Memorandum April 13, 2021

To: Dan Brown, USEPA

From: Peter Leinenbach, USEPA

Subject: Review of the draft TFW Policy Committee report "Review of current and proposed riparian management zone prescriptions in meeting westside Washington State anti-degradation temperature standards".

Seven harvest alternatives for Np streams were presented in the draft TFW Policy Committee report. Of these seven, three were presented as having "the best chance of succeeding at meeting the resource and economic objectives" (henceforth referred to as Forwarded Alternatives (FAs)).

It appears that stream temperatures will increase above 0.3*C for the three FAs, however Alternative C appears to be the most potentially protective of stream temperature increases of the three FAs. Specific review comments associated with each of the three FAs are presented below.

It is important to point out that a modification of Alternative D could be sufficiently protective of water quality (i.e., <0.3*C temperature increase), while allow for management within the outer portion of the 100' buffer zone (potentially dramatically changing the economic score) and thus would likely be designated with the highest score. Specifically, this proposed modified Alternative D would designate thinning within the 75'-100' outer zone (up to 50% of basal area), while maintain vegetation within the inner 0' to 75' zone as unharvested. This buffer configuration would protect against excessive temperature increases and have added resilience to potentially subsequent windthrow damage within the inner zone.

Comments on the three Forwarded Alternatives

Alternative C - 100% buffer, 75' feet, both banks

Summary of Comment – The relevant and recent research was used to develop this scenario (Groom et al 2018) indicates that a 75' no-cut buffer zone appears to be a threshold for maintaining a minimum level of protection again stream temperature increases (> 0.3*C).

Detailed comments -

- Reported research associated with Groom et al 2018 indicated a mitigation of stream temperature increases resulted from no-cut buffer width of 75ft (Figure 1). Accordingly, additional harvesting within the 75' no-cut buffer would be expected to result in measurable stream temperature increase (> 0.3*C).
- The upper credible lines associated with the reported Groom et al 2018 research (Figure 1) indicate that stream temperature increases associated with a 75' no-cut buffer **can be much greater** than 0.3*C (i.e., 0.5*C to 0.6*C). In addition, the upper credible lines indicate that a buffer width greater than 95' would be needed to ensure temperature are maintained below 0.3*C for greater than 90% of the time.
- Harvesting "economically valuable" trees within the "outer zone" will be removing the vegetation that is most likely to be providing stream shade within this "outer zone". Specifically, the age (i.e., height) of the tree would be a large determinate of its "economic value", and that

the distance of the shadow cast by a tree is dependent on the height of the tree. That is, taller trees cast longer shadows, and therefore have a greater probability of shading the stream channel when located within the "outer zone".

Alternative E – Site Specific Buffer

Summary of Comment – It is proposed in the draft report that this alternative will result in stream temperature increases greater than 0.3*C, which is problematic. This result is likely due to fact that this alternative only focuses on a portion of the potential daily heat load (i.e., 10:00-14:00), leaving the other 42% of the daily heat load unassessed. In addition, this alternative is problematic because there is uncertainty with stream temperature predictions due to a lack of research on the effects of this alterative, along with the potential unlimited variability of prescribed "site specific" buffer prescriptions associated with this alternative.

Detailed Comments –

- It is not possible to determine if this proposed buffer management will be protective of water temperature increase because it has not been tested/studied.
- This alternative utilizes modeling to design each harvest action and therefore uncertainty/variability associated with the modeling effort needs to be assessed.
- Due to the "site specific" nature for each buffer design, it is not likely possible to determine the adequacy for the various potential buffer treatments.
- The SHADESHED will only account for 58% of the daily heat energy load to the stream, leaving 42% of the heat load unaccounted in the assessment. This is relevant because it was reported that only a 7% stream shade loss is associated with a measurable temperature increase. Accordingly, it is possible that additional heat loading **not** associated with the 10:00 – 14:00 period (i.e., 42%) will result in a cumulative shade loss beyond the 7% shade loss threshold.
- This alternative can result in very narrow buffers (10ft) which are likely to result in dramatic alternative consequence on stream temperature (i.e., increased air temperatures) and other water quality constituents, (i.e., excessive sediment loading), along with potential secondary effects (i.e., blow down).

Alternative F – Aspect-based Buffer

Summary of Comment –Under this management alternative, research (Figure 1) indicates that stream temperature will increase above 0.3*C for north-south orientated streams, and it is likely that many east-west orientated streams will also result in similar problematic temperature increases.

Detailed Comments –

- The 65' buffer associated with the north-south orientated streams will result in measurable temperature increases (> 0.3*C) (i.e., up to approximately 0.7*C reported in Figure 1).
- The 75' south side buffer on east-west orientated stream will be the minimum buffer width needed to protect against stream temperature increases as reported in Groom et al 2018 (i.e., Figure 1). However, the Groom et al research utilized a two-sided buffer condition when estimating temperature response with the Bayesian model. Accordingly, the narrow 25' "north bank" buffer may result stream temperature increases above reported Bayesian modeled levels.