Floods of January 1953 in Western Oregon and Northwestern California

By S. E. RANTZ

FLOODS OF 1953

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PREFACE

This report on the floods of January 1953 in western Oregon and northwestern California was prepared in the Geological Survey, Water Resources Division, Luna B. Leopold, chief hydraulic engineer, under the general direction of J. V. B. Wells, chief, Surface Water Branch. The data were assembled and the report prepared under the supervision of R. S. Lord, district engineer.

Basic records of discharge in the area delineated by this report were collected in cooperation with the States of Oregon and California, municipal corporations, and agencies of the Federal Government. Acknowledgment is made to the Corps of Engineers, Department of the Army, for contributions to this report: to the San Francisco District, for a tabulation of flood damage in California, and for records of rainfall at 35 sites in California obtained from a canvass of private records; and to the Portland District, for a tabulation showing the effect of reservoir storage on flood peaks in the Willamette River basin.

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FLOODS OF 1953

FLOODS OF JANUARY 1953 IN WESTERN OREGON AND NORTHWESTERN CALIFORNIA

By S. E. Rantz

ABSTRACT

The floods of January 17–21, 1953, in western Oregon and northwestern California were notable for the magnitude of the peak discharges produced over so large an area. Noteworthy, too, is the record-breaking damage in some California basins. The area affected included the basins of the Willamette River and minor Columbia River tributaries in Oregon, all coastal basins in Oregon, and those coastal basins in California north of the Mattole and lower Eel Rivers. In general, the flood-producing storm began on January 15 in the north half of the area affected and on January 16 in the south half. The storm reached maximum intensity on January 17–18 and ended on January 20. The series of antecedent storms in December and early January soaked the ground and made conditions favorable for maximum runoff from the storm of January 15–20. Reservoir storage had no appreciable effect on flood magnitudes except in the Willamette River basin in Oregon. The storm and resulting floods caused the loss of 11 lives and damages amounting to about $12.5 million.

INTRODUCTION

The floods of January 17–21, 1953, occurred in an area extending from the Columbia River in Oregon to the Mattole and lower Eel Rivers in California (fig. 48), and include the region affected by the major flood of October–November 1950. The 1953 floods not only covered a larger area than the 1950 floods, but also produced peak discharges that were generally greater. However, because a comprehensive report on the 1950 flood has already been published by the Geological Survey (Water-Supply Paper 1137–E, Floods of 1950 in Southwestern Oregon and Northwestern California), only brief data on the 1953 floods are given herein.

This report presents a tabulation of peak discharges at gaging stations during the 1953 floods, and gives the ratios of the peak discharges of the 1953 floods to those of the 1950 floods. Other data presented are a description of the floods, an analysis of flood damage, and a brief analysis of peak discharge at three gaging stations in California. These stations—Klamath River near Klamath, Redwood Creek at Orick, and Mad River near Arcata—were selected for analysis because the greatest flood damage in 1953 occurred near those sites, and because no flood data were available for those sites when the 1950 flood

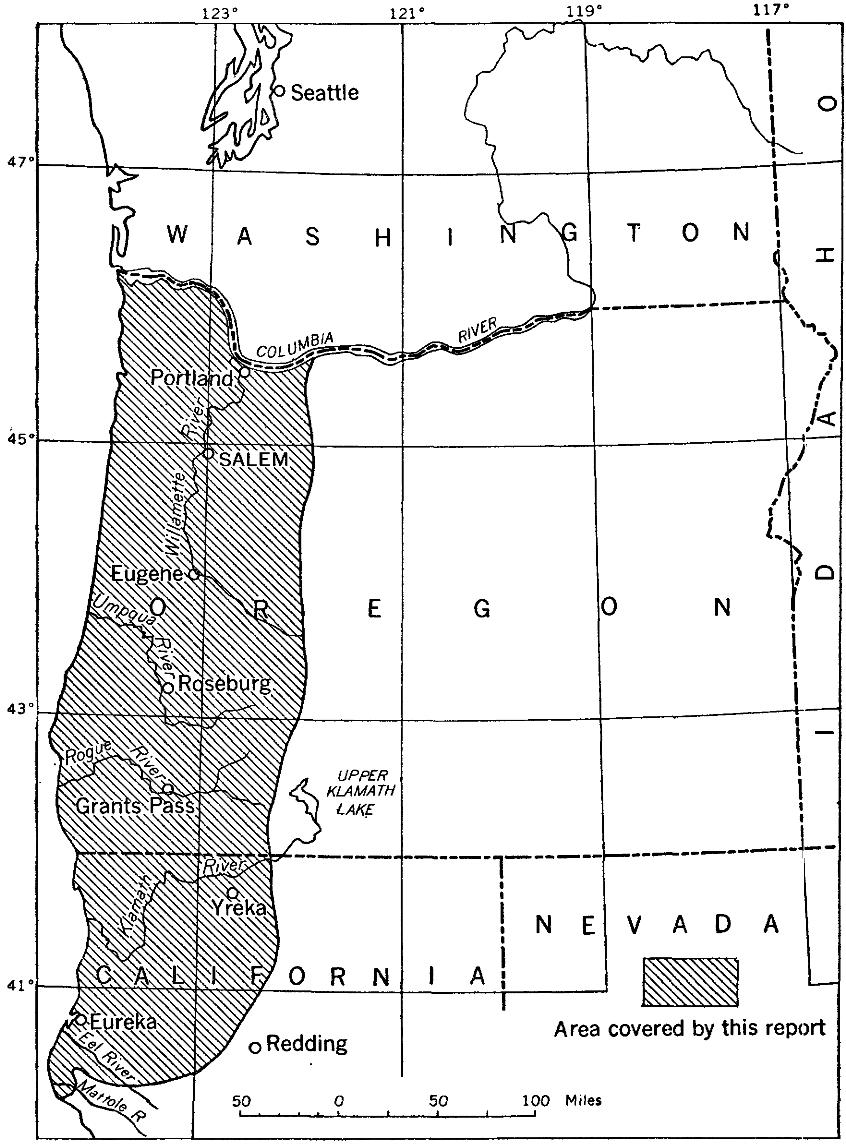

FIGURE 48.—Map showing location of area covered by this report.

report was prepared. Daily discharges at gaging stations in the flood area are published in Geological Survey Water-Supply Papers 1285 and 1288, parts 11 and 14 respectively, of the series "Surface Water Supply of the United States" for the water year 1953, but are not included in this report.

GENERAL DESCRIPTION OF THE FLOODS

The floods of January 17–21, 1953, were caused by an intense frontal storm that extended over the western parts of Washington and Oregon, and northern California, from the Canadian border on the north to San Francisco Bay on the south. This storm, which centered over northwestern California and southwestern Oregon, reflected the effect of the combination of a moist unstable airmass, strong west-southwest winds, and the orientation of the coastal mountain ranges at right angles to the flow of air. The combination of these three factors repeatedly is found in Pacific Coast winter storms; but an unusual feature was the persistence of the strong flow of moist air. Rain started falling on January 15 in the north half of the area shown on figure 48, but there was no precipitation until the following day in the south half of the area. The storm reached its maximum intensity on January 17 and 18, and continued until January 20. The meteorology of this storm has been described in detail in the "Monthly Weather Review" for January 1953, a U. S. Weather Bureau publication.

The isohyetal map (pl. 9)[1] presents a generalized picture of the areal distribution of the precipitation of January 15–20. The isohyets clearly show the orographic influence of the Coast Range. The storm spent itself on the west slopes of the Cascade Range. The greatest storm total recorded at any Weather Bureau station was 21.21 inches at Klamath, Calif., but a privately owned precipitation gage near Crescent City, Calif. had a total catch of 23.02 inches. The greatest 24-hour precipitation catch, 9.86 inches, was likewise recorded at Klamath.

Conditions were favorable for high runoff from the storm because of a series of six antecedent storms in December 1952 and January 1953. The last of these storms was closely followed by the storm of January 15–20. During this latter period unusually high temperatures prevailed and the freezing level was above the 5,000-foot altitude, so that relatively little precipitation fell as snow. There was little snow cover in the Coast Range prior to this storm, but melting snow did increase the flow of those streams heading in the Cascade Range.

As the intense rains of January 17–18 fell on saturated ground, streams rose rapidly on those 2 days. Most of the streams crested on January 18 or 19, but continuing rains slowed the streamflow recession and many streams had secondary peaks on January 20 (figs. 49 and 50). On the lower reaches of the Willamette River main

[1] In the explanation of this plate the reference to table 2 applies to the gaging station numbers and not to the isohyetal lines.

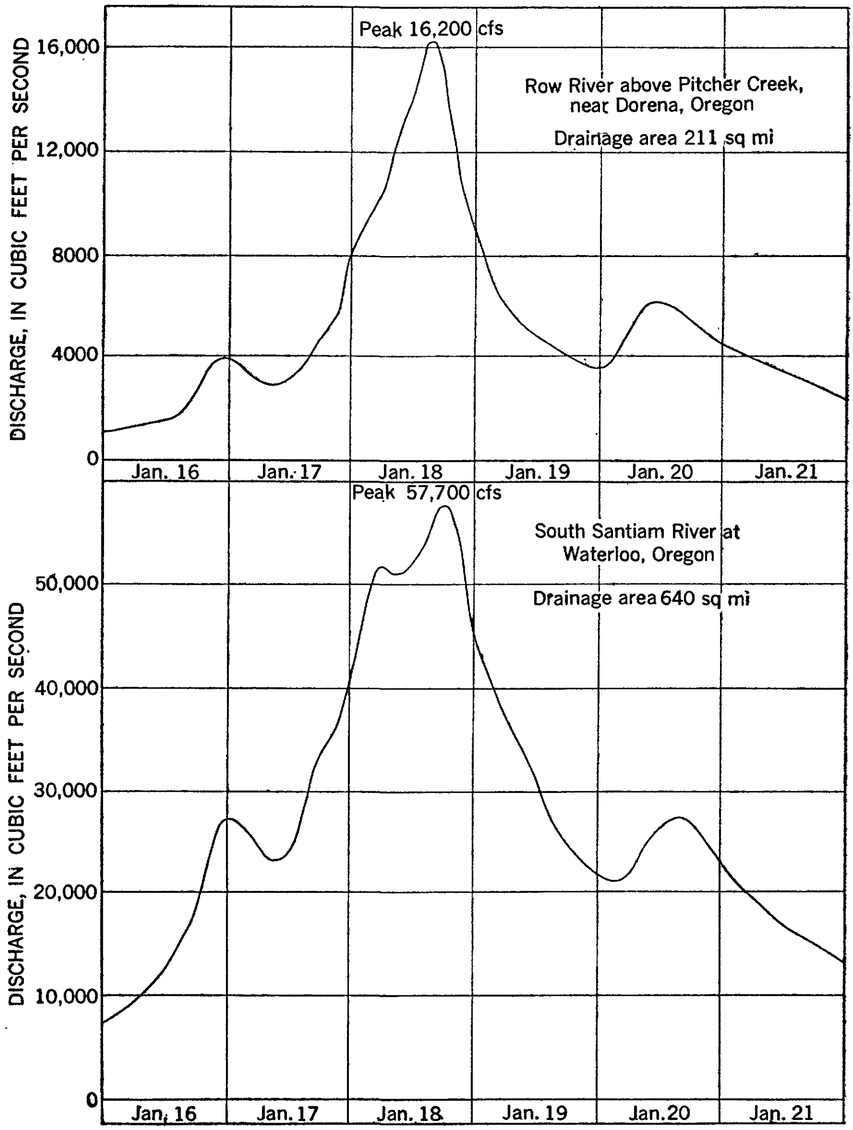

FIGURE 49.—Discharge hydrographs for selected stream-gaging stations in Oregon.

stem in Oregon, where slopes are comparatively flat, peaks did not occur until January 20 and 21.

The most serious flooding occurred in southwestern Oregon and northwestern California, particularly in the basins of Klamath and Mad Rivers and Redwood Creek in California. In the California towns of Klamath, near the mouth of Klamath River, and Orick, near the mouth of Redwood Creek, a large percentage of the population moved out as water rose to a depth of about 4 feet in the streets.

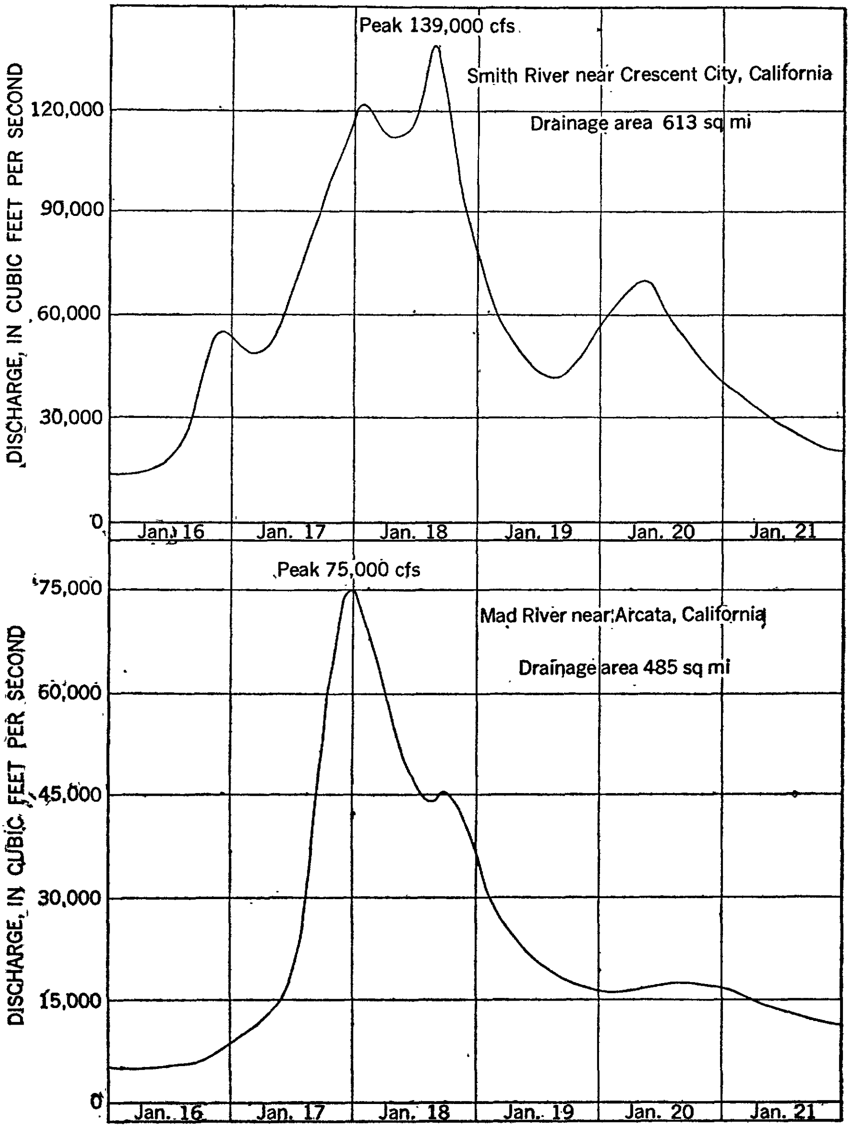

FIGURE 50.—Discharge hydrographs for selected stream-gaging stations in California.

Both towns were declared disaster areas by the Red Cross. In Oregon, several hundred persons living in the Willamette River valley between Eugene and Springfield were evacuated, as were many families in the Rogue and Coquille River basins. Throughout most of the area discussed in this report, floods and slides caused severe damage to highways, causing isolation of towns. The failure of telephone and powerlines caused additional hardship.

FLOOD DAMAGE

Eleven lives were lost as a direct or indirect result of the floods, and damage amounted to about $12,500,000. Table 1 summarizes the results of a damage survey made in California by the Corps of Engineers, San Francisco District. No such detailed study was made in Oregon, but the U.S. Weather Bureau estimates that in Oregon, flood damage, direct and indirect, totaled about $2,500,000, while storm damage amounted to about $750,000.

PEAK DISCHARGE

Peak discharges for the floods of January 17–21, 1953, at stream-gaging stations in Oregon and California are shown in table 2. The index numbers in the first column of the table correspond to the numbers on plate 9. The river basins are arranged in order from north to south, and within basins the gaging stations are arranged in downstream order. For purposes of comparison, table 2 also gives the maximum discharges known before January 1953, and the ratios of the peak discharges in January 1953 to those in October–November 1950. The isopleths, or lines of equal ratios, in figure 51 give a generalized picture of the relative peak rates of runoff during the two flood periods. For the most part, ratios greater than 1.5 indicate areas where little flooding occurred in 1950.

STORAGE

Only in the Willamette River basin in Oregon did reservoir storage affect the magnitude of flood runoff. Floodflow in the upper part of this basin was partly controlled by Lookout Point Reservoir on Middle Fork Willamette River, Cottage Grove Reservoir on Coast Fork Willamette River, Dorena Reservoir on Row River, Fern Ridge Reservoir on Long Tom River, and Detroit Reservoir on North Santiam River. Lookout Point Reservoir acted merely as a detention reservoir, because Lookout Point Dam was under construction at the time. Computations by the Corps of Engineers indicate that the five reservoirs had the net effect of reducing peak discharge of Willamette River at Salem from 292,000 cfs (cubic feet per second) to 251,000 cfs (table 3).

Ground-water storage may have appreciably reduced flood peaks in the Rogue and North Umpqua River basins. The soil and mantle rock in the upper parts of these basins near Crater Lake are of volcanic origin and very porous. Large quantities of rain and snowmelt are absorbed, and released gradually during the ensuing weeks and months.

Another moderating factor is channel storage, which is effective on the flat, lower reaches of larger rivers. This reduced the peak dis-

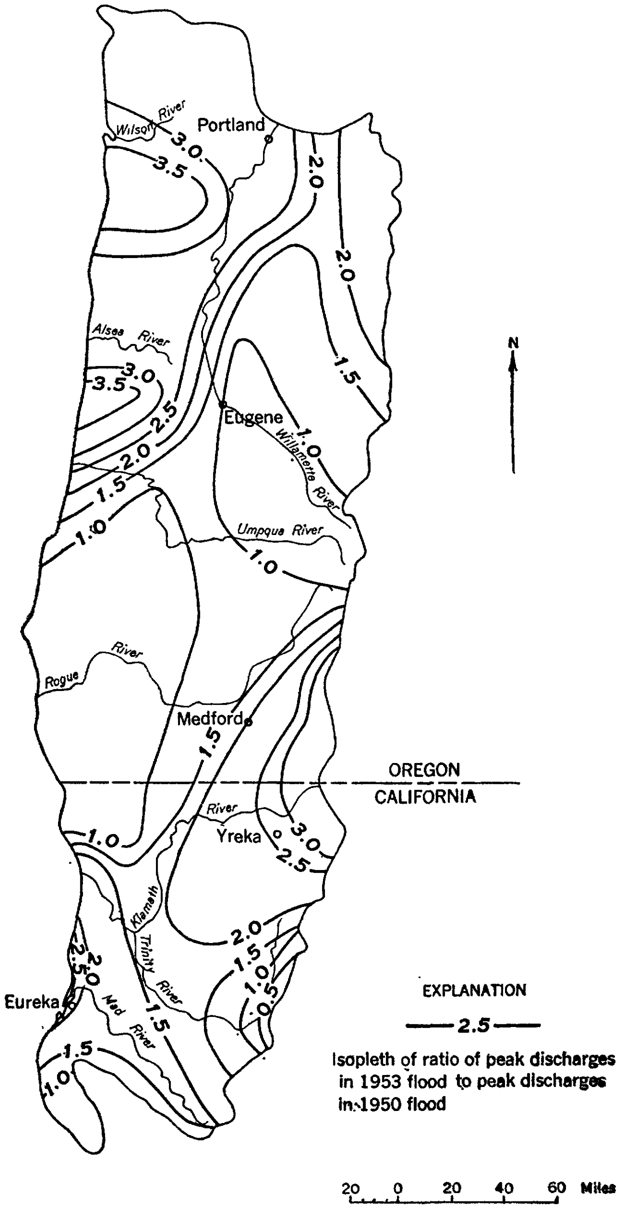

FIGURE 51.—Map of western Oregon and northwestern California showing ratios of peak discharges in January 1953 to those in October-November 1950.

charge of the Willamette River from 251,000 cfs at Salem to 248,000 cfs at Wilsonville. In the intervening drainage area of 1,120 square miles, Mill Creek at Salem reached a peak of 10 cfs per square mile on January 18, South Yamhill River near Whiteson reached a peak of 41 cfs per square mile on January 19, and North Yamhill River at Pike reached a peak of 48 cfs per square mile on January 18. Despite the large contributions by intervening tributaries, the peak discharge of the Willamette River decreased 3,000 cfs between Salem and Wilsonville.

ANALYSIS OF PEAK DISCHARGE

As mentioned in the introduction and illustrated by table 2 and figure 51, the floods of January 17–21, 1953, affected a larger area and, in general, had greater peak discharges than the floods of October–November 1950. The 1950 flood was the subject of a comprehensive report, Geological Survey Water-Supply Paper 1137–E, but at the time of preparation of that report no discharge data were available for the three California stream-gaging stations Klamath River near Klamath, Redwood Creek at Orick, and Mad River near Arcata. Because of this deficiency in discharge data in 1950 and because the greatest flood damage in 1953 occurred in the vicinity of these stations, the flood hydrology of the basins above these sites is discussed in some detail in the paragraphs that follow.

KLAMATH RIVER NEAR KLAMATH, CALIF.

A gaging station was established at this site near the mouth of Klamath River in December 1919. It was discontinued in June 1926 and was not reactivated until November 1950. The basin upstream from this station is a complex area of about 12,100 square miles. Hydrologically, the Klamath River basin is divided into two sections at Keno, Oreg., 25 miles upstream from the California border. The upper basin is a high volcanic plateau about 4,000 square miles in area, composed of broad, flat valleys separated by low mountain ranges. The lower section is a rugged mountainous region about 8,000 square miles in area. The Shasta, Scott, Salmon, and Trinity Rivers are the principal tributaries of the Klamath River.

Peak discharge for Klamath River near Klamath can be reliably predicted from the sum of the peak discharges for Klamath River at Somesbar and Trinity River near Hoopa (fig. 52). Trinity River enters the Klamath River 23 miles downstream from the Somesbar gaging station, but the timing of peak discharges at the Somesbar and Hoopa stations is generally such that the Klamath River crests passing Somesbar arrive at the mouth of Trinity River almost simultaneously with the Trinity River crests passing Hoopa. This timing is favored by the fact that flood crests on Trinity River near Hoopa are commonly very broad owing to the timing of the peak discharges that occur on the two principal branches of Trinity River—the South Fork and the main stem above the South Fork.

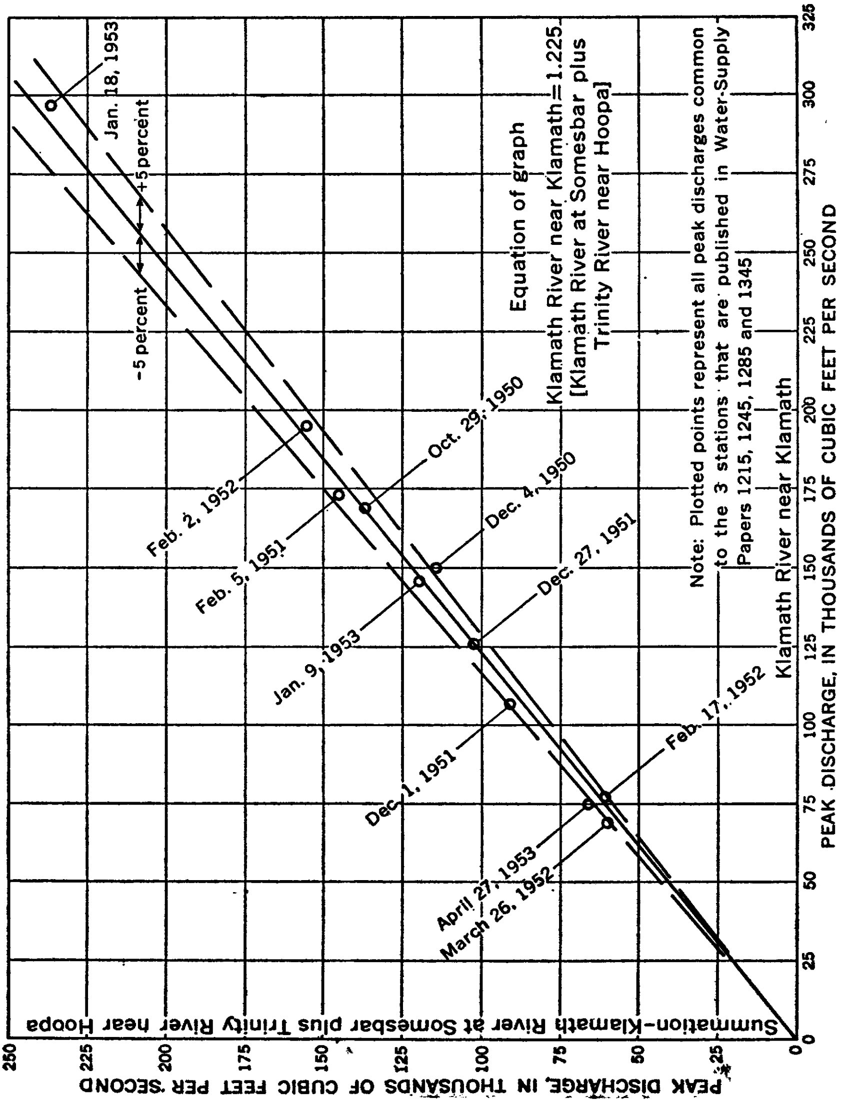

FIGURE 52.—Correlation of peak discharge for Klamath River near Klamath, Calif.

The ungaged area above the gaging station on Klamath River near Klamath is only 780 square miles, or 6.4 percent of the drainage area above that point, and hence contributes only a small amount, percentagewise, to the peak discharge at the Klamath gaging station. Partly for that reason and partly because of the favorable timing of the peaks that pass the Somesbar and Hoopa gaging stations, the dispersion of points on the graph of relationship (fig. 52) is small, and an attempt to improve the relationship by estimating the effect of the contribution from the ungaged area seems not to be warranted.

Because the peaks passing the Somesbar gaging station are sharp and those passing the Hoopa gaging station are broad, the time of occurrence of peaks at the one on Klamath River is more closely related to the time of occurrence of peaks at the Somesbar station than at the Hoopa station. In general, about 8 or 9 hours are required for flood crests passing the gaging station on Klamath River at Somesbar to reach the one on Klamath River near Klamath.

The upper section of the Klamath River basin did not experience floodflows either in October–November 1950 or in January 1953. The small contribution of the upper basin to floodflows downstream is evident from an inspection of the record in table 2 for Klamath River below Fall Creek near Copco, Calif. During the flood of October–November 1950, the peak flow for Klamath River near Klamath occurred on October 29, before the installation of a recording instrument at that station. The relationship graph of figure 52 indicates, however, that the peak discharge on that day was about 170,000 cfs. This discharge is substantiated by the knowledge that the crest stage was slightly below that observed for the peak of February 5, 1951, also shown on the graph. On the basis of a preliminary study of regional flood frequency a discharge of 170,000 cfs has a probable recurrence interval, as an annual peak, of about 3 years. The peak discharge in January 1953 was 297,000 cfs. The study of regional flood frequency indicates that a discharge of 297,000 cfs may be expected to be equaled or exceeded, on the average, once in about 25 years. This is consistent with our knowledge of historic floods on the river, the 1953 peak having been just slightly exceeded in 1927, and greatly exceeded by the floods of 1862, 1881, and 1890. The 1953 flood at this gaging station has a smaller probable recurrence interval than those for the stations on Redwood Creek and Mad River discussed below, owing to the relatively low peak discharge of Trinity River, which is the principal tributary of Klamath River.

REDWOOD CREEK AT ORICK, CALIF.

A gaging station was established in September 1911 at Orick near the mouth of Redwood Creek. It was discontinued in August 1913 and was not reactivated until September 1953. Redwood Creek drains an area of 278 square miles in the Coast Range. Its basin is roughly rectangular and is about 55 miles long. Redwood Creek follows a northwesterly course throughout its length and is joined by its principal tributary, Prairie Creek, 1.0 mile above the gaging station. Altitudes in the basin range from about 5,000 to about 10 feet above sea level at the gaging site.

There was no gaging station in operation on Redwood Creek at the time of the floods of October–November 1950 and January 1953. Systematic discharge measurements were made, however, during the 1953 water year, and a stage-discharge relationship established. Based on the assumption that this relationship was valid during the 1950 flood and on a knowledge of the approximate crest stage of the stream, the peak discharge for October–November 1950 is estimated to be 23,000 cfs. A preliminary study of regional flood frequency indicates that this discharge has a probable recurrence interval, as an annual peak discharge, of about 3 years. In January 1953, Redwood Creek had a peak discharge of 50,000 cfs. The study of regional flood frequency indicates that the recurrence interval of a discharge of 50,000 cfs is about 50 years.

MAD RIVER NEAR ARCATA, CALIF.

In December 1910 a gaging station was established at this site near the mouth of Mad River. In September 1913 it was discontinued and was not reactivated until August 1950. The basin upstream from the station has a drainage area of 485 square miles and is roughly rectangular, being about 75 miles long and about 6.5 miles wide. The orientation of this narrow basin is such that it lies almost normal to the usual storm paths. It is a rugged region with four parallel ridges of the Coast Range running most of the length of the basin. Altitudes in the basin range from about 6,000 feet above sea level to about 30 feet above sea level at the gage.

Mad River basin was not seriously affected by the flood-producing storms of October–November 1950. A preliminary study of regional flood frequency indicates that the peak discharge of 29,000 cfs for that flood has a probable recurrence interval, as an annual maximum discharge, of about 2 years. In January 1953, however, the peak discharge was 75,000 cfs. The study of regional flood frequency indicates that a discharge of 75,000 cfs may be expected to be equaled or exceeded, on the average, about once in 50 years.

A unit-hydrograph analysis was made for the storm of January 15–20, 1953, to provide information on the flood hydrology of the basin (fig. 53). Unit hydrographs characteristically are not well adapted to long, narrow basins such as Mad River basin, because this slope has little modifying effect on uneven rainfall distribution. Fur-

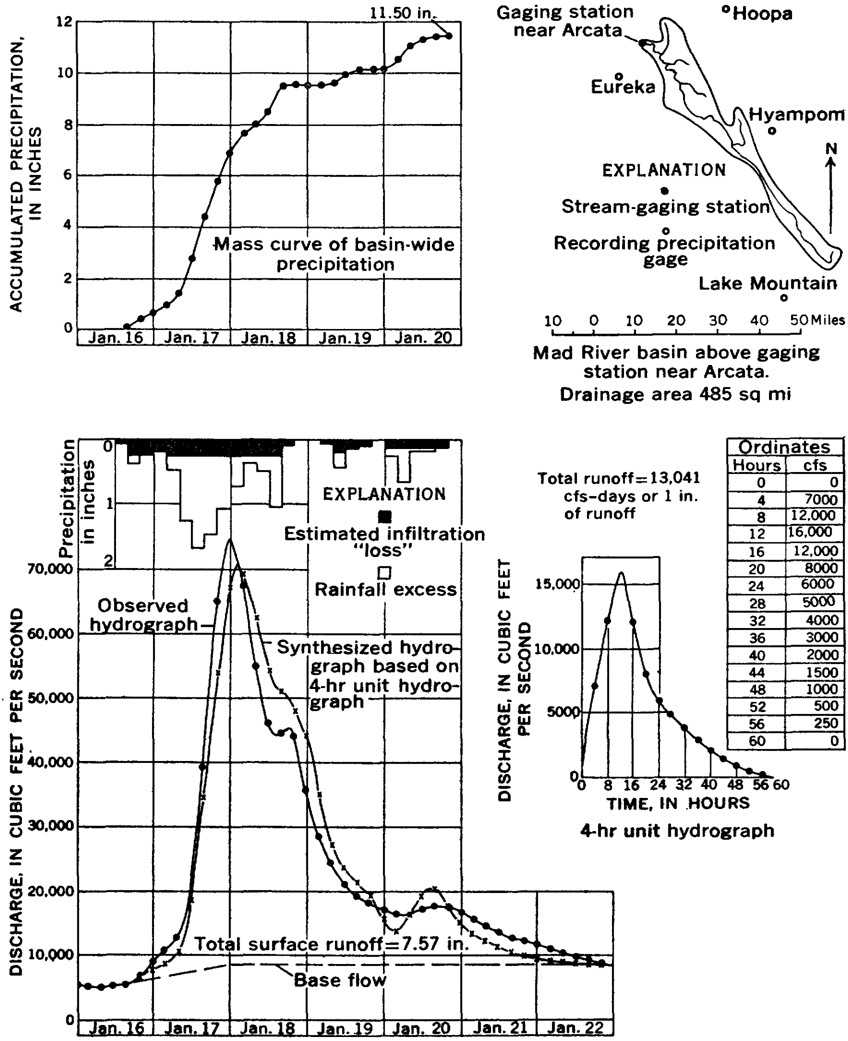

FIGURE 53.—Rainfall-runoff analysis for Mad River near Arcata, Calif.

thermore, the unit hydrograph requires an arbitrary separation of base flow from surface runoff.

The records for the four recording rain gages in the vicinity of the basin (see map on fig. 53) show that rainfall was unevenly distributed during the complex storm of January 15–20. The larger bursts of rainfall during the storm occurred at different times at the four rain gages. Despite the shortcomings of the unit hydrograph, it is the best means available for predicting the discharge hydrograph to be expected from complex storms.

The rainfall and runoff records for the January 1953 flood period indicate that 4 hours is a favorable time base for the unit hydrograph for Mad River near Arcata. The arbitrary separation of runoff into base flow and components of surface runoff, shown on the discharge hydrograph of figure 53, is based on an inspection of the normal recession curve for the gaging station. The recession curve, when plotted on semilogarithmic paper, departs from linearity at 8,400 cfs, which is considered as the upper limit of base flow for the purpose of this study. The total rainfall throughout the basin of 11.50 inches was planimetered from the isohyetal map (pl. 9). The rainfall was distributed on a time basis in accordance with the rainfall distribution at the recording rain gage at Hyampom, the one closest to the center of mass of the basin. A basin-wide distribution of rainfall based on an average distribution at the four recording rain gages was tried but gave poor results. Figure 53 shows the time distribution of rainfall that was used, as well as a mass curve of basin-wide rainfall based on that distribution. Infiltration "losses" were assumed to have occurred at the rate of 0.06 inch per hour during the first phase of the storm, 0.04 inch per hour during the second phase, and 0.03 inch per hour during the final phase of the storm.

The magnitude of these losses is dictated by the need to make surface runoff equal rainfall excess. Because of the uncertainties connected with computing the volume of precipitation on a mountainous basin from a sparse network of rain gages, the computed losses are actually index figures rather than absolute values.

Additional data shown in figure 53 are (a) the 4-hour unit hydrograph that was derived, (b) the observed discharge hydrograph at the gaging station during the flood period, and (c) a synthesized discharge hydrograph based on the 4-hour unit hydrograph. The unit hydrograph shown is not an average one for the basin but was derived from the complex storm of January 15–20, during which there were 15 periods of rainfall excess. The peaks of the observed and synthesized hydrographs agree in time within 3 hours, and in discharge, within 5.3 percent.

Table 1.—*Summary of damages in California during floods of January 17–21, 1953*

	Flood damage							Storm damage, all basins	Total damage, storm and flood
	Eel River	Smith River	Mad River	Redwood Creek	Klamath River	Miscellaneous streams	Total, all basins		
Inundation:									
Residential:									
Direct	$18,300	--------	$6,500	$76,000	$253,000	--------	$353,800	$722,000	$1,075,800
Indirect	1,000	--------	--------	--------	--------	--------	1,000	1,048,000	1,049,000
Nonresidential:									
Direct	63,800	$26,500	181,100	385,000	589,000	$75,000	1,320,400	--------	1,320,400
Indirect	207,700	221,500	250,700	303,000	429,000	52,000	1,463,900	--------	1,463,900
State and county roads:									
Direct	64,000	119,500	205,700	121,000	328,000	191,300	1,029,500	1,003,000	2,032,500
Indirect	40,000	2,500	120,900	60,000	93,000	141,000	457,400	474,000	931,400
Railroads:									
Direct	138,500	--------	29,900	--------	--------	--------	168,400	--------	168,400
Indirect	30,000	--------	--------	--------	--------	--------	30,000	--------	30,000
Agriculture (direct):									
Bank cutting	38,400	9,000	48,100	24,000	87,000	--------	206,500	--------	206,500
Bank protection works	25,500	--------	7,700	--------	--------	--------	33,200	--------	33,200
Other	133,000	132,000	269,100	93,500	279,000	--------	906,600	16,000	922,600
Total:									
Inundation:									
Direct	284,600	146,000	423,200	582,000	1,170,000	266,300	2,872,100	1,725,000	4,597,100
Indirect	278,700	224,000	371,600	363,000	522,000	193,000	1,952,300	1,522,000	3,474,300
Agriculture	196,900	141,000	324,900	117,500	366,000	--------	1,146,300	--------	1,162,300
Total	481,500	287,000	748,100	699,500	1,536,000	266,300	4,018,400	1,741,000	5,759,400
Grand total	760,200	511,000	1,119,700	1,062,500	2,058,000	459,300	5,970,700	3,263,000	9,233,700

TABLE 2.—*Summary of flood stages and discharges in western Oregon and northwestern California during floods of January 1953*

No. (pl. 9)	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during present flood				Ratio of peaks 1953–50
				Date	Gage height (feet)	Discharge		Time	Gage height (feet)	Discharge		
						Cfs	Cfs per square mile			Cfs	Cfs per square mile	
	Oregon											
	Sandy River basin:											
1	Little Sandy River near Bull Run	22.3	1911–13 1919–53	Nov. 20, 1921	9.18	5,320	239	Jan. 17, 11 p.m.	6.86	2,820	126	2.64
2	Bull Run River at Bull Run	136	1949–53	Feb. 24, 1950	12.45	10,200	75.0	Jan. 17, 10:30 p.m.	13.91	13,000	95.6	2.17
3	Sandy River below Bull Run River, near Bull Run.	440	1910–14 1929–53	Mar. 31, 1931	20.6	58,000	132	Jan. 18, 4 p.m.	15.80	34,200	77.7	2.26
	Willamette River basin:											
4	Salmon Creek near Oakridge	117	1913–19 1933–53	Dec. 28, 1945	8.40	8,040	68.7	do	7.16	5,710	48.8	1.17
5	Middle Ford Willamette River below North Ford, near Oakridge.	924	1911–12 1923–53	do	[1] 18.8	81,800	88.5	Jan. 18, 6 p.m.	12.16	59,400	64.3	.99
6	Fall Creek below Winberry Creek, near Fall Creek.	186	1911 1935–53	do	18.0	22,500	121	Jan. 18, 4:30 p.m.	13.41	12,200	65.6	.95
7	Coast Fork Willamette River at London.	69	1935–53	do	13.25	8,800	128	Jan. 18, 2 p.m.	10.78	6,110	88.6	.90
8	Row River above Pitcher Creek, near Dorena.	211	1935–53	do	14.33	19,600	92.9	Jan. 18, 3:30 p.m.	12.83	16,200	76.8	.97
9	Mosby Creek at mouth, near Cottage Grove.	96	1946–53	Oct. 28, 1950	10.82	7,160	74.6	Jan. 18, 5 p.m.	10.18	6,490	67.6	.91
10	Willamette River at Springfield	2,030	1911–13 1928–53	Dec. 29, 1945	20.9	140,000	69.0	Jan. 19, 2 a.m.	[2] 15.39	92,900	45.8	1.0
11	South Fork McKenzie River near Rainbow.	211	1947–53	Dec. 28, 1945	[3] 9.3	24,500	116	Jan. 18, 3 p.m.	8.34	16,400	77.7	1.32
12	McKenzie River near Coburg	1,310	1944–53	do	17.36	88,200	67.3	Jan. 19, 1:30 a.m.	16.87	78,500	59.9	1.51
13	Willamette River at Harrisburg	3,420	1944–53	1861 Dec. 29, 1945	[3] 21 19.69	 210,000	 61.4	do	17.95	[2] 149,000	43.6	1.1
14	Long Tom River near Noti	88	1935–53	Feb. 18, 1949	18.62	4,930	56.0	Jan. 19, 4 a.m.	17.69	3,790	43.1	2.48
15	Marys River near Philomath	159	1940–53	Dec. 15, 1946	20.67	8,250	51.9	Jan. 18, about 12 p.m.	[4] 20.8	7,920	49.8	3.50
16	Calapooya River at Albany	372	1940–53	Jan. 2, 1943 Jan. 8, 1948	[5] 25.5 	 24,900	 66.9	Jan. 19, 12 p.m.	[5] 21.7	15,400	41.4	.96
17	Willamette River at Albany	4,840	1878–82 1883–88 1892–1953	Dec. 4, 1861	36.0	340,000	70.3	Jan. 20, 7–8 a.m.	28.03	[2] 174,000	36.0	1.2
18	North Santiam River below Boulder Creek, near Detroit.	216	1907–9 1928–53	Dec. 28, 1945	[1] 11.24	20,300	94.0	Jan. 18, 3:30 p.m.	8.64	13,700	63.4	2.09
19	Breitenbush River above Canyon Creek, near Detroit.	106	1932–53	do	[1] 11.86	11,600	109	Jan. 18, 1 p.m.	10.95	9,490	89.5	2.02
20	Little North Santiam River near Mahama.	110	1931–53	do	15.20	19,900	181	do	12.61	14,600	133	1.35
21	Middle Santiam River at mouth, near Foster.	287	1951–53	do		[6] 41,800	146	Jan. 18, 3:30 p.m.	19.23	36,400	127	

TABLE 2.—*Summary of flood stages and discharges in western Oregon and northwestern California during floods of January 1953*—Con.

No. (pl. 9)	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during present flood				Ratio of peaks 1953–50
				Date	Gage height (feet)	Discharge		Time	Gage height (feet)	Discharge		
						Cfs	Cfs per square mile			Cfs	Cfs per square mile	
	Oregon—Continued											
22	Wiley Creek near Foster	52	1947–53	Jan. 7, 1948	7.52	5,410	104	Jan. 18, 2 p.m.	[7] 6.74	4,320	83.1	1.19
23	South Santiam River at Waterloo	640	1905–7 1910–11 1923–53	Dec. 28, 1945	22.85	74,200	116	Jan. 18, 6:30 p.m.	19.43	57,700	90.2	1.27
24	Luckiamute River near Suver	240	1905–11 1940–53	[5] Dec. 29, 1937 Feb. 18, 1949	[6] 33.5 33.10	25,000 23,800	104 99.2	Jan. 19, 6–7 a.m.	29.89	14,600	60.8	3.62
25	Willamette River at Salem	7,280	1909–16 1927–53	Dec. 4, 1861	[3] 39	500,000	68.7	Jan. 20, 10 p.m.	26.17	[3] 251,000	34.5	1.6
26	Willamina Creek near Willamina	65	1934–53	Mar. 31, 1931	[9] 12	9,500	146	Jan. 18, 2:30 p.m.	8.63	4,170	64.2	3.50
27	South Yamhill River near Whiteson	502	1940–53	Feb. 11, 1949	43.39	28,900	57.6	Jan. 19, 6 p.m.	41.41	21,700	43.2	3.54
28	North Yamhill River at Pike	66.8	1948–53	Feb. 10, 1949	9.98	6,280	94.0	Jan. 18, 1:30 p.m.	7.13	3,190	47.8	3.65
29	Willamette River at Wilsonville	8,400	1948–53	Dec. 4, 1861 Feb. 20, 1949	105 [3] 83.20	--- 196,000	--- 23.3	Jan. 21, about 12 p.m.	90.0	[3] 248,000	29.5	1.7
30	Molalla River near Canby	323	1928–53	Jan. 7, 1948	14.9	25,100	77.7	Jan. 18, 9–10 p.m.	12.50	21,000	65.0	1.94
31	Pudding River at Aurora	479	1928–53	Jan. 7, 1923 Dec. 30, 1937	25.0 [4] 24.5	27,900 25,400	58.2 53.0	Jan. 20	22.12	15,600	32.6	2.80
32	Scoggin Creek near Gaston	44.0	1940–53	Feb. 17, 1949	15.53	3,460	78.6	Jan. 20, 6 p.m.	11.12	1,240	28.2	2.69
33	Gales Creek near Forest Grove	66	1940–53	do	[1] 10.90	6,410	97.1	Jan. 20, 12 m.	5.56	2,050	31.1	2.88
34	McKay Creek near North Plains	27.6	1940–43 1948–53	do	11.23	2,100	76.1	Jan. 20, 7:30 p.m.	10.71	800	29.0	8.42
35	Clackamas River near Cazadero	657	1908–53	Mar. 31, 1931	556.5	60,800	92.5	Jan. 18, 5:30 p.m.	552.16	40,700	61.9	1.73
36	Johnson Creek at Sycamore	28.2	1940–53	Feb. 10, 1949	13.77	2,110	74.8	Jan. 18, about 7 p.m.	[3] 10.0	1,020	36.2	3.04
	Clatskanie River basin:											
37	Clatskanie River near Clatskanie	53.0	1949–53	Feb. 24, 1950	5.29	2,000	37.7	Jan. 20, 10:30 p.m.	3.26	948	17.9	5.27
	Big Creek basin:											
38	Big Creek near Knappa	31.9	1949–53	Feb. 24, 1950	4.01	2,130	66.8	Jan. 18, 11:30 p.m.	2.50	1,080	33.9	2.23
	Youngs River basin:											
39	Youngs River near Astoria	40.1	1927–53	Nov. 24, 1927	[1] 6.52	6,300	157	Jan. 18, 11–12 p.m.	10.02	2,530	63.1	1.79
40	North Fork Klatskanine River near Olney.	14.0	1949–53	Jan. 20, 1950	4.59	806	57.6	Jan. 18, about 10 p.m.	4.07	462	33.0	1.24
	Coastal streams between Columbia and Umpqua River basins:											
41	Wehalem River near Foss	667	1939–53	Feb. 17, 1949	19.04	36,900	55.3	Jan. 19, 2:30 a.m.	14.59	22,800	34.2	3.07
42	Wilson River near Tillamook	159	1914–16 1931–53	Dec. 21, 1933	[1] 19.28	30,000	189	Jan. 19, 3:30 a.m.	12.16	13,900	87.4	2.57
43	Trask River near Tillamook	143	1931–53	(10) Dec. 22, 1933	[3] 17 13.00	30,000 20,000	210 140	Jan. 19, 3 a.m.	9.06	11,400	79.7	3.15
44	Westucca River near Blaine	91.2	1952–53	---	---	---	---	Jan. 19, about 3 a.m.	[4] 8.1	7,110	78.0	---
45	Siletz River at Siletz	202	1905–12 1924–53	Feb. 17, 1949	25.17	37,000	183	Jan. 18, 4:30 p.m.	22.26	29,500	146	2.44

46	Alsea River near Tidewater	334	1939-53	Feb. 3, 1890	[9] 29.5			Jan. 18, 10 p.m.	20.99	26,100	78.1	2.37
				Jan. 7, 1948	22.43	27,800	83.2					
47	Lake Creek at Triangle Lake	50	1931-53	Feb. 18, 1949	[11] 8.68	4,180	83.6	Jan. 19, 7 a.m.	7.94	3,640	72.8	3.53
	Umpqua River basin:											
48	South Umpqua River near Brockway	1,640	1905-12	February 1890	[9] 33			Jan. 18, 10:30 p.m.	30.36	89,200	54.4	0.87
			1923-26	Oct. 29, 1950	32.4	102,000	62.2					
			1948-53									
49	North Umpqua River above Copeland Creek, near Toketee Falls.	471	1949-53	do	11.30	12,200	25.9	Jan. 18, 3 p.m.	12.23	14,100	29.9	1.16
50	Umpqua River near Elkton	3,680	1905-53	1861	45.5			Jan. 19, 1 a.m.	43.0	199,000	54.1	.96
				Oct. 30, 1950	44.2	208,000	56.5					
	Coos River basin:											
51	Daniels Creek near Eastside	14.5	1950-53	Oct. 28, 1950	9.96	1,170	80.7	Jan. 18, 10 a.m.	10.26	1,290	89.0	1.10
	Coquille River basin:											
52	South Fork Coquille River at Powers	169	1916-26	Dec. 28, 1945	20.57	30,500	180	Jan. 18, 2:30 p.m.	17.64	24,900	147	1.02
			1928-53									
	Rogue River basin:											
53	Rogue River above Prospect	332	1908-12	do	8.4	11,900	35.8	Jan. 18, about 4 p.m.	7.95	10,500	31.6	1.38
			1923-53									
54	South Fork Rogue River near Prospect	79	1924-31	Dec. 19, 1929	[1] 4.58	1,700	21.5	Jan. 18, 5 p.m.	5.94	[12] 1,760	22.3	3.48
			1949-53									
55	Red Blanket Creek near Prospect	40	1925-53	Nov. 29, 1942	[1] 5.1	1,630	40.8	Jan. 18, 3:30 p.m.	6.02	1,280	32.0	1.53
56	Big Butte Creek near McLeod	249	1945-53	Jan. 7, 1948	9.4	4,680	18.8	Jan. 18, 4:30 p.m.	11.1	6,390	25.7	1.89
57	Elk Creek near Trail	133	1945-53	Dec. 28, 1945	13.2	9,880	74.3	Jan. 18, 4:30 p.m.	13.32	10,000	75.2	1.24
58	South Fork Little Butte Creek near Lake Creek.	138	1921-53	Jan. 7, 1948	6.48	3,920	28.4	Jan. 18, 4 p.m.	5.89	2,870	20.8	2.09
59	Emigrant Creek near Ashland	64.3	1920-53	Feb. 20, 1927		5,260	81.8	Jan. 18, 3 p.m.	7.4	[3] 2,570	40.0	([13])
60	Bear Creek at Medford	279	1915-53	do	10.57	10,200	36.6	Jan. 18, 10 p.m.	5.47	4,940	17.7	2.0
61	Rogue River at Raygold, near Central Point.	2,020	1905-53	1861-62	[3] 32			Jan. 18, 8:30 p.m.	17.83	56,500	28.0	1.31
				Feb. 21, 1927	24.8	110,000	54.5					
62	Rogue River at Grants Pass	2,420	1939-53	1861-62	[3] 39			Jan. 18, 10 p.m.	23.9	77,000	31.8	1.18
				Dec. 29, 1945	23.16	70,000	28.9					
63	Powell Creek near Williams	8.6	1946-53	Oct. 29, 1950	5.14	938	109	Jan. 18, 2 p.m.	5.36	1,110	129	1.18
64	Applegate River near Wilderville	694	1938-53	do	17.5	25,800	37.2	Jan. 18, 11 p.m.	18.3	27,700	39.9	1.07
65	Slate Creek at Wonder	30.9	1913	do	9.72	4,020	130	Jan. 18, 2 p.m.	9.48	3,820	124	.95
			1943-53									
66	Grave Creek at Pease Bridge, near Placer.	22	1940-53	do	6.95	3,550	161	do	6.28	2,890	131	.81
67	Sucker Creek near Holland	76	1941-53	do	[1] 8.75	5,720	75.3	Jan. 18	7.75	6,580	86.6	1.15
68	Illinois River at Kerby	364	1926-53	Feb. 20, 1927	[1] 19.6	52,000	143	Jan. 18, 5 p.m.	13.2	46,800	129	.96

California

	Smith River basin:											
69	Smith River near Crescent City	613	1931-53	Oct. 29, 1950	39.51	152,000	248	Jan. 18, 3:30 p.m.	37.80	139,000	227	0.91
	Klamath River basin:											
70	Klamath River below Fall Creek, near Copco.	4,370	1923-53	Apr. 27, 1938	47.30	[14] 9,660		Jan. 18, 6 p.m.	4.56	[14] [15] 3,520		
				May 3, 1938								
71	Shasta River Yreka	796	1933-41	Feb. 29, 1940	6.72	2,440	3.07	Jan. 18, 9 p.m.	6.90	2,520	3.17	3.2
			1944-53									
72	Scott River near Fort Jones	662	1941-53	Feb. 2, 1952	12.11	8,320	12.6	Jan. 19, 12:30 a.m.	15.08	16,000	24.2	2.33
73	Klamath River near Seiad Valley	6,980	1912-25	Dec. 31, 1913	[1] 13.3	26,500	3.8	Jan. 19, 1:30 a.m.	20.10	[3] 55,200	7.9	
			1951-53									
74	Salmon River at Somesbar	746	1911-15	February 1927	[1] 24.8	49,000	65.7	Jan. 18, 8 a.m.	19.23	45,900	61.5	2.17
			1927-53	Dec. 28, 1945	15.82	33,000	44.2					

TABLE 2.—*Summary of flood stages and discharges in western Oregon and northwestern California during floods of January 1953*—Con.

No. (pl. 9)	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during present flood				Ratio of peaks 1953-50
				Date	Gage height (feet)	Discharge		Time	Gage height (feet)	Discharge		
						Cfs	Cfs per square mile			Cfs	Cfs per square mile	
	California—Continued											
	Smith River basin—Continued											
75	Klamath River at Somesbar	8,480	1927-53	Feb. 21, 1927	50.8	141,000	16.6	Jan. 18, 12 m	49.7	137,000	16.2	1.84
				[8] Dec. 28, 1945	40.0	97,000	11.4					
76	Trinity River at Lewiston	727	1911-53	Feb. 28, 1940	20.8	40,300	55.4	Jan. 18, 11:30 p.m.	15.23	17,600	24.2	.45
77	South Fork Trinity River near Salyer	899	1950-53	Feb. 2, 1952	27.3	34,700	38.6	Jan. 18, 5 a.m.	27.30	37,400	41.6	1.50
78	Trinity River near Hoopa	2,840	1911-14 1916-18 1931-53	Feb. 28, 1940	31.2	124,000	43.7	Jan. 18, 11 a.m.	27.28	98,200	34.6	1.57
79	Klamath River near Klamath	12,100	1910-26 1950-53	Feb. 2, 1952	33.98	195,000	16.1	Jan. 18, 7 p.m.	43.67	297,000	24.5	1.75
	Redwood Creek basin:											
80	Redwood Creek at Orick	278	1953					Jan. 18	23.95	50,000	180	2.17
	Mad River basin:											
	Mad River near Arcata	485	1910-13 1950-53	Feb. 1, 1952	19.52	42,100	86.8	Jan. 17, 11 p.m.	26.15	75,000	155	2.59
	Eel River basin:											
82	Eel River at Scotia	3,113	1910-15 1916-53	Feb. 2, 1915	55.5	351,000	113	Jan. 18, 2 p.m.	37.36	151,000	48.5	1.25
				Dec. 11, 1937	55.1	345,000	111					
83	Van Duzen River at Bridgeville	200	1911-13 1939-51	Jan. 21, 1943	25.5	21,600	108	Jan. 17	24.5	20,000	100	1.08
84	Van Duzan River near Bridgeville	214	1950-53	Oct. 28, 1950		20,000	93.5	Jan. 17, 10 p.m.	17.30	22,300	104	1.12
	Mattole River basin:											
85	Mattole River near Petrolia	240	1911-13 1950-53	Jan. 25, 1912	[4] 27.1	[16] 48,000	200	Jan. 18, 10 p.m.	17.13	28,300	118	.83
86	North Fork Mattole River at Petrolia	37.6	1951-53	Dec. 1, 1951	8.25	4,950	132	Jan. 17, 2 p.m.	8.63	4,950	132	

[1] Site and datum then in use.
[2] Partly regulated.
[3] About.
[4] From graph based on gage readings.
[5] Affected by backwater from Willamette River.
[6] At former site upstream where drainage area is 6 percent smaller.
[7] Maximum gage height, 7.80 ft on Jan. 18, 1953, backwater from debris.
[8] Probably on this date.
[9] From information by local residents.
[10] Probably occurred either in November 1921 or on March 31, 1931.
[11] Affected by backwater from debris.
[12] Includes flow of power canal.
[13] No flow during flood of October-November 1950 owing to regulation.
[14] Regulated.
[15] No flood flow upstream from this station.
[16] Datum then in use.

TABLE 3.—*Reduction of peak discharge by reservoirs in the Willamette River basin during floods of January 1953*

[Asterisk (*) indicates that data were furnished by Corps of Engineers, Portland District]

Stream-gaging station	Natural peak (cfs)	Regulated flow at time of natural peak (cfs)	Regulated peak flow (cfs)	Reduction in peak (cfs)
Middle Fork Willamette River at Lowell (below Lookout Point Reservoir)	*64, 100	62, 600	62, 600	1, 500
Coast Fork Willamette River below Cottage Grove Dam	*8, 640	40	2, 650	5, 990
Row River near Cottage Grove (below Dorena Reservoir)	*19, 400	*100	5, 070	14, 300
Willamette River at Springfield	*98, 600	----------	92, 900	5, 700
Willamette River at Harrisburg	*171, 000	----------	149, 000	22, 000
Long Tom River below Fern Ridge Dam, near Smithfield	*14, 500	55	3, 630	10, 900
Willamette River at Albany	*201, 000	----------	174, 000	27, 000
North Santiam River at Niagara (below Detroit Reservoir)	*32, 800	2, 100	11, 000	21, 800
Willamette River at Salem	*292, 000	----------	251, 000	41, 000
Willamette River at Wilsonville	*284, 000	----------	248, 000	36, 000

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