The Yellowstone River Instream Reservation

DECEMBER 16, 1986 - DECEMBER 15, 1987

NINTH ANNUAL REPORT

Compiled by:
Liter Spence and Fred Nelson

Montana Department of Fish, Wildlife & Parks
Fisheries Division
1420 East Sixth Avenue
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INTRODUCTION

The Order of the Board of Natural Resources and Conservation establishing water reservations for the Yellowstone basin was signed on December 15, 1978. As a result of that Order, the Department of Fish, Wildlife and Parks (MDFWP) was granted an instream reservation for the Yellowstone River at Sidney of approximately 5.5 million acre-feet of water, with differing amounts granted in upstream reaches and tributaries.

The MDFWP applied for instream reservations on many streams and tributaries where little, if any, flow data were available. When granting instream reservations for those waters, the Board frequently granted a percentile flow rather than a specific amount of water in cfs or acre-feet. In such cases, the MDFWP was directed by the Board, through condition 116, to develop and submit to the Board within 5 years of December 15, 1978, a plan to convert the minimum flow instream reservation quantities into cubic feet of water per second and acre-feet of water per month.

Condition 117 states that the reservant shall submit an annual progress report to the Board setting forth accomplishments toward completion of such work as outlined in condition 116, a schedule of anticipated progress, and other information as may be prescribed by the Board. This ninth annual progress report fulfills those requirements and presents the quantified flows for all but one of the stream reaches where reservations were granted by the Board. It also discusses the 1987 drought.

INSTREAM FLOW QUANTIFICATIONS

The first annual progress report outlined a tentative plan for accomplishing the objectives in condition 116. The tentative plan was then reviewed, commented on and revised. In the second annual report, a final plan to convert the minimum-flow instream reservations into cubic feet of water per second and acre-feet per month, using hydrologic modeling techniques, was submitted to the Board. This was done pursuant to the Board's order, specifically condition 116(b). The Department of Natural Resources and Conservation (DNRC) concurred in the plan as presented and additionally suggested a provision for verifying the chosen methodology (Riggs' Method) using existing long-term gaging stations in the area. The testing and verification of the Riggs' Method were performed by Systems Technology, Inc. and presented verbally to the Board. A summary of the verification procedure was presented in the third annual report. The findings in general were very good, and the report states that better results than those obtained during verification can be achieved through a careful study of basin characteristics for all gaged streams in the Upper Yellowstone Basin, and the omission of hydrologically different streams.

The final plan for quantifying the percentile flows was approved by the Board on June 5, 1981. Streams in need of quantification at that time are shown in Table 1.

Completed Quantifications

The quantification of the granted percentile flows is being completed by the Helena office of the USGS through a cost-share cooperative agreement with the MDFWP. During the first year of the agreement (phase 1), the needed flow data were collected for 22 stream sites within the Yellowstone River drainage upstream from the Shields River. The preliminary instream flow quantifications that were derived by the USGS for these sites were presented in the fifth annual report. During the second year of the agreement (phase 2), the needed flow data were collected for 19 stream sites in the Shields River drainage as well as the Yellowstone River drainage downstream from the Shields River. The preliminary flow quantifications for these sites were presented in the sixth annual report. The draft of a formal report that finalized the quantifications for phase 1 and 2 streams was completed by the USGS in September, 1985 and reviewed by this Department. The final report was released in 1986, and is included in the eighth annual report as Appendix A.

The quantification of the granted percentile flows was originally scheduled to be completed for all Yellowstone tributaries in 1985. However, unforseen MDFWP budget constraints prevented the USGS from completing all scheduled tasks during the allotted contract period. The MDFWP renegotiated its contract with the USGS and rescheduled the remaining tasks.

The USGS decided during the second year of the agreement (phase 2) to extend streamflow records at all gages used in the regression analyses (Riggs' Method) to a common 1934-82 base period. The purpose of the record extension was to eliminate any bias that might result from using a short-record gage that might not be representative of long-term hydrologic conditions. All final quantifications (except Hanging Woman, Otter, and Pumpkin creeks) are based on this common period.

For Hanging Woman, Otter, and Pumpkin creeks, the Board granted the "historic minimum monthly flows," rather than percentile flows, as the instream reservation. There were limited gage records available on these streams at the time of the Board's order. A reliable method for synthesizing flows on these prairie streams was not available prior to establishment of gages on each stream. Therefore, the historic record was limited to the period the gages were operated. More than 10 years' record is now available on each stream, and these records were used to quantify the historic minimum monthly flows. These records include the drought years of 1977 and 1984.

The six flow quantifications listed on pages 3 and 4 of the fifth annual report were recalculated by the USGS to encompass the 1934-82 base flow period, and were presented in Table 1 of the seventh annual report. These six sites are:

1. Bluewater Creek (Mouth-Headwaters) #6-2078
2. Brackett Creek (Mouth-Sheep Creek) #6-1940
3. Rock Creek (Mouth-Custer National Forest) #6-2095
4. Sweet Grass Creek (Mouth-Forest Service boundary) #6-2005
5. Clarks Fork Yellowstone River #6-2075 (near Belfry)
6. Clarks Fork Yellowstone River #6-2085 (at Edgar)

The final results of all flow quantifications completed to date are presented in Table 2. This ninth annual report contains all the final quantifications presented in the eighth annual report plus most of those which remained at the time that report was completed (see table 3 of eight annual report). The streams are presented in the same order as found in the original reservation application, i.e., Upper Yellowstone, Middle Yellowstone, and Lower Yellowstone River basins.

The USGS site numbers in the heading for some streams correspond to those in Appendix A, Tables 7, 8 and 11 of the eighth annual report. Flows for streams not designated by a USGS site number in this report were determined independently of the Phase 1 and 2 agreements. Monthly and total volume in acre-feet were calculated from the quantified percentile flows (cfs).

The quantification of the granted percentile flows for the Yellowstone spring creeks and tributaries to the Stillwater and Clarks Fork Yellowstone rivers was completed by the USGS during phase 3 of the agreement. The results are presented in Appendix

A. The four spring creeks required special treatment due to the unusual nature of their flows.

Remaining Quantifications

This ninth annual report contain's almost all the flow quantifications required, and approved, by the Board on June 5, 1981. The only remaining stream reach to be quantified is the "Shields River at its mouth." Ten years of streamflow measurements were required at this site to calculate the 90th percentile flows granted by the Board. The tenth measurement year will be completed October 1, 1988, after which time the flows will be quantified. They will be presented in the tenth annual report.

For reasons stated in footnotes to Table 3 of the eighth annual report, percentile flows on the following stream reaches will not be quantified:

1) Cedar Creek - Second Fork to North Fork
2) Eight Mile Creek - Big Draw to North Fork
3) Rock Creek (Shields) - Forest Service boundary in Sec. 8 to Smeller Creek
4) Trail Creek - Mouth to West Pine Creek

Table 1. Summary of streams where flow quantifications were required on June 5, 1981.

Basin/Sub-basin	Stream
UPPER YELLOWSTONE RIVER (Gardiner to Boulder River)	
Above Shields River	Bear Creek
	Cinnabar Creek
	Mol Heron Creek
	Cedar Creek
	Tom Miner Creek
	Rock Creek
	Big Creek
	Six Mile Creek
	Fridley Creek
	Eight Mile Creek
	Mill Creek
	Trail Creek
	Suce Creek
	Coke (Miner) Creek
	Billman Creek
	Fleshman Creek
	Armstrong Spring Creek
	Nelson Spring Creek
	McDonald Spring Creek
	Emigrant Spring Creek
Shields River	Smith Creek
	Flathead Creek
	Rock Creek
	Brackett Creek
	Shields River @ mouth
	Cottonwood Creek
	N.F. Brackett Creek
	M.F. Brackett Creek
	S.F. Brackett Creek
Below Shields River	Bridger Creek
	Lower Deer Creek
	Upper Deer Creek
	Sweet Grass Creek
	Mission Creek
	Little Mission Creek

MIDDLE YELLOWSTONE RIVER (Boulder River to Bighorn River)	
Stillwater River	Castle Creek Picket Pin Creek W.F. Stillwater River Little Rocky Creek W. Fishtail Creek E. Fishtail Creek Fishtail Creek E. Rosebud Creek W. Rosebud Creek
Clarks Fork River	Clarks Fork River Butcher Creek Willow Creek Red Lodge Creek Clear Creek Dry Creek Rock Creek Sage Creek Bluewater Creek
LOWER YELLOWSTONE RIVER (Bighorn River to North Dakota State line)	Rosebud Creek
Tongue River	Hanging Woman Creek Otter Creek Pumpkin Creek

1987 DROUGHT

Since the Board established the Yellowstone Water Reservations on December 15, 1978, a number of water use permits have been issued which are junior to the Yellowstone Reservations. The MDFWP holds substantial instream flow reservations in the Yellowstone basin which can affect water availability for junior water permit holders under certain flow conditions.

Through the water use permit application objection process, the MDFWP notifies all junior water permit applicants, at the time they apply for a water use permit, of the existence of the instream flow reservations. They are informed that, under certain low stream flow conditions, the instream flow reservations may affect water availability for their projects. All water use permits granted in the Yellowstone basin which are junior to the instream flow reservations are conditioned to recognize the reservations.

SCS snow survey reports predicted that the Yellowstone basin would experience severe water shortages in the summer of 1987. The April 1 most probable "streamflow forecast" for the Yellowstone basin ranged from 62-89 percent of normal, with the lowest percentages occuring in the headwaters of the Yellowstone mainstem. April 1 snowpack was 60% of normal in the Yellowstone basin above Livingston, and 55% of normal in the Shields River. Snowpack in other parts of the basin ranged from 66-88 percent of normal.

It was anticipated that flows would fall below those granted in the Yellowstone Reservation for the protection of fish and wildlife habitats and water quality. To protect these instream reservations, the MDFWP, on June 30, 1987 sent a letter to the 126 junior water permit holders on reservation streams in the basin, notifying them of the potential drought and the fact that the instream reservations could affect their water use during the irrigation season (see letter in Appendix B). The letter stated that we would notify them again should low flows fall below our reservations.

Warm, dry weather early in the season caused irrigation to begin much earlier than normal. Peak flows were well below, and occurred about a month earlier than normal.

DFWP began monitoring flows twice per week on June 16, 1987 at 10 gage sites in the basin. On that date, flows were below the reservations at 7 of the 10 sites. This situation persisted through June. During July and August some streams were below and some above their reservations. This variation occcured because the granted reservation amounts changed on the first of each month (more frequently at some sites during the high flow period). Thus a given reservation could be below the actual streamflow on one day and above it the next (and vice versa) (see Appendix C). This variation creates some enforcement problems.

With stream flows dropping, it appeared conditions would become rather grim for the fisheries. However, during July and August, several general and local rainstorms in the basin caused flows to increase. These precipitation events occurred periodically throughout the greater part of the summer irrigation season, temporarily taking the pressure off receding water levels.

On the Yellowstone mainstem, flows generally were above the reservations after mid-July at Billings, Miles City, and Sydney. At Livingston, flows dropped relatively lower but still fluctuated above and below the reservations. Flows were sometimes well below the reservations in early July. However, in August and September the granted reservation amounts decreased and actual flows did not significantly fall below the granted flows. Not until late September and October did actual flows stabilize below the reservations for those months (Appendix C). Little or no precipitation occurred during these months but the weather had also cooled. By late fall, most, but not all, irrigators had ceased diverting water.

In addition, where flows did fall below the reservations on some streams, there were so few junior water users that closing their diversions would have had little or no effect on stream flows. The DFWP thus felt it was not prudent to ask those junior users to cease diverting water, and the second notification letter requiring this action was not sent.

Table 2

Final Instream Flow Quantifications

Quantifications of granted percentile flows in cubic feet per second and acre-feet per month. All quantifications are adjusted to a common 1934-82 base period except for Hanging Woman, Otter, and Pumpkin creeks in the Lower Yellowstone Basin.

UPPER YELLOWSTONE BASIN

(Gardiner to Mouth of Boulder River)

ARMSTRONG SPRING CREEK
Mouth to Origin

50th Percentile May-Sep.
10th Percentile Oct.-Apr.

	Cfs	AF
Jan.	102.0	6,272
Feb.	102.0	5,665
Mar.	102.0	6,272
Apr.	118.0	7,021
May	135.0	8,301
Jun.	151.0	8,985
Jul.	133.0	8,178
Aug.	120.0	7,378
Sep.	116.0	6,902
Oct.	110.0	6,764
Nov.	109.0	6,486
Dec.	105.0	6,456
		84,680 AF/year

Table 2 (continued).

BEAR CREEK
Mouth to North Fork (USGS Site No. 2)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	10.1	621
Feb.	9.58	532
Mar.	10.8	664
Apr.	32.2	1,916
May	90.8	5,583
Jun.	322.0	19,160
Jul.	135.0	8,301
Aug.	46.7	2,871
Sep.	38.8	2,309
Oct.	18.1	1,113
Nov.	16.5	982
Dec.	12.4	762
		44,814 AF/year

BEAR CREEK
North Fork to Fish Lake (USGS Site No. 1)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	5.68	349
Feb.	5.35	297
Mar.	6.15	378
Apr.	19.9	1,184
May	56.2	3,456
Jun.	186.0	11,068
Jul.	71.9	4,421
Aug.	24.3	1,494
Sep.	21.1	1,255
Oct.	10.3	633
Nov.	9.48	564
Dec.	7.11	437
		25,536 AF/year

Table 2 (continued).

BIG CREEK
Mouth to Millfork Creek (Gage No. 06191800)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	25.0	1,537
Feb.	23.0	1,277
Mar.	26.0	1,599
Apr.	57.0	3,392
May	117.0	7,194
Jun.	240.0	14,281
Jul.	97.0	5,964
Aug.	35.0	2,152
Sep.	33.0	1,964
Oct.	36.0	2,214
Nov.	34.0	2,023
Dec.	29.0	1,783
		45,380 AF/year

BIG CREEK
Millfork Creek to Bark Cabin Creek

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	9.0	553
Feb.	8.0	444
Mar.	9.0	553
Apr.	19.0	1,130
May	41.0	2,521
Jun.	84.0	4,998
Jul.	33.0	2,029
Aug.	12.0	738
Sep.	11.0	654
Oct.	13.0	799
Nov.	12.0	714
Dec.	10.0	615
		15,748 AF/year

BILLMAN CREEK
Mouth to Coke (Miner) Creek (USGS Site No. 20)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	9.66	594
Feb.	9.18	510
Mar.	10.4	640
Apr.	31.0	1,845
May	87.7	5,393
Jun.	27.8	1,654
Jul.	8.11	499
Aug.	2.53	156
Sep.	2.58	154
Oct.	17.4	1,070
Nov.	15.8	940
Dec.	11.9	732
		14,187 AF/year

BILLMAN CREEK
Coke (Miner) Creek to Fork South of NE Corner Sec. 20
(USGS Site No. 18)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	5.25	323
Feb.	4.94	274
Mar.	5.70	350
Apr.	18.6	1,107
May	52.6	3,234
Jun	21.6	1,285
Jul.	6.10	375
Aug.	1.88	116
Sep.	1.96	117
Oct.	9.50	584
Nov.	8.78	522
Dec.	6.59	405
		8,692 AF/year

Table 2 (continued).

BRACKETT CREEK
Mouth to Sheep Creek (USGS Gage No. 06194000)

50th Percentile Jan.-Dec.[1]

	Cfs	AF
Jan.	7.0	430
Feb.	7.0	389
Mar.	9.0	553
Apr.	42.0	2,499
May	93.0	5,718
Jun.	79.0	4,701
Jul.	27.0	1,660
Aug.	10.0	615
Sep.	11.0	654
Oct.	11.0	676
Nov.	9.0	536
Dec.	7.0	430
		18,861 AF/year

[1]Derived from the actual gage records of the Brackett Creek gage (#06194000). These cfs figures differ from those in Table 8 of the USGS report, which are estimates based on the Riggs' Method. (See Appendix A, pages 16-19)

Table 2 (continued).

BRACKETT CREEK
Sheep Creek to Skunk Creek (USGS Site No. 32)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	5.77	355
Feb.	5.77	320
Mar.	7.55	464
Apr.	40.4	2,404
May	89.6	5,509
Jun.	75.6	4,498
Jul.	29.6	1,820
Aug.	11.1	682
Sep.	11.9	708
Oct.	9.08	558
Nov.	7.31	435
Dec.	5.79	356
		18,109 AF/year

[1]These cfs figures differ from those in Table 8 of the USGS report, which are estimates based on the Riggs' Method. Those estimates were adjusted to account for the difference between the estimates derived from regression equations using the Riggs' Method, and the values determined from the gage record (No. 06194000). See explanation in Appendix A, Pages 16-19.

Table 2 (continued).

BRACKETT CREEK
Skunk Creek to Confluence of North, Middle and South Forks[1]
(USGS Site No. 31)

50th Percentile Jan.-Dec.[2]

	Cfs	AF
Jan.	3.20	197
Feb.	3.20	178
Mar.	4.26	262
Apr.	29.2	1,738
May	63.2	3,886
Jun.	49.0	2,916
Jul.	21.3	1,310
Aug.	7.98	491
Sep.	8.79	523
Oct.	5.01	308
Nov.	4.00	238
Dec.	3.17	195
		12,242 AF/year

[1]Shown in reservation application (page 32), and Order of the Board as "Brackett Creek-Skunk Creek to one mile up North, Middle, and South Forks."

[2]These cfs figures differ from those shown in Table 8 of the USGS report, which are estimates based on the Riggs' Method. Those estimates were adjusted to account for the difference between the estimates derived from regression equations using the Riggs' Method, and the values determined from the gage record (No. 06194000). See explanation in Appendix A, Pages 16-19.

Table 2 (continued).

CEDAR CREEK
Mouth to Second Fork (USGS Site No. 7)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	3.02	186
Feb.	2.81	156
Mar.	3.30	203
Apr.	11.7	696
May	33.0	2,029
Jun.	28.7	1,708
Jul.	8.43	518
Aug.	2.63	162
Sep.	2.68	159
Oct.	5.48	337
Nov.	5.15	306
Dec.	3.84	236
		6,696 AF/year

CINNABAR CREEK
Mouth to Cottonwood Creek (USGS Site No. 5)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	4.29	264
Feb.	4.21	234
Mar.	4.88	300
Apr.	16.3	970
May	46.1	2,835
Jun.	38.8	2,309
Jul.	11.9	732
Aug.	3.76	231
Sep.	3.73	222
Oct.	8.13	500
Nov.	7.54	449
Dec.	5.65	347
		9,393 AF/year

Table 2 (continued).

CINNABAR CREEK
Cottonwood Creek to FS Boundary in T8S, R7E and Sec. 32
(USGS Site No. 4)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	3.35	206
Feb.	3.13	174
Mar.	3.67	226
Apr.	12.8	761
May	36.1	2,220
Jun.	35.7	2,124
Jul.	10.8	664
Aug.	3.41	210
Sep.	3.41	203
Oct.	6.09	374
Nov.	5.70	339
Dec.	4.26	262
		7,763 AF/year

COKE (MINER) CREEK
Mouth to Miner (Eldridge) Creek (USGS Site No. 19)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	4.02	247
Feb.	3.77	209
Mar.	4.38	269
Apr.	14.9	887
May	42.0	2,582
Jun.	13.2	785
Jul.	3.46	213
Aug.	1.05	65
Sep.	1.14	68
Oct.	7.30	449
Nov.	6.79	404
Dec.	5.08	312
		6,490 AF/year

Table 2 (continued).

COTTONWOOD CREEK
Mouth to Little Cottonwood Creek (USGS Site No. 27)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	7.98	491
Feb.	7.98	443
Mar.	8.34	513
Apr.	20.9	1,244
May	79.8	4,907
Jun.	105.0	6,248
Jul.	33.3	2,048
Aug.	11.0	676
Sep.	10.1	601
Oct.	13.8	848
Nov.	11.9	708
Dec.	9.43	580
		19,307 AF/year

COTTONWOOD CREEK
Little Cottonwood Creek to Trespass Creek (USGS Site No. 26)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	5.44	334
Feb.	5.44	302
Mar.	5.69	350
Apr.	15.1	898
May	74.8	4,599
Jun.	105.0	6,248
Jul.	41.4	2,546
Aug.	13.7	842
Sep.	12.4	738
Oct.	9.40	578
Nov.	8.18	487
Dec.	6.43	395
		18,317 AF/year

Table 2 (continued).

EIGHTMILE CREEK
Mouth to Big Draw (USGS Site No. 14)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	10.5	646
Feb.	9.99	555
Mar.	11.2	689
Apr.	33.3	1,981
May	93.9	5,774
Jun.	63.2	3,761
Jul.	20.8	1,279
Aug.	6.72	413
Sep.	6.40	381
Oct.	18.9	1,162
Nov.	17.1	1,017
Dec.	12.9	793
		18,451 AF/year

EMIGRANT SPRING CREEK
Mouth to Origin

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	5.2	320
Feb.	5.2	289
Mar.	5.2	320
Apr.	9.0	536
May	12.5	768
Jun.	16.6	988
Jul.	12.5	768
Aug.	9.2	566
Sep.	7.4	440
Oct.	6.2	381
Nov.	5.8	345
Dec.	5.4	332

6,053 AF/year

FLATHEAD CREEK
Mouth to Muddy Creek (USGS Site No. 25)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	18.8	1,156
Feb.	18.8	1,044
Mar.	22.4	1,377
Apr.	33.6	1,999
May	123.0	7,563
Jun.	119.0	7,081
Jul.	25.7	1,580
Aug.	9.71	597
Sep.	8.51	506
Oct.	30.6	1,882
Nov.	26.7	1,589
Dec.	22.4	1,377

27,751 AF/year

Table 2 (continued).

FLATHEAD CREEK
Muddy Creek to Cache Creek (USGS Site No. 24)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	13.4	824
Feb.	13.4	744
Mar.	16.1	990
Apr.	31.1	1,851
May	112.0	6,887
Jun.	107.0	6,367
Jul.	35.2	2,164
Aug.	13.3	818
Sep.	11.4	678
Oct.	21.7	1,334
Nov.	18.8	1,119
Dec.	15.8	972
		24,748 AF/year

FLATHEAD CREEK
Cache Creek to S.F. Flathead Creek (USGS Site No. 23)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	4.20	258
Feb.	4.20	233
Mar.	5.24	322
Apr.	12.9	768
May	43.8	2,693
Jun.	33.1	1,970
Jul.	13.4	824
Aug.	5.07	312
Sep.	4.61	274
Oct.	6.74	414
Nov.	5.69	339
Dec.	4.86	299
		8,706 AF/year

Table 2 (continued).

FLESHMAN CREEK
Mouth to Perkins Creek (USGS Site No. 21)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	2.72	167
Feb.	2.53	140
Mar.	2.99	184
Apr.	10.7	637
May	30.3	1,863
Jun.	6.57	391
Jul.	1.55	95
Aug.	0.46	28
Sep.	0.52	31
Oct.	4.95	304
Nov.	4.66	277
Dec.	3.48	214
		4,331 AF/year

FRIDLEY CREEK
Mouth to Miller Creek (USGS Site No. 13)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	1.58	97
Feb.	1.46	81
Mar.	1.76	108
Apr.	6.81	405
May	19.2	1,181
Jun.	29.7	1,767
Jul.	8.76	539
Aug.	2.74	168
Sep.	2.78	165
Oct.	2.90	178
Nov.	2.77	165
Dec.	2.05	126
		4,980 AF/year

Table 2 (continued).

FRIDLEY CREEK
Miller Creek to Needle Creek (USGS Site No. 12)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	6.12	376
Feb.	5.77	320
Mar.	6.62	407
Apr.	21.2	1,261
May	59.8	3,677
Jun.	69.6	4,141
Jul.	23.3	1,433
Aug.	7.55	464
Sep.	7.13	424
Oct.	11.1	682
Nov.	10.2	607
Dec.	7.64	470
		14,262 AF/year

LITTLE MISSION CREEK
Mouth to Little Mission Forks (USGS Site No. 36)

90th Percentile May-Sep.
50th Percentile Oct.-Apr.

	Cfs	AF
Jan.	2.00	123
Feb.	2.00	111
Mar.	2.55	157
Apr.	9.66	575
May	38.1	2,343
Jun.	31.9	1,898
Jul.	5.60	344
Aug.	1.72	106
Sep.	1.65	98
Oct.	3.19	196
Nov.	2.65	158
Dec.	2.28	140
		6,249 AF/year

MCDONALD SPRING CREEK
Mouth to northern boundary of Sec. 22

50th Percentile May-Sep
10th Percentile Oct-Apr

	Cfs	AF
Jan.	7.2	443
Feb.	7.2	400
Mar.	7.2	443
Apr.	12.1	720
May	16.8	1,033
Jun.	21.3	1,267
Jul.	16.8	1,033
Aug.	12.7	781
Sep.	10.4	619
Oct.	8.6	529
Nov.	10.2	607
Dec.	9.5	584
		8,459 AF/year

MIDDLE FORK BRACKETT CREEK
Mouth to One Mile Upstream[1] (USGS Site No. 29)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	1.28	79
Feb.	1.28	71
Mar.	1.66	102
Apr.	10.5	625
May	35.3	2,170
Jun.	25.3	1,505
Jul.	4.61	283
Aug.	1.74	107
Sep.	1.69	101
Oct.	2.04	125
Nov.	1.68	100
Dec.	1.45	89
		5,357 AF/year

[1]Shown in reservation application (page 32), and Order of the Board as "Brackett Creek-Skunk Creek to one mile up North, Middle, and South forks."

Table 2 (continued).

MILL CREEK
Mouth to East Fork (USGS Gage No. 06192000)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	33.0	2,029
Feb.	34.0	1,888
Mar.	33.0	2,029
Apr.	80.0	4,760
May	388.0	23,857
Jun.	757.0	45,045
Jul.	323.0[1]	19,860
Aug.	115.0[1]	7,071
Sep.	89.7[1]	5,338
Oct.	51.0	3,136
Nov.	58.0	3,451
Dec.	47.0	2,890
		121,354 AF/year

[1]Values for these three months are estimates derived for USGS Site No. 15 using the Riggs' Method.

MISSION CREEK
Mouth to Little Bear Draw (USGS Site No. 37)

90th Percentile May-Sep.
50th Percentile Oct.-Apr.

	Cfs	AF
Jan.	6.79	418
Feb.	6.79	377
Mar.	8.36	514
Apr.	24.6	1,464
May	122.0	7,502
Jun.	94.6	5,629
Jul.	27.4	1,685
Aug.	9.68	595
Sep.	8.05	479
Oct.	11.0	676
Nov.	9.35	556
Dec.	7.93	488
		20,383 AF/year

Table 2 (continued).

MOL HERON CREEK
Mouth to Cinnabar Creek (USGS Site No. 6)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	9.93	611
Feb.	9.45	525
Mar.	10.6	652
Apr.	31.8	1,892
May	89.7	5,515
Jun.	125.0	7,438
Jul.	45.6	2,804
Aug.	15.1	928
Sep.	13.6	809
Oct.	17.9	1,101
Nov.	16.2	964
Dec.	12.3	756
		23,995 AF/year

MOL HERON CREEK
Cinnabar Creek to Yellowstone Park Boundary (USGS Site No. 3)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	6.91	425
Feb.	6.53	363
Mar.	7.46	459
Apr.	23.4	1,392
May	66.2	4,070
Jun.	92.7	5,516
Jul.	32.4	1,992
Aug.	10.6	652
Sep.	9.78	582
Oct.	12.5	769
Nov.	11.4	678
Dec.	8.60	529
		17,427 AF/year

Table 2 (continued).

NELSON SPRING CREEK
Mouth to Origin

50th Percentile May-Sep.
10th Percentile Oct.-Apr.

	Cfs	AF
Jan.	61	3,751
Feb.	61	3,387
Mar.	61	3,751
Apr.	61	3,630
May	33	2,029
Jun.	33	1,964
Jul.	33	2,029
Aug.	33	2,029
Sep.	33	1,964
Oct.	61	3,751
Nov.	61	3,630
Dec.	61	3,751
		35,666 AF/year

NORTH FORK BRACKETT CREEK
Mouth to One Mile Upstream[1] (USGS Site No. 28)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	2.08	128
Feb.	2.08	116
Mar.	2.66	164
Apr.	11.9	708
May	40.4	2,484
Jun.	29.9	1,779
Jul.	11.3	695
Aug.	4.26	262
Sep.	3.92	233
Oct.	3.32	204
Nov.	2.77	165
Dec.	2.38	146
		7,084 AF/year

[1]Shown in reservation application (page 32), and Order of the Board as "Brackett Creek-Skunk Creek to one mile up North, Middle, and South forks."

Table 2 (continued).

ROCK CREEK (SHIELDS DRAINAGE)
Mouth to Forest Service West Boundary Sec. 8 (USGS Site No. 34)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	5.77	355
Feb.	5.77	320
Mar.	6.03	371
Apr.	15.9	946
May	68.0	4,181
Jun.	132.0	7,854
Jul.	48.6	2,988
Aug.	16.2	996
Sep.	14.5	863
Oct.	9.96	612
Nov.	8.66	515
Dec.	6.81	419
		20,420 AF/year

ROCK CREEK (YELLOWSTONE DRAINAGE)
Mouth to Steele Creek (USGS Site No. 10)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	4.36	268
Feb.	4.09	227
Mar.	4.74	291
Apr.	15.9	946
May	45.0	2,767
Jun.	109.0	6,486
Jul.	39.1	2,404
Aug.	12.9	793
Sep.	11.8	702
Oct.	7.90	486
Nov.	7.34	437
Dec.	5.50	338
		16,145 AF/year

Table 2 (continued).

SIXMILE CREEK
Mouth to North Fork (USGS Site No. 11)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	6.60	406
Feb.	6.23	346
Mar.	7.13	438
Apr.	22.6	1,345
May	63.7	3,917
Jun.	157.0	9,342
Jul.	59.1	3,634
Aug.	19.8	1,217
Sep.	17.5	1,041
Oct.	11.9	732
Nov.	10.9	649
Dec.	8.23	506
		23,573 AF/year

SMITH CREEK
Mouth to Bitter Creek (USGS Site No. 22)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	2.61	160
Feb.	2.61	145
Mar.	3.31	204
Apr.	23.9	1,422
May	85.1	5,233
Jun.	75.5	4,493
Jul.	13.6	836
Aug.	5.14	316
Sep.	4.67	278
Oct.	4.17	256
Nov.	3.49	208
Dec.	2.99	184
		13,735 AF/year

Table 2 (continued).

SOUTH FORK BRACKETT CREEK
Mouth to One Mile Upstream[1] (USGS Site No. 30)

50th Percentile Jan.-Dec.

	Cfs	AF
Jan.	0.97	60
Feb.	0.97	54
Mar.	1.27	78
Apr.	8.29	493
May	27.4	1,685
Jun.	18.5	1,101
Ju.	5.68	349
Aug.	2.15	132
Sep.	2.05	122
Oct.	1.54	95
Nov.	1.26	75
Dec.	1.09	67
		4,311 AF/year

[1]Shown in reservation application (page 32), and Order of the Board as "Brackett Creek-Skunk Creek to one mile up North, Middle, and South forks."

Table 2 (continued).

SUCE CREEK
Mouth to Lost Creek (USGS Site No. 17)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	0.83	51
Feb.	0.76	42
Mar.	0.93	57
Apr.	3.96	236
May	11.2	689
Jun.	34.5	2,053
Jul.	10.4	639
Aug.	3.27	201
Sep.	3.28	195
Oct.	1.53	94
Nov.	1.48	88
Dec.	1.09	67
		4,412 AF/year

TOM MINER CREEK
Mouth to Canyon Creek (USGS Site No. 9)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	20.7	1,273
Feb.	19.9	1,105
Mar.	21.9	1,347
Apr.	58.8	3,499
May	166.0	10,207
Jun.	188.0	11,187
Jul.	72.7	4,470
Aug.	24.6	1,513
Sep.	21.3	1,267
Oct.	37.0	2,275
Nov.	33.0	1,964
Dec.	25.0	1,537
		41,644 AF/year

Table 2 (continued).

TOM MINER CREEK
Canyon Creek to Trail Creek (USGS Site No. 8)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	22.0	1,353
Feb.	21.3	1,183
Mar.	23.3	1,433
Apr.	62.0	3,689
May	175.0	10,760
Jun.	211.0	12,555
Jul.	83.2	5,116
Aug.	28.3	1,740
Sep.	24.3	1,446
Oct.	39.4	2,423
Nov.	35.0	2,083
Dec.	26.6	1,636
		45,417 AF/year

TRAIL CREEK
West Pine Creek to South Boundary Sec. 35
(USGS Site No. 16)

50th Percentile May-Sep.
20th Percentile Oct.-Apr.

	Cfs	AF
Jan.	7.93	488
Feb.	7.52	418
Mar.	8.54	525
Apr.	26.3	1,565
May	74.3	4,568
Jun.	59.0	3,511
Jul.	19.3	1,187
Aug.	6.20	381
Sep.	5.93	353
Oct.	14.3	879
Nov.	13.1	780
Dec.	9.84	605
		15,260 AF/year

Table 2 (continued).

MIDDLE YELLOWSTONE BASIN

(Boulder River to Big Horn River)

Table 2 (continued).

BLUEWATER CREEK
Mouth to Headwaters
(USGS Gage No. 06207800)

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	26.5	1,629
Feb.	27.5	1,527
Mar.	27.0	1,660
Apr.	28.0	1,666
May	27.0	1,660
Jun.	25.5	1,517
Jul.	24.0	1,476
Aug.	25.0	1,537
Sep.	26.0	1,547
Oct.	27.0	1,660
Nov.	27.0	1,607
Dec.	27.0	1,660
		19,146 AF/year

BRIDGER CREEK
Headwaters to Krone Ditch Headgate (USGS Site No. 40)

90th Percentile Jan.-Dec.

	Cfs	AF
Jan.	1.48	91
Feb.	1.48	82
Mar.	1.52	94
Apr.	4.77	284
May	25.3	1,556
Jun.	43.7	2,600
Jul.	3.44	212
Aug.	1.01	62
Sep.	1.01	60
Oct.	1.98	122
Nov.	2.46	146
Dec.	1.75	108
		5,417 AF/year

Table 2 (continued).

BUTCHER CREEK
Headwaters to West Butcher Creek

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	0.5	31
Feb.	0.6	33
Mar.	1.0	61
Apr.	1.6	95
May	3.7	228
Jun.	3.7	220
Jul.	1.1	68
Aug.	0.3	18
Sep.	0.5	30
Oct.	0.8	49
Nov.	0.7	42
Dec.	0.6	37
		912 AF/year

BUTCHER CREEK
West Butcher Creek to Mouth

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	5.3	326
Feb.	10.2	566
Mar.	8.7	535
Apr.	12.7	756
May	18.4	1,131
Jun.	32.5	1,934
Jul.	50.0	3,074
Aug.	58.0	3,566
Sep.	36.0	2,142
Oct.	18.0	1,107
Nov.	8.8	524
Dec.	5.8	357
		16,018 AF/year

Table 2 (continued).

CASTLE CREEK
Mouth to 1,500 ft. above Picket Pin Creek

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	9.2	566
Feb.	9.3	516
Mar.	10.6	652
Apr.	15.2	904
May	39.3	2,416
Jun.	56.5	3,362
Jul.	22.0	1,353
Aug.	10.0	615
Sep.	11.3	672
Oct.	13.8	848
Nov.	12.2	726
Dec.	10.2	627
		13,257 AF/year

CLARKS FORK YELLOWSTONE RIVER[1]

90th Percentile Oct.-May
70th Percentile June-Sep.

	Cfs	AF
Jan.	300.0	18,446
Feb.	299.0	16,606
Mar.	308.0	18,938
Apr.	357.0	21,243
May	1,051.0	64,623
Jun.	3,569.0	212,370
Jul.	1,537.0	94,506
Aug.	399.0	24,534
Sep.	393.0	23,385
Oct.	332.0	20,414
Nov.	401.0	23,861
Dec.	330.0	20,291
		559,217 AF/year

[1]Measured at USGS gage No. 06208500 "Clarks Fork River at Edgar."

Table 2 (continued).

CLARKS FORK YELLOWSTONE RIVER[1]

90th Percentile Oct.-May
70th Percentile June-Sep.

	Cfs	AF
Jan.	186.0	11,437
Feb.	194.0	10,774
Mar.	189.0	11,621
Apr.	250.0	14,876
May	1,062.0	65,300
Jun.	3,477.0	206,896
Jul.	1,640.0	100,840
Aug.	423.0	26,009
Sep.	240.0	14,281
Oct.	117.0	7,194
Nov.	200.0	11,901
Dec.	229.0	14,081
		495,210 AF/year

[1]Measured at USGS gage No. 06207500 "Clarks Fork River near Belfry."

CLEAR CREEK
Headwaters to Mouth

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	9.8	602
Feb.	7.3	405
Mar.	14.0	861
Apr.	9.1	541
May	1.5	92
Jun.	1.4	83
Jul.	3.8	234
Aug.	7.8	480
Sep.	10.6	631
Oct.	39.1	2,404
Nov.	20.6	1,226
Dec.	13.1	805
		8,364 AF/year

Table 2 (continued).

DRY CREEK
Headwaters to Mouth

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	2.2	135
Feb.	2.7	150
Mar.	4.6	283
Apr.	3.7	220
May	1.5	92
Jun.	0.7	42
Jul.	0.4	24
Aug.	7.4	455
Sep.	10.6	631
Oct.	12.0	738
Nov.	2.6	155
Dec.	2.2	135
		3,060 AF/year

EAST FISHTAIL CREEK
West Fishtail Creek to its East Fork

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	1.2	74
Feb.	1.2	67
Mar.	1.5	92
Apr.	2.4	143
May	8.5	523
Jun.	9.5	565
Jul.	3.2	197
Aug.	1.4	86
Sep.	2.0	119
Oct.	1.7	104
Nov.	1.6	95
Dec.	1.3	80
		2,145 AF/year

Table 2 (continued).

EAST ROSEBUD CREEK
Custer Nat'l Forest Boundary to W. Rosebud Creek

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	58.2	3,578	
Feb.	58.4	3,243	
Mar.	58.3	3,585	
Apr.	73.2	4,356	
May	296.2	18,213	
Jun.	732.3	43,575	
Jul.	317.2	19,504	
Aug.	93.0	5,718	
Sep.	52.6	3,130	
Oct.	41.7	2,564	
Nov.	62.4	3,713	
Dec.	68.2	4,193	
		115,372	AF/year

FISHTAIL CREEK
Confluence of East & West Fishtail Creeks to Mouth

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	4.1	252	
Feb.	4.2	233	
Mar.	4.9	301	
Apr.	7.2	428	
May	36.3	2,232	
Jun.	51.5	3,064	
Jul.	19.9	1,224	
Aug.	9.0	553	
Sep.	10.3	613	
Oct.	6.0	369	
Nov.	5.4	321	
Dec.	4.5	277	
		9,867	AF/year

Table 2 (continued).

LITTLE ROCKY CREEK
Mouth to Forest Service Road #1414 Crossing

85th Percentile Jan.-Dec.

	Cfs	AF
Jan.	0.3	18
Feb.	0.3	17
Mar.	0.4	24
Apr.	0.6	36
May	6.6	406
Jun.	7.2	428
Jul.	2.4	148
Aug.	1.0	61
Sep.	1.5	89
Oct.	0.4	24
Nov.	0.4	24
Dec.	0.3	18
		1,293 AF/year

LOWER DEER CREEK
Headwaters to I-90 (USGS Site No. 39)

90th Percentile Jan.-Dec.

	Cfs	AF
Jan.	3.09	190
Feb.	3.09	172
Mar.	3.12	192
Apr.	10.4	619
May	51.9	3,191
Jun.	101.0	6,010
Jul.	13.7	842
Aug.	4.55	280
Sep.	4.03	240
Oct.	4.28	263
Nov.	4.90	292
Dec.	3.61	222
		12,513 AF/year

Table 2 (continued).

PICKET PIN CREEK
Mouth to Mouth of Swamp Creek

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	2.0	123	
Feb.	2.0	111	
Mar.	2.4	148	
Apr.	3.7	220	
May	13.7	842	
Jun.	16.6	988	
Jul.	5.8	357	
Aug.	2.5	154	
Sep.	3.5	208	
Oct.	2.9	178	
Nov.	2.6	155	
Dec.	2.2	135	
		3,619	AF/year

RED LODGE CREEK
Custer Nat'l Forest to Cooney Reservoir

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	11.0	676	
Feb.	18.0	1,000	
Mar.	21.5	1,322	
Apr.	41.0	2,440	
May	51.0	3,136	
Jun.	77.0	4,582	
Jul.	25.0	1,537	
Aug.	22.0	1,353	
Sep.	19.0	1,130	
Oct.	25.5	1,568	
Nov.	21.5	1,279	
Dec.	11.5	707	
		20,730	AF/year

Table 2 (continued).

ROCK CREEK (CLARKS FORK YELLOWSTONE)
Mouth to Custer National Forest
(USGS Gage No. 06209500)

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	29.0	1,783	
Feb.	27.0	1,500	
Mar.	25.5	1,568	
Apr.	30.0	1,785	
May	113.0	6,948	
Jun.	418.5	24,902	
Jul.	326.5	20,076	
Aug.	205.5	12,636	
Sep.	108.5	6,456	
Oct.	66.0	4,058	
Nov.	45.0	2,678	
Dec.	34.5	2,121	
		86,511	AF/year

SAGE CREEK
Headwaters to Crow Reservation

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	2.3	141	
Feb.	2.3	128	
Mar.	2.8	172	
Apr.	4.2	250	
May	11.3	695	
Jun.	13.3	791	
Jul.	4.6	283	
Aug.	2.0	123	
Sep.	2.8	167	
Oct.	3.3	203	
Nov.	3.0	178	
Dec.	2.5	154	
		3,285	AF/year

Table 2 (continued).

SWEET GRASS CREEK
Mouth to Forest Service Boundary (Gage No. 06200500)

90th Percentile Jan.-Dec.

	Cfs	AF
Jan.	8.0	492
Feb.	8.0	444
Mar.	8.0	492
Apr.	10.0	595
May	84.0	5,165
Jun.	252.0	14,995
Jul.	112.0	6,887
Aug.	41.0	2,521
Sep.	26.0	1,547
Oct.	20.0	1,230
Nov.	16.0	952
Dec.	10.0	615
		35,935 AF/year

UPPER DEER CREEK
Headwaters to a Point Upstream from I-90 Bridge (USGS Site No. 38)

90th Percentile Jan.-Dec.

	Cfs	AF
Jan.	3.06	188
Feb.	3.06	170
Mar.	3.08	189
Apr.	13.3	791
May	64.6	3,972
Jun.	130.0	7,736
Jul.	7.17	441
Aug.	2.25	138
Sep.	2.11	126
Oct.	4.23	260
Nov.	4.85	289
Dec.	3.57	220
		14,520 AF/year

Table 2. (continued)

WEST FISHTAIL CREEK
East Fishtail Creek to Richmond - Kennedy Ditch

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	0.9	55	
Feb.	0.9	50	
Mar.	1.1	68	
Apr.	1.7	101	
May	11.4	701	
Jun.	13.4	797	
Jul.	4.7	289	
Aug.	2.0	123	
Sep.	2.8	167	
Oct.	1.2	74	
Nov.	1.2	71	
Dec.	1.0	61	
		2,557	AF/year

WEST FORK STILLWATER RIVER
Mouth to Castle Creek

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	21.1	1,297	
Feb.	21.3	1,183	
Mar.	23.5	1,445	
Apr.	32.8	1,952	
May	135.5	8,332	
Jun.	238.1	14,168	
Jul.	104.1	6,401	
Aug.	49.4	3,037	
Sep.	45.1	2,684	
Oct.	32.3	1,986	
Nov.	28.0	1,666	
Dec.	23.5	1,445	
		45,596	AF/year

Table 2. (continued)

WEST FORK STILLWATER RIVER
Castle Creek to Sweetgrass/Stillwater County Line

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	8.5	523	
Feb.	8.7	483	
Mar.	9.9	609	
Apr.	14.3	851	
May	133.7	8,221	
Jun.	234.5	13,954	
Jul.	102.4	6,296	
Aug.	48.6	2,988	
Sep.	44.5	2,648	
Oct.	12.8	787	
Nov.	11.4	678	
Dec.	9.5	584	
		38,622	AF/year

WEST FORK STILLWATER RIVER
Sweetgrass/Stillwater County Line to Tumble Creek

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	3.0	184	
Feb.	3.1	172	
Mar.	3.6	221	
Apr.	5.8	345	
May	102.0	6,272	
Jun.	210.0	12,496	
Jul.	73.0	4,488	
Aug.	28.0	1,722	
Sep.	24.0	1,428	
Oct.	5.0	307	
Nov.	4.4	262	
Dec.	3.4	209	
		28,106	AF/year

Table 2 (continued).

WEST ROSEBUD CREEK
Custer Nat'l Forest Boundary to Fiddler Creek

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	38.2	2,349	
Feb.	38.4	2,133	
Mar.	41.6	2,558	
Apr.	56.7	3,374	
May	192.7	11,848	
Jun.	358.4	21,326	
Jul.	162.0	9,961	
Aug.	77.9	4,790	
Sep.	66.9	3,981	
Oct.	59.2	3,640	
Nov.	50.7	3,017	
Dec.	42.8	2,632	
		71,609	AF/year

WEST ROSEBUD CREEK
Fiddler Creek to Mouth

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	48.6	2,988	
Feb.	48.8	2,710	
Mar.	52.5	3,228	
Apr.	70.9	4,219	
May	180.9	11,123	
Jun.	331.1	19,702	
Jul.	149.7	9,205	
Aug.	71.8	4,415	
Sep.	62.4	3,713	
Oct.	75.9	4,667	
Nov.	64.6	3,844	
Dec.	54.6	3,357	
		73,171	AF/year

Table 2. (continued)

WILLOW CREEK
Forest Boundary to Cooney Reservoir

85th Percentile Jan.-Dec.

	Cfs	AF	
Jan.	6.0	369	
Feb.	4.0	222	
Mar.	9.0	553	
Apr.	16.0	952	
May	19.0	1,168	
Jun.	26.0	1,547	
Jul.	24.0	1,476	
Aug.	20.0	1,230	
Sep.	24.0	1,428	
Oct.	19.0	1,168	
Nov.	16.5	982	
Dec.	7.5	461	
		11,556	AF/year

Table 2 (continued).

LOWER YELLOWSTONE BASIN

(Big Horn River to North Dakota State Line)

Table 2 (continued).

HANGING WOMAN CREEK
East Fork to Tongue River (Gage No. 06307600)

Historic Minimum Monthly Flows[1]

	Cfs	AF
Jan.	0.30	18.4
Feb.	0.60	33.3
Mar.	0.66	40.6
Apr.	0.61	36.3
May	0.52	32.0
Jun.	0.34	20.2
Jul.	0.01	0.6
Aug.	0.00	0.0
Sep.	0.00	0.0
Oct.	0.04	2.5
Nov.	0.18	10.7
Dec.	0.06	3.7
		198.3 AF/year

[1]Period of record September 1973 through September 1984. The 1934-82 common base period was not used on this stream.

OTTER CREEK
Bear Creek to Tongue River (Gage No. 06307740)

Historic Minimum Monthly Flows[1]

	Cfs	AF
Jan.	1.67	102.7
Feb.	1.87	103.8
Mar.	2.65	162.9
Apr.	1.59	94.6
May	2.61	160.5
Jun.	2.14	127.3
Jul.	0.28	17.2
Aug.	0.08	4.9
Sep.	0.13	7.7
Oct.	0.40	24.6
Nov.	1.63	97.0
Dec.	2.05	126.0
		1,029.2 AF/year

[1]Period of record October 1972 through September 1984. The 1934-82 common base period was not used on this stream.

Table 2 (continued).

PUMPKIN CREEK
Deer Creek to Tongue River (Gage No. 06308400)

Historic Minimum Monthly Flows[1]

	Cfs	AF
Jan.	0.00	0.0
Feb.	0.00	0.0
Mar.	0.01	0.6
Apr.	0.00	0.0
May	0.00	0.0
Jun.	0.00	0.0
Jul.	0.00	0.0
Aug.	0.00	0.0
Sep.	0.00	0.0
Oct.	0.00	0.0
Nov.	0.00	0.0
Dec.	0.00	0.0
		0.6 AF/year

[1]Period of record October 1972 through September 1984. The 1934-82 common base period was not used on this stream.

ROSEBUD CREEK
Cottonwood Creek to Yellowstone River (Gage No. 06296003)

80th Percentile Jan.-Dec.

	Cfs	AF
Jan.	7.0	430
Feb.	18.0	1,000
Mar.	22.0	1,353
Apr.	36.0	2,142
May	28.0	1,722
Jun.	37.0	2,202
Jul.	9.0	553
Aug.	7.0	430
Sep.	2.0	119
Oct.	9.0	553
Nov.	10.0	595
Dec.	12.0	738
		11,837 AF/year

rpt/517.3

APPENDICES

Appendix A. Final quantifications of granted percentile flows under phase 3 of USGS/DFWP agreement.

NUMBER	SITE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1.	Red Lodge Creek	25.5	21.5	11.5	11.0	18.0	21.5	41.0	51.0	77.0	25.0	22.0	19.0
2.	Willow Creek	19.0	16.5	7.5	6.0	4.0	9.0	16.0	19.0	26.0	24.0	20.0	24.0
3.	Butcher Creek	0.8	0.7	0.6	0.5	0.6	1.0	1.6	3.7	3.7	1.1	0.3	0.5
4.	West Fishtail Creek	1.2	1.2	1.0	0.9	0.9	1.1	1.7	11.4	13.4	4.7	2.0	2.8
5.	East Fishtail Creek	1.7	1.6	1.3	1.2	1.2	1.5	2.4	8.5	9.5	3.2	1.4	2.0
6.	Little Rocky Creek	0.4	0.4	0.3	0.3	0.3	0.4	0.6	6.6	7.2	2.4	1.0	1.5
7.	W. Rosebud at Pine Grove Camp (Upper Section)	59.2	50.7	42.8	38.2	38.4	41.6	56.7	192.7	358.4	162.0	77.9	66.9
8.	W. Rosebud Bl. Ingersoll Creek (Lower Section)	75.9	64.6	54.6	48.6	48.8	52.5	70.9	180.9	333.1	149.7	71.8	62.4
9.	Castle Creek	13.8	12.2	10.2	9.2	9.3	10.6	15.2	39.3	56.5	22.0	10.0	11.3
10.	Fishtail Creek	6.0	5.4	4.5	4.1	4.2	4.9	7.2	36.3	51.5	19.9	9.0	10.3
11.	Picket Pin Creek	2.9	2.6	2.2	2.0	2.0	2.4	3.7	13.7	16.6	5.8	2.5	3.5
12.	Sage Creek	3.3	3.0	2.5	2.3	2.3	2.8	4.2	11.3	13.3	4.6	2.0	2.8
13.	W. Fork Stillwater at County Line	12.8	11.4	9.5	8.5	8.7	9.9	14.3	133.7	234.5	102.4	48.6	44.5
14.	W. Fork Stillwater at Mouth	32.3	28.0	23.5	21.1	21.3	23.5	32.8	135.5	238.1	104.1	49.4	45.1
15.	Clear Creek at Mouth	39.1	20.6	13.1	9.8	7.3	14.0	9.1	1.5	1.4	3.8	7.8	10.6
16.	Dry Creek at Mouth	12.0	2.6	2.2	2.2	2.7	4.6	3.7	1.5	0.7	0.4	7.4	10.6
17.	Emigrant Spring Creek	6.2	5.8	5.4	5.2	5.2	5.2	9.0	12.5	16.6	12.5	9.2	7.4
18.	South McDonald Spring Creek *	12.5	12.1	11.6	11.3	11.3	11.3	16.1	21.5	26.5	21.1	16.8	14.3
19.	Middle McDonald Spring Creek	8.6	10.2	9.5	7.2	7.2	7.2	12.1	16.8	21.3	16.8	12.7	10.4
20.	North McDonald Spring Creek *	3.2	3.0	2.8	2.6	2.6	2.6	4.6	6.4	8.5	6.4	4.7	3.8
21.	Armstrong Spring Creek	110.0	109.0	105.0	102.0	102.0	102.0	118.0	135.0	151.0	133.0	120.0	116.0

Note: Monthly percentile is 85 for all months except for the last 5 spring creeks. For these streams, monthly percentile is 50 for the months May-September and 10 for the months October-April.

* Flows not granted by The Board.

Percentile Discharges for East Rosebud Cr at Roscoe (06203500)
1934-82 extended base period (85th percentile)

PCT .90	PCT .80	PCT .70	PCT .60	PCT .50	PCT .40	PCT .30	PCT .20	PCT .10	Mean	Name
35.6	47.8	57.7	65.5	77.3	84.6	90.5	101.4	129.2	78.7	OCT
38.9	55.3	72.9	77.5	82.1	88.3	93.7	107.3	114.4	84.8	NOV
66.9	69.4	73.4	75.4	78.3	81.3	85.1	89.9	95.0	79.0	DEC
55.0	61.4	65.8	66.1	70.5	73.4	74.5	78.3	81.3	70.0	JAN
57.3	59.5	64.4	68.0	69.1	70.2	72.9	74.5	83.7	69.1	FEB
55.9	60.6	63.3	64.7	65.9	68.5	71.3	72.4	78.6	67.2	MAR
72.6	73.7	80.0	89.7	96.9	109.9	127.1	146.4	217.9	115.1	APR
231.8	310.6	385.9	417.4	489.0	541.8	603.2	660.0	754.7	494.1	MAY
695.2	769.4	856.5	920.1	998.5	1072.8	1133.6	1271.3	1374.3	1014.6	JUN
242.1	392.4	423.5	446.7	555.6	618.8	708.5	865.3	951.1	585.7	JUL
80.5	105.4	118.9	136.7	146.9	172.0	215.8	260.6	284.0	171.7	AUG
47.8	57.3	69.9	75.4	83.5	97.4	116.5	132.8	152.9	96.5	SEP

PERCENTILE DISCHARGES, IN CFS, FOR NELSON SPRING CREEK
(PERCENTILES ARE 10 FOR OCT-APR, 50 FOR MAY-SEP)

****

OCT	61
NOV	61
DEC	61
JAN	61
FEB	61
MAR	61
APR	61
MAY	33
JUN	33
JUL	33
AUG	33
SEP	33

PERCENTILE DISCHARGES, IN CFS, FOR
BIG CREEK AT MOUTH OF BARK CABIN CR.
(PERCENTILES ARE 20 FOR OCT-APR AND
50 FOR MAY-SEP)

****

OCT	13
NOV	12
DEC	10
JAN	9
FEB	8
MAR	9
APR	19
MAY	41
JUN	84
JUL	33
AUG	12
SEP	11

Butcher Creek near Absarokee
85 Percentile

	cfs
October	18
November	8.8
December	5.8
January	5.3
February	10.2
March	8.7
April	12.7
May	18.4
June	32.5
July	50
August	58
September	36

West Fork Stillwater River near Tumble Creek near Nye
85 Percentile

	cfs
October	5.0
November	4.4
December	3.4
January	3.0
February	3.1
March	3.6
April	5.8
May	102
June	210
July	73
August	28
September	24

APPENDIX B

Initial notification letter to
Yellowstone basin junior water users

Montana Department of Fish, Wildlife & Parks

1420 East Sixth Avenue
Helena, Montana 59620
June 30, 1987

Dear Water Permit Holder:

Current predictions are that flows will be extremely low this summer in many Montana streams. These low flows may cause inconvenience and hardship for persons dependent on that water for their livelihood as well as adversely affect fish and other water-dependent wildlife.

Foreseeing such possibilities, the 1973 Montana legislature passed the Montana Water Use Act, which established a process for reserving water in Montana's streams for fish, wildlife and water quality. Between 1974-1979 the reservation process was applied to the Yellowstone River and its tributaries. The Board of Natural Resources allocated flows among the various users by an order signed on December 15, 1978. A significant portion of the flows were reserved for instream purposes. Consequently, Yellowstone drainage water permit holders having priority dates after December 15, 1978 are subject to the instream flows granted by the Board.

During drought years flows are very likely to fall below the instream reservations on many Yellowstone basin streams. When these conditions occur, the Department of Fish, Wildlife and Parks notifies all junior water permit holders to cease their diversions for as long as flows are below our reservations.

Streamflows on some streams have already dropped below the instream reservations for this time of year. However, the purpose of instream flows during the (normal) spring high water period is to maintain the channel characteristics (i.e. size, shape) which provide the physical aquatic habitats for fish and other aquatic life. This year spring flows were not high enough to perform those functions, yet flows are still high enough that fish habitat has not yet been adversely affected. Therefore, the department will not enforce the provisions of the reservations until the high flow period ends and we begin to experience low summer flows. At that time, if flows are below the instream reservations, we will notify junior users to cease their diversions.

This letter is being sent to all water permit holders of record having permits junior to the instream flow reservation. While it is not our intent to cause undue hardship, it is incumbent upon us to protect the rights granted for the protection of fish, wildlife and water quality. Your adherence to the law and judicious use of water during this drought period will aid us in that endeavor.

Sincerely,

James W. Flynn
Director

Appendix C: 1987 Streamflow/Instream Reservations monitored at USGS gage near Livingston.