

**Climatological Data for September, 1909.**  
**DISTRICT No. 8, TEXAS AND RIO GRANDE VALLEY.**

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**GENERAL CLIMATOLOGICAL CONDITIONS.**

The month of September was marked by an excess of temperature in the greater portion of the district and by a general deficiency of precipitation. It was the driest September in Texas during the last eighteen years. The temperature averaged nearly normal in Colorado and over 1° above the normal in Texas, but there was a decided deficiency in New Mexico. In fact, so far as this territory is concerned, there has been but one September in the last fifteen years—that of 1902—which was colder than the month under discussion. While the precipitation was generally deficient, there was a moderate excess in Colorado, over limited areas in New Mexico, and in a few localities in Texas. In the last-named State showery conditions obtained locally at infrequent intervals until the 23d, after which date there was a period of clear, cool and invigorating weather. The amount of cloudiness, however, previous to that date was also considerably less than the normal. In Colorado and New Mexico the precipitation practically all occurred during the first two weeks of the month, and the number of rainy days averaged about five. A small amount of precipitation in both Colorado and New Mexico was in the form of snow, the greatest monthly snowfall being 4 inches at Platoro, Colo. The prevailing wind direction was southwest in Colorado and New Mexico, and south in Texas, and the wind movement was mostly light.

**TEMPERATURE.**

The month opened with warm weather prevailing throughout the district, and this condition continued with but little interruption until the 13th, when there was a sharp fall in temperature extending over Colorado, New Mexico, and the northern portion of Texas. During this cool spell the temperature fell to 30° at Garnett, Colo.; 34° at Fort Stanton, N. Mex.; and 41° at Plainview, Tex. It was of short duration however and did not affect the southern half of Texas. From the 16th to the 22d there was a constant increase of temperature, culminating in unusually warm weather, which was followed by a general and sharp fall of temperature on the 23d. Cool weather obtained in the greater portion of the district until the close of the month, and the lowest temperatures of the month occurred during its prevalence. In Colorado the temperature fell to 24° at San Luis; in New Mexico, to 27° at Fort Stanton; and in Texas, to 34° at Carmona and at Colorado. At some of the higher stations in Colorado and New Mexico, however, a lower minimum temperature occurred than that recorded at San Luis or at Fort Stanton, respectively. The first to the third were the warmest days of the month, although in Texas the temperature was abnormally high also from the 9th to the 11th, and from the 20th to the 22d. The highest temperatures reported were: In Colorado, 84° at Blanca; in New Mexico, 97° at Alamogordo and at Rincon; and in Texas, 108° at Encinal, Fort McIntosh, Tilden, and Zapata. The daily range of temperature was greatest during the third decade, which was due to active nocturnal radiation under the influence of a strong anticyclonic area, but the variability of temperature from day to day was comparatively small throughout the month. The local monthly mean temperatures ranged from 47.9° at Hope-well, N. Mex., to 83.3° at Fort McIntosh, Tex.

**PRECIPITATION.**

The precipitation over the Rio Grande watershed was less than the normal, the deficiency being most marked over the lower portion from Fort Clark to Brownsville. Over the extreme upper portion there was an excess of nearly one-half inch. A similar excess occurred in New Mexico over a fairly long stretch from Taos Canyon to Mountainair, and there was

also a slight excess over a limited area at Del Rio, Tex. Over the intervening and by far greater portions of the watershed the deficiencies ranged in New Mexico from 0.02 inch at Strauss to 0.93 inch at San Marcial, and in Texas from 0.85 inch at El Paso to 4.55 inches at Brownville. However, the general deficiency over the New Mexico portion of the watershed averaged only 0.12 inch and, considering the excess of nearly 0.50 inch in Colorado, the precipitation southward to the Texas border line averaged nearly normal. It is well to remember, in this connection, that practically all the precipitation occurred during the first two weeks of the month. The average precipitation over the watershed as a whole approximated 1.30 inches, which is less than 50 per cent of the amount received during the preceding month. The extremes of precipitation ranged in Colorado from 0.76 inch at Blanca to 3.07 inches at La Veta Pass; in New Mexico, from 0.08 inch at Orogrande to 3.88 inches at Swastika Ranch; and in Texas, from 0.00 inch at Fort McIntosh to 3.16 inches at Del Rio. Some snow occurred in the upper watershed, but the greatest amount did not exceed four inches.

Conditions in the Rio Pecos watershed were not as good as in that of the Rio Grande. There was a general deficiency of precipitation amounting to over one-half inch in the entire watershed except the extreme upper portion. The upper basin southward nearly to Santa Rosa was favored with an abundant supply of precipitation, the monthly amounts ranging from 1.60 inches at Windsors Ranch to 3.91 inches at Las Vegas. From Santa Rosa southward to the Rio Grande there was a general deficiency ranging from 0.37 inch at Carlsbad, N. Mex., to 3.04 inches at Fort Stockton, Tex. The average precipitation over the watershed as a whole was 1.16 inches, which is nearly 50 per cent less than the normal and only about one-half the amount received during August. The greatest local monthly rainfall was 3.91 inches at Las Vegas, and the least 0.12 inch at Pastura, both in New Mexico. In Texas the extremes were 0.50 inch at Barstow and 0.18 inch at Fort Stockton.

Throughout the watersheds of the remaining rivers in the district, comprising the Nueces, San Antonio, Guadalupe, Lavaca, Colorado, Brazos, Trinity, Neches, and Sabine, as well as over the coastal plains draining directly into the Gulf of Mexico, there was a general deficiency of precipitation averaging over 2 inches. In the Nueces drainage area the average precipitation was only 0.86 inch, which is about 35 per cent of that of the preceding month. The greatest amount was 2.17 inches at Sabinal, and the least 0.00 inch at Encinal. The San Antonio and Guadalupe watersheds averaged 1.20 inches or about one-half inch less than the August rainfall over the same area. A marked excess of over 1 inch occurred at Victoria below the confluence of these two rivers. The monthly rainfall at this place was 4.25 inches, the heaviest in Texas. There was no precipitation at San Marcos on the San Marcos River, which is one of the tributaries of the Guadalupe. In the Lavaca watershed the precipitation ranged from a trace at Hallettsville to 0.70 inch at Edna, and the average was less than 50 per cent of the August rainfall. The Colorado watershed was the most favored in the Texas portion of the district. It had an average precipitation of 1.51 inches, exceeding the August average by about 0.30 inch. Nevertheless there was a marked deficiency over the greater portion of its area. The heaviest monthly rainfall was 3.21 inches at Wharton, and the least 0.13 inch at Fairland. East of the Colorado there was a decided diminution in precipitation, the average over the Brazos watershed being only 0.95 inch, which is 1.40 inches less than it was in August. In several localities of the middle Brazos

watershed there was either no precipitation or the amounts were too small to be measured. The heaviest monthly amount was 2.52 inches at Hillsboro. The watersheds of the Trinity and of the Neches received considerably more moisture than that of the Brazos, the averages being 1.01 and 1.46 inches, respectively. These amounts were only about half of what they were in August. The precipitation over the Sabine watershed averaged only 0.88 inch or over 50 per cent less than in the preceding month. The heaviest monthly amounts in these last three watersheds were, respectively, 2.27 inches at Crockett; 3.05 inches at Dialville; and 1.46 inches at Longview. The least were, respectively, a trace at Jewett; 0.27 inch at Beaumont; and 0.21 inch at Wills Point.

#### RIVER CONDITIONS.

The volume of water carried by the rivers of the district was less than during the preceding month. There was a moderate rise in the upper Rio Grande from the 8th to the 11th, but it did not affect the river materially some distance south of the Texas-New Mexico border line. The extreme lower Rio Grande Valley was still flooded at the opening of the month, the crest of the August flood having nearly reached the mouth of the river. From Eagle Pass to Zapata the river was nearly normal, although there was a gradual diminution in volume from the first to the last of the month. There was, however, ample water in the stream for irrigating purposes. The Rio Pecos probably also carried sufficient water for irrigation; at least no report to the contrary has been received. The average depths of the Brazos and Colorado rivers were 1 foot less than in August and those of the Guadalupe, Trinity, Neches, and Sabine a fraction of a foot; and all these streams carried considerably less than the average September volume of water. In some of their portions the river stages were the lowest on record for September while some of the smaller tributaries were without running water.

#### MISCELLANEOUS.

The droughty conditions in Texas were very injurious to farming and gardening operations, and inhabitants, stock, and pastures suffered much because of lack of water. In some portions of Texas water had to be hauled in by trains at a considerable cost, and in others engines had to be installed for the purpose of pumping water for the cattle.

Frost occurred at most of the higher stations in Colorado from the 21st to the 24th. In New Mexico there was killing frost in several northern counties on the 13th and 14th, and a general light frost in southern counties on the 27th and 28th, but vegetation was not materially damaged. In Texas light frost occurred in a number of widely separated localities on the 28th and 29th without, however, causing any injury.

A cloudburst was reported on the afternoon of the 9th 2 miles west of Vaughn, N. Mex., in the upper watershed of the Rio Pecos. At Vaughn itself the precipitation on that day was only 0.17 inch.

A damaging wind and hailstorm occurred at Palestine, Tex., on the 22d. The wind attained a velocity of 48 miles per hour, which was the maximum wind velocity reported from regular Weather Bureau stations. The damage to buildings, trees, and other property was heavy.

A project is under way to levee the Rio Grande in drainage District No. 1 of Hidalgo County, Tex. A levee and drainage bond issue for \$176,000 was voted by that county in 1908, but for various reasons the Attorney General of the State of Texas withheld his approval. It has been reported that since the August flood of the lower Rio Grande the opposition to the project has disappeared and it is understood that the work of leveeing will begin at an early date.

Levee work is also contemplated on the Brazos River in Washington and Burleson counties under the levee and drainage district act of the thirty-first legislature. This is expected to reclaim about 80,000 acres of land.

An irrigation project is contemplated near Bay City, Matagorda County, Tex., and precipitation data in connection therewith have been furnished the supervising engineer by the central office of the Texas section.

The following notes are reprints from the Reclamation Record for October, 1909:

New Mexico, Carlsbad Project (completed): The enlargement of the Black River cut-off ditch and the work of operating and maintaining the canal system have been continued during the month. The supply of water in Pecos River has been ample for irrigation purposes on the project and for three days 2,000 second-feet of water were allowed to pass over the spillway at Avalon Dam.

New Mexico, Hondo Project (completed): The total rainfall during the year to the end of September has amounted to 6.84 inches. The amount of water available for irrigation during the month has been insufficient to supply the growing crops and orchards, but partial irrigation has been of some value.

New Mexico, Leasburg Project (completed): During the month of September the flow of the Rio Grande at the Leasburg diversion has varied from 1,000 to 10,000 second-feet, giving an ample supply of water for irrigation on the project. The survey of farm units has been continued.

New Mexico-Texas, Rio Grande Project (preliminary work): The survey of small tracts within the reservoir site has been continued and is nearly completed. Topographic surveys in El Paso Valley have been continued and a total area of about 23,000 acres has been mapped.

The following report of the damage caused to the Zuni Dam, and of the loss of the Bluewater Dam on the 6th of September, 1909, is furnished by Mr. C. E. Linney, Section Director, Santa Fe, N. Mex.

The recent partial loss of the massive stone and concrete dam at the reservoir of the Bluewater Development Company, 12 miles southwest of the village of Bluewater, Valencia County, N. Mex., and the damage to the spillway and adjoining lands of the Zuni Reservoir, at Blackrock, McKinley County, N. Mex., on the 6th of September, 1909, were no doubt due to the frequent heavy rains over the Zuni Mountains during July and August, and to sudden and heavy downpours on, or rather within, the drainage basins of these reservoirs on the 4th and 5th days of September.

The dam first mentioned is a stone and concrete structure 386 feet long placed in the canyon at the junction of the Azul and Bluewater creeks, 12 miles southwest of the village of Bluewater, and over 1,000 feet higher than the village. It is spoken of as an ideal site, having been first selected by the U. S. Geological Survey, and known then as U. S. Geological Survey Reservoir No. 33. It was later taken up by the Bluewater Development Company, which built the present dam. The total area embodied in the reservoir is 3,435 acres, with a storage capacity of 92,000 acre feet, received from the combined waters of the Cottonwood, Azul, and Bluewater creeks, which have an approximate drainage area of 240 square miles, much of which is well forested. The second dam is a dry rock, earth and concrete structure placed between the arms of two mesas on the Zuni River 4 miles northeast of the village and pueblo of Zuni. It creates a reservoir a mile square, with an average depth of 35 feet, and a capacity to irrigate about 8,000 acres of land. Its drainage area is somewhat greater than that of the Bluewater Reservoir. Within this reservoir the water stood at a depth of 90 feet at the dam, and was within 1 foot of the top of the spillway when the damage occurred.

Thus far stations are lacking in the higher altitudes of the region in which these reservoirs, or their drainage basins, are located and the amount of precipitation over the mountains is therefore purely speculation, but the following stations are adjacent to the region and no doubt point the way to much greater amounts in the higher altitudes. During August the precipitation was as follows: Manuelito, 7.55; Blackrock, 2.83; Fort Wingate, 5.40; Bluewater Reservoir, 3.73; Bluewater (village), 4.09; San Rafael, 10.03 inches. To this the following amounts were added up to the 6th of September: Manuelito, 1.21; Blackrock, 1.33; Fort Wingate, 2.22; Bluewater Reservoir, 1.96 inches. At Bluewater the gage was lost in the

flood. Heavy downpours were reported to be general over the region from the 22d to the 26th of August, the 29th and 30th of August, the 1st of September and the 4th and 5th of September, with rain continuing on the 6th. These late heavy rains coming upon land that was already saturated, passed rapidly down the steep slopes into the arroyos and canyons causing an unusual volume of water which exceeded the resisting strength of the dams and they gave way.

Mr. E. Z. Ross, General Manager of the Bluewater Development Company, thus describes the break in their dam, and its cause:

Under normal conditions the water in the lake stands within six feet of the top of the dam. Any rise over that causes it to flow over the spillway.

The rainfall was unprecedented. The Bluewater project has a drainage area of more than 200 square miles, and for several days a steady rain fell over its entire area. The watchman at the dam saw the water in the lake rise rapidly on Sunday (the 5th). Monday a wave 2 feet high swept across the surface of the lake, causing an unprecedented rise. This came from the mountain side where it was raining steadily, and bore directly down on the dam. The top of the stone and cement structure was loosened. Then came the cloudburst which brought down a wall of water 5 feet high against our works, already straining under the weight of water. The flood brought down great logs, railroad ties, and other debris which beat against the walls like battering rams. The result was inevitable, and the dam broke for a distance of about 100 feet. When the dam broke the lake rushed through the 12 miles of canyon to the Bluewater Valley. It required about six hours for the flood to pass from the reservoir to the valley and with telephone connection there was ample warning of the approaching danger and no lives were lost. The canyon was swept clean. Great boulders were hurled before the flood as so much paper. When the flood reached the valley it did not spread out, as supposed, but carried by its own force, rushed out across the valley tearing a bed for itself. It was first a stream without banks, then it made banks for itself. The flood rushed on across the valley to the railroad track cutting it in two, and on to the malpais beds on the northern side of the valley, where it was checked and turned back again cutting the railroad tracks lower down. Several miles of railroad track were submerged, about 10,000 feet of track were washed away, and the roadbed for several miles on either side was softened so as to be unsafe.

There was no loss of life and very little loss of live stock. The part of the valley swept by the flood was mostly waste land before the flood occurred. It had been the dumping ground of previous floods and was strewn with boulders and was unfit for farming. That is, the worst of the flood went over raw land and the cultivated area escaped damage almost entirely. The farmers of the Bluewater Valley shipped vegetables out both east and west on the first trains to pass (night of the 9th) after the flood, showing that their crops were not totally destroyed, as first reported.

Estimates as to the damage done to the valley and to the irrigations works of the company vary widely, but it is probable that, exclusive of the loss and damage to the railroad property, \$50,000 will not fully cover the loss. It is asserted that the company will shortly begin the restoration of the dam, and it is hoped that this can be accomplished in time for next season's work.

At Zuni, or Blackrock, since it is at the latter place the reservoir is located, 4 miles northeast of Zuni, the following is given by the Government engineers, in regard to the damage done:

The reservoir had been gradually filling for the past six weeks, and on Monday, September 6, the water was within a foot of the spillway level. Everything was all right thus far. In the evening it was noticed that water was coming through the west side of the mesa south of the dam. Before long the floor of the spillway had been undermined and gradually settled 5 to 7 feet. The water had gotten between the lava rock and the sand bed on which it rests, and this underground flow has continued since, lowering the water in the reservoir 11 feet up to yesterday morning (5th). Mr. Ritter, the engineer in charge, expects the flow to stop before reaching the 30 foot level, another drop of 6 feet. The water flowing under the mesa empties into the old river bed below the dam, and this has been ample to carry it off. No damage whatever was done to the village of Zuni or to anything below the dam. The dam, gate tower, and tunnel are intact, but the entire ground between the mess house and the dam has sunk, clear across the mesa, from east to west, and the water is flowing out under the south quarry.

Supt. Wm. J. Oliver, adds the following, in a letter to this office:

It was not heavy rains that caused the break in the spillway of the dam. The dam proper is uninjured. The cause of the break was that there was a strata of sand rock under part of the spillway and the adjoining section

of land. The water washed out this strata of sand rock, causing the spillway and adjoining land to fall some distance. The water did not escape rapidly and no damage to property has been noticed. During the rainy season there has been greater precipitation in the vicinity than at the station, and there have been numerous cloudbursts which found their way into the reservoir. From present indications no permanent injury will be sustained.

The postmaster at Ramah, a village about 20 miles east-northeast of Blackrock, in the mountains and near the headwaters of the Zuni River, gives the following report:

The rainfall here at Ramah has been very heavy nearly every day for eight weeks, or more, but no floods have occurred. There have been, however, cloudbursts in the surrounding country, and on Sunday and Monday (5th and 6th) before the Bluewater Dam went out very heavy rains fell on the Zuni Mountains. The Zuni Dam did not go out, the water having never gone over the spillway. Faulty foundation was the cause, as the dam was built in malpais country. The water, after the reservoir filled, having sufficient pressure to find its way under and around the dam, washed out the sand and caused a bad settlement of the spillway, and of the whole mesa on the south of the dam.

The postmaster at Guam says:

It has rained about every day for the last thirty days in this vicinity, and on several occasions the rainfall increased to the proportions of cloudburst.

The postmaster at Gallup says:

Storms have been almost continuous since the early part of July. Storms, not general, but local, extending from a point near Fort Defiance, Ariz., to the Zuni Mountains, in fact following the pine forests. Electrical storms were more noticeable than ever before. Three cloudbursts have occurred in the above rainy district within the past month and more water has been running in the channels of streams than was ever known before.

Capt. C. C. Whitcomb, surgeon in charge, Fort Wingate, N. Mex., says: "At the fort there have been no exceedingly heavy rains of short duration." But it is noticed that just prior to the loss of the Bluewater Dam 1.20 inches occurred on the 4th and 0.50 inch on the 5th, after a month in which 5.40 inches of precipitation occurred, and of which 1.30 inches fell in three hours on the 25th of August, and 0.50 inch in two hours on the following day, indicating heavy local rains.

Mr. W. A. L. Tarr, cooperative observer at Manuelito says:

Lightning and sudden hard rains occurred on the 1st, 4th, and 5th. Cloudbursts swept down on the 4th and the Rio Puerco and all ditches were two-thirds full to overflowing. Again on the 7th to the northeast a great deal of rain occurred. Considerable vegetation has been washed out of the canyons by the rains.

In conclusion it seems fairly well established that heavy downpours (so-called cloudbursts) did occur over the Zuni Mountain country quite generally on the 29th and 30th of August and on the 1st, 4th, and 5th of September, probably reaching a climax on the latter days. This heavy fall, dashed upon ground already filled to saturation by the heavy rains of August, rushed quickly down the steep slopes into the arroyos and canyons causing a great volume of water, with flood waves and resulting damage. However, it is also apparent, if no cloudbursts did occur in the higher altitudes, as reported by numerous correspondents, that a fall approaching that which did occur at Fort Wingate (the station nearest to the headwaters of these streams) coming upon an expanse of foothills and mountains already saturated by long continued and heavy rains would be abundantly able to produce a volume of water sufficiently large to cause flood waves mentioned and to do the damage<sup>1</sup> which has been reported, especially where the reservoirs were filled almost, or quite to storage capacity prior to the last onslaught.

<sup>1</sup>It appears from the above reports that the Zuni Dam was sufficiently strong to withstand the floods and cloudbursts that attacked it; but that the natural foundations of the reservoir basin gave way under the great pressure of the water. This weak sandstone stratum would have developed independently of cloudbursts, as soon as the water in the reservoir rose to the reported extreme height. Evidently it is necessary to have as complete knowledge as possible of the geological nature of the floors as well as of the dam anchorage of our great irrigation reservoirs, if such accidents are to be avoided.—C. A. jr.

TABLE 1.—Climatological data for September, 1909. District No. 8, Texas and Rio Grande Valley.

Stations.	Counties.	Elevation, feet.	Length of record, yrs.	Temperature, in degrees Fahrenheit.					Precipitation, in inches.					Sky.				Prevailing wind direction.	Observers.
				Mean.	Departure from the normal.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Total.	Departure from the normal.	Greatest in 24 hours.	Total snowfall unmelting.	Number of rainy days, .01 inch or more.	Number of clear days.	Number of partly cloudy days.		
<i>Colorado.</i>																			
Amethyst (near).....	Mineral	8,730	1															Don C. La Font.	
Blanca.....	Costilla	8,403		55.0		84	27	23	23	45	0.76		0.31	T.	5	17	12	L. C. Audrain.	
Cumbres.....	Conejos	10,015	3															Venita A. Good.	
Garnett.....	Costilla	7,576	16	54.7	+ 1.0	78	17	30	147	45	1.62	+ 0.82	0.61	3.0	6	17	8	Chas. Speiser.	
Hermit.....	Hinsdale	9,843									2.25		0.83	1.5	7			C. C. Mason.	
La Veta Pass.....	Costilla	9,000									3.07		1.22	2.0	7	11	14	Norvin R. Lively.	
Manassa.....	Conejos	7,700	3	54.2		77	2	26	147	44	0.93		0.50	0.0	2	16	3	J. B. Chapman.	
Platoro.....	do.	9,675	2								2.08		0.60	4.0	8	23	1	Walter R. Hook.	
Saguache.....	Saguache	7,740	17															Eugene Williams.	
San Luis.....	Costilla	7,794	13	55.0	- 0.5	78	2	24	33	45	1.18	+ 0.01	0.37	0.0	9	19	9	P. B. Albright.	
Wagon Wheel Gap.....	Mineral	8,434	10															Ellwood Bergey.	
<i>New Mexico.</i>																			
Agricultural College.....	Dona Ana	3,863	43	71.4	- 1.6	95	27	40	29	47	0.92	- 0.53	0.51	0.0	5	19	11	N. M. Agric. College.	
Alamogordo (near).....	Otero	4,338	9	70.3		97	1	41	27	41	1.14		0.82	0.0	2	18	12	Jas. C. Dunn.	
Alamogordo.....	do.	4,320									1.69		0.77	0.0	4			Agent E. P. & S. W. R. R.	
Albuquerque.....	Bernalillo	5,200	32	67.1 <sup>b</sup>	- 1.3	87 <sup>b</sup>	30	44 <sup>b</sup>	28	35 <sup>b</sup>	0.52	- 0.36	0.47	0.0	2			University of N. M.	
Amisett.....	Taos	9,018									2.84		0.95	0.0	10	15	11	Geo. W. Oates.	
Ancho.....	Lincoln	6,112									0.70		0.30	0.0	4	20	7	Agent E. P. & S. W. R. R.	
Aspen Grove Ranch.....	Rio Arriba	9,000									1.87		0.60	0.0	5	25	3	Junius D. Maupin.	
Bateman Ranch.....	do.	8,900									0.22		0.22	0.0	4	16	12	John W. Bateman.	
Bluewater.....	Valencia	6,732	8															Bluewater Developm't Co	
Bluewater Reservoir.....	do.	9,000									1.06		0.01	0.0	3	24	4	Do.	
Boas.....	Chaves	4,154		67.6		93	21	36	27	49	0.27		0.27	0.0	1	23	7	D. C. Savage.	
Capitan.....	Lincoln	6,348									2.49		1.63	0.0	7	17	11	Agent E. P. & S. W. R. R.	
Carlsbad.....	Eddy	3,120	15	71.8	- 2.0	95	21	39	29	52	1.00	- 0.35	0.43	0.0	5	16	12	U. S. Reclamation Serv.	
Carriazo (1).....	Lincoln	5,429	2	65.4		90	3	37	28	46	0.26		0.13	0.0	4	19	11	A. H. Harvey.	
Carriazo (2).....	do.	5,438									0.23		0.15	0.0	5	24	6	Agent E. P. & S. W. R. R.	
Chama.....	Rio Arriba	7,851	8	55.0	- 2.7	79	30	26	22	43	1.83	- 0.14	0.53	0.0	6	19	11	Frank C. Johnson.	
Clouderoft (1).....	Otero	8,650	7															M. P. Cookly.	
Clouderoft (2).....	do.	8,650						29	28		2.77		0.60	0.0	9	22	8	Agent E. P. & S. W. R. R.	
Corona.....	Lincoln	6,666									1.63		0.52	0.0	5	19	4	Do.	
Coyote.....	do.	5,800									0.34		0.22	0.0	12	17	6	Do.	
Cundiyo.....	Santa Fe	6,888									0.84		0.23	0.0	7	19	6	Do.	
Demonstration Farm.....	San Miguel	6,800	1								3.25		1.62	0.0	5			Teofilo Viljal.	
Duran (1).....	Torrance	6,272	1	61.4		86	2	30	27	46	0.50		0.30	0.0	2	18	11	W. H. Birkhead.	
Duran (2).....	do.	6,273									0.50		0.30	0.0	2	17	13	Agent E. P. & S. W. R. R.	
Edson Mine.....	Taos	10,600																Frank L. Paxton.	
Elk (near).....	Chaves		10	61.9 <sup>a</sup>	- 3.0	83 <sup>a</sup>	30	36 <sup>a</sup>	27	39 <sup>a</sup>	1.13	- 1.71	0.78	0.0	6	19	11	Boyd Williams.	
Escondido.....	Otero	4,014									1.71		0.48	0.0	3	22	7	Agent E. P. & S. W. R. R.	
Espanola.....	Rio Arriba	5,590	13	62.6	0.0	89	3	32	23	45	2.31	+ 1.07	1.30	0.0	7	20	4	Mrs. E. F. McBride.	
Estancia.....	Torrance	6,140	4	64.2		92	7	30	30	55	1.25		0.41	0.0	6	19	9	Agent N. M. Cent. R. R.	
Fort Stanton.....	Lincoln	6,231	30	90.1	- 1.2	92	2	27	28	51	0.59	- 1.41	0.35	0.0	3	14	13	U. S. Sanitarium.	
Fort Sumner.....	Guadalupe	3,969	7	69.0		92	17	36	27	50	0.48		0.16	0.0	4	30	0	F. A. Manzanares.	
Gallinas.....	Lincoln	6,635									0.56		0.47	0.0	2	27	3	Agent E. P. & S. W. R. R.	
Gallinas Planting Stat'n.....	San Miguel	7,500	3	56.7		81	30	30	23	42	2.86		1.65	0.0	5	18	11	U. S. Forest Service.	
Harvey's Upper Ranch.....	do.	9,400									3.04		1.52	0.0	5	19	7	Simon B. Warner.	
Hillsboro.....	Sierra	5,224	10	68.0 <sup>c</sup>	- 0.6	90 <sup>b</sup>	27	41	26	42 <sup>b</sup>	1.00	- 1.19	0.55	0.0	4	25	5	J. M. Webster.	
Hodges.....	Taos	8,434									1.94		1.22	0.0	3	21	4	Ralph W. Johnson.	
Hondo Reservoir.....	Chaves	3,904	1	68.8		96	11	37	28	49	0.30		0.25	0.0	3	24	5	U. S. Reclamation Serv.	
Hope.....	Eddy		3															N. L. Johnson.	
Hopewell.....	Rio Arriba	9,500		47.9		72	3	22	23	39	2.42		1.47	1.0	9	7	18	John T. Blanton.	
Laguna.....	Valencia	5,840	5	63.0		90	3	35	23	43	1.40		1.25	0.0	3	20	0	Gus Weiss.	
Lagunita.....	Guadalupe	4,500	5	65.4		92	2	36	23	50	0.56		0.23	0.0	5	20	7	P. A. Turnbull.	
La Huerta.....	Eddy	3,111	1								1.07		0.31	0.0	5	23	5	D. Barclay Sutherland.	
Lake Valley.....	Sierra	5,415	5								1.02		0.50	0.0	6	12	18	Wm. P. Keil.	
Las Vegas.....	San Miguel	6,384	23	61.0	+ 0.1	90	3	30	27	49	3.91	+ 1.59	2.17	0.0	6	21	7	Dr. Wm. C. Bailey.	
Los Lunas (near).....	Valencia	4,900	18	65.2	+ 0.1	90	2	40	23 <sup>a</sup>	42	2.00	+ 0.32	0.90	0.0	3	16	13	Richard Pohl.	
Los Tanos.....	Guadalupe	4,919									0.74		0.38	0.0	4	20	8	Agent E. P. & S. W. R. R.	
Magdalena.....	Socorro	6,557	4	60.9		84	3	30	26	49	1.48		0.80	0.0	4	16	14	Wm. Pender.	
Mineral Hill.....	San Miguel	7,050	5								2.43		1.29	0.0	4	21	4	W. M. Nelson.	
Monument.....	Eddy	3,500	4															James M. Cook.	
Mountainair.....	Torrance	6,547	7	62.0		90	3	34	27	43	1.90		0.72	0.0	6	24	4	John W. Corbett.	
Newman.....	Otero	3,989									1.69		1.29	0.0	7	21	0	Agent E. P. & S. W. R. R.	
Noria.....	Dona Ana	4,414									0.09		0.03	0.0	4	14	16	Do.	
Orogrande.....	Otero	4,171									0.08		0.06	0.0	2	13	16	Do.	
Oscuro (near).....	Lincoln	5,016									0.47		0.35	0.0	4			Eugene F. Jones.	
Oscuro (2).....	do.	5,016									0.45		0.32	0.0	4	20	10	Agent E. P. & S. W. R. R.	
Otis.....	Eddy	3,100									0.73		0.32	0.0	4	26	2	A. M. Hove.	
Otto.....	Santa Fe	6,200									2.47		1.26	0.0	6			Otto Goetz.	
Pastura.....	Guadalupe	5,285									0.12		0.12	0.0	1	29	0	Agent E. P. & S. W. R. R.	
Red River.....	Taos	8,650		50.6		79	5	22	23	45	1.00		0.30	0.0	4	20	9	Mrs. L. R. Penn.	
Rincon.....	Dona Ana	4,030	11	70.8	- 0.5	97	2	40	29	48	0.60	- 0.85	0.50	0.0	2	16	11	Chas. H. Raitt.	
Rio Grande Dam.....	Sierra	4,265	11	70.7		96	2	44	28	43	1.13	- 0.57	0.93	0.0	4	20	5	U. S. Reclamation Serv.	
Rosedale.....	Socorro	6,910	5	60.6		82	2	36	13	31	1.23		0.46	0.0	7	18	3	W. H. Martin.	
Roswell.....	Chaves	3,578	12	68.3	- 2.0	93	21	36	28	48	0.40	- 0.89	0.40	0.0	1	20	9	U. S. Weather Bureau.	
San Marcel.....	Socorro	4,439	14	68.4	- 1.0	96	37	41	28	38	0.80	- 0.93	0.70	0.0	2	12	13	Agent A. T. & S. F. R. R.	
San Rafael.....	Valencia	6,509	6	63.4		85	17	36	13	44	2.14	+ 0.62	0.88	0.0	4	24	4	Dr. C. M. Grover.	
Santa Fe.....	Santa Fe	7,013	37	59.1	- 1.5	81													

TABLE 1.—Climatological data for September, 1909. District No. 8—Continued.

Table with columns: Stations, Counties, Elevation, Length of record, Temperature (Mean, Departure from normal, Highest, Date, Lowest, Date, Greatest daily range), Precipitation (Total, Departure from normal, Greatest in 24 hours, Total snowfall unmeted), Number of rainy days, Number of clear days, Number of partly cloudy days, Number of cloudy days, Prevailing wind direction, Observers.

TABLE 1.—Climatological data for September, 1909. District No. 8—Continued.

Stations.	Counties.	Elevation, feet.	Length of record, yrs.	Temperature, in degrees Fahrenheit.						Precipitation, in inches.				Sky.			Prevailing wind direction.	Observers.	
				Mean.	Departure from the normal.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Total.	Departure from the normal.	Greatest in 24 hours.	Total snowfall unmelted.	Number of rainy days, .01 inch or more.	Number of clear days.			Number of partly cloudy days.
<i>Texas—Cont'd.</i>																			
Panther.....	Hood.....	1,000	19							0.54	- 1.07	0.40	0.0	3	11	18	1	E. H. Snider.	
Pierce.....	Wharton.....		3	75.6		96	21	42	27	41	0.21	0.15	0.0	3	22	7	1	R. B. Pointer.	
Plainview.....	Hale.....	3,370	1	69.8		95	1†	39	29	47	0.37	0.22	0.0	3	23	7	1	J. F. Sander.	
Port Lavaca.....	Calhoun.....	20	8	80.0		98	20	46	29	43	2.90	1.85	0.0	4	21	8	1	J. H. Bickford.	
Ricardo.....	Nueces.....			78.3		103	21	46	29	44	0.17	0.07	0.0	4	25	5	0	Lindsay Waters.	
Riverside§§	Walker.....	169	5							1.33		0.70	0.0	3	23	5	1	Mrs. C. W. Higdon.	
Robert Lee§§	Coke.....	1,850	1	75.0		98*	11	42	28	41*	1.54	0.71	0.0	3	24	5	1	H. D. Pearce.	
Rockland§§	Tyler.....	136	5							2.50		2.00	0.0	3	23	3	1	D. W. Bellamy.	
Rossville.....	Atascosa.....	558	2	80.4		102	25	44	28	40	1.24	0.70	0.0	3	12	15	3	W. F. M. Ross.	
Runge.....	Karnes.....	308	14							1.19	- 1.89	1.10	0.0	3	23	3	2	Reiffert & Frobese.	
Sabinal.....	Uvalde.....	964	5	79.2		102	21†	47	29†	41	2.17	1.77	0.0	3	11	14	5	Jas. Johnston.	
San Angelo.....	Tom Green.....		1															C. W. Goff.	
San Antonio.....	Bexar.....	701	24	79.0	+ 1.9	100	22	51	29	35	0.56	- 0.38	0.37	0.0	5	17	11	2	U. S. Weather Bureau.
San Augustine.....	San Augustine.....			78.8		102	10†	38	29	47	0.47	0.20	0.0	5	12	16	2	F. A. Wilson.	
San Juanita§	Hidalgo.....			82.2*		105	21	49*	29	42*	0.00	0.00	0.0	0	10	9	11	J. B. McAllen.	
San Marcos§§	Hayes.....	588	16	77.9	- 0.4	99	22	45	29	40	0.00	- 2.77	0.00	0	26	0	4	Miss L. C. Ford.	
San Saba.....	San Saba.....	1,712	5	75.1		100	11	36	28	47	2.45	2.30	0.0	2	27	3	0	Jas. Burns.	
Santa Gertrudes.....	Nueces.....		7							0.00		0.00	0.0	0	0	0	0	J. B. Wright, jr.	
Seymour.....	Baylor.....	1,180	3	75.1		100	10†	40	28	44	2.13	2.00	0.0	2	24	5	1	F. M. Deaver.	
Somerville.....	Burleson.....	251						50	28		1.50	0.90	0.0	2	14	0	16	W. A. Dolan.	
Sonora.....	Sutton.....	2,200	6															Mike Murphy.	
Sugaland.....	Fort Bend.....	79	11	79.2		99	9†	44	29	41	0.81	- 3.08	0.73	0.0	3	23	7	0	O. M. Bakke.
Taylor.....	Williamson.....	583	8	78.0		97	22	47	29	39	0.21	0.18	0.0	3	26	3	1	U. S. Weather Bureau.	
Temple.....	Bell.....	630	15	78.2	+ 1.1	100	1†	49	28†	35	0.00	- 2.77	0.00	0	25	1	4	W. B. Tyer.	
Tilden†	McMullen.....		3	80.4		108	21	41	29	51	1.06	0.66	0.0	3	8	10	2	Wm. Kuykendall.	
Uvalde.....	Uvalde.....	937	1	79.0		105	22	44	29	47	1.02	0.85	0.0	3	28	0	2	F. M. Getzendaner.	
Valley Junction§§	Robertson.....	289	4							0.60		0.30	0.0	2	2			T. M. Williams.	
Victoria§§	Victoria.....	187	11	78.6	- 2.3	100	21	46	29	40	4.25	+ 1.13	2.43	0.0	4			C. C. Zirjacks.	
Waco§§	McLennan.....	424	20	79.6	+ 0.8	102	10	44	28	39	0.38	- 2.45	0.38	0.0	1	26	0	4	E. H. Hall.
Waxahachie§§	Ellis.....	556	13	77.6	+ 0.4	105	10†	39	28†	52	0.33	- 2.93	0.33	0.0	1	23	5	2	C. D. Longserre.
Weatherford§§	Parker.....	864	20	77.5	+ 0.9	100	12	45	28	35	1.05	- 1.71	0.66	0.0	4	27	1	2	Miss J. Stickfort.
Wharton§§	Wharton.....	105	7	76.9		96	9†	45	29†	35	3.21	1.23	0.0	4	23	5	2	Mrs. F. M. Hughs.	
Wills Point.....	Van Zandt.....	524	4	78.4		104	9†	43	28	36	0.21	0.21	0.0	1	25	3	2	W. W. Gibbard.	
Zapata.....	Zapata.....			80.8		108	21	45	29	46	0.05	0.05	0.0	1	13	15	2	F. H. Earnest.	

\* Precipitation included in that of the next measurement.  
 \*\* Temperature extremes are from observed readings of the dry-bulb; means are computed from observed readings.  
 † Also on other dates.  
 ‡ Data are from standard instruments not supplied by the U. S. Weather Bureau.  
 § Instruments are read in the morning; the maximum temperature then read is charged to the preceding day, on which it almost always occurs.  
 ¶ Estimated by observer.  
 †† Precipitation for the 24 hours ending on the morning when it is measured.  
 ‡‡ Precipitation is less than 0.01 inch rain or melted snow.  
 §, §, §, etc., indicate, respectively, 1, 2, 3, etc., days missing from the record.







TABLE 3.—Maximum and minimum temperatures at selected stations September, 1909. District No. 8, Texas and Rio Grande Valley.

Date.	Colorado.						New Mexico.												Texas.									
	Garnett.		San Luis.		Agricultural College.		Carlsbad.		Fort Stanton.		Mountainair.		Rosedale.		Roswell.		Santa Fe.		Santa Rosa.		Ablene.		Big Springs.		Brownsville.		Corpus Christi.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1...	78	47	75	43	93	60	94	62	84	46	88	51	79	55	90	61	79	56	94	57	96	73	99	72	89	70	88	74
2...	74	46	73	39	95	62	94	62	87	50	89	54	82	54	91	59	80	54	96	58	94	71	96	70	88	73	87	78
3...	73	45	77	43	95	66	92	62	86	51	90	52	81	55	88	59	81	55	95	58	94	72	96	70	88	75	85	81
4...	70	43	71	46	94	67	93	62	81	50	76	56	77	54	88	61	72	57	91	58	93	73	96	71	90	75	88	79
5...	72	55	64	51	90	67	90	64	77	58	74	56	73	56	86	67	68	56	94	61	90	70	95	73	90	76	86	78
6...	69	48	70	45	85	64	92	68	78	56	75	56	74	56	87	64	71	56	85	63	92	73	96	71	89	76	87	78
7...	72	44	71	46	85	66	94	66	77	51	79	52	74	50	91	65	73	53	86	62	92	72	96	70	89	73	87	75
8...	73	39	72	42	91	67	93	64	77	55	82	53	77	53	89	66	75	50	83	60	92	71	97	69	90	73	85	77
9...	75	39	75	44	89	63	92	63	77	47	79	50	70	55	88	58	70	49	89	56	93	69	96	68	90	72	87	78
10...	72	44	76	38	89	63	93	63	81	44	78	49	74	49	88	59	73	53	89	53	95	72	98	66	89	73	88	74
11...	75	42	73	36	85	63	91	64	78	53	76	53	67	51	86	62	71	55	86	63	96	75	98	73	90	72	88	77
12...	68	44	65	45	86	64	83	67	77	49	76	58	73	52	87	60	68	43	83	58	94	76	95	73	92	74	86	79
13...	57	32	68	41	87	55	80	58	69	43	76	33	67	36	76	54	57	36	72	40	90	69	89	59	90	76	87	78
14...	65	30	65	38	81	57	81	50	71	34	69	33	66	42	78	47	67	35	77	43	77	59	83	55	88	75	83	73
15...	75	32	70	50	80	52	84	50	70	34	69	38	67	41	79	48	68	44	81	43	78	56	84	56	88	72	86	73
16...	73	32	75	42	79	53	82	49	70	36	72	37	66	40	77	45	70	45	80	42	82	56	86	64	89	73	86	73
17...	71	32	67	41	81	52	84	52	70	37	76	42	67	44	81	47	67	47	82	43	87	66	84	63	87	72	86	73
18...	75	33	70	42	86	56	80	55	78	49	80	45	71	46	85	63	70	45	85	52	89	67	90	67	88	73	89	75
19...	74	32	71	34	89	50	93	59	82	39	84	44	77	47	88	53	73	43	80	48	88	66	90	60	89	72	89	75
20...	75	33	72	36	90	51	93	58	82	40	71	46	79	40	90	52	74	46	88	49	84	66	86	60	94	72	95	74
21...	78	34	73	40	90	55	95	52	82	44	83	51	81	51	93	53	76	47	89	58	96	64	97	63	93	77	99	75
22...	61	30	63	29	88	55	92	58	73	43	76	40	72	48	73	51	68	43	76	46	80	61	93	61	90	78	89	78
23...	64	31	69	24	84	51	79	47	74	37	79	36	72	45	76	43	69	37	77	42	77	54	77	50	90	77	88	75
24...	73	35	76	30	84	54	84	54	79	46	74	36	81	42	74	49	76	43	72	42	80	45	81	54	84	47	87	71
25...	76	34	76	33	85	53	82	46	76	35	82	47	73	46	80	43	74	45	84	44	79	51	84	53	83	60	79	60
26...	75	36	76	35	77	51	81	45	68	31	75	38	68	43	75	41	66	44	77	47	76	51	78	50	83	60	80	59
27...	75	31	73	29	88	46	80	45	68	36	74	34	66	41	75	41	67	41	77	38	75	47	76	44	81	58	78	58
28...	75	30	69	31	79	44	82	42	78	27	78	36	70	41	79	36	71	40	86	37	80	45	83	40	81	56	77	54
29...	76	33	72	28	87	40	91	39	82	34	83	45	76	48	86	38	75	44	92	43	85	55	90	49	86	51	80	55
30...	75	34	74	30	79	49	90	48	85	43	85	49	77	52	88	45	75	49	92	47	86	53	91	50	86	59	78	60
Mns	72.1	37.3	71.5	38.4	86.4	56.5	87.9	55.7	77.1	43.1	78.5	45.5	73.0	48.3	83.8	52.8	71.2	47.0	85.2	51.0	87.0	63.6	90.3	61.2	88.2	70.4	85.7	72.1

Date.	Texas.																													
	Del Rio.		El Paso.		Fort McIntosh.		Fort Stockton.		Fort Worth.		Galveston.		Hallettsville.		Houston.		Lufkin.		Palestine.		Plainview.		San Antonio.		Seymour.		Taylor.			
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1...	94	72	92	65	96	76	94	59	92	74	91	80	07	71	98	72	99	71	94	72	95	68	93	73	95	67	95	74		
2...	94	69	94	70	97	76	94	64	96	71	83	80	95	72	98	73	99	69	95	76	94	65	94	72	95	75	95	73		
3...	92	74	93	67	94	76	89	65	96	75	83	81	97	71	96	73	98	72	94	74	93	62	93	72	95	74	95	71		
4...	94	76	93	69	95	76	91	67	94	76	88	81	99	72	94	73	99	70	94	71	91	60	93	72	97	76	93	71		
5...	94	74	87	60	96	76	89	67	95	71	88	81	90	72	92	73	99	70	92	74	87	65	93	75	91	71	93	72		
6...	94	74	84	65	95	76	93	67	94	74	87	80	95	70	99	69	98	68	94	73	92	62	92	72	94	69	93	72		
7...	94	72	83	65	96	75	95	65	97	76	88	79	95	68	98	70	100	68	96	73	93	67	92	71	93	75	95	70		
8...	93	70	90	63	97	75	91	65	95	75	86	78	93	72	97	73	100	70	96	75	90	60	92	70	92	74	94	71		
9...	94	73	86	66	95	76	93	67	97	76	88	80	93	69	100	71	99	72	97	76	92	56	94	69	97	72	95	69		
10...	97	70	88	68	99	76	96	65	100	78	88	82	97	73	96	73	102	73	99	76	92	61	96	74	100	66	97	73		
11...	96	72	86	66	99	78	94	64	99	79	88	81	98	72	98	74	100	72	98	77	92	61	95	75	100	72	97	73		
12...	96	76	85	67	99	76	96	66	96	79	88	83	97	74	101	74	100	72	96	76	90	67	95	74	98	76	96	73		
13...	96	75	79	59	99	78	86	68	95	75	88	80	98	73	96	74	101	72	94	74	80	58	93	73	92	67	94	71		
14...	80	65	78	60	95	78	82	56	79	64	84	78	89	71	93	76	98	69	88	74	79	41	84	72	78	57	87	67		
15...	84	62	73	60	95	72	81	47	85	63	83	74	89	69	90	67	93	69	88	67	77	48	90	66	80	56	88	66		
16...	89	61	76	53	95	72	83	48	86	69	85	72	89	72	88	72	88	70	86	69	81	47	83	71	84	53	87	67		
17...	83	70	79	57	97	74	85	61	89	59	84	76	91	73	90	70	89	64	86	64	80	47	82	70	87	59	90	67		
18...	90	70	84	64	97	70	86	66	91	58	88	76	92	69	92	69	92	70	88	62	84	56	92	70	89	62	93	64		
19...	93	70	83	57	100	72	92	61	93	68	89	77	93	69	92	68	94	63	90	66	89	57	93	70	88	65	92	70		
20...	93	66	89	56	102	72	92	58	90	66	85	76	96	68	90	74	88	72	88	71	86	54	95	70	86	64	94	68		
21...	98	65	89	63	108	72	96	66	94	69	88	73	97	71	95	69	95	70	92	69	95	58	100	68	97	62	96	69		
22...	97	68	82	64	107	78	91	63	85	69	87	80	98	77	94	75	98	74	97	70	89	52	100	75	90	58	97	73		
23...	85	66	82	60	101	80	81	45	79	59	86	71	87	71	87	68	93	66	81	62	75	43	87	68	78	50	84	63		
24...	84	56	82																											