

Memorandum

June 1, 2017

To: John Palmer, USEPA

From: Peter Leinenbach, USEPA

Subject: Estimated CWR volume in Herman Creek Cove

The potential for Herman Creek Cove to provide CWR for migratory Columbia River salmonids was developed based on data presented in the 2010 Cramer Fish Sciences report title “Temperature characteristics of Herman Creek Cove and its Function as a cold-water Refuge for Adult Salmon”. Because all measured stream temperatures reported in this study were more than 2 degrees Celsius cooler than the mainstem Columbia (21.6°C) on the day of sampling (8/5/2010), it was concluded that the Herman Creek Cove will provide CWR for migratory Columbia River salmonids (**Figure 1** and **Table 1**).

Figure 1. Illustration of the reported surface (i.e., 0.5 ft depth) water temperatures within the Herman Creek Cove on 8/5/2010 (Data Source – 2010 Cramer Fish Science Report)

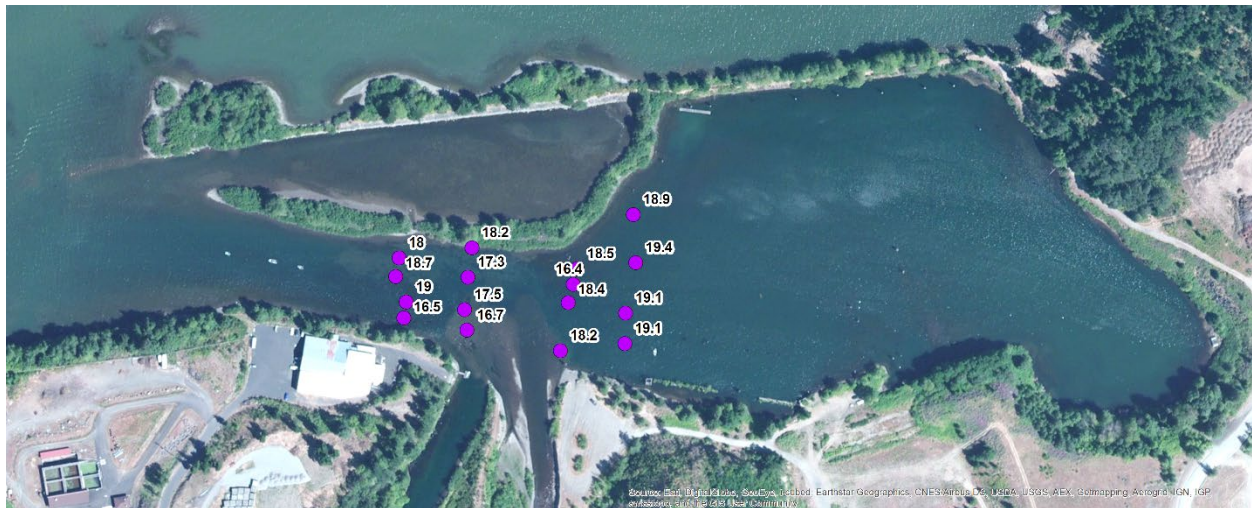


Table 1. Average water temperatures within the Herman Creek Cove area on 8/5/2010

Measurement Depth	Average Water Temperature
Average at the Herman Creek mouth	14.2°C
Average at 0.5 ft in Cove	18.2°C
Average at 4 ft in Cove	16.4°C
Average at 8 ft in Cove	15.7°C
Average at 12 ft in Cove	14.9°C
Nearest Measured Mainstem Columbia River Daily Average Temperature for 8/5/2010	21.6°C

Unfortunately, detailed bathymetric data is not available for the Herman Creek Cove region. Accordingly, water depths within the cove were estimated from the NOAA nautical chart that covers the Herman Creek Cove region (i.e., NOAA Chart #58352) (**Figure 2**). Specifically, the cove was separated into three depth sections based on the three reported values in this chart, and it was assumed that the depths were uniform within each zone (**Figure 3**). The surface area and volume associated with each group is presented in **Table 2**. The total CWR volume in the Herman Creek Cove is 217,848 m³.

Figure 2. Illustration of Reported NOAA Water Depths (ft) within the Herman Creek Cove.

[Source - http://tilesevice.charts.noaa.gov/tileset.html#18532_2-locator]

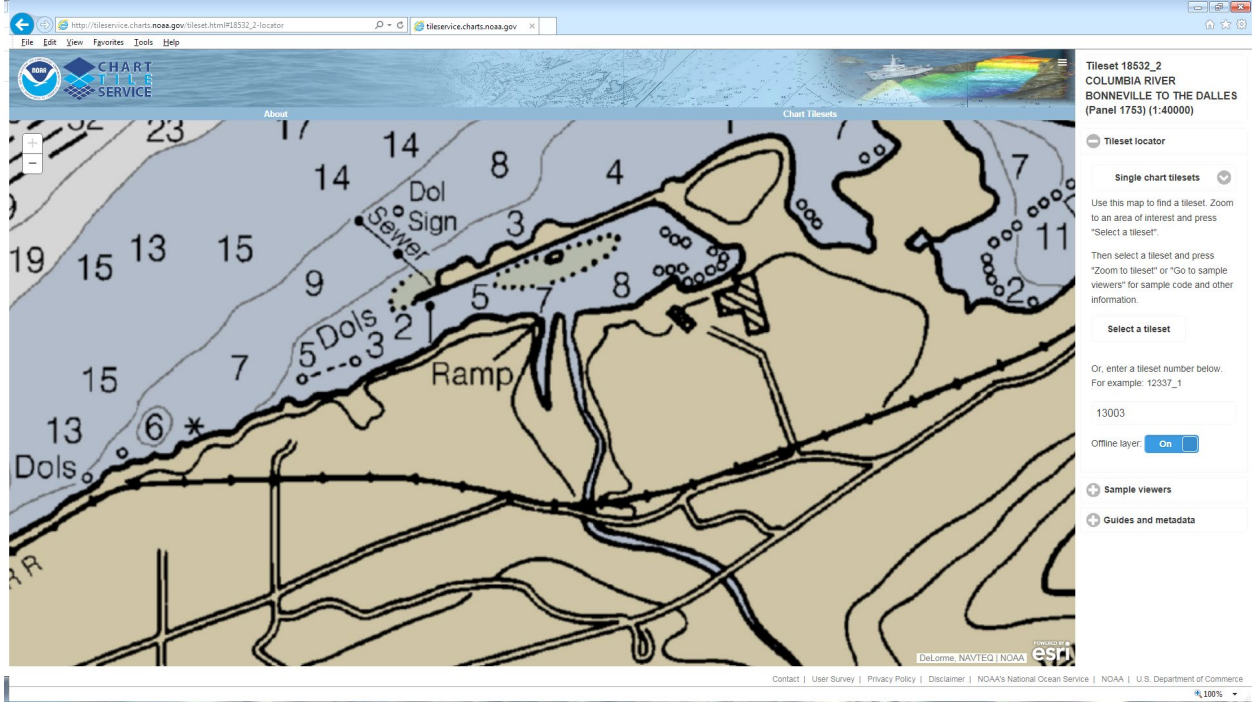


Figure 3. NOAA Water Depth Groups (ft) within the Herman Creek Cove.



Table 2. Calculated Surface Areas and Volumes within the Herman Creek Cove.

Cove Depth Group	Surface Area (m ²)	Volume (m ³)
5 ft	8,018	12,219
7 ft	16,279	34,733
8 ft	70,085	170,896
Total Herman Creek Cove CWR Volume (m³)		217,848