

The Official WSF is computed on the 3rd work day of the month, January through July, using the 5-day QPF 50% exceedance value. FRM is computed at standard intervals and posted online at: <http://www.nwd.usace.army.mil/Missions/Water/Columbia/FloodControl>

The MARCH Water Supply Forecast sets BiOp actions as highlighted in the table below.

Forecast Point	Forecast period	Forecast	BiOp Actions to be Determined
Hungry Horse	April – August Provided by Reclamation	January, February, March Final	Sets min. flows at Hungry Horse and Columbia Falls
	May – September Provided by Reclamation	January, February, March Final	Sets VARQ FRM targets
		April Final	Sets VARQ FRM targets and VARQ refill flows
		May, June Final	Sets VARQ refill flows
The Dalles	April – September Provided by NWRFC	March Final	Sets CRWMP adjustments at Grand Coulee
	April – August Provided by NWRFC	April Final	Sets spring flow objective at McNary Dam
		May Final	Sets end of September draft limits at Hungry Horse and Libby
		July Final	Sets end of August draft limit at Grand Coulee
Lower Granite	April – July Provided by NWRFC	April Final	Sets spring flow objective at Lower Granite
		June Final	Sets summer flow objective at Lower Granite
Libby	April – August Provided by Corps Seattle District	December Final	Sets end of December variable draft target
		January, February, March Final	Sets VARQ FRM targets
		April Final	Sets VARQ FRM targets and VARQ refill flows
		May Final	Sets Libby min. sturgeon flow volume and min. bull trout flows for after sturgeon pulse through Sept. Sets VARQ FRM targets and VARQ refill flows
		June Final	VARQ refill flows
Dworshak	April – July Provided by Corps Walla Walla District	January to June Final	Manage for reservoir FRM and refill

Source: 2019 Water Management Plan
<http://pweb.crohms.org/tmt/documents/wmp/2019/>

March 6, 2019

**Hungry Horse Dam – Official Water Supply Forecast
MARCH 2019**

There was a moderate rally in the Flathead basin and inflow forecasts have jumped a bit. Even with this rally we are projected to keep drafting the Hungry Horse to meet Columbia Falls Minimum Flows through April. The current Apr 30 projection for space in Hungry Horse is 750 KAF based on maintain Columbia Falls minimum flows which is well in excess of the 375 KAF flood risk requirement for the end of April. Below are the volumes for the March 2019 final forecast for Hungry Horse:

Mar-Jul: 1,790 kaf (91%)

Apr-Aug: 1,750 kaf (90%)

May-Sep: 1580 kaf (93%)

The minimum flows downstream of Hungry Horse are as follows:

Columbia Falls: 3,480 cfs

Hungry Horse: 870 cfs

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COLUMBIA - THE DALLES DAM (TDAO3) Forecasts for Water Year 2019

Official Forecast

10 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	74000	81086	87	90733	92704
APR-JUL	61966	68324	86	79428	79855
APR-AUG	69013	75475	86	85839	87532
JAN-SEP	87874	95343	83	105543	114216
JAN-JUL	75783	82020	81	93022	101368
OCT-SEP	101415	108884	83	119085	130518

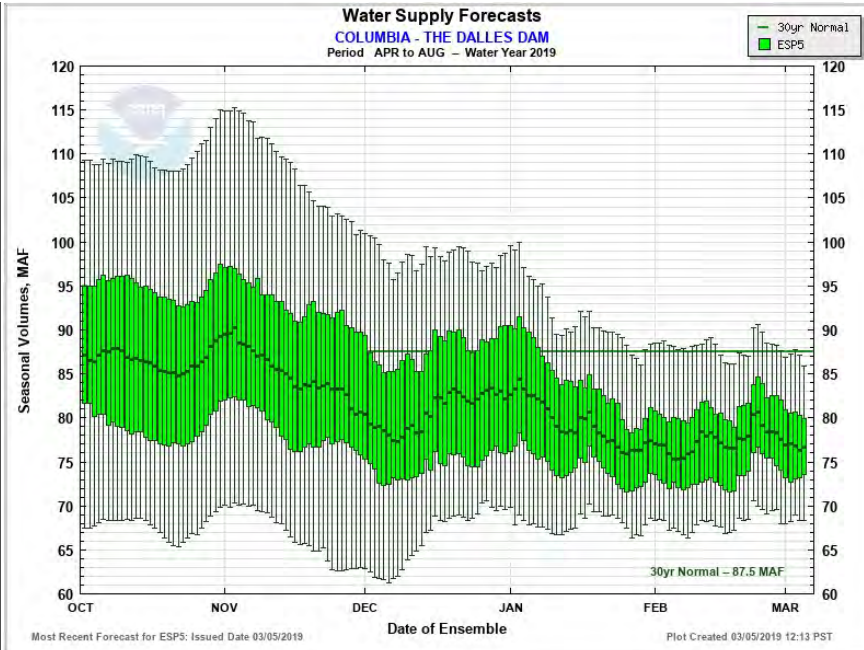
5 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	73186	82519	89	92639	92704
APR-JUL	61823	69677	87	79196	79855
APR-AUG	68401	76636	88	85898	87532
JAN-SEP	87792	97575	85	109594	114216
JAN-JUL	76149	84495	83	97008	101368
OCT-SEP	101333	111116	85	123136	130518

0 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	73540	82899	89	93638	92704
APR-JUL	61421	69857	87	79826	79855
APR-AUG	67751	77408	88	87429	87532
JAN-SEP	87721	98044	86	109515	114216
JAN-JUL	77078	84920	84	95728	101368
OCT-SEP	101262	111585	85	123056	130518

Move the mouse over the desired "Forecast Period" to display a graph.



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SNAKE - LOWER GRANITE DAM (LGDW1) Forecasts for Water Year 2019

Official Forecast

10 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	18776	21720	97	27306	22279
APR-JUL	16518	19210	97	24562	19848
APR-AUG	17643	20492	97	25998	21091
JAN-SEP	23979	26965	90	32751	29872
JAN-JUL	21697	24242	88	29985	27440
OCT-SEP	27969	30955	89	36742	34667

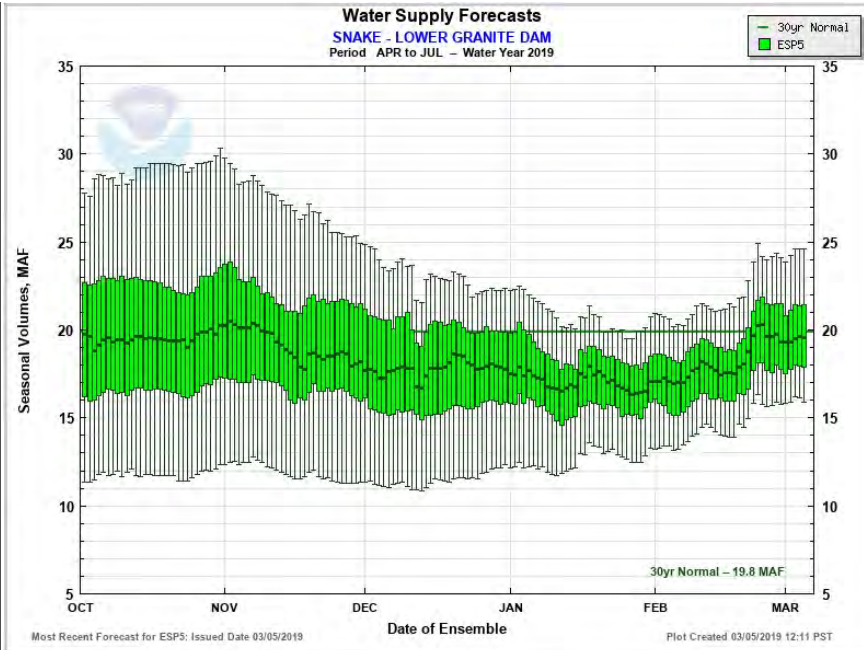
5 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	18243	22130	99	27506	22279
APR-JUL	15919	19563	99	24598	19848
APR-AUG	17062	20880	99	26239	21091
JAN-SEP	23993	27419	92	33354	29872
JAN-JUL	21673	24780	90	30712	27440
OCT-SEP	27983	31410	91	37344	34667

0 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	18176	21962	99	26985	22279
APR-JUL	15855	19392	98	24009	19848
APR-AUG	17030	20678	98	25503	21091
JAN-SEP	23797	27641	93	32571	29872
JAN-JUL	21507	25009	91	29726	27440
OCT-SEP	27787	31631	91	36561	34667

Move the mouse over the desired "Forecast Period" to display a graph.



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Overlay

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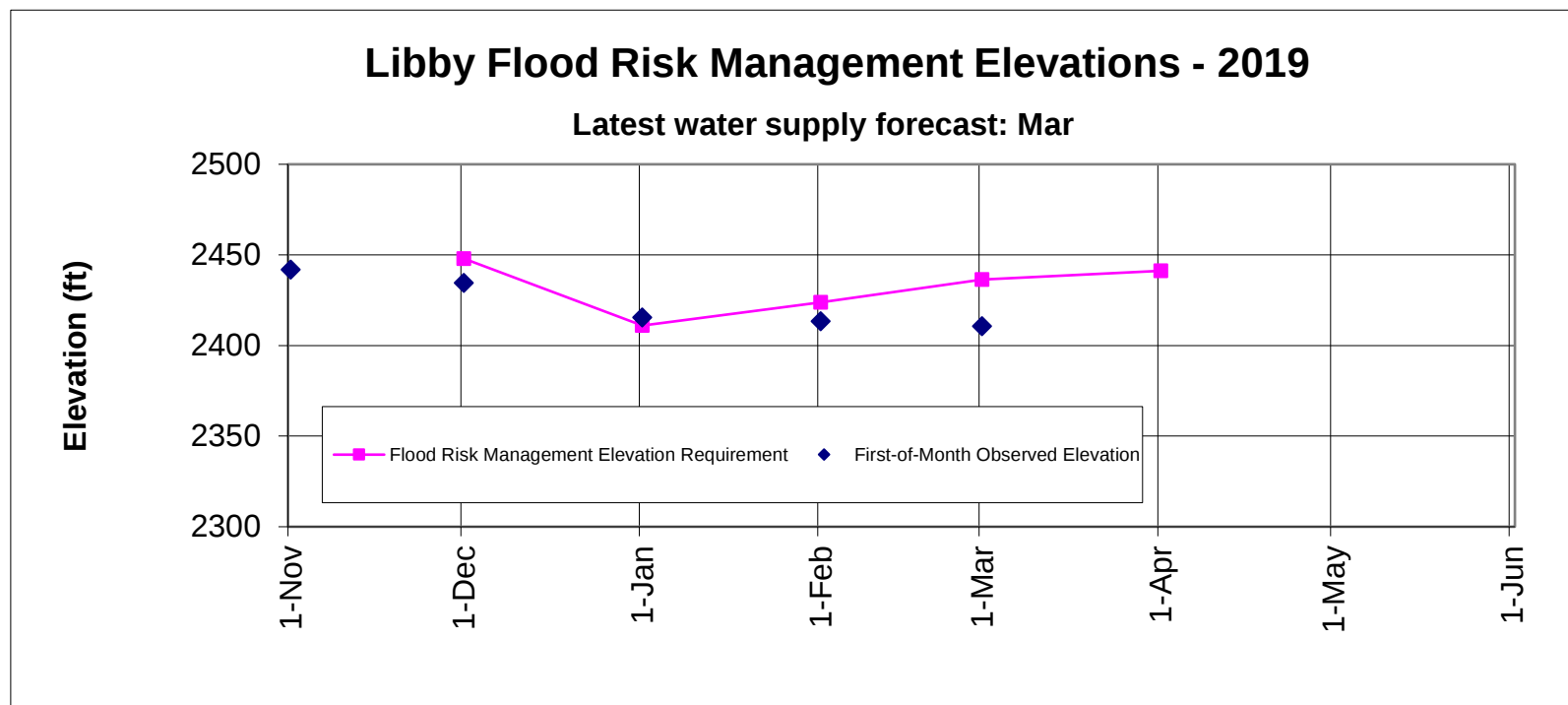
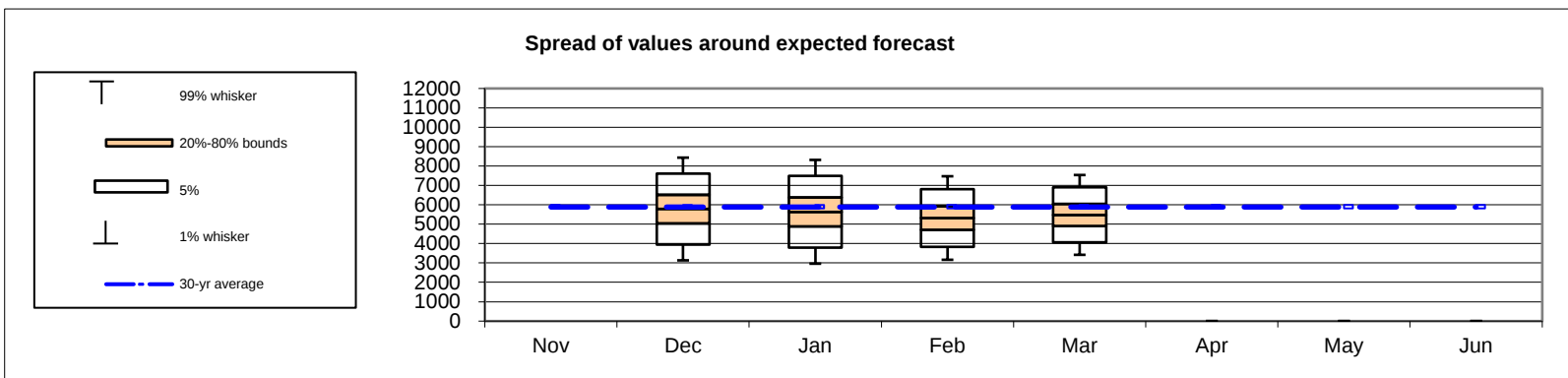
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Libby : March Runoff Forecast & Flood Risk Management Calculation

WY 2019

Runoff Forecast and Flood Risk Management					1981-2010 Average	Percent of Average	1929-2008 Average	Percent of Average
Most Probable Runoff Volume:					5885	93%	6282	87%
Apr-Aug					5342	93%	5720	87%
Apr-Jul					4821	93%	5199	86%
May-Jul								
31-Mar Flood Risk Management Space					793			
31-Mar Flood Risk Management Elevation					2441.3			
Seasonal Flood Risk Management					VARQ Flood Risk Management Implemented			
Forecast Date >>	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Apr-Aug Runoff Forecast		5784	5639	5318	5478			
First-of-Month Elev	2441.9	2434.6	2415.5	2413.3	2410.6			
Date >>	30-Nov	31-Dec	31-Jan	28-Feb	31-Mar	30-Apr		
Flood Risk Management Space	500	2000	1511	1002	793			
Flood Risk Management Elevation	2448.0	2411.0	2423.9	2436.4	2441.3			



Notes:

1. The given forecast is the official Corps of Engineers forecast for Libby. If you have any questions please contact Logan Osgood-Zimmerman (206) 764-6928, Kevin Shaffer (206) 764-3660, Sonja Michelsen (206) 316-3947, or Jon Moen (206) 764-3561.
2. If a prior month's forecast as published in this document is different than what was originally published in the issue month, then the earlier forecast has been adjusted to reflect updated values for precipitation or streamflow.
3. The Akamina Pass snow station was destroyed in a fire in Sept. 2017. Akamina Pass SWE was estimated based on a regression equation and observed values at nearby sites Grave Creek, Poorman Creek, Lost Creek South, and Mount Odium.

Libby : March Runoff Forecast & Flood Risk Management Calculation

Apr-Aug Runoff Forecast Calculation:						
Variable	Month(s)	Units	Observed Value	Percent of Average	Regression Coefficient	Marginal Runoff (KAF)
			A		B	=A*B
SOI	ΣJun:Jul					
Eureka RS, MT	ΣOct:Feb Prcp	inches	5.27	106%	65.9	347.1
West Glacier, MT	ΣOct:Feb Prcp	inches	12.56	89%	28.5	358.1
Cranbrook A, BC	ΣOct:Feb Prcp	millimeters	128.30	95%	2.7	350.3
Fernie, BC	ΣOct:Feb Prcp	millimeters	494.00	86%	0.6	311.2
Hawkins Lake, MT	1-Mar SWE	inches	16.90	84%	24.3	411.2
Stahl Peak, MT	1-Mar SWE	inches	25.40	89%	19.1	485.4
East Creek, BC	1-Mar SWE	millimeters	806.00	114%	0.7	523.9
Moyie Mountain, BC	1-Mar SWE	millimeters	299.00	85%	1.3	379.7
Sunshine Village, AB	1-Mar SWE	millimeters	388.40	83%	1.3	489.4
Akamina Pass, AB	1-Mar SWE	millimeters	315.30	81%	1.0	327.9
South Racehorse Creek, AB	1-Mar SWE	millimeters	251.60	73%	1.4	352.2
Intercept			1		1142.0	1142.0
1-Mar Forecast (KAF)					Σ	5478.4

Data used in Libby Water Supply Forecast

WY 2019

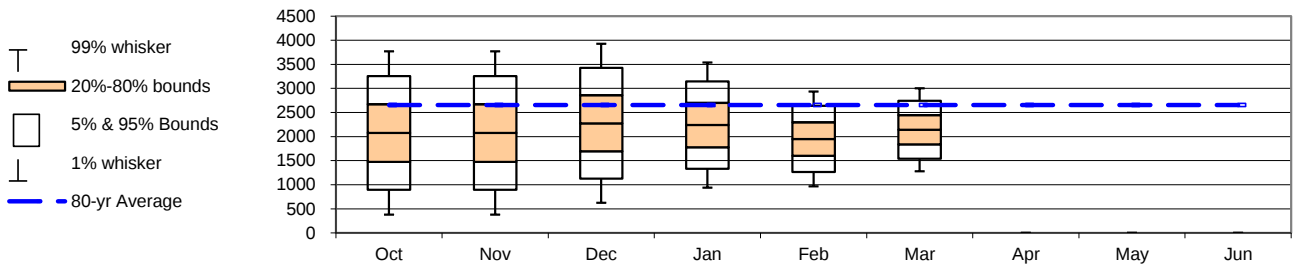
Climate Data				Jun-18	Jul-18				
SOI				-0.10	0.20				
Precipitation Data	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Units
Eureka RS, MT	1.64	0.55	0.40	0.94	1.74				inch
West Glacier, MT	2.55	3.19	2.24	2.29	2.29				inch
Cranbrook A, BC	34.50	14.60	26.60	19.00	33.60				mm
Fernie, BC	87.00	139.00	117.00	83.00	68.00				mm
Snow Water Equiv	1-Jan			1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Hawkins Lake, MT				13	17				inch
Stahl Peak, MT			14	20	25				inch
East Creek, BC				709	806				mm
Moyie Mountain, BC			153	223	299				mm
Sunshine Village, AB			272	373	388				mm
Akamina Pass, AB				259	315				mm
South Racehorse Creek, AB				180	252				mm
Streamflow	Jan			Feb	Mar	Apr	May	Jun	Units
Libby Inflow Volume			162.5	120.6					KAF
Reservoir Elevation	1-Nov	1-Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Libby FOM Elev	2441.9	2434.6	2415.5	2413.3	2385.9				feet

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 Approving Official
 Ch., Hydrologic Engineering and Power Branch
 Northwestern Division

Logan Osgood-Zimmerman, P.E.
 Water Management Section
 Seattle District

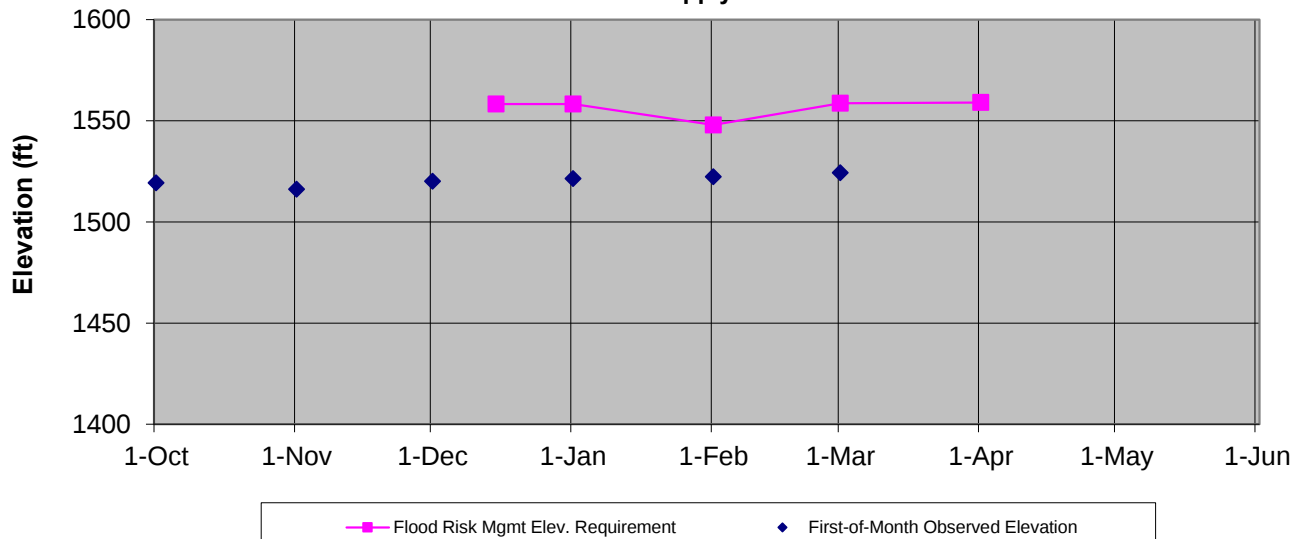
Runoff Forecast and Flood Risk Management (FRM)						1981-2010 Average	Percent of 30yr Average	1929-2008 Average	Percent of Average
Most Probable Runoff Volume	Apr-Jul	2142	KAF			2438	88%	2655	81%
	May-Jul	1567	KAF			1784	88%	1959	80%
31-Mar Flood Risk Management Space			689	KAF					
31-Mar Flood Risk Management Elevation			1559.0	ft					
Seasonal Flood Risk Management (assumes no shift of flood risk management space to Grand Coulee)									
Forecast Date>>	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Apr-Jul Runoff Forecast	2075	2075	2276	2239	1951	2142			
First-of-Month Elev	1519.3	1516.1	1520.1	1521.4	1522.3	1524.3			
Date >>		15-Dec	31-Dec	31-Jan	28-Feb	31-Mar	15-Apr	30-Apr	31-May
FRM Space	--	700	700	849	694	689			
FRM Elevation	--	1558.2	1558.2	1547.9	1558.6	1559.0			

Spread of values around expected forecast



Dworshak Flood Risk Management Elevations - WY 2019

Latest water supply forecast: Mar



Dworshak : March Runoff Forecast & Flood Risk Management Calculation

Apr-Jul Runoff Forecast Calculation					
Variable	Month	Observed Value	% of Average	Regression Coefficient	Marginal Runoff (KAF)
		A		B	=A*B
SOI	Sep	-0.90		220.73	-198.7
HQSI Cumulative Precip	Oct-Date	18.30	81%	23.39	428.0
Elk Butte SWE	1-Mar	29.9	102%	10.16	303.3
Hoodoo Basin SWE	1-Mar	30.6	94%	10.01	306.3
Sherwin SWE	1-Mar	10.2	117%	25.42	259.3
Lost Lake SWE	1-Mar	36.2	84%	6.99	253.0
Crater meadows SWE	1-Mar	37.8	107%	13.06	493.7
Intercept		1		296.75	296.8
1-Mar Forecast (KAF)				Σ	2141.7

Data Station	Sept	Nov	Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun
Climate (Stdzd SOI)									
September SOI	-0.90								
Precipitation (in)	Oct								
Headquarters, ID	3.80	5.60	5.30	2.20	1.40	--	--		
Cumulative HQSI Data	3.80	9.40	14.70	16.90	18.30	--	--		
Snow Water Equiv (First of Month values) (in)									
Elk Butte, ID				15.5	20.6	29.9	--		
Cool Creek, ID				21.5	26.7				
Hoodoo Basin, MT				14.4	21.1	30.6	--	--	--
Sherwin, ID				3.7	6.1	10.2	--		
Shanghi Summit, ID								--	--
Lost Lake, ID				18.8	26.1	36.2	--	--	--
Hemlock, ID								--	--
Crater Meadows Mar						37.8	--		
Streamflow (End of Month) (kaf)				Jan	Feb	Mar	Apr	May	Jun
Dworshak Inflow				114	121	--	--	--	--

Notes:

1. The given forecast is the official Corps of Engineers forecast for Dworshak. If you have any questions please contact Steve Hall (509-527-7550), Alfredo Rodriguez (509-527-7532), or Jon Roberts (509-527-7518).
2. Due to updated values for precipitation, snow or streamflow, subsequent forecasts may be different from the forecast published herein.
3. Elk Butte quit reporting on 2/6 with a value of 22.4" of SWE. This station value was average using Lost Lake value of 36.2in & Lolo Pass value of 23.5in for a value of 29.85in.
4. Headquarters precipitation gage has reported intermittently and its value will be updated if a correction can be made for the location.

Approval:

John J. Heitstuman P.E., D.WRE
Chief Hydrology Section
Walla Walla District USACE

William D. Proctor, P.E.
Ch., Hydrologic Engineering and Power Branch
Columbia Basin Water Management Division



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COLUMBIA - GRAND COULEE DAM (GCDW1) Forecasts for Water Year 2019

Official Forecast

10 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	46671	51432	86	57043	60110
APR-JUL	38197	42208	83	48122	51015
APR-AUG	43602	47868	84	53253	56763
JAN-SEP	52451	57189	83	62935	68694
JAN-JUL	43643	48281	81	54633	59599
OCT-SEP	59643	64381	84	70128	76824

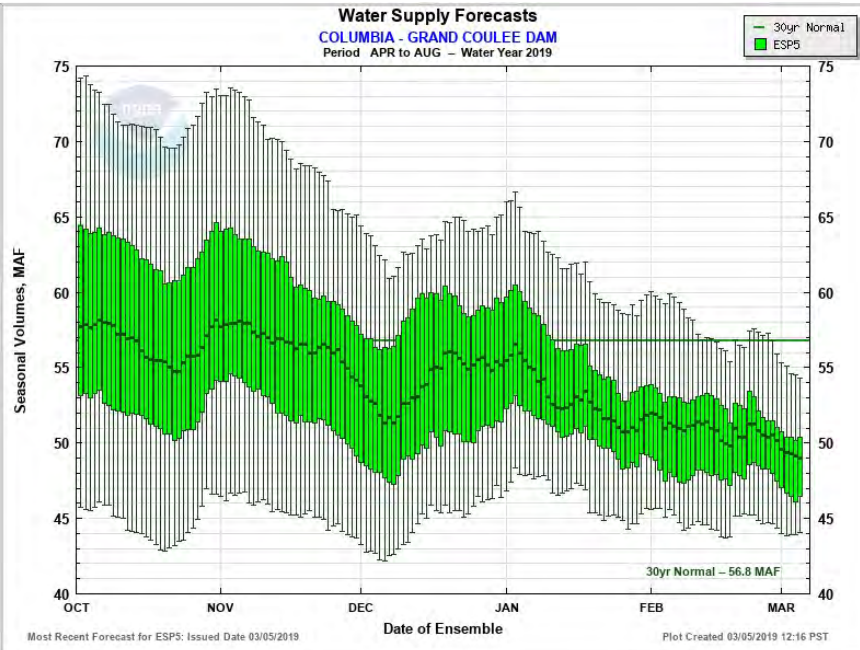
5 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	47043	52636	88	58436	60110
APR-JUL	38215	43498	85	48459	51015
APR-AUG	44081	48998	86	54334	56763
JAN-SEP	52715	58704	85	64497	68694
JAN-JUL	43857	49580	83	54618	59599
OCT-SEP	59908	65896	86	71690	76824

0 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	47010	53238	89	59644	60110
APR-JUL	38941	43737	86	49856	51015
APR-AUG	44032	49792	88	55535	56763
JAN-SEP	52985	59618	87	66241	68694
JAN-JUL	44776	49841	84	56262	59599
OCT-SEP	60178	66810	87	73433	76824

Move the mouse over the desired "Forecast Period" to display a graph.



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PEND OREILLE - ALBENI FALLS DAM (ALFW1) Forecasts for Water Year 2019

Official Forecast

10 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	9164	10636	83	12799	12815
APR-JUL	8359	9609	82	11560	11777
APR-AUG	8798	10169	82	12282	12354
JAN-SEP	10561	11985	79	14297	15226
JAN-JUL	9705	11027	78	13084	14189
OCT-SEP	12243	13667	79	15978	17218

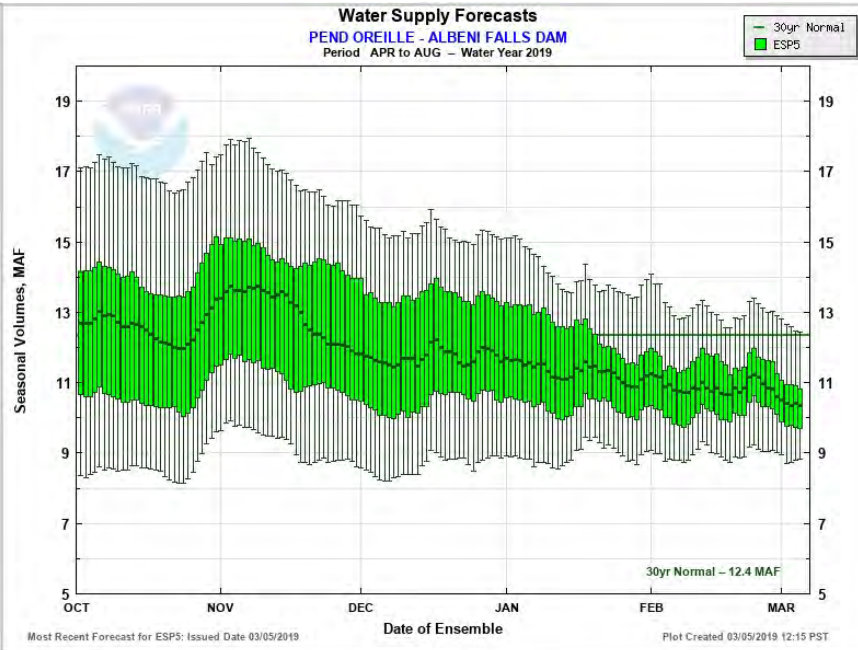
5 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	9255	10779	84	12955	12815
APR-JUL	8402	9848	84	11716	11777
APR-AUG	8838	10354	84	12426	12354
JAN-SEP	10850	12292	81	14447	15226
JAN-JUL	10031	11322	80	13185	14189
OCT-SEP	12532	13974	81	16128	17218

0 days QPF: Ensemble: 2019-03-05 Issued: 2019-03-05

APR-SEP	9408	10952	85	13230	12815
APR-JUL	8423	9839	84	12152	11777
APR-AUG	8942	10456	85	12738	12354
JAN-SEP	10809	12415	82	15017	15226
JAN-JUL	9965	11406	80	13854	14189
OCT-SEP	12490	14097	82	16698	17218

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