

RECLAMATION

Managing Water in the West

December 7, 2016

Dear Customer:

Attached is the monthly water supply outlook and projected operations for Yellowtail Dam and Powerplant. Streamflows into Bighorn Lake during November were 116% of average. Based on the December 1 water supply forecast and the planned releases out of Boysen and Buffalo Bill Reservoirs, the December runoff into Bighorn Lake is expected to equal 103,400 acre-feet (100% of average). If you have any questions or concerns, please feel free to call me at (406) 247-7334.

Clayton R. Jordan
Reservoir and River Operations



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

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

Present Elevations & Storages:

	Elevation (feet)	Storage (acre-feet)	Percent of Average	Percent Full
Boysen	4720.71	661,014	114	89
Buffalo Bill	5370.29	470,121	109 *	73
Bighorn Lake	3637.03	984,586	112	96

Actual Inflows (1,000's of Acre-Feet):

Water Year 2017	Inflow	Percent of Average
October	202.6	127
November	139.9	116
Water Year 2016	Inflow	Percent of Average
October	133.5	84
November	121.1	102
December	116.1	114
January	118.1	115
February	123.8	117
March	111.5	77
April	122.0	81
May	358.3	131
June	422.8	97
July	128.7	50
August	135.9	91
September	180.9	111
April-July	1,031.8	93

Actual Gains between Boysen and Buffalo Bill to Yellowtail (1,000's of Acre-Feet):

Water Year 2017	Gains	Percent of Average
October	116.9	177
November	77.5	136
Water Year 2016	Gains	Percent of Average
October	34.3	51
November	58.0	103
December	51.2	136
January	52.7	132
February	64.3	130
March	53.0	74
April	32.2	98
May	21.5	40
June	-37.0 (avg. 92.6)	-
July	-97.7 (avg. -61.4)	-
August	-55.1 (avg. -52.7)	-
September	47.9	504
April-July	-78.1 (avg. 117.8)	-

December 1 Runoff Forecast (December Inflows - 1,000's of Acre-Feet):

Agency	Inflows	Percent of Average
USBR	103.4	100

Average based on past 30 years

*This does not reflect the 30 year average because in 1992 the capacity of the reservoir was increased to approximately 646,565 acre-feet as a result of raising the dam. The average used here reflects data from 1993 through 2016.

SNOW and PRECIPITATION UPDATE
Based on Mountain Data from NRCS SNOTEL Sites
As of December 1, 2016

BASIN Data Site Name	Elev.	Snow Water Equivalent			Total Precipitation		
	feet	Current	Median	% Median	Current	Median	% Median
UPPER YELLOWSTONE RIVER BASIN							
Beartooth Lake	9360	4.1	6.1	67	4.9	5.5	89
Box Canyon	6670	.5	1.7	29	4.1	4.1	100
Brackett Creek	7320	1.5	3.7	41	8.9	8.0	111
Burnt Mtn Canyon	5880 7870	1.3 1.7	1.3 3.0	100 57	4.9 7.6	5.1 4.8	96 158
Cole Creek	7850	2.6	4.1	63	3.2	5.0	64
East Boulder Mine	6335	.8	-M	*	6.1	-M	*
Evening Star	9200	5.1	7.2	71	11.6	8.3	140
Fisher Creek	9100	6.0	8.8	68	11.5	9.1	126
Monument Peak	8850	3.0	5.3	57	9.5	6.4	148
Northeast Entrance	7350	1.0	1.7	59	6.5	4.1	159
Parker Peak	9400	6.3	6.1	103	9.4	5.6	168
Placer Basin	8830	1.7	5.2	33	5.8	6.3	92
Porcupine	6500	.3	1.0	30	3.8	3.9	97
Sacajawea	6550	1.4	2.9	48	9.1	7.6	120
Shower Falls	8100	3.6	6.1	59	12.0	7.4	162
S Fork Shields	8100	1.6	4.0	40	8.4	6.4	131
Sylvan Lake	8420	3.3	5.2	63	13.1	7.2	182
Sylvan Road	7120	1.4	2.8	50	10.0	5.9	169
Thumb Divide	7980	1.2	3.2	38	7.7	5.4	143
Two Ocean Plateau	9240	8.0	8.6	93	10.8	8.1	133
White Mill	8700	3.9	6.0	65	8.0	7.1	113
Wolverine	7650	1.6	2.0	80	6.1	4.1	149
Younts Peak	8350	1.0	4.3	23	5.7	5.0	114
Basin Index (%)					62		130
WIND RIVER BASIN (WYOMING)							
Burroughs Creek	8750	.9	-M	*	3.7	-M	*
Castle Creek	8400	.4	-M	*	2.7	-M	*
Cold Springs	9630	1.4	2.5	56	3.7	3.7	100
Deer Park	9700	1.1	4.1	27	4.4	5.6	79
Hobbs Park	10100	3.2	4.5	71	4.9	4.5	109
Kirwin	9550	1.7	3.4	50	4.4	4.0	110
Little Warm	9370	1.0	2.9	34	5.2	4.2	124
Owl Creek	8975	1.0	1.6	62	2.5	2.2	114
South Pass	9040	.8	3.9	21	2.5	5.3	47
St. Lawrence Alt	8620	.6	2.1	29	3.7	3.2	116
Togwotee Pass	9580	5.2	7.2	72	8.7	7.3	119
Townsend Creek	8700	1.0	2.5	40	4.1	4.3	95
Younts Peak	8350	1.0	4.3	23	5.7	5.0	114
Basin Index (%)					46		101
SHOSHONE RIVER BASIN (WYOMING)							
Blackwater	9780	7.1	7.1	100	10.5	6.6	159
Evening Star	9200	5.1	7.2	71	11.6	8.3	140
Marquette	8760	1.8	-M	*	4.0	-M	*
Sylvan Lake	8420	3.3	5.2	63	13.1	7.2	182
Sylvan Road	7120	1.4	2.8	50	10.0	5.9	169
Younts Peak	8350	1.0	4.3	23	5.7	5.0	114
Basin Index (%)					67		154

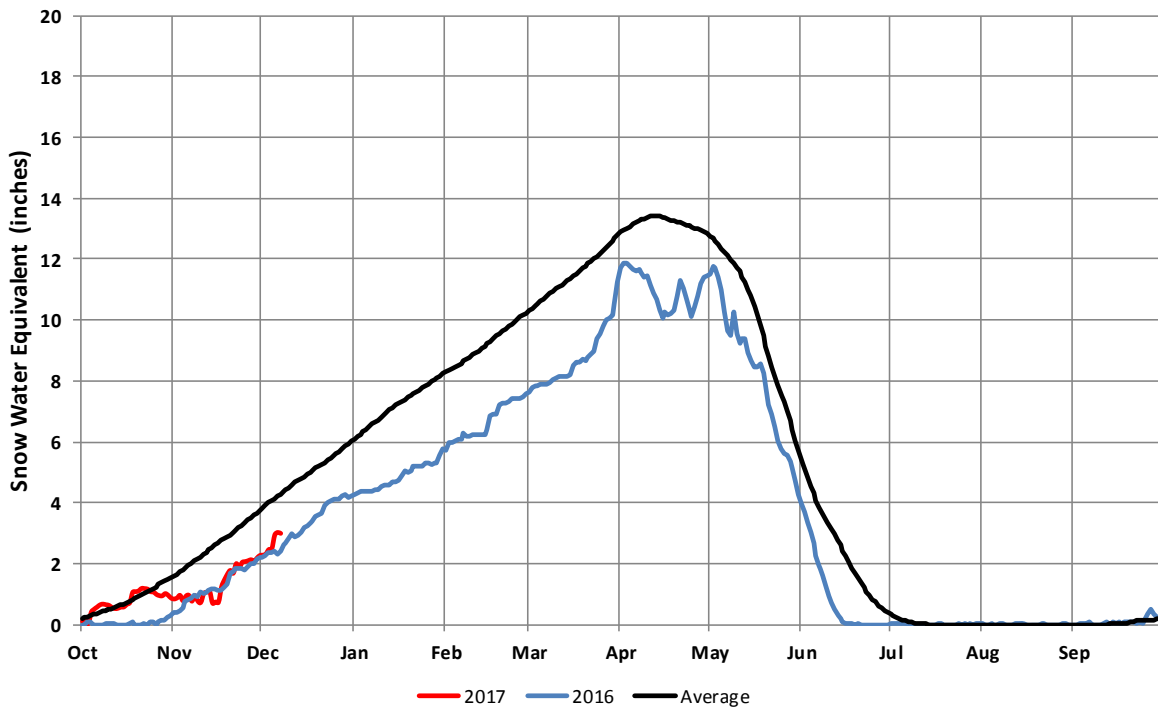
SNOW and PRECIPITATION UPDATE
Based on Mountain Data from NRCS SNOTEL Sites
As of December 1, 2016

BASIN Data Site Name	Elev.	Snow Water Equivalent			Total Precipitation		
		Current	Median	% Median	Current	Median	% Median
BIGHORN BASIN ABOVE YELLOWTAIL DAM							
Bald Mtn.	9380	6.7	5.8	116	5.7	5.2	110
Bear Trap Meadow	8200	.6	1.4	43	2.5	3.2	78
Blackwater	9780	7.1	7.1	100	10.5	6.6	159
Bone Springs Div	9350	3.8	5.1	75	5.2	4.9	106
Burroughs Creek	8750	.9	-M	*	3.7	-M	*
Castle Creek	8400	.4	-M	*	2.7	-M	*
Cold Springs	9630	1.4	2.5	56	3.7	3.7	100
Deer Park	9700	1.1	4.1	27	4.4	5.6	79
Evening Star	9200	5.1	7.2	71	11.6	8.3	140
Grave Springs	8550	1.4	1.9	74	2.7	3.7	73
Kirwin	9550	1.7	3.4	50	4.4	4.0	110
Little Warm	9370	1.0	2.9	34	5.2	4.2	124
Marquette	8760	1.8	-M	*	4.0	-M	*
Middle Powder	7760	1.4	3.1	45	2.4	4.4	55
Owl Creek	8975	1.0	1.6	62	2.5	2.2	114
Powder River Pass	9480	.6	2.9	21	3.2	4.1	78
Shell Creek	9580	4.9	5.0	98	4.0	4.6	87
South Pass	9040	.8	3.9	21	2.5	5.3	47
St. Lawrence Alt	8620	.6	2.1	29	3.7	3.2	116
Sylvan Lake	8420	3.3	5.2	63	13.1	7.2	182
Sylvan Road	7120	1.4	2.8	50	10.0	5.9	169
Timber Creek	7950	1.5	1.7	88	3.0	3.2	94
Togwotee Pass	9580	5.2	7.2	72	8.7	7.3	119
Townsend Creek	8700	1.0	2.5	40	4.1	4.3	95
Younts Peak	8350	1.0	4.3	23	5.7	5.0	114
Basin Index (%)				63			112

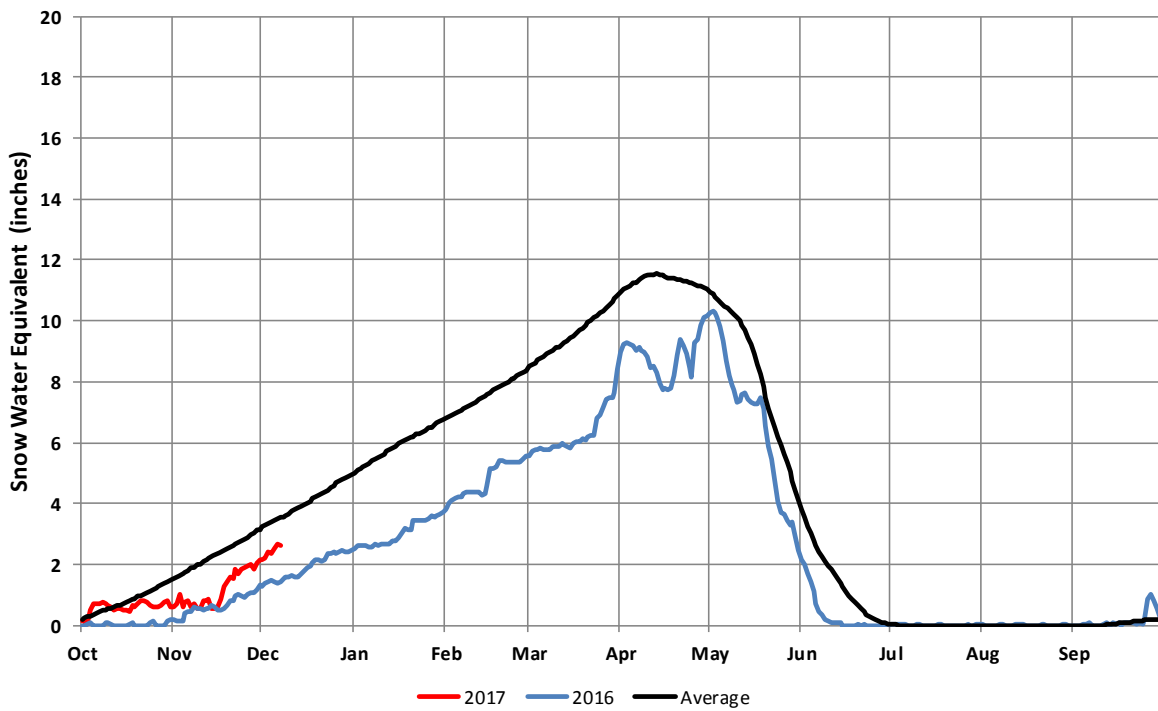
-M = Missing data

* = Data may not provide a valid measure of conditions.

Snowpack above Bighorn Lake



Snowpack in Bighorn Mountains



BHXAOP V1.16 Run: 07-Dec-2016 15:25
 Based on Most Probable Inflow Forecast

BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir		Initial Cont 984.6 kaf Elev 3637.03 ft					Maximum Cont 1278.9 kaf Elev 3657.00 ft				Minimum Cont 469.9 kaf Elev 3547.00 ft				Total
	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov		
Boysen Release	kaf	56.9	56.9	51.4	63.3	122.4	126.4	122.4	126.4	92.5	89.6	75.0	55.0	1038.2	
Boysen Release	cfs	925	925	926	1029	2057	2056	2057	2056	1504	1506	1220	924		
Buffalo Bill Release	kaf	12.6	12.6	11.4	12.6	70.8	120.2	166.5	176.7	127.8	99.5	46.9	21.1	878.7	
Buffalo Bill Release	cfs	205	205	205	205	1190	1955	2798	2874	2078	1672	763	355		
Station Gain	kaf	33.9	38.3	44.4	62.7	39.9	62.2	119.0	-61.3	-45.3	16.4	65.2	56.1	431.5	
Monthly Inflow	kaf	103.4	107.8	107.2	138.6	233.1	308.8	407.9	241.8	175.0	205.5	187.1	132.2	2348.4	
Monthly Inflow	cfs	1682	1753	1930	2254	3917	5022	6855	3933	2846	3454	3043	2222		
Turbine Release	kaf	156.2	164.5	148.5	164.5	256.7	272.7	241.3	208.2	207.2	191.8	183.2	159.8	2354.6	
Bypass/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	
Total Release	kaf	156.2	164.5	148.5	164.5	256.7	272.7	241.3	208.2	207.2	191.8	183.2	159.8	2354.6	
Total Release	cfs	2540	2675	2674	2675	4314	4435	4055	3386	3370	3223	2979	2686		
Spring Flow	kaf	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	4.2	50.8	
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	0.0	111.6	
Afterbay Rels	kaf	160.5	168.8	152.4	168.8	260.9	277.0	245.5	212.5	211.5	196.0	187.5	164.0	2405.4	
Afterbay Rels	cfs	2610	2745	2744	2745	4385	4505	4126	3456	3440	3294	3049	2756		
River Release	kaf	160.5	168.8	152.4	168.8	259.6	265.1	222.7	184.4	184.5	178.5	184.5	164.0	2293.8	
River Release	cfs	2610	2745	2744	2745	4363	4311	3743	2999	3001	3000	3001	2756		
Min Release	kaf	160.5	92.2	83.3	92.2	148.8	153.7	148.8	153.7	184.5	178.5	184.5	89.3	1670.0	
End-Month Content	kaf	931.8	875.1	833.8	807.9	784.3	820.4	987.0	1020.6	988.4	1002.1	1006.0	978.4		
End-Month Elevation	ft	3632.15	3625.85	3620.61	3617.00	3613.38	3618.78	3637.23	3640.00	3637.35	3638.50	3638.82	3636.49		
Net Change Content	kaf	-52.8	-56.7	-41.3	-25.9	-23.6	36.1	166.6	33.6	-32.2	13.7	3.9	-27.6	-6.2	
Yellowtail Power	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	
Turbine Release	kaf	156.2	164.5	148.5	164.5	256.7	272.7	241.3	208.2	207.2	191.8	183.2	159.8	2354.6	
Generation	gwh	59.734	62.573	54.837	61.323	99.598	107.320	98.504	84.439	83.502	76.774	72.924	61.943	923.471	
End-Month Power Cap	mw	280.1	274.1	269.1	265.7	262.2	267.4	284.9	287.5	285.0	286.1	286.4	284.2		
% Max Gen		28	29	28	29	48	50	48	39	39	37	34	30		
Ave kwh/af		382	380	369	373	388	394	408	406	403	400	398	388	392	
Upstream Generation	gwh	7.241	7.198	6.412	7.642	28.407	33.109	32.933	34.728	31.708	28.293	18.492	10.427	246.590	
Total Generation	gwh	66.975	69.771	61.249	68.965	128.005	140.429	131.437	119.167	115.210	105.067	91.416	72.370	1170.061	

BHXAOP V1.16 Run: 07-Dec-2016 15:01
 Based on Minimum Probable Inflow Forecast

BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir	2016	Initial Cont 984.6 kaf Elev 3637.03 ft				Maximum Cont 1278.9 kaf Elev 3657.00 ft				Minimum Cont 469.9 kaf Elev 3547.00 ft				Total
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Boysen Release	kaf	56.9	56.9	51.4	62.3	41.7	72.2	71.4	70.7	67.6	65.5	50.7	35.7	703.0
Boysen Release	cfs	925	925	926	1013	701	1174	1200	1150	1099	1101	825	600	
Buffalo Bill Release	kaf	12.6	12.6	11.4	12.6	31.7	101.2	105.0	118.7	108.3	94.0	41.5	12.2	661.8
Buffalo Bill Release	cfs	205	205	205	205	533	1646	1765	1930	1761	1580	675	205	
Station Gain	kaf	27.1	30.8	35.1	54.0	20.3	10.0	1.3	-70.0	-52.3	-0.8	46.2	50.0	151.7
Monthly Inflow	kaf	96.6	100.3	97.9	128.9	93.7	183.4	177.7	119.4	123.6	158.7	138.4	97.9	1516.5
Monthly Inflow	cfs	1571	1631	1763	2096	1575	2983	2986	1942	2010	2667	2251	1645	
Turbine Release	kaf	156.2	156.2	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	130.7	1613.7
Bypass/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
Total Release	kaf	156.2	156.2	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	130.7	1613.7
Total Release	cfs	2540	2540	2181	1930	1951	2124	2312	2387	2370	2223	1979	2196	
Spring Flow	kaf	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	4.2	50.8
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	0.0	111.6
Afterbay Rels	kaf	160.5	160.5	125.0	123.0	120.3	134.9	141.8	151.1	150.0	136.5	126.0	134.9	1664.5
Afterbay Rels	cfs	2610	2610	2251	2000	2022	2194	2383	2457	2440	2294	2049	2267	
River Release	kaf	160.5	160.5	125.0	123.0	119.0	123.0	119.0	123.0	123.0	119.0	123.0	134.9	1552.9
River Release	cfs	2610	2610	2251	2000	2000	2000	2000	2000	2000	2000	2000	2267	
Min Release	kaf	160.5	160.5	125.0	123.0	119.0	123.0	119.0	123.0	123.0	119.0	123.0	89.3	1507.3
End-Month Content	kaf	925.0	869.1	845.9	856.1	833.7	886.5	926.6	899.2	877.1	903.5	920.2	887.4	
End-Month Elevation	ft	3631.45	3625.12	3622.21	3623.51	3620.60	3627.20	3631.61	3628.65	3626.09	3629.13	3630.95	3627.30	
Net Change Content	kaf	-59.6	-55.9	-23.2	10.2	-22.4	52.8	40.1	-27.4	-22.1	26.4	16.7	-32.8	-97.2
Yellowtail Power	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Turbine Release	kaf	156.2	156.2	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	130.7	1613.7
Generation	gwh	59.641	58.800	43.146	42.244	40.861	47.774	51.352	55.088	54.287	48.730	44.266	47.829	594.018
End-Month Power Cap	mw	279.4	273.4	270.6	271.9	269.1	275.4	279.6	276.7	274.3	277.2	278.9	275.5	
% Max Gen		28	27	22	20	20	22	25	26	25	24	21	23	
Ave kwh/af		382	376	356	356	352	366	373	375	373	368	364	366	368
Upstream Generation	gwh	7.231	7.169	6.370	7.506	11.385	26.128	25.824	27.560	25.914	22.950	13.695	5.732	187.464
Total Generation	gwh	66.872	65.969	49.516	49.750	52.246	73.902	77.176	82.648	80.201	71.680	57.961	53.561	781.482

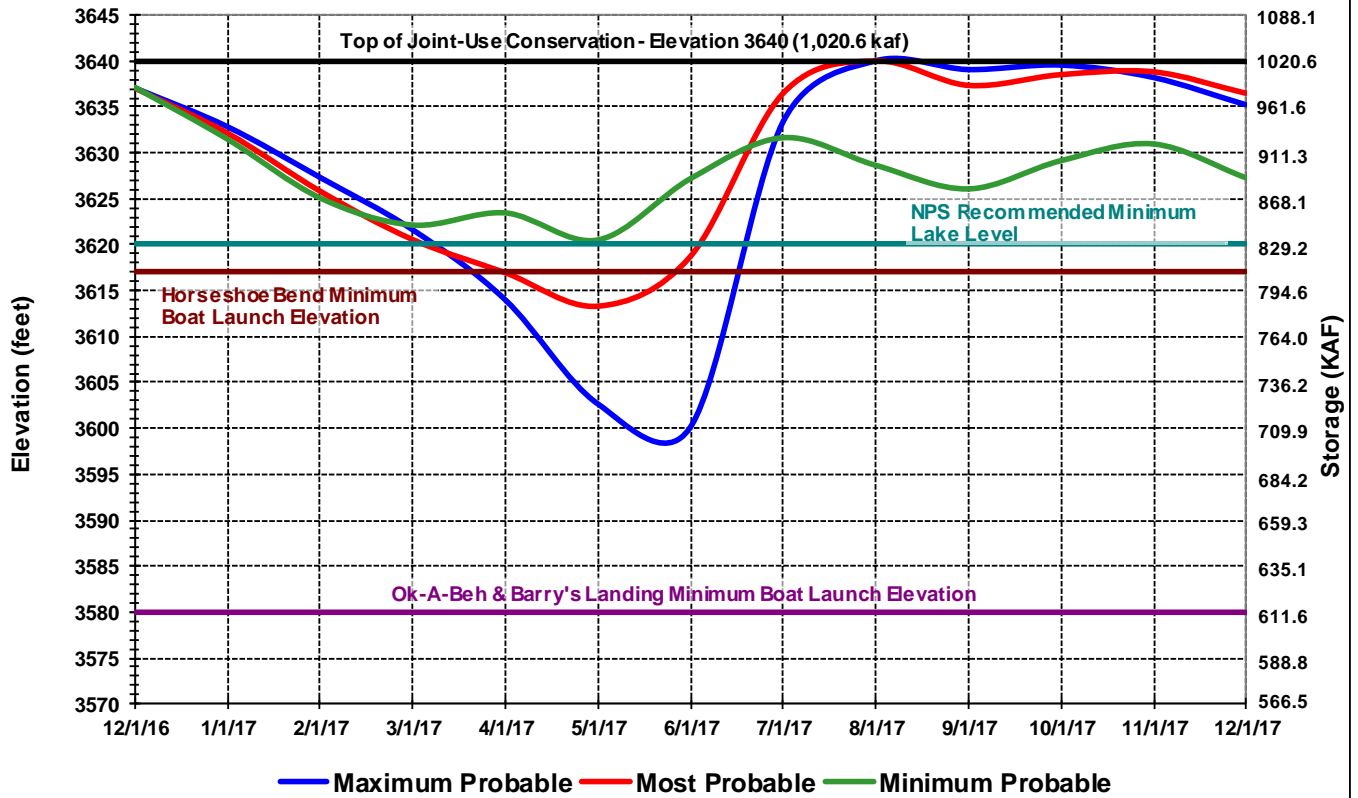
BHXAOP V1.16 Run: 07-Dec-2016 15:01
 Based on Maximum Probable Inflow Forecast

BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir		Initial Cont Elev 3637.03 ft					Maximum Cont Elev 3657.00 ft				Minimum Cont Elev 3547.00 ft				Total
2016		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	
Boysen Release	kaf	56.9	56.9	51.5	104.5	130.9	184.5	273.6	282.8	131.1	88.4	63.7	55.0	1479.8	
Boysen Release	cfs	925	925	927	1700	2200	3001	4598	4599	2132	1486	1036	924		
Buffalo Bill Release	kaf	12.6	12.6	11.4	12.6	76.1	209.3	289.7	302.4	154.4	102.5	49.6	21.2	1254.4	
Buffalo Bill Release	cfs	205	205	205	205	1279	3404	4869	4918	2511	1723	807	356		
Station Gain	kaf	40.6	45.8	53.7	71.3	51.0	128.9	266.4	0.1	-28.7	36.7	84.2	64.8	814.8	
Monthly Inflow	kaf	110.1	115.3	116.6	188.4	258.0	522.7	829.7	585.3	256.8	227.6	197.5	141.0	3549.0	
Monthly Inflow	cfs	1791	1875	2099	3064	4336	8501	13944	9519	4176	3825	3212	2370		
Turbine Release	kaf	156.2	166.6	162.7	241.7	322.3	368.9	357.0	368.9	268.7	221.6	213.9	175.3	3023.8	
Bypass/Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	167.1	239.0	139.7	0.0	0.0	0.0	0.0	545.8	
Total Release	kaf	156.2	166.6	162.7	241.7	322.3	536.0	596.0	508.6	268.7	221.6	213.9	175.3	3569.6	
Total Release	cfs	2540	2709	2930	3931	5416	8717	10016	8272	4370	3724	3479	2946		
Spring Flow	kaf	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	4.2	50.8	
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	0.0	111.6	
Afterbay Rels	kaf	160.5	170.9	166.6	246.0	326.5	540.3	600.2	512.9	273.0	225.8	218.2	179.5	3620.4	
Afterbay Rels	cfs	2610	2779	3000	4001	5487	8787	10087	8342	4440	3795	3549	3017		
River Release	kaf	160.5	170.9	166.6	246.0	325.2	528.4	577.4	484.8	246.0	208.3	215.2	179.5	3508.8	
River Release	cfs	2610	2779	3000	4001	5465	8594	9704	7885	4001	3501	3500	3017		
Min Release	kaf	160.5	170.9	166.6	246.0	89.3	92.2	89.3	92.2	246.0	208.3	215.2	149.4	1925.9	
End-Month Content	kaf	938.5	887.2	841.1	787.8	723.5	710.2	943.9	1020.6	1008.7	1014.7	998.3	964.0		
End-Month Elevation	ft	3632.81	3627.28	3621.58	3613.94	3602.60	3600.06	3633.34	3640.00	3639.05	3639.53	3638.19	3635.21		
Net Change Content	kaf	-46.1	-51.3	-46.1	-53.3	-64.3	-13.3	233.7	76.7	-11.9	6.0	-16.4	-34.3	-20.6	
Yellowtail Power	2016	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	
Turbine Release	kaf	156.2	166.6	162.7	241.7	322.3	368.9	357.0	368.9	268.7	221.6	213.9	175.3	3023.8	
Generation	gwh	59.822	63.708	61.180	93.617	121.926	150.660	145.800	150.660	110.632	90.337	86.651	68.780	1203.773	
End-Month Power Cap	mw	280.7	275.4	270.0	262.8	252.0	249.6	281.2	287.5	286.6	287.1	285.8	283.0		
% Max Gen		28	30	32	44	59	70	70	70	52	44	40	33		
Ave kwh/af		383	382	376	387	378	408	408	408	412	408	405	392	398	
Upstream Generation	gwh	7.243	7.186	6.445	11.056	29.422	33.532	33.742	35.289	35.044	28.765	18.291	10.511	256.526	
Total Generation	gwh	67.065	70.894	67.625	104.673	151.348	184.192	179.542	185.949	145.676	119.102	104.942	79.291	1460.299	

BIGHORN LAKE

BIGHORN LAKE ELEVATION



BIGHORN RIVER FLOW BELOW AFTERBAY

