Columbia and Lower Snake Rivers Temperature TMDL
Responses to Public Comments

August 13, 2021

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U.S. Environmental Protection Agency
Region 10

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Introduction

On May 18, 2020, EPA published the final Columbia and lower Snake Rivers Temperature Total Maximum Daily Loads under the Clean Water Act. The TMDLs were available for public comment from May 21 to August 20, 2020 (extended from July 21). The public comment period was announced at EPA's public notice web site (epa.gov/publicnotices) and on the Columbia Temperature TMDL web site. Comments were accepted by mail and email.

EPA received comment letters from 61 organizations and over 1900 individuals. This Response to Comments document is organized into 47 Comment Categories. EPA has determined in this Response to Comments document that there are topics or issues that fall are outside the scope of the TMDL because they cannot be addressed directly by the TMDL but may be resolved through other federal, state, tribal, and other interested parties' actions. These topics are included in Comment Category A and may also be found within other comment categories. EPA responded to comments in Categories B-, including those that questioned EPA's bases or derivation of the TMDL or that offered recommendations about how or why to make changes to the TMDL.

Comment Category A. Outside Scope of TMDL or No Response Warranted

Comment A1

Commenter Methow Valley Citizens Council

Comment

These elevated temperatures are a significant factor in limiting the fitness and survival of native salmon and steelhead of the Columbia and Snake rivers. Despite tens of millions of dollars annually spent to recover the remaining native salmon, the near lethal temperatures in the Columbia and Snake rivers almost ensure the failure of these recovery efforts if not reversed. In addition, failure to recover Columbia and Snake River salmon would significantly hamper efforts to recover Southern Resident Killer Whales, listed as Endangered under the Endangered Species Act over 15 years ago. Their population has declined 10% since their listing, and a major reason for their precarious status is lack of Chinook salmon, their preferred food.

Response

EPA has established the TMDL to implement applicable water quality standards. The Regional efforts and resources dedicated to recovery of salmon and Southern Resident Killer Whales generally are otherwise outside the scope of this TMDL.

Comment A2

Commenter Northwest River Partners

Comment

RiverPartners respectfully recommends that EPA revise its Total Maximum Daily Load for Temperature in the Columbia and Lower Snake Rivers and provide a Draft TMDL which addresses the concerns mentioned in these comments. Given the signaling by the states of Washington and Oregon, there is every reason to think that the TMDL will be utilized to determine the respective approach of these two states towards hydroelectric facilities on the mainstem Columbia and lower Snake rivers.

Response

Potential changes or approaches to hydropower are outside the scope of this TMDL. EPA considered comments received during the 2020 Public Comment Period and made changes. This re-issued TMDL is the result.

Comment A3

Commenter **The American Waterways Operators**

Comment

AWO recognizes the importance of the careful development of the TDML to ensure long-term river health and to protect the many vital authorized uses of the CSRS. AWO acknowledges the impacts of CSRS rising temperatures and urges EPA to consider the environmental benefits of navigation as it develops the TDML.

AWO is concerned that the TMDL, if improperly developed, could prioritize certain authorized uses like fish and wildlife habitat over other equally important authorized uses like navigation and contribute to growing pressures to breach dams and navigation locks on the system. Specifically, interest groups may try to leverage the TDML to call for the breaching of CSRS dams on the grounds that dam breaching is the only way to restore lower river temperatures and recover endangered salmon species.

Response

Any proposed dam breaching would be outside of the scope of this TMDL. EPA recognizes that there are multiple uses of the river system. This TMDL focuses on meeting temperature water quality standards. See also responses to Comment A4 and Comment D2.

Comment A4

Commenter **The American Waterways Operators**

Comment

Recognizing the impacts that the TMDL will have on Congressionally authorized uses of the CSRS, it is imperative that EPA remains highly sensitive to impacts on navigation.

Response

The various uses of the Columbia and Lower Snake Rivers, including navigation, are outside the scope of this TMDL. Also, see response to Comment D2.

Comment A5

Commenter **The American Waterways Operators**

Comment

AWO contends that barging on the river is a vital tool in reducing emission and greenhouse gas impacts of freight transportation and must be carefully considered as EPA develops its TDML. AWO is concerned that without careful consideration of all federally authorized uses, the TMDL could threaten the viability of environmentally beneficial navigation on the CSRS.

Response

See responses to Comment A4 and Comment D2.

Comment A6

Commenter Affiliated Tribes of Northwest Indians

Comment

WHEREAS, the best available science shows that the four Lower Snake River dams, and certain Columbia River dams, are the main causes of human-induced water temperature problems, and temperatures in a free-flowing Lower Snake River would be much more supportive of successful salmon migration and spawning; and WHEREAS, the U.S. Environmental Protection Agency (EPA) released a temperature Total Maximum Daily Load (TMDL) analysis under the Clean Water Act that identifies temperature reductions, called Load Allocations, for certain dams on the Lower Snake and Columbia rivers necessary to meet water quality standards for temperature and fully support salmon migration; and

WHEREAS, the Washington Department of Ecology recently exercised its broad authority under Section 401 of the Clean Water Act to protect water quality and fisheries by issuing conditions (hereinafter, "401 Certifications") regarding the lower Columbia and Lower Snake River dams operated by the U.S. Army Corps of Engineers (Corps); and

WHEREAS, Washington's 401 Certifications legally require the Corps' dams to meet Washington's water quality standards for temperature and all other pollutants, including meeting the Load Allocations in EPA's temperature TMDL; now,

THEREFORE, BE IT RESOLVED, that ATNI supports the Washington Department of Ecology's 401 Certifications for dams on the Lower Snake and Columbia rivers to address temperature and other water quality issues and meet the Load Allocations in EPA's temperature TMDL; and,

BE IT FURTHER RESOLVED, that ATNI hereby calls upon the Corps to withdraw its appeal of Washington's 401 Certifications

Response

The comment recites the Affiliated Tribes of Northwest Indians' resolution on the Washington Ecology 401 certification of permit conditions and related litigation, which is outside the scope of EPA's establishment of this TMDL. Broader issues related to the development and implementation of National Pollutant Discharge Elimination System (NPDES) wastewater discharge permits under the Clean Water Act are outside of the scope of the TMDL.

Comment A7

Commenter Affiliated Tribes of Northwest Indians

Comment

BE IT FINALLY RESOLVED, that ATNI hereby calls upon EPA to withdraw its recent re-interpretation of Clean Water Act Section 401, through which EPA purports to deprive tribes and states of their authority, granted by federal law, to protect water quality and fisheries.

Response

See response to Comment A6.

Comment A8

Commenter Chelan, Douglas and Grant PUDs

Comment

The Mid-C PUDs Contribution

As the EPA' s evaluation on climate change states "Future air and water temperature warming rates will ultimately be dictated by the actual levels of greenhouse gas emissions and the evolution of the complex global energy system (Isaak et al. 2018)." As hydropower generators, the Mid-C PUDs are well positioned to support greenhouse gas emission goals in the electric sector as well as the electrification of other sectors. Our ability to follow load and provide firm capacity also makes hydropower a strategic partner with other renewable resources in achieving environmental outcomes. We believe that any TMDL should accommodate hydropower's continued contribution to the region's carbon reduction and clean energy goals. An inaccurate and overly prescriptive approach could threaten to compound the very outcomes the TMDL intends to avoid.

Response

Potential changes or approaches to hydropower are outside the scope of this TMDL To the extent the comment is that the re-issued TMDL is inaccurate or overly prescriptive, EPA disagrees.

Comment A9

Commenter Northwest Hydroelectric Association

Comment

C. Dams Provide Vital Support to Other Waterbody Uses

Dams are also vital to realizing other uses of the Columbia and Snake Rivers. Dams of course provide an exceptionally large share of clean electricity for the Pacific Northwest; in Washington, for example, hydropower facilities produced nearly five times as much net generation as the next closest source (natural gas) during March 2020. As a non-emitting source of electricity, the hydropower projects of NWHA members will also be particularly important to achieving Washington’s goal of one hundred percent clean electricity by 2045.

Beyond their core hydroelectric function, dams support other designated uses. Reservoirs provide recreational and boating opportunities to the public. Dams and their storage also support water supply or storage for residential, industrial uses, and they enable agricultural irrigation as well. Given these benefits, any regulatory course that might severely impact dam operations would ultimately undermine the designated uses of the Columbia and Lower Snake Rivers.

Response

The TMDL identifies total pollutant loads that would meet water quality standards and allocates loads among point sources and nonpoint sources. The various uses of reservoirs associated with dams, including electricity generation, are outside the scope of the TMDL.

Comment A10

Commenter Orca Conservancy

Comment

Orca Conservancy wishes to thank the Environmental Protection Agency (EPA), Region 10 for your hard work developing this report, especially during the coronavirus pandemic. We applaud you for your perseverance. We want it noted (and on record) that the coronavirus pandemic is a direct result of human activity/involvement in the degradation of natural habitat.

Response

EPA appreciates the support for public service expressed in the comment.

Comment A11

Commenter Orca Conservancy

Comment

The findings of this study clearly demonstrate that the waters of the Columbia and Snake rivers have become too hot to support healthy salmon numbers for the tribal communities, the fishing communities, and the Southern Resident communities (J, K, and L pods). In 2001 EPA produced another study stating, Temperature, perhaps more than any other environmental parameter, greatly affects the status of fish and other aquatic life. Therefore, due to the EPA findings, both in the past and now, Orca Conservancy strongly supports urgent action to recover the salmonid species, which are also endangered and/or threatened. Bold actions needed are the continued spill over the dams to cool the waters, extensive planting of trees near tributaries to also aid in cooling waters, and most importantly, removing the lower Snake River dams as the best means for recovering the Southern Residents and the salmon species of the Columbia and Snake rivers. We do not have the luxury of time, nor do we need more studies and debates. The science is clear.

Response

The potential for dam removal in the future is outside the scope of this TMDL.

Comment A12

Commenter Orca Conservancy

Comment

The SRKW population is the most intensively studied population of marine mammals in the world, and the best available science tells us that healthy wild Chinook salmon runs are critical to SRKW recovery. The SRKWs historic use of west coast waters qualify this community as an important re-source to the states of Washington, Oregon and California, and therefore SRKWs should be considered when evaluating the potential impact of hot waters on fish in the Columbia River Basin. As NMFS recently acknowledged, "new information … confirms that … [S]outhern [R]esidents spend substantial time in coastal areas of Washington, Oregon and California and utilize salmon returns to these areas." These coastal waters are recognized as an essential foraging area for this critically endangered population in the winter and spring and are currently under consideration to be designated as critical habitat for the SRKW18, which will include a much larger and densely populated portion of the Chinook salmon range along the Pacific coast. Between 1976 and 2004 there had been only 11 documented sightings in United States (U.S.) coastal waters. Between 2006 and 2011, 131 acoustic detections were collected by deploying acoustic recorders in seven locations on the continental shelf of the U.S. west coast from Cape Flattery, WA to Pt. Reyes, CA to detect and record endangered SRKWs. Detection rates of SRKWs were greater in 2009 and 2011 than in 2006 - 2008, were most common in the month of March, and occurred with the greatest frequency off the Columbia River and Westport, which was likely related to the presence of their most commonly consumed prey, Chinook salmon. The use of passive acoustic recorders has greatly increased the knowledge of seasonal and annual occurrences of SRKW in the coastal waters of the United States. Satellite tracking of individual SRKWs also revealed the extent to which they used Pacific coastal waters, and their focus on the migratory routes of Chinook for most of this time. Further, use of this portion of the range has increased as Fraser River Chinook runs have declined, indicating Chinook runs from the Columbia River Basin are likely to be more important in the coming years than they were in the first 40 years of intensive study of SRKWs. As noted in the TMDL, current temperature conditions in the Columbia and Snake rivers are not conducive to restoring and sustaining healthy salmon runs. It is imperative that in order to recover the SRKWs, we need to ensure all steps are taken to recover Chinook runs in the Columbia River Basin.

Response

Attainment of the water quality criteria would support beneficial uses of the waters included in the TMDL study area. The effect of salmon on Orca survival is outside the scope of this TMDL.

Comment A13

Commenter Orca Conservancy

Comment

Orca Conservancy believes we need help from the EPA to guide the PNW to a place where abundant wild salmon and steelhead populations can once again support communities, livelihoods, and honor treaty rights, but most importantly wild salmon is needed to sustain the critically endangered Southern Resident killer whales. The 72 remaining SRKWs are a totem species and an icon for the state of Washington. As an organization that has been advocating for this population's recovery, it is undeniable that this population is trying incredibly hard to continue its existence within its core habitat. It is also undeniable that we, as humans, continue to create obstacle after obstacle which undermines the SRKWs rightful existence.

Response

See response to Comment A12.

Comment A14

Commenter PNGC Power

Comment

As a not-for-profit, member-owned electric cooperative that relies on these federal dams for over eighty percent of our power supply, we are concerned that this TMDL if finalized inaccurately, could have long-term negative implications on our region's critical energy infrastructure. In the spirit of the Administration's October 19, 2018 Presidential Memorandum, we ask that to the extent permitted by law, EPA approach the interrelated CWA regulations on the CRS broadly, with a look toward minimizing unnecessary regulatory burdens and fostering more efficient decision making so that these federal projects are better able to meet the demands of their authorized purposes.

Response

EPA has made every effort to ensure accuracy when addressing public comments and re-issuing the TMDL. EPA reasonably determined the allocation structure of this TMDL, as discussed in Section 6.0. See response to Comment LL40. Any implementation issues regarding hydroelectric power supply, electricity costs, and operations should be addressed as part of the states' process to develop implementation plans.

Comment A15

Commenter PNGC Power

Comment

In PNGC's May 1, 2020 comments regarding EPA's draft NPDES proposal (also applicable to this TMDL), we pointed out that currently, over eighty percent of PNGC's power supply comes from the Bonneville Power Administration ("BPA"). While the Corps of Engineers ("the Corps") is congressionally authorized to operate the hydroelectric generating facilities requiring CWA permitting, BPA is the federal agency directed by Congress to market and distribute the power generated at these facilities.

BPA is self-financed and therefore covers all of its costs with revenues from Northwest ratepayers such as PNGC and other purchasers of its power and transmission products and services. BPA receives no annual appropriations from Congress. Therefore, costs applied to these hydroelectric facilities as a result of new permitting processes increase BPA's power rates, which in turn impact utility ratepayers throughout the region. This includes the nearly 200,000 member homes, farms and businesses PNGC serves, many in rural, disadvantaged communities.

Response

See response to Comment A14.

Comment A16

Commenter PNGC Power

Comment

If these federal hydroelectric generating facilities become subject to temperature limitations as proposed in EPA's TMDL through the incorporation of the load allocations into the NPDES permits, the Corps would likely be required to make costly changes to the operations of these projects.

Response

See response to Comment A14. See also response to Comment A6. The issuance and implementation of NPDES permits are outside the scope of the TMDL.

Comment A17

Commenter Pacific Northwest Waterways Association

Comment

We would like to begin by expressing our support for the comments provided by Northwest RiverPartners. As a Northwest RiverPartners member, we firmly agree with their position on the CLSRT TMDL and the need for its revision. If these revisions are not made, the TMDL as written will threaten the vitality of the Federal Columbia River Power System ("FCRPS") and the multiple purposes for the system as established by the United States Congress.

Response

This comment does not require a response.

Comment A18

Commenter Pacific Northwest Waterways Association

Comment

Per the Columbia River System Operations Draft Environmental Impact Statement, we know that our dams provide relatively low-cost, carbon-free energy that cannot be replicated by other resources. They provide critical balancing and contingency reserves for Bonneville Power Administration ("BPA"). They also have a unique ramping capability, which means they can reduce generation to very low levels when demand is low and increase (i.e., ramp) generation with little notice to meet daytime peaks. This is especially important as the Northwest increasingly relies on intermittent solar and wind power to reach carbon goals.

Given the signaling by the states of Washington and Oregon, there is every reason to think that the TMDL will be utilized to determine the respective approach of these two states towards hydroelectric facilities on the mainstem Columbia and lower Snake Rivers. Pacific Northwest Waterways Association supports Northwest RiverPartners' recommendation that EPA revise its Total Maximum Daily Load for Temperature in the Columbia and Lower Snake Rivers and provide a revised Draft TMDL which addresses the concerns mentioned in these comments.

Response

See response to Comment A14.

Comment A19

Commenter Port of Clarkston

Comment

The Port of Clarkston requests that EPA more deeply consider the complex problem it seeks to address in its Total Maximum Daily Load for Temperature in the Columbia and Lower Snake Rivers and provide, at a minimum, a revised Draft TMDL which addresses the concerns mentioned in these comments. Given the signaling by the states of Washington and Oregon, there is every reason to think that the TMDL will be utilized to determine the respective approach of these two states towards hydroelectric facilities on the mainstem Columbia and lower Snake rivers.

If revisions are not made, the TMDL, as written, needlessly threatens the vitality of the Federal Columbia River Power System ("FCRPS") and the multiple purposes for the system as established by the United States Congress. This would contribute higher carbon load, thus increasing ambient temperatures and global climate change.

Per the Columbia River System Operations Draft Environmental Impact Statement, policies surrounding the lower Snake River dams can mean the difference of region-wide blackouts, the failure to be able to meet the region's clean energy goals, and billions of dollars of extra costs forced on Northwest families.

Response

See response to Comment A14. Additionally, the CRSO EIS is outside the scope of this TMDL.

Comment A20

Commenter Port of Clarkston

Comment

- The PNNL study measured water velocities at the various sample sites too. They found that the reservoirs were flowing downstream more or less continuously even with the low summertime flows. This causes constant mixing, so stratification is not a highly defined as it is in Dworshak Reservoir.

- The current spill program has significantly changed the nature of the water temperature regimes of the LSR reservoirs. Mass spill to 120 or 125 percent TDG passes large quantities of water from about 50-feet in depth under the standard spill gates. There are seven standard gates at LGR, LGO, and LMO, and nine at IHR. Cooler water would be passed downstream through turbines because their intakes are 75 to 85-feet below the surface. Overflow weirs, one at each dam, pass 5,000 to 10,000 cfs while late summer flows range from 20,000 to 40,000 cfs.

- Hot water was entering the surface exits of the LGR and LGO fish ladders causing adult fish to delay until a pump system was installed to bring colder water up from depth around each exit so adult fish migration would not be hindered by a temperature block. Installing such features at all four LSR dams is included in the Columbia River System Operation EIS alternatives currently under public consideration.

Response

EPA agrees that run-of-river reservoirs stratify less than the deep storage reservoir behind Dworshak Dam. EPA cannot confirm at this time that the spill program has significantly changed river temperatures as asserted in the comment, as a detailed monitoring and modeling assessment would be required to quantify these effects. The RBM10 model assumes that upstream cross-sectional average temperatures are passed through the dams, and the accuracy of the model during spill periods suggests that varied spill has a relatively minor effect on overall river temperatures.

Regarding the CRSO EIS, EPA's re-issuance of this TMDL is separate and distinct from the proceedings to identify alternatives associated with the operations of the Federal Columbia River Power System in an Environmental Impact Statement under the National Environmental Policy Act. The EIS is outside the scope of this TMDL.

Regarding fish ladders, see response to Comment J4.

Comment A21

Commenter Port of Clarkston and Port of Whitman County

Comment

The EPA Columbia and Snake River TMDL report (2020) also details the temperature contribution of each dam (turbine cooling water) which is miniscule for the LSR dams. If point source permits were required, cooling water and potential oil spills would be the sources. Non-toxic vegetable oils have been used in the turbines for decades. Similarly, polychlorobiphenyl (PCB) oils were eliminated from transformers at the dams years ago.

Response

The dams contribute heat by impounding the river and discharging cooling and other process waters. Cooling and process water discharges from the dams are point source discharges regulated by NPDES permits. These discharges are assigned wasteload allocations in the TMDL.

The conditions in NPDES permits for pollutants other than temperature are the responsibility of relevant NPDES permitting authorities. See response to Comment A6.

Comment A22

Commenter Port of Clarkston

Comment

So why have there been continuous efforts to breach the lower Snake River dams for three decades? It's the water. Idahoans do not want anybody taking any of their water. Any water than gets out of Idaho without irrigating a crop or generating a kilowatt is wasted. The Idaho legislature made this clear. So, they target the lower Snake River dams.

Response

See response to Comment A3.

Comment A23

Commenter Washington Association of Wheat Growers (WAWG) and Washington Grain

Comment

The security of the carbon-free federal hydropower supply sourced from the Columbia-Snake River System should be enhanced. TMDL efforts should not be used to dismantle the hydro system.

Response

The TMDL identifies the total load that would meet water quality standards and allocates the available load among sources. Implementation of the TMDL is the responsibility of the states and EPA is committed to supporting the states, tribes, federal agencies and other interested stakeholders during TMDL implementation. Regarding the potential for dam breaching, see response to Comment A3.

Comment A24

Commenter Washington Association of Wheat Growers (WAWG) and Washington Grain

Comment

Our membership base largely resides, and industry partners are based, in rural communities. Communities that depend on power generated by river dams. If the dams on the lower Snake River, for example, were replaced by a combination of other energy sources, rates could increase as much as 19% as referenced in a recent Environmental Impact Statement. The role of dams to produce affordable, reliable, clean, and renewable energy cannot be easily dismissed or replaced.

Response

See response to Comment A14.

Comment A25

Commenter Washington Association of Wheat Growers (WAWG) and Washington Grain

Comment

Regional wheat producers rely on a complex system of rivers, rail, and highways to transport our product. Of the nearly 153 million bushels of wheat produced in Washington, about 60% of it is transported via the Columbia-Snake River System. Barging is proven to be the most efficient and least carbon-intensive mode of cargo transportation available to us. As such, the wheat industry maintains our strong opposition to any attempt to breach the lower Snake River dams and considers such a possible disruption to the river system to be an extreme—and unnecessary— measure. Dam breaching would have devastating and long-lasting impacts on our industry and many Northwest communities that rely on the clean power, irrigation supply, and navigable waters made possible by the federal system of locks and dams. Breaching would not only negatively affect agriculture, but also manufacturing, transportation, trade, and tourism businesses.

Response

The potential for dam breaching is outside the scope of this TMDL. See response to Comment A3.

Comment A26

Commenter Washington Association of Sewer and Water Districts

Comment

Finally, public entities are always concerned with costs, and our members are no different. We encourage EPA and the States to recognize the fiscal realities of the current times and develop innovative compliance strategies that maximize environmental outcomes for modest financial investments.

Response

EPA acknowledges that, depending on the actions of other federal and state agencies, implementation of the TMDL may impose costs. A TMDL is required by the Clean Water Act and TMDL implementation is the responsibility of the states. EPA is committed to helping the states, tribes and other federal agencies as needed and appropriate during TMDL implementation.

Comment A27

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA should correct the deficiencies in the TMDL and integrate it into the NPDES permits for the FCRPS by incorporating Washington's certification conditions.

The Yakama Nation expects that the EPA will meaningfully consider this comment and incorporate it the final TMDL.

The EPA has not provided clarification as to the relationship between the TMDL and the anticipated NPDES permits for the FCRPS. However, the Yakama Nation also expects the EPA to integrate the final revised TMDL into these NPDES permits by incorporating Washington's certification conditions. Without integration into enforcement mechanisms, the TMDL cannot further the objective of the meaningful and effective water temperature control.

Response

See response to Comment A6.

Comment A28

Commenter Yakima County Farm Bureau

Comment

The YCFB as a matter of principle is in favor of Hydroelectric power and totally opposed to breaching any Columbia River or Snake River dams. The YCFB believes that these dams should remain in operation for their entire physical life span and that they are much more valuable intact than breached, for a multitude of reasons. (Please refer to our second attachment) The YCFB believes that the facts show that breaching the Lower Snake River Dams would negatively impact efforts to reduce the region's carbon footprint. If the region is going to be able to withstand a loss of fossil fuel based electrical generation due to artificial restraints on carbon emissions while at the same time move towards electric mobile transportation, then we simply can't afford to lose ANY renewable energy sources, much less one that provides abundant clean power such as Hydropower. Breaching dams at this stage would create a catastrophic loss of power to our grid just when all the renewables become more critical.

Response

Electricity generation and the potential for dam breaching are outside the scope of this TMDL. See response to Comment A14.

Comment A29

Commenter Yakima County Farm Bureau

Comment

The life cycle of salmon varies between species but the bulk of them spend a much greater portion of their life span in the ocean than in fresh water. As the concern for environmental conditions intensifies, it is wise to consider that what happens to the salmon in the ocean proportional to the time they spend there as very impactful. As atmospheric carbon dioxide levels have come under scrutiny for influencing ocean conditions with regards to how salmon prosper in the ocean, the argument in favor of retaining all renewable, non-carbon based electric power generation becomes much stronger. Similarly, the trend towards electric mobile transportation is also strengthening. That electricity to power our future cars, trucks and trains must also be accounted for. Our power grid and its renewable portion of it the generating capacity will be more in demand than ever to accommodate CO2 emission reductions. All at a time when the generating base is about to be drastically diminished because of the amount of electricity created by carbon-based sources in the first place.

Currently, our power from Hydroelectric sources accounts for slightly less than 50% of the total generated. Wind accounts for about 9% with Solar at about 1%. Coal and other carbon-based capacities account for the balance at about 40%.

It is imperative to fully consider the potential reductions to our electric generation base as a whole in the discussions of breaching any hydro power producing dams: The argument that breaching the Lower Snake River Dams only reduces our capacity by a mere 5% may appear acceptable but not when one realizes that an additional 40% of the production, that of the carbon base generation is already on the “chopping block”! The risk to our power security is not a mere 5% as in the discussion about breaching the Lower Snake River Dams nor is it just the 40% lost due to our carbon based power contribution being eliminated, rather it is a combination amounting to a staggering and untenable 45% percent loss of electric production.

Response

The TMDL has been established to target the applicable temperature water quality standards for surface waters, as required by the Clean Water Act, including beneficial uses associated with all salmonid life stages. Electricity generation and the potential for dam breaching are outside the scope of this TMDL. See responses to Comment A3 and Comment A14.

Comment A30

Commenter Yakima County Farm Bureau

Comment

The YCFB believes that our once successful salmon hatchery programs must be revitalized to bolster the fishery as well. The South Resident Orcas (Orcas) population increase and fall parallels the rise and fall of the hatchery fish and the State of Washington and other interests would do well to heed that fact. It has become popular on the I-5 corridor to divert attention away from the Puget Sound where so many real threats exist for the Orcas and chose to demonize the four Lower Snake River Dams, particularly when in 2016, the NOAA Fisheries under the Obama Administration assigned the threat to these marine mammals from these dams as low.

Improved regulation of the harvest of Salmon must also be “on the table”. For far too long, the United States has allowed foreign interests unregulated access to our coastal areas to the detriment of the Salmon and other fish. Beyond that, our own commercial and sport fishing interests have to reduce harvests to allow a sustainable fishery.

The YCFB believes that an endangered species should not be in a “can” much less “on sale” on a grocery store shelf while Billions of dollars are invested towards mitigation of salmon habitat as well as also ensuring the highest possible fish passage survival rates at our hydroelectric dams. The YCFB believes that the depredation of salmon must also be addressed before their populations can be stabilized. Predator reduction is simply the only recourse. The control of Cormorants has provided some success, but that needs to be pursued more aggressively and our society must make a choice with respect to the other major salmon predators: To deal with species such as Terns, Seals and Sea Lions or continue to lose vast quantities of salmon and fail to substantially increase fish runs.

The spilling of water from the dams has been used extensively and is expected to be utilized to a greater degree to control water temperature and salmon survival. The YCFB believes that there is a limit to the amount that can be spilled and help fish. That is because excessive spillage is very detrimental to fish due to dissolved gases created by the action. The water that is spilled also is not available to generate power either and that is a loss for renewable energy.

The breaching of dams is a poor tool to save various fish species when many other options exist that have been or are already about to be implemented to improve their survival without damaging our electric generation capacity, transportation system and regional economy. With the planned reductions in CO2 emissions simultaneously reducing our supply of electricity and placing added burdens on the grid by electrifying our transportation, to consider dam breaching is not simply bordering upon insanity, it is insane.

Response

Salmon harvest and the potential for dam breaching are outside the scope of this TMDL. See response to Comment A3.

Comment A31

Commenter Yakima County Farm Bureau

Comment

While the Preferred Alternative of retaining the Lower Snake River dams and spilling more water for fish carries an estimated rate hike of 2.5%, the breaching alternative cost rises to about a 50% hike. The YCFB is opposed to any rate hike, the cost of breaching would be disastrous to agriculture, particularly with respect to irrigation rates.

Response

EPA's re-issuance of this TMDL is separate and distinct from the proceedings to identify alternatives associated with the operations of the Federal Columbia River Power System in an Environmental Impact Statement under the National Environmental Policy Act. See response to Comment A3.

Comment A32

Commenter Yakima County Farm Bureau

Comment

The fact is that irrigation power bills amount to a substantial impact to farms and ranches in Washington State. The YCFB believes that a substantial increase in electric rates would negatively impact agriculture and a rate increase of up to 50% as suggested in the CRSO EIS due to breaching would CRIPPLE our industry as well as many other supporting businesses and activities that agriculture is sustained by.

Response

Electricity rates are outside the scope of this TMDL. See response to Comment A14.

Comment A33

Commenter Yakima County Farm Bureau

Comment

When the Lower Snake River Dams were constructed, tens of thousands of acres of additional land became irrigated and losing that agricultural production caused by breaching would be unacceptable. The YCFB believes that the promises offered to make the farm families "whole" due to a loss of their irrigation are hollow. Even if their loss were to be fully compensated, simple money does not reimburse for the loss of one's way of life. Also, the true cost of compensation would be staggering.

Response

See response to Comment A3.

Comment A34

Commenter Yakima County Farm Bureau

Comment

The gain to migratory fish due to breaching is much less certain. There is a serious issue about what the effect of sudden, large releases of silt and mud built up behind the dams will have upon the river below each dam breached. Any purported gains could take years if not decades to come to fruition and instead breaching may well set back salmon and other migratory fish in the meantime.

Furthermore, the debate about dam breaching has been occurring for many years. During that time there has been much improvement with regard to the technology to mitigate the fish issues around dams. Study of the other elements of the migratory fish environment has also been advancing. It is finally being recognized that issues such as predation and over-fishing (both domestically and internationally) are very important factors. The YCFB believes that addressing those two issues would far outweigh losses due to dam passage.

Response

See response to Comment A3.

Comment A35

Commenter Yakima County Farm Bureau

Comment

The YCFB believes that the Orca's rise in numbers and then their subsequent decline is significantly correlated to the rise and fall of artificial releases of hatchery reared fish. As the releases of hatchery salmon have declined, the Orcas finding fewer reared fish had to turn to the wild salmon which then also declined because of the added pressure from the Orcas. If we need more Orcas, then it is obvious that we need to resume rearing and releasing more hatchery fish to feed them.

Response

See Response to Comment A12.

Comment A36

Commenter Yakima County Farm Bureau

Comment

Our hydroelectric dams generate reliable power economically and provide water for irrigation as well as serving in flood mitigation. Further, our dams form an important transportation system along with great recreational opportunities. Trading this “sure bet” system that is the envy of the world for two less reliable generating systems that have serious short comings is nonsensical. The supposed environmental gains related to breaching are dubious. The argument that dam breaching would save the Southern Resident Orcas is fallacious when the facts speak otherwise. New technology is already boosting fish survival around the dams with the promise of more innovations in the future without breaching.

Response

See response to Comment A3.

Comment A37

Commenter Methow Valley Citizens Council

Comment

EPA’s temperature modeling suggests that if the lower Snake River dams were to be removed, the river temperatures would be within State limits even in the month of August. This strongly suggests that removal of the lower four dams on the Snake River is the most likely action that could reverse river temperatures increases over time.

Response

See response to Comment A3.

Comment A38

Commenter Methow Valley Citizens Council

Comment

These elevated temperatures are a significant factor in limiting the fitness and survival of native salmon and steelhead of the Columbia and Snake rivers. Despite tens of millions of dollars annually spent to recover the remaining native salmon, the near lethal temperatures in the Columbia and Snake rivers almost ensure the failure of these recovery efforts if not reversed. In addition, failure to recover Columbia and Snake River salmon would significantly hamper efforts to recover Southern Resident Killer Whales, listed as Endangered under the Endangered Species Act over 15 years ago. Their population has declined 10% since their listing, and a major reason for their precarious status is lack of Chinook salmon, their preferred food.

Response

Efforts related to salmon and Orca recovery are outside the scope of this TMDL. See response to Comment Category A.

Comment A39

Commenter Consumers Power, Inc.

Comment

Many of our members are seniors with limited or fixed incomes and are particularly sensitive to increased costs for essential services like electricity. The rural communities we serve were ravaged economically when the federal and state forests were severely impacted by restrictions on timber harvesting in the 1980s and 1990s. Many of the families who live and work in these communities continue to suffer economically today and are also sensitive to the same cost increases. We are concerned that serious shortcomings in the development of the CLSRT TMDL may contribute to additional cost burdens that they will be forced to bear.

Response

See response to Comment A14.

Comment A40

Commenter Northwest River Partners

Comment

The remaining focus of our letter is to suggest that EPA's approach to developing the CLSRT TMDL for the Columbia and lower Snake rivers warrants significant revisions. If these revisions are not made, the TMDL, as written, needlessly threatens the vitality of the Federal Columbia River Power System and the multiple purposes for the system as established by the United States Congress.

Response

There are multiple uses of the Columbia and Lower Snake Rivers. The TMDL addresses high temperatures, as required by the Clean Water Act, to protect beneficial uses identified in the State of Washington water quality standards. Other important uses of the river system are outside the scope of this TMDL.

Comment A41

Commenters Benton Rural Electric Association, Big Bend Electric Cooperative, Blachly-Lane Electric Cooperative, Clearwater Power, Eugene Water and Electric Board, Fall River Electric Cooperative, Franklin PUD, Grays Harbor PUD, Inland Power and Light, Lewis County PUD, Mason County PUD 1, Northwest River Partners, Okanogan County PUD, PUD of Benton County, Raft River Electric Cooperative, Skamania County PUD

Comment

RiverPartners respectfully recommends that EPA revise its Total Maximum Daily Load for Temperature in the Columbia and Lower Snake Rivers and provide a Draft TMDL which addresses the concerns mentioned in these comments. Given the signaling by the states of Washington and Oregon, there is every reason to think that the TMDL will be utilized to determine the respective approach of these two states towards hydroelectric facilities on the mainstem Columbia and lower Snake rivers.

Per the Columbia River System Operations Draft Environmental Impact Statement, policies surrounding the lower Snake River dams can mean the difference of region-wide blackouts, the failure to be able to meet the region's climate goals, and billions of dollars of extra costs forced on Northwest families.

Response

The CRSO EIS is outside the scope of this TMDL. See response to Comment A20.

Comment A42

Commenter Northwest River Partners

Comment

CONCLUSION

As the world struggles with the repercussions of climate change, the Pacific Northwest has been able to establish some of the most aggressive clean energy goals in the nation thanks to the region's hydropower availability. Hydropower produces roughly 90% of the Northwest's renewable energy and is essential to our ability to reliably add intermittent resources to the grid.

Despite the fact that over 50% of the region's electricity comes from renewable power, the Northwest still has some of the most affordable electricity rates in the nation due to its hydropower abundance. Maintaining the capabilities of the Northwest's hydropower system is critical at a time of a historic recession and a health crisis that has especially harmed our most vulnerable communities.

Response

See response to Comment A32.

Comment A43

Commenter Northwest River Partners

Comment

The signaling provided by the states of Washington and Oregon make it apparent that they intend to use the TMDL to make significant energy policy decisions. As a result, the CLSRT TMDL potentially and unfairly threatens a resource that is critical to the climate change fight. This is a fight that we must win if we want to protect endangered salmonid species.

Response

EPA acknowledges that dams are an important source of clean energy. At the same time, EPA's assessment has determined that the dams affect river temperatures, and the TMDL addresses this by determining allocations that, if implemented, would decrease temperatures.

Comment A44

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 42, Section 6.5, general:

Reservoirs have inundated tributaries and lost cool habitat. This is related to cold water refuges but goes beyond that. The loss of critical habitat from cool areas being inundated by warm reservoir waters should be quantified and specifically addressed by allocations and implementation.

Response

Habitat assessment considerations and maintaining cool critical habitat are an issue to be addressed during TMDL implementation. TMDLs themselves do not address lost critical habitat. However, the river temperature effects of water impoundment are addressed in the nonpoint dam allocations that are included in this TMDL.

Comment A45

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA should correct the deficiencies in the TMDL and integrate it into the NPDES permits for the FCRPS by incorporating Washington's certification conditions. The Yakama Nation expects that the EPA will meaningfully consider this comment and incorporate it the final TMDL.

The EPA has not provided clarification as to the relationship between the TMDL and the anticipated NPDES permits for the FCRPS. However, the Yakama Nation also expects the EPA to integrate the final revised TMDL into these NPDES permits by incorporating Washington's certification conditions. Without integration into enforcement mechanisms, the TMDL cannot further the objective of the meaningful and effective water temperature control.

Response

See response to Comment A6.

Comment A46

Commenter Seattle City Light

Comment

At the same time, EPA's recently released draft NPDES permits for the federal CRSO dams assert heretofore unapplied provisions of section 316(b) of the Clean Water Act to hydropower facilities, requiring the application of the Best Technology Available (BTA) for entrainment and impingement screening at all cooling water intakes of hydropower facilities, and to monitor temperature in all cooling water outfalls. In both cases, it appears at present that these requirements are being proposed across the board, without an apparent screening of the risks of the intakes to cause impingement or entrainment, or the cooling water intake structure(s) to actually heat the water. For example, the Draft NPDES permit for the Dalles Lock and Dam (WA0026701) indicates that 27 cooling water intakes (for the 27 cooling water outfalls) must have intake screens and/or other technologies installed (if they are not already), regardless of the intake flows and whether or not there is any evidence of impingement/entrainment with the existing technology. Such an application does not appear to be a risk-based application of regulation, but appears largely procedural and hence, while potentially costing an excessive amount, may have equivocal fish benefits.

Response

See response to Comment A6. Broader issues related to the development and implementation of National Pollutant Discharge Elimination System (NPDES) wastewater discharge permits under the Clean Water Act would be distinct proceedings outside of the scope of the TMDL.

Comment A47

Commenter Seattle City Light

Comment

We encourage the EPA to work closely with its State and Tribal partners to reconcile monitoring provisions that appear to be overreaching, potentially increasing compliance costs significantly without necessarily benefitting the species. For example, Ecology asserts that they must conduct an independent review of EPA's determination of BTA, and that permittees must prepare additional annual reporting (e.g., Ecology's proposed annual cooling water intake structures report; operation and maintenance manual) that will address elements already required by EPA's provisions (e.g., EPA's requirement for a Quality Assurance Plan for all monitoring to be conducted, and development of a best management practices plan).

Response

See response to Comment A6.

Comment A48

Commenter Over 1000 individuals

Comment

The Lower Snake and Columbia rivers are too hot for endangered salmon and steelhead. The Total Maximum Daily Load (TMDL) study recently released by EPA clearly shows that the dams are the main cause of increased water temperatures. Large, shallow reservoirs created by the dams, coupled with intensifying climate change, threatens the Columbia and Snake rivers' already imperiled salmon and steelhead.

The science is clear-restoring the Lower Snake River is our very best opportunity to restore imperiled salmon and orca populations. I urge you to work with the people and policymakers in the Northwest to develop a comprehensive package of measures that restores the Lower Snake River and its salmon, helps feed starving Southern Resident orca, and invests in clean energy that protects the health of our communities and our river.

Northwest people and leaders must work together to craft a bold and effective plan that achieves these goals as quickly as possible. Without effective leadership, we risk losing these iconic species and the special benefits they bring to our region.

Response

EPA agrees that a number of interested parties and leaders must work together now, and into the future, to restore water temperatures in the Columbia and Lower Snake Rivers. TMDL implementation is the responsibility of the states, and EPA is committed to supporting the states, tribes, federal agencies and other interested parties during TMDL implementation.

Comment A49

Commenter Washington Department of Ecology

Comment

Since dams are identified as a key source of temperature pollution in the TMDL, focusing on how to better control this source is critical to successfully reducing temperature in the Columbia and Snake Rivers. We have issued 401 certifications to Washington nonfederal dam operators with Federal Energy Regulatory Commission (FERC) licenses and they have been working to implement those 401 certifications through actions to address their temperature impacts for the last 12 years. In order to address our water quality standards, including temperature, we need to address all impacts associated with dams and hydropower operations. We need to build resiliency in our rivers to prepare for the ongoing impacts of climate change.

On May 7, 2020, we took the important first step of issuing 401 certifications to the eight federal dams on the Columbia and Snake Rivers. Our 401 certification authority for the federal dams is a key piece in ensuring the federal dams are meeting the water quality standards. Unfortunately, instead of stepping up to the challenge, the Army Corps has challenged our authority to protect state waters in an appeal to the Pollution Control Hearings Board. The decision to appeal means that a federal agency isn't willing to do its part to address temperature pollution and instead believes that all other Washington sources should bear the burden of heat contribution from the federal dams. We struggle to see a path forward to implementation of the TMDL without 401 certifications as a regulatory tool to address the federal dams.

Response

See response to Comment A6.

Comment A50

Commenter Port of Clarkston

Comment

There's a childhood story about the people who wanted gold faster, killing the goose that laid golden eggs. There are several geese that lay golden eggs in this situation that are endangered by the CLSRT TMDL. The first is Dworshak dam. The people who live near that dam have call against the water collected there. At some point as water becomes more scarce, releases to solve warming water temperatures for fish can migrate will slow so significantly as to make little impact on increasing heat inputs or cease altogether. The fight for water will begin with the Clearwater River and specifically Dworshak dam, and then how will compliance with the CLSRT TMDL fare?

The entire Columbia/Snake hydropower system is another goose providing golden eggs-this in the form of carbon-free energy generation in facilities that are already constructed and merely need maintained. At some point, operational feasibility of the dams will cease, particularly as more and more resources for managing for fish are demanded, which occurs unfairly through the CLSRT TMDL. Politics enter that fray as well, since hydropower doesn't even get to be named "renewable" although it is essential for integrating wind and solar (which will never be adequate to serve the needs in the northwest), has zero carbon releases, and is as renewable as gravity and precipitation can make it.

Response

See response to Comment A40.

Comment A51

Commenter Various NGOs

Comment

Adequate protections for water temperature are necessary to ensure the continued existence of Columbia and Snake river salmon and steelhead, and the Southern Resident Killer Whales that depend on them. Some Chinook salmon from the Columbia and Snake Rivers migrate through the Salish Sea. The Salish Sea contains Critical Habitat for endangered Southern Residents, and the National Marine Fisheries Service has proposed expanding that Critical Habitat designation to include the marine waters traversed by all Columbia and Snake river Chinook. These Chinook salmon contribute to availability and quality of prey for Southern Residents, which are a Primary Constituent Element of their Critical Habitat. With a population of 72, any action—including a deficient TMDL—

that further degrades their habitat and prey availability jeopardizes the continued existence of Southern Residents in violation of Section 7 of the Endangered Species Act.

Response

See response to Comment A1.

Comment A52

Commenter Public Utility District No. 1 of Douglas County

Comment

Douglas PUD supports EPA's suggested path forward on establishing site specific water temperature standards that will make the TMDL an outcome-based load allocation provided the Clean Water Act (CWA) processes are followed and with oversight from State of Washington. Douglas PUD's commitment and record of enhancing designated uses within the state of Washington is well documented, including the implementation of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), Aquatic Settlement Agreement and associated Water Quality Management Plan. Douglas PUD remains committed to meeting all of its mitigation requirements, even as climate change negatively impacts the waters within the Columbia River Basin. Importantly, the Wells Project defends against at warming climate given its renewable nature.

Response

EPA disagrees that the May 2020 TMDL suggested establishing site specific water temperature standards. See response to Comment E1 regarding the change to the TMDL based on comments received on use attainability analyses.

Comment A53

Commenter Port of Whitman County Commissioners

Comment

Similarly, we would like to see a balance achieved in this TMDL process. While water temperature is a significant concern for fish populations, assigning unattainable standards sets dam operators up for certain failure. It is clear that the states of Washington and Oregon intend to base energy and environmental policy on this report. Unfortunately, this could force a dam breaching outcome, which would run counter to the objective of the TMDL.

Response

See response to Comment A3.

Comment A54

Commenter Oregon Department of Fish and Wildlife

Comment

The development, configuration, and operation of the hydrosystem have negatively impacted salmon migration and survival in numerous ways. These well-documented impacts include protracted and impeded migrations resulting in increased or extended exposure to diminished water quality, including high water temperatures. Upon returning to freshwater, adult salmon that encounter high water temperatures often experience migration delays. Adult salmon forced to stop or slow their migration, and languish for days or weeks in warm water, begin dying from stress and disease. Heat-stressed salmon are also more likely to succumb to predators or fall back after passage. Further, exposure to sub-lethal temperature stress contributes to diminished reproductive success.

Response

EPA does not disagree with the facts presented in the comment, which does not otherwise warrant a response.

Comment A55

Commenter Port of Clarkston

Comment

Water temperature data has been collected in association with adult fish passage operations at Bonneville (1938), McNary (1953), The Dalles (1958), Ice Harbor (1961), John Day (1968), Lower Monumental (1969), Little Goose (1970), and Lower Granite (1975) dams since each of the dams became operational (Attachment 1). As recommended by the fishery agencies, scroll case temperatures (temperature taken from gages on the scroll cases of the turbine units) are recorded and reported with daily adult fish passage reports. Scroll case temperature was thought by the fishery agency representatives to provide the best daily average river temperature measurement. The Portland District, Corps of Engineers, provided this information to the fishery agencies, water quality agencies, and any other person on the mailing list until the advent of the Internet system. The information is currently available to the public via Internet through the Northwest Division, Corps of Engineers homepage (http://www.nwp.usace.army.mil/op/fishdata/Adultfishcounts.htm). Annual Fish Passage Reports have been published each year by the Portland District of the Corps and are available from 1938 through 1998. Daily temperature information is available for each day at each dam in these publications.

Many times, during the course of my career, I have reviewed the temperature situation at the projects, and diagnosed “temperature problems.”

Response

EPA is relying on the current temperature monitoring systems at forebays and tailraces of the dams. The comment does not identify a concern with EPA’s use of available data and information to derive a total load and allocation structure in the TMDL.

Comment A56

Commenter Port of Clarkston

Comment

In Lower Granite Reservoir, the cool water from the Clearwater flows under the warm water from Hells Canyon. In an infrared photography project in the 1990s, photographs of barge tows on the reservoir clearly showed the wake stirred up cool water while the surface water ahead and to the sides of the tow was notably warmer. Incidentally the infrared pictures of water entering the Snake from the Grand Ronde and Imnaha, undammed tributaries, was in the high 70's.

Response

EPA does not disagree with the factual assertions in the comment, which does not otherwise warrant a response.

Comment A57

Commenter Northwest Hydroelectric Association

Comment

The TMDL Appropriately Recognizes the Infeasibility of Addressing Temperature Through a TMDL

The TMDL acknowledges that sources of heat loading outside its allocation structure are significant, if not the most significant, influences on river temperatures during the critical summer months. Chief among these sources are elevated air temperatures and heat loading upstream in either Canada or Idaho. NWHA agrees that it is entirely reasonable and appropriate for EPA to recognize that, due to these external factors, it is impossible to achieve the applicable numeric water quality standards for temperature in the Snake and Columbia Rivers.

Ignoring that fact would put the TMDL on unstable ground. At least one federal court has held that a TMDL should not be designed so that it is "inequitable" to downstream jurisdictions within the study area, and the same court held that a TMDL should not be "impractical" or "impossible." Imposing a heavier burden on regulated entities in Washington and Oregon on account of actions in Canada and Idaho would be both inequitable and impractical.

The TMDL is just as poor a means of addressing long-term trends in air temperature. The Clean Water Act provides no means for curbing global phenomena like climate change or even for curbing regional greenhouse gas emissions that might contribute to climate change. At best, an allocation for increased air temperatures would be a largely symbolic gesture. Neither EPA nor the state implementation agencies could leverage the Clean Water Act to require reduced air emissions, and no enforcement mechanism exists to address exceedances of an allocation for air temperature. The U.S. Court of Appeals for the Ninth Circuit has looked unfavorably on allocation structures that are "unenforceable."

Response

The commenter provides its views about the Clean Water Act and case law but does not identify a concern with EPA's derivation of the total load or allocation structure in the May 18, 2020 TMDL. This comment does not warrant a response.

Comment A58

Commenter Columbia River Inter-Tribal Fish Commission

Comment

Tributary restoration will be beneficial but will take time. The TMDL assigns 0.1°C of the loading capacity to tributaries. This allocation is equivalent to the cumulative temperature increase caused by existing riparian shade loss in the tributary watersheds. Appendix F of the TMDL reports modeling efforts to identify how much tributary temperatures could be changed by manipulating riparian vegetation shade. The study found that average August stream temperature could be 0.4°C lower if shade is restored across the system. However, the study recognized that it is unlikely that tributary riparian shade restoration will occur to the extent that temperature reductions will be significant. The report advises that additional restoration options together with shade restoration will be required to keep temperatures near their current condition. Tributary restoration to minimize mainstem temperature impairments will take a significant amount of time and should be accelerated to achieve any substantial benefit.

Response

EPA has clarified the tributary allocation discussion in the TMDL to emphasize that the allocations are set to achieve temperatures within 0.5°C of the natural condition of the tributary at its mouth. EPA agrees with the commenter that restoring riparian shade is one potential implementation action to take to improve temperatures in the tributaries. Implementation efforts by other federal and state agencies to analyze tributary temperature impacts and meet the load allocation assigned to the tributaries are subsequent and distinct actions. EPA is committed to supporting TMDL implementation efforts.

Comment A59

Commenter Methow Valley Citizens Council

Comment

We also wish to voice our support for a greater level of involvement by the states of Washington and Oregon in forcing the federal dam facilities to comply with state water quality temperature criteria. Time has shown that EPA and other federal agencies have limited capacity to compel the federal agencies responsible to take more decisive action to move towards improving temperature conditions.

Response

TMDL implementation is the responsibility of the states. EPA is committed to supporting TMDL implementation efforts by the states, other federal agencies, tribes and interested stakeholders.

Comment A60

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The CTUIR DNR is disappointed that the TMDL suggests that numeric temperature criteria in the states' water quality standards are unlikely to ever be met. While we acknowledge the need for realism and respect the difficulties that lie ahead, we should also never lose sight of the aspirational goals of the TMDL and, fundamentally, the Clean Water Act itself, on which it is based.

Response

EPA does not agree that the TMDL suggests that numeric temperature criteria are unlikely to ever be met. EPA recognizes that river temperatures vary naturally and has determined that implementing the TMDL load and wasteload allocations will result in criteria being met the majority of the time, and in a reduction of the frequency of temperature criteria exceedances. Although this TMDL cannot ensure that the applicable criteria will be met at all times and all places, it restricts the identified point and non-point sources to the increases that can be allocated consistent with existing State of Washington and Oregon WQS.

Comment A61

Commenter U.S. Army Corps of Engineers

Comment

The TMDL documents the wasteload allocations for point sources, the load allocations for non-point sources and natural background, and a margin of safety, to identify the maximum amount of pollutant (i.e., water temperature allocation) that the Columbia-Snake River system can receive and still meet applicable Water Quality Standards (WQS). The TMDL accurately states that "even if all the allocations in the TMDL are implemented and temperature reductions are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places." This is due to a myriad of factors that are discussed throughout the TMDL and outlined in this letter.

Response

The comment restates EPA's determinations regarding the TMDL and does not otherwise warrant a response.

Comment A62

Commenter National Hydropower Association Northwest

Comment

The TMDL recognizes that air temperatures have increased by 1.5 degrees Celsius since 1960. If the temperature continues to increase at this rate it has the potential to drastically impact the environment. Reducing emissions from the electricity sector by expanding renewable energy is an important step in our efforts to reverse this trend. NHA believes the hydropower resources on the Columbia and Snake Rivers are indispensable sources of renewable energy and are essential components of any climate change solution. In addition, should the climate continue to warm despite our efforts to reduce emissions, dams are useful tools to manage water if environmental conditions change. While the EPA's production of the TMDL may not be the appropriate venue to consider emissions and climate change policies, implementation of the TMDL must look more broadly. The dams included in this TMDL serve multiple purposes, including irrigation, recreation, navigation, fish and wildlife restoration, and renewable energy generation. How these resources operate is the result of extensive stakeholder processes and collaboration. In addition, the retirement and replacement of fossil fuel resources in the region poses a serious resource adequacy challenge for the electric grid and financial costs to ratepayers. Policies designed to implement the TMDL must consider and balance the TMDL in context with the multipurpose nature of these dams and their stakeholders.

Response

See response to Comment A3.

Comment A63

Commenter Individual email received

Comment

Implementation of the TMDL depends on development of implementation plans by the states of Washington and Oregon, which may be poorly equipped to do so without additional financial and technical support. Is such funding to be made available? Can funding be built into the modernized Columbia River Treaty?

Response

The funding of state water programs from various state and federal sources is outside the scope of the TMDL. There is no funding specifically dedicated to implementing this TMDL.

Comment A64

Commenter Individual email received

Comment

Sec. 1 Introduction, 2nd paragraph, Page 2. Please insert additional information to explain the regulatory status and ongoing temperature water quality activities pertaining to the upstream human activities in Idaho.

Response

See response to Comment T6.

Comment A65

Commenter Individual email received

Comment

Water temperatures and releases from mainstem dams should be managed in such a way as to make salmon and steelhead the highest priority. These runs of fish sustained people living in the region for thousands of years, and they remain an important food source for tribal nations, and those of us living in the Northwest. If properly managed, they also provide a renewable resource worth millions of dollars to regional economies. We should make protecting and enhancing salmon and steelhead runs our main objective in managing these rivers and the dams that control their flows.

Response

See response to Comment A1

Comment Category B. Within the Scope of the TMDL Program, but Not Included in Categories Below

Comment B1

Commenter Columbia Riverkeeper

Comment

TMDL Section 1

Page 1, Section 1.0: no mention of earlier effort? Earlier TMDL efforts paragraph could be added to TMDL

Response

See the Introduction Section of the TMDL regarding additional background information.

Comment B2

Commenter U.S. Army Corps of Engineers

Comment

o. Page 36, Table 6-1. Ice Harbor Dam is located at river mile 9, not 6.

p. Page 53, paragraph 1, "Equation 6-1 in Section 6.3" is referenced. This equation appears to be missing from the document.

q. Page 62. Tables 6-18 and 6-19 are not referenced in text.

r. Page 70, Table 6-22 and elsewhere. The Clearwater confluence is at approximately river mile 139, not 138.

Response

o. The target sites are established at monitoring locations downstream of the dams. Ice Harbor Dam is located at RM9, but the monitoring location at Ice Harbor is downstream. The monitoring site is listed on the DART website as RM6. EPA has changed the tables to correctly reference this monitoring location/target site.

p. As noted in this comment, the equation referenced on Page 53 was omitted. EPA has included the equation in the revised document.

q. Tables 6-18 and 6-19 were referenced incorrectly before; this has now been corrected.

r. The river mile number for the Clearwater River has been corrected.

Comment B3

Commenter U.S. Army Corps of Engineers

Comment

t. Appendix B, Page 4, Table of Contents. Dworshak Dam tailrace is on the North Fork Clearwater River, not the Clearwater River. Lower Monumental is spelled incorrectly.

u. Table B-1, page 56. Data gap identified for PAQW 2015 and 2016 should be the same as stated for 2014.

Response

EPA has corrected these typographical errors.

Comment Category C. 303(d) Listings

Comment C1

Commenter U.S. Forest Service

Comment

The document references the Washington Department of Ecology (Ecology) 2012 CWA section 303(d) list. The current water quality assessment for the state of Washington was approved by EPA on July 22, 2016.

Response

When EPA references Ecology's "2012 303(d) list", it is referencing the latest list of freshwater impairments that EPA approved in 2016. The State of Washington submitted what Ecology originally called the "2014 list" on September 28, 2015; followed by several amendments. EPA received the last amendment on June 3, 2016. In EPA's July 22, 2016 approval letter, sent to Ecology, EPA noted that it was approving the list as the "2012 list" because the assessment included data collected through May 1, 2011 and Ecology had not submitted any other 2012 assessment.

Comment Category D. Water Quality Standards

Comment D1

Commenter Columbia Riverkeeper

Comment

The TMDL makes no mention of the Endangered Species Act. The nexus of ESA with the TMDL seems like a critical aspect of managing the Columbia and Snake Rivers. The TMDL should include a brief summary of ESA issues, including listed species and the history of court cases and biological opinions as they relate to water temperatures.

Response

There are salmonid species currently listed as threatened or endangered under the Endangered Species Act within the Columbia River Basin. The Columbia and Lower Snake Rivers Temperature TMDL will be one element of species recovery in the Basin, as temperature is a critical aspect of salmonid life cycles, and when implemented, the TMDL will reduce the frequency of water temperature exceedances. Although important, EPA does not agree that the history of court cases and biological opinions is necessary to summarize in this temperature TMDL.

Comment D2

Commenter The American Waterways Operators

Comment

AWO recognizes the importance of the careful development of the TDML to ensure long-term river health and to protect the many vital authorized uses of the CSRS. AWO acknowledges the impacts of CSRS rising temperatures and urges EPA to consider the environmental benefits of navigation as it develops the TDML.

AWO is concerned that the TMDL, if improperly developed, could prioritize certain authorized uses like fish and wildlife habitat over other equally important authorized uses like navigation and contribute to growing pressures to breach dams and navigation locks on the system. Specifically, interest groups may try to leverage the TMDL to call for the breaching of CSRS dams on the grounds that dam breaching is the only way to restore lower river temperatures and recover endangered salmon species.

Response

The Columbia and Lower Snake River Temperature TMDL was properly developed to protect all authorized uses in the State of Washington and State of Oregon water quality standards. This TMDL establishes temperature allocations designed to attain applicable temperature criteria. Specific implementation activities to make progress toward those allocations will be determined by the states, in conjunction with relevant stakeholders, including the dam operators.

Comment D3

Commenter The American Waterways Operators

Comment

Recognizing the impacts that the TMDL will have on Congressionally authorized uses of the CSRS, it is imperative that EPA remains highly sensitive to impacts on navigation.

Response

See response to Comment D2.

Comment D4

Commenter The American Waterways Operators

Comment

AWO contends that barging on the river is a vital tool in reducing emission and greenhouse gas impacts of freight transportation and must be carefully considered as EPA develops its TMDL. AWO is concerned that without careful consideration of all federally authorized uses, the TMDL could threaten the viability of environmentally beneficial navigation on the CSRS.

Response

See response to Comment D2.

Comment D5

Commenter Columbia Riverkeeper

Comment

TMDL Section 2

Page 6, Section 2.0: No explanation is provided for why the TMDL does not include the standards of the Colville and Spokane Tribes. The Spokane Tribal standards have more stringent criteria for fall, winter, and spring (September, Oct-March, and April – May). This appears to contradict the statement: “EPA used the most protective of these criteria to develop the TMDL.” Therefore, this TMDL may not be protecting Tribal waters, which may be a violation of the Clean Water Act, federal rules, and case law.

Response

EPA has revised the TMDL to address the Spokane Tribe of Indians and the Confederated Tribes of the Colville Reservation applicable water quality criteria for temperature. EPA has included the addition of a target site within Lake Roosevelt to address the Spokane numeric standards that are more stringent than the State of Washington standards at this location in the months of September and October.

Comment D6

Commenter Various NGOs

Comment

EPA’s TMDL does not require fall cooling necessary to meet Oregon’s narrative water quality standards. Oregon’s water quality standards require that the “seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern.” EPA’s regulations require TMDLs to attain such “narrative” water quality criteria. Columbia and Lower Snake river dams significantly minimize and delay the natural fall cooling pattern that should prevail in these waterways. Accordingly, the dams are causing a significant departure from the “natural seasonal thermal pattern” in violation of Oregon’s narrative standard. The TMDL focuses exclusively on meeting numeric criteria and does not purport to protect or restore the natural seasonal thermal pattern of the Columbia and Snake rivers—despite the National Marine Fisheries Service’s conclusion that such narrative criteria were necessary to mitigate the numeric migration criterion adopted by Oregon. Accordingly, the TMDL illegally fails to attain Oregon's narrative water quality criteria for temperature.

Response

EPA has added language in the TMDL (Section 2.6) explaining how the natural seasonal thermal pattern (NSTP) narrative standard is addressed, as follows: "For the purposes of this TMDL, this narrative criterion applies to the change in the cooling pattern in the fall caused by dam impoundments, because the river cools more slowly in an impounded condition than in a free-flowing condition. EPA determined that numeric targets associated with the numeric criteria used in the TMDL would reduce fall temperatures to attain the NSTP narrative criterion. Specifically, the dam allocations associated with the 16°C criterion at Grand Coulee Dam, the 13°C criterion at Bonneville Dam in October and the 20°C criterion for the lower Columbia Dams in September would result in attainment of the NSTP narrative criterion."

The portion of the Snake River covered by this TMDL is located within the State of Washington, so the Oregon NSTP standard does not apply to the Snake River in this TMDL.

Comment D7

Commenter Various NGOs

Comment

The TMDL's temperature targets and load allocations do not address the water quality standards of the Spokane Tribe of Indians or the Confederated Tribes of the Colville Reservation. Unless EPA's efforts to engage these two tribes in full government-to-government consultation about the TMDL have expressly stated EPA's intention to sidestep these tribal nations' water quality standards, EPA likely is not fulfilling its consultation obligation. Additionally, ignoring tribal water quality standards "applicable" to the Columbia River results in a TMDL that is not "established at levels necessary to attain and maintain the applicable narrative and numerical [water quality standards]." The tribal water quality standards are significantly different, and in some ways more protective of water temperature and fisheries, than Washington's standards. For instance, the Spokane Tribe of Indian's temperature criteria is 13.5 degrees C in September and October, while Washington's criteria at that time and place is 16 degrees C. Accordingly, a TMDL designed to meet Washington's water quality standards is not a legal or functional substitute for meeting tribal water quality standards. Considering EPA's position that "[i]mplementation of this TMDL is largely the responsibility of State and Tribal governments," EPA might have at least designed the TMDL to meet the applicable tribal water quality standards.

Response

See response to Comment D5.

Comment D8

Commenter Bonneville Power Administration

Comment

Appendix A: Temperature Water Quality Standards for the Columbia and Lower Snake Rivers:

1. Page 4: Bonneville requests that Table 1 and Appendix A include information on the Canadian standards, and that the Canadian standards also be presented in the TMDL document.

Response

See Section 2.6 of the TMDL. EPA has clarified the information regarding the Canadian temperature standards, set by the provincial government of British Columbia, that are applicable at the border with Washington State. Table 2-1 and Appendix A of the TMDL focus on the applicable standards for the waters within the TMDL study area. Canadian provincial standards apply outside of the boundaries of the TMDL.

Comment D9

Commenter Bonneville Power Administration

Comment

In addition, Bonneville recommends that the Canadian standards also be presented in the TMDL main document and in Appendix A

Response

See response to Comment D8.

Comment D10

Commenter Bureau of Reclamation

Comment

In the latter category, the TMDL inappropriately applies the water quality criteria for uses in Lake Roosevelt to locations miles downstream of Grand Coulee and Priest Rapid dams. While intended as a simplifying assumption, this assumption is inconsistent with the plain language of Washington's water quality standards and overlooks considerable variation likely occurring across such a large expanse

Response

The rationale for the target temperature assignment in the TMDL is stated in the TMDL as follows: "At two locations in the Columbia River — Grand Coulee Dam and Priest Rapids Dam — the applicable Washington temperature criteria changes at the dam. At both of these locations, the TMDL uses the more stringent criteria as the target temperature (**Error! Reference source not found.**) in order to protect uses and to target attainment of criteria in the reservoirs upstream of these dams." The TMDL does not use a simplifying assumption, but rather the different assignment of target temperatures that apply at those locations to ensure achievement of standards upstream from these two dams.

Comment D11

Commenter Bureau of Reclamation

Comment

The TMDL applies the wrong water quality criterion below Grand Coulee Dam.

States develop water quality criteria to protect designated uses in specific river reaches or waterbodies. In two locations in Washington, the boundary between reaches of the Upper Columbia River is defined by Grand Coulee and Priest Rapids Dams. At these locations, the TMDL applies the water quality standard for the upstream reach 51 miles below the boundary at Grand Coulee and 88 miles below the boundary at Priest Rapids. This constitutes 25% of the reach between Grand Coulee and Priest Rapids Dam and 100% of the reach between Priest Rapids Dam and the border between Washington and Oregon. The practical effect of this approach is that the load allocations for Grand Coulee and Priest Rapids Dams are based on water quality standards that do not apply to the reaches affected by the releases from those dams.

Washington law does not require this approach. TMDLs apply criteria to specific river miles or to the entire waterbody based on the designated use. Washington unambiguously established the boundaries of each waterbody within the Columbia River and designated uses and water quality standards within them. WAC 173-201A-206 does not provide discretion to modify the boundaries of waterbodies or the standards that apply within them. Rather, it provides instruction to the department to apply the more stringent criteria "[a]t the boundary between waterbodies protected for different uses." WAC 173-201A-206 (3)(d) (Emphasis added). "At the boundary" describes locations between two waterbodies where standards might be ambiguous. The term cannot reasonably be read to encompass so much of a reach as to obviate the state's designation of specific standards for that reach. Thus, Reclamation requests EPA recalculate the TMDL allocations using the appropriate temperature standard and update the TMDL to be reflective of this.

Response

TMDLs may require interpretation of water quality standards in setting instream water quality targets, particularly in cases when water quality standards vary within the study area. In this case, when criteria are becoming less stringent in the downstream direction, actions must be targeted to the more stringent standard at a location where the standard changes. Otherwise, standards will not be achieved in the reach upstream of that target site. Finally, dams impact river temperatures both upstream and downstream of the dam, so the focus of the comment on dam releases neglects temperature impacts within the impoundments. See also response to Comment D10.

Comment D12

Commenter Chelan, Douglas, and Grant PUDs

Comment

The State of Washington (WAC 173-201A-260(1)(a)) recognizes that water bodies may not be able to meet water quality criteria due to the natural conditions of the water body. Under these circumstances, the natural conditions become the water quality criteria. The TMDL acknowledges this statute, but explicitly does not evaluate the State's criteria in the context of natural conditions.

"Although Washington and Oregon have developed numerous temperature TMDLs using the "natural condition" provisions of the States' WQS, those provisions were not used to develop this TMDL. For this TMDL, EPA has not attempted to estimate the natural conditions of the mainstems of the Columbia and lower Snake Rivers ... "

The TMDL does not provide guidance for the State of Washington on what constitutes a suitable background from an implementation perspective in-lieu of a truly natural condition which no longer applies in the current environment and is difficult or impossible to estimate accurately.

Response

As stated in the TMDL:

“Although Washington and Oregon have developed numerous temperature TMDLs using the “natural condition” provisions of the States’ WQS, those provisions were not used to develop his TMDL. These existing “natural condition” TMDLs attempted to estimate the instream water quality conditions that occurred prior to human development. For this TMDL, EPA has not attempted to estimate the natural conditions of the mainstems of the Columbia and lower Snake Rivers for two reasons. First, Oregon WQS do not currently include a natural condition provision. Consequently, for the lower Columbia River, where the border between Oregon and Washington divides the River, EPA developed the TMDL using the existing numeric criteria, relying on the more protective aspects of the two States’ criteria to determine the total load from bank-to-bank. Secondly, there is no functional basin-wide water quality model for estimating the natural conditions of the Columbia and lower Snake Rivers. An appropriate basin-wide model would incorporate the upper portions of the watershed in Canada and Idaho and would estimate the natural flow and temperature regime that existed prior to construction of dams and irrigation diversions. For these reasons, EPA relied on the existing numeric criteria to develop this TMDL.”

Comment D13

Commenter Columbia River Inter-Tribal Fish Commission

Comment

EPA needs to do more to protect all salmonid life stages. EPA itself also has a responsibility to ensure that cold water designated, and existing uses are protected consistently and equally throughout the Columbia Basin. EPA is required when approving state criteria to consider protection of downstream uses and provide for the attainment of standards in downstream waters. The number of days that Washington’s criteria were exceeded at Anatone, WA ranged from 55 – 74 days/year for the 2011-2016 period.

The Idaho cold water criteria in the Snake River are a daily maximum (DM) of 22ºC and an average daily maximum (ADM) of 19ºC versus a downstream Washington DM of 19-20ºC and ADMs of 16-17.5ºC. EPA’s Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards recommends salmon/trout migration criteria of 20ºC seven-day average of the daily maximum (7DADM) and migration/juvenile rearing of 18ºC 7DADM. It seems irrational for EPA to allow such wide discrepancies in rivers that cross or share state boundaries, share the same salmon populations and life histories, and have similar use designations for salmon migration, spawning, and rearing.

Relatedly, in November 2019, EPA approved Idaho's Revised Site-Specific Criteria for spawning temperature for the Snake River below Hells Canyon Dam. The approval allows an increase in allowable spawning temperatures of 1.5°C from the former criteria of 13°C to now 14.5°C. This action was another giant step backward in protecting ESA-listed fish and will not help mitigate the effects of climate change. EPA should advocate for basin-wide standards as described in the 2003 Guidance and reverse its approvals of site- specific criteria that do not meet the 2003 Region 10 Guidance. EPA itself also has a responsibility to ensure that cold water designated, and existing uses are protected consistently and equally throughout the Columbia Basin. EPA is required when approving state criteria to consider protection of downstream uses and provide for the attainment of standards in downstream waters. The number of days that Washington's criteria were exceeded at Anatone, WA ranged from 55 – 74 days/year for the 2011-2016 period. The Idaho cold water criteria in the Snake River are a daily maximum (DM) of 22ºC and an average daily maximum (ADM) of 19ºC versus a downstream Washington DM of 19-20ºC and ADMs of 16-17.5ºC. EPA's Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards recommends salmon/trout migration criteria of 20ºC seven-day average of the daily maximum (7DADM) and migration/juvenile rearing of 18ºC 7DADM. It seems irrational for EPA to allow such wide discrepancies in rivers that cross or share state boundaries, share the same salmon populations and life histories, and have similar use designations for salmon migration, spawning, and rearing.

Response

TMDLs address water quality impairments based on currently applicable water quality standards. EPA acknowledges that states and tribes have adopted varying temperature criteria across the basin. The TMDL process interprets and incorporates, but does not alter, the state and tribal water quality standards applicable to reaches of the Columbia and lower Snake rivers.

Comment D14

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL should consider comprehensive strategies to restore the natural thermal regime to protect salmon at all life stages. The TMDL is focused on peak summertime temperatures, which is significant with respect to salmon adult migration. CRITFC is also concerned about protecting salmon spawning and egg incubation that occur during or soon after the period of summer maximum temperature. Dams, reservoirs, and irrigation withdrawals can lead to a loss of temperature diversity, such that maximum temperatures occur for an extended period of time leaving little cold-water refuge areas available for spawning and egg incubation. Under these conditions the duration of exposure to 20°C can impair gamete development and viability, reproductive behavior and success, pre-spawning survival, and smoltification of outmigrants.

Protection of the entire salmon life cycle is critical in terms of achieving standards. By October the current condition is 2.68°C warmer than free flowing condition. Recent work on thermal tolerance of a wide range of fish species shows that spawning adults and embryos have narrower tolerance ranges and are most vulnerable and a critical bottleneck in the life cycle of fish. Fall chinook are undergoing pre-spawning and spawning at temperatures that significantly exceed their historic norms. Implementation of the TMDL should focus on management strategies that are designed to keep temperatures at 20°C or below plus a narrative provision that would require restoration of a natural thermal regime.

Response

See response to Comment D6.

Comment D15

Commenter Public Utility District No. 1 of Douglas County

Comment

Washington's WQS appear to be 16°C from the Canadian border to Grand Coulee Dam, 17.5°C from the base of Grand Coulee Dam to below Priest Rapids Dam, 20°C from Lower Granite to Ice Harbor dams and 20°C from below Priest Rapids Dam to the Columbia River Estuary. While it is not the intent of the TMDL to discuss the merits of the current WQS, the WQS assigned to each of the four study areas appear to be rather arbitrary, and the TMDL hinges on these WQS. As an example, the lower Snake River section has a standard of 20°C but has the same species assemblage and a very similar array of ESA listed species as the section of river from Wells to Priest Rapids where the water temperature standard is instead only 17.5°C. Both of these sections of river have Chinook, Coho, Sockeye, Steelhead, Bull Trout, White Sturgeon and Pacific Lamprey and yet the WQS differ dramatically.

Response

TMDLs are designed to establish pollutant allocations at levels necessary to implement the currently applicable water quality standards. The applicable temperature WQS have been developed by state and tribal governments to protect the most sensitive aquatic life designated uses in the Columbia and Lower Snake Rivers, such as salmonid spawning, rearing and migration. Appendix A to the TMDL contains detailed information on the applicable state and tribal temperature WQS used to develop the temperature targets in the TMDL. Each state and tribal government with authority for setting WQS under the CWA along the Columbia and Snake Rivers is able to determine the numeric criteria required to protect designated beneficial uses for each of these segments.

Comment D16

Commenter Public Utility District No. 1 of Douglas County

Comment

"The temperature WQS are designed to protect the beneficial uses in those waters, the most sensitive of which are salmon migration and spawning (page 1)."

The WQS should be consistent throughout those sections of the Columbia Basin that have similar species assemblages, including having similar designated uses. Why the species listed above are enhanced by allowing a 20°C water quality standard in the Snake River but only 17.5°C in the Mid-Columbia cannot be defended. Please either remain consistent by increasing the WQS for the Wells to Priest Rapids section of river or reducing the standards for the lower Snake River projects.

Response

See response to Comment D15.

Comment D17

Commenter Public Utility District No. 1 of Douglas County

Comment

While it is more conventional for TMDLs to use a natural condition baseline, Douglas PUD understands EPA's desire to instead compare temperature observations and model results to WQS using both the with and without dams scenarios. This is especially necessary in the face of climate change that has been occurring before and after the hydro-system was developed. However, the Washington WQS again seem arbitrary. For example, in Idaho the WQS are 22°C (daily maximum) and 19°C (daily average; page 19) when they are designed to protect the spawning, rearing, and migration for the same species found in the lower Snake River (20°C) and upper Columbia River (17.5°C).

Response

See response to Comment D15.

Comment D18

Commenter Washington Department of Ecology

Comment

2.3 "The Washington water quality standard for the Snake River is 19 C daily maximum."

Correction: The Washington water quality standard for the Snake River is 20 C daily maximum.

Response

EPA has corrected the TMDL.

Comment D19

Commenter Oregon Department of Environmental Quality

Comment

First, EPA must revise the TMDL to assign allocations that fully achieve the numeric criteria for the Oregon temperature water quality standard. EPA recently cited the inability to fully achieve the numeric criteria as the reason for its disapproval of Oregon DEQ's Willamette Basin Mercury TMDL. EPA's current TMDL for temperature in the Columbia and Lower Snake fails to show how applicable standards will be met.

Further, it is unlawful for EPA to try and skirt its responsibility by suggesting that Washington and Oregon change their federally-approved water quality standards by conducting a use attainability analysis to change applicable designated uses. EPA is effectively taking the position that threatened and endangered salmon and steelhead populations in the Columbia Basin should be allowed to go extinct.

Response

This TMDL restricts the identified point and nonpoint sources to increases in temperature that can be allocated under WA and OR WQS, which is consistent with the Oregon and Washington approved WQS. Other sources of warming to the Columbia and Lower Snake Rivers, including temperature loads entering the TMDL study area from Idaho and Canada and increases to air temperature from global climate change, have not been assigned allocations as part of this TMDL. EPA's TMDL does not preclude Oregon DEQ from issuing a further revision to the TMDL under Oregon law that further responds to concerns raised in the comment.

In addition, regarding the comment about conducting a use attainability analysis, see response to Comment E1.

Comment D20

Commenter Oregon Department of Environmental Quality

Comment

Section 2.2 Oregon

On page 9, EPA describes Oregon's narrative criteria including reference to the seasonal thermal pattern in the Columbia River, which must reflect the natural seasonal thermal pattern. The TMDL does not address this narrative criterion. EPA should evaluate its modeling, and describe and address any differences in the seasonal thermal pattern when comparing current conditions with:

1. A scenario without the dams, and
2. Attainment of the biologically based numeric water quality criteria

Response

See response to Comment D6.

Comment D21

Commenter Oregon Department of Environmental Quality

Comment

Protecting Cold Water Criteria in Spring

Section 3.1 Columbia and Lower Snake Temperature Data and Water Quality Exceedances

EPA's TMDL identifies July through September as the critical period with the most exceedances of the temperature water quality criteria. The temperature TMDL must address all parts of the temperature water quality standard, and not only the base numeric criteria. One important part of the temperature water quality standard is the Protecting Cold Water (PCW) criteria, which limits anthropogenic warming to no more than 0.3°C when water temperatures are below the biologically based numeric criteria. Of specific concern is that the TMDL address the PCW criteria during the period of spring juvenile salmonid migration. Snake River spring/summer Chinook salmon and Snake River summer steelhead are Endangered Species Act listed evolutionarily significant units (ESUs) of salmonids that are experiencing significant population declines. These ESUs migrate down the lower Snake River and the Columbia River in the spring. The TMDL must address the PCW criteria, not only during July through September, but also during the spring.

Response

Oregon's PCW narrative criterion is an important provision of the state's WQS for protection against degradation of cold-water resources. By definition, the PCW criterion applies when temperatures are below the biologically-based numeric criteria. TMDLs address waters and seasonal time frames when temperatures exceed these criteria. This TMDL addresses the period of impairment when applicable numeric criteria are exceeded (i.e., June through October). EPA does not have evidence that anthropogenic impacts are greater than 0.3°C in the off-season. RBM10 model results for the month of June suggest that dams cause minor warming, or at times, benefits, (making the river colder than the free-flowing river) in the spring.

Comment D22

Commenter Oregon Department of Environmental Quality

Comment

EPA's TMDL does not meet Oregon's temperature WQS unless allocations are made to background sources, including air temperature and GHG.

The federal regulations (40 C.F.R. 130.7(c)(1)) require that TMDLs, "shall be established at levels necessary to attain and maintain the applicable narrative and numerical WQS with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. Determinations of TMDLs shall take into account critical conditions for stream flow, loading, and water quality parameters."

On page 2 of the TMDL, EPA states that with allocations implemented it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places. While EPA addressed major sources of in-river heat, it failed to allocate reductions to one of the most important sources of heat and temperature exceedances in the Columbia River, air temperatures and their rise due to climate change. Without allocations to GHG and air temperatures, it is unlikely that the TMDL is consistent with Section 303(d) of the Clean Water Act (CWA), and EPA's implementing regulations at 40 CFR Part 130, and that the Columbia River temperature TMDL is not established at a level necessary to attain and maintain the applicable water quality standards. EPA must allocate reductions of air temperature and GHG in the TMDL. Because of EPA's role in setting national environmental policy and as the primary science advisor to the U.S. government when negotiating international treaties and their implementation, EPA should be identified as having responsibility for identifying climate change strategies and the implementation of those strategies.

Response

This TMDL restricts the identified point and nonpoint sources to increases in temperature that can be allocated consistent with the Oregon and Washington approved WQS. Other sources of warming to the Columbia and Lower Snake Rivers, including temperature loads entering the TMDL study area from Idaho and Canada and increases to air temperature from global climate change, have not been assigned allocations as part of this TMDL. As noted in the Reasonable Assurance section of the TMDL, the federal government addresses climate change through international collaboration and domestic actions.

Comment D23

Commenter Port of Clarkston

Comment

Salmonids do not need the average temperature in the river at any given place to be exactly 20°C or lower-. They need cool water zones or channels within tributaries, rivers and reservoirs through which they can move. According to the 2006 PNNL study, temperatures measured near the surface and at various depths indicated that while the surface temperature may have been higher than 20°C, at greater depth, temperatures were below the standard, depending on the depth. That the species have survived over millennia where temperatures were high in the summer lends weight to the conclusion that basic assumptions in the CLSRT TMDL about average and exact temperatures are incorrect and need re-evaluated.

As the graph from a 2006 examination of water temperatures immediately below shows, there are a range of temperatures at different depths that serve the fish well. Water stratifies to cooler layers as; depth grows: Salmonids need cooler water at different locations, depending where they are in their life cycles:
1) As smolts move downstream, cooler water needs to be near foraging or resting areas closer to shore, and,

2) As adults migrate upstream to spawn, they require deeper but narrower channels of cool water
The key to getting the right answer to the river temperature problem is to have adequate information to properly define the problem. For each species, for the point in their life migration cycle, at what specific location in the river is cool water needed and at what temperature? For smolts, how much does spill help and how much does it hinder because spill of warmer surface water destroys stratification at tailraces. For adults, does the pathway from the cooler water make its way to the fish ladders, or are there bottlenecks? What about the temperatures at the top of the fish ladders, which can be as close as 8 feet from the surface of the reservoir? Can pit tags be modified to provide more feedback as to conditions through which fish are traveling so that mapping of locations where cool water is needed can be established?

Releasing cold water to cool down 100% of the river is a luxury when water is scarce. Water will become more scarce in the near future as 10-90% of the regional snowpack goes away due to climate change. This situation demands a thoughtful, careful approach once the real problem is identified.

Response

EPA has determined that both the cross-sectional average temperature and localized temperature conditions (such as those noted in this comment) are important for protection of aquatic life. Due to the large scale of the study area, the TMDL source assessment focuses on the larger scale, cross-sectional average temperature. Regarding localized temperatures, see also response to Comment J4

Comment D24

Commenter Port of Clarkston

Comment

3. Extensive searching for current information and review of past information has not changed my opinion on the ability to regulate the temperature of the lower Snake River to the 20° C (68° F) standard pressed for by the plaintiffs in 1999 or in the current political atmosphere. That is:

- Historic water temperatures of the lower Snake River commonly exceeded the 20° C standard in July and August, sometime being as high as 25 to 27° C (Peery and Bjornn, 2002).

- The free-flowing Snake River ran through a 2,000 foot to 200-foot-deep arid canyon with high temperatures over 43° C in the Lewiston, ID area to 46° C near Pasco, WA. Searing summer sun and hot winds heated the shallow river too hot for summer Chinook and steelhead passage and too hot for fall Chinook spawning (Tom Meekin, Washington Department of Fisheries, pers comm). Combined with low summer flows, water temperatures were higher than after impoundment by Ice Harbor (IHR), Lower Monumental (LMO), Little Goose (LGO), and Lower Granite (LGR) dams.

Response

TMDLs are designed to establish pollutant allocations at levels necessary to implement the currently applicable water quality standards. Appendix A to the TMDL contains detailed information on the applicable state and tribal temperature standards used to develop the temperature targets in the TMDL.

Comment D25

Commenter Port of Clarkston

Comment

In that same deposition I found historic data that showed the undammed lower Snake River reached up to 83 degrees whereas after Ice Harbor Dam began operating, the maximum temperature was 77 degrees. University of Idaho researchers corroborated my finding with 1950s data showing the temperature of the Snake at the mouth up to 80 degrees.

Response

See response to Comment D24.

Comment D26

Commenter Port of Whitman County

Comment

Extensive searching for current information and review of past information has not changed my opinion on the ability to regulate the temperature of the lower Snake River to the 20° C (68° F) standard pressed for by the plaintiffs in 1999 or in the current political atmosphere. That is:

• Historic water temperatures of the lower Snake River commonly exceeded the 20° C standard in July and August, sometime being as high as 25 to 27° C (Peery and Bjornn, 2002).

• The free-flowing Snake River ran through a 2,000 foot to 200-foot-deep arid canyon with high temperatures over 43° C in the Lewiston, ID area to 46° C near Pasco, WA. Searing summer sun and hot winds heated the shallow river too hot for summer Chinook and steelhead passage and too hot for fall Chinook spawning (Tom Meekin, Washington Department of Fisheries, pers comm). Combined with low summer flows, water temperatures were higher than after impoundment by Ice Harbor (IHR), Lower Monumental (LMO), Little Goose (LGO), and Lower Granite (LGR) dams.

• Several commenters have stated that the primary source of water heating in reservoirs is from solar energy and mixing with hot air due to wind-wave action. This is less pronounced in the LSR reservoirs because they are run-of-river reservoirs with constant downstream water movement whereas storage reservoirs like Dworshak have far more pronounced stratification because the water is not moving. The LSR reservoirs are in a relatively narrow canyon and have converted what was a shallow, warm summertime river to four reservoirs around 20-feet deep at the upper end to 100+feet deep at the next dam. In contrast, Dworshak Reservoir (DWR) on the Northfork Clearwater River ranges from a cold mountain river a few feet deep at the upper end to 602 feet deep 2-mile wide reservoir at the dam. The LSR reservoirs under pre-1990s circumstances did not stratify to any extent. That is, the surface water would only be a degree or so warmer than the underlying, flowing reservoir water. Dworshak, a storage reservoir, is designed to capture winter and spring flood water and store it for release over the summer. In summer, Dworshak stratifies at 24° C in the top layer, up to 20- feet deep, and 50° C down to 40° C in the lower and deepest parts of the reservoir.

• Before the mid-1990s, LGR received waters up to 26° C from the Snake River (Anatone gauge) and 25° C from the Clearwater (Spaulding gauge). The hot water passed through LGR and about a week later reached LGO. Similarly, a week or so later, the hot water reached LMO, and another week, IHR. Liscom, et. al., 1985 published temperature data (Appendix B.6) that corroborates what I reported from Corps Annual Fish Count Reports through 1998 (EXCEL spreadsheet). Starting in the 1990s, the fishery agencies and tribes represented by the Fish Passage Center requested spring releases of cool water from DWR with the expressed purpose of cooling the LSR for adult salmon and steelhead migration. The Corps complied with the request and cold-water releases from DWR have morphed into a routine that enabled keeping the lower Snake River below 21° C during most summers for over two decades. Graphic representation of this affect is demonstrated in the PowerPoint file labeled Port Temperatures.

• Water from Hells Canyon typically enters LGR at Lewiston at up to 25° C, while Clearwater River water enters at 10° to 14° C. Thus, LSR reservoirs now have significant temperature stratification because hotter Snake River water rides above the colder Clearwater River water all the way to LGR (PNNL – 15532.pdf, 2006). There colder water is passed through turbines or under normal spill gates and hotter water passes over the overflow spillway weir. The PNNL study measured temperatures near the surface and at various depths that indicated surface temperature exceeding the 20° C criterion while at greater depth, temperatures were below the standard depending on the depth. That juvenile salmon and steelhead equilibrate total dissolve gas at 120 to 125 percent normal is an argument of the fishery agencies and tribes for more spill. Similarly, the fact that adult salmon and steelhead would migrate in the cooler, deeper waters should be accounted for. The ability of fall Chinook juveniles rearing in the reservoirs likewise would be able to regulate temperatures by utilizing deeper water. Turbine passage studies show that fall Chinook are distributed deeper than stream type Chinook which are guided better by turbine intake screens, and deeper than steelhead smolts that guide best by turbine intake screens. Guiding efficiency is governed by their depth in the water as it enters the turbine intakes.

• The PNNL study measured water velocities at the various sample sites too. They found that the reservoirs were flowing downstream more or less continuously even with the low summertime flows. This causes constant mixing, so stratification is not a highly defined as it is in Dworshak Reservoir.

• The current spill program has significantly changed the nature of the water temperature regimes of the LSR reservoirs. Mass spill to 120 or 125 percent TDG passes large quantities of water from about 50-feet in depth under the standard spill gates. There are seven standard gates at LGR, LGO, and LMO, and nine at IHR. Cooler water would be passed downstream through turbines because their intakes are 75 to 85-feet below the surface. Overflow weirs, one at each dam, pass 5,000 to 10,000 cfs while late summer flows range from 20,000 to 40,000 cfs.

• Hot water was entering the surface exits of the LGR and LGO fish ladders causing adult fish to delay until a pump system was installed to bring colder water up from depth around each exit so adult fish migration would not be hindered by a temperature block. Installing such features at all four LSR dams is included in the Columbia River System Operation EIS alternatives currently under public consideration.

• The EPA Columbia and Snake River TMDL report (2020) corroborates the fact that the Snake River (Anatone Gauge) mean maximum temperature exceeds the 20° C standard by 2 to 4° C during July, August, and September (2011 to 2016) while cold water from the Clearwater River typically keeps the lower Snake River 1 to 2° C cooler (Table 6.2) at LGR. Figures 6.1 through 6.3 show how water temperatures at Anatone, LGR, LGO, LMO, and IHR exceed the 20° C standard during July, August, and September (2011 to 2016).

Response

See response to Comment D24. In addition, EPA agrees that there may be dam management operations that would improve local temperatures in and immediately downstream of the dams. Section 7.0 of the TMDL contains further information on entities and programs that are responsible for evaluating these actions.

Comment D27

Commenter Port of Whitman County

Comment

Although there is a great deal more information available now (some of which I was able to review), my opinion about adhering to the 20° C water temperature TMDL is not practical for the LSR. Historically, that standard was routinely exceeded during the summer months in the free flowing LSR. Installation of the four reservoirs reduced the maximum temperature to some degree by creating four deep pools that were heated by solar and air sources at a lesser degree than the shallow river. This has been reduced further with the cold-water releases from Dworshak Reservoir. Though unable to meet the 20° C standard consistently, more tolerable water temperatures have been achieved. This has not occurred without complications. Now, temperature differences between the Snake River and the Clearwater River waters have caused stratification in the reservoirs as warm water has flowed above the colder water. This caused thermal block problems at LGR and LGO fish ladder exits that have been corrected. Correction of similar problems at LMO and IHR are included in future plans (CRSO-20EIS).

Response

See response to Comment D24.

Comment D28

Commenter U.S. Army Corps of Engineers

Comment

Tables 3-3 through 3-7 as well as Figures 21 and 22 in Appendix B. The Washington 20 °C daily maximum (DM) is shown for the Clearwater Station at river mile 137 and the Dworshak Dam tailrace station. Both of these stations are in Idaho, and the Washington standard does not apply. Please change to the Idaho standard.

Response

EPA has corrected these errors in the referenced tables and the two figures in Appendix B.

Comment D29

Commenter U.S. Army Corps of Engineers

Comment

Page 10, Section 2.3, paragraph 3. The daily maximum water temperature standard for the Snake River is 20 °C, not 19 °C.

Response

EPA has corrected this typographical error.

Comment D30

Commenter Western Division of the American Fisheries Society

Comment

The Idaho cold water criteria in the Snake River are a daily maximum (DM) of 22 C and an average daily maximum (ADM) of 19 C versus a Washington DM of 19-20 C and ADMs of 16-17.5 C and an Oregon DM and ADM of 20 C. It seems irrational for EPA to allow such wide discrepancies in rivers that cross or share state boundaries, share the same salmon and steelhead populations and life histories, and have similar use designations for salmon and steelhead migration, spawning and rearing. The connection between mainstem rivers and their entire drainage basins needs to be clearly reflected in the final TMDL if temperatures are to be reduced to achieve restoration of sustainable and harvestable wild salmon and steelhead populations in these rivers.

Response

Under the Clean Water Act, states are authorized to develop water quality standards for waters within their jurisdiction. The standards across this basin vary as noted in the comment, and EPA has assessed and reconciled these differences to identify target temperatures that achieve applicable standards.

Comment D31

Commenter Western Division of the American Fisheries Society

Comment

Exposure of juveniles to high surface water temperatures was not referenced in the TMDL, but average river temperatures have often resulted in high incidence of disease-caused mortality of juveniles (Maule et al. 1996; McCullough 1999).

Response

The TMDL target temperatures protect all life stages of salmonids.

Comment D32

Commenter Western Division of the American Fisheries Society

Comment

The purpose of a TMDL is to limit heat loads so as to meet acute impacts, not just average or chronic impacts. The draft TMDL gives very little consideration to impacts on the temporal or spatial distribution of water temperature and the probabilities of having multiple annual events in a series that could affect salmon populations through acute impacts. Probabilities of co-occurring high air temperature and low river flows would lead to variations in level of biological impact. In addition, the variations in flows and temperatures as boundary conditions should be explored for biological impact. For example, the ability of Dworshak Dam to counteract the warming that is produced in the lower Snake River seems to be taken as a constant. Alternative dam operations to counteract drought and low Dworshak Reservoir levels so as to manage river temperatures should be described. Impacts tend to be smoothed out by use of monthly averages. Management of loads to not produce acute impacts is as important as avoidance of chronic impacts. Greater frequency of acute temperatures, such as those observed in 2015 (Isaak et al. 2018), emphasizes that heat loading in the TMDL must also account for maximum temperatures and not just average conditions.

Oregon promotes maintenance of the “natural thermal pattern” (NTP) in temperatures (p. 9). Oregon needs to ensure that diel thermal exposure during migration does not impair salmon migration or survival if daily minima are increasing as well as maxima. Oregon’s temperature standard includes the goal of maintaining an NTP. However, the DART data for The Dalles Dam 5-day average daily (5DAD) temperature for the period 1995-2020 show a prolonged period of 5DAD temperature from July-September starting with years 2013-2019. The EPA TMDL was only based on years 2011-2016. The years 2013-2016 showed extensive periods in July and August where temperatures exceeded criteria at Bonneville Dam (Appendix B, p. 35) by 2-3°C. If the TMDL were to include the years 2017-2019, it would incorporate several years in which temperatures have been so extreme that interference with migration, metabolic stress, reproductive success, and increased incidence of disease are likely to have cause increased mortality (McCullough 1999, McCullough et al. 2003).

It is stated in the TMDL (p. 22) that temperature exceedances decline significantly in the Lower Snake River in September, whereas criteria are exceeded virtually continuously in August. For temperatures to decline to reach appropriate spawning temperatures in the fall Chinook spawning period, it is important to follow a natural pattern of decline so that adults do not accumulate lethal temperature loads during holding and gamete maturation periods. Biologically meaningful coldwater refuges have not been identified for the Snake River in the fall Chinook spawning period area. The natural thermal regime and potential of multiple occurrences of acute temperature impacts to fish should have been included.

Response

EPA has determined that the TMDL data assessment of river conditions in 2011-2016, which includes the occurrence of acute events such as the summer of 2015 heat wave, is reasonable and appropriate for the purpose of developing a TMDL. The water quality criteria protect aquatic life against both acute and chronic effects, and the TMDL applies those criteria with a margin of safety (see TMDL for the conservative elements of the assessment and allocations).

The concern about impacts to fish are addressed by setting the allocation to point and nonpoint sources to 0.3°C across the study area.

Some aspects of this comment go beyond the scope of the TMDL. For the Dworshak Dam operations example, the Corps manages cold water releases based on real-time weather data and forecasting to address acute warming events. The TMDL identifies current impacts and goals for temperature improvements. In addition, the exceedance assessment identifies whether actions such as Dworshak operations in the 2011-2016 timeframe met target temperatures. This information and the allocations in the TMDL provide the appropriate information for future management actions.

Regarding maximum temperatures, see also response to Comment **Error! Reference source not found.**.

Regarding the natural seasonal thermal pattern standard, see response to **Error! Reference source not found.**.

Regarding cold water refuges in the Snake River, the geographic scope of the cold water refuge study area is the lower Columbia River from its mouth to the confluence with the Snake River. EPA has not studied cold water refuges in the Snake River.

Comment D33

Commenter Western Division of the American Fisheries Society

Comment

What options are built into the TMDL to control Columbia and Snake River temperatures for migration in the July-September period? Will a natural thermal pattern, such as that used in Oregon, be produced by reducing water temperatures in September according to a natural pattern leading to fall Chinook spawning?

Response

The TMDL establishes pollutant allocations at levels necessary to implement the currently applicable water quality standards, and the allocations apply between June and through September each year.

Regarding the natural thermal pattern in the fall, see response to Comment D6.

Comment D34

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA has an obligation to ensure that the TMDL is consistent with the Yakama Nation's Treaty rights.

The EPA, as a federal agency, has a fiduciary trust obligation to the Yakama Nation. The development of the TMDL clearly triggers this responsibility, given the TMDL's potential impact on the Yakama Nation's resources. Accordingly, the Yakama Nation expects that the EPA will protect and give full effect to the Yakama Nation's Treaty reserved rights during this process. At a minimum, the EPA must ensure that the TMDL is sufficiently stringent to avoid harm to fish populations caused by excessive temperatures. In order to give full effect to the Treaty of 1855, however, the EPA should also develop and incorporate an accurate "natural condition" model that considers temperature changes and impacts since 1855. The Yakama Nation's Treaty rights must be "understood as bearing the meaning that the Yakamas understood [them] to have in 1855." With respect to taking fish, the Yakamas understood that they "would forever be able to continue the same off reservation…fishing practices as to time, place, method, species and extent as they had or were exercising." Rather than securing a mere "equal opportunity" to catch fish, then, the Treaty of 1855 guarantees to the Yakama Nation a portion of the harvest. This guarantee is "worthless without harvestable fish." Accordingly, actions or inactions which threaten the survival of Treaty-reserved fish stocks may constitute a violation of the Treaty of 1855.

The federal government, including its agencies, has a fiduciary trust obligation to the Yakama Nation. This obligation is based on the Yakama Nation's cession of certain rights to roughly ten million acres of land in reliance on federal promises to protect the Yakama Nation's resources for future generations. The trust responsibility imposes fiduciary duties on the federal government with respect to "any Federal government action" which relates to the Yakama Nation. The U.S. Supreme Court has stated that the federal trust obligation to the Native Nations should be judged by the "most exacting fiduciary standards."

The federal government's trust obligation is distinct from but related to its responsibilities stemming from the Treaty of 1855. Where a Native Nation has reserved treaty rights, the federal government has a duty to protect those rights. Therefore, "in carrying out its fiduciary duty, it is the [federal government's]…responsibility to ensure that Indian rights are given full effect."

With respect to the TMDL, the Treaty of 1855 prohibits water temperatures that would result in harm to Treaty-reserved fish stocks or to the "time, place, method, species and extent" of Treaty harvests. If temperature exceedances become significant enough to threaten the survival of Treaty-reserved stocks, then the Yakama Nation's guaranteed portion of harvestable fish is likewise threatened. Furthermore, since the Treaty of 1855 and its assurances must be interpreted as the Yakama Nation's negotiators would have understood them, the Columbia River's "natural condition" in 1855 should serve as the baseline for evaluating temperature changes and impacts in the TMDL.

Response

EPA acknowledges treaty responsibilities and the Tribe's interest in addressing temperature impacts. EPA has determined the current water quality standards, as applied in this TMDL, are protective of fishery resources. The TMDL provides a full assessment of the significant sources of warming within the study area, including climate change, dams, point sources, and tributaries.

Regarding the issue of applying natural condition estimates in the TMDL, see response to Comment D12.

Comment D35

Commenter Yakima County Farm Bureau

Comment

With regards to the water temperature of the Snake and Columbia River the YCFB believes that though these rivers have warmer water than optimum at times during the summer that it is not out of line with what the temperature would be in natural free flowing conditions. Further, the YCFB believes that for extended periods of time the impounded water condition fosters lower overall water temperatures and thus causes a delaying effect to a seasonal temperature spike that would occur sooner under natural free flowing conditions.

The YCFB notes that the Washington State Department of Ecology has chosen or is proposing water temperature targets that are lower than the actual temperature of water from either river as it enters Washington State. Thus, the arbitrary limit is unrealistic and impossible to attain. The YCFB believes that Washington and Oregon must create reasonable limits for temperatures and recognize the vital resource both economically and environmentally that our hydroelectric dams provide the citizens of the region.

There is great debate as to what water temperatures were prior to the construction of the Columbia River System (CRS). There is less conjecture as to what the Snake River's water temperatures were prior to the construction of the Lower Snake River Dams. Those temperature records are revealing and illustrate that low summer flows of a natural stream that winds through a naturally hot dry region will greatly increase its temperature.

The YCFB is fully aware that impounded waters will stratify with respect to temperature with colder water deeper in the water body and warmer water at the surface. The EPA has correctly found that the impounding of water on the CRS delays the temperature rise compared to a natural running reach because the high air temperature found in the region during summer can't reach the deeper water behind each dam.

Response

See response to Comment D24. In addition, the TMDL concludes that human sources of warming, notably dam impoundments and climate change, significantly increase the temperatures of both the Columbia and Snake river mainstems. Dam impoundments cause cumulative increases in the daily average temperatures consistently across the study area in the summer and fall.

Comment D36

Commenter Individual email received

Comment

Sec. 2 Water Quality Standards, 1st paragraph, Page 6. Since water quality standards are based upon protection of the most sensitive aquatic life uses in the Columbia and lower Snake Rivers, these standards are to protect threatened summer and fall Chinook salmon and steelhead and endangered sockeye salmon. These salmonids spawn, rear and migrate in these rivers. Implementation of the temperature TMDL will protect water quality for these threatened and endangered salmonids and potentially could assist in achieving recovery levels for these fish. This section should contain additional information that discusses water quality standards and protection and potential effect(s) on threatened and endangered salmonids.

Response

The temperature water quality standards from the States of Oregon and Washington, the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians were evaluated and incorporated into the TMDL, where applicable. Section 2.0 of the TMDL and Appendix A discuss water quality standards. Section 1.0 of the TMDL (Introduction) highlights information regarding potential effects on threatened and endangered salmonids.

Comment D37

Commenter Individual email received

Comment

Sec. 2.3 Standards for Upstream Waters, Page 10. Water temperature data for Anatone, WA on the Snake River from Table 3-2 appears to be warmer than the water quality standards for Idaho. What is the approach needed to address the excessive warm water temperature in the Snake River leaving Idaho? Please provide that information in this section.

Response

See responses to Comment K4 and Comment K11, below. The State of Idaho is upstream of the geographic boundary of what is included in this TMDL. EPA encourages the state to develop temperature TMDLs for waters in Idaho that take this TMDL into consideration and looks forward to working in coordination with the state as future temperature TMDLs are developed and implemented.

Comment Category E. Use Attainability Analysis

Comment E1

Commenter Washington Department of Ecology

Comment

In Section 1.1, EPA suggests a use attainability analysis due to the potential inability to meet temperature water quality standards, stating "One option for addressing the conflict created by the inability to achieve applicable water quality criteria at all times and all places is for the States to make changes to their applicable designated uses."

We are disappointed that EPA is telling the states to weaken their water quality standards as part of the temperature TMDL. Ecology does not intend to do a use attainability analysis (UAA) at this time. We must first focus on implementing actions that can improve water quality. The goal of a UAA is to determine what designated use is attainable. Without the process of reviewing and implementing improvement measures to achieve TMDL goals in the Snake and Columbia rivers, the level of use attainment that can be gained will not be fully understood. By suggesting a UAA now, EPA is prematurely suggesting that we weaken the current level of protection which is designated for salmon rearing and migration. Protecting and restoring salmon is a priority for Washington and for these rivers, and adaptive management through the TMDL process must be our first priority rather than rushing to weaken the standards.

We want EPA to modify language of Section 1.1 to clarify that <u>after implementation actions are taken to address temperature pollution</u>, a UAA is a tool to be considered if temperature water quality standards are not met. We also request that EPA articulate the basis and process of a UAA, given that this regulatory action would require EPA review and approval along with formal ESA consultation.

Response

Designated uses in state water quality standards are determined by the state, including any revisions to WQS. As such, EPA has revised the TMDL by removing the paragraph regarding use attainability analyses.

Comment E2

Commenter Idaho Department of Environmental Quality

Comment

While the CWA and Federal Regulations have provisions that would allow states to remove or revise uses through UAAs, the development of UAAs and revised uses and criteria for both waters within the TMDL boundaries and upstream waters is not likely a practical or viable tool, as the designated uses for these waters are existing uses and could not be removed or revised to less sensitive uses. IDEQ suggests EPA provide more language describing how it envisions UAAs serving as practical, implementable solution.

Response

See response to Comment E1.

Comment E3

Commenter Washington Department of Ecology

Comment

We do not agree with EPA's recommendation to weaken our water quality standards and are asking for the statement to be removed from the TMDL. It is imperative that we not give up protecting Columbia and Snake Rivers for our salmon and orca before we have even started to address the key sources of temperature pollution. The TMDL study identifies climate change and dams as the biggest contributors to temperature pollution in the Columbia and Snake Rivers and highlights the importance for action. However, instead of outlining a pathway to addressing these sources and focusing on what we can do to lower temperatures and protect salmon, EPA suggests that we simply lower our standards. We believe that suggestion is unwarranted and unhelpful.

Response

See response to Comment E1.

Comment E4

Commenter Various NGOs

Comment

Finally, we object to EPA's suggestion that Oregon and Washington weaken their water quality standards rather than address the actual water temperature issues impairing salmon and steelhead migration and survival. The purpose of a TMDL is to meet water quality standards, not weaken them. EPA's repeated suggestion that the states employ Use Attainability Analyses is, at its core, an invitation to abandon salmon recovery efforts in the

Columbia and Snake rivers. A Use Attainability Analysis is a Clean Water Act procedure by which states may, under limited circumstances, remove a designated use for a specific water body. Here, EPA is asking Oregon and Washington to remove salmon migration, spawning, and rearing as uses of the Columbia and Lower Snake rivers. EPA's suggested course of action is, frankly, unconscionable and directly at odds with the Pacific Northwest's long-standing effort to conserve and restore Columbia River basin salmon runs and ensure sustainable fisheries. Use Attainability Analyses will not restore healthy salmon runs or sustainable fisheries; EPA should withdraw its inappropriate request and focus on concrete actions to reduce water temperatures.

Given that EPA's approval of Oregon's current water quality criteria for temperature violated EPA's duty not to jeopardize the continued existence of many Columbia River basin salmon and steelhead populations, it is difficult to see how EPA could approve less-protective criteria without violating Section 7 of the Endangered Species Act. Cf. National Marine Fisheries Service, 2015 CRSO Biological Opinion on EPA's Proposed Approval of Certain Oregon Water Quality Standards, p. 1 (2015).

Response

See response to Comment E1.

Comment E5

Commenter Columbia Riverkeeper

Comment

TMDL Section 1

Page 2, Section 1.1, paragraph beginning "One option…": a. This paragraph has no relevance to the TMDL, and I can see no good reason why it was included. It also ignores the issue that EPA should be regulating upstream states to protect the water quality of downstream state (Oklahoma v Arkansas). If they want to raise the issue of upstream water quality, they should explain how they are addressing temperatures in the Snake and Clearwater Rivers in Idaho and Oregon.

Response

Regarding Section 1.1, see response to Comment E1.

Regarding the geographic scope of the TMDL, the TMDL is focused on addressing impacts within the study area. EPA has not evaluated sources upstream of the study area. If waterbodies upstream of the TMDL geographic scope are listed as impaired, TMDLs are required to be developed for those waterbodies according to applicable water quality standards. See also response to Comment K1.

Comment E6

Commenter Bonneville Power Administration

Comment

Given the significant regional benefits of these federal dams, including providing carbon free energy to support Northwest states' climate goals, this type of regulatory uncertainty and potential for litigation could be avoided. Bonneville appreciates that the TMDL stated that a Use Attainability Analysis (UAA) is one potential path forward. A UAA could evaluate a change to designated uses and thus, the temperature standards so that they are reflective of climate change, a holistic basin approach, and temperature standards upstream of the TMDL boundary in Canada and Idaho.

Response

See response to Comment E1.

Comment E7

Commenter Columbia River Inter-Tribal Fish Commission

Comment

Invoking "Use Attainability Analysis" is inappropriate for this TMDL. EPA suggests that states could proceed with a "Use Attainability Analysis" (UAA) as a viable pathway for satisfying regulatory requirements. These statements take a simple view of the situation that neither the states, nor the EPA, could legally implement. The process of conducting a UAA is to analyze whether uses of a waterbody specified under a state's water quality standards are attained. These are called designated uses and they may be different from existing uses. UAAs are not available to change existing uses and federal regulations require water quality levels that protect existing uses. In this TMDL, EPA suggests that states consider removing several salmon life stage uses of the river, including migration, spawning, and rearing, rather than addressing and improving the integrity of this waterbody to protect those life stages. This is in direct contravention to the objective of the Clean Water Act. Furthermore, fish, and specifically salmonids, are existing uses in the river system and cannot be removed.

It would be inconceivable for CRITFC's member tribes or anyone living in the Pacific Northwest to envision a Columbia River system without a salmon fishery. It is fundamentally wrong to assume that a use that has existed since time immemorial could be legally determined to be unattainable. This suggested compliance pathway to the states should be removed from the TMDL document.

Response

See response to Comment E1.

Comment E8

Commenter Columbia River Inter-Tribal Fish Commission

Comment

Finally, EPA's suggestion that the states remove designated uses simply to help the river meet water quality standards violates the objective of the Clean Water Act and does not serve to protect the legacy for any future generations.

Response

See response to Comment E1.

Comment E9

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The CTUIR DNR also believes there should be no language to suggest that a suitable state “fall-back” response to consistent violations of temperature water quality criteria is to weaken the criteria—“move the goalposts.” Simply retreating to Use Attainability Analyses by the states is an abdication of responsibility that does nothing to protect resources or meet legal obligations. Salmon migration, spawning, and rearing must always remain preeminent, sacrosanct beneficial uses of the Columbia and Lower Snake Rivers, not subject to any diminishment through regulatory sleight-of-hand.

Response

See response to Comment E1.

Comment E10

Commenter More than 150 Individual commenters

Comment

The EPA literally stands for the Environmental Protection Agency-protection against harm and especially the calamity of extinction. I deeply disapprove of this apathetic suggestion that "a river's uses are no longer expressly for salmon" as a reasonable solution to lower the bar in environmental standards because the standards are too difficult to meet. This is utterly unacceptable to me. It is an absolute disgrace for an organization that holds the great responsibility of working under the name Environmental Protection Agency to stoop to indifference about two extinctions and the collapse of an ecosystem when we need you to rise up and protect.

Response

See response to Comment E1.

Comment E11

Commenter Idaho Conservation League

Comment

We also comment on EPA’s discussion of removing designated uses for salmon and steelhead from the Columbia and Snake Rivers (TMDL page 2). These designated uses are part of the critical habitat for multiple ESA-listed species and cannot be removed. We consider it dangerous for EPA to suggest this possibility in light of the clear impact of high water temperatures on salmonid migration. We thus advocate for EPA to clarify their comments on the removal of designated uses, especially in relation to the following listed protections:

- Critical habitat under the Endangered Species Act for listed populations in the Columbia and Snake River systems

- Essential Fish Habitat for all salmonid species designated by the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fisheries Act

- Protections for tribal access to harvest of salmon and steelhead under Tribal Treaties

- Treatment of fish in relation to hydroelectric generation under the Pacific Northwest Electric Power Planning and Conservation Act of 19

Response

See response to Comment E1.

Comment E12

Commenter Idaho Wildlife Federation

Comment

EPA's should remove the suggestion that Washington and Oregon employ Use Attainability Analyses to remove salmon migration, spawning, and rearing as "Uses" of the Columbia and Lower Snake Rivers.

EPA admits that even if all the allocations in the TMDL are implemented, it is unlikely that the numeric criteria portion of the WQS will be met at all times. With the current system in place, EPA believes the States are setting the bar too high with temperature WQS meant to safeguard beneficial uses such as salmon migration and spawning. EPA suggests to Oregon and Washington to conduct a Use Attainability Analysis to remove salmon migration, spawning, and rearing as "uses" of the Columbia and Lower Snake Rivers to simulate compliance with establish WQS. By undergoing a Use Attainability Analysis, the states could prove that attaining that use is not feasible and the conflict would simply vanish.

EPA's suggestion to the States to weaken their WQS ignores decades of efforts to improve water temperature issues for salmonid species in the Columbia and Snake Rivers. Conducting a Use Attainability Analysis to remove these uses would only wipe away enforceable standards in place and would not solve the issue that Endangered Species Act (ESA)-listed salmon and steelhead species face with harmful water temperatures caused by dams and reservoirs on the Snake and Columbia Basins. It also suggests that Oregon and Washington should essentially write off economies and communities reliant on salmon and steelhead, even into riverside towns of Central Idaho, because it is too difficult to achieve temperatures that can provide for thriving populations of salmonid species in the current system. Idaho's anadromous fish must travel these corridors to return to their natal streams as adults, where Idahoans and riverside towns rely on them for their economic and cultural importance.

IWF rejects EPA's notion that Oregon and Washington weaken their WQS rather than substantially addressing water temperature issues that harm our fish during their migrations to Idaho. We must move away from ignoring known harms to our fish to simply move the goal posts and check new boxes of success. Our goals should strive for healthy, harvestable, and well-distributed runs of salmon and steelhead throughout the Columbia and Snake Basins and providing those species with adequate and enforceable measures to minimize harm while in the system.

Response

See response to Comment E1.

Comment E13

Commenter Oregon Department of Fish and Wildlife

Comment

The EPA seems to be suggesting that the states of Washington and Oregon change their applicable designated uses for the lower Columbia and Snake rivers to address the existing disconnect between summer water quality (temperature) exceedances >68° F and state water quality standards based on designated uses for salmon and steelhead rearing and migration habitats not to exceed 68° F. ODFW recommends the EPA remove these inappropriate suggestions. The lower Columbia and Snake rivers support both salmon and steelhead stocks, currently listed under the Endangered Species Act (ESA), which provide important regional commercial and recreational fisheries benefits as well as significant cultural importance to the citizens and Native American tribes of the Pacific Northwest.

Response

See response to Comment E1.

Comment E14

Commenter Oregon Department of Environmental Quality

Comment

Section 1.1 Total Maximum Daily Loads and Clean Water Act

EPA suggests, on page 2, that the state could conduct a use attainability analysis and change the designated use. EPA's statement implies that the agency is ready to conclude that salmon and steelhead migration through the Columbia and lower Snake should no longer be protected under federal law. This astounding position detracts from what Oregon believes is an appropriate approach to the TMDL: addressing the anthropogenic sources that are adding heat to the system and that can be altered by allocating the 0.3°C human use allowance. Strong action to implement a TMDL will result in overdue actions needed to address major temperature impacts to this system. Conducting a UM and revising the biologically based numeric criteria would not result in beneficial environmental outcomes, nor will it alter the any significant conclusion about action needed to significantly reduce temperature impacts in the basin.

Response

See response to Comment E1.

Comment E15

Commenter Orca Conservancy

Comment

It is clear that SRKWs are steadily decreasing their presence in what was, historically, their core habitat. Correlations with salmon returns, along with our studies of killer whale feeding habits, make it clear that this absence is due to a need to search for food in other areas. Until overall Chinook runs improve it is likely that we will continue to see as well a decline in the total number of SRKWs. Managing the salmon populations in the Columbia and Snake rivers at the brink of extinction jeopardizes the continued existence of ESA listed Southern Resident Killer Whales. In order to ensure these populations survive, the smolt adult ratio (SAR) needs to be increased to 4-6% and not the measly 1% currently seen in the basin. Historical data suggests that salmon runs within the Columbia River Basin ran well in the millions. It is therefore unacceptable that EPA would suggest "one option for addressing the conflict created by the inability to achieve applicable water quality criteria at all times and all places is for the States to make changes to their applicable designated uses." Orca Conservancy is appalled at the suggestion and finds it conflicts with the EPA's mission to uphold federal laws, which includes the Endangered Species Act's requirement to protect the critical habitat of endangered Southern Resident Killer Whales, which includes Columbia and Snake River Chinook as a primary constituent element.

Response

See response to Comment E1.

Comment E16

Commenter Pacific Fishery Management Council

Comment

EPA is suggesting that Oregon and Washington remove salmon migration as a designated use of the Columbia and Lower Snake rivers. Weakening state water quality standards will not restore healthy salmon runs or create sustainable fisheries. In fact, doing so would impair Columbia/Snake River salmon migration and survival. Recommendation: EPA should withdraw this suggestion from the TMDL and focus on Federal actions to reduce water temperatures.

Response

See response to Comment E1.

Comment E17

Commenter Public Power Council

Comment

Limitations of Using Designated Water Quality Criteria

In comparison to numerous TMDLs which were developed using "natural condition" provisions for water temperature, EPA chose to base this TMDL on the existing numeric criteria from Washington and Oregon's water quality standards. While this decision is understandable given the limitations of scope addressed above and the limits of the RBM10 model, it results in the use of water quality criteria which are disconnected from reality and are often unachievable.

The relevant Oregon and Washington water quality standards are largely based on fish biology and are not representative of the natural state of the Columbia and Lower Snake Rivers. For example, Washington has set a water quality criterion of twenty degrees Celsius for the Lower Snake River, but natural conditions would likely often exceed this limit. There is no leeway in this criterion, and it is taken as given. As the TMDL is currently written, dams will be tasked with meeting water quality standards over which they do not have control and cannot meet, because the standards are unattainable and disconnected from actual river temperatures.

Free-flowing rivers are experiencing increases in warm water temperatures and frequently exceed standards that are based on fish biology. Recently, the Fraser River, a major free-flowing river on the West Coast of Canada, has experienced numerous days above the twenty-degree Celsius threshold.5 As with the Columbia River, these high water temperatures have increased in frequency and severity as air temperatures have increased. Increases in water temperatures in the Fraser River, and other free-flowing rivers in Alaska, point to the fact that climate change, not dams, is the leading cause of increasing river temperatures.

There is a balance between protecting fish and other wildlife and setting standards which are unreasonable and unattainable. Failing to consider natural conditions when forming the TMDL creates standards that are unreasonable and unattainable. Exemplifying another approach, Idaho DEQ has rejected EPA's more stringent and protective temperature criteria because DEQ is concerned that these criteria are unattainable.7DEQ's opinion reflects the fact that the approach that EPA has chosen is not universally accepted.

EPA points to the possibility of Washington and Oregon conducting a Use Attainability Analysis (UAA) to change their relevant water quality standards. The UAA process would allow Oregon and Washington to revise their standards based on attainability as well as cost considerations. PPC believes that UAAs may be useful in specific parts of the TMDL, such as revising water temperature standards below Bonneville dam (see Temperature Calculations at Bonneville below), and PPC is supportive of pursuing UAAs to amend unattainable standards.

Response

See response to Comment E1.

Comment E18

Commenter U.S. Army Corps of Engineers

Comment

The Corps agrees with EPA's determination that the existence of the dams, as operated for Congressionally-authorized project purposes, contribute to a shift in the natural water temperature regime in the Columbia and Snake Rivers and creates cooler than natural conditions in the spring and early summer and slightly warmer conditions during the fall and winter months. The Corps, however, also recognizes that historical water temperatures in the lower Columbia River, before major development of dams, frequently exceeded the current numerical standard of 20°C during the summer months (O'Connor 2019, in draft). Given this, the Corps supports EPA's suggestion that the States of Oregon and Washington make changes to their applicable designated uses, as part of a use attainability analysis. Other complicating factors, such as climate change, may also contribute to water temperature exceedances and should be captured in the use attainability analysis as well.

Response

See response to Comment E1.

Comment E19

Commenter Upper Snake River Tribes (USRT) Foundation

Comment

In the TMDL, EPA mentions the option of states conducting a UAA that "demonstrates that attaining the use is not feasible because of one of the six factors listed in 40 C[.]F[.]R[. §] 131.10(g)6 " because of the "inability to achieve applicable water quality criteria at all times and all places." Although this option is permitted via 40 C.F.R. § 131.10(g), this option should always be used as a last resort for states, and never an immediate viable option to meet applicable water quality criteria presented in a TMDL. The restoration of salmon and steelhead populations, and those who rely on these fish, desperately depends on states making necessary decisions to improve water quality criteria and lower the water temperature of the Columbia Basin River system. If states choose not to do so by conducting a UAA that EPA then approves, the future of salmon and steelhead is bleak, if not nonexistent.

Response

See response to Comment E1.

Comment E20

Commenter Western Division of the American Fisheries Society

Comment

We are concerned about further relaxing temperature standards. The TMDL suggests that Washington and Oregon should develop Use Attainability Analyses (UAAs) that would potentially result in injurious designated uses and thermal criteria for salmon and steelhead for at least the Columbia and Lower Snake Rivers. Those UAAs would further lower the likelihood of sustaining, let alone rehabilitating, viable and harvestable salmon and steelhead populations in the basin.

Response

See response to Comment E1.

Comment E21

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The Yakama Nation objects to the EPA's assertion that states can merely revise designated uses to allow for compliance with water quality standards.

At the outset, the Yakama Nation is discouraged by the EPA's assertion that "[e]ven if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places."17 The Yakama Nation acknowledges that sources of heat pollution beyond the regulatory reach of the EPA (and the Clean Water Act overall) may contribute to higher temperatures. However, the Yakama Nation contends that, to account for these other sources, the EPA should design the TMDL so that it is stringent enough to ensure that compliance with applicable numeric criteria is indeed possible.

More problematic, however, is the EPA's assertion that "[o]ne option for addressing the conflict created by the inability to achieve applicable water quality criteria at all times and all places is for the States to make changes to their applicable designated uses."18 The most sensitive beneficial uses in the Columbia and Snake Rivers are salmon migration and spawning.19 Taken together, the EPA seems to be implying that the states could revise their salmon migration and spawning uses to be less stringent by citing infeasibility, which would allow for compliance with applicable criteria.

The Yakama Nation would be categorically opposed to such an action by the states. Salmon have used the Columbia River for migration and spawning since time immemorial. These uses are sacred to the Yakama Nation's culture and central to the federal government's promises in the Treaty of 1855. Water quality standards that do not protect migration and spawning would be in direct conflict with the Yakama Nation's Treaty-reserved rights and traditional way of life. Accordingly, the EPA should strike this potential "option" from the final TMDL.

Response

See response to Comment E1.

Comment E22

Commenter Public Utility District No. 1 of Chelan County

Comment

The Initial TMDL also explains that the temperature criteria are likely not achievable, due to the external factors described above. For this reason, EPA appropriately acknowledges that a use attainability analysis may be appropriate. The federal regulations, adopted by Ecology, explain that a designated use may be removed when it either no longer exists or is not attainable. Federal regulations allow revision of a designated use if its attainment is not feasible due to one of six factors. One such factor is whether human caused conditions (such as climate change) limit the attainment of the highest aquatic life uses and cannot be remedied or would cause more environmental damage to correct than to leave in place. Another factor is whether changes to dams (within or outside the TMDL boundaries) or their operations necessary to attain the use would be infeasible. Chelan PUD agrees that the applicable temperature criteria are unattainable and warrant revision. Moreover, the TMDL should recognize that negative operational restrictions on hydropower projects could adversely impact the watershed by increasing emissions, further exacerbating the climate change that is one of the predominant causes of the temperature increases.

Response

See response to Comment E1.

Comment E23

Commenter Public Utility District No. 1 of Chelan County

Comment

Additionally, the final TMDL should recognize that it may be appropriate to reconsider the numeric temperature criteria. As described herein, Chelan PUD and its partners have undertaken significant work to protect aquatic species, and specifically salmon. The success of this work demonstrates that cold water species are supported, despite the temperature exceedances during the critical period addressed in the TMDL. Where, as here, the attainable condition of existing and designated use is protected and the existing criteria are not achievable, consideration of site-specific criteria is appropriate. Thus, it is important that the final TMDL recognizes this concept as an option for changing the applicable criteria.

Response

See response to Comment E1.

Comment E24

Commenter Northwest River Partners

Comment

The TMDL should encourage the states of Washington and Oregon to pursue a Use Attainability Analysis ("UAA"). A UAA could evaluate a change to designated uses and thus, the temperature standards so that they are reflective of climate change, a holistic basin approach, and temperature standards upstream of the TMDL boundary in Canada and Idaho.

Response

See response to Comment E1, above. Any decision to pursue a UAA is a decision made by the states.

Comment E25

Commenter Upper Snake River Tribes Foundation, Inc.

Comment

After reviewing the Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load (hereafter referred to as the "TMDL") issued by U.S. Environmental Protection Agency Region 10 (hereafter referred to as "EPA") , USRT has notable concerns regarding states' use of conducting a Use Attainability Analysis (hereafter referred to as "UAA") , presentation of temperature averages, and National Pollutant Discharge Elimination System (NPDES) point source permitted facilities' wasteload allocation (WLA) effects on the Columbia River.

The purpose of a TMDL is to help implement state water quality standards based on the relationship between pollution sources and in-stream water quality conditions. "The TMDL establishes the allowable loadings or other quantifiable parameters for a waterbody and thereby provides the basis for states to establish water quality-based controls. These controls should provide the pollution reduction necessary for a waterbody to meet water quality standards." The Columbia and Lower Snake River Temperature TMDL in question "examines sources of temperature impairments on the Columbia River, from the Canadian border to the Pacific Ocean; and on the lower Snake River in Washington, from its confluence with the Clearwater River at the Idaho border to its confluence with the Columbia River." This river system is vital to Columbia and Snake River salmon and steelhead, which are at risk of extinction due to fish-killing hot water within this river system. The importance of these fish to USRT's tribes cannot be diminished.

Historically, the Bannock, Paiute, and Shoshone peoples harvested salmon and trout throughout the Columbia River Basin for subsistence. Annual salmon and steelhead runs in what are now [Idaho], Nevada, [Oregon], and Washington provided harvest opportunities throughout the year. Access to anadromous fish for subsistence and ceremonial purposes has been eliminated from much of the Upper Snake River Basin following the construction of dams (for hydroelectric, flood control, and irrigation purposes) along the Columbia and Snake Rivers. Once a mainstay of the tribal diet, anadromous fish have been absent from waters within, or near, tribal reservations for nearly a century, effectively preventing three generations of tribal members from practicing their cultural practices and traditions.

Based on the purpose and function of a TMDL, it is imperative that the water quality criteria identified in a TMDL be implemented by each state, in this case Oregon and Washington, in order to benefit all affected parties and help restore salmon and steelhead populations within the Columbia River Basin.

In the TMDL, EPA mentions the option of states conducting a UAA that "demonstrates that attaining the use is not feasible because of one of the six factors listed in 40 C[.]F[.]R[. §] 131.10(g)6" because of the "inability to achieve applicable water quality criteria at all times and all places." Although this option is permitted via 40 C.F.R. § 131.10(g), this option should always be used as a last resort for states, and never an immediate viable option to meet applicable water quality criteria presented in a TMDL. The restoration of salmon and steelhead populations, and those who rely on these fish, desperately depends on states making necessary decisions to improve water quality criteria and lower the water temperature of the Columbia Basin River system. If states choose not to do so by conducting a UAA that EPA then approves, the future of salmon and steelhead is bleak, if not nonexistent.

Response

See response to Comment E1.

Comment Category F.Current Conditions Data Analysis

Comment F1

Commenter Columbia Riverkeeper

Comment

TMDL Section 3

Page 14, Section 3.1: a. Explain why July-October were chosen for monthly, and not the entire year. Some of the applicable water quality criteria apply year-round.

Response

Water quality criteria apply year-round but TMDLs focus on periods during the year when the criteria are exceeded, and actions are needed to reduce pollutant loads so that applicable water quality criteria are attained and maintained.

Comment F2

Commenter Columbia Riverkeeper

Comment

TMDL Section 3

Page 16, Table 3.1: Why is the annual maximum higher than any of the monthly maximums at almost every site? If August is the month of warmest temperatures, wouldn't the annual maximum be the same or lower?

Response

The values reported in this table are average maximum temperatures (i.e., averages of the six maxima for the period 2011-2016. The month of August is not always the month of annual peak temperature. The peak temperature can occur in July and September in some years. This is the reason for the differences noted in this comment. See also Comment F7 for changes in the metrics used in the TMDL.

Comment F3

Commenter Columbia Riverkeeper

Comment

TMDL Section 3

Pages 17-21, Tables 3.2-3.7: The annual number of days in exceedance is sometimes higher than the sum of days from July through October. In what other months are the temperatures exceeded? Those months should be included in the analysis.

Response

This discrepancy is primary due to the extreme high temperatures in June 2015 that exceeded criteria. The TMDL has been revised to address the month of June.

Comment F4

Commenter Public Utility District No. 1 of Douglas County

Comment

"In the portion of the Columbia River above Priest Rapids Dam, the majority of criteria exceedances occur in the months of August and September. In the mid-Columbia, from Wells Dam to Wanapum Dam, water temperatures exceed the criterion more frequently, for a longer average duration and by a higher average magnitude. The lower mainstem Columbia, below McNary Dam, has a higher criterion (20 C) but exhibits only slightly fewer criteria exceedances (page 15)."

Douglas PUD finds this paragraph misleading and suggests that EPA strike the paragraph from the TMDL. This paragraph, as written, is a commentary on the WQS differences rather than reach specific influences on temperature. The Mid-Columbia River has projects that are run-of-river and have little storage capacity relative to larger run-of-river projects below them and large storage projects above them. Indeed, reach specific influences in the Wells Project show either zero influence in increasing water temperatures or a cooling effect depending on the month. See tables 6-6, 6-7, 6-8, and 6-9 in columns E (Reach Impact for Wells Dam). In fact, in later months, Wells' reach impact provides a cooling effect as much as -0.5°C in the month of October (pages 47-50). The TMDL has to be cautious when using language that infers worse conditions in reach impacts when the data from their own model suggest otherwise.

Response

EPA has retained the quoted language describing a straightforward comparison of temperature measurements and water quality criteria. This part of the TMDL makes no statement regarding the cause of exceedances. There is another section in the TMDL (See Section 6.0 – Total Maximum Daily Load Analysis) assessing the sources of heat to the Columbia and Lower Snake Rivers, and that section includes a detailed assessment of the impacts from dams within each reach.

Comment F5

Commenter Washington Department of Ecology

Comment

Figure 3-5 should have the tributary points scaled based on proportional flow contribution. In the current figure, each point is given an equal weight, which is not as informative.

Response

EPA agrees that the flow of the tributary determines its impact on the mainstem river. The table prior to this figure (Table 3-4) provides some information on flow proportion. This figure is a straightforward depiction of tributary temperatures. Note that the figure number was a typographic error and has been corrected to now read Figure 3-4.

Comment F6

Commenter Washington Department of Ecology

Comment

Table 3-9 Temperature disparity in the Lewis River between Table 3-9 (12.5 C) and Table 5-1 (16.6 C).

Response

The estimates in the two tables are from different sources and point to uncertainty and data limitations for the Lewis River temperature. Table 3-9 is based on the estimates derived for RBM10 with methodology described in the model development report (Appendix C). Table 5-1 is based on the NorWest database and statistical model. The differences are caused by the different methods of handling statistics and data gaps. The difference would have minimal effects on mainstem temperature due to the difference in flow between the Lewis and Columbia rivers, but the Lewis River temperature is critical as a cold water refuge and the NorWest model provides the best August estimates (RBM10 requires 365 days of temperature estimates, whereas the original focal point for NorWest model development was the month of August).

Comment F7

Commenter Oregon Department of Environmental Quality

Comment

Section 3.1 Columbia and Lower Snake Temperature Data and Water Quality Exceedances

EPA must clarify the following statement on page 14: "The results for each year were then used to calculate a single average value for annual and monthly (July- October) average mean and maximum temperatures." Is "monthly (July - October) average mean temperatures" the same as "monthly (July - October) average temperatures"? It is unclear why EPA uses both terms average and mean. In addition, EPA must explain what exactly is meant by "maximum temperatures" Is this the maximum temperature for each month, an average of daily maximum temperatures, or some other statistic?

Response

It is common to use “mean” and “average” interchangeably in technical reports. The meaning is identical.

In response to other comments, EPA has changed the metric for maximum measured temperatures in the TMDL. The original metric was the “average maximum temperature” for each month, calculated as the average of the six highest recorded temperatures for a given month (July – October) over the six years of 2011-2016. The revised “maximum temperature” in the TMDL is now the single highest temperature recorded for a given month (June through October) in the same time frame of 2011-2016. See also response to Comment S1.

Comment F8

Commenter Oregon Department of Environmental Quality

Comment

For Table 3-2, EPA must define what is meant by average maximum temperature and monthly average maximum temperatures. In addition, EPA must explain how it is that very little warming occurs between McNary Dam and Bonneville Dam, a distance of 150 miles. According to Table 3.2, Current Conditions, there is essentially no change in mean annual or mean monthly water temperatures. The maximum temperatures for September and October increase only 0.2 and 0.3°C and the annual maximum and monthly maximum temperatures for July and August increase less than 1°C.

Response

Regarding Table 3-2 headings, see response to Comment F7, above. Regarding temperature changes between McNary Dam and Bonneville Dam, the river enters the cooler environment of the Columbia Gorge downstream of John Day and the river responds to this change. This characteristic of the river is seen in both measurements and RBM10 simulations.

Comment F9

Commenter U.S. Army Corps of Engineers

Comment

Page 13, Tables 3-2 through 3-7 of main text as well as multiple tables in Appendix B. River temperature data were only retrieved from the DART database. Consequently, there are several cells that are highlighted in red due to missing data. In several cases, the missing data is available from the Corps and U.S. Geological Survey databases.

Tables 3-2 through 3-7. The Dworshak Dam tailrace monitoring station (DWQI) is located on the North Fork Clearwater River at river mile 0.5, not the Clearwater River at river mile 55.

Response

EPA relied on Corps data published and available in the DART database. The references to the Dworshak monitoring station in Tables 3-2 through 3-7 have been corrected.

Comment F10

Commenter U.S. Forest Service

Comment

P. 27, Table 3-9. Hood, Sandy, Kalama and the Deschutes have identical estimated mean temperatures. Is this correct given the differences in flow paths/lengths, surrounding climate, etc?

Response

As noted in the table, these are estimated temperatures. Some of the tributaries with limited or no temperature data are assumed to be similar in temperature to nearby tributaries that are monitored more regularly.

Comment F11

Commenter Individual email received

Comment

The NorWeST stream temperature data contains an egregious error that must be corrected before any analysis from that model takes place. I have made such a request to USDA previously, but they have yet to make the necessary correction. The NorWeST stream database contains temperature readings from the Lower Snake River. Those readings should be flagged as being within a reservoir because they are in a reservoir. As it stands, those readings are modeled as being on a free flowing river, which it is not.

Response

The TMDL does not rely on NorWeST temperature estimates for the Snake River. All temperature information for the Columbia and Snake rivers is based on measured temperatures and/or RBM10 model outputs. NorWeST temperature estimates are used to provide a comparison of estimated temperatures at tributary mouths and the mainstem Columbia River.

Comment F12

Commenter Individual email received

Comment

Sec. 3.1 …Data and Water Quality Exceedances, Page 23. As stated on page 23, "Based on EPA's evaluation of available data from 2011-2016, temperature criterion exceedances at the Little Goose, Lower Monumental, and Ice Harbor Dams generally begin to occur in mid-July, ranging between 16-18 days, on average (Table 3-4). In August, water temperatures exceed the WQC for an average of 20 days below Little Goose Dam, 29 days below Lower Monumental Dam, and 31 days below Ice Harbor Dam (Table 3-5). In September, exceedances at Little Goose and Lower Monumental Dams drop significantly, averaging 4 and 6 days, respectively. At Ice Harbor Dam, however, water temperatures exceed the criterion for an average of 14 days by an average magnitude of 0.8°C in September (Table 3-6)." Between mid-July and mid-September, the water temperature in the lower Snake River is above water quality standards during the summer migration of the threatened summer and fall chinook and steelhead and endangered sockeye salmonids. These temperature impairments need to be reduced for these fish.

Response

This TMDL has been established to target the applicable temperature water quality standards as required under the Clean Water Act. When waters are determined to be impaired for one or more water quality standards, they are listed on the state's CWA 303(d) list of impaired waters. TMDLs are developed to create the pollution budget that will help return those impaired waters to attaining and maintaining water quality standards. The state and tribal water quality standards for temperature are set at levels to be protective of fish.

Comment F13

Commenter Individual email received

Comment

Attached are two files as PDF's; one containing Water Temperature data measured on the Lower Columbia River in 1875 (SalmonHistoricalReports.PDF) and the other containing Water Temperature data measured on the Lower Snake River in the 1950's (SnakeWaterTemps1950s.PDF).

As can be seen from a Data Table contained in the first attachment, Water Temperatures of 70 Degrees F were measured on the Lower Columbia River in 1875; and on the date of this Temperature measurement in 1875 data collection was 'terminated' so possibly the Water Temperatures in 1875 got even hotter than 70 Degrees F on the Lower Columbia River downstream of Portland, Oregon.

The second attachment contains daily Water Temperature data collected by the United States Geological Survey (USGS) during the 1950's on the Lower Snake River downstream of Clarkston, Washington. As can be seen from this attachment, exceeding 68 Degrees F on the Lower Snake River was an 'Annual Event' even under 'Natural Conditions' prior to the construction of the Lower Snake River Dams; the first of which came online in the early 1960's.

Please consider this Historical Temperature Data as part of the current TMDL process; and include it in your current reports. This information is contained within Federal Reports published as Public Information.

Response

See response to Comment U47.

Comment Category G. Source Assessment

Comment G1

Commenter Columbia Riverkeeper

Comment

A more detailed narrative is needed to summarize the findings in Appendix D. Important information is reported there that explains many of the key drivers of temperatures in the two rivers.

Response

EPA appreciates the comment that important information explaining key drivers of temperatures is included in Appendix D and has determined that Appendix D provides a reasonable description of the scenario assumptions and results.

Comment G2

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

Page 28, Section 4.0, first paragraph:

a. Other sources that impact temperature should be mentioned and discussed, and evidence provided to document why they were not included: changes in groundwater inflows; water withdrawals; irrigation return flows; and riparian shading. Assumptions of negligible impact should be tested with sensitivity analyses.

b. …"where they enter into Washington from Canada, and from Idaho and Oregon, respectively."

Response

Appendix D of the TMDL describes two of the four sources noted in the comment as follows: "The following processes are not simulated because they have relatively minor influences on the cross-sectional average temperature of these large mainstem rivers: groundwater and hyporheic flow interactions, topographical and riparian shade, and heat exchange at the water/sediment interface."

EPA assessed the impact of the largest water withdrawal in the study area (Banks Lake project; see Appendix D). Irrigation flows returning to the mainstem via the 23 tributaries with load allocations are incorporated into the TMDL through those allocations. It was not feasible to analyze small return flows directly to the Columbia River, and the tributary analysis demonstrates that smaller inflows have a negligible impact on mainstem temperatures due to the large flow differential between these small flows and the mainstem rivers.

Regarding potential sources on the Snake River upstream of the TMDL study area, see response to Comment K11.

Comment G3

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

Page 30, Section 4.2, third paragraph and Table 4-1: Appendix D contains a variety of scenarios that provide important information. Table 3-1 in Appendix D has 13 scenarios, but Table 4-1 only shows 5. This section should summarize all scenarios and their implications for the TMDL.

Response

The complete information from the modeling analysis is included in the TMDL and appendices. The section of the TMDL (Section 4.0) noted in this comment provides summary information. Additional information pertinent to the TMDL is provided in later sections of the TMDL (e.g., Section 6.0 -). Appendix D describes all of the modeling assessment information. Several scenarios provide background or supplemental information on temperature dynamics across the river system, so they are not included in the summary within the main body of the TMDL.

Comment G4

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

Page 30, Section 4.3: Appendix D shows important information about the effect of climate change on the free-flowing river versus current conditions. The modeling results suggest that a free-flowing river is much more resilient to climate change than the current river, in terms of the magnitude of water temperature increases. This is an important point and should be included in this section and in the analysis of allocations.

Response

EPA agrees that this is important information, and believes it is reasonable to retain the information in Appendix D. See also response to Comment G7.

Comment G5

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 70, two bullets on the bottom of the page: Other sources of warming should be included on this list, including irrigation return flows, reduced groundwater inflows, and increased water withdrawals.

Response

EPA has revised this section of the TMDL to discuss water quality criteria attainment and excess temperature (Section 6.8). For example, the impacts on mainstem temperatures of the sources identified in the comment are an order of magnitude lower than the estimated climate change impact to date (1.5°C +/- 1.0°C), based on the estimated impacts from the Banks Lake withdrawal and tributaries (on the order of 0.1°C). See also response to Comment G2.

Comment G6

Commenter Bonneville Power Administration

Comment

Page 43: The TMDL and specifically Section 6.5 did not acknowledge or address other sources of non-point source temperature increases. Bonneville requests that the TMDL include a discussion on land use and other anthropogenic non-point sources of temperature, in addition to dams.

Response

The tributary analysis and heat load allocation to tributaries in the TMDL address land use and non-point sources of temperature impacts in the watershed to the extent that the EPA had information available.

Comment G7

Commenter Oregon Department of Environmental Quality

Comment

In DEQ's temperature TMDLs for Oregon, DEQ typically allocates shade to nonpoint sources while also allocating channel morphology and flows for meeting the temperature criteria. Point sources are also given wasteload allocations to minimize warming from NPDES permitted sources. However, air temperature has a significant effect on water temperature, which EPA acknowledges in the Columbia and Snake River temperature TMDL.

Although temperature TMDLs typically identify loss of riparian shade as a nonpoint source of heat, loss of shade is not a significant source on the mainstem Columbia and Snake rivers. The width of these large rivers results in the surfaces of the rivers being directly exposed to full solar radiation during daylight hours. The presence or absence of trees on the banks does not create any measurable instream temperature effects. In contrast, shade restoration in tributary watersheds can improve tributary temperatures.

Therefore, control of other sources of heat, through inclusion of appropriate load allocations including air temperature, is crucial for meeting temperature water quality standards in the Columbia and Snake Rivers.

Response

EPA has evaluated sources of temperature loading within the TMDL study area and allocated the available 0.3°C to point sources, dams, and tributaries. Increases to air temperature from global climate change have not been assigned allocations as part of this TMDL. Also see response to Comment EE1.

Comment G8

Commenter Pacific Fishery Management Council

Comment

Data presented in the TMDLs clearly show that water entering the lower Snake River at the Clearwater confluence meets CWA temperature standards for salmon and is cool enough to support salmon migration throughout the summer and fall. However, there is a misconception that upstream conditions are responsible for increased water temperatures.

Recommendation: To avoid further confusion, the TMDL should clearly explain that the lower Snake River dam impoundments (not upstream conditions) are primarily responsible for water quality standard violations in the lower Snake River.

Response

There are no temperature measurements at the Snake/Clearwater confluence, so the TMDL does not include a determination about water quality impairments at this location. The TMDL modeling assessment includes simulation of the long term daily average temperature at the confluence area, but this is a different metric than the daily maximum temperature that is used for evaluation of criteria exceedances. EPA does not have sufficient information to determine the relative responsibility of lower Snake River dam impoundments and impacts at the upstream boundary, because there are no models available to provide estimates of the anthropogenic impact to water temperatures at the boundary.

Comment Category H. Irrigation Withdrawals and Inputs

Comment H1

Commenter Columbia Riverkeeper

Comment

Irrigation return flows should be included in the TMDL. The locations of return flow should be mapped and listed in tables. Flow and temperature data from irrigation return flows should be described. Load allocations should be set for return flows. The effect of return flows should be included in the analysis of Banks Lake withdrawals. Future increases in Banks Lakes withdrawals and irrigation return flows should also be evaluated.

Response

See response to Comment G2. The TMDL focuses on addressing current conditions and activities and not potential future activities. Future changes to Banks Lake operations can be evaluated as part of TMDL implementation.

Comment H2

Commenter Columbia Riverkeeper

Comment

TMDL Section 6.0, general: Impacts from irrigation diversions and return flows should be estimated and reported in the TMDL.

a. Although diversions do not receive allocations, their effect on temperature should still be evaluated so that their impacts are understood, and overall restoration can take them into account.

b. Irrigation return flows may be significantly large and warm as a whole, and their impacts also need to be quantified and included in load allocations.

c. The RMJOC-II hydrologic modeling exercise provides the input data needed to evaluate these impacts.

d. Future plans for increased Banks Lake withdrawals and increased irrigation return flows should be included in the TMDL.

Response

See response to Comment G2 and Comment H1. The RBM10 hydrologic model provided sound scientific information for the TMDL. Additional modeling analysis was not feasible with available project resources.

Comment H3

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL needs more analysis of irrigation practices and effects. There is insufficient assessment of the effects of irrigation withdrawals and returns. An evaluation of the Banks Lake pump storage operations is included in the TMDL by simulating current conditions with Banks Lake flows and with those flows set to zero. The simulation shows a maximum impact to mean monthly temperature of 0.1°C in both July and August at McNary and John Day dam tailraces. However, this evaluation represents only a portion of the impact of irrigating 6.5 million acres of land in the Columbia Basin.

The National Research Council (2004) reports that water withdrawals in July are 6.8% of the mean flow during average (1960-1999 years) at John Day Dam. In the critical months of July and August in low water years the proportion of water withdrawal climbs to 16.6%. These months have the highest water withdrawals and have noticeable effects on mainstem flows, especially during dry years. Additional increases to mainstem withdrawals have been proposed.

Given the findings in the TMDL and the basin-wide withdrawals there should be some attribution of load allocated to these actions. The Banks Lake analysis is only a start to assessing the impact of all withdrawals on river temperatures. While limiting irrigation withdrawals may be beyond the legal scope of State TMDL implementation plans, actions that limit their impact should be included in a comprehensive plan.

Response

The RBM10 model uses flow data that accounts for irrigation withdrawals. EPA has assumed that the current rate of withdrawal of water for agricultural use will continue (2011-2016). This represents the critical low-flow summer condition downstream of Grand Coulee dam. While withdrawals do not add heat loads to the Columbia River, reduction in water withdrawals could improve instream temperatures and could be considered during TMDL implementation.

See also response to Comment H5.

Comment H4

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The TMDL should more closely examine irrigation practices and effects; analysis of the extensive irrigation activity occurring throughout the Columbia River Basin is too limited.

Response

See response to Comment G2.

Comment H5

Commenter Western Division of the American Fisheries Society

Comment

The TMDL provides insufficient assessment of the effects of irrigation withdrawals and returns, despite their effects on the volume of water in the mainstems and ground water, as well as how return flows could either warm or cool the mainstems, depending on how and when that water is returned. The single evaluation done on Banks Lake does not constitute a complete analysis of the impact of irrigating 6.5 million acres of land in the Columbia River basin. Groundwater pumping from aquifers bordering the mainstem (National Research Council 2004) may be significantly depleting cold water entry into the river. Current water withdrawals in July on the Columbia River average 6.8–8.6% of mean flows. Under minimum July flows, the proportion of water withdrawal climbs to 16.8%. Under proposed increases in withdrawals, this would increase to about 21% of total flow (National Research Council 2004). Given that return flows are likely much warmer during the high withdrawal periods, the lack of analysis of this impact is a major oversight.

Burns et al. (2012) evaluated 60,000 wells in the Columbia Plateau Regional Aquifer System (CPRAS), which covers an area of about 44,000 mi2 in Oregon, Washington, and Idaho. This study found very rapid declines in groundwater levels throughout this region, which have resulted in reduced groundwater flows toward the Columbia and Snake Rivers. This great reduction in cold groundwater inflow to the mainstems would likely impair river temperatures and eliminate river margin cold refuges. This impact was not modeled in the TMDL. WDOE’s groundwater mapping and monitoring service (https://apps.ecology.wa.gov/eim) reveals extensive pumping of groundwater from aquifers adjoining the Columbia River and in its tributary watersheds.

Response

The TMDL and RBM10 model incorporate all significant flow inputs to the Columbia and Snake rivers, and a number of tributaries likely carry irrigation return flows back to the mainstem. The model estimates for instream flow show good agreement with measured flows, and the temperature simulations are consistently accurate, so major omissions in inflows and outflows are not evident at this time. See also responses to Comment G2 and Comment V1.

Comment Category I. RBM10

Comment I1

Commenter Columbia Riverkeeper

Comment

The RMJOC-II analysis provides a powerful data set of Columbia and Snake River hydrology, with and without dams and irrigation water use. The TMDL should evaluate this data set and compare its flow calculations to RMJOC-II. Scenarios for temperature should be developed using the RMJOC-II data set, to evaluate climate change impacts on the current conditions river and a river without regulation or irrigation.

Response

EPA has determined that the existing flow information in the TMDL and RBM10 model is adequate for the purposes of the TMDL. This TMDL does not regulate river flow. At the same time, flow is a baseline factor in the TMDL analysis and is varied in some scenarios, so it is important that the flow information is accurate. This TMDL assumes flow management for the period 2011 to 2016 is representative of future flow management. Much of the flow management occurs upstream of the study area and is outside the geographic scope of the TMDL.

The RMJOC-II project assesses management across the entire basin and there are difficulties in mapping the RMJOC-II flow estimates to the TMDL study area. The TMDL modeling assessment captures existing flow management using measured river flows within the study area, starting at the Canadian border and at the Snake River, at Anatone.

Flow management at Grand Coulee is incorporated into the current conditions model and removed in the free-flowing scenario. Otherwise, the dams within the study area are run-of-river dams that do not substantially alter river flows. EPA did not assess all irrigation withdrawals; however, EPA did evaluate the largest irrigation withdrawal in the study area, the Banks Lake withdrawal, and found it to cause a relatively small impact to river temperatures.

EPA has assessed climate change impacts under impounded and free-flowing conditions within the study area. A temperature model of the entire basin is not available.

Comment I2

Commenter Columbia Riverkeeper

Comment

Confirmation scenarios should be run with a split data set. This would help evaluate the effect of the model's assumptions and parameter selection on an extrapolated set of conditions. I use the term "confirmation" ("verification" and "validation" are commonly used terms for the same process), although it might be better described as a quality assessment blind test. The extrapolated run with comparison to measured data would evaluate how much error might be expected in scenarios such as the free-flowing river.

Response

EPA does not agree that additional scenario tests, as described in the comment, will aid in the understanding of model quality or model error. The quality of the model and model error for the "current conditions" scenario (i.e., calibrated model) are documented thoroughly in the Model Development Report (Appendix C of the TMDL). By definition, a model scenario is a prediction of conditions under hypothetical events (e.g., free-flowing river), and the results from the model run cannot be compared to measurements, because there are no measurements for a hypothetical event/model scenario. For more information on the model scenarios analyzed in the TMDL, see Appendix D (Model Scenario Report).

Comment I3

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

Page 29, Section 4.1, first paragraph:

a. explain why RBM10 was selected for the TMDL. This framework has several weaknesses: it is uniquely developed by EPA Region 10, so it lacks a track record and breadth of application; and it simulated daily averages so it cannot be compared directly to the daily maximum water quality criteria.

b. Explain why CE-QUAL-W2 wasn't used. This framework has been applied successfully in dozens of applications and provides a dynamic simulation with results as daily maximum temperatures.

Response

All water quality models have strengths and limitations. The RBM10 model shows very good accuracy in simulating current Columbia and Snake River temperatures. The quality and theory of the model have been extensively documented and peer-reviewed, and the model has been applied many times since 2001. Other organizations have successfully applied versions of this model framework to rivers in the United States, and abroad, including published studies by researchers at the U.S. Geological Survey, University of California at Los Angeles, and Wageningen University in the Netherlands.

The simulation of daily average temperature is reasonable in large rivers with low diel variation, and the daily average metric provides a margin of safety in the estimation of dam impacts, the largest source of heat outside of climate change.

EPA was able to efficiently update RBM10 for this project and did not have sufficient resources to develop a CE-QUAL-W2 model (W2) for this system. The W2 model is significantly more complex than RBM10 and simulating the free-flowing scenario with that model would be particularly difficult.

Comment I4

Commenter Columbia Riverkeeper

Comment

Page 31, Section 4.4:

a. "EPA relies on the RBM10 model…as the best available estimates of the temperature changes…" This is a broad claim that cannot be proven. The Corps has used the CEQUAL-W2 model, which may provide a better estimate in some ways. Reword, perhaps: "…as a robust model whose results are of a quality adequate to meet the goals of the TMDL."

Response

EPA has retained the original language. The RBM10 model assessment provides the only available estimate of cumulative dam impacts on mainstem river temperatures across this study area. The Corps' CE-QUAL-W2 model, as currently developed, simulates river temperatures with the dams in place. It is not capable of simulating the free-flowing river conditions.

Comment I5

Commenter Various NGOs

Comment

EPA's use of the RBM10 model is a well-documented, scientific approach that yields conservative load allocations based on daily average water temperatures to implement the applicable water quality criteria. Like any model of a complex natural system, RBM10 contains assumptions and uncertainties. Nevertheless, it is an appropriate and defensible tool to produce temperature load allocations for Columbia and Lower Snake river dams.

Response

Comment noted.

Comment I6

Commenter Bonneville Power Administration

Comment

Paragraph 2. Page 28: It states, “Mathematical models, such as the RBM10 model of the Columbia and lower Snake Rivers, are commonly used by EPA and state agencies in TMDL analyses.” Bonneville requests that EPA add language to this section of the TMDL acknowledging the significant model development work accomplished by the federal agencies.

Response

EPA recognizes that other federal agencies have developed models, but those models were not developed or applied to generate the information necessary for a TMDL, such as scenarios to evaluate dam impoundment impacts and point source impacts.

Comment I7

Commenter Northwest Hydroelectric Association

Comment

NWHAs supports the recognition in the TMDL that dams play a minimal role in any temperature criteria exceedances. Evidence compiled by the National Oceanic and Atmospheric Administration (NOAA) indicates that parts of the Lower Snake River routinely experienced temperatures between 20°C-25°C in the 1950s, far earlier than recent concerns over the abundance of salmon or other species.

Dams within the Columbia and Snake River basins have been demonstrated to moderate extreme water temperatures by shifting some of the summer heat into the fall and thereby reducing temperature variability. Further, temperature levels before and after dam construction have been demonstrated to remain steady or even decrease, even as air temperatures increase. In many instances, dams reduce water temperatures by storing cooler water and releasing it when ambient temperatures have increased. That might often be the case, for instance, when ambient temperatures begin to increase in early summer months, and while the reverse scenario might sometimes occur (with stored water being warmer), evidence indicates that any such effect is not a key reason why water quality standards might be exceeded.

Relying on RBM-10 modeling conducted by the U.S. Army Corps of Engineers, NOAA concluded that breaching dams along the Lower Snake River would have a near-trivial impact on temperature exceedances. The “near-natural condition[s]” reduced exceedances of a 20°C standard in that reach by only 5 of 64 days. If that same basic effect holds for other reaches with lower numeric criteria, it seems likely that the number of exceedances might be reduced even less (and perhaps not at all).

EPA’s conclusion that temperature exceedances are largely driven by factors other than dams should be reflected throughout the TMDL. As discussed in more detail below, the manner in which some data is presented, and certain assumptions made by EPA, are inconsistent with this important conclusion.

Response

EPA disagrees that the dams have minimal effect on Columbia and Snake River temperatures. As documented in the TMDL and the Model Scenario Report, the two primary human impacts to temperature of these rivers are climate change and dams. As noted in the comment, the temperature impacts of the dams can vary based on numerous factors. The TMDL assessment accounts for these factors and provides estimates of the impact of the dams on daily average temperatures.

EPA is not aware of any modeling conducted by the U.S. Army Corps of Engineers using EPA's RBM10 model. As described in the TMDL assessment, EPA has determined, using the RBM10 model, that the lower Snake River dams warm the river in the summer/fall period and contribute to temperature criteria exceedances.

Comment I8

Commenter Oregon Department of Environmental Quality

Comment

Heat Source Evaluation

Sections 1.0 Introduction and 1.1 Total Maximum Daily Loads and Clean Water Act

The introduction lists source categories of heat loading that EPA evaluated. Although EPA did evaluate increasing air temperatures and other factors associated with climate change, EPA did not evaluate solar radiation and air temperature that influence water temperature as part of "background," which is identified on page 2 as part of the load allocation (LA). EPA needs to explain or correct this apparent disconnect between its analysis and load allocation.

Response

Solar radiation and air temperature are included in the RBM10 model, so these background conditions are incorporated into all of the TMDL modeling analyses. See also response to Comment EE7.

In addition, the climate change analysis in Appendix G describes long term trends in air temperatures due to anthropogenic activity.

Comment I9

Commenter PNGC Power

Comment

Troublingly, EPA's TMDL findings about temperature impacts of the federal dams appear to be inaccurate due to flaws in the agency's model. The TMDL relies upon a one-dimensional mathematical temperature model, which lacks the detail necessary to provide accurate results for a river system with the complexity of the CRS. Additionally, the model appears to make arbitrary assumptions by keeping some dams in and leaving others out of its analysis, such as including Dworshak Dam as part of its free-flowing river scenario. Due to these and other shortcomings, the model lacks the precision necessary to meet EPA's stated objective of a TMDL, which is "to determine the loading capacity of the waterbody and to allocate that load among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved."

Response

EPA has determined that the RBM10 model represents the model with adequate detail, provides river temperature estimates that reasonably match measured temperatures, and is well-suited to assessing source contributions to elevated temperatures. The Dworshak Dam (aka North Fork Clearwater River mouth) is appropriately included in the model as a boundary condition, but this location is outside of the geographic area for the TMDL. It is therefore not considered a heat source and is set to current conditions for all load allocation evaluations.

Comment I10

Commenter Port of Whitman County Commissioners

Comment

Recently, Mr. McKern wrote an update to his 1999 declaration on temperature regulation in response to Civil No. 99-442-FR filed by the National Wildlife Federation, et. al. against the U.S. Army Corps of Engineers for exceeding temperature and dissolved gas standards in the lower Snake River. Extensive research on current information sources has not changed the biologist's opinion on the ability to regulate the temperature of the lower Snake River to the 20°C (68°F) standard. KEY POINTS: These are the key points drawn from Mr. McKern's research:

• A 2002 study of historic water temperatures in the Lower Snake River for the U.S. Army Corps of Engineers (USACE) found that the lower portion of the free-flowing Snake River commonly exceeded the 20°C (68°F) standard in July and August, sometimes running as high as 25-27°C1.

• The free-flowing Snake River ran through a 2,000-foot to 200-foot deep arid canyon with high temperatures over 43°C in the Lewiston, ID area to 46° C near Pasco, WA. Searing summer sun and hot winds heated the shallow river to temperatures too high for summer Chinook and steelhead passage, as well as fall Chinook spawning. Combined with low summer flows, water temperatures were higher than after impoundment by Ice Harbor (IHR), Lower Monumental (LMO), Little Goose (LGO) and Lower Granite (LGR) dams.

• Installation of the four reservoirs along the Lower Snake River in the 1960s and 70s reduced peak temperatures by creating four deep pools, ranging from 20 feet deep at the upper end to over 100 feet deep at the next dam. These pools are heated by solar and air sources to a lesser degree than a shallow, free-flowing river. Cold-water releases from Dworshak Reservoir have further reduced temperatures. Though unable to meet the 20°C standard consistently, more tolerable water temperatures have been achieved.

• Several commenters have stated that the primary source of water heating in reservoirs is from solar energy and mixing with hot air due to wind-wave action. This is less pronounced in the Lower Snake River reservoirs because they are run-of-river reservoirs with constant downstream water movement; whereas, storage reservoirs like Dworshak have far more pronounced stratification because the water is not moving.

• Starting in the 1990s, the fishery agencies and tribes represented by the Fish Passage Center requested spring releases of cool water from DWR with the expressed purpose of cooling the Lower Snake River for adult salmon and steelhead migration. The Corps complied with the request and cold-water releases from DWR have morphed into a routine that enabled keeping the lower Snake River below 20°C during most summers for over two decades.

Based on this research, as well as the comments of our partner organization, Northwest RiverPartners, we recommend the implementation of a multi-dimensional model for analysis. As Northwest RiverPartners commented, "The RBM10 model is a one-dimensional model. It is not well-suited to solving for issues of the magnitude and complexity of the analysis in the TMDL, nor can it provide the precise outcomes upon which major policy decisions should rest." The selected model should be able to replicate the effects of river impoundment shown in the 2002 USACE study, maintain consistency in its inclusion or exclusion of dams as part of the free-flowing river and incorporate the entirety of the Columbia and Snake river basins.

Response

EPA has determined the RBM10 model provides good river temperature estimates and is well-suited to assessing source contributions to elevated temperatures. EPA was able to efficiently update RBM10 for this project and did not have sufficient resources to develop a multi-dimensional model (e.g., CE-QUAL-W2 model) for this system. The CE-QUAL-W2 model is significantly more complex than RBM10 and simulating the free-flowing scenario with the CE-QUAL-W2 model would be particularly difficult. Development of a basin-wide model was infeasible given EPA's available resources.

Comment I11

Commenter Consumers Power, Inc.

Comment

We are troubled as well by the differences between the EPA's modeling results and the 2002 study of lower Snake River water temperatures by the U.S. Army Corps of Engineers. The failure of the EPA's model to replicate real world results suggests a deficiency within the model or inadequacy of the model itself and should be addressed appropriately in a revised draft TMDL.

Response

EPA has determined the RBM10 model accuracy is on par with all temperature models developed to date. The model development report shows the good agreement between simulated and measured temperatures.

Comment I12

Commenter Northwest River Partners

Comment

However, because the CLSRT TMDL is intended to be used by the states of Washington and Oregon to develop energy and environmental policy, a known shortcoming in the RBM10 model, as described above, indicates the model may not be suitable for its purposes.

Response

EPA has determined RBM10 is suitable for use in developing this TMDL. The TMDL is intended to aid in understanding and improving current water temperature conditions.

Comment I13

Commenter Northwest River Partners

Comment

The draft TMDL should recognize and address the following considerations:

1) The RBM10 model is a one-dimensional model that is not well-suited to solving for issues of the magnitude and complexity of the analysis in the TMDL, nor can it provide the precise outcomes upon which major policy decisions will rest.

2) In determining whether the TMDL should utilize the RBM10 model or a different model, EPA should rerun its RBM10 simulation for the years identified by the 2002 USACE study, which compared actual river temperature data before and after the lower Snake River dams were built. If the RBM10 model is unable to accurately replicate the effects of river impoundment, then the EPA should abandon the RBM10 model in favor of a model that can more accurately match complexities that EPA is attempting to simulate.

Response

The RBM10 model has been calibrated against actual (measured) river temperatures in both free-flowing and impounded locations, and the success of the calibration demonstrates that the model is capable of estimating the effects of river impoundment.

Comment I14

Commenter Northwest River Partners

Comment

Likely in an effort to ensure that the full potential of heat sources is accounted for, conservative assumptions are used in the CLSRT TMDL modeling. Specifically, a conservative approach is taken in the case in calculating temperature impacts for each source of heat loading that do not have already defined impacts for National Pollutant Discharge Elimination System ("NPDES") point source discharges, nonpoint source heat from dams and reservoirs, and tributaries. Furthermore, the current conditions that are used to evaluate the impairments in the model domain are calculated using conservative assumptions. For example, the TMDL notes that:

EPA is also using the mean of the monthly maxima recorded for the 2011 – 2016 period to establish the current conditions benchmark. In other words, exceedances at a given location are the mean of the six highest daily maximum temperature recorded in that month over the period 2011 – 2016.

Because this TMDL calculates exceedances from such a conservative standpoint, outlier temperatures have a greater influence on the exceedances than more typical temperatures, and so the TMDL overestimates the magnitude of impairments. Cumulatively, conservative assumptions such as this one could lead to a large margin of safety that could overestimate the restrictions that need to be implemented to meet the WQS ("Water Quality Standards"). Such restrictions could threaten the hydropower system availability that serves such a vital role in providing affordable, carbon-free energy to the Northwest.

Response

TMDLs are required by regulation to be developed with a margin of safety. While some conservative assumptions have been employed, EPA does not believe these assumptions result in unreasonable allocations.

As noted in Section 6.2 of the TMDL, EPA's goal is to capture central tendencies in the multi-year simulations (e.g., long-term mean conditions) while also considering seasonal variation and critical conditions. In addition, conservative assumptions are needed to ensure that impacts are not underestimated and to account for uncertainties in the data.

Comment Category J. RBM10 – General

Comment J1

Commenter Columbia Riverkeeper

Comment

TMDL Section 3

Page 13, Section 3.0: the period 2011-2016 is a reasonable time frame, based on the information in the DEIS. However, an explanation is needed here as to why it is reasonable. Show the flow and air temperature percentiles for each year.

Response

EPA has determined the 2011-2016 timeframe captures interannual variation and additional details would not significantly influence that determination.

Comment J2

Commenter PNGC Power

Comment

Along these lines, we urge EPA to revisit and correct what we understand to be flaws in its temperature model and issue a revised Draft TMDL with notice and public comment.

Response

EPA has determined the RBM10 model is an appropriate and adequate tool for this TMDL. See responses to comments on the RBM10 model in Comment Categories I, J, K, and L.

Comment J3

Commenters Benton Rural Electric Association, Big Bend Electric Cooperative, Blachly-Lane Electric Cooperative, Clearwater Power, Eugenia Water and Electric Board, Fall River Electric Cooperative, Franklin PUD, Grays Harbor PUD, Inland Power and Light, Lewis County PUD, Mason County PUD 1, Okanogan County PUD, Pacific Northwest Waterways Association, PUD of Benton County, Raft River Electric Cooperative, Skamania County PUD

Comment

The CLSRT TMDL relies upon the one-dimensional RBM10 model, which lacks the detail and sophistication necessary to provide precise results for a river system with the complexity of the Columbia-Snake river system.

Response

See response to Comment I9.

Comment J4

Commenter Western Division of the American Fisheries Society

Comment

The DART monitoring sites at the dams (and therefore the RBM10 model estimates) provide unrepresentative measurements of total river conditions, including nearshore, dam forebays, and adult fish ladders that salmon must pass through. Water at these river locations is not well mixed and is often much warmer than ambient river temperatures in the summer (Caudill et al. 2013). If temperatures in the mixed and aerated waters near the monitoring sites below dams are not the same as those in surface and slowly flowing waters where many salmon and steelhead migrate, the model may significantly underestimate threats to the fish (Caudill et al. 2013; Keefer and Caudill 2016).

Response

EPA agrees that the tail race monitoring locations represent well-mixed, cross-sectional average river temperatures and river temperatures can vary at nearshore, dam forebays, and adult fish ladder locations. The RBM10 model is one-dimensional, and, by definition, provides a cross-sectional average temperature of the river at a given location. This level of spatial resolution in the model does not provide information about temperature conditions or impacts in specific locations around dams, such as forebays and fish ladders. Nevertheless, the TMDL target temperatures still apply at these locations (forebays and fish ladders) and should be used in site-specific assessment of current conditions and exceedances of target temperatures. EPA has added clarifying this point in the target temperature section of the TMDL.

Comment J5

Commenter Northwest River Partners

Comment

Northwest RiverPartners believes it is important to address warming river temperatures and also recognizes the complexity of modeling a river system like the Columbia-Snake system. That said, the RBM10 model used by EPA to produce its TMDL, while useful for certain purposes, represents an oversimplified view. It artificially truncates the Columbia and Snake rivers at the borders of Washington state. It also includes inconsistent assumptions and lacks the sophistication to holistically model the complexity of these rivers in a precise way.

Response

EPA has determinedRBM10 reasonably represents the complexity of this system and produces good quality estimates of river temperature across the study area. It is common practice to select geographic boundaries (and associated model boundaries) for TMDLs that align with programmatic goals, resource limitations, and jurisdictional borders. See also responses in Comment Category K below.

Comment Category K. Geographic Area of Analysis

Comment K1

Commenter Columbia Riverkeeper

Comment

The TMDL study area should include the Snake River from the Oregon/Idaho border to the Clearwater River.

Response

EPA is retaining the current geographic boundaries of the TMDL. It is common practice to select geographic boundaries (and associated model boundaries) for TMDLs that align with programmatic goals, resource limitations, and jurisdictional borders. From the outset of this project, the TMDL study area has been identified as the Columbia and Snake river mainstems within the jurisdiction of Washington and Oregon. The model does not currently extend to the Oregon/Idaho border, and extending the model would require significant time and resources.

Comment K2

Commenter Columbia Riverkeeper

Comment

TMDL Section 1

Page 2, Section 1.2: It's not clear why the TMDL begins at the confluence of the Clearwater River. The segment of the Snake River above the Clearwater River is also on the 303d list for Temperature (Listing ID: 14217). This reach should also be addressed in the TMDL.

Response

See response to Comment K1.

Comment K3

Commenter Columbia Riverkeeper

Comment

TMDL Section 1

Page 4, Table 1.1: the last two listings for the Snake River are upstream of the Clearwater River and below the Anatone gage. If these two segments are listed, they should be included in the TMDL. In addition, the RBM10 model begins at Anatone, so the Snake River from Anatone to the Clearwater River should have been included.

Response

See response to Comment K1.

Comment K4

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

Page 30, Section 4.2, second paragraph:

a. The Snake River above Anatone is shared by Idaho and Oregon, and both states should be mentioned.

b. EPA's evaluation should include whether the temperature TMDL for the Snake River upstream of Anatone is adequate to protect Washington's water quality standards.

Response

The TMDL geographic area does not include waters upstream of Anatone. The model boundary is located at Anatone because it is the location of a long-term monitoring site. There is currently no model available to assess Snake River conditions between the Hells Canyon TMDL location and the Anatone location, so an evaluation of the effect of the Hells Canyon TMDL on Washington waters is not possible at this time.

Comment K5

Commenter Columbia River Inter-Tribal Fish Commission

Comment

Furthermore, this TMDL does not include the Snake River between the states of Oregon and Idaho, which is highly impacted by Idaho Power Company's Hells Canyon Complex.

Response

See responses to Comment K1 and Comment K4.

Comment K6

Commenters Benton Rural Electric Association, Big Bend Electric Cooperative, Blachly-Lane Electric Cooperative, Clearwater Power, Eugene Water and Electric Board, Fall River Electric Cooperative, Franklin PUD, Grays Harbor PUD, Inland Power and Light, Lewis County PUD, Mason County PUD 1, Okanogan County PUD, PNGC Power, PUD of Benton County, Raft River Electric Cooperative, Skamania County PUD

Comment

This TMDL did not attempt to simulate the entire Columbia River Basin with its RBM10 model, but instead truncated the Columbia and Snake rivers near the Washington state borders. This arbitrary limitation does not allow the model to accurately account for all of the sources of river temperature warming throughout the basin, such as tributary sources and sources upstream of the boundary (i.e., Canada and Anatone, WA).

Response

See response to Comment K1. The model accurately accounts for conditions at the boundaries and sources within the study area.

Comment K7

Commenter Port of Clarkston

Comment

The TMDL needs an expanded footprint to create a manageable, practical standard that is fair, consistent and replicable elsewhere in the United States. EPA, by virtue of being a federal agency with national oversight, cannot simply adopt two interested states' limited footprint when conditions in five states and one foreign country are impacting measurements. Thus, the Port concludes the TMDL has a starting point that fails to achieve assignment to pollutant sources that is meaningful. EPA is required to take a broader, more comprehensive look at sources in order to set a fair and equitable standard. Accepting the boundaries defined by only Oregon and Washington-which are difficult even for those states to defend--is to foster political goals by creating artificial boundaries.

As discussed in the Introduction above, the Port is disappointed that over 900 miles and hundreds of tributaries feeding into waters at RM 139--the starting point on the Snake River for the TMDL are dismissed. We recommend the following full watershed depicted in the map below be fully included in the analysis and modeling in the TMDL. To leave out so much area of significant impact creates an unreliable model no matter how careful the analysis might have been in creating boundary assumptions.

Response

There is currently no water quality model of the entire Columbia Basin to supply information for a larger scale TMDL. Nevertheless, this TMDL reasonably assesses sources and their impact to river temperatures within the study area. See also response to Comment K1.

Comment K8

Commenter Northwest River Partners

Comment

The typical methodology for a TMDL for temperature would approach river temperature modeling on a basinwide scale. However, according to the CLSRT TMDL, the geographic scope of this TMDL begins at the mainstem of the Columbia River at the US-Canadian border (River Mile 745) and within the mainstem of the lower Snake River in Washington, from its confluence with the Clearwater River at the Idaho border (RM 139).

While RiverPartners' recognizes the inherent complexity of modeling a river system the size of the Columbia/Snake system, policymakers are left with a very incomplete view of the causes of river temperatures exceedances if confined to the CLSRT TMDL's artificial borders. This modeling truncation, again, unfairly places the burden of upstream river temperature mitigation on dams located within Washington state.

Response

The TMDL modeling analysis estimates current impacts of dams assuming current border temperatures and compares that impact to an allocated impact of 0.1°C. This is a reasonable approach given the geographic scope of the TMDL. See also response to Comment K1.

Comment K9

Commenter Northwest River Partners

Comment

The RBM10 model or any subsequent model should incorporate the entirety of the Columbia and Snake river basins, instead of artificially limiting the model boundaries to the borders of Washington and Oregon. The artificial limitation doesn't allow the model to accurately account (i.e., holistically solve) for all of the sources of river temperature warming throughout the basin, such as tributary sources and sources upstream of the boundary (i.e., Canada and Anatone, WA).

Response

See response to Comment K1.

Comment K10

Commenter Northwest River Partners

Comment

As we noted earlier, even if all of the dams on the mainstem Columbia and lower Snake rivers within Washington state were eliminated, the Washington and Oregon state water quality standards would frequently be exceeded.

Lastly, we believe that modeling the entire Columbia River Basin would help the CLSRT TMDL better address the issue of inconsistent water quality standards for the same purpose for the same body of water. As an example, upstream of the model's current boundaries, in both Canada and Idaho, the water quality standards for the Columbia and Snake Rivers are 2°C higher than downstream in Washington. In fact, Idaho Department of Environmental Quality (DEQ) has questioned the appropriateness of a 20°C numeric standard for the Snake River for protection of cold-water species, "due to reservations as to its attainability". Idaho DEQ writes:

DEQ and EPA do not agree on acceptable criteria for temperature for Idaho water bodies. At issue is a balance between temperature that is protective of cold water-dependent species yet attainable in most water bodies. Numerous studies and investigations have been conducted by DEQ and others to determine the impact of temperature on aquatic life in various water bodies. In April 2003, EPA Region 10 issued guidance to states and tribes in the Pacific Northwest on temperature criteria to protect endangered salmonids. Idaho participated in developing this guidance but in the end dissented on most of the recommended criteria due to reservations as to their attainability. These reservations persist to this day.

For the reasons noted above, it is important that the TMDL incorporate a basin-wide approach instead of artificially limiting the model boundaries to the borders of Washington and Oregon. The artificial limitation doesn't allow the model to accurately account (i.e., holistically solve) for all of the sources of river temperature warming throughout the basin, such as tributary sources and sources upstream of the boundary (i.e., Canada and Anatone, WA).

Response

See response to Comment K1.

Comment K11

Commenter Public Power Council

Comment

Limitations of TMDL Scope

EPA's documentation clearly describes the incomplete scope of the TMDL and the resulting limitations. For example, the TMDL is limited to the geography and water quality standards in Washington and Oregon, but the Columbia and Snake River basins extend deep into Idaho and Canada. Incoming water from these upstream locations frequently exceeds Oregon and Washington temperature standards, but the TMDL takes these upstream conditions as given. To this point, TMDL documentation acknowledges that, "Even if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places. Sources outside the allocation structure of this TMDL contribute to warmer temperatures."

These temperature sources outside the TMDL's geographic scope are material. During the summer and early fall, incoming water temperatures regularly exceed Washington water quality standards by two to three degrees Celsius. These exceedances are higher than any single source identified in the TMDL and are frequently greater than the impact of the entire FCRPS.

Not only is the physical temperature of incoming boundary waters higher than Washington's water quality standards, but the upstream water temperature standards are higher as well. Both Canada and Idaho have set water quality standards that are several degrees higher than those in Washington. This means that even if Canada and Idaho develop TMDLs for the Columbia and Snake Rivers, those waters would not necessarily be managed to reach Washington's standards. This jurisdictional disconnect creates an additional barrier to generating a practicable TMDL. Taking these boundary conditions as a "given" and assigning pollution allocations and mitigation responsibilities to a subset of the region is unreasonable and unequitable.

Response

EPA acknowledges that inflowing boundary temperatures exceed water quality standards at times, but the human impacts at these boundary locations are unknown, as there are no available temperature models upstream of the TMDL study area. This point has been stated more clearly in the TMDL. Although this TMDL cannot ensure that the applicable criteria will be met at all times and places, it restricts the identified point and non-point sources to the increases that can be allocated consistent with existing State of Washington and Oregon WQS.

Comment Category L. Model Limitations

Comment L1

Commenter Columbia Riverkeeper

Comment

The discussion of uncertainty should be expanded to be comprehensive and, when possible, quantitative. The analysis of uncertainty should also review the effect of simplifying assumptions and parameter selection on the scenarios, in particular the free-flowing river scenarios. The TMDL should analyze the effect of uncertainty in the TMDL on potential bias in the analysis and on implicit margins of safety.

Response

The technical reports for the modeling assessment include quantitative information on model error/uncertainty and model sensitivity analysis. Minimizing model bias is a core goal of model calibration, and the bias in the RBM10 model is near zero. The TMDL identifies implicit margins of safety in the analysis.

Comment L2

Commenter Columbia Riverkeeper

Comment

Two sources of uncertainty in particular need more evaluation: the use of meteorological data from locations far from the rivers, and the use of the evaporation coefficient.

a. Exploring the weather data by comparison to local sources of data would be one way to confirm the validity of that approach.

b. The sensitivity of the evaporation coefficient should be explored further, in particular with the free-flowing scenarios.

Response

Meteorological data location assignment and the evaporation coefficient are adjusted in model calibration. Comparison of local and regional weather data would not shed new light on overall model uncertainty. The sensitivity of river temperature to the evaporation coefficient is already clear from the sensitivity analysis conducted and documented in the Model Development Report (Appendix C of the TMDL). The uncertainty due to these factors is minimized by calibrating the model to observed temperatures, and the model accuracy in those comparisons is provided in Appendix C.

Comment L3

Commenter Columbia Riverkeeper

Comment

TMDL Section 4

This discussion of uncertainty should be expanded. In particular, the spatial and temporal uncertainties created by using a one-dimensional model with a daily average time step should be explored in detail.

RBM10 is particularly weak for Lake Roosevelt, which has stratification and long retention times. The uncertainties this introduces should be discussed.

The title of this section is “Accounting for Uncertainty”. However nowhere in the section is any accounting provided. Suggest: “Sources of Uncertainty”

Response

EPA has described the assumptions and uncertainties of the model, and the spatial and temporal uncertainty is captured in the extensive calibration results across time and space in the Model Development Report (Appendix

C of the TMDL). Daily average temperatures from the model are compared to measured daily average temperatures.

EPA disagrees that the model is particularly weak for Lake Roosevelt. The calibration error statistics and plots show similar agreement between measurements and model results at the Grand Coulee tailrace monitoring location as are seen at other locations across the study area.

Comment L4

Commenter Columbia Riverkeeper

Comment

Based on past reviews of temperature models, local wind conditions can be the biggest factor providing uncertainty in a model. CE-QUAL-W2 provides wind sheltering coefficients that are site specific. RBM10 calibrated by adjusting heat flux coefficients for each weather station by season, effectively adjusting wind and relative humidity data for each met station to improve the model's fit. (I infer that air vapor pressure is derived from weather station relative humidity, water surface vapor pressure from the temperature of the water.) This may be a major source of uncertainty. Local wind data where available should be compared to the data used for the model. A sensitivity run with local data substituted for NWS stations should be considered.

Response

EPA concurs that wind is an important factor. However, additional model runs, as described, would not lead to changes in the model, since the evaporation coefficient is a calibration parameter.

Comment L5

Commenter Bonneville Power Administration

Comment

Bonneville has significant concerns with the limitations of EPA's RBM-10 model used in the TMDL. The one-dimensional nature of EPA's RBM-10 model means that it cannot simulate dam operations which pass water downstream from a particular depth within the water column and is too simplistic to simulate other riverine effects.

Additionally, EPA's analysis allows for large data gaps between measured monitoring sites, leaving large portions of the river to model interpolation. The model segments representing impounded reaches are very large, in some cases over 20 miles. The impact of assuming constant width and depth for such large reaches does not appear to have been explored. An accurate representation of the river's surface area over a varying depth is important for ensuring the appropriate amount of solar heating occurs. Bonneville recommends that this discussion be added to the TMDL.

Response

The one-dimensional modeling approach does have limitations due to simplification of the system (as do all models), but the RBM10 model provides reasonably accurate estimates of cross-sectional average river temperature throughout the system, including upstream and downstream of dams.

Contrary to the comment, the model does not assume constant width and depth in any reach (see Appendix E of the model report). The geometry of the river is different for each model segment to match the actual geometry of the river. While the modeled river geometry is variable over space, it is assumed to be constant over time. This is because the run-of-river dams impound the river at a nearly constant elevation.

Comment L6

Commenter Bonneville Power Administration

Comment

The TMDL presents and relies on a different temperature metric than the standards for which the TMDL is designed to ensure attainment, for example 7-DADM versus monthly average for the TMDL.

The EPA RBM-10 model as applied in the TMDL uses daily average values for model inputs such as flow, temperature boundary conditions and meteorology and produces daily average outputs. The daily average model output is compared with the Washington and Oregon temperature standards which are based on daily maximum of 7-DADM temperatures. This is conservative since the daily maximum water temperature is typically 0.1-0.4 degrees warmer than the daily average water temperature (USEPA 2020, Appendix H), with the larger differences occurring during the summer months. Moreover, the TMDL only compares daily average model results when evaluating exceedances of the standard, even where the standard is based on the 7-DADM. Appendix H of the TMDL provides a justification for this—for the Columbia River, the daily maximum and 7-DADM temperatures are rarely different by more than 0.2 degrees, though occasionally the difference can be larger, up to 0.6 degrees. This was also evaluated for the Snake River.

While it is true that the daily maximum and 7-DADM temperatures are similar, there is no reason that the TMDL could not have considered both daily maximum and 7-DADM modeled temperatures to the appropriate standards. This would aid federal dam operators and others in TMDL implementation efforts with Oregon and Washington since those states will be relying on the 7-DADM. Moreover, the model is also unable to simulate any reduction in diurnal fluctuations that occur in impounded reaches. Since the TMDL focuses substantially on comparisons between "Dams" and "No Dams" scenarios, this is a significant limitation.

Additionally, the data presented in the TMDL make it difficult to compare results between tables due to lack of standardization of table metrics. For example, Table 3-2 has month average and month maximum observed temperatures, and Table 6-22 shows a single minimum and maximum value for the model run (for each month), presumably to show the range of model results. The lack of standardization between tables can lead to confusion and misinterpretation of the analysis.

Thus, Bonneville recommends that the TMDL be recalculated and the data tables be presented as the 7-DADM.

Response

EPA has determined the TMDL appropriately addresses the need to use varied temperature data metrics. EPA has used 7-DADM temperatures in the data assessment, including the evaluation of temperature target exceedances. For the source assessment, the RBM10 model is the only available model of this system that includes a free-flowing river configuration to assess dam impacts across both the Columbia and Snake river mainstems, and this model simulates daily average temperatures. Since hourly temperatures are necessary to compute 7-DADM and daily maximum values, it is not feasible to revise the TMDL source assessment tables to 7-DADM values. The difference in the metric of the model simulations (daily average) and criteria (daily maximum, 7-DADM) was evaluated and considered in the margin of safety for the TMDL.

Comment L7

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The TMDL should not discount the inevitability of acute heat loading events and should consider the necessity of ameliorating their impacts on salmonid populations when they occur.

Response

See response to Comment S1.

Comment L8

Commenter Public Utility District No. 1 of Douglas County

Comment

"The full simulation period is used for long term trend analysis, and the period 2011- 2016 is used to represent current conditions for the TMDL (page 29)."

Douglas PUD is concerned that the model doesn't accurately represent improved temperature conditions and improved temperature data collection at the Wells Project since 2013. Starting in 2013 Douglas PUD installed 10 new real-time thermistors throughout the Wells Project. These new devices collect highly accurate project wide water temperature data and the new date is also reflective of improvements made at the Wells Dam and Wells Hatchery intended to reduce the use of water and reduce the temperature of the water that is used. These installations and modifications were part of Douglas PUD's 401 Water Quality Certification implementation process and as part of the Wells HCP required replacement of the Wells Hatchery.

In particular, since the Wells Fish Hatchery was modernized, water temperatures in the hatchery outfall have improved dramatically and are now well below the water temperatures observed in the mainstem Columbia River adjacent to the hatchery. The large increase in ground water flow at the hatchery results in a net reduction in water temperatures immediately below Wells Dam. However, the data used by EPA, in the TMDL, labeled WELW, is not representative of current tailrace conditions. It is representative of an old, outdated spawning channel used to move water through the hatchery facility. Instead, Douglas PUD removed the old hatchery spawning channel as part of the modernization of this facility and replaced it with a new colder water conveyance structure. Since 2016, water flowing through the hatchery from July through October often provides a cold water refuge (CWR) for a number of salmonids. Wells Fish Hatchery outfall temperatures are now much colder than river temperatures during the time of year that the TMDL focuses on (July – October).

Again, Table 6-13 (page 54) lists the Wells Fish Hatchery as a minor facility. Douglas PUD would note that during the periods from July through October, approximately 35% of the water used in the hatchery is ground water with the balance being surface water. Ground water temperature in the Wells Fish Hatchery approximates 10-13°C and is coldest during the summer months. We would expect that Wells Fish Hatchery outfall temperatures are 7-10°C cooler than Columbia River temperatures from July to October and as such act as a CWR for salmonid species. Indeed, thousands of adult salmonids use the hatchery outfall each summer and fall as a refuge from mainstem Columbia River water temperatures.

Finally, water temperature observations in tailraces were used for all Projects, except Wells, where forebay measurements were used (WEL station) as tailwater measurements at Wells Project were infrequent. As the WEL measurements are at a depth of 10 feet, it is possible that they are slightly higher (0.5-0.8°C) during the warmer summer months due to a small seasonal stratification, increased in part by very warm flows from the Okanogan River. This could slightly overestimate the summer impact of the Wells Project based on observations and completely misses the added value of Wells Fish Hatchery providing cooler water to downstream environments.

Response

EPA appreciates the information provided on the local improvement actions in the Wells Dam vicinity related to Fish Hatchery operations. EPA supports all efforts to create and maintain cold water refuges.

Based on review of the error statistics in the Model Development Report (Appendix C), the possible bias at the WEL forebay station is not reflected as a significant bias in the model estimates for cross sectional average temperature at the dam location.

Comment L9

Commenter Public Power Council

Comment

Limitations of Modeling Approach

Because there is no way to measure river temperatures in a free-flowing Columbia or Lower Snake River, EPA is relying on a mathematical model to inform its TMDL documentation. Basing the TMDL on a model presents significant challenges, as allocations and mitigation responsibility can be significantly impacted by model assumptions and design. The RBM10 model used in this TMDL analysis is a simple, one-dimensional thermal model of the Columbia and Lower Snake rivers.

RBM10 does not include dam operations, account for changes in water temperature at different depths, or look at maximum daily temperatures. Its simplicity gives it a fast-run time and provides the ability to look at long time periods. However, this simplicity, especially when combined with gaps in data availability, means that the model cannot reflect real-world conditions with a high degree of accuracy or certainty.

As in other areas, EPA provides documentation acknowledging the limitations of the TMDL modeling and the uncertainty inherent in its analysis. EPA confirms a mean error of roughly one half a degree Celsius when comparing the RBM10 model's outputs to actual measured water temperatures. This error calculation is for the current conditions scenario and has been calibrated with measured data. It is likely that average error and uncertainty for the free-flowing river scenario is even greater, given that there is no current data from which to calibrate the model, and assumptions must be made about river flows and bathymetry.

Although there is uncertainty and error in its modeling outputs, EPA has not included any error or uncertainty in the calculated allocation exceedances. Instead, EPA has opted to be "conservative" with its assumptions to "ensure that impacts are not underestimated." This approach results in allocation exceedances which appear to be definite and clear but are in fact uncertain and may exaggerate and provide an incomplete view of dam impacts on river temperatures. As with other areas of the TMDL, this approach can also lead to unequitable and unreasonable mitigation responsibilities.

Other research into dam impacts on river temperatures has highlighted both similar takeaways as well as potential flaws in EPA's analysis. For example, a study of the Lower Snake River using the MASS1 model concurred with EPA's conclusion that dams impact seasonal river temperatures because they increase thermal mass and cause rivers to heat up and cool down more slowly. However, that same analysis found that dams decreased water temperature variability and did not necessarily increase overall warming. There is enough uncertainty about the impacts of dams on river temperatures that models and simulations must be used very carefully in forming policy decisions.

EPA should rework its TMDL documentation to bring forward uncertainty and modeling error into its results. The current format of the TMDL creates a false sense of certainty about dam impacts when there is in fact substantial modeling uncertainty to bring into question some of the TMDL's findings. Policymakers need to be aware of these limitations in the TMDL, especially when developing the Implementation Plan and considering mitigation responsibilities.

Response

EPA disagrees that the RBM10 model cannot simulate real-world conditions, as model capability is demonstrated in the calibration information in the model report. The model error in the free-flowing scenario may or may not be larger than the current conditions error (note the low error in RBM10 simulations of the free-flowing Clearwater River).

Regarding the comment that "EPA has not included any error or uncertainty in the calculated allocation exceedances", the allocation exceedances are based on the simple difference temperature conditions in two model runs (current conditions and free-flowing runs). This is the best estimate of the dam impact.

The RBM10 model development and application for this TMDL assesses a larger body of data, uses more recent data, and is more thoroughly documented than the MASS1 analysis from the early 2000s referenced in the comment. EPA has determined that this assessment provides the best available information on dam impacts in the Columbia and Lower Snake rivers.

Comment L10

Commenter U.S. Army Corps of Engineers

Comment

The EPA's use of water temperature metrics is inconsistent, and often times, confusing throughout the TMDL. The Corps suggests EPA use the daily or seven day average daily maximum water temperature metric throughout the TMDL, which is consistent with Oregon and Washington's water temperature criteria portion of the WQS.

Response

See response to Comment L6.

Comment L11

Commenter Western Division of the American Fisheries Society

Comment

No model was provided for estimating the natural, background temperature conditions of the Columbia and Lower Snake Rivers and waters flowing into them. This is a serious oversight given that current temperatures are driven by natural conditions as well as by anthropogenic climate change, land uses, and dams/reservoirs throughout the basin. The rationale for not including a natural condition provision (pg. 11) is not well substantiated. It seems useful to have a reasonable estimate of background (i.e., natural, reference conditions) for temperatures for use as a baseline and an effort should be made to develop one since one does not exist.

Response

EPA agrees that it would be informative to have a natural condition estimate at the two upstream boundaries to the TMDL. However, it is neither necessary nor feasible to conduct the significant technical work to develop estimates at this time. As noted in the TMDL, EPA has not attempted to estimate the natural conditions of the mainstems of the Columbia and lower Snake Rivers for two reasons. First, Oregon water quality standards do not currently include a natural condition provision. Consequently, for the lower Columbia River, where the border between Oregon and Washington divides the river, EPA developed the TMDL using the existing numeric criteria, relying on the more protective aspects of the two States' criteria to determine the total load from bank-to-bank. Secondly, there is no functional basin-wide water quality model for estimating the natural conditions of the Columbia and lower Snake Rivers. See Section 2.6 of the TMDL.

Comment L12

Commenter Western Division of the American Fisheries Society

Comment

There is a small amount of topographic shading that occurs in the mid-Columbia reaches that is not accounted for. In Rocky Reach alone, Dr. Scott Wells estimated using CE-QUAL-W2 modeling that topographic shading could result in a maximum temperature impact on the Columbia River of 0.06°C (S. Wells, Portland State University, personal communication). By ignoring this small but physical source of cooling by its use of RBM10 EPA, in effect, the TMDL reserves this as a further thermal load to be filled by heat inputs.

Response

EPA does not possess the modeling information to confirm the claim of a 0.06°C impact of topographic shade in the Rocky Reach area. Regardless, this difference is small in the context of model calibration error. In other words, the accepted calibration error is higher than this level and this difference is "in the noise". More importantly, the exclusion of topographic shade in the model has no effect on the TMDL source assessment results, and the TMDL does not "reserve" the topographic impact load. The model setup is identical for each scenario (no topographic shade), so the estimated impact of a particular source category on river temperatures is caused by comparing the presence and absence of the source evaluated in the model run.

Comment L13

Commenter Western Division of the American Fisheries Society

Comment

Why was a natural condition model not developed for this TMDL as has been done for others? Page 11 states that such a functional model does not exist, and therefore one was not used. However, one could have been developed in anticipation of this TMDL, especially given the level of impairment and the importance of these rivers to socially and economically important anadromous fisheries.

Response

The construction of a model for the entire basin would be a major undertaking, and this was not feasible for the EPA, based on available resources and project schedule. See also response to Comment L11.

Comment L14

Commenter Western Division of the American Fisheries Society

Comment

Why does the draft TMDL give very little consideration to impacts on the temporal or spatial distribution of water temperature and the probabilities of having multiple annual events in a series that could affect salmon populations? Probabilities of high air temperature and low river flows would lead to variations in level of biological impact, and variations in flows and temperatures should be explored as boundary conditions. For example, the ability of Dworshak Dam to counteract the warming that is produced in the lower Snake region seems to be taken as a constant. Alternate river operations to counteract drought and low Dworshak Reservoir levels so as to manage river temperatures should be described. Impacts tend to be smoothed out by use of monthly averages. The purpose of a TMDL is to limit heat loads so as to meet acute impacts, as well as average or chronic impacts. Management of loads to not produce acute impacts is as important as avoidance of chronic impacts. Greater frequency of acute temperatures as found in 2015 (Isaak et al. 2018) emphasizes that heat loading in the TMDL must also account for maximum temperatures.

Response

EPA has determined the TMDL data assessment of river conditions in 2011-2016, which includes the occurrence of acute events, is reasonable and appropriate for the purpose of developing a TMDL. The questions raised in this comment are best addressed in implementation. For the Dworshak Dam operations example, the Corps carefully manages cold water releases based on real-time weather data and forecasting to address acute warming events. The TMDL identifies current impacts and goals for temperature improvements. In addition, the exceedance assessment identifies whether actions such as Dworshak operations in the 2011-2016 timeframe met target temperatures. This information and the allocations in the TMDL provide the appropriate information for future management actions. See also response to Comment S1.

Comment L15

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA failed to use the most protective temperature measurement threshold for computation, determination, and development of the TMDL.

Throughout the TMDL, the EPA switches between multiple regulatory measures of temperature. These include Daily Average Temperature (DA), Maximum Daily Temperature (DM), and 7 Day Average Daily Maximum Temperature (7-DADM). In Appendix H, the EPA provides its purported justification for relying on the DM, rather than the 7-DADM. The EPA asserts that “it is clear that there is no mathematically clear answer to the question of which averaging period is more stringent – in all cases where EPA was faced with choosing between two equivalent WQC with different averaging periods, we utilized the DM averaging period.”

However, it is well known in regulatory fields that the DM can under predict exceedances, making the 7-DADM preferable for such analyses. As illustrated in the figure below, which was taken from Appendix H, the DM under-predicts number and duration of temperature exceedances (Delta T is negative) during the time periods of concern: July, August, September, and October.

Therefore, it would appear that the EPA is attempting to downplay temperature exceedances by employing the DM rather than the 7-DADM. This foundational deficiency has the potential to impact a significant portion of the analyses in the TMDL, as well as any subsequent regulatory action or control plans which rely on the TMDL. The Yakama Nation requests more clarification as to why the EPA chose to utilize the DM as opposed to the 7-DADM. Without adequate explanation, the Yakama Nation asserts that the EPA should use the 7-DADM when indicated by state and tribal regulations.

Response

EPA disagrees with the assertion that temperature exceedances are underestimated using the DM metric. EPA found an error in the plot in question in this comment (Appendix H; Figure 4). The erroneous plot does indicate a potential problem with the DM metric, but the corrected plot shows symmetry around the x-axis for this comparison, supporting EPA's assertion that the two metrics provide similar stringency when viewed in a time series plot. EPA has corrected Figure 4 in Appendix H.

EPA has revised the TMDL to use the highest DM temperature for a given month to make the exceedance determination (see response to Comment S1). This is the most conservative approach to estimating the scale of exceedance.

Comment L16

Commenter Northwest River Partners

Comment

According to section 4.1 of the CLSRT TMDL, the EPA utilized the following approach to modeling the Columbia and lower Snake rivers.

In order to support TMDL development, EPA used the RBM10 water quality model to replicate and predict the temperature fluctuations in the Columbia and lower Snake Rivers. RBM10 is a one-dimensional mathematical temperature model that simulates the thermal energy budget of the mainstem Columbia and lower Snake Rivers.

It is important to note that, while we recognize that the one-dimensional model allows for faster run-times, its comparatively simplistic nature lacks the ability to solve for complex problems that a multi-dimensional model could.

Of specific concern is the inability of EPA's RBM10 model to simulate diurnal temperature fluctuations which are important in determining the impact of the ten federal dams on exceedances of Washington and Oregon temperature criteria which are based on daily maximum and 7-day average of the daily maximum (7-DADM) water temperature values. Therefore, the TMDL cannot fully represent the influence of the dams on water temperatures.

This simplification may overstate the impact of the dams relative to a "No Dams" scenario resulting in a misrepresentation of the impacts the ten federal dams have on river temperatures. Additionally, the RBM10 model may not be able to represent actions (e.g. different dam operations) taken during TMDL implementation that may result in lower river temperatures.

Response

The RBM10 model simulates the Columbia and Snake river temperature regime reasonably and adequately for the TMDL. The model limitations described in the comment are described in the model documentation and

TMDL. Because the dam impacts on daily average temperatures are generally higher than dam impacts on daily maximum temperatures, the use of the daily average metric for analysis of dam impacts is an appropriate component of the required margin of safety. EPA agrees that during implementation, different types of model and assessment tools can and should be applied to support temperature reduction actions such as alternative dam operations.

Comment L17

Commenter Northwest River Partners

Comment

Due to the one-dimensional, linear nature of the RBM10 model, it cannot fully represent the spatial and temporal complexity of the Columbia and lower Snake river system. In large rivers such as the Columbia River, heat flow cannot be fully encompassed by average temperatures in a model reach, because the cross-sectional area does not have uniform heat distribution, but rather has vertical stratification with warmer waters closer to the surface and cooler waters deeper below the surface. Appendix C states such limitations of the model:

Limitations include the spatial and temporal resolution of the model. The one-dimensional representation provides cross-sectional average predictions and does not represent vertical stratification. The daily time step simulates daily average temperatures; daily maximum and minimums are not estimated.

Vertical stratification plays a critical role in many efforts to lessen any effects dams have on river temperatures, as dams discharge water from their cooler depths downstream rather than hotter water closer to the surface, and this choice is not reflected by the average temperature of the forebay as the model uses in its calculations, leading to an overestimation of the effects of dams on river temperatures.

Response

Regarding temporal resolution, see response to Comment L16. The model does not use forebay temperatures. Rather, the model simulates the cross-sectional average temperature at all locations. Because of the modest temperature stratification behind run-of-river dams, the tailrace temperatures are similar to the cross-sectional average temperature behind the dams. There is no support for the statement that the 1D vertical representation leads to overestimation of dam impacts.

Comment L18

Commenter Northwest River Partners

Comment

Statistical analyses of the RBM10 model reveals that the model consistently overestimates lower Snake River temperatures over the sample timeframe of 2007 – 2016, except for the July-August period where it slightly underestimates temperatures with a mean error of -0.008°C. During the critical September-October period, the model overestimates lower Snake River water temperatures with a mean error of 0.227°C. In addition, over the April-November timeframe, the model overestimates lower Snake River temperatures with a mean error of

0.206°C and over the entire year (January-December), the model overestimates lower Snake River temperatures with a mean error of 0.103°C. While lower Snake River temperatures do not significantly affect Columbia River temperatures based on the sensitivity analysis in Appendix C, this overestimation does reveal flaws in the RBM10 model and raises questions on whether it should be used to model this river system. It is of particular concern that this model overestimates lower Snake River temperatures because interest groups have already called for the breaching of the lower Snake River dams and overestimating the temperatures in the model could impair the ability of policymakers to make informed decisions on the lower Snake River dams.

Response

In model development, the goal is to achieve a low bias (mean error), ideally centered around zero (values above and below zero) indicating that the error is balanced around the measured temperature. For the key period of the TMDL (summer and early fall), as noted in the comment, the model error is reasonably close to, and brackets, zero (slightly below zero in July-August, slightly above zero in September-October). The comment focuses on the September-October timeframe and generalizes that the model overestimates temperatures, when it actually provides reasonably unbiased estimates across the entire TMDL time frame. In addition, the factors leading to the minor over-estimates of temperature in the months of September-October apply to both impounded and free-flowing scenarios, so they do not speak to any bias in the impact analysis.

Comment L19

Commenter Northwest River Partners

Comment

Due to the extreme complexity of the Columbia-Snake system and the relative simplicity of the RBM10 model, the CLSRT TMDL relies on many assumptions that oversimplify its geographical area of focus. As an example, the model segments representing impounded reaches are very large, in some cases over 20 miles, and assume uniform depth of the entire segment. While assumptions like these allow for the RBM10 model to maintain its efficiency as a linear model, there is an intrinsic risk of misrepresenting the system each time a simplifying assumption is applied. As a result, there is a substantial risk that inaccuracies based on oversimplifications in the model will accumulate over the full model domain, leading to significant errors in the output of the model.

Response

All water quality models simplify river systems. The RBM10 model strikes a reasonable balance in capturing all key system characteristics, and this is demonstrated in the accuracy in model calibration across time and space. Model error has been assessed and documented thoroughly in Appendix C. Error does not accumulate over the full model domain, as there is consistent accuracy across the study area.

The model segments are approximately 1 mile long and reaches of constant geometry are generally 1 to 10 miles long.

Comment Category M. Loading Capacity and 0.3 Allowance

Comment M1

Commenter Public Utility District No. 1 of Douglas County

Comment

Figure 6-1 (page 40) is inherently confusing. It may be helpful to change the y-axis scale. The biggest take away is that in July, at the Canadian/U.S. border, the Columbia River is 2.0°C above the WQS.

"As illustrated in Figure 6-1 through Figure 6-3, the water temperatures as the rivers cross the upstream boundaries of the TMDL study area (Canadian border and the Washington/Idaho border) exceed the Washington water quality criteria by a substantial margin from July through September. The current water quality conditions present a significant challenge to achieving downstream water quality standards in Washington and Oregon (page 42)."

Response

The commenter is correct in interpreting the July information for the Canadian border.

Comment M2

Commenter Idaho Department of Environmental Quality

Comment

In section 1.2 Total Maximum Daily Load Geographic Scope and Water Quality Impairments (page 2), it states "The geographic scope of this temperature TMDL includes State waters within the mainstem of the Columbia River from the Canadian border (River Mile [RM] 745) to the Pacific Ocean; and within the mainstem of the lower Snake River in Washington from its confluence with the Clearwater River at the Idaho border (RM 139) to its confluence with the Columbia River." However, in Section 3 (page 13), the TMDL document compares current temperature conditions at location in Idaho, such as the Snake River near Anatone and Clearwater River, that are well outside of the "geographical scope" of the Columbia River and Lower Snake River temperature TMDL. Additionally, Section 6.3 (page 39) presents estimates of load capacity and load reduction for a location outside of the geographical scope of the TMDL, the Snake River near Anatone. IDEQ understands it is common for TMDLs to develop allocations at the mouth of tributaries to TMDL segments and for the upstream geographical boundaries of TMDL endpoints, but it is rare to develop estimates of load capacity and required reductions at a location that is 29 miles upstream of RM 139, the upstream boundary of this TMDL. IDEQ supports using RM 139 as the upstream boundary for this TMDL. Consistent with that boundary, IDEQ requests EPA remove the estimate of load capacity and temperature reduction for the Snake River near Anatone and replace it with an estimate of load capacity and load reduction at the geographical end point on the Columbia River Temperature TMDL on the Snake River (i.e., the confluence of the Clearwater and Snake River along the Idaho border at RM 139).

Response

The best data for Snake River temperatures at the TMDL boundary (confluence of Snake and Clearwater Rivers) are collected at the long-term monitoring site at Anatone, WA. The use of this data should not be construed to imply that the TMDL extends above the Snake/Clearwater confluence. The geographic scope of the TMDL study area is discussed in Section 1.2 of the TMDL.

Comment M3

Commenter Oregon Department of Environmental Quality

Comment

Heat is an energy flux term. As such, DEQ uses the terms thermal load, excess thermal loads, etc., rather than heat loads, etc. DEQ suggests EPA provide an explanation, possibly in a footnote, on how terms are defined in thermodynamics vs. common usage terms used in this TMDL.

Response

There is no difference in meaning between the terms “heat load” and “thermal load”. Equations used for heat load calculations are included in the wasteload allocation section (Section 6.5.2) of the TMDL and in Appendix I (TMDL Heat Load Tables).

Comment M4

Commenter Public Utility District No. 1 of Chelan County

Comment

EPA should resolve confusion regarding Figures 6-1 through 6-4.

Although Figures 6-1 through 6-4 are intended to demonstrate the difference between the water temperature at various locations as compared to the water quality standard, as presented the figures are misleading. The figures create the implicit suggestion that the facility listed is the cause of the exceedance, and that the reduction needed reflects changes needed at each facility. But, based on the conclusions reached elsewhere in the Initial TMDL that run-of-the-river dams have minimal effect on river temperatures, this suggestion is not correct. Rather, the purpose of the tables is to illustrate the applicable temperature standard in various segments of the river, and how the measured temperature in various locations compares to that standard. The figures do not attribute the cause of the elevated temperature, nor are they meant to allocate responsibility for reductions to various facilities. To aid in clarifying the information provided in these figures, we suggest EPA use notes below these figures that explicitly recognize that the target sites are locations where long-term temperature measurements have occurred and do not directly attribute heating to the reservoirs. This will more clearly and accurately convey the information without creating confusion.

Response

EPA has determined the figures are an appropriate comparison of measured river temperatures and target temperatures at the monitoring locations. Section 6.0 of the TMDL includes a description of the monitoring system and target site locations. The impact of dams is a separate matter that is analyzed in detail in the allocations section (6.5 of the TMDL).

Comment Category N. 0.3 WQS Interpretation

Comment N1

Commenter Various NGOs

Comment

I. EPA's reliance on a 0.3 degree C "human-use" allowance is not supported by applicable state or tribal water quality standards or the underlying facts.

EPA set the temperature targets in the TMDL at 0.3 degrees C above the applicable numeric temperature criteria. To justify for this approach, EPA relied on a so-called "human use" allowance, summarized in the TMDL as follows:

"when the receiving waters are not attaining standards, the available increase in loading capacity for human-caused sources in the Columbia River is 0.3°C above the criterion. Washington WQS have an analogous 0.3°C allowance, resulting in an available increase in loading capacity for anthropogenic sources of 0.3°C above the criteria…"

As explained below, however, EPA's use of a 0.3 degree C human-use allowance to set temperature targets for this TMDL was inappropriate and unjustified.

a. WAC 173-201A-320(3)(a) is not an across-the-board 0.3 degree C increase in Washington's temperature criteria. Throughout the TMDL, EPA purports to rely on WAC 173-201A-320 to support EPA's position that Washington's water quality standards contain a 0.3 degree C human-use allowance. However, WAC 173-201A-320 is not related to human-use allowances or TMDL target setting in any way. This regulation—which EPA selectively cites for the proposition that a "measurable change" is a "[t]emperature increase of 0.3°C or greater"—applies only in the context of Tier II review. EPA's reliance on language in WAC 173-201A-320 to justify TMDL temperature targets above Washington's temperature criteria is, therefore, misguided and illegal. Moreover, clinging to an out-of-context phrase in Washington's Tier II review regulations strongly signals that EPA knows that (as explained below) Washington's actual human-use allowance does not apply under these circumstances.

EPA also cannot credibly assert that 0.3 degrees C is the smallest temperature increment that can be used when setting TMDL targets or load allocations. In fact, much of the TMDL's distribution of allowable human-caused temperature pollution—between point sources, tributaries, and dams—is premised on divvying up the 0.3 degree C human use allowance. It is arbitrary and capricious for EPA to simultaneously assert that 0.3 degrees C is the smallest measurable temperature increment while purporting to assign fractions of that increment to different categories of polluters.

b. Washington’s 0.3 degree C human-use allowance does not apply here.

For the following reasons, Washington’s human-use allowance is not applicable to the Columbia and Lower Snake rivers and EPA should not have used it to set temperature targets in the TMDL. Washington’s human-use allowance regulation reads, in its entirety:

“When a water body’s temperature is warmer than the criteria in Table 200(1)(c) (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).”

The circumstances on the Lower Snake and Columbia rivers in Washington do not justify EPA’s use of the 0.3 degree C increment. Accordingly, EPA’s use of this increment will result in TMDL load allocations that are not “established at a level necessary to implement the applicable water quality standards” as required by the Clean Water Act.

Response

This TMDL relies on water quality standards that vary based on jurisdiction (i.e., Washington, Oregon, and tribal waters) and geographic location across the basin. Sections 2.1 and 2.2 of the TMDL explain the availability of the 0.3 °C temperature increase in state WQS. In addition, EPA has reconciled the differences in applicable state and tribal standards to allow for a consistent and reasonable allocation approach. EPA disagrees that 0.3 °C is the smallest increment that can be used in setting TMDL targets or load allocations. Instead, 0.3 °C is identified in Oregon and Washington state standards as an allowable temperature increment or below the threshold for being a “measurable change”. This TMDL does not incorporate the State of Washington’s human use allowance.

The TMDL applies an allocation approach consistent with numerous temperature TMDLs by the States of Washington and Oregon, where an increase of 0.3°C is allowed for anthropogenic sources when temperatures are above water quality criteria. EPA interprets and implements these increases in both states’ standards as establishing a threshold for incremental allowable changes in water temperature. The 0.3°C threshold is a reasonable and well-established threshold for temperature allocations in TMDLs.

Comment N2

Commenter Various NGOs

Comment

EPA cannot rely on the 0.3 degree C human-use allowance because EPA has not determined why the Lower Snake and Columbia rivers are warmer than the temperature criteria. Washington’s human-use allowance only applies when a water exceeds a temperature criterion “due to natural conditions.” As explicitly stated in the TMDL, EPA did not examine or determine whether the temperature exceedances in the Lower Snake and Columbia rivers are due to natural conditions or human impacts. Without this critical piece of information, it was arbitrary and capricious for EPA employ Washington’s human-use allowance to set temperature targets in the TMDL.

Response

See response to Comment N1.

Comment N3

Commenter Washington Department of Ecology

Comment

We want EPA to explain in greater detail which water quality standards are relied upon to allow the 0.3°C allowance in Figures 6-2 through 6-4. How are the allowances in the bar graphs related or not related to the aggregate allocations in Table 6.3? It seems from these figures that each dam is provided an allowance based on the ‘measurable change’ condition referenced in WA Standards described in Section 2.1. If the 0.3°C allowance is already applied to account for error based on the measurable change language, from where is the 0.3°C aggregate allocation in Table 6.3 derived?

Response

See response to Comment N1. The bar charts provide a graphical representation of the 0.3°C in the context of the numeric criteria and measured temperatures.

From the 0.3°C allocated to sources of heat upstream of a given location, the specific allocation to dams is 0.1°C, cumulatively. This means that the allocation applies to the cumulative impact of all dams upstream of a given target site.

Comment N4

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA has not adequately justified its reliance on a 0.3°C allowance for temperature targets. The EPA utilized a 0.3°C allowance for temperature targets in the TMDL, relying in part on a provision in Washington’s water quality standards which provides that a “temperature increase of 0.3°C or greater” constitutes a “measurable change.” However, the cited provision applies to Washington’s Tier II reviews. These reviews are only conducted for the following actions:

(a) [NPDES] waste discharge permits;

(b) State waste discharge permits to surface waters;

(c) Federal Clean Water Act Section 401 water quality certifications; and

(d) Other water pollution control programs authorized, implemented, or administered by [the Dept. of Ecology].

An EPA-developed TMDL does not seem to fit into any category on the list. Therefore, it is unclear why the EPA cited this regulation to support a 0.3°C allowance. Indeed, the fresh water designated uses and criteria section of Washington’s water quality standards, which would seem applicable here, provides that:

[w]hen a water body's temperature is warmer than the criteria in Table 200 (1)(c) (or within [0.3°] of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the [7-DADM] temperature of that water body to increase more than [0.3°C].

The EPA has not concluded that the Columbia River's temperature impairment is due to "natural conditions." Presumably, this is the reason that the EPA did not cite the fresh water designated uses and criteria section for its 0.3°C allowance. However, since the cited "Tier II" provision cannot apply here, the EPA must clarify the basis for employing the 0.3° allowance in this TMDL.

Relatedly, the EPA provides no rationale for its decision to ignore applicable tribal water quality standards in the TMDL. These applicable standards may have more stringent criteria that would affect the 0.3°C allowance for temperature targets. The EPA is authorized to treat tribes as states for certain provisions of the Clean Water Act, including Section 303(c). Where a tribe promulgates Section 303(c) water quality standards that are approved by the EPA, then those tribal standards carry the same authority as approved state standards. Therefore, the EPA must consider applicable tribal standards in the TMDL.

Response

Regarding the 0.3°C allowance, see response to Comment N1.

Regarding tribal standards, EPA agrees and has revised the TMDL to use the Spokane tribal numeric temperature criteria applicable in September and October to develop TMDL targets. See the new language in the TMDL and response to Comment D5.

Comment Category O. 0.3 Allocation

Comment O1

Commenter Various NGOs

Comment

EPA did not determine whether the Lower Snake and Columbia rivers are warmer than the temperature criteria "due to natural conditions."

EPA cannot rely on the .3 degree C human-use allowance because EPA has not determined why the Lower Snake and Columbia rivers are warmer than the temperature criteria. Washington's human-use allowance only applies when a water exceeds a temperature criterion "due to natural conditions." As explicitly stated in the TMDL, EPA did not examine or determine whether the temperature exceedances in the Lower Snake and Columbia rivers are due to natural conditions or human impacts. Without this critical piece of information, it was arbitrary and capricious for EPA employ Washington's human-use allowance to set temperature targets in the TMDL.

Response

See response to Comment N1.

Comment O2

Commenter Various NGOs

Comment

Global warming has already consumed any available human-use allowance. Even if EPA could justify applying the human-use allowance to the Columbia and Lower Snake rivers, the 0.3 degree C human-use allowance would already be consumed by the effects of human-caused global warming. Global warming has caused temperatures in the Lower Snake and Columbia rivers to increase by 1 to 2 degrees C since the 1960s. EPA does not and cannot seriously dispute that the current, rapid trend in global warming is largely or entirely due to human actions, specifically atmospheric carbon pollution. Therefore, human actions that result in global warming have already caused the Lower Snake and Columbia rivers to increase by more than the theoretically allowable 0.3 degree C increment. EPA's attempt to allocate the 0.3 degree C increment between point sources, tributaries, and the dams is therefore arbitrary and capricious because any theoretically available temperature increment has already been consumed by human-caused climate change.

Response

See responses to Comment G7 and Comment EE1.

Comment O3

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL should not rely on Washington's Human Use Allowance for temperature targets. EPA implements a 0.3°C so-called human use allowance to set temperature targets in the TMDL based on Washington State's water quality standards. The provision is inapplicable to this TMDL and should not be used as the basis for allocating targets without proper justification. Part of this clarification would entail EPA to determine whether the waters of the Columbia and Snake rivers are exceeding temperature criterion due to "natural conditions".

Response

See response to Comment N1.

Comment O4

Commenter Public Utility District No. 1 of Douglas County

Comment

It is confusing that major tributaries get automatic allocation (0.1°C) of the 0.3°C available. Are tributaries not part of the background that would have been part of natural conditions? Should their inputs and warming and cooling effects on each specific section of mainstem river be quantified as background processes rather than temperature adders?

Response

Major tributaries to the Columbia and Lower Snake Rivers contribute a mixture of natural background heat loads as well as heat loads from upstream nonpoint and point source discharges. As stated in the TMDL, EPA has not assessed sources within the tributaries and has therefore not divided the 0.1°C allocation between anthropogenic and natural heat loading in the tributaries. Section 6.5.5 of the TMDL includes information on the restoration potential (i.e., reducing temperatures) in the tributaries to help provide context for the allocation assigned to the tributaries.

Comment O5

Commenter Public Utility District No. 1 of Douglas County

Comment

The allocation of 0.1°C individually for (1) point sources, (2) tributary inflows, and (3) non-point sources (dams) seems arbitrary. Having noted that point sources and tributaries each cause less than a 0.1°C increase compared to the base case, the allocation effectively (and seemingly arbitrarily) removes point sources and tributary inflows from actions needed to meet their allocations. This leaves only non-point sources (dams) to meet an allocation to comply with WQS.

Response

The method of allocation in any TMDL is a policy decision informed by science. Section 6.5 of the TMDL details the factors that EPA evaluated to assign the allocations (i.e., a heat budget) to point sources, tributaries, and dams. EPA disagrees that the TMDL assigns these allocations arbitrarily or that the TMDL removes the need for actions by point sources or tributaries to meet their allocations. This TMDL reasonably allocates the allowable 0.3°C increase above numeric criteria to each of the three source categories. Each source category is responsible for achieving the allocation of 0.1°C. The tributary allocation is an allowable change of 0.5°C above natural background at the mouth of the tributary, translating to a cumulative impact of 0.1°C in the mainstem Columbia and Snake rivers. More detailed assessment will be needed during TMDL implementation to determine whether the tributaries are achieving their allocation.

Comment O6

Commenter Oregon Department of Fish and Wildlife

Comment

Proposed water temperature allocations are described in Section 6.5 of the draft TMDL study materials. Proposed allocations appear to be somewhat arbitrarily allocated equally (0.1 °C) among three Source Groups: Dams (nonpoint source); NPDES regulated discharge locations (point source); and inflow from major tributaries. ODFW recommends the EPA more thoroughly explain the rationale between these allocations in the final TMDL document.

Response

Section 6.5 of the TMDL details the factors that EPA evaluated to assign the allocations (i.e., a heat budget) to point sources, major tributaries, and dams. EPA disagrees that the TMDL assigns these allocations arbitrarily.

Comment O7

Commenter Public Power Council

Comment

Human Use Allowances

PPC does not object to EPA's incorporation and treatment of the .3-degree Celsius Human Use Allowance. While EPA's decision to split the .3 degrees between dams, point source discharges, and tributaries is not specifically supported, it is not unreasonable given the minor impacts of point sources and tributaries to river temperatures. Including additional mitigation and monitoring requirements for these would be unduly burdensome and would not materially impact river conditions.

Response

EPA has determined the allocations assigned are supported in the TMDL and explained in Section 6.5. See response to Comment O6.

Comment O8

Commenter U.S. Army Corps of Engineers

Comment

Please consider distributing the human use allowance based on current distribution of thermal impact of source categories receiving an allocation rather than an even but arbitrary split.

Response

Section 6.5 of the TMDL details the factors EPA used to assign the allocations to point sources, major tributaries, and dams, which are based primarily on the current conditions, opportunities for restoration, and heat loads from these sources. EPA disagrees that the TMDL assigns these allocations arbitrarily.

Comment O9

Commenter Western Division of the American Fisheries Society

Comment

We are concerned about the interpretation of the 0.3°C aggregate load allocation being misinterpreted. Different people that reviewed the document had different interpretations of what this aggregate allocation meant. Some thought it was, for example, a per dam allowance, which could result in a cumulative 4.5°C allocation across all dams in the system, which is substantial and doesn't even include the other NPDES and tributary allocations (Table 6-3). The aggregate load allocation should be defined clearly in the front of the TMDL and be periodically repeated in the document as needed to minimize misunderstanding its meaning.

Response

EPA recognizes the complexity of the cumulative impact analysis and allocations. The language of the TMDL is clear in allocating to groups of sources (cumulatively). The allocations in the TMDL are designed to limit the cumulative heat load of all dams upstream of any location along the mainstem of the Columbia and Snake Rivers to 0.1°C.

Comment Category P. Temperature Targets

Comment P1

Commenter Columbia Riverkeeper

Comment

The TMDL should address all temperature criteria that apply to the Columbia and Snake River, including all Tribal standards, and criteria for all seasons.

Response

EPA has addressed all applicable criteria in the development of this TMDL. The TMDL currently incorporates applicable tribal standards. See also response to Comment D5.

Comment P2

Commenter Columbia Riverkeeper

Comment

The TMDL fails to make the case that the "target locations" represent the location of largest impacts. An analysis of temperatures in each model segment for a limited set of output might help confirm that regulating to the target locations are protective of the river.

Response

See response to Comment HH1.

Comment P3

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 35, Section 6.1.1, second paragraph: target sites were the tailraces of dams, and their well-mixed conditions match the model well.

a. Because they are well-mixed, they may not represent a location where the daily maximum temperature is highest. This is particularly true for Lake Roosevelt, which stratifies and may have much warmer temperatures in surface waters in the reservoir.

b. The vertical structure of temperature should be analyzed. Evaluate where there are higher temperatures at the surface of the reservoir and evaluate them for compliance with standards. Also, evaluate where there is cooler water in deeper waters.

c. The temperature patterns from upstream to downstream in every segment should be evaluated to determine the locations where the highest temperatures occur. Either this will confirm the tailrace as being an acceptable location to evaluate criteria, or the “hot spots” should be included as target locations.

d. In general, EPAs decision to choose “target sites” seems arbitrary and unrelated to compliance with the state’s standards. Three alternative locations were provided, with justification for each. If a thorough analysis of model results was conducted to determine critical locations, it should be described. Then either evidence should be provided to show these locations are protective, or an alternative approach developed.

Response

EPA agrees the tailraces do not represent stratified surface waters in reservoirs. The TMDL modeling and assessment focuses on identifying impacts at the tailrace locations, which are well-mixed and align with the modeling assumptions. EPA has added language noting that the target temperatures apply to all parts of the water column, including surface water impoundments.

EPA analyzed monitoring data across the study area, and the TMDL provides tables and plots showing the locations with maximum temperatures.

Regarding selection of target sites and analysis of critical conditions, see response to Comment HH1.

Comment P4

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 36, Table 6-1: Locations should be added for the Hanford Reach (upstream of Snake River); Camas/Washougal (RM 119); Anatone (just below the ID/OR state line); and the Interstate Bridge (Clarkston/Lewiston just upstream of the Clearwater River – Dept. of Ecology monitoring location).

Response

EPA has determined the target sites provide adequate coverage of this large base. Anatone and the Interstate bridge are not within the TMDL study area and were not incorporated into the TMDL analysis. The Hanford Reach is distinctive, as a free-flowing reach of the Columbia River, and this is addressed in the modeling of dam impacts.

Comment P5

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 38, Table 6-2: Locations should be added for the Hanford Reach (upstream of Snake River); Camas/Washougal (RM 119); and the Interstate Bridge (Clarkston/Lewiston just upstream of the Clearwater River – Dept. of Ecology monitoring location).

Response

See response to Comment P4.

Comment P6

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 40, Section 6.3, Figure 6-1: It's good to include Anatone on this figure. Also include the Hanford Reach (upstream of Snake River); Camas/Washougal (RM 119); and the Interstate Bridge (Clarkston/Lewiston just upstream of the Clearwater River – Dept. of Ecology monitoring location).

Response

See response to Comment P4. Also, the monitoring data at Pasco helps to represent the lower part of the Hanford Reach.

Comment P7

Commenter Various NGOs

Comment

The Clean Water Act requires EPA to establish TMDL load allocations at "level[s] necessary to implement the applicable water quality standards." At best, the load allocations in this TMDL would implement some state temperature standards, at some times and places, under some circumstances. Sometimes meeting temperature standards falls far short of EPA's mandate. For the times, places, and conditions identified below, the TMDL's load allocations are not sufficient to ensure compliance with the temperature standards.

The TMDL's focus on tailrace temperatures ignores persistent temperature problems in fishways and dam forebays.

By focusing exclusively on tailrace temperatures, the TMDL does not study or address the long-recognized problem of higher-than-average water temperature in fishways and dam forebays. Warmer water in fishways and forebays frequently violates numeric and narrative water quality standards and can create migration blockages, delays, and fall-back problems—all of which decrease adult salmon survival and reproductive success. Modifications at certain fishways in recent years have improved migration, but temperature-driven migration blockages at other dams persist. Under the Clean Water Act, a TMDL must be "established at a level necessary to implement the applicable water quality standards." Further, EPA has stated that "No TMDL will be approved if it will result in a violation of water quality standards." State water quality standards for temperature apply in the fishways and at dam forebays; to the extent that each dam creates site-specific temperature hot-spots in the fishways, forebay, or elsewhere, the TMDL should include those locations in its list of temperature targets. Failing to address this important aspect of the temperature problem in the Columbia and Lower Snake rivers is contrary to the language of the Clean Water Act and counterproductive to the goal of restoring adequate migratory habitat for salmon and steelhead.

Response

EPA does not agree that the load allocations in the TMDL would implement some state temperature standards, at some times and places, under some circumstances. See response to Comment A60.

Regarding target temperatures applying as well to fishways and forebays, EPA has made a change to the TMDL. See response to Comment J4.

Comment P8

Commenter Idaho Wildlife Federation

Comment

The TMDL does not ensure temperature criteria will be achieved throughout the entire focal area and throughout the year.

The TMDL notes that all target sites are at the tailraces of dams. EPA believes that because the rivers are relatively well-mixed at the tailraces, these data provide a better estimate of the cross-sectional average river temperature than the forebay. While measuring at the tailrace is likely a good estimate across the basin, the TMDL does not address temperature inadequacies in other areas such as forebays and in passage structures that may fail to meet WQS. Compared to well-mixed tailraces, water entering fish ladders are usually fed by surface water from the above reservoirs. Fish passage structures are times of high stress for migrating salmonid species-mortality may be increased with temperatures that are higher than the averages from the more mixed tailraces.

Response

See response to Comment J4.

Comment P9

Commenter Idaho Wildlife Federation

Comment

IWF believes the TMDL should analyze temperatures in forebays and fishways in addition to tailraces and assess temperatures over a longer timeframe to at least minimize violations of WQS in the current river system. EPA's conclusion that the impact of the dams on the daily average temperature is greater than the impact on the daily maximum temperature is troublesome when addressing the identified use of Salmon and Steelhead migration- Salmonids spend more time per day and for a greater number of days, on average, enduring harmful conditions with a dammed system when compared to a free-flowing river. This is especially true with Snake River Basin salmon and steelhead returning to Idaho. These conditions surely decrease overall salmon and steelhead abundance and reproductive success.

Response

Regarding forebays and fishways, see response to Comment J4.

Dams impact the daily average temperature more than the daily maximum temperature because they increase the thermal inertia of the river and dampen daily peak temperatures (see Appendix H for more information). However, this finding does not diminish the concern about dam impacts on salmonids.

Comment P10

Commenter Oregon Department of Environmental Quality

Comment

EPA used dam tailrace locations instead of forebay locations, with exception of Wells Dam, for evaluating current conditions and as target sites for modeling TMDL target temperatures. Use of well-mixed tailrace locations for these purposes is appropriate, considering references in the OARs to well-mixed sampling locations. However, the TMDL does not evaluate, and address as appropriate, forebay temperatures relative to current conditions in the tailrace and attainment of the biologically based numeric water quality criteria at target sites. Juvenile and adult salmonids spend a large portion of their migration in the forebay. As a result, it is important to understand changes in forebay temperatures and differences contrasted with tailrace temperatures.

According to Table 3-1 Data Access in Real Time (DART) data locations, on page 14, there are 140 river miles between the most downstream monitoring site, located at Warrendale, and the mouth of the Columbia. Aside from the 154-mile stretch between the Canadian border and the nearest downstream monitoring site, all other distances between DART locations are nearly half the 140-mile distance. Supplemental temperature data, from a monitoring location between Warrendale and the mouth of the Columbia, must be used to better inform current conditions and the modeling performed for the target site at RM 42 described on page 35. Monitoring data within this 140-mile distance must be used to validate EPA's reliance on modeling to estimate the cumulative impacts of upstream heat loads.

Response

The TMDL modeling and assessment focus on the cross-sectional average river temperature, and the monitoring locations that best align with this analysis are the well-mixed tailrace locations. EPA agrees that there are smaller, local areas of higher temperatures, such as dam forebays and fish ladders, that may affect aquatic life. EPA has added language in the target temperature section of the TMDL noting that target temperatures apply throughout the waterbodies. See response to Comment J4.

EPA supports augmenting the monitoring program in the lowest portion of the study area, but in the absence of data in this area, the TMDL must rely on model estimates of impact. A primary purpose for using models is to estimate conditions in areas that are not monitored. Based on the accuracy of the RBM10 model across the study area, EPA has reasonable confidence in model results in this lower reach despite the lack of monitoring data.

Comment P11

Commenter Pacific Fishery Management Council

Comment

The TMDL does not address the problem of higher-than-average water temperature in fishways. Water in fishways frequently violates numeric and narrative water quality standards and can create migration blockages, delays, and fallback problems, all of which can result in direct and indirect mortality and decreased reproductive success of salmon. The TMDL must assure that fishway temperatures comply with Clean Water Act (CWA) directives to ensure habitable migratory pathways for salmon.

Response

Regarding forebays and fishways, see response to Comment J4.

Comment P12

Commenter Port of Clarkston

Comment

Although there is a great deal more information available now (some of which I was able to review), my opinion about adhering to the 20° C water temperature TMDL is not practical for the LSR. Historically, that standard was routinely exceeded during the summer months in the free flowing LSR. Installation of the four reservoirs reduced the maximum temperature to some degree by creating four deep pools that were heated by solar and air sources at a lesser degree than the shallow river. This has been reduced further with the cold water releases from Dworshak Reservoir. Though unable to meet the 20° C standard consistently, more tolerable water temperatures have been achieved. This has not occurred without complications. Now, temperature differences between the Snake River and the Clearwater River waters have caused stratification in the reservoirs as warm water has flowed above the colder water. This caused thermal block problems at LGR and LGO fish ladder exits that have been corrected. Correction of similar problems at LMO and IHR are included in future plans (CRSO-EIS).

Response

While EPA recognizes the practical challenges involved, the Clean Water Act requires that TMDLs be developed for waters listed as impaired in order to achieve the applicable water quality standards. EPA also recognizes that Dworshak Reservoir cold water releases have substantial effects on the thermal regime of the Clearwater and Snake Rivers. Because the TMDL addresses large scale impacts, EPA has not analyzed concerns about temperature impacts in specific fish ladders, but EPA anticipates that the states will examine fish ladder issues as part of TMDL implementation.

Comment Category Q. Load Allocations

Comment Q1

Commenter Washington Department of Ecology

Comment

Water withdrawal at Grand Coulee Dam for the Banks Lake Project constitutes about 10% of the River. The TMDL estimates that this withdrawal for the Banks Lake Project has a 0.1°C impact in July and August (Appendix D, Section 3.9.2). This is a significant impact when compared to the 0.3°C total temperature allocation in the TMDL. We note that the Banks Lake Project impact is not explicitly referenced in the main part of the TMDL and appears to be an unaccounted source in the TMDL allocations.

Response

As noted in the comment, increases to in-stream temperatures from the Banks Lake water diversion and pump project were analyzed as part of the RBM10 modeling effort and presented in Appendix D (Model Scenario Report) of the TMDL. Section 6.2 of the TMDL clarifies that these impacts are considered as part of the "critical conditions" analysis of the TMDL because these represent low-flow summer conditions downstream of Grand Coulee Dam. For the purposes of this TMDL, EPA has determined that flow conditions are more appropriately considered in the context of critical conditions rather than the allocation structure. The TMDL also states that, in order to conservatively estimate critical summer conditions where seasonal low flows result in warmer temperatures, EPA assumed that historical levels of agricultural withdrawals (for the years 2011-2016) would continue.

Comment Q2

Commenter Public Utility District No. 1 of Chelan County

Comment

Tables 6-6 through 6-9 are difficult to interpret for the average reader. While EPA has provided "notes" in Table 6-5 to assist with the interpretations of the Tables 6-6 through 6-9, the terminology in the column headers is confusing and misleading. For example, "Measured Target Exceedances" that have been calculated from existing data at the tailraces of the dams (except for Canadian Border, Hanford Reach and Snake Confluence) not only represent the heating from non-point sources, but also cumulatively represent the effects of point sources and climate change and conditions above the TMDL boundaries. While these discussions are presented elsewhere, it would be helpful to explicitly note this in Table 6-5 so that the average reader correctly interprets that "Measured Exceedance" does not equate to "dam impact".

In addition, we suggest that EPA supplement the step-by-step discussion of the calculations with a flow chart or a decision tree that will enable a non-technical reader to easily understand what the load allocations in the tables actually mean.

Response

EPA acknowledges the complexity of this section of the TMDL and believes that review of the entire Section 6.5 of the TMDL will help lead to an understanding of the allocation information provided. EPA agrees that the "Measured Exceedance" is caused by all contributing sources, not the dams alone. The table includes a separate column for the cumulative dam impact.

Comment Category R. Load Allocations – General

Comment R1

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL should limit heat loads to meet acute impacts, not just average or chronic impacts. Management of loads to not produce acute impacts is as important as avoidance of chronic impacts. Greater frequency of acute temperatures as found in 2015 (Isaak et al. 2018) emphasizes that heat loading in the TMDL must explicitly account for maximum temperatures. EPA's goal was to capture central tendencies in the simulations and an evaluation of current conditions is based on years 2011-2016 similar to the CRSO Environmental Impact Statement analysis. While 2011-2016 includes a range of flow and temperature conditions, 2015 more closely represents acute warm temperature/low flow conditions. For example, the total number of days in July that exceeded the 17.5°C criteria at Grand Coulee in 2015 was 18 days. But the number of July days that exceeded the criteria for the averaged 2011-2016 period was only 5 days. The TMDL uses the averaged days of exceedances to set load allocations. In addition, the analysis of thermal impacts tends to be smoothed out using monthly averages.

The TMDL allocations should be developed for conditions when temperatures are most extreme and where interference with migration, metabolic stress, reproductive success, and increased incidence of disease are likely to cause increased mortality.

Response

EPA agrees and has changed the metric used to evaluate target temperature exceedances. See response to Comment L14**Error! Reference source not found.**

Comment Category S. Time Frame of Allocations

Comment S1

Commenter Various NGOs

Comment

The TMDL's focus on average monthly maximum temperatures in July through October is not sufficient to implement the applicable water quality standards.

The TMDL should address violations of the daily water quality criteria that can occur in late June in the lower Columbia and Lower Snake rivers. The states' 20 degree C water quality criteria apply in June, but the TMDL only "evaluates water quality exceedances from July – October." This results in a TMDL that does not provide load allocations in late June and, therefore, violates the Clean Water Act by failing to implement the water quality standards. This is no mere clerical error; late-June water temperatures above the criteria do occur and can have devastating effects on salmon and steelhead. For instance, in 2015, water temperatures reached "20°C (68°F) at the peak of the [sockeye] run, in late June." That late-June hot water event precipitated the death of roughly 250,000 adult sockeye in the Columbia and Lower Snake rivers. Accordingly, EPA's focus on average monthly maximum temperatures does not protect beneficial uses or ensure compliance with the standards at critical times.

When setting temperature load allocations for the dams, EPA should have used the worst-case conditions—not the observed monthly maximums averaged over a six-year period. EPA's guidance clearly states that:

"When developing a TMDL . . . An attempt is made to use a reasonable 'worst case' condition. For example, stream analysis often uses a low flow (e.g., 7-day low flow, once in 10-years commonly known as 7Q10 or biologically-based 4-day 3-year flows) high temperature design condition."

Indeed, when developing Waste Load Allocations for the point sources in this TMDL, EPA appears to have attempted something along these lines. When describing the loading capacity of the rivers more generally, however, EPA did not use a reasonable worst-case low flow/high temperature design condition, such as a 7Q10, as required by its own guidance. Instead, EPA appears to have used the average monthly maximum temperatures in the Columbia and Lower Snake during July, August, September, and October from 2011 to 2016. This does not comply with EPA's guidance or ensure that the TMDL's load allocations will be sufficient to meet the criteria and protect salmon and steelhead during periods of above-average water temperature.

Response

EPA has changed the TMDL in response to this and similar comments regarding the data analysis used to estimate exceedances of target temperatures. The water quality criteria in Washington do not define an acceptable frequency of exceedance; therefore, EPA agrees with the commenter that evaluation of the maximum daily maximum temperature over the assessment period (2011-2016) is more appropriate than the averaging-of-peaks approach used previously. Accordingly, EPA has revised the exceedance levels using the maximum temperatures for each month for the period 2011-2016. Because of the unusually warm temperatures in June 2015, this change results in the addition of June as a month of impairment that is addressed in the allocations analysis.

Comment S2

Commenter Upper Snake River Tribes (USRT) Foundation

Comment

In order to provide the most accurate data for establishing water quality criteria, it is crucial that EPA use data from a worst-case scenario instead of averaging data collected over a time period. In the TMDL, EPA took the average of temperature conditions from calendar years 2011 – 2016 covering the months of July –October. Although this data set revealed that on average, water temperatures exceeded the 7-day average daily maximum (7-DADM) by 1.8°C, and the annual maximum exceedance magnitude averaged 3.2°C. EPA should have used data representing a "worst-case scenario," such as the data from 2015, the hottest year on record for the Northwest dating back to 1895. Pursuant to EPA's publication Guidance for Water Quality-based Decisions: The TMDL Process, "When developing a TMDL, design conditions are those critical conditions that must be specified in order to determine attainment of water quality standards. In specifying conditions in the waterbody, an attempt is made to use a reasonable 'worst case' condition." Thus, although the average temperature data used by EPA does show that the river system is, indeed, too hot, data from 2015 follows the EPA's "worst-case" scenario TMDL guidance and would provide more efficient data for establishing water quality criteria for the Columbia and Lower Snake Rivers.

Response

See response to Comment S1.

Comment S3

Commenter Bonneville Power Administration

Comment

EPA misrepresented Oregon's 13°C criteria in the TMDL and does not reflect the use that is occurring during the specified temporal period.

The TMDL and several tables and graphics misrepresent Oregon's salmon and steelhead spawning through fry emergence 13°C 7-DADM site specific criteria that applies to below Bonneville Dam, River Mile 143.5-141.5. EPA inappropriately modeled and presented the entire October 31 day period in its tables and graphics instead of splitting October into two periods as stated in Table 2-1 "Summary of temperature criteria and aquatic life uses for the Columbia and lower Snake Rivers":

- October 1-14 when Oregon's and Washington's 20°C criteria
- October 15-31 when Oregon's 13°C 7-DADM applies and Washington's 20°C criteria

This misapplication of Oregon's October 13°C criteria puts additional burden on the ten federal dams because there are 14 days where the criteria is 20°C and those values were used to average over a 31 day period and compared to the 13°C criteria.

Thus, Bonneville requests that EPA redo the analysis and update the TMDL to reflect the temporal nature of Oregon's October criteria based on the actual period the criteria is in effect. Bonneville also requests EPA describe this temporal criteria change in all appropriate areas of the TMDL so that the resulting analysis breaks out the month of October into two discrete temporal periods, October 1-14 and October 15-31, for purposes of presenting data and developing allocations. These corrections should be made in the following tables, figures and associated text: Table 3-2 (pg16), Table 3-7 (pg. 21), Table 6-2 (pg. 38), Table 6-9 (pg. 50), Table 6-10 (pg. 51), Table 6-18 (pg. 62), Table 6-22 (pg. 70) and Figure 6-4 (pg. 42).

Response

EPA has changed the method of estimating target temperature exceedances in response to this and similar comments regarding the more stringent criterion in the month of October to support fall spawning. The exceedance is now estimated using data for the October 15-31 period, and this change results in lower levels of exceedance.

EPA has retained the full month of October in the Source Assessment and Allocation sections of the TMDL. While the data analysis for the exceedance estimate at a given river location is straightforward, the impact analysis does not have the same temporal precision. This is because cumulative upstream conditions and impacts at one time will affect downstream temperatures at a later time, due to the travel time of a parcel of water moving downstream. EPA has determined it is reasonable to maintain the month-by-month analysis for allocations given the inherent uncertainty in the timing of impacts across a large basin.

Also see response to Comment U24.

Comment S4

Commenter Washington Department of Ecology

Comment

Table 6-1 Why is June not included in this table?

Response

See response to Comment S1.

Comment S5

Commenter Idaho Wildlife Federation

Comment

EPA concludes that climate change has estimated increases in river temperatures since the 1960s range from 0.2C to 0.4C per decade, for a total water temperature increase to date of 1.5C+ 0.5C2. With this conclusion, IWF struggles to understand why the TMDL only addresses exceedances of WQS between July and October. There is evidence that temperature exceedance occurs outside of this time frame, such as the 250,000 sockeye killed by high temperatures beginning in June 2015. NOAA Fisheries concluded that though June and July 2015 river temperatures were unprecedented, it should be reasonable to expect that similar events could occur in the future.

Response

See response to Comment S1.

Comment S6

Commenter Public Power Council

Comment

EPA should correct calculations for allocations below BON for the October 15 to March 31 timeframe. River temperatures were calculated based on averaging the month of October, when the water quality criterion changes mid-month. Using the monthly average over-estimates river temperatures for days after October 15.

Response

See response to Comment S3.

Comment S7

Commenter Public Power Council

Comment

Specific Modeling Assumptions and Calculations

Among other issues, there are two specific modeling assumptions and calculations in the TMDL that PPC believes are unreasonable or incorrect and should be changed. The first is the inclusion of cool water discharges from Dworshak in the free-flowing river scenario. The second is the calculation for river temperatures at Bonneville dam for October. These are discussed in greater detail below.

Temperature Calculations at Bonneville

EPA has set load allocations below BON in October based on Oregon's water quality criteria intended to protect spawning salmon. Oregon's standard changes from twenty degrees Celsius to thirteen degrees Celsius on October 15th. Although the more stringent standard only applies to half of the month, starting on October 15th, EPA has averaged the entire month of October in its calculations.

This treatment results in artificially raised temperatures for the more stringent compliance period because air and water temperatures in early October tend to be warmer than those in late October. EPA should rework the calculation for this segment of the river to include only the October 15th to March 31st period when the more stringent standard applies. This will correct a misapplication of the standard and lead to a more reasonable allocation.

Oregon should also monitor and consider modifying this specific water quality criterion. The more stringent thirteen-degree standard is intended to protect salmonid spawning, but fish passage data shows that these fish do not arrive until November 1. Maintaining the more stringent standard when there is no need is unreasonable and unwarranted.

Response

EPA has made a change to the TMDL data assessment for the October time frame to line up with the standards change on October 15th. See response to Comment S3.

Regarding the time frame for the criterion, TMDLs must incorporate the applicable state and tribal water quality standards and the time frame of the standards is typically set by states and tribes (i.e., while this TMDL is established by EPA, EPA did not set the standards).

Comment S8

Commenter U.S. Army Corps of Engineers

Comment

The “allocation exceedance” and “reduction needed” for Bonneville Dam (Table 6-9 and Figure 6-4, respectively) are incorrectly calculated. The 13°C WQS water temperature criterion applies to the second half of the month of October, rather than the entire month. This calculation should be corrected for all tables and figures in the TMDL.

Response

EPA has made a change to the TMDL assessment for the October time frame. See response to Comment S3.

Comment S9

Commenter Public Power Council

Comment

EPA has set load allocations below BON in October based on Oregon’s water quality criteria intended to protect spawning salmon. Oregon’s standard changes from twenty degrees Celsius to thirteen degrees Celsius on October 15th. Although the more stringent standard only applies to half of the month, starting on October 15th, EPA has averaged the entire month of October in its calculations.

This treatment results in artificially raised temperatures for the more stringent compliance period because air and water temperatures in early October tend to be warmer than those in late October. EPA should rework the calculation for this segment of the river to include only the October 15th to March 31st period when the more stringent standard applies. This will correct a misapplication of the standard and lead to a more reasonable allocation.

Oregon should also monitor and consider modifying this specific water quality criterion. The more stringent thirteen-degree standard is intended to protect salmonid spawning, but fish passage data shows that these fish do not arrive until November 1. Maintaining the more stringent standard when there is no need is unreasonable and unwarranted.

Response

See response to Comment S3.

Comment Category T. Idaho and Canada Boundary Condition Assumptions

Comment T1

Commenter Columbia Riverkeeper

Comment

The Oregon/Idaho temperature TMDL for the Snake River upstream of Washington should be described and its potential impacts on the river downstream should be discussed. In particular, the ability of that TMDL to meet Washington Standards should be evaluated, and possible implementation strategies explored that would lower temperatures in Washington. The scenarios that evaluated upstream boundaries show the importance of this issue to downstream water temperatures.

Response

See response to Comment K4.

Comment T2

Commenter Columbia Riverkeeper

Comment

TMDL Section 2

Page 10, Section 2.3: A TMDL was established for the Snake River upstream of Washington (Idaho and Oregon). The implications of this TMDL on downstream waters should be described and discussed.

Response

See response to Comment K4.

Comment T3

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 42, Section 6.4: "…this TMDL is established using the existing temperature data at both borders because there is inadequate information (e.g., data, water quality models) to evaluate potential future actions that may be taken near these locations and therefore inadequate information to estimate any resulting temperature changes that may occur in the future." This is not exactly true – there is a temperature TMDL for the Snake River upstream of the Washington border. This TMDL should be evaluated both for the long-term effect on downstream temperatures if fully implemented, and on its adequacy to protect Washington's Water Quality Standards.

Response

See response to Comment K4.

Comment T4

Commenter The American Waterways Operators

Comment

AWO encourages EPA to carefully consider Northwest River Partners comments suggesting that EPA must consider temperatures from non-impounded rivers and water flowing from Canada to establish an accurate TMDL model.

Response

The TMDL accounts for current temperatures entering the study area from Canada. The model accurately reflects those temperatures. The temperatures of an un-impounded Columbia River in Canada have not been assessed, because there is no model available for that reach of the Columbia River upstream of the TMDL study area.

Comment T5

Commenter Bonneville Power Administration

Comment

As the principal funding entity for the ten federal dams identified in the TMDL, Bonneville respectfully submits the following comments:

EPA's TMDL unreasonably and inappropriately assigns responsibility for temperature impacts upstream of the boundary condition set in the TMDL from Canada and Idaho to the ten federal dams operating on the Columbia and Snake rivers.

Bonneville has significant concern with EPA's TMDL methodology, which disregards the holistic, basin-wide nature of the temperature impacts in the Columbia and Snake rivers. EPA essentially assigns the entire burden of attaining the temperature allocations to the ten Columbia and Snake River federal dams and ignores the upstream temperature sources outside the TMDL boundary. These ignored sources include the Columbia River upstream of the Canadian border, the Snake River upstream of Anatone, and all tributaries draining into the mainstem Columbia and Snake Rivers. This inaccuracy is compounded by the fact that upstream of the boundary, in both Canada and Idaho, the water quality standards for the Columbia and Snake Rivers are 2°C higher than downstream in Washington.

As EPA knows, the temperature standards in Washington and Oregon for the Columbia and Snake rivers are more stringent than upstream river temperature standards in Canada and Idaho. In fact, Idaho Department of Environmental Quality (DEQ) has questioned the appropriateness of a 20°C numeric standard for the Snake River for protection of cold-water species "due to reservations as to its attainability":

"DEQ and EPA do not agree on acceptable criteria for temperature for Idaho water bodies. At issue is a balance between temperature that is protective of cold water-dependent species yet attainable in most water bodies. Numerous studies and investigations have been conducted by DEQ and others to determine the impact of temperature on aquatic life in various water bodies. In April 2003, EPA Region 10 issued guidance to states and tribes in the Pacific Northwest on temperature criteria to protect endangered salmonids. Idaho participated in developing this guidance but in the end dissented on most of the recommended criteria due to reservations as to their attainability. These reservations persist to this day."

Without upstream temperature reductions or alignment of state temperature standards, efforts to reduce temperature under this TMDL will be not achieve their intent. EPA's TMDL approach to boundary conditions is flawed because it fails to account equitably and holistically for heat added from all sources basin-wide.

Response

The TMDL does not assign responsibility to dams for upstream boundary conditions. See response to Comment T23. Tributary impacts on temperature in the mainstem are addressed by the tributary allocations. EPA disagrees that the approach to boundary conditions is flawed. On the contrary, this approach focuses the TMDL on sources within the study area. Additional future actions, including assessment of the impact of upstream sources on the boundary temperatures, can be undertaken to align upstream actions and actions addressed by this TMDL.

Comment T6

Commenter Bonneville Power Administration

Comment

Bonneville recognizes the need for the efficiencies on EPA's part to develop this TMDL, however, an undertaking of this importance demands thorough examination of all aspects of the temperature sources in the Columbia River basin holistically. For example, EPA's Columbia and Snake rivers temperature TMDL technical analysis should be linked to and be incorporated into the upcoming temperature TMDL on the mainstem Snake River which is due for completion in December of 2026. Linking these two TMDLs and having temperature standard continuity between states and boundaries will provide a more holistic approach for TMDL implementation and allow for a broad understanding of how upstream sources impact this Snake River and Columbia River temperature TMDL. Figure 20 in Appendix B of the TMDL shows that Snake River temperatures upstream of Anatone are above both Washington's 20°C and Idaho's 22°C standards. Bonneville requests that the TMDL include a discussion about the frequency and magnitude of these temperature standard exceedances above the TMDL boundary and discuss how this TMDL relates to the upcoming Snake River Hells Canyon TMDL.

Response

The TMDL provides the relevant information about temperatures at the Anatone locations. EPA will be involved in the Snake River/Hells Canyon Temperature TMDL, scheduled to be completed in 2026. Also, see response to Comment K4.

Comment T7

Commenter Bonneville Power Administration

Comment

Lastly, in TMDL Section 6.7, EPA discusses numerous sources of warming that contribute to excess temperature in this TMDL. However, EPA does not mention that temperature standards upstream of the boundary are warmer than within the TMDL study area. Bonneville recommends EPA add a third bullet stating that the temperature criteria upstream of the boundaries in Idaho and Canada both have cold water numeric standards that are 2°C higher than Washington's downstream temperature standard.

Response

Sections 2.5 and 2.6 of the TMDL include information on the applicable standards, including upstream waters. Section 6.7 of the TMDL is focused on the current measured conditions at the borders.

Comment T8

Commenter Bureau of Reclamation

Comment

As a general matter, complex relationships and data gaps confounded the large scale of the TMDL analysis. In the former category, the TMDL portrays the delay in water transit of incoming excessively warm water from Canada as part of the thermal load attributable to warming that occurs in Lake Roosevelt. As a result, the TMDL overstates the extent to which activities subject to the TMDL, as opposed to other sources, affect temperature. This limits its usefulness in implementation efforts aimed at attainment and overestimates the load allocation attributable to Grand Coulee in the TMDL.

Response

See response to Comment U13.

Comment T9

Commenter Bureau of Reclamation

Comment

Incoming warm water from Canada prevents attainment of water quality standards.

The TMDL recognizes that daily average water temperatures in the Columbia River at the border with Canada exceed the 16° Celsius (°C) water temperature criterion in July, August, and September. Although the TMDL acknowledges that these boundary conditions may affect how often it is possible to meet water quality standards, it does not discuss the impact of incoming water from the Canadian border specifically. Instead, the attainability analysis presents conditions at the last dams on the Columbia and Snake Rivers: Bonneville and Ice Harbor. This understates the fact that warm incoming water from Canada precludes attainment of water quality standards at the border and affects attainment downstream. The impacts these inflowing waters have on meeting water quality standards after being delayed in Lake Roosevelt are not accounted for; for example, water temperatures that exceed criteria in August at the border may not pass through the reservoir until September or October when downstream criteria is exceeded. Reclamation recognizes that this limitation in EPA's methodology may require further refinement of the precise load allocation attributable to Grand Coulee operations to inform future attainability or TMDL discussions.

Response

The TMDL identifies boundary temperatures as a major issue in achieving standards. However, EPA's technical analysis appropriately isolates the Grand Coulee impact and estimates its individual impact. Also see response to Comment U13.

Comment T10

Commenter Chelan, Douglas and Grant PUDs

Comment

The TMDL compares current conditions to a "free-flowing" scenario. We believe that the title "free-flowing" is inaccurate, leading to confusion and misunderstanding, and mischaracterizes conditions in the Columbia River. Critical to the understanding of this TMDL is that the "free flowing" scenario, used as the baseline, still includes the large storage darns on the Columbia River in Canada. The water temperatures entering the United States are vastly impacted and shaped by these storage projects and they have a material effect on water temperature.

From the TMDL:

"Sources outside the allocation structure of this TMDL contribute to warmer temperatures. These sources include increased air temperatures throughout the study area and upstream human activities in Idaho and Canada, resulting in Columbia and Snake River water temperatures that already exceed the numeric criteria portion of the WQS when those rivers enter the geographic area covered by this TMDL.

Indeed, by EPA's own accounting, in August water entering Washington from Canada exceeds the State's water quality standards 99% of the time. And because the EPA's analysis does not address or require any load reduction above the TMDL boundary, the TMDL puts downstream dams in an impossible compliance environment:

"Even if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met … "

As indicated above, the TMDL does not provide any indication on how states should implement these allocations given the infeasibility of compliance within the TMDL boundaries and given the limited jurisdiction of the states to implement the load allocations.

Response

The TMDL load allocations for dams are based on their impact and are not based on achieving a fixed temperature. Achieving the load allocations for dams is not tied to the upstream water temperatures. See also responses to Comment T23 and Comment U7.

Comment T11

Commenter Clearwater Paper Corporation

Comment

Finally, when EPA last issued Clearwater's NPDES Permit in 2005 (and again in a draft NPDES Permit in 2019) a thorough temperature assessment was undertaken by EPA (and certified by IDEQ in a water quality certification) that Clearwater's permitted temperature discharge complied with both Idaho's and Washington's temperature water quality standards. Part of the analysis applied the natural background temperature provisions in both Idaho and Washington's standards. The subject TMDL determined that it would not utilize the natural background temperature provision in Washington's standards because there was no basin-wide water quality model that estimated natural conditions. Clearwater requests that the subject TMDL acknowledge that use of natural background temperature conditions in individual point source permitting decisions upstream of the boundary of the TMDL are not precluded by the TMDL.

Response

The Clearwater Paper Corporation's NPDES permitted discharge lies outside the study area of this TMDL, though its heat load was accounted for in the WLA analysis. This ensures that the facility's current maximum heat load is part of the TMDL assumptions for point source impacts. The TMDL does not assign a WLA for this facility and determined that the discharge did not cause or contribute to downstream temperature impairments in the TMDL study area. The future NPDES permit conditions for this facility should be consistent with these assumptions, but also apply other Idaho and Washington temperature standards and mixing zone requirements at the point of discharge. This TMDL does not preclude future assessment approaches and decisions by the IDEQ NPDES permitting program. EPA has added clarifying language to the TMDL for this facility.

Comment T12

Commenter Public Utility District No. 1 of Douglas County

Comment

"Sources outside the allocation structure of this TMDL contribute to warmer temperatures. These sources include increased air temperatures throughout the study area and upstream human activities in Idaho and Canada, resulting in Columbia and Snake River water temperatures that already exceed the numeric criteria portion of the WQS when those rivers enter the geographic area covered by this TMDL (page 2)." and "Between 2011 and 2016, Columbia River water entering the United States at the Canadian Border (RM 745) frequently exceeded Washington's applicable 7-DADM criterion of 16°C in July, August, and September. On average, water temperatures exceeded the 7-DADM by 1.8°C, and the annual maximum exceedance magnitude averaged 3.2°C (page 15)."

The study does not model or attempt to assign a load allocation to the largest sources of thermal input into the system, the headwater storage projects located upstream from the run-of-river dams and outside the study area. Again, Douglas PUD agrees with the findings of the study but we are concerned that by omitting these upstream heat sources, the TMDL ignores the largest sources of thermal input. This leaves the run-of-river hydro operators with no clear path to compliance. An expanded study area is needed to fully understand and properly identify ways to reach compliance with the WQS.

Response

While recognizing that upstream boundary temperatures exceed criteria within the study area, EPA is not aware of any modeling analysis of Columbia and Snake river temperatures under free-flowing conditions upstream of the study area, so EPA cannot confirm that the upstream dam impacts are significant. Also, see response to Comment T10.

Comment T13

Commenter Washington Department of Ecology

Comment

Multiple times in this TMDL, EPA identifies Idaho's upstream influence on temperatures in the Snake River (6.4 Boundary Conditions). We would like more clarity on how EPA will use their role in Idaho's regulatory program to work with Idaho to address downstream standards in Washington. In particular, we request clarity and answers to the below questions:

What is EPA doing to make sure Idaho's regulatory programs, such as TMDLs or NPDES permits, are designed to meet downstream water quality standards?

Response

As a federal oversight agency, EPA has certain responsibilities regarding water quality impacts that cross state and tribal boundaries. This TMDL was developed in response to the need to reduce water temperatures in the Columbia and Snake rivers, addressing the water quality standards of the States of Washington and Oregon, the

Spokane Tribe of Indians, and the Confederated Tribes of the Colville Reservation. The TMDL analysis includes nearby Idaho NPDES sources, on the Snake and Clearwater rivers, in the WLA assessment, to ensure consistency across the Idaho/Washington border. EPA will continue reviewing actions taken in Idaho waters upstream of this TMDL to help coordinate and resolve water quality issues, where needed. EPA encourages the State of Washington to identify specific concerns about upstream pollution sources affecting Washington waters so that all involved stakeholders can continue to work together to resolve the concerns.

Comment T14

Commenter Washington Department of Ecology

Comment

It is our understanding that the Grand Coulee generally acts as a reset on temperature conditions, in regards to Canada's temperature impacts on the Columbia below Grand Coulee. This would mean that Canada's temperature impacts are largely confined from the Canadian border to Lake Roosevelt.

If our understanding is correct, we ask that EPA make this more explicit in the TMDL to demonstrate that Canadian temperature impacts do not have a significant effect below the Grand Coulee dam. If we are misunderstanding this element of the TMDL, we ask that EPA discuss in the TMDL the actions the federal government can take to address temperature impacts from sources outside of our border.

Response

EPA's evaluation indicates that impacts from Grand Coulee Dam tend to reset the temperature between the Canadian border and the Grand Coulee target site below the dam. In the Model Scenario Report (Appendix D of the TMDL), model results indicate that the benefits of hypothetical cooler temperatures at the Canadian border are short-lived and have largely dissipated when the Columbia River flows past Grand Coulee tailrace. The tailrace temperatures are similar to current conditions.

Comment T15

Commenter Washington Department of Ecology

Comment

Can EPA explain the influence of the Dworkshak dam on this TMDL in more detail? The TMDL does not clearly communicate the assumptions EPA used for the Dworshak dam influence on downstream temperature. We would appreciate the TMDL providing clear background information on how the Dworkshak dam operates and the important role that dam operation plays in addressing temperature impacts. Can EPA ensure that the Dworshak will stay operating at current conditions?

Response

The importance of Dworshak Dam operations is described in Sections 3.0 and 4.0 of the TMDL, and modeling assumptions for Dworshak Dam as part of the dam impact analysis are described in the Model Scenario Report (Appendix D). See also responses to Comment U7 and Comment U68.

Comment T16

Commenter Idaho Department of Environmental Quality

Comment

Section 3.4 of Appendix D (page 34) discusses the cooling effect of discharges from Dworshak Dam. These discharges are described as "a significant cooling effect to the lower Snake River." However, Section 1.1 of the TMDL document (page 2) states "[s]ources outside the allocation structure of this TMDL contribute to warmer temperatures" and "water temperatures that already exceed the numeric criteria portion of the WQS when those rivers enter the geographic area covered by this TMDL." It is inconsistent to acknowledge that waters from the State of Idaho have a cooling effect that contributes to attainment of temperature standards downstream of the Snake-Clearwater confluence, while suggesting that Idaho waters may also lead to non-attainment of the TMDL. IDEQ requests that EPA amend the TMDL to show the net temperature effect of the Clearwater River and the Snake River at the upstream geographic boundary of the TMDL (i.e., the confluence of the Clearwater and Snake Rivers along the Idaho border at RM 139).

Response

Human activities upstream of the TMDL study area may warm and/or cool downstream waters. EPA has estimates of Dworshak Dam cooling impacts, but other point and nonpoint sources upstream of the TMDL study area (that may contribute to warming) have not been estimated, because there is no model currently available for the Snake and Clearwater river reaches upstream of the TMDL study area. EPA has included extensive information about the impact of Dworshak Dam operations on cooling the temperatures in the Snake River within the TMDL study area in the Model Scenario Report (Appendix D) of the TMDL.

Comment T17

Commenter Oregon Department of Environmental Quality

Comment

Section 1.1 Total Maximum Daily Loads and Clean Water Act

On page 2, the TMDL states:

Even if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places. Sources outside the allocation structure of this TMDL contribute to warmer temperatures. These sources include increased air temperatures throughout the study area and upstream human activities in Idaho and Canada, resulting in Columbia and Snake River water temperatures that already exceed the numeric criteria portion of the WQS when those rivers enter the geographic area covered by this TMDL. Although the TMDL cannot ensure that the applicable criteria will be met at all times and places, this TMDL restricts the identified point and nonpoint sources to the increases that can be allocated under Washington and Oregon WQS (0.3°C above WQC), as discussed below, consistent with those existing WQS.

The TMDL does not document or explain what information EPA is relying on or evaluating to conclude that activities in Idaho and Canada are influencing the water temperature of the Columbia River that form the Washington and Oregon border. EPA should document its analysis that leads to this conclusion.

Response

Because dams and other human impacts exist upstream of the TMDL study area on both the Columbia and Snake rivers, EPA has determined it is reasonable to conclude that there is some impact on temperatures entering the TMDL study area due to sources upstream. The magnitude of the impact is unknown due to the lack of models developed for these reaches. See response to Comment T16.

Comment T18

Commenters Benton Rural Electric Association, Big Bend Electric Cooperative, Blachly-Lane Electric Cooperative, Clearwater Power, Eugene Water and Electric Board, Fall River Electric Cooperative, Franklin PUD, Grays Harbor PUD, Inland Power and Light, Lewis County PUD, Mason County PUD 1, Okanogan County PUD, Pacific Northwest Waterways Association, PUD of Benton County, Raft River Electric Cooperative, Skamania County PUD

Comment

The states of Washington and Oregon are signaling their intention to base energy and environmental policy on the CLSRT TMDL. This outcome is problematic because, as EPA notes, "The current water quality conditions present a significant challenge to achieving downstream water quality standards in Washington and Oregon." This challenge arises because water temperatures entering Washington state from Canada and from Idaho often significantly exceed the respective states' water quality standards during the peak summer months. This confounding situation raises the possibility that the FCRPS dams will be held to unattainable standards.

Response

See responses to Comment T10 and Comment T23.

Comment T19

Commenter Port of Clarkston

Comment

By failing to include actual impacts of heat coming from the non-federal storage dams--Brownlee, Oxbow and Hells Canyon--upstream on the mainstem of the Snake River (resulting 'from human activity) and non-human activity heat impacts created in the summer in Hells Canyon from RM 247 to RM 139 and from readings from the gauge at Orofino before Dworshak cold water releases mitigate temperatures, the CLSRT TMDL has created such a weak foundation as to make aII subsequent conclusions flawed.

Response

The Hells Canyon dams and Dworshak Dam are outside of the TMDL study area. The TMDL reasonably and appropriately assesses impacts within the TMDL study area. See also response to Comment T23.

Regarding Dworshak Dam specifically, see responses to Comment P12, Comment T15, and Comment T16.

Comment T20

Commenter Seattle City Light

Comment

Further complicating matters is the assertion in Ecology's section 401 water quality certification requirements that failure to meet TMDL allocations would lead to the denial of the 401-water quality certification for the facility in question, requiring reapplication by the operator. Given that in many locations incoming water will simply be too warm to meet standards (e.g., as it typically enters Washington from both Canada and Idaho during summer and early fall), the value of the TMDL process to lead to the necessary and needed changes is in question in the absence of an even broader watershed approach.

Response

The Washington State Department of Ecology's Clean Water Act Section 401 certification actions are outside the scope of the TMDL. See responses to Comment A27 and Comment A45. The TMDL is required by the Clean Water Act and provides value in setting the necessary load and wasteload allocations and helping to guide implementation efforts toward reducing temperature impacts.

Comment T21

Commenter Western Division of the American Fisheries Society

Comment

Similarly, the TMDL is limited only to Oregon and Washington; however, most of the Columbia and Snake River flows and thermal loads originate in British Columbia and Idaho. As in Oregon and Washington, much of the thermal loading that occurs in Idaho and British Columbia results from land and water uses and the TMDL should not ignore these upstream sources.

Response

See response to Comment T12.

Comment T22

Commenter Consumers Power, Inc.

Comment

Chief among CPI's concerns is that no consideration is given in the CLSRT TMDL for water temperatures close to or exceeding state water quality standards before the water even reaches state boundaries, in which case the federal dams could be held to unattainable standards. We urge you to rectify this deficiency in the draft CLSRT TMDL.

Response

See response to Comment T24.

Comment T23

Commenter Northwest River Partners

Comment

As the CLSRT TMDL notes, the water temperatures entering Washington state from Canada and from Idaho often significantly exceed Ecology's water quality standards during the peak summer months:

As illustrated in Figure 6-1 through Figure 6-3, the water temperatures as the rivers cross the upstream boundaries of the TMDL study area (Canadian border and the Washington/Idaho border) exceed the Washington water quality criteria by a substantial margin from July through September. These upstream temperature exceedances mean that even if the dams located in Washington state and Oregon did not exist, the state's water quality standards would regularly go unmet.

NWRP recognizes that river temperatures are a serious environmental concern, especially pertaining to salmonid survival. However, the shortcomings of the TMDL model (described below) combined with very aggressive water quality standards established by Ecology and DEQ, mean that the FCRPS could be placed in an untenable position--unfairly penalized and bearing the responsibility for upstream river conditions.

EPA's own comments in the CLSRT TMDL indicate its understanding of this confounding situation. EPA notes, "The current water quality conditions present a significant challenge to achieving downstream water quality standards in Washington and Oregon."

Response

The TMDL does not assign responsibility to dams for reducing temperature impacts attributed to upstream boundary conditions. On the contrary, the dam impact analyses are specifically designed to isolate dam impacts from all other impacts, as well as the boundary conditions. The modeling isolates the dam impacts by simulating the temperature change caused by the change in geometry and hydraulics between an impounded and a free-flowing condition. In that analysis, upstream boundary conditions are unchanged between the impounded and free-flowing model simulations. There is no linkage in the language of the TMDL allocations between the dam allocations/impacts and the upstream boundary conditions. See Section 6.5 of the TMDL for more information on the allocations.

Comment T24

Commenter Chelan, Douglas and Grant PUDs

Comment

While the TMDL has presented a reasonably sound technical analysis and stated the assumptions and limitations of the TMDL, there are specific areas of concern for the Mid-C PUDs. These include the compliance challenges associated with water temperatures entering the TMDL boundary that exceeded the State of Washington's standards.

Response

See response to Comment T23,**Error! Reference source not found.** above.

Comment Category U. Dams

Comment U1

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 42, Section 6.5, general:

Temperatures in fish ladders are often above state temperature criteria. This problem should be analyzed and fish ladders at each dam should have allocations set and implementation strategies.

Response

See response to Comment J4.

Comment U2

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 44, Table 6-4: Missing Ice Harbor Dam.

Response

EPA has corrected the referenced table.

Comment U3

Commenter Port of Clarkston

Comment

Starting in the 1990s, the fishery agencies and tribes represented by the Fish Passage Center requested spring releases of cool water from DWR with the expressed purpose of cooling the LSR for adult salmon and steelhead migration. The Corps complied with the request and cold-water releases from DWR have morphed into a routine that enabled keeping the lower Snake River below 21° C during most summers for over two decades. Graphic representation of this affect is demonstrated in the PowerPoint file labeled Port Temperatures. Water from Hells Canyon typically enters LGR at Lewiston at up to 25° C, while Clearwater River water enters at 10° to 14° C. Thus, LSR reservoirs now have significant temperature stratification because hotter Snake River water rides above the colder Clearwater River water all the way to LGR (PNNL – 15532.pdf, 2006). There colder water is passed through turbines or under normal spill gates and hotter water passes over the overflow spillway weir. The PNNL study measured temperatures near the surface and at various depths that indicated surface temperature exceeding the 20° C criterion while at greater depth, temperatures were below the standard depending on the depth. That juvenile salmon and steelhead equilibrate total dissolve gas at 120 to 125 percent normal is an argument of the fishery agencies and tribes for more spill. Similarly, the fact that adult salmon and steelhead would migrate in the cooler, deeper waters should be accounted for. The ability of fall Chinook juveniles rearing in the reservoirs likewise would be able to regulate temperatures by utilizing deeper water. Turbine passage studies show that fall Chinook are distributed deeper than stream type Chinook which are guided better by turbine intake screens, and deeper than steelhead smolts that guide best by turbine intake screens. Guiding efficiency is governed by their depth in the water as it enters the turbine intakes.

- The PNNL study measured water velocities at the various sample sites too. They found that the reservoirs were flowing downstream more or less continuously even with the low summertime flows. This causes constant mixing, so stratification is not a highly defined as it is in Dworshak Reservoir.

- The current spill program has significantly changed the nature of the water temperature regimes of the LSR reservoirs. Mass spill to 120 or 125 percent TDG passes large quantities of water from about 50-feet in depth under the standard spill gates. There are seven standard gates at LGR, LGO, and LMO, and nine at IHR. Cooler water would be passed downstream through turbines because their intakes are 75 to 85-feet below the surface. Overflow weirs, one at each dam, pass 5,000 to 10,000 cfs while late summer flows range from 20,000 to 40,000 cfs.

- Hot water was entering the surface exits of the LGR and LGO fish ladders causing adult fish to delay until a pump system was installed to bring colder water up from depth around each exit so adult fish migration would not be hindered by a temperature block. Installing such features at all four LSR dams is included in the Columbia River System Operation EIS alternatives currently under public consideration.

Response

EPA recognizes the importance of Dworshak Dam operations in helping to reduce Snake River temperatures in the TMDL and supports actions to cool waters flowing through the fish ladders. Regarding fish ladders, see also response to Comment J4. The TMDL is based on an assessment of the cross-sectional average river temperature using a one-dimensional model, and vertical temperature stratification is not simulated in this type of model.

Comment U4

Commenter Various NGOs

Comment

The TMDL's analysis clearly shows that the four Lower Snake River dams, and certain Columbia River dams, cause significant temperature problems throughout the summer and fall. For instance, the Lower Snake River dams can raise the temperature of the Lower Snake between .7 and 3.2 degrees C from July to October—often causing or contributing to water quality standards violations. The analysis also suggests that a free-flowing Lower Snake River would cool periodically throughout summer in a manner that would facilitate fish migration even during otherwise hot years. These important conclusions, from an expert scientific agency, should inform efforts to restore Columbia River basin salmon and steelhead.

Response

This is a re-statement of the TMDL findings on dam impacts (Note that Snake River dam impacts range from 0.3°C to 3.2°C, as listed in Table 4-1 of the TMDL). The TMDL assessment findings should help inform efforts to understand and improve river temperatures during TMDL implementation.

Comment U5

Commenter Various NGOs

Comment

To alleviate any potential confusion by future readers of the TMDL, EPA should add the label "Load Allocation" to the heading of Column H in Tables 6-6 through 6-9 of the TMDL.

Response

EPA finds that the tables are accurately labeled. The load allocation for dams is a cumulative increase of 0.1°C to the mainstem temperatures. Column H in the tables shows the level of exceedance at a given location due to the cumulative dam impact. It is not the load allocation assigned to each individual dam/location.

Comment U6

Commenter Various NGOs

Comment

EPA should treat dams as point sources of temperature pollution and assign them Waste Load Allocations.

EPA should have assigned the dams Waste Load Allocations. Instead, the TMDL miscategorized the dams' heat pollution as nonpoint source pollution and, consequently, assigned the dams Load Allocations. Heat pollution from the dams and reservoirs is point source pollution within the meaning of Clean Water Act Section 301(a), 33 U.S.C. § 1311(a). Heat is a pollutant; dams are point sources; and the Columbia and Snake rivers meet any definition of the waters of the United States. The only outstanding issue was whether the dams caused the "addition" of heat to the rivers, and the TMDL conclusively answers that question in the affirmative. EPA's reliance on the 40-year-old Gorsuch decision is unavailing; that case is distinguishable on the facts and its reasoning has not convinced subsequent courts. Neither does the Water Transfer Rule support EPA's position, as EPA expressly disclaimed that its rule applies to dams. The reasoning in LA County Flood Control District also cannot save EPA's failure to properly categorize the dams' heat pollution because that opinion was premised on the intervening point source not adding a pollutant to the water. Here, as EPA's TMDL conclusively demonstrates, the dams and reservoirs cause the addition of heat pollution to the rivers. Accordingly, they are point sources of temperature pollution that should receive Waste Load Allocations in the TMDL.

In addition to complying with the purpose and plain meaning of the Clean Water Act, assigning the dams Waste Load Allocations would allow EPA to satisfy the "reasonable assurances" requirement discussed in Section III, above, because the Waste Load Allocations would become enforceable effluent limits in EPA's pending National Pollution Discharge Elimination System permits for the dams on the Lower Snake and Columbia rivers. This would cure a legal defect in the TMDL and relieve other industrial and municipal point source dischargers of the burden of addressing the Corps' heat pollution.

Response

The TMDL assigns the dams both load and wasteload allocations. The wasteload allocations for the dams apply to outfalls that add pollutants from the dam operations such as oil and grease, and thus, are subject to NPDES permitting. The U.S. Army Corps of Engineers submitted NPDES permit applications for these outfalls in 2015. The load allocations for the dams address the waters that flow over the spillway or pass through the turbines. This pass-through water is not subject to NPDES permitting because pollutants are not added as a result of dam operations. See *National Wildlife Federation v. Consumers Power Company*, 862 F.2d 580 (6th Cir. 1988); *National Wildlife Federation v. Gorsuch*, 693 F.2d 156 (D.C. Cir. 1982). Sources not regulated under the NPDES program are assigned load allocations. Therefore, the temperature effects from dams related to reservoir temperatures are nonpoint sources and assigned load allocations per 40 CFR 130.2.

Comment U7

Commenter Bonneville Power Administration

Comment

The TMDL compares current conditions with dams to a "free-flowing Columbia and Snake Rivers" without dams, but yet includes Dworshak dam operations and existence in both the current conditions and "free-flowing" TMDL scenario.

EPA's RBM-10 analysis of the free-flowing scenario is not a free-flowing scenario because it arbitrarily includes Dworshak Dam cold water operations in both the current conditions and free-flowing TMDL scenarios. This analysis is used in developing allocations, which inaccurately represents the ten federal dam system because the ten federal dams' construction and operations are removed under the free-flowing simulation. This inconsistent application of the status of the ten federal dams in EPA's model and TMDL is not reasonable and does not provide the federal agencies with any temperature cooling credit from the Dworshak dam operation.

Response

The TMDL is clear in defining the "free-flowing" scenario as providing river temperature estimates for a free-flowing condition in all waters within the study area. This properly targets the analysis on sources within the geographic area of the TMDL. Dworshak Dam, located on the Clearwater River in Idaho, is outside of the study area, as are other anthropogenic structures and activities in the upper parts of the basin in Canada and Idaho.

EPA has consistently recognized the benefits of Dworshak Dam operation on Snake River temperatures, and the TMDL modeling assessment includes information on the scale of these benefits. At the same time, the dams within the study area contribute to exceedances of target temperatures. It is reasonable to include current

Clearwater River flows and temperatures as a baseline assumption for evaluating compliance with Snake River water quality standards and sources contributing to exceedances.

The question around a "cooling credit" for the federal dam system from the Dworshak Dam operation can be considered by the states during TMDL implementation.

Comment U8

Commenter Bonneville Power Administration

Comment

4. Page 44: Ice Harbor Dam is missing from Table 6-4, Bonneville requests it be added.

Response

See response to Comment U2.

Comment U9

Commenter Bonneville Power Administration

Comment

Page 67-68: Bonneville requests EPA use consistent graphical plots and update the x-axis and y-axis to represent the same axis in Figure 6-5, 6-6, 6-7 for comparison. When cross-comparing, it is hard to determine similarities when the axes are not consistent. Additionally, Bonneville requests that EPA add a line across the y-axis representing the water quality 20°C criteria.

Response

Because of the comment, EPA reviewed the graphical plots and has determined the figures are reasonably clear and understandable.

Comment U10

Commenter Bonneville Power Administration

Comment

More specifically, Bonneville recommends that EPA recalculate the temperature allocation tables (Tables 6-6 to 6-9) with all Columbia River Basin's heat sources accounted for in a holistic basin-wide approach to attain water quality standards or identify an alternative attainable temperature standard that will protect beneficial uses for the mainstem Columbia and Snake rivers basin wide, and then assign temperature reduction targets more equitably across the entire Columbia River Basin.

Response

The TMDL accounts for known heat sources based on the best available information and model. The allocations are equitable, with the 0.3°C available loading capacity divided equally among the three source categories. It would not be appropriate for EPA to establish an alternative temperature water quality standard as part of this TMDL. Typically, decisions regarding applicable uses and standards, including the process of conducting a Use Attainability Analysis (UAA), are initiated by a state.

Comment U11

Commenter Bonneville Power Administration

Comment

Bonneville's specific concern is the inability of EPA's RBM-10 model to simulate diurnal temperature fluctuations which are important in determining the impact of the ten federal dams on exceedances of Oregon and Washington temperature criteria which are based on daily maximum and 7-day average of the daily maximum (7-DADM) water temperature values. Therefore, the TMDL cannot fully represent the influence of the dams on water temperatures. This may overstate the impact of the dams relative to a "No Dams" scenario resulting in a misrepresentation of the impacts the ten federal dams have on river temperatures. Additionally, the RBM-10 model may not be able to represent actions (e.g., different dam operations) taken during TMDL implementation that may result in lower river temperatures.

Response

The TMDL adequately considers and addresses the model limitations. EPA agrees that the daily average simulations may modestly overstate the dam impact due to the need to be conservative, as this characteristic of the analysis is a key element in the Margin of Safety required under the TMDL regulations at 40 CFR 130.7(c). The RBM10 model, moreover, reflects the best science currently available to EPA for purposes of this TMDL.

EPA agrees that the RBM10 model limitations may affect analysis of certain implementation actions and encourages the states to consider the use of other assessment tools if such tools provide more detailed information for implementation efforts.

Comment U12

Commenter Bonneville Power Administration

Comment

EPA's RBM-10 model analysis of current conditions relies on impacts from the existence of the ten federal dams themselves, including their construction. It is important for EPA to recognize that the operational limitations necessary to achieve the congressionally authorized purposes of these federal dams should not be subject to the TMDL and TMDL Implementation Plans. The federal dams provide significant regional benefits, such as carbon free energy, navigation and irrigation. The TMDL fails to recognize that the federal dams' ability to achieve temperature targets is limited by their operational constraints and combines the dams' existence and operational impacts together.

Bonneville recommends that EPA recalculate the temperature allocations presented in the cumulative excess dam impacts tables (Tables 6-6 to 6-9) with the dams in place rather than removing dams in the "free-flowing" scenario.

Response

The TMDL provides a straightforward estimation of cumulative dam impacts, from both federal and public utility district operated dams, on river temperatures. The primary impact from dams is the river geometry and travel time change caused by the impoundment of water behind the dam. With longer residence time, and slower travel time downstream, the water gets warmer. Since the impact on water temperatures from the dams is estimated using the free-flowing scenario in the model, removal of that scenario would eliminate the only way of estimating the dam impact.

The analysis of different sources and estimate of pollutant loads from those sources is a required element of TMDLs. Analysis of source contributions of pollutants in a TMDL is a separate matter from consideration of the possible implementation actions to reduce those impacts on water quality and the constraints involved. Implementation of the TMDL is a responsibility of the states. EPA acknowledges the Congressional authorization of the federal dams and recognizes the associated complexities associated with implementation of the TMDL. The Clean Water Act, however, requires issuance of a TMDL to provide the "heat budget" to sources to facilitate implementation of actions to reduce temperatures and attain and maintain beneficial uses of surface waters.

Comment U13

Commenter Bureau of Reclamation

Comment

Together these complex relationships and information shortcomings can confuse the thermal load attributable to Lake Roosevelt with the effects of incoming warm water at the Canadian border or other loads upstream of the dam. Reclamation seeks to operate Grand Coulee Dam to maximize the public benefits of the facility. At times, however, it may not be feasible to operate the dam in a way that causes water temperatures to meet applicable standards, particularly given the role of sources outside of Reclamation's control. To the extent it could be possible to influence temperatures through operations at Grand Coulee, Reclamation's authority to so operate the dam and reservoir is limited to addressing the effects Reclamation's actions cause.

Response

The RBM10 modeling analysis provides a reasonable estimate of nonpoint Grand Coulee Dam impacts on Columbia River temperatures from the impoundment of the river. The border temperatures are identical in the current and free-flowing scenarios, and the only difference between the scenarios is the geometry of the river and Grand Coulee outflow operations. These differences provide a reasonable estimate of the dam impact that is isolated from the border temperatures.

EPA acknowledges that there are challenges that may arise in implementation of the TMDL, including challenges involved in altering operations at Grand Coulee Dam to reduce impact and influence river temperatures. EPA is committed to supporting federal, state, and tribal partners during TMDL implementation efforts.

Comment U14

Commenter Bureau of Reclamation

Comment

The TMDL analysis does not distinguish incoming water temperature from thermal loads caused by the existence of Grand Coulee Dam.

To calculate the cumulative excess temperature loads due to dams, the TMDL compared the “Current” and “Free Flowing” RBM-10 model scenarios for each summer month. This method is best understood as calculating the net effect between dams on the temperature regime, without isolating the impacts of the dams specifically. For many dams with water residence times of less than a month this comparison is not necessarily problematic. For Grand Coulee, however, with residence times from 20 to 60 days, this approach fails to distinguish between warming of water in Lake Roosevelt and the delayed transit of warm water from Canada.

In actuality, temperatures in Lake Roosevelt and in the Columbia River downstream of Grand Coulee result from many heat exchange pathways. Some are due to incidental heat sources or sinks in the reservoir, such as long and short-wave radiation or evaporation. Others result from water flowing into the reservoir from tributaries, or from the Columbia River upstream of Lake Roosevelt. In addition to these factors, by slowing the flow of rivers, dams increase the residence time of incoming waters. The effect of this regulation on water temperature is to shift the timing of when high and low temperatures occur within the river. Notwithstanding the different sources of these temperature inputs, the TMDL fails to distinguish thermal loads from incoming waters at the Canadian border from the non-point source temperature loads attributable to Lake Roosevelt.

The values produced using a simple comparison between free-flowing and current conditions at Grand Coulee reveals the scale of this issue. Although “impounded water is warmed by solar radiation and warm air temperatures during the summer,” (TMDL at 22) the TMDL model suggests the residence time effect cools the Upper Columbia by 0.8 and 0.2 °C in July and August respectively. Similarly, warming attributed to Grand Coulee Dam in September can be understood simply as the arrival at the dam of warm summer waters at a time when Canadian inflow is beginning to cool.

Critically, the residence time effect is not the same as a thermal load. It adds no additional thermal energy to the system. Rather, residence times affect when an upstream thermal load – in this case the combined load of incoming water from Canada and the load associated with thermal energy absorbed by Lake Roosevelt – appear at a point, whether in the reservoir or in the Columbia River below Grand Coulee Dam. Other than quantities of energy advected to air and land, thermal loads from Canada must transit downstream. These loads are beyond the reach of any entity subject to this TMDL. By characterizing both sources as excess thermal energy attributed to Grand Coulee, the TMDL suggests that Reclamation is more capable of controlling thermal loads than is actually the case. And by overstating the role of Grand Coulee in causing thermal conditions, the TMDL limits its usefulness as a tool to support water quality standard attainment.

Response

EPA disagrees that the TMDL fails to distinguish thermal loads from incoming waters at the Canadian border from the non-point source temperature loads attributable to Lake Roosevelt, and that the TMDL overstates the role of Grand Coulee in impacting river temperatures. See response to Comment U13.

The residence time and travel time changes caused by dams and the impoundment of water impacts river temperatures. This impact and other dynamics noted in the comment are accounted for in the model scenarios. Modeling shows that Grand Coulee Dam substantially impacts the thermal load of the river. The TMDL accounts for both positive (cooling) and negative (warming) impacts from the dam on downstream waters. Actions that will need to be taken to reduce water temperature impacts can be addressed during implementation of the TMDL. EPA is committed to supporting federal, state, and tribal partners during TMDL implementation efforts.

Comment U15

Commenter Bureau of Reclamation

Comment

In summary, Reclamation is concerned that the TMDL may overstate the thermal load attributable to Grand Coulee Dam, conflate that thermal load with the effect of residence time behind the reservoir, and measure that gross impact against an inappropriate standard below the dam.

Response

See responses to Comment U13, Comment U14, and Comment D10.

Comment U16

Commenter Bureau of Reclamation

Comment

Most importantly, future TMDL efforts implicating Grand Coulee must identify the incremental temperature effects of dam operations. In the TMDL, EPA compared a free-flowing river with current operations. Because Reclamation has no discretion over the existence of Grand Coulee Dam, which affects hydrology irrespective of Reclamation's operational decisions, this comparison provides little insight into what Reclamation may do to affect water temperature. Thus, a necessary first step in future TMDL analyses is to account for the baseline temperature effects attributable to the existence of Grand Coulee.

Future TMDL efforts should also be based on the same metric as expressed in the water quality standards. The TMDL identifies load allocations for dams based on daily average temperatures. The applicable temperature standards, however, are based on 7-day average daily maximum temperatures. These values can differ by 0.2 to 0.6 °C. When used in comparison with modeled current conditions, it is possible that these errors compound. Analyzing modeled results on the same metric as the standard is expressed would help avoid this error and provide a more useful compliance metric.

Response

See responses to Comment U13, Comment U14, and Comment L6.

Comment U17

Commenter Chelan, Douglas and Grant PUDs

Comment

On Improving the Clarity of the Language in the TMDL

As discussed above, the TMDL should go to greater lengths to inform readers on the nature of the "free-flowing" scenario and the implications of a baseline that includes point and non-point sources outside of the TMDL boundary. We suggest that EPA provide clarification that the "free-flowing" scenario is intended to provide a representative background temperature in the river that reconciles the heating that occurs outside of the TMDL boundaries and consider renaming the scenario to "background" to avoid confusion.

Response

EPA has described the free-flowing scenario in the Model Scenario Report in Appendix D of the TMDL. The intent of the free-flowing scenario is not to provide a representative background temperature. The scenario estimates the temperature impact of the dams (cumulatively) by mathematically removing all of them from the model and seeing what temperatures look like without the dams in place. The other conditions in both scenarios (current condition/dams in vs. free-flowing condition/dams out), such as the known tributary and boundary temperatures, are unchanged. This model setup isolates the impacts from the dams from the impacts of these other sources of heat loading to the Columbia and lower Snake rivers.

Comment U18

Commenter Chelan, Douglas and Grant PUDs

Comment

Tables 6-6 through 6-9 are very complicated and the column titles are easy to misinterpret. Even though EPA has provided a step by step discussion of how the columns in the table were derived, it is hard for the average reader of this TMDL to follow the explanations and intended application of columns from the context of compliance or implementation. EPA should consider simplifying the step-by-step discussion by including a flow chart or a decision tree to clearly illustrate when the different columns of the table apply to a specific site. Secondly, the TMDL does not provide any indication on how these tables may be used by Washington and Oregon when implementing the TMDL.

Response

See response to Comment Q2.

Comment U19

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL must include water temperatures in fishways and forebays. By focusing on tailrace data collection sites, the TMDL does not provide clarifying information on temperatures in fishways where cold water species concentrate during the passage season. While modifications at two of the Lower Snake projects have improved water temperature differentials in the ladder (the measurement of water temperature at the entrance of the adult ladder compared to the temperature at the exit), the water temperatures do not necessarily reflect tailrace conditions or meet state water quality criteria. These are temporary solutions that, at best, reduce adults from holding in the ladder but do not protect adults from the impacts of high temperatures.

Criteria set in the FCRPS biological opinion is not a solution to this issue either, because the document only requires that a 1°C differential between the entrance and the exit of the ladders. Water conditions in fishways should also be meeting state water quality criteria and avoid temperature-driven migration blockages. In 2015 high water temperatures slowed and impacted adult sockeye passage such that most of the Snake River run did not make it to Lower Granite Dam, let alone get through or past the project. Snake River sockeye adult survival (BON-LGR) was 0.04, which was much lower than previous years (2009 to 2014), ranging from 0.44 and 0.77. Due to this low survival, emergency transport operations were required to aid sockeye passage. While 2015 was unique, with climate change these conditions will occur in higher frequencies. Because of this, the TMDL should include fishways in its list of temperature targets since they are critical migration pathways for existing fisheries.

Response

See response to Comment J4.

Comment U20

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

EPA should support more uniform, consistent temperature standards that protect all salmonid life stages, in all waters they inhabit, notwithstanding artificial state boundaries or differing jurisdictions. The TMDL should also consider comprehensive approaches (i.e., more natural thermal regimes) to address all salmonid life stages beyond just those associated with the warm summer/fall, lower-flow months.

The TMDL should consider water temperatures in dam fishways and forebays, and not just in the tailraces, and appropriate criteria should apply to them all.

Response

The TMDL addresses the applicable state and tribal temperature water quality standards at the times of the year that those standards are exceeded. The water quality standards address all salmonid life stages.

Regarding fishways and forebays, see response to Comment J4.

Comment U21

Commenter Public Utility District No. 1 of Douglas County

Comment

The TMDL analysis of observations and modeling related to the Wells Project shows:

-During July and August, current water temperatures are lower than predicted for the free-flowing case (Tables 6-6 and 6-7).

-During September and October, water temperatures decline under current conditions from Grand Coulee to Chief Joseph to Wells (Tables 6-8 and 6-9).

-This suggests that upstream dam removal could increase the number of exceedances during July and August (and probably early September), while only decreasing exceedances in (late) September and October. However, the TMDL analysis also seems to suggest a possible beneficial effect of Chief Joseph and Wells cooling the releases from Grand Coulee, although this could also be attributed to cooling air temperatures and reduced solar radiation in the early fall.

These observations are consistent with the findings of a WQS temperature compliance study for the Wells Project completed in 2008. Likewise, it's important to consider that certain areas of the hydro system, including the Wells Project, provide either no effect or a cooling effect compared to the free-flowing scenario.

Response

The dynamic nature of dam impacts seen in the results of the TMDL assessment, such as the observations in this comment, will help inform TMDL implementation. Development of TMDL implementation plans is the responsibility of the states.

Comment U22

Commenter Washington Department of Ecology

Comment

EPA assigned a 0.1 °C temperature allocation collectively for all dams on the Columbia and Lower Snake Rivers. This collective allocation means that Ecology's implementation plan will need to determine how to divide this 0.1 °C load allocation amongst the dams. We ask that the EPA outline options for how this division of the allocation could be accomplished. In an earlier presentation about this TMDL, the EPA shared temperature allocations given to individual dams. We understand that dams and their temperature impacts are interconnected, and we request EPA acknowledge this by including potential allocation divisions. We request that EPA include this information in the TMDL as it will be beneficial information for Ecology as we develop our implementation plan.

Response

EPA did not assess individual dam allocations and cannot provide a definitive division of the cumulative 0.1℃ allocation to individual dams because the impacts are interconnected. EPA has included the reach impact at each target site in the TMDL tables, and this reach impact information can provide insight into potential individual dam impacts. Ecology may consider the reach impact information during development of its TMDL implementation plan for Washington.

Comment U23

Commenter Washington Department of Ecology

Comment

The RBM10 water temperature model applied in this TMDL cannot estimate water temperatures for a specific portion of the water column (i.e., is not applied when water column temperatures vary with depth). Instead, it estimates an overall average water column temperature. For this reason, only hydroelectric facility tailrace locations (downstream discharge) were used as model assessment points. Tailrace outflow tends to be highly mixed and uniform in temperature. However, the model output and assessment locations have the combined effect of depressing the actual level of temperature impact while posing a constraint to its application to Washington's water temperature criteria. This is because:

Washington's water temperature criteria are based on an assessment of daily maximum temperatures, not averages. Washington's temperature criteria are based on either a daily or a seven-day assessment period. This TMDL applied a monthly time scale for its temperature assessment. Use of the tailrace as an assessment point ignores heating occurring in the upper water column of the forebay of each hydroelectric facility. The tailrace discharge reflects water temperatures from a portion of the water column far below the forebay surface and is largely buffered from the hydroelectric facility's real heating effect which tends to be observed most prominently in the forebay's upper water column. Using tailraces as compliance points may underestimate exceedances or completely miss hotter areas of the river system. The TMDL does not discuss forebay temperatures relative to current conditions in the tailrace and meeting water quality criteria at the target sites. Forebays are important areas for juvenile and adult salmonids, as they spend a large portion of their stream migration there. So, it is important to understand changes in forebay temperatures and differences contrasted with tailrace temperatures.

Response

See response to Comment J4.

Comment U24

Commenter Washington Department of Ecology

Comment

Given that hundreds of miles of the Columbia River are covered by this TMDL, an assessment of travel times should be provided in the analysis. The analysis applied a metric to determine the effect of each hydroelectric facility's effect on water temperature referred to as the cumulative impact (CI). It is based on the difference between monthly average tailrace temperatures with the dams in place (current condition) in comparison to the temperatures predicted given their removal. While most of the facilities operate as run-of -river (upstream storage is minimized), the reality is that during the critical period of July-October, the river volume has increased (wider and deeper) with reduced overall velocities now compared to a pre-dam condition. This results in increasing travel times. By assuming similar travel times, even given the monthly assessment period applied in the TMDL, the error of travel times increases the further the assessment point is located from the upper boundary used in the model. With increasing separation, water representing the river with dams in place in the current scenario and without dams in place are subjected to differing meteorological and hydraulic heating and cooling effects. This impacts the intent of the exercise which was to solely examine the influence of the dams on water temperatures.

In addition, a cumulative impact metric was used to determine the periods and levels of temperature reductions required to achieve the relevant criteria. Given this importance, the level of analysis error resulting from scenario travel time differences should be examined and the TMDL should provide a justification to the analysis approach taken.

Response

EPA provides a travel time analysis in the Model Scenario Report (Appendix D, Section 3.3). The TMDL is not assuming similar travel times between the current and free-flowing conditions. The travel times are different in the two scenarios. This change in residence and travel times, in addition to the change in river volume/geometry, causes the temperature impact of the dams on the Columbia and lower Snake rivers. The comparison of river temperature, with and without dams at a given location, meets the intent of examining the influence of dams on river temperatures. EPA disagrees that the travel time difference between scenarios introduces an error of any kind. In fact, that difference is intrinsic to the analysis of the source impact on temperatures. EPA is not aware of another practical way of isolating and estimating the impact of the dams.

EPA also recognizes that dam impoundment impacts are not instantaneous like point source impacts. The impact at a given location is caused by the aggregate impacts of changes to the river upstream of that point and slowing of the travel time of the river is a key aspect of the cumulative dam impact. Because impacts at a given location are not tied to specific actions on specific dates at the dams, it is reasonable to aggregate impacts by month and acknowledge the uncertainty in attributing impacts to individual dams. Also see the response to Comment S3.

Comment U25

Commenter Washington Department of Ecology

Comment

The TMDL evaluated the level of temperature impact associated with each of the Columbia River facilities based on two metrics: the temperature exceedance (TE) and the cumulative impact (CI).

A rule was applied to these metrics: if the target exceedance level is greater in magnitude than the cumulative impact range, then the level of temperature reduction required is the cumulative impact temperature differential minus 0.1 C. The underlying assumption is that the exceedance is greater than what the dams can be reasonably considered responsible for. Therefore, the reference, in terms of impact, becomes the cumulative impact differential.

If the target exceedance is less than the cumulative impact differential, then 0.1 C is subtracted from the target exceedance level. The underlying assumption here is that the target exceedance is entirely attributed to the dams.

This approach requires that the two metrics share some commonality – a common frame of reference. That link would assume to be the maximum (from observed data) and the estimated model average temperatures, which are assumed to be equivalent in the TMDL. However, there is a disparity between these two temperature estimates. A comparison of the predicted monthly average temperatures (model predicted– current condition scenario) to the observed monthly maximums for July and August, indicates a median difference of 1.3 C and 0.9 C, respectively. Differences were largest at Rock Island (~1.7 C) and lowest at Priest Rapids (~0.5 C).

The study did compare daily maximums to daily average temperatures and found only around a 0.2 C difference at the John Day dam tailrace based on 2016 data throughout the year with no discernable seasonal influences affecting this difference. However, based on the monthly maximums calculated from 2011-2016 hourly data in comparison to the model predicted average temperatures, the difference is 1.9 C and 0.9 C for July and August, respectively.

Response

This comment is exploring varied calculations of daily average/maximum temperature differences that are not comparable. In general, the difference on a given day between the daily average and daily maximum temperature of the Columbia River is small (for example, 0.2°C at the John Day Dam). The difference between maximum monthly temperatures and monthly average temperatures is much larger, because the maximum monthly temperature is the single highest value within the month, compared to a temperature that is the 30-day average for the month.

Comment U26

Commenter Washington Department of Ecology

Comment

It appears like the TMDL allocation approach was to provide only 0.1 C to the hydroelectric facilities of the assumed 0.3 C increase allowed by the criteria. Based on how the temperature exceedance metric (TE) is calculated it appears like an "allocation" of 0.3 C was already assigned. The TE is the observed maximum temperature (for a particular assessment location) above the combined appropriate criteria and an additional 0.3 C. If this is correct, subtracting a portion of that "allocation" or 0.1 C from the TE just further increases that "allocation" effectively by another 0.1 C. The net result is the allocation of 0.3 C to each facility and the estimated temperature reduction required to achieve the criteria falling short of that target. We request that EPA clarify their allocation approach and ensure that all allocations fit within the 0.3 C increase allowed by the criteria.

Response

EPA reviewed the dam allocation exceedance calculation and agrees that there is a minor error in this step of the calculation. The estimated allocation exceedance depends on whether the dam impact is greater or less than the measured target temperature exceedance. If the dam impact is less than the target temperature exceedance, then the full dam impact (minus the allowed 0.1°C allocation) must be eliminated, along with reductions from other sources, to achieve target temperatures. If the dam impact is greater than the target temperature exceedance, then only a fraction of the full dam impact needs be eliminated to achieve the targets.

In the first case, the full dam impact must be addressed, and subtracting of 0.1°C from the full dam impact is simply applying the load allocation for dams to estimate the exceedance. In the second case, the 0.1°C subtraction was in error, as noted in the comment, because that amount is already counted in the fraction of dam impact that is acceptable. Also, in this instance, the exceedance will be less than the full dam impact minus 0.1°C. In these instances, the dam allocation exceedance has been revised to be the current measured temperature minus the target temperature and reducing the dam impact by this amount will achieve the target temperatures. EPA has corrected the tables and language to eliminate the subtraction of 0.1°C from the target temperature exceedance in these cases.

Comment U27

Commenter Idaho Conservation League

Comment

Table 6-4 (pg 44): Ice Harbor Dam is not shown. Please correct this error.

Response

See response to Comment U2.

Comment U28

Commenter Idaho Conservation League

Comment

Steps used in explaining Tables 6-6 through 6-9 are not correct (pg 45). Step 4 states:

“If Column G (‘Measured Target Exceedance”) is greater than 0.1, then the dams upstream of this location are cumulatively contributing to impairment and the analysis proceeds to Step 5.” Column G does not measure the cumulative impact of upstream dams: Column F (“RBM10 Cumulative Impact”) does. If this column’s value is > 0.1, the stream is impaired at this location due to the cumulative impacts of upstream dams, and analysis should proceed to Step 5. Please correct this error.

Response

EPA agrees that the wording of Step 4 was confusing and has edited this sentence in the TMDL. It now reads: “For locations with a measured target exceedance (Column G), assess whether the estimated cumulative impact of upstream dam(s) exceeds the 0.1°C LA at that location. If this impact (Column F) is greater than 0.1, then the dams upstream of this location are cumulatively contributing to impairment and the analysis proceeds to Step 5. If no contribution to impairment is identified, the analysis moves to the next target site downstream."

Comment U29

Commenter Northwest Hydroelectric Association

Comment

The temperature criteria established by Washington and Oregon were driven in large part by the goal of protective aquatic life, and specifically salmon. However, there is evidence that the salmon are not adversely impacted by the temperature exceedances, and certainly not by the operation of dams. Different salmon migrate at different times of year, and in at least some dammed stretches of the Columbia River, according to NOAA, the critical period for salmon migration—and temperature impacts on that migration—is the month of June.

The TMDL does not formally study this month. Yet it might be precisely when the release of cooler water from dam impoundments helps to ameliorate rising ambient temperatures. In fact, the TMDL illustrates that in July, the current temperature in the Columbia River is lower than that during the free-flowing scenario for many of the river segments; it is not until the confluence of the Snake River that the temperature exceeds the water quality standard. NOAA also found that some species have shown abundance above historic levels in some recent years. In fact, a recent NOAA study found that 2014 was the best year for salmon since 1938.

NWHA notes there is some evidence of adult salmon deaths occurring in 2015 during the months of June or July. However, in recognition of the fact that dams have minimal effects during those months, NOAA concluded that the dams had no contribution to those salmon deaths. Rather, the agency found that it was natural sources of heat that caused the issue. In fact, cool water discharges from stratified hydroelectric power project reservoirs were one of the short-term measures employed as part of the emergency response strategy.

Even if dams were contributing to exceedances of the standard, those exceedances are not causing adverse impact on aquatic life. NOAA studies have concluded that adverse impacts to salmon occur when water temperature reaches 21-22 degrees. Both the Washington and Oregon water quality standards are below this number. Thus, the standard is more stringent than needed to protect salmon. This is consistent with the experience in the rivers.

Response

TMDLs must be based on currently applicable standards. Water quality standards that are promulgated by the states are reviewed/approved by EPA through a regulatory and participatory public process. The temperature standards for the States of Washington and Oregon went through these processes, including scientific analysis, and consultations with the Services (NOAA Fisheries and the U.S. Fish and Wildlife Service), pursuant to the Endangered Species Act.

EPA has extended the TMDL time frame to include the month of June, and the RBM10 modeling analysis indicates that dams have a warming impact on the Columbia River in June. See also response to Comment S1.

Comment U30

Commenter Northwest Hydroelectric Association

Comment

Areas of Clarification Needed in the TMDL

NWHA respectfully suggests that EPA consider making clarifications to several aspects of the TMDL. As discussed above, EPA properly concludes that temperature exceedances are largely driven by factors other than dams. However, some of the assumptions made by EPA in its analysis, inaccuracies in the model, and the graphical presentation of data, are inconsistent with that conclusion. For example, the technical appendices to the TMDL describe the 0.1°C allocation to dams as an aggregate allocation applicable to the sector as a whole. However, both the appendices and the main TMDL document appear to attribute portions of temperature exceedances to individual dams. EPA should make it abundantly clear to the States that these are not binding, project-specific load allocations.

Response

The TMDL assessment found that dams are a significant contributor to temperature exceedances along with climate change. The TMDL is clear in assigning the 0.1°C allocation in aggregate to dams upstream of a given target site, and it provides information on the estimated current cumulative impact and reach impacts that can guide the implementation plans developed by the states.

Comment U31

Commenter Northwest Hydroelectric Association

Comment

Additionally, EPA's "free-flowing" scenario is problematic because it removes only those dams that are within the boundary of the TMDL, rather than applying the scenario all the way upstream. A true free-flowing scenario may further illustrate that the presence of the dams does not affect –or improves –temperature levels. Issues in how "free flowing" is defined likely skew the modeling results.

Response

Aside from the influence of Grand Coulee Dam in cooling the upper Columbia River in early summer, the dams contribute heat and warm the rivers during the TMDL timeframe (i.e., between June and October). Regarding the application and interpretation of the "free-flowing" scenario, see response to Comment U7, above.

Comment U32

Commenter Northwest Hydroelectric Association

Comment

These conservative definitions and assumptions are applied to develop Tables 6-6 through 6-9, which could be read to suggest allocations for individual facilities. But this does not appear to be EPA's intent, given the text and conclusions reached elsewhere in the document. As noted above, the data in these tables also result from inaccurate modeling. Thus, clarity is needed that, given the conclusions regarding the minimal impact of dams on temperature, alternative implementation measures are more likely to address the temperature exceedances than individual allocations to dams. The suggestion of individual facility allocations is the result of inaccurate modeling, and conflicts with the greater body of information and analysis that results in EPA's conclusion that dams have minimal impact on temperature.

Response

EPA has determined the modeling assessment is reasonable and accurate, and scientific peer reviewers have not identified flaws in the model and/or its application in the TMDL. See also response to Comment U30.

Comment U33

Commenter Oregon Department of Fish and Wildlife

Comment

The Draft TMDL study document describes using observed temperatures from various hydrosystem project forebay and tailwater monitoring locations to assess current (2011-2016) compliance with water quality standards for the study reaches. Migratory fish, including anadromous salmon and steelhead must migrate via hydrosystem project fish ladders to complete their lifecycles and reproduce. Water temperatures in fish ladders have been found to typically exceed water temperatures in associated tailwater areas where waters are well mixed. The majority of fish ladder water, other than at Lower Granite and Little Goose Dams, is drawn from near the surface water of the fore bay area which can be the warmest water temperature strata in a project forebay when reservoirs stratify. Temperature discontinuities between tailraces, fish ladders, and reservoir forebay areas can and do disrupt adult fish migration. ODFW recommends EPA assess water temperatures in hydrosystem fish ladders as well as tailrace and forebay monitoring locations to complete the final TMDL study document and compare those temperatures against state water quality standards set for salmon and steelhead which rear and migrate the lower Columbia and Snake rivers prior to setting load allocations.

Response

See response to Comment J4.

Comment U34

Commenter Oregon Department of Fish and Wildlife

Comment

The draft TMDL study material's analysis of water temperature in the lower Columbia and Snake rivers definitively shows that the lower four Snake River dams, and lower Columbia River dams, are the main causes of anthropogenic temperature problems. Reduced water travel time and increased surface area with exposure to solar radiation are primary contributors to high reservoir temperatures. As the draft TMDL study materials explain, "The 15 dams within the TMDL area have a cumulative warming effect during the summer and early fall." Specifically, the TMDL results show that the lower Snake River dams consistently raise the temperature of the lower Snake between 0.7 and 3.2 degrees C from July to October--often causing or contributing to violations of the applicable water quality standard. This is of particular concern for ESA-listed salmon and steelhead as these exceedances are an impairment of designated critical habitat in this reach. The draft TMDL study materials also suggest that the dams prevent the lower Snake from cooling periodically throughout the summer months in a manner that would facilitate fish migration even during otherwise hot years. These important and definitive scientific findings should help guide efforts to restore Columbia River basin Salmon and steelhead populations. Overall, the draft TMDL study materials show that temperatures in a free-flowing lower Snake River would be much more supportive of successful salmon and steelhead rearing and migration.

Response

See response to Comment U4.

Comment U35

Commenter Oregon Department of Fish and Wildlife

Comment

The draft TMDL study materials indicate that the Snake River upstream of the Clearwater confluence sometimes exceeds the 20° C water quality criterion. While true, such statements have resulted in confusion and misinformation; leading to claims by some that the lower Snake dams are being held responsible for water quality problems caused elsewhere. Such claims are misleading and disingenuous. The TMDL's data clearly show that water entering the lower Snake (e.g., at the Clearwater confluence) is cooler than the water leaving the lower Snake which is too hot for salmon and steelhead -and that the four lower Snake dams are the only significant anthropogenic cause of heat pollution in this reach. To avoid further confusion, ODFW recommends that the final TMDL document should clearly explain that the lower Snake River dams (not upstream conditions) are primarily responsible for water quality standard violations in the lower Snake River. Without these four dams, the lower Snake River would likely remain cool enough for salmon migration, even in very warm years like 2015.

Response

The TMDL and appendices provide adequate explanations of the findings for the lower Snake River. The warm temperatures at the upper boundary of the TMDL on the Snake River are a factor in the exceedances downstream, because these higher temperatures require larger cold water releases from Dworshak to cool the lower Snake River and achieve target temperatures at Lower Granite Dam. In addition, the lower Snake River dams are a significant source of warming in this area, to levels above the target temperatures.

Comment U36

Commenter Oregon Department of Environmental Quality

Comment

Federal and non-federal dams are a significant contributor to temperature pollution in the Columbia and Lower Snake. EPA's TMDL must determine how the operation of the dams and the pools that they create affect stream temperatures and identify how operational changes must be used to meet allocations made to each facility.

Response

The TMDL has determined the effect of dam impoundments on river temperatures. The evaluation of operational changes at the dams to meet the allocations in the TMDL is an implementation activity. Development of implementation plans and TMDL implementation are managed by the states. EPA will support state partners in implementation as appropriate.

Comment U37

Commenter Oregon Department of Environmental Quality

Comment

Corrections for TMDL tables

Table 1. Corrections for TMDL tables

TMDL Table: 6-4 Mainstem Columbia and lower Snake River dams

Comment: Add a row of information for Ice Harbor Dam.

Response

See response to Comment U2.

Comment U38

Commenter Oregon Department of Environmental Quality

Comment

Section 6.5.1 Dams: On page 45, the TMDL states:

EPA used the RBM10 temperature model to estimate the dams' impacts on river temperature by comparing daily average river temperatures with and without the presence of dams. The target temperatures are daily maxima. Since the diel variation is typically greater in a free-flowing river than when dams are present, the impact of the dams on the daily average temperature is greater than the impact on the daily maximum temperature. The daily average temperature is therefore a more conservative indicator of dam impact. This component of the analysis is considered as a margin of safety (Section 6.6).

The effect of reservoirs on dampening diel temperature fluctuations might not only reduce daily maximum temperatures and increase daily minimum temperatures immediately downstream from dams but might also increase daily maximum and daily average temperatures at certain locations further downstream. Reservoirs often reduce diel temperature fluctuations. Therefore, they can appear to "cool" the river because daily maximum tailrace temperatures are reduced. But daily minimum tailrace temperatures are also increased, which can result in greater average and daily maximum temperatures further downstream. As water that leaves the reservoir early in the morning flows downstream, it warms to daily maximum temperatures that are greater than temperatures would be in the absence of a reservoir. Therefore, simply eliminating diel fluctuations can result in warmer daily maximum temperatures up to a distance of a half days' time-of-travel downstream.

It is difficult to follow Steps 1-5 shown on page 45 describing the process used to estimate each dam's temperature impacts. Whenever referring to a column, it would be helpful to specify the column letter and make sure phrases in text exactly match titles in tables. For example, is "cumulative dam impact" the same as "RBM10 Cumulative Impact?" The description should also define terms such as "excess dam impact" and "cumulative excess dam impact."

Response

EPA acknowledges the complexity of the dam impact analysis and believes the explanation in the TMDL is reasonably clear and straightforward. EPA has revised language in the steps describing the process to estimate temperature impacts for better clarity. Also see response to Comment U28.

Comment U39

Commenter Pacific Fishery Management Council

Comment

The TMDL analysis of water temperature in the Columbia and Lower Snake rivers shows that the lower four Snake River dam impoundments, and certain Columbia River dam impoundments, are a significant source of human-induced temperature increases, along with climate change. Increased water residence time, coupled with greater surface area that leads to increased insolation, are the primary contributors to high summer reservoir temperatures. The TMDL also suggests that the dams prevent the lower Snake from cooling periodically throughout the summer months in a manner that would facilitate fish migration even during otherwise hot years. Overall, the TMDL shows that temperatures in a free-flowing lower Snake River would be much more supportive of successful salmon migration and spawning, and therefore salmon recovery.

Recommendation: These findings from the Federal agency charged with protecting the integrity and uses of our nation's waterways should guide efforts to restore Columbia River basin salmon populations and fisheries.

Response

See response to Comment U4.

Comment U40

Commenter PNGC Power

Comment

Given the long-term implications of this TMDL on federal dams critical to the Pacific Northwest's reliable and economical carbon-free power supply, it is important that EPA's TMDL accurately assess the impacts of federal dams on water quality.

Response

The modeling assessment provides estimates of the cumulative impact of dams. Since the dams and their impacts are interconnected, EPA determined that it was appropriate to identify and allocate the allowable dam impacts on water temperatures on a cumulative basis. EPA notes that that the lower Snake River dams are federally owned and operated, and the Columbia River dams are a mix of both federally operated and public utility district operated dams.

Comment U41

Commenter PNGC Power

Comment

Specific to this proceeding, we again strongly urge EPA to establish a TMDL that accurately assesses the impacts of federal dams on water quality.

Response

See response to Comment U40.

Comment U42

Commenters Benton Rural Electric Association, Big Bend Electric Cooperative, Blachly-Lane Electric Cooperative, Clearwater Power, Eugene Water and Electric Board, Fall River Electric Cooperative, Grays Harbor PUD, Inland Power and Light, Lewis County PUD, Mason County PUD 1, Okanogan County PUD, PNGC Power, PUD of Benton County, Raft River Electric Cooperative, Skamania County PUD

Comment

• This TMDL includes significant arbitrary assumptions, such as including large storage dams in its "free flowing" state. These larger dams can release artificially cool water during the summer. This inconsistent treatment (i.e., including some dams but excluding others) places an unfair temperature standard on the downstream dams.

• A 2002 study prepared by the Corps compared pre-lower Snake River dam measurements from 1955-1958 to measurements taken after the lower Snake River dams were constructed. The study found no evidence that river temperatures had increased, and instead remained unchanged or slightly lower after completion of the four lower main stem dams. This finding runs contrary to what we are seeing in this TMDL's modeling output (see NWRP's comments for citation).

• A 2002 peer-reviewed study from Pacific Northwest National Laboratory showed that dams within the Columbia River and Snake River basins tend to moderate extreme water temperatures. This finding is consistent with the Corp's 2002 finding described above.

Response

Regarding the free-flowing analysis, see response to Comment U7.

The most definitive estimates of dam impacts are made with models that compare temperatures with and without dams under identical hydrologic and weather conditions. This is the type of assessment conducted for the TMDL. A data analysis using measured temperatures before and after dam construction is significantly hampered by natural variation. See also response to Comment L9.

Comment U43

Commenter Pacific Northwest Waterways Association

Comment

The TMDL, as written, includes significant arbitrary assumptions, such as including large storage dams in a “free flowing” state. These larger dams can release cool water during the summer. This inconsistent treatment (i.e., including some dams but excluding others) places an unfair temperature standard on the downstream dams.

Response

The TMDL and supporting documents describe the assumptions of the TMDL related to its geographic scope. The temperature standard applies to a given river location independent of the source assessment. Regarding the free-flowing analysis, see response to Comment U7.

Comment U44

Commenter Port of Clarkston

Comment

The CLSRT TMDL needs to give appropriate weight to historical data, in order to properly identify heat pollutant sources.

The inadequacy of the boundary defined in the CLSRT TMDL is discussed above. Instead of using relevant information, the CLSRT TMDL simulated heat impacts outside the narrow footprint through a model (RBM 10) that has an arbitrary cap and compares results to so-called "free flowing" rivers during periods of time dammed up river water was released to cool the Snake and Columbia Rivers for the benefit of salmonids. To follow this simulation and to ignore historical pre-dam and pre-Dworshak cold water release data is the only way to incorrectly force a conclusion that the four lower Snake River dams contribute to water temperature warming.

Response

EPA disagrees that the RBM10 model includes any “arbitrary cap”. EPA has conducted and documented a transparent modeling assessment of river temperatures with and without Dworshak releases and discusses the assessment in the Scenario Report (Appendix D of the TMDL). The conclusion that the lower Snake River dams contribute to warming of river temperatures is based on a straightforward comparison of simulated river temperatures with and without the four dams. Also see response to Comment U7.

Comment U45

Commenter Port of Clarkston

Comment

•Several commenters have stated that the primary source of water heating in reservoirs is from solar energy and mixing with hot air due to wind-wave action. This is less pronounced in the LSR reservoirs because they are run-of-river reservoirs with constant downstream water movement whereas storage reservoirs like Dworshak have far more pronounced stratification because the water is not moving. The LSR reservoirs are in a relatively narrow canyon and have converted what was a shallow, warm summertime river to four reservoirs around 20-feet deep at the upper end to 100+feet deep at the next dam. In contrast, Dworshak Reservoir (DWR) on the Northfork Clearwater River ranges from a cold mountain river a few feet deep at the upper end to 602 feet deep 2-mile-wide reservoir at the dam. The LSR reservoirs under pre-1990s circumstances did not stratify to any extent. That is, the surface water would only be a degree or so warmer than the underlying, flowing reservoir water. Dworshak, a storage reservoir, is designed to capture winter and spring flood water and store it for release over the summer. In summer, Dworshak stratifies at 24° C in the top layer, up to 20-feet deep, and 50° F (10°C) down to 40° F (4.4 °C) in the lower and deepest parts of the reservoir.

•Before the mid-1990s, LGR received waters up to 26° C from the Snake River (Anatone gauge) and 25° C from the Clearwater (Spaulding gauge). The hot water passed through LGR and about a week later reached LGO. Similarly, a week or so later, the hot water reached LMO, and another week, IHR.

Response

EPA has not conducted an analysis of data collected before the mid-1990s or data on stratified temperatures within Dworshak reservoir. EPA has determined that the general descriptions of the dams and temperature conditions in the comment are accurate, and the river characteristics of the lower Snake River are reasonably represented in the RBM10 model.

Comment U46

Commenter Port of Clarkston

Comment

Opponents of the LSR dams appear to be pushing temperature problems as a means of forcing removal or breaching of the dams. Unfortunately, that would probably worsen rather than lessen the temperature problem. The shallow more turbulent river would be more subject to heating in the arid desert-like canyon than the deeper reservoirs experience. The PNNL report indicates that cold-water releases from Dworshak Reservoir regain some temperature from the dam down to Lewiston due to mixing with Clearwater River water from above Orofino, and due to solar and wind action in the lower Clearwater canyon.

Response

The TMDL modeling assessment indicates that daily average temperatures would be substantially cooler in a free-flowing Snake River. Current Dworshak Dam operations provide substantial cooling of the lower Snake River, though the cooling benefits diminish as the water flows downstream to each successive target site.

Comment U47

Commenter Port of Clarkston

Comment

Before the dams were constructed, water temperatures in the lower Snake River reached higher temperatures than have occurred since the dams have been in operation. The Proceedings of the Twelfth Pacific Northwest Symposium on Water Pollution Research (Public Health Service (PHS) 1963) provides the following: "The Snake River normally reaches a temperature of 65ºF late in June and quickly exceeds 70ºF. where it remains throughout the summer months…." Figure 3 on Page 47 of that document (Attachment 2) shows a maximum temperature in 1958 of approximately 80ºF, and periods exceeding 68ºF lasting for 60 to 75 days in 1955, 1956, 1957, and 1958. Ice Harbor Dam was installed in 1961, Lower Monumental in 1969, Little Goose in 1970, and Lower Granite in 1975. Therefore, water temperatures in the free flowing river before the dams were constructed exceeded the water temperature standards. Many of the declarations by the plaintiffs' contain generalities about storage reservoirs that do not apply to the lower Snake River run-of-river reservoirs. From the PHS, 1963: "In general, it can be said that large and deep impoundments will decrease downstream water temperatures in the summer and increase them in the winter, if withdrawal depths are low; that shallow impoundments with large surface areas will increase downstream water temperatures in the summer; that water periodically withdrawn from the surface of a reservoir will increase downstream water temperatures; that a reduction in normal stream flow below and impoundment will cause marked temperature increases, and that 'run-of-river' impoundments, when the surface area has not been markedly increased over the normal river area, will produce only small increases in downstream water temperatures….".

The lower Snake River reservoirs are run-of-river reservoirs that are for the most part narrow and deep. My review of the temperature data for the four reservoirs over the years indicates that temperature rises start with waters entering Lower Granite Reservoir (early to mid-July) and progress downstream through Ice Harbor Reservoir (mid-July to early August) with little additional increase within the reservoirs (Attachment 3). As cool water enters Lower Granite Reservoir in late August or September, the reverse occurs with a cooling trend progressing downstream through the series of reservoirs. I have reviewed the maximum water temperatures reached at each of the four lower Snake River dams for each year since they became operational. Attachments 4, 5, 6, and 7 show maximum water temperatures at Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams since they have been in place. The trend lines on these graphs show that the maximum water temperatures have declined since the dams were installed.

Response

TMDLs are focused on current conditions rather than historic conditions, and the targets for this TMDL are fixed numeric temperature criteria and not natural conditions, consistent with applicable Oregon and Washington water quality standards. See also response to Comment U46.

Comment U48

Commenter Port of Clarkston

Comment

The trends of water temperatures at the four dams are downward since they went into operation (Attachments 4, 5, 6, and 7). This phenomenon is strongly influenced by the release of cold water from Dworshak Reservoir. This practice was started by the Corps on an experimental basis in 1991 and became a regular operation in the 1995 as a measure to cool off the lower Snake River for the benefit of ESA listed fall chinook. The effect is most dramatic at Lower Granite Dam where temperatures have been 71ºF or lower for the five of the past six years. From 1975 to 1991, maximum temperatures ranged from 72 to 78ºF. 10. The typical pattern of water warming up in the lower Snake River is almost entirely dependent on the inflow of warm water from the Clearwater and Snake rivers into Lower Granite and then Little Goose Reservoir. There are no significant tributaries from the confluence of the Snake and Clearwater until below Little Goose Dam. The Palouse and Tucannon rivers enter Lower Monumental Reservoir below Little Goose Dam and influence temperatures in Lower Monumental and Ice Harbor reservoirs.

The maximum water temperature of record at the Spalding Gage on the Clearwater River above Lower Granite Reservoir was 82ºF (28ºC), August 13, 1963. However, temperatures at the Spalding Gage are influenced by cold water discharges from Dworshak Reservoir on the North Fork of the Clearwater River. Just up the main Clearwater River above the North Fork at the Orofino gage where temperatures are not affected by Dworshak releases, water temperatures reached 85ºF (29.5ºC), July 25, 1994, and 78ºF (25.5ºC), August 7, 1997 (USGS, 1997). Temperatures at the Anatone Gage in the Snake River just above Lower Granite Reservoir reflect the combined water temperatures from the Salmon, Grande Ronde, and Imnaha rivers, and the Snake River from Hells Canyon. Hells Canyon water temperatures are affected by the temperatures of releases from Brownlee Reservoir (a storage reservoir) as passed through the Oxbow and Hells Canyon (run-of-river) reservoirs. Maximum water temperature at the Anatone gage was 78ºF (25.5ºC), August 26, 1991, and 74ºF (23.5ºC), August 6-7, 22-23 in 1997 (USGS, 1997). In 1998, maximum water temperatures equaled the 1991 mark of 78ºF (USGS, 1998). In summary, this data shows that as discharge from the Snake and Clearwater rivers warms up in the summer, the lower Snake River warms up starting with Lower Granite Reservoir and working on downstream over a matter of a few days. As the weather cools, and cool water starts coming in from the Clearwater and Snake rivers, the reservoirs cool off from Lower Granite working downstream to Ice Harbor Reservoir.

The four lower Snake River reservoirs are run-of-river reservoirs, not to be confused with storage reservoirs. Storage reservoirs are typically large reservoirs with large surface areas. The surface waters warm during the summer, and the reservoirs typically stratify (develop layers of warm water above the cool water below). Currents in run-of-river reservoirs typically mix the water and prevent stratification even during summer low flow periods. There may be localized warming in shallow areas, but the reservoirs are usually within 1 or 2ºF from top to bottom. This is the case with the lower Snake River reservoirs.

The allegation is made that the Snake River reservoirs have increased the number of days the temperature exceeds the 68ºF (20ºC) standard. I found that from 1955 through 1958 (before the dams were in operation), temperatures exceeded 68ºF for 60 to 75 days per year (Attachment 2). At Ice Harbor Dam, the number of days that water temperatures exceeded 68ºF ranged from 0 in 1993 to over 81 in 1987 (Attachment 8). The average number of days over 68ºF was 49 days, considerably less that the 60 to 75 days from the 1955 – 1958 data. At Lower Monumental, Little Goose, and Lower Granite dams, the average number of days exceeding the standard was 45, 44, and 44 days respectively, again well below the number of days from the period before the dams.

Trends for maximum temperatures have been downward at all four dams (Attachments 9, 10, 11, and 12). At Little Goose Dam, where there is a significant break in the data because fish counting was discontinued for a number of years, the trend for days exceeded is slightly upward (Attachment 11). The trend is consistently downward at the other three dams. Low flows from the Clearwater and Snake rivers and hot summertime temperatures contributed to the longer period of exceeding the standard in some years, but maximum temperatures have been lower since 1991 in all four reservoirs due to cold water releases from Dworshak Reservoir. The cooler waters from the Clearwater have mixed with the warmer waters from the Snake River resulting in cooler waters in the lower Snake River reservoirs.

Response

See response to Comment U47.

Comment U49

Commenter Port of Clarkston

Comment

When I looked at when temperatures exceeded the standard, it was apparent that the first day of exceeding typically came earlier at Lower Granite Dam than at Little Goose. The first day at Little Goose typically came before the first day at Lower Monumental and the first day at Lower Monumental before the first day at Ice Harbor (Attachment 8). This indicates that warm water from the Snake and Clearwater rivers was moving down through the system. The same trend was apparent for the last day exceeding the standard. This indicates that cool water was moving from the Snake and Clearwater rivers down through the reservoir system. If the reservoirs were causing significant heating in the river, and the temperatures of the tributaries were not having a significant influence, I would expect the warming trend to progress from Ice Harbor reservoir, upstream. The reason why is because the canyon is shallower, and the climate hotter and dryer in the Ice Harbor area than in the area of the upper reservoirs.

Response

TMDLs typically employ models to incorporate the hydrologic and heat transfer processes affecting river temperatures. In this case, the RBM10 model provides robust estimates of dam impoundment impacts using carefully developed model setups that isolate the impacts from the dams (cumulatively) on the river temperatures from other factors that also influence river temperatures. By comparing the current conditions (dams in) with the free flowing (dams out) scenarios, with other factors being identical, the only difference between the scenarios is the geometry of the river and dam operations. These differences provide a reasonable estimate of the dam impact that is isolated from the other influences on temperatures.

Comment U50

Commenter Port of Clarkston

Comment

The plaintiffs allege that the way the Corps is operating the dams causes increased water temperatures. I am convinced that the water temperatures in the reservoirs are controlled primarily by the water temperatures coming into Lower Granite Reservoir from the Snake and Clearwater rivers, and into the lower two reservoirs from the Tucannon and Palouse rivers. There are no operational measures that I know of that the Corps could take at the Lower Snake River dams that would measurably reduce the temperature of the waters in the reservoirs. The Corps is making cold water releases from Dworshak Reservoir that, as I have described, make a substantial difference in lowering water temperatures in the lower Snake River.

Based on my review of the data, and over 28 years of experience in dealing with temperature issues related to dam operations, it is my conclusion that the water of the lower Snake River does not get as warm as it did before the dams were installed. It is also my conclusion that water temperatures are determined more by the temperature of inflow from the main river and tributaries than by the heating of surface waters in the run-of-reservoirs. The reservoirs may slow the passage of hot water down the river, but the length of time that criteria are exceeded is less than it was before the dams were installed.

Response

EPA agrees that river temperatures at the boundaries of the TMDL and Dworshak operations influence downstream temperatures in the lower Snake River. The TMDL analysis also indicates that dams have a substantial, cumulative warming impact on the rivers. Regarding historic conditions, see response to Comment U47. The range of changes to operational measures to meet the allocations relate to implementation of the TMDL. Implementation is the responsibility of the states, and EPA is committed to supporting the states, federal agencies and tribes in implementing the TMDL, as appropriate.

Comment U51

Commenter Port of Clarkston

Comment

Heated waters from southern Idaho flow through Hells Canyon to the lower Snake where they typically enter Lower Granite Reservoir with high temperatures up to 78 degrees.

Water coming in from the Clearwater River historically reached up to 75 degrees. In the mid-1990s, the Corps began releasing cool water from Dworshak Reservoir to cool the lower Snake River. This was a complex procedure because Dworshak Hatchery pumps water from the North Fork below the dam for rearing steelhead and spring Chinook salmon.

Juvenile salmon growth is controlled by water temperature, so temperature of water released at the dam had to be carefully regulated to rear fish to release size in one year. This was achieved with regulating gates in the dam and cool water from Dworshak has allowed the Corps to keep lower Snake River below 70 degrees almost every year and below 68 degrees much of the summer each year.

Response

See responses to Comment U46 and Comment U50.

Comment U52

Commenter Port of Clarkston

Comment

Because the warm water rides above the cool water warm water in the Lower Granite fish ladder was a concern. The Corps solved this problem by pumping cool water up at the fish ladder exit where it goes into the ladder. Before, warm water caused fish to stop in the ladder, where they now pass safely upstream. This problem can occur to a lesser degree at Little Goose, Lower Monumental, and Ice Harbor dams, but now a solution to the problem is known. Nonetheless, warm water continues from Hells Canyon downstream, and in a deposition in a 1990s lawsuit by environmentalists against the Corps for violating temperature and total dissolved gas state standards, I tracked the progress dam by dam, and it clearly showed that the warm water was coming from Hells Canyon and the Clearwater River, not heating up in the lower Snake River Reservoirs.

Response

See response to Comment U50.

Comment U53

Commenter Port of Clarkston

Comment

In current and recent lawsuits, environmentalists have asserted that water in all reservoirs heats up. That is true in reservoirs where there is no current to mix warmer water with cooler water. Storage reservoirs like those in southern Idaho and Dworshak Reservoir are subject to surface warming in the summer. They stratify with a warmer layer above and colder water below. If you have gone swimming in Dworshak Reservoir in August, you may have been in 75-degree water with your toes in 50-degree water. The lower Snake River reservoirs are run-of-river reservoirs. Limnology studies showed that except in limited backwater areas, there is very little heating of surface waters because they are continually moving. Even during low flows of late summer or in the winter, the waters are mixing all the time.

Response

While run-of-river and the storage dams are notably different in physical and thermal conditions, EPA determined in the TMDL modeling assessment that both types of dams had a warming impact on the Columbia and Snake rivers during most of the time frame of the TMDL (June through October). The exception is Dworshak Dam, which releases cold water in the summer and fall using a selective withdrawal structure built into the dam.

Comment U54

Commenter Port of Clarkston

Comment

Run of-the-river-dams, specifically the four lower Snake River dams--contrary to statements in the CLSRT TMDL--do not contribute heat and instead moderate water temperature extremes.

The following graph showing Lower Granite Dam temperature input and outputs couldn't be more current. It records information as of 8 a.m. yesterday morning. This graph shows high water temperatures upstream of Dworshak on the Clearwater River and on the mainstem Snake River near Anatone, Washington. Also, the graph shows the moderating effect of Dworshak cold water releases at the Lewiston gauge, and lastly, the graph demonstrates the moderating effects of the reservoir, as illustrated by the fact that input temperatures are increasing, cold water releases from Dworshak are slightly decreasing, but the water temperatures at the Lower Granite tailwater is decreasing August 17 - 19, 2020 when the expected result would be continued increase in temperatures.

The incorrect assignment of water warming to run-of-the-river dams-forced by EPA only through manipulation of the boundary inputs of the RBM10 model, with states guiding EPA to this conclusion for political, not scientific, reasons-is for the purpose of forcing federal agencies to solve a water quality problem that is not from human activities but from air temperatures in existence prior to human record. To assert that run-of-the-river dams contribute to heat load is to ignore historic data discussed above.

Response

See response to Comment U44.

Comment U55

Commenter Port of Whitman County Commissioners

Comment

“Opponents of the LSR dams appear to be pushing temperature problems as a means of forcing removal or breaching of the dams,” writes John McKern, U.S. Army Corps of Engineers fish and wildlife biologist (retired). “Unfortunately, that would probably worsen rather than lessen the temperature problem. The shallow, more turbulent river would be more subject to heating in the arid desert-like canyon than the deeper reservoir’s experience.”

Response

See response to Comment U46.

Comment U56

Commenter Port of Whitman County

Comment

Opponents of the LSR dams appear to be pushing temperature problems as a means of forcing removal or breaching of the dams. Unfortunately, that would probably worsen rather than lessen the temperature problem. The shallow more turbulent river would be more subject to heating in the arid desert-like canyon than the deeper reservoirs experience. The PNNL report indicates that cold-water releases from Dworshak Reservoir regain some temperature from the dam down to Lewiston due to mixing with Clearwater River water from above Orofino, and due to solar and wind action in the lower Clearwater canyon. It could be suggested that more cold water could be released from Dworshak Reservoir. However, Dworshak National Fish Hatchery pumps the majority of its rearing water from the North Fork below the dam. Installing a large enough pipeline from the reservoir with temperature control would be very expensive. Changing the rearing regime would be more problematic than it has been by changes thus far. The growth of steelhead and Chinook reared at DNFH is governed by water temperature. Further cooling the water pumped into the hatchery could force 1-year rearing to smolt size to 2-year rearing, reducing the mitigation capacity of the hatchery.

Response

See response to Comment U46.

In addition, potential changes to dam operations to improve river temperatures, such as increasing more cold water from Dworshak Reservoir, can be considered as options during TMDL implementation. EPA agrees that a number of interested parties and leaders should work together now, and into the future, to restore water temperatures in the Columbia and Lower Snake Rivers. EPA is committed to supporting the states, tribes, federal agencies and other interested parties during TMDL implementation.

Comment U57

Commenter Public Power Council

Comment

EPA should remove cooling water impacts of Dworshak from the free-flowing scenario used to calculate allocations. This cooling water impact is not representative of water temperatures in a free-flowing river without dams and is inappropriate.

Response

See response to Comment U7.

Comment U58

Commenter U.S. Army Corps of Engineers

Comment

Sources outside the allocation structure of this TMDL (e.g. climate change, upstream human activities in Idaho and Canada, tributary loading) contribute to warmer temperatures in the mainstem Columbia and Snake Rivers, making it impossible to meet the numeric and narrative water temperature criteria throughout the TMDL study area, and particularly in the lower rivers during certain times of year. The Corps should only be expected to address temperature effects associated with operation and maintenance of the dams, not potential exceedances caused by other sources (e.g., water coming into the TMDL study area from Canada and Idaho or tributary sources).

Response

The TMDL modeling scenarios isolate the dam impacts from the boundary conditions at the Canadian and Idaho borders. Also see response to Comment U56.

Comment U59

Commenter U.S. Army Corps of Engineers

Comment

In addition to the above comments, the Corps offers specific technical comments and suggested edits to the TMDL as follows:

Clarify definition of free-flowing which is used throughout the document to explain that projects are influenced by tributary loading, upstream dams and the operation of those dams. Text included in Section 4.2 (page 30) describes this adequately, but this nuanced differentiation is not carried into tables. Consider relabeling as “Scenario X” to limit misleading readers.

In Table 6-22, add footnote to the Canadian Border, Anatone and Clearwater Confluence, indicating that these points are impacted by tributary loading, upstream dam storage regulation and should not be considered "free-flowing" conditions.

Additionally, please fix the reference to “no dam” in the steps listed on page 45, Step 2 for consistency.

Response

EPA has determined labeling the scenario “free-flowing” is more helpful for the reader. Given the clarity on the scenario characteristics, both earlier in the TMDL document and in the Model Scenario Report (Appendix D), EPA is not making changes to the description of the free-flowing scenario at this time.

The reference to “no dams” in the analytical steps was removed, so now it is clear that this step is referring to the free-flowing condition as defined elsewhere.

Comment U60

Commenter U.S. Army Corps of Engineers

Comment

The method used to calculate the “allocation exceedances” is biased due to the inconsistent use of daily average and daily maximum temperatures (as documented on page 45, paragraph 2). The data used for the calculation is prior to the development of the allocation for dams and therefore, it is not appropriate to term it an “exceedance” because the allocation did not exist at that time of the data collection. Furthermore, the “allocation exceedance” is not a required element of the TMDL. The Corps is concerned that this calculation could have unintended consequences during implementation and non-TMDL related activities. Please either accurately recalculate the “allocation exceedance” using the daily maximum temperature and rename, or, remove from Tables 6-6 through 6-9 and update the text accordingly.

Response

In this section of the TMDL, “allocation exceedance” refers to an estimated temperature impact greater than the cumulatively allocated amount of allowable temperature impact. The “maximum measured exceedance” is the maximum measured temperature minus the target temperature. The maximum measured exceedance is used in one step of the calculation of allocation exceedance, and this step reduces the estimated dam allocation exceedance to the measured exceedance when the dam impact is greater than the measured exceedance. EPA acknowledges that varied data types (i.e., model, measurement) and metrics are used in the estimation of dam allocation exceedance, but the use of conservative metrics in this set of calculations is reasonable as a margin of safety.

Regarding the daily average versus daily maximum metric, see response to Comment U11.

Comment U61

Commenter U.S. Army Corps of Engineers

Comment

e. Ice Harbor Dam is missing from Table 6-4. Please correct.

Response

See response to Comment U2, above.

Comment U62

Commenter U.S. Army Corps of Engineers

Comment

Tables 6-6 through 6-9 are hard to follow and should be edited. The “RBM10 Cumulative Impact” is important source assessment information. We suggest simplifying these tables into one table with each row containing a river location and each column a month. The “RBM10 Cumulative Impact” would be the result and should be highlighted if there is a “Measured Target Exceedance”. This would resolve the biased calculation using daily average and daily maximum but still provide useful information. If these tables remain, the Corps suggests including all data that are used to quantify allocation exceedances (e.g., observed data) in the table so that it is easier to understand the math applied to each river reach.

Response

EPA has determined that all of the data in these tables are needed to demonstrate how EPA estimated cumulative dam impacts on river temperatures, measured temperature exceedances, and estimated temperature impact reductions needed from the dams in order to achieve the cumulative 0.1°C load allocation set by the TMDL.

Comment U63

Commenter Public Utility District No. 1 of Chelan County

Comment

Dams and other sources within the TMDL area are, at most, only one of several contributors to river temperature.

First, many types of sources contribute to elevated river temperatures, not just regulated facilities that are within or that discharge to the river. Many of these sources are natural or outside the geographic scope of the Initial TMDL area, and thus cannot be addressed by it. For example, there are long-term trends in climatic conditions and air temperature in the Columbia and Snake River basins. The Initial TMDL estimates that these trends alone account for a river temperature increase of approximately 1.5°C. River temperatures might also change due to natural variation in local hydrology, geomorphology, or vegetation patterns. EPA has correctly acknowledged that exceedances in the mainstem of the Columbia River are, to a significant degree, caused by temperature impacts originating in Canada or Idaho.

In fact, current temperature levels are not unique; they have been elevated for decades. Research from another federal agency, NOAA Fisheries, indicates that temperatures in some reaches often exceeded 20°C, and sometimes even 25°C, prior to the construction of many dams. Other research, assisted by EPA using the same model as the Initial TMDL, found that even dam removal would do little to reduce temperature exceedances. In the Initial TMDL, that model again finds that the applicable numeric criterion would often be exceeded even in a no-dam, free-flowing scenario. In fact, the modeling shows that, in some instances, dams have a cooling effect on water temperatures.

Response

EPA agrees, and the TMDL reflects, that many sources contribute to elevated river temperatures. Given the warming trend due to climate change, EPA does not agree that “current temperatures aren’t unique; they have been elevated for decades.” Natural variation in river temperature is significant, as shown in the monitoring data and the TMDL modeling assessment. Nevertheless, there is a clear and significant warming trend in river temperatures. EPA conducted a technical review of available research on the impacts of regional climate change, particularly increasing air temperatures, on Columbia and lower Snake River temperatures, with data and information dating back to 1960 (See Appendix G to the TMDL).

Issues and discussions around dam removal are outside of the scope of the TMDL. EPA assessed a hypothetical free-flowing condition, with no dam impacts included within the study area, in order to assess the cumulative impact of the dams on river temperatures and assign the load allocation for the non-point source temperature impacts of the dams in the TMDL.

Comment U64

Commenter Public Utility District No. 1 of Chelan County

Comment

Neither Rocky Reach nor Rock Island Dam substantially contributes to temperature criteria exceedances.

As previously noted, Chelan PUD operates two Projects on Columbia River segments subject to the TMDL: the Rocky Reach Dam at river mile 472 and the Rock Island Dam at river mile 453. Both Projects are situated within Jurisdictional Reach D, hold hydropower licenses from the Federal Energy Regulatory Commission ("FERC"), and have received Section 401 water quality certifications from Ecology. Both Projects, moreover, operate in run-of-river mode with relatively modest storage capacities. As a result, their impacts on river temperature are small.

That conclusion has been affirmed, for example, by the Comprehensive Settlement Agreement for the Rocky Reach Project. This agreement was joined by a large number of stakeholders in the Rocky Reach relicensing proceedings before FERC. Its component Water Quality Management Plan finds that "[r]un-of-river hydroelectric projects, such as the Rocky Reach Project, have a de minimis effect on water temperatures" and that past EPA modeling found less than a 0.1 °C effect on summertime Columbia River temperatures.

Although the Initial TMDL's analysis differs in its details, it too demonstrates that Chelan PUD's facilities are not a substantial source of elevated temperatures in the Columbia River. We interpret tables 6-6 through 6-9 of the Initial TMDL to indicate that, in July and August, when there is a small amount of modeled reach-specific heating within the Chelan PUD Project reaches (no more than a total of 0.4 °C), the cumulative contributions of dams above the Snake River confluence, including the Chelan PUD dams, either do not exceed the Initial TMDL's 0.1 °C cumulative allocation (July) or exceed the allocation by only a small amount (a maximum of 0.4 °C in August). In September and October, when there is a cumulative allocation exceedance, the reach-specific heating within the Chelan PUD Project river reach is zero or negative, meaning the run-of-the-river nature of the Projects' contributes to cooling the river.

Moreover, the Initial TMDL's analysis of the temperature effects of dams is based on assumptions that are designed to allow a margin of safety, such that the actual effects are less than the analysis indicates. For example, the Initial TMDL determines exceedances based only on the highest daily temperatures during a particular month, even though the applicable criterion for Jurisdictional Reach D is a seven-day average of daily maxima. The temperature effects of the dams are also assessed using a daily average temperature, which the Initial TMDL recognizes is "a more conservative indicator of dam impact" than use of a daily maximum. This is because dams dampen diel temperature fluctuations, resulting in less effect on daily maximum temperatures-the basis for the temperature criteria-than daily average temperatures. Based on the above, it is likely that Rocky Reach and Rock Island Dams are even smaller contributors to the observed temperature exceedances in the river than the small contributions identified in tables 6-6 to 6-9.

Any small temperature increases caused by the Chelan PUD Projects should also be assessed against the measures Chelan PUD has already taken to address temperature. The Initial TMDL recognizes that tributary restoration projects can reduce temperatures in the mainstem. For example, the Habitat Conservation Plans in which Chelan PUD participates fund projects to restore tributary habitat. Through these projects, Chelan PUD and its partners identify restoration projects that also help to improve tributary temperature.

Response

While certain individual dams may have small impacts, there is also the issue of the cumulative impacts of the 15 dams in the study area on river temperatures. EPA agrees with the comment about efforts to improve tributary temperatures and habitat. See also response to Comment U56.

Comment U65

Commenter Public Utility District No. 1 of Chelan County

Comment

EPA should consider an alternative terminology for "free-flowing. "

The use of the term "free-flowing" to represent the baseline conditions without dams is misleading. As the Initial TMDL notes, "EPA's evaluation does not consider or reflect free-flowing conditions upstream of the TMDL study area boundaries in Canada or Idaho." A truly free-flowing condition would be reflective of the natural conditions or natural background levels, which is defined in the Washington water quality standards as "surface water quality that was present before any human-caused pollution." Furthermore, the Initial TMDL acknowledges that "EPA's estimate of the ... temperature conditions without the 15 dams and point sources ...do not represent the 'natural' river temperatures because the impacts of numerous sources remain imbedded in the temperature predictions both within the TMDL area (e.g., climate change) and outside the TMDL area (e.g., loading from sources upstream of the TMDL boundary in Idaho and Canada)." Thus, the anthropogenic factors outside of the TMDL boundary have not been entirely removed in the "free-flowing" scenario. Therefore, we suggest EPA consider the use of an alternative terminology such as "background condition" to accurately indicate that this is the condition against which the TMDL evaluates anthropogenic temperature effects.

Response

The term “free-flowing” more accurately describes this scenario than the term “background condition” because “background” implies that natural conditions are simulated, when this scenario, as noted, does not include natural conditions at the boundaries. The defining characteristic of this scenario is that the river geometry is set to free-flowing conditions within the TMDL study area.

Comment U66

Commenter Consumers Power, Inc.

Comment

We are also concerned about seemingly arbitrary decisions to include some large storage dams in modeling the hypothetical “free flowing” state of the river while excluding others. Such inconsistent treatment of major river components significantly increases the risk of introducing bias into the EPA’s modeling results, leading in turn to possibly unfair and undesirable state policy outcomes which are based on this body of work.

Response

See responses to Comment U43 and Comment U7.

Comment U67

Commenter Northwest River Partners

Comment

RiverPartners recognizes that river temperatures are a serious environmental concern, especially pertaining to salmonid survival. That said, while there have been occurrences of spikes in temperature in the lower Snake and lower Columbia rivers due to soaring air temperatures during heat waves, these events are outliers, not the norm.

When considering the effect of dams on river temperatures, it is also important to recognize that damaging water temperatures are not unique to the impounded rivers. For example, in 1994, due to record high water temperatures, approximately 466,000 adult fish perished in the undammed Fraser River before reaching their spawning grounds.

More recently, record breaking temperatures in Alaska led to die-offs in several undammed rivers. One event in particular, originally reported by NPR, highlighted the problem. An official estimate was not released, but biologists believe as many as 200,000 to 300,000 fish were in the river during the extreme heat event.

In 2002, a team of researchers conducted a water temperature study on behalf of the US Army Corps of Engineers ("USACE"). The team compared pre-lower Snake River dam measurements of water temperature from 1955-1958 to measurements taken after the lower Snake River dams were constructed. The research found no evidence that river temperatures had increased as a result of the dams, and instead appeared to have remained unchanged or slightly lower. The team identified air temperature and flow levels as the biggest influences on temperatures in the river.

Air temperatures in the Columbia River Basin have trended upward significantly since 1955. Data available through the University of Washington's climate change tools show that the average air temperature recorded near Kennewick, Washington, has increased at a rate of 0.37 degrees Fahrenheit per decade. (Appendix 1 of this document includes a graph of air temperatures provided through the University of Washington's Pacific Northwest Temperature, Precipitation, and Snow Water Equivalent Trend Analysis Tool.)

These conditions would suggest higher water temperatures in the lower Snake River over time, but as noted above, the 2002 Corps of Engineers study demonstrated that lower Snake river temperatures remained unchanged or slightly lower than pre-impoundment levels.

As will be discussed later, we strongly encourage that the EPA test the veracity of its TMDL against these real-world temperature comparisons before and after the lower Snake River dams were constructed.

If the TMDL model cannot replicate the actual outcomes, then the model needs to be recalibrated or redesigned before it can suitably guide Northwest regional energy policy.

Response

RBM10 is suitable for use in developing this TMDL because the RBM10 model has been calibrated against decades of measured river temperatures in both free-flowing and impounded locations. In addition, RBM10 reflects the best science currently available to EPA for purposes of this TMDL. The success of the calibration demonstrates that the model is capable of estimating the effects of river impoundment at the dam locations. EPA does not believe additional model testing or calibration is necessary.

Water quality models like RBM10 are the best available tools for estimating the nonpoint source dam impacts on river temperatures. Impacts estimated using river temperature measurements 1-2 years before and after dam construction will be highly variable due to high natural variation in river temperatures. Regarding applying RBM10 to 1950s conditions, EPA does not have resources to gather data and conduct such an assessment. Potential limitations of such an effort would include data quality/representativeness concerns, and likely substantial data gaps (e.g., for boundary conditions) in the historic data could also hamper the quality of a model simulation in this period.

Comment U68

Commenter Northwest River Partners

Comment

Assumptions Leading to Unintended Biases in the Model

Additionally, in its CLSRT TMDL, EPA arbitrarily kept some dams in and left others out of its estimation of temperatures in a hypothetical “free-flowing” river. This decision, as an unintended consequence, led the RBM10 model to incorrectly attribute increased temperatures to downstream dams. To elaborate, the CLSRT TMDL demonstrates that the hottest water in the modeled river system occurs on the Snake River at Anatone, WA (River Mile 167), upstream of the Snake’s confluence with the Clearwater. The annual maximum river temperature at Anatone is 24.2 degrees Celsius.

The CLSRT TMDL also shows that river temperatures upstream of Dworshak Dam on the Clearwater River are significantly higher (by roughly 4.5 degrees Celsius) than the water released from Dworshak Dam, due to that dam’s ability to draw water from its cooler depths.

Because the releases from Dworshak Dam are unseasonable cold in the summer, temperatures downstream of Dworshak will immediately start to warm toward the equilibrium created by the ambient air temperatures. However, the RBM10 model mistakenly attributes this warming to the downstream dams, instead of the ambient temperatures.

This same challenge regarding the RBM10 model was submitted in comments to EPA Region 10, dated February 8, 2019. In this case, the comments pertain to the effect of Grand Coulee Dam instead of Dworshak Dam, but the underlying issue is the same. The commenter noted:

It is clear and well understood that Grand Coulee Dam releases unseasonably cold water in the early summer and unseasonably warm water in the late summer and fall. Consequently, temperatures downstream of Grand Coulee Dam will respond in the direction towards equilibrium with atmospheric conditions and the magnitude of this response will be proportional to the difference from natural or 'free-flowing' conditions. This has the effect of showing large temperature 'impacts' in the river closest to Grand Coulee Dam.

Northwest RiverPartners has other technical concerns related to CLSRT TMDL and the RBM10 model. These concerns are included in Appendix 2 of our comments.

Again, RiverPartners sincerely respects the challenges of trying to model a river system as complex as the Columbia-Snake system. However, because the CLSRT TMDL is intended to be used by the states of Washington and Oregon to develop energy and environmental policy, a known shortcoming in the RBM10 model, as described above, indicates the model may not be suitable for its purposes.

Whatever model is ultimately utilized by EPA for its TMDL should be consistent in the inclusion/exclusion of all dams in its free-flowing scenario.

Response

The TMDL assesses impacts of the dams within the clearly defined geographic area of the TMDL, and it assumes the current river temperatures in the mainstem rivers at the upstream boundaries**.** Dworshak Dam is located within the State of Idaho, outside of the TMDL study area. Its current operations and influence on river temperatures are represented in the boundary temperatures at the upstream end of the Snake River portion of the TMDL. The model estimates for the impact of the lower four Snake River dams are independent of Dworshak Dam operations; they are representative of the changes in river geometry and hydraulics when comparing the model scenarios of an impounded river system (current conditions) and a free-flowing river system (modeling temperatures without any dams in place). EPA has determined it is reasonable and appropriate to estimate this impact of the dams on river temperatures under current conditions upstream of the four lower Snake River dams located within the TMDL study area.

As noted in the TMDL, dam impacts on river temperatures are linked and cumulative, so temperatures released by an upstream dam (e.g., Grand Coulee) will influence the impact of the downstream dams. This is not a flaw in the analysis. EPA believes that the RBM10 model provides the best available information on the cumulative impacts of the dams, and these estimates inform the TMDL.

Comment U69

Commenter Northwest River Partners

Comment

Alternative Approaches

A 2002 peer-reviewed study from Pacific Northwest National Laboratory showed that dams within the Columbia River and Snake River basins tend to moderate extreme water temperatures. The PNNL paper states:

…the reservoirs decrease the water temperature variability. The reservoirs also create a thermal inertia effect that tends to keep water cooler later into the spring and warmer later into the fall compared to the un-impounded river condition.

The chart below comes from the 2002 PNNL paper. Critically, you can see that the study showed that the river temperatures at Ice Harbor dam—the dam furthest downstream on the lower Snake River—tends to shift the heat out of the key summer months and into the autumn months where it poses less of a threat to salmonid health.

While the PNNL work also relied on a one-dimensional model for predicting river temperatures, this peer-reviewed study is more consistent with the 2002 study by USACE referenced earlier, which utilized actual air and river temperature data before and after the lower Snake River dams were built. As a reminder, those data sets showed that although air temperatures had risen after the construction of the four lower Snake River dams, river temperatures had not increased.

The fact that the PNNL study is more consistent with real world outcomes provides suitable reason to question whether the RMB10 model is the correct model to utilize for a TMDL that intends to estimate the effects of river impoundment.

Response

The 2002 PNNL MASS1 model has similarities to the RBM10 model, but the RBM10 model calibration and evaluation process was more extensive. The RBM10 model was calibrated with a focus on summer/fall, whereas the PNNL model was calibrated for a single period (i.e., March through October), which may mask any bias/accuracy issues. Also, the RBM10 model was calibrated for a full 10-year calibration period, whereas the PNNL model was calibrated for two partial years. In addition, the RBM10 model has lower bias and substantially better accuracy than the 2002 PNNL model, based on model error statistics. Finally, the level of detail in the documentation for RBM10 exceeds that of the PNNL model, with more information on model sub-elements and performance. For these reasons, EPA has greater confidence in the RBM10 results regarding dam impacts on river temperatures.

EPA has determined, through the RBM10 modeling analysis, that dams warm the Columbia and Snake Rivers in both summer and fall months.

Comment U70

Commenter Northwest River Partners

Comment

The RBM10 model or any replacement model selected by EPA should be consistent in its inclusion or exclusion of dams as part of the free-flowing river. EPA's arbitrary decision to include Dworshak Dam as part of the free-flowing river places an additional and unfair burden on the downstream dams in the TMDL study. This inconsistency is a known shortcoming of the TMDL analysis, which leads to predictably erroneous outcomes.

Response

See response to Comment U7.

Comment U71

Commenter Northwest River Partners

Comment

In order to calculate expected exceedances of WQS, the TMDL used observed data of Daily Maximum ("DM") temperatures, specifically the DM that is highest for each month of interest from 2011-2016. Since these calculations are based on current data, the moderating effects of dam waters on river temperatures are included in the current conditions. However, the free-flowing condition would not have the benefits of dams moderating water temperatures, and so would have greater variability and therefore likely have higher DM measurements, particularly earlier in the year. As a result, while comparisons between the current and free-flowing models can predict changes in average temperatures between these two conditions, a conclusion cannot be made as to whether free-flowing conditions would significantly affect DM observations. Because this TMDL uses DM temperatures to calculate exceedances, the free-flowing model cannot be used to draw conclusions on whether free-flowing conditions would result in significantly less impaired water temperatures based on the method used in this TMDL. The TMDL writes:

EPA used the RBM10 temperature model to estimate the dams' impacts on river temperature by comparing daily average river temperatures with and without the presence of dams. The target temperatures are daily maxima. Since the diel variation is typically greater in a free-flowing river than when dams are present, the impact of the dams on the daily average temperature is greater than the impact on the daily maximum temperature.

While this approach is more conservative, it does not allow for analysis on the effects of free-flowing conditions on water impairment, which calls into question the efficacy of using this RBM10 model for this purpose.

Response

EPA has explained in the TMDL how the differences in temperature metrics should be considered and interpreted. The model is used for analyzing the impact of the dams on river temperatures, and monitoring data measurements are used for exceedance determinations. As noted in the TMDL (and this comment), the dam impact analysis using daily average temperatures is more conservative, and this provides an appropriate margin of safety element for the TMDL.

Comment U72

Commenter Port of Clarkston

Comment

Historic information which should be considered to determine the contribution of run-of-the-river dams to heat pollutants follows.

- Early ancillary data from the Lower Columbia River downstream of Portland, OR, can be found in the 1878 Report of the Commissioner on Fish and Fisheries, which on p. 807, discussed 1875 findings where water temperatures were 20°C or greater for 39% of the days in July and 31 % of the days in August.

- Historic water temperatures of the lower Snake River commonly exceeded the 20°c standard in July and August, sometime being as high as 25 to 27°C).

- Additional evidence of warm historic temperatures can be seen in the Bonneville scrollcase data. From 1949 to 1959, a period when few mainstem dams were in place, temperature records indicate that both maximum and average temperatures regularly exceeded 20°C during August for that period.

Figure 3 Data from DART

-Some relevant data was collected in the Snake River prior to completion of Brownlee, Owbox and Hells Canyon Dams, specifically information collected by the USFWS from 1955 to 1957. They reported that the average daily temperature for July and August in 1957 for sites near Hells Canyon met to exceeded 20°C between 61 and 100% of the time (see Figure 4).

-Prior to construction of seven Snake River dams 12, water temperatures at the mouth of the Snake River during the four years 1955 through 1958 were consistently over 20°C from early July until mid-September. The number of days the mean water temperature exceeded 20°C averaged 70.5 days for the four years, ranging from 61 days in 1955 to 86 days in 1958. Monthly water temperatures during June, July, August and September during 1955 through 1958 averaged 17.2°, 22.0°, 23.3° and 20.3°C respectively. The following shows data from 1957 depicting the percentage of days when average temperatures exceeded 20°c: Compare this to results from 1973-81, (after the seven dams were constructed but prior to cold water releases from Dworshak for cooling purposes became a standard practice), water temperatures at the mouth averaged 14.5°, 19.0°, 21.9° and 20.1 °C from July to mid-September. (Peery, C.A., and T.C. Bjornn, 2002). Each one of these comparisons show lower water temperatures after the Snake River was impounded, but before Dworshak cold water releases began in 1992 for the specific purpose of reducing water temperature.

- In their 2009 Water Quality Plan, the U.S. Army Corps of Engineers concluded that historically, the Columbia and Snake rivers have always experienced warm water exceeding 20°C during specific times of the year.

- Before the mid-1990s, the Lower Granite Reservoir received waters up to 26° C from the Snake River (Anatone gauge) and 25° C from the Clearwater (Spaulding gauge). (John McKern-Appendix 1)

Response

The TMDL findings regarding dam impacts on river temperatures are based on the modeling assessment using the RBM10 model. This assessment found that run-of-river dams cause warming in the summer and fall. The modeling process to estimate dam impacts is straightforward. The impact is calculated by comparing the model-simulated river temperatures both with and without the dams in place. While historical river temperatures may provide insights on the range of historical river temperatures, they would not provide an estimate of dam impacts, in and of themselves. In addition, because river temperatures vary considerably from year to year, it is important to use a consistent time frame when evaluating impacts. The TMDL consistently uses data and information from the years 2011-2016.

Comment U73

Commenter Individual email received

Comment

In addition, although dam removal will still result in elevated temperatures on some days, it is not clear whether this impairs fish survival in a significant way. Can fish withstand short intervals of elevated temperatures and at which developmental stages? This information would be helpful to include in this report.

Response

The potential for dam removal is outside the scope of the TMDL. See response to Comment A3.

Fish thermal tolerance has been accounted for, as it was factored in during the development of the temperature criteria in the state and tribal water quality standards that have been evaluated and incorporated into the TMDL. The temperature criteria are the starting point to appropriately set the load allocation for non-point sources of heat and the wasteload allocations for the point sources of heat (facilities operating with NPDES permits).

Comment U74

Commenter Individual email received

Comment

It seems that there is a constant campaign to discredit the overwhelmingly positive aspects of our Pacific Northwest Dam systems. This time it is water temperatures. In 2002, researchers compared pre-lower Snake River dam measurements of water temperatures from 1955-1958 to measurements taken after the dams were constructed. They found NO evidence that river temperatures had increased as a result of the dams and instead remained unchanged or slightly lower, even though air temperatures had increased. The research team identified air temperature and flow levels as the biggest influences on temperatures in the river. The problem with taking an excessive and unrealistic regulatory approach is that it could add billions of dollars to the cost of operating the hydroelectric dam system without actually helping our salmon! It is totally unfair to burden the Pacific Northwest communities with higher electric bills while farms, ranches and commercial businesses depend on our high quality, low cost power. It seems as if the political powers that be are bent on making sure the dams are at fault for water temperatures! The weather is under God's control as are the temperatures of the rivers. Our dams must remain in place.

Response

In establishing this TMDL, EPA has analyzed dam impacts on river temperatures using a well-documented and transparent scientific analysis. The findings of this analysis are consistent with findings on the impacts of dams on water temperatures in other TMDLs. While EPA acknowledges the concerns about the potential impact of TMDL implementation on hydroelectric power, power generation across the Pacific Northwest is a topic that is outside the scope of the TMDL. Implementation of the TMDL is the responsibility of the states and EPA is committed to supporting state, federal, tribal and other stakeholders in TMDL implementation as appropriate. See also the responses to Comment A2, Comment A8, Comment A9.

Comment U75

Commenter Individual email received

Comment

Highly reputable studies have shown that dams help mitigate summer temperature extremes: a 2002 peer-reviewed study by Pacific Northwest National Laboratory showed that dams within the Columbia and Snake river basins moderate extreme water temperatures by shifting some of the summer heat into the fall and thereby flattening the temperature curve. The study refers to this phenomenon as a thermal inertia effect.

Again in 2002, researchers compared pre-lower Snake River dam measurements of water temperature from 1955-1958 to measurements taken after the dams were constructed. They found no evidence that river temperatures had increased as a result of the dams, and instead appeared to have remained unchanged or slightly lower, even though air temperatures had increased.

The team identified air temperature and flow levels as the biggest influences on temperatures in the river.

Response

Regarding the 2002 study, see response to Comment U69.

Regarding historic temperatures, see response to Comment U47.

Comment U76

Commenter Individual email received

Comment

Sec. 6.5.1 Dams, Tables 6-6 thru 6-8 The Snake River downriver analysis below the Clearwater Confluence demonstrates adverse temperature impairment for this river segment. This impairment needs to be corrected by modification of the river operation to achieve water quality standards such that the water quality conditions are protective of endangered and threatened salmonids migrating during July, August, and September. As a sensitivity analysis, EPA is requested to develop a case where water is not available from Dworshak Reservoir to cool water downstream of Clearwater Confluence. A second component of the sensitivity analysis would be to demonstrate how far downstream temperature water quality standards would be achieved if free flowing conditions were maintained without reservoirs behind the Snake River dams during July, August, and September. Modifications of the Snake River dams could be achieved by opening the locks and spillways during that time period.

Response

EPA assessed Snake River temperatures without cold water releases from Dworshak Dam, for both impounded and free-flowing conditions in the lower Snake River and provided graphical results in the model scenario report (Appendix D).

Comment U77

Commenter Individual email received

Comment

The reach that contains the Snake River reservoirs has the largest temperature increase for the Columbia and Lower Snake Rivers. If the Snake River reservoirs temperature increases were eliminated or reduced, it is likely that the Columbia River downstream of Snake Confluence would achieve water quality standards for temperature or at least minimize adverse impacts to threatened and endangered migrating salmonids, permittees and other water users. Thus, EPA is urged to prioritize resolving adverse temperature effects from the Snake River reservoirs. EPA is requested to consider additional modeling to minimize adverse temperature effects on the Columbia River downstream of the Snake Confluence. Additional modeling should include opening the locks and spillways while reducing the reservoir depth to reduce and minimize adverse temperature effects during July, August, and September.

Response

While the lower Snake River dams contribute to elevated temperatures in the lower Columbia River, these impacts are lower than the cumulative impact of the Columbia River dams at the location where the Snake River enters the Columbia River (see dam impact information in Section 6.5.1 of the TMDL). Additionally, the impacts of McNary and John Day Dams downstream of the confluence are equal to or higher than the impact of the Snake River dams.

Regarding modeling of alternative dam operations, this type of analysis can be pursued to inform TMDL implementation activities.

Comment U78

Commenter Individual email received

Comment

Lower Granite has the largest adverse temperature increase, followed by Little Goose and Ice Harbor on the Columbia and Lower Snake Rivers. EPA is urged to consider focusing upon correction of Lower Granite, Little Goose, and Ice Harbor to reduce adverse temperature effects. Additional options should be identified, modeled, and evaluated including an option of opening the locks and spillways and reducing the reservoir depth of these three dams during July, August, and September to reduce adverse temperature effects.

Response

The estimated impacts of individual dams on a given reach varies depending on the month (see the tables in Section 6.5.1 of the TMDL). See also Comment U77, above.

Comment U79

Commenter Franklin PUD

Comment

As written, the TMDL includes some dams but excludes placing an unfair temperature standard on the downstream dams.

A 2002 study under the Corps of Engineers (USACE) compared pre-lower Snake River dam measurements from 1955-1958 to measurements taken after the lower Snake River dams were constructed. The study found no evidence that river temperatures had increased, and instead remained unchanged or slightly lower after completion of the four lower main stem dams. This real-life finding runs contrary to what we are seeing in the TMDL's modeling output. In addition, a 2002 peer-reviewed study from Pacific Northwest National Laboratory showed that dams within the Columbia River and Snake River basins tend to moderate extreme water temperatures.

Response

See response to Comment U42.

Comment Category V. Tributaries – General

Comment V1

Commenter Columbia Riverkeeper

Comment

TMDL Section 3

Page 26, final paragraph:

a. Explain why these 23 tributaries were selected.

b. There are several wasteways where irrigation return flows return to the Columbia River. A list of these should be provided, and temperature data from these described where available.

Response

The selected tributaries incorporated into the TMDL are the ones that contribute the vast majority of flow to the mainstems, after the rivers cross into the TMDL study area. With these tributaries represented in the RBM10 model, the mainstem river temperature can be simulated with good calibration of both flow and temperature data. It is not practical for a TMDL of this large of a geographic scale to include each individual small tributary and wasteway in the analysis and allocation structure.

Comment V2

Commenter Bonneville Power Administration

Comment

Lastly, Bonneville questions whether tributary temperature reductions will take place under this TMDL if tributary point and non-point sources are not under the jurisdiction of this TMDL and subsequent TMDL Implementation Plans. This unrealistic assumption that this TMDL will result in tributary temperature reductions that are outside of the federal agencies ability to influence, may reduce the likelihood of success at meeting existing mainstem Columbia and Snake temperature criteria and place significant additional and unrealistic burdens on the ten federal dams to meet TMDL allocations.

Response

The tributaries are sources of heat to the mainstem Columbia and lower Snake rivers within the TMDL study area and are therefore assigned an allocation in the TMDL. EPA has determined that the cumulative tributary load allocation can lead to actions that can make meaningful improvements in tributary temperatures during TMDL implementation, as the tributaries are currently significantly impacted themselves by heat loading from both point and nonpoint sources. The load allocations in the TMDL for dams and for tributaries are separate, and success or failure of tributary improvements places no additional burden on the dams to meet their own distinct load allocation set by the TMDL.

In addition to the TMDL load allocations, the tributaries are required to meet water quality standards under the CWA. If those water bodies are impaired, then states and/or tribes would develop TMDLs to address the sources of impairment within the tributary watersheds and help improve water temperatures.

Comment V3

Commenter Bonneville Power Administration

Comment

5. Page 61: It states, “EPA used the model to evaluate the relationship between tributary and mainstem temperatures; through trial-and-error”. Additionally, page 4 of Appendix I states in the Refined Tributary Allocations section states “Through trial-and-error, model results indicated...” Bonneville requests that EPA explain what “trial and error” method was used and how it was applied in the TMDL.

Response

A trial-and-error effort in this context means that the model was run multiple times with varied tributary temperatures, until the change in the mainstem temperature matched the load allocation of 0.1°C. After multiple trials of increasing change in tributary temperatures in the model runs (e.g., 0.1°C, 0.2°C, 0.3°C), it was found that a uniform change in tributary temperatures of 0.5°C resulted in a model-predicted change of 0.1°C in the lower Columbia River, so therefore, in order for the tributaries to meet their cumulative 0.1°C load allocation, each individual tributary temperature needs to be within 0.5°C of its natural condition.

Comment V4

Commenter Cities of Camas, Gresham, and Washougal

Comment

Section 3.2 Tributary Temperature in the TMDL does not clearly define the basis for allocating 0.1 degrees C heat load to the 23 major tributaries to the Columbia and Snake Rivers. The City of Camas requests that EPA clearly define the technical basis for this significant allocation of one-third of the total 0.3 degrees C allowable heat load allocation in the Columbia River.

The reasons for stating that the TMDL has significant uncertainty in assigning 0.1 degrees C (one-third) of the TMDL heat load allocation to tributaries during July-October is as follows:

- All tributaries included in the TMDL contribute an average water temperature that is 1.6 degrees C colder than the mainstem Columbia River temperature in September and even colder water is contributed in October (see Section 3.2 and Appendix E-Tributary Assessment Methods and Results);
- All tributary river temperatures in October are shown to be below 14.5 degrees C and only 3 of 21 tributaries to the Columbia River were above 13.0 degrees C (refer to TMDL Table 3-9);
- 21 of 23 tributaries have temperature criteria cooler than the Columbia and Snake River criteria (refer to TMDL Table 6-20); and
- These TMDL temperature data demonstrate that tributaries are providing thermal benefits to the Columbia and Snake Rivers in October and are not contributing heat loads above the 20 degree C temperature criteria.

Response

EPA has determined the cumulative tributary load allocation (0.1°C) is reasonable given that there are heat sources in the tributaries and this heat moves downstream to the Columbia and Snake rivers. The TMDL must budget for these sources of heat. This is addressed by the load allocation to the tributaries at their confluence with the mainstems. The relative temperature of the tributary compared to the mainstem is not relevant to the allocations, which apply to all anthropogenic heat sources affecting tributary temperatures at their mouths. TMDL implementation will be managed by the states. EPA finds that it is appropriate for the states and other interested parties to consider actions to reduce tributary temperatures below the mainstem temperature criteria, if those tributaries are warmed by anthropogenic sources of heat and therefore contribute that heat to the mainstem rivers. See also response to Comment V2 and **Error! Reference source not found.**.

Comment V5

Commenter City of Camas

Comment

In addition, as TMDLs are implemented on these tributaries and tributary heat loads decrease, they will increasingly contribute to thermal reductions in the mainstem. Therefore, the City is requesting that EPA include a method in the TMDL to reassign portions of the tributaries source allocation to the reserve allocation category as TMDLs are implemented on tributaries and as temperature criteria are achieved on each tributary. Support for this request to reassign tributary source allocations as TMDLs are implemented are listed as follows:

- 9 of 22 listed tributaries have had TMDLs completed so they will be contributing thermal benefits to the mainstem Columbia and Snake Rivers (see TMDL Table 6-20); and

- EPA modeling of the thermal improvements to the mainstem Columbia and Snake Rivers when tributary temperatures achieve temperature criteria through TMDL implementations show a cumulative maximum reduction of 0.2 degrees C is forecast for the Columbia River at RM 42, and this cumulative reduction is double the tributaries allocation of 0.1 degrees C (see page 63 in TMDL).

Response

If future monitoring data indicates that the heat load contributions from any source category to the mainstem rivers have significantly changed from the levels described and assessed in the TMDL, the TMDL may be revised and re-issued, either in part or in whole.

Comment V6

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please clearly define the basis for allocating 0.1 degrees C heat load to the 23 major tributaries and include a method to reassign portions of the tributaries source allocation to the reserve allocation category as TMDLs are implemented on tributaries and temperature criteria are achieved. As tributary TMDLs are implemented and tributary heat loads decrease they will increasingly contribute to thermal reductions in the Columbia and Lower Snake Rivers.

The TMDL (Table 6-3) shows the allocations to three sources groups to achieve the 0.3 degrees C allowable temperature change.

However, Section 3.2 Tributary Temperature in the TMDL does not clearly define the basis for allocating 0.1 degrees C heat load to the tributaries. The basis of uncertainty for the TMDL heat load allocation to tributaries during July-October includes the following: All tributaries included in the TMDL contribute an average water temperature that is 1.6 degrees C colder than the mainstem Columbia River temperature in September and even colder water is contributed in October (Section 3.2 and Appendix E – Tributary Assessment Methods and Results); All tributary river temperatures in October are shown to be below 14.5 degrees C and only 3 of 21 tributaries to the Columbia River were above 13.0 degrees C (Table 3-9); 21 of 23 tributaries have temperature criteria cooler than the Columbia and Snake River criteria; and These TMDL temperature data demonstrate that tributaries are providing thermal benefits to the Columbia and Snake Rivers in October and are not contributing heat loads above the 20 degree C temperature criteria.

Support for the request to reassign tributary source allocations as TMDLs are implemented are as follows: 9 of 22 listed tributaries have had temperature related TMDLs completed so they will be contributing thermal benefits to the mainstem Columbia and Lower Snake Rivers (Table 6-20); and EPA modeling of the thermal improvement to the mainstems when tributary temperatures achieve temperature criteria through TMDL implementations show a cumulative maximum reduction of 0.2 degrees C is forecast for the Columbia River at RM 42, and this cumulative reduction is double the tributaries allocation of 0.1 degrees C.

Response

See responses to **Error! Reference source not found.** and **Error! Reference source not found.**.

Comment V7

Commenter Washington Department of Ecology

Comment

Table 6-20

-Entiat River is listed as not having a TMDL but it is a 4B Temperature Project site.

-This table shows the Yakima River having a Water Quality Criteria of 17.5 C when it is noted as 21 C in WAC 173-201(a) table 602. This should be corrected.

Response

EPA has added a footnote to the table regarding the Entiat 4B designation and corrected the criterion for the Yakima River to 21°C.

Comment V8

Commenter Idaho Department of Environmental Quality

Comment

In section 6.5.5 Tributaries (page 63); the TMDL references “a number of small tributaries that have de minimis impacts to the mainstem temperature….” Please elaborate or provide appendix references to the de minimis analyses and threshold values that were used to determine “de minimis impacts.”

Response

It was not feasible for EPA to individually analyze all tributaries in a study area this large with available resources. See response to Comment V1 for an explanation for the selection of the 23 tributaries included in the TMDL.

Comment V9

Commenter Oregon Association of Clean Water Agencies

Comment

The Columbia River TMDL includes an allocation for all major tributaries of 0.1 degrees C. Oregon DEQ has developed TMDLs for Columbia River tributaries including the Willamette River. In developing these TMDLs, DEQ has used a human use allowance of 0.3 degrees C. EPA should ensure that the tributary allocations noted in the Columbia River TMDL do not conflict with the approach that Oregon DEQ has taken in developing the temperature TMDLs for the Columbia River tributaries. We recommend that the TMDL include specific discussion on how the Columbia River TMDL is consistent with approach used in the tributary TMDLs.

Response

The load allocation for tributaries (cumulatively) is an allowable impact of 0.1°C on the mainstem Columbia and Snake rivers (1/3 of the total 0.3°C to be allocated). This translates to a uniform allowance of 0.5°C impact above natural conditions at the mouth of each tributary. EPA does not believe that this mainstem load allocation conflicts with the State of Oregon application of the 0.3°C human use allowance in TMDLs for tributaries. Tributary temperature assessments should apply water quality criteria (including any applicable human use allowance) within the tributary while also assessing the 0.5°C allowable impact at the mouth.

Comment V10

Commenter U.S. Army Corps of Engineers

Comment

Please consider including unidentified, local nonpoint sources of heat within the allocation to the Major Tributary category.

Response

The tributaries are cumulatively assigned a 0.1°C allowable impact on the mainstem Columbia and Snake rivers. The tributary load allocation applies to all sources within a tributary that contribute to the water temperature at the tributary mouth. Additional assessments would be needed to identify the sources of heat within the tributaries. Because of the large geographic scale of this TMDL, it was not feasible for EPA to conduct those assessments when developing the TMDL. See also response to Comment V2.

Comment V11

Commenter Western Division of the American Fisheries Society

Comment

Neither EPA nor the States have attempted to model tributary water temperature inputs after restoration of floodplains, channel width, hyporheic flows, historic channel structure (pools, LWD), or historic streamflows. Therefore, why does the TMDL suggest allowing further increases in tributary temperatures over the current criteria?

Response

The cumulative tributary load allocation is a 0.1°C increase to mainstem temperatures, which translates to a uniform allowance of 0.5°C impact above natural conditions at the mouth of each tributary. The baseline for application of this load allocation is the natural condition within tributaries, not current conditions or water quality criteria within tributaries. EPA has revised the tributary section of the TMDL (Section 6.5.5) to clarify this point. Case-by-case analysis of tributaries will determine whether temperature reductions are needed during TMDL implementation.

Comment V12

Commenter Western Division of the American Fisheries Society

Comment

The TMDL should also provide a vehicle for summarizing the cumulative proposed outputs of tributary TMDLs, their adequacy, and missing TMDLs and types of analyses based on current knowledge.

Response

Comment noted. TMDL implementation in the tributaries is under state authority. EPA will continue to support state partners in the implementation of the TMDL.

Comment Category W. Limitations of Tributary Analysis

Comment W1

Commenter Bonneville Power Administration

Comment

Bonneville is concerned with EPA's modeling analysis conducted by "trial and error" to identify the approximate uniform decrease in tributary temperatures that would result in a 0.1°C decrease in mainstem Columbia and Snake River temperatures.

EPA's TMDL analysis resulted in a determination that reducing all tributary temperatures by 0.5°C produced a 0.08°C decrease in monthly average temperature for September at River Mile 42. The 0.5 °C change in tributary temperatures is consistent with the work of Fuller et al. (2018), which is presented in Appendix F of the TMDL. However, the analysis presented in Fuller et al. is likely not "feasible" given the varying land uses, owners, geography, geology, hydrology and topography of the study area.

Bonneville requests that EPA accurately represent the Fuller study in the TMDL, see Appendix F: ORD Technical Memorandum on Tributary Restoration, lines 34-36. The Fuller et al. study reports significant variability in the difference in tributary temperatures for best case shading versus current conditions. Achieving a 0.5°C average reduction in water temperature is likely to be manageable for some tributaries, but not for all tributaries identified in the TMDL. Bonneville requests EPA clarify the statement made on page 61 of the TMDL which states, “An assessment of restoration potential in Columbia River tributaries indicates that the estimated average summer impact of riparian shade loss is an average temperature increase of 0.5°C in these tributaries (Fuller et al. 2018),” and add the sentence from lines 34-36 of Appendix F to the statement on page 61 of the TMDL, "However, the feasibility of this large-scale restoration effort is not likely, so additional restoration options to cool streams should also be undertaken to help maintain stream temperatures near their current condition (Fuller et al. 2018)."

Response

The language in the body of the TMDL is intended to provide a general indication of the scale of impacts within tributaries in comparison with the load allocation. The feasibility of temperature restoration in the tributaries is a TMDL implementation issue. EPA will continue to support state, tribal and federal partners during TMDL implementation.

Comment W2

Commenter Bonneville Power Administration

Comment

Bonneville is concerned that EPA did not acknowledge the realistic limitations of the climate change analysis and that this analysis will add an unrealistic TMDL load allocation burden onto the ten federal dams. This coarse level tributary modeling identifies a tremendous amount of assumptions relative to conservation feasibility of meeting the stream shade criteria identified in this technical memo, such as public vs. private riparian restoration. Nonetheless, EPA stated in the TMDL that the Fuller et al. work found that average August stream temperatures would be reduced by 0.5°C under a theoretical best-case shading scenario.

Response

See responses to Comment V2 and Comment FF2.

Comment W3

Commenter Bonneville Power Administration

Comment

To compound these limitations, the RBM10 model can only model impacts of reduced tributary temperatures on daily average temperatures in the mainstem Columbia and Snake Rivers. Furthermore, the TMDL reports the resulting changes in mainstem temperatures on a monthly average basis. In reality, impacts of restoration on particular tributaries is likely to vary considerably even within a given month. Additionally, the impact of restoration activities may have a larger impact on daily maximum temperatures than on daily average temperatures, but this cannot be simulated using EPA’s RBM10 model.

Response

A variety of information sources will be available to evaluate tributary temperature improvements over time. These include monitoring data, models of the tributaries, and the RBM10 model of the mainstem Columbia and

Snake rivers. Each of these information sources will have limitations. Future assessments can surmount the limitations and successfully evaluate progress of tributary temperature improvements that help to achieve the water quality improvement goals of this TMDL.

Comment W4

Commenter Bonneville Power Administration

Comment

Further, water temperature data are limited in availability on some of the tributaries. Page 17 of Appendix C notes that because of this limited data, the Hood, Sandy and Kalama Rivers were assumed to have the same temperatures as the Deschutes River. Ideally, EPA should justify this decision by presenting correlations or another analysis to demonstrate that these rivers would have similar temperatures, especially since the Deschutes River temperatures, east of the Cascades are being used to represent rivers west of the Cascades. Regardless, Bonneville is concerned that this limited data and assumed tributary temperatures add a degree of uncertainty to the validity of the tributary temperature analysis resulting in unrealistic temperature reduction targets.

Response

EPA acknowledges that the data limitations for some tributaries are substantial. The TMDL does not include specific temperature targets or temperature reduction targets for the tributaries. They are allocated a cumulative temperature increase to the mainstem rivers. This allows for future refinements in tributary monitoring and analysis while establishing clear targets for the allowable tributary impact on the mainstems, in accordance with the TMDL allocations. The estimated tributary temperatures in the TMDL are provided as general information on the estimated range of conditions in the tributaries.

Comment W5

Commenter Bonneville Power Administration

Comment

Due to the size of the Columbia River relative to its tributaries and because of limitations in the ability to monitor water temperatures, even substantial reductions in water temperature on the tributaries will, in some cases, have impacts on the Columbia River that are difficult to measure (e.g., < 0.1 °C). This highlights the importance of having a model that can evaluate the impacts of tributary restoration on mainstem daily maximum and 7-DADM temperatures to hundredths of degrees when evaluating the potential of specific restoration activities, this further emphasizes the limitations of the RBM-10 model for this application.

Response

See responses to Comment W3 and Comment W4. The most significant limitations for analysis are the lack of tributary monitoring data and lack of tributary temperature models.

Comment W6

Commenter Bonneville Power Administration

Comment

Page 27: See Table 3-9, Bonneville requests that EPA explain why some of these tributaries are colder in August, as compared to July (a time when temperatures are peaking). See Columbia River tributaries John Day, Deschutes, Hood and Sandy; same for Snake River tributaries Tucannon and Palouse. If this is a data gap issue, the TMDL should include this explanation. Please see Bonneville comment below for Appendix C comment #3 for Page 17: Section 2.5.2.

Response

EPA has not analyzed individual tributary temperature patterns for causation. Data limitations on tributary temperatures are substantial, particularly for the Hood and Sandy rivers. EPA notes that Columbia River peak temperatures can occur in July, August, or September, depending on the year.

Comment W7

Commenter Cowlitz Indian Tribe

Comment

As part of this, we also encourage EPA to place additional emphasis on tributary impacts, inclusive of tributary dams. We encourage EPA to include additional information on tributary temperature effects into the TMDL.

Response

The states are generally the lead agencies in TMDLs, and assessments of the tributaries within their jurisdictions are part of state TMDL development and water quality management activities. EPA encourages the states to build an information base for the tributaries identified in this TMDL to track assessment and temperature restoration progress in the tributaries. EPA is committed to supporting the states during TMDL implementation.

Comment W8

Commenter Oregon Department of Environmental Quality

Comment

The first paragraph of this section includes a finding attributable to Fuller et al. 2018: "Assessment of restoration potential in Columbia River tributaries indicates that the estimated average summer impact of riparian shade loss is an average temperature increase of 0.5°C in these tributaries." An excerpt from Fuller et al. 2018, states:

Across the study region, our models predicted mean August riparian shade restoration stream temperatures (under the present climate scenario) to be on average 0.5°C (± 0.39SO) cooler than current vegetation shade steam temperatures. Streams that were predicted to cool the most between current and restored riparian vegetation scenarios were generally smaller streams with bank-full widths of 5m or less. Additionally, the mainstem Columbia River tributaries are predicted to reach the mainstem river on average (flow-weighted) by 0.4°C (± 0.24SO) cooler than they are currently under the same restoration conditions (current versus restored riparian shade for the present climate).

EPA should clarify whether the impact of restoring riparian vegetative shade on tributary temperatures during the summer is 0.4°C or 0.5°C and clarify whether the reference to "average temperature increase of 0.5°C" is a flow-weighted average.

In the second paragraph under Section 6.5.5, on page 61, EPA states: EPA was able to use the RBM10 model to estimate the effect of temperature changes at the mouths of the tributaries on the temperature of the mainstem Columbia and Snake rivers. EPA used the model to evaluate the relationship between tributary and mainstem temperatures; through trial-and-error, model results indicated that a uniform tributary reduction of 0.5°C below current temperatures, at the confluence with the mainstem, results [in] a maximum cumulative temperature change in the mainstem approximately equal to the 0.1 °C temperature allocation.

The "uniform tributary reduction of 0.5°C" is a greater reduction than the amount suggested to be attainable under best case scenarios by Appendix F: "the mainstem Columbia River tributaries are predicted to reach the mainstem river 29 on average (flow-weighted) by 0.4°C (± 0.24SD) cooler than they are currently under the same 30 restoration conditions (current versus restored riparian shade for the present climate)."

Also, the second paragraph under Section 6.5.5 references model results in Table 6-10 and 6- 11 whereas the model results in Table 6-18 and 6-19 should be referenced instead.

For DEQ to conduct an assessment of whether or not DEQ's existing tributary allocations are sufficient to meet the TMDL's 0.1 °C allowance for the tributaries, EPA should add a summary table to the TMDL which shows expected Restored Temperature Differences for tributaries that are provided Load Allocations.

Response

EPA has corrected the average riparian shade impact for tributaries reported in the TMDL from Fuller et al. (2018) from 0.5°C to 0.4°C.

The load allocation for tributaries is expressed as an allowable temperature impact of 0.1°C and this translates to an allowable impact at the mouth of each tributary of 0.5°C. The load allocation is not a temperature reduction from current conditions.

EPA has corrected the table references in the second paragraph of section 6.5.5.

EPA does not have the water quality computational models necessary to provide the “restored temperature differences” for tributaries. To evaluate tributary impacts for comparison to the load allocations, the states of Washington and Oregon will need to employ water quality models to determine whether impacts from the sources of heat in a given tributary exceed 0.5°C at its mouth.

Comment W9

Commenter Western Division of the American Fisheries Society

Comment

The TMDL omits discussion of other tributary impairments, anthropogenic versus natural heating of tributaries, tributary TMDLs, Cold Water Refuge (CWR) impairments, and corrective actions. Instead, the TMDL focuses narrowly on the mainstem Columbia and Lower Snake Rivers, thereby ignoring the fundamental relationship between mainstem rivers and their entire drainage basins (Colvin et al., 2019).

Response

The RBM10 model includes all 23 tributaries assessed in the TMDL, and the assessment of tributaries is conducted at the level of detail that is feasible, given the limited information on tributary impacts, particularly the lack of models for many of the 23 tributaries. See responses to Comment V1, Comment V3 and Comment V4.

Comment W10

Commenter Western Division of the American Fisheries Society

Comment

Why does the TMDL not incorporate the TMDLs of all tributaries to the Columbia and Snake rivers, including the Middle Snake River? Why are these not mentioned? Will, for example, Idaho be accountable to deliver water to Washington waters in the Snake River so that its water temperature standards are met? TMDL Table 6-20 shows that 13 of 20 of the Columbia River principal tributaries do not have TMDLs completed. This is essential if management plans are going to be able to assist in meeting mainstem Columbia River temperatures. It took 20 years for EPA to assume its role in developing a mainstem TMDL. How will EPA ensure that necessary tributary TMDLs will be developed?

Response

Under the Clean Water Act, the TMDL program is implemented by the states, and EPA typically approves or disapproves state TMDL submissions. This TMDL does not cover Idaho waters, as they are outside of the boundary of this TMDL study area. The level of anthropogenic heat contributions to the Snake River temperature at the Clearwater River confluence has not been assessed, so it is unclear whether substantial cooling of the Snake River at this location is possible. EPA will support any future efforts by the States of Oregon and Idaho to assess this question, as appropriate.

Comment Category X. CWR Cold Water Refugia

Comment X1

Commenter Columbia Riverkeeper

Comment

TMDL Section 5

Page 32, final paragraph:

a. Provide an explanation of the contents of Table 5-1, especially “Plume CWR Volume” and “Stream CWR Volume”.

b. Explain the methodology that allowed EPA to estimate that these tributaries represented 97% of CWRs.

Response

The re-issued TMDL includes additional information to clarify the table and refers to the Final EPA CWR Plan. Specific pages of the Final Plan are cited in the TMDL Section 5.0.

Comment X2

Commenter Columbia Riverkeeper

Comment

TMDL Section 5

Page 33, Figure 5-1:

a. Why is the John Day River not shown?

b. Show the state line on the map

Response

EPA checked the figure and has clarified the TMDL. The purpose of the figure is to highlight the location of the 23 cold water refuges, including 12 primary cold-water refuges for the Lower Columbia River. The John Day River is not one of the identified cold-water refuges, which is why it is not labeled in the figure.

Comment X3

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 64, Section 6.5.6: Additional information should be provided for these CWR tributaries: 303d listings for temperature; degree of impairment (temperature above criteria); and target dates for state TMDL studies (where known).

Response

The EPA published a Final CWR Plan on January 7, 2021. We encourage interested parties to review the Final Plan for more information. Additional information from the Final Plan has also been included in the TMDL. The Final Plan can be found at https://www.epa.gov/sites/production/files/2021-01/documents/columbia-river-cwr-plan-final-2021.pdf

Comment X4

Commenter Various NGOs

Comment

The TMDL also does not ensure compliance with Oregon's narrative water quality standard requiring sufficiently well-distributed cold water refugia. EPA's temperature refuges plan should explain what it would mean to have the sufficiently well-distributed cold water refugia in the Columbia River required by Oregon's narrative temperature criteria (and whether they exist). Compliance with a valid, final temperature refuges plan should achieve compliance with Oregon's narrative criteria for thermal refuges and, therefore, be a requirement of this temperature TMDL. Instead of providing for its thermal refuges plan to become a requirement of the TMDL, EPA cites its draft thermal refuges plan, claiming that the draft remains "under review" and asserting that its "preliminary findings provide a framework" for assuring that the refugia narrative criterion is met. This is meaningless. By placing the refuges plan outside the TMDL, EPA claims credit for its research on refuges while undermining any future attempts to enforce the refuges plan. Ultimately, EPA's TMDL provides no concrete protections for thermal refugia and does not ensure Oregon's narrative criteria will be met—undermining EPA's tremendous investment of time and resources in studying thermal refuges to support adult steelhead and fall Chinook migration in the context of the hydrosystem and climate change.

Response

The TMDL reflects the information included in EPA's Final Cold Water Refuge Plan. The TMDL establishes the targets to protect CWR and meet Oregon's narrative water quality standard. The recommendations in the Final CWR Plan may be used by the States of Oregon and Washington as they develop their own plans and actions to implement the TMDL. Also see response to Comment X3.

Comment X5

Commenter Bonneville Power Administration

Comment

Bonneville has significant reservations with statements made by EPA on the "Draft Columbia River Cold Water Refuges Plan" during the June 16th Northwest Power and Conservation Council meeting, and the related assumptions that are proposed to be incorporated into the TMDL.

During the June 16th Northwest Power and Conservation Council Fish Committee meeting, EPA stated that the findings of the EPA's Columbia River Cold Water Refuges Plan would be incorporated into this TMDL and that they are exploring adding the Umatilla River to the TMDL's list of twelve Cold Water Refuge tributaries (Table 6-21 of the TMDL). Additionally, EPA stated that they would desire to have an aspirational engineered, man-made cold water "Herman Creek type cove" in the John Day pool reservoir area. It is important for EPA, the TMDL and EPA's Columbia River Cold Water Refuges Plan to acknowledge that the twelve currently identified cold water refuges presented in the TMDL are within watersheds originating within the Cascade Range that contribute late season runoff through reduction in high elevation snowpack. However, the John Day River and the Umatilla River both fall within the Mid-Columbia NorWeST Processing Unit and with the exception of the Deschutes River, have contributing basins of different physiography, elevation and contributory hydrology than the identified cold water refugia systems.

It would not be reasonable, purposeful, implementable, practicable, or cost effective to develop a cold water refuge in the John Day pool reservoir area or add the Umatilla River to the list of twelve identified cold water refuges presented in the TMDL. The hydro-physiographic conditions in these rivers, coupled with much different land use patterns all affect the ability for the John Day and Umatilla systems to be classified as a cold water refuge under the same conditions as the twelve tributaries that are currently identified in the TMDL.

Response

EPA's Final Cold Water Refuge Plan identifies that a cooler Umatilla River is needed to attain the State of Oregon's Cold Water Refuge narrative provision in WQS, for the reasons identified in the Final EPA Plan. Oregon's temperature TMDL for the Umatilla River identifies the potential for a cooler river at the confluence with the Columbia River through implementation of the Umatilla River TMDL.

The Final Cold Water Refuge Plan recommends evaluation of increased cold water refuges in the Lower Columbia River, in light of climate change impacts, but does not include an explicit recommendation to construct cold water refuges in the John Day pool reservoir. Also see response to Comment X3.

Comment X6

Commenter Bonneville Power Administration

Comment

Page 64: Table 6-21, Temperature targets for 12 CWR in the lower Columbia River, has a reference to Footnote 18, however there is no Footnote 18. Bonneville requests EPA add Footnote 18 to page 64.

Response

This omission has been corrected. The footnote 18 referenced in this comment was in error. See Table 6-23 in the TMDL.

Comment X7

Commenter Public Utility District No. 1 of Douglas County

Comment

The importance of CWR is discussed at length on page 32, but there is no acknowledgement that the Wells Fish Hatchery Facility provides this CWR to salmonids and the extent of protection is not quantified in the TMDL.

Response

The State of Oregon's Cold Water Refuge narrative provision (in WQS) only applies to waters in Oregon; there is currently no similar provision in the State of Washington water quality standards. Therefore, the EPA CWR Plan addresses implementing the CWR narrative provision in the State of Oregon. Also see response to Comment X3.

Comment X8

Commenter Oregon Department of Fish and Wildlife

Comment

The EPA eloquently describes actions underway to finalize the draft Columbia River Cold Water Refuges Plan in Section 6.5.6. However, it is unclear to ODFW how this effort relates to the remainder of draft TMDL study materials. Nowhere else in the document is this information regarding cold water refuges used to help set load allocations or otherwise inform the document conclusions or outcomes. ODFW recommends EPA clarify the role of cold-water refuges in TMDL process as part of the final TMDL document.

Response

This TMDL establishes temperature, flow and volume targets for 13 cold water refuges, in order to attain the State of Oregon's CWR narrative criteria. The TMDL does not set load allocations to sources of heat to meet this narrative provision in OR's standards. The EPA's Final CWR Plan provides the technical basis used to establish the CWR-related targets included in the TMDL. For more information on the role of CWR, and how the states of Oregon and Washington can use the recommendations when developing implementation plans, see the EPA's Final CWR Plan. Also see response to Comment X3.

Comment X9

Commenter Oregon Department of Environmental Quality

Comment

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

Comment: The Tanner Creek temperature criterion is 18°C.

Response

EPA has corrected this temperature criterion for Tanner Creek in the TMDL.

Comment X10

Commenter Oregon Department of Environmental Quality

Comment

Section 5.0 Cold Water Refuge

DEQ acknowledges EPA's thorough work on the Columbia River Cold Water Refuges Plan and the contribution of this document for addressing Oregon's Cold Water Refugia narrative criteria. The TMDL should include a description of the geographic extent of the CWR.

Response

The EPA has clarified this in the TMDL. The Final CWR Plan is referenced in the TMDL, as the Plan discusses in more detail the geographic extent of the cold water refuges. Also see response to Comment X3.

Comment X11

Commenter U.S. Army Corps of Engineers

Comment

Page 31, Section 5.0 and page 64, Section 6.5.6. Cold water refugia are also present on the lower Snake River near the Lyons Ferry Hatchery, and the Clearwater River provides cold-water refuge for salmonids that migrate up the middle Snake River.

Response

See response to Comment X7.

Comment X12

Commenter Western Division of the American Fisheries Society

Comment

It is not clear from the information provided that the TMDL presents a heat loading scheme, the negative impacts of which can overcome the limited refuge habitat available. There are 12 primary cold-water refuges that constitute 97% of total CWR habitat in the Lower Columbia River. Of these, 6 are on the Washington side of the Columbia River mainstem and 6 are on the Oregon side. Information provided in the TMDL attests to steelhead seeking CWR habitat when river temperatures exceed 20ºC and fall Chinook when water temperatures exceed 20-21ºC. In the temperature range 20-25º, in addition to the need to seek cold refuge and recover from migration stress, adult salmon encounter incipient lethal temperatures at 21-22ºC (Sockeye and Chinook, respectively). In addition, incipient lethal temperatures occur for juvenile salmonids at 25ºC, and impaired reproductive capacity, bioenergetic depletion, and increased disease-related mortality of adults and juveniles occur at those temperatures as well (McCullough 1999, McCullough et al. 2003). Residence times in refuges can be prolonged because of high migration temperatures. It is helpful to have as much CWR habitat in the system as possible, especially when Columbia River temperatures reach 23ºC during migration. However, it is not clear from information provided that the TMDL presents a heat loading scheme wherein negative impacts can be overcome by the limited refuge habitat available. To use the CWR available during upstream migration, adults must cross the mainstem repeatedly to use them as stepping stones. The spacing of CWRs in relation to travel rates and times between CWRs could easily result in adult body temperatures exceeding safe levels and result in bioenergetic depletion.

Response

EPA agrees that CWR are important. EPA's Final Cold Water Refuge Plan includes the basis for the 13 CWR needed to attain the State of Oregon's WQS narrative provision, and the recommendation to increase CWR in the future, in light of climate change. Also see response to Comment X3.

Comment X13

Commenter Western Division of the American Fisheries Society

Comment

Is average water temperature the right metric, or should the TMDL focus on bigger temperature differentials in smaller locations in Cold Water Refuges as stepping stones (or both)? How often did cold water refuges not meet standards, and if this happened, were the areas still designated as CWRs? Should the TMDL suggest incentives for creating additional, spatially distributed cold water refuges? There is an absence of CWRs above John Day Dam, and the TMDL should provide guidance on how to develop CWRs, such as by obtaining ground water rights that would then allow greater ground water releases to the rivers.

Response

The data underlying the CWR Plan was measured using average water temperatures. August mean temperatures were determined to be appropriate measurements to reflect average conditions for fish in the Columbia River and tributaries. Information on daily range and daily maximums for the CWR tributaries are also displayed in the Plan. Several of the CWR tributaries have maximum hourly temperatures that exceed temperature standards, but still qualify as CWR due to average temperatures being cooler (>2°C) than the Columbia River. Several of the CWR tributaries have maximum hourly temperatures below the applicable numeric temperature criterion. The Final CWR Plan acknowledges the absence of CWR above John Day Dam and includes a cooler Umatilla River as necessary to meet the State of Oregon's narrative CWR provision.

Comment X14

Commenter Yakima County Farm Bureau

Comment

With the impoundment of water behind the dams and the stratification of colder water at the lower depths of the water column the opportunity to create Cold Water Refuges (CWR) exists. A CWR is a structure where pumps move water from lower (colder) regions of the water body behind our reservoirs upward to certain areas at the surface of the body or in other instances utilize the colder water on fish ladders for the salmon to provide a sanctuary and resting place for them during less than favorable warm season water temperatures in the River System. Another mitigation tool that is gaining traction is the Salmon Cannon. The combination of the Cannon and a CWR to entice the upward migrating fish to these lifting devices may prove very useful.

Response

EPA understands that pumps delivering cold water into adult fishways have been previously installed and operated at Lower Granite and Little Goose Dams. This type of mitigation and other temperature reduction measure implementation efforts will be addressed by the states, tribes, EPA and other federal partners during the implementation of the TMDL.

Comment X15

Commenter U.S. Forest Service

Comment

P. 64, RVLW 6-21. The third column shows a footnote of "18", but do not see the definition of the page.

Response

See response to Comment X6. This omission has been corrected.

Comment Category Y. Wasteload Allocations

Comment Y1

Commenter Columbia Riverkeeper

Comment

A reserve is not appropriate for a TMDL where no reasonable assurance can be provided that allocations for the dams will be met. It is reasonable to “grandfather in” existing discharges, but future discharges should find a way to be included in the point source waste load allocation, such as by paying for load reductions of another source. A “bubble allocation” for all point sources would be one way to accomplish this, such as was used in the earlier draft TMDL.

Response

Comment noted. EPA has determined it is reasonable to include a reserve allocation for point sources in this TMDL, as the existing sources contribute less heat load to the mainstem rivers than the allocated 0.1°C cumulative impact. See response to Comment GG1.

EPA has noted in the TMDL that trading is an option for implementation of allocations. There are no draft versions of the TMDL that have included a “bubble allocation” for point sources.

Comment Y2

Commenter City of Camas

Comment

The City of Camas requests that the EPA clarify that the Temperature TMDL Waste Load Allocations {WLAs) only apply to NPDES point source dischargers during the historical periods when the Columbia and/or Snake Rivers exceeded their applicable temperature criterion. Section 6.2 on page 39 starts with the statement "The critical time periods for this TMDL are July-October for all locations." While the focus on this four-month season is consistently applied throughout the document, the WLAs for NPDES permitted facilities listed in Table 6-12 and Table 6-13 do not explicitly indicate that the WLA applies only for this four-month period. The City of Camas requests that EPA provide a statement in the text or footnote for Table 6-12 and Table 6-13 confirming that WLAs apply only during the four-month period of July-October, and to a portion of that period when the Columbia and Snake Rivers are out of compliance with water quality standards within the applicable river reach.

Response

EPA has clarified the time period when the WLAs apply in the TMDL. Based on other comments and analyses, the period of applicability of WLAs has been extended to include the months of June through October each year.

Comment Y3

Commenter City of Camas

Comment

Application of Thermal WLAs When Discharge Temperatures Are Below the Temperature Criteria

The City of Camas requests that the TMDL only apply WLAs to point source dischargers when the effluent from those dischargers exceeds the applicable temperature criterion at the discharge location. The WLAs for NPDES permitted point sources are presented in Tables 6-12 through 6-15 and it is explained in the first paragraph on page 51 that the "WLA was calculated using the facility design flow and the highest known or estimated temperature of the facility effluent." With the approach for WLA calculation used in the TMDL, discharges of effluent at temperatures below the applicable river temperature criteria appear to still be subject to a WLA and potential thermal load limits. Since discharges of effluent at temperatures below the applicable river temperature criteria contribute to river cooling and additional progress towards attainment of the temperature criteria in the river, thermal loads limits should not apply when the effluent temperature is below the applicable river temperature criteria.

The following plot illustrates the relationship between effluent flow and temperatures and applying a thermal WLA without a threshold 20 degrees C temperature for the receiving water and effluent temperature. If the City of Camas effluent flow reached 8.7 mgd in an October wet weather event, then effluent temperature would have to be 18 degrees C to stay within the TMDL defined WLA. In the wet season, with periodic higher effluent flows the effluent temperatures would have to be even lower to meet the WLA. The City of Camas is requesting that the TMDL state that an ETL approach should be used in applying the thermal WLAs to NPDES permits or that the WLAs (based on a zero receiving water reference temperature) will only apply when effluent and river temperatures are above the applicable river temperature criteria. Failure to address the regulation of thermal waste loads with this consideration will put several point sources in jeopardy of compliance in the near-term during periods when their effluent is actually contributing to the reduction of river temperatures.

Response

For facilities that are discharging below the 20°C water quality criterion, EPA recommends that the permit writer verify that the data in the TMDL tables accurately reflect discharge temperatures. If the discharge temperature is accurate, and below the applicable water quality criterion, a temperature limit in the permit may not be needed.

The permit must still implement the WLA for the 13°C water quality criterion in the Columbia River in October. See response to Comment Y5.

Comment Y4

Commenter City of Camas

Comment

This discharge temperature issue has been addressed in the Oregon Department of Environmental Quality's 2008 report "Temperature Water Quality Standard Implementation-A DEQ Internal Management Directive" through the definition of Excess Thermal Load (ETL) wasteload allocations and ETL calculations for use in NPDES permit compliance. The TMDL should either: 1) clarify that WLAs (based on a zero receiving water reference temperature) will only apply when effluent temperatures are above the applicable river temperature criteria; or 2) state that an ETL approach (see equation below) should be taken by the states in applying the thermal WLAs to NPDES permits and in defining monitoring and compliance requirements within NPDES permits.

WLA = (Tps- Twqc) x Qps x Cf where, WLA = thermal waste load allocation

Tps = temperature of the point source discharge when Tps > Twqc Twqc = applicable water quality criteria temperature Qps = flow of the point source discharge Cf= unit conversion factor

Response

The WLAs in the TMDL are expressed as the total amount of heat a facility can discharge, whereas Excess Thermal Loads (ETLs) are the amount of heat above the criterion a facility can discharge. In expressing the WLAs in terms of the total heat loading of each facility, the TMDL is aligned with the assumptions of the modeling assessment of point source impacts, where each point source is characterized by its total heat load. EPA has determined the WLAs are expressed in the TMDL in a reasonable manner using the effluent temperature rather than excess temperature. Discharges below water quality criteria temperatures can be addressed on a case-by-case basis in the permitting process. See also response to Comment Y3.

Comment Y5

Commenter City of Camas

Comment

This City of Camas requests that the EPA not include October in the compliance period for point sources below RM 141.5. Tables 3-2 through 3-6 in the TMDL document that the 20 degrees C criteria is only exceeded in the months of July through September for this region of the river.

Table 6.1 lists the two water quality temperature criteria that Oregon applies in the lower Columbia River in October. The year-round criterion is 20 degrees C for River Miles O to 141.5, and the temperature criterion in a two-mile river segment below Bonneville Dam (RM 141.5 to 143.5) is 13 degrees C for October 15-March 31. Table 3-7 shows no temperature exceedances of the 20 degrees C temperature criterion in October from the Priest Rapids Dam (RM 396) to the Pacific Ocean. It would not be correct for the TMDL WLAs to apply to NPDES permitted facilities during periods of the year when the Columbia and Snake Rivers are in compliance with the 20 degrees C water temperature criterion.

Response

EPA agrees that for discharges below River Mile 141.5, the WLAs only apply from June through September.

In general, WLAs must apply throughout the time frame of the TMDL (June-September) at all locations, because point source discharges influence downstream temperatures, and the most downstream reach (lower Columbia River) is impaired throughout this period.

In October, from the upstream boundaries of the TMDL to River Mile 141.5, point source discharges influence downstream temperatures at the location of RM 141.5, where the 13°C criterion supporting salmonid spawning applies. Therefore, WLAs apply for all sources upstream of RM 141.5 in October.

Comment Y6

Commenter City of Camas

Comment

The City of Camas requests that the EPA clarify that implementation of the TMDL WLAs will be on a monthly average basis. Tables 6-12 and Table 6-13 define WLAs for NPDES point sources, but these tables do not state the seasonal period when applicable. The City requests that EPA specify that WLAs are to be applied by as monthly average values for compliance with the WLAs, and this was the basis for the modeling within the TMDL.

Response

EPA has determined it is reasonable to apply the WLAs as monthly average permit limits and has added language to the TMDL. The state NPDES permitting program will make final determinations about translating WLAs from the TMDL into individual permit limits.

Comment Y7

Commenter City of Gresham

Comment

The City requests that the EPA clarify that the Temperature TMDL Waste Load Allocations (WLAs) only apply to NPDES point source dischargers during the historical periods when the Columbia and/or Snake Rivers exceeded their applicable temperature criterion. Section 6.2 on page 39 starts with the statement “The critical time periods for this TMDL are July-October for all locations.” While the focus on this four-month season is consistently applied throughout the document, the WLAs for NPDES permitted facilities listed in Table 6-12 and Table 6-13 do not explicitly indicate that the WLA applies only for this four-month period. The City requests that EPA provide a statement in the text or footnote for Table 6-12 and Table 6-13 confirming that WLAs apply only during the four-month period of July-October, and to a portion of that period when the Columbia and Snake Rivers are out of compliance with water quality standards within the applicable river reach.

Response

See response to Comment Y2.

Comment Y8

Commenter City of Gresham

Comment

This City requests that the EPA not include October in the compliance period for point sources below RM 141.5 (below Bonneville Dam). Tables 3-2 through 3-6 in the TMDL document that the 20 degrees C criteria is only exceeded in the months of July through September for this region of the river. Table 6.1 lists the two water quality temperature criteria that Oregon applies in the lower Columbia River in October. The year-round criterion is 20 degrees C for River Miles 0 to 141.5, and the temperature criterion in a two-mile river segment below Bonneville Dam (RM 141.5 to 143.5) is 13 degrees C for October 15-March 31. Table 3-7 shows no temperature exceedances of the 20 degrees C temperature criterion in October from the Priest Rapids Dam (RM 396) to the Pacific Ocean. It would not be correct for the TMDL WLAs to apply to NPDES permitted facilities during periods of the year when the Columbia and Snake Rivers are in compliance with the 20 degrees C water temperature criterion, which is during October through June.

Response

See response to Comment Y5.

Comment Y9

Commenter City of Gresham

Comment

The City requests that the TMDL only apply WLAs to point source dischargers when the effluent from those dischargers exceeds the applicable temperature criterion at the discharge location. The WLAs for NPDES permitted point sources are presented in Tables 6-12 through 6-15 and it is explained in the first paragraph on page 51 that the "WLA was calculated using the facility design flow and the highest known or estimated temperature of the facility effluent." With the approach for WLA calculation used in the TMDL, discharges of effluent at temperatures below the applicable river temperature criteria appear to still be subject to a WLA and potential thermal load limits. Since discharges of effluent at temperatures below the applicable river temperature criteria contribute to river cooling and additional progress towards attainment of the temperature criteria in the river, thermal loads limits should not apply when the effluent temperature is below the applicable river temperature criteria.

This discharge temperature issue has been addressed in the Oregon Department of Environmental Quality's 2008 report "Temperature Water Quality Standard Implementation – A DEQ Internal Management Directive" through the definition of Excess Thermal Load (ETL) wasteload allocations and ETL calculations for use in NPDES permit compliance. The TMDL should either: 1) clarify that WLAs (based on a zero receiving water reference temperature) will only apply when effluent temperatures are above the applicable river temperature criteria; or 2) state that an ETL approach (see equation below) should be taken by the states in applying the thermal WLAs to NPDES permits and in defining monitoring and compliance requirements within NPDES permits.

The following plot illustrates the relationship between effluent flow and temperatures and applying a thermal WLA without a threshold 20 degrees C temperature for the receiving water and effluent temperature. If the Gresham effluent flow reached 20 mgd in an October wet weather event, then effluent temperature would have to be 18 degrees C to stay within the TMDL defined WLA. In the wet season, with higher effluent flows the effluent temperatures would have to be even lower to meet the WLA. The City is requesting that the TMDL state that an ETL approach should be used in applying the thermal WLAs to NPDES permits or that the WLAs (based on a zero receiving water reference temperature) will only apply when effluent and river temperatures are above the applicable river temperature criteria.

Failure to address the regulation of thermal waste loads with this consideration will put several point sources in jeopardy of compliance in the near-term during periods when their effluent is actually contributing to the reduction of river temperatures.

Response

See response to Comment Y3 and Comment Y4.

Comment Y10

Commenter City of Gresham

Comment

Definition of Parameters for the WLAs Application

The City requests that the EPA clarify that implementation of the TMDL WLAs will be on a monthly average basis. Tables 6-12 and Table 6-13 define WLAs for NPDES point sources, but these tables do not state the seasonal period when applicable. The City requests that EPA specify that WLAs are to be applied by as monthly average values for compliance with the WLAs, and this was the basis for the modeling within the TMDL.

Response

See response to Comment Y6.

Comment Y11

Commenter City of Portland

Comment

The wasteload allocations in the TMDL should be expressed as excess thermal loads: the heat load discharged by a facility when the effluent temperature is above the applicable water quality criterion. BES supports EPA's approach of expressing wasteload allocations as a heat load (kcal/day) to provide facilities with appropriate flexibility to manage operations to reduce the impact of their discharge on the receiving waterbody, however, these heat loads should be expressed as an excess thermal load. Currently, the wasteload allocations in the TMDL are expressed without reference to the applicable water quality criterion. Wasteload allocations represent the thermal load from a point source that can be discharged without resulting in a cumulative exceedance of the human use allowance—the allowable anthropogenic heat load that results in no more than a cumulative 0.3°C increase above the applicable criterion. Without incorporating the water quality criterion into the calculation, the wasteload allocations do not represent the loading capacity of the receiving water allocated to point sources. Additionally, as currently expressed, the wasteload allocations do not account for the fact that when a facility's effluent temperature is at or below the applicable water quality criterion, the effluent does not contribute to an exceedance of the criterion. Wasteload allocations in the TMDL should be expressed as excess thermal loads using the following equation: $ETL = (Teff - TWQC) \times Qeff \times Cf$ where: ETL = excess thermal load (kcal/day), when Teff > TWQC; Teff = effluent temperature (°C); TWQC = applicable water quality criterion (°C); Qeff = effluent flow (cubic feet per second); Cf = conversion factor: 2,446,665 (kcal · second/°C· ft^3· day).

Using the excess thermal load equation described above is consistent with the approach utilized by Oregon DEQ in other temperature TMDLs. Expressing the wasteload allocations as excess thermal loads will also allow the state agencies to account for situations when effluent temperatures are at or below the applicable water quality criterion.

Response

See response to Comment Y4.

Comment Y12

Commenter City of Portland

Comment

The TMDL should clearly specify the time period for which the wasteload allocations apply. As currently written, the TMDL highlights July through October as the critical time period when temperature criteria exceedances are observed (pg. 39). It is not clear, however, whether the wasteload allocations apply outside of the critical period.

Response

See response to Comment Y2.

Comment Y13

Commenter City of Washougal

Comment

The City of Washougal requests that the EPA clarify that the Temperature TMDL Waste Load Allocations (WLAs) only apply to NPDES point source dischargers during the historical periods when the Columbia and/or Snake Rivers exceeded their applicable temperature criterion. Section 6.2 on page 39 starts with the statement "The critical timer periods for this TMDL are July-October for all locations." While the focus on this four-month season is consistently applied throughout the document, the WLAs for NPDES permitted facilities listed in Table 6-12 and Table 6-13 do not explicitly indicate that the WLA applies only for this four-month period. The City requests that EPA provide a statement in the text or footnote for Table 6-12 and Table 6-13 confirming that WLAs apply only during the four-month period of July-October, and to a portion of that period when the Columbia and Snake Rivers are out of compliance with water quality standards within the applicable river reach.

Response

See response to Comment Y2.

Comment Y14

Commenter City of Washougal

Comment

The City of Washougal requests that the TMDL only apply WLAs to point source dischargers when the effluent from those dischargers exceeds the applicable temperature criterion at the discharge location. The WLAs for NPDES permitted point sources are presented in Tables 6-12 through 6-15 and it is explained in the first paragraph on page 51 that the “WLA was calculated using the facility design flow and the highest known or estimated temperature of the facility effluent.” With the approach for WLA calculation used in the TMDL, discharges of effluent at temperatures below the applicable river temperature criteria appear to still be subject to a WLA and potential thermal load limits. Since discharges of effluent at temperatures below the applicable river temperature criteria contribute to river cooling and additional progress towards attainment of the temperature criteria in the river, thermal loads limits should not apply when the effluent temperature is below the applicable river temperature criteria.

This discharge temperature issue has been addressed in the Oregon Department of Environmental Quality’s 2008 report “Temperature Water Quality Standard Implementation—A DEQ Internal Management Directive” through the definition of Excess Thermal Load (ETL) wasteload allocations and ETL calculations for use in NPDES permit compliance. The TMDL should either: 1 clarify that WLAs (based on a zero receiving water reference temperature) will only apply when effluent temperatures are above the applicable river temperature criteria; or 2) state that an ETL approach (see equation below) should be taken by the states in applying the thermal WLAs to NPDES permits and in defining monitoring and compliance requirements within NPDES permits.

The following plot illustrates the relationship between effluent flow and temperatures and applying a thermal WLA without a threshold 20 degrees C temperature for the receiving water and effluent temperature. If the City of Washougal effluent flow reached 3.0 mgd in an October wet weather event, then effluent temperature would have to be 18 degrees C to stay within the TMDL defined WLA. In the wet season, with periodic higher effluent flows the effluent temperatures would have to be even lower to meet the WLA. The City is requesting that the TMDL state that an ETL approach should be used in applying the thermal WLAs to NPDES permits or that the WLAs (based on a zero receiving water reference temperature) will only apply when effluent and river temperatures are above the applicable river temperature criteria.

Failure to address the regulation of thermal waste loads with this consideration will put several point sources in jeopardy of compliance in the near-term during periods when their effluent is actually contributing to the reduction of river temperatures.

Response

See responses to Comment Y3 and Comment Y4.

Comment Y15

Commenter City of Washougal

Comment

The City of Washougal requests that the EPA not include October in the compliance period for point sources below RM 141.5. Tables 3-2 through 3-6 in the TMDL document that the 20 degrees C criteria is only exceeded in the months of July through September for this region of the river.

Table 6.1 lists the two water quality temperature criteria that Oregon applies in the lower Columbia River in October. The year-round criterion is 20 degrees C for River Miles 0 to 141.5, and the temperature criterion in a two-mile river segment below Bonneville Dam (RM 141.5 to 143.5) is 13 degrees C for October 15-March 31. Table 3-7 shows no temperature exceedances of the 20 degrees C temperature criterion in October from the Priest Rapids Dam (RM 396) to the Pacific Ocean. It would not be correct for the TMDL WLAs to apply to NPDES permitted facilities during periods of the year when the Columbia and Snake Rivers are in compliance with the 20 degrees C water temperature criterion, which is during October through June.

Response

See response to Comment Y5.

Comment Y16

Commenter City of Washougal

Comment

The City of Washougal requests that the EPA clarify that implementation of the TMDL WLAs will be on a monthly average basis. Tables 6-12 and Table 6-13 define WLAs for NPDES point sources, but these tables do not state the seasonal period when applicable. The City requests that EPA specify that WLAs are to be applied by as monthly average values for compliance with the WLAs, as this was the basis for the modeling within the TMDL.

Response

See response to Comment Y6.

Comment Y17

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL has insufficient information and analysis on mixing zones. National Pollutant Discharge Elimination System (NPDES) permittees are allocated a 0.1°C increment of load allocation from the human use allowance. The TMDL presents data on the heat sources discharge these loads on average. The TMDL only evaluated the impact of hot water on mainstem temperatures after complete mixing.

Since the EPA RBM-10 model one-dimensional, this review of the cumulative point source thermal contribution misses the impacts that these sources could have on presenting blockages to adult migration. There is no consideration of the temporal or spatial distributions of these point sources. In years where there is a probability of high air temperature and low river flow, point source releases of temperature of up to 79.6 MGD at 45°C could lead to conditions that require immediate action.

In 2015, EPA committed to carrying out conservation measures to minimize adverse effects of permitted thermal discharge plumes and to work with the Oregon Department of Environmental Quality (ODEQ) on technologies to limit mixing zone sizes to the smallest extent practicable. ODEQ in turn reported in 2018 that they intended to identify technical and policy alternatives that would allow permit holders to meet temperature requirements. The TMDL should map mixing zones for point sources and assess how these areas might impede salmon migration particularly during low flow/high temperature periods. State implementation plans should require tertiary treatment of point source thermal pollution during low flow/high temperature periods.

Response

Mixing zones are smaller scale phenomena that cannot be feasibly addressed in the TMDL. State water quality standards contain specific provisions to limit the impact of mixing zones on local conditions near outfall pipes. These provisions are evaluated and applied as part of the NPDES permit issuance process.

Comment Y18

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The TMDL should also more thoroughly examine mixing zones, including the extent to which they may mask or mischaracterize the impacts of more acute, discrete temperature loading inputs or situations.

Response

See response to Comment Y17.

Comment Y19

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please remove the point source dischargers from the TMDL. Table 4-1 in the TMDL document (page 30) provides the estimated range of temperature impacts for current sources, as modeled by EPA:

Table 4-1 acknowledges that NPDES point sources have a negligible to small contribution (0.0 to 0.1 degrees C), yet implementing the TMDL for point sources would impact 126 different facilities in Washington and Oregon (31 “major facilities” are listed in Table 6-12 and 95 “minor facilities” are listed in Table 6-13, totaling 126 facilities). This would require Oregon and Washington to update permits and develop compliance strategies for these 126 facilities, which may include costly infrastructure investments and burdensome compliance challenges for what is little or no environmental benefit. At a time when many private employers and state and local governments are addressing budget challenges, this aspect of the TMDL places a significant new burden on the point source permitted community that does not meet the public value standard of delivering high environmental benefit commensurate with the associated public expenditure.

Response

While the TMDL assessment shows that point sources have a smaller overall impact to the mainstem Columbia and lower Snake Rivers, the receiving water is impaired and the Clean Water Act and implementing regulations require a Total Maximum Daily Load to be identified, including individual waste load allocations for point sources. Because the WLAs are calculated at maximum current heat loads, EPA does not expect the NPDES effluent limits implementing the TMDL WLA to require significant infrastructure investments from the point source dischargers, as long as maximum heat loads and discharge volumes do not change. If increases in WLAs are needed in the future, point source dischargers can request that its permitting agency review new information and consider an allotment from the reserve that has been included in the TMDL.

Comment Y20

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please clarify that the TMDL for temperature only applies to NPDES point source dischargers during the July to October period and only to a portion of that period when the Columbia and Lower Snake River water temperatures exceed applicable temperature criteria. It would not be appropriate for the WLAs to apply to NPDES permitted facilities during periods of the year when the Columbia and Snake rivers are in compliance with the applicable water quality standards.

Section 6.2 on page 39 starts with the following statement: “The critical time periods for this TMDL are July-October for all locations.” While the focus on this four-month season is consistently applied throughout the document, the WLAs for NPDES permitted facilities listed in Table 6-12 and Table 6-13 do not explicitly state that the WLA applies only for this four-month period. Please provide a statement in the text or footnote for Table 6-12 and Table 6-13 confirming that WLAs apply only during the four-month period of July-October, or to a portion of that period when the Columbia and Snake rivers are out of compliance with water quality standards within the applicable river reach. For instance, below Bonneville Dam for River Miles 0 to 141.5, where the year-round criterion is 20 C, Tables 3-2 through 3-6 suggest that the 20 C criteria is only exceeded in the months of July through September.

Response

For the critical time period in the TMDL, see response to Comment Y2. Regarding when WLAs apply, see response to Comment Y5.

Comment Y21

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

The TMDL should only apply to point source dischargers when the effluent from those dischargers exceeds the temperature criteria and therefore the discharges are contributing to the impairment status.

The Waste Load Allocations (WLAs) for NPDES permitted point sources are presented in Tables 6-12 through 6-15 and it is explained in the first paragraph on page 51 that the "WLA was calculated using the facility design flow and the highest known or estimated temperature of the facility effluent." With the approach for WLA calculation used in the TMDL, discharges of effluent at temperatures below the applicable river temperature criteria appear to still be subject to a WLA and potential thermal load limits. Because discharges of effluent at temperatures below the applicable river temperature criteria contribute to river cooling and additional progress towards attainment of the temperature criteria in the river, thermal loads limits should not apply when the effluent temperature for discharges is below the applicable river temperature criteria.

This situation has been addressed in the Oregon Department of Environmental Quality's 2008 report "Temperature Water Quality Standard Implementation – A DEQ Internal Management Directive" through the definition of Excess Thermal Load (ETL) wasteload allocations and ETL calculations for use in NPDES permit compliance. The TMDL should either: 1) clarify that WLAs will only apply when effluent temperatures are above the applicable river temperature criteria; or 2) state that an ETL approach should be taken by the states in applying the thermal WLAs to NPDES permits. Failure to address the regulation of thermal waste loads with this consideration will put several point sources in jeopardy of noncompliance during periods when their effluent is contributing to the reduction of river temperatures relative to the applicable water quality standard.

Response

See responses to Comment Y3 and Comment Y4.

Comment Y22

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

October should not be included in the compliance period for point sources below RM 141.5 (below Bonneville Dam). Table 6.1 lists the two water quality temperature criteria that Oregon applies in the lower Columbia River in October. The year-round criterion is 20 degrees C for River Miles 0 to 141.5, and the temperature criterion in a two-mile river segment below Bonneville Dam (RM 141.5 to 143.5) is 13.0 degrees C for October 15-March 31. Table 3-7 shows no temperature exceedances of the 20.0 degrees C temperature criterion in October from the Priest Rapids Dam (RM 396) to the Pacific Ocean. It would not be appropriate for the WLAs to apply to NPDES permitted facilities during periods of the year when the Columbia and Snake rivers are in compliance with the 20 C water temperature criterion.

Response

See response to Comment Y5.

Comment Y23

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please clarify that implementation of the WLAs is intended to be on a monthly average basis. The paragraph on page 53 immediately preceding Table 6-12 states: "The assumptions of the modeling assessment can be considered in determining how to translate the TMDL waste load allocations into permit limits. In the model, a point source is input as a continuous heat load, and this is analogous to a source discharging continuously at its monthly average permit limit. Collectively, if all the sources discharge this load on average, the goal of the TMDL for point sources will be achieved." This paragraph is the context for presenting the WLAs in Table 6-12 and Table 6-13. However, the headings for the parameters (flow, temperature, WLA) do not explicitly indicate the time period basis for measurements. Please confirm that the intent of the TMDL is for the states of Washington and Oregon to apply the flow and waste load values as monthly average values for compliance with the WLAs, as this approach was the basis for the modeling within the TMDL.

The difference in interpretation of the thermal waste loads against the WLAs on a daily as opposed to a monthly basis for instance could put several point sources at risk of non-compliance under current conditions.

Response

See response to Comment Y6.

Comment Y24

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

The TMDL should support adjustment to the WLAs of Columbia River discharges based on an environmental benefit and/or economic efficiency for a change in the current WLAs. This could take two forms:

(1) a change in flow allocation (and therefore WLA) between two or more Columbia River permitted discharges or

(2) the consolidation of flows from two or more separately permitted discharges into one, where one or more facilities are currently a Columbia River discharger (and therefore receiving a WLA) and other facilities may currently discharge to a tributary of the Columbia River (and therefore not directly receiving a WLA).

Response

This comment appears to relate to the types of NPDES effluent limit adjustments that could be considered as part of an approved water quality trading program. Water quality trading is an implementation mechanism. EPA supports water quality trading as a potentially cost effective and environmentally beneficial approach to meeting the water quality goals established by the TMDL. Point sources may consider meeting their temperature permit limit under a state-approved water quality trading plan that is prepared and submitted according to the applicable state's rules and guidance documents. Important trading issues such as establishing the geographical boundaries within which trading may be conducted consistent with the TMDL will be discussed with the states and the interested stakeholders as part of TMDL implementation.

Comment Y25

Commenter Washington Department of Ecology

Comment

Although we do not foresee large changes to our NPDES permits, it would be helpful to understand the assumptions behind the WLAs in this TMDL. Can EPA provide further guidance on how to interpret WLAs? Typically, TMDLs have text that explain this, and we need to understand the assumptions for WLAs to know how to best interpret them.

Response

EPA has described the technical approach and assumptions for WLAs in the TMDL to support interpretation by NPDES programs. In addition, EPA has developed a new appendix, Appendix J, to provide additional clarification on WLA assumptions and considerations for NPDES permit writers.

Comment Y26

Commenter Washington Department of Ecology

Comment

The list of general permittees and general permit types that are de minimis needs clarification (Table 6-15; and page 52, last paragraph).

In particular, it is not clear if the list of de minimis permittees is narrow (a subset of the particular permittees in Table 6-15 whose data is available); broad (permittees covered under the general permits listed in the last paragraph on page 52 as well as other general permits); or something in between.

Facilities who discharge to the Columbia River with coverage under Washington's Sand and Gravel General Permit are missing from the list of facilities considered on page 52 and are not assigned WLAs. In regards to discharges for these permits, we would like to know: Will the states have to use reserves allocated for point source loads to accommodate those covered by the sand and gravel general permit that were not considered in EPA's modeling, or would they (or could they) also be considered de minimis as many of the other general permit dischargers were? If considered part of the reserves or de minimis (in either case), what guidance do we provide to those permittees in regards to their discharge?

It would be useful also to clarify that stormwater permittees are de minimis, as they appear to be from language on pages 58 and 60 of the TMDL (page 60: “Because the estimated temperature impacts from these sources are minimal and intermittent, EPA has not assigned a WLA to stormwater sources in this TMDL”.) It would be useful to clarify if new permittees might also be considered de minimis – for example, new fish rearing facilities and possibly other facilities covered under individual or general permits.

Response

This TMDL covers a large geographic area with many point sources, and EPA has made determinations based on the available information. While EPA used the best information available at the time of TMDL establishment, some new sources or sources not listed in the TMDL may require new or increased wasteload allocations and permit limits in the future based on new information. This is one of the purposes of the reserve allocation. Case-by-case review of permits can also determine whether loadings can be considered negligible for the purposes of NPDES permitting.

Regarding stormwater, see response to Comment Y30.

Comment Y27

Commenter Oregon Association of Clean Water Agencies

Comment

The TMDL notes that the critical time periods are July to October and available data indicate that temperature criteria exceedances occur during this time period. The TMDL does not define the timeframe when the wasteload allocations would apply. Since a timeframe is not specified, wasteload allocations can be interpreted to apply on a year-round basis. This would mean that municipal wastewater treatment facilities could exceed the wasteload allocations during the wet season when flows are higher. We recommend that the TMDL specify a time period for application of the wasteload allocations that is consistent with the temperature criteria exceedances.

Response

See response to Comment Y2.

Comment Y28

Commenter Oregon Association of Clean Water Agencies

Comment

The TMDL also states that the point source inputs were modeled as a continuous load, which is analogous to a point source discharging continuously at its monthly average permit limit. As such, we recommend that the TMDL specifically state that the wasteload load allocations be expressed as a monthly average limit in NPDES permits.

Response

See response to Comment Y6.

Comment Y29

Commenter Oregon Association of Clean Water Agencies

Comment

Over the last two decades, Oregon DEQ has developed a number of TMDLs for temperature. Oregon's TMDLs specify wasteload allocations for point sources in terms of "excess thermal load". Excess thermal load is defined as the thermal load that is in excess of the applicable standard. This is an effective means of limiting the application of the thermal loads to the time period when criteria exceedances occur. We recommend that EPA express the point source wasteload allocations in terms of "excess thermal loads".

Response

See response to Comment Y4.

Comment Y30

Commenter Oregon Department of Environmental Quality

Comment

Finally, EPA must revise the TMDL to include wasteload allocations (WLAs) for National Pollutant Discharge Elimination System permitted sources. Under 40 CFR 122.44(d)(l)(i) and (d)(l)(vii)(B), without a WLA, point sources may not be allowed to discharge the TMDL allocated pollutant, in this case heat. EPA-approved Oregon TMDLs (Hood River Temperature TMDL and Upper Klamath and Lost Subbasins Temperature TMDL) provide WLAs for sources that are considered de minimis and provide a template for how such de minimis discharges are to be treated within the TMDL.

Response

EPA reviewed the referenced state-issued temperature TMDLs and found that the state is referring to a stormwater discharge analysis. In these TMDLs, ODEQ included a narrative statement that the stormwater discharges could continue at current discharge levels, as impacts from stormwater on mainstem river temperatures are considered to be negligible. EPA has revised the Columbia and Lower Snake Rivers Temperature TMDL to state that the TMDL assumes continuing discharges from stormwater sources at current levels to have an negligible impact on mainstem river temperatures.

Comment Y31

Commenter Oregon Department of Environmental Quality

Comment

When calculating thermal (heat) loads, EPA multiplies temperature in units of degrees Celsius by river flow rate and a conversion factor rather than expressing temperature (T) in units Kelvin. Use of T in °C in the equation implies that ice at 0°C has zero thermal load, which is not the case (if ice at 0°C is placed in contact with ice at -20°C, heat will flow from 0°C ice to -20°C ice). Therefore, total thermal load should technically be calculated using Kelvin. It would be helpful if EPA provides a brief explanation and justification for their use of Celsius.

Response

EPA is using the Celsius scale in the TMDL, where 0°C is the freezing point of water. The TMDL is, by definition, addressing water in the fluid state. The specific heat capacity of water is 4.184 joules/g-°C and 4.184 joules/g-°K, and therefore, the heat required to change water temperature by 1°C is the same as that required for a 1°K change in the fluid state.

Comment Y32

Commenter Oregon Department of Environmental Quality

Comment

The approach used by EPA to derive wasteload allocations is inconsistent with the approach used by ODEQ to develop thermal wasteload allocations. In Oregon, thermal wasteload allocations are specified as "excess thermal loads," as follows:

ETL = (6.T)(QR + QE)CF

Where:

ETL = Excess Thermal Load (kcal/day)

6-T = Allocated allowable river temperature increase due to a point source, °C

QR= River flow rate upstream of discharge (cfs or ems)

QE = Effluent flow rate (cfs or ems)

CF = Conversion Factor (86.4 x 106 if flow as ems, 2,446,665 if flow as cfs)

Note that ETL is independent of river temperature. River temperature factors in when determining if thermal wasteload allocations will be met for a given effluent temperature and flow combinations, as follows:

ETL for a given effluent T and Q combination = QE(T E-T c)CF

Where:

TE = Effluent temperature, °C

Tc = Applicable temperature criterion, °C

Response

See response to Comment Y4.

Comment Y33

Commenter Oregon Department of Environmental Quality

Comment

Section 6.5.2 NPDES Permitted Point Sources

On pages 52 and 53, this TMDL includes examples of industrial general permits that are considered de minimis with regard to temperature impacts to the Columbia and Lower Snake Rivers. These include Confined Animal Feeding Operations (CAFOs), in-stream placer mining, pesticide discharges, fruit packers, seafood processing, net pen aquaculture, and fish hatchery permits. As stated in the TMDL, EPA did not assign a wasteload allocation for these facilities because the type of industry, permit requirements, and/or available data indicate the temperature impacts from these sources are de minimis. In the future, if it is determined that these facilities are a heat load source, EPA states that the permittees will work with the permitting authorities to determine if the reserve allocation or additional heat load within the reach is available.

Using EPA's rationale for the list included in the TMDL, the following general permits should also be included as de minimus in EPA's list: 500J boiler blowdown, 1700A washwater, 400J log ponds, and 1500A petroleum hydrocarbon cleanup permits. Further, the 1400A and 1400B general permits for fruit packing are both Water Pollution Control Facility permits, which, because they do not discharge to surface waters, are not subject to the TMDL and should not be included.

While DEQ agrees the temperature impacts from these types of industry are not significant. DEQ is concerned that without a wasteload allocation a permitted facility would not be able to discharge any heat. EPA should provide a WLA for facilities in the Columbia River that are authorized to discharge under the 100J, 200J, 400J, 500J, 900J, 1500A, and 1700A general permits.

Facilities covered under these general permits are not expected to discharge materials likely to significantly contribute to heat. Therefore, WLAs for these facilities in the Columbia River currently permitted or permitted in the future under by 100J, 200J, 400J, 500J, 900J, 1500A, and 1700A should be assigned a wasteload allocation within a reach. EPA should assign a separate "bubble" wasteload allocation to each reach in the Columbia River for all general permit sources. A bubble wasteload allocation would be set aside in each reach for the applicable general permits. Tabulating and tracking the permittees and associated thermal loads can occur to ensure assigned wasteload allocations would not exceed the bubble allocation. Once exceeded, reserve capacity would need to be applied for and allocated to additional permittees covered under a general permit. In Table 2, DEQ lists general permits and information in support of a wasteload allocation in a reach for these sources.

DEQ agrees temperature impacts from sources covered under the 700PM, 2300A, and CAFO general permits are de minimis and it is appropriate to not assign a wasteload allocation. The general permits 700PM and 2300A cover mobile operations. Operations that may occur in the Columbia River with 700PM and 2300A general permit coverage are not expected to influence heat. CAFO general permit 01-2016 does not authorize a discharge except in an extreme storm event where discharge will be comprised of stormwater. As mentioned above, the 1400A and 14008 general permits for fruit packing are do not allow a discharge to surface waters and should not be included. In the future, if it is determined that these facilities are a heat load source, the permittees can work with the permitting authorities to determine if the reserve allocation or additional heat load within the reach is available. In Table 3, DEQ lists general permits and information in support of not assigning a wasteload allocation.

WLAs should be assigned to Oregon Fish Hatcheries on the Columbia River covered by a 300J fish hatchery general permit. In the future, a fish hatchery that seeks new coverage under a 300J general permit should work with EPA and permitting authorities to determine if the reserve allocation or additional heat load within the reach is available. Table 4 lists the hatcheries.

Response

For facilities covered under a general permit, WLAs were assigned where facilities were believed to have a temperature discharge and where information were available. Note that some hatcheries discharge below water quality standards and therefore may not need a temperature limit. Sectors that are not expected to add temperature to their discharges include facilities covered under the CAFO general permit and pesticide general permit. Therefore, these facilities do not require a temperature limit, unless there are site-specific circumstances that indicate a heat discharge. For other facilities not receiving a WLA covered by a general permit, the permit writer should evaluate each facility's operations and make a case-by-case determination whether additional temperature monitoring is needed and whether a temperature/heat load limit is needed. If a permit limit is needed, the permit writer may access the reserve allocation or engage in water quality trading if authorized by the state in its NPDES permit.

EPA does not have sufficient information about general permit discharges to assign "bubble" wasteload allocations or a portion of the reserve to these sources. When general permits are reissued, the states of Oregon and Washington, in consultation with EPA, will need to evaluate and authorize a portion of the reserve for these sources.

For any facilities that do not discharge to surface waters, the TMDL does not apply and no WLA is necessary.

Comment Y34

Commenter Washington Association of Sewer and Water Districts

Comment

Of particular concern to our members is whether or not point sources should even be included in this TMDL since their contributions to temperature increase are miniscule compared to dams and climate change, as reflected in Table 4.1 in the TMDL document. With 126 facilities affected, the burden of revising permits, administration and providing oversight on the part of permitting agencies would be substantial. Permittees would need to perform analyses for optimization, develop compliance strategies, revise plans, and possibly develop and implement capital projects, for what appears to be little environmental benefit compared to other discharges and impacts. For these reasons, point sources should be removed from this TMDL.

Response

See response to Comment Y19.

Comment Y35

Commenter Washington Association of Sewer and Water Districts

Comment

Another concern of our members is the need for precise and consistent definitions to ensure the pathway to compliance is clear. It must be clear whether measurements are reported as daily or monthly averages to avoid confusion and potential regulatory or legal implications regarding compliance. Clarification and consistent application of river mile designations and well-defined river reaches is also needed to ensure proper access to reserve allocations by point source dischargers.

Response

See response to Comment Y6.

Comment Y36

Commenter Western Division of the American Fisheries Society

Comment

Effluents should not be assumed to be benign simply if they match an overheated ambient river temperature. It appears that the TMDL assumes that the Portland sewage treatment plant releases a constant temperature discharge all year (Table 6-12). It is not stated what the discharge temperature is in July, August, and September. Also, the ability of this discharge to heat the Columbia River during these months depends upon the temperature differential between the river and the sewage flow (gpm) and temperature. Discharging heated effluent into a river that is already overheated may not produce much additional heating, but it certainly does not provide a cooling effect. The ability of any discharge to heat the mainstem should be compared to the temperature of the river at its historical, baseline flow (i.e., compared to the temperature target for that location along the river). The effluent target temperature should be equal to the river target temperature or less. Likewise, in tributaries, point source and non-point source temperatures entering tributaries should not exceed the temperatures set as water quality standards after mixing for those stream segments and should be less so to meet water quality standards at the downstream extent of each thermal zone (e.g., 16, 18, or 20°C).

Oregon's Division 41 temperature standards state: "Following a temperature TMDL or other cumulative effects analysis, waste load and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact." Temperatures already exceed criteria significantly in many locations and months. It is also conceded that dams produce cumulative temperature increases.

Response

The TMDL technical assessment has shown that point sources currently contribute to a very small increase (less than 0.1°C) in Columbia and Snake river temperatures. The TMDL allocates this small impact to the point sources. This allows point sources to discharge at their current temperatures. Because the impact of point sources is less than 0.1°C, this approach to allocating to point sources is consistent with the Oregon provision quoted in the comment.

Comment Y37

Commenter Western Division of the American Fisheries Society

Comment

Waste Load Allocations (WLAs) were calculated based on available data, but in many cases temperatures and volumes of discharges are not known. How will this necessary information be collected in the near future and how will it be factored into revisions to the TMDL and its WLAs?

Response

NPDES facilities have been afforded the opportunity to provide additional data during the comment period for the TMDL. Additional data will be collected by dischargers to demonstrate compliance with their permits. The reserve allocation also allows for future WLA adjustments as needed.

Comment Category Z. Industrial, Municipal and General Permits (except Stormwater)

Comment Z1

Commenter Seattle City Light

Comment

As a matter of policy, City Light supports regulatory efficiency and hence recommends the EPA work with its sister State and Tribal agencies addressing water quality concerns such that actions required by permittees are founded on the consideration of inherent risks at each intake and outfall proposed for monitoring and are not applied unnecessarily where actions that could be applied would not yield tangible benefit to fisheries resources in the Columbia basin.

Response

EPA is working with states and tribes to coordinate permitting approaches and promote reasonable implementation of the TMDL WLAs. See also response to Comment Y19.

Comment Category AA. Dam Permits

Comment AA1

Commenter PNGC Power

Comment

Compounding this concern, is the requirement precipitated by the NPDES permitting action, to acquire a water quality certification from the Washington Department of Ecology ("Ecology") under section 401 of the CWA. Ecology's May 7, 2020 401 certifications for each of the federal dams imposed a significant set of conditions on the operations of the CRS facilities. If upheld, the stringent conditions in the 401 certifications must be incorporated by EPA when the agency issues the final NPDES permits. One of the conditions Ecology is looking to impose through the 401 certifications is compliance with this TMDL.

Response

See response to Comment A6.

Comment AA2

Commenter Seattle City Light

Comment

Notwithstanding the above concerns, City Light supports prudent and appropriate monitoring to meet the needs of these federal and state permits, particularly when it is tightly tied to increasing our understanding of the impacts of factors such as temperature, entrainment and impingement that can have adverse effects on the recovery of Endangered Species Act-listed salmonids. We are concerned, however, that there are multiple redundant requirements in the monitoring provisions being proposed that add little value.

Response

See response to Comment A46.

Comment AA3

Commenter Northwest River Partners

Comment

In that light, we would like to begin by expressing our support for the comments provided by one of RiverPartners' member organizations, PNGC Power, during the comment period for the National Pollution Discharge Elimination System permits issued for dams on the lower Columbia and lower Snake rivers.

PNGC Power, in its comments submitted to the Environmental Protection Agency ("EPA") on 5/1/2020, wrote,

At a time when our country is fighting to contain a coronavirus that is seriously threatening human health and the economy, policymakers must be particularly cautious about the imposition of potentially costly new regulatory requirements. To the extent regulations are warranted, conditions imposed must be carefully calibrated to address risk and result in demonstrable benefits. As you know, our region's carbon-free federal hydropower supply sourced from the CRS [Columbia River System], is the engine of the Pacific Northwest's economic prosperity and environmental sustainability. We ask EPA to partner with us to enhance the security it provides.

Response

EPA has been working and will continue to work together with all interested parties to implement actions that help reduce temperatures in the Columbia and Snake Rivers. The TMDL incorporates the applicable state and tribal water quality standards for temperature, as required by the Clean Water Act. The load and waste load allocations included in the TMDL were calculated through computational modeling, with the temperature standards as the endpoints.

Comment AA4

Commenter Northwest River Partners

Comment

While EPA is not suggesting a particular application of the CLSRT TMDL, it is clear that the states of Washington and Oregon intend to use the TMDL to regulate river temperatures. Washington state's Department of Ecology ("Ecology") has specifically required through its 401 Water Quality permitting process that the following National Pollutant Discharge Elimination System ("NPDES") permits include a requirement to meet the load allocations in the TMDL, once finalized:

- Lower Granite Lock and Dam, NPDES Permit No. WA0026794
- Little Goose Lock and Dam, NPDES Permit No. WA0026786
- Lower Monumental Lock and Dam, NPDES Permit No. WA0026808
- Ice Harbor Lock and Dam, NPDES Permit No. WA0026816
- McNary Lock and Dam, NPDES Permit No. WA0026824
- John Day Project, NPDES Permit No. WA0026832
- The Dalles Lock and Dam, NPDES Permit No. WA0026701
- Bonneville Project, NPDES Permit No. WA0026778

Similarly, the Oregon Department of Environmental Quality ("DEQ") requested that EPA incorporate into the NPDES permits the CLSRT TMDL.

Response

See response to Comment A6. Broader issues related to the development and implementation of National Pollutant Discharge Elimination System (NPDES) wastewater discharge permits under the Clean Water Act are outside of the scope of the TMDL.

Comment AA5

Commenter Port of Clarkston

Comment

The EPA Columbia and Snake River TMDL report (2020) also details the temperature contribution of each dam (turbine cooling water) which is miniscule for the LSR dams. If point source permits were required, cooling water and potential oil spills would be the sources. Non-toxic vegetable oils have been used in the turbines for decades. Similarly, polychlorobiphenyl (PCB) oils were eliminated from transformers at the dams years ago.

Response

See response to Comment D24.

Comment Category BB. Stormwater

Comment BB1

Commenter Washington Department of Transportation

Comment

It looks like MS4 stormwater is not considered a significant source (no WLA). However, I did notice that WSDOTs MS4 permit is not included in the list of permittees on table 6-16. I'm assuming WSDOT has permit covered facilities (WSDOT facilities with Phase I and II areas) within the TMDL boundary but am not sure.

Response

See response to Comment BB2.

Comment BB2

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 60, Section 6.5.3, next to last paragraph in this section: Providing no allocations for stormwater NPDES permits is effectively a "zero discharge" requirement. However, a summer thunderstorm on warm pavement, which then discharges to the river, could be a significant load in a large urban area. As part of implementation, EPA and the State of Washington should enforce zero discharge and eliminate summer stormwater discharges.

Response

MS4 stormwater discharges are considered to contribute negligible heat amounts to mainstem river temperatures. Therefore, stormwater discharges are not assigned a wasteload allocation as part of this TMDL. EPA has revised the TMDL to state that it assumes continuing discharges from stormwater sources at current levels to be negligible, however the states have discretion as part of TMDL implementation and ongoing permit review to incorporate additional conditions or best management practices into these permits.

Comment BB3

Commenter Oregon Association of Clean Water Agencies

Comment

Stormwater discharges

Section 6.5.3 includes discussion of stormwater discharges and notes that the temperature TMDLs developed by Oregon DEQ and Washington Ecology have not considered stormwater discharges as a significant source of heat load during the summer critical period, primarily because of minimal precipitation in most of the Pacific Northwest during the summer and early fall. The TMDL states that because the temperature impacts from stormwater discharges are minimal and intermittent, EPA did not assign a wasteload allocation to stormwater sources. We support these conclusions. Additionally, we recommend that the TMDL include a specific statement that stormwater sources are considered de minimis. This approach would be consistent with the findings made for other sources in section 6.5.2 of the TMDL whose temperature impacts were deemed to be minimal and we considered de minimis.

Response

See response to Comment BB2.

Comment BB4

Commenter Oregon Department of Environmental Quality

Comment

Results of the 2020 census may show that additional municipalities, which discharge stormwater to the Columbia River, require MS4 permits because population is the primary factor in determining if a municipality requires an MS4 permit. In addition, DEQ anticipates renewing the construction, industrial and municipal stormwater general permits on a regular basis. EPA did not assign a WLA to stormwater sources because their temperature impacts are “minimal and intermittent.” On page 60, EPA states:

If additional data indicate that any of the various sources of stormwater are a significant source of thermal loading, then the States or EPA may access a portion of the reserve capacity or available heat load within the reach to allow for continued discharge from stormwater facilities.

DEQ would like clarification on how EPA defines “significant” for purposes of needing to request a portion of the reserve capacity. DEQ does not anticipate any MS4, construction or industrial stormwater permit registrant would be a significant source of thermal loading. Please state that in the TMDL documents so there is clarity regarding future MS4’s, construction and industrial stormwater permit registrants.

Response

EPA recommends case-by-case review, in coordination with relevant state NPDES permitting authorities, of new information related to stormwater discharges.

Comment Category CC. Available Data and WLA Corrections

Comment CC1

Commenter City of Camas

Comment

The TMDL lists a thermal WLA in Table 6-13 for the Camas WWTP of 587 million kcals/day, based on a reference temperature of zero. This WLA has been calculated by applying a maximum effluent temperature of 25.5 degrees C and an effluent flow of 6.1 mgd. The City of Camas WWTP submitted a General Sewer Plan/Wastewater Facility Plan amendment to the Washington Department of Ecology in 2016. This document supports the state and local coordinated planning basis for the applicable service area for future flows of 10.16 mgd (dry season) on a monthly average flow basis. The City of Camas requests that EPA update the allocation for the Camas WWTP to the appropriate maximum month effluent flow of 10.16 mgd.

Response

EPA has not changed the wasteload allocation, because the basis for all wasteload allocations is the currently permitted design flow of a facility and not a projected future flow. If the permitted design flow increases in the future, a facility can request a higher wasteload allocation that would be subject to the management and limitations of the reserve allocation in the TMDL.

Comment CC2

Commenter City of Gresham

Comment

The City of Gresham Wastewater Treatment Plant NPDES Permit No. 102523 already has an assigned heat load allocation that is an Excess Thermal Load (ETL) allocation, which means that it is based on the 20 degrees C temperature criterion and the equation included under TMDL Comment #5. Schedule A in the Gresham WWTP NPDES permit states in the footnote to Table A1 that: "Upon approval of a Total Maximum Daily Load for temperature for this sub-basin, this permit may be re-opened and new temperature and/or thermal load limits assigned." It is the City's understanding that this footnote in the NPDES permit indicates that the existing thermal load limits in the permit may be revised upon approval of this TMDL and such changes would not constitute backsliding according to the Clean Water Act. The City requests that EPA confirm that changes to the thermal load limits in the NPDES permit will avoid anti-backsliding restrictions.

Response

The NPDES permit development process for the City of Gresham will determine appropriate limits in the future based on current permit requirements, the TMDL wasteload allocation, and applicable anti-backsliding regulations.

Comment CC3

Commenter City of Gresham

Comment

The TMDL lists a thermal WLA in Table 6-12 for the Gresham WWTP of 1,350 million kcals/day, based on a reference temperature of zero. This WLA has been calculated by applying a maximum effluent temperature of 23.9 degrees C and an effluent flow of 15.0 mgd. The City of Gresham completed a WWTP Master Plan Update (2017). This document supports the state and local coordinated planning basis for the applicable service area for future flows of 15.9 mgd (dry season) on a monthly average flow basis. The City requests that EPA update the allocation for the Gresham WWTP to the appropriate effluent flow of 15.9 mgd in Table 6-12 to fully respect the coordinated basis of planning.

Response

See response to Comment CC1.

Comment CC4

Commenter City of Portland

Comment

The effluent flow value used to calculate the wasteload allocation for the CBWTP in the TMDL should be changed to 150.0 million gallons per day (MGD) to reflect the current capacity of the facility. The Oregon Department of Environmental Quality (DEQ) recently renewed the NPDES permit for the CBWTP (effective July 1, 2020). This permit includes more accurate facility characteristics, including maximum daily, weekly, and monthly flow rates to calculate waste discharge limits; these facility flow rates are 450 MGD, 250 MGD, and 150 MGD, respectively. The effluent flow of 130.0 MGD used in the TMDL to calculate the wasteload allocation for the CBWTP (Table 6-12; pg. 53) does not accurately reflect the capacity of the facility or the flows currently permitted by DEQ. EPA should update the effluent flow for the CBWTP to 150.0 MGD to reflect the current maximum monthly effluent flow and recalculate the wasteload allocation for the facility.

Response

EPA has adjusted this wasteload allocation based on the currently permitted facility capacity of 150 mgd.

This change and other revisions to the wasteload allocations based on new information also result in a change to the reserve allocation, which is the remainder of the loading capacity, within the 0.1°C aggregate wasteload allocation, after allocations to current point sources. EPA has recalculated the reserve allocation for the revised TMDL based on information received from numerous facilities as described in this response to comments document. In the process of re-calculating the reserve, an error was found in the translation of modeling information into the May 2020 TMDL that was specific to the reserve loading value (4.4×10^9 kcal/day). The corrected value was 5.7×10^9 kcal/day, based on the assumed point source loadings assessed in May 2020.

Using the new 2021 information from point sources and re-running the model, the reserve allocation in the TMDL is now 4.8×10^9 kcal/day for June through September. A reduced reserve loading is necessary to achieve the 0.1°C aggregate wasteload allocation in October in the upper and middle Columbia reaches, upstream of Priest Rapids Dam. The reserve allocation for this section of the river in October is 2.0×10^9 kcal/day. A table has been added to the TMDL that lists the reserve allocation reaches and loadings.

Comment CC5

Commenter City of Washougal

Comment

The TMDL lists a thermal WLA in Table 6-13 for the Washougal WWTP of 204 million kcals/day, based on a reference temperature of zero. This WLA has been calculated by applying a maximum effluent temperature of 24.1 degrees C and an effluent flow of 2.24 mgd. The City of Washougal WWTP sent a Revised Facility Plan based on the hydraulic expansion to the Department of Ecology in May 2014. This document supports the state and local coordinated planning basis for the applicable service area for future flows of 4.36 mgd (dry season) on a monthly average flow basis. The City requests that EPA update the allocation for the Washougal WWTP to the appropriate effluent flow of 4.36 mgd in Table 6-13 to fully respect the coordinated basis of planning.

Response

See response to Comment CC1.

Comment CC6

Commenter Clearwater Paper Corporation

Comment

Clearwater did not receive a wasteload allocation (WLA) in the subject TMDL. It is not clear whether EPA's failure to provide a WLA to Clearwater's facility in the subject TMDL was an oversight. For example, on pp. 2-3 of the document it indicates that allocations for all point source dischargers to the assessment units in Table 1-1 were provided. Clearwater's facility discharges to the lower Snake River immediately upstream of RM 139 but downstream of the Anatone Station which is within the Assessment Units in Table 1-1. Moreover, Clearwater's temperature loading was utilized in Appendix D and relied upon in the TMDL to ensure boundary conditions "accounted for" Clearwater's discharge. See p. 54. However, it does not appear Clearwater's discharge was accounted for in the subject TMDL nor did the facility receive a WLA in Section 6.5.2 and Table 6-12 of the subject TMDL. This is of concern to Clearwater because a number of other pulp and paper mills are listed in Table 6-12, and Clearwater should be treated the same way as other competitors in the region with respect to the subject TMDL.

We assume EPA intentionally did not provide Clearwater a WLA because of how the subject TMDL drew its upstream boundary. Nevertheless, Clearwater seeks clarity on how or if the subject TMDL impacts its NPDES Permit. For example, the subject TMDL should make clear that the assumptions and requirements of the subject TMDL do not apply to permitting decisions for upstream sources including Clearwater's NPDES Permit. Alternatively, the TMDL should make clear that the WLAs in Appendix D (including Clearwater's temperature loading) and the current temperature limits in Clearwater's permit (set by EPA) are consistent with the assumptions and requirements of the subject TMDL. Such determinations by EPA in the subject TMDL will help inform IDEQ during the permit renewal process for Clearwater's facility.

Response

See response to Comment T11. The NPDES permit development process will determine appropriate limits in the future, based on current permit requirements and the assumptions of the TMDL per 40 CFR 122.4(d).

Comment CC7

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please correct the river mile (RM) designation for several major facilities, as further explained below.

Table 6-12 lists WLAs for Major facility NPDES permitted facilities on the Columbia River including the "Salmon Creek STP" under permit number WA0023639 near the bottom of page 53. The Location (river mile, RM) designation is incorrect for this facility in the TMDL (where it is listed as RM 103.2). The NPDES permits for this facility lists the discharge as located in the "Columbia River between River mile 95 and 96". This facility is typically listed as discharging at RM 96.

The basis for river mile (RM) designations needs to be defined in Section 1.2 of the TMDL. There are other inconsistencies in RM designations compared to the RMs shown in NOAA charts and Army Corps of Engineers Condition Surveys are as follows: Vancouver Marine Park WRF is RM 109.2 (not RM 109.5); Portland Columbia Boulevard WTP is RM 105.3 (not RM 102.5); Vancouver Westside WRF is RM 105.1 (not RM 105); and River Road Generating Plant is RM 103.2 (not RM 105).

Response

Minor discrepancies in river mile estimate are a common issue in water quality assessment due to differing methods of river delineation. EPA does not believe these differences in location have a significant impact on the permit impact analysis. However, EPA has reviewed the information in the comment and revised the locations in the TMDL. ODEQ has reissued the permit for the City of Portland, and the fact sheet lists the location as river mile 105.5, so EPA has used that river mile designation in the TMDL.

Comment CC8

Commenter Public Utility District No. 1 of Douglas County

Comment

Table 6-13 (page 55) Data for Wells Dam Permit Number WA0991031 comes from a yet to be issued draft permit and to our knowledge has not been assigned a permit number. In addition, data provided in the TMDL that references Wells Dam point source use of water (units of million gallons a day) and temperature additions should be considered preliminary and therefore, not appropriate for use in this TMDL. Since the waste load allocation in the final TMDL is based on information in a draft National Pollutant Discharge Elimination System (NPDES) permit and there would be an opportunity to revise as appropriate during NPDES development, Douglas PUD is concerned that these data should not be used in a final TMDL.

More generally, we are concerned that the Waste Load Allocation (WLA) for “minor facilities” identified as point source polluters listed in Tables 6-13, either represent industry standards for column “Temp (C)”, or have not been developed from physical monitoring data. Should the WLA not be a difference between ambient and discharge temperature? The use of 17.7°C for Wells Fish Hatchery and 35.4°C for Wells Dam seem inaccurate since these are maximum temperatures rather than deltas from ambient.

The reported temperature of 35.4°C would be the temperature at one discharge location and not representative of all discharge locations at Wells Dam, nor the difference or change in water temperature from ambient (maximum delta of 14.44°C). Using a change in ambient water temperature approach, for example, the additive WLA for the Wells Project operating all ten turbine units at Wells Dam is closer to 1.12E+09 kcal/day plus minor additions for new HVAC systems being installed at the Wells project and therefore conflicts with the 3.81E+09 are listed in the TMDL (Table 6-13). While the overestimation would allow for compliance, we feel compelled to point out that it is likely an extreme value if not an overestimation of actual WLA at the Wells Project.

In addition, during the study period, Wells Fish Hatchery is likely providing a reduction in kcal/day compared to ambient conditions due to the influence of colder ground water at the outfall. We believe the 2.42E+09 kcal/day listed in Table 6-13 is high during most times of the year if not always. We are not certain how EPA filled out this table and are concerned a consistent approach for all of these facilities may be lacking. Again, water temperatures between July and October at Wells Fish Hatchery are likely colder, if not much colder, than Columbia River temperatures and provide a CWR for migrating salmonids.

Response

EPA used the best available information from the states to estimate maximum heat loads. If the State of Washington’s NPDES permit program finds that new information for any specific facility warrants a change in that facility’s wasteload allocation in the future, EPA will review the new information and consider revising the WLA/TMDL, as warranted.

The TMDL establishes total heat loads (from 0°C baseline) for all point source discharges and not heat loads above the ambient temperature. The comment compares values from both methods of establishing total heat loads, and they are not comparable. The comment does not include any new information/proposed corrections to the values used for setting WLAs in the TMDL, and therefore EPA is not revising the WLAs for these facilities at this time.

Comment CC9

Commenter Washington Department of Ecology

Comment

Table 6-12 WLAs for "Major facility" NPDES permitted facilities on the Columbia River. This comment contains corrected daily maximum flow and corrected daily maximum temperature as well as a new WLA.

Response

EPA reviewed the new flow and temperature information provided by a large number of permitted facilities within the TMDL study area. EPA has incorporated the revised flow and temperature information provided by the State of Washington into the modeling and WLA calculations in the TMDL.

Comment CC10

Commenter Washington Department of Ecology

Comment

Table 6-13 WLAs for "Minor facility" NPDES permitted facilities on the Columbia River:

-Change Grand Coulee WWTP to City of Grand Coulee WWTP.

-Change City of Coulee Dam to City of Coulee Dam WWTP.

-Change Interior, Reclamation to Grand Coulee Dam WWTP.

-The two Agrium facilities listed in the minor table have the same permit numbers as two in the major table. Also, the river miles, flows, and temperatures are not consistent. It would be best to remove the Agrium facilities from the minor table and only have the Agrium facilities in the major table.

-Goldendale is listed at a “minor facility” NPDES permitted facilities on the Columbia River. However, the City of Goldendale discharges from a facility on the Little Klickitat River.

-TrueGuard (AKA All Weather Wood Treating) WA0040029 is missing in the TMDL Table 6-12), but probably needs to be added since the TMDL includes Exterior Wood (WA0040711), a similar facility in the same Washougal Industrial Park location. Both these facilities are individual permits for Stormwater only and neither is known to discharge any heat load, as there is no process wastewater discharge.

-Consider declaring Asotin de minimus or providing a WLA. Our records suggest a design flow of 0.164 MDG, and a maximum temperature discharge of 25 C. The thermal load appears to be about 1/3 of 1% of the reserve allocation in a single reach. We understand there are reserves associated with multiple river reaches.

Response

Since mainstem temperature impacts from stormwater are considered to be negligible, the Exterior Wood facility should not have been included. It has been removed from the WLA tables.

Asotin is not listed with a WLA because it discharges to the Snake River upstream of the TMDL geographic boundary (Clearwater confluence). As noted in the TMDL, Asotin and other sources in this vicinity are included in the model and the permit impact and reserve analysis, so their current maximum thermal loadings are acceptable and accounted for in the TMDL.

EPA has incorporated the remaining corrections included in this comment into the TMDL.

Comment CC11

Commenter Public Utility District No. 2 of Grant County

Comment

The Priest Rapids Hatchery is owned by Grant PUD and operated by the Washington Department of Fish and Wildlife (WDFW), whom maintains an Upland Fish Hatchery General National Pollutant Discharge Elimination System (NPDES) Permit (WAG137013) for discharges into the Columbia River downstream of Priest Rapids Dam. The Priest Rapids Hatchery permit was not included in the TMDL's list of permits in Section 6.5.2. Table 6-12, Table 6-13, or Table 6-15. Grant PUD is uncertain if the Priest Rapids Hatchery was left off the list of permitted facilities due to the timing of its operations only partially overlapping with the temporal scope of TMDL. Nevertheless, we provide the following information to EPA for consideration as you finalize the TMDL.

a. The Priest Rapids Hatchery operates from the first week after Labor Day to late June. During September before Labor Day, July, and August there are no water withdrawals or discharges from the facility.

b. The Priest Rapids Hatchery withdraws water from the Priest Rapids Dam forebay and on-site groundwater wells. The water from these two sources is used to create water temperatures in the hatchery that are safe and promote prescribed fish growth. The design flow for the Priest Rapids Hatchery is 102 cfs (66 million gallons per day) from Priest Rapids Dam forebay and 7,300 gallons per minute (10.5 million gallon per day) from the on-site wells for a combined design flow of 76.5 million gallons per day.

c. All water used in the Priest Rapids Hatchery is returned to the Columbia River via an open discharge channel. The channel is approximately 2.6 km long and enters the Columbia River 3.5 miles river kms downstream of Priest Rapids Dam. Additionally, the discharge channel enters the Columbia River approximately 11 river kms upstream of the Priest Rapids Dam tailrace water quality monitoring site. The State of Washington's numeric water quality criteria temperature in this reach of the Columbia River is 20°C daily maximum. Note that this water quality monitoring site includes mixing from the Priest Rapids Hatchery and was the source of the data that was used in EPA's RBM10 model.

d. Temperature monitoring in the discharge channel is not a requirement of the NPDES permit and has not been regularly conducted. However, on September 13, 2016, staff from WDFW deployed temperature monitoring devices in the discharge channel approximately 0.6 kms upstream from the confluence with the Columbia River. Data was collected until December 3, 2016. The data from that monitoring activity collected during the temporal scope of the TMDL are provided in Table 1.

Response

EPA has consulted with the State of Washington and has added the Priest Rapids Hatchery to the TMDL assessment and WLA table. Also see response to Comment CC4.

Comment CC12

Commenter Public Utility District No. 2 of Grant County

Comment

The values (discharge flow and temperature) used in Table 6-13 of the TMDL for Wanapum and Priest Rapids Dams appear to have been taken from Grant PUD's application for NPDES permits for those facilities and, in the case of Priest Rapids Dam's temperature, from an "industry average" value. These values do not represent "the facility design flow and the highest known or estimated temperature of the facility effluent…" as described and intended by the TMDL. Below, we provide EPA with values for discharge flow and temperature that more accurately describes operations at each dam.

a. For discharge flow, the values used by EPA represents the design flow for the cooling water intake structure only. In addition to this discharge, each dam also has sump discharge, which may capture water from locations such as gravity supply floor drains, grout gallery gutter drains, unit dewatering, and fish ladder dewatering, etc. The effluent from these sumps were included in Grant PUD's NPDES application and should be included in the TMDL wasteload analysis and allocation. Our best estimates for the potential maximum discharges, accounting for both cooling water intake and sump discharges, are provided in Table 2.

b. For temperature, the values in Grant PUD's NPDES application were recorded from single day grab samples at cooling water intake and effluent locations (note that the intake sampling location was inside the dam and not representative of incoming, or forebay, temperature). At Wanapum Dam, this sample was taken on April 23, 2019. At Priest Rapids Dam, the sample was taken on May 7, 2019. On April 23, 2019, the daily average temperature at Wanapum forebay was 7.5°C. On May 7, 2019, the daily average temperature at Priest Rapids forebay was 10.6°C. In both circumstances, the Columbia River, and therefore the intake temperatures, were relatively cold and do not represent the highest estimated temperatures of facility effluent. Project level effluent temperatures are not currently recorded at the dams, we therefore recommend the following approach to estimate maximum effluent temperatures, detailed in Table 3 and Table 4 below. First, the difference between the cooling water effluent grab sample temperature and the forebay temperature on the sampling date were used to calculate a project added temperature. Next, this project added temperature was averaged and added to the highest observed daily average forebay temperature from 2011 – 2019 at each project. The final value (column J in Table 4) is our estimated effluent temperature.

Response

EPA has consulted with the State of Washington and has revised the WLA for this facility based on the information provided. See also response to Comment CC4.

Comment CC13

Commenter Oregon Association of Clean Water Agencies

Comment

The TMDL divides the 0.3 degrees C human use allocation equally between NPDES point sources and reserve, dams and nonpoint sources, and major tributaries. The wasteload allocations for point sources are based on the design flow and effluent temperature data. We have asked our members to ensure that the design flows and effluent temperatures used in the evaluation accurately portray the discharge characteristics of the wastewater treatment facility. We also urge EPA to work with Oregon Department of Environmental Quality (DEQ) to ensure that the best available information is used to define wasteload allocations for municipal point sources.

Response

EPA has consulted with Oregon DEQ on all wasteload allocations for permitted facilities under their authority.

Comment CC14

Commenter Oregon Department of Environmental Quality

Comment

Regarding Table 6-12 WLAs for "Major facility" NPDES permitted facilities on the Columbia River

Comment: The maximum effluent temperature for Hood River OR STP should be changed to 27.0°C and the associated WLA changed accordingly.

Regarding Table 6-15 NPDES permitted facilities not receiving WLAs

Comment: Warrenton STP and Oregon Cherry Growers (Riverside Facility) also need to be added to the list of permittees with calculated WLAs in TMDL Table 6-13. Information for assessing their WLAs are shown in Table 5.

Comment: A note needs to be added for Pacific Coast Seafoods Company LLC stating that it shares an outfall with Warrenton STP.

Response

EPA has changed the Hood River OR STP wasteload allocation based on the new information provided.

The TMDL has been revised to include wasteload allocations for both Warrenton STP and Oregon Cherry Growers. See also response to Comment CC4.

For the Warrenton STP and Pacific Coast Seafoods facilities, the permits can address the issue of the shared outfall without added language in the TMDL. For shared outfalls, monitoring should be conducted upstream of the commingling of wastewater.

Comment CC15

Commenter Oregon Department of Environmental Quality

Comment

Generally, when developing wasteload allocations for point sources, model runs are performed at a design low river flow condition (7Q10, 30Q5, etc.). Modeling performed by EPA was performed utilizing data over many years, so would capture design low flow years, and river flow rates less than design low flows. Will evaluating the impacts of point sources at 90th percentile levels be of a similar conservative nature as using a design low river flow condition?

Response

The multi-year RBM10 model simulations afford the option of a dynamic estimate of point source impacts. The TMDL evaluates point source impacts using a 90th percentile level, which is equivalent to a 10% exceedance probability. A 7Q10 flow is expected to occur approximately once in ten years, or 10% of the long-term period. The approaches are not identical, but they assess point source impacts conservatively using a 10th percentile exceedance probability.

Comment CC16

Commenter U.S. Army Corps of Engineers

Comment

The Corps supports the approach that the Waste Load Allocation (WLA) should allow for the continuation of current outfall operations with regard to temperature. The WLAs should reflect the current maximum daily load based on design flow and maximum discharge temperature. Due to the complexity of the number of outfalls, different types of outfalls and different designs, determining the current maximum daily load for nine projects straddling two states is challenging. The Corps is concerned that a WLA that does not represent the maximum daily load could cause a limitation in the NPDES permit. The Corps requests a forum to jointly review the design flow of outfalls for each project and maximum likely temperature, which could lead to revisions of the WLA. We would also like to discuss specific instances where the TMDL might have been in error. For instance, it is unclear what data were used to generate Tables 6-13 and 6-14. We were unable to recreate the WLAs using the data submitted to EPA via our initial NPDES permits. As an example, it appears that Bonneville Powerhouse 1 discharges were omitted and the McNary flow rate was underestimated. The TMDL reports a flow at Bonneville Dam (OR), of 0.86 millions of gallons per day (MGD) whereas our calculation is 22.11 MGD. Likewise, McNary (OR) is reported as 15.9 MGD whereas our calculation is 36.9 MGD. In addition, water temperature at this location vastly differs from what we submitted to EPA (23.6°C is reported, but 27.4°C was what was submitted in our initial NPDES permits). Furthermore, the data used for the WLAs for point source outfalls may not reflect true conditions since the data used to calculate the WLAs was from an extremely limited data set (from a single day of sampling, collected only on equipment in operation that day). If data collected during initial sampling is found to be inconsistent and effect the WLA's, the Corps requests that there be a provision to make adjustments to the permit based on more complete information.

Response

Based on this comment and additional information provided by the U.S. Army Corps of Engineers, EPA has revised the wasteload allocations for these dams to reflect current discharges more accurately.

Comment CC17

Commenter U.S. Army Corps of Engineers

Comment

Section 6.5.2. Table 3.5 in Appendix D indicates that the Clearwater Paper Company discharges 44.7 millions of gallons per day (MGD) at 33 °C into the Snake River at river mile 139.3. Since this is the largest single point thermal discharge into the lower Snake River, and occurs in the State of Washington, it should be identified in this section.

Response

This Idaho facility is outside the TMDL study area and does not receive a wasteload allocation in the TMDL for that reason, but is incorporated into the assumptions of the point source assessment as described in Appendix D. See also response to Comment T11.

Comment CC18

Commenter Upper Snake River Tribes (USRT) Foundation

Comment

The last concern of USRT is regarding NPDES point source permitted facilities' WLA effects on the Columbia River. In calculating WLAs for major and minor NPDES permitted facilities on the Columbia River, EPA "used the best available data, but in some cases, temperature data from facilities were limited." However, EPA concludes that "[c]ollectively, if all the sources discharge this load on average, the goal of the TMDL for point sources will be achieved." Upon looking at the list of major and minor facilities, the discharge temperature for some of these facilities is exceedingly hot – some as high as 40°-45°C (104°- 113°F). Although tribal governments were told by EPA during an EPA Coordination Webinar that irrigation withdrawals, nonpoint source heating, NPDES point sources and tributaries' temperature impacts "pale in comparison" to the temperature impacts of climate change and dams along the system, it is still concerning that exceedingly hot water is being discharged into the same river system that heat sensitive salmon and steelhead are navigating. USRT recommends that EPA thoroughly research the effects of these NPDES permitted facilities' discharges on the river system, taking into consideration the future predictions of climate change, and using worst-case scenario data to calculate WLAs.

Response

EPA has taken a conservative approach to setting the wasteload allocations in the TMDL (using the 90^{th} percentile metric and assumption of simultaneous maximum discharge) to assure that the wasteload allocations achieve the 0.1°C allocation for point sources. Potential local impacts near an outfall should be addressed in NPDES permitting to achieve state mixing zone provisions.

Comment CC19

Commenter Public Utility District No. 1 of Chelan County

Comment

On July 14, 2020, Chelan PUD requested that EPA extend the comment period on the Initial TMDL for an additional 30 days to allow adequate time for Chelan PUD to develop more accurate flow and temperature information in support of proposed revisions to the wasteload allocations (WLAs) in Table 6-13 for Chelan PUD's facilities. Chelan PUD appreciates EPA granting our extension request. The proposed revisions to the WLAs and supporting flow and temperature information are set forth and described in the body of this letter.

Response

Comment noted.

Comment CC20

Commenter Public Utility District No. 1 of Chelan County

Comment

EPA should revise the Wasteload Allocations for Chelan PUD facilities to more accurately reflect their discharge flows and temperatures.

As previously mentioned, Chelan PUD respectfully requests that EPA revise the flow, temperature and WLA values in Table 6-13 of the Initial TMDL to those shown in Table 1 below, in order to more accurately reflect the discharges from these Chelan PUD facilities. Table 6-13 is described as using "facility-specific design flow and maximum temperature data (or temperatures representative of the industry sector if effluent data were not available) to derive wasteload allocations for each facility." The flow and temperature values listed in Table 6-13, however do not accurately reflect the design flows and maximum discharge temperatures for the four facilities owned by Chelan PUD listed in the table. The flow, temperature, and WLA values in Table 1, below, more accurately reflect conditions of maximum heat discharge for each facility. They are based on the best available information, including design and planned specifications and measurements, and for the hatcheries, the applicable temperature criterion for the Columbia River.

In deriving the Table 1 flows for the point source discharges from Rocky Reach and Rock Island Dams that will be subject to a National Pollutant Discharge Elimination System (NPDES) permit, Chelan PUD excluded intermittent discharges such as drainage flows and sump pumps that are not expected to add a significant heat load to the river. Furthermore, the Table 1 temperatures listed for the dams are not the maximum discharge temperatures of all the NPDES sources at the dams, but rather are the maximum discharge temperatures, during conditions of maximum heat discharge, of those NPDES sources with sufficiently high discharge flows to be the primary component of the heat load to the river. For example, under some operating conditions, some low-flow discharges have been measured up to 35°C at Rock Island Dam and 45°C at Rocky Reach Dam.

The flows indicated for the hatcheries in Table 1 were derived based on best available information regarding current and planned operating conditions and HCP fish production goals. In Table 6-13 the industry average temperatures that are used for the Eastbank and Chelan hatcheries are below the corresponding numeric temperature criterion that is applicable at the point of discharge. Furthermore, the NPDES permits under which these hatcheries presently operate prohibit discharges to temperature-impaired waterbodies at temperatures in excess of the applicable temperature criterion. Sources that discharge at or below the numeric criterion cannot contribute to an exceedance of the criterion. For this reason, in both Oregon and Washington, existing temperature TMDLs typically include WLAs that are calculated on the basis of the heat that is discharged at or above the temperature criterion. Therefore, we respectfully request that EPA consider providing WLAs for the hatcheries that are derived from the current applicable numeric temperature criterion as indicated in Table 1.

Recognizing the uncertainties in temperature and discharge that affect the calculation of the WLAs, the Initial TMDL appropriately sets aside a reserve allocation for point sources to be used for, amongst other purposes, "adjustments to the calculated WLAs if, for example, the data that EPA considered during TMDL development are not representative of the existing discharge." Chelan PUD notes that the Rocky Reach Dam and Rock Island Dam NPDES permits are in the application process. For all four facilities, data more representative of existing discharges may be forthcoming in the future, which may warrant Ecology drawing on the reserve to adjust the WLAs for individual point sources as described in the Initial TMDL. For these reasons, we support inclusion of a reserve allocation to be managed by Washington and Oregon during implementation.

Response

EPA has revised the wasteload allocations for point source discharges from Rocky Reach and Rock Island Dams in response to the information received.

Comment CC21

Commenter Public Utility District No. 1 of Chelan County

Comment

Chelan PUD offers a minor correction in the Initial TMDL related to the description of a facility incorrectly attributed to Chelan PUD and the Rock Island Dam. Table 6-13 of the Initial TMDL describes NPDES Permit WA0501487 as held by Rock Island Dam. Chelan PUD understands that this permit is in fact held by the City of Rock Island for its wastewater treatment plant.

Response

EPA has corrected the facility name for the referenced permit in the TMDL table.

Comment CC22

Commenter City of Clarkston, WA

Comment

In the discharge fact sheet created for the Clarkston WWTP in 2016 (WA0021113), temperature is listed as a Category 2 concern immediately upstream of the WWTP discharge, and it is not listed as a concern immediately downstream of the WWTP. The fact sheet also concluded that the effluent temperature from the Clarkston WWTP does not have a reasonable potential to exceed the state's temperature criterion. Please remove Clarkston from inclusion in the TMDL.

Response

NPDES permits evaluate the reasonable potential for a facility's discharge to violate water quality standards in the nearfield, whereas TMDLs look at the impact of all sources in a study area that may cause or contribute to temperature impairments. The TMDL allocates heat to all individual point sources to ensure that point sources located within the TMDL study area have wasteload allocations included in the TMDL, and that they can continue to discharge heat. The Clarkston WWTP is in the study area, discharges heat, and is therefore assigned a wasteload allocation.

Comment CC23

Commenter Public Utility District No. 1 of Douglas County

Comment

Looking at the information presented for the Wells Project (especially in Tables 6-6 through 6-9), it seems that the impact of the Wells Project is very small, and in fact, an argument could be made that it may not exceed WQS during July and August (if the “natural conditions” criterion in the Washington temperature standards is considered), and further both Chief Joseph and Wells provide some cooling benefit for warm releases originating from Grand Coulee during September and October.

Response

This is a reasonable interpretation of the modeling results provided for the Wells Project in the referenced tables. EPA notes that the TMDL applies numeric criteria in the allocation process, so the reference to the Washington natural conditions criterion is not relevant to the dam impact analysis in the TMDL.

Comment Category DD. Water Quality Attainment and Excess Temperature

Comment DD1

Commenter Bonneville Power Administration

Comment

Page 69: For the two bullets on this page, Bonneville recommends adding "in the free flowing simulations" at the end of each bullet on page 69. It will assist the reader in categorizing modeled effects.

Response

The language in the TMDL that describes the information in the table, preceding the bullets, clearly states that the information is based on simulations of the free-flowing condition. Therefore, EPA is not making changes to the bullets on this page.

Comment DD2

Commenter Public Utility District No. 1 of Douglas County

Comment

“Even if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places (page 2).”

Douglas PUD agrees with this conclusion in the TMDL, but we are concerned that the TMDL is being set up to fail when actually many of the dams help to maintain and even reduce water temperatures during certain seasons. The clear recognition that without the dams, the system is still out of compliance, is important particularly during the load allocation process that will be implemented by Washington State. It appears to Douglas PUD that it is impossible to meet the WQS without addressing incoming water temperatures to the study area. On the contrary, based on the data reported, the Wells Project provides a cooling effect during the latter part of the season that the TMDL covers (see comment 5).

Response

See responses to Comment T10 and Comment T24.

EPA has determined the TMDL assessment of cumulative dam impacts as well as reach impacts will assist the state of Washington in identifying sound implementation actions that reflect the differences in dam impacts across time and space. In addition, EPA will look for opportunities in the future to engage with the British Columbia provincial government to address Columbia River trans-boundary water temperature issues in the years to come.

Comment DD3

Commenter Public Utility District No. 1 of Chelan County

Comment

The TMDL cannot account for the principal sources of the temperature criteria exceedances.

Second, the Initial TMDL cannot adequately account for these extraneous or extraterritorial sources of river warming. There is no evaluation of natural and anthropogenic sources of thermal loading originating in Canada, and there is no current technical record or TMDL process to justify allocations for sources in Idaho. Even within the study area, a TMDL is not an appropriate or effective mechanism for accounting for global temperature trends caused by climate change. The time horizon of such changes is long and their root causes diffuse. In contrast, the Initial TMDL is necessarily fashioned on a set of temperature data from a relatively short period reflecting current conditions. Load allocations implemented by near-term regulatory actions cannot hope to address long-term global trends in temperature.

As discussed above, even in a free-flowing scenario, the temperature standard would not be met. Moreover, run-of-the-river facilities such as those of Chelan PUD, with modest storage, have little or no effect on river temperatures, and, accordingly, little or no ability to reduce them.

Response

The TMDL evaluated all sources of heat loading to the system. This TMDL restricts the increases in river temperatures from NPDES permitted point sources, dam operations, and tributaries to levels that can be allocated under applicable WA and OR temperature WQS. Other sources of warming to the Columbia and Lower Snake Rivers, including temperature loads entering the TMDL study area from Idaho and Canada and increases to air temperature from global climate change, have not been assigned allocations as part of this TMDL.

Comment Category EE. Climate Change

Comment EE1

Commenter Various NGOs

Comment

The TMDL should include strategies to address climate change and its predictable impact on the rivers' attainment of water quality standards over the next several decades. Due to the effects of climate change—including reduced snowpack, increased water temperatures, and lower summer flows—the frequency of temperature criteria exceedances will likely increase. While EPA has done important technical work to identify the effects of climate change on river temperatures thus far, the TMDL's baseline conditions and load allocations do not address foreseeable future temperature increases linked to climate change. Importantly, EPA has committed to "consider climate change impacts when developing . . . load allocations in Total Maximum Daily Loads." This TMDL should be no exception to that goal. Failing to propose load allocations, or other "adaptive management approach[es]," sufficient to address foreseeable future climate conditions and increases in water temperature is a departure from EPA's stated policy and will result in a TMDL that quickly becomes outdated and unhelpful.

Response

EPA recognizes the global and regional effects to in-stream temperatures and hydrology resulting from climate change trends. During TMDL development, EPA determined that a warming trend due to climate change has significantly affected temperatures in the rivers since the 1960s, and these adverse thermal impacts continue to increase. A synthesis of available scientific evidence indicates that climate change has increased summer water temperatures in the Columbia and Snake Rivers by approximately 1.5°C since the 1960s.

The allowable thermal loading capacity of the Columbia and lower Snake Rivers under this TMDL is limited, with a total allowable loading capacity of a 0.3°C increase in river temperature, allocated to all point and nonpoint sources, as contemplated in the states' WQS. EPA recognizes the scale of these temperature impacts in comparison with the 0.3°C available to allocate. EPA decided not to allocate a portion of the 0.3°C to temperature increases resulting from climate change. EPA does not believe it is reasonable to assign an allocation to climate change as part of this TMDL, when allocating the entire 0.3°C to this source would severely restrict or prohibit all human activities in this large basin, while only accounting for a small portion of climate change's total impacts.

As noted in Section 7.0 of the TMDL, the Federal Government has made commitments relevant to responding to the adverse effects of climate change. In January 2021, the U.S. rejoined the Paris Agreement, the international treaty within the United Nations Framework Convention that aims to limit global warming, increase climate resiliency, and develop financial channels to assist developing countries implement emission reduction measures. The Federal Government also has committed to address climate change through a government-wide approach to mitigate and adapt to the adverse effects of climate change under EO 14008. A National Climate Task Force composed of cabinet-level secretaries and chaired by the National Climate Advisor was established to facilitate the organization and deployment of key federal actions to reduce climate pollution and to engage on climate matters with tribal, state, and local governments and leaders of various sectors of the economy (EOP 2021).

This TMDL contains information available to EPA on currently ongoing programs to reduce nonpoint loads as well as noting other potential actions that may be taken to reduce such loads, but EPA is unable to dictate specific actions as part of an implementation plan for this TMDL. As implementation activities continue and/or new information becomes available, there is the opportunity to revise and update this TMDL to reflect future conditions.

Comment EE2

Commenter Chelan, Douglas and Grant PUDs

Comment

While the TMDL has presented a reasonably sound technical analysis, and stated the assumptions and limitations of the TMDL, there are specific areas of concern for the Mid-C PUDs. These include:

A lack of accounting for climate change as a major heat source that will preclude the attainment of current standards despite the load allocations in the TMDL.

Response

EPA evaluated available information on global climate trends and accounted for climate change in the TMDL source assessment (see TMDL Chapter 4 and Appendix G). The TMDL also makes clear that climate has been an important factor in non-attainment with water quality standards. See response to Comment EE1.

Comment EE3

Commenter Columbia River Inter-Tribal Fish Commission

Comment

In addition, climate change should be allocated a portion of the 0.3°C human use allowance, given that this is largely a human impact. In EPA's 2012 Water Program Strategy, EPA commits to consideration of climate change when developing load allocations. Despite the TMDL clearly establishing the significance of increasing air temperatures associated with climate change on warming in the Columbia River, no allocation or protections are given to what will clearly be continued warming in the future.

Response

See response to Comment EE1.

Comment EE4

Commenter Washington Department of Ecology

Comment

This TMDL identifies climate change as a dominant contributor to temperature to the Columbia and Snake Rivers, but EPA does not include a plan for addressing climate change impacts in the TMDL. It is clear that EPA recognizes the significance of climate change as a source of temperature pollution, and it is therefore incumbent upon EPA to develop measures to address it. Instead, the TMDL fails to detail a single action the federal government can take to address climate change. This is unacceptable.

Response

Section 7.0 of the TMDL has been updated with currently available information on the commitments the federal government has made to address climate change. Effects of climate change on the Columbia Basin temperatures are a complex issue that will need to continue to be addressed by many interested parties and stakeholders, including the EPA and the U.S. government as a whole. The TMDL implementation process will provide opportunities for the states, in concert with the EPA, to investigate ways to mitigate climate change impacts, along with the other, more traditional impacts on temperature in the Columbia and Lower Snake systems. This TMDL contains information available to EPA on currently ongoing programs to reduce nonpoint loads as well as noting other potential actions that may be taken to reduce such loads, but EPA is unable to dictate specific actions as part of an implementation plan for this TMDL.

Comment EE5

Commenter Washington Department of Ecology

Comment

Appendix D, Section 4.0 states: "This RBM10 model assessment considered temperature impacts to the Columbia and Snake Rivers from point sources, tributaries, dams, climate change, and an agricultural water withdrawal. The assessment results indicate that climate change and dam impacts are the dominant sources impacting river temperatures, with impacts that are an order-of-magnitude higher than point sources, agricultural withdrawals (Banks Lake project), and tributaries."

This TMDL study identifies climate change and dams as the biggest contributors to temperature pollution in the Columbia and Snake Rivers. This study highlights the importance for implementation of actions to address temperature impacts from dams and to take action on climate change because both are causing impacts to the Columbia and Snake Rivers. While we appreciate that this TMDL highlights these temperature sources and recognizes the need to collectively take steps to address both of these contributors, we are disappointed that EPA has not articulated what can be done to address these significant sources of heat.

When the TMDL's silence on actions to address climate change and dams is combined with the recommendation that we change the water quality standards to make them "more achievable" it appears EPA is trying to skirt its responsibility under the federal Clean Water Act. The purpose of a TMDL is to describe a plan for restoring impaired waters.

The TMDL should include more specific recommendations for how the federal dams and climate impacts can be addressed.

Response

See response to Comment EE4.

Comment EE6

Commenter Washington Department of Ecology

Comment

This TMDL names climate change as a dominant source of temperature pollution to the Columbia and Lower Snake Rivers and demonstrates, yet again, the impact climate change is having on Washington's valuable natural resources. The TMDL identified a strong link between air temperature and Columbia River water temperature and showed increases in air temperature and water temperature since the 1960's. By naming climate change as one of the biggest two sources of temperature pollution, it is important that EPA include information on what the federal government can do to address it. But the current TMDL is completely silent on the actions that the federal government can take to address climate change.

Response

See response to Comment EE4.

Comment EE7

Commenter Oregon Department of Fish and Wildlife

Comment

ln addition, ODFW finds the lack of a proposed allocation for future climate change impacts (water temperature increases) troubling. Future climate change impacts to water temperature are both predictable and are the single most significant likely source of increasing summer water temperatures in the lower Columbia and Snake rivers. Setting load allocations without accounting for future climate change impacts in those allocations will set in motion regulatory and non-regulatory actions, likely to fail to achieve durable pollutant outcomes for ESA-listed salmon and steelhead and other state designated uses for these reaches. ODFW recommends EPA fully consider likely water temperature pollutant loads from future climate change and expand allocation Source Groups to include future climate change as Source Group in the final TMDL document.

Response

As stated in the TMDL, temperature loads entering the TMDL study area from Idaho and Canada and increases to air temperature from global climate change (existing or future) are not allocated a part of the available 0.3°C. EPA Region 10 will engage with and support states in implementation of the Columbia and Lower Snake Temperature TMDL, particularly where the states want to address climate change and its impacts on attainment of water quality standards in surface waters.

See also response to Comment EE1.

Comment EE8

Commenter Oregon Department of Environmental Quality

Comment

EPA should consider giving an allocation to climate conditions as a source of heat affecting water temperatures. DEQ believes it is important for the TMDL to recognize the role of past and current climate conditions that influence the river temperature and to account for them in the allocations. There are many local and global actions being taken with the objective of reducing impacts from climate, and it is appropriate for the TMDL to reinforce the need for these actions through an allocation.

Response

See response to Comment EE1.

Comment EE9

Commenter Oregon Department of Environmental Quality

Comment

EPA provides important information on the effect of climate change on Columbia and Snake River water temperatures. EPA's Columbia and Lower Snake Rivers Temperature TMDL identified a strong link between air temperature and Columbia and Snake River water temperature. They also showed increases in air temperature and water temperature since the 1960's. The TMDL discusses climate change but does not include allocations for reductions in air temperatures or greenhouse gases (GHG) that are known to affect global air temperatures. EPA should include allocations for these reductions as has been done for other TMDLs, including mercury TMDLs.

Response

See response to Comment EE1.

Comment EE10

Commenter Oregon Department of Environmental Quality

Comment

For the Columbia and Snake River regions, EPA should allocate air temperature reductions to levels that occurred in 1915-1959 that would then relate to water temperature reductions. EPA should also allocate GHG reductions for meeting the allocated air temperature reductions. The air temperature and GHG reductions could be calculated from the difference between 1915-1959 and 1997-2006 air temperatures and GHG levels.

There is precedence for allocating to air sources in TMDLs with implementation occurring at the local, national, and international level. In mercury TMDLs around the U.S., allocations (reductions of mercury) to air sources (both regional and global sources of mercury) have been assigned in numerous mercury TMDLs (including DEQ's 2019 Willamette Basin Mercury TMDL and EPA's 2019 Willamette Basin Mercury TMDL) and have referenced regional, national and global efforts as the bases for air mercury reductions. A similar conceptual model relating reduction of GHG air temperatures and then water temperatures would be consistent with the mercury TMDL conceptual models. Actions in the Columbia Basin could contribute a portion to the overall global effort needed to reduce GHG emissions to reduce air temperatures.

Response

Regarding the allocation to climate change, see response to Comment EE1.

Regarding the analogy of mercury TMDLs to this TMDL, EPA does not believe that the analogy is appropriate. A model examining the inter-relationship of GHG loading, air temperatures, and water temperatures would be a substantial modeling effort and was not considered necessary for the purposes of this TMDL as the RBM10 model analyzed current and historic water temperature trends and no allocations to increased air temperatures resulting from global climate change were assigned.

Comment EE11

Commenter Pacific Fishery Management Council

Comment

With predicted reduced snowpack, lower summer river flows, and increased water temperatures, the frequency of TMDL exceedances will increase in the future. The TMDL baseline conditions and load allocations do not address foreseeable future temperature increases linked to climate change. The EPA has committed to "consider climate change effects when developing... load allocations in Total Maximum Daily Loads"; this TMDL should be no exception to that goal. Failing to propose load allocations, or other "adaptive management approach[es]," would be a departure from EPA policy and will quickly result in an insufficient TMDL.

Recommendation: The TMDL should include strategies that address climate change and its predictable effects on the rivers' future attainment of water quality standards.

Response

See responses to Comment EE1.

Comment EE12

Commenter Public Power Council

Comment

In addition to boundary conditions, EPA also recognizes that climate change has impacted river temperatures in the Columbia and Snake. EPA's analysis estimates that since 1960, increases in air temperature have led to water temperature increases between one and two degrees Celsius. Even though climate change is one of the largest drivers of water temperature increases, it is essentially treated as "out of scope," because EPA does not have jurisdiction to enforce a broad climate policy to mitigate for this. This puts the burden of mitigating the impacts of climate change on river temperatures on specific subsets of regional stakeholders, particularly dams and dam operators.

Hydropower is an extremely flexible and valuable carbon-free resource. It is the primary driver of the low carbon content of the Northwest grid and can help to integrate additional renewable energy resources in the future. Rather than acknowledging hydropower's contribution to combatting climate change, the TMDL places the burden for mitigating the impacts of climate change on river temperature squarely on hydro facilities. As air temperatures continue to warm, dams will increasingly be called upon to mitigate rising river temperatures. This feedback loop is intrinsic to the limited scope and nature of the TMDL and will result in unequitable and unreasonable obligations as hydro facilities are tasked with mitigating the impacts of a global issue to which they do not contribute.

Response

See response to Comment EE2., above. EPA disagrees with the comment that effects from global climate change were treated as "out of scope". EPA evaluated available information on global climate trends and accounted for climate change in the TMDL, see page 1 of the TMDL and Appendix G for more information.

The TMDL load allocations do not burden dams with mitigating climate change impacts. The dam impacts are estimated assuming the climate conditions of 2011-2016 and are therefore the current impacts. There are no additional requirements for dams stated in the TMDL related to the climate change trend.

Comment EE13

Commenter Western Division of the American Fisheries Society

Comment

The effects of climate change should be integrated more throughout the TMDL. The climate projections suggest huge challenges of meeting the TMDL with local solutions. Not only will the mainstems (Columbia and Lower Snake Rivers) be affected, but the tributaries and the CWRs currently acknowledged will also be affected by this warming. Although the climate information is presented in Appendix G, the TMDL should better integrate and highlight those risks for management agencies, policy makers and the general public throughout the document.

Response

The current climate change assessment adequately highlights the climate change impacts across the basin.

Comment EE14

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA failed to incorporate climate change into the TMDL's loading allocation or reserve allocation.

The EPA acknowledges the current warming trends associated with climate change in Section 4.3 of the TMDL. Appendix G likewise provides a detailed discussion of climate change trajectory and impacts to stream temperatures. Nevertheless, the EPA did not include future climate scenarios in the 0.3˚C loading allocation of the TMDL.

The EPA's omission here is a major flaw in the TMDL and is inconsistent with relevant EPA guidance that calls for consideration of climate change in establishing load allocations. As noted above, climate change has aggravated temperature impacts in the Columbia River Basin at the expense of fish populations. It is likely that temperature increases caused by anthropogenic climate change already account for a significant portion of the 0.3º loading allocation.

Similarly, the EPA cannot contend that these increases will cease over the lifespan of the TMDL. Accordingly, a reserve allocation that does not address the inevitability of continued temperature increases as a result of climate change does not reasonably account for future sources of thermal impairment. The EPA must incorporate climate change into these allocations in the final TMDL.

Response

See response to Comment EE2.

Comment Category FF. Technical Aspects of Climate Change Analysis

Comment FF1

Commenter Columbia Riverkeeper

Comment

The impacts of emerging and future climate change should be evaluated in more detail. The effect of increased air temperatures on worsening the impacts of dams should be clearly presented.

Response

The climate change assessment (Appendix G) describes the effects of air temperature changes and the combined impact of climate change and dams on the warming trend in river temperatures.

Comment FF2

Commenter Bonneville Power Administration

Comment

It does not appear that the climate change analysis was taken into account when calculating allocations for the TMDL.

The climate change analysis presented by EPA demonstrates that water temperature increases of 0.2°C – 0.4°C degrees per decade have occurred since 1960. These water temperature increases due to climate change are likely to continue over the next century in the Columbia River Basin, with some variability depending on the emissions scenario, location and month. However, it does not appear that the climate change analysis was taken into account when calculating heat load and waste load allocations for the TMDL in Section 6.5. Thus, Bonneville is concerned that an unreasonable burden will be placed on the ten federal dams to mitigate for climate change. This is especially concerning since the TMDL clearly states river temperatures have increased since the 1960s by 1.5°C ± 0.5°C4 and will likely continue to increase.

Response

See response to Comment EE1.

Comment FF3

Commenter Bonneville Power Administration

Comment

EPA conducted a limited modeling analysis to assess the impacts of climate change for this TMDL. Given the impact air temperatures and wind speed play on climate change in the basin, the TMDL does not provide sufficient rationale for selecting weather stations used in the modeling. Additional weather station data from airports could have been utilized to supplement the TMDL analysis. At a minimum, the rationale for the selection of datasets that were used should be discussed in the TMDL.

Response

The rationale for selection of weather stations is included in Appendix C, which describes how the model was developed. EPA has determined the weather data used for the model are representative of the weather conditions across the study area, and this is demonstrated by the accuracy of model predictions that rely on those data.

Comment FF4

Commenter Oregon Department of Fish and Wildlife

Comment

The effects of climate change are analyzed in Section 4.3 of the draft TMDL study materials. However, EPA's climate change analysis appears to be focused on observed water temperature increases between 1960 to the present. From ODFW's perspective, it is unclear how this analysis relates to the estimates of water temperature increases assigned to climate change in Table 4.1, increases of 1.0-2.0° C (1.8 to 3.6° F). ODFW recommends EPA clearly explain why this period of record was chosen and how it relates to (i.e., predicts) likely future climate change impacts in the final TMDL document.

Response

The TMDL evaluates current sources of heat, so the estimated current impacts to the rivers (i.e., river warming to-date) are most relevant to this TMDL source assessment. The assessment in Appendix G references the research EPA relied on to identify the 1960s as a reasonable starting point for estimating warming-to-date. Appendix G also includes available information on predicted river temperatures by the end of the century in the Columbia River and tributaries.

Comment FF5

Commenter Northwest River Partners

Comment

EPA recognizes the impact of climate change on increased temperatures in the Columbia and Snake rivers. EPA writes, "Based on available information, the estimated increase in river temperatures since 1960 ranges from 0.2°C to 0.4°C per decade, for a total water temperature increase to date of 1.5°C ± 0.5°C."

Even though EPA acknowledges climate change is one of the largest drivers of water temperature increases in the Columbia River Basin, it appears that EPA is, de facto, placing the burden of reversing climate-caused temperature changes unfairly on dam operations located within Washington state.

This choice highlights an important logical contradiction. Hydropower is the Pacific Northwest's strongest tool to fight climate change, yet this TMDL threatens to reduce hydropower's capabilities and/or make it less economic. Unfortunately, this outcome may increase the threat of climate change on endangered and threatened salmonid species in the Northwest and worldwide.

Response

See response to Comment EE1. The impact estimate and load allocation to dams is not linked to the estimated climate change impact. The comparison of cumulative dam impacts to the load allocation (0.1°C) is based on mean monthly impacts for the period 2011-2016. See also response to Comment EE12. above.

Comment Category GG. Reserve Capacity

Comment GG1

Commenter Columbia Riverkeeper

Comment

TMDL Section 6, Page 61, Section 6.5.4:

a. A reserve is not appropriate for additional point sources that can increase temperatures, given that reasonable assurance for reducing temperatures from dams is unlikely, the river will remain impaired, and additional point sources will increase impairment. The TMDL should be designed to discourage new point source of water above criteria and encourage the reduction and elimination of discharges.

b. A zero reserve would incentivize point sources to reduce effluent temperatures; if they could "sell" part of the allocation for future growth. This would set a "no net increase" in point source temperatures in place.

c. In general, a mechanism should be included in the TMDL to encourage reduced point source temperatures, since climate change is likely to increase the temperatures of effluent, especially from stormwater and lagoon treatment systems.

Response

The modeling assessment has shown that point sources have a minor impact on overall mainstem river temperatures. The TMDL assigns an equal 0.1°C to the three source categories receiving allocations in the TMDL, including the point source category. The reserve allocation is a fraction of the already small impact allocated cumulatively to all point sources discharging within the TMDL study area. The reserve allocation provides a mechanism for permitting authorities and permittees to address changes in activities and discharges. Therefore, EPA is retaining the reserve allocation, as revised, to align with the WLA modifications previously described in this document. The allocation trading program described in Section b. of this comment could be considered as part of an approved temperature water quality trading program developed as part of TMDL implementation.

Comment GG2

Commenter City of Camas, City of Gresham and City of Washougal

Comment

The Cities of Camas, Gresham and Washougal request that the EPA consider clarifying explicitly where and how river reaches apply to the modeling and the reserve allocations. The TMDL references the term "reaches" throughout the document but does not clearly define the river regions within each reach. Section 2.4 refers to 10 reaches on the Columbia River and one reach on the Snake River in referring to applicable water quality temperature criteria and cites Table 2-2. Section 6.5.1 (Dams) states that ''this analysis estimates the cumulative temperature impact in each reach caused by all upstream dam impoundments and estimates when and where this impact exceeds the 0.1 °C cumulative dam load allocation." This statement implies that a reach is the river segment between dams on the Columbia River - in the context of temperature modeling of the dams, however, it is not clearly stated. EPA should clearly define the river reaches applied in the TMDL at some point early in the document.

An important element of the TMDL defined by river reaches is the reserve allocation. In Section 6.5.4-Reserve Allocations, the TMDL states (on page 61) that "EPA inserted a heat load in the model at the midpoint of each TMDL reach" … and "the resulting reserve load for each reach is 4.4 x 109 Kcal/day." The City of Camas requests that the TMDL document include a table to define each river reach in the TMDL so that NPDES point source dischargers can understand their locations along the river and the associated reserve allocations available to dischargers within their respective reach.

Response

In general, reaches are the river segments between temperature target sites, which correspond to monitoring locations at the dam sites as noted in the comment. EPA agrees that additional clarity is needed on the spatial distribution of the reserve loading, and we have added a table to the Reserve Allocations section of the TMDL that lists the reserve allocations by time period and reach.

Comment GG3

Commenter City of Camas, City of Gresham, and City of Washougal

Comment

The Cities of Camas, Gresham, and Washougal request that the EPA clarify reserve allocation implementation approach as discussed below. In Section 6.5.4 of the TMDL, Reserve Allocations (pages 60-61) discusses consideration for the needs of future growth, new point sources, adjustments to the waste load allocations (WLAs), and other non-point sources. The TMDL is clear in delegating the requirement for managing reserve allocations to the states on page 61: "The reserve needs to be managed by Washington and Oregon during implementation, including maintaining a system to track the reserve, determining whether a point source can access the reserve, and establishing a process for granting a portion of the reserve." However, the TMDL document does not provide specific guidance on the approach or rules that would be acceptable to EPA to be consistent with the overall TMDL framework.

The City of Camas is requesting that reserve allocations for future growth allocations should be prioritized according to official growth planning frameworks within the states. Wastewater utilities develop General Sewer Plans and Wastewater Facilities Plans and coordinate them with the communities Comprehensive Plans to document and plan services for the growth within urban areas, including an assessment of necessary provisions for treatment and discharge locations. The reserve allocations for future growth should respect and compliment this established planning framework.

Response

EPA agrees that additional work is needed to manage the reserve allocation during TMDL implementation. Because EPA TMDLs do not include implementation plans, which are the responsibility of the states, management of the reserve is not included in the TMDL. EPA will assist in developing a plan for managing the reserve along with the states and tribes after TMDL issuance.

Comment GG4

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Concerning River Reaches Applied in the TMDL

Please define the term "reaches" as the term is used throughout the document. The TMDL does not clearly define the river regions within each reach. Section 2.4 refers to 10 reaches on the Columbia River and one reach on the Snake River in referring to applicable water quality temperature criteria – and cites Table 2-2. Section 6.5.1 (Dams) states that "the cumulative temperature impact in each reach caused by all upstream dam impoundments and estimates when and where this impact exceeds the 0.1°C cumulative dam load allocation." This implies that a reach is the river segment between dams on the Columbia River in the context of temperature modeling of the dams, however, it is not clearly stated. Please clearly define the river reaches applied in the TMDL in the document.

This definition is important because of the method applied for reserve allocations. In Section 6.5.4 – Reserve Allocations, the TMDL states (on page 61) that "EPA inserted a heat load in the model at the midpoint of each TMDL reach"… and "the resulting reserve load for each reach is 4.4 x 109 Kcal/day." It is recommended that the TMDL document include a table to define each river reach in the TMDL so that NPDES point source dischargers can understand their locations along the river and the associated reserve allocations available to dischargers within their respective reach.

Response

See response to **Error! Reference source not found.**.

Comment GG5

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Regarding Reserve Allocations

Section 6.5.4 discusses Reserve Allocations (page 60-61) including consideration for the needs of future growth, new point sources, adjustments to the waste load allocations (WLAs), and other non-point sources. The TMDL is clear in delegating the requirement for managing reserve allocations to the states on page 61: "The reserve needs to be managed by Washington and Oregon during implementation, including maintaining a system to track the reserve, determining whether a point source can access the reserve, and establishing a process for granting a portion of the reserve." However, the TMDL document does not provide specific guidance on the approach or rules that would be acceptable to EPA to be considered consistent with the overall TMDL framework. Please accept the following comments on the topic of reserve allocations:

Future Growth

Reserve allocations for future growth allocations should be prioritized according to official growth planning frameworks within the states. For example, in Washington, an official planning process is established under the Growth Management Act (GMA) and other statutory and administrative code frameworks that allocates growth to counties. Counties then allocate growth to urban and non-urban areas. Wastewater utilities then provide General Sewer Plans (WAC 173-240) and related documents to serve the growth within urban areas, including an assessment of necessary provisions for treatment and discharge locations. The reserve allocations for future growth should respect and compliment this established planning framework. For example: The Salmon Creek STP (WA0023639) received an approval for its most recent Wastewater Facility Plan/General Sewer Plan Amendment from Ecology on August 27, 2013. This document supports the state and county coordinated planning basis for the applicable service area for future flows of 30.70 mgd on a monthly average flow basis. Please update the allocation for the Salmon Creek STP to 30.70 mgd in Table 6-12 to fully respect this coordinated basis of planning. The City of Vancouver's Marine Park WRF (WA0024368) received approval for its most recent General Sewer Plan (2011) from Ecology in December 2011. This document supports the state and county coordinated planning basis for the applicable service area for future flows of 24.2 mgd on a monthly average flow basis. Please update the allocation for the Vancouver's Marine Park WRF to 24.2 mgd in Table 6-12 to fully respect the coordinated basis of planning.

Response

See response to **Error! Reference source not found.**. Regarding the requests to update the wasteload allocations, see response to Comment CC1.

Comment GG6

Commenter Washington Department of Ecology

Comment

In section 6.5.4, the TMDL is not clear as to which river reaches are associated with the reserve allocations. We understand these reserve allocation reaches are the reaches between points (locations) identified in Tables 3-2 through 3-7, but clarification would be helpful.

Response

See response to **Error! Reference source not found.**.

Comment GG7

Commenter Washington Department of Ecology

Comment

We would like EPA to reassess the reserve allocations in this TMDL. These allocations should reconcile how nonpoint temperature reduction actions at dams will impact WLAs assigned via NPDES permits. Implementation actions at dams could increase point source temperature loads and this has not been factored into the waste load allocation given to the dams. We want assurance that the reserve allocation is sufficient to deal with these types of implementation actions in the future.

Response

EPA does not believe that implementation actions to reduce nonpoint dam impacts will increase point source temperature loads. The reserve allocation was established based on a minor fraction of the current point source loads If discharge limits need to be revised during TMDL implementation, the reserve will be managed by the three permitting authorities (EPA, Washington, and Oregon), which will include establishing a process for granting a portion of the reserve to individual point sources and maintaining a system to track its usage over time.

Comment GG8

Commenter Washington Department of Ecology

Comment

In terms of reserve management, we will work with Oregon DEQ to manage the reserve allocation in this TMDL. Since the TMDL model resides with EPA, we would require EPA's assistance in tracking and assigning the reserve. Additionally, Ecology suggests that EPA develop procedures for obtaining reserve capacity and identify that you will do this in the TMDL.

Response

As the states of Oregon and Washington continue to develop their implementation plans for this TMDL, EPA will assist in managing the reserve and provide modeling support if needed. EPA agrees that it would be helpful to develop procedures for managing requests for obtaining reserve capacity and suggests that the procedures be collectively developed by EPA, the states and the tribes.

Comment GG9

Commenter Oregon Association of Clean Water Agencies

Comment

The TMDL notes that a reserve allocation of 0.1 degrees C is available for future growth, new point source discharges, adjustments for facilities where the assigned wasteload allocation was not representative, and non-point sources that were not considered during TMDL development. The TMDL states that the reserve would be administered by Washington and Oregon, which would include maintaining a system to track the reserve, determining whether a point source can access the reserve, and establishing a process for granting a portion of the reserve. We recommend that a portion of the reserve be allocated to Oregon and a portion to Washington rather than the allocation of the reserve based on first use.

Response

See response to **Error! Reference source not found.**.

Comment GG10

Commenter Oregon Department of Environmental Quality

Comment

DEQ will work with Washington Department of Ecology to create the framework for policy decisions involving assigning reserve allocations for future use. EPA should affirm that the states are the appropriate decision-making bodies and, due to the fact that the TMDL model resides with EPA, that EPA will support the evaluation of whether to grant reserve capacity by running the model or conducting other appropriate analyses. In addition, due to the multi-state nature of these evaluations and decisions, Oregon believes it would be appropriate for EPA to track and assign the reserve based on the decisions of the relevant state.

Response

See response to Comment GG8.

Comment GG11

Commenter Washington Association of Sewer and Water Districts

Comment

This TMDL also needs to recognize and coordinate with approved growth needs. Our members participate in and must comply with a number of planning processes. Some of these state, local, and federally delegated processes have the potential to conflict with the allocations established by the proposed TMDL. Planning that establishes future growth projections is already in place across the state and needs to be considered in establishing reserve allocations.

Response

See response to **Error! Reference source not found.**. EPA agrees that future growth projections will play an important role in managing the reserve.

Comment GG12

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The EPA should not include a reserve allocation in the TMDL because the system is not currently meeting temperature criteria.

Apart from disputing the EPA's decision to not include climate change scenarios in the TMDL's reserve allocation, the Yakama Nation also questions the logic of including a reserve allocation in the TMDL at all.

The EPA makes clear that temperatures in portions of the Columbia and Snake Rivers exceed applicable criteria. Moreover, as noted above, the EPA concedes that "[e]ven if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places." In other words, the study area is already out of compliance with applicable standards and the TMDL is not stringent enough to provide for compliance.

The Yakama Nation is unclear as to why, in light of these issues, the EPA has established a 0.01° C reserve allocation for future uses. The most problematic purpose contemplated by the reserve allocation is the vague "future growth." This provides a greenlight for further development and heat pollution on the Columbia River. The EPA should instead include a zero reserve allocation to better align with the urgency of addressing thermal impairment in the Columbia River.

Response

See response to Comment GG1.

Comment Category HH. Seasonal Variation and Critical Conditions

Comment HH1

Commenter Columbia Riverkeeper

Comment

TMDL Section 6, Page 39, Section 6.2:

a. "To ensure that critical temperature locations are identified…" It's not clear why longitudinal results were not evaluated to identify the critical locations in the rivers, rather than pre-selecting locations.

b. Were outputs processed at "major tributary confluences" upstream or downstream of the confluence, or both?

c. It's not clear why it was a conservative assumption that "EPA assumed that historical levels of agricultural withdrawals (2011-2016) would continue." If this is conservative for estimating current conditions, the impact of these withdrawals should be included in determining sources of temperature impairment.

Response

As noted in the TMDL and supporting assessments, the target sites are locations where monitoring is conducted. EPA also identified critical locations. To address specific source impacts, EPA has also used model estimates at sites that are not monitored target sites. For example, the source assessment modeling includes simulation results for RM 42. This location is downstream of the Bonneville target site in the vicinity of large point source discharges and is the location of modeled maximum point source impacts. Water quality data are not available at RM 42, but EPA used the model to estimate the cumulative impacts of upstream heat loads (from point sources and tributaries) at this location. EPA also considered model temperature estimates above and below the lower Snake River confluence on the Columbia River. EPA included these sites (labeled Hanford Reach and Snake Confluence) in the dam impact assessment to evaluate the extent to which the lower Snake River dams are contributing to downstream warming of the mainstem Columbia River.

All cumulative impacts were assessed at the target sites and additional locations including the critical location for point sources (RM 42), which is also the critical location for tributaries when a uniform change in temperature is applied to the tributaries.

Since reduced river flow results in higher temperatures, the TMDL notes that the modeling analysis includes the effect of the primary water withdrawal (Banks Lake project). EPA has also estimated the impact of the Banks Lake project in the model scenario report (Appendix D).

Comment HH2

Commenter Western Division of the American Fisheries Society

Comment

The TMDL is exclusively focused on peak summertime temperatures. This certainly is biologically significant with respect to adult migration of sockeye, steelhead, Chinook, and downstream juvenile migration. However, pre-spawning and spawning temperatures tend to be overlooked in the TMDL.

For example, the RBM10 current temperatures for Hanford Reach is 18.76 ºC, whereas the RBM10 free-flowing temperature is 17.26°C (Appendix D, Table 3-6). It had already been noted that temperatures delivered from Canada have been elevated (3.2°C in August, and 2.2ºC in September). Even by October when substantial numbers of fish are migrating, the average temperature in the Columbia River under current conditions is 2.68ºC warmer than under the free-flowing scenario. Fig 6-4 highlights these high fall water temperatures. This indicates that fall Chinook currently are undergoing pre-spawning and spawning at temperatures significantly exceeding free-flowing norms. Protection of the entire life cycle is critical in terms of setting standards as well as in creating a TMDL that protects the beneficial uses.

Response

State and tribal water quality standards for temperatures are set at levels to protect all stages of the salmonid life cycle. The TMDL identifies and incorporates the applicable temperature WQS for each of the impaired reaches included this study area.

Comment Category II. Margin of Safety

Comment II1

Commenter Columbia Riverkeeper

Comment

TMDL Section 6

Page 45, Section 6.5.1: "The daily average temperature is therefore a more conservative indicator of dam impact. This component of the analysis is considered as a margin of safety (Section 6.6)." This is an appropriate approach to provide a margin of safety.

Response

Comment noted.

Comment II2

Commenter Columbia Riverkeeper

Comment

TMDL Section 6, Page 65, Section 6.6:

a. First bullet: two different metrics are combined here. Using the DM instead of 7-DADM is a conservative assumption. But averaging 6 years may or may not be conservative, so it should be discussed separately.

i. The average of the 6 years may be conservative if, as past studies have suggested, a median year has a bigger impact than a hot year. This should be discussed, with evidence, in more detail

b. Third bullet:

i. The reserve allowance is not a margin of safety, for the reason noted (may be eventually used up),

ii. As noted in an earlier comment, stormwater sources were not included, which takes away from the margin of safety if warm stormwater discharges continue to occur.

c. Fourth bullet: this is not necessarily a conservative assumption. Impacts may be larger in a moderate year than in hot years. However, my understanding is that those six years represented a representative range of flow and temperature conditions. As noted in an earlier comment, the TMDL should document the conditions in those 6 years (percentiles of flow and air temperatures compared to historical).

d. Starting with "In addition to the above, …", through the rest of the section: the quality of the model should be documented in the framework section (section 4.1) but does not count as a margin of safety.

Response

EPA has determined that the characteristics of the elements listed regarding the margin of safety are reasonable and appropriate, except for inclusion of the reserve allocation. The reserve allocation has been removed as part of the margin of safety.

Regarding averaging and the selected years of analysis, see also response to Comment II3.

EPA believes it is reasonable to discuss the quality of the water quality modeling as a relevant factor in the margin of safety determination.

Comment II3

Commenter Various NGOs

Comment

The TMDL's implicit margin of safety is arbitrary and inadequate. All TMDLs must include a margin of safety to ensure compliance with state and tribal water quality standards despite inherent uncertainties. For the following reasons, this TMDL's implicit margin of safety is not adequate:

• As explained in more detail in the comments of Paul Pickett, incorporated herein by reference, the reserve allocation for point sources is not a margin of safety. EPA alternatively describes the "reserve" as a margin of safety and part of the increment that states can distribute to industrial and municipal point source dischargers. It is arbitrary and illogical for EPA to assert that the "reserve" is both things at once.

• The TMDL's use of monthly average maxima in development of temperature allocations is not a conservative assumption supporting an "implicit" margin of safety. As explained in Section II(b), above, and in other comments submitted by the Idaho Conservation League, the average monthly maxima strategy relied on by EPA does not even satisfy the requirement to provide a reasonable worst-case analysis. This inadequate methodology certainly cannot provide an additional, implicit margin of safety.

• Focusing on summer temperatures from 2011 to 2016 cannot form the basis of an implicit margin of safety. While these temperatures are warmer than average summer temperatures during the last few decades, climate data suggest that they are part of an ongoing and intensifying trend. The Columbia and Snake rivers are unlikely to revert to historical average temperatures in the near future, so the use of recent temperature data does not provide a margin of safety. As explained Section IV, above, the failure to include any load allocations or adaptive measures to address the foreseeable impacts of future climate change makes the implicit margin of safety inadequate.

Response

EPA agrees with the first bullet in this comment. See response to Comment II2.

Regarding the second bullet, EPA has changed the metric of the data analysis to the maximum temperature reported for each month over the 2011-2016 period, which is more stringent than the previous metric, using averages. EPA has determined that this additional conservative element of incorporating the maximum temperature reported for each month provides another implicit margin of safety element into the TMDL.

Regarding the third bullet, there is a multi-decade record of temperature conditions in these rivers, and EPA purposely selected the most recent period available (2011-2016) at the time the TMDL assessment began, because this period includes the highest recorded water temperatures (including the extreme temperatures experienced in 2015). This selection provides a measure of conservatism and is therefore another reasonable component of the implicit of safety.

Comment II4

Commenter Idaho Conservation League

Comment

Explanation of using RBM10 Daily Average outputs versus the Daily Maximum WQS is poorly explained (pg 45).

The TMDL uses the existing RBM10 model to assess the impacts of all pollutant sources on water temperature. We do not disagree with the use of the RBM10 model in this TMDL, but we do not believe its use has been fully justified in the scientific methodology explained on page 45.

The TMDL states:

"Since the diel variation is typically greater in a free-flowing river than when dams are present, the impact of the dams on the daily average temperature is greater than the impact on the daily maximum temperature. The daily average temperature is therefore a more conservative indicator of dam impact." The comparison of dams' effect on daily average temperatures versus daily maximum temperatures is poorly explained and needs to be demonstrated graphically. From this statement alone it is not clear how or why dams would impact daily averages more than they would daily maxima. The reader can imagine a river without dams (and greater diel variation) having extreme temperatures at day and night, with the average somewhere in the middle. A dammed river could have the same average, with daily extremes just closer to that average (showing lower diel variation). The Daily Average thus would change little due to the impact of dams, while the Daily Maximum would change dramatically.

The data and model results show this scenario is not the case, but because they are not cited here, the use of RBM10 results to document the effect of dams on daily maximum water temperatures is inadequately explained or justified.

More to this point, the TMDL states that this component of the analysis related to using RBM10 results is "considered as a margin of safety" (45). Again, without any justification as to how using Daily Averages from RBM10 results is related to Daily Maxima, it is impossible to say whether this is a good source for a margin of safety. The use of RBM10 results could overestimate or underestimate the impact of dams on actual water quality impairment under WQS and cannot be taken as conservative at face value.

Response

EPA reaffirms that the approach taken to assess dam impacts is conservative and has included more information in Appendix H, including graphical information demonstrating this point. EPA has determined this is reasonable and appropriate to include as an element of the margin of safety. See also, responses to Comment II1 and Comment II2.

Comment II5

Commenter Idaho Conservation League

Comment

The TMDL mischaracterizes its use of monthly maxima in development of temperature allocations (pg 65).

In its list of “conservative assumptions that form an “implicit [Margin of Safety] in derivation of temperature allocations” the TMDL states:

“EPA is also using the mean of the monthly maxima recorded for the 2011 – 2016 period to establish the current conditions benchmark. In other words, exceedances at a given location are the mean of the six highest daily maximum temperature[s] recorded in that month over the period 2011 – 2016.” The TMDL is mischaracterizing the use of these records in the last sentence. The values used are the mean of the highest daily maximum temperatures recorded in that month over the period 2011-2016, but this does not make them the six highest daily maximum temperatures for a given month across that whole period. The exceedances were averaged from the highest daily maxima for a given month in a given year for six years, not from the highest six daily maxima across the whole period. The highest six daily maximum temperatures could have all been from the same year, but the TMDL samples from each year of a six-year period. This mischaracterization should be fixed.

Response

See response to Comment II2.

Comment II6

Commenter Idaho Conservation League

Comment

The use of recent high-temperature years should not be taken as part of the Margin of Safety (pg 65). In its list of “conservative assumptions that form an “implicit [Margin of Safety] in derivation of temperature allocations” the TMDL states:

“The TMDL assessment focuses on six recent years of data and modeling (2011 – 2016), and this period, compared to the historic record, is characterized by relatively high air temperature and river temperature.” This TMDL is meant for use in a river system that will be changed by the effects of climate change. Those effects have already been observed in recent years, as water and air temperatures continue to climb in the Pacific Northwest. In assessing the state of the river, the historical record is thus not as relevant as the most recent years. The use of observations from 2011-2016 is thus appropriate for this TMDL but should not be accounted as part of the Margin of Safety. The trend of climate change is well-studied and well-understood, and significant efforts have been made to study the effects of climate change on the hydrograph and water temperatures of the Pacific Northwest. The River Management Joint Operating Committee (RMJOC) has created predictions for air temperature and streamflows at various horizons and under different climatic scenarios. Significantly, air temperatures are expected to continue to increase and late summer flows are expected to decline as the hydrograph shifts earlier in the year.

This is not to state that this TMDL should factor in the RMJOC results. It is clear that using only data from recent years is a fair approximation of current river conditions, which should not be included as part of the MOS. As climate change continues to impact the river, the 2011-2016 data used will be increasingly non-representative of the river system, and this TMDL should be routinely refreshed with more current data.

Response

See response to Comment II3.

Comment II7

Commenter Northwest Hydroelectric Association

Comment

These attributions may be the result of several assumptions made by EPA, which EPA itself acknowledges overstate a dam's impact. For example, EPA recognizes that the assumptions made in determining the margin of safety are conservative indicators of dam impact. However, such conservative assumptions are not necessary given the acknowledgment that dams do not drive the temperature exceedances.

Response

The TMDL identifies dams as important drivers of temperature exceedances. EPA has determined that the conservative assumptions in the dam impact analysis are appropriately included in the implicit Margin of Safety.

Comment II8

Commenter Public Power Council

Comment

EPA should incorporate uncertainty and error ranges into its allocations, as these allocations are based on modeling assumptions and likely do not accurately reflect real-world conditions.

Response

The allocations are not based on modeling assumptions. They are based on a programmatic decision to distribute the allowable temperature impact from state WQS among the three source categories, where 0.1°C impact is allocated cumulatively to the point sources, tributaries, and nonpoint dam impacts. The model is used to estimate current impacts for comparison to the allocated level of impact. The uncertainties and error ranges in model predictions are described in Appendices C and D of the TMDL.

Comment II9

Commenter Oregon Department of Environmental Quality

Comment

Sections 6.5.4 Reserve Allocations and 6.6 Margin of Safety state that the reserve allowance is considered part of the implicit margin of safety until the reserve is allocated for future uses. This approach conflates two very distinct elements of a TMDL, and to be consistent with the federal requirements specifying that the margin of safety account for uncertainty in predicting how well pollutant reductions will result in meeting water quality standards. Conservative assumptions used in the TMDL analysis or in developing a TMDL target contribute to the implicit margin of safety. The reserve allocation by its very nature and definition should be solely reserved for future use and not double counted toward a margin of safety that would diminish as the reserve allocation is assigned for future uses.

Response

EPA has deleted the reference to the reserve allocation as part of the margin of safety. See also response to Comment II2.

Comment Category JJ. Reasonable Assurance

Comment JJ1

Commenter Various NGOs

Comment

The TMDL correctly identifies certain dams as significant sources of heat pollution and assigns those dams load allocations to help meet temperature standards. Unfortunately, the TMDL lacks the requisite "reasonable assurances" that those dams will actually meet their load allocations. As EPA has explained:

"when a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, the TMDL must provide "reasonable assurances" that nonpoint source control measures will achieve expected load reductions . . . . This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards."

Given the circumstances and history described below, EPA's claim that such reasonable assurances exist with respect to federal dams is disingenuous and arbitrary.

Recent Clean Water Act Section 401 Certification actions by Washington and Oregon for eight federal dams on the Columbia and Lower Snake rivers might provide reasonable assurances—if EPA would acknowledge those 401 Certifications in this TMDL and stop working to undermine them. In response to a request from EPA, the Washington Department of Ecology (Ecology) recently issued 401 Certifications for eight federal dams on the lower Columbia and Lower Snake rivers. Ecology's 401 Certifications require the Corps' dams to "meet the load allocations in the Columbia and Lower Snake River Temperature Total Maximum Daily Load." Section 401 Certifications for dams are federally enforceable, permit-like documents that can provide reasonable assurances for TMDL purposes, and EPA has committed to partner with states and use all available federal and state laws and regulatory programs—such as Clean Water Act Section 401 Certifications—to achieve TMDL load allocations for nonpoint sources. EPA inexplicably ignores these eight recent 401 Certifications that are expressly conditioned to implement the TMDL's load allocations. EPA has also previously withdrawn, and continues to withhold, final NPDES permits for the Corps' dams in a misguided effort to avoid Ecology's 401 Certifications. EPA also recently promulgated new Clean Water Act regulations in an illegal attempt to strip states and tribes of their authorities to issue 401 Certifications. By ignoring and working to undermine 401 Certifications for federal dams on the Columbia and Lower Snake rivers, EPA is violating its own TMDL guidance and removing any reasonable assurance that the federal dams will meet this TMDL's load allocations.

The federal agencies overseeing the hydrosystem have proven extremely resistant to any actions to improve temperature conditions for salmon and steelhead—let alone the transformative, structural changes likely necessary to achieve the TMDL's load allocations for the Columbia and Lower Snake river dams. Nevertheless, EPA says that "implementation of this TMDL depends on . . . River temperature reduction efforts by other federal agencies." For the reasons below, EPA's 'dependence' on federal dam managers to address temperature problems is completely unfounded and does not provide any reasonable assurance that the dams will meet their load allocations.

As EPA well knows, federal agencies like the Corps have long sought to obscure, and avoid responsibility for, their dams' impacts on water temperature in the Columbia and Lower Snake rivers. EPA's sudden reliance on the Corps and others to voluntarily meet the TMDL's load allocations is, therefore, perplexing and arbitrary. Nearly twenty years ago, the Corps prevailed upon EPA to bury the TMDL at issue here. When EPA took up the TMDL again several years later, the Corps pressed EPA to pretend that the impacts of the dams were somehow part of the natural river system and beyond the reach of the TMDL. Rebuffed, and concerned that EPA would issue a TMDL containing load allocations for the dams, the Corps pressured the State of Oregon to eliminate salmon and steelhead as Clean Water Act-protected uses of the Columbia River (an invitation Governor Kulongoski pointedly refused). Now that EPA has issued this TMDL, the Corps is asking the Washington Pollution Control Hearings Board to invalidate the 401 Certifications that make the TMDL's dam load allocations legally enforceable. Perhaps most troubling from a "reasonable assurances" standpoint, the Corps' 401 Certification appeal asserts (albeit without specifics or substantiation) that complying with the TMDL's load allocations would be beyond the Corps' legal authorization. In other words, the Corps claims that meeting the TMDL's load allocation would be illegal. Given the Corps' long-running and highly successful campaign to avoid acknowledging or addressing the dams' water quality standards violations, EPA's reliance on the Corps' "river temperature reduction efforts" is cynical, misguided, and provides no assurance that the dams will meet the TMDL's load allocations.

The federal plans and reports mentioned in the TMDL57 similarly do not contain the "reasonable assurances" required by EPA's guidance requires. Specifically, the TMDL states that:

"The Final EIS and Biological Opinion [for the federal hydropower system] may identify water temperature improvement projects for the Columbia River, similar to those identified in the Water Quality Plan for Total

Dissolved Gas and Temperature (USACE 2009) and the Sockeye Salmon Passage Report (NOAA 2016)." None of these four documents provide "reasonable assurances" that the dams will meet their load allocations. The CRSO BiOp and EIS explicitly state that the Corps will not change the configuration or operation of its dams to reduce heat pollution caused by the reservoirs or meet the TMDL's load allocations. Accordingly, EPA's reliance on the BiOp and EIS to meet the TMDL load allocations is arbitrary and contradicted by the plain text of these documents. Furthermore, the Corps' Water Quality Plan for Total Dissolved Gas and Temperature and NMFS' 2016 Sockeye Salmon Passage Report have made little to no impact on average river temperatures over the last decade, so any temperature improvements "similar to" the measures in those documents will not help meet the dams' load allocations.

Three decades of illegal plans by the CRSO agencies have not alleviated the dams' temperature pollution; the 2020 BiOp and EIS explicitly continue this approach and, in fact, promise not to take actions that could meet the dams' load allocations.

EPA also has no reasonable basis to expect that Oregon and Washington's TMDL programs will help meet the load allocations for tributaries in this TMDL. EPA claims that, "As Washington and Oregon continue to develop and implement TMDLs for tributaries, EPA expects modest improvements in mainstem Columbia River temperatures." This expectation is unfounded. EPA provides no evidence that Oregon and Washington's TMDLs have resulted in tributary temperature improvements thus far or will in the future. Washington's TMDL program has ground to a halt, and Oregon's existing temperature TMDLs violate the Clean Water Act by allowing temperatures higher than numeric criteria. EPA cannot rely on these other TMDLs as reasonable assurances.

Reasonable assurance that the dams will meet their TMDL load allocations might be achieved by the following actions:

• EPA incorporating Washington's 401 Certification conditions (and Oregon's 401(a)(2) Objections) into the pending NPDES permits for the dams and issuing these NPDES permits;

• EPA revising the TMDL to make the dams' temperature allocations into Waste Load Allocations (as discussed in Section V, below); and

• The Corps withdrawing its appeals of Washington's 401 Certifications for eight dams on the Columbia and Lower Snake Rivers that require compliance with the TMDL's load allocations for dams.

Without such actions to provide reasonable assurances that the dams will meet their load allocations, the Clean Water Act requires EPA to significantly reduce or eliminate the temperature waste load allocations for industrial and municipal dischargers.

Response

As stated in the TMDL, this TMDL is being issued by EPA, which lacks authority to implement nonpoint source controls or otherwise assure reductions in nonpoint source pollution; typically the basis for an evaluation reasonable assurances that nonpoint source allocations will be achieved. Implementation of this TMDL depends on development of implementation plans by Washington and Oregon, as well as river temperature reduction efforts by other federal agencies. EPA has adequately summarized the available information, stakeholders, and potential actions that could lead to TMDL allocations being achieved. As detailed in the TMDL, further temperature reductions to point source discharges will not affect the river temperatures in a significant way.

Comment JJ2

Commenter Bonneville Power Administration

Comment

On page 73: It states, "The Fish and Wildlife Program includes fish passage and tributary improvements, both key areas in reducing water temperature." Columbia River Fish Mitigation funding is used for structural changes, e.g., ladder cooling water pumps at Lower Granite and Little Goose dams. However, some fish passage opportunities within tributaries (e.g., culvert replacements) are funded by Bonneville's Fish and Wildlife Program. Bonneville suggests the cited text be replaced with the following: "The Fish and Wildlife Program includes tributary improvements and the US Army Corps of Engineers' Columbia River Fish Mitigation (CRFM) Program includes passage improvements, both are key areas in reducing water temperature."

Response

The text in the TMDL has been revised as suggested.

Comment JJ3

Commenter Bonneville Power Administration

Comment

Page 73: It states, "Federal power agencies have maintained and are likely to continue current fixed monitoring at the tailraces and forebays of the federal dams." Bonneville requests the word "power" be removed from this sentence, so it reads "Federal agencies…"

Response

The text in the TMDL has been revised as suggested.

Comment JJ4

Commenter Washington Department of Ecology

Comment

The EPA repeatedly states in this TMDL that temperature water quality standards cannot be met in all places at all times. But meeting water quality standards is a critical element of an approvable TMDL.

When the EPA establishes or approves a TMDL that allocates pollutant loads to both point and nonpoint sources, it determines whether there is reasonable assurance that the load allocations (LAs) will be achieved, and water quality standards (WQS) will be attained. EPA does that to be sure that the wasteload allocations

(WLAs) and load allocations (LAs) established in the TMDL are not based on overly generous assumptions regarding the amount of nonpoint sources pollutant reductions that will occur.

This is necessary because the WLAs for point sources are determined, in part, on the basis of the expected contributions to be made by nonpoint sources to the total pollutant reductions necessary to achieve WQS. If the reductions embodied in LAs are not fully achieved because of a failure to fully implement needed nonpoint source pollution controls, or that the reduction potential of possible BMPs or actions was overestimated, the collective reductions from all sources will not result in attainment of WQS. As a result, EPA must demonstrate whether a TMDL provides reasonable assurance that nonpoint source controls will achieve expected load reductions.

When EPA Region 10 evaluates our TMDLs for reasonable assurances, they consider the following questions: "One practical way to evaluate reasonable assurance is to consider whether it addresses these questions: 1) Do practices capable of reducing specified pollutant load exist? 2) Does the TMDL describe a plan or process to implement such practices?" There is no description in the TMDL of practices that are capable of reducing the pollutant load necessary to achieve the LA. We would like EPA to identify what practices exist to reduce temperature pollution and describe potential implementation actions that could meet the LAs assigned to the dams and the tributaries.

Response

EPA's statements in the TMDL that the TMDL cannot ensure or cannot predict that numeric temperature criteria will be met at all times and in all places are intended to reflect the large variability of the river system. As noted in the re-issued TMDL, Section 6.8, based on the model simulations for 2011-2016, achieving the allocations would achieve the target temperatures on average but not during warmer-than-average weather periods.

As noted in Reasonable Assurance (Section 7.0), "The regulatory and non-regulatory measures described above and described in more detail in the states' implementation plans and federal dam operation plans provide adequate reasonable assurance for the temperature wasteload and load allocations in this TMDL." Section 7.0 goes on to note that this federal TMDL is being issued by EPA, which lacks authority to implement nonpoint source controls or otherwise assure reductions in nonpoint source pollution. Implementation of this TMDL depends on development of implementation plans by the States of Washington and Oregon, as well as river temperature reduction efforts by other federal agencies. Therefore, this TMDL contains information available to EPA regarding current programs to reduce nonpoint loads, as well as noting other potential actions that may be taken to reduce such loads. EPA is unable to dictate specific actions as part of an implementation plan for this TMDL, and recommends that the states, in developing their implementation plans, consider continued development, revision, and implementation of tributary TMDLs, including protection of CWRs; funding mechanisms to address traditional nonpoint sources of heat; voluntary conservation programs; a collaborative monitoring and tracking program; and other activities designed to reduce water temperature.

Comment JJ5

Commenter Washington Department of Ecology

Comment

This TMDL identifies dams as one of the biggest impacts to increased temperatures in the Columbia and Snake Rivers. However, the TMDL does not include actions that the federal dams can take to meet their load allocations, nor is there any certainty that any actions will be implemented. We would like the EPA to clarify what actions can be taken by federal dams to reduce their temperature impact.

Specifically, we would like EPA to include in this TMDL how they envision federal dams to meet their load allocations. 401 certification serves as a crucial administrative tool for requiring temperature reductions. To address temperature impacts from dams, Ecology issued 401 certifications to federal dams to address temperature pollution on May 7, 2020. The Army Corps of Engineers has appealed these certifications. This appeal demonstrates that federal dams do not think they need to meet Washington Water Quality Standards or the federal Clean Water Act. Without 401 certification authority, how can there be reasonable assurance that the LA assigned to dams will be implemented?

We thought there was a clear implementation pathway for federal dams, but the tool we were relying on to protect state water quality is unfortunately being litigated. Although we are confident in our legal case, if the Army Corps does prevail, what tools are available to Ecology to regulate how there is reasonable assurance that the reductions necessary to meet the LA assigned to the federal dams will be achieved.

Response

The outcome of the litigation will be relevant but not determinative of Washington's ability to implement the load allocations in this TMDL. EPA will continue to support the parties in implementation of the TMDL regardless of the outcome. The Reasonable Assurance (Section 7.0) and Next Steps (Section 8.0) sections of the TMDL contain information regarding the likely stakeholders, venues, and some potential actions that the federal and public utility district dam operators may take to reduce temperature impacts to the Columbia and Lower Snake Rivers.

Comment JJ6

Commenter Idaho Wildlife Federation

Comment

The TMDL states that this process may identify water temperature improvement projects for the Columbia River to provide a reasonable assurance that the pollution reduction levels specified in the TMDL will be achieved, and therefore, that applicable standards will be attained6. While we appreciate the efforts by many federal, state, and nonprofit entities to provide these assurances, we cannot accept the pending 2020 Final Columbia River System Operations (CRSO) EIS and associated NOAA Fisheries Biological Opinion for the federal hydropower system as an immediate and concrete assurance. Even if the CRSO EIS were finalized, the CRSO agencies' analyses plainly state that changes to the hydropower system with the selected alternative, including mitigating for harmful water temperatures to salmonids, provide minimal systemic improvements for our bleak anadromous fish runs. Given that this process has been struck down time and time again in the courts for lacking substantial changes to the current hydropower system, the conclusion and reliance on this pending document to provide reasonable assurance cannot be taken seriously.

Response

The EPA's evaluation of this TMDL's reasonable assurance does not rely on the CRSO EIS and Biological Opinion. These actions are referenced as sources of further information on the river systems as well as potential actions to manage operations to reduce temperature impacts of the federal dams, in addition to the other entities and actions that may be involved as the states develop the TMDL implementation plans.

Comment JJ7

Commenter Oregon Department of Environmental Quality

Comment

EPA must acknowledge and address in the TMDL the many limitations dam operators are subject to in meeting their TMDL allocations. These include obligations in operating the Columbia River System (CRS) for a variety of Congressionally-authorized purposes including, but not limited to, water quality, fish and wildlife conservation, power system management, irrigation / water supply and navigation. In addition to the requirement to meet obligations under the Clean Water Act, including allocations under this TMDL, the operators must also meet Endangered Species Act (ESA) requirements in dam operations. For example, the 2019 NOAA National Marine Fisheries Service Columbia River System Biological Opinion (Biological Opinion) includes operational measures for minimizing risks to ESA listed salmonids. These measures include minimum pool levels for constraining water releases for navigation at the lower Snake River dams and irrigation at the John Day Dam on the Columbia River. The Biological Opinion specifies John Day Dam's minimum irrigation pool for April 10 through September 30. This restriction may impact potential flow augmentation options for temperature mitigation. DEQ expects that minimum operating pool, minimum irrigation pool and normal operating elevation range will be addressed in the Water Quality Management Plans implementing the TMDL.

Response

See response to Comment A40. EPA recognizes the complexity and numerous uses of the Columbia and Lower Snake Rivers. As stated in the TMDL's Reasonable Assurance section, EPA expects the states to work within their authorities to implement activities to reduce nonpoint source heat loading, in coordination with federal dam operators and other stakeholders.

Comment JJ8

Commenter Confederated Tribes and Bands of the Yakama Nation

Comment

The TMDL does not include reasonable assurances for achieving load reductions. In Section 7 of the TMDL, the EPA rightfully notes the importance of including reasonable assurances to achieve compliance:

[p]roviding reasonable assurance that nonpoint source control measures will achieve expected load reductions increases the probability that the pollution reduction levels specified in the TMDL will be achieved, and therefore, that applicable standards will be attained.

Nevertheless, the EPA fails to include adequate reasonable assurance that nonpoint sources associated with dams, which the EPA asserts are the largest contributors of thermal impairment, will meet the necessary load reductions set forth in the TMDL.

The EPA's discussion on reasonable assurances ignores ongoing regulatory processes related to the FCRPS, including its own draft NPDES permits and Section 401 certification actions by Washington and Oregon. The EPA can incorporate Washington's certification conditions, which include compliance with the TMDL, into the pending NPDES permits for these dams to provide reasonable assurance of compliance. The EPA should expressly acknowledge this action, as well as any other potential assurance actions, in the final TMDL.

Response

See responses to Comment JJ1 and Comment JJ4, above.

Comment JJ9

Commenter Individual email received

Comment

EPA concluded in Section 4 that dams constructed between 1932 and 1975 on the Columbia and lower Snake River have a cumulative warming impact on the mainstem rivers in the summer period. The Columbia River System Operations (CRSO) agencies (US Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration) are currently finalizing the 2020 Final CRSO EIS and associated NOAA Fisheries Biological Opinion for the federal hydropower system. The Final EIS and Biological Opinion may identify water temperature improvement projects for the Columbia River, similar to those identified in the Water Quality Plan for Total Dissolved Gas and Temperature (USACE 2009) and the Sockeye Salmon Passage Report (NOAA 2016). The federal power agencies continue to review control measures outlined in these plans and implement operational adjustments, as appropriate, with the potential to lower water temperatures.

Based upon the efforts of CRSO to date, water temperature has increased in the Columbia and lower Snake River to levels that exceed water quality standards. EPA should not expect any water temperature improvement from CRSO. Instead, EPA should specifically request the District Court to enforce CRSO to comply with temperature water quality standards or cease operations. Continuing to allow CRSO to operate without water quality temperature compliance, CRSO threatens the existence of threatened summer and fall chinook, steelhead, and endangered sockeye salmonids.

Response

The CRSO EIS Record of Decision and associated Biological Opinion were completed in 2021, which contain some measures to reduce water temperatures as part of the Water Quality Plan. The States of Oregon and

Washington are the lead agencies for implementation of the TMDL and will be working with the federal dam agencies to identify and implement actions to reduce water temperatures. EPA is currently coordinating with the States of WA and OR as they move toward implementation plan development. EPA plans to coordinate with the federal dam agencies as the states develops their implementation plans.

Comment JJ10

Commenter Individual email received

Comment

The Columbia River Basin Federal Caucus provides an ongoing forum for federal agencies in the Columbia River basin to work together on the planning, science, and implementation of actions to address water temperature improvements. Past and ongoing actions have included river operations, structural configurations at specific hydropower projects, and habitat restoration in the tributaries. The 2008 Columbia River Basin Federal Caucus Memorandum of Understanding identifies implementation of Clean Water Act and water temperature actions as a priority focus area for the Caucus. The Columbia River Federal Caucus coordinates with the Columbia River Federal Executives as described in the MOU, including potential coordination on water temperature improvements.

This Idaho citizen requests the Columbia River Basin Federal Caucus to prioritize its activities to reduce water temperature in the Lower Snake River during June, July, August, and September to improve salmonid aquatic habitat.

Response

EPA participates on the Columbia River Basin Federal Caucus and is currently working with the Caucus to prioritize water temperature reduction actions. EPA continues to advocate that federal agencies participating in the Caucus focus on water temperature improvements throughout the Columbia River Basin, in both the mainstem river and the tributaries, and will advocate for a focus on water temperature improvements by the new Columbia River Basin Collaboration convened and managed by the States of Idaho, Montana, Oregon and Washington.

Comment JJ11

Commenter Individual email received

Comment

The Northwest Power Act requires the Northwest Power and Conservation Council to implement the Columbia River Basin Fish and Wildlife Program to mitigate the impact of the federal hydropower system. The Fish and Wildlife Program includes fish passage and tributary improvements, both key areas in reducing water temperature. The Fish and Wildlife Program provides an opportunity for State leadership as temperature improvement actions move forward. Members of the Council are appointed by the Governors of Idaho, Montana, Washington, and Oregon. State leadership through the Northwest Power and Conservation Council during implementation planning could provide opportunities to share information and coordinate with federal agencies on proposed actions to mitigate the temperature increases attributable to the federal hydropower system.

EPA should initiate with the Governor of Idaho actions to reduce water temperature in the Snake River upsteam of Anatone, Washington. Also, EPA should initiate an additional action to establish that Idaho and Washington have the same water quality standard in the Snake River when these States share the river as a boundary.

Response

As stated in the TMDL, waters in Idaho, upstream of Anatone, Washington, are outside of the TMDL study area. The State of Idaho is responsible for developing TMDLs for Idaho waters, and EPA will work with the State of Idaho, as appropriate, on related TMDLs that are developed. Water quality standards are typically set by states and tribes through a public participation process and approved by EPA. Also see responses to Comment T5, Comment T6, and Comment T13.

Comment Category KK. Tribal Consultation and Public Outreach

Comment KK1

Commenter The American Waterways Operators

Comment

AWO requests that EPA reissue a revised draft TMDL and provide stakeholders with the opportunity to provide comments before the draft is finalized.

Response

The TMDL regulations at 40 CFR 130.7 require that EPA considers comments, makes necessary changes, and transmits the TMDL to the states for incorporation into their Water Quality Management plans. EPA also plans to transmit the TMDL to the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians, as the TMDL incorporates these tribes' WQS for temperature. Further, the regulations require EPA to establish the TMDL within 30 days of disapproval and then seek comment.

Comment KK2

Commenter National Hydropower Association Northwest

Comment

As the national trade association for the hydropower industry, NHA is uniquely situated to provide information on hydropower's growing role in the nation's climate change policies. As the EPA notes, implementation of the TMDL is the responsibility of Washington and Oregon, but EPA will remain a key facilitator amongst stakeholders. NHA requests to be included in EPA stakeholder outreach and to be notified of opportunities to supply information and public comments.

Response

See response to Comment KK1. Implementation will be primarily the responsibility of the states, and EPA is committed to working with states, tribes and other partners during TMDL implementation.

Comment KK3

Commenter Port of Whitman County Commissioners

Comment

Thank you again for the opportunity to comment. We ask that you please incorporate these recommendations, as well as the attached summary review of temperature research, into your report. In addition, we respectfully request the issuance of a revised TMDL and the ability for stakeholders to participate in a public comment period before it is finalized.

Response

See responses to Comment KK1 and Comment KK2.

Comment KK4

Commenter Northwest River Partners

Comment

We ask that EPA revise its analysis and issue a Draft CLSRT TMDL and that stakeholders are provided with the opportunity to provide comments before the draft is finalized.

Response

See response to Comment KK1. EPA issued this TMDL in May of 2020 and provided an opportunity to comment at that time. EPA has considered comments and made appropriate revisions.

Comment Category LL. TMDL Implementation

Comment LL1

Commenter Bonneville Power Administration

Comment

The TMDL and TMDL Implementation Plans should not prevent adaptive management included in the 2019 NMFS CRS BiOp (and in any future CRS consultation documents) and not restrict the Corps' and Reclamation's ability to carry out its congressionally authorized purposes.

The 2019 NMFS CRS BiOp is currently in effect but will be replaced by updated biological opinions that incorporate new actions and will be supported by analysis developed during the Columbia River System

Operations Environmental Impact Statement National Environmental Policy Act process. To account for changing conditions over that timeframe, the new biological opinions will continue to rely upon adaptive management of the Columbia River System. If TMDL implementation plans lead to a loss of existing adaptability and a loss of existing regional collaboration and creativity to solve complex issues, that would be in direct conflict with the 2019 NMFS CRS BiOp and any future CRS Endangered Species Act (ESA) consultations. The TMDL and TMDL Implementation Plans should not impact the adaptive management of these federal dams and future technological innovations.

Response

The statutory purpose of a TMDL is to identify sources of water quality impairments and establish allocations for all sources that contribute to the impairments in order to attain water quality standards. EPA recognizes that water quality protection is one purpose among other similarly important purposes. These multiple purposes are most appropriately addressed during the implementation phase of the TMDL. States have the lead for implementation of the TMDL.

Comment LL2

Commenter Bonneville Power Administration

Comment

EPA's TMDL methodology precludes the statutorily mandated consideration of authorized purposes, uses and values of the federal hydro system such as recreation, agriculture, industry and navigation because it simulates mainstem temperatures with the absence of ten federal dams.

There are limitations to the conditions and authority that may be imposed through EPA's TMDL or the states TMDL Implementation Plans. It is important that EPA and the state water quality agencies, Oregon Department of Environmental Quality (ODEQ) and Washington Department of Ecology (Ecology), who will be responsible for implementing the TMDL, recognize any conditions that are imposed by the TMDL, TMDL Implementation Plans, and NPDES permits and associated 401 certifications. Specially, EPA, ODEQ and Ecology should not interfere with the Corps' and Reclamation's ability to operate these facilities for the multiple purposes authorized by Congress. See National Wildlife Federation v. U.S. Army Corps of Engineers, 384 F.3d 1163 (9th Cir. 2004). Further, the language of the Clean Water Act (CWA) explicitly recognizes that the provisions of the CWA cannot be construed to affect the Corps' ability to maintain navigation. See 33 USC 1371(a); In re Operation of Missouri River System Litigation, 418 F.3d 915 (8th Cir. 2005).

In this situation, where EPA has to develop the TMDL, it would be imprudent for EPA to potentially frustrate Congress' explicit intent that the federal dams serve specific authorized purposes without a more carefully crafted discussion of how dam operations and purposes will be treated in the TMDL process, especially TMDL implementation. When Congress wrote the CWA it was fully aware of the federal dams, and could not have intended for the CWA to prevent the dams from serving their explicit statutory purposes. This is supported by (1) the fact that Congress has continually funded the dams before, during and after the CWA's 1972 reauthorization, and (2) at Section 303©(2)(A) of the CWA mandates consideration of a water body's use and value for recreation, agriculture, industry, navigation, and other purposes in the establishment of water quality standards. By funding federal dams while simultaneously enacting the CWA, Congress clearly intended for clean water to coexist with recreation, agriculture, industry, and navigation.

…However, Bonneville is concerned that EPA's methods may result in a TMDL and TMDL Implementation Plans that will encourage protracted litigation. EPA's TMDL does not discuss how the federal dams' multiple congressionally authorized purposes, the federal dams' operations, or upstream sources outside of the TMDL area, including tributaries, will be acknowledged within the regulatory framework, and thus is inviting potential litigants to engage the United States in extended litigation by proposing unrealistic temperature targets (allocations) for the ten federal dams. These unrealistic temperature targets may set unprecedented implications nationally for all streams with large or medium sized dams or clusters of dams.

Response

See Response to Comment LL1.

Comment LL3

Commenter Chelan, Douglas and Grant PUDs

Comment

The Mid-C PUDs Contribution

As the EPA' s evaluation on climate change states "Future air and water temperature warming rates will ultimately be dictated by the actual levels of greenhouse gas emissions and the evolution of the complex global energy system (Isaak et al. 2018)." As hydropower generators, the Mid-C PUDs are well positioned to support greenhouse gas emission goals in the electric sector as well as the electrification of other sectors. Our ability to follow load and provide firm capacity also makes hydropower a strategic partner with other renewable resources in achieving environmental outcomes. We believe that any TMDL should accommodate hydropower's continued contribution to the region's carbon reduction and clean energy goals. An inaccurate and overly prescriptive approach could threaten to compound the very outcomes the TMDL intends to avoid.

Response

EPA recognizes hydropower's continuing contribution to meeting the region's energy needs. See response to Comment LL1.

Comment LL4

Commenter Public Utility District No. 1 of Chelan County

Comment

The success of the Habitat Conservation Plans is also strong evidence that Chelan PUD's Projects do not impair salmonid spawning, rearing, or migration, the use protected by the numeric criterion. The Habitat Conservation Plans achieved no-net-impact on listed species by 2013, and this achievement occurred despite the warming temperatures. Annual returns to the Chelan PUD projects have dramatically improved over the last two decades.

This success demonstrates that the measures being implemented to protect aquatic species such as salmon are working - and that the temperature exceedances are not resulting in adverse impacts on those species.

Response

EPA agrees that Habitat Conservation Plans can play an important role in TMDL implementation. Development and implementation of HCPs and regulatory or voluntary environmental restoration plans are encouraged by EPA to restore water temperatures and aquatic uses in the Columbia and lower Snake Rivers.

Comment LL5

Commenter Port of Clarkston

Comment

The pattern emerging from this data results in the conclusion that much of the problem attempting to be solved through a TMDL is not created by human,-activities and therefore requires solutions that are beyond setting a simple water quality standard for an incredibly complex series of situations.

The states of Washington and Oregon attempted to develop TMDLs, and their failure to do so is telling. How could they force a single solution when the problem is global? One single measurement does not signify success or failure for the salmonids themselves. Their needs do not align with current measurement points, and key data is lacking to determine-regardless of the heat source-what would be best for fish. Unlike the TMDLs in existence, there is not one single source of the heat problem; the most significant contribution comes from sources other than human activities (see Figure 6), and with climate change the non-human source will become more significant in the future. Where some responsibility may be attributed to storage dams, so many of the point sources are outside the study area.

The default position by the states and now EPA is to assign responsibility to the managers of just 15 federal dams. The Port theorizes that this assignment occurs because federal dam operations include resources (such as Dworshak Dam) which can, in the short-term and through very careful management, mitigate non-human sources and/or sources of heat from non-federal dams. The fairness and equity of forcing that solution needs to be carefully considered.

Response

TMDLs are designed to establish pollutant allocations at levels necessary to implement the currently applicable water quality standards. The temperature WQS within the scope of the TMDL have been developed by state and tribal governments to protect the most sensitive aquatic life designated uses in the Columbia and Lower Snake Rivers, such as salmonid spawning, rearing and migration. Appendix A of the TMDL contains detailed information on the approved state temperature WQS used to develop the TMDL temperature targets.

In developing the TMDL, EPA evaluated all sources of increased temperature loading to the Columbia and Lower Snake Rivers, and assigned allocations to NPDES permitted point sources, dam operations, and tributaries to levels that can be allocated under applicable WA and OR temperature WQS. Other sources of warming to the

Columbia and Lower Snake Rivers, including temperature loads entering the TMDL study area from Idaho and Canada and increases to air temperature from global climate change, have not been assigned allocations as part of this TMDL. Temperature impairments in the Columbia Basin are a result of numerous sources and factors, and all of them need to be addressed to return the Columbia and Lower Snake Rivers to applicable WQS.

Comment LL6

Commenter Northwest Hydroelectric Association

Comment

Dams are also vital to realizing other uses of the Columbia and Snake Rivers. Dams of course provide an exceptionally large share of clean electricity for the Pacific Northwest; in Washington, for example, hydropower facilities produced nearly five times as much net generation as the next closest source (natural gas) during March 2020. As a non-emitting source of electricity, the hydropower projects of NWHA members will also be particularly important to achieving Washington's goal of one hundred percent clean electricity by 2045.

Beyond their core hydroelectric function, dams support other designated uses. Reservoirs provide recreational and boating opportunities to the public. Dams and their storage also support water supply or storage for residential, industrial uses, and they enable agricultural irrigation as well. Given these benefits, any regulatory course that might severely impact dam operations would ultimately undermine the designated uses of the Columbia and Lower Snake Rivers.

Response

See response to Comment A40.

Comment LL7

Commenter Northwest River Partners

Comment

The signaling provided by the states of Washington and Oregon make it apparent that they intend to use the TMDL to make significant energy policy decisions. As a result, the CLSRT TMDL potentially and unfairly threatens a resource that is critical to the climate change fight. This is a fight that we must win if we want to protect endangered salmonid species.

Response

See responses to Comment LL40 and Comment LL41.

Comment LL8

Commenter Bureau of Reclamation

Comment

Implementation of the TMDL will require additional analyses utilizing peer-reviewed tools.

Reclamation recognizes that, although EPA's RBM-10 model has been used in other TMDLs, it is not able to represent how Grand Coulee operations affect water temperature. Among other limitations to representing operations, RBM-10 simplifies operations and spatial temperature heterogeneity, such as thermal stratification in reservoirs. Implementation of the TMDL would thus benefit from tools capable of more completely reflecting how dam operations can affect water temperature.

Response

EPA acknowledges that the one-dimensional RBM10 model has limitations that may limit the analysis of some implementation actions, including analysis of detailed structure or operational alternatives. The Bureau of Reclamation has developed a two-dimensional model of Grand Coulee and Lake Roosevelt, and this model could provide valuable information in the evaluation of temperature improvement alternatives.

EPA disagrees that RBM10 is not capable of estimating of the current impacts of Grand Coulee on Columbia River temperatures. The model is extensively tested against measured temperatures below Grand Coulee dam, and the model error statistics are at levels consistent with other locations across the TMDL study area (see calibration information in Appendix C of the TMDL and a comparison of simulated and measured temperatures in Figure 3-2 in Appendix D).

Comment LL9

Commenter Washington Association of Sewer and Water Districts

Comment

Finally, public entities are always concerned with costs, and our members are no different. We encourage EPA and the States to recognize the fiscal realities of the current times and develop innovative compliance strategies that maximize environmental outcomes for modest financial investments.

Response

Costs will be one of many issues that will be considered during TMDL implementation. Development of TMDL implementation plans are the responsibility of the States of Washington and Oregon, and EPA is committed to working in partnership with states, tribes and local entities to achieve temperature reductions in the Columbia and lower Snake River system.

Comment LL10

Commenter City of Camas

Comment

Water Quality Credit Trading

The City of Camas requests that the EPA provide a statement of support in the TMDL for the use of water quality credit trading consistent with EPA guidance as an approach to attain the desired water quality objectives. Trading areas are typically defined based upon areas of consistent temperature criteria and location in relation to the point of maximum impact within a river reach. The City of Camas is requesting that EPA include statements of support for the use of water quality credit trading consistent with EPA and Washington guidance to comply with the TMDL, establish geographical boundaries where the trading would be allowed, consistent with the TMDL, or establish the procedures for defining geographic trading areas.

Response

EPA supports water quality trading as a potentially cost effective and environmentally beneficial approach to meeting the water quality goals established by the TMDL. Point sources may consider meeting their temperature permit limit under a state-approved water quality trading plan that is prepared and submitted according to the applicable state's rules and guidance documents. Trading program aspects, such as establishing the geographic boundaries of the trading area, will be discussed with the states and interested stakeholders as part of TMDL implementation. EPA has added language to the TMDL and Appendix J on water quality trading.

Comment LL11

Commenter City of Gresham

Comment

The City requests that the EPA clarify in the TMDL the use of water quality credit trading as an approach to attain the desired water quality objectives. Oregon has water quality trading guidance consistent with EPA guidance and trading may be a key method for ensuring compliance with the TMDL. The TMDL does not specify methods and rules for point source dischargers to comply with the WLAs, however trading programs will require the definition of geographic trading areas within which trading could occur between contributing sources. Trading areas are typically defined based upon areas of consistent temperature criteria and location in relation to the point of maximum impact within a river reach. The City of Gresham is requesting that EPA include statements of support for the use of water quality credit trading consistent with EPA and Oregon guidance to comply with the TMDL, establish geographical boundaries where the trading would be allowed, consistent with the TMDL, or establish the procedures for defining geographic trading areas.

Response

See response to **Error! Reference source not found.**.

Comment LL12

Commenter City of Washougal

Comment

The City of Washougal requests that the EPA provide a statement of support in the TMDL for the use of water quality credit trading consistent with EPA guidance as an approach to attain the desired water quality objectives. Trading areas are typically defined based upon areas of consistent temperature criteria and location in relation to the point of maximum impact within a river reach. The City of Washougal is requesting that EPA include statements of support for the use of water quality credit trading consistent with EPA and Washington guidance to comply with the TMDL, establish geographical boundaries where the trading would be allowed, consistent with the TMDL, or establish the procedures for defining geographic trading areas.

Response

See response to **Error! Reference source not found.**.

Comment LL13

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The role of the FCRPS in exacerbating heat conditions in the river cannot be overstated, and EPA, along with the states and the federal partners, needs to develop management or other options to improve conditions throughout the system.

Response

See response to Comment JJ4. Implementation will depend on the development of TMDL Implementation Plans by the States of Washington and Oregon as well as river temperature reduction efforts by other federal agencies, tribes, NGOs, PUDs, NPDES permittees, and other interested parties.

Comment LL14

Commenter Port of Clarkston

Comment

EPA must not embrace narrow, short-term limited thinking on this issue. Should EPA agree with the Port that the preponderance of impact comes from natural, not human-caused conditions, they should withdraw this discussion from the TMDL arena and start asking difficult but very important questions, such as what new storage facilities should be built in the Columbia/Snake River watershed to assure that people in the Pacific Northwest have water to drink? This point in time is a tipping point. EPA can go with a political flow and keep an inadequate model that forces a unmeaningful result, or it can take on leadership responsibilities and partner with agencies in a discussion with more far-reaching longer-term benefits. We're at war with conditions that individual agencies or small collections of agencies managing 15 dams cannot begin to address on their own. It is essential that we recognize that we're at war and start planning accordingly, instead of playing games with simulations to get outcomes that satisfy popular opinion. This is the time to begin looking forward.

Response

There are a number of sources of heat loading to the river system. It will take everyone working together on these issues, with all of the available tools, to reduce temperatures in the Columbia and Lower Snake rivers.

As discussed in Sections 4.0, 6.0 and Appendix D of the TMDL, EPA recognizes that there is evidence of a warming trend in Pacific Northwest waters and in the Columbia River mainstem since 1960, as indicated by literature and analyses conducted by EPA. In addition, the dams can have a cooling effect or a warming effect on the rivers, depending on the season and size of the reservoir. The EPA is committed to working with state, tribal and local partners to address a range of needs related to water quality in the Columbia basin.

Comment LL15

Commenter Port of Clarkston

Comment

The Port of Clarkston requests that EPA more deeply consider the complex problem it seeks to address in its Total Maximum Daily Load for Temperature in the Columbia and Lower Snake Rivers and provide, at a minimum, a revised Draft TMDL which addresses the concerns mentioned in these comments. Given the signaling by the states of Washington and Oregon, there is every reason to think that the TMDL will be utilized to determine the respective approach of these two· states towards hydroelectric facilities on the mainstem Columbia and lower Snake rivers.

If revisions are not made, the TMDL, as written, needlessly threatens the vitality of the Federal Columbia River Power System ("FCRPS") and the multiple purposes for the system as established by the United States Congress. This would contribute higher carbon load, thus increasing ambient temperatures and global climate change.

Per the Columbia River System Operations Draft Environmental Impact Statement, policies surrounding the lower Snake River dams can mean the difference of region-wide blackouts, the failure to be able to meet the region's clean energy goals, and billions of dollars of extra costs forced on Northwest families.

Response

See response to Comment A40.

Comment LL16

Commenter Cowlitz Indian Tribe

Comment

One step is to increase monitoring throughout the basin, continuing to understand factors and improve the modeling effort. In particular, we recommend monitors downstream of the major lower Columbia River point sources at Portland, Vancouver, Kalama, Longview, and Wauna, to characterize their impacts on the lower Columbia River. We encourage EPA and other federal agencies to consult with Tribes and other entities to place additional monitors to help us fully characterize the problem and being evaluating new activities that may assist the recovery.

Response

Implementation of this TMDL, including any decisions regarding ongoing or increased monitoring, depends on development of implementation plans by Washington and Oregon, as well as river temperature reduction efforts by other federal agencies. See response to **Error! Reference source not found.**.

Comment LL17

Commenter Columbia River Inter-Tribal Fish Commission

Comment

The TMDL needs Federal Agency commitment to reduce water temperatures at dams. EPA's use of this "human use allowance" is not legally appropriate but accepting that EPA has used it to set temperature targets in this TMDL, CRITFC has concerns about the subsequent allocation of the allowance. EPA has determined that heat is contributed by impounding water behind dams as a nonpoint source of pollution and then allocates 0.1℃ of the total 0.3℃ human use allowance to impacts from dam impoundments. The TMDL leaves how this allowance will be met to implementation programs designed by the states that may not have the authority to compel changes to federal dam operations. The TMDL suggests that the Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) will identify water temperature improvement projects for the Columbia River and may develop control measures that could lower water temperatures. However, CRITFC's review of the draft EIS does not find a pathway to substantive temperature reductions in the preferred alternative.

EPA itself lacks authority to implement nonpoint source controls or assure reductions in nonpoint source pollution but provides a commitment to coordinate federal agency efforts through the Federal Caucus. Previously, the promise of Federal Caucus coordination and intervention has not resulted in any actions that reduce temperature exceedances in the ten years since a 2008 Federal Caucus Memorandum of Understanding naming water temperature reductions as a priority focus area was signed. More substantive actions are needed. The TMDL purports that "federal dam operation plans provide adequate reasonable assurance for the temperature waste load and load allocations in this TMDL." Without a more significant commitment to redefine federal dam operation plans these assurances appear to be neither reasonable nor adequate. The Federal Caucus needs to play a stronger role in coordinating federal responsibility to support the state implementation plans.

Response

See responses to Comment N1 and Comment JJ10.

EPA acknowledges that one agency alone cannot address all of the connected issues, and we are committed to working with federal, tribal, and state partners to reduce temperatures in the Columbia and Snake rivers. During the May 2021 Columbia River Federal Caucus Meeting, EPA began discussions with federal agencies to identify temperature reduction actions in the Columbia River to assist with state implementation of the TMDL.

Comment LL18

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The TMDL should recognize that, while tributary restoration may prove beneficial in terms of eventual water temperature reductions, such results may not be evident for a long period of time, and criteria may continue to remain unmet to the detriment of salmon populations during that period.

Response

The purpose of a TMDL is to establish load and wasteload allocations to attain and maintain applicable water quality standards. Implementation plans developed by the state, in cooperation with stakeholders and public, will determine the likely actions, milestones, and timeframes needed to attain the TMDL allocations. It is true for the majority of TMDLs that there is a delay between the establishment of the TMDL and when water quality improvements from implementation activities begin to be observed.

Comment LL19

Commenter PNGC Power

Comment

If these federal hydroelectric generating facilities become subject to temperature limitations as proposed in EPA's TMDL through the incorporation of the load allocations into the NPDES permits, the Corps would likely be required to make costly changes to the operations of these projects.

Response

See response to Comment A16.

Comment LL20

Commenter Confederated Tribes of the Umatilla Indian Reservation

Comment

The TMDL should more fully consider potential options for cold-water releases and augmentation.

Response

The EPA finalized the Columbia River Cold Water Refuges Plan in January 2021, and the Plan includes water temperature reduction and management measures for states to use when implementing the TMDL. For more information on EPA's recommendations for maintaining cold water refuges in the Columbia basin, see the EPA Columbia River Cold Water Refuges Plan, found at https://www.epa.gov/sites/production/files/2021-01/documents/columbia-river-cwr-plan-final-2021.pdf

Comment LL21

Commenter Discovery Clean Water Alliance and City of Vancouver, WA

Comment

Please provide a statement of support for the use of water quality trading consistent with EPA guidance to comply with the TMDL and establish geographical boundaries where the trading would be allowed, consistent with the TMDL, or establish the procedures for defining geographic trading areas.

Trading areas are typically defined based upon areas of consistent temperature criteria and location in relation to the point of maximum impact within a river reach. Washington and Oregon have water quality trading guidance consistent with EPA guidance and trading may be a key means for ensuring compliance with the TMDL. The TMDL does not specify means for point source dischargers to comply with the WLAs; however, trading programs will require the definition of geographic trading areas within which trading could occur between contributing sources.

Response

See response to **Error! Reference source not found.**.

Comment LL22

Commenter Washington Department of Ecology

Comment

We are also disappointed that this TMDL identifies Idaho and Canada as sources of temperature to the Columbia and Snake Rivers without any guidance on how to address them. EPA and the federal government have a key continuing role to play in reducing temperature pollution from the operation of federal dams, Idaho, and climate change. We struggle to understand how the TMDL provides reasonable assurance that water quality standards will be met when multiple temperature sources are identified with no identified actions to address them. EPA should include more clarity and guidance on how to implement temperature reductions in this TMDL and explicitly explain how they will continue their role in helping Washington meet our temperature water quality standards. Doing so will advance the very important work of implementing the TMDL and ensuring that we effectively address temperature pollution in the Columbia and Lower Snake Rivers.

Response

See response to **Error! Reference source not found.**. Temperature loads entering the TMDL study area from Idaho and Canada have not been assigned allocations as part of this TMDL. If waterbodies upstream of the TMDL geographic scope are listed as impaired, TMDLs are required to be developed by the state for those waterbodies, according to applicable state and tribal water quality standards.

Comment LL23

Commenter Washington Department of Ecology

Comment

The Lower Snake River dams provide a certain challenge for temperature reductions. Again, this TMDL fails to identify specific actions that can address temperature pollution from these dams. The identification of specific actions would be helpful as we plan to implement this TMDL and determine what temperature reductions dams in the Snake River can achieve in an established timeline. Again, there needs to be reasonable assurances that all dams will achieve the assigned LA.

Response

See responses to Comment JJ4 and **Error! Reference source not found.**.

Comment LL24

Commenter Idaho Department of Environmental Quality

Comment

After reviewing the TMDL, it is apparent that the Columbia and Lower Snake River temperature TMDL could have significant ramifications for waterbodies upstream of the TMDL's geographic extent on the Snake River. IDEQ reads this temperature TMDL as implying a potential for temperature reductions in upstream waters and requests EPA provide clarification on the vision for accomplishing this. Given the complexity of the Snake River's hydrologic system, variable land uses, high priority and interstate waters, IDEQ believes EPA should form and lead a working group to include IDEQ and others to address upstream temperature reductions that may be necessary to reasonably assure the Columbia and Lower Snake River Temperature TMDL meets its objectives. Idaho is generally concerned with implications for how this TMDL may affect regulatory decisions for stakeholders in Idaho. We request that EPA provide language to confirm that this TMDL does not establish load capacity, load allocations, or wasteload allocations outside of the geographic extent of the Columbia River and Lower Snake River Temperature TMDL. Furthermore, EPA should add additional language to clarify that Columbia River and Lower Snake River Temperature TMDL does not provide legal authority to alter water rights or mandate releases from manmade impoundments.

Response

The geographic scope of TMDL is clearly laid out in Section 1. If waterbodies upstream of the TMDL geographic scope are listed as impaired, TMDLs are required to be developed for those waterbodies according to applicable water quality standards. In addition, the State of Oregon and EPA will be working on Snake River/Hells Canyon Temp TMDL through 2026 and will seek to involve the State of Idaho in that effort.

Comment LL25

Commenter Northwest Hydroelectric Association

Comment

NWHA agrees with EPA that Oregon and Washington hold ultimate responsibility for implementing the TMDL. Yet EPA should still remain fully cognizant of limitations and flexibilities at the implementation stage, and it should develop final allocations with those considerations in mind. A TMDL must be "established at a level necessary to implement the applicable water quality standards[.]" It must also "established at [a] level necessary to attain and maintain the applicable" water quality standards. If final allocations require unrealistic or infeasible reductions in temperature impacts, they will not be able to "implement" the needed water quality improvements. Nor will they be able to "attain and maintain" the standards. They will instead be the sort of unenforceable allocations criticized by the Ninth Circuit.

Constraints on implementation are particularly important for any allocations to hydropower facilities. For example, at any dam, the Washington Department of Ecology must first focus on "reasonable and feasible improvements[,]" and for federally licensed facilities—essentially all projects not operated by the Corps—the Washington Department of Ecology "may only require a person to mitigate or remedy a water quality violation or problem to the extent there is substantial evidence such person has caused such violation or problem." If an allocation to dams effectively require reductions beyond the exceedances attributable to them, it might be largely unenforceable.

EPA should also develop allocations with an eye towards flexible, efficient implementation for hydropower facilities. Federal regulations and guidance have long considered Best Management Practices (BMPs), rather than direct limits on temperature impacts, as the default mechanism for implementing load allocations for non-point sources. In fact, EPA has traditionally urged improvements at non-point sources first through voluntary or incentive-based programs, and NWHA applauds EPA's decision to continue doing so here.

Finally, if a TMDL cannot provide a feasible path forward to reasonable compliance with numeric criteria, NWHA agrees with EPA's suggestion that a use attainability analysis or other reconsideration of the temperature water quality standards might be necessary. Reconsideration of those numeric criteria might be particularly appropriate where, as here, aquatic uses can persist despite technical exceedances.

Response

Regarding TMDL implementation, see **Error! Reference source not found.**. Regarding reconsideration of water quality standards, see response to Comment E1.

Comment LL26

Commenter Oregon Department of Fish and Wildlife

Comment

As ODFW understands the process, part of the TMDL includes the development of an implementation plan when developed pollutant criteria are not being met. On page 72, the EPA suggests that this task should fall to the affected states " ... to work within their authorities to implement activities to reduce nonpoint source heat loading." While some measures could potentially be implemented at the state level, it is unclear to ODFW how uncoordinated, state-developed responses could address one of the main contributors to nonpoint source pollution causing lack of compliance - thermal loads in large reservoirs managed by the US Army Corps of Engineers and Bureau of Reclamation. Furthermore, addressing another major contributor - climate change - would be better addressed in a regional, coordinated fashion. Given that multiple jurisdictions are involved and would require coordination to effectively reduce nonpoint source heat loading, ODFW requests clarification from EPA regarding their suggestion that EPA cannot assist in the development of an implementation plan.

Response

Regarding the development of an implementation plan, see Section 7.0 of the TMDL and response to **Error! Reference source not found.**. EPA is committed to supporting states, tribes, and other partners in developing implementation plans and implementing the TMDL.

Comment LL27

Commenter Oregon Association of Clean Water Agencies

Comment

Reserve Allocation

The TMDL estimates that the reserve load is 4.4X10 e9 kcal/day, which is similar to the wasteload allocation of a single large discharge in the TMDL area. Since there is limited reserve load available for NPDES point sources, the TMDL should include discussion of other compliance tools. We recommend that the TMDL include a discussion of the actions that the point source can take to offset thermal loads in excess of the TMDL-specified wasteload allocation. For example, a point source may be able to implement a water quality trading program where they conduct riparian planting to generate thermal credits to offset thermal loads from the treatment facility. Providing a framework for utilizing other compliance tools besides limited reserves would enable point sources to fully consider the range of alternatives such as those that provide broader ecological benefits than technology-based solutions.

Response

Regarding the establishment of a water quality trading program, see response to **Error! Reference source not found.**. Regarding implementation of the TMDL see response to **Error! Reference source not found.**.

Comment LL28

Commenter Oregon Department of Environmental Quality

Comment

There is evidence that dam operations and processes during certain times of the year are a thermal barrier to the upstream migration of adult salmonids, resulting in adverse effects on beneficial uses. This issue should be addressed in the TMDL and addressed during development of the Water Quality Management Plans for implementing the TMDL in Idaho, Oregon, and Washington.

Response

See response to **Error! Reference source not found.**.

Comment LL29

Commenter Orca Conservancy

Comment

There is a growing movement of bipartisan support to ensure that salmon from the Columbia River Basin, and the SRKWs, do not go extinct, and in fact, that we recover these populations with a goal of more nearly reaching historical levels. These two quotes serve as prime examples of this support: "Salmon need one thing – they need a river." Idaho Representative Mike Simpson. "The problems faced by orcas and salmon are human-caused, and we as Washingtonians have a duty to protect these species. The impact of letting these two species disappear would be felt for generations." Governor Jay Inslee. Therefore, the TMDL must not only come up with a plan for cooling the rivers to meet current needs but must also address the challenges of a warming planet in order to secure the future for these related, endangered species.

Response

See response to **Error! Reference source not found.**.**Error! Reference source not found.**

Comment LL30

Commenter Port of Clarkston and Port of Whitman County

Comment

It could be suggested that more cold water could be released from Dworshak Reservoir. However, Dworshak National Fish Hatchery pumps the majority of its rearing water from the Northfork below the dam. Installing a large enough pipeline from the reservoir with temperature control would be very expensive. Changing the rearing regime would be more problematic than it has been by changes thus far. The growth of steelhead and Chinook reared at DNFH is governed by water temperature. Further cooling the water pumped into the hatchery could force 1-year rearing to smolt size to 2-year rearing, reducing the mitigation capacity of the hatchery.

So, the question remains, how do you cool the lower Snake River to meet the 20° C standard? The only way that seems feasible to me would be to install temperature control on existing storage reservoirs above Hells Canyon. Given the vast area utilizing the stored water in southern Idaho and eastern Oregon and the thermal stratification of Brownlee Reservoir, this does not seem very promising. Another option would be to construct more storage reservoirs for the purpose of providing cold water. A large storage reservoir on the Salmon River, ID, could contribute cold water like Dworshak does now, but that concept would be politically unfavorable. While I was working at the Corps, reconnaissance level studies were initiated on more storage reservoirs in the Clearwater Basin in ID, and in OR on the Grande Ronde River and Catherine Creek. A More extensive study was carried out on the Weiser River, ID. Galloway Dam was studied as a method of providing up to 700,000 acre-feet of supplementation to offset or add to the 427,000 acre-feet being supplied by the Bureau of Reclamation reservoirs under the current Water Budget. At over 300-feet high and as a direct tributary to Brownlee Reservoir, Galloway could be equipped with temperature control outlets and contribute to the cooling of

Brownlee. Adding temperature control at Brownlee Dam could then contribute cooler water through Hells Canyon.

Response

EPA encourages the commenter to present these ideas for implementation activities to the States of Washington and Oregon during development of their respective TMDL implementation plans. While EPA issued this federal TMDL on behalf of the states, the states have the lead for implementing the TMDL.

Comment LL31

Commenter Port of Whitman County

Comment

So, the question remains, how do you cool the lower Snake River to meet the 20° C standard? The only way that seems feasible to me would be to install temperature control on existing storage reservoirs above Hells Canyon. Given the vast area utilizing the stored water in southern Idaho and eastern Oregon and the thermal stratification of Brownlee Reservoir, this does not seem very promising. Another option would be to construct more storage reservoirs for the purpose of providing cold water. A large storage reservoir on the Salmon River, ID, could contribute cold water like Dworshak does now, but that concept would be politically unfavorable. While I was working at the Corps, reconnaissance level studies were initiated on more storage reservoirs in the Clearwater Basin in ID, and in OR on the Grande Ronde River and Catherine Creek. A More extensive study was carried out on the Weiser River, ID. Galloway Dam was studied as a method of providing up to 700,000 acre-feet of supplementation to offset or add to the 427,000 acre-feet being supplied by the Bureau of Reclamation reservoirs under the current Water Budget. At over 300-feet high and as a direct tributary to Brownlee Reservoir, Galloway could be equipped with temperature control outlets and contribute to the cooling of Brownlee. Adding temperature control at Brownlee Dam could then contribute cooler water through Hells Canyon.

Response

See response to **Error! Reference source not found.**.

Comment LL32

Commenter U.S. Army Corps of Engineers

Comment

There is limited opportunity to change bulk river water temperatures through operational or structural technologies at run-of-river dams; however, passageways within the structures such as fish bypass channels and fish ladders can be influenced by project operations when the river is thermally stratified. For example, the development of cooling pumps and sprayers in adult fish ladders at Lower Granite and Little Goose dams on the lower Snake River have been constructed and the feasibility of such structures at other dams were analyzed under the CRSO EIS and on-going evaluations continue. Where some level of stratification does occur (e.g. Lower

Granite forebay), passing water through the lowest outlets at the dams (e.g., turbines) may provide some temperature benefits, as opposed to spilling warmer water near the top of the reservoirs over the dams. Tools developed during preparation of the EIS may also provide additional insight on determining feasibility of upstream project operational changes, such as Dworshak Dam temperature operations, as well as exploring other possible modifications or operations.

Response

See response to **Error! Reference source not found.**.

Comment LL33

Commenter Upper Snake River Tribes (USRT) Foundation

Comment

The restoration of salmon and steelhead populations is of utmost importance to the tribes. "The ecological, cultural, and social impacts related to the loss of anadromous fisheries…to members of the [tribes] cannot be understated. From time immemorial the peoples of the Snake River Basin [and Columbia River Basin] used anadromous fish resources for subsistence and in their traditional cultural practices." USRT requests that EPA consider the proposals in this comment letter to better protect current salmon and steelhead populations, and further aid salmon and steelhead recovery throughout the Columbia and Lower Snake Rivers.

Response

See response to **Error! Reference source not found.**.

Comment LL34

Commenter Washington Association of Sewer and Water Districts

Comment

Our members support establishing a robust water quality trading program. This TMDL seems ideal for a water quality trading program as Washington and Oregon currently have guidance regarding trading and could begin implementation as part of a compliance strategy that could lead to better environmental outcomes. It would be helpful if EPA would establish this in the TMDL.

Response

See response to **Error! Reference source not found.**.

Comment LL35

Commenter Western Division of the American Fisheries Society

Comment

A total maximum daily load (TMDL) is expected to set load reductions of that pollutant that are needed to limit its pollution sources through wasteload allocations from point sources and load allocations from diffuse sources. The TMDL does this in a very cursory manner. Instead, it leaves allocations up to the States, which were unable to establish temperature TMDLs for the Columbia and Lower Snake Rivers in the first place—let alone waste loads. To sustain salmon and steelhead, the EPA must play a much greater role with the FCRPS because three States and British Columbia have failed to manage their thermal loadings.

Response

Regarding the development of an implementation plan, see Section 7.0 of the TMDL and response to **Error! Reference source not found.**. EPA is committed to supporting states, tribes, and other partners in developing implementation plans and implementing the TMDL.

Comment LL36

Commenter Western Division of the American Fisheries Society

Comment

EPA (2002) showed using field data in Lake Roosevelt that "the reservoir does stratify under certain circumstances and that downstream temperatures can be affected significantly by withdrawing water from various levels of the reservoir." A different result was produced by BOR (2018) in which it claimed that despite the reservoir being deep and a "storage reservoir," it behaved more like a run-of-river reservoir and didn't produce reliable stratification. However, the BOR report notes that at times data at and below 240 feet from the forebay surface might not be available and there may be questions about the reliability of the data. This analysis also was based on only one USGS sensor. Consequently, it seems that there remain significant questions about an ability to use deep-water releases to cool the Columbia River downstream in summer.

Response

Any ideas for implementation activities presented in the TMDL are intended to demonstrate the wide range of partners and potential activities available for evaluation by the states. See also responses to **Error! Reference source not found.** and **Error! Reference source not found.**.

Comment LL37

Commenter Western Division of the American Fisheries Society

Comment

Why does the TMDL not outline a plan for collecting much-needed temperature data moving forward? The TMDL relies heavily on modeled as opposed to in situ temperatures throughout both rivers, and it is unclear how representative the temperature data used in the models is given that they are associated with dams in well-mixed zones. The consequences of this are unknown. A clear temperature data collection plan is needed. Both could be outlined in the TMDL.

Response

See responses to **Error! Reference source not found.** and **Error! Reference source not found.**.

Comment LL38

Commenter Western Division of the American Fisheries Society

Comment

Why does the TMDL not suggest general guidance on actions, perhaps in a separate section, for temperature reduction in the Columbia and Lower Snake rivers and their upstream tributaries? What might these options be? Appendix F to the TMDL states that it is unlikely that tributary restoration will occur to the extent that temperature reductions will be significant. Why? It also states that additional rehabilitation and mitigation options will be required. There are, in fact, science-based temperature reducing practices such as: limit water withdrawals, implement irrigation efficiencies (e.g., reduce use of center-pivot systems that increase evaporation), and use deep-water returns that cool water as opposed to open return ditches that flow directly into receiving waters; use deep-water (versus nearshore) returns for point sources to reduce thermal plumes injurious to migrating fish; reduce upstream heat sources (British Columbia and Idaho); require tertiary treatment of all point sources, including stormwater, to reduce the non-thermal stressors to thermally stressed salmon and steelhead (Yeakley et al. 2014); revegetate tributary riparian canopies to reduce their temperatures by 0.5ºC (Gregory et al. 1991; FEMAT 1993; McAllister 2008; Fuller et al. 2018); and address non-mixed stressful or lethal temperatures at or near fish ladders, dams, and other structures. Actions could also include developing hypolimnetic release capabilities during critical migration periods for storage reservoirs (Brownlee, Dworshak, Roosevelt) as has been done for Upper Willamette River storage reservoirs. The lag times between recognizing the thermally-caused loss of salmon populations, analyzing the use of these reservoirs for thermal maintenance, building a physical structure, implementing new flow releases, and measuring population recovery are so prolonged that this TMDL should already be laying out these details.

Response

See responses to **Error! Reference source not found.** and **Error! Reference source not found.**.

Comment LL39

Commenter Public Utility District No. 1 of Chelan County

Comment

A TMDL is not self-executing, and it must be implemented through later regulatory actions. 28 Yet the final TMDL will still play an important role in guiding implementation by Washington and Oregon agencies. The Initial TMDL, for instance, rightly acknowledges that Best Management Practices ("BMPs") are one of the primary feasible options available for addressing impacts from non-point sources. 29 The Initial TMDL is also correct to promote the use of voluntary or incentive-based measures as efficient and cost-justified means of improving water quality. 30 As noted above, the work of Chelan PUD and its partners in the Habitat Conservation Plans demonstrates that these types of programs can protect aquatic life uses while avoiding unnecessary costs. Thus, it is important that the final TMDL retain the language promoting the use of such implementation measures.

Response

The language on voluntary actions and BMPs has been retained in the TMDL.

Comment LL40

Commenter Northwest River Partners

Comment

It is worthwhile noting that some interest groups have already called for the breaching of the four lower Snake River dams as a result of EPA's CLSRT TMDL report. This call is very alarming and exemplifies the extreme consequences that could result from finalizing a TMDL that does not accurately capture the temperature contribution of the dams and makes the dams responsible for upstream river conditions.

The region's dependence on the lower Snake River dams should not be underestimated. The 2020 Columbia River System Operations Draft Environmental Impact Statement shows that breaching the four lower Snake River dams could:

- More than double the risk of region-wide blackouts
- Add 3 million metric tons of carbon to the atmosphere each year from electricity production
- Cost up to $1 billion a year in additional power costs and raise BPA power costs rates by 50%
- Harm the regional economy in the amount of $740 million a year in lost goods and services sold
- Result in the loss of 4,900 jobs as a result of higher electricity rates
- Reduce our ability to safely add new wind and solar power to the grid
- Cost $458 million in social welfare from the loss of irrigated land and jobs for farm laborers
- Add 79,000 semi-trucks to the road each year
- Provide very minimal benefits for salmonids populations.

In short, the stakes around the CLSRT TMDL's precision are extremely high, given the possibility that the model could be used to justify extreme measures that would be especially burdensome to the region's most vulnerable residents.

Response

TMDLs are pollution budgets to attain state and tribal water quality standards and are required under the Clean Water Act. EPA recognizes the potential social and economic impacts of TMDL implementation. Socio-ecomomic factors can be considered in setting allocations, but the allocations must be designed in a manner that achieves applicable state and tribal water quality standards. EPA stands by its assessment of dam impacts on the temperatures in the mainstem Columbia and lower Snake rivers. Those impacts are estimated by comparing river temperatures with and without the dams using the same border temperatures for both model scenarios.

The TMDL source assessment analysis shows that the cumulative impact of dams and climate change are two major impacts on river temperature. The TMDL allocates an amount of allowable heat impact on the mainstem rivers from the dams, based on the applicable state and tribal water quality standards for temperature.

Comment LL41

Commenter Seattle City Light

Comment

While the publication of the TMDL is very welcome, multiple other regulatory actions affecting hydropower operations and salmonid recovery in the Columbia and Snake River watersheds are at play at present, including the recently released Columbia River Systems Operations (CRSO) Draft Environmental Impact Statement (EIS), EPA-issued National Pollutant Discharge Elimination (NPDES) permits for the federal hydropower facilities that constitute the CRSO, and draft section 401 water quality certifications for these same NPDES permits recently issued by the Washington State Department of Ecology. The overlapping implications for compliance by operators attempting to meet these requirements is challenging.

Response

EPA recognizes the complexity and numerous uses of and actions affecting the Columbia and Lower Snake Rivers. As stated in the TMDL's Reasonable Assurance section, EPA expects the states to work within their authorities to implement activities to reduce nonpoint source heat loading, in coordination with federal dam operators and other stakeholders.

Comment LL42

Commenter Individual commenters

Comment

I'm writing in support of a robust, multi-faceted, long-term plan to maintain lower average temperatures in the system. I want to see a plan that the public can give input on, a plan that includes:

- Investment in and collaboration with state Fish and Wildlife agencies, nonprofit restoration agencies and Federal agencies to restore shaded riparian areas in major tributaries, which are a point cooling source for the system.
- Proactive collaboration with Idaho regulators and policymakers to implement a TMDL for the Idahoan section of the Lower Snake River.
- Implementation of additional TMDLs for all 12 Cold Water Refuge (CWR) tributaries which EPA identified as significantly able to provide cooling point sources. This will ensure the long-term viability of these CWRs to ameliorate nonpoint heat sources.

Response

See response to **Error! Reference source not found.**.

Comment LL43

Commenter Columbia River Inter-Tribal Fish Commission

Comment

EPA should consider alternative options for cold water releases. EPA field data from 2002 shows that in Lake Roosevelt "the reservoir stratifies under certain circumstances and that downstream temperatures can be affected significantly by withdrawing water from various levels of the reservoir". Despite these findings, a different result was produced by the Bureau of Reclamation in 2018, which claims that despite the reservoir being a deep, storage reservoir it behaved more like a run-of-river reservoir and didn't produce reliable stratification. However, their report notes that at times data at and below 240 feet from the forebay surface was not available and there may be questions about the reliability of the data. This analysis also was based on only one USGS sensor. Consequently, it seems that there remain significant questions about an ability to use deep water releases to cool the Columbia River downstream in summer. Temperature control structure release of deep, cold water from storage reservoirs (Brownlee, Dworshak, Roosevelt) or upriver on the Snake river from Idaho Power's Hells Canyon Complex, could have considerable impact on downstream temperatures and should be part of a comprehensive implementation plan.

Response

EPA agrees that it is important to assess potential cooling of downstream waters using alternative water releases from storage reservoirs. Lake Roosevelt is within the TMDL study area, and a load allocation is established at Grand Coulee Dam tailrace, whereas Dworshak and Brownlee are outside of the study area. Analyses of potential actions to improve temperature conditions are not included in the TMDL, because this activity will occur in TMDL implementation, under the authority of the states of Washington and Oregon. While recognizing that the volume of colder water at depth behind Grand Coulee Dam is limited, EPA encourages the development of a comprehensive analysis of alternatives at Grand Coulee Dam to provide cooler releases in during critical time periods.

Comment LL44

Commenter Individual email received

Comment

TMDLs are designed to identify a path for attainment of water quality standards in an impaired waterbody. As such, I do not believe that the current TMDL meets that goal. Based on EPA's analyses, it does not appear that removal of dams will be sufficient to lower temperature. While this report provides recommendations for states to consider such as continued development, revision, and implementation of tributary TMDLs, funding mechanisms to address traditional nonpoint sources of heat; voluntary conservation programs; a collaborative monitoring and tracking program; and other activities designed to reduce water temperature, I do not think that this TMDL provides sufficient data to understand the likely impacts from these measures in part or combined or provides an understanding of what it will take to achieve success in protecting salmon and other fish from elevated water temperatures. More modeling should be included using combined measures. Within this modeling, it would be most useful to treat the Columbia River system as a whole, including consideration of the river portion in Canada – such considerations would also include reservoir management and perhaps floodplain development. It might also be helpful to incorporate findings from the finalized version of the Columbia River Cold Water Refuges Plan when that becomes available.

Response

Dam removal is outside of the scope of the TMDL. See response to Comment A3. Development of statewide TMDL implementation plans will be led by the States of Washington and Oregon, and EPA is committed to working in partnership with states, tribes and local entities to achieve temperature reductions in the Columbia and lower Snake River system. EPA was able to model the TMDL study area based on 60 years of data collected.

Regarding the final EPA Cold Water Refuge Plan, EPA has incorporated findings from the Plan into this TMDL.

Comment LL45

Commenter Individual email received

Comment

Sec. 1 Introduction, 2nd paragraph, Page 2. With one of the water quality goals to be achieved by the temperature TMDL that is to support fishable water quality in the Lower Snake River, EPA should request the Lower Snake River Dams to be operated and modified in such a way that will result in attainment of the TMDL for temperature in the Lower Snake River.

Response

TMDL implementation is the responsibility of the states. EPA is committed to working in partnership with the states and federal agencies responsible for dam operations and to finding ways to achieve temperature reductions in the Columbia and lower Snake River system. See also response to Comment D26.

Comment LL46

Commenter Individual email received

Comment

I have a possible suggestion to reduce river water temperatures without removing dams. The idea is to shade the slow moving areas of the rivers using satellites that could track the sun during summer months providing continuous shade as needed to reduce water warming. It seems that the satellites would not need to be too large or complicated being their sole purpose would be to provide shade by staying between the sun and the areas of the river system that need the shade. This is just an idea that would need to be studied to determine the effectiveness and cost, but it seems like it may have some merit.

Response

There are a number of temperature reduction measures that will be helpful during TMDL implementation and into the future to reduce water temperatures. Regarding implementation, see Section 7.0 of the TMDL and response to **Error! Reference source not found.**. EPA is committed to supporting states, tribes, and other partners in developing implementation plans and implementing the TMDL.

Comment LL47

Commenter Individual email received

Comment

We need to plant wide strips of riparian buffers of native trees, bushes and grasses on all our waterways to cool and clean the water besides to reduce flooding. We need to buy up private land on the floodplains so rivers can have room to move as climate disruption is bringing increased flooding. I expect the EPA to use the best science and advocate for a healthier planet, not coddle Big Business. Please DO YOUR JOB! Thank you.

Response

Regarding the development of an implementation plan, see Section 7.0 of the TMDL and response to **Error! Reference source not found.**. EPA is committed to supporting states, tribes, and other partners in developing implementation plans and implementing the TMDL.

Comment Category MM. Appendix A (Temperature Water Quality Standards)

EPA did not receive any comments on Appendix A of the TMDL.

Comment Category NN. Appendix B (Data Compilation)

Comment NN1

Commenter Bonneville Power Administration

Comment

Appendix B: Temperature Data Compilation, Quality Assurance and Analysis:

Page 23: Table 17 shows that at Pasco river temperatures are higher as compared to Priest Rapids, but it is an un-impounded reach. Bonneville is concerned with how this reach warming is applied to dam allocations in the TMDL and requests EPA add an explanation, including whether this warming is due to natural conditions or anthropogenic sources.

Response

Both impounded and un-impounded reaches warm in the summer due to the increased air temperature affecting the entire river. The reach between Priest Rapids and the Snake River confluence is independently represented with a separate line item calculation in the dam allocation tables. This incorporates the changes in temperature in this reach while segregating those changes from the McNary Dam impact in the next reach.

Comment NN2

Commenter Bonneville Power Administration

Comment

Appendix B: Temperature Data Compilation, Quality Assurance and Analysis:

Page 42: Top of page incorrectly states Dworshak Dam is at river mile 0.5. Bonneville requests that the river mile be corrected.

Response

EPA has revised the heading to clarify that the Dworshak tailrace monitoring site is at river mile 0.5 of the North Fork Clearwater River.

Comment NN3

Commenter Bonneville Power Administration

Comment

Appendix B: Temperature Data Compilation, Quality Assurance and Analysis:

Page 51: Figure 28 is misleading. The figure shows temperatures at Ice Harbor, Priest Rapids and McNary. It appears to show that Snake River temperatures have a large impact on Lower Columbia temperatures at McNary Dam. However, this may not be the case because the data show that the warming occurs near the Tri-Cities downstream of Priest Rapids Dam. Bonneville requests that EPA include a discussion on warming occurring in the Tri-Cities and its impact on mainstem Columbia River temperatures.

Response

EPA agrees a clarification is warranted and has added a note to the Figure 28 figure description that there is warming of the Columbia River between Priest Rapids Dam and the Snake River confluence not represented in this plot due to data limitations at the Pasco monitoring site.

Comment Category OO. Appendix C (Model Development Report)

Comment OO1

Commenter Columbia Riverkeeper

Comment

Sources of uncertainty for this model include:

a. Topographic and riparian shade assumed negligible

b. Sediment heat exchange assumed negligible

c. Groundwater and hyporheic flow and heat exchange assumed negligible. This neglect of this term could present problems for the no-dams scenario, since actual conditions without dams may be cooler when these terms are included.

d. Reservoir elevation change assumed negligible (except for Grand Coulee)

e. Lake Roosevelt elevation changes and Grand Coulee Dam outflows are decoupled.

f. Flow is routed by simple mass balance and continuity

g. Smaller tributaries that were not included assumed negligible

  i. Irrigation return flows (CBIP wasteways)

  ii. Sanpoil, White Salmon, Little White Salmon, and Wind Rivers

  iii. Willamette River tributaries downstream of the gage (which is quite a ways upstream)

h. River gradient is high enough to assume no attenuation and simple travel time calculation

i. Estimated temperatures for the Hood, Sandy, and Kalama Rivers were based on the Deschutes River. This appears to be a poor choice, since the Deschutes is a much different system from the other three.

j. Meteorological stations are widely dispersed, and in two cases (Spokane and Yakima) far from the river.

  i. "In addition, the meteorological data were similar between most of the selected stations, indicating that the number and distribution of stations provided adequate spatial resolution of meteorological conditions throughout the model domain area." No explanation of what "similar" means and how it was tested.

  ii. A comparison of the met station used to the more widely dispersed AgriMet stations could help assess the variability introduced from the stations selected.

k. Calibration to heat flux transfer coefficients Ev runs the risk of curve-fitting. Approach used was reasonable, but a model verification run would help to assess the impact of Ev values.

l. Variability of dam operations alter the mass balance of the flow regime. This is related to the run-of-the river assumption, since changes in dam operations implies that the outflows of the reservoir are being manipulated and reservoir elevations change.

These sources of uncertainty should be discussed in Section 4.4 of the TMDL, and also in Appendix D as part of an evaluation of uncertainty of the scenarios.

Response

All models are simplified mathematical representations of a system. The model has been extensively peer-reviewed, and model performance, as well as assumptions, characteristics, and uncertainties in model development, are described at length in the RBM10 model documentation report (Appendix C). While the model does not represent every feature of the system, it does include all of the major features that influence the temperature of these rivers, and the model evaluations documented in Appendix C demonstrate that it is an accurate and useful analytical tool.

Comment OO2

Commenter Columbia Riverkeeper

Comment

Section 3.0, Calibration

a. The temperature calibration metrics are not unusual for temperature modeling, and especially for a model of a system this large.

b. The model performance was less accurate for the Snake River in the fall, although still within a reasonable range. This should be investigated.

c. Underprediction of flows raises questions. It could reflect the absence of irrigation return flows and groundwater inflows. The flow balance from RMJOC-II should be compared to the model flows to see if there are significant discrepancies.

d. Graphical results look reasonable.

Response

EPA agrees that the model is well-documented for calibration metrics and shows reasonable graphical results. EPA has determined the flow balance is reasonably represented in the model and errors are minor.

Comment OO3

Commenter Columbia Riverkeeper

Comment

Section 4.0 – alternative upstream boundaries

It’s reassuring that moving the boundary downstream improves it a little but not a lot. Whenever the model domain is made shorter, the results are likely to improve regardless.

Response

Evaluating model performance using different upstream boundaries was one of many checks on model performance and factors influencing model accuracy.

Comment OO4

Commenter Columbia Riverkeeper

Comment

Section 5.0 Sensitivity Analyses

a. The number of parameters analyzed was fairly limited. The sensitivity to the evaporation coefficient adds to concerns about the use of this parameter to calibrate. This reinforces the need for a confirmation scenario.

b. An interesting pattern is that increased temperature and increase evaporation coefficient offset each other. So, if local air temperatures are incorrect (difference between met station and river location) the evaporation coefficient would be offsetting that error. So, the model could be trading incorrect temperatures with incorrect wind. Again, a possibility of curve-fitting here.

c. The sensitivity of river temperatures to upstream temperatures is significant. This points to the question raised in the main TMDL about the Snake River TMDL in Idaho and Oregon. It would be interesting to plug in a scenario with a successful TMDL upstream. Of course, the upstream TMDL is doing "offsets" – cooling tributaries to offset reservoir temperatures. I wonder what affect that could have on the Snake in Washington?

i. Likewise, Lake Roosevelt stratifies a bit. The model suggests the tailrace represents average temperatures in the reservoir. Or does it? Maybe the tailrace represents surface water temperatures. With a one-dimensional model, there's no way of telling. Perhaps cool water from deeper in the lake could be selectively withdrawn to cool the river below Grand Coulee? If they have vertical temperature profiles, perhaps the "version B" model could be run with relatively cool hypolimnetic temperatures.

Response

EPA recognizes these points as previously identified issues. The sensitivity analysis provides insight into influential factors in the model simulations.

Comment OO5

Commenter Columbia Riverkeeper

Comment

The lack of a confirmation run is concerning. The input data set should have been split and the model calibrated with one set, and then rerun with the second data set without changing calibration. This would provide more information about model quality and uncertainty introduced from the framework and input variables. In particular, it would assess whether calibrating to the evaporation coefficient constituted "curve fitting" (artificially achieving a better fit to observe data by a parameter with no physical meaning), or if it represented an estimate of legitimate local conditions that weren't measured. This is important since the no-dam scenarios would depend on the appropriateness of the evaporation coefficient, and the potential accuracy of extrapolating to unmeasurable conditions is unknown.

Response

EPA does not believe that splitting the calibration process into two steps, as suggested, would provide a benefit to the quality of the model. The RBM10 model has been thoroughly tested and calibrated against a long-term record of data that captures a wide range of variation in conditions.

Comment OO6

Commenter Bonneville Power Administration

Comment

Additionally, Appendix C of the TMDL provides plots of simulated and observed flows but limited statistical comparisons. While overall model data agreement for flow appears to be good, the figures show the model generally under predicts low flows and over predicts high flows. The Appendix states that “in general, the model captures the trends and magnitudes of flows with high correlation coefficients typically above 0.9 during most periods excepting the months of September and October when the correlation coefficient is 0.4.” A correlation coefficient of 0.4 for two of the critical months is inadequate flow calibration and causes Bonneville concern that the model is less reliable for these months. The issues with the flow calibration may contribute to the model also tending to over predict high temperatures and under predict low temperatures. Bonneville is concerned that over prediction of the high temperatures under current conditions may lead to overestimation of temperature impact from the ten federal dams.

Response

The RBM10 model predicts temperatures with minimal bias and does not show a tendency to over-predict high temperatures under current conditions. Similarly, there is no evidence indicating a bias in the RBM10 model estimates of dam impacts on mainstem river temperatures.

EPA has evaluated the correlation coefficients and other aspects of the flow simulation and finds reasonable agreement between measured and simulated flow. Similar to the temperature model evaluation, the quality of the underlying flow model should be evaluated using quantitative error statistics (e.g., root mean square error, correlation coefficients) and qualitative comparisons (e.g., calibration plots). While the correlation coefficient is lower in the September/October time frame, the overall calibration viewed in the plots shows reasonable agreement between model predictions and measurements. A more detailed review indicates that a relatively small number of large flow discrepancies is having a disproportionate impact on the correlation coefficient value. Because the correlation coefficient is influenced significantly by a relatively small number of simulation days with abnormal errors, it can be misleading to quantify/qualify the virtues of the overall model performance using the correlation coefficient alone. In addition to the reasonable agreement in the calibration plots, the value of another error statistic in September/October (Table 3-13 in Appendix C), the root mean square error (RMSE) for the same model data and measurements is fairly low (24 kcfs) and is consistent with values at other times of the year.

Comment OO7

Commenter Bonneville Power Administration

Comment

Appendix C: RBM10 Model Development Report:

Page 10: In Section 2.3.1 Grand Coulee Flow Representation, Bonneville requests that EPA include a discussion on how water was routed at Grand Coulee and other reaches for the un-impounded scenario to understand how allocations were calculated.

Response

The flow representation for both current and un-impounded (free-flowing) conditions at Grand Coulee is described in the Scenario Report (Appendix D). As stated in the report: “In the Current Conditions scenario, flow operations at Grand Coulee are simulated in RBM10 by prescribing observed tailrace flows immediately below the dam. In the Free-Flowing scenario, flow operations at Grand Coulee are removed from the model so flows freely move from upstream to downstream (**Error! Reference source not found.**). Flows increase or decrease depending on the presence of tributaries or withdrawals.”

Comment OO8

Commenter Bonneville Power Administration

Comment

Appendix C: RBM10 Model Development Report:

Page 21: It states, “The evaporative heat flux is generally calculated as a function of the wind speed and the difference between the saturated vapor pressure at the water temperature and the vapor pressure in the overlying air.” Bonneville recommends changing “water temperature” to “water surface.”

Response

As the language in the Appendix is accurate, and the Model Development Report (Appendix C) has undergone two external peer reviews prior to the establishment of the TMDL, EPA is retaining Appendix C language without revision at this time.

Comment OO9

Commenter Bonneville Power Administration

Comment

Appendix C: RBM10 Model Development Report:

Page 68: It states, “The Grand Coulee Dam is subject to flood control operations, which result in variable flow discharges through the dam.” Bonneville requests that EPA replace the sentence so that it reads “The Grand Coulee Dam is subject to flood control operations, which is one of many operations, that results in variable flow discharges at Grand Coulee Dam.”

Response

See response to Comment OO8.

Comment OO10

Commenter Bonneville Power Administration

Comment

Appendix C: RBM10 Model Development Report:

Page A-8: It states, “Temperatures at the Columbia River upstream boundary generally varied between 3°C and 19°C.” However, examining the figures it shows that temperatures were at or over 20°C during some times. Bonneville requests that the text be revised to reflect the actual temperature range at the upstream boundary.

Response

See response to Comment OO8.

Comment Category PP. Appendix D (Model Scenario Report)

Comment PP1

Commenter Columbia Riverkeeper

Comment

The analysis in the TMDL, especially in Appendix D, shows the major impacts of Lake Roosevelt on downstream temperatures. Yet the analysis of Lake Roosevelt is limited, since it simulates the reservoir in one dimension.

a. The TMDL should include an analysis of the thermal structure of the reservoir.
b. Show how stratified conditions relate the simplifying assumption of lateral and vertical averaging of temperatures in the reservoir.
c. Show the spatial extent of water meeting or not meeting criteria, and availability in time and space of conditions suitable to salmonids.
d. Also evaluate the potential for selective withdrawal to reduce downstream temperatures, such as is done at Dworshak Dam for the Snake River.
e. Consider using the CE-QUAL-W2 model for Lake Roosevelt and the RBM-10 model downstream of Grand Coulee Dam. At least explain why CE-QUAL-W2 wasn’t used for Lake Roosevelt.

Response

Regarding Comments a, b, and c: Because of the large geographic scale of this TMDL, it was not feasible to conduct a detailed analysis of Lake Roosevelt. EPA has determined the impact assessment of Grand Coulee Dam on mainstem Columbia temperatures (the dam forms Lake Roosevelt) is reasonable and appropriate.

Regarding Comment d: Selective withdrawal is appropriately evaluated in the implementation phase. Assessment of this potential action would not affect the core elements of the TMDL (e.g., load allocations).

Implementation of the TMDL is under state authority and EPA plans to support states, tribes, federal agencies and other partners during TMDL implementation.

Regarding Comment e: The RBM10 model provides a reasonably accurate prediction of temperatures at the monitoring location below Grand Coulee. For scenarios, such as the free-flowing scenario, it is good practice to use the same model for the two comparison runs (e.g., with dams, without dams) to better isolate the impact under scrutiny. Otherwise, difference seen in the results are a combination of the scenario difference and differences in the model frameworks (RBM10 and CE-QUAL-W2), which use different equations and numerical solution approaches. Finally, it is important to note that there is no CE-QUAL-W2 model of this portion of the river that represents free-flowing conditions.

Comment PP2

Commenter Columbia Riverkeeper

Comment

Page 8, Section 2.2.3: The discussion on this page has several problems

a. "EPA achieved these goals through the following actions:" The action listed do not make a convincing case that this statement is true.

b. First bullet: aggregating 6 years will lose the variation between years, which is part of "critical conditions".

c. Second bullet: monthly averaging may lose important information on critical periods, such as a heat wave lasting less than a month. In addition, there is no physical or biologic reason to use a calendar month.

Response

This section of the Model Scenario Report states that **"**EPA's goal is to capture central tendencies in the multi-year simulations (e.g., long-term mean conditions) while also capturing seasonal variation and critical conditions. In addition, conservative assumptions are needed to ensure that impacts are not underestimated.**"** The report then lists six assumptions or approaches EPA takes to balance the assessment, while this comment addresses two of the six approaches. EPA has determined that the full set of six assumptions and approaches collectively represent a reasonable set of assumptions and provide context for each individual assumption.

Comment PP3

Commenter Columbia Riverkeeper

Comment

Page 13: "A single-day outlier…" this discussion emphasizes the concern expressed in other comments about the potential influence of the evaporation coefficient on the accuracy of the model when extrapolating outside observed conditions. There is uncertainty about the physical meaning of the evaporation coefficient how it contributes to uncertainty in the scenarios. As noted elsewhere, a confirmation model run is called for.

Response

The outlier noted in the report is the result of known issues with non-linear equations in models and is not a symptom of a significant issue with the model. The evaporation equation used in RBM10 is a well-established approach from the peer-reviewed literature, and its use as part of RBM10 has also been peer-reviewed.

Comment PP4

Commenter Columbia Riverkeeper

Comment

Table 3-1, row WD1: "…without the diversion/return flow." How was return flow modeled? The irrigation return flows were not included as tributaries. See earlier comment about including irrigation return flow in the model.

Response

The "return flow" referred to in Table 3-1 is the return flow from Banks Lake back to the Grand Coulee forebay when pump storage is employed. Return flows downstream are not modeled. The only change in flows in WD1 is setting the positive and negative flows in the feeder canal for the Banks Lake Project to zero. See also response to Comment G2.

Comment PP5

Commenter Columbia Riverkeeper

Comment

Page 33," A multiplier of 1.3 was applied to the Canyon data…": Total annual water volumes should be similar for the with- and without-Dworshak Dam flow inputs. Was that tested? If it was, show that as additional evidence of the reasonableness of that approach.

Response

The assessment period incorporated into the modeling scenarios includes the summer and fall months, so annual water volumes are not relevant to this analysis. The flow factor is used to account for ungauged flow into Dworshak reservoir during the summer/fall assessment period.

Comment PP6

Commenter Columbia Riverkeeper

Comment

Page 34, "The Ahsakha temperatures were looped for each year…": was the possibility considered of finding six years in the Ahsakha temperature record that match the 6 scenario years, in terms of total flow and air temperatures, or in terms of percentile distributions? This could have been a more robust approach.

Response

The approach taken in the modeling effort was to use a multiple-year average of measured daily temperatures for the pre-Dworshak period (1957-1970), because the product of the analysis was an estimate of the multiple-year average impact of Dworshak operations. EPA has determined that the approach taken was reasonable for the Dworshak impact assessment.

Comment PP7

Commenter Columbia Riverkeeper

Comment

Figures 3-27 and 3-28: Yakima, Oregon ???

Response

EPA has corrected this typographical error.

Comment PP8

Commenter Columbia Riverkeeper

Comment

Page 76, Section 3.8.3: This analysis and its description seem weak. The source reference used was from a study in Ontario, which has many differences from the Columbia Basin. No local information was used to compare the analysis results. It's hard to believe there are no studies that provide estimates of summer stormwater volume and water temperatures. Many cities are using models to estimate stormwater runoff. There may also be studies of stormwater where temperatures were taken. This analysis provides no information on the precipitation used for the assessment or how flow volumes were calculated. The results show the impact by reach, but it's not clear where the largest impact occurred. It's also not clear which model was used. The impacts of stormwater on the free-flowing river should be assessed.

Response

The stormwater analysis was a screening calculation analysis to determine whether stormwater is a potential source of heat loading to the mainstem Columbia and lower Snake rivers. If the screening analysis indicated that stormwater is impacting temperatures, additional analysis of the kind suggested in this comment would have been undertaken. However, the screening analysis demonstrated that stormwater is not a significant source of heat loading. The screening analysis did not involve any modeling.

Comment PP9

Commenter Columbia Riverkeeper

Comment

Page 77, Section 3.9: There is no discussion of how outflows were handled, since apparently irrigation return flows were not included in the model. It's not clear if the analysis considers both the effect of flow diversion and return flows of heated water.

Response

See response to Comment G2 and Comment PP4, above.

Comment PP10

Commenter Columbia Riverkeeper

Comment

Page 84, Section 5.0: more discussion of uncertainty should be provided. Which factors likely have the greatest effect? Do the sources of uncertainty add a bias to the analysis of scenarios, and does that bias tend to increase or decrease impacts?

Response

Additional detail on assumptions and uncertainties in the model are provided in the Model Development Report (Appendix C). The sensitivity analysis provides model test results that indicate the most important factors affecting river temperatures. The model bias is very low, as shown in the error statistics.

Comment PP11

Commenter Bonneville Power Administration

Comment

Appendix D: RBM10 Model Scenario Report:

Page 3: Section 2.1 states that "the model update was conducted in two phases in 2017 and 2018." However, Appendix C states that the model updates were conducted over three phases. Bonneville requests that this discrepancy be corrected in both Appendix C and D.

Response

EPA has corrected the Model Scenario Report (Appendix D) to include a description of the third phase of the model development.

Comment PP12

Commenter Bonneville Power Administration

Comment

Appendix D: RBM10 Model Scenario Report:

Page 13: In regards to Figure 2-5, there is a discussion on removing outlying data points; however, there is no such discussion in Appendix C. Bonneville requests that this discussion be included in both Appendix C and D, and that the method be carried out consistently.

Response

The outliers affected only a few simulation days and were therefore not a significant issue in model development and evaluation.

Comment Category QQ. Appendix E (Tributary Assessment Methods and Results)

Comment QQ1

Commenter Bonneville Power Administration

Comment

Additionally, in Appendix E, Page 2, it appears two methodologies were combined in the 2040 and 2080 Condition Analysis – August section. It appears the TMDL climate change analysis is looking at trends over the historical record while projecting those trends into the future, while the NorWest analysis is based on climate models. Bonneville suggests revisiting the methodology of this analysis and reconciling them and providing a rationale for their use in the TMDL.

Response

The future warming estimates in Appendix E are based on the best available estimates for the Columbia River and its tributaries. There is a different information base for the mainstem versus the tributaries; however, measurements and models have been used to project future warming in both the mainstem and tributaries. This information is summarized in Appendix G of the TMDL. For the tributaries, the NorWest model (Isaak et al., 2018) provides the foundational information for future warming estimates.

Comment QQ2

Commenter Bonneville Power Administration

Comment

Appendix E: Tributary Assessment Methods and Results:

Page 2: Use of the words “cool off” is misleading. Tributaries do not “cool off” relative to other rivers, but warm less and slower. Bonneville recommends deleting the language “cool off” because it is inaccurate and confusing and replace it with “warm slower”.

Response

EPA does not find the language misleading. The full text in Appendix E is: "Results of this analysis indicate that, based on flow weighted average conditions, tributaries are generally warmer than the Columbia at their confluence with the Columbia River during the spring/early summer period, and subsequently "cool off" relative to the Columbia River later in the summer period (Table 1, and Figures 1 through 4)." The plots referenced in this part of the Appendix show that tributaries become colder relative to the Columbia River in the late summer and early fall.

Comment QQ3

Commenter Bonneville Power Administration

Comment

Appendix E: Tributary Assessment Methods and Results:

Page 12, Figure 8: The tributary temperatures for the 2040s bar graph indicate some tributaries are warmer than the Columbia River at their confluence than in the 2080s. This seems counter-intuitive. Bonneville recommends adding an explanation for these results.

Response

The change in relative temperature between the Columbia River and a given tributary depends upon multiple factors, and different trend trajectories, as climate change affects water temperatures differently in different types of waterbodies. In order to understand what may happen in the future, the reader would need to examine each tributary statistical model to determine the reasons for differing trends between tributaries, over decadal time frames.

Comment QQ4

Commenter Oregon Department of Environmental Quality

Comment

Appendix E: Tributary Assessment Methods and Results

A note in Table 1 states, "Positive value indicates Tributary Colder than the Mainstem Columbia River at the confluence." It may be more intuitive if positive values indicate that tributary temperatures are warmer than Columbia River temperatures.

Response

EPA has changed the colder/warmer sign convention in Table 1 as suggested in this comment. The change was made to the TMDL Table 3-9 as well.

Comment Category RR. Appendix F (ORD Technical Memorandum on Tributary Restoration)

Comment RR1

Commenter Columbia River Inter-Tribal Fish Commission

Comment

Tributary restoration will be beneficial but will take time. The TMDL assigns 0.1°C of the loading capacity to tributaries. This allocation is equivalent to the cumulative temperature increase caused by existing riparian shade loss in the tributary watersheds. Appendix F of the TMDL reports modeling efforts to identify how much tributary temperatures could be changed by manipulating riparian vegetation shade. The study found that average August stream temperature could be 0.4°C lower if shade is restored across the system. However, the study recognized that it is unlikely that tributary riparian shade restoration will occur to the extent that temperature reductions will be significant. The report advises that additional restoration options together with shade restoration will be required to keep temperatures near their current condition. Tributary restoration to minimize mainstem temperature impairments will take a significant amount of time and should be accelerated to achieve any substantial benefit.

Response

EPA has clarified the tributary allocation discussion in the TMDL to emphasize that the allocations are set to achieve temperatures within 0.5°C of the natural condition of the tributary at its mouth. EPA agrees with the commenter that restoring riparian shade is one potential implementation action to take to improve temperatures in the tributaries. Implementation efforts by other federal and state agencies to analyze tributary temperature impacts and meet the load allocation assigned to the tributaries are subsequent and distinct actions. EPA is committed to supporting TMDL implementation efforts.

Comment Category SS. Appendix G (Climate Change)

Comment SS1

Commenter Bonneville Power Administration

Comment

Lastly, in Appendix G, Bonneville recommends deleting Section 2.4 because the described estimated trends in this section are based on modeled data using the Mantua et al. (2010) and Mohseni et al. (1998) predictions, which are simplistic and are not the best available science in this context, especially considering real time high quality observed data are available. Additionally, Section 3.1 correctly represents RMJOC-II findings, and other regional work using older IPCC-4 data. However, IPCC-4 -based work is essentially obsolete since it is now over 13 years old. Bonneville suggests EPA recalculate the climate change analysis using IPCC-5 data, which is the best available science and readily available.

Response

EPA's climate change assessment is a synthesis of all available information at the time of the analysis. All of the analyses that EPA considered during TMDL development are peer-reviewed studies, and all have strengths, limitations, and uncertainties. EPA does not agree that simple approaches or older analyses should be disqualified from consideration in this kind of synthesis. EPA's estimate of warming to date (1.5°C +/- 0.5°C) is based on the consideration of the full body of information available.

IPCC-4 and IPCC-5 information is related to global carbon emission scenarios and future climate prediction, whereas the TMDL is primarily focused on impacts to date on Columbia and lower Snake river temperatures between 1960 and the present.

Comment SS2

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

Page 1: Original text states, "The Pacific Northwest and the Columbia River have a unique set of responses to climate factors…" However, the document does not identify what the "unique set of responses" are. Bonneville requests EPA identify and include a description in Appendix G of the "unique set of responses" to climate factors in the TMDL area.

Response

The quoted language is stating that there are regional factors that influence climate change over time.

Comment SS3

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

Page 6: Table 2-1 includes sites that are outside of the TMDL study area. Bonneville suggests revising this section to include just the studies which apply to the TMDL study area, and not west side basins which have very different hydrology.

Response

EPA opted to incorporate all Pacific Northwest studies into the synthesis document, recognizing the large variation in climate and hydrology across this region.

Comment SS4

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

4. Page 7: Original text states, "Both rivers are wide, which minimizes the impact of shade on river temperatures, and many large impoundments are present on each river, which result in pooling and flow retention, allowing for enhanced heating due to atmospheric influences." This may be true, but if impoundments are going to be discussed, Bonneville suggests that the impacts of impoundment stratification and reservoir temperature complexity should also be included.

Response

The text is sharing general characteristics of both rivers, and EPA has determined the language is accurate in describing these general characteristics.

Comment SS5

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

Page 7 to end of first paragraph Page 8, including Figure 2-4: Including ENSO, PDO, and sunspot cycles seem irrelevant for the TMDL and it is not clear why they were included. Bonneville suggests deleting these references.

Response

EPA has determined that ENSO (El Niño – Southern Oscillation), PDO (Pacific Decadal Oscillation) and sunspot cycles are relevant to the assessment of the emergence of anthropogenic climate change from other climate-influencing factors.

Comment SS6

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

Page 18: Section 3.2.1 the relative rates of change seem reasonable, but due to issues with calibration of downscaled climate data with local tributaries across the basin Bonneville cautions against using modeled data from the TMDL to compare against absolute temperature criteria. Instead, Bonneville recommends using the NorWeST data which relies upon direct in-river measurements because it has better accuracy for capturing in-river conditions across most of the region.

Response

This section of Appendix G does not reference the use of modeled data from the TMDL. NorWest data is one of several sources of peer-reviewed information considered during EPA's climate change synthesis analysis discussed in the appendix.

Comment SS7

Commenter Bonneville Power Administration

Comment

Appendix G: Climate Change:

Pages 3 and 4: The y-axis in Figures 2-1, 2-2 and 2-3 is too large, resulting in smoothed out annual temperature trends. Bonneville suggests changing the y-axis to +8 to +14C so that the inter-annual variability is more accurately depicted.

Response

EPA has determined that the plots are clear depictions of the trend and variability of water temperatures and is retaining the figures in the TMDL.

Comment SS8

Commenter Chelan, Douglas and Grant PUDs

Comment

On a Warming Environment

We commend EPA for their inclusion of Appendix G on climate change impacts to the Columbia and Snake Rivers. As recognized by the TMDL, the temperature of the Columbia River is largely driven by air temperature, and the air temperature in our region is warming. According to the TMDL, climate change has increased water temperature in the Columbia River by 1.5°C since 1960 and is expected to continue to warm by 0.2 - 0.4°C per decade.

This warming trend is critical in the context of this TMDL, which establishes a total allocation of 0.1 °C of warming to the 15 dams of the Columbia and Snake River hydrosystem. While climate change itself may be related to anthropogenic activity, present scientific evidence suggests that it has and will continue to result in the warming of the Columbia River basin with or without the dams, thus increasing the "free-flowing" temperature of the system. Immediately, this poses a significant compliance challenge going forward because the TMDL does not allow for compliance against an evolving "natural" condition, rather it provides a load allocation as of now.

Response

EPA agrees that climate change poses a significant challenge.

Comment SS9

Commenter Oregon Department of Environmental Quality

Comment

Appendix G, page 11, Table 2-3 is titled, Comparison of baseline and current air and water temperatures (1915-1959; 1997-2006) (based on Mantua et al., 2010). However, the table only contains water temperatures for those time periods and the change per decade, but not the air temperatures. EPA should include the corresponding columns for air temperatures, specifically, air temperatures for 1915-1959, 1997-2006 mean air temperatures and change per decade for air temperature for the locations and months in Table 2-3.

Response

This TMDL is focused on setting the heat “budget” for the Columbia and lower Snake rivers, as required by the Clean Water Act, so that states, tribes, and other partners can implement actions to reduce water temperatures. EPA has provided air temperature information to ODEQ and can provide additional information in the future.

Comment Category TT. Appendix H (Temperature Metric Analysis)

Comment TT1

Commenter Bonneville Power Administration

Comment

Appendix H: Temperature Metric Analysis:

1. Page 4: Figure 4 shows a seasonal trend in the difference between daily maximum and 7-DADM temperature (positive in the early part of the year, negative in the latter part of the year). This does not make sense, as mathematically, the difference between these values must pass through 0 at minimum every 7 days. Bonneville requests replacing this figure with the correct dataset.

Response

See response to Comment L15.

Comment Category UU. Appendix I (TMDL Heat Load Tables)

Comment UU1

Commenter Bonneville Power Administration

Comment

Appendix I: Temperature Heat Loads:

Page 2: Original text states, “Calculated head loads for loading capacity and allocations…” replace the two instances of the word “head” with the word “heat”.

Response

EPA has corrected these two typographical errors.

Comment UU2

Commenter Washington Department of Ecology

Comment

The heat loads estimated in the TMDL for each hydroelectric facility are based on 2011-2016 monthly average flow levels (Appendix I). This approach assumes that there will be little change to flow in the future. In reality, based on recent history of flow management for the Columbia River, addressing temperature issues will likely require an increase in summer and fall period flows. Increasing flow could result in an exceedance in the load allocation. Increasing systemwide (at Grand Coulee) critical period flows may have a much greater effect on the calculated heat load (the magnitude of flow is considerably greater than the 0.3 C maximum temperature increase allowed) and is, therefore, a controlling factor. From this perspective, the incentive to achieving the load allocation could be to reduce system flows, which is counter to positive fisheries enhancement measures. We request that EPA examine the potential impact of different flow level management decisions.

Response

The TMDL focuses on river temperatures rather than heat loads in several areas, and this comment notes some of the issues that arise when only evaluating heat loads. The emphasis on river temperature includes the allocation of an allowable temperature change (0.3°C) to sources, setting of river temperature targets, and the evaluation of temperature changes caused by the dams (rather than heat load changes). Because flow management can reduce heat loading at target sites without changing river temperatures, EPA has determined all proposed implementation actions by dam operators should be evaluated based on their effect on river temperatures rather than head loads passing through the target sites.

Assessment of the impact of alternative flow management on river temperatures is an activity that can be incorporated into the states' TMDL Implementation Plan. EPA is committed to supporting states, federal agencies, tribes and other stakeholders in implementing action to reduce water temperatures.

Point source impacts are directly related to the discharged heat loads, so wasteload allocations expressed as heat loadings are appropriate and necessary. This is noted in section 6.3 of the TMDL.