

**The APRIL WSF sets BiOp actions as highlighted in the table below.**

**Other projects are provided for informational purposes only.**

In 2017, the official WSF will be computed on the 3rd work day of the month, January through July, using the 5-day QPF 50% exceedance value. FRM will be computed at the same intervals as before, available online at: <http://www.nwd.usace.army.mil/Missions/Water/Columbia/FloodControl>

| Forecast Point | Forecast period                                        | Forecast                          | BiOp Actions to be Determined                                                                                                                        |
|----------------|--------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hungry Horse   | April – August<br>Provided by Reclamation              | January, February, March<br>Final | Sets min. flows at Hungry Horse and Columbia Falls                                                                                                   |
|                | May – September<br>Provided by Reclamation             | January, February, March<br>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<br>Provided by NWRFC                 | March Final                       | Sets CRWMP adjustments at Grand Coulee                                                                                                               |
|                | April – August<br>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<br>Provided by NWRFC                      | April Final                       | Sets spring flow objective at Lower Granite                                                                                                          |
|                |                                                        | June Final                        | Sets summer flow objective at Lower Granite                                                                                                          |
| Libby          | April – August<br>Provided by Corps Seattle District   | December Final                    | Sets end of December variable draft target                                                                                                           |
|                |                                                        | January, February, March<br>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.<br>Sets VARQ FRM targets and VARQ refill flows |
|                |                                                        | June Final                        | VARQ refill flows                                                                                                                                    |
| Dworshak       | April – July<br>Provided by Corps Walla Walla District | January to June Final             | Manage for reservoir FRM and refill                                                                                                                  |

April 4, 2017

**Hungry Horse Dam – Official Water Supply Forecast  
APRIL 2017**

The volumes for the April final forecast for Hungry Horse Inflows are:

Apr-Jul: 1,955 kaf (105%)

Jan-Jul: 2,407 kaf (115%)

Apr-Aug: 2,023 kaf (105%)

May-Sep: 1,778 kaf (105%)

**Mary Mellema**

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



# Northwest River Forecast Center Water Supply Forecasts

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## COLUMBIA - THE DALLES DAM (TDAO3) Forecasts for Water Year 2017

### Official Forecast

10 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

| Forecast Period | Forecasts Are in KAF |        |         |        | 30 Year Average (1981-2010) |
|-----------------|----------------------|--------|---------|--------|-----------------------------|
|                 | 90 %                 | 50 %   | Average | 10 %   |                             |
| APR-SEP         | 106189               | 111689 | 120     | 121335 | 92704                       |
| APR-JUL         | 91405                | 97471  | 122     | 107465 | 79855                       |
| APR-AUG         | 100539               | 105668 | 121     | 115084 | 87532                       |
| JAN-SEP         | 140441               | 145942 | 128     | 155588 | 114216                      |
| JAN-JUL         | 125659               | 131724 | 130     | 141718 | 101368                      |
| OCT-SEP         | 162514               | 168015 | 129     | 177661 | 130518                      |

5 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

|         |        |        |     |        |        |
|---------|--------|--------|-----|--------|--------|
| APR-SEP | 105945 | 111840 | 121 | 122117 | 92704  |
| APR-JUL | 91264  | 96520  | 121 | 107460 | 79855  |
| APR-AUG | 99903  | 105039 | 120 | 116295 | 87532  |
| JAN-SEP | 140198 | 146093 | 128 | 156370 | 114216 |
| JAN-JUL | 125518 | 130774 | 129 | 141713 | 101368 |
| OCT-SEP | 162271 | 168166 | 129 | 178443 | 130518 |

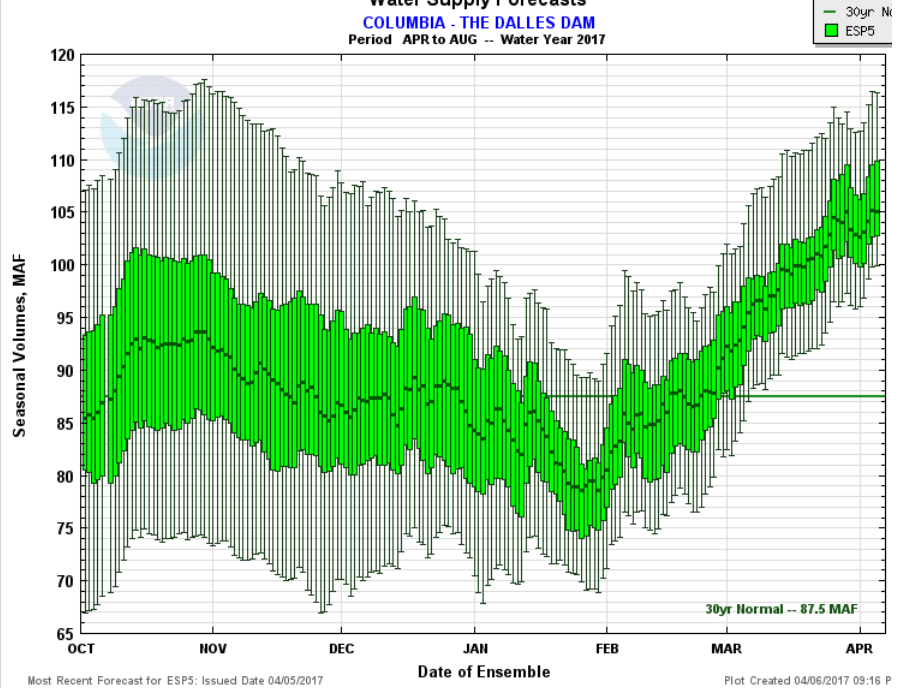
0 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

|         |        |        |     |        |        |
|---------|--------|--------|-----|--------|--------|
| APR-SEP | 102819 | 109819 | 118 | 119086 | 92704  |
| APR-JUL | 88873  | 94932  | 119 | 104142 | 79855  |
| APR-AUG | 96454  | 103415 | 118 | 113180 | 87532  |
| JAN-SEP | 137071 | 144072 | 126 | 153338 | 114216 |
| JAN-JUL | 123126 | 129185 | 127 | 138395 | 101368 |
| OCT-SEP | 159145 | 166145 | 127 | 175412 | 130518 |

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

## Water Supply Forecasts

COLUMBIA - THE DALLES DAM  
Period: APR to AUG -- Water Year 2017



Max Scale Scale To Data Scale To Last 45 Days

### Overlay

[ESP10](#)[ESP5](#)[ESP0](#)

### Data Files

[CSV \(ESP5 / APR-AUG\)](#)[Forecast Ensemble](#)

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## SNAKE - LOWER GRANITE DAM (LGDW1) Forecasts for Water Year 2017

### Official Forecast

10 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

| Forecast Period | Forecasts Are in KAF |       |           |       | 30 Year Average (1981-2010) |
|-----------------|----------------------|-------|-----------|-------|-----------------------------|
|                 | 90 %                 | 50 %  | % Average | 10 %  |                             |
| APR-SEP         | 29058                | 31570 | 142       | 34815 | 22279                       |
| APR-JUL         | 26224                | 28495 | 144       | 31740 | 19848                       |
| APR-AUG         | 27678                | 29992 | 142       | 33350 | 21091                       |
| JAN-SEP         | 42263                | 44776 | 150       | 48021 | 29872                       |
| JAN-JUL         | 39429                | 41701 | 152       | 44945 | 27440                       |
| OCT-SEP         | 46663                | 49206 | 142       | 52451 | 34667                       |

5 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

|         |       |       |     |       |       |
|---------|-------|-------|-----|-------|-------|
| APR-SEP | 29327 | 31289 | 140 | 34836 | 22279 |
| APR-JUL | 26337 | 28373 | 143 | 31756 | 19848 |
| APR-AUG | 27723 | 29861 | 142 | 33358 | 21091 |
| JAN-SEP | 42533 | 44495 | 149 | 48042 | 29872 |
| JAN-JUL | 39543 | 41579 | 152 | 44962 | 27440 |
| OCT-SEP | 46963 | 48924 | 141 | 52472 | 34667 |

0 days QPF: Ensemble: 2017-04-05 Issued: 2017-04-05

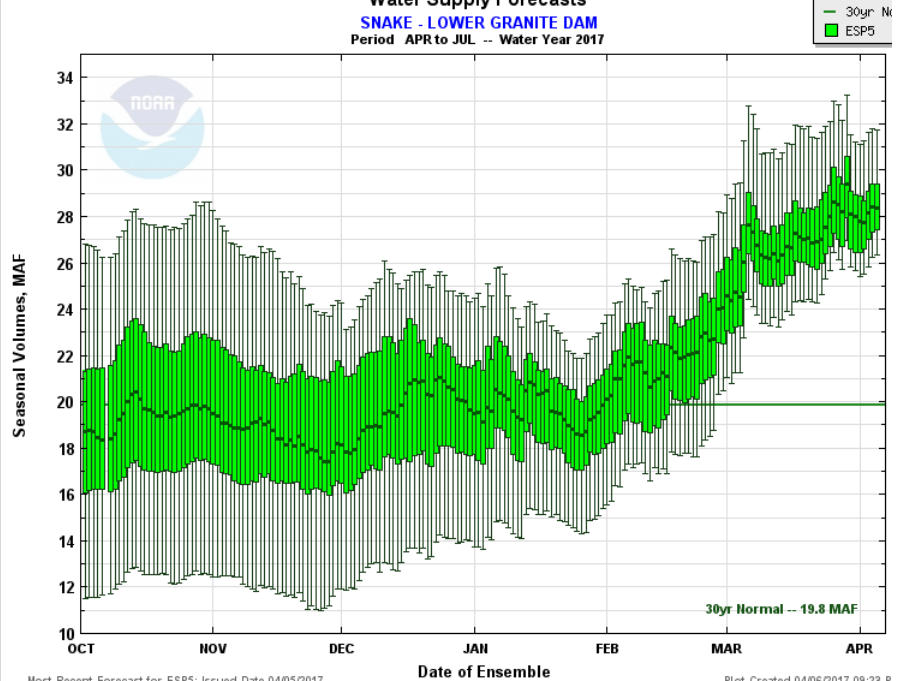
|         |       |       |     |       |       |
|---------|-------|-------|-----|-------|-------|
| APR-SEP | 28445 | 30718 | 138 | 34240 | 22279 |
| APR-JUL | 25530 | 27870 | 140 | 31111 | 19848 |
| APR-AUG | 26888 | 29293 | 139 | 32687 | 21091 |
| JAN-SEP | 41651 | 43924 | 147 | 47446 | 29872 |
| JAN-JUL | 38736 | 41075 | 150 | 44317 | 27440 |
| OCT-SEP | 46080 | 48353 | 139 | 51875 | 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 2017



Most Recent Forecast for ESP5: Issued Date 04/05/2017

Plot Created 04/06/2017 09:23 P

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

### Overlay

[ESP10](#)[ESP5](#)[ESP0](#)

### Data Files

[CSV \(ESP5 / APR-JUL\)](#)[Forecast Ensemble](#)

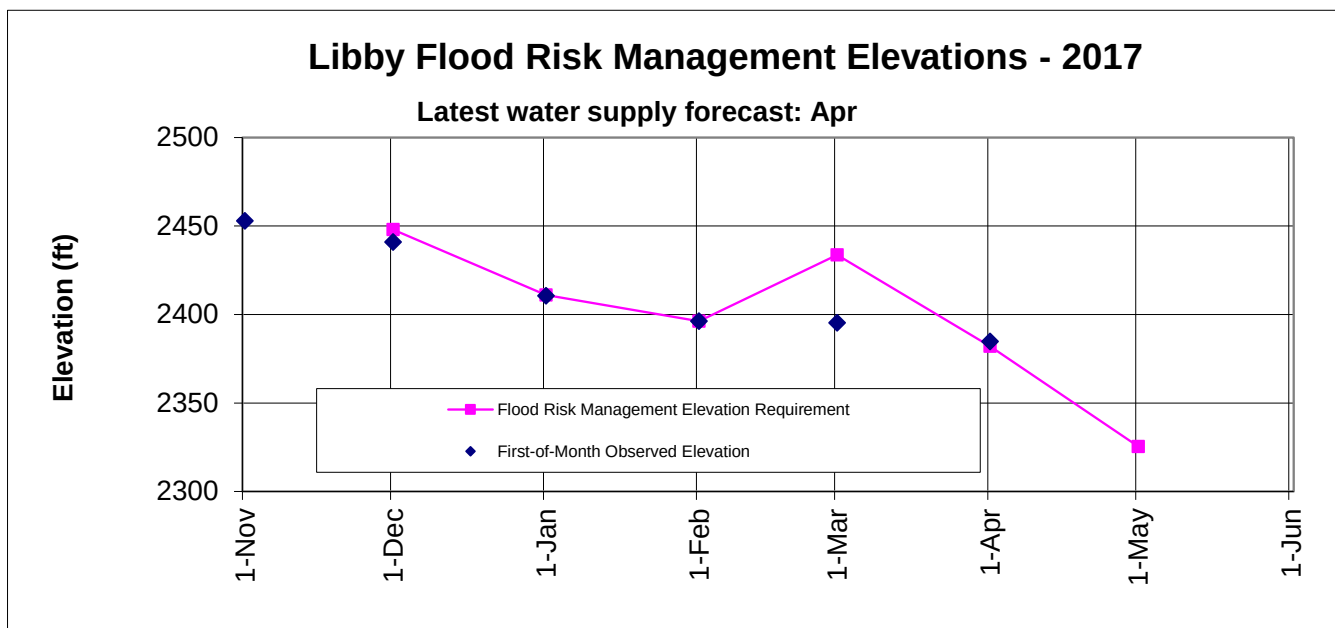
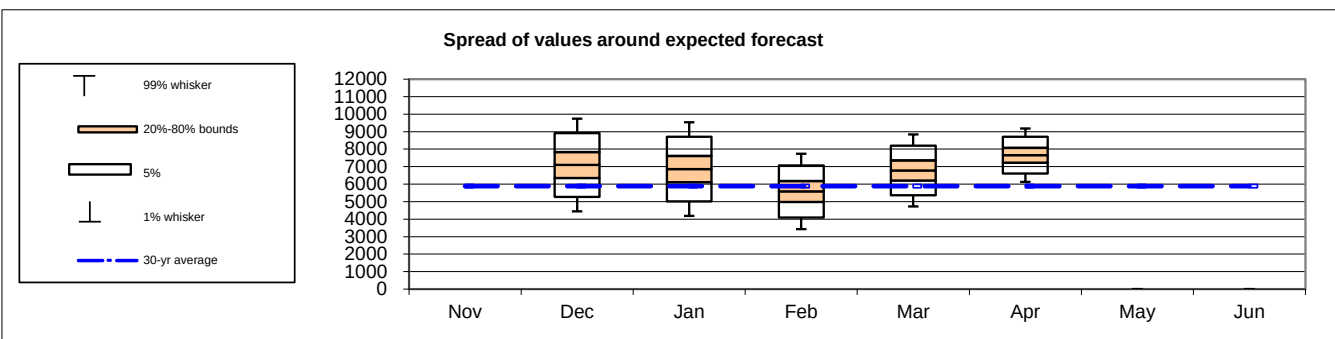
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# Libby : April Runoff Forecast & Flood Risk Management Calculation

WY 2017

| Runoff Forecast and Flood Risk Management |        |                                        |        | 1981-2010<br>Average | Percent of<br>Average | 1929-2008<br>Average | Percent of<br>Average |      |
|-------------------------------------------|--------|----------------------------------------|--------|----------------------|-----------------------|----------------------|-----------------------|------|
| Most Probable Runoff Volume:              |        | Apr-Aug                                | 7654   | KAF                  | 5885                  | 130%                 | 6282                  | 122% |
|                                           |        | Apr-Jul                                | 6948   | KAF                  | 5342                  | 130%                 | 5720                  | 121% |
|                                           |        | May-Jul                                | 6270   | KAF                  | 4821                  | 130%                 | 5199                  | 121% |
| 30-Apr Flood Risk Management Space        |        |                                        | 4303   | KAF                  |                       |                      |                       |      |
| 30-Apr Flood Risk Management Elevation    |        |                                        | 2325.4 | ft                   |                       |                      |                       |      |
| Seasonal Flood Risk Management            |        | VARQ Flood Risk Management Implemented |        |                      |                       |                      |                       |      |
| Forecast Date >>                          | Nov    | Dec                                    | Jan    | Feb                  | Mar                   | Apr                  | May                   | Jun  |
| Apr-Aug Runoff Forecast                   |        | 7093                                   | 6861   | 5583                 | 6783                  | 7654                 |                       |      |
| First-of-Month Elev                       | 2452.9 | 2440.9                                 | 2410.5 | 2396.2               | 2395.2                | 2384.7               |                       |      |
| Date >>                                   | 30-Nov | 31-Dec                                 | 31-Jan | 28/29-Feb            | 31-Mar                | 30-Apr               |                       |      |
| d Risk Management Space                   | 500    | 2000                                   | 2083   | 2145                 | 2453                  | 2772                 |                       |      |
| isk Management Elevation                  | 2448.0 | 2411.0                                 | 2396.2 | 2433.7               | 2382.1                | 2325.4               |                       |      |



- 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, Kristy Riley (206) 316-3947, Kevin Shaffer (206) 764-3660, Logan Osgood-Jacobs (206) 764-6928, 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.
  - October Precip capped at Mean plus 2 standard deviations. A memo to NWD summarizes the methodology used.
  - Due to missing data, South Racehorse Creek SWE was estimated using a principal components regression with surrounding gages that are not already in the forecast.

## Libby : April 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:Mar Prcp | inches      | 9.90           | 170%               | 68.5                   | 678.2                 |
| West Glacier, MT                     | ΣOct:Mar Prcp | inches      | 21.27          | 129%               | 29.5                   | 626.8                 |
| Cranbrook A, BC                      | ΣOct:Mar Prcp | millimeters | 273.93         | 172%               | 3.0                    | 819.1                 |
| Fernie, BC                           | ΣOct:Mar Prcp | millimeters | 796.07         | 118%               | 0.7                    | 565.2                 |
| Hawkins Lake, MT                     | 1-Apr SWE     | inches      | 29.50          | 118%               | 22.4                   | 661.7                 |
| Stahl Creek, MT                      | 1-Apr SWE     | inches      | 39.70          | 114%               | 19.7                   | 782.1                 |
| East Creek, BC                       | 1-Apr SWE     | millimeters | 1020.00        | 119%               | 0.7                    | 744.6                 |
| Moyie Mountain, BC                   | 1-Apr SWE     | millimeters | 560.00         | 131%               | 1.2                    | 677.6                 |
| Sunshine Village, AB                 | 1-Apr SWE     | millimeters | 681.00         | 121%               | 1.4                    | 973.8                 |
| Akamina Pass, AB                     | 1-Apr SWE     | millimeters | 516.00         | 111%               | 0.7                    | 371.5                 |
| South Racehorse Creek, AB            | 1-Apr SWE     | millimeters | 505.90         | 118%               | 1.4                    | 683.0                 |
| Intercept                            |               |             | 1              |                    | 70.5                   | 70.5                  |
| 1-Apr Forecast (KAF)                 |               |             |                |                    | Σ                      | 7654.0                |

### Data used in Libby Water Supply Forecast

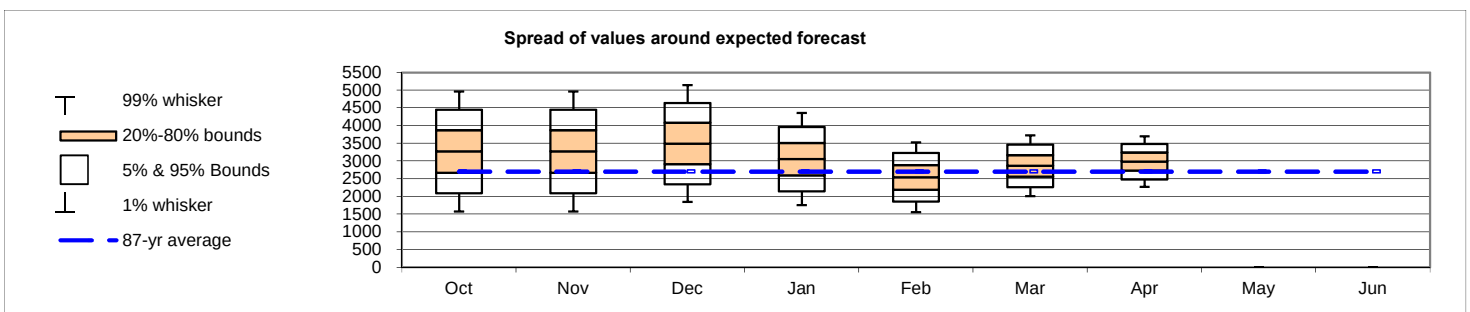
WY 2017

| Climate Data              |  |        |        |        | Jun-16 | Jul-16 |        |       |       |       |      |
|---------------------------|--|--------|--------|--------|--------|--------|--------|-------|-------|-------|------|
| SOI                       |  |        |        |        | 0.60   | 0.40   |        |       |       |       |      |
| Precipitation Data        |  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr   | May   | Units |      |
| Eureka RS, MT             |  | 2.34   | 1.07   | 1.53   | 0.57   | 3.12   | 1.27   |       |       | inch  |      |
| West Glacier, MT          |  | 5.91   | 2.71   | 2.27   | 1.32   | 3.53   | 5.53   |       |       | inch  |      |
| Cranbrook A, BC           |  | 54.93  | 20.20  | 46.60  | 16.80  | 83.80  | 51.60  |       |       | mm    |      |
| Fernie, BC                |  | 238.07 | 157.00 | 76.00  | 33.00  | 168.00 | 124.00 |       |       | mm    |      |
| Snow Water Equiv          |  | 1-Jan  |        |        | 1-Feb  | 1-Mar  | 1-Apr  | 1-May | 1-Jun | Units |      |
| Hawkins Lake, MT          |  |        |        |        | 12     | 22     | 30     |       |       | inch  |      |
| Stahl Creek, MT           |  |        |        |        | 21     | 22     | 33     | 40    |       |       | inch |
| East Creek, BC            |  |        |        |        |        | 527    | 711    | 1020  |       |       | mm   |
| Moyie Mountain, BC        |  |        |        |        | 171    | 221    | 376    | 560   |       |       | mm   |
| Sunshine Village, AB      |  |        |        |        | 281    | 388    | 514    | 681   |       |       | mm   |
| Akamina Pass, AB          |  |        |        |        |        | 188    | 368    | 516   |       |       | mm   |
| South Racehorse Creek, AB |  |        |        |        |        | 206    | 340    | 506   |       |       | mm   |
| Streamflow                |  | Jan    |        |        | Feb    | Mar    | Apr    | May   | Jun   | Units |      |
| Libby Inflow Volume       |  | 227.9  |        |        | 203.7  | 452.8  |        |       |       | KAF   |      |
| Reservoir Elevation       |  | 1-Nov  | 1-Dec  | 1-Jan  | 1-Feb  | 1-Mar  | 1-Apr  | 1-May | 1-Jun | Units |      |
| Libby FOM Elev            |  | 2452.9 | 2440.9 | 2410.5 | 2396.2 | 2395.2 | 2384.7 |       |       | feet  |      |
|                           |  |        |        |        |        |        |        |       |       |       |      |

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

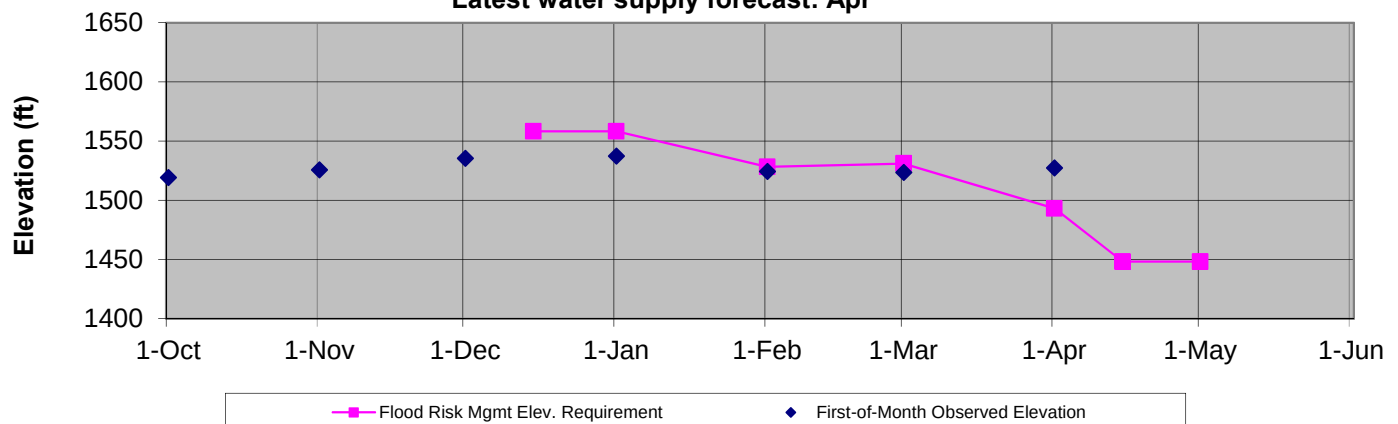
Joel Fenolio, P.E.  
 Upper Columbia Senior Water Manager  
 Seattle District

| Runoff Forecast and Flood Risk Management (FRM)                                                  |        |         |        |        |        | 1981-2010<br>Average | Percent of<br>30yr Average | 1929-2008<br>Average | Percent of<br>Average |
|--------------------------------------------------------------------------------------------------|--------|---------|--------|--------|--------|----------------------|----------------------------|----------------------|-----------------------|
| Most Probable Runoff Volume                                                                      |        | Apr-Jul | 2984   | KAF    |        | 2438                 | 122%                       | 2696                 | 111%                  |
|                                                                                                  |        | May-Jul | 2182   | KAF    |        | 1784                 | 122%                       | 1972                 | 111%                  |
| 30-Apr Flood Risk Management Space                                                               |        |         | 1986   | KAF    |        |                      |                            |                      |                       |
| 30-Apr Flood Risk Management Elevation                                                           |        |         | 1448.3 | 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                                                                          | 3271   | 3271    | 3493   | 3055   | 2541   | 2867                 | 2984                       |                      |                       |
| First-of-Month Elev                                                                              | 1519.1 | 1525.9  | 1535.4 | 1537.3 | 1524.5 | 1523.6               | 1527.4                     |                      |                       |
|                                                                                                  |        |         |        |        |        |                      |                            |                      |                       |
| Date >>                                                                                          |        | 15-Dec  | 31-Dec | 31-Jan | 28-Feb | 31-Mar               | 15-Apr                     | 30-Apr               | 31-May                |
| FRM Space                                                                                        | --     | 700     | 700    | 1120   | 1082   | 1551                 | 1986                       | 1986                 |                       |
| FRM Elevation                                                                                    | --     | 1558.2  | 1558.2 | 1528.3 | 1531.1 | 1493.1               | 1448.3                     | 1448.3               |                       |



## Dworshak Flood Risk Management Elevations - 2017

Latest water supply forecast: Apr



## Dworshak : April 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      | 1.20           |              | 171.32                 | 205.6                 |
| HQSI Cumulative Precip              | Oct-Date | 38.50          | 141%         | 22.32                  | 859.3                 |
| Elk Butte SWE                       | 1-Apr    | 35.8           | 104%         | 11.61                  | 415.6                 |
| Hoodoo Basin SWE                    | 1-Apr    | 42.4           | 108%         | 10.27                  | 435.4                 |
| Sherwin SWE                         | 1-Apr    | 4.8            | 70%          | 19.49                  | 93.6                  |
| Lost Lake SWE                       | 1-Apr    | 50.4           | 97%          | 7.91                   | 398.7                 |
| Crater meadows SWE                  | 1-Apr    | 44.2           | 103%         | 13.37                  | 591.0                 |
| Intercept                           |          | 1              |              | -15.43                 | -15.4                 |
| 1-Apr Forecast (KAF)                |          |                |              | $\Sigma$               | 2983.7                |

| Data Station                                         | Sept | Nov   | Dec   | 1-Jan | 1-Feb | 1-Mar | 1-Apr | 1-May | 1-Jun |
|------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Climate (Stdzd SOI)</b>                           |      |       |       |       |       |       |       |       |       |
| September SOI                                        | 1.20 |       |       |       |       |       |       |       |       |
| <b>Precipitation (in)</b>                            | Oct  |       |       |       |       |       |       |       |       |
| Headquarters, ID                                     | 7.90 | 3.90  | 3.70  | 4.70  | 8.20  | 10.10 | --    |       |       |
| Cumulative HQSI Data                                 | 7.90 | 11.80 | 15.50 | 20.20 | 28.40 | 38.50 | --    |       |       |
| <b>Snow Water Equiv (First of Month values) (in)</b> |      |       |       |       |       |       |       |       |       |
| Elk Butte, ID                                        |      |       |       | 14.8  | 20.3  | 32.1  | 35.8  |       |       |
| Cool Creek, ID                                       |      |       |       | 15.9  | 20.8  |       |       |       |       |
| Hoodoo Basin, MT                                     |      |       |       | 11.9  | 17.2  | 31.8  | 42.4  | --    | --    |
| Sherwin, ID                                          |      |       |       | 6.5   | 8.5   | 10.2  | 4.8   |       |       |
| Shanghi Summit, ID                                   |      |       |       |       |       |       |       | --    | --    |
| Lost Lake, ID                                        |      |       |       | 17.8  | 24.6  | 39.0  | 50.4  | --    | --    |
| Hemlock, ID                                          |      |       |       |       |       |       |       | --    | --    |
| Crater Meadows Mar                                   |      |       |       |       |       | 35.6  | 44.2  |       |       |
| <b>Streamflow (End of Month) (kaf)</b>               |      |       |       | Jan   | Feb   | Mar   | Apr   | May   | Jun   |
| Dworshak Inflow                                      |      |       |       | 127   | 471   | 1242  | --    | --    | --    |

### 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), Amanda Connell (509-527-7632), 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.

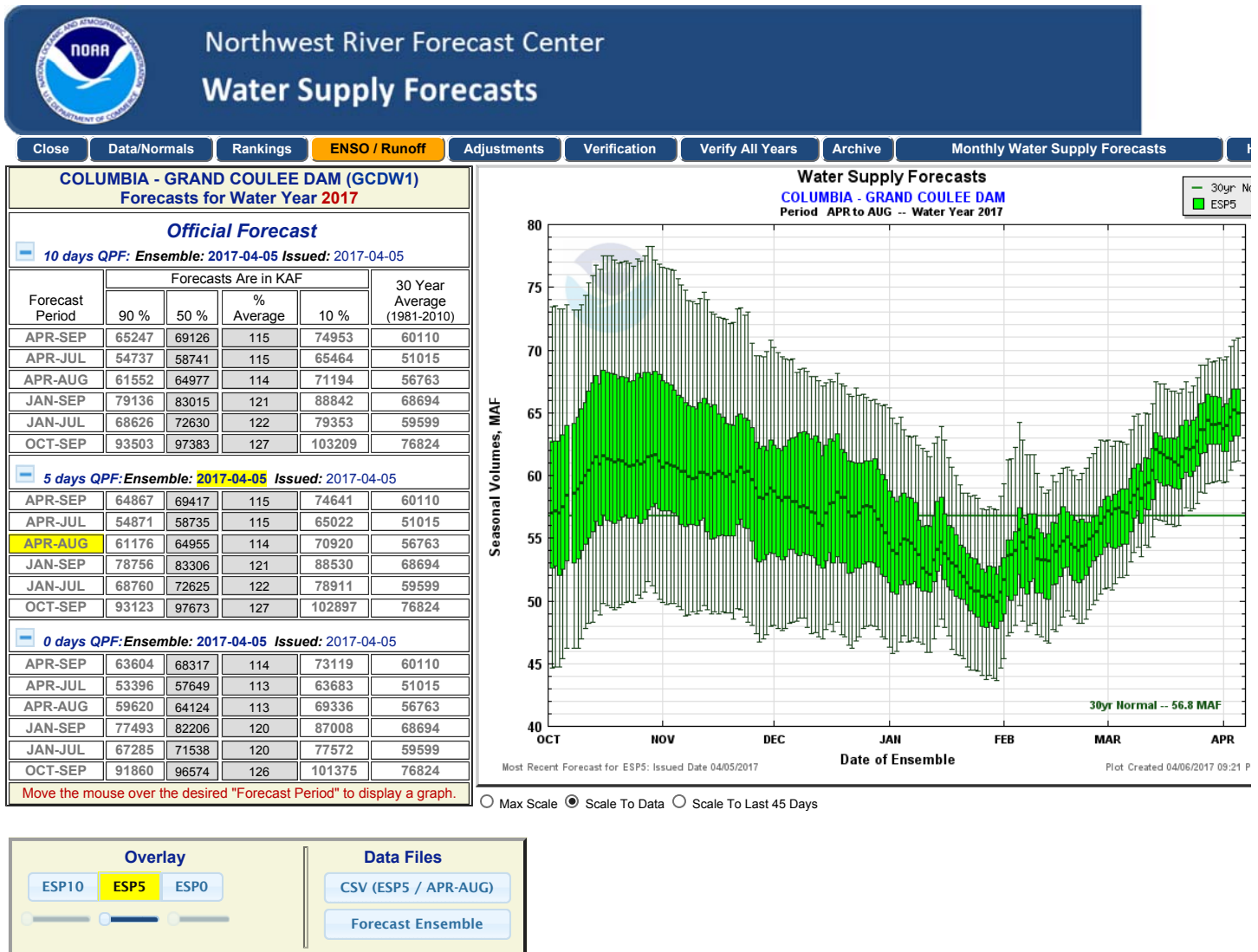
Approval:

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



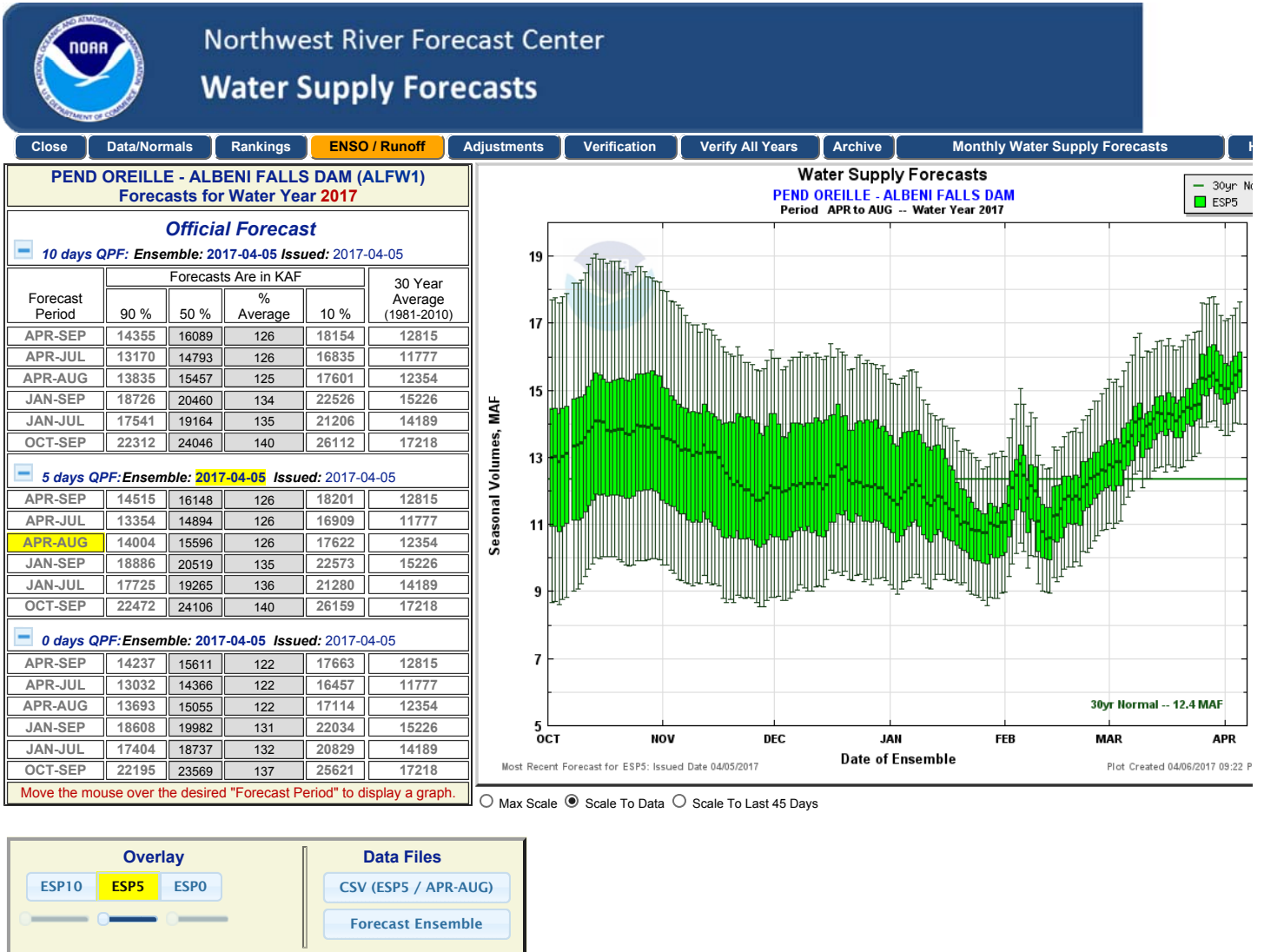
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