The Official Water Supply Forecasts for January through July are computed on the 3rd work day of the month. Flood Risk Management (FRM) is computed at standard intervals and posted at: www.nwd.usace.army.mil/Missions/Water/Columbia/FloodControl

The MAY 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/

May 1, 2019

Hungry Horse Dam – Official Water Supply Forecast
MAY 2019

The volumes for the May 2019 final forecast for Hungry Horse Inflows are:

- May-Jul: 1,350 kaf (86%)
- Jan-Jul: 1,816 kaf (87%)
- Apr-Aug: 1,730 kaf (89%)
- May-Sep: 1,460 kaf (86%)

The minimum flows downstream of Hungry Horse for the rest of the calendar year are as follows:

- Columbia Falls: 3,480 cfs
- Hungry Horse: 870 cfs

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Joel Fenolio, P.E.
Water Management - Operations Team Supervisor
U.S. Bureau of Reclamation
PN Regional Office
Boise, ID

Northwest River Forecast Center

Water Supply Forecasts

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

Official Forecast

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

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	81885	86966	94	93167	92704
APR-JUL	70128	74645	93	81139	79855
APR-AUG	76825	81262	93	87851	87532
JAN-SEP	97735	102816	90	109017	114216
JAN-JUL	85978	90495	89	96989	101368
OCT-SEP	111276	116357	89	122558	130518

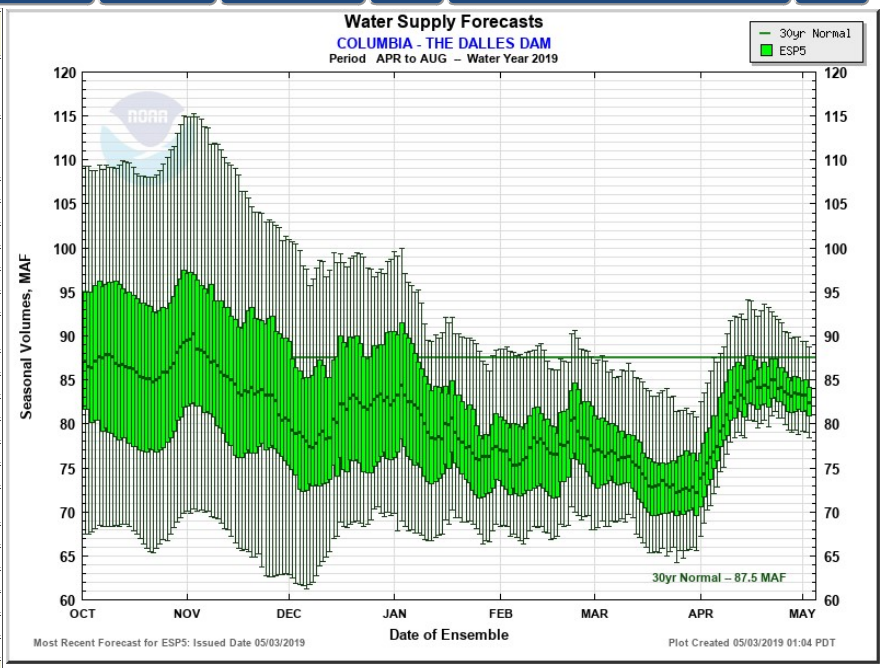
5 days QPF: ***Ensemble:*** **2019-05-03** ***Issued:*** 2019-05-03

APR-SEP	83490	87405	94	93786	92704
APR-JUL	70784	75580	95	81467	79855
APR-AUG	78435	82415	94	88712	87532
JAN-SEP	99340	103255	90	109636	114216
JAN-JUL	86634	91430	90	97317	101368
OCT-SEP	112881	116796	89	123177	130518

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

APR-SEP	84307	88836	96	95953	92704
APR-JUL	72426	76956	96	82986	79855
APR-AUG	79598	83502	95	90468	87532
JAN-SEP	100157	104686	92	111803	114216
JAN-JUL	88276	92806	92	98836	101368
OCT-SEP	113698	118226	91	125344	130518

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



○ Max Scale ◉ Scale To Data ○ Scale To Last 45 Days

Overlay: ESP10 | ESP5 | ESP0

Data Files: CSV (ESP5 / APR-AUG) | Forecast Ensemble

Northwest River Forecast Center

Water Supply Forecasts

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

Official Forecast

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

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	24351	25780	116	27992	22279
APR-JUL	21922	23216	117	25155	19848
APR-AUG	23154	24491	116	26597	21091
JAN-SEP	30154	31584	106	33795	29872
JAN-JUL	27725	29019	106	30958	27440
OCT-SEP	34144	35574	103	37785	34667

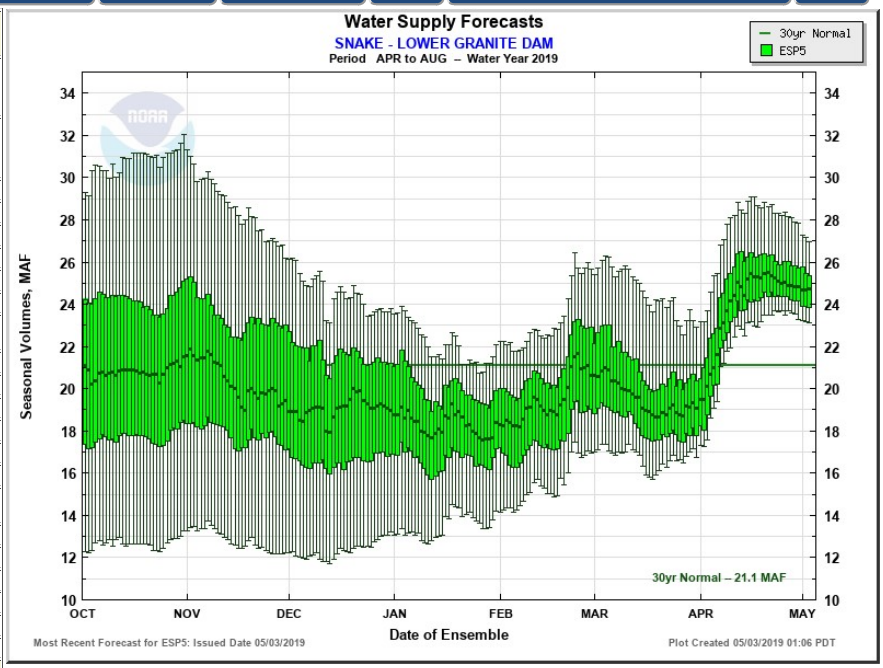
5 days QPF: ***Ensemble:*** **2019-05-03** ***Issued:*** 2019-05-03

APR-SEP	24273	26005	117	28190	22279
APR-JUL	21830	23247	117	25586	19848
APR-AUG	23097	24728	117	26947	21091
JAN-SEP	30076	31808	106	33993	29872
JAN-JUL	27633	29050	106	31389	27440
OCT-SEP	34066	35799	103	37983	34667

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

APR-SEP	24826	26246	118	29508	22279
APR-JUL	22288	23591	119	26741	19848
APR-AUG	23610	24914	118	28190	21091
JAN-SEP	30629	32049	107	35311	29872
JAN-JUL	28091	29394	107	32544	27440
OCT-SEP	34620	36039	104	39301	34667

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



Max Scale | Scale To Data | Scale To Last 45 Days

Overlay: ESP10 | ESP5 | ESP0

Data Files: CSV (ESP5 / APR-JUL) | Forecast Ensemble

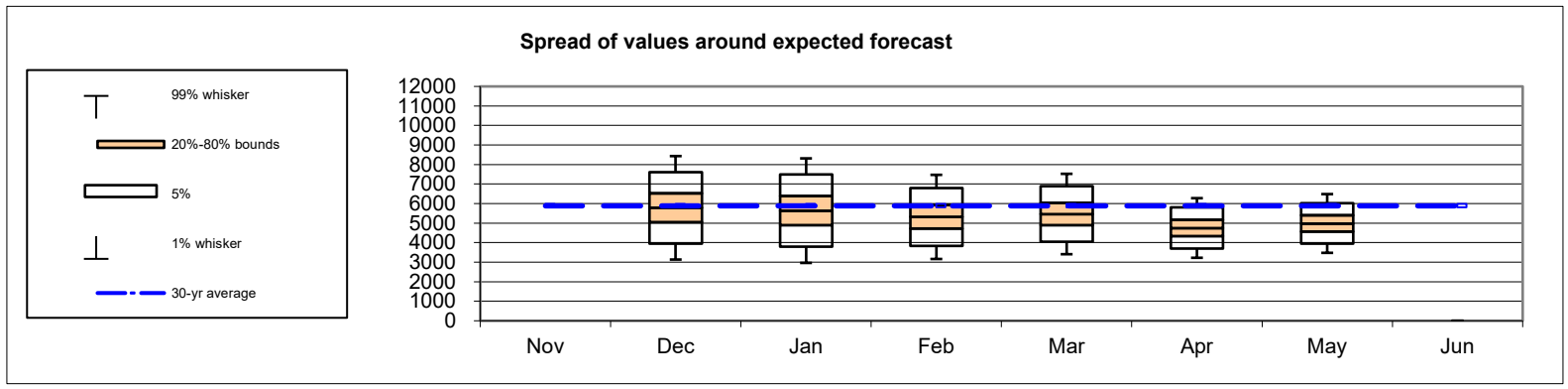
Libby: May Runoff Forecast & Flood Risk Management Calculation WY 2019

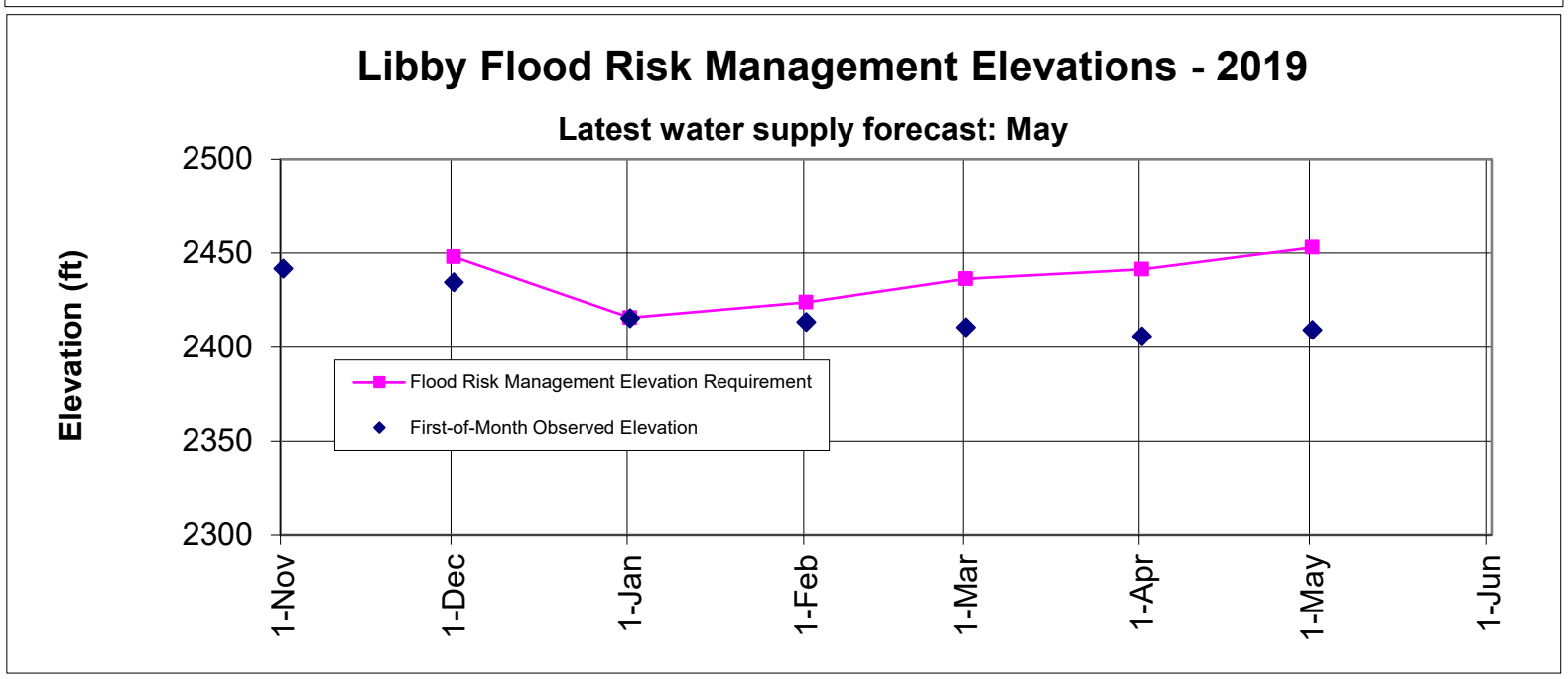
Runoff Forecast and Flood Risk Management				1981-2010 Average	Percent of Average	1929-2008 Average	Percent of Average
Most Probable Runoff Volume:	Apr-Aug	4983	KAF	5885	85%	6282	79%
	Apr-Jul	4522	KAF	5342	85%	5720	79%
	May-Jul	4092	KAF	4821	85%	5199	79%

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	5467	4752	4983	
First-of-Month Elev	2441.9	2434.6	2415.5	2413.3	2410.6	2405.8	2409.2	

Date >>	30-Nov	31-Dec	31-Jan	28-Feb	31-Mar	30-Apr
FRM Space	500	1826	1511	1002	790	276
FRM Elevation	2448.0	2415.7	2423.9	2436.4	2441.4	2453.0





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, Hand Creek, and Mount Odlum.

Libby: May 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	*∑Jun:Jul*					
Eureka RS, MT	*∑Oct:Apr Prcp*	*inches*	7.03	103%	57.5	403.9
West Glacier, MT	*∑Oct:Apr Prcp*	*inches*	17.20	93%	28.0	482.3
Cranbrook A, BC	*∑Oct:Apr Prcp*	*millimeters*	152.50	83%	2.8	427.0
Fernie, BC	*∑Oct:Apr Prcp*	*millimeters*	597.00	79%	0.6	364.2
Hawkins Lake, MT	*1-May SWE*	*inches*	19.80	75%	17.3	342.5
Stahl Peak, MT	*1-May SWE*	*inches*	31.30	84%	16.7	524.0
East Creek, BC	*1-May SWE*	*millimeters*	961.00	105%	0.6	547.8
Moyie Mountain, BC	*1-May SWE*	*millimeters*	233.00	64%	0.9	212.0
Sunshine Village, AB	*1-May SWE*	*millimeters*	443.20	72%	1.3	558.4
Akamina Pass, AB	*1-May SWE*	*millimeters*	260.20	77%	0.6	143.1
South Racehorse Creek, AB	*1-May SWE*	*millimeters*	168.70	46%	0.8	140.0
Intercept			1		408.0	408.0
	Forecast May-August Inflow (KAF)				∑	4553.2
	Observed April Inflow (KAF)					429.5
	1-May Forecast, April-August Inflow (KAF)				∑	4982.6

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	0.80	0.96		inch
West Glacier, MT	2.55	3.19	2.24	2.29	2.29	1.09	3.55		inch
Cranbrook A, BC	34.50	14.60	26.60	19.00	33.60	4.00	20.20		mm
Fernie, BC	87.00	139.00	117.00	83.00	68.00	13.00	90.00		mm
Snow Water Equiv			***1-Jan***	***1-Feb***	***1-Mar***	***1-Apr***	***1-May***	***1-Jun***	***Units***
Hawkins Lake, MT				13	17	18	20		inch
Stahl Peak, MT			14	20	25	28	31		inch
East Creek, BC				709	806	842	961		mm
Moyie Mountain, BC			153	223	299	284	233		mm
Sunshine Village, AB			272	373	379	433	443		mm
Akamina Pass, AB				259	316	348	260		mm
South Racehorse Creek, AB				180	252	241	169		mm
Streamflow			***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***	***Units***
Libby Inflow Volume			162.5	120.6	175.8	429.5			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	2410.6	2405.8	2409.2		feet

William D. Proctor, P.E.
Approving Official
Ch., Hydrologic Engineering and Power Branch
Northwestern Division

Logan Osgood-Zimmerman, P.E.
Upper Columbia Senior Water Manager
Seattle District

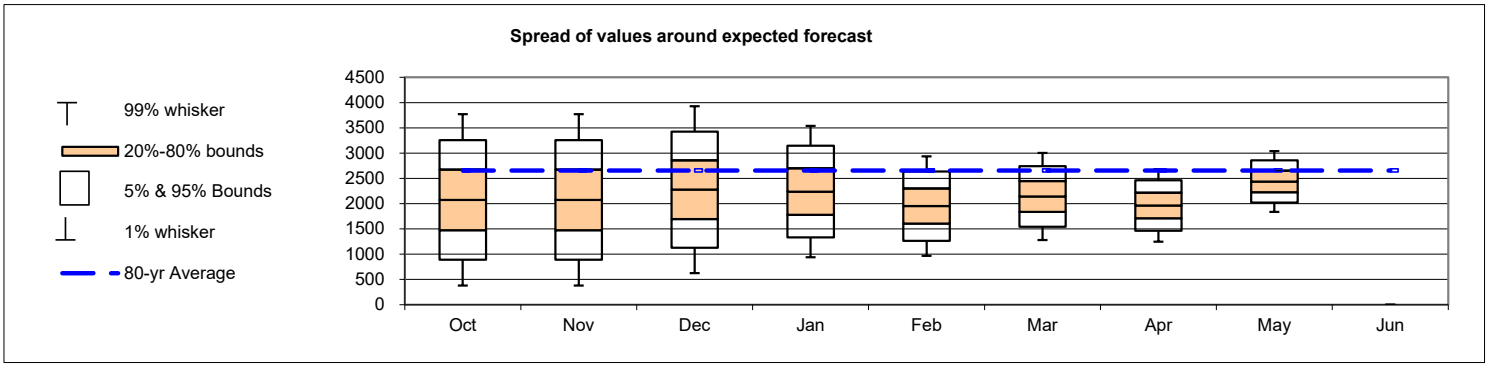
Dworshak : May Runoff Forecast & Flood Risk Management Calculation **WY 2019**

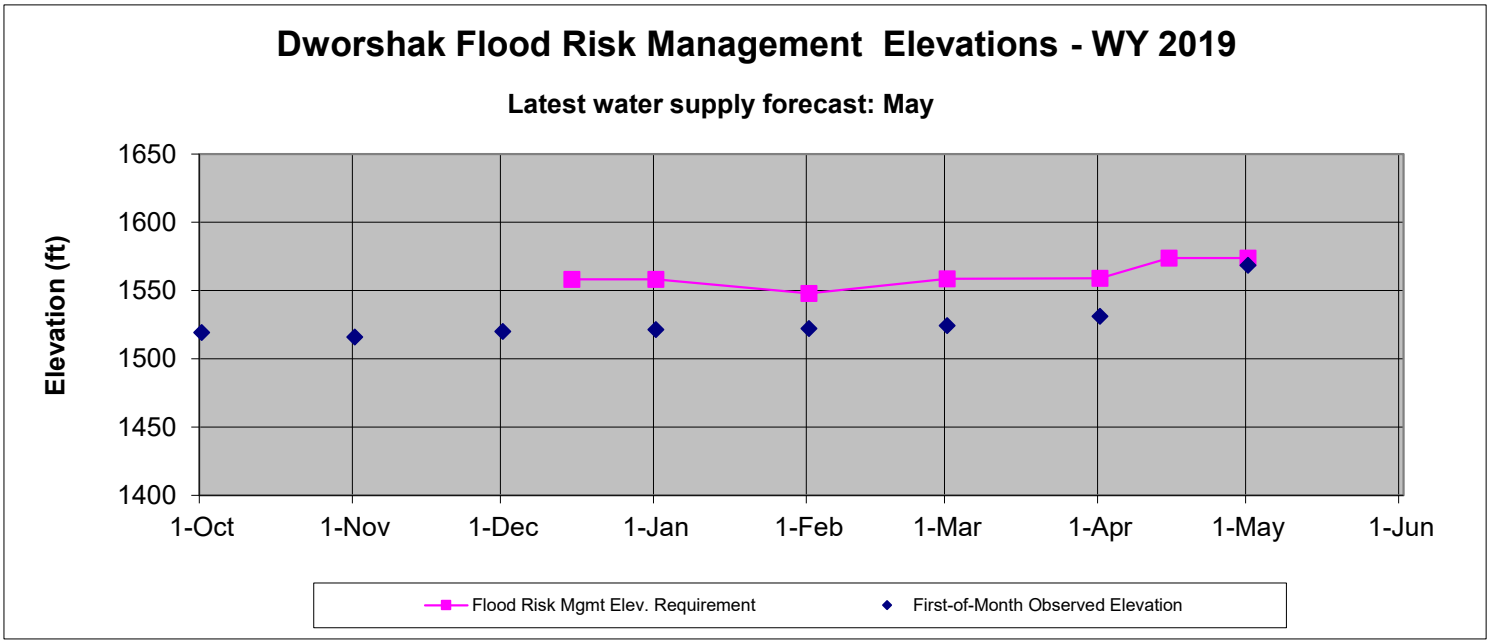
Runoff Forecast and Flood Risk Management (FRM)				1981-2010 Average	Percent of 30yr Average	1929-2008 Average	Percent of Average
Most Probable Runoff Volume	Apr-Jul	2438	KAF	2438	100%	2655	92%
	May-Jul	1509	KAF	1784	85%	1959	77%

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	1964	2438	
First-of-Month Elev	1519.3	1516.1	1520.1	1521.4	1522.3	1524.3	1531.3	1568.6	

Date >>		15-Dec	31-Dec	31-Jan	28-Feb	31-Mar	15-Apr	30-Apr	31-May
FRM Space	--	700	700	849	694	689	460	460	0
FRM Elevation	--	1558.2	1558.2	1547.9	1558.6	1559.0	1573.8	1573.8	1595.0





Dworshak : May 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		122.04	-109.8
Hoodoo Basin SWE	*1-May*	37.9	94%	11.71	443.8
Shanghi Summit SWE	*1-May*	7.6	55%	14.41	109.5
Lost Lake SWE	*1-May*	44.7	87%	9.67	432.2
Hemlock SWE	*1-May*	47.4	119%	11.58	548.9
Intercept		1		84.24	84.2
	1-May Forecast (KAF)			∑	1508.9

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	2.70	#N/A		
Cumulative HQSI Data	3.80	9.40	14.70	16.90	18.30	21.00	#N/A		
Snow Water Equiv (First of Month values) (in)									
Elk Butte, ID				15.5	20.6	29.9	31.3		
Cool Creek, ID				21.5	26.7				
Hoodoo Basin, MT				14.4	21.1	30.6	33.1	37.9	--
Sherwin, ID				3.7	6.1	10.2	5.7		
Shanghi Summit, ID								7.6	--
Lost Lake, ID				18.8	26.1	36.2	39.8	44.7	--
Hemlock, ID								47.4	--
Crater Meadows Mar						37.8	40.1		
Streamflow (End of Month) (kaf)				Jan	Feb	Mar	Apr	May	Jun
Dworshak Inflow				114	121	219	929	--	--

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.

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

Northwest River Forecast Center

Water Supply Forecasts

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

Official Forecast

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

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	47509	51505	86	55925	60110
APR-JUL	39916	42829	84	47747	51015
APR-AUG	44759	48038	85	52606	56763
JAN-SEP	53609	57605	84	62025	68694
JAN-JUL	46016	48929	82	53847	59599
OCT-SEP	60801	64798	84	69218	76824

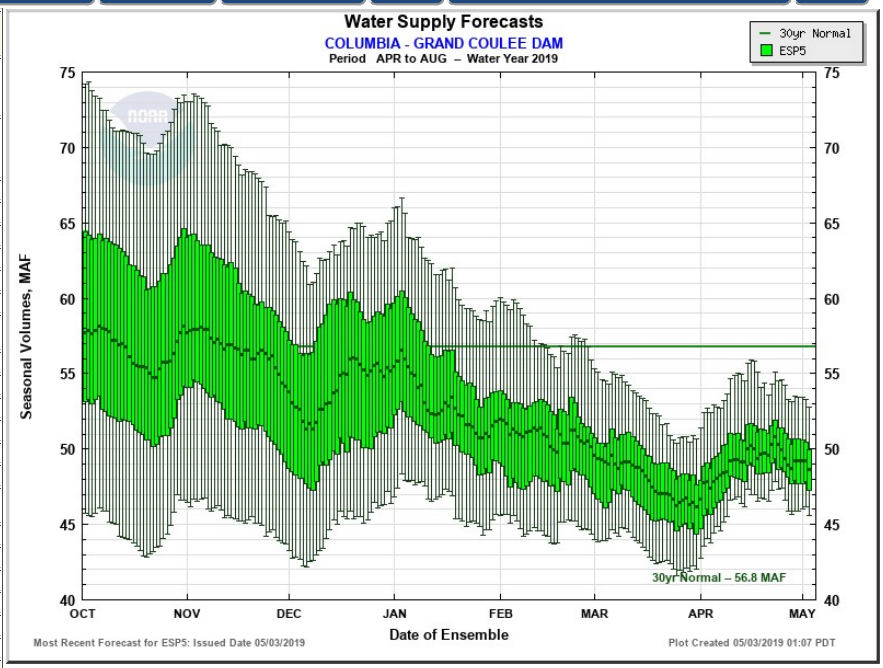
5 days QPF: ***Ensemble:*** **2019-05-03** ***Issued:*** 2019-05-03

APR-SEP	48635	52180	87	56135	60110
APR-JUL	40460	43514	85	47700	51015
APR-AUG	45604	48664	86	52755	56763
JAN-SEP	54735	58281	85	62235	68694
JAN-JUL	46561	49614	83	53800	59599
OCT-SEP	61928	65473	85	69428	76824

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

APR-SEP	49039	52962	88	56949	60110
APR-JUL	41095	44035	86	48492	51015
APR-AUG	46040	49110	87	53646	56763
JAN-SEP	55139	59062	86	63049	68694
JAN-JUL	47195	50135	84	54592	59599
OCT-SEP	62331	66254	86	70241	76824

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



Max Scale | Scale To Data | Scale To Last 45 Days

Overlay: ESP10 | ESP5 | ESP0

Data Files: CSV (ESP5 / APR-AUG) | Forecast Ensemble

Northwest River Forecast Center

Water Supply Forecasts

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

Official Forecast

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

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	30 Year Average (1981-2010)
APR-SEP	11233	12126	95	13430	12815
APR-JUL	10220	11061	94	12323	11777
APR-AUG	10794	11631	94	12952	12354
JAN-SEP	12812	13705	90	15009	15226
JAN-JUL	11799	12639	89	13902	14189
OCT-SEP	14493	15387	89	16691	17218

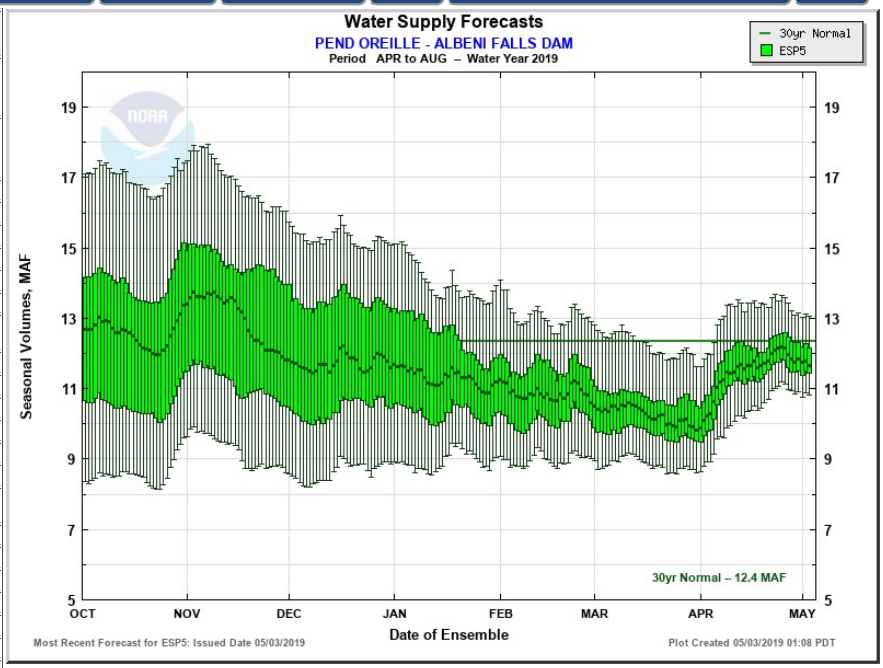
5 days QPF: ***Ensemble:*** **2019-05-03** ***Issued:*** 2019-05-03

APR-SEP	11255	12206	95	13543	12815
APR-JUL	10349	11032	94	12371	11777
APR-AUG	10828	11658	94	13055	12354
JAN-SEP	12834	13785	91	15122	15226
JAN-JUL	11928	12611	89	13950	14189
OCT-SEP	14515	15466	90	16804	17218

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

APR-SEP	11406	12486	97	13853	12815
APR-JUL	10423	11368	97	12756	11777
APR-AUG	10978	11961	97	13377	12354
JAN-SEP	12984	14064	92	15432	15226
JAN-JUL	12002	12946	91	14335	14189
OCT-SEP	14666	15746	91	17113	17218

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



Max Scale | Scale To Data | Scale To Last 45 Days

Overlay: ESP10 | ESP5 | ESP0

Data Files: CSV (ESP5 / APR-AUG) | Forecast Ensemble