

The official APRIL final water supply forecast sets BiOp actions at all projects in the table below. Forecasts for GCL and ALF are also provided for informational purposes.

April Final WSF is on the 6th working day of the month (April 8), which includes one additional day to ensure most recent snow data and ESP forecasts are included.

Forecast Point	Forecast Period	Forecast	BiOp Actions to be Determined
Hungry Horse (Provided by Reclamation)	April – August	January, February, March Final	Sets min. flows at Hungry Horse and Columbia Falls
	May – September	January, February, March Final	Sets VARQ flood control targets
		April Final	Sets VARQ flood control targets and VARQ refill flows
		May, June Final	Sets VARQ refill flows
The Dalles (Provided by NWRFC)	April – August	April Final	Sets spring flow objective at McNary Dam and informs decision on juvenile fish transportation operations at McNary
		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 (Provided by NWRFC)	April – July	April Final	Sets spring flow objective at Lower Granite and informs decision on juvenile fish transportation operations at Lower Snake projects
		June Final	Sets summer flow objective at Lower Granite
Libby (Provided by Corps Seattle District)	April – August	December Final	Sets end of December variable draft target
		January, February, March Final	Sets VARQ flood control targets
		April Final	Sets VARQ flood control 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 refill flows
		June Final	VARQ refill flows
Dworshak (Provided by Corps Walla Walla District)	April – July	October through June	Manage for reservoir refill

Water Year 2014 - Official APRIL Final Water Supply Forecast

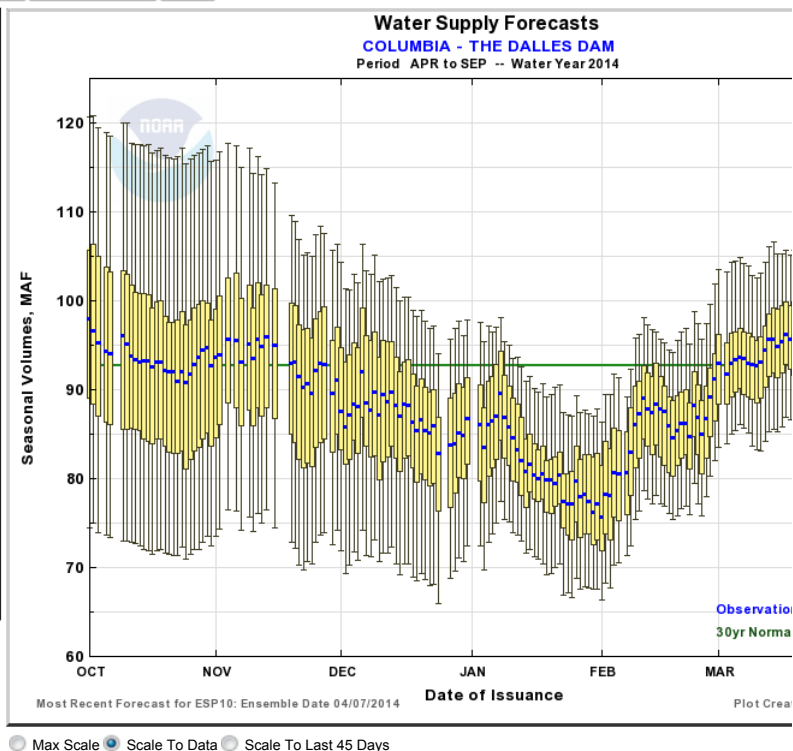


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COLUMBIA - THE DALLES DAM (TDAO3)					
Forecasts for Water Year 2014					
Official Forecast					
☐ 10 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08					
Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	90954	96313	104	107354	92704
APR-JUL	76480	82454	103	93281	79855
APR-AUG	85806	90860	104	101831	87532
JAN-JUL	97851	103825	102	114652	101368
☐ 5 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08					
APR-SEP	91560	98238	106	108537	92704
APR-JUL	77606	83524	105	94884	79855
APR-AUG	86665	92057	105	103128	87532
JAN-JUL	98977	104895	103	116255	101368
☐ 0 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08					
APR-SEP	92501	99395	107	111105	92704
APR-JUL	78378	84658	106	96205	79855
APR-AUG	86821	93787	107	105528	87532
JAN-JUL	99749	106030	105	117576	101368
Move the mouse over the desired "Forecast Period" to display a graph.					



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Water Year 2014 - Official APRIL Final Water Supply Forecast



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SNAKE - LOWER GRANITE DAM (LGDW1) Forecasts for Water Year 2014

Official Forecast

☐ 10 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	22499	24678	111	27859	22279
APR-JUL	19947	22090	111	25232	19848
APR-AUG	21256	23491	111	26610	21091
JAN-JUL	27174	29316	107	32459	27440

☐ 5 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

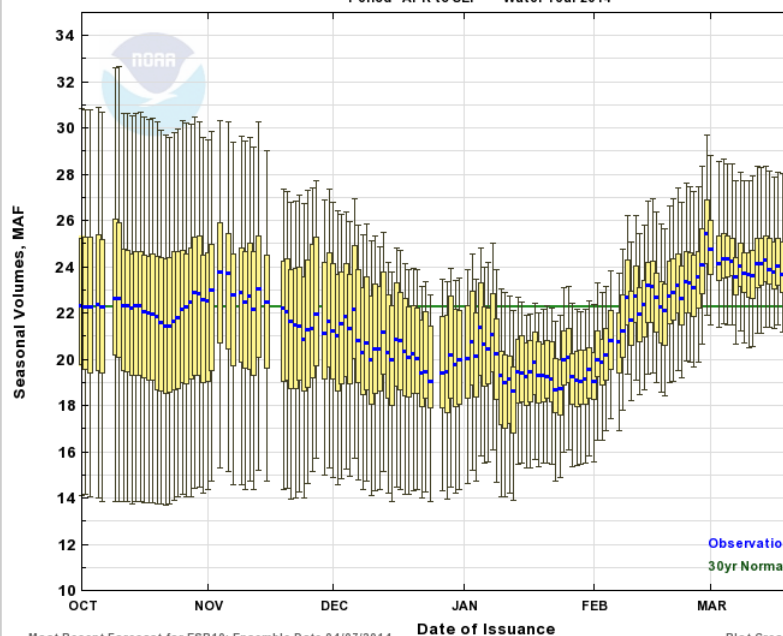
APR-SEP	22927	24763	111	28217	22279
APR-JUL	20173	22237	112	25570	19848
APR-AUG	21500	23494	111	26967	21091
JAN-JUL	27400	29464	107	32797	27440

☐ 0 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	23071	25532	115	28735	22279
APR-JUL	20447	22820	115	26131	19848
APR-AUG	21732	24298	115	27490	21091
JAN-JUL	27674	30046	109	33358	27440

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Water Supply Forecasts SNAKE - LOWER GRANITE DAM Period APR to SEP -- Water Year 2014



Most Recent Forecast for ESP10: Ensemble Date 04/07/2014

Plot Crea

☐ Max Scale ☒ Scale To Data ☐ Scale To Last 45 Days

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☐ ESP10 ☒ ESP5 ☐ ESP0

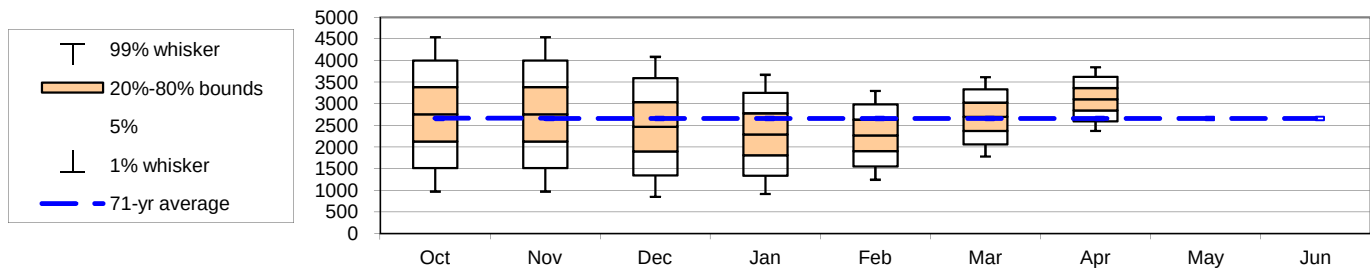
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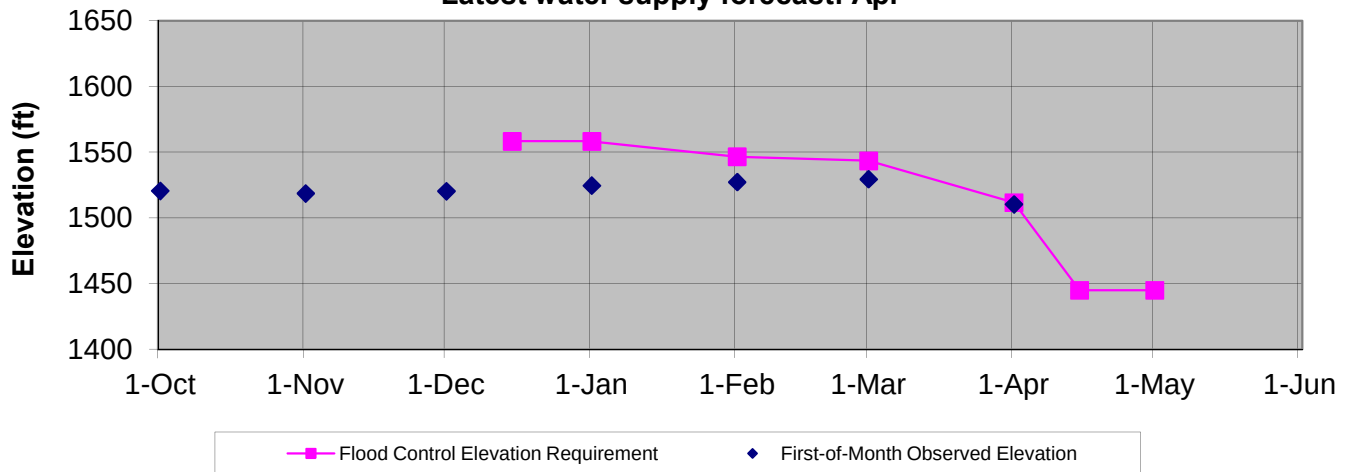
Dworshak : April Runoff Forecast & Flood Control Calculation**WY 2014**

Runoff Forecast and Non-Shifted Flood Control						1981-2010 Average	Percent of 30yr Average	1929-2010 Average	Percent of Average
Most Probable Runoff Volume	Apr-Jul	3111	KAF	2438	128%	2663	117%		
	May-Jul	2281	KAF	1784	128%	1953	117%		
30-Apr Flood Control Space			2016	KAF					
30-Apr Flood Control Elevation			1445.0	ft					
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	2758	2758	2470	2296	2274	2701	3111		
First-of-Month Elev	1520.6	1518.7	1520.4	1524.6	1527.3	1529.5	1510.4		
Date >>	15-Dec	31-Dec	31-Jan	28-Feb	31-Mar	15-Apr	30-Apr		
Flood Control Space	--	700	700	869	912	1336	2016	2016	
Flood Control Elevation	--	1558.2	1558.2	1546.5	1543.5	1511.6	1445.0	1445.0	

Spread of values around expected forecast

**Dworshak Flood Control Elevations - 2014**

Latest water supply forecast: Apr



- Notes:
1. The given forecast is the official Corps of Engineers forecast for Dworshak. If you have any questions please contact Jeremy Giovando (509 527 7053), or Steve Hall (509 527 7550).
 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 control space is fixed at 700 KAF.
 4. 15-Apr target elevation does not reflect flood control shift operation between Dworshak and Grand Coulee.
 5. 30-Apr target elevation may vary as runoff occurs throughout the month of April.

Dworshak : April 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
SOI	Sep	0.30		171.32	51.4
HQSI Cumulative Precip	Oct-Date	28.30	112%	22.32	631.7
Elk Butte SWE	1-Jan	42.9	108%	11.61	498.1
Hoodoo Basin SWE	1-Jan	52.3	115%	10.27	537.1
Sherwin SWE	1-Jan	3.4	34%	19.49	66.3
Lost Lake SWE	1-Jan	59.6	99%	7.91	471.4
Crater meadows SWE	1-Jan	65.1	142%	13.37	870.4
Intercept		1		-15.43	-15.4

1-Apr Forecast (KAF)

Σ 3110.9

Data Station	Sept	Nov	Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun
Climate (Stdzd SOI)									
September SOI	0.30								
Precipitation (in)	Oct								
Headquarters, ID	0.40	4.20	4.90	5.00	5.80	8.00	--		
Cumulative HQSI Data	0.40	4.60	9.50	14.50	20.30	28.30	--		
Snow Water Equiv (First of Month values) (in)									
Elk Butte, ID				12.8	21.4	32.2	42.9		
Cool Creek, ID				16.6	28.6				
Hoodoo Basin, MT				13.3	22.2	37.3	52.3	--	--
Sherwin, ID				2.7	6.0	9.3	3.4		
Shanghi Summit, ID								--	--
Lost Lake, ID				19.8	30.0	44.9	59.6	--	--
Hemlock, ID								--	--
Crater Meadows Mar						46.9	65.1		
Streamflow (End of Month) (kaf)				Jan	Feb	Mar	Apr	May	Jun
Dworshak Inflow				132	143	678	--	--	--

Approval:

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

Peter Brooks, P.E., D. WRE
Ch., Hydrologic Engineering and Power Branch
Columbia Basin Water Management Division

*The official Dworshak Dam forecast is computed by the Corps Walla Walla District (provided on previous pages).
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NF CLEARWATER - DWORSHAK DAM (DWRI1) Forecasts for Water Year 2014

Official Forecast

☐ 10 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	2894	3118	121	3478	2575
APR-JUL	2733	2964	123	3336	2419
JAN-JUL	3684	3915	119	4287	3289

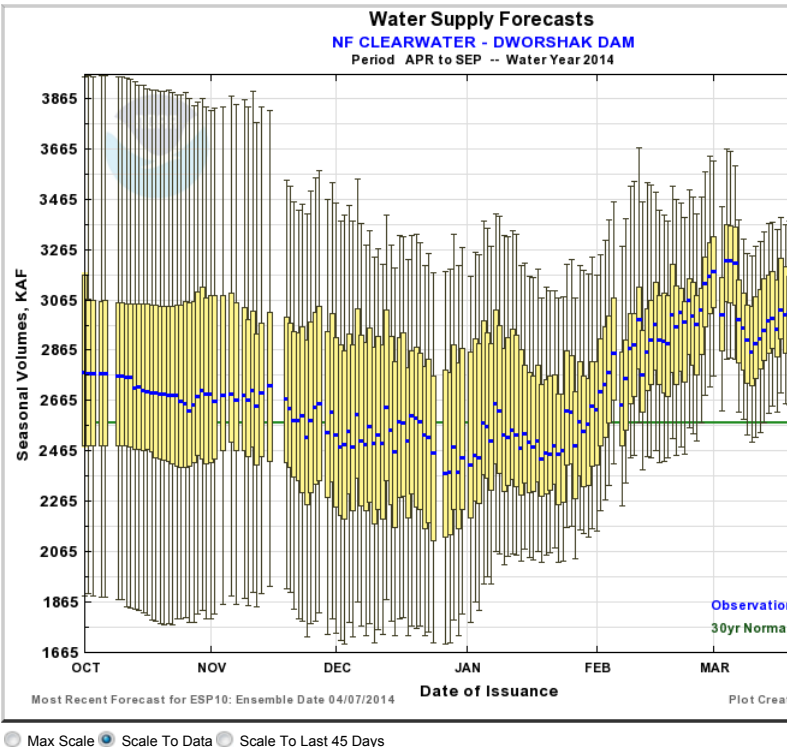
☐ 5 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	2891	3152	122	3546	2575
APR-JUL	2749	2985	123	3371	2419
JAN-JUL	3700	3936	120	4322	3289

☐ 0 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	2927	3187	124	3610	2575
APR-JUL	2767	3039	126	3461	2419
JAN-JUL	3718	3990	121	4412	3289

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



Overlay

ESP10 ESP5 ESP0

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*The Grand Coulee Dam water supply forecast is not used for implementation of any BiOp actions.
This forecast is provided for informational purposes only.



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COLUMBIA - GRAND COULEE DAM (GCDW1) Forecasts for Water Year 2014

Official Forecast

☐ 10 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	59684	63408	105	70476	60110
APR-JUL	49625	53413	105	60851	51015
APR-AUG	56220	59606	105	66866	56763
JAN-JUL	57601	61389	103	68827	59599

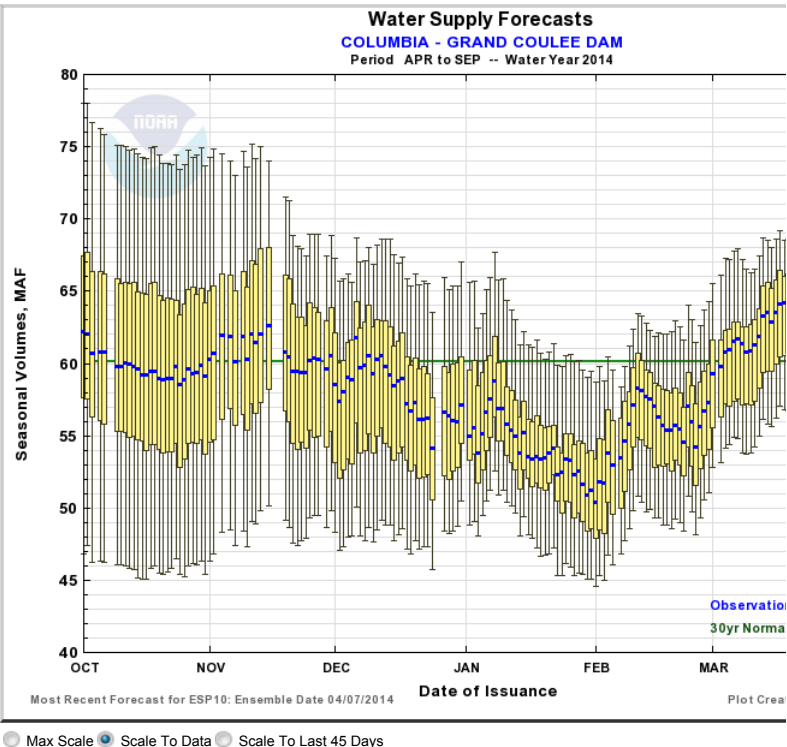
☐ 5 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	59897	64677	108	71114	60110
APR-JUL	49922	53791	105	61104	51015
APR-AUG	56453	60382	106	66890	56763
JAN-JUL	57898	61767	104	69080	59599

☐ 0 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	60384	64926	108	71922	60110
APR-JUL	50695	54087	106	61409	51015
APR-AUG	56720	60896	107	68300	56763
JAN-JUL	58671	62063	104	69385	59599

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



Overlay

ESP10 ESP5 ESP0

Data Files

CSV (ESP10 / APR-SEP)



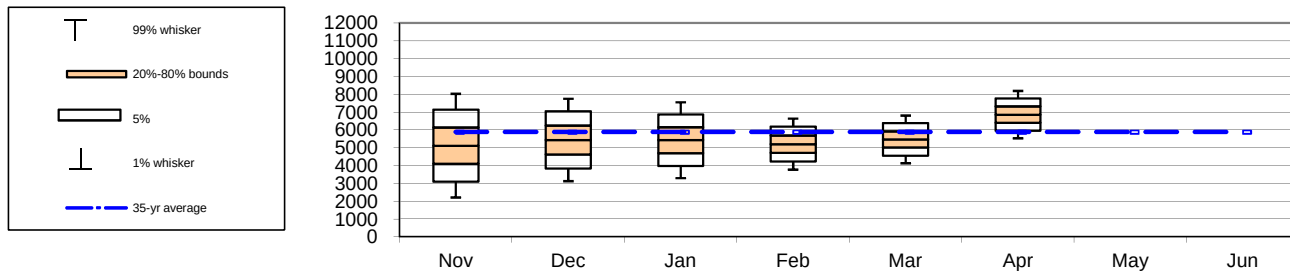
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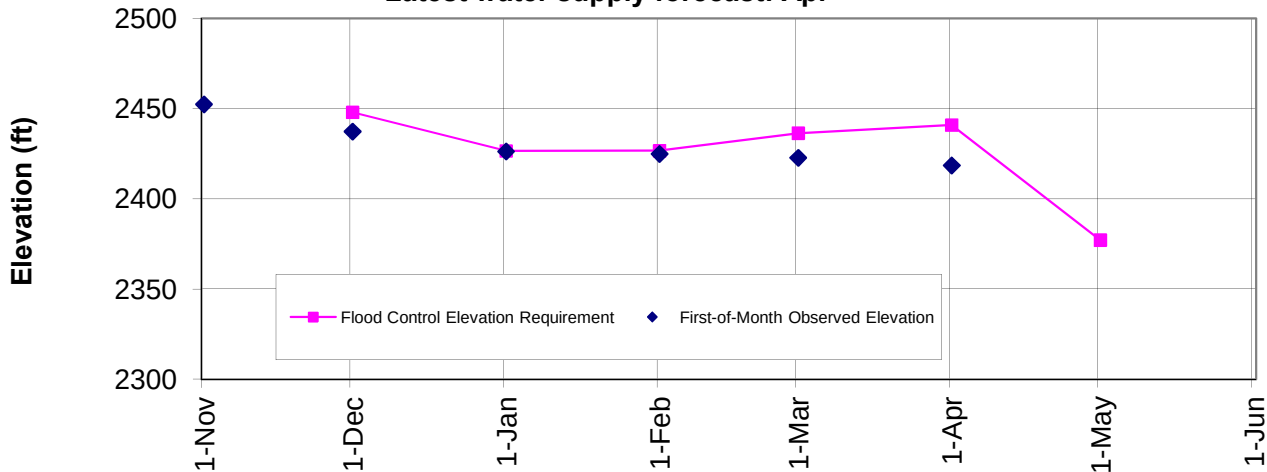
Libby : April Runoff Forecast & Flood Control Calculation**WY 2014**

Runoff Forecast and Flood Control						1981-2010 Average	Percent of Average	1929-2008 Average	Percent of Average
Most Probable Runoff Volume:		Apr-Aug	6868	KAF		5885	117%	6282	109%
		Apr-Jul	6234	KAF		5342	117%	5720	109%
		May-Jul	5626	KAF		4821	117%	5199	108%
30-Apr Flood Control Space				3063	KAF				
30-Apr Flood Control Elevation				2377.2	ft				
Seasonal Flood Control									
VARQ Flood Control Implemented									
Forecast Date >>	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Apr-Aug Runoff Forecast	5125	5446	5432	5213	5478	6868			
First-of-Month Elev	2452.5	2437.4	2426.3	2424.9	2422.8	2418.6			
Date >>	30-Nov	31-Dec	31-Jan	28/29-Feb	31-Mar	30-Apr			
Flood Control Space	500	1400	1400	1000	809	3063			
Flood Control Elevation	2448.0	2426.6	2426.7	2436.4	2440.9	2377.2			

Spread of values around expected forecast

**Libby Flood Control Elevations - 2014**

Latest water supply forecast: Apr

**Notes:**

1. 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.
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.

Libby : April 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
QBO	Σ Jan:Mar		-4.45		-1.8	8.2
PNA	Σ Oct:Jan		-1.92		-83.9	161.2
West Glacier, MT	Σ Dec:Mar Prcp	inches	14.57	131%	51.3	748.1
Fernie, BC	Σ Dec:Mar Prcp	inches	20.76	119%	41.4	859.7
Sunshine Village, AB	1-Apr SWE	inches	23.35	105%	52.4	1224.4
East Creek, BC	1-Apr SWE	inches	35.83	106%	25.8	925.7
Stahl Peak, MT	1-Apr SWE	inches	40.40	116%	27.3	1102.1
Gardiner Creek, AB	1-Apr SWE	inches	29.65	128%	18.1	537.4
Three Isle Lake, AB	1-Apr SWE	inches	20.55	108%	51.2	1052.9
Intercept			1		247.9	247.9
1-Apr Forecast (KAF)					Σ	6867.6

Data used in Libby Water Supply Forecast**WY 2014**

Climate Data	Jan-13	Feb-13	Mar-13	Jun-13	Jul-13	Oct-13	Nov-13	Dec-13	Jan-14
SOI				1.20	0.80				
QBO	-6.07	-1.23	2.85						
PNA						-0.21	-1.14	-1.16	0.59
Precipitation Data	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Units
Eureka, MT	0.37	1.16	0.77	1.06	0.64				inch
Libby 1 NE RS, MT	0.59	2.22	1.20	1.08	0.81				inch
West Glacier, MT	0.55	4.31	2.66	3.37	2.05	6.49			inch
Fernie, BC	27.50	128.50	210.00	91.50	64.00	161.81			mm
Snow Water Equiv	1-Jan			1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Floe Lake, BC			274	408	517				mm
Sunshine Village, AB			236	329	417	593			mm
East Creek, BC			335	471	578	910			mm
Stahl Peak, MT			15	21	26	40			inch
Gardiner Creek, AB			257	352	489	753			mm
Three Isle Lake, AB			213	279	354	522			mm
Lost Creek South, AB			273	408	538				mm
Morrissey Ridge, BC			286	401	548				mm
Hawkins Lake, MT			8	14	20				inch
Streamflow	Jan			Feb	Mar	Apr	May	Jun	Units
Libby Inflow Volume			190.4	134.1	241.8				KAF
Reservoir Elevation	1-Nov	1-Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	Units
Libby FOM Elev	2452.5	2437.4	2426.3	2424.9	2422.8	2418.6			feet

Peter F. Brooks, P.E., D. WRE
 Approving Official
 Ch., Hydrologic Engineering and Power Branch
 Northwestern Division

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

for:

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KOOTENAI - LIBBY DAM (LYDM8) Forecasts for Water Year 2014

Official Forecast

☐ 10 days QPF: Ensemble: 2014-04-07 Issued: 2014-04-08

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	5917	6757	108	8004	6254
APR-JUL	5116	5829	109	7118	5342
APR-AUG	5604	6426	109	7676	5885
JAN-JUL	5699	6412	107	7701	6002

☐ 5 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

APR-SEP	6015	6896	110	8065	6254
APR-JUL	5181	5865	110	7133	5342
APR-AUG	5693	6516	111	7700	5885
JAN-JUL	5764	6448	107	7716	6002

☐ 0 days QPF Ensemble: 2014-04-07 Issued: 2014-04-08

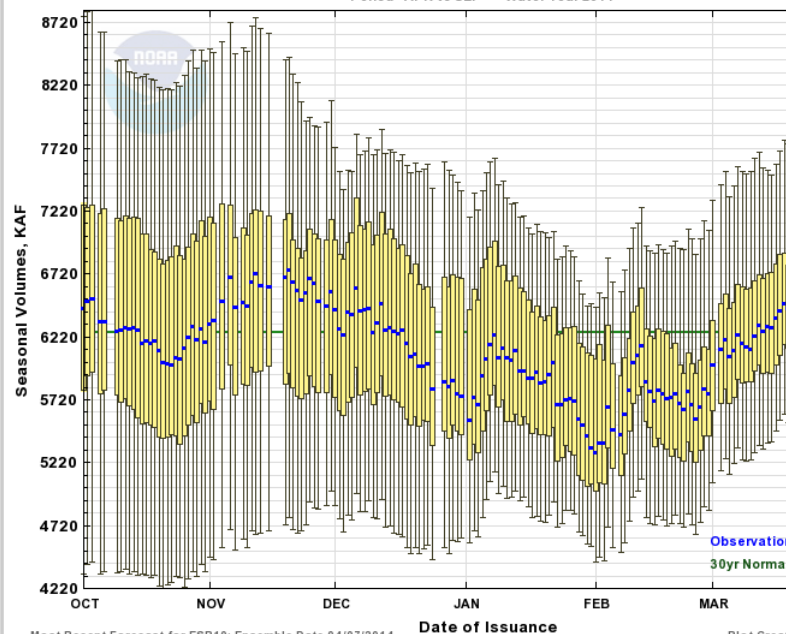
APR-SEP	5997	6917	111	8224	6254
APR-JUL	5158	5946	111	7286	5342
APR-AUG	5684	6532	111	7846	5885
JAN-JUL	5741	6529	109	7869	6002

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

Water Supply Forecasts

KOOTENAI - LIBBY DAM

Period APR to SEP -- Water Year 2014



☐ Max Scale ☒ Scale To Data ☐ Scale To Last 45 Days

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ESP10 ESP5 ESP0

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April 3, 2014

Hungry Horse Dam

Volumes for the official APRIL final forecast for Hungry Horse inflow:

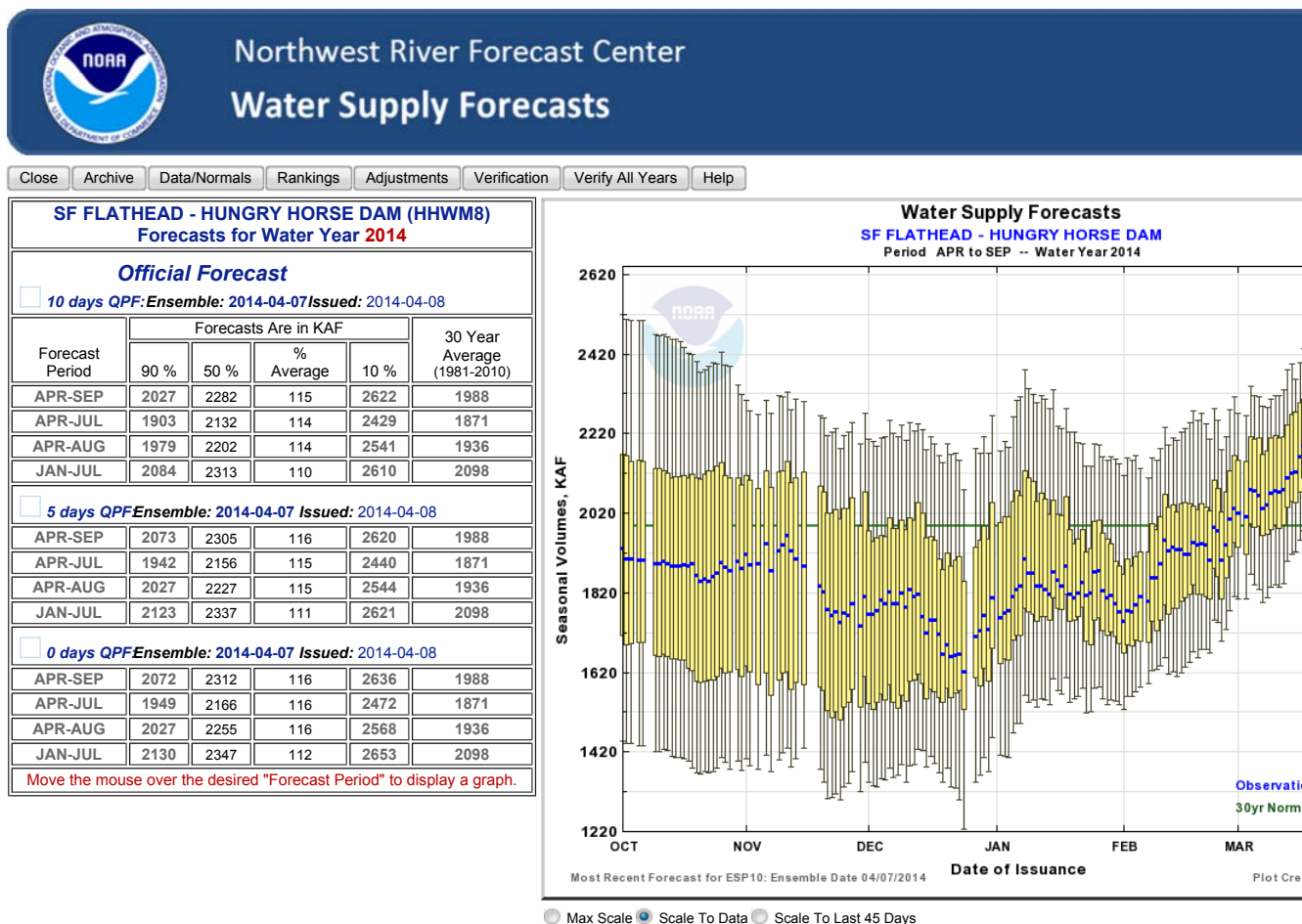
- Apr - Jul: 2,436 kaf (130%)
- Jan – Jul: 2,617 kaf (125%)
- Apr – Aug: 2,517 kaf (130%)
- May – Sep: 2,200 kaf (130%)

The minimum flows downstream of Hungry Horse are as follows:

- Columbia Falls: 3,500 cfs
- Hungry Horse: 900 cfs

Mary Mellema
River and Reservoir Operations
U.S. Bureau of Reclamation
PN Regional Office
Boise, ID 83706

*The official Hungry Horse Dam forecast is computed by the Bureau of Reclamation (provided on previous page).
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Overlay

ESP10
ESP5
ESP0

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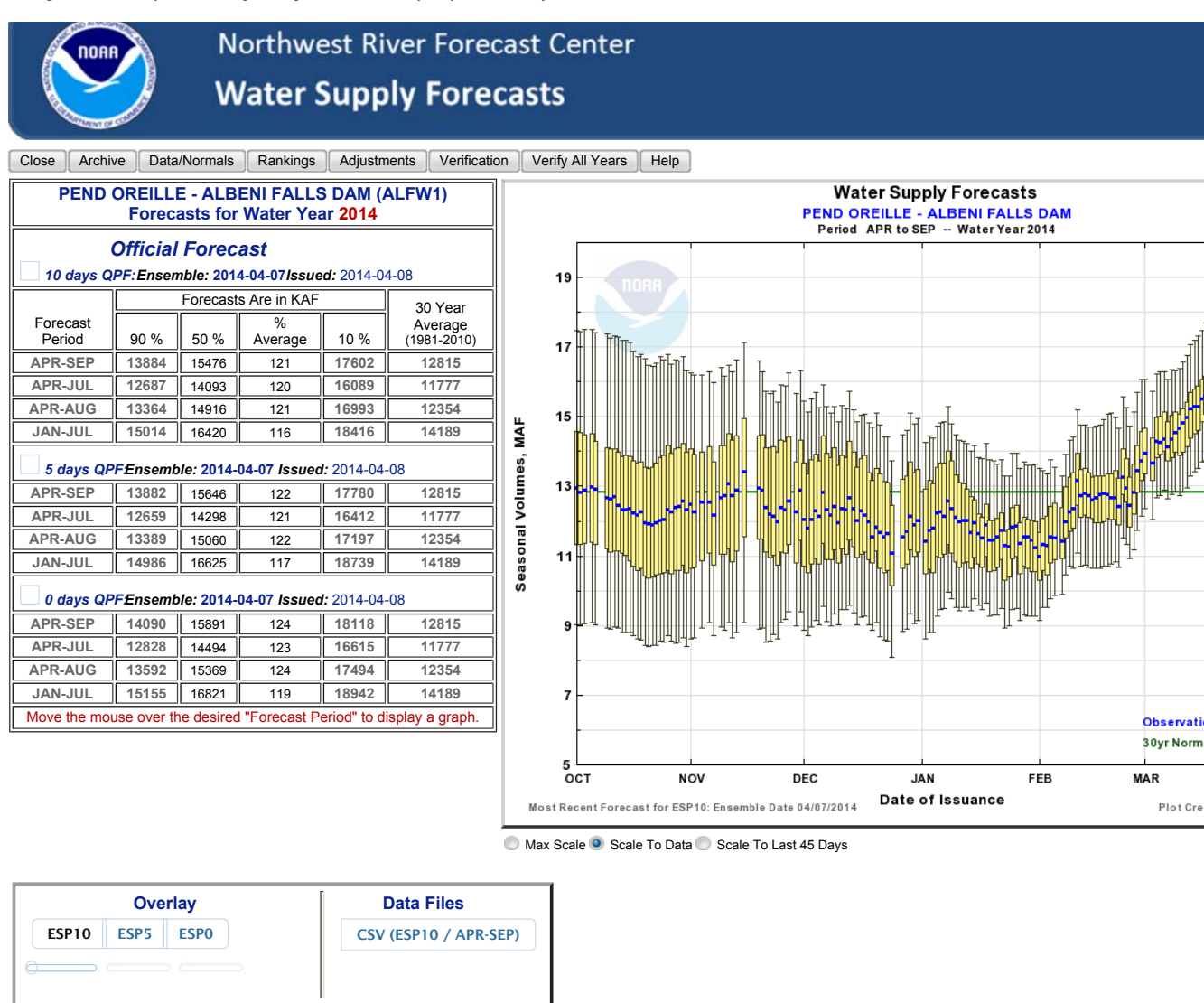
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