

RECLAMATION

Managing Water in the West

November 8, 2016

Dear Customer:

Attached is the Monthly Water Supply Outlook and projected operations for Yellowtail Dam and Powerplant. Streamflows into Bighorn Lake during October were 127 percent of average. Based on the November 1 water supply forecast and the planned releases out of Boysen and Buffalo Bill Reservoirs, the November runoff into Bighorn Lake is expected to equal 113,300 acre-feet (94 percent of average). If you have any questions or concerns, please feel free to contact 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
 November 1, 2016

Present Elevations & Storages:

	Elevation (feet)	Storage (acre-feet)	Percent of Average	Percent Full
Boysen	4719.99	648,184	112	87
Buffalo Bill	5366.19	441,268	103 *	68
Bighorn Lake	3637.74	992,930	111	97

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

Water Year 2017	Inflow	Percent of Average
October	202.6	127
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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
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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)	-

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

Agency	Inflows	Percent of Average
USBR	113.3	94

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 November 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	2.3	2.7	85	3.7	2.3	161	
Box Canyon	6670	.0	.1	0*	3.7	2.0	185	
Brackett Creek	7320	.0	1.0	0*	6.4	4.1	156	
Burnt Mtn Canyon	5880	.0	.0	*	3.0	3.5	86	
	7870	.0	.6	0*	5.7	1.9	300	
Cole Creek	7850	.0	2.8	0	1.7	3.1	55	
East Boulder Mine	6335	.0	-M	*	4.5	-M	*	
Evening Star	9200	3.7	2.4	154*	9.0	3.3	273	
Fisher Creek	9100	3.2	2.7	119*	8.4	3.6	233	
Monument Peak	8850	1.3	2.0	65*	7.1	2.8	254	
Northeast Entrance	7350	.0	.0	*	5.1	1.8	283	
Parker Peak	9400	4.0	2.7	148	6.9	2.6	265	
Placer Basin	8830	.1	2.6	4	3.9	3.3	118	
Porcupine	6500	.0	.0	*	2.9	2.0	145	
Sacajawea	6550	.0	.3	0*	6.1	4.2	145	
Shower Falls	8100	1.9	2.6	73	9.5	3.6	264	
S Fork Shields	8100	.0	1.4	0*	5.7	3.2	178	
Sylvan Lake	8420	1.1	1.7	65*	10.3	3.1	332	
Sylvan Road	7120	.0	.3	0*	7.7	2.3	335	
Thumb Divide	7980	.0	.4	0*	6.3	2.2	286	
Two Ocean Plateau	9240	5.6	3.2	175	8.5	3.1	274	
White Mill	8700	1.6	2.2	73*	6.0	2.9	207	
Wolverine	7650	.0	.0	*	4.5	1.9	237	
Younts Peak	8350	.0	1.5	0*	4.7	2.2	214	
Basin Index (%)							75*	210
WIND RIVER BASIN (WYOMING)								
Burroughs Creek	8750	.0	-M	*	3.2	-M	*	
Castle Creek	8400	.0	-M	*	2.0	-M	*	
Cold Springs	9630	.0	.8	0	2.3	1.9	121	
Deer Park	9700	.0	1.7	0	3.6	3.2	112	
Hobbs Park	10100	1.7	2.0	85	3.3	2.4	138	
Kirwin	9550	.7	1.7	41	3.1	2.0	155	
Little Warm	9370	.0	1.2	0	4.0	1.9	211	
Owl Creek	8975	.0	.8	0	1.3	1.3	100	
South Pass	9040	.0	1.3	0*	2.4	2.4	100	
St. Lawrence Alt	8620	.0	.9	0	2.7	1.8	150	
Togwotee Pass	9580	2.4	2.7	89	6.4	2.8	229	
Townsend Creek	8700	.0	1.0	0	2.8	2.4	117	
Younts Peak	8350	.0	1.5	0*	4.7	2.2	214	
Basin Index (%)							31	151
SHOSHONE RIVER BASIN (WYOMING)								
Blackwater	9780	5.7	2.8	204	8.2	2.8	293	
Evening Star	9200	3.7	2.4	154*	9.0	3.3	273	
Marquette	8760	.0	-M	*	2.1	-M	*	
Sylvan Lake	8420	1.1	1.7	65*	10.3	3.1	332	
Sylvan Road	7120	.0	.3	0*	7.7	2.3	335	
Younts Peak	8350	.0	1.5	0*	4.7	2.2	214	
Basin Index (%)							121*	291

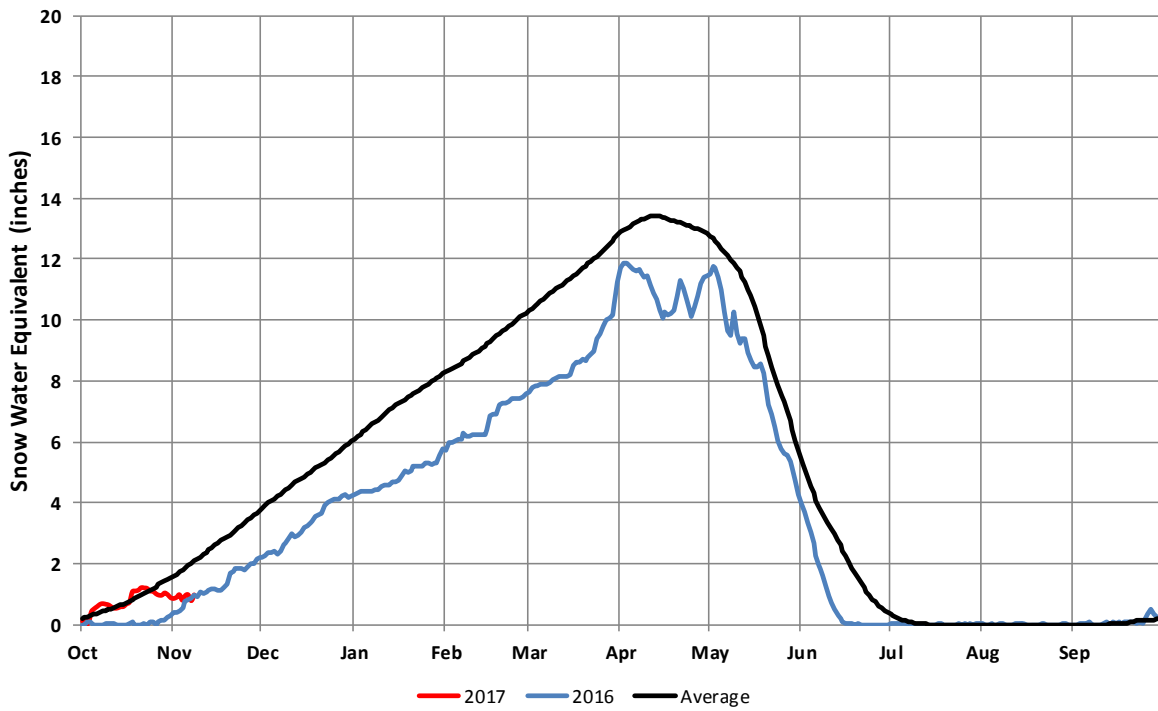
SNOW and PRECIPITATION UPDATE
Based on Mountain Data from NRCS SNOTEL Sites
As of November 1, 2016

BASIN Data Site Name	Elev.	Snow Water Equivalent			Total Precipitation		
		Current	Median	% Median	Current	Median	% Median
BIGHORN BASIN ABOVE YELLOWTAIL DAM							
Bald Mtn.	9380	4.0	3.1	129	3.5	2.8	125
Bear Trap Meadow	8200	.0	.5	0*	1.9	1.8	106
Blackwater	9780	5.7	2.8	204	8.2	2.8	293
Bone Springs Div	9350	1.4	2.8	50	3.6	2.8	129
Burroughs Creek	8750	.0	-M	*	3.2	-M	*
Castle Creek	8400	.0	-M	*	2.0	-M	*
Cold Springs	9630	.0	.8	0	2.3	1.9	121
Deer Park	9700	.0	1.7	0	3.6	3.2	112
Evening Star	9200	3.7	2.4	154*	9.0	3.3	273
Grave Springs	8550	.0	.9	0*	2.1	2.3	91
Kirwin	9550	.7	1.7	41	3.1	2.0	155
Little Warm	9370	.0	1.2	0	4.0	1.9	211
Marquette	8760	.0	-M	*	2.1	-M	*
Middle Powder	7760	.0	1.1	0*	2.4	2.6	92
Owl Creek	8975	.0	.8	0	1.3	1.3	100
Powder River Pass	9480	.0	1.4	0	2.7	2.2	123
Shell Creek	9580	3.1	2.9	107	3.1	2.4	129
South Pass	9040	.0	1.3	0*	2.4	2.4	100
St. Lawrence Alt	8620	.0	.9	0	2.7	1.8	150
Sylvan Lake	8420	1.1	1.7	65*	10.3	3.1	332
Sylvan Road	7120	.0	.3	0*	7.7	2.3	335
Timber Creek	7950	.0	.7	0	1.4	2.1	67
Togwotee Pass	9580	2.4	2.7	89	6.4	2.8	229
Townsend Creek	8700	.0	1.0	0	2.8	2.4	117
Younts Peak	8350	.0	1.5	0*	4.7	2.2	214
Basin Index (%)					65		170

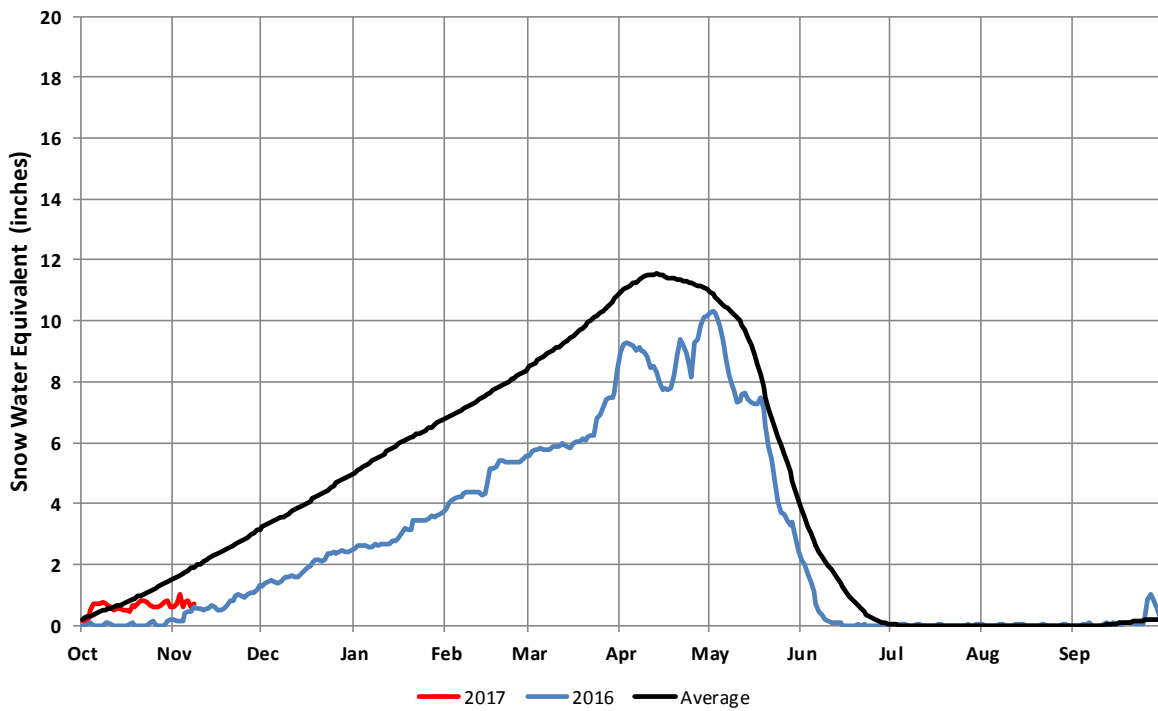
-M = Missing data

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

Snowpack above Bighorn Lake



Snowpack in Bighorn Mountains



BHXAOP V1.16 Run: 08-Nov-2016 16:26
 Based on Most Probable Inflow Forecast

BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir	Initial Cont 992.9 kaf Elev 3637.73 ft				Maximum Cont 1278.9 kaf Elev 3657.00 ft				Minimum Cont 469.9 kaf Elev 3547.00 ft				Total	
	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		Oct
Boysen Release	kaf	49.1	50.7	50.7	45.8	57.2	109.6	135.4	131.1	133.7	98.9	78.2	65.5	1005.9
Boysen Release	cfs	825	825	825	825	930	1842	2202	2203	2174	1608	1314	1065	
Buffalo Bill Release	kaf	12.2	12.6	12.6	11.4	12.6	79.3	110.6	143.2	180.9	132.6	96.4	46.8	851.2
Buffalo Bill Release	cfs	205	205	205	205	205	1333	1799	2407	2942	2157	1620	761	
Station Gain	kaf	52.0	33.9	38.3	44.4	62.7	39.9	62.2	119.0	-61.3	-45.3	16.4	65.2	427.4
Monthly Inflow	kaf	113.3	97.2	101.6	101.6	132.5	228.8	308.2	393.3	253.3	186.2	191.0	177.5	2284.5
Monthly Inflow	cfs	1904	1581	1652	1829	2155	3845	5012	6610	4120	3028	3210	2887	
Turbine Release	kaf	145.2	150.1	150.1	135.6	150.2	252.1	271.4	236.5	210.9	207.2	191.8	183.2	2284.3
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	145.2	150.1	150.1	135.6	150.2	252.1	271.4	236.5	210.9	207.2	191.8	183.2	2284.3
Total Release	cfs	2440	2441	2441	2442	2443	4237	4414	3975	3430	3370	3223	2979	
Spring Flow	kaf	4.2	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	50.8
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	111.6
Afterbay Rels	kaf	149.4	154.4	154.4	139.5	154.5	256.3	275.7	240.7	215.2	211.5	196.0	187.5	2335.1
Afterbay Rels	cfs	2511	2511	2511	2512	2513	4307	4484	4045	3500	3440	3294	3049	
River Release	kaf	149.4	154.4	154.4	139.5	154.5	255.0	263.8	217.9	187.1	184.5	178.5	184.5	2223.5
River Release	cfs	2511	2511	2511	2512	2513	4285	4290	3662	3043	3001	3000	3001	
Min Release	kaf	89.3	92.2	92.2	83.3	92.2	148.8	153.7	148.8	153.7	184.5	178.5	184.5	1601.7
End-Month Content	kaf	961.0	908.1	859.6	825.6	807.9	784.6	821.4	978.2	1020.6	999.6	998.8	993.1	
End-Month Elevation	ft	3634.94	3629.64	3623.95	3619.50	3617.00	3613.42	3618.92	3636.47	3640.00	3638.30	3638.23	3637.75	
Net Change Content	kaf	-31.9	-52.9	-48.5	-34.0	-17.7	-23.3	36.8	156.8	42.4	-21.0	-0.8	-5.7	0.2
Yellowtail Power	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Turbine Release	kaf	145.2	150.1	150.1	135.6	150.2	252.1	271.4	236.5	210.9	207.2	191.8	183.2	2284.3
Generation	gwh	55.145	56.680	55.959	49.103	55.121	97.747	106.833	96.258	85.651	83.677	76.728	72.753	891.655
End-Month Power Cap	mw	282.7	277.7	272.3	268.0	265.7	262.3	267.5	284.2	287.5	285.9	285.8	285.4	
% Max Gen		27	26	26	25	26	47	50	46	40	39	37	34	
Ave kwh/af		380	378	373	362	367	388	394	407	406	404	400	397	390
Upstream Generation	gwh	7.316	7.567	7.544	5.927	8.063	27.917	32.440	33.715	35.301	32.245	26.650	17.672	242.357
Total Generation	gwh	62.461	64.247	63.503	55.030	63.184	125.664	139.273	129.973	120.952	115.922	103.378	90.425	1134.012

BHXAOP V1.16 Run: 08-Nov-2016 16:26
 Based on Minimum Probable Inflow Forecast

BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir	Initial Cont 992.9 kaf Elev 3637.73 ft				Maximum Cont 1278.9 kaf Elev 3657.00 ft				Minimum Cont 469.9 kaf Elev 3547.00 ft				Total	
	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		Oct
Boysen Release	kaf	49.1	50.7	50.7	45.8	57.2	49.1	72.2	71.4	73.8	73.8	53.6	50.7	698.1
Boysen Release	cfs	825	825	825	825	930	825	1174	1200	1200	1200	901	825	
Buffalo Bill Release	kaf	12.2	12.6	12.6	11.4	12.6	42.6	107.2	110.7	118.7	108.3	94.0	41.7	684.6
Buffalo Bill Release	cfs	205	205	205	205	205	716	1743	1860	1930	1761	1580	678	
Station Gain	kaf	44.2	27.1	30.8	35.1	54.0	20.3	10.0	1.3	-70.0	-52.3	-0.8	46.2	145.9
Monthly Inflow	kaf	105.5	90.4	94.1	92.3	123.8	112.0	189.4	183.4	122.5	129.8	146.8	138.6	1528.6
Monthly Inflow	cfs	1773	1470	1530	1662	2013	1882	3080	3082	1992	2111	2467	2254	
Turbine Release	kaf	145.2	150.0	150.0	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	1615.8
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	145.2	150.0	150.0	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	1615.8
Total Release	cfs	2440	2440	2440	2181	1930	1951	2124	2312	2387	2370	2223	1979	
Spring Flow	kaf	4.2	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	50.8
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	111.6
Afterbay Rels	kaf	149.4	154.3	154.3	125.0	123.0	120.3	134.9	141.8	151.1	150.0	136.5	126.0	1666.6
Afterbay Rels	cfs	2511	2509	2509	2251	2000	2022	2194	2383	2457	2440	2294	2049	
River Release	kaf	149.4	154.3	154.3	125.0	123.0	119.0	123.0	119.0	123.0	123.0	119.0	123.0	1555.0
River Release	cfs	2511	2509	2509	2251	2000	2000	2000	2000	2000	2000	2000	2000	
Min Release	kaf	149.4	154.3	154.3	125.0	123.0	119.0	123.0	119.0	123.0	123.0	119.0	123.0	1555.0
End-Month Content	kaf	953.2	893.6	837.7	808.9	814.0	809.9	868.7	914.5	890.2	874.3	888.8	905.7	
End-Month Elevation	ft	3634.22	3628.02	3621.13	3617.14	3617.88	3617.29	3625.07	3630.34	3627.62	3625.75	3627.46	3629.38	
Net Change Content	kaf	-39.7	-59.6	-55.9	-28.8	5.1	-4.1	58.8	45.8	-24.3	-15.9	14.5	16.9	-87.2
Yellowtail Power	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Turbine Release	kaf	145.2	150.0	150.0	121.1	118.7	116.1	130.6	137.6	146.8	145.7	132.3	121.7	1615.8
Generation	gwh	55.057	56.430	55.557	42.649	41.705	40.552	47.546	51.207	54.961	54.245	48.548	44.111	592.568
End-Month Power Cap	mw	282.0	276.1	269.6	265.8	266.5	265.9	273.3	278.3	275.8	274.0	275.6	277.4	
% Max Gen		27	26	26	22	19	20	22	25	26	25	23	21	
Ave kwh/af		379	376	370	352	351	349	364	372	374	372	367	362	367
Upstream Generation	gwh	7.305	7.534	7.495	5.869	7.965	14.964	26.972	26.568	27.371	25.931	21.794	13.491	193.259
Total Generation	gwh	62.362	63.964	63.052	48.518	49.670	55.516	74.518	77.775	82.332	80.176	70.342	57.602	785.827

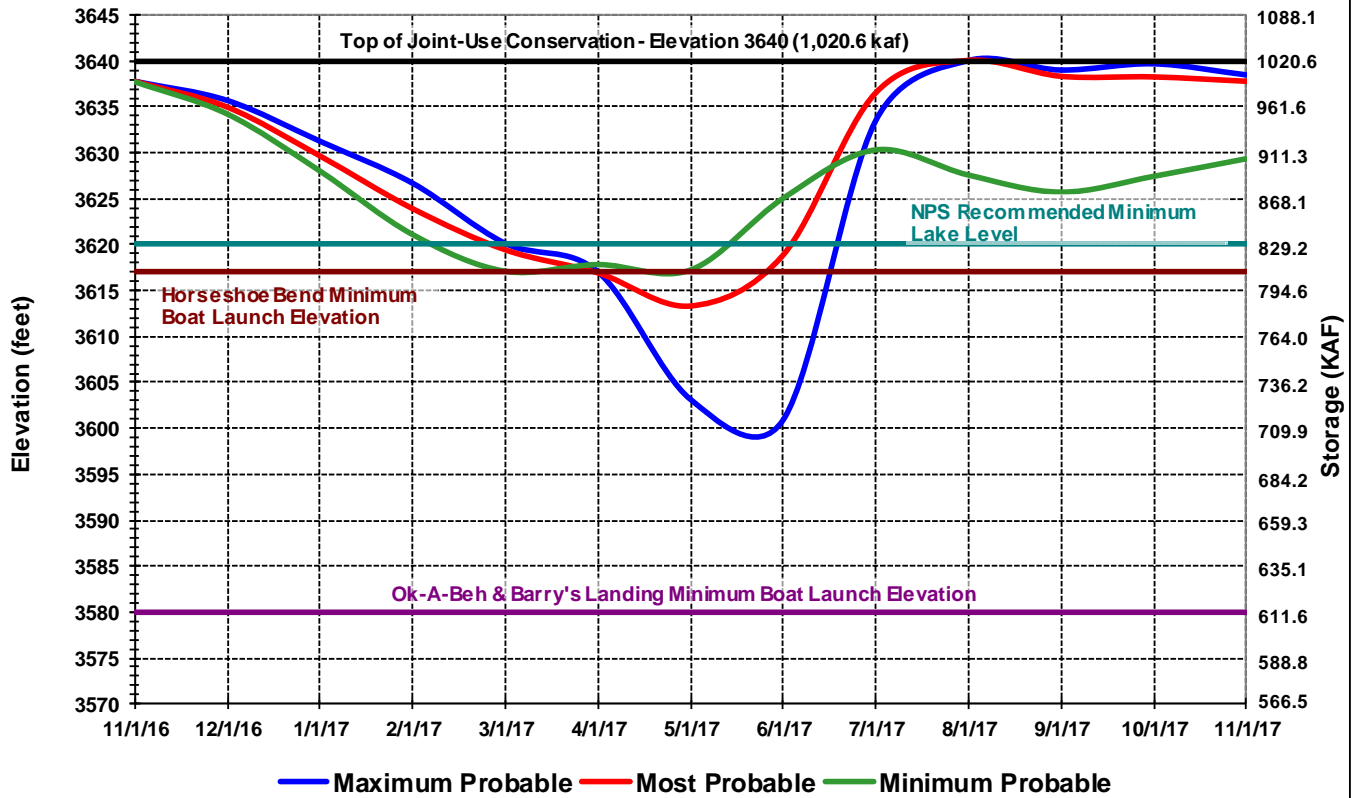
BHXAOP V1.16 Run: 08-Nov-2016 16:26
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BIGHORN LAKE MONTHLY OPERATIONS

Bighorn Reservoir	Initial Cont 992.9 kaf Elev 3637.73 ft				Maximum Cont 1278.9 kaf Elev 3657.00 ft				Minimum Cont 469.9 kaf Elev 3547.00 ft				Total	
	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		Oct
Boysen Release	kaf	49.1	50.7	50.7	45.8	104.5	130.9	184.5	278.3	287.5	131.1	88.4	63.3	1464.8
Boysen Release	cfs	825	825	825	825	1700	2200	3001	4677	4676	2132	1486	1029	
Buffalo Bill Release	kaf	12.2	12.6	12.6	11.4	64.4	94.7	187.3	220.2	305.4	153.5	105.1	51.5	1230.9
Buffalo Bill Release	cfs	205	205	205	205	1047	1591	3046	3701	4967	2496	1766	838	
Station Gain	kaf	59.7	40.6	45.8	53.7	71.3	51.0	128.9	266.4	0.1	-28.7	36.7	84.2	809.7
Monthly Inflow	kaf	121.0	103.9	109.1	110.9	240.2	276.6	500.7	764.9	593.0	255.9	230.2	199.0	3505.4
Monthly Inflow	cfs	2033	1690	1774	1997	3906	4648	8143	12855	9644	4162	3869	3236	
Turbine Release	kaf	145.2	150.0	150.0	162.7	262.2	358.3	368.9	357.0	368.9	268.7	221.6	213.9	3027.4
Bypass/Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	0.0	143.7	177.4	148.3	0.0	0.0	0.0	469.4
Total Release	kaf	145.2	150.0	150.0	162.7	262.2	358.3	512.6	534.4	517.2	268.7	221.6	213.9	3496.8
Total Release	cfs	2440	2440	2440	2930	4264	6021	8337	8981	8411	4370	3724	3479	
Spring Flow	kaf	4.2	4.3	4.3	3.9	4.3	4.2	4.3	4.2	4.3	4.3	4.2	4.3	50.8
Irrigation Reqmnt	kaf	0.0	0.0	0.0	0.0	0.0	1.3	11.9	22.8	28.1	27.0	17.5	3.0	111.6
Afterbay Rels	kaf	149.4	154.3	154.3	166.6	266.5	362.5	516.9	538.6	521.5	273.0	225.8	218.2	3547.6
Afterbay Rels	cfs	2511	2509	2509	3000	4334	6092	8407	9051	8481	4440	3795	3549	
River Release	kaf	149.4	154.3	154.3	166.6	266.5	361.2	505.0	515.8	493.4	246.0	208.3	215.2	3436.0
River Release	cfs	2511	2509	2509	3000	4334	6070	8213	8668	8024	4001	3501	3500	
Min Release	kaf	149.4	154.3	154.3	166.6	266.5	89.3	92.2	89.3	92.2	246.0	208.3	215.2	1923.6
End-Month Content	kaf	968.7	922.6	881.7	829.9	807.9	726.2	714.3	944.8	1020.6	1007.8	1016.4	1001.5	
End-Month Elevation	ft	3635.64	3631.20	3626.63	3620.09	3617.00	3603.11	3600.84	3633.42	3640.00	3638.97	3639.66	3638.45	
Net Change Content	kaf	-24.2	-46.1	-40.9	-51.8	-22.0	-81.7	-11.9	230.5	75.8	-12.8	8.6	-14.9	8.6
Yellowtail Power	2016	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Turbine Release	kaf	145.2	150.0	150.0	162.7	262.2	358.3	368.9	357.0	368.9	268.7	221.6	213.9	3027.4
Generation	gwh	55.230	56.833	56.254	60.973	102.665	135.058	150.660	145.800	150.660	110.613	90.363	86.701	1201.810
End-Month Power Cap	mw	283.4	279.2	274.8	268.6	265.7	252.5	250.3	281.3	287.5	286.5	287.2	286.1	
% Max Gen		27	27	26	32	48	65	70	70	70	52	44	40	
Ave kwh/af		380	379	375	375	392	377	408	408	408	412	408	405	397
Upstream Generation	gwh	7.320	7.573	7.565	5.957	24.495	29.310	33.276	33.675	35.307	35.044	29.327	18.770	267.619
Total Generation	gwh	62.550	64.406	63.819	66.930	127.160	164.368	183.936	179.475	185.967	145.657	119.690	105.471	1469.429

BIGHORN LAKE

BIGHORN LAKE ELEVATION



BIGHORN RIVER FLOW BELOW AFTERBAY

