total rise of 5.8 feet for the flood. Below Fort Hancock the progress of the flood, which had its origin in the headwaters of the river, was marked by a flood in the lower portion which began about the same time.

From June 9 to 13 about 4 inches of rain fell over the watershed of the Rio Grande below El Paso. In the vicinity of Fort McIntosh the very heavy fall of about 8 inches occurred.

At Langtry, Tex., the river rose 6.1 feet on the 11th and 12th, reaching the stage of 9.0 feet. The crest of this flood reached Eagle Pass, Tex., on the 14th, where the total rise from the beginning of the rainfall was 11.1 feet and the gage reading 13.8 feet. The very heavy rainfall which occurred in the vicinity of Fort McIntosh masked the rise which was coming down the river from above that point, the highest stage at Fort McIntosh being reached on the 14th, as at Langtry. The high water reached Carrizo, Tex., on the 15th. The total rise from the 12th to 14th being about 14.5 feet. The flood passed Roma, Tex., on the 16th and recorded a level of 19.5 feet, or total a rise of 15.4 feet between the 12th and 16th. High water was reached at Fort Ringgold, Tex., on the 19th, the total rise amounting to about 15 feet. The river overflowed above Brownsville, Tex., on the evening of the 15th and then remained at about the same level until the 24th. The total rise was 13.0, or about half a foot higher than any level reached during the past twenty years.

Most of the damage resulting from the flood occurred in the vicinity of Berino, N. Mex., and was due to the giving away of the head gates of the San Jose irrigating ditch. Farms and buildings were flooded, causing damage to the extent of about $15,000. Near Fort Ringgold several slight changes in the channel of the river are reported. For about thirty miles above Brownsville traffic was interfered with for a few days on account of the overflowed bottoms.

No regular flood forecasts are issued for the Rio Grande, but the appearance of a marked rise at a station is wired to all points on the river below that station by the local observer. On June 13 Mr. H. O. Rawlins, the river observer at Eagle Pass, notified all places below his station that an 8-foot rise had occurred at Eagle Pass. This information undoubtedly resulted in a considerable saving of stock and other property.

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during June are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Corn and minor crops made satisfactory progress, and are generally promising. Cotton retarded by cool nights, but, while small, was improving at close of month, when squares were becoming general and some blooms were forming.—*F. P. Chaffee.*

Arizona.—There were quite good rains over a large part of Arizona during the latter half of the first and the first half of the second decade of June, but during the rest of the month the weather was dry. Moderate temperatures prevailed most of the month, but the latter part was very warm. As a rule crops did well during the month, having been revived by the showers and the increased flow of irrigation water. There was some damage later by dry weather. Range feed was plentiful and stock did well.—*M. E. Blystone.*

Arkansas.—The month was cool with less than the normal rainfall. Considerable progress was made in cleaning fields of weeds and crops were generally clean. Cotton made slow progress, but by the end of the month the plant, while small, was healthy, the stand fair and was beginning to take on forms. Corn made a slow, steady growth; at the close of the month nearly all had been laid by; it was tasseling well, and the stalk, while small, was healthy. Harvesting of wheat and oats progressed under favorable weather conditions; the yields were light. Early potatoes were harvested and good yields of excellent quality were secured. Apples will be a short crop of inferior quality.—*Edward B. Richards.*

California.—Conditions were generally favorable for crops, with the exception of deficient rainfall. Fires caused considerable damage to standing grain in the Sacramento Valley, and deciduous fruits in some sections were slightly injured by heat. Grain harvest commenced in nearly all sections before the 15th, and haying was progressing. Heavy crops of grain and hay were being harvested in southern California, and fair crops in other sections. Deciduous fruits, grapes, and oranges were in good condition.—*G. H. Willson.*

Colorado.—The small amount of sunshine on the eastern slope and the general lack of seasonable warmth were unfavorable to rapid growth, but this was largely compensated by copious and well distributed precipitation. Small grain and potatoes, as a rule, made excellent progress; corn grew slowly, owing to cool weather; beets made good advance; gardens, fruits, and cantaloupes did well. About one-half of the alfalfa crop was in stack at the close of month; ranges improved rapidly and afforded excellent pasturage; prospects were good for a fine crop of native hay.—*F. H. Brandenburg.*

Florida.—The month was cooler than the average, with a moderate deficiency in precipitation. Cotton made slow growth the first half of month, advancing favorably the latter half, although the staple was about two weeks late; fruiting was quite general. The corn crop is good. Cane, sweet potatoes, pineapples, citrus fruits, and minor crops doing well.—*A. J. Mitchell.*

Georgia.—A cool, wet month, the coolest June in twelve years, and with one exception the wettest. The night temperatures were unseasonably low, particularly on the 13th, when very light frost formed in a few northern localities. Excessive rains occurred in numerous sections, while in a few counties the rainfall was considerably deficient. The general conditions were unfavorable to agriculture. Crops made slow growth and were poorly cultivated. Cotton was generally small and sickly; blooming began much later than usual. Minor crops have promise of yielding satisfactorily.—*J. B. Marbury.*

Idaho.—Though no extremely high temperatures were recorded during the month many of the nights were unusually warm, and the mean temperature was, with one exception, higher than that of any June in the past eleven years. Over the northern counties precipitation was ample for needs of vegetation and crops made unusually rapid growth; elsewhere water for irrigation has been abundant and irrigated crops have made satisfactory advance.—*S. M. Blandford.*

Illinois.—The weather conditions, particularly temperature, were unfavorable for crop advance throughout the month. It was too cool for growth, and the corn crop at the end of the month was very uneven, being about two weeks backward. The fields were clean and the crop in a good state of cultivation. Oats were short and uneven. The hay crop was promising, clover being exceptionally heavy. Great destruction to corn and wheat ensued from inundation in counties bordering on the Mississippi. It was estimated that over 500,000 acres under cultivation were ruined. The wheat crop was very much below the average.—*Wm. G. Burns.*

Indiana.—Excessive moisture during first decade delayed farm work, and low temperature until last three days of month retarded crop growth. Corn planting finished after the 15th, three weeks late at end of month. Wheat and clover harvest under way last half of month, clover heavy, wheat light. Oats uneven, suffering from rust, and unpromising. Prospect for potatoes fairly good. Apples promised less than average crop, and other tree fruit light to fair. Tomatoes, melons, gardens, cucumbers, and tobacco in fairly good condition.—*W. T. Blythe.*

Iowa.—Cool and dry weather was favorable for wheat and oats, checking tendency to rust and rank growth, but corn needed more warmth and sufficient rainfall to prevent encrusting the surface. Good progress was made, however, in planting, replanting, and cultivating corn, and warmer weather in closing decade brought the crop forward in better condition than was deemed possible at the outset. Hay harvest began early with good prospects. Apple crop better than in recent years.—*John R. Sage.*

Kansas.—Cool, dry month. Wheat harvest began in extreme south during second week, extending to central during fourth week. Corn improved as cultivation progressed and temperature rose. Cutting first crop of alfalfa began first week and second crop last week. Grass fine. Apples in good condition south, poor north. Potatoes good crop, doing well outside flooded district.—*T. B. Jennings.*

Kentucky.—The month was exceptionally cool, the temperature averaging lower than ever previously recorded for June in this section. Light frosts were reported in some localities on the 12th and 13th, causing a little damage to tender vegetation. The rainfall was about normal and fairly well distributed. The cool weather was unfavorable to corn and it made very slow growth during the month. The setting of tobacco was about completed during the first half of the month, and it started off fairly well. Oats and rye did fairly well. Irish potatoes and gardens showed good advance. The harvesting of wheat was generally completed during the last week, and a light crop was reported. The cool weather was favorable to apples and there was less complaint of dropping than usual.—*H. B. Hersey,*

Louisiana.—There was not sufficient rainfall during the early part of the month for agricultural interests, but general and sufficient showers occurred toward the close of the month. Unseasonably low temperatures prevailed during the greater part of the month and retarded the growth and development of vegetation. Cotton made very little progress until toward the close of the month and the crop is generally two to three weeks later than usual. Careful and systematic cultivation caused stubble and fall plant cane to hold their own, but spring plant suffered serious injury in some sections as a result of the cool, dry weather. Rice is promising. Corn made slow but healthy growth. Oat harvest was completed under favorable conditions. Truck gardens promise a good yield.—*I. M. Cline.*

Maryland and Delaware.—Abundant moisture favored grasses, but hindered cultivation and harvest, while low temperatures checked growth in corn. Wheat harvest progressed, giving light yields, but returns from barley and rye were fair to good; oats improved in the upper counties

although affected with rust; some hay was cut with local loss by showers; tobacco was grassy but grew well. Apples continued promising. Truck prospered, although lack of sufficient sunshine caused small crops to mature slowly.—*Edward C. Easton.*

Michigan.—June was generally quite cool for best crop growth. The early part of the month was especially dry in the northern counties and Upper Peninsula; ample showers during latter half greatly improved all vegetation. Wheat, rye, early potatoes, sugar beets, peas, and barley made good progress. Old meadows were rather thin and short. Oats, garden truck, and corn were slow, corn especially backward. Haying began last week of month. Apple prospects continue promising.—*C. F. Schneider.*

Minnesota.—Dry weather continued in the Red River Valley, except for a few light showers, till the rains of the 29th and 30th. Crops on fall plowed lands withstood the drought fairly well, but wheat, oats, barley, and flax on spring plowed land were in great danger at end of month. Frequent heavy rains in southern portions flooded lowlands and kept level lands wet. Rye and clover in bloom and winter wheat and timothy heading early in month. Haying began about the middle of the month. Early barley heading and rye ripening about the 25th.—*T. S. Outram.*

Mississippi.—The mean temperature was the lowest on record for June. Cotton made very slow growth and at the close of the month was small, uneven, and about three weeks late, but generally well cultivated and healthy. Corn did remarkably well; the early was laid by in fine condition. The planting of peas for forage was general. Sugar cane, sorghum, and melons were promising. Vegetable crops yielded well.—*W. S. Belden.*

Missouri.—The month was unseasonably cool, it being the coolest June of which there is any record in this State. The low temperature was unfavorable for corn and cotton and those crops were backward, but after the first week were generally well cultivated. Practically all crops on the Missouri and Mississippi bottoms were destroyed by floods, but replanting was in progress during the latter part of the month. Wheat harvest progressed favorably, but the yield was generally light. Oats were damaged somewhat by rust and lice, but promised fair to good yields, except in some southern counties. Meadows made a heavy growth. Apples continued to decline.—*A. E. Hackett.*

Montana.—Cool nights and an insufficiency of sunshine made growth of all crops rather slow. The precipitation, however, was very favorable for all vegetation; the monthly amount was below the normal, but showers were gentle and frequent and all of the moisture was absorbed by the ground. Grain is in fair to good condition, but late. The alfalfa crop is good and generally ready to be harvested. Hay and ranges made great improvement toward the last of the month, but the hay crop will be below the average. Potatoes are good and fruit prospects are very good.—*Montrose W. Hayes.*

Nebraska.—Rain and the wet condition of the soil early in the month retarded farm work. Corn planting and the cultivation of the early planted corn progressed rapidly in the second week and this work continued throughout the month, a little corn being planted the last week in June. The low temperature of June, the late planting of much of the crop, and the retarding of cultivation by wet weather resulted in corn being unusually small and weedy at the close of the month. The month was very favorable for the growth of grass, and pastures were in fine condition, while the hay crop promises to be very large. Wheat and oats generally grew well, although some rust appeared in nearly all fields, but not sufficiently to do much damage. Potatoes continue in fine condition.—*G. A. Loveland.*

Nevada.—The weather throughout the month was very favorable for the growing crops and for harvesting hay and grain. Frost on the morning of the 3d damaged garden truck slightly in a few localities. Irrigation water was quite plentiful in all districts, and crops of all kinds made rapid growth. Live stock improved in condition, the range feed and pasturage being fine and abundant in all sections. Fruit prospects the best in years.—*J. H. Smith.*

New England.—The weather for the month was marked by an unusual amount of cloudiness, temperature decidedly below normal, and quite uniform and excessive rainfall. The average temperature for the district, 59.5°, is the lowest for June of record, and the average rainfal, 6.71 inches, the largest for June. The weather conditions were very unfavorable for all crops. Frosts occurred in interior and northern sections and resulted in considerable damage in some localities. The month closed with several days of favorable weather. All crops backward, and excepting grass, at a standstill.—*J. W. Smith.*

New Jersey.—The chief characteristics of the month were the abnormally low temperature, excessive and uneven distribution of rainfall, and the very dense smoke that prevailed throughout the State on the 4th, 5th, and 6th. It was so dense that it obscured the sun and caused considerable irritation of the eyes. Cultivation and planting were delayed in the central and northern sections, the ground being too wet to work.—*Edward W. McGann.*

New Mexico.—Almost daily rains during first two decades over northern portion, but in extreme southwest not greatly above normal. Accompanying cold weather retarded crop growth, especially corn, and following closely on the lambing season killed many lambs and ewes. But the rains changed the aspect of the spring season from one of drought to one of excellent prospects for stock and crops.—*R. M. Hardinge.*

New York.—The temperature was decidedly below normal, and drought continued until the 7th. After the 10th the ground was too wet for cultivation, and corn, potatoes, and beans were poor and very backward June 30, but a marked improvement in wheat, rye, barley, oats, pastures, and meadows immediately followed abundant rains. Grapes continued promising, but other fruit generally light, except apples, which varied from light to heavy. Farm work much delayed.—*R. G. Allen.*

North Carolina.—The month was very unfavorable for the growth of most crops on account of the unusually low temperatures that prevailed; with the exception of June, 1878, only, the month was the coldest on record. Frosts occurred in the mountain district on the 13th and 14th. The month was also very wet, farm work was interrupted, and crops became rather grassy. Cotton made very little growth and was very small at the close. Corn improved considerably. Tobacco and all minor crops did fairly well. Harvesting winter wheat, oats, and rye progressed favorably. The prospect for fruit remained favorable in the central-east portion of the State.—*C. F. von Herrmann.*

North Dakota.—The month was quite unfavorable for crops of all kinds. The precipitation was considerably below the normal amount, and, owing to the deficiency from former months, quite a serious drought prevailed over the State at the close of the month, on all except some lowlands in river bottoms. Early sown wheat that was up and doing well, dried out in many places, while that sown late failed to germinate. Fortunately the weather was cool and partly cloudy most of the time, which was of great help to all vegetation.—*B. H. Bronson.*

Ohio.—The mean temperature was the lowest ever recorded here in June. Corn was planted late, germinated slowly, and was small at end of month. Wheat was being harvested in south and middle at end of month, with yield less than expected. Oats made fair growth, but headed rather short. Clover and timothy improved; tobacco did very well; early potatoes yield well; gardens and pastures continued good; grapes and blackberries promising; apples promise only light to fair crop.—*B. L. Waldron.*

Oklahoma and Indian Territories.—The weather conditions were more favorable for the cultivation, harvesting, and growth of all crops; corn and cotton fields were well cleaned; early corn was laid by and the late placed to a good stand. Cotton made slow growth, was damaged by web worms, and was in a poor to fair condition. Soft and hard wheat were harvested with fair to good yields over Oklahoma and light to fair yields over Indian Territory. Oats, alfalfa, and hay were being harvested with fair to good yields; the oat crop was deteriorating at the close of the month, due to red rust. Cane, kaffir and broom corn were planted and came up to a good stand; potatoes matured and were being gathered with good yields; range grass made a fair growth and stock was doing well.—*C. M. Strong.*

Oregon.—The early part of the month was dry and quite warm, but during the second decade cooler weather set in and copious rains fell in nearly all sections. The rains were a great help to crops in general, especially fall and spring wheat, which were doing poorly on account of the dry weather. Hops, corn, potatoes, field onions, and sugar beets made satisfactory advance. Haying was delayed on account of the wet weather and lack of sunshine, and some damage resulted to clover and vetch through becoming overripe and lodging. Cherries did not yield well, but there was an abundance of strawberries. Pears, prunes, and some varieties of late apples promise good yields.—*Edward A. Beals.*

Pennsylvania.—The coldest and wettest June in the history of the service. Drought broken and crops revived by copious showers of 6th and 7th, but cool weather and excessive moisture during remainder of the month retarded plowing, planting, and seeding, and was decidedly unfavorable to growth of crops. Month closed with haying and harvesting under way in southern counties; corn backward, weedy and uneven, and growing slowly; pasturage ample; oats, potatoes, truck, and berries satisfactory; timothy improving rapidly; apples filling nicely, and other fruits fair to scarce.—*T. F. Townsend.*

Porto Rico.—Under the favorable conditions generally prevailing vegetation took on a vigorous growth and all crops made marked progress during the month, except over a central area extending from San Juan to Ponce and westward over the south side, where there was a deficiency in the rainfall so great as to check plant growth and in a few instances to cause the death of the plant. The plant canes over this dry section especially are somewhat backward and irregular, as much replanting had to be done. Ratoons, however, look well. The coffee crop is decidedly promising, the trees almost breaking under the weight of the fruit. Experimental cotton is in good condition and promising. The April planting is now maturing. Mango and alligator pear trees are in full bearing with promise of abundant crops. Pineapples plentiful. Small crops and ground provisions in average abundance. Pastures excellent.—*William H. Alexander.*

South Carolina.—Cool nights and excessive precipitation over all but the western parts were inimical to crops, especially cotton. Field crops could not be properly cultivated. Floods and erosive rains damaged bottomland crops and hillsides, but bottomlands were largely replanted to corn. Unusually severe hailstorms destroyed crops over extensive areas, necessitating much replanting. Tobacco suffered severely from hail but otherwise thrived. Minor crops, garden truck, and pastures were not unfavorably affected, except that melons are much later than

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observations. Of course this number is much smaller than the total number of stations.

Summary of temperature and precipitation by sections, June, 1903.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.					Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	73.2	−5.0	Thomasville	99	19	Riverton, Scottsboro.	42	13	4.88	+0.22	Flomaton	9.70	Lock No. 4	2.05
Arizona	77.6	−2.1	Parker	120	28	Willcox	30	3	0.59	+0.39	Fort Defiance	4.67	8 stations	0.00
Arkansas	70.4	−6.5	DeQueen, Warren	99	21	Russellville	37	12	2.53	−1.27	Rison	8.01	Conway	0.45
California	70.9	+0.8	Imperial	121	28	Bodie	14	3, 17	0.07	−0.23	Cedarville	1.78	100 stations	0.00
Colorado	59.0	−4.5	Lamar	101	29	Longs Peak	19	1	2.79	+1.33	Santa Clara	9.25	Cedar Edge	0.16
Florida	78.6	−1.1	{Fort Meade {Rockwell	99 99	20 26	Molino Stephensville	54	13	6.69	−0.58	Rockwell	14.54	Malabar	1.64
Georgia	74.4	−3.8	Columbus	101	19	Diamond	41	13	6.00	+1.22	Diamond	11.57	Experiment	2.27
Idaho	64.0	.....	{Lewiston {Garnet	99 99	11 15	Forney	28	24	1.40	.....	Grangeville	3.86	Blackfoot	0.06
Illinois	66.3	−5.6	Peoria	95	30	Lanark	31	12	2.88	−1.34	Rantoul	6.13	St. John	1.37
Indiana	66.1	−6.1	La Porte	94	30	Greensburg and Veedersburg.	36	13	3.72	−0.29	Butlerville	9.49	Valparaiso	1.32
Iowa	64.6	−5.6	Cedar Rapids and Sigourney.	96	30	Denison	30	4	2.86	−1.52	Humboldt	6.04	West Union	0.75
Kansas	67.2	−6.6	Ness City	103	29, 30	{Wallace {Achilles	33 33	1 11	2.40	−1.65	Ulysses	7.10	Anthony	0.38
Kentucky	68.6	−5.8	Paducah	96	30	Fords Ferry	37	13	3.61	−0.72	Manchester	6.30	Mayfield	0.70
Louisiana	75.5	−3.9	Rayne	101	19	Mansfield	47	2	4.18	−1.82	Lake Charles	9.14	Ruston	0.99
Maryland and Delaware	66.3	−5.3	Boettcherville, Md.	96	30	Deer Park, Md.	35	2	5.48	+2.16	Bachmans Valley, Md	13.87	Denton, Md	2.10
Michigan	59.8	−4.6	Owosso	94	30	Humboldt	18	10	2.65	−0.49	Detroit	6.32	2 stations	0.35
Minnesota	62.3	−2.6	6 stations	90	6, 14, 27	Pokegama Falls	25	11	1.96	−2.38	Lynd	5.22	Beaulieu	0.36
Mississippi	73.6	−5.4	Laurel	101	7	Walnut Grove	44	14	3.09	−1.69	Natchez	6.58	Boggan	1.04
Missouri	67.3	−6.3	{Caruthersville {Princeton	95 95	20 30	Ironton, Montreal	36	13	3.25	−1.53	Seymour	8.30	Bethany	1.22
Montana	63.1	+2.8	Miles City	100	17	Toston	26	10	1.66	−0.93	Livingston	3.24	Butte	0.80
Nebraska	64.5	−5.0	6 stations	98	29, 30	Agate	29	10	2.21	−1.65	Odell	5.68	Fort Robinson	0.71
Nevada	64.4	.....	Rioville	113	28	Hamilton	28	10	0.45	.....	Elko	1.60	5 stations	0.00
New England*	59.5	−5.4	Morrisville, Vt	89	6	Patten, Me	21	1	6.71	+3.83	Bemis, Me	14.60	Nantucket, Mass.	1.10
New Jersey	64.0	−5.7	Paterson	92	3	{Layton {Charlotteburg	37 37	2 5	7.68	+4.20	Dover	15.02	Cape May C. H.	2.39
New Mexico	64.5	−4.9	Alamogordo	108	28	Alma	30	1	3.90	+2.43	Raton	9.44	Cambray	0.43
New York	60.6	−4.6	Elmira	90	30	Beaver	25	1	6.95	+3.46	Wappingers Falls	20.61	Little Falls	2.20
North Carolina	70.3	−4.1	Washington	98	30	Highlands	32	14	6.10	+1.65	Highlands	13.85	Pittsboro	1.92
North Dakota	62.4	−1.6	Napoleon	96	28	Mayville	27	11	1.22	−2.51	Portal	3.13	Mayville	0.04
Ohio	64.4	−5.3	North Royalton	95	30	Millport	35	2	3.97	+0.11	Dayton	9.09	Ripley	2.02
Oklahoma and Indian Territories	70.4	−6.1	Durant, Ind. T	102	18	Kenton, Okla	35	2	2.10	−1.47	Durant, Ind. T.	5.88	Holdenville, Ind. T.	0.48
Oregon	63.6	+3.1	Coyote	110	14	Bend, Silver Lake	26	3	1.70	+0.51	Bay City	6.83	Drain	0.34
Pennsylvania	63.5	−5.1	York	90	7	Dushore	34	1	6.53	+2.72	South Bethlehem	11.76	Confluence	3.74
Porto Rico	79.7	.....	Manati	100	19	Cidra	54	18	5.93	.....	Central Colos	16.70	Barros	0.03
South Carolina	74.2	−3.7	{Batesburg {Liberty	96 96	21 30	Clemson College	42	13	8.09	+3.23	Stateburg	18.42	Due West	3.95
South Dakota	65.0	−2.2	Leola	102	17	3 stations	30	11	3.05	−1.04	Ladelle	8.51	Oelrichs	1.00
Tennessee	68.9	−6.2	Jackson, Savannah	95	21	Rugby	32	13	3.95	−0.63	Benton	9.43	Dyersburg	0.58
Texas	74.7	−4.2	Fort Ringgold	107	24	Llano	38	1	4.10	+0.71	Rockport	12.67	Brownwood	0.90
Utah	65.7	+0.8	St. George	110	27	Loa	27	3, 6	0.47	−0.10	Monticello	1.72	3 stations	0.00
Virginia	67.4	−5.7	Newport News	94	30	Burkes Garden	38	24	6.06	+2.09	Charlottesville	15.82	Bristol	1.70
Washington	63.7	+3.1	Ephrata	104	11	Grand Mound	29	3	1.88	+0.26	Clearwater	8.74	Trinidad	0.00
West Virginia	65.1	−5.0	Echo	93	30	Terra Alta, Travellers Repose.	34	18	4.80	−0.08	Terra Alta	12.30	Lillydale	2.01
Wisconsin	62.4	−4.1	Barron	94	27	Koepenick	26	12	1.85	−2.46	Harvey	3.87	Beloit	0.50
Wyoming	58.9	−0.8	Hyattville	102	28	South Pass City	22	11	1.27	−0.13	Moore	3.54	Evanston	0.19

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut..

usual. Frequent rains caused much rotting of peaches and grapes. The rains also interfered with wheat and oat harvest, and damaged grain in the shock to some extent. The conditions were more favorable by the close of the month.—*J. W. Bauer.*

South Dakota.—Frost on the 11th affected corn, potatoes, and gardens, but not materially. Drought in some northern counties the latter part of the month injured spring wheat, oats, barley, spelt, rye, and grasses; otherwise these crops and also potatoes and flax did well. Flax and millet sowing was about completed in the second decade. Corn, which was not generally a good stand, due principally to poor seed, was backward, but generally made good progress after the 15th. There was some local damage by hail.—*S. W. Glenn.*

Tennessee.—The month was favorable to crops, although the wet weather the first week hindered farm work and the low temperature throughout the month prevented rapid growth. But the rainfall was generally sufficient. Although somewhat backward at the close of the month corn, cotton, and tobacco were looking well; clover was unusually fine; wheat was yielding much below the average; winter oats were good, but spring oats only fair; a good crop of hay was being harvested; apples promised a fair crop, but peaches were scare.—*H. C. Bate.*

Texas.—The month was the coolest June on record. With the exception of the southern and north-central portions, which experienced drought until the general rainfall of the 13th and 14th, all sections received sufficient moisture throughout the month to keep vegetation in good growing condition. The cool weather of the first half greatly retarded the growth of cotton; under more favorable temperature conditions the plants made very rapid growth the latter half, but the crop was between two and three weeks later than usual at the close of the month. Corn made very rapid growth and an average yield of the early planted is assured. Grain was harvested. Wheat, rye, and fall oats made about the average yield and spring oats a light yield. Rice, sugar cane, and miscellaneous crops did well.—*L. H. Murdoch.*

Utah.—The weather during June presented no unusual features. Precipitation was mostly local in character and was unevenly distributed. Vegetation on irrigated soil made a rapid growth, but dry land crops suffered greatly from lack of moisture. The cutting of fall wheat had begun in the extreme southern counties, and the yield will be light. Spring wheat and oats, as well as sugar beets, were in good condition, and indications pointed to good yields. The harvesting of alfalfa was completed during the month and average yield were generally realized. Pastures were drying up and the supply of irrigation water, though still ample, was preceptibly diminishing.—*R. J. Hyatt.*

Virginia.—Considerable cool weather prevailed over the State throughout the month, particularly in the opening days and again about the 13th to 17th, while the precipitation was quite decidedly above normal. Crop growth was, on the whole, favorable. Both winter wheat and oats ri-

pened and harvest was begun and gardens, pastures, and meadows did very well. The usual June crop of apples occurred, but it was for the most part not excessive, and an average crop was left on the trees.—*Edward A. Evans.*

Washington.—Although the mean temperature of the month was high and the precipitation somewhat above normal, yet both were so badly distributed that the effect on the crops was not so beneficial as it ought otherwise to have been. Burning winds injured wheat during the period from the 6th to the 11th. The first week of the month was cool, with severe frosts on the 3d; the last week was cool and showery, which was beneficial for filling wheat. The prospect is for a short wheat crop. Not much haying done yet.—*G. N. Salisbury.*

West Virginia.—Showery weather, with moderate temperature and ample sunshine, generally favorable for crop growth, except corn, for which the nights were rather too cool. At the close of June wheat and rye harvest were well advanced over the southern section, with fair to good yield; oats were greatly improved and meadows were making good growth, with prospect for better hay crop than expected; gardens and potatoes were doing finely and millet was promising; apples were generally a poor crop, except in some counties in the panhandle section, where they were promising.—*E. C. Vose.*

Wisconsin.—The month was deficient both in warmth and moisture, but mainly favorable for oats, barley, spring and winter wheat, and rye. Corn made very slow growth and at the end of the month was much below the normal condition. On the 11th and 12th a severe frost occurred generally over the State, except in the extreme southern counties and along Lake Michigan, doing considerable damage to winter rye, corn, and small fruits in exposed localities.—*W. M. Wilson.*

Wyoming.—The abundant and well distributed showers during the first two decades of the month were very beneficial to the ranges and meadows, which at the close of the month were generally in excellent condition. The prevailing cool weather during most of the month retarded rapid advancement of grain, gardens, and alfalfa, and those crops at the close of the month were nearly two weeks backward, although usually in good condition.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

"LA LUNE MANGE LES NUAGES." A NOTE ON THE THERMAL RELATIONS OF FLOATING CLOUDS.

By Mr. W. N. SHAW, F. R. S., F. R. Met. Soc.

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It is always difficult to be sure that different persons are in agreement in identifying meteorological phenomena, and I will therefore state in a few words the conditions to which, according to my notions, the French proverb refers.

A single layer of drifting fleecy clouds—detached stratus—is rendered visible by the illumination of the moon not very long after sunset. The illumination not only shows the clouds, but shows that they are diminishing, and finally the moon is left in possession of an unusually clear sky. If this is not a correct description of the phenomena to which the proverb refers, it describes a state of things for which I desire to suggest a physical explanation which is not without interest.

I will put the matter in another way: A floating cloud, a finite mass of air carrying water particles, is losing heat by radiating into space through the clear air above it more heat than it receives from the earth beneath; the water globules will, in consequence of this loss of heat, evaporate, and the cloud will vanish. The converse of this proposition may be stated in slightly different form, thus: A floating cloud is receiving heat from the sun above and the earth beneath, and in consequence of this gain of heat condensation will take place, and the cloud become thicker.

These statements are paradoxical, and to exaggerate the apparent paradox it is only necessary to point out that, as the cloud consists of saturated air, evaporation means a rise of temperature, condensation a fall of temperature; for evaporation implies more vapor in the gaseous form, which is only possible at a higher temperature, and vice versa. So we may reduce the proposition from the meteorological form to a more conventionally physical one, and say that the abstraction of heat from a floating mixture of air and water will cause elevation of its temperature, or briefly, will warm the mixture, whereas the addition of heat will cool it.

The explanation of the apparent paradox is a simple one, as may be seen from the following consideration:

Suppose a mass of moist air at the surface of the earth to be warmed; it rises, and in consequence expands adiabatically and cools. Suppose that it rises just sufficiently high to form a cloud; then if it had been less warmed it would not have risen high enough for condensation to take place. If it had been more warmed it would have risen higher, and a cloud might have been formed even denser than in the first case. Supplying less heat before the condensation took place is, of course, equivalent to removing some after the first condensation occurred; one side of the proposition follows therefore at once, if we can assume that the cloud was formed by the adiabatic cooling of rising air. It is, of course, the changes of pressure incidental to differences of level (due to change of density) which produce the paradoxical thermal effects. But although this mode of treating the problem shows well enough that a cloud which is losing heat by radiation into space will grow warmer and disappear, it does not give any satisfactory proof that the cloud would grow thicker if the sun shone upon it.

The course of events for a floating cloud can, however, be very clearly followed out by means of Hertz's diagram of thermal lines for moist air, which is published in Vol. I of the Meteorologische Zeitschrift, and is reproduced in Waldo's Modern Meteorology.[1] The diagram represents the state of a mixture of air and water under varying conditions of pressure and temperature, the lines of reference being set out according to the logarithms of the pressure and of the temperature from absolute zero. Since the pressure scale is logarithmic, equal intervals along it correspond approximately to equal steps of height in the atmosphere. The adiabatic lines for different stadia and the lines of saturation for given percentage composition, enable all the changes in thickness of a cloud under varying quantities of heat to be followed. The diagram is approximate only, but sufficiently nearly accurate to indicate satisfactorily the changes that take place in floating cloud. For this purpose we must add to the diagram a line indicating the relation of temperature and height, or pressure, for the atmosphere in equilibrium, i. e., the line of temperature gradient. This, of course, is a variable line, depending on the condition of the upper atmosphere for the time being; but supposing, for example, the temperature gradient to be uniform and equal to 0.5° C. for every 100 meters (as given by Berson's figures for heights up to 2000 meters), we get a line across the diagram nearly straight, and dropping 1° in temperature for every 200 meters of height, as shown at the base of the diagram. The direction of the line being fixed, its position on the diagram must be defined by drawing it in the proper direction through a selected point representing the condition of a floating cloud. We may take a water cloud just above the freezing point, say at 5° C., at 1200 meters height. Through the point identified by these conditions we can draw the equilibrium line of temperature, and know that whatever be the initial state of a mass of air it will rise or sink, following the changes which Hertz's diagram represents, until the equilibrium line is reached. In fig. 1 certain parts of Hertz's diagram are reproduced and the equilibrium line is added. The point A represents the state of the floating cloud at 5° C. at 1200 meters, saturated with about 6.2 grams of water vapor per kilogram of mixture, as indicated by its position with reference to the saturation lines which are dotted in the figure. QAQ' is the adiabatic line for saturated air. SAS' is the saturation line for 6 grams of moisture per kilogram of mixture; the dotted lines parallel to this on either side represent the saturation lines for 7 grams and 5

[1] The complete memoir is given in Abbe's Mechanics of the Earth's Atmosphere.—ED.