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 (<a href="https://streamstats.usgs.gov/ss/">https://streamstats.usgs.gov/ss/</a>). 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.

Table 1. Measured Current 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 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		

<sup>&</sup>lt;sup>1</sup> The most downstream gage location near the confluence with the Columbia River was used in this assessment.

<sup>&</sup>lt;sup>2</sup> 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 cfs <sup>3</sup>, 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		

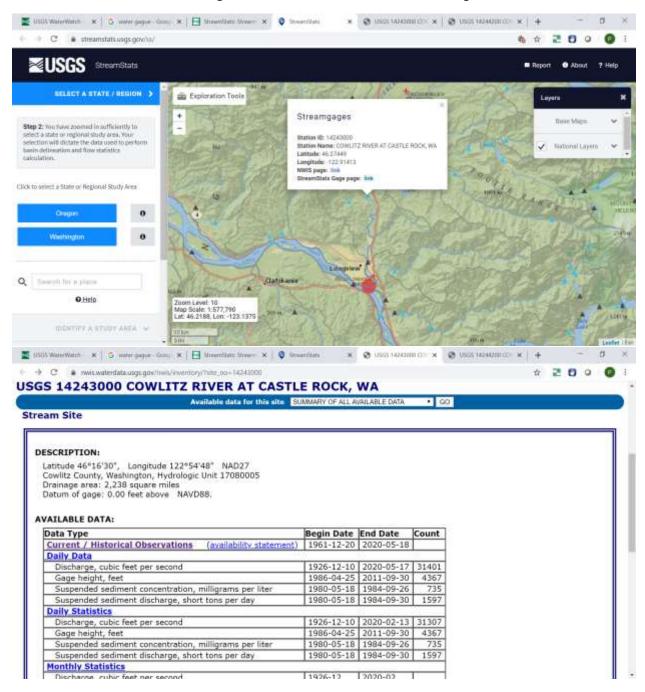
Finally, USGS gages were never present on three of the CWR streams - Tanner Creek, Eagle Creek, and Herman Creek.

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

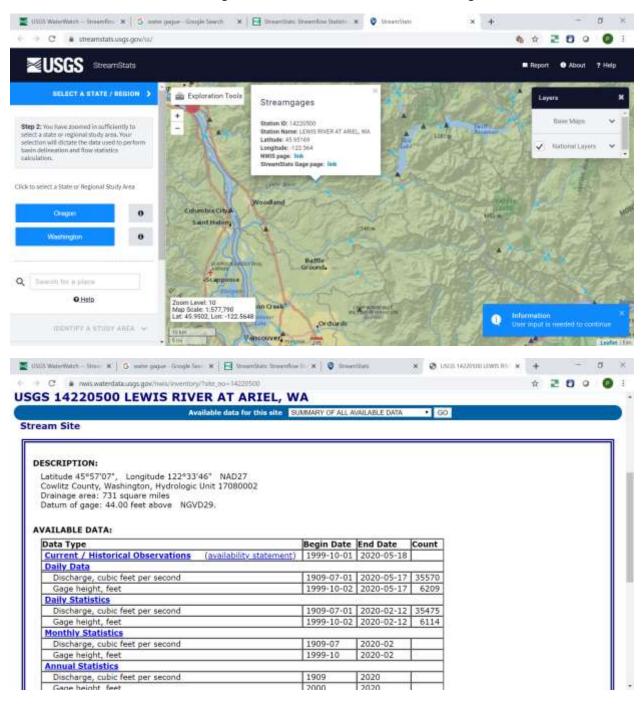
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<sup>&</sup>lt;sup>3</sup> Flow sampling occurred during the CWR plume monitoring effort implemented by USEPA during the week of August 15, 2016.

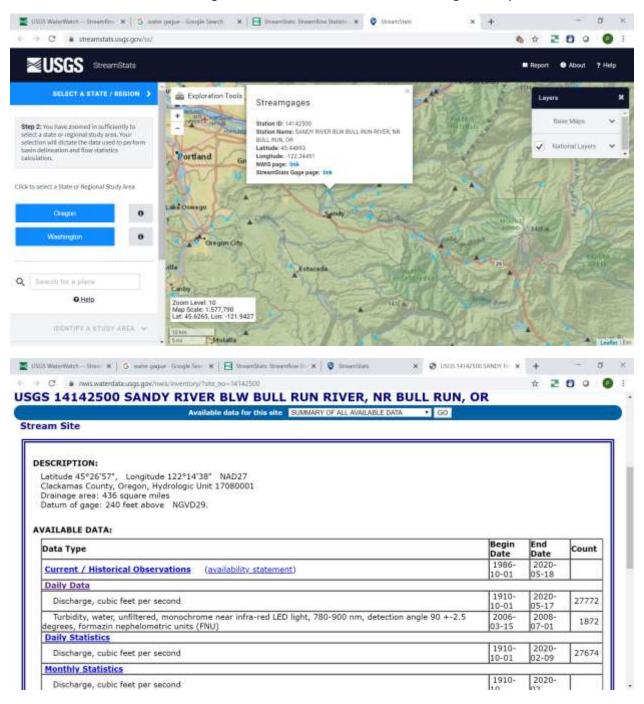
## CWR Stream in Washington with Current USGS Stream Flow Gauge - Cowlitz River



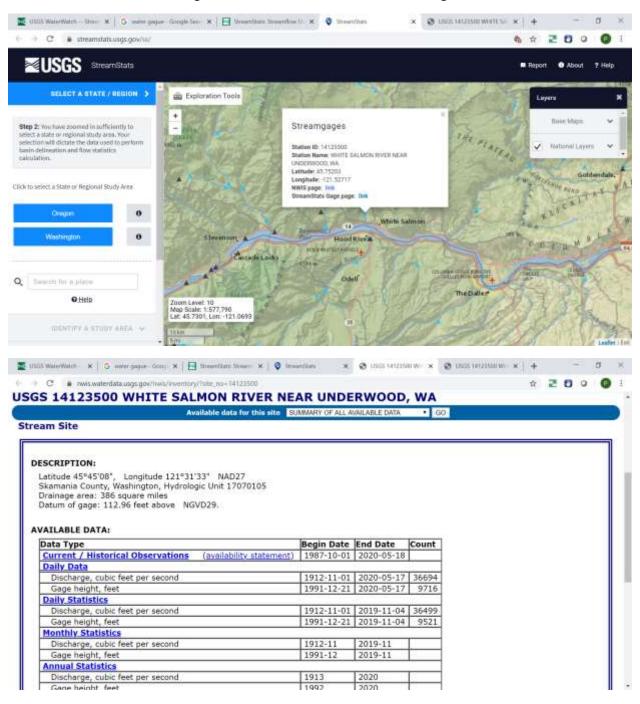
## CWR Stream in Washington with Current USGS Stream Flow Gauge - Lewis River



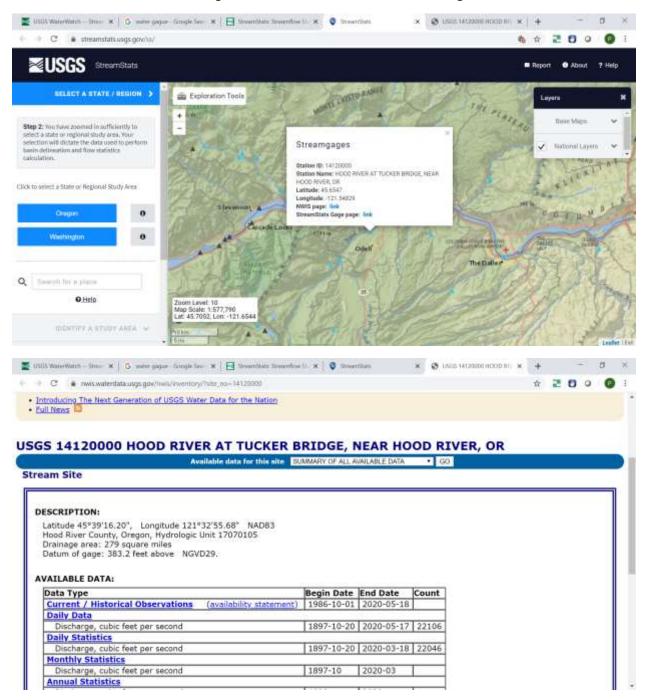
## CWR Stream in Oregon with Current USGS Stream Flow Gauge - Sandy River



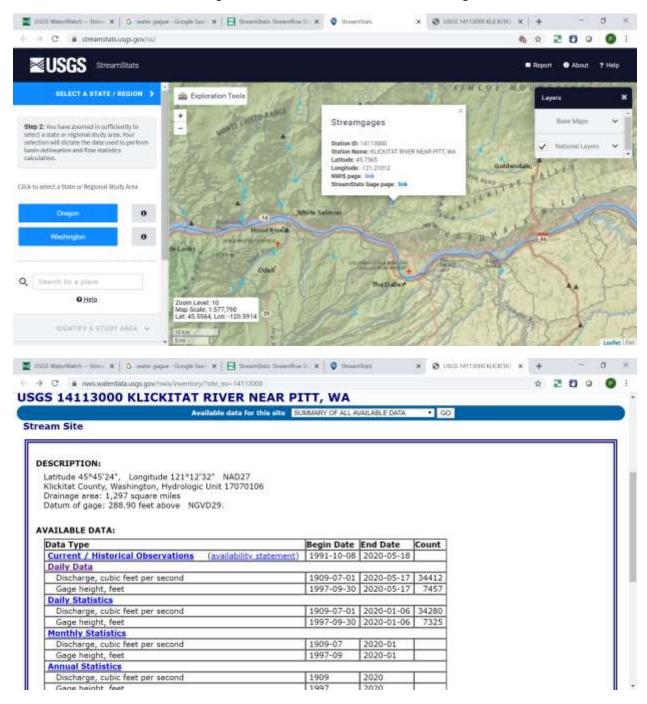
## CWR Stream in Washington with Current USGS Stream Flow Gauge - White Salmon River



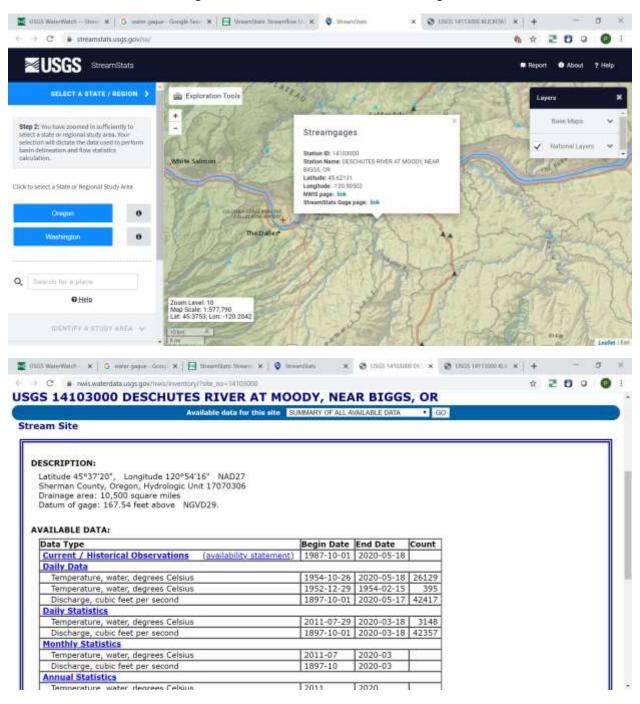
## CWR Stream in Oregon with Current USGS Stream Flow Gauge - Hood River



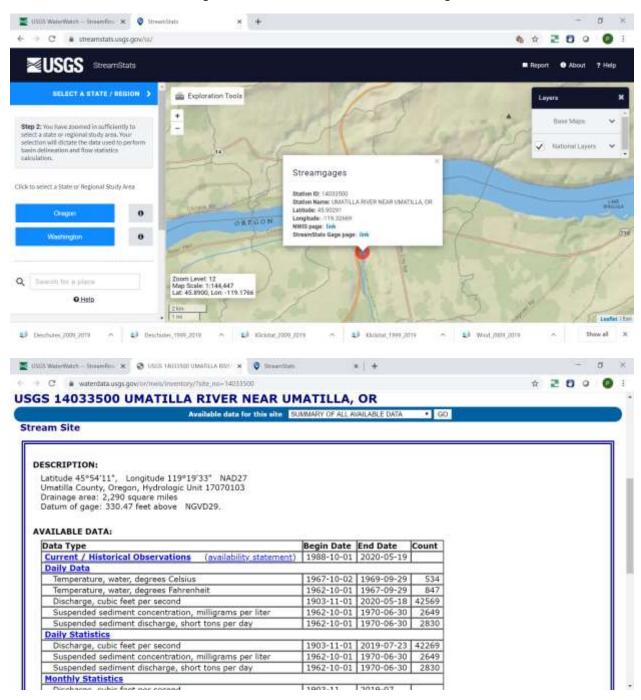
## CWR Stream in Washington with Current USGS Stream Flow Gauge - Klickitat River



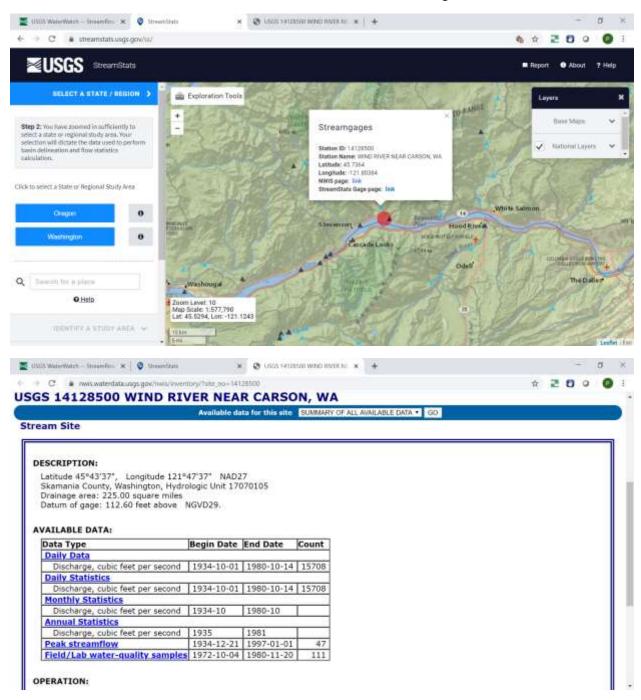
## CWR Stream in Oregon with Current USGS Stream Flow Gauge – Deschutes River



# CWR Stream in Oregon with Current USGS Stream Flow Gauge - Umatilla River



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



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

