MEMORANDUM

TO: Fish and Wildlife Committee Members

FROM: Leslie Bach

SUBJECT: EPA Presentation on Draft Columbia River Cold Water Refuges Plan

BACKGROUND:

Presenter: John Palmer, U.S. Environmental Protection Agency

Summary: John Palmer will provide an overview of the recently released Draft Columbia River Cold Water Refuges Plan. He will describe the data and modeling used to identify cold water refuge tributaries in the mainstem lower Columbia River and the use of those refuges by salmon and steelhead. He will also discuss strategies to protect, enhance and restore cold water refuges for future benefit.

Relevance: Actions related to cold-water habitat are identified in numerous locations in the 2014 Fish and Wildlife Program. Protecting and restoring habitat is a key sub-strategy in the Ecosystem Function section of the Program (page 41). An important aspect of this is ensuring that the habitats that are restored and protected are providing the appropriate thermal regimes for fish and other aquatic life. Specific to mainstem habitat measures, the Program states that “The Council will consider additional mainstem habitat actions including “identifying, protecting restoring and managing thermal refugia for salmonid use during high water-temperature periods” (page 43). Under the Climate-Change sub-strategy, the general measures call for the action agencies to “evaluate the effectiveness and feasibility of possible
actions to mitigate effects of climate change…other actions to create or protect cool water refugia in mainstem reaches or reservoirs” (page 58).

**Background:** Salmon and steelhead that migrate during the summer months when Columbia River water temperatures reach or exceed 20°C may endure adverse effects in the form of disease, stress, decreased spawning success, and lethality. To minimize their exposure to warm temperatures in the Columbia River, many salmon and steelhead temporarily move into areas of cooler water, which are called cold water refuges (CWR). In the Lower Columbia River, these CWR are primarily where cooler tributary rivers flow into the Columbia River. Protecting and restoring these cold water refuges is important for the survival of migrating salmon and steelhead and the recovery of future populations.

**More Info:** [EPA Draft Columbia River Cold Water Refuges Plan](#)
EPA Columbia River
Cold Water Refuges Plan

June 2020

John Palmer
EPA Region 10
Overview

- EPA released Draft Cold Water Refuge (CWR) Plan in October 2019
- Plan is focused on the Lower Columbia River from the Snake River to the ocean
- Oregon temperature water quality standard is 20°C with sufficiently distributed CWR to aid migrating salmon and steelhead
  - CWR are areas that are at least 2°C cooler than the main channel
- EPA is issuing the Plan to meet our obligation under the Endangered Species Act
- Plan also is the basis for the CWR targets in EPA’s May 2020 Columbia/Snake River Temperature TMDL
- EPA plans to finalize CWR Plan after the Col/Snake TMDL comment period closes on July 21
EPA Columbia River CWR Plan

1. Map and quantify the CWR areas in the Lower Columbia River

2. Characterize the extent to which salmon and steelhead use CWR

3. Assess whether current CWR is sufficient to meet Oregon’s CWR standard

4. Identify actions to protect, restore, or enhance CWR
12 Primary CWR in Lower Columbia River (23 Total CWR)
## Lower Columbia River CWR
(12 Primary - color highlighted/23 Total)

<table>
<thead>
<tr>
<th>Tributary Name</th>
<th>River Mile</th>
<th>August Mean Mainstem Temperature (DART) °C</th>
<th>August Mean Tributary Temperature (NorWeST) °C</th>
<th>August Mean Temperature Difference °C</th>
<th>August Mean Tributary Flow (NHD &amp; USGS*) cfs</th>
<th>Plume CWR Volume (&gt; 2°C Δ) m³</th>
<th>Stream CWR Volume (&gt; 2°C Δ) m³</th>
<th>Total CWR Volume (&gt; 2°C Δ) m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skamokawa Creek (WA)</td>
<td>30.9</td>
<td>21.3</td>
<td>16.2</td>
<td>-5.1</td>
<td>23</td>
<td>450</td>
<td>1,033</td>
<td>1,483</td>
</tr>
<tr>
<td>Mill Creek (WA)</td>
<td>51.3</td>
<td>21.3</td>
<td>14.5</td>
<td>-6.8</td>
<td>10</td>
<td>110</td>
<td>446</td>
<td>556</td>
</tr>
<tr>
<td>Abernethy Creek (WA)</td>
<td>51.7</td>
<td>21.3</td>
<td>15.7</td>
<td>-5.6</td>
<td>10</td>
<td>81</td>
<td>806</td>
<td>887</td>
</tr>
<tr>
<td>Germany Creek (WA)</td>
<td>53.6</td>
<td>21.3</td>
<td>15.4</td>
<td>-5.9</td>
<td>8</td>
<td>72</td>
<td>446</td>
<td>518</td>
</tr>
<tr>
<td>Cowlitz River (WA)</td>
<td>65.2</td>
<td>21.3</td>
<td>16.0</td>
<td>-5.4</td>
<td>3634</td>
<td>870,000</td>
<td>684,230</td>
<td>1,554,230</td>
</tr>
<tr>
<td>Kalama River (WA)</td>
<td>70.5</td>
<td>21.3</td>
<td>16.3</td>
<td>-5.0</td>
<td>314*</td>
<td>14,000</td>
<td>27,820</td>
<td>41,820</td>
</tr>
<tr>
<td>Sandy River (OR)</td>
<td>84.4</td>
<td>21.3</td>
<td>16.6</td>
<td>-4.8</td>
<td>1291*</td>
<td>120,000</td>
<td>493,455</td>
<td>613,455</td>
</tr>
<tr>
<td>Washougal River (WA)</td>
<td>117.1</td>
<td>21.3</td>
<td>18.8</td>
<td>-2.5</td>
<td>469</td>
<td>9,900</td>
<td>22,015</td>
<td>31,915</td>
</tr>
<tr>
<td>Bridal Veil Creek (WA)</td>
<td>117.6</td>
<td>21.3</td>
<td>19.2</td>
<td>-2.1</td>
<td>107*</td>
<td>740</td>
<td>32,563</td>
<td>33,303</td>
</tr>
<tr>
<td>Wahkeena Creek (WA)</td>
<td>128.9</td>
<td>21.3</td>
<td>11.7</td>
<td>-9.6</td>
<td>7</td>
<td>120</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>Oneonta Creek (OR)</td>
<td>134.3</td>
<td>21.3</td>
<td>13.1</td>
<td>-8.2</td>
<td>29</td>
<td>820</td>
<td>54</td>
<td>874</td>
</tr>
<tr>
<td>Tanner Creek (OR)</td>
<td>140.9</td>
<td>21.3</td>
<td>11.7</td>
<td>-9.6</td>
<td>38</td>
<td>1,300</td>
<td>413</td>
<td>1,713</td>
</tr>
<tr>
<td>Eagle Creek (OR)</td>
<td>142.7</td>
<td>21.2</td>
<td>15.1</td>
<td>-6.1</td>
<td>72</td>
<td>2,100</td>
<td>888</td>
<td>2,988</td>
</tr>
<tr>
<td>Rock Creek (WA)</td>
<td>146.6</td>
<td>21.2</td>
<td>17.4</td>
<td>-3.8</td>
<td>47</td>
<td>530</td>
<td>1,178</td>
<td>1,708</td>
</tr>
<tr>
<td>Herman Creek (OR)</td>
<td>147.5</td>
<td>21.2</td>
<td>12.0</td>
<td>-9.2</td>
<td>45</td>
<td>168,000</td>
<td>1,698</td>
<td>169,698</td>
</tr>
<tr>
<td>Wind River (WA)</td>
<td>151.1</td>
<td>21.2</td>
<td>14.5</td>
<td>-6.7</td>
<td>293</td>
<td>60,800</td>
<td>44,420</td>
<td>105,220</td>
</tr>
<tr>
<td>Little White Salmon (WA)</td>
<td>158.7</td>
<td>21.2</td>
<td>13.3</td>
<td>-7.9</td>
<td>248*</td>
<td>1,097,000</td>
<td>11,661</td>
<td>1,108,661</td>
</tr>
<tr>
<td>White Salmon River (WA)</td>
<td>164.9</td>
<td>21.2</td>
<td>15.7</td>
<td>-5.5</td>
<td>715*</td>
<td>72,000</td>
<td>81,529</td>
<td>153,529</td>
</tr>
<tr>
<td>Hood River (OR)</td>
<td>165.7</td>
<td>21.4</td>
<td>15.5</td>
<td>-5.9</td>
<td>374</td>
<td>28,000</td>
<td>0</td>
<td>28,000</td>
</tr>
<tr>
<td>Klickitat River (WA)</td>
<td>176.8</td>
<td>21.4</td>
<td>16.4</td>
<td>-5.0</td>
<td>851*</td>
<td>73,000</td>
<td>149,029</td>
<td>222,029</td>
</tr>
<tr>
<td>Deschutes River (OR)</td>
<td>200.8</td>
<td>21.4</td>
<td>19.2</td>
<td>-2.2</td>
<td>4772*</td>
<td>300,000</td>
<td>580,124</td>
<td>880,124</td>
</tr>
<tr>
<td>Umatilla River (OR)</td>
<td>284.7</td>
<td>20.9</td>
<td>20.8</td>
<td>-0.1</td>
<td>87*</td>
<td>0</td>
<td>10,473</td>
<td>10,473</td>
</tr>
</tbody>
</table>
Cowlitz River CWR

1.5 million m³
CWR volume
Herman Creek/Cove CWR

170,000 m³ CWR volume
Little White Salmon River/Drano Lake
CWR

1.1 million m³
CWR volume
Deschutes River CWR

880,000 m³ CWR volume
Bonneville Dam Temperatures and Fish Passage

Adult Salmon & Steelhead Passage at Bonneville Dam
June - September 2007-2016 Average

Number of Fish/Day

Date

Temp deg. C

Refuge use

Fall Chinook  Steelhead  Sockeye  Summer Chinook  Temperature
Fish use of CWR

- 18-19°C threshold for CWR use
- 70-80% steelhead use CWR when temps are 21-22°C

Source - Keefer et. al. 2009

- 21°C threshold for CWR use
- 15-30% use CWR with 21-22°C
- Underestimate – no plume use

Source - Goniea et. al. 2006
Steelhead use of CWR
Columbia River between Bonneville Dam and The Dalles Dam

Steelhead 14-156; tagged 8-26-2002

26 Aug 30 Aug 3 Sep 7 Sep 11 Sep 15 Sep 19 Sep 23 Sep 27 Sep 1 Oct

Temperature (C)

Fish 30-minute
BON daily mean
ICH daily mean

Little White Salmon
White Salmon

Start
LWD
Dalles
John Day
McNary
Goose
IceH
LoMo
Lyons

Bonneville

The Dalles

University of Idaho
College of Natural Resources
Fall Chinook use of CWR example
Accumulation of Steelhead in Bonneville Reservoir Reach

Average Number of Steelhead in Bonneville Reach (2007 - 2016)

60,000 – 70,000 Steelhead in CWR
Fall Chinook CWR Use in Bonneville Reach

Average Temps in early Sept (20-21C)

Warm Temps early Sept (22C)
Steelhead Dam Passage - Current vs 1950s/60s

Current 2007-2016 average

Decade after The Dalles Dam was Built 1957-1966 average

- **Steelhead CWR use appears to be an adaptation to warmer Columbia River temperatures**
- Current temperatures are about 2°C warmer than the 1950s
  - 10 days above 20°C and 0 days above 21°C in an average year (1950s)
  - 57 days above 20°C and 27 days above 21°C in an average year (Current)
Future Lower Columbia River Temperatures (Aug mean)

Assumes a continuation of the 0.3°C/decade trend (since 1960)
Are there sufficient CWRs to Meet Oregon’s CWR standard?

- Evaluated based on current conditions
- Draft Plan stated maintaining CWR volumes in the 12 primary CWRs appears to be sufficient to meet Oregon’s CWR standard
- Based on additional analysis on CWR distribution and public comment, Final Plan likely to say a cooler Umatilla River is also needed to provide dependable CWR in an important location
- EPA also recommends restoring other tributaries to increase CWR and potentially ‘creating CWR’ in light of predicted continued Columbia River warming
- Important to recognize that OR CWR standard is not intended to allow for or compensate for a warmer Columbia River

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (Historic)</td>
<td></td>
</tr>
<tr>
<td>21.5 (Current)</td>
<td></td>
</tr>
<tr>
<td>22.5 (2040)</td>
<td></td>
</tr>
</tbody>
</table>

Depends on Columbia River Temperature (Aug Mean)
CWR Targets in Columbia River Temperature TMDL

Table 6-21  Temperature targets for 12 CWR in the lower Columbia River

<table>
<thead>
<tr>
<th>Tributary Name</th>
<th>RM</th>
<th>Tributary Temperature Maximum Target*8</th>
<th>TMDL</th>
<th>TMDL Target (°C)</th>
<th>Water Quality Standard (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>August Mean °C 5-Year Average</td>
<td></td>
<td>7-Day Average of the Daily Maximum</td>
<td>7-Day Average of the Daily Maximum</td>
</tr>
<tr>
<td>Cowlitz River</td>
<td>65.2</td>
<td>16.0</td>
<td>No</td>
<td>-</td>
<td>17.5</td>
</tr>
<tr>
<td>Lewis River</td>
<td>84.4</td>
<td>16.6</td>
<td>No</td>
<td>-</td>
<td>17.5</td>
</tr>
<tr>
<td>Sandy River</td>
<td>117.1</td>
<td>18.8</td>
<td>Yes</td>
<td>18.3</td>
<td>18</td>
</tr>
<tr>
<td>Tanner Creek</td>
<td>140.9</td>
<td>11.7</td>
<td>No</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Eagle Creek</td>
<td>142.7</td>
<td>15.1</td>
<td>No</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Herman Creek</td>
<td>147.5</td>
<td>12.0</td>
<td>No</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Wind River</td>
<td>151.1</td>
<td>14.5</td>
<td>Yes</td>
<td>16.3</td>
<td>16</td>
</tr>
<tr>
<td>Little White Salmon River</td>
<td>158.7</td>
<td>13.3</td>
<td>No</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>White Salmon River</td>
<td>164.9</td>
<td>15.7</td>
<td>No</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Hood River</td>
<td>165.7</td>
<td>15.5</td>
<td>Yes</td>
<td>16.3</td>
<td>16</td>
</tr>
<tr>
<td>Klickitat River</td>
<td>176.8</td>
<td>16.4</td>
<td>No</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Deschutes River</td>
<td>200.8</td>
<td>19.2</td>
<td>No</td>
<td>-</td>
<td>18</td>
</tr>
</tbody>
</table>

As described in EPA’s draft CWR plan, the effectiveness of a CWR depends on water temperature relative to the mainstem, size (volume and flow), and accessibility of the area to migrating salmon and steelhead.
Actions to Protect and Restore CWRs (Chapter 7 in CWR Plan)

14 Tributary Assessment ‘Snapshots”

Factors affecting temperature

Water Withdrawals

Climate Change

Riparian and Channel Conditions

Dams and Hydromodifications
1. Protect CWRs Through Existing Regulatory Programs

- Federal Forest plans
- State forest practices
- Columbia River Gorge Management Plan
- County Shoreline Master Plans/land use regulations
- Wild and Scenic River Plans
- State limits on new water withdraws/in-stream flow rules
- FERC flow requirements for Dams
- State water quality standard limits on new thermal discharges

Cowlitz Watershed
2. Restoration Actions within CWR Watersheds

- Salmon Recovery Plans and implementation actions
- Temperature TMDLs and Plans
- Watershed Resource Plans
- Restore stream vegetation, channel complexity, floodplain function and summer flows in target reaches
- Projects generally supported with public funds (BPA, salmon recovery, clean water, agricultural conservation)
- Counteract predicted increased temps from climate change
2 Cont. Restore Umatilla River consistent with Oregon Temperature TMDL

Umatilla River

Umatilla Basin TMDL

Umatilla Basin Project “Phase 3” potential to increase flows and lower temperatures in the Lower Umatilla River and increase CWR
3. Manage Dams to Release Cool Summer Flows

- Cowlitz River (Mayfield Dam)
- Lewis River (Merwin Dam)
- Sandy River (Bull Run Dam/Reservoir)
- Deschutes River (Pelton Round Butte Project)
- Recognize multi-objectives/current operations
4. Restore Confluence Areas and “Create” CWR

- Sediment removal feasibility studies
- CWR enhancements
- Create CWR in John Day Reservoir with groundwater??

Oneonta Creek Confluence (LCEP)

Wind River

Herman Creek Cove
Assess Fishing Regulations in CWR

- ODFW and WDFW fishing regulations
- Tribal fisheries
- Consider fishing restrictions during warm conditions
- Minimize incidental take of wild fish

Drano Lake

Lower Deschutes River
Additional Studies (Chapter 8)

- Install Pit-tag detector arrays in CWR
- Temperature and flow monitoring in CWR Tributaries
- Additional studies on CWR use
  - Assess changed conditions from studies 20 years ago
  - Assess below Bonneville Dam
  - Determine differences in survival rates from CWR use
  - Assess mortality/effects from warm Columbia River temperatures