UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3188

WATER
DIVISION

December 16, 2020

EPA received comments from contributing organizations and individuals on the October 2019 Draft Columbia River Cold Water Refuges Plan. EPA reviewed and considered all the comments and has provided a summary of the comments along with responses in the table below. The following entities provided written comments, which are included in this document below the summary table:

Bluefish – Bluefish.org
BPA – Bonneville Power Administration
Brian Maschoff
CREST – Columbia River Estuary Study Taskforce
CRITFC – Columbia River Inter-Tribal Fish Commission
CRK – Columbia Riverkeeper
CTUIR – Confederated Tribes of the Umatilla Indian Reservation
DRA – Deschutes River Alliance
FPC – Fish Passage Center
NMFS – National Marine Fisheries Service
NWEA – Northwest Environmental Advocates
ODFW - Oregon Department of Fish and Wildlife
TCA – The Conservation Angler
WDFW – Washington Department of Fish and Wildlife
WDNR – Washington Department of Natural Resources
USACE – U.S. Army Corps of Engineers
USFS – U.S. Forest Service
Yakama – Yakama Nation Fisheries

Comment	Commenters	Response
Columbia and Snake River Temperature Related Comments		
The Plan does not address actions to cool warm Columbia River mainstem temperatures that exceed the 20°C numeric criteria. EPA should complete the Columbia River Temperature TMDL to address these warm river temperatures.	Bluefish, CRITFC, CRK, FPC, USFS, NWEA, TCA, WDFW	EPA agrees current and projected future summer water temperatures in the Lower Columbia River are a significant concern for migrating salmon and steelhead. EPA established the Columbia and Lower Snake Rivers Temperature TMDL in May 2020, which the final Plan now mentions. TMDL implementation plans need to be developed and implemented to meet the TMDL. As noted in the final Plan, actions to address the mainstem water temperatures will be addressed in the TMDL implementation plans and are not part of the scope of the CWR Plan.
The Plan does not address the Snake River and the impact of the four	BlueFish, NWEA	EPA agrees that the four Snake River dams warm the Snake River in the summer and fall. EPA also agrees

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Snake River dams on Snake and Columbia River water temperatures. The NorWeST Model inaccurately addresses Lower Snake River temperatures.		that a warmer Snake River warms the Columbia River a small amount downstream from the Snake River confluence. However, actions to reduce either Snake River or Columbia River mainstem temperatures are beyond the scope of the CWR Plan. The CWR plan focused on application of Oregon's CWR narrative criteria, which only applies to the Columbia River that is part of Oregon, which is downstream of the Snake River dams.
The Plan does not address the problem of warm waters in dam fish ladders that contribute to delayed adult migration.	CRITFC, FPC, ODFW	EPA agrees that warm surface forebay temperatures at certain dams supply warm water to the fish ladders that can create a delay in adult migration and that exposure to warm temperatures in the ladders and the forebays is a significant concern. In the Lower Columbia River, recent data show this to be a significant concern at the John Day and McNary dams. EPA revised the Plan and Appendix 12.1 to present data on warm forebay temperatures at these two dams as part of the Plan's characterization of Columbia River temperature variability. However, actions to cool fish ladder temperatures are beyond the scope of the CWR Plan. The recently issued NMFS Biological Opinion (2020) on the Columbia River System Operations addresses this issue.
The Plan does not recognize stratification that occurs in John Day and McNary reservoirs.	CRITFC, NMFS, NWEA, USACE	EPA agrees that recent data collected by the Army Corps in these reservoirs demonstrate warmer surface waters in the John Day and McNary reservoirs during warm days. EPA revised the Plan to discuss surface warming in the forebays at these two dams. EPA also revised Appendix 12.1 to include this data.
Regarding historical Columbia River water tempertures trends presented in Chapter 5: why does Figure 5-1 only display data up to year 2000? what is the year/version of RBM10 model used in Figure 5-2? The standard error in Figure 5-2 seems large.	BPA	Figure 5-1 displays data only up to 2000 because EPA used this figure from the National Academy of Sciences report (2004); it is not original data from EPA. For information on RBM10, please refer to EPA's RBM10 model development report (EPA 2019). Figure 5-2 does not demonstrate model predictive capability or model error. Rather, Figure 5-2 displays natural variability around the temperature trend lines for each month shown.
The Plan refers to the A1B scenario for predicted future greenhouse gas trends, which is outdated. Why not use more recent information (e.g., RMJOC-II)? It is unclear what modeling is used for the future projections, and the plan should include a range for predicted future temperatures.	BPA, Yakama	EPA extrapolated the past warming trend of 0.3°C per decade for future trends for the Columbia River mainstem and used the USFS NorWeST model for predicted future tributary temperatures. EPA noted that the 0.3°C per decade trend for the Columbia River mainstem is similar in magnitude to predictions of future Columbia River mainstem temperatures under the A1B scenario. EPA recognizes the A1B scenario was part of the Intergovernmental Panel on Climate Change (IPCC) 2007 report, which has been updated with modified scenarios (e.g., RCP 6.0) as part of

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		IPCC's 2013 report. This section of the Plan, however, cites model results that used the A1B scenario, so it is appropriate to mention the A1B scenario in this context. EPA recognizes there is uncertainty about predicted future temperatures, as reflected in IPCC's 2013 report. EPA chose to show an extrapolation of the past trend as a prediction of future Columbia River mainstem temperatures recognizing that actual temperatures could be warmer or cooler depending on the resultant trajectory of greenhouse gas emissions over the 21st century. EPA's Assessment and Synthesis of the Literature on Climate Change Impacts on Temperatures of the Columbia and Snake Rivers (Appendix 12.16, 2020) cited all known and available information in the published literature related to river temperature trends and projections. RMJOC-II does not include river temperature or climate change projections. RMJOC-II contains only precipitation, air temperature and flow, which EPA has included for reference.
Fish and CWR Related Comments		
EPA's method of estimating the number of fish in CWR needs further explanation and is uncertain. EPA should include a sensitivity analysis and range, not just a point estimate. The percentage of CWR use may be lower today due to decreased transport of juveniles. Disproportionate PIT tagging of Snake River steelhead may distort CWR estimates in Deschutes River.	CRITFC, FPC, ODFW, NMFS, NWEA	EPA recognizes the uncertainties around its estimates of the number of fish in CWR. EPA revised Appendix 12.13 to further explain the methods to estimate the number of fish in CWR and made a few adjustments to improve method consistency. EPA also revised the Plan to acknowledge uncertainties in its estimates and to note that EPA's estimates of the number of fish are rough estimates. EPA does not believe a sensitivity analysis is warranted because the year-to-year variability in CWR use appears to be more significant than the uncertainty in the CWR use estimates for a given year. As demonstrated in the Plan, the number of fish in CWR depends on river temperature and run size, which varies by year. EPA recognizes the comments indicating that adults that are transported as juveniles stray more than in-river juvenile migrants. The commenters suggest that because the percentage of transported juveniles was higher prior to 2007, the percentage of fish using CWR when the studies were conducted in the early 2000s may be higher than what occurs currently because staying adults may have been counted as using CWR in these studies. For this reason, it is possible that the percent of CWR use as a function of temperature reported in Keefer et. al. 2009 and Goniea et al. 2006 from studies conducted in the early 2000s has

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		changed. However, EPA's estimates of the number of fish in CWR is based on recent fish count data at Bonneville and The Dalles dams. Further, recent analysis of PIT-tag fish passing these two dams was added to Appendix 12.13 to further characterize CWR use. This analysis indicates river temperature is the driving factor in CWR use. The PIT-tag analysis indicates that there does not appear to be a significant difference in CWR use between steelhead that were transported as juveniles versus those that were not. EPA amended the plan to note this additional analysis. EPA acknowledges that more Snake River steelhead are PIT-tagged versus Columbia River steelhead and that this may distort the estimated number of steelhead in the Deschutes River. The resulting bias would be that EPA's estimates of the number of Columbia River steelhead and the total number of steelhead using the Deschutes River is low.
The Plan suggests harvest is the reason fish that use CWR have lower survival rates than those fish that do not use CWR, but lower survival of fish using CWR may be due to other factors such as higher staying for adults that were transported as juvenile fish.	FPC, ODFW	The commenters raise valid points regarding the uncertainty as to why limited studies to date have shown lower survival rates for fish that use CWR versus those that don't. EPA revised the Plan to indicate that factors other than harvest in CWR may contribute to lower survival with CWR use, such as: fish using CWR may be straying due to being transported as juveniles; fish using CWR may have higher mortality in the mainstem because they have greater susceptibility to warm mainstem temperatures; and fish may obtain diseases in CWR. However, PIT-tag analysis conducted by Brian Maschoff (Appendix 12.13) did not show adult steelhead that were transported as juveniles use CWR at a higher rate than those that were not transported. Further, the studies reviewed (Keefer et al. 2009 and NMFS 2017) indicate that documented fish harvest in CWR largely explained the difference in survival rates.
PIT-tag analysis presented to EPA provides additional analysis on the extent of CWR use.	Brian Maschoff	EPA appreciates the analysis and comments provided by Mr. Maschoff. Some of this analysis, as well as supplemental information provided by Mr. Maschoff, is included in Appendix 12.13 characterizing delayed migration between Bonneville Dam and The Dalles Dam for steelhead and fall Chinook.
Why is the Kalama River not included in the primary CWR tributaries?	USFS	As noted in the Plan, the Kalama River is very shallow at the confluence area in part due to tidal influences. Based on field observations, EPA concluded that CWR

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		use was limited and therefore did not classify it as a primary CWR.
CWR Sufficiency Related Comments		
The conclusion that CWR are currently sufficient is not well supported and needs to be more robust. EPA overly relies upon NOAA's 90%+ adult BON-MCN survival rate, which does not account for annual variation with less survival, wild vs. hatchery fish survival, and populations that migrate mostly in summer. CWR is not sufficiently distributed due to the lack of CWR in the Lower Columbia River upstream of the Deschutes River, including the John Day Reservoir. Disease in CWR with high density of fish was not considered in determining if there is a sufficient amount of CWR. Specific populations at high risk show higher migration mortality (e.g., Asotin steelhead), which should be considered in addition to the overall adult survival rates. EPA should make a single conclusion that CWR is not sufficient if it will not be sufficient in the future.	CRITFC, CRK, CREST, NWEA, TCA, WDFW, Yakama	EPA agrees there are uncertainties regarding the factors that EPA relied upon in its CWR sufficiency findings (e.g., adult migration survival rates through the Lower Columbia River, carrying capacity of CWR, disease risk in CWR, and distribution of CWR). For instance, EPA acknowledges the information presented by WDFW showing that Asotin steelhead have lower adult survival than NOAA's aggregate 90% survival rate from BON-MCN, which indicates that adverse current migration conditions in the lower Columbia River are a significant risk to this population. It is difficult, however, to determine if this reduction in survival is due to the warm mainstem temperatures or insufficient CWR. EPA revised the Plan to further highlight the uncertainties in the factors it relied upon in its assessment of sufficiency of CWR to meet Oregon's CWR narrative water quality standard. EPA also recognizes Oregon CWR standards call for 'sufficiently distributed" CWR and that there currently is a lack of CWR upstream of the Deschutes River. In light of these uncertainties and lack of CWR upstream of the Deschutes River, EPA revised the Plan to conclude that attainment of Oregon's CWR standard will require a cooler Umatilla River to provide more CWR in this part of the Columbia River, in addition to maintaining the CWR temperatures and volumes of the 12 primary CWR. Assessment of attainment of a water quality standard should be made on current conditions, not on a predicted future condition. Nevertheless, EPA recognizes the predicted changes to Columbia River temperatures from climate change and the likely increased use and dependence on CWR in the future. Therefore, the Plan includes recommendations to expand CWR in potential areas throughout the Lower Columbia River in addition to increased CWR at the Umatilla River.
Actions to Protect and Restore CWR Related Comments		
The Plan is not really a plan due to lack of specific actions, responsible entities, and milestones. Recommendations are too vague. The Plan needs specific recommendations for specific parties with reporting and deadlines. The Plan does not meet the	CRITFC, CREST, CRK, USFS, NMFS, NWEA, TCA	EPA agrees that the recommendations for CWR protection and restoration can and should be strengthened. EPA revised the Plan to add more specific actions and to identify responsible parties. However, this is a broad Plan covering over a dozen watersheds, and it cannot realistically be as specific as an individual plan for a specific watershed. Further,

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reasonable and prudent alternative (RPA) because it does not identify and prioritize actions.		because multiple watershed and fish recovery plans are already in place for the CWR watersheds, EPA chose to highlight ongoing or planned programs and projects in existing plans that serve to protect and restore CWR. This approach serves to both protect and restore aquatic habitat and fish recovery within the watershed and to protect and improve the CWR function at the mouth of the tributary. EPA has coordinated closely with NMFS on the development and revisions to the Plan, including the revised recommended actions, and has confirmed with NMFS prior to the release of the final plan that it meets the RPA.
The Plan's recommended actions in Chapter 7 are inadequate. The Plan should not rely on implementation of TMDLs since they are inadequate. TMDL load allocations are not translated into specific actions. EPA has not reviewed how successful the Wind, Klickitat, and Fifteenmile TMDLs have been. WA and OR forest practice rules are insufficient to protect cold water. No specific agriculture practices or water use improvements are identified. The Plan provides inadequate evaluation or prioritization of other plans cited. The Plan contains no specifics on who should be taking actions. States' use of antidegradation/Tier 3 is too vague. EPA should direct states to re-write TMDLs with measurable actions and specific Best Management Practices (BMPs).	NWEA, TCA, CRITFC, CRK	As noted above, EPA revised the Plan to add more specific actions, to identify responsible parties, and to highlight actions that serve to protect and restore CWR that can be found in identified existing plans. EPA also highlighted target reaches for restoration that EPA GIS modeling indicated potential for increased stream shade that salmon recovery plans also identify as important for salmon habitat restoration. EPA identified a number of programs that are important for the protection of CWR watersheds, including federal forest plans, state forest land plans, state forest practices, and county land use regulations. Many of these plans are developed to meet federal and state requirements and, in some cases, updates are needed to meet those requirements. EPA did not evaluate these programs for adequacy as part of this Plan. There are other forums addressing the adequacy of these plans (e.g., agency review of state forest practices, Ecology approval of county shoreline master plans, EPA approval of state CWA non-point programs and CZARA programs). As a general matter, the array of riparian protection programs in the CWR watersheds are fairly good. Riparian protections on federal forest land and on state and private forest lands in Washington have undergone extensive ESA and CWA review and will continue to do so. EPA and others have expressed concerns about the adequacy of riparian protections on private forest land in Oregon. However, the extent of Oregon private forest in the CWR watersheds is limited. For example, Tanner, Eagle, and Herman Creek watersheds are almost entirely federal land, including extensive portions designated as wilderness areas. Further, County Shoreline Master Plans in Washington (which must be approved by Ecology),

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		the Management Plan for the Columbia River Gorge National Scenic Area, Wild and Scenic River, and wilderness area designations serve important roles in riparian protection in CWR watersheds. That said, there are opportunities for improvement. For example, EPA agrees that riparian protection on agricultural lands and Oregon forest land should be strengthened. EPA did not review the adequacy of TMDLs or TMDL implementation plans as part of this Plan. EPA is recommending that Ecology conduct a progress assessment of Wind River Temperature TMDL implementation. EPA also recommends the completion of TMDLs or straight-to-implementation TMDLs in key areas (e.g., Deschutes River, East Fork of Lewis River, and lower tributaries to the Cowlitz River). Many of the existing plans in CWR watersheds overlap in identifying necessary restoration (e.g., sub-basin plans, salmon recovery plans, TMDL implementation plans, watershed plans). The primary approach to restoration of these areas is through grant funding of restoration projects. By highlighting restoration target areas in the CWR Plan, EPA intends to elevate the importance of specific restoration projects that can serve to benefit CWR. Several of the plans EPA cites include project descriptions at the reach level.
Chapter 7 of the Plan needs to include reference to other plans, including other USFS plans and the Management Plan for the Columbia River Gorge National Scenic Areas (CRGNSA) that covers the lower reaches of 10 of the 12 CWR tributaries. Refer to USFS Aquatic Conservation Strategy (ACS), not just riparian reserves.	USFS	EPA agrees with the USFS recommendations and has revised the Plan to reflect these comments.
The Plan does not prioritize the Deschutes River adequately given its importance. The proposed actions to protect and restore the Deschutes are too weak. The role of the Pelton-Round Butte (PRB) selective withdrawal project in warming temperatures and potential to cool temperature is not sufficiently addressed. The USFWS and NMFS	DRA, USFS, TCA	EPA agrees that the Deschutes River provides critical CWR as the only primary CWR above The Dalles Dam. EPA revised the Plan to highlight the importance of this CWR, to demonstrate that current temperatures provide only marginal CWR, and to emphasize that actions are needed to maintain and cool temperatures at the mouth in light of predicted warming from climate change. EPA revised the Plan to recommend assessment of changes to PRB tower operations to potentially cool the Deschutes River at

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Habitat Conservation Plan (HCP) in development is not mentioned.		the mouth in August; to urge development of a Deschutes River Temperature TMDL and associated implementation plan to aid in efforts to maintain and cool the Lower Deschutes River; and to highlight the HCP.
The Plan should emphasize protecting and enhancing all potential CWR, including the small tributaries.	CREST, CRITFC, TCA, NMFS, NWEA, USFS	EPA agrees, in light of predicted future warming from climate change, that all potential additional CWR, including the non-primary CWR, should be protected and restored. EPA made this recommendation in the draft and revised the Plan to clarify this point.
The Plan should put greater emphasis on improving CWR at the tributary confluence area with the Columbia River, including actions to eliminate shallows, increase channel depth, restore alluvial fans, and restore native vegetation.	CRITFC, USFS	The draft Plan discussed the sedimentation concern at the confluence of several of the CWR tributaries and recommended feasibility studies to remove the sediment. EPA agrees that feasibility studies to address the sediment issues at the confluence areas should comprehensively assess restoration solutions. EPA revised the Plan to focus on restoration and sediment management in these areas.
The Plan should recommend stricter fishing restrictions in CWR. Identify temperature threshold to trigger restrictions.	TCA, CREST, NMFS, NWEA	EPA revised the recommendation to say that this Plan may inform future fishing regulations in CWR. Neither EPA nor the state water quality agencies have jurisdiction over fishing regulations. Decisions affecting fishing regulations include many factors beyond EPA's expertise.
The Plan lacks a sense of urgency to protect and restore CWR.	CRK, CRITFC, NWEA, TCA	EPA agrees efforts to protect and restore CWR are urgent, especially in light of climate change. EPA revised the Plan to highlight the need for more CWR to attain Oregon's CWR standard and to emphasize the recommendations for CWR protection and restoration actions.
Water Quality Standard Related Comments		
Designated uses are not protected. Sockeye are not protected by the water quality standards (WQS) since adverse effects occur at temperatures less than 20°C and CWR does not mitigate the effects. WQS should be developed to protect sockeye. Washington's WQS should include CWR criteria to supplement the 20°C numeric criteria. Address Oregon's "seasonal thermal pattern" narrative criteria for the Columbia River. Recognize and make	NWEA, TCA, CRITFC	The focus of this Plan is to interpret and apply Oregon's CWR narrative criteria. EPA did not evaluate the protectiveness of Oregon and Washington's 20°C numeric water quality standard for the Columbia River. The states' tri-annual review processes are the appropriate forums to address the state standards. Oregon's "seasonal thermal pattern" criteria addresses the river temperatures and is distinct from the CWR narrative criteria so it is not addressed in this Plan. EPA, however, acknowledges the significant sockeye mortality in June and early July 2015, when

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recommendations regarding state antidegradation policies, outstanding water designations, and Oregon's Protecting Cold Water narrative criteria.		temperatures atypically reached 20°C during the peak of the sockeye run, as described in the Plan and NOAA's Sockeye Report (NOAA, 2016). Important actions noted in the final CWR Plan include application of Oregon and Washington antidegradation requirements and Oregon's Protecting Cold Water criteria in CWR watersheds with river temperatures below the applicable numeric temperature criteria. EPA also revised the Plan to recommend use changes in two Oregon CWR watersheds (Tanner and Herman Creeks) to reflect the current cold temperatures and associated uses.
Readability and Editorial Related Comments		
Figures are difficult to read, need to be clearer or available separately. For example, Figures 2-5, 2-6, 2-7, 7-4 (and similar figures)	NWEA	EPA enlarged several of the figures, including those in Chapter 2. EPA recognizes some of the figures in Chapter 7 are small, but the reader can zoom the text in an electronic version of the Plan to view it better.
Editorial comments and technical corrections were noted.	NMFS, NWEA, ODFW, WDNR, USFS, Yakama	EPA appreciates the identification of a number of confusing or incorrect statements and references and has revised the Plan to address them.
Positive Aspects of the Plan Related Comments		
Overall, the Plan provides a good assessment of CWR and is a well-researched report. Scientific information about salmonid use of CWR is impressive and generally easy to understand. The Plan is scientifically sound. It is a great report and very useful.	CREST, CTUIR, NMFS, NWEA, TCA, USFS, Yakama	EPA appreciates the comments on aspects of the draft Plan that commenters found to be scientifically sound and useful.

December 5, 2018

To Whom It May Concern,

The Environmental Protection Agency (EPA) "Columbia Cold Water Refuge (CWR) Plan" relies substantially upon the results of the US Department of Agriculture NorWeST summer stream temperature scenarios of the Western United States. As such, my comment here will focus primarily on a substantial error within their "1-kilometer resolution spatial statistical stream network model", which greatly misinforms the EPA's CWR report.

Following that critique, this comment will address the EPA's omission of the Lower Snake River (LSR) from their CWR plan. Removal of the LSR dams in southeastern Washington -- undergoing serious consideration by the US Army Corps of Engineers -- is a reasonable and prudent solution for addressing water temperature needs of Northwest salmon and steelhead. On the other hand, removal of the LSR from the CWR is an inexcusable flaw. Please know, that Federal Judge Michael Simon will be seeing this comment, as will Earthjustice.

It is painful for me to make these criticisms. The errors and omissions are obvious and should have been readily recognized by the developers of these government publications. Having been involved in the effort to recover Idaho's wild Salmon and Steelhead for two decades now, I am unfortunately becoming accustomed to the political maneuvering that has been, and continues to be, insider-meddling of government documents. This is a strong allegation, but it is not put forth without substantial data and documentation.

At The Confluence of Two Important Rivers

Highest
The drainage basin of the Clearwater River is 9,650 square miles and has an average annual discharge of 15,300 cubic feet per second (cfs). As the largest tributary of the Snake River, flowing from the high mountain peaks of the Continental Divide, its clear cool waters were once the world's largest producer of steelhead trout. But in 1972, with the construction of 717-foot tall Dworshak Dam, the world's greatest run of steelhead was extirpated.

To "mitigate" this great loss, the world's largest steelhead hatchery was built a dozen miles downstream. Currently classified as a "Threatened" species worthy of Endangered Species Act protection, the declining numbers of Snake River Steelhead have triggered the Early Warning Indicator of the 2014 Biological Opinion (the very same document that set this CWR Plan into motion). With "recovery" and delisting unimaginable for 50 to 100 years (see NOAA Fisheries Recovery Plan), Idaho Fish & Game now considers it good news if they are able to trap enough steelhead for their broodstock hatchery needs. Importantly, this year's dismal run will trip the Significant Decline Trigger of NOAA Fisheries' Adaptive Management Implementation Plan.

Longest
The drainage basin of the Snake River is 108,000 square miles and encompasses parts of six western states. The largest tributary of the Columbia River, its flows have been recorded as high as 410,000 cfs but average flows are 55,000 cfs at Ice Harbor Dam on the Lower Snake River.

Midway up the Lower Snake River, and flooded by the federal government's Lower Monumental Dam in 1969, is Washington's first National Historic Landmark, the Marmes Rockshelter that holds elk bones, human remains and tools from over 10,000 years ago. Evidence suggests the site first sheltered humans 11,230 years ago and occupation continued for the next 8,000 years.

To the headwaters of the Salmon River, following a 950-mile migration and climbing 6000 feet to snow-fed lakes in Idaho's Sawtooth Mountains, ten thousands of Sockeye would spawn annually. In 2015, warm water conditions in the Columbia and Snake Rivers killed 99% of the Endangered Snake River Sockeye run. This tragedy is very well documented. Sturgeon found belly-up were sliced open, only to find they had engorged themselves with dead Sockeye.

Curiously, the CWR Plan carefully avoids elaborating on this tragic, warm-water incident:

When the river does warm earlier and coincide with sockeye and summer Chinook fish runs, as it did in 2015, the use of CWR is seen as an ineffective migration strategy for these fish. This appears to be because delayed upstream migration by holding in CWR results in exposure to warmer mainstem temperatures during their continued upstream migration as river temperatures continue to heat up from early to mid-summer (CWR Plan page 24).

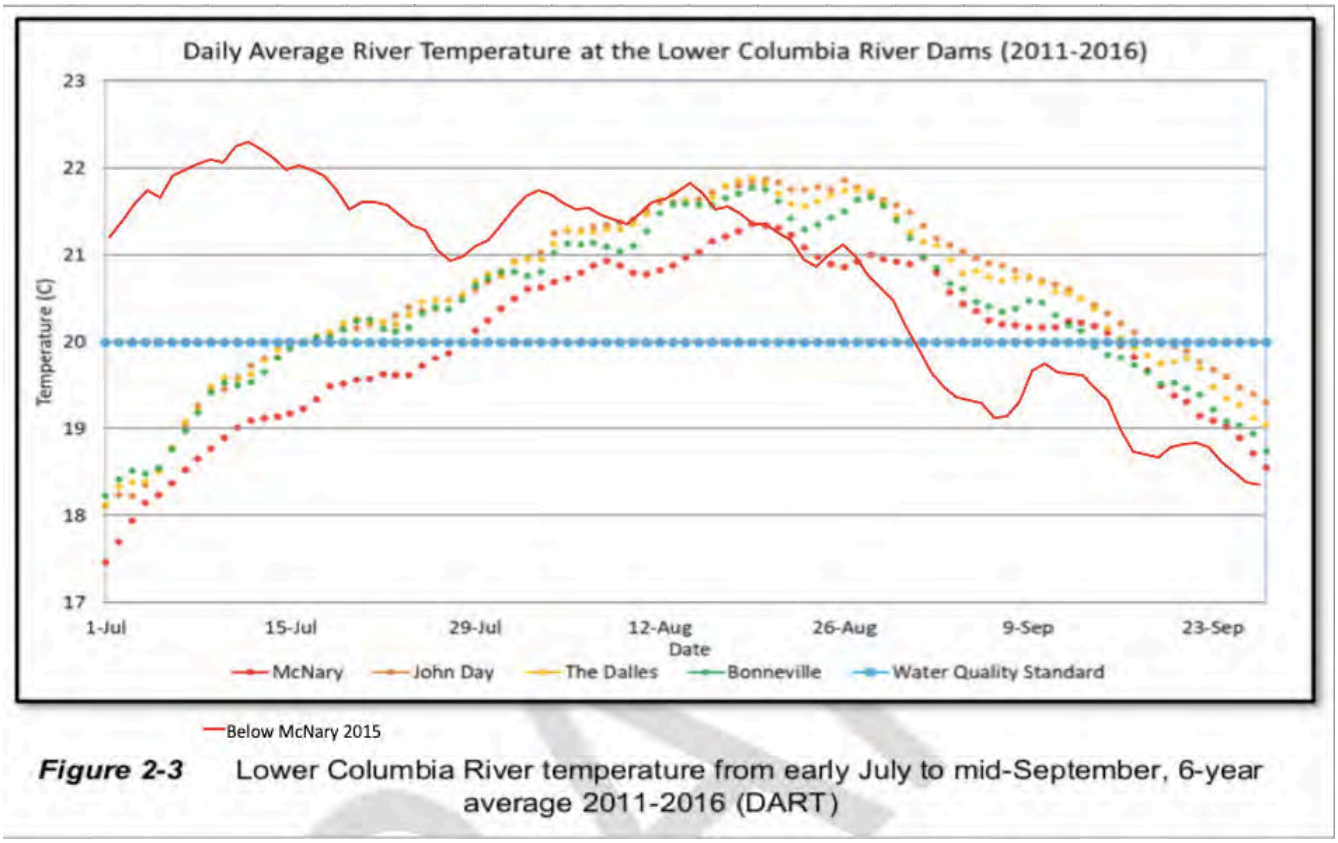
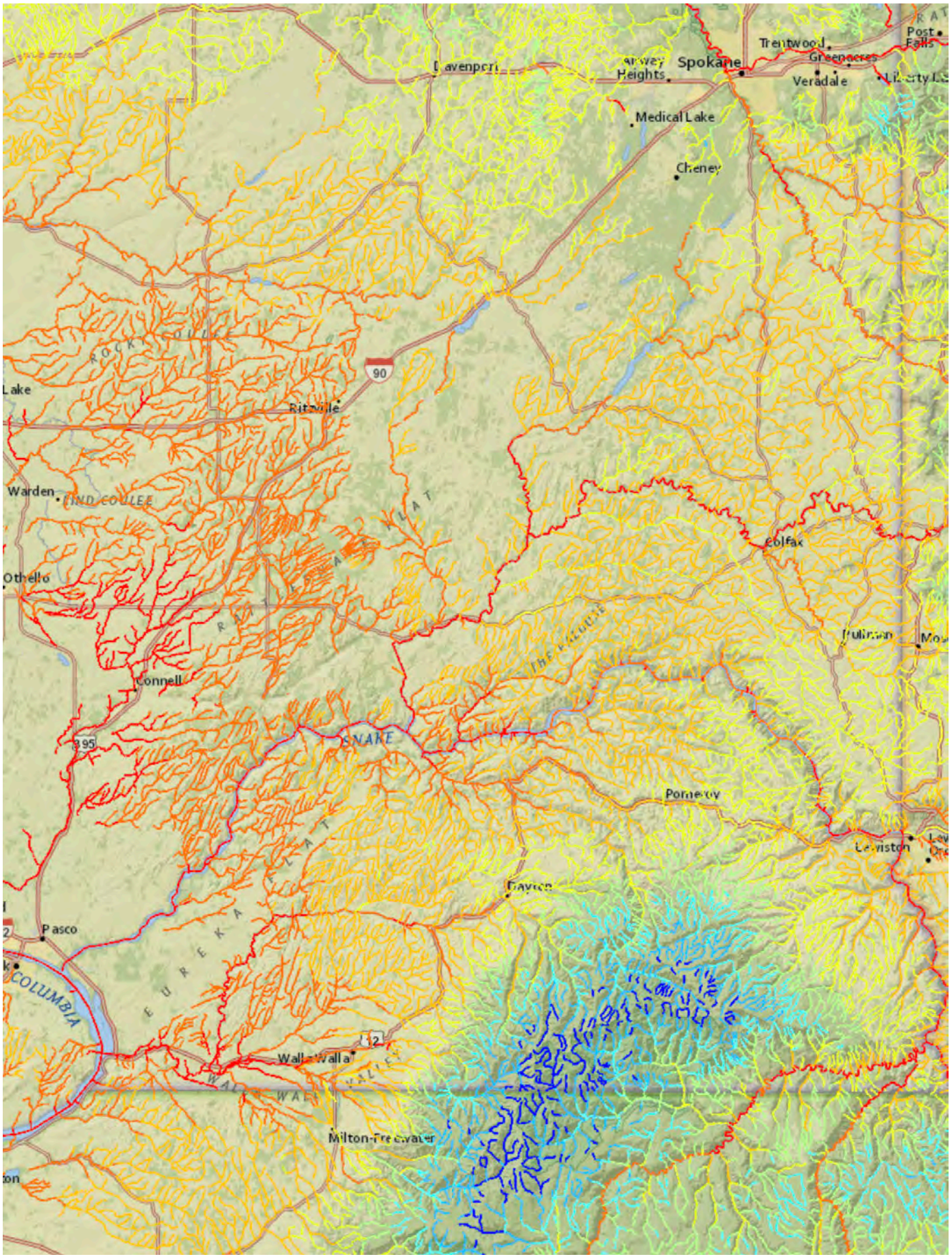


Figure 2-3 of CWR with July 2015 Columbia River temperature below McNary Dam appended by bluefish.

Government employees who fail to address Endangered Species needs are violating the Endangered Species Act and are subject to both civil and criminal penalties (Section 3(12) ESA). By ignoring the injury to Idaho's endangered fish, finding instead that existing river conditions are "not sufficiently impairing", brings all of the CWR authors into the purview of this legislation.

NOAA's Biological Opinion (2019) on the Operations of the Columbia River System, NOAA concluded these losses under current conditions are ***not substantially impairing*** *the recovery of ESA-listed Snake River steelhead and Fall Chinook* (CWR Plan page 51).

Would the CWR authors have us ignore the needs of critically endangered Sockeye? That would be a risky proposition for both the ESA-protected fish, and thereby the CWR authors themselves.



Map: Estimated stream temperatures of Lower Snake River vicinity as modeled by NorWeST.

Stream Temperature Modeling

The result of countless hours of tedious, mind-numbing work, is on display at the NorWeST Modeled Stream Temperatures website (see tinyurl.com/snz8sve), a collaborative project of the US Department of Agriculture and US Forest Service.

By considering the river slope, latitude and elevation of temperature gauges, an impressive map is created (see map of previous page). Think of that a minute. This is rather remarkable: Upstream river temperatures are estimated from downstream recording devices. How is this accomplished?

At the start of the estimating, adjustments are made for recorded temperature readings from within slack-water reservoirs, which are big absorbers of solar radiation. Air temperatures and elevation of temperature recording devices further inform the model. Addition of the average slope of a riverbed helps to estimate the speed of cold-water inputs. The slower the movement of a stream, the more heat absorbed for a given length of travel; reservoirs store lots of heat. To the opposite effect, glaciers bring cold water for an extended time, and are also included in the modeling.

With heaps of historic data carefully inputted, an impressive interactive map is created. The modeled temperatures of nearly all of the streams, creeks and rivers of the West are presented. Impressive.

Oddly, an important input was left aside: The impounded waters of the Lower Snake River dams are missing. For some reason, the NorWeST model has been told that the Lower Snake is a river, but the model needs to know that it is actually a reservoir. Thermometer readings in the wide slack water reservoirs are indicative of the heat that is being absorbed and stored in its slow-moving waters. The model is misinformed: The LSR is not a free flowing river. The LSR has been a reservoir for fifty years, so it is a wonder how the modelers might have missed that fact.

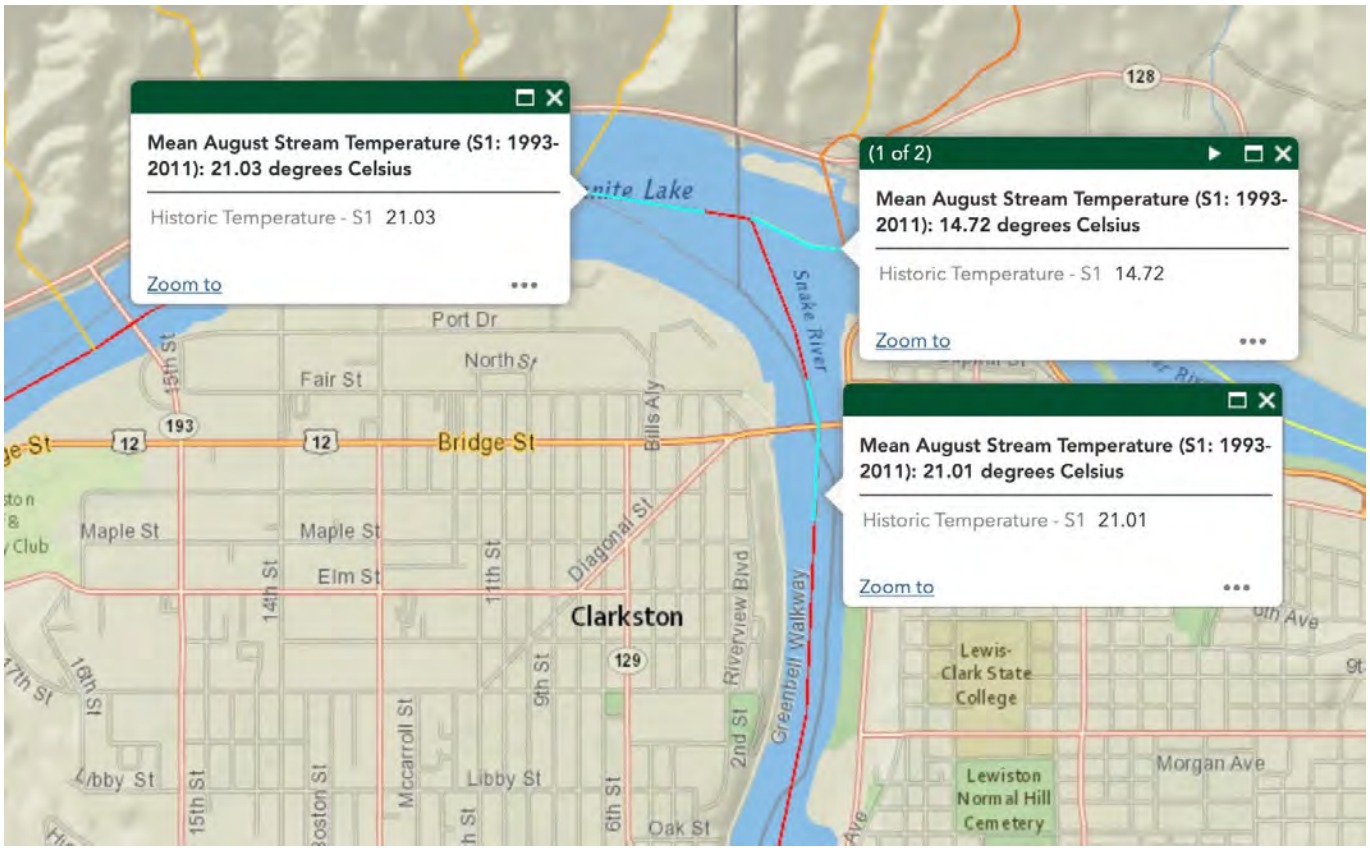
An Obvious Error in modeling the Lower Snake River

From a high-level view (see map previous page), the orange hues that designate the warm water flowing in the Lower Snake Basin, contrast noticeably from the cooler colors of the nearby basins to their north and south. Did the stream temperature modelers somehow miss this oddity?

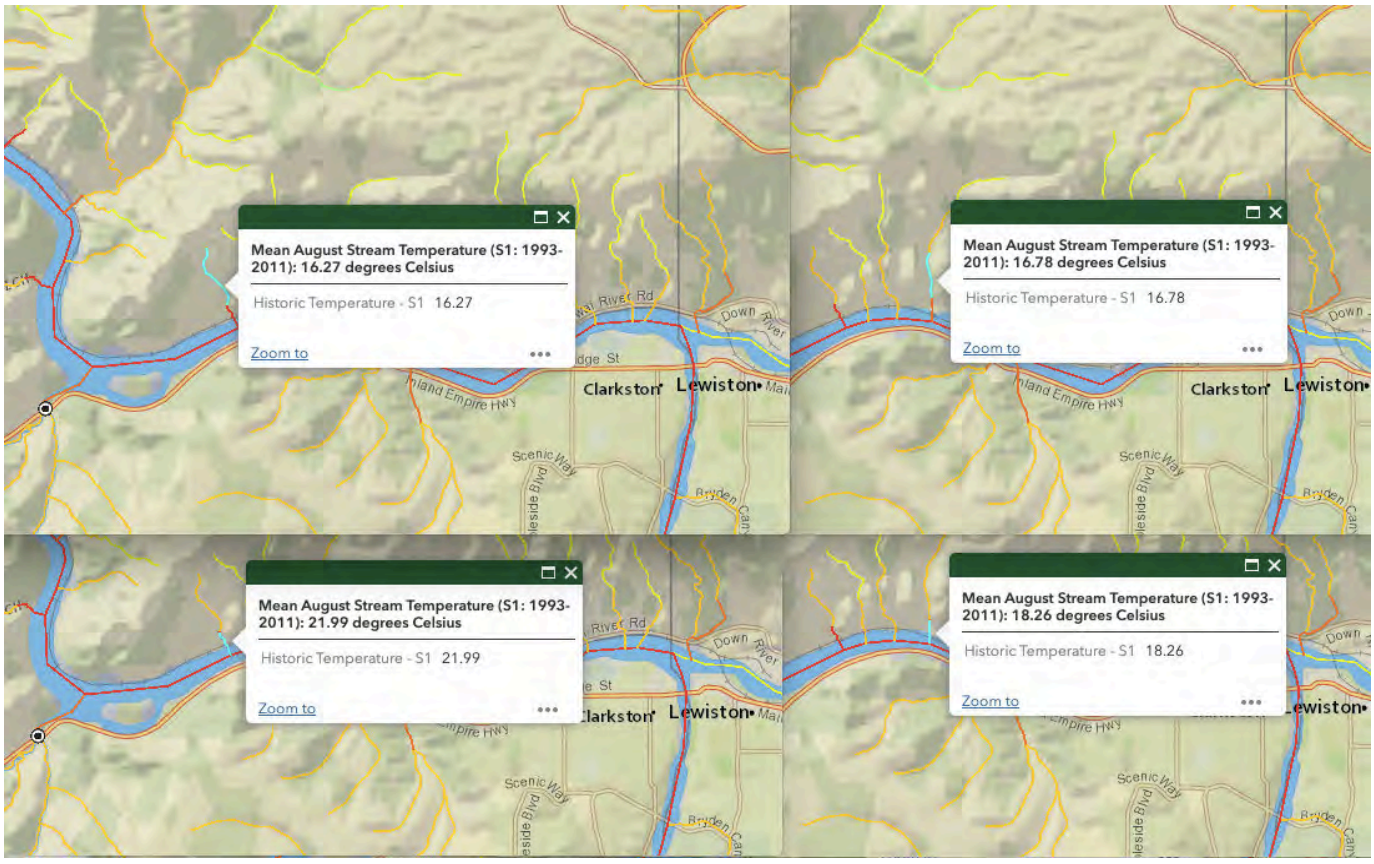
A closer look, zooming into the border towns of Lewiston/Clarkston, brings further unease. Separating the explorer-namesake cities, the warm Snake River from the south meets the cool Clearwater River flowing from the Continental Divide Mountains to the east. Rather than mixing into an equilibrium temperature at the rivers confluence, the model has the Snake becoming warmer! This is clearly incorrect. Warm water plus cool water does not bring warmer water. The NorWeST model is obviously confused here (see upper map next page). Computer programmers refer to this type of problem as "Garbage in, garbage out".

Continuing our map exploration downstream (see map on previous page), one notices warm red spikes from a multitude of small tributaries joining the Lower Snake. In their final descent, the modeled stream temperatures suddenly rise as though hot springs were present near the banks of the Lower Snake River (see lower map on next page). But there are no such heat sources along this section of the river.

Not knowing that the input temperature readings on the Lower Snake are located within a slow-moving, heat absorbing reservoir, the model guesses that warm water must be flowing in from the sides, and that the cool Clearwater River must somehow disappear without any effect at its confluence with the warm Lower Snake River. The model results are absurd.



The Snake River is modeled as becoming warmer below its confluence with Clearwater River.



The NorWeST model incorrectly guesses that small tributaries are abundant sources of heat.

Excusable or Inexcusable?

Compared to the laborious details of connecting the streams to rivers, and creeks to streams, while repeatedly checking for topological connectivity, adding four reservoirs is extremely simple. The modelers need only state the elevation of the four LSR reservoirs, and then allow the Geographic Information System (GIS) software to precisely determine the shoreline. The slow speed and width of the LSR reservoirs would be readily calculated and the spatial statistical model could then estimate the solar radiation input and heat absorption to correspond to the temperature readings within these reservoirs. It would have been easy for the modelers to include these four reservoirs in the model input. Four elevations needed input, but were not. Why the omission?

For those unaware that Senator Slade Gorton rewrote the cover page of the previous NEPA process regarding the Lower Snake River dams -- and adding that the LSR dam "breaching is not necessary at this time to recover listed salmon and steelhead stocks" -- these temperature anomalies might seem to be excusable as just a small oversight, an inconsequential error that will quickly be corrected following this comment. But for those that have seen decades of dishonest reports from a variety of government agencies, this becomes just one more example of insider meddling, dishonesty and might well be considered as fraud. Add to the list of abusers, the Department of Agriculture and US Forest Service for their seriously flawed NorWeST model. The handling of this public comment will determine whether the Environmental Protection Agency may also be added to the growing list of agencies guilty of insider meddling and fraud.

The authors of the CWR Plan must have seen the source of the warm water problems: It is abundantly obvious that the LSR reservoirs are thermal reservoirs. Uninitiated readers of the CWR draft, however, will not see this fact because this fact has been purposely hidden from view.

Cold water plus hot water makes warm water. Correct? Well, not always. Seventy-five pages of a CWR Plan have ample room to explain, but it does not. In a reservoir, mixing is often absent.

Cool water is denser than warm water. Being heavier by volume, it sinks below the warm water that floats on top. This is why the cooling from the Clearwater River does not make it past Lower Granite dam; the coolest water stays below the dams' spillways and turbine intake. Similarly, at the confluence of the Columbia and Snake Rivers the warmer Snake River floats on top of the cooler Columbia. The CWR somewhat describes this occurrence, but greatly obfuscates the fact that the Snake River warms the Lower Columbia. Study Figure 4 (next page) to see the fact.

The Snake River flow is generally close to 20% that of the Columbia River in July and August, so the temperature of the Columbia River has a larger impact after mixing. Figure 4 illustrates this blending, showing the Columbia River (yellow) mix with the smaller yet warmer Snake River (blue) leading to the temperature at McNary (MCPW, Columbia River below McNary Dam near Umatilla*).*

Did you follow that? If the rivers were to actually mix, the smaller Snake River would influence the temperature downstream by "close to 20%". But Figure 4 (next page) reveals that mixing is **not** occurring, meanwhile the text suggests the opposite of that finding. Downstream of McNary Dam, the Columbia River closely corresponds to the temperature of the Snake River, which merged without mixing with the Columbia River, thirty-five miles upstream. The warm water floats on top.

McNary dams spillways and turbine intakes pass this warm surface water downstream. It is the Lower Snake River reservoirs that are the source of the warm temperature problem. This is obvious and irrefutable, but the CWR authors have ignored stating that fact. Why are the CWR authors seeking to hide the truth?

The vertical stratification behind McNary Dam is more complicated than that of other reservoirs in the Lower Columbia River. This is due to the influence of the Snake River on the Columbia River 35 miles upstream. Where the Snake River enters the Columbia River, the Columbia River is cooler than the Snake River during the summer (Figure 4). The merging of the cooler Columbia River and the warmer Snake River likely contributes to the more substantial vertical temperature gradient in the McNary reservoir, with the warmer Snake River water layering on top of the cooler Columbia River water. (CWR Plan Appendix 1 page 11)

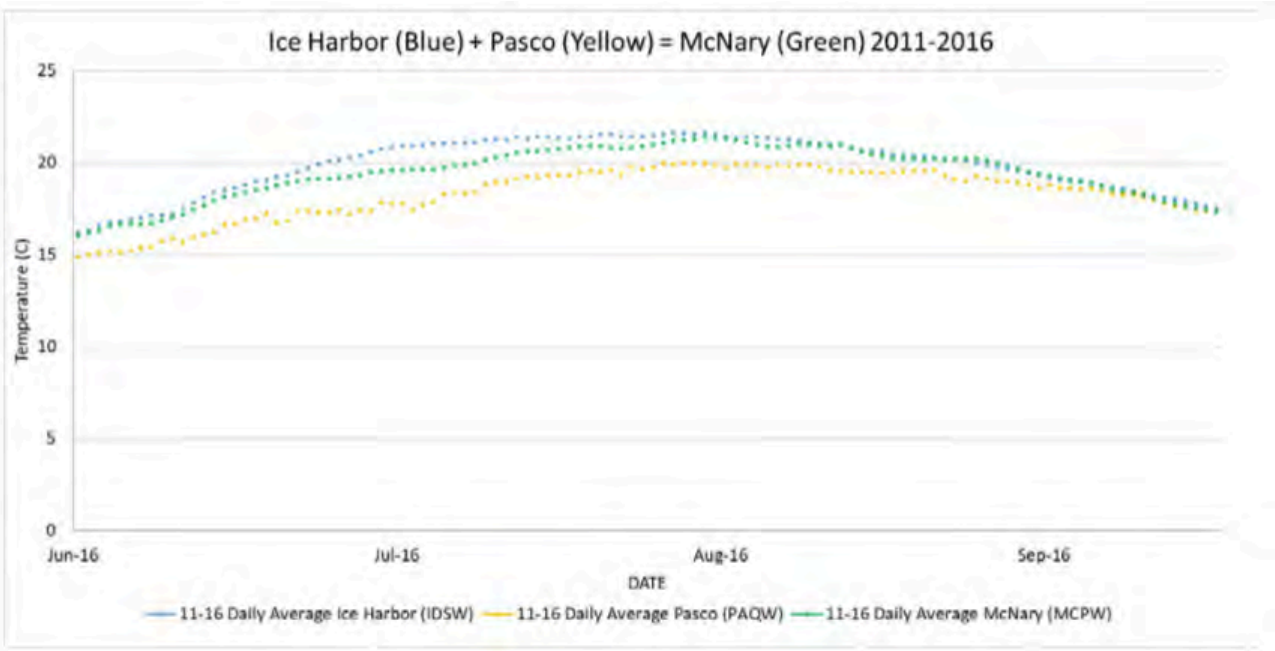


Figure 4 Influence of the Snake River (IDSW) and Columbia River as measured upstream of the Snake confluence in Pasco (PAQW) on the Lower Columbia River as measured at McNary Dam (MCPW)

Explanation of Obfuscation

Before presenting their draft out for public view and comment, insiders bent upon keeping the LSR dams, corrupted the CWR draft. By incorporating a well-used strategy of limiting the scope of a plan (or report), the warm waters of the Lower Snake River were concealed by placing them outside the scope of study. In its opening pages, the reader is told that the CWR will include the Snake River.

Since the Snake River entry at river mile 325 is near the Oregon-Washington border, EPA extended some of the analyses in the plan to the Snake River. (CWR Plan page 3)

The leading map (Figure 2-1, next page) suggests that the CWR Plan will look at Columbia River tributaries far up into Washington. Five pages later, we learn that the study will stop at the confluence of the Snake River. With 191 tributaries <u>below</u> the Snake River included, the Lower Snake River (entering top right of Figure 2-5 on next page) is almost completely ignored.

The National Hydrography Dataset identifies 191 tributaries that flow directly into the Columbia River between the mouth of the Columbia River and the confluence with the Snake River. Current August mean water temperatures for these rivers were obtained from a Spatial Stream Network model developed by the U.S. Forest Service (page 8). Figure 2-5 illustrates these 191 tributary confluences (white dots) along with the predicted August mean temperature of the tributary.

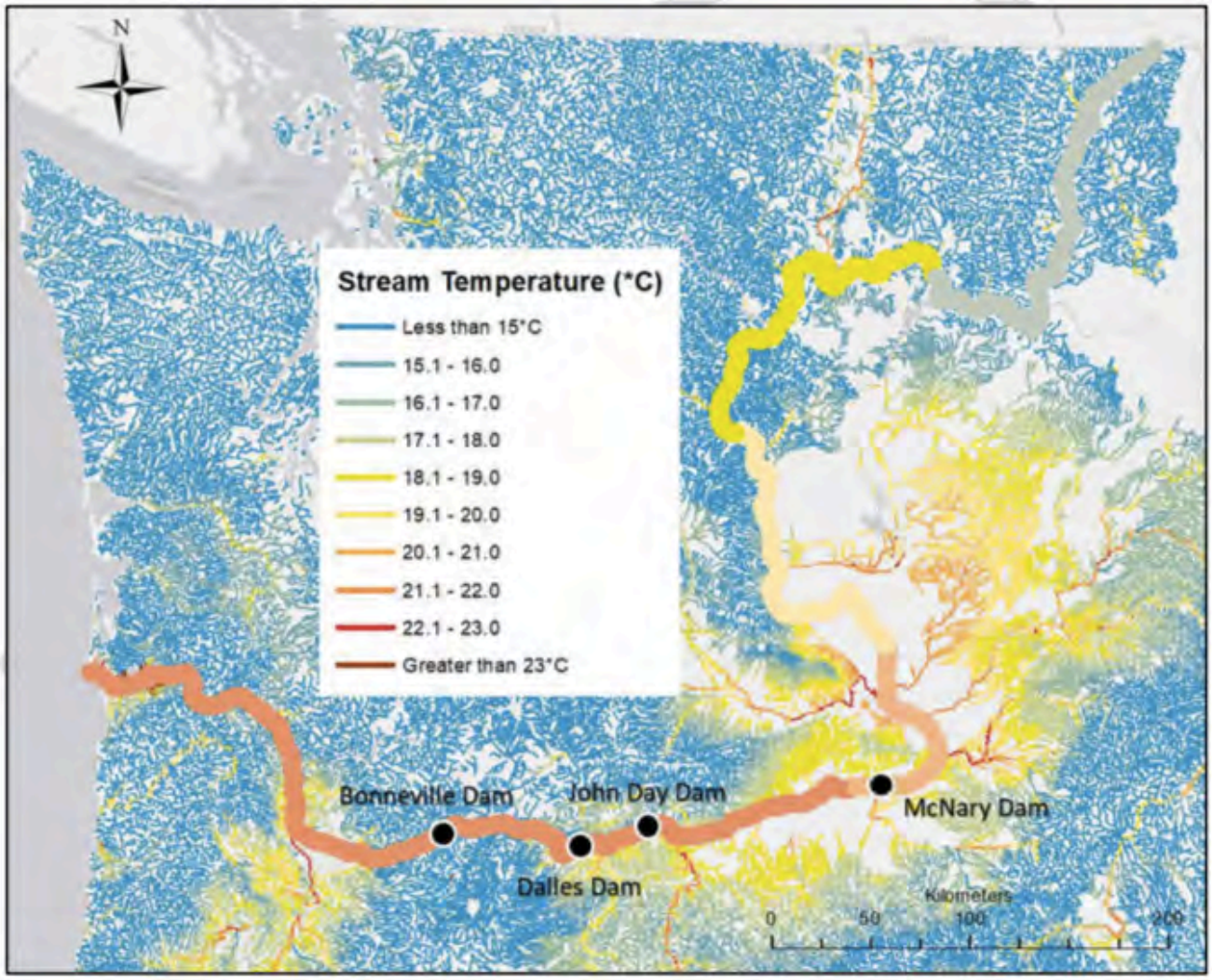


Figure 2-1 Current August mean water temperature in the Columbia River and tributaries (2011-2016) (Appendix 12.14)

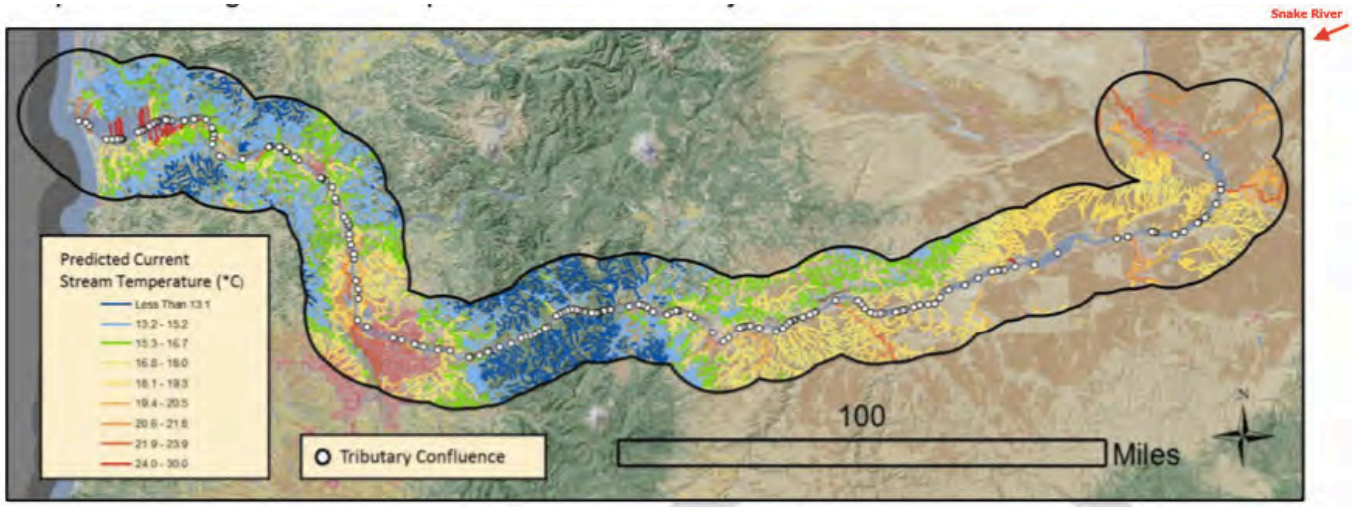


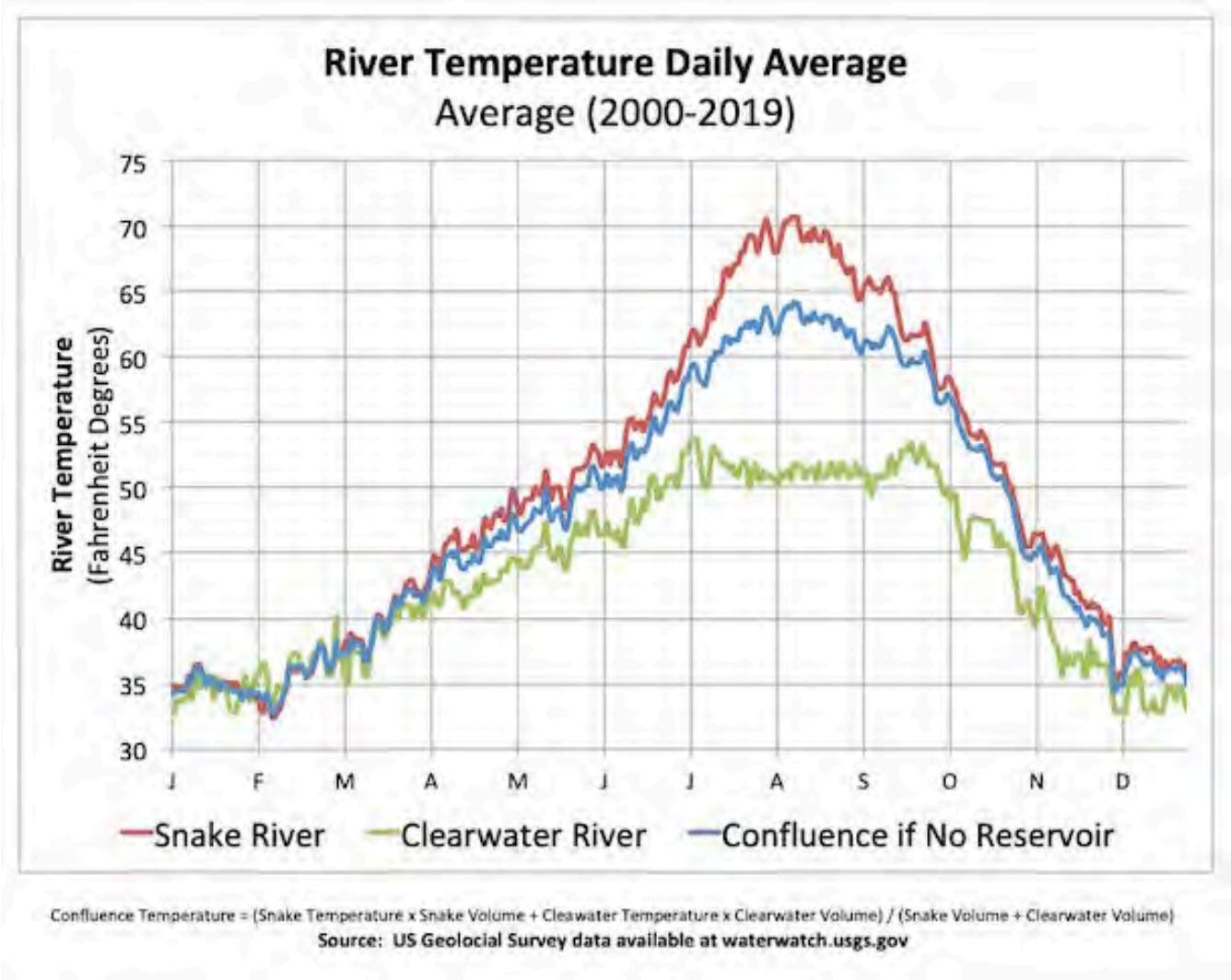
Figure 2-5 191 tributary confluences with the Lower Columbia River (white dots), with predicted stream temperatures from the NorWeST database [predicted August mean stream temperature for the 1993-2011 period]

Though seldom mentioned elsewhere in the CWR Plan, the Snake River does appear in the discussion of the HexSim model by noting that the Lower Snake River should have been included.

If too much energy is lost during migration and pre-spawning, a fish may not have enough energy to complete spawning.... However, to evaluate the implications of energy use on spawning success, energy loss needs to be evaluated within the context of the entire migratory journey, including holding and spawning. For example, Grande Ronde summer steelhead migrate another 170 miles upstream in the Snake River before traveling up the Grande Ronde River to their spawning grounds.
...
In summary, it is necessary to model the full migration to the spawning grounds to fully assess energy loss and the potential for pre-spawning mortality, as was done in the Plumb (2018) and Conner et al. (2019) papers. (CWR Plan page 69).

As it stands now, the cooler Clearwater River slips under the warmer, less dense Snake River. Then at Lower Granite Dam, the warm surface water passes downstream, with the cool Clearwater inflows trapped beneath the reservoir's thermocline.

Using US Geological Survey stream data, it is easy to calculate water temperatures if the rivers were to mix. Summer temperatures would be six-Fahrenheit degrees cooler and the Columbia River would also be cooler, with the Snake River turning into a Cool Water Refuge tributary.



Confluence Temperature = (Snake Temperature x Snake Volume + Cleawater Temperature x Clearwater Volume) / (Snake Volume + Clearwater Volume)
Source: US Geolocial Survey data available at waterwatch.usgs.gov

If the Lower Snake River dams truly were harmless, as the Save Our Dams lobby would have us believe, would there be such a grand effort towards hiding the truth? Why not let the facts speak for themselves?

By including just one more mile to the scope of study, the whole story changes entirely (see final page of this comment, comparing Figure 2-7 of CWR Plan and an amended version by bluefish).

The authors of the CWR surely know the temperature problem confronting the migrating salmon and steelhead. After seeing the graphics of the next page, you too will know the root of the temperature problem.

With this serious charge of illegitimate meddling, I now conclude this comment. If just one more mile were included in the CWR Plan the Lower Snake River would be included. Quite obviously, the CWR authors purposely excluded the Lower Snake from our view. This is inexcusable.

Sincerely,

Scott Levy
bluefish.org
promoting an open and **honest** dialogue concerning the plight of Idaho's wild Salmon and Steelhead.

BEWARE: the Save Our Dams lobby does not want you to see this comparison.

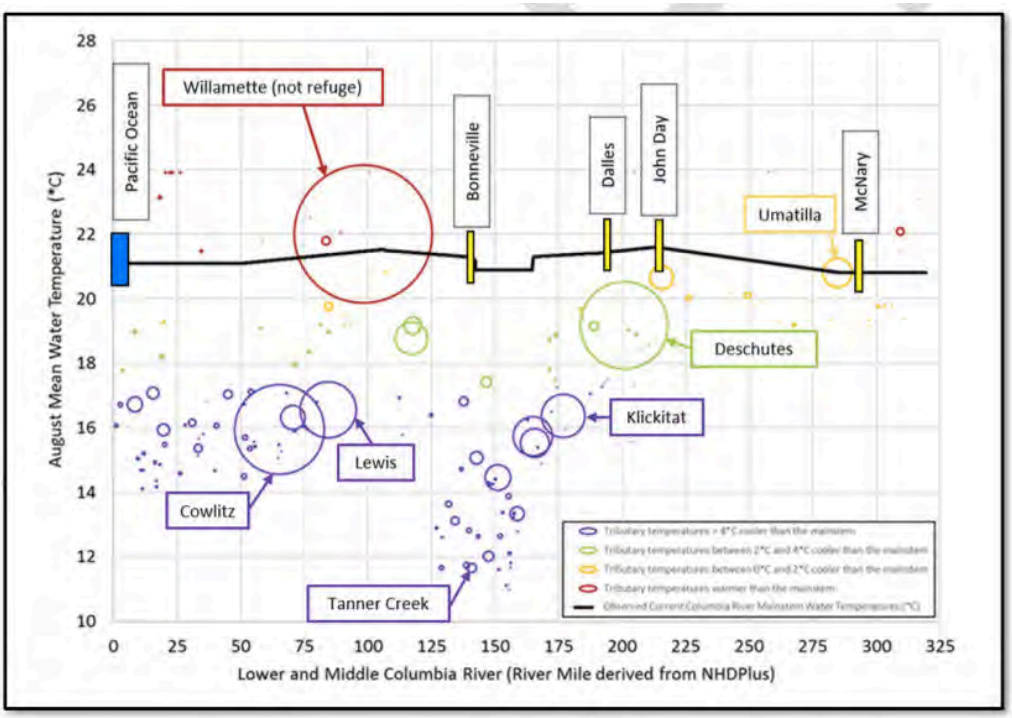


Figure 2-7 Modeled August mean stream temperatures for tributaries in the Lower Columbia River. Circle sizes illustrate relative tributary flow.

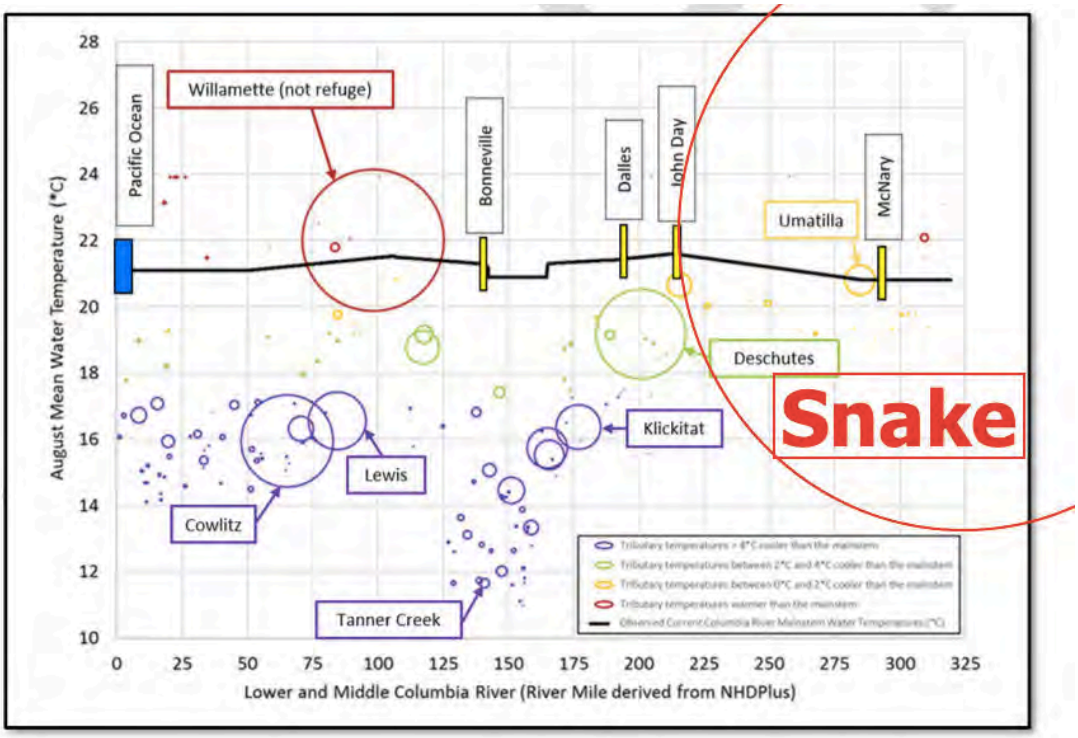


Figure 2-7 Modeled August mean stream temperatures for tributaries in the Lower Columbia River. Circle sizes illustrate relative tributary flow.

From: Lut,Agnes (BPA) - E-4 <axlut@bpa.gov>
Sent: Wednesday, December 4, 2019 8:35 AM
To: Palmer, John <Palmer.John@epa.gov>
Subject: RE: Draft Columbia River Cold Water Refuge Plan

Good Morning John
Thank you for the opportunity to review and provide comments on EPA's draft Columbia River Cold Water Refuge Plan. BPA appreciates the collaboration.
As part of our review, we have the following comments to submit for EPA's consideration which are mainly on the climate change section of the document:

Climate Change Comments: pgs 61-66:

1. P 61: Please explain why the historical temperature graph only goes up through 2004?
2. P 62: The RBM10 documentation citation is from 2018, but is the model itself much older? Please state what model version of RBM10 is being used.
3. P 62: The standard errors could be pretty large (+/- 1°C or +/- 2°F) for a monthly time step, would you say that was expected and regular for such a modeling effort?
4. P 63. An outdated version of the IPCC-4 air temperatures is being used (A1B emissions scenario, which was the more aggressive scenario back in 2008). Considering there is plenty of updated IPCC-5 data, downscaled to high resolution (available from UW as part of RMJOC-II) why was this updated air temperature data not used in the analysis?
5. P 63: EPA cites Dan Isaak's NorWEST SSN model (2018) (https://www.fs.fed.us/rm/boise/AWAE/projects/SpatialStreamNetworks.shtml) and Yearsley (2009), it is unclear where the climate change projections came from or whether EPA is extrapolating 1940-2004 trends forward. Please clarify.
6. Appendix 12: Goes into a little more detail, with a cover memo dated February, 2019. Why was the year 1994 removed from the "historical" Columbia River water temperatures 1993-2003? Please provide rationale or add it back in.
7. Appendix 12: These results only average a few select years, and show inconsistent averages between individual river locations. Please provide explanation in the document on why this is occurring.
8. General Comment on Climate Change: Why was the RMJOC-II climate change findings not used for the Climate Change section? In regards to climate change analysis, the RBM10 is a rather simplistic 1D column model which does not take into account other confounding variables like reservoir stratification, groundwater influences, etc. Please provide explanation in the document on why RMJOC-II was not utilized for the climate change analysis.

If you have any questions about our comments, please let me know.
Thank you
Agnes

Agnes Lut
Clean Water Act Policy Advisor
BONNEVILLE POWER ADMINISTRATION
bpa.gov | P 503-230-5651 | C 971-271-4784 | axlut@bpa.gov

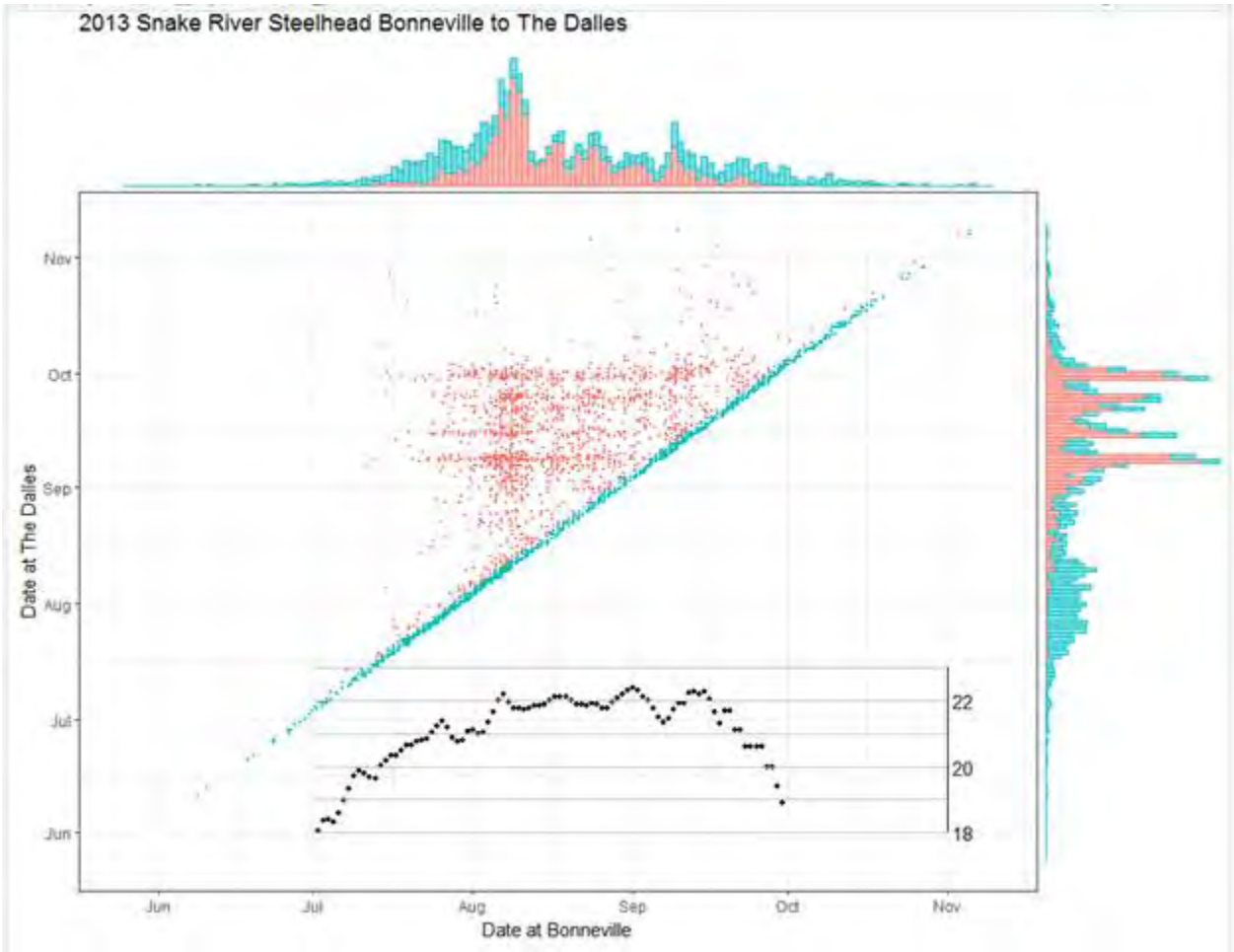
From: Brian Maschhoff <bmasch@gmail.com>
Sent: Friday, October 4, 2019 10:34 AM
To: Palmer, John <Palmer.John@epa.gov>
Cc: Merz, Martin <merz.martin@epa.gov>
Subject: RE: Draft Columbia River Cold Water Refuge Plan

John,

Thank you for including me on this.

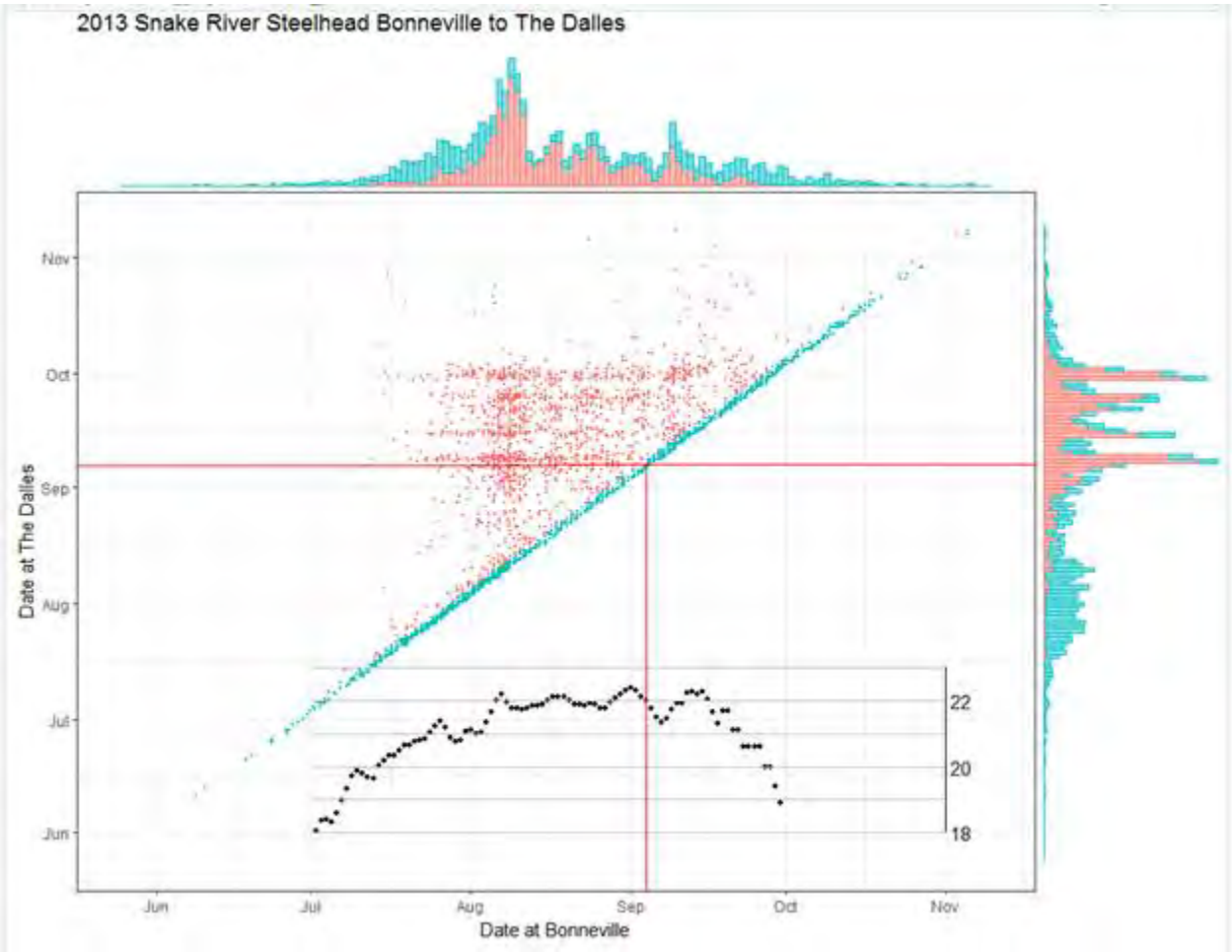
I have some results you will find interesting. I worked on this a little bit ago, but the summer and into September was a bit crazy in my world. Plus, I wanted to write it up in a more formal way, but everything else kept taking priority. I know this is reaching you rather late in the process, but here it is. I am happy to present this more fully in the near future.

This analysis uses data I already had for PIT-tagged fish (tagged primarily as juveniles) detected at Bonneville and The Dalles, plus the daily temperatures at the dams. Without further ado, here is the picture:

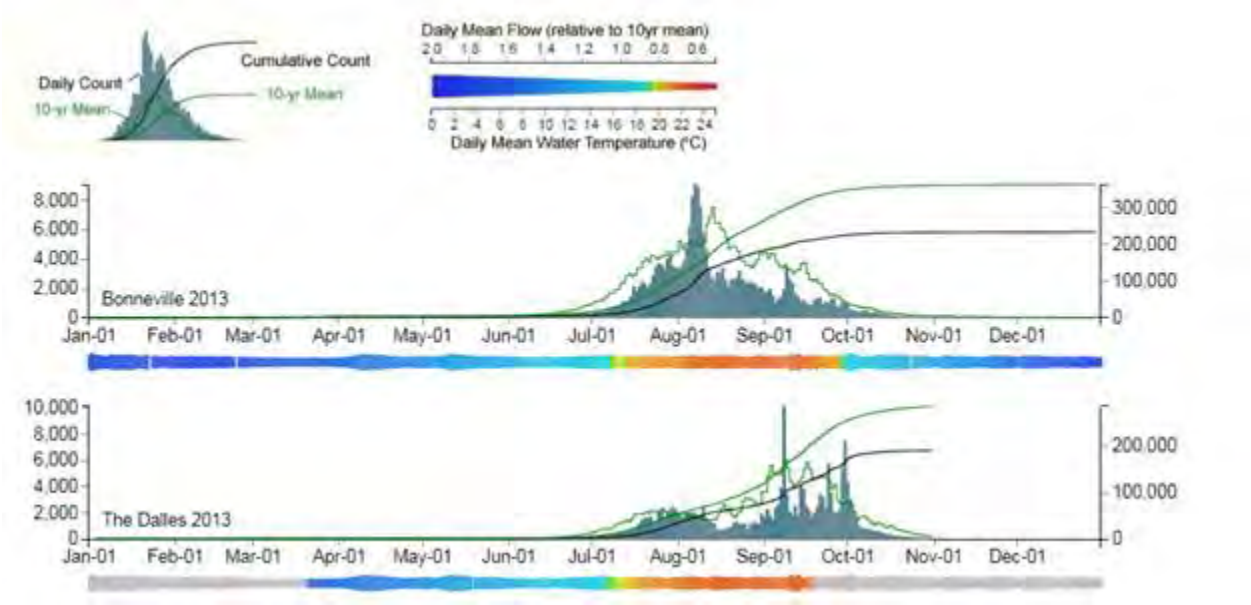


There are four components to the above chart:

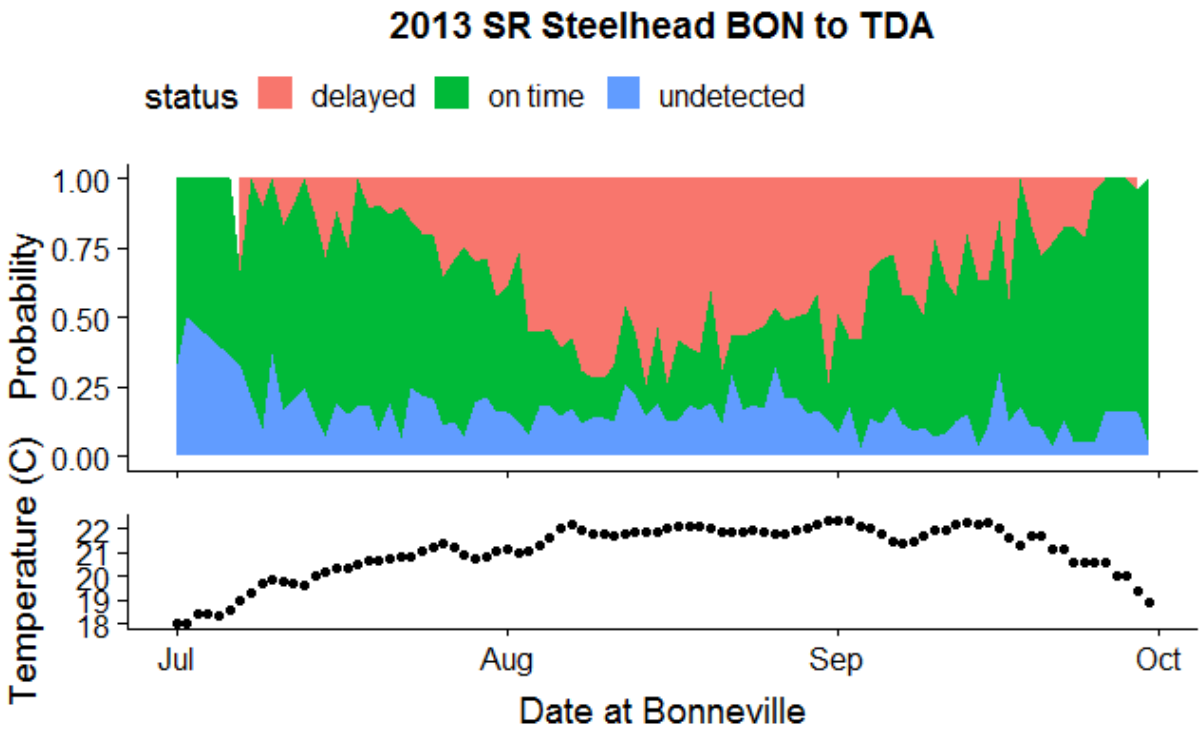
1. Scatterplot of detection datetime at Bonneville (the last adult detection at one of the adult sites) vs. the first detection datetime at The Dalles. The color encoding is True/False for “delayed”. I am using a threshold of > 6 days travel time between dams equals “delayed”. This is arbitrary, but as you can observe in the above, is a reasonable choice. In any case, for the clearly delayed steelhead, there are rather interesting patterns in both the vertical and horizontal directions. This scatterplot doesn’t give a good sense of the relative number of fish delayed, though, since a lot of blue dots might be overlapping near the apparent diagonal.
2. At the top is a histogram of the detections by day at BON, with the same color encoding. This is of course the arrival rate, and the relative height of red to blue at a given day corresponds to the fraction which will take longer that tmax (or 6 days) to get to TDA
3. On the left is the corresponding histogram for arrivals at The Dalles, rather different, and highly structured profile from the top. Clearly, many of the fish which depart Bonneville from July into August don’t arrive until September-October, but more interestingly, they arrive in bunches (OK, schools), with each group including fish with a large spread of travel times.
4. Inset at the bottom is the forebay daily mean temperature at Bonneville (degrees C). This provides one measure of the reservoir temperature around the time that the fish finally arrive at TDA (as shown below). One could also use temperatures at TDA tailrace (or some average), but there is minimal difference between these. Also apparent is the temperatures at which the probability of delay becomes large.



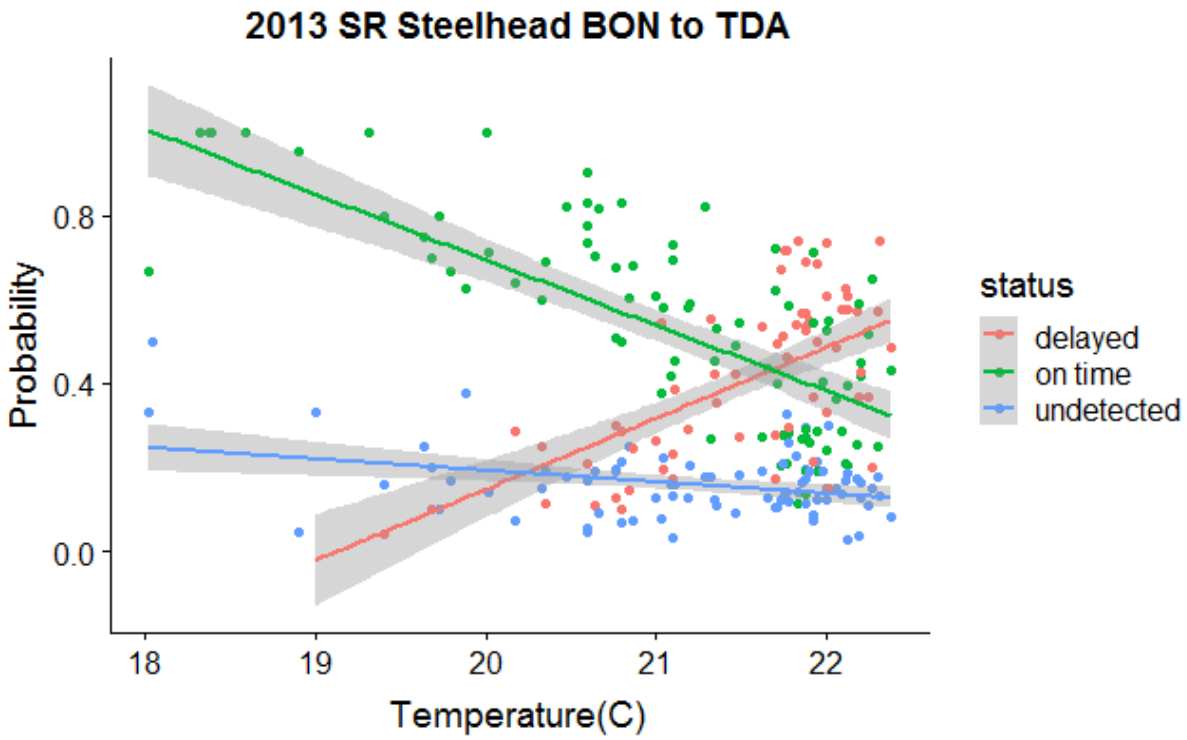
The same punctuated arrival distribution at The Dalles is also observed in the steelhead visual ladder counts (shown below), so it is clear that something interesting is going on even without the connection between the times at BON and TDA for each fish.



Returning to the PIT-tag analysis, the probability of a fish experiencing delay (> 6 days travel time) by date at BON can be computed from the top histogram (#2) of BON arrivals. However, that analysis (by definition) only includes fish detected at both dams, and we should also consider the fish detected only at BON.

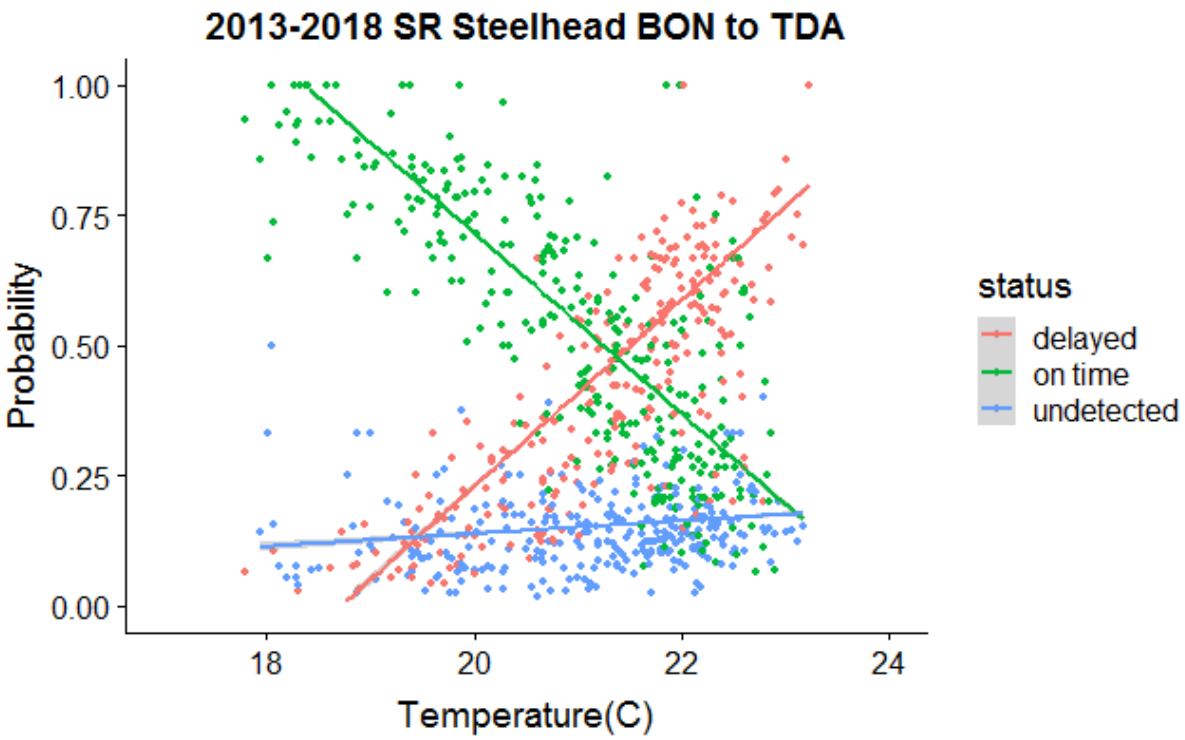


Also, the probability of delay can be correlated to temperature:



It is of course no surprise that “on time” decreases and “delayed” increases with temperature, but at least for that year, there was much less effect on the probability of not being detected at The Dalles.

I have repeated the above analyses for years 2014-2018 (and for Fall Chinook. There is considerable difference between years. While 2013 is the most striking, the delay to and punctuated arrivals at TDA is always present to some extent. Combining years for steelhead:



Discussion

Here I will state the obvious:

1. Many steelhead take longer than 6 days to travel between Bonneville and The Dalles
2. Groups of fish often arrive at TDA at a date irrespective of their travel time (or date at BON)
3. The probability of being delayed increases with temperature
4. From PIT-tag data alone, it is not possible to discern what each fish was doing in between detections, where they spent their time.

There are many other explanations, of varying degree of likelihood, but I will describe one model which is consistent with the PIT-tag results and the prior work using radio-tagged fish. I call it:

The Bar Hopping Model

Consider a street with several drinking establishments, but different closing times. As one bar closes, the patrons there move on down the street and some of them stop at the next open bar while others just go home (or maybe another open one). And when that second one closes, the bar hopping repeats and so forth until all bars are closed for the night.

Alternately, consider the reservoir above Bonneville with a several cool water refuges. Some fish just want to get to The Dalles right away, but others stop at the nearest spot (CWR) to cool off. The fish in a hurry are the blue diagonal in the top chart. The fish at the CWR stay there until something prompts them to leave (perhaps a trigger low temperature differential between the CWR and the reservoir). Some of the those departing swim all the way to The Dalles (yielding a peak in the TDA arrival distribution determined by the “closing time” plus the direct travel time from that CWR location to TDA. This repeats until all CWR have kicked out all of their customers (some, sadly, never make it home).

This can be contrasted with the “Rest Stop” model, where some fish stop and spend some time (a given mean +/- some variability) before moving on. This model is not consistent with the PIT-tag analysis presented above, however. Arrival time is either closely correlated with BON departure time – or not at all (the peaks).

Of course, the CWR are not likely lined up geographically in order of “closing time”, and thus it might not be possible to assign a given arrival peak with a particular CWR. But complementary radio tag data might provide the correlation. The PIT-tag data is readily available with much larger sample sizes than practical with radio tags, and the confounding factor of fish distress after being cut open at the Bonneville AFF is avoided.

The PIT-tag data can of course be subsetted by specific attributes (hatchery/wild, release subbasin, juvenile transported or not, age, etc.), although this would make the data a bit noisier.

Regards,
Brian

COLUMBIA RIVER ESTUARY
STUDY TASKFORCE

December 4, 2019

John Palmer, EPA Region 10
VIA EMAIL: palmer.john@epa.gov

RE: Columbia River Cold Water Refuges Plan

Dear Mr. Palmer:

Thank you for the opportunity to provide comments on the final draft of the Columbia River Cold Water Refuges Plan. This plan provides useful information on the current temperature conditions faced by salmon and steelhead migrating through the Lower Columbia River Estuary, as well as an estimation of future concerns due to the gradual rise in water temperatures facing the Columbia River Basin.

The Columbia River Estuary Study Taskforce (CREST) is a bi-state Council of Governments that works with local jurisdictions in Oregon and Washington at the mouth of the Columbia River. For 45 years, CREST has provided coastal and estuarine technical services for members and coordinated activities between local, state, and federal agencies. Our work has focused on land use planning, particularly land use planning as it relates to natural resources, and large-scale watershed restoration in the Columbia River Estuary. CREST develops and implements restoration projects that expand habitat and food web connectivity to increase overall salmonid survival. As restoration practitioners on the Columbia River, we appreciate the opportunity to expand on the recommendations provided in the Columbia River Cold Water Refuges Plan to encourage the continued survival of salmonid populations in the Columbia River basin.

CREST's recommendations include not only increasing protection and restoration actions on the existing Cold Water Refuge (CWR) tributaries, but also assessing and prioritizing restoration opportunities on marginal CWR tributaries and tributaries. While these tributaries do not currently provide cold water inputs of more than two degrees Celsius, they may have the capacity to provide cooler temperature inputs in the future with additional restoration actions. Our recommendations also encourage the

818 Commercial Street, Suite 203, Astoria, OR 97103 Phone: (503) 325-0435 Fax: (503) 325-0459 Web: columbiaestuary.org

EPA to work with state and federal regulators to update fishing regulations to protect salmonids utilizing CWR during the periods of warm Columbia River temperatures.

Restoration

Assess Marginal CWR Tributaries for Restoration Opportunities

CREST specializes in removing dilapidated tide gates, culverts, and failing levees to restore hydrologic function both directly on the mainstem of the Columbia River, and on its tributaries. Some of the projects that CREST has implemented in the estuary directly contribute cold water to the system and were not previously accessible to fish because they had perched and damaged culverts at the confluence of the Columbia River. Although not seen as CWR tributaries because of their size, they contribute CWR to the juvenile salmon migration route on the Washington shore in the estuary (McMichael et al. 2010 Migration Behavior and Survival of Juvenile Salmonids in the Lower, Columbia River, Estuary, and Plume in 2010).

Fort Columbia and Megler Creek are examples of culvert replacement projects near the Astoria-Megler Bridge where perched, undersized culverts were replaced for increased fish access and to restore hydrologic processes. That stretch of the Washington shoreline is heavily armored with riprap and has many small cold-water drainages with perched culverts that flow into the Lower Columbia River. Though these lower Columbia projects focus on juvenile coastal Coho, chum, steelhead, and Chinook habitat, they also offer cold-water "stepping stones" for adult Fall Chinook and summer steelhead migrating through the system.

Although the studies referenced in the Columbia River Cold Water Refuges Plan indicate that the current number and distribution of CWR habitat is sufficient, we need to be proactive, knowing that rising global temperatures will eventually reduce the effectiveness of these tributaries during periods when the Columbia River water temperatures are the highest. Restoration projects should be targeted at the twelve recognized CWR tributaries and should also be implemented in areas that lack large influences of cold water. We encourage the EPA to partner with state and local practitioners to assess the marginal CWR tributaries and tributaries that have characteristics that make them close to being marginal, and prioritize restoration actions on those tributaries such as increasing riparian plant cover and restoring natural stream morphology and complexity. We believe increasing cold water inputs from additional tributaries such as those that CREST has completed at Fort Columbia and Megler Creek, may help to maintain sufficient spatial and temporal extent of CWR as the temperatures in the Columbia River rise further due to increased global temperatures.

Research Tributary Diversion Structures

We also want to mention research conducted by our colleagues from the Lower Columbia Estuary Partnership on diversion structures at the mouth of tributaries to deflect mainstem river flows, therefore protecting the integrity of the plume. These structures could encourage eddy formation which slows water and scours out sediment, resulting in cold-water retention at the mouth of the tributary. The structures could also extend the plume footprint further into the mainstem and can be constructed with onsite materials (i.e. large wood). We believe that additional research into the effectiveness of these diversion structures may be beneficial in proactively exploring techniques that will help maintain the effectiveness of existing CWR, and improve marginal CWR, into the future.

Protection of Existing CWR

Update Fishing Regulations to Protect Primary CWR Tributaries

In addition to prioritizing restoration on CWR tributaries and tributaries with potential to provide cold water inputs, CREST also encourages the EPA to work with state and federal regulators to update fishing regulations to protect the CWR habitat. Stricter fishing regulations should be implemented to restrict harvesting fish in CWR tributaries, as well as at their confluences with the Columbia River, during the periods of warmest temperatures. Restricting fishing within the CWR tributaries and at the confluences of the twelve primary CWR tributaries should be established to protect endangered species during their most vulnerable time to ensure that harvesting does not decrease the survival rates of Columbia River salmon and steelhead populations.

Thank you, again, for this opportunity to provide comments on the recommendations of the Columbia River Cold Water Refuges Plan. Going forward, we believe the plan will be useful in protecting CWR in the Columbia River, and maintaining their effectiveness in providing refuge habitat for migrating salmonids during periods of the year when water temperatures increase to the point of causing adverse impacts on population survival. We look forward to learning where the EPA takes the information you have collected during this planning process. Please feel free to contact us with questions or if you need additional information.

Sincerely,

Denise Lofman
Director

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232

(503) 238-0667
F (503) 235-4228
www.critfc.org

December 6, 2019

Via Electronic Mail

John Palmer
Environmental Protection Agency Region 10
1200 6th Avenue
Suite 155 (19-C09)
Seattle, WA 98101
Email: palmer.john@epa.gov

RE: EPA's Columbia River Cold Water Refuges Plan, October 2019 Draft

Dear Mr. Palmer:

The Columbia River Inter-Tribal Fish Commission (CRITFC) is very concerned about rising water temperatures in the Columbia River Basin. The region needs water temperatures that are supportive of the most sensitive uses by salmonids and other cold-water fish. With climate change, water temperatures have and will continue to rise and without actions to reverse the trend, the value of cold water refuges (CWR) for protecting fish populations increases. The draft EPA Columbia River Cold Water Refuges Plan (Plan), however, misses the opportunity to improve and expand the current menu of existing CWR, which are not enough – in quantity and quality – to protect cold water fish. Protecting areas that provide CWR to aquatic resources is a priority for the Columbia River tribes in their efforts to protect important treaty fisheries. EPA and the states must do more.

Human development throughout the Columbia River Basin has wrought habitat destruction and weakened the quality of the waters, reducing some salmonid populations to the edge of extinction. Historically, average annual salmon runs returning to the Columbia Basin above Bonneville Dam were estimated to have been in the range of 5 to 11 million fish. These runs have declined by over 90 percent, and currently 13 salmon and steelhead trout populations in the Basin are listed under the Endangered Species Act. NOAA Fisheries' November 2015 Biological Opinion[1] (2015 BiOp) found that altered water temperature is a factor contributing to the mortality of six listed salmon and steelhead populations. The 2015 BiOp states that without implementation of Oregon's CWR narrative criteria, salmon and steelhead abundance reductions are likely. Climate change is causing water and ambient air temperatures to climb, further reducing options for survival and recovery.
CWR should not be a surrogate for mainstem temperatures that cannot adequately protect sensitive uses and serve as a pass for Oregon, Washington, and the EPA to fail to do what is

[1] NMFS, Endangered Species Act Biological Opinion on the Environmental Protection Agency's Proposed Approval of Certain Oregon Water Quality Standards Including Temperature and Intergravel Dissolved Oxygen (November 3, 2015).

necessary to reduce water temperatures overall in the Basin. The Plan needs more concrete objectives and strategies to improve the number, size, and quality of all the potential and existing CWRs feeding into the mainstem Columbia River.

The Plan estimates the current use and spatial distribution of CWR on the lower Columbia River and provides evidence that over time, fall chinook and steelhead are becoming increasingly reliant on the presence of CWR along the mainstem. EPA presents data in Figure 4-2 which shows that estimated survival of in-river and transported fall chinook is clearly related to temperature. EPA uses the HexSim model to illustrate the energy benefits of CWR use when temperatures exceed 21°C (Section 6.2). All these findings support the need for CWRs in the Lower Columbia River, but disturbingly, EPA concludes that the spatial and temporal extent of existing CWRs appears to be sufficient (page 76) even as mainstem mean August water temperatures continue to rise (Section 5.1). Evidence cited by EPA to support this conclusion rests on the harvest and straying adjusted 2012-2016 adult survival rate from Bonneville Dam to McNary Dam as being over 90 percent. The conclusion that current CWR conditions and use are sufficient, which is the main objective of EPA's report, is too important to get wrong, yet it is based on inconclusive and inadequate data that does not consider the full complexity of the impact of temperature on adult survival.

The Plan contains data that are inconsistent with its conclusions and lack tangible objectives. For example, table 6-1 (page 75) exhibits the adjusted Snake River adult salmon and steelhead survival, including both runs of fish that pass through the lower Columbia River when water temperatures exceed 20°C and portions of the runs that migrate when temperatures are below 20°C. It is not possible to determine how temperature is impacting survival from this data set and how CWR use contributes to survival. EPA notes that in some individual years (2011, 2013, 2016) the survival rate is as low as 80 percent (page 50), raising questions as to the source of the differences. Additionally, using "adjusted" harvest rates may seem a reasonable thing to attempt, it is an extremely difficult estimation to make as evidenced by the difficulty in matching the harvest data maintained by the *U.S. v. Oregon* Parties to fish survival. Mixing and matching two different sources of data, i.e. PIT tag data which represents a small component of the total adult return, and run reconstruction estimates of adult harvest, do not always align with the PIT tag data. The method assumes that that PIT tag data is representative of the data used in the run reconstruction, which isn't true in most cases. Harvest-corrected adult survival rate is more appropriate as an index, rather than an actual rate. Basing the Plan's primary conclusion about the "sufficiency" of CWR in the Columbia River on "harvest-corrected" survival is not defensible. Any estimate given of the 90 percent survival should account for the inherent error in data and uncertainty estimates given for the survival estimates.

EPA's assertion that the current distribution of CWR is "sufficient" conflicts with the Plan's acknowledgement that there are no CWR between the Deschutes River and McNary Dam (page 74), a stretch of nearly 100 miles. It is difficult to accept the conclusion that current temperature conditions are sufficient for adult migration when the six species of salmon and steelhead impacted by the CWR criteria remain on the ESA list and smolt-to-adult return rates are well below the 2-6 percent goal of the regional target. EPA's conclusion that there are enough CWR under current conditions conveys a lack of the urgency and understanding that is necessary to develop a coordinated plan to enhance, protect, and restore these areas. We recommend that EPA and the states construct artificial CWR in this area to address this deficiency between the Deschutes River and the mouth of the Snake River.

The Plan erroneously attributes the significant loss of adult sockeye in 2015 to the warm water temperatures in the lower Columbia River when water temperatures from all areas of the river impacted these fish. Adult sockeye migrate upriver faster than other salmonids, so it is unlikely that the lower river was the only factor in their loss. This event demonstrates that Oregon's current temperature criteria, and use of refugia as mitigation for that criteria, fails to protect a designated use of the water. The Plan must address this failure and create tangible objectives to protect all of these species now and in the future.

Columbia River Mainstem Actions

The driver of the Plan and the need for CWR are warm water temperatures in the mainstem Columbia River. The Plan however, disregards this, focusing mostly on tributary restoration actions and relying almost exclusively on Total Maximum Daily Load (TMDL) and watershed conservation plans for those tributaries. EPA needs to focus on actions within the mainstem as well as the tributaries, evaluating and prioritizing actions that will improve the quality of refugia and promote cooler water temperatures. Measures could include reconstruction of tributary mouths to eliminate shallows, increasing channel depth, engineered controls that limit mixing with the mainstem, and eliminate invasive aquatic plant species from CWR that contribute to warming. Additional measures are urgently needed to identify, prioritize and expand thermal refugia in the mainstem and take other measures such as improvements to temperatures in fishways and possible reductions in reservoir surface areas exposed to thermal radiation to prevent additional salmonid stock losses. With climate change impacts clearly accelerating, the states and EPA must expedite these measures.

EPA must also complete the Columbia River Temperature TMDL and include a CWR component. EPA's 2018 draft report entitled "Assessment of Impacts to Columbia and Snake River Temperatures using the RBM10 Model" for the TMDL effort estimated the difference in mainstem temperature with a free-flowing Snake River both with and without Dworshak operations. The average difference in August was approximately 4°F with a free-flowing Snake River. The Columbia River Temperature TMDL should be completed and its recommended actions implemented to fully limit the impact of warming rivers on endangered species.

Chapter Specific Comments

Chapter 2 – Cold Water Refuges in the Lower Columbia River

- While average mean temperatures in the Columbia and Snake rivers provide a convenient measure of a set historical time series, these data are conservative and likely do not reflect the true measure of elevated temperatures and their impact on biota. Historical maximum daily temperatures should also be considered in the report as they are much more of a detriment and challenge to salmon and other freshwater biota viability and persistence than mean average temperatures. While these data may be lacking, inclusion of them in the final report would provide an important comparison with daily mean temperatures.
- Run-of-river reservoirs' temperature stratification is less than storage reservoirs, but it still can have a significant effect on migrating salmonids and Pacific lamprey.

Chapter 3 – Salmon and Steelhead Use of Cold Water Refuges

- Acoustic tag and PIT tag data suggests that a sockeye delay in CWR when the river warms earlier is not an effective strategy. However, it remains unknown if there is a benefit to CWR use in normal years. If there were no thermal refuges, even if there is an 80-90 percent mortality using the refuge, it might be 100 percent if not used. Improved PIT tag monitoring of sockeye in CWR is needed to estimate actual use.
- The use of CWR by sockeye is unknown. The Plan documents the significant loss of adult sockeye from warm temperatures in the lower Columbia River despite the fact that adult sockeye migrate much faster upstream than other salmonids. Sockeye losses underscore how CWRs fail to provide adequate protection if water temperatures exceed 20°C.

Chapter 5 – Historic and Future Trends in Columbia River Temperatures

- The Plan should note that most of the historical water temperature data acquired from dam sites is turbine scroll case data. Scroll cases are many feet at depth below dam forebay elevations and water is mixed from the water column when it goes into the scroll case. Therefore, the highest water temperatures in the river are found at the reservoir forebay surfaces during warm summer afternoons. Salmon, steelhead and Pacific lamprey are exposed to these warmer temperatures as they navigate fish ladders to migrate upstream. Much of the water that enters fishways at fishway exits comes from forebay sites, so this data should not be relied upon as indicative of conditions experienced by fish in the river.

Chapter 6 – Sufficiency of Cold Water Refuges in the Lower Columbia River

- Adult fish use of the river is dependent on the number of fish returning in any particular year class. This depends on a multitude of factors, including, but not limited to, freshwater juvenile survival, hatchery releases, and general river conditions including flows, water quality, ocean and estuary conditions, predation and disease. In abundant adult return years, crowding conditions at dam fishways with warm water temperatures has a major impact on salmonid passage and eventual contribution to upstream spawning areas. The combination of an abundant returning year class and elevated mainstem temperatures exceeding 20°C has a severe devastating effect on that year class that would resonate through several year classes into the future.

Chapter 7 – Actions to Protect and Restore Cold Water Refuges

- Table 7-1 summarizes actions to protect and restore CWRs at 12 primary locations. It is uncertain how actions were scored or prioritized in this Table in order to receive a checkmark as a recommended action.
- Actions to address sedimentation at river mouths is checked for only four of the CWR locations but discussed as a need in the detailed sections on more than these four CWRs. For example, on page 93, sediment build-up at the mouth of the Sandy River is linked to warmer water but it is not shown as an action for the Sandy River in Table 7-1.
- Limits on new water withdrawals is discussed as an issue for the Cowlitz on page 86, but not indicated as an action in Table 7-1 for the Cowlitz River CWR.
- While we concur that improving tributary refugia is an important objective, the most extreme temperature problem is in the mainstem Columbia River, as described in the Plan and elsewhere. Dam reservoirs and dams themselves act as considerable heat sinks,

warming the river in the day with latent warming at night. The final report for this project should discuss the mainstem with research, potential structural engineering and changes in river operations (i.e., more spring flow to reduce river heating; releases from storage reservoirs such as Lake Roosevelt) and remedies at dams to reduce anadromous fish exposure to elevated warm temperatures, particularly cumulative exposure, that exceed water quality standards.

- The Plan should include creating CWR where there is a need. The paucity of CWR's in the warmest section of the river is not going to change unless we change it to address present and future impacts from climate change. Climate change impacts are accelerating, not decreasing; therefore, these actions must be expedited to prepare for future events such as 2015.
- 7.1.1 White Salmon River - The statement that there is a natural barrier at RM 1.3 is incorrect. After Condit Dam was removed, salmon and steelhead and Pacific lamprey were restored to the river above Husum Falls (RM 7.5). Some accounts indicate that they may reach areas below BZ Corner (RM 12). Also, there is no evidence that salmon or steelhead were negatively affected by Condit Dam removal. Immediately after the initial dam blast that released reservoir sediment downstream, CRITFC representatives observed upstream migration of steelhead from Underwood toward the Condit Dam site. In fact, steelhead, salmon and lamprey populations have successfully recolonized the river habitat above the dam. It is likely that some of these fish entered the river for thermal refugia from the warmer Bonneville Pool.

Chapter 8 – Additional Research Needs

We recommend the following specific research and actions to be included in the final report for this project:

- Additional Lower Columbia habitat and thermal refugia investigations are urgently needed. Recent USGS research using electrical imaging and distributed temperature sensing (using 1 km cable monitoring) in the Hanford Reach (Slater et al. 2010) was able to identify thermal refugia in the Reach based on geomorphological structure and hyporheic flows. A pilot study below Bonneville Dam was conducted by USGS in 2017 but limited resources prevented completion of the study and any further work. This work should be restarted in earnest. If physical thermal sensing could be combined with active thermal adult radio telemetry studies potential identification and use of mainstem thermal refugia sites could be ascertained.
- Dam adult fishways need modification to improve and reduce thermal and crowding characteristics to reduce adult anadromous fish exposure to elevated water temperatures. Follow up this review with prioritization of pilot studies and structures on dams and evaluate their success or failure.
- Encourage and support fisheries of American Shad to reduce their numbers and free additional space in the ladders for salmon and steelhead.
- Maintain and enhance existing CWR with maintenance efforts to reduce impacts from sediment deposition and invasive aquatic macrophytes were applicable.
- Evaluate and fund engineering efforts to development of hyporheic flows in the reach upstream from the Deschutes River to create additional CWR.
- Support engineering R&D to assess the viability of creating artificial CWR's in the Deschutes River to Snake River reach using shoreline wells into deep cold aquifers,

combined with pumping stations to create CWR for migrating adults during the warm water periods (July-September).

- Evaluate measures to expand and optimize existing CWR sites throughout the lower Columbia River where feasible to prepare for the future temperature increases as described in the report.
- Assess geomorphological and groundwater characteristics of confluences between the mainstem and tributaries for thermal regimes and upstream flow and other hydrological regulation to improve these regimes.
- Support/institute hydrological and river operational studies and hydrodynamic modeling to assess alternative river operations to reduce river temperatures:

    a) Assess timed releases from low level outlets at Grand Coulee which stratifies in the summer (see EPA 2002).

    b) Assess increased late spring/early summer mainstem flows from upstream storage reservoirs to keep mainstem temperatures cooler longer. CRITFC has technical capability to assist EPA with these actions.

<u>An Urgent Need for Protection and Enhancement of CWR in the Columbia River</u>

Despite EPA's conclusion in the Plan that current condition and spatial distribution of CWR in the Columbia River is sufficient, there is an urgent need for increased protection and enhancement of these areas in the Basin. The Plan documents that warming river temperatures have already greatly impacted the fish populations in the Columbia River. Additional warming in the system could be devastating without cohesive implementation plans that ensure enough CWR areas to allow salmon and steelhead to migrate without significant adverse effects.

Policies and legislation that prioritize protecting and increasing CWR areas are needed. Restoration actions beyond increased tributary restoration actions, tributary TMDLs and existing watershed conservation plans are needed that focus specifically on the mainstem Columbia River. These should include reconstruction of river confluence areas to eliminate shallows, replanting native vegetation and increasing channel depths. As rivers continue to warm under climate change, CWR will become more essential to the survival of native fish populations.

If you have any questions, please feel free to contact Laura Gephart or Dianne Barton with CRITFC's Watershed Department, at 503-238-0667.

Sincerely,

Jaime A. Pinkham
Executive Director

Suggested Additional References

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Columbia Riverkeeper
407 Portway Ave., Ste. 301
Hood River, OR 97031
phone 541.387.3030
www.columbiariverkeeper.org

December 3, 2019

John Palmer
U.S. Environmental Protection Agency, Region 10
1200 6th Avenue, Suite 155 (19-C09)
Seattle, WA 98101

Sent via email to: *palmer.john@epa.gov*

RE: EPA's draft study on thermal refuges in the lower Columbia River

Dear John,

Columbia Riverkeeper (Riverkeeper) submits these comments on the U.S. Environmental Protection Agency's (EPA) draft study of thermal refuges in the lower mainstem Columbia River (hereinafter, the "draft study"). Riverkeeper appreciates the time and effort that informed this draft study and the many resources contained therein. Riverkeeper works to protect and restore the Columbia River and all life associated with it, from the headwaters to the Pacific Ocean. Riverkeeper represents over 16,000 members and supporters in Oregon and Washington and regularly comments on decisions impacting water quality and temperature pollution in the Columbia River. Many of Riverkeeper's members fish for, eat, or otherwise enjoy the salmon and steelhead that are jeopardized by EPA's failure to adequately control temperature pollution in the Columbia River.

Riverkeeper adopts and incorporates by reference comments submitted by Northwest Environmental Advocates, the Fish Passage Center, and the State of Washington on EPA's draft study. As detailed in those comments, Riverkeeper also questions EPA's contradictory conclusions that existing thermal refuges fully support the designated beneficial use of salmon migration—but that the river in general is too hot to support salmon migration and likely to get hotter due to climate change. The obvious reality is that existing thermal refuges do not fully support sockeye and spring/summer Chinook migration through the lower Columbia. And the species that *do* utilize thermal refuges, including steelhead and fall Chinook, are likely to see the purported benefits of this behavior diminish or disappear as the river warms over the next several decades. Accordingly, EPA's core determination—that thermal refuges fully support salmon migration—appears unsupported by EPA's draft study.

Riverkeeper also echoes Northwest Environmental Advocates' point that the draft document EPA produced is not a "plan" in any meaningful or normal sense of that word. Furthermore, a plan to meet a water quality standard is called a Total Maximum Daily Load

(TMDL). Unfortunately, EPA has ignored and, at times, actively resisted its duty to prepare a TMDL to address temperature pollution in the Columbia for the better part of two decades. Riverkeeper sincerely hopes that EPA will soon issue a TMDL to meet temperature standards in the Columbia and Snake rivers, which should include a robust and enforceable plan to protect and restore thermal refuges.

Riverkeeper writes separately to emphasize the urgent need for EPA to address the water temperature crisis in the Columbia River. Thermal refuges were supposed to supplement, not replace, attainment of Oregon's 68º F criterion. The grim reality is that most of the Columbia does not meet the 68º F criterion during most of every summer. Without meaningful leadership from EPA to address temperature problems, the dams and climate change will soon make the Columbia—with or without thermal refuges—too hot for salmon and steelhead to survive.

Please do not hesitate to contact me if Riverkeeper can be of further assistance.

Sincerely,

Miles Johnson
Senior Attorney
(541) 490 – 0487
miles@columbiariverkeeper.org

From: Scott O'Daniel <scottodaniel@ctuir.org>
Sent: Tuesday, December 03, 2019 8:26 AM
To: Wu, Jennifer <Wu.Jennifer@epa.gov>
Subject: RE: Reminder: Draft Columbia River Cold Water Refuge Plan - comments due by December 3, 2019

I reread the Umatilla section and I'm very happy with it. Thank you for this work– it is really useful.
~s

DESCHUTES RIVER ALLIANCE

U.S. Environmental Protection Agency, Region 10
Attn: John Palmer,
1200 Sixth Ave, Suite 155 (19-C09)
Seattle, WA 98101

VIA EMAIL: palmer.john@epa.gov

Re: Columbia River Cold Water Refuges Plan – Final Draft Feedback

Mr. Palmer and the Environmental Protection Agency, Region 10 Staff:

The Deschutes River Alliance respectfully submits these comments on the U.S. Environmental Protection Agency's Columbia River Cold Water Refuges Project Plan. We appreciate the opportunity to voice our concerns during this process.

DRA is a science-based research and advocacy organization seeking collaborative solutions to basin-wide threats to the health of the Deschutes River and its tributaries. We advocate for water quality, a healthy ecosystem, and for the establishment and protection of robust populations of resident and anadromous fish throughout the river's entire watershed. As such, the Plan's impacts on the lower Deschutes River and throughout the greater Deschutes Basin are of critical interest to our supporters and Board of Directors.

We have two main concerns with the Cold Water Refuges Plan (the Plan) as currently drafted. First, the Plan does not prioritize the Deschutes River and its Cold Water Refuge (CWR) despite its centrally important role. Though the Plan itself points out many of the significant attributes that make it important to migratory fish, no additional focus or prioritization is given to the Deschutes. Second, the actions proposed to protect and enhance the Deschutes River's temperature and CWR are far too weak. The Plan does not thoroughly analyze the factors contributing to warm river temperatures, fails to propose actions that sufficiently address the root of warming, and omits standards, requirements, procedures, or deadlines for implementing the actions.

1. **The Deschutes River actions should be prioritized because of its importance as a Cold Water Refuge.**

The importance of the Deschutes River's Cold Water Refuge (CWR) to the Columbia River's migratory fish cannot be overstated. While other CWRs provide important waystations along the Columbia River, the Deschutes' unique and vital characteristics set it apart. Due to its size, location, vulnerability, and the critical habitat it provides for

those endangered species beyond the CWR itself, the Deschutes River should receive additional attention and should be prioritized for the vitally important CWR it provides.

The key role that the Deschutes CWR plays in Columbia River fish migration necessitates the prioritization we call for. Its large size, important location along the Columbia River, and its vulnerability to increasing temperatures all require additional attention and effective response actions. As noted in the draft Plan, the Deschutes CWR is the third largest at over 880,000m^3.[1] Its large size is also important for its heavy use by migrating fish.[2] The large volume is even more important when looking at the CWR's location on the Columbia. The Deschutes CWR is the *only* primary CWR between the Bonneville Dam and the mouth of the Snake River. While the Umatilla River CWR is identified as a tributary that could be restored to provide additional CWRs,[3] it would only provide a little over 46,000m^3 of refuge – significantly less than the Deschutes. Additionally, the Umatilla is already warmer than the Deschutes and would require significant action to make it a viable CWR. Not only can the Deschutes CWR be considered the midway point for migratory fish heading to the Snake River, it is also located in the warmest stretch of the Columbia – between The Dalles Dam and John Day Dam.[4] This final checkpoint for fish migrating to the Snake River confluence highlights its importance. While the size and location of this CWR alone would be enough to warrant prioritization, the need for action is amplified when also considering the current condition of the lower Deschutes River. Though the Deschutes is currently around 2 degrees Celsius cooler than the Columbia,[5] its temperature is already considered non-optimal for some CWR purposes.[6] As warming proceeds as predicted by the Plan, the Deschutes' CWR could cease to exist and the Deschutes River's temperature would become lethal for cold water fish by 2040.[7] Losing the Deschutes CWR – the third largest and only significant CWR after the Bonneville Dam – would have an enormous impact on these migratory fish. For these reasons – size, location, and vulnerability – the Deschutes River and its CWR should receive additional, prioritized, and targeted attention in this plan.

[1] U.S. Environmental Protection Agency "Columbia River Cold Water Refuges Plan - Draft" (October 2019), *hereinafter* "CWR Plan." At page 14.
[2] CWR Plan, page 40.
[3] CWR Plan, page 76.
[4] CWR Plan, Figure 2-2 at page 6.
[5] CWR Plan, Table 5-1 at page 66.
[6] CWR Plan, at page 76.
[7] CWR Plan, Table 4-1 at page 46.

Beyond the Deschutes' role in providing its CWR, the actions proposed to preserve its CWR would further benefit those same migrating fish. The Deschutes is listed as critical habitat for steelhead and bull trout.[8] As temperatures warm as predicted by this Plan[9] under a status quo approach, those threatened and endangered species will be subjected to increased environmental pressures. Reducing temperature throughout the Deschutes River and its tributaries would not only benefit those species through Deschutes CWR itself, but would work to strengthen the protections that the critical habitat (*i.e.* the lower Deschutes River) provides. This additional benefit, already provided by the proposed actions, is well within the Plan's goals and provides further justification for additional attention and prioritization of the Deschutes River and its CWR.

2. The actions specified for the Deschutes River are under-analyzed, under-explained, and are unlikely to be achieved without specific requirements.

The description of the Deschutes River Watershed, factors analyzed, and the actions identified to protect its CWR require further consideration. Section 7.15 of the Columbia CRW Plan specifically addresses the Deschutes' CWR.[10] This section, however, does not effectively describe the water temperature situation in the river's basin, nor does it accurately describe some key details. Additionally, it leaves out important developing actions, specifically a basin-wide Habitat Conservation Plan. Worse, the proposed "protective and enhancing" actions offer few new strategies and no mechanisms that ensure those minimal actions are achieved. To better protect and enhance the water temperature of this vital CWR-providing river, a deeper, more accurate description must be provided in addition to stronger, broader, and required response actions.

The Plan's description of the Deschutes Basin is incomplete. Particularly, in the "Factors that Influence Temperature" section,[11] the 'dams and hydromodifications' and 'water use' subsections are not accurately described. DRA has concerns with certain characterizations of the Pelton-Round Butte (PRB) Hydroelectric Project. First, the Selective Water Withdrawal (SWW) Tower's role as a temperature regulator is not justified. DRA is skeptical of how the EPA determined that the SWW Tower allows for temperature regulation that "more closely match[es] the natural thermal profile" of the

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[8] U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States," (October 2010), 75 FR 36898, 63935 – 63936.
50 CFR § 226.212(p)(13).
[9] *See* Note 7.
[10] CWR Plan, pages 143-147.
[11] CWR Plan, pages 145-146.

river during the late spring and early summer warm water releases. EPA must provide scientific justification for this assertion. Additionally, despite temperatures that violate Oregon's numeric water quality criteria, the Plan does not attribute any fault to PRB's operation and fails to cite to any justification for this omission. As the graph[12] included here shows, temperatures pre-SWW Tower were markedly cooler during the important migration months from June to August when compared to current Tower operations-resulting temperatures. Additionally, the resulting cooling effect from SWW Tower operations in the fall months is far less than the corresponding warming during the spring months. A return to the substantially – not "slightly"[13] – cooler, bottom-drawn water releases from PRB could indeed have a cooling effect in the lower Deschutes River. In fact, DRA has established that PRB temperature management does have an effect on lower Deschutes River temperature for the entire 100 river miles.[14] Cooler, nighttime water releases from PRB were measurable and distinct from warmer, daytime water releases, even as they approached the mouth of the Deschutes. EPA's claim that the SWW Tower allows for better mimicking of natural thermal profiles is arbitrary, as is its assertion that the SWW Tower operations "do not appear to have increased temperatures," especially in light of DRA's findings.

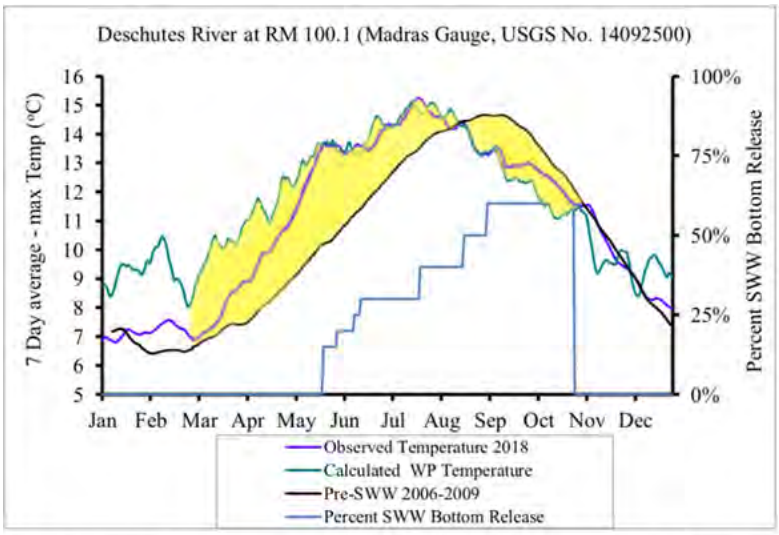

Figure 2. Calculated without project temperatures (as 7dAM) for the PRB Project compared to the pre-SWW 3-year average (2006-2009) and observed 2018 7dAM discharge temperatures. Teal line reflects the percent bottom water withdrawal.

Moving on from the specific concerns at PRB, the issues surrounding the 'water use' subsection are not fully described. Beyond describing the in-stream flow requirement,

[12] This graph is taken from PGE's Annual Water Quality Monitoring report. We have added the yellow shading to highlight the temperature difference between pre- and post-SWW Tower operations. Campbell, Lori (on behalf of PGE and CTWSRO) "Pelton Round Butte Project (FERC 2030) 2018 Water Quality Monitoring Report," (April 2019), Figure 2, at page 10. *Available at*: https://www.portlandgeneral.com/.../2018-water-quality-annual-monitoring.pdf?la=en.

[13] CWR Plan, page 146.

[14] Greg McMillan, *et al.* "Airborne Thermal Infrared Remote Sensing Of the Lower Deschutes River" (2016). *Available at*: https://static1.squarespace.com/static/58c778d4414fb5205e205605/t/5d2d1387fa7bfa00016176d4/1563235235661/9+DRA+2016+Airborne+Thermal+Imaging+Report.pdf.

mentioning that the river might have "potential over-allocation" issues, and briefly suggesting that reducing diversions would help lower temperature, this topic is barely considered. You do not describe the system of impoundments throughout the watershed and you fail to consider the warming effect that those impoundments create. This subsection glosses over the enormous water quality issues, temperature and otherwise, that over-allocation creates throughout the basin. Finally, this section, as well as the "Ongoing Activities" section, fails to mention the proposed Deschutes Basin Habitat Conservation Plan (HCP) put forth by eight Central Oregon irrigation districts and the City of Prineville.[15] While the draft HCP is currently making its way through the administrative process, it will undoubtedly have an impact on the lower Deschutes and likely on the CWR as well, whether directly through changed operations or through a pair of in-stream flow leasing and conservation funds. Overall, the temperature-increasing impacts that water use, impoundment, diversion, and allocation have on the lower Deschutes River must be more thoroughly considered.

Finally, the actions proposed to "protect and enhance" the Deschutes CWR are unlikely to effectively stem the predicted temperature increases over the coming decades. A mere four, non-specific actions are put forth at the end of the Deschutes' section.[16] While those four actions touch on important topics, they do not go far enough. Whether merely calling for 'support' or 'evaluation,' or vaguely directing 'protection' or 'restoration,' the actions need to be more robust and have specific implementation and evaluation requirements for specific actors. This can be achieved through minimum standards, established deadlines, compliance reports, or other confirmation mechanisms. Lastly, the list of actions should be expanded to successfully address impending warming. If water is being overallocated, EPA must establish mechanisms that ensure enough water will be present. EPA could also establish a fund that purchases and leases in-stream water rights. Creating clear plans to restore riparian vegetation not only in "high differential" areas but throughout the Deschutes Basin will ensure the shade's cooling effect will be sufficient. Mandating that PRB operations do not increase water temperatures will ensure that it is not a contributing factor to predicted increasing temperatures and ongoing water quality violations. These are just some of the actions that should be added to an effective CWR Plan that preserves the vitally important Deschutes CWR for decades to come. Without a proper understanding of the Deschutes Basin's current conditions, a complete list of ongoing activities, and

[15] Arnold Irrigation District, *et al.* "Draft Deschutes Basin Habitat Conservation Plan" (2019). HCP, Public Notice, and Environmental Impact Statement available at: https://www.federalregister.gov/documents/2019/10/30/2019-23670/draft-environmental-impact-statement-and-draft-habitat-conservation-plan-receipt-of-applications-for.
[16] CWR Plan, page 147.

without clear, specific, and far-reaching actions, the Deschutes River and its CWR cannot be sufficiently protected or restored.

3. Conclusion

The Columbia River Cold Water Refuges Project Plan must address these shortcomings before it is finalized. The Deschutes CWR's important size and location, as well as its vulnerability to continued warming, demand additional attention and prioritization. The critical habitat that the river provides, in addition to the CWR, also, demands additional attention and prioritization. The Plan needs to expand its analysis of the recommended actions, propose additional actions that will better address warm temperatures, and establish procedures, requirements, or deadlines for implementing and achieving those actions' goals.

We look forward to your response.

Sincerely,

Sarah Cloud
Executive Director
Deschutes River Alliance

Greg McMillan
President
Deschutes River Alliance

Ben Kirsch
Legal Consultant
Deschutes River Alliance

FISH PASSAGE CENTER

847 N.E. 19th Avenue, #250, Portland, Oregon 97232
Phone: (503) 833-3900 Fax: (503) 232-1259
www fpc.org
e-mail us at fpcstaff@fpc.org

November 21, 2019

John Palmer
Environmental Protection Agency, Region 10
1200 6th Avenue, Suite 155 (19-C09)
Seattle, WA 98101

Re: Comments on Draft Columbia River Cold Water Refuges Plan.

Dear Mr. Palmer-

Thank you for the opportunity to review and provide comments on the draft Columbia River Cold Water Refuges Plan. We offer the following comments for your consideration, followed by more detailed discussion of each.

- The use of CWR does not address the cause or the solution to high water temperatures for adult and juvenile salmon migration through the hydrosystem.
- The report does not incorporate information on the impact of warm fishways on adult fish passage at dams and the degree to which warm ladder temperatures could be contributing to the lack of passage between projects under high water temperatures.
- The use of two methodologies for estimating CWR and reservoir usage for adult steelhead is confusing and the underlying assumptions for these methods warrant further explanation/justification. Furthermore, some of the studies cited in Appendix 13 indicate that the assumption of 10% reservoir usage by steelhead adults in the BON to TDA reach at temperatures above 20°C may be low. It would be helpful to provide a sensitivity analysis that illustrates how CWR usage rates may change under different assumptions. This would illustrate the uncertainties surrounding these values.
- The use of point estimates to describe CWR usage does not account for the sampling error inherent in the studies that were replied upon for these analyses. Providing

prediction intervals for the estimates of CWR usage would be helpful to illustrate the uncertainties surrounding these values.

- The assumption used in this report that 60% of all steelhead adults using the Deschutes CWR are from the Snake River, based on PIT-tag recoveries, needs further investigation. This assumption does not account for the disproportionate tagging efforts for Snake River steelhead, compared to the Mid- and Upper Columbia regions. Furthermore, this analysis does not account for the fact that only Snake River steelhead are subject to juvenile transportation, which results in a higher propensity to stray (i.e., use CWR) and, therefore, likely lead to a higher detection probability for this DPS.
- Several studies have demonstrated that Chinook and steelhead adults that were transported as juveniles have a higher propensity to stray than those that migrated in-river. The EPA report seems to suggest that harvest in or near CWR is the primary reason why adults who use CWR have lower survival rates than those that do not use CWR. However, the reduced survival of adults that use CWR may be confounded by the increased propensity for straying in adults that were transported as juveniles. The majority of the studies that were cited as showing decreased survival in adults that use CWR were conducted at a time when transportation proportions were high. In recent years (MY 2006 and later), transportation proportions have decreased substantially.

General Comments

Cold water refuges do not address the cause or the solution to high water temperatures for adult and juvenile salmon migration through the hydrosystem. The report does not address impacts of warm water temperatures on juvenile salmon during their downstream migration. In general, temperatures exceeding 68 °F result in increased incidence of disease and mortality in downstream migrating juvenile salmonids throughout the hydrosystem. In addition, the report does not incorporate information on the impact of warm water in adult fishways on adult fish passage at dams and the degree to which warm ladder temperatures could be contributing to the lack of passage between projects under high water temperatures. Clabough et al (2009) found that a significantly higher percentage of tagged fish exited the fish ladder back into the tailrace at Lower Granite when water temperatures exceeded 18 °C. This difference was significant for spring/summer chinook, but not for steelhead and fall chinook. Overall, the passage of adults was longer through the fish ladder at Lower Granite when water temperatures exceeded 18 °C. Additionally, NOAA (2016) found that, at ladder temperature differentials of greater than 1 °C, Chinook and steelhead have a higher likelihood of entering the ladder multiple times followed by exits back into the tailrace. Delayed passage and increased likelihood of re-entering the tailrace during periods when temperatures in the fishways are elevated and/or periods of excessive temperature differentials may contribute to CWR usage in the Mid-Columbia. If this is occurring, methods for preventing elevated temperatures and excessive temperature differentials between entrances and exits should be further explored.

Chapter 3 – Salmon and Steelhead Use of Cold Water Refuges (and Appendix 13)

3.4 – Steelhead Use of Cold Water Refuges

Section 3.4 of this report provides results from analyses conducted by EPA to estimate the degree to which steelhead adults use CWR in the Bonneville pool (i.e., Bonneville Dam (BON) to The Dalles Dam (TDA)). Methods for these analyses are presented in Appendix 13. The FPC has questions regarding the methods described in Appendix 13. As described in Section 1.1.1 of Appendix 13, EPA used two different methods to estimate the number of steelhead using CWR, depending on whether temperatures at Bonneville Dam were above or below 20°C. Data used to generate these estimates were provided in Table 1 of Appendix 13. Below is a summary of these two methods, as presented in Appendix 13:

Temperatures > 20°C:
Reservoir = BON Count (less 18%) + TDA Count + (10% of Accumulated Steelhead)
CWR = Accumulated Steelhead - Reservoir

Temperatures ≤ 20°C:
CWR = Accumulated Steelhead * Percent in CWR (*as presented in Keefer and Caudill 2017*)
Reservoir = Accumulated Steelhead - CWR

The use of two methodologies for estimating CWR and reservoir usage is confusing and convoluted. Furthermore, the assumptions behind the methodology for >20°C temperatures need additional explanation. First, it is unclear why fish counted at TDA were added to the BON count and accumulated steelhead for the estimate of fish using the reservoir in the BON pool. Fish counted at TDA would have exited the reach and, therefore, are not subject to use the reservoir or CWR in the BON pool. Second, the Draft Report does not provide rationale or supporting evidence for the 10% value used in this methodology. The lack of technical rationale raises doubt regarding the applicability of this methodology. As noted in the Appendix, Keefer and Caudill (2017) provides estimates of percent usage over a range of temperatures for steelhead adults. Furthermore, data presented in Keefer et al. (2009) suggest that reservoir usage is in the 60% (at 20°C) to 20% (at 22°C) range (Figure 4 of Keefer et al. 2009). Assuming a reservoir usage of only 10% seems extreme, based on the data presented in Keefer et al. (2009). Therefore, we suggest conducting a formal sensitivity analysis to better illustrate how estimates of CWR usage may change with these different assumptions/methodologies.

3.5 – Fall Chinook Use of Cold Water Refuges

Section 3.5 provides results from analyses conducted by EPA to estimate the degree to which fall Chinook adults use CWR in the Bonneville pool (i.e., Bonneville Dam (BON) to The Dalles Dam (TDA)). As with the steelhead analyses, methods for the fall Chinook analyses are presented in Appendix 13. However, unlike steelhead, EPA used a single methodology for fall Chinook, which assumed that the number of fish using CWR was dependent on temperature. The basis for this analysis came from a study by Goniea et al. (2006). EPA estimated the number of fall Chinook adults in CWR by multiplying fish counts and the proportions of cold water usages provided in Goniea et al. (2006), which were summarized in tabular form in Appendix 13. However, this generalization by EPA ignores sampling error in the original study and possible differences in environmental conditions between the study years and current years.

It would be more informative if EPA were to provide a prediction interval for the estimated numbers of fall Chinook adults using CWR, based on the variability in the data presented in Goniea et al. (2006).

In summary, EPA's methods to estimate the number of steelhead and fall Chinook adults using CWR (Sections 3.4 and 3.5) lack quantitative measurements of uncertainty, and discussion of how this may affect the results and conclusions. To make the report more informative, we encourage EPA to address the uncertainties while employing these methods and illustrate these uncertainties in their estimates (e.g., prediction intervals).

3.8 – Deschutes River Cold Water Refuge Use

In Section 3.8, the report uses PIT-tag detections in the mouth of the Deschutes River to indicate that Snake River fish are using this area as a CWR. Table 3.5 shows that 61% of the PIT-tagged fish that were detected in the mouth of the Deschutes were from fish originating in the Snake River. Although 61% of PIT-tag detections were from Snake River fish, this does not necessarily mean that 61% of all fish present in the Deschutes CWR are from the Snake River. Juvenile tagging efforts for the Snake River DPS are more intensive than the Lower Columbia, Upper Columbia, and Middle Columbia DPSs. Given the disproportionate nature of tagging, one would expect that a disproportionate number of returning PIT-tagged adults would be from the Snake River DPS. When comparing different basins, PIT-tagging efforts must be accounted for when associating returning PIT-tag proportions to populations.

In addition, the detection efficiency of PIT-tag detection in the Deschutes River is not reported. It is possible that detection efficiency differs between populations, particularly if usage of the CWR differs between populations. For example, the Snake River DPS is the only population segment that is subject to transportation and, therefore, more susceptible to straying, which could be confused for CWR usage. Given this higher propensity to stray, it seems likely that detection probability for Snake River steelhead would be higher than the other DPSs. Differences in detection probabilities between populations will further skew the results of Tables 3.5 and 3.6 and overestimate the number of fish using the Deschutes CWR.

Chapter 4 – Temperature and Fish Harvest Impacts on Migrating Salmon and Steelhead

In Section 4.2 of this report, EPA presents past FPC analyses of the effects of temperature on steelhead (FPC 2016) and fall Chinook (FPC 2018) adult survival from Bonneville Dam to McNary Dam, noting that survival decreases by 7-10% as temperatures rise above 21°C. As noted by EPA, the FPC analysis on fall Chinook (FPC 2018) also indicated that fall Chinook that were transported as juveniles had lower survival than those that migrated in-river. However, the EPA report omitted important details about the steelhead analysis (FPC 2016). In the 2016 FPC memorandum, steelhead adults that were transported as juveniles had much lower survival (BON-MCN) and much longer travel times than those that migrated in-river. These differences occurred at all temperatures, including those below 18°C. Therefore, fish that were transported as juveniles were excluded from the 2016 FPC analysis, as this group was not applicable to the primary objective of the analyses regarding the effect of water temperature on upstream survival.

Since these original FPC analyses, the Comparative Survival Study (CSS) has conducted similar analyses of adult success that have demonstrated that steelhead adults that were transported as juveniles had lower survival (BON-MCN) and longer travel times than those that migrated in-river (McCann et al. 2017) (Figures 1 and 2). The CSS conducted similar adult upstream survival analyses for the MCN-LGR reach and found a similar pattern of decreasing conversion probabilities (MCN-LGR) with increasing temperatures and lower conversion probabilities for Snake River fall Chinook and steelhead adults that were transported as juveniles compared to those that migrated in-river (McCann et al. 2018) (Figure 3).

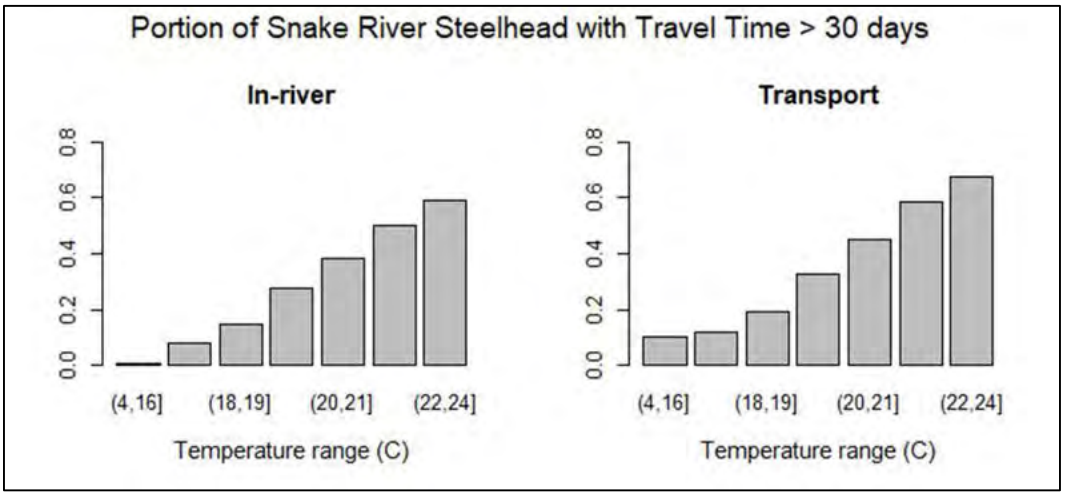

Figure 1. Bar charts of the proportions of steelhead adults with travel times >30 days in water temperatures ranging from 4-24°C, broken out by whether they were transported or migrated in-river as juveniles. Taken from Figure 8.11 from McCann et al. (2017).

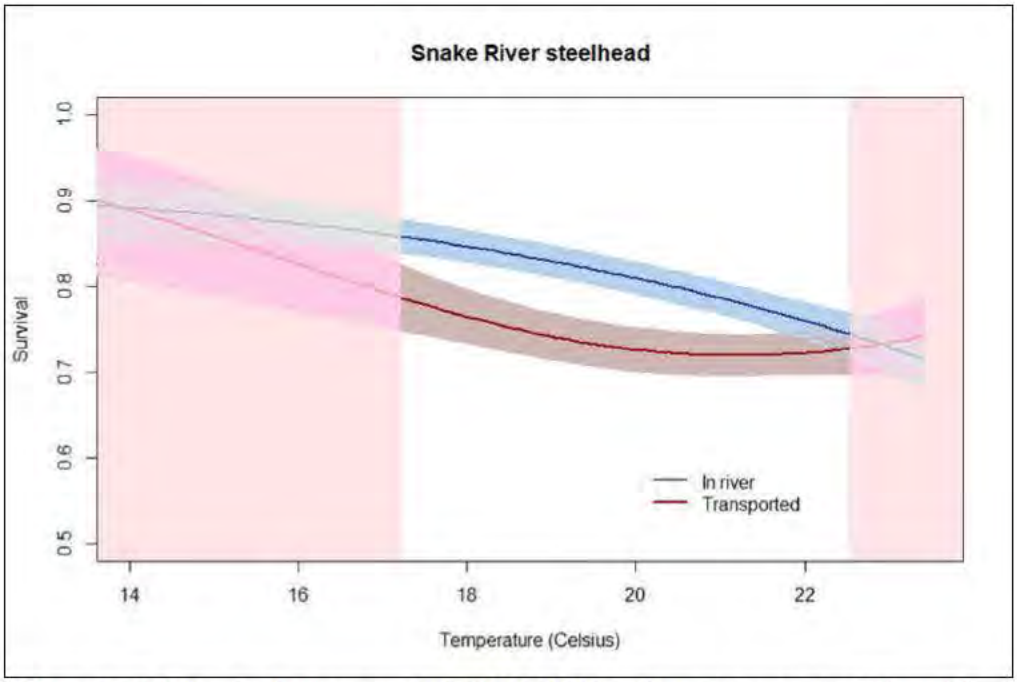

Figure 2. Relationship between survival (BON-MCN) and temperature using CJS model with individual covariates in a quadratic form and random year effects. Taken from Figure 8.14 of McCann et al. (2017).

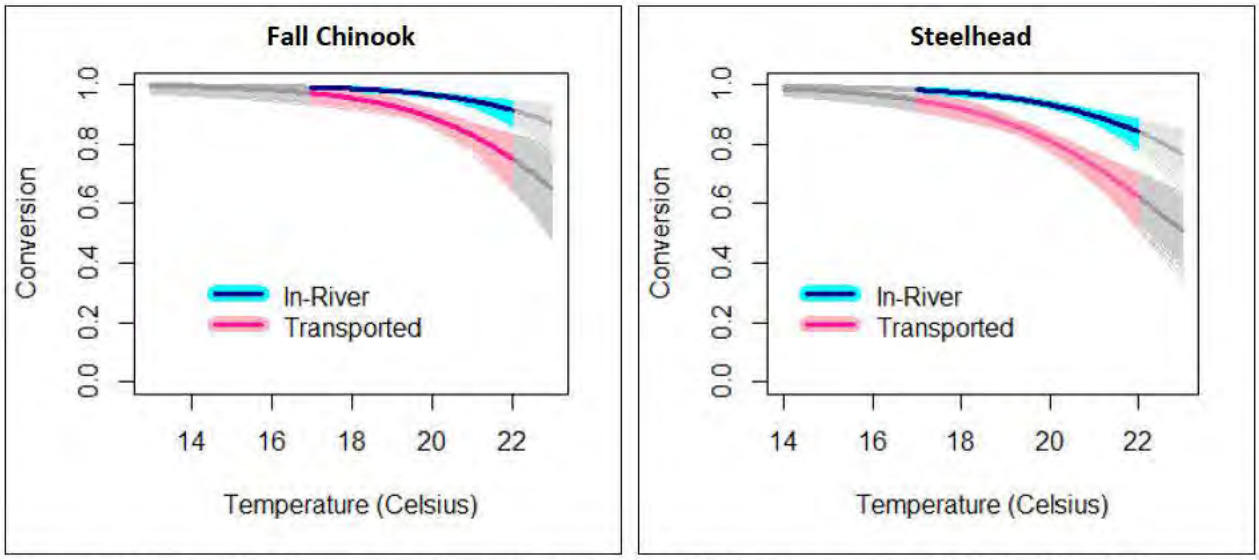

Figure 3. Relationship between conversion probability (MCN-LGR) and temperature for Snake River fall Chinook (left) and steelhead (right) adults that were transported as juveniles (pink) versus those that migrated in-river (blue). Taken from Figures 7.4 and 7.8 of McCann et al. (2018).

The FPC and CSS results all indicated that fall Chinook and steelhead adults that were transported as juveniles had lower upstream survival rates than those that migrated in-river. In Sections 4.3 and 4.4, the EPA Report summarizes studies that indicate fall Chinook and steelhead adults that use CWR have lower adult survival than those that did not use CWR,

presumably due to increased susceptibility to harvest while in the CWR. However, several studies have also demonstrated that Chinook and steelhead adults that were transported as juveniles have a higher propensity to stray than those that migrated in-river (Keefer et al. 2008, Tuomikoski et al. 2010, Tuomikoski et al. 2011, Keefer and Caudill 2012, and Ruzycki and Carmichael 2010). The EPA report seems to suggest that harvest in or near CWR is the primary reason why adults who use CWR have lower survival rates than those that do not use CWR and, therefore, reducing harvest around CWR would increase the success of fish using CWR.

However, the reduced survival of adults that use CWR may be confounded by the increased propensity for straying and decreased upstream survival for adults that were transported as juveniles compared to those that migrated in-river. In other words, how much of the loss at CWR is actual harvest due to CWR use and not the result of increased straying and/or decreased upstream survival due to transportation? The majority of the studies cited by the EPA report as showing decreased survival in adults that use CWR were conducted at a time when transportation proportions were high. In more recent years (2006 and later), transportation proportions have decreased substantially (Figure 4). Given this, it is possible that CWR usage may have declined since the original radio tag studies were conducted in the late 1990s and early 2000s. One way to investigate this could be to incorporate more recent PIT-tag recovery data from the John Day and/or Deschutes rivers to investigate whether straying rates have changed in more recent years, in response to the decreasing transportation proportions. While the uncertainty of current CWR usage in relation to changes in the transportation program is highlighted in Chapter 8 of the EPA report (Uncertainties and Additional Research Needs), the EPA Report should incorporate a more thorough discussion of the impacts of transportation operations on upstream survival and straying in the body of Chapter 4.

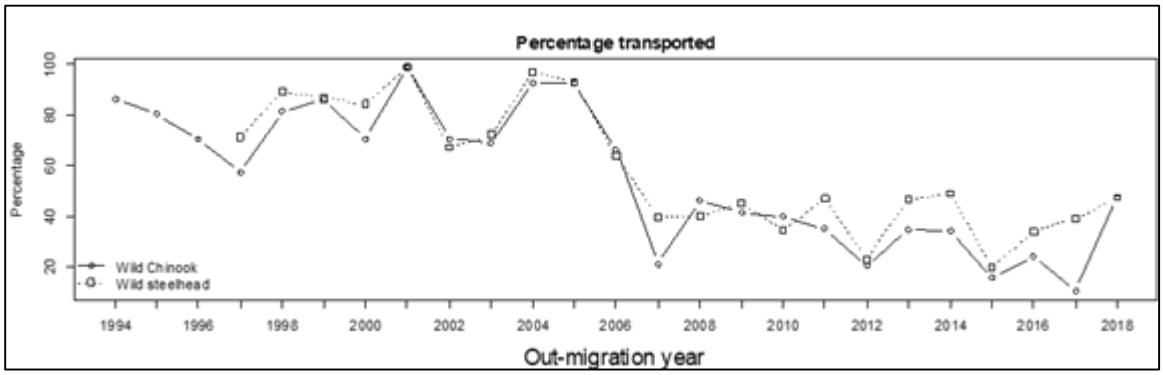

Figure 4. Estimated proportion transported for Snake River wild yearling spring/summer Chinook and wild steelhead over the historical context of the Comparative Survival Study. Proportion transported is shown as expressed by population proportion of T_0 fish in migration years before 2006 and T_x fish for the years 2006 and beyond. Taken from Figure 1.6 of McCann et al. (2019).

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McCann, J, B Chockley, E Cooper, B Hsu, S Haeseker, R Lessard, C Petrosky, T Copeland, E Tinus, A Storch, and D Rawding. 2018. Comparative Survival Study of PIT-tagged spring/summer/fall Chinook, summer steelhead, and sockeye: 2018 Annual Report. BPA Project #19960200.

McCann, J, B Chockley, E Cooper, B Hsu, S Haeseker, R Lessard, T Copeland, E Tinus, A Storch, and D Rawding. 2019. Comparative Survival Study of PIT-tagged spring/summer/fall Chinook, summer steelhead, and sockeye: 2019 Draft Annual Report. BPA Project #19960200.

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Tuomikoski, J, J McCann, T Berggren, H Schaller, P Wilson, S Haeseker, J Fryer, C Petrosky, E Tinus, T Dalton, and R Ehlke. 2011. Comparative Survival Study of PIT-tagged spring/summer Chinook and summer steelhead: 2011 Annual Report. BPA Project #19960200.

Comments from NMFS, Columbia River Hydropower Branch (West Coast Region) on EPA's DRAFT Columbia River Cold Water Refuge Plan, October 2019

Submitted: December 6th, 2019

1) Title page -Cold Water Refuges Plan

The document is more of an assessment with some observations and recommendations. Recommend renaming it as such, unless it is called for being a plan in the 2015 BiOp. At most, it is a conceptual plan.

2) In Section 2.1, Page 8, there is the following paragraph in EPA's draft:

"There is little daily variation in the temperature of the Columbia River. Since the river is so large, it does not react quickly to the air temperature differential between night and day as smaller rivers and creeks tend to do. The vertical stratification of Lower Columbia River reservoirs is also minimal since they are 'run of river' reservoirs, where water moves quickly through without time to fully stratify. In contrast, reservoirs with longer residence times often exhibit a warm top layer, a thermocline, and a cold layer on the bottom (Appendix 12.1)."

This statement is not supported by recent data. USGS just presented the results of a two year Corps funded study that confirmed there is thermal stratification in John Day reservoir in June, July, and August. Additionally, the thermistor string data just outside of the McNary fish ladder (example pasted below) indicates similar thermal stratification there as well. It appears that thermal stratification sets up in late June, July, and August in deep reservoirs where intense solar radiation heats the surface but not the deeper water. Other than correcting the record, this is worth noting since vertical stratification impacts fish ladder temperatures and differentials, with ladders being partially fed by surface water. This creates a differential in the fish ladder and can cause fish to delay and potentially seek thermal refugia.

Table for McNary Pool Temperature Profile Data (similar information, though not this table, can be found in the following report, which is provided along with these comments.
Army Corps of Engineers. Lower Columbia River Dam Forebays Temperature Depth Profile Study for 2019. November 2019.

Time		Temps (F) at increasing depths--→									
07/09/2019	00:00	70.5	70.4	70.3	69.1	67.8	66.2	65.7	65.5	65.5	65.5
	01:00	70.2	70.2	69.2	68.9	68.2	67.1	65.7	65.5	65.4	65.4
	02:00	70.1	70.1	70.1	69.0	68.6	65.8	65.6	65.6	65.6	65.5
	03:00	70.0	69.9	69.2	69.1	67.4	65.8	65.6	65.4	65.4	65.4
	04:00	69.8	69.5	68.7	68.6	67.0	65.6	65.5	65.4	65.4	65.4
	05:00	69.6	68.4	68.2	68.0	67.7	65.4	65.4	65.4	65.4	65.4
	06:00	69.3	68.4	68.2	67.9	66.4	65.5	65.5	65.4	65.4	65.3
	07:00	68.7	68.6	68.6	67.9	67.0	65.4	65.4	65.3	65.3	65.4
	08:00	69.0	68.9	68.7	67.7	66.9	65.7	65.4	65.4	65.3	65.3

09:00	68.9	68.5	68.2	68.1	67.5	65.4	65.3	65.2	65.3	65.3
10:00	69.2	68.7	68.6	68.6	67.7	65.5	65.4	65.2	65.3	65.2
11:00	70.7	69.1	68.7	68.7	68.2	65.5	65.4	65.3	65.2	65.2
12:00	69.7	69.3	69.1	68.8	67.7	65.2	65.2	65.2	65.2	65.2
13:00	73.5	69.3	69.2	69.2	68.7	65.5	65.2	65.2	65.2	65.2
14:00	70.0	69.7	68.1	67.9	67.2	66.7	65.8	65.2	65.2	65.2
15:00	70.7	68.9	68.0	68.0	67.7	66.7	65.9	65.4	65.4	65.2
16:00	71.0	70.2	69.5	69.2	65.9	65.4	65.4	65.2	65.2	65.2
17:00	-	-	-	-	-	-	-	-	-	-
18:00	72.1	71.6	69.2	69.1	68.5	67.7	65.5	65.3	65.2	65.2
19:00	75.7	75.6	71.0	70.1	68.6	67.2	65.9	65.3	65.3	65.2
20:00	74.5	74.5	74.4	69.5	69.0	67.3	65.6	65.4	65.4	65.2
21:00	73.3	73.1	69.7	69.6	69.3	67.1	66.0	65.8	65.6	65.3
22:00	74.1	74.0	72.6	69.3	68.9	67.5	66.3	65.3	65.3	65.2
23:00	73.1	72.3	72.2	72.1	69.3	68.3	66.9	65.3	65.2	65.2

3) Page 8-10 and beyond
August is important to focus on due to being the current period of hottest weather and lowest flow and relevance for steelhead adult in-migration, presumably. However, with a changing climate, are there other periods of the year, presently or predicted (modelled or otherwise) that warrant consideration for the importance of CWR (for species migrating at other times). Just touching on the subject if little is known presently would be beneficial looking ahead.

4) Page 10:Figure 2-7
This is a nice way to present the concept. Tables 2-1, 2-2, 2-3 are also very helpful and with good context. Recommendation to reorder the list of the refuges in Table 2-3 based on presumed benefit or importance. This could be size, net difference in temp, flow, available habitat area for fish, etc. Alternatively add another table that provides that ordering.

5) The 2C Criteria – Pages 12-13
The 2C (colder than the mainstem) criteria justification is explained in one the many appendixes, but most readers will not go that deep into the document to find it. It could be helpful to include the justification at one or two places early on in the document. The rationale is a good one, and it is consistent with Oregon's definition of CW criteria.

6) Selection of Tributaries Providing Cold Water Refuge – Page 12
In the recent report by the Lower Columbia Estuary Project, they focus on the importance of Horsetail / Oneonta Creek, Multnomah-Wahkeena Creeks, and Bridal Veil Creek as cold-water refugia, particularly due to the fact that there are few potential cold-water refugia locations between the Lewis River and Eagle Creek (which is a 60 mile distance). May be good to mention the recommendations provided for these tributaries in this report, even though they are smaller tributaries than those included in the "final list" in this report.

Lower Columbia River Thermal Refuge Study, 2015–2018
Keith Marcoe, Chris Collins, Catherine Corbett, Mike Burke, Matthew Schwartz, Paul Kolp, Amanda Hanson. A report of research by Lower Columbia Estuary Partnership for US EPA, October 2018.

7) Page 17 and others
Figures that cover the entire basin or large parts of it could be enlarged to take up at least half a page. It will be too difficult to see the white dots and trib names, etc when smaller, or in a printed version.

8) Figures 2-9 to 2-20 are very helpful for seeing the actual geography and tribs discussed however it is not clear what the yellow pin is intending to depict (clarify) and the graphs are unintelligible at that scale.

9) Section 3.3, beginning on Page 27.
The work cited appears to be the most current and best that we have. However, it is 10 years old or even older. Many changes have occurred during that period of time to both the operations of the River, a changing climate, as well as land use impacts. Making a stronger reference to these facts and describing the need to conduct current investigations or at least validation into assumptions into fish use, timing and extent with current conditions would strengthen the report. Particularly true given the strong reliance we, collectively, have on what we know about the fish use of the system and that information is 10 years old or older. This could be included in the Sections 8 and 9 as well.

10) Pages 28 & 29
Good use of figures to represent the steelhead and Chinook use of the river and refuges. Appreciate the citing of prior work. Would be helpful to describe the overall sample size of fish that were marked and tracked so that a reader can understand how representative these individual accounts are of a broader population (since these are, literally, single fish accounts). The examples should also be labeled as such. For instance, “this fish represents the average or an outlier from a sample of X number of tagged and tracked individuals.”

11) Re: Bonneville Pool Refugia – Beginning on Page 30

NMFS staff have made similar observations of long residence times in the Bonneville pool based on PIT tag data, especially for steelhead. EPA makes the assumption that they are spending the time in thermal refugia such as Drano Lake. Due to a lack of tag detection capability at this site, there is no direct tag evidence of use of this habitat, though there is ample indication of the presence of steelhead at this location (via fishery catches) and the hypothesis is reasonable. There is a large scale pattern of Snake River steelhead delaying in the Lower Columbia through the fall and even into the next spring.

12) Historic Steelhead Use of CWRs – Page 38

This is an important observation to include.

13) Re: Dalles Pool Refugia – beginning on Page 39.

NMFS staff did the PIT tag analysis used in this section of the report. One thing that was hard to determine was if there was a definite survival advantage conferred by time in thermal refugia. Results did show that fish that used the Deschutes cold-water refugia had a higher mortality rate (most likely due to harvest) than fish that were not detected in the Deschutes, but no differences in survival between the two groups beyond McNary could be demonstrated. This does not mean there is no advantage to using thermal refugia. The question may need to be asked in a different way, or there may be some benefit that is not obvious with the data that is available.

14) Page 53, it is not clear how this sentence relates to the Figure referenced below, but adding more information could make the claim more evident from information presented in the figures:
"Supporting Plumb's findings, ***Figure 4-6*** (Connor et al. 2018) shows that the early portion of the spawning distribution of fall Chinook is predicted to drop below the energy threshold needed for successful spawning and experience pre-spawning or premature mortality."

15) Shifts in Run Timing (for Summer Chinook and Sockeye) Section - Beginning on Page 54
Slightly different topic than what is being discussed for summer Chinook and sockeye in this section, but this section could include a paragraph about the ability or potential for Snake River fall Chinook or steelhead to shift their run timing (later), and still successfully spawn and produce recruits, especially if winter stream temperatures may be on the rise, or whether there is evidence as to why this would not be a successful adaptation.

1) Factors that Influence Eagle Creek Watershed Temperature – page 50.
Describing the Eagle Creek Fire impacts from a spatial extent and burn severity from the USFS is very helpful. However, it would add a great deal to take the next step and describe the relative impact to stream hydrology, temperature and hydro-geomorphology that is either already experienced or is predicted given the impact of the fire to areas like Eagle Creek, Tanner Creek, etc. Identify and known or expected watershed restoration actions that are underway, could be undertaken, should be pursued, etc. beyond just identifying studies or fire impacts. Recognizing this is the USFS' and other jurisdictions, it would still be useful.

16) Action Recommendations, and Uncertainties – Beginning on Page 154 -
NMFS strongly supports the following recommendations which have been made, or could be added to this section:

- One possible (short-term and direct) action to protect thermal refugia for fishes is to limit harvest in thermal refugia. Many of the thermal refugia identified are very popular fishing spots.
- The data documenting CWR fish use would benefit from increased direct evidence of use and adding tag detection arrays at more locations of interest, and funding radio-tracking and tag detection analysis work. Since there is evidence for high use of Drano Lake as a cold-water refuge by steelhead, and since it is a popular fishing location during times of cold-water refuge use, adding tag detection arrays at this location would be a high priority.
- Data on fall Chinook use of cold-water refuges seems lacking compared to those for steelhead, so a recommendation could be made for similar, future fall Chinook studies
- The distribution of thermal refugia is rather limited, with almost no large sources of cool water upstream of the Deschutes. Water temperatures in some of the eastern tributaries could potential be lowered by reducing water withdrawals and improving riparian cover.

17) In General:

Overall, a good assessment and inventory of known cold water refugia in the Lower Columbia. In general, a well-researched report that can form a strong basis for developing actions to protect cold water refugia.

NORTHWEST ENVIRONMENTAL ADVOCATES

November 19, 2019

John Palmer
Region 10
U.S. Environmental Protection Agency
1200 6th Avenue, Suite 155 (19-C09)
Seattle, WA 98101 *Via email only*: palmer.john@epa.gov

Re: **Columbia River Cold Water Refuges Plan, DRAFT (Oct. 2019)**

Dear John:

Approximately a quarter century after the Oregon 1992–1994 triennial review that ended in 1996—the first triennial review in which the importance of thermal refugia was first identified as a key part of providing designated use protection—the U.S. Environmental Protection Agency (EPA) has issued a purported plan to ensure that such refugia offset the hazards salmonids face in migrating through the increasingly hot waters of the Columbia River. Two lawsuits against EPA later; two lawsuits against the National Marine Fisheries Service (NMFS) later; two NMFS biological opinions later, two EPA Region 10 temperature guidance documents later . . . EPA has finally issued a draft plan to identify, evaluate, and possibly protect thermal refugia in the Columbia River. EPA, *Columbia River Cold Water Refuges Plan, DRAFT* (Oct. 2019) (hereinafter "Plan").

In our opinion, while the scientific information about salmonids' use of refugia is impressive and generally easy to understand, the "plan" aspect of this plan is so seriously lacking as to not exist. Plan: "a method of achieving an end." Merriam-Webster, *available at* https://www.merriam-webster.com/ dictionary/plan. Plan: "An orderly or step-by-step conception or proposal for accomplishing an objective" or "[a] proposed or intended course of action." The American Heritage Dictionary of the English Language, 5th Edition, *available at* https://www.wordnik.com/words/plan. This EPA plan is not a plan. It is a very nice report that contains a conclusion—that there are likely sufficient refugia now but will not be in the future—and that cites many other plans and makes such tepid recommendations that one is fearful of calling them recommendations. Certainly recommending that someone, somewhere, at some time, follow some other group of plans is not a plan itself. It's a dodge. It is EPA failing to do anything at all to generate a sense of urgency to state governments that they must take actions to address their failing nonpoint source control programs (and other related failings, such as water flow management, dams, etc.), and to set out the actions that EPA and other federal agencies must take or should take. In a plan that relies heavily on statements about protecting riparian

vegetation, remarkably EPA says absolutely nothing about its own role in ensuring that states protect and restore forested riparian vegetation. In fact, this plan says very little about changing fundamental aspects of the regulatory status quo under the Clean Water Act and state legal authorities even in those instances when EPA hints broadly at it.

Prior to jumping into the first section on the regulatory background, this document should give a short discussion of why temperature is an important water pollution issue to address, why the Columbia is of particular importance, why EPA believes that thermal refugia offer relief from a 20º C criterion but not warmer temperatures, the role of uncertainty in EPA's beliefs, and briefly discuss that which is rather obliquely referred to later in the document, namely the 2015 death of sockeye that EPA describes as "the use of CWR [cold water refugia] is seen as an ineffective migration strategy for these fish." *Plan* at 24.

I. Page by Page Review

1.1 Regulatory Background

Page 2 – This page includes what is purportedly a quotation from Oregon's water quality standards that says "the Lower Columbia River: 'must have coldwater refugia that's sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body.'" Despite its having quotation marks, this is not an accurate quotation because Oregon's water quality standards are not grammatically incorrect and do not include contractions. Also, there should be a citation added: OAR 340-041-0028(4)(d). In addition, EPA should include information about the designated uses in the Columbia River as designated by the State of Washington. *See* WAC 173-201A-602. Instead, EPA focuses only on those waters that are covered by the Oregon narrative criterion, as if the designated uses on their own—which presumably are identical or near identical in both states—do not demand the same protection to salmonids as that provided by the Oregon narrative criterion, namely the ability to migrate through the Columbia River to their natal streams. EPA should make clear that its analysis meets Washington's water quality standards as well as the Reasonable and Prudent Alternative set out in the NMFS Biological Opinion that caused EPA to issue the plan. *See* NMFS, *Endangered Species Act Biological Opinion on the Environmental Protection Agency's Proposed Approval of Certain Oregon Water Quality Standards Including Temperature and Intergravel Dissolved Oxygen* (Nov. 3, 2015) (hereinafter "NMFS Biological Opinion").

The same is true with regard to Oregon's definition of cold water refugia, which requires only that the refugia be "at least 2 degrees Celsius colder than the daily maximum temperature of the adjacent well mixed flow of the water body." While the NMFS Biological Opinion did not find that this definition jeopardizes salmonids, it is obvious that at some set of elevated temperatures that are two degrees Celsius from each other, this definition no longer protects the designated

uses even if the lower of the temperatures poses less of a threat. Given that EPA finds that Lower Columbia River temperatures "reach peak temperatures of about 22°C in mid-August," *Plan* at 24, and EPA has also found that two degrees less than 22º C, namely 20º C, causes "significant disease risk," *Plan* at Table 4-1, the definition is already inconsistent with facts in the water. As EPA goes on to predict rising temperatures in both the Columbia River and the tributaries that provide the thermal refugia, EPA's failure to discuss the definition, as if it were set in regulatory stone, is a significant misstep. These increased temperatures are in the range of very high deleterious effects, as demonstrated by the summary of those effects in Table 4-1. Elsewhere, as in Recommendation No. 26 part c, EPA mentions that steps might be taken under the Clean Water Act to provide more protection so it is not as if EPA considers such matters as outside the scope of this document. *See Plan* at 161 ("Consider special designations, antidegradation policies, and/or narrative water quality criteria as appropriate to prevent warming above current temperatures and maintain existing flows in the 12 priority CWR tributaries.").

Page 2 – We humbly suggest that EPA should cite the name of the case that invalidated the Endangered Species Act consultation that led to this plan. The citation for that case is: *Northwest Environmental Advocates v. U.S. E.P.A.*, 855 F.Supp.2d 1199, 1128 (2012). Note that the original NMFS Biological Opinion listed cold water refugia as a mitigating factor for the adverse effects of the EPA-approved water quality standards on salmonids. *Id*. In fact, three of the six mitigating factors were about refugia. *Id.* ("To support its conclusion, the NMFS listed six mitigating factors, including: . . . (3) the provision for cold water refugia, (4) consideration of aspects of water temperature cycles and refugia, (5) the narrative criterion protecting migration without significant adverse effects[.]"). But for this NWEA lawsuit, NMFS would not have developed any analysis demonstrating that the State of Oregon was ignoring this key provision of the EPA-approved water quality standards. But for this lawsuit, EPA would not have developed any analysis of whether the cold water refugia are and will be in the future sufficient to protect migrating salmon in the Lower Columbia River.

Page 3 – It is unclear why EPA makes reference to NMFS's having concluded that "evidence in the record" indicated the refugia narrative criterion was not being implemented. There was no "record" other than what NMFS compiled in the course of its evaluation.

Page 3 – This EPA plan should make reference to the Willamette and what is or is not happening with that corollary plan but the word literally is not to be found in this document.

1.2 Types of Cold Water Refuges

Page 3 – The discussion of refugia in stratified reservoirs mentions that fish may reside in "cooler water at depth." It does not state whether this cooler water may be impaired in other ways, such as lack of dissolved oxygen, that would render it unsuitable for salmonids.

1.3 Overview of the Columbia River Cold Water Refuges Plan

Pages 3–5 – EPA states that the geographic scope of its plan is "focused on the Lower Columbia River between the mouth and river mile 309 (Oregon-Washington border), where the Oregon cold water narrative criteria applies (Figure 1-1)." EPA's plan is inadequate as it suggests a lack of a legal requirement to protect the migrating salmon from the 20º C criterion in Washington State based on the lack of a similar refugia-specific narrative criterion. The Clean Water Act is clear that designated uses must be protected regardless of the criteria. *PUD No. 1 of Jefferson Cnty. v. Wash. Dept. of Ecology*, 511 U.S. 700 (1994). We agree that EPA should have, as it says it did, extended its analysis to the Snake River even though the rationale—"since the Snake River entry at river mile 325 is near the Oregon-Washington border"—is flawed. Based on the current August mean water temperature reported by EPA, *Plan* at Fig 2-1, and Washington's designated uses, EPA should have included the portion of the Columbia River in Washington State.

Pages 9–10 – Figures 2-5 and 2-6 are of significant importance and should be available for the public and various agencies to see with the kind of detail that cannot be achieved in a print format, or at least the print format that EPA offers here. Specifically, EPA should offer the reader the ability to access these figures online with the ability to zoom in on details and/or it should print portions of the overall map at a scale that allows the details to be read. Without the details, the information is not useable. Likewise, Figure 2-7 should be prepared with an on-line version that labels all of the tributaries.

Page 25 – EPA shows on Figure 3-1 that the "[r]efuge use" is during the period of time in which temperatures at Bonneville Dam exceed 20º C. However, the text and Figure 3-2 say something different: "As shown in Figure 3-2, migrating steelhead begin to use CWR when the Columbia River temperature reaches 19°C, and when temperatures are 20°C or higher approximately 60-80% of the steelhead use CWR." Therefore, the indication of refugia use on Figure 3-1 is incorrect because it does not reflect the use of refugia when temperatures reach 19º C and it purports to include steelhead.

Page 28 – EPA needs to discuss the ramifications for its conclusion that some salmonids are not using cold water refugia to mitigate their exposure to high water temperatures. EPA's approval of the Oregon 20º C criterion was based on the narrative criteria that accompany it. If some species of salmonids are being harmed by or are not protected by the 20º C criterion and do not use the thermal refugia to mitigate that harm, then Oregon's water quality standards are not performing the function for which they were adopted and approved by EPA. Specifically, EPA finds that sockeye "are most susceptible to warm temperatures with limited mortality at 19-20°C and significant mortality at 20-21°C." *Plan* at 45. Sockeye do not appear to use refugia. *Id*. at 54. Yet, in 2015, "Lower Columbia river temperatures were significantly warmer than average during the June-July sockeye run, reaching 20°C (68°F) at the peak of the run, in late June." *Id.*

at 55; *see also id.* Fig 4-7. EPA recounts the results that year:

> In early June when river temperatures were below 19°C, survival between the two dams was high (90-100%). During week 4 in Figure 4-8 (June 22–28), when river temperature climbed above 20°C, survival dropped to 70% for Columbia River sockeye and 50% for Snake River sockeye (10% for Snake River sockeye transported as juveniles). In weeks 5-8, when river temperatures exceeded 21°C, survival was very low (0-20%). Because most of the Snake River sockeye migrated in late June and July, the overall survival for Snake River sockeye between Bonneville Dam and McNary Dam was only 15% in 2015 (FPC 2015).

Id. at 55. EPA's own conclusion demonstrates that Oregon's temperature standards do not protect sockeye. Either new numeric criteria that correspond to the runs of species that are not using the river during the very highest temperatures but that are affected by high temperatures during their period of river use need to be adopted or some other solution must be found in the water quality standards. The fact that this plan finds that the refugia do not provide mitigation to all salmonids migrating through the Lower Columbia River means that this plan must set out a solution to that regulatory problem. It does not, however, even engage in the topic.

3.4 Steelhead Use of Cold Water Refuges

Pages 30–35 – EPA explains how it has calculated the number of steelhead using the refugia and the estimated density. It does not mention here that the density in combination with the temperatures to which the fish are exposed increase adverse impacts of fish disease. Later in the plan, we see that EPA has identified the carrying capacity of the refugia as an issue that needs research. *Plan* at 157 ("high densities of adult fish are known to contribute to the spread of disease."). Nonetheless, EPA should address the issue to the best of its ability without the benefit of the research it has flagged is needed. The very heart of the question of whether there are sufficient refugia, as the plan is required to address, involves whether use of the refugia identified are sufficient to harbor fish, including without increasing their risk of disease from proximity. Instead, the plan's only references to disease, other than in the context of the needed research, is the disease caused by higher temperatures.

3.5 Fall Chinook Use of Cold Water Refuges

Pages 35–37 – Same comment as immediately above.

Pages 38–39 – EPA concludes that salmonids did not historically rely on cold water refugia to the degree that they do now, with the higher river temperatures. Again, this suggests that EPA should discuss the impact of fish disease and the metabolic effects of holding in refugia on this reliance.

4.1 Adverse Temperature Effects to Migrating Adult Salmon and Steelhead

Page 45 – In the first paragraph, EPA states that Oregon and Washington have a 20º C maximum water quality criterion for the Columbia River, which is consistent with EPA's recommended criteria. This is incorrect. First, as EPA knows, Oregon's standard includes additional narratives—one of which is the subject of this very document—because 20º C is not sufficiently protective. Second, EPA Region10's recommendations to states on water quality standards for temperature mirror EPA's belief that the 20º C criterion is not sufficiently protective:

> To protect this use, EPA recommends a 20°C maximum 7DADM numeric criterion plus a narrative provision that would require the protection, and where feasible, the restoration of the natural thermal regime. EPA believes that a 20°C criterion would protect migrating juveniles and adults from lethal temperatures and would prevent migration blockage conditions. However, EPA is concerned that rivers with significant hydrologic alterations (e.g., rivers with dams and reservoirs, water withdrawals, and/or significant river channelization) may experience a loss of temperature diversity in the river, such that maximum temperatures occur for an extended period of time and there is little cold water refugia available for fish to escape maximum temperatures.
>
> In this case, even if the river meets a 20°C criterion for maximum temperatures, the duration of exposure to 20°C temperatures may cause adverse effects in the form of increased disease and decreased swimming performance in adults, and increased disease, impaired smoltification, reduced growth, and increased predation for late emigrating juveniles (e.g., fall chinook in the Columbia and Snake Rivers). Therefore, in order to protect this use with a 20°C criterion, it may be necessary for a State or Tribe to supplement the numeric criterion with a narrative provision to protect and, where feasible, restore the natural thermal regime for rivers with significant hydrologic alterations. Critical aspects of the natural thermal regime that should be protected and restored include: the spatial extent of cold water refugia (generally defined as waters that are 2°C colder than the surrounding water), the diurnal temperature variation, the seasonal temperature variation (i.e., number of days at or near the maximum temperature), and shifts in the annual temperature pattern. The narrative provision should call for the protection, and where feasible, the restoration of these aspects of the natural temperature regime. EPA notes that the protection of existing cold water refugia should already be provided by the State's or Tribe's antidegradation provisions or by the cold water protection provisions discussed in Section V.2 below. Thus, the new concept introduced by the narrative provision EPA recommends here is the restoration of the natural thermal regime, where feasible.

EPA, *EPA Region 10 Guidance For Pacific Northwest State and Tribal Temperature Water Quality Standards* (April 2003) at 29.

4.5 Energy Loss and Pre-Spawning Mortality of Fall Chinook Salmon from Exposure to Warm Migration Temperatures

Page 54 – The paragraph on the likely effects of climate change ("Under simple temperature increases of . . . .") on timing of and survival after increased temperatures is oddly placed in the document. We do not object to its being here so long as the information is also repeated later on in the document where climate change is discussed.

4.6 Increased Mortality and Shift in Run Timing of Sockeye and Summer Chinook from Warm Migration Temperatures

Page 54 – Discussing the hazards to sockeye of delaying migration by using cold water refugia omits any statement as to whether the timing of their migration is the same as it was historically or it is altered. This is relevant information that should be included one way or the other. What EPA describes in this section is sockeye that are stuck between a "rock and a hard place." On one hand, if they use the refugia and delay, they will be harmed by warmer upstream temperatures and by not using the refugia they are harmed by the downstream temperatures.

Page 55 – Fig. 4-7 should have temperatures converted or added to reflect the Celsius temperatures used throughout the document. The same is true of Fig. 4-11 on page 59 and possibly other figures.

Pages 56–57 – The information set out in this section supports the need for EPA to interpret the designated uses and existing uses, as protected under the antidegradation policies of the states consistent with federal rules, of the Columbia as requiring protection, as discussed above. For example, EPA states that, "[o]ver time, because the June sockeye migrants are more successful, the genetic traits of the June migrants increase as a percentage of the population, contributing to the shift in migration timing (Crozier et al. 2011)." And, EPA says that "Figure 4-10 shows how increasing July river temperatures at Bonneville Dam (Panel B) over the past 60 years has resulted in earlier migration of Columbia River sockeye salmon." Likewise, EPA states that, "much like the sockeye salmon run, the summer Chinook run has also shifted to earlier in the year, likely in response to rising July temperatures." *Plan* at 59. EPA is silent on protection of these species as existing uses even though they are protected by state water quality standards. *See, e.g.*, OAR 340-04100004(1); *Northwest Environmental Advocates v. U.S.E.P.A.*, 855 F.Supp.2d 1199, 1220-1222 (D. Or. 2012).

5.1 Historic Temperature Conditions of the Lower Columbia River

Page 61 – When "EPA notes that flow regulation, land use changes, natural variability, and other factors likely influenced the observed changes, and increased water temperatures may not be ascribed solely to anthropogenic climate change influences," EPA should also note that it is long overdue to prepare a temperature Total Maximum Daily Load (TMDL) for the Columbia River, pursuant to section 303(d) of the Clean Water Act, a regulatory document in which this refugia information must be included.

5.2 Future Temperature Conditions of the Lower Columbia River and Its Tributaries

Pages 64–67 – EPA concludes:

> It is therefore likely that fewer salmon and steelhead will migrate in the Lower Columbia River during mid-July through August in the future under these warming trends, resulting in a change in the timing of salmon and steelhead runs. Adult sockeye salmon and summer Chinook will likely continue to migrate earlier as already observed, with very few migrants in July. Adult fall Chinook are likely to migrate later with minimal migrants in August, and those that do migrate then will likely need to use CWR to have sufficient energy to successfully spawn. Steelhead may use CWR for longer duration to avoid peak temperatures, or they may not be able to use CWR over the mid-summer like they currently do because mainstem temperatures are too warm in late July/early August for steelhead to reach the CWR in the Bonneville reach. If the latter proves true, this may result in a bi-modal migration pattern for steelhead with early summer and late summer runs. However, whether these species can shift their migration timing to adapt to the rate of warming, and whether such shifts can be done successfully without disruption to their full freshwater life cycle, is uncertain (Crozier et al. 2011 and Keefer & Caudill 2017).

Plan at 64. On page 66, EPA goes on to say that

> Temperatures in the tributaries to the Lower Columbia River, including the 23 tributaries that currently provide CWR, are also predicted to increase due to climate change. Table 5-1 displays the predicted increase in August mean temperatures for the 23 CWR tributaries (12 primary CWR highlighted in blue) using the NorWeST SSN model (Appendix 12.17). August mean temperatures for the CWR tributaries are predicted to increase by 1.2–1.5°C by 2040 and by 2.1–2.7°C by 2080 relative to current baseline (1995–2011).

> Of significant concern are those primary CWR tributaries that are predicted to have August mean temperatures that exceed 18°C. Tributary temperatures exceeding 18°C, although still serving as CWR if more than 2°C cooler than the Columbia River, are at levels associated with increased risk of disease and energy loss. For instance, by 2040, the Deschutes, Lewis, and Sandy Rivers are predicted to exceed 18°C, temperatures that will diminish their CWR function. By 2080, the Cowlitz, White Salmon, and Klickitat Rivers are predicted to have August mean temperatures exceeding 18°C, diminishing their CWR function.

Id. at 66. So how does EPA conclude that there are sufficient thermal refugia to meet the standard?

6.1 CWR SUFFICIENCY ASSESSMENT FRAMEWORK

Page 67 – EPA complains that evaluating whether the existing refugia are sufficient to meet the requirements of the Oregon water quality standards that it approved is "complex" because Oregon does not have "quantitative metrics to define what is sufficient." This lack of clarity is a reflection of EPA's own disinterest in the role of the refugia in real life. Oregon clearly, by its inaction that was highlighted by the NMFS BiOp, was only interested in tacking on the cold water refugia narrative criterion in order to get EPA to approve a temperature criterion of 20º C that it knew was not protective of salmonids. At the time of the EPA approval, EPA was well aware that Oregon had no plan and no intention to implement this criterion, including because Oregon claimed that it would do so through NPDES permits, which was an obviously false assertion. EPA's complaints come across as whining when instead the agency should reflect on its own shortcomings in approving the provision in the first place, when it knew that it was just a paperwork exercise. Only by being honest about its failings can the agency not repeat its mistakes in the future.

Page 67 – EPA should include the source for the statement: "mortality of caught and released fish" in cold water refugia. We believe that EPA has obtained information from NMFS on this topic and that it should reveal the source because it would be useful for the fish and wildlife agencies in pursuing restrictions on fishing in the cold water refugia where without restrictions the fish cannot, in fact, obtain refuge.

Page 67 – We appreciate EPA's recognition that "although CWR can help mitigate adverse effects to migrating salmon and steelhead when Columbia River temperatures exceed 20°C, the CWR narrative standard should not be interpreted to 'allow for' or to 'fully compensate for' Columbia River water temperatures higher than the 20°C numeric criterion." Note that this is not what EPA argued in its briefs to the court. *See, e.g.*, *Nw. Envtl. Advocates v. EPA*, Civil No. 05-1876-HA, United States' Memorandum in Support of United States' Cross-Motion for Partial Summary Judgment on Clean Water Act Claims and in Opposition to Plaintiff's Motion for

Partial Summary Judgment on Clean Water Act Claims (Jan 14, 2011) at 29. We believe that this point should be made in any summaries of EPA's findings and recommendations so as to not leave the wrong impression with readers that the presence of refugia somehow means there are no problems with temperature in the Columbia nor hazards associated with the 20º C criterion.

Page 68 – We fully support EPA's evaluation of the sufficiency of refugia in the three time frames. However, it is unclear on what basis EPA stops at 2040, especially in light of its own predictions that temperatures will dramatically rise in both the Columbia River and the tributaries that provide thermal refugia by the year 2080. *See Plan* at 66, Table 5-1.

Page 74 – On this page, EPA concludes that,

> the lack of CWR in the nearly 100 miles between the Deschutes River and McNary Dam, including the John Day reservoir which has the highest temperatures in the Lower Columbia River, is of concern. This nearly 100-mile reach poses the greatest risk from warm temperatures for migrating salmon and steelhead. Thus, it is difficult to conclude that CWR distribution is sufficient based solely on locations. In addition, there is very little opportunity to restore CWR in this reach, and even under natural conditions there were likely only a few small tributaries (e.g. Willow Creek, Rock Creek) and the Umatilla River that provided CWR.

While it does little or nothing for the fish themselves, this conclusion leads to the result that EPA must revisit its approval of the Oregon 20º C criterion for this stretch of the Columbia River. In addition, EPA should reconcile this conclusion with its other conclusion that there are, in fact, sufficient thermal refugia. The facts should guide the conclusion, not the desire to justify EPA's approval of the water quality standard.

Page 74 – EPA concludes that "[t]he strongest line of evidence that the current amount of CWR is sufficient under current Columbia temperatures is the adult survival rates from Bonneville Dam to McNary Dam. As discussed in Section 4.4, the adult survival rate after accounting for harvest and straying for Snake River steelhead and fall Chinook is over 90%." EPA then cites NOAA's conclusion that it "does not view adult migration conditions in this river segment as 'substantially impaired' for upper Columbia and Snake River steelhead and Snake River fall Chinook." Frankly, this is an odd conclusion. First, it fails to address the species that do not rely on refugia and are, nonetheless, adversely affected by the 20º C criterion, e.g., sockeye. Second, this statement only applies to the already and admittedly severely depressed populations of steelhead and Chinook. Were the species' populations to increase, would the refugia be sufficient? Presumably the desired goal of the Clean Water Act is not to maintain salmonid populations at a level at which they are defined as at risk of extinction, known as "threatened" and "endangered" under the Endangered Species Act. Third, is the definition of a protective

water quality standard one that does not cross a line that is defined as "substantially impaired"? That is not how we read the Clean Water Act and EPA's implementing regulations. 40 C.F.R. § 131.11(a) ("the criteria shall support the most sensitive use"). Fourth, having estimated that the same survival rate applies to both hatchery and wild Snake River fall Chinook, Plan at 50, did EPA calculate the effect of that rate on the wild fish population? Fifth, after citing the assertion that temperature-related mortality is not currently "substantially impairing" the recover of Snake River steelhead and fall Chinook, did EPA combine this less-than-substantial loss with other losses to consider that species on the verge of extinction do not necessarily need to owe their status to any single adverse impact on their populations? And, finally, given that to have the in-the-water effect of protecting, enhancing, and/or restoring thermal refugia—which EPA confirms are essential elements to Oregon's water quality standards and salmonid survival of Columbia River migration—the extraordinarily slow wheels of regulation must begin to move, the trees must be protected and planted, the best management practices for nonpoint sources must be implemented—that is to say there is zero time to waste to get ready for a hotter future—how does EPA draw any conclusion that suggests the problem of inadequate thermal refugia is not upon us now? EPA cannot turn a switch on twenty years down the road to protect the fish; that switch must be turned on now.

Page 75 – EPA concludes that, "primarily because there does not appear to be capacity limitations on the use of CWR in the Lower Columbia River, and adult steelhead and fall Chinook migration survival rates exceed 90% in this reach, EPA's assessment is that the current amount of CWR is sufficient under current Columbia River temperatures." This statement is not supported by EPA's failure to evaluate capacity limitations, particularly with regard to disease. The finding rests on an extremely flimsy basis of something not appearing to be a problem about which nothing is known. In addition, EPA concluded that "the lack of CWR in the nearly 100 miles between the Deschutes River and McNary Dam . . . is of concern. *Plan* at 74.

Page 76 – On this page, EPA summarizes the uses of thermal refugia and concludes that the spatial and temporal extent "appears to be sufficient" now but "may not be in the future." First, how is it that EPA can conclude it "may" not be in the future when EPA has predicted very high temperatures under future conditions? And on the same page conclude that "there is significant risk that the Lower Columbia River adult migration survival rates for steelhead and fall Chinook will decrease in the future"? There doesn't seem to be any "may" about it. Second, there is a lot of science in this report that is titled a plan. How is it that EPA comes to a conclusion that it "appears" there are sufficient refugia? It seems more likely that EPA has concluded that the refugia that exist are all that are there rather than they are sufficient. Because EPA in this very document states that historically refugia were not the critical key to salmonid survival than they are today. Since EPA goes on to conclude that by 2040, "there is significant risk that the current amount of CWR will not be sufficient to minimize the risk to migrating salmon and steelhead," EPA should draw a single conclusion: that there are not sufficient refugia. When EPA approves a water quality standard, it is not approving it for a limited period of time but, rather, based on the

science it has before it. Instead, EPA divides the future into periods for which it draws different conclusions, and then fails to sound the alarm, an alarm that might have led to a plan that called for urgent action rather than the tepid response laid out in the remainder of this document.

7 Actions to Protect & Restore Cold Water Refuges

Page 77 (and Appendix 12.20) – In this opening to the beginning of the plan aspect of the plan, EPA starts with its conclusion from the analysis part of the plan that there are sufficient refugia. As we stated immediately above, that is a problem. EPA establishes zero sense of urgency in any of its proposals. Then, EPA highlights two refugia in addition to the 12 primary tributaries: the Umatilla River and Fifteenmile Creek. As EPA points out, the Umatilla is "the only significant opportunity for increased CWR in the warm 93-mile reach between the Deschutes River CWR and McNary Dam." It errs, however, when it chooses to lean on the TMDLs that have been completed "indicating the potential for decreased summer temperatures in the river (Appendix 12.20)." To the extent that EPA is relying on completed TMDLs for predicted temperatures, this is in error. TMDLs, seeking to meet the now-vacated natural conditions criterion that allowed purportedly natural conditions to supersede the numeric criteria, modeled purported natural temperatures. The problem with these temperatures is that they did not remove all anthropogenic impacts in the modeling process. In fact, many of them are quite explicit as to what anthropogenic impacts remain. One of the more obvious impacts that remain in the purportedly natural temperatures is the heat from the majority of streams miles in a basin. As Oregon generally only modeled the mainstem rivers, assumptions had to be made about what to use for tributary inputs. These assumptions ranged from the use of current temperatures to the numeric criteria. Some TMDLs and their extensive appendixes state this piece of information clearly and others do not. As a result of using an assumption that does not reflect the removal of current anthropogenically-influenced conditions such as existing lack of vegetation, lack of tributary flows, dams, wide channels, width:depth ratios, loss of groundwater inputs, and loss of channel complexity, the modeling outputs predicted temperatures that could not have been "natural." As NWEA detailed in a brief to a successful federal court challenging EPA's approval of numerous Oregon TMDLs, and citing the administrative record in that case:

> Anthropogenic influences that were omitted from determinations of purportedly natural criteria are set out at: AR00005 at 63 (Rogue, Applegate; channel armoring and wetland draining), *id*. at 90 (current tributary temperatures and flows); AR0034 at 1131 (Snake: upstream sources, impoundments, changes in flow, channel straightening, diking, and removal of riparian vegetation); AR0085 at 4203 (Umatilla, Walla Walla: channel armoring, wetland draining, urbanization); AR0086 at 4329 (Umatilla, Walla Walla: mainstem and tributary flows); AR0108 at 4913 (Willamette: some dams, tributary temperatures), *id.* at 4914 (dams, flow, simplified channel), *id*. at 4915 (loss of channel complexity, velocities); *id*. at 4918 (deepening, bank armoring, dike construction, aggregate

> mining, wetlands and floodplain reclamation); AR0166 at 10598 (Umatilla, Willow Creek: channel conditions, hydrology); AR0182 at 11137 (Umpqua: floodplain connectivity, large woody debris, channel complexity), *id*. at 11118 (dam reservoirs); AR0218 at 12760 (Rogue, Bear: loss of off-channel areas, natural stream widths), *id*. at 12764, (irrigation activities); AR0253 at 13720 (Molalla-Pudding: tributary temperatures and flows); AR0283 at 14427 (Rogue: stream location, hydrology), *id.* at 14434 (58 dams); AR0309 at 15505 (Middle Columbia, Miles Creeks: dams), *id*. at 15527 (estimated tributary natural conditions); AR0319 at 15782 (Lower Grande Ronde: channel width and bank stability); AR0342 at 16825 (Malheur: all changes except riparian vegetation); AR0371 at 17823 (John Day: groundwater and sinuosity); AR0373 at 18071 (John Day: current tributary temperatures).

Nw. Envtl. Advocates v. EPA, Plaintiff's Motion for Summary Judgment on Clean Water Act and Endangered Species Act Claims, Civil No. 3:12-cv001751-AC (Nov. 25, 2014) at 19– 20, fn 16. It is highly inappropriate for EPA to cite to the so-called natural temperatures that come from these TMDLs because they do not represent the lowest temperatures that could be achieved.

The cited appendix is a memorandum that includes a discussion of the Umatilla TMDL that states: "significant restoration needs to be completed on the Umatilla before it becomes a viable cold water refuge. The TMDL identifies improved water use efficiency and riparian vegetation to restore floodplain connectivity as well as improving water quality to col water temperatures[.]" Appendix 12.20 at 2. EPA notes about Fifteenmile Creek that "the Fifteenmile Creek TMDL, which models temperatures under fully restored conditions and describes actions needed to restore the watershed. The modeling analysis in the temperature TMDL for this creek indicates that if flow and shade were restored to near "natural" conditions, the summer river temperatures could be significantly reduced and flow restored to the point that a CWR could be formed at the creek's confluence with the Columbia River." *Id*. at 4. Naturally, it is not rocket science that increasing flows and shade would lead to cooler waters. That is an early view of one of the primary problems with this plan.

EPA concludes that in the absence of analysis, i.e., TMDLs, completed for "the other 10 non-primary CWR tributaries and potentially other tributaries to the Lower Columbia River," it can only conclude that these "may have the potential to be restored to provide additional CWR. Restoration activities, such as riparian planting, bank stabilization, or water efficiency improvements in the other 10 non-primary CWR tributaries may increase the quality and quantity of their CWR. The EPA had limited information to quantify temperature improvements after restoration, so this Plan focused on areas with temperature TMDLs and other available information to select the two "restore" tributaries as described above." *Id*. at 4. Thus, in Table 1 of this appendix, EPA identifies eight potential refugia tributaries —Skamokawa Creek, Mill Creek, Abernethy Creek, Germany Creek, Bridal Veil Creek, Wahkeena Creek, Oneonta Creek,

Rock Creek—for which there is "no information on restored natural temperatures," the basis for not identifying them as priorities for restoration. This is a poor basis upon which to reject any potential refugia. First, the impacts of climate change and the uncertainty of the carrying capacity issue suggest that this is an emergency and the definition of an emergency is to do everything possible. Second, the results of the TMDL modeling exercises are inherently flawed so waiting on them seems pointless. Third, the TMDLs do not, in fact, guide any activities that are aimed at controlling nonpoint source pollution, the primary source of stream warming. EPA is pointlessly letting a technicality stand in the way.

Unless a tributary is simply not able to provide any benefit to migrating salmonids, it seems foolish to eliminate it from consideration for a lower priority restoration. In a warming world in particular, it should be true that all potential refugia be treated to the treatment EPA proposes for the 12 primary tributaries plus the Umatilla and Fifteenmile Creek, namely "to: 1) avoid human actions that could increase temperatures of the tributary, and 2) restore the tributary to cool temperatures to potentially partially or fully counteract predicted warming from climate change" or "to restore . . . watersheds to provide additional CWR." The only reason to treat a less useful tributary differently is the allocation of restoration funding. However, all regulatory actions that should be taken, most of which are not discussed in this so-called plan, do not require such funding.

On page 7 of this appendix, there is note to the author to "cite memo" for "Factors influencing temperature: riparian vegetation" that you probably would like to fix.

Pages 81–82 – Table 7-1 includes only four "Actions to Protect and Restore CWR," namely to restore stream morphology, limit new water withdrawals, maintain/restore riparian shade, and to address sedimentation at the mouth. Again, this is not rocket science. This plan falls well short of explaining how these changes are going to come about, step by step. Needless to say, each of these identified refuges includes a check mark on riparian shade protection and all but one includes stream morphology. Repeating what scores of other plans and reports have to say is not itself a plan to protect, enhance, and restore cold water refugia.

Pages 83–152 – Comments set out below pertaining to subsections 7.3 through 7.16 are both specific to those subsections and apply generally to all of the subsections. For example, the comment pertaining to page 83 below that discusses ambiguities in EPA's language applies to all such use of language in describing the same information for the other refugia. In another example, the comment pertaining to Figure 7-4 on page 85 applies to all such figures in the subsections. We have attempted to refrain from repeating ourselves when it would serve no purpose other than to increase the length of these comments.

7.3 COWLITZ RIVER (RIVER MILE 65) – PROTECT AND ENHANCE

Page 83 – EPA states:

> The lower portion of the Cowlitz River is designated for salmonid spawning, rearing, and migration by the Washington Department of Ecology, which assigns a water quality criterion of 17.5°C for maximum water temperatures. The maximum water temperature modeled for the Cowlitz River is 21°C (1993-2011) (Appendix 12.18). Based on actual maximum temperature readings, the lower Cowlitz River is on the 303(d) list for temperature impaired waters.

It is unclear, from the U.S. Forest Service website cited in the Appendix 12.18, what "maximum temperatures" are being modeled. These presumably are not the modeled natural temperatures that could be achieved if flows, vegetation, channel morphology and the like were restored. So, what are they? And why are they relevant? EPA does not say. EPA also does not say why a waterbody described as violating water quality standards currently is under a title termed "protect and enhance." Enhance seems to be a lesser level of effort than "restore," the word used for the two non-primary refugia that are in worse shape. It is inconsistent and misleading to use different words and, at the very least, EPA should explain why one 303(d) listing is of better quality than another 303(d) listing such that some waters do not warrant being labeled for restoration by EPA.

Page 84 – The fact that this refuge is the equivalent of "approximately 622 Olympic-sized swimming pools" is not any kind of explanation of crowding that might take place and cause disease-related problems. Perhaps it helps to visualize it but it's not particularly helpful. It would be more helpful if one is trying to make relative comparisons to put the information into a table.

Page 85 – EPA states that "[t]he riparian forests along the lower 20 miles of the Cowlitz River have been severely degraded through industrial and commercial development, and channelization in these areas limits potential for recovery." This is a rather important area, as it is the refuge area, and therefore, even if, say, the river is too wide to be shaded (this information is not given), making it more fish-friendly would seem to be a priority. Concluding that its potential for "recovery," a vague term, does not state what really might be able to be accomplished. It is unclear what the point of a plan is when it seems to give up pretty readily, rather than to really dive in and see if something could be done or it is completely hopeless.

EPA also states that "[r]estoration of riparian shade on private forestlands, which cover much of the lower Cowlitz basin, is expected to improve through time and implementation of Washington's State Forest Practice Rules." This is the first of many references to the states' logging rules. Remarkably, EPA does not distinguish between the better Washington rules and

the really terrible Oregon rules that we will discuss below. But the Washington logging practices are not fully protective of designated uses, as Ecology can attest to, and EPA knows full well. *See, e.g.*, Washington Department of Ecology, *2009 Clean Water Act Assurances Review for Washington's Forest Practices Program* 3 (July 15, 2009) ("After ten years, no studies have been completed or data collected that provide an indication of whether or not the forest practices rules are improving water quality or maintaining forested waters in compliance with the water quality standards."); Memorandum from Mark Hicks, Ecology, to Forest Practices Board, Re: *Clean Water Act Milestone Update* (April 22, 2019) ("It has been almost 20 years since the Assurances were first granted, but the effectiveness of the rules remains largely untested."); William Ehinger and Stephanie Estrella, Ecology, and Greg Steward, Northwest Indian Fisheries Commission, *Type N Hard Rock Study Stream Temperature/Shade*, presentation to the TFW Committee Meeting (Oct. 5, 2017). Therefore, in what appears to be an emergency setting—will there be sufficient thermal refugia to support migrating salmon throughout the entire Columbia River basin?—a mention of the existing logging practices without any corresponding mention of how they must be improved is stunning. What kind of plan is this that just says "OK, people, just keep doing whatever you're doing"? The Washington logging practices are not adequate. What does EPA think should happen with these logging practices to address a current or imminent emergency <u>bearing in mind that trees that have been cut take many years in which to grow and provide full shade</u> (and protect streams from sedimentation etc.)? The answer to that would be the start of a real plan.

Page 85 – Figure 7-4 and others like it in this document, are not explained and could, just conceivably, be the most important contribution from this document. Who did the analysis; where can it be found in more granular detail and better color differences; how was "maximum potential shade" identified; what is the width of the riparian area that constitutes "maximum potential shade"; how does this area relate to forest and agricultural practices; which areas of greatest difference between potential maximum and current shade would require new regulation or funding to address (e.g., are on agricultural lands versus are replanted areas that were logged); what are the temperature ramifications of the various shade differences; what types of land use are most causing the shade differences; why does EPA conclude in its discussion of these results that "[r]estoration of riparian shade on private forestlands, which cover much of the lower Cowlitz basin, is expected to improve through time and implementation of Washington's State Forest Practice Rules"; in what timeframe does EPA believe that what percentage of this undershaded watershed will be remedied under current regulations; how does EPA factor in "higher potential for restoration" to achieving protection, enhancement, and restoration of thermal refugia? In short, how does EPA suggest that the data and findings reflected in Figure 7-4 (and similar maps for other refugia) be used and why does it not provide any recommendations specifically to use them?

Page 86 – EPA's conclusion that climate change will "exacerbate low summer flows in the mainstem Cowlitz River, because of lower snowpack melt in the summer" points to the need for

recommendation on flows. There is nothing. EPA's conclusions about the effects of climate change here, as throughout this document, should point to the need for immediate actions yet there is nothing urgent in the "plan" aspects of the plan. Since one primary attribute of a watershed that is capable of maintaining the coldest possible waters is forested riparian areas, and forested riparian areas can only come about if they are fully protected as they exist or they are given the longest possible timeframe in which to grow before temperatures rise, it is difficult to understand why EPA has not identified as an urgent priority maintaining or restoring buffers of a sufficient width, density, and height to protect maximum shade and the other attributes of a waterbody that maintains colder water (e.g., channel morphology). While logging and farming are not the only incursions into a future with full forested riparian buffers, EPA does not address these two sources of stream warming. If EPA's conclusion is that we should just give up in our attempt to keep water at temperatures appropriate for cold water salmonids—which to all appearances it has already done—it should just come out and say so. This continued appearance of talking about temperature standards and temperature TMDLs without any concurrent action that actually provides protection to the fish is hypocritical and unseemly. Finally, EPA should make clear that under the circumstances it has identified with regard to climate change, the water quality goal for this refuge is not to meet existing water quality standards. It should be to exceed them to the maximum extent possible. This goal should be reflected in Washington's (and Oregon's) water quality standards, which should be revised. Anything else is merely acquiescence in the warming that will occur, warming that will reduce the efficacy of this waterbody's acting like a thermal refuge from the ever-increasing temperatures of the Columbia River. EPA should make recommendations for different approaches that could be used to effect that goal, and not a goal that shows up merely on paper. For example, Washington could make all or parts of the watershed a Tier III Outstanding Natural Resource Water. However, stopping with that designation, rather than spelling out specifically how it would be implemented, would be a meaningless gesture as ONRW status has no implications for nonpoint sources in the absence of specific and deliberate actions. ONRW status also does not address restoration needs.

Page 87 – EPA recommends that someone (passive voice) should "[i]Implement under Washington State Forest Practice Rules for riparian management on state and private forest lands." *See* comments for page 85 above.

Page 87 – EPA's "plan" to "protect and enhance" this cold water refuge is to implement plans that have already been written or are being drafted; we count four such plans for this particular refuge. Big picture, what is EPA doing here? What value added is there to EPA's enumerating these plans and implying, without any apparent review, that they are sufficient to protect and enhance this refuge? Why if the lower part of this refuge is violating water quality standards, does EPA say nothing about the need to "restore" it? The NMFS Biological Opinion stated that the purpose of this plan was to "adequately interpret the narrative criterion to allow for implementation of the criterion through DEQ's Clean Water Act authorities" and to "identify and prioritize potential actions by DEQ and/or other parties to protect, restore or enhance CWR."

NMFS Biological Opinion at 270-271. Yet, nothing in the EPA recommendations for this refuge identifies any priorities for potential action other than to say that two of the existing watershed management plans "detail key priorities contributing to recovery and mitigation in the basin, such as managing regulated stream flows through the hydropower system and restoring floodplain and riparian function." EPA does not even state that the priorities already identified in those plans are key to protecting the coldest possible water in this refuge. EPA does not even assert that the cited plans are consistent with the goal of protecting this cold water refugia. Although one might assume that to be the case, there is no basis for concluding it is so. Such watershed plans could, for example, be more focused on spawning habitat. There is no discussion anywhere in the plan that discusses, in general, Ecology's or DEQ's Clean Water Act authorities, a discussion that could and should be the jumping off point for EPA's recommendations as to specifically which of those authorities could be used in what specific fashion to accomplish the end desired for this refuge or any of the identified refugia. There is nothing in this Washington refuge recommendations that explains what EPA or Oregon DEQ could do to obtain improvements by Washington using its Clean Water Act or other authorities.

With regard to Oregon's authorities, for example, in this plan EPA does not recognize that EPA itself has concluded that Oregon's logging practices are inadequate to meet water quality standards. EPA/ National Oceanic and Atmospheric Administration, *NOAA/EPA Finding that Oregon has Not Submitted a Fully Approvable Coastal Nonpoint Program* 4 (Jan. 30, 2015) ("the State has not identified or applied additional management measures that fully address the program weaknesses the federal agencies noted in the January 13, 1998, Findings for Oregon's Coastal Nonpoint Program. Specifically, the State has not implemented or revised management measures, backed by enforceable authorities, to (1) protect riparian areas for medium-sized and small fish-bearing (type "F") streams and non-fish-bearing (type "N") streams; (2) address the impacts of forest roads, particularly on so-called "legacy" roads; (3) protect high-risk landslide areas; and (4) ensure adequate stream buffers for the application of herbicides, particularly on non-fish-bearing streams."). EPA is also well aware that Oregon DEQ has authority over logging practices in several ways, one of which is by having the DEQ's Environmental Quality Commission petition the Board of Forestry if it believes the state Forest Practices Act rules are not adequate for achieving water quality standards. *Id*. at 3 – 4. Another is that DEQ has the authority to develop and implement load allocations for forestlands in TMDLs. *See* Memorandum from Larry Knudsen, Senior Assistant Attorney General, Natural Resources Section, Oregon Department of Justice, to Neil Mullane, Water Quality Division Administrator, Oregon DEQ, Re: *DEQ Authority to Develop and Implement Load Allocations for Forestland Sources* 2 (July 2, 2010) ("If the BOF [Board of Forestry] does not adopt basin-specific BMPs or if the DEQ finds that the BOF's BMPs are not as protective as the safe harbor BMPs, the DEQ will require the forestland owner to comply with the safe harbor BMPs [developed by DEQ to be adequate to meet the load allocation in a TMDL], or to develop its own BMPs and submit them to the DEQ for review and approval."). Rather than to suggest that DEQ should continue to defer to the Oregon Board of Forestry on logging practices that according to EPA do not meet

water quality standards, let alone load allocations in TMDLs, EPA could specifically recommend the steps that DEQ could and should take to achieve the goal of protecting and enhancing, and possibly even restoring, thermal refugia. Or, perhaps, logging practices are not the top priority for a specific refuge, in which case EPA should identify the priorities, whether they are for agricultural practices, instream water flows, dam operation, etc. and then spell out specifically what steps need to be taken and by whom.

Going back to Washington, although EPA states that "[t]he Cowlitz River watershed is one of the most intensely farmed basins in western Washington," *Plan* at 86, the recommendations include precisely zero actions that any Washington agency could take to address riparian buffers along waters that move through farmland. The section instead, discusses water rights and water consumption, an obviously highly important issue to achieving sufficient and sufficiently cold water in the refuge. *See id.* Notwithstanding an EPA conclusion in the text that, given the absence of instream flow rules and the lower mainstem's being open to new water rights, "[l]imiting additional water use will help maintain CWR plume volumes and colder water temperatures," EPA does not include any reference to water rights in its recommendations. There is no sense from the text whether EPA reviewed the other plans to which it defers to see if they are based on science or based on compromise (e.g., fail to mention riparian vegetation needed on agricultural lands), whether they are consistent with the protection and restoration of this water as a thermal refugia, whether the priorities are consistent with that aim, and whether there is anything in the plans that are specific and clear. For all we know, these plans are as vague as the EPA draft plan we are looking at here, a plan that, for example, says to implement logging practices established by the states that EPA knows are not sufficient to provide the maximum thermal protection. In short, as a plan, this is a travesty.

7.4 Lewis River (River Mile 84) – Protect and Enhance

Page 88 – *See* comments for page 83 of the Plan above with regard to the discussion of the applicable criteria, the "maximum water temperature," and 303(d) listing.

Page 90 – *See* comments for page 85 above with regard to Figure 7-8 and accompanying text.

Page 90 – On what basis is this helpful: "Further, the East Fork Lewis is currently listed as impaired for temperature. Having already developed a Quality Assurance Project Plan, Washington Department of Ecology is scheduled to develop a watershed action plan for temperature for the East Fork Lewis in 2019." Please explain why this future plan will lead to actual actions that will protect and enhance—to say nothing of restore—temperatures in this refuge. *See* comments for pages 83–87 above.

Page 91 – EPA states: "The Washington Department of Ecology is developing a watershed plan to address high levels of coliform bacteria and temperature in the East Fork Lewis River. Both

plans provide excellent analysis and recommendations for prioritized restoration actions in the watershed. The 2010 plan meets Endangered Species Act and state habitat and salmon recovery requirements. Recommended actions include mitigating the effects of diking and channelization, increasing water discharge from dams in times of low flow, and increasing riparian protections." *See* comment for page 90; *see also* comments for pages 83–87 above.

Page 92 – EPA states that someone should "[i]mplement Washington's Forest Practice Rules on state and private forests on the lower Lewis River, as noted in the Washington Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan appendix on the Lewis River. This includes road maintenance and bank stabilization to reduce sediment build-up at the confluence." *See* comments for pages 83–87 above. EPA also states that riparian shading would be particularly helpful in rivermiles 0 – 15 but fails to identify the steps to make that happen. EPA also states that a future plan for the East Fork Lewis River should include actions "that maintain high flows and cold temperature downstream." This is not helpful; it's stating the obvious. EPA should explain the steps needed to make this outcome take place.

7.5 Sandy River (River Mile 117) – Protect and Enhance

Page 95 – EPA states that: "[w]ater quality modeling in ODEQ's Sandy River Basin TMDL (2005) predicted a temperature increase of approximately 0.5ºC with maximum potential vegetation under low flow conditions. Increased riparian shade can help to reduce sedimentation and maintain CWR volumes and temperatures." *See* comments for page 77 (and Appendix 12.20) above about relying on TMDLs.

Page 97 – EPA recommends that someone should "[i]Implement Oregon's Forest Practices Act on state and private forest lands throughout the watershed." *See* comments for pages 77, 83–87 above.

7.6 Tanner Creek (River Mile 141) – Protect and Enhance

Page 102 – EPA states that "[a]ctions to protect and enhance the Tanner River CWR include: . . . [c]onsider[ing] special designations, antidegradation policies, and/or narrative water quality criteria as appropriate to prevent warming of the creek above current temperatures and maintain existing flows." *See* comments for pages 83–87 above. EPA's suggestion is so vague as to be meaningless. Even if EPA elaborated a little more, to suggest for example that Tier III of the antidegradation policy could be applied, it could still be as meaningless to the fish. For a plan to have meaning to the designated uses, it must explain how precisely an action will be helpful. In that example, a Tier III status would not be helpful absent specific policies intended to protect water quality from nonpoint sources.

7.7 Eagle Creek (River Mile 143) – Protect and Enhance

Page 103 – *See* comments for page 83 of the Plan above with regard to the discussion of the applicable criteria and the "maximum water temperature."

Page 107 – EPA urges someone to "[i]mplement Oregon's Forest Practices Act at the mouth of Eagle Creek" as well as the generic "[c]onsider[ation of] special designations, antidegradation policies, and/or narrative water quality criteria as appropriate to prevent warming of the creek above current temperatures and maintain existing flows." *See* comments for pages 83–87, 102 above.

7. 9 Herman Creek (River Mile 147.5) – Protect and Enhance

Page 112 – Once again, EPA offers up the generic actions to protect and enhance Herman Creek and Herman Creek Cove to include consideration of "special designations, antidegradation policies, and/or narrative water quality criteria as appropriate to prevent warming of the creek above current temperatures and maintain existing flows." *See* comments for pages 83–87, 102 above.

7.9 Wind River (River Mile 151) – Protect and Enhance

Page 113 – *See* comments for page 83 of the Plan above with regard to the discussion of the applicable criteria, the "maximum water temperature," and 303(d) listing.

Page 115 – EPA states that "[w]ater quality modeling in Washington Department of Ecology's Wind River Watershed Temperature TMDL (2001) predicted that maximum potential vegetation could decrease water temperatures at the mouth from 18°C to 14°C under average flow conditions." It is likely that this undercalculates the temperature that could be achieved but EPA cannot know without examining the assumptions that Ecology used in its modeling calculations. *See* discussion about OregonTMDLs for page 77 (and Appendix 12.20) above.

Pages 115–116 – EPA states that "[w]ater rights are heavily allocated for agricultural uses" and "[b]ecause water use is high and supply is limited, more water use may reduce the CWR plume volume and increase temperatures in the CWR," but offers nothing more than a tepid recommendation to "[c]onsider additional SWSLs and instream flow rules, given current limited stream flows."

Page 116 – EPA states, without any useful comment, that "[f]urther, there currently exists a temperature TMDL, developed in 2002." It would be useful if EPA told us how much that TMDL has accomplished in the 17 years since it was completed. That would set the foundation for any recommendations EPA might make about the states' using their 303(d) programs and

authorities to actually protect and restore thermal refugia. Instead, EPA is silent. Evaluation of the science without a concurrent evaluation of the regulatory structure that either works is not working to protect and restore refugia should be key to this plan. *See* comments for pages 83–87 above.

Page 117 – EPA recommends that someone "[i]mplement Washington's Forest Practice Rules on state and private forest lands on the middle and lower Wind River" along with "actions in the mainstem Wind River, Panther Creek, and Upper and Lower Trout Creek noted in the Wind River Habitat Restoration Strategy and Wind River Temperature TMDL." EPA does not explain what "actions" are set out in the cited TMDL, whether they are adequate, whether there is any history of acted on the actions, and whether the purported actions are specific and clear enough to rely on. EPA merely tells the reader this is a plan to implement a plan the sufficiency of and ambiguity in which we have not bothered to investigate. Further, despite noting that "[w]ater rights are heavily allocated for agricultural uses," *Plan* at 115, the recommendations are silent on what might be necessary to ensure shading of streams traversing agricultural lands.

7.10 Little White Salmon River (River Mile 158.7) – Protect and Enhance

Pages 118–122 – *See* comments for pages 83–87 above.

7.11 White Salmon River (River Mile 165) – Protect and Enhance

Pages 123–127 – *See* comments for pages 83–87 above.

7.12 Hood River (River Mile 166) – Protect and Enhance

Pages 128 –132 – *See* comments for pages 83–87 above.

7.13 Klickitat River (River Mile 177) – Protect and Enhance

Pages 133–137 – *See* comments for pages 83–87 above.

Page 137 – EPA recommends that someone "[i]mplement Little Klickitat River Temperature TMDL targets for increased riparian shade in the Little Klickitat River." Published in 2002, roughly 17 years ago, EPA should evaluate whether anybody has, in fact, implemented anything in this TMDL since it was published. Such analysis would inform EPA as to the degree that it can or should rely on states' 303(d) programs and what kind of recommendations are required that are more than simply citing to other plans as the solution to the problem. What does EPA mean by implementing "TMDL targets for increased riparian shade"? The TMDL showed that "an increase in effective shade from riparian vegetation buffers have the potential to significantly decrease the water temperatures in the mainstem of the Little Klickitat River." Ecology, *Little*

Klickitat River Watershed Temperature Total Maximum Daily Load (July 2002) at 51. It also showed that "[d]ecreasing the channel average wetted W/D ratio decreases the water temperature further, with the exception of the section below Bloodgood Creek which has a low W/D ratio due to mechanical channelization." *Id*. No offense to the modelers who did this work but the impact of shade and width:depth ratio is not rocket science and it does not instruct as to what actions must be taken to meet water quality standards. The TMDL goes on to make essentially the same observations about various prongs of the Little Klickitat River. *See id.* at 53. The TMDL sets out "effective shade targets" in Table 10 and summarizes the load allocations for nonpoint sources as the need for effective shade and, in some instances, a width:depth ratio. *Id*. at 58–59. It then wraps up with a laundry list of what one might call allusions to BMPs, or pre-BMPs, namely vague references to various types of best management practices without any quantification, without any clarity of what implementation is necessary or required. So when EPA says in this plan that someone should implement the TMDL targets for increased riparian shade, it first ignores the other random list of non-quantifiable actions the TMDL seemingly recommends. Second, EPA cites only to a set of effective shade targets that, while expressed numerically, are not translated into anything clear. What do these shade targets mean for not cutting down trees or the need to plant trees? Specifically, they have not been translated into the height, width, and density of riparian buffers that are needed to be maintained on lands used for farming and logging. It is not clear that Ecology has used these shade targets in any of its work. And third, would the effective shade targets once translated into numeric riparian buffers also control sediment such that the width:depth ratios could be restored or protected from degradation? In short, in its plan EPA cites to a plan that, while being a TMDL, is similarly meaningless and without teeth or substance and certainly does not readily translate into any meaningful actions on the ground or in the water.

7.14 Fifteen Mile Creek (River Mile 188.9) – Restore

Page 138 – *See* comments for page 83 of the Plan above with regard to the discussion of the applicable criteria, the "maximum water temperature," and 303(d) listing.

Pages 139–142 – EPA states:

> Fed by snow-melt runoff and groundwater contributions, Fifteenmile Creek could potentially deliver cold water down to the confluence, providing additional CWR for migrating salmonids with continued water quantity and riparian habitat restoration. However, agriculture is vital to the local economy, valued at roughly $22 million per year. Agricultural land types include orchards, vineyards, and pasture. Primary agricultural products include wheat, cattle, and cherries.

* * *

> There is a substantial area for additional riparian vegetation restoration in the lower watershed along the tributary streams and creeks on the mainstem (Figure 7-44). The lower watershed was widely denuded for use as agricultural land.
>
> * * *
>
> The conversion of riparian areas to agricultural lands has resulted in the removal of tall grasses and small trees. Water quality modeling in ODEQ's Middle Columbia-Hood (Miles Creek) Subbasin TMDL (2008) predicted that maximum potential vegetation and increased flows could decrease water temperatures at the mouth from 25°C to 18°C under low flow conditions, a significant decrease.

Despite this description of the significant improvement in temperature that could be achieved and noting that agriculture is the primary reason why it is not, EPA recommends only that someone should:

> Maintain the riparian restoration work done in previous years as noted in the Fifteen Mile Creek Basin Aquatic Habitat Restoration Strategy and Middle Columbia-Hood (Miles Creek) TMDL. . . . [and] [e]ncourage private landowners to enter riparian buffer programs. Fund fencing projects for pasture lands near riparian areas to minimize the impacts of grazing.

This is not a plan; it's a statement that if shade and other attributes that come from forested riparian buffers are not present, temperatures will remain high and if they are installed and protected, temperatures will decrease. This is mere musing by EPA and is not a plan to protect or restore cold water refugia to save salmon on the Columbia River and meet water quality standards. *See also* comments for pages 83–87 above.

What is really obnoxious about EPA's description of this watershed is its implied assumption that use of the land and water by agriculture means that nothing can or will be done. EPA says: "However, agriculture is vital to the local economy, valued at roughly $22 million per year." "However" is like the "though" in the sentence "I would like you to do us a favor, though." "However" here means "nothing is going to happen here for salmon and in fact, we, the EPA, don't even think it should happen," just as "though" means a *quid pro quo*. From that statement likely springs the fact that EPA does not even recommend that the state consider regulating farmland to require riparian buffers, let alone actually use its legal authorities. Rather, it says, the state should encourage landowners to get paid to protect public waters from their private activities. EPA does not even recommend an additional funding program to make sure that cold water refugia exist for salmon in the future.

7.15 Deschutes River (River Mile 201) – Protect and Enhance

Page 143–147 – *See* comments for pages 83–87 above.

7.16 Umatilla River (River Mile 284.7) – Restore

Page 148 – *See* comments for page 83 of the Plan above with regard to the discussion of the applicable criteria, the "maximum water temperature," and 303(d) listing.

Pages 149–150 – *See* comments for pages 77, 83–87, 137, 139–142 above.

Pages 151–152 – EPA's comments that "[e]fforts to conserve and increase water flows will help to cool water temperatures and increase CWR volume" is really not helpful and not a plan. It's merely a statement of the obvious. Citing other plans or general propositions that are laid out in other plans that may or may not be implemented—and EPA can be sure that the TMDLs are not implemented—also is not a plan. In this context, the least EPA could do is to identify the barriers to implementing TMDLs and other plans and make recommendations to address them. EPA could also state what it will do if the states fail to use their existing legal authority to make the needed changes.

7.17 Summary of Actions to Protect and Restore Cold Water Refuges

Protect Through Regulatory Programs

Page 153 – As explained above, an EPA plan that says keep on implementing, even if you aren't, all the "existing programs and regulatory actions that help keep waters cool" is not a recipe for success and neither is using the "state forest practice regulations" that EPA knows are not adequate to meet water quality standards and therefore are not adequate to protect, enhance, or restore the thermal refugia upon which EPA has shown in this document the salmonids migrating in the Columbia River rely. Being silent on the lack of agricultural practices to protect water temperatures is not a plan. Reiterating that "minimizing additional water withdrawals will help" is not helpful or a plan. Neither is reiterating the extremely unhelpful and vague comment that "[w]ater quality standard updates, such as special designations, antidegradation policies, or narrative criteria could be a means for helping maintain current river temperatures in the primary CWR tributaries." Yes, they "could be" but if EPA doesn't explicitly recommend some changes that it thinks will be helpful, they probably won't be. Moreover, EPA does not address the disconnect between water quality standards, millions of dollars of studies for TMDLs etc., and thousands of pages of all sorts of plans and . . . the fish. EPA does not even go so far as to recommend that state actually protect cold water at the temperatures current achieved. What is horribly missing from a section entitled "protect through regulatory programs" is any discussion of, you know, actual regulatory programs and how they might be made to work.

Restore Riparian Shade, Stream Morphology, and Instream Flow

This is more of the same that EPA has already spent scores of pages reiterating: it would be nice if someone implemented all the existing plans. EPA states that:

> Restoration of the CWR in all primary and "restore" tributaries can be accomplished by the following actions, many of which are outlined in the salmon recovery plans and TMDLs:
> 1) Restoring riparian shade: Restoration of riparian shade should be targeted to those areas that have the greatest potential for increased shade in the watershed and are river reaches important for salmon habitat restoration.
> 2) Restoring stream morphology and complexity, including narrower channels and increased pools: Increasing the amount of instream large woody debris to create pools of cold water and trap sediment that would otherwise reach the river mouth will aid in keeping waters cool as they reach the tributary mouth and join the Columbia River.

But this is what every temperature TMDL says to one degree or the other. EPA has added absolutely nothing new to the equation. It has not set out any recommendation to take steps to actually implement the TMDLs. We reiterate: none of this material about how to protect and restore stream temperature is rocket science. Such basic statements by EPA cannot possibly be what NMFS had in mind when it instructed EPA to develop a plan to actually protect refugia for the salmonids that actually depend upon them to migrate through the hot temperatures of the Columbia River.

7.18 Action to Address Fishing in Cold Water Refuges

Page 154 – As we commented above, EPA should include the citation(s) regarding the data that show that "fishing in CWR reduces the survival of steelhead that use CWR compared to those that do not, offsetting the benefits to fish using CWR." Hiding the ball here make it only harder to achieve the goal of updating the fishing regulations that EPA suggested "could be considered," with emphasis on the word "could" because it would apparently be too extreme for EPA to say "should" even as it admits that would protect the fish, the designated use for which this entire exercise has been to support.

8 Uncertainties and Additional Research Needs

Density Effects and Carrying Capacity of Cold Water Refuges

Page 157 – EPA admits that "[t]here is no research on the carrying capacity of CWR for adult salmon or steelhead" and "[i]t is therefore fairly speculative as to what densities cause fish to

avoid or leave CWR." Notwithstanding this conclusion, EPA has determined that there are sufficiently distributed refugia. Stunningly, while noting that "[a]lso, high densities of adult fish are known to contribute to the spread of disease." EPA concludes only that "[t]his could be a concern for CWR that are colder than the Columbia River but are in the 18-20°C range, which are temperatures at which disease risk is elevated (e.g., Deschutes River)." It certainly is a concern and will increasingly be one. EPA's conclusion that "[t]he extent to which CWR use at varying densities contributes to increase disease (and associated mortality) is unknown," should be followed by the acknowledgment that in fact EPA does not know and on that basis cannot determine if there are currently sufficient refugia to mitigate the effects of a 20º C criterion let alone the actual temperatures in the Columbia River. The issue of disease has been well documented by EPA itself in the scientific papers that supported the Region 10 guidance for temperature standards. This should have been a major factor in its evaluation.

9 SUMMARY AND RECOMMENDATIONS

Pages 158–162 – Our comments on this section are short because we have said most of what is necessary above and do not choose to repeat it. That should not be read as an endorsement of the extremely thin recommendations found in this section, which are a reflection of those found throughout the document.

Pages 158–162 – EPA purports to set out the water quality standards for temperature for the Columbia River:

> The water quality standard for the Lower Columbia River is 20°C, which is intended to minimize the risk of adverse effects to migrating salmon and steelhead from exposure to river temperatures that are warmer than 20°C.

As explained above, this is incorrect and should be fixed. A standard is not a criterion.

Sufficiency of Cold Water Refuges to Support Migrating Adult Salmon and Steelhead

EPA concludes that "the spatial and temporal extent of existing CWR appears to be sufficient under current and 20°C Columbia River temperatures but may not be in the future." We find this to be misleading. EPA found quite clearly that they would not be in the future and at best found that it cannot determine if there are sufficient refugia in the present. Moreover, "maintaining the current temperatures, flows, and volumes of the 12 primary CWR in the Lower Columbia River" is more than "important to limit significant adverse effects to migrating adult salmon and steelhead from higher water temperatures elsewhere in the water body," it is critical to those adverse effects. That is EPA's conclusion but its summary of its conclusion suffers from the same passive view and passive voice found throughout the entire document. EPA continues to say that "[a]dditional CWR in the Lower Columbia River may be needed due to the predicted

continued gradual warming of the Columbia River," when it can only be concluded that, based on the climate change evaluation set forth in the document, there is no "may" about the need. Again, it is a necessity. Whether the fish will survive even if EPA and the states made their best efforts is another question. In that matter, EPA can afford to not be definitive and can tell us the truth: they may not survive although it is our legal and moral obligation to try to save them.

Watershed Characteristics of 12 Primary Cold Water Refuges

EPA makes the following observation regarding the importance of dams on four of the refuges:

> Four of the primary tributaries (Cowlitz, Lewis, Sandy, Deschutes Rivers) have upstream storage dams that can influence summer temperatures by releasing water from cooler depth within the storage reservoir and by controlling summer release flows.

But EPA fails to go beyond making this observation, namely to suggesting that it will itself, or ask some other agency to, take actual steps to order or negotiate changes in the operation of these dams. A "plan" should be a plan for action, not a set of musings. And then, EPA muses some more:

> Although the 12 primary CWR tributaries are relatively cool, there are impacts within the watershed that can warm the tributary, including floodplain degradation, water withdrawals and reduced summer flow, sedimentation, and loss of riparian shade. Climate change has already warmed all tributaries to some extent and is predicted to continue to warm these tributaries in the future. Restoration of the anthropogenic impacts within the watershed can help offset predicted warming.

Recommended Actions to Protect and Restore Cold Water Refuges

This musing leads to some extremely limited comments on what could be done to protect, enhance, and restore the maximum amount of cold water available in these refuges. As its "Recommended Actions to Protect and Restore Cold Water Refuges," EPA states that someone should:

> 26. Protect existing 12 primary CWR through the implementation of existing programs and regulatory actions that help keep waters cool.
>
> a. Since extensive portions of the priority CWR tributaries include forest lands, important protective actions include continued implementation of U.S. Forest Service plans and State Forest practice regulations.

b. Since additional water withdrawal during the summer can diminish the size and function of the primary 12 CWR tributaries, minimize additional water withdrawals that would decrease summer flows.
c. Consider special designations, antidegradation policies, and/or narrative water quality criteria as appropriate to prevent warming above current temperatures and maintain existing flows in the 12 priority CWR tributaries.

In addition, EPA suggests that someone should:

27. Restore degraded portions of the 12 primary CWR watersheds to enhance the quality of the CWR and to counteract predicted future increases in tributary river temperature by: 1) restoring riparian shade, 2) restoring stream morphology and complexity, including narrower channels and increased pools, and 3) implementing watershed conservation measures to restore summer flows.

And then someone should act on the fact that,

30. [B]ased on information provided in completed temperature TMDLs, EPA identified the Umatilla River and Fifteenmile Creek as having the potential to provide increased CWR in the Lower Columbia River if thermally-degrading features of the watersheds were restored.

EPA is remarkably mealymouthed in this set of recommendations, the summary of which takes up less than one page in the document. The word "consider" and the overall use of the passive voice could not make these recommendations sound less urgent. The lack of specificity guarantees that they will be ignored, taking up more room on the bookshelves along with all of the other plans. We trust that by now in these comments we need not say more to make the point.

Recommended Action Regarding Fishing in Cold Water Refuges

This recommendation that information "could be considered" is more of the same, no urgency, no actual plan, just more musing. Instead, EPA should recommend that the fishing agencies make this a priority. There is certainly no point in taking all of the expensive, time-consuming and difficult actions proposed or hinted at throughout this plan and then letting recreational fishing people harass the very fish that are attempting to see "refuge" from dangerously high water temperatures.

II. What is Fundamentally Missing from EPA's Plan

The comments above explain what is largely the problem with this plan, namely that it is not a plan. But here, we add a little bit more, certainly well short of writing a plan ourselves.

A. The Biological Opinion and the Reasonable and Prudent Alternative

EPA had asserted to NMFS that it "expects the cold water refugia provision to be primarily considered in NPDES permits and TMDLs." *NMFS Biological Opinion* at 173. As NMFS subsequently found, EPA was sadly and profoundly mistaken in its assumption, expectation, or general cop-out, whichever it was. In fact, NMFS found that:

> Overall, the narrative criterion pertaining to CWR does not, to date, appear to be an effective means for minimizing the adverse effects likely to be experienced by migrating salmon and steelhead under the 20°C migration corridor criterion. In the Willamette River TMDL, the DEQ mentions only two specific streams as possibly providing refugia, even though substantial research on off-channel habitats that may provide such refugia has been done in this river. The John Day River TMDL does not even attempt to directly address the narrative criterion. Also, according to EPA, the state has not provided any analyses of or determinations as to the part of the narrative criterion that requires that CWR "are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body". The DEQ apparently has not released any work on CWR in the Columbia River.

Id. at 176 (footnotes omitted). As a consequence, NMFS set out the primary intended outcome of the Reasonable and Prudent Alternative that required this plan: "The purpose of the CWR plan is to adequately interpret the narrative criterion to allow for implementation of the criterion through DEQ's Clean Water Act authorities [including to] identify and prioritize potential actions by DEQ and/or other parties to protect, restore or enhance CWR." *NMFS Biological Opinion* at 270–271 (emphasis added). Without the "implementation . . . through Clean Water Act authorities" specifically called for by NMFS, this would be like any other plan: much paper with no benefit to fish. But that is not what NMFS required. It is clear that EPA has not met the terms of the Reasonable and Prudent Alternative.

B. Some Suggestions

In addition to addressing our comments set out above, EPA should:

- Drop the passive voice.

- Direct the states to rewrite all the relevant temperature TMDLs with specific direction that each establish clear, measurable actions, including quantitative BMPs, that are tied to meeting the TMDLs' load allocations. It is well past time to make sure that state agencies and private land owners are held accountable for the measures that are necessary to implement the TMDLs. They cannot be if the measures are not clear. For example, the ambiguity of the TMDLs precludes a pathway to their use to ensure adequate logging practices. It allows for the continued failure of states to regulate agriculture. It precludes a willing landowner from knowing what actions to take. A heavy reliance on TMDLs to protect and restore the refugia of the Columbia River by EPA points in one direction: TMDLs that do not need translation to understand what actions are required by whom in order to meet water quality standards.
- Require Oregon and Washington to meet the precise terms of the Clean Water Act section 319(b)(2), namely to identify the BMPs that are necessary to meet water quality standards (including load allocations), the programs through which those BMPs will be implemented, and a schedule with annual milestones for implementing them at the earliest possible date.
- Call for immediate forest practices rule changes to protect these refugia.
- Call for the states to use their legal authority to ensure that agricultural BMPs are put in place.
- Identify the means by which dam operations can be regulated to protect thermal refugia.
- Set out a list of actions that EPA will take if states fail to make schedules to implement nonpoint source controls and carry out that implementation including NPDES actions and withholding section 319 funds.
- Not use this document to count on TMDLs that are based on illegal and now vacated water quality standards and flawed analysis that fails to evaluate purely natural conditions when identifying the temperatures that could be achieved.
- Add page numbers to appendixes.
- Place more emphasis in its summary and conclusions on the uncertainty inherent in this exercise, such as the complete lack of knowledge about the carrying capacity and concerns about disease transmission within refugia.
- Express some modicum of urgency to its findings and recommendations.
- Distinctly call out the fact that the Columbia River water temperatures do not support healthy salmon populations including because some species do not use thermal refugia, because there is no assurance that the refugia are sufficiently well distributed, and because temperatures are not meeting water quality standards.
- Call out the fact that the sockeye require different criteria at different times of year than are currently in Oregon and Washington standards.
- Not leave the casual reader with the impression that there is no reason to be concerned about either the 20º C criterion or current water temperatures in the Columbia River because EPA has concluded that there appear to be sufficient cold water refugia created by the tributaries.

- Say something about the Willamette River.
- Note clearly that implementation of the Oregon temperature standards must mirror the basis for EPA's approval and NMFS's Biological Opinion of the numeric criteria for salmonid rearing—that are themselves the water quality goals for the thermal refugia in Oregon as tributaries—namely that those criteria would be met at the farthest point downstream where the uses are designated, *see e.g. NMFS Biological Opinion* at 193, and set out the ways in which this implementation must take place, for example in evaluating waters pursuant to 303(d), developing TMDLs, and in establishing BMPs for nonpoint sources.
- Provide some analysis of the other narrative provision associated with the Oregon 20º C criterion for the Columbia River, to the extent that EPA has developed information about it: "the seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern." OAR 340-041-0028(4)(d). While it is a separate criterion, it is also linked to the refugia criterion as the content of this plan shows. It would be helpful for that information to be pulled into a separate section. Note that EPA's extensive discussion of timing and use should explain the role of the existing use protection for designated uses provided by the antidegradation policy. In failing to address the intersection of migration timing and use of cold water refugia, EPA misses the boat because both criteria are required in order to protect the designated uses. One without the other leaves a two-legged stool that does not protect the uses.
- Recognize, discuss, and make recommendations pertaining to the fact that Oregon has a provision in its temperature standards that is intended to protect existing temperatures that are below numeric criteria called the Protecting Cold Water criteria. *See* OAR 340-041-0028(11).

In conclusion, EPA has a lot of work to do to turn this report into a plan that will allow for the implementation of the thermal refugia criterion through Oregon DEQ's Clean Water Act authorities.

Sincerely,

Nina Bell
Executive Director

Attachments:

Washington Department of Ecology, *2009 Clean Water Act Assurances Review for Washington's Forest Practices Program* (July 15, 2009)

Memorandum from Mark Hicks, Ecology, to Forest Practices Board, Re: *Clean Water Act Milestone Update* (April 22, 2019)

William Ehinger and Stephanie Estrella, Ecology, and Greg Steward, Northwest Indian Fisheries Commission, *Type N Hard Rock Study Stream Temperature/Shade*, presentation to the TFW Committee Meeting (Oct. 5, 2017)

Memorandum from Larry Knudsen, Senior Assistant Attorney General, Natural Resources Section, Oregon Department of Justice, to Neil Mullane, Water Quality Division Administrator, Oregon DEQ, Re: *DEQ Authority to Develop and Implement Load Allocations for Forestland Sources* (July 2, 2010)

Type N Hard Rock Study
Stream Temperature/Shade

William Ehinger and Stephanie Estrella-Ecology
Greg Stewart-NWIFC

TFW Policy Committee Meeting
5 October 2017

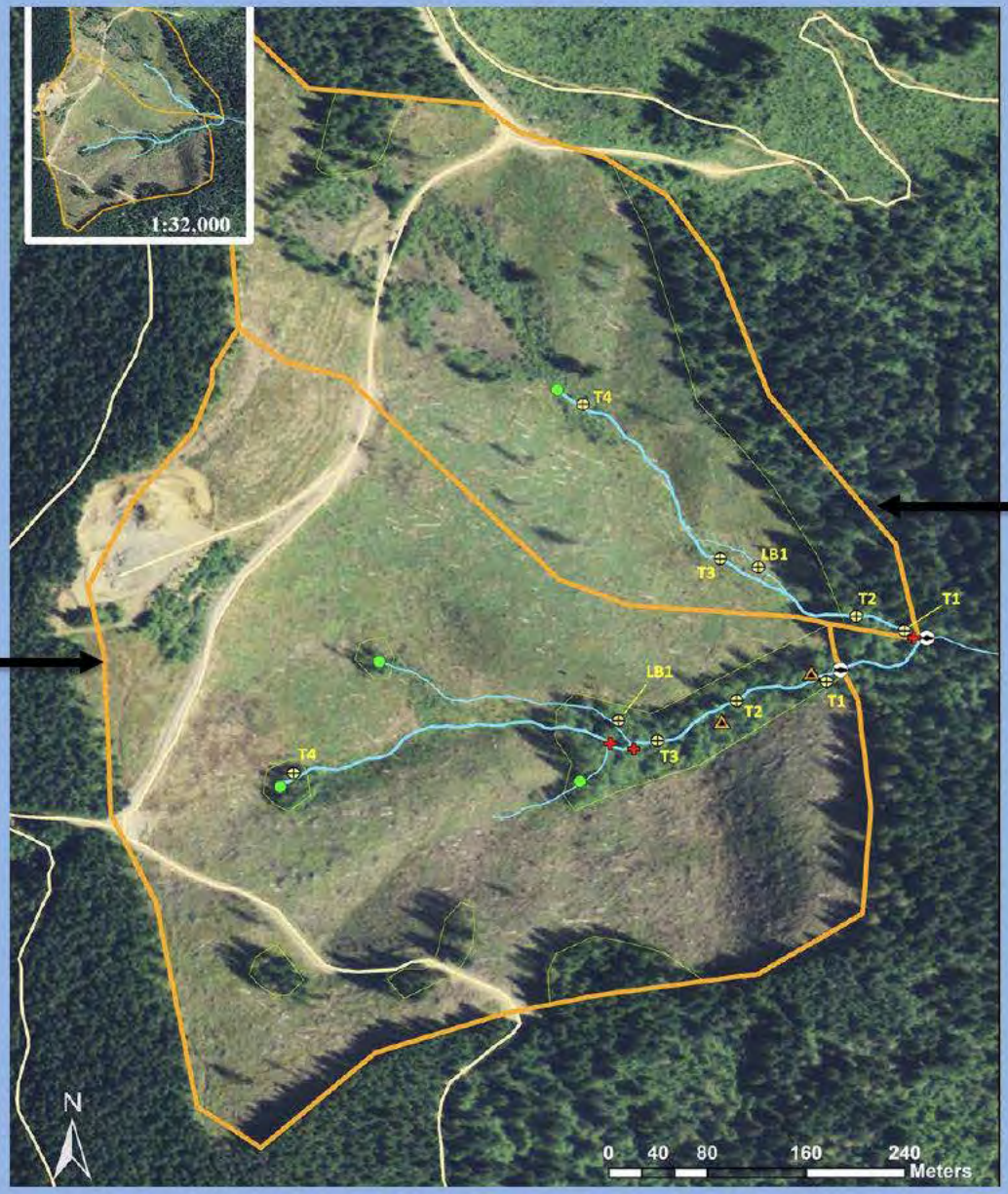
Type N Hard Rock

Objective: Estimate the effect of timber harvest on riparian shade and stream temperature.

Performance Targets:

- Shade available within 50’ for at least 50% of stream length
- WQS for stream temperature

Temperature-locations within sites

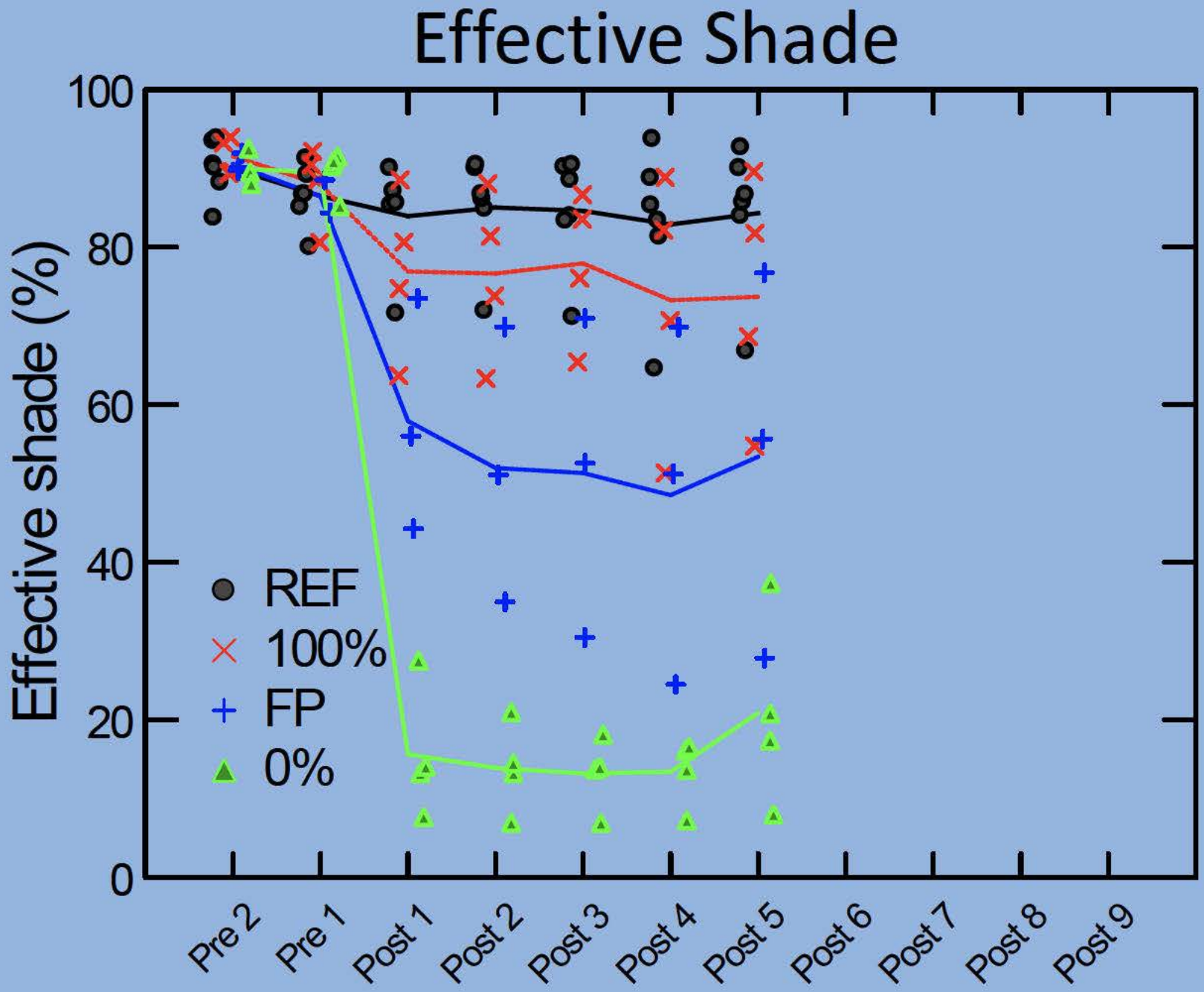


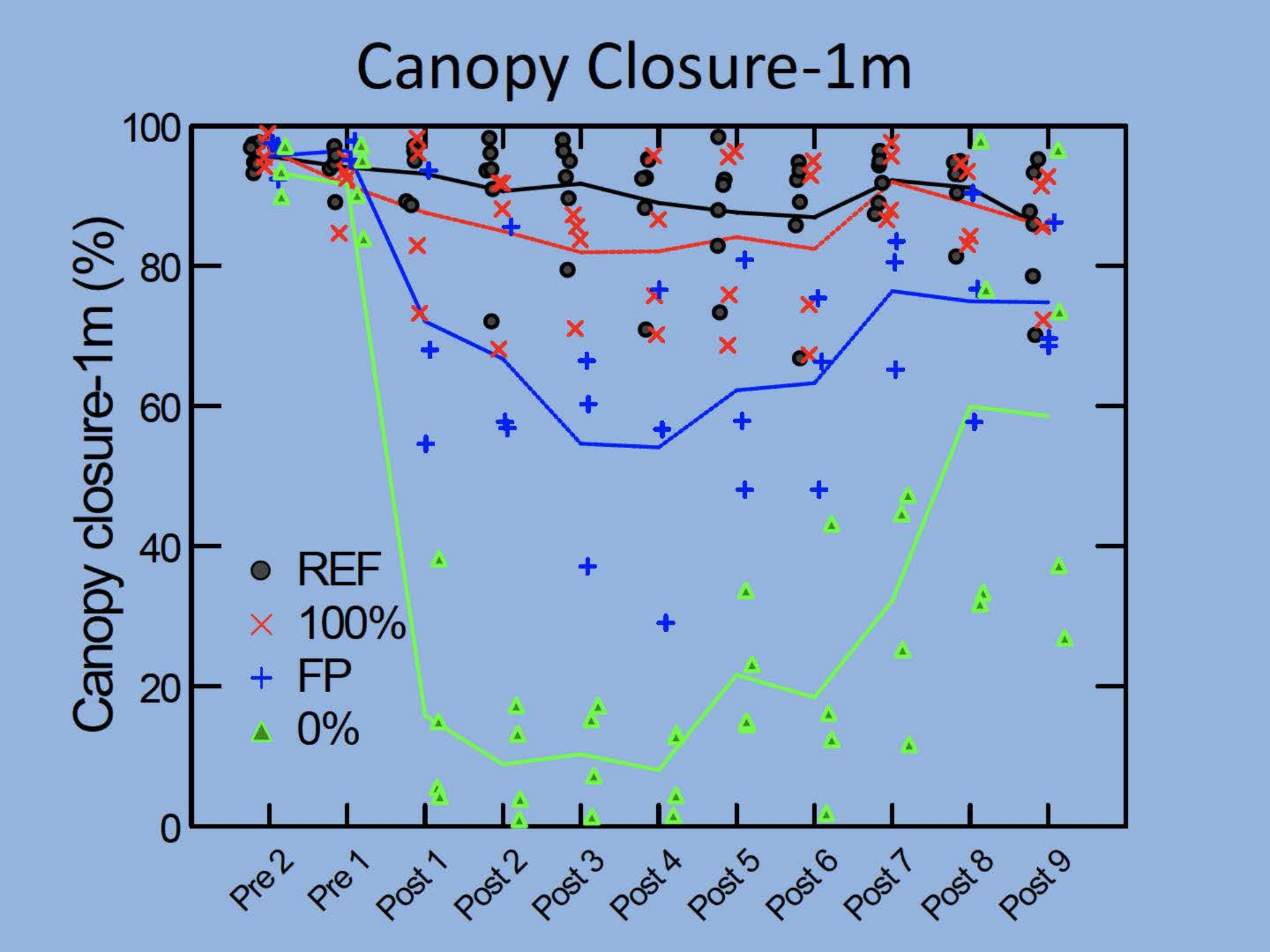
CASC-0%

CASC-FP

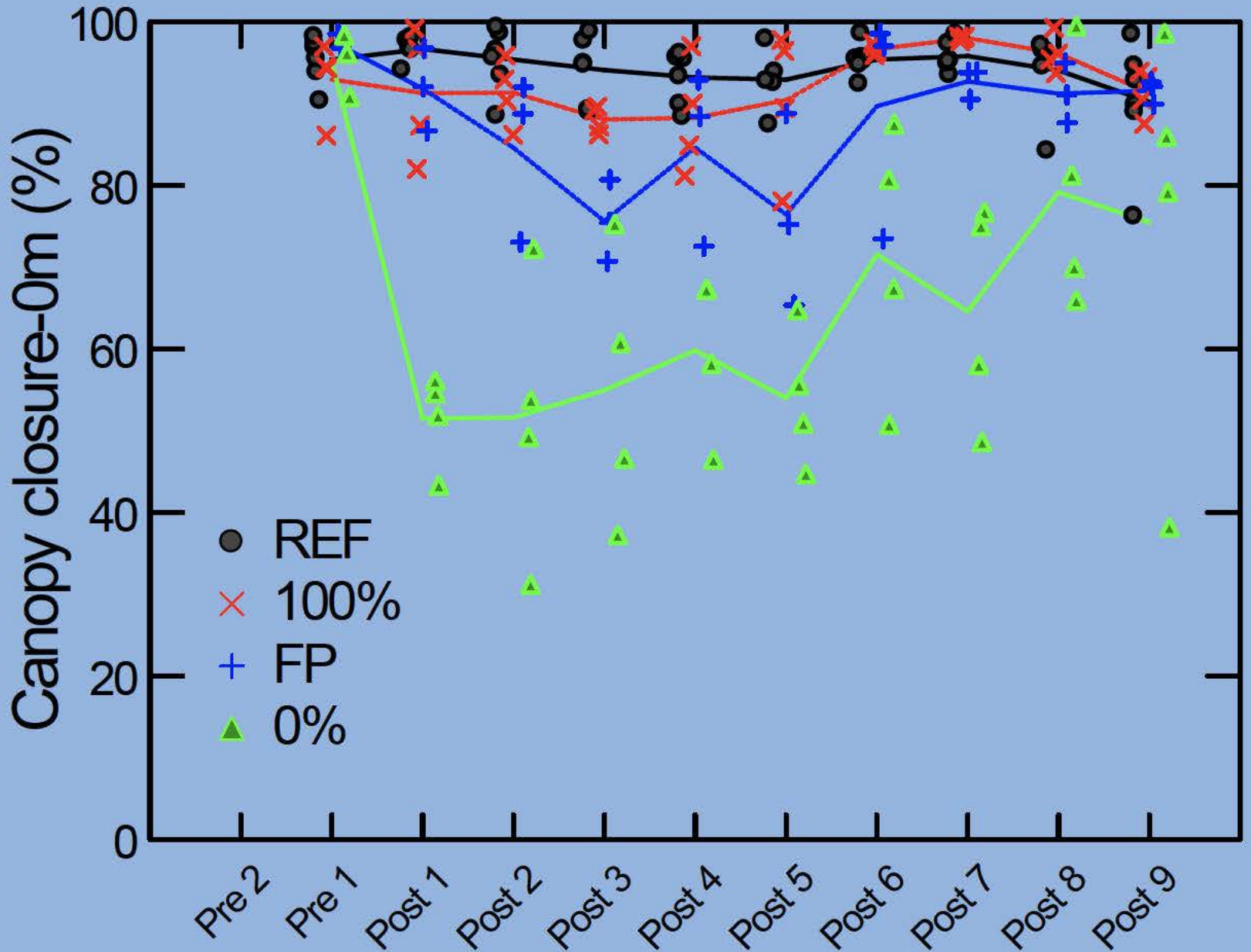
Shade-Results

- Immediate post-harvest reductions.
- Shade increase began around the fifth year post-harvest.
- By Post 8, little difference in mean canopy closure-1m between REF and 100%.
- By Post 8, little difference in mean canopy closure- water surface among REF, 100%, FP.


Effective Shade
Effective shade (%)
100
80
60
40
20
0
REF
100%
FP
0%
Pre 2
Pre 1
Post 1
Post 2
Post 3
Post 4
Post 5
Post 6
Post 7
Post 8
Post 9


Canopy Closure-1m
Canopy closure-1m (%)
100
80
60
40
20
0
REF
100%
FP
0%
Pre 2
Pre 1
Post 1
Post 2
Post 3
Post 4
Post 5
Post 6
Post 7
Post 8
Post 9

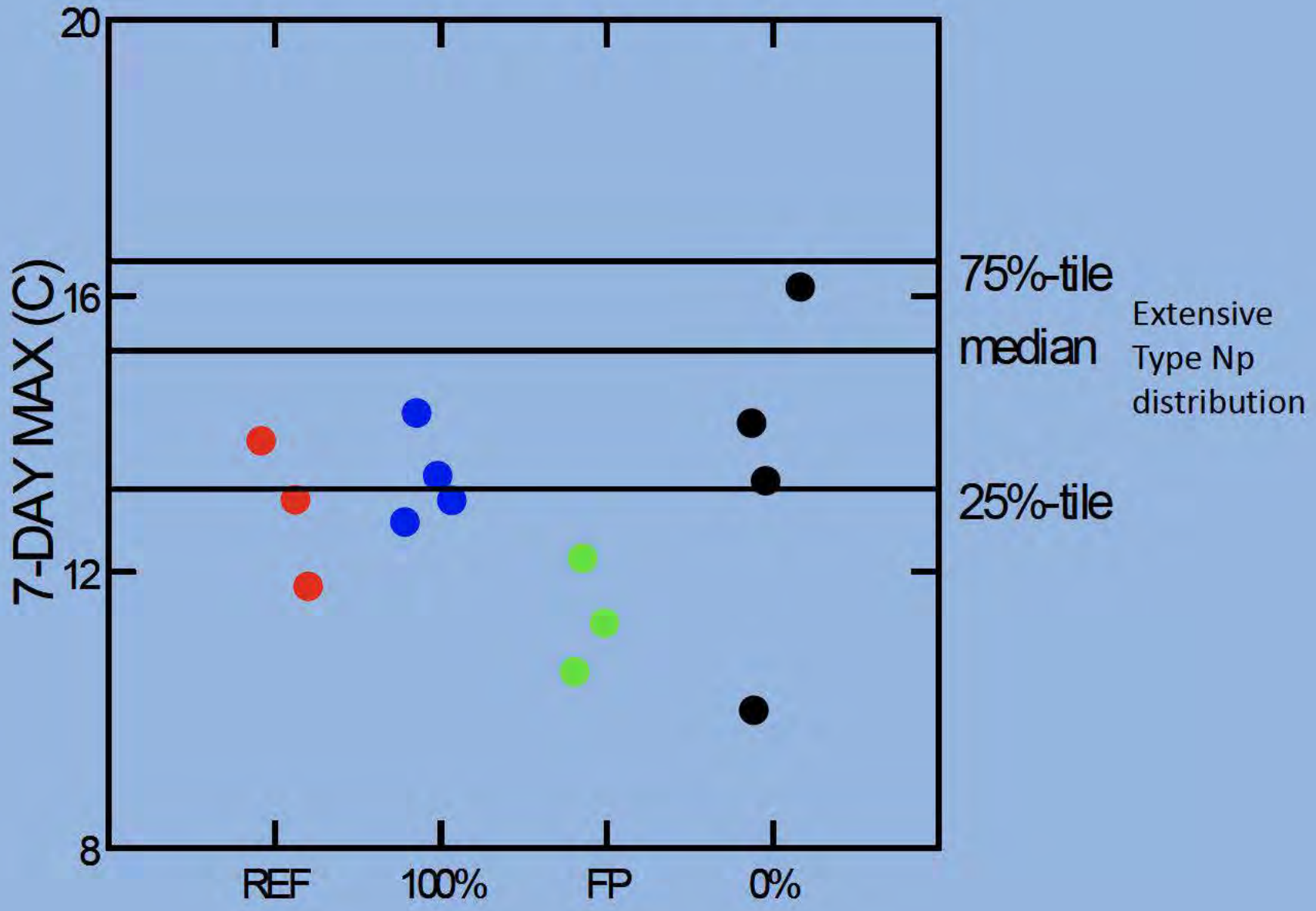
Canopy Closure-water surface



Temperature-Results

- Pre-harvest temperatures were relatively low

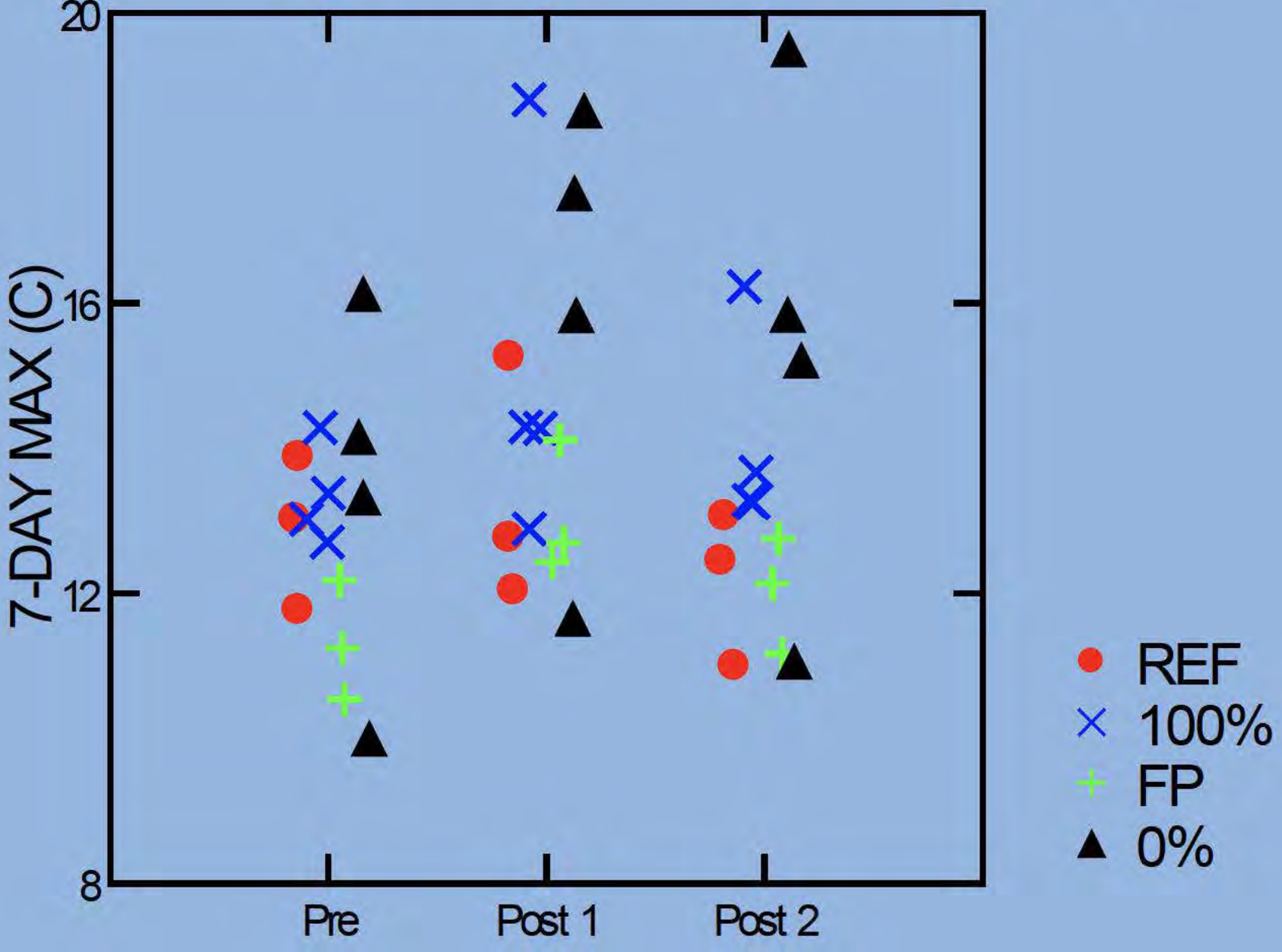
Pre-harvest 7-day max



Temperature-Results

- Post-harvest, temperatures were higher

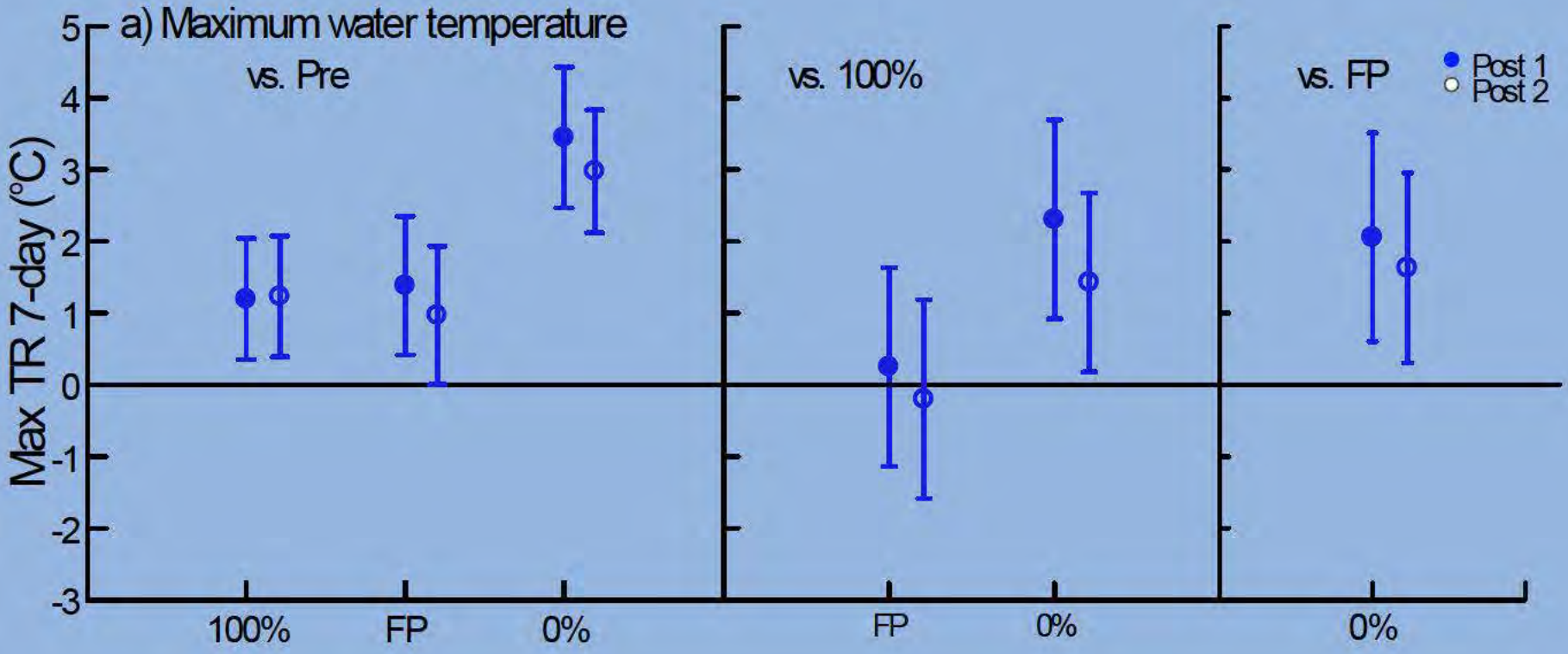
Pre and post-harvest 7-day max



Temperature-Treatment effects

- Stream temperature increased significantly in all three buffer treatments

Post-harvest temperature change



Post-harvest temperature change

Year-Treatment	Change (°C)	P-value
Post 1-100%	1.2	0.0069
Post 2-100%	1.2	0.0056
Post 1-FP	1.4	0.0064
Post 2-FP	1.0	0.0489
Post 1-0%	3.4	<.0001
Post 2-0%	3.0	<.0001

Temperature-Spatial extent

- Higher temperatures were found throughout the stream networks in all buffer treatments.

Temperature Response-Spatial Extent

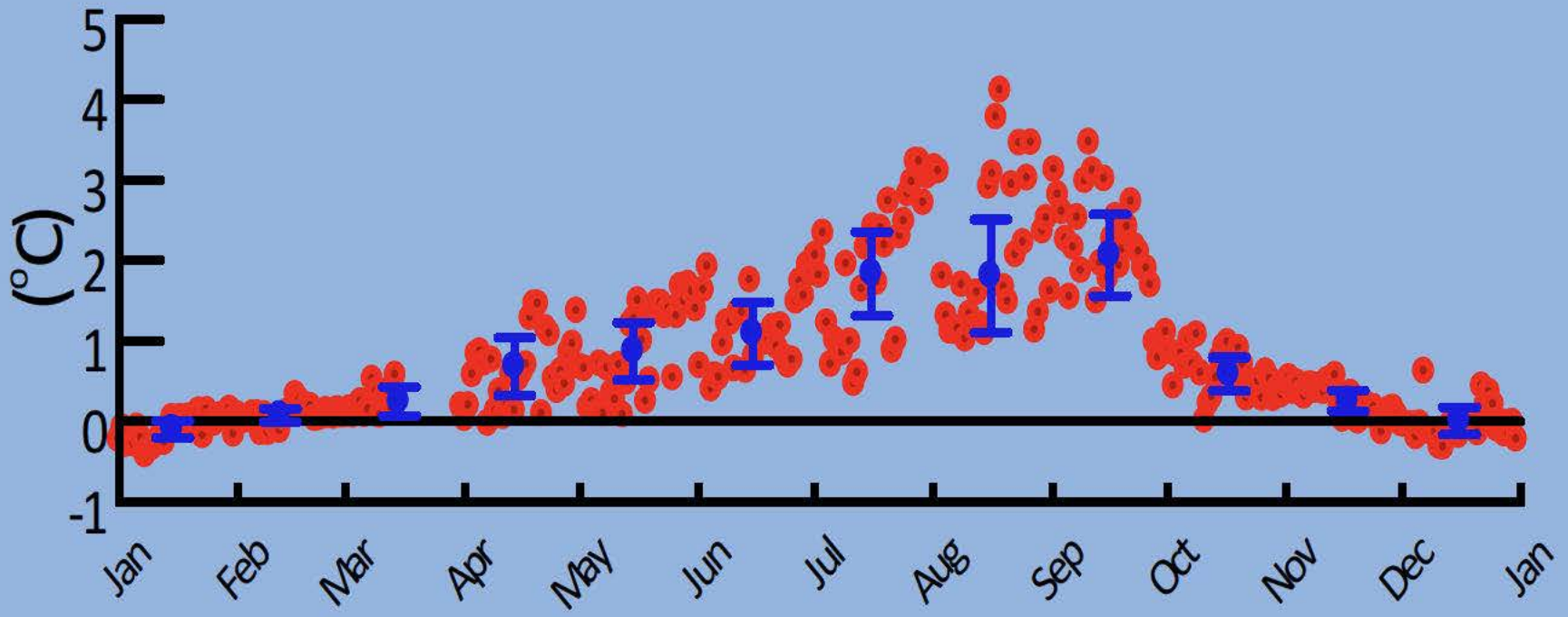
- Across the 37 locations monitored within the 11 harvested sites, July maximum daily temps:
  - Increased significantly ($P < 0.05$) at 30 locations
  - Decreased at three locations
  - Did not change at 4 locations

Temperature-Temporal effects

- Temperature often elevated from early spring through the fall months.

Temperature Response-Temporal Extent

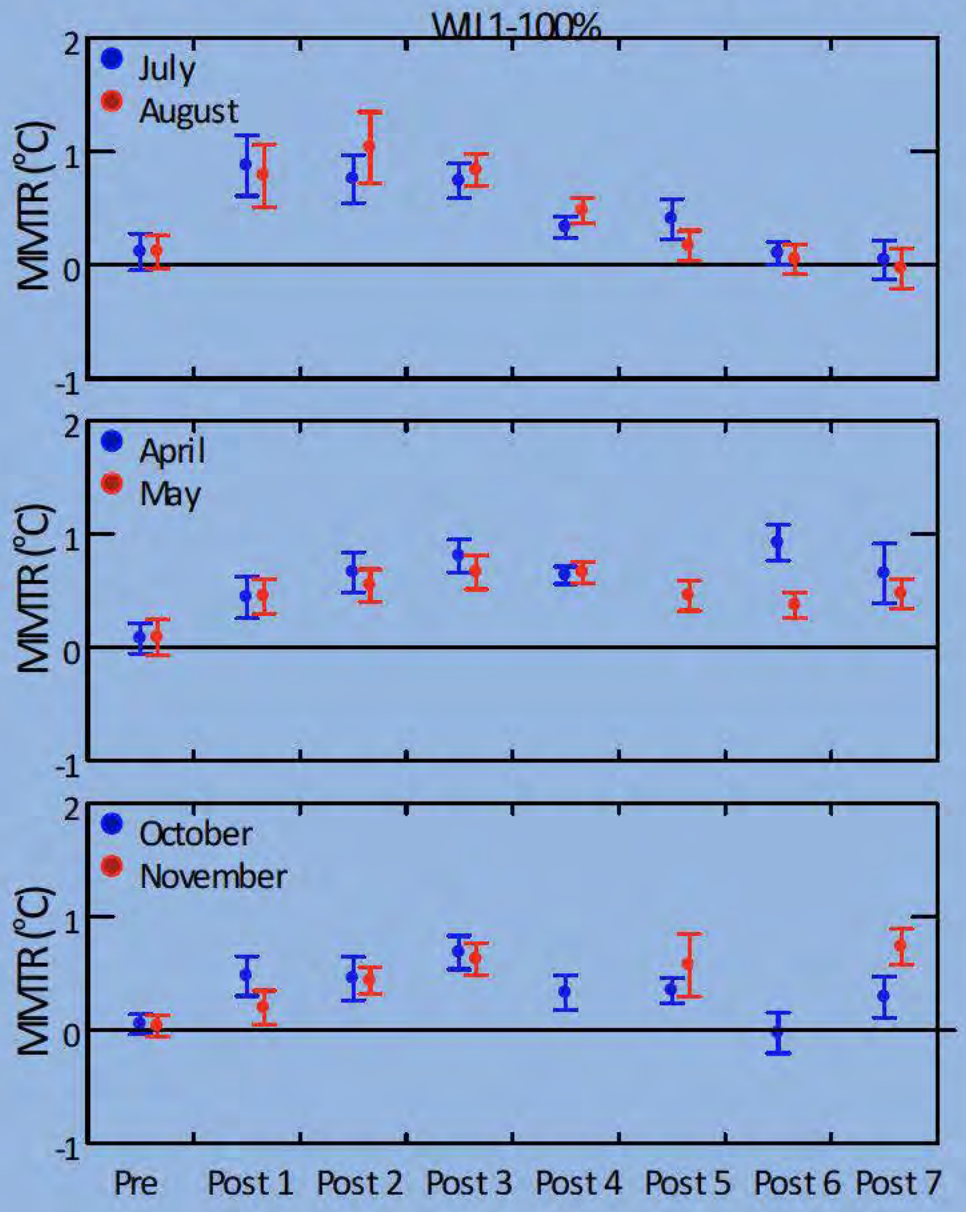
Temperature increase was greatest in the summer but persisted for six or more months at most sites.



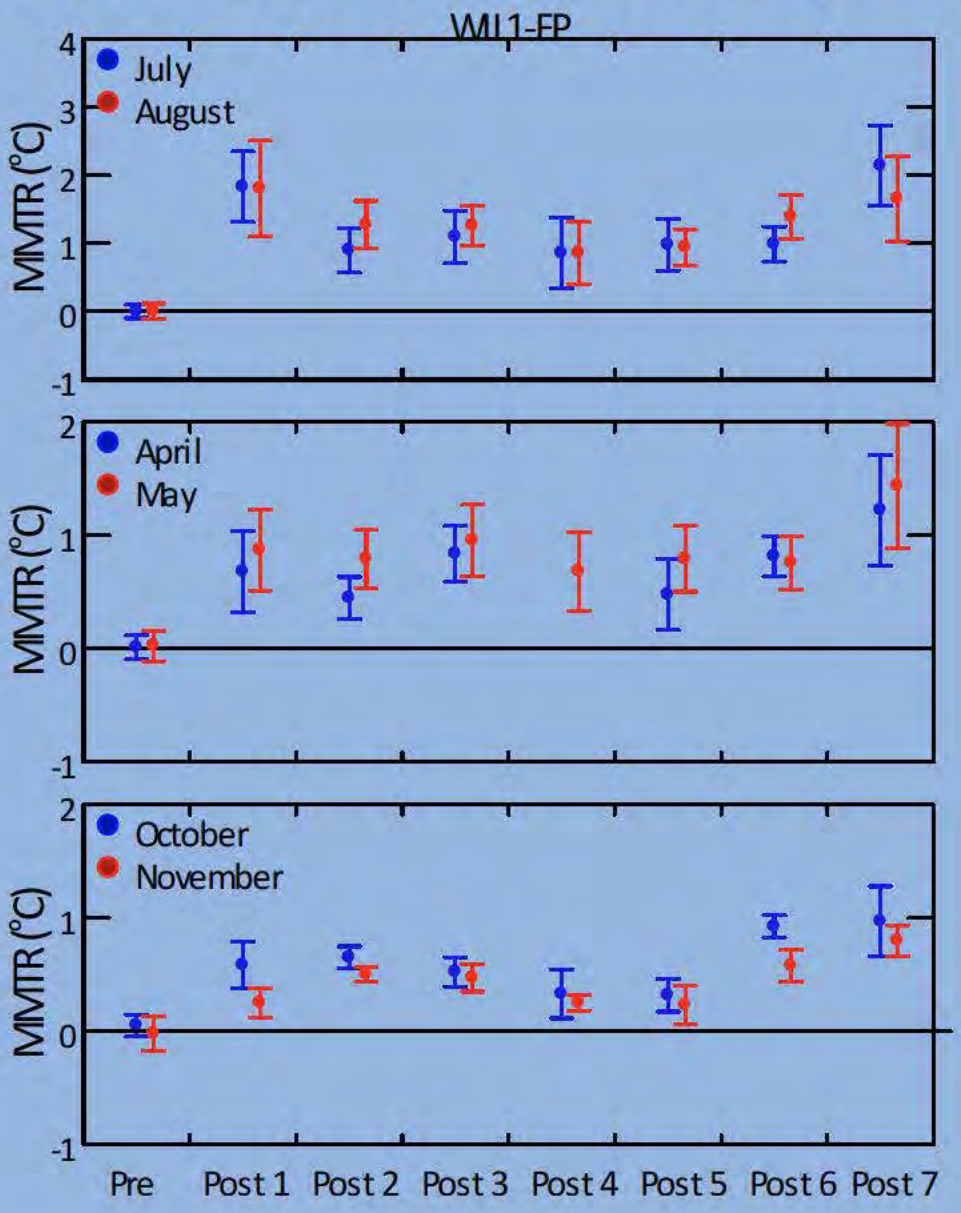
Temperature-Temporal effects

- Elevated temperatures persisted for 7+ years at most sites.

Seasonal MMTR x Year, WIL1-100%



Seasonal MMTR x Year, WIL1-FP



After 7 years?

	100%		FP		0%		Downstream	
	Elev*	ND**	Elev	ND	Elev	ND	Elev	ND
Spring	4	0	3	0	4	0	6	0
Summer	2	2	2	1	4	0	5	1
Fall	4	0	3	0	4	0	5	1

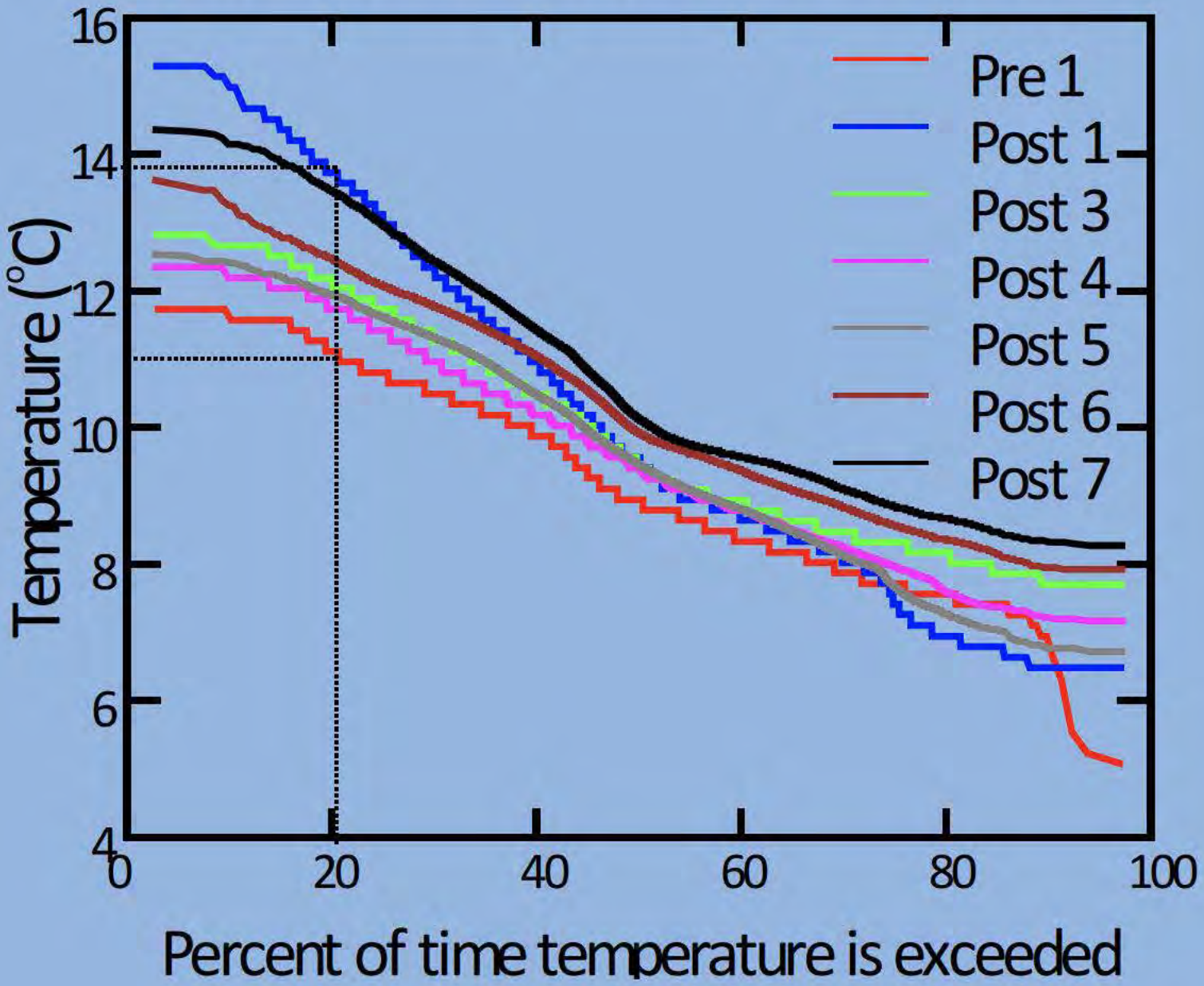
*Elev-Elevated MMTR **ND-No difference from pre-harvest

- Three of 11 sites back to pre-harvest summer maximum temperature
- All 11 sites have elevated spring and fall temperature
- **Downstream -** Five of six locations downstream of the harvest unit have elevated temp in spring, summer, and fall.
- By Post 7 most MMTR < 1 degree C

Temperature-year round

- There is a substantial shift in the annual temperature distribution (e.g., greater proportion of time above a specific temperature threshold).

Temperature Duration Curve WIL1-FP



Conclusions

- None of the buffer treatments prevented significant increases in stream temperature.
- Reduction in shade persisted well beyond two years post-harvest.
- Temperature increased from early spring into the fall at most sites and persisted through 7 years post-harvest.
- By 7 years post-harvest mean monthly temperature increase was <1.0^{o}C at most sites.
- Results from Soft Rock study are very similar.

FINAL SETTLEMENT AGREEMENT

ORIGINAL

WHEREAS, the subject of this Settlement Agreement ("Agreement") is the litigation captioned as Northwest Environmental Advocates v. Locke, et al., Civil No. 09-0017-PK, as filed on January 6, 2009, in the U.S. District Court for the District of Oregon ("Lawsuit");

WHEREAS, Plaintiff in the Lawsuit is Northwest Environmental Advocates ("Advocates" or "Plaintiff"); and Defendants in the Lawsuit are Gary Locke, in his official capacity as Secretary of the Department of Commerce, Lisa P. Jackson, in her official capacity as Administrator of the U.S. Environmental Protection Agency ("EPA"), and Dr. Jane Lubchenco, in her official capacity as Administrator of the National Oceanic and Atmospheric Administration ("NOAA") (collectively, "Defendants");

WHEREAS, the State of Oregon implements a coastal zone management program approved by NOAA under the Coastal Zone Management Act ("CZMA"), 16 U.S.C. § 1455;

WHEREAS, the Coastal Zone Act Reauthorization Amendments of 1990 ("CZARA"), 16 U.S.C. § 1455b, presently require a state with an approved CZMA program, such as the State of Oregon, to develop a Coastal Nonpoint Pollution Control Program ("CNPCP") and submit the CNPCP to NOAA and EPA for approval;

WHEREAS, CZARA, 16 U.S.C. § 1455b(a)(2), requires State CNPCPs to be closely coordinated with State water quality plans, which include water quality standards and Total Maximum Daily Loads ("TMDLs"), developed pursuant to Section 303 of the Clean Water Act ("CWA"), 33 U.S.C. § 1313;

WHEREAS, CZARA, 16 U.S.C. § 1455b(b)(3), requires State CNPCPs to implement and from time-to-time revise additional management measures for identified land uses and areas as necessary to protect designated uses and achieve and maintain applicable water quality standards under CWA Section 303;

WHEREAS, CZARA, 16 U.S.C. § 1455b(c), requires NOAA and EPA to withhold certain amounts of grant funds available to states under CZMA Section 306, 16 U.S.C. § 1455, and CWA Section 319, 33 U.S.C. § 1329, respectively, when NOAA or EPA, respectively, determine a state has failed to submit an approvable CNPCP;

WHEREAS, Oregon first submitted its CNPCP in 1995, and, in 1998, EPA and NOAA identified forty conditions that Oregon would have to meet to obtain full program approval of its CNPCP, including a condition that Oregon adopt additional management measures for forestry to achieve and maintain water quality standards;

WHEREAS, forested lands are the primary land type in Oregon's coastal areas, and logging in these areas contributes to impairment of water quality and designated uses;

WHEREAS, EPA and NOAA have not fully approved Oregon's CNPCP under CZARA, in part because Oregon has failed to satisfy the condition requiring additional management measures for forestry;

WHEREAS, EPA and NOAA have not withheld any CZMA Section 306 grant funds or CWA Section 319 grant funds from Oregon;

WHEREAS, the Lawsuit alleges that NOAA and EPA, by not making a final decision approving or disapproving Oregon's CNPCP, and by not withholding CZMA Section 306 grant funds and CWA Section 319 grant funds from Oregon, are in violation of CZARA and the Administrative Procedure Act ("APA"), 5 U.S.C. § 706;

WHEREAS, the Lawsuit also stated claims under the Freedom of Information Act, 5 U.S.C. § 552, which Plaintiff and Defendants (collectively, "the Parties") settled and the Court dismissed, with prejudice, on September 18, 2009;

WHEREAS, in 1998, EPA and NOAA determined that Oregon's current Forest Practice Rules are inadequate to achieve and maintain water quality and fully support designated beneficial uses, and reiterated this determination in 2004 and 2008 with respect to riparian protections, high-risk landslide areas, and legacy roads;

WHEREAS, Oregon, in order to resolve the outstanding condition on its CNPCP for additional management measures for forestry, has proposed to develop Implementation Ready TMDLs, which is a new and novel approach to achieving and maintaining water quality standards in the State's coastal sub-basins, and which includes the development and issuance of enforceable load allocations, implementation plans, and "safe harbor" Best Management Practices ("BMPs") throughout Oregon's CNPCP management area (collectively, "Oregon Coastal TMDL Approach");

WHEREAS, on May 12, 2010, EPA and NOAA sent a letter to the State of Oregon, a copy of which is attached hereto as Exhibit A, which encouraged the Oregon Department of

Environmental Quality ("ODEQ") to develop additional management measures for forestry, and to resolve the related outstanding condition on its CNPCP, by implementing the Oregon Coastal TMDL Approach, and which stated the agencies' belief that the Oregon Coastal TMDL Approach, along with measures to address the other outstanding conditions, could enable the State to receive full approval of its CNPCP;

WHEREAS, on July 2, 2010, and in response to EPA and NOAA's May 12, 2010, letter, the Oregon Attorney General sent a legal opinion, which is attached hereto as Exhibit B, to EPA and NOAA that describes the Oregon Coastal TMDL Approach as a new process by which ODEQ "assigns [load allocations] to individual property owners—including forestland owners—adjacent to the waterbody as opposed to the general [load allocation] for the nonpoint source pollution sectors as has typically been done in previous TMDLs. The water quality management plan (WQMP) issued in conjunction with the TMDL would require each source to undertake an approved implementation plan specific to the property. The [O]DEQ would also establish 'safe harbor' BMPs or other ground control measures that it believes to be adequate to meet the [load allocations] to the maximum extent practicable.";

WHEREAS, the July 2, 2010, legal opinion further concludes that "[O]DEQ is authorized to establish its own implementation requirements to the extent required by the CWA and to the extent that controls adopted by the [Oregon Board of Forestry] under the [Oregon Forest Practices Act] are deemed by [O]DEQ to be inadequate to implement the TMDL. . . . [O]DEQ

may legally conclude, and in some cases likely must conclude, that implementation of its safe harbor BMPs is required.";

WHEREAS, the July 2, 2010, legal opinion confirms that ODEQ has the authority to develop and enforce the Oregon Coastal TMDL Approach, specifically proposing that "[i]f the [Board of Forestry] does not adopt basin-specific BMPs or if the [O]DEQ finds that the [Board of Forestry's] BMPs are not as protective as the safe harbor BMPs, the [O]DEQ will require the forestland owner to comply with the safe harbor BMPs, or to develop its own BMPs and submit them to the [O]DEQ for review and approval," and concluding that "if the [Board of Forestry] does not promulgate such implementation measures, [O]DEQ has the authority to directly order compliance with the load allocation because such measures are required by the CWA.";

WHEREAS, on July 26, 2010, ODEQ sent a letter to EPA and NOAA, which letter is attached hereto as Exhibit F, in which ODEQ commits to implementing the Oregon Coastal TMDL Approach, as described in the July 26, 2010, letter and Attachment A to that letter, "in the coastal basins beginning with the Mid-Coast Basin and then in the subsequent coastal basin[s]." The July 26, 2010, letter states that Attachment A was reviewed by the "Oregon Governor's Office for the specific purpose of identifying options the state would be committed to implement to resolve the conditional approval issues associated with the state's Coastal Nonpoint Source Control Plan.";

WHEREAS, in the July 26, 2010, letter, and Attachment A to that letter, ODEQ commits to developing Oregon Coastal TMDLs that will "specifically identify significant nonpoint

sources, including significant forestry sources," and ODEQ commits to establishing enforceable load allocations in the TMDLs, and to developing safe harbor BMPs for the load allocations established for those sources, as well as to issuing implementation orders to significant sources, including significant forestry nonpoint sources that have received load allocations through the Oregon Coastal TMDL Approach. Further, Attachment A to the July 26, 2010, letter states that ODEQ will approve or disapprove TMDL Implementation Plans "based on the plans ability to meet the load allocations or [Oregon Board of Forestry] basin specific rule[s]" and that ODEQ "would reserve its authority to impose BMPs under ORS 468B.110 to the extent necessary to comply with Sections 303 and 309 of the CWA.";

WHEREAS, EPA and NOAA continue to believe that the Oregon Coastal TMDL Approach could meet the additional management measure for forestry, and recognize the importance of the Oregon Coastal TMDL Approach incorporating necessary management practices that will achieve load allocations so as to achieve and maintain water quality standards;

WHEREAS, the Performance Partnership Agreement (PPA)/Performance Partnership Grant (PPG) between EPA Region X and ODEQ for the period July 1, 2010, to June 30, 2012, provides that $100,000 from the CWA Section 319 funding be used for each of the two years for development of the Oregon Coastal TMDL Approach;

WHEREAS, the Parties presently believe that ODEQ's commitment to the Oregon Coastal TMDL Approach puts Oregon on a path to meet the condition for additional

management measures for forestry, which is necessary to achieve full approval of its CNPCP; and

WHEREAS, the Parties therefore believe that their mutual and individual interests will be best served if any and all remaining disputes between them concerning the issues raised by the Lawsuit are resolved without further litigation.

THEREFORE, in the interests of the public, the Parties, and judicial economy, the Parties hereby agree as follows:

1. On or before November 15, 2013, NOAA and EPA shall sign for prompt publication in the Federal Register a notice announcing a proposed decision to either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's CNPCP, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3) and (4). If EPA and NOAA propose to approve Oregon's CNPCP, the Federal Register notice shall announce a thirty (30) day public comment period on that proposal. If EPA and NOAA propose to find that Oregon has failed to submit an approvable program, the Federal Register notice shall announce a ninety (90) day public comment period on that proposal and shall also announce EPA's and NOAA's intent, pursuant to 16 U.S.C. § 1445b(c)(3) and (4), to withhold CWA Section 319 and CZMA Section 306 grant funds from Oregon beginning in the funding cycles that immediately follow the agencies' finding. EPA or NOAA shall provide Advocates with a copy of the proposed final decision prior to or concurrent with publishing it in the Federal Register. EPA and NOAA may

use the process outlined in the October 16, 2003, memorandum from Diane Regas, entitled "Approving and Disapproving State Programs under the Coastal Zone Act Reauthorization Amendment of 1990" to guide their final review and decision-making process. The October 16, 2003, Diane Regas memorandum is attached to this Agreement as Exhibit C.

2. On or before May 15, 2014, EPA and NOAA shall either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's CNPCP, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3) and (4). If EPA and NOAA make a finding that the State of Oregon has failed to submit an approvable program, the agencies shall, pursuant to 16 U.S.C. § 1455b(c)(3) and (4), withhold CWA Section 319 and CZMA Section 306 grant funds from Oregon beginning in the funding cycles that immediately follow the agencies' finding and in all future years unless and until EPA and NOAA issue a Full Approval Decision Memorandum approving the State's CNPCP without conditions. After May 15, 2014, EPA and NOAA shall not award full CWA Section 319 or CZMA Section 306 grant funds to Oregon based on any conditional approval of Oregon's CNPCP. EPA or NOAA shall provide Advocates with a copy of the final decision within five days of it being signed.

3. In their review of ODEQ's proposed schedule for implementing the Oregon Coastal TMDL Approach throughout Oregon's CNPCP management area, EPA and NOAA will consider Advocates' comments on ODEQ's proposed schedule. EPA and NOAA shall review ODEQ's proposed schedule to ensure that it provides a reasonable timeline for implementing the

State's additional management measures for forestry and that it includes developing or updating TMDLs for all sub-basins in the CNPCP management area using the Oregon Coastal TMDL Approach.

4. Pursuant to 33 U.S.C. § 1329(h), and through the CWA Section 319 program generally, EPA shall continue to work with ODEQ to provide that future agreements regarding the use of performance partnership funding be used to assist Oregon in implementing its Oregon Coastal TMDL Approach throughout the CNPCP management area to ensure that forestry impacts to water quality are addressed. Additionally, pursuant to 16 U.S.C. § 1455b(d), and to assist Oregon with satisfying the condition on Oregon's CNPCP that requires the adoption of additional management measures for forestry, EPA and NOAA will consider and respond to any requests by ODEQ for technical assistance with developing and implementing the Oregon Coastal TMDL Approach, including requests by ODEQ to provide preliminary feedback as to whether proposed safe harbor BMPs in the Mid-Coast Basin TMDLs could achieve Oregon water quality standards.

5. By December 31, 2012, pursuant to their authorities under 16 U.S.C. § 1455b(d), and based upon Oregon's July 2, 2010, Attorney General's Opinion, the July 26, 2010, ODEQ commitment letter, the schedule for implementing the Oregon Coastal TMDL approach that EPA and NOAA requested the state submit by March 31, 2011, the Mid-Coast Basin TMDLs implementing the Oregon Coastal TMDL Approach that EPA and NOAA requested the state to submit by June 30, 2012, and any other information, EPA and NOAA shall provide ODEQ with

a written initial assessment. This written initial assessment will evaluate (a) whether implementation of the Oregon Coastal TMDL Approach in the Mid-Coast Sub-basins, including the safe harbor BMPs, is likely to result in actions that achieve and maintain water quality standards, and (b) whether Oregon's plan for developing and updating TMDLs for all sub-basins in the CNPCP management area using the Oregon Coastal TMDL Approach could satisfy the outstanding forestry condition on Oregon's CNPCP under 16 U.S.C. § 1455b(b)(3). In developing their initial assessment, EPA and NOAA shall consider any comments Plaintiff may have submitted with respect to ODEQ's proposed TMDLs and BMPs. EPA and NOAA shall send a copy of the written initial assessment to Plaintiff.

6. In addition to the fees already paid as part of the settlement of Plaintiff's FOIA claims (claims four and five) in the Lawsuit, EPA and NOAA shall pay Plaintiff a total of eighty-three thousand five hundred dollars and no cents ($83,500.00) for costs and attorneys' fees arising out of the APA claims (claims one, two and three) in the Lawsuit. EPA and NOAA shall make the payments required by this Paragraph within ninety (90) days of the date of entry of the Agreed Order (attached hereto as Exhibit D) dismissing the APA claims without prejudice. Payment shall be made to the Washington Forest Law Center. Payment may be made by electronic funds transfer or by check made payable and sent by First Class Mail to: Washington Forest Law Center, c/o Paul Kampmeier, 615 Second Ave., Suite 360, Seattle, Washington 98104. After entry of the Agreed Order that is attached hereto as Exhibit D, Plaintiff shall provide Defendants with the necessary account information for electronic funds transfer.

7. Plaintiff agrees that receipt of the payment required by Paragraph 6 of this Agreement shall operate as a release of Plaintiff's present claims under the Equal Access to Justice Act, 28 U.S.C. § 2412, for the fees, expenses, and costs incurred through and including the date of this Agreement. Plaintiff shall provide written communication to Defendants to confirm Plaintiff has received the funds. This Agreement, the release described in this Paragraph, and the payments required by Paragraph 6 of this Agreement shall not in any way limit Plaintiff's right or ability to seek or collect costs and attorney fees incurred in any other lawsuit, including any lawsuit that raises claims identical or similar to those raised in the Lawsuit.

8. Within five (5) days of the full execution of this Agreement, and pursuant to Federal Rule of Civil Procedure 41(a), the parties shall file with the United States District Court for the District of Oregon the Agreed Order and Stipulations that are attached to this Agreement as Exhibits D and E. Should the Court, for any reason, modify, alter, or refuse to enter the Agreed Order that is attached hereto as Exhibit D, this Agreement will be void, and the Parties will meet and confer to determine whether they can finalize a settlement agreement that accommodates the Court's concerns.

9. In the event that Advocates, EPA, or NOAA believe that any party to this Agreement has failed to comply with any term or condition of this Agreement, or in the event that there is any dispute or controversy about any part of this Agreement, the parties shall use their best efforts to settle and resolve the controversy. To that end, the party raising the dispute

shall commence an informal dispute resolution period, to be no shorter than thirty (30) days, by giving written notice to the other party(s) stating the nature of the matter to be resolved and the position of the party asserting the controversy. The Parties shall consult and negotiate with each other in good faith and, recognizing their mutual interests in the ongoing integrity of this Agreement, attempt to reach a just and equitable solution satisfactory to all parties. If, after implementation of the informal dispute resolution process in this Paragraph, EPA or NOAA have not performed the obligations established in Paragraph 6 of this Agreement, Plaintiff may seek enforcement of the Agreed Order dismissing claims one, two, and three without prejudice. If, after implementation of the informal dispute resolution process in this Paragraph, EPA or NOAA have not performed any other obligation established in this Agreement, Plaintiff's sole judicial remedy will be to re-initiate litigation on or after December 16, 2013.

10. Any notices required or provided for by this Agreement shall be in writing, effective upon receipt, and sent to the following:

For Northwest Environmental Advocates:

Paul A. Kampmeier, Staff Attorney
Washington Forest Law Center
615 Second Avenue, Suite 360
Seattle, Washington 98104

Allison LaPlante
Pacific Environmental Advocacy Center
Lewis and Clark Law School
10015 SW Terwilliger Blvd
Portland, Oregon 97219

Nina Bell, Executive Director
Northwest Environmental Advocates
P.O. Box 12187
Portland, Oregon 97212-0187

For Defendants:

Kristofor R. Swanson
U.S. Department of Justice
Environmental & Natural Resources Division
Natural Resources Section
P.O. Box 663
Washington, DC 20044-0663

Stephanie Campbell
Attorney-Adviser
Office of General Counsel for Ocean Services
National Oceanic and Atmospheric Administration
1305 East-West Highway, Suite 6111
Silver Spring, MD 20910

John King
Chief, Coastal Programs Division
Office of Ocean and Coastal Resource Management
National Ocean Service
National Oceanic and Atmospheric Administration
1305 East-West Highway, Room 11305
Silver Spring, MD 20910

Ankur Tohan
Assistant Regional Counsel
U.S. EPA, Region 10
1200 Sixth Avenue, Suite 900 (ORC-158)
Seattle, Washington 98101

David Powers
Regional Manager for Forests and Rangelands
U.S. EPA Region 10, OOO
805 SW Broadway, Suite 500

Portland, OR 97205

or such other person as either party may designate in writing to the other parties.

11. The parties agree that nothing in this Agreement shall be interpreted as, or shall constitute, a commitment or requirement that EPA or NOAA take action in contravention of the APA or any other law or regulation. With respect to EPA's and NOAA's final decision on Oregon's CNPCP, nothing in this Agreement shall be construed to limit or modify the discretion accorded to EPA and NOAA by the APA, CZARA, or general principles of administrative law.

12. The parties agree that nothing in this Agreement shall be interpreted as, or shall constitute, a requirement that EPA or NOAA obligate or pay any funds exceeding those available, or take any other action in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other applicable appropriations law.

13. This Agreement and the Agreed Order and Stipulations set forth in Exhibits D and E constitute the entire agreement of the Parties, and no statements, agreement, or understanding, oral or written, which is not contained herein, shall be recognized or enforced. Except as expressly stated herein, this Agreement and the Agreed Order and Stipulations set forth in Exhibits D and E supersede all prior agreements, negotiations, and discussions between the parties with respect to the subject matters discussed herein.

14. This Agreement may be modified or amended only by written agreement signed by all parties.

15. The terms of this Agreement shall become effective upon execution by all parties.

16. The undersigned representatives of each party certify that they are fully authorized by the party or parties they represent to agree to and bind them to the terms and conditions of this Agreement and do hereby agree to the terms herein, including EPA's and NOAA's obligations under Paragraph 6.

17. The parties agree that this Agreement was negotiated and entered into in good faith and that it constitutes a settlement of claims that were vigorously contested, denied, and disputed by the parties. Nothing in this Agreement shall be interpreted as, or constitute, an admission of liability or fact or a waiver of any claims or defenses. Advocates reserves the right to challenge and/or appeal any decision or action by ODEQ, EPA, or NOAA, including but not limited to any TMDL submitted by ODEQ to EPA and any final decision by EPA and NOAA on Oregon's CNPCP.

18. Whenever possible, each provision of this Agreement shall be interpreted in such a manner as to be effective and valid. If a court finds any provision of this Agreement to be prohibited by or invalid under applicable law, the Parties shall work together in good faith to implement the letter and spirit of this Agreement to the extent possible. In no event shall Plaintiff be required to return the payments required by Paragraph 6 of this Agreement.

Approved by Counsel for the parties:

Date: Sept. 22, 2010 WASHINGTON FOREST LAW CENTER

By: _____
Paul A. Kampmeier, WSBA #31560

FINAL SETTLEMENT AGREEMENT

Date: 9/23/10

PACIFIC ENVIRONMENTAL ADVOCACY CENTER

By: _____
Allison LaPlante, OSB #02361

Attorneys for Plaintiff Northwest Environmental Advocates

Date: 9/27/2010

U.S. DEPARTMENT OF JUSTICE

By: _____
Kristofor R. Swanson, Colo. Bar # 39378

Attorneys for Defendants Gary Locke, Lisa P. Jackson, and Dr. Jane Lubchenko

Exhibit A

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

U.S. Environmental Protection Agency

MAY 12 2010

Neil Mullane
Administrator
Water Quality Division
Department of Environmental Quality
811 SW Sixth Avenue
Portland, Oregon 97204

Bob Bailey
Administrator
Coastal Division
Department of Land, Conservation and Development
635 Capitol Street, NE, Suite 150
Salem, Oregon 97301

Dear Mr. Mullane and Mr. Bailey:

The Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) have been working closely with you and your staff to address the remaining conditions on Oregon's Coastal Nonpoint Pollution Control Program (Coastal Nonpoint Program). We are very pleased with the progress that has been made. Over the past several months, we have had several meetings and conversations to discuss Oregon's October 29, 2009 draft approach to receive full approval of its Coastal Nonpoint Program the state shared with us in January. We would like to take this opportunity to formally follow up on the state's proposal and clarify what EPA and NOAA would need from the state before we are able to consider fully approving Oregon's Coastal Nonpoint Program.

We are highly supportive of Option #1, the prescriptive TMDL approach, extended to address all three outstanding forestry issues, for meeting the additional management measures for forestry, as well as the two strategies you laid out for satisfying the new development and onsite disposal system conditions. We believe these approaches could enable the state to receive full approval of its Coastal Nonpoint Program. However, additional clarification and details are needed before we can make a final decision.

The enclosed attachment lists the information Oregon must provide and timeline for doing so before EPA and NOAA would be able to approve Oregon's program. We recognize that some of these items may be challenging and require time to complete. EPA and NOAA developed the timeline in consultation with state staff to ensure due dates were reasonable yet keep the process moving forward. If sufficient progress is not being made, EPA and NOAA may disapprove Oregon's program and withhold a portion of the state's Clean Water Act Section 319 and Coastal Zone Management Act Section 306 funding pursuant to 16 U.S.C. § 1455b(c).

After careful consideration, EPA and NOAA no longer believe pursuing a change to the Forest Practices Act (Option #2) is a viable option at this time. It would take years for the rule change process to play out and there is no certainty the resource-intensive effort would ultimately result in substantive rule changes to address NOAA and EPA's remaining forestry concerns: adequate protection of riparian and landslide-prone areas, and management/maintenance of forestry roads impairing water quality, particularly legacy roads.

As always, EPA and NOAA look forward to continuing to work with you to address the remaining conditions on your Coastal Nonpoint Program. Please let us know if there is any specific assistance you need. For example, we would be happy to provide existing reports and data, and/or comparable examples on how the outstanding additional management measures for forestry can be met. NOAA's National Marine Fisheries Service could also provide information on forest management strategies that will help protect aquatic species, including salmon.

We encourage you to share proposed riparian, landslide, and legacy road best management practices (BMPs) as well as drafts of the onsite disposal system rules and TMDL Implementation Guidance with us to review. Early NOAA and EPA feedback will help ensure the BMPs, onsite rules, and TMDL Implementation Guidance will help to protect water quality and aquatic resources and satisfy the conditions on the state's Coastal Nonpoint Program.

Please contact either Dave Powers of EPA Region 10 at (503) 326-5874 or Allison Castellan of NOAA at (301) 563-1125 if you have questions.

Sincerely,

John King, Chief
Coastal Programs Division
Office of Ocean and Coastal Resource Management
National Oceanic and Atmospheric Administration

Mike Bussell, Director
Office of Water and Watersheds
Environmental Protection Agency, Region 10

Enclosure

cc: Don Yon, OR DEQ
Amanda Punton, OR DLCD
Eugene Foster, OR DEQ HQ
Don Waye, EPA HQ
Dave Powers, EPA R10
Allison Castellan, NOAA

Attachment

What NOAA and EPA Need from Oregon for Coastal Nonpoint Program Approval

OSDS:

1. Adopt new rules requiring regular inspections for OSDS. Inspecting the systems at time of property transfer by trained/certified inspectors as laid out in Oregon's October 29, 2009 draft strategy is sufficient. Please provide NOAA/EPA with a copy of the draft rules to review to ensure the final rules will meet Coastal Nonpoint Program requirements.

Timeline:

- **November 30, 2010:** Policy Option Package for Rules Development completed.
- **January 2011 through June 2011:** Request funding from the 2011 Oregon Legislature to support time-of-sale inspections for OSDS.
- **June through December 2012:** Provide draft(s) of rule language to NOAA and EPA for review/comment.
- **December 31, 2012:** Rule development completed.
- **January 31, 2013:** Submit new rules to NOAA and EPA for review/approval.
- **March 2013:** Rule implementation and inspections begin.

New Development:

1. Complete TMDL Implementation Guidelines for the Coastal Nonpoint Program management area that incorporate the new development management measure requirements or practices consistent with the new development measure. Please provide NOAA and EPA with drafts of the guidance to review to ensure the final product will meet Coastal Nonpoint Program requirements.

2. Submit a strategy and schedule for completing and updating TMDL Implementation Plans within the Coastal Nonpoint Program management area to be consistent with the new TMDL Implementation Guidance.

Timeline:

- **June 30, 2010:** Initial draft guidance document completed and provided to NOAA and EPA for review and comment.
- **December 31, 2010:** Final draft guidance document completed and provide to NOAA and EPA for review and comment.
- **March 31, 2011:** Public review of final draft guidance document completed.
- **June 30, 2011:** Final guidance document released and submitted to NOAA and EPA, along with strategy and schedule for updating TMDL Implementation Plans.
- **June/July 2011:** Workshops for Designated Management Agencies begins.

Additional Management Measures for Forestry:

1. Commit to the prescriptive TMDL, Implementation Plan, and "safe harbor" BMP approach ("Option 1" under the State's proposal) that will satisfy the additional management measures for forestry condition, specifically addressing riparian and landslide-prone areas, and road issues.

2. Provide a legal opinion from the Oregon Attorney General's Office that clearly concludes Oregon DEQ has the authority to prevent nonpoint source pollution and require implementation of the additional management measures for forestry. Specifically, under the state's current proposal, the legal opinion must conclude that DEQ has the authority to enforce TMDLs, including "safe harbor" BMPs, with regard to riparian buffers, landslide-prone areas, and legacy roads.

3. Provide a more detailed description of the new prescriptive TMDL process. This revised description should:
   a. Clarify the mechanism DEQ plans on using to require prescriptive, "safe harbor" BMPs. Will the BMPs (or possibly a menu of "safe harbor" BMPs to select from) be placed in the TMDLs themselves or only included in the TMDL Implementation Plans? Does DEQ's enforcement authority apply to both TMDLs and Implementation Plans?

   b. Briefly describe how the prescriptive TMDL approach will address NOAA and EPA's concerns with landslide prone areas and road density and maintenance, particularly on "legacy roads." During our January 14th meeting/conference call, the state discussed the potential use of DOGAMI LIDAR coverages, Relative Bed Stability, and GRAIP methodologies to assess, target, and address landslide prone areas and road issues in support of the new prescriptive TMDL process. DEQ should briefly describe these methodologies and/or others and how they will be used in the new TMDL process. The description should include how these tools will help target and, where needed, develop "safe harbor" BMPs.

   c. Provide a few examples of the types of "safe harbor" BMPs Oregon would use to address our concerns about adequate protection of riparian and landslide-prone areas and management/maintenance of forestry roads, specifically legacy roads, and meet load allocations and surrogate targets. We recognize that the BMPs could vary from parcel to parcel based on the site conditions but we need a reasonable assurance that the types of "safe harbor" BMPs Oregon is developing link to, and would meet, water quality standards and protect beneficial uses. For example, requirements for restricting harvest intensities and methods on high risk landslide prone areas should be described along with the triggers or thresholds for their application. We recommend providing comparable examples of harvest restrictions on high risk landslide prone areas such as those applied under the Washington Forests and Fish rules as well as the harvest restrictions under the Oregon Forest Practices Act rules related to high risk landslide areas above roads and buildings. The Northwest Forest Plan also includes measures for landslide prone areas that DEQ could consider.

   d. Briefly describe DEQ's approval/disapproval process for TMDL Implementation Plans. To address the additional management measures for forestry condition, decisions to approve or disapprove need to be based on the plan's ability to meet load allocations or surrogate targets. If DEQ's decisions are based on a basin-specific rule adopted by BOF, then such rule must have the ability to meet load allocations or surrogate targets.

4. Provide a schedule for developing new prescriptive TMDLs and safe harbor BMPs and updating existing TMDLs and Implementation Plans within the 6217 boundary following the new prescriptive TMDL process.

5. Complete and submit to EPA and NOAA a prescriptive TMDL that includes safe harbor BMPs and a TMDL Implementation Plan for the Mid-Coast basins and that addresses the outstanding additional management measures for forestry condition.

Timeline:

- **June 30, 2010:** Submit a legal opinion from Oregon's Attorney General's Office (Item 2).
- **September 30, 2010:** Provide commitment that Oregon will pursue prescriptive TMDL process for addressing the additional management measures for forestry condition **January 31, 2011:** Provide additional detail on the prescriptive TMDL process (Item 3).
- **March 31, 2011:** Provide a schedule for implementing the prescriptive TMDL approach throughout the Coastal Nonpoint Program management area which includes a timeline for developing new TMDLs as well as updating existing TMDLs.
- **June 30, 2012:** Complete and submit prescriptive TMDLs and TMDL Implementation Plans for Mid-Coast basins.

Exhibit B

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

JOHN R. KROGER
Attorney General

MARY H. WILLIAMS
Deputy Attorney General

DEPARTMENT OF JUSTICE
GENERAL COUNSEL DIVISION

MEMORANDUM

DATE: July 2, 2010

TO: Neil Mullane, Water Quality Division Administrator
Department of Environmental Quality

FROM: Larry Knudsen, Senior Assistant Attorney General
Natural Resources Section

SUBJECT: DEQ Authority to Develop and Implement Load Allocations for Forestland Sources

Question and Brief Answer

You have asked whether the Department of Environmental Quality (DEQ) has the legal authority to develop specific load allocations (LAs) and implementation measures for forestland owners. The question assumes the following facts: A waterbody within the coastal zone fails to meet water quality standards[1] for temperature, turbidity or suspended solids. Forestland operations on properties adjacent to the waterbody contribute significantly to the pollutant load that is responsible for the failure of the waterbody to meet standards. The DEQ has determined that statewide best management practices (BMPs) implemented by the Oregon Board of Forestry (BOF) under the Forest Practices Act (FPA)[2] are inadequate to ensure the achievement of water quality standards.

Based on these assumed facts, the DEQ would issue a total maximum daily load (TMDL) for the waterbody along with a water quality management plan (WQMP). Under the TMDL, the DEQ proposes to assign LAs to individual property owners—including forestland owners—adjacent to the waterbody as opposed to general LAs for the nonpoint source pollution sectors as has typically been done in previous TMDLs. The water quality management plan (WQMP) issued in conjunction with the TMDL would require each source to undertake an approved implementation plan specific to the property. The DEQ also would establish "safe harbor" BMPs or other control measures that it believes to be adequate to meet the LA to the maximum extent practicable.[3] In the case of forestlands, if the Board of Forestry adopts best management practices that are at least as protective as the DEQ BMPs, compliance with the BOF BMPs

[1] In this memorandum, the term water quality standard is used in its narrow sense to mean only those standards required under Clean Water Act Section 303 (33 USC §1313) and the EPA's implementing rules adopted by the Environmental Quality Commission (EQC) under ORS 468B.035 and codified in OAR chapter 340, division 41.
[2] ORS 527.610 to ORS 527.785.
[3] It is anticipated that the DEQ would consult with Oregon Department of Forestry when developing the safe harbor BMPs and in other matters relating to TMDL development and enforcement.

1515 SW Fifth Ave, Suite 410, Portland, OR 97201
Telephone: (971) 673-1880 Fax: (971) 673-1886 TTY: (800) 735-2900 www.doj.state.or.us

would constitute implementation of the LAs. If the BOF does not adopt basin-specific BMPs or if the DEQ finds that the BOF's BMPs are not as protective as the safe harbor BMPs, the DEQ will require the forestland owner to comply with the safe harbor BMPs, or to develop its own BMPs and submit them to the DEQ for review and approval.

As discussed in the Legal Analysis section below, we believe that the DEQ does have the legal authority to develop and enforce these source specific LAs for landowners, including owners of forestlands.

Background

Under the Coastal Zone Management Act,[4] Oregon is required to develop and submit to the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Agency (NOAA) a Coastal Nonpoint Source Pollution Control Plan.[5] Under Clean Water Act (CWA) Section 319, the state is also required to develop and submit to the EPA a plan for the control of nonpoint source pollution.[6] Under coastal zone statutes and the EPA's CWA guidance, a state's coastal nonpoint source plan is to be closely coordinated with its CWA Section 319 nonpoint source plan, and also with any TMDLs developed under CWA Section 303. Essentially, the coastal plan serves to update or supplement the Section 319 plan.

The DEQ has determined that water quality in a number of coastal basins fails to meet certain water quality standards including those for temperature and suspended sediment.[7] Further, the EPA and NOAA have asserted that the coastal plan submitted by Oregon does not adequately protect water quality with respect to pollutant loads from operations on private forest lands, specifically with respect to riparian areas, landslide prone areas, and forest roads. Unless the State of Oregon takes action to resolve these concerns, the EPA and NOAA have indicated that they will consider the state to be out of compliance with these federal laws and they will withhold federal funds under the CZMA that are currently administered by the Department of Land Conservation and Development (DLCD) and funds under the CWA that are administered by the DEQ.[8]

Legal Analysis

Under the federal Clean Water Act, Oregon is required to develop general water quality standards that are adequate to protect designated uses as well as actual uses in existence as of 1975.[9] Under the applicable statutes, the Environmental Quality Commission (EQC) is

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[4] 16 USC § 1451 to § 1466.
[5] 16 USC § 1455(b).
[6] 33 USC § 1329(b).
[7] *See* DEQ's CWA Section 305(b) Report at http://www.deq.state.or.us/wq/assessment/rpt0406.htm.
[8] 16 USC § 1455b(c); 33 USC § 1329. In addition, a suit filed by environmental groups against the EPA and NOAA is presently pending in the U.S. Federal District Court. It seeks an order requiring the agencies to withhold grant funds based on the lack of approval of Oregon's Coastal Plan. *NWEA v. Gutierrez*, C09-017 (D. Or.1/6/09).
[9] 33 USC 1313 (CWA Section 303); 40 CFR 131.4(e); 40CFR 131.6. These standards must then be approved by the EPA and to the extent that a state fails to adopt standards or adopts standards that are not adequately protective, the EPA will promulgate standards for the state. *Id.* 40 CFR part 131.

responsible for adopting these standards.[10] The CWA includes several strategies designed to ensure that water standards are achieved and maintained. Point sources are generally prohibited from adding pollutants to waters of the United States without a National Pollutant System Discharge System (NPDES) permit.[11] Such permits must include technology based effluent limits and additional water quality based effluent limits when needed to ensure that the discharge will not cause or contribute to a violation of standards. Nonpoint sources, in turn, are typically subject to state management plans required by CWA Section 319. [12] Nonpoint source management plans typically use BMPs or similar control measures to reduce pollutants to the maximum extent practicable. There are also mechanisms for addressing water pollution from federal sources and activities.[13]

Oregon's statutes create a special relationship between the DEQ and the Oregon Department of Forestry (ODF) with respect to the regulation of water quality on state and privately held forestlands. The statutes require forest operations to be conducted in full compliance with water quality rules and standards adopted by the EQC.[14] For nonpoint source discharges, the BOF is directed to develop best management practices that ensure, to the maximum extent practicable, that forest operations will be conducted in a manner that will not impair the achievement or maintenance of water quality standards. Thus, the BOF essentially develops the BMPs that are the basis of Oregon's Section 319 plan for controlling nonpoint sources pollution associated with state and private forest lands in order to meet water quality standards. The statutes also provide a mechanism for the EQC to petition the BOF for more effective BMPs in the event the Commission concludes that nonpoint source discharges from forest operation being conducted in accordance with current BMPs significantly contribute to WQS violations.[15] To the extent that a forest operation is being conducted in compliance with applicable BMPs, operators are generally shielded from liability for violation of water quality standards.[16]

Clean Water Act Section 303 has additional provisions, generally referred to as the TMDL program, designed to address situations where standards are not being met despite the Section 402 and Section 319 programs discussed above.[17] The CWA requires states to identify those waters of the U.S. where standards are not being met and where the effluent limits imposed under NPDES permits and the Section 319 Nonpoint Source Management Plan are not expected to bring the waterbody into compliance with the standards.[18] Under this program, the CWA requires and Oregon statutes authorize DEQ to establish a TMDL with load allocations for the various sources of pollutants and to implement these allocations via implementation plans,

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[10] *See* ORS 468B. 010; 468B.035; 468B.048. The standards are codified in OAR chapter 340, Division 41.
[11] CWA Sections 301 and 402 (33 USC §§ 1311, 1342).
[12] 33 USC § 1329.
[13] *See, e.g.*, CWA Section 313 (33 USC § 1323) governing federal facilities and activities and CWA Section 401 (33 USC § 1341) addressing federal licenses and approvals.
[14] ORS 527.724.
[15] ORS 527.765.
[16] ORS 527.770. *See also* ORS 468B.050 (prohibiting violations of water quality standards).
[17] 33 USC § 1313.
[18] 40 CFR § 130.7.

permits and orders developed to bring the water body into compliance with the water quality standards.[19]

The water quality statutes generally give DEQ very broad authority to implement TMDLs.[20] With respect to operations on forestlands, however, neither the EQC nor DEQ may "promulgate or enforce any effluent limitations[21] or controls on nonpoint source discharges" from forest operations, unless controls imposed under the FPA are insufficient to meet the requirements of the Clean Water Act.[22] The EQC's rules governing TMDLs also specify that the DEQ will look to the ODF to act as its designated management agency for implementation of TMDLs on state and private forestlands.

When the DEQ issues a TMDL, it is required to issue waste load allocations to point sources and load allocations to nonpoint sources that contribute significantly to the failure of the waterbody to meet standards.[23] These allocations, along with an accounting for natural background and a margin for safety, may not exceed the assimilative capacity of the waterbody.[24] DEQ also must develop plans to implement the allocations established in the TMDL.[25] The allocations in a TMDL are not water quality standards. They are measures designed to bring a waterbody that fails to meet water quality standards into compliance when the basic CWA provisions, e.g. NPDES permits and the Section 319 Nonpoint Source Plan are not expected to be adequate. Thus, the measures needed to implement load allocations under a TMDL for a specific basin, often will need to be more stringent than the general BMPs designed to maintain water quality standards under the Section 319 Plan.

DEQ is authorized and directed to establish load allocations and implementation requirements based on an individual sources of pollution or sectors of similar sources.[26] The rules specify, however, the ODF is expected to be the designated management agency that develops TMDL implementation plans for nonpoint source pollution from state and private forest operations and that it will use the authorities provided by the FPA.[27] Should ODF decline to act as the designated management agent, however, DEQ is authorized to establish its own implementation requirements to the extent required by the CWA and to the extent that controls adopted by the BOF under the FPA are deemed by DEQ to be inadequate to implement the TMDL. Thus in situations when the ODF is not carrying out the role of designated management agency and implementing BMPs adequate to implement the LA, DEQ may legally conclude, and in some cases likely must conclude, that implementation of its safe harbor BMPs is required.

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[19] 33 USC § 1313(d); ORS 468B.030; 468B.035; ORS 468B.110. Oregon's rules governing establishment and implementation of TMDLS are set out in OAR chapter 340, division 42.
[20] ORS 468B.010; 468B.030; 468B.110.
[21] ORS 468B.110(2). The term "effluent limit" refers to a specific type of water quality permit condition and normally would not be used in the context of nonpoint source pollution controls. Its use in this context is somewhat unclear.
[22] *Id.* (referencing ORS 527.765 and 527.700).
[23] 30 USC § 1313(d); 40 CFR § 130.7.
[24] OAR 340-042-0040.
[25] 33 USC § 1313(d)(1)(D); 40 CFR 131.7(d)(2).
[26] OAR 340-042-040(2)(h) and (l)(H); OAR 340-042-0080(1).
[27] OAR 340-042-0080(2).

Conclusion

We conclude that DEQ is required to develop and implement LAs for nonpoint sources of pollution, including, when applicable, pollutant loads from operations on state and private forest lands. In fulfilling this legal requirement, DEQ is authorized to establish allocations for individual nonpoint sources. Based on the assumptions set out above, we conclude that the law would allow DEQ to identify BMPs or other control measures needed to implement source specific LAs, including allocations for forest operations. In keeping with statutory directives and the policies in the EQC's TMDL rules, however, the BOF would be given an opportunity to adopt new BMPs or control measures that are as effective as the safe harbor BMPs and that would be implemented by ODF. If the BOF does not promulgate such implementation measures, DEQ has the authority to directly order compliance with the load allocation because such measures are required by the CWA.

2076981

cc: Bob Bailey, DLCD
Marvin Brown, ODF

Exhibit C

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

October 16, 2003

MEMORANDUM

SUBJECT: Approving and Disapproving State Programs under the Coastal Zone Act Reauthorization Amendments of 1990

FROM: Diane Regas, Director /s/
Office of Wetlands, Oceans, and Watersheds

TO: Water Division Directors, Regions II, IV- VI and IX-X

We have made considerable progress during the past year in our efforts to achieve approval of all State coastal nonpoint pollution control programs under Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). Of the 29 States that originally were part of the program, 15 have fully approved programs and one other is about to be fully approved. I know that this progress could not have been achieved without the hard work of the Regional staff, our partners at the National Oceanic and Atmospheric Administration (NOAA), and, of course, the State nonpoint source and coastal management staff that have worked diligently with all of their partners to produce approvable programs that will benefit their States' coastal waters for many years to come.

Despite this progress, there are also 13 States whose conditional approvals have expired and who have not yet obtained full approval of their coastal nonpoint programs. It remains our challenge to continue and to increase our ongoing efforts to work closely and actively with these States, in partnership with our colleagues in NOAA, to help them surmount any remaining obstacles to full approval.

Our goal is to achieve full approval of all State coastal nonpoint pollution programs. Coastal water quality will be best served if States develop and implement approvable CZARA programs. EPA and NOAA do not have any authority to implement these programs in lieu of the States. Therefore, it is absolutely critical for the States to be positioned to implement these programs fully and effectively. I ask you to give a very high priority to devoting staff time to working closely with the States to help them complete development of their programs and to thereby achieve full approval.

To assure that every State achieves full approval of its CZARA program, Regions may, where appropriate, include specific provisions in State-EPA agreements that call upon States to work assiduously to address those management measures and enforceable policies and mechanisms (EP&M's) that have not yet been approved. Similarly, where appropriate, Regions may include grant conditions in States' Section 319 grants that require the States to take specific steps to resolve remaining issues that currently preclude full program approval.

Regions should be careful to document and to maintain records, as they have in the past, of all communications with and documents provided to or by the State regarding their progress towards full approval. Examples of documents that should be maintained are written comments provided by EPA, NOAA or outside groups to the State; documents provided to EPA/NOAA by the State; records of oral conversations with the State; testimony of State or Federal officials before State legislatures or other relevant bodies regarding the steps being taken by the State to achieve full approval; and any other evidence of the State's progress towards obtaining full approval.

We recognize that there may be a few States that ultimately do not succeed, despite significant efforts by State and Federal staff, in their efforts to develop approvable CZARA programs. In any case where the Region intends to disapprove a State's program, we recommend that the Region should follow these procedures, which will assure that the States and all other interested parties have an adequate opportunity to provide input to the Region before it makes a decision to disapprove the program:

(1) Prepare a draft written document that identifies each of the management measures and EP&M's for which the State program fails to meet program requirements, and include a justification for this finding that explains in what respect the State's program fails to meet the measure or EP&M.

(2) Provide this draft document to the State and provide the State 60 days to comment on the draft and/or to submit additional information that may enable EPA and NOAA to approve the program.

(3) If the State program remains unapprovable at this point, revise the draft document as appropriate and publish a Federal Register notice announcing EPA's proposal to disapprove the program, and provide to the public at least a 90-day comment period on the revised draft document.

(4) Prepare a final document to approve or disapprove the program, including final findings and justifications as appropriate:

(a) If the program is approved, use existing processes for preparing the final approval document.

(b) If the program is not approved, identify each management measure and EP&M for which the State program fails to meet program approval requirements. The document must be accompanied by clear findings.

Regions should coordinate with Headquarters on these State program issues, particularly if a Region is considering a disapproval, since EPA's disapproval of a State program would result in the reduction of that State's 319 grant.

We have coordinated with NOAA in the development of this policy. NOAA concurs with this memorandum, and the two agencies are taking a consistent approach on this issue.

If you have any questions or comments regarding the process described above or more generally regarding CZARA program reviews and approvals, please contact me at 202-566-1146 (regas.diane@epa.gov), or have your staff contact Dov Weitman, Chief of the Nonpoint Source Control Branch, at 202-566-1207 (weitman.dov@epa.gov).

Exhibit D

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

PAUL KAMPMEIER (WSBA #31560)
Washington Forest Law Center
615 Second Avenue, Suite 360
Seattle, Washington 98104-2245
(206) 223-4088 x 4
(206) 223-4280 [fax]
pkampmeier@wflc.org

Attorney for Plaintiff

IGNACIA S. MORENO
Assistant Attorney General

KRISTOFOR R. SWANSON (Colo. Bar # 39378)
kristofor.swanson@usdoj.gov
U.S. Department of Justice
Natural Resources Section
P.O. Box 663
Washington, DC 20044-0663
Tel: 202-305-0248
Fax: 202-305-0506

Attorney for Defendants

UNITED STATES DISTRICT COURT

DISTRICT OF OREGON

NORTHWEST ENVIRONMENTAL ADVOCATES,

Plaintiff,

Civ. No. CV09-0017-PK

v.

GARY LOCKE, et al.,

Defendants.

AGREED ORDER DISMISSING APA CLAIMS WITHOUT PREJUDICE

AGREED ORDER

Having considered the parties' joint motion for dismissal of the Administrative Procedure Act claims (claims one, two, and three) in the complaint filed in this action on January 6, 2009, as well as the parties' stipulations in support of that motion, the Court hereby GRANTS the parties' joint motion for dismissal without prejudice.

Accordingly, IT IS HEREBY ORDERED:

1. On or before November 15, 2013, NOAA and EPA shall sign for prompt publication in the Federal Register a notice announcing a proposed decision to either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's Coastal Nonpoint Pollution Control Program, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3) and (4).

2. On or before May 15, 2014, EPA and NOAA shall either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's Coastal Nonpoint Pollution Control Program, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3) and (4). If EPA and NOAA make a finding that the State of Oregon has failed to submit an approvable program, the agencies shall, pursuant to 16 U.S.C. § 1455b(c)(3) and (4),withhold Clean Water Act Section 319 and Coastal Zone Management Act Section 306 grant funds from Oregon beginning in the funding cycles that immediately follow the agencies' finding and in all future years unless and until EPA and NOAA issue a Full Approval Decision Memorandum approving the State's Coastal Nonpoint Pollution Control Program without conditions.

3. Plaintiff's only judicial remedy for any failure by EPA and NOAA to meet the requirements set forth in Paragraph 1 and 2 of this Agreed Order will be re-initiation of litigation.

4. Within ninety days of entry of this order, EPA and NOAA shall pay Plaintiff a total of eighty-three thousand five hundred dollars and no cents ($83,500.00) for costs and attorneys' fees incurred to date in prosecution of claims one, two, and three. The payment required by this Order shall not in any way limit Plaintiff's right or ability to seek or collect costs and attorney fees incurred in any other lawsuit, including any lawsuit that raises claims identical or similar to those raised in Plaintiff's January 6, 2009, complaint.

5. Pursuant to Federal Rule of Civil Procedure 41(a)(2), claims one, two, and three in the complaint filed in this action on January 6, 2009, are dismissed without prejudice.

6. The Court shall retain jurisdiction to enforce and oversee compliance with the terms and conditions of this Order. See Kokkonen v. Guardian Life Ins. Co. of America, 511 U.S. 375 (1994).

IT IS SO ORDERED:

Dated: _____

_____
Paul J. Papak
United States Magistrate Judge

Presented by:

s/ Paul Kampmeier
PAUL KAMPMEIER (WSBA #31560)
Washington Forest Law Center
615 Second Avenue, Suite 360
Seattle, Washington 98104-2245
(206) 223-4088 x 4

pkampmeier@wflc.org

ALLISON M. LaPLANTE (OSB #02361)
Pacific Environmental Advocacy Center
10015 S.W. Terwilliger Blvd.
Portland, Oregon 97219-7799
(503) 768-6894 [phone]; (503) 768-6642 [fax]
laplante@lclarke.edu

Attorneys for Plaintiff

s/ Kristofor R. Swanson
KRISTOFOR R. SWANSON
(Colo. Bar No. 39378)
U.S. Department of Justice
Natural Resources Section
P.O. Box 663
Washington, DC 20044-0663
Tel: 202-305-0248
Fax: 202-353-2021
Email: kristofor.swanson@usdoj.gov

Attorney for Defendants

Exhibit E

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

PAUL KAMPMEIER (WSBA #31560)
Washington Forest Law Center
615 Second Avenue, Suite 360
Seattle, Washington 98104-2245
(206) 223-4088 x 4
(206) 223-4280 [fax]
pkampmeier@wflc.org

Attorney for Plaintiff

IGNACIA S. MORENO
Assistant Attorney General

KRISTOFOR R. SWANSON (Colo. Bar # 39378)
kristofor.swanson@usdoj.gov
U.S. Department of Justice
Natural Resources Section
P.O. Box 663
Washington, DC 20044-0663
Tel: 202-305-0248
Fax: 202-305-0506

Attorney for Defendants

UNITED STATES DISTRICT COURT

DISTRICT OF OREGON

NORTHWEST ENVIRONMENTAL ADVOCATES,

Plaintiff,

Civ. No. CV09-0017-PK

v.

GARY LOCKE, et al.,

Defendants.

STIPULATIONS IN SUPPORT OF JOINT MOTION TO DISMISS APA CLAIMS WITHOUT PREJUDICE

The parties in the above-captioned action hereby request that the Court enter the parties' Agreed Order dismissing, without prejudice, the first, second, and third claims in Plaintiff's Complaint. Plaintiff filed the complaint in this case on January 6, 2009. See Dkt. No. 1. The complaint brought claims under the Administrative Procedure Act ("APA"), 5 U.S.C. §§ 701-706, the Coastal Zone Act Reauthorization Amendments of 1990 ("CZARA"), 16 U.S.C. § 1455b, and the Freedom of Information Act ("FOIA"), 5 U.S.C. § 552. The parties previously settled the FOIA claims (claims four and five in the complaint) and the Court dismissed those claims with prejudice pursuant to the parties' stipulated motion and agreed order. See Dkt. Nos. 24 & 25. The remaining claims (claims one, two, and three in the complaint) challenge EPA's and NOAA's implementation of CZARA as it relates to Oregon.

The parties have now entered a settlement agreement as to Plaintiff's first, second, and third claims. Pursuant to the parties' September 2010 settlement agreement, the parties hereby stipulate as follows:

1. On or before November 15, 2013, NOAA and EPA shall sign for prompt publication in the Federal Register a notice announcing a proposed decision to either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's Coastal Nonpoint Pollution Control Program, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3) and (4).

2. On or before May 15, 2014, EPA and NOAA shall either: (a) issue a Full Approval Decision Memorandum approving, without conditions, Oregon's Coastal Nonpoint Pollution Control Program, pursuant to 16 U.S.C. § 1455b(c)(1); or (b) make a finding that the State of Oregon has failed to submit an approvable program, pursuant to 16 U.S.C. § 1455b(c)(3)

and (4). If EPA and NOAA make a finding that the State of Oregon has failed to submit an approvable program, the agencies shall, pursuant to 16 U.S.C. § 1455b(c)(3) and (4),withhold Clean Water Act Section 319 and Coastal Zone Management Act Section 306 grant funds from Oregon beginning in the funding cycles that immediately follow the agencies' finding and in all future years unless and until EPA and NOAA issue a Full Approval Decision Memorandum approving the State's Coastal Nonpoint Pollution Control Program without conditions.

3. Plaintiff's only judicial remedy for any failure by EPA and NOAA to meet the requirements set forth in Paragraph 1 and 2 of the parties' Agreed Order will be re-initiation of litigation.

4. Within ninety days of entry of the Agreed Order dismissing claims one, two, and three, EPA and NOAA will pay Plaintiff a total of eighty-three thousand five hundred dollars and no cents ($83,500.00) for costs and attorneys' fees incurred to date in prosecution of claims one, two, and three. The Parties agree that the payment required by the parties' settlement agreement and Agreed Order shall not in any way limit Plaintiff's right or ability to seek or collect costs and attorney fees incurred in any other lawsuit, including any lawsuit that raises claims identical or similar to those raised in Plaintiff's January 6, 2009, complaint.

5. The parties will move the court to dismiss, without prejudice, claims one, two, and three in the present action by seeking entry of the parties' Agreed Order.

Pursuant to these stipulations, the parties respectfully request that the Court sign and enter the parties' Agreed Order dismissing, without prejudice, the first, second, and third claims for relief in Plaintiff's January 6, 2009, Complaint. The parties note that, should the Court decide not to enter the Agreed Order as is, the parties' settlement agreement will be void and the

parties will need to meet and confer to determine whether they can still finalize a settlement agreement. Entry of the parties' Agreed Order will serve to dismiss Plaintiff's suit in its entirety.

Respectfully submitted this 28th day of September, 2010.

s/ Paul Kampmeier
PAUL KAMPMEIER (WSBA #31560)
Washington Forest Law Center
615 Second Avenue, Suite 360
Seattle, Washington 98104-2245
(206) 223-4088 x 4
(206) 223-4280 [fax]
pkampmeier@wflc.org

ALLISON M. LaPLANTE (OSB #02361)
Pacific Environmental Advocacy Center
10015 S.W. Terwilliger Blvd.
Portland, Oregon 97219-7799
(503) 768-6894 [phone]; (503) 768-6642 [fax]
laplante@lclarke.edu

Attorneys for Plaintiff

s/ Kristofor R. Swanson
KRISTOFOR R. SWANSON
(Colo. Bar No. 39378)
U.S. Department of Justice
Natural Resources Section
P.O. Box 663
Washington, DC 20044-0663
Tel: 202-305-0248
Fax: 202-353-2021
Email: kristofor.swanson@usdoj.gov

Attorney for Defendants

Exhibit F

Final Settlement Agreement
Northwest Environmental Advocates v. Locke, et al.
U.S. District Court for the District of Oregon
Case No. CV09-0017-PK

David Powers

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Headquarters
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
FAX (503) 229-6124
TTY 1-800-735-2900

July 26, 2010

Michael Bussell,
USEPA Region 10
Office of Water and Watersheds
1200 Sixth Avenue, OWW-135
Seattle, WA 98101

John King
Office of Coastal Resource Management
National Ocean and Atmospheric Administration
1305 East West Highway #11305
Silver Spring, MD. 20910

RE: Oregon Department of Environmental Quality's commitment to implement the Implementation Ready TMDL Approach Identified in the "Oregon Department of Environmental Quality's Response to the EPA and NOAA's Conditions of Fully Approving Oregon's Coastal Nonpoint Program (CNPCP), submitted by letter dated May 12, 2010"

Dear Mr. Bussell and Mr. King:

This letter is to provide additional detail on Oregon Department of Environmental Quality's (DEQ) commitment to implement the Prescriptive TMDL approach. It should be noted, that in the attached material, Attachment A, describing the Options developed by the State of Oregon to address the three conditions to the CNPCP, the Department used the term "Prescriptive TMDL", in the months since this material was first developed that term has evolved to "Implementation Ready TMDLs". The terms mean the same thing, but the Department will be using the term Implementation Ready TMDL to describe the future detailed TMDL approach.

Implementation Ready TMDLs provide additional detail on sources of the pollutant, specifics on TMDL implementation for point and nonpoint sources, and reasonable assurance that the TMDL will result in pollutant load reductions for restoring water quality and meeting water quality standards. DEQ has the authority for developing Implementation Ready TMDLs in OAR 340-042.

The Department of Environmental Quality sent a letter to you on July 21, 2010 in response to your joint letter of May 12, 2010 wherein we committed to resolving the remaining three Nonpoint Source Plan elements for the Coastal Nonpoint Plan within the schedule provided or as modified by the DEQ. However, it has come to our attention that the commitments description was not as clear as it could have been. Consequently, we would like to provide this clarification for the Department's commitments under the " Additional Management Measures for Forestry" section of the July 21st letter.

1.) DEQ commits to implementing the Implementation Ready TMDL Approach (prescriptive TMDL approach), Implementation Plan, and "safe Harbor" BMP approach described in Option 1 of Attachment A to this letter which would identify BMPs that could be used to meet the load allocations. This document was developed by the state and reviewed by the affected state agencies and the Oregon Governor's Office for the specific purpose of identifying options the state would be committed to implement to resolve the conditional approval issues associated with the state's Coastal Nonpoint Source Control Plan.
2.) DEQ will use the Implementation Ready TMDL approach in the coastal basins beginning with the Mid-Coast Basin and then in the subsequent coastal basin on a schedule to be described in a letter to be submitted to EPA/NOAA on or before September 30, 2010.
3.) The Implementation Ready TMDL approach will provide more detailed source delineation than the current Oregon TMDL approach thus allowing DEQ to specifically identify significant nonpoint sources, including significant forestry sources.
4.) DEQ commits to establishing enforceable load allocations in the Implementation Ready TMDL for all significant nonpoint sources, including significant forestry nonpoint sources.
5.) DEQ commits to developing "safe Harbor" BMP's for the load allocations established for the significant nonpoint sources, including significant forestry nonpoint sources.
6.) DEQ commits to issuing an implementation order to significant sources, including significant forestry nonpoint sources that have received load allocations through the Implementation Ready TMDL Approach.
7.) DEQ commits to using the Implementation Ready TMDL approach in the Mid Coast Basin to address temperature and bacteria 303(d) listings. A similar approach will be used for sediment in the Mid Coast Basin.

We hope this clarifies the Department's commitments and position.

Sincerely,

Neil Mullane

Neil Mullane, Administrator
Water Quality Division

Cc: Marvin Brown, ODF
Peter Daugherty, ODF
Don Waye, EPA HQ
David Powers, EPA Region 10
Allison Castellan, NOAA HQ
Don Yon, DEQ WQ HQ
Amanda Punton, DLCD
Eugene Foster, DEQ WQ HQ

State of Oregon Approach to Receive Final Approval of the Coastal Nonpoint Source Control Plan

(Provided to EPA/NOAA on July 26, 2010 to identify the material which had been discussed by the state agencies and the Oregon Governor's Office in the Fall of 2009 and previously approved for release to the federal agencies in an effort to outline proposed approaches for resolving the conditional approval of Oregon's (CNPCP))

Introduction

The purpose of this document is to identify options developed by the State of Oregon for addressing EPA & NOAA's conditional approval of three management measures in the State of Oregon's Coastal Nonpoint Source Control Plan (CNPCP) and getting full approval from the federal agencies for these management measures.

Three management measures in the CNPCP were identified as deficient and received conditional approvals by the federal agencies. These management measures were:

1. Forest Management in Critical Coastal Areas: Specific areas that need to be addressed are:
    a. Increased riparian protection of small, medium, and non-fish bearing streams;
    b. High risk landslide areas;
    c. Mitigating the Impacts of legacy roads.
2. On-Site
3. Urban Development

States with an approved coastal zone management program must develop and submit to EPA and the National Oceanic and Atmospheric Administration (NOAA) for approval a CNPCP. The CNPCP serves as an update and expansion of the State nonpoint source management program developed under section 1329 of Title 33 (Clean Water Act). The three conditionally approved management measures must receive final approval by the USEPA and NOAA to have an approved CNPCP for the State of Oregon.

Options for Getting Full Approval of Management Measures

Forest management in critical coastal areas

There are two options outlined below for addressing increased riparian protection in the forest management measure. One option is a basin specific approach using TMDLs and the other is a region wide programmatic approach. The second approach would also be used to address high risk landslides and mitigating the impacts of legacy roads.

Option #1: TMDL Process for Increased Riparian Protection (January 2010 through January 2011)

TMDL developed for a basin that is more prescriptive and requires nonpoint sources of pollution to meet the TMDL load allocations. TMDLs are a requirement of the CWA.

A more prescriptive TMDL would evaluate loadings at the landowner scale and assigns load allocations to specific sources such as: land owners, crop type, or a specific land use.

The TMDL and Water Quality Management Plan (WQMP) would be developed to:

1. identify loading capacity to meet a WQS (for example, temperature);
2. use a surrogate for the load allocation (for example, effective shade) to meet the WQS;
3. assign load allocations to specific public and private sources identified in the TMDL;
4. identify "safe harbor" BMPs that could be used to meet the load allocation (for example, basal tree area retention within a riparian management area);
5. require TMDL Implementation Plans from all sources assigned a load allocation, sources would be required to identify in their plan how they will meet their load allocation;
6. The TMDL would be issued as an administrative order by DEQ.
7. DEQ would request that the BOF implement these LAs with *basin specific rules* using the proposed safe harbor BMPs or other BMPs that are equally effective.
8. DEQ approval or disapproval of TMDL Implementation Plans based on the plans ability to meet the load allocations or the basin specific rule adopted by the BOF

If the Board declines to implement the TMDLs, DEQ could ask the EQC to petition the Board under ORS 527.765. However, DEQ would reserve its authority to impose BMPs under ORS 468B.110 to the extent necessary to comply with Sections 303 and 309 of the CWA.

Option #2: Programmatic Process for Increased Riparian Protection, High Density Landslide Areas, & Legacy Roads (March 2010 through July 2011)

There will be combined EQC & BOF meetings to explore these areas of concern. Five joint sessions would be held one for each of the following areas:

1. CZARA litigation: background, process, and legal issues and definitions, specifically on the meaning of legacy roads
2. Policy: EQC and the CWA for achieving WQS; BOF and FPA for protecting beneficial uses
3. Implementation of TMDLs and FPA and what other land uses, owners (federal, state) and states are doing for riparian protection
4. ODF & DEQ present available technical information (such as RipStream Study results) on these three areas in regards to water quality standards, TMDLs, and Category 4B
5. Recommendations by EQC and BOF on how to move forward

Depending on the outcome of the combined EQC and BOF meetings and recommendations the EQC could petition the BOF to begin rule changes to address identified needs. This may include increased riparian protections for small, medium and non-fish bearing streams, high density landslide areas, and legacy roads in order to receive full approval for the forestry management measure and meet the requirements of the CWA.

On-Site

DEQ will work on a rule change to require inspections by certified inspectors from either DEQ or the County of on-site systems at the time of property transfer. Certification of Inspectors would occur. Inspections would at least include the tank, any treatment units, and drainfield. The schedule for development of this program is:

Policy Option Package for Rules Development completed by November 2010

Request Funding from the 2011 Oregon Legislature to Support On-Site Time of Sale Inspections – January 2011 through June 2011

Rule Development completed by December 2012

Rule Implementation and Inspections begin in March 2013

Urban Development

A detailed Urban TMDL Implementation Plan Guidance document will be developed by DEQ. The process for developing the Guidance is:

Initial Draft Guidance Document completed March 2010

Final Draft Guidance Document completed September 2010

Public Review of Final Draft Guidance Document completed December 2010

Final Guidance Document completed March 2011

Workshops for DMAs begin April 2011

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DEPARTMENT OF ECOLOGY
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Memorandum

April 22, 2019

TO: Forest Practices Board

FROM: Mark Hicks, Ecology Forest Practices Lead

SUBJECT: Clean Water Act Milestone Update

The Washington State Department of Ecology (Ecology) committed to provide the Forest Practices Board (Board) with periodic updates on progress being made to meet milestones established for retaining the Clean Water Act 303(d) Assurances (Assurances) for the Forest Practices Rules (Title 222 WAC) and associated programs. The last update to the Board was in August 2018.

Under state law (RCW 90.48.420(1)) the adoption of "forest practices rules pertaining to water quality by the forest practices board shall be accomplished after reaching agreement with the director of the department *(Ecology)* or the director's designee on the board… so that compliance with such forest practice[s] rules will achieve compliance with water pollution control laws". This directive is integral to meeting legislative intent to use the Forest Practices Rules affecting water quality protection to satisfy requirements of section 208, 209, and 305 of the federal Clean Water Act, as regards silvicultural activities (RCW 90.48.425) and to achieve compliance with all applicable requirements of federal and state law with respect to nonpoint sources of water pollution from forest practices" (RCW 76.09.010(2)). The Forest and Fish Report (FFR), adopted by the Board under direction of RCW 77.85, includes the goal to meet the requirements of the Clean Water Act for water quality on non-federal forest lands and using the adaptive management program to revise the rules as needed. The FFR, with this goal and the performance target of meeting the state standards, was subsequently incorporated into the state Forest Practices Habitat Conservation Plan (FPHCP Introduction and Implementation Agreement clause 10.1).

The Assurances were originally granted in 1999 as part of the FFR and spell out the terms and conditions of how Section 303(d) of the federal Clean Water Act will be applied to lands subject to the FFR. The Assurances establish that the state's forest practices rules and programs, as updated through a formal Adaptive Management Program (AMP), will be used as the primary mechanism for bringing and maintaining forested watersheds in compliance with the state water quality standards. Those original Assurances were to last for only a ten year period. After conducting a review of the program and hearing from stakeholders that they were committed to its' success,

Ecology conditionally extended the assurances for another ten years. This extension was given in good faith but was conditioned on the program meeting a list of milestones that included process improvements and performance objectives.

The 2009 milestones were established to create a framework for making steady progress in gathering information critical for assessing the effectiveness of the rules in protecting water quality as mandated by state law. Equally important was the intention to stimulate changes that would result in a more effective research program to test and adjust the rules consistent with adaptive management.

Ecology's regular updates to the Board have served as a way to report progress and to identify challenges. The updates have also provided the Board with an opportunity to make necessary changes or course corrections to keep the milestones on schedule and to protect the integrity of the program. Ecology appreciates that the Board has continually been receptive to the concerns we have expressed. Unfortunately, key milestones have languished because of limited cooperator resources and project funding, disagreement amongst stakeholders who need to be in consensus in order for projects to move forward, and the addition of new and competing priorities and assignments from the Board.

The Assurances are based on the premise that given the mandates in state law (RCW 76.09.370(7)) Ecology and the EPA can rely on the AMP to use sound scientific principles to test the effectiveness of the FFR-based rules in meeting water quality standards, and "to make adjustments as quickly as possible to forest practices" if they are ineffective. It has been almost 20 years since the Assurances were first granted, but the effectiveness of the rules remains largely untested. When the ten year conditional extension was granted, Ecology understood meeting the corrective milestones would be a challenge. But delays in completing many of these milestone projects now precludes them from being completed before the 2024 sunset date for Forest and Fish Support Account (FFSA) funding. This further puts at risk completion of the milestones.

Ecology acknowledges our attempt to use the corrective milestones to stimulate program improvements has been ineffective. The science-based Adaptive Management Program struggles with inefficiency and stakeholder conflict. Even with hiring more contractors and outside experts, it has been a struggle to move projects forward at pace.

Ecology appreciates the Board's desire to reinvigorate the program through a meeting of the principals, and to use fiscal and performance audits of the program to look for improvement. With less than a year remaining of the ten year extended Assurances, Ecology looks to the Board and cooperators to make process improvements to the Adaptive Management Program and ensure the successful use of the Type N studies. Ecology will need certainty the AMP can be relied on to meet the expectations originally set by the legislature.

Enclosed are two tables showing the milestones and their current status. Points of note are highlighted in red and reflect changes since our last briefing:

- Table 1 shows the non-CMER project milestones. These milestones are implemented outside of the Cooperative Monitoring, Evaluation, and Research (CMER) program and are largely within the control of the Forest Practices Operations Section of the Department of Natural Resources (DNR) or the Timber Fish and Wildlife Policy Committee (Policy).
- Table 2 shows the CMER Research Milestones.

Ecology is pleased to report that several overdue milestones were completed or begun during this reporting period. These include:

- Completing a study plan for conducting a small forest landowner road survey
- Approving a final report for the Buffer Integrity-Shade Effectiveness study
- Implementation the Eastside Type N Effectiveness Monitoring study at half the study sites

Also of note, Ecology has eliminate the milestones for conducting the planned Mass Wasting Landscape-Scale Effectiveness in recognition of unreasonable technical challenges.

Please contact me if you have any questions or concerns (360) 407-6477.

Enclosure

Table 1. Summary Non-CMER Project Milestones and their current status.

Non-CMER Project Milestones		
	Summarized Description of Milestone	**Status as of April 2019[1]**
2009	July 2009: CMER budget and work plan will reflect CWA priorities.	**Completed** October 2010
	September 2009: Identify a strategy to secure stable, adequate, long-term funding for the AMP.	**Completed** October 2010 AMP funding to be substantially reduced in 2024 without legislative action.
	October 2009: Complete Charter for the Compliance Monitoring Stakeholder Guidance Committee.	**Completed** December 2009
	December 2009: Initiate a process for flagging CMER projects that are having trouble with their design or implementation.	**Completed** November 2010 Process not being used in Policy or CMER.
	December 2009: Compliance Monitoring Program to develop plans and timelines for assessing compliance with rule elements such as water typing, shade, wetlands, haul roads and channel migration zones.	**Completed** March 2010
	December 2009: Evaluate the existing process for resolving field disputes and identify improvements that can be made within existing statutory authorities and review times.	**Completed** November 2010
	December 2009: Complete training sessions on the AMP protocols and standards for CMER, and Policy and offer to provide this training to the Board. Identify and implement changes to improve performance or clarity at the soonest practical time.	**Completed** May 2016
2010	January 2010: Ensure opportunities during regional RMAP annual reviews to obtain input from Ecology, WDFW, and tribes on road work priorities.	**Completed** September 2011
	February 2010: Develop a prioritization strategy for water type modification review.	**Completed** March 2013
	March 2010: Establish online guidance that clarifies existing policies and procedures pertaining to water typing.	**Completed** March 2013

Non-CMER Project Milestones		
	Summarized Description of Milestone	**Status as of April 2019[1]**
	June 2010: Review existing procedures and recommended any improvements needed to effectively track compliance at the individual landowner level.	**Completed** November 2010
	June 2010: Establish a framework for certification and refresher courses for all participants responsible for regulatory or CMP assessments.	**Completed** September 2013
	July 2010: Assess primary issues associated with riparian noncompliance (using the CMP data) and formulate a program of training, guidance, and enforcement believed capable of substantially increasing the compliance rate.	**Completed** August 2012
	July 2010: Ecology in Partnership with DNR and in Consultation with the SFL advisory committee will develop a plan for evaluating the risk posed by SFL roads for the delivery of sediment to waters of the state.	Completed December 2018
	July 2010: Develop a strategy to examine the effectiveness of the Type N rules in protecting water quality at the soonest possible time that includes: a) Rank and fund Type N studies as highest priorities for research, b) Resolve issue with identifying the uppermost point of perennial flow by July 2012, and c) Complete a comprehensive literature review examining effect of buffering headwater streams by September 2012.	**Not Progressing** Board directed a technical workgroup to develop Board Manual revisions. Policy agreed to use the dry-season survey method year-round rather than having wet season default distances. No further action has occurred and a map-based method is still needed. To be addressed after water typing Board Manual work is completed in 2019. This could be completed in 2021.
	October 2010: Conduct an initial assessment of trends in compliance and enforcement actions taken at the individual landowner level.	**Completed** November 2010
	October 2010: Design a sampling plan to gather baseline information sufficient to reasonably assess the success of alternate plan process.	**Completed** December 2014
	December 2010: Initiate process of obtaining an independent review of the Adaptive Management Program.	**Off Track** Policy has periodically noted the need for this review and failed attempts have been made by DNR to get State Auditor to do the work. A new attempt is

Non-CMER Project Milestones		
	Summarized Description of Milestone	**Status as of April 2019[1]**
		underway with hope to get an audit before 2022.
2011	December 2011: Complete an evaluation of the relative success of the water type change review strategy.	**Completed** March 2013
	December 2011: Provide more complete summary information on progress of industrial landowner RMAPs.	**Completed** September 2011
2012	October 2012: Reassess if the procedures being used to track enforcement actions at the individual land owner level provides sufficient information to potentially remove assurances or otherwise take corrective action.	**Completed** June 2012
	Initiate a program to assess compliance with the Unstable Slopes rules.	**Completed** October 2017
2013	November 2013: Prepare a summary report that assesses the progress of SFLs in bringing their roads into compliance with road best management practices, and any general risk to water quality posed by relying on the checklist RMAP process for SFLs.	**Off Track** State, Tribal, and Small Landowner caucus staff cooperatively developed a plan to conduct online and field surveys to inform the condition of SFL roads. Implementation is intended to begin in 2019. Completion expected in 2020.

Table 2. Summary CMER Research Milestones and their current status.

CMER Research Milestones		
Description of Milestone		**Status as of April 2019[1]**
2009	Complete: Hardwood Conversion – Temperature Case Study (Completed as data report)	**Completed** June 2010
	Study Design: Wetland Mitigation Effectiveness	**Completed** October 2010
2010	Study Design: Type N Experimental in Incompetent Lithology	**Completed** August 2011
	Complete: Mass Wasting Prescription-Scale Monitoring	**Completed** June 2012
	Scope: Mass Wasting Landscape-Scale Effectiveness	**Milestone Eliminated** UPSAG by consensus opposes doing this study due to concerns over the technical and logistical complexity of developing comparative mass wasting rates. They also question the value in deriving these estimates. Given their well stated concerns, and that other CMER studies will have more direct value to water quality protection, Ecology is removing this milestone.
	Scope: Eastside Type N Effectiveness	**Completed** November 2013
2011	Complete: Solar Radiation/Effective Shade	**Completed** June 2012
	Complete: Bull Trout Overlay Temperature	**Completed** May 2014
	Implement: Type N Experimental in Incompetent Lithology	**Completed** October 2017
	Study Design: Mass Wasting Landscape-Scale Effectiveness	**Milestone Eliminated** Discussed above for 2010 Scoping.
2012	Complete: Buffer Integrity-Shade Effectiveness	**Completed** November 2018

CMER Research Milestones		
Description of Milestone		**Status as of April 2019[1]**
	Literature Synthesis: Forested Wetlands Literature Synthesis	**Completed** January 2015
	Scoping: Examine the effectiveness of the RILs in representing slopes at risk of mass wasting.	**Completed** April 2017
	Study Design: Eastside Type N Effectiveness	**Completed** March 2018
2013	Scoping: Forested Wetlands Effectiveness Study	**Completed** December 2016
	Wetlands Program Research Strategy	**Completed** January 2015
	Scope: Road Prescription-Scale Effectiveness Monitoring	**Completed** March 2016
	Study Design: Examine the effectiveness of the RILs in representing slopes at risk of mass wasting.	**Underway** Study is being designed and implemented in five phases with the first phase sent to ISPR January 2018 and is now in SAG response review and likely to be completed in 2019. Study design for final phase estimated for 2023.
	Implement: Eastside Type N Effectiveness	**Underway** Began implementing study on half of the planned number of sites in October 2018 while still trying to secure sites in the east Cascades. Full study should be in implementation by late 2019.
2014	Complete: Type N Experimental in Basalt Lithology	**Completed** August 2017
	Study Design: Road Prescription-Scale Effectiveness Monitoring	**Completed** **February 2017** Unexpected permit delayed the start of study to Spring 2019. Projected completion estimated for 2026.

CMER Research Milestones		
Description of Milestone		**Status as of April 2019[1]**
	Scope: Type F Experimental Buffer Treatment	**Complete** December 2015 Completion of study scheduled for 2028.
	Implementation: Examine the effectiveness of the RILs in representing slopes at risk of mass wasting	**Earlier Stage Underway** See discussion above for 2013 Study Design. Phase 1 implementation to likely to being in 2020. Projected completion of study in 2025.
	Study Design: Forested Wetlands Effectiveness Study	**Underway** Draft for first phase of implementation in ISPR review. Second phase study design likely to be completed in 2021. Projected completion of study in 2028.
2015	Complete: First Cycle of Extensive Temperature Monitoring	**Underway** In post-ISPR review at CMER with project completion expected in 2019.
	Scope: Watershed Scale Assess. of Cumulative Effects	**Off Track** Project intended to follow other effectiveness monitoring studies which are behind schedule. Policy scheduled study to begin in 2026.
	Scope: Amphibians in Intermittent Streams (Phase III)	**Not Progressing** Ecology asked that the Type N Basalt study, once completed, be examined to inform the need for this study. Ecology intends this study address the question of whether harvesting, particularly clear-cutting, along portions of streams that go seasonally dry has a greater detrimental effect on stream associated amphibians. Policy scheduled start of study for 2020.
2017	Study design: Watershed Scale Assess. of Cumulative Effects	**Off Track**

CMER Research Milestones		
Description of Milestone		**Status as of April 2019[1]**
		Discussed above for 2015 scoping. Study design scheduled for 2027.
	Study Design: Amphibians in Intermittent Streams (Phase III)	**Off Track** Discussed above for 2015 scoping. Study design scheduled for 2021.
2018	Complete: Roads Sub-basin Effectiveness	**Not Progressing** Project to be re-scoped in 2027 with completion in 2031.
	Implement: Watershed Scale Assess. of Cumulative Effects	**Off Track** Discussed above for 2015 scoping. Implementation scheduled to start 2028.
	Complete: Type N Experimental in Incompetent Lithology	**On Track** Projected completion in 2019.
2019	Complete: Eastside Type N Effectiveness	**Earlier Stage Underway** Discussed for 2013 implementation. Projected completion in 2026.

Status terminology:

"Completed" - milestone has been satisfied (includes those both on schedule and late).

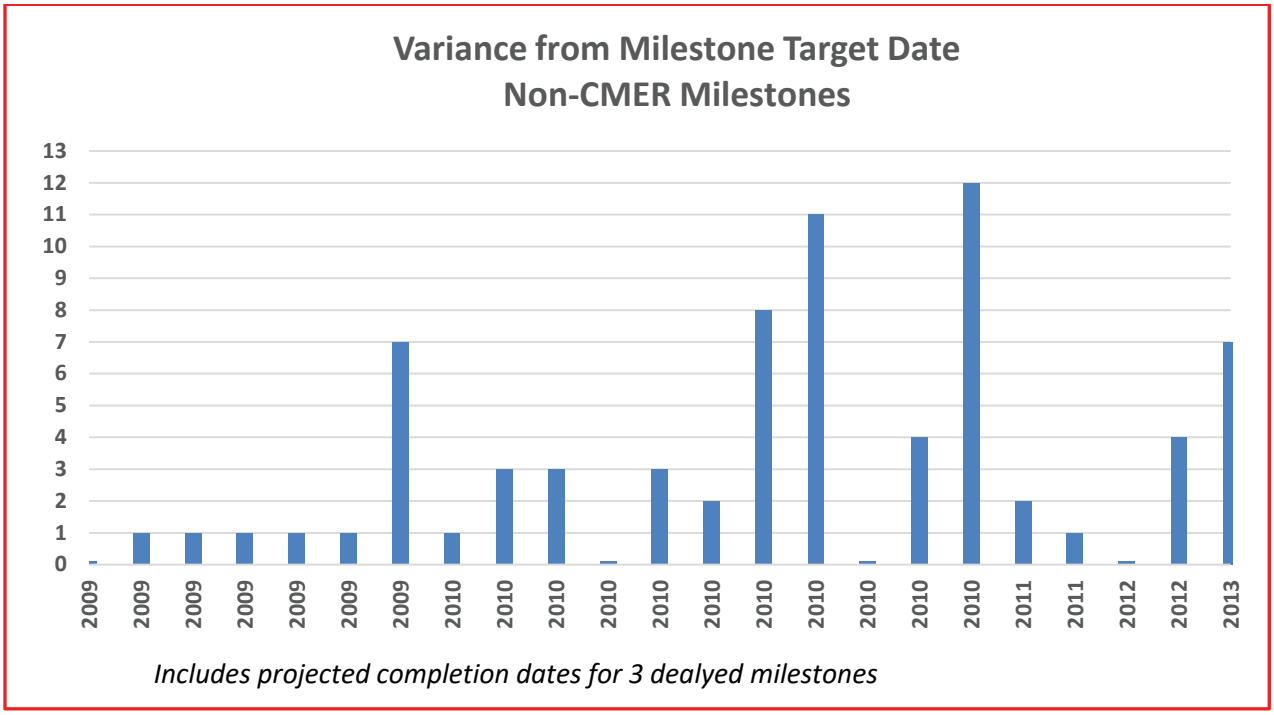
"On Track" - work is occurring that appears likely to satisfy milestone on schedule.

"Underway" - work towards milestone is actively proceeding, but likely off schedule.

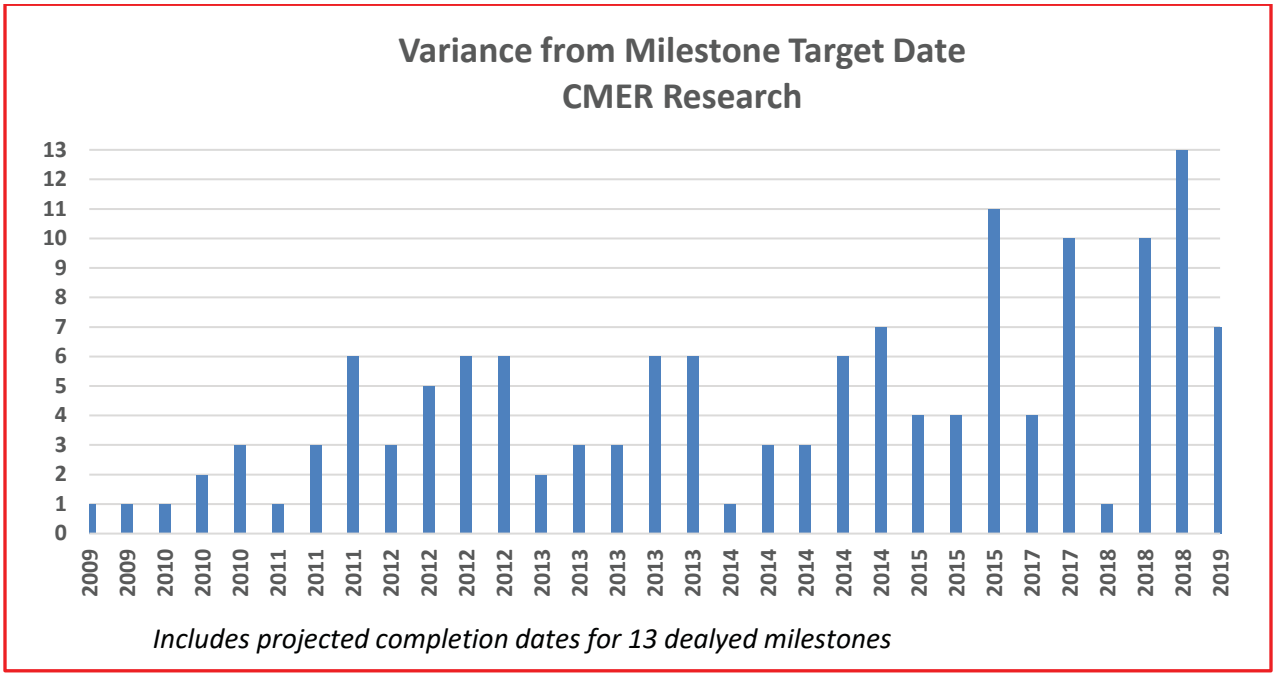
"Earlier Stage Underway" – project initiated, but is at an earlier stage (off schedule) then the listed milestone.

"Not Progressing" - no work has begun, or work initiated has effectively stopped.

"Off Track" - 1) No work has begun and inadequate time remains, 2) key stakeholders are not interested in completing the milestone, or 3) attempt at solution was inadequate and no further effort at developing an acceptable solution is planned.



Includes projected completion dates for 3 dealyed milestones



Includes projected completion dates for 13 dealyed milestones

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October 9, 2009

Forest Practices Board Members
PO Box 47012
Olympia, WA 98504-7012

RE: Forests and Fish Program – Completion of Clean Water Act Review

Ladies and Gentlemen:

The Washington State Department of Ecology has completed the 2009 Clean Water Act (CWA) review of the state's forest practices and adaptive management programs. We are now releasing the enclosed findings paper broadly to stakeholders and the public. Although the paper was completed in early July 2009, I wanted to have a chance to evaluate the commitment forests and fish participants have in taking the steps needed to strengthen the existing program. Such a commitment is crucial to ensuring the state's forest practices program can be depended upon to bring or maintain forested waters in full compliance with the state water quality standards and the federal CWA.

In September, I had a chance to meet with the key stakeholders as part of the Forest Ecosystem Collaborative sponsored by Commissioner Goldmark. While the group grappled with many thorny and complicated issues, and its work is not done, it is clear that we all share a goal of finding ways to strengthen the existing programs and to look for innovative approaches to resolve many of the broader problems facing the timber industry in Washington.

After carefully weighing the level of stakeholder commitment and the benefit of providing a clear path to maintaining CWA coverage, I have decided to conditionally extend the CWA assurances. This extension is based on meeting a scheduled set of milestones for program improvements and research development. It is vital to maintaining the assurances into the future that the list of CWA milestones is incorporated into the planning process of the state's forest practices and adaptive management programs. My hope is that by releasing the CWA findings now, and thereby formalizing the milestones, partners in the forest practices and adaptive management programs will move swiftly to take the required action necessary to accomplish the needed improvements and research milestones.

Sincerely,

Jay J. Manning,
Director

Enclosure

cc: EPA
Forests and Fish Policy
Forest Practices Board Liaisons
NMFS
USFWS

2009 Clean Water Act Assurances Review of Washington's Forest Practices Program

Examining the effectiveness of Washington's forest practices program in bringing waters into compliance with state water quality standards and the federal Clean Water Act

Washington State Department of Ecology

July 15, 2009

For information on this review contact:
Mark Hicks, Forest Water Quality Coordinator

mhic461@ecy.wa.gov
(360) 407-6477

Table of Contents

Introduction

Under Washington state law (Chapter 90.48 RCW) forest practices rules are to be developed so as to achieve compliance with the state water quality standards and the federal Clean Water Act (CWA). The Department of Ecology (Ecology) has been designated as the state water pollution control agency for all purposes of the CWA, and has been directed to take all action necessary to meet the requirements of that Act. The Clean Water Act assurances (CWA assurances) granted by Ecology in 1999 as part of the Forests and Fish Report (FFR) expired June 30, 2009. The assurances established that the state's forest practices rules and programs, as updated through a formal adaptive management program, would be used as the primary mechanism for bringing and maintaining forested watersheds into compliance with the state water quality standards.

This paper summarizes the findings of a review by Ecology on the progress the state's forest practices program is making in bringing waters into compliance with state surface water quality standards (Chapter 173-201A WAC) and the federal Clean Water Act. This review is being used as the basis for determining whether or not to extend the CWA assurances into the future.

As detailed below, Ecology finds that the Forests and Fish program has not achieved the level of information needed to verify that water quality in the forested environment will meet water quality standards, or to verify that the conditions for offering the assurances in 1999 have been satisfied. In spite of these shortcomings, Ecology believes the Forests and Fish program still offers a viable and compelling management strategy for achieving water quality goals in the forested environment. Ecology has concluded, therefore, that continuation of CWA assurances is warranted if specific actions are taken to improve the program's performance.

Summary of Findings

In 1999 as part of the FFR (http://www.dnr.wa.gov/Publications/fp_rules_forestsandfish.pdf), Ecology in consultation with the United State Environmental Protection Agency established the CWA assurances. In 1999, Ecology assumed ten years would be sufficient time to test the forest practices rules and to identify trends in water quality improvement. That expectation has not been met. After ten years, no studies have been completed or data collected that provide an indication of whether or not the forest practices rules are improving water quality or maintaining forested waters in compliance with the water quality standards. Similarly, data is lacking with which to conduct a thorough analysis of how effective operational and enforcement programs are in applying the forest practices rules.

The foundation for granting the CWA assurances was the belief that the FFR was a substantial step forward in environmental protection, and when implemented would provide the quickest and most efficient means for achieving environmental goals and compliance with the state's water quality standards. Developing CWA mandated total maximum daily loads (TMDLs) to serve as regulatory water cleanup tools for forested watersheds was therefore viewed as a low priority, and the CWA assurances established that Ecology would rely on the FFR-based forest practices program for an initial ten-year period. It was assumed in 1999 that research and

monitoring would occur to demonstrate that implementing the FFR would improve water quality and eventually bring forested waters into full compliance with the state's surface water quality standards and thereby also satisfy the conditions under Section 303 of the federal CWA.

The original FFR language is not clear on whether or not it was intended that the assurances could be extended beyond the 2009 deadline, but nothing in the report fundamentally alters Ecology's authority to continue to rank conducting TMDLs on forest lands subject to the FFR rules as a low priority with or without the existence of formal assurances. The value of offering formal assurances is that they provide landowners and agencies with a predictable and consistent regulatory system; and in doing so provide an additional motivation for stakeholders to participate in the adaptive management program.

As part of this 2009 review, Ecology has examined all of the written conditions for maintaining the assurances established in Schedule M-2 of the 1999 Forests and Fish Report. Ecology has also examined all of the issues highlighted in a supplemental 2006 Ecology White Paper. The 2006 paper was written to let stakeholders to the FFR process know some of the specific information Ecology would need for this 2009 review.

Ecology has concluded the forest practices and adaptive management programs have not fully met the expectations of research and program performance that underlie the basis for providing the CWA assurances. The adaptive management program has not provided the information needed to validate the effectiveness of the rules in protecting water quality. In fact, no field studies or assessments have been completed that test the ability of the rules to meet state water quality standards. Moreover, these studies are still many years away from completion, and the budget for the science program is set to be significantly reduced. Staffing cuts are expected over the next year or two that may further impact the ability of the various elements of the forest practices and adaptive management programs to operate at past levels. Added to the direct effect of reduced staffing, several key stakeholder groups openly express a growing lack of support for continuing with the current adaptive management program.

The lack of information to evaluate the effectiveness of the rules can in part be attributed to the initial priorities established in the FFR that placed validating operational aspects of the rules ahead of water quality studies. However, the adaptive management program (AMP) has also had significant trouble developing and using the research results developed as part of these initial prioritization agreements (i.e., last fish habitat model, uppermost point of perennial flow, desired future conditions basal area target).

Improvements in the system are necessary to create a program that participants can rely on to provide a more efficient and confident program for testing the effectiveness of the rules in protecting water quality and modifying the rules as appropriate.

State laws establish that the forest practices rules must be designed to achieve compliance with the state water quality standards and placed Ecology in the lead for making this determination. However, the Legislature also formally established the adaptive management program as the primary mechanism for bringing the rules into alignment with the state standards. The current program, even with its challenges, creates a well established foundation for moving ahead.

Policy and procedure manuals guide the process; full time professional project managers and Cooperative Monitoring, Evaluation, and Research (CMER) program staff are available to assist CMER volunteer scientists in carrying out their projects; and Forest and Fish Policy (Policy) representatives of the various stakeholder caucuses remain engaged at present and have advanced strategic plans to improve their own performance as well as the performance of the overall program. On the operational side, the compliance monitoring program has been established and is constantly expanding as time goes on, guidance documents and training continue to improve, and experienced agency staff stand ready across the state to implement the rules.

Taken in total, the forest practices program provides a substantial framework for bringing the forest practices rules and activities into full compliance with the water quality standards. Ecology has concluded it is in the best interests of water quality, and is consistent with legislative intent, to work with the other participants to make needed improvements to the existing program. Ecology is therefore conditionally extending the CWA assurances with the intent to stimulate the needed improvements to the forest practices and adaptive management programs. Ecology, in consultation with key stakeholders, has established specific corrective milestones (shown in the next section). The extension of the assurances is conditioned on meeting these research and administrative milestones by the specific target dates described. These milestones serve as a corrective action plan necessary to retain the assurances into the foreseeable future.

Steps are already being taken to address many of the corrective milestones associated with operational issues, compliance monitoring, and assessing progress under Road Maintenance, Abandonment, and Planning (RMAP) rules. Based on this ongoing progress, Ecology fully expects these steps to be successful in the short-term. Ecology's highest concern going forward is with the adaptive management program. These concerns are greatest regarding the ability to fund the needed studies and assessments at a rate that creates a viable science-based program. Scientific studies and assessments need to be designed to provide Policy and the Forest Practices Board (Board) with information sufficient to enable these policy makers to make informed science-based policy decisions. Just as importantly, policy makers must be committed to using science to fairly and efficiently revise the forest practices rules and programs as needed.

Compliance with the milestones described herein will demonstrate sufficient progress to satisfy the CWA assurances and the adaptive management provisions of the state water quality standards (WAC 173-201A-510(3)). Because extending the assurances is based on meeting the specific research and administrative milestones identified above by the specific dates listed, failure to meet any milestone would be considered a basis for potentially withdrawing the assurances at that time. In evaluating compliance with the milestones established herein, Ecology will consider the cause for missing any milestones and be considerate of the fact that:

- The state and nation are both experiencing a severe economic recession and it may take a couple of years before funding to fully support the AMP is available.
- Unexpected and uncontrollable circumstances may cause deviations from this schedule, such as catastrophic events causing the loss of study sites.
- Until a project has a study design developed, it is not possible to identify an accurate time frame for its completion (or in some cases to determine if the project remains a CWA priority).

To be successful in meeting these milestones and consequently the CWA assurances, the caucus principals will need to work together to find funding and to support the actions needed to meet the specific milestones. Ecology is working therefore to support the strategic goal to bring together the principals as soon as practical to renew and maintain a spirit of cooperation and collaboration among the six caucuses.

Considerations and Corrective Milestones

The following lists the conditions[1] that are the basis for continuing to provide the CWA assurances to the state's forest practices program (shown in bold font). Similar conditions have been grouped together into categories. Following the list of conditions is a summary of the key findings (shown in italics) and the corrective remedies identified as "milestones". These milestones are intended to create a corrective action plan that ensures steady incremental improvement and provides a basis to continue the assurances. Failure to meet any milestone by the deadline established would be cause for Ecology to revoke the assurances at that point in time.

Many of the remedies identified necessarily focus on the state Department of Natural Resources (DNR). This focus recognizes DNR has primary responsibility for implementing the Forest Practices Act and rules and supporting the adaptive management program. DNR has been working cooperatively with Ecology and others to enact solutions to many of the issues noted below both prior to and independent of this CWA review.

I. Establish Rules and Funding to Implement the Forests and Fish Report

Conditions for retaining the assurances include:

1. **Having final regulations consistent with the Report.***
2. **No significant loss of funding or staffing to the state regulatory agencies dedicated to forest practice regulation or monitoring.***
3. **Court orders, changes to the CWA, state or federal regulatory changes that cannot be otherwise addressed.***
4. **No weakening of enabling State statutes or regulations which affect the Report and its implementation.***

[1] Conditions in this context refers to the "Reopeners, Modifications, and Causes of Withdrawal of Assurances" noted in Schedule M-2 of the Forests and Fish Report as well as to those described as necessary in Ecology's January 11, 2006, Clean Water Act Assurances White Paper provided to the Forests and Fish Policy Committee and the Forest Practices Board to help provide a more detailed description of some of the information Ecology would need for this 2009 review. Items directly called out in Schedule M-2 are shown followed by an asterisk.

Discussion: The CWA Assurances were provided based on establishing and maintaining an adequately funded and operationally effective forest practices program that implements the FFR. Meeting this requires that DNR and the other resource agencies and cooperators provide and maintain adequate staffing and funding to keep the field operations and adaptive management programs running effectively. It also requires that no significant changes to laws and regulations take place that undermine the foundation of water quality protection established in the FFR.

These conditions for retaining the assurances have not been fully met. Rules were initially adopted to implement the FFR, and substantial resources were put into action to implement a formal adaptive management program. Countering these successes, however, staffing has not been adequate to fully implement the rules and programs, changes have been made to the laws that weaken some of the original protections established in the FFR, and significant reductions in staffing and funding have recently occurred that are likely to remain over the next two to three years as the state's economy recovers from the current recession.

Remedies identified to support continuation of the assurances include:

(a) Federal pass-through funding has diminished since the inception of the FFR and is predicted to be depleted in the second half of the 10-11 biennium. In addition, the state and nation are both suffering through the worst economic period on record since the great depression. Continued CMER funding is based partially on general fund state revenue in DNR's budget and partially on timber tax revenue. At this time the state is experiencing cuts to the general fund, and harvesting with its associated revenue stream has declined by approximately fifty percent. Recognizing the likelihood of budget shortfalls in the adaptive management program, it is important that water quality studies be designated as high priority, and efforts made to ensure their timely completion. The adaptive management program should also develop strategies to make better use of partnerships (e.g., monitoring consortium, Puget Sound Partnership, USFS) and to prepare to compete for grant monies. This may in part necessitate developing study plans with the intention of having them ready to compete for outside funding as sources emerge. In addition, it is imperative that new dedicated long term funding sufficient to carry out the requirements of the FFR be secured as soon as possible, as a reliance on grants is unlikely to be either workable or sufficient to maintain an adequate program.

Milestones:

1) **By July 2009, and in subsequent budget and planning years, the AMP Administrator with the assistance from the Policy and CMER committees will send to the Forest Practices Board a revised CMER work plan and budget that places key water quality studies as high priorities as described in section II(c) regarding the adaptive management program.**
2) **By September 2009, the Forest and Fish Policy Budget Committee will identify a strategy that will be implemented with caucus principal support to secure stable, adequate, long-term funding for the AMP.**

(b) Ecology recognizes some procedures can have the practical effect of creating shortfalls in staffing where those same staff resources would otherwise be adequate. Problems with the water type modification (WTM) requests are an example of this. WTM requests often do not receive field reviews due to the inadequacy of resource agency staffing. This situation occurs predominately when the water type modification request forms are passed along to the tribal and state resource agency personnel in large batches for the DNR-mandated 30-day review period. This makes it problematic for existing staff in the resource agencies and tribes to review all of the requests. As a consequence, many are approved without an appropriate level of review. Efforts are needed to ensure water type modification requests are adequately evaluated by resource agency staff. Compounding the workload issues associated with reviewing WTM forms, concerns continue to persist about how protocol surveys are conducted and the conditions established for multidisciplinary teams to conduct their reviews in the field. The practical effect is that resource agency staff must invest substantial time to re-affirm what is established in formal protocols and guidance. Most of these problems relate to the improper recognition of what constitutes barriers to fish migration and can likely be remedied by the use of more training and guidance and adherence to the Board Manual Section 13 and WAC 222-16-30 and -31. Problems also occur related to placing unreasonable expectations on multidisciplinary review teams - such as scheduling the site visit during periods of heavy snow cover or at the same time interdisciplinary teams have been called elsewhere in the region. These types of issues interfere with the effective use of available staff resources and generally impair the overall integrity of the program.

Milestones:

(1) By February 2010, DNR in consultation with WDFW, Ecology, and the tribes will develop a prioritization strategy for water type modification. The intent of this strategy will be to manage the number of change requests sent to cooperating agencies for 30-day review so it is within the capacity of those cooperators to respond to effectively. The strategy should consider standardizing the current ad hoc process of holding monthly coordination meetings with agency and tribal staff in all the DNR regions. This should allow group knowledge and resources to be more efficiently used to evaluate change requests.

(2) By March 2010, DNR Forest Practices will establish online guidance that clarifies existing policies and procedures pertaining to water typing. The intention is to ensure regional staff and cooperators remain fully aware of the most current requirements and review processes for changing water type and coordinating the review of multidisciplinary teams.

(3) By February 2011, DNR in consultation with WDFW, Ecology, and the Tribes will complete an evaluation of the relative success of the water type change review strategy. Results of this review would be used to further refine the strategy.

(c) Approximately fifty percent of the state's private forests are owned by small forest landowners (SFL). Subsequent to the FFR, the Legislature modified the inventory, planning, and reporting requirements for SFL roads (RCW 76.09.410 and 76.09.420).

Rather than requiring Road Maintenance and Abandonment Plans (RMAPs) for all their roads, SFLs must submit a checklist RMAP in association with any forest practice application (FPA). This checklist RMAP process requires that roads used in association with that FPA be brought up to current road standards, but it does not address any of the landowner's roads that would not be used for that harvest. To understand if SFL roads are posing a threat to water quality, DNR should work with Ecology to find innovative ways to follow through with its current proposal to assess the condition and rate of compliance of SFL roads. Ecology believes this is an important survey and intends to work with DNR to develop a means that could be used to get this work done with existing staff and funding, if additional resources are not made available by the Legislature. Ecology's focus is on assessing the potential delivery of sediment to waters of the state. In developing a survey plan, DNR should consider opportunities to add this task to site visits associated with funding fish passage projects on SFL parcels, to use cooperative assistance similar to that used to evaluate the success of hardwood conversions on SFL properties, and other cost effective means to accomplish this work.

Milestone:

(1) By July 2010 Ecology in partnership with DNR, and in consultation with the SFL advisory committee, will develop a plan for evaluating the risk posed by SFL roads for the delivery of sediment to waters of the state.

(2) By November 2013 Ecology in partnership with DNR, and in consultation with the SFL advisory committee will prepare a summary report that assesses the progress of SFLs in bringing their roads into compliance with road best management practices, and any general risk to water quality posed by relying on the checklist RMAP process for SFLs. If a significant portion of SFL roads are estimated to pose a risk of damage to public resources, then a report will be prepared in time to brief the Legislature in December 2013.

II. An Adaptive Management Program to Update Rules and Guidance

Conditions for retaining the assurances include:

1. **No new water quality standards not anticipated in this (Forests and Fish) Report unless those new standards can be accommodated with adaptive management.***

2. **No general failure to upgrade regulations or guidance called for in adaptive management. This includes failure to develop agreed upon resource objectives, research priorities, and compliance monitoring programs.***

3. **Development of an approved Adaptive Management Program (AMP) section in the Forest Practices Board Manual that will provide formal procedures for participants to successfully link science questions to policy decisions.**

4. **Establishment of a Cooperative Monitoring, Evaluation, and Research Committee (CMER) Work Plan that includes water quality-related projects that have been prioritized for funding and includes program integration across spatial scales.**

5. **Easy access to reports and data from the AMP on the Internet so the information can be used in existing public processes associated with the Clean Water Act.**

6. **Specific resolution by CMER of the following issues:**
   - **Develop a protocol for identifying perennial stream initiation points.**
   - **Estimate the current status of stream temperature and riparian stand conditions on forest lands.**
   - **Evaluate the reach-scale effectiveness of riparian buffer prescriptions at providing adequate shading post-harvest to protect stream temperatures.**
   - **Evaluate the cumulative effects of harvest on stream temperature.**
   - **Evaluate the cumulative effects of forest practices on sediment input and stream habitat.**

Discussion: The CWA assurances were established on the condition that an effective adaptive management program (AMP) would be established and maintained. A healthy and effective AMP is central to the ability of Ecology to offer the CWA assurances. The AMP needs to provide a scientific framework for testing whether the forest practices rules are effective in protecting water quality, and for identifying any changes needed to rules not found effective. Substantial progress has been made through establishing the structure and formal operational procedures of the AMP. An AMP board manual was developed to further outline how the program should operate, and significant funding and effort has occurred to get scientific studies underway to test various portions of the rules and guidelines governing forest practices.

In spite of these substantial efforts, the AMP has not completed any studies that directly test the effectiveness of the rules in protecting water quality. The science arm of the AMP has also been largely unsuccessful in providing research findings the Forest and Fish Policy Committee (Policy) and the Forest Practices Board (Board) will reliably use to validate or to revise the forest practices regulations and guidance. There are significant problems with the ability of the policy and science arms of the AMP to work together to test and revise the rules in a timely and effective manner. Part of the problem is simply inherent in a program that seeks to develop consensus among stakeholders with competing interests. But the problems also seem rooted in the foundation of the AMP itself. AMP participants frequently disagree about the appropriate roles of science and policy, as well as what role the initial negotiated forests and fish rules should play in evaluating the acceptability of future changes. These disagreements appear in part to stem from a lack of clarity in the underlying rules and guidance. Combined with poor communication between the science and policy arms of the program, this is compromising the AMP's effectiveness. To the credit of its participants, strategic planning efforts are underway with the intention of identifying and correcting the shortcomings of the program. The Policy committee has developed a strategic plan (see Appendix) with five broad goals supported by multiple objectives and specific tasks designed to revitalize the adaptive management program. There is also general understanding that

testing the effectiveness of the rules for protecting water quality must be a top priority if Ecology is to continue the assurances.

The state legislature (RCW 76.09.370) directed that forest practices rules covering aquatic resources only be adopted or changed by the Board where those changes are consistent with recommendations resulting from a scientifically based adaptive management process. The stated purpose of having the adaptive management process is to make adjustments as quickly as possible to portions of the forest practices rules that are not achieving resource objectives. Both as a participant and reviewer, Ecology has concluded that fundamental improvements are needed to ensure the rules and associated programs will be tested and revised in a timely manner based on scientific inquiry, as intended by the legislature and consistent with CWA assurances.

Remedies identified to support continuation of the assurances include:

(a) Much of the recent conflict among participants of the adaptive management program is centered on disagreements about what constitutes the proper roles of the Board, Policy, and CMER in revising rules and guidelines; and what the role of science and economics should be in the decision making process. The roles of CMER and Policy should be clarified, and revisions should be made to the decision-making process as needed to ensure science remains the foundation for changing the forest practices rules. Improved communication between CMER and Policy is needed with the aim of ensuring that CMER studies have the greatest potential to provide answers that Policy will use to validate or suggest revisions to the forest practices regulations and guidance. The adaptive management program (CMER, Policy, and Board) would benefit from an outside audit on its performance, structure, and decision-making framework. Such outside audits should occur periodically (perhaps every five years) and be used to actively improve the program. This remedy is consistent with the first goal of the Strategic Goals, Objectives, and Tasks document recently completed by the Policy Committee (see Appendix). To ensure the AMP's operations are transparent to the public, the results of these audits should be discussed at the Forest Practices Board.

Milestones:

(1) By December 2009, the AMP program administrator, with the assistance of CMER and Policy, will complete the ongoing training sessions on the AMP protocols and standards for CMER, and Policy. This is intended to remind participants of the agreed upon protocols. Opportunity should also be provided to identify portions of the protocols and associated rules that need revision to improve performance or clarity. Any identified improvements to the Board Manual or regulations should be implemented at the soonest practical time. Subsequent to this effort, the administrator will offer to provide this training to the Board.

(2) By December 2010, the AMP Program administrator shall initiate the process of obtaining an independent review of the Adaptive Management Program. This review shall be done by representatives of an independent, third party research organization and include:

i. **An examination of the structure and function of the program, based on its technical performance, fiscal efficiency, and overall accountability.**
ii. **An assessment of the performance and efficiency of the consensus-based decision processes.**
iii. **A review of the rigor of CMER science and whether it productively adds to the body of Pacific Northwest region science to confidently address the L-1 Questions.**
iv. **An evaluation of the interactions of science and policy within the AMP.**
v. **Identification of any different approach the AMP could employ to assure a more certain and timely outcome of projects and commensurate changes to rules and guidelines.**

Upon completion, the results of this independent review shall be taken to CMER and Policy to develop responses and recommendations for any needed corrections. Within six months of completion, the report along with the responses of the CMER and Policy committees will be provided to the Board. Ecology will be engaged in discussions with cooperators to examine ways to initiate this important task as soon as possible.

(b) The amount of forest that must be retained in buffers to protect water quality and other public resources is dependent on the type of the waterbody. Non-fish bearing perennial streams (Type Np) receive substantially less forested buffers than do fish bearing waters. Ecology contends that the prescriptions associated with the Type Np rules have the greatest potential risk of violating the water quality standards. To apply the Np rules as intended requires the identification of the point at which the flow becomes perennial (flows year round in a normal water year). Ecology needs to know at the soonest possible time if the Np rules are effective in protecting water quality. At this time, however, there is no protocol for determining the highest point of perennial flow initiation, no information for assessing how accurate the current best professional judgment-based approach is in identifying the uppermost point, and no studies completed to test the effectiveness of the Np rules in protecting water quality and other public resources. Sufficient Type N studies are contained within the CMER work plan to allow a science-based assessment of the protection and relative risks provided by the existing prescriptions. However, the first study to assess the effectiveness of the Np rules in protecting water quality will not be done until September 2012. To support sound decision-making, it is important that Policy and CMER work together to establish a strategy to expediently ensure rules associated with Type Np waters maintain those waters in compliance with the state water quality standards. This strategy needs to include at a minimum: (1) development of a protocol for identifying with reasonable accuracy the uppermost point of perennial flow - this could be a new approach or validation and documentation of the existing approach; (2) an updated review of the scientific literature pertaining to buffering streams sharing the physical characteristics of Np streams; (3) ranking and funding of the Type N studies as highest priorities for CMER research; and (4) identification of key research questions that caucus participants want answered in preparation for a review of the Type N rules -such as the effect of not-buffering dry stream segments.

Milestones:

(1) By July 2010, Policy, in consultation CMER, will develop a strategy to examine the effectiveness of the Type N rules in protecting water quality at the soonest possible time. This strategy needs to include at a minimum:

- **i. Ranking and funding of the Type N studies as highest priorities for CMER research.**
- **ii. By July 2012, developing a protocol for identifying with reasonable accuracy the uppermost point of perennial flow, or develop documentation demonstrating the spatial and temporal accuracy of the existing practice used to identify this point;**
- **iii. By September 2012, completing a comprehensive literature review examining the effect of buffers on streams physically similar to the Type Np waters in the forest practices rules prior to completion of the Type N basalt effectiveness study. This should be conducted or overseen by CMER (or conducted by an independent research entity).**

(c) After almost ten years, no CMER studies have been completed that inform whether or not the forest practices rules can be relied on to bring waters into compliance with the state water quality standards and the CWA. In addition, the state in general, and the AMP in particular, are facing an increasingly difficult budget situation and will not be able to maintain the level of research effort it has in the past without an infusion of new resources. To directly address the need to have water quality-related projects prioritized for funding, the annual CMER work plan and budget exercise should be used to formally establish and maintain water quality studies as high priorities in the adaptive management program. A prioritized list of projects and milestones is presented in Table 1 below to help focus the budget prioritization effort and to ensure water quality studies are expediently pursued. Table 1 shows the water quality priorities and general timeframes for study development needed to support continuation of the CWA assurances. Ultimately, the success of any program of studies will be determined when the studies are finished. It will be critical, therefore, that ongoing and planned studies be designed to assess compliance with the water quality standards, and that follow-up studies needed to provide finer resolution are expediently planned and implemented. Such follow-up studies are not described in this document but will need to be addressed as they arise and as the milestones listed herein are met.

Milestones:

(1) By July 2009, and in subsequent planning years, the projects identified by Ecology in Table 1 will be reflected in the CMER budget and work plan in a manner that establishes a priority schedule for study development. Failure to meet any of the milestones identified without prior consent by Ecology may be viewed as a basis to revoke the CWA assurances at that point in time.

(2) By December 2009, the AMP Manager with the assistance of the co-chairs of Policy and CMER will initiate a process for flagging projects for the attention of Policy that are having trouble with their design or implementation. This process should identify projects not proceeding on a schedule reflecting a realistic but

expedient pace (i.e., a normal amount of time to complete scoping, study design, site selection, etc.).

Table 1: List of Research Milestones to Support Continuation of CWA Assurances	
	Task Description
2009	Complete: Hardwood Conversion – Temperature Case Study
	Study Design: Wetland Mitigation Effectiveness
	Study Design: Testing the Accuracy of Unstable Landform Identif.
2010	Complete: Mass Wasting Prescription-Scale Monitoring
	Implement: Wetland Mitigation Effectiveness (Pilot)
	Study Design: Amphibians in Intermittent Streams (Phase III)
	Study Design: Type N Experimental in Incompetent Lithology
	Scope: Mass Wasting Landscape-Scale Effectiveness
	Scope: Eastside Type N Effectiveness (new study needed)
2011	Complete: Bull Trout Overlay Temperature
	Complete: Solar Radiation/Effective Shade
	Implement: Eastside Type N Effectiveness
	Implement: Amphibians in Intermittent Streams (Phase III)
	Implement: Type N Experimental in Incompetent Lithology
	Study Design: Mass Wasting Landscape-Scale Effectiveness
	Scope: Wetland Management Zone Effectiveness Monitoring
2012	Complete: Type N Experimental in Basalt Lithology
	Complete: Buffer Integrity-Shade Effectiveness
	Complete: Wetland Mitigation Effectiveness
	Complete: Amphibians in Intermittent Streams (Phase III)
	Implement: Testing the Accuracy of Unstable Landform Identif.
	Scope: Wetland/Stream Water Temperature Interactions
2013	Complete: First Cycle of Extensive Temperature Monitoring
	Scope: Effectiveness of RMAP Fixes
	Scope: Wetland Hydrologic Connectivity
2014	Study Design: Effectiveness of RMAP Fixes
	Scope: Type F Experimental Buffer Treatment
2016	Complete: Type N Experimental in Incompetent Lithology
	Scope: Watershed Scale Assess. of Cumulative Effects
2017	Complete: Eastside Type N Effectiveness (new study needed)
	Study design: Watershed Scale Assess. of Cumulative Effects
2018	Complete: Roads Sub-basin Effectiveness
	Implement: Watershed Scale Assess. of Cumulative Effects

III. Consistent Compliance and Enforcement of the Forest Practices Rules

Conditions for retaining the assurances include:

1. **No failure to implement the rules for any reason.***
2. **No lack of enforcement of forest practices on the part of state regulatory agencies.***
3. **No broad scale landowner non-compliance exists with meeting the forest practice regulations or the FFR.***
4. **If an individual landowner fails to implement forest management practices or demonstrates a pattern of non-compliance, such as repeated enforcement actions, the assurances may be withdrawn for that landowner. All available enforcement and other options under federal and state law will be considered. This will include, but not be limited to: the requirement for a TMDL; enforcement of water quality standards violations and forest practice laws and regulations.***
5. **Documentation based on compliance monitoring data demonstrating that the rules are being implemented in a reasonably consistent manner across in each DNR region.**
6. **Documentation based on compliance monitoring data demonstrating when the rules are different for small landowners than for large landowners, what level of compliance is being achieved by each landowner category.**
7. **Documentation based on compliance monitoring data demonstrating how well rules regarding water quality protection measures such as riparian buffers; road construction, maintenance and abandonment; alternate plans; and unstable slope requirements are being implemented.**
8. **Results of an analysis of alternate plan compliance with standards in the rules that evaluates whether alternate plans provide protection to public resources at least equal in overall effectiveness as default forest practices prescriptions.**

Discussion: The CWA assurances were conditioned on the ability to demonstrate the forest practices rules are being consistently and effectively applied at all scales – statewide, DNR region, and individual landowner. In the discussion and milestones that follow, the CMP is often identified as a vehicle for satisfying the formal corrective milestones; however, Ecology would support the use of alternative programs and stand alone initiatives if they would be more effective.

Statewide compliance patterns. From a statewide perspective, DNR has done an admirable job in developing a formal program to assess compliance. The compliance monitoring program (CMP) does a good job at assessing overall compliance rates with selected conditions in approved forest practices applications (FPA). The draft 2006/2007 biennial

compliance report, for example, provides sound evidence that no significant difference exists in rates of compliance with FPA conditions between large and small forest landowners. Preliminary results from the draft report found that seventy-five percent of the riparian activities evaluated were in compliance on both small and industrial landowner lands. Of the road activities evaluated, eighty-seven and eight-six percent were in compliance on small and industrial landowner lands, respectively. Ecology field staff actively participating in the forest practices program support the contention that landowner compliance is reasonably good statewide. However, the statistics demonstrate that approximately one out of every four riparian prescriptions evaluated experienced at least some level of non-compliance. This fact suggests initiatives are needed to identify the causes of non-compliance and to reduce the incidence level.

A significant concern for Ecology is that the CMP is focused on assessing compliance with only select provisions of approved FPAs. This means the CMP is not providing an adequate assessment of compliance with other important provisions of the forest practices rules related to water quality protection. Only compliance with provisions established in an approved FPA that can be readily evaluated during a short field visit are currently being assessed in the CMP. Critical areas of omission from formal compliance assessment efforts include:

1. *Water typing decisions (wetland versus lake or stream, fish-bearing versus non fish-bearing, seasonal versus perennial).*
2. *Designation of channel migration zones and inundated and associated wetlands.*
3. *Unstable slope rules.*
4. *Measurements of bankfull stream width.*
5. *Adherence to streamside shade rules.*
6. *Haul roads used to remove the harvested timber.*

In addition, no program exists to determine if approved alternate plans are equal in overall effectiveness as compared with the default forest practices rules.

<u>Regional and landowner compliance patterns</u>. The CMP has not provided information that allows compliance patterns to be assessed at either regional or landowner scales. Ecology staff reports that forestry staff within the DNR regions are generally doing an excellent job of applying and enforcing the rules. However, staff and other cooperators often express the belief that regional differences exist in the application of the forest practices rules and in undertaking enforcement actions. Without unbiased data on regional compliance patterns, however, these concerns can neither be confirmed nor dismissed.

<u>General issues</u>. There is no effective mechanism in place to resolve disagreements between members of field review teams or conflicts over enforcement decisions in a timely manner. This is particularly a problem when DNR staff is a party to the disagreement since DNR is the final arbitrator of the forest practices rules.

Remedies identified to support continuation of the assurances include:

(a) Past problems with getting concerns addressed over the content and procedures included in the CMP suggests significant value may accrue through the formation of the newly authorized CMP stakeholder guidance committee. Ecology strongly encourages DNR to continue to engage key cooperators in finalizing a charter for the committee that defines the roles and the decision-making process to be used. Many of the remedies discussed would be appropriately handled by that committee.

Milestone:

(1) By October 2009, DNR will complete the Charter for the Compliance Monitoring Stakeholder Guidance Committee and determine which issues identified herein related to compliance monitoring will be dealt with by the committee. This is intended to help move these issues forward on schedule as well as to flag the items for which an alternative process for resolution is needed.

(b) The Compliance Monitoring Program (CMP) does not currently examine compliance with numerous rule elements of importance to protecting water quality. The existing structure of the CMP may preclude an assessment of compliance with some of these rule elements. In such cases, separate studies are needed to supplement the current CMP. Separate studies or CMP assessment methodology are needed to examine the level of compliance with rule requirements for water typing, shade, wetland identification and mitigation, unstable slopes, channel migration zones, and haul roads. More detailed guidance and training should also occur to enhance consistency in defining the boundaries for measuring bankfull width and channel migration zones.

Milestone:

(1) By December 2009, DNR in partnership with Ecology and with the aid of the CMP stakeholder guidance committee, will develop general plans and timelines for exploring options and data collection methods for assessing compliance with rule elements such as water typing, shade, wetlands, haul roads and channel migration zones. The goal is to initiate these programs by December 2011.

(c) Disagreements occur at both the field and policy level regarding interpretations of regulations and guidance. These disputes are often allowed to continue unresolved and carry-over to other situations for very long periods of time. These disputes result in the unequal application of the rules and guidelines between landowners and regions, as well as wasting limited staff resources and harming professional working relationships. DNR should ensure an effective formal procedure exists to efficiently resolve field disputes. This procedure should include participation by appropriate representation of policy and technical experts from participating caucuses. The objective is to ensure timely investigations occur of the concerns of any participating cooperators regarding field determinations, but the more paramount objective should be to identify the underlying basis for the disagreement and minimize its reoccurrence in the future through revised training, guidance, or rules.

Milestone:

(1) By December 2009, DNR with assistance of Ecology and WDFW, will evaluate the existing process for resolving field disputes and identify improvements that can be made within existing statutory authorities and review times. Although resolution of the specific issue at hand should be a goal, the overarching purpose of this milestone is to establish a process that will identify the basis for the dispute and to put in place revised guidance, training, reporting pathways, other measures that will minimize the reoccurrence of similar disputes in the future. This process should consider how to best involve the appropriate mix of both policy and technical participants to thoroughly resolve the issue at hand.

(d) Training is needed to decrease conflict among cooperators engaged in compliance assessments, and to minimize noncompliance rates that may be due to a misunderstanding of the forest practices rules and guidance.

Milestone:

(1) By June 2010, DNR with consultation with Ecology and WDFW (or with the CMP stakeholder guidance committee), will establish a framework for certification and refresher courses for all participants responsible for regulatory or CMP assessments. This will be focused on aiding in the application of rules regarding bankfull width, CMZ boundaries, application of road rules, and wetlands. Consideration should be given to including a curriculum of refresher courses on assessing difficult situations.

(e) The current compliance rate of seventy-five percent for riparian prescriptions contained in approved FPAs is not sufficient to support long-term maintenance of the assurances.

Milestone:

(1) By July 2010, DNR with the assistance of Ecology, will assess the primary issues associated with riparian noncompliance (using the CMP data) and formulate a program of training, guidance, and enforcement believed capable of substantially increasing the compliance rate – with a goal of getting greater than ninety percent compliance by 2013. Ecology will consider of the rating of noncompliance since not all infractions have the same effect on public resources (e.g., is it predominately at levels within reasonable field method limits or likely to occur even with due diligence) when determining if this compliance target rate milestone has been satisfied.

(f) The conditions established in the FFR for granting the assurances necessitate tracking compliance at both a broad scale and at the landowner level. The existing CMP has not been collecting information at a pace that allows comparisons to occur at the regional or landowner level. In addition to satisfying the CWA Assurances, there is a need to track compliance issues at the landowner level to support both voluntary (training) and regulatory (escalating enforcement) corrective mechanisms as part of DNR's existing compliance and enforcement programs. Recognizing that a random sample-based program will unlikely be capable of identifying non-compliance patterns at the landowner

scale, DNR should work with Ecology, WDFW, and the Tribes to determine the best alternative mechanism to identify problem landowners. In resolving this issue, the use of both informal and formal enforcement documents should be evaluated as an adjunct to the data collected from the CMP.

Milestone:

(1) By June 2010, DNR, Ecology, and WDFW will meet to review existing procedures and recommended improvements needed to more effectively track compliance at the individual landowner level. The goal will be to ensure the compliance pattern of individual landowners can be effectively examined by October 2010. This should consider the types and qualities of enforcement actions that occur (e.g., conference notes, notices of correction, stop work orders, penalties). These procedures and their effectiveness in identifying compliance trends at the landowner level will be reassessed by Ecology by October 2012 to ensure the program provides sufficient information to take action where appropriate to remove the CWA assurances and take any other necessary corrective action with landowners having persistent compliance problems.

(g) Alternate plans allow significant deviations from the forest practices rules and result in trading different forms of natural resource protections in space and time (such as sacrificing short-term shade to get large woody debris more quickly) so long as the resulting alternate plan "provides protection to public resources at least equal in overall effectiveness as provided by the act and rules" (WAC 222-12-040). No program exists to validate that approved plans are complying with this foundational element of the alternate plan rules. At present, the program represents the application of the best professional judgment of DNR foresters and other cooperators invited to participate as part of field advisory teams. It is important to begin collecting a sample of baseline data (a resource inventory) on alternate plans before and after the harvest. This is needed to create a foundation that will allow a general assessment of whether alternate plans are equal in overall protection to the baseline rules and whether they are meeting the state water quality standards.

Milestone:

(1) By October 2010, DNR in partnership with Ecology, and in consultation with WDFW, the Tribes, and the SFL advisory committee, will design a sampling plan to gather baseline information sufficient to reasonably assess the success of the alternate plan process. This sampling plan should include how to select sample sites, how to best document the content and assumptions contained in the alternate plan, what to monitor and how frequently to do so, and responsibilities for who will conduct the sampling. The goal of this effort is to initiate data collection in the 2011 field season.

IV. Programs to Bring Roads up to Design and Maintenance Standards

Conditions for retaining the assurances include:

1. **Road Maintenance and Abandonment Plan (RMAP) results that are readily available, including: where RMAPs are complete, a summary of all active, orphan, and abandoned roads.**
2. **Results of an analysis of small forest landowner roads not yet covered by RMAPs or checklist RMAPs. The goal of the analysis is to estimate whether these roads potentially threaten water quality, so that strategies can be developed or modified to assure they reach the 2016 goal.**

Discussion: Ecology maintains that it is very important to ensure roads are on track to comply with construction and maintenance standards by 2016 as mandated in the forest practices rules. This recognizes the high concern regarding the impact of road design and maintenance on protecting water quality. DNR reports that large landowners are predominately on schedule to meet the 2016 target date for bringing all their roads into compliance. This, coupled with successful CMER studies on the effectiveness of road prescriptions, should allow Ecology and the forest practices program to identify a level of prescriptions and ongoing maintenance and monitoring that will meet the CWA objectives into the long term. This would be a substantial success and one that Ecology, DNR, and the other cooperators should continue to focus on. One problem with the RMAP program is that it was not designed to allow an outside assessment of its progress or input into the priorities chosen for road and culvert repair. Such an assessment is made more difficult by the fact that the data is collected and stored in different formats by different landowners and regions. While Ecology is reasonably confident that DNR is correctly assessing that landowners are on track to meet the 2016 goal and are not deferring priority work, some effort is needed to help provide tools that will better illustrate the basis for that assessment.

The story is much less clear for the roads maintained by small forest landowners (SFL). These landowners occupy approximately fifty percent of the private forestlands in the state, and it is critical that they also be on a course to success. The state Legislature eliminated the planning requirements for SFL, making it very difficult to know how well their roads are being maintained in compliance with water quality standards and other resource objectives. DNR was charged by the Legislature with conducting two interim assessments on the status of roads on SFL properties. The first briefing period was in December 2008, but provided no actual direct assessment of the condition, risk, or progress of SFL roads. The second briefing date is December 2013. But if substantial problems exist that are not identified until 2013, there is little chance corrective action can be taken in time to reach the 2016 target for bringing roads into compliance with current management practices. Ecology's concurrence at the Forest Practice Board regarding the action taken to revise the SFL RMAP requirements in April 2006 was based in part on commitments by DNR to in part assess the overall compliance rate of SFL roads. This commitment remains important and is reflected below as a formal milestone.

Remedies identified to support continuation of the assurances include:

(a) It would facilitate tracking progress with RMAPs if the original plan to complete a GIS forest roads layer and getting all the RMAPs into a GIS framework could be accomplished. Alternatively, a reporting structure is needed that summarizes progress to date and activities still remaining to allow Ecology and other interested parties to gain more confidence that roads are on target to meet the 2016 deadline.

Milestones:

(1) By January 2010, as part of the regional RMAP annual meeting process, DNR should ensure opportunities are being provided in all the regions to obtain input from Ecology, WDFW, and tribes formally participating in the forests and fish process regarding road work priorities.

(2) By December 2011, DNR with the assistance of large landowners, will provide summary information for all industrial landowners having RMAPs. The summary information will include at a minimum: Date RMAP completed, total miles of road covered under the RMAP, total miles of road brought up to standards, total number of fish barriers removed, and a brief statement describing the strategy for bringing all roads into compliance by 2016 that demonstrates even-flow or otherwise provides confidence compliance will be attained by 2016. If reasonable and feasible, the summary will show the annual progress on road and barrier improvement that has occurred since the inception of the RMAP, and DNR will provide a master summary for all industrial landowners combined.

(b) To understand if the checklist RMAP process is effective in protecting waters of the state, it is critical DNR work with small forest landowners (SFLs) to assess the rate of compliance with road maintenance and abandonment requirements on road segments with the potential to deliver sediment to waters of the state prior to the 2013 legislative update.

Milestones:

(1) Milestones to address this issue were established in Part I of this paper.

V. Landowners to Share Data

Conditions for retaining the assurances include:

1. **Landowners will share water quality data collected in cooperative research, adaptive management, and TDML development. Landowners are further encouraged to share all pertinent data to assist in water quality planning efforts.**

Discussion: Within the CMER program, landowners have actively participated in conducting scientific studies and supplying environmental data associated with those studies. Some landowners have also cooperated in sharing data to assist in developing TMDLs in

mixed use watersheds (includes non-forestry activities). Landowners have not otherwise freely shared water quality data collected on their land. It is important to note, however, the specific language in the assurances encourages but does not require landowners to share water quality data outside of the listed programs.

Ecology considers this condition to currently be met and no remedies needed.

VI. Training and Technical Assistance to Improve Implementation

Conditions for retaining the assurances include:

1. **Establishing a manual with detailed guidance regarding contents and approval processes for alternate plans.**
2. **Implementing the regional unstable landform Identification project.**
3. **Identifying high landslide hazard areas.**
4. **Training to identify potentially unstable slopes.**
5. **Training programs for operators on road maintenance and construction standards.**
6. **Outreach to small forest landowners on protecting public resources.**

Discussion: The CWA assurances were conditioned on developing tools and programs that provide ongoing guidance to landowners and cooperators on the effective implementation of the forest practices rules.

- *The requisite alternate plan board manual was developed in 2007, and processes are in place to continue to revise and improve that manual over time as issues arise.*
- *An evaluation occurred to verify that no regionally unique forms of unstable slopes existed that would need supplemental guidance, and DNR provides regular training around the state for foresters and other professionals interested in enhancing their ability to identify unstable slopes. DNR also provides lists of qualified experts who are available to assist landowners in identifying potentially unstable slopes and meeting the forest practices rule requirements for those sites.*
- *Rules and a board manual have been produced that describe the requirements for constructing and maintaining roads. In addition, Ecology has assisted DNR in providing training to the DNR regional offices on road standards and, working together, have just completed an updated round of training for forestry and water quality staff. Training on road BMPs also takes place through the contract loggers' association, and some of the large landowners require loggers to have taken this before they will contract with them.*

In 1999, the Washington State Legislature authorized a Small Forest Landowner Office (SFLO) within DNR. The SFLO was directed to serve as a "resource and focal point for small forest landowner concerns and policies" with a goal to improve the economic viability and environmental quality of small forestland holdings. The Family Forest Fish Program

administered out of the SFLO has provided twelve million dollars in assistance that has opened up 439 miles of fish habitat, helping also to reduce sediment and improve water quality. The SFLO provides training on road maintenance twice a year to hundreds of small forest landowners and provides stewardship planning classes to help SFLs manage their land.

Given the generally high confidence that guidance and outreach programs will continue to be updated as needed, all of the training and outreach conditions linked to the CWA assurances are considered to have been met except where noted as a milestone elsewhere herein. One element that has not been completed satisfactorily is the identification of high landslide hazard areas. The Landslide Hazard Zonation (LHZ) project was created to provide an improved screening tool by describing and mapping all potentially unstable slopes in priority watersheds. The LHZ project also provides information useful for selecting appropriate mitigation action. GIS data created from this project (landslides and hazard zones) are available from DNR. Considerable progress has been made in completing the LHZ project. Staff vacancies were recently filled and the program was making reasonable progress in mapping landslide hazards. Against these fine accomplishments, however, there still remains a majority of the state to map and even at the current pace it will be many more years before all the commercial forest lands in the state have been completed. Of the 229 watersheds that were originally prioritized, 129 were deemed critical. DNR estimates they may be able to complete the 129 by 2013 if all goes as planned and they can retain their current workforce. Unfortunately, the recent budget cuts associated with the current economic downturn has resulted in proposed cuts to the LHZ program that may impede its progress.

Ecology considers this condition to currently be met and no remedies needed.

Supplemental Recommendations

The preceding section established milestones intended to serve as a mandatory corrective action plan for extending the CWA assurances. Some issues were identified as part of this review that do not rise to the level of a mandatory milestone, but that if addressed may benefit the forest practices and adaptive management programs. These are provided as recommendations that do not affect Ecology's decision on whether or not to continue to offer the CWA assurances.

(a) To better assess the adequacy of staffing and funding, DNR should continue to audit the forest practices program's ability to effectively and consistently implement the forests and fish rules. To the extent feasible, these audits should consider the staffing of all cooperators integral to field teams and address whether a lack of staffing is affecting the overall success of the program in effectively implementing forests and fish rules and protecting water quality. As has been noted by several cooperators in reflecting on this concern, adequacy is not just boots on the ground but includes having the right people trained correctly with the right tools and implementing the rules correctly. For just this reason, it is imperative that the issue be addressed through a broad framework of assessment, training, and audits. DNR has a process for conducting audits of regional office performance. Ecology recommends that those audits continue at regular intervals with some method provided to track changes in performance. While serving as a mechanism to assess general adherence to standard processes and to identify potential weaknesses, the audits do not directly assess adequacy of staffing or success in meeting rule elements. This gap in performance assessment information, however, can likely be filled by strengthening the compliance monitoring program. Needed improvements to the compliance monitoring program are discussed separately in this document.

(b) Ecology provides necessary water quality expertise that is at risk of loss due to a lack of dedicated, dependable, and adequate funding. Ecology should explore alternate funding opportunities for Ecology staff. A work assessment should also be conducted by Ecology with the assistance of DNR to identify where additional resources may be needed, or where they should be redirected to better protect water quality.

(c) The AMP Administrator with assistance from the Policy and CMER committees should identify a strategy to work in partnership with other research institutions and entities, and to be in the best position to apply for new monies as they become available.

(d) Past and ongoing CMER studies and their associated data are not readily available or housed in any defined location. This puts this information at risk of being lost, and makes it largely inaccessible to the public as well as to AMP participants who could otherwise use the information to improve the efficiency of ongoing and planned studies. To help ensure the availability of reports and data generated through the AMP, the current efforts by DNR to scan all CMER reports into digital formatting should be supported. The effort of CMER and the Northwest Indian Fisheries Commission to develop an archival and GIS-based data acquisition system should similarly be supported.

(e) Ecology and the Adaptive Management Program should actively encourage voluntary efforts to further expand the role of landowners and other cooperators in data collection programs. Expanding the ability of landowners, tribes, and other cooperators to provide data to assess status and trends would enable a more robust sampling program, and potentially provide an ability to separate regional from statewide trends.

(f) The potential damage to water quality and public resources from unstable slopes is significant, and completion of the LHZ mapping program provides important supplementary information to help landowners identify unstable slopes. DNR should continue to look for ways to fully fund the LHZ mapping program to ensure that all of the priority watersheds are completed in the shortest practical time.

(g) Ecology finds a need for a summary of the state of the knowledge with regards to the potential impact of the forest practices rules on amphibians. This should be done at the earliest practical opportunity and include both CMER and Policy representatives in an effort to understand whether the program is collecting the information needed to address rule effectiveness.

Appendix: Adaptive Management Program Strategic Goals, Objectives, and Tasks

Forests & Fish Report Vision for Adaptive Management: "An Adaptive Management program is necessary to monitor and assess implementation of forest practices rules and achieve desired resource objectives. Adaptive Management is a formal process for evaluating the current resource status and, over time, for evaluating the effectiveness of rules and guidance in protection, maintenance, and enhancement of habitat necessary to meet resource goals and objectives, for making adjustments to forest practices on a regional or statewide basis, and for requiring mitigation, where necessary, to achieve resource objectives." (Forests & Fish Report, p. 70)

Goal 1: Assess and improve Adaptive Management Program efficiency and effectiveness

Objective 1: On an ongoing basis, assess the efficiency and effectiveness of the program in meeting the Program's mission and vision.

Task 1: AMPA / CMER Co-Chairs - By December 2008, develop a timeline estimating when critical questions in the CMER work plan will be answered.

Task 2: Forest Practices Operations ADM/ CMP Manager - By December 2008, a steering committee or other collaborative process, shall be established to guide and make recommendations on compliance monitoring efforts. Such a steering committee will need to meet in a timely manner so delays don't occur in the training of survey crews and the collection of field data.

Task 3: AMPA / CMER Co-Chairs - By January 2009, synthesize CMER work completed since 2000, summarize knowledge gained and assess progress towards answering FFR Adaptive Management key questions.

Task 4: Policy Co-Chairs / AMPA / CMER Co-Chairs - By January 2009, clarify when and how research and monitoring results will be used to assess current rules and policies, i.e., should action be recommended in response to each project in a program, or should all projects in a program be completed before action is recommended, or something in between? Review and document decision with caucus principals as necessary.

Task 5: AMPA / CMER Co-Chairs / CMP Manager - By March 2009, determine timing and coordination between compliance monitoring and effectiveness monitoring projects, and report results to Policy. (Note - Task 5 is dependent upon the timing of task 2. The intent is to complete task 5 within three months of the compliance monitoring steering committee's (or similar collaborative process) acceptance of the revised compliance monitoring design. More will be known about the timing of task 2 by the end of this month.)

Task 6: Policy Co-Chairs / AMPA / CMER Co-Chairs - By March 2009, review the CMER Work Plan to ensure programs/projects are prioritized appropriately tightly focused on FFR resource objectives/performance targets and key deadlines/time frames are identified.

Task 7: CMER Co-Chairs - By April 2009, revise the CMER Work Plan to incorporate key components of CMER science synthesis, reflect Policy's prioritization of projects, and include project schedule estimates.

Task 8: AMPA / CMER Co-Chairs - By December 2009, synthesize applicable non-CMER research for priority topic areas identified as a result of completing Tasks 1, 2, and 6.

Objective 2: Every ten years the structure, process, and performance of the Adaptive Management Program will be independently reviewed.

Task 1: Policy Co-Chairs / AMPA / CMER Co-Chairs - By January 2010, obtain independent review of the Adaptive Management Program. This review shall be done by representatives of independent, third party research organizations and include:

- An examination of the structure and function for technical performance, fiscal efficiency and overall accountability.
- An assessment of the performance and efficiency of the consensus-based decision processes.
- A review of the rigor of CMER science and the responsiveness of CMER work to body of PNW region science that is applicable to the L-1 Key Questions.
- An evaluation of the interactions of science and policy within the AMP.

Goal 2: Reestablish and maintain productive, collaborative caucus relationships

Objective 1: In order to more productively resolve contentious forest practices issues, the Department of Natural Resources (DNR) will lead efforts to renew and maintain cooperation and collaboration among the six caucuses as an alternative to competitive lobbying and litigation.

Task 1: Commissioner of Public Lands - By January 2009, convene a meeting of caucus principals to determine their commitment to the Timber, Fish & Wildlife (TFW)/Forests & Fish Report (FFR) vision and ground rules, review caucus relationships, reinforce responsibilities and recognize capacity challenges of caucus representatives, and review how economic viability intersects with the Adaptive Management Program.

Task 2: Caucus Principals - By February 2009, write a joint letter summarizing outcomes of Task 1 and giving appropriate direction to caucus representatives.

Task 3: Policy Co-Chairs / AMPA / CMER Co-Chairs - By April 2009, develop and implement a plan to improve understanding and conformance with WAC 222-12-045, the TFW / FFR ground rules and responsiveness to Board Manual Section 22 guidance.

Goal 3: Secure adequate program funding and enhance communications

Objective 1: To ensure funding is available for caucus participation in the AMP as well as priority research and monitoring projects, the Forest Practices Division Manager, in cooperation with caucus principal support, will lead efforts to obtain stable, adequate, long-term funding.

Task 1: F&F Policy / Caucus leads - Support DNR's unstable slopes decision package, which includes a request to double the GF-S Adaptive Management fund from $1.2M per biennium to $2.4M.

Task 2: Policy Budget Committee - By June 2009, develop a plan to obtain dependable, long-term funding adequate for participation, research and monitoring projects, and program management.

Objective 2: Raise the public profile of the AMP.

Task 1: AMPA / Policy Co-Chairs / CMER Co-Chairs - By July 2009, develop and implement an AMP communication and outreach strategy.

Goal 5: Increase research capabilities and scientific knowledge

Objective 1: Strengthen and develop partnerships with other research organizations.

Task 1: AMPA / CMER Co-Chairs - On an ongoing basis, explore and develop partnerships with other natural resource research organizations. Report back to CMER and Policy biannually on progress.

Oregon
Kate Brown, Governor

Department of Fish and Wildlife
Ocean Salmon & Columbia River Program
17330 SE Evelyn Street
Clackamas, OR 97015
(971) 673-6000
FAX (971) 673-6075
www.dfw.state.or.us/

6 December 2019

John Palmer
Environmental Protection Agency, Region 10
Oregon Department of Environmental Quality
700 NE Multnomah St., Ste. 600
Portland, OR 97232

Re: Comments on the Columbia River Cold Water Refuge Plan

Dear Mr. Palmer:

The Oregon Department of Fish and Wildlife (ODFW) is submitting these comments in response to the U.S. Environmental Protection Agency's (EPA) draft Cold Water Refuge Plan for the Columbia River (hereafter, Plan). While we agree further measures are essential to protect and recover imperiled salmon and steelhead stocks, we are nonetheless concerned the Plan may discount some key points of discussion.

General Comments

Current use of cold water refuges is quantified based on information from studies conducted in the late 1990s through early 2000s (e.g., Goniea et al., 2006 and Keefer et al., 2009). These studies tracked returning adult salmon and steelhead that would have out-migrated as juveniles during a period when rates of transportation generally approached or exceeded 80%. Yet, average rates of transportation from 2006 through the present have ranged from about 30% to 40% (Figure 1). Studies (e.g., reviewed in Keefer and Caudill 2014) indicate rates of straying are commonly higher for fish that are transported as juveniles compared to fish that migrate in-river where the effect can manifest as straying into sites near natal streams or as long-distance straying; straying may be permanent or temporary. Because estimates of current use of tributaries by adult fish, as presented in the Plan, rely on assumptions based on information from studies conducted prior to a de-emphasis on transportation (i.e., pre-2006), these estimates may be exaggerated. We acknowledge EPA has discussed briefly this potential source of bias in an appendix, but we feel the topic represents an important caveat that should be addressed in the main report. We would also encourage EPA to incorporate more contemporary data into analyses and account for transportation history to the extent possible in the estimation process. This may require relying to a greater degree on information from PIT tags as opposed to acoustic telemetry.

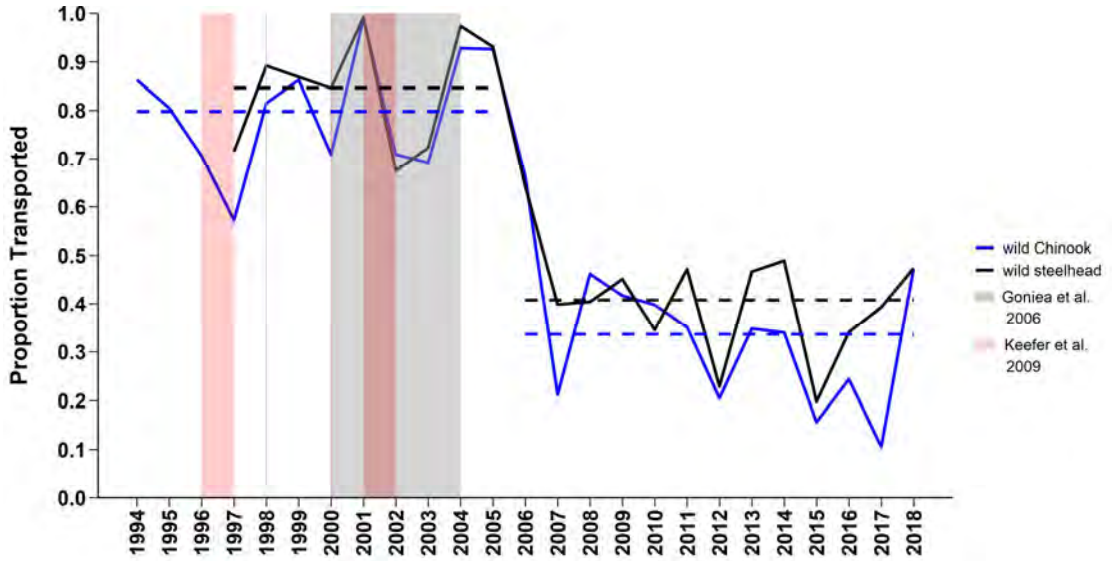


Figure 1. Proportion of wild Chinook and steelhead outmigrants transported, 1994–2018. Dashed lines indicate mean proportions transported before (1994–2005) and after (2006–2018) de-emphasis on transportation. Gray shading represents the period during which the Goniea et al. (2006) study was conducted. Red shading represents the period during which the Keefer et al. (2009) study was conducted. The x-axis indicates migration year; adult fish monitored during the two studies would have outmigrated several years prior to what is indicated by the shaded regions.

Discounting temporal variation in rates of transportation, and consequently rates of straying, may also complicate other conclusions in the Plan. The Plan states fish that use cold water refuges, on average, home less successfully than those fish that migrate in-river, and that this disparity can be attributed to increased rates of harvest in cold water refuges. To support this claim, the Plan appears to point to Figure 7 and accompanying text in Keefer et al. (2009). The figure shows comparisons among various "fate" categories ("Homed" [successfully], main stem harvest, "Strayed" and "Unknown") for adult steelhead that either were or were not recorded in tributaries during the 2001–2003 return years. The authors assert differences in bars representing homing success between fish that used tributary habitat, and those that did not was accounted for by the substantial difference in the proportion of tagged steelhead between the two groups (use and non-use) that "Strayed". From Figure 7, it would then appear that straying, and not harvest, accounted for most of the variation in homing success. However, in the Methods section, Keefer et al. (2009) indicate approximately 1/3 of the fish in the "Strayed" category were known to have been harvested in tributaries. They go on to speculate that a majority of the remaining fish in that category were lost to unreported harvest, given: (1) "almost no fish were reported on spawning grounds" and (2) "many transmitter signals ceased", which is consistent with harvest. Yet, the fate of those remaining steelhead in the "Strayed" category is necessarily unknown. An alternative line of reasoning might suggest that many of the unaccounted for steelhead were actually strays (not harvested). This argument would be supported by the large number of fish that were transported before the study period and the disparity in sample sizes between barged and in-river tagged fish included in Keefer et al. (2009). If we accept this alternative, it stands to reason that differences in rates of homing between fish that use tributaries and those that do

not might be smaller or negligible after de-emphasis on transportation (i.e., post-2005). ODFW would encourage EPA to consider a range of explanations when drawing conclusions that are uncertain and incorporate into the Plan information from models that account for effects explicitly, including transportation history (e.g., McCann et al. 2017).

Further, the studies relied upon to assert the effect of harvest in tributaries on adult success were conducted during periods when retention of adult hatchery steelhead was permitted, i.e., prior to 2017. Beginning in 2017 steelhead fisheries have been subject to rolling retention and angling closures in the Columbia River and associated tributary mouths upstream of Bonneville Dam. As such, it is unclear how the harvest effect noted in Keefer et al. (2009) would translate to the present. The Plan appears to speculate that reduced adult success may result from post-release mortality–and this would have to be the case in a period, such as the present, where retention is prohibited–but no evidence is presented to support this contention. As above, relying on information from studies that do not reflect conditions (e.g., fish passage or fisheries management strategies) in the recent past is misleading. Assertions must be supported in the current context and important caveats should be highlighted.

We are concerned the Plan may, by omission, discount other important main stem temperature-related constraints to adult migration success. For example, Caudill et al. (2013) found large temperature differentials between the top and bottom of fish ladders at dams in the Snake River led to passage delays ranging from hours to days. The authors also noted that fish internal body temperatures equilibrated to ladder temperatures often exceeding 20°C, indicating the potential for deleterious physiological effects. Presumably, migration delays and acute physiological distress resulting from ladder differentials could have cumulative effects as migrating adults must negotiate multiple projects. Along these lines, our primary concern is that the Plan overlooks temperature-related constraints that may be as important as lack of cold water refuge. ODFW would encourage EPA to explore in the Plan solutions to deal with ladder differentials and other deleterious temperature-related factors that may also conspire to limit adult migration success.

Specific Comments

4.3, para 2: "Wild steelhead using CWR, which are required to be released when caught…"

Comment: *While this may be true of non-tribal fisheries, tribal fisheries are full retention.*

4.3, para 4: "…it is difficult to separate how much of the…decrease in steelhead and fall Chinook survival…"

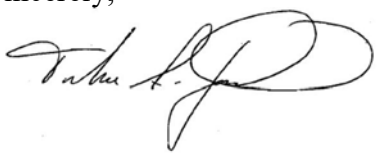
Comment: *The studies cited to support this argument provide estimates of survival/success only for steelhead. Presumably these finding cannot be translated directly to fall Chinook.*

4.4, para 2: "'Adjusted' denotes the survival rate, factoring in the estimated percentage that are harvested or stray…adjusted survival highlights the percentage that does not survive for unknown reasons."

Comment: *Assuming this description relies on the NOAA Fisheries' analysis for the hydrosystem BA/BO, the U.S. v. Oregon Technical Advisory committee has commented in the past that these estimates a very sensitive to variation in estimates of harvest and stray rates. Accounting for this variation would likely explain a large proportion of the "unknown" mortality. This comment applies elsewhere throughout the document.*

Thank you for the opportunity to comment on Columbia River Cold Water Refuge Plan. On behalf of ODFW, while we have concerns of the plan as written, we look forward to continuing work with EPA to help ensure the future of salmon and steelhead stocks so important to the region.

Sincerely,



Tucker A. Jones
Ocean Salmon and Columbia River Program Manager
Oregon Department of Fish and Wildlife
971.673.6067

Cc: Curt Melcher, Director, Oregon Department of Fish Wildlife
Ed Bowles, Fish Division Administrator, Oregon Department of Fish and Wildlife

THE CONSERVATION ANGLER

John Palmer
Environmental Protection Agency – Region 10
1200 6th Avenue, Suite 155 (19-C09)
Seattle Washington 98101

December 6, 2019
Transmitted via email

Comments on the October 2019 Environmental Protection Agency Draft Columbia River Cold Water Refuges Plan

Dear Mr. Palmer:

The Conservation Angler has reviewed the draft EPA Plan for Columbia River Cold Water Refugia (Draft CWR Plan) and offers the enclosed comments for you and your staff to consider as you move towards finalizing a plan for these critical cold-water resources in Oregon and Washington.

The scientific information about salmon and steelhead use of refugia is important and exceptionally clear. However, Draft CWR Plan reports that while there may be enough existing refugia presently, there will not be enough in the future — and that statement alone should generate a sense of urgency for EPA and state governments to take actions to address failing nonpoint source control programs.

To ensure that this draft plan results in action to protect the identified CWR, EPA must direct Oregon, Washington and Idaho to rewrite the relevant temperature TMDLs and direct the states to establish clear, measurable actions, including quantitative BMPs, that must be aimed at meeting the TMDLs' load allocations as state agencies and private land owners need to be held accountable for the measures that are necessary to implement the TMDLs. They cannot be if the measures are not clear. Reliance on TMDLs to protect and restore the Columbia River CWR by EPA can only occur if the TMDLs do not need translation for each entity subject to the load allocation to understand what actions are required in order to meet water quality standards. To that end, Oregon, Washington and Idaho must meet the precise CWA terms in sec. 319(b)(2) and identify the BMPs necessary to meet water quality standards, the specific programs through which those BMPs will be implemented, and an implementation schedule with annual completion milestones as soon as possible. EPA should identify the actions it will take if states do not meet milestones to implement nonpoint source controls and EPAS should be committed to carry out that implementation including NPDES actions and withholding section 319 funds.

The current fact we all must face is that Columbia River water temperatures do not support healthy salmon populations as some salmon and steelhead do not use CWR, the CWR are not sufficiently well distributed, and because temperatures are not meeting existing water quality standards. The diversity of migratory needs is highlighted by the fact that the sockeye require different criteria at different times of year than are currently in existing standards. These issues are amplified by the lack of knowledge of the carrying capacity of each CWR and disease transmission issues when larger numbers of salmon and steelhead congregate and mix within refugia.

EPA's extensive coverage of CWR timing and use by salmon and steelhead should explain the role of the existing use protection for designated uses provided by the narrative portion of Oregon's antidegradation policy (providing that "the seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern." While a separate criterion, it is ultimately related to the refugia criterion. EPA should connect the intersection of migration timing and use of cold water refugia with the natural seasonal thermal pattern, because both numeric and narrative criteria are required in order to protect the designated uses.

The time EPA has invested in examining the CWR issue is extremely valuable. To realize the benefits of this investment of time, expertise and knowledge, EPA must ultimately adopt a plan that contains actionable requirements that protect the sources of the cold water that create the thermal refugia in the Columbia River.

Sincerely,

David Moskowitz
Executive Director

Comments on 2019 EPA Cold Water Refuge Draft Plan

Researched and drafted by Bill M. Bakke for The Conservation Angler

November 2019

"Some of the environmental features that influence population characteristics are very obvious. Temperature, for example, is probably the most important environmental factor for salmonids; it affects nearly every phase of their life history, and is certainly the major influence in stock separation and isolation." (Bannon 1993)

Introduction:

The Draft EPA Cold Water Refuge Report (2019) utilizes the best available information on salmon and steelhead life history, their tolerances for warming water caused by development, including hydroelectric dams, climate change, and fisheries. It does an exhaustive evaluation of these factors affecting migrating adult salmonids in the Columbia River returning to their spawning grounds. It documents what is known about salmon and steelhead behavior in adjusting to a warming river that is presently causing mortality. The report documents the likely increase in Columbia River water temperatures and forecasts the potential outcomes for these fish in 2040 and 2080. This document provides the sobering likelihood that salmon and steelhead will become extinct due to temperature changes in their migrational habitat and negative effects on reproductive success in their spawning streams. Climate change will also affect their reproductive success in the streams they use for spawning and juvenile rearing. Further, the report documents issues related to present management to protect salmon and steelhead utilizing cold water refuges, migration up and downstream of dams, fishways too hot for fish to use, and life history adjustments fish are already using to adjust to an overheated river.

As documented in the EPA Cold Water Refuge Report for the Columbia River, the present summer temperatures (July through September) are increasing mortality on adult summer steelhead and fall chinook salmon, both of which are protected species threatened with extinction. In addition, ESA protected summer chinook are also vulnerable and sockeye are at the greatest risk from water temperature increases under current conditions.

There is evidence that sockeye are returning earlier by a few weeks to avoid hot flows in the river. Other species, especially summer steelhead have evolved to utilize cold water refuges where tributaries enter the Columbia River. Unlike chinook that spawn in the fall, summer steelhead spawn in the spring and can reside in cold water refuges for days and months before moving upriver to spawn. While fall chinook utilizes cold water refuges it is for a shorter period due to their reproductive schedule.

Major Issues to Address in the Draft EPA Cold Water Refuge Report:

1) Number of CWR should be expanded to include those that were left out of consideration due to size. By not recognizing that migrating heat stressed fish, principally steelhead, utilize cold water refuges they encounter on migration, all CWRs should be managed to protect fish and the sources of cold water.

Recommendation: That EPA include all small and large CWR identified in the Draft EPA CWR Report (2019) to provide migrating salmon and steelhead with cold water areas in the Columbia River to protect the survival and reproductive success of wild salmonids threatened with extinction.

2) Fisheries need to be managed so that CWR are closed to fishing when Columbia River water temperatures reach 17ºC (62.6ºF). Marine (1992) suggested that an incipient upper lethal temperature limit for pre-spawn adult salmonids was 17º C (62.6º F) to 20º C (68.0º F).

Optimal temperatures for migrating adult salmon and steelhead are in the 12-16°C (53.6 to 60.89ºF) range with minimal adverse effects below 18°C (64.4ºF) (EPA 2003). The States of Oregon and Washington have a 20°C (68ºF) maximum water quality criteria for the Lower Columbia River, which is consistent with EPA's recommended criteria for large mainstem rivers that naturally warm to this level and are used by salmon and steelhead for migration (EPA 2003). (Page 45 EPA CWR Rept.)

The fishery managers of Oregon and Washington need to establish a temperature trigger that is used to close fisheries in CWR to provide the maximum protection for wild salmon and steelhead threatened with extinction and protected by the federal Endangered Species Act.

Recommendation: That EPA consult with Oregon and Washington fishery managers and NMFS to establish a no fishing trigger based on temperature of 17° C (62.6°F) to maximize protection of salmon and steelhead threatened with extinction and protected by the federal Endangered Species Act.

3) Even though the draft EPA CWR Report (2019) did not specifically address temperature effects on migrating juvenile salmon and steelhead, warming Columbia River water temperatures can cause steelhead to stop their physiological smolting process and residualize and not migrate to the ocean. The critical temperature causing this physiological change in steelhead is 13°C (55.4 F), causing them to become non-migrants (Zaugg and Wagner 1973) In 2015 the Columbia River warmed up to this critical temperature in late April, the migrational timing for steelhead is April and May.

The large hydro-electric dams on the Columbia River slow the migration of steelhead smolts and when median travel times increase beyond 15 days, survival decreased considerably. (Williams 2004). This can mean that Columbia River water temperatures in 2015 were warm enough in late April to cause steelhead smolts to stop the smolting process and residualize, causing high mortality of non-migrating residualized juvenile steelhead. These water temperatures are expected to be normalized as a result of climate change as early as 2040.

New numeric criteria that correspond to the runs of salmon and steelhead that are not using the river during the very highest temperatures but that are affected by high temperatures during their specific period of river use need to be adopted - or else some other solution must be found in the water quality standards.

Recommendation: The EPA addresses the effects of climate warming of the Columbia River for impacts on juvenile salmonids. It may be that during warm water, conditions less than 13° C, salmon and steelhead smolts can benefit from thermal refuges. The fact that the Draft CWR Plan finds that the refugia do not provide mitigation to all salmonids migrating through the Lower Columbia River makes it imperative that the final plan sets out a solution to that regulatory problem. At this draft stage, it does not even engage in the topic.

4) Life history diversity among wild salmon and steelhead is well documented, providing flexibility that is important to their survival in fluctuating environmental conditions. The EPA CWR Report identifies some life history diversity that assists salmon and steelhead to cope with water warming conditions.

"The use of CWRs extends the range of arrival dates at the Snake River confluence, which may decrease energy loss for those late arriving individuals who will then migrate through the Snake River when it is cooler. Therefore, while the entire population does not see an energy benefit in the model reach of the migration corridor. CWRs potentially increase the diversity of energy conserving migration strategies." (EPA CWR Rept. page 69)

"Current steelhead and fall Chinook use of CWR appears to provide some individuals physiological and energetic benefits by allowing them to avoid warm mid-summer Columbia River temperatures and continue migrating upstream when temperatures have cooled. The CWR provide for a diversity of successful migration strategies. (EPA CWR Rept. page 74)

Sockeye have encountered "Increasing July river temperatures at Bonneville Dam over the past 60 years has resulted in earlier migration of Columbia River sockeye salmon. The median passage date, which historically was the first week of July, is now the last week of June." (EPA CWR Rep. page 57)

"Fall Chinook migrating in August, that used CWR, had a higher proportion with sufficient energy to complete spawning than those that did not." (EPA CWR Rept. page 52)

"As average temperatures increased, Chinook who did *not* utilize CWR were forced to migrate later in the year from Bonneville Dam to have enough energy reserves left to spawn. However, for Chinook that *did* utilize CWR during migration under increasing river temperatures, passage dates from Bonneville Dam were on average 18-27 days earlier than fish that did

not utilize CWR. This finding supports the conclusion that using CWR during upriver migration may provide early migrants with an energetic advantage over fish that do not use them. Further, the proportion of fish that seek and use thermal refuge is likely to increase as temperature increases (Connor et al. 2018). (EPA CWR Rept. page 54)

These examples of life history diversity and the survival value provided by CWRs illustrates the biological flexibility of salmon and steelhead to adjust to changes in their migration habitat. There are two major factors that can reduce life history diversity and flexibility. Harvest, especially in CWRs, and hatchery mitigation for federal dams have an impact on life history diversity that is under the control of the fishery agencies and NMFS. Scientific evidence has accumulated over the last 50 years that genetic and ecological impacts of hatchery fish on wild fish causes lower reproductive success and causes lower survival. Harvest in CWRs also limits their benefit to fish that use them, reducing breeding survival. In addition, the fishery managers and NMFS have not established escapement criteria for wild salmon and steelhead by natal stream. Taken together, the value of CWRs for recovery and protection of wild threatened salmon and steelhead is reduced by current fishery management.

Recommendation: That EPA consult with the fishery managers in the Columbia River basin and NMFS to provide the harvest protection of fish using CWRs, establish escapement criteria by natal stream for wild salmonids, and control impacts of the hatchery mitigation program on the reproductive success and survival of wild salmon and steelhead to maximize the benefits of CWRs and life history diversity of salmonids.

5) While protecting CWR associated with tributaries is of extreme importance for protecting migrating steelhead and salmon, the forecast provided by EPA analysis for 2040 indicates that the Columbia River temperature may cause extinction of Columbia River salmonids. This means other adjustments are required to decrease temperatures in the Columbia and Snake rivers. It is suggested by scientists in their recent letter to decision makers (October 22, 2019) that removal of four Snake River dams is necessary to cool not only the Snake River but the Columbia River downstream from the Snake River Confluence.

The letter from scientist's state: "FCRPS dams and reservoirs increased slack water surface area and decreased water velocity compared to a free-flowing river; increased slack water surface area now serves as a collector of solar energy, and the slow-moving water allows more time for heat to accumulate, compared to free flowing conditions (Yearsley et al. 2001, EPA 2003, FPC 2015)."

"EPA stated that an un-impounded river could, on average, be 3.5°C/6.3°F cooler in late summer and early fall when measured at the site potential for John Day Dam. EPA modeling also showed that, when considered collectively, the four lower Snake Dams could affect temperatures up to a potential maximum of 6.8°C/12.2°F (EPA, 2003). The impact of additional heating in lower Snake River reservoirs is clear, and it can drive water temperatures above 68°F for extended periods in late summer and early fall – dangerous for salmon and steelhead. (Cannamela 2019).

The Draft EPA CWR Report makes it clear that the accumulating effects of climate change will raise water temperatures in the Columbia and Snake Rivers that will cause extinction of wild salmonids that are already threatened with extinction under current and forecast water warming conditions. The scientist's letter to decision makers recommends: "In the current NEPA review process, in which FCRPS alternatives are being studied by federal Action Agencies to restore ESA-listed salmon populations, strategies to reduce overall mainstem water temperatures do not appear to be sufficiently addressed. This serious flaw, if uncorrected, will mean that hot mainstem water will remain unmitigated and salmon and steelhead losses will continue and worsen over time," (Cannamela 2019).

Additionally, while EPA explains how it calculates the number of steelhead using refugia and their estimated density, the Draft CWR Plan does not mention that the density estimates, in combination with the temperatures to which salmon and steelhead are exposed, actually work in consort to increase adverse impacts of fish disease. EPA must directly address the density and disease issue because answering the question of whether there are sufficient refugia, as is required by the EPA CWR Plan, will require knowing whether use of the refugia that have been identified are 1) sufficient to harbor fish, and 2) that refugia use does not increase the risk of disease that is likely higher based on the number of fish using the refugia. The Draft EPA CWR Plan must include a review of the known literature on fish diseases and the use of professional judgement on the risk and impact on salmon and steelhead from diseases caused by higher temperatures within CWR.

Recommendation: Given the evaluation by EPA in the Draft CWR Report, TCA recommends that EPA provide the federal and state action agencies with a set of actions that collectively, will prevent the extinction of salmon and steelhead in the Columbia and Snake Rivers.

The EPA CWR Plan must provide actions that have specific implementation and evaluation requirements for specific responsible parties. EPA must propose minimum standards, established deadlines, compliance reporting and likely other more specific action-oriented mechanisms. Lastly, the list of actions should be expanded to successfully address impending warming.

The EPA CWR Plan must address water allocation to ensure enough water will remain instream to meet the critical beneficial uses of cold water be present. EPA should provide a complete list of proposed activities – regulatory and voluntary – that can be employed by responsible parties in every CWR. Without specific, and far-reaching actions, the EPA will lose the chance to protect or restore CWR throughout the Columbia Basin.

The EPA CWR Plan should expand its proposed actions that will better address the human-caused warm water temperatures Establishing specific procedures, requirements, or deadlines for implementing and achieving a set of proposed actions as well as monitoring for attainment over time.

6) The Deschutes River must be given a higher and prioritized ranking because of its importance as a Cold-Water Refuge. While other CWRs provide important refuge from the Columbia River' warm waters, the Deschutes' unique and critical characteristics require more attention. Its large size, important location along the Columbia River, and its vulnerability to increasing temperatures all require additional attention and effective response actions. The Deschutes is the third largest CWR and its large size within and adjacent to the Columbia is vital as evidenced by its heavy use by migrating salmon and steelhead. The large volume and size are more significant considering its location on the Columbia as the only primary CWR between the Bonneville Dam and the mouth of the Snake River. In fact, the Deschutes CWR marks halfway point for salmon and steelhead migrating to the Upper Columbia and Snake Rivers and its significance increases because it located in the warmest stretch of the Columbia – between The Dalles Dam and John Day Dam. The Deschutes River is THE most important refugia for fish migrating to the Snake River confluence. TCA believes the EPA's own analysis proves that the Deschutes River's size and location warrant higher priority.

Aside from the case for a higher priority for the Deschutes, the EPA CWR Plan is deficient in proposing specific actions necessary to protect the sources of the cold water that creates the Deschutes CWR. The need for action is amplified when considering that the current condition of the lower Deschutes River, since 2010, is only approximately 2 degrees Celsius cooler than the Columbia in June, July and parts of August due to a change in the operation of the Pelton-Round Butte Dam Complex whose revised operations were approved by FERC. Warmer and less clean water is released from the dam complex until early to mid-August, when water releases are modified, and colder water is released – coinciding with peak migration of upriver steelhead and salmon in the Columbia. As the warming trends proceed as predicted by the Plan, the Deschutes CWR's could also cease to exist and river's temperature could become lethal for cold water fish by 2040.

Losing the Deschutes CWR would have an enormous impact on migrating salmon and steelhead. The Deschutes River and its CWR should receive additional, prioritized, and targeted attention in this protective plan because of its size, location, and vulnerability. The importance of the Deschutes River's Cold-Water Refuge (CWR) to the long-term sustainability of Columbia River's salmon and steelhead cannot be understated.

Recommendation: The Deschutes River is critical habitat for steelhead and bull trout. EPA must propose that Oregon reduce water temperatures throughout the Deschutes River Basin and its tributaries. These actions would benefit cold-water dependent species throughout the Deschutes and the CWR itself. The EPA CWR Plan should identify specific streamflow protection actions throughout the Basin, including:

a. Require a review of the Pelton-Round Butte Dam license so that its operations do not jeopardize the significance of the Deschutes CWR,

b. Require consultation between the EPA, USFWS and NOAA Fisheries on the Upper Deschutes HCP (currently in draft form) to insure it does not harm the Deschutes CWR,
c. Require that ODEQ and OWRD examine the current surface water use and groundwater mitigation program in the Deschutes contributes to the future effectiveness of the Deschutes CWR and does not diminish future cold-water inputs to the Deschutes River.
d. Require that EPA and NOAA Fisheries consult over the impact of any fisheries that adversely impact the effectiveness of the Deschutes CWR for migrating ESA-listed wild salmon and steelhead.

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END OF FORMAL COMMENT

Additional Resources

Notes from 55 Scientist' Letter on Removing Snake River Dams 10-22-19

"Reservoir heating is exacerbated today by a warming climate. Historically, construction of FCRPS dams and reservoirs increased slack water surface area and decreased water velocity compared to a free-flowing river; increased slack water surface area now serves as a collector of solar energy, and the slow-moving water allows more time for heat to accumulate, compared to free flowing conditions (Yearsley et al. 2001, EPA 2003, FPC 2015)."

"EPA stated that an un-impounded river could, on average, be 3.5°C/6.3°F cooler in late summer and early fall when measured at the site potential for John Day Dam. EPA modeling also showed that, when considered collectively, the four lower Snake Dams could affect temperatures up to a potential maximum of 6.8°C/12.2°F (EPA, 2003). The impact of additional heating in lower Snake River reservoirs is clear, and it can drive water temperatures above 68°F for extended periods in late summer and early fall – dangerous for salmon and
steelhead.

"In summer 2015, 96% of endangered adult Snake River sockeye salmon died during their upriver migration through the lower Columbia and Snake Rivers, due to the combined effects of very hot air and water temperatures, low flows, and the presence of mainstem dams and their associated reservoirs (FPC 2015). The extreme conditions faced by migrating adult salmon in 2015 will become more frequent as the climate continues to warm.

"Studies indicate that all Snake River salmon species (sockeye, spring/summer Chinook, fall Chinook and steelhead) experience reduced survival at elevated water temperatures above 18°C (64°F), which is, notably, 2°C cooler than the established water quality standard of 20°C (68°F). (Crozier et al. 2014, McCann et al. 2018).

"The option of breaching lower Snake River dams, combined with existing or modified cold water releases, has enormous potential to alleviate the very serious problem of elevated summer temperatures in the lower Snake River, and increase the survival rate from out-migrating smolts to returning adults (smolt-to-adult return; SAR) for all salmon species (Marmorek et al. 1998, Peters and Marmorek 2001, McCann et al. 2017). It would also significantly increase available spawning and rearing habitat for imperiled Snake River Fall Chinook.

"No other action or actions can significantly lower summer water temperatures in the lower Snake River on a long-term basis, while also providing additional cooling in the lower Columbia.

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Excerpted Notes from the EPA CWR Report on salmon and steelhead information

Summer Steelhead:

On a given day when Columbia River temperatures typically exceed 20°C, the vast majority of steelhead (80-90%) are in CWR (Page 30 EPA CWR Rept.)

Steelhead that pass Bonneville Dam in late July and August wait until September to pass The Dalles Dam. Since more steelhead are entering the Bonneville reach than leaving the reach during this time, it results in an accumulation of steelhead within the Bonneville reach (Page 30 EPA CWR Rept.)

Optimal temperatures for migrating adult salmon and steelhead are in the 12-16°C (53.6 to 60.89ºF) range with minimal adverse effects below 18°C (64.4ºF) (EPA 2003). The States of Oregon and Washington have a 20°C (68ºF) maximum water quality criteria for the Lower Columbia River, which is consistent with EPA's recommended criteria for large mainstem rivers that naturally warm to this level and are used by salmon and steelhead for migration (EPA 2003). (Page 45 EPA CWR Rept.)

"Richter and Kolmes (2005) reported the upper optimal temperature for adult salmonid migration to be 18o C. (64.4o F). Marine (1992) suggested that an incipient upper lethal temperature limit for pre-spawn adult salmonids was 17o C (62.6oF) to 20o C (68.0oF) and McCullough et al. (2001) indicated that exposure of adult salmonids to constant temperatures of 21o C(69.8oF) to 22o C(71.6oF) for one week was lethal.

By comparison, <10% were detected in refugia when main stem temperatures were between 14C (57.2 F) and 18 8C (64.7 F). With continued warming, the likelihood of thermoregulation rapidly increased, with >70% of the aggregate run using refugia at the warmest times (i.e., 21 8C) (71.2 F.) (Keefer et al. 2009)

Energy Loss under Different Scenarios: CWRs increase the diversity of energy conserving migration strategies.

"The energy loss (fat loss) within the model reach (Bonneville Dam to Snake River confluence) increased for all four populations with increased Columbia River temperatures. The summary of energy loss for Grande Ronde summer steelhead for the different scenarios. If too much energy is lost during migration and pre-spawning, a fish may not have enough energy to complete spawning. (EPA CWR Rept. page 69)

"Snake River Steelhead: The use of CWRs extends the range of arrival dates at the Snake River confluence, which may decrease energy loss for those late arriving individuals who will then migrate through the Snake River when it is cooler. Therefore, while the entire population does not see an energy benefit in the model reach of the migration corridor. CWRs potentially increase the diversity of energy conserving migration strategies." (EPA CWR Rept. page 69)

"Current steelhead and fall Chinook use of CWR appears to provide some individuals physiological and energetic benefits by allowing them to avoid warm mid-summer Columbia River temperatures and continue migrating upstream when temperatures have cooled. The CWR provide for a diversity of successful migration strategies. (EPA CWR Rept. page 74)

Tributary temperatures exceeding 18°C, although still serving as CWR if more than 2°C cooler than the Columbia River, are at levels associated with increased risk of disease and energy loss. (EPA CWR 2019 Rept. page 66)

"We used radiotelemetry to assess thermoregulatory behaviors for 14 populations (n = 3985) of adult summer steelhead (*Oncorhynchus mykiss*) as they passed through the Columbia River migration corridor. Steelhead use of small cool-water tributaries (''thermal refugia'') rapidly increased when the Columbia River reached a temperature threshold of about 19 8C. (67.64º F) When main stem temperatures were warmest (i.e., >21 8C) (76.24º F), more than 70% of the tagged fish used refugia sites and these fish had median refugia residence times of 3–4 weeks. Thermoregulatory responses were similar across populations, but there were large among-population differences in the incidence and duration of refugia use likely linked to population-specific migration timing patterns. In survival analyses using 1285 known-origin steelhead, fish that used thermal

refugia were significantly less likely to survive to natal basins, were harvested at relatively high rates in refugia tributaries, and had greater unknown mortality in the main stem. These results highlight the trade-off between the presumed physiological benefits of thermal refugia use and a likely increase in harvest and other mortality risks that arise when preferred thermal habitats are severely constricted." (Keefer 2009).

This scientific evidence indicates that the approved EPA temperature criteria (EPA 2003) that the States of Oregon and Washington adopted (20ºC (68.0ºF) does not protect salmon and steelhead in the Columbia River and other waters of these states. Oregon has closed the thermal refuge at the mouth of the Deschutes to fishing to protect steelhead when Columbia River water temperatures reach 68º F. in 2018 and 2019. This was well after threatened wild steelhead were using the Deschutes thermal refuge and were vulnerable to the fishery.

"Fish Passage Center conducted an analysis of the survival rates between these two dams as a function of Columbia River water temperature. ***Figure 4-1*** shows that the survival rate for steelhead (PIT-tagged 2003-2015) decreases at 18°C (64.4o F) temperatures and higher, and there is about a 10% reduction in survival at 21-22°C temperatures compared to 18°C and below temperatures." (EPA CWR Report page 46)

Fall Chinook:

The survival rates for fall Chinook at three different temperature ranges (below 20°C, 20-21°C, and >21°C) with a decline in survival with warmer temperatures. There is approximately a 7-8% decrease in survival for temperature >21°C versus below 20°C. ***Figure 4-2*** also shows that adults that were transported in barges down the Columbia River as juveniles have less survival than those that migrated downstream in the Columbia River. (EPA CWR Rept. page 46)

"the migration survival of an individual steelhead or a fall Chinook salmon between Bonneville Dam and McNary Dam decreases by 7-10% as temperatures rise above 21°C. It should be noted that other factors, such as increased harvest of fish that moved into CWR due to the rise in temperature, could be contributing to the decreased survival rates. (EPA CWR Rept. page 48)

"While early fall Chinook migrants are exposed to warmer temperatures in comparison to later migrants, using CWR as a coping strategy can influence the amount of energy reserves a fish has at time of spawning. Holding in CWR and migrating later when Columbia and Snake River temperatures are lower can reduce thermal exposure and energy loss." (EPA CWR Rept. page 52)

"Fish using CWR experienced lower cumulative temperatures and energy loss, which increased the proportion of early migrants surviving to spawn. For instance, among fall Chinook migrating in August, those that used CWR had a higher proportion with sufficient energy to complete spawning than those that did not." (EPA CWR Rept. page 52)

"As average temperatures increased, Chinook who did *not* utilize CWR were forced to migrate later in the year from Bonneville Dam to have enough energy reserves left to spawn. However, for Chinook that *did* utilize CWR during migration under increasing river temperatures, passage dates from Bonneville Dam were on average 18-27 days earlier than fish that did not utilize CWR. This finding supports the conclusion that using CWR during upriver migration may provide early migrants with an energetic advantage over fish that do not use them. Further, the proportion of fish that seek and use thermal refuge is likely to increase as temperature increases (Connor et al. 2018). (EPA CWR Rept. page 54)

Snake River Fall Chinook: "The river temperature during the latter part of the fall Chinook migration, when the fish are preparing to spawn, is an important factor in spawning success, and CWR in the Lower Columbia River can serve to allow the fish to arrive at the spawning grounds when river temperatures are cooler. (EPA CWR Rept. page 69)

Sockeye Salmon:

"Sockeye salmon migrate through the Lower Columbia River in June and July prior to the warmest summer river temperatures that typically occur in August. If sockeye salmon were to delay their migration by entering CWR, they would end up encountering warmer Columbia River temperatures during their continued upstream migration. (EPA CWR Rep. page 54)

"The unusually warm June and July Lower Columbia River temperatures that occurred in 2015 illustrate the relationship between warmer river temperatures and increased mortality of sockeye salmon. As shown in 2015 Lower Columbia river temperatures were significantly warmer than average during the June-July sockeye run, reaching 20°C (68°F) at the peak of the run, in late June. Typically, temperatures are about 16°C (61°F) during the peak of the sockeye run in late June." (EPA CWR Rep. page 55)

"In 2013 and 2014, for sockeye migrating through Lower Columbia River when temperatures exceeded 64°F (18°C) survival decreased, most dramatically for Snake River sockeye." (EPA CWR Rep. page 56)

"Increasing July river temperatures at Bonneville Dam (Panel B) over the past 60 years has resulted in earlier migration of Columbia River sockeye salmon. The median passage date, which historically was the first week of July, is now the last week of June." (EPA CWR Rep. page 57)

"Thus, as July river temperatures have increased, the July sockeye migrant mortality has increased. Over time, because the June sockeye migrants are more successful, the genetic traits of the June migrants increase as a percentage of the population, contributing to the shift in migration timing (Crozier et al. 2011)." (EPA CWR Rep. page 57)

Summer Chinook:

"Summer Chinook, like sockeye salmon, migrate through the Lower Columbia River in June and July prior to the warmest summer temperatures. Summer Chinook likely do not use CWR, except for brief periods of respite. Summer Chinook also have increased adult mortality with increased temperatures. 2013, 2014, and especially 2015 had above normal river temperatures during the June-July migration period for Snake River summer Chinook passing Bonneville Dam. The decreased survival rate of Snake River summer Chinook between Bonneville and McNary dams for 2013, 2014, and 2015 relative to the average survival rate (80%). The warmer-than-average temperatures in these years is likely a contributing factor to the decreased survival. (EPA CWR Rept. page 58)

4.3 FISHING HARVEST OF SALMON AND STEELHEAD IN COLD WATER REFUGES

"the correlation between increased Columbia River temperature and decreased migration survival of adult steelhead and fall Chinook in the Lower Columbia River could also be associated with increased fishing harvest in CWR at warmer Columbia River temperatures. Fishing harvest in CWR also makes it difficult to directly measure the benefits of CWR to migrating adult salmon and steelhead. EPA CWR Rept. page 48)

Keefer et al. (2009) analyzed the migration success of steelhead that used CWR versus those that did not use CWR. This study found that migration success to the spawning tributaries for those steelhead (wild and hatchery) that used CWR was about 8% less than those steelhead that did not use CWR, which initially suggests CWR use is not beneficial. However, the study also indicated that fishing harvest in CWR explained the decreased survival. Wild steelhead using CWR, which are required to be released when caught, experienced a 4.5% decrease in survival during migration to their spawning tributaries compared to wild steelhead that did not use CWR. This increased mortality, however, could be associated with catch and release mortality and incidental catch of wild steelhead in CWR.

"The mortality appeared to be most directly related to fisheries inside refugia where reported harvest rates were about 13% for upper Columbia steelhead populations and ranged from 4%–17% for the various Snake River groups. "On balance, we expect that population-level risk of harvest inside thermal refugia is likely greatest for fish that enter the study reach during the peak of thermoregulatory behavior from late July through early September. (Keefer 2009)

"In the Columbia River system, where many important refugia have already been identified, managers must now balance demands for fisheries with more conservative restrictions in refugia sites to protect populations listed under the Endangered Species Act." (Keefer 2009)

"NOAA (2017) also found that the survival rate for steelhead (wild and hatchery) from The Dalles Dam to McNary Dam was about 9% less for those steelhead that used CWR (detected in the Deschutes River) versus those that did not use CWR.

NOAA's assessment also provided data on fish harvest in the Deschutes River that explained the reduced survival for those steelhead using CWR." (EPA CWR Rept. page 48)

"Due to fishing harvest in CWR, it is difficult to directly measure the extent to which steelhead and fall Chinook CWR use may lead to higher migration survival rates due to avoidance and minimization of exposure to warm Lower Columbia River temperatures. Similarly, it is difficult to separate how much of the observed 7-10% decrease in steelhead and fall Chinook survival in the Lower Columbia River when temperatures exceed 21°C is due to temperature effects versus fishing harvest. More sophisticated studies, perhaps during periods with no fishing, would likely be needed to accurately answer these questions quantitatively." (EPA CWR Rept. page 48)

Recommendation: Steelhead begin to use CWR (<10%) when CR temperatures are at 57.2F to 64.7F. Since these are fish threatened with extinction CWR temperatures at this level should be a trigger for no angling. With climate change CR water temperatures will increase earlier than this data shows for current conditions so a precautionary trigger for angling use in these CWR should be set at the lower temperature level.

Salmon and Steelhead Migration and avoidance of warm water temperatures by using CWR.

"…steelhead as they migrate through the Bonneville reach. As shown, on a given day when Columbia River temperatures typically exceed 20°C (68.0° F), the vast majority of steelhead (80-90%) are in CWR and only a portion are in the Columbia River. ((M. Keefer, personal communication, August 31, 2017). Page 30

"The density associated with 18°C or cooler volume may be a better indicator of density, because steelhead residing for an extended period are likely to seek temperatures below 18°C (64.4° F). The maximum estimated density of steelhead is 0.16 steelhead per cubic meter, which is 407 steelhead in an Olympic-sized swimming pool.". Page 35

"There is a significant delay in steelhead passage over The Dalles Dam and accumulation of steelhead in the Bonneville reach during the period of summer maximum temperatures." Page 37

"Limited temperature data collected in the 1950s depicted in ***Figure 3-14*** shows summer peak temperatures were lower compared to current day temperatures. Current daily average temperatures exceed 20°C for about two months and exceed 21°C for one month, but during the 1950s daily average temperatures typically only exceeded 20°C for a short period (a week) and did not exceed 21°C. And, as described earlier, >20°C temperatures are associated with a high level of CWR use by steelhead. These data suggest steelhead use of CWR in the Bonneville reach was historically less than what we observe currently, and that steelhead are using CWR more today in response to increased summer temperatures of the Lower Columbia River." (Page 38)

"The estimated total number of SR steelhead using Deschutes River CWR in an average year is 27,659 (NOAA 2017a). Assuming 61% of all steelhead in Deschutes River CWR are SR steelhead, the total number of steelhead using the Deschutes River CWR in an average year is 45,343. (Page 40)

"As noted above, the overall percentage of SR steelhead that use the Deschutes River as CWR is 12-18%. In August, during peak river temperatures, the percentage rises to near 25% (NOAA 2017a). This percentage is less than the percentage of steelhead that use Bonneville Reach CWR, which is about 85% during peak temperatures. There are several possible reasons for this lower percentage of use of the Deschutes River: 1) the percent of steelhead using the Deschutes River reported here does not capture use of the Deschutes plume only; 2) the Deschutes River is just one CWR on one side of the river and the Bonneville Reach CWR consists of 7 primary CWR; and 3) steelhead are encountering the Deschutes River after many have already spent time in CWR in the Bonneville Reach and later in the summer as the Lower Columbia River begins to cool.

"Nonetheless, the Deschutes River is a heavily used CWR and is the only primary CWR between The Dalles Dam and McNary Dam." (Page 40)

"those steelhead populations with high CWR use are those where a high proportion of the population migrates through the Lower Columbia River when temperatures are warmest (i.e., late July through late August as reflected in the shaded area). Steelhead populations from the John Day, Umatilla, Grande Ronde, Imnaha, Yakima, Snake, Salmon, and Walla Walla all use

CWR to a significant extent. The steelhead populations that use CWR the least are those that mostly migrate through the Lower Columbia River before (Tucannon, Hanford, and Lyons Ferry) or after (Clearwater) the warmest temperatures." (Pages 40-41)

Note: The description above suggests that B-run steelhead utilize Deschutes CWR extensively.

"Similarly, those populations of fall Chinook that migrate through the Lower Columbia River in August and early September use CWR the most." (Page 43)

"The Snake River fall Chinook population has increased, so today we might expect a higher proportion of Snake River fall Chinook using CWR." (Page 43)

"Optimal temperatures for migrating adult salmon and steelhead are in the 12-16°C range with minimal adverse effects below 18°C (EPA 2003)." (Page 45)

"Both the States of Oregon and Washington have a 20°C maximum water quality criteria for the Lower Columbia River, which is consistent with EPA's recommended criteria for large mainstem rivers that naturally warm to this level and are used by salmon and steelhead for migration (EPA 2003). (Page 45)

"the adverse effects to migrating adult salmon and steelhead in the Lower Columbia River as temperatures rise above 18°C. In general, as temperatures rise, disease risk, stress, energy loss, avoidance behavior, and mortality rates increase. Sockeye are most susceptible to warm temperatures with limited mortality at 19-20°C and significant mortality at 20-21°C. Steelhead are also susceptible to these temperature ranges but exhibit avoidance behavior by seeking cold water refuges (CWR) as is demonstrated in this plan. Chinook are more tolerant to warm temperatures, with avoidance behavior (seeking CWR) and mortality occurring at higher temperatures (21-22°C and higher).

"the survival rate for steelhead (PIT-tagged 2003-2015) decreases at 18°C temperatures and higher, and there is about a 10% reduction in survival at 21-22°C temperatures compared to 18°C and below temperatures. (Page 46)

The survival rates for fall Chinook at three different temperature ranges (below 20°C, 20-21°C, and >21°C) with a decline in survival with warmer temperatures. There is approximately a 7-8% decrease in survival for temperature >21°C versus below 20°C. Adults that were transported in barges down the Columbia River as juveniles have less survival than those that migrated downstream in the Columbia River. (Page 46)

Life History Diversity:

"Thus, as July river temperatures have increased, the July sockeye migrant mortality has increased. Over time, because the June sockeye migrants are more successful, the genetic traits of the June migrants increase as a percentage of the population, contributing to the shift in migration timing (Crozier et al. 2011)." (EPA CWR Rep. page 57)

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EXCERPTED NOTES ON Draft 2019 EPA Draft Cold Water Refuge Plan CR (BM Bakke)

Columbia River Warming:

"August mean Columbia River temperatures at Bonneville Dam would have warmed at a lower rate and to a lesser extent without the dams since 1970.

"August mean temperatures in the Lower Columbia River are projected to increase from near 22°C currently to near 23°C in 2040 and near 24°C in 2080. August mean temperatures in the 23-24°C range would likely result in a significant amount of lethality to migrating adult salmon and steelhead. It is therefore likely that fewer salmon and steelhead will migrate in the Lower Columbia River during mid-July through August in the future under these warming trends, resulting in a change in the timing of salmon and steelhead runs. (Pages 63-64)

"Adult sockeye salmon and summer Chinook will likely continue to migrate earlier as already observed, with very few migrants in July.

"Adult fall Chinook are likely to migrate later with minimal migrants in August, and those that do migrate then will likely need to use CWR to have sufficient energy to successfully spawn.

"Steelhead may use CWR for longer duration to avoid peak temperatures, or they may not be able to use CWR over the mid-summer like they currently do because mainstem temperatures are too warm in late July/early August for steelhead to reach the CWR in the Bonneville reach. If the latter proves true, this may result in a bi-modal migration pattern for steelhead with early summer and late summer runs. However, whether these species can shift their migration timing to adapt to the rate of warming, and whether such shifts can be done successfully without disruption to their full freshwater life cycle, is uncertain (Crozier et al. 2011 and Keefer & Caudill 2017). (Page 64)

"The increase in summer river temperature has increased the use of cold water refuges (CWR) by steelhead and fall Chinook in the Lower Columbia River, and has contributed to increased mortality of migrating adult sockeye and summer Chinook, and is contributing to earlier sockeye salmon and summer Chinook runs." (Page 63)

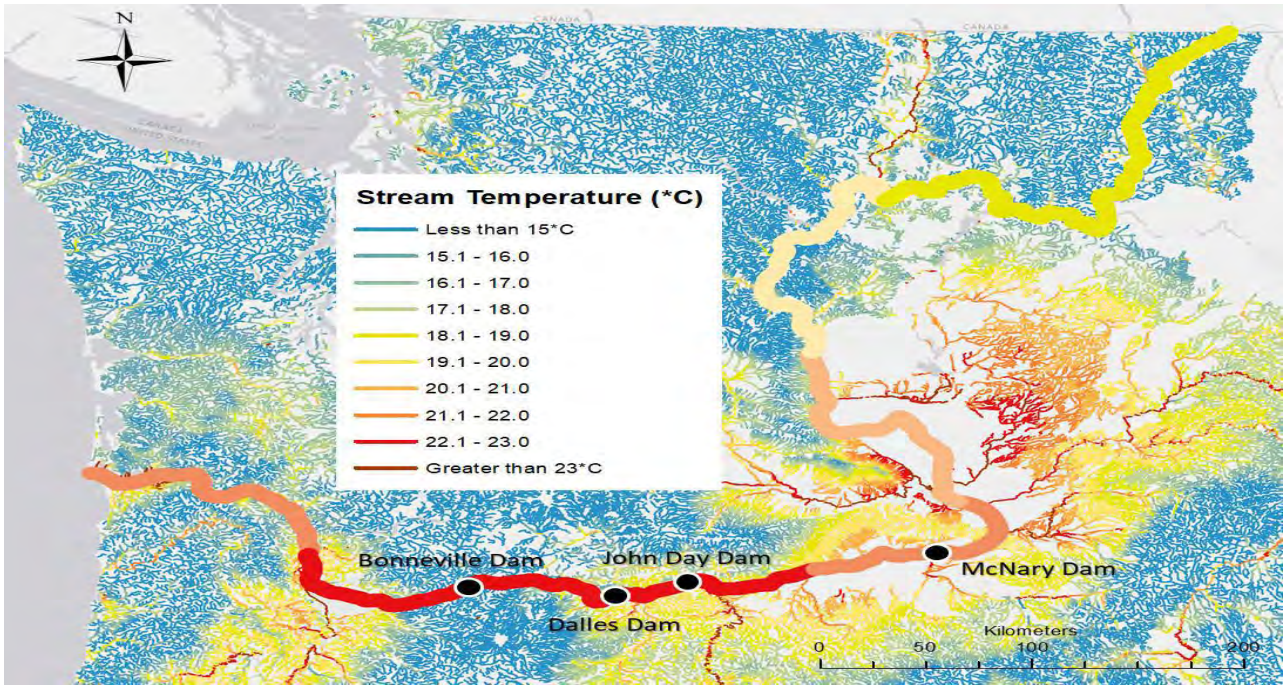
"By 2040, the Deschutes, Lewis, and Sandy Rivers are predicted to exceed 18°C (64.4° F), temperatures that will diminish their CWR function. By 2080, the Cowlitz, White Salmon, and Klickitat Rivers are predicted to have August mean temperatures exceeding 18°C, diminishing their CWR function.

In the following table, streams marked with (*) are summer steelhead natal streams or very important thermal refuges. These streams are also important for spring chinook. Wind River has an introduced hatchery stock and Hood River has a few wild spring chinook being replaced by Deschutes R. origin spring chinook. 20.0° C = 68.0°F and is the high temperature standard used by government as the upper limit for salmon.

Future temperature conditions of the Lower Columbia River tributaries

Tributary Name	Current (°C) (1995-2011)	2040 (°C)	2080 (°C)
Kalama R*	16.3	17.7	18.8
Sandy R	18.8	20.3	21.4
Washougal R*	19.2	20.7	21.8
Eagle Cr	15.1	16.5	21.8
Herman Cr.*	12.0	13.4	14.3
Wind R*	14.5	15.9	16.8
L White Salmon*	15.7	17.2	18.2
Hood R *	15.5	17.0	17.9
Klickitat *	16.4	17.8	18.8
Deschutes*	19.2	20.7	21.7

"There are two exceptions to this assumption in the Lower Columbia River. The first exception is fish mortality from fishing in CWR. As presented in Section 4.3, fish that enter into CWR have a lower adult migration survival rate through the Lower Columbia River compared to fish that do not use CWR. This appears to be explained by fish harvest in CWR and mortality of caught and released fish. However, the role of water quality standards under the Clean Water Act (CWA) is to ensure the water is of sufficient quality (in this case, water temperature) to protect designated uses of the water body (in this case, salmon and steelhead). Therefore, EPA did not consider fishing mortality in the assessment of CWR sufficiency, recognizing that the amount of fish mortality in CWR can change through fish management decisions. Thus, EPA evaluated the sufficiency of CWR in the Lower Columbia River as if there was no fishing to focus our assessment on water quality conditions to support migrating salmon and steelhead." (Page 67)



Estimated 2040 August mean water temperature in the Columbia River and tributaries

Note: Columbia River salmon and steelhead migration during July through September, the water temperature was high, and an estimated 250,000 sockeye salmon died in migration. According to the CSS (2019) report, the 2015 SAR estimate of 0.10% is the lowest among the CSS 20-year dataset.

In the Columbia River, reduced survival was observed at temperatures exceeding 20°C (68°F) (Naughton et al., 2005). Crozier et al. (2014) observed reduced sockeye survivals at temperatures above 18°C (64°F), and Keefer et al. (2008) observed 100% mortality at 22°C (72°F). (FPC Oct. 15, 2015)

In 2015 (April–August), temperatures exceeded the 20°C (68°F) standard at the Middle Columbia sites 43%–46% of the passage season. While 2015 had the highest proportion of days exceeding the 20°C (68°F) standard, Middle Columbia sites commonly exceeded the 20°C (68°F) standard for 20%–30% of the passage season over the previous ten years. These exceedances typically begin in mid-July or August whereas in 2015 exceedances began in late June. (FPC Oct. 15, 2015)

Bonneville Forebay Water Temperature Same for Tailrace

Year	Num. Days	Days Exceeding 68ºF	Prop. Days Exceeding 68ºF	Max Temp (º F)	First Day Exceeding 68ºF
2015	153	69 0.	45	73.2	24-Jun

"Oregon's CWR narrative standard stipulates the Lower Columbia River must have CWR that is sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body (i.e., Columbia River). Oregon, however, does not have quantitative metrics to define what is sufficient so this Chapter includes a framework to make this assessment given the current state of information available. (Page 67)

Note: *Water temperatures in the Columbia River can change from weather influence, so fish can migrate from a CWR to another one as river temperature fluctuates during changes in weather. Therefore, it is important to designate all areas with CWR important for fish survival during migration. It would be necessary for managers to give the benefit to the fish that are heat stressed as they migrate upstream rather than make assumptions about how salmon and steelhead use their environment and temperature cues relative to migration and use of CWRs. In addition, the lower Columbia River now flows during summer months at 70ºF (21ºC) and fishing is regulated for release wild threatened steelhead in that temperature by ODFW and WDFW as if it had no mortality downside, so one must wonder if these agencies are more concerned about commodity production than conservation. If their purpose was conservation the fishery would be closed when the River is 20ºC.*

"The second exception to the assumption that CWR are beneficial to migrating salmon and steelhead is that using CWR may induce fish to enter CWR and ultimately cause more harm due to the delay in their migration. As discussed in this Plan, sockeye salmon and summer Chinook migrate through the Lower Columbia River prior to the onset of the warmest summer temperatures, and extended CWR use would likely be harmful due to exposure to warmer conditions during their continued migration. With these two exceptions explained, the evidence presented in this Plan suggests that CWR use appears to be physiologically beneficial for those species that use CWR the most, which are summer steelhead and fall Chinook. (Page 66)

Thermal Value and Use by Salmonids in CR Quotes in EPA 2019

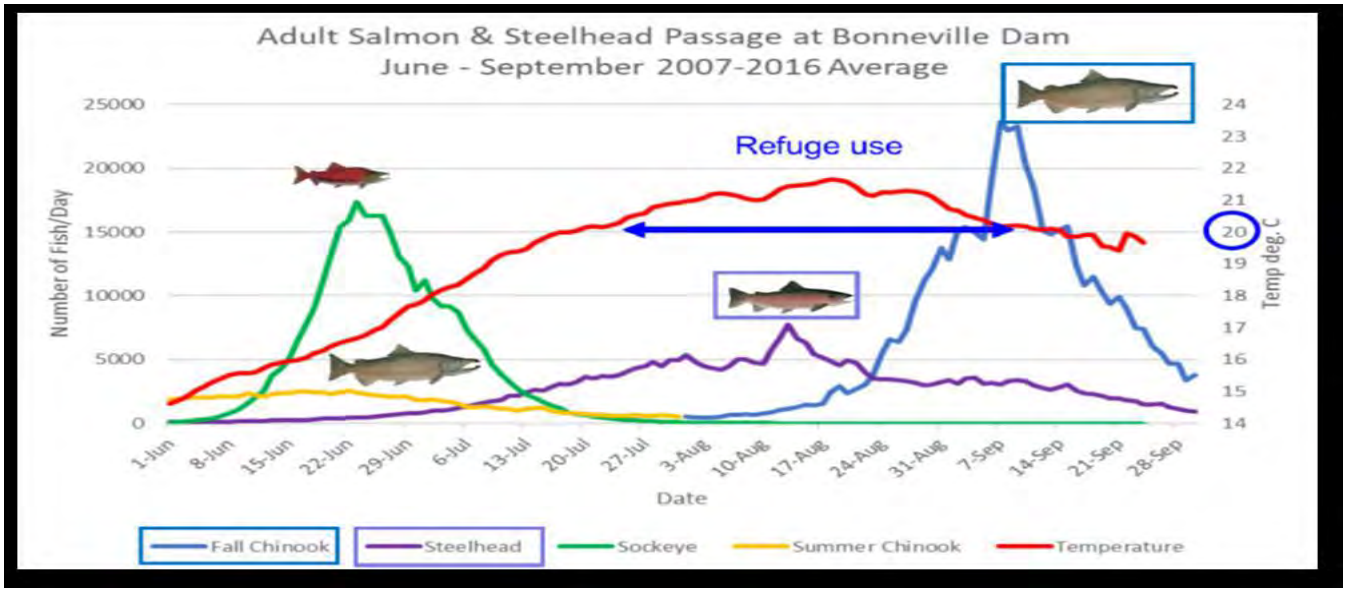


Figure 3-1 Salmon and steelhead Bonneville Dam passage and temperature (DART) Page 25

Page 52: "While early fall Chinook migrants are exposed to warmer temperatures in comparison to later migrants, using CWR as a coping strategy can influence the amount of energy reserves a fish has at time of spawning. Holding in CWR and migrating later when Columbia and Snake River temperatures are lower can reduce thermal exposure and energy loss."

Page 54: "Chinook who did *not* utilize CWR were forced to migrate later in the year from Bonneville Dam to have enough energy reserves left to spawn. However, for Chinook that *did* utilize CWR during migration under increasing river temperatures, passage dates from Bonneville Dam were on average 18-27 days earlier than fish that did not utilize CWR. This finding supports the conclusion that using CWR during upriver migration may provide early migrants with an energetic advantage over fish that do not use them. Further, the proportion of fish that seek and use thermal refuge is likely to increase as temperature increases (Connor et al. 2018)."

Climate Change Effects by 12 Major Cold-Water Refuge Columbia River Tributaries:

Page 83-87: -Cowlitz R.- **Climate Change**: In 2040, average August temperatures in the Cowlitz River are predicted to rise to 17°C compared to 23oC in the Columbia River. In 2080, August temperatures in the Cowlitz River are expected to rise further to 18°C compared to 24°C in the Columbia River. Therefore, the Cowlitz River could still be considered a marginal CWR by 2080. However, as temperatures rise, mountain glaciers which help the Cowlitz River stay cool, will recede. Studies at the University of Washington have shown that climate change will likely exacerbate low summer flows in the mainstem Cowlitz River, because of lower snowpack melt in the summer.

Pages 88-92: - Lewis R. - **Climate Change:** In 2040, August temperatures in the Lewis River are projected to rise to 18°C, compared to 23°C in the Columbia River. In 2080, August temperatures are expected to further rise to 19°C compared to 24°C in the Columbia River. Therefore, increases in Lewis River temperatures are expected to shift the refuge from an average quality refuge (16-18°C) to a marginal quality refuge (>18°C). Still, the Lewis River is expected to be 5°C cooler than temperatures in the Columbia River in the summer, even under climate change projections.

Page 96: - Sandy River: - **Climate Change:** In 2040, average August temperatures in the Sandy River are predicted to rise to 20°C compared to 23°C in the Columbia River. In 2080, August temperatures in the Sandy are expected to rise further to 21°C compared to 24°C in the Columbia River. Therefore, although the Sandy River will still be cooler than the Columbia River by 3°C in 2040 and 2080, the absolute temperature of the Sandy River will be higher, which decreases its benefit to salmon.

"A significant tributary with dams is on the Bull Run River, the drinking water source for the City of Portland. Historically, the unused water from the top of the thermally stratified Bull Run reservoirs was released to the Bull Run River and warmed temperatures in the Sandy. In the past few years, however, the Portland Water Bureau has used a selective withdrawal system to release higher volumes of colder water in the summer, which has resulted in colder waters reaching the Sandy. This along with other measures in the *Bull Run Water Supply Habitat Conservation Plan* (2008) have helped to reduce harmful effects to salmon from the Bull Run River reservoirs."

Page 101: Tanner Creek - **Climate Change:** In 2040, Tanner Creek's average August water temperature is projected to increase to 13°C while the mainstem Columbia River is projected to average 23°C. In 2080, average August water temperature in Tanner Creek is expected to rise by an additional degree to 14°C compared to 24°C in the Columbia River. Therefore, while water temperatures are projected to increase in future decades, Tanner Creek is predicted to provide a small plume of good quality refuge (<16°C) for migrating salmonids, even under climate change projections."

"It is important to note that temperature modeling of Tanner Creek occurred prior to the Eagle Creek Fire. Post-fire restoration work will be critical to ensure that the creek's water temperatures stay at or below the projected levels."

Page 104: Eagle Creek – "**Climate Change.** In 2040, average August temperatures in Eagle Creek are predicted to be 17°C compared to 22°C in the Columbia River. In 2080, August temperatures in Eagle Creek are expected to rise further to 18°C compared to 23°C in the Columbia River. Therefore, Eagle Creek is expected to shift from a good CWR (<16°C) to an average CWR (16-18°C), unless restoration actions such as increased riparian vegetation offset increasing water temperatures. Eagle Creek is still expected to be more than 5°C cooler than temperatures in the Columbia River in the summer, even under climate change projections.

Pages 108-109: Herman Creek- **Climate Change:** In 2040, average August temperatures in Herman Creek are expected to be 13°C compared to 22°C in the Columbia River. In 2080, August temperatures in Herman Creek are expected to rise further to 14°C compared to 23°C in the Columbia River. Therefore, Herman Creek will remain a good CWR (<16°C), even under future climate change projections. This contrasts with many other CWR in the Lower Columbia River where climate change will warm refuges to sub-optimal temperatures for salmon.

Herman Creek is designated by ODEQ for salmon and trout rearing and migration with a water quality criterion of 18°C for maximum water temperatures. The maximum water temperature modeled for Herman Creek is 13.7°C (1993-2011) (Appendix 12.18). Based on actual maximum temperature readings, the lower portion of Herman Creek is not on the 303(d) list for temperature impaired waters. Herman Creek and Herman Creek Cove provide 169,698 m3 of cold water, the size of approximately 68 Olympic-sized swimming pools, and the sixth largest CWR in the Lower Columbia River. In August, the creek has an average flow of 45 cfs.

Constructed levees protect Herman Creek Cove from inflow of warmer Columbia River waters. Thermal stratification of the water in the cove provides a cool layer of water. The CWR is estimated to be primarily."

"**Climate Change:** In 2040, average August temperatures in Herman Creek are expected to be 13°C compared to 22°C in the Columbia River. In 2080, August temperatures in Herman Creek are expected to rise further to 14°C compared to 23°C in the Columbia River. Therefore, Herman Creek will remain a good CWR (<16°C), even under future climate change projections. This contrasts with many other CWR in the Lower Columbia River where climate change will warm refuges to sub-optimal temperatures for salmon.

Page 116: Wind River – "**Climate Change:** In 2040, average August temperatures in the Wind River are predicted to be 16°C compared to 22°C in the Columbia River. In 2080, August temperatures in the Wind River are expected to rise further to 17°C compared to 23°C in the Columbia River. Therefore, the Wind River will change from being a good CWR (<16°C) to an average CWR (16-18°C), unless restoration actions such as increased riparian vegetation offset increasing water temperatures. The Wind River is still expected to be more than 6°C cooler than temperatures in the Columbia River in the summer, even under climate change projections.

Pages 118-119: Little White Salmon River - "**Climate Change:** In 2040, average August temperatures in the Little White Salmon River are predicted to be 15°C compared to 22°C in the Columbia River. In 2080, August temperatures in the Little White Salmon River are expected to rise further to 16°C compared to 23°C in the Columbia River. Therefore, the Little White Salmon River will change from being a good CWR (<16°C) to an average CWR (16-18°C), unless restoration actions such as increased riparian vegetation offset increasing water temperatures. The Little White Salmon River is still expected to be more than 7°C cooler than temperatures in the Columbia River in the summer, even under climate change projections."

"The mean August temperature of the Little White Salmon River is 13°C, almost 8°C cooler than the mainstem Columbia River in August, making the Little White Salmon River a good quality refuge (<16˚C). The lower portion of the Little White Salmon is designated for core summer salmonid habitat by the Washington Department of Ecology with a water quality criterion of 16°C for maximum water temperatures. The maximum water temperature modeled for the Little White Salmon is 15.6°C (1993-2011) (Appendix 12.18). Based on actual maximum temperature readings, the lower Little White Salmon River is not on the 303(d) list for temperature impaired waters.

The cooler water in the thermal refuge is primarily near the inlet of the Little White Salmon River into Drano Lake (~10°C–18°C), and at the bottom of Drano Lake (16°C–21°C), and migrating salmon are estimated to use up to 1.3 miles upstream as a refuge. Drano Lake makes the Little White Salmon River confluence the second largest CWR along the Columbia River, with a total volume of 1,101,126 m3, approximately 450 Olympic-sized swimming pools. The Little White Salmon River has a modest summer stream flow of 88 cfs. Fish leaving the Little While Salmon will travel 6.3 miles upriver before encountering the White Salmon River, the next CWR."

Page 126: White Salmon River - "**Climate Change**: In 2040, average August temperatures in the White Salmon River are predicted to be 17°C compared to 23°C in the Columbia River. In 2080, August temperatures in the White Salmon River are expected to rise further to 18°C compared to 24°C in the Columbia River. Therefore, the White Salmon River is expected to be an average CWR (16-18°C), even under climate change projections. The White Salmon River is still expected to be more than 6°C cooler than temperatures in the Columbia River in the summer."

"August temperatures in the White Salmon River are expected to rise further to 18°C compared to 24°C in the Columbia River. Therefore, the White Salmon River is expected to be an average CWR (16-18°C), even under climate change projections. The White Salmon River is still expected to be more than 6°C cooler than temperatures in the Columbia River in the summer."

Page 128-131: "Hood River - "**Climate Change:** In 2040, August temperatures in the Hood River are projected to rise to 16°C, compared to 23°C in the Columbia River. In 2080, August temperatures in the Hood River are expected to rise to 17°C compared to 24°C in the Columbia River. Therefore, increases in Hood River temperatures are expected to keep the Hood River as an average CWR (16-18°C). Still, the Hood River is expected to be more than 7°C cooler than temperatures in the Columbia River in the summer, even under climate change projections." Temperatures in August average 15.5°C, 6°C cooler than the Columbia River. This classifies the Hood River a good CWR.

"The lower portion of the Hood River is designated by ODEQ as core cold water habitat with an assigned water quality criterion of 16°C for maximum water temperatures. The maximum water temperature modeled for the Hood River is 19.1°C (1993-2011) (Appendix 12.18). Based on actual maximum temperature readings, the lower Hood River is on the 303(d) list for temperature impaired waters. The Hood River is the eleventh largest CWR in the Lower Columbia River with a cold-water plume volume of 28,000 m3,"

Page 133-137: Klickitat R. **- Climate Change:** In 2040, average August temperatures in the Klickitat River are predicted to be 18°C compared to 23°C in the Columbia River. In 2080, August temperatures in the Klickitat River are expected to rise further to 19°C compared to 24°C in the Columbia River. Therefore, the Klickitat River will change from being an average CWR (16-18°C) to a marginal CWR (>18°C), unless restoration actions such as riparian vegetation and increased water flows offset increasing water temperatures. The Klickitat River is still expected to be more than 5°C cooler than temperatures in the Columbia River in the summer, even under climate change projections.

Pages 138-140: Fifteenmile Creek- **Climate Change:** Like the other cold-water tributaries, average August temperatures in Fifteenmile Creek are predicted to increase approximately 1.5°C in 2040 for a temperature of 20.7°C, compared to 23°C in the Columbia River. In 2080, August temperatures in Fifteenmile Creek are expected to rise further to 21.7°C, compared to almost 24°C in the Columbia River.

Pages 133-147: Deschutes R.- **Climate Change***:* Currently, the Deschutes River averages 19.2°C in August. Modeled stream temperature data from NorWeST shows that by 2040, this is predicted to increase to 20.5°C, and by 2080 to 21.6°C. Comparatively, the mainstem of the Columbia River at river mile 201 where the Deschutes River enters currently averages 21.5°C in August. At this location the Columbia River is predicted to rise to 23.0°C and 24.0°C by 2040 and 2080, respectively. While the Deschutes River is predicted to remain relatively cooler than the Columbia River by about 2.5°C, by 2040, it is likely to be above accepted temperature thresholds for migration. By 2080, it is likely to reach lethal levels for steelhead and salmon.

Pages 148-152: Umatilla R. - **Climate Change**: In 2040, average August temperatures in the Umatilla River are predicted to be 21°C compared to 22°C in the Columbia River. In 2080, August temperatures in the Umatilla River are expected to rise further to 22°C compared to 23°C in the Columbia River. [therefore, the Umatilla River is not a CWR.] If the Umatilla River is restored, there could be a greater difference between Umatilla and Columbia River water temperatures to make the Umatilla River a CWR.

-End of Comment and Notes-

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Southwest Region 5 • 5525 South 11th Street, Ridgefield, WA 98642
Telephone: (360) 696-6211 • Fax: (360) 906-6776

December 2, 2019

Mr. John Palmer
EPA Region 10
1200 6th Avenue, Suite 155 (19-C09)
Seattle, WA 98101

Sent via email: palmer.john@epa.gov

Re: Columbia Cold Water Refuges Plan

Dear Mr. Palmer,

On behalf of the Washington Department of Fish and Wildlife, thank you for the opportunity to comment on the Columbia Cold Water Refuges Plan developed by the Environmental Protection Agency (EPA). The geographic scope of the EPA plan is the Lower Columbia River (LCR), which is defined as the area from the mouth to McNary Dam. Maintaining LCR water temperatures that support healthy native fish populations is critical to meet the social and cultural goals of the citizens of Washington state. Currently, summer water temperatures in the LCR exceed the approved standard of 20°C, which place native cold water fishes at risk to increased direct and indirect mortality from elevated temperatures. This is especially concerning given the imperiled status of most Columbia River salmon and steelhead that are listed for protection under the Endangered Species Act, and Washington state's commitment to Columbia River salmon recovery. Washington has invested substantial resources in salmon recovery including a coordinated statewide vision, the creation of the Governor's Salmon Recovery Office, the creation of regional salmon recovery boards to develop local solutions to salmon recovery, the development of regional salmon recovery plans adopted by the National Oceanic and Atmospheric Administration (NOAA), and billions of dollars in recovering imperiled salmon and steelhead populations along with federal, local, and private partners. As a result of recommendations from the Governor's Orca Task Force, actions have been funded to increase Columbia River salmon populations, which are an important food source to imperiled Southern Resident Killer Whales. Since all juvenile and adult Columbia Basin salmon and steelhead populations migrate through the LCR, maintaining LCR water temperatures that do not jeopardize salmon and orca recovery and the billions of dollars of investment by Washington state and its partners is a high priority for WDFW and the state as a whole.

The EPA indicates that this plan was developed to address NOAA's conclusion that the EPA approved LCR temperature standard of 20°C and the cold water refuges (CWR) narrative were likely to jeopardize the survival and recovery of salmon and steelhead listed under the ESA. The

report concludes on page 160 that: "the spatial and temporal extent of existing CWR appears to be sufficient under current and 20°C Columbia River temperatures but may not be in the future. Therefore, maintaining the current temperatures, flows, and volumes of the 12 primary CWR in the LCR is important to limit significant adverse effects to migrating adult salmon and steelhead from higher water temperatures elsewhere in the water body." Given the social and cultural importance of protecting and restoring Columbia Basin salmon and steelhead, we suggest that EPA use more robust science-based analytical methods to evaluate the impacts of elevated water temperatures on imperiled salmon and steelhead populations across the entire salmon and steelhead life cycle. Life cycle analysis using tools such as population viability analysis (PVA) is helpful to supporting conclusions regarding future population abundance and persistence. In contrast to focusing on the role of elevated temperatures in depressed salmon and steelhead populations and persistence probabilities, the EPA plan focuses on addressing the CWR sufficiency. It also relies heavily on the 2019 FRCPS BiOp that, "NOAA does not view adult migration conditions in this river segment as substantially impaired for upper Columbia and Snake River steelhead and Snake River fall Chinook based on adult survival statistics (NOAA 2019.)" While adult survival rates are informative in quantifying natural and human induced mortality, it is important to focus on adult mortality rates of natural origin salmon and steelhead since these populations have adapted to their natural environment and are the cornerstone of salmon recovery. The EPA used the NOAA results from their Table 6-1 to support CWR sufficiency; however, the adult survival rates in this table appear to include hatchery fish, do not capture the uncertainty and annual variability in survival, and include steelhead populations that migrate later in the season when water temperatures are less than 20°C. To provide a more realistic example of adult survival rates for natural origin Snake River steelhead that migrate during elevated water temperatures, we estimated adult survival rates for natural origin Asotin steelhead from the Snake River using a Cormack-Jolly-Seber model (Figure 1.) The adult survival estimates for Asotin steelhead are less than those used by EPA (Figure 4-3 and Table 6-1) and are generally consistent with those reported by Keefer et al. (2017.) Our assessment is that there is substantial mortality (~30%) between Bonneville (BON) dam and Lower Granite (LWG) dam for this population, and survival rates between BON and McNary (MCN) dam are much less than 90%, which is the EPA proposed sufficiency survival rate (EPA 2019, page 75.)

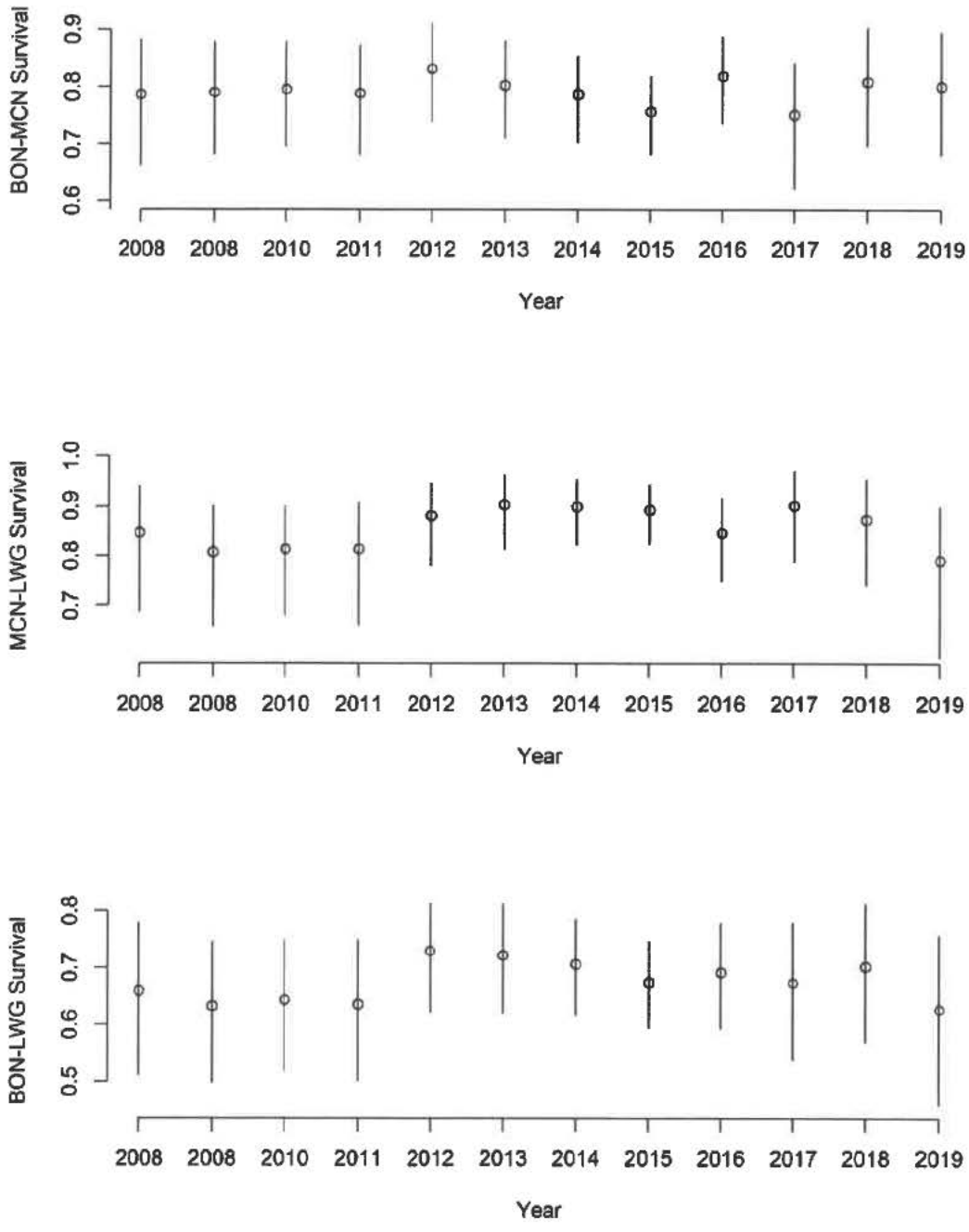


Figure 1. Adult survival rates from BON to MCN (upper panel), MCN to LWG (middle panel), and BON to LWG (lower panel) based on a survival analysis of passive integrated transponder (PIT) tags from natural origin Asotin summer steelhead. Open circles represent the median and vertical lines represent the 95% CI.

Another approach used to address the sufficiency of CWR was the use of the HexSim software. We appreciate the analysis summary from the HexSim modeling but model descriptions, assumptions, sensitivity analysis, and validation are not described in sufficient detail to evaluate and support the reported results. We encourage EPA to better describe the HexSim modeling. Due to these concerns, we relied on the Passive Integrated Transponder (PIT) survival presented in the EPA plan by the Fish Passage Center (FPC) for recent survival estimates. FPC showed that adult steelhead survival declined sharply as water temperatures exceed 18°C and adult fall Chinook salmon survival declines above 20°C (EPA 2019, page 47). For steelhead there is a ~ 10% decline in survival for every 2.5°C increase temperatures and an ~8% decline in survival for fall Chinook salmon as temperatures increase from 20°C to above 21°C. The FPC analysis reflected current use of CWR and included fish that did and did not use CWR. The observed increase in mortality associated with increasing water temperatures continues to place ESA-listed Columbia River and Snake River steelhead populations and Snake River fall Chinook salmon populations at risk of extinction and places the healthier salmon populations at risk of decline. These is substantial mortality at elevated water temperatures and when coupled with the low adult survival rates described above, it is our opinion the conclusion that existing CWR appear to be sufficient is not supported by the data and reported analysis for these species.

The EPA plan is incomplete because the potential impacts of decreased survival and productivity due to elevated water temperature were not addressed across the life cycle of salmon and steelhead using the LCR. For example, we recommend the EPA plan quantitatively address possible negative impacts in survival and productivity due to elevated water temperature in the following areas: 1) adult salmon and steelhead populations that did not use CWR (e.g. sockeye salmon and spring and summer Chinook salmon); 2) juvenile salmon populations that migrate through the LCR during elevated water temperatures (e.g. fall Chinook salmon); 3) elevated water temperatures in fish ladders; 4) cumulative impacts of increased temperature at locations upstream of the LCR (e.g. Snake River salmon and steelhead populations in the lower Snake River); 5) potentially increased impacts due to straying by adult salmon and steelhead that were transported as juveniles, particularly for the portion of the juvenile populations that are transported in response to elevated instream temperatures; 6) temperature impacts in the context of declining salmon and steelhead populations; and 7) clarifying the time period to which the EPA plan applies.

Salmon Population with Minimal Use of CWR

The water temperatures during June and July 2015 in the LCR were well above the recent average temperatures and exceeded 20°C. NOAA estimated the direct mortality to adult sockeye salmon ranged from 40% to 95% primarily due to high water temperature during the LCR migration period (NOAA 2016). The Snake River sockeye salmon population, which is listed as endangered under ESA, had the highest mortality, which ranged from 74% - 95%. In addition, the weekly sockeye salmon mortality was near 10% at water temperatures less than 19°C and generally above 80% at water temperatures greater than 21°C. In 2015, adult sockeye salmon also experienced lower migration survival rates in upstream reaches as fish returned to natal spawning areas possibly due to delay in migration, depletion of energy stores through heightened respiration, potentially reduced productivity due to deformation of eggs, decreased viability of gametes, and increased incidence of disease. The mortality of adult sockeye salmon that

remained in river or were transported as juveniles between Bonneville Dam and their natal spawning area was 100% and 97%, respectively (NOAA 2016, Table 4). The high mortality experienced by adult sockeye salmon in 2015 provides strong evidence that endangered Snake River as well as non-listed upper Columbia River sockeye salmon are currently at high risk for increased direct and indirect mortality when water temperatures exceed the temperature standard and the survival benefits from CWR are not realized. To prevent increased mortality for this species from elevated water temperatures, we recommend EPA directly address actions to achieve the LCR water temperature standard.

Populations at Low Abundance

The direct and indirect mortality of salmon and steelhead due to elevated water temperatures needs to be placed in context of the population status. Most Columbia River salmon and steelhead populations were proposed for protection under ESA in the 1990s. Some of these populations were proposed as endangered due to their low abundance because populations at low abundance are at higher risk of extinction compared with populations at high abundance. Columbia River populations have recently declined to levels near those in the 1990s (Figure 2) and we recommend EPA address survival reductions due to elevated water temperatures for all Columbia Basin salmon and steelhead populations that migrate when temperatures exceed the water temperature standard.

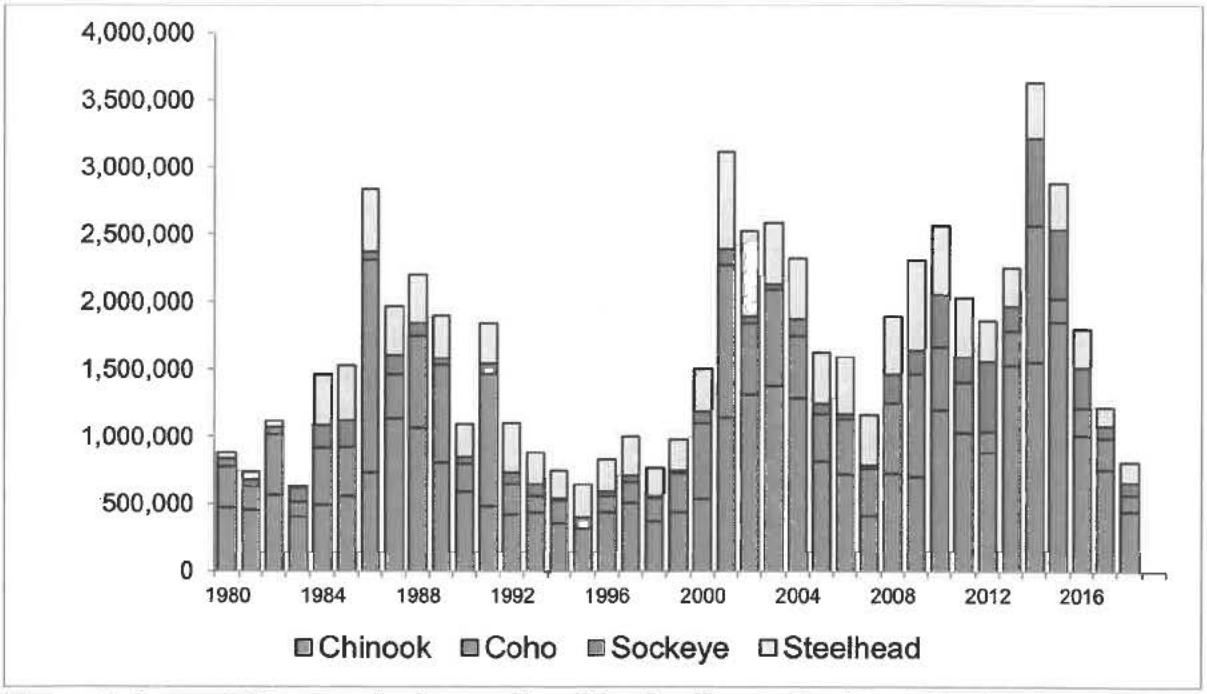


Figure 2. Figure 2. Returns of salmon and steelhead to the mouth of the Columbia River (Source US v. OR Technical Advisory Group).

Recently, NOAA Fisheries provided notice that the ESA listed Snake River steelhead population has triggered the "Early Warning" indicator due to low abundance and rapid decline. While we are concerned with all Snake River steelhead populations, we are very concerned with the impacts from elevated water temperatures on the Tucannon and Asotin populations, which are

small and have experience a recent severe decline. Asotin Steelhead population have declined from above 1,000 spawners in 2011 to just above 100 spawners in 2018 (Figure 3). Since many of the Asotin steelhead pass when the LCR water temperature standard is exceeded, modeling survival impacts due to elevated water temperatures would be useful for the Asotin or Tucannon steelhead population to address CWR sufficiency.

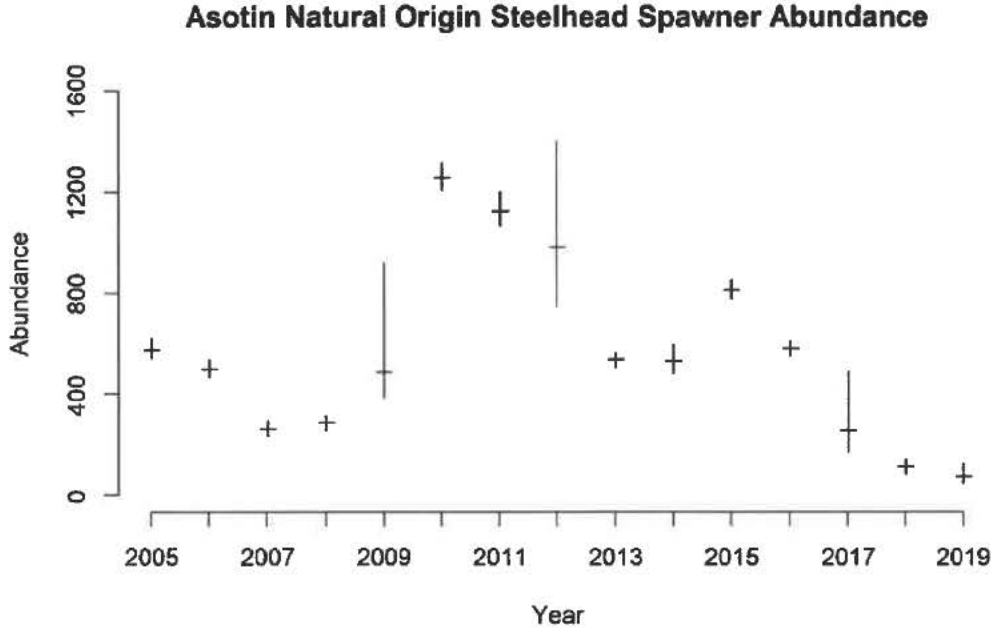


Figure 3. Adult abundance estimates for natural origin Asotin summer steelhead by spawning year. Horizontal lines represent the median and vertical lines represent the 95% CI.

Fisheries Impacts

As pointed out in the EPA plan, steelhead and fall Chinook salmon use CWR and fishery impacts in the mainstem LCR and CWR have direct and indirect impacts to adult salmon and steelhead. Mark selective fisheries are implemented for all steelhead and most salmon fisheries by Washington and Oregon. This requires anglers to release natural origin fish as determined by the presence of an adipose fin. All mainstem fisheries (downstream of the Highway 395 Bridge near Pasco, Washington) are managed not to exceed impact rates of 2% on natural origin steelhead. In years of low steelhead abundance, Washington and Oregon fisheries managers reduced recreational fishery impacts to less than 1%. Treaty fisheries, which occur between BON and MCN, are managed based on an abundance-based harvest rate schedule. LCR and CWR salmon and steelhead fisheries have been approved in the US v. OR Fisheries Biological Opinion (NOAA 2018).

Since steelhead use CWR and fishery impacts are a concern, we extend the above Asotin Creek survival model to account for impacts from the treaty and recreational fisheries from BON to LWG. We used fishery impact rates from the 2019 Joint State Staff reports, which include direct harvest estimates from the treaty and indirect (catch and release) impacts from the recreational fishery, which also includes recreational fishery impacts from catch and release of natural origin steelhead in CWR (ODFW and WDFW 2019, WDFW and ODFW 2019). Since Asotin steelhead

are considered part of the steelhead Group A management unit, we applied the Group A natural origin fishery impact rates in our analysis. Our results are summarized in Figure 4. Treaty fishery impacts are ~5% in most years and recreational impacts are <2% between BON and MCN including CWR. Recreational fishery impacts between MCN and LWG are < 1%. The increased survival, assuming no fisheries, is similar to those provided by NOAA in Figure 4-3 (EPA 2019, page 50). When fishery impacts are accounted for, the BON to MCN adult steelhead survival rates for the Asotin population do not reach the 90% survival threshold in the LCR proposed for sufficiency by EPA.

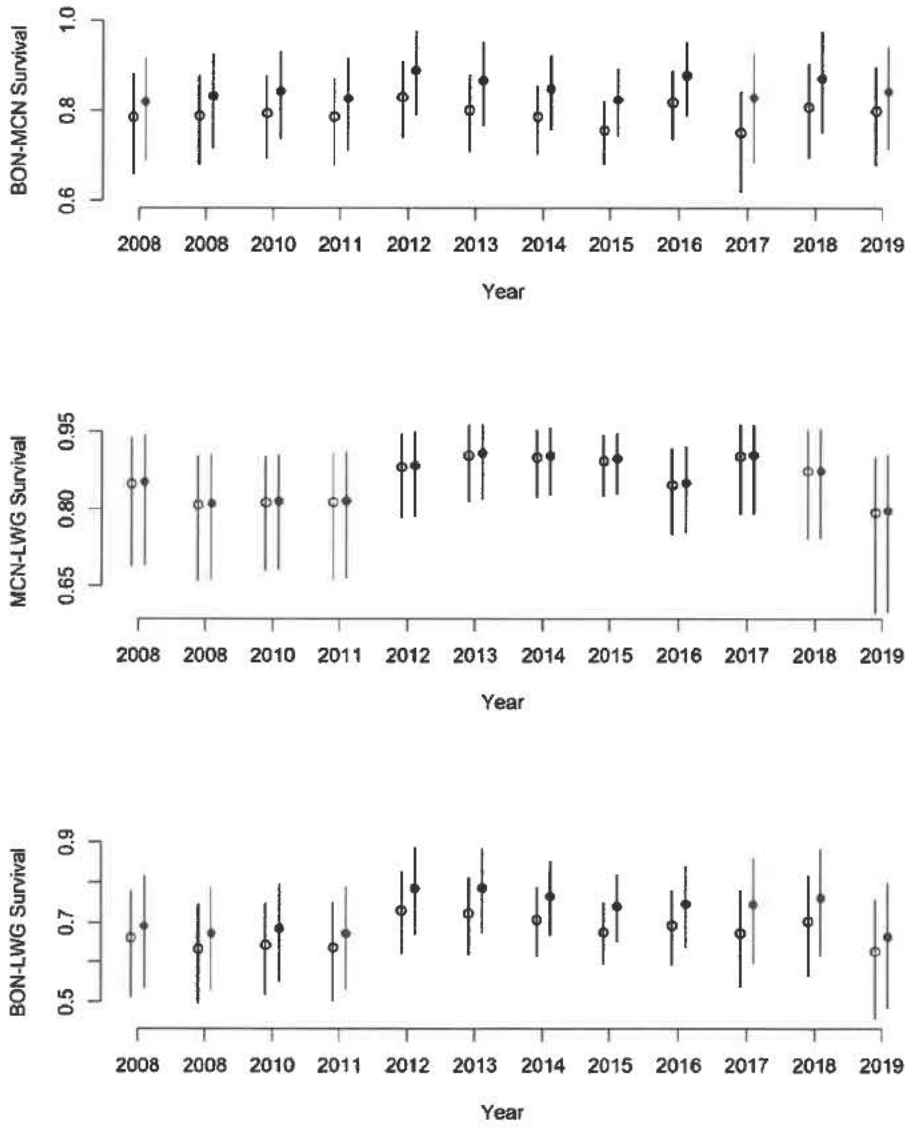


Figure 4. Adult survival rates from BON to MCN (upper panel), MCN to LWG (middle panel), and BON to LWG (lower panel) based on a survival analysis of passive integrated transponder (PIT) tags from natural origin Asotin summer steelhead. Open circles represent the median survival with fisheries, closed circles represent the predicted median survival without fisheries, and vertical lines represent the 95% CI.

Increasing Water Temperatures

The EPA plan also analyzed possible salmon and steelhead response due to a predicted increase in water temperature from climate change, and concluded that due to predicted gradual warming of the Columbia River by 2040 there's a "significant risk that the current amount of CWR will not be sufficient to minimize the risk to migrating salmon and steelhead" (EPA 2019, page 76). Since water temperatures are expected to increase from the present to 2040, salmon and steelhead mortalities from exposure to elevated water temperatures are also expected to increase. If the plan's predicted increase in water temperatures due to climate change occurs as predicted in 2080, there is a high probability that thermal blockages to adult upstream salmon and steelhead migration will occur. If thermal blockages occur and fish do not use or have access to quality CWR (e.g. between the Deschutes (RM 201) and MCN (RM 291)), significant mortality, even for steelhead that benefit from CWR, could occur as exhibited by sockeye salmon in 2015. Based on predicted increases in water temperature between 2040 and 2080, thermal blockages may be the largest single threat to the persistence of Columbia River salmon and steelhead in the later part of the 21st century, and it will exacerbate current mortality due to elevated water temperatures. Given the limited tools to address increased water temperatures (e.g. riparian plantings, floodplain connectivity, or shaping flows from upstream reservoirs) and the years it takes to slow or stop the increase in water temperatures, we strongly recommend that the EPA consider immediate implementation of aggressive actions to limit increases in water temperatures in CWR and also call for aggressive actions to limit or reverse further increases in water temperatures in the mainstem Columbia and Snake rivers and their tributaries.

Thank you for your consideration of these comments. For a portion of our response we focused on survival of natural origin Asotin summer steelhead to illustrate our concerns in the EPA plan. We recommend EPA to pursue additional analyses that we identified in our fourth paragraph to support the temperature standard and CWR narrative for other salmon and steelhead populations. We hope these comments are helpful as EPA addresses LCR water temperatures that continue to cause direct and indirect mortality to Columbia River salmon and steelhead populations.

Sincerely,

Daniel J. Rawding
Columbia River Salmon Recovery Policy Coordinator

References

Keefer, M.L., & others C.C. 2017. Assembly and analysis of radio-telemetry and temperature logger data from adult Chinook salmon and steelhead migrating through the Columbia River Basin. Prepared for Tetra Tech and the U.S. Environmental Protection Agency. Technical Report 2017-1.

NOAA Fisheries. 2016. 2015 Adult Sockeye Salmon Pass Report. National Marine Fisheries Service.

NOAA Fisheries, US Fish and Wildlife Service, and Bureau of Indian Affairs. 2018. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response: Consultation on effects of the 2018-2027 U.S. v. Oregon Management Agreement. NRc-2017-7164.

ODFW and WDFW. 2019. 2019 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and Other Species.

WDFW and ODFW. 2019. 2019 Joint Staff Report: Stock Status and Fisheries for Fall Chinook Salmon, Coho Salmon, Chum Salmon, Summer Steelhead, and White Sturgeon.

From: DICKSON, LOWELL (DNR) <LOWELL.DICKSON@dnr.wa.gov>
Sent: Thursday, December 5, 2019 5:08 PM
To: Palmer, John <Palmer.John@epa.gov> Cc: Huinker, James (DNR) <James.Huinker@dnr.wa.gov>; AMIOTTE, LALENA (DNR) <Lalena.Amiotte@dnr.wa.gov>; PALAZZI, DAVID (DNR) <DAVID.PALAZZI@dnr.wa.gov>; kirsten.feifel@dnr.wa.gov; Gorman, Thomas (DNR) <Thomas.Gorman@dnr.wa.gov>; Piening, Carol (DNR) <Carol.Piening@dnr.wa.gov>; kristin.swenddal@dnr.wa.gov
Subject: WA DNR Comments: Draft Columbia River Cold Water Refuge Plan

Hello John, Thanks for providing an opportunity for Washington DNR Aquatics Division to comment on the draft Columbia River Cold Water Refuge Plan. This was clearly a very large effort, with lots of moving pieces and supporting documents.

Given DNR's proprietary authority over state-owned aquatic lands, we strive to anticipate any potential future changes to how aquatic lands are (or should be) managed for ESA listed species and habitat. We have a habitat stewardship program in place to avoid and minimize any impacts to important aquatic habitats, which in the future could include cold water refuge for salmonids. Additionally, we're always interested in reviewing how our authority is described or recognized within the plan, if appropriate. Please find our comments below:

1. A recommendation of the Plan is to conduct future fish and temperature monitoring to confirm fish use and temperature delineations, especially in locations below the Bonneville Dam. DNR's Habitat Stewardship Specialist for Rivers District, James Huinker, is interested in staying abreast of, and possibly participating in temperature and fish-use monitoring work at CWR sites in Washington. He can be reached at james.huinker@dnr.wa.gov .

2. Thank-you for sending along zipped GIS features portraying partial extent of these CWR's. I attempted to overlay the draft Plan's CWR "boundaries" with state-owned aquatic lands, in order to identify potential impacts to existing or future aquatic land uses. Unfortunately, I could not determine the lower extents (defined here by me as the downstream extent out into the Columbia River) of these CWR's, since I only received GIS data for the upriver tributary CWR boundary features and not the downstream (plume-modelled?) extents. Suggestion: It would be very helpful for integrating the Plan's CWR's into DNR's aquatic land management if we had access to a complete description of how each of the Plan's CWR boundaries are defined spatially (or could be, using the data). This would include information on what GIS data to use, or alternately explaining why it may be inappropriate/premature to construct such a boundary due to constraints of data or modeling, etc. I imagine other entities may also find such information useful too.

3. After reviewing the plan, we understand the technical/scientific nature of the Plan which basically characterizes CWR locations and catalogs ESA-listed salmonid uses (and potential future uses) in CWR's along the Columbia river. The plan does not describe land management authorities in much detail. However, the Plan does summarize upland management ownership/authority by acres by watershed for each CWR. While the extent of aquatic land ownership can be tricky even for us to define (depending upon history, location, etc.), we feel it's important to include a general description of this important land

base somewhere in the Plan. Where appropriate, we suggest perhaps including a brief sentence or two such as: "Washington DNR has management authority over all navigable bedlands, shorelands and tidelands of the state. This includes rivers, lakes and marine waters. By statute, any uses occurring on or over state-owned aquatic lands must obtain a legal use authorization from the state."

Additional DNR information on DNR aquatic land management can be found using the links below:

- Aquatic land ownership:http://www.dnr.wa.gov/Publications/aqr_aquatic_land_boundaries.pdf
- Uses of aquatic lands: https://www.dnr.wa.gov/programs-and-services/aquatics/leasing-and-landtransactions
- Aquatic land habitat stewardship: https://www.dnr.wa.gov/programs-andservices/aquatics/stewardship-measures.

Of our three comments above, number 2 is the most pressing, since we have already begun assessing how we might integrate this new CWR information into stewardship of aquatic lands. Having a best estimate of the CWR boundaries is key to this process. Any additional information on spatial extent and boundaries would be very helpful.

Thanks again for the opportunity to comment on the draft Plan.

Lowell Dickson Environmental Planner
Washington DNR
Aquatics Division
(360) 902-1362

US Army Corps of Engineers ®
Portland District

Lower Columbia River Dam Forebays

Temperature Depth Profile Study for 2019

Bonneville Dam Forebay near the Washington Shore Fish Ladder Exit: Bonneville Project's Work Boat and Crew, and Technical Lead, Tina Lundell, Retrieving Equipment on September 11, 2019

Contents

temperature gradients. The resulting data analyses are provided to FPOM Regional members in the form of this report.

The Dalles and Bonneville forebay site locations were well-mixed all summer in 2018 and 2019, but John Day exhibited periods of significant temperature differences between the surface and deeper parts of the reservoir, suggesting a stratified reservoir and potential for fish ladder temperature control near the exit.

3. Methods

To determine if cooler water exists at depth near the chosen LCR forebay fish ladder exits, the water quality team from NWW (Russ Heaton and Darren Pecora) developed the monitoring methods and led the installation of the temperature profile equipment for both of the 2018 and 2019 studies. The NWW team has experience with this type of monitoring from temperature profile equipment they installed near the four Snake River and McNary Dam forebay fish ladder exits.

At each monitoring location near the fish ladder exit, up to two sets of temperature profile arrays (cables) were mounted to the dam structure, and up to two floating temperature strings were deployed in the forebay, depending on the site. The exception was at the Bonneville Washington Shore site, where no arrays were installed on the dam. Each array consisted of several Onset Hobo® temperature data loggers (Figure 3-1) which were attached to a vertical steel cable and spaced five to ten feet apart, depending on the depth of the site (five feet apart closer to the surface). The loggers were pre-programmed with the site location, depth, and hourly data collection intervals.

Each floating temperature string was suspended between a surface buoy and a 12-lb mushroom anchor or 30-lb sounding weight depending on water velocity (Figure 3-2). Two steel cables were also attached to the buoy and anchored upstream from the temperature string with a 170-lb steel plate, far apart from each other to create a tripod effect.

The temperature strings that were mounted on the dam structure were attached on top to either a steel bracket or an eyebolt with a 12-lb mushroom anchor attached at the bottom. At the John Day South fish ladder site, the NWW crew designed a bracket that was mounted to the dam structure in order to allow the temperature string to hang straight down since the dam structure extends outward toward the river bottom (Figure 3-3). At the Bonneville Dam, the project's work boat crew welded a bracket onto an existing pier near the Washington Shore fish ladder exit so that a temperature string could be mounted on its surface.

Water temperature differentials were calculated between the 5 foot deep sensor and the deepest sensor on selected strings. These differentials describe how mixed or stratified the water column became during the sampling period. Water temperature differentials were also calculated between the selected 5 foot deep sensors and tailwater water temperatures. Tailwater hourly water temperature data was used from total dissolved gas

gaging stations. When available, fish ladder exit pool Hobo data was downloaded from the Fish Passage Center website and differentials were calculated between the exit pool Hobo data logger and the tailwater and plotted with the 5 foot deep sensor and tailwater differential. These differentials indicate how much different environmental conditions a fish would experience between the tailwater and the forebay exit.

The opening of the intake for the fish ladder exits in the dam forebays, ranges from around 10 to 15 feet deep. The 5 foot deep sensor was used in this report to compare to the tailwater temperatures because the fish ladders tend to pull the most water from the 5 foot range in the water column. Warmer water is less dense and there is less friction near the surface which results in a greater volume of the 5 foot depth water contributing to fish ladder exit temperatures. This report is also exhibiting the warmest water which may have affected the fish ladder for comparison.

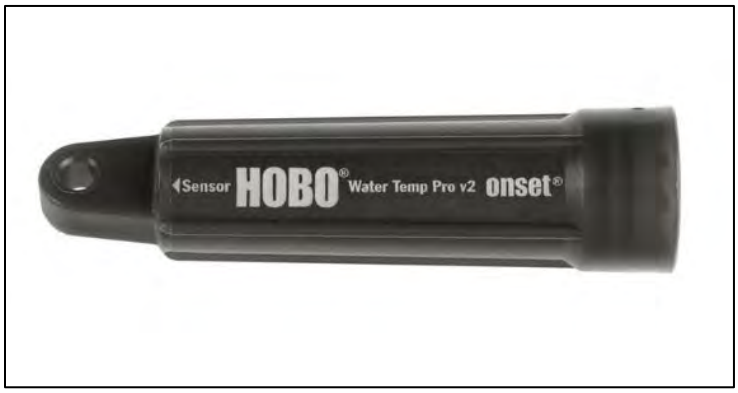


Figure 3-1. Onset Hobo ® Logger for collecting Water Temperature Data. Note: actual size about 4 inches in length.

Figure 3-2. Equipment for the Floating Temperature Strings, including Yellow Buoys, Fish Weights (30-lb), Steel Anchor Plates (170-lb), and Mushroom Weight (30-lb) for the Wall Mounted Strings, with Cable and Data Logger Attached (on right).

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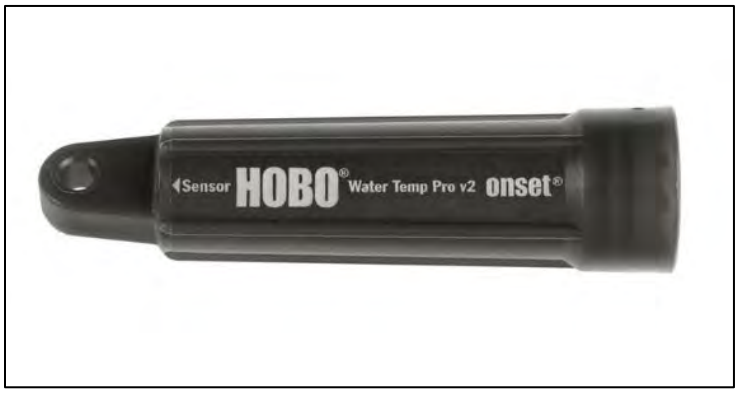

Figure 3-1. Onset Hobo ® Logger for collecting Water Temperature Data. Note: actual size about 4 inches in length.

Figure 3-2. Equipment for the Floating Temperature Strings, including Yellow Buoys, Fish Weights (30-lb), Steel Anchor Plates (170-lb), and Mushroom Weight (30-lb) for the Wall Mounted Strings, with Cable and Data Logger Attached (on right).

Figure 3-3. North of the John Day South Fish Ladder Exit: Steel Bracket Mounted to Dam Structure to Allow Temperature String to Hang Freely at Bottom of Structure.

4. Monitoring Sites

A total of 12 thermal profile strings were deployed at temporary locations in the forebays (upstream) of the John Day, The Dalles, and Bonneville Dams. Five of these temperature depth profile strings were installed on the dam structures near the fish ladder exits from May 20 - 22, 2019. The remaining seven floating temperature strings were deployed a month later, from June 10 - 12, 2019. The floating strings were deployed almost a month later than the strings attached to the dam structure due to excessively high total flows of about 300 kcfs in May. The floating string locations were in the same general location as those in the 2018 study. By June 10, the total flows had receded to about 230 kcfs, which provided somewhat safer in-water working conditions within the Boat Restriction Zone (BRZ). The floating strings were deployed at least 100 feet from the fish ladder exits at each project in the LCR. There can be significant fluctuations in temperatures near the turbine intakes, so these areas were avoided when possible.

The temperature strings and equipment (anchors, buoys, and cables) were retrieved at the end of the study on September 9, 10, and 11 at John Day Forebay, The Dalles and Bonneville forebays, respectively. The data was manually downloaded from each Onset Hobo data logger and analyzed at the end of the study.

The details for each station location are included in Table 1, including the total depth of each temperature string and the number of Hobo loggers per string. The GPS coordinates were recorded for both the floating temperature strings and the strings attached to the dam structures. The bathymetric maps shown below include the approximate location of each temperature profile string in relation to the fish ladder exit. Some of the floating string locations were further out from the fish ladder exit than originally planned, due in part to finding greater depths for the study and a more level river bottom for the anchors to rest on. In addition, in 2019, The Dalles floating string (TDA-EA-2) had a buoy stolen from one of two anchor cables which caused it to drift closer to the other floating string (TDA-EA-3). Refer to the following figures for these maps: Figure 4-1, Figure 4-2, Figure 4-3, and Figure 4-4.

Table 1 Temperature Profile String Sampling Sites at the Lower Columbia River Forebays near the Fish Ladder Exits, 2019 Temperature Strings Mounted on Structures Deployed May 20 - 22; Floating Temperature Strings deployed on June 10 - 12, 2019. Datum WGS84.
Note: Fixed locations are the same as the 2018 study and floating locations are similar.

Location of Fish Ladder (FL) Exit	Station Number & Description	Depth (initial)	Number of sensors	North (Latitude) Datum WGS84	West (Longitude) Datum WGS84
John Day South	JDA-SS-1 Fixed, on structure: 90 ft. south of FL	74	8	45°42.684’	120°41.308’
	JDA-SS-2 Fixed on structure: 86 ft. north of FL	101	11	45°42.708’	120°41.331’
Values in () converted from decimals.	JDA-SS-3 Floating: 175 ft. from FL	78	9	45°42.707’	120°41.281’
	JDA-SS-4 Floating: 265 ft. from FL	93	11	45°42.741	120°41.293’
The Dalles East	TDA-EA-1 Fixed on structure: 100 ft. from FL	60	8	45°37.204’	121°7.244’
	TDA-EA-2 Floating: ~110 ft. from FL	41	6	45°37.225’	121°07.249’
(downstream of TDA-EA-2)	TDA-EA-3 Floating: 161 ft. from FL	65	8	45°37.207’	121°07.260’
The Dalles North	TDA Fixed on structure: 167 ft. from FL	21	4	45°36.912’	121°08.178’
Bonneville Bradford Island	BON-BI-1 Fixed on structure: ~ 6 ft. from FL	10.5	3	45°38.462’	121°56.629’
	BON-BI-2 Floating: 170 ft. from FL	34	5	45°38.436’	121°56.616’
Bonneville Washington Shore	BON-WN-1 Fixed, on pier: 50 ft. from FL	26	5	45°38.863’	121°56.043’
	BON-WN-2 Floating: 190 ft. from FL	40	6	45°38.850’	121°56.065’

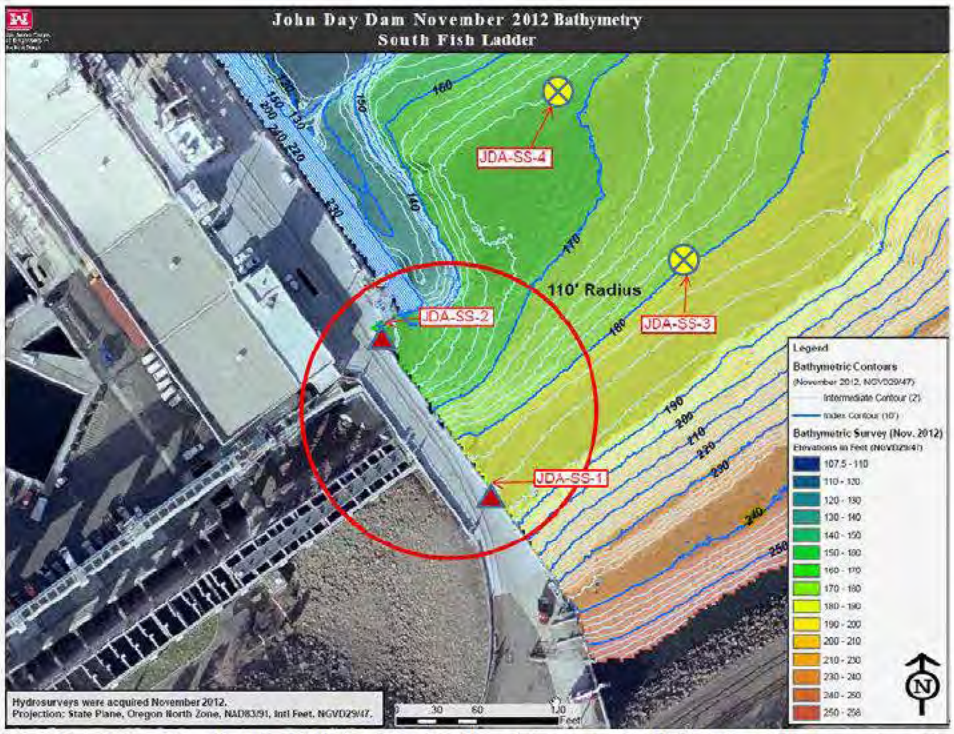

Figure 4-1. The John Day South Fish Ladder Exit and Locations of the Four Temperature Profile Strings; JDA-SS-1 and JDA-SS-2 (red triangle) are attached to the Structure, while JDA-SS-3 and JDA-SS-4 are Floating Strings (yellow circle).

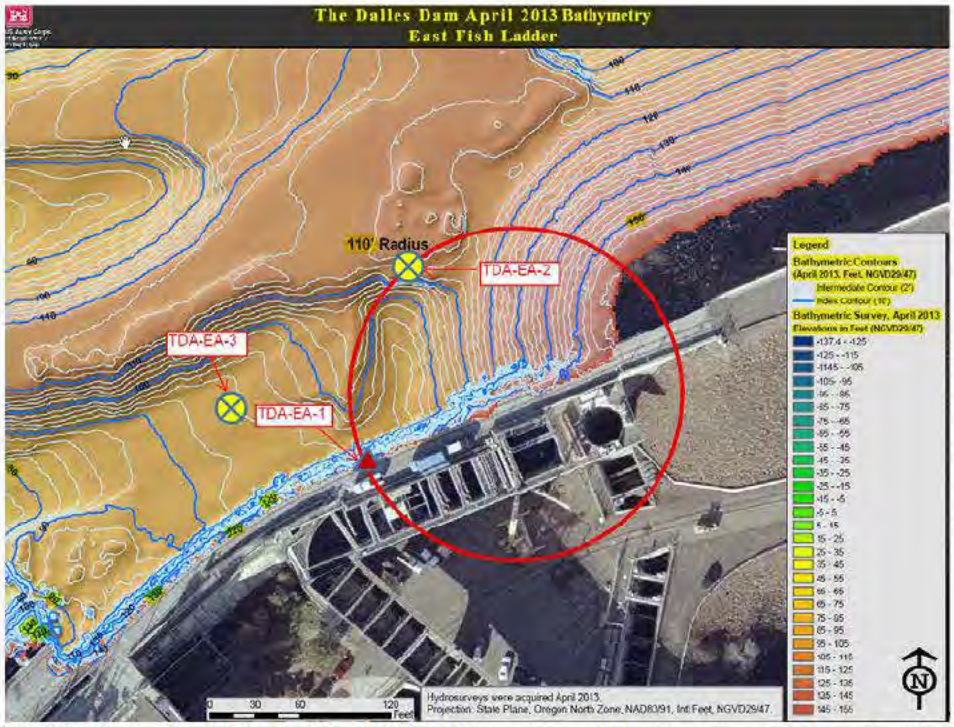

Figure 4-2. The Dalles East Fish Ladder Exit and Locations of the Four Temperature Profile Strings; TDA-EA-1 is attached to the structure (red triangle), while TDA-EA-2 and TDA-EA-3 are floating strings (yellow circle).

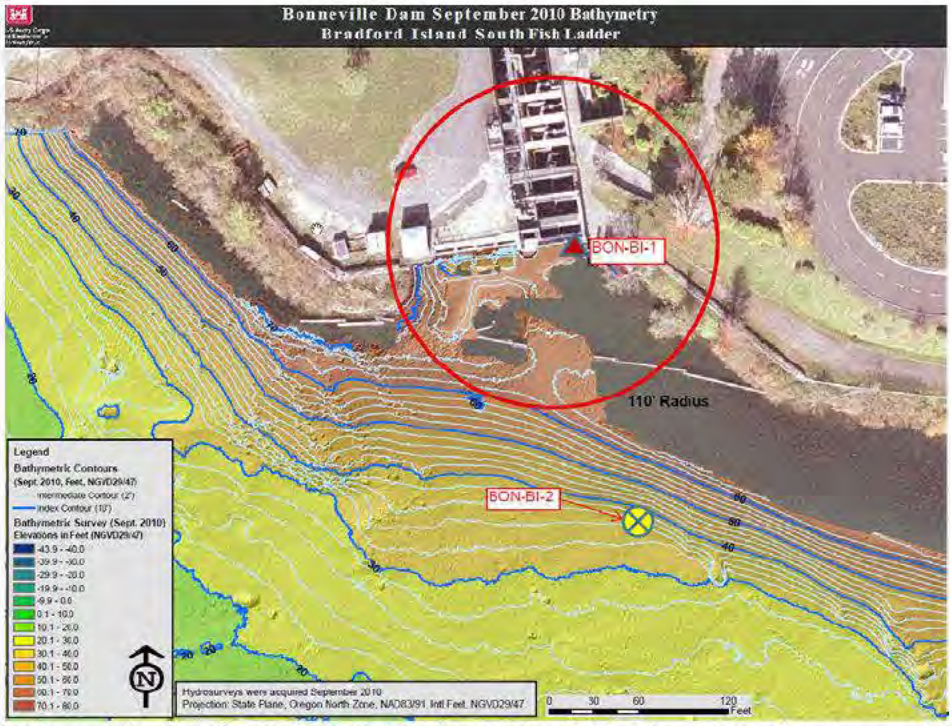

Figure 4-3 Bonneville Bradford Island Fish Ladder Exit and Locations of the Two Temperature Profile Strings; BON-BI-1 is attached to the Structure (red triangle), while BON-BI -2 is a Floating String (yellow circle).

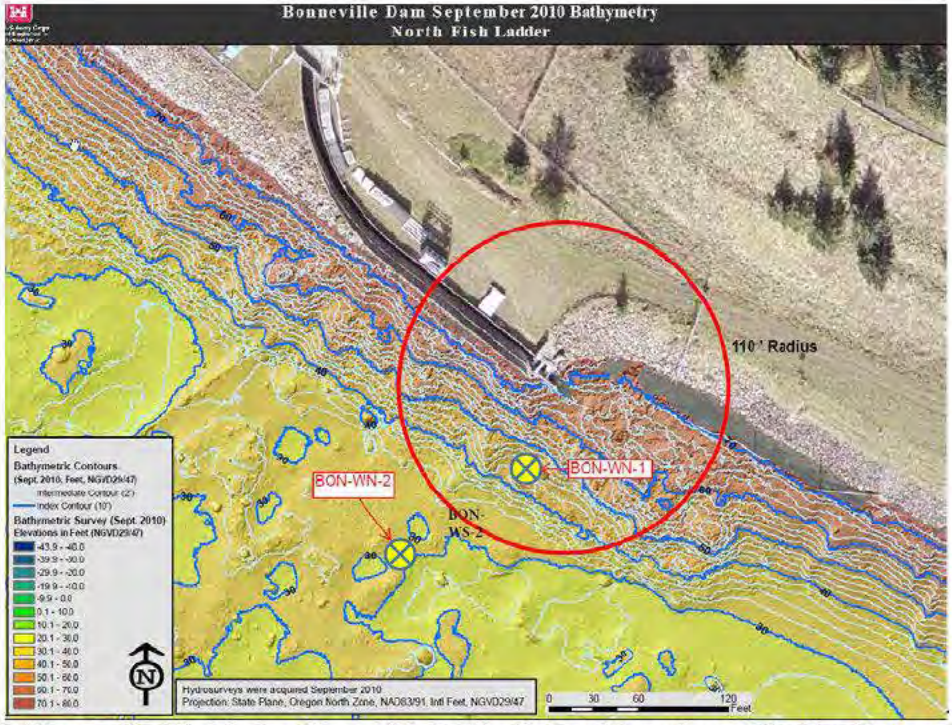

Figure 4-4 Bonneville Washington Shore Fish Ladder Exit and Locations of the Two Temperature Profile Strings; BON-WN-1 is attached to an Existing Pier and BON-WN-2 is a Floating String (yellow circle).

5. Water Temperature Vertical Profile Results

5.1 John Day South Fish Ladder Exit

The resulting vertical profile water temperature data (2019) measured at four sites near the John Day South fish ladder exit indicates that the reservoir has a vertical thermal gradient in the summer with cooler water at depth (Figure 5-1 - Figure 5-4). The approximate depth of the steepest thermal gradient was about 50 feet. Beyond this depth, temperatures were only about one to two degrees cooler in the hypolimnetic zone. The water intake that feeds the fish ladder is at a depth of about 10 - 15 feet; therefore the sensors at one foot in depth were not included in the analysis; however, the sensors at five feet in depth are still relevant. The most significant variations in temperature within the thermal gradient occurred mostly from late May to early June, again in late June, and in early August and September. During the remainder of the summer the reservoir was generally weakly stratified and prone to mixing due to high wind events.

It was first expected that water temperatures next to the John Day Dam structure may be slightly warmer compared to the floating strings, due to warming effects of the concrete absorbing ambient heat; however, in both study years (2018 and 2019) it was observed that temperatures were very similar. Hourly water temperature values from the deep floating string were subtracted from the structure mounted (fixed) string (JDA-SS-2 - JDA-SS-4 = *Tdiff*) to observe differences between the two sites. Descriptive statistics (minimum, maximum, mean, median, standard deviation, and variance) were calculated from *Tdiff* to look at the variability between the two strings at depths in relation to structural warming effects from June 10 to September 9, 2019 (Table 2). A positive value indicates that the fixed string temperatures were warmer than the floating string.

The data revealed that there were only minor differences between the two John Day forebay sites (Table 2). The standard deviations from the 2018 and 2019 studies were less than the accuracy of the thermistor (+/-0.38 °F) at all depths. In 2019, the 5 foot sensor on the structure (JDA-SS-2) had a standard deviation of 0.36 and was stationary while the floating sensors (JDA-SS-4) remained in the same position in the water column throughout the sampling period. The forebay water surface elevation varied approximately 1.5 feet during the sampling period which may have caused slightly warmer temperatures at the 5 feet deep stationary sensor. There are hourly values that are slightly warmer and also slightly cooler as indicated in the *Tdiff* minimum and maximum. The median and mean reveal the structure mounted string is slightly cooler for a majority of the water column, differences are negligible and less than 0.1 °F. The fixed and floating sites examined exhibit similar temperatures.

It is a viable option to use the temperature string data from the equipment attached to the dam structure at this location (JDA-SS-2) which will save time, money, coordination, and is less risky than operating a watercraft and deploying equipment in the BRZ. In terms of pumping cool water from depth close to the dam, variability decreases with depth between the structure mounted and floating locations once you get below the surface depths (i.e., 5-feet).

Table 2 Descriptive Statistics for the Difference of Water Temperature Strings JDY-SS-2 minus JDY-SS-4 (Tdiff) at Selected Depths for John Day Forebay Hourly Vertical Profile Temperatures Measured from the Structure Mounted (SS-2) and Floating Strings (SS-4), 86 and 265 Feet, respectively, from the South Fish Ladder Exit, June 10 - September 9, 2019. Note: a positive value indicates that SS-2 is warmer.

Parameter	5 ft	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft
Data Count	2177	2177	2177	2177	2177	2177	2177	2177	2177
Min (°F)	-3.59	-2.34	-1.79	-1.96	-2.21	-1.79	-1.52	-1.14	-0.97
Max (°F)	2.52	1.66	1.01	1.27	1.13	1.34	1.47	1.60	1.69
Mean (°F)	-0.01	-0.07	-0.08	-0.06	-0.06	-0.02	-0.03	0.02	0.09
Median (°F)	-0.03	-0.03	-0.03	-0.03	-0.03	0.02	0.02	0.02	0.06
StaDev (°F)	0.36	0.29	0.24	0.22	0.24	0.26	0.22	0.18	0.16
Variance (°F)	0.13	0.08	0.06	0.05	0.06	0.07	0.05	0.03	0.03

The two fixed temperature strings which were mounted on the dam structure (JDA-SS-1 and JDA-SS-2) had hourly temperature differences with depth, overall ranging from 1 - 6 ºF from surface to bottom (Figure 5-1 and Figure 5-2). Although there were a few exemptions when the maximum temperature differentials ranged from 6.6 - 8.7 °F with depth. For example, JDA-SS-1 exhibited a maximum differential of 8.7°F on June 12, and on May 31 and August 3, both sites had differentials ranging from 6.6 - 7.1°F. There is not much difference in the range of temperatures between these two fixed sites which were about 176 feet apart, even though JDA-SS-2 is deeper (101 feet deep) and further north (towards turbine intakes) compared to location JDA-SS-1 (74 feet deep) and south of fish ladder exit (Table 3).

In addition, water temperature differentials for the deepest fixed site at John Day (JDA-SS-2) were typically less than 6 °F in Figure 5-6, which compares the 5 foot and 100 foot deep sensors for both 2018 and 2019. As mentioned previously, the exceptions were about three hours in 2019 were differentials were slightly higher, closer to 7°F, compared to about six hours in 2018, with a maximum of 8.2°F on June 20. Overall, May and June differentials were greater in 2019, compared to 2018, due partially to much lower total flows in 2019[1], which may result in less mixing of temperatures in the water column. Conversely, the 2018 water temperature differentials at John Day were greater than 2019 from mid-July through mid-August when the ambient temperatures were much hotter by comparison which had a warming effect on the surface water.

Both of the John Day Dam floating temperature string sites had similar thermal gradients compared to the wall mounted string sites when comparing similar depths. These two floating strings, JDA-SS-3 and JDA-SS-4, were about 175 and 265 feet from the South fish ladder exit, respectively. The temperature differences with depth overall ranged from about 3 - 5°F (from surface to bottom). The maximum differences in these vertical profile temperatures at the floating sites occurred on June 12 from 1400 to 2000 hours

[1] The adjusted runoff measured at The Dalles in May, 2018, was 176% of 30-year average (1981-2010) compared to 100% in 2019; adjusted runoff in June, 2018, was 88% of 30-year average and 74% in 2019.

with 6.0 and 7.2°F at JDA-SS-3; 6.3 - 7.8°F at JDA-SS-4; and 6.1°F on August 6 at 1700 hour (JSA-SS-3) (Figure 5-3 and Figure 5-4). The JDA-SS-4 string was about 20-feet deeper (95 feet) and further north of the South fish ladder exit (towards turbine intakes) compared to the JDA-SS-3 floating string which was more in-line with the fish ladder exit. The descriptive statistics show that the difference in temperatures between all four sites was overall minimal (Table 3).

The John Day forebay vertical profile water temperatures were compared with the nearby ambient temperatures at the John Day River Bridge (JDOO) site (in green) and the upstream McNary (MCPW) outflow temperatures, measured 1.5-miles downstream of McNary Dam (in blue). Profile temperatures used for this analysis were from the deepest wall mounted string (JSA-SS-2) and the floating string (JDA-SS-4) and measured near the surface (5 feet deep) and the bottom of the reservoir (100 feet at SS-2 and 80 feet at SS-4) (Figure 5-5, top).

During mid to late June and through the month of August, the profile temperatures at the two deeper John Day forebay sites were about 0.5 - 2°F warmer at the deepest location (80 - 100 feet), compared to the McNary outflow temperatures measured 75-miles upstream at a depth of about 15 feet. These McNary cooler outflows likely became warmer and well-mixed while moving downstream due to ambient warming from solar radiation while flows ranged from 100 - 180 kcfs in August. In addition, the Umatilla and John Day tributaries also typically contribute warmer water in this reach of the Columbia River between McNary and John Day dams. Wind conditions likely played a role in how much warmer water temperatures became while travelling downstream to John Day Dam.

The ambient air temperatures measured near the John Day Dam at the JDOO gage, shows typical hot summer weather patterns throughout the summer, with the exception of mid-June when it was slightly cooler (Figure 5-5, top). For example, maximum air temperatures were 100 - 101°F from August 5 - 7 for 15 hours (compared to 57 hours in 2018 ranging from 100 - 107°F); and 376 hours ranged from 90 - 99°F from June 10 - September 7, 2019. The correlating surface water temperatures during these hot summer days mostly ranged between approximately 70 - 78°F, while temperatures were often about 3 - 5°F cooler with depth. In early August, elevated air temperatures effected the 5 and 10 ft sensors, a few days later the deep sensors showed a 1 - 2°F increase in temperature. For example, on August 6 at 1700 hour, while the air temperature was 101°F, water temperatures near the surface of the fixed and floating strings were 75.4 and 76.6°F, respectively, and 71°F near the bottom (for both). However, two days later these bottom temperatures were about 72.4°F (ambient temperature at 83°F). Overall, the summer ambient air temperatures were not as hot in 2019 (>100 °F), compared with 2018; however, 2019 had more hours where temperatures ranged between 90 - 100°F compared to 2018.

In addition, wind conditions also affect how stratified the John Day forebay is, which is evident in Figure 5-5 (bottom), which shows wind measured near the John Day River Bridge (JDOO) during the same time period, from June 10 - September 9. For example

from mid to late June, high wind conditions greater than 20 mph (up to 35 mph), combined with ambient temperatures cooler than 80°F, contributed to the water column becoming weakly stratified for about 10 days. These stronger wind events often coincide with slightly cooler ambient air temperatures. Unfortunately, air temperatures and wind data were missing for several days in mid-August. Wind speeds averaged 13 mph over the 2019 study period, compared with an average of 12 mph over the same 2018 study period.

Water temperature differentials were also calculated with John Day tailwater TDG station (JHAW) temperature data and compared to the South fish ladder exit near surface (5 feet deep) JDA-SS-2 data and the fish ladder exit pool data (JDAASMD6) located within the fish ladder (Figure 5-7). Data from the site within the fish ladder was not available in 2018; however, it was available in 2019. The differential results indicate that the 5 feet deep sensor data had temperatures frequently 2 - 4 °F warmer compared to the tailwater, with a few instances of 4 - 6 °F warmer. The JDAASMD6 temperature differentials within the fish ladder were similar to those calculated near the surface, but typically about 0.5 - 1.5 °F less, showing a few instances of 4 - 5 °F warmer than the tailwater temperatures.

In addition, water temperature differentials were calculated with this John Day tailwater TDG station (JHAW) data and compared to the JDA-SS-2 near surface data for both 5 and 10 feet (close to the fish ladder water intake) and near the bottom (90 and 100 feet) (Figure 5-8). The slightly deeper surface sensor data (10 feet) often had temperature differentials about 1 - 3 °F cooler than those calculated for the 5 feet deep sensor data, with maximum differentials typically less than 3 °F warmer compared to the tailwater. The near bottom sensors ranged from about 2 °F cooler (briefly in mid-June), to typically less than 1 °F cooler than or equal to the tailwater temperatures. These results may infer that if water was pumped from 90 - 100 feet deep it could cool the fish ladder and immediate forebay exit area enough to match tailwater temperatures and enhance fish passage.

Table 3 Descriptive Statistics for John Day Forebay Hourly Vertical Profile Temperatures Measured from the South Fish Ladder Exit with Structure Mounted and Floating Strings, June 10 - September 9, 2019.

		Sensor Depths										
Station	**Parameter**	**5 ft**	**10 ft**	**20 ft**	**30 ft**	**40 ft**	**50 ft**	**60 ft**	**70 ft**	**80 ft**	**90 ft**	**100 ft**
JDA-SS-1	**Data Count**	2177	2177	2177	2177	2177	2177	2177	2177			
JDA-SS-1	**Min (ºF)**	61.9	61.8	60.5	60.3	60.2	60.1	60.1	60.0			
JDA-SS-1	**Max (ºF)**	78.2	74.8	74.3	73.9	73.7	73.4	73.1	73.1			
JDA-SS-1	**Mean (ºF)**	69.7	69.4	69.2	69.1	68.9	68.8	68.7	68.6			
JDA-SS-1	**Median (ºF)**	70.8	70.7	70.6	70.5	70.4	70.3	70.1	69.9			
JDA-SS-2	**Data Count**	2177	2177	2177	2177	2177	2177	2177	2177	2177	2177	2177
JDA-SS-2	**Min (ºF)**	62.0	61.6	60.5	60.4	60.2	60.2	60.1	60.1	60.1	60.1	60.1
JDA-SS-2	**Max (ºF)**	78.2	76.2	74.2	73.9	73.7	73.4	73.1	73.2	73.2	73.2	73.1
JDA-SS-2	**Mean (ºF)**	69.6	69.5	69.2	69.1	69.0	68.9	68.7	68.7	68.6	68.6	68.5
JDA-SS-2	**Median (ºF)**	70.8	70.7	70.6	70.4	70.4	70.3	70.1	70.0	69.8	69.8	69.8
JDA-SS-3	**Data Count**	2177	2177	2177	2177	2177	2177	2177	2177			
JDA-SS-3	**Min (ºF)**	62.2	62.1	61.9	60.4	60.4	60.1	60.1	60.1			
JDA-SS-3	**Max (ºF)**	77.4	75.4	74.4	73.9	73.7	73.4	73.1	73.1			
JDA-SS-3	**Mean (ºF)**	69.6	69.5	69.3	69.1	69.0	68.9	68.7	68.7			
JDA-SS-3	**Median (ºF)**	70.8	70.7	70.6	70.5	70.4	70.3	70.1	70.0			
JDA-SS-4	**Data Count**	2177	2177	2177	2177	2177	2177	2177	2177	2177		
JDA-SS-4	**Min (ºF)**	62.5	62.3	61.6	60.7	60.5	60.3	60.1	60.1	60.1		
JDA-SS-4	**Max (ºF)**	76.8	76.1	74.2	74.1	73.5	73.4	73.0	72.9	72.8		
JDA-SS-4	**Mean (ºF)**	69.7	69.5	69.3	69.2	69.0	68.9	68.8	68.7	68.5		
JDA-SS-4	**Median (ºF)**	70.8	70.8	70.6	70.5	70.4	70.3	70.2	70.0	69.8		

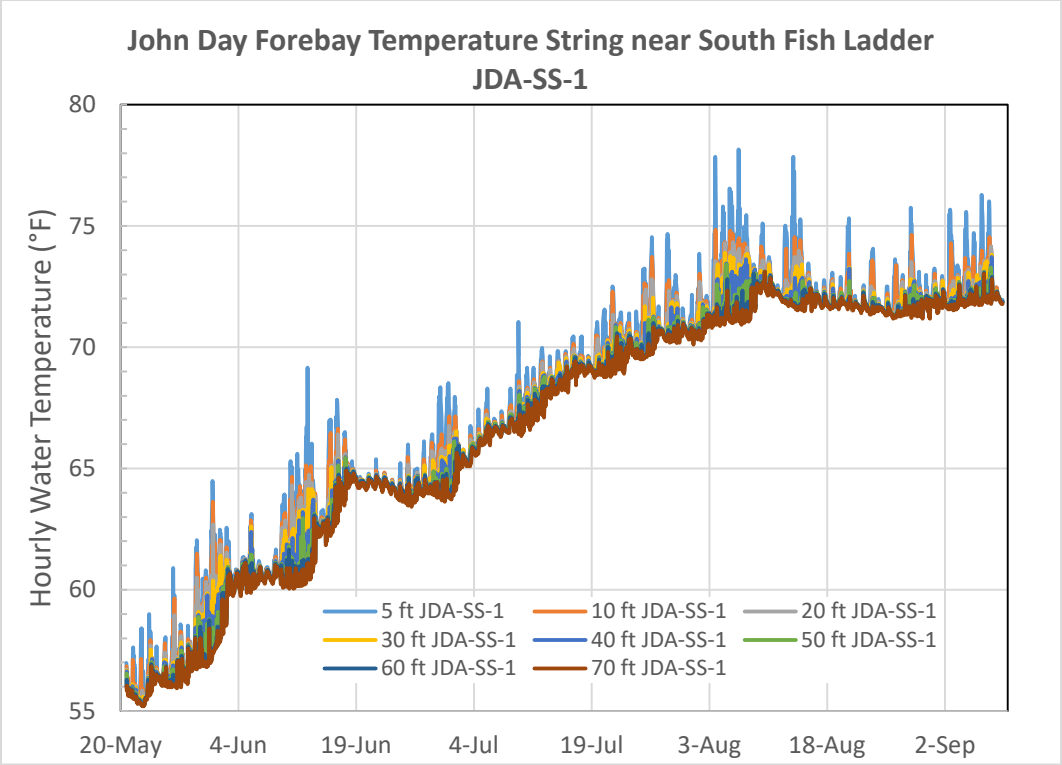

Figure 5-1 John Day Forebay Hourly Vertical Profile Temperatures Measured from the Dam Structure near the South Fish Ladder Exit using Hobo Data Loggers, May 20 - September 09, 2019

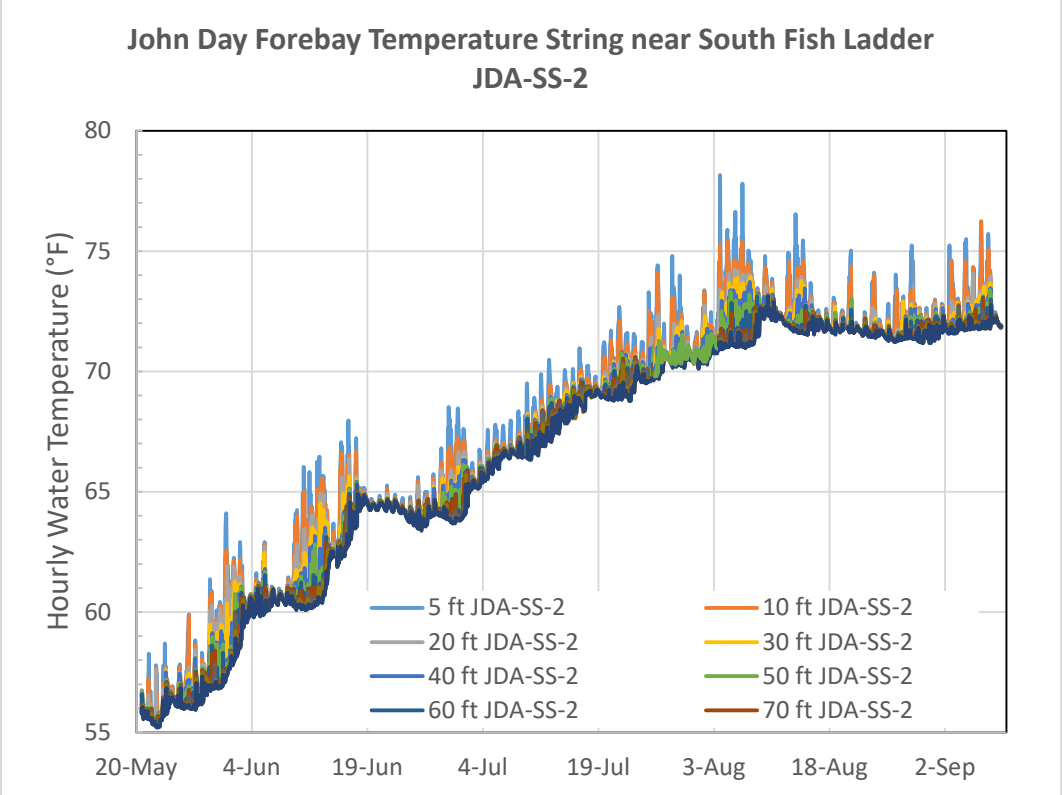

Figure 5-2 John Day Forebay Hourly Vertical Profile Temperatures Measured from the Dam Structure North of the South Fish Ladder Exit, May 20 - September 09, 2019

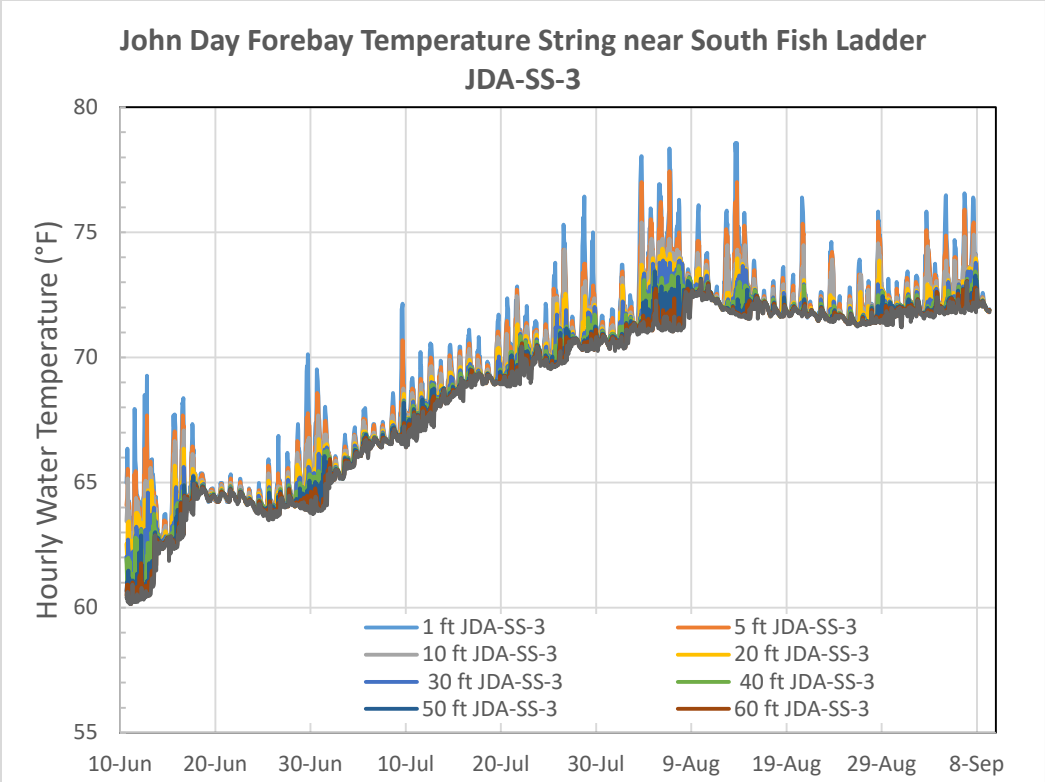

Figure 5-3 John Day Forebay Hourly Vertical Profile Temperatures Measured from the Floating String 180 Feet from the South Fish Ladder Exit, June 10 - September 9, 2019

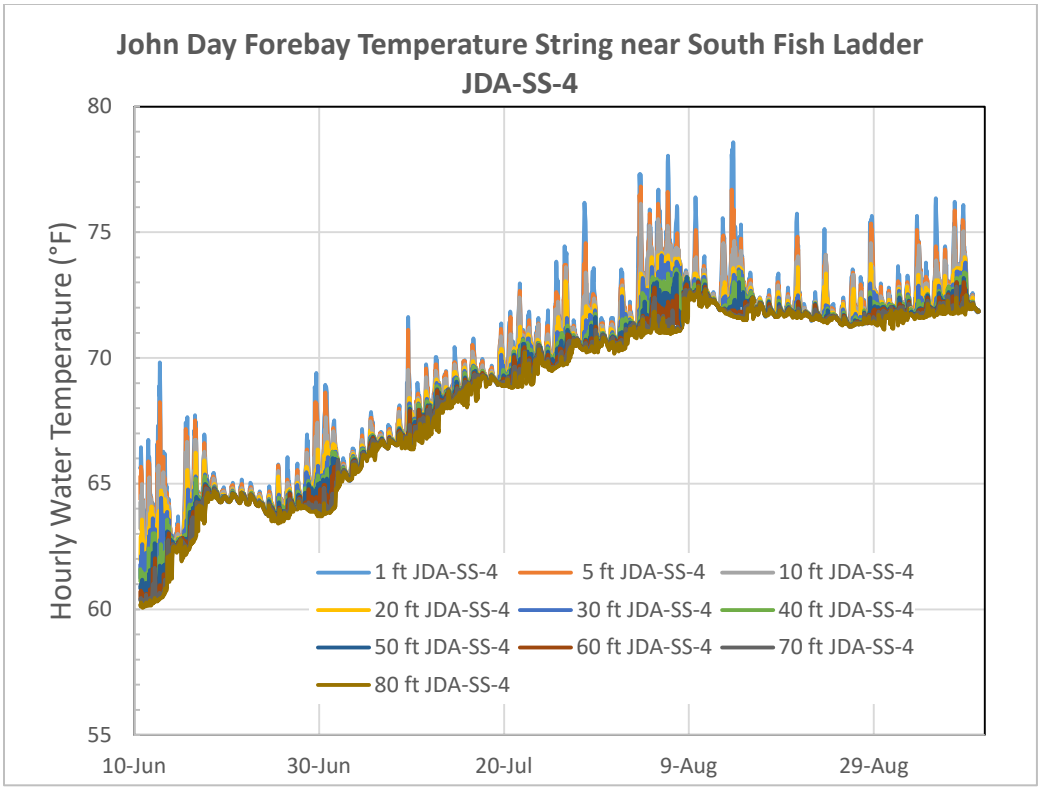

Figure 5-4 John Day Forebay Hourly Vertical Profile Temperatures Measured from the Floating String 235 Feet from the South Fish Ladder Exit (further North than SS-3), June 10 - September 9, 2019

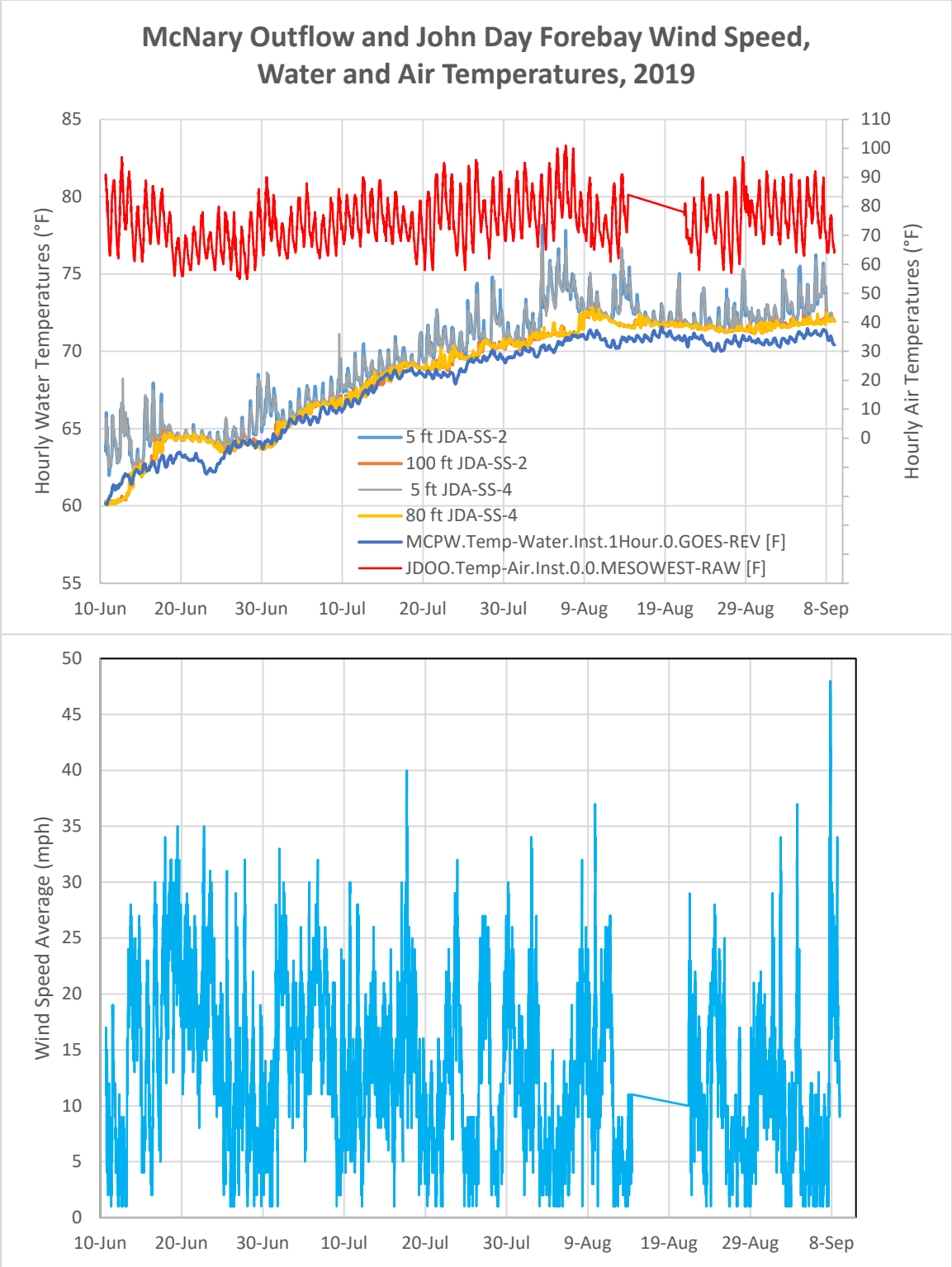

Figure 5-5 McNary Outflow Temperatures (MCPW) and John Day Forebay Hourly Vertical Profile Temperatures Measured from the Wall Mounted (SS-2) and Floating (SS-4) Strings near the South Fish Ladder Exit, and Air Temperatures Measured at the John Day River Bridge (JDOO) Site (top) and Average Hourly Wind Speed Measured at the JDOO Site (bottom), June 10 - September 9, 2019

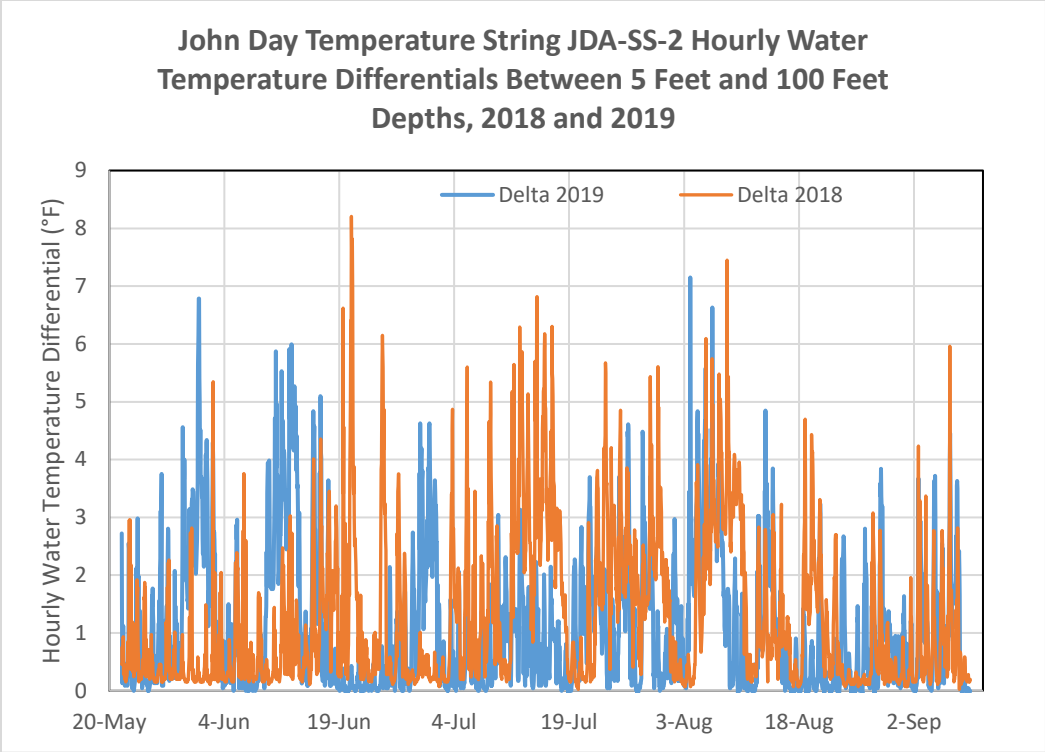

Figure 5-6 John Day Forebay Hourly Vertical Profile Temperatures Differentials JDA-SS-2 Calculated between 5 Feet and 100 Feet Depths, May 20 - September 9, 2018 and 2019

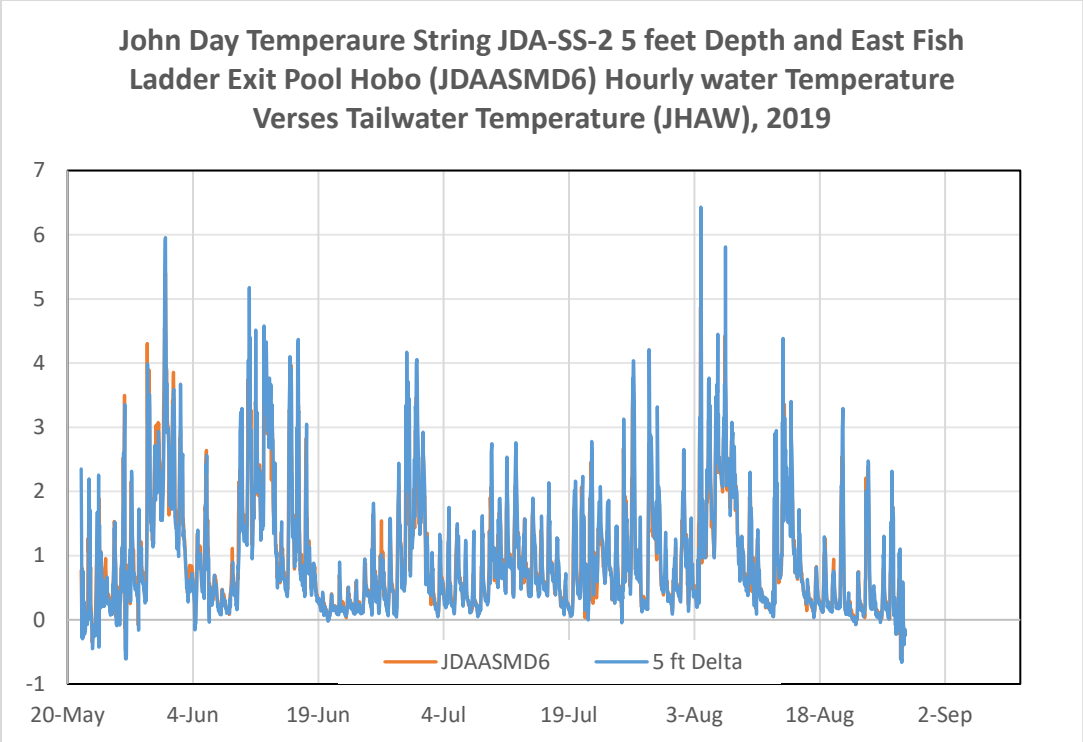

Figure 5-7 John Day Forebay Hourly Vertical Profile Temperatures Differentials JDA-SS-2 (Wall Mounted) Calculated between 5 foot Depth and East Fish Ladder Exit Pool Hobo Verses Tailwater TDG Station (JHAW) Water Temperature, May 20 - August 28, 2019. Note: a positive differential indicates the fish ladder exit area is warmer compared to tailwater temperatures.

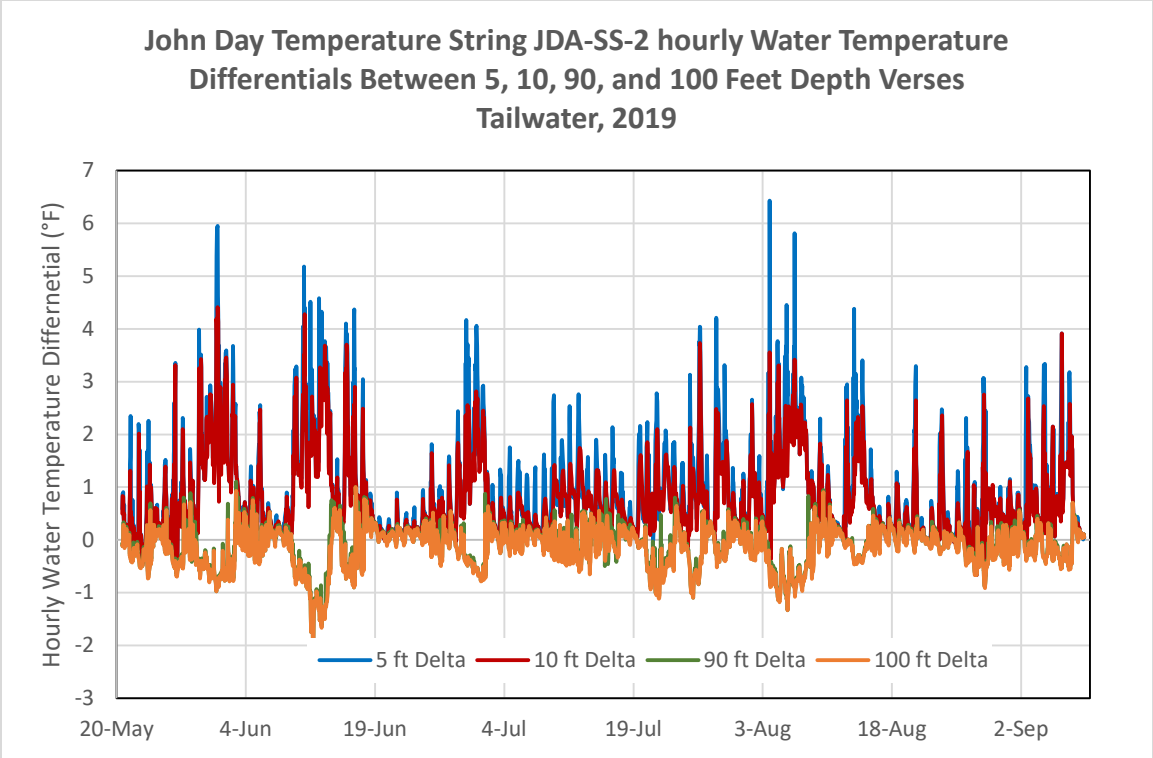

Figure 5-8 John Day Forebay Hourly Vertical Profile Temperatures Differentials JDA-SS-2 Calculated between Selected Depths and Tailwater TDG Station (JHAW) Water Temperature, May 20 - September 9, 2019

5.2 The Dalles East and North Fish Ladder Exits

The resulting vertical profile temperatures measured at the three sites near The Dalles East fish ladder exit and one site near the North fish ladder exit show that the reservoir is well-mixed and therefore only has a slight thermal gradient. This is in contrast to a steeper temperature gradient and deeper John Day forebay thermal profile. The bathymetry and water velocity are some of the main driving factors for a well-mixed water column and poor thermal gradients at these Lower Columbia projects (including Bonneville). Furthermore, the resulting profile temperatures near the East fish ladder exit were combined to show how little variation there was between these three sites, including the wall mounted and two floating temperature string sites which were all at least 110 feet from the fish ladder exit. Only the three top sensors (1 - 10 feet deep) and the bottom sensor of each string at the East fish ladder site was plotted for clarity in displaying the ranges of temperature data (Figure 5-9). The descriptive statistics show that the difference in temperatures between all four sites (including the North site) was overall minimal (Table 4).

In addition, summer diurnal temperature changes that occurred near the surface at The Dalles East Fish ladder sites were typically less than one degree, although there was often an additional half degree of warming during the peak daytime hours.

The fixed temperature string which was mounted on the dam structure downstream of the East fish ladder exit (TDA-EA-1) and the two floating temperature strings (TDA-EA-2 and TDA-EA-3) had typical temperature differences from surface to bottom of less than 0.5°F (Figure 5-9). Overall, there was minimal difference in the range of temperatures between these three strings, even though the TDA-EA-2 floating site (in front of exit) was about 20 feet shallower than the other two sites which were about 60 - 67 feet deep.

Water temperature differentials for the deepest site at The Dalles (TDA-EA-3) which compares the 5 foot and 60 foot deep sensors, were consistently less than 0.4 °F for both years of this study (2018 and 2019), with the exception of a few hours (Figure 5-10). For example, the greatest temperature differences for this deepest site occurred in August (2019) with about seven instances varying between 0.5 - 0.7 °F, plus a maximum difference of almost 0.9 °F on September 2. In 2018, there were only about five instances where temperature differences were closer to 0.5 °F.

There was also a vertical profile temperature string that was attached to The Dalles Dam structure 167-feet south of the North fish ladder exit. This site showed similar results to the sites near the East fish ladder, with typically little thermal gradient in the water column (Figure 5-12). This North fish ladder site, TDA-NO-1, was quite shallow (21 feet) compared to the other East fish ladder sites.

Water temperature differentials which compares the 5 foot and 20 foot deep sensors for the fixed temperature string near the North fish ladder, typically varied by less than 0.5°F for both study years (2018 and 2019), similar to the East fish ladder site (Figure 5-13)Figure 5-13. However, there were a few hours (about 12) where temperatures varied more with depth, between 0.7 - 1.5°F. These slightly more stratified conditions occurred from mid-July through mid-September (end of 2019 study). There was likely more stratification during these periods due to warmer ambient air temperatures and less wind that influenced the warming of surface temperatures. There is also the possibility that the fixed sensor near the surface may have been briefly exposed to warmer ambient conditions if there were any waves in the forebay.

Water temperature differentials were also calculated with The Dalles tailwater TDG station (TDDO) temperature data and compared to the East fish ladder exit near surface (5 feet deep) TDA-EA-3 data and fish ladder exit pool data (TDAAEMD9) located within the fish ladder (Figure 5-11). The same temperature comparison was done with the North fish ladder exit near surface (5 feet deep) TDA-NO-1 data and fish ladder exit pool data (TDAANMD6) (Figure 5-14).

The differential results were similar at both The Dalles fish ladders and indicated that the 5 feet deep sensor data consistently matched tailwater temperatures since they only varied by +/- 0.4 °F. Overall, the TDA-NO-1 fixed fish ladder exit temperatures were slightly warmer compared to floating site at TDA-EA-3. The fish ladder exit Hobo sensor also nearly matched the tailwater temperatures and were only 0.1 to 0.4 °F warmer (plus a few hours were up to 1.2°F warmer). These results indicate that water coming into the fish ladder already matches the tailwater and the water column temperature differential of less

than 0.5 °F (overall) and would not make pumping water from depth a reasonable endeavor with the collected data.

Table 4 Descriptive Statistics for The Dalles Forebay Hourly Vertical Profile Temperatures Measured from the East and North Fish Ladder Exit with Structure Mounted and Floating Strings, June 11 - September 10, 2019.

		Sensor Depths						
Station	**Parameter**	**5 ft**	**10 ft**	**20 ft**	**30 ft**	**40 ft**	**50 ft**	**60 ft**
TDA-EA-1	**Data Count**	2181	2181	2181	2181	2181	2181	2181
TDA-EA-1	**Min (°F)**	61.3	61.3	61.3	61.3	61.3	61.3	61.2
TDA-EA-1	**Max (°F)**	72.8	72.7	72.7	72.6	72.6	72.6	72.6
TDA-EA-1	**Mean (°F)**	68.7	68.7	68.7	68.7	68.7	68.7	68.7
TDA-EA-1	**Median (°F)**	70.2	70.2	70.2	70.2	70.2	70.2	70.2
TDA-EA-2	**Data Count**	2181	2181	2181	2181	2181		
TDA-EA-2	**Min (°F)**	61.5	61.3	61.3	61.3	61.2		
TDA-EA-2	**Max (°F)**	72.9	72.7	72.6	72.7	72.6		
TDA-EA-2	**Mean (°F)**	68.8	68.7	68.7	68.8	68.7		
TDA-EA-2	**Median (°F)**	70.3	70.3	70.2	70.3	70.2		
TDA-EA-3	**Data Count**	2181	2181	2181	2181	2181	2181	2181
TDA-EA-3	**Min (°F)**	61.5	61.3	61.3	61.3	61.3	61.3	61.3
TDA-EA-3	**Max (°F)**	72.9	72.7	72.7	72.6	72.6	72.6	72.6
TDA-EA-3	**Mean (°F)**	68.8	68.7	68.7	68.7	68.7	68.7	68.7
TDA-EA-3	**Median (°F)**	70.3	70.3	70.2	70.2	70.2	70.2	70.2
TDA-NO-1	**Data Count**	2181	2181	2181				
TDA-NO-1	**Min (°F)**	61.5	61.5	61.5				
TDA-NO-1	**Max (°F)**	73.6	73.5	73.0				
TDA-NO-1	**Mean (°F)**	68.7	68.7	68.7				
TDA-NO-1	**Median (°F)**	70.2	70.2	70.2				

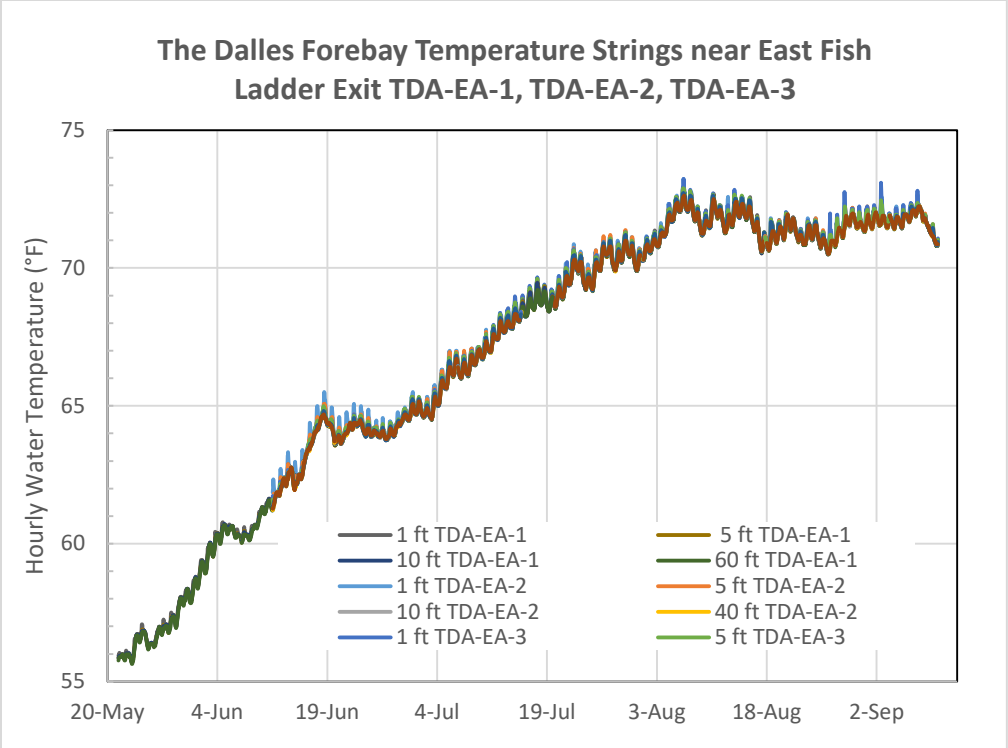

Figure 5-9 The Dalles Forebay Hourly Vertical Profile Temperatures Measured from the Wall Mounted and Two Floating Strings near the East Fish Ladder Exit, May 21 - September 10, 2019

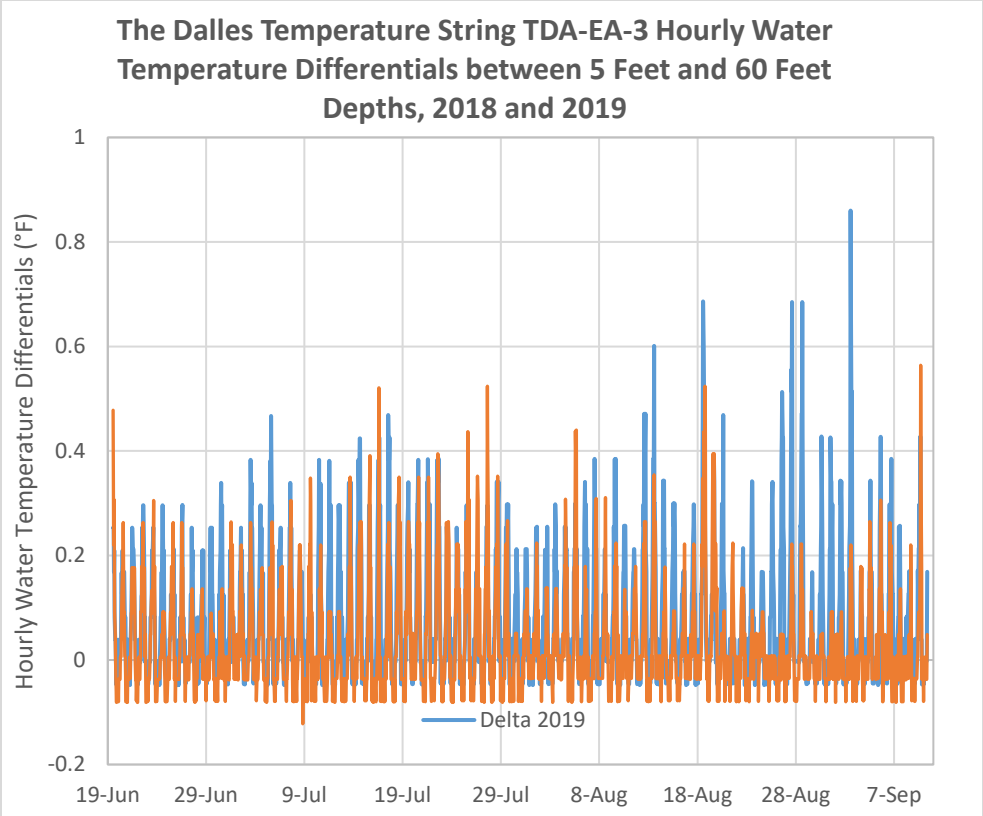

Figure 5-10 The Dalles Forebay Hourly Vertical Profile Temperatures Differentials for Floating String TDA-EA-3 Calculated between 5 Feet and 60 Feet Depths, June 19 - September 10, 2018 and 2019

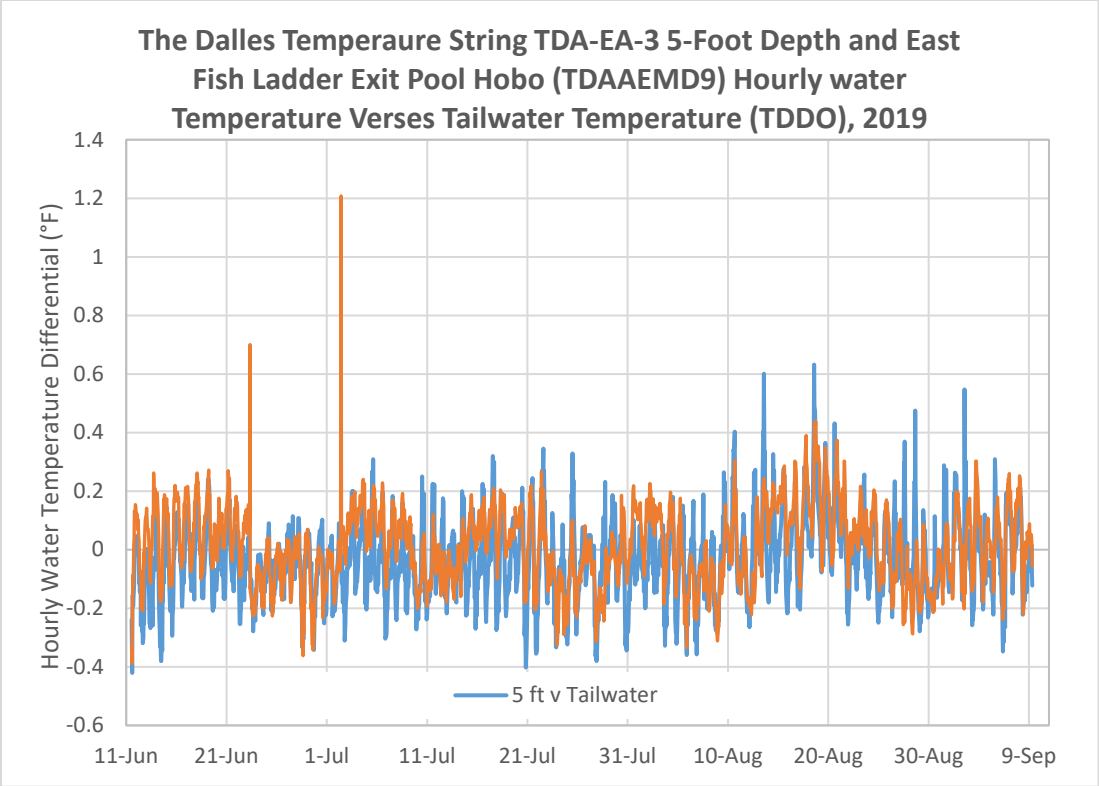

Figure 5-11 The Dalles Forebay Hourly Vertical Profile Temperatures Differentials for Floating String TDA-EA-3 Calculated between 5 feet Depth and Fish Ladder Exit Pool Hobo Verses Tailwater TDG Station (TDDO) Water Temperature, June 11 - September 10, 2019. Note: a positive differential indicates the fish ladder exit area is warmer compared to tailwater temperatures.

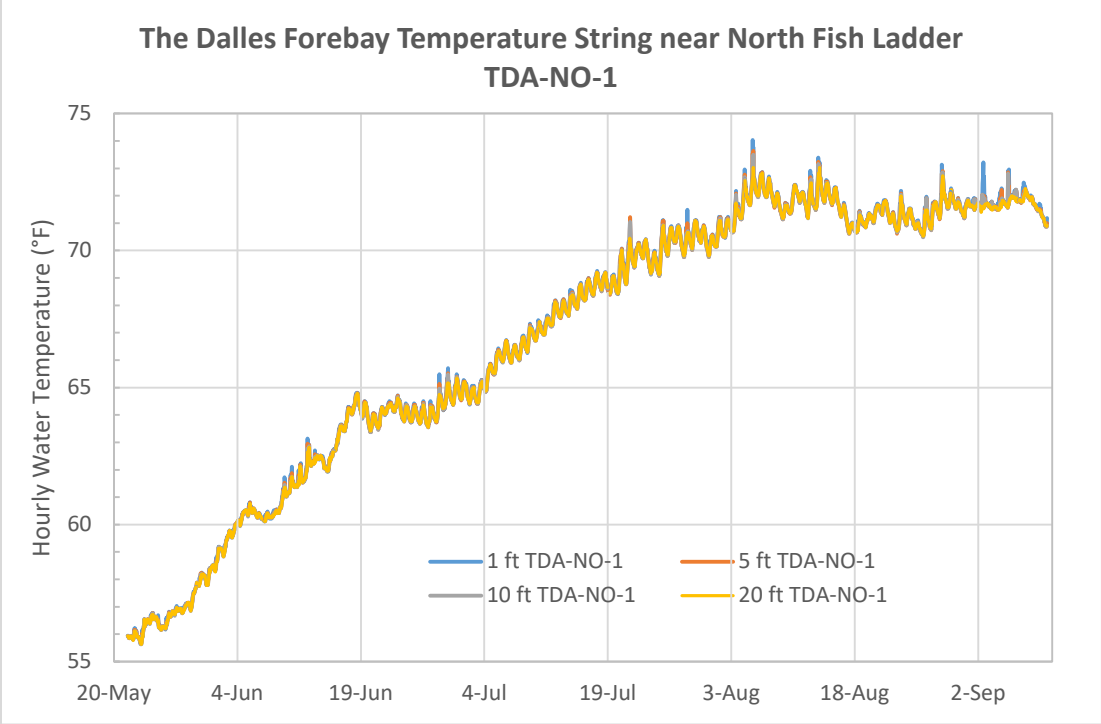

Figure 5-12 The Dalles Forebay Hourly Vertical Profile Temperatures Measured from the Wall Mounted String about 167 Feet from the North Fish Ladder Exit, May 21 - September 10, 2019

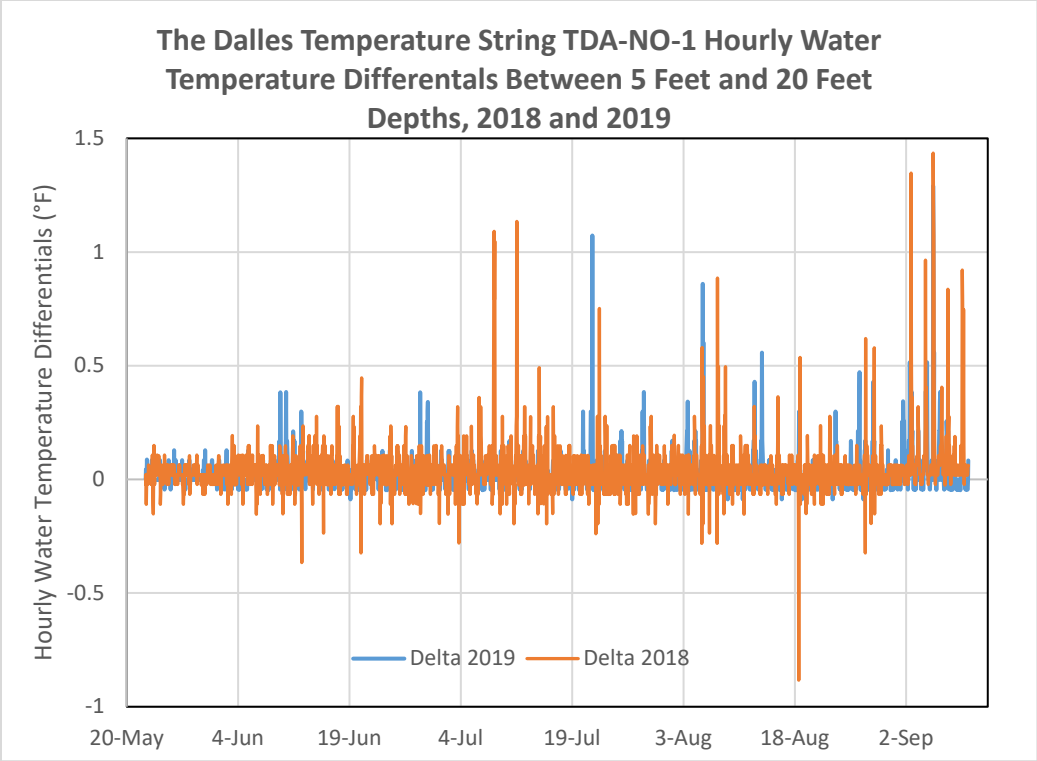

Figure 5-13 The Dalles Forebay Hourly Vertical Profile Temperature Differentials TDA-NO-1 Calculated between 5 feet and 20 Feet Depths, May 21 - September 10, 2018 and 2019

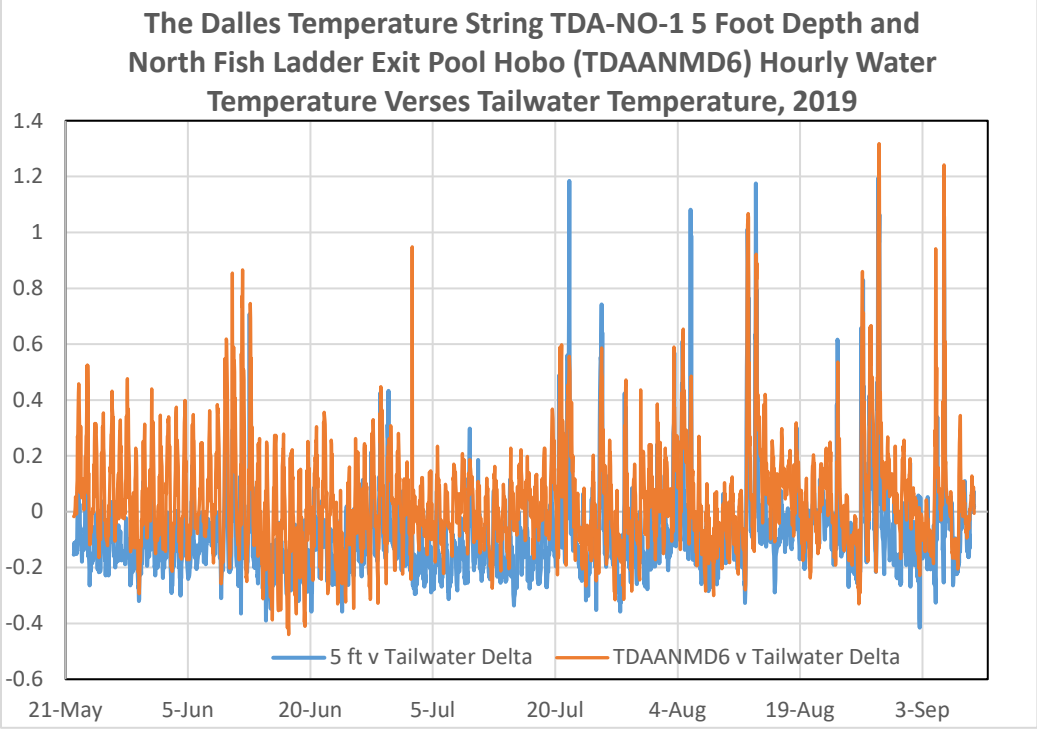

Figure 5-14 The Dalles Forebay Hourly Vertical Profile Temperatures Differentials TDA-NO-1 Calculated between 5 feet Depth and Fish Ladder Exit Pool Hobo Verses Tailwater TDG Station (TDDO) Water Temperature, May 21 - September 10, 2019. Note: a positive differential indicates the fish ladder exit area is warmer compared to tailwater temperatures.

5.3 Bonneville Bradford Island and Washington Shore Fish Ladder Exits

The resulting vertical profile temperatures near the Bradford Island and Washington Shore fish ladder exits show that the Bonneville reservoir is well-mixed with very little stratification occurring, similar to The Dalles forebay. The Bonneville results are in contrast to the steep thermal gradient and deeper John Day forebay thermal profile. The bathymetry and water velocity are some of the main driving factors for a well-mixed water column and poor thermal gradients at these Lower Columbia projects (including The Dalles). Also, the descriptive statistics in Table 5 show that the difference in temperatures between all four sites was overall minimal. The resulting Bonneville forebay temperatures were combined for each fish ladder exit site since there is little variation between them (Figure 5-15 and Figure 5-18). `

In addition, summer diurnal temperature changes that occurred near the surface at the Bonneville sites were typically around half of a degree. Although there was often an additional half degree of additional warming during the peak daytime hours, similar to The Dalles.

The temperature string sites near the Bradford Island fish ladder exit included a wall mounted site within a few feet from the fish ladder which was only 10.5-feet deep (BON-BI-1). As expected, this fixed site had very little variation in temperature with depth; while the 34-feet deep floating temperature string site (BON-BI-2) had slightly more variability (Figure 5-15). This floating string site which was about 170 feet from the fish ladder exit, had typical temperature differences from surface to bottom of about 1.0°F.

Water temperature differentials for this deepest site (BON-BI-2) which compares the 5 foot and 30 foot deep sensors, fluctuated mostly between 0.5 and 1.0 °F for both study years (2018 and 2019). The few exceptions when temperature differentials were slightly greater, was in late June, 2019, with a 1.2 °F differential for a couple hours; and also from late June through July in 2018, with about seven hours of differentials between 1.2 - 1.4 °F (Figure 5-16).

The two profile temperature string sites near the Washington Shore fish ladder exit included the fixed site on the existing pier which was 26 feet deep (BON-WN-1) and the floating site at 40 feet deep (BON-WN-2). These Washington Shore sites were 50 feet (BON-WN-1) and 190 feet (BON-WN-2) from the fish ladder exit. Both sites had even less variation in temperatures with depth (< 0.5°F) compared to the Bradford Island floating site, even though they were slightly deeper than the Bradford Island site.

At the deeper floating site (BON-WN-2), the water temperature differentials between the 5 foot and the 38.5 foot sensors varied overall by only 0.2 °F for both study years (2018 and 2019) indicating a highly mixed water column (Figure 5-19). Although, there were hourly exceptions in 2018 when temperature differentials from August 6 - 9 (around 1600 hour) ranged between 0.6 - 0.9°F. The water column was likely slightly stratified during these hours (2018) due to extremely hot ambient conditions and less wind, which was also the pattern at the John Day forebay during this period.

Water temperature differentials for Bonneville Dam were calculated with the Warrendale tailwater TDG station (WRNO) temperature data and compared to near surface (5 foot deep) BON-BI-2 data and fish ladder exit pool data located within the fish ladder (Figure 5-17). The same comparison was done with the Washington Shore fish ladder with the near surface BON-WN-2 data; however, the fish ladder exit pool temperature data was not available at this location (Figure 5-20). Note: WRNO tailwater temperatures were used instead of Cascade Island (closer to the tailwater) for both 2018 and 2019 studies, since the Cascade Island data was not available during part of 2018 and it has a 0.25 to 0.5 variation.

The differential results were similar at both Bonneville fish ladders and indicated that the 5 feet deep sensors consistently matched tailwater temperatures and varied +/- 0.5 °F. The Bradford Island fish ladder exit Hobo sensor overall matched the tailwater (< 0.7 °F warmer), and was often 0.1 to 0.4 °F warmer than the 5 foot sensor from BON-BI-2. These results indicate that water coming into the ladder already nearly matches the tailwater and the water column temperature differential of less than 0.5 °F would not make pumping water from depth a reasonable endeavor with the collected data.

Table 5 Descriptive Statistics for Bonneville Forebay Hourly Vertical Profile Temperatures Measured from the Bradford Island and Washington Shore Fish Ladder Exit with Structure Mounted and Floating Strings, June 12 - September 11, 2019.

		Sensor Depths					
Station	**Parameter**	**5 ft**	**10 ft**	**15 ft**	**20 ft**	**30 ft**	**40 ft**
BON-BI-1	**Data Count**	3165	3165				
BON-BI-1	**Min (ºF)**	57.6	57.6				
BON-BI-1	**Max (ºF)**	73.6	73.6				
BON-BI-1	**Mean (ºF)**	66.7	66.7				
BON-BI-1	**Median (ºF)**	67.2	67.2				
BON-BI-2	**Data Count**	3165	3165		3165	3165	
BON-BI-2	**Min (ºF)**	57.6	57.6		57.6	57.5	
BON-BI-2	**Max (ºF)**	73.7	73.5		73.5	73.4	
BON-BI-2	**Mean (ºF)**	66.7	66.6		66.6	66.5	
BON-BI-2	**Median (ºF)**	67.3	67.1		67.1	67.0	
BON-WN-1	**Data Count**	3165	3165	3165	3165		
BON-WN-1	**Min (ºF)**	57.8	57.8	57.8	57.8		
BON-WN-1	**Max (ºF)**	73.6	73.5	73.5	73.5		
BON-WN-1	**Mean (ºF)**	66.6	66.6	66.6	66.6		
BON-WN-1	**Median (ºF)**	67.1	67.1	67.1	67.1		
BON-WN-2	**Data Count**	3165	3165		3165	3165	3165
BON-WN-2	**Min (ºF)**	57.8	57.8		57.8	57.8	57.8
BON-WN-2	**Max (ºF)**	73.8	73.5		73.6	73.5	73.5
BON-WN-2	**Mean (ºF)**	66.7	66.6		66.7	66.6	66.6
BON-WN-2	**Median (ºF)**	67.1	67.1		67.1	67.1	67.0

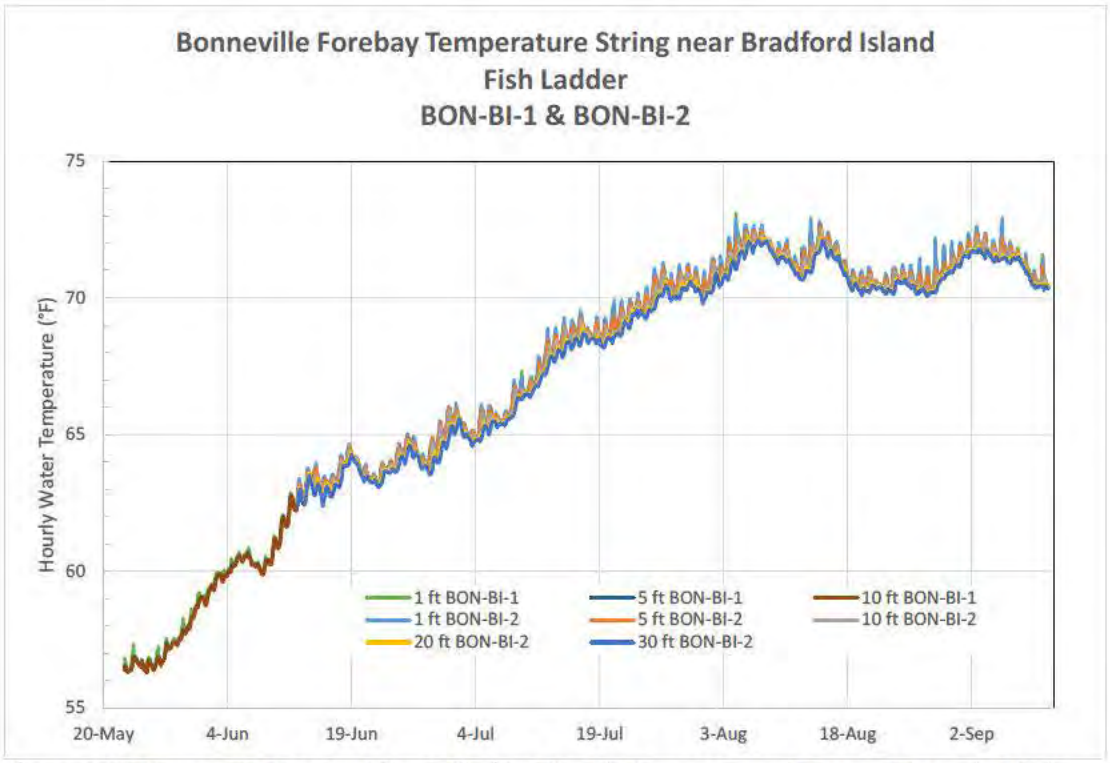

Figure 5-15 Bonneville Forebay Hourly Vertical Profile Temperatures Measured from the Wall Mounted and Floating Strings near the Bradford Island Fish Ladder Exit, May 22 - September 11, 2019

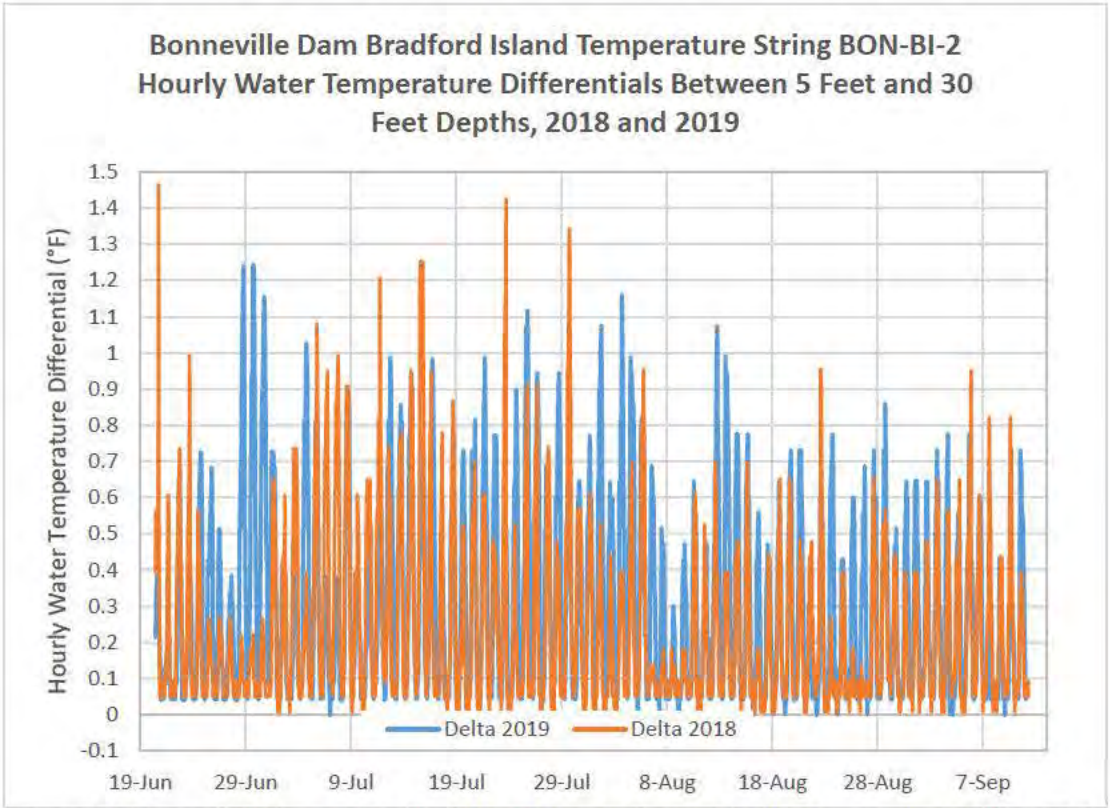

Figure 5-16 Bonneville Dam at Bradford Island Hourly Vertical Profile Temperatures Differentials BON-BI-2 Calculated between 5 Feet and 30 Feet Depths, June 20 - September 11, 2018 and 2019

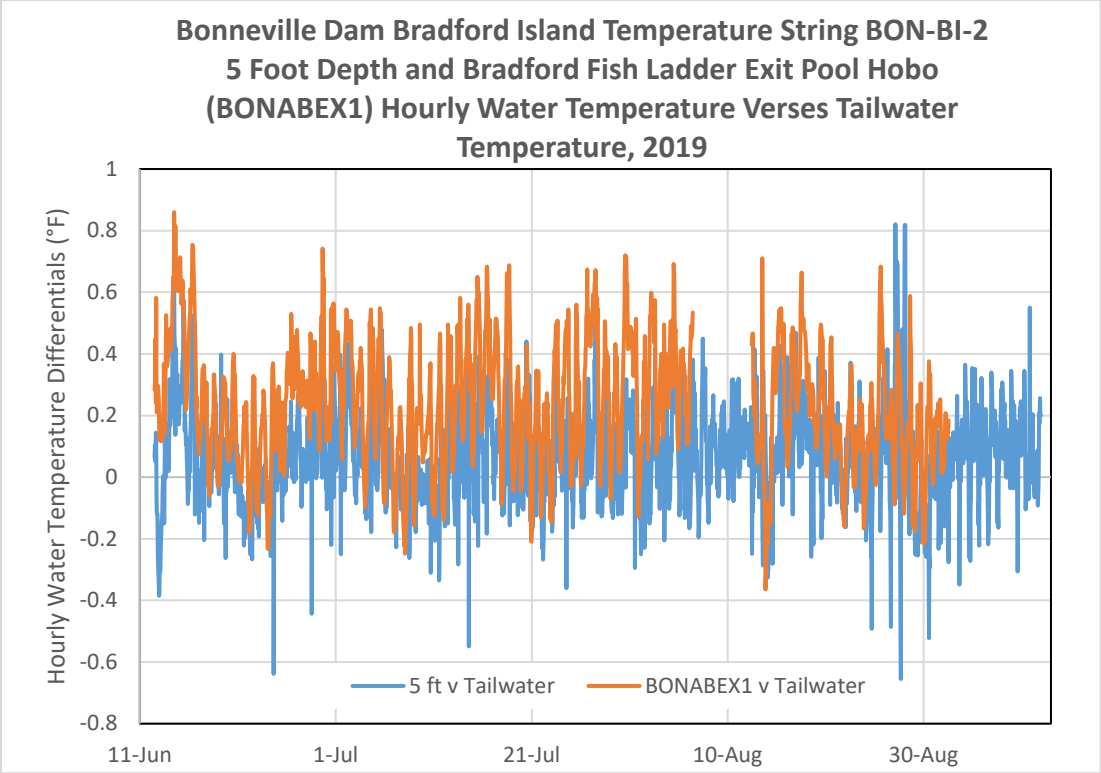

Figure 5-17 Bonneville Dam at Bradford Island Forebay Hourly Vertical Profile Temperatures Differentials BON-BI-2 Calculated between 5 foot Depth and Fish Ladder Exit Pool Hobo Verses Warrendale Tailwater TDG Station (WRNO) Water Temperature, June 12 - September 11, 2019. Note: a positive differential indicates the fish ladder exit area is warmer compared to tailwater temperatures.

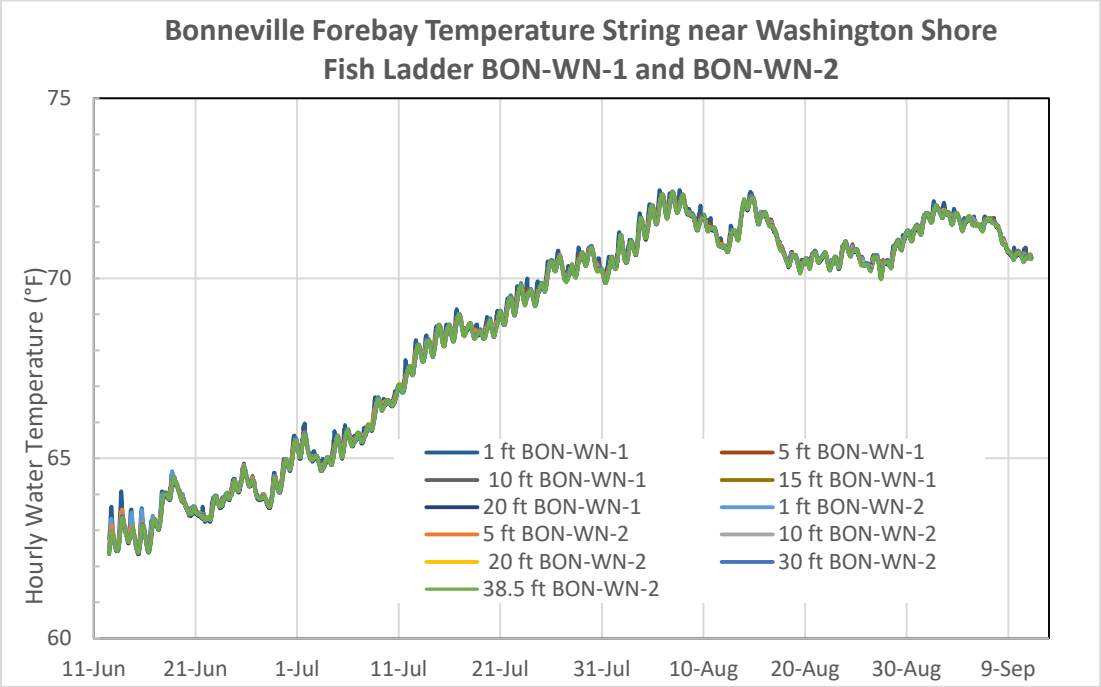

Figure 5-18 Bonneville Forebay Hourly Vertical Profile Temperatures Measured from the Pier Mounted and Floating Strings near the Washington Shore Fish Ladder, June 12 - September 11, 2019

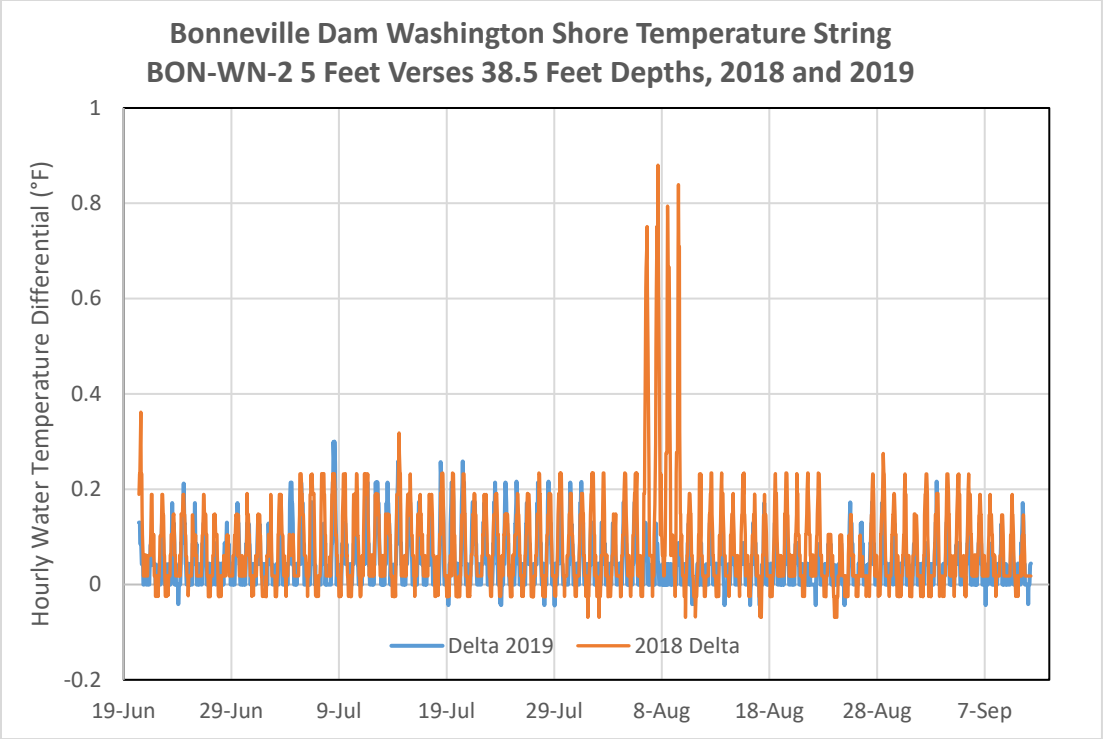

Figure 5-19 Bonneville Dam at Washington Shore Hourly Vertical Profile Temperatures Differentials BON-WN-2 Calculated between 5 Feet and 38.5 Feet Depths, June 20 - September 11, 2018 and 2019

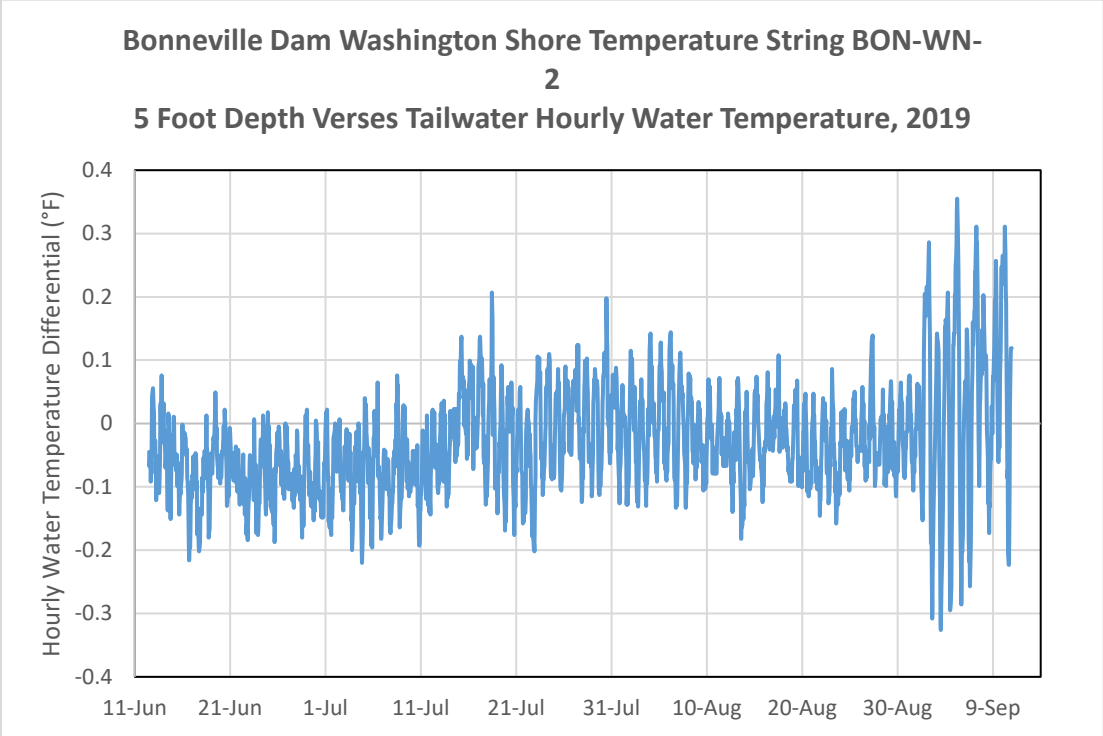

Figure 5-20 Bonneville Dam at Washington Shore Forebay Hourly Vertical Profile Temperatures Differentials BON-BI-2 Calculated between 5 feet Depth Verses Tailwater TDG Station (WRNO) Water Temperature, June 12 - September 11, 2019. Note: a positive differential indicates the fish ladder exit area is warmer compared to tailwater temperatures.

6. Conclusions

The John Day, The Dalles, and Bonneville Dam forebays profile temperature data from the 2019 study shows similar results to the 2018 study, even though the two water years were somewhat different. During May in 2018, there were much higher (above average) total flows (runoff), compared to 2019; however, overall summer total flows were below average for both years (74 - 88% of 30-year average). In addition, ambient air temperatures were average to above average throughout the study period for both years.

The resulting 2019 data indicated that the John Day forebay near the South fish ladder exit is weakly stratified, depending on wind and ambient conditions, while there is very little stratification in The Dalles and Bonneville Forebays near the sampling sites. While there is sometimes cooler water available at depth (up to 3 - 6°F) at the John Day sites, temperatures can still be quite warm near the bottom. Whereas at The Dalles East and Bonneville's Bradford Island and North Shore fish ladders, water temperatures were relatively well-mixed and warm throughout the water column, as there was little variation in temperatures with depth (0.5 - 1.5 ºF). The bathymetry and water velocity, rather than the type of water year, are some of the main driving factors for a well-mixed water column and poor thermal gradients at these Lower Columbia River projects (TDA and BON). In addition, temperatures did not vary much laterally between the sites at each fish ladder exit location.

After conducting this two year temperature profile study at the John Day, The Dalles, and Bonneville Dams fish ladder exits, it helped to answer some questions. For example, the amount of stratification (or lack of) found in the 2018 and 2019 studies appears to be typical in the water column; there likely is not much potential for more stratification in the water column; there wasn't really less wind than usual to allow the water to stratify more at the John Day sites.

In summary, the water column measured both at depth near the selected fish ladder exit sites and at the tailwater sites remained over the critical water temperature of 68 °F between July 15 to September 12, 2018 and 2019, in the Columbia River below McNary Dam (Figure 6-1). This study also concludes that at the John Day Dam forebay near the South fish ladder exit study sites, there is a steeper thermal gradient compared to The Dalles and Bonneville projects. If this cooler water were to be pumped from the bottom at one of the John Day study sites, it may match the tailwater temperatures at times; however, at The Dalles and Bonneville forebays it may be a negligible endeavor.

Since salmonid passage also occurs in the system during this warmer period from mid-July through mid-September, these fish may experience sub lethal/lethal water temperatures when passing dams. The option of pumping cooler deeper water from the South fish ladder exit area at the John Day Dam, may be a viable one that could assist with the safe passage of salmonids during these warmer summer periods. For future studies, it would also be interesting to survey thermal refugia in the Lower Columbia River, i.e. pockets of deep cold water that are below 68°F, that may provide some relief for the passing salmonids.

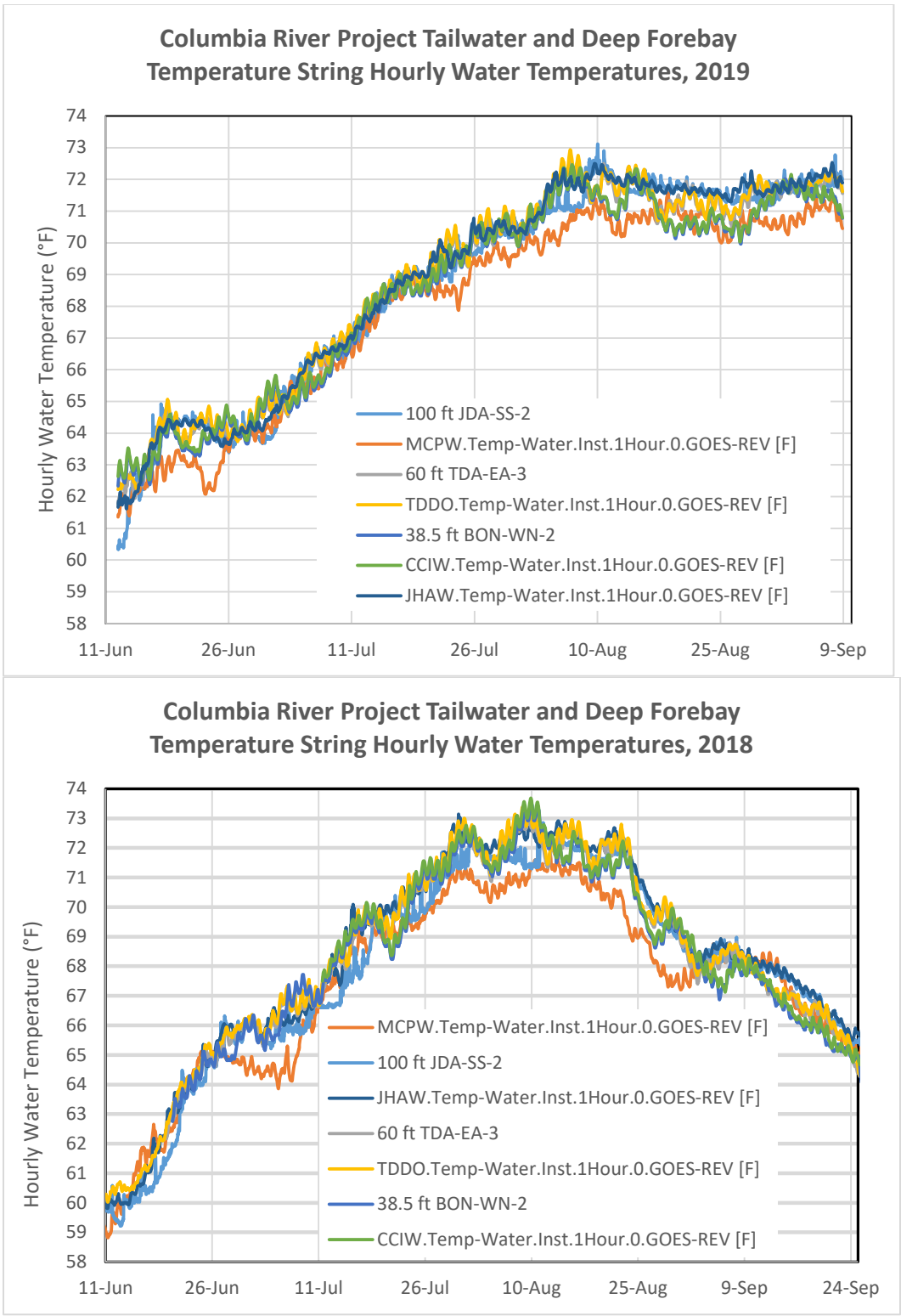

Figure 6-1 John Day, The Dalles, and Bonneville Dams Forebay Hourly Deepest Temperature and Tailwater TDG Stations (MCPW, JHAW, TDDO, CCIW) Water Temperature, June 12 - September 9, 2019 (Top) and June 12 - September 24, 2018 (Bottom). Note: the 2019 study ended before the 2018 study.

Draft Columbia River Cold Water Refuges Plan, October 2019
Comments from US Forest Service (USFS)

Overarching Comment

We generally found the Draft Columbia River Cold Water Refuges Plan (CWR Plan) to be scientifically sound. Furthermore, overall, we believe the plan is implementable on National Forest System lands. As reflected in our comments below, however, there are opportunities to improve the plan.

General Comments

1. Pg. 76. EPA concluded that: "the spatial and temporal extent of existing CWR appears to be sufficient under current and 20°C Columbia River temperatures but may not be in the future. Therefore, maintaining the current temperatures, flows, and volumes of the 12 primary CWR in the Lower Columbia River is important to limit significant adverse effects to migrating adult salmon and steelhead from higher water temperatures elsewhere in the water body. Further, additional CWR in the Lower Columbia River may be needed due to the predicted continued gradual warming of the Columbia River. The 11 non-primary CWR tributaries and other potential tributaries may provide additional CWR through restoration and enhancement."

   While this conclusion is generally supported by the analysis in the document, it does not appear that EPA considered other needs and potential opportunities to achieve the CWR Plan's overall goal of "supporting migrating adult salmon and steelhead…in the Lower Columbia River" (p.2). Specifically, EPA may need to consider whether additional actions are needed to improve stream temperature conditions in the mainstem Columbia River itself, rather than just the tributary CWR.

2. Pg. 5-23. EPA's process for assessing and identifying CWR is generally rational, transparent and scientifically sound. Given the established criteria, however, it is unclear why the Kalama River was not identified as a CWR. Its temperatures are relatively low and summer flow volumes are comparable to or higher than some of the other CWR. The only apparent reason for is omission is the fact that it is tidally influenced and thus may be inaccessible during low tides. EPA should consider whether that fact entirely negates its function as a CWR.

3. The CWR Plan properly emphasizes the critical role of shade in protecting and restoring the water temperatures needed to achieve the plan's goals. However, it is important to consider other controlling factors such as river-floodplain connectivity, channel morphology, functioning meadows, functioning alluvial fans, surface-groundwater interactions, and diversions when addressing existing conditions and recommended restoration actions. These factors are addressed well in some parts of the plan, but less so in others.

In particular, for areas within the Columbia River Gorge National Scenic Area (CRGNSA), additional consideration of these factors is needed. Specifically, we suggest that:

- More attention is needed on the effects of hatchery diversion dams, including stream dewatering and upstream migration barriers, on at least three of the important CWR in the CRGNSA (Tanner Creek, Eagle Creek and Herman Creek).
- Additional consideration and discussion of the degree to which alluvial fans in the CGRNSA are functioning and the associated effects on stream temperatures is warranted.
- An assessment of the impact of the borrow pit "lakes" along I-84 and Highway 14 on temperatures at the mouth of many of the Columbia River tributaries should be considered.

These issues are addressed below in further detail.

4. Consistent with legal mandates, the USFS generally relies on passive restoration rather than active restoration of riparian vegetation in designated wilderness areas.
5. Strategic acquisition of lands critical to aquatic resource conservation, via the Land and Water Conservation Fund, is a useful tool for USFS to maintain or restore shade and other watershed and riparian functions linked to stream temperature. This should be noted in the relevant "Watershed Snapshots" or elsewhere in the document.
6. EPA properly cited many of the USFS documents, management plans and programs relevant to the maintenance and restoration of stream temperatures and CWR. Some key items, however, are missing and should be incorporated into the final document. These include:

    - *Memorandum of Understanding between State of Oregon Department of Environmental Quality and the USDA Forest Service, Pacific Northwest Region (2014),* which outlines the agencies' strategy for managing and controlling point and nonpoint source water pollution from NFS lands in Oregon.
    - *Memorandum of Understanding between USDA Forest Service, Region 6 and Washington State Department of Ecology for Meeting Responsibilities under Federal and State Water Quality Laws (2019),* which outlines a similar strategy for NFS lands in Washington.
    - *USDA Forest Service (2012). National Best Management Practices for Water Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. FS-990a.* This document outlines USFS practices for managing nonpoint source pollution and monitoring the implementation and effectiveness of those practices.
    - *USDA Forest Service (2011). Watershed Condition Framework. FS-977. Washington, DC. 24 pp.* This document describes the 6-step process that USFS uses to protect NFS watersheds by implementing practices to maintain or improve watershed condition.

- *Columbia River Gorge National Scenic Area Management Plan (2011),* which should be referenced in the "Watershed Snapshots" for each of the primary CWR, except those associated with the Cowlitz and Lewis Rivers. This is important since the mouths and/or lower reaches of 10 of the 12 primary CWR are located within (CRGNSA), which is managed by a combination of the USFS and the Columbia River Gorge Commission, as well as some of the counties.
- *USFS Deschutes National Forest Land and Resource Management Plan (1990) and USFS Ochoco National Forest Land and Resource Management Plan (1989),* which apply to lands that contribute flows to the Deschutes River.
- *USFS Umatilla National Forest Land and Resource Management Plan (1990),* which applies to lands that contribute flows to the Umatilla River.

7. Many of the "Watershed Snapshots" include the following language or variants thereof: "Implement actions in the USFS Gifford Pinchot National Forest Land and Resource Management Plan (1990) and its amendments on federal forest lands in the upper watershed, including the establishment of Riparian Reserves."

   Riparian reserves are a foundational component of a key amendment to USFS Land and Resource Management Plans within the range of the Northern Spotted Owl, known as the Northwest Forest Plan (NWFP). However, it is only one component of the comprehensive Aquatic Conservation Strategy (ACS) included in the NWFP and all ACS components are relevant to achieving the goals of EPA's CWR plan. As such, for all "Watershed Snapshots", please revise the language accordingly: "On National Forest System lands, implement actions in the [insert relevant management plan(s) noted in Comment #3 above] and its amendments, which include an aquatic strategy."

   The term "aquatic strategy" should be footnoted, perhaps only once, to indicate that they each include the following key components: "strategic aquatic goals and objectives, designated riparian areas and specific watersheds where conservation and restoration are emphasized, an integrated watershed restoration program, analysis and monitoring, and standards and guidelines." This general "aquatic strategy" language applies to both NWFP-ACS as well as the PACFISH and INFISH strategies, which amended Land and Resource Management Plans on NFS lands outside of the NWFP area.

Specific Comments

1. Pg. 2, 1.2. Types of Cold Water Refuges. EPA concluded that "other types of CWR are minor in scope…". Are there not some meaningful CWR provided by inflowing groundwater? Were there more in the past, especially when alluvial fans were still functioning at the mouths of the tributary channels along the Lower Columbia River? Could any of those CWR be restored?
2. Pg. 74, 6.3. Assessment on CWR Sufficiency, Current Conditions: Fish Use and CWR Capacity. What does it mean when the capacity of a CWR (e.g., Eagle Creek and Rock Creek) is exceeded? When that occurs, would migrating fish move further upstream? The CRGNSA is specifically interested in Eagle Creek and evaluating whether restoration near the mouth could expand existing capacity.
3. Pg. 77. It should be noted that the Mt. Hood National Forest is an active participant/stakeholder in implementing the steelhead recovery plan in Fifteenmile Creek, much of which is relevant to the CWR Plan.
4. Pg. 80, 7.2. Characteristics of primary cold water refuge tributaries, paragraph 6. The statement that sediment build-up at tributary mouths leads to warmer surface temperatures is not entirely accurate. In fact, functioning alluvial fans at the mouths of tributaries and the associated hyporheic flow typically acts to maintain and/or cool water temperatures. Perhaps the largest driver of warm temperatures at the mouths of the tributaries in the CRGNSA (10 of the 12 primary CWRs) is development and channelization of the streams. Aggradation of sediment in the channel resulting from excessive upstream erosion can, however, result in wider, shallower streams with warmer surface temperatures. A discussion of alluvial fan function would be key in this section. It is our understanding that development and channelization resulting in non-functioning alluvial fans at the mouths of many of these tributary channels is one of the main limiting factors, along with regulated flows and backwater from dams, of chum spawning in the Columbia River Gorge. Additionally, the number of ponds created from borrow pits for building of the highways and railroads are a major factor in increased stream temperatures for these CWRs. Those ponds, however, also maximize capacity. These tradeoffs should be further considered now and into the future via research.
5. Pg. 81, Table 7-1. Tanner, Eagle, and Herman Creeks are in the CRGNSA, not the Mt Hood National Forest.
6. Pg. 81, Table 7-1. Eagle Creek, Herman Creek and Tanner Creek all have channel spanning diversion dams that prevent upstream passage of fish and divert most, if not all, of the flow at Eagle Creek and Tanner Creek. It would seem appropriate to add potential actions to this table that might address these conditions.
7. Pg. 93, Sandy River, near bottom of page. The shallower channel can have a warming effect, but the hyporheic flow resulting from the functioning debris fan can cool

temperatures. Decreased flows associated with consumptive uses are more likely to be driving warmer temperatures than sediment issues.

8. Pg. 94, Sandy River, Text and Figure 7-12. The CRGNSA manages the land on the Sandy River Delta, while Oregon owns the land under the East Channel. The lower approximately 3 miles of the Sandy River is the western extent of the CRGNSA and is subject to the CRGNSA Management Plan (even the private areas).
9. Pg. 97, Sandy River, action bullets. The following two bullets should be added.
    - Implement actions in the Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy.
    - On NFS lands, continue to implement projects identified in Watershed Restoration Action Plans (2011-2021) for the Upper Sandy Basin.

    Also, please note that the uppermost reaches of the Upper Sandy Basin are in designated Wilderness. As such, these areas are subject to limited management.
10. Pg. 100, Tanner Creek. Most of the Tanner Creek watershed is located within designated wilderness managed by the USFS. The USFS generally relies on passive restoration rather than active restoration in these areas. It is also important to consider that even though the Eagle Creek Fire was human caused, wildfire is a natural process that delivers nutrients, sediment and large wood to stream channels. Ultimately these processes and natural recovery provides for improved habitat conditions over time.
11. Pg. 100-101, Tanner Creek, Dams and Hydromodifications & Water Use. The statements about the diversion dam at mile 0.8 are incorrect. The Tanner Creek watershed is a priority watershed per the USFS Watershed Condition Framework for the CRGNSA. The highest priority essential project in the Watershed Restoration Action Plan for the Tanner Creek watershed is to restore fish passage through the diversion at mile 0.8, operated by the Oregon Department of Fish and Wildlife, and to restore floodplain connectivity near the mouth by obliterating the road accessing the diversion that is confining the stream channel. Riparian vegetation planting is also important. This is intended to address the fact that most of the flow in Tanner Creek is diverted at this diversion dam, resulting in warmer stream temperatures and lack of upstream fish passage. Additionally, the lack of floodplain connection and reduced riparian vegetation at the mouth likely contribute to warmer stream temperatures in the stream in this lower reach.
12. Pg. 101, Tanner Creek. One of the largest risks of sediment delivery to Tanner Creek is likely road failures from the NFSR 8400777 Road, a mid-slope road on the east side of Tanner Creek. As a result of recommendations made in the Eagle Creek Fire Burned Area Emergency Response (BAER) Report, all of the stream crossing culverts were removed and replaced with low-water crossings or fords, which mitigated much of the

road failure concerns. However, drainage from this road onto the steep slopes that burned with moderate and/or high severity is an additional potential for sediment delivery to Tanner Creek.

13. Pg. 101, Tanner Creek. Actions to protect and enhance the Tanner Creek CWR should also include removal of the diversion dam as discussed previously.
14. Pg. 102, Tanner Creek. Change "Columbia River Gorge Scenic Area" to "Columbia River Gorge National Scenic Area" and consider adding a reference to implementing the Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy.
15. Pg. 103, Eagle Creek. The lower reach of Eagle Creek, from the diversion dam downstream, has had multiple exceedances of the 18 degrees C maximum water temperature criteria based on stream temperature monitoring conducted by the USFS.
16. Pg. 104, Eagle Creek. The Eagle Creek Trailhead is located within the CRGNSA. The CRGNSA manages the lower portion of the watershed and trail and the Mt. Hood National Forest manages the upper sections. The Eagle Creek Recreation Area and trailhead are also developed in addition to the Cascade Fish Hatchery and the Eagle Creek Overlook Group campground, including a paved floodplain road that accesses the trailhead and diversion dam. The existing level of development at the mouth of Eagle Creek has an impact on the valley bottom connectivity of the stream channel and its complexity and ability to access its floodplain.
17. Pg. 105, Eagle Creek. Moderate severity fire consumes up to 80% of ground cover and surface organic matter. Higher levels of consumption are classified as high burn severity. This is not clear in the text.
18. Pg. 105, Eagle Creek, Dams and Hydromodifications. There is a diversion dam that has a water right that exceeds the flow in the stream for much of the summer and therefore diverts almost the entire flow in the channel. This impacts temperatures and flow in the channel for the reach below it until the return flow location, approximately 2800 feet downstream. This dam is also an aquatic organism passage barrier that has been identified by the USFS as a priority for restoration.
19. Pg. 106, Eagle Creek, Water Use. See previous comment regarding dams and hydromodifications.
20. Pg. 106, Eagle Creek, Climate Change. The resiliency of Eagle Creek to climate change has been reduced by development at the mouth of Eagle Creek and on the floodplain, which has directly warmed temperatures and caused the stream to become confined and channelized, thereby minimizing interactions with its floodplain. In order to maintain cooler temperatures from upstream, it will be important to consider restoration activities that allow the channel to interact with its floodplain and the alluvial valley bottom.

21. Pg. 107, Eagle Creek, Ongoing Activities in the Eagle Creek Watershed and Recommended Actions to Protect and Enhance the Cold Water Refuge. A bullet should be added that says "Implement actions in the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy*." Also add a bullet that discusses restoring valley bottom connection of Eagle Creek near the mouth, as discussed in the previous comments.
22. Pg. 109, Herman Creek. The mouth and lower reaches of Herman Creek are located within the CRGNSA. The introduction should mention the hatchery diversion dam that is a barrier to upstream fish passage.
23. Pg. 110, Herman Creek, Factors that Influence Temperature in the Herman Creek Watershed, Protecting and Enhancing Riparian Vegetation. There is not a clear linkage between riparian shade and groundwater.
24. Pg. 114, Wind River, Introduction to the Wind River Watershed and P. 117, Wind River, Action bullets. The mouth and lowest reach of Wind River is located within the CRGNSA and is managed according to the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy.* In addition, it is important to consider that alluvial sediment deposition is a natural process and channelizing streams may exacerbate stream energies and potentially stream temperatures.
25. Pg. 119, Little White Salmon River, Introduction. Drano Lake and the mouth and lower reaches of the Little White Salmon River are located within the CRGNSA.
26. Pg. 120, Little White Salmon River, Factors that Influence Temperature in the Little White Salmon River Watershed Protecting and Enhancing Riparian Vegetation. Private and public lands within the CRGNSA boundary are also managed by the CRGNSA Management Plan and its amendments, which protects cultural, natural and scenic resources in the Columbia Gorge, including water resources and riparian vegetation.
27. Pg. 122, Little White Salmon River, action bullets - A bullet should be added that says "Implement actions in the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy*."
28. Pg. 123, White Salmon River. Current information indicates that there's a natural fish barrier at river mile 1.3. The Yakama Nation Fisheries biologists would be a good resource to verify this.
29. Pg. 124, White Salmon River, Introduction. The mouth and lowest reach of the White Salmon River are located within the CRGNSA and is managed per the CRGNSA Management Plan and its amendments. The USFS CRGNSA is also tasked with managing the Wild & Scenic River corridor.

31. Pg. 127, White Salmon River, action bullets. Two bullets should be added:
    - "Implement actions in the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy.*
    - "Implement actions in the *Lower White Salmon National Wild and Scenic River Management Plan*."
32. Pg. 129, Hood River, Introduction. The mouth of the Hood River is located within the CRGNSA boundary. However, since much of this area overlaps with the City of Hood River, very little of the watershed is managed by the CRGNSA.
33. Pg. 130. The Middle Fork Irrigation District is currently in the process of applying for a Clean Water Act, 401 certification for releases to mitigate stream temperature impacts on Laurence Lake.
34. Pg. 130. The Confederated Tribes of the Warm Springs Reservation also operates and manages a fish hatchery on the Middle Fork Hood River.
35. Pg. 132, Hood River, action bullets. Portions of this watershed are managed by CRGNSA. See similar comments.
36. Pg. 134, Klickitat River, Introduction. The mouth and lowest reach of the Klickitat River are located within the CRGNSA and is managed per the CRGNSA Management Plan and its amendments. The USFS CRGNSA also manages the Wild and Scenic River portions of the Klickitat River per the Lower Klickitat River Management Plan.
37. Pg. 135, Klickitat River, Protecting and Enhancing Riparian Vegetation. It's important to differentiate riparian shade from topographic shade. The canyon walls themselves provide very effective shade. In addition, a major factor in riparian shade potential and floodplain connection for the Lower Klickitat River is the highway that runs up the valley bottom and limits available floodplain interaction and shade potential. There are substantial reaches with armoring for road protection as well.
38. P. 136-137, Klickitat River, action bullets.
    - "Implement actions in the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy.*
    - "Implement actions in the *Lower Klickitat River Management Plan*."
39. P. 139, Fifteenmile Creek, Introduction. The mouth and lowest reach of the Fifteenmile Creek are located within the CRGNSA. See similar comments.
40. Pg. 139. On NFS lands, segments of Fifteenmile Creek were designated by the 2009 Omnibus Bill as a National Recreation Area. All reaches on NFS lands are also candidate for Wild and Scenic River designation. The uppermost reaches are Wilderness.

41. Pg. 141, bullet 1. Also consider projects that will soon be identified in the following pending plans: Wild and Scenic River Plan, Water Quality Restoration Plan (per OR-DEQ MOU), and Watershed Restoration Action Plan.
42. P. 141-142, Fifteenmile Creek, Action bullets - A bullet should be added that says "Implement actions in the *Columbia River Gorge National Scenic Area Management Plan and its amendments, which include an aquatic strategy."*
43. Pg. 142, bullet 3. Consider acknowledging voluntary conservation tillage program by landowners.
44. Pg. 143. Besides the ongoing efforts to improve flows, etc. to help with temperature issues, it should be noted that there is a Habitat Conservation Plan in progress that is geared toward conservation measures that will benefit some of the species of concern.
45. Page 143. Two of the watershed councils that are working toward improving conditions of riparian areas and diversion issues on important tributaries were mentioned in the CWR Plan. However, the Middle Deschutes Watershed Council is missing. They are working on similar activities and specifically on one of the important tributaries mentioned in the CWR plan.
46. Pg. 144, Deschutes River, Introduction. The western edge of the Deschutes River is the eastern most extent of the CRGNSA on the Oregon side. A very small portion of land on the west side of the Deschutes River at the mouth is managed by the CRGNSA per the CRGNSA Management Plan and its amendments.
47. Pg. 153, Protect Through Regulatory Programs. The CRGNSA Management Plan and its amendments are critical to include in this section of the document since the actual cold water refuge portions of 10 of the 12 primary CWRs are located within the CRGNSA.
48. Pg. 153, Restore Riparian Shade, Stream Morphology, and Instream Flow. The mouths of many, if not all, of the CWRs have been highly channelized and thus have limited floodplain connectivity, which typically has an adverse effect on stream temperatures. Thus, restoring stream morphology would not necessarily involve "narrower channels". Instead, it should include reconnection of streams to their floodplains and valley bottoms and restoration of associated sediment regimes.
49. Pg. 154, Cool Water Releases from Dams. This should include a discussion of the diversion dams on Eagle Creek and Tanner Creek, since they are dewatering the stream channels and also have stream temperatures impacts in the lower reaches of the streams.
50. Pg. 154, Sediment Management. A discussion of the high degree of development on alluvial fans, resulting in disconnection of streams from their floodplains and associated effects to the sediment regime should be addressed. In addition, backwater effects from the Bonneville Dam are very key to this discussion and should be included as well. Active restoration will likely not occur in Eagle Creek or Tanner Creek in the middle or

upper reaches, since they are located within a designated wilderness. The Eagle Creek Fire is anticipated to add much needed large wood and nutrients to the stream channels and natural revegetation is anticipated to improve overall riparian conditions over time. Sediment build-up behind large wood should add to complexity and floodplain development.

From:	Bill Sharp
To:	Wu, Jennifer; Palmer, John
Subject:	Re: Reminder: Draft Columbia River Cold Water Refuge Plan - comments due by December 3, 2019
Date:	Monday, December 02, 2019 3:24:46 PM
Attachments:	YN Review_comments_02Dec2019.docx

Jennifer and John,

The Yakama Nation Fisheries Program respectfully submits the attached comments from our review of the *Draft Columbia River Cold Water Refuge Plan.*

Thank you,

Bill Sharp

Bill Sharp
Research Scientist
Yakama Nation Fisheries
PO Box 151
Toppenish, WA. 98948
office 509.865.5121 Ext. 6355
cell 509.945.3167

Draft Report: Columbia River Cold Water Refuges Plan, prepared by US Environmental Protection Agency, Region 10, 1200 Sixth Avenue, Suite 155, Seattle, WA 98101,

Primary Reviewer: Shuba Pandit (Ph.D., Biostatistician /Research Scientist of Yakama Nation Fisheries).

Reviewed Date: Nov 30, 2019

Review comments:

The Plan characterizes the water temperature and the available Cold water refuges (CWR) area and the extent to which salmon and steelhead use the CWR. Furthermore, the Plan also provides recommendation actions to protect and restore the CWR. In general, the report reads well; however, there are a few comments/concerns. Some of these comments are given below.

1. In general, I agree with the authors that the increasing water temperature affects the anadromous fish, especially steelhead and Chinook. However, the Plan does not provide enough support to validate the assumption that the available CWR provides a positive impact on the fish survival. Basically the authors have tried to support the assumptions through the physiological studies, such as increasing metabolism activities or energy loss (bioenergetics model, pages 51, 52 and 69) in the increasing temperature, increasing a possibility of diseases occurrence, increasing stress and so on. However, the previous research findings have not supported yet all of the assumptions that the CWR is absolutely beneficial. Keefer et al., (2009) and NOAA (2017) reported that migration success to the spawning tributaries for those steelhead that used CWR was less than those steelhead that did not use CWR (page 48, section 4.3). However, you are assuming that this mortality might be associated with harvest and catch and release mortality. I would argue that there are many factors that may have played a role in decreasing the survival probability. For example, if the area of CWR is not sufficient, the CWR can be a bottleneck from which mortality might have been increased due to density dependence factor or increasing diseases or predations. The rate of predation can be increased in the

CWR. Furthermore, disease is more likely to break out and parasites are also more likely to spread under these conditions (high density in the CWR). Having limited CWR can be dangerous, but your analysis showed that available CWR was sufficient for the current condition. The assessment framework of the Plan has been prepared based on limited research findings and with several assumptions (page 67 of the Plan). If some of the assumptions are invalid or assumptions do not meet in the further research studies, the Plan may not a good working document and it can mislead the Managers. I, therefore, think that more research findings are needed to accurately answer or test the assumptions (see your assumptions in page 67) quantitatively before the assessment is prepared/published.

Note from Bill Bosch (YN Fisheries Biologist) relating information from Yakima Basin (outside of study area), but offered here for consideration/perspective: *I would just note a corollary on Shubha's point #1. In periods when warm water in the mainstem or "normal" migratory routes fish use might delay or impede the ability to get back to their natal streams, fish could stray either into the system where the cold water refuge is or to a non-natal stream nearby – but just because a fish didn't return to its natal stream doesn't mean it didn't survive, so hopefully strays are included in any survival measures they report. We know this is occurring in the Yakima Basin in recent years – warm waters in the lower Yakima for extended periods in the late spring and summer months are causing fish (some later arriving spring chinook, summer chinook, and sockeye) to stray at greater rates than we see in years where the water has been cooler.*

2. You indicated that the existing CWR is sufficient to support salmon and steelhead under the current lower Columbia August temperature, except for Eagle Creek and Rock Creek (page 74). However, your findings are based on the research findings that were conducted on aquaculture environment (page 74). I am not sure this finding is a representation of the natural condition since aquaculture is more of control system, calling into question the capacity of the currently Cold-water refuges (CWR).

3. All of the values of temperature, population size, etc. that are provided in the report are the average (mean) value as if no variability around its mean were there. For example, you provided the August mean temperature of Lower Columbia River from 2011-2016 in figure 2-2, and there was only about 0.5-degree Celsius water temperature difference

among the dams. Average value of the temperature among the dams might be similar or statistically not significant, but how much variability around the mean is also important because the variability (temporal) acts as an important driver governing population dynamics and stability.

Similarly, the cold-water refuges (CWR) areas at the confluence of the 12 tributaries to the mainstem (Columbia River) were estimated by subtracting the water temperature of tributaries from the mainstem Columbia River's water temperature. However, the temperatures of the mainstem and tributaries were predicted by two different models, especially the water temperature of the mainstem river was estimated by DERT and the tributaries' temperatures were estimated from NorWest Model (table 2-1, pages 11 and 12). I was looking for the accuracy of the models' output, but did not find any information about the accuracy of the model's output either in the report or appendix. If accuracy of the models is low, it can mislead your conclusion and also your area of CWR can be changed. Therefore, you need to determine the accuracy of the predicted temperatures of both models and the accuracy should be reported in the Plan.

4. Similarly, you provided temperature profile based on only one individual steelhead (figure 3-5 in your plan), fall Chinook (Figure 3-6) and summer Chinook (figure 3-7) to illustrate the temperature profile and the use of cold water refugee in the Columbia River. I am not sure the temperature profile created from the individual gives a general overview of the use of the cold-water refugee. Especially previous research findings showed that there was substantial individual variability among steelhead from all identified populations. Even the paper you cited (Keefer et al. 2009) stated that "…*there was substantial individual variability among steelhead from all identified populations. Some fish showed no thermoregulatory behavior despite migrating at the warmest times, while others remained in refugia for weeks to months after fall cooling (e.g., Keefer et al. 2008)".* Thus, the temperature profile based on single fish of the species does not provide a general overview of the temperature profile of the species they used in the Columbia river unless you provide a temperature profile with its variability (Standard error, SE) using many populations of the species.

5. The Plan requires to provide detail information concerning which Global Circulation Models (GCMs) were used to predict the future water temperature. Each model is different, and so their results are also different. It would be good to predict the range of predictions of future temperature based on different GCM models and emission scenarios (2000 Special Report on Emission Scenarios, SRES) or 2010 Representative Concentration Pathways (RCP). You indicated that the predications were based on A1B scenario, which is considered to be a medium impact scenario (CO2 concentration will be 603 ppm at 2100). How about if the temperature increases with the low (B1) or high emission scenario (A2) and what impacts do we expect? The Plan should provide a range of prediction of future water temperature and determine its impact on the CWR and fish behavior.

Minor comments

6. Please review all of your figures because some of the legends of the figure can't be read, for example: Figure 3-4; figures 2-9 to 2-20
7. Table 7-1 Headwaters for Lewis River, should that read Mt. Adams and Mt St. Helens rather than Mt. Rainer.

References:

- Keefer, M. L., Clabough, T. S., Jepson, M. A., Johnson, E. L., Peery, C. A., & Caudill, C. C.2018. Thermal exposure of adult Chinook salmon and steelhead: Diverse behavioral strategies PloS one, 13(9), e0204274.
- Keefer, M. L., Peery, C. A., & High, B. 2009. Behavioral thermoregulation and associated mortality trade-offs in migrating adult steelhead (Oncorhynchus mykiss): variability among sympatric populations Canadian Journal of Fisheries and Aquatic Sciences, 66(10), 1734-1747.
- NOAA Fisheries. 2017. Supplemental Recovery Plan Module for Snake River Salmon and Steelhead – Mainstem Columbia River Hydropower Projects. National Marine Fisheries Service.

From: Bill Sharp <Bill_Sharp@Yakama.com> Sent: Thursday, November 14, 2019 12:12 PM To: Wu, Jennifer <Wu.Jennifer@epa.gov> Subject: Re: Reminder: Draft Columbia River Cold Water Refuge Plan - comments due by December 3, 2019

Jennifer,

Great report. This will guide much of our work moving forward. Only one comment. Table 7-1 Headwater for Lewis, should that read Mt Adams instead?

Again, great work.

Thanks, Bill.

Bill Sharp
Research Scientist
Yakama Nation Fisheries
PO Box 151
Toppenish, WA. 98948
office 509.865.5121 Ext. 6355
cell 509.945.3167

Table 7-1 Location and characteristics of primary cold

River Name and CWR Quality	Watershed Characteristics				Actions to Prote	
	Location/ River Mile	Headwaters	Percent Forested	Dams	Restore Stream Morphology	Limit New Water Withdrawals
Cowlitz River (average)	Below Bonneville Dam (RM 65.2)	Mt. Rainier and Mt. St. Helens	62%	X	X	
Lewis River (average)	Below Bonneville Dam (RM 84.4)	Mt. Rainier and Mt. St. Helens	66%	X	X	X
Sandy	Below					

Bill Sharp

Research Scientist

Yakama Nation Fisheries

PO Box 151

Toppenish, WA. 98948

office 509.865.5121 Ext. 6355

cell 509.945.3167