

Richard Devlin
Chair
Oregon

Chuck Sams
Oregon

Mike Milburn
Montana

Doug Grob
Montana



Northwest Power and Conservation Council

Guy Norman
Vice Chair
Washington

Patrick Oshie
Washington

Jim Yost
Idaho

Jeffery C. Allen
Idaho

October 5, 2021

MEMORANDUM

TO: Committee Members

FROM: Leslie Bach

SUBJECT: EPA work efforts to address temperature in the Columbia and Lower Snake River: TMDL, Federal Dam NPDES Permits and Cold Water Refuges Plan

BACKGROUND:

Presenters: Mary Lou Soscia and John Palmer, U.S. Environmental Protection Agency

Summary: EPA staff will provide an update on ongoing efforts related to water temperatures in the mainstem Columbia River and lower Snake River. These efforts include both regulatory and management actions to protect and improve water temperatures for fish and other aquatic life. They will provide an overview of the recently released Columbia and Lower Snake River Temperature Total Maximum Daily Loads (TMDLs) and summarize information from the Columbia River Cold Water Refuges Plan. They will also discuss the National Pollutant Discharge Elimination System (NPDES) permits for the lower Columbia and lower Snake River dams.

Relevance: The Water Quality sub-strategy of the 2014 Fish and Wildlife Program calls for the federal and state agencies and tribes to "...implement water quality improvement measures to reduce water temperatures and TDG to meet state, EPA-approved tribal, and federal water quality standards to improve the health, condition, and survival of anadromous and native resident fish, as well as their related spawning and rearing habitat, in the Columbia Basin". It also calls for the federal action agencies to "...incorporate the provisions of various total maximum daily loads

(TMDLs) as they are developed and approved into the regional Water Quality Plan, particularly TMDL provisions containing allocations affecting federal hydropower projects in the Columbia River Basin”.

Actions related to cold-water habitat are identified in numerous locations in the 2014 Fish and Wildlife Program. 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”.

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. The TMDL examines sources of temperature impairments on the Columbia River, from the Canadian border to the Pacific Ocean, and on the lower Snake River in Washington, from its confluence with the Clearwater River at the Idaho border to its confluence with the Columbia River. It identifies the temperature reductions necessary to meet summer water quality standards in the rivers as well as the allowable “thermal loading capacity”. Temperature load allocations from the TMDL are included as conditions in the NPDES permits for the federal dams on the lower Columbia and Snake Rivers.

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 (CWRs). In the Lower Columbia River, these CWRs 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. The Columbia River Cold Water Refuges Plan focuses on the lower 325 miles of the Columbia River from the Snake River to the ocean. The plan describes the available CWRs in the Lower Columbia River and identifies actions to protect and restore CWRs.

More Info: [Columbia and Lower Snake Rivers TMDL](#)

[Federal Dam NPDES Permits](#)

[Columbia River Cold Water Refuges Plan](#)

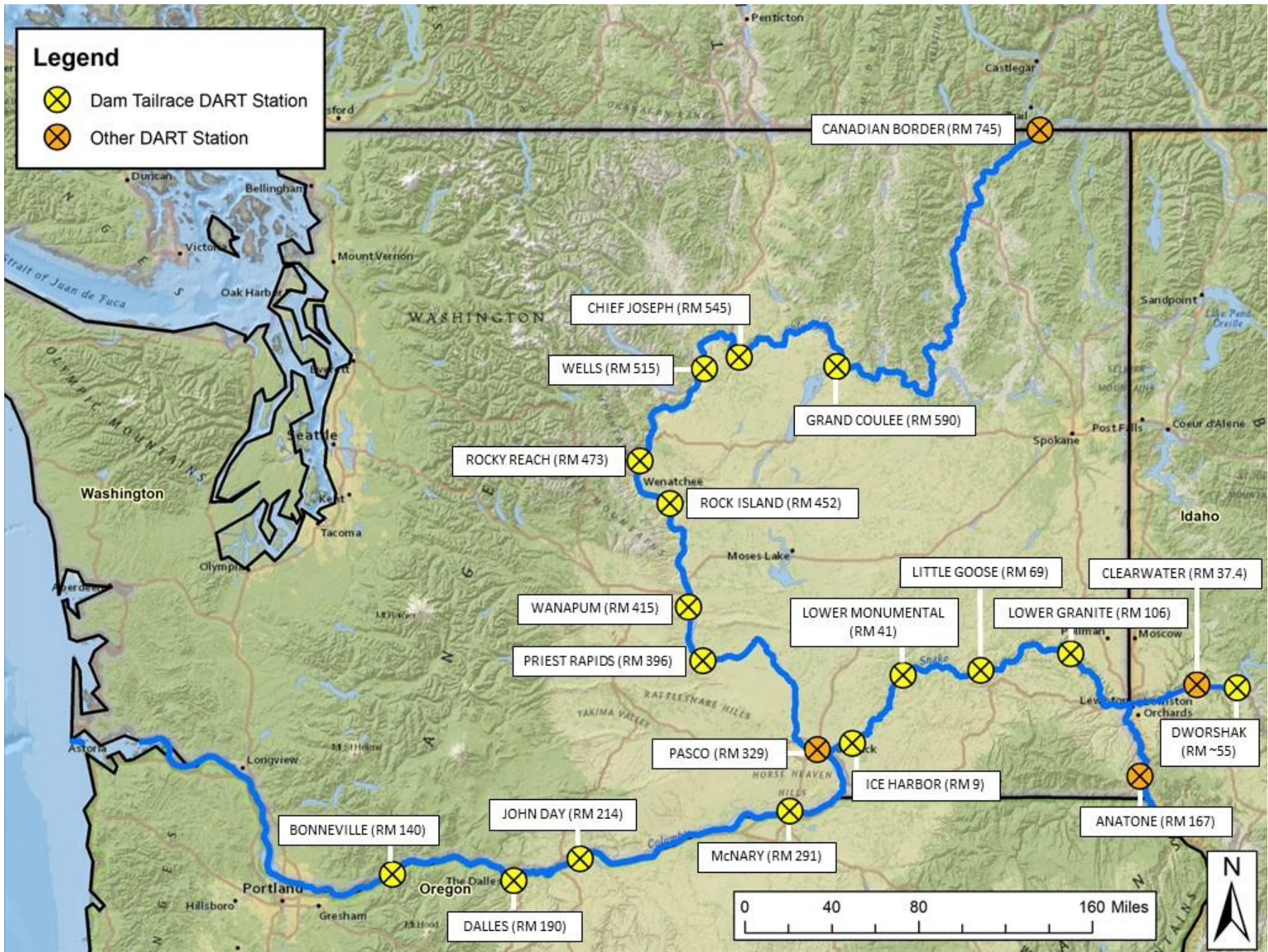
EPA Columbia and Lower Snake River
Temperature TMDL
Cold Water Refuge Plan
Federal Dam NPDES Permits



October 2021

Columbia/Lower Snake River Temperature TMDL

- EPA established the Columbia/Lower Snake River Temperature TMDL in May 2020 to address temperature impairments in portions of the Columbia and Lower Snake Rivers.
- After considering public comments (61 organizations and 1900 individuals), EPA reissued the TMDL on August 13, 2021 and transmitted it to the States of OR and WA for their implementation responsibility. EPA also shared the TMDL and related documents with the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians.
- The overall structure of the May 2020 EPA-established TMDL has not changed.
- This TMDL set allocations for 15 hydroelectric dams, 127 point sources (including cooling water discharges from the dams), and 23 tributaries.
- The next steps are for the states to develop plans to implement the TMDL.



Col-Snake River TMDL Geographic Scope & Model Domain

Executive Summary Points

- Temperature exceedances of water quality criteria (WQC) are widespread from June through October and are primarily due to the impacts of climate change and dam impoundments.
- Temperature reductions of approximately 3°C are necessary to meet the summer 20°C WQC within the lower Columbia River and the lower Snake River.
- Climate change has warmed summer Columbia and Snake River temperatures by about 1.5°C since 1960.
- Dam impoundments both cool and warm the Columbia and Snake River temperatures depending on time of year and location – warming greatest in late summer and fall.
- The allowable thermal loading capacity of the Columbia and lower Snake Rivers is limited to 0.3°C for all sources at all locations along the rivers.
- EPA has divided the 0.3°C allowable load capacity equally (0.1°C each) among non-point source discharges from dam impoundments, NPDES point sources, and major tributaries.
- The TMDL sets temperature, flow, and cold-water volume targets for 13 cold water refuge tributaries to attain the State of Oregon's cold-water refugia WQC.

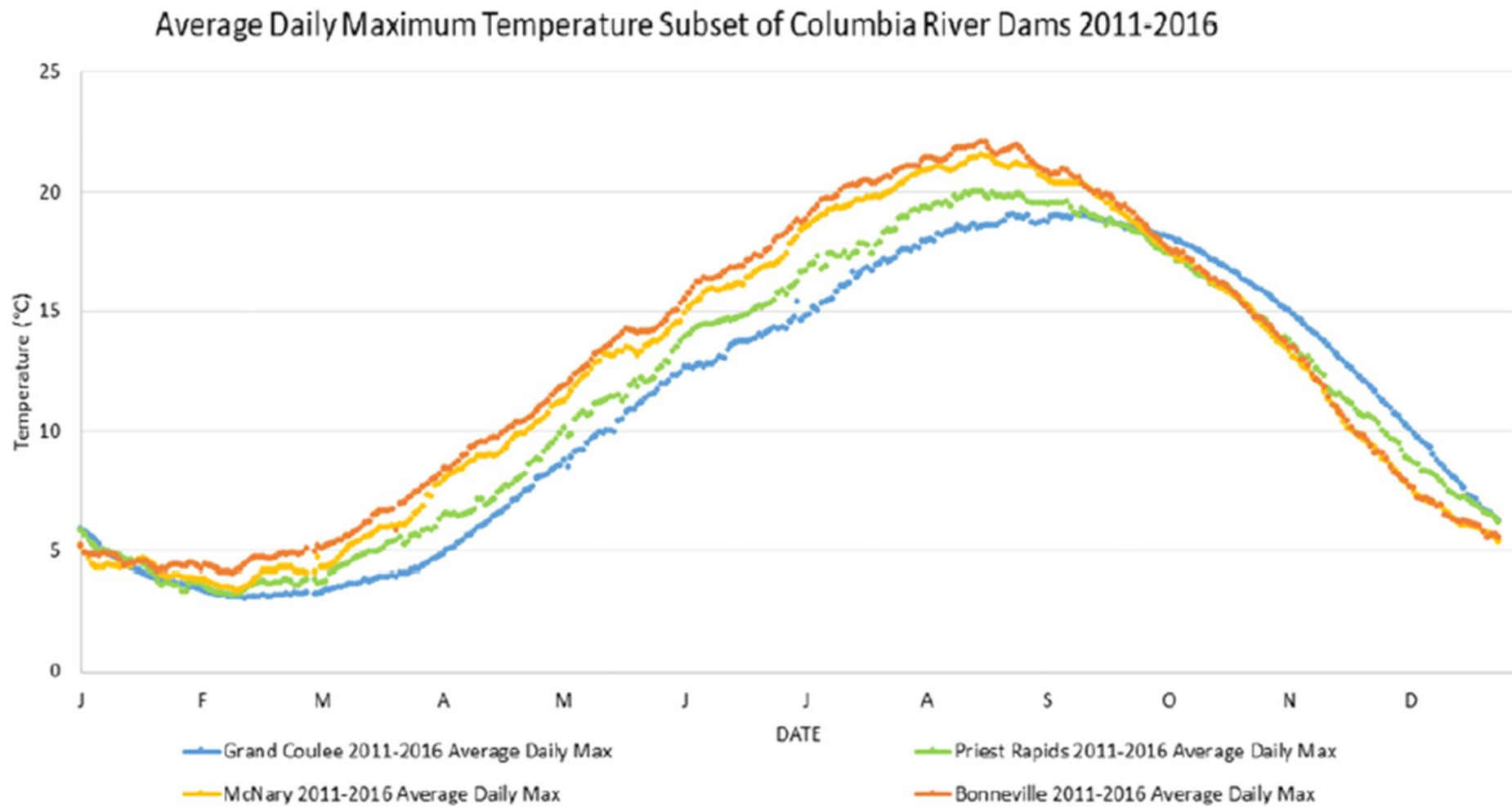


Figure 3-2 Columbia River warming as it flows downstream from Grand Coulee (blue) to Bonneville (orange)

Average Daily Maximum Temperature Lower Snake River Dams 2011-2016
(WA Criterion: 20°C 1-DMax)

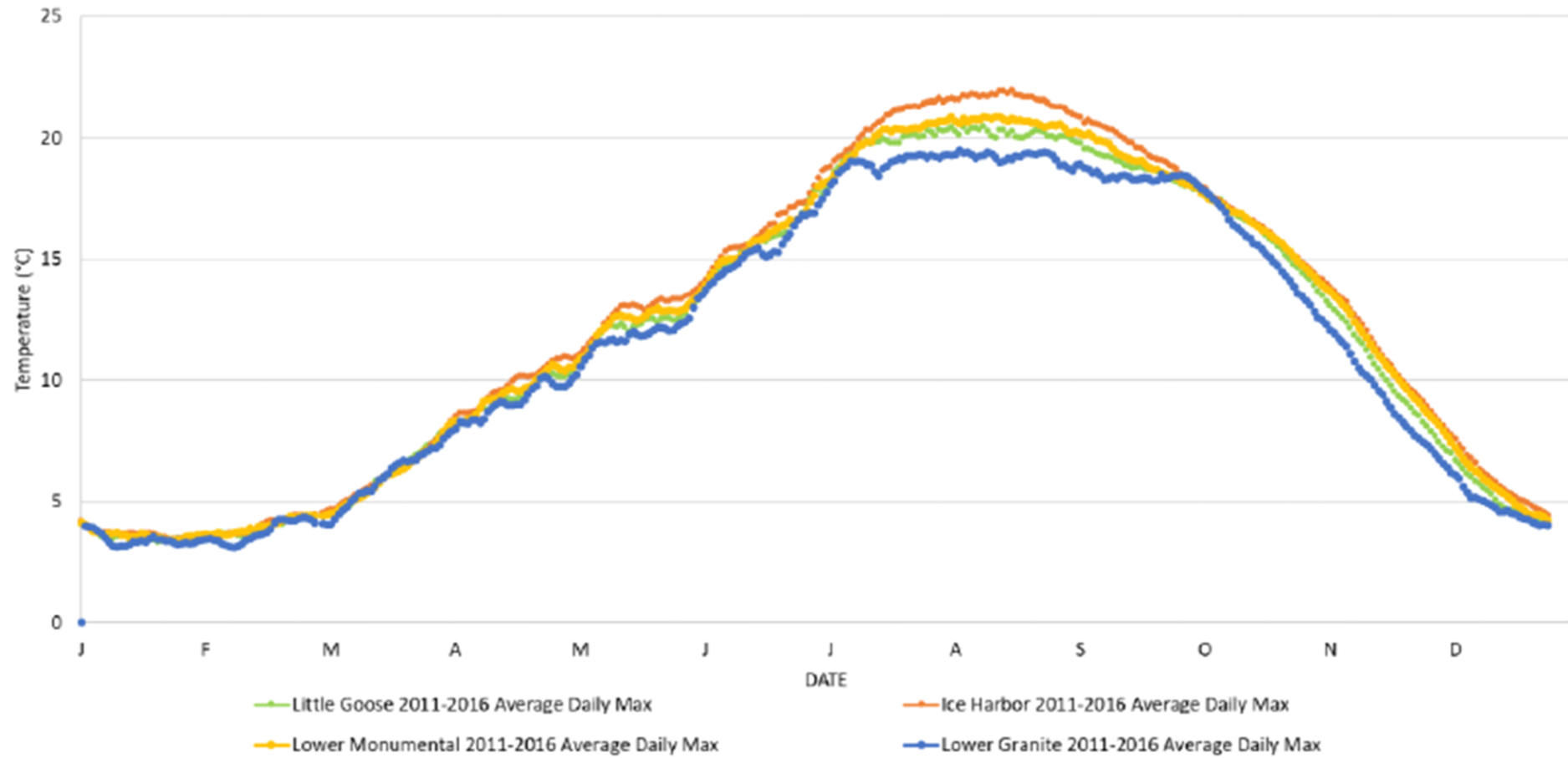


Figure 3-3 Snake River warming as it flows downstream from Lower Granite Dam (blue) to Ice Harbor Dam (orange)

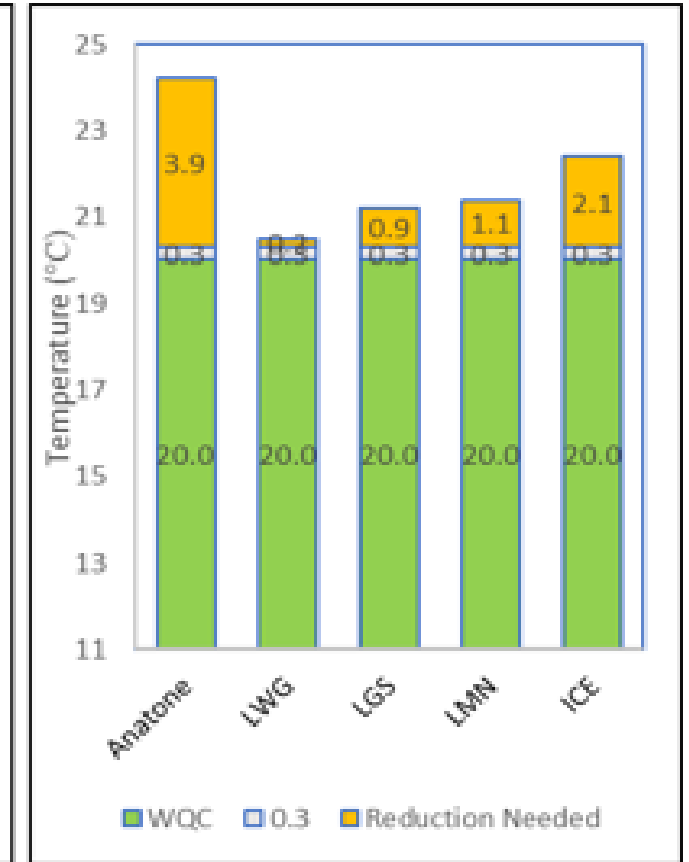
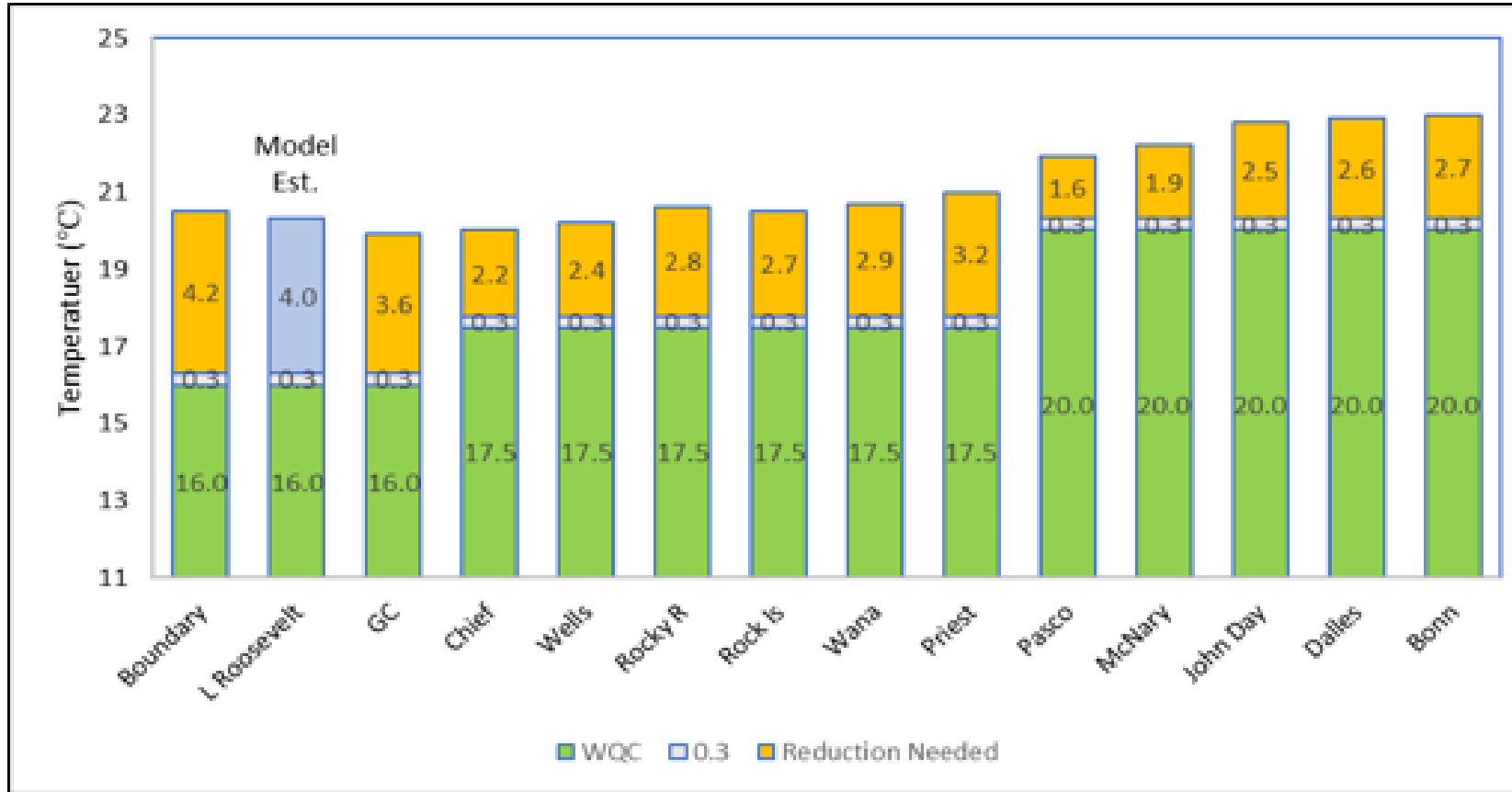


Figure 6-3 Comparing measured maximum monthly temperatures to the target temperatures – August



0.3°C Load Capacity

(Allowable temperature increment per the WQS)

Loading Capacity for human-caused sources is 0.3°C increase to the water quality standard.

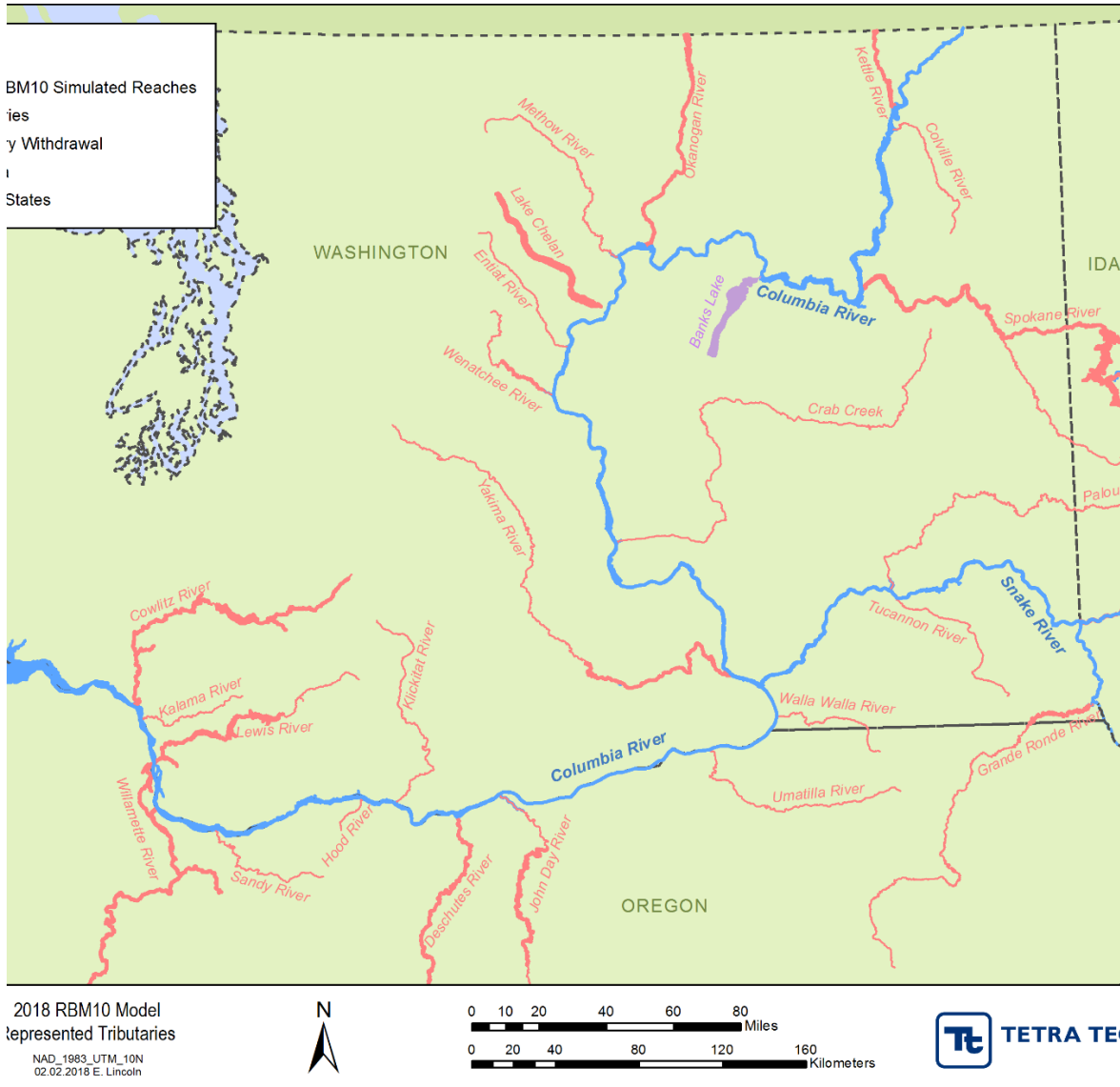
- 0.1°C to 127 NPDES permitted point sources
- 0.1°C to 23 tributaries
- 0.1°C to nonpoint source dam impacts (cumulative for all dams)

Table 6-8 Cumulative excess dam impact on Columbia and lower Snake Rivers temperatures – August

Location	Dam Number	RBM10 Current (°C)	RBM10 Free Flowing (°C)	RBM10 Reach Impact (Δ°C)	RBM10 Cumulative Impact (Δ°C)	Measured Target Exceedance (Δ°C)	Allocation Exceedance (Δ°C)	Notes
A	B	C	D	E	F	G	H	I
Columbia River								
Canadian Border	NA	17.77	17.78	NA	NA	4.2	NA	1
Lake Roosevelt	NA	18.31	18.13	0.2	0.2	4.0	0.1	2
Grand Coulee	1	18.11	18.29	-0.4	-0.2	3.6	None	6
Chief Joseph	2	18.20	18.39	0.0	-0.2	2.2	None	6
Wells	3	18.45	18.66	0.0	-0.2	2.4	None	6
Rocky Reach	4	18.87	18.83	0.2	0.0	2.8	None	6
Rock Island	5	18.98	18.86	0.1	0.1	2.7	None	4
Wanapum	6	19.40	19.05	0.2	0.3	2.9	0.2	2
Priest Rapids	7	19.62	19.15	0.1	0.5	3.2	0.4	2
Hanford Reach	NA	20.02	19.64	-0.1	0.4	1.6	0.3	2
Snake Confluence	NA	20.36	19.69	0.3	0.7	NA	NA	7
McNary	8	20.86	19.87	0.3	1.0	1.9	0.9	2
John Day	9	21.54	20.29	0.3	1.3	2.5	1.2	2
Dalles	10	21.50	20.32	-0.1	1.2	2.6	1.1	2
Bonneville	11	21.57	20.51	-0.1	1.1	2.7	1.0	2
Snake River								
Anatone	NA	22.50	22.50	NA	NA	3.8	NA	1
Clearwater Confluence	NA	18.32	18.28	NA	NA	NA	NA	1
Lower Granite	12	19.47	18.64	0.8	0.8	0.2	0.2	3
Little Goose	13	20.24	19.05	0.4	1.2	0.9	0.9	3
Lower Monumental	14	20.62	19.27	0.2	1.3	1.1	1.1	3
Ice Harbor	15	21.42	19.68	0.4	1.7	2.1	1.6	2

NPDES Point Sources Waste Load Allocations

- WLAs for 127 major & minor facilities (kcal/day) based on discharge at current levels
 - Maximum discharges evaluated – max temperature and design flow
- Reserve in each reach
 - Approximately equal to heat load of largest individual point sources
 - Reserve is smaller in upper Columbia reaches in October
- 90th percentile impact of current maximum discharges plus reserve is 0.1 °C at multiple critical locations depending on the month (RM42, Priest Rapids, McNary).



Tributaries (focused on 23 largest)

Allocation of 0.1° C cumulative increase in Columbia and Snake Rivers

Equates to a 0.5°C increase in tributary temperature above it's natural condition

Climate Change

Since 1960, estimated Columbia River warming of $1.5^{\circ}\text{C} \pm 1.0^{\circ}\text{C}$

Future predictions also assessed for informational purposes
Predictions from 2 studies : 1.7° to 2.0°C warming by 2100

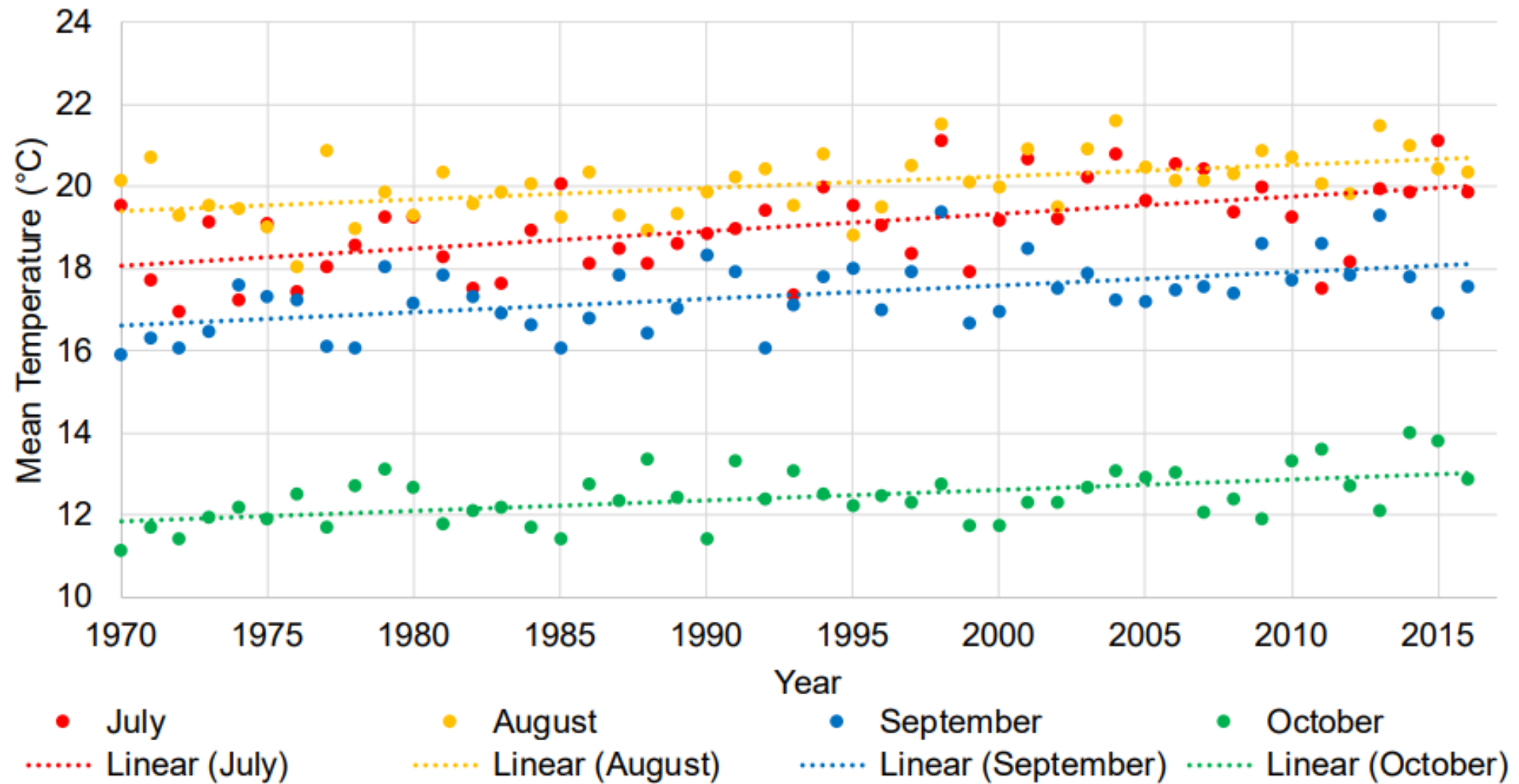


Figure 3-37 Simulated monthly mean temperatures at Bonneville Dam (Free-Flowing)

Cold Water Refuge Targets

- Intended to attain Oregon's Cold Water Refugia narrative WQS
 - Must have sufficiently distributed CWR to aid migrating salmon and steelhead
 - CWR are areas that are at least 2°C cooler than the main channel
- Reflects conclusions in the Final 2021 EPA Columbia River Cold Water Refuge Plan
- Temperature, flow, and CWR volume targets for 13 cold water refuge tributary sites

Tributaries Providing Cold Water Refuge in the Lower Columbia River

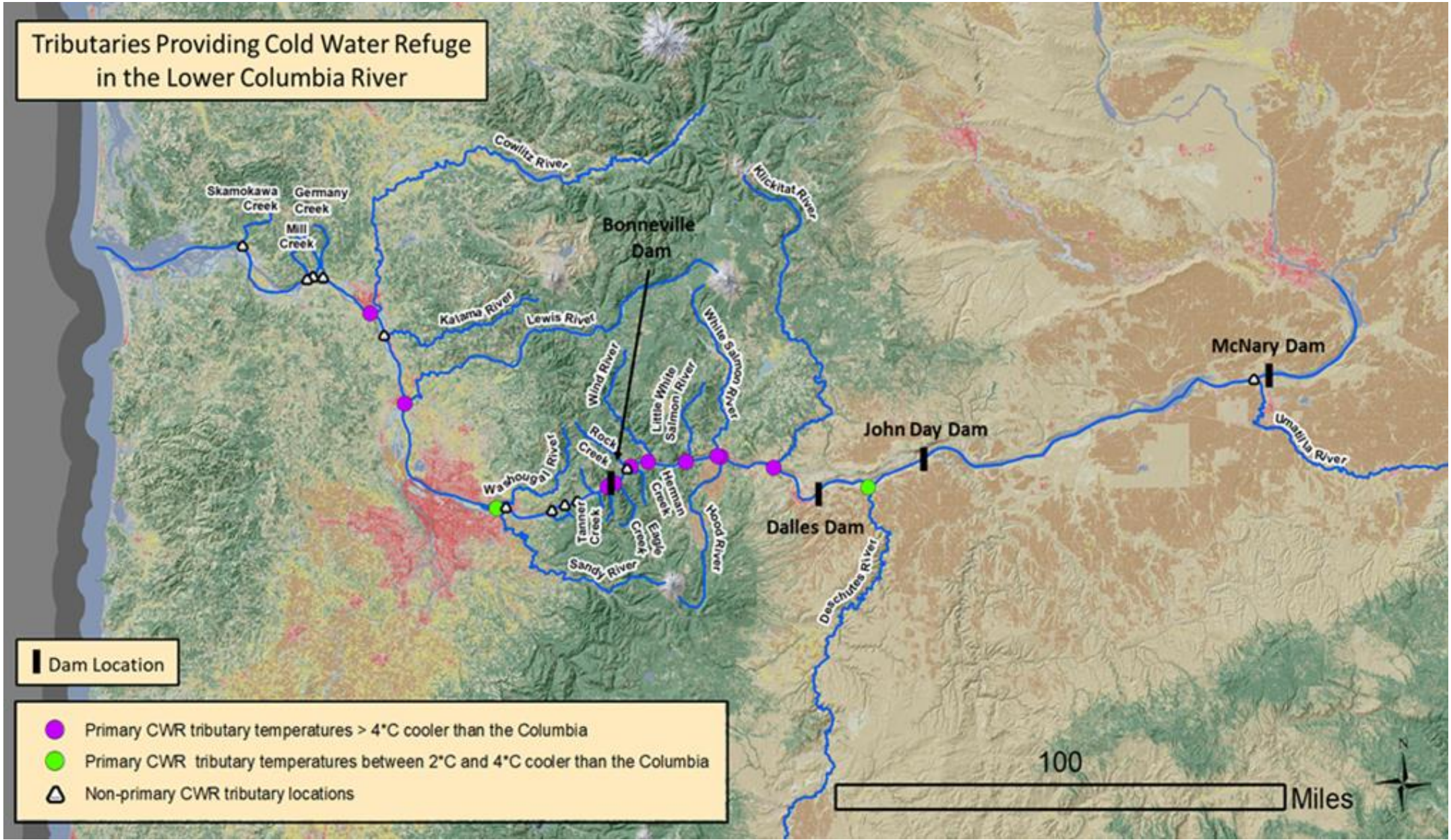


Table 6-24 Temperature, flow, and CWR volume targets for 13 CWR in the lower Columbia River

Tributary Name	RM	Water Quality Standard	Tributary Temperature Maximum Target	Listed as Impaired ²²	Flow Target	CWR Volume Target
		7DADM (°C)	August Mean 5-Year Average (°C)		August Mean cfs	August Mean m ³
Cowlitz River	65.2	17.5	16.0	Yes	3634	1,554,230
Lewis River	84.4	17.5	16.6	Yes	1291	613,455
Sandy River	117.1	18	18.8	Yes*	469	31,915
Tanner Creek	140.9	18	11.7	No	38	1713
Eagle Creek	142.7	18	15.1	No	72	2988
Herman Creek	147.5	18	12.0	No	45	169,698
Wind River	151.1	16	14.5	Yes*	293	105,220
Little White Salmon River	158.7	16	13.3	Yes*	248	1,108,661
White Salmon R	164.9	16	15.7	No	715	153,529
Hood River	165.7	16	15.5	Yes*	374	28,000
Klickitat River	176.8	16	16.4	Yes	851	222,029
Deschutes River	200.8	18	19.2	Yes	4772	880,124
Umatilla River	284.7	18	18.0 ²³	Yes*	250 ²⁴	31,512 ²⁵

²² Asterisks in this column indicate that a temperature TMDL has been completed.

²³18.0°C (7-DADM) is the applicable numeric criteria and the target for the Oregon Umatilla River Basin Temperature TMDL and Water Quality Management Plan.

²⁴250 cfs reflects the August 16 – September 30 target flow associated with the Phase 2 Umatilla Basin Water Exchange and the maximum modelled flow in the Oregon Umatilla River Basin Temperature TMDL and Water Quality Management Plan.

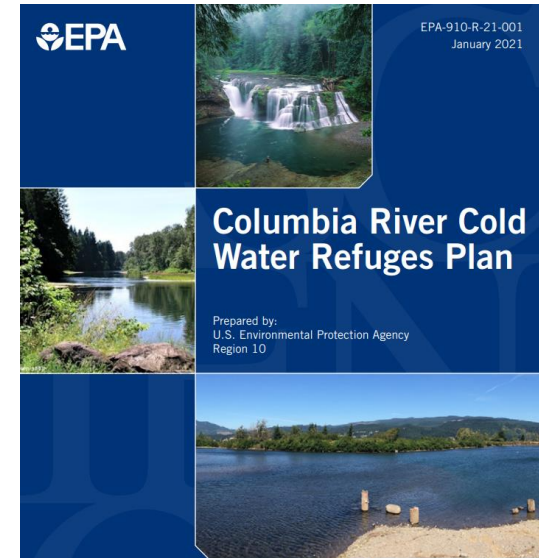
²⁵Estimated CWR volume when the river is at 18°C with 250 cfs flow.

TMDL Implementation

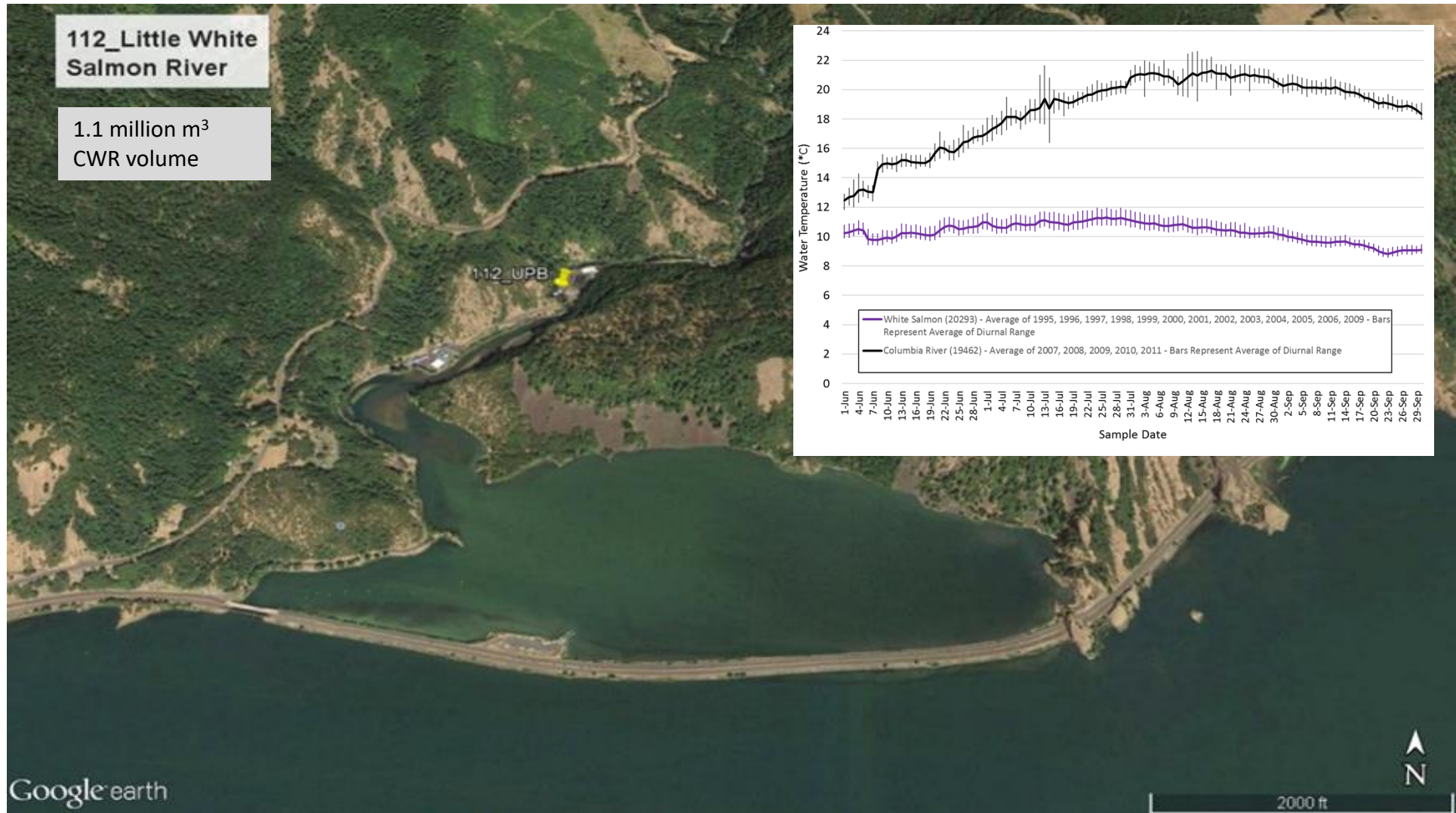
- Responsibility of the States of Washington and Oregon
- State and Tribal-issued CWA 401 Certifications for dams
 - 5 PUD Dams (FERC Licenses) and 10 Federal Dams (EPA-issued NPDES Permits)
- State and EPA-issued NPDES permits for point source discharges
- State-issued TMDLs and implementation plans for tributaries impaired for temperature
- EPA Cold Water Refuge Plan recommendation actions
- Restoration project funding from multiple sources

EPA Columbia River CWR Plan

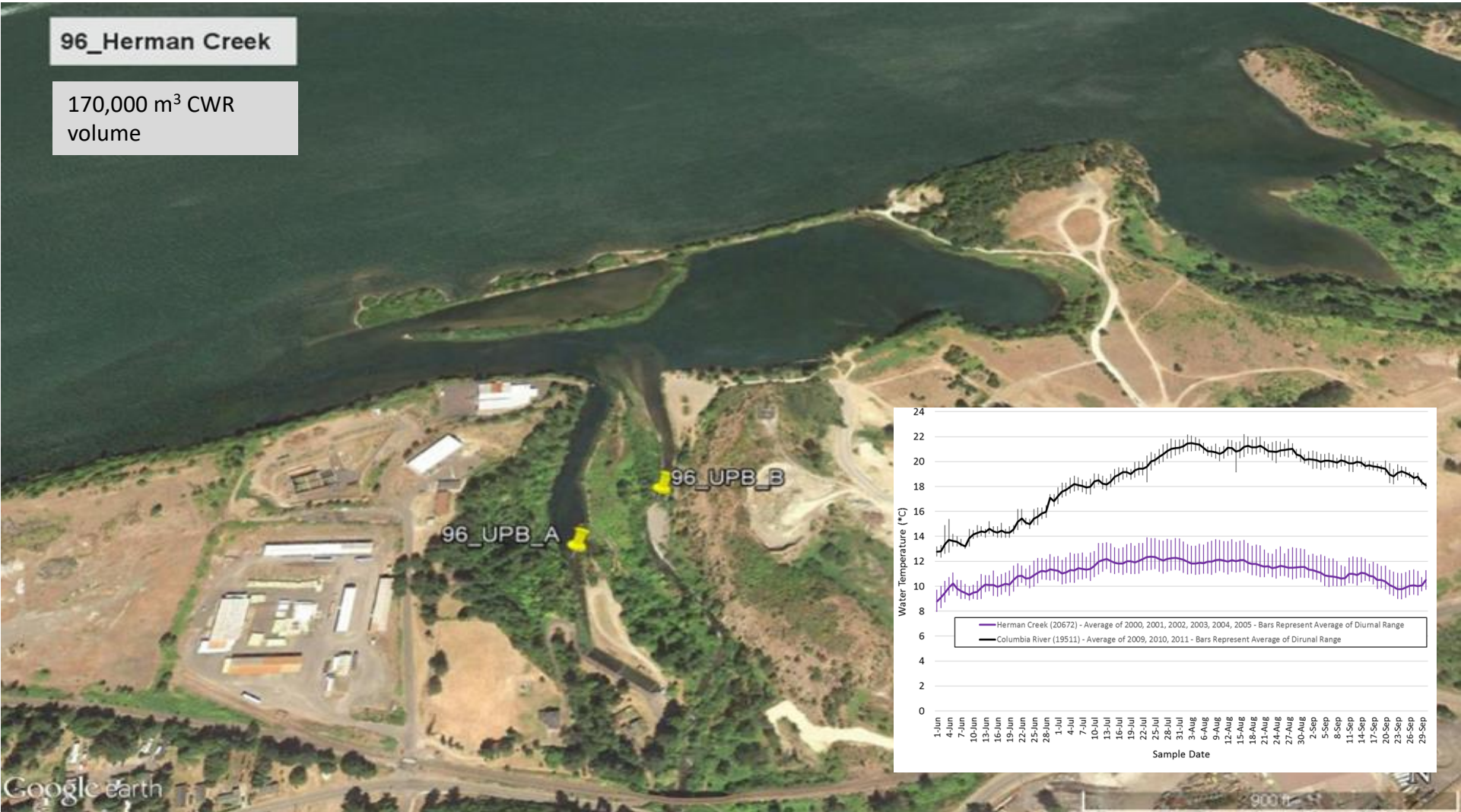
1. Describes the CWR areas in the Lower Columbia River
2. Characterizes how salmon and steelhead use CWR
3. Assesses the amount of CWR needed to meet Oregon's CWR narrative standard
4. Identifies actions to protect, restore, or enhance CWR
5. Recommends future CWR studies and monitoring



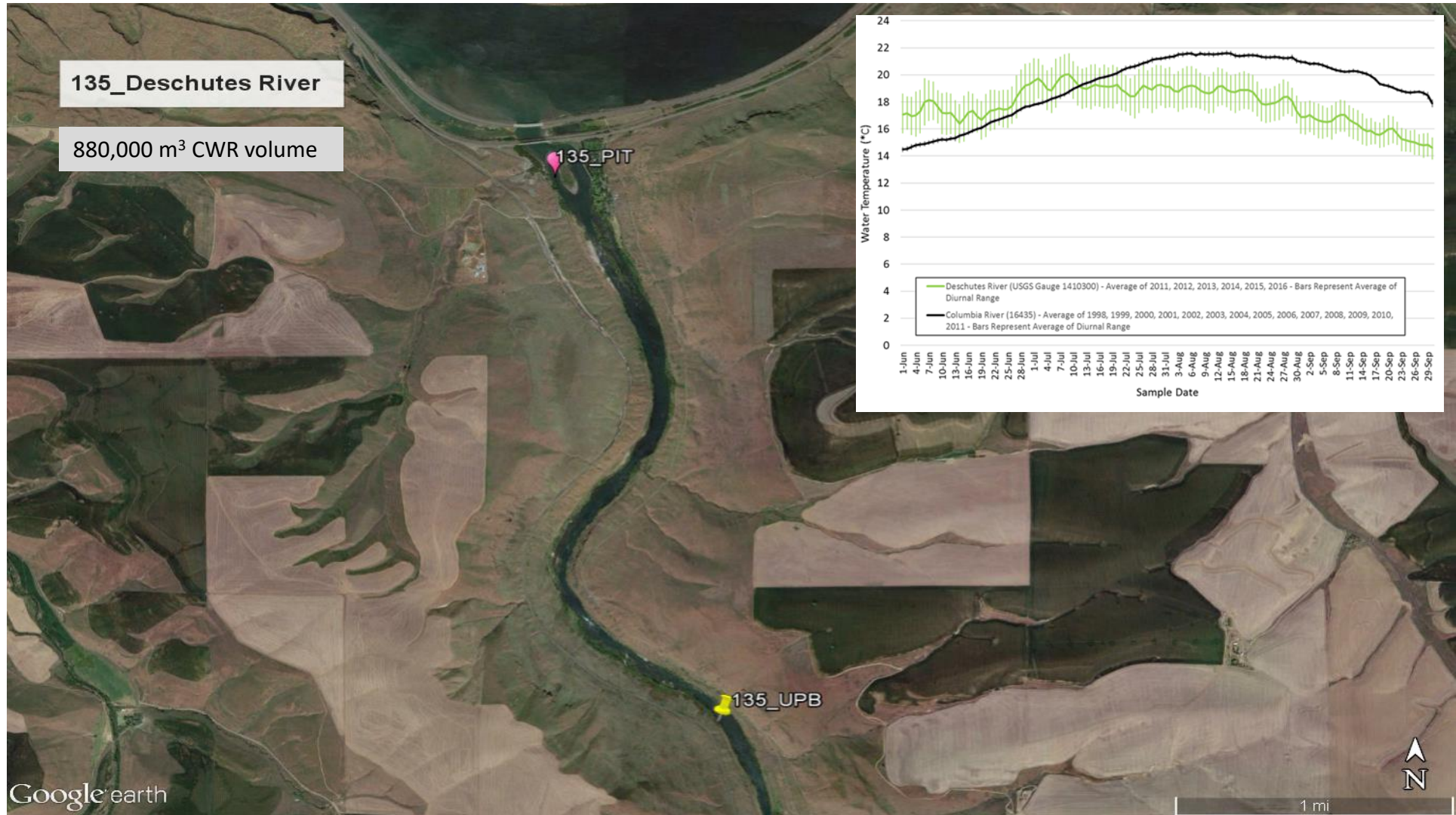
Little White Salmon River/Drano Lake CWR



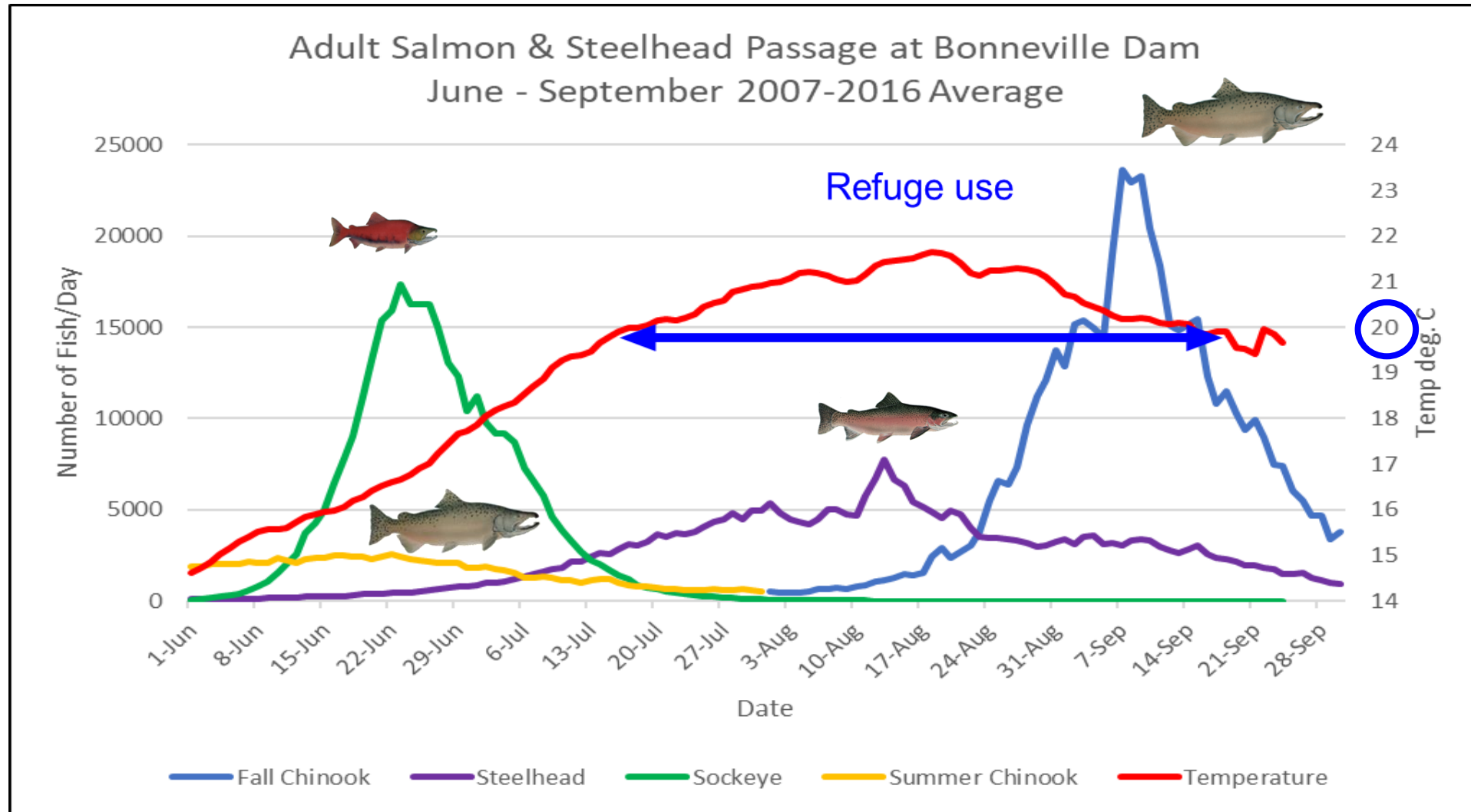
Herman Creek/Cove CWR



Deschutes River CWR

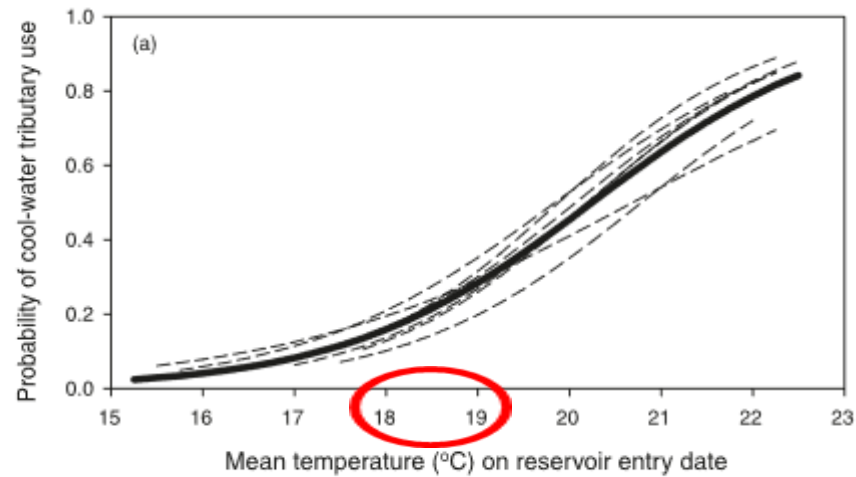


Bonneville Dam Temperatures and Fish Passage



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

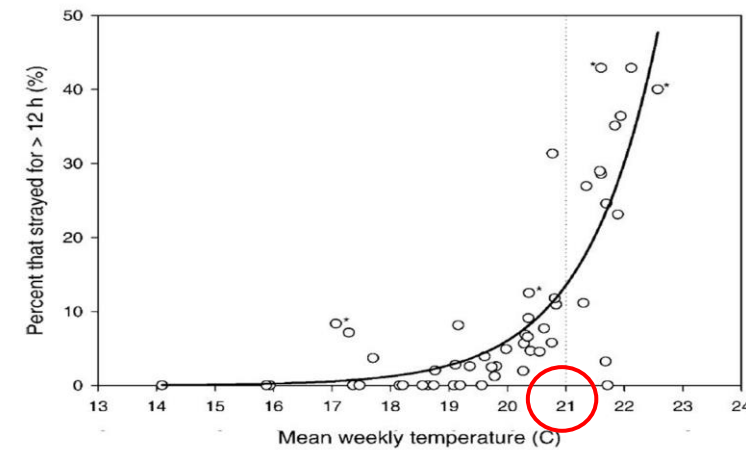
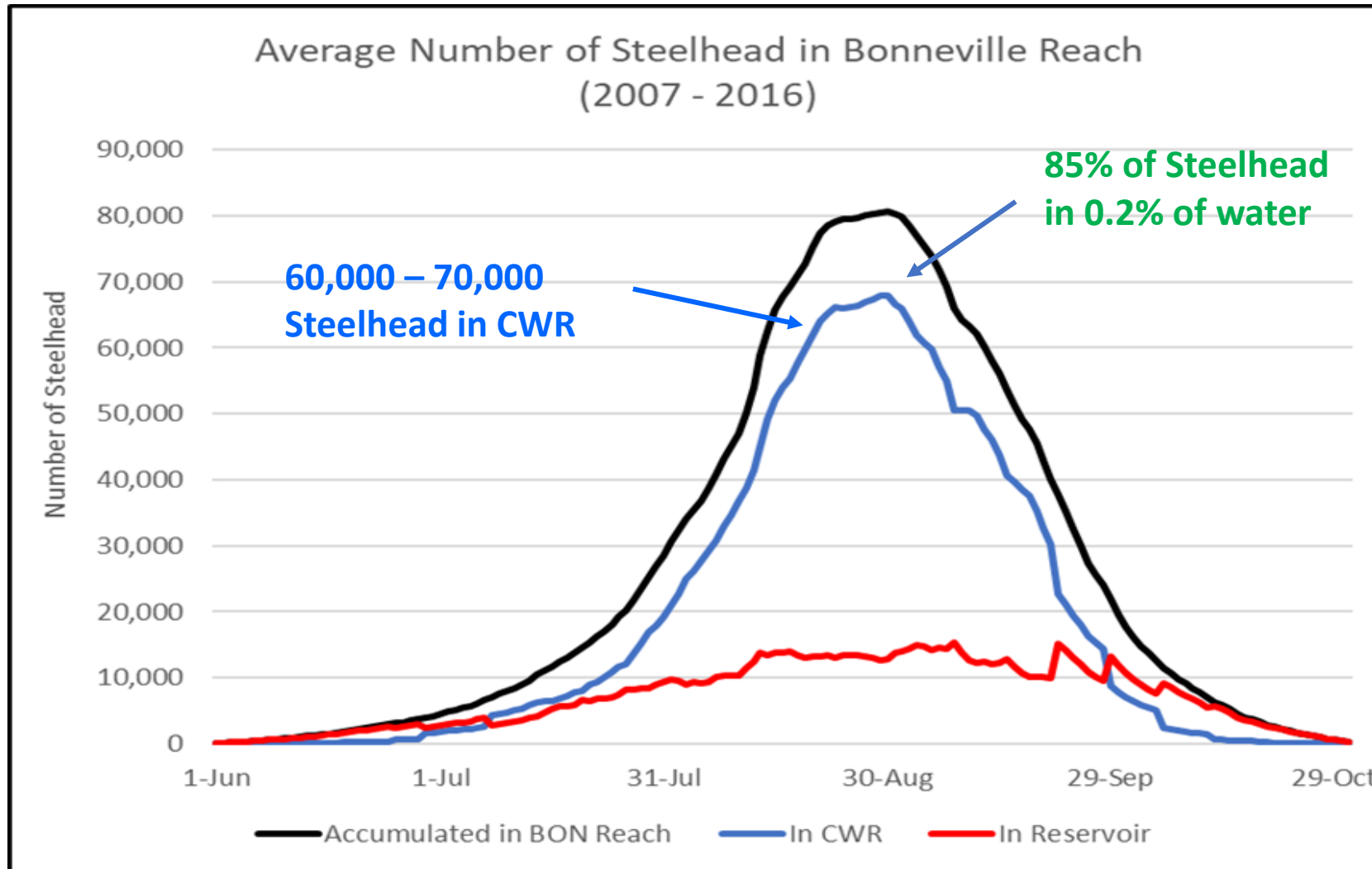


FIGURE 6.—Relationship between the percent of fall Chinook salmon that used (>12 h) coolwater tributaries and mean weekly water temperatures at Bonneville Dam. Circles represent 52 weekly bins (mean = 41 fish/bin; range = 4–122 fish/bin). The curve is the exponential regression line that best fits the data ($r^2 = 0.80$; $P < 0.0001$; percent = $6.558 \cdot e^{0.8002 \cdot \text{temperature}}$). 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 in Bonneville Reservoir Reach CWRs



of Steelhead in Each Bonneville Reach CWR

Tributary Name	Tributary Temp	Plume CWR Volume (> 2°C Δ)	Stream CWR Volume (> 2°C Δ)	Total CWR Volume (> 2°C Δ)	% of CWR in BON Reach	# Steelhead in Each CWR (1999-2016 Avg)	# Steelhead in Each CWR High Year (2009)	# Steelhead in Each CWR Low Year (2012)
	°C	m3	m3	m3				
Eagle Creek	15.1	2,100	888	2,988	0.2%	109	259	39
Rock Creek	17.4	530	1,178	1,708	0.1%	63	148	22
Herman Creek	12.0	168,000	1,698	169,698	9.5%	6,216	14,726	2,188
Wind River	14.5	60,800	44,420	105,220	5.9%	3,854	9,131	1,357
Little White Salmon River	13.3	1,097,000	11,661	1,108,661	61.9%	40,613	96,208	14,297
White Salmon River	15.7	72,000	81,529	153,529	8.6%	5,624	13,323	1,980
Hood River	15.5	28,000	0	28,000	1.6%	1,026	2,430	361
Klickitat River	16.4	73,000	149,029	222,029	12.4%	8,133	19,267	2,863
Total		1,501,430	290,403	1,791,833	100%	65,639	155,492	23,107

Chapter 7 in CWR Plan - Actions to Protect and Restore CWRs



Protect and restore riparian and channel conditions



Protect and enhance river flows



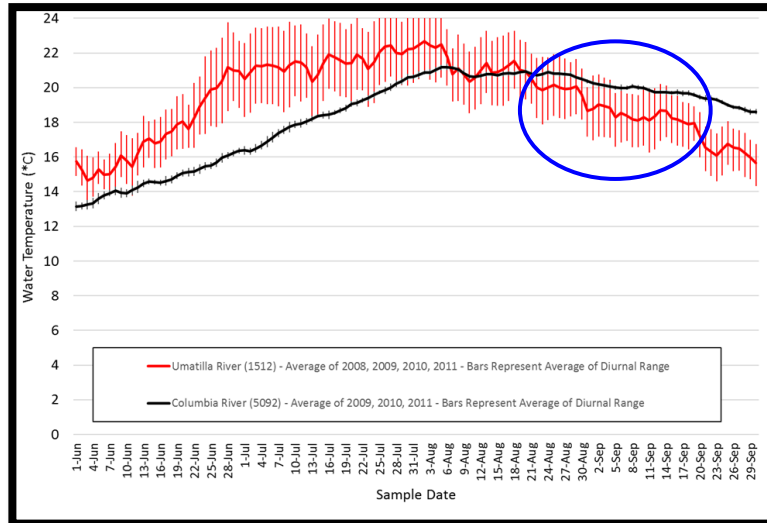
Address sediment build-up



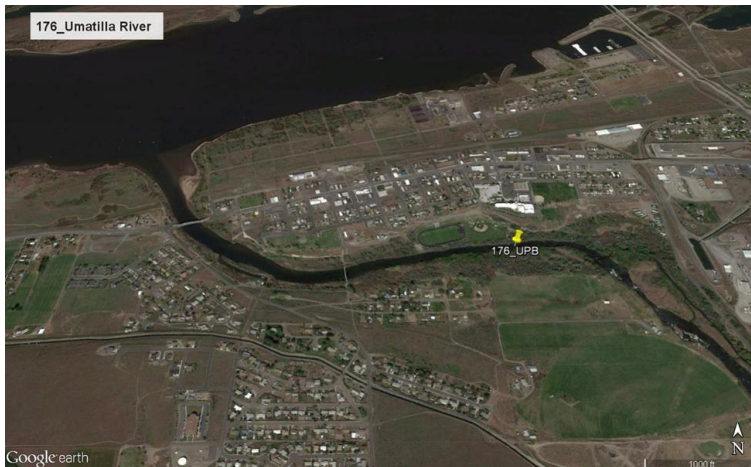
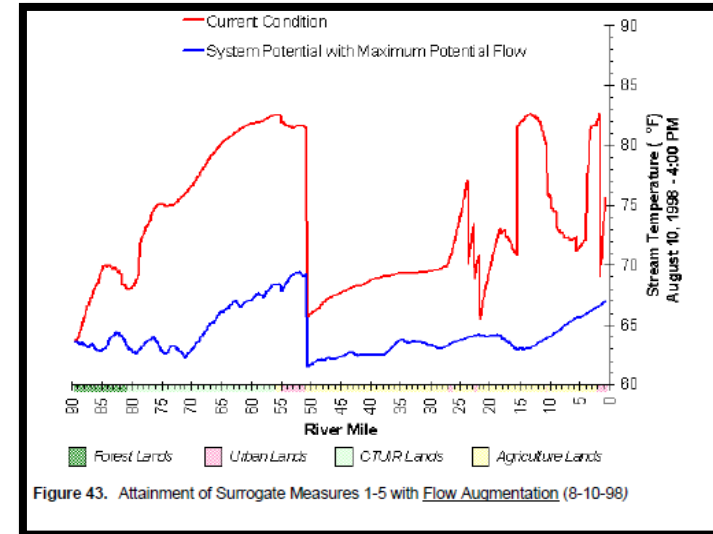
Operate dams for cold summer flows

Additional Umatilla Basin Water Exchange

Umatilla River



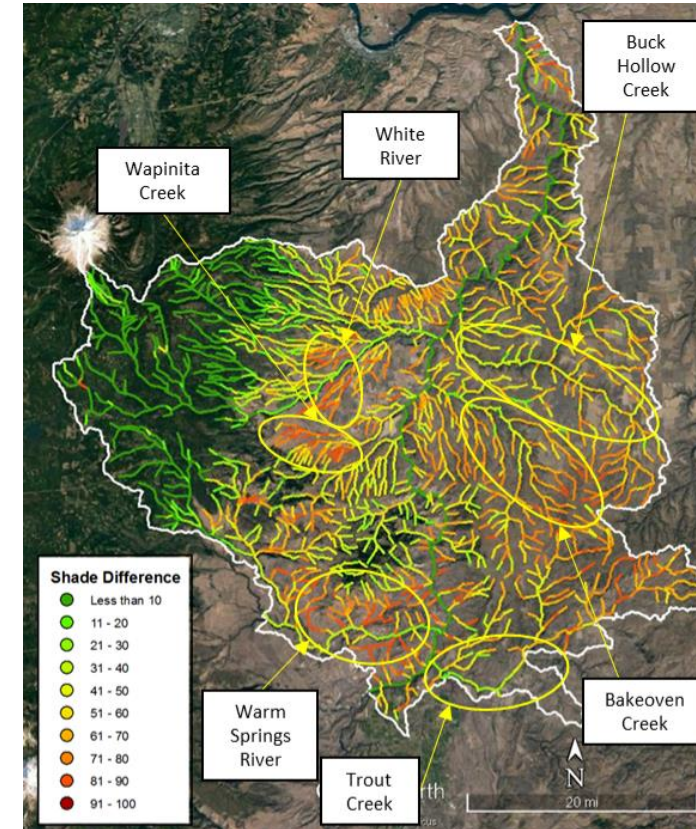
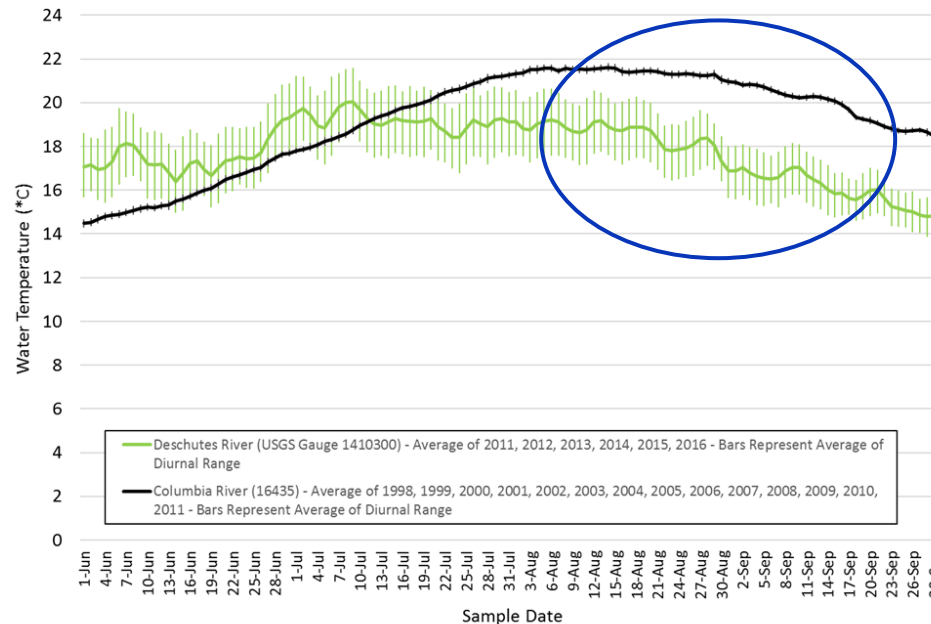
Umatilla Basin TMDL



- Pump additional Columbia River water for irrigation and reduce irrigation withdrawals from the Umatilla River to restore flows
- Part of Umatilla Tribe (CTUIR) water rights claim settlement
- Requires Congressional Funding

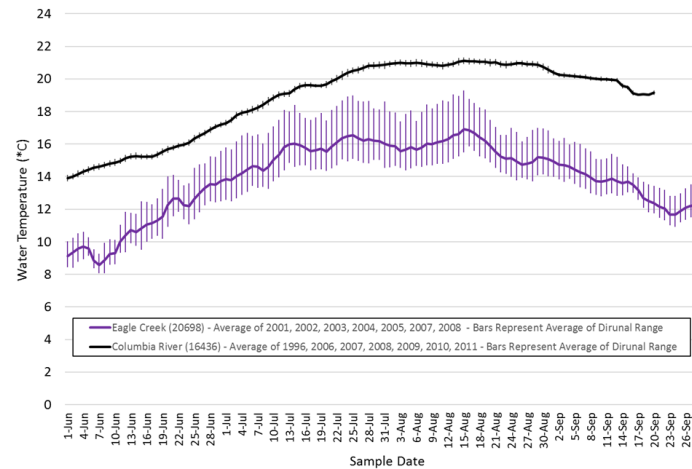
Cool the Deschutes River

- Pelton Round Butte Operations
 - Maximum bottom withdraw in Aug/Sept
- Deschutes Basin HCP
 - Ensure Aug/Sept temps below PRB are not warmed, preferably cooled
- Steam riparian habitat restoration
 - Steelhead recovery plan

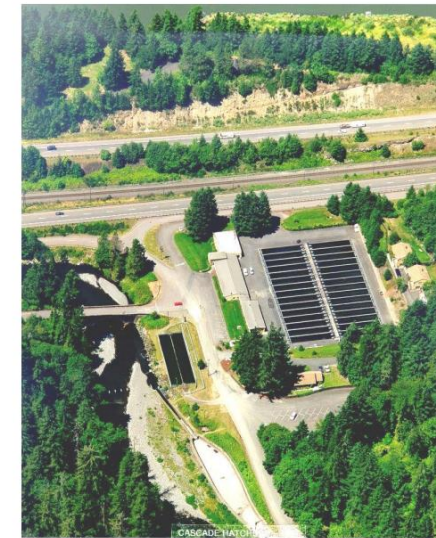


Groundwater Supply at Eagle Creek Cascade Hatchery

- Creek withdrawal currently supplies hatchery
- If replaced with groundwater supply it would cool river and increase CWR Volume
- ODFW defined Eagle Creek a ‘thermal sanctuary’ and owns hatchery



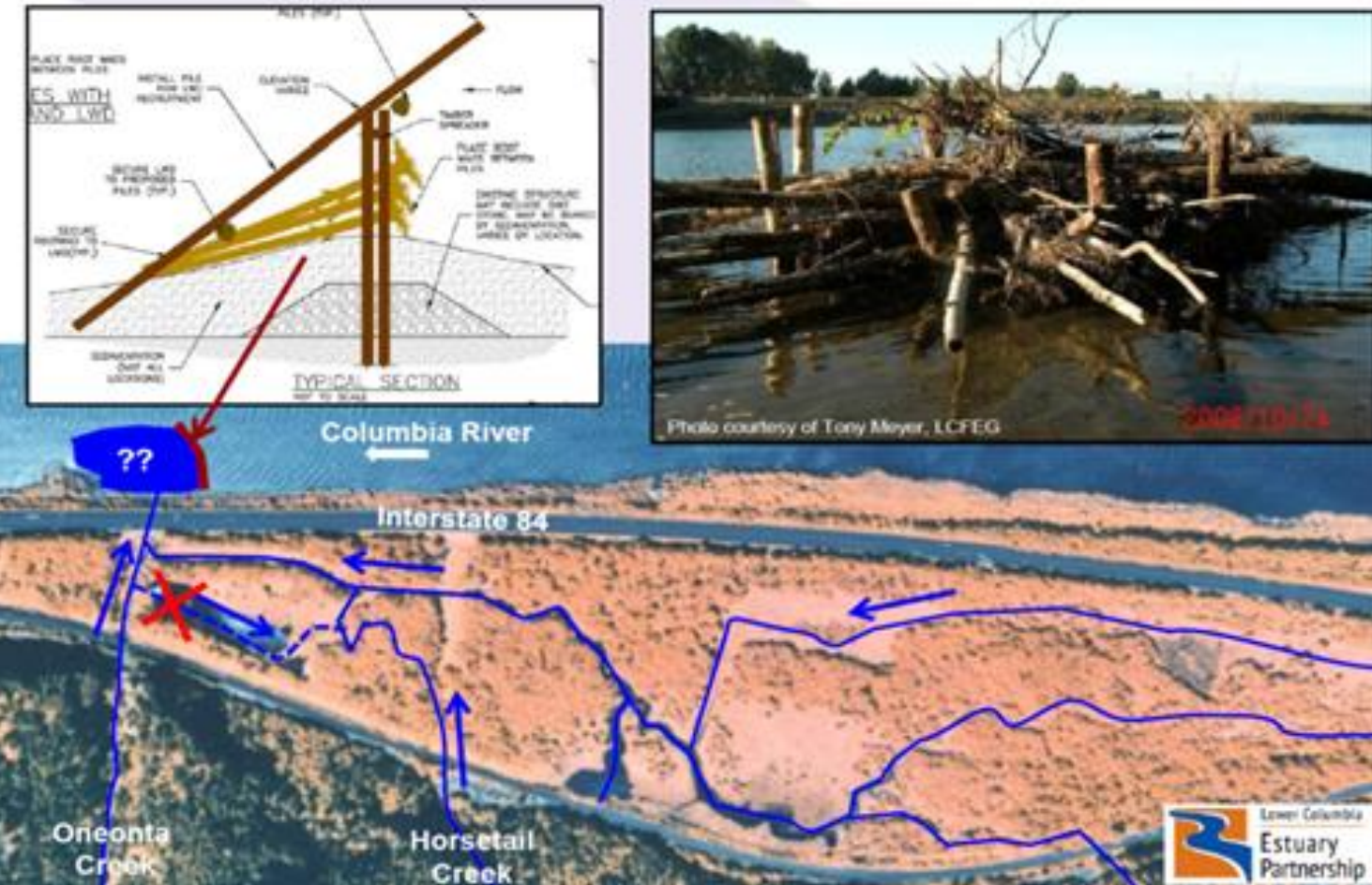
CASCADE HATCHERY



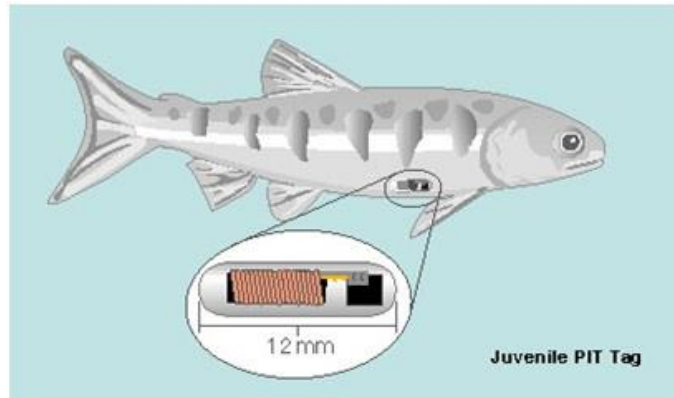
PROGRAM MANAGEMENT PLAN
2020

Enhance Oneonta Creek CWR (Lower Columbia Estuary Partnership Design)

Restoration Actions – Example 5: modify bathymetry to increase hydraulic shadow



Install Pit-Tag Detectors & Temp/Flow Gages in CWR streams



- Current Detectors
 - Deschutes River (disc.?)
 - Hood River
 - Upstream in Wind and Klickitat
- Recommended
 - Little White Salmon/Drano Lake
 - Herman Creek Cove
 - Lower Klickitat
 - Cowlitz or Lewis Rivers
- Current USGS flow gauges (near mouth)
 - Cowlitz, Lewis, Sandy, White Salmon, Hood, Klickitat, Deschutes, and Umatilla Rivers. (USGS and others)
- Re-install previous USGS flow gauges & new flow gauges (near mouth)
 - Re-install gauges at Wind and the Little White Salmon Rivers
 - New gauges at Tanner, Eagle, and Herman Creeks
 - USGS, Ecology, ODEQ, USFW, others
- Current USGS temperature gauge (near mouth)
 - Deschutes near Moody
- Install temperatures gages (near mouth at USGS flow gauge locations)
 - All of the other 11 primary CWR tributaries and the Umatilla River (USGS, Ecology, ODEQ, USFW, others)

Columbia River Gorge Commission Doubles Riparian Protection on 7 CWR streams

Environment

Columbia River Gorge management plan updated to protect salmon, address climate change, support cideries

Updated Oct 19, 2020; Posted Oct 19, 2020



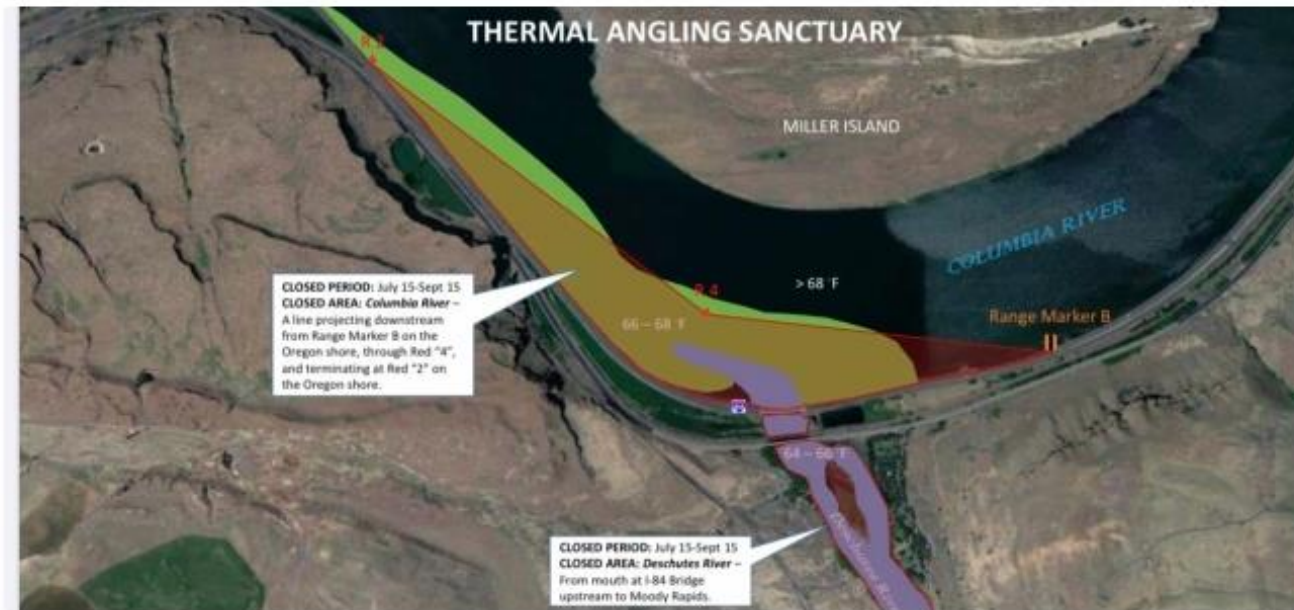
The U.S. Congress established the Columbia River Gorge National Scenic Area in 1986. This view of the Vista House is from Chanticleer Point in the Columbia River Gorge on Nov., 25 2018. Mark Graves/Staff LC- (photo courtesy of Jamie Hale)

A. Streams and riparian areas – protecting and enhancing aquatic and riparian systems. This includes expanding stream buffers, requiring vegetation enhancement, protecting cold water refuge habitats for fish, and other approaches.

(1) Apply a 200-foot buffer width to these EPA priority cold water refuge streams within the GMA: the Sandy River, Wind River, Little White Salmon River, White Salmon River, Hood River, Klickitat River, and

Oregon Closes Steelhead Fishing in Three Oregon CWR (Deschutes River, Herman Creek and Eagle Creek)

New Oregon Rules Protect Migrating Columbia Wild Steelhead and Salmon Within Cold Water Refugia



OCTOBER 5, 2020 ~ LEAVE A COMMENT

EPA Issued NPDES permits for Lower Columbia and Snake federal dams: What do they cover?



*Heat from reservoirs



Wicket gates, in-line equipment, lubricated wires



Cooling Water Discharges and Backwash Strainers



Drains, Sumps



Cooling Water Intake Structures



Permit Conditions

- Oil and grease: 5 mg/L daily maximum numeric limit; wkly/monthly monitoring; BMP plans/annual report
- pH: Columbia 7-8.5; Snake 6.5-8.5; wkly/monthly monitoring
- Heat: Numeric heat loads from Columbia River Temperature TMDL; representative continuous monitoring
- Flow: 1/month monitoring
- Other monitoring
- Meet Total Dissolved Gases standard
- No toxics discharges
- No visible oil sheen
- No floating or deleterious substances



Other Permit Provisions

- Water Quality Attainment Plan (WA 401 Requirement)
 - Measures to reduce temperatures in dam operations
- BMP Plan and Annual Updates
 - Prevention, minimization, tracking, reporting of oil and grease
- Environmentally Acceptable Lubricants (EALs) Annual Report
- PCB Management Plan and Annual Report
- CWIS Annual Pla

Federal Dam Permit Status

- Issued Lower Snake Dam Permits in September 2021
- Lower Columbia River Dam Permits pending
 - Addressing Oregon CWA 401 issues
- Anticipated public notice for Grand Coulee, Chief Joseph, and Dworshak Dam permits – November 2021

Thank you – Questions ?