

The June Final WSF sets BiOp actions as defined in the table below where highlighted.

Other projects are provided for informational purposes only.

For flood control requirements, see: <http://www.nwd.usace.army.mil/Missions/Water/Columbia/FloodControl>

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

June 2, 2016

**Hungry Horse Dam – Official Water Supply Forecast
JUNE 2016**

Here are the forecast volumes from the June final forecast for Hungry Horse inflow:

Jun-Jul: 535 kaf (62%)

Jan-Jul: 1937 kaf (92%)

Apr-Aug: 1695 (88%)

May-Sep: 1235 (73%)

Mary Mellema

River and Reservoir Operations

U.S. Bureau of Reclamation

PN Regional Office

Boise, ID 83706



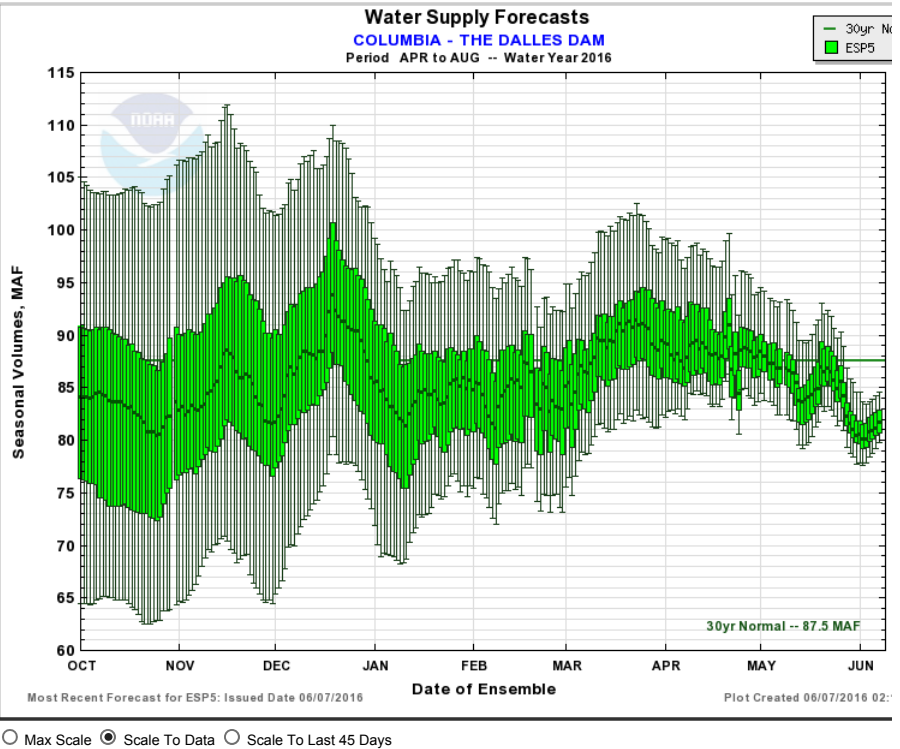
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COLUMBIA - THE DALLES DAM (TDAO3)					
Forecasts for Water Year 2016					
Official Forecast					
10 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07					
Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	84158	86317	93	88880	92704
APR-JUL	73474	74620	93	76867	79855
APR-AUG	79441	81275	93	83707	87532
JAN-SEP	109191	111350	97	113912	114216
JAN-JUL	98507	99652	98	101900	101368
OCT-SEP	124705	126864	97	129427	130518
5 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07					
APR-SEP	84299	86524	93	89504	92704
APR-JUL	73679	75071	94	77623	79855
APR-AUG	79729	81716	93	84552	87532
JAN-SEP	109331	111557	98	114537	114216
JAN-JUL	98712	100103	99	102656	101368
OCT-SEP	124846	127071	97	130051	130518
0 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07					
APR-SEP	83614	86400	93	90046	92704
APR-JUL	72840	74860	94	78284	79855
APR-AUG	78977	81493	93	85109	87532
JAN-SEP	108647	111433	98	115078	114216
JAN-JUL	97872	99892	99	103316	101368
OCT-SEP	124161	126947	97	130592	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 2016

Official Forecast

10 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	18946	19098	86	19395	22279
APR-JUL	16623	16708	84	16961	19848
APR-AUG	17803	17921	85	18175	21091
JAN-SEP	26561	26713	89	27010	29872
JAN-JUL	24238	24322	89	24576	27440
OCT-SEP	30409	30561	88	30858	34667

5 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07

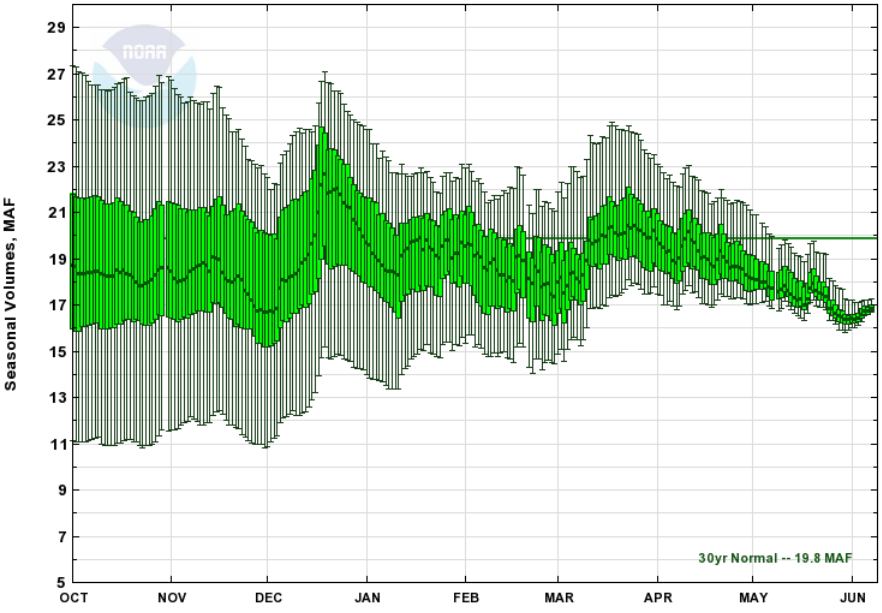
APR-SEP	18995	19259	86	19692	22279
APR-JUL	16676	16860	85	17270	19848
APR-AUG	17840	18055	86	18522	21091
JAN-SEP	26610	26874	90	27306	29872
JAN-JUL	24291	24475	89	24884	27440
OCT-SEP	30458	30722	89	31154	34667

0 days QPF: Ensemble: 2016-06-07 Issued: 2016-06-07

APR-SEP	18913	19371	87	20123	22279
APR-JUL	16577	16941	85	17664	19848
APR-AUG	17762	18176	86	18926	21091
JAN-SEP	26528	26986	90	27738	29872
JAN-JUL	24192	24556	89	25279	27440
OCT-SEP	30376	30834	89	31586	34667

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

Water Supply Forecasts
SNAKE - LOWER GRANITE DAM
 Period: APR to JUL -- Water Year 2016



Most Recent Forecast for ESP5: Issued Date 06/07/2016

Plot Created 06/07/2016 02:...

☐ Max Scale
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Libby : June Runoff Forecast & Flood Control Calculation

WY 2016

Runoff Forecast and Flood Control

Most Probable Runoff Volume:

Apr-Aug	6445	KAF
Apr-Jul	5936	KAF
May-Jul	4785	KAF

1981-2010 Average	Percent of Average	1929-2008 Average	Percent of Average
5885	110%	6282	103%
5342	111%	5720	104%
4821	99%	5199	92%

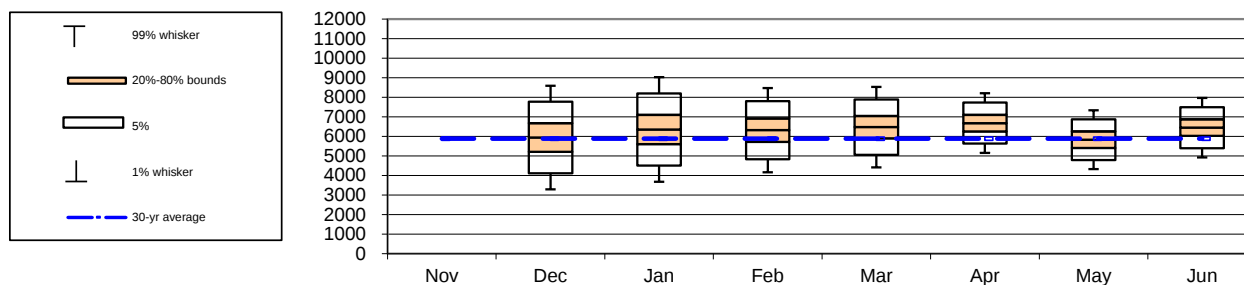
Seasonal Flood Control

VARQ Flood Control Implemented

Forecast Date >>	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Apr-Aug Runoff Forecast		5940	6354	6318	6472	6681	5831	6445
First-of-Month Elev	2440.7	2436.5	2415.0	2411.0	2410.1	2397.6	2406.5	2419.9

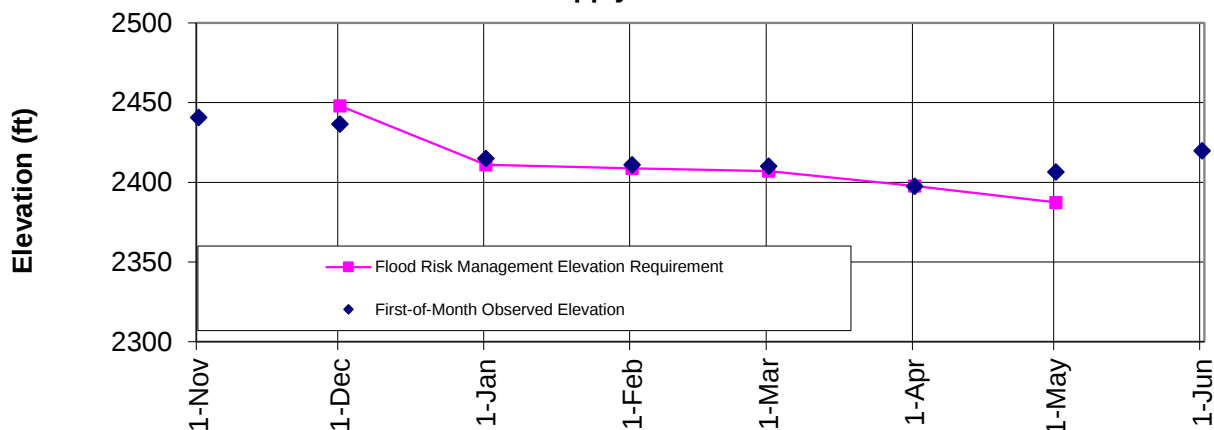
Date >>	30-Nov	31-Dec	31-Jan	28-Feb	31-Mar	30-Apr
Flood Control Space	500	2000	2083	2145	2453	2772
Flood Control Elevation	2448.0	2411.0	2408.7	2407.0	2397.8	2387.4

Spread of values around expected forecast



Libby Flood Control Elevations - 2016

Latest water supply forecast: Jun



Notes:

- The given forecast is the official Corps of Engineers forecast for Libby. If you have any questions please contact Joel Fenolio (206) 764-6683, Kevin Shaffer (206) 764-3660, Adam Price (206) 764-3604, or Kristian Mickelson (206) 764-6927.
- 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.

Notes: The June water supply forecast is significantly higher than last month (May WSF was 5831 KAF, 99% of average) due to high inflow volumes in April and May. There have been unseasonably warm temperatures this spring causing significant snowmelt within the basin. The remaining snowpack within the basin is approximately 25% of average.

Libby : June Runoff Forecast & Flood Control 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:May Prcp	inches	12.07	139%	37.7	454.6
West Glacier, MT	ΣOct:May Prcp	inches	26.03	123%	22.5	584.7
Cranbrook A, BC	ΣOct:May Prcp	millimeters	278.70	121%	2.0	565.8
Fernie, BC	ΣOct:May Prcp	millimeters	878.40	104%	0.5	441.0
Hawkins Lake, MT	1-Jun SWE	inches	0.00	0%	10.1	0.0
Stahl Creek, MT	1-Jun SWE	inches	22.30	77%	10.3	229.9
East Creek, BC	1-Jun SWE	millimeters	380.00	52%	0.4	164.3
Moyie Mountain, BC	1-Jun SWE	millimeters	0.00	0%	0.8	0.0
Sunshine Village, AB	1-Jun SWE	millimeters	208.00	44%	0.6	129.2
Akamina Pass, AB	1-Jun SWE	millimeters	0.00	0%	0.7	0.0
South Racehorse Creek, AB	1-Jun SWE	millimeters	0.00	0%	0.6	0.0
Intercept			1		978.0	978.0
1-June Forecast (KAF)					Σ	3547.4

Data used in Libby Water Supply Forecast

WY 2016

Climate Data				Jun-15	Jul-15				
SOI				-0.60	-1.10				
Precipitation Data	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Units
Eureka RS, MT	1.37	1.73	2.69	1.33	0.59	0.51	0.67	3.18	inch
West Glacier, MT	1.93	2.45	4.62	3.07	2.68	3.68	1.20	6.40	inch
Cranbrook A, BC	16.60	49.30	50.80	38.00	17.20	29.00	6.00	71.80	mm
Fernie, BC	104.00	198.40	172.00	104.00	85.00	112.00	15.00	88.00	mm
Snow Water Equiv			1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Hawkins Lake, MT				17	23	30	21	0	inch
Stahl Creek, MT			15	24	32	39	34	22	inch
East Creek, BC				691	846	1006	791	380	mm
Moyie Mountain, BC			185	286	353	406	0	0	mm
Sunshine Village, AB			252	291	414	541	479	208	mm
Akamina Pass, AB				283	320	464	73	0	mm
South Racehorse Creek, AB				286	361	429	148	0	mm
Streamflow			Jan	Feb	Mar	Apr	May	Jun	Units
Libby Inflow Volume			189.4	199.1	294.0	1150.6	1746.9		KAF
Reservoir Elevation	1-Nov	1-Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Libby FOM Elev	2440.7	2436.5	2415.0	2411.0	2410.1	2397.6	2406.5	2419.9	feet

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

Joel Fenolio, P.E.
 Upper Columbia Senior Water Manager
 Seattle District

Dworshak : June Runoff Forecast & Flood Control Calculation

WY 2016

Runoff Forecast and Flood Risk Management (FRM)

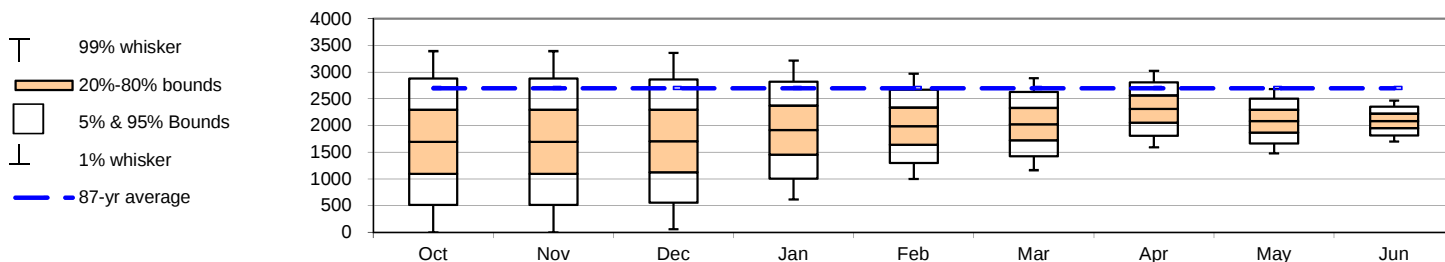
				Average	Average	Average	Average
	Apr-Jul	2083	KAF	2418	86%	2696	77%
	May-Jul	1182	KAF	1771	67%	1972	60%
	Jun-Jul	411	KAF	847	49%	926	44%

Seasonal Flood Control (assumes no shift of flood control space to Grand Coulee)

Forecast Date>>	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Apr-Jul Runoff Forecast	1676	1676	1708	1913	1986	2025	2308	2080	1182
First-of-Month Elev	1518.2	1515.0	1516.1	1522.7	1528.2	1551.6	1568.2	1566.8	1592.7

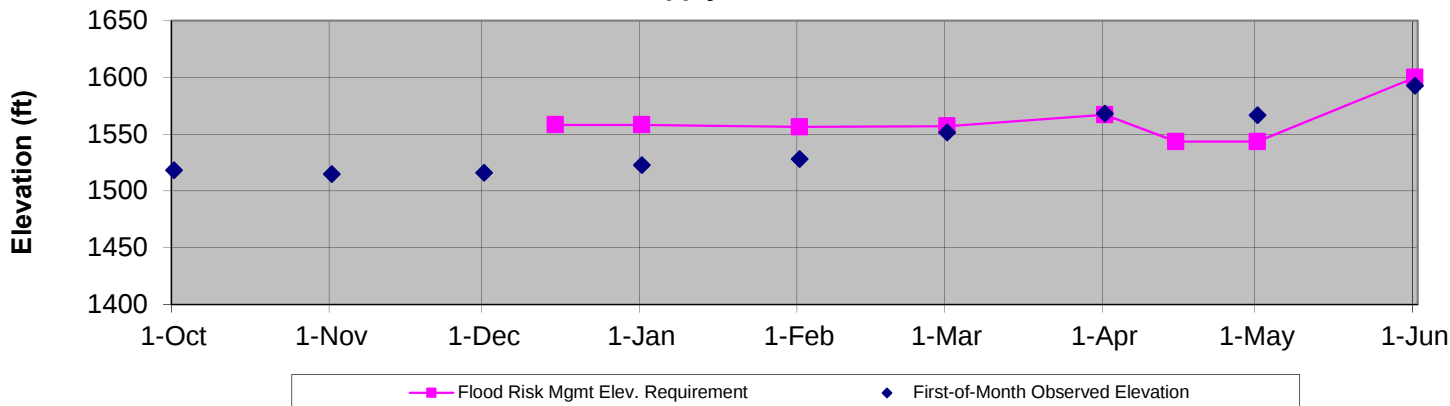
Date >>	15-Dec	31-Dec	31-Jan	29-Feb	31-Mar	15-Apr	30-Apr	31-May	
FRM Space	--	700	700	727	718	567	912	912	0.0
FRM Elevation	--	1558.2	1558.2	1556.4	1557.0	1567.1	1543.5	1543.5	1600

Spread of values around expected forecast



Dworshak Flood Risk Mgmt Elevations - 2016

Latest water supply forecast: Jun



Dworshak : June Runoff Forecast & Flood Control Calculation

Apr-Jul Runoff Forecast Calculation					
Variable	Month	Observed Value	% of Average	Regression Coefficient	Marginal Runoff (KAF)
		A		B	=A*B
Hoodoo Basin SWE	1-Jun	19.0	73%	8.21	156.0
Shanghi Summit SWE	1-Jun	0.0	0%	10.26	0.0
Lost Lake SWE	1-Jun	19.0	58%	6.14	116.7
Hemlock SWE	1-Jun	0.0	0%	7.57	0.0
Intercept		1		138.78	138.8
1-Jun Forecast (KAF)				Σ	411.4

Data Station	Sept	Nov	Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun
Climate (Stdzd SOI)									
September SOI	-1.60								
Precipitation (in)									
Oct									
Headquarters, ID	2.80	3.80	6.40	6.30	4.20	6.90	2.50		
Cumulative HQSI Data	2.80	6.60	13.00	19.30	23.50	30.40	32.90		
Snow Water Equiv (First of Month values) (in)									
Elk Butte, ID				14.6	25.8	30.8	38.1		
Cool Creek, ID				17.2	26.5				
Hoodoo Basin, MT				15.1	22.6	29.6	36.7	31.7	19.0
Sherwin, ID				4.6	7.3	5.5	0.7		
Shanghi Summit, ID								8.4	0.0
Lost Lake, ID				19.9	31.7	41.2	52.3	44.4	19.0
Hemlock, ID								31.8	0.0
Crater Meadows Mar						37.9	50.3		
Streamflow (End of Month) (kaf)				Jan	Feb	Mar	Apr	May	Jun
Dworshak Inflow				171	415	631	901	770	--

Notes:

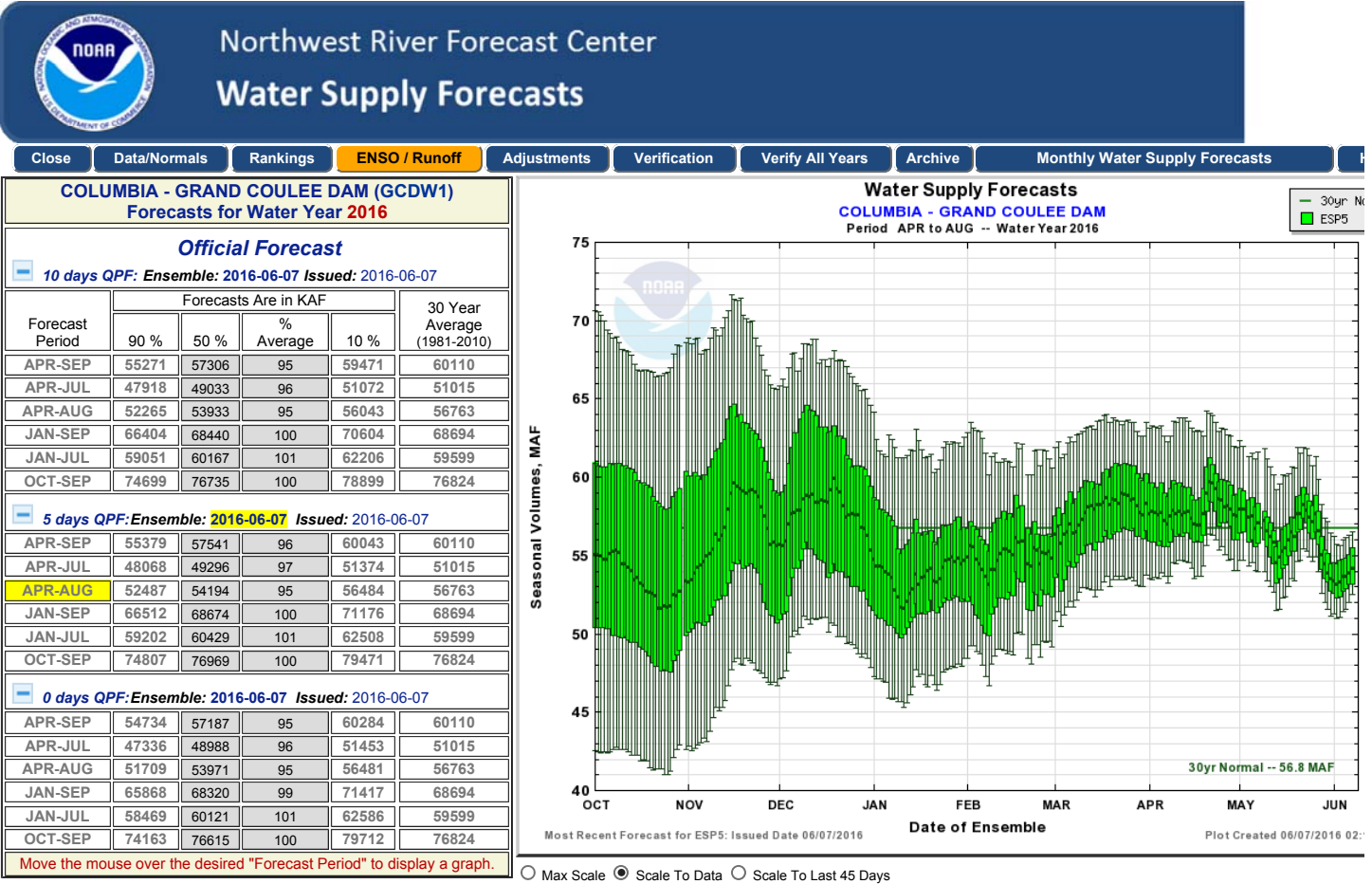
1. The given forecast is the official Corps of Engineers forecast for Dworshak. If you have any questions please contact Steve Hall (509 527 7550), Wayne Jousma (509-527-7606), or Alfredo Rodriguez (509-527-7532).
2. Due to updated values for precipitation, snow or streamflow, subsequent forecasts may be different from the forecast published herein.
3. 15-Dec and 31-Dec Flood Management Space is fixed at 700 KAF.

Approval:

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

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

Grand Coulee Dam forecasts are not used for implementation of BiOp actions.
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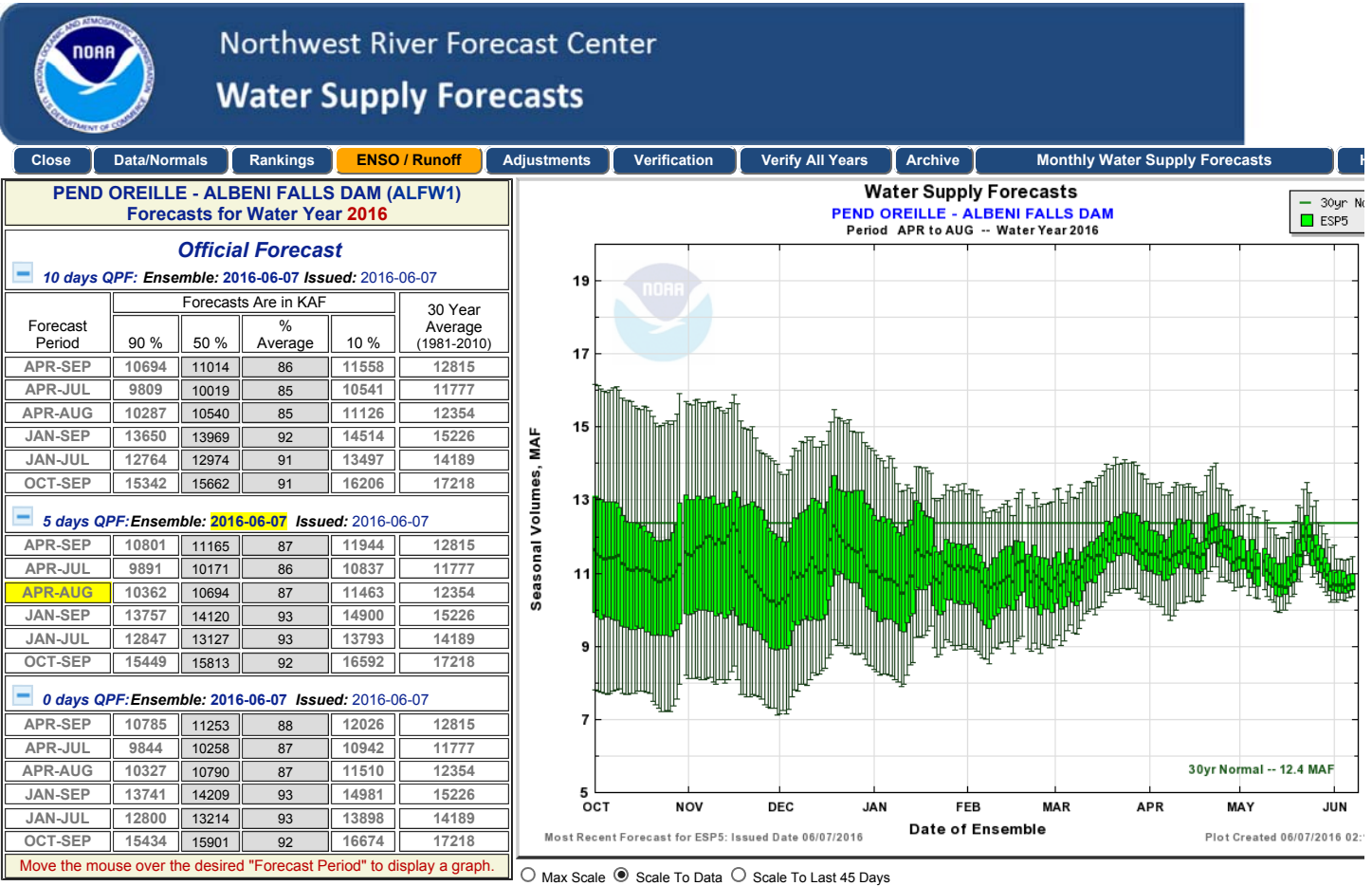
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