Cold Water Refugia Sanctuaries for Wild Salmon and Steelhead

David Moskowitz
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Cold Water Refugia

- Oregon standards define cold water refugia as:
- “those portions of a water body where, or times during the diel temperature cycle when, the water temperature is at least 2 degrees Celsius colder than the daily maximum temperature of the adjacent well mixed flow of the water body”
- Source: OAR 340-041-0002(10)

Why are these places Important in the Columbia River?

- Columbia River migration now exposes wild salmon and steelhead to temperatures reaching or exceeding 20°C (68F)
- These temperatures are bad for fish

-Stress

-Disease

- Decreased spawning success

- Mortality

- Like any smart animal, salmon and steelhead move to cooler water

How Warm is Warm?

- When mainstem river temperatures reach 64F, salmon and steelhead begin to feel stressed
- 64F = 17.78C
- When water temperatures reach 68F, salmon and steelhead seek colder water and residency in these cooler waters last from days to weeks.
- 68F = 20C
- When water temperatures increase to 68.5F, steelhead remain in cooler water temperatures for weeks and months.
- 68.5F = 20.28C

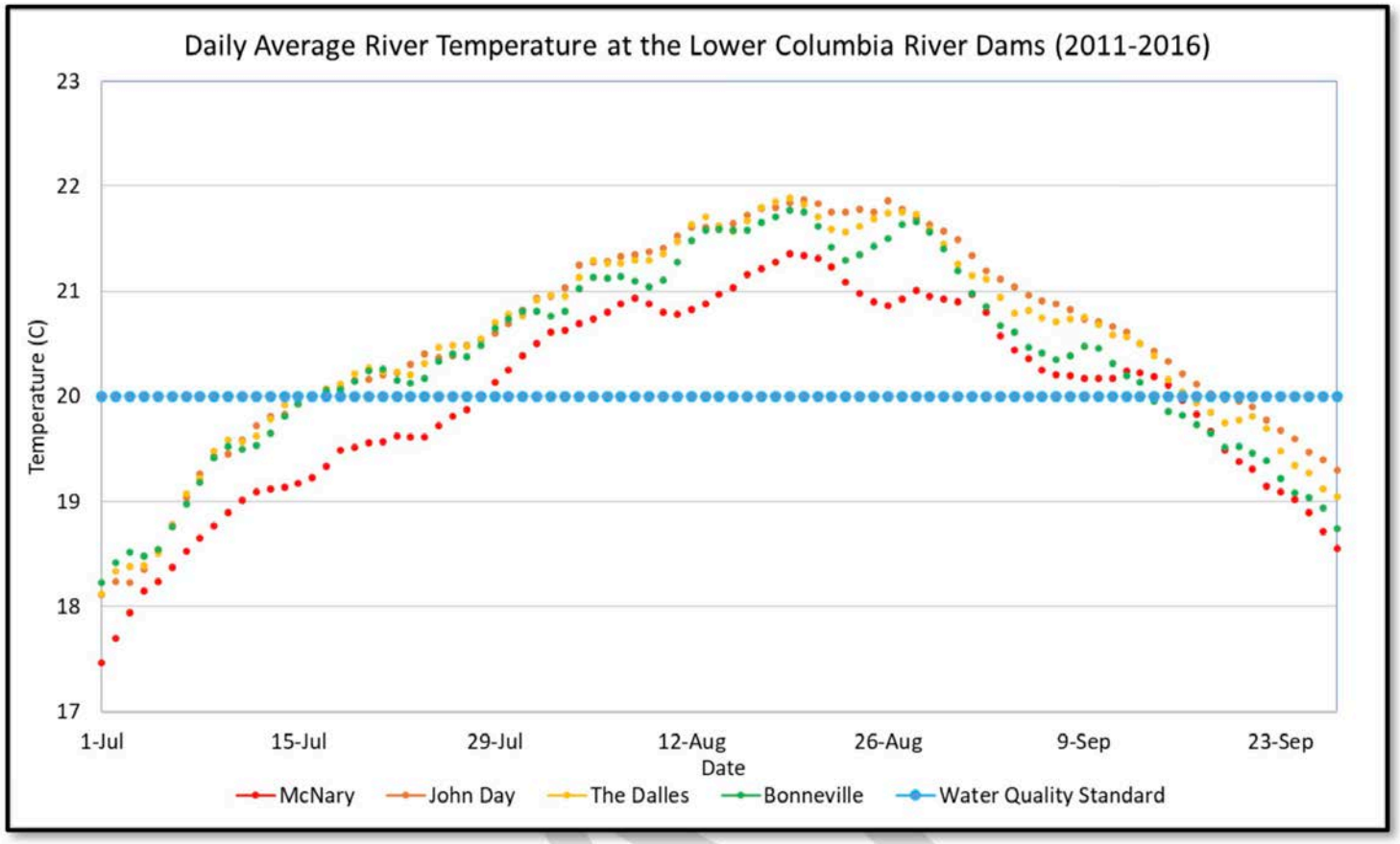


Figure 2-3 Lower Columbia River temperature from early July to mid-September, 6-year average 2011-2016 (DART)

When are CWR Important?

Where are these places?

The USEPA identified 191 tributary sources entering the Columbia River from the mouth to the Snake River.

23 of these sources were at least 2C cooler than the Columbia in the July-September period and of sufficient measurable volume.

12 of these top 23 sources were deemed priority cold water refugia for migrating salmon and steelhead.

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 River (WA)	158.7	21.2	13.3	-7.9	88	1,097,000	4,126	1,101,126
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	169*	0	46,299	46,299

[1] Only provide intermittent cold water refugia; CWR volume represents volume when river is greater than 2°C colder than Columbia River.
[2] Tidally influenced and may be inaccessible during low tides.

Table 2-3 Twelve primary CWR tributaries (highlighted in bold and color)

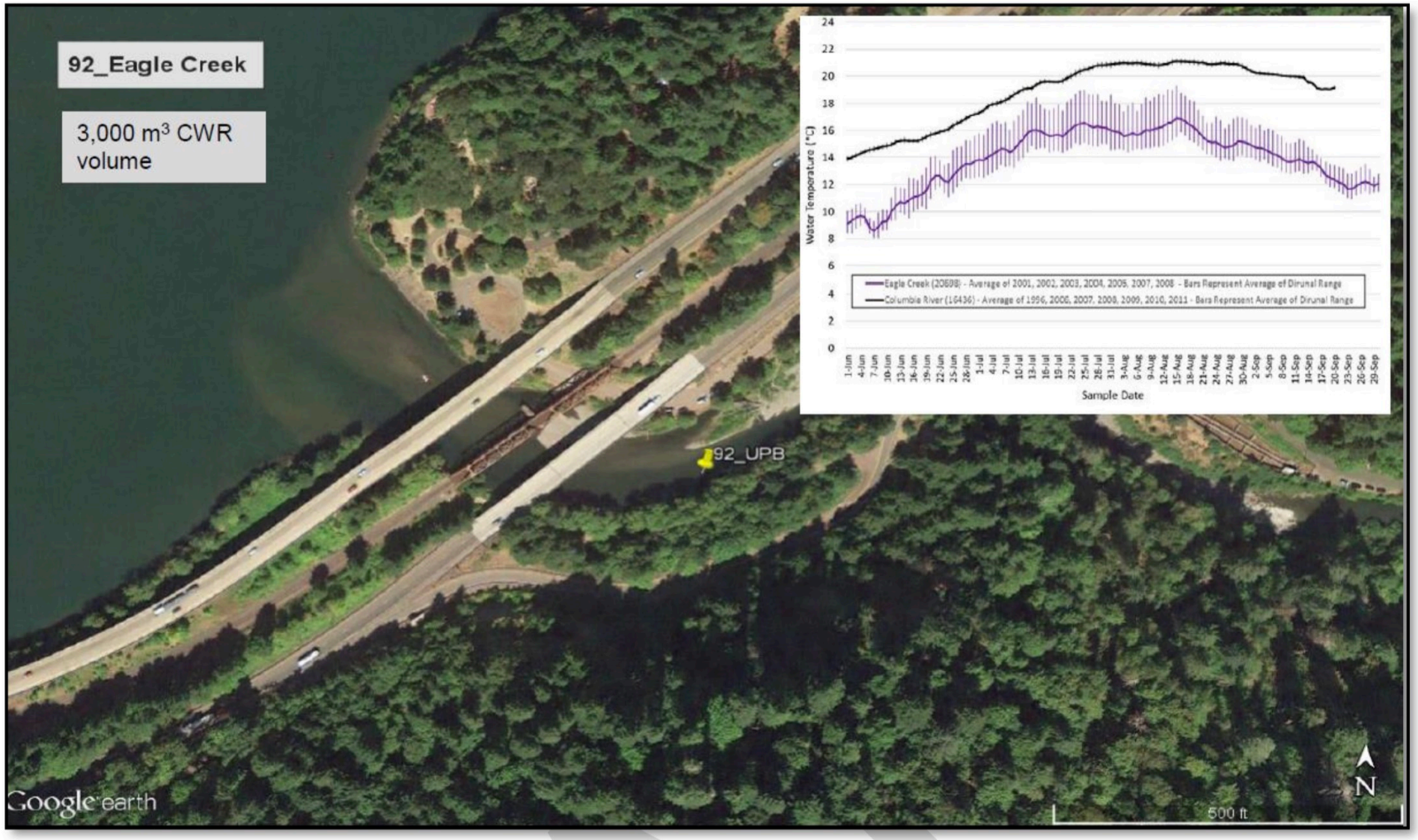


Figure 2-13 Eagle Creek Cold Water Refuge

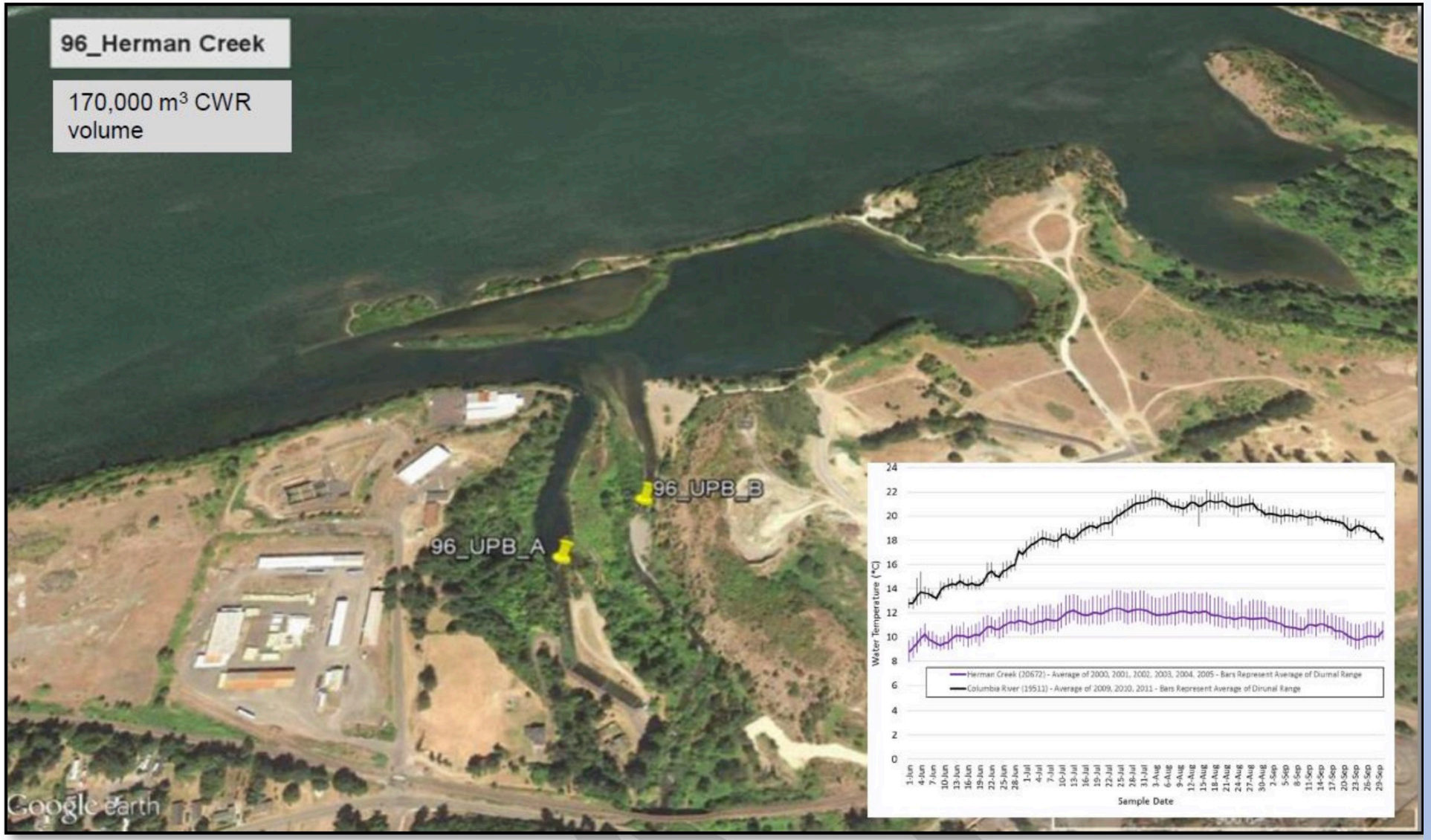


Figure 2-15 Herman Creek and Cove Cold Water Refuge

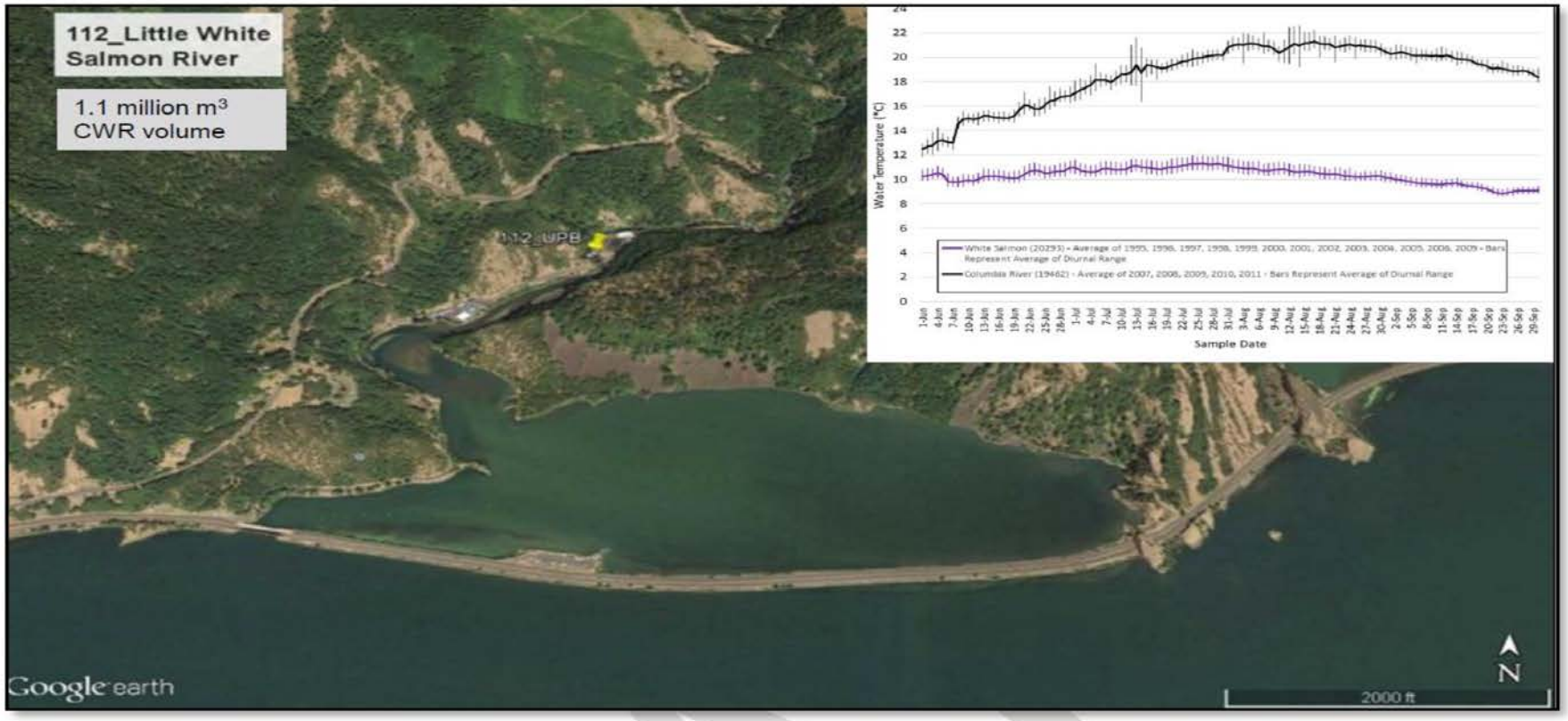


Figure 2-17 Little White Salmon River and Drano Lake Cold Water Refuge

Like Shooting Fish in a Barrel

Drano Lake, WA

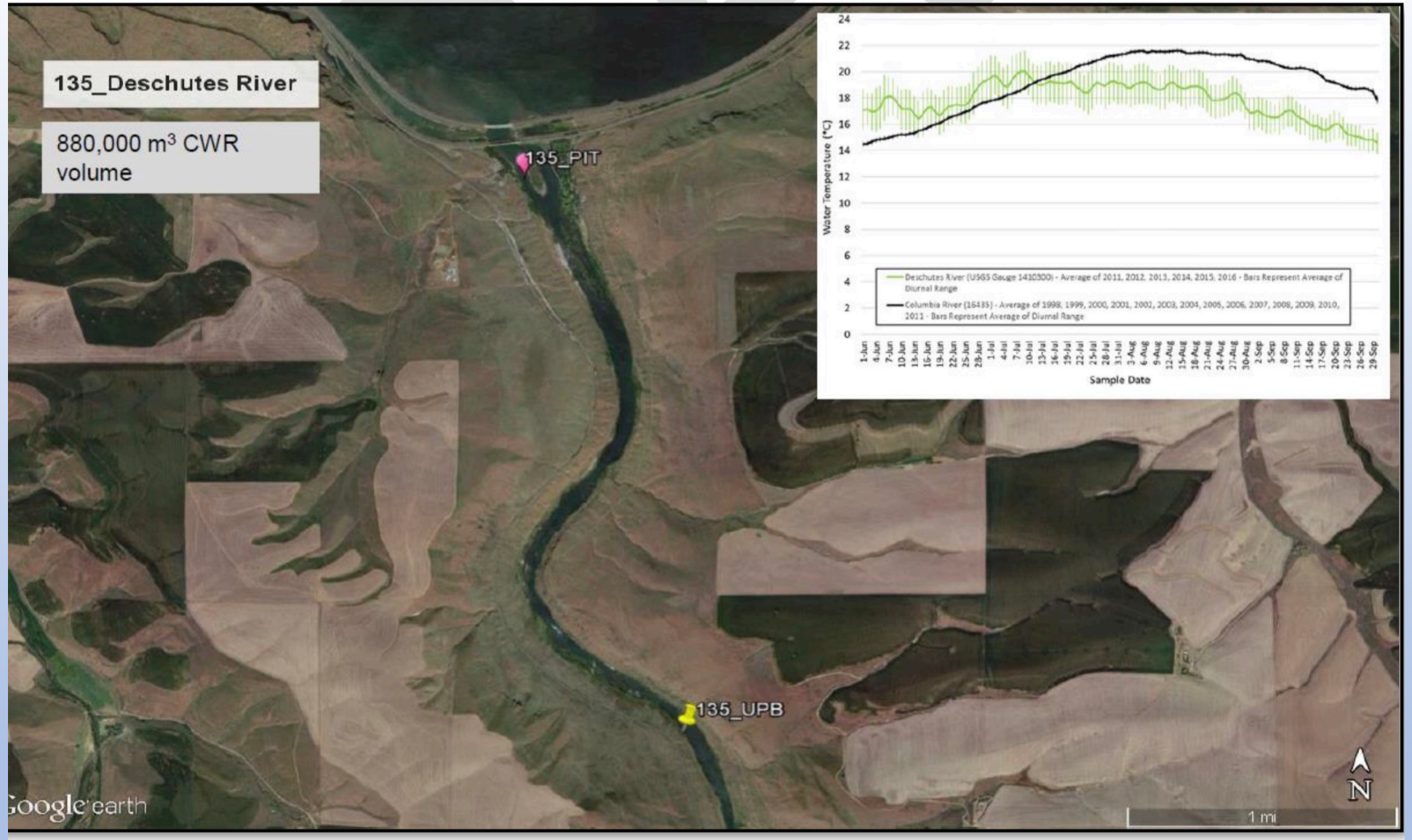
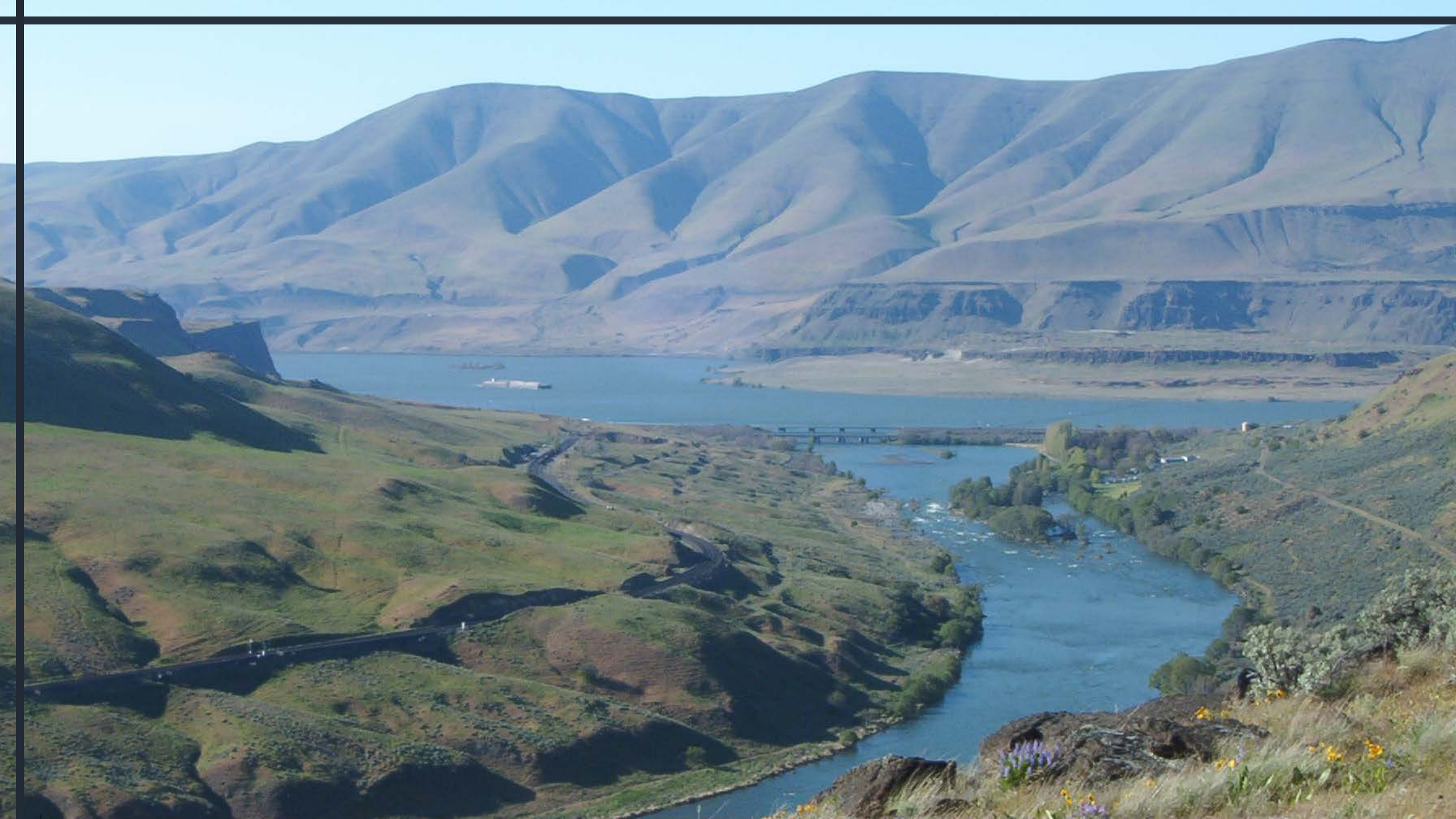
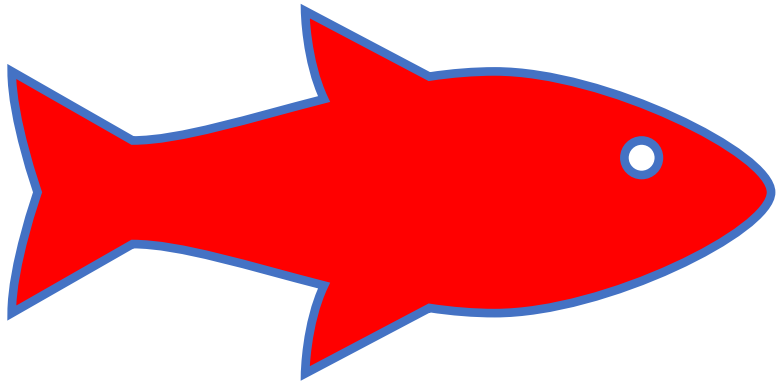


Figure 2-20 Deschutes River Cold Water Refuge



Key EPA Findings

- The extent and distribution of existing CWR provide migratory pathway for wild salmon and steelhead
- Wild steelhead and salmon currently using CWR do not exhibit survival benefits due to angling encounters with CWR
- Current rate of water temperature increases (+.3C/decade) will make Columbia River a lethal migratory pathway by 2040



Oregon's To Do List

Create	Create No Fishing Sanctuaries at Columbia River CWR sites in Oregon Waters (Eagle Creek, Herman Creek, Deschutes River)(ODFW)
Work	Work with Washington to create No Fishing Sanctuaries on the north bank of the Columbia River (Cowlitz, Lewis, Wind River, Little White Salmon (Drano Lake))(ODFW + WDFW)
Designate	Designate CWR Sources as Outstanding Resource Waters to prevent water quality diminishment of CWR sources (ODEQ)
Identify	Identify CWR in other Oregon waterways that deserve protection and provide sanctuary from angling (Rogue, Umpqua, Coastal rivers)