

Memorandum

May 19, 2020

To: John Palmer, R10USEPA

From: Peter Leinenbach, R10USEPA

Subject: Comparison between NHDPlus modeled August mean flow conditions and available flow data collected at the primary Cold Water Refugia (CWR) streams.

USGS stream flow gage locations¹ on “primary” CWR streams was obtained from the USGS StreamStats website (<https://streamstats.usgs.gov/ss/>). This effort determined that 8 of the 13 primary CWR streams currently have an operational USGS stream flow gage. Daily flow statistic values were downloaded for these sites and August mean flow conditions were summarized for two time periods (i.e., 1999 through 2019 and 2009 through 2019) (**Table 1**). Modeled NHDPlus² mean August stream flow conditions observed at these USGS gage location indicate that, for most sites, there is a close association between the modeled and observed conditions. However, both the Umatilla and Deschutes rivers have large differences between modeled and measured August average flow conditions: Both systems are highly regulated, possibly causing this discrepancy.

Primary CWR Site with Currently Operated Flow Gauge	USGS Gauge Number	USGS Gage August Mean Flow 1999 2019	USGS Gage August Mean Flow 2009 2019	NHDPlus EROM August Mean Flow (Q0001E)
Cowlitz River	14243000	3880	3996	3581
Lewis River	14220500	1489	1357	1352
Sandy River	14142500	467	434	453
White Salmon River	14123500	702	704	692
Hood River	14120000	340	330	367
Klickitat River	14113000	831	864	850
Deschutes River	14103000	4507	4544	3446
Umatilla River	14033500	72	87	384

¹ The most downstream gage location near the confluence with the Columbia River was used in this assessment.

² The August Extended Unit Runoff Method (EROM) model was obtained from the NHDPlus website and it represents the mean August flow statistic estimates for NHDFlowline features in the NHDPlus network. The Q0001E EROM flow attribute is the gage adjusted values and was used in this assessment.

Two of the primary CWR streams previously had flow data collect at a USGS gage, but these gages stopped collecting August flow data in 1977. Measured “historic” flows are relatively similar to modeled NHDPlus flows at the Wind River Primary CWR site, but there was a large difference between reported modeled and measured conditions at the Little White Salmon River Primary CWR site. On August 17, 2016, USEPA measured that the Little White Salmon River was 206 cfs³, which indicates that the EROM model is likely underestimating flow conditions within this river: There are several unique cold water groundwater sources within this reach of the Little White Salmon River and the NHDPlus model may not be able to account for these water inputs.

Table 2. Measured Historic Flow (cfs) and NHDPlus Modeled Flow at the Primary CWR Streams

Primary CWR Site with Currently Operated Flow Gauge	USGS Gauge Number	USGS Gage August Mean Flow 1959 1977	USGS Gage August Mean Flow 1969 1977	NHDPlus EROM August Mean Flow (Q0001E)
Wind River	14128500	243	248	289
Little White Salmon R.	14125500	248	263	88

Finally, USGS gages were never present on three of the CWR streams - Tanner Creek, Eagle Creek, and Herman Creek.

Screenshots of USGS gage locations used in this assessment are presented on the following pages.

³ Flow sampling occurred during the CWR plume monitoring effort implemented by USEPA during the week of August 15, 2016.

CWR Stream in Washington with Current USGS Stream Flow Gauge – Cowlitz River

USGS StreamStats

Step 2: You have zoomed in sufficiently to select a state or regional study area. Your selection will dictate the data used to perform basin delineation and flow statistics calculation.

Click to select a State or Regional Study Area

Oregon 0

Washington 0

Search for a place

Help

IDENTIFY A STUDY AREA

Streamgages

Station ID: 14243000
 Station Name: COWLITZ RIVER AT CASTLE ROCK, WA
 Latitude: 46.27449
 Longitude: -122.91413
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 46.2188, Lon: -123.1975

USGS WaterWatch | water.gauge - Google | StreamStats: Stream | StreamStats | USGS 14243000 | USGS 14244200

nwis.waterdata.usgs.gov/nwis/inventory/?site_no=14243000

USGS 14243000 COWLITZ RIVER AT CASTLE ROCK, WA

Available data for this site: [SUMMARY OF ALL AVAILABLE DATA](#) GO

Stream Site

DESCRIPTION:

Latitude 46°16'30", Longitude 122°54'48" NAD27
 Cowlitz County, Washington, Hydrologic Unit 17080005
 Drainage area: 2,238 square miles
 Datum of gage: 0.00 feet above NAVD88.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1961-12-20	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1926-12-10	2020-05-17	31401
Gage height, feet	1986-04-25	2011-09-30	4367
Suspended sediment concentration, milligrams per liter	1980-05-18	1984-09-26	735
Suspended sediment discharge, short tons per day	1980-05-18	1984-09-30	1597
Daily Statistics			
Discharge, cubic feet per second	1926-12-10	2020-02-13	31307
Gage height, feet	1986-04-25	2011-09-30	4367
Suspended sediment concentration, milligrams per liter	1980-05-18	1984-09-26	735
Suspended sediment discharge, short tons per day	1980-05-18	1984-09-30	1597
Monthly Statistics			
Discharge, cubic feet per second	1926-12	2020-03	

CWR Stream in Washington with Current USGS Stream Flow Gauge - Lewis River

Streamgages

Station ID: 14220500
 Station Name: LEWIS RIVER AT ARIEL, WA
 Latitude: 45.95169
 Longitude: -122.564
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.9502, Lon: -122.5648

USGS 14220500 LEWIS RIVER AT ARIEL, WA

Available data for this site: [SUMMARY OF ALL AVAILABLE DATA](#) [GO](#)

Stream Site

DESCRIPTION:
 Latitude 45°57'07", Longitude 122°33'46" NAD27
 Cowlitz County, Washington, Hydrologic Unit 17080002
 Drainage area: 731 square miles
 Datum of gage: 44.00 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1999-10-01	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1909-07-01	2020-05-17	35570
Gage height, feet	1999-10-02	2020-05-17	6209
Daily Statistics			
Discharge, cubic feet per second	1909-07-01	2020-02-12	35475
Gage height, feet	1999-10-02	2020-02-12	6114
Monthly Statistics			
Discharge, cubic feet per second	1909-07	2020-02	
Gage height, feet	1999-10	2020-02	
Annual Statistics			
Discharge, cubic feet per second	1909	2020	
Gage height, feet	2000	2020	

CWR Stream in Oregon with Current USGS Stream Flow Gauge - Sandy River

Streamgages

Station ID: 14142500
 Station Name: SANDY RIVER BLW BULL RUN RIVER, NR BULL RUN, OR
 Latitude: 45.44993
 Longitude: -122.24891
 NWIS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.6265, Lon: -121.9427

USGS 14142500 SANDY RIVER BLW BULL RUN RIVER, NR BULL RUN, OR

Available data for this site [SUMMARY OF ALL AVAILABLE DATA](#) [GO](#)

Stream Site

DESCRIPTION:
 Latitude 45°26'57", Longitude 122°14'38" NAD27
 Clackamas County, Oregon, Hydrologic Unit 17080001
 Drainage area: 436 square miles
 Datum of gage: 240 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1986-10-01	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1910-10-01	2020-05-17	27772
Turbidity, water, unfiltered, monochrome near infra-red LED light, 780-900 nm, detection angle 90 +-2.5 degrees, formazin nephelometric units (FNU)	2006-03-15	2008-07-01	1872
Daily Statistics			
Discharge, cubic feet per second	1910-10-01	2020-02-09	27674
Monthly Statistics			
Discharge, cubic feet per second	1910-10-01	2020-05-18	

CWR Stream in Washington with Current USGS Stream Flow Gauge - White Salmon River

Streamgages

Station ID: 14123500
 Station Name: WHITE SALMON RIVER NEAR UNDERWOOD, WA
 Latitude: 45.75003
 Longitude: -121.52717
 MWIS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.7301, Lon: -121.0693

USGS 14123500 WHITE SALMON RIVER NEAR UNDERWOOD, WA

Available data for this site [SUMMARY OF ALL AVAILABLE DATA](#) [GO](#)

Stream Site

DESCRIPTION:
 Latitude 45°45'08", Longitude 121°31'33" NAD27
 Skamania County, Washington, Hydrologic Unit 17070105
 Drainage area: 386 square miles
 Datum of gage: 112.96 feet above NGVD29

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1987-10-01	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1912-11-01	2020-05-17	36694
Gage height, feet	1991-12-21	2020-05-17	9716
Daily Statistics			
Discharge, cubic feet per second	1912-11-01	2019-11-04	36499
Gage height, feet	1991-12-21	2019-11-04	9521
Monthly Statistics			
Discharge, cubic feet per second	1912-11	2019-11	
Gage height, feet	1991-12	2019-11	
Annual Statistics			
Discharge, cubic feet per second	1913	2020	
Gage height, feet	1997	2020	

CWR Stream in Oregon with Current USGS Stream Flow Gauge - Hood River

Streamgages

Station ID: 14120000
 Station Name: HOOD RIVER AT TUCKER BRIDGE, NEAR HOOD RIVER, OR
 Latitude: 45.6547
 Longitude: -121.54829
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.7062, Lon: -121.6544

USGS WaterWatch - Stream - water gauge - Google Sev - StreamStats: Streamflow - StreamStats - USGS 14120000 HOOD RIVER

[Introducing The Next Generation of USGS Water Data for the Nation](#)
[Full News](#)

USGS 14120000 HOOD RIVER AT TUCKER BRIDGE, NEAR HOOD RIVER, OR

Available data for this site [SUMMARY OF ALL AVAILABLE DATA](#) GO

Stream Site

DESCRIPTION:

Latitude 45°39'16.20", Longitude 121°32'55.68" NAD83
 Hood River County, Oregon, Hydrologic Unit 17070105
 Drainage area: 279 square miles
 Datum of gage: 383.2 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1986-10-01	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1897-10-20	2020-05-17	22106
Daily Statistics			
Discharge, cubic feet per second	1897-10-20	2020-03-18	22046
Monthly Statistics			
Discharge, cubic feet per second	1897-10	2020-03	
Annual Statistics			

CWR Stream in Washington with Current USGS Stream Flow Gauge – Klickitat River

Streamgages

Station ID: 14113000
 Station Name: KLICKITAT RIVER NEAR PITT, WA
 Latitude: 46.7545
 Longitude: 121.21012
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.5564, Lon: -120.5914

USGS 14113000 KLICKITAT RIVER NEAR PITT, WA

Available data for this site: [SUMMARY OF ALL AVAILABLE DATA](#) GO

Stream Site

DESCRIPTION:
 Latitude 45°45'24", Longitude 121°12'32" NAD27
 Klickitat County, Washington, Hydrologic Unit 17070106
 Drainage area: 1,297 square miles
 Datum of gage: 288.90 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1991-10-08	2020-05-18	
Daily Data			
Discharge, cubic feet per second	1909-07-01	2020-05-17	34412
Gage height, feet	1997-09-30	2020-05-17	7457
Daily Statistics			
Discharge, cubic feet per second	1909-07-01	2020-01-06	34280
Gage height, feet	1997-09-30	2020-01-06	7325
Monthly Statistics			
Discharge, cubic feet per second	1909-07	2020-01	
Gage height, feet	1997-09	2020-01	
Annual Statistics			
Discharge, cubic feet per second	1909	2020	
Gage height, feet	1997	2020	

CWR Stream in Oregon with Current USGS Stream Flow Gauge – Deschutes River

Streamgages

Station ID: 14103000
 Station Name: DESCHUTES RIVER AT MOODY, NEAR BIGGS, OR
 Latitude: 45.62131
 Longitude: -120.90903
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.3753, Lon: -120.2042

USGS 14103000 DESCHUTES RIVER AT MOODY, NEAR BIGGS, OR

Available data for this site: [SUMMARY OF ALL AVAILABLE DATA](#) [GO](#)

Stream Site

DESCRIPTION:
 Latitude 45°37'20", Longitude 120°54'16" NAD27
 Sherman County, Oregon, Hydrologic Unit 17070306
 Drainage area: 10,500 square miles
 Datum of gage: 167.54 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1987-10-01	2020-05-18	
Daily Data			
Temperature, water, degrees Celsius	1954-10-26	2020-05-18	26129
Temperature, water, degrees Celsius	1952-12-29	1954-02-15	395
Discharge, cubic feet per second	1897-10-01	2020-05-17	42417
Daily Statistics			
Temperature, water, degrees Celsius	2011-07-29	2020-03-18	3148
Discharge, cubic feet per second	1897-10-01	2020-03-18	42357
Monthly Statistics			
Temperature, water, degrees Celsius	2011-07	2020-03	
Discharge, cubic feet per second	1897-10	2020-03	
Annual Statistics			
Temperature, water, degrees Celsius	2011	2020	

CWR Stream in Oregon with Current USGS Stream Flow Gauge – Umatilla River

Streamgages

Station ID: 14033500
 Station Name: UMATILLA RIVER NEAR UMATILLA, OR
 Latitude: 45.92291
 Longitude: -119.32569
 NWIS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 12
 Map Scale: 1:144,447
 Lat: 45.8900, Lon: -119.3768

USGS 14033500 UMATILLA RIVER NEAR UMATILLA, OR

Available data for this site: [SUMMARY OF ALL AVAILABLE DATA](#) GO

Stream Site

DESCRIPTION:
 Latitude 45°54'11", Longitude 119°19'33" NAD27
 Umatilla County, Oregon, Hydrologic Unit 17070103
 Drainage area: 2,290 square miles
 Datum of gage: 330.47 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations (availability statement)	1988-10-01	2020-05-19	
Daily Data			
Temperature, water, degrees Celsius	1967-10-02	1969-09-29	534
Temperature, water, degrees Fahrenheit	1962-10-01	1967-09-29	847
Discharge, cubic feet per second	1903-11-01	2020-05-18	42569
Suspended sediment concentration, milligrams per liter	1962-10-01	1970-06-30	2649
Suspended sediment discharge, short tons per day	1962-10-01	1970-06-30	2830
Daily Statistics			
Discharge, cubic feet per second	1903-11-01	2019-07-23	42269
Suspended sediment concentration, milligrams per liter	1962-10-01	1970-06-30	2649
Suspended sediment discharge, short tons per day	1962-10-01	1970-06-30	2830
Monthly Statistics			
Discharge, cubic feet per second	1903-11	2019-07	

CWR Stream in WA with Historic USGS Stream Flow Gauge – Wind River

Streamgages

Station ID: 14128500
 Station Name: WIND RIVER NEAR CARSON, WA
 Latitude: 43.7384
 Longitude: -121.80384
 NWS page: [link](#)
 StreamStats Gage page: [link](#)

Zoom Level: 10
 Map Scale: 1:577,790
 Lat: 45.8294, Lon: -121.1243

USGS 14128500 WIND RIVER NEAR CARSON, WA

Available data for this site [SUMMARY OF ALL AVAILABLE DATA](#) [GO](#)

Stream Site

DESCRIPTION:
 Latitude 45°43'37", Longitude 121°47'37" NAD27
 Skamania County, Washington, Hydrologic Unit 17070105
 Drainage area: 225.00 square miles
 Datum of gage: 112.60 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Daily Data			
Discharge, cubic feet per second	1934-10-01	1980-10-14	15708
Daily Statistics			
Discharge, cubic feet per second	1934-10-01	1980-10-14	15708
Monthly Statistics			
Discharge, cubic feet per second	1934-10	1980-10	
Annual Statistics			
Discharge, cubic feet per second	1935	1981	
Peak streamflow	1934-12-21	1997-01-01	47
Field/Lab water-quality samples	1972-10-04	1980-11-20	111

OPERATION:

CWR Stream in WA with Historic USGS Stream Flow Gauge – Little White Salmon River

The screenshot shows the USGS StreamStats interface. On the left, there are navigation options for Oregon and Washington, and a search bar. The main map area shows a topographic view of the Little White Salmon River. A red dot on the river indicates the location of the streamgage. A pop-up window titled "Streamgages" provides the following details:

- Station ID: 14125500
- Station Name: LITTLE WHITE SALMON RIVER NEAR COOK, WA
- Latitude: 45.72346
- Longitude: -121.634
- NWIS page: [link](#)
- StreamStats Gage page: [link](#)

Additional map information includes: Zoom Level: 12, Map Scale: 1:144,447, Lat: 45.7484, Lon: -121.5569.

The screenshot shows the USGS NWIS website for station 14125500. The page title is "USGS 14125500 LITTLE WHITE SALMON RIVER NEAR COOK, WA". Below the title, there is a "Stream Site" section with the following information:

DESCRIPTION:
 Latitude 45°43'25", Longitude 121°37'58" NAD27
 Skamania County, Washington, Hydrologic Unit 17070105
 Drainage area: 134 square miles
 Datum of gage: 150.00 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Daily Data			
Discharge, cubic feet per second	1956-10-01	1977-10-05	7675
Daily Statistics			
Discharge, cubic feet per second	1956-10-01	1977-10-05	7675
Monthly Statistics			
Discharge, cubic feet per second	1956-10	1977-10	
Annual Statistics			
Discharge, cubic feet per second	1957	1978	
Peak streamflow	1957-02-26	1977-03-09	21
Field measurements	1909-10-04	1977-12-13	2
Water-Year Summary	2008	2008	1