ern California, Arizona, and Nevada, and the high Sierra during the last decade be considered abnormal. A light rain fell at San Francisco on the morning of the 15th and was forecast on the evening map of the 14th, and was the first rain reported at San Francisco on that date during the last fifty-five years.—*A. G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

Owing to the frequency of low pressure areas in British Columbia with trough-like extensions reaching south over the eastern portion of this district, numerous thunderstorms occurred in the mountains and foothills of eastern Oregon, eastern Washington, and Idaho, while to the west of the Cascade Mountains rains were infrequent and crops suffered for lack of moisture. The rainfall attending these troughs of low pressure caused damaging floods in ravines and canyons. On the afternoon of the 16th a maximum wind velocity of 60 miles an hour from the southeast occurred at North Head, Wash., for which timely warnings were issued. During this gale the schooner *Zampa* was disabled and drifted ashore near Leadbetter Point early on the morning of the 17th.—*Edward J. Beals, District Forecaster.*

RIVERS AND FLOODS.

Although the Mississippi River fell steadily throughout the month, good average stages were maintained. The lowest stages in the Missouri River were also recorded on the last day of the month; but during the first decade there was a moderate flood over the lower portion, caused mainly by water from the Kansas River. The following report on this flood was prepared by Mr. P. Connor, in charge of the United States Weather Bureau office at Kansas City, Mo.:

Kansas City and the smaller towns near the junction of the Missouri and Kansas rivers escaped a recurrence of last year's flood, with all its disastrous consequences, by a very small margin. As it really happened, there was a flood that caused anxiety and considerable loss, but nothing in comparison with that of last year.

The losses this year were greatly diminished by the promptness and unanimity of action on the part of those interested in the flood warnings. This was in marked contrast with their conduct of last year, when they waited and watched the rising waters until it was too late to save anything.

The flood this year was simply one of a series of climaxes caused by the aggravated conditions that have obtained in this section of the West since spring opened. It covered a very brief period, came up suddenly, passed off suddenly, and was restricted to the extreme eastern portion of the Kansas River and the Missouri at and below Kansas City.

The spring and early summer months, like those of 1903, in Kansas and western Missouri, were abnormally wet. At Kansas City there was an excess of nearly 17 inches of precipitation from March 1 to July 8, the date of highest water. Fortunately for this community and interests below Kansas City, the most violent storms occurred outside the Kansas, commonly known as the Kaw, watershed. The rainfall in the Kaw Valley, while far too heavy and frequent for good farm work, was so distributed that the streams could carry it off without overflowing their banks until July 6, although twice in June rather heavy rains on successive days caused a good many of them to become almost bank full in places.

On the morning of July 4 rather heavy rains were reported throughout the Kaw Valley and northwest Missouri, with the larger streams in the Kaw Valley at ordinary stages. On the morning of July 5 only ordinary rains were reported over the same territory. There was as yet no cause for serious apprehension, but on the afternoon and the night of the 5th uniformly heavy rains fell over the greater portion of the Kaw Valley and northwest Missouri. At Kansas City the fall was 2.31 inches in eighteen hours, and it was equally heavy along the Kaw River to Topeka and along the Missouri to some distance above St. Joseph.

The great quantity of rain that fell in the basin at the junction of the Missouri and Kaw rivers had an immediate effect in raising the rivers at Kansas City, and in consequence the Missouri had risen 2.7 feet by the morning of July 6, placing it 1.1 feet above the danger line. The Kaw River rose 4 to 5 feet.

The following warning was issued on the morning of July 6:

"Heavy rains in the past twenty-four hours in this section have caused the Missouri River to go 1.1 feet above the danger line at Kansas City. The indications are that the Missouri may go 2 feet higher and the Kaw 4 to 5 feet higher by Thursday evening. In the absence of further rains the figures given express the maximum stages anticipated."

The following warnings were mailed to 22 places between Kansas City and Boonville:

"Heavy rains in past twenty-four hours caused a decided rise in the Kansas River and in the Missouri in this locality. A further rise of 2 feet in the Missouri is anticipated, which will place it at 24 feet, 3 feet above danger line. This stage, augmented by the streams below Kansas City is liable to cause damage in low places."

The Kaw River rose rapidly during the 6th, overflowing portions of Argentine and Armourdale, Kans., and the Missouri was getting into the low places in Harlem, opposite Kansas City.

On July 7 the Missouri had risen 1.3 feet by 7 a. m., and the Kaw had risen 4.2 feet by 9 a. m. Weather conditions continued in favor of rain.

The following forecast was issued:

"The Kaw River rose 4.2 feet and the Missouri 1.3 feet in past twenty-four hours. The Kaw will rise about 3 feet and the Missouri about 1.5 feet in the next thirty hours, which, in the absence of heavy rains, should be the crest of the flood. But the rain outlook is very uncertain and great caution should be exercised by all interested. The immediate outlook means that Argentine, Armourdale, Harlem, and the lowlands below Kansas City will be inundated, and will threaten the wholesale district in the west and the east bottoms."

The following message was sent to 17 places between Kansas City and Boonville, all that could be reached by telephone:

"The lowlands between Kansas City and Boonville will be overflowed by Friday night" (July 8).

During the day of July 7 Armourdale, Argentine, Harlem, and the low bottoms were gradually being flooded. But the inhabitants of those cities took warning and began moving their effects on the 6th. Those not having a second story to their buildings in which to store their belongings, moved them to higher ground. Many of the plants in the Kaw bottoms, including the packing houses, stock yards, manufacturing plants, etc., ceased operations. Water entered all the cellars in the west bottoms of Kansas City, and by evening threatened an invasion of the streets. Train service was crippled to the westward.

On July 8 the weather outlook had somewhat improved. The Missouri River at 7 a. m. was 25.2 feet; the Kaw had risen about 3 feet at the stock yards. The forecast this morning was:

"Rivers practically stationary since 4 a. m. to-day. Only slight fluctuations are anticipated, although prospective rains may raise the flood level slightly."

This information was issued before a report from Topeka that a 7 or 8-foot rise had taken place there could be proved erroneous. About 11 a. m. the statement was given out that the immediate outlook favored a slight fall to-night and Saturday (9th) in both rivers.

The local situation on this date was slightly more aggravated, but there was no distress. Business in the bottoms generally came to a standstill. The menacing aspect of a good sized flood always causes alarm and anxiety, yet in this case it was not working material damage except in the interruption to business, the cost of moving goods out of the way, etc.

On the morning of July 9 the Missouri was 24.8 feet, a fall of 0.4 foot. The fall in the Kaw was more pronounced.

The following forecast was issued:

"Both rivers will continue to fall during the next forty-eight hours, the Kaw about 4 feet and the Missouri 2 to 3 feet."

The river conditions and outlook were telephoned to 17 points between Kansas City and Boonville at noon.

On the morning of July 10 the Missouri had fallen 1.4 feet; the Kaw about twice as much. On July 11 the Missouri read 21.9 feet, a fall of 2.9 feet in forty-eight hours, about what had been anticipated.

The forecast issued on the 11th was:

"The Missouri will be within its banks Tuesday and will continue falling in the absence of heavy rains. The Kaw will be within its banks to-night and will continue falling."

On July 12 both rivers were within their banks, and the statement was issued that they would continue falling.

The flood having subsided the inhabitants of the deserted cities moved back, and the wheels of industry once more began to revolve in the west bottoms.

In this community the collective loss was so distributed that it is impossible to make an intelligent estimate. Probably 5000 persons moved their effects to places of safety, and then back again to their homes; railroad traffic was interrupted for four or five days, and roadbeds required some repairs; two temporary bridges across the Kaw were wrecked. The interruption to business and loss of time by the thousands of employees in the big manufacturing establishments, also represent a considerable sum of money,

There were no lives lost.

Between Topeka and Kansas City about one-half the bottom land was overflowed, and about forty per cent of the crops ruined.

Below Kansas City the loss was entirely to the growing crops on the lowlands, and was approximately $400,000 between Kansas City and Boonville.

While the flood was in progress at the eastern end of the Kaw River, there was a moderate flood in the western portion, but fortunately for this community and interests below, the heavy rains were so timed that the highest stage was reached in the western overflow after the crest of the eastern one had passed Kansas City.

From July 6 to 14 the Smoky Hill River and subsidiary creeks overflowed their banks from Salina to Junction City, Kans., the highest water occurring on the 10th. East Salina was overflowed, and about sixty per cent of the growing crops on the bottom land between that place and Junction City were greatly damaged. From east of Junction City to Topeka there was no damage of consequence.

When the volume of water from the overflowed land west of Junction City came on, it had but little effect on the eastern end of the river; in fact it did not wholly check the falling tendency at Topeka.

From July 6 to 12 the Republican River overflowed its banks at Clay Center, the maximum stage occurring on the 7th. Growing corn in the bottoms at Clay Center and in localities below was damaged.

The majority of people here do not realize by what good fortune they escaped another disastrous flood. Seventy per cent of the amount of water that came down last year would have caused as great a flood, owing to the condition of the Kaw channel, which still retains many reminders of the flood of 1903.

The same general rain conditions that caused the Kansas River flood also extended southward through the Arkansas River Valley where similar experiences were encountered, though in a lesser degree. As a matter of fact, practically every stream in the eastern half of the State of Kansas was in flood, with the usual attendant conditions of damage and destruction. At Wichita, the Arkansas River reached a stage of 10.2 feet, 0.2 foot above the danger line, and but 0.8 foot below the great high-water stage of 1877. The river gage was washed away soon after the flood began, and three days before the maximum stage was reached the water was flowing through some of the streets of the city. As the flood tide proceeded beyond the limits of the State of Kansas, the following high stages were reached: Webbers Falls, Ind. T., 25.1 feet, 2.1 feet above the danger line; Fort Smith, Ark., 25.5 feet, 3.5 feet above the danger line; and Little Rock, Ark., 25 feet, 2 feet above the danger line.

As far as could be learned no considerable damage was done by this flood after leaving the State of Kansas, although large areas of lowlands were overflowed.

The stages in the Ohio River and its tributaries were sufficient for all purposes of navigation except in the upper Tennessee, where low water necessitated a suspension of steamboat work for about two-thirds of the month.

Nothing of particular interest relative to the remaining rivers of the country has been observed.

The highest and lowest water, mean stage, and monthly range at 195 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

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 July 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.—Weather generally favorable for crop growth, except excessive and slightly damaging rains in scattered localities, and hailstorm in Coffee County destroyed crops over an area 4 by 14 miles. Cotton fruited well and was quite promising at the close of the month, though wet weather then caused too rapid growth; bolls began opening about the 20th; first bale marketed 26th. Corn and minor crops did well; some early corn matured during last decade. Large crop of late peaches were marketed.—*F. P. Chaffee.*

Arizona.—Temperatures averaged slightly below normal during July. Droughty conditions continued to prevail over most of the Territory during the first two decades, but during the third decade good rains fell over most of the Territory. During the drought crops, except in the lower Colorado Valley, were in very poor condition, and the condition of cattle was deplorable. The rains, however, revived the growth of vegetation and started grass on the ranges, and by the end of the month both cattle and crops had improved greatly.—*M. E. Blystone.*

Arkansas.—The temperature was below normal and the rainfall slightly in excess. Cotton made satisfactory growth and was fruiting nicely by the close of the month; some was laid by grassy. Early corn made a good crop; the late planted was promising. Harvest of wheat and oats was completed and thrashing begun; yields were satisfactory, quality medium. Some hay saved. Late potatoes were planted and came up to good stand; sweet potatoes promising. Apples fair crop; peaches good. Stock healthy.—*Edward B. Richards.*

California.—The abnormally cool weather during a greater part of July retarded the development of crops to some extent. Severe thunderstorms, accompanied by heavy rains, occurred in the mountains of southern California, and two lives were lost by lightning. Grain harvesting and thrashing were nearly completed, the crop below average in yield and quality. The hay crop was unusually heavy and of excellent quality. Deciduous fruits were not yielding the large crops expected. Grapes were giving promise of one of the largest yields for several years.—*Alexander G. McAdie.*

Colorado.—Month was favorable. Harvesting of winter wheat was practically finished; crop generally good, except in northeastern counties. Harvesting of spring grain was begun; good crops, but considerable rust in spring wheat. Corn and second crop of alfalfa made good growth. Ranges good, except in south-central counties. Cutting of native hay was begun. Potatoes and beets were excellent. Heavy crops of raspberries, cherries, and apricots marketed. Apples and peaches coming in. Melons late, but promising.—*F. H. Brandenburg.*

Florida.—Comparative cool, dry weather was favorable for work. Corn suffered during the early part of the month over a portion of the State for rain, and the early planting greatly deteriorated. Cotton pushed forward, though the weed was smaller than usual, plants fruited very well and were generally free of insects. Citrus fruits over a portion of the belt suffered for rain early in the month. The pineapple crop was harvested, the yield was short.—*A. J. Mitchell.*

Georgia.—July was the fourth consecutive month with temperature below normal and the tenth with deficient rainfall. The distribution of rainfall over the district was very irregular, but no damaging drought occurred except in a few widely scattered localities. Crops generally were in excellent condition at the close of the month. Cotton made good growth, plants bloomed and fruited well and bolls began opening in the extreme south about the 25th. The commercial output of peaches was large.—*J. B. Marbury.*

Idaho.—A pronounced warm period occurred from the 20th to the 27th; marked cool periods were from the 13th to the 16th and on the 29th and 30th, the latter culminating in light frosts in elevated districts, doing little damage. Some injury was caused by drought, but crops in general made satisfactory progress. In most instances the range afforded ample subsistence for stock. Water for irrigation held out well.—*Edward L. Wells.*

Illinois.—Corn maintained a good condition throughout the month; at the end of the month the crop was mostly in tassel, and some fields were earing. Oats were practically all cut and considerable thrashing had been done during the third decade. Wheat harvesting was hindered somewhat by wet weather, but the crop was secured generally in good condition. Favorable weather for curing hay prevailed.—*Wm. G. Burns.*

Indiana.—The nights were abnormally cool. The precipitation was deficient during the last week. Corn was mostly laid by during the last decade and was looking well. Wheat harvest was finished about the 20th; yield very light, quality poor. Oats were harvested and clover hay made during the last half of the month; good crops were secured. Cutting timothy was under way at the end of the month. Apple and pear trees suffered from blight, and fruit prospects were materially lessened.—*W. T. Blythe.*

Iowa.—This was the coldest July since 1891, when the State average was 68.6°. Excessive rainfall from 2d to 15th developed rust in small grain, causing much damage to spring wheat. Latter half of month was drier and favorable for harvesting operations. The corn crop was laid by a week later than usual, but made fair progress during warmer period of the month. Conditions were favorable for potatoes, apples, and minor crops.—*John R. Sage.*

Kansas.—Wheat and oat harvests completed under difficulties, owing to wet weather. Wheat yield greater than expected, quality below average. Oats light. Corn improved rapidly, and was earing well in the central counties and tasseling in the northern; corn planted in the river valleys after the last flood grew rapidly. A good crop of tame hay was secured. Second crop of alfalfa generally stacked and was a good crop. Apples dropped badly in several counties. Peaches a good crop.—*T. B. Jennings.*

Kentucky.—The temperature and precipitation were slightly less than normal. Showers were irregularly distributed; some localities had too much rain, while others were suffering from drought at close of month. Wheat was harvested with yield and quality better than expected, Oats