

RECLAMATION

Managing Water in the West

December 7, 2016

Dear Customer:

Attached is the Monthly Water Supply Outlook and projected operations for Canyon Ferry Dam and Reservoir. The anticipated inflow during December is forecasted to be 192.0 kaf, or 92 percent of the 30-year average. If you have any questions or concerns, please contact me at 406-247-7320 or Clayton Jordan at 406-247-7334.

Stephanie Micek
Reservoir and River Operations



U. S. Department of the Interior
Bureau of Reclamation
Montana Area Office
River and Reservoir Operations

CANYON FERRY RESERVOIR OPERATIONS
Water Supply Forecasts and Reservoir Operations
December 1, 2016

<u>Elevation</u>	<u>Storage (af)</u>	<u>% Average*</u>	<u>% Full</u>
3785.79	1,531,073	96	81

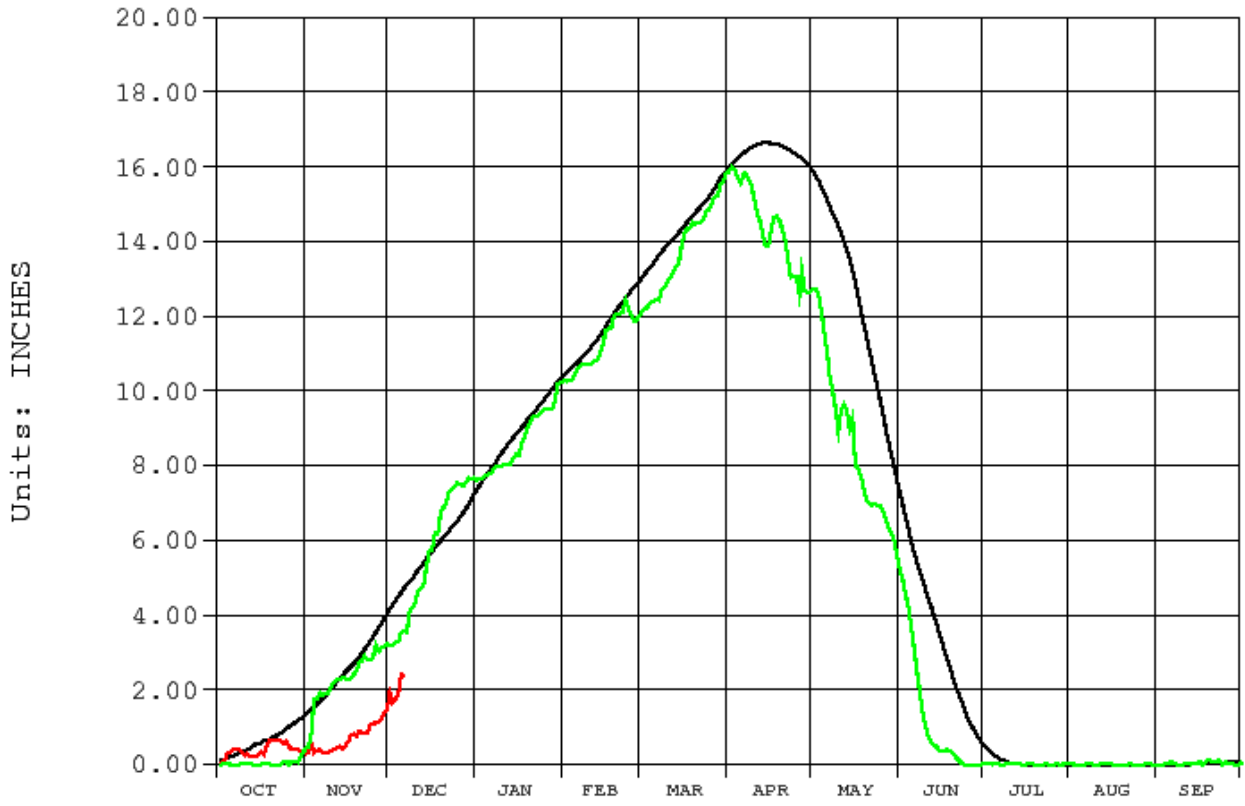
*percent of average is based on past 30 years

Actual Inflows (1,000 Acre-Feet):

<u>Month</u>	<u>Inflow</u>	<u>Percent of Average*</u>
<u>Water Year 2017</u>		
October	210.8	92
November	244.9	100
<u>Water Year 2016</u>		
	2,731.6	82
October	174.1	74
November	199.7	82
December	192.0	92
January	200.0	96
February	208.5	105
March	219.4	88
April	342.2	115
May	519.5	109
June	364.6	56
July	114.2	42
August	79.4	57
September	117.6	72
<i>April – July</i>	<i>1,340.5</i>	<i>79</i>

Canyon Ferry
Snow Water Equivalent (SWE)
52% of Average

Archive Data From 1-OCT Through 30-SEP
 Plotted 12/06/2016 15:53 (Provisional Data Subject to Revision)



CFR Canyon Ferry Lake, Missouri River near Helena, MT
 SE_AVG Snow Water Equivalent Average (inches)
 SE Snow Water Equivalent (inches)

2017
 2017 2016

CANYON FERRY LAKE MONTHLY OPERATIONS

Canyon Ferry Reservoir		Initial Cont Elev			1531.0 kaf 3785.79 ft			Maximum Cont Elev			1993.0 kaf 3800.00 ft			Minimum Cont Elev			445.5 kaf 3732.31 ft		
		2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total				
Reservoir Inflow	kaf	192.0	189.0	185.0	224.0	297.0	525.0	762.0	267.0	137.0	158.0	229.0	244.0	3409.0					
HV Canal Diversions	kaf	0.0	0.0	0.0	0.0	11.0	18.4	17.0	18.4	18.4	12.0	0.0	0.0	95.2					
HV Pump Turbines	kaf	0.0	0.0	0.0	0.0	14.5	22.7	18.3	18.4	19.1	13.4	0.0	0.0	106.4					
Turbine Release	kaf	236.1	230.1	207.9	230.1	218.2	338.1	309.7	242.8	242.1	239.3	263.1	254.7	3012.2					
Turbine Release	cfs	3840	3742	3743	3742	3667	5499	5205	3949	3937	4022	4279	4280						
Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	18.7	122.3	0.0	0.0	0.0	0.0	0.0	141.0					
River Release	kaf	236.1	230.1	207.9	230.1	232.7	379.5	450.3	261.2	261.2	252.7	263.1	254.7	3259.6					
River Release	cfs	3840	3742	3743	3742	3911	6172	7568	4248	4248	4247	4279	4280						
Min Release	cfs	3840	3728	3693	3718	3911	3959	3707	3981	3975	3944	3918	3936						
Total Dam Release	kaf	236.1	230.1	207.9	230.1	243.7	397.9	467.3	279.6	279.6	264.7	263.1	254.7	3354.8					
Total Dam Release	cfs	3840	3742	3743	3742	4096	6471	7853	4547	4547	4448	4279	4280						
End-Month Content	kaf	1486.9	1445.8	1422.9	1416.8	1470.1	1597.2	1891.9	1879.3	1736.7	1630.0	1595.9	1585.2						
End-Month Elevation	ft	3784.4	3783.0	3782.2	3782.0	3783.8	3787.9	3797.0	3796.6	3792.3	3788.9	3787.9	3787.5						
Net Change	kaf	-44.1	-41.1	-22.9	-6.1	53.3	127.1	294.7	-12.6	-142.6	-106.7	-34.1	-10.7	54.2					
Canyon Ferry Power	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total					
Turbine Release	cfs	3840	3742	3743	3742	3667	5499	5205	3949	3937	4022	4279	4280						
Tailwater Elev	ft	3650.8	3650.8	3650.8	3650.8	3650.8	3651.1	3651.3	3650.9	3650.9	3650.9	3650.9	3650.9						
Average Head	ft	134.3	132.9	131.8	131.3	132.1	134.8	141.2	145.9	143.6	139.7	137.5	136.8						
Average Power	mw	39.4	37.9	37.7	37.5	36.8	56.7	56.7	43.6	42.9	43.0	45.5	45.3						
Average Kwh/Af		124	123	122	121	121	125	132	134	132	129	129	128	127					
Generation	gwh	29.314	28.198	25.334	27.900	26.496	42.185	40.824	32.438	31.918	30.960	33.852	32.616	382.035					
End-Month Power Cap	mw	57	57	56	56	57	57	57	57	57	57	57	57						
Hauser	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total					
Missouri Gain	kaf	8.8	9.0	9.3	10.2	9.0	5.4	13.1	1.3	3.3	5.2	9.1	8.4	92.1					
End-Month Content	kaf	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2						
Release	kaf	244.9	239.1	217.2	240.3	241.7	384.9	463.4	262.5	264.5	257.9	272.2	263.1	3351.7					
Release	cfs	3983	3889	3911	3908	4062	6260	7788	4269	4302	4334	4427	4422						
Turbine Release	cfs	3983	3889	3911	3908	4062	4740	4740	4269	4302	4334	4427	4422						
Turbine Bypass	cfs	0	0	0	0	0	1520	3048	0	0	0	0	0						
Generation	gwh	10.312	10.069	9.146	10.118	10.178	12.272	11.877	11.053	11.138	10.859	11.462	11.080	129.564					
Holter	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total					
Missouri Gain	kaf	1.1	1.6	2.2	1.0	2.3	3.3	10.3	6.0	4.4	4.1	2.1	1.4	39.8					
End-Month Content	kaf	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9						
Release	kaf	246.0	240.7	219.4	241.3	244.0	388.2	473.7	268.5	268.9	262.0	274.3	264.5	3391.5					
Release	cfs	4001	3915	3951	3924	4101	6313	7961	4367	4373	4403	4461	4445						
Min Release	cfs	4000	3900	3900	3900	4100	4100	4100	4100	4100	4100	4100	4100						
Turbine Release	cfs	4001	3915	3951	3924	4101	6313	7100	4367	4373	4403	4461	4445						
Turbine Bypass	cfs	0	0	0	0	0	0	861	0	0	0	0	0						
Generation	gwh	20.956	20.506	18.692	20.553	20.787	33.066	35.988	22.873	22.905	22.318	23.366	22.531	284.541					

CANYON FERRY LAKE MONTHLY OPERATIONS

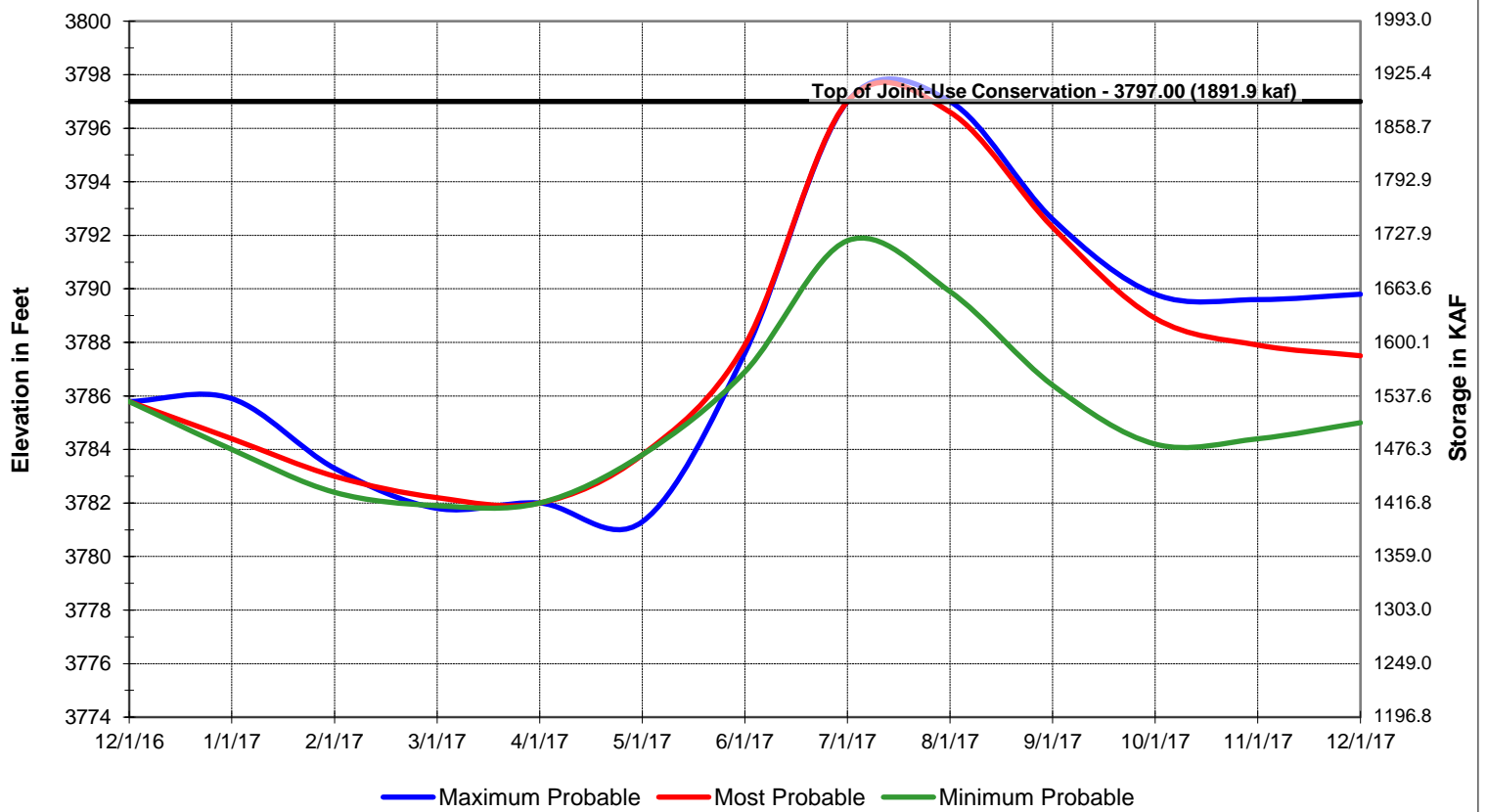
Canyon Ferry Reservoir		Initial Cont 1531.0 kaf Elev 3785.79 ft					Maximum Cont 1993.0 kaf Elev 3800.00 ft				Minimum Cont 445.5 kaf Elev 3732.31 ft			
2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Reservoir Inflow	kaf	170.0	165.0	169.0	203.0	234.0	295.0	348.0	139.7	91.0	125.0	192.0	208.0	2339.7
HV Canal Diversions	kaf	0.0	0.0	0.0	0.0	5.0	12.0	16.0	17.0	16.0	12.0	0.0	0.0	78.0
HV Pump Turbines	kaf	0.0	0.0	0.0	0.0	6.6	14.9	18.3	18.9	18.8	15.0	0.0	0.0	92.5
Turbine Release	kaf	226.0	210.6	186.1	198.6	169.0	174.1	156.5	165.1	167.8	165.3	185.1	190.3	2194.5
Turbine Release	cfs	3676	3425	3351	3230	2840	2831	2630	2685	2729	2778	3010	3198	
Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
River Release	kaf	226.0	210.6	186.1	198.6	175.6	189.0	174.8	184.0	186.6	180.3	185.1	190.3	2287.0
River Release	cfs	3676	3425	3351	3230	2951	3074	2938	2992	3035	3030	3010	3198	
Min Release	cfs	3676	3425	3351	3230	2951	3074	2938	2992	3035	3030	3010	3198	
Total Dam Release	kaf	226.0	210.6	186.1	198.6	180.6	201.0	190.8	201.0	202.6	192.3	185.1	190.3	2365.0
Total Dam Release	cfs	3676	3425	3351	3230	3035	3269	3207	3269	3295	3232	3010	3198	
End-Month Content	kaf	1475.0	1429.4	1412.3	1416.7	1470.1	1564.1	1721.3	1660.0	1548.4	1481.1	1488.0	1505.7	
End-Month Elevation	ft	3784.0	3782.4	3781.9	3782.0	3783.8	3786.9	3791.8	3789.9	3786.4	3784.2	3784.4	3785.0	
Net Change	kaf	-56.0	-45.6	-17.1	4.4	53.4	94.0	157.2	-61.3	-111.6	-67.3	6.9	17.7	-25.3
Canyon Ferry Power 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Turbine Release	cfs	3676	3425	3351	3230	2840	2831	2630	2685	2729	2778	3010	3198	
Tailwater Elev	ft	3650.8	3650.8	3650.8	3650.8	3650.7	3650.7	3650.7	3650.7	3650.7	3650.7	3650.7	3650.8	
Average Head	ft	134.1	132.4	131.3	131.1	132.2	134.6	138.6	140.1	137.4	134.6	133.6	133.9	
Average Power	mw	37.4	34.0	32.9	31.4	26.9	27.2	25.3	26.2	26.4	26.5	29.2	31.6	
Average Kwh/Af		123	120	119	118	115	116	116	118	117	115	117	120	118
Generation	gwh	27.826	25.296	22.109	23.362	19.368	20.237	18.216	19.493	19.642	19.080	21.725	22.752	259.106
End-Month Power Cap	mw	57	56	56	56	57	57	57	57	57	57	57	57	
Hauser 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Missouri Gain	kaf	7.1	4.5	7.2	8.6	7.8	0.4	1.9	1.9	0.9	1.8	4.0	4.8	50.9
End-Month Content	kaf	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	
Release	kaf	233.1	215.1	193.3	207.2	183.4	189.4	176.7	185.9	187.5	182.1	189.1	195.1	2337.9
Release	cfs	3791	3498	3481	3370	3082	3080	2970	3023	3049	3060	3075	3279	
Turbine Release	cfs	3791	3498	3481	3370	3082	3080	2970	3023	3049	3060	3075	3279	
Turbine Bypass	cfs	0	0	0	0	0	0	0	0	0	0	0	0	
Generation	gwh	9.815	9.057	8.141	8.725	7.722	7.974	7.442	7.827	7.894	7.667	7.962	8.216	98.442
Holter 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Missouri Gain	kaf	0.6	0.1	1.1	1.9	1.1	1.2	7.8	4.7	3.1	2.4	1.5	1.3	26.8
End-Month Content	kaf	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	
Release	kaf	233.7	215.2	194.4	209.1	184.5	190.6	184.5	190.6	190.6	184.5	190.6	196.4	2364.7
Release	cfs	3801	3500	3500	3401	3101	3100	3101	3100	3100	3101	3100	3301	
Min Release	cfs	3800	3500	3500	3400	3100	3100	3100	3100	3100	3100	3100	3300	
Turbine Release	cfs	3801	3500	3500	3401	3101	3100	3101	3100	3100	3101	3100	3301	
Turbine Bypass	cfs	0	0	0	0	0	0	0	0	0	0	0	0	
Generation	gwh	19.909	18.332	16.558	17.814	15.718	16.237	15.718	16.237	16.237	15.718	16.237	16.732	201.447

CANYON FERRY LAKE MONTHLY OPERATIONS

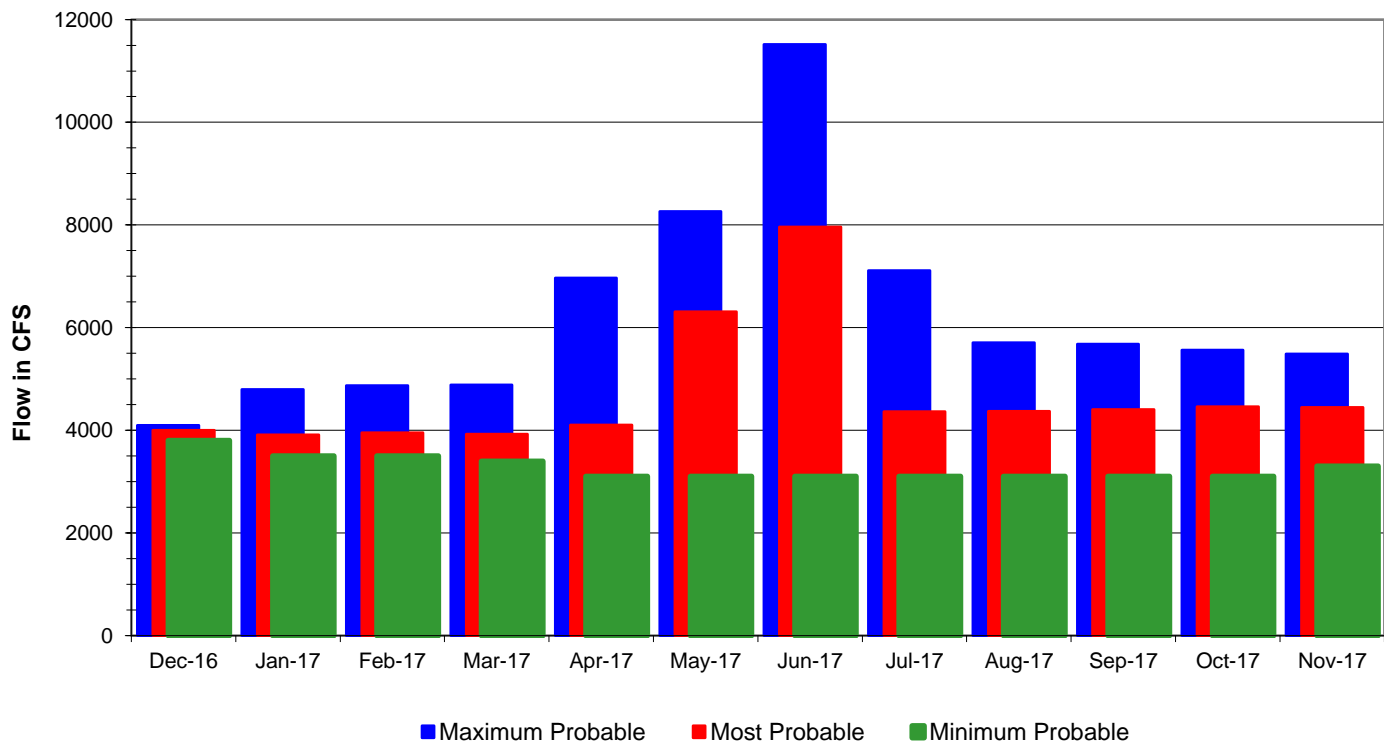
Canyon Ferry Reservoir		Initial Cont 1531.0 kaf Elev 3785.79 ft					Maximum Cont 1993.0 kaf Elev 3800.00 ft				Minimum Cont 445.5 kaf Elev 3732.31 ft			
2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Reservoir Inflow	kaf	243.0	206.0	211.0	289.0	389.0	694.0	959.0	433.0	206.0	245.0	318.0	323.0	4516.0
HV Canal Diversions	kaf	0.0	0.0	0.0	0.0	11.0	18.4	17.0	18.4	18.4	12.0	0.0	0.0	95.2
HV Pump Turbines	kaf	0.0	0.0	0.0	0.0	14.9	23.4	18.4	18.3	19.0	13.3	0.0	0.0	107.3
Turbine Release	kaf	240.7	283.3	255.9	283.3	336.5	343.7	311.3	310.3	314.0	309.0	325.4	315.3	3628.7
Turbine Release	cfs	3915	4607	4608	4607	5655	5589	5231	5046	5107	5193	5292	5299	
Spill/Waste	kaf	0.0	0.0	0.0	0.0	48.4	117.0	306.9	86.0	0.0	0.0	0.0	0.0	558.3
River Release	kaf	240.7	283.3	255.9	283.3	399.8	484.1	636.6	414.6	333.0	322.3	325.4	315.3	4294.3
River Release	cfs	3915	4607	4608	4607	6719	7873	10698	6743	5416	5416	5292	5299	
Min Release	cfs	3915	3915	3833	3825	3850	3711	3284	3731	3807	3838	3828	3911	
Total Dam Release	kaf	240.7	283.3	255.9	283.3	410.8	502.5	653.6	433.0	351.4	334.3	325.4	315.3	4389.5
Total Dam Release	cfs	3915	4607	4608	4607	6904	8172	10984	7042	5715	5618	5292	5299	
End-Month Content	kaf	1533.3	1456.0	1411.1	1416.8	1395.0	1586.5	1891.9	1891.9	1746.5	1657.2	1649.8	1657.5	
End-Month Elevation	ft	3785.9	3783.3	3781.8	3782.0	3781.3	3787.6	3797.0	3797.0	3792.6	3789.8	3789.6	3789.8	
Net Change	kaf	2.3	-77.3	-44.9	5.7	-21.8	191.5	305.4	0.0	-145.4	-89.3	-7.4	7.7	126.5
Canyon Ferry Power 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Turbine Release	cfs	3915	4607	4608	4607	5655	5589	5231	5046	5107	5193	5292	5299	
Tailwater Elev	ft	3650.8	3650.9	3650.9	3650.9	3651.2	3651.3	3651.8	3651.2	3651.0	3651.0	3651.0	3651.0	
Average Head	ft	135.0	133.7	131.7	131.0	130.4	133.2	140.5	145.8	143.8	140.2	138.7	138.7	
Average Power	mw	40.5	47.9	47.2	47.0	55.9	56.7	56.7	56.7	56.6	56.2	56.6	56.6	
Average Kwh/Af		125	126	124	123	120	123	131	136	134	131	129	129	128
Generation	gwh	30.132	35.638	31.718	34.968	40.248	42.185	40.824	42.185	42.110	40.464	42.110	40.752	463.334
End-Month Power Cap	mw	57	57	56	56	56	57	57	57	57	57	57	57	
Hauser 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Missouri Gain	kaf	9.4	8.9	11.9	13.3	11.8	17.2	34.1	13.3	10.8	10.0	13.0	9.3	163.0
End-Month Content	kaf	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	
Release	kaf	250.1	292.2	267.8	296.6	411.6	501.3	670.7	427.9	343.8	332.3	338.4	324.6	4457.3
Release	cfs	4067	4752	4822	4824	6917	8153	11271	6959	5591	5584	5504	5455	
Turbine Release	cfs	4067	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	
Turbine Bypass	cfs	0	12	82	84	2177	3413	6531	2219	851	844	764	715	
Generation	gwh	10.530	12.272	11.085	12.272	11.877	12.272	11.877	12.272	12.272	11.877	12.272	11.877	142.755
Holter 2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Missouri Gain	kaf	2.0	2.5	2.9	3.6	3.1	6.7	14.5	9.4	7.2	5.6	3.7	2.0	63.2
End-Month Content	kaf	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	
Release	kaf	252.1	294.7	270.7	300.2	414.7	508.0	685.2	437.3	351.0	337.9	342.1	326.6	4520.5
Release	cfs	4100	4793	4874	4882	6969	8262	11515	7112	5708	5679	5564	5489	
Min Release	cfs	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	
Turbine Release	cfs	4100	4793	4874	4882	6969	7100	7100	7100	5708	5679	5564	5489	
Turbine Bypass	cfs	0	0	0	0	0	1162	4415	12	0	0	0	0	
Generation	gwh	21.475	25.105	23.058	25.571	35.324	37.188	35.988	37.188	29.897	28.786	29.143	27.823	356.546

CANYON FERRY RESERVOIR

CANYON FERRY RESERVOIR ELEVATION



MISSOURI RIVER FLOW BELOW HOLTER



WATER YEAR 2017