U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

CLIMATOLOGICAL SERVICE

DISTRICT No. 10, GREAT BASIN

ALFRED H. THIESSEN
DISTRICT EDITOR

REPORT FOR JUNE, 1912

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CLIMATOLOGICAL DATA FOR JUNE, 1912.

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ALFRED H. THIESSEN, District Editor.

GENERAL SUMMARY.

For the district as a whole very nearly normal conditions prevailed during June, the mean temperature being but a fraction of a degree below normal, and the average precipitation a few hundredths of an inch above normal.

Compared with last year the present June was somewhat cooler and much wetter. It was generally favorable for vegetation, but there was some complaint of the weather in Nevada being unfavorable for garden truck, the temperature being too low for rapid growth, and the frequency of dry winds was harmful. In the northern counties of Utah there was a dearth of moisture on the dry farms, and excessive windiness caused rapid evaporation.

Sunshine was somewhat below the normal amount, especially in Utah. At Salt Lake City only 69 per cent was recorded; Reno, Nev., had 81 per cent; and Winnemucca, Nev., 84 per cent.

For the district there was an average of 4 rainy, 14 clear, 10 partly cloudy, and 6 cloudy days.

TEMPERATURE.

The temperature for the district averaged 63.2°, which is 0.7° below normal. The warmest stations were in the level country west of the Wasatch Mountain, in the Nevada area, except the central portion, and in the Oregon area. Stations reporting temperatures below normal were those in the southern half of the Utah area and in the eastern portion of the Nevada area, although there were many exceptions to this general division.

The local mean temperatures in the Utah area ranged from 51° at Woodruff to 78.2° at Lemay, which were also the lowest and highest in the district. The lowest and highest monthly means in the Wyoming area were 55° at Evanston and 56.8° at Border; in Idaho, 61.4° at Weston and 63.4° at Grace; in Oregon, 55.4° at Cliff and 58° at Burns; and in Nevada, 57.2° at Potts and 73.4° at Jean.

The greatest plus departure of the mean temperature from the normal was 5.2° at Quinn River Ranch, while the greatest minus departure was 7.3° at Potts, both in Nevada. As a rule, however, the departures from the normal were less than 3°.

The month began with normal temperatures, which gradually increased, culminating in very warm weather on the 5th, 6th, and 7th, on which dates some stations reported their highest temperatures. After the 7th the temperatures fell, and from the 14th to the 18th the lowest temperatures of the month were recorded at most stations. During this period frosts from light to killing occurred nearly everywhere, and in Utah did considerable damage to beans, potatoes, corn, and other garden vegetables. After the 18th higher temperatures generally prevailed, except in the Nevada area, where moderately cool weather continued for the remainder of the month, but the night temperatures did not fall so low as they did on the 16th–18th.

The highest temperatures in the respective States or parts of States were: 90° on the 25th at Cokeville, Wyo.; 90° on the 24th at Grace, Idaho; 100° on the 27th at Low, Utah; 89° on the 5th at Cliff and Silver Lake and on the 24th at Burns, Oreg.; 88° on the 3d at Truckee, Cal.; and 104° on the 4th at Jean, Nev. The lowest reported were: 22° on the 25th at Evanston, Wyo.; 30° on the 16th at Weston, Idaho; 21° on the 16th at Strawberry Tunnel, west, and on the 13th, 19th, and 28th at Woodruff, Utah; 23° on the 15th at Cliff, Oreg.; 30° on the 15th at Truckee, Cal.; and 23° on the 16th at Eureka, Nev.

PRECIPITATION.

On the average June is next to the driest month of the year, the normal rainfall being about 0.60 inch. The precipitation during this month consists for the most part of local showers, which explains the irregular distribution of moisture, stations quite near one another receiving widely varying amounts.

The precipitation for the present June averaged about normal. The largest monthly amounts fell in the Oregon area and northern portion of the Utah area; and the least in the Nevada and southern portion of the Utah areas.

Many stations reported amounts considerably over an inch; while 10 stations reported only traces, and 3 stations no rain whatever.

The rainiest portion of the month was from the 5th to the 14th but many stations reported fairly good amounts on various dates during the last half of the month.

STRAWBERRY VALLEY PROJECT.

The Strawberry Tunnel is now receiving considerable attention. The mountain is now nearly pierced and it is expected that water will be furnished farmers through this tunnel next spring.

Regarding the progress made during June, Project Engineer J. L. Lytel reported as follows:

At Strawberry Tunnel, 458 linear feet were excavated at the west heading, and 395 linear feet at the east heading. At the east heading the material encountered was a combination of shale and sandstone. Heavy flows of water were encountered in the top and sides during the latter part of the month, which greatly impeded the progress of the work.

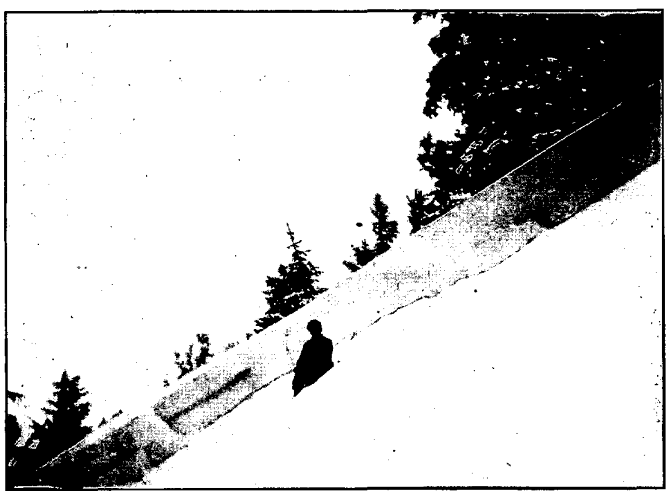
At the west heading the material encountered varied from mud and shale, carrying considerable water, to sandstone and shale. The water encountered at this heading was not sufficient to impede progress. Some swelling ground was encountered, which necessitated considerable retimbering, and nine shifts were lost on this account. At the west heading 541 feet of sides and arc lining and 257 feet of bottom were placed. The tunnel, as a whole, is about 82 per cent completed. At Indian Creek dike and on the Indian Creek diversion canal melting snow and frequent rains have kept the ground too wet for any construction work. At Strawberry Dam a small force was engaged in overhauling equipment, operating the sluicing tunnel, and other like duties. At the east portal of Strawberry Tunnel the shaft for the controlling works was completed and excavation of the portal cut commenced.

SNOW SLIDES AND SLIPS.

By LEON PEUGEOT, Superintendent Burro Mine, Utah.

During my years in the hills I have had ample opportunity to become well acquainted with snow slides; and having noted conditions existing previous to various slides, I believe that a little study by the man on the ground may often be the means of saving life and property.

My knowledge of slides was obtained in the vicinity of Burro mine, located on Black Mountain, in the Wasatch



Showing how in a "break slide" the snow breaks away to some underglazed surface. Note the wall of snow about 5 feet high in the background. The author of this article is seated on the underglazed surface.

Range, 8¾ miles as the crow flies from Salt Lake City and 7 miles from Bountiful. The mine camp is located in Howard's Hollow, named after a Mr. Howard, a Mormon pioneer, who, with his oxen, met his death at this point in a snowslide while snaking logs for use in connection with the building of the Mormon Temple.

Howard's Hollow is an immense draw or basin starting from the west side of the ridge and running to Mill Creek below, a distance of a mile and a quarter. The camp lies a quarter of a mile below the crest of the ridge, the ridge altitude being about 10,500 feet and the camp altitude above sea level being about 10,000 feet. The altitude of the creek is about 8,500 feet. The angle of the slope from the ridge to the camp is 39°, and the angle from the camp to the creek is 26°. The slide zone is from the ridge to the creek.

Slides depend on numerous things—weight of snow, warmth, sudden cold, excess of snow at a given angle, the nature of the underlying snow, and the temperature and the weather that prevailed when the first snows of the season were laid. In fact this early snow has much to do with the most dangerous and damaging of all slides, namely, the "to-the-ground slides," which are to be feared more than all others, for they carry more ice and solids, and they shear all in their path—make a clean sweep, so to speak..

Next in point of danger is the "break slide." This gives way to some underglazed surface, say, from 2 to 4 feet down. This is dangerous to man and beast, but not necessarily to buildings and other property, because it will be confined to the layer which broke away and slide over all beneath. Another is the surface or fresh snowslide, and to man this rarely does more damage than to frighten him, although smothering is possible and death might result from that cause.

In this locality January, February, and March are the usual slide months, and each succeeding month of these is more dangerous than the preceding one. As a rule the snow slides down before April 1, and slides seldom occur in December. However, one should be watchful at all times when the ground is snow covered, and especially so in February and March.

Previous to snowslides the air is frequently moist, the mist heavy, and the exposed parts of the observer feel sticky, or more as if a damp rag were pressing the skin. The snow is soggy and occasional glimpses of trees and timber give the impression that they are sweating a sort of mildew. The bright sun and clear-day slides are the ones, however, that swell the death lists; for it is on such days that the foreman orders his men out for timbers, never giving a thought to the stillness of the atmosphere, the depth of the snow, the density thereof, the temperatures of the past few days, or (the most essential and vital point) the early snows of the season. If you should question him as to the possible danger of a slide he would laugh at you and probably tell you that the snow is solid enough to bear up a troupe of elephants, or that it can not slide until it melts enough for the water to soak through and take the frost out of the ground, or other indefinite reasons.

In the early part of 1911 a snowslide occurred at Alta, Utah, that caused the death of several men and a large loss of property and business delays. To my mind this catastrophe would have been reduced to a minimum if proper forethought had been given. Alta, compared to this locality, is nearly identical and only a few miles separate the two camps. The day in question gave me every reason, from my own experiences, to expect a slide. We were in need of mine timbers, but I advised the foremen to hold the men indoors. I was so sure of the slide probabilities that I even went to the kitchen and instructed the cook to keep a low fire, saying that if the slide did come he should rush to the stove and put out his fire. Shortly afterward the slide came. It may have been a lucky guess on my part, for I do not believe that anyone can predict a slide to a day.

We often hear of men seeing a slide coming, running 50 or 100 feet, and hanging on to a tree until the slide passes. This is pure fiction. When it comes to a genuine slide, you do not see it coming; if you saw anything it would be gone almost instantly. A snow slip may start from a footfall, a heavy gust of wind, a blast, or a jar. It is simply a case of very dry snow piled on a hard, glassy surface at a steep angle, a little urging of which causes it to slip. It is not caused by its own weight as a slide proper is, but rather by the lack of moisture, the iced surface, and the dryness of the fresh fall.

The fan or wagon-wheel slide is another variety of slip. If there is a fall of from 2 to 4 inches of snow on a moist surface and the sun comes out warm and the pine boughs with little dabs of snow on their branches seemingly grow suddenly weary of holding them and let them drop simultaneously, they start rolling down the hill, growing larger and larger and narrower and narrower until they become like so many 5-foot wagon wheels. About this stage of their growth they will wobble precisely like a wheel coming off a buggy and fall flat, starting hundreds of other little wheels going.

The appearance of the slope afterwards is like a large-ribbed fan, and at the end of each rib lies a flat disk for a tassel. A swishing noise accompanies the construction of this immense fan, about as loud as a fan of this size would make if some giant were using it. There is no danger in this kind of a slip or slide except to loose objects.

There are two other conditions that may cause needless terror when slides are quite impossible. The first, or crust drop, is brought about by a flaky fall of a few inches of snow on a solid undersurface followed by snow which comes in small round, hard pellets resembling tapioca and varying in size from one-sixteenth to one-fourth inch in diameter. It is almost as hard as hail, and is the meanest snow the mountain man has to contend with. It is nearly impossible to shovel it, for it runs like so much grain, and when driven by the wind cuts one's face and fills every nook and crack or space. A knot-hole in a building, if not plugged, will furnish entry for a roomfull of tapioca snow. It is very difficult to walk on.

After the fall of tapioca snow sunshine and warmth may come, with a freeze at night. This forms a hard crust thick enough to prevent a man's weight from breaking through it. The crust itself has little support from its snow fluff beneath, merely the strength of the layer itself, and the small brush here and there prevents its dropping. In walking along, the snow will suddenly drop from under one's feet, and, like waves at sea, the snow ahead goes up and down for 50 or 100 feet, producing a startling effect, but not in the least dangerous.

The second harmless affair is due to a sudden drop of temperature that causes the snow to crack open with reports like that of a small cannon. These crevices are often a hundred feet or more in length and vary from 1 to 2 inches in width. This is an indication of the solid, frozen state of the snow to a great depth, and is simply due to contraction by the intense cold. Never have I known a slide to follow immediately such an occurrence, and those that did come, later in the season, did not give way at these places.

A menace to life and property that must not be overlooked is the snow cone or crest. This is caused by the wind blowing the snow over a ridge. Seldom more than one is formed in the same place during the winter, for the making of them is a slow process. Each day as the wind sweeps the flat surface of the ridge the snow is blown over, causing the snow platform to slowly spread out and hang over the basin below. On warm days at the edges where the sun strikes thawing ensues, and the wind sweeping dry snow from shaded portions of the ridge onto and over these melting edges turns it into ice and builds them farther outward.

This awning-like crest will often project a distance of 20 or 30 feet before the overhanging weight and is sufficient to send it tearing down the hill, crushing all in its path. An efficient remedy for these evils is to dynamite the crest by simply loading a 6-foot log with dynamite, sinking it horizontally about 3 feet deep in the top of the snow ridge as nearly over the base of the cone as can be judged. When the fuse is lighted and the explosion occurs one may see a miniature slide in action.

The real avalanche of snow or death-dealing "to-the-ground slide" is the one to be given the most thought. The man on the ground must note the contour of the country, the angles, cliffs, tree belts, hog backs, etc., for they all play an important part in the formation of heavy slides. The first snows are the ones to be noted carefully. It is then that the foundation is laid for the subsequent to-the-ground slides.

Suppose the snow at this early stage is packed hard and, the surface slightly thawing, a storm of tapioca snow comes; the melting surface holds the tapioca from running down hill, the round pellets sinking to a depth of about 2 inches and cementing lightly as they fall. This is followed by a wet blanket of flaky snow of a few inches, then followed by a cold wave and the ideal foundation is laid for a to-the-ground slide. The cold penetrates through the light blanket of snow and the state of affairs that formerly existed is entirely changed.

First the former melting hillside surface has become an ice layer or crust; second, the pellets of tapioca snow between the outside crust and the roof or blanket crust have contracted and separated, each pellet becoming a little round ball for future snow to slide upon. Other snows come, higher and higher piles the mass on its unstable foundation; winter has set in, and the snows in texture are fluffy and light. Later on come the thaws, and as the temperature changes so does our source of trouble, 6 or 10 feet below. The snow settles, water penetrates to the ice cover or blanket crust, where its downward progress is halted, and it trickles down the angle of the hill and slowly but surely wears and weakens the ice arch it travels over. The storms of winter have banked huge drifts in spots and the extra weight at these points causes the weakened arch below to give way, and the overhead load drops on the little hard balls of tapioca that the ice arch sheltered.

The immense weight of snow rapidly gains momentum and the to-the-ground slide has started, beyond all human power of stopping.

Similar conditions may occur more than once, as described above, during the early winter, but the danger is materially reduced with each slide, as the volume of snow to move will usually not be so great, and they assume the features of the break slide, always giving way at the top layers first. This is possible because they are formed in colder weather and are not so securely iced together, sometimes slipping down in succession in midwinter, creating a buffer or blockade at the bottom of the slide region which tends to hold other slides from coming down.

Camp buildings in the mountains should be constructed of heavy timbers and should be set into the hill so that the roof has the same slope as the hill. Any space appearing between the back of the building and the face of the hill should be lagged across a few feet below the roof and filled up even with the hillside. The air space below the lagging protects the inside walls from damp and mold. The doors should always open inward. The smoke pipe should never be braced with tie rods or a snow slide will tear the roof off; only the first joint or so should be braced, and that with ordinary wire, and as the snow depth increases 2-foot lengths may be added without wiring. Buildings should never be placed one below another like steps, but on the same elevation or level. Timber or brushwood should not be cut directly above the camp, as it holds some of the snow from sliding. At a reasonable distance above the camp there should be dug an open trench, about 6 feet deep and 6 feet wide, in the shape of a crescent, the prongs pointing down the hill to the right and left of the camp. This forms a protection from falling rocks and from cloudbursts in the summer time; and during the melting season it turns the water from above away from the camp, permitting the camp to be the first dry spot to show on the mountains.

SOME EFFECTS OF SURFACE SLOPE ON CLIMATE.

By J. CECIL ALTER, Observer, U. S. Weather Bureau.

In a mountainous agricultural region it is usual to find great variations in the advancement of the seasons, as shown by the differing stages of crop and general vegetation development, even along the same parallel of latitude, because of the wide differences in exposure and elevation presented. It is interesting to note that in many Utah valleys, neighborhoods within a very few miles of each other and differing only a few hundred feet in elevation have climates so different as to make the stages of common crop growth several weeks apart.

The cultivated portion of the Salt Lake Valley south of Salt Lake City is about 10 miles wide, having an altitude along the Jordan River of about 4,250 feet above sea level. From here the ground rises gradually toward the east to the Wasatch Mountains, and toward the west to the Oquirrh Mountains, where the agricultural lands merge into the foothills at an average altitude of about 4,450 feet, or a total rise of about 200 feet in something less than 5 miles. In fact the valley floor in places is so wide and flat as to confine this rise to within approximately 2 miles.

Such is the case between Wandamere, a suburb of Salt Lake City about 5 miles south and 1 mile east of the center of the city, and East Mill Creek, a community next to the Wasatch foothills, 2 miles nearly due east of Wandamere. The general conditions noted along the slope between these two places prevail on the same slope to the southward for a distance of 10 or 12 miles, and also across the valley toward the west, on the slope up to the Oquirrh Mountains; therefore the data gathered from an examination of the East Mill Creek to Wandamere slope may be safely assumed to apply in a general way to the entire valley.

As shown by the berry vines and tree fruits the East Mill Creek springtime is on the average about two weeks in advance of the season of the lower neighbor, Wandamere. This anomaly exists primarily because the growth of vine and tree crops is dependent principally on the temperature of the atmosphere, and not so much on the temperature of the soil. But fundamentally this dissimilarity in climate has its birth in the nightly transferrence of air from the mountain to the valley by air drainage.

The draining of the cool air nightly into the Wandamere bottoms causes the accumulation of spring temperatures to lag; that is, the mean temperature for the 24 hours is lower than at East Mill Creek. This condition causes an appreciable lethargy in the opening of the fruit and berry blossoms at Wandamere; and the orchards at East Mill Creek, which lie well above the level to which the cold imported air usually fills, get an average of two weeks' start, because their nighttime temperatures average higher, thus giving a greater accumulation of growing temperatures in the same length of time.

The height to which the accumulated cold air extends up the slope each night varies constantly, probably ranging from an inappreciably small distance to as far as the East Mill Creek district itself under favorable conditions; therefore orchards along the slope show progressively and quite regularly the change from the Wandamere to the East Mill Creek conditions.

The slope is a very gradual and even one, therefore the 200-foot rise, representing two weeks' difference in the season, may be fairly accurately divided into units of one day earlier for fruit for each 14 feet of rise from Wandamere toward East Mill Creek.

The daily march of normal temperatures in the spring at Salt Lake City is at the rate of about 1 degree rise in every three days; and from this information the direct deduction is made that the 14-foot rise in elevation, equaling one day's advance in fruit, is therefore equivalent to one-third of a Fahrenheit degree increase in the daily mean temperature. The total difference in the daily spring mean temperatures between East Mill Creek and Wandamere, calculated on this basis, is, therefore, $4\frac{2}{3}°$ Fahrenheit. But since temperature records are available at neither of these places this figure must remain as purely a deduction at present.

Thus from natural necessity truck and vegetable fields are spread over the lowlands of the Salt Lake Valley, while the higher slopes are covered with fruit trees and berry vines.

TABLE 1.—*Climatological data for June, 1912. District No. 10, Great Basin.*

Stations.	Counties.	Elevation, feet.	Length of record, years.	Temperature, in degrees Fahrenheit.							Precipitation, in inches.				Number of rainy days, 0.01 inch or more.	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 clear days.	Number of partly cloudy days.	Number of cloudy days.		
Wyoming.																				
Border	Uinta	6,085	10	56.8	+ 1.5	84	28	28	15	48	1.54	+ 0.48	0.65	0	6	12	12	6	w.	S. W. Condron.
Cokeville	do	6,204	2	56.6[d]		90	25	26	15†	51[d]	1.18		0.35	0	7	27	1	2	w.	E. J. Tuckett.
Evanston	do	6,860	16	55.0	+ 0.7	81	6	22	25	54	1.21	+ 0.24	0.39	0	7	12	14	4	sw.	Frank Tucker.
Idaho.																				
Geneva	Bear Lake	6,171	4								1.07		0.46	0	6	23	4	3		F. W. Boehme.
Grace	Bannock	5,400	5	63.4		90	24	32	14	47	1.26		0.66	0	3	14	5	11	n.	Donald R. Shirk.
Paris	Bear Lake	5,946	17	55.8	+ 0.1	83	29	28	14†	46	0.95	+ 0.24	0.30	0	5	19	5	6	sw.	John Norton.
Weston	Oneida	4,460	14	61.4	+ 0.8	88	24†	30	16	47	0.84	− 0.11	0.57	0	5	17	6	7	sw.	Wm. T. Chatterton.
Utah.																				
Alpine	Utah	4,900	13								0.44	− 0.27	0.44	0	1	17	13	0		T. F. Carlisle.
Beaver	Beaver	6,000	8	62.5		90	3	30	15	47	T.		T.	0	0	9	12	9	s.	E. D. Bacon.
Black Rock	Millard	4,872	8	62.8		92	5	30	17	55	T.		T.	0	0	17	11	2		W. D. Livingston.
Burrville	Sevier		1	57.2		93	7	28	15	53	0.20		0.20	0	1					F. R. Curtis.
Castle Rock	Summit	6,244	7								1.87		0.83	0	17	7	19	4	w.	David Moore.
Cedar City	Iron	5,750	7	66.4		89	4	33	16	36	0.13		0.04	0	5	14	9	7	sw.	Parley Dalley.
Center	Tooele			64.6		92	6†	30	16	49	0.28		0.15	0	3	16	12	2	s.	L. C. Peterson.
Clarkston	Cache										0.88		0.41	0	5	13	8	9		W. J. Griffiths.
Corinne	Boxelder	4,240	42	66.5	− 4.0	92	9†	33	17	46	0.84	+ 0.27	0.38	0	3	12	7	11		A. C. Murphy.
Deseret	Millard	4,541	17	66.2	+ 1.1	92	5	32	16	49	0.14	− 0.23	0.07	0	3	14	3	13	s.	S. W. Western.
Erekson	Tooele										0.17		0.09	0	4					N. W. Erekson.
Enterprise	Washington	4,270	6								0.20		0.20	0	1	10	7	13	s.	John Day.
Fairfield	Utah	4,866	1																	W. Harden Ashby.
Farmington	Davis	4,267	11	66.8	+ 2.5	92	25†	35	16	47	0.80	− 0.06	0.80	0	1	17	12	1	s.	Charles Boylin.
Fillmore	Millard	5,100	20	69.4	+ 1.7	97	2†	33	16	46	0.20	− 0.32	0.07	0	4					J. J. Starley.
Frisco	Beaver	7,318	16	64.8	− 3.5	91	5	34	16	41	0.10	− 0.22	0.10	0	1					Essen Nordberg.
Garrison	Millard		9																	E. M. Smith.
Government Creek	Tooele	5,277	11	63.8	+ 0.7	91	26	28	16	47	0.21	− 0.41	0.13	0	2	10	3	17	s.	Walter James.
Granger	Salt Lake			65.0[f]		89	25†	33	16	40	0.88		0.44	0	4					Geo. E. Greene.
Grantsville	Tooele		1								0.74		0.35	0	4	16	7	7	s.	J. C. Woodmansee.
Grouse Creek	Boxelder		4								1.46		0.82	0	7	7	12	11	sw.	Philip Paskett.
Heber	Wasatch	5,606	19	60.8	+ 1.6	88	6	27	16	52	0.66	+ 0.13	0.20	0	5	18	10	2	s.	John Crook.
Henefer	Summit	5,301	12	59.6	+ 1.3	86	5†	27	16	54	1.53	+ 0.84	0.43	0	7	11	16	3	w.	William Brewer.
Hooper	Weber	4,436	1								0.89		0.89	0	1					T. M. Jones, Jr.
Ibapah (near)	Tooele	7,500	8																	J. S. Lawton.
Ibex	Millard		1																	John J. Watson.
International	Tooele	5,370	1																	I. S. R. Co.
Iosepa	do		1	68.9		96	26	34	16	47	0.81		0.35	0	4	13	6	11	s.	Geo. K. Hubbell.
Joy	Juab			67.2		97	4	39	16†	42	0.00		0.00	0	0					A. M. Laird.
Junction	Piute										0.16		0.16	0	1	20	10	0	s.	Joseph Jensen.
Kanosh	Millard	5,250	2								0.10		0.05	0	3					Geo. Crane.
Kelton	Boxelder	4,230	32	64.6	− 4.7	92	27	31	16	45	0.10	− 0.27	0.10	0	1	9	19	2	se.	F. W. Klock.
Lemay	do		1	78.2		93	24	55	16	24	0.25		0.25	0	1	14	14	2		Agent S. P. Co.
Levan	Juab	5,010	22	64.4	+ 1.6	89	27	31	16	40	0.18	− 0.37	0.15	0	3	15	9	6	sw.	William Brown.
Logan	Cache	4,507	21	64.6	+ 1.4	87	20	33	16	35	0.91	+ 0.12	0.63	0	5					Utah Experiment Station.
Low	Tooele			72.0		100	27	36	17	45	0.07		0.04	0	3	12	17	1	n.	Agent W. P. Ry. Co.
Lucin	Boxelder	4,504	5	58.3[e]		89	5	30	22†	46	T.		T.	0	0	17	8	5		R. G. Crocker.
Lund	Iron	5,086	3																	Job F. Hall.
Manti	Sanpete	5,575	17	61.4	− 3.3	85	27	30	17	42	0.55	+ 0.18	0.16	0	5	7	1	22		J. M. Anderson.
Maple Creek	Utah										0.81		0.58	0	3	15	13	2		Lewis W. Gillilan.
Marion	Summit	6,400	7								0.90		0.28	0	7	6	3	21	s.	Jas. Woolstenhulme.
Marysvale	Piute	6,076	12	61.8	+ 2.3	92	4	32	16	54	0.16	− 0.14	0.07	0	5	8	11	11	s.	John W. Henry.
Meadowville	Rich	6,200	11	59.3	+ 3.3	86	20	28	15	49	0.40	− 0.46	0.20	0	3	20	6	4	w.	J. S. Moffat.
Midlake	Boxelder		1	70.4		84	4	41	15	19	0.40		0.20	0	3	10	7	13	e.	Agent S. P. Co.
Midvale	Salt Lake			66.4		95	26†	33	15	51	0.90		0.53	0	5	11	16	3	s.	M. J. Joy.
Milford	Beaver	4,962	4	67.2		95	3	40	17†	45	T.		T.	0	0	22	0	8	s.	Agent Salt Lake route.
Mills	Juab										0.11		0.07	0	4					Geo. McCune.
Millville	Cache	4,848	17								1.15	+ .33	0.71	0	6	10	20	0	s.	Fred Yeates.
Minersville	Beaver	5,070	8																	George Roberts, sr.
Modena	Iron	5,479	11	62.6	− 0.6	90	5	34	16	45	0.05	− 0.35	0.03	0	2	14	11	5	sw.	U. S. Weather Bureau.
Morgan	Morgan	5,068	7	63.0[k]		89[k]	27†	30[k]	16	44[k]	0.06		0.04	0	2					A. O. Kingston.
Moroni	Sanpete	5,519	4	63.0		86	6	32	16	36	0.87		0.35	0	5	8	8	14	sw.	B. F. Eliason.
Mosida	Utah			70.3		96	6	38	16	45	0.17		0.09	0	4	24	6	0		R. P. Curtis.
Mount Nebo	do	4,650	10	69.6		96	7	32	16	44	0.09		0.06	0	2	17	12	1	s.	D. C. Walkey.
Nephi (near)	Juab		7																	S. Boswell.
Newcastle	Iron		1																	T. W. Jones.
Oak City	Millard	4,900	5																	Peter Nielson.
Ogden	Weber	4,310	41	65.2	− 6.2	86	29†	30	16	35	0.31	− 0.36	0.17	0	2	12	16	2	w.	A. Van De Graff.
Panguitch	Garfield			58.4		86	3	30	17	52	T.		T.	0	0	13	11	6		John N. Henrie.
Park City	Summit	7,800	7	59.0		87	17	31	21	49	0.24		0.06	0	9	17	7	6		Gertrude Evans.
Park Valley	Boxelder		1								0.84		0.24	0	6	11	13	6	se.	A. O. Evans.
Parowan	Iron	5,970	21	66.4	+ 2.3	89	3†	34	16	39	0.33	+ 0.14	0.11	0	5	18	8	4		Alex. Matheson.
Payson	Utah	4,637	8								0.49		0.26	0	3	11	19	0	nw.	D. L. Coombs.
Pelican Point	do	4,600	1																	B. M. Mendenhall.
Pine Cliff Ranch	Summit		1	55.8[e]		77[e]	20†	22[e]	16	41[e]	0.78		0.27	0	4					L. E. Leavitt.
Pinto	Washington	5,907	14	58.0[e]	− 1.3	88	4	30	1	51	0.20	− 0.02	0.16	0	2	17[b]	7[b]	4[b]	s.	J. H. Harrison.
Promontory	Boxelder	4,913	33								0.14		0.14	0	1					F. C. Houghton.
Provo	Utah	4,532	23	66.1	+ 1.3	98	6	31	16	54	0.58	− 0.02	0.45	0	3	8	22	0	n.	James A. Oliver.
Randolph	Rich	6,442	10								1.19		0.72	0	6	18	7	5	sw.	Wm. Rex.
Ravier	Salt Lake		1								0.84		0.22	0	8					E. L. Terry.
Richfield	Sevier	5,350	18																	Joseph J. Jensen.
Richmond	Cache										1.34		0.84	0	8	5	20	5		J. R. Thompson.
Saltair	Salt Lake	4,220	8	67.2		88	21†	43	16	23	0.50		0.23	0	6					E. J. Bench.
Salt Lake City	do	4,360	38	69.2	+ 0.9	90	27	40	16	31	0.90	+ 0.13	0.49	0	9	13	15	2	se.	U. S. Weather Bureau.
Scipio	Millard	5,260	17	63.4	+ 0.1	90	5	27	17	50	0.30	− 0.07	0.20	0	3	14	4	12	sw.	Thos. Memmott.
Showell	Boxelder			61.6		91	6	29	15†	53	1.19		0.34	0	4	18	12	0		Richard Ilgner.
Silver City	Juab	6,127	2								0.12		0.10	0	2	13	17	0	sw.	J. L. Stark.
Spanish Fork	Utah	4,585	2	67.6		90	6†	34	16	40	0.59		0.27	0	5	9	21	0		U. S. Reclamation Service.
Strawberry Tunnel—W	do	7,650	6	57.3		81	26	21	16	43	1.32		0.40	0	8	13	16	1		Do.
Thistle	do	5,075	18	61.8	− 1.2	95	6	26	16†	58	0.30	− 0.21	0.30	0	1	8	22	0	sw.	John Thorgierson.
Tooele	Tooele	4,900	16	65.9	+ 0.3	87	20†	34	16	38	1.16	+ 0.49	0.50	0	8	3	12	15	ne.	E. A. Bonelli.
Utah Lake pump'g sta.	Utah	4,500	7																	W. A. Knight.
Vernon	Tooele										0.47		0.17	0	6	8	19	3	sw.	Glynn Bennion.

TABLE 1.—*Climatological data for June, 1912. District No. 10*—Continued.

Stations.	Counties.	Elevation, feet.	Length of record, years.	Temperature, in degrees Fahrenheit.							Precipitation, in inches.				Number of rainy days, 0.01 inch or more.	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 clear days.	Number of partly cloudy days.	Number of cloudy days.		
Utah—Continued.																				
Wendover	Tooele		1	69.8		96	19†	40	15	35	0.09		0.09	0	1	18	12	0	se.	J. S. Cooper.
Whisky Creek	Millard		1								T.		T.	0	0					George Stevens.
Winder	Garfield										0.22		0.12	0	2					C. H. Mangum.
Woodruff	Rich	6,500	10	51.0k		81k	28	21k	13†	60k	0.64		0.25	0	4	4	7	8		A. L. Eastman.
Oregon.																				
Burns	Harney	4,157	20	58.0	+ 0.5	89	24	29	14	43	1.17	+ 0.46	0.33	0	5	17	10	3	sw.	J. C. Welcome, jr.
Cliff	Lake	4,300	4	55.4		89	5	23	15	51	1.21		0.54	0	4	12	5	13	nw.	John C. Green.
Paisley	do	4,500	8																	E. C. Woodward.
Silver Lake	do	4,700	14	56.8	+ 1.2	89	5	27	15	52	1.97	+ 0.98	0.64	0	9	15	12	3	n.	L. W. Charles.
California.																				
Tahoe	Placer	6,240	2																	R. M. Watson.
Truckee	Nevada	5,819	41	54.3	− 3.1	88	3	30	15	46	T.	− 0.37	T.	T.	0	6	11	13	sw.	Southern Pacific Co.
Nevada.																				
Austin	Lander	6,594	23																	F. O. Booe.
Battle Mountain	do	4,843	41	64.4a	− 2.4	96a	19	34a	4†	52a				0		18	7	5	w.	Southern Pacific Co.
Beowawe	do	4,905	41	62.2	− 5.8	93	7†	27	6	56				0		20	0	10	w.	Do.
Carlin	Elko	5,232	41	61.6	− 1.1	96	19	26	15	58				0						Do.
Carson Dam	Churchill	4,032	5	65.2		93	4†	39	23	43	0.56		0.56	0	1	19	8	3	w.	U. S. Reclamation Service.
Cherry Creek	White Pine	6,450	4	62.8		90	6	27	16	42	0.04		0.02	0	3	17	9	4	w.	J. H. Leishman.
Clover Valley	Elko	6,000	11																	J. F. Wiseman.
Columbia	Esmeralda	5,750	5	66.0		94	4	33	16	43	0.00		0.00	0	0	22	6	2	se.	A. Booth.
Dry Farm	Elko		0	60.6		90	6	28	15	51	0.75		0.38	0	4					Walfrid Sohlman.
Elko	do	5,432	41	61.0	− 2.1	88	4†	29	16	52	1.02	+ 0.50	0.56	0	6	16	3	11	w.	E. J. Clark.
Ely	White Pine	6,421	21	59.6b	− 0.7	87h	3	27h	16	51h	0.22	− 0.18	0.12	0	3	19	1	10	sw.	R. F. Mathias.
Eureka	Eureka	6,500	9	61.9		87	2†	23	16	45	0.69		0.33	0	5	13	6	11	s.	Clay Simms.
Fallon	Churchill	3,965	7	65.5		96	4†	36	23	49	0.22		0.14	0	4	22	4	4	s.	U. S. Experiment Station.
Fernley	Lyon	4,200	39	64.5	− 2.3	96	3†	34	16	52	0.26	+ 0.07	0.26	0	1	12	17	1	w.	Mrs. G. A. Steele.
Gardnerville	Douglas	4,830	12	59.2c	− 2.4	96c	3	32c	21	43	0.30	+ 0.08	0.17	0	2	21	1	8	w.	W. M. Maule.
Geyser	Lincoln		8			95	17				0.20		0.20	0	1	13	16	1	s.	Mrs. J. F. Wambolt.
Golconda	Humboldt	4,697	33	66.0	− 1.3	93	26	33	15	48	0.27	− 0.24	0.12	0	3	4	11	15	w.	Southern Pacific Co.
Halleck	Elko	5,631	19	60.2	− 1.5	91	26	26	15	50	0.47	− 0.08	0.22	0	4	13	16	1	w.	Do.
Hawthorne	Mineral	4,659	18	68.1	+ 0.4	98	19	38	16†	44	0.43	+ 0.18	0.28	0	3	22	5	3	sw.	G. B. Stannard.
Jean	Clark	2,074	4	73.4		104	4	43	25	57	T.		T.	0	0	18	12	0	nw.	Salt Lake Route.
Lahontan	Churchill		0	68.7		98	1†	39	22	40	0.28		0.15	0	4	23	5	2	w.	U. S. Reclamation Service.
Lewers' Ranch	Washoe	5,500	24	59.0	− 1.1	94	4	31	23	50	0.50	+ 0.09	0.50	0	1	16	14	0		Ross Lewers.
Lovelocks	Humboldt	3,977	18	64.6	− 3.2	97	4†	36	16	52	0.30	+ 0.09	0.10	0	5	16	13	1	s.	A. P. Tilford.
Millett	Nye		4																	Fred J. Jones.
Mina	Mineral	4,600	5	68.0		98	3†	36	23	45	0.00		0.00	0	0	29	0	1	ne.	Southern Pacific Co.
Potts	Nye	6,990	19	57.2	− 7.3	89	19	24	16	53	0.20	− 0.06	0.15	0	2	10	2	18	s.	Miss Mamie Potts.
Quinn River Ranch	Humboldt	8,450	10	63.2b	+ 5.2	94b	6	27b	16	54h	0.07	− 0.37	0.07	0	1	10	3	17	sw.	F. M. Payne.
Rebel Creek	do		0	62.4		91	5†	32	15	49	0.84		0.34	0	7	12	8	10	sw.	E. J. Hyatt.
Reno	Washoe	4,532	41	61.8	+ 0.8	93	4	37	23	42	0.47	+ 0.23	0.24	0	4	19	7	4	w.	U. S. Weather Bureau.
Soda Lake	Churchill	4,534	5																	U. S. Reclamation Service.
Tecoma	Elko	4,812	34	59.4	− 4.4	98	27	30	3	58	0.38	− 0.16	0.25	0	4	11	9	10	se.	Southern Pacific Co.
Tonopah	Nye	6,090	7	63.8		89	3	34	23	29	0.02		0.01	0	2	18	10	2	se.	U. S. Weather Bureau.
Wells	Elko	5,631	40	58.4	− 4.2						0.75	+ 0.28	0.75	0	1	28	0	2		Southern Pacific Co.
Winnemucca	Humboldt	4.432	33	64.4	+ 1.1	94	5	33	15	45	1.14	+ 0.50	0.77	0	6	14	10	6	ne.	U. S. Weather Bureau.

a, b, c, etc., indicate, respectively, 1, 2, 3, etc., days missing from the record.
** Temperature extremes are from observed readings of the dry bulb; means are computed from observed readings.
† Also on other dates.
T. Precipitation is less than 0.01 inch rain or melted snow.

TABLE 2.—*Daily precipitation for June, 1912. District No. 10, Great Basin.*

Stations.	Watershed.	Day of month. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
Wyoming.																																
Border	Bear							T.			.29		T.	.65	.17		.03										.25				.15	1.54
Cokeville	do							T.	.04		.25			.31	.35	T.	.10	.11											T.	.02	T.	1.18
Evanston	do									T.	.10		T.	.39	.26	.07	.11						T.		.16	.12	T.	T.	T.			1.21
Idaho.																																
Geneva	Bear				.12									.46	.32	.10														.02	.05	1.07
Grace	do						.40			.20				.66																		1.26
Paris	do							.08						.30	.20	.30														.07		0.95
Weston	do								.08	.06			.07	.57																	.06	0.84
Utah.																																
Alpine	G. S. Lake													.44																		0.44
Beaver	Sevier Lake					T.		T.	T.		T.															T.	T.	T.				T.
Black Rock	do								T.																							T.
Burrville	do																							.20								0.20
Castle Rock	G. S. Lake							.03	.04	.03	.80	.05	.48	.05		.04	.06		.02			.01		.13	.03	.02			.01	.02	.05	1.87
Cedar City	Desert								.01													.02			.03				.03	.04		0.13
Center	do					T.		T.			.09														.04			T.	.15			0.28
Clarkston	G. S. Lake						.05	.03			.04			.41	.35																	0.88
Corinne	do								.12					.38		.34																0.84
Deseret	Sevier Lake							.02			T.														.05			.07				0.14
Erekson	Desert					.09		.05			.01			.02																		0.17
Enterprise	G. S. Lake																								.20						T.	0.20
Fairfield	do																															
Farmington	do								T.	T.		T.	T.	.80	T.	T.																0.80
Fillmore	Sevier Lake							.06	.04		T.	T.				T.									.07				T.	.03		0.20
Frisco	Desert							.10																								0.10
Garrison	do																															
Government Creek	do								.08		.13																					0.21
Granger	do							T.	.22	.11	.11			.44	T.								T.									0.88
Grantsville	G. S. Lake								.10		.35		.07				.22															0.74
Grouse Creek	Desert							.04	.22	.82	T.		.31	.03		T.							T.							.02	.02	1.46
Heber	G. S. Lake							.20		.05	T.			.06										T.	.20		.15			T.	T.	0.66
Henefer	do							T.	.40		.33		.05	.43	.05	T.	T.						T.	T.		.22	.05			T.	T.	1.53
Hooper	do												.89					T.														0.89
Ibapah (near)	Desert																															
Ibex	do																															
International	G. S. Lake																															
Iosepa	Desert								.28		.35		T.	.10											.08		T.					0.81
Joy	do																															0.00
Junction	Sevier Lake										T.			T.	T.												T.	.16				0.16
Kanosh	do								.03													.02								.05		0.10
Kelton	G. S. Lake								T.		T.			.10	T.																	0.10
Lemay	Desert									T.			.25																			0.25
Levan	Sevier Lake								.15																.02						.01	0.18
Logan	G. S. Lake							.01		.04			.63	T.	.13		.10															0.91
Low	do										.01			.02											.04						T.	0.07
Lucin	Desert																T.													T.		T.
Lund	do																															
Manti	Sevier Lake						T.	T.	.12		T.			.16		.05	T.								T.					.09	.13	0.55
Maple Creek	G. S. Lake								.58		.16		.07				T.					T.			T.				T.	T.	T.	0.81
Marion	do							.03	.27		.08		T.	.28	.05		T.										.07		T.		.12	0.90
Marysvale	Sevier Lake					.02		T.	.01		.05	T.	.01	T.								T.				T.	T.	T.	.07	T.	T.	0.16
Meadowville	G. S. Lake										.15		.05		.20		T.										T.					0.40
Midlake	do							T.		.10			T.	.20		T.							T.								.10	0.40
Midvale	do							.29		.03	.03		.53	.02																		0.90
Milford	Sevier Lake				T.																			T.								T.
Mills	do					.02		T.	.07		T.	T.										T.		T.	T.		.01	T.		T.	.01	0.11
Millville	G. S. Lake								.07	.03	.08		T.	.71	.23	.03									T.							1.15
Minersville	Sevier Lake																															
Modena	Desert							T.			T.		T.												.02				.03			0.05
Morgan	G. S. Lake														.02		.04															0.06
Moroni	Sevier Lake						T.	T.	.19	T.	.09	T.		.21			T.					T.	T.	T.			.35	T.	T.	.03	T.	0.87
Mosida	G. S. Lake								.09		.01				T.										.03		.04					0.17
Mount Nebo	do					.06			.03		T.											T.		T.	T.							0.09
Nephi (near)	do																															
Newcastle	Desert																															
Oak City	Sevier Lake																															
Ogden	G. S. Lake					T.									.14	.17						T.										0.31
Panguitch	Desert					T.																										T.
Park City	G. S. Lake	.04	.06	.02	.01											.03				.01	.02	.04					.01					0.24
Park Valley	Desert									.06	.24	.17		.09	.23																.05	0.84
Parowan	do					.05					.07	T.										.05			.11	T.			.05			0.33
Payson	G. S. Lake								.26		.20			.03																	T.	0.49
Pelican Point	do																															
Pine Cliff Ranch	do							.08						.27	.23										.20							0.78
Pinto	Desert																							T.	.04				.16			0.20
Plentiful	G. S. Lake																															
Promontory	do															.14																0.14
Provo	do								.45		.05			.08													T.					0.58
Randolph	do										.72					.15	.05	.19						.03					T.	.05		1.19
Revier	do						.18	.22		.01	.12		.06	.16	T.							.07							.02			0.84
Richfield	Sevier Lake																															
Richmond	G. S. Lake							.01		.10			.84	.08	.22	.02	.05						T.							.02		1.34
Saltair	do								.11		.07		.02	.23	.06														.01			0.50
Salt Lake City	do							.08	.02	.04	T.		.05	.49	.03		.01					.06			.12					T.	T.	0.90
Scipio	Desert	.04						T.	T.					.06								T.					.20					0.30
Showell	do									.20	.32			.34																	.33	1.19
Silver City	do				T.						.10																			.02		0.12
Spanish Fork	G. S. Lake								.27	T.	.20			.02											T.		.08		.02	T.	T.	0.59
Strawberry Tunnel (West).	do								.40	T.	.13	.12		.15		.08	T.							.23	T.	.18	.03	T.		T.		1.32
Thistle	do								.30	T.	T.	T.		T.	T.	T.								T.	T.		T.	T.			T.	0.30
Tooele	do							T.	.11	.01	.26		T.	.14		.02	.11	T.							.50		T.	T.	T.	.01		1.16
Utah Lake Pumping Station.	do																															
Vernon	Desert					.02	T.	.07			.17		.05				T.					T.		T.	.07		T.	T.		T.	.09	0.47
Wendover	do											.09																				T.

TABLE 2.—*Daily precipitation for June, 1912. District No. 10*—Continued.

Stations.	Watershed.	Day of month.																														Total.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Utah—Continued.																																
Whisky Creek	Desert																										T.					0.24
Winder	Sevier Lake																						.10								.12	0.69
Woodruff	G. S. Lake												.25				.02								.12		.25		T.			2.00
Oregon.																																
Ana River	SE. drainage							.01	.09			.03	.05							T.		.01		.13						.08	.07	0.47
Bear Valley	do																															
Burns	do								.33			.10	.30	.26																	.18	1.17
Burns Mill	do							.05		.16			.35	.19	.12								.19	.16							.25	1.47
Christmas Lake	do					T.	T.	T.	.05			T.	.42	T.	T.				T.	T.	T.	.16	.03					T.		.11	.21	0.98
Cliff	do							T.					.54	.10	.03															.08	.46	1.21
Diamonds	do							T.	.32				.10	.22	.05															.24	T.	0.93
Embody	do								.22				.17	.42	.08	.04					.06	.02										1.01
Fort Rock	do					T.	T.	.75	T.			.30	.10	T.	T.						.05	.21	T.	T.						.02		1.43
Paisley	do																															
Seneca	do							.40	.20	T.	.10	.20	.10	.07	.07							T.	.02	.07							.22	1.45
Silver Lake	do							.31	.33				.39										.64	.07	.02			.13		.02	.06	1.97
Valley Falls	do						T.					T.	.18	.36	.03	.02					T.	.33	.38							.01	.02	1.33
California.																																
Bijou	Truckee																															
Boca	do												T.										T.	T.								T.
Bridgeport	East Walker			.02						.02													.36									0.40
Deer Park	Truckee																						.10	.25								0.35
Glen Alpine	do												.06										T.	T.								0.06
Hobart Mills	do					.17				.02			.20										.19	.65								1.23
Lundy	East Walker																						T.									T.
Markleeville	East Carson										.16					.03																0.19
Shields Ranch	East Walker									.11													.17									0.28
Silver Creek	East Carson										.21					.05																0.26
Tahoe	Truckee																															
Tallac	do				T.	T.	T.		T.				.50										.25	.25								1.00
Truckee	do																							T.								T.
Woodfords	West Carson				T.	T.				.14														.22								0.36
Nevada.																																
Arthur	Humboldt										.60	*	*	.40																		1.00
Austin	Reese																															
Battle Mountain	Humboldt																															
Beowawe	do																															
Bishop	do							.26	.08	.07	.28		.21																			0.90
Carlin	do																															
Carson Dam	Carson									.56													T.									0.56
Cherry Creek	Humboldt					.01	T.	T.		.02	.01		T.										T.									0.04
Clover Valley	do																															
Columbia	Desert																															0.00
Dry Farm	Humboldt										.26		.10	.38	.01																	0.75
Elko	do					T.	T.	.01	.01	.56	.34		.03	.07	T.								T.		T.						T.	1.02
Ely	do							.03			.12																			.07		0.22
Eureka	do					.02		.04		.24	.06		.33																			0.69
Fallon	Carson									T.	.14		.01										.02	.02								0.22
Fernley	Truckee					T.	T.	T.		T.			T.										.26									0.26
Gardnerville	Carson				T.		T.																.13	.17								0.30
Geyser	Humboldt							.20																								0.20
Glenbrook	Truckee																															
Golconda	Humboldt						.10	.05						.12																		0.27
Halleck	do							T.	.22	.10	.05		.10																			0.47
Hawthorne	Desert												.03										.28	.12								0.43
Jean	do																												T.			T.
Lahontan	Carson					T.	T.			.06			.02									.05	.15									0.28
Lewers Ranch	Truckee					T.	T.						T.										.50									0.50
Lovelocks	Humboldt						.03		.08	.05			.04											.10								0.30
Massacre Lakes	Desert																															
Mill City	Humboldt							*	.50				.25																			0.75
Millett	Reese																															
Mina	Desert																															0.00
North Fork	Humboldt						T.	T.		.51	.20		.10		.03								T.		T.							0.84
Potts	Reese				T.			T.		.15	.05		T.																			0.20
Quinn River Ranch	Humboldt							.07																								0.07
Rebel Creek	do						.05	.02	.20	.02			.34		.16								T.	.05								0.84
Reno	Truckee				T.		.08		T.	.14			.01										.24	T.								0.47
Skelton	Humboldt									.36	.03		.72																			1.11
Smith	West Walker									.10													.52									0.62
Soda Lake	Carson																															
Spooners Ranch	Truckee						.05																*	4.00								4.05
Sweetwater	East Walker																															
Tecoma	Humboldt								.06	.25			.04		.03																	0.38
Tonopah	Desert												.01										.01									0.02
Wells	Humboldt										.75																					0.75
Willow Point	LittleHumboldt							*	.50	.45	.04		.01																			1.00
Winnemucca	Humboldt					.02	.02		.77	.02			.23		.08																	1.14

* Precipitation included in that of the next measurement.
‡ Separate dates of falls not recorded.
‖ Precipitation for the 24 hours ending on the morning when it is measured.
T. Precipitation is less than 0.01 inch rain or melted snow.

TABLE 3.—*Maximum and minimum temperatures at selected stations for June, 1912. District No. 10, Great Basin.*

Date.	Wyoming.				Weston, Idaho.		Utah.																			
	Border.		Evanston.				Corinne.		Government Creek.		Joy.		Marysvale.		Meadowville.		Modena.		Ogden.		Parowan.		Provo.		Salt Lake City.	
	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	69	32	68	32	74	36	75	41	76	39	86	43	83	35	71	36	80	35	80	55	82	43	82	37	76	51
2	74	32	72	37	82	38	79	40	84	49	92	50	89	35	80	42	86	41	81	58	88	50	89	40	84	54
3	71	38	72	40	79	40	88	43	81	44	90	50	87	40	77	39	87	45	78	60	89	51	87	44	79	57
4	75	31	76	34	82	35	89	43	85	45	97	52	92	42	78	39	89	45	74	56	89	55	88	38	83	54
5	78	32	79	37	85	39	86	43	87	50	86	51	79	43	80	40	90	47	79	59	65	51	91	41	86	58
6	82	39	81	45	86	43	90	53	89	57	89	57	86	45	79	47	85	47	83	62	79	64	98	53	90	65
7	81	51	75	44	85	53	90	55	83	59	90	50	85	48	84	55	86	54	84	64	84	58	90	55	86	59
8	77	52	72	49	85	53	88	57	82	48	87	51	82	48	77	53	79	44	81	62	83	52	86	54	85	58
9	76	42	70	38	78	45	92	59	81	43	85	50	81	46	76	54	73	42	76	59	79	49	87	54	76	59
10	76	38	65	39	75	40	80	47	71	42	90	46	74	40	69	41	73	49	75	58	73	46	78	44	71	55
11	73	37	74	38	79	39	80	47	77	42	66	50	77	37	79	39	79	41	68	52	79	44	83	42	77	53
12	74	40	71	41	80	42	84	48	80	52	76	40	78	41	77	40	79	50	74	53	81	48	85	48	81	60
13	64	40	67	42	65	50	78	45	75	46	80	50	76	49	65	45	79	47	78	56	79	53	78	52	72	51
14	58	38	57	37	65	42	71	46	69	46	82	51	77	46	64	39	79	44	74	55	78	53	73	51	66	51
15	52	28	51	29	58	33	57	35	58	29	79	40	64	46	53	28	69	44	67	32	74	41	54	41	56	43
16	52	30	50	24	63	30	60	38	59	28	66	39	61	32	59	30	64	34	56	30	64	34	63	31	57	40
17	63	30	60	32	69	33	69	33	64	33	69	39	69	35	69	31	72	43	58	39	72	36	74	32	68	47
18	69	33	65	30	75	35	76	44	85	38	80	44	77	33	68	33	79	38	65	42	79	41	80	36	73	52
19	75	34	75	32	80	38	84	48	83	41	80	50	82	35	79	34	84	42	72	48	84	47	86	40	83	52
20	83	35	78	36	85	39	89	47	89	49	90	51	87	41	86	37	84	43	76	51	86	53	95	41	89	58
21	83	43	80	46	85	50	88	61	83	46	90	50	83	52	84	48	79	50	78	52	82	52	94	49	86	65
22	72	43	73	47	80	51	84	61	78	53	89	48	75	51	73	49	78	57	78	56	77	52	80	62	83	67
23	81	44	76	47	85	49	88	57	86	56	91	54	82	57	83	45	79	42	81	59	82	58	90	69	87	65
24	82	41	77	41	88	48	90	53	84	53	90	51	83	54	80	44	80	52	82	58	80	56	91	51	87	66
25	80	45	76	22	85	49	87	53	86	50	94	52	87	41	79	46	84	44	85	60	83	49	91	47	90	60
26	80	42	75	44	88	50	89	56	91	55	92	60	86	43	77	46	86	47	83	56	86	53	92	52	90	69
27	82	65	77	41	87	48	92	57	89	57	90	60	87	44	84	44	85	46	83	54	87	57	93	49	90	66
28	84	43	76	46	86	45	91	59	89	55	93	60	82	46	84	55	85	48	84	52	82	62	92	53	90	68
29	76	53	74	47	81	63	86	68	83	60	68	46	84	50	78	58	73	47	86	53	80	51	90	62	87	67
30	78	36	72	49	79	53	89	63	83	53	74	53	78	44	78	51	75	45	86	59	79	45	87	50	82	65
Mns.	74.1	39.6	71.1	38.9	79.1	43.6	83.0	50.0	80.3	47.4	84.7	49.6	80.4	43.3	75.7	42.9	80.0	45.1	76.8	53.7	82.6	50.1	84.9	47.3	80.3	57.8

Date.	Burns, Oreg.		Nevada.																									
			Cherry Creek.		Elko.		Eureka.		Fallon.		Jean.		Lovelocks.		Mina.		Potts.		Quinn River ranch.		Reno.		Tecoma.		Tonopah.		Winnemucca.	
	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	75	37	84	54	82	36	83	38	90	41	95	75	91	45	89	94	84	34	86	36	85	47	70	38	82	55	88	48
2	79	39	85	44	87	38	87	45	93	51	101	44	95	48	92	53	87	38	89	45	89	51	78	40	86	62	90	45
3	81	36	83	47	84	40	85	45	92	55	103	48	92	54	98	59	78	33	89	52	91	52	68	30	89	65	88	52
4	80	40	85	46	88	36	87	44	96	50	104	55	97	58	98	56	88	40	93	40	93	54	80	42	88	64	93	50
5	87	48	86	48	88	46	85	53	96	57	102	60	97	52	96	62	87	47	93	51	91	56	78	34	87	64	94	59
6	87	50	90	51	88	46	87	50	94	53	102	58	97	52	92	61	85	40	94	55	89	52	74	43	85	63	91	56
7	84	46	88	56	85	46	81	50	89	55	100	60	93	51	92	60	80	43	85	57	79	54	65	33	81	61	89	53
8	76	35	84	44	81	43	78	48	86	52	92	52	79	51	87	56	77	37	79	54	73	49	78	44	75	63	78	51
9	76	38	72	43	67	40	70	38	79	47	95	48	81	49	72	55	61	42	......	......	75	47	80	32	63	48	72	50
10	74	36	71	39	63	46	66	39	81	45	92	45	78	47	82	48	67	42	......	......	81	45	71	37	66	44	80	45
11	76	40	76	40	77	43	78	40	87	48	95	50	85	41	84	58	75	38	88	40	82	51	80	43	76	54	85	51
12	82	42	80	45	74	52	75	41	86	61	93	57	77	54	80	55	70	40	79	53	66	54	78	39	69	50	74	51
13	64	35	73	41	68	43	72	44	77	44	91	50	71	43	82	44	72	36	71	47	68	52	80	44	75	48	71	46
14	64	29	68	42	67	45	67	37	75	45	90	51	69	41	77	52	65	34	65	43	70	46	80	43	67	44	66	43
15	63	38	58	45	55	30	61	30	75	42	89	49	67	40	75	44	57	33	62	35	66	40	50	32	63	39	62	33
16	67	38	60	27	64	29	63	23	72	37	87	48	75	36	72	38	64	24	70	27	70	37	55	37	68	39	70	35
17	78	45	68	34	73	40	75	32	82	38	85	48	84	44	83	42	76	26	82	32	81	42	70	42	73	50	80	44
18	69	44	75	41	78	42	79	44	88	42	94	49	90	48	89	46	81	33	89	55	87	47	80	40	80	57	86	48
19	70	39	81	44	85	43	85	50	94	48	100	46	92	46	95	51	89	36	93	53	88	54	85	40	85	62	91	57
20	74	42	89	47	87	49	85	61	85	48	98	53	77	45	93	48	81	49	85	55	71	44	84	39	81	54	88	46
21	75	40	83	53	76	47	78	38	75	38	93	52	72	40	81	46	69	37	65	41	60	41	85	42	62	42	67	42
22	79	39	83	50	75	53	71	67	67	45	89	47	71	38	67	44	68	49	75	45	48	39	78	41	63	35	73	47
23	80	48	79	49	81	54	72	50	70	36	96	47	74	40	72	36	68	36	75	46	62	37	85	39	60	34	77	46
24	89	46	83	49	85	43	78	58	86	43	96	49	90	38	83	51	77	40	87	33	80	39	88	47	72	46	88	44
25	86	45	86	49	88	44	82	54	90	51	98	43	94	45	87	49	80	41	90	39	83	48	87	45	78	53	91	50
26	84	40	88	48	88	43	83	59	88	44	99	46	84	42	90	53	79	42	83	45	77	44	90	48	81	56	86	49
27	80	41	86	49	86	46	84	52	85	42	96	50	85	46	88	52	80	37	79	45	82	42	98	47	81	67	82	50
28	68	40	87	48	87	40	83	52	89	47	100	55	89	44	90	54	79	38	82	45	80	45	94	40	81	59	86	44
29	64	38	84	58	84	41	79	54	86	45	89	58	89	44	90	50	74	43	83	44	74	47	96	38	74	57	83	50
30	67	32	80	53	77	51	75	45	78	48	91	52	77	39	85	46	75	46	69	44	71	45	93	41	73	52	72	41
Mns.	75.9	40.2	79.8	45.8	78.9	43.2	77.8	46.0	84.4	46.6	95.2	51.5	83.7	45.4	85.4	50.6	75.8	38.5	81.4[b]	45.0[b]	77.1	46.6	79.0	39.8	75.5	52.2	81.4	47.5

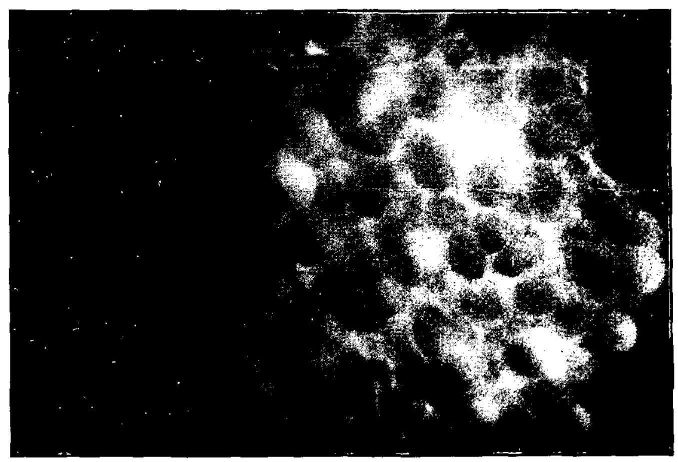
[a], [b], [c], etc., indicate, respectively, 1, 2, 3, etc., days missing from the record.
§§ Instruments are read in the morning; the maximum temperature then read is charged to the preceding day, on which it almost always occurs.

MAMMATO-CUMULUS CLOUDS.

By W. J. Humphreys, Professor of Meteorological Physics, U. S. Weather Bureau.

The accompanying illustrations, from photographs taken at Bartlesville, Okla., June 15, 1912, at 6.30 p. m., by Mr. Loran C. Twyford, show an admirable example of that unusual cloud formation commonly known as the mammato-cumulus.

Mr. Twyford writes that possibly 45 minutes before the clouds were seen a cyclone did great damage about 20 miles away, and in the direction from which the clouds came. Similar clouds were observed by Prof. H. C. Frankenfield [1] at St. Louis in connection with and just preceding the tornado of May 27, 1896, that did much damage in that city. They have also been noted occasionally by many other observers and in various parts of the world but usually in the neighborhood of tornadoes, squalls, or other violent atmospheric disturbances.



Osthoff [2] in his report on 67 occurrences of the mammato-cumulus which he observed during the course of 21 years, 1885–1905, says that they are tenfold more frequent during summer than in winter, and nearly as many fold more frequent of afternoons than of mornings. He also finds that this particular formation occurs at various levels and especially as a modification of the strato-cumulus and other sheet clouds.

Presumably, then, the formation of mammato-cumuli is dependent upon certain unusual conditions incident to hot weather and that are often productive of severe local storms. Just exactly how they are formed, however, is not certain, but apparently they are due to local down rushes, or cataracts, of cold air, the general process conceivably being as follows:

1. A violent up rush, under cyclonic conditions, of the lower atmosphere, and consequent projection, by virtue of acquired momentum, to elevations beyond the equilibrium level, where it is dynamically cooled to temperatures below that of the surrounding air.
2. A rapid horizontal spreading, under the influence of the cyclonic whirl, of the overlying cooled atmosphere at a considerable elevation, and therefore often above a stratus cloud of some type.
3. A descent in numerous places of the abnormally cold and consequently unstable air upon and through the underlying cloud stratum; thereby in each such place forcing the cloud below its wonted level and at the same time, through counter convection, raising its intermediate portions above their former position, and thus accentuating the whole phenomenon of pendulous formation.

The actual process, whether in general as above suggested, or some other not so obvious, seems to require an existing cloud to render it visible, and to be such as to convert a stratus of whatever type into a group of festooned, pendulous, pocket or mammato-cumulus clouds, as run some of its numerous names.

Apparently this type of cloud has very rarely been photographed, and therefore it is earnestly hoped that Mr. Twyford and many others may secure additional records for the further study of this interesting, unusual, and, because of its frequent close relation to tornadoes, perhaps even ominous phenomenon.

[1] *Monthly Weather Review*, vol. 24, p. 77, 1896.
[2] Met. Zeit., vol. 23, p. 401, 1906.

Total Precipitation, June, 1912.

Departure of the Mean Temperature from the Normal, June, 1912.