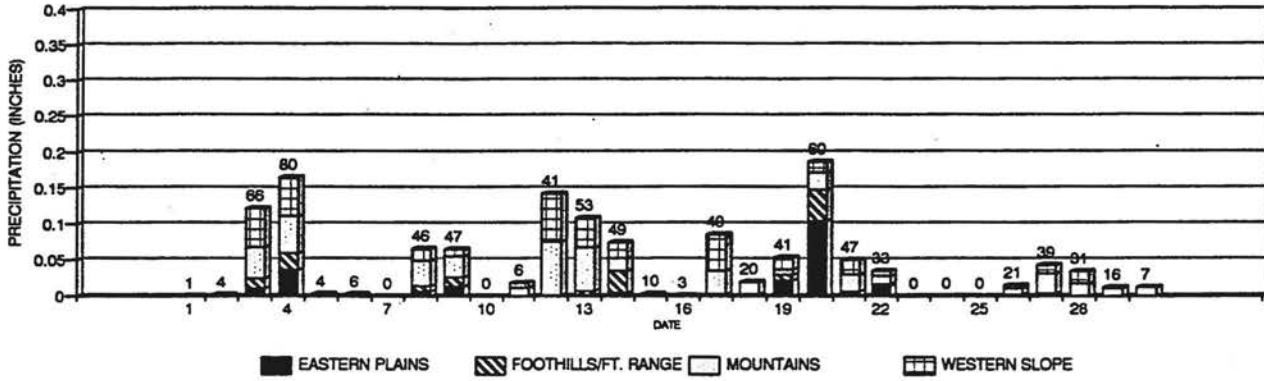


# NOVEMBER 1994 PRECIPITATION

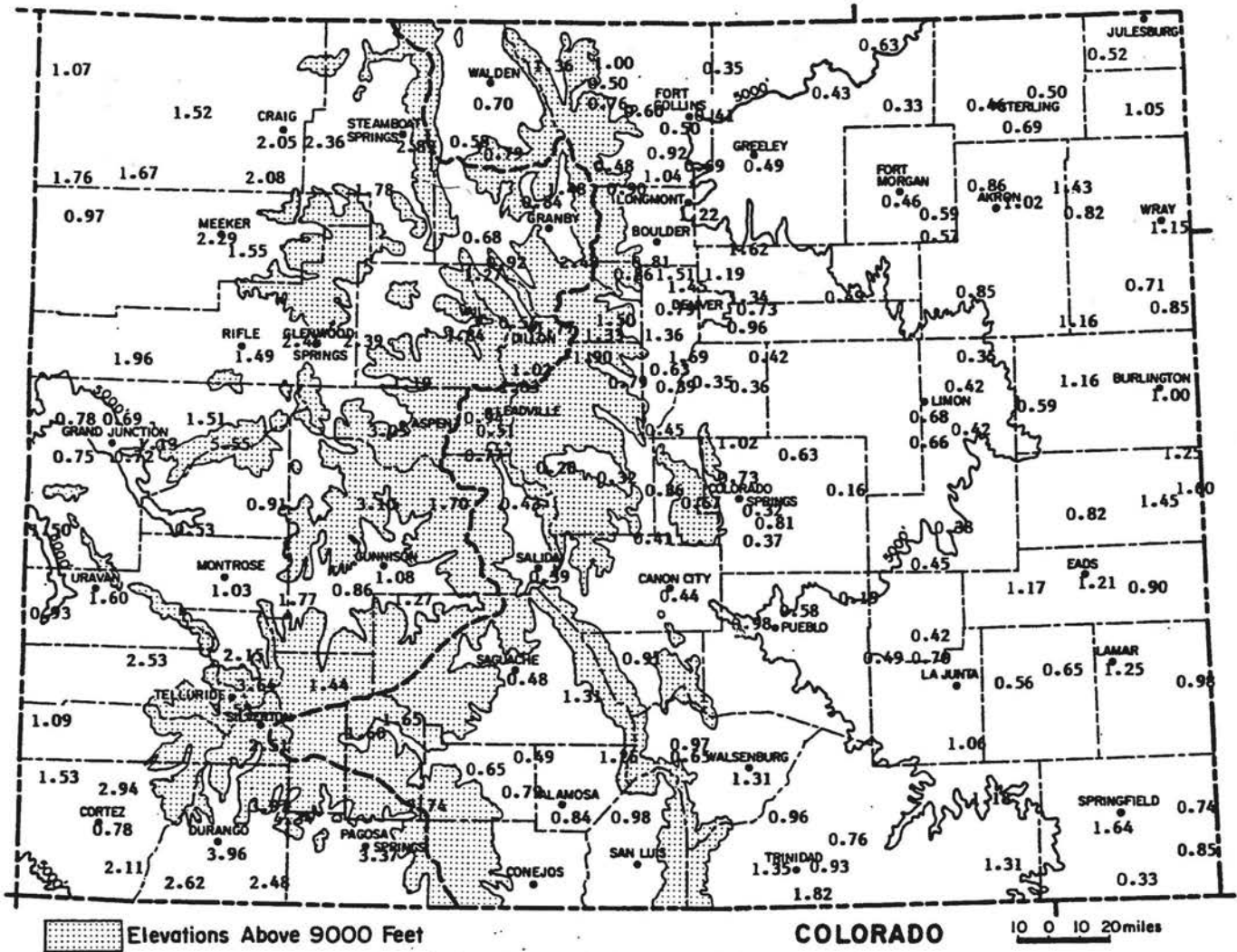
Eight storm systems produced 5 precipitation episodes for Colorado in November. The majority of precipitation fell Nov. 3-4, 12-14, and 16-20. Precipitation fell on nearly half the days in November in the mountains. On the Eastern Plains, most stations reported 3-5 days with

measurable precipitation. The storm 3-4th was the only precipitation episode that brought precipitation to most areas of Colorado at the same time. Overall, state-averaged precipitation for November totalled 1.35" compared to the 1961-1990 average of 0.95".

COLORADO DAILY PRECIPITATION - NOV 1994

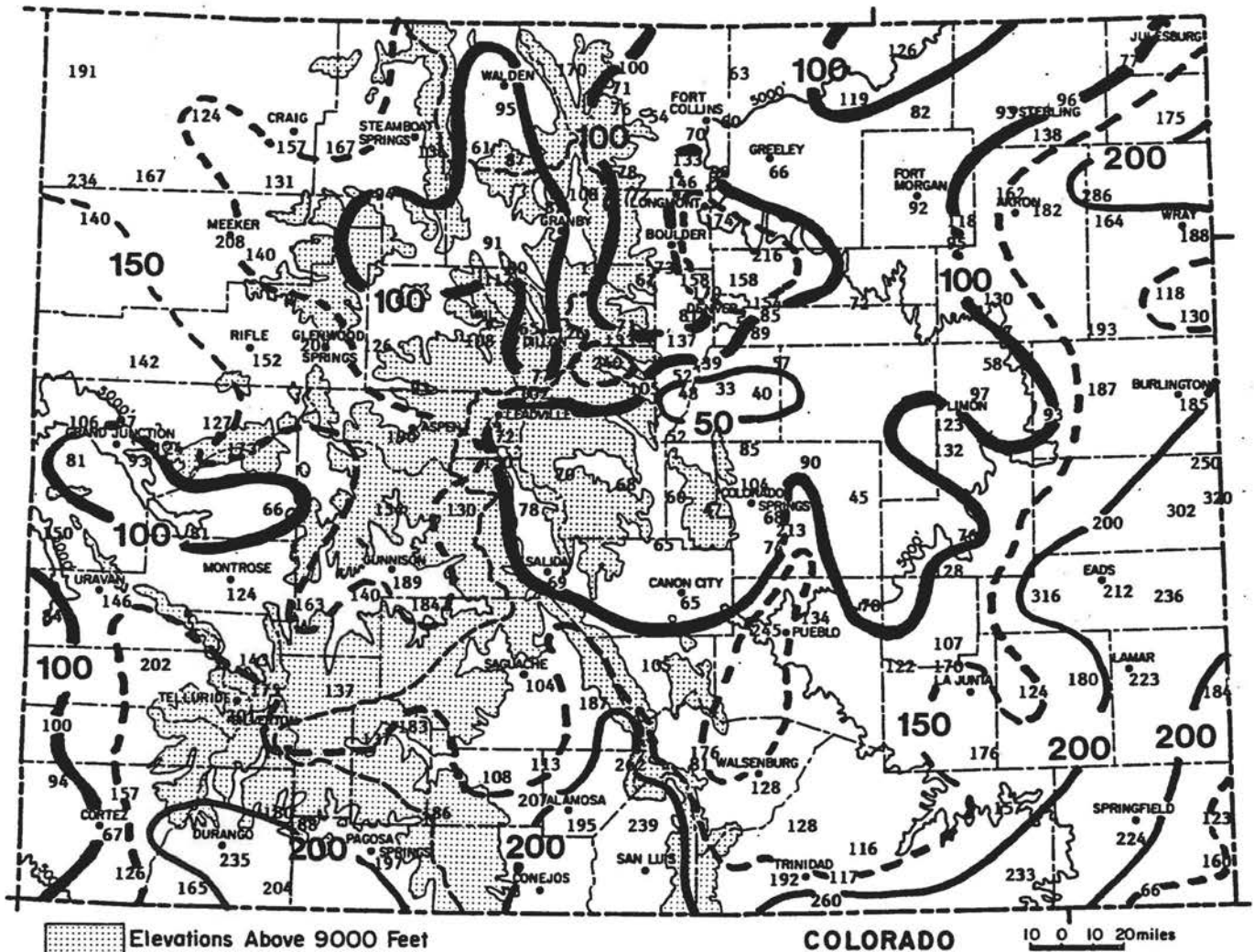


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)

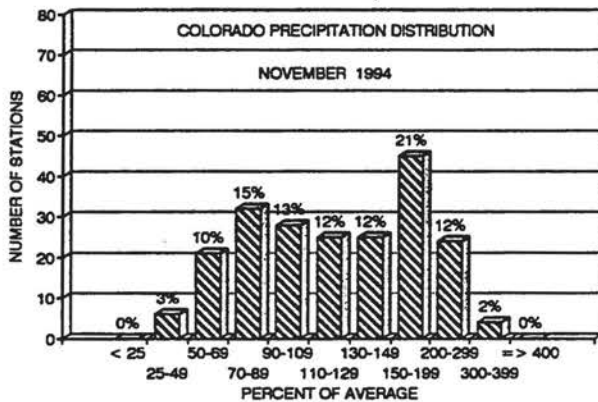




# NOVEMBER 1994 PRECIPITATION COMPARISON



November 1994 Precipitation as a Percent of the 1961-90 average.



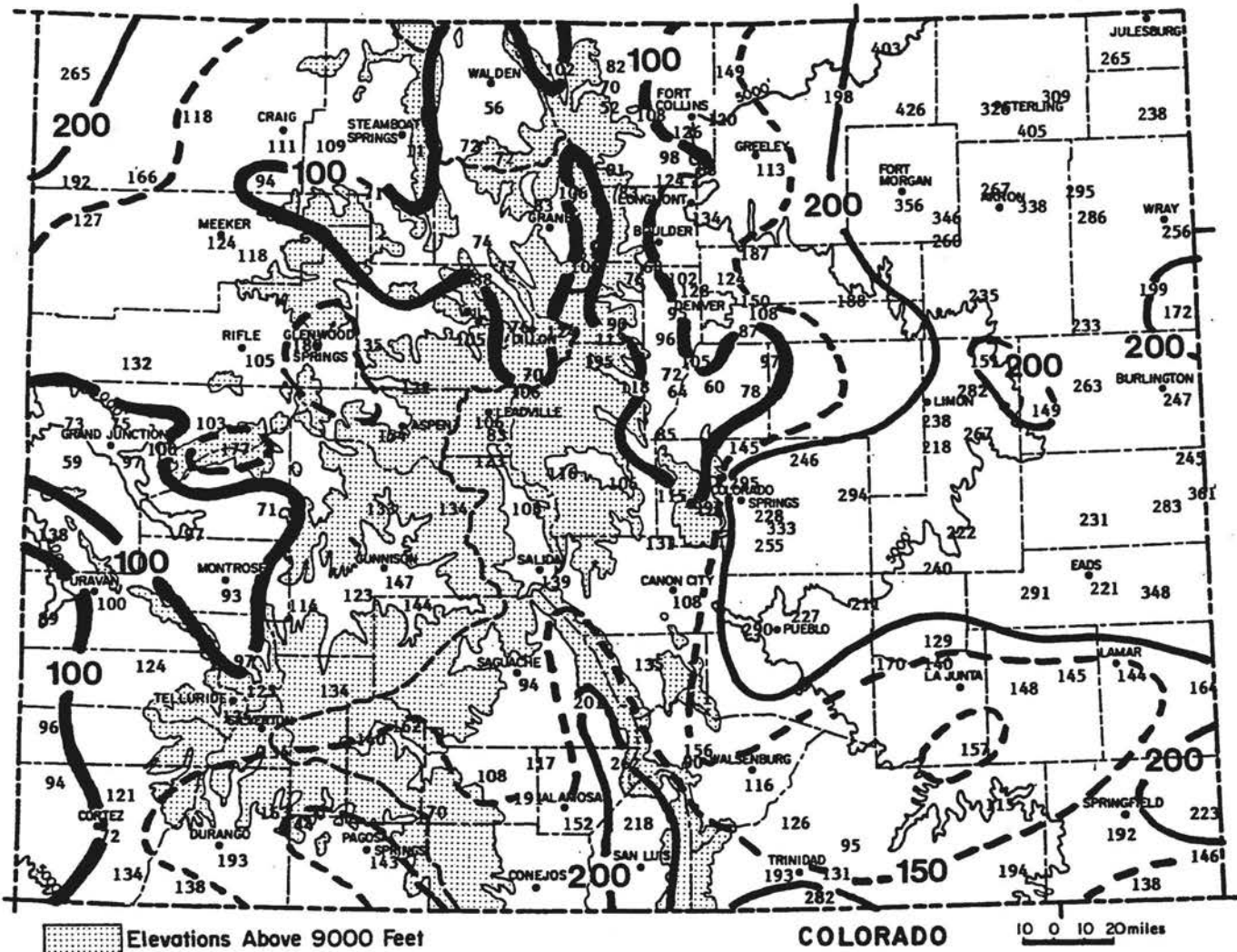
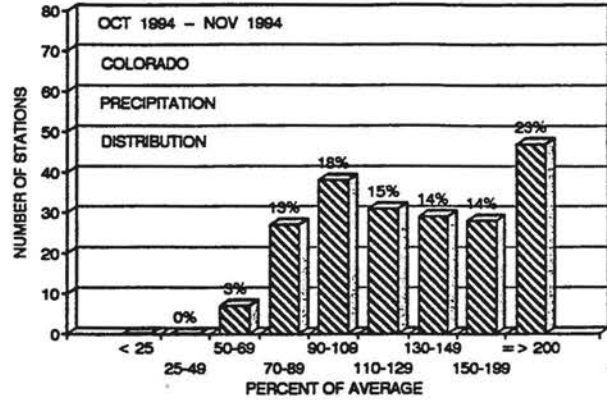
There were both wetter and drier than average conditions experienced in Colorado during November, but wet areas outnumbered dry areas about 2 to 1. Haswell, Arapahoe and Cheyenne Wells recieved more than 300% of average, while a few stations between Denver and Colorado Springs got less than 50% of average. 14% of Colorado's weather stations got more than double the normal November precipitation.

## NOVEMBER 1994 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	1.34"	16th wettest in 123 years of record (wettest = 3.21" in 1946)
Durango	3.96"	6th wettest in 102 years of record (wettest = 4.55" in 1982)
Grand Junction	0.69"	37th wettest in 103 years of record (wettest = 2.39" in 1895)
Las Animas	0.56"	39th wettest in 128 years (settest = 3.06" in 1946)
Pueblo	0.58"	33rd wettest in 126 years of record (wettest = 2.48" in 1991)
Steamboat Springs	2.89"	11th wettest in 90 years of record (wettest = 5.59" in 1985)

## 1995 WATER YEAR PRECIPITATION

So far, the 1995 water year is off to a good start. Two months into the new water year, the majority of Colorado is wetter than average. Much of southern and eastern Colorado has received more than 150% of average so far. The wet start has been particularly welcomed by farmers in northeastern Colorado who suffered through their driest growing season in many years this past summer. The majority of Colorado's High Country is also off to a good start. This is important both for winter recreation and for next year's water supply. Midwinter periods have not been productive snow accumulation months in the high mountains (in comparison to longterm averages) during the past several years, so early moisture has become a larger contributor to water resources. A few areas have missed the brunt of the autumn storms and remain drier than average for this date. These areas include much of the Front Range foothills, North Park, portions of the Upper Colorado basin (76% of average so far at Dillon), and extreme west central Colorado. North Park (the North Platte watershed) continues to experience longterm drought conditions. Since 1986, North Platte water supplies have been persistently low.



## COMPARATIVE HEATING DEGREE DAY DATA FOR NOVEMBER 1994

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (303) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700	1174								2308
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8850
	93-94	232	221	425	718	1168	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095								2325
BOULDER	AVE	0	7	136	367	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	851	514	146	10	5648
	94-95	4	0	77	442	848								1371
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981
	94-95	50	85	286	674	1018								2093
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	6320
	93-94	0	25	189	450	953	978	1060	1068	854	499	144	1	8021
	94-95	4	0	80	370	836								1290
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987
	93-94	0	22	153	435	816	864	886	828	609	468	M	0	M
	94-95	0	0	42	361	695								1098
COLORADO SPRINGS	AVE	6	18	164	468	816	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	926	749	576	223	14	6271
	94-95	10	14	96	486	811								1419
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	508	926	1148	1086	1038	895	528	272	14	6404
	94-95	4	0	111	522	891								1528
CRAIG	AVE	32	58	275	608	998	1342	1479	1193	1094	687	419	193	8378
	93-94	87	60	286	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613	1133								1969
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	93-94	13	33	232	598	1052	1245	1231	1010	768	533	238	0	8943
	94-95	0	0	67	423	794								1284
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	93-94	1	20	152	488	900	948	946	879	618	485	104	3	5544
	94-95	3	2	57	397	804								1283
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1464	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192								3054
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6636
	94-95	2	2	104	559	952								1619
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1116	M	1258	1080	779	639	330	64	M
	94-95	M	M	M	M	M								M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7463
	94-95	59	48	286	677	937								2007
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	869	493	141	8	6002
	94-95	3	3	89	460	820								1375
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1166	704	550	126	8	M
	94-95	9	8	106	435	896								1456
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	870	389	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	69	0	5297
	94-95	0	0	24	368	832								1224

\* = AVES ADJUSTED FOR STATION MOVES    M = MISSING    E = ESTIMATED

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (303) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	381	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10462
	94-95	205	188	423	761	1154								2731
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6308
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957
	94-95	1	3	68	441	860								1373
GUNNISON	AVE	130	204	435	763	1143	1609	1766	1456	1237	867	580	306	10518
	93-94	M	M	M	M	M	1323	1693	1734	1527	1044	736	460	185
	94-95	87	74	343	737	1136								2377
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	93-94	0	12	90	389	935	925	994	882	555	400	78	0	5260
	94-95	0	3	40	288	690								M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	93-94	354	390	591	915	1368	1478	1499	1321	1196	994	662	338	11106
	94-95	310	314	539	895	1257								3315
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	96	6961
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	16	6797
	94-95	12	13	124	513	925								1587
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	718	533	182	8	6430
	94-95	13	0	62	435	884								1394
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1098	785	594	280	52	7373
	94-95	13	5	170	578	1087								1653
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	69	6383
	93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	6298
	94-95	4	2	113	489	895								1503
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	M	1009							M
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	687	467	143	0	5950
	94-95	0	6	57	388	785								1236
RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6681
	93-94	E	13	7	199	484	975	1171	1132	921	682	468	194	M
	94-95	3	0	105	497	947								1552
STEAMBOAT SPRINGS	AVE	113	166	396	725	1122	1525	1606	1318	1160	801	543	297	9779
	93-94	168	144	395	710	1260	1486	1427	1294	965	678	392	133	9050

## NOVEMBER 1994 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	44.7	20.1	32.4	-2.4	69	9	969	0	47	0.63	0.13	126	4
STERLING	49.1	25.1	37.1	-0.9	72	14	831	0	57	0.46	-0.03	94	3
FORT MORGAN	47.2	22.4	34.8	-0.2	72	11	898	0	51	0.46	0.08	121	4
AKRON 1N	47.3	24.6	35.9	-1.2	72	13	866	0	51	0.86	0.33	162	7
AKRON 4E	45.8	21.5	33.6	-3.0	72	8	930	0	45	1.02	0.46	182	4
HOLYOKE	46.9	24.6	35.7	-2.3	68	15	840	0	43	1.05	0.45	175	4
JOES 2SE	47.8	24.4	36.1	-2.9	75	12	858	0	64	1.16	0.56	193	5
BURLINGTON	47.8	25.9	36.9	-1.1	78	14	836	0	64	1.00	0.46	185	2
LIMON WSMO	46.4	21.5	34.0	-1.2	75	5	925	0	58	0.68	0.13	124	6
CHEYENNE WELLS	50.5	26.5	38.5	-1.1	76	11	788	0	81	1.45	0.97	302	4
EADS	51.8	25.4	38.6	-1.2	77	14	783	0	99	1.21	0.64	212	2
ORDWAY 21N	47.7	18.5	33.1	-4.4	74	4	951	0	65	0.45	0.10	129	3
ROCKY FORD 2ESE	57.6	26.3	42.0	1.6	82	12	685	1	146	0.70	0.29	171	2
LAMAR	54.4	24.9	39.6	-1.1	77	13	753	0	121	1.25	0.69	223	4
LAS ANIMAS 1N	57.2	26.5	41.8	0.4	82	15	690	0	146	0.56	0.11	124	3
HOLLY	56.6	25.8	41.2	1.3	80	11	707	0	139	0.98	0.45	185	3
SPRINGFIELD 7WSW	55.3	28.2	41.8	-0.5	81	16	689	0	133	1.64	0.91	225	3

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	49.5	25.4	37.5	0.0	74	12	820	0	68	0.50	-0.21	70	7
GREELEY UNC	46.9	25.2	36.1	-1.3	71	14	860	0	55	0.49	-0.25	66	4
ESTES PARK	42.6	22.6	32.6	0.1	61	4	964	0	26	0.48	-0.13	79	5
LONGMONT 2ESE	48.3	22.3	35.3	-1.9	75	4	884	0	67	1.22	0.52	174	3
BOULDER	47.6	25.5	36.5	-4.3	73	9	848	0	57	2.25	1.19	212	6
DENVER WSFO AP	50.5	25.4	37.9	-1.1	75	6	804	0	83	1.34	0.47	154	6
EVERGREEN	49.9	17.2	33.6	-0.8	72	3	937	0	76	1.36	0.37	137	6
CHEESMAN	49.6	9.8	29.7	-3.3	70	-12	1053	0	80	0.45	-0.41	52	4
LAKE GEORGE 8SW	43.0	14.2	28.6	-0.1	61	-2	1085	0	23	0.32	-0.15	68	6
ANTERO RESERVOIR	40.9	12.5	26.7	2.0	58	-7	1142	0	16	0.26	-0.11	70	4
RUXTON PARK	34.7	13.8	24.2	-0.8	49	-7	1216	0	0	0.67	-0.25	73	9
COLORADO SPRINGS WSO	49.6	25.9	37.7	-0.3	72	14	811	0	71	0.32	-0.15	68	5
CANON CITY 2SE	54.5	28.7	41.6	-1.4	76	13	695	0	122	0.44	-0.23	66	7
PUEBLO WSO AP	53.8	23.6	38.7	-0.3	79	12	785	0	113	0.58	0.15	135	4
WESTCLIFFE	46.3	15.3	30.8	-1.9	66	-10	1017	0	47	0.91	0.05	106	5
WALSENBURG	54.6	28.4	41.5	-0.3	74	10	696	0	121	1.31	0.29	128	7
TRINIDAD AP	55.0	25.5	40.2	-1.0	80	10	735	0	131	0.76	0.11	117	4

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	38.4	12.6	25.5	-1.0	57	-9	1177	0	20	0.70	-0.03	96	7
LEADVILLE 2SW	36.1	9.6	22.9	-2.0	55	-12	1257	0	6	0.51	-0.39	57	13
SALIDA	48.0	21.9	34.9	-1.1	67	0	895	0	57	0.39	-0.17	70	3
BUENA VISTA	46.0	15.7	30.9	-3.0	64	3	1018	0	40	0.43	-0.12	78	4
SAGUACHE	44.5	15.5	30.0	-1.4	65	0	1042	0	34	0.48	0.02	104	5
HERMIT 7ESE	43.0	6.1	24.6	-0.4	63	-17	1208	0	28	1.60	0.44	138	7
ALAMOSA WSO AP	42.1	8.9	25.5	-4.4	67	-14	1174	0	35	0.84	0.41	195	5
STEAMBOAT SPRINGS	40.1	14.3	27.2	-1.9	62	-8	1128	0	35	2.89	0.77	136	15
YAMPA	37.1	13.8	25.5	-3.7	60	-5	1175	0	21	0.98	-0.21	82	13
GRAND LAKE 1NW	40.7	12.5	26.6	0.4	58	-8	1145	0	23	1.48	0.12	109	14
GRAND LAKE 6SSW	38.6	14.1	26.4	-1.5	58	-5	1154	0	12	0.84	-0.12	88	20
DILLON 1E	38.4	11.6	25.0	-1.8	58	-6	1192	0	18	0.54	-0.29	65	9
CLIMAX	29.4	-0.9	14.3	-5.7	48	-18	1515	0	0	1.83	0.04	102	15
ASPEN 1SW	40.7	15.9	28.3	-2.2	61	-3	1095	0	27	3.05	1.45	191	17
CRESTED BUTTE	34.7	8.6	21.7	-2.3	55	-21	1295	0	7	3.10	1.09	154	15
TAYLOR PARK	34.1	9.7	21.9	-2.4	53	-12	1287	0	2	1.70	0.40	131	13
TELLURIDE	38.9	11.6	25.3	-4.7	61	-14	1185	0	19	3.53	1.78	202	14
PAGOSA SPRINGS	45.6	16.5	31.1	-2.1	63	-10	1009	0	29	3.37	1.66	197	11
SILVERTON	35.7	4.5	20.1	-6.8	56	-16	1337	0	6	2.51	0.69	138	13
WOLF CREEK PASS 1E	29.5	8.5	19.0	-6.7	44	-23	1372	0	0	7.74	3.58	186	14



**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	39.3	14.7	27.0	-4.6	63	-4	1133	0	34	2.05	0.75	158	9
HAYDEN	39.3	15.7	27.5	-4.7	62	-8	1115	0	32	2.36	0.95	167	12
MEEKER 3W	41.8	15.2	28.5	-5.5	64	-7	1087	0	41	2.29	1.22	214	11
RANGELY	41.8	17.6	29.7	-4.6	60	-1	1050	0	31	0.97	0.28	141	6
GLENWOOD SPRINGS	45.3	22.7	34.0	-1.9	66	2	923	0	43	2.44	1.24	203	14
RIFLE	45.7	20.7	33.2	-3.5	68	-1	947	0	44	1.49	0.51	152	11
GRAND JUNCTION WS	47.3	26.8	37.0	-3.2	65	10	832	0	48	0.69	-0.02	97	11
PAONIA 1SW	49.6	25.6	37.6	-1.5	69	8	813	0	70	0.91	-0.45	67	13
DELTA	50.3	26.3	38.3	-0.8	71	6	794	0	74	0.53	-0.12	82	7
GUNNISON	40.0	13.8	26.9	-1.5	63	-4	1136	0	24	1.08	0.51	189	11
COCHETOPA CREEK	42.3	13.3	27.8	-0.2	63	-3	1108	0	29	1.27	0.58	184	11
MONTROSE NO 2	46.7	23.2	34.9	-2.8	68	9	895	0	50	1.03	0.20	124	7
URAVAN	51.6	25.3	38.4	-2.5	71	9	790	0	78	1.60	0.51	147	11
NORWOOD	45.9	19.9	32.9	-1.3	65	-4	861	0	33	2.53	1.28	202	10
YELLOW JACKET 2W	45.1	21.4	33.3	-3.9	63	0	944	0	28	1.53	-0.09	94	8
CORTEZ	47.7	22.5	35.1	-3.2	67	7	891	0	50	0.78	-0.38	67	10
DURANGO	45.6	20.3	32.9	-4.2	63	5	952	0	30	3.96	2.28	236	12
IGNACIO 1N	45.7	18.7	32.2	-3.9	62	4	979	0	26	2.48	1.27	205	9

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

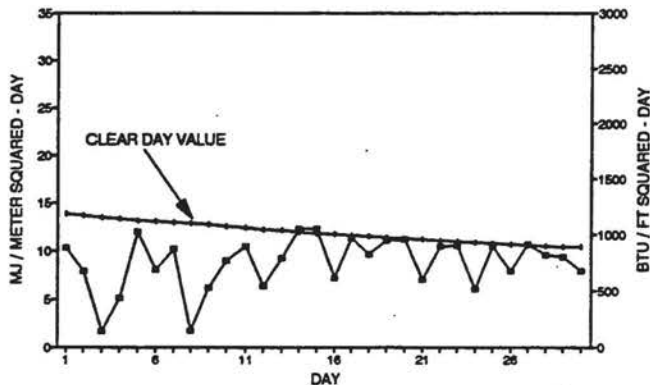
**NOVEMBER 1994 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	9	8	13	--	--
Denver	9	13	8	63%	65%
Fort Collins	10	8	12	--	--
Grand Junction	6	10	14	47%	63%
Limon	INC	INC	INC	--	--
Pueblo	NA	NA	NA	63%	73%

CLR = Clear      PC = Partly Cloudy      CLDY= Cloudy

November can be a relatively cloudy month in Colorado and that was the case this year. Rapidly changing weather throughout the month resulted in no lasting periods of clear, sunny weather. For most of the State, November cloudiness was greater than normal, and solar energy was lower than average.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION NOVEMBER 1994**

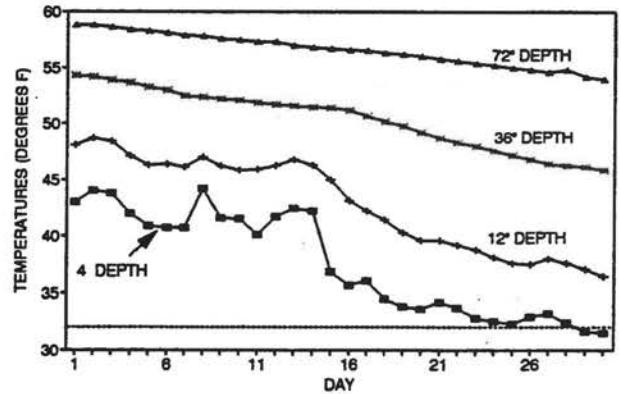


**NOVEMBER 1994 SOIL TEMPERATURES**

November soil temperatures dropped sharply and by the end of the month soil near the surface had begun to freeze.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES NOVEMBER 1994**



**HATS OFF TO: Dr. Glen Cobb at University of Northern Colorado.**

Daily weather observations have been taken in Greeley for more than 100 years. For more than 20 years Dr. Cobb at the Earth Science Department at UNC has supervised the Greeley station and trained many students to take accurate weather observations. Thanks a ton for all you've done, and keep up the good work.

## MAINTAINING CONTINUITY IN CLIMATE OBSERVATIONS IN COLORADO

Most people take climate data for granted. There is a common assumption, probably bolstered by media weather reports, that every town has a weather station and always has. That might be true, if you count the cow thermometer in front of the hardware store or the coffee can rain gauge in Aunt Mildred's back yard (or the bank thermometer that always reads 106° on summer afternoons when your own thermometer says 88°F). Just because there are some weather instruments outdoors doesn't mean we have useful climate information. And even when data have been recorded, it doesn't mean they have been included in published documents and electronic data bases. I wish we had 125 years of accurate climate data for every town, reservoir and mountain pass in Colorado, but it just isn't so.

Much of the most useful climate data for the U.S. comes from the National Weather Service. It is composed primarily of long-term detailed around-the-clock data from major city airports (NWS First Order stations) and less detailed but more numerous volunteer weather observations from the NWS Cooperative Program. These data are so useful because great efforts have been made to collect data uniformly, continuously, accurately and consistently. Furthermore, for more than 100 years the data have been consistently gathered, checked, summarized, published, inventoried, archived and (in recent years) digitized so that anyone wanting to find and use the information is able to do so.

To a climatologist, any long record of at least 30 complete years of data from a single location represents an opportunity to accurately define the climate of that area and recognize its variability and extremes. With shorter, incomplete or inconsistent records, we often find ourselves guessing on questions of considerable importance. Design temperatures, heating degree day normals, evaporation rates and 100-year rainstorms are just a few criteria that are routinely needed to design homes, build streets or operate utilities. All require years and years of climate data. Did you know that the amount of chlorine put into municipal water systems is directly related to the long-term average temperature for each individual town and city? Inaccurate or insufficient data could mean poor planning and inefficient use of resources.

*What can we do today to make sure that our climate data resources of the future will meet our needs?* Here are some suggestions:

Each community in Colorado should strive to have a weather station and should make sure the data are provided to the Colorado Climate Center and the NWS. Data from each weather station should be used and displayed locally on a regular basis. This generally results in a greater appreciation of the data and the climate itself. It also typically leads to stronger commitment to data quality.

The historical significance of weather data must be recognized. As such, weather station locations should be selected with care and treated with respect so that stations can

be maintained at fixed locations for many decades. If stations do have to be moved (which often result in data discontinuities) efforts should be made to collect a period of overlapping data from both the old and new locations. The effects of the move can then be approximated and historical data can be adjusted to be consistent with the new location (or vice versa).

The reality that collecting accurate and consistent data is difficult must be recognized. Every effort should be made when weather stations are established to make sure that accurate instruments are obtained, that instruments are well cared for and calibrated, that the instruments are mounted and installed in appropriate locations, that proper observational procedures are used, and that data are routinely checked by climatologists and other experts. (I plan to write special features in 1995 concerning challenges and solutions for getting the most accurate temperature and precipitation measurements.)

Rural data collection must also be given emphasis. Many of Colorado's long-term weather stations have been subject to urbanization. As a result, urban heat islands which develop over most urban areas have caused warming trends at many sites. It is just as important that we know long-term climate trends from rural areas that have not been affected by local heat islands.

A strong and persistent commitment is required to collect scientifically useful long-term data. As such, it is very helpful to find individuals who love the weather and climate and who do not find this requirement a burden. So often we find that data quality deteriorates quickly, both from manual and automated stations, when the individuals involved are not interested in the weather.

Automation of weather observations (electronic data collection) may be an acceptable approach for collecting uniform and consistent data but limitations exist and must be recognized. Data need to be looked at regularly to spot developing problems. System failures due to power outages and lightning strikes must be avoided. Maintenance and calibration must be carried out routinely. It also must be recognized that some common measurements are difficult to automate. For example, accurate precipitation measurements continue to be very difficult to automate at any cost. Organizations purchasing electronic weather stations need to plan and budget for instrument repair and replacement. Failure to do so leads to deterioration and loss of data.

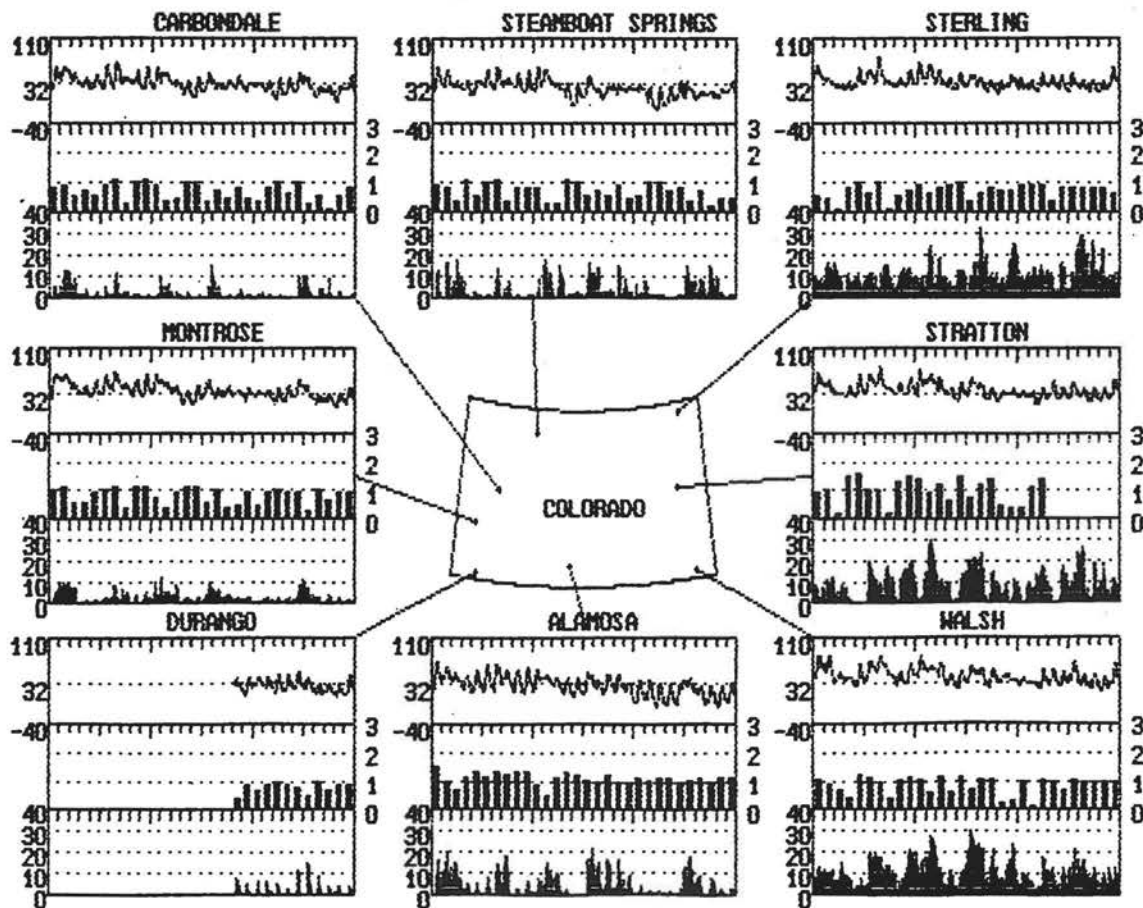
There is more that we can say about data continuity, but this is a good start. Here at the Colorado Climate Center we hope to continue to work to provide Colorado with the best possible data resources to help us address the challenges of the 21st Century. If you have questions or need help in establishing or maintaining weather stations, please contact us.

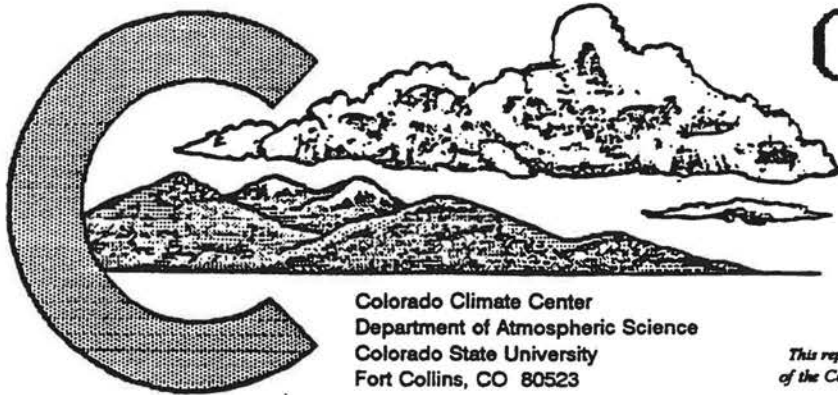


	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	26.0	n/a	30.7	34.2	23.6	34.4	35.8	41.6
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	67.3 1/14	n/a n/a	66.6 7/14	66.7 7/13	61.3 7/14	77.5 7/13	75.2 7/16	78.8 2/15
minimum:	-11.6 23/ 6	n/a n/a	-0.9 29/ 5	7.9 29/ 7	-13.5 23/ 8	13.1 19/ 7	11.1 23/ 5	16.9 29/ 5
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	83 / 12	n/a / n/a	87 / 20	76 / 22	86 / 15	55 / 17	33 / 11	78 / 29
11 AM	49 / 21	n/a / n/a	61 / 26	49 / 25	68 / 21	38 / 21	32 / 16	54 / 34
2 PM	36 / 22	n/a / n/a	50 / 27	39 / 25	49 / 21	29 / 21	29 / 21	45 / 35
5 PM	41 / 20	n/a / n/a	54 / 25	47 / 25	57 / 19	35 / 19	27 / 21	50 / 33
11 PM	74 / 16	n/a / n/a	80 / 23	72 / 24	87 / 17	48 / 18	28 / 11	69 / 30
monthly average wind direction ( degrees clockwise from north )								
day	192	n/a	213	201	169	198	169	179
night	160	n/a	160	161	152	214	195	226
monthly average wind speed ( miles per hour )	3.82	n/a	1.37	2.14	2.60	9.12	7.83	9.86
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	419	n/a	457	518	428	68	253	39
3 to 12	189	n/a	85	180	143	490	280	477
12 to 24	65	n/a	2	2	25	148	174	185
> 24	0	n/a	0	0	0	14	13	19
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	1096	n/a	654	842	657	683	843	851
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	140	n/a	80	102	80	114	15	144
40-60%	30	n/a	56	57	73	52	23	59
20-40%	29	n/a	94	73	78	60	37	47
0-20%	14	n/a	68	38	61	44	37	37

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

DECEMBER 1994

Volume 18 Number 3

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

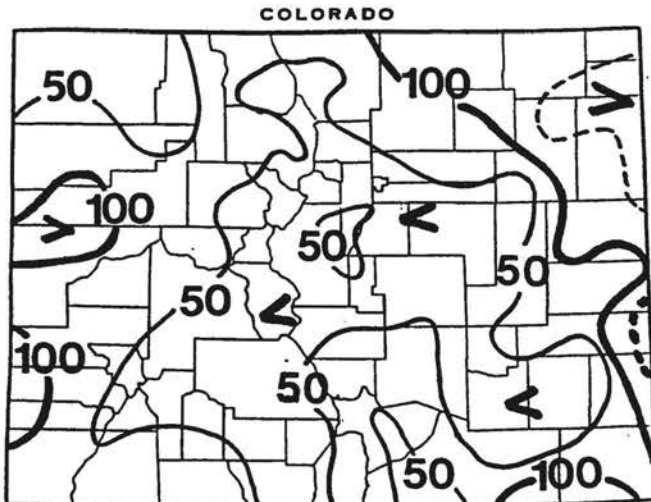
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## December Climate in Perspective – Dry and Mild

Storm systems during the first half of December delivered some precipitation to the State. Then two consecutive weeks of dry and unseasonably mild weather, including extremely warm temperatures for the Christmas holiday, sent people outdoors hiking and biking instead of skiing. Finally, a surge of sharply colder temperatures and fluffy snow at the end of the month was a reminder that winter was still around. Overall, the month ended up warmer than average statewide and drier than normal in most areas.

### Precipitation

Nine weather systems could be seen on weather maps and satellite pictures spreading clouds across Colorado in December. Many of the storms were fast moving and had



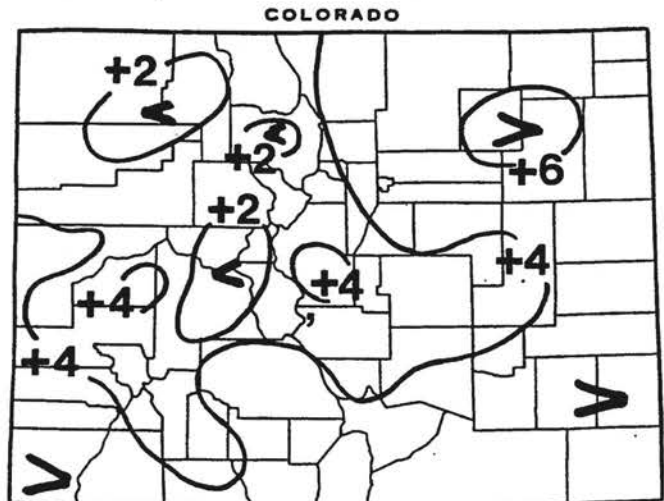
December 1994 precipitation as a percent of the 1961-1990 average.

little moisture with them. Only four systems (5-6th, 7-8th, 13-14th and 29-31st) brought much moisture, and only two systems, one early and one at the end of December, affected

most of the State. The majority of Colorado ended up with less December precipitation than usual with many areas in the mountains and near the Front Range getting less than 50% of average. Salida, Shaw and Hugo each reported no measurable moisture for the month. The only areas with above average precipitation were in extreme western Colorado and across portions of the northeastern and extreme southeastern plains.

### Temperatures

It is common to have some mild days in December, but nearly two consecutive weeks of dry and unseasonably warm temperatures late in the month had mountain ski and resort operators more than a little nervous. All of Colorado ended up warmer than average for the month with readings of 4-6 degrees F above normal across eastern and southern areas. There were just a few colder pockets near the Northern and Central Mountains where temperatures were less than 2 degrees F above average. A brief burst of cold air early in December and a surge of arctic air late in the month were the only reminders of the season.



Departure of December 1994 temperatures from the 1961-90 ave.

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## DECEMBER 1994 DAILY WEATHER

- 1-3 December began warm and dry with strong downslope winds (local gusts 40-60 mph) along the Front Range 1-2nd. Temperatures rose into the 60s and 70s east of the mountains. La Junta 1S reported 76° on the 1st, the warmest in Colorado. It was also mild west of the mountains except where cold air pooled in some of the snowcovered mountain valleys. A few high-mountain snowflurries fell 1-2nd. Clouds increased on the 3rd, but temperatures remained mild.
- 4-6 Moist southwesterly winds aloft spread clouds across the State, and cooler air moved southward across the Eastern Plains late on the 4th. Low clouds, fog and subfreezing temperature covered eastern Colorado by the 5th. Low elevation rains and mountain snows spread northeastward on the 5th and became quite heavy overnight especially in the southwest. 1.27" of cold rain and wet snow fell at Durango by morning on the 6th with 1.60" of moisture at Vallecito Dam. Two feet of fresh snow fell at Wolf Creek Pass. Much of the remainder of Colorado also received moisture, but not nearly so heavy (only 2" of snow at Breckenridge). East of the mountains a combination of light snow, ice pellets and freezing drizzle made travel hazardous. Wray picked up 3" of snow and ice before it ended near sunset on the 6th.
- 7-10 Mild temperatures returned briefly on the 7th, but a cold front with moist air from the Pacific reached the State spreading snow across the Northern and Central Mountains. Steamboat Springs picked up 11" of new snow by early on the 8th. Little moisture made it across the mountains, but Canon City got 2.5" of snow by late afternoon. Skies then cleared and temperatures plummeted to their lowest levels of the season in many areas. Pueblo reported -5° on the 9th. Taylor Park Dam was the coldest in the State for the month with -37°F. Sunshine but cold temperatures then persisted through the 10th.
- 11-15 Three troughs of low pressure aloft rapidly crossed the Western U.S. Clouds, gusty winds and a few mountain snowshowers were all that accompanied the first system on the 11th. A stronger system with more moisture approached late on the 12th but weakened as it hit the mountains on the 13th. Just a few inches of mountain snow and a light Western Slope dusting was all that fell. Following a cool and mostly dry day on the 14th, another weak system crossed the area on the 15th accompanied by some mountain snow showers. Temperatures in the mountains were very cold (high of 18° at Crested Butte on the 15th with a low of -20°F), but east of the mountains conditions were seasonal.
- 16-18 High pressure dominated the region. Temperature inversions caused local air pollution concentrations to build up. It was dry statewide with chilly temperatures in several mountain valleys but unseasonable warm east of the mountains. Denver hit 65° on the 18th.
- 19 Downslope winds became ferocious from the Continental Divide eastward as a low pressure area aloft strengthened while crossing the State. Many locations along the Front Range saw wind gusts of 50-70 mph with 90+ mph in some wind-prone areas. Property damage was reported along the Front Range.
- 20-22 Cold in the high mountain valleys with lows well below zero each night but otherwise clear, dry and unseasonably warm statewide.
- 23-25 A weak upper-level low pressure area south of Colorado spread clouds into the State, especially on the 23rd. Some very light rain reached extreme southwestern Colorado on the 24th. Otherwise, dry and very warm temperatures were the rule statewide for the Christmas holiday with daytime temperatures east of the mountains in the 50s and 60s. Highs in the 40s with melting snow up in the mountains kept many skiers off the slopes.
- 26-28 Sunny weather with light winds and much above average temperatures covered Colorado. Ski operators fretted while many families enjoyed hiking and biking outings on their Christmas vacations. Clouds increased and temperatures finally cooled a bit on the 28th.
- 29-31 A Pacific storm system spread dense clouds across western Colorado on the 29th with some light snow late in the day. East of the mountains, much colder air arrived from the north along with local fog and low clouds. A combination of an upper-level storm center south of the State and the first surge of true arctic air from the north combined on the 30th to produce snow over the eastern 3/4 of Colorado. Areas of freezing drizzle made for atrocious driving conditions east of the mountains. The snow was fluffy and light with little moisture content, but by morning on the 31st 2-8" of snow had fallen in many areas. Boulder reported 8". Temperatures on the 31st were very cold and by evening began to dip below zero. Limon dropped to -10° by midnight – their coldest temperature for the entire year of 1994.

Highest Temperature	76°F
Lowest Temperature	-37°F
Greatest Total Precipitation	3.32"
Least Total Precipitation	Trace
Greatest Total Snowfall	53.5"
Greatest Snow Depth	46"

### Weather Extremes

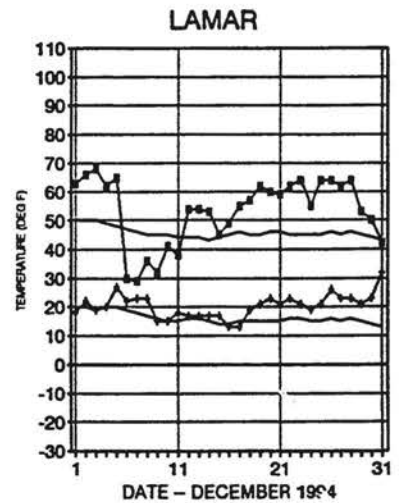
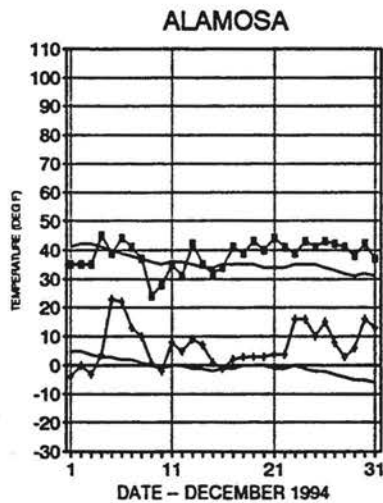
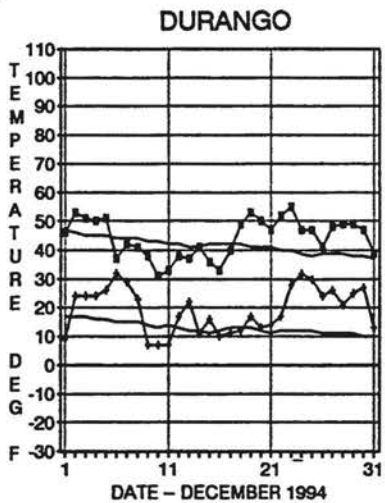
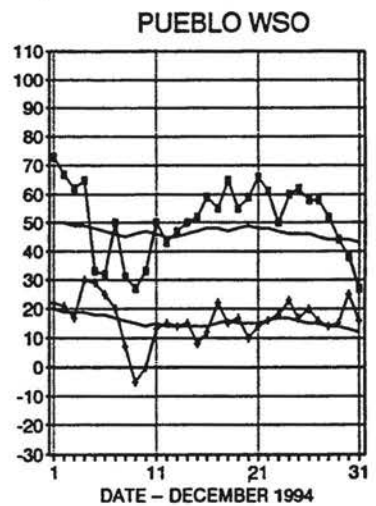
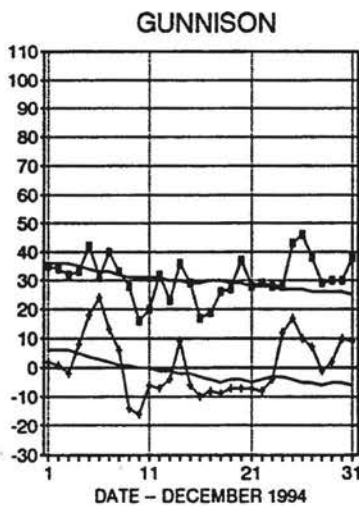
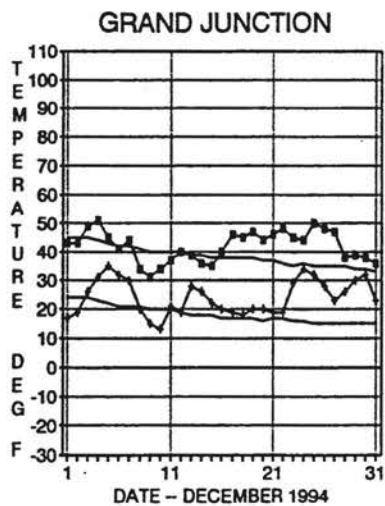
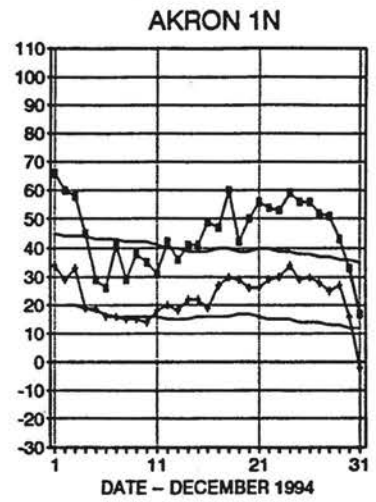
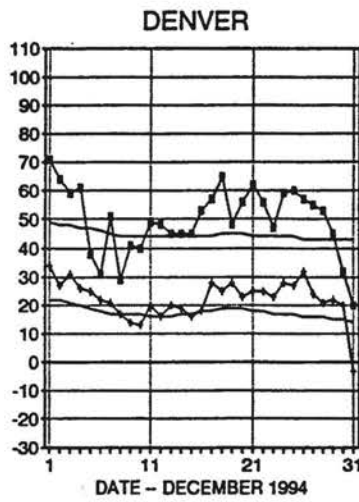
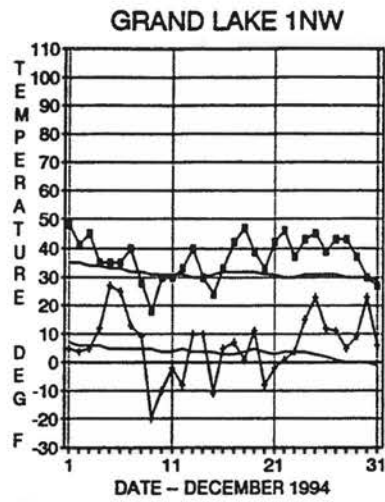
December 1	La Junta 1S
December 9	Taylor Park Dam

December 1	La Junta 1S
December 9	Taylor Park Dam
	Wolf Creek Pass 1E
	Hugo, Salida, Shaw
	Wolf Creek Pass 1E
	Wolf Creek Pass 1E

## DECEMBER 1994 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)



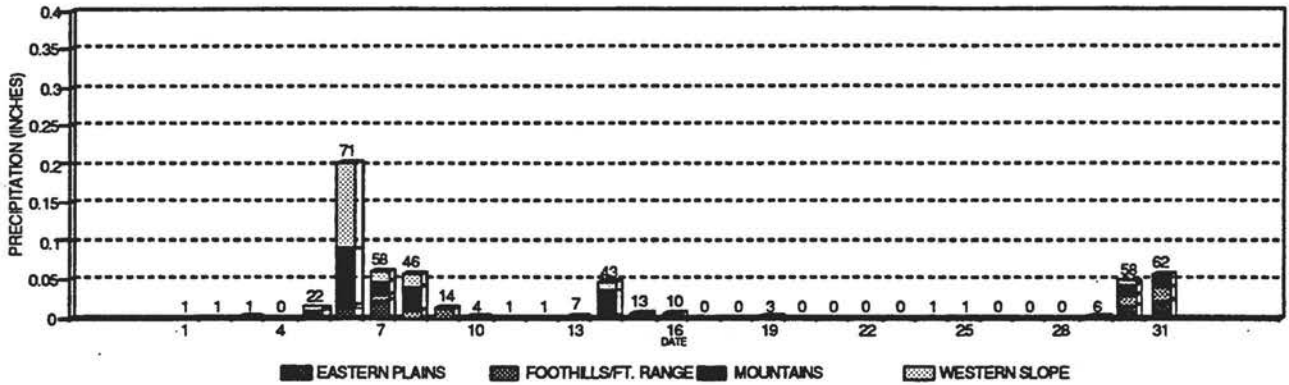


## DECEMBER 1994 PRECIPITATION

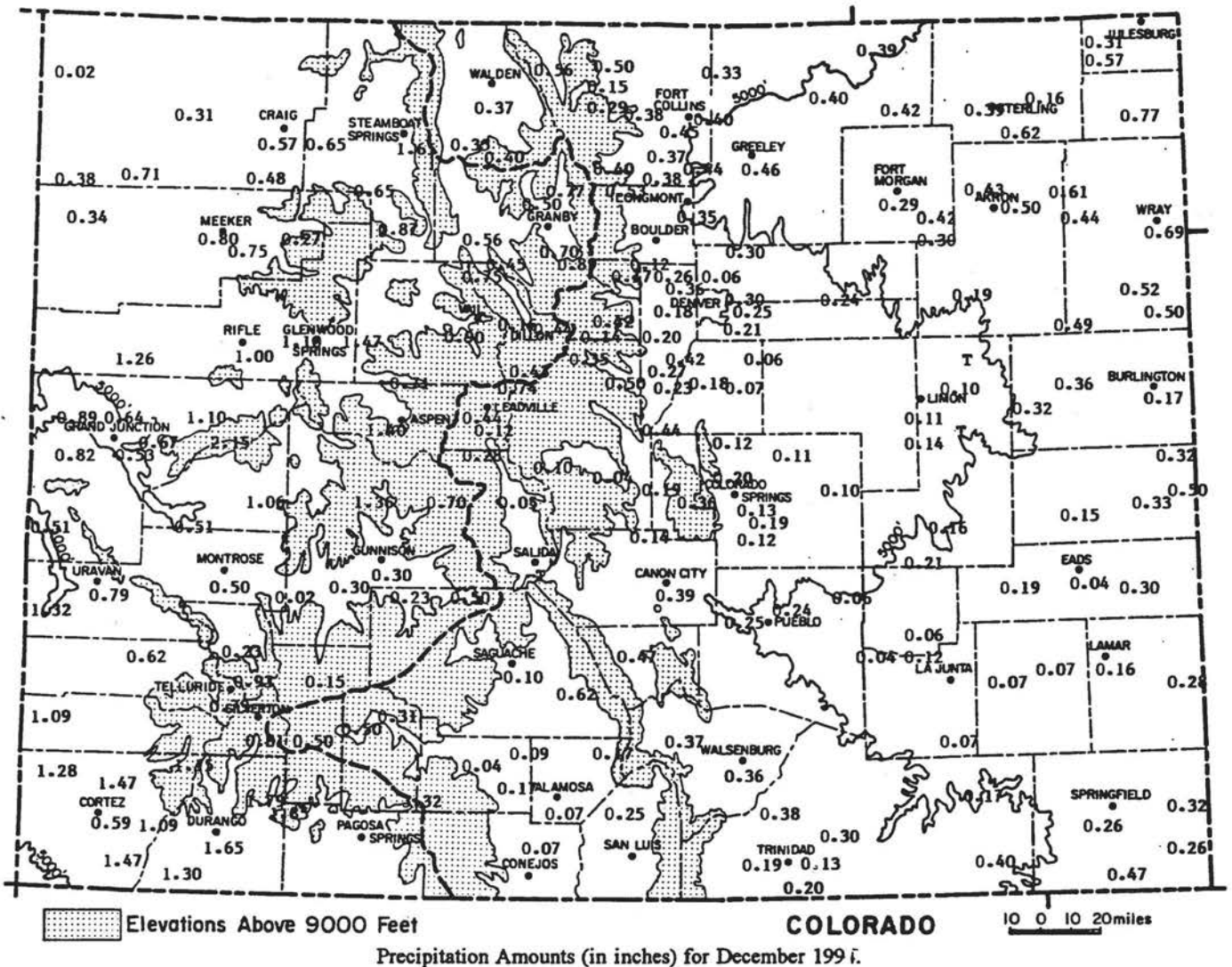
Nine storm systems managed to cause only 4 precipitation episodes for Colorado in December. The majority of precipitation fell December 5-8, 13-14, and 29-31. Precipitation only fell on 2-3 days all month on the Eastern Plains. In the mountains, 5 to 10 precipitation days were

observed with fewer on the Western Slope. The storm 5-8th dropped about 0.34" averaged across the State, nearly 2/3 of the December total. Overall, state-averaged precipitation for December totalled 0.52" compared to the 1961-1990 average of 0.91 inches.

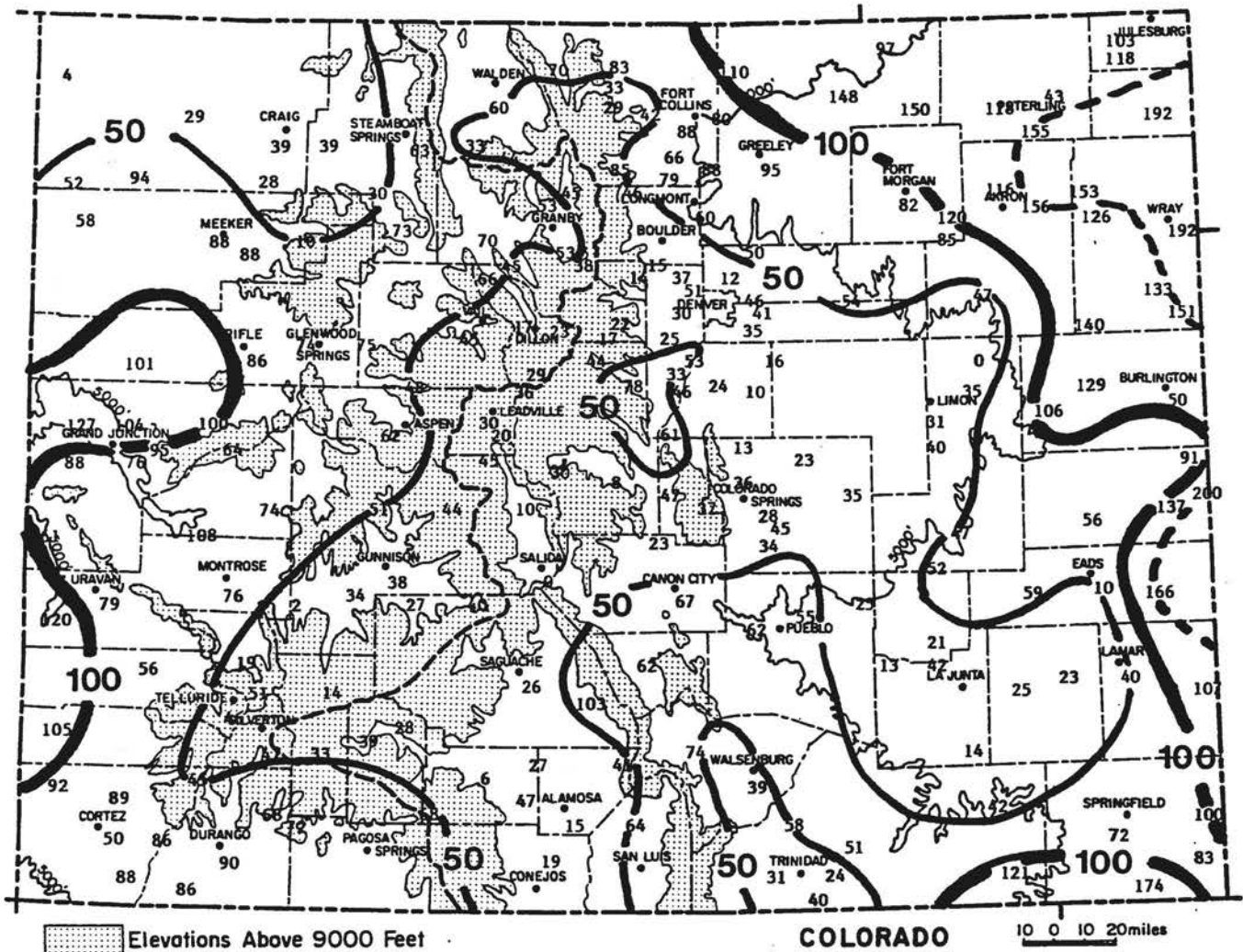
COLORADO DAILY PRECIPITATION - DEC 1994



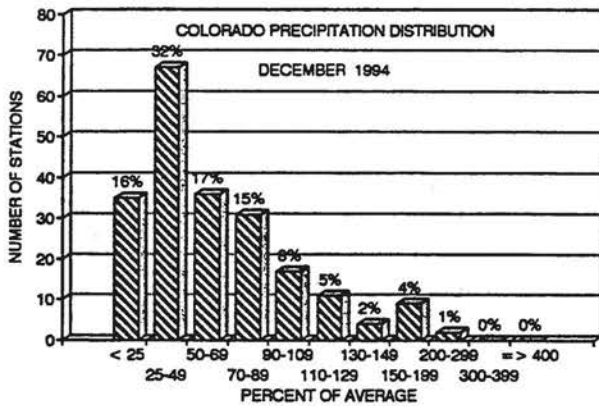
(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)



## DECEMBER 1994 PRECIPITATION COMPARISON



December 1994 Precipitation as a Percent of the 1961-90 average.



Nearly half of Colorado's official weather stations reported less than 50% of average December precipitation. Only about 10% of the stations received above average moisture with most of these in eastern Colorado. Based on a selected set of stations, this month ranked 13th driest on record during the past 100 years.

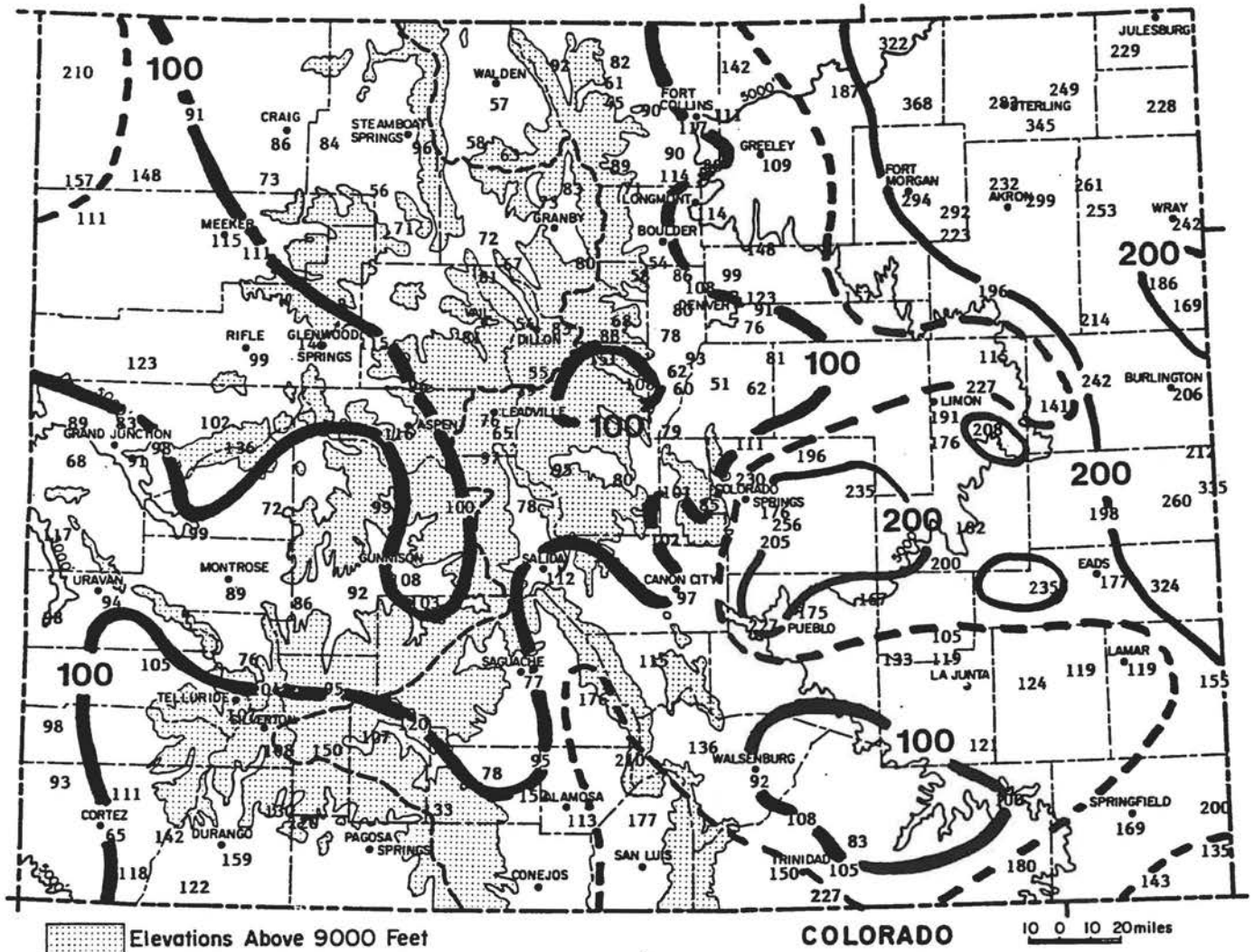
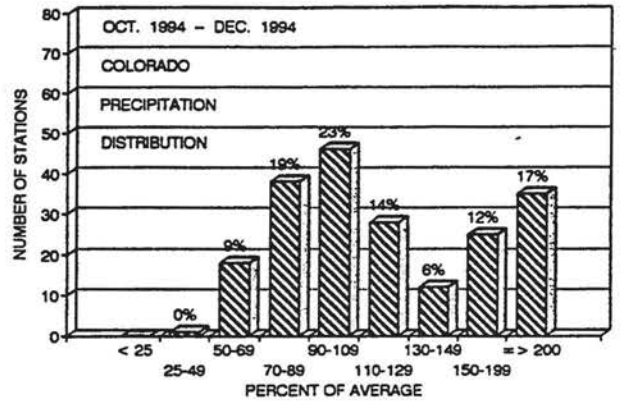
### DECEMBER 1994 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	0.30"	37th driest in 123 years of record (driest < 0.01" in 1881 and 1905)
Durango	1.65"	48th wettest in 101 years of record (wettest = 7.37" in 1921)
Grand Junction	0.64"	38th wettest in 103 years of record (wettest = 1.89" in 1951)
Las Animas	0.07"	34th driest in 128 years (driest < 0.01" in 1993 & 23 prior years)
Pueblo	0.24"	48th driest in 127 years of record (driest < 0.01" in 1993 & 7 prior years)
Steamboat Springs	1.65"	29th driest in 90 years of record (driest = 0.50" in 1986)



# 1995 WATER YEAR PRECIPITATION

December slowed the pace of statewide precipitation accumulation. After a pretty good and much welcomed start to the new water year in October and December, areas with below average accumulated totals began to spread in December. Most of eastern Colorado remains well above average due to exceptionally wet October weather. Southwestern Colorado also remains above average as do areas in extreme northwest Colorado. For much of the Front Range and most areas in the Northern and Central Mountains, however, the picture is not rosey with generally 70-90% of average after three months. A few localized areas remain surprisingly dry. Walden, Dillon and Breckenridge have barely received 50% of average so far. Much of the foothills west of Denver, Boulder and Fort Collins are also very dry. The Sedalia-Castle Rock area continues the dry pattern that began last year. Since June 1, 1994, Sedalia has received just 3.93" of precipitation, 37% less than average.



October - December 1994 Precipitation as a Percent of the 1961-90 average.

# COMPARATIVE HEATING DEGREE DAY DATA FOR DECEMBER 1994

**HEATING DEGREE DATA**
**COLORADO CLIMATE CENTER (303) 491-8545**
**HEATING DEGREE DATA**
**COLORADO CLIMATE CENTER (303) 491-8545**

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700	1174	1307							3615
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8650
	93-94	232	221	425	716	1188	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095	1265							3590
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	63	5554
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5848
	94-95	4	0	77	442	848	890							2261
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	782	415	77	7961
	94-95	50	65	286	674	1018	1143							3236
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	659	519	254	34	6320
	93-94	0	25	189	450	953	978	1060	1068	654	499	144	1	6021
	94-95	4	0	80	370	836	908							2198
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4967
	93-94	0	22	153	435	816	864	886	828	600	468	M	0	M
	94-95	0	0	42	361	695	760							1858
COLORADO SPRINGS	AVE	6	18	164	468	818	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	926	749	576	223	14	6271
	94-95	10	14	98	486	811	969							2388
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	508	926	1148	1086	1038	695	528	272	14	6404
	94-95	4	0	111	522	891	1012							2540
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	6376
	93-94	67	60	286	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613	1133	1316							3265
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	93-94	13	33	232	598	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	67	423	794	1025							2309
DENVER	AVE	0	0	144	429	780	1054	1094	885	808	504	253	71	6020
	93-94	1	20	152	488	900	948	948	679	618	465	104	3	5544
	94-95	3	2	57	397	804	890							2153
DILLON	AVE	282	341	555	856	1203	1504	1567	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192	1378							4432
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6636
	94-95	2	2	104	559	952	1025							2644
EAGLE	AVE	25	72	275	617	961	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1116	M	1258	1080	779	639	330	64	M
	94-95	M	M	M	M	M	M							M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7483
	94-95	59	48	286	677	937	1029							3036
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	669	493	141	6	6002
	94-95	3	3	89	460	820	977							2332
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	166	495	1008	M	M	1166	704	550	126	6	M
	94-95	9	8	106	435	898	1030							2486
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	66	0	5297
	94-95	0	0	24	366	832	964							2208

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	361	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10462
	94-95	205	188	423	781	1154	1456							4187
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5657
	94-95	1	3	68	441	860	1005							2378
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	308	10516
	93-94	M	M	M	M	M	1323	1693	1734	1527	1044	736	460	185
	94-95	87	74	343	737	1136	1512							3689
LAS ANIMAS	AVE	0	0	69	338	750	1086	1141	862	707	370	121	0	5455
	93-94	0	12	90	389	935	925	994	862	555	400	78	0	5260
	94-95	0	3	40	288	690	882							M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10670
	93-94	354	390	591	915	1368	1478	1490	1321	1198	994	662	338	11106
	94-95	310	314	539	895	1257	1406							4721
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	96	6981
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	18	6797
	94-95	12	13	124	513	925	1043							2630
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	248	557	1005	1064	1022	1053	718	533	182	8	6430
	94-95	13	0	62	435	884	949							2343
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1096	785	594	280	52	7373
	94-95	13	5	170	578	1087	1207							3060
MONTROSE	AVE	0	11	143	453	819	1159	1248	935	791	510	248	68	6383
	93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	6296
	94-95	4	2	113	489	895	1072							2575
PAGOSA SPRINGS	AVE	64	115	324	636	964	1330	1423	1131	1029	756	512	244	8548
	93-94	84	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	M	1009	M	M	M	M	M	M	M
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	667	467	143	0	5650
	94-95	0	6	57	388	785	964							2200
RIFLE	AVE	0	23	184	502	858	1237	1330	960	825	549	296	95	6881
	93-94	E	13	7	199	464	975	1171	1132	921	682	488	194	M
	94-95	3	0	105	497	947	1123							2675
STEAMBOAT SPRINGS	AVE	113												

DECEMBER 1994 CLIMATE DATA

EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	44.8	18.4	31.6	5.1	66	6	1026	0	41	0.39	-0.01	98	3
STERLING	48.0	19.5	33.7	5.7	67	5	961	0	68	0.39	0.06	118	3
FORT MORGAN	48.8	14.5	31.6	6.6	71	-13	1030	0	85	0.29	-0.06	83	4
AKRON 1N	45.0	23.0	34.0	6.2	66	-2	953	0	42	0.43	0.06	116	3
AKRON 4E	46.1	21.1	33.6	6.9	67	8	967	0	47	0.50	0.18	156	3
HOLYOKE	46.5	20.4	33.4	4.7	70	2	973	0	65	0.77	0.37	192	3
JOES 2SE	47.5	21.3	34.4	4.8	67	7	941	0	60	0.49	0.14	140	2
BURLINGTON	46.7	24.1	35.4	6.2	64	14	908	0	51	0.17	-0.17	50	2
LIMON WSMO	45.1	17.1	31.1	3.9	66	-10	1043	0	40	0.11	-0.24	31	3
CHEYENNE WELLS	47.1	23.9	35.5	5.3	60	2	909	0	44	0.33	0.09	138	3
EADS	47.7	21.5	34.6	4.3	64	0	936	0	59	0.04	-0.33	11	2
ORDWAY 21N	47.6	13.1	30.4	1.9	63	3	1065	0	56	0.12	-0.11	52	2
ROCKY FORD 2ESE	53.3	17.7	35.5	4.6	70	7	906	0	104	0.12	-0.16	43	2
LAMAR	53.5	20.4	36.9	6.1	68	13	863	0	112	0.16	-0.24	40	1
LAS ANIMAS 1N	53.3	19.5	36.4	5.0	74	10	882	0	115	0.07	-0.21	25	2
HOLLY	50.7	20.7	35.7	5.5	67	15	902	0	90	0.28	0.02	108	1
SPRINGFIELD 7WSW	51.7	23.5	37.6	4.0	69	11	841	0	75	0.26	-0.10	72	2

FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	47.0	19.5	33.3	4.2	64	8	977	0	50	0.45	-0.06	88	4
GREELEY UNC	45.0	19.7	32.4	4.1	64	4	1005	0	43	0.46	-0.02	96	4
ESTES PARK	41.0	20.9	31.0	4.5	58	-3	1048	0	8	0.40	-0.07	85	9
LONGMONT 2ESE	50.1	18.1	34.1	5.9	67	4	949	0	80	0.35	-0.23	60	4
BOULDER	48.4	23.8	36.1	2.6	67	7	890	0	57	0.49	-0.31	61	4
DENVER WSFO AP	49.7	22.2	36.0	5.0	71	-3	890	0	75	0.30	-0.34	47	4
EVERGREEN	49.7	13.4	31.6	3.9	67	0	1029	0	59	0.20	-0.59	25	5
CHEESMAN	48.7	4.0	26.4	-0.1	64	-18	1187	0	48	0.44	-0.27	62	4
LAKE GEORGE 8SW	39.8	5.0	22.4	5.1	53	-17	1312	0	3	0.04	-0.42	9	2
ANTERO RESERVOIR	40.8	3.4	22.1	6.9	51	-15	1324	0	2	0.10	-0.23	30	3
RUXTON PARK	32.6	11.5	22.0	3.5	46	-13	1326	0	0	0.36	-0.59	38	4
COLORADO SPRINGS WSO	46.2	21.0	33.6	3.8	64	1	969	0	44	0.13	-0.33	28	3
CANON CITY 2SE	53.5	26.8	40.2	3.2	71	12	760	0	109	0.39	-0.19	67	3
PUEBLO WSO AP	51.1	16.2	33.6	3.6	73	-5	964	0	94	0.24	-0.19	56	3
WESTCLIFFE	43.3	10.4	26.9	2.7	54	-20	1172	0	7	0.47	-0.28	63	4
WALSENBURG	53.4	27.8	40.6	6.6	67	2	751	0	97	0.36	-0.55	40	3
TRINIDAD AP	52.5	22.2	37.4	4.9	65	2	850	0	92	0.30	-0.28	52	3

MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	34.8	7.9	21.3	3.2	45	-15	1346	0	0	0.37	-0.24	61	6
LEADVILLE 2SW	35.3	3.5	19.4	1.9	47	-23	1406	0	0	0.12	-0.48	20	6
SALIDA	46.1	15.6	30.9	3.8	59	1	1049	0	24	0.00	-0.40	0	0
BUENA VISTA	43.4	12.3	27.8	2.2	55	-1	1143	0	7	0.05	-0.44	10	1
SAGUACHE	40.4	9.7	25.1	4.4	48	0	1151	0	0	0.10	-0.28	26	1
HERMIT 7ESE	35.6	-4.8	15.4	2.8	48	-20	1530	0	0	0.50	-0.78	39	4
ALAMOSA WSO AP	38.3	6.9	22.6	5.2	45	-4	1307	0	0	0.07	-0.38	16	1
STEAMBOAT SPRINGS	32.3	5.2	18.8	1.6	43	-18	1424	0	0	1.65	-0.93	64	10
YAMPA	32.8	12.6	22.7	2.5	43	-13	1300	0	0	0.87	-0.32	73	7
GRAND LAKE 1NW	36.7	6.2	21.5	3.9	48	-20	1343	0	0	0.77	-0.92	46	11
GRAND LAKE 6SSW	31.1	4.5	17.8	0.4	43	-16	1456	0	0	0.50	-0.43	54	10
DILLON 1E	35.9	4.7	20.3	2.1	49	-16	1378	0	0	0.16	-0.76	17	5
CLIMAX	29.7	-0.8	14.4	2.4	42	-23	1559	0	0	0.74	-1.28	37	10
ASPEN 1SW	37.5	10.5	24.0	1.5	47	-9	1265	0	0	1.40	-0.85	62	8
CRESTED BUTTE	30.3	-4.4	13.0	0.5	41	-31	1606	0	0	1.36	-1.27	52	7
TAYLOR PARK	27.2	-6.3	10.5	0.2	37	-37	1681	0	0	0.70	-0.88	44	6
TELLURIDE	38.6	5.4	22.0	0.5	51	-19	1326	0	1	0.79	-0.91	46	7
SILVERTON	33.8	-2.6	15.6	-1.6	43	-25	1523	0	0	0.81	-0.89	48	5
WOLF CREEK PASS 1E	31.9	9.4	20.6	-0.1	44	-16	1367	0	0	3.32	-1.53	68	10

## WESTERN VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	33.1	11.6	22.4	1.6	44	-7	1316	0	0	0.57	-0.88	39	6
HAYDEN	31.7	11.6	21.7	1.6	43	-6	1336	0	0	0.65	-1.01	39	7
MEEKER 3W	36.9	14.9	25.9	0.9	52	-9	1207	0	1	0.80	-0.10	89	6
RANGELY	33.7	12.9	23.3	3.1	45	-3	1288	0	0	0.34	-0.24	59	5
GLENWOOD SPRINGS	39.0	17.7	28.4	3.1	51	2	1130	0	1	1.10	-0.37	75	7
RIFLE	40.5	16.6	28.6	3.4	53	3	1123	0	3	1.00	-0.15	87	6
GRAND JUNCTION WS	42.0	24.1	33.0	4.5	51	13	984	0	1	0.64	0.03	105	4
PAONIA 1SW	45.5	21.1	33.3	4.8	56	5	974	0	17	1.06	-0.37	74	7
DELTA	43.3	20.3	31.8	2.9	54	8	1025	0	4	0.51	0.04	109	2
GUNNISON	30.9	1.0	16.0	1.5	46	-16	1512	0	0	0.30	-0.48	38	5
COCHETOPEA CREEK	36.1	3.5	19.8	4.8	47	-15	1393	0	0	0.23	-0.63	27	3
MONTROSE NO 2	40.6	19.8	30.2	2.6	51	5	1072	0	1	0.50	-0.15	77	3
URAVAN	46.2	21.3	33.7	3.3	58	11	961	0	13	0.79	-0.21	79	6
NORWOOD	40.7	17.1	28.9	4.0	54	-7	1114	0	2	0.62	-0.47	57	4
YELLOW JACKET 2W	44.7	23.2	34.0	6.2	59	8	954	0	20	1.28	-0.11	92	4
CORTEZ	44.8	19.5	32.1	4.1	55	2	1012	0	13	0.59	-0.59	50	4
DURANGO	44.2	19.0	31.6	4.2	55	7	1025	0	10	1.65	-0.18	90	5
IGNACIO 1N	43.9	17.4	30.6	4.7	55	8	1056	0	7	0.99	-0.29	77	4

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

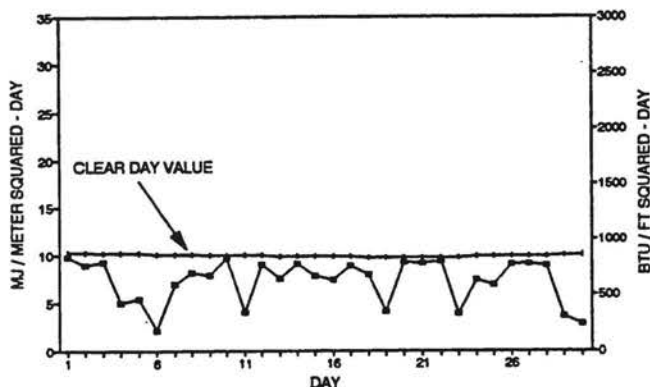
### DECEMBER 1994 SUNSHINE AND SOLAR RADIATION

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	14	10	7	-	-
Denver	14	10	7	66%	67%
Fort Collins	11	11	9	-	-
Grand Junction	12	5	14	60%	61%
Pueblo	NA	NA	NA	70%	71%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

There were more clear days than usual for December statewide and relatively few cloudy days east of the mountains. There were a number of days, however, with dense cloud cover. As a result, sunshine and solar energy ended up near average for the month or slightly below.

### FT. COLLINS TOTAL HEMISPHERIC RADIATION DECEMBER 1994

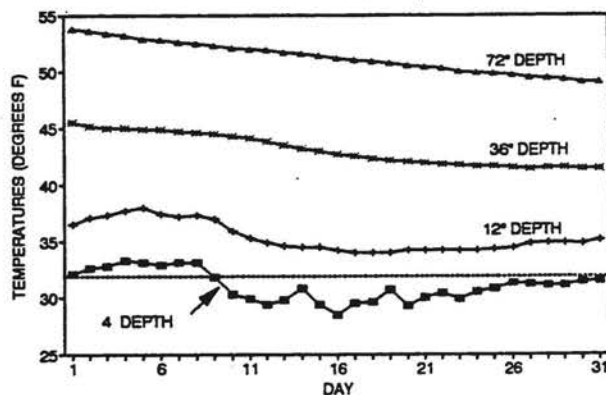


### DECEMBER 1994 SOIL TEMPERATURES

December soil temperature data show that the soil froze early in the month following a cold period. In the top one foot soil layer, temperatures than slowly warmed through the end of the month while deeper temperatures showed their normal winter cooling.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

### FORT COLLINS 7 AM SOIL TEMPERATURES DECEMBER 1994



HATS OFF TO: *The Southeast Colorado Research Center near Springfield, Colorado.*

The Southeast Colorado Research Center became an official cooperative weather station nearly 40 years ago. The commitment of their small staff to accurate long-term climate monitoring to support agricultural research remains strong. Thanks for a job well done.



## WHY DOESN'T WINTER FEEL LIKE WINTER?

As I write this, January is passing and February is fast approaching. I have talked to dozens of people about our winter weather so far and we have reached consensus – it just doesn't feel like winter this year. Yes, there have been some cold, snowy days. There have been howling downslope windstorms along the Front Range. California storms have crossed the Sierras and brought heavy snow to Colorado. Avalanches have already caused some trouble. Upslope fog and low clouds have covered eastern Colorado a time or two. Strong temperature inversions have left residents of Colorado's valley towns freezing. All of these are normal parts of winter weather in Colorado. But something is still missing this year.

What's missing? To answer this question, we looked at historical weather data from all across Colorado to find what it is that we Coloradans associate with winter. What we found is that temperature departures from average and total snowfall (numbers that climatologists work with and TV weathermen quote liberally) only give hints as to how we judge the severity of winter. There are many other factors that affect our perceptions. Here is the list we came up with. If there are some items that I have forgotten, send us a card or hook up to INTERNET and add your thoughts to our list: [nolan@ulysses.atmos.colostate.edu](mailto:nolan@ulysses.atmos.colostate.edu)

### Common features of perceived hard winters in Colorado:

- A rapid change, usually in November, from mild to persistently cold, windy and snowy weather.
- A cold and snowcovered Thanksgiving with many skiers.
- Ice skating by early December, but too cold to skate by New Years.
- A week or more of very cold temperatures (subzero) around Christmas.
- Several consecutive cloudy days with very cold daytime temperatures. (Remember that the definition of "very cold" changes from place to place. Folks in Kremmling may find a 25° January day just toasty while in Canon City it may only have to be 48° before folks think its cold.) But when it's cloudy and the daytime temperature is below 20°F, then most people admit it's cold wherever they are in Colorado.
- Multiple cold waves or one lengthy arctic blast with several days with subfreezing daytime temperatures and subzero readings at night (east of the mountains or near Grand Junction, less than a week will suffice, but up in the mountains at least two frigid weeks in a row are needed to get the attention of natives).
- Very few mild days with no prolonged warm periods.

- Cold winds. There is nothing like wind to bring home the true meaning of cold.
- Frequent snows, even if the amounts are light.
- Scraping frost and ice from our car windshields morning after morning for months at a time.
- Snow that just won't melt (give up cleaning up after the dog and just wait until spring – yuck!). In some areas just two weeks or more with snowcover is a big deal while up in the mountains it has to be five months or longer to be noteworthy.
- Red Mountain Pass and Loveland Pass closed frequently by avalanches. I-70 closed east of Denver at least once with hundreds of travelers stranded at Limon.
- Icy roads day after day accompanied by occasional periods of fog and blowing snow. There is nothing like tension at the wheel to make you wish for summer.
- Soil is still frozen in early April
- Spring storms that drop new snow faster than you can shovel it.

When you look at this list, you can see why winter so far has seemed pretty tame. The snows that have fallen have melted quickly (at lower elevations). Even in the mountains, it has been mild and dry enough that mountain driving has usually been easy. Both Thanksgiving and Christmas were warm with more folks hiking, biking or doing spring cleaning, than skiing. Most of the winds so far have been warm, and warm periods have lasted for weeks. Road closings have been few.

Here in Fort Collins, the signs of an easy winter have been especially obvious. Golfers have been out tuning up their games nearly all winter. Contractors have finishing jobs on time or ahead of schedule. Foundations are being dug and concrete poured even in the middle of January – and construction workers have almost looked comfortable. The Streets Department has been sealing cracks in roads instead of plowing snow. People are watering their yards. I have biked to work almost all winter.

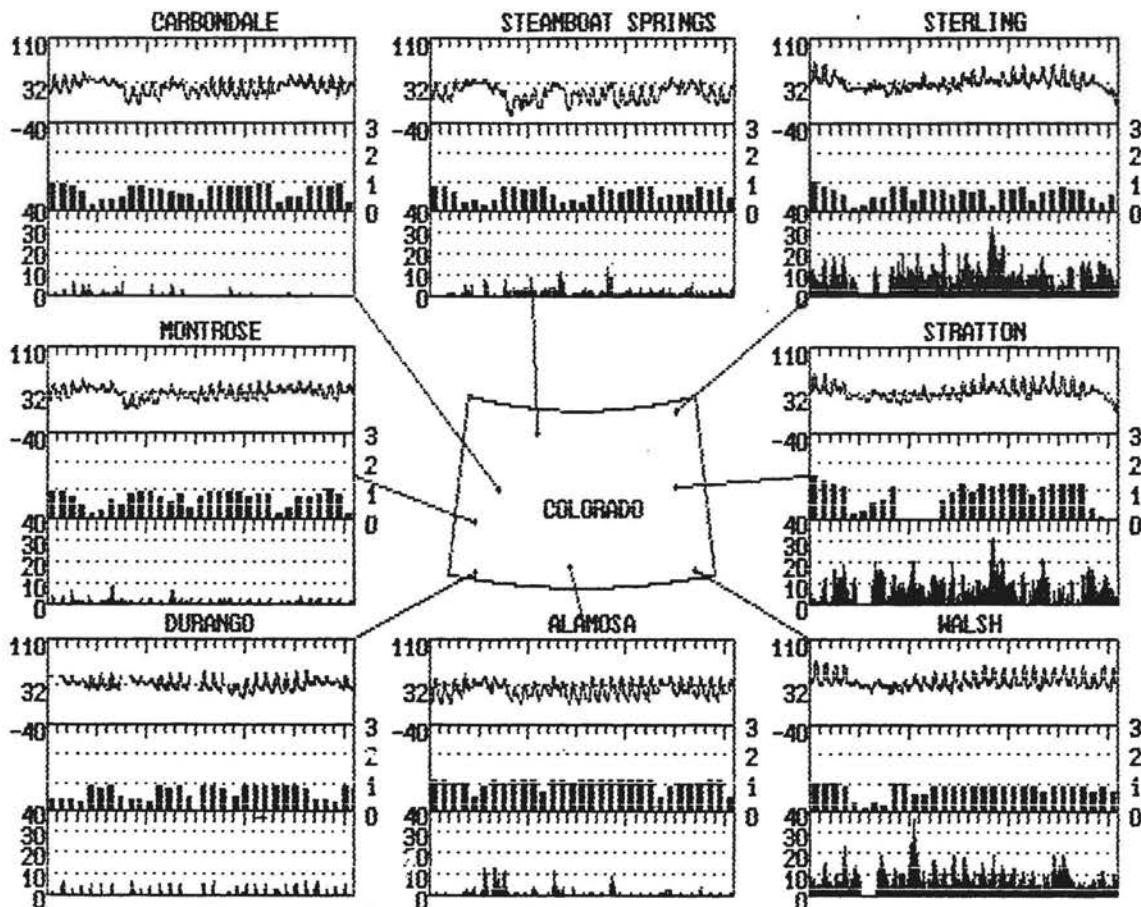
The real proof, however, can be found where young children live. Even though the calendar says it's the middle of winter, mittens are still in pairs, boots are still clean and dry, roller blades are still in use, and parents are not quite as frazzled as usual. Don't pack away our winter clothes and fill your outdoor swimming pool quite yet, though. Winter may be over soon on the calendar, but that doesn't mean that winter is over. Sometimes our February cold waves and spring storms are the worst of all. Don't say I didn't warn you.

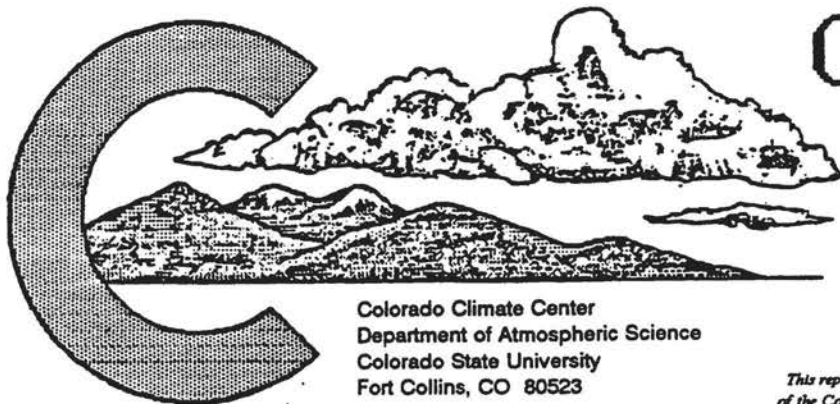
WTHRNET WEATHER DATA DECEMBER 1994

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature (°F)	21.6	30.7	22.5	28.6	13.1	31.4	31.7	36.6
monthly temperature extremes and time of occurrence (°F day/hour)								
maximum:	47.1 4/15	53.8 22/14	48.4 4/14	50.9 4/15	41.5 24/15	68.2 1/15	64.9 25/15	70.9 1/15
minimum:	-3.6 10/7	8.8 16/4	-4.5 9/6	0.7 10/6	-23.4 9/5	-7.2 31/23	-2.4 31/0	14.7 9/5
monthly average relative humidity / dewpoint (percent / °F)								
5 AM	86 / 8	82 / 19	91 / 13	85 / 19	87 / 4	49 / 13	39 / 9	74 / 23
11 AM	55 / 19	48 / 25	68 / 20	58 / 25	85 / 14	36 / 18	36 / 20	47 / 30
2 PM	35 / 20	39 / 26	53 / 24	45 / 25	61 / 18	29 / 20	33 / 22	38 / 31
5 PM	39 / 17	48 / 25	59 / 22	51 / 24	70 / 15	33 / 15	36 / 17	47 / 28
11 PM	77 / 13	80 / 23	88 / 18	83 / 22	89 / 8	47 / 13	41 / 10	73 / 25
monthly average wind direction (degrees clockwise from north)								
day	188	162	172	232	132	201	138	210
night	161	n/a	n/a	130	101	216	229	250
monthly average wind speed (miles per hour)	1.21	n/a	n/a	0.79	1.13	8.27	7.24	7.90
wind speed distribution (hours per month for hourly average mph range)								
0 to 3	593	n/a	n/a	695	567	128	222	49
3 to 12	63	n/a	n/a	33	52	464	379	552
12 to 24	7	n/a	n/a	0	1	142	137	107
> 24	0	n/a	n/a	0	0	10	6	8
monthly average daily total insolation (Btu/ft <sup>2</sup> ·day)	933	655	628	720	572	583	863	773
"clearness" distribution (hours per month in specified clearness index range)								
60-80%	173	99	110	151	102	111	29	181
40-60%	43	72	59	34	64	61	24	45
20-40%	30	34	69	70	77	63	31	26
0-20%	7	47	50	34	33	38	27	28

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

**JANUARY 1995**

Volume 18 Number 4

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

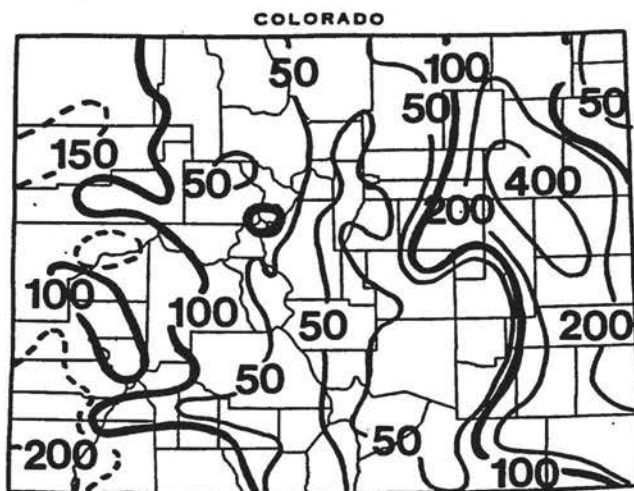
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering.*

## January Climate in Perspective – Pacific Storms

A series of Pacific storm systems brought heavy precipitation to California and Nevada in January but weakened as they reached Colorado. With Pacific airmasses dominating, temperatures were above average during much of the month. Modest doses of snow added favorably to the mountain snowpack, but a large area just east of the Continental Divide remained very dry. An unusual January rainstorm soaked parts of eastern Colorado. Overall, January temperatures were much above average statewide. Precipitation totals ranged from much below to much above average.

### Precipitation

Ten storm systems, seven from the Pacific and three from Canada, were responsible for January's precipitation and weather changes. Pacific storms 4-6th, 7-8th, 11-12th,



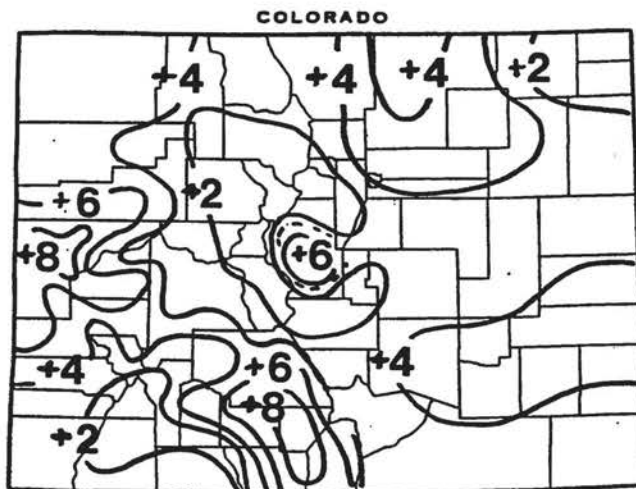
January 1995 precipitation as a percent of the 1961-1990 average.

16-17th and 25-28th accounted for most of western Colorado's January moisture. Rain 26-27th contributed

nearly all of the Eastern Plains January moisture. For the Front Range, the snow 28-29th was the only significant precipitation all month. For the month as a whole, precipitation was above average near the Utah border and much above average across parts of the Eastern Plains. The Front Range and other areas just east of the Continental Divide were much drier than average.

### Temperatures

A moderate outbreak of arctic air chilled eastern Colorado the first week of January. Frigid air from radiational cooling also filled some of Colorado's mountain valleys later in January. But for most of January, mild Pacific air was dominant. Snow cover was also less than usual. The combination resulted in temperatures for the month as a whole that were 3 to 6 degrees F above average over most of the State. Alamosa temperatures climbed above 40° on 14 days during the month and barely dropped below zero at night. The resulting anomaly was 8.6°F above average.



Departure of January 1995 temperatures from the 1961-90 ave.

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January 1995 Precipitation Comparison .....	39	(JCEM WITHRNET January 1995 – will be included in Feb 95 issue)	



## JANUARY 1995 DAILY WEATHER

- 1-4 January 1 brought widespread subzero temperatures. Denver recorded -7° while Grand Lake 6SSW reported -31°F. New Year's Day was cold but sunny. Most winds were light, but strong northwesterly winds produced biting windchill effects in the high mountains and eastern foothills. It remained cold on the 2nd (Kremmling had a high of only +2°) and clouds increased. A new surge of Arctic air dropped down over northern and eastern Colorado during the day. Up to 3" of very fluffy snow fell along the Front Range overnight. The cold persisted 3-4th, especially east of the mountains, with numerous subzero readings.
- 4-8 Clouds thickened and snow began on the 4th across southwestern Colorado as a strong Pacific storm system approached. Up to 18" of snow fell by midday on the 5th over the Southwestern Mountains. Heavier snows then shifted to northwest-facing mountain ranges as the storm passed quickly south of the State early on the 6th. Only a few flakes of snow made it into eastern Colorado, but cold temperatures prevailed. More snow fell in the mountains 7-8th as more Pacific moisture moved inland. Totals of 3-12" were common throughout the mountains. At the same time, temperatures warmed rapidly east of the mountains with the help of strong westerly downslope winds. Gusts in windprone areas along the foothills exceeded 70 mph, but little damage was reported.
- 9-10 A ridge of high pressure over the region brought unseasonably mild temperatures statewide. Pueblo hit 70° on the 10th, and Lamar enjoyed 71°F. Mid and high clouds were widespread. Estes Park had a low of just 39° on the 10th.
- 11-13 Another Pacific storm system moved across Colorado, but this system left most of its moisture behind. Snowfall with water contents of 0.3" to 1.0" were noted over southwest Colorado with lesser amounts to the north and light rain at the lowest elevations. No moisture and scarcely any clouds made it across the mountains, and eastern Colorado enjoyed more mild weather. Some strong winds were reported on the 11th, especially near the Front Range.
- 14-15 Warm Colorado weather continued as a new storm system hit California. Highs in the 40s were common in the mountains while 60s were the rule to the east. Las Animas reached 76° on the 15th, the warmest in the State. Many other areas were close behind. Sunshine was abundant on the 14th, but clouds thickened and precipitation began late on the 15th on the Western Slope.
- 16-18 Deep low pressure crossed northern Colorado on the 16th and dropped heavy precipitation across northwestern Colorado. Nearly a foot of snow was measured at Meeker, Maybell, Craig and Dinosaur with lesser amounts to the south and east. Windy, colder weather followed the storm east of the mountains. Most plains areas remained dry, but flurries dropped up to 2" of snow over northeastern counties on the 17th. Most mountain snows diminished 17-18th and temperatures were very cold, but as winds aloft veered to the northwest some heavy snow continued in local areas in the northern mountains.
- 19-24 Most of Colorado experienced a period of sunny, dry and tranquil weather. Temperatures were seasonal statewide 19-21st. A small storm nicked southern Colorado 20-22nd with clouds and a dusting of snow. With clear skies, very cold air settled into Colorado's snowcovered mountain valleys. Several locations had lows below -20° each morning 21-24th. Taylor Park's -36° on the 23rd was the coldest temperature of the month. Clouds increased from the west on the 24th.
- 25-29 A new storm system approached. Scattered mountain snows and valley rains developed in the western Colorado on the 25th while temperatures climbed into the 50s across the east. Modest precipitation fell over southwestern Colorado on the 26th (7" of snow at Wolf Creek Pass). By early on the 27th a low pressure center had developed in western Kansas. Rain spread across some of the Eastern Plains late on the 26th and continued all day on the 27th in a band from Springfield north to Akron. Steady rains accumulated to more than 0.50", unusually heavy for midwinter. Flagler, Lindon and Woodrow each got more than 1" – near record rainfall for January. Rains changed to snow on the high ground late on the 27th and dropped as much as 3" at Limon. Late on the 28th snow developed again, mostly along the Front Range, as cold air dropped southward into the State. 1-3" totals were common along the Front Range, but Boulder awoke to 8" of new snow on the 29th. Patches of dense fog east of the mountains gave way to bright sunshine but chilly temperatures.
- 30-31 After a cold morning on the 30th (-22° at Fraser), temperatures rebounded and ended the month above average. Strong northwesterly winds developed in the foothills and high mountains on the 31st with gusts exceeding 60 mph in some areas.

### Weather Extremes

Highest Temperature	76°F
Lowest Temperature	-36°F
Greatest Total Precipitation	4.94"
Least Total Precipitation	Trace
Greatest Total Snowfall	89.4"
Greatest Snow Depth	65"

January 15  
January 18, 23

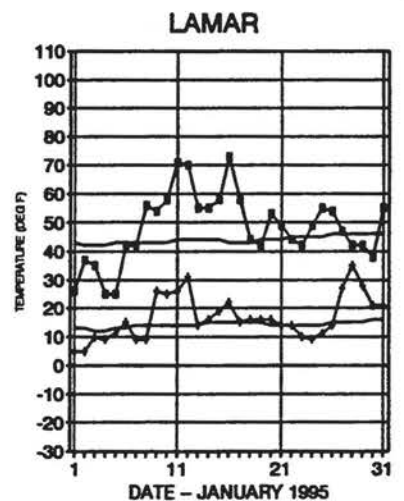
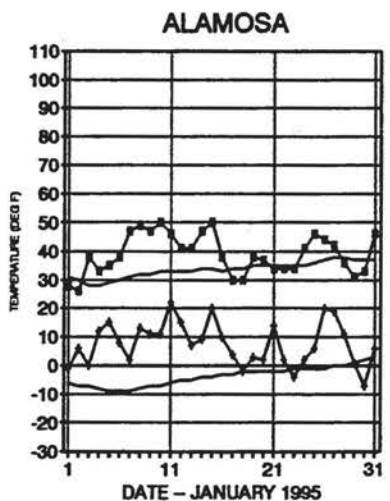
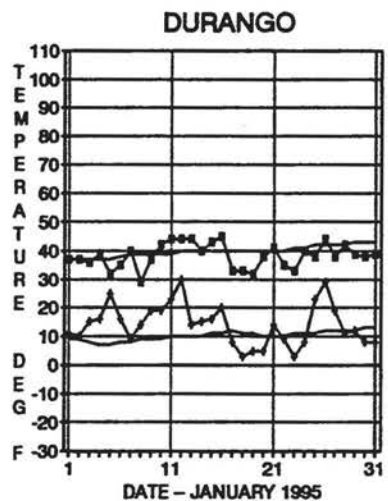
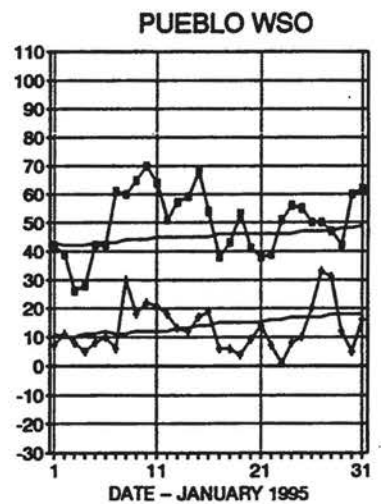
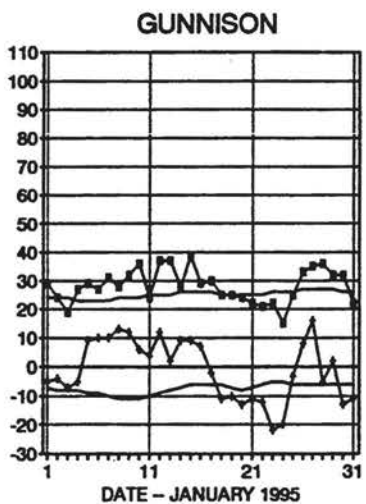
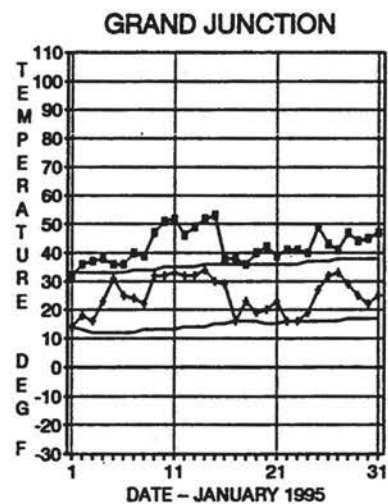
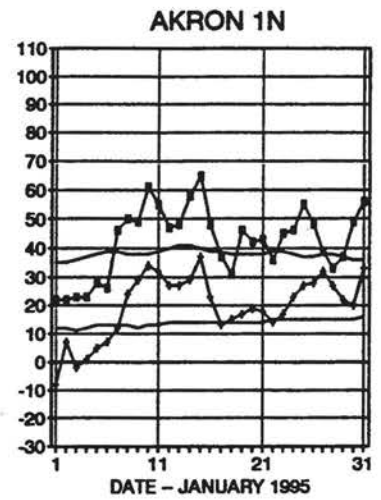
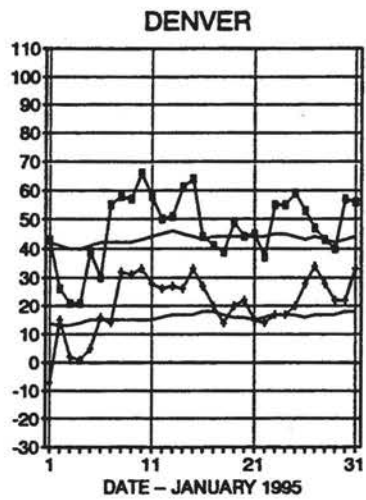
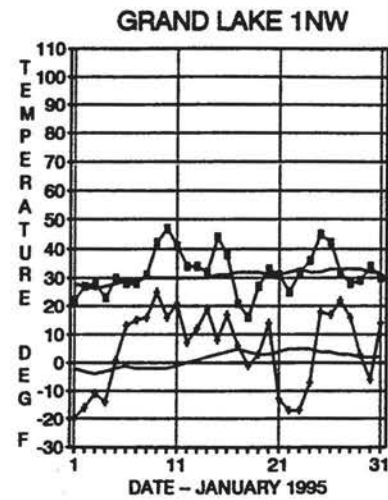
Las Animas  
Taylor Park Dam  
Wolf Creek Pass 1E  
Ordway 2ENE, Tacony 10SE, Colo. Springs NWS  
Wolf Creek Pass 1E  
Wolf Creek Pass 1E



## JANUARY 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

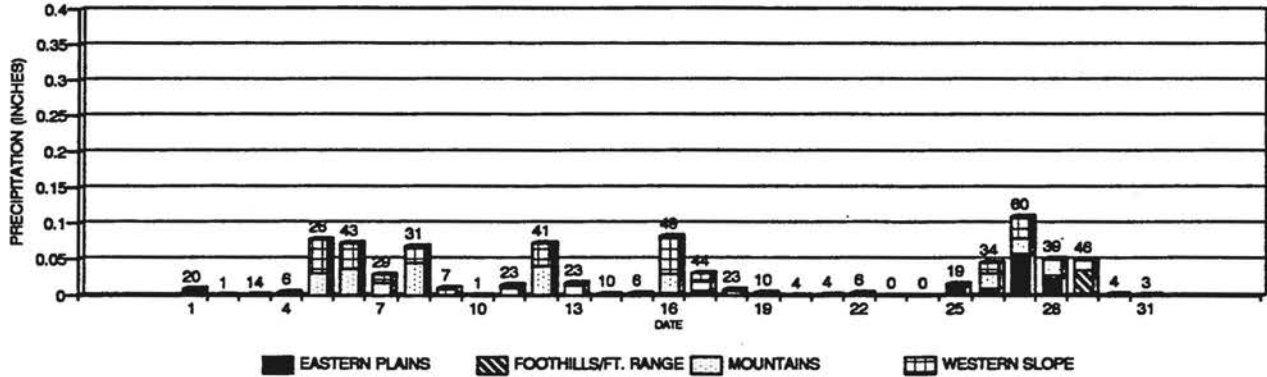


# JANUARY 1995 PRECIPITATION

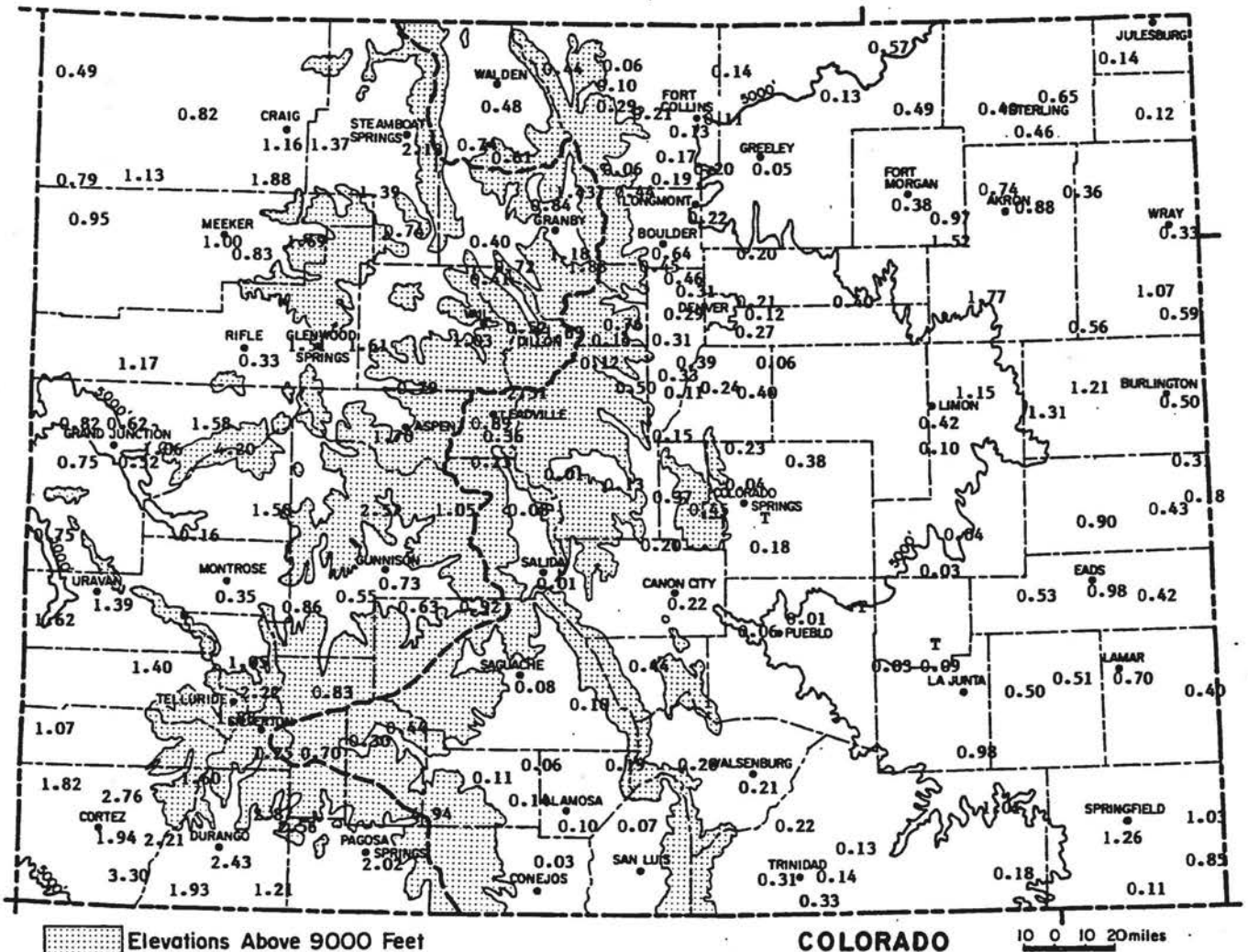
Ten weather systems affected Colorado in January. Nearly all precipitation was limited to western Colorado until the 26-29th when significant moisture fell east of the mountains. January 27 was the only day of the month when more than half of the State (60%) received measurable

precipitation on the same day. For the month as a whole, only 1-4 days with measurable precipitation occurred east of the Continental Divide while snow fell on 12-20 days in the mountains. State-averaged precipitation for January totalled 0.82" compared to the 1961-1990 normal of 0.77".

COLORADO DAILY PRECIPITATION - JAN 1995

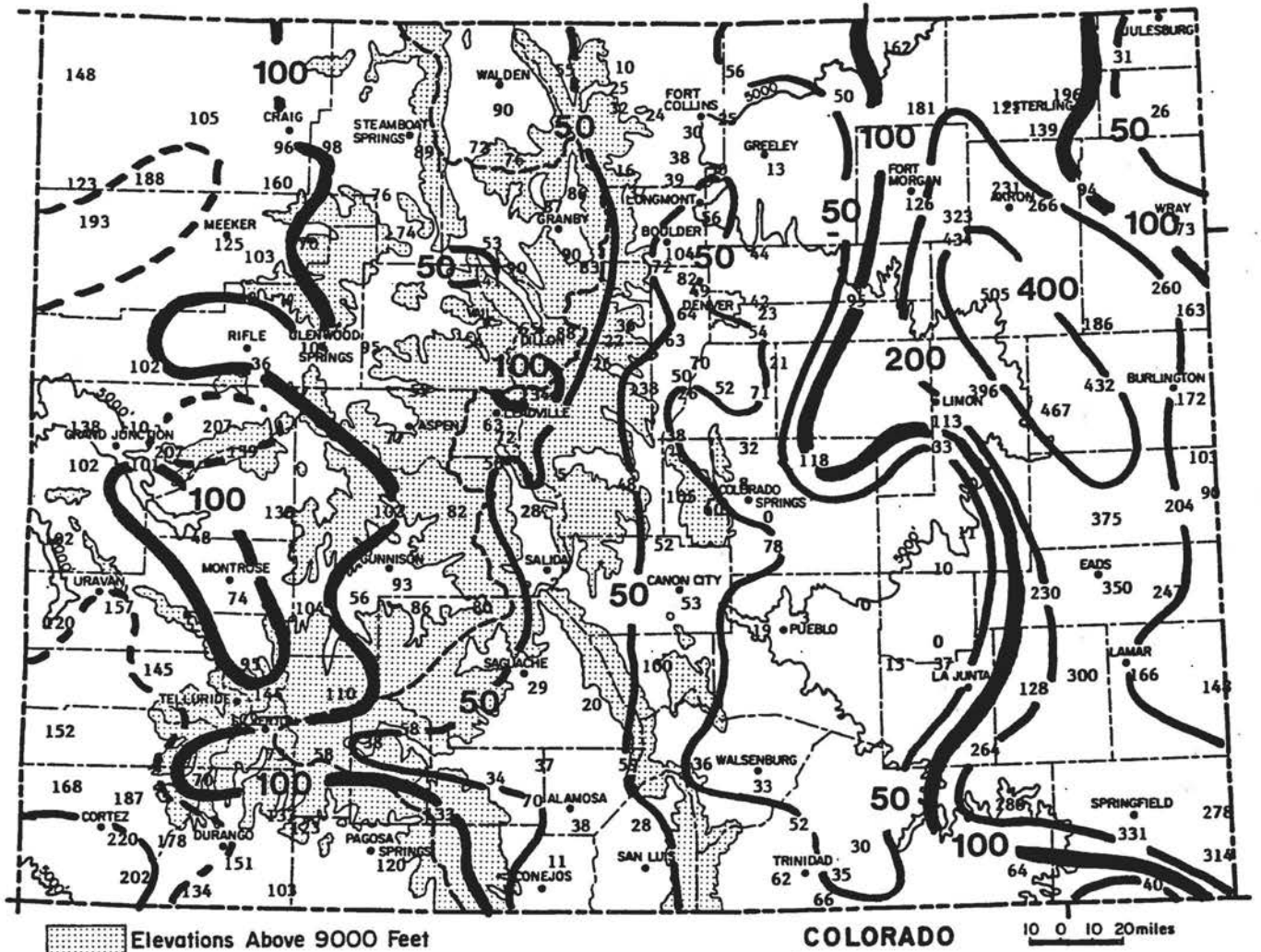


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)

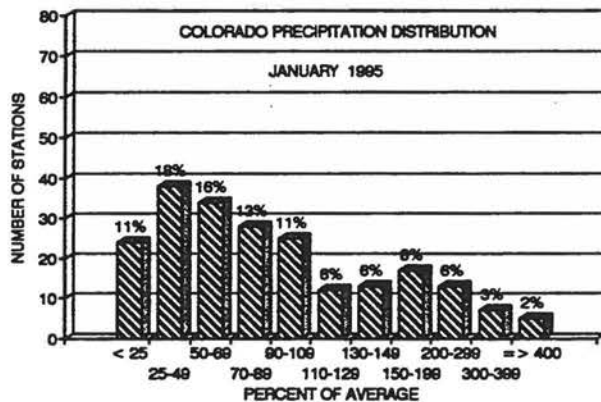


Precipitation Amounts (in inches) for January 1995.

# JANUARY 1995 PRECIPITATION COMPARISON



January 1995 Precipitation as a Percent of the 1961-90 average.



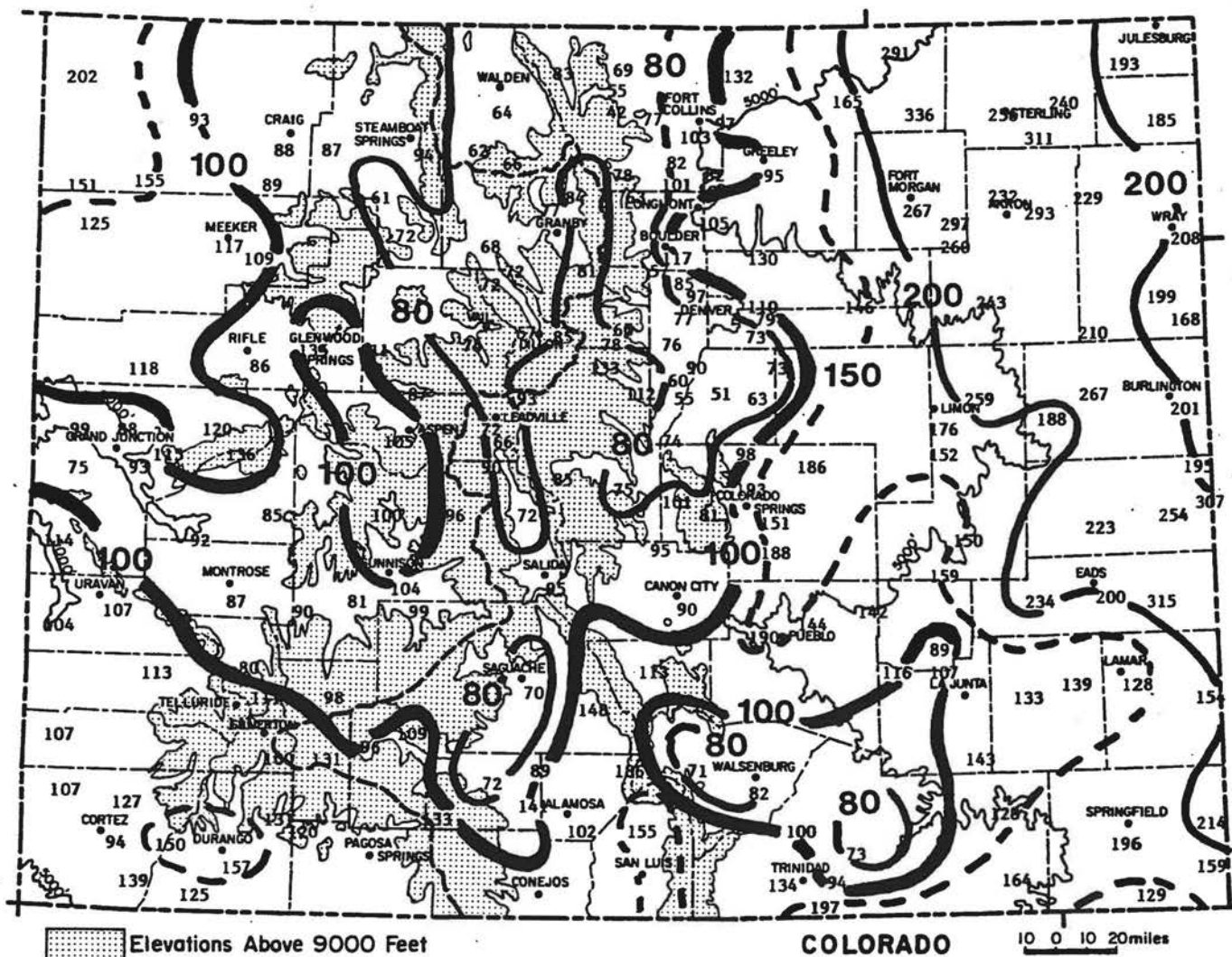
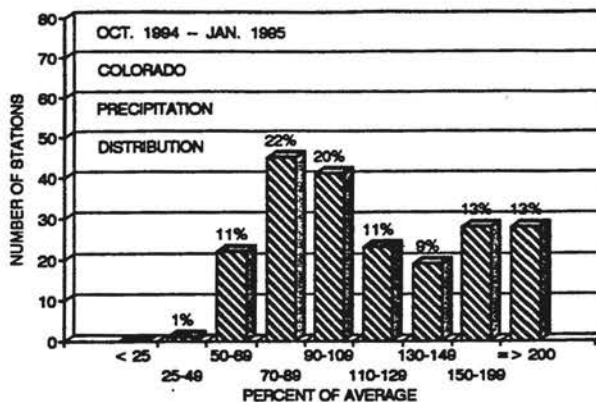
January precipitation totals ranged from 0% of average near Pueblo and Colorado Springs to more than 500% of average in the normally very dry areas east of Limon and Last Chance. Overall, dry areas outnumbered wet areas about 2 to 1 statewide although state-averaged total precipitation was near average.

## JANUARY 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	0.21"	37th driest in 124 years of record (driest = 0.01" in 1933, '34, '52 & '65)
Durango	2.43"	22nd wettest in 102 years of record (wettest = 6.95" in 1906)
Grand Junction	0.62"	38th wettest in 104 years of record (wettest = 2.46" in 1957)
Las Animas	0.50"	25th wettest in 129 years (wettest = 1.60" in 1944)
Pueblo	0.01"	5th driest in 127 years of record (driest < 0.01" in 1880, 1923, '33 & '34)
Steamboat Springs	2.13"	43rd wettest in 89 years of record (wettest = 5.80" in 1980)

# 1995 WATER YEAR PRECIPITATION

With the help of the unusual January rain storm, nearly all of eastern Colorado continues to show water year precipitation totals to date that are considerably above average. Nearly 3 times as much precipitation than normal has fallen in the Akron area since October 1, 1994. But remember, these areas don't normally get much during the winter months and these excesses (1.00" - 3.00") still don't make up for the deficits accumulated during the summer of 1994. Across the southern and westernmost portions of Colorado precipitation totals have been near or above average. Accumulated precipitation since October 1, 1994 continues to lag behind the average across the Northern and Central Mountains and along the Front Range foothills. Many weather stations in this area have received less than 80% of average. Cheesman Reservoir stands at 74% of average while Kremmling and Walden report 68% and 64% of average, respectively. Areas in the Front Range foothills have now been predominantly dry and without much winter snowcover for two years.



October 1994 - January 1995 Precipitation as a Percent of the 1961-90 average.



# COMPARATIVE HEATING DEGREE DAY DATA FOR JANUARY 1995

## HEATING DEGREE DATA

## COLORADO CLIMATE CENTER (303) 491-8848

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700	1174	1307	1267						4902
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8850
	93-94	232	221	425	718	1188	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095	1265	1317						4907
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	651	514	148	10	5646
	94-95	4	0	77	442	848	890	939						3200
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981
	94-95	50	65	266	674	1018	1143	1236						4472
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	6320
	93-94	0	25	189	450	853	978	1060	1068	654	499	144	1	6021
	94-95	4	0	80	370	836	908	1036						3234
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4967
	93-94	0	22	153	435	816	964	886	828	609	468	M	0	M
	94-95	0	0	42	361	695	760	888						2746
COLORADO SPRINGS	AVE	6	18	164	468	816	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	926	749	576	223	14	6271
	94-95	10	14	98	486	811	969	1035						3423
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	508	926	1148	1096	1038	695	528	272	14	6404
	94-95	4	0	111	522	891	1012	1151						3691
CRAIG	AVE	32	56	275	606	996	1342	1479	1193	1094	667	419	193	8376
	93-94	87	60	286	619	1168	1369	1317	1237	837	621	295	83	7959
	94-95	13	14	196	613	1133	1316	1332						4617
DELTA	AVE	0	10	125	403	774	1126	1221	888	719	435	186	38	5927
	93-94	13	33	232	598	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	67	423	794	1025	964						3293
DENVER	AVE	0	0	144	429	780	1054	1064	885	806	504	253	71	6020
	93-94	1	20	152	488	900	948	948	879	618	485	104	3	5544
	94-95	3	2	57	397	804	890	957						3110
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192	1378	1494						5926
DURANGO	AVE	6	37	203	512	848	1172	1246	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1064	1057	695	561	300	20	6636
	94-95	2	2	104	559	952	1025	1193						3837
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1116	M	1258	1080	779	636	330	64	M
	94-95	M	M	M	M	M	M	M						M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	99	7483
	94-95	59	48	286	677	937	1029	1180						4216
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	669	493	141	6	6002
	94-95	3	3	89	460	820	977	1019						3371
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1168	704	550	126	6	M
	94-95	9	8	106	435	898	1030	1176						3662
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	369	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	99	0	5297
	94-95	0	0	24	368	832	964	962						3170

\* = AVES ADJUSTED FOR STATION MOVES    M = MISSING    E = ESTIMATED

## HEATING DEGREE DATA

## COLORADO CLIMATE CENTER (303) 491-8848

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	381	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10462
	94-95	205	188	423	761	1154	1456	1430						5617
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957
	94-95	1	3	68	441	860	1005	1066						3444
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	93-94	M	M	M	M	1323	1693	1734	1527	1044	736	460	185	M
	94-95	87	74	343	737	1136	1512	1583						5472
LAS ANIMAS	AVE	0	0	69	338	750	1068	1141	862	707	370	121	9	5455
	93-94	0	12	90	389	935	925	994	882	555	400	78	0	5260
	94-95	0	3	40	268	690	882	934						M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	93-94	354	390	591	915	1368	1478	1499	1321	1196	994	662	336	11106
	94-95	310	314	539	895	1257	1406	1500						6221
LIMON	AVE	6	21	189	521	879	1189	1218	991	924	603	344	96	6961
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	16	6797
	94-95	12	13	124	513	925	1043	1117						3747
LONGMONT	AVE	0	10	171	488	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	716	533	182	8	6430
	94-95	13	0	82	435	864	949	1076						3419
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1096	785	564	280	52	7373
	94-95	13	5	170	578	1087	1207	1306						4366
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	6296
	94-95	4	2	113	489	895	1072	1068						3643
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	6548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	1009	M	1253						M
PUEBLO	AVE	0	0	62	357	735	1051	1061	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	687	467	143	0	5650
	94-95	0	8	57	368	785	964	1026						3228
RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881
	93-94	E	13	7	199	464	975	1171	1132	921	662	488	194	M
	94-95	3	0	105	497	947	1123	1064						3759
STEAMBOAT														

## JANUARY 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	40.1	14.8	27.5	4.3	59	-13	1156	0	15	0.57	0.22	163	5
STERLING	39.5	13.6	26.6	1.1	63	-14	1184	0	14	0.40	0.07	121	3
FORT MORGAN	41.2	12.5	26.9	4.4	66	-19	1176	0	24	0.38	0.08	127	4
AKRON 1N	42.4	19.6	31.0	5.0	65	-8	1045	0	27	0.74	0.42	231	4
AKRON 4E	40.4	15.1	27.8	2.4	65	-14	1145	0	24	0.88	0.55	267	5
HOLYOKE	41.5	15.8	28.7	1.5	67	-16	1119	0	24	0.12	-0.34	26	3
JOES 2SE	43.5	16.1	29.8	1.2	67	-9	1086	0	43	0.56	0.26	187	5
BURLINGTON	43.3	19.4	31.3	3.3	64	-3	1036	0	34	0.50	0.21	172	2
LIMON WSMO	43.0	14.5	28.7	3.2	62	-10	1117	0	33	0.42	0.05	114	3
CHEYENNE WELLS	45.6	20.4	33.0	4.2	66	-5	985	0	45	0.43	0.22	205	3
EADS	48.1	18.9	33.5	5.7	69	2	969	0	64	0.98	0.70	350	3
ORDWAY 21N	42.9	10.2	26.5	0.5	63	-5	1184	0	33	0.03	-0.26	10	1
ROCKY FORD 2ESE	51.1	17.1	34.1	5.0	70	-3	948	0	90	0.09	-0.15	38	2
LAMAR	48.3	17.3	32.8	3.8	73	5	991	0	66	0.70	0.28	167	5
LAS ANIMAS 1N	51.6	17.6	34.6	5.1	76	6	934	0	96	0.50	0.22	179	4
HOLLY	48.7	15.6	32.1	4.3	75	4	1013	0	76	0.40	0.13	148	3
SPRINGFIELD 7WSW	48.5	20.9	34.7	2.9	73	-3	934	0	73	1.26	0.88	332	4

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	45.3	18.5	31.9	4.2	65	-10	1019	0	34	0.13	-0.30	30	3
GREELEY UNC	42.5	18.2	30.4	3.2	63	-14	1066	0	26	0.06	-0.31	16	4
ESTES PARK	38.0	19.0	28.5	3.0	52	-12	1125	0	2	0.06	-0.30	17	2
LONGMONT 2ESE	46.2	14.0	30.1	3.5	67	-12	1076	0	55	0.22	-0.17	56	3
BOULDER	46.9	22.1	34.5	4.0	66	-4	939	0	44	0.64	0.03	105	4
DENVER WSFO AP	47.2	20.5	33.9	4.2	66	-7	957	0	57	0.21	-0.29	42	3
EVERGREEN	45.0	8.4	26.7	0.0	63	-8	1180	0	34	0.31	-0.18	63	3
CHEESMAN	44.2	-0.2	22.0	-2.5	61	-22	1327	0	32	0.15	-0.24	38	2
LAKE GEORGE BSW	36.9	4.2	20.6	6.1	51	-15	1369	0	2	0.13	-0.14	48	2
ANTERO RESERVOIR	38.2	2.0	20.1	6.4	52	-16	1382	0	2	0.01	-0.17	6	1
RUXTON PARK	28.4	8.5	18.4	1.4	43	-5	1435	0	0	0.45	-0.30	60	4
COLORADO SPRINGS WSO	44.0	18.8	31.4	2.6	62	-11	1035	0	32	0.00	-0.29	0	0
CANON CITY 2SE	49.0	23.2	36.1	1.1	66	1	888	0	63	0.22	-0.19	54	3
PUEBLO WSO AP	50.1	13.1	31.6	4.1	70	1	1028	0	77	0.01	-0.31	3	1
WESTCLIFFE	40.9	10.1	25.5	3.3	56	-11	1216	0	8	0.44	0.00	100	2
WALSENBURG	47.6	25.1	36.4	3.5	60	0	879	0	44	0.21	-0.41	34	3
TRINIDAD AP	48.9	19.0	33.9	2.7	66	-6	955	0	66	0.13	-0.30	30	4

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	32.0	4.9	18.4	2.5	45	-23	1438	0	0	0.48	-0.05	91	7
LEADVILLE 2SW	30.7	2.2	16.4	1.5	45	-14	1500	0	0	0.36	-0.14	72	13
SALIDA	43.2	13.8	28.5	1.6	55	1	1122	0	8	0.01	-0.37	3	1
BUENA VISTA	40.1	9.7	24.9	-0.7	53	-2	1236	0	2	0.08	-0.20	29	2
SAGUACHE	39.2	11.5	25.4	7.3	58	5	1218	0	5	0.08	-0.19	30	2
HERMIT 7ESE	33.7	-3.2	15.2	5.4	46	-25	1535	0	0	0.30	-0.48	38	3
ALAMOSA WSO AP	39.0	7.6	23.3	8.6	50	-7	1287	0	0	0.10	-0.16	38	1
STEAMBOAT SPRINGS	30.3	5.1	17.7	2.8	48	-20	1458	0	0	2.13	-0.24	90	13
GRAND LAKE 1NW	31.9	5.2	18.6	2.7	47	-20	1430	0	0	1.43	-0.23	86	17
GRAND LAKE 6SSW	26.8	-1.1	12.9	-0.5	43	-31	1608	0	0	0.84	-0.12	88	15
DILLON 1E	30.7	2.4	16.5	0.8	49	-16	1494	0	0	0.52	-0.27	66	12
CLIMAX	25.4	-7.0	9.2	-0.8	39	-22	1724	0	0	2.51	0.64	134	13
ASPEN 1SW	34.3	10.3	22.3	2.1	49	-8	1317	0	0	1.70	-0.50	77	13
CRESTED BUTTE	27.8	-4.5	11.6	2.1	41	-29	1648	0	0	2.57	0.07	103	13
TAYLOR PARK	26.0	-8.4	8.8	2.1	35	-36	1735	0	0	1.05	-0.23	82	8
TELLURIDE	34.3	4.2	19.3	-0.2	51	-18	1409	0	1	1.88	0.35	123	14
PAGOSA SPRINGS	37.7	10.9	24.3	4.2	46	-12	1253	0	0	2.02	0.34	120	12
SILVERTON	31.9	-2.4	14.7	-0.4	47	-22	1551	0	0	1.25	-0.45	74	11
WOLF CREEK PASS 1E	25.5	4.5	15.0	-2.3	40	-11	1545	0	0	4.94	1.25	134	20

## WESTERN VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	31.4	12.2	21.8	4.3	46	-8	1332	0	0	1.16	-0.04	97	9
HAYDEN	31.8	11.5	21.6	4.6	46	-17	1338	0	0	1.37	-0.02	99	12
MEEKER 3W	33.9	11.2	22.6	0.6	52	-12	1306	0	1	1.00	0.20	125	9
RANGELY	32.7	11.8	22.3	5.9	49	-1	1317	0	0	1.49	1.00	304	3
GLENWOOD SPRINGS	37.9	17.7	27.8	4.3	52	0	1147	0	1	1.51	0.07	105	12
RIFLE	40.4	19.1	29.8	7.4	51	0	1084	0	1	0.33	-0.57	37	6
GRAND JUNCTION WS	42.4	24.9	33.7	8.7	53	14	962	0	5	0.62	0.06	111	9
PAONIA 1SW	42.5	22.1	32.3	6.9	60	10	1005	0	11	1.50	0.42	139	9
DELTA	43.5	22.6	33.0	6.9	57	10	984	0	15	0.16	-0.17	48	2
GUNNISON	28.2	-0.8	13.7	4.6	39	-22	1583	0	0	0.73	-0.05	94	10
COCHETOPA CREEK	32.9	2.1	17.5	7.8	44	-17	1464	0	0	0.63	-0.10	86	9
MONTROSE NO 2	39.9	20.7	30.3	5.5	52	10	1068	0	4	0.35	-0.12	74	4
URAVAN	44.9	22.5	33.7	6.1	56	13	962	0	10	1.39	0.51	158	8
NORWOOD	38.2	15.5	26.8	4.2	49	2	1174	0	0	1.40	0.44	146	8
YELLOW JACKET 2W	38.5	18.0	28.2	3.0	50	2	1132	0	0	1.82	0.74	169	11
CORTEZ	40.2	15.1	27.6	3.1	50	0	1151	0	0	1.94	1.06	220	11
DURANGO	38.3	14.1	26.2	1.2	45	3	1193	0	0	2.43	0.83	152	12
IGNACIO 1N	36.5	13.6	25.0	2.6	45	-2	1231	0	0	1.21	0.04	103	7

Data are received by the Colorado Climate Center for more locations than appear in these tables.  
Please contact the Colorado Climate Center if additional information is needed.

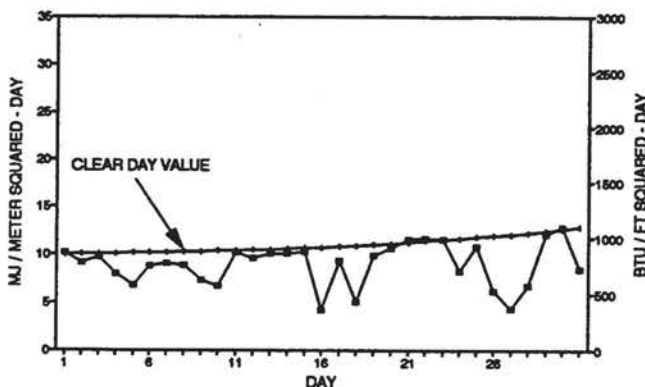
### JANUARY 1995 SUNSHINE AND SOLAR RADIATION

	Number of Days			Percent Possible	Average % of Possible
	CLR	PC	CLDY	Sunshine	Possible
Colorado Springs	4	17	10	-	-
Denver	7	14	10	65%	71%
Fort Collins	12	9	10	-	-
Grand Junction	2	7	22	58%	61%
Pueblo	NA	NA	NA	66%	75%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Clouds associated with Pacific storm systems covered western and southern Colorado throughout much of January resulting in less solar radiation than normal for those areas. Cloudcover dissipated east of the mountains, and northeastern Colorado received near average solar energy.

### FT. COLLINS TOTAL HEMISPHERIC RADIATION JANUARY 1995

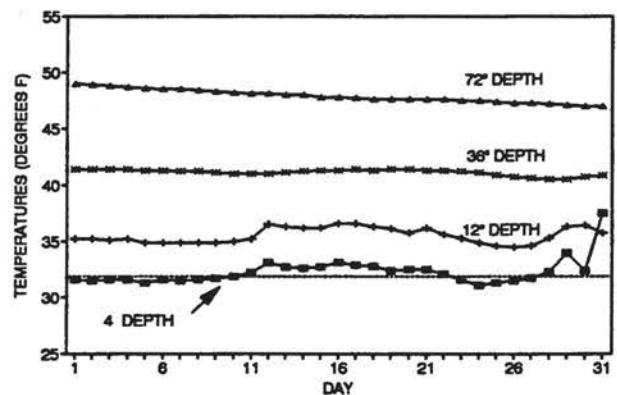


### JANUARY 1995 SOIL TEMPERATURES

Snowcover in early January insulated the ground from the harshest arctic outbreak of the winter. Only a very shallow layer of soil remained frozen during the month, and this frost melted completely the last day of the month, a full 4 weeks earlier than normal.

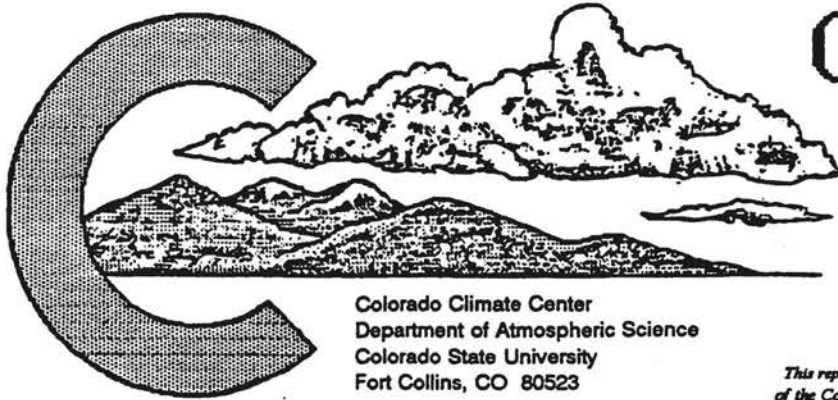
These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

### FORT COLLINS 7 AM SOIL TEMPERATURES JANUARY 1995



### HATS OFF TO: Mr Donald Clever of Pleasantview

Weather observers who tend the National Weather Service recording raingages are not always recognized in our reports. This month we would like to thank Don Clever from Pleasantview in southwestern Colorado for 42+ years of diligent service. It doesn't rain much there, but by persistence Don has added up more than 500 inches including 6.6" in October 1972. Many thanks!



# COLORADO CLIMATE

**FEBRUARY 1995**

Volume 18 Number 5

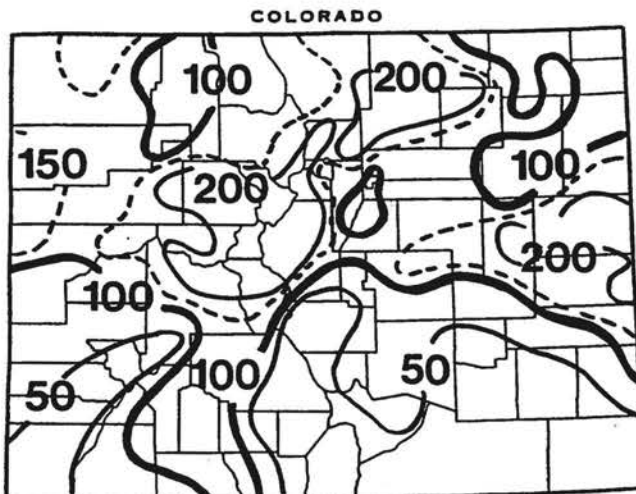
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## February Climate in Perspective – Very Warm and a Big Storm

If you didn't look at the calendar, you would have thought it was April. The only difference was it wasn't as breezy or as changeable as most April's are. Temperatures were exceptionally mild, except for a week in mid February, and ended up 4 to 11°F above average statewide. A potent onslaught of snow and wind Feb. 8-14th buried the Central Mountains under 3 to 7 feet of new snow. Precipitation totals ended up above average for most mountain areas but drier than average over much of southern Colorado.

### Precipitation

For most of February Colorado weather was extremely mild with no storms of consequence. But the period of Feb. 8 to 14th tried to make up for it (see Special



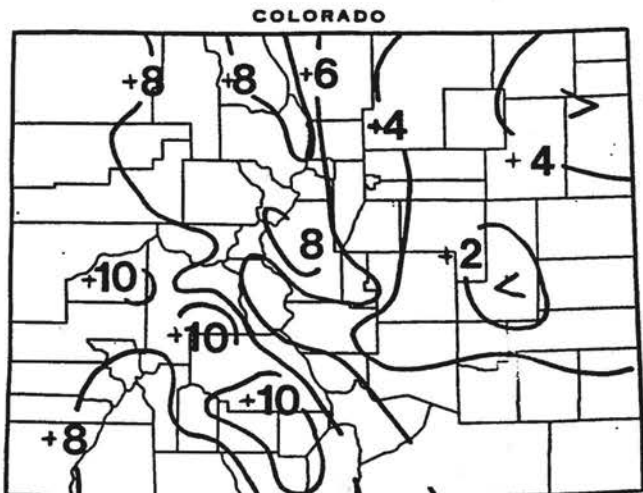
February 1995 precipitation as a percent of the 1961-1990 average.

Feature on page 55). Most of the State received some precipitation, but the storm was concentrated in the Central Mountains and along the Front Range. The only other

precipitation worth talking about was a much weaker storm 27-28th. Precipitation for the month ended up much above average over the Central Mountains, parts of the northern Front Range and over portions of east central and northwestern Colorado. The big storm skipped most of southern Colorado. Much of southeastern Colorado and a small portion of the southwest corner received less than 50% of average.

### Temperatures

A week of cold weather (especially east of the mountains) associated with the big snowstorm kept February from being the warmest February on record, but it still came close. Phenomenally persistent warm weather dominated the region for most of the month with daily temperatures as much as 20° above average at times. Temperatures for the month as a whole ended up 8-11°F above average over most of the mountains and Western Slope. East of the mountains, most places were 3-5° warmer than average. By late in the month, spring flowers were emerging and trees buds were beginning to swell.



Departure of February 1995 temperatures from the 1961-90 ave.

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## FEBRUARY 1995 DAILY WEATHER

- 1-2 February got off to a very warm start with near record temperatures. Wind gusts along the Front Range exceeded 60 mph in wind prone areas. La Junta reached 77° on the 1st. A disturbance passed north of Colorado on the 2nd bringing slightly cooler temperatures from the mountains eastward and a skiff of snow to the Northern and Central Mountains. Wind gusts reached 70 mph at Rocky Flats.
- 3-7 A high pressure ridge over the western U.S. brought sunshine and much above average temperatures to western Colorado. Highs climbed to near 40° each day in the mountains with upper 50s at lower elevations. East of the mountains, skies were partly cloudy and temperatures were also mild. Cooler air on the back side of the ridge tried to push in from the northeast on the 3rd and again on the 5-6th. A period of light snow late on the 6th brought up to 1" of snow to north-eastern counties. Clouds increased over western Colorado on the 7th as a storm approached.
- 8-9 Clouds thickened on the 8th, and valley rains and mountain snows spread eastward during the day. Paonia picked up 0.46" of rain while Rangely totalled .53" of rain changing to snow. Temperatures cooled but were still above average, especially at night. A few light showers and flurries made it across the mountains. Snows continued in the mountains on the 9th. 7" fell at Grand Lake, but most totals were light. Winds aloft increased. Temperatures east of the mountains remained mild, but an arctic cold front approached quickly from the north.
- 10-15 A surge of polar air pushed into eastern Colorado, and temperatures dropped into the teens by late on the 10th. Fog, low clouds and snow developed in the cold air and spread southward. 3-8" fell along the Front Range. Snow also increased in the mountains during the day and became heavy in spots. Cold easterly "upslope" winds and light snow continued across eastern Colorado 11-12th with temperatures staying mostly in the teens during the day and dropping near zero at night. 5-10" of fluffy, dry snow fell along the southern Front Range. An area of heavy snow also developed in east central Colorado. Very strong westerly winds above the mountains drove moist air up and over the Central Mountains. Copious snowfall resulted (1-3 feet 11-12th). Daytime temperatures along the Continental Divide in northern Colorado were near 0°F. Avalanches became numerous by the afternoon of the 12th and some mountain roads were impassable. Snows tapered off temporarily on the 13th. Temperatures moderated in the mountains but fog, flurries and frigid air continued to the east. Folks in Limon awoke to a -19° reading. Colorado Springs only had a high of 13° on the 13th, but up in the mountains temperatures reached into the 40s. Then a final surge of wind and snow (rain at lower elevations - 0.92" at Durango) attacked Colorado on the 14th. Late in the day, snow fell at a rate of 3" per hour in some locations. The Fairplay area was hit by one of their worst snowstorms in memory. Temperatures east of the mountains soared briefly into the 50s until the storm raced onto the Plains during the evening accompanied by intense local snowshowers, strong winds and some lightning. Skies cleared on the 15th but it was cold and breezy with subzero morning temperatures. Several schools and roads were closed in the aftermath of the huge snowstorm. (Refer to the Special Feature on page 55 for snowfall totals for the entire storm.)
- 16-18 With clear skies and deep snow, nights were very cold in the mountains. Taylor Park recorded -26° on 17th. Temperatures warmed through the period especially east of the mountains as downslope winds developed. An upper air disturbance skipped across northern Colorado on 18th with more winds and a skiff of snow.
- 19-26 Sunny, dry and very warm weather accompanied a large high pressure ridge over the West. Near record temperatures developed, and low elevation snows melted. Alamosa hit 60° on the 20th, and Denver reached 71° on the 21st. It was a little cooler east of the mountains on the 23rd, but warmer again 24-25th. Holly and Las Animas each hit 80° on the 25th, the hottest in the State. A weak disturbance crossed southern Colorado on the 25th with a few rain and snow showers. Springlike cumulus clouds formed on the 26th, heralding an approaching storm.
- 27-28 Warm weather persisted over western Colorado, but a sharp cold front moved southward across the Eastern Plains on the 27th dropping temperatures nearly 40 degrees and bringing low clouds and a dangerous combination of freezing drizzle and snow. Much of the State received precipitation, but most snowfall reports were less than 3". Allenspark had 8" of new snow by morning on the 28th. Temperature contrasts were dramatic on the 28th with Grand Junction and Alamosa reporting highs of 59° and 50°, respectively, while Akron only got up to 17°F.

Highest Temperature	80°F
Lowest Temperature	-26°F
Greatest Total Precipitation	5.47"
Least Total Precipitation	Trace
Greatest Total Snowfall	62.1"
Greatest Snow Depth	69"

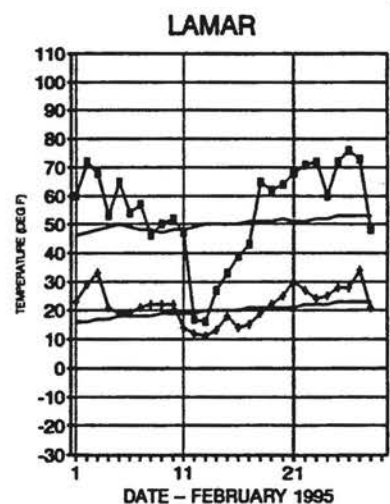
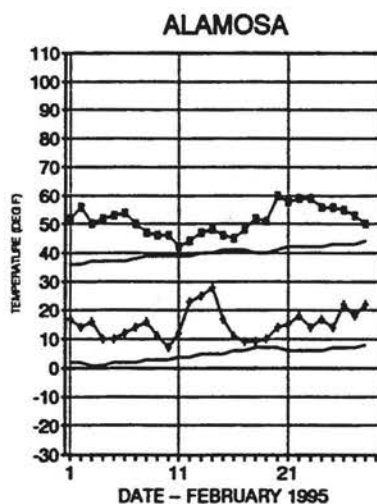
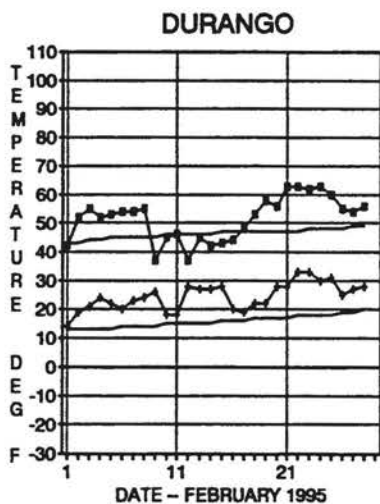
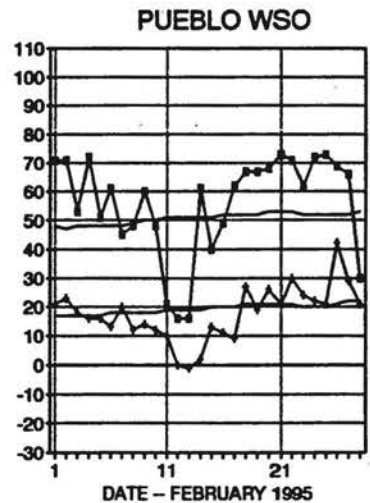
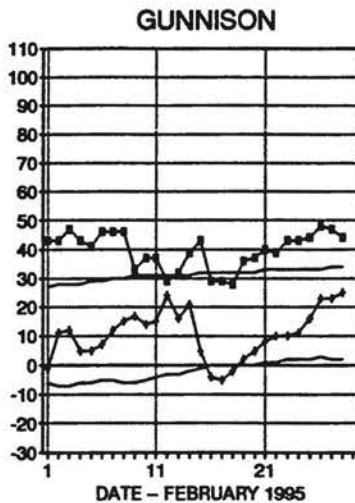
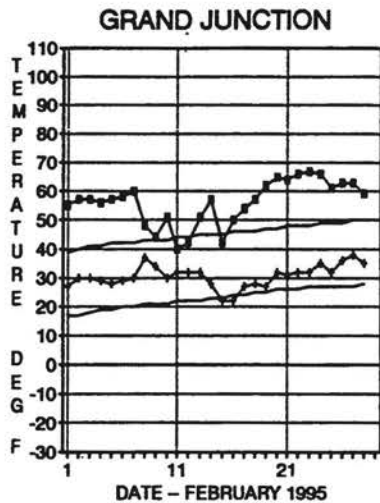
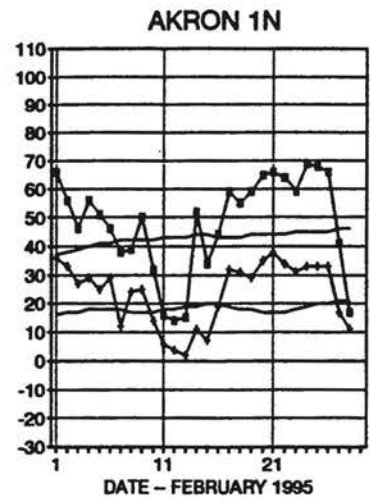
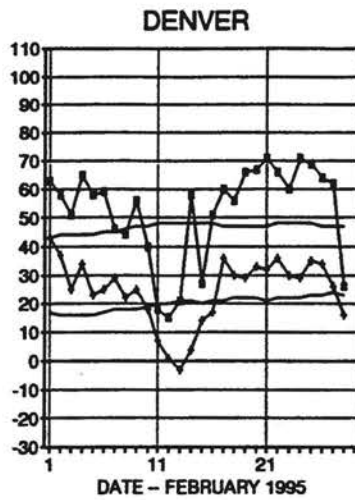
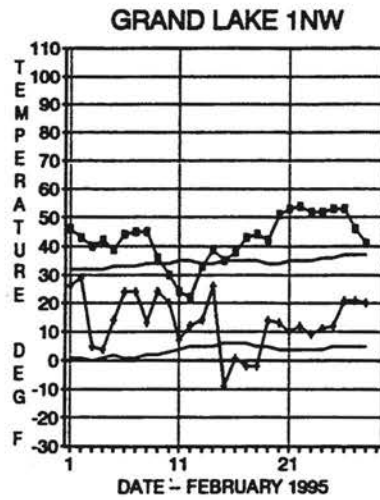
### Weather Extremes

February 25	Las Animas, Holly
February 17	Taylor Park Dam
	Wolf Creek Pass 1E
	Blanca, Center 4SSW, San Luis 2SE
	Wolf Creek Pass 1E
February 15	Bonham Reservoir

## FEBRUARY 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

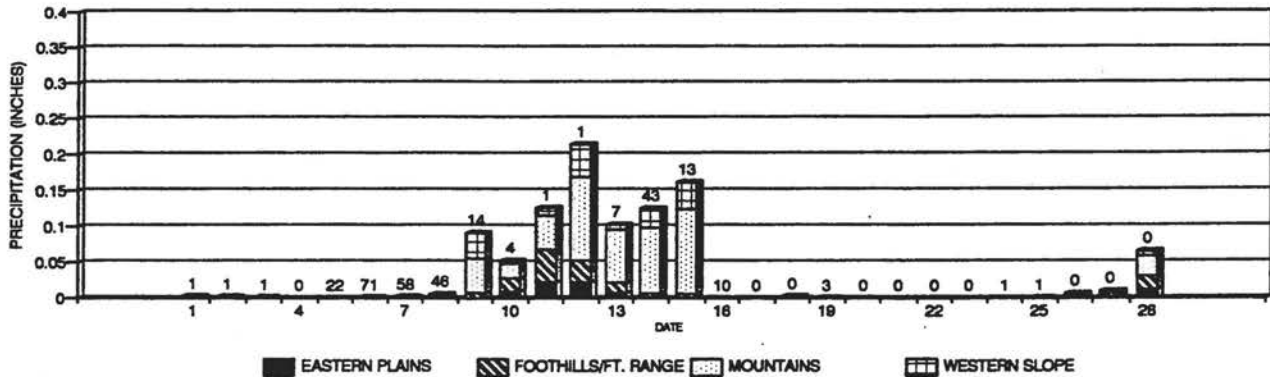


## FEBRUARY 1995 PRECIPITATION

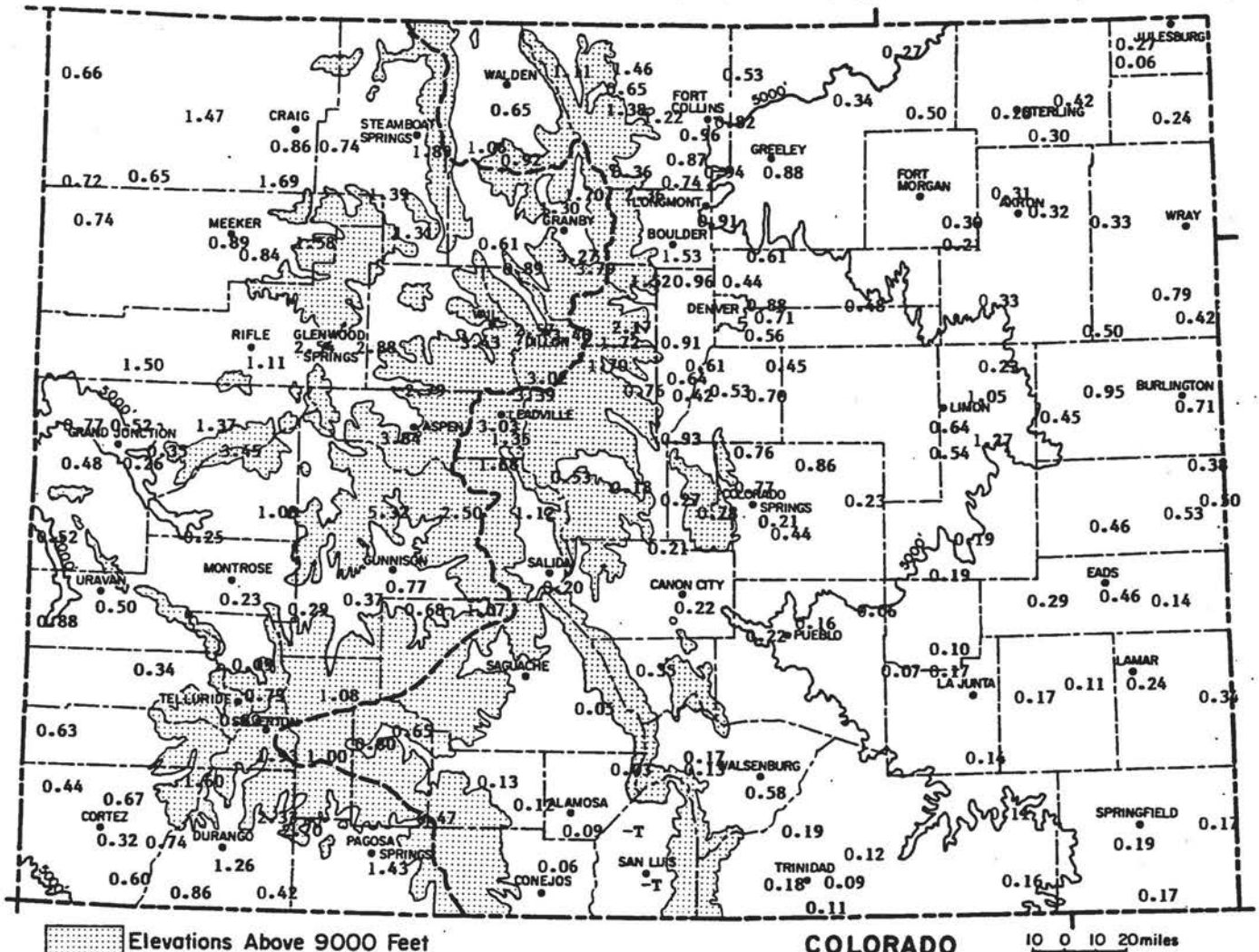
Nine weather systems affected Colorado in February, but most of these were weak and skirted well north of the State. The complex storm systems Feb. 8-14 ended up dropping almost all of the month's precipitation. Another smaller storm February 27-28th made a lesser contribution.

Overall, there were 3 to 7 days with measurable precipitation on the Western Slope and east of the mountains. Mountain areas reported from 6 to 13 days with precipitation. State-averaged precipitation for February totaled 0.99" compared to the 1961-1990 average of 0.75".

COLORADO DAILY PRECIPITATION - FEB 1995

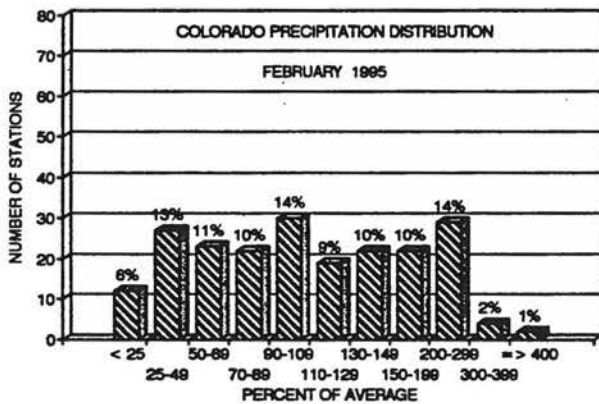
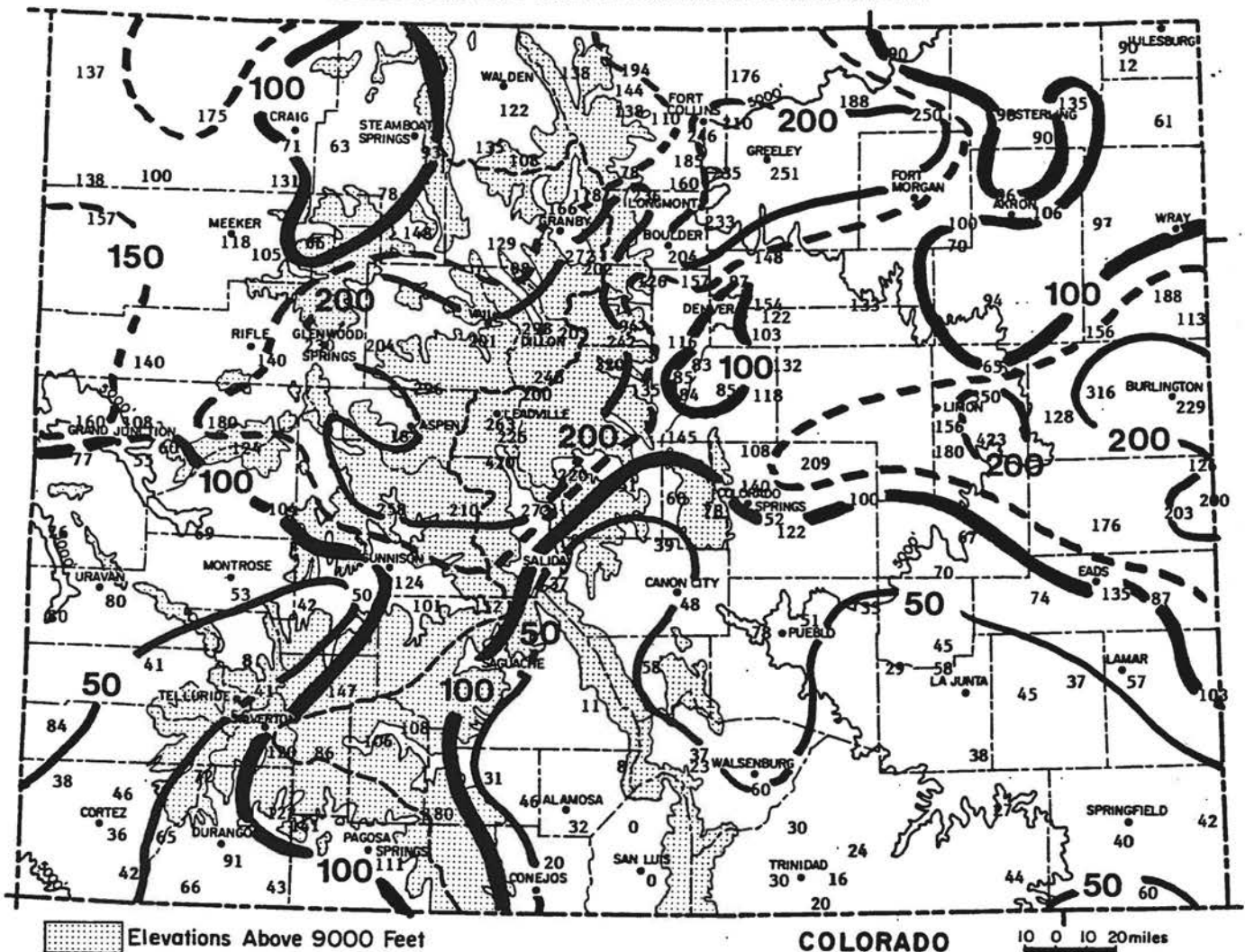


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)



Precipitation Amounts (in inches) for February 1995.

## FEBRUARY 1995 PRECIPITATION COMPARISON



February precipitation totals ranged from less than 10% of average in parts of the San Luis Valley to nearly 300% of average at Vail and 420% of average at Twin Lakes Reservoir south of Leadville. Despite wide variations in precipitation, wet areas ended up outnumbering drier than average areas by a small margin.

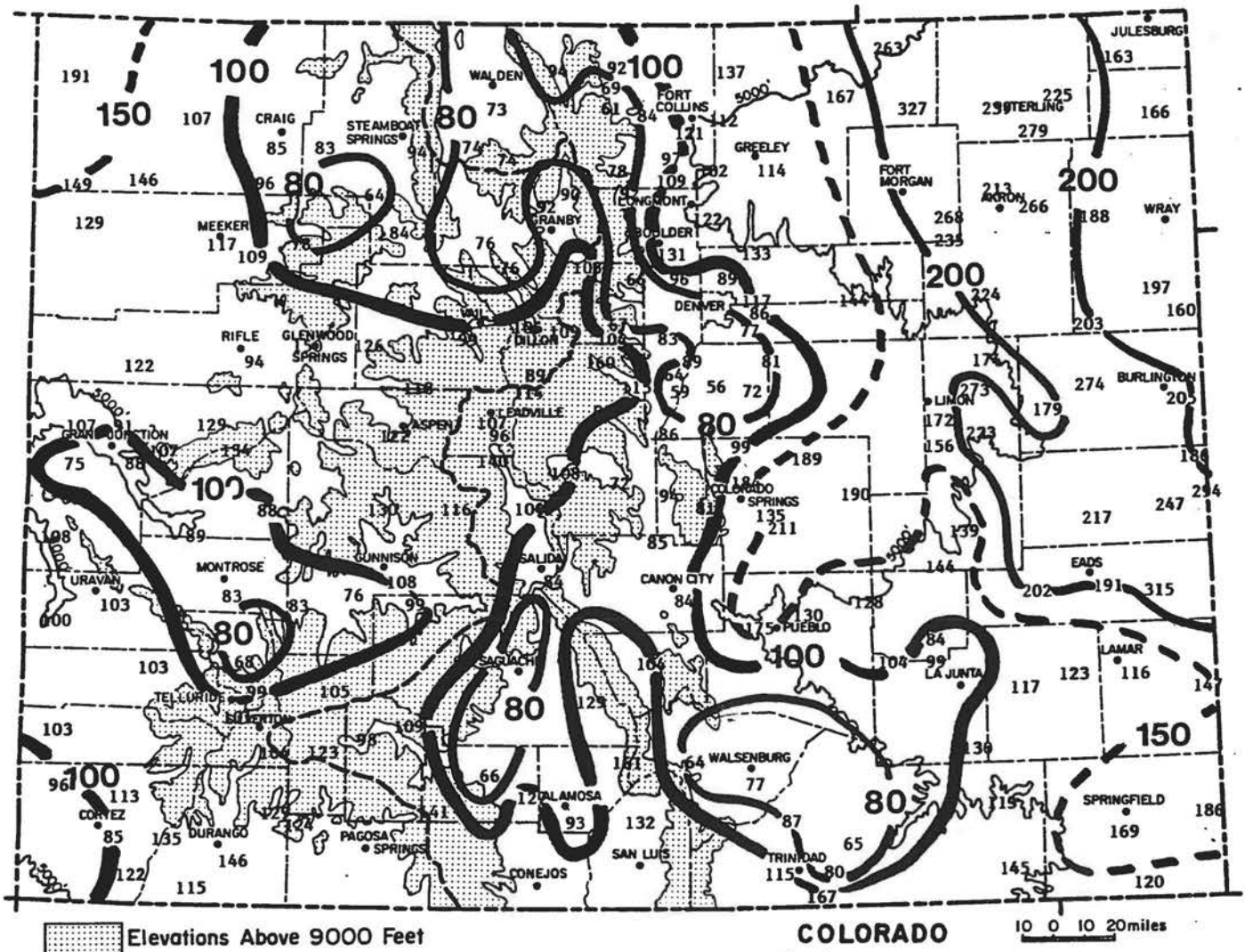
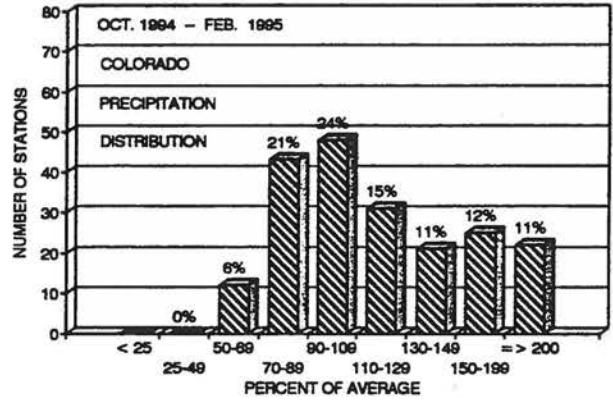
### FEBRUARY 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	0.88"	24th wettest in 124 years of record (wettest = 2.01" in 1934)
Durango	1.26"	49th wettest in 101 years of record (wettest = 7.02" in 1911)
Grand Junction	0.52"	51st wettest in 104 years of record (wettest = 1.77" in 1893)
Las Animas	0.17"	55th driest in 129 years (driest < 0.01" in 1994 and 11 previous years)
Pueblo	0.16"	36th driest in 127 years of record (driest < 0.01" in 1970 and 3 previous years)
Steamboat Springs	1.89"	39th driest in 90 years of record (driest = 0.30" in 1935)



# 1995 WATER YEAR PRECIPITATION

The big February snowstorm made a significant contribution to Colorado's water supply picture for the coming months. In a one week time period, areas from Crested Butte to Winter Park got as much moisture as normally falls in 2 to 3 winter months combined. Beneficial moisture also lessened concerns about low snowpack in the North and South Platte river basins. By the end of February, precipitation since October 1, 1994 was still lagging behind the long-term average over portions of the Northern Mountains and the Front Range foothills. Drier than average conditions were also expanding just east of the mountains in southcentral Colorado. Near average to above average conditions now prevail over most of the remainder of western Colorado. Well above average precipitation totals continue out on the Eastern Plains.



October 1994 - February 1995 Precipitation as a Percent of the 1961-90 averages.

## COMPARATIVE HEATING DEGREE DAY DATA FOR FEBRUARY 1995

COLORADO CLIMATE CENTER (303) 491-8545													COLORADO CLIMATE CENTER (303) 491-8545																	
HEATING DEGREE DATA													HEATING DEGREE DATA																	
STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN	STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN			
ALAMOSA	AVE	42	96	306	667	1053	1473	1559	1193	1014	717	453	174	8749	GRAND LAKE	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	381	10542	
	93-94	51	118	342	735	1187	1435	1412	1179	930	699	387	89	8544		93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10482	
	94-95	62	53	319	700	1174	1307	1287	882					5764		94-95	205	188	423	761	1154	1456	1430	1034					6651	
ASPEN	AVE	95	150	348	651	1029	1339	1378	1162	1116	798	524	262	8850	GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306	
	93-94	232	221	425	718	1188	1351	1290	1172	979	771	443	149	8939		93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957	
	94-95	106	85	335	704	1065	1265	1317	911					5818		94-95	1	3	68	441	860	1005	1066	815					4259	
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554	GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516	
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5648		93-94	M	M	M	M	1323	1693	1734	1527	1044	736	460	185	M	
	94-95	4	0	77	442	848	890	839	737					3937		94-95	87	74	343	737	1136	1512	1583	1110					6582	
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003	LAS ANIMAS	AVE	0	0	89	338	750	1088	1141	862	707	370	121	9	5455	
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981		93-94	0	12	90	389	935	925	994	882	655	400	78	0	8260	
	94-95	50	65	286	674	1018	1143	1236	902					5374		94-95	0	3	40	288	690	882	934	698					M	
BURLINGTON	AVE	0	9	138	432	822	1132	1175	948	859	519	254	34	6320	LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870	
	93-94	0	25	189	450	953	978	1068	854	499	144	1	1	6021		93-94	354	390	591	915	1368	1478	1499	1321	1196	994	682	338	11108	
	94-95	4	0	80	370	836	908	1036	787					4031		94-95	310	314	539	895	1257	1406	1500	1135					7356	
CANON CITY	AVE *	0	11	91	325	645	896	933	756	688	408	193	41	4987	LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	86	6861	
	93-94	0	22	153	435	818	864	886	828	609	468	M	0	M		93-94	7	48	237	564	1064	1054	1117	1058	766	828	238	16	6797	
	94-95	0	0	42	361	695	760	888	645					3391		94-95	12	13	124	513	925	1043	1117	929					4875	
COLORADO SPRINGS	AVE	6	18	164	468	816	1091	1122	924	859	558	302	87	6415	LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443	
	93-94	0	40	212	519	972	1008	1032	926	749	576	223	14	6271		93-94	12	30	246	557	1005	1084	1022	1053	718	533	182	8	6430	
	94-95	10	14	98	486	811	969	1035	811					4234		94-95	13	0	62	435	884	949	1078	782					4201	
CORTEZ	AVE *	0	11	148	474	828	1163	1237	958	853	594	322	81	6667	MEEKER	AVE	28	56	261	564	927	1240	1345	1088	906	651	394	164	7714	
	93-94	10	14	185	508	926	1148	1086	1038	695	528	272	14	6404		93-94	54	42	253	565	1077	1317	1258	1098	785	694	260	52	7373	
	94-95	4	0	111	522	891	1012	1151	688					4379		94-95	13	5	170	578	1087	1207	1306	863					5229	
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376	MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383	
	93-94	87	60	296	619	1168	1369	1317	1237	837	621	295	63	7959		93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	6296	
	94-95	13	14	196	613	1133	1316	1332	946					5563		94-95	4	2	113	489	895	1072	1068	679					4322	
DELTA	AVE	0	10	126	403	774	1126	1221	888	719	435	186	38	5927	PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548	
	93-94	13	33	232	598	1052	1245	1231	1010	758	533	238	0	6943		93-94	94	143	357	M	M	M	M	M	M	M	M	M	M	M
	94-95	0	0	67	423	794	1025	984	655					3948		94-95	M	M	M	M	1009	M	1253	872					M	
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020	PUEBLO	AVE	0	0	82	357	735	1051	1091	837	722	396	152	10	5413	
	93-94	1	20	152	488	900	948	946	879	618	485	104	3	5544		93-94	0	18	155	491	973	1020	1081	915	687	487	143	0	5650	
	94-95	3	2	57	397	804	890	957	738					3848		94-95	0	6	57	388	785	964	1028	788					4016	
DILLON	AVE	282	341	555	858	1203	1504	1587	1355	1321	1008	747	459	11216	RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881	
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732		93-94	E	13	7	196	484	975	1171	1132	921	682	488	194	M	
	94-95	265	247	505	845	1182	1378	1494	1109					7035		94-95	3	0	105	497	947	1123	1084	715					4474	
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911	STEAMBOAT SPRINGS	AVE *	113	166	396	725	1122	1525	1606	1316	1169	801	543	297	9779	
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6636		93-94	166	144	395	710	1260	1486	1427	1294	965	678	392	133	9050	
	94-95	2	2	104	558	952	1025	1193	746					4583		94-95	67	49	289	674	1126	1424	1458	1048					6135	
EAGLE	AVE	25	72	275	617	981	1376	1435	1108	958	675	422	164	8106	STERLING	AVE	0	9	149	462	852	1200	1265	963	643	504	238	56	6541	
	93-94	53	52	277	603	1116	M	1258	1080	779	639	330	64	M		93-94	0	14	193	459	966	1066	1072	1056	653	484	112	3	6058	
	94-95	M	M	M	M	M	M	M	M					M		94-95	6	0	78	385	831	961	1184	790					4235	
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094	TELLURIDE	AVE	152	204	390	679	1095	1290	1336	1126	1101	819	574	310	8968	
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7483		93-94	228	249	455	788	1210	1443	1478	1276	1049	860	827	234	9875	
	94-95	59	48	286	677	937	1026	1180	893					5109		94-95	175	161	395	722	1185	1326	1409	1015					6438	
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	826	525	272	77	6368	TRINIDAD	AVE	0	7	87	364	690	955								

**FEBRUARY 1995 CLIMATE DATA**

**EASTERN PLAINS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	45.8	19.3	32.6	3.1	72	-8	902	0	71	0.27	-0.03	90	5
STERLING	51.0	22.1	36.6	5.1	73	3	790	0	107	0.20	-0.02	91	3
AKRON 1N	48.0	23.6	35.8	5.2	69	2	812	0	84	0.31	-0.01	97	5
AKRON 4E	48.9	20.9	34.9	4.8	69	-4	836	0	83	0.32	0.02	107	6
HOLYOKE	51.4	22.5	37.0	5.0	76	5	779	0	113	0.24	-0.15	62	4
JOES 2SE	51.9	22.8	37.3	3.7	73	-6	768	0	110	0.50	0.18	156	5
BURLINGTON	49.9	22.8	36.3	3.3	72	2	797	0	94	1.03	0.72	332	5
LIMON WSMO	45.9	17.3	31.6	1.8	67	-19	928	0	69	0.64	0.23	156	7
CHEYENNE WELLS	51.4	22.3	36.9	3.6	73	-5	780	0	102	0.53	0.27	204	6
EADS	51.5	22.4	36.9	2.7	73	5	778	0	118	0.46	0.12	135	5
ORDWAY 21N	50.4	14.8	32.6	0.6	70	-10	900	0	97	0.19	-0.08	70	2
ROCKY FORD 2ESE	59.9	20.2	40.0	4.9	75	6	691	0	180	0.17	-0.12	59	1
LAMAR	54.6	21.8	38.2	3.2	76	11	743	0	135	0.24	-0.18	57	3
LAS ANIMAS 1N	57.1	22.8	39.9	4.4	80	10	696	0	166	0.17	-0.20	46	6
HOLLY	55.8	21.8	38.8	5.4	80	12	726	0	151	0.34	0.01	103	4
SPRINGFIELD 7WSW	56.9	24.5	40.7	5.0	74	9	675	0	142	0.19	-0.28	40	2

**FOOTHILLS/ADJACENT PLAINS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	50.5	22.7	36.6	4.2	70	2	787	0	98	0.96	0.57	246	7
GREELEY UNC	48.8	22.5	35.7	2.8	72	2	815	0	91	0.88	0.53	251	9
ESTES PARK	43.9	21.1	32.5	5.5	61	-1	900	0	20	0.36	-0.10	78	5
LONGMONT 2ESE	52.9	20.5	36.7	5.3	74	-3	782	0	124	0.91	0.52	233	5
BOULDER	51.9	24.9	38.4	2.9	71	1	737	0	106	1.53	0.78	204	7
DENVER WSFO AP	52.4	24.5	38.5	5.1	71	-3	738	0	120	0.88	0.31	154	6
EVERGREEN	50.9	14.9	32.9	4.2	67	-9	893	0	84	0.91	0.13	117	6
CHEESMAN	52.5	5.5	29.0	2.5	66	-22	1002	0	89	0.93	0.29	145	5
LAKE GEORGE BSW	42.8	9.0	25.9	7.0	53	-5	1088	0	5	0.18	-0.17	51	4
ANTERO RESERVOIR	43.5	7.9	25.7	8.6	55	-14	1096	0	8	0.53	0.29	221	4
RUXTON PARK	36.6	15.2	25.9	7.4	50	-4	1089	0	0	0.78	-0.22	78	6
COLORADO SPRINGS WSO	49.7	21.9	35.8	3.8	67	-2	811	0	95	0.21	-0.19	52	5
CANON CITY 2SE	57.6	25.9	41.7	3.7	75	-1	645	0	167	0.22	-0.23	49	3
PUEBLO WSO AP	55.8	17.5	36.6	3.6	73	-1	788	0	156	0.16	-0.15	52	3
WESTCLIFFE	49.0	15.9	32.6	7.0	60	-1	867	0	49	0.35	-0.25	58	1
WALSENBURG	58.4	25.9	42.1	6.5	70	-3	634	0	147	0.58	-0.38	60	3
TRINIDAD AP	57.8	22.2	40.0	5.1	75	-2	691	0	164	0.12	-0.37	24	1

**MOUNTAINS/INTERIOR VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	41.0	13.6	27.3	8.4	52	-6	1050	0	4	0.65	0.12	123	8
LEADVILLE 2SW	38.1	10.3	24.2	7.2	54	-13	1135	0	5	1.35	0.75	225	12
SALIDA	51.7	17.0	34.3	4.6	64	-9	850	0	75	0.20	-0.34	37	2
BUENA VISTA	48.1	17.0	32.5	4.0	59	0	902	0	40	1.12	0.71	273	7
HERMIT 7ESE	44.9	3.0	23.9	9.7	58	-14	1142	0	10	0.80	0.05	107	2
ALAMOSA WSO AP	51.2	15.2	33.2	11.2	60	7	882	0	41	0.09	-0.19	32	2
STEAMBOAT SPRINGS	41.8	13.0	27.4	7.9	54	-9	1046	0	5	1.89	-0.13	94	10
YAMPA	39.9	15.8	27.8	6.6	51	-13	1032	0	1	1.31	0.43	149	7
GRAND LAKE 1NW	42.3	13.3	27.8	8.7	54	-9	1034	0	11	1.70	0.27	119	13
GRAND LAKE 6SSW	37.6	9.8	23.7	7.3	45	-12	1147	0	0	1.30	0.52	167	14
DILLON 1E	39.2	11.4	25.3	6.8	53	-8	1109	0	3	2.57	1.71	299	9
CLIMAX	36.0	4.5	20.3	8.3	52	-15	1246	0	1	3.39	1.70	201	13
ASPEN 1SW	44.9	19.5	32.2	9.2	55	8	911	0	12	3.84	1.79	187	8
CRESTED BUTTE	36.7	4.3	20.5	7.0	46	-18	1239	0	0	5.32	3.26	258	10
TAYLOR PARK	38.0	-4.8	16.6	6.0	48	-26	1349	0	0	2.50	1.31	210	9
TELLURIDE	43.9	13.1	28.5	6.0	56	-6	1015	0	9	0.83	-0.65	56	7
PAGOSA SPRINGS	49.4	17.8	33.6	7.8	61	9	872	0	38	1.43	0.15	112	6
SILVERTON	42.4	6.0	24.2	5.8	54	-9	1134	0	6	1.93	0.33	121	6
WOLF CREEK PASS 1E	37.4	13.6	25.5	7.1	52	2	1100	0	1	6.47	2.88	180	8

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	43.9	18.0	30.9	9.4	58	-6	946	0	13	0.86	-0.34	72	4
HAYDEN	40.9	17.3	29.1	7.4	50	-6	997	0	0	0.74	-0.42	64	5
MEEKER 3W	47.7	20.1	33.9	7.9	62	-5	863	0	39	0.89	0.14	119	7
RANGELY	47.6	20.5	34.1	9.8	60	-1	862	0	38	0.74	0.27	157	3
GLENWOOD SPRINGS	50.0	24.3	37.2	7.1	62	10	773	0	43	2.54	1.44	231	7
RIFLE	54.1	24.4	39.2	9.1	67	13	715	0	92	1.11	0.32	141	9
GRAND JUNCTION WS	56.1	30.6	43.4	9.2	67	22	596	0	110	0.52	0.04	108	6
PAONIA 1SW	55.9	29.6	42.7	10.6	70	21	617	0	105	1.08	0.05	105	7
DELTA	57.4	25.4	41.4	7.5	68	18	655	0	117	0.25	-0.11	69	4
GUNNISON	39.6	10.7	25.2	10.5	48	-5	1110	0	0	0.77	0.15	124	7
COCHETOPA CREEK	44.4	11.0	27.7	12.2	51	-5	1039	0	1	0.68	0.01	101	7
MONTROSE NO 2	53.5	27.3	40.4	8.8	65	19	679	0	75	0.23	-0.20	53	4
NORWOOD	49.8	25.2	37.5	9.6	62	12	765	0	43	0.34	-0.48	41	3
YELLOW JACKET 2W	50.6	28.3	39.5	9.7	64	20	708	0	49	0.44	-0.71	38	5
CORTEZ	54.5	25.7	40.1	10.1	66	9	688	0	87	0.32	-0.55	37	3
DURANGO	51.7	24.5	38.1	6.9	63	14	746	0	63	1.26	-0.12	91	8
IGNACIO 1N	51.1	23.1	37.1	8.3	63	17	775	0	50	0.42	-0.55	43	4

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

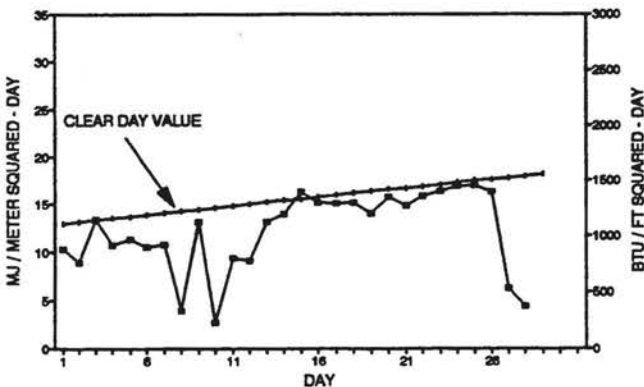
**FEBRUARY 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	7	15	6	-	-
Denver	9	12	7	65%	70%
Fort Collins	8	12	8	-	-
Grand Junction	11	7	10	78%	65%
Pueblo	NA	NA	NA	86%	73%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Except for the big storm 8-14th and a lesser storm late in the month, sunshine was abundant statewide in February. Most areas of Colorado experienced less cloudiness and received more solar energy than normal. The combination of abundant sunshine and warm temperatures resulted in very low energy demand for space heating.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION FEBRUARY 1995**

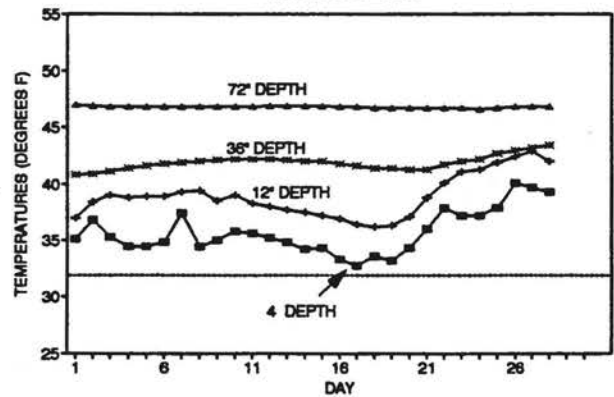


**FEBRUARY 1995 SOIL TEMPERATURES**

Soil temperatures were warmer than average throughout February. Near the end of the month, near-surface soil temperatures were up to their normal late March values. Some farmers and gardeners were able to begin working the soil in preparation for spring planting.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES FEBRUARY 1995**



**HATS OFF TO:** *Burton Hass of Hass Ranch south of Limon, Colorado*

Weather observing sometimes runs in the family. Erna Hass began measuring precipitation and snowfall south of Limon in 1941. Her son, Burton, took over the station on the Hass Ranch during the 1970s and continues the 54-year tradition. Many, many thanks for the great work – and may the winds blow gently for the rest of this spring!



## THE FINAL WORD ON THE WINTER OF 1995

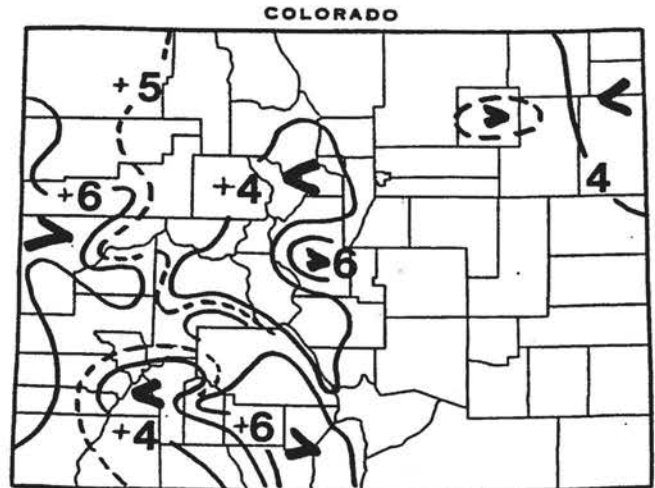
All winter I have dealt with phone calls about the "abnormal" winter we were having. The calls came in left and right around Christmas, diminished in early January (while it was cold and snowy), increased again later in January and early February (warm weather), changed a bit in mid February (during big snowstorm in the mountains) and then escalated in late February as crocuses and daffodils began to emerge. Most of the calls were the media looking for a story to get the attention of their readers/listeners/watchers. A lot of us are vulnerable like that – always ready to pay attention to a story about the weather, even if it's not terribly significant.

As the winter progressed, more and more of the calls were from long-time Colorado residents who were truly concerned by the apparent lack of winter weather. It was bringing back unforgettable recollections to some Colorado natives of droughts and floods in the 1930s, 1950s and 1960s. The natives were getting restless, and that restlessness helped spawn the article in the December 1994 *Colorado Climate* entitled "Why doesn't winter feel like winter?"

How abnormal was the winter of 1995? Now it is March, and we no longer need to speculate. We have assembled temperature, precipitation and snowcover data for the three-month period, December 1994 through February 1995, and compared it to data for previous winters dating back more than 100 years. This three-month period is not the true calendar winter, but it is normally the coldest three months of the year and makes a practical definition of winter.

Yes, it was warm. It was not our imagination. It was not the media bending our perceptions. Every inch of Colorado was warmer than average. The map above shows the statewide departure from average for the combined three-month period. Most of Colorado ended up at least 4 degrees Fahrenheit above average. For a given day 4 degree deviations from average are totally normal. Even for an entire winter month, +4 anomalies are common. When averaged over the entire three-month winter season, however, this constitutes a significant and fairly rare anomaly, especially when it covers a large area at the same time.

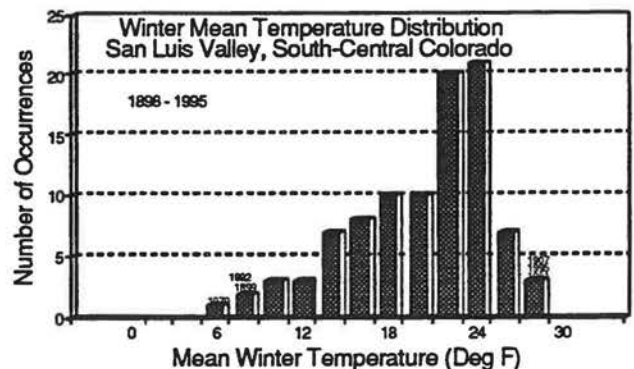
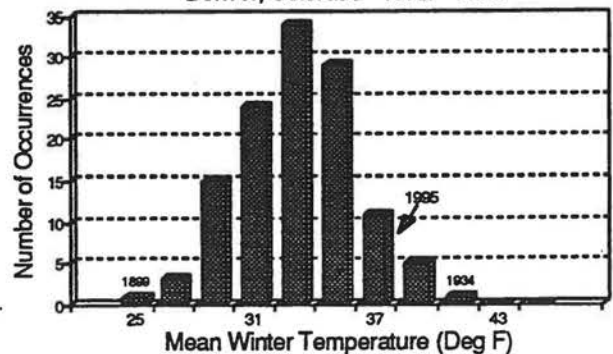
Was this the warmest winter on record? I don't know how many times I've been asked this question, but the answer is "no". We closely examined the historic temperature records from sites throughout Colorado with consistent long-term data. Denver's mean winter temperature of 36.1°F was 4.7° above the 1961-1990 average and ranked 7th in 123 years of recorded temperatures. Fort Collins' winter ranked 5th warmest in 107 years with a departure of +4.2°F. Steamboat Springs and Cheyenne Wells also ranked fifth warmest. Rocky Ford, with a +4.7° departure ranked 3rd warmest as did Grand Junction with an impressive +7.3° anomaly. Alamosa, a traditional Colorado cold spot, had the largest deviation from average, +8.2°F. (Remember, it was just three years ago when we wrote a special feature about their unusually cold winter. The 1992 season was nearly 20 degrees colder than this year.) Historic



December 1994 through February 1995 mean temperature departures from 1961-90 average.

records are not consistent and complete at Alamosa for the past century, but based on data from other stations in the San Luis Valley it appears that 1995 was one of the two warmest winters on record. 1907 is the only comparably mild winter.

Mean Winter Temperature Distribution  
Denver, Colorado 1872 - 1995



1995 was especially unusual because all parts of Colorado were extremely warm at the same time. This has only happened a handful of times in the past century. The winter of 1981 was clearly the warmest on record for the State and was about 1.5°F warmer than 1995. 1934 was next in line. 1995 ranks third followed by 1907. Other years have been very warm in portions of the State but not statewide. 1935, 1958, 1976, 1986 and 1992 were very mild over much of eastern Colorado. 1911, 1940 and various other years were warm for parts of western Colorado depending on local cloud and snowcover conditions.

### Lots of Warm Days

While the mean winter temperature is a convenient single-number way to describe and compare past winters, it only tells a small and sometimes misleading part of what the winter was actually like. Here are some other statistics that help put the 1995 winter into perspective. Alamosa saw temperatures climb to 50° or higher a remarkable 20 times during the winter. Some natives of the San Luis Valley are said to have secretly been using their automobile air conditioners during the winter to be comfortable. Denver enjoyed 43 days, nearly half of the winter, with daytime maximum temperatures of 55° or higher. On 23 days temperatures reached 60° or more. The longest period where temperatures stayed below 50° was only 9 days. 70° winter temperatures were quite common in southeastern Colorado. Las Animas hit 70° or higher on 15 days.

Some years we have lots of warm weather balanced off with periods of extreme cold, but not this year. For example, Grand Junction only had two days when the mercury stayed below freezing all day. Their average is 21 days. Only 8 days all winter had below average temperatures. 34 days were at least 10° above the daily average.

Cold extremes were not very extreme. Alamosa's coldest temperature December-February was only -7°F. Most years will see a handful of temperatures of -20° or colder. In all, the temperature fell below zero on only 8 days compared to an average of 45 days. There were two episodes of subzero arctic airmasses east of the mountains, one in early January and another in mid February, but these coldwaves were trivial compared to what we sometimes get. Fort Collins' temperatures only fell below zero twice compared to an average of 9 times. Back in 1962 there were 16 subzero days in January alone. In a few areas of western Colorado, the temperatures never dropped below +10° all winter. Grand Junction's coldest temperature December-February was +13°F. The coldest temperature in all of Colorado for the winter was -37°F at Taylor Park. That sounds plenty cold (and it is), but most winters bring colder temperatures.

### It Was Not As Dry As It Seemed

What about precipitation? It seemed dry, I agree, but when we looked at the data we found that most weather stations received average or above precipitation totals. The February 8-14 storm saved parts of the Central Mountains from

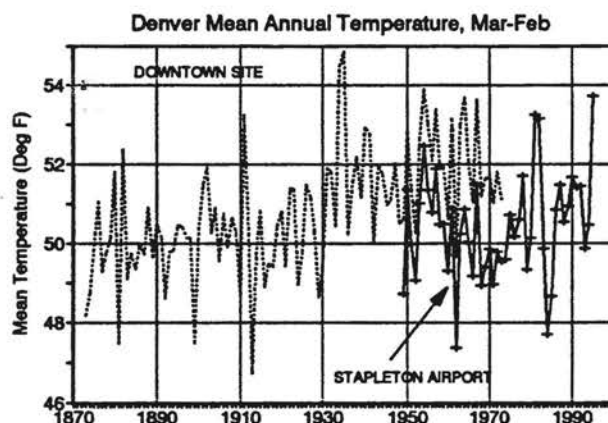
being well below average, but even without that storm this year was nothing compared to the truly dry winters such as 1904, 1924, 1931, 1954, 1977 and 1981. Just last year was a drier winter than 1995 for many parts of Colorado. There were a few areas, however, that could legitimately claim 1995 to be exceptionally dry. Pueblo, for example, reported just 0.41" for the December-February period, 37% of average and the 10th driest winter in 127 years. Colorado Springs also experienced their 10th driest winter with a 0.34" total. Del Norte, in the San Luis Valley, measured 0.28", their 5th driest in the past 77 years. Fowler, east of Pueblo, only recorded 0.14". But for most of Colorado, winter precipitation was pretty decent.

While precipitation totals weren't bad, the frequency of precipitation days was less than normal, especially east of the mountains. There were also lengthy periods without precipitation at lower elevations. Boulder, for example, went 21 days in a row without measurable precipitation in December, 25 days in January and had a 9-day and 12-day dry period in February. These prolonged dry periods, all of which were accompanied by above average temperatures, added greatly to the perception of a winterless winter.

Snowcover, or lack of it, was also a significant aspect of the 1995 winter. Many areas received fairly typical amounts of snow, but it did not linger. Across eastern Colorado, snowcover duration varied from only about one week in parts of the Arkansas Valley to close to 5 weeks near Akron. This was two to three less weeks of snowcover than normal. Boulder totalled 38.6" of snowfall from December through February, but the snow only stayed on the ground 24 days. Alamosa, had only 8 days with snowcover compared to an average of 39. Grand Junction had only one day with snowcover December through February, and much of their winter precipitation fell as rain.

### Very Warm For Past 12 Months

A very interesting and significant bit of climate information appeared as we studied and compared statistics. Not only was the winter mild statewide, but so was last spring and last summer. Since March of 1994, November was the only month with widespread below average temperatures.



Combining temperatures for the March 1994 - February 1995 12-month period, we found that much of Colorado has just experienced it's warmest year on record. 1994-95 appears comparable to March 1934 - February 1935 period in the midst of the infamous dust bowl.

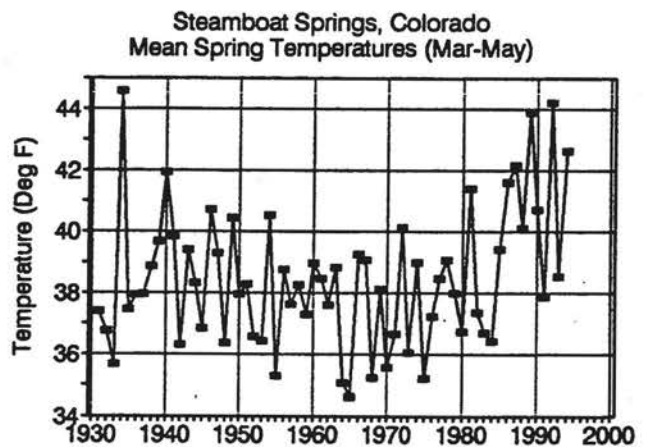
**What Comes Next?**

This is what most of you want to know – and you know what my answer will be. Being honest, I have to tell you that "I don't know for sure". I can give you some information that may be useful, though. Using past years to anticipate future results is tricky business, but in extreme conditions the results often become more meaningful.

Rank of Warmest Winters of Record	What Happened Next			
	Spring		Summer	
	Temp.	Precip.	Temp.	Precip.
1. 1981 (very dry)	Warm	Wet	Hot	Wet
2. 1934 (ave precip)	Very Warm	Very Dry	Very Hot	Very Dry
3. 1995 (ave precip)	????	????	????	????
4. 1907 (ave precip)	Warm	Average	Cool	Average
5. 1954 (very dry)	Warm	Very Dry	Very Hot	Dry
6. 1935 (dry)	Cool	Very Wet	Very Hot	Very Dry

Based on this information alone, there appears to be a good chance that we should expect above average temperatures in the months ahead. Of the five warmest winters in the past century, 4 were followed by warmer than average springs. Three of the five were followed by much hotter than average summers. The precipitation picture, always the tougher variable to forecast, gives a mixed message. Anything may happen in the spring, while past years suggest a better than 50/50 chance for a dry summer.

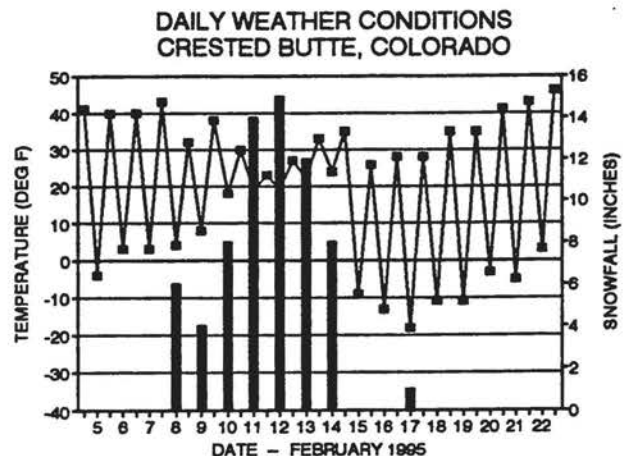
I have one last thing to add. Here at the Colorado Climate Center we are constantly tracking and updating trends in temperatures and precipitation over all regions of Colorado. Most but not all weather stations are showing long-term increases in temperature and not much overall change in precipitation. The locations that have shown the most warming are typically in areas that have become more urbanized over the past few decades. But a particularly curious trait has occurred in the time series of springtime temperatures. Across all of Colorado, springs became consistently and systematically warmer beginning 10 years ago. Since then, most spring seasons (defined as March-May) have been noticeably warmer than the previous average. Warm springs have significant implications for snowmelt, water supply, plant development, budding and blossoming, frost damage potential (frost dates often don't correlate with seasonal mean temperatures) and water consumption. Hopefully I will be able to address this subject in more detail in the near future.



**THE SNOWSTORM OF FEBRUARY 1995**

February was a remarkably warm and snowfree month. Mountain skiers worked harder to fend off sunburn and emerging rocks than to keep warm. But right in the middle of the month, and right in the middle of the State came a snowstorm that some folks will remember for a long time.

Meteorologists could see a change coming as plentiful Pacific moisture dribbled slowly into Colorado February 7-8. Warm temperatures allowed the atmosphere to hold much more water vapor than normal for early February. Meanwhile, the coldest airmass of the winter dropped southward out of Canada and produced a dramatic northeast-southwest temperature gradient across the Rockies. This gradient rapidly strengthened the jet stream across the region. With the help of cold upslope (easterly) winds along the Colorado Front Range and howling westerly winds above the mountains, a convergence pattern developed that made for a very interesting week in



Unless noted otherwise, the special features contained in *Colorado Climate* are prepared and edited by Nolan Doesken, Assistant State Climatologist, at the Colorado Climate Center. Comments and questions are always welcome.



Breckenridge, Vail and all the central Colorado communities that economically depend on snow for their winter livelihoods.

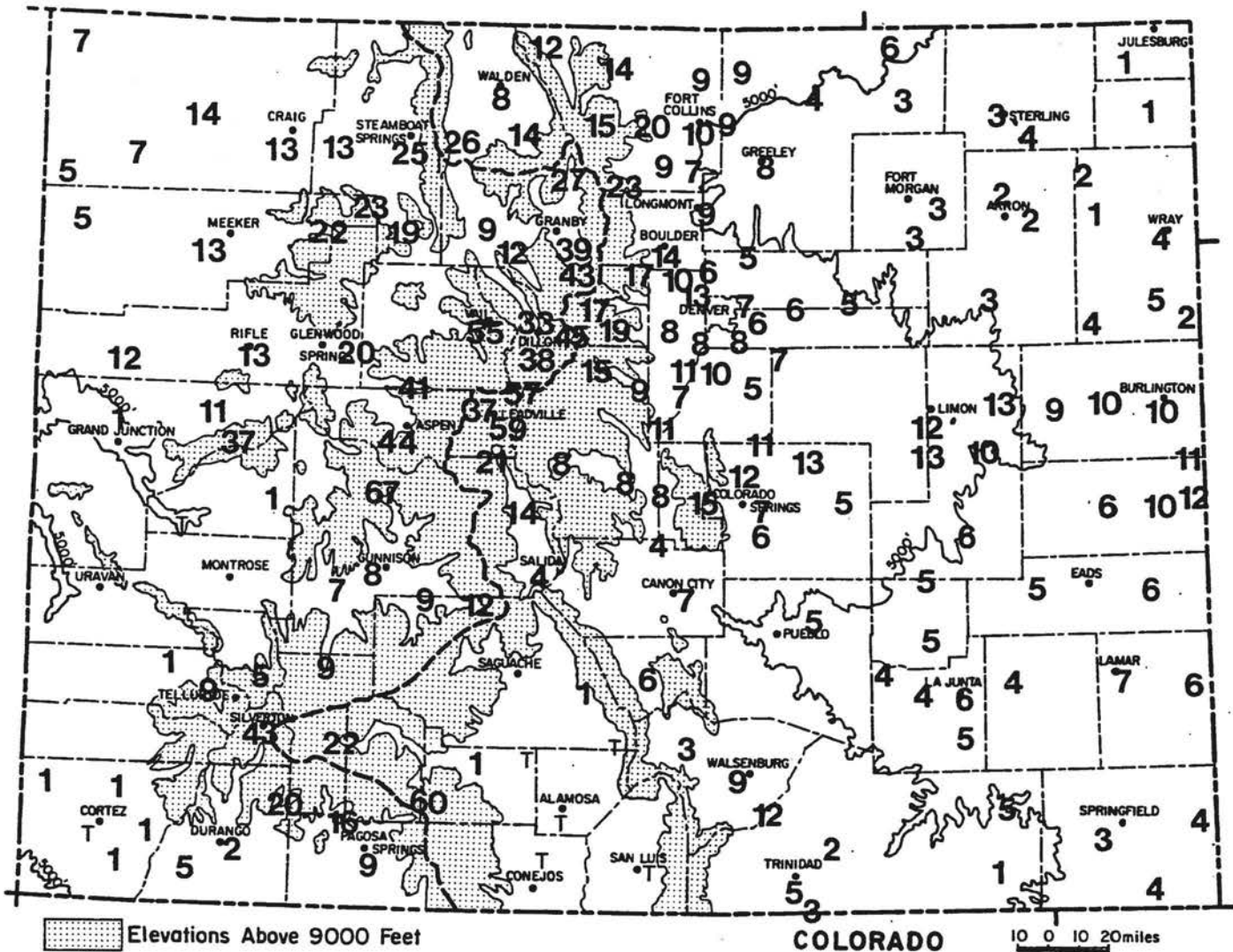
The graph below depicts the daily temperature and snowfall pattern during this memorable week. Temperatures remained fairly mild throughout the period west of the Continental Divide. This is a necessary condition for most of Colorado's heaviest widespread snows.

All of Colorado's high country received significant falls of new snow, but the storm concentrated on the Central Mountains. Even as the mountains were being buried, some of Colorado's western valleys remained nearly snowfree. Ouray only had three brief episodes of snow during the week dropping a total of 5 inches. Ridgway only accumulated a trace of snow for the period.

For the State as a whole, there have been a good number of snowstorms in the past that match or surpass this one. The most recent episode occurred just two years ago in February 1993. But for those of you who live and work or who happened to be travelling through or recreating in the area from Crested Butte northeastward to Winter Park, you will

probably be telling some stories for years to come. In those areas this storm will probably stay on the list of top 5 worst snowstorms for many years. 40 to 70 inches of fresh snow that our data sources show (remember, most of the official National Weather Service cooperative stations are in valleys) is a lot of snow even if it is less than the totals that were reported to the media during the storm. It was more than enough to snarl traffic (some highways were closed for several days), spawn numerous and large avalanches and absolutely delight the minority of skiers who are skilled and capable in skiing through shoulder-deep powder.

Most people welcomed the snow. It brought thousands of acre feet of water to fill reservoirs in the spring. But the storm was a nightmare to some. Motorists were trapped for hours on clogged highways. Skiers arriving in Denver anxious to hit the slopes at times could not reach their destinations. The Colorado Department of Transportation was criticized for being too conservative with road closures and avalanche control. But care and safety was appropriate. There were at least two avalanche-related fatalities in Colorado during the blitz and there easily could have been more.



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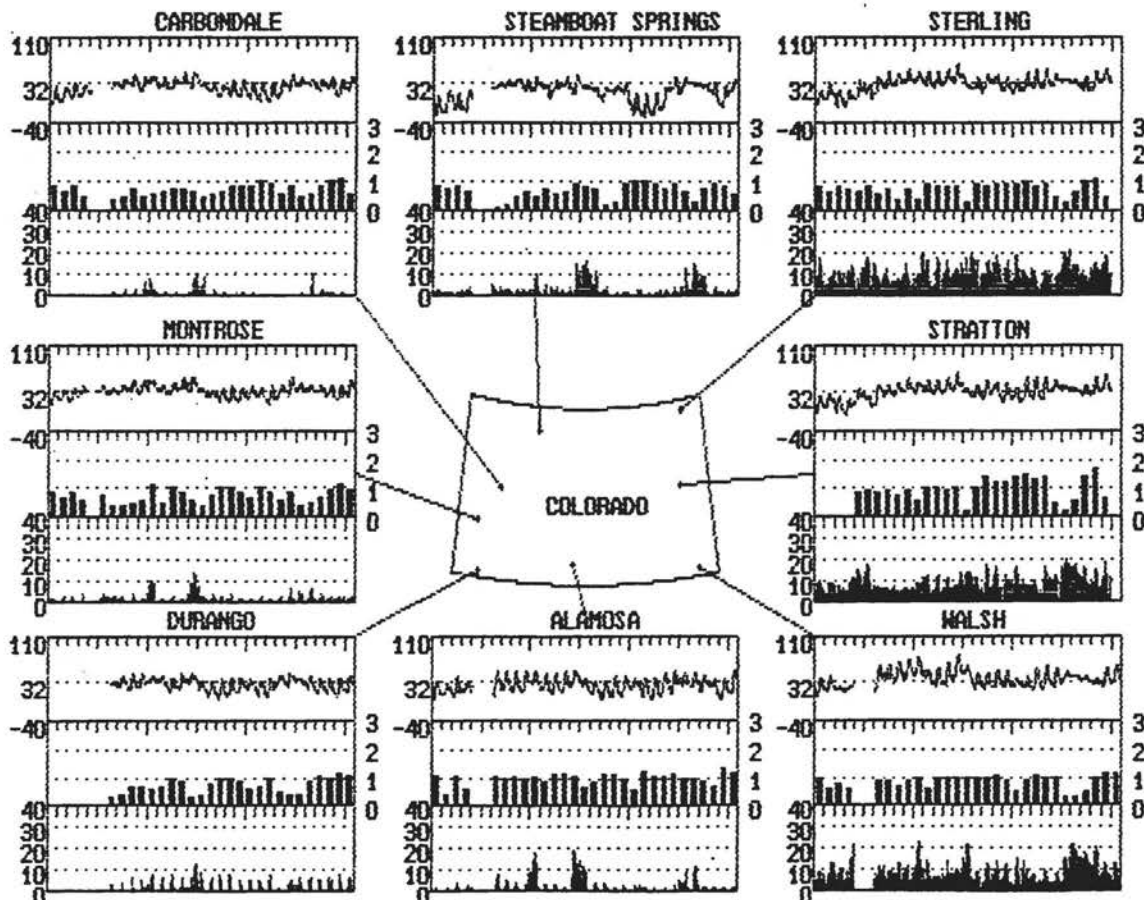


WTHRNET WEATHER DATA JANUARY 1995

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	23.0	24.9	24.0	29.7	15.0	28.6	28.2	34.4
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	50.0 10/16	44.6 25/13	49.3 15/12	52.3 15/12	45.7 15/14	62.1 15/14	60.1 15/14	74.5 15/15
minimum:	-4.4 23/ 7	-4.2 18/ 8	-5.3 1/ 8	8.1 1/ 7	-27.8 22/ 8	-9.6 3/ 7	-10.8 4/ 8	3.9 1/ 7
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	85 / 10	84 / 14	90 / 15	83 / 21	87 / 7	46 / 9	59 / 12	76 / 21
11 AM	50 / 18	59 / 23	71 / 22	63 / 25	82 / 15	29 / 12	50 / 22	53 / 29
2 PM	32 / 18	56 / 25	57 / 24	47 / 25	64 / 18	25 / 15	46 / 25	43 / 29
5 PM	33 / 16	60 / 24	57 / 23	47 / 23	70 / 16	29 / 13	52 / 23	48 / 27
11 PM	67 / 13	83 / 20	83 / 19	77 / 22	88 / 11	45 / 12	58 / 15	69 / 22
monthly average wind direction ( degrees clockwise from north )								
day	194	191	188	202	145	251	174	204
night	142	n/a	n/a	140	116	238	210	257
monthly average wind speed ( miles per hour )	1.64	n/a	n/a	1.22	1.77	7.94	7.73	7.85
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	563	n/a	n/a	640	494	101	76	51
3 to 12	83	n/a	n/a	63	90	506	556	524
12 to 24	14	n/a	n/a	5	16	137	112	121
> 24	0	n/a	n/a	0	0	0	0	0
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	958	727	651	744	626	696	896	820
"clearness" distribution ( hours per month in specified clearness index range )								
60-80Z	139	71	67	93	76	135	53	137
40-60Z	50	68	76	66	85	56	38	66
20-40Z	51	54	91	87	44	53	31	58
0-20Z	9	39	31	22	58	38	36	29

The State-Wide Picture

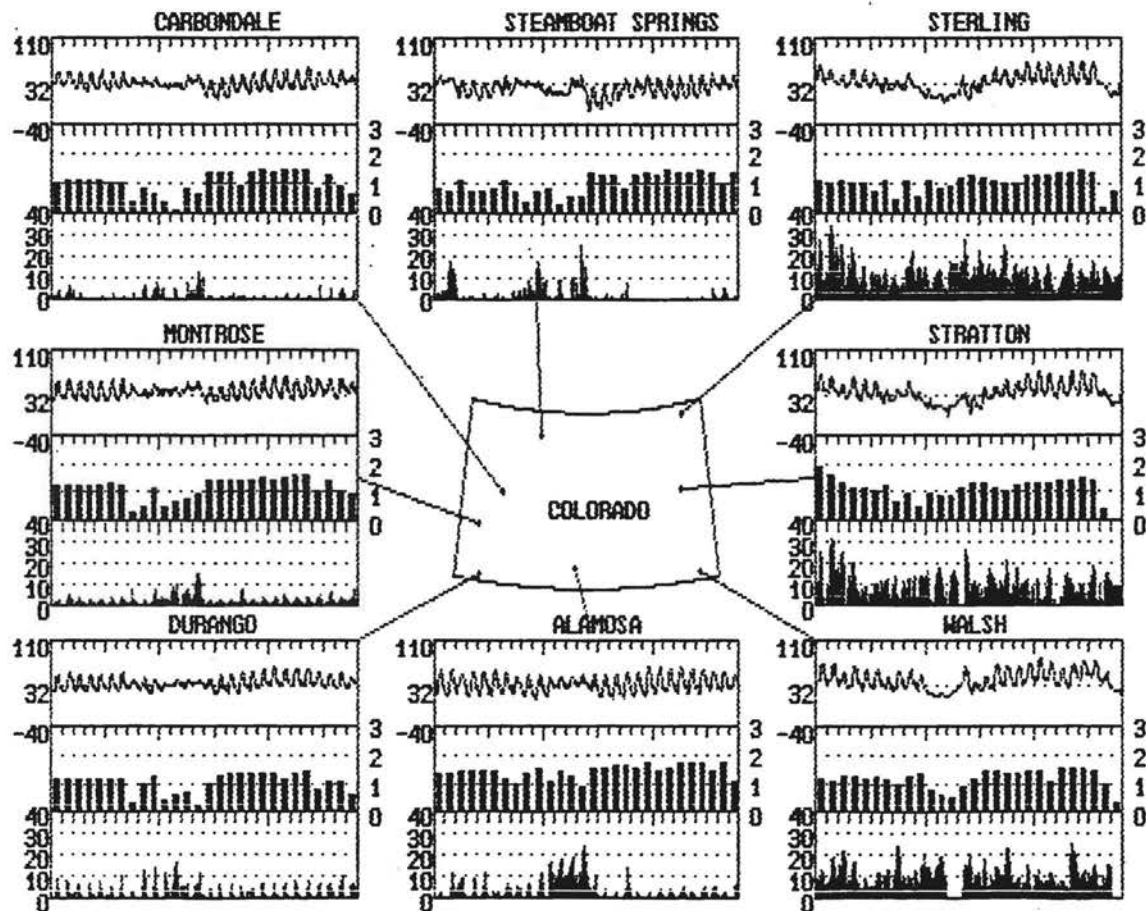
The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.

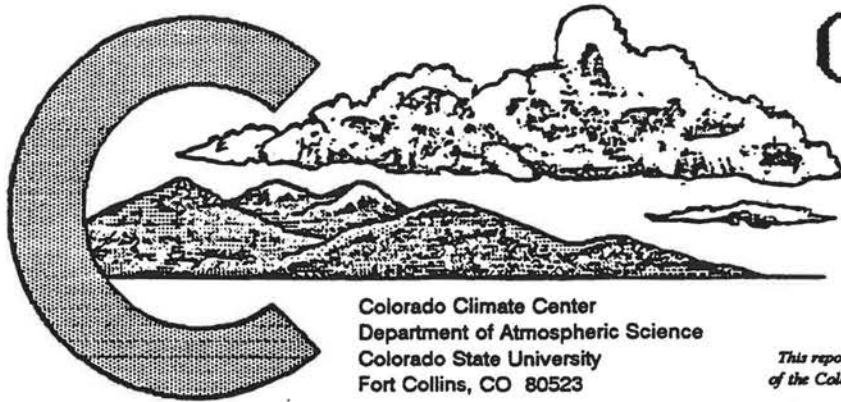


WTHRNET WEATHER DATA FEBRUARY 1995

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	32.9	34.0	32.2	37.4	23.5	33.7	33.7	39.0
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	62.6 20/16	60.4 21/16	58.5 24/17	64.2 21/16	48.9 26/15	69.8 25/15	71.8 21/15	75.9 21/15
minimum:	7.7 10/ 6	14.2 16/ 5	5.5 16/ 7	17.6 15/ 7	-15.2 15/ 8	-0.8 12/21	-6.0 13/ 5	11.7 12/19
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	84 / 16	78 / 20	95 / 22	79 / 23	89 / 13	39 / 10	43 / 10	76 / 24
11 AM	36 / 24	51 / 28	64 / 29	43 / 29	69 / 21	25 / 15	35 / 21	49 / 30
2 PM	22 / 22	45 / 30	50 / 31	33 / 28	50 / 24	23 / 18	35 / 25	40 / 31
5 PM	24 / 21	40 / 28	50 / 30	35 / 27	57 / 24	24 / 16	40 / 25	39 / 29
11 PM	58 / 19	73 / 25	86 / 26	66 / 25	87 / 18	35 / 10	43 / 13	65 / 26
monthly average wind direction ( degrees clockwise from north )								
day	198	189	186	257	154	226	136	175
night	154	91	n/a	151	n/a	235	208	231
monthly average wind speed ( miles per hour )	2.78	1.81	0.76	1.88	n/a	10.05	8.04	8.86
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	470	464	445	544	n/a	35	189	49
3 to 12	162	144	47	110	n/a	438	324	436
12 to 24	30	8	0	6	n/a	183	147	150
> 24	0	0	0	0	n/a	16	12	1
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	1404	1023	984	1165	982	1019	1121	1146
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	118	136	139	149	128	150	145	168
40-60%	35	63	51	44	74	55	58	51
20-40%	25	53	59	52	54	45	29	42
0-20%	6	52	47	22	34	30	18	23

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

MARCH 1995

Volume 18 Number 6

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

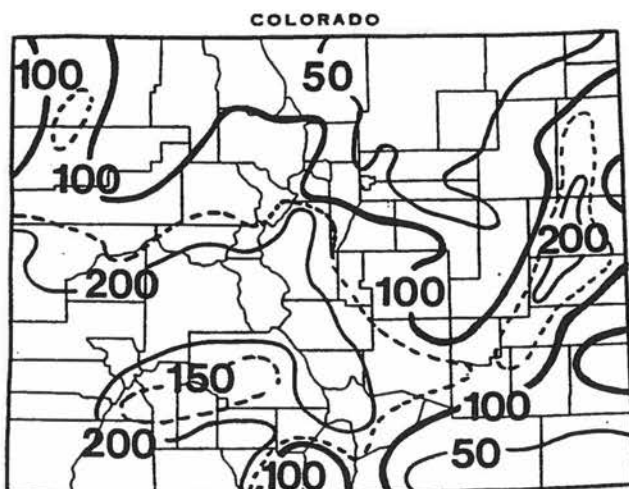
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## March Climate in Perspective – Warm, Windy and Stormy

March weather is usually changeable and active. This year did not disappoint us. Heavy mountain snows early in the month, some subzero temperatures, howling duststorms and record breaking warm temperatures, a nasty blizzard on the plains and feet of foothills snow late in March were all a part of the picture. Overall, March ended warmer than average over most of the State and wetter than average except across northern Colorado.

### Precipitation

Pacific storms pounded southwestern Colorado early in March. Then smaller storms crossed the state every few days bringing small doses of moisture primarily to the



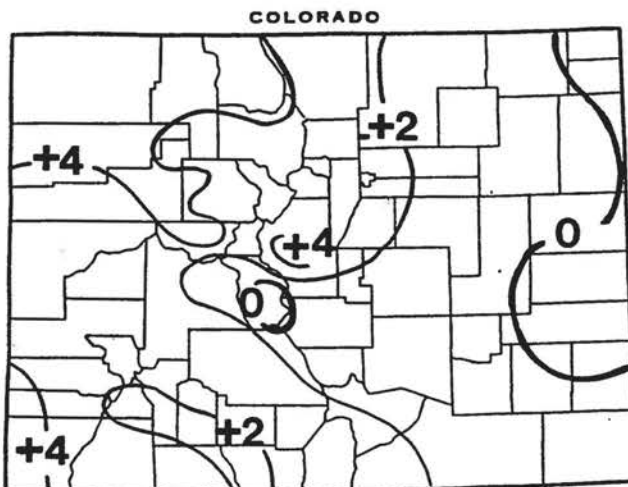
March 1995 precipitation as a percent of the 1961-1990 average.

western half of the State. During the final week of the month, cold, snowy weather affected most of the State, and the Eastern Plains got nailed by an old-fashioned blizzard on the 26th. Precipitation totals for the month as a whole ended

up more than 200% of average over much of southwestern Colorado and also along a portion of the southern foothills and east central plains. Below average totals were observed across northern Colorado and in southeastern Colorado from Trinidad eastward to the Kansas border. Some of these areas were very dry with local totals less than 25% of average at Trinidad, Fort Morgan and Fort Collins.

### Temperatures

Warmer than average temperatures, which have persisted across Colorado for most of the past year, continued in March but with some notable interruptions. Polar air gripped eastern Colorado early in March, and very chilly weather affected the entire State the final week of the month. The 2 1/2 weeks of warm weather in between (including near record highs 10-11th and extremely warm temperatures on the 21st) kept most of the State above average for the month as a whole. March temperatures ranged from about five degrees above average over parts of western Colorado to near or slightly below average readings in extreme eastern counties.



Departure of March 1995 temperatures from the 1961-90 average.

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## MARCH 1995 DAILY WEATHER

- 1-7 Storms that brought flooding to California sent a stream of mild, moist air into western Colorado the first 6 days of March. Areas below 7500 feet received mostly rain while higher elevations had snow. The heaviest precipitation fell in southwestern Colorado on the 1st, late on the 2nd into the morning of the 3rd and 5-6th. This final surge brought precipitation to nearly all of Colorado and deposited more than 1.00" over most of southwestern Colorado including 2.20" in less than 24 hours at Mesa Verde. Snowfall totals for the 6-day period included 38" at Aspen and more than 80" at Wolf Creek Pass 1E. Meanwhile, arctic air covered eastern Colorado 1-2nd with periods of snow and freezing drizzle. Temperatures only reached into the teens and low 20s. As much as 6" of snow fell along the southern foothills. Fog lingered over portions of the Eastern Plains 3-4th, while warmer temperatures and downslope gusty winds developed along the Front Range. The cold air returned late on the 5th along with rain and snow. Canon City got 6" of snow on the 6th. Skies cleared early on the 7th. Much of Colorado had their coldest morning of the month. Sedgwick dropped to -5°F. Taylor Park dipped to -36°, the coldest in the State.
- 8-12 Colorado enjoyed dry weather 8-10th with temperatures by the 10th climbing to near 70°. High clouds and winds increased. A deep low pressure area developed on the 11th. Temperatures east of the mountains soared to near record levels. Wind gusts of over 40 mph buffeted the Western Slope. Precipitation spread into southwestern Colorado late on the 11th, but the storm fizzled on the 12th. Only a few light showers crossed the mountains, but winds gusted as high as 40-70 mph in eastern Colorado. The 13th brought sunshine, lighter winds and mild temperatures to most of the State.
- 14-17 High pressure brought sunny weather with light winds 14-15th. Warmer than average temperatures continued, but a minor upper air disturbance and Pacific cold front triggered some afternoon convective buildups on the 16th. Rumbles of thunder (the first of the season) gave way to a period of rain and snow that continued overnight along the Front Range. Six inches of snow fell near Mount Evans, and the Ruxton Park station near Pikes Peak received 9 inches. Only a few light showers fell elsewhere in the State.
- 18-20 It was mild and dry on the 18th. A Pacific cold front zipped across the State early on the 19th bringing a few inches of snow to the Northern and Central Mountains. Both Craig and Hayden picked up 0.51" of moisture. Almost no precipitation fell east of the mountains, but strong winds and some blowing dust accompanied the cold front. Some weather stations reported wind gusts of around 50 mph. Winds diminished and skies were partly cloudy on the 20th.
- 21-24 Strong winds rattled windows and picked up dust each day. Record warm temperatures developed east of the mountains on the 21st with the help of dry westerly winds. The new Denver airport reached 78°. Campo in extreme southeastern Colorado was the warmest in the State in March with 89°. Winds of 40-60 mph were reported both east and west of the mountains. A deep low pressure area crossed northern Colorado on the 22nd. A few inches of snow fell in the mountains. A major wind and duststorm developed over eastern Colorado. 80 mph gusts were reported near the foothills. Morning temperatures were cooler on the 23rd, but the winds picked up again during the day. Clouds increased over western Colorado on the 24th as a trough of low pressure approached. Again, winds were strong over much of the State.
- 25-26 The large low pressure trough moved over Colorado on the 25th bringing colder temperatures, clouds and scattered rain and snow showers. A strong storm center then formed over Oklahoma and moved northward into Kansas on the 26th. Precipitation began as rain in eastern Colorado early but turned to snow. Blizzard conditions developed out on the plains as northerly winds gusted to more than 40 mph. Heavy precipitation fell from south of La Junta north to Holyoke with locally 6-10" of wet snow and more than 1" of water content. Several highways were blocked, and many schools were closed the next day.
- 27-31 March ended with very cold, damp weather. The blizzard moved out of the area, but another round of snow developed late on the 27th and became heavy in the southern foothills south of Denver to Walsenburg. Snow continued on the 28th with as much as 2 feet of new snow reported near the Wet Mountains. Snow fell over much of the State on the 29th as the upper level low remained over Colorado. High temperatures only reached into the teens in some mountain locations. Grand Junction reported 3.7" of snow, their heaviest of the entire winter. Skies began clearing from the north on the 30th. Subzero temperatures were reported early on the 31st in the mountains including -22 at Taylor Park. Temperatures warmed a bit on the 31st. A few convective sprinkles developed during the afternoon.

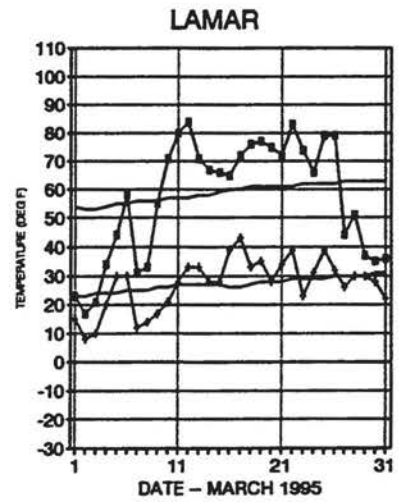
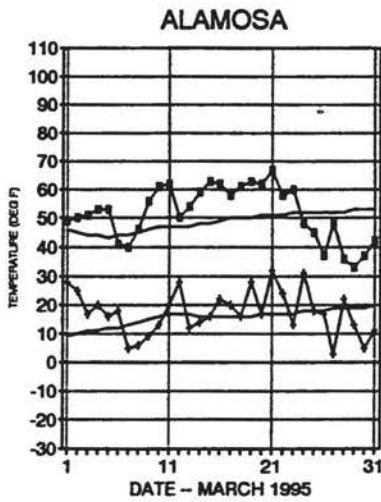
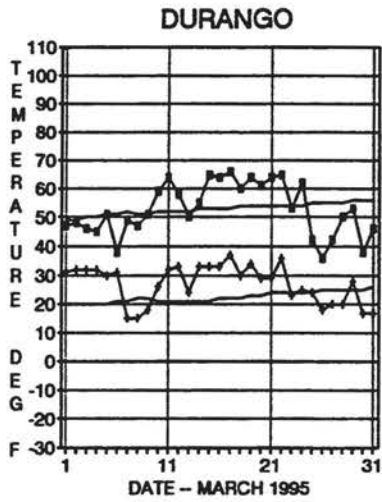
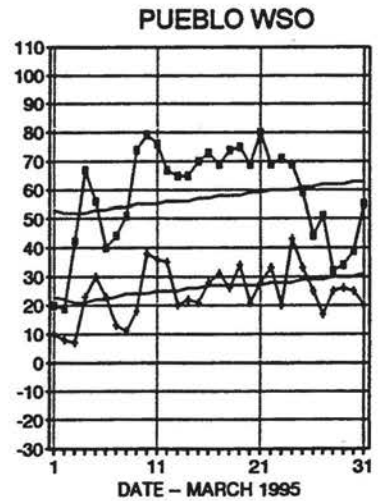
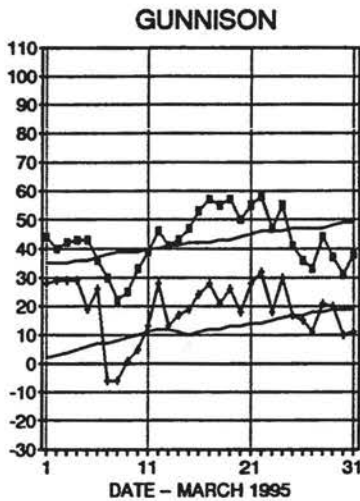
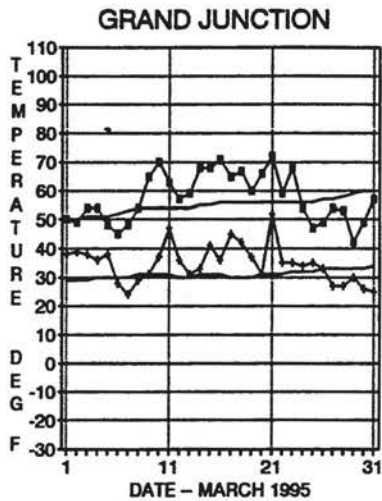
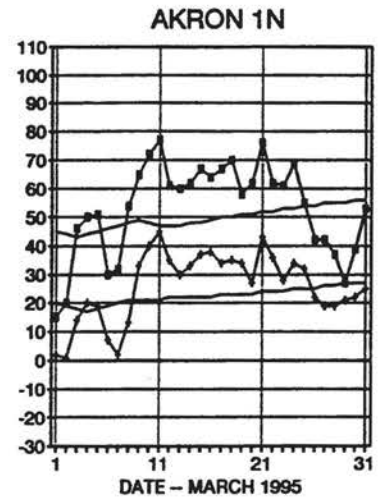
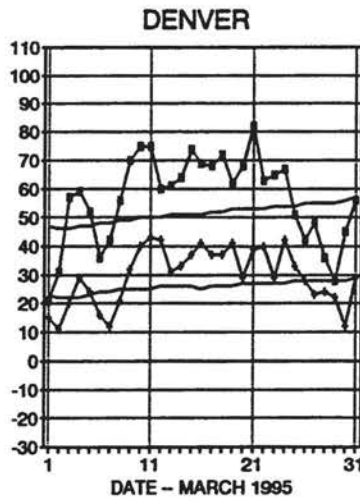
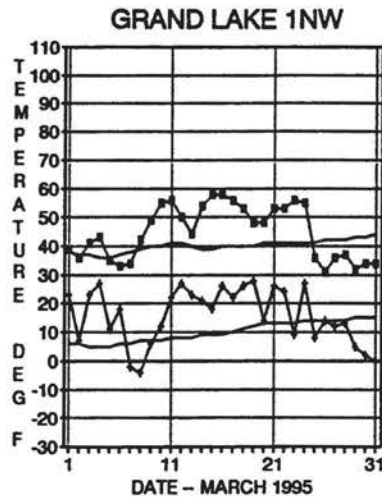
		Weather Extremes	
Highest Temperature	89°F	March 21	Campo 7S
Lowest Temperature	-36°F	March 7	Taylor Park Dam
Greatest Total Precipitation	13.78"		Wolf Creek Pass 1E
Least Total Precipitation	0.12"		Briggsdale
Greatest Total Snowfall	138.1"		Wolf Creek Pass 1E
Greatest Snow Depth	92"	March 7	Wolf Creek Pass 1E



## MARCH 1995 TEMPERATURE COMPARISON

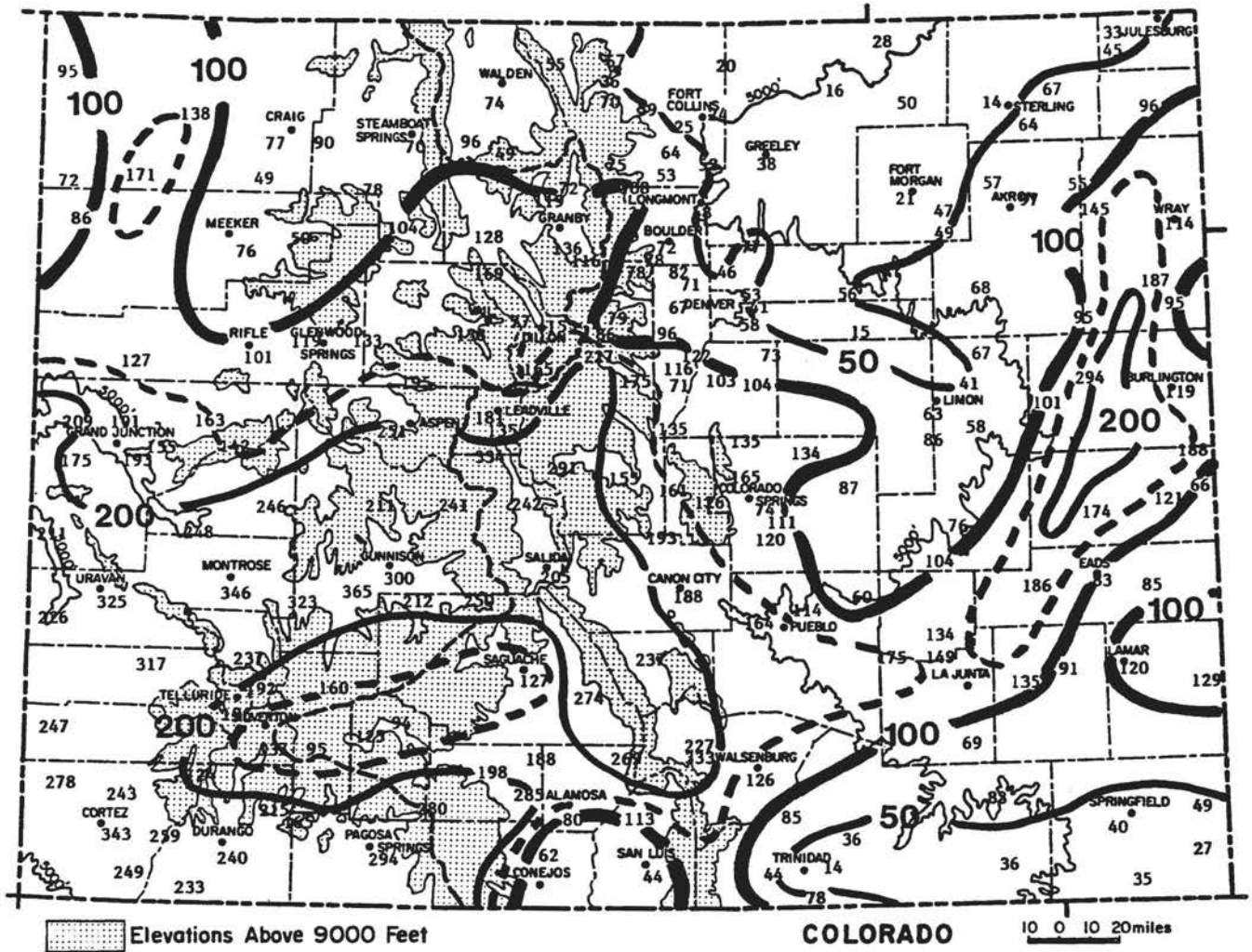
Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

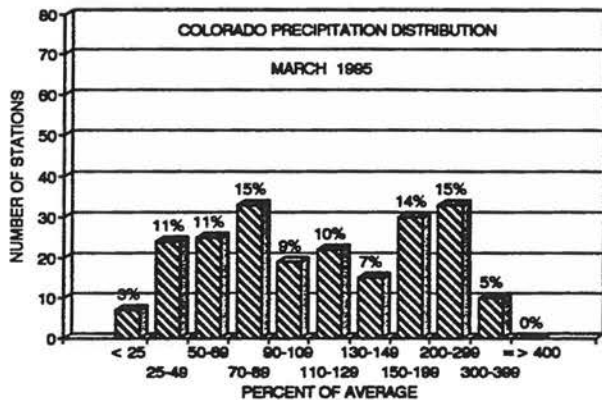




## MARCH 1995 PRECIPITATION COMPARISON



March 1995 Precipitation as a Percent of the 1961-90 average.



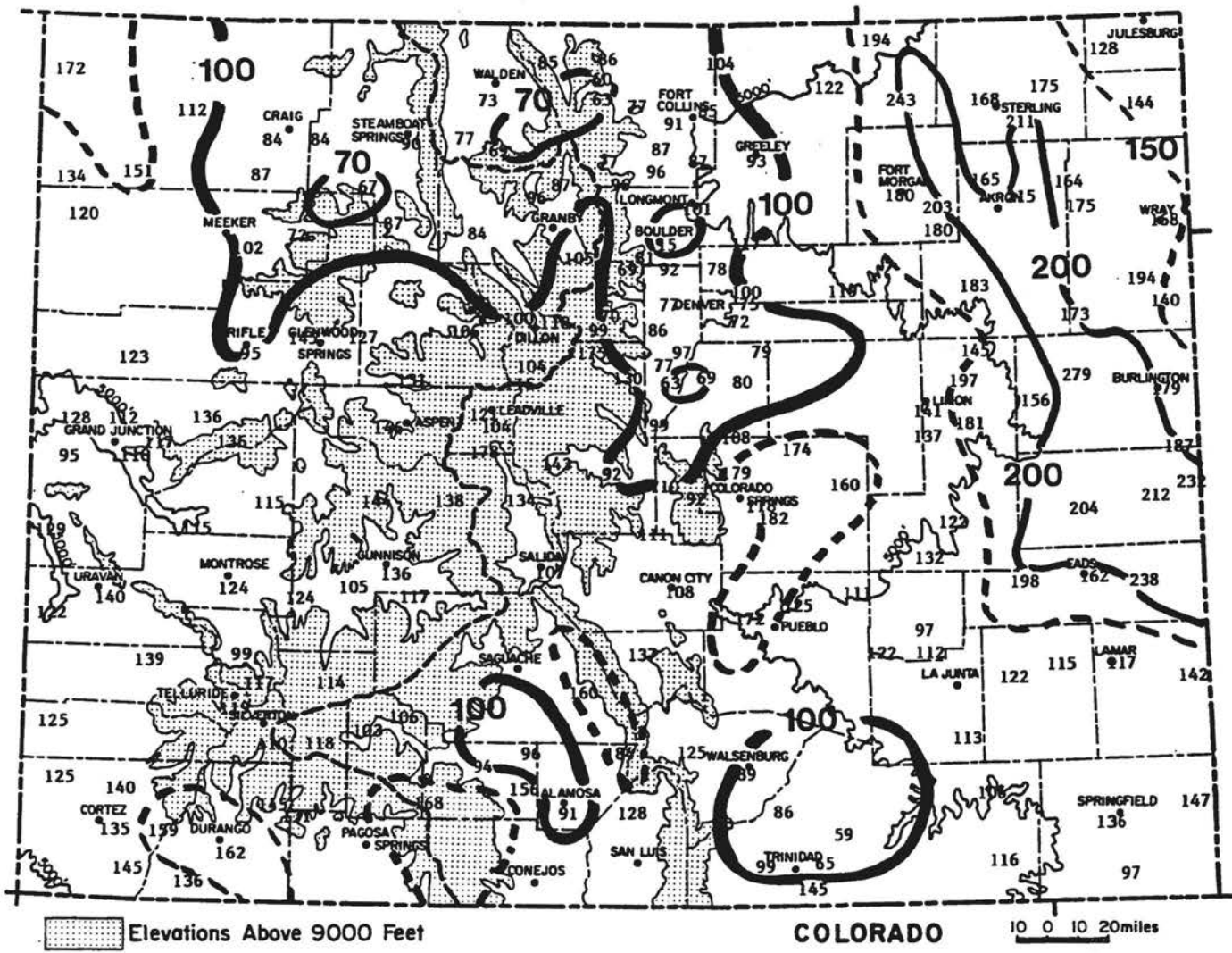
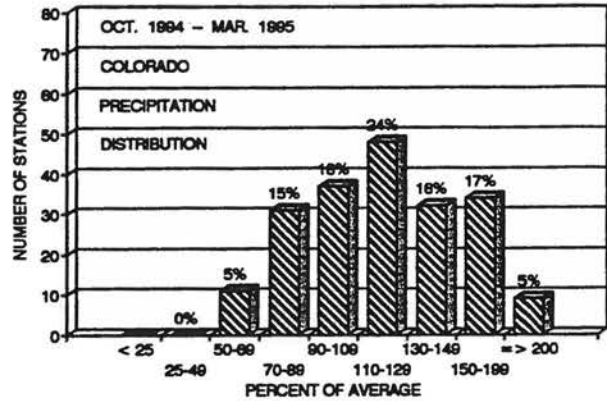
March precipitation ranged from less than 25% of average in areas near Weld County and near Trinidad to nearly 400% of average over portions of southwestern Colorado. Statewide, wetter than average areas outnumbered dry areas by a small margin.

### MARCH 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	0.68"	37th Driest in 124 years of record (driest = 0.11" in 1908)
Durango	3.97"	6th wettest in 101 years of record (wettest = 4.87" in 1938)
Grand Junction	1.74"	8th wettest in 104 years of record (wettest = 2.36" in 1912)
Las Animas	0.96"	31st wettest in 129 years (wettest = 3.06" in 1973)
Pueblo	0.88"	39th wettest in 127 years of record (wettest = 3.06" in 1905)
Steamboat Springs	1.44"	22nd driest in 90 years of record (driest = 0.49" in 1910)

# 1995 WATER YEAR PRECIPITATION

Much of Colorado benefited from above average precipitation in March. In particular, some parts of the Eastern Plains that were so dry last spring and summer continue to show substantially above average precipitation totals for the first six months of the 1995 water year. Most of the mountains and nearly all of the Eastern Plains show water year precipitation totals that are above or much above average. Unfortunately, the driest areas of Colorado, going into March with respect to average, were the areas that got the least precipitation during March. As a result, very dry conditions remain in the Northern Mountains, in North Park (the North Platte River Basin), the Front Range from Pikes Pike north into Wyoming and the immediate Trinidad area. Some of these areas have received less than 70% of the average winter precipitation. These same areas typically receive a larger fraction of their annual precipitation during April and May than other portions of Colorado. This means these areas could improve markedly with the help of a wet spring or deteriorate further with a dry spring.



October 1994 - March 1995 Precipitation as a Percent of the 1961-90 average.



## COMPARATIVE HEATING DEGREE DAY DATA FOR MARCH 1995

### HEATING DEGREE DATA

### COLORADO CLIMATE CENTER (303) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700	1174	1307	1267	882	934				6718
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8850
	93-94	232	221	425	718	1168	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095	1265	1317	911	988				6806
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5646
	94-95	4	0	77	442	848	890	939	737	703				4840
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7881
	94-95	50	65	286	674	1018	1143	1236	902	966				6340
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	6320
	93-94	0	25	189	450	853	1068	1068	854	499	144	1		8021
	94-95	4	0	80	370	836	908	1036	797	779				4810
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987
	93-94	0	22	153	435	816	864	886	826	509	468	M	0	M
	94-95	0	0	42	361	695	760	868	645	690				4081
COLORADO SPRINGS	AVE	6	18	164	468	816	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	926	749	576	223	14	8271
	94-95	10	14	98	486	811	969	1035	811	810				5044
CORTEZ	AVE	0	11	146	474	826	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	508	926	1148	1096	1038	895	528	272	14	8404
	94-95	4	0	111	522	891	1012	1151	668	733				5112
GRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	887	419	193	8376
	93-94	87	60	286	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613	1133	1316	1332	946	875				6438
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	93-94	13	33	232	598	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	67	423	794	1025	964	655	620				4568
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	93-94	1	20	152	488	900	948	948	879	618	485	104	3	5544
	94-95	3	2	57	397	804	890	957	738	674				4522
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192	1378	1494	1109	1167				8202
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6636
	94-95	2	2	104	559	852	1025	1193	746	773				5356
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1116	M	1258	1060	779	639	330	64	M
	94-95	M	M	M	M	M	M	M	M	M				M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7483
	94-95	59	48	286	677	937	1029	1180	893	891				6000
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	669	493	141	6	6002
	94-95	3	3	89	460	820	977	1019	787	737				4895
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1168	704	550	126	6	M
	94-95	9	8	106	435	898	1030	1176	M	761				4423
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	69	0	5297
	94-95	0	0	24	368	832	984	962	596	578				4344

\* = AVES ADJUSTED FOR STATION MOVES    M = MISSING    E = ESTIMATED

### HEATING DEGREE DATA

### COLORADO CLIMATE CENTER (303) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE 6SSW	AVE	214	260	468	781	1113	1478	1600	1361	1283	945	660	381	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10482
	94-95	205	188	423	761	1154	1456	1430	1034	1165				7816
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957
	94-95	1	3	68	441	860	1005	1066	815	718				4977
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	93-94	M	M	M	M	M	1323	1693	1734	1527	1044	736	460	185
	94-95	87	74	343	737	1138	1512	1583	1110	1062				7644
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	93-94	0	12	90	389	935	925	994	882	555	400	78	0	5260
	94-95	0	3	40	288	690	882	934	698	653				M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	93-94	354	390	591	915	1368	1478	1499	1321	1196	994	662	338	11108
	94-95	310	314	539	895	1257	1406	1500	1135	1220				8578
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	96	6961
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	16	6797
	94-95	12	13	124	513	925	1043	1117	928	874				5549
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	718	533	182	8	8430
	94-95	13	0	82	435	884	949	1076	782	762				4963
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1096	785	584	280	52	7373
	94-95	13	5	170	578	1087	1207	1306	863	812				6041
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	93-94	14	15	181	520	956	1155	1120	992	664	487	203	9	6296
	94-95	4	2	113	489	895	1072	1068	679	705				5027
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	1009	M	1253	872	885				M
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	687	467	143	0	5950
	94-95	0	6	57	388	785	964	1028	788	734				4750
RIFLE	AVE	0	23	164	502	858	1237	1330	980	825	549	298	95	6881
	93-94	E	13</											

## MARCH 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	48.4	20.7	34.5	0.9	75	-6	937	0	104	0.26	-0.64	29	6
STERLING	55.4	25.0	40.2	1.7	82	1	763	0	169	0.15	-0.86	15	2
AKRON 1N	53.1	25.8	39.5	2.6	77	1	785	0	138	0.54	-0.46	54	6
AKRON 4E	51.7	22.9	37.3	0.9	77	-4	851	0	143	0.89	-0.02	98	9
HOLYOKE	50.5	24.1	37.3	-1.8	81	-3	854	0	152	1.16	-0.04	97	9
BURLINGTON	52.9	26.3	39.6	0.1	80	0	779	0	162	1.17	0.19	119	3
LIMON WSMO	51.6	21.6	36.6	0.1	74	1	874	0	123	0.60	-0.34	64	8
EADS	54.6	27.2	40.9	-0.8	81	3	738	0	174	0.72	-0.14	84	5
ORDWAY 21N	52.5	19.9	36.2	-2.3	75	-4	885	0	145	0.70	0.03	104	6
ROCKY FORD 2ESE	62.2	27.5	44.9	2.0	83	7	617	0	241	1.00	0.33	149	7
LAMAR	57.3	27.1	42.2	-0.9	84	8	700	0	216	1.08	0.18	120	7
LAS ANIMAS 1N	60.6	26.8	43.7	0.0	86	9	653	0	239	0.96	0.25	135	6
HOLLY	57.2	27.0	42.1	0.6	85	6	704	0	218	1.00	0.23	130	7
SPRINGFIELD 7WSW	59.4	26.9	43.2	0.8	85	7	668	0	210	0.38	-0.56	40	6

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	54.0	27.9	41.0	2.7	75	8	737	0	132	0.35	-1.01	26	3
GREELEY UNC	55.2	28.1	41.6	1.3	77	2	718	0	151	0.44	-0.69	39	3
ESTES PARK	43.6	25.2	34.4	3.4	64	7	940	0	31	0.65	-0.21	76	7
LONGMONT 2ESE	55.1	25.3	40.2	2.3	79	5	762	0	162	0.56	-0.59	49	5
BOULDER	55.2	29.0	42.1	2.6	76	10	703	0	147	1.21	-0.45	73	9
DENVER WSWO AP	56.6	29.4	43.0	4.0	82	11	674	0	168	0.68	-0.60	53	8
EVERGREEN	52.2	19.8	36.0	3.0	72	0	891	0	123	1.41	-0.05	97	7
CHEESMAN	52.3	11.6	31.9	0.4	75	-11	1017	0	115	1.86	0.49	136	9
LAKE GEORGE 8SW	44.1	15.1	29.6	2.9	61	-22	1089	0	32	1.18	0.42	155	8
ANTERO RESERVOIR	44.8	15.7	30.3	6.4	60	-24	1066	0	36	1.43	0.94	292	11
RUXTON PARK	34.7	13.4	24.0	1.0	49	-6	1261	0	0	2.66	0.56	127	12
COLORADO SPRINGS WSO	51.3	26.1	38.7	1.5	75	4	810	0	117	0.71	-0.24	75	8
CANON CITY 2SE	55.4	29.6	42.5	0.5	78	7	690	0	164	1.73	0.81	188	10
PUEBLO WSO AP	58.0	24.2	41.1	1.1	80	7	734	0	200	0.88	0.11	114	7
WESTCLIFFE	47.7	17.0	32.4	0.3	67	-9	1003	0	61	2.92	1.69	237	7
WALSENBURG	57.1	30.1	43.6	2.8	74	7	653	0	168	1.93	0.40	126	7
TRINIDAD AP	59.7	25.4	42.5	1.5	80	10	689	0	205	0.31	-0.54	36	6

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	43.4	18.3	30.8	5.4	58	-6	1054	0	25	0.56	-0.19	75	6
LEADVILLE 2SW	39.5	11.4	25.5	3.5	55	-13	1220	0	8	1.22	0.32	136	18
SALIDA	49.3	21.6	35.5	-1.0	70	-2	907	0	86	1.44	0.74	206	9
BUENA VISTA	47.5	19.8	33.6	-0.4	65	-3	966	0	60	1.67	0.98	242	9
SAGUACHE	49.9	22.0	35.9	2.7	66	8	895	0	62	0.51	0.11	128	5
HERMIT 7ESE	44.9	10.9	27.9	8.2	57	-19	1144	0	20	1.65	0.34	126	6
ALAMOSA WSO AP	51.8	17.4	34.6	2.3	67	3	934	0	81	0.36	-0.09	80	5
STEAMBOAT SPRINGS	45.8	19.3	32.5	4.2	60	3	996	0	41	1.44	-0.60	71	14
YAMPA	41.4	18.2	29.8	1.8	57	-5	1084	0	23	1.23	0.05	104	12
GRAND LAKE 1NW	44.8	15.7	30.3	5.1	58	-4	1070	0	31	1.11	-0.43	72	12
GRAND LAKE 6SSW	41.1	13.2	27.1	3.5	54	-15	1165	0	6	1.12	0.18	119	16
DILLON 1E	40.4	13.9	27.1	3.0	55	-7	1167	0	14	0.85	-0.24	78	11
CLIMAX	37.1	6.9	22.0	6.0	51	-9	1325	0	1	2.69	0.55	126	17
ASPEN 1SW	45.3	20.5	32.9	4.4	59	4	988	0	33	5.53	3.33	251	17
CRESTED BUTTE	38.8	8.0	23.4	1.9	52	-27	1281	0	1	4.96	2.62	212	16
TAYLOR PARK	37.3	1.3	19.3	1.4	50	-36	1411	0	0	3.35	1.96	241	14
TELLURIDE	42.1	15.8	28.9	1.9	56	-15	1111	0	15	4.06	1.99	196	15
PAGOSA SPRINGS	50.4	22.1	36.3	3.4	65	5	885	0	70	4.69	3.10	295	16
SILVERTON	40.7	8.8	24.7	0.7	57	-17	1239	0	11	3.02	0.82	137	15
WOLF CREEK PASS 1E	31.4	14.3	22.8	0.9	46	-4	1299	0	0	13.78	8.86	280	18

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	49.5	22.5	36.0	4.6	67	11	633	0	50	1.24	-0.36	78	5
HAYDEN	49.1	23.5	36.3	5.9	63	5	882	0	60	1.19	-0.12	91	10
RANGELY	54.4	28.1	41.2	4.7	66	17	730	0	104	0.75	-0.12	86	6
GLENWOOD SPRINGS	54.7	28.5	41.6	4.0	69	15	716	0	112	1.67	0.27	119	12
RIFLE	55.5	27.3	41.4	2.7	70	15	724	0	116	0.95	0.01	101	11
GRAND JUNCTION WS	57.6	34.7	46.1	3.0	72	24	578	0	135	1.74	0.83	191	11
PAONIA 1SW	55.3	31.1	43.2	3.4	71	18	670	0	117	3.40	2.02	246	15
DELTA	57.5	32.2	44.8	3.0	73	21	620	0	140	1.39	0.83	248	5
GUNNISON	42.6	18.4	30.5	3.5	58	-6	1062	0	23	1.86	1.24	300	14
COCHETOPA CREEK	46.0	16.8	31.4	4.7	63	-9	1032	0	32	1.55	0.82	212	12
MONTROSE NO 2	54.1	30.1	42.1	2.6	69	16	705	0	105	2.25	1.60	346	12
URAVAN	59.5	32.0	45.8	2.5	76	22	588	0	170	3.25	2.25	325	13
NORWOOD	50.4	26.6	38.5	3.7	63	5	813	0	66	3.72	2.55	318	12
YELLOW JACKET 2W	52.4	29.6	41.0	5.2	64	16	737	0	79	3.76	2.41	279	12
CORTEZ	54.0	28.2	41.1	3.8	69	15	733	0	110	4.60	3.26	343	11
DURANGO	52.9	26.8	39.8	2.1	66	15	775	0	87	3.97	2.32	241	15

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

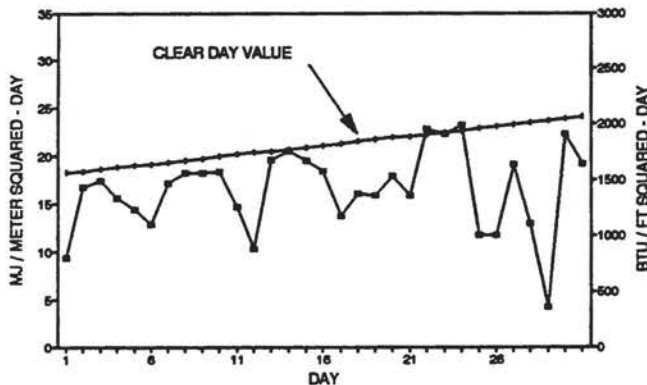
**MARCH 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible	Average % of Possible
	CLR	PC	CLDY	Sunshine	Possible
Colorado Springs	7	11	13	-	-
Denver	NA	NA	NA	77%	69%
Fort Collins	7	15	9	-	-
Grand Junction	8	8	15	69%	64%
Pueblo	NA	NA	NA	85%(?)	74%

CLR = Clear      PC = Partly Cloudy      CLDY= Cloudy

There was more cloudiness and less solar radiation than average for March across most of western and southern Colorado. Northern Colorado had slightly less cloudiness and a bit more solar radiation than average. The steady influx of Pacific storm systems was responsible for this pattern.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION MARCH 1995**

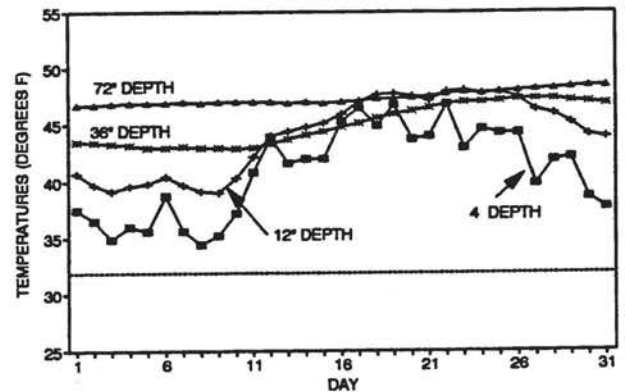


**MARCH 1995 SOIL TEMPERATURES**

Soil temperatures remained steady early in March but then climbed rapidly and remained much above average until returning closer to normal late in the month. Deep soil temperatures (below 36") are the warmest on record for this time of year.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES MARCH 1995**



HATS OFF TO: *Ron Lehman of Montrose, Colorado*

Montrose is one of Colorado's Centennial plus weather stations with observations dating back to 1885. Observations have been taken at the Uncompahgre Valley Water Users Association since 1911. Ronald Lehman has been supervising weather observers for many years. Thanks, - we appreciate the good work.

## AND YOU THOUGHT MEASURING AIR TEMPERATURE WAS EASY?

Tremendous effort has been expended over the past decade studying global climate records. Still scientists cannot tell us for certain how much global temperatures have changed during the past 200 years. There is also no final consensus on how much our climate will be warming in the decades to come. It's not even certain that it will warm up at all, although evidence is still strong that some warming will be noted. But one thing that millions of dollars of research has proven – to me at least – is that **measuring air temperature accurately and consistently is not a simple task.** Historic temperature data from weather stations all over the world, some dating back well over 100 years, are all filled with inconsistencies and local effects that make precise evaluations of the world's long-term temperature trends extremely challenging.

But what could possibly be hard about measuring the air temperature? All you need is a thermometer, a place to put it, and a way to read it, right? I'm sure that's what I believed for many years. I still vividly remember the little red, white and blue thermometer that my dad mounted on the outside of their bedroom window. When I got tall enough, I got to pull open the curtains and read that thermometer each day before breakfast. Later, my folks bought me my very own thermometer which I installed on the outside frame of my north-facing upstairs bedroom window. We eventually got one of those indoor-outdoor thermometers and mounted it in the kitchen. No matter where I was in the house, I was always close to a thermometer. We also had one on the north outside wall of our old garage. I think that was a gift from the local grain elevator. Never do I recall doubting or questioning any of those thermometers. Rarely did I notice how different they read depending on the position of the sun or the strength of the wind.

It has taken me twenty years as a young weather enthusiast and another 20 years as a professional climatologist and an official weather observer to finally gain

an appreciation for this problem. There is a very good reason why only some weather stations are "Official".

### Some Causes for Temperature Inconsistencies

It is easy to measure the temperature of a thermometer. Even cheap hardware store thermometers are usually surprisingly accurate at measuring their own temperature. The hard part is getting the thermometer to read the temperature of the air and to do it consistently. That is the purpose for standardizing requirements to take official temperature observations.

Here are a few things that we know affect temperature readings:

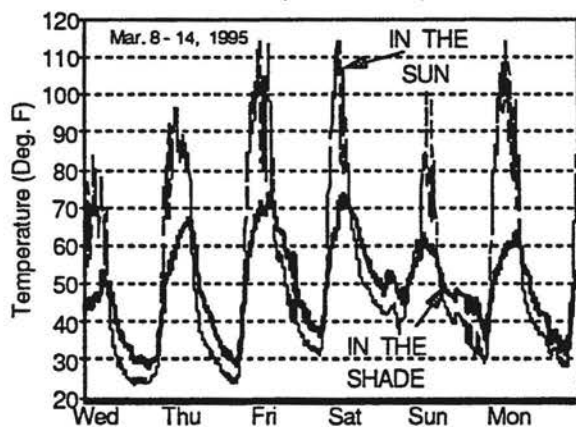
- 1) Height of thermometer above the ground.
- 2) Ground cover and vegetation in the immediate vicinity of the weather station.
- 3) Vegetation, pavement, buildings, etc in a wide radius around the weather station.
- 4) Proximity of buildings that may shade the weather station, reflect sunlight and/or give off heat.
- 5) Obstacles that affect wind speed at the station.
- 6) **Type, location, orientation and color of the weather shelter used to protect the thermometers from direct sun.**

In addition to these "exposure" issues, there are several other instrumental and observing issues

- 8) Time of observation.
- 9) Height of weather observer with respect to height of liquid-in-glass thermometers.
- 10) Changing instruments from manual to electronic.
- 11) Rounding temperatures up or down.
- 12) Accurately recording the temperature data.
- 13) Handling missing data due to observer absence or equipment failure.

All of these factors can influence temperature. Any type of change can have surprisingly large impacts on the resulting temperature data. Fresh white paint on a dingy old wooden weather shelter will produce cooler daytime temperatures, especially when winds are light. A broken wooden louver that allows a little direct sunlight in the shelter will elevate temperatures. Changing the time of day when an observer reads and records daily maximum and minimum temperatures from the early morning to the late afternoon or evening will produce markedly warmer mean daily temperatures. Even changing the angle at which an observer looks at a liquid-in-glass thermometer will affect the readings.

Fort Collins, CO Temperature Comparison





Moving a weather station to a new location can obviously affect data. The new Denver Airport is a fine example. March 1995 temperatures there were 3.5° F cooler than at Stapleton. (We will very soon be writing up some early results of data comparisons between the Denver Stapleton weather station and DIA.) But even subtle local changes in the environment around a weather station can make a big difference. Building a new garage ten feet from the station would have an immediate affect. Other changes, like the slow growth of a big tree gradually shading and blocking wind movement at a weather station are subtle but just as important. When averaged over a year or over many years, all of these changes can more than compensate for the actual variations in seasonal and annual temperature that we are trying to observe and document. *For these reasons, the greatest of care and consistency must be taken when we establish and maintain weather stations so that we measure and record what we need.*

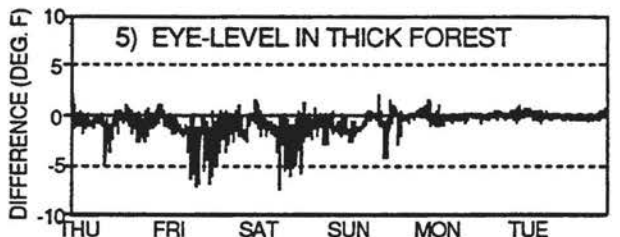
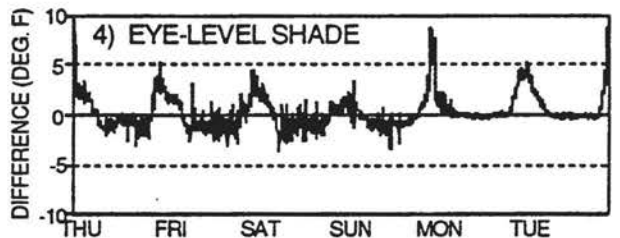
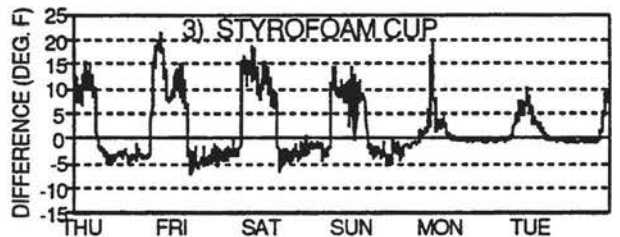
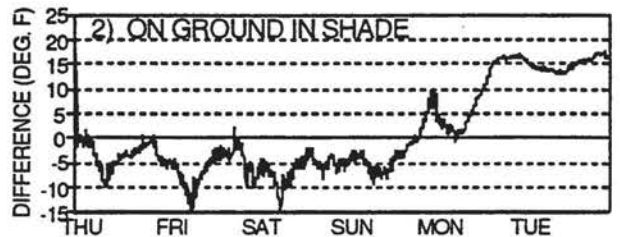
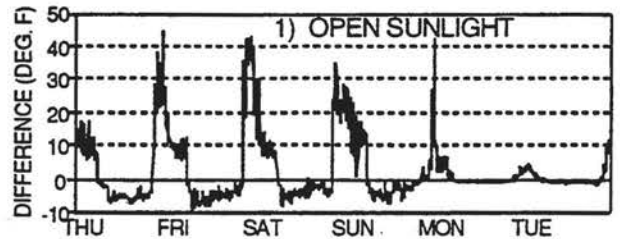
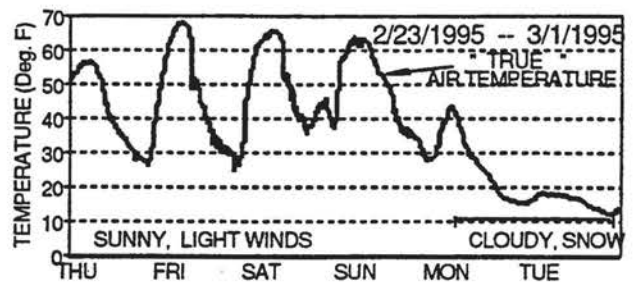
### Local Exposure Comparisons

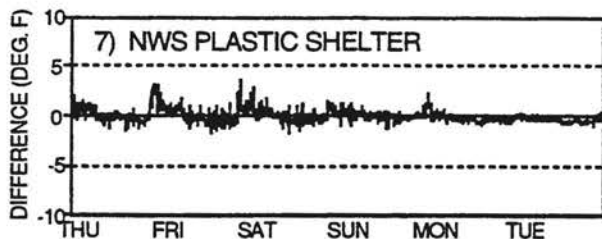
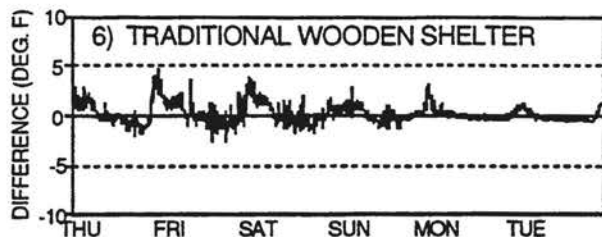
Of all the factors affecting the accuracy, consistency and representativeness of temperature measurement, thermometer location and exposure are probably the most important.

Recently we had a unique opportunity to study in detail the importance of exactly where and how a thermometer is exposed to the air. During February and March we worked together with Rich Bachand, Tom Stohlgren and other scientists and assistants from the U.S. Dept. of Interior National Biological Survey. They provided us with 13 portable recording digital thermometers that we were able to install in all sorts of exposures at the Fort Collins Weather Station. We then compared those readings with the temperatures recorded from four thermometer systems that we already operate at the station. A special calibration temperature system was installed to establish the "true air temperature" to which all other thermometers were compared.

We put thermometers in the sun and we put them in the shade. We put them beneath trees. We laid them on the ground. We hung them in the air. We put them in different commonly used shelters (radiation shields) including the old wooden type and the new plastic ones. We even tried making our own inexpensive shelter using a styrofoam cup. There were so many thermometers that we had to be careful where we stepped. During our test period we had calm, sunny weather and also some cloudy, cold and snowy days. It was a good combination of weather for this type of study. Using digital data loggers, temperatures were summarized into 6-minute averages for all times of day. The results were fascinating.

The graphs that follow summarize what we experienced. The top graph shows the "true" air temperature measured by the specially calibrated, shielded





and aspirated thermometer. Below it are graphs showing how a variety of exposures differed from the true air temperature. Positive differences mean that temperatures were warmer than true air temperature.

What we saw were predictable yet surprising.

1) The thermometer in open sunlight read much warmer than the true air temperature during the day but especially during the hours just after sunrise. For brief periods when winds were calm, temperatures read 40°F or more too warm. Even in strong winds, temperatures were often 10 degrees high. Nighttime temperatures measured by the exposed thermometer were much cooler than the true air temperature (5-10°F) when skies were clear but only slightly cooler when it was cloudy.

2) A thermometer in the shade but mounted down at ground level read cooler than air temperature almost all the time both during the day and at night. Why did it then become warmer than the air temperature part way through the experiment? It snowed! As soon as it was covered by snow it was insulated from the air above and read about 15 degrees F warmer than the air temperature.

3) The styrofoam cup idea seemed brilliant but, alas, it read much too warm during the day (even on cloudy, snowy days) and too cool at night (especially on clear nights).

4) The thermometer mounted in the shade of the weather station building was more representative of true air temperature but still was 5 degrees or more too warm at times during the day, depending on sunlight reflection and wind conditions, and a few degrees too cool on clear nights.

5) A thermometer hung at eye level in a dense thicket of trees compared extremely well during cloudy, snowy weather, but read cooler than "true" air temperature both during the day and at night when skies were clear.

6) Even the thermometer within the traditional National Weather Service wooden temperature shelter showed some biases. Temperatures within the wooden shelter were a little warmer than the true air temperature during the day and slightly cooler at night.

7) The best overall comparison with "true" air temperature was found within the newer plastic weather shelter used by the National Weather Service with their electronic Maximum-Minimum Temperature System (MMTS). There were some minor biases at times, but most of the time temperatures were within one degree F of the "true" air temperature.

At the end of this experiment, we placed all thermometers together in an ice-water mixture designed to provide a consistent temperature at the freezing point. Thus we were able to see if the sensors themselves were accurate and consistent with each other. We were very happy to find that all thermometers read very close to each other with a maximum difference among sensors of 0.4°F. Most of the test instruments read slightly cooler than the calibration reference temperature.

### Conclusions

You may have never thought much about it, but measuring true air temperature is indeed a challenging undertaking. This little test has provided a great set of examples of just how careful we must be to make sure that all weather stations are set up with standards for proper and consistent thermometer exposure. Shielding thermometers from direct sunlight is extremely important. Just how that is accomplished can result in differences of several degrees. When conditions are cloudy and windy, it doesn't make much difference where your thermometer is. But when skies are clear and winds are light, determining true air temperature becomes very difficult.

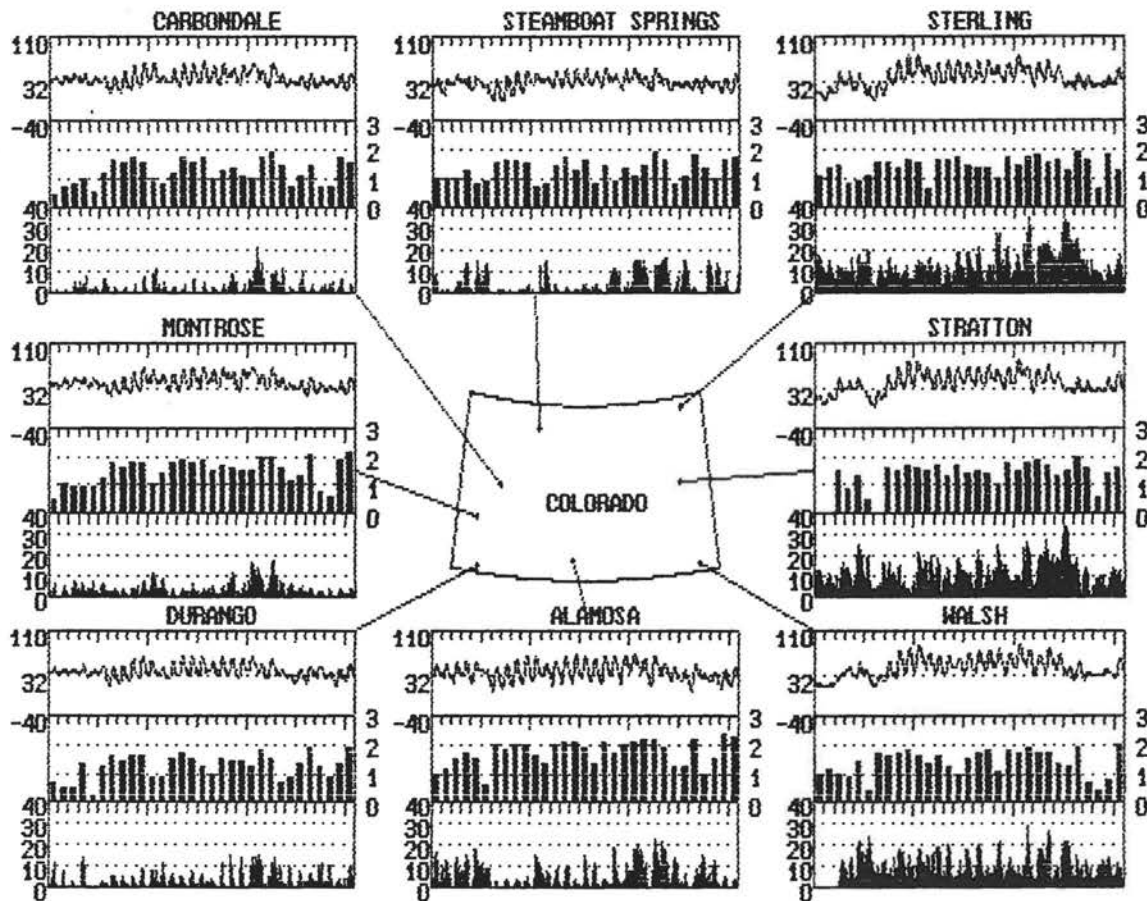
### Now It's Your Turn

Now, whenever you drive past the temperature sign at the bank or look at the cow thermometer mounted on the wall of the barn, think twice about that temperature reading. Good luck with your temperature measurements. If you have any questions or need some help, give me a call.

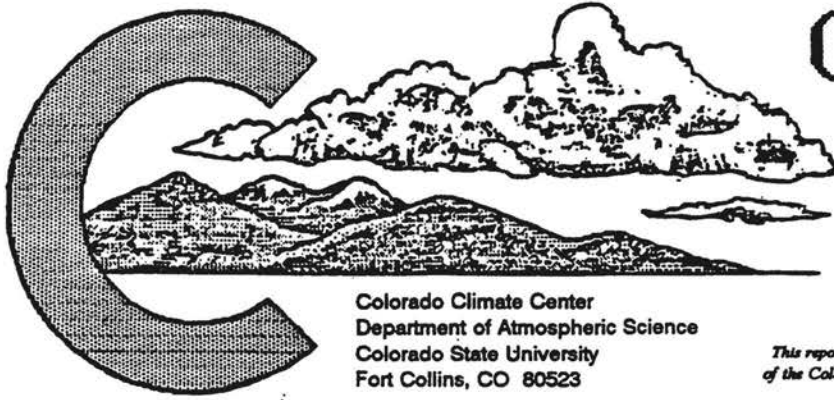
	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature (°F)	35.9	36.7	37.1	40.8	30.6	38.5	39.5	42.5
monthly temperature extremes and time of occurrence (°F day/hour)								
maximum:	67.1 21/14	61.9 16/14	67.6 16/16	67.8 21/13	55.4 16/14	77.7 10/15	79.7 21/14	86.0 21/15
minimum:	3.9 27/6	9.7 7/7	10.4 7/7	16.2 27/6	-3.6 7/7	-3.1 7/6	-1.8 7/7	9.3 2/19
monthly average relative humidity / dewpoint (percent / °F)								
5 AM	77 / 17	76 / 23	88 / 26	74 / 26	87 / 19	39 / 12	54 / 18	79 / 28
11 AM	34 / 24	46 / 28	61 / 31	50 / 30	55 / 24	27 / 19	51 / 33	53 / 33
2 PM	27 / 23	37 / 27	47 / 31	38 / 29	45 / 25	22 / 21	50 / 37	44 / 32
5 PM	28 / 23	37 / 26	42 / 29	35 / 27	45 / 24	20 / 20	53 / 37	44 / 31
11 PM	53 / 19	65 / 24	70 / 27	56 / 26	76 / 24	32 / 13	53 / 22	67 / 28
monthly average wind direction (degrees clockwise from north)								
day	194	199	220	217	183	202	146	168
night	158	80	142	150	133	209	200	221
monthly average wind speed (miles per hour)	4.85	2.86	1.69	2.91	2.85	10.87	10.27	9.17
wind speed distribution (hours per month for hourly average mph range)								
0 to 3	370	441	500	471	455	48	86	35
3 to 12	286	217	121	244	144	444	399	483
12 to 24	88	18	7	13	41	220	237	179
> 24	0	0	0	0	0	32	22	7
monthly average daily total insolation (Btu/ft <sup>2</sup> ·day)	1713	1231	1218	1468	1286	1395	1383	1368
"clearness" distribution (hours per month in specified clearness index range)								
60-80%	106	131	122	112	120	171	178	160
40-60%	54	72	79	55	96	87	69	85
20-40%	53	83	94	69	102	67	51	81
0-20%	15	71	58	48	27	34	28	40

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.







# COLORADO CLIMATE

APRIL 1995

Volume 18 Number 7

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

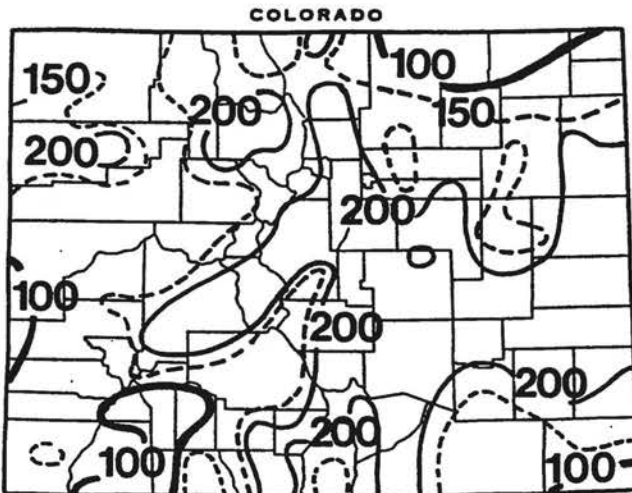
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## April Climate in Perspective – Cold, Wet Weather Sets In

April weather was divided neatly into two opposite halves. The first half of the month was predominantly sunny, dry, warm and occasionally windy – except for a brief but potent spring blizzard April 9-10. The last half of the month brought persistent cloudy, cold weather with frequent rain and snow. Overall, April ended up cooler than average statewide with most areas receiving more precipitation than normal.

### Precipitation

Twelve storm systems affected Colorado's weather in April. The few storms that passed by early in the month brought mostly wind and little precipitation. The exception



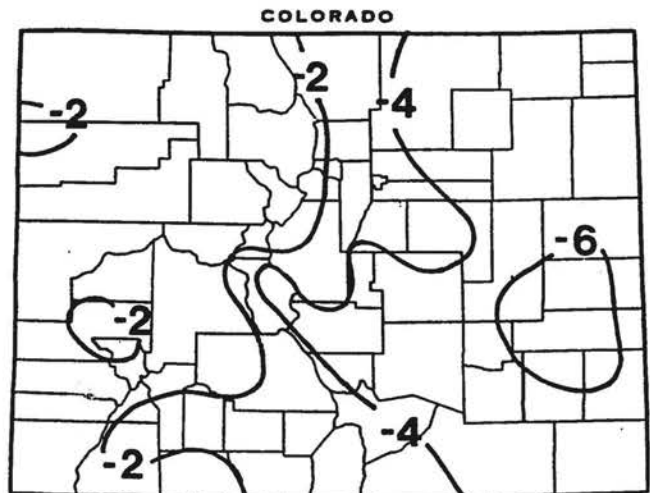
April 1995 precipitation as a percent of the 1961-1990 average.

was a large storm that crossed the State 8-10th that brought significant moisture to all except a few areas of western Colorado. Beginning on the 15th, storms continuously moved across the region bringing rain and snow almost every day. Precipitation totals for the month ended up more than 200%

of average over nearly all of the Front Range (5-7" of precipitation and over 6 feet of snow in many eastern foothills locations). Parts of the east central plains and the Northern and Central Mountains were also much above average. There were just a few locations that reported less moisture than average. These included eastern Weld County, western Logan County, southeastern Baca County, the Silverton area and a few points on the Western Slope.

### Temperatures

Warm temperatures and accompanying strong winds dried soils and hastened initial plant growth early in April. A statewide cold spell April 9-11th, then set the tone for the remainder of the month. Outdoor activities were retarded and plant growth diminished as colder than normal temperatures prevailed the last half of the month. Temperatures for the month as a whole ended up 4 to 6 degrees Fahrenheit below average over most of the eastern Plains. In and west of the mountains, temperature departures were generally 1 to 3 degrees F below average.



Departure of April 1995 temperatures from the 1961-90 average.

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## APRIL 1995 DAILY WEATHER

- 1-3 April began with sunshine and normal temperatures. A weak Pacific cold front crossed the State on the 2nd accompanied by very light showers across northern counties. Skies cleared on the 3rd as temperatures remained mild.
- 4-7 Colorado enjoyed dry and very warm weather. Low pressure passed far north of the State on the 5th producing strong winds along the Front Range with 30-50 mph gusts. Temperatures climbed into the 70s at lower elevations with some 80s in southeastern Colorado. Afternoon convective clouds formed each day producing virga but no precipitation at the ground.
- 8-11 Warm, windy weather on the 8th heralded a sudden change. Showers, thunderstorms and mountain snow developed late in the day as a large low pressure trough deepened over the West. The entire State felt the impact of the developing storm as temperatures plummeted by 20° to 40°F. Several inches of snow fell in the mountains with rainshowers in the lower valleys. Snow increased east of the mountains and became heavy late on the 9th as arctic air from the Northern Plains joined the storm. The storm diminished in western Colorado on the 10th, but a fury continued from the Front Range eastward closing many roads and schools. Temperatures only rose into the 20s and 30s. Snow piled into large drifts. 3-7" of snow was measured over most plains areas. Close to 10" fell near La Junta. 11" was measured at Boulder and Canon City with more than 15" at higher elevations. Only a few areas were skipped. Fort Collins got less than 1". The storm moved eastward on the 11th, but cold winds and some areas of snow (4" at Greeley) continued. Limon had a morning low of +4°F.
- 12-14 Snow melted as temperatures rapidly warmed back up above average. 70s and low 80s were reported on the 13th at lower elevations along with brisk winds. Winds strengthened, and areas of blowing dust developed on the 14th, as an intense low pressure center moved eastward across Wyoming. Wind gusts of 50 mph were common both east and west of the mountains. Gusts reached 70-80 mph in a few areas causing some damage to buildings and trees.
- 15-22 The beginning of a long episode of cold, damp weather began innocently enough on the 15th as remnants of the previous day's storm left clouds and chilly winds across northeastern Colorado. Clouds thickened over southwest Colorado. Rain and snowshowers began as

a new storm took shape over the Southwest. Skies unexpectedly cleared on Easter morning (16th), but clouds returned later in the day. Snow increased in the mountains. By early on the 17th precipitation spread east of the mountains. Morning thunder and small hail hit parts of the lower Arkansas Valley. Fort Collins enjoyed 0.65" of rain and melting snow. Many areas east of the mountains got more than 0.50" later during the day, including a few inches of wet snow. 6" of snow fell in Colorado Springs. 1.16" of mixed rain and snow fell north of Ordway. Precipitation ended and skies cleared temporarily on the 18th, but a major new storm moved in from the southwest and covered much of the State by early on the 19th. 13" of snow fell on Buena Vista with heavier amounts in the surrounding mountains. Precipitation diminished again on the 20th, and temperatures warmed just a bit (51° in Denver), but showers increased again later in the day. Northwest Colorado got some peeks at the sun on the 21st, but dense clouds and steady precipitation covered eastern and southern counties. 1.27" of cold rain soaked Las Animas. Precipitation diminished on the 22nd, but many areas still received occasional rain or snow showers. The Pikes Peak area began digging out from nearly 4 feet of snow in recent days.

23-26 Winds aloft shifted to the northwest, but the result was still the same – cold and wet. An upper level disturbance triggered widespread showers in and near the mountains on the 23rd. 7" of wet snow fell at Allenspark. Only scattered showers fell on the 24th, but then a stronger system dropped down from the NW on the 25th. Warmer temperatures were followed by a round of thundershowers. Rain turned to locally heavy snow by early on the 26th with blizzard conditions on the Palmer Ridge. 13" fell near Mount Evans while Limon got 3" of snow.

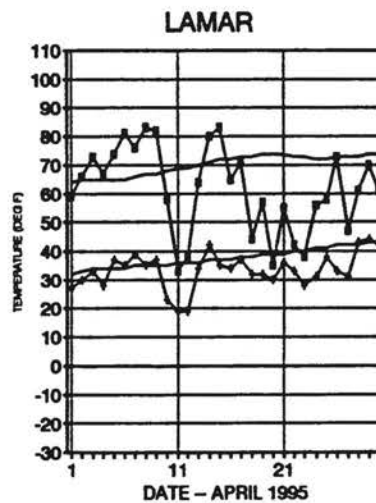
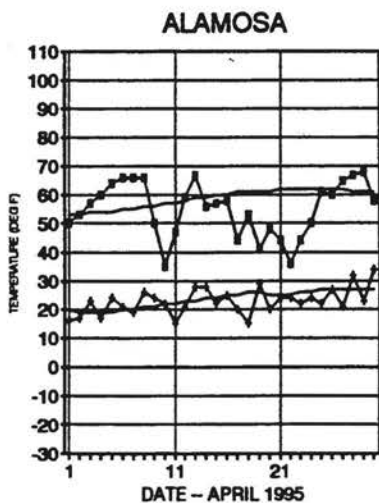
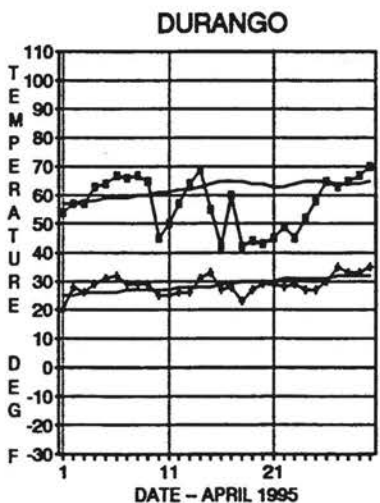
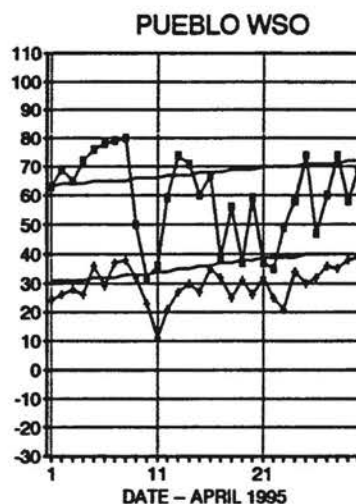
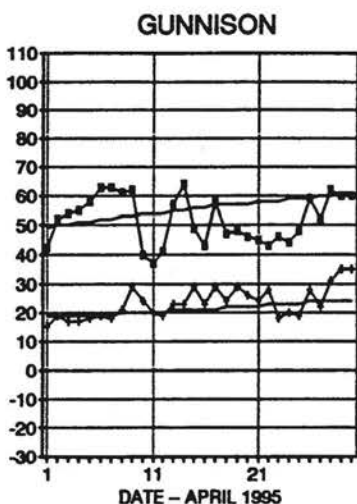
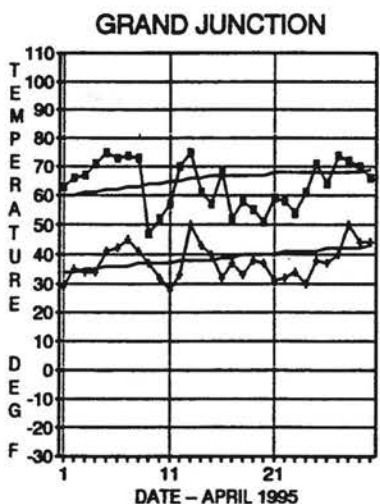
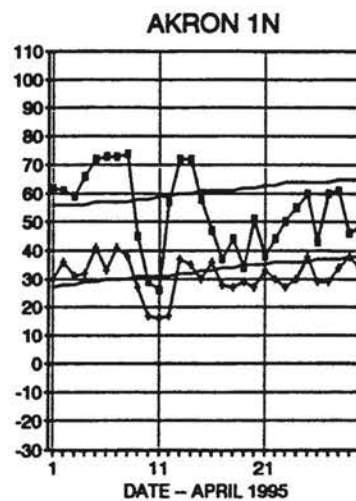
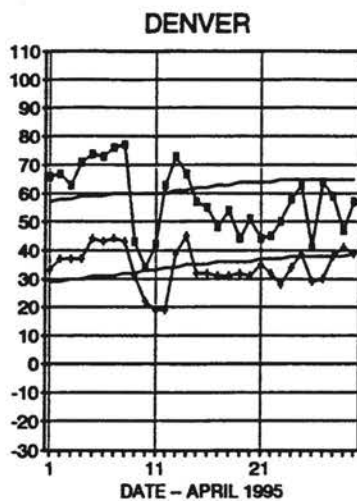
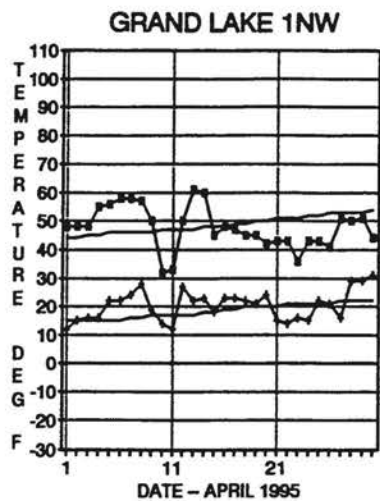
27-30 The 27th brought the last hard freeze of the spring for many agricultural areas. Warm sunshine on the 27th was short-lived as a combination of cold air from the north and a storm from the west set off thundershowers with small hail on the 28th over northern counties of Colorado. This final April storm spared southwestern Colorado but put northeastern counties under dense clouds and cold rain. Longmont totalled 1.20". Sunshine broke through the clouds on the 30th, but this warmth helped trigger more storms. 3/4" hail fell at Denver's new airport.

		Weather Extremes	
Highest Temperature	86°F	April 7, 8	Las Animas
Lowest Temperature	-17°F	April 1	Taylor Park Dam
Greatest Total Precipitation	7.16"		Mount Evans Research Center
Least Total Precipitation	0.15"		Hermit 7ESE
Greatest Total Snowfall	104.3"		Mount Evans Research Center
Greatest Snow Depth	69"	April 21	Bonham Reservoir

## APRIL 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

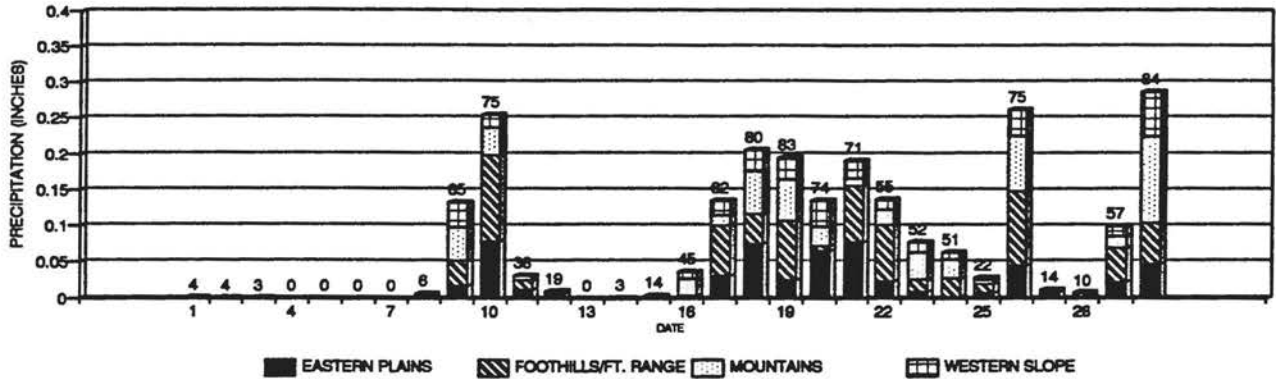


## APRIL 1995 PRECIPITATION

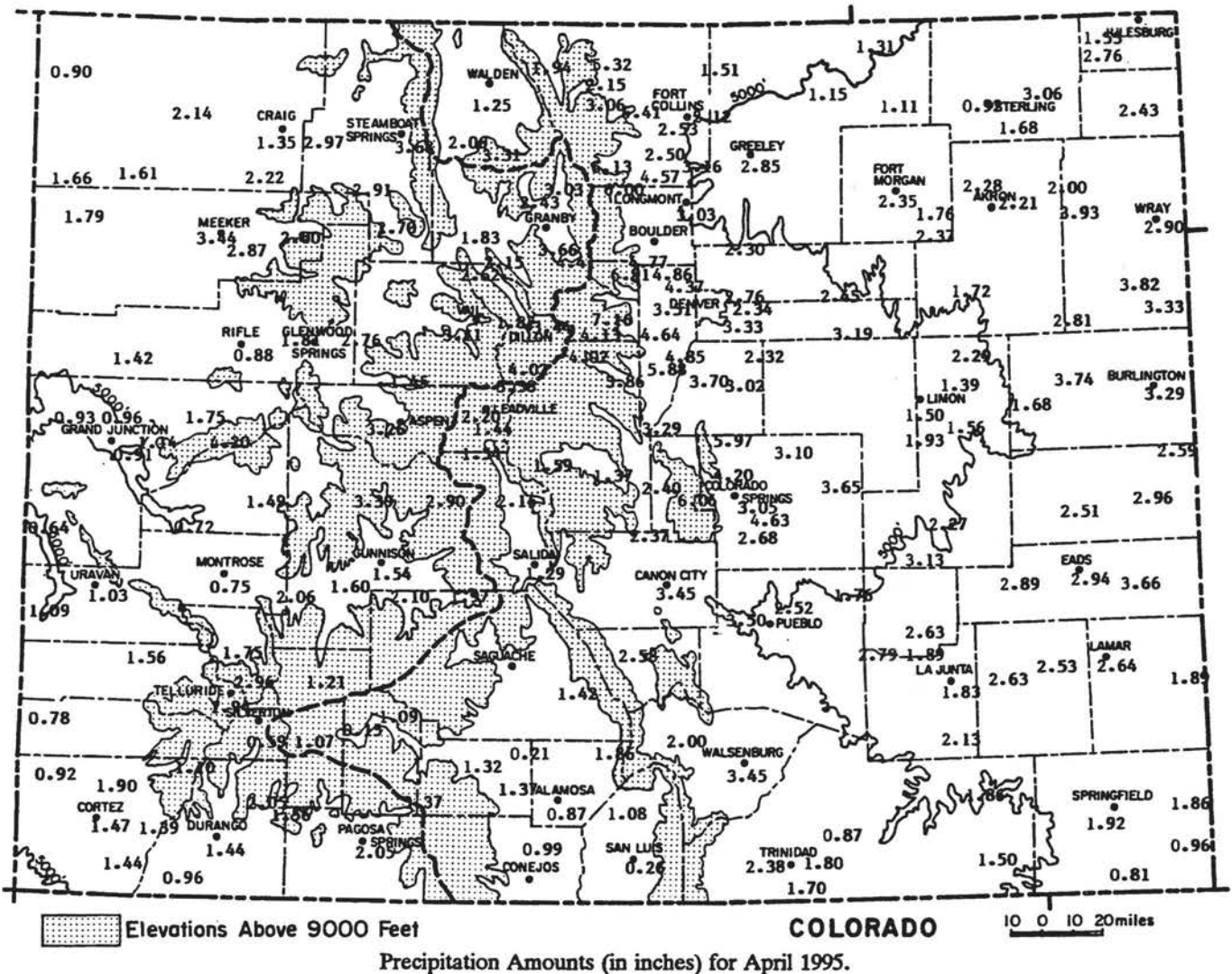
Twelve storm systems affected Colorado during April. Of these, nine brought significant precipitation to many parts of the State. The result was numerous days with measurable precipitation, especially during the last half of the month. Most areas east of the mountains and on the Western Slope

had 8 to 11 days with precipitation. 10 to 17 days had precip. in and near the mountains. Measurable precipitation fell at more than 50% of Colorado's weather stations on 13 days during April. State-averaged precipitation for April totalled 2.35" compared to the 1961-90 average of 1.29".

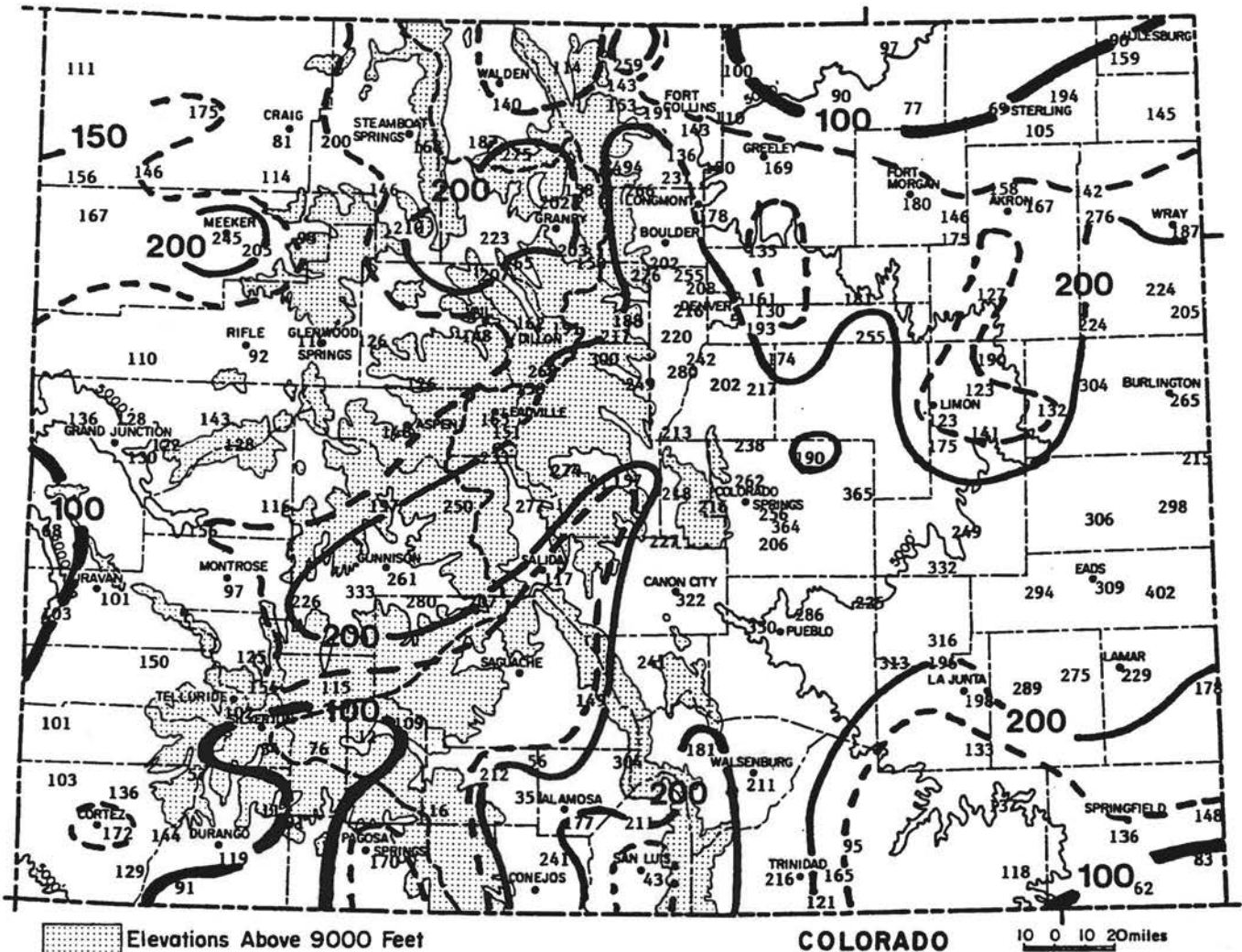
COLORADO DAILY PRECIPITATION - APR 1995



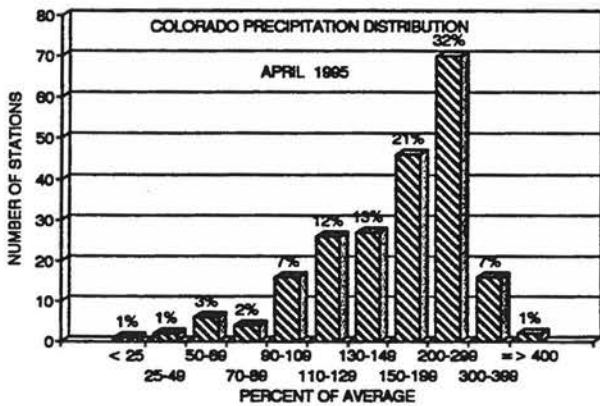
(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)



# APRIL 1995 PRECIPITATION COMPARISON



April 1995 Precipitation as a Percent of the 1961-90 average.



## APRIL 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	2.76"	23rd wettest in 124 years of record (wettest = 8.24" in 1900)
Durango	1.44"	35th wettest in 101 years of record (wettest = 5.54" in 1926)
Grand Junction	0.96"	35th wettest in 104 years of record (wettest = 1.95" in 1965)
Las Animas	2.63"	14th wettest in 129 years (wettest = 7.54" in 1900)
Pueblo	2.52"	13th wettest in 126 years of record (wettest = 8.13" in 1900)
Steamboat Springs	3.68"	10th wettest in 90 years of record (driest = 5.13" in 1920)

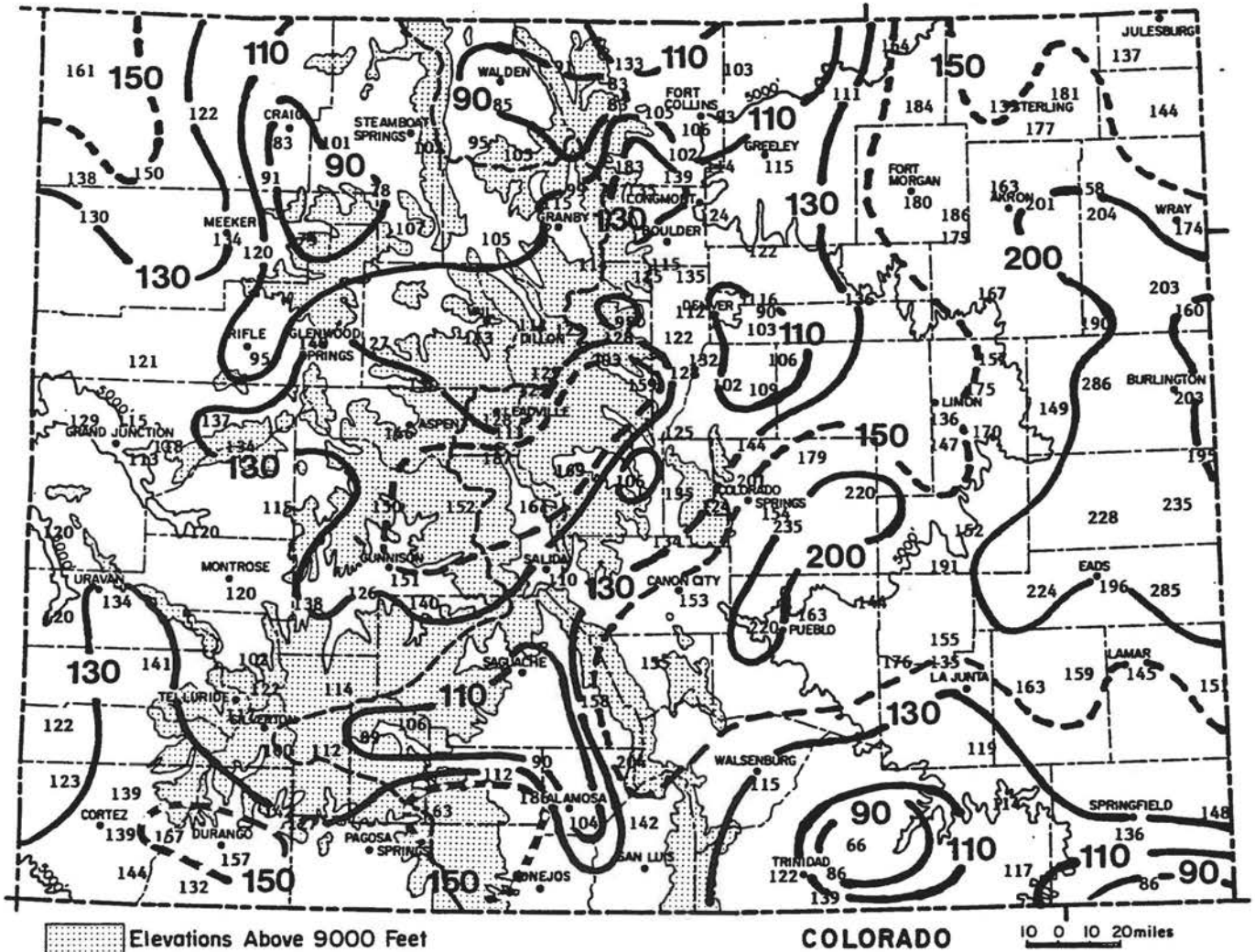
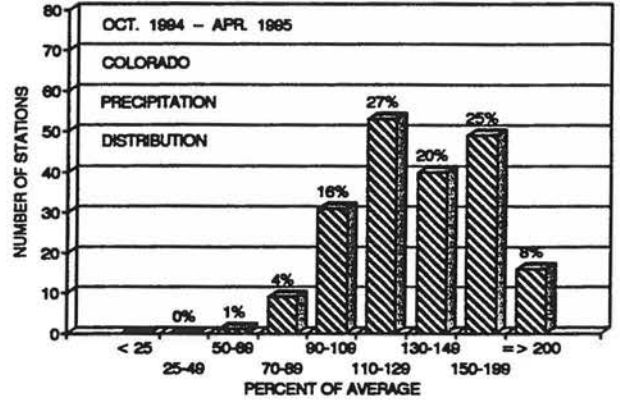
April precipitation totals were above average at nearly 90% of Colorado's official weather stations. 40% of the State received more than 200% of average. Overall, this appears to be the wettest April in Colorado since 1957 and the 12th wettest on record since 1888.



## 1995 WATER YEAR PRECIPITATION

The wet April weather continued to add favorably to Colorado's water supplies for the approaching summer season. Drier than average areas decreased considerably and currently include only limited areas of north central Colorado and a few scattered areas in extreme southern Colorado. Instead of drought, concerns over excess water and potential flooding are beginning to emerge. A few areas in the Central and Southern Mountains have now received more than 150% of the average October-April accumulated precipitation. Across the Eastern Plains, widespread abundant precipitation has been reported. A number of weather stations have received more than 200% of average. Examples of October-April precipitation totals include 8.20" at Pueblo Reservoir, 220% of average, 10.29" at Fountain, 235% of average, 8.86" at Cheyenne Wells, 235% of average, and 12.37" at Stratton, 286% of average. Colder than average temperatures statewide have also greatly slowed the mountain snowmelt. Many areas above 10,000 feet had their deepest snow of the winter at the end of April with little or no melting taking

place. This brings back memories of the 1983 water year when heavy spring precipitation and cold temperatures dramatically changed water supply outlooks in a matter of just a few weeks.





## APRIL 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	52.3	26.4	39.4	-4.6	73	14	759	0	108	1.31	-0.04	97	12
STERLING	57.9	30.9	44.4	-4.6	79	19	609	0	162	0.92	-0.40	70	7
FORT MORGAN	57.2	29.4	43.3	-3.2	76	15	644	0	153	2.35	1.05	181	11
AKRON 1N	53.9	31.0	42.5	-4.3	74	16	670	0	122	2.28	0.84	158	13
AKRON 4E	54.6	28.6	41.6	-4.8	75	15	695	0	131	2.21	0.89	167	13
HOLYOKE	55.8	32.0	43.9	-5.5	78	20	623	0	144	2.43	0.76	146	10
JOES 2SE	59.7	34.6	47.1	0.1	78	22	529	0	179	2.81	1.56	225	8
BURLINGTON	57.4	30.7	44.0	-5.8	77	15	623	0	165	3.29	2.05	265	7
LIMON WSMO	53.5	28.2	40.8	-4.2	73	4	717	0	125	1.50	0.29	124	11
CHEYENNE WELLS	58.9	30.7	44.8	-5.4	80	13	599	0	167	2.96	1.97	299	11
EADS	58.2	31.4	44.8	-6.8	80	13	596	0	178	2.94	1.99	309	11
ORDWAY 21N	53.9	24.8	39.4	-10.1	73	10	762	0	135	3.13	2.19	333	10
ROCKY FORD 2ESE	65.3	32.6	48.9	-4.1	82	16	474	0	251	1.89	0.93	197	9
LAMAR	61.7	33.2	47.5	-6.4	83	19	520	0	218	2.64	1.49	230	9
LAS ANIMAS 1N	64.1	33.2	48.6	-5.6	86	19	486	0	239	2.63	1.72	289	9
HOLLY	61.9	32.0	46.9	-5.9	85	19	535	0	220	1.89	0.83	178	8
SPRINGFIELD 7WSW	65.2	31.7	48.4	-3.6	81	11	489	0	251	1.92	0.51	136	10

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	56.4	32.4	44.4	-3.1	76	22	611	0	130	2.53	0.77	144	15
GREELEY UNC	56.6	32.6	44.6	-4.5	78	21	606	0	149	2.85	1.17	170	13
ESTES PARK	46.1	26.1	36.1	-2.4	64	16	859	0	46	6.13	4.89	494	17
LONGMONT 2ESE	57.8	30.3	44.1	-3.4	79	19	616	0	160	3.03	1.33	178	12
BOULDER	57.2	33.0	45.1	-2.7	74	17	590	0	139	5.45	3.29	252	16
DENVER WSFO AP	57.5	34.2	45.9	-2.3	77	19	569	0	151	2.76	1.05	161	15
EVERGREEN	52.8	22.5	37.7	-3.4	71	-2	812	0	110	4.64	2.54	221	12
CHEESMAN	53.0	14.1	33.5	-6.0	70	-6	937	0	102	3.29	1.75	214	9
LAKE GEORGE 8SW	46.0	21.0	33.5	-2.9	60	0	935	0	28	1.37	0.50	157	8
ANTERO RESERVOIR	44.7	17.8	31.2	-2.1	57	4	1004	0	23	1.46	0.88	252	7
RUXTON PARK	35.9	14.9	25.4	-6.1	48	0	1181	0	0	6.06	3.26	216	11
COLORADO SPRINGS WSO	52.4	30.2	41.3	-5.3	74	13	703	0	111	3.05	1.86	256	15
CANON CITY 2SE	58.6	33.5	46.1	-4.9	76	17	558	0	171	3.95	2.88	369	10
PUEBLO WSO AP	59.4	29.5	44.5	-5.5	80	11	608	0	190	2.52	1.64	286	10
WESTCLIFFE	48.7	22.5	35.6	-5.2	63	-6	873	0	57	2.58	1.51	241	11
WALSENBURG	60.1	31.8	45.9	-3.1	73	9	566	0	184	3.45	1.82	212	8
TRINIDAD AP	60.4	31.2	45.8	-4.3	79	10	571	0	196	0.87	-0.04	96	6

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	48.3	19.6	33.9	-1.1	63	9	926	0	37	1.25	0.36	140	10
LEADVILLE 2SW	42.2	16.6	29.4	-1.0	55	-2	1058	0	6	1.44	0.49	152	17
SALIDA	53.3	26.1	39.7	-5.0	68	14	751	0	105	1.29	0.19	117	6
BUENA VISTA	50.5	21.1	35.8	-5.6	65	8	866	0	70	2.14	1.37	278	11
HERMIT 7ESE	49.6	17.6	33.6	3.4	62	2	933	0	45	0.15	-1.06	12	2
ALAMOSA WSO AP	55.0	22.8	38.9	-2.5	68	15	777	0	110	0.87	0.38	178	7
STEAMBOAT SPRINGS	52.4	25.4	38.9	0.1	67	16	778	0	77	3.68	1.50	169	12
YAMPA	47.5	22.6	35.1	-1.9	62	6	893	0	42	2.70	1.42	211	15
GRAND LAKE 1NW	47.7	20.4	34.0	0.4	61	12	921	0	31	3.03	1.12	159	14
GRAND LAKE 6SSW	46.0	20.5	33.2	-0.2	58	13	944	0	17	2.43	1.23	202	17
DILLON 1E	43.8	18.7	31.3	-1.5	56	6	1005	0	17	1.87	0.72	163	12
CLIMAX	38.6	10.1	24.4	1.4	49	-5	1215	0	0	3.38	1.14	151	14
ASPEN 1SW	48.5	25.4	37.0	-1.5	61	16	832	0	41	3.26	1.06	148	16
CRESTED BUTTE	42.2	16.6	29.4	-1.6	54	-8	1061	0	6	3.39	1.67	197	10
TAYLOR PARK	40.7	9.9	25.3	-3.5	52	-17	1182	0	1	2.90	1.74	250	12
TELLURIDE	46.2	22.4	34.3	-1.2	59	10	912	0	39	1.94	0.05	103	13
PAGOSA SPRINGS	55.5	23.7	39.6	-1.7	67	11	757	0	118	2.05	0.85	171	9
SILVERTON	43.0	15.7	29.4	-3.6	54	-2	1063	0	8	0.59	-1.11	35	9
WOLF CREEK PASS 1E	37.2	12.2	24.7	-4.7	45	2	1201	0	0	3.37	0.48	117	11

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	XNorm	#days
CRAIG 4SW	55.6	27.7	41.6	-0.6	69	20	692	0	108	1.35	-0.30	82	7
HAYDEN	55.0	27.8	41.4	-0.9	70	19	701	0	99	2.97	1.49	201	14
MEEKER 3W	55.6	27.8	41.7	-1.3	71	19	692	0	112	3.44	2.04	246	15
RANGELY	59.1	31.3	45.2	-2.5	72	21	587	0	151	1.79	0.72	167	10
GLENWOOD SPRINGS	60.3	31.8	46.0	0.1	72	25	563	0	166	1.81	0.26	117	12
RIFLE	61.0	31.4	46.2	-0.8	74	20	556	0	181	0.88	-0.07	93	13
GRAND JUNCTION WS	63.8	37.4	50.6	-1.4	75	28	425	0	216	0.96	0.21	128	10
PAONIA 1SW	61.0	33.8	47.4	-0.7	73	25	521	0	181	1.49	0.21	116	11
GUNNISON	52.0	23.4	37.7	-0.6	64	15	811	0	73	1.54	0.95	261	9
COCHETOPA CREEK	52.5	21.7	37.1	0.1	63	12	830	0	72	2.10	1.35	280	10
MONTROSE NO 2	58.7	31.6	45.1	-2.9	71	26	589	0	147	0.75	-0.02	97	7
URAVAN	65.3	34.1	49.7	-1.9	77	25	453	0	240	1.03	0.02	102	10
NORWOOD	55.5	29.4	42.5	-0.0	68	15	670	0	107	1.56	0.52	150	5
YELLOW JACKET 2W	58.1	30.3	44.2	-0.2	68	19	619	0	142	0.92	0.03	103	8
CORTEZ	57.4	28.7	43.0	-1.4	70	22	652	0	134	1.47	0.62	173	7
DURANGO	57.0	28.6	42.8	-2.7	70	20	658	0	134	1.44	0.23	119	9

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

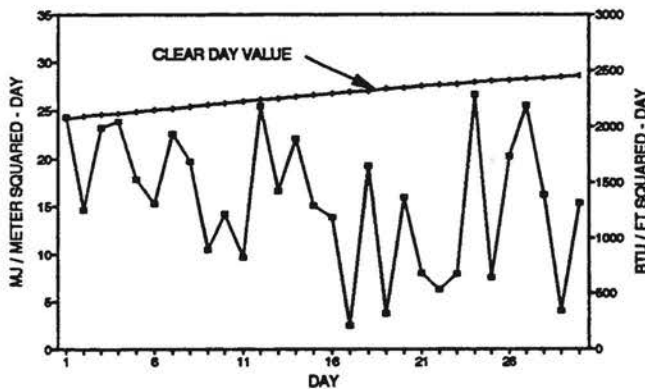
**APRIL 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	2	10	18	-	-
Denver	NA	NA	NA	41%	67%
Fort Collins	4	9	17	-	-
Grand Junction	3	14	13	71%	70%
Pueblo	NA	NA	NA	NA	75%

CLR = Clear    PC = Partly Cloudy    CLDY= Cloudy

April is often a relatively cloudy month in Colorado, but April 1995 was much cloudier than usual. More than half of the month was predominantly cloudy. Thick, low clouds on several days resulted in very low solar radiation totals especially east of the mountains. This was one of the cloudiest Aprils since solar radiation measurements began.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION APRIL 1995**

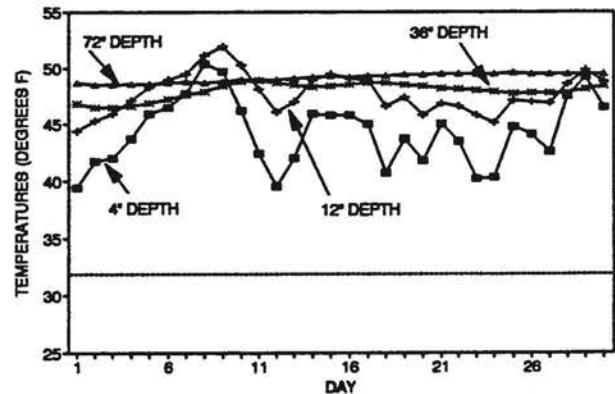


**APRIL 1995 SOIL TEMPERATURES**

Soil temperatures rose steadily early in April but then leveled off and actually declined later in the month. Much colder than average soil temperatures meant that early farming and gardening activities that sometimes can begin in April had to be delayed.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES APRIL 1995**



**HATS OFF TO: Mrs. Sundberg of Hayden, Colorado**

Mrs. Carolyn (Beth) Sundberg has been recording daily weather conditions in Hayden with diligence, enthusiasm and accuracy for 23 years. She has seen lots of weather in those years including a maximum temperature of 98° and a low of -44°F. Thanks, and keep up the great work!



## SPRINGTIME IN COLORADO – MORE SURPRISES!!

My, how our weather has changed. Our amazingly mild winter has given way to cloudy, chilly, and very wet weather. It moved in around the 16th of April and as of late May it's still here. Just a few weeks ago some of us along the Front Range thought we were drying up and blowing away. Now the mud is knee deep, grass is knee high, and we have had to turn our attention from drought to floods.

Is this weather unprecedented? Not really. During the spring we can count on a few days and sometimes a few weeks when our weather turns cloudy and humid like the Midwest, Great Lakes or mid-Atlantic coast. The last few years these cloudy, humid periods have been short. This year is trying to make up for lost time.

To set the record straight, we dug into the record books to see how often we have experienced cold, wet springs. Wet spring weather is usually associated with colder than normal temperatures, but not always. Therefore, we scanned both the precipitation records and the temperature data separately before putting it all together. This analyses was further complicated by the well known fact that it is extremely rare for the entire state to be comparably wet or dry at the same time. To accommodate that fact of nature, we looked both at regionally averaged data and individual weather station reports.

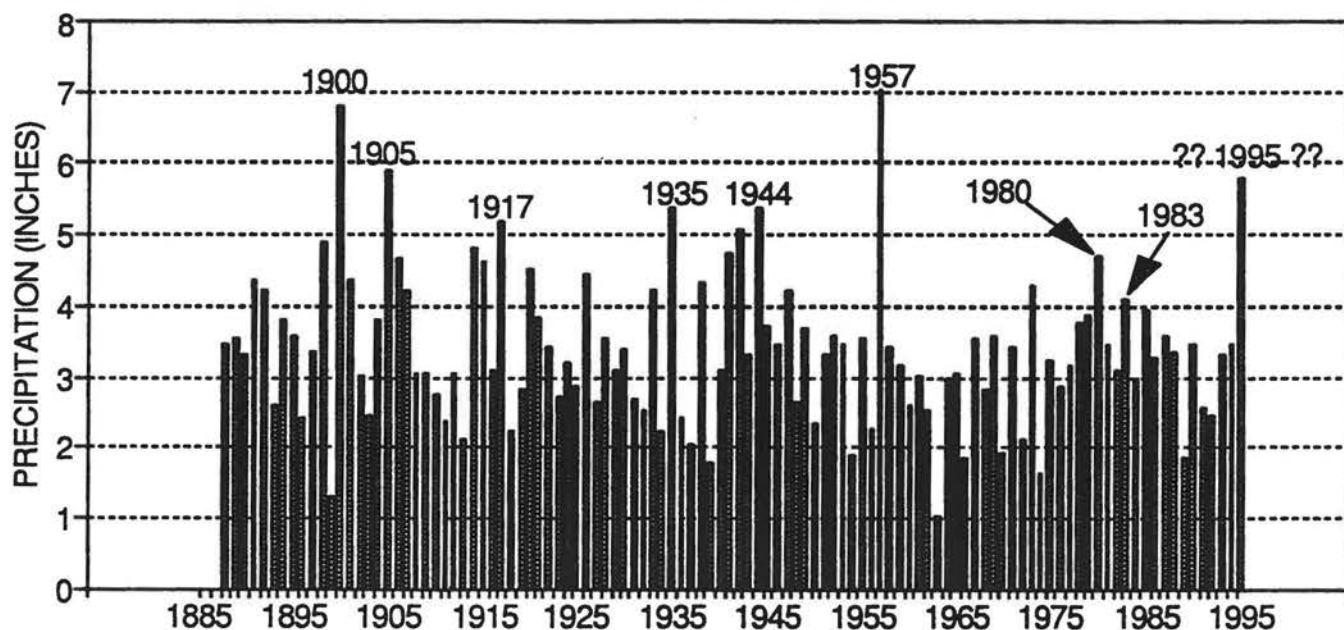
For the purpose of this study we defined spring as April and May combined (it is always easiest for us to work with whole months). On average during this 2-month period, the wettest portions of Colorado are the higher elevations of the Northern and Central Mountains, and all

of the Front Range. Southwestern Colorado is typically quite dry. For example, April-May average precipitation ranges from 1.13" at Alamosa, 1.53" at Eagle and 2.28" at Durango to 4.29" at Steamboat Springs, 4.49" at Sterling and 5.16" at Boulder. Last year spring precipitation totals were below average except in parts of southern Colorado.

Wet springs with 200% or more of average over sizeable areas of the State have occurred on fairly regular intervals during the past century. As a rule, there have been one or two wet springs in practically every decade. For example, (you can spot these years on the graph below) 1983 was modestly wet over most of Colorado and 1980 was very wet along the Front Range. Going back a bit further many wet springs can be found. 1973, 1969, 1947, 1942, 1941, 1933 (yes, there were even some wet springs during the dust bowl years), 1926, 1921, 1915, 1914, 1907, 1906, 1901 and 1898 all come to mind. In each of those years some areas were quite wet while other parts of the State were closer to average. Somewhere in Colorado, April-May precipitation totals were 8" or greater in most of those years. Local flooding occurred in some of those years.

Standing out head and shoulders above the others were a set of springs unlike anything we have seen in recent years – 1900, 1905, 1917, 1935, 1944 and 1957. If all springs were like that, Colorado would have a different appearance. River channels would be larger, soil types would be a bit different, vegetation would grow taller, different types of plants would thrive, and more of us would own umbrellas and raincoats. Fort Collins totalled over 12" in the spring (April-May) of 1900

## COLORADO STATEWIDE PRECIPITATION APRIL – MAY TOTALS



Unless noted otherwise, the special features contained in *Colorado Climate* are prepared and edited by Nolan Doesken, Assistant State Climatologist, at the Colorado Climate Center. Comments and questions are always welcome. E-mail address: [nolan@ulysses.atmos.colostate.edu](mailto:nolan@ulysses.atmos.colostate.edu)

including 10.47" in April alone. Even relatively wet locations like Chicago, Pittsburg or New York City rarely receive 10 inches of precipitation in a month. Springfield, down in southeast Colorado, totalled 16.12" that spring. Lamar was drenched with 13.09" in the spring of 1944.

The impact of wet, spring weather is greatest when temperatures are cold. Colder than average spring temperatures mean delayed melting of the mountain snowpack, reduced evapotranspiration rates and less demand for irrigation water. 1900 and 1944, although extremely wet, were not cold. Fields dried fairly quickly those years as summer made a strong comeback.

To see what truly soggy springs were like, we need to look back to 1905, 1917, 1935 and 1957. Holyoke (northeastern Colorado) received 10.24" in the spring of 1905. Westcliffe got 10.36" and Limon reported 9.86" in the spring of 1935. 1957 still ranks as the wettest April-May combination in Colorado's recorded history. Many weather stations collected more than 10" of rain. Boulder had a remarkable 2-month total of 16.12".

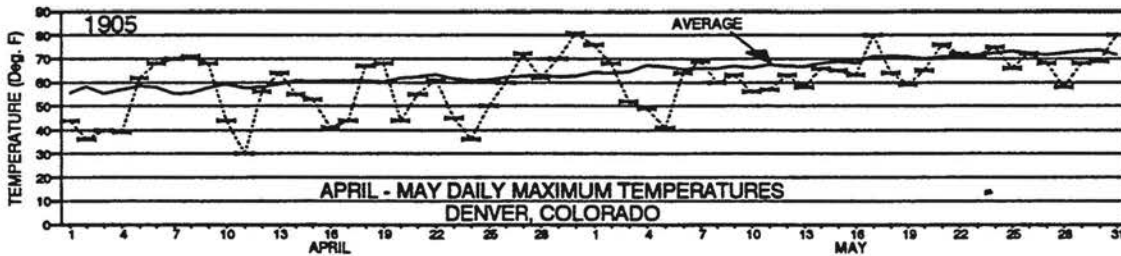
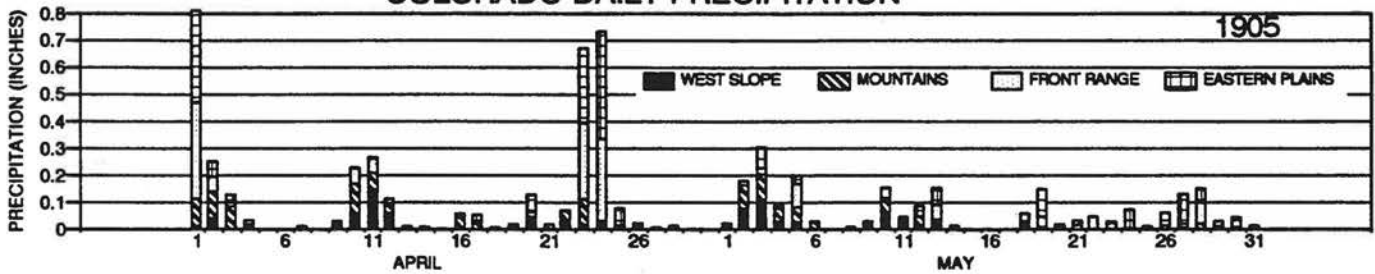
The graphs shown here should give you some idea about what those springs were like. I will include 1983 in the sample since many of us still remember the high water levels early that summer when the temperatures finally warmed up and snowmelt accelerated. By examining these past years we will be in a better position to judge how 1995 is stacking up.

What was especially unusual about 1905, 1917, 1935 and 1957 was the widespread and persisting nature of the spring cold and precipitation. Precipitation fell almost every day somewhere in the State and warm spells were brief. In 1935, several weeks of wet weather culminated in localized but extremely heavy rains May 30-31st. Several fatalities accompanied the resulting floods.

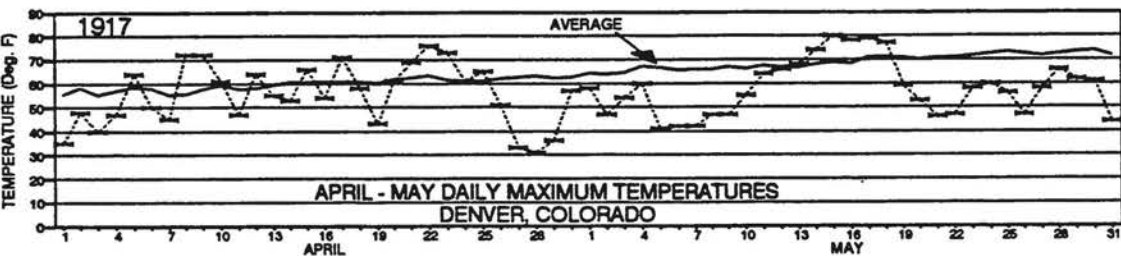
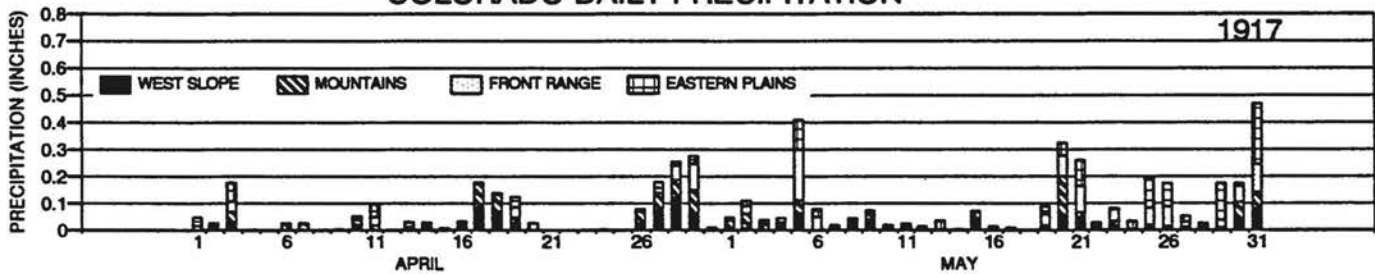
As it stands now, the spring of 1995 is in the same league with these most memorable cold, wet springs of the past. Next month we will show the final ranking.

— Thanks to Jim Harrington, parttime assistant and faithful data digger, who helped put together these statistics —

### COLORADO DAILY PRECIPITATION

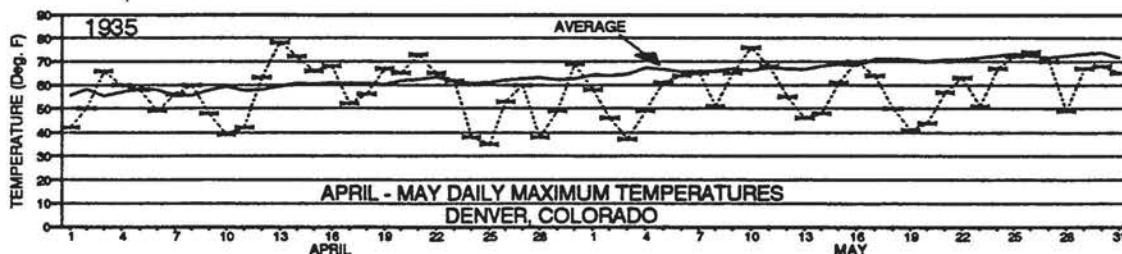
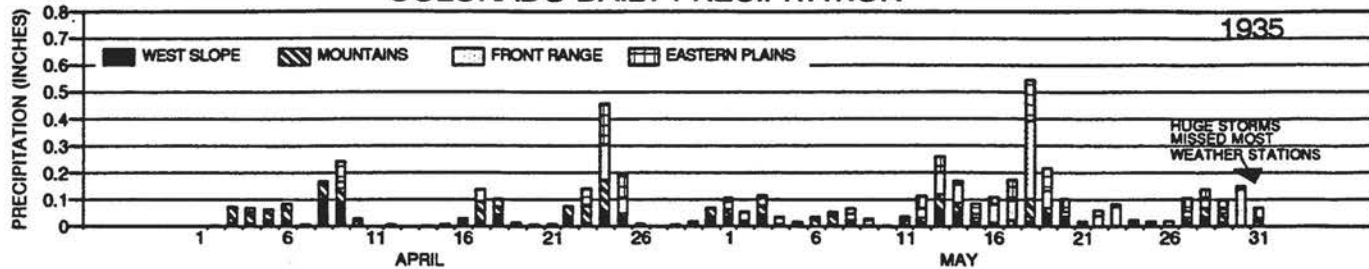


### COLORADO DAILY PRECIPITATION

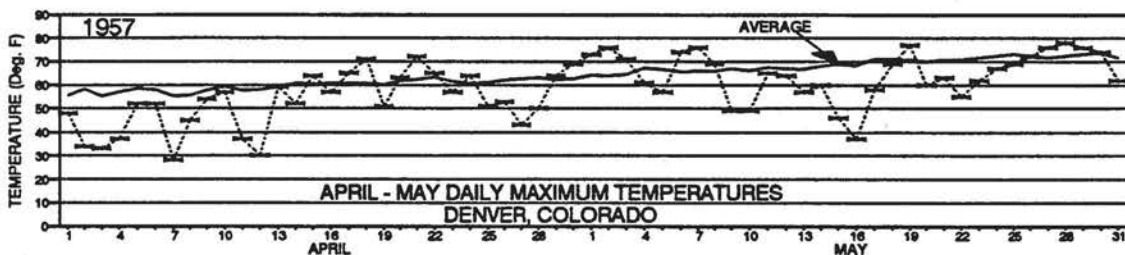
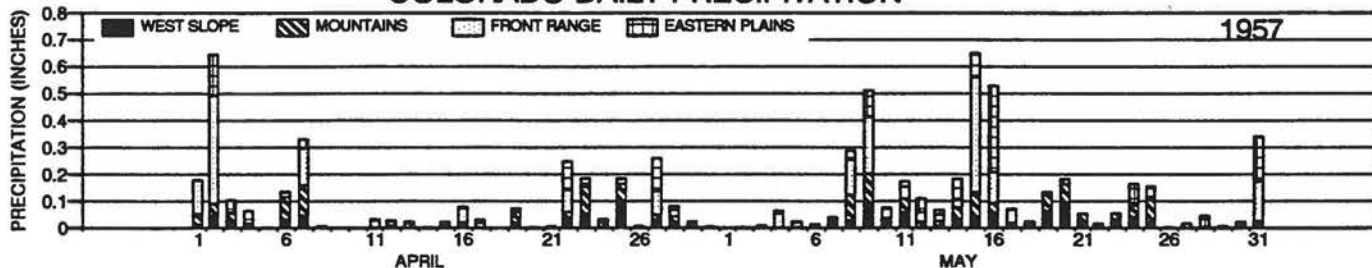


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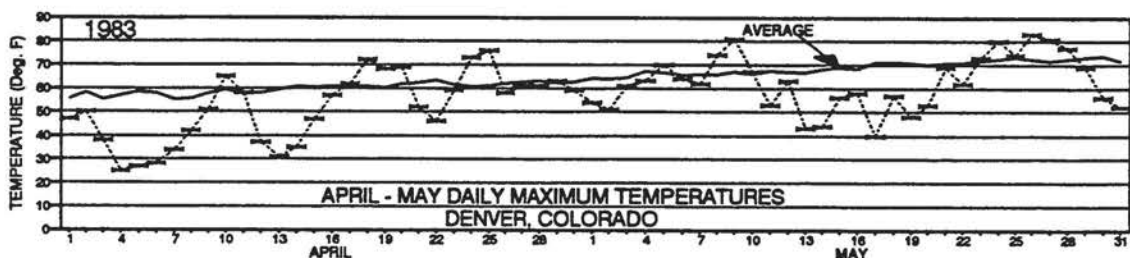
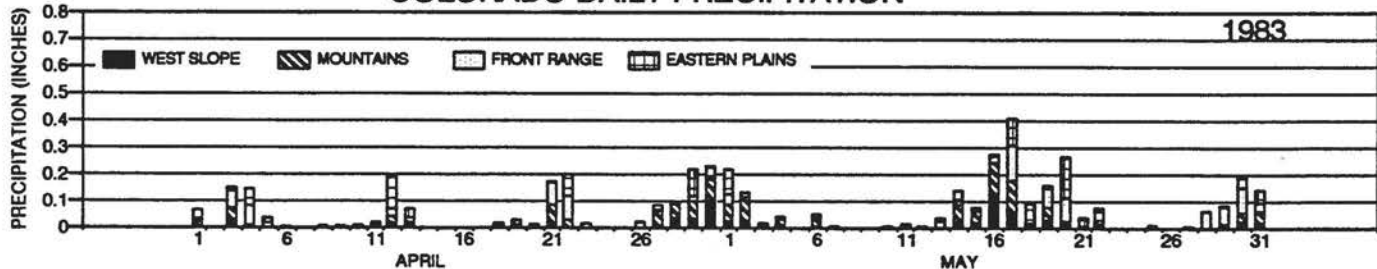
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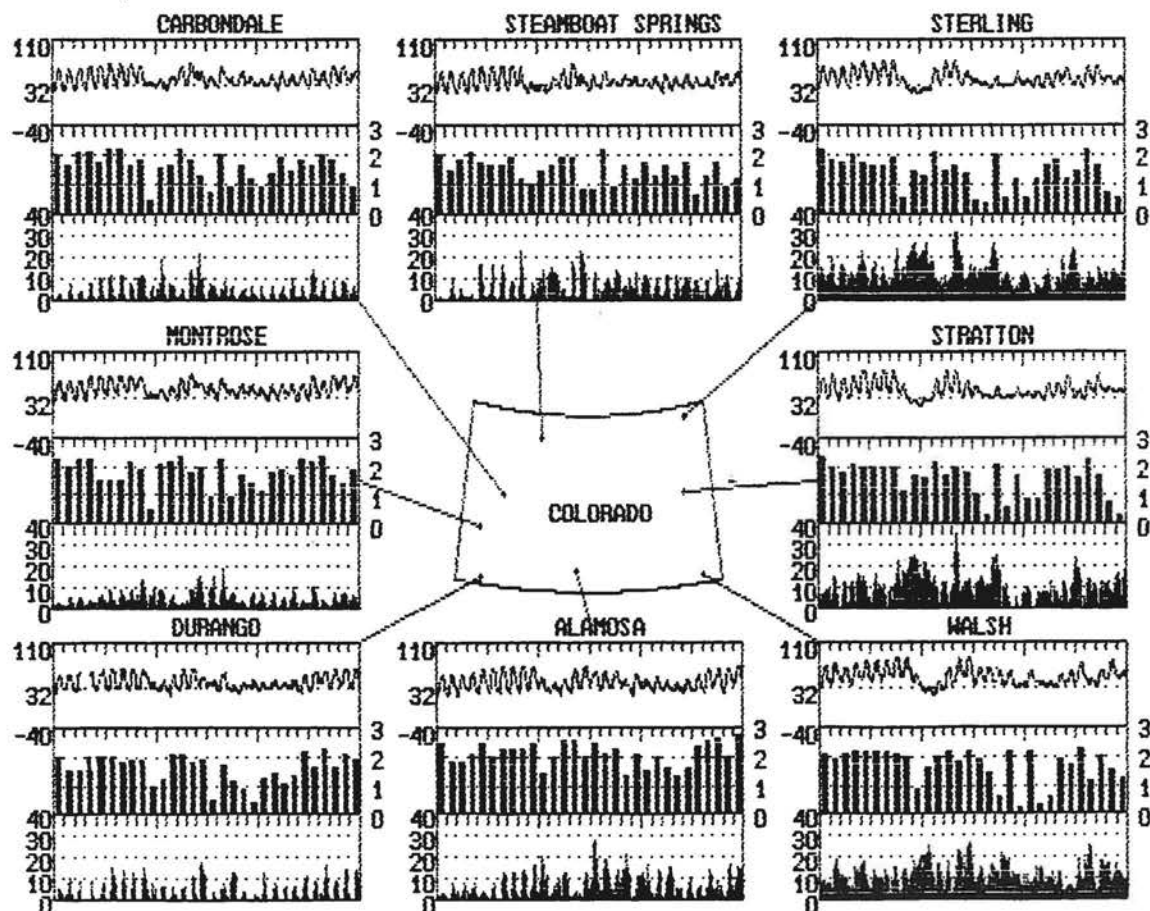
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WTHRNET WEATHER DATA APRIL 1995

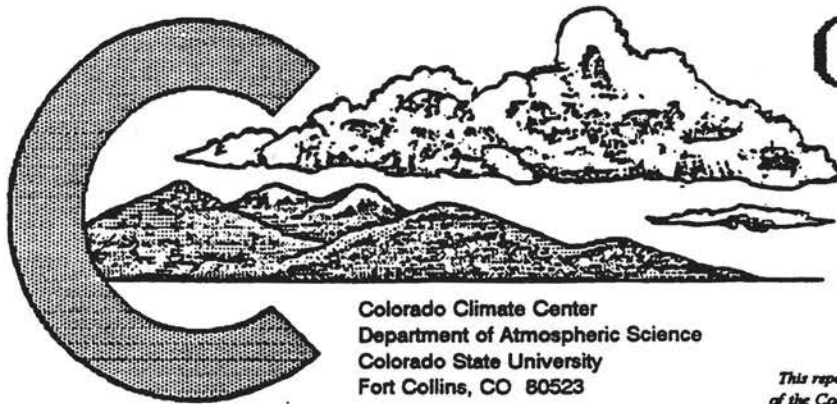
	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	39.6	40.1	42.2	45.3	37.5	42.1	43.1	48.2
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	67.3 13/15	64.4 29/16	67.3 7/15	70.7 13/16	66.4 13/14	74.1 7/17	78.4 7/15	82.4 14/14
minimum:	14.7 11/ 6	17.1 11/ 6	20.3 1/ 6	22.5 1/ 5	16.0 9/ 7	17.4 11/ 1	14.5 11/ 4	16.7 11/ 6
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	72 / 19	67 / 21	83 / 27	67 / 25	87 / 24	48 / 19	42 / 17	78 / 32
11 AM	27 / 23	38 / 26	45 / 33	33 / 29	49 / 29	30 / 23	49 / 36	49 / 37
2 PM	24 / 24	33 / 27	36 / 31	26 / 28	38 / 28	26 / 24	46 / 38	42 / 36
5 PM	27 / 24	31 / 26	36 / 30	26 / 27	43 / 28	26 / 23	42 / 35	38 / 35
11 PM	52 / 21	53 / 23	59 / 28	45 / 25	71 / 27	40 / 21	45 / 23	65 / 33
monthly average wind direction ( degrees clockwise from north )								
day	227	203	225	224	209	198	132	190
night	151	n/a	155	160	139	190	176	219
monthly average wind speed ( miles per hour )	4.97	3.47	2.26	3.38	3.95	10.24	8.70	10.11
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	334	304	487	397	337	49	166	19
3 to 12	297	182	177	307	246	450	368	484
12 to 24	86	33	8	12	37	211	172	209
> 24	3	0	0	0	0	10	14	8
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	2086	1571	1590	1796	1464	1384	1587	1668
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	121	148	151	128	118	119	152	183
40-60%	52	90	87	85	84	84	89	83
20-40%	58	81	91	80	107	88	65	48
0-20%	19	57	55	34	74	89	69	59

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.







# COLORADO CLIMATE

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

**MAY 1995**  
 Volume 18 Number 8

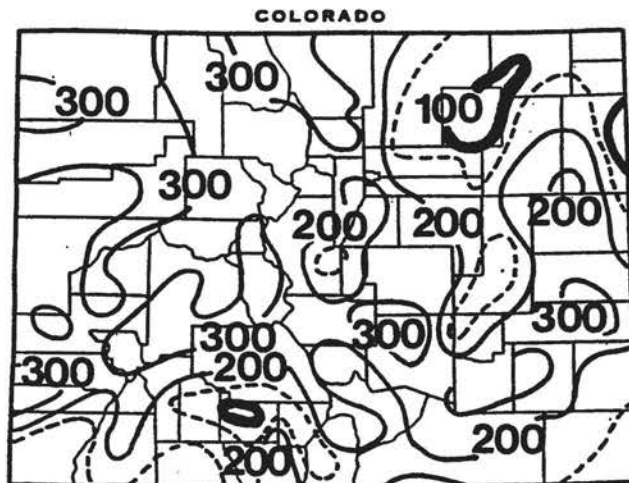
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## May Climate in Perspective – Cold, Cloudy and Wet

May weather picked up where April left off with widespread clouds, frequent fog, rain almost every day, mountain snows and much below average temperatures. Overall, May will be remembered as one of the wettest on record for many parts of the State. Flooding conditions developed on some rivers and streams even though cold temperatures retarded snowmelt.

### Precipitation

It has been nearly 40 years (1957) since spring precipitation in Colorado has been so heavy and widespread (see Special Feature). Precipitation fell frequently and lasted



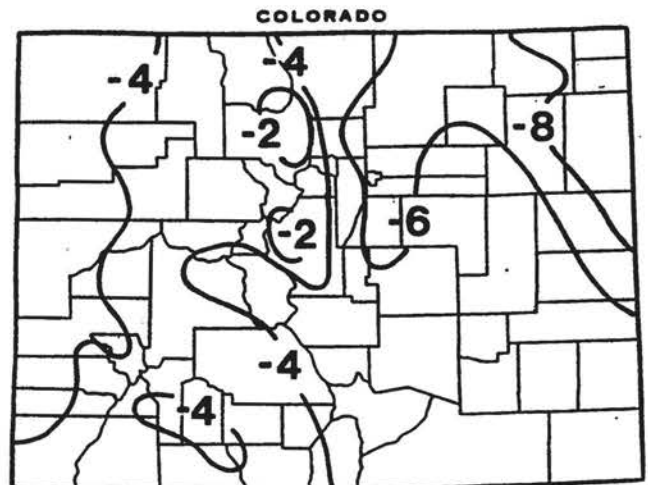
May 1995 precipitation as a percent of the 1961-1990 average.

hours or days at a time. Parts of northern Colorado had 26 days with measurable precipitation. Mountain and foothill snowfall totals were excessive for so late in the season. Snow fell on 18 days in May along the Front Range with many areas above 8,000 feet totalling more than 50". Almost the entire State ended up wetter than average. Two-thirds of

Colorado received more than 200% of average. Numerous areas in northern and eastern Colorado totalled more than 5" of precipitation for the month. Examples of record May totals included 9.59" at Boulder, 9.34" near Loveland, 8.70" at Idalia, and 8.12" near Kit Carson. 6.21" at Craig made this their wettest month ever recorded.

### Temperatures

Temperatures in May were well below average statewide. Almost all areas east and west of the mountains ended up at least 4 degrees colder than average. Conditions were especially extreme in northeastern Colorado where most locations were at least 6 degrees cooler than normal. A few stations (e.g. Wray, Akron, Burlington) were 8 degrees below average making this one of the coldest May's this century. There were just a few small areas in the Northern and Central Mountains that were only 2 degrees below average. Because of extensive cloudcover, daytime temperatures were especially cool – more than 20 degrees below average on many days.



Departure of May 1995 temperatures from the 1961-90 average.

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## MAY 1995 DAILY WEATHER

- 1-4 The storm of April 30th departed eastern Colorado early on the 1st. Morning temperatures were cold, especially in the mountains (+1°F at Taylor Park). Then most areas enjoyed a pleasant, dry day. Rain and mountain snow spread eastward across Colorado on the 2nd. Dinosaur Natl. Monument reported 0.80" of rain. The storm passed quickly eastward on the 3rd, but conditions remained cold and showery. 7" of snow fell west of Boulder. As skies cleared on the 4th, some low elevation frost was reported. The remainder of the day was mostly dry, with mild temperatures and sunshine (a rare day for May 1995).
- 5-9 A powerful spring storm kicked up strong southerly winds on the 5th gusting to near 60 mph in several parts of the State. Then thunderstorms erupted which continued overnight across the plains. 1.41" of rain fell near La Junta. Residents of Fort Collins were surprised by an 8 am funnel cloud on the 6th. Some showers fell in western Colorado, but most of Colorado enjoyed a decent day. That changed quickly on the 7th as the main storm moved closer bringing thick clouds, mountain snows and big thunderstorms on the plains. The storm eased into Kansas on the 8th but not until hail and tornadoes pounded the northeast plains (2.27" of rain at Akron), winds swept the Front Range (60 mph at Fort Collins) and heavy snow fell in the mountains (7" at Walden and 17" at Climax). Cool temperatures remained on the 9th, but skies cleared. Only some light showers teased eastern Colorado.
- 10-14 A cool but pleasant spring day on the 10th deteriorated as a small storm hustled in from California bringing light rain showers and mountain snows by evening. Sunshine appeared again on the 11th, but showers from yet another storm reached the Western Slope late in the day. Strong winds, thunderstorms, cold rain and mountain snow became widespread on the 12th. 1.26" of rain fell in the Glenwood Canyon and 12" of snow fell on the Grand Mesa. Heavy storms also erupted in NE Colorado. Cool but drier air moved in on the 13th, but a Canadian cold front brought cold upslope rains and brief snow to parts of the Front Range overnight. Skies cleared statewide midday on the 14th.
- 15 The only heatwave in May lasted one day. Temperatures shot into the 80s at lower elevations with 60s and 70s in the mountains. The State's hot spot was La Junta with 93°F.
- 16-18 The large storm that had been spinning over California began moving eastward. Clouds thickened, and big thunderstorms exploded across southeastern Colorado late on the 16th. Las Animas received 1.53" by midnight. Overnight, rain developed statewide and became heavy at times. The snow line dropped rapidly. By late on the 17th, 30" of snow fell at Echo Lake near Mt. Evans with heavier amounts from Pikes Peak southward. Rains also changed to snow in east-central Colorado. Limon got 5", and 3" fell at Cheyenne Wells. Heavy rains caused local flooding along the Front Range and raised water levels on both the South Platte and Arkansas Rivers. Pueblo totalled 2.81" from the storm and Boulder received 3.51" in 24 hours. Most precipitation ended late on the 17th. It was very nippy early on the 18th. Burlington dropped to 31° and Lamar hit 34°F. Only scattered light thundershowers developed later in the day.
- 19-21 A dry and warm period on the Western Slope, but thunderstorms continued to developed daily, especially over northeast Colorado.
- 22-25 A cool high pressure area over the Northern Plains combined with a stationary low pressure trough over the Southwest to produce 4 consecutive gloomy days over eastern and northern Colorado. Cold, damp upslope winds caused persistent drizzle, fog and light rain along the Front Range with heavy, wet snow in the foothills. 1.87" of rain fell at Fort Collins. Denver's high temperature on the 23rd was only 41°F.
- 26-27 The low pressure trough aloft finally started moving and crossed Colorado. Despite cool temperatures, strong storms developed on the 26th and rumbled across the State late into the night. Lamar reported 1.26" of rain. 1.44" fell at Marston Lake. Skies cleared in western Colorado on the 27th, but more thundershowers developed east.
- 28-31 The upper low stalled and strengthened again. Scattered showers turned into widespread steady rains late on the 28th. Cold temperatures and soaking rains squelched Memorial Day weekend activities. Trinidad totalled 1.70" of rain on the 29th. Precipitation continued into the 30th with 1-2" totals reported in the northern foothills sending the St. Vrain and Big Thompson Rivers out of their banks. Finally, the storm loosened its grip on the 31st. Sunshine returned and temperatures finally climbed near 70°F. Still some thundershowers developed mostly east of the mountains.

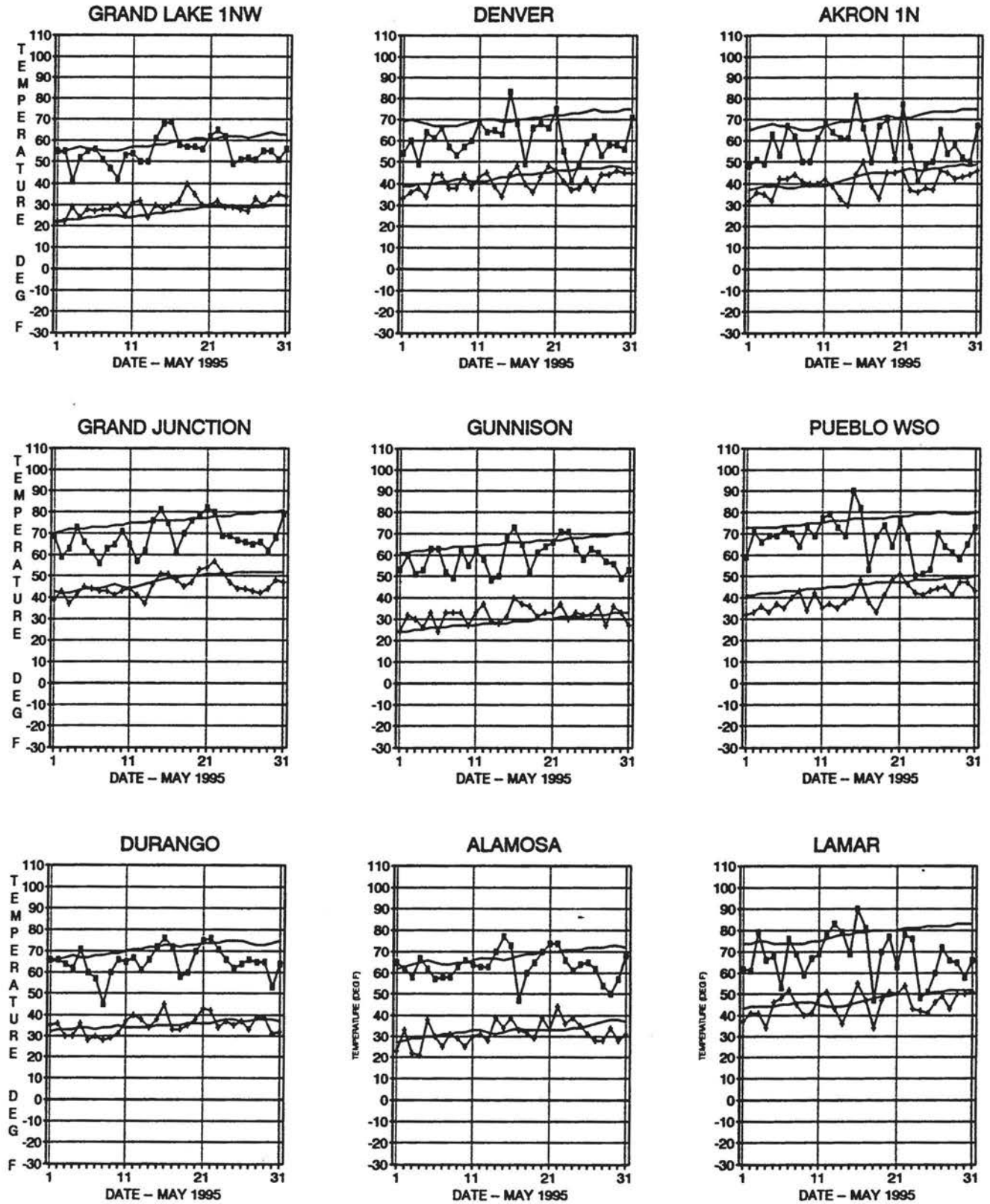
### Weather Extremes

Highest Temperature	93°F	May 15	La Junta
Lowest Temperature	1°F	May 1	Taylor Park Dam
Greatest Total Precipitation	9.59"		Boulder
Least Total Precipitation	0.61"		Del Norte
Greatest Total Snowfall	79.9"		Mount Evans Research Center
Greatest Snow Depth	70"	May 13	Bonham Reservoir

## MAY 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

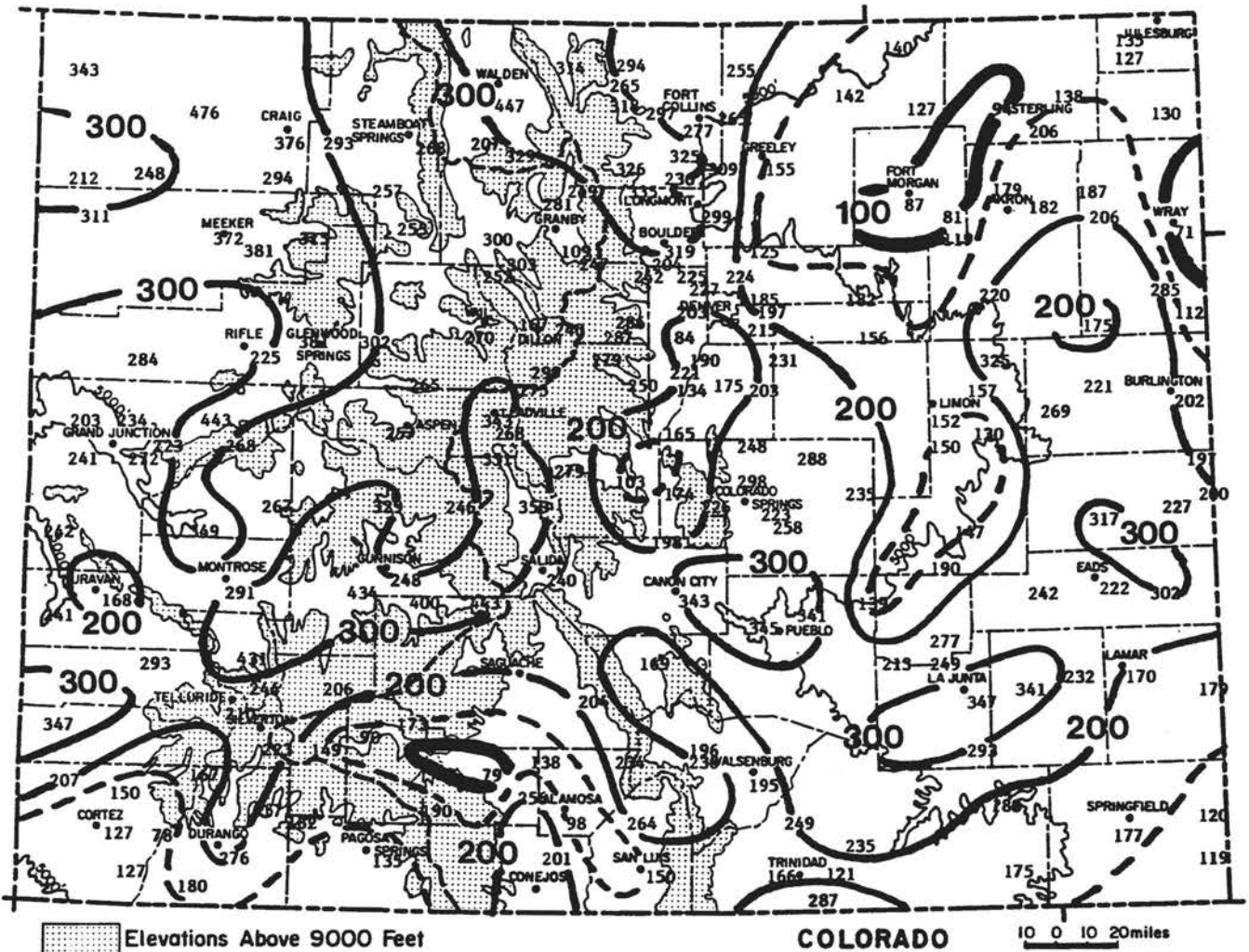
Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)



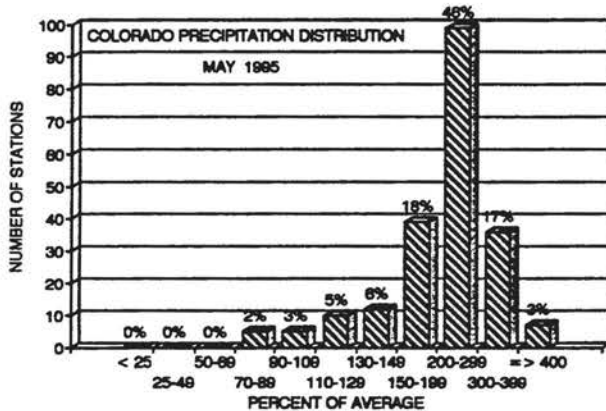




## MAY 1995 PRECIPITATION COMPARISON



May 1995 Precipitation as a Percent of the 1961-90 average.



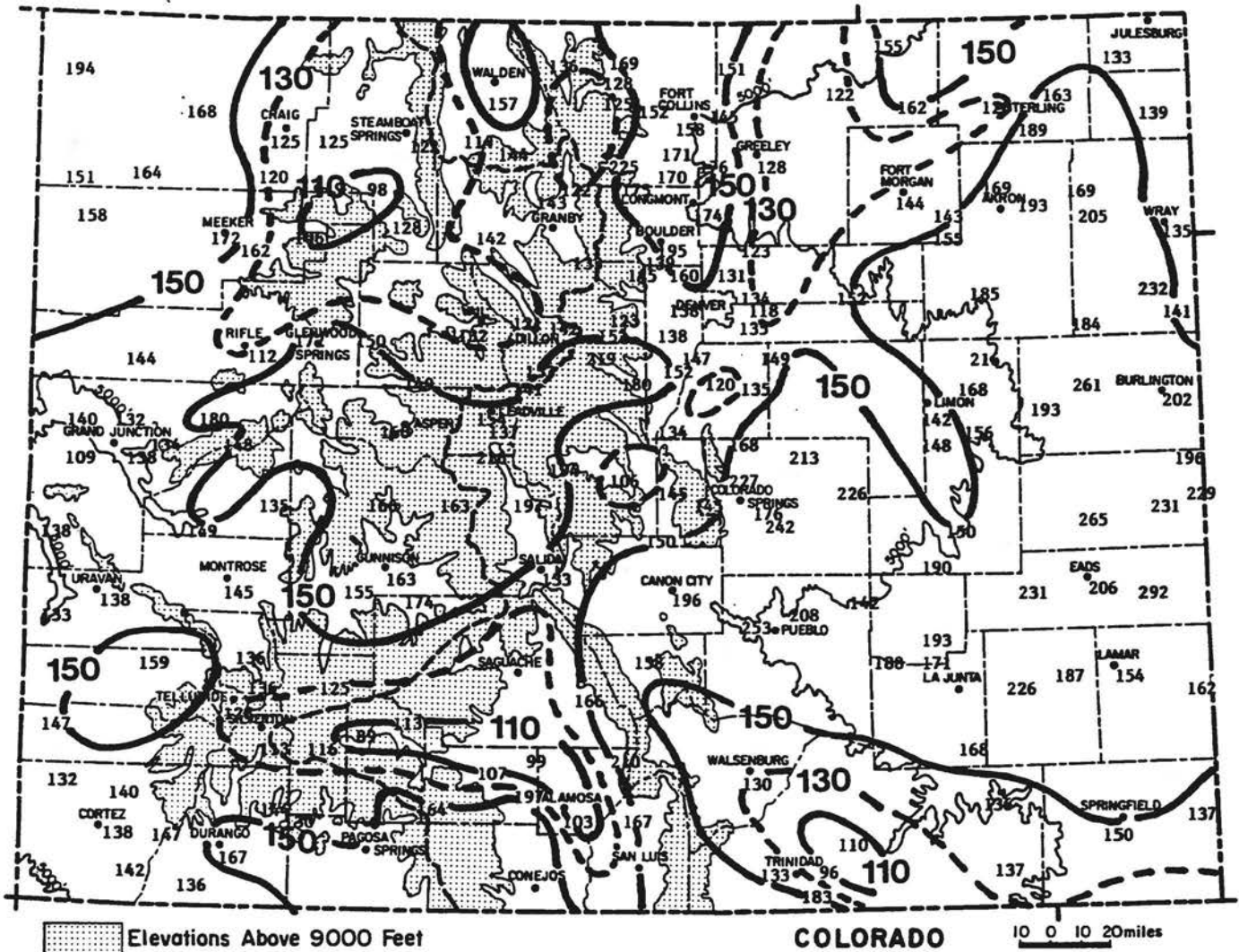
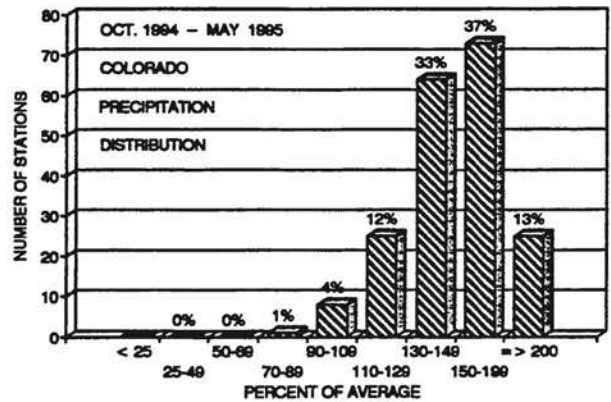
Almost all of Colorado's official weather stations were wetter than average in May. It is extremely rare to have such wide areas wet at the same time. 2/3 of Colorado's weather stations received more than 200% of average. This is especially unusual for a month that typically receives relatively heavy precipitation.

### MAY 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	4.44"	12th wettest in 124 years of record (wettest = 8.57" in 1876)
Durango	2.96"	7th wettest in 101 years of record (wettest = 3.72" in 1947)
Grand Junction	2.04"	2nd wettest in 104 years of record (wettest = 2.74" in 1906)
Las Animas	6.96"	Wettest in 130 years (previous wettest = 5.63" in 1944)
Pueblo	4.27"	4th wettest in 127 years of record (wettest = 5.43" in 1957)
Steamboat Springs	5.66"	Wettest in 89 years of record (Previous wettest = 5.42" in 1981)

## 1995 WATER YEAR PRECIPITATION

In one month, areas of northwestern and eastern Colorado received between 1/3 and 1/2 of their normal precipitation for the entire year. In combination with the above average precipitation already experienced in April, statewide precipitation is now above average over the entire State. Only a few tiny areas remain where precipitation totals since October 1, 1994 are near normal. These include a small area southwest of Steamboat Springs, a tiny area near Trinidad and a few spots in the Rio Grande Valley. Elsewhere, water year precipitation totals are now much above average. Half of the official weather stations have received 150% or more of average. This is the wettest it has been in Colorado since the mid 1980s. Concerns over drought have now been totally washed away, and flooding has emerged as a significant threat. Several rivers and streams already reached or exceeded flood stage during some of May's larger rainfall events.



## COMPARATIVE HEATING DEGREE DAY DATA FOR MAY 1995

### HEATING DEGREE DATA

### COLORADO CLIMATE CENTER (970) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	53	319	700	1174	1307	1287	882	934	777	538		8033
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1118	798	524	262	8850
	93-94	232	221	425	718	1188	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095	1265	1317	911	988	832	667		8305
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5646
	94-95	4	0	77	442	848	890	938	737	703	500	431		5661
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981
	94-95	50	65	286	674	1018	1143	1236	902	968	866	626		7632
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	6320
	93-94	0	25	189	450	853	978	1060	1068	854	499	144	1	6021
	94-95	4	0	80	370	836	908	1036	797	779	623	440		5873
CANON CITY	AVE *	0	11	91	325	645	896	833	756	688	408	193	41	4987
	93-94	0	22	153	435	816	864	886	828	608	488	M	0	M
	94-95	0	0	42	361	695	780	888	645	690	558	330		4969
COLORADO SPRINGS	AVE	6	18	164	468	816	1091	1122	924	859	558	302	87	6415
	93-94	0	40	212	519	972	1008	1032	926	740	578	223	14	6271
	94-95	10	14	96	466	811	969	1035	811	810	703	477		6224
CORTEZ	AVE *	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	506	928	1148	1086	1038	895	528	272	14	6404
	94-95	4	0	111	522	891	1012	1151	686	733	652	438		6203
CRAIG	AVE	32	58	275	606	996	1342	1479	1193	1094	687	419	193	8376
	93-94	87	60	286	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613	1133	1316	1332	946	875	692	567		7697
DELTA	AVE	0	10	125	403	774	1128	1221	898	719	435	186	38	5927
	93-94	13	33	232	596	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	67	423	794	1025	984	655	620	M	289		M
DENVER	AVE	0	0	144	429	780	1054	1094	885	808	504	253	71	6020
	93-94	1	20	132	466	900	948	946	879	618	485	104	3	5544
	94-95	3	2	57	397	804	890	957	738	674	569	431		5522
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1006	747	459	11218
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192	1378	1494	1109	1167	1005	808		10015
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911
	93-94	8	43	201	522	968	1169	1094	1057	695	581	300	20	6636
	94-95	2	2	104	559	952	1025	1183	748	773	658	458		6472
EAGLE	AVE	25	72	275	617	961	1376	1435	1106	958	675	422	164	8106
	93-94	53	52	277	603	1118	M	1258	1080	779	639	330	64	M
	94-95	M	M	M	M	M	M	M	M	M	M	M		M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1006	1079	1029	859	710	343	89	7483
	94-95	59	48	286	677	937	1029	1180	893	891	612	633		7445
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	985	994	669	493	141	6	6002
	94-95	3	3	89	460	820	977	1019	787	737	611	431		5937
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1166	704	550	126	6	M
	94-95	9	8	106	435	896	1030	1176	842	761	644	377		6286
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	93-94	4	0	50	410	875	1102	1025	853	540	360	69	0	5297
	94-95	0	0	24	368	832	984	962	596	578	425	256		5025

\* = AVES ADJUSTED FOR STATION MOVES    M = MISSING    E = ESTIMATED

### HEATING DEGREE DATA

### COLORADO CLIMATE CENTER (970) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE 6SSW	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	381	10542
	93-94	297	274	406	813	1250	1543	1577	1404	1200	828	526	254	10462
	94-95	205	188	423	761	1154	1456	1430	1034	1165	944	688		9448
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	93-94	4	15	178	492	955	1021	1005	1059	843	473	109	3	5957
	94-95	1	3	68	441	860	1005	1066	815	718	606	408		5991
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	93-94	M	M	M	M	M	1323	1693	1734	1527	1044	736	480	185
	94-95	87	74	343	737	1136	1512	1583	1110	1082	811	569		9054
LAS ANIMAS	AVE	0	0	99	338	750	1088	1141	862	707	370	121	9	5455
	93-94	0	12	90	389	935	925	994	882	555	400	78	0	5260
	94-95	0	3	40	288	690	882	934	696	653	486	225		M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	93-94	354	390	591	915	1368	1478	1499	1321	1198	994	662	338	11106
	94-95	310	314	539	895	1257	1406	1500	1135	1220	1058	856		10490
LIMON	AVE	6	21	189	521	879	1189	1218	991	924	603	344	96	6961
	93-94	7	48	237	564	1064	1054	1117	1058	766	628	238	16	6797
	94-95	12	13	124	513	925	1043	1117	828	874	717	486		6752
LONGMONT	AVE	0	10	171	488	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	718	533	182	8	6430
	94-95	13	0	62	435	864	949	1076	782	762	616	429		6008
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1086	785	594	280	52	7373
	94-95	13	5	170	578	1087	1207	1308	863	812	692	529		7262
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	93-94	14	15	181	520	958	1155	1120	992	664	487	203	9	6296
	94-95	4	2	113	489	895	1072	1068	679	705	589	377		5993
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	M	1009	M	1253	872	885	757	534	M
PUEBLO	AVE	0	0	82	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1061	915	687	467	143	0	5950
	94-95	0	6	57	388	785	964							

## MAY 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	55.1	35.9	45.5	-8.0	79	26	598	0	106	3.52	1.02	141	22
STERLING	61.8	42.6	52.2	-6.8	86	31	393	4	194	3.00	-0.17	95	15
FORT MORGAN	63.2	42.0	52.6	-3.9	91	32	377	1	207	2.32	-0.33	88	22
AKRON 1N	58.5	40.1	49.3	-7.2	81	30	478	0	145	6.15	2.72	179	20
AKRON 4E	57.5	38.6	48.0	-8.4	81	28	518	0	132	5.93	2.68	182	19
HOLYOKE	59.5	42.3	50.9	-8.1	80	32	429	0	163	4.40	1.04	131	17
JOES 2SE	63.6	44.8	54.2	-3.8	87	32	333	7	223	4.82	2.07	175	18
BURLINGTON	60.3	40.9	50.6	-8.6	85	31	440	2	181	5.90	2.99	203	16
LIMON WSMO	59.3	38.8	49.1	-4.5	81	28	486	0	161	3.81	1.31	152	23
CHEYENNE WELLS	64.3	40.5	52.4	-7.2	89	32	390	7	233	6.88	3.85	227	16
ORDWAY 21N	61.7	37.9	49.8	-9.2	86	28	466	0	196	3.41	1.62	191	12
ROCKY FORD 2ESE	71.7	43.7	57.7	-4.4	90	35	228	10	344	4.02	2.41	250	16
LAMAR	67.9	45.2	56.6	-5.9	90	34	263	9	294	4.27	1.77	171	15
LAS ANIMAS 1N	69.9	45.8	57.9	-5.6	91	37	225	12	320	6.96	4.92	341	12
HOLLY	69.3	44.0	56.6	-5.4	87	34	259	5	304	4.55	2.02	180	16
SPRINGFIELD 7WSW	70.5	42.0	56.2	-4.4	86	32	274	10	333	4.78	2.08	177	18

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	60.6	41.1	50.8	-5.6	81	33	431	0	178	7.47	4.78	278	21
GREELEY UNC	61.0	42.3	51.6	-6.3	85	35	408	0	187	4.14	1.48	156	19
ESTES PARK	50.4	32.5	41.4	-5.1	70	25	722	0	57	6.46	4.48	326	17
LONGMONT 2ESE	62.0	39.8	50.9	-6.2	85	31	429	1	198	7.00	4.66	299	21
BOULDER	62.4	39.4	50.9	-6.1	82	32	431	0	199	9.59	6.59	320	23
DENVER WSFO AP	60.6	41.0	50.8	-6.4	83	33	431	0	177	4.44	2.04	185	20
EVERGREEN	56.7	32.0	44.3	-4.6	71	20	633	0	126	5.14	2.36	185	18
CHEESMAN	59.5	23.8	41.6	-6.4	80	13	715	0	164	3.12	1.23	165	19
LAKE GEORGE BSW	53.8	30.3	42.0	-3.9	71	21	704	0	79	1.34	0.05	104	10
ANTERO RESERVOIR	54.3	29.1	41.7	-1.3	68	18	716	0	80	2.40	1.54	279	13
RUXTON PARK	42.8	22.7	32.8	-8.2	54	13	992	0	5	6.11	3.41	226	18
COLORADO SPRINGS WSO	59.8	39.1	49.4	-6.0	81	31	477	0	165	4.81	2.66	224	17
CANON CITY 2SE	66.5	41.9	54.2	-4.8	88	32	330	3	264	5.12	3.63	344	16
PUEBLO WSO AP	67.8	40.3	54.0	-5.5	90	32	335	0	283	4.27	3.02	342	13
WESTCLIFFE	58.8	30.1	44.5	-4.8	73	19	629	0	152	2.36	0.97	170	12
WALSENBURG	66.9	39.3	53.1	-4.6	84	31	363	2	272	3.35	1.64	196	14
TRINIDAD AP	68.1	40.2	54.1	-4.8	88	32	332	4	288	3.95	2.27	235	16

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	53.5	30.2	41.9	-2.2	69	14	711	0	83	5.46	4.24	448	21
LEADVILLE 2SW	48.7	25.5	37.1	-2.7	60	10	856	0	30	2.42	1.52	269	21
SALIDA	61.0	33.5	47.3	-4.7	79	23	545	0	184	2.53	1.48	241	13
BUENA VISTA	57.9	31.2	44.5	-5.5	75	20	626	0	136	3.26	2.33	351	14
HERMIT 7ESE	56.7	26.0	41.3	-0.2	70	18	725	0	116	0.91	-0.10	90	4
ALAMOSA WSO AP	63.3	31.5	47.4	-3.0	77	21	538	0	214	0.63	-0.01	98	8
STEAMBOAT SPRINGS	58.0	32.6	45.3	-2.5	74	20	605	0	143	5.66	3.55	268	25
YAMPA	53.2	30.6	41.9	-4.9	68	20	707	0	77	3.47	2.10	253	23
GRAND LAKE 1NW	54.7	29.5	42.1	-0.7	69	22	702	0	91	4.81	2.88	249	25
GRAND LAKE 6SSW	54.6	30.5	42.5	-1.2	70	20	688	0	89	3.88	2.50	281	26
DILLON 1E	50.0	27.2	38.6	-3.5	64	15	808	0	38	2.19	0.88	167	21
CLIMAX	45.0	18.2	31.6	-0.9	54	8	1029	0	7	5.18	3.30	276	18
ASPEN 1SW	54.2	32.1	43.1	-3.9	70	22	667	0	91	5.41	3.31	258	24
CRESTED BUTTE	48.5	26.7	37.6	-4.4	64	12	840	0	42	4.81	3.35	329	16
TAYLOR PARK	47.6	24.3	35.9	-4.3	61	1	894	0	28	3.25	1.93	246	14
TELLURIDE	52.4	30.6	41.5	-3.0	66	21	722	0	67	3.75	1.97	211	16
PAGOSA SPRINGS	62.3	32.8	47.5	-1.7	75	20	534	0	201	1.54	0.40	135	10
SILVERTON	48.7	27.3	38.0	-4.6	63	19	827	0	37	3.35	1.85	223	15
WOLF CREEK PASS 1E	43.4	23.5	33.5	-5.7	55	16	971	0	8	3.86	1.83	190	17



**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	58.3	34.7	46.5	-4.0	74	27	567	0	139	6.21	4.56	376	18
HAYDEN	59.7	36.3	48.0	-3.7	76	29	518	0	158	4.11	2.71	294	20
MEEKER 3W	59.4	36.0	47.7	-3.3	76	26	529	0	155	5.59	4.09	373	26
RANGELY	63.0	40.6	51.8	-4.9	80	29	399	0	211	3.11	2.11	311	18
GLENWOOD SPRINGS	64.1	37.9	51.0	-3.6	79	29	428	0	226	5.83	4.30	381	23
RIFLE	64.6	38.5	51.5	-4.1	80	28	410	0	235	2.39	1.33	225	12
GRAND JUNCTION WS	68.4	45.3	56.8	-5.2	82	37	256	9	303	2.04	1.17	234	13
PAONIA 1SW	65.9	41.4	53.7	-3.4	79	34	343	0	255	3.56	2.23	268	16
DELTA	68.6	42.3	55.5	-3.9	83	33	289	1	296	1.99	1.42	349	14
GUNNISON	59.1	31.8	45.4	-2.0	73	24	599	0	151	1.64	0.98	248	18
COCHETOPA CREEK	58.5	30.3	44.4	-2.0	73	21	632	0	144	3.16	2.37	400	15
MONTROSE NO 2	65.3	39.8	52.5	-4.7	79	32	377	1	248	2.48	1.63	292	18
URAVAN	72.3	41.4	56.9	-4.3	85	25	252	7	354	1.68	0.68	168	15
YELLOW JACKET 2W	64.0	36.3	50.1	-4.0	74	29	454	0	221	2.28	1.18	207	11
CORTEZ	65.5	35.7	50.6	-2.8	78	24	439	0	246	1.16	0.25	127	8
DURANGO	64.9	35.0	50.0	-3.5	76	28	458	0	238	2.96	1.89	277	15

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

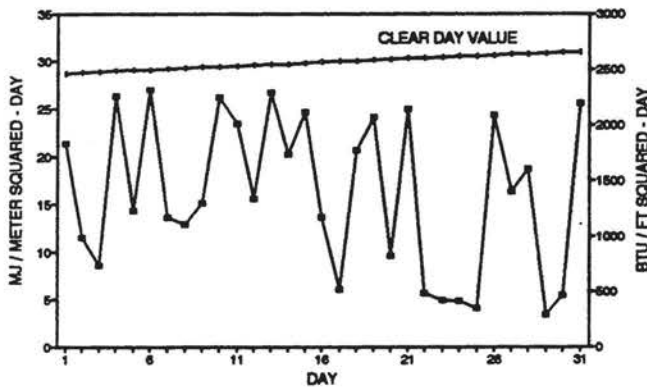
**MAY 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	3	10	18	--	--
Denver	NA	NA	NA	37%	64%
Fort Collins	4	8	19	--	--
Grand Junction	2	8	21	62%	73%
Pueblo	NA	NA	NA	64%(?)	75%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

May was an exceptionally cloudy month. Cloud cover was especially thick and persistent over northern Colorado and along the Front Range. The period May 22-25 was about as gloomy as it gets for Colorado with very little solar energy reaching the ground.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION MAY 1995**

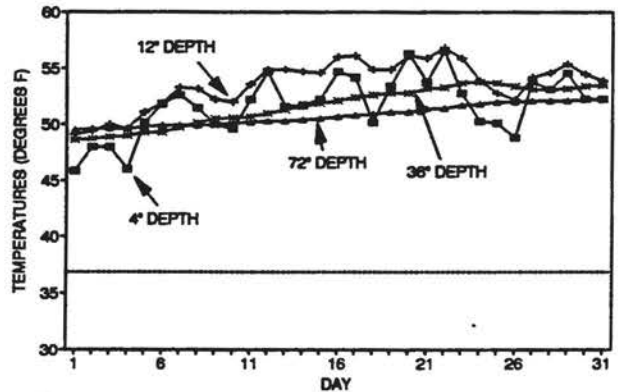


**MAY 1995 SOIL TEMPERATURES**

Soil temperatures made some upward progress early in May, but still lagged behind normal. Later in May soil temperatures cooled again. By the end of the month, soil temperatures near the surface were close to the lowest they have been so late in the spring.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES MAY 1995**



**HATS OFF TO:** *Jesse Jenkins of Taylor Park Dam,*

Jesse Jenkins has been the official weather observer at Taylor Park Dam, (Colorado's reliable coldest spot, 35 miles NE of Gunnison) for 16 years. In a typical year, the temperature there drops below zero 91 days. Temperatures below -40°F occur fairly regularly. It has also gotten as warm as 86°F. Thank you so much for helping observe Colorado's coldest weather – and please don't move to Phoenix.

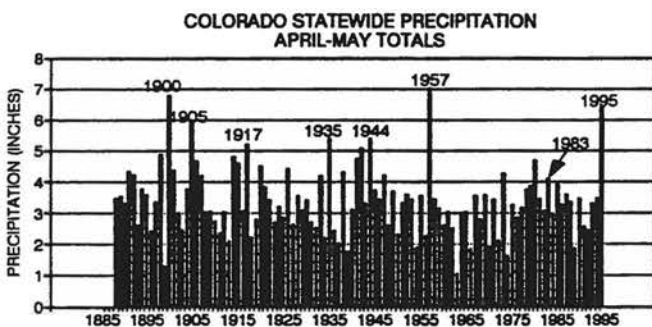
## THE ANATOMY OF THE SPRING OF 1995

Climate is a strange and wonderful thing. It annoys us, disappoints us, entertains us and delights us. One of the things about climate that really amazes me is how well and how quickly things average out. Starting in March of 1994, Colorado was consistently warmer than average and predominantly drier than average. The summer of 1994 was one of the hottest on record and drier than most of us care for. The winter of 1994-95 was uncommonly mild – (and I heard few complaints, except from the ski industry and from folks who were getting nervous about what might come next). It honestly looked like "Global Warming" was reality here in Colorado.

Then suddenly, the weather changed, as it has done so many times in the past. In a matter of two months Colorado has made up all or most of the precipitation deficit accumulated in the previous year or more. Temperatures have quickly begun to even out. We would not have imagined this back in April.

### Precipitation

Last month we gave a historic view of cold, wet springs of the past. Now we can give final statistics on how 1995 actually ranked. Based on statewide April-May precipitation totals, 1995 has become the 3rd wettest on record for Colorado with a 2-month total of 6.41". This compares to a longterm statewide average of 3.40 and a 1994 total of 3.48". The wettest April-May total in recorded history was 7.02" in 1957. 1900 came in second with 6.79". In contrast, the driest April-May on record for the State was 1.05" in 1963.

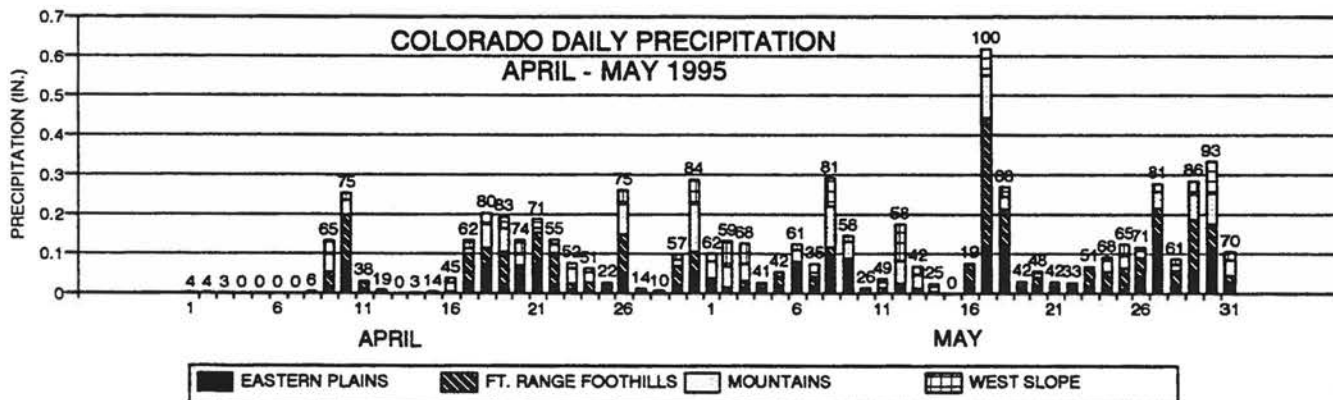


Some examples of 2-month 1995 precipitation totals at individual stations include 5.40" at Buena Vista, 318% of average, 7.64" (248% of average) at Glenwood Springs, 9.03" (311% of average) at Meeker, 8.16" (347% of average) at Pueblo Reservoir, 10.93" (330%) at Brandon, 12.52" (264%) at Idalia and 15.04" (263% of average) at Boulder. 1995 ranked as the 1st, 2nd or 3rd wettest spring on record for many locations in Colorado. At Meeker, it broke the old record by more than 2 inches.

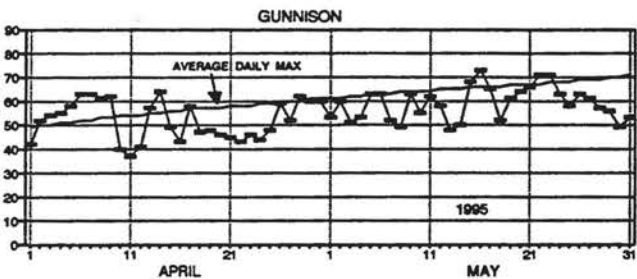
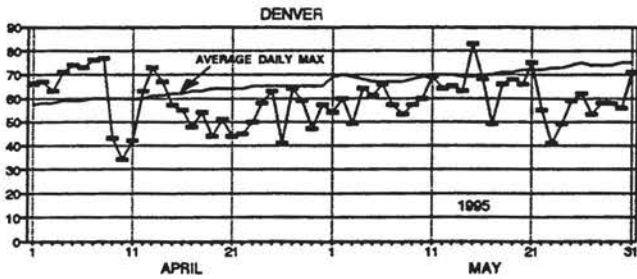
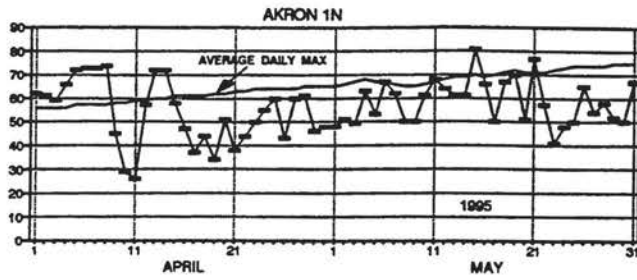
One of the factors that made this spring so unusual was the frequency and duration of precipitation. The graph below shows statewide daily precipitation for April-May and the percentage of Colorado weather stations reporting measurable precipitation each day. Historically, April and May are known for relatively large numbers of days with widespread precipitation, but nothing like what occurred in 1995. From April 8 to the end of May, precipitation was reported somewhere in Colorado on all but two days. Precipitation was also widespread. There were 31 days when more than half of the State's official weather stations received measurable precipitation. Most individual stations reported at least 25 days with measurable precipitation. In the Northern and Central Mountains and near the Front Range some locations had 40 days with precipitation. Areas near Lake Granby reported 43 days with measurable precipitation. Except for 1935, no previous year has had as many wet spring days. It wasn't just brief showers either. There were several episodes with continuous precipitation for days at a time, especially in northern Colorado.

### Temperatures

Beginning in mid April, temperatures remained predominantly below average. Daytime temperatures were especially chilly. For April and May combined, many locations east of the mountains had daily maximum temperatures for April and May that were at least ten degrees below average. Graphs are presented on the next page showing each day's maximum temperature for Akron, Denver and Gunnison with respect to their averages. From April 15 to May 31 most days were much below average. Warmer periods were all very brief.



Unless noted otherwise, the special features contained in *Colorado Climate* are prepared and edited by Nolan Doesken, Assistant State Climatologist, at the Colorado Climate Center. Comments and questions are always welcome. E-mail address: [nolan@ulysses.atmos.colostate.edu](mailto:nolan@ulysses.atmos.colostate.edu)



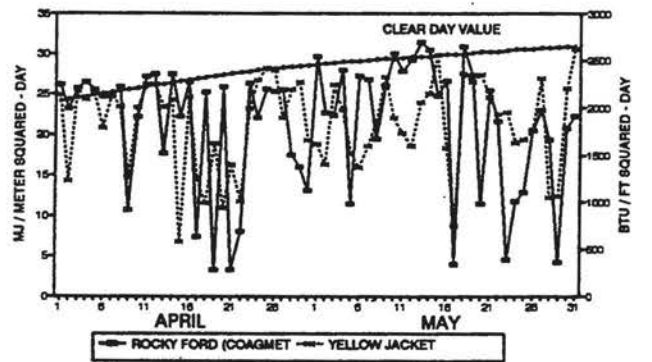
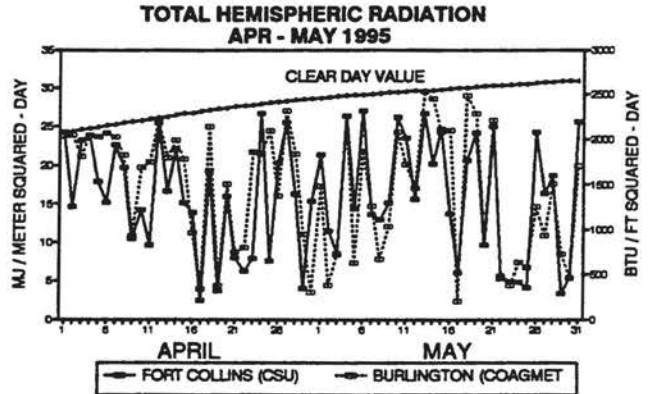
From a statewide perspective, April-May 1995 ranks as the 5th coldest spring on record. Only 1917, 1920, 1973 and 1983 were colder. Almost all wet springs in Colorado have been accompanied by colder than average temperatures. 1900 was an exception, but that year April precipitation single-handedly made it a wet spring (April 1900 was by far the wettest individual month in Colorado's history). May 1900 was significantly warmer and drier than average. There have only been a few occasions when cold springs have been drier than average. This occurred back in 1909 and 1929. As a rule we can count on cold and wet happening together.

#### Sunshine (or lack of it)

With all the precipitation that fell, it is no surprise that the spring of 1995 was much cloudier than usual. The traditional determination of clear, partly cloudy and cloudy days that has been made for decades at National Weather Service First-Order stations is being phased out so I cannot give you those statistics for many locations. For the time being, the Grand Junction NWS office still makes this determination. From April 8 through May 31, only 2 clear days were observed there. 20 days were judged to be partly cloudy. The remaining 32 days were cloudy. In northern, central and northeastern Colorado it was even cloudier.

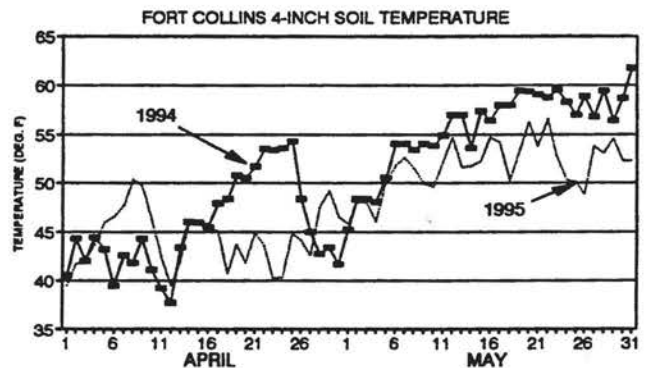
Many of these cloudy days were truly dark and gloomy. One of the best ways to evaluate sunshine is by

measuring solar radiation, the energy received from the sun. The following graphs show the solar energy reaching the ground at several sites around Colorado. Averaged over the 2-month period, solar radiation was approximately 20% below average and 21% less than 1994. Measurements of solar radiation have only been taken for about 20 years, but 1995 was nearly 10% less than the previous low spring based on Fort Collins data.



#### Soil Temperatures

Soil temperatures gave a direct reflection of the cloudy, cold and wet spring weather. The following graph shows how soil temperatures during April and May of 1995 compared with 1994. In terms of seed germination and plant growth, these differences are very large.



**Impacts**

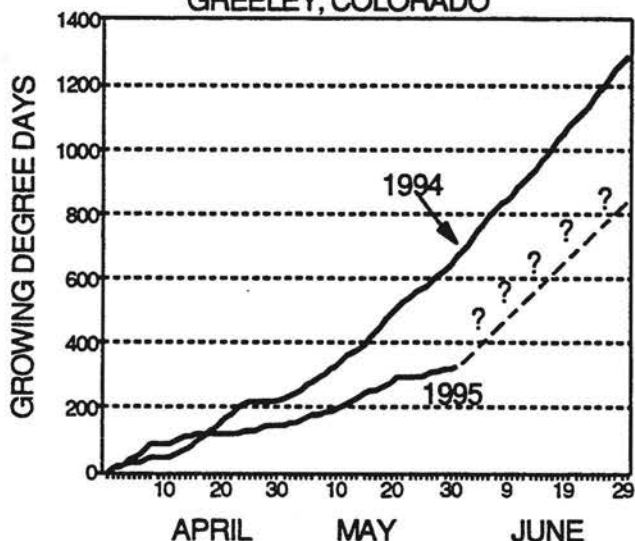
We won't know all the impacts of this wet spring for some time to come, but we can certainly identify a few. Statewide surface water supplies have been restored. Most reservoirs will be back to capacity after being depleted last year. Some local flooding has already occurred, and emergency managers have been on their toes. High water is inevitable on most Colorado rivers and streams on into July. This will mean more risks for white water rafters and other river sports. Some fatalities have already occurred.

Businesses that rely on spring outdoor recreation took quite a beating. The Memorial Day Weekend was so cold and wet that most folks just stayed home. Not as much ice cream was eaten as usual, but movie theaters and movie rentals did a brisk business. Boots, raincoats and umbrellas were also in hot demand.

Colorado's agricultural industries probably experienced the greatest impacts. Winter wheat is on its way to an excellent year (1957, 1980 and 1983, years with cold, wet springs, also had bumper crops). However, harvest will be delayed by slow development which means more opportunity for wind and hail damage.

The outlook for other crops is less optimistic. Many field crops were planted much later than normal. Seed germination and early growth has been slow. Growing degree days (crop heat units) calculated from daily temperatures is one way that farmers and crop scientists track crop growth and development. The graph below gives an example of just how cool this spring was in comparison to 1994. There is potential for considerable impact if crops do not mature. We won't know for sure until the summer progresses.

**ACCUMULATED CORN GROWING DEGREE DAYS  
GREELEY, COLORADO**



It isn't just the crops that are affected. Insects and weeds are also affected by weather conditions. This year's wet weather has harmed some pests like the Russian wheat aphid and grasshoppers. But other pests will be having a great year. The sale of mosquito repellent has already skyrocketed. Some weeds are also having a great year. Thistles are growing like gangbusters. Cool weather grasses have also been growing great. In my years in Colorado, this is the first time I recall driving down country roads and having the grasses beside the road as tall as my car (part of that is because it has also been too wet to mow).

Range conditions which deteriorated badly in 1994 have benefitted greatly by the widespread precipitation and cool temperatures. Forest fire potential has been almost totally squelched. But that will probably be temporary. The rapid and lush growth of grasses will mean a large supply of quick burning fuels when the inevitable dry weather comes.

**What Comes Next**

Of course, now you want to know what comes next. Back in our February issue of Colorado Climate we indicated that springs following unusually warm winters have been highly variable in the past. Summers, however, were usually hot and dry. Now let's do the same thing with cold, wet springs.

Rank of Wettest Springs of Record	What Happened Next (June - September)	
	Temp.	Precip.
1. 1957 (cold)	Average	Wet
2. 1900 (average)	Hot	Very Dry
3. 1995 (cold)	????	?????
4. 1905 (cold)	Average	Dry
5. 1935 (cold)	Hot	Dry
6. 1944 (cool)	Average	Dry
7. 1917 (very cold)	Cool	Dry

After all this moisture it may seem hard to believe, but most cold, wet springs are followed by dry summers with variable temperatures. If I were you I wouldn't make any life-changing decisions based on this information – unless I could tell you why that happens (which I can't, at least not yet). For now just store it in the back of your mind and we can talk about it later in the summer.

Thanks to those of you who have provided feedback to us about the content of our monthly climate summaries. Also, thanks for the suggestions of topics for future special features. We currently have a list of several dozens topics. We will try our best to address them – one by one. Please stay in touch.

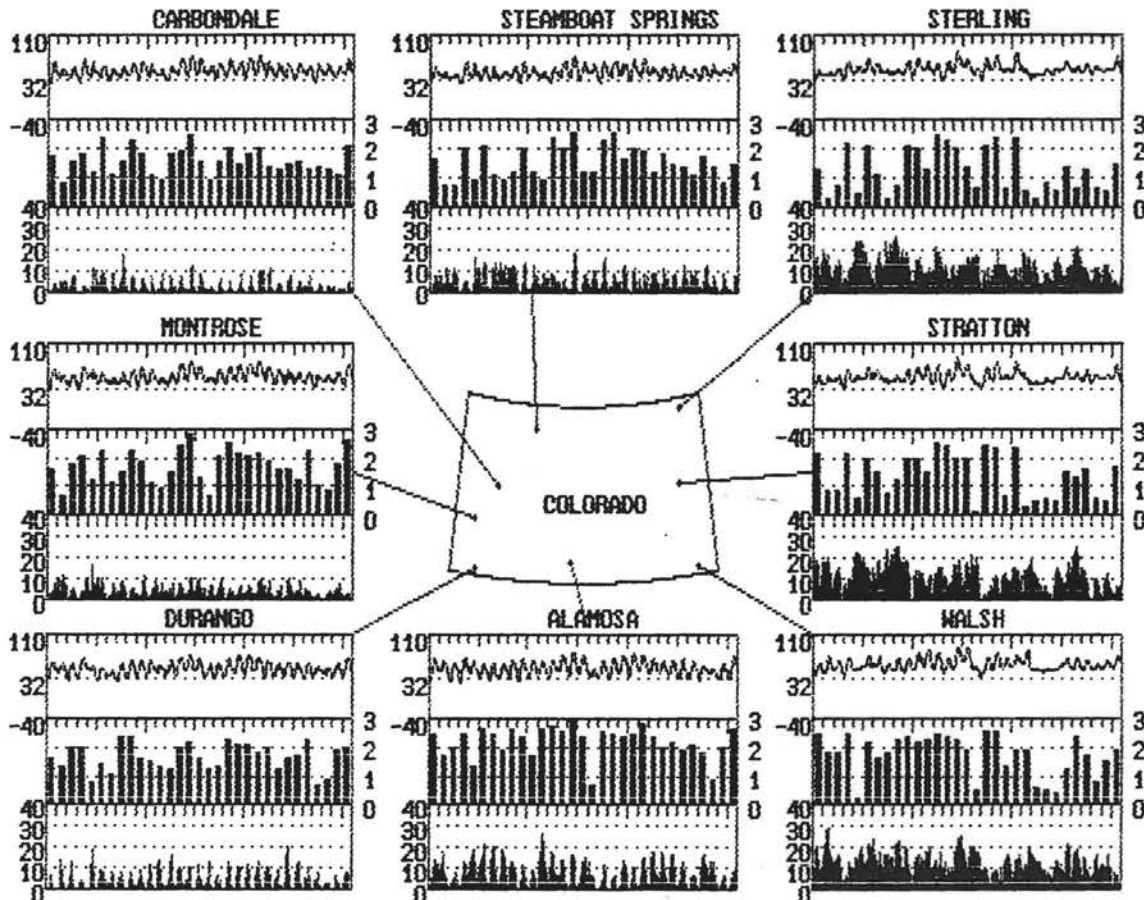
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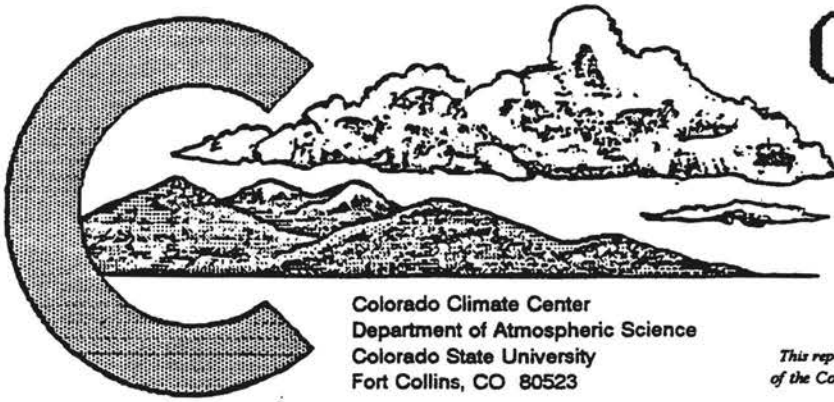


	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	48.5	47.4	47.6	51.2	44.9	49.7	50.6	55.6
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	76.5 15/15	70.5 20/15	75.0 15/14	78.3 15/16	71.6 15/16	81.0 15/15	84.4 15/16	86.4 16/16
minimum:	22.5 4/ 5	27.1 6/ 4	26.8 1/ 5	28.6 1/ 5	25.3 4/ 5	29.3 18/ 5	32.0 30/ 0	35.1 1/ 5
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	76 / 28	73 / 29	75 / 36	76 / 34	87 / 33	56 / 32	44 / 29	92 / 45
11 AM	27 / 31	41 / 35	55 / 42	46 / 40	54 / 39	35 / 31	39 / 36	64 / 49
2 PM	24 / 30	32 / 33	47 / 41	38 / 38	50 / 38	30 / 31	39 / 39	54 / 49
5 PM	26 / 29	29 / 31	53 / 40	38 / 37	54 / 37	32 / 31	40 / 39	52 / 47
11 PM	49 / 29	58 / 31	80 / 39	61 / 37	80 / 37	49 / 33	42 / 31	81 / 47
monthly average wind direction ( degrees clockwise from north )								
day	215	194	229	223	208	159	120	166
night	169	93	152	148	136	194	175	202
monthly average wind speed ( miles per hour )	6.15	3.07	1.76	3.08	3.62	9.89	9.94	10.88
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	273	436	557	429	391	54	132	26
3 to 12	347	244	140	314	308	449	323	429
12 to 24	122	18	3	1	21	237	281	279
> 24	2	0	0	0	0	4	8	10
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	2186	1657	1550	1719	1525	1243	1391	1733
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	121	121	100	125	102	89	100	171
40-60%	93	122	108	96	81	62	79	92
20-40%	80	104	118	103	133	99	70	62
0-20%	37	87	101	84	109	186	160	106

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

**JUNE 1995**

Volume 18 Number 9

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## June Climate in Perspective – Cool and Wet Again

June weather conditions were cloudier, cooler and wetter than usual for the third month in a row. Strong thunderstorms with local downpours, some damaging hail and a few tornadoes were also numerous. At last, there were some hot, dry summer days to help corn grow and wheat ripen, but with that came rapidly melting mountain snowpack causing many rivers and streams to run near flood stage. Although water levels were very high, actual damage from flooding was fairly minor. Unfortunately, several river recreationalists lost their lives.

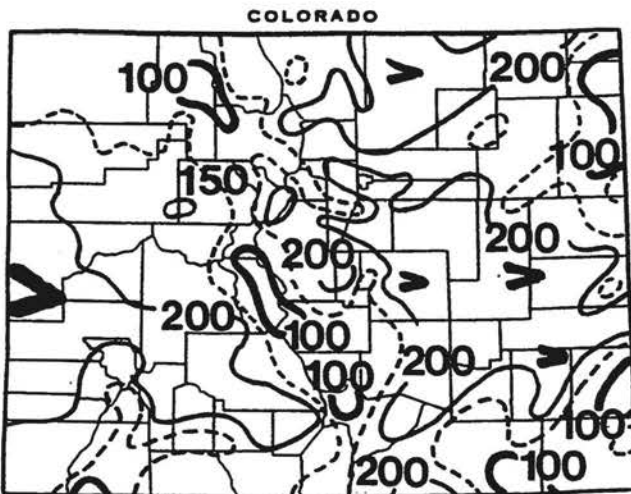
### Precipitation

Big thunderstorms were the rule early in June, especially east of the mountains. Then a strong mid-June weather system brought widespread rainfall to western

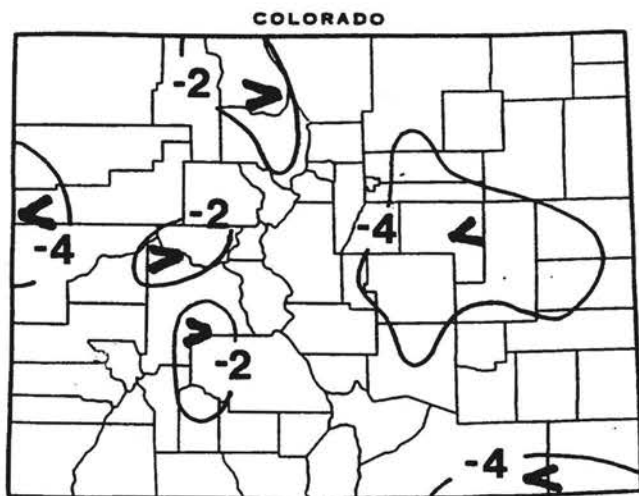
totals exceeded 200% of average over much of the Front Range and Eastern Plains and over portions of western Colorado. New Raymer's 9.50" monthly total was the wettest in the State. Just a handful of locations received less June precipitation than average including Steamboat Springs, the Collegiate Valley near Salida, and a few small areas in extreme eastern and southern Colorado.

### Temperatures

June temperatures were cooler than average in all areas of Colorado. Most locations ended up a modest 2 to 3 degrees F cooler than normal for the month. Portions of eastern Colorado and an area near Grand Junction on the Western Slope were more than 4 degrees below average. These temperatures were very comfortable at lower elevations. Only one heatwave in mid June took the mercury up into the 80s and 90s. In the mountains, cool June temperatures continued to retard snowmelt rates. Readings finally made it up close to 60 degrees June 11-16th and 19-28th bringing surging runoff. Denver's high temperature only reached 90° one time compared to 16 days of 90 or greater in June 1994.



June 1995 precipitation as a percent of the 1961-1990 average.



Departure of June 1995 temperatures from the 1961-90 average.

Colorado. The month ended with three days of gloomy, drizzly weather that even included some high elevation snow. Total June precipitation ended up less than May 1995 but still much above average across most of the State. Monthly

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## JUNE 1995 DAILY WEATHER

- 1-5 June 1st was very pleasant with lots of sunshine, mild temperatures and only a few scant showers. But on the 2nd, an approaching low pressure trough helped trigger severe storms with heavy rains east of the mountains. 3.28" of rain fell at New Raymer contributing to more flooding on the South Platte River. Despite cool temperatures, more big storms popped up 3-4th. Pueblo was pounded with hail. Sedgwick got 2.92" of rain and Brandon (north of Lamar) received 2.90" on the 3rd. Parts of Colorado Springs and southeast Denver received more than 2" on the 4th. Bright sunshine returned statewide on the 5th with only a few isolated thundershowers near the Nebraska border.
- 6-10 Strong winds developed on the 6th as a new storm approached. A cold front then spawned severe weather along the Front Range late in the day. More severe weather erupted on the 7th. 1.75" of rain fell at Sterling, and Fort Lupton was clobbered by damaging hail. The storms then gave way to fog with steady, cold rain over northeast Colorado. Scattered showers and thundershowers fell elsewhere with some mountain snow. Sterling had a high of only 51° on the 8th. Precipitation ended on the 9th after dropping well over 1" along the Front Range. Winter Park had 5" of new snow. Morning temperatures were very chilly - 30° at Durango. Skies cleared statewide, but temperatures remained unseasonably cool. Climax recorded a low of 15° on the 10th. Temperatures then warmed in western Colorado, but an upper disturbance kept eastern parts of the State cloudy and cool with light showers along the Front Range.
- 11-15 At last some heat and dry weather arrived in Colorado, but this also meant accelerated snowmelt and high runoff in rivers and streams flowing out of the mountains. Low elevation temperatures climbed into the 80s and 90s 12-15th. Pueblo hit 95° on the 14th and Grand Lake reached 78° on the 15th. The hottest temp. in Colorado in June was 102° at Holly on the 15th. Some afternoon widely scattered high-based thunderstorms developed which spit out a little lightning and some strong winds but very little rain.
- 16-18 A major upper air disturbance and surface cold front approached Colorado from the West on the 16th. Visibilities lowered in blowing dust (from the Southwest deserts) during the afternoon as southerly winds gusted over 50 mph in several areas. Thunderstorms developed in southwest Colorado. Then steady rains spread northeastward and continued over most of western Colorado on the 17th adding to flood waters in some areas. 1.45" of rain fell at Norwood with 1.48" at Delta (their heaviest one-day June rains on record). Strong winds continued. Alamosa reported a 60 mph gust. Then a Midwestern-like thunderstorm squall line moved out of the mountains during the evening and dissipated over the plains. Many areas reported hail. 1.22" of rain and hail was reported at Eleven Mile Reservoir. Skies cleared overnight. Deep blue skies but cool temperatures and brisk winds were the rule on the 18th.
- 19-20 Dry and seasonally warm statewide with just isolated storms east of the mountains. High snowmelt runoff continued.
- 21-25 A weakening low pressure area crossed Colorado slowly during this period. Western Colorado enjoyed plentiful sunshine but cooler than average temperatures. East of the mountains, scattered thunderstorms formed each day, some of which were quite heavy. Akron reported 0.64" of rain on the 21st. A tornado did some damage east of Colorado Springs on the 22nd. 0.98" of rain fell at Lamar on the 23rd. Severe thunderstorms were expected across much of eastern Colorado on the 24th, but temperatures were too cool (only 60s and low 70s) to get big storms going. A few more storms popped up on the 25th, most numerous along the Front Range. Some hail and strong winds were reported.
- 26-27 Typical late-June weather embraced Colorado with hot days and some afternoon convective clouds. Some impressive lightning was observed late on the 27th, but little rain fell.
- 28-30 June ended with another round of very cool, wet weather. A cold front dipped southward over northern and eastern Colorado early on the 28th. Low upslope clouds formed along the Front Range. Then powerful thunderstorms rumbled across the plains. By early on the 29th, 1.83" of rain had fallen at Castle Rock, with 2.90" at John Martin Reservoir. Showers expanded statewide on the 29th. Gunnison reported 0.87" of rain. Del Norte totalled 1.15" on the 30th, very heavy for that time and place. Areas along the Front Range and over eastern Colorado experienced dense clouds, fog and record cold daytime temperatures on both the 29th and 30th. Allenspark only reached 42° on the 29th and Denver was just 55°F. Springfield only hit 62° on the 30th. Some snowflakes fell in the higher mountains.

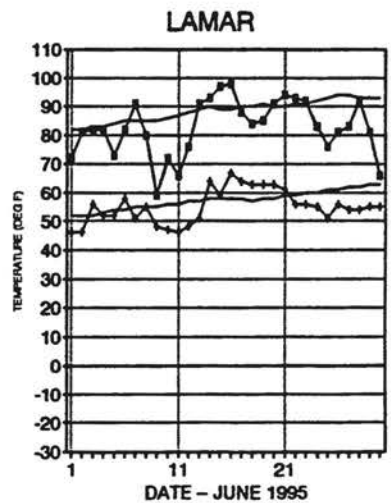
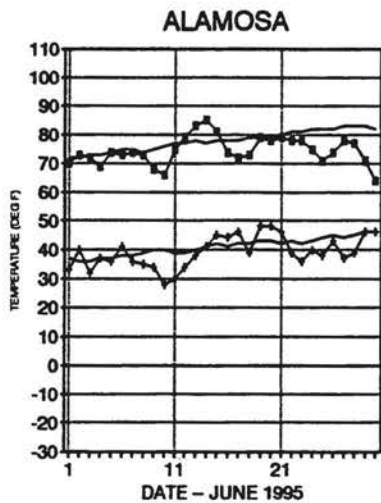
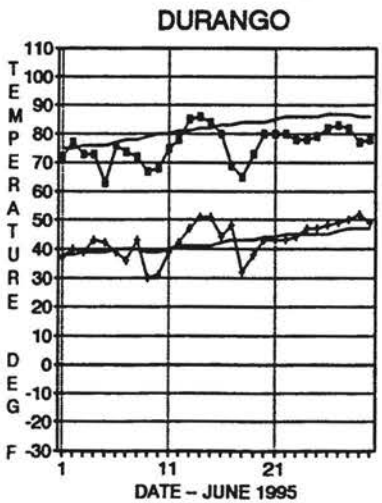
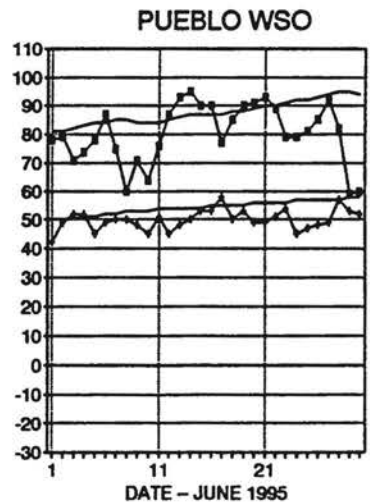
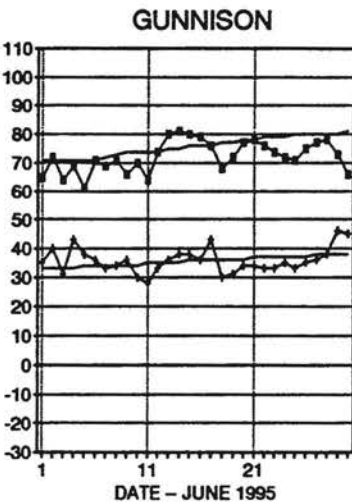
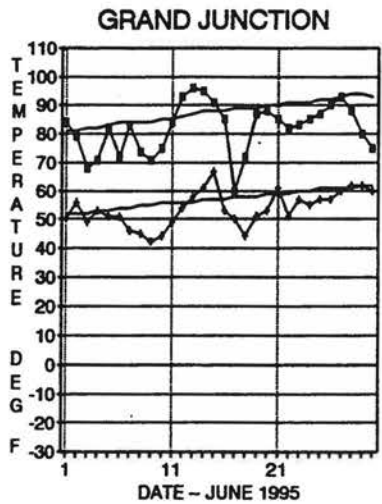
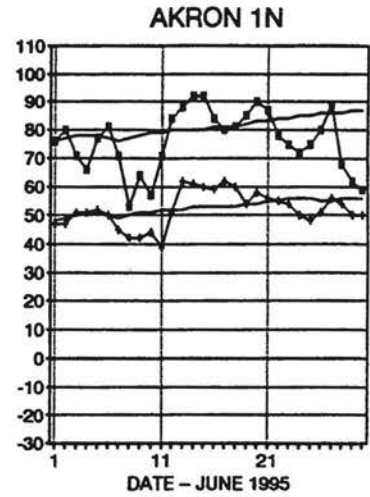
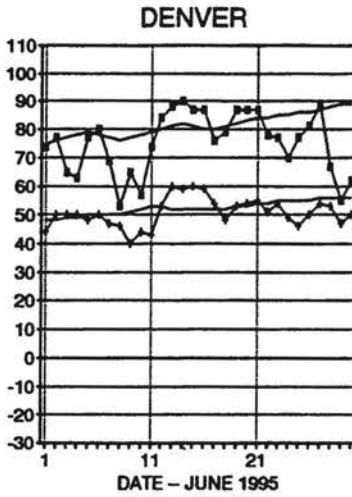
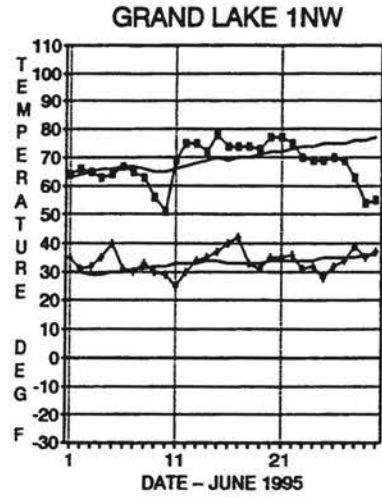
### Weather Extremes

Highest Temperature	102°F	June 15	Holly
Lowest Temperature	15°F	June 10	Climax
Greatest Total Precipitation	9.50"		New Raymer
Least Total Precipitation	0.61"		Fort Lewis
Greatest Total Snowfall	12"		Keystone 5E
Greatest Snow Depth	36"	June 1	Mt. Evans Research Center

## JUNE 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)



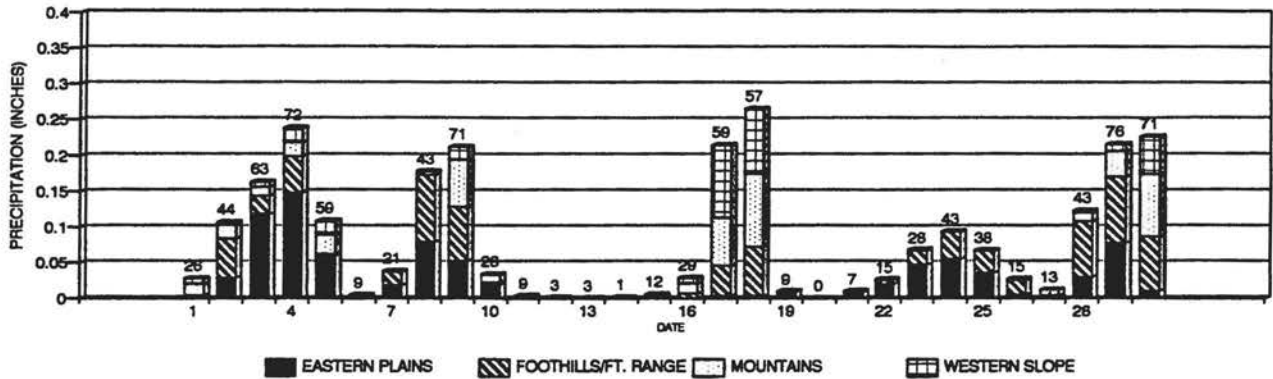


## JUNE 1995 PRECIPITATION

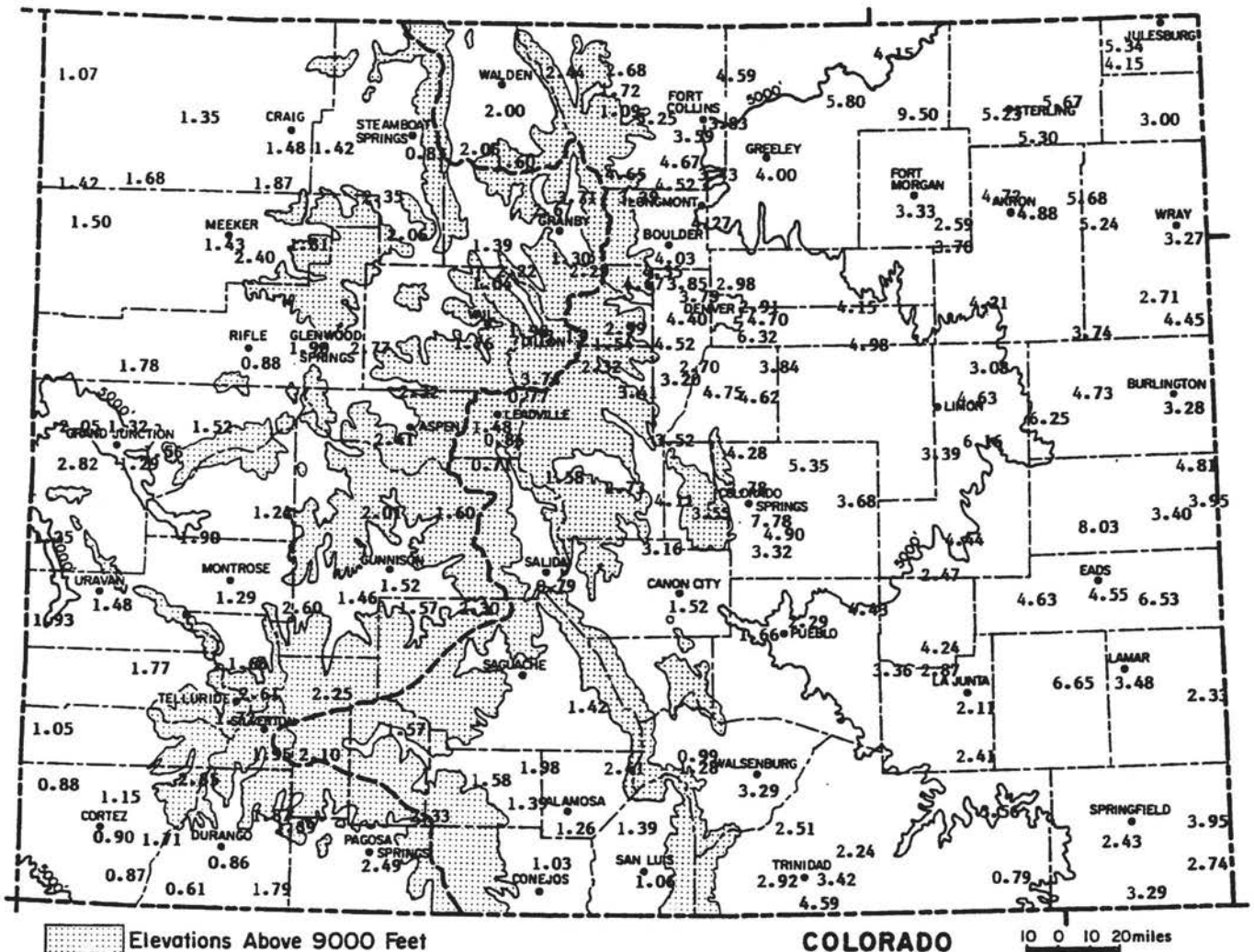
June precipitation consisted of several widespread episodes and a number of days with scattered or isolated convective storms. Most precipitation fell June 2-4th, 7-9th, 16-17th and 28-30th. The storms 2-4th were primarily in the eastern half of Colorado while the 16-17th storm system

focused on the western half of the State. State-averaged precipitation for June totaled 2.55" compared to a normal of 1.46". Since April 1, Colorado statewide precipitation has been 199% of average which makes this one of the wettest April-June periods on record for Colorado.

### COLORADO DAILY PRECIPITATION - JUN 1995

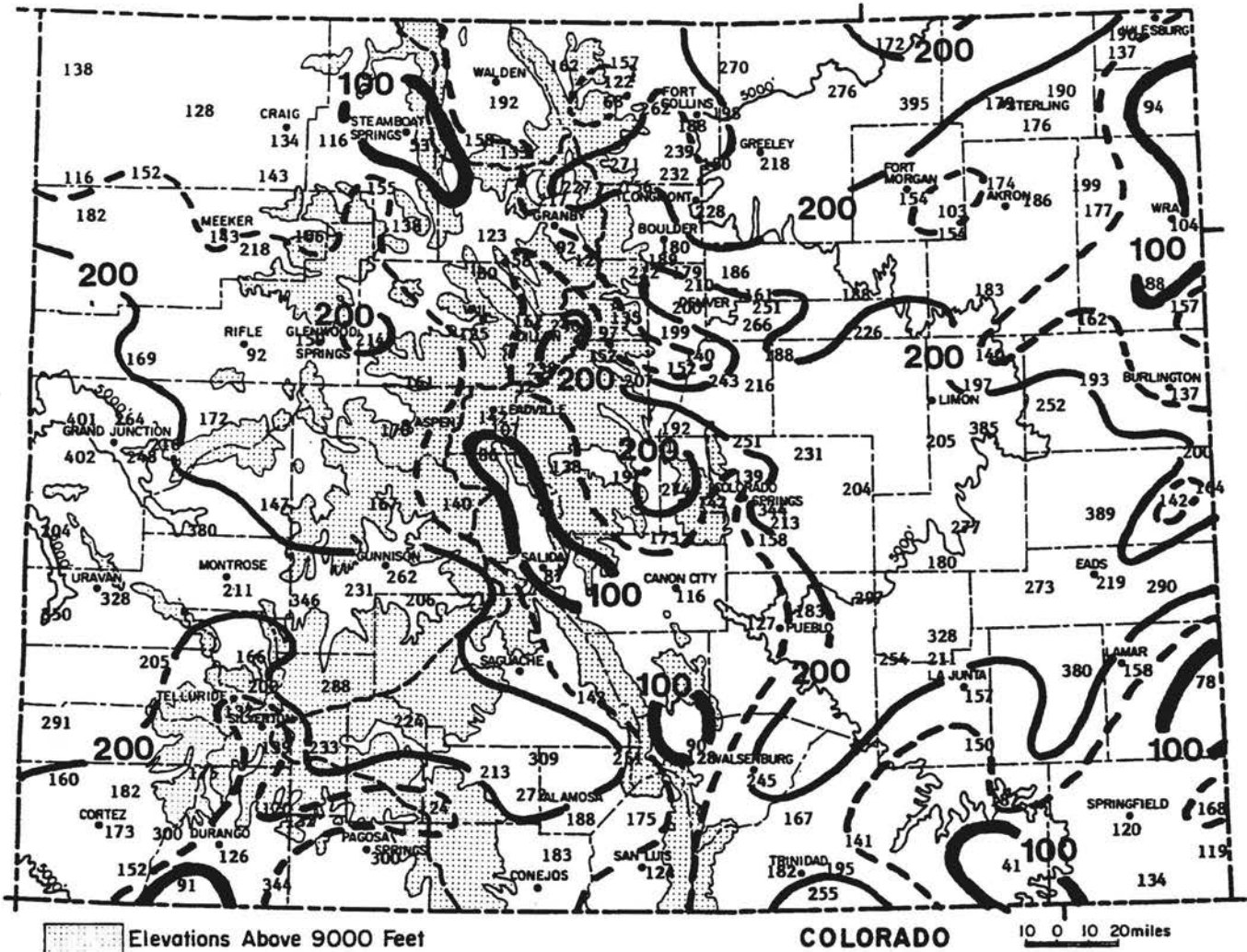


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)

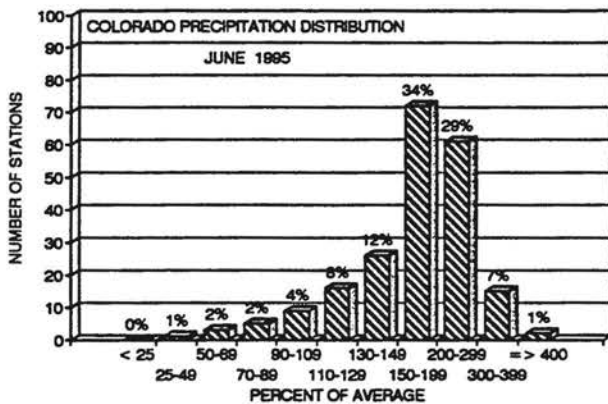


Precipitation Amounts (in inches) for June 1995.

## JUNE 1995 PRECIPITATION COMPARISON



June 1995 Precipitation as a Percent of the 1961-90 average.



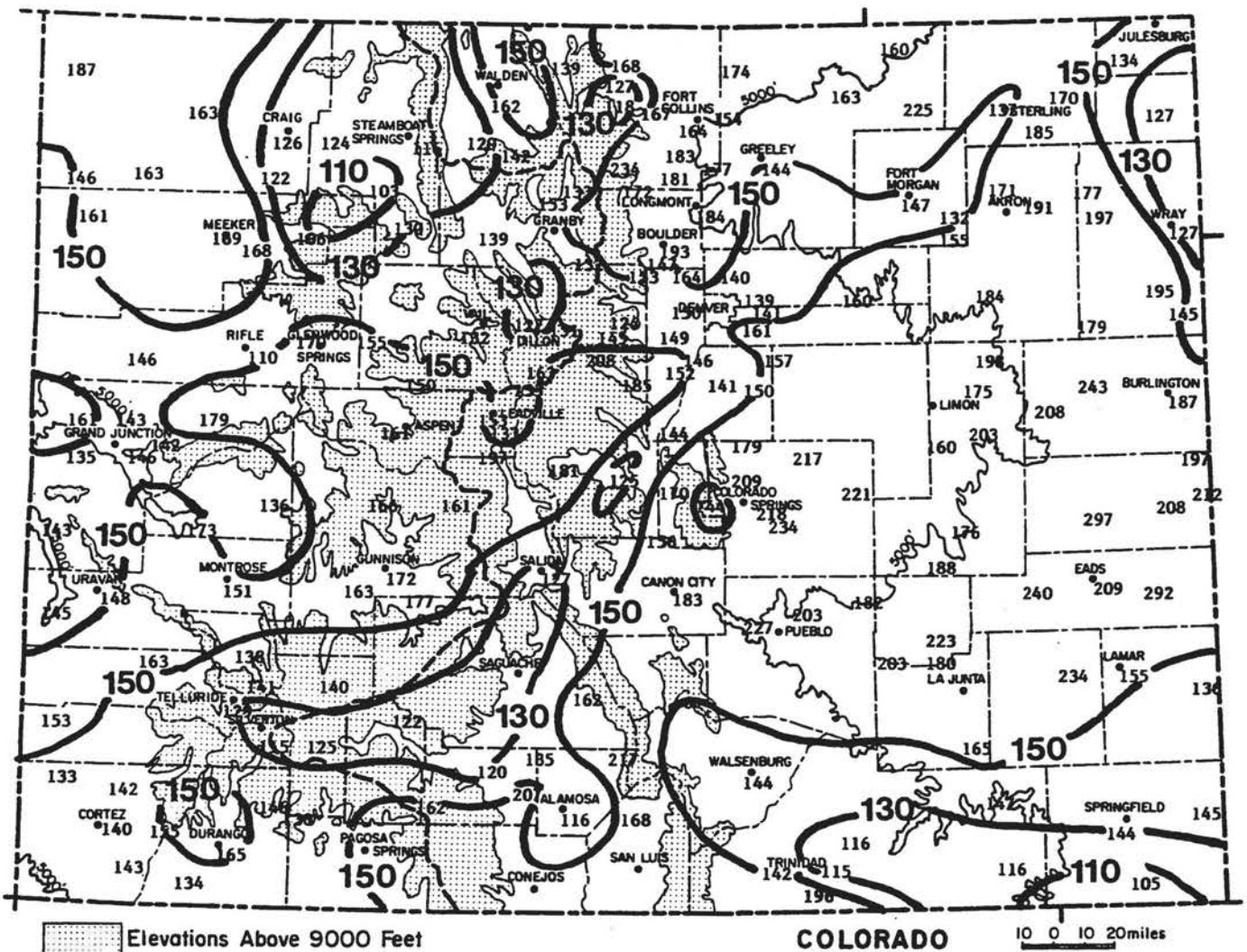
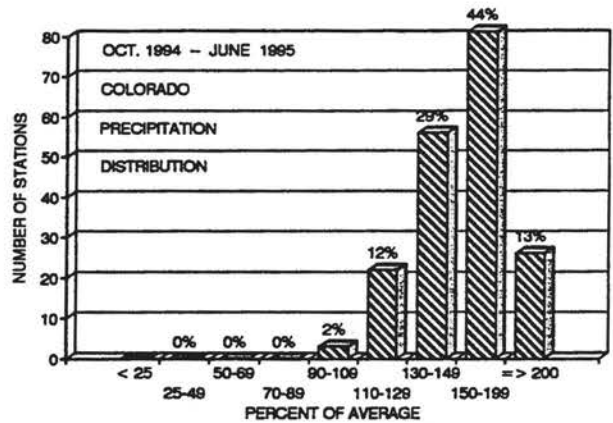
For the second month in a row, practically the entire State was wetter than average. Only about 6% of Colorado's official weather stations received less June precipitation than average. 37% of the weather stations reported at least double the average June rainfall.

### JUNE 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	2.91"	15th wettest in 124 years of record (wettest = 4.96" in 1882)
Durango	0.86"	39th wettest in 101 years of record (wettest = 5.53" in 1927)
Grand Junction	1.32"	10th wettest in 104 years of record (wettest = 2.07" in 1969)
Las Animas	4.60"	3rd wettest in 130 years (wettest = 5.67" in 1965)
Pueblo	2.29"	20th wettest in 126 years of record (wettest = 7.14" in 1921)
Steamboat Springs	0.83"	20th driest in 89 years of record (Driest < 0.01" in 1919)

## 1995 WATER YEAR PRECIPITATION

One would never guess by looking at accumulated water year precipitation totals at the end of June that we had been talking about drought only a few months ago. As of June 30, every weather station in Colorado has received equal to or greater than the normal October-June accumulated precipitation. 86% of Colorado's weather stations have received at least 130% of average, and a remarkable 57% of the stations have received 150% or more of average. Wet areas are spread across all of Colorado. Most of eastern Colorado has received between 150 and 200% of average. Some locations in east central Colorado are on a record-breaking track. For example, Kit Carson has already received 24.17" since October 1, 297% of average. Stratton's 23.08" total is also impressive, 243% of average. The only "not so wet" areas east of the mountains are in extreme northeastern and southeastern Colorado. In western Colorado, water year precipitation varies from about 115% of average at Steamboat Springs and 120% at Del Norte up to 172% of average at Gunnison and 187% at Browns Park Refuge.



October 1994 - June 1995 Precipitation as a Percent of the 1961-90 average.

## COMPARATIVE HEATING DEGREE DAY DATA FOR JUNE 1995

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8548

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	308	667	1053	1473	1559	1193	1014	717	453	174	8749
	93-94	51	118	342	735	1167	1435	1412	1179	930	699	387	89	8544
	94-95	62	63	319	700	1174	1307	1267	882	934	777	538	238	8271
ASPEN	AVE	95	150	348	651	1029	1339	1378	1162	1116	798	524	262	8850
	93-94	232	221	425	718	1188	1351	1290	1172	979	771	443	149	8939
	94-95	106	85	335	704	1095	1265	1317	911	988	832	667	319	8624
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	93-94	5	26	202	508	875	905	905	899	651	514	146	10	5648
	94-95	4	0	77	442	848	890	939	737	703	590	431	121	5782
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	93-94	83	144	357	687	1070	1208	1172	1124	882	762	415	77	7981
	94-95	50	65	286	674	1018	1143	1236	902	968	866	626	M	M
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	6320
	93-94	0	25	189	450	853	978	1080	1068	654	499	144	1	6021
	94-95	4	0	80	370	836	908	1036	797	779	823	440	72	5945
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987
	93-94	0	22	153	435	818	864	886	828	609	468	M	0	M
	94-95	0	0	42	361	695	780	888	645	690	558	330	63	5032
COLORADO SPRINGS	AVE	8	18	164	468	816	1091	1122	924	859	558	302	87	8415
	93-94	0	40	212	519	972	1008	1032	926	749	578	223	14	8271
	94-95	10	14	98	486	811	969	1035	811	810	703	477	152	6376
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	93-94	10	14	165	508	928	1148	1088	1038	695	528	272	14	6404
	94-95	4	0	111	522	891	1012	1151	868	733	652	439	117	6320
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	93-94	87	60	296	619	1168	1369	1317	1237	837	621	295	63	7959
	94-95	13	14	196	613	1133	1316	1332	946	875	692	567	225	7922
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	93-94	13	33	232	596	1052	1245	1231	1010	758	533	238	0	6943
	94-95	0	0	67	423	794	1025	984	655	620	M	269	64	M
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	93-94	1	20	152	488	900	948	946	879	618	485	104	3	5544
	94-95	3	2	57	397	804	890	957	738	674	569	431	115	5637
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	93-94	327	350	579	889	1291	1484	1486	1307	1152	925	630	312	10732
	94-95	265	247	505	845	1192	1378	1494	1109	1167	1005	808	495	10510
DURANGO	AVE	6	37	203	512	848	1172	1246	952	853	594	363	127	6911
	93-94	6	43	201	522	968	1169	1094	1057	695	561	300	20	6636
	94-95	2	2	104	559	952	1025	1193	746	773	658	458	164	6636
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	93-94	53	62	277	603	1116	M	1258	1090	779	839	330	64	M
	94-95	M	M	M	M	M	M	M	M	M	M	M	M	M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	93-94	85	140	347	695	1011	1096	1079	1029	859	710	343	89	7483
	94-95	59	48	286	677	937	1029	1180	893	891	812	633	279	7724
FORT COLLINS	AVE	0	12	178	471	825	1113	1156	913	828	525	272	77	6368
	93-94	5	22	207	533	944	1003	965	994	669	493	141	6	6002
	94-95	3	3	89	460	820	877	1019	787	737	611	431	104	6041
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	93-94	0	19	168	495	1006	M	M	1166	704	550	126	6	M
	94-95	9	8	106	435	898	1030	1178	842	761	644	377	95	6381
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	93-94	4	0	59	410	875	1102	1025	853	540	360	69	0	5297
	94-95	0	0	24	368	832	984	962	596	578	425	256	47	5072

\* = AVES ADJUSTED FOR STATION MOVES    M = MISSING    E = ESTIMATED

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8548

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE 6SSW	AVE	214	260	488	781	1113	1476	1600	1361	1263	945	660	381	10542
	93-94	297	274	496	813	1250	1543	1577	1404	1200	828	526	254	10482
	94-95	205	188	423	761	1154	1456	1430	1034	1165	944	688	403	9851
GREELEY	AVE	0	7	156	446	831	1153	1206	924	806	492	231	52	6308
	93-94	4	15	178	492	955	1021	1005	1059	643	473	109	3	5957
	94-95	1	3	68	441	860	1005	1066	815	718	606	406	90	6061
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	93-94	M	M	M	M	1323	1693	1734	1527	1044	736	460	185	M
	94-95	67	74	343	737	1136	1512	1583	1110	1062	811	599	323	9377
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	93-94	0	12	99	335	925	994	882	555	400	76	0	0	5290
	94-95	0	3	40	288	690	882	934	696	653	486	225	32	M
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10670
	93-94	354	390	561	915	1368	1478	1499	1321	1198	994	662	338	11106
	94-95	310	314	539	895	1257	1408	1500	1135	1220	1058	856	547	11037
LIMON	AVE	8	21	189	521	879	1169	1218	991	924	603	344	96	6961
	93-94	7	48	237	564	1064	1054	1117	1058	768	628	236	16	6797
	94-95	12	13	124	513	925	1043	1117	928	874	717	486	M	M
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	93-94	12	30	246	557	1005	1064	1022	1053	718	533	182	8	6430
	94-95	13	0	62	435	884	949	1076	782	762	618	429	117	6125
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	968	651	394	164	7714
	93-94	54	42	253	565	1077	1317	1258	1098	785	594	290	52	7373
	94-95	13	5	170	578	1087	1207	1306	863	812	692	529	219	7481
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	93-94	14	15	161	520	956	1155	1120	992	664	487	203	9	8296
	94-95	4	2	113	489	895	1072	1068	679	705	589	377	115	6189
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	93-94	94	143	357	M	M	M	M	M	M	M	M	M	M
	94-95	M	M	M	M	1009	M	1253	872	885	757	534	316	M
PUEBLO	AVE	0	0	82	357	735	1051	1091	837	722	396	152	10	5413
	93-94	0	18	155	491	973	1020	1081	915	687	487	143	0	595



## JUNE 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	72.2	46.4	59.3	-3.1	87	33	192	24	353	4.15	1.75	173	13
STERLING	80.2	53.1	66.7	-2.8	96	39	71	128	498	5.23	2.32	180	12
FORT MORGAN	77.4	51.7	64.5	-2.0	91	42	95	87	449	3.33	1.18	155	11
AKRON 1N	76.3	52.0	64.2	-2.8	92	39	104	88	445	4.72	2.01	174	14
AKRON 4E	77.0	49.3	63.1	-3.5	92	37	121	75	429	4.88	2.26	186	12
HOLYOKE	77.9	53.9	65.9	-2.9	94	41	85	121	486	3.00	-0.18	94	12
JOES 2SE	79.4	53.7	66.5	-2.0	93	39	69	125	508	3.74	1.44	163	9
BURLINGTON	79.4	52.0	65.7	-4.1	95	42	72	101	477	3.28	0.90	138	11
CHEYENNE WELLS	80.0	51.3	65.7	-3.8	95	40	73	100	478	3.40	1.02	143	11
EADS	79.8	54.0	66.9	-3.9	94	46	58	123	499	4.55	2.48	220	9
ORDWAY 21N	81.4	51.8	66.6	-2.9	96	41	60	115	488	2.47	1.10	180	13
ROCKY FORD 2ESE	84.4	53.4	68.9	-3.0	97	45	28	152	537	2.87	1.51	211	12
LAMAR	82.8	55.1	68.9	-3.1	98	46	42	167	548	3.48	1.29	159	10
LAS ANIMAS 1N	83.6	55.9	69.8	-3.6	101	48	32	183	554	4.60	2.83	260	13
HOLLY	84.8	54.4	69.6	-2.9	102	45	30	177	546	2.33	-0.65	78	13
SPRINGFIELD 7WSW	81.3	51.7	66.5	-4.0	92	41	52	105	508	2.43	0.41	120	11

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	75.7	49.9	62.8	-2.9	92	41	104	47	414	3.59	1.69	189	19
GREELEY UNC	77.1	50.9	64.0	-4.0	93	42	90	67	437	4.00	2.17	219	14
ESTES PARK	64.8	40.3	52.6	-3.4	80	32	366	0	235	4.65	2.94	272	9
LONGMONT 2ESE	77.9	48.7	63.3	-3.1	94	41	117	70	432	4.27	2.40	228	14
BOULDER	76.1	48.6	62.3	-3.2	90	40	121	46	415	4.03	1.80	181	19
DENVER WSO AP	75.4	50.7	63.0	-3.9	90	40	115	66	418	2.91	1.11	162	12
EVERGREEN	71.3	39.8	55.5	-2.5	89	32	279	5	330	4.52	2.25	199	13
CHEESMAN	74.3	31.1	52.7	-4.8	90	22	362	0	369	3.52	1.69	192	12
LAKE GEORGE 8SW	66.4	39.1	52.8	-2.4	78	33	363	0	254	2.73	1.35	198	13
ANTERO RESERVOIR	66.6	33.6	50.1	-1.8	77	23	440	0	258	1.58	0.44	139	9
RUXTON PARK	57.7	33.5	45.6	-4.4	72	24	576	0	135	3.55	1.05	142	12
COLORADO SPRINGS WSO	72.7	48.6	60.6	-4.6	87	43	152	30	359	7.78	5.52	344	13
CANON CITY 2SE	79.5	52.2	65.8	-2.2	94	45	63	97	473	1.52	0.21	116	8
PUEBLO WSO AP	80.3	49.9	65.1	-4.4	95	42	64	76	457	2.29	1.04	183	11
WALSENBURG	77.9	49.5	63.7	-3.1	89	39	95	63	451	3.29	1.95	246	11
TRINIDAD AP	79.2	50.0	64.6	-4.0	93	41	83	80	464	2.24	0.66	142	12

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	67.6	36.4	52.0	-1.6	78	29	382	0	271	2.00	0.96	192	12
LEADVILLE 2SW	62.9	30.3	46.6	-2.2	71	23	547	0	200	0.86	0.06	108	7
SALIDA	74.5	39.1	56.8	-4.0	86	28	241	2	377	0.79	-0.11	88	6
HERMIT 7ESE	68.0	31.1	49.6	-0.4	82	22	453	0	278	3.44	2.71	471	5
ALAMOSA WSO AP	74.5	39.2	56.9	-2.5	85	28	238	0	376	1.26	0.59	188	4
STEAMBOAT SPRINGS	72.4	37.7	55.0	-0.4	85	30	292	0	343	0.83	-0.72	54	7
YAMPA	66.7	36.9	51.8	-3.3	78	28	390	0	255	2.06	0.57	138	11
GRAND LAKE 1NW	67.9	33.6	50.7	-0.6	78	25	421	0	277	3.71	2.08	228	13
GRAND LAKE 6SSW	67.2	35.3	51.2	-1.0	78	27	403	0	263	2.67	1.44	217	16
DILLON 1E	63.8	32.7	48.3	-2.4	73	24	495	0	218	1.93	0.78	168	12
CLIMAX	55.2	26.8	41.0	-2.5	66	15	713	0	101	0.77	-0.69	53	4
ASPEN 1SW	69.2	39.1	54.1	-1.4	80	30	319	0	296	2.41	1.00	171	10
CRESTED BUTTE	65.3	32.8	49.0	-2.0	75	27	471	0	238	2.01	0.81	167	8
TAYLOR PARK	61.9	31.1	46.5	-3.5	71	26	546	0	188	1.60	0.46	140	7
TELLURIDE	66.4	34.1	50.3	-2.7	76	25	434	0	256	1.72	0.42	132	8
PAGOSA SPRINGS	73.0	35.2	54.1	-3.5	83	26	316	0	354	2.49	1.66	300	8
SILVERTON	63.0	32.3	47.6	-2.6	72	25	514	0	205	1.95	0.55	139	9
WOLF CREEK PASS 1E	56.5	32.3	44.4	-3.4	66	25	609	0	110	2.33	0.46	125	6

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	71.8	42.8	57.3	-3.3	83	33	225	1	336	1.48	0.38	135	7
HAYDEN	74.4	41.9	58.2	-2.3	85	29	203	7	378	1.42	0.20	116	9
MEEKER 3W	74.4	41.3	57.8	-2.2	86	32	219	11	377	1.43	0.43	143	9
RANGELY	77.7	48.1	62.9	-3.9	91	38	102	47	432	1.50	0.68	183	8
GLENWOOD SPRINGS	78.0	43.2	60.6	-3.0	88	35	139	13	432	1.90	0.64	151	10
RIFLE	78.6	43.4	61.0	-3.2	92	35	138	24	429	0.88	-0.07	93	4
GRAND JUNCTION WS	81.9	53.6	67.8	-4.6	96	42	47	138	532	1.32	0.82	264	5
PAONIA 1SW	81.2	48.0	64.6	-1.8	96	35	79	76	477	1.24	0.40	148	9
DELTA	81.6	48.8	65.2	-3.1	94	39	64	76	484	1.90	1.40	380	7
GUNNISON	72.3	35.6	54.0	-1.8	81	28	323	0	341	1.52	0.94	262	7
COCHETOPA CREEK	72.6	35.3	54.0	-1.1	82	26	321	0	345	1.57	0.81	207	8
MONTROSE NO 2	77.4	47.2	62.3	-4.3	89	36	115	42	431	1.29	0.68	211	5
URAVAN	85.6	49.4	67.5	-3.2	96	40	39	121	515	1.48	1.03	329	5
NORWOOD	74.2	41.9	58.0	-2.6	83	29	205	3	375	1.77	0.91	206	3
YELLOW JACKET 2W	77.1	44.6	60.9	-3.1	88	31	137	19	418	0.88	0.33	160	6
CORTEZ	80.7	44.4	62.5	0.4	92	33	117	50	455	0.90	0.38	173	6
DURANGO	76.2	42.9	59.6	-2.5	86	30	164	10	403	0.86	0.18	126	7
IGNACIO 1N	77.4	39.3	58.4	-3.7	87	31	195	2	417	1.79	1.27	344	6

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

**JUNE 1995 SUNSHINE AND SOLAR RADIATION**

**JUNE 1995 SOIL TEMPERATURES**

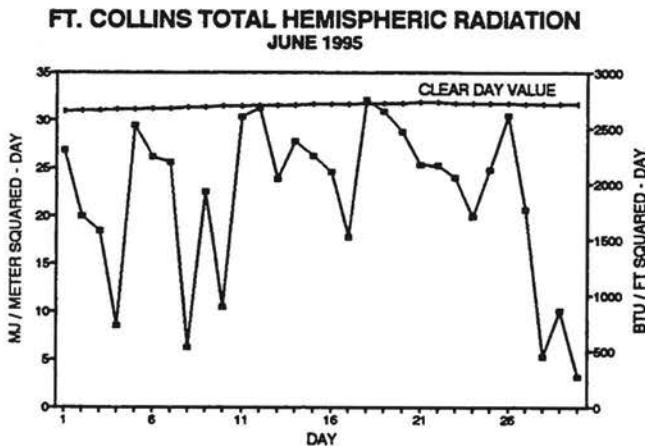
	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	7	10	13	-	-
Denver	NA	NA	NA	59%	71%
Fort Collins	6	15	9	-	-
Grand Junction	12	10	8	79%	80%
Pueblo	NA	NA	NA	64%	79%

Soil temperatures in June continued to lag behind average but warmed up enough to allow germination and growth of warm weather plants. Cooling occurred again late in the month leaving near-record low soil temperatures for early summer at the end of the month.

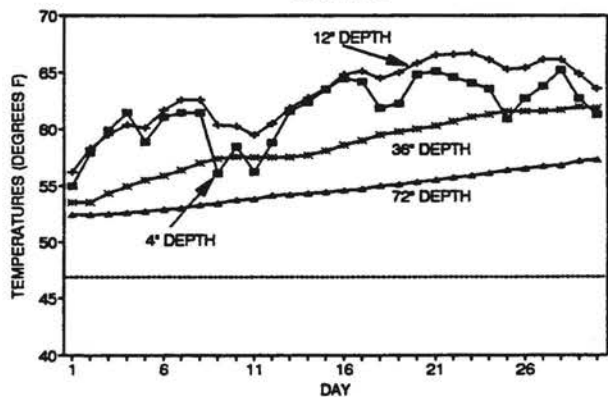
These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Colorado enjoyed much more sunshine than during either April or May, but cloudcover was still more extensive and persistent than normal. The dense cloudiness June 28-30th was extremely unusual for early summer. Cloudiness was greatest along the Front Range and across northeastern Colorado.



**FORT COLLINS 7 AM SOIL TEMPERATURES JUNE 1995**



**HATS OFF TO: Marvin Rankin of Westcliffe, Colorado**

Marvin Rankin, Colorado's highest ranking weather observer in terms of years of service, is preparing to retire after a remarkable career of 56 years as the Westcliffe weather observer. Mr. Rankin received special honors at the Centennial Celebration for cooperative weather observations back in 1991. The Rankin family deserves recognition and thanks not only from us but from everyone who utilizes Colorado climate data. We thank you so much!!

## HOW HARD CAN IT RAIN?

At any location in Colorado, precipitation typically falls 200 to 400 hours per year. This increases to over 500 hours per year in high mountain areas in northern and central Colorado. But of these hundreds of hours, most of them bring light precipitation (0.10" or less of precipitation per hour). In most years and at most places, only a handful of hours per year bring heavy precipitation (more than 0.30" of precipitation per hour). Occasionally, much more rain can fall in an hour. These intense rains happen infrequently, but for certain applications, they are the most important hours of the year.

Whenever a dam, a bridge, a highway, an office building, a parking lot, a subdivision, or even a house is built, it is important to have a good idea of how hard it can rain. How we handle runoff from heavy storms is often taken for granted, but it can make all the difference in the world. It may be a minor inconvenience if it rains so hard that the gutters on your roof can't carry the water away as fast as it falls. That inconvenience turns into a problem if the water in a subdivision flows into someone's basement instead of into a detention pond, ditch or storm sewer. That problem turns into great frustration if the water floods an intersection or underpass during rush hour, stalling dozens of cars. That frustration turns into a nightmare when water sweeps over culverts, cuts across roads, destroys bridges and carries away cars or homes. The nightmare becomes a total disaster if one of Colorado's many dams were to give way to the flood waters. Since 1900, about 320 Coloradans have been killed by flash flooding.

By knowing how hard it can rain, and by having a reasonable idea of how often it rains that hard, engineers and planners can do a pretty good job of designing homes, buildings, parking lots, roads, bridges, dams and spillways that will safely carry away the water from most storms. If money was no object, we could do even better and hardly ever suffer flood damage. But the cost of total safety is high. To accomplish total safety would mean that we humans would have to overcome our natural desire to live, work and play close to water. When left to our own devices we reliably choose to build and develop in flood plains.

The Colorado Climate Center is currently working on a fascinating research project for the State of Colorado, Department of Natural Resources, Water Resources Division examining heavy rains in Colorado. By investigating tons of data from all over the State, we hope to be able to better answer the question, "How hard can it rain?"

This study began early this year. In recent months we have assembled information from as many weather stations as possible to help identify the times, places and intensities of the heaviest rains in Colorado. We are examining maximum precipitation totals from recording raingages for 1-hour, 2-hour, 3-hour, 6-hour, 12-hour and 24-hour periods. Many of Colorado's weather stations only measure precipitation totals once each day. For these many stations we are identifying the maximum 1-day, 2-day and 3-day precipitation totals for each year since data collection began.

A list of the heaviest rainstorms that have been historically documented is now being assembled. We will be studying these storms in more detail to see how large, how intense, and how long-lasting extreme precipitation has been.

We will be working on this project for another full year, but let me show you a few things that we have found so far. For starters, here is an updated list of the largest one-day precipitation totals at selected locations in Colorado. (We showed similar information back in the June 1985 issue of *Colorado Climate*).

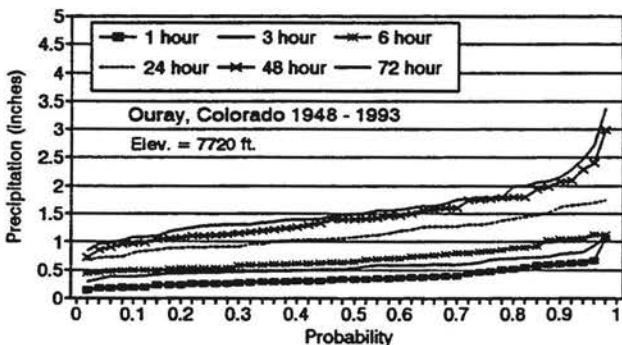
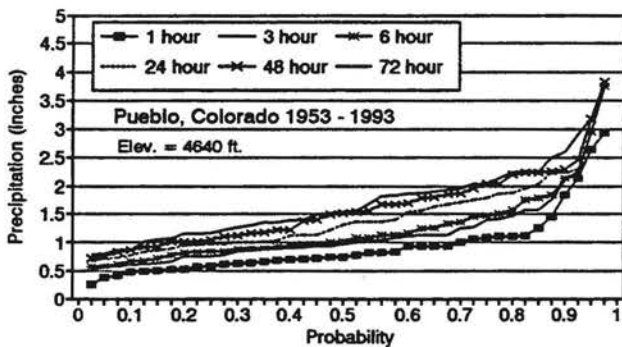
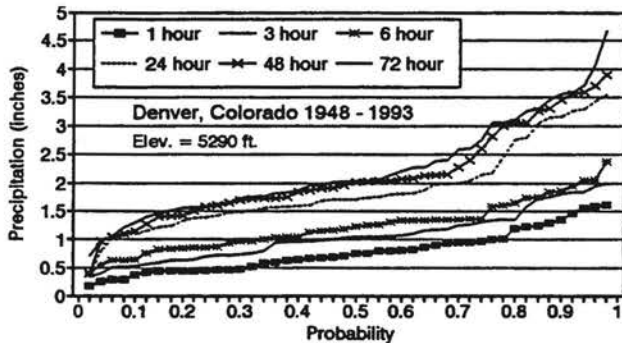
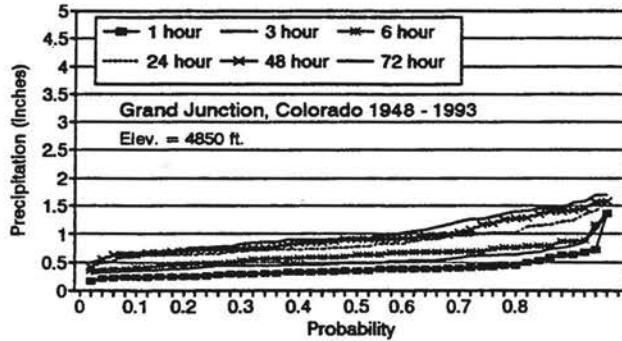
Maximum Observed One-Day Precipitation (Inches)			
Location	Amount	Date	Yrs of Record
Alamosa	1.78	Jul 28, 1939	61
Aspen	2.87*	Mar 14, 1960	68
Boulder	4.80	Jul 31, 1919	100
Burlington	4.00	Oct 19, 1908	101
Canon City	4.31	May 30, 1894	101
Colorado Spr	3.64	Jul 7, 1947	53
Cortez	2.20	Dec 16, 1908	86
Craig	1.96	Aug 7, 1970	63
Denver	6.50	May 22, 1876	125
Dillon	2.34	Dec 1, 1909	86
Durango	3.65	Oct 19, 1972	98
Eagle	1.75	Jun 2, 1943	63
Fort Collins	4.43	July 25, 1977	117
Grand Junction	1.87	Sep 22, 1941	104
Gunnison	1.60	Feb 21, 1894	101
Lamar	5.64	May 29, 1964	100
Leadville	2.10	Dec 24, 1983	53
Meeker	3.24	Aug 10, 1925	59
Montrose	1.70	Oct 20, 1963	106
Pueblo	2.95	Aug 29, 1955	40
Silverton	4.05	Oct 5, 1911	88
Steamboat Spr	2.71	Mar 2, 1929	93
Sterling	4.88	Aug 15, 1968	85
Trinidad	4.52	Jul 3, 1981	46

\* = questionable data

The heaviest rainfall rates (rainfall per hour or day) in Colorado occur east of the mountains. Holly, in extreme southeastern Colorado reported 11.08" of rain in 24 hours back on June 17, 1965, the heaviest rainfall in Colorado at an official weather station. There have been heavier unofficial reports, however, and some of these are likely true. The storms that caused the devastating flood in the Big Thompson Canyon the evening of July 31, 1976 dropped approximately 12" in 5 hours. A similar amount of rain fell near Penrose, Colorado the night of June 3, 1921 during an 18-hour period. The infamous Plum Creek storm of June 16-17 of 1965 dropped more than 14" of rain in several areas north and east of Colorado Springs. Although very localized, the "Daddy of 'em all" was the day and night of May 30, 1935. A system of storms managed to miss nearly every official raingage, but results of special post-storm surveys known as "bucket surveys" suggested that close to 24" of rain

may have fallen in two small areas of eastern Colorado, one near Elbert and the other north of Burlington. It is possible that these estimates could be off by several inches, but even if they were – imagine what your neighborhood would be like if you got more than 15" of rain in less than 24 hours. It would not be pretty.

Maximum Observed Precipitation Amounts for Specified Durations



Our primary focus in this study is on the really big storms, but in the process we are examining the heaviest precipitation that has fallen in every month of every year at every station in Colorado as far back as data have been collected. In so doing, you can see why it is easy for us to get complacent and not be too careful in where we put our structures and how well we build them. In Grand Junction, for example, in 75% of all years there have been no storms with more than 1.00" of rain in 24-hours at the National Weather Service airport weather station. Only 17% of the years since 1948 had maximum one-hour rainfall totals greater than 0.50". Much more rain falls east of the mountains, but even so, most years do not bring heavy rains to any individual point. Maximum daily rainfall is less than 2.00" in approximately 75% of all years based on Denver weather observations taken at Stapleton Airport. Half of all years never see a maximum hourly rainfall total of more than 0.75".

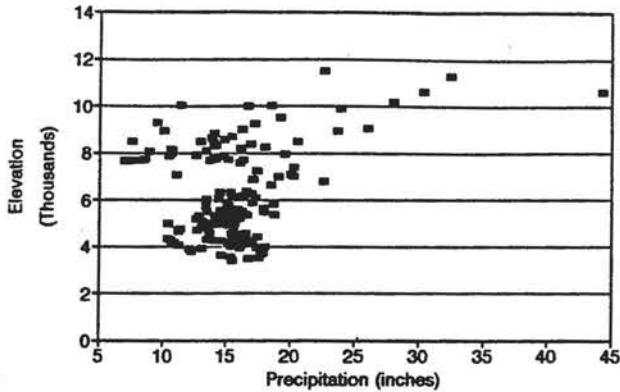
The graphs to the left show the observed distribution of maximum annual precipitation totals for various time periods for selected locations. It takes a while to get used to looking at these graphs, but they say a lot about the likelihood of heavy precipitation. Precipitation amounts for the various storm durations at the 0.5 probability are equivalent to what engineers and hydrologists call a 2-year storm. At the higher end of the scale, the 0.8 nonexceedance probability is a 5-year storm, the 0.9 probability is a 10-year storm. The precipitation values associated with a 0.99 nonexceedance probability is an estimate of the 100-year storm. Interesting observations from these graphs are that 72-hour precipitation is only slightly greater than 48-hour since most heavy Colorado storms do not last longer than 2 days. Also, it is interesting that Denver gets greater precipitation than Pueblo for long duration storms, but Pueblo exceeds Denver in short duration.

We are also looking into the very interesting question of how intense rainfall changes with elevation. While annual and seasonal precipitation totals increase with elevation in most areas of Colorado, intense precipitation rates decrease with elevation. Much of the work we will be doing in the next year will be looking in greater detail at storm characteristics at higher elevations where many dams and reservoirs have been built during the past 100 years.

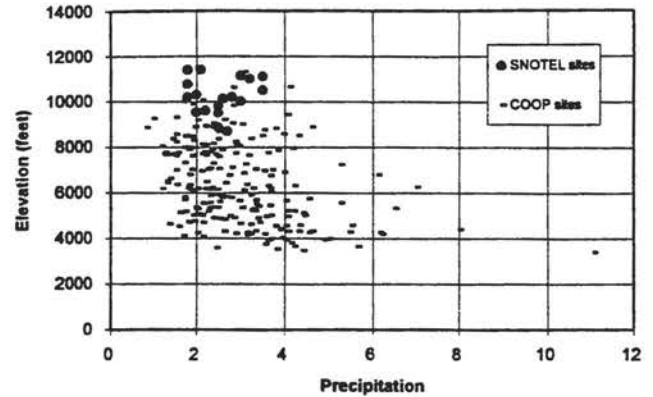
One of the important things to remember when considering and designing for heavy precipitation is that for some applications, of which dams and spillways may be the best example, it is not how heavy it has rained in the past 10, 25, 50 or 100 years that matters. Rather, what matters most is how heavy it could rain anytime after the structure is built. Whenever I look at the graph of maximum daily precipitation each year at Denver, it makes me stop and think. If the weather station had not been there back in 1876, we would be tempted to believe that anything greater than 4" in 24-hours is a huge rain. But the 6.50" that fell back on May 22, 1876 puts that in perspective and has encouraged engineers to design structures a bit more conservatively.



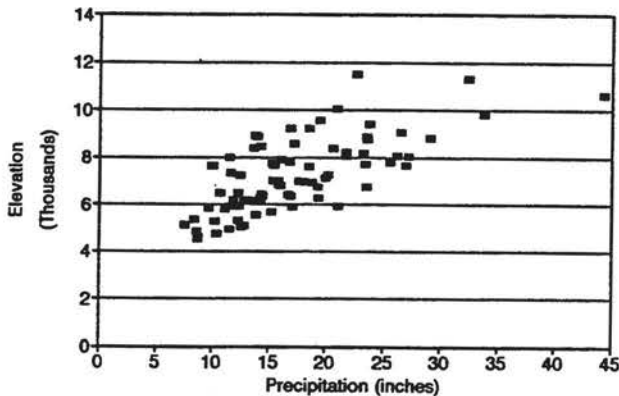
### Elevation vs Oct-Sept Avg Precip East of the Continental Divide



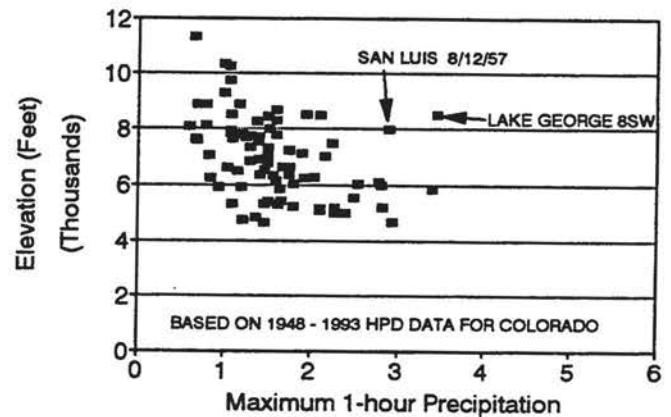
### Maximum 1 day Precipitation vs Elevation



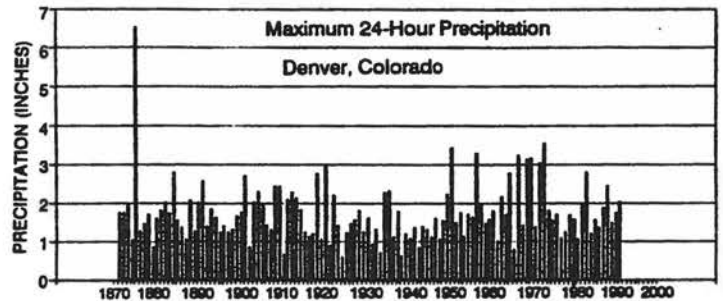
### Elevation vs Oct-Sept Avg Precip West of the Continental Divide



### Max. 1-hour Precipitation vs. Elevation



Finally, have you ever wondered, during a truly intense thunderstorm downpour, just how hard it can rain for brief periods. There are a few documented instances (none yet in Colorado, to my knowledge) where more than 1" of rain has fallen in one minute. The maximum rates observed for very short time periods here in Colorado have been on the order of 0.30 - 0.40" per minute. These cloud bursts usually last less than 5 minutes. Rainfall totals of around 1" in ten minutes (a rainfall rate of 6" per hour) do occur occasionally, primarily east of the mountains. Anything over a total of 2" in an hour constitutes a very heavy storm capable of causing flooding. A handful of stations in eastern Colorado have reported more than 3" in an hour. Only a few storms (fortunately) maintain high rainfall rates for longer time periods. These are the ones that really scare us and these are the ones that have claimed many lives – the Cheyenne, WY storm of 1985, the Big Thompson storm of 1976, the Plum Creek storm of 1965, the eastern Colorado storm of 1935 and the Pueblo storm of 1921. These storms have struck before and will strike again. The odds say that most of us will never experience such a tumult, but some of us will. Therefore, it is best that we all be prepared.



### HAVE YOU WITNESSED A BIG STORM?

Tell us about it!!

If you have any information on exceptionally heavy storms (greater than 4" in 6-hours) or intense short-duration rainfall rates in excess of 0.30" per minute or 3" per hour, please bring them to our attention. Extreme storms can be very localized and can miss the official raingages. Your reports of these heavy storms could help our current study and could impact engineering design and construction in the future. Please share your information with us.

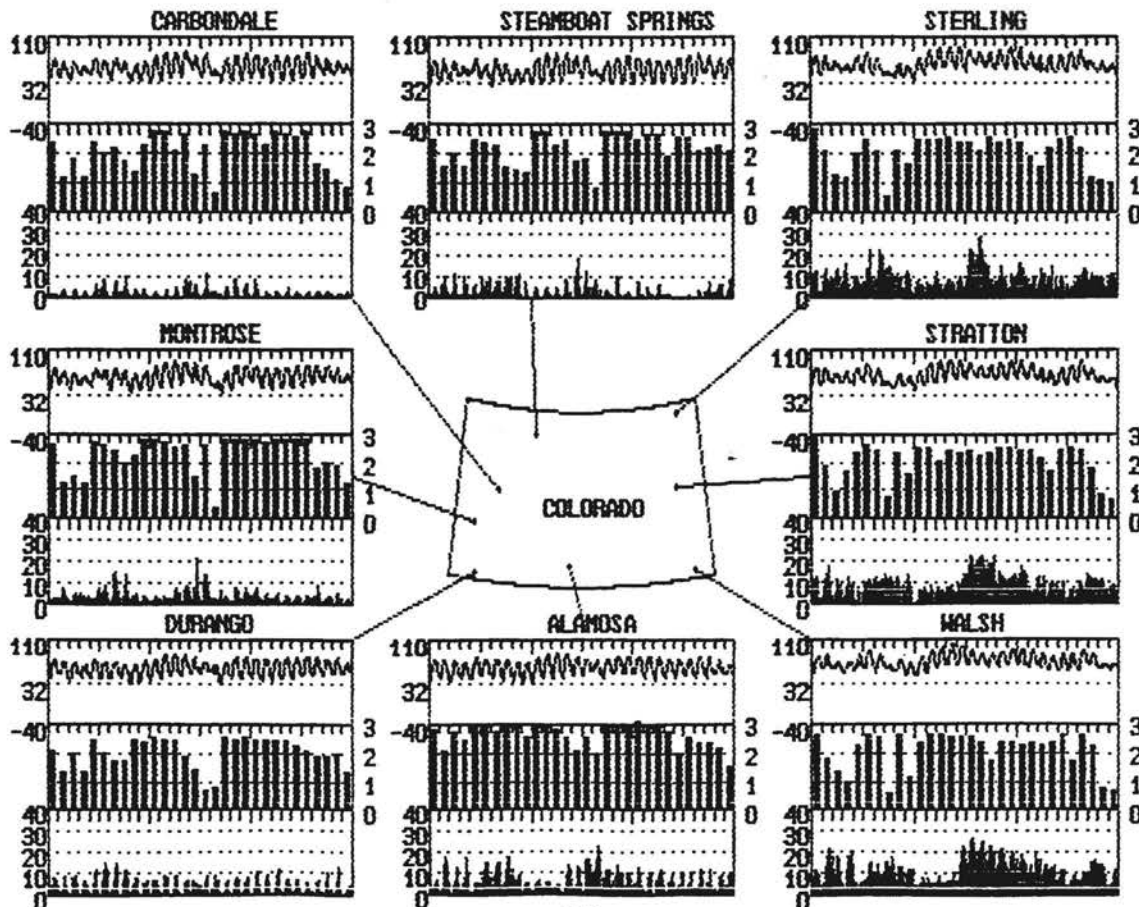
WTHRNET WEATHER DATA

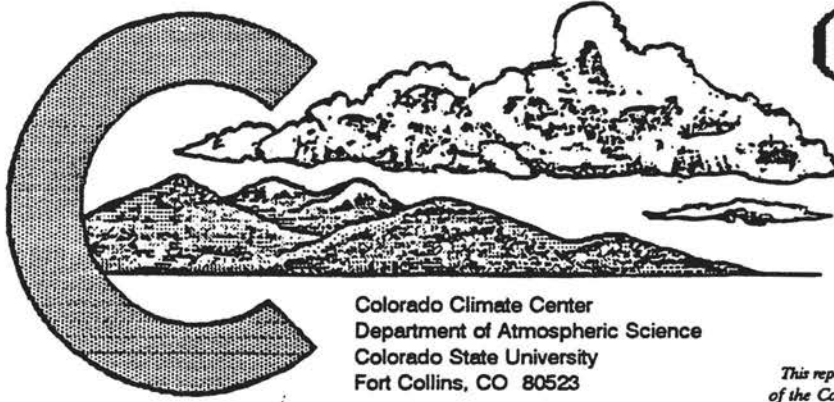
JUNE 1995

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	58.3	56.5	57.3	61.5	53.5	63.7	64.9	68.1
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	84.2 13/15	81.3 13/14	85.5 14/15	88.2 13/14	82.2 27/13	92.7 14/16	92.3 13/14	98.2 14/14
minimum:	30.7 10/ 5	28.9 9/ 5	32.7 11/ 5	35.1 9/ 5	28.6 7/ 5	32.0 29/ 0	32.0 29/ 0	44.1 11/ 2
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	82 / 37	69 / 34	90 / 39	65 / 37	86 / 34	49 / 37	38 / 34	85 / 52
11 AM	31 / 42	30 / 40	42 / 47	30 / 41	39 / 44	21 / 35	30 / 45	46 / 55
2 PM	24 / 40	25 / 38	35 / 44	23 / 39	30 / 41	16 / 35	30 / 49	37 / 52
5 PM	27 / 39	25 / 37	36 / 43	25 / 39	34 / 41	18 / 35	29 / 48	37 / 51
11 PM	51 / 38	51 / 36	66 / 42	43 / 37	81 / 41	38 / 37	35 / 39	67 / 53
monthly average wind direction ( degrees clockwise from north )								
day	180	190	226	232	212	185	147	161
night	153	75	122	144	106	190	184	211
monthly average wind speed ( miles per hour )	4.98	2.76	1.16	2.72	1.79	7.63	7.84	9.88
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	301	457	539	482	490	99	145	55
3 to 12	353	249	85	226	144	524	451	421
12 to 24	66	10	0	12	2	92	124	233
> 24	0	0	0	0	0	5	0	11
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	2618	1999	2049	2289	2181	2021	2091	2078
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	112	202	209	190	226	197	166	227
40-60%	53	95	101	73	96	79	76	57
20-40%	39	74	74	67	67	70	66	65
0-20%	17	50	45	36	30	72	59	67

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

**JULY 1995**  
 Volume 18 Number 10

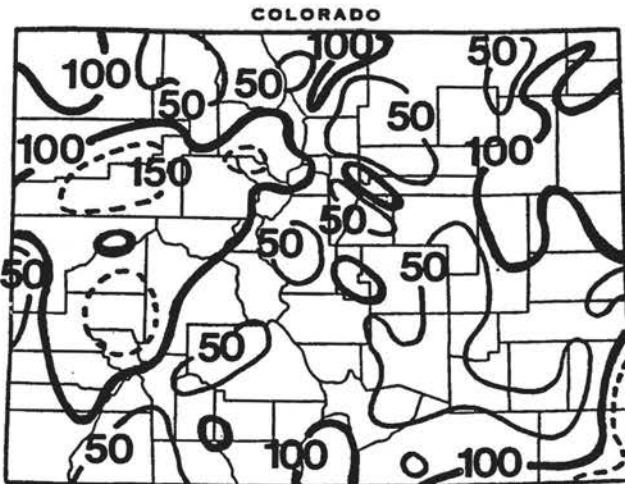
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## July Climate in Perspective – Hot Weather Arrives

The endless cold, damp spring of 1995 finally loosened its grip but not before snow and cold rain chilled many Fourth of July activities. Two separate week-long statewide heatwaves sent Coloradans scurrying for sunblock, beachtowels and air conditioners. Thunderstorms were common in early and mid July, but were sparse later in the month. Overall, July ended up a cooler than average statewide and drier than average over all but west central and extreme eastern Colorado.

### Precipitation

July got off to a very wet start with more soaking rains adding to already high rivers in western Colorado the first few days of the month. But after that, the daily



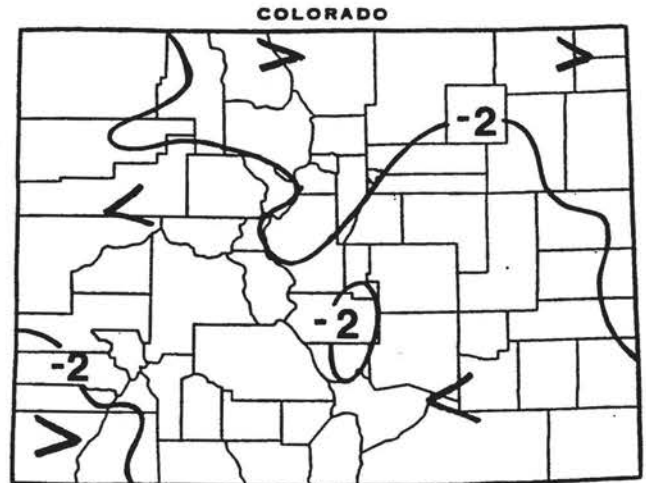
July 1995 precipitation as a percent of the 1961-1990 average.

thunderstorms, that are so much a part of the natural daily cycle in mid summer, were much less numerous than usual.

There were a few local downpours (32 reports of at least 1 inch of rain in 24 hours), but very few days with monsoonal moisture reaching northward into the State triggering widespread thunderstorm activity. Precipitation totals ended up less than 50% of average over several parts of Colorado. Above average rainfall was limited to west central Colorado and some locations on the Eastern Plains. Longmont got by with just 0.31" (27% of average) for the month while Walsh picked up 6.00" (204% of average).

### Temperatures

Two searing statewide heatwaves lifted the mercury into the 70s and 80s in the mountains and 90s and 100s at lower elevations. They were not enough to make up for the very chilly first 5 days of the month, the pleasant days in mid July and the surprisingly cold weather of the 31st. As a result, temperatures at most stations ended up 1 to 3 degrees Fahrenheit cooler than average with a few locations in southwest Colorado 4 degrees below normal.



Departure of July 1995 temperatures from the 1961-90 average.

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## JULY 1995 DAILY WEATHER

- 1-5 July got off to a chilly start. Most of the State experienced high temperatures each day 15-25 degrees cooler than average. Thunderstorms were numerous over western Colorado 1-3rd. Palisade reported 0.83" on the 1st, and Wolf Creek Pass was soaked with 2.67". The Meredith weather station totalled 2.22" for the 4 days ending on the 4th. As a cold front swept across Colorado on the 3rd, rain changed to snow in the Northern and Central Mountains above 10,000 feet leaving several inches of new snow on the high country for the 4th of July. High temperatures in the mountains on the Fourth only reached the 40s and 50s which encouraged many campers to head home early. Areas east of the mountains were spared much rain, but the Walsh weather station was inundated by 3.80" late on the 1st. Bands of showers dampened some picnics on the 4th. Skies cleared on the 5th, and temperatures began to climb.
- 6-12 Cold weather was soon forgotten as a large high pressure ridge developed over the Rockies. By the 8th, daytime temperatures were in the 90s, and Grand Junction hit 100° for the first time this summer. The 10-12th were extremely hot causing some of Colorado's rivers and streams to reach an unusually late secondary snowmelt peak. The Roaring Fork near Carbondale approached record levels but caused minimal damage. The heat was especially fierce in northeastern Colorado. Yuma hit 105° on the 11th. Sterling surpassed 100° five days in a row including 106° on the 11th and 105° on the 12th. Sunshine was the rule until clouds increased from the southwest on the 12th. Widely scattered high-based thunderheads developed each afternoon, 7-12th, producing lightning and gusty winds. Very little rain reached the ground. A wind gust in Denver on the 10th injured a man when a large tree was toppled.
- 13-14 A moister airmass moved into western Colorado on the 13th, and temperatures returned to normal. Many thunderstorms developed on the Western Slope. Damaging wind gusts struck the Steamboat area. Telluride picked up 0.72" of rain. The stormy area shifted eastward on the 14th along with cool temperatures. Heavy storms fell from the Pikes Peak area northeastward to Nebraska. The Sedgwick 5S weather station picked up 2.93" from the storm.
- 15-16 High pressure at the surface and cool air aloft produced mostly dry and cool weather with just a few scattered late day thundershowers. Daytime temperatures were very comfortable (70s and 80s at lower elevations). Nighttime temperatures fell into the 30s in the mountains.
- 17-19 Temperatures remained below normal. Some monsoonal moisture reached southern Colorado, while humid air over the plains states moved toward Colorado from the east. Scattered storms developed on the 17th. A few gained strength over the northeast plains. Yuma picked up 1.65" of rain, while the Leroy 5WSW station near Sterling got dumped on with 3.48". Showers were numerous on the 18th but mostly light. A cold front pushed into Colorado from the northwest early on the 19th and triggered morning storms across northern Colorado spreading east and south during the day. 2.31" of rain fell in a short time at the Buckhorn weather station west of Fort Collins. Hail 3" deep accumulated south of Burlington.
- 20-23 West to northwest winds aloft brought drier air to Colorado along with slightly cooler than average temperatures. A few storms developed each day. Except for some moderate rains out on the plains, most storms had gusty winds but little rain.
- 24-30 Another heatwave sent temperatures toward the 100° mark at lower elevation stations. Sunshine was relentless 24-28th. Holly reached 105° on the 26th. The hottest temperature in the State for the month was 107° at LaJunta 20S on the 28th. Steamboat Springs climbed to 92° on the 29th. That same day, Grand Junction and Uravan baked with 104° and 105°F, respectively. A few storms developed on the 29th. Many strong wind gusts were reported. A cold front arrived late on the 30th to end this heatwave. Accompanying storms dropped 1.25" of rain at Kit Carson and 1.32" at Genoa during the night.
- 31 Low clouds, drizzle and fog surprised residents of northeast Colorado, and daytime temperatures stayed in the 50s and 60s. This was one of the most dramatic one-day temperature changes for mid summer on record. At the new Denver airport (DIA) the high reached 62° compared to 95° on the 30th. Only small amounts of light rain and drizzle were reported. Western Colorado also enjoyed cooler temperatures but with less fanfare.

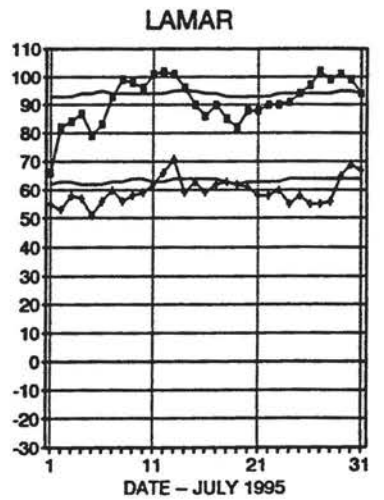
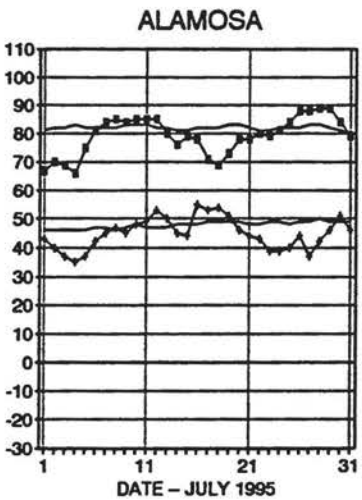
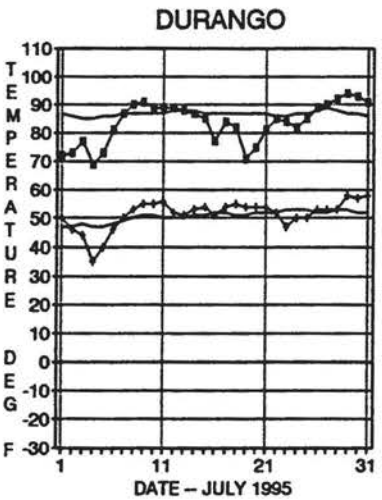
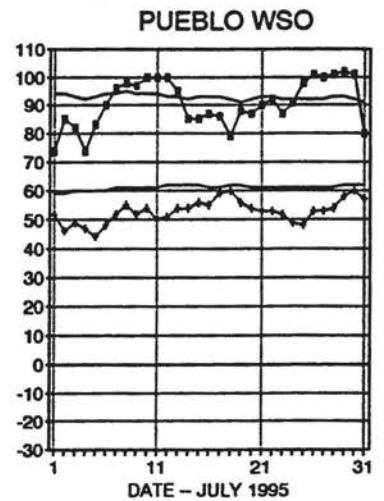
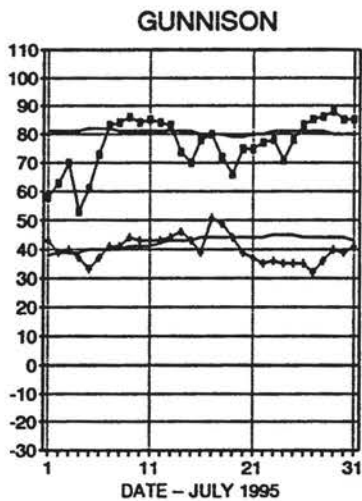
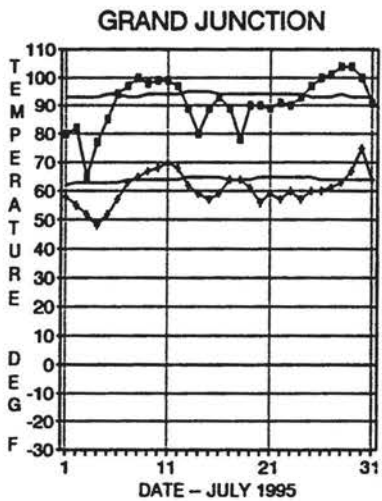
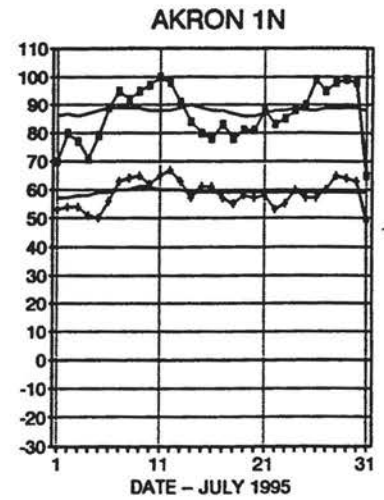
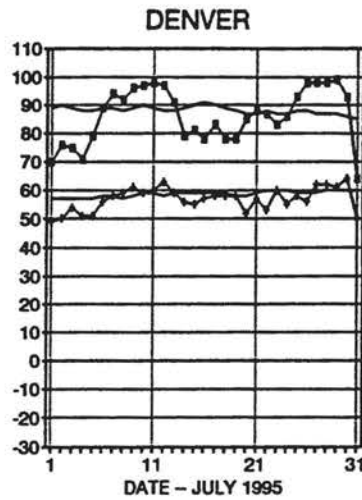
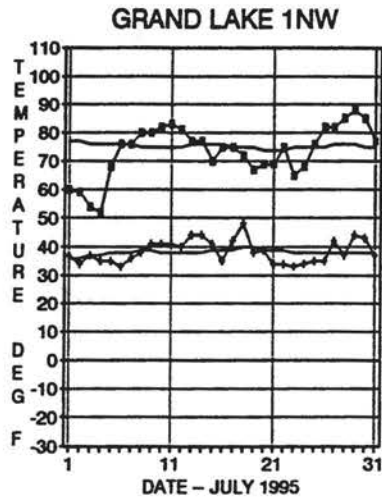
Weather Extremes			
Highest Temperature	107°F	July 28	LaJunta 20S
Lowest Temperature	12°F	July 4	Climax
Greatest Total Precipitation	6.00"		Walsh
Least Total Precipitation	0.31"		Longmont
Greatest Total Snowfall	2"		Climax
Greatest Snow Depth	2"	July 3	Climax



## JULY 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

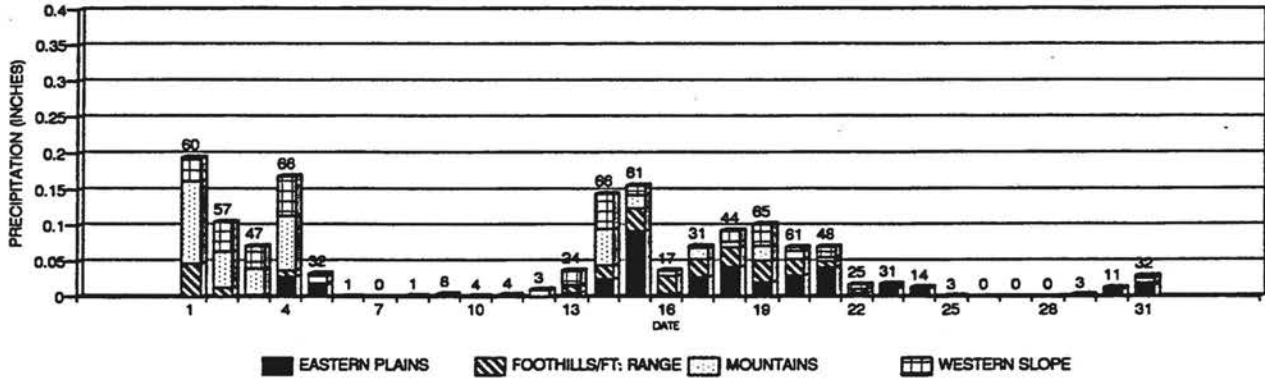


# JULY 1995 PRECIPITATION

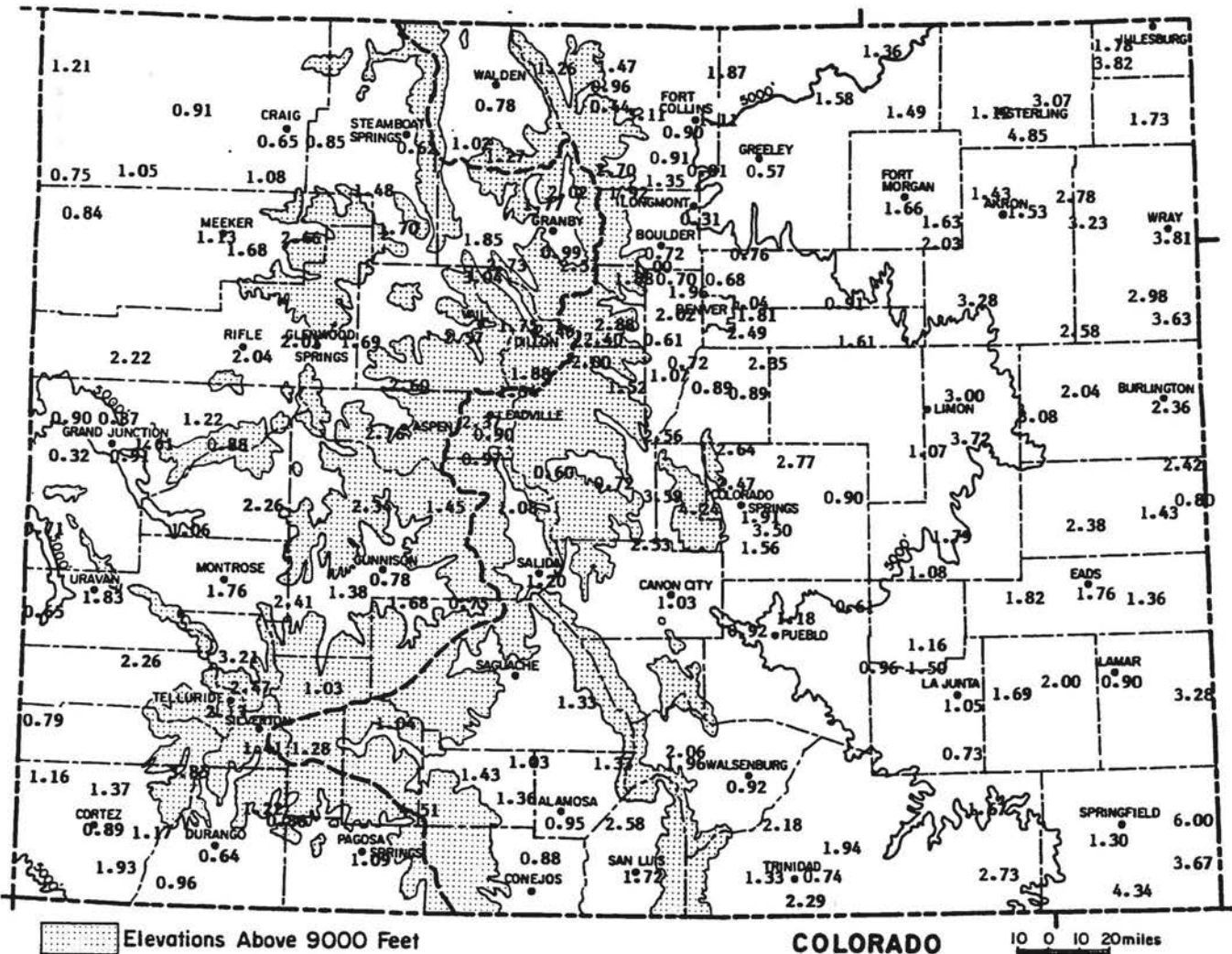
The first 4 days of July contributed the majority of the month's precipitation for much of western Colorado. Thundershowers were a daily occurrence from the 13th to the 23rd and provided most of eastern Colorado's July rainfall. Very little precipitation fell during the two 7-day heatwaves

6-12th and 24-30th. State-averaged precipitation for July totalled 1.57" compared to a normal of 1.96". July is often the wettest month of the year for Colorado in terms of accumulated statewide precipitation, but that was not the case this year.

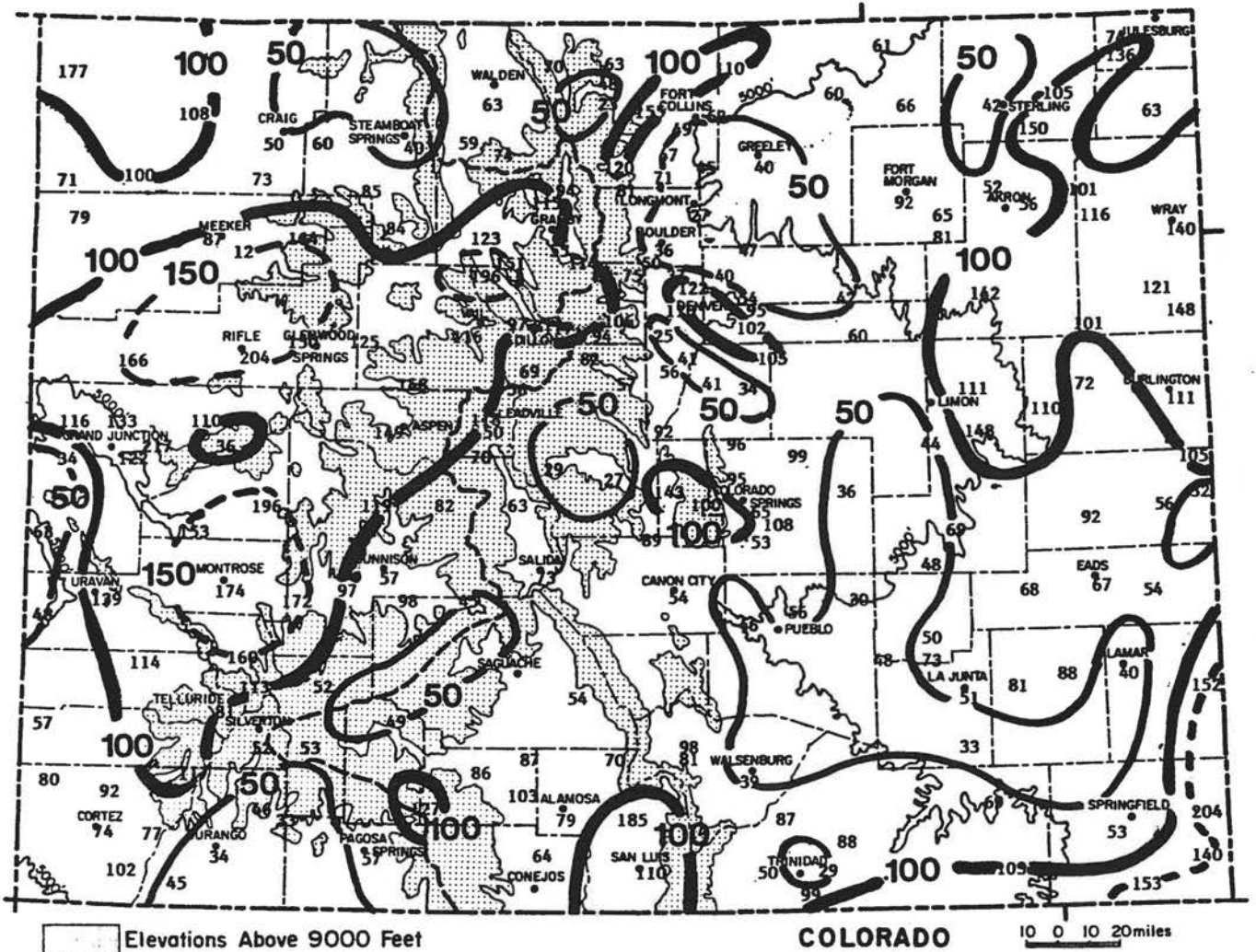
### COLORADO DAILY PRECIPITATION - JUL 1995



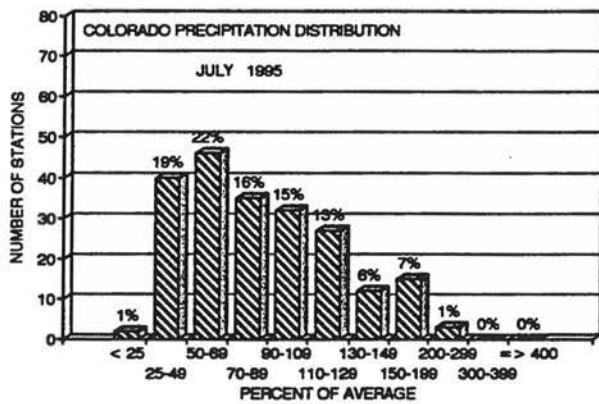
(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)



## JULY 1995 PRECIPITATION COMPARISON



July 1995 Precipitation as a Percent of the 1961-90 average.



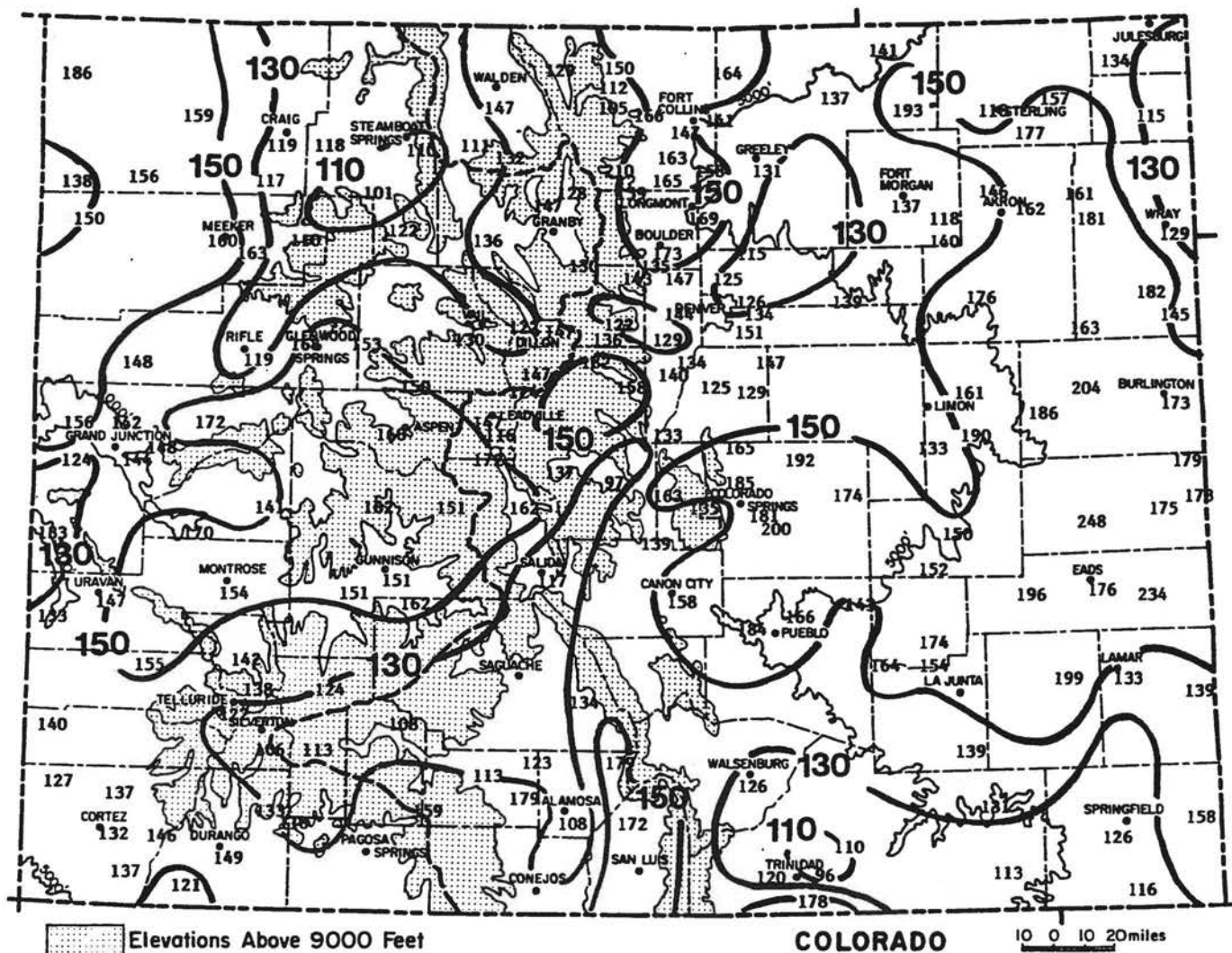
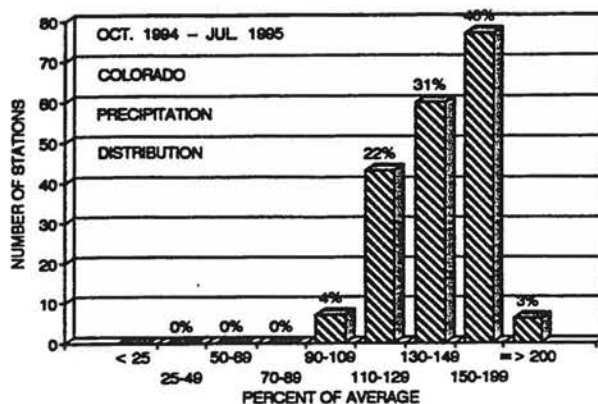
The majority of Colorado weather stations were drier than average in July. 20% of the stations reported less than 50% of average, and close to 2/3 of all reporting station had less than average. There were some wet areas, however, and 8% of the stations received at least 150% of average.

### JULY 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	1.04"	42nd driest in 124 years of record (driest = 0.01" in 1901)
Durango	0.64"	10th driest in 101 years of record (driest = 0.02" in 1900)
Grand Junction	0.87"	29th wettest in 104 years of record (wettest = 2.72" in 1929)
Las Animas	1.69"	56th wettest in 130 years (driest < 0.01" in 1901)
Pueblo	1.18"	42nd driest in 126 years of record (driest = 0.09" in 1987)
Steamboat Springs	0.62"	13th driest in 89 years of record (driest < 0.01" in 1898)

## 1995 WATER YEAR PRECIPITATION

While most of Colorado received less than average precipitation for July it was barely noticeable and almost welcomed. Snowmelt runoff kept streamflows very high during July on many of Colorado's rivers and streams. Direct runoff was available for irrigation in many areas so that reservoir water could be retained for later use. As of the end of July, accumulated precipitation for the water year was above average at all but 2 reporting stations, and those stations were very close to average. Nearly half of Colorado's official weather station have precipitation totals for the year exceeding 150% of average making this an exceptional year for the State. These wettest areas include northwest Colorado, the Central Mountains, the northern Front Range and a large area on the Eastern Plains. Kit Carson, in Cheyenne County, has already totalled 26.55" of precipitation for the water year, 248% of average.



October 1994 - July 1995 Precipitation as a Percent of the 1961-90 average.



## COMPARATIVE HEATING DEGREE DAY DATA FOR JULY 1995

HEATING DEGREE DATA													COLORADO CLIMATE CENTER (970) 491-8546																
STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN	STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	308	667	1053	1473	1559	1193	1014	717	453	174	8749	GRAND LAKE 6SSW	AVE	214	260	468	781	1113	1478	1600	1381	1283	945	660	381	10542
	94-95	82	53	319	700	1174	1307	1287	882	934	777	538	238	8271		94-95	205	188	423	761	1154	1458	1430	1034	1165	844	688	403	9851
	95-96	102												102		95-96	270												270
ASPEN	AVE	95	150	348	651	1029	1339	1376	1182	1116	798	524	282	8850	GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	94-95	106	85	335	704	1095	1265	1317	911	988	832	667	319	8624		94-95	1	3	68	441	860	1005	1068	815	718	606	408	90	6081
	95-96	194												194		95-96	282												282
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554	GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	308	10516
	94-95	4	0	77	442	848	890	939	737	703	590	431	121	5782		94-95	87	74	343	737	1138	1512	1583	1110	1062	811	599	323	9377
	95-96	16												16		95-96	204												204
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003	LAS ANIMAS	AVE	0	0	89	338	750	1088	1141	862	707	370	121	9	5455
	94-95	106	85	288	674	1018	1143	1236	902	966	866	628	M	M		94-95	0	3	40	288	690	882	934	696	653	466	225	32	4929
	95-96	134												134		95-96	0												0
BURLINGTON	AVE	0	9	138	432	822	1132	1175	948	859	519	254	34	6320	LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	728	439	10870
	94-95	4	0	80	370	836	908	1036	797	779	623	440	72	5945		94-95	310	314	539	895	1257	1406	1500	1135	1220	1058	856	547	11037
	95-96	20												20		95-96	385												385
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987	LIMON	AVE	6	21	189	521	879	1169	1218	991	924	803	344	96	6961
	94-95	0	0	42	361	695	780	888	645	690	558	330	63	5032		94-95	12	13	124	513	925	1043	1117	928	874	717	486	M	M
	95-96	17												17		95-96	M												M
COLORADO SPRINGS	AVE	8	18	164	468	816	1091	1122	924	859	558	302	87	6415	LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	94-95	10	14	98	468	811	969	1035	811	810	703	477	152	6376		94-95	13	0	62	435	884	949	1078	782	762	816	429	117	6125
	95-96	38												38		95-96	14												14
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667	MEEKER	AVE	28	56	261	564	927	1240	1345	1066	998	651	394	164	7714
	94-95	4	0	111	522	891	1012	1151	688	733	652	439	117	6320		94-95	13	5	170	578	1087	1207	1306	863	812	692	529	219	7481
	95-96	24												24		95-96	67												57
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376	MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	94-95	13	14	196	613	1133	1316	1332	946	875	692	567	225	7922		94-95	4	2	113	489	895	1072	1068	679	705	589	377	115	6108
	95-96	75												75		95-96	34												34
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927	PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	758	512	244	8548
	94-95	0	0	67	423	784	1025	984	655	620	M	289	64	M		94-95	M	M	M	M	1009	M	1253	872	885	757	534	316	M
	95-96	20												20		95-96	148												148
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020	PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	94-95	3	2	57	397	804	890	957	738	674	569	431	115	5637		94-95	0	6	57	388	785	964	1028	788	734	608	335	64	5757
	95-96	19												19		95-96	7												7
DILLON	AVE	282	341	655	856	1203	1504	1587	1355	1321	1008	747	459	11218	RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881
	94-95	265	247	505	845	1192	1378	1494	1109	1167	1005	808	495	10510		94-95	3	0	105	497	947	1123	1084	715	724	556	410	138	6302
	95-96	356												356		95-96	44												44
DURANGO	AVE	6	37	203	512	848	1172	1246	952	853	594	363	127	6911	STEAMBOAT SPRINGS	AVE	113	166	396	725	1122	1525	1606	1316	1169	801	543	297	9779
	94-95	2	2	104	559	952	1025	1193	746	773	658	458	164	6636		94-95	67	49	289	674	1128	1424	1458	1046	996	778	605	292	8806
	95-96	38												38		95-96	132												132
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106	STERLING	AVE	0	9	149	462	852	1200	1285	963	843	504	238	66	6541
	94-95	M	M	M	M	M	M	M	M	M	M	M	M	M		94-95	6	0	78	385	831	961	1184	790	763	609	393	71	6071
	95-96	M												M		95-96	6												6
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094	TELLURIDE	AVE	152	204	390	679	1005	1290	1336	1128	1101	819	574	310	8986
	94-95	59	48	286	677	937	1029	1180	893	891	612	633	279	7724		94-95	175	161	395	772	1185	1328	1409	1015	1111	912	722	434	9617
	95-96	111												111		95-96	271												271
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368	TRINIDAD	AVE	0	7	87	364	690	955	995	815	722	444	218	42	5339
	94-95	3	3	89	460	820	977	1019	787	737	611	431	104	6041		94-95	2	4	66	274	735	850	955	691	689	571	332	83	6252
	95-96	4												4		95-96	11												11
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6480	WALDEN	AVE	189	273	498	825	1161	1457	1528	1296	1237	909	657	348	10378
	94-95	9	8	106	435	898	1030	1176	842	761	644	377	95	6381															

## JULY 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	84.2	51.9	68.1	-1.6	99	44	38	142	521	1.36	-0.84	62	10
STERLING	92.4	58.5	75.4	-0.1	106	50	6	335	674	1.12	-1.50	43	6
FORT MORGAN	87.0	54.6	70.8	-2.2	100	46	18	206	583	1.66	-0.14	92	6
AKRON 1N	86.7	58.5	72.6	-1.0	100	49	15	259	642	1.43	-1.32	52	8
AKRON 4E	88.1	54.5	71.3	-2.1	102	48	20	223	590	1.53	-1.20	56	10
HOLYOKE	86.8	59.9	73.4	-1.3	100	52	19	286	659	1.73	-1.02	63	10
JOES 2SE	88.9	60.2	74.6	-0.4	101	54	13	317	682	2.58	0.03	101	7
BURLINGTON	88.3	58.4	73.3	-2.3	100	51	20	286	651	2.36	0.25	112	11
CHEYENNE WELLS	90.6	58.2	74.4	-0.9	101	46	9	310	665	1.43	-1.10	57	8
EADS	89.9	58.8	74.4	-2.3	99	51	1	298	678	1.76	-0.86	67	5
ORDWAY 21N	90.4	54.7	72.6	-3.3	103	44	20	263	609	1.08	-1.14	49	12
ROCKY FORD 2ESE	92.6	55.9	74.3	-2.5	102	47	1	298	645	1.50	-0.54	74	6
LAMAR	91.4	59.6	75.5	-2.1	102	51	4	336	694	0.90	-1.33	40	7
LAS ANIMAS 1N	93.4	59.3	76.3	-2.8	105	51	0	360	696	1.69	-0.39	81	8
HOLLY	93.1	58.4	75.8	-2.6	105	52	2	346	676	3.28	1.13	153	9
SPRINGFIELD 7NSW	90.7	56.5	73.6	-2.1	101	46	1	275	654	1.30	-1.15	53	6

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	85.2	55.5	70.3	-1.2	98	50	4	175	590	0.90	-0.93	49	11
GREELEY UNC	88.4	57.1	72.8	-0.6	103	50	7	255	630	0.57	-0.84	40	6
ESTES PARK	73.7	45.6	59.6	-1.9	87	40	163	5	375	2.70	0.46	121	11
LONGMONT 2ESE	89.3	53.7	71.5	-0.9	102	48	14	222	582	0.31	-0.80	28	4
BOULDER	86.0	55.0	70.5	-0.5	97	46	16	194	592	0.72	-1.25	37	9
DENVER WSO AP	86.3	56.8	71.5	-2.0	99	49	19	229	610	1.04	-0.87	54	13
EVERGREEN	81.2	43.5	62.4	-1.4	96	36	111	39	461	0.61	-1.80	25	8
CHEESMAN	81.8	33.8	57.8	-4.7	96	25	222	6	465	2.56	-0.22	92	12
LAKE GEORGE 8SW	74.0	42.5	58.2	-2.8	85	26	204	2	381	0.72	-1.86	28	7
ANTERO RESERVOIR	74.4	37.8	56.1	-1.8	86	32	269	0	385	0.60	-1.43	30	8
RUXTON PARK	67.5	38.9	53.2	-1.3	80	32	357	0	276	4.24	0.04	101	13
COLORADO SPRINGS WSO	81.4	53.4	67.4	-3.6	95	46	38	120	524	1.91	-0.99	66	14
CANON CITY 2SE	87.7	57.8	72.8	-1.7	99	48	17	268	646	1.03	-0.85	55	10
PUEBLO WSO AP	90.8	52.8	71.8	-3.7	102	44	7	228	595	1.18	-0.92	56	10
WALSENBURG	85.3	54.4	69.9	-2.4	96	46	16	178	588	0.92	-1.40	40	9
TRINIDAD AP	88.0	54.5	71.3	-2.7	100	45	11	215	610	1.94	-0.25	89	8

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	75.5	39.5	57.5	-1.5	89	34	225	1	399	0.78	-0.45	63	8
LEADVILLE 2SW	69.3	35.3	52.3	-2.0	82	30	385	0	315	0.90	-0.90	50	9
SALIDA	82.0	43.7	62.9	-2.7	92	34	98	38	482	1.20	-0.45	73	6
BUENA VISTA	78.7	43.5	61.1	-3.6	90	35	134	21	444	1.08	-0.61	64	6
HERMIT 7ESE	74.5	35.2	54.9	-1.1	87	28	307	0	387	2.53	0.05	102	3
ALAMOSA WSO AP	79.3	44.8	62.1	-2.8	89	35	102	19	465	0.95	-0.24	80	6
STEAMBOAT SPRINGS	80.3	42.2	61.2	-0.7	92	36	132	25	460	0.62	-0.91	41	7
YAMPA	73.9	44.0	59.0	-2.0	88	33	187	10	381	1.70	-0.31	85	11
GRAND LAKE 1NW	73.7	38.3	56.0	-0.8	88	33	270	1	374	2.02	-0.11	95	13
GRAND LAKE 6SSW	72.3	40.2	56.2	-1.9	82	35	262	0	350	1.77	0.24	116	14
DILLON 1E	69.6	36.9	53.3	-3.3	81	33	356	0	311	1.75	-0.04	98	13
CLIMAX	63.8	32.5	48.2	-1.8	75	12	513	0	233	1.34	-1.02	57	8
ASPEN 1SW	73.3	44.8	59.0	-3.0	86	36	194	16	371	2.76	0.91	149	11
CRESTED BUTTE	70.8	35.9	53.4	-3.6	83	29	352	0	331	2.34	0.38	119	10
TAYLOR PARK	66.8	36.8	51.8	-4.2	79	30	401	0	270	1.45	-0.31	82	6
TELLURIDE	73.5	38.6	56.1	-2.9	86	27	271	4	372	2.13	-0.47	82	8
PAGOSA SPRINGS	78.8	41.4	60.1	-4.2	89	33	148	2	453	1.09	-0.79	58	9
SILVERTON	71.0	36.5	53.8	-1.7	83	29	341	0	334	1.41	-1.29	52	9
WOLF CREEK PASS 1E	63.7	38.7	51.2	-2.0	75	28	422	0	220	4.51	0.97	127	13

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	81.0	47.3	64.1	-3.1	93	43	75	55	477	0.65	-0.65	50	6
HAYDEN	81.8	47.6	64.7	-2.2	95	39	66	64	492	0.85	-0.56	60	8
MEEKER 3W	84.1	45.8	65.0	-1.5	97	34	57	62	510	1.13	-0.17	87	10
RANGELY	87.8	54.2	71.0	-2.4	101	46	19	214	599	0.84	-0.22	79	9
GLENWOOD SPRINGS	84.6	47.3	65.9	-4.1	97	33	58	94	507	2.03	0.68	150	12
RIFLE	87.3	48.5	67.9	-2.7	100	40	44	142	541	0.00	-1.00	0	0
GRAND JUNCTION WS	91.3	60.9	76.1	-2.7	104	48	8	362	710	0.87	0.22	134	7
PAONIA 1SW	88.1	55.3	71.7	-1.1	100	45	21	234	610	2.26	1.11	197	9
DELTA	87.9	53.8	70.9	-2.8	99	44	20	212	581	1.06	0.37	154	7
GUNNISON	76.5	40.0	58.3	-3.3	88	32	204	1	419	0.78	-0.57	58	10
COCHETOPA CREEK	77.3	39.4	58.3	-3.0	89	31	197	1	426	1.68	-0.02	99	9
MONTROSE NO 2	83.9	52.3	68.1	-4.4	95	41	34	134	540	1.76	0.75	174	7
URAVAN	93.6	56.0	74.8	-2.2	105	44	0	312	650	1.83	0.52	140	8
NORWOOD	81.0	48.9	65.0	-1.4	94	37	70	74	494	2.26	0.29	115	7
YELLOW JACKET 2W	86.5	52.6	69.5	-0.9	98	40	25	173	582	1.16	-0.29	80	7
CORTEZ	87.3	51.5	69.4	1.4	98	37	24	166	576	0.89	-0.31	74	5
DURANGO	83.7	51.4	67.5	-1.2	94	35	38	127	548	0.64	-1.21	35	7
IGNACIO 1N	84.7	46.3	65.5	-3.1	95	36	45	66	519	1.51	0.15	111	2

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

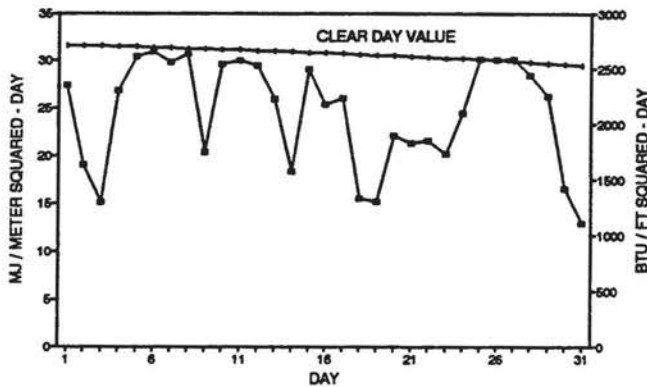
**JULY 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	14	10	7	--	--
Denver	NA	NA	NA	76%	71%
Fort Collins	12	14	5	--	--
Grand Junction	22	2	7	91%	78%
Pueblo	NA	NA	NA	84%	78%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Sunshine was the rule in Colorado in July. For the entire State sunshine and solar radiation was above average. This was greatly welcomed by the agriculture industry that needed heat and sunshine to help the many crops delayed by the cool, wet spring weather of the past three months.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION JULY 1995**

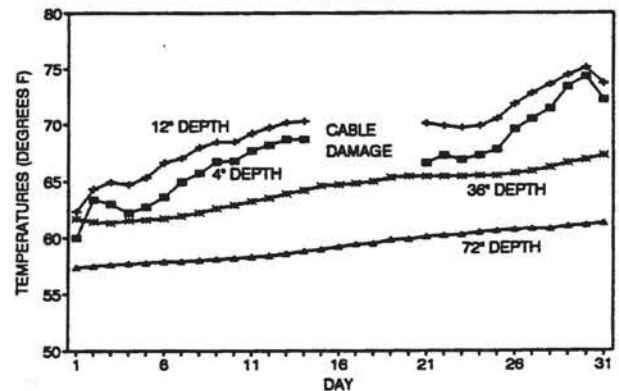


**JULY 1995 SOIL TEMPERATURES**

The two 7-day heatwaves had a dramatic affect on soil temperatures. By the end of the month soil temperatures had finally increased to near or above average as far down as three feet beneath the surface.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES JULY 1995**



**HATS OFF TO:** Phillip Virden of Lake City, Colorado

Mr. Virden has been diligently observing and reporting daily weather conditions for the National Weather Service since 1978. Lake City is not on the beaten path, but their climate is as interesting as any place in the country. Phil, thanks for a job well done, and keep it up for another 100 years (or more).

## CHANGE, CHANGE, CHANGE

You probably think I'm talking about Global Warming and Climate Change again. Sorry to disappoint you, as I have a different "change" in mind today. But let's make a point of revisiting Global Warming and Colorado Warming very soon. We haven't talked about it for a while, and it appears that the world's scientific community is coming closer to saying "Global Warming is upon us."

The change that's on my mind today involves the National Weather Service (NWS). There have been a lot of change going on in that organization during the last few years and it is just now having a big affect on the weather and climate business here in Colorado. Here are a few of the changes taking place.

### Forecast Offices

For many years there has been one primary NWS Forecast Office in Colorado (Denver) and several smaller satellite offices (Colorado Springs, Pueblo, Alamosa and Grand Junction). As a part of NWS modernization and restructuring, there are now three equally staffed forecast offices. The Denver office at Stapleton remains and is now supported by forecast offices at Pueblo and Grand Junction. Parts of eastern central Colorado are now being served by the Goodland, KS, NWS office. The Denver office is scheduled to relocate to Boulder in a few years to be closer to research and educational facilities.

There are pros and cons to reorganizations like this. Western, southeastern and extreme eastern Colorado will likely now receive better forecast and warning. Many Colorado residents have long felt that Colorado weather forecasters only pay attention to the Front Range metropolitan areas – Denver, in particular. This should no longer be the case. At the same time, some personal services that Colorado citizens and individual economic sectors have received from the NWS are being cut back. Agricultural weather forecasts are scheduled to terminate. Direct phone access to NWS personnel may be limited. Emphasis will be placed on local forecasting and aggressive warning for severe weather. NWS forecasters will receive more education and training. Collaborative research is being encouraged.

### Automated Surface Observing System (ASOS)

In 1992, the automation of surface aviation weather observations began. Sites at Alamosa, Pueblo, Colorado Springs and Denver were among the first units deployed in the U.S. There are now additional ASOS installations in Colorado including electronic weather stations at the Limon airport, Lamar, Akron, Burlington, LaJunta, Cortez, Montrose, Meeker, Craig and Grand Junction. Most of these stations have not yet been commissioned, but they are now automatically transmitting weather observations updated hourly or more frequently.

ASOS is a sophisticated and expensive system, but so far the NWS original plans to totally replace human weather observers at airports nationwide has not been realized. There are several important meteorological phenomena such as hail, thunder, tornadoes, freezing rain and virga (indicative of dangerous localized wind gusts) that ASOS cannot detect. There are also other serious operational and climatological limitations such as the fact that ASOS does not measure snowfall. As a result, NWS and Federal Aviation Administration officials are currently requiring human weather observers to remain at some sites to provide augmentation, backup and error checking.

### Radar

For more than 25 years Colorado has been served by one official operational NWS weather reconnaissance radar. It was situated south of Limon where it could scan the entire Colorado Front Range and Eastern Plains. As of this summer, there are now two NWS WSR-88D (NEXRAD) radars in operation, one east of Denver and one north of Pueblo. Radars at Cheyenne, WY, and Goodland, KS, also watch the Colorado skies. Before winter, the new Grand Junction radar, situated on the top of Grand Mesa, will provide the first detailed look at storms developing or moving into western Colorado. Radar is currently the best tool for detecting severe storms (hail, tornadoes, and flash floods) as they form and move. This expanded radar coverage will result in better detection and public warning for severe weather. Don't be surprised to hear more severe weather warnings than ever before, especially over western and southern Colorado.

### Cooperative Weather Observations

This is a particularly sensitive topic for climatologists. The Cooperative Program is the network of local weather stations, many volunteer, from all areas of the country. We rely on these stations for monitoring and documenting current and historic climatic conditions nationwide. It is a low-visibility, low-cost and sometimes low-priority program but with huge value and countless users who depend on the information.

For many years, one NWS employee working out of the Denver office has been responsible for managing most of Colorado's 200+ cooperative weather stations. A Goodland, KS, representative covered the eastern 1/4 of the State. With the changes in NWS offices and responsibilities, management of the Cooperative Program is now being decentralized. Beginning this year, each of the Forecast Offices will take care of those stations in their own immediate area of forecast and warning responsibility. Several staff members at each office may share program management responsibilities.

We are watching this transition closely. For nearly 20 years we have received the data from all Colorado cooperative stations every month from Denver. Starting this year, we will receive data from four NWS offices. Instead of coordinating with two NWS employees, I will not need to stay in touch with four data acquisition managers and 20 technicians. I am uneasy about this communication challenge, but it is also exciting that more people should now be available to recruit and train new observers, service existing stations and fix faulty equipment. Hopefully, it will all work out for the best.

If you are a Cooperative Observer for the NWS please be aware of these changes. Make sure you know who to contact for equipment problems and for sending in data.

There may also be more changes to the Cooperative Program. To help the new forecast offices, more observers will be encouraged to call or electronically send in their daily reports. If this could be accomplished accurately, the Climate Center may be able to provide more frequent and timely climate updates in the future.

### Summary

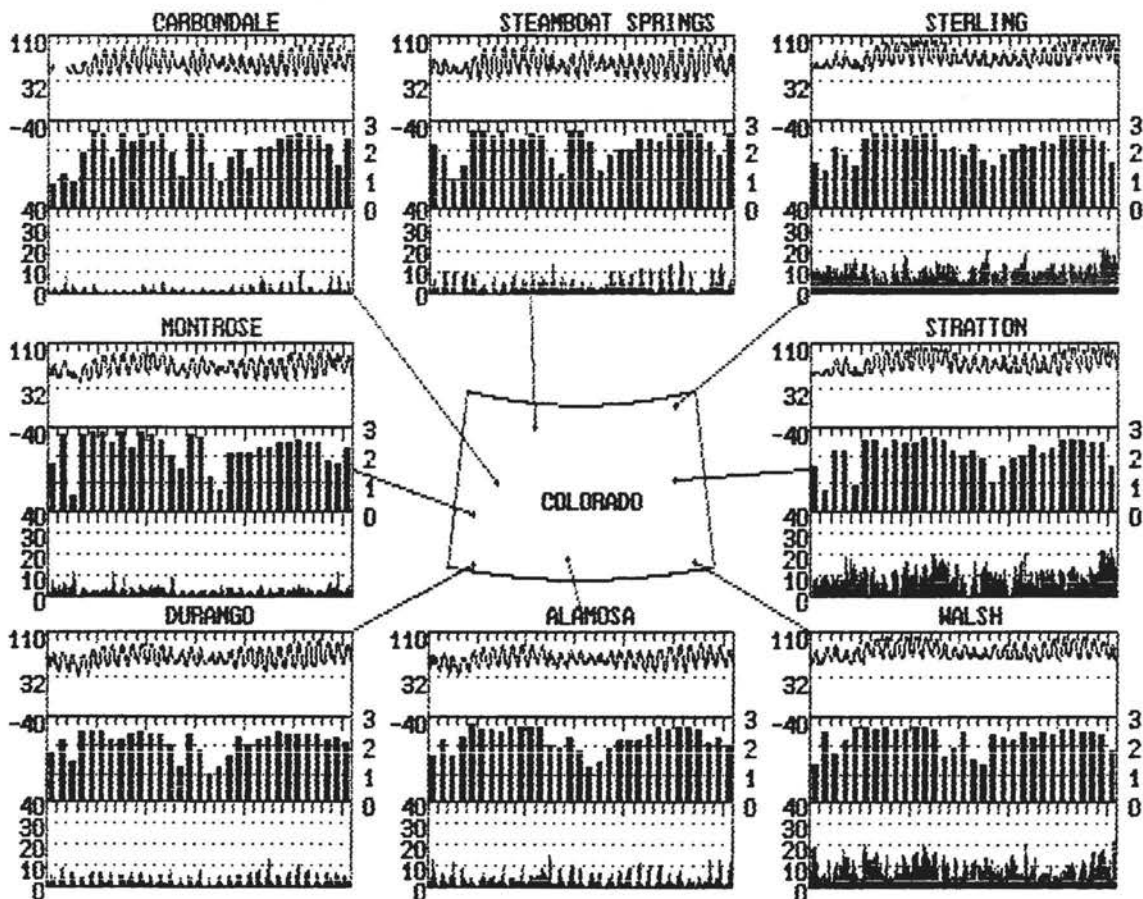
This is a brief summary of some of the recent changes in the NWS. My apologies to the NWS for any inaccuracies or misrepresentations in this sketchy report. I have left some things out (satellite data, computer models, etc.), but perhaps this will help you understand why things seem to be changing so quickly in the weather world.

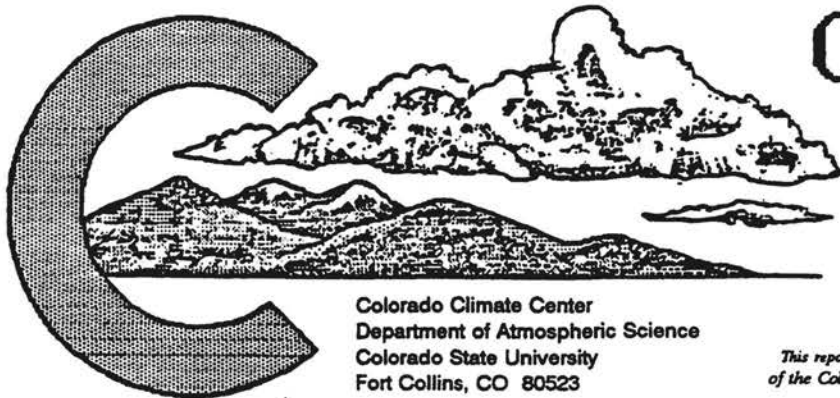


	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature (°F)	62.0	64.0	62.6	67.0	60.1	72.7	72.8	74.6
monthly temperature extremes and time of occurrence (°F day/hour)								
maximum:	88.7 28/16	93.0 28/15	97.3 29/15	93.7 29/13	94.5 29/13	103.3 12/17	101.3 11/16	99.7 11/15
minimum:	35.6 4/5	34.2 4/5	38.3 27/5	40.5 4/5	32.0 27/5	49.6 30/5	51.6 5/5	51.6 5/4
monthly average relative humidity / dewpoint (percent / °F)								
5 AM	91 / 43	61 / 37	92 / 43	74 / 44	85 / 38	36 / 36	26 / 31	80 / 55
11 AM	46 / 54	27 / 43	42 / 53	39 / 52	33 / 48	15 / 37	13 / 36	37 / 57
2 PM	35 / 50	21 / 41	32 / 51	28 / 48	23 / 43	12 / 38	11 / 38	28 / 54
5 PM	38 / 48	22 / 40	35 / 50	27 / 47	26 / 42	15 / 38	13 / 37	34 / 53
11 PM	67 / 48	50 / 40	69 / 47	52 / 46	78 / 45	28 / 36	21 / 33	65 / 56
monthly average wind direction (degrees clockwise from north)								
day	161	189	207	233	221	194	175	160
night	156	75	N/A	144	114	208	228	221
monthly average wind speed (miles per hour)	2.75	1.96	0.74	1.92	2.36	8.19	8.35	8.08
wind speed distribution (hours per month for hourly average mph range)								
0 to 3	461	529	542	573	523	34	134	74
3 to 12	270	206	46	171	176	608	449	526
12 to 24	9	1	0	0	9	102	161	144
> 24	0	0	0	0	0	0	0	0
monthly average daily total insolation (Btu/ft <sup>2</sup> ·day)	2230	2090	2012	2205	2203	2112	2105	2261
"clearness" distribution (hours per month in specified clearness index range)								
60-80%	274	255	237	245	266	231	143	286
40-60%	65	74	67	62	74	87	76	66
20-40%	53	49	75	60	62	68	67	38
0-20%	37	56	60	36	33	39	59	42

The State-Wide Picture

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location: the top graph displays the hourly ambient air temperature, ranging from -40°F to 110°F, the middle one gives the daily total solar radiation on a horizontal surface, up to 4000 Btu/ft<sup>2</sup>/day, and the bottom graph illustrates the hourly average wind speed between 0 and 40 miles per hour.





# COLORADO CLIMATE

**AUGUST 1995**

Volume 18 Number 11

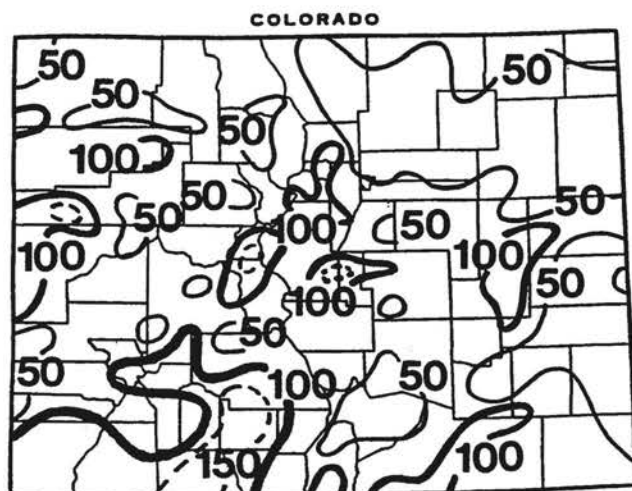
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## August Climate in Perspective – Hot and Dry

Historic data shows that most years in Colorado with very wet and cool springs are followed by dry and hot summers. August lived up to expectations with most areas of the State considerably drier than average. Temperatures were above average nearly every day of the month. Denver reported 21 days with maximum temperatures of 90° or higher. Las Animas reached 100° or higher 14 days.

### Precipitation

Traditionally, early August is known for lively and numerous thunderstorms with potential for local flooding. But this year early August was very quiet with only infrequent storms. Subtropical moisture eventually made its way



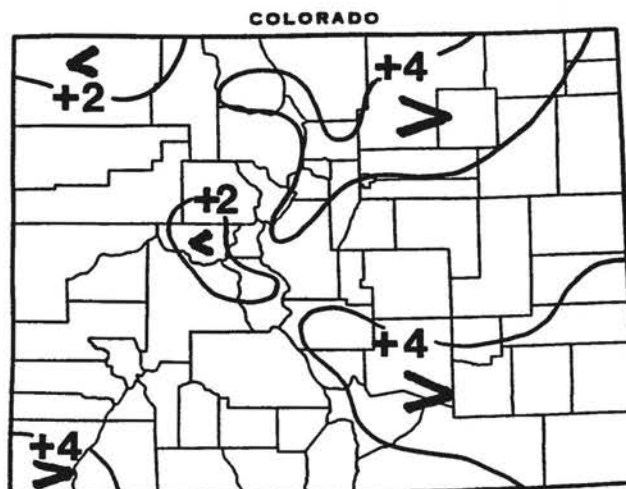
August 1995 precipitation as a percent of the 1961-1990 average.

northward into Colorado, and afternoon thunderstorms became a routine daily occurrence 11-28th mostly in or near the mountains. Only southwestern sections of the State and

localized areas in central and west central Colorado ended up wetter than average. Pagosa Springs managed 21 days with thunder and more than 200% of average precipitation. Most other areas of Colorado were drier than average with 50% of average or less over wide areas, especially east of the mountains. Loveland only received 0.17" for the entire month.

### Temperatures

Hot temperatures abounded in Colorado in August. Temperatures climbed above 100° on several occasions east and west of the mountains. Nighttime temperatures were reluctant to cool off, even in the mountains. Gunnison, and other mountain towns, had several nights when temperatures stayed above 50°F. (That doesn't sound all that warm, considering that many eastern U.S. cities suffered in August with sweltering heat and humidity and craved a few 50° readings.) For the month as a whole, most Colorado weather stations ended up 3 to 5 degrees F above average.



Departure of August 1995 temperatures from the 1961-90 average.

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## AUGUST 1995 DAILY WEATHER

- 1-2 It was unseasonably chilly early on the 1st. Several new record low temperatures were set including 46° at Pueblo. Spicer (southwest of Walden) had the coldest reading in Colorado for the month with 25°F. Sunshine prevailed 1-2nd as temperatures quickly warmed again.
- 3-5 Summerlike temperatures prevailed with daytime readings in the 80s and 90s except cooler in the mountains. Most areas remained dry, but some thunderstorms developed each day. A weak cool front snuck into northeast Colorado on the 3rd triggering a few strong storms. Some potent storms popped up on the 4th in southeast Colorado. A tornado struck near Colorado Springs. Thunder rumbled over western Colorado in the early morning hours on the 5th associated with an upper air disturbance. Scattered storms then moved out across the Eastern Plains. Strong wind gusts were common with the storms, but moderate rains and hail were very spotty.
- 6-8 A hot spell sent temperatures soaring across Colorado. Grand Junction exceeded 100° each day. The official weather station 20 miles south of La Junta reached 108° on the 7th. A few high-based thunderstorms developed late on the 7th. Temperatures remained very warm that night. Palisade had a low of 77°F. Boulder only dropped to 72°F. Winds increased on the 8th as a Pacific cold front approached. Several strong thunderstorms developed late that day. After reaching a high of 103°F, Burlington was cooled with a 0.95" rain. Trinidad also had a good shower.
- 9-12 Temperatures were cooler statewide on the 9th. Just a few late day thunderstorms developed, mostly along the Front Range. Then very hot weather returned, especially for southeast Colorado. Las Animas reached 108° on the 11th. Subtropical moisture seeped into western Colorado resulting in increasing convective activity each day. Some strong evening storms erupted on the 11th. By the 12th, thundershowers were widespread from the mountains westward.
- 13-15 A deep low pressure area for this time of year moved across Wyoming and Montana on the 13th bringing drier air and gusty mountain winds to Colorado. Temperatures remained hot on the 13th, but were much cooler on the 14th, especially east of the mountains where clouds hugged the Front Range and a few heavy showers developed. The 15th was sunny and dry with seasonal temperatures.
- 16-17 Most of Colorado was hot and dry, but some monsoonal moisture in western Colorado fueled thundershowers, most numerous on the 16th in southwest Colorado.
- 18-19 It was very hot on the 18th, but a well defined cold front crossed the region during the evening. Strong northeasterly winds developed east of the mountains. An area of strong thunderstorms formed near Denver. Storms spread eastward and southward and continued late into the night. 1.65" of rain fell at Cherry Creek Dam. There were unofficial reports of more than 4" of rain in parts of Elbert and El Paso counties. Temperatures were much cooler on the 19th. Clouds and moisture lingered in southern Colorado, and widespread precipitation fell in south-central Colorado throughout the day. Del Norte recorded 0.56" on the 19th.
- 20-28 A large upper-level high pressure ridge was responsible for hot and muggy weather. Southwesterly winds aloft delivered moist air into southwestern Colorado which fueled frequent and occasionally heavy storms. Most of the heavier storms fell in southwestern and central Colorado, but a few big boomers made it out on the plains. 1.60" fell in a short burst at the Buckley National Guard base on the 21st. Pagosa Springs was pounded with a 2.36" downpour on the 22nd (1.75" in 40 minutes) causing some local damage. 0.97" of rain fell west of Leadville on the 23rd, 1.52" drenched the Altenbern Ranch on the 24th, and 1.50" soaked Florissant Fossil Beds Natl. Monument on the 25th. Evening storms moved across southeastern Colorado on the 25th. The hot weather continued except for slightly cooler readings east of the mountains 25-26th. Humidity gradually decreased and storms became fewer and smaller 26th-28th.
- 29-31 Temperatures showed little sign of autumn as highs continued to climb into the 80s and 90s each day. It hit 92° at Glenwood Springs on the 31st. Mountain evenings did get a bit cooler, though, and Fraser reported 33° each morning 30-31st. Showers continued in southwestern Colorado on the 29th, but by the 31st the entire State was clear and dry.

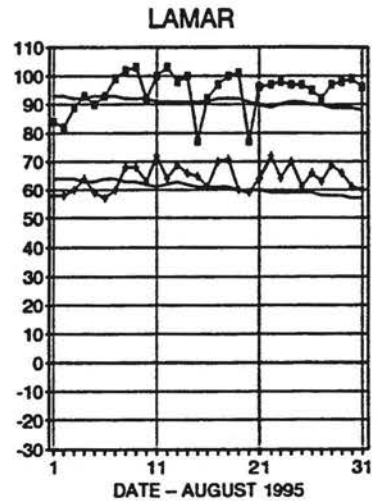
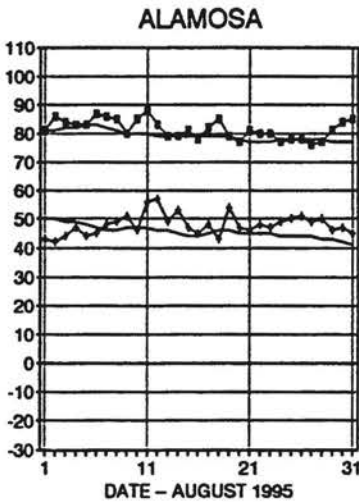
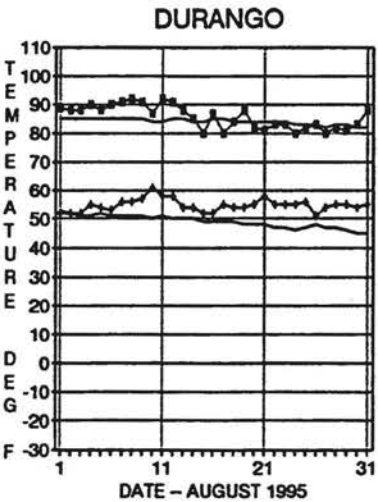
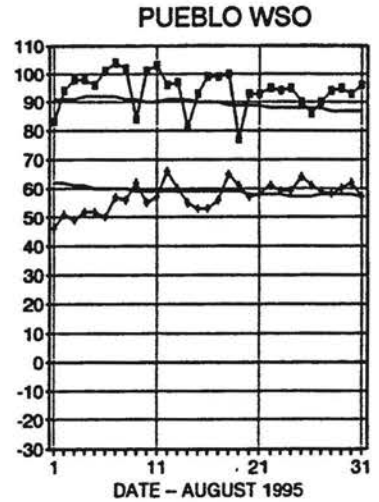
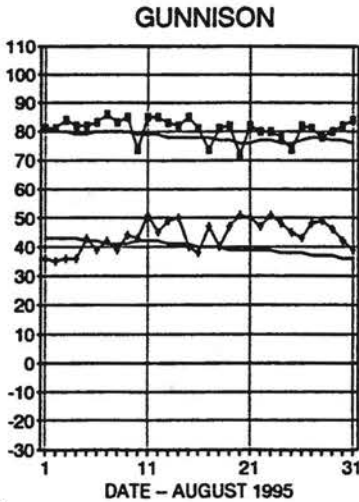
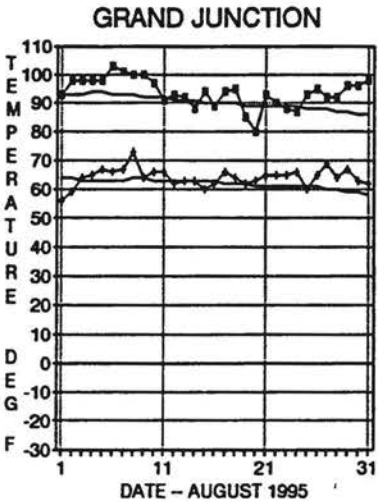
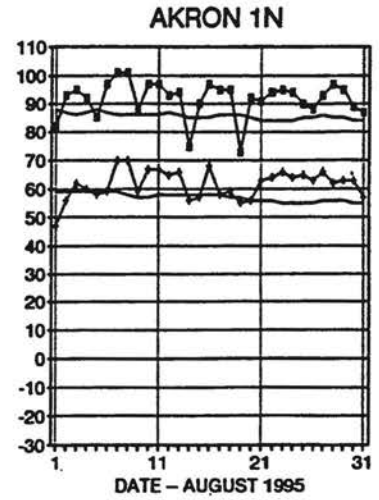
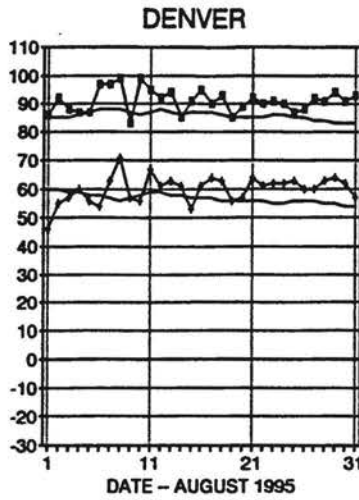
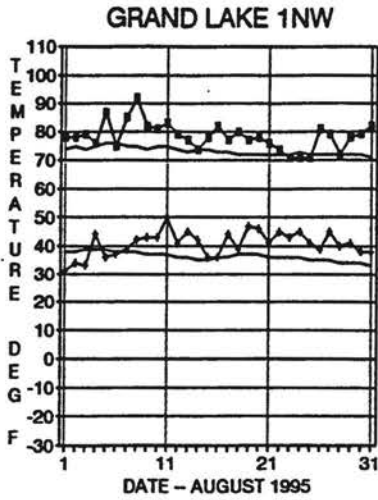
### Weather Extremes

Highest Temperature	108°F	August 7 August 11, 18	LaJunta 20S Las Animas
Lowest Temperature	25°F	August 1	Spicer
Greatest Total Precipitation	5.14"		Pagosa Springs
Least Total Precipitation	0.10"		Browns Park Refuge
Greatest Total Snowfall	none reported		
Greatest Snow Depth	none reported		

## AUGUST 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)



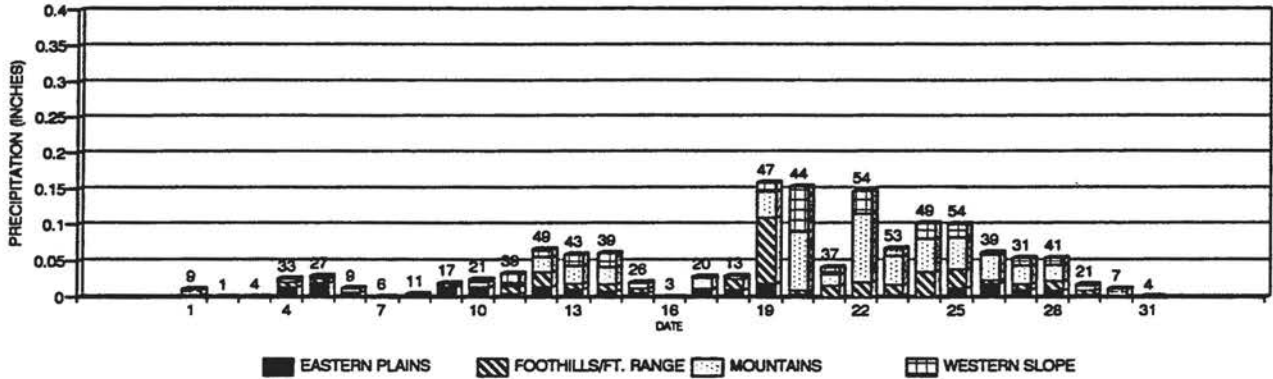


## AUGUST 1995 PRECIPITATION

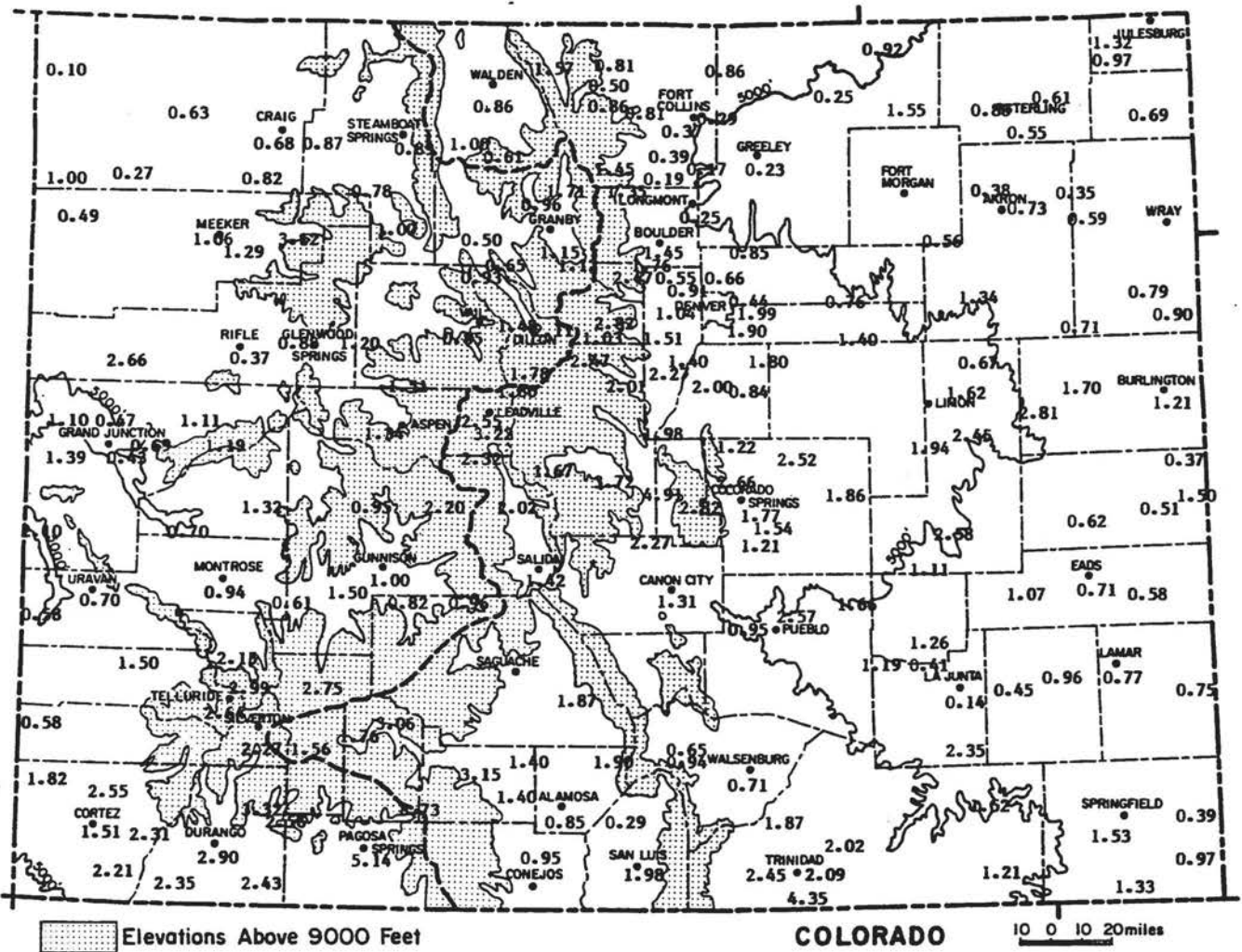
Thundershowers developed somewhere in Colorado on most days during August, but widespread activity was limited to 12-13th, 18-19th and 22-25th. Activity was especially persistent over southwestern Colorado 19-28th. Measurable precipitation fell on 21 days during the month at

Ouray, but 14 of those days received less than 0.10". Many weather stations east of the mountains reported measurable precipitation on 5 days or less. State-averaged precipitation totalled 1.44" for August compared to a normal of 1.86".

### COLORADO DAILY PRECIPITATION -AUG 1995

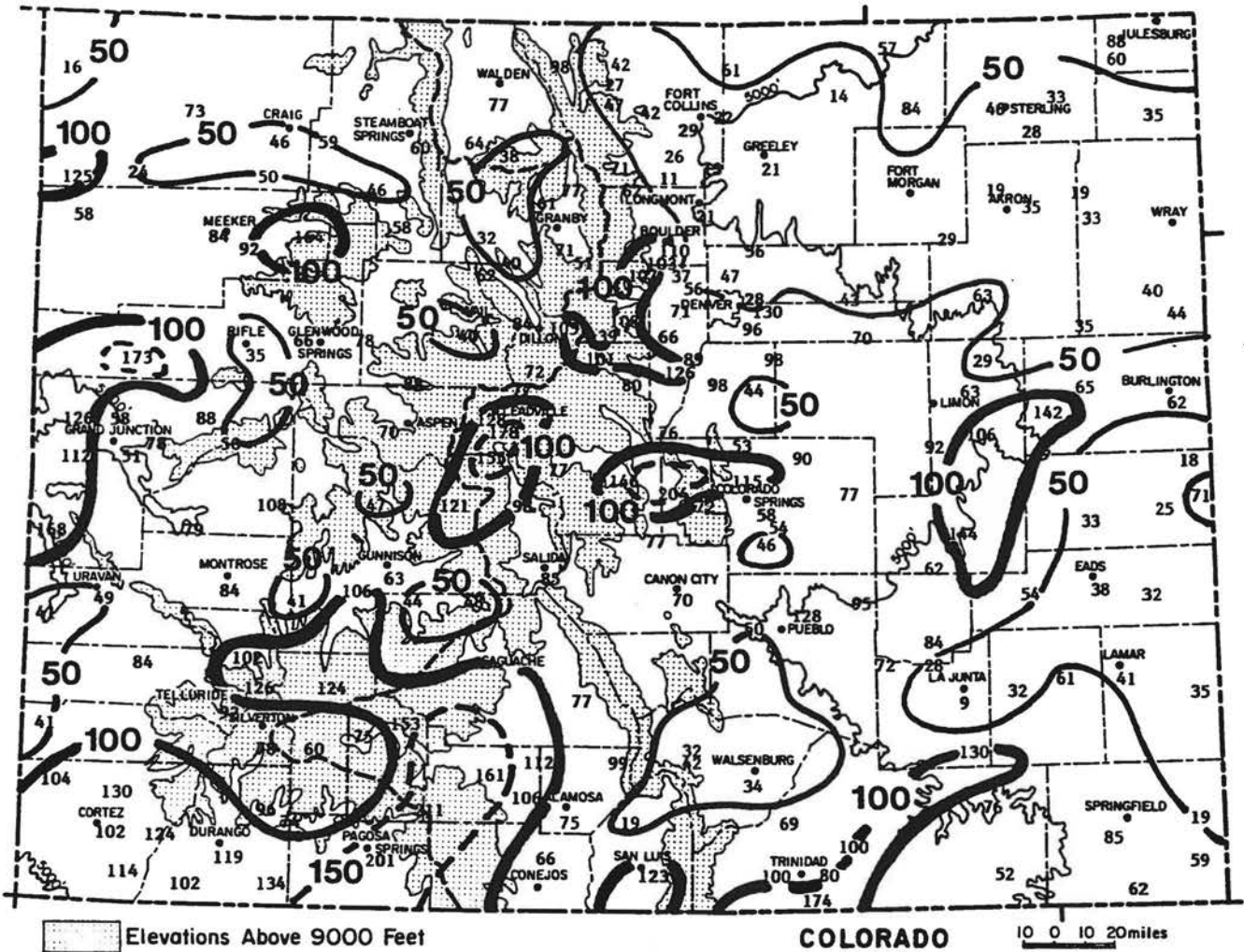


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)

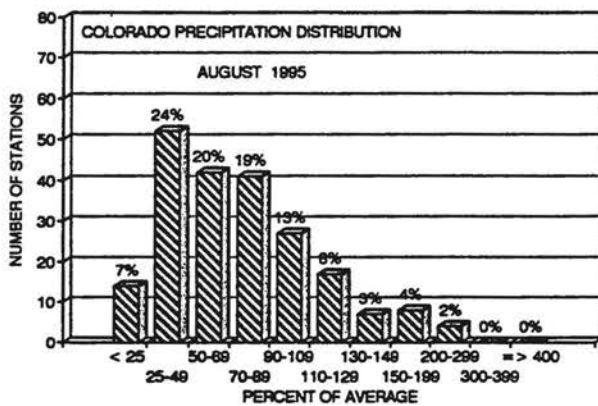


Precipitation Amounts (in inches) for August 1995.

## AUGUST 1995 PRECIPITATION COMPARISON



August 1995 Precipitation as a Percent of the 1961-90 average.



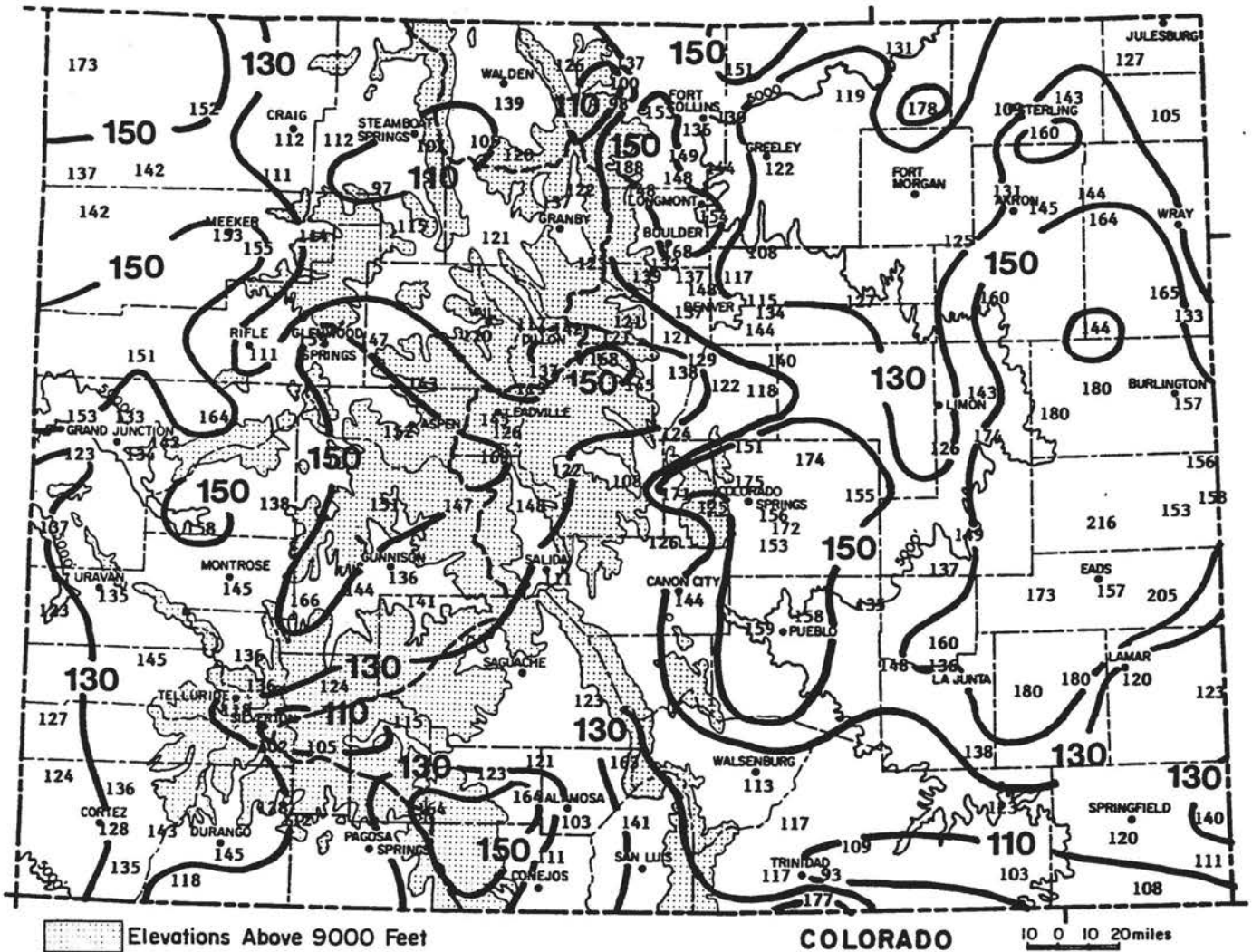
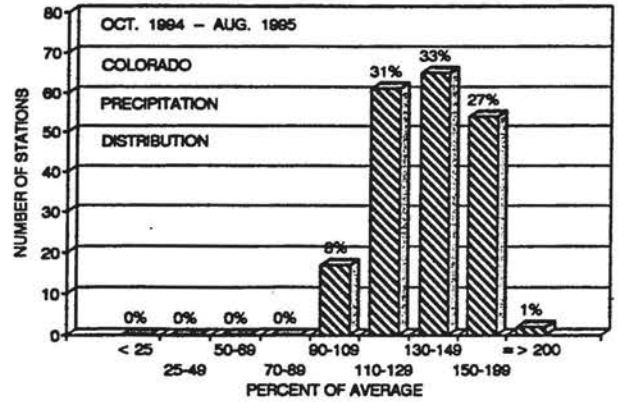
There were some very wet areas in August over portions of southwestern Colorado. However, the majority of weather stations were drier than normal for the month. Close to 3/4 of the official weather stations were drier than average, and nearly one-third reported less than 50% of average.

### AUGUST 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	0.44"	18th driest in 124 years of record (driest = 0.02" in 1924)
Durango	2.90"	29th wettest in 101 years of record (wettest = 6.55" in 1993)
Grand Junction	0.47"	22nd driest in 104 years of record (driest = 0.02" in 1903)
Las Animas	0.45"	24th driest in 130 years (driest < 0.01" in 1904)
Pueblo	2.57"	33rd wettest in 126 years (wettest = 5.85" in 1955)
Steamboat Springs	0.89"	20th driest in 89 years of record (driest < 0.17" in 1944)

## 1995 WATER YEAR PRECIPITATION

Hot, dry weather in August was welcomed by many irrigated farmers hoping their crops could make up for late plantings and slow early growth. The topsoil and grasses dried out quickly, however, and a few wildfires were ignited. Late season streamflows continued above average in most areas of Colorado despite the dry August weather – a continued response to the abnormally cool and damp spring. Irrigation water use climbed, but only minor reservoir depletions were noted, signifying that much more water will be in storage at the end of 1995 than was available last year. Accumulated water year precipitation totals show that despite dry July and August weather, practically the entire State is still above or much above average for the year as a whole. Many weather stations on the Eastern Plains, in the Central Mountains and over portions of extreme west-central Colorado have measured at least 150% of average for the October through August period.



## COMPARATIVE HEATING DEGREE DAY DATA FOR AUGUST 1995

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8545

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	94-95	82	53	319	700	1174	1307	1287	882	934	777	538	238	8271
	95-96	102	25											127
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8850
	94-95	106	85	335	704	1095	1265	1317	911	988	832	667	319	8624
	95-96	194	90											284
BOULDER	AVE	0	7	136	387	728	973	1004	815	744	474	235	53	5554
	94-95	4	0	77	442	848	890	939	737	703	590	431	121	5782
	95-96	16	1											17
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	94-95	50	65	286	674	1018	1143	1236	902	966	866	626	M	M
	95-96	134	40											174
BURLINGTON	AVE	0	9	138	432	822	1132	1175	946	859	519	254	34	8320
	94-95	4	0	80	370	836	908	1036	797	779	623	440	72	5945
	95-96	20	11											31
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987
	94-95	0	0	42	361	695	760	888	645	690	558	330	63	5032
	95-96	17	0											17
COLORADO SPRINGS	AVE	6	18	164	468	818	1091	1122	924	859	558	302	87	6415
	94-95	10	14	98	466	811	969	1035	811	810	703	477	152	6376
	95-96	38	3											41
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	94-95	4	0	111	522	891	1012	1151	688	733	652	439	117	6320
	95-96	24	0											24
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	887	419	193	8376
	94-95	13	14	196	613	1133	1316	1332	946	875	692	567	225	7922
	95-96	75	13											88
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	94-95	0	0	87	423	794	1025	984	655	620	M	289	64	M
	95-96	20	0											20
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	94-95	3	2	57	397	804	890	957	736	674	569	431	115	5637
	95-96	19	0											19
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	94-95	265	247	505	845	1192	1378	1494	1109	1167	1005	808	495	10510
	95-96	356	242											598
DURANGO	AVE	6	37	203	612	846	1172	1246	952	853	594	363	127	6911
	94-95	2	2	104	559	952	1025	1193	746	773	658	458	164	6636
	95-96	38	0											38
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	184	8106
	94-95	M	M	M	M	M	M	M	M	M	M	M	M	M
	95-96	M	M											M
EVERGREEN	AVE	78	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	94-95	59	48	286	677	937	1029	1180	893	891	612	633	279	7724
	95-96	111	39											150
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	94-95	3	3	89	460	820	977	1019	787	737	611	431	104	6041
	95-96	4	1											5
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	94-95	9	8	106	435	898	1030	1176	842	761	644	377	95	6381
	95-96	18	M											M
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	94-95	0	0	24	368	832	984	962	596	578	425	256	47	5072
	95-96	8	0											8

\* = AVES ADJUSTED FOR STATION MOVES

M = MISSING

E = ESTIMATED

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE 6SSW	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	381	10542
	94-95	205	188	423	761	1154	1456	1430	1034	1165	944	688	403	9851
	95-96	270	166											436
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	94-95	1	3	68	441	860	1005	1066	815	718	606	408	90	6081
	95-96	262	0											262
GUNNISON	AVE	130	204	435	763	1143	1609	1788	1456	1237	867	580	306	10516
	94-95	87	74	343	737	1136	1512	1583	1110	1062	811	599	323	9377
	95-96	204	78											282
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	94-95	0	3	40	288	690	882	934	696	653	486	225	32	4929
	95-96	0	0											0
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	94-95	310	314	539	895	1257	1406	1500	1135	1220	1058	856	547	11037
	95-96	385	273											656
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	96	6961
	94-95	12	13	124	513	925	1043	1117	928	874	717	466	M	M
	95-96	M	M											M
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	94-95	13	0	62	435	884	949	1076	762	762	616	429	117	6125
	95-96	14	12											26
MEEKER	AVE	28	58	261	564	927	1240	1345	1086	998	651	394	164	7714
	94-95	13	5	170	578	1087	1207	1306	863	812	692	529	219	7481
	95-96	57	9											66
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	246	68	6363
	94-95	4	2	113	489	895	1072	1068	679	705	589	377	115	6108
	95-96	34	0											34
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	94-95	M	M	M	M	M	M	M	M	M	M	M	M	M
	95-96	148	30											178
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	94-95	0	6	57	388	785	964	1028	788	734	608	335	64	5757
	95-96	7	0											7
RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881
	94-95	3	0	105	497	947	1123	1084	715	724	556	410	138	6302
	95-96	44	0											44
STEAMBOAT SPRINGS	AVE	113	166	396	725	1122	1525	1606	1316	1169	801	543	297	9779
	94-95	67	49	289	674	1128	1424	1458	1046	996	778	605	292	8806
	95-96	132	40											172
STERLING	AVE	0	9	149	482	852	1200	1265	963	843	504	238	56	6541
	94-95	6	0	78	385	831	961	1184	790	763	609	393	71	6071</



## AUGUST 1995 CLIMATE DATA

### EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	87.9	53.8	70.9	3.7	99	44	17	207	595	0.92	-0.68	58	7
STERLING	95.5	61.0	78.3	5.3	104	47	8	426	725	0.88	-1.00	47	3
AKRON 1N	91.8	61.6	76.7	5.3	101	47	1	372	733	0.38	-1.55	20	3
AKRON 4E	92.5	56.5	74.5	3.0	105	40	17	319	649	0.73	-1.31	36	4
HOLYOKE	89.6	61.3	75.5	3.0	100	46	13	345	712	0.69	-1.26	35	6
JOES 2SE	91.4	61.7	76.5	3.6	101	49	7	373	725	0.71	-1.29	36	4
BURLINGTON	91.8	60.3	76.0	2.9	103	46	11	361	701	1.21	-0.74	62	4
CHEYENNE WELLS	96.7	61.4	79.1	6.0	103	53	0	441	742	0.51	-1.49	26	4
EADS	94.2	61.2	77.7	3.8	102	51	0	401	732	0.71	-1.12	39	1
ORDWAY 21N	95.5	57.4	76.4	3.3	105	48	5	366	666	1.11	-0.66	63	5
ROCKY FORD 2ESE	96.8	59.9	78.3	4.2	104	52	0	419	718	0.41	-1.01	29	4
LAMAR	94.6	64.1	79.4	4.3	103	57	0	454	770	0.77	-1.08	42	3
LAS ANIMAS 1N	97.7	63.8	80.8	4.5	108	57	0	497	774	0.45	-0.92	33	4
HOLLY	97.0	63.2	80.1	4.6	106	56	0	474	765	0.75	-1.36	36	2
SPRINGFIELD 7NSW	96.1	60.2	78.1	4.6	103	53	0	415	721	1.53	-0.25	86	8

### FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	88.5	57.8	73.1	3.9	99	46	1	261	667	0.37	-0.89	29	9
GREELEY UNC	91.7	59.2	75.5	4.3	101	46	0	334	696	0.23	-0.84	21	4
ESTES PARK	78.2	47.5	62.8	3.3	87	36	75	15	456	1.45	-0.59	71	12
LONGMONT 2ESE	92.5	55.4	73.9	3.9	104	42	12	299	641	0.25	-0.94	21	3
BOULDER	89.8	58.1	74.0	4.5	99	44	1	285	689	1.45	0.14	111	6
DENVER WFSO AP	90.7	60.0	75.3	3.9	99	46	0	327	715	0.44	-1.08	29	9
EVERGREEN	83.8	47.9	65.8	3.9	94	38	39	74	523	1.51	-0.75	67	13
CHEESMAN	85.0	37.2	61.1	0.6	95	31	123	10	524	1.98	-0.60	77	15
LAKE GEORGE 8SW	77.7	47.1	62.4	3.4	85	42	78	4	437	3.72	1.18	146	11
ANTERO RESERVOIR	77.4	41.3	59.4	3.6	85	34	170	2	432	1.67	-0.48	78	8
RUXTON PARK	68.7	40.1	54.4	1.9	76	34	321	0	297	2.82	-1.08	72	14
COLORADO SPRINGS WSO	86.3	57.5	71.9	3.3	94	49	3	226	656	1.77	-1.26	58	11
CANON CITY 2SE	91.0	62.5	76.7	4.7	98	51	0	371	750	1.31	-0.55	70	8
PUEBLO WSO AP	94.2	57.1	75.7	3.2	104	46	0	338	669	2.57	0.57	129	5
WALSBURG	89.7	59.9	74.8	5.0	96	46	0	313	720	0.71	-1.35	34	8
TRINIDAD AP	91.5	58.2	74.9	3.3	99	47	0	314	687	2.02	0.01	100	9

### MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	80.0	40.8	60.4	3.9	85	29	135	2	476	0.86	-0.25	77	12
LEADVILLE 2SW	73.0	38.9	56.0	3.4	78	32	273	0	363	3.22	1.42	179	13
SALIDA	84.7	49.6	67.2	3.5	93	42	12	86	551	1.42	-0.25	85	13
BUENA VISTA	81.5	46.8	64.2	1.9	89	43	40	23	497	2.02	-0.03	99	10
HERMIT 7ESE	75.8	41.2	58.5	4.2	85	31	195	0	408	1.76	-0.58	75	12
ALAMOSA WSO AP	81.5	47.9	64.7	2.3	88	42	25	23	507	0.85	-0.27	76	11
STEAMBOAT SPRINGS	84.5	43.8	64.2	4.0	89	33	40	23	534	0.89	-0.59	60	5
YAMPA	77.0	46.7	61.9	2.5	84	37	100	8	429	1.00	-0.72	58	6
GRAND LAKE 1NW	78.5	40.8	59.6	4.7	92	31	165	4	446	1.71	-0.49	78	6
GRAND LAKE 6SSW	76.4	42.5	59.5	2.9	81	30	166	1	417	0.96	-0.61	61	14
DILLON 1E	73.7	40.2	56.9	2.1	80	32	242	0	375	1.48	-0.27	85	13
CLIMAX	67.7	37.8	52.8	4.3	87	34	371	0	282	1.80	-0.51	78	11
ASPEN 1SW	75.8	48.3	62.0	1.5	85	42	90	7	411	1.45	-0.45	76	14
CRESTED BUTTE	76.2	39.6	57.9	2.4	82	31	215	0	412	0.95	-1.05	48	11
TAYLOR PARK	70.6	40.9	55.8	1.7	78	34	279	0	326	2.20	0.39	122	11
TELLURIDE	75.5	43.3	59.4	1.9	82	34	168	1	406	2.22	-0.63	78	14
PAGOSA SPRINGS	80.8	48.2	64.5	2.1	87	40	30	25	500	5.14	2.59	202	16
SILVERTON	73.9	41.4	57.6	3.9	80	35	219	0	378	2.27	-0.63	78	16
WOLF CREEK PASS 1E	67.6	42.0	54.8	3.5	77	38	307	0	280	8.73	4.60	211	20

**WESTERN VALLEYS**

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	85.0	49.5	67.2	1.8	91	40	13	90	557	0.68	-0.77	47	7
HAYDEN	84.9	48.9	66.9	2.1	91	33	17	83	559	0.87	-0.59	60	8
MEEKER 3W	86.4	49.8	68.1	3.6	93	38	9	113	564	1.06	-0.19	85	10
RANGELY	90.0	56.2	73.1	2.4	96	45	0	256	660	0.49	-0.35	58	5
GLENWOOD SPRINGS	88.4	53.4	70.9	2.9	95	42	0	189	610	0.88	-0.45	66	9
RIFLE	90.9	52.2	71.5	2.8	98	40	0	210	605	0.37	-0.68	35	6
GRAND JUNCTION WS	93.8	64.2	79.0	2.8	103	56	0	444	782	0.47	-0.34	58	6
PAONIA 1SW	91.1	58.5	74.8	4.1	100	52	0	312	693	1.32	0.10	108	6
DELTA	91.1	57.9	74.5	3.4	98	49	0	299	677	0.70	-0.18	80	3
GUNNISON	81.0	43.8	62.4	3.2	86	35	78	7	489	1.00	-0.57	64	15
COCHETOPEA CREEK	82.7	43.6	63.2	3.6	89	35	63	15	512	0.82	-1.02	45	8
MONTROSE NO 2	87.2	56.9	72.1	2.1	94	52	0	228	656	0.94	-0.17	85	9
URAVAN	96.0	59.5	77.7	2.8	103	53	0	404	713	0.70	-0.72	49	6
NORWOOD	83.7	53.1	68.4	4.0	90	47	1	113	566	1.50	-0.28	84	7
YELLOW JACKET 2W	87.7	55.8	71.8	3.6	97	50	0	217	639	1.82	0.07	104	13
CORTEZ	87.5	55.2	71.4	4.4	95	49	0	206	639	1.51	0.03	102	12
DURANGO	85.7	54.7	70.2	3.7	92	51	0	169	607	2.90	0.48	120	14
IGNACIO 1N	86.3	52.4	69.3	3.0	94	45	0	139	584	2.43	0.62	134	4

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

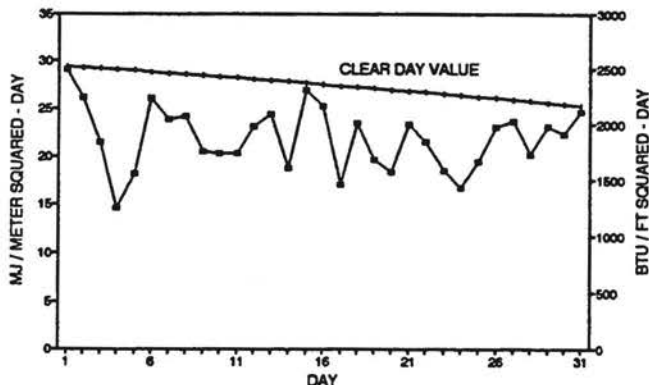
**AUGUST 1995 SUNSHINE AND SOLAR RADIATION**

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	10	20	1	--	--
Denver	NA	NA	NA	82%	72%
Fort Collins	10	17	4	--	--
Grand Junction	15	12	4	90%	77%
Pueblo	NA	NA	NA	79%	78%

CLR = Clear    PC = Partly Cloudy    CLDY= Cloudy

August was the second month in a row with abundant sunshine. There were more clear days, more sunshine and more solar energy reaching the surface than normal across all except a portion of southern Colorado. This sunshine, combined with above average temperatures, was hard on outdoor workers, but was helpful for Colorado's warm-weather crops.

**FT. COLLINS TOTAL HEMISPHERIC RADIATION AUGUST 1995**

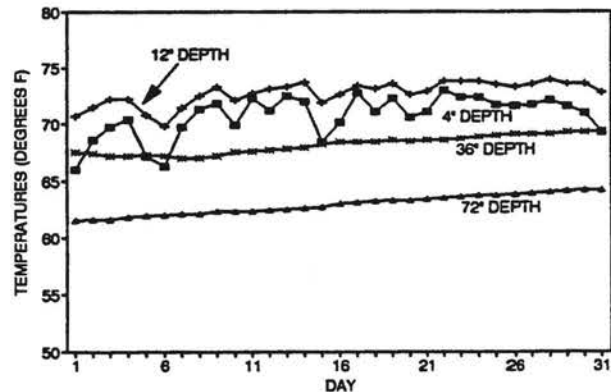


**AUGUST 1995 SOIL TEMPERATURES**

The combination of hot air temperatures and above average sunshine resulted in very warm soil temperatures with relatively little day to day variation.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

**FORT COLLINS 7 AM SOIL TEMPERATURES AUGUST 1995**



**WE'VE LOST SOMEONE VERY SPECIAL - Marvin Rankin of Westcliffe, Colorado**

Marvin Rankin passed away earlier this summer at age 87. He had been the Westcliffe observer from 1939 until shortly before his death. It appears from our history files for Colorado weather stations that no other person has ever served as an official observer here in Colorado for such a long time. Mr. Rankin was proud of the service he was able to provide for so many years. With his passing, we have lost a very special and very loyal weather observer. We shall miss him indeed.

## SOME COLORADO PREDICTIONS

### Introduction

You may have noticed that many of us climatologists are reluctant to make predictions. Maybe that's why we chose climatology instead of weather forecasting – we don't like to stick our necks out. Over the years I have had very good success reporting and documenting what the weather has done. I wouldn't have done nearly as well predicting what was going to happen.

I've also noticed a tendency among many of us that as we get older we get bolder, and so it is that I feel that the time has come to make some predictions. These predictions, however, may not be what you think. Let me explain.

It is a very dynamic world in which we live. All the tools of climatology seem to be changing constantly. Computer systems, data base structures, mapping methods, communications, sources of data, uses of data, value of data – everything is changing so quickly. Uncertainty abounds. What should public institutions be doing and what belongs in the private sector? What should the Federal government be doing and what is the responsibility of States? What is the 1990s mission of Land Grant universities? How can we most accurately monitor and document Colorado's climate? How can we best communicate our climate information? How can we do this consistently and reliably year after year even as the tools and parameters change?

### Climate Data – The Essential Ingredient For Climatology

The future of climatology is directly tied to the future of climate data. The decisions, designs, policies and plans that are made in the future will be based upon the data collected today, tomorrow and the next day – temperature, precipitation, snowfall, humidity, wind, sunshine and other elements that may become important. As we contemplate the future direction and goals of the Colorado Climate Center, we must consider what data resources we may have to work with in the future.

What follows is a brief discussion of several current weather and climate data sources in Colorado accompanied by some of my personal thoughts and predictions concerning their value and utility for climate applications in the years to come. I may offend a few people with my comments. Perhaps I will motivate some others. Please recognize that these are my personal views. They do not represent an institutional position.

### Some Predictions About Climate Data In Colorado

As we move toward the 21st Century, data will continue to be the focus and the future of climate activities. An effective, competitive state climate center will need to have immediate and direct access to real-time weather observations from a variety of sources. Many organizations and individuals will want or need to be collecting weather data, so it should be

possible to obtain most data for detailed climate monitoring without having to collect it ourselves. It will also be just as important, as it has been in the past, to have the best possible long-term climate data from as many locations as possible around the State for all sorts of analyses of climate variations, changes and extremes.

Familiarity with observing procedures, data quality control methods and a broad range and variety of weather observing equipment will be a very important area of expertise for Climate Center personnel. Many groups collecting weather data will not have this expertise.

### Available Data Sources

Since weather affects so many activities, weather stations and station networks will continue to grow as long as economic conditions remain stable or grow in Colorado (very likely for at least the next decade). Data from all networks will not be needed in order to satisfactorily monitor most statewide climatic conditions. A major challenge for the Colorado Climate Center will be to determine which existing data sources are of the highest quality and will have the broadest applications for climate monitoring, research and service.

The following is a list of what I believe will be the primary sources of climate data in the decade to come. Some of these are current networks. Others I anticipate will be forming soon.

### Data Source And Predictions For Future

Airport Weather Observations: Automated aviation weather observations from airport locations will continue and will be expanded to more small airports. Frequency of communicating observations will be increased to time intervals of 15 minutes. Systematic human augmentation of these automated observations by certified weather observers or by control tower personnel will take place at a few busy airports.

Natural Resources Conservation Service Mountain Snowpack Monitoring System: The station network measuring snowpack water content and precipitation in remote mountainous areas (currently referred to as SNOTEL) will be maintained because of its importance for anticipating summer water supplies. The number of these SNOTEL stations will likely decrease slightly in the years to come, but more meteorological sensors will be added to existing sites encouraging more applications of the data.

Bureau of Land Management/U.S. Forest Service Remote Automated Weather Stations: This network will be continued because of its direct use in wildfire prediction and fire management. Sites are typically on remote federal lands



with no other data sources nearby. The number of stations will be reduced from 1995 levels. This may be offset by improved data quality and broader availability.

U.S. Bureau of Reclamation Alert Networks: Automated weather stations will be operated upstream from several USBR reservoirs. Data will become very useful for storm studies, providing duration and areal coverage of local storms. Data won't add much for routine statewide climate monitoring.

National Weather Service Cooperative Network: The traditional Cooperative Network of predominantly volunteer manual weather stations will be preserved as long as the local/regional NWS forecast office organization structure is in use. If NWS forecast offices do not become real-time routine daily users of the data, expect the cooperative program to decay. More data will reach the NWS by computer. Expect a decrease in the number of temperature monitoring stations. However, an increase in the number of precipitation measuring stations is likely. Snowfall measurement needs improvement, but will likely not change.

Remote Sensing: Expect more deduced surface climate fields from remote platforms. Precipitation from radar will be estimated. Temperature, humidity, solar radiation, evapotranspiration and snowcover will be estimated from satellites. All these expanded products will continue to rely on surface observations for development and calibration and verification. Climatological applications of radar precipitation estimates will be a disappointment, but the information will be of great value for flood forecasts and storm studies.

Other Federal Sources: Expect isolated and predominantly short-duration data collection activities from a variety of federal sources mostly related to specialized research activities predominantly related to water resources issues.

Urban Flood Warning Networks: As urban population continues to grow, expect to see more localized, high density real-time heavy precipitation networks in and upstream of urban areas on the Front Range. Similar networks may not be deployed elsewhere in State even if population grows substantially except near large reservoirs which are determined to pose some risk to downstream population centers. Data from these networks may be useful for local storm studies and operational precipitation distribution analyses, but may not be adequate for longterm climate monitoring.

Air Quality Networks: Weather stations associated with air quality monitoring are likely to continue. More of these weather stations will appear in mountain communities where air pollution hazards go hand and hand with population increases. It should be possible to make these data more available for real-time access and broader climatological uses.

Transportation Networks: Roadway information system weather stations have begun to be deployed in Colorado in recent years. The number of highway weather stations will increase for the next few years but then will decrease as the costs associated with collecting reliable ongoing weather data are recognized and federal support for such activities decreases.

The data, now used for operational management decisions, will be found to have considerably climatological potential, due to the unique locations of many of the stations on mountain passes and in remote blizzard-prone areas.

Non-highway mass transportation systems will begin to grow in the 21st Century and will have their own specialized weather data needs.

Agricultural Weather: Crop-specific weather sensitivities such as diseases, insect pest development, freezes, irrigation water use, soil fertility, erosion and environmental quality along with expansion of high tech farming practices will require field-specific weather conditions at certain times of the year that will greatly increase the number of electronic ag weather stations in Colorado. Cooperative Federal, state, university and private participation in ag weather networks is very likely due to mutually beneficial partnerships, research activities and educational outreach. Station maintenance and data quality control will be major problems for ag weather networks resulting in data that is not of the highest value for subsequent climate applications. Some general agricultural weather data needs will be met using data products derived from other data sources.

Educational Weather Data: Expect to see electronic weather stations in most schools in Colorado in the next few years. Weather has been found to be a "real science" that is less abstract than other sciences and easier to teach to relatively young children. It is arguable that children need electronic weather stations to learn the basics of data collection and meteorology, but it will probably happen anyway. Don't expect data quality from these stations to be adequate for all uses and longterm applications, since a commitment to station maintenance and preservation may be sporadic at best. Also instrument quality and exposures will likely be poor. For security, many stations will be placed on roof tops making data questionable for climatological purposes.

Special Longterm Research: Funding for longterm ecological studies will be continued that will allow ongoing climate monitoring on the Pawnee Grasslands and on Niwot Ridge in the mountains west of Boulder. These data sources should be held to high standards and will be made readily available for research and educational purposes.

Benchmark Climatological Station Network: A few special stations will be established by the climatological research community to help preserve longterm observational continuity. Such data, consistent with past records, will be a necessary ingredient for properly interpreting and using data from a variety of constantly changing instruments, locations and exposures.

Industrial Weather Stations: With so much data and weather information floating around, it will be very interesting to see if industry chooses to access and utilize data collected by others or whether weather-sensitive businesses will choose to gather their own data at sites that meet specific local needs. I predict that some of both will



take place. Some industrial weather stations will probably be available for public use, but most will not.

**Statewide Water Use Network:** Within the next few years, Colorado water interests will begin the development of statewide real-time weather monitoring networks designed to help estimate daily water use for many basins and watersheds across the State. Emphasis will be placed on non-urban irrigated areas. Several urban areas are already actively involved in seasonal weather monitoring for water management. Potential exists here for statewide cooperation to utilize existing weather station data.

**Electronic Weather Enthusiasts Network:** There is going to be more weather data collected and communicated than ever before, but it will not keep individual weather enthusiasts from having their own weather stations. The Internet era will allow these hobbyists to exchange data electronically. Many will also share their data publicly. Most such data will come from urban areas and mountain communities that are already well covered by existing networks. However, the quality of these data may surpass many of the public sources due to observer care and commitment. Therefore, it will be worthwhile to utilize some of these data sources for climatological purposes.

**Community Weather Stations:** There will be a growing movement to consolidate local weather data collection activities. It won't come easy, but several Colorado communities will set up new weather stations or designate existing weather stations as official community stations. Organizations will pool resources to operate and maintain such weather stations. Some will serve as cooperative sites for the National Weather Service, but many will not. Several local schools will share access to these stations to avoid all having their own to take care. Cable TV stations will access and display these data in order to have more accurate data than presently displayed. Data will be freely provided and will be archived locally.

All in all, in the years to come there will be more real time weather data and more potential climate information than we currently would know what to do with. There will be a

desire to standardize data collection to overcome the inevitable problems associated with combining data collected for different purposes in different ways with different instruments. Periodically groups will discuss and plan for standardizing data collection, but more than likely it will not come to pass. In the end, most data collectors will use the instruments and observing procedures they want to gather only the data they think they need for their own specific purposes.

#### Should We Try To Use All The Data?

We climatologists hate to see weather data "go, to waste" without being processed into climatological information. We will want to figure out how to get our hands on all these data sources. That may be a mistake. We must realize that most weather data is collected for immediate operational uses that are often tolerant of inaccuracies and inconsistency. Many data sources will suffer from poor data quality, poor maintenance and lack of consistency. Many instruments in use will not be capable of gathering years of accurate data. The best current example is precipitation. Very few automated precipitation gages now in use collect accurate year-round precipitation data. If we were starting over attempting to document Colorado's precipitation resources only using automated weather station, we would probably underestimate statewide precipitation by 50%.

What this shows us is that we will have to be selective. We must move with wisdom to maintain appropriate levels of accuracy and historical consistency, and we must not be afraid to point out the deficiencies in modern observing networks.

The Colorado Climate Center is currently working on a comprehensive climate monitoring plan for Colorado that can take advantage of the best data that are currently being collected that are likely to be maintained, with consistency, into the future. We will keep you posted on progress.

---

### "Colorado Climate" on the Internet and World Wide Web

Are traditional publications going to become obsolete? Some people think so and others don't. It is predicted that within 2 years more than 3/4 of U.S. households will have Internet access. The Colorado Climate Center has been on the Internet for several years already, but not until 1995 have we found many users outside of the educational system. Now we transmit data daily via Internet and reply to electronic climate requests from all across the country.

To check out the Colorado Climate Center "Homepage" on the World Wide Web go to:

— <http://ulysses.atmos.colostate.edu/>

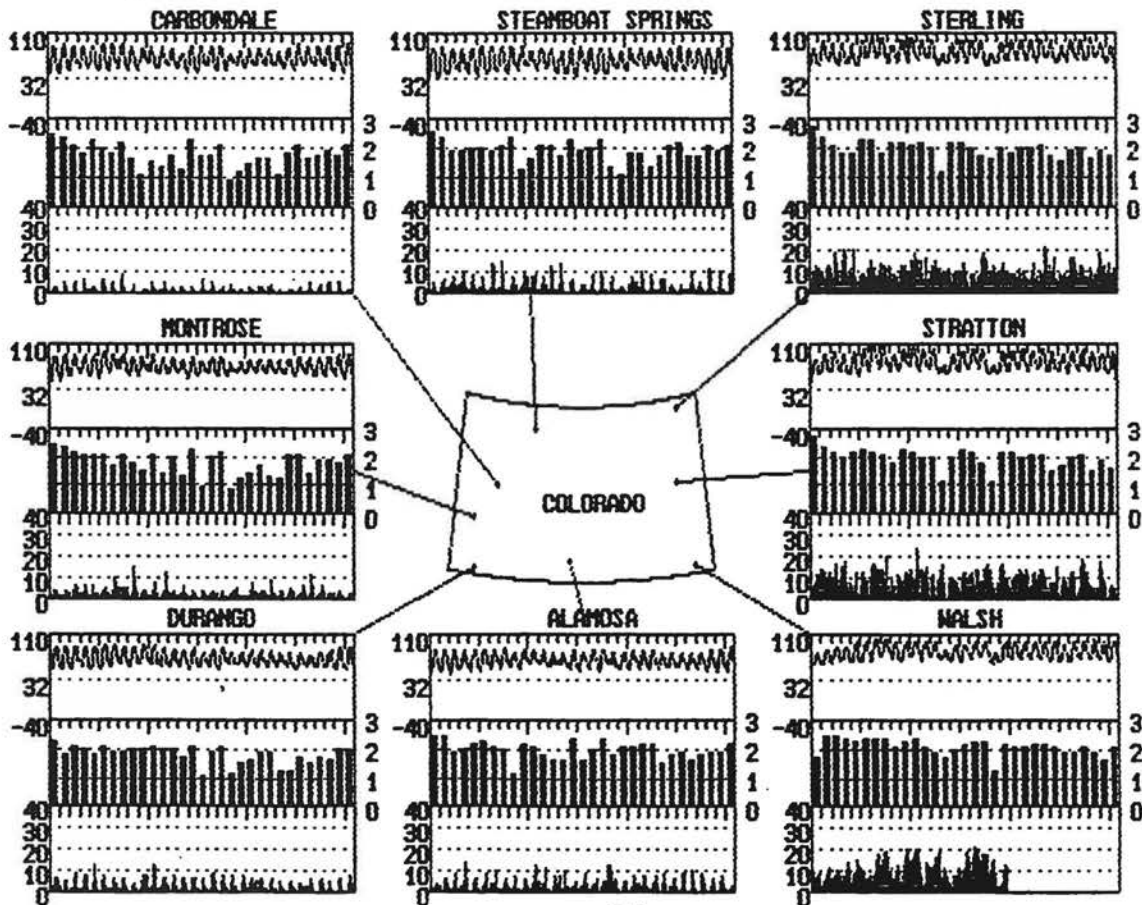
Since we spend a lot of dollars publishing and distributing this newsletter, and since we don't have very much money, it has been suggested that we terminate traditional publication of "Colorado Climate" and instead make some of its content available on Internet. *What do you think of this option?* It would allow much more timely distribution of some routine climate monitoring products. We could broaden our information dissemination. But it might result in our losing contact with some very important climate information users.

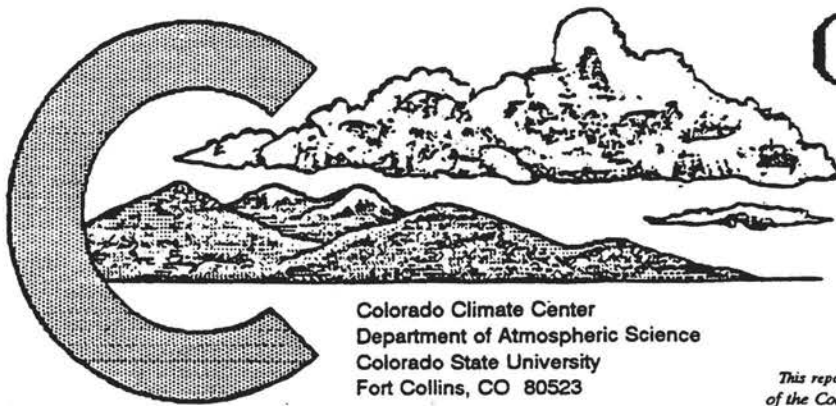
We would like to hear what you think. In the near future we will be sending out a special mailing to all of our subscribers which will include a questionnaire about the "Colorado Climate" monthly newsletter. We hope that you will take the time to respond.

WTHRNET WEATHER DATA AUGUST 1995

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	63.6	66.4	65.8	69.2	62.3	76.2	76.8	78.2
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	84.7 8/14	89.1 6/17	92.8 31/15	93.2 6/17	88.5 9/16	103.5 7/16	105.3 7/14	99.3 7/15
minimum:	41.2 3/ 5	46.4 1/ 6	38.7 2/ 6	42.4 1/ 5	29.5 1/ 5	32.0 30/ 0	32.0 30/ 0	55.9 1/ 0
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	94 / 48	71 / 46	93 / 48	79 / 50	98 / 44	33 / 37	25 / 33	75 / 59
11 AM	53 / 58	32 / 49	47 / 58	45 / 60	46 / 58	11 / 37	10 / 37	38 / 61
2 PM	37 / 55	27 / 46	35 / 57	36 / 57	37 / 56	9 / 39	9 / 38	26 / 57
5 PM	44 / 53	27 / 45	37 / 56	39 / 56	37 / 55	10 / 38	10 / 38	26 / 55
11 PM	75 / 52	58 / 47	71 / 52	61 / 53	87 / 50	17 / 33	15 / 32	54 / 57
monthly average wind direction ( degrees clockwise from north )								
day	199	181	200	225	227	173	162	152
night	128	80	n/a	147	115	188	204	168
monthly average wind speed ( miles per hour )	2.39	2.06	0.67	1.86	1.94	7.85	7.46	7.87
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	518	506	532	593	534	36	162	126
3 to 12	215	216	32	147	154	624	458	299
12 to 24	7	2	0	4	4	84	123	139
> 24	0	0	0	0	0	0	1	0
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	1968	1784	1755	1787	1922	1976	1969	2083
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	241	190	174	197	237	240	238	291
40-60%	74	104	110	90	91	89	88	66
20-40%	63	68	102	80	67	43	34	35
0-20%	33	48	26	39	23	20	29	21

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location; the top graph displays the hourly ambient air temperature, the middle graph gives the daily total horizontal solar radiation, and the bottom graph shows the hourly average wind speed. More detailed weather sets are available from the Colorado Weather Network. Please contact the WeatherNet at (303) 492-0242.





# COLORADO CLIMATE

SEPTEMBER 1995

Volume 18 Number 12

Colorado Climate Center  
 Department of Atmospheric Science  
 Colorado State University  
 Fort Collins, CO 80523

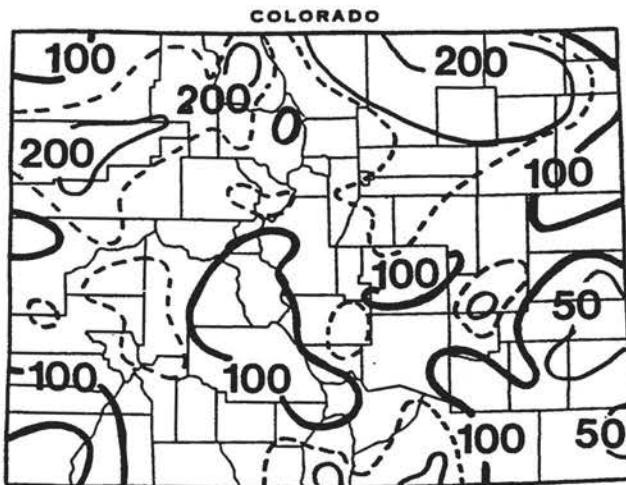
*This report has been prepared each month since February 1977 with the support of the Colorado Agricultural Experiment Station and the College of Engineering*

## September Climate in Perspective – Big Variety

September weather included days of intense summer heat, lively thunderstorms, cold drenching rains and (for parts of the State) heavy snow. An early snowstorm September 20-21 and a hard killing freeze September 22 were the last thing that Colorado farmers wanted to see after the challenging year they had already experienced. For the month as a whole, temperatures were near the monthly normal and precipitation was predominantly above average.

### Precipitation

It looked like September was going to continue where August left off with very dry weather for much of the State. However, with the help of a showery period 6-11th,



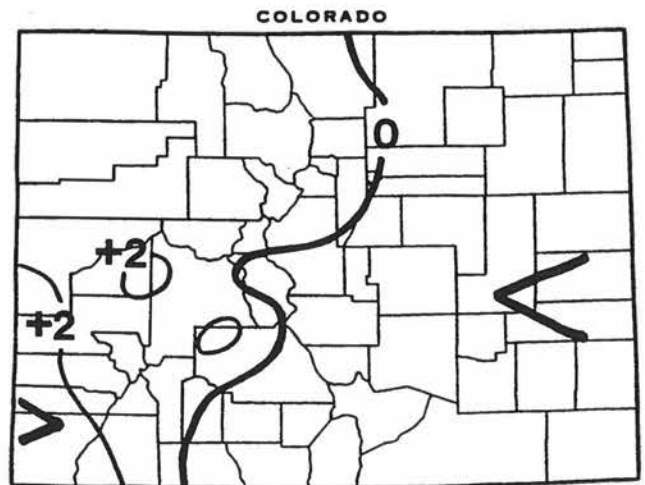
September 1995 precipitation as a percent of the 1961-1990 average.

rain and snow 18-21st and a major Pacific storm system 28-29th focused on western Colorado, most of the State ended up wetter than average. The wettest areas were found over

the northern half of the State. Meeker, Walden, Fort Collins, Greeley, Akron and Sterling all received over 200% of average. At the same time, a number of areas ended up below average. A few locations in southeast Colorado reported less than 50% of average.

### Temperatures

Temperatures in western Colorado gradually cooled through the month, while eastern Colorado experienced several large swings from hot to cold. Record high temperatures in early September were offset by near record cold later in the month. For the month as a whole, temperatures ended up near average over the eastern half of Colorado. In western Colorado, weather stations ended up 1 or 2 degrees above average. For most agricultural areas of Colorado the growing season ended abruptly September 21-22 with a widespread hard freeze. This was one to three weeks earlier than average.



Departure of Sept. 1995 temperatures from the 1961-90 average.

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## SEPTEMBER 1995 DAILY WEATHER

- 1-5 A large high pressure ridge aloft covered the Rocky Mountain region and produced very hot temperatures. 90s were common each day with 80s in the mountains and some 100s at low elevations. Steamboat Springs hit 91° on the 1st. Campo had the hottest temperature in the State – 106° on the 2nd. Several record highs were set on the 4th including 97° at Denver and 100° at Grand Junction. Pueblo reached 101° on the 5th. Nighttime temperatures were also unusually warm. Most of the State was sunny and dry through the period, but some thunderstorms developed each day, especially near the Front Range. A great lightning display developed late on the 2nd, but most locations received little rain.
- 6-11 Much colder air dropped down from the north on the 6th. Thunderstorms rumbled along the Front Range. Clouds and moisture also increased in western Colorado. By the 7th, fog, drizzle and low clouds shrouded eastern Colorado with daytime temperatures remaining in the 50s and 60s. Scattered thundershowers dampened western Colorado. Alamosa got 0.63" on the 7th. Cool, damp weather continued 8-10th over much of the State with some locally heavy showers each day. Cortez received 0.91" on the 8th. 1.05" fell at Sterling. Colorado Springs reported 1.32" on the 9th. An upper disturbance then moved eastward across the State early on the 11th. Nocturnal thunderstorms and strong winds were observed in the Northern Mountains. A line of thunderstorms moved across parts of the Eastern Plains. Hail fell near Pueblo. Dry air then returned to the State.
- 12-17 Pleasant late-summer weather brought warm days but cool nights. Beautiful cirrus clouds drifted in on the 13th from a distant Pacific hurricane. Most of the State remained dry, but showers developed in and near the mountains, mostly on the 14th. Temperatures climbed into the 90s over northeastern Colorado on the 15th. A weak cold front brought cooler temperatures east of the mountains on the 16th and a few thundersprinkles. Warm temperatures then returned on the 17th, but with increasing humidity and some light late-day thundershowers.
- 18-22 A Canadian cold front and a low pressure trough from the west combined to bring cooler, showery weather to Colorado on the 18th. Light rain was widespread over western Colorado. Snow fell above 11,000 feet. Precipitation spread eastward overnight with significant rains along the Front Range. Greeley totalled 0.95" by midday on the 19th. Pleasant weather was noted over southern and western Colorado on the 20th, but temperatures continued to drop over northeastern counties. A new surge of cold air arrived late on the 20th. Rains turned to snow along the Northern Front Range and became heavy during the evening as it spread southward. Most of eastern Colorado saw the first snow of the season. Areas hardest hit by this early snow were the Front Range cities from Fort Collins to Denver where 4-10" of wet snow accumulated. Up to 17" fell in the foothills. Heavy snow also hit parts of eastern Colorado. Joes and Idalia each reported 10 inches. Millions of dollars of damage resulted from broken tree branches. Some areas were without power for several days. Temperatures stayed in the 30s east of the mountains on the 21st while temperatures west of the mountains were much warmer. Skies cleared late on the 21st, allowing an early killing freeze to end the 1995 growing season over much of the State. The Wellington 5WNW station north of Fort Collins dipped to 19° early on the 22nd. Sargents had the lowest temperature in the State, 4°F. Snow quickly melted on the 22nd as temperatures moderated.
- 23-25 Clouds increased on the 23rd as a new disturbance moved down from the north. Cold rain and mountain snows developed late along the Front Range. Precipitation intensified over southern Colorado on the 24th. Aguilar reported 0.58" of rain, and 0.73" fell south of Trinidad. Skies cleared, but temperatures were nippy early on the 25th. Pueblo had a low of 29°F.
- 26-30 The winds aloft began bringing moist Pacific air into western Colorado. A few light showers fell over western Colorado 26-27th, while eastern Colorado enjoyed mild and dry conditions. A low pressure area crossed the State from the southwest on the 28th bringing considerable cloudiness statewide and areas of rain mostly in western Colorado. A much stronger Pacific storm system reached Colorado on the 29th with rain soaking much of the mountains and Western Slope. Late day thunderstorms developed east of the mountains. Brush picked up 1.12" from a strong storm. Rain changed to snow in the mountains overnight. Total precipitation from the storm exceeded 1.50" at several Western Slope locations. A foot of snow fell on Grand Mesa. Skies cleared from west to east on the 30th.

### Weather Extremes

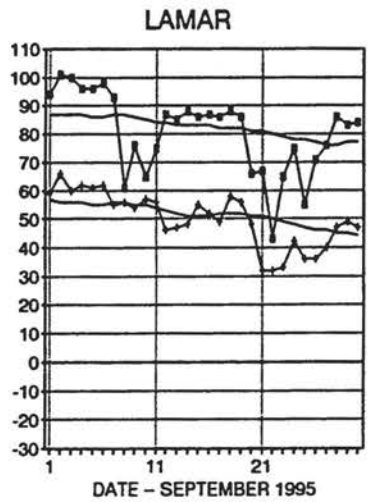
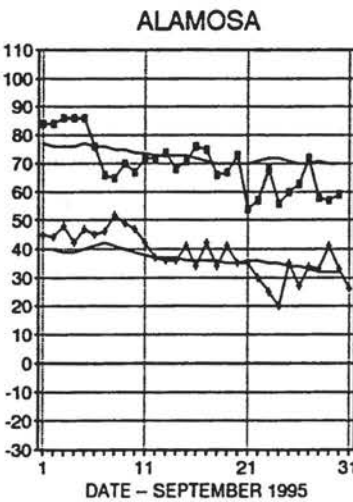
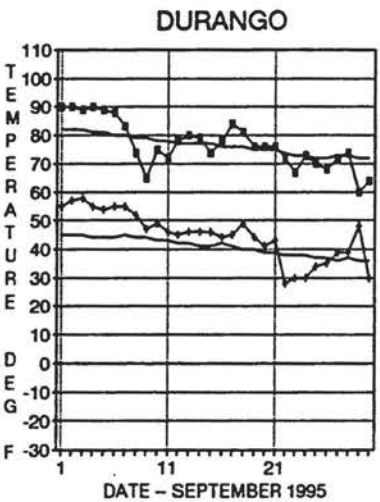
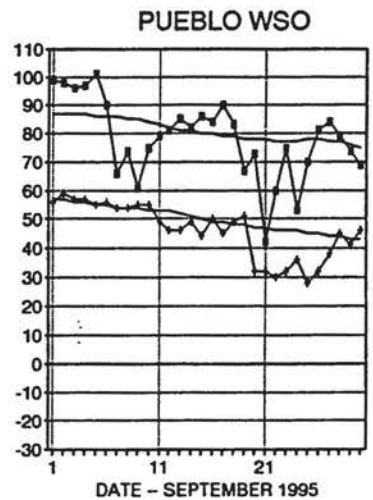
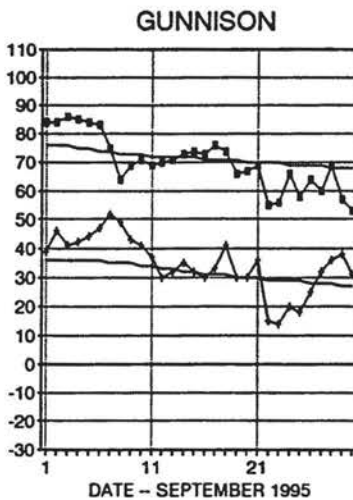
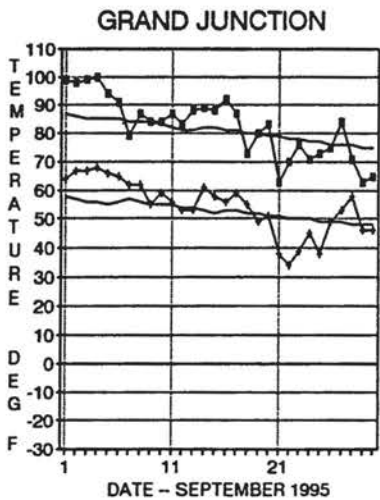
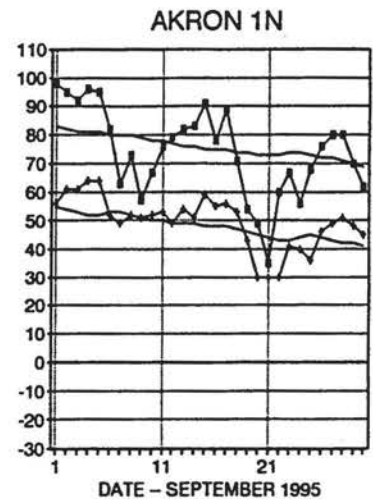
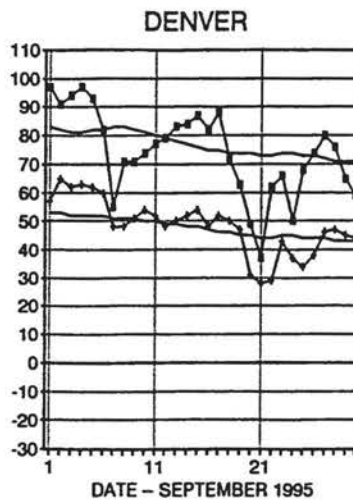
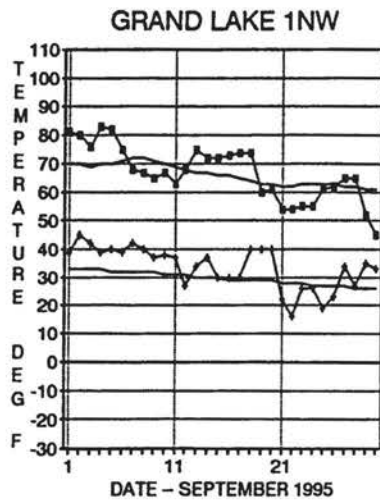
Highest Temperature	106°F	September 2	Campo 7S
Lowest Temperature	4°F	September 22	Sargents
Greatest Total Precipitation	4.47"		Wolf Creek Pass 1E
Least Total Precipitation	0.12"		Fruita
Greatest Total Snowfall	22.0"		Buckhorn Mtn. 1E
Greatest Snow Depth	15"	September 21	Rustic 9WSW



## SEPTEMBER 1995 TEMPERATURE COMPARISON

Observed daily high and low temperatures are shown along with smoothed daily averages for the 1961-1990 period for nine selected locations. (Note: The time of observation effects the recorded high and low temperatures. Durango,

Gunnison, and Lamar each take their observations at 8 a.m. Grand Lake takes their daily measurement at 5 p.m. The remaining stations shown below report at midnight.)

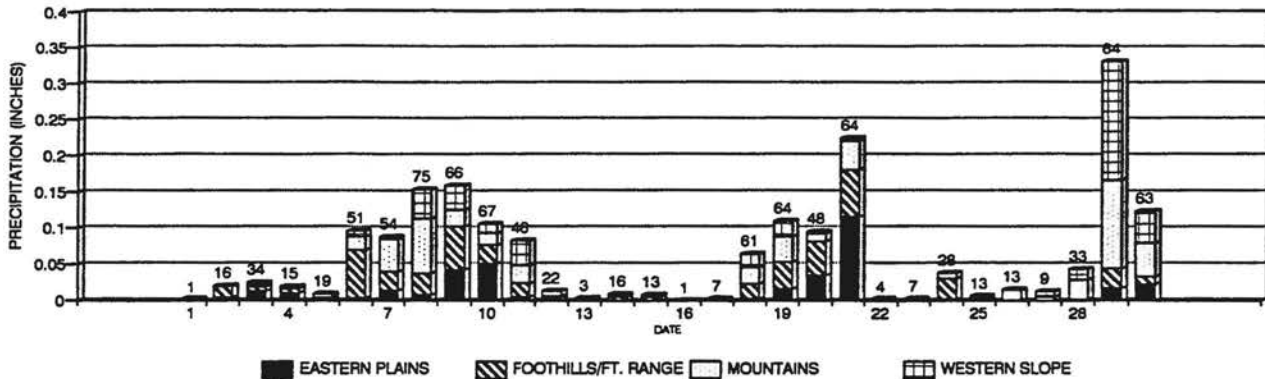


## SEPTEMBER 1995 PRECIPITATION

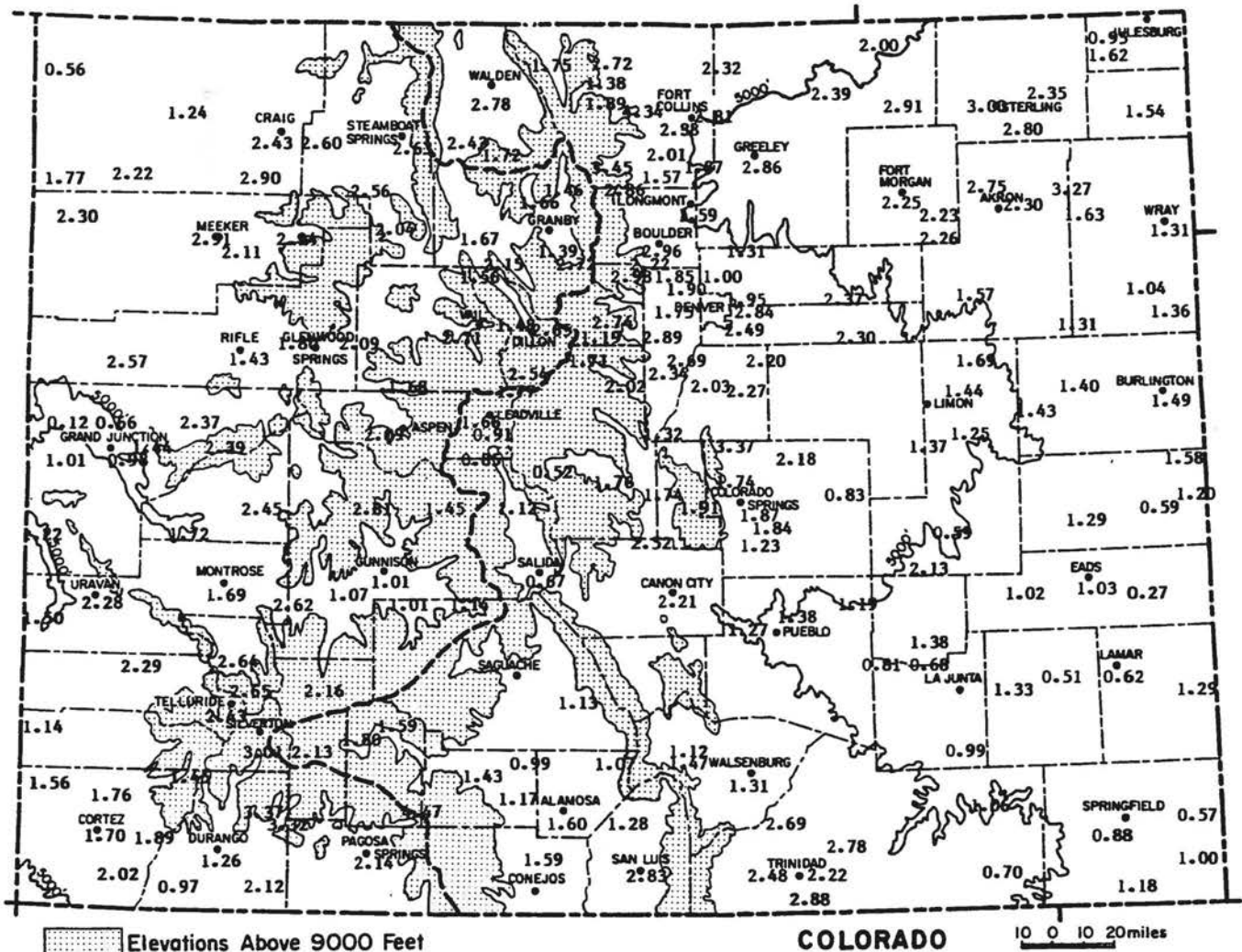
Three episodes accounted for most of September's precipitation. Scattered showers 6-11th were most numerous in and near the mountains. The period 18-21st was especially wet east of the mountains. The final storm episode 28-30th dropped most of its precipitation on western Colorado.

Measurable precipitation fell on 5-10 days on the plains and 7-10 days on the Western Slope. In the mountains and along the Front Range some areas had 15 days or more with precipitation. State-averaged precipitation totalled 1.91" compared to a normal of 1.40".

COLORADO DAILY PRECIPITATION - SEP 1995

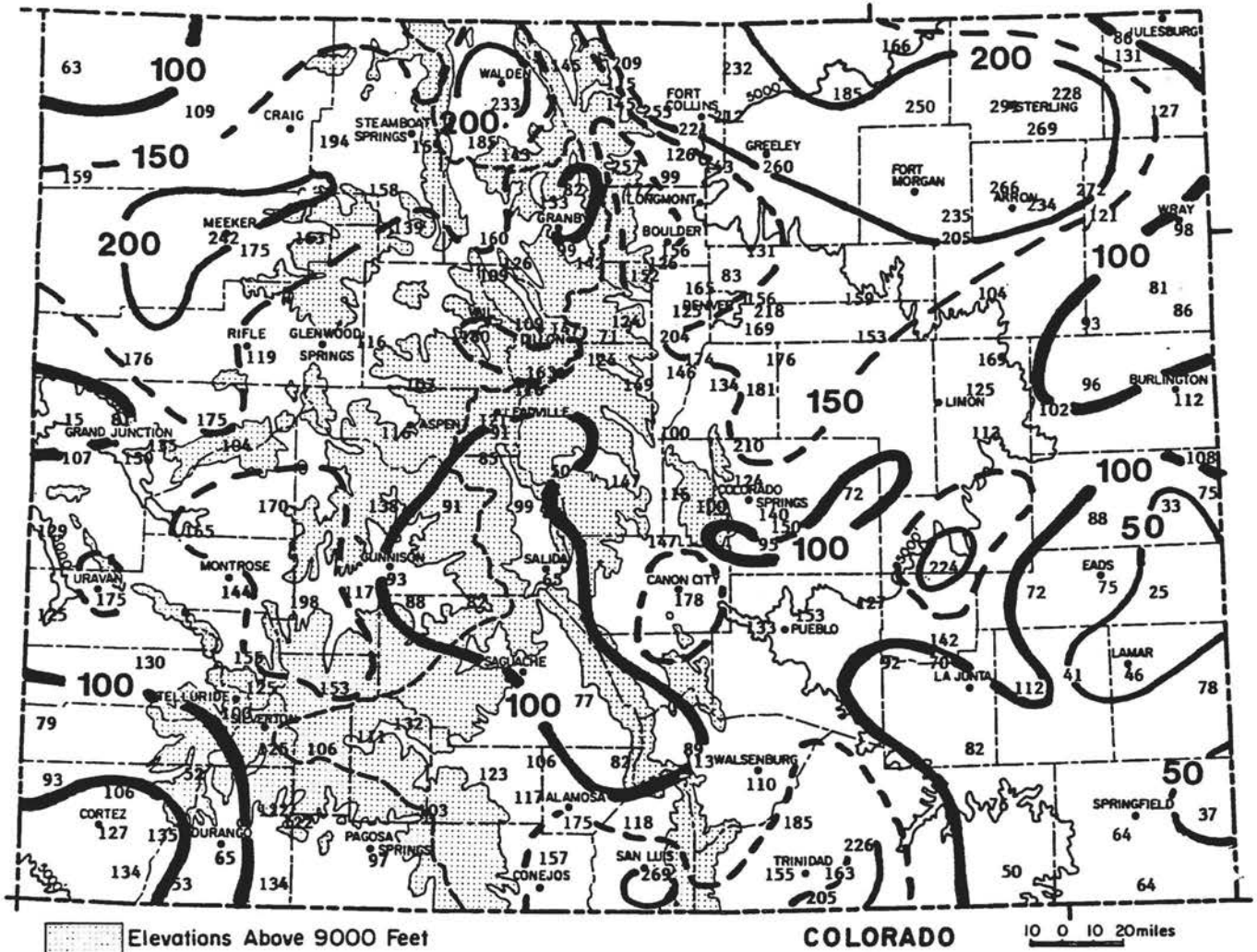


(due to differences in time of observation at official weather stations, precipitation may appear on more days than it actually fell)

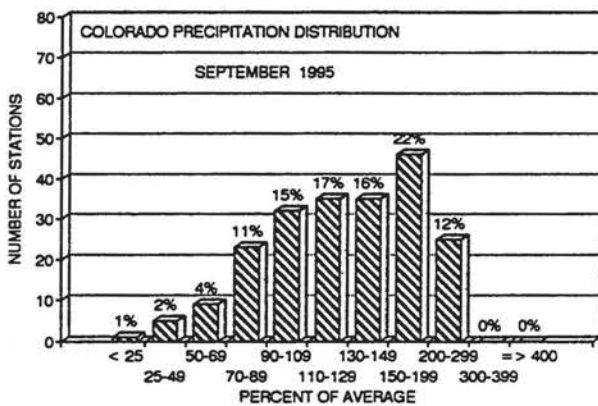


Precipitation Amounts (in inches) for September 1995.

## SEPTEMBER 1995 PRECIPITATION COMPARISON



September 1995 Precipitation as a Percent of the 1961-90 average.



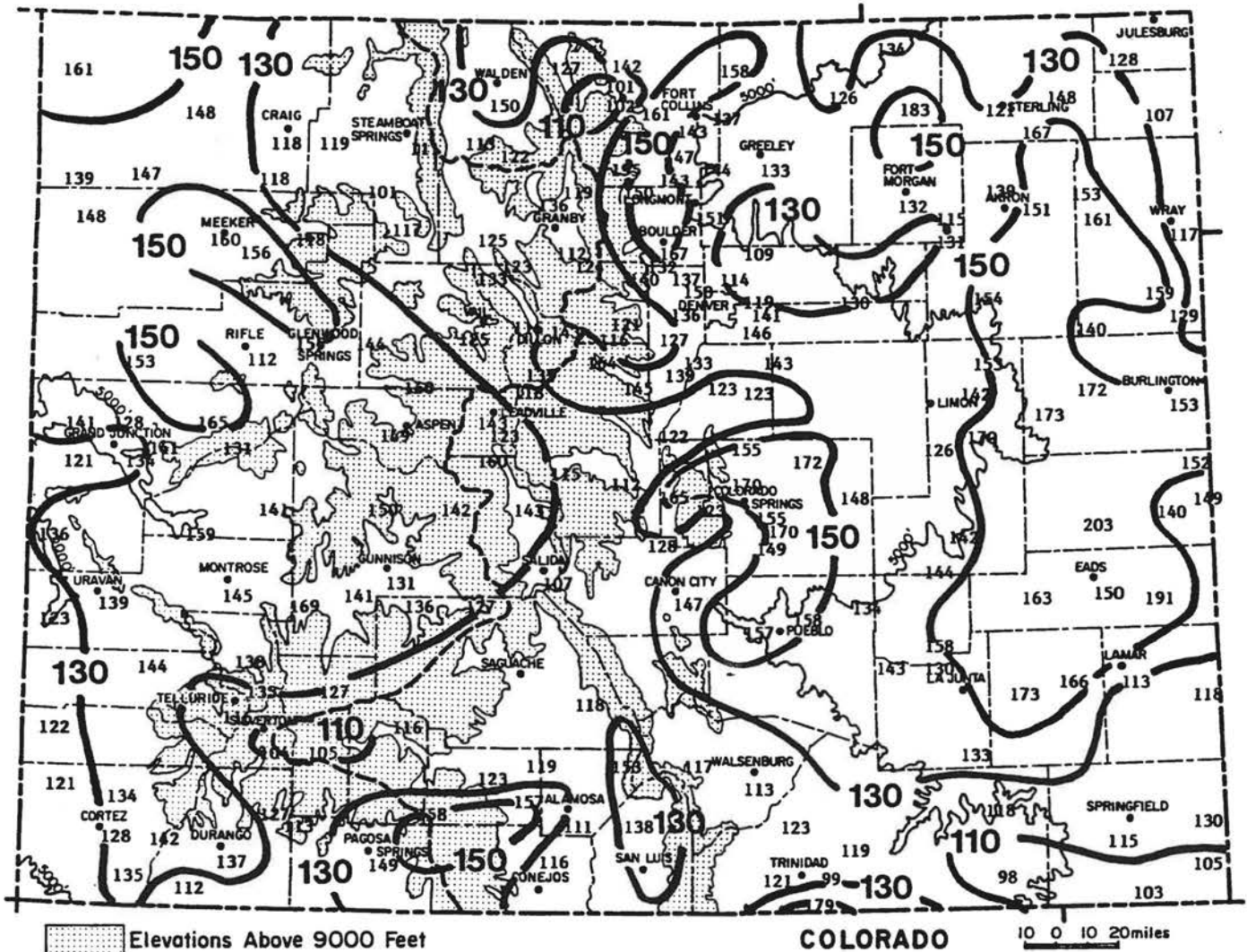
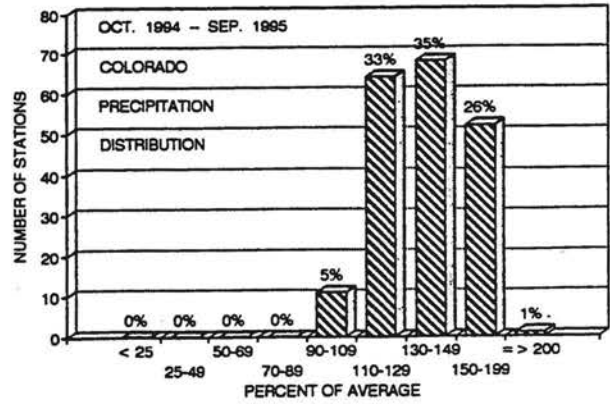
Most of Colorado was wetter than average in September. Approximately 3/4 of the official weather stations had average or above precipitation, and close to 1/3 exceeded 150% of average. As usual, there were exceptions, and a handful of locations received less than 50% of average.

### SEPTEMBER 1995 PRECIPITATION RANKING FOR SELECTED COLORADO CITIES

Station	Precip.	Rank
Denver	1.95"	21st wettest in 124 years of record (wettest = 4.67" in 1961)
Durango	1.20"	33rd driest in 102 years of record (driest < 0.01" in 1953)
Grand Junction	0.66"	51st driest in 104 years of record (driest < 0.01" in 1892, 1901, 1944 and 1953)
Las Animas	1.33"	36th wettest in 130 years (wettest = 4.87" in 1941)
Pueblo	1.38"	28th wettest in 126 years of record (wettest = 4.50" in 1875)
Steamboat Springs	2.63"	13th wettest in 89 years of record (wettest = 8.15" in 1961)

# 1995 WATER YEAR PRECIPITATION

A wet September was a fitting conclusion for the 1995 Water Year. The year ended up wetter than average over the entire State. A handful of stations received between 98% and 110% of average for the year. All other areas received higher percentages. Sizeable areas of eastern Colorado ended the year with more than 150% of average. All in all, it was a most interesting year with climate anomalies affecting recreation, business and agriculture in very significant ways. The very wet spring added greatly to Colorado's surface water supplies and replenished reservoir levels in practically all areas of the State. The persisting cold wet weather, however, slowed agricultural activities greatly during the spring and made several crops in northeastern Colorado vulnerable to the early freeze that occurred in September.



October 1994 - September 1995 Precipitation as a Percent of the 1961-90 average.



## COMPARATIVE HEATING DEGREE DAY DATA FOR SEPTEMBER 1995

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ALAMOSA	AVE	42	98	306	667	1053	1473	1559	1193	1014	717	453	174	8749
	94-95	62	53	319	700	1174	1307	1287	882	934	777	538	238	8271
	95-96	102	25	334										461
ASPEN	AVE	95	150	348	651	1029	1339	1376	1162	1116	798	524	262	8850
	94-95	106	85	335	704	1095	1265	1317	911	988	832	667	319	8624
	95-96	194	90	310										594
BOULDER	AVE	0	7	136	387	726	973	1004	815	744	474	235	53	5554
	94-95	4	0	77	442	848	890	939	737	703	590	431	121	5782
	95-96	18	1	188										203
BUENA VISTA	AVE	50	111	318	620	960	1243	1259	1047	992	729	477	197	8003
	94-95	50	65	286	674	1018	1143	1236	902	968	866	626	M	M
	95-96	134	40	338										510
BURLINGTON	AVE	0	9	138	432	822	1132	1175	948	859	519	254	34	6320
	94-95	4	0	80	370	836	908	1036	797	779	623	440	72	5945
	95-96	20	11	159										190
CANON CITY	AVE	0	11	91	325	645	896	933	756	688	408	193	41	4987
	94-95	0	0	42	361	695	760	888	645	690	558	330	63	5032
	95-96	17	0	134										151
COLORADO SPRINGS	AVE	8	18	164	468	816	1091	1122	924	859	558	302	87	6415
	94-95	10	14	98	486	811	969	1035	811	810	703	477	152	6378
	95-96	38	3	231										272
CORTEZ	AVE	0	11	146	474	828	1163	1237	958	853	594	322	81	6667
	94-95	4	0	111	522	891	1012	1151	688	733	652	439	117	6320
	95-96	24	0	142										166
CRAIG	AVE	32	58	275	608	996	1342	1479	1193	1094	687	419	193	8376
	94-95	13	14	196	613	1133	1316	1332	946	875	692	567	225	7922
	95-96	75	13	252										340
DELTA	AVE	0	10	125	403	774	1128	1221	888	719	435	186	38	5927
	94-95	0	0	87	423	784	1025	984	655	620	M	289	64	M
	95-96	20	0	107										127
DENVER	AVE	0	0	144	429	780	1054	1094	885	806	504	253	71	6020
	94-95	3	2	57	397	804	890	957	738	674	569	431	115	5637
	95-96	19	0	192										211
DILLON	AVE	282	341	555	856	1203	1504	1587	1355	1321	1008	747	459	11218
	94-95	265	247	505	845	1192	1378	1494	1109	1167	1005	808	495	10510
	95-96	356	242	508										1106
DURANGO	AVE	6	37	203	512	846	1172	1246	952	853	594	363	127	6911
	94-95	2	2	104	559	952	1025	1193	746	773	658	458	164	6638
	95-96	38	0	168										208
EAGLE	AVE	25	72	275	617	981	1376	1435	1106	958	675	422	164	8106
	94-95	M	M	M	M	M	M	M	M	M	M	M	M	M
	95-96	M	M	M										M
EVERGREEN	AVE	76	122	349	651	945	1194	1218	1039	1011	741	512	234	8094
	94-95	59	48	286	677	937	1029	1180	893	891	812	633	279	7724
	95-96	111	39	328										478
FORT COLLINS	AVE	0	12	176	471	825	1113	1156	913	828	525	272	77	6368
	94-95	3	3	89	460	820	977	1019	787	737	611	431	104	6041
	95-96	4	1	199										204
FORT MORGAN	AVE	0	8	144	445	840	1197	1277	963	831	492	222	41	6460
	94-95	9	8	106	435	898	1030	1178	842	761	644	377	95	6381
	95-96	18	M	M										M
GRAND JUNCTION	AVE	0	0	55	332	738	1125	1240	854	670	389	132	13	5548
	94-95	0	0	24	368	832	984	962	596	578	425	256	47	5072
	95-96	8	0	73										81

\* = AVES ADJUSTED FOR STATION MOVES

M = MISSING

E = ESTIMATED

### HEATING DEGREE DATA

COLORADO CLIMATE CENTER (970) 491-8545

STATION		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
GRAND LAKE 6SSW	AVE	214	260	468	781	1113	1476	1600	1361	1283	945	660	361	10542
	94-95	205	188	423	761	1154	1456	1430	1034	1165	944	688	403	9851
	95-96	270	166	422										858
GREELEY	AVE	0	7	158	446	831	1153	1206	924	806	492	231	52	6306
	94-95	1	3	88	441	860	1005	1066	815	718	606	408	90	6081
	95-96	262	0	174										436
GUNNISON	AVE	130	204	435	763	1143	1609	1786	1456	1237	867	580	306	10516
	94-95	87	74	343	737	1136	1512	1583	1110	1062	811	599	323	9377
	95-96	204	78	371										653
LAS ANIMAS	AVE	0	0	69	338	750	1088	1141	862	707	370	121	9	5455
	94-95	0	3	40	288	690	882	934	696	653	486	225	32	4929
	95-96	0	0	102										102
LEADVILLE	AVE	272	337	522	817	1173	1435	1473	1318	1320	1038	726	439	10870
	94-95	310	314	539	895	1257	1406	1500	1135	1220	1058	856	547	11037
	95-96	385	273	543										1201
LIMON	AVE	6	21	189	521	879	1169	1218	991	924	603	344	96	6961
	94-95	12	13	124	513	925	1043	1117	928	874	717	496	M	M
	95-96	M	M	M										M
LONGMONT	AVE	0	10	171	468	834	1141	1190	941	840	525	253	70	6443
	94-95	13	0	62	435	884	949	1076	782	762	616	429	117	6125
	95-96	14	12	202										228
MEEKER	AVE	28	56	261	564	927	1240	1345	1086	998	651	394	164	7714
	94-95	13	5	170	578	1087	1207	1306	863	812	692	529	219	7481
	95-96	57	9	221										287
MONTROSE	AVE	0	11	143	453	819	1159	1246	935	791	510	248	68	6383
	94-95	4	2	113	489	895	1072	1068	679	705	589	377	115	6108
	95-96	34	0	146										180
PAGOSA SPRINGS	AVE	64	115	324	636	984	1330	1423	1131	1029	756	512	244	8548
	94-95	M	M	M	M	1009	M	1253	872	885	757	534	318	M
	95-96	148	30	307										485
PUEBLO	AVE	0	0	62	357	735	1051	1091	837	722	396	152	10	5413
	94-95	0	6	57	388	785	964	1028	788	734	608	335	64	5757
	95-96	7	0	157										164
RIFLE	AVE	0	23	184	502	858	1237	1330	980	825	549	298	95	6881
	94-95	3	0	105	497	947	1123	1084	715	724	556	410	138	6302
	95-96	44	0	164										208
STEAMBOAT SPRINGS	AVE	113	168	396	725	1122	1525	1606	1316	1169	801	543	297	9779
	94-95	87	49	289	674	1128	1424	1458	1048	996	778	605	292	8806
	95-96	132	40	318										490
STERLING	AVE	0	9	149	462	852	1200	1265	963	843				

SEPTEMBER 1995 CLIMATE DATA

EASTERN PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
NEW RAYMER 21N	72.0	43.6	57.8	-0.2	93	24	266	57	352	2.00	0.80	167	11
STERLING	80.0	48.9	64.4	1.4	101	28	137	130	458	3.00	1.97	291	11
AKRON 1N	74.1	49.4	61.8	-0.1	98	30	186	95	396	2.75	1.72	267	10
AKRON 4E	76.1	46.8	61.4	-0.9	99	27	188	86	399	2.30	1.32	235	8
HOLYOKE	74.5	50.5	62.5	-0.2	97	29	173	105	421	1.54	0.33	127	6
JOES 2SE	78.2	52.5	65.3	2.0	97	36	109	127	469	1.31	-0.09	94	4
BURLINGTON	77.0	49.4	63.2	-0.3	97	30	159	111	433	1.49	0.16	112	9
CHEYENNE WELLS	80.3	48.6	64.5	0.2	100	30	140	131	471	0.59	-1.16	34	4
EADS	77.9	48.4	63.1	-2.1	99	29	160	112	443	1.03	-0.33	76	5
ORDWAY 21N	79.9	46.6	63.3	-0.3	101	27	155	111	443	2.13	1.18	224	6
ROCKY FORD 2ESE	84.3	47.8	66.1	0.1	103	31	89	129	503	0.68	-0.29	70	5
LAMAR	80.6	50.0	65.3	-1.2	101	32	119	137	488	0.62	-0.71	47	5
LAS ANIMAS 1N	82.4	51.4	66.9	-0.6	104	31	102	170	511	1.33	0.15	113	6
HOLLY	82.6	51.5	67.0	1.2	103	33	102	170	508	1.19	-0.45	73	7
SPRINGFIELD 7WSW	82.3	49.2	65.8	-0.0	99	26	90	117	501	0.88	-0.49	64	7

FOOTHILLS/ADJACENT PLAINS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
FORT COLLINS	73.0	47.3	60.1	-0.1	95	24	199	59	387	2.88	1.58	222	14
GREELEY UNC	75.5	49.1	62.3	0.1	99	28	174	100	416	2.86	1.76	260	12
ESTES PARK	64.6	37.5	51.1	-0.9	84	18	414	4	243	3.45	2.11	257	13
LONGMONT 2ESE	76.9	43.9	60.4	-0.4	100	23	202	74	402	1.59	0.25	119	7
BOULDER	74.7	47.1	60.9	-0.1	95	23	186	70	400	2.96	1.06	156	16
DENVER WSO AP	74.5	48.2	61.3	-1.0	97	28	192	88	399	1.95	0.70	156	12
EVERGREEN	71.3	37.6	54.4	0.3	92	16	328	18	329	2.89	1.48	205	13
CHEESMAN	73.2	27.5	50.3	-3.2	96	11	436	2	351	1.32	0.01	101	8
LAKE GEORGE 8SW	65.5	37.0	51.2	-0.6	82	22	403	0	251	1.76	0.57	148	10
ANTERO RESERVOIR	66.9	32.4	49.7	1.0	82	18	453	0	263	0.52	-0.50	51	4
RUXTON PARK	56.0	33.5	44.7	-0.8	73	15	603	0	115	1.91	0.01	101	16
COLORADO SPRINGS WSO	71.3	46.7	59.0	-1.6	94	29	231	60	349	1.87	0.54	141	9
CANON CITY 2SE	77.6	50.6	64.1	0.1	96	32	134	113	456	2.21	0.97	178	13
PUEBLO WSO AP	78.5	46.0	62.2	-1.3	101	28	157	80	433	1.38	0.48	153	10
WALSENBURG	77.1	47.9	62.5	-0.3	95	27	145	76	430	1.31	0.12	110	8
TRINIDAD AP	77.9	47.5	62.7	-1.2	100	28	150	91	443	2.78	1.55	226	12

MOUNTAINS/INTERIOR VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
WALDEN	66.9	33.2	50.0	1.4	86	12	442	0	264	2.78	1.59	234	13
LEADVILLE 2SW	62.1	31.1	46.6	0.2	76	11	543	0	186	0.91	-0.09	91	7
SALIDA	74.3	39.2	56.8	0.2	91	21	261	22	367	0.67	-0.35	66	7
BUENA VISTA	71.3	36.4	53.9	-1.2	86	19	336	10	331	1.12	-0.01	99	10
HERMIT 7ESE	69.2	31.1	50.1	2.4	81	15	437	0	295	1.82	0.21	113	11
ALAMOSA WSO AP	69.6	37.9	53.8	-1.0	86	20	334	4	300	1.60	0.69	176	8
STEAMBOAT SPRINGS	73.7	34.8	54.2	2.0	91	17	318	5	354	2.63	0.98	159	13
YAMPA	67.9	37.1	52.5	0.7	84	16	370	2	280	2.04	0.58	140	12
GRAND LAKE 1NW	67.0	33.6	50.3	2.2	83	16	435	0	264	1.46	-0.32	82	18
GRAND LAKE 6SSW	65.5	35.9	50.7	1.3	81	18	422	0	244	1.66	0.42	134	17
DILLON 1E	63.9	31.8	47.9	0.1	80	14	508	0	218	1.48	0.13	110	9
CLIMAX	57.4	27.5	42.5	0.5	72	10	669	0	142	1.77	0.25	116	9
ASPEN 1SW	69.8	39.5	54.7	1.7	86	22	310	6	302	2.05	0.25	114	11
CRESTED BUTTE	66.0	31.5	48.8	1.2	83	14	482	0	250	2.81	0.78	138	11
TAYLOR PARK	59.7	32.7	46.2	-0.8	76	15	558	0	157	1.45	-0.14	91	7
TELLURIDE	66.8	34.7	50.8	-0.2	81	20	420	0	261	2.43	0.01	100	16
PAGOSA SPRINGS	70.7	38.4	54.6	-0.3	86	23	307	1	319	2.14	-0.05	98	13
SILVERTON	64.2	32.5	48.3	1.1	79	20	493	0	220	3.01	0.61	125	15
WOLF CREEK PASS 1E	55.6	33.6	44.6	-0.5	73	21	602	0	110	4.47	0.15	103	17

## WESTERN VALLEYS

Station	Temperature						Degree Days			Precipitation			
	Max	Min	Ave	Dep	Highest	Lowest	Heat	Cool	Grow	Tot	Dep	%Norm	#days
CRAIG 4SW	74.3	40.0	57.1	0.4	93	21	252	25	361	2.43	1.13	187	7
HAYDEN	73.3	41.5	57.4	1.3	92	22	247	26	349	2.60	1.26	194	14
MEEKER 3W	76.6	39.9	58.3	1.8	93	20	221	27	391	2.91	1.71	242	10
RANGELY	80.4	46.4	63.4	2.3	96	25	132	94	470	2.30	1.09	190	6
GLENWOOD SPRINGS	78.9	44.5	61.7	2.4	96	26	153	58	430	1.80	0.14	108	10
RIFLE	79.5	42.8	61.1	1.0	98	22	164	56	437	1.43	0.23	119	7
GRAND JUNCTION WS	82.5	54.4	68.5	1.7	100	34	73	185	555	0.66	-0.15	81	7
PAONIA 1SW	81.2	48.5	64.8	2.5	97	31	110	112	483	2.45	1.01	170	9
DELTA	82.2	46.9	64.5	1.8	99	29	107	101	487	1.72	0.68	165	7
GUNNISON	70.2	34.6	52.4	0.7	86	14	371	0	311	1.01	-0.07	94	15
COCHETOPA CREEK	73.3	34.4	53.9	2.2	90	13	332	7	353	1.01	-0.13	89	11
MONTROSE NO 2	77.4	46.7	62.1	0.6	93	29	146	67	432	1.69	0.52	144	9
URAVAN	86.0	49.9	67.9	2.1	103	34	71	167	544	2.28	0.98	175	8
NORWOOD	73.8	43.8	58.8	1.9	89	24	213	34	375	2.29	0.54	131	8
YELLOW JACKET 2W	78.4	47.2	62.8	2.2	94	29	122	63	443	1.56	-0.11	93	9
CORTEZ	80.5	44.2	62.3	2.8	96	29	142	71	466	1.70	0.37	128	7
DURANGO	76.9	44.8	60.9	2.0	90	28	168	52	419	1.26	-0.65	66	11
IGNACIO 1N	75.9	41.2	58.5	0.3	90	26	213	28	390	2.12	0.54	134	5

Data are received by the Colorado Climate Center for more locations than appear in these tables. Please contact the Colorado Climate Center if additional information is needed.

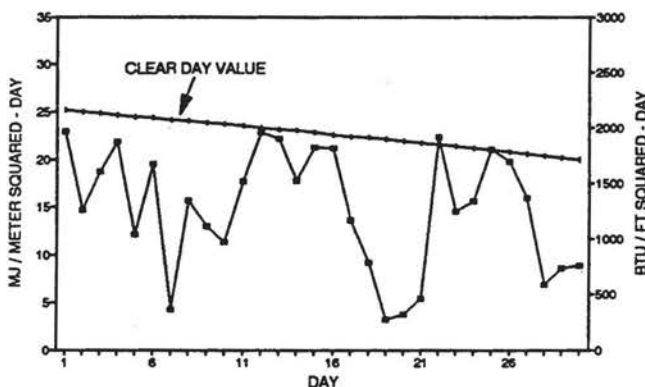
### SEPTEMBER 1995 SUNSHINE AND SOLAR RADIATION

	Number of Days			Percent Possible Sunshine	Average % of Possible
	CLR	PC	CLDY		
Colorado Springs	6	11	13	--	--
Denver	NA	NA	NA	72%	74%
Fort Collins	6	10	14	--	--
Grand Junction	14	11	5	89%	79%
Pueblo	NA	NA	NA	59%	80%

CLR = Clear    PC = Partly Cloudy    CLDY = Cloudy

Most of Colorado experienced more clouds and less solar radiation in September than average. Cloudcover was particularly dense and persistent along the Front Range. In western Colorado approximately half the month was sunny.

### FT. COLLINS TOTAL HEMISPHERIC RADIATION SEPTEMBER 1995

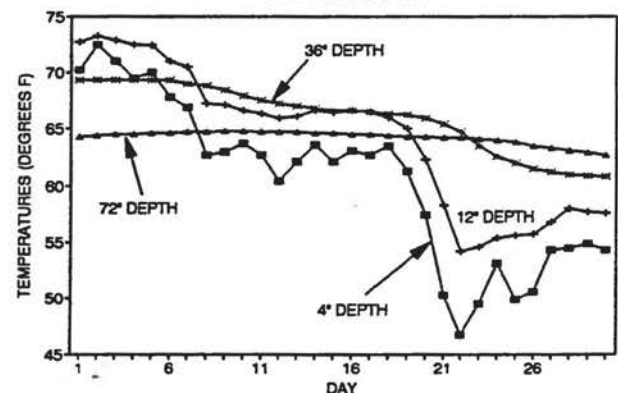


### SEPTEMBER 1995 SOIL TEMPERATURES

Soil temperatures remained warmer than usual for late summer until the cloudy, wet and snowy weather sent temperatures plummeting.

These soil temperature measurements were taken at Colorado State University beneath sparse unirrigated sod with a flat, open exposure. These data are not representative of all Colorado locations.

### FORT COLLINS 7 AM SOIL TEMPERATURES SEPTEMBER 1995



HATS OFF TO: *Trinidad, Colorado, City Weather Station.*

Weather observations have been taken daily in Trinidad since 1877 with only a few interruptions. Since 1954 staff of the Trinidad Power Plant have taken the responsibility for the daily observations. Continuous long-term weather observations are of great value and utility, and we thank the staff of the City of Trinidad Power Plant for their commitment.

## A REVIEW OF THE 1995 WATER YEAR

### Significant Features

The 1995 water year will be remembered for its very mild winter, the extraordinarily cloudy, cold and wet spring, a very hot late summer and an early snow and hard freeze. The figure below outlines some of the significant features and weather events of the year.

### 1995 WATER YEAR HIGHLIGHTS

	EVENTS	PATTERNS
OCT	Big Hailstorm Ft. Range	Cool and Damp
NOV	Plentiful Mountain Snow	Strong Jet Steam
DEC	Springlike Christmas Brief New Year's Coldwave	Dry and Mild
JAN	Rain on the Plains	Moist Pacific Storms
FEB	Big Mountain Snow	Very Mild
MAR	Blizzards and Dust	More Pacific Storms
APR	Very Cloudy	
MAY	Wet and Gloomy	Incredibly Cold and Wet Spring
JUN	Huge Mountain Snowpack Fear of Flooding Rushing Snowmelt Mountain Snow July 4	
JUL		Heatwaves Begin
AUG	Drying Quickly Too Hot for School	Persistent Heat
SEP	Tree-Snapping Snow and Early Freeze	

### 1995 Winter Season

The water year began with a violent bang as potent thunderstorms October 1 and 5 dropped damaging hail on several areas east of the mountains. A mid-October snowstorm stranded dozens of hunters in southwest Colorado. November brought cold weather and good early season snow as several fast-moving storms crossed the State. The stormy weather retreated from Colorado in December. Three consecutive weeks of dry and unusually warm weather, including much of the holiday period, made Colorado's giant ski industry very nervous.

Pacific storms pounded California in January but mostly dissipated as they reached the Rockies. Small doses of snow refreshed mountain snowpack and produced acceptable skiing conditions. A blast of subzero cold arrived for New Year's Day but soon retreated leaving all of Colorado much warmer than usual for January. A rare heavy January rain soaked parts of the Eastern Plains late in the month. February was also incredibly mild with abundant sunshine and little precipitation, but a unique mid-month storm dumped several feet of snow on the Central Mountains including nearly 5 feet of snow at Leadville and Fairplay. Many roads were closed by

avalanche conditions, but local skiers revelled in shoulder-deep powder. Another big dump of mountain snow came in early March; the leftovers from another California flooding onslaught. Most of the rest of March was dry, windy and warm with several days of blowing dust on the plains. A storm in late March and another in April closed roads and schools with blizzard conditions on the plains. Starting in the last half of April, the warm weather pattern that had prevailed throughout midwinter gave way to a persistent cold, cloudy and wet pattern.

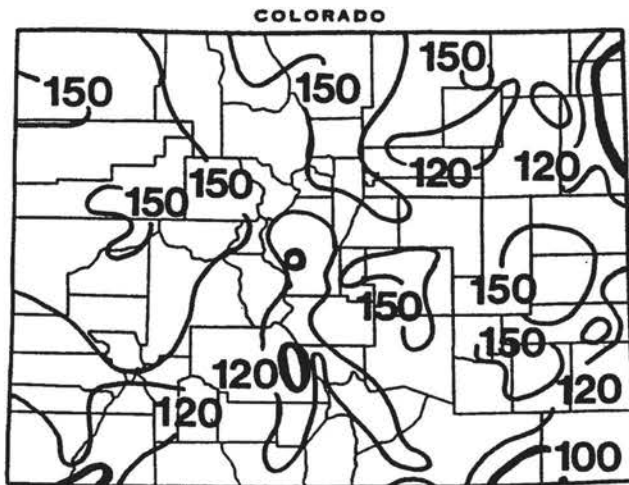
For the seven month winter period as a whole, October - April, all of Colorado was warmer than average and most areas except for portions of the northern mountains were wetter than average. Because of the warm temperatures, more precipitation than normal fell as rain or melted soon after it fell. Winter snowpack was generally below average until the wet spring weather arrived.

### 1995 Growing Season

Temperatures did not warm up at all during May, and rain fell nearly every day. (See Special Feature in May 1995 "Colorado Climate.") Evaporation rates were extremely low. Mountain snows continued to accumulate. Within a matter of weeks, Colorado went from being concerned about drought to being gravely concerned about flooding. A large, widespread storm May 17 sent several Front Range rivers out of their banks. Farmers delayed planting crops, but several ski areas remained open. June was also cooler and wetter than normal with many severe storms. At last mountain snows began to melt. The last blast of winter-like weather came on the 4th of July weekend with more cold rains and high-mountain snow. Rivers remained close to flood stage well into the summer. Most mountain snow melted politely, and relatively little flood damage occurred. However, about a dozen river recreationalists drowned during the runoff season as they challenged the rushing water. The excess runoff filled reservoirs that had been drawn down in 1994. The cool, wet spring encouraged excellent vegetative growth of trees, shrubs and grasses. The 1995 winter wheat harvest was delayed but was a very fine crop in most areas.

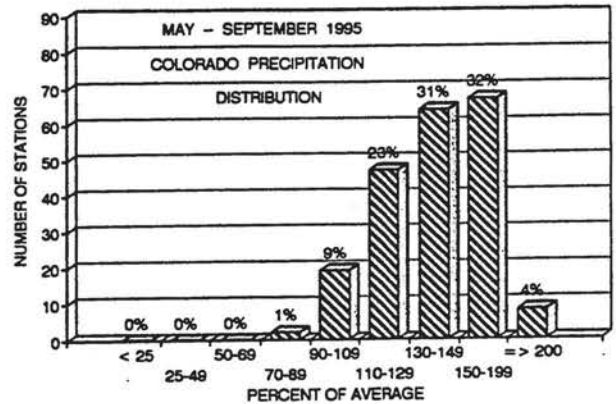
From July 7 to early September, temperatures soared well above average. This was one of the hottest August's on record for portions of the State. Thunderstorms were fewer in number, lighter and less widespread than usual. There were a few severe local storms with hail and flash floods (like the storm that knocked Pagosa Springs August 22), but there were not as many as usual. Soil and vegetation dried out quickly, and a few wildfires were ignited. Most farmers delighted in the hot weather as late-planted crops tried to catch up. Unfortunately, the early snowstorm and hard freeze in September dashed hopes for a full recovery. Agricultural production was not as bad as it could have been, but the impact of the early freeze may have been several million dollars.





Growing Season (May–Sept) 1995 precipitation as a percent of 1961-90 average.

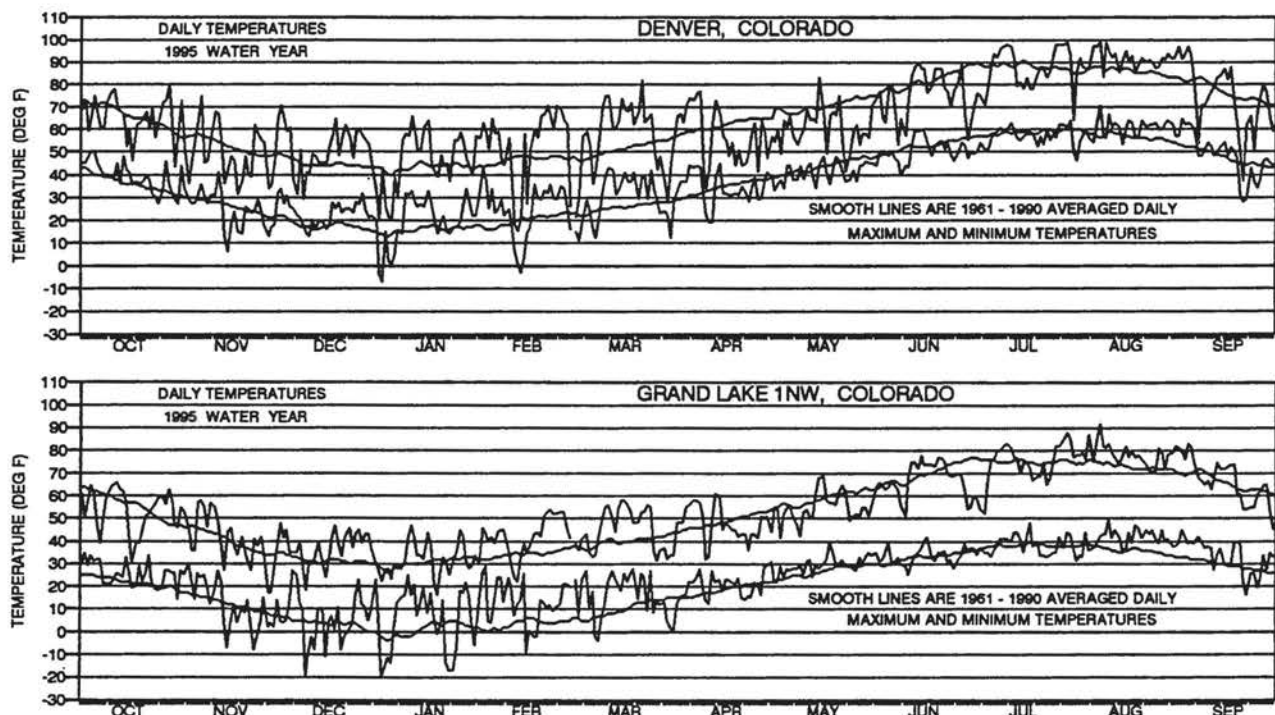
Overall, the 1995 growing season was cooler and wetter than average. This was a complete turn around from the very hot and dry growing season of 1994. Nearly all of Colorado's official weather stations reported average or above average May-September precipitation totals. More than 1/3 of the State received at least 150% of average. The wettest areas when compared to average were found over west central and northwestern Colorado, along the northern Front Range foothills and urban corridor and across scattered areas on the Eastern Plains. A few locations exceeded 20" of precipitation for the period, a rarity for Colorado. The highest May-September totals included 22.74" at Buckhorn Mountain 1E (west of Fort Collins) and 21.00" at Wootton Ranch (south of Trinidad). Totals also exceeded 20" at Flagler, Kit Carson, Leroy 5WSW (near Sterling) and at Eastonville.



### Temperature Summary

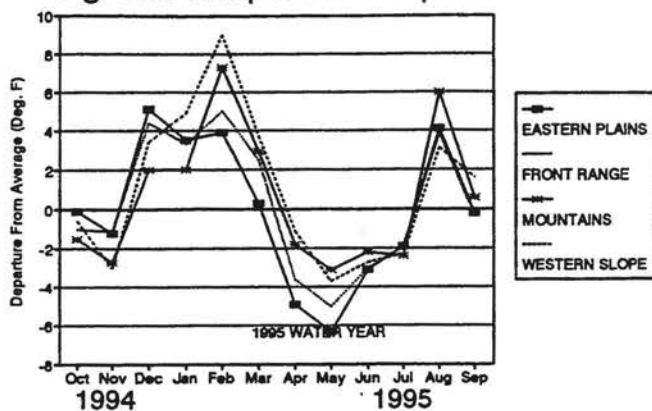
The graphs below give an indication of the daily march of temperatures through the 1995 water year. The key features were the numerous extremely mild days throughout the midwinter period, the persisting cold weather during the spring and the late summer heat. There were a few brief intrusions of arctic air during the winter, but they were more than offset by the large number of days from late November into early April when temperatures were 10 to 20 degrees F above average. It has now been nearly five years since the last major and prolonged winter outbreak of polar air – December 1990.

An interesting feature of the 1995 water year was the statewide month-to-month consistency in temperature anomalies (see graph below). The entire State was cooler than average during the fall, very mild from December to early April, cold from mid April into July and hot in August. For Colorado, the period from March 1994 through February 1995 was the warmest on record for any time this century.



Unless noted otherwise, the special features contained in *Colorado Climate* are prepared and edited by Nolan Doesken, Assistant State Climatologist, at the Colorado Climate Center. Comments and questions are always welcome. E-mail address: nolan@ulysses.atmos.colostate.edu

## Regional Temperature Departures

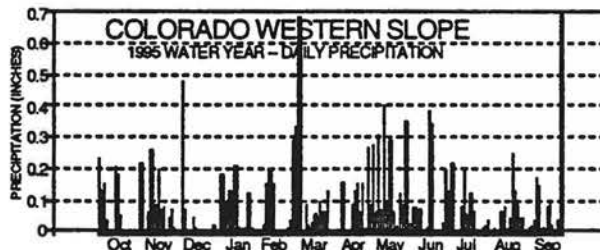
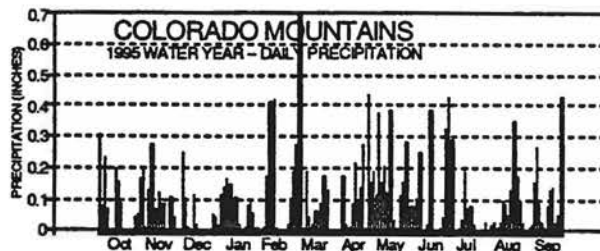
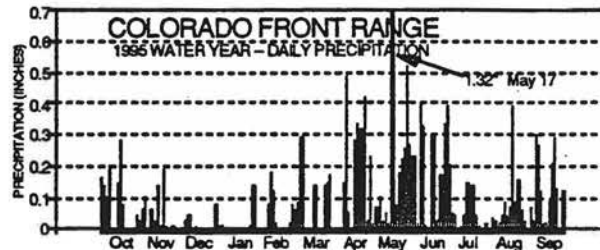
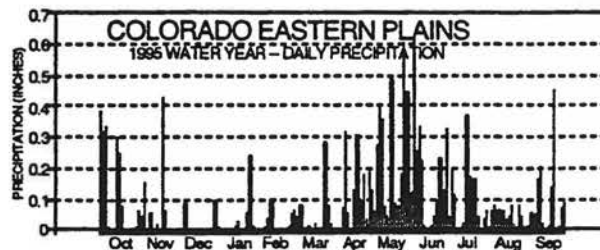


## Precipitation Summary

Precipitation for the year, averaged across the State's many weather stations, totalled 21.03" which is 136% of average. By any definition, this classifies as a very wet year, and probably exceeds slightly the most recent wet years of 1983 and 1984. Statewide, this appears to be the wettest year since 1965 and one of the 8th wettest years in the past 107 years. The wet spring months were nearly totally responsible for the year's excess moisture. The wettest individual weather station for the year was Wolf Creek Pass 1E with 70.29 inches. The least precipitation was 8.41" at Center 4SSW only 40 miles from Wolf Creek Pass as the crow flies.

Spring precipitation contributes more to soil moisture and streamflow than precipitation that falls at other times of year. This was certainly the case in 1995. Streamflow volumes for the water year ended up far above average, exceeding 150% of average in some basins. Water consumption during the year was extremely low until about the middle of July when crops were finally growing fast and the first prolonged heatwave hit the State. Thereafter, water utilization was very high, but still not as great as this year's abundant supply. As a result, large volumes of water were able to be stored for future use. Many reservoirs in Colorado were at fairly low levels going into 1995 as a result of the dry summer of 1994 and several years of low snowpack prior to 1993. Reservoir storage was fully replenished in most basins and now is back close to the high storage levels that were observed in Colorado in the mid 1980s.

The graphs here show the day by day precipitation totals during the 1995 water year for various regions of Colorado. The sporadic winter precipitation is evident along with the unusually dry late July - early August period (commonly the heart of the summer monsoon period). This was more than offset by the relentless spring precipitation. The regional average of 1.32" for the Front Range for May 17 is quite extreme.



## Acknowledgments

Many thanks to all of the cooperative weather observers in Colorado for your faithful efforts in 1995. The Colorado Climate Center's ability to accurately monitor and describe climate variations, extremes and long-term trends depends on the on going commitment of all of you observers. Thanks for another good year.

As a new year begins, go out and check your equipment. Make sure your precipitation gage is in good shape and doesn't leak. We probably have some dry years to look forward to, so we don't want any precious precipitation to get away from us.

WTHRNET WEATHER DATA SEPTEMBER 1995

	Alamosa	Durango	Carbondale	Montrose	Steamboat Springs	Sterling	Stratton	Walsh
monthly average temperature ( °F )	53.5	59.1	55.7	58.9	51.2	60.8	61.9	64.8
monthly temperature extremes and time of occurrence ( °F day/hour )								
maximum:	85.6 4/14	86.5 3/16	93.6 1/16	91.0 3/16	88.5 1/15	100.2 5/14	99.3 2/14	101.7 5/16
minimum:	21.2 23/ 6	29.5 22/ 5	19.9 22/ 6	23.7 22/ 6	14.7 22/ 6	29.5 22/ 5	30.0 20/23	30.6 22/ 6
monthly average relative humidity / dewpoint ( percent / °F )								
5 AM	94 / 38	62 / 38	94 / 40	80 / 42	98 / 36	40 / 32	28 / 26	82 / 49
11 AM	53 / 48	29 / 41	45 / 49	48 / 51	49 / 48	21 / 33	17 / 31	42 / 50
2 PM	40 / 45	22 / 38	38 / 47	38 / 50	37 / 46	18 / 34	15 / 33	31 / 47
5 PM	41 / 44	22 / 37	36 / 46	38 / 47	41 / 44	17 / 33	14 / 32	34 / 46
11 PM	75 / 42	46 / 37	71 / 42	61 / 43	88 / 40	29 / 29	21 / 25	67 / 49
monthly average wind direction ( degrees clockwise from north )								
day	181	189	221	229	214	187	131	142
day	131	56	n/a	150	120	198	191	170
monthly average wind speed ( miles per hour )	2.11	4.05	0.70	1.87	2.22	8.25	7.24	6.93
wind speed distribution ( hours per month for hourly average mph range )								
0 to 3	500	290	508	568	452	53	226	125
3 to 12	164	403	43	147	174	535	346	382
12 to 24	4	7	0	1	6	132	148	97
> 24	0	0	0	0	0	0	0	0
monthly average daily total insolation ( Btu/ft <sup>2</sup> ·day )	1543	1521	1445	1468	1469	1352	1384	1541
"clearness" distribution ( hours per month in specified clearness index range )								
60-80%	186	181	162	176	179	165	147	176
40-60%	65	94	93	71	72	70	70	79
20-40%	63	56	64	70	57	49	51	57
0-20%	42	30	38	37	51	59	68	40

The figure below shows monthly weather at WTHRNET sites around the state. Three graphs are given for each location; the top graph displays the hourly ambient air temperature, the middle graph gives the daily total horizontal solar radiation, and the bottom graph shows the hourly average wind speed. More detailed weather sets are available from the Colorado Weather Network. Please contact the WeatherNet at (303) 492-0242.

