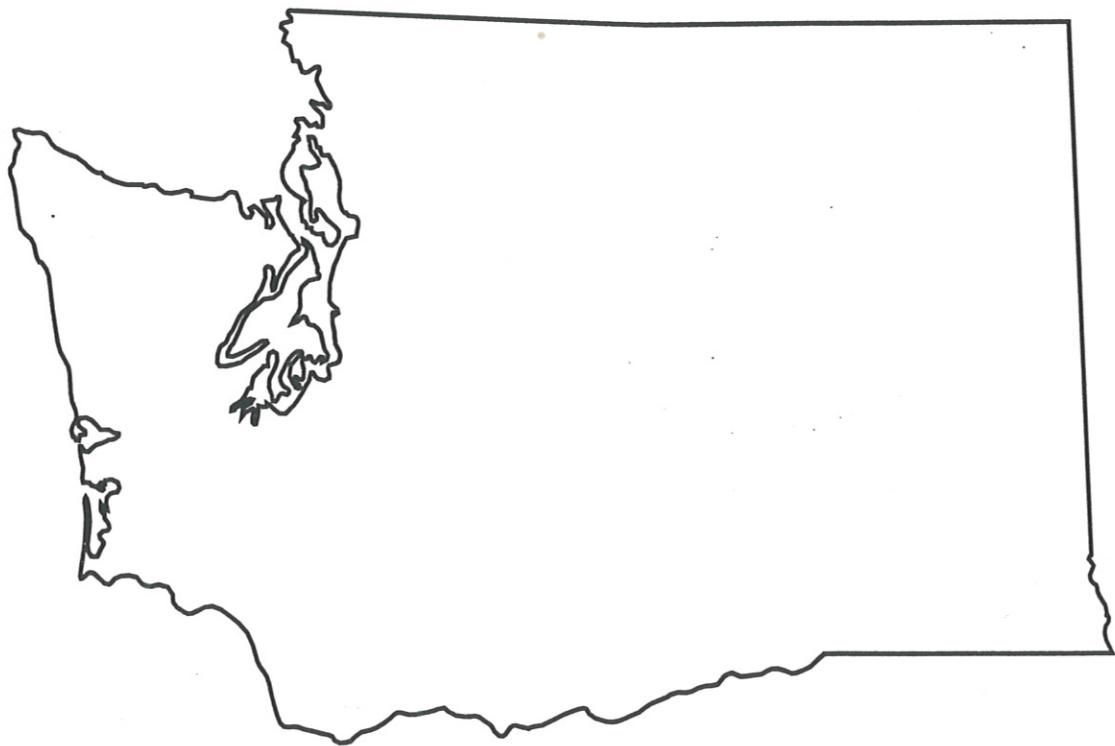




Water Resources Data Washington Water Year 1993

Rec'd 5-20-94



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT WA-93-1
Prepared in cooperation with the State of Washington
and with other agencies

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2

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PREFACE

This volume of the annual Washington hydrologic data report is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and quality of water provide the hydrologic information needed by State, local and Federal agencies, and the private sector for developing and managing our Nation's land and water resources.

The report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who edited and assembled the reports. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the collection, processing, and tabulation of the data:

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DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1992--Continued

Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Date	Measurements Discharge (ft ³ /s)
ICICLE CREEK BASIN--Continued						
Icicle Creek	Wenatchee River	Lat 47°32'59", long 120°40'46", in SE 1/4 NW 1/4 sec.26, T.24 N., R.17 E., Chelan County, 3.4 mi south of Leavenworth, 1.3 mi upstream from Leavenworth National Fish Hatchery, and at mile 3.9.	211	1991	10- 2-91 10-10-91	83 73
CRAB CREEK BASIN						
12470500 Rocky Ford Creek near Ephrata	Moses Lake	Lat 47°18'46", long 119°26'40", in SW 1/4 SW 1/4 sec.16, T.21 N., R.27 E., Grant County, Hydrologic Unit 17020015, on right bank, 1.4 mi downstream from source at Rocky Ford Springs, 5.0 mi east of Ephrata, and 6.3 mi upstream from mouth.	12	1909-11, 1942-91	10-10-91 11-21-91 12-19-91 2- 7-92 4-16-92 6-11-92 8- 6-92	58 50 52 44 34 36 43
TUCANNON RIVER BASIN						
13344500 Tucannon River near Starbuck	Snake River	Lat 46°30'17", long 118°03'55", in NE 1/4 SW 1/4 sec.21, T.12 N., R.38 E., Columbia County, 180 ft downstream from county road bridge, 0.5 mi downstream from Smith Hollow, 3.0 mi east of Starbuck, 3.3 mi downstream from Pataha Creek, and at mile 7.9	431	1915-17‡, 1928-31‡, 1958-90‡	11- 7-90 4- 3-91 5-29-91 7- 2-91 9- 3-91 10-22-91 1- 2-92 2-25-92 4-20-92 6-16-92 8-18-92	b90 b124 b212 b107 b50 56 88 179 204 62 31
PALOUSE RIVER BASIN						
13348000 South Fork Palouse River	Palouse River	Lat 46°43'57", long 117°10'48", in NE 1/4 NE 1/4 sec.6, T.14' N., R.45 E., Whitman County, on right bank at State Street crossing in Pullman, 600 ft upstream from Missouri Flat Creek, and at mile 22.2.	132	1934-42‡, 1948, 1954, 1958-59, 1959-82‡, 1983-91	10-11-91 3-16-92 5-28-92	4.7 20 5.4
WALLA WALLA RIVER BASIN						
Yellowhawk-Garrison Diversion	Walla Walla River	Lat 46°04'34", long 118°16'18", in NE 1/4 NW 1/4 sec.23, T.7 N., R. 36 E., Walla Walla County, 50 ft downstream from headgate diversion, from Mill Creek, and 1.5 mi east of Walla Walla.	---	---	7-15-91 9- 4-91 1- 3-92 2-24-92 6-17-92 8-20-92	b24 b17 27 23 34 11
Touchet River	.....do.....	Lat 46°19'07", long 117°58'06", in SE 1/4 NW 1/4 sec.30, T.10 N., R.39 E., Columbia County, at U.S. Highway 12 crossing in Dayton, and at mile 53.3	---	1991	10-22-91 1- 2-92 2-25-92 4-20-92 6-16-92 8-18-92	39 98 272 262 50 29
14017600 Touchet River	.....do.....	Lat 46°02'29", long 118°40'59", in NE 1/4 NE 1/4 sec.33, T.7 N., R.33 E., Walla Walla County, at U.S. Highway 12 crossing, 0.5 mi west of Touchet, and 0.6 mi upstream from mouth.	747	1962-65, 1972-75, 1977-91	8-25-92	20

‡ Operated as a continuous-record gaging station.

b Not previously published.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1993--Continued

Stream	Tributary to	Location	Drainage area (mi ²)	Measured previously (water years)	Measurements Date	Discharge (ft ³ /s)
OKANOGAN RIVER BASIN						
12443600 Similkameen River	Okanogan River	Lat 48°56'05", long 119°26'27", in NE 1/4 SW 1/4 sec.28, T.40 N., R.27 E., Okanogan County, at Twelfth Avenue bridge in Oroville.	3,590	1929-30, 1935, 1937, 1939-40, 1943-44, 1975-92	3-23-93 5-20-93 8-11-93	474 11,900 1,970
ICICLE CREEK BASIN						
12458000 Icicle Creek	Wenatchee River	Lat 47°32'28", long 120°43'08", in SE 1/4 SE 1/4 sec.28, T.24 N., R.17 E., Chelan County, on right bank, 1,000 ft upstream from Icicle Canal diversion dam, 0.4 mi upstream from Snow Creek, 4.8 mi southwest of Leavenworth, and at mile 5.8.	193	1926, 1936-72, 1975-77, 1991-92	9-30-93	71
12458500 Icicle Creek	.....do.....	Lat 47°33'49", long 120°40'00", in SW 1/4 NW 1/4 sec.24, T.24 N., R.17 E., Chelan County, downstream side county road bridge, near center of span, 1.8 mi south of Leavenworth, and at mile 2.5.	211	---	10-15-92 12- 9-92 2-12-93 4-16-93 5-15-93 6- 9-93	93 144 154 381 3,170 1,210
CRAB CREEK BASIN						
12470500 Rocky Ford Creek	Moses Lake	Lat 47°18'46", long 119°26'40", in SW 1/4 SW 1/4 sec.16, T.21 N., R.27 E., Grant County, Hydrologic Unit 17020015, on right bank, 1.4 mi downstream from source at Rocky Ford Springs, 5.0 mi east of Ephrata, and 6.3 mi upstream from mouth.	12	1909-11, 1942-92	10- 8-92 10- 8-92 2- 4-93 4- 9-93 5-28-93 6-24-93 7-20-93 8-19-93	57 55 37 30 25 37 35 39
YAKIMA RIVER BASIN						
Wilson Creek	Yakima River	Lat 46°55'01", long 120°30'25", in NE 1/4 SW 1/4 sec.31, T.17 N., R.19 E., Kittitas County, 200 ft upstream from mouth, 0.7 mi downstream from Cherry Creek, 0.8 mi south of Thrall.	382	1914, 1915, 1971, 1973-75, 1977	12- 8-92 2- 9-93 4- 7-93 8- 3-93	89 106 174 314
GRANDE RONDE RIVER BASIN						
Grande Ronde River	Snake River	Lat 46°04'13", long 117°00'16", in SW 1/4 NE 1/4 sec.23, T.7 N., R.46 E., Asotin County, Hydrologic Unit 17060106, at county road bridge, 2.8 mi upstream from mouth, 1.5 mi downstream from Joseph Creek, and 8 mi southeast of Anatone.	---	1976-77, 1981	12- 3-92 1-27-93 9-15-93	828 1,090 706

12470500 ROCKY FORD CREEK NEAR EPHRATA, WA

LOCATION.--Lat $47^{\circ}18'46''$, long $119^{\circ}26'40''$, in SW 1/4 SW 1/4 sec.16, T.21 N., R.27 E., Grant County, Hydrologic Unit 17020015, on right bank 1.4 mi downstream from source at Rocky Ford Springs, 5.0 mi east of Ephrata, and 6.3 mi upstream from mouth.

DRAINAGE AREA.--458 mi², of which, 446 mi² in vicinity of Banks and Soap Lakes is noncontributing.

PERIOD OF RECORD.--June 1909 to April 1910, July to December 1911, August 1942 to September 1991 (discontinued). Prior to January 1910, published as Upper Crab Creek near Ephrata.

REVISED RECORDS.--WSP 1933: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,068.51 ft above U.S. Bureau of Reclamation datum. Prior to Jan. 1, 1912, nonrecording gages at sites 4.5 mi to 5.5 mi downstream at different datums. Aug. 19, 1942, to May 23, 1945, water-stage recorder at site 3.5 mi downstream at datum 5.37 ft lower. May 23, 1945, to June 15, 1977, water-stage recorder at site 0.2 mi downstream at datum 3.53 ft lower.

REMARKS.--No estimated daily discharges. Records good. Base flow derived from Rocky Ford Springs; no known regulation or diversion but may be influenced by ground-water recharge from irrigation beginning in 1952 (Columbia Basin Project). Effective October 1991, this station will become a miscellaneous measurement site.

AVERAGE DISCHARGE.--49 years (water years 1943-91), 73.7 ft³/s, 53,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 212 ft³/s Apr. 15-18, 1956, gage height, 3.58 ft at datum then in use; minimum observed, 20 ft³/s Aug. 13-18, 1911.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 63 ft³/s Sept. 6-9, gage height, 5.73 ft; maximum gage height, 6.15 ft Oct. 1, 4; minimum discharge, 27 ft³/s on several days in April.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	57	51	51	41	38	35	32	31	33	36	50	60
2	57	51	52	41	37	35	29	28	33	36	49	61
3	57	51	53	41	37	35	30	32	33	36	50	61
4	57	51	53	41	37	35	29	31	33	35	51	60
5	56	51	53	41	37	34	29	30	34	36	50	61
6	56	51	53	41	37	34	28	31	33	36	51	61
7	55	51	53	40	37	34	28	31	35	36	52	62
8	55	50	52	40	37	34	28	30	35	37	52	62
9	54	50	52	40	37	33	28	30	35	37	51	62
10	54	50	51	40	37	33	28	29	34	37	52	61
11	54	50	51	40	37	33	27	31	34	37	52	60
12	53	50	51	39	37	33	28	31	35	38	53	60
13	52	50	51	39	36	33	28	31	34	38	53	60
14	52	50	50	39	36	33	28	31	33	39	54	60
15	51	50	50	39	36	32	28	30	33	39	54	60
16	50	50	50	39	37	32	27	31	35	39	55	60
17	50	50	49	38	37	32	28	31	34	40	56	60
18	49	50	49	38	36	33	30	30	35	40	56	61
19	49	50	49	38	36	32	30	30	34	41	57	60
20	49	50	48	38	36	32	30	30	34	42	58	60
21	50	50	48	38	36	32	30	32	34	42	58	59
22	50	50	47	38	36	31	29	32	34	43	60	59
23	50	51	47	38	36	31	28	31	35	44	59	59
24	50	51	46	39	36	31	28	32	34	45	59	59
25	51	50	46	39	36	30	28	32	36	45	60	59
26	51	50	45	38	36	30	27	32	35	46	60	59
27	51	50	45	38	36	30	27	33	35	46	59	59
28	51	50	43	39	36	30	27	32	35	47	59	59
29	51	50	42	39	---	30	27	34	36	47	60	59
30	51	51	42	39	---	30	29	33	35	48	60	59
31	51	---	42	38	---	30	---	33	---	48	60	59
TOTAL	1624	1510	1514	1216	1023	1002	853	965	1028	1256	1710	1802
MEAN	52.4	50.3	48.8	39.2	36.5	32.3	28.4	31.1	34.3	40.5	55.2	60.1
MAX	57	51	53	41	38	35	32	34	36	48	60	62
MIN	49	50	42	38	36	30	27	28	33	35	49	59
AC-FT	3220	3000	3000	2410	2030	1990	1690	1910	1910	2040	2490	3390
3570												

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1991, BY WATER YEAR (WY)

MEAN	75.9	68.9	61.8	58.6	61.5	69.2	74.7	79.2	82.7	85.1	84.1
MAX	138	129	117	104	110	169	206	199	179	165	155
(WY)	1957	1957	1957	1957	1956	1956	1956	1956	1956	1956	1956
MIN	37.1	35.7	33.6	31.9	31.1	30.5	28.4	31.1	34.3	40.5	39.1
(WY)	1948	1948	1948	1948	1948	1991	1991	1991	1991	1947	1947

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR	FOR 1991 WATER YEAR	WATER YEARS 1942 - 1991
ANNUAL TOTAL	17004	15503	
ANNUAL MEAN	46.6	42.5	
HIGHEST ANNUAL MEAN			73.7
LOWEST ANNUAL MEAN			139
HIGHEST DAILY MEAN	66	Sep 3	42.5
LOWEST DAILY MEAN	34	May 2	211
ANNUAL SEVEN-DAY MINIMUM	36	Apr 28	Apr 14 1956
ANNUAL RUNOFF (AC-FT)	33730	30750	Apr 11 1991
10 PERCENT EXCEEDS	60	59	Apr 23 1991
50 PERCENT EXCEEDS	46	39	53400
90 PERCENT EXCEEDS	38	30	101
			27
			72
			46

CRAB CREEK BASIN

297

12471000 MOSES LAKE AT MOSES LAKE, WA

LOCATION.--Lat 47°06'11", long 119°19'02", in SW 1/4 SW 1/4 sec.28, T.19 N., R.28 E., Grant County, Hydrologic Unit 17020015, on east shore 35 ft north of Interstate 90, 1.7 mi upstream from outlet, at town of Moses Lake, and at mile 55.9.

DRAINAGE AREA.--3,080 mi², of which 665 mi² is noncontributing.

PERIOD OF RECORD.--June 1909 to September 1914 and November 1936 to September 1945 (fragmentary), October 1945 to current year. Published as "at Neppel" 1912-14.

REVISED RECORDS.--WSP 1933: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is U.S. Bureau of Reclamation datum. Prior to Apr. 3, 1910, nonrecording gage at site 0.6 mi northeast at different datum. Apr. 3, 1910, to Sept. 30, 1914, and Nov. 19, 1936, to Nov. 24, 1944, nonrecording gages at site 2.8 mi northeast at Parker Horn at various datums. Oct. 30, 1945, to Mar. 12, 1955, water-stage recorder at site near west shore on downstream side of bridge on U.S. Highway 10 at present datum.

REMARKS.--Elevation controlled between 1,041 ft and 1,047 ft by two outlet structures at south end of lake. Many small diversions for irrigation.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,048.29 ft Mar. 10, 1950; minimum observed, 1,038.17 ft Aug. 27, 1910.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,046.97 ft Oct. 2; minimum, 1,043.49 ft Dec. 4.

ELEVATION (FEET USBR), WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1046.94	1046.87	1043.53	1043.72	1043.94	1043.79	1044.38	1046.66	1046.64	1046.70	1046.60	1046.82
2	1046.95	1046.80	1043.53	1043.72	1043.92	1043.78	1044.62	1046.68	1046.61	1046.73	1046.62	1046.83
3	1046.92	1046.74	1043.53	1043.71	1043.91	1043.79	1044.89	1046.71	1046.58	1046.76	1046.63	1046.83
4	1046.87	1046.73	1043.54	1043.72	1043.91	1043.81	1045.28	1046.74	1046.57	1046.79	1046.65	1046.76
5	1046.84	1046.73	1043.56	1043.73	1043.91	1043.80	1045.73	1046.76	1046.59	1046.79	1046.67	1046.77
6	1046.78	1046.72	1043.58	1043.73	1043.90	1043.79	1046.12	1046.77	1046.64	1046.80	1046.68	1046.88
7	1046.74	1046.72	1043.60	1043.75	1043.88	1043.79	1046.31	1046.77	1046.66	1046.80	1046.68	1046.90
8	1046.70	1046.70	1043.62	1043.76	1043.86	1043.77	1046.26	1046.79	1046.69	1046.81	1046.66	1046.86
9	1046.68	1046.66	1043.66	1043.77	1043.85	1043.77	1046.23	1046.78	1046.72	1046.80	1046.65	1046.83
10	1046.68	1046.51	1043.70	1043.78	1043.84	1043.75	1046.18	1046.76	1046.74	1046.74	1046.63	1046.79
11	1046.67	1046.24	1043.73	1043.80	1043.83	1043.74	1046.17	1046.75	1046.71	1046.68	1046.62	1046.75
12	1046.66	1045.95	1043.76	1043.82	1043.82	1043.75	1046.17	1046.78	1046.66	1046.63	1046.61	1046.73
13	1046.65	1045.67	1043.76	1043.83	1043.83	1043.74	1046.25	1046.81	1046.64	1046.62	1046.61	1046.75
14	1046.65	1045.41	1043.76	1043.84	1043.83	1043.74	1046.37	1046.80	1046.62	1046.57	1046.63	1046.73
15	1046.68	1045.19	1043.77	1043.86	1043.83	1043.73	1046.44	1046.78	1046.61	1046.55	1046.67	1046.75
16	1046.70	1044.99	1043.77	1043.88	1043.83	1043.73	1046.48	1046.78	1046.60	1046.60	1046.70	1046.77
17	1046.70	1044.81	1043.76	1043.89	1043.83	1043.72	1046.46	1046.83	1046.61	1046.61	1046.74	1046.77
18	1046.72	1044.64	1043.79	1043.91	1043.83	1043.71	1046.41	1046.71	1046.61	1046.67	1046.78	1046.73
19	1046.74	1044.50	1043.82	1043.92	1043.83	1043.70	1046.41	1046.61	1046.62	1046.64	1046.81	1046.68
20	1046.75	1044.36	1043.78	1043.93	1043.82	1043.69	1046.40	1046.54	1046.61	1046.61	1046.84	1046.68
21	1046.77	1044.23	1043.76	1043.94	1043.82	1043.69	1046.33	1046.49	1046.62	1046.63	1046.86	1046.71
22	1046.78	1044.11	1043.76	1043.95	1043.82	1043.68	1046.30	1046.41	1046.63	1046.67	1046.85	1046.78
23	1046.81	1043.99	1043.75	1043.96	1043.82	1043.68	1046.27	1046.37	1046.64	1046.71	1046.83	1046.83
24	1046.84	1043.92	1043.75	1043.97	1043.81	1043.70	1046.30	1046.47	1046.66	1046.78	1046.78	1046.83
25	1046.89	1043.87	1043.75	1043.98	1043.81	1043.74	1046.38	1046.61	1046.67	1046.84	1046.73	1046.84
26	1046.89	1043.80	1043.74	1043.99	1043.80	1043.72	1046.43	1046.69	1046.67	1046.80	1046.70	1046.83
27	1046.91	1043.73	1043.74	1044.00	1043.80	1043.70	1046.50	1046.75	1046.68	1046.66	1046.70	1046.80
28	1046.92	1043.66	1043.73	1044.00	1043.80	1043.71	1046.54	1046.74	1046.69	1046.63	1046.69	1046.79
29	1046.93	1043.59	1043.72	1043.99	---	1043.80	1046.58	1046.71	1046.69	1046.62	1046.71	1046.79
30	1046.94	1043.54	1043.72	1043.98	---	1043.94	1046.62	1046.69	1046.69	1046.59	1046.74	1046.79
31	1046.94	---	1043.72	1043.96	---	1044.16	---	1046.66	---	1046.58	1046.80	---
MEAN	1046.79	1045.25	1043.70	1043.86	1043.85	1043.76	1046.13	1046.69	1046.65	1046.69	1046.71	1046.79
MAX	1046.95	1046.87	1043.82	1044.00	1043.94	1044.16	1046.62	1046.83	1046.74	1046.84	1046.86	1046.90
MIN	1046.65	1043.54	1043.53	1043.71	1043.80	1043.68	1044.38	1046.37	1046.57	1046.55	1046.60	1046.68

WTR YR 1991 MEAN 1045.58 MAX 1046.95 MIN 1043.53