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DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FLOODS OF JANUARY 1974 IN WASHINGTON

By

R. J. Longfield

OPEN-FILE REPORT

Tacoma, Washington
1974

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By R. J. Longfield

ABSTRACT

Record floods occurred in parts of Washington during January 14-21, 1974. The floods resulted from runoff from warm, moderately heavy rain that continued most of the week, augmented by runoff from the rapid melting of a near-record snowpack that extended to low elevations. New-record peak flows occurred at many gaging stations which have been operated continuously for 20 to 50 years and at one which has been operated since 1907. At least two deaths were attributable to the floods, and property damage in the four hardest hit counties were estimated by the U.S. Army Corps of Engineers to be $21 million.

INTRODUCTION

This report provides provisional data on the floods of January 1974 in Washington for immediate use by the many Federal, State, and local agencies and private interests that are involved in and concerned with water-related activities. Such activities requiring flood information include flood-control projects, flood-plain zoning, shoreline management, highway and bridge design, water-pollution control, fisheries and game management, power development, and water-supply and irrigation projects. The 1974 flood data in this report are subject to revision prior to formal publication in the annual report series.

This report includes flood data for all drainage basins where the 10-year recurrence interval was equaled or exceeded at one or more sites, plus selected nearby basins that help the definition of the flood area (figs. 1 and 2). Data are tabulated for all streamflow stations presently in operation in those basins. The recurrence intervals for the January 1974 floods at the stations are based on regional analysis of peak streamflow data by Bodhaine and Thomas (1960).

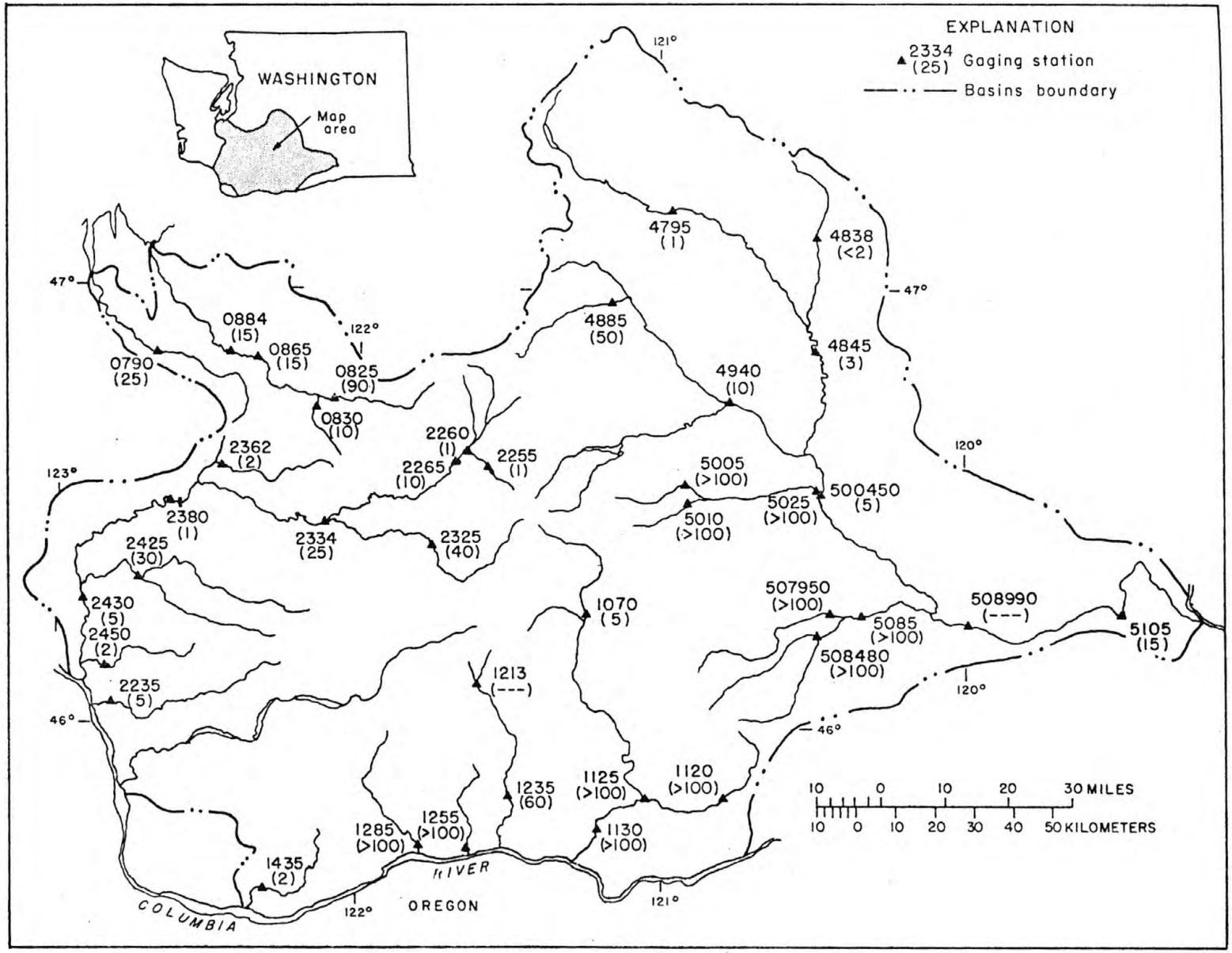

FIGURE 1.--River basins in southern Washington affected during floods of January 1974, showing streamflow-gaging-station numbers (abbreviated) and, in parentheses, calculated recurrence intervals, in years, at the stations. Station names and complete numbers are given in table 2.

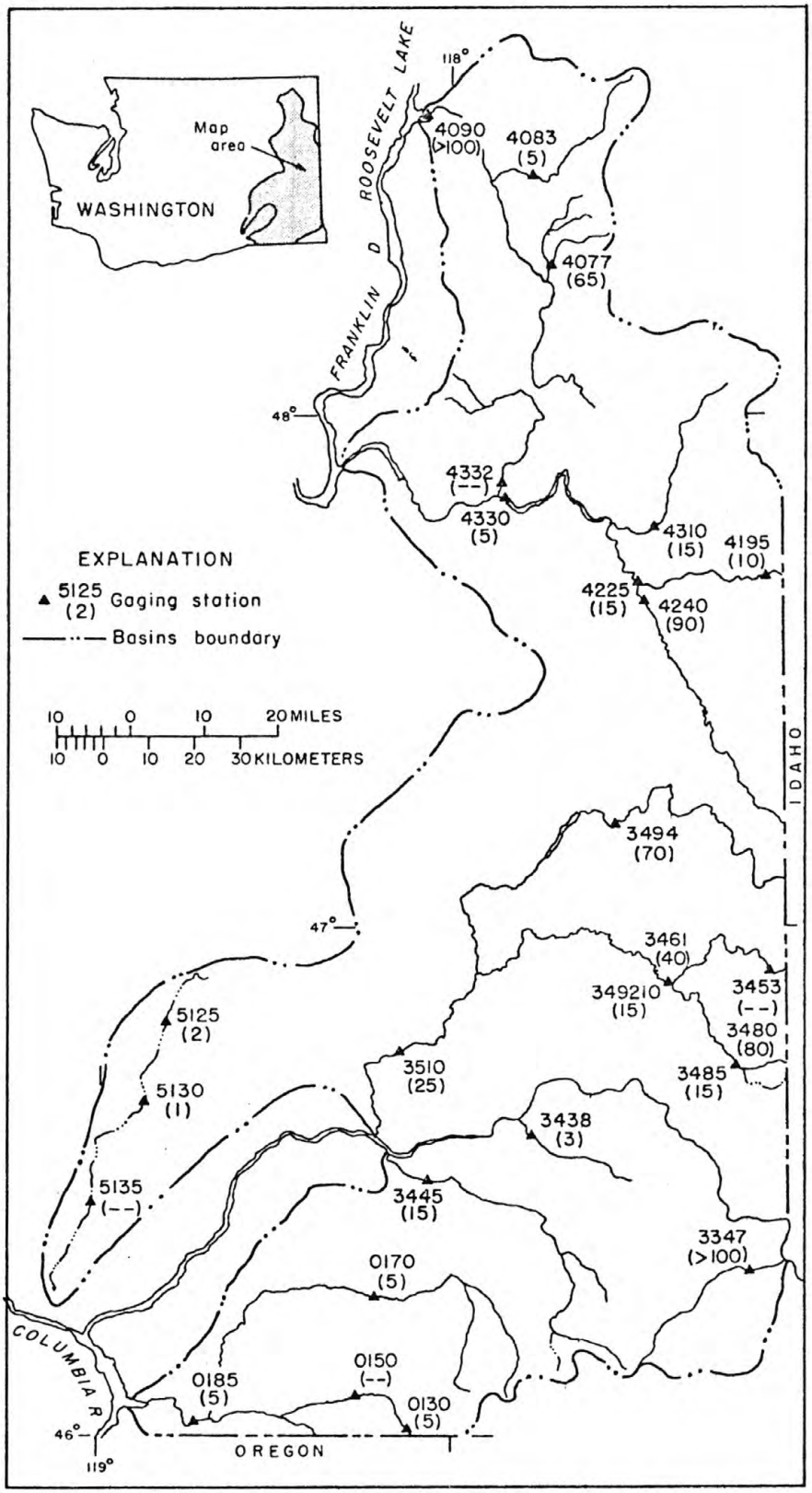

FIGURE 2.--River basins in eastern Washington affected during floods of January 1974, showing streamflow-gaging-station numbers (abbreviated) and, in parentheses, calculated recurrence intervals, in years, at the stations. Station names and complete numbers are given in table 1.

Also presented are climatological data from selected weather stations and a graphical representation of runoff at three streamflow stations.

Below are listed the factors for converting English to metric units for all values used in the report.

Multiply	By	To get
inches	25.4	millimeters (mm)
feet (ft)	0.3048	meters (m)
square miles (mi^2)	2.590	square kilometers (km^2)
cubic feet per second (ft^3/s)	0.02832	cubic meters per second (m^3/s)

ANTECEDENT CONDITIONS

Heavy and widespread rainfall on the lowlands and snowfall at higher elevations throughout most basins in Washington during October-December 1973 completely reversed the drought and low-flow conditions that had prevailed during the late summer and early fall of 1973. The steady rainfall during these 3 months produced large runoffs in streams but no unusually high peak flows. Precipitation during the latter part of December was steady, with large amounts as rain in some areas of western Washington and as snow in eastern Washington. Stream discharges at the end of December were generally in the upper median to excessive range throughout Washington, except on the eastern slope of the Cascade Range where they were slightly less than normal.

Results of snow surveys conducted during December 27-January 3 indicated an excessive amount of water content in the snowpack in almost all river basins. Although this excessive water content was not confined to any particular elevation zone, there was significantly greater-than-normal water content at elevations below about 2,500 ft (760 m). On January 1, the snowpack in the Nisqually River basin at the 2,760-ft (841-m) elevation was 205 percent of average and the water content was about 8 inches (200 mm); at the 4,550-ft (1,387-m) elevation the snowpack had almost 30 inches (760 mm) of water content, and above 5,000-ft (1,524-m) elevation it had in excess of 40 inches (1,020 mm) of water. Snow surveys in the Yakima River basin indicated a water content about twice that of the 1958-72

average. All snow measured at elevations between 3,250 and 4,500 ft (991 and 1,372 m) in the Cowlitz River basin had water contents in excess of 22 inches (560 mm) and that measured between 2,200 and 3,200 ft (671 and 975 m) had about 9 inches (230 mm) of water. These quantities were about 150 percent of average. In the Lewis River basin, lowland areas between elevations of 2,000 and 2,200 ft (610 and 671 m) had snowpacks with water contents ranging from 7.4 to 12.4 inches (188 to 315 mm); in the previous year some of these areas had no snow in early January. All snow measured above the 3,800-ft (1,158-m) elevation in the Lewis River basin had between 32 and 37 inches (810 and 940 mm) of water, the greatest recorded on comparable dates in 16 years. The White Salmon and Wind River basins also had heavy snowpacks in the early days of January.

The period January 3-12 was cold and dry almost everywhere in the State. According to the National Weather Service (written commun., Feb. 22, 1974), the maximum snow depths during January 11-13 were 30 inches (760 mm) at Anatone, 19 inches (480 mm) at Satus Pass, 17 inches (430 mm) at Wind River, 13 inches (330 mm) at White Swan, and between 7 and 10 inches (180 and 250 mm) at Colville, Spokane, Pullman, Walla Walla, Ellensburg, and Yakima.

DESCRIPTION OF THE FLOOD

The record floods of January 14-21, 1974 were caused by a combination of several climatological and hydrological events not necessarily occurring simultaneously, or in all areas of Washington. A southwesterly storm system consisting of many fronts passed over the State during January 12-19, and, although the resulting rains were not exceptionally heavy in most areas, they were moderate and fell consistently all week long. Precipitation gages in the Cascade Range, Yakima Valley, Blue Mountains, and Palouse area indicated that generally the largest quantity of precipitation occurred during January 14-16.

The storm also caused above-normal temperatures to persist during January 13-19. During the nights the temperature did not drop below freezing and during the days it reached maximums in the midfifties and low sixties in some parts of both eastern and western Washington. Information from the National Weather Service (written commun., Feb. 22, 1974) indicated that the

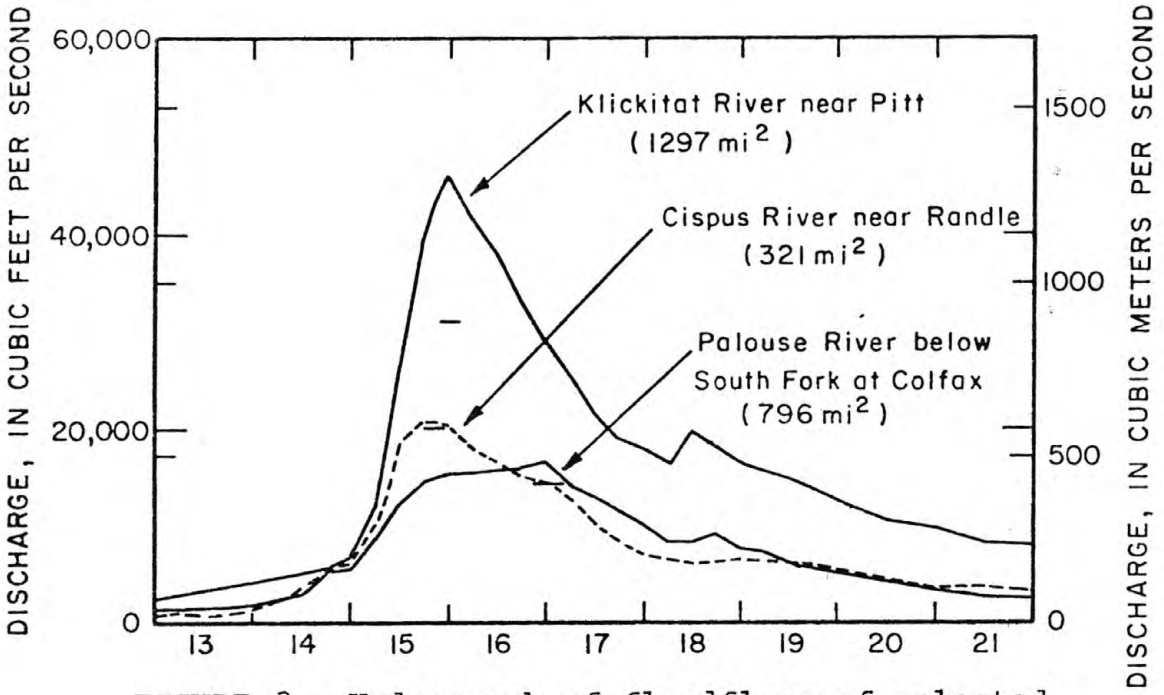

FIGURE 3.--Hydrograph of floodflows of selected streams, January 13-21, 1974. Previous peak flows of these streams are indicated by short lines below these peaks.

freezing level rose from below the 2,000-ft (610-m) elevation on January 11 to about 6,000 ft (1,830 m) on January 12 and as high as 8,000 ft (2,440 m) on January 14 during the warm storm period. Strong winds also accompanied the storm. Snow on the ground diminished rapidly after January 12.

Table 1 presents daily climatological records at selected weather stations in Washington.

Flooding in most basins was the result of runoff from precipitation combined with rapid snowmelt runoff triggered by above-normal, above-freezing temperatures for several days and nights. The warm rain, strong warm winds blowing across the snowpack, and the drastic change in freezing level, increased the rate of snowmelt. Also, frozen ground in some areas of eastern Washington at the start of the storm period undoubtedly contributed to increased surface runoff during the early stages of the floods in those basins.

Snowmelt and precipitation continuing for several days resulted in both high rates of flow and large volumes of runoff over a substantially long period. Hydrographs of three selected streams in the flood areas are shown in figure 3.

Severe flooding occurred in the middle and lower reaches of most rivers having their headwaters in the Cascade Range south of the Puyallup River basin on the western slope and south of the Wenatchee River basin on the eastern slope. In eastern Washington severe flooding also occurred in the Asotin, Palouse, Colville, and Spokane River basins. Many streams exceeded previous record flows dating back 20 to 50 years. Flood peaks exceeded previous maxima of record in the Deschutes, upper Nisqually, Cispus, upper Cowlitz, Colville, Asotin, upper Palouse, American, Ahtanum, Klickitat, White Salmon, and Wind River basins. Also flooding was extremely severe on ungaged right-bank tributaries to the Yakima River between Union Gap and Mabton.

Observations by field parties during the time of flooding and results of the February 1 snow survey revealed that (1) the snowpack below the 2,000-ft (610-m) elevation had generally decreased since January 1; (2) the snowpack between the 2,000- and 3,000-ft (610- and 910-m) elevations had a net increase in water content, but a part of it had been lost to runoff during the flood; and (3) the snow at most high-elevation courses was extremely heavy and wet, as much of the rainfall had been absorbed in the snow.

Peak flows recorded in the flood areas and their recurrence intervals are summarized in table 2. The recurrence intervals greater than 50 years shown in the table are approximate because there are only a few long-term streamflow stations in the flood areas. The recurrence intervals are plotted on figures 1 and 2 at the data-collection sites to depict the contribution of different areas of the basins to the flood.

At least two lives were lost in Washington during the flood. Property damage was reported by the U.S. Army Corps of Engineers to total $21 million in Asotin, Klickitat, Yakima, and Whitman Counties. Excessive property damage and loss of bridges and roadways occurred in other counties. A total flood-damage value is not available.

REFERENCE CITED

Bodhaine, G. L., and Thomas, D. M., 1960, Floods in Washington, magnitude and frequency: U.S. Geol. Survey open-file report, 25 p.

TABLE 1.--Daily climatological data for selected weather stations in Washington. From National Weather Service (written commun., Feb. 22, 1974)

[Shown in order from top to bottom for each station are maximum and minimum air temperatures (°F), precipitation (inches), and snow on the ground (inches)]

Weather station and time of observation	January							
	12	13	14	15	16	17	18	19
Republic -----	11	29	39	44	44	43	40	41
(8:30 a.m.)	-6	9	28	36	40	27	25	27
	--	.10	.11	.47	.07	.33	.11	.20
	13	12	11	9	5	3	4	3
Chewelah------	17	33	42	47	50	49	44	42
(8:00 a.m.)	2	12	31	37	43	35	29	31
	T	.34	.37	1.05	.44	.35	--	.92
	4	5.5	1.0	--	--	--	--	1.0
Dayton--------	10	47	58	64	61	57	53	57
(8:00 a.m.)	-8	8	40	44	47	39	32	38
	.01	.14	.03	.20	.32	.36	.11	.11
	8	5	--	--	--	--	--	--
Ellensburg----	18	45	46	42	49	44	40	37
(7:45 a.m.)	10	4	12	27	31	31	29	27
	.04	--	.08	.66	.09	*T	.31	.21
	8	8	8.5	3.5	2.5	*T	5.75	3
White Swan----	15	18	50	55	56	55	50	46
(8:00 a.m.)	5	7	10	37	46	39	32	32
	.14	.18	.08	1.14	.52	T	.55	.27
	11	13	8	*T	--	--	3	1
Satus Pass----	22	44	44	46	44	41	43	43
(5:00 p.m.)	2	20	34	35	36	29	28	27
	.36	1.0	.73	3.34	1.25	.08	.93	.10
	19	11	7	2	--	--	--	--
Longview------	31	45	50	55	55	52	51	54
(7:00 a.m.)	14	26	44	48	51	37	35	36
	.08	.49	.43	1.65	1.26	.33	.34	.34
	--	--	--	--	--	--	--	--
Glenoma-----	41	39	49	55	57	50	48	51
(8:00 a.m.)	13	33	36	43	45	35	35	32
	.24	.55	.70	2.03	1.52	.97	.19	.67
	1	--	--	--	--	--	--	--

*Trace.

TABLE 2.--Summary of flood stages and discharges in Washington

[Of two or three entries listed under maximum floods, the first pertains to the flood being reported, the second pertains to the maximum flood previously known during the period of record, and the third pertains to the maximum flood known outside the period of record]

Data-collection site		Drainage area (mi^2)	Period of record	Maximum floods			Recurrence interval (years)
Station number	Station name			Date	Water-surface elevation (ft)	Discharge (ft^3/s)	
	PART 12 - Pacific Slope basins and upper Columbia River basins						
Deschutes River basin							
0790	Deschutes River near Rainier	89.8	1949-73	Jan. 15, 1974 Jan. 21, 1972	15.68 15.28	7,760 7,420	25
Nisqually River basin							
0825	Nisqually River near National	133	1942-73	Jan. 15, 1974 Jan. 29, 1965	11.25 11.15	15,000 11,000	90
0830	Mineral Creek near Mineral	75.2	1942-73	Jan. 15, 1974 Jan. 20, 1972	10.53 10.87	9,060 9,740	10
0865	Nisqually River at La Grande	292	1906-11, 1919-31, 1943-73	Jan. 16, 1974 Nov. 23, 1959	9.67 9.63	[a]21,000 [a]20,700	15
0884	Nisqually River above Powell Creek, near McKenna	431	1941-63, 1969-73	Jan. 16, 1974 Dec. 12, 1955	11.14 12.06	[a]23,200 [a]20,800	15
Colville River basin							
4077	Chewelah Creek at Chewelah	94.1	1957-73	Jan. 16, 1974 Mar. 30, 1960	5.16 3.50	400 355	65
4083	Little Pend Oreille River near Colville	132	1957-73	Jan. 16, 1974 May 10, 1961	4.10 5.14	470 1,060	5
4090	Colville River at Kettle Falls	1,007	1922-73	Jan. 21, 1974 Apr. 23, 1956	9.84 10.17	3,360 3,230	>100
Spokane River basin							
4195	Spokane River above Liberty Bridge, near Otis Orchards	3,880	1929-73	Jan. 20, 1974 Dec. 25, 1933	21.23 22.24	[a]44,800 50,100	10
4225	Spokane River at Spokane	4,290	1891-73	2400 Jan. 19 to 1600 Jan. 20, 1974. May 31, 1894	28.9 --	[a]46,100 [b]49,000	15
4240	Hangman Creek at Spokane	689	1948-73	Jan. 15, 1974 Feb. 3, 1963	12.89 13.35	18,300 20,600	90
4310	Little Spokane River at Dartford	665	1929-32, 1946-73	Jan. 15, 1974 Feb. 17, 1970	7.03 7.29	2,860 3,170	15
4330	Spokane River at Long Lake	6,020	1939-73	Jan. 19, 1974 May 24, 1948	77.40 78.66	[a]49,700 [a]49,400	5
4332	Chamokane Creek below falls, near Long Lake	179	1971-73	Jan. 16, 1974 Apr. 10, 1971	4.42 3.75	1,950 1,320	--

TABLE 2.--Summary of flood stages and discharges in Washington--Continued

Data-collection site		Drainage area (mi^2)	Period of record	Maximum floods			Recurrence interval (years)
Station number	Station name			Date	Water-surface elevation (ft)	Discharge (ft^3/s)	
Yakima River basin							
4795	Yakima River at Cle Elum	495	1906-73	Jan. 16, 1974	4.85	[a]4,150	1
				Nov. 14, 1906	[c]12.5	25,600	
4838	Naneum Creek near Ellensburg	69.5	1957-73	Jan. 15, 1974	2.22	350	<2
				June 7, 1964	40.8	968	
4845	Yakima River at Umtanum	1,594	1906-73	Jan. 16, 1974	34.93	[a]10,600	3
				Nov. 15 or 16, 1906	41.1	41,000	
4885	American River near Nile	78.9	1909-15, 1939-73	Jan. 16, 1974	77.10	3,350	50
				June 2, 1968	76.61	2,840	
4940	Naches River below Tieton River, near Naches	941	1905, 1908-73	Jan. 16, 1974	17.70	[a]11,700	10
				Dec. 22 and 23, 1933	[c]14.33	[a]32,200	
500450	Yakima River above Ahtanum Creek, at Union Gap	3,479	1966-73	Jan. 16, 1974	946.19	[a]27,000	5
				Mar. 14, 1972	946.06	[a]19,200	
5005	North Fork Ahtanum Creek near Tampico	68.9	1907-73	Jan. 15, 1974	5.45	1,560	>100
				May 20, 1956	3.00	823	
5010	South Fork Ahtanum Creek at Conrad Ranch, near Tampico	24.8	1915-73	Jan. 15, 1974	5.39	1,200	>100
				Dec. 23, 1933	3.10	424	
5025	Ahtanum Creek at Union Gap	173	1904, 1907-08, 1910-14, 1951-53, 1960-73	Jan. 16, 1974	6.94	2,920	>100
				Mar. 3, 1910	[c]8.9	1,530	
507950	Logy Creek near Toppenish	99.9	(d)	Jan. 15 or 16, 1974	--	12,800	>100
508480	Dry Creek near Toppenish	158	(d)	Jan. 15 or 16, 1974	--	13,000	>100
				Feb. 3, 1963	--	7,440	
5085	Satus Creek below Dry Creek, near Toppenish	434	(d)	Jan. 15 or 16, 1974	--	33,900	>100
508990	Yakima River at Mabton	5,359	1970-73	Jan. 18, 1974	15.20	[a]39,000	--
				Mar. 15, 1972	10.02	[a]21,000	
5105	Yakima River at Kiona	5,615	1895-1915, 1933-73	Jan. 18, 1974	18.70	[a]40,700	15
				Dec. 23, 1933	21.57	67,000	
Esquatzel Coulee basin							
5125	Providence Coulee at Cunningham	27.8	1952-73	Jan. 14, 1974	3.75	102	2
				Feb. 21, 1956	10.04	2,160	
5130	Esquatzel Coulee at Connell	234	1953-73	Jan. 15, 1974	7.47	66	1
				Feb. 21, 1956	12.68	5,560	
5135	Esquatzel Coulee at Eltopia	551	1953-73	Jan. 16, 1974	5.73	43	--
				Feb. 22, 1956	18.23	3,740	

TABLE 2.--Summary of flood stages and discharges in Washington--Continued

Data-collection site		Drainage area (mi^2)	Period of record	Maximum floods			Recurrence interval (years)
Station number	Station name			Date	Water-surface elevation (ft)	Discharge (ft^3/s)	
			PART 13 - Snake River basin				
Asotin Creek basin							
3347	Asotin Creek below Kearney Gulch, near Asotin	170	1959-73	Jan. 16, 1974	7.54	[e]3,100	>100
				Dec. 23, 1964	7.95	2,720	
Deadman Creek basin							
3438	Meadow Creek near Central Ferry	66.2	1963-73	Jan. 16, 1974	6.60	1,010	3
				Sept.13, 1966	9.22	2,380	
				Feb. 3, 1963	10.33	2,230	
Tucannon River basin							
3445	Tucannon River near Starbuck	431	1914-17, 1928-31, 1958-73	Jan. 16, 1974	5.68	4,080	15
				Dec. 22, 1964	9.84	7,980	
Palouse River basin							
3453	Palouse River at Palouse	--	1973	Jan. 16, 1974	16.08	11,400	--
				Unknown	12.63	7,100	
3461	Palouse River at Colfax	497	1955-73	Jan. 16, 1974	13.45	12,800	40
				Dec. 24, 1964	11.14	8,510	
3480	South Fork Palouse River at Pullman	132	1934-42, 1959-73	Jan. 16, 1974	7.05	2,750	80
				Jan. 21, 1972	9.46	4,570	
				Feb. 26, 1948	9.5	5,000	
3485	Missouri Flat Creek at Pullman	27.1	1934-40, 1960-73	Jan. 16, 1974	4.40	830	15
				Jan. 21, 1972	6.65	1,220	
				Feb. 26, 1948	6.3	1,500	
3492.1	Palouse River below South Fork, at Colfax	796	1963-73	Jan. 16, 1974	18.70	16,800	15
				Jan. 21, 1972	17.98	14,700	
				Feb. 3, 1963	16.49	14,500	
3494,	Pine Creek at Pine City	302	1961-73	Jan. 16, 1974	15.07	5,300	70
				Feb. 3, 1963	20.90	10,600	
3510	Palouse River at Hooper	2,500	1897-1916, 1951-73	Jan. 16, 1974	16.45	21,300	25
				Feb. 4, 1963	19.13	33,500	
			PART 14 - Lower Columbia River basin				
Walla Walla River basin							
0130	Mill Creek near Walla Walla	59.6	1913-17, 1938-73	Jan. 16, 1974	17.17	1,350	5
				Dec. 23, 1964	19.26	3,240	
0150	Mill Creek at Walla Walla	95.7	1941-73	Jan. 16, 1974	4.21	[a]1,400	--
				Dec. 28, 1945	[c]4.0	[a]2,760	
0170	Touchet River at Bolles	361	1924-29, 1951-73	Jan. 17, 1974	9.18	4,700	5
				Dec. 23, 1964	14.06	9,350	
0185	Walla Walla River near Touchet	1,657	1951-73	Jan. 17, 1974	11.62	9,600	5
				Dec. 22, 1964	18.90	33,400	

TABLE 2.--Summary of flood stages and discharges in Washington--Continued

Data-collection site		Drainage area (mi^2)	Period of record	Maximum floods			Recurrence interval (years)
Station number	Station name			Date	Water-surface elevation (ft)	Discharge (ft^3/s)	
Klickitat River basin							
1070	Klickitat River above West Fork, near Glenwood	151	1944-73	Jan. 16, 1974 May 27, 1948	4.02 4.28	2,800 3,280	5
1120	Little Klickitat River near Goldendale	83.5	1911, 1912, 1947-51, 1958-70	Jan. 16, 1974 Dec. 22, 1964	10.55 15.0	4,750 5,200	>100
1125	Little Klickitat River near Wahkiacus	280	1944-73	Jan. 16, 1974 Dec. 23, 1964	16.4 [c]11.65	14,500 17,300	>100
1130	Klickitat River near Pitt	1,297	1909-12, 1928-73	Jan. 16, 1974 Dec. 23, 1964	17.12 14.34	46,000 31,100	>100
White Salmon River basin							
1213	White Salmon River below Cascades Creek, near Trout Lake	32.4	1957-73	Jan. 16, 1974 Dec. 23, 1964	3.68 3.86	946 1,070	5
1235	White Salmon River near Underwood	386	1912, 1913, 1915-30, 1935-73	Jan. 15, 1974 Dec. 29, 1917	12.85 [c]9.5	16,000 9,700	60
Little White Salmon River basin							
1255	Little White Salmon River near Cook	134	1956-73	Jan. 15, 1974 Jan. 21, 1972	9.43 9.92	8,080 9,250	>100
Wind River basin							
1285	Wind River near Carson	225	1934-73	Jan. 15, 1974 Jan. 20, 1972	21.91 19.29	44,500 31,400	>100
Washougal River basin							
1435	Washougal River near Washougal	108	1944-73	Jan. 15, 1974 Jan. 20, 1972	12.45 16.21	14,200 22,600	2
Kalama River basin							
2235	Kalama River below Italian Creek, near Kalama	198	1946-73	Jan. 15, 1974 Jan. 20, 1972	13.28 15.80	13,600 17,900	5
Cowlitz River basin							
2255	Lake Creek near Packwood	19.2	1911-24, 1930-42, 1949-54, 1959-73	Jan. 17, 1974 Dec. 22, 1933 Dec. 18, 1917	3.16 5.9 [c]6.0	[a]198 1,400 --	1
2260	Lake Creek at mouth, near Packwood	26.5	1907-15, 1962-73	Jan. 15, 1974 Mar. 15,16,1908	4.02 [c]4.00	[a]440 1,440	1

TABLE 2.--Summary of flood stages and discharges in Washington--Continued

Data-collection site		Drainage area (mi^2)	Period of record	Maximum floods			Recurrence interval (years)
Station number	Station name			Date	Water-surface elevation (ft)	Discharge (ft^3/s)	
Cowlitz River basin--continued							
2265	Cowlitz River at Packwood	287	1911-19, 1929-73	Jan. 15, 1974 Dec. 21, 1933	11.88 13.0	23,900 36,000	10
2325	Cispus River near Randle	321	1910-12, 1929-73	Jan. 15, 1974 Dec. 22, 1933	12.66 [c]12.7	21,700 20,000	40
2334	Cowlitz River near Randle	1,030	1947-73	Jan. 16, 1974 Nov. 24, 1959	23.53 [c]19.50	65,700 47,500	25
2362	Tilton River above Bear Canyon Creek, near Cinebar	141	1956-73	Jan. 15, 1974 Jan. 20, 1972	10.52 14.79	9,580 17,600	2
2380	Cowlitz River below Mayfield Dam	1,400	1910, 1911, 1934-73	Jan. 16, 1974 Dec. 13, 1946 Dec.22 or 23,1933	16.68 24.75 (f)	[a]22,500 67,000 (f)	1
2425	Toutle River near Silver Lake	474	1909-12, 1919-23, 1929-73	Jan. 15, 1974 Jan. 20, 1972	19.26 20.90	33,100 38,000	30
2430	Cowlitz River at Castle Rock	2,238	1926-73	Jan. 16, 1974 Dec. 23, 1933	21.86 31.6	[a]68,600 139,000	5
2450	Coweman River near Kelso	119	1950-73	Jan. 15, 1974 Nov. 20, 1962 Feb. 24, 1950	10.05 14.10 12.8	4,860 9,720 7,730	2

[a] Flow regulated.

[b] Estimated.

[c] Site and (or) datum then in use.

[d] Miscellaneous site.

[e] Approximately.

[f] Exceeded flood of Dec. 13, 1946.