June 9, 2020

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

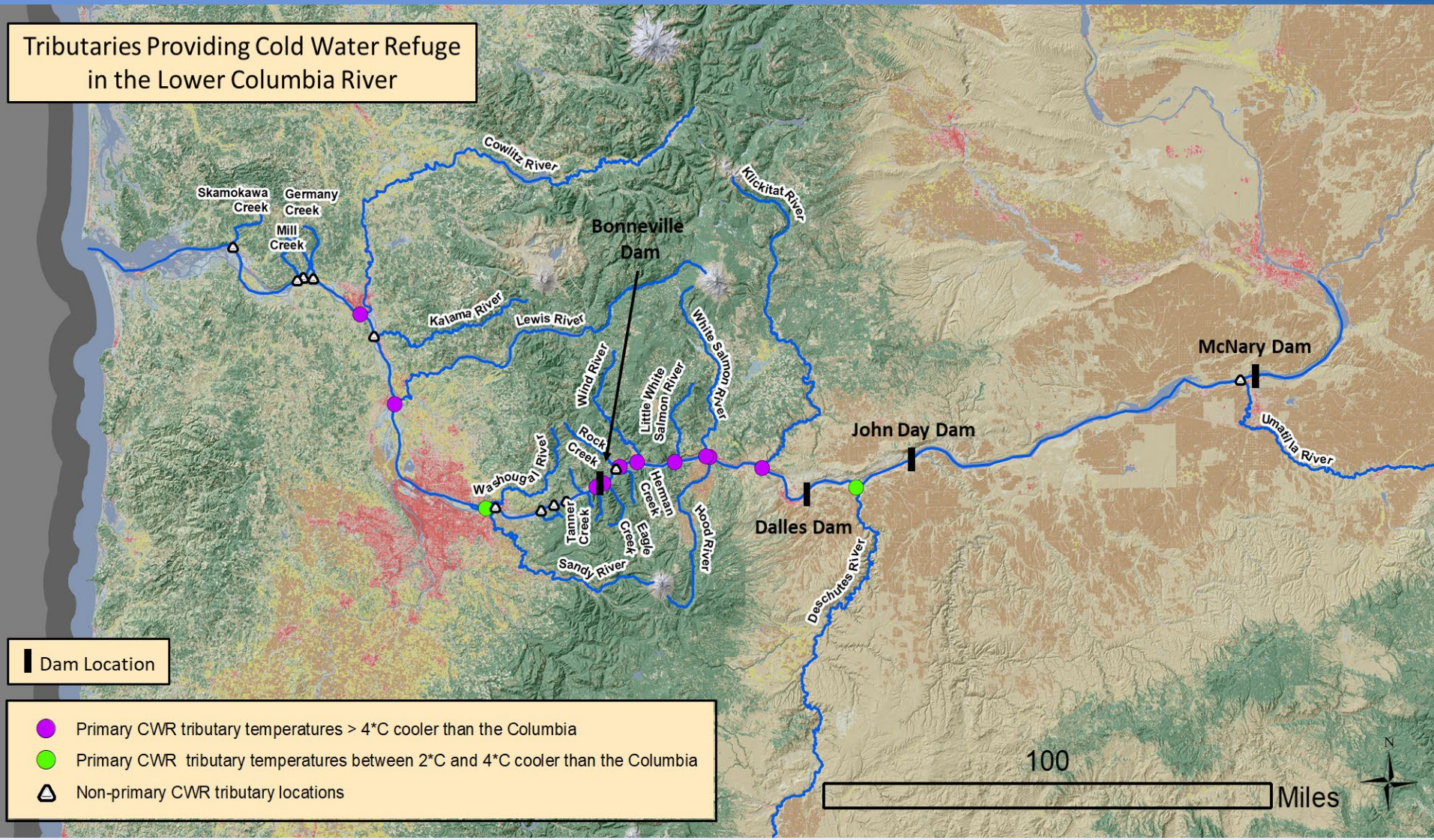
1. Map and quantify the CWR areas in the Lower Columbia River

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

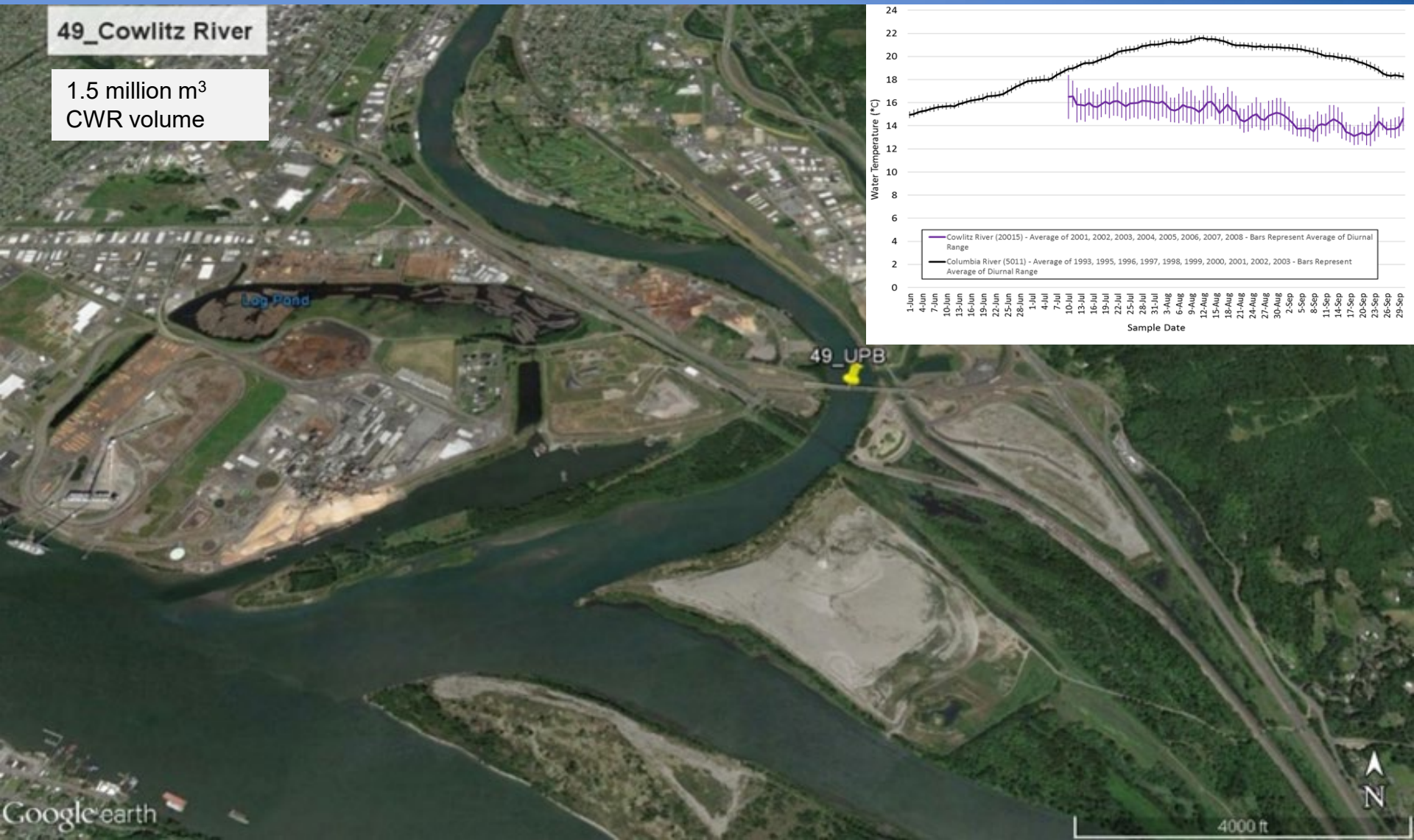
12 Primary CWR in Lower Columbia River (23 Total CWR)



Lower Columbia River CWR
(12 Primary - color highlighted/23 Total)

Tributary Name	River Mile	August Mean Mainstem Temperature (DART)	August Mean Tributary Temperature (NorWeST)	August Mean Temperature Difference	August Mean Tributary Flow (NHD & USGS*)	Plume CWR Volume (> 2°C Δ)	Stream CWR Volume (> 2°C Δ)	Total CWR Volume (> 2°C Δ)
		°C	°C	°C	cfs	m^3	m^3	m^3
Skamokawa Creek (WA)	30.9	21.3	16.2	-5.1	23	450	1,033	1,483
Mill Creek (WA)	51.3	21.3	14.5	-6.8	10	110	446	556
Abernethy Creek (WA)	51.7	21.3	15.7	-5.6	10	81	806	887
Germany Creek (WA)	53.6	21.3	15.4	-5.9	8	72	446	518
Cowlitz River (WA)	65.2	21.3	16.0	-5.4	3634	870,000	684,230	1,554,230
Kalama River[2] (WA)	70.5	21.3	16.3	-5.0	314*	14,000	27,820	41,820
Lewis River (WA)	84.4	21.3	16.6	-4.8	1291*	120,000	493,455	613,455
Sandy River (OR)	117.1	21.3	18.8	-2.5	469	9,900	22,015	31,915
Washougal River[1] (WA)	117.6	21.3	19.2	-2.1	107*	740	32,563	33,303
Bridal Veil Creek (WA)	128.9	21.3	11.7	-9.6	7	120	0	120
Wahkeena Creek (WA)	131.7	21.3	13.6	-7.7	15	220	0	220
Oneonta Creek (OR)	134.3	21.3	13.1	-8.2	29	820	54	874
Tanner Creek (OR)	140.9	21.3	11.7	-9.6	38	1,300	413	1,713
Eagle Creek (OR)	142.7	21.2	15.1	-6.1	72	2,100	888	2,988
Rock Creek[1] (WA)	146.6	21.2	17.4	-3.8	47	530	1,178	1,708
Herman Creek (OR)	147.5	21.2	12.0	-9.2	45	168,000	1,698	169,698
Wind River (WA)	151.1	21.2	14.5	-6.7	293	60,800	44,420	105,220
Little White Salmon (WA)	158.7	21.2	13.3	-7.9	248*	1,097,000	11,661	1,108,661
White Salmon River (WA)	164.9	21.2	15.7	-5.5	715*	72,000	81,529	153,529
Hood River (OR)	165.7	21.4	15.5	-5.9	374	28,000	0	28,000
Klickitat River (WA)	176.8	21.4	16.4	-5.0	851*	73,000	149,029	222,029
Deschutes River (OR)	200.8	21.4	19.2	-2.2	4772*	300,000	580,124	880,124
Umatilla River[1] (OR)	284.7	20.9	20.8	-0.1	87*	0	10,473	10,473

Cowlitz River CWR



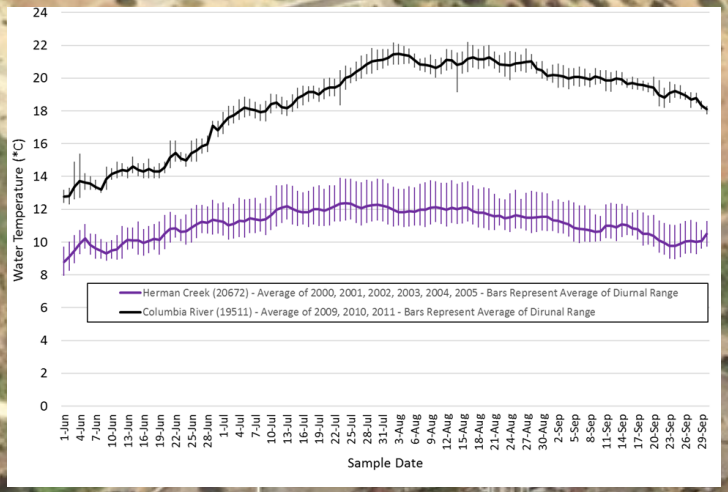
Herman Creek/Cove CWR

96_Herman Creek

170,000 m^3 CWR volume

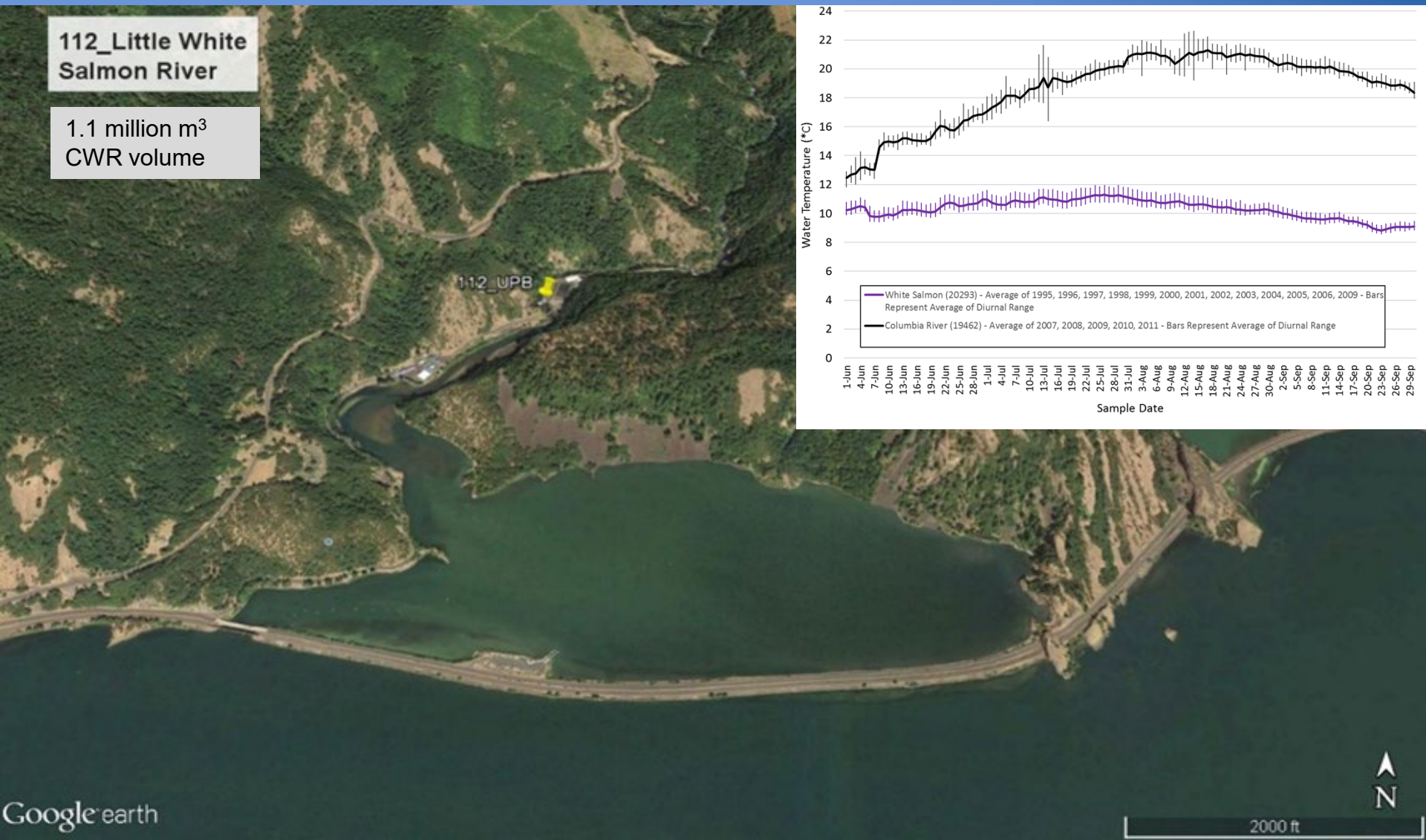
96_UPB_B

96_UPB_A



Google earth

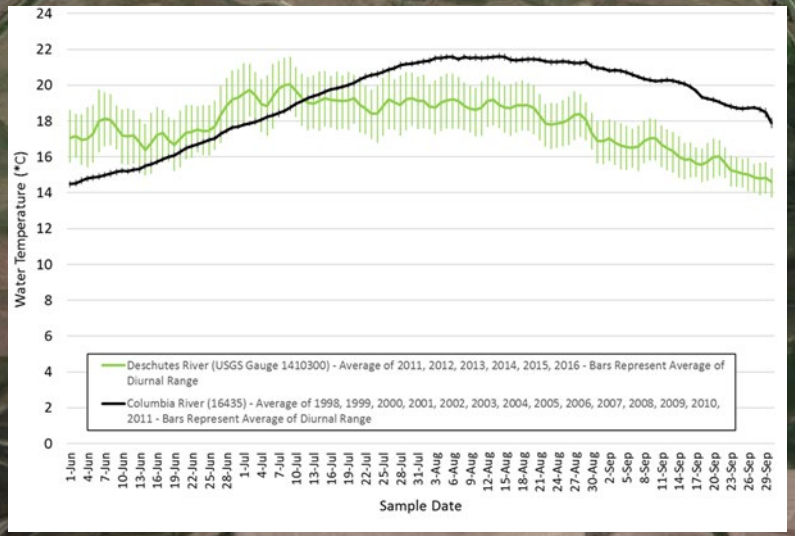
Little White Salmon River/Drano Lake CWR



Deschutes River CWR

135_Deschutes River

880,000 m^3 CWR volume



135_PIT

135_UPB

Google earth

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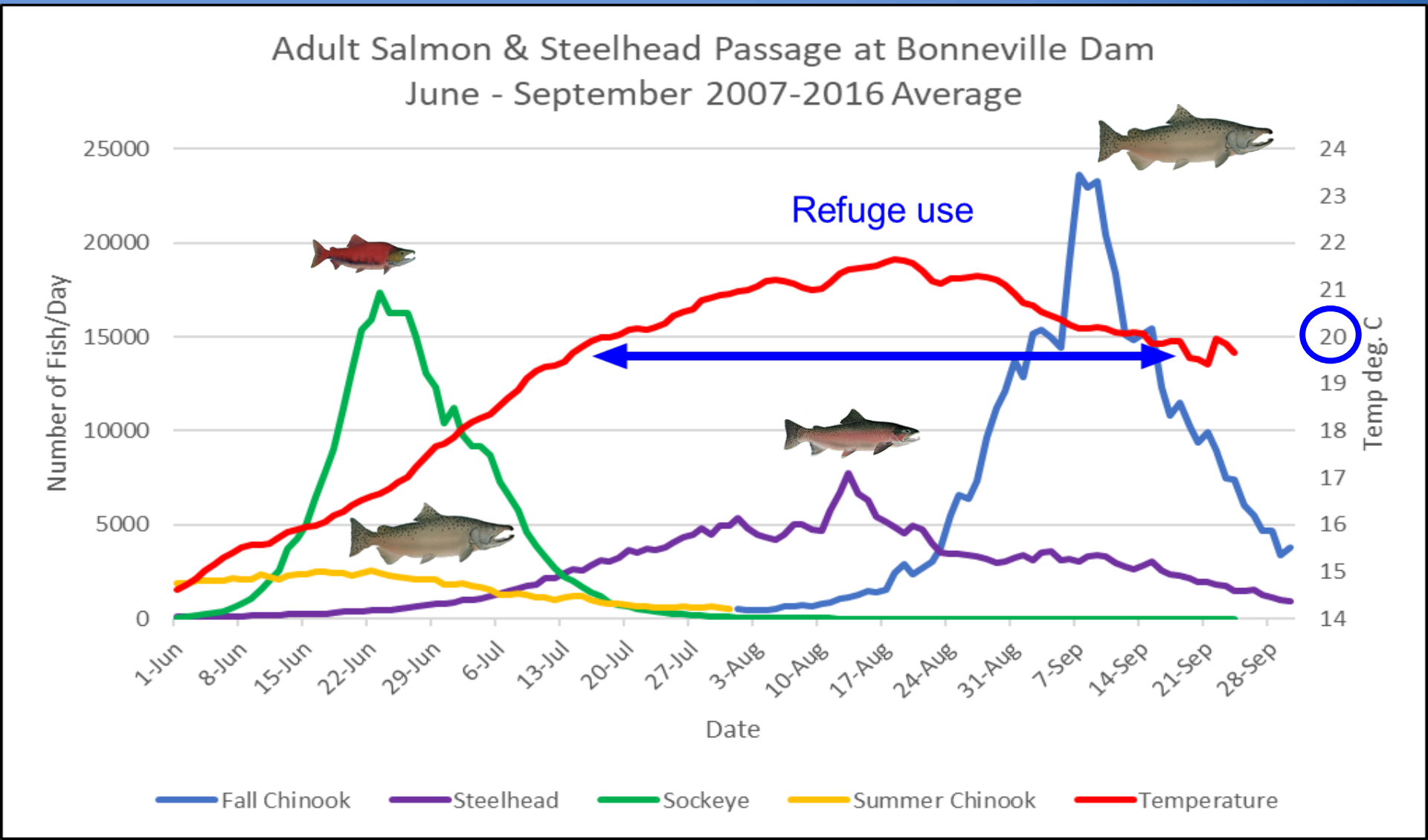
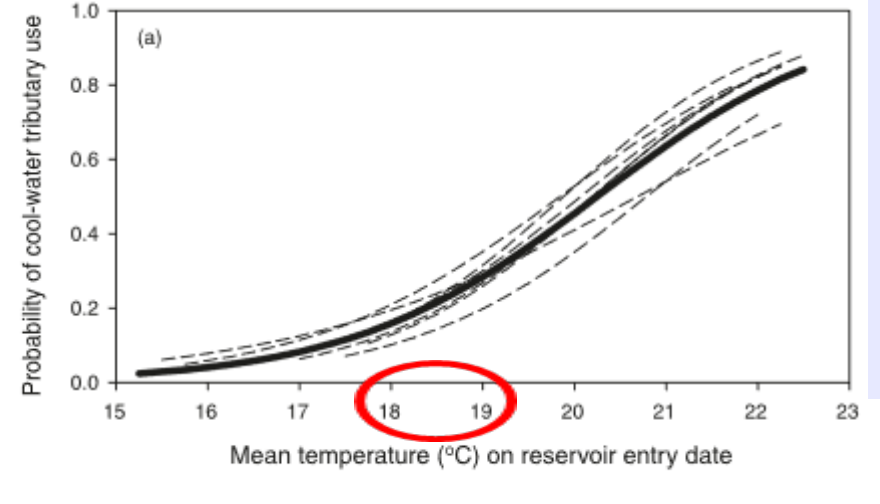
1 mi

Bonneville Dam Temperatures and Fish Passage



Fish use of CWR

Steelhead



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

Source - Keefer et. al. 2009

Fall Chinook

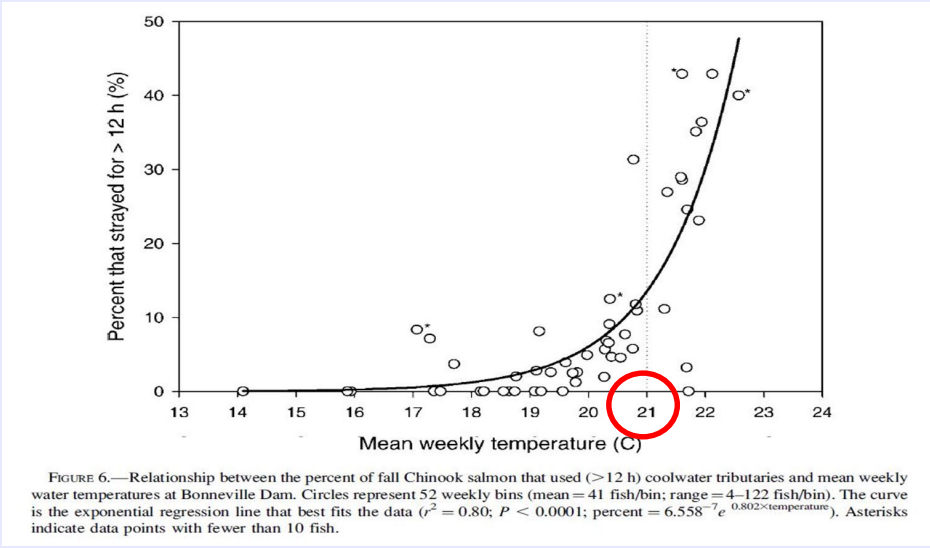


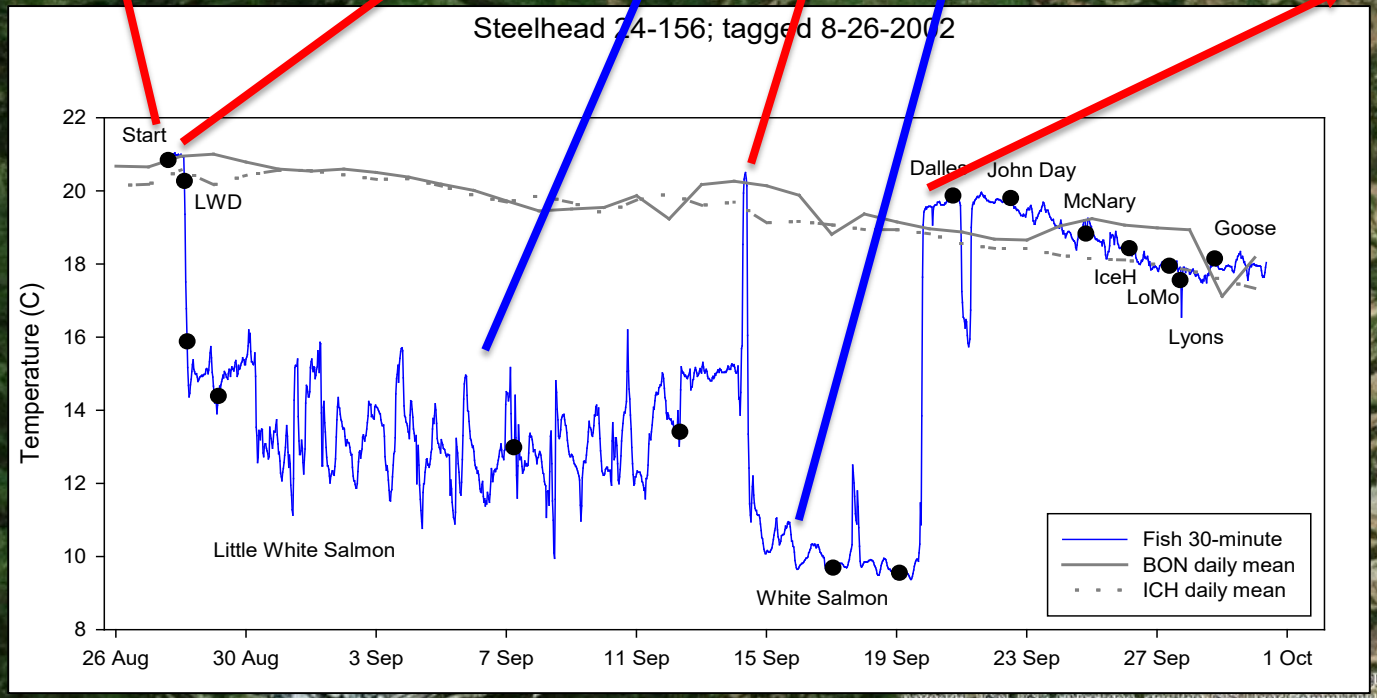
FIGURE 6.—Relationship between the percent of fall Chinook salmon that used (>12 h) coolwater tributaries and mean weekly water temperatures at Bonneville Dam. Circles represent 52 weekly bins (mean = 41 fish/bin; range = 4–122 fish/bin). The curve is the exponential regression line that best fits the data ($r^2 = 0.80$; $P < 0.0001$; percent = $6.558^{-7} e^{0.802 \times \text{temperature}}$). Asterisks indicate data points with fewer than 10 fish.

- 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



Bonneville

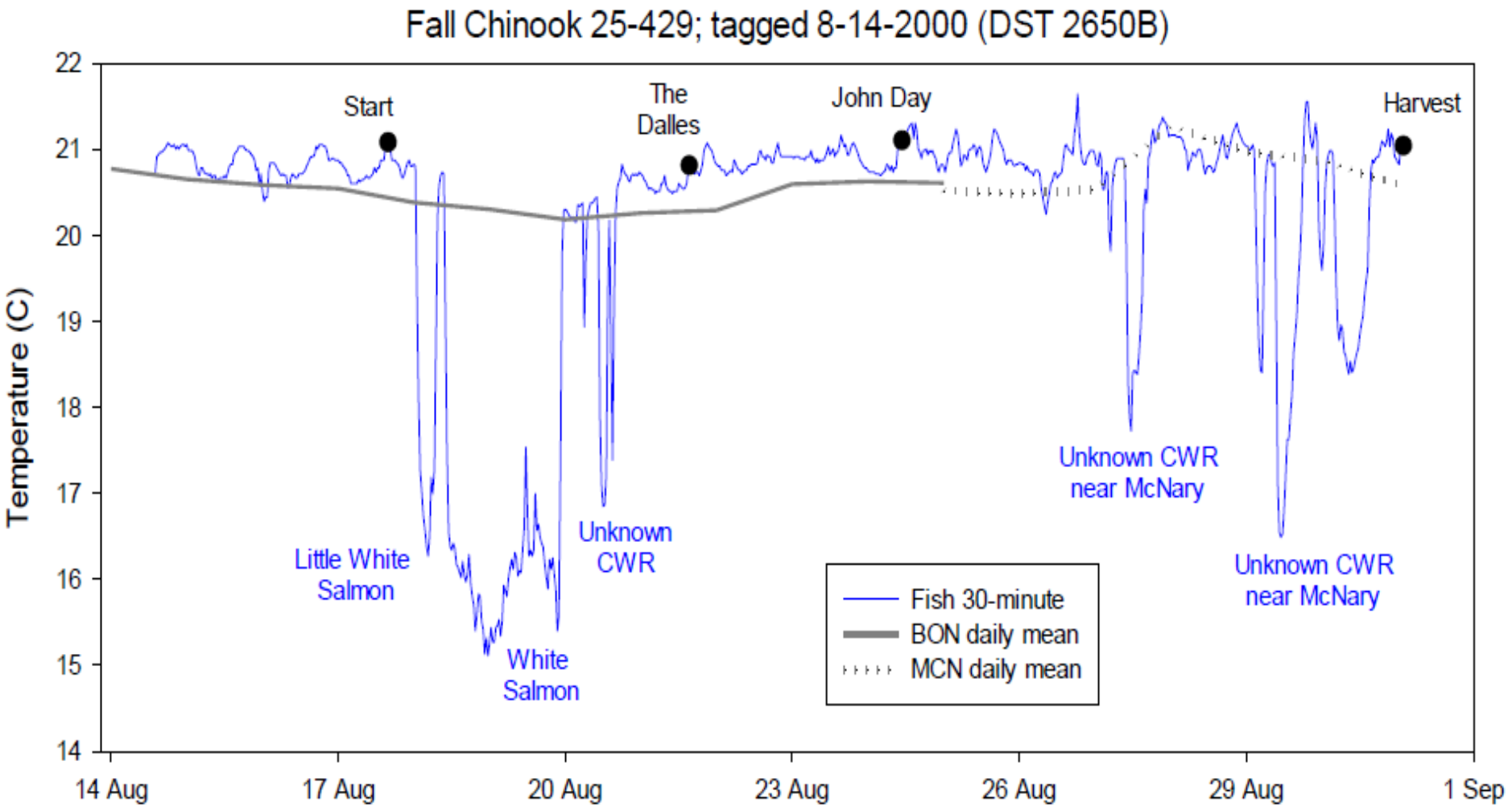
92 94 96 100 112 115 116 119 120 122 123 125 127 128 129

The Dalles

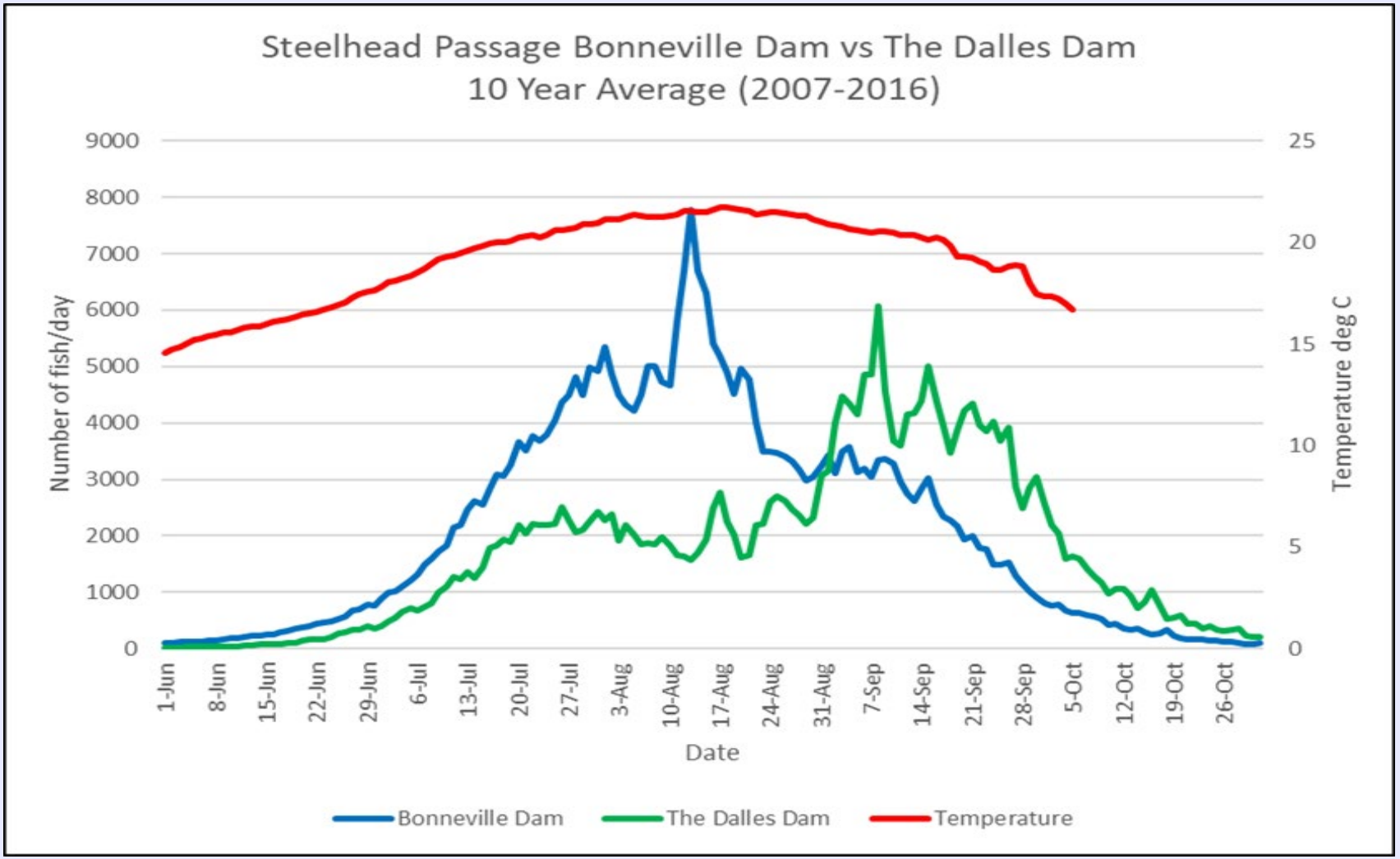
University of Idaho
College of Natural Resources

Fall Chinook use of CWR example

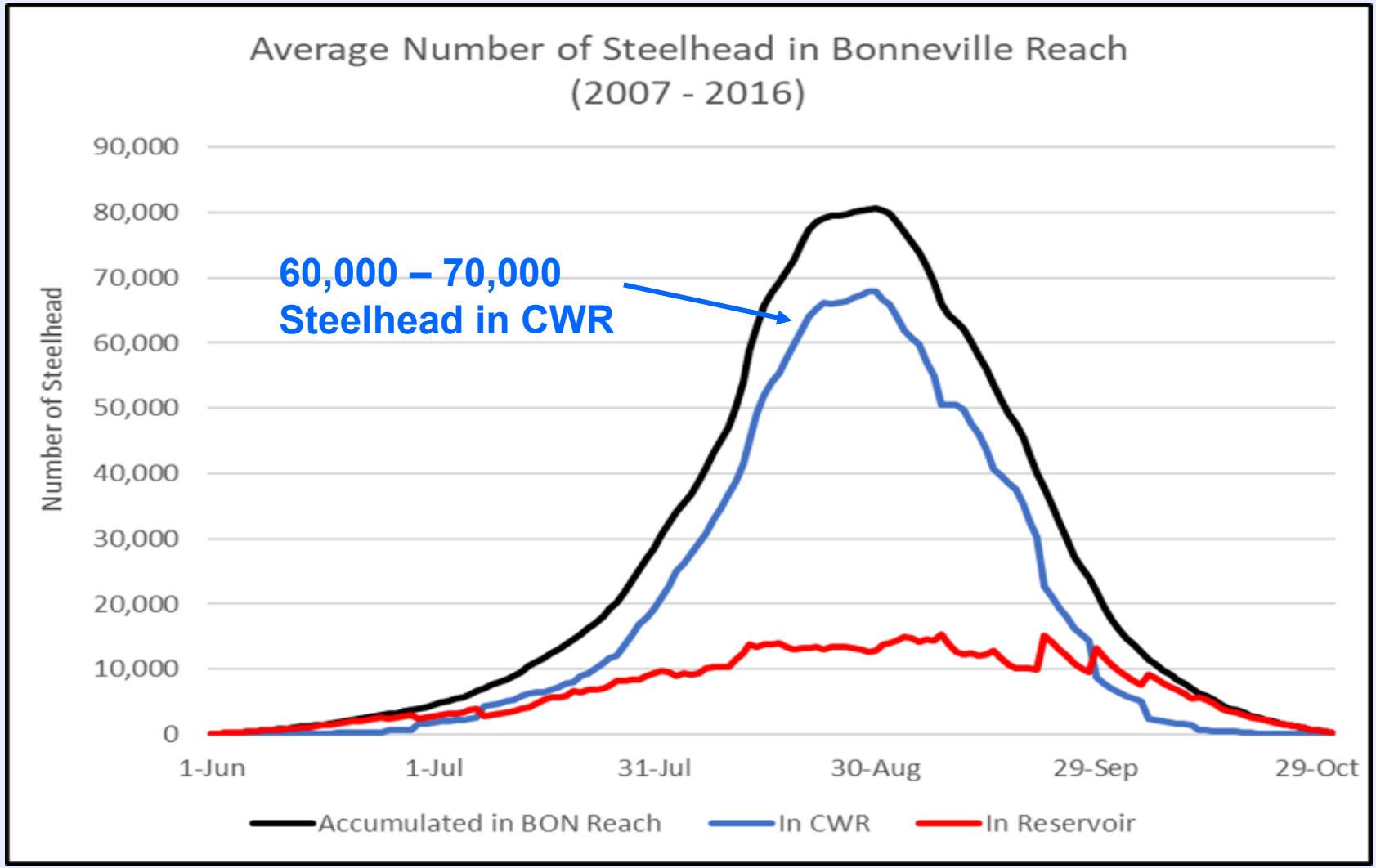
University of Idaho
College of Natural Resources



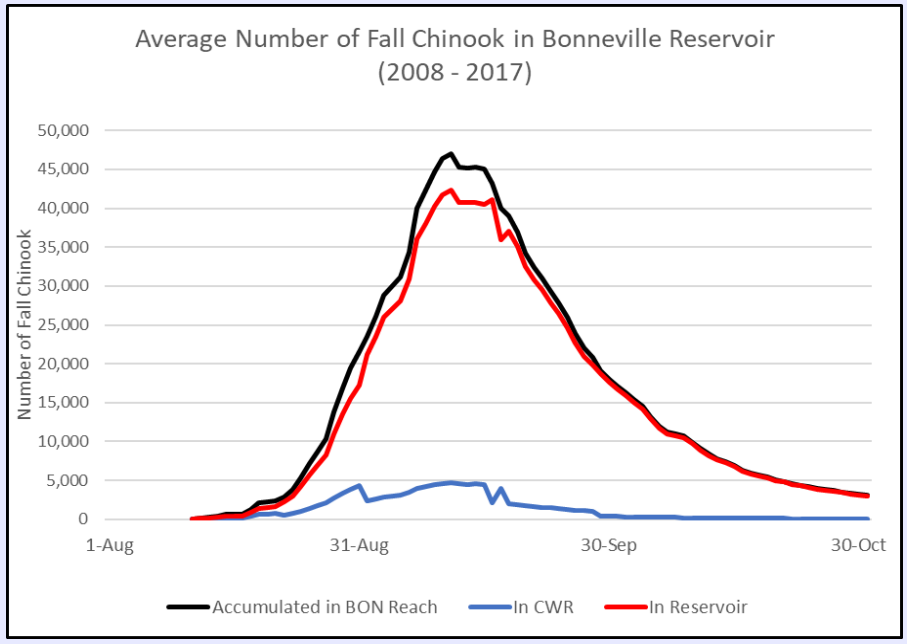
Bonneville Dam vs The Dalles Dam Steelhead Passage



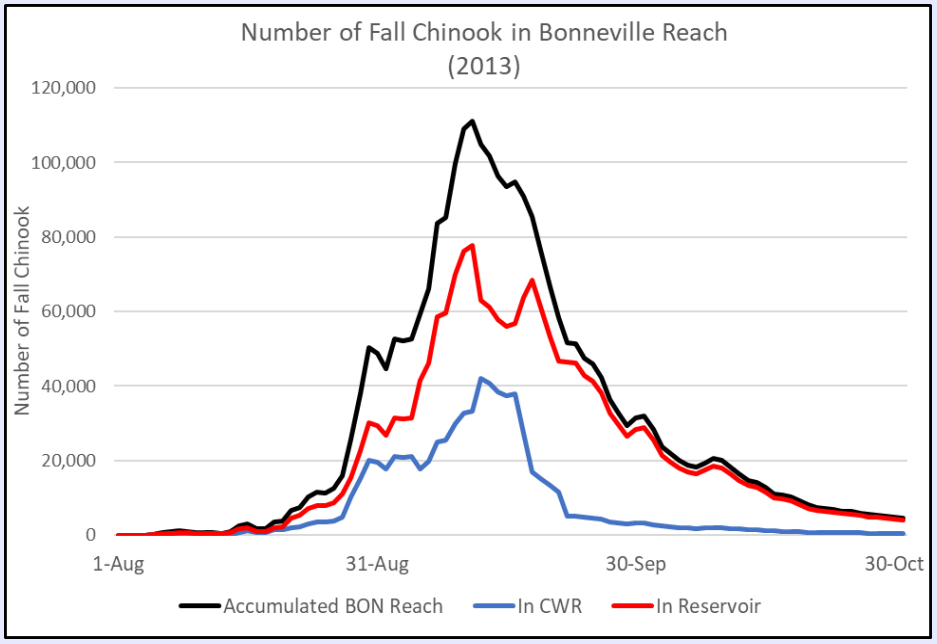
Accumulation of Steelhead in Bonneville Reservoir Reach



Fall Chinook CWR Use in Bonneville Reach



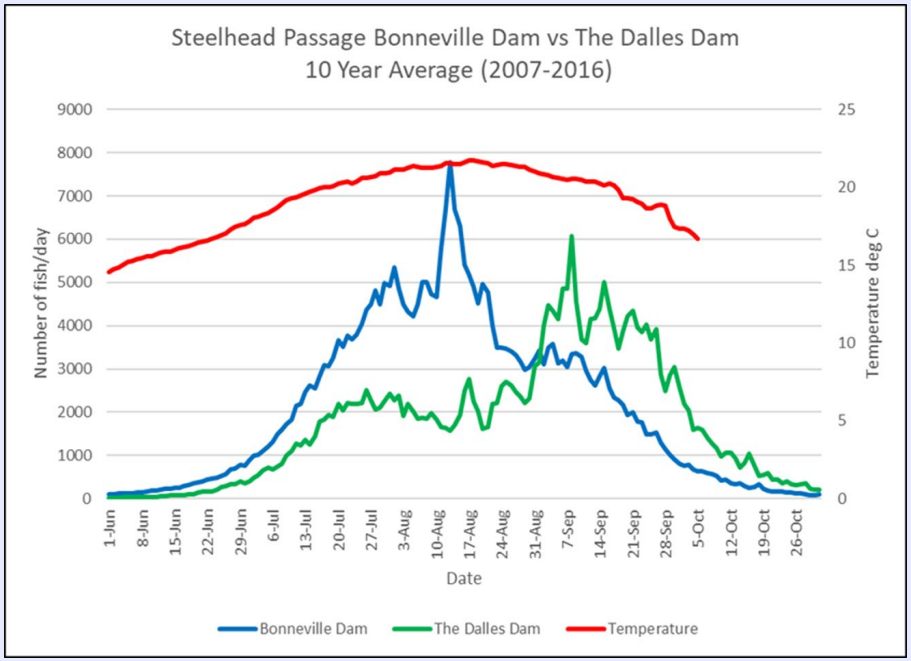
Average Temps in early Sept (20-21C)



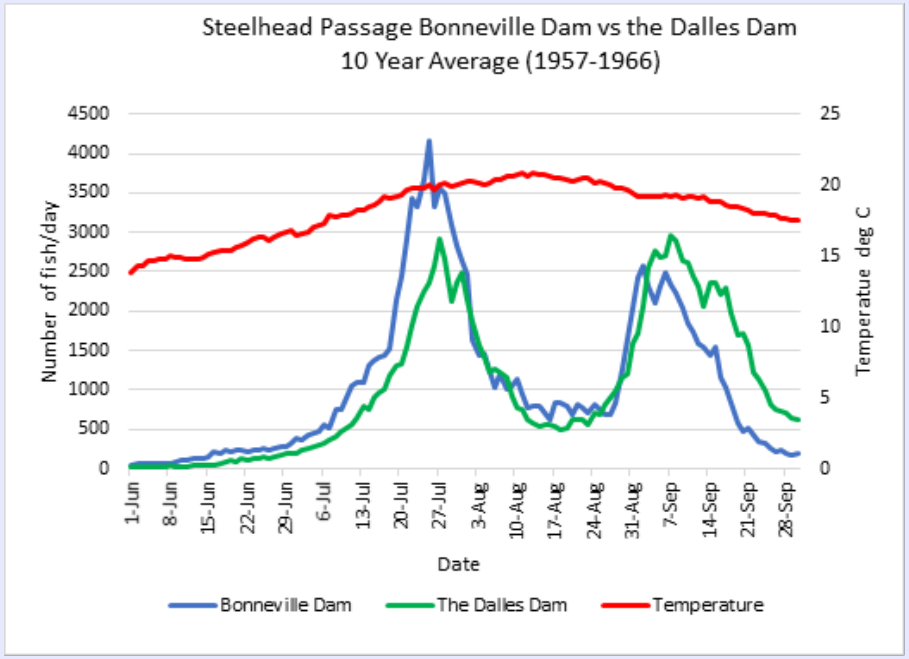
Warm Temps early Sept (22C)

Steelhead Dam Passage – Current vs 1950s/60s

Current 2007- 2016 average

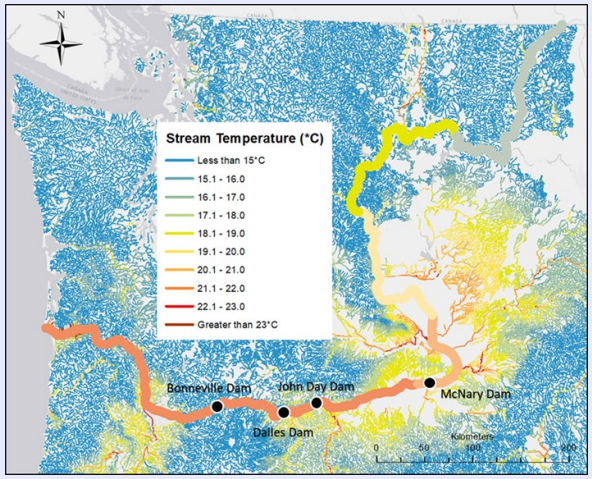


Decade after The Dalles Dam was Built 1957-1966 average

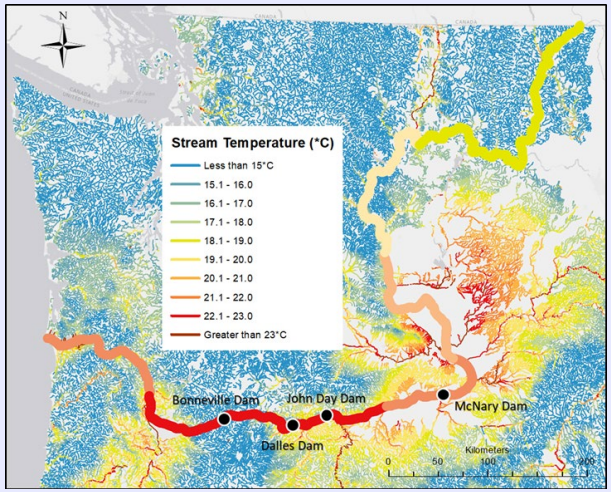


- ***Steelhead CWR use appears to be an adaptation to warmer Columbia River temperatures***
- Current temperatures are about 2°C warmer than the 1950s
  - 10 days above 20°C and 0 days above 21°C in an average year (1950s)
  - 57 days above 20°C and 27 days above 21°C in an average year (Current)

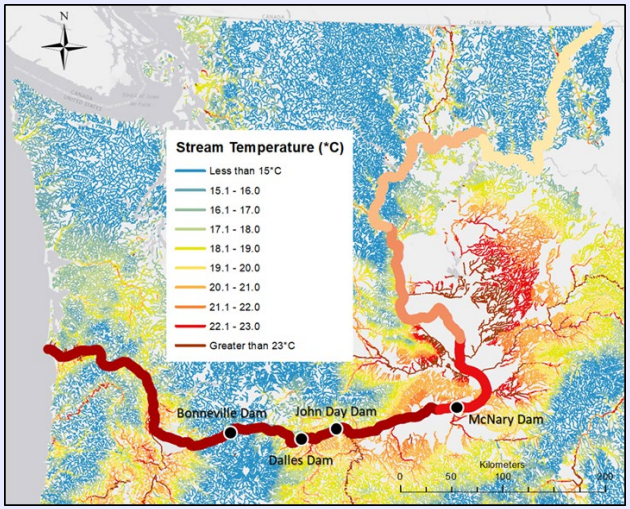
Future Lower Columbia River Temperatures (Aug mean)



Current



2040



2080

Assumes a continuation of the 0.3C/decade trend (since 1960)

Are there sufficient CWRs to Meet Oregon's CWR standard?

Depends on Columbia River Temperature
(Aug Mean)

20C (Historic)	21.5C (Current)	22.5C (2040)

- 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

CWR Targets in Columbia River Temperature TMDL

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

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

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

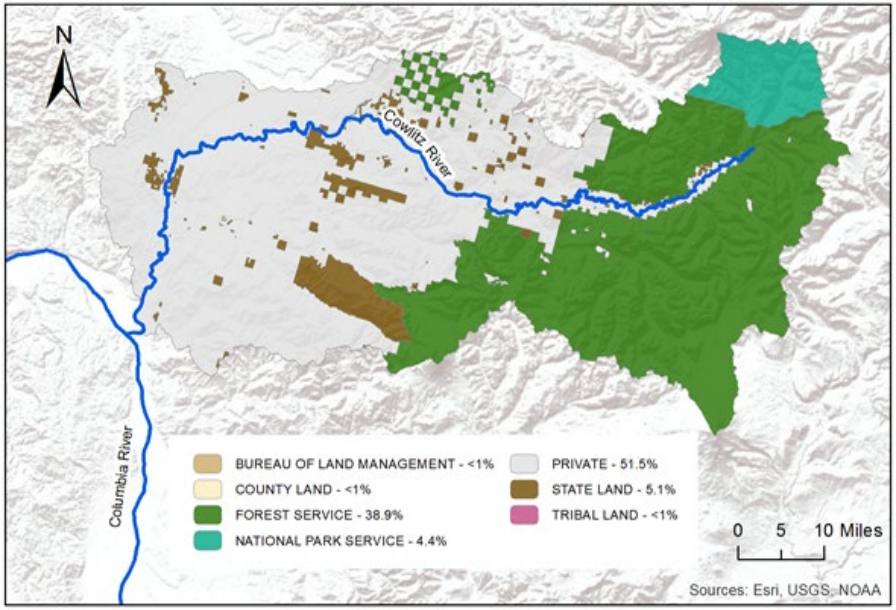
Climate Change

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

- NW Power Conservation Sub-basin Plans (2004)
- 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

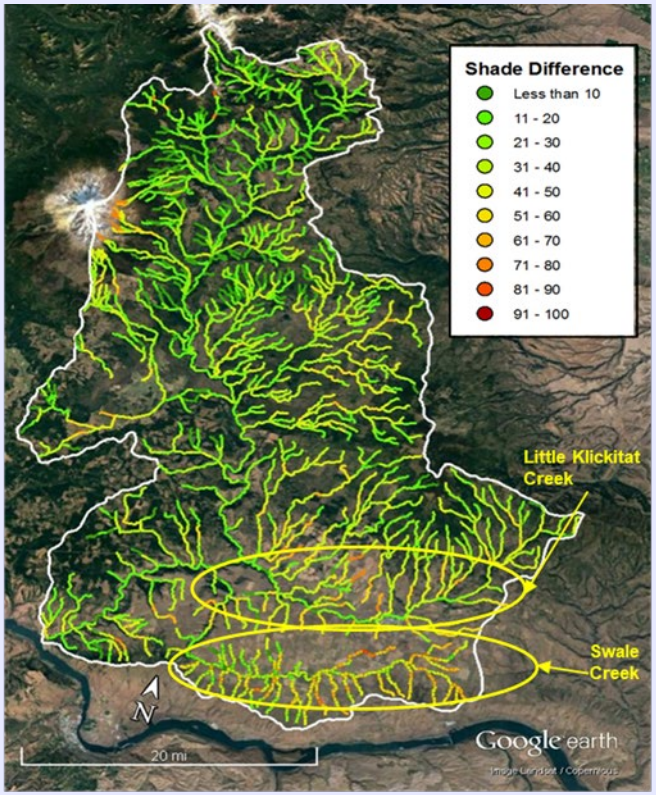
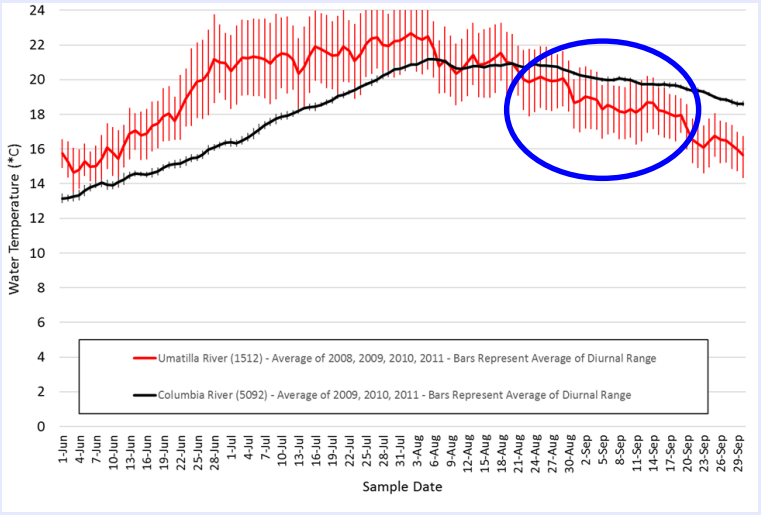


Fig. 5 Klickitat River Shade Difference between System Potential and Current Shade, Peter Leinenbach, 7/14/17

2 Cont. Restore Umatilla River consistent with Oregon Temperature TMDL

Umatilla River



Umatilla Basin TMDL

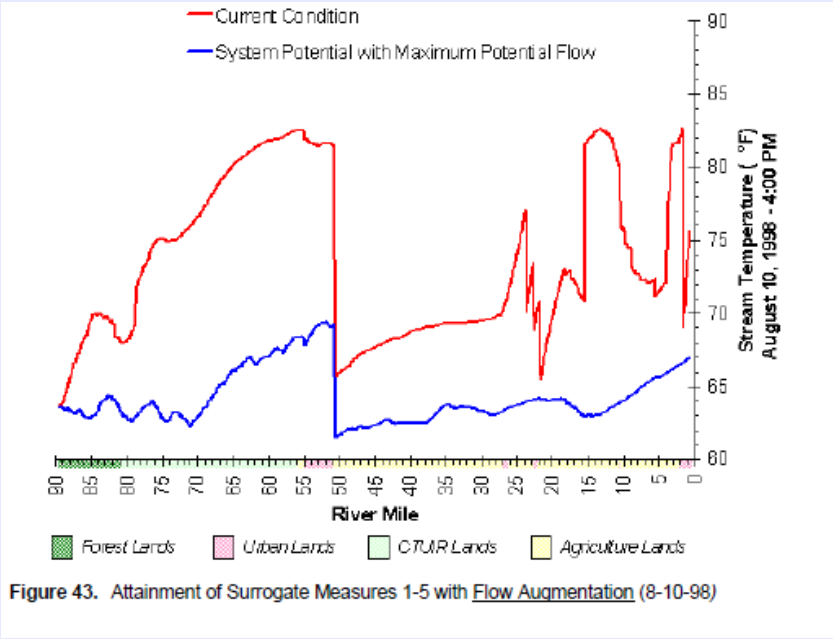
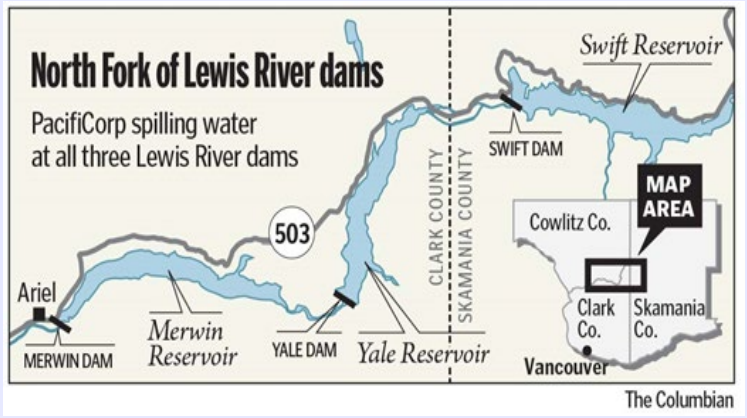


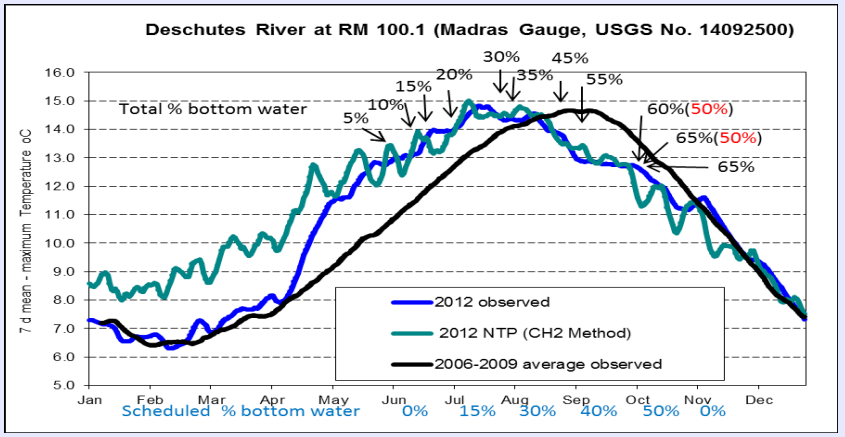
Figure 43. Attainment of Surrogate Measures 1-5 with Flow Augmentation (8-10-98)

Umatilla Basin Project "Phase 3" potential to increase flows and lower tempertures 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



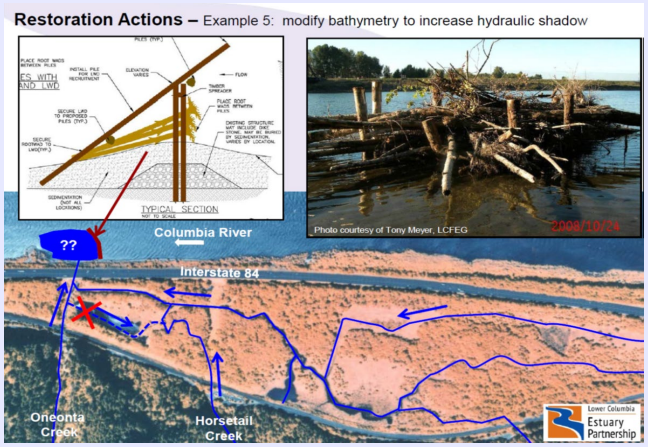


4. Restore Confluence Areas and "Create" CWR

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

Wind River

Oneonta Creek Confluence (LCEP)



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