

Appendix D: Section IV. Water Resources in the Yellowstone River Basin: Streamflow

Mean annual discharge in Upper, Middle and Lower Yellowstone Basin

Table 3a. Upper Yellowstone River Basin: Mean Annual Discharge for Various Periods of Measurement:													
Mainstem	Tributary	USGS Station	Drainage Area (mi ²)	Period of Record	Period of Record Mean Annual Discharge (cfs)		1929-1941 Mean Annual Discharge (cfs)		2000-2010 Mean Annual Discharge (cfs)		1981-2010 Mean Annual Discharge (cfs)		1981-2010 Unit Annual Runoff (cfs/mi ²)
					n	Mean	n	Mean	n	Mean	n	Mean	
Yellowstone River at Yellowstone Lake Outlet, Yellowstone National Park, Wyoming		06186500	991	1922-82, 1983-86, 1988-2010	81	1327.0	13	1057.5	11	1197.5	25	1311.8	1.324
	Gardiner River near Mammoth YNP	06191000	200	1984-2010	61	211.9	3	154.8	11	182.6	26	203.3	1.017
Yellowstone River at Corwin Springs, Mont.		06191500	2,619	1889-93, 1910-2010	105	3124.2	13	2493.8	11	2834.4	30	3094.0	1.181
Yellowstone River near Livingston, Mont.		06192500	3,551	1897-1905, 1928-32, 1937-2010	86	3747.5	7	3029.9	11	3347.0	30	3648.0	1.027
	Shields River near Livingston MT	06195600	852		34	271.4			11	204.4	30	259.3	0.304
	Boulder River at Big Timber MT	06200000	523		64	556.3			11	445.6	30	488.2	0.933
	Stillwater River near Absarokee MT	06205000	975		71	923.9	6	719.3	10	778.0	25	1311.8	1.345
	Clarks Fork Yellowstone near Belfry, MT	06207500	1,154	1921-2013	91	934.2	13	804.9	11	827.5	30	879.2	0.762
	Clarks Fork Yellowstone at Edgar, MT	06208500	2,022	1921-2013	73	1029	13	895.1	11	890.2	24	971.2	0.480
	Rock Creek near Red Lodge, MT	06209500	105		61	166.8	7	145.5	10	130.7	13	141.2	1.345
Yellowstone River at Billings, Mont.		06214500	11,805	1904-05, 1928-2010	84	6930.9	13	5409.2	11	5755.2	30	6623.7	0.561

(Note: Only means of annual discharge are reported. Comparison of the mean and median values of annual discharge shows there is no significant difference at p=0.001)

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Table 3b. Middle Yellowstone River Basin: Mean Annual Discharge for Various Periods of Measurement:													
Mainstem	Tributary	USGS Station	Drainage Area (mi ²)	Period of Record	Period of Record Mean Annual Discharge (cfs)		1929-1941 Mean Annual Discharge (cfs)		2000-2010 Mean Annual Discharge (cfs)		1981-2010 Mean Annual Discharge (cfs)		1981-2010 Unit Annual Runoff (cfs/mi ²)
					n	Mean	n	Mean	n	Mean	n	Mean	
	Pryor Creek at Pryor MT	06216000	117		41	30.561			9	18.9	28	24.6286	0.211
	Bighorn River at Kane WY	06279500	15,762		83	2130.8	12	2062.3	11	1356.0	30	1906.2	0.121
	Bighorn River near St. Xavier MT	06287000	19,667		78	3386.3	7	3120.4	11	2353.1	30	3026.1	0.154
	Bighorn River above Tullock Cr near Bighorn, Mont.	06294500	22,414	1945-55, 1956-2010	67	3674.4			11	2495.6	30	3300.6	0.147
	Little Bighorn River near Hardin MT	06294000	1,294		59	276.0			11	194.8	30	226.5	0.175
	Sarpy Creek near Hysahm MT	06294940	453		10	7.056					3	3.3267	0.007
Yellowstone River at Forsyth, Mont.		06295000	40,146	1921-23, 1977-2010	35	10434.8			11	8487.1	30	10079.2	0.251
	Tongue River near Dayton WY	06298000	206		81	173.8			11	142.4	30	157.1	0.763
	Tongue River at Stateline near Decker MT	06306300	1,453		53	438.0			11	343.4	30	388.9	0.268
	Tongue River at Dam, near Decker MT	06307500	1,770		74	431.0			11	333.2	30	383.1	0.216
	Hanging Woman Creek near Blrney, MT	06307600	470		28	3.1			7	0.8	19	1.6	0.003
	Prairie Dog Creek near Acme, WY	06306250	358	1970-10-01 to 2010-10-01	20	34.09			10	24.89	10	24.89	0.070
	Pumpkin Creek near Miles City MT	06308400	697		20	19.2			6	14.5	10	11.9	0.017
	Tongue River at Miles City, Mont.	06308500	5,397		70	405.2			11	283	30	340.4	0.063
Yellowstone River at Miles City, Mont.		06309000	48,253	1922-23, 1928-2010	80	11247	13	9400.8	11	8820.5	30	10476.2	0.217

(Note: Only means of annual discharge are reported. Comparison of the mean and median values of annual discharge shows there is no significant difference at p=0.001)

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Mainstem	Tributary	USGS Station	Drainage Area (mi ²)	Period of Record	Period of Record Mean Annual Discharge (cfs)		1929-1941 Mean Annual Discharge (cfs)		2000-2010 Mean Annual Discharge (cfs)		1981-2010 Mean Annual Discharge (cfs)		1981-2010 Unit Annual Runoff (cfs/mi ²)
					n	Mean	n	Mean	n	Mean	n	Mean	
	Clear Creek near Arvada WY	06324000	1,100		53	177.8			7	159.9	8	157.5	0.143
	Powder River at Moorehead MT	06324500	8,085		81	438.2	12	421.3	11	325.4	30	402.6	0.050
	Little Powder River above Dry Creek, near Weston WY	06324970	1,237		40	21.8			11	16.1	30	19.8	0.016
	Powder River near Locata, Mont.	06326500	13,068	1938-2010	75	563.8	3	552.1	11	368.5	30	468.9	0.036
	O'Fallon Creek near Ismay MT	06326600	699		14	10.8							
	Burns Creek near Savage MT	06329200	233		17	5.9					3	5.5	0.024
Yellowstone River at Glendive MT		06327500	66,788		23	13271.3			8	10130.1	8	10130.1	0.152
Yellowstone River near Sidney, Mont.		06329500	69,083	1910-31, 1933-2010	46	12005.9			11	8726.5	30	10675.3	0.155

(Note: Only means of annual discharge are reported. Comparison of the mean and median values of annual discharge shows there is no significant difference at p=0.001)

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4. Percent difference in mean annual discharge for various periods compared with long-term mean and various periods of streamflow

Table 4. Yellowstone River Basin: Percent difference in mean annual discharge for various periods compared with long-term mean

Mainstem	Tributary	USGS Station	Drainage Area (mi ²)	Record Length	Period of Record Mean (cfs)	1981- 2010 Mean (cfs)	Percent Difference		Percent Difference 1929- 1941 Mean		Percent Difference 2000-2010 Mean From	
							1981- 2010 Mean From Period of Record Mean	1929- 1941 Mean (cfs)	1929- 1941 Mean From Period of Record Mean	2000-2010 Mean (cfs)	2000-2010 Mean From Period of Record Mean	
Yellowstone River at Yellowstone Lake Outlet, Yellowstone National Park, Wyoming												
		06186500	991	1922-82, 1983-86,	1327.0	1311.8	-1.1	1097.0	-17.3	1197.5	-9.8	
	Gardiner River near Mammoth YNP	06191000	200	1988-2010 1984-2010	211.9	203.3	-4.1	147.3	-30.5	182.6	-13.8	
Yellowstone River at Corwin Springs, MT												
		06191500	2,619	1889-93, 1910-2010	3124.2	3094.0	-1.0	2608.0	-16.5	2834.4	-9.3	
Yellowstone River near Livingston, MT												
		06192500	3,551	1897-1905, 1928-32, 1937-2010	3747.5	3648.0	-2.7	3152.0	-15.9	3347.0	-10.7	
	Shields River near Livingston MT	06195600	852	1978-2013	271.4	259.3	-4.5			204.4	-24.7	
	Boulder River at Big Timber MT	06200000	523	1947-2013	556.3	488.2	-12.2			445.6	-19.9	
	Stillwater River near Absarokee MT	06205000	975	1910-2013	923.9	1311.8	42.0	762.5	-17.5	778.0	-15.8	
	Clarks Fork Yellowstone near Belfry, MT	06207500	1,154	1921-2013	934.2	879.2	-5.9	796.3	-14.8	827.5	-11.4	
	Clarks Fork Yellowstone at Edgar, MT	06208500	2,022	1921-2013	1029	971.2	-5.6	890.3	-13.5	890.2	-13.5	
	Rock Creek near Red Lodge, MT	06209500	105	1932-2013	166.8	141.2	-15.3	145.9	-12.5	130.7	-21.6	
Yellowstone River at Billings, MT												
		06214500	11,805	1904-05, 1928-2010	6930.9	6567.5	-5.2	5469.0	-21.1	5573.0	-19.6	
	Pryor Creek at Pryor MT	06216000	117	1968-2008	30,561	24.8	-18.9		16.2		-47.0	
	Bighorn River at Kane WY	06279500	15,762	1929-2013	2130.8	1906.2	-10.5	2062.3	-3.2	1356.0	-36.4	
	Bighorn River near St. Xavier MT	06287000	19,667	1935-2013	3386.3	2849	-15.9	3426	1.2	2111	-37.7	
	Bighorn River above Tullock Cr near Bighorn, Mont.	06294500	22,414	1945-55, 1956-2010	3674.4	3003	-18.3			2229	-39.3	
	Little Bighorn River near Hardin MT	06294000	1,294	1953-2013	276.0	222	-19.6			183.8	-33.4	
Yellowstone River at Forsyth, MT												
		06295000	40,146	1921-23, 1977-2010	10434.8	10079.2	-3.4			8487.1	-18.7	
	Tongue River near Dayton WY	06298000	206	1919-1926, 1941-2013	173.8	157.1	-9.6			142.4	-18.1	
	Tongue River at Stateline near Decker MT	06306300	1,453	1960-2013	438.0	388.9	-11.2			343.4	-21.6	
	Tongue River at Dam, near Decker MT	06307500	1,770	1939-2013	431.0	383.1	-11.1			333.2	-22.7	
	Hanging Woman Creek near Birney, MT	06307600	470	1973-2013	3.1	1.6	-48.7			0.8	-72.9	
	Tongue River at Miles City, Mont.	06308500	5,397	1938-2013	405.2	340.4	-16.0			283	-30.2	
Yellowstone River at Miles City, MT												
		06309000	48,253	1922-23, 1928-2010	11247	10476	-6.9	9400.8	-16.4	8820.5	-21.6	
	Clear Creek near Arvada WY	06324000	1,100	1916,1940-2013 1929-2013	177.8	157.5	-11.4			159.9	-10.1	
	Powder River at Moorehead MT	06324500	8,086		438.2	402.6	-8.1	421.3	-3.9	325.4	-25.7	
	Little Powder River above Dry Creek, near Weston WY	06324970	1,237	1973-2012	21.8	19.8	-9.1			16.1	-26.0	
	Powder River near Locate, Mont.	06326500	13,068	1938-2010	563.8	468.9	-16.8	552.1	-2.1	368.5	-34.6	
Yellowstone River at Glendive MT												
		06327500	66,788	1898-1910,2003-2012	13271.3	10130.1	-23.7			10130.1	-23.7	
Yellowstone River near Sidney, MT												
		06329500	69,083	1910-31, 1933-2010	12005.9	10675.3	-11.1			8726.5	-27.3	

(Note: Only means of annual discharge are reported. Comparison of the mean and median values of annual discharge shows there is no significant difference at p=0.001)