April 4, 2023

MEMORANDUM

TO: Council Members

FROM: Leslie Bach and Daniel Hua

SUBJECT: Basin Climate and Water Supply Outlook

BACKGROUND:

Presenter: Dr. Henry Pai, Senior Hydrologist, Northwest River Forecast Center, NOAA

Summary: Dr. Pai will provide an update on current hydrologic and climatic conditions and seasonal water supply forecasts for the Columbia Basin. He will provide a brief background on the methods used by NOAA to develop the forecasts, and discuss the current conditions and expectations for the upcoming water management season. This information is critical for informing decisions regarding dam management, hydropower production and fisheries operations across the Basin.

Relevance: The Mainstem Hydrosystem Flow and Passage strategy and the Climate Change strategy of the 2014/2020 Fish and Wildlife Program both call for the federal agencies to implement measures to better understand and track climate and river conditions and to use that information to identify and implement hydrosystem management actions that protect and improve conditions for fish. In addition, several applications of water supply forecasting for various seasonal time periods of a water year, which begins in October and ends in the following September, are in hydro-regulation planning studies. These include: (1) Biological Opinion (BiOP) operations at various hydropower projects such as setting the amount of spill, minimum and maximum flow constraints or flow in
turbines; (2) flood control operations which determine how much to draft various reservoirs to absorb the freshet runoff; (3) estimating the volume and timing of water to be released from Canadian reservoirs according the Columbia River Treaty; and (4) setting hydro-regulations to ensure a high probability of refill for all reservoirs at the end of the water year. Results from these studies enable planners to determine operations of the hydrosystem projects, which include hydropower generation over the water year.

Background: Climate and water supply forecasting is a critical component of annual water management for Columbia River system operations. It also informs long-term planning and decision-making on operations that affect both hydropower supply and fish passage and survival. Annual planned actions for reservoir operations and fish passage during the fish migration seasons are described in the Corps of Engineers’ Water Management Plan and Fish Operations Plan. In-season adjustments on dam and reservoir operations to accommodate changing conditions are discussed and considered through regional forum processes such as the Technical Management Team. All of these discussion and decision-making processes utilize the information provided on Basin water supply and runoff forecasting.

More Info: Forecast information and maps are available on the Northwest River Forecast Center website.
April 2023 Northwest Power and Conservation Council Meeting

Henry Pai
NWRFC.watersupply@noaa.gov
NOAA Mission: To understand and predict changes in the Earth’s environment ... to meet our Nation’s economic, social, and environmental needs

NWS Mission: The NWS provides weather, hydrologic, and climate forecasts and warnings ... for the protection of life and property and the enhancement of the national economy

RFC Role: The River Forecast Centers carries out the NOAA and NWS missions by providing streamflow forecasts and information datasets for the well being of the public
NWS River Forecast Centers

Northwest RFC:
- Includes portions of 8 States and British Columbia
- Basin Area = 326,127 square miles
- Entire Columbia River Basin
- Coastal Rivers of Oregon and Washington
NWRFC Domain and Forecast Services

- 10-day deterministic forecasts
  - Issued twice daily
  - Updated as needed
- Seasonal probabilistic forecasts
- ~350 locations
- Use conceptual hydrologic modeling
- Coordinate with USACE, USBR, BPA, and others on streamflow regulation
Cooler temperatures since November have kept snowpack conditions elevated relative to seasonal precipitation values.

Decreased melt and rain have caused observed runoff to date to remain well below normal.

Apr-Sep water supply forecasts remain mostly normal to below normal, with exception in southern Idaho where forecasts are much higher than normal.
Precipitation and Snow

Seasonal Precipitation
Oct 1, 2022 – Apr 09, 2023

Seasonal Precipitation
(Percent Normal)

- Below 50%
- 50 – 70%
- 70 – 90%
- 90 – 110%
- 110 – 130%
- Above 130%

Apr 10 2023

SWE (% Avg)
- Questionable
- Not Available
- Zero
- < 25
- 25-50
- 50-75
- 75-90
- 90-110
- 110-125
- 125-150
- 150-175
- > 175

Creation Time: Monday, Apr 10, 2023
Northwest River Forecast Center
Snow and Precipitation

Apr 10 2023

Snow data from NRCS, BC Hydro, and Alberta Environment and Parks. Precip averages from PRISM OSU and PCIC.

68% of normal (Apr 10)
Snow data from NRCS, BC Hydro, and Alberta Environment and Parks. Precip averages from PRISM OSU and PCIC.
Snow and Precipitation

Apr 10 2023

Snow data from NRCS, BC Hydro, and Alberta Environment and Parks. Precip averages from PRISM OSU and PCIC.
28-day average flow

Observed Streamflow and Adjusted Runoff

Explanation - Percentile classes

- Low: <10
- Below normal: 10-24
- Normal: 25-75
- Above normal: 76-90
- High: >90
- Not-ranked

Sunday, April 09, 2023

Leaflet | Powered by Leaflet, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFD, NRCan
Water Year to Date Adjusted Runoff

% Normal Runoff Oct 1- Apr 10

Upper Columbia Basin
- Mica: 70
- Duncan: 74
- Queens Bay: 51
- Libby: 61
- Hungry Horse: 51
- Grand Coulee: 54

Snake River Basin
- American Falls: 78
- Lucky Peak: 58
- Dworshak: 47
- Lower Granite: 61

Lower Columbia Basin
- The Dalles: 55
Quantitative Precipitation Forecast (QPF) Sources:
- Days 1 - 2 NWS Weather Forecast Offices (WFO) in the US, WPC in BC
- Days 3 - 7 NWS Weather Prediction Center (WPC)
- Days 8 - 10 NWS National Blend of Models (NBM)
Water Supply Forecasts

% Normal Apr-Sep Volume

Upper Columbia Basin
- Mica: 79
- Duncan: 90
- Queens Bay: 84
- Libby: 82
- Hungry Horse: 85
- Grand Coulee: 85

Snake River Basin
- American Falls: 114
- Lucky Peak: 106
- Dworshak: 93
- Lower Granite: 88

Lower Columbia Basin
- The Dalles: 84
# Water Supply Forecasts

## COLUMBIA - GRAND COULEE DAM (GCDW1)
Forecasts for Water Year 2023

### Official Water Supply

**ESP with 10 Days QPF Ensemble:** 2023-04-10 **Issued:** 2023-04-10

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<tr>
<th>Forecast Period</th>
<th>90%</th>
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### Experimental Water Supply

**HEFS with 15 Days EQPF Ensemble:** 2023-04-10 **Issued:** 2023-04-10

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### Reference

**ESP with 0 Days EQPF Ensemble:** 2023-04-10 **Issued:** 2023-04-10

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

www.nwrfc.noaa.gov/water_supply/ws_forecasts.php?id=GCDW1
Water Supply Forecasts

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2023

**Official Water Supply**
ESP with 10 Days OOF
Ensemble: 2023-04-10 Issued: 2023-04-10

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**Experimental Water Supply**
HEFS with 15 days EQFF
Ensemble: 2023-04-10 Issued: 2023-04-10

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**Reference**
ESP with 0 Days QPF
Ensemble: 2023-04-10 Issued: 2023-04-10

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

www.nwrfc.noaa.gov/water_supply/ws_forecasts.php?id=TDAO3
Monthly Water Supply Forecasts

Water Supply Volume Monthly Forecasts (ESP10) for Water Year 2023

(TDAO3) COLUMBIA - THE DALLES DAM

Obs Runoff
ESP10 Forecast
30 Year Average

Ensemble Date: 2023-04-10
Plot Created: 04/10/2023 01:14 P

By May-July 2023, the dynamical models suggest a potential return to El Niño, while the statistical models indicate the continuation of ENSO-neutral into the Northern Hemisphere summer, before warming up to borderline El Niño conditions in the late summer/fall 2023.
Water Supply Take Home Messages

Cooler temperatures since November have kept snowpack conditions elevated relative to seasonal precipitation values.

Decreased melt and rain have caused observed runoff to date to remain well below normal.

Apr-Sep water supply forecasts remain mostly normal to below normal, with exception in southern Idaho where forecasts are much higher than normal.
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All presentations held at 10:00 am Pacific Time unless noted otherwise.