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Subject: Key scientific aspects of the Oregon Department of Forestry Westside Riparian Rule Analysis

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1) **Meeting the Protecting Cold Water Criterion is of critical importance for Oregon's biological resources.** There are at least two fundamental reasons for this. First**, salmon, trout, and stream-dwelling amphibian species evolved in coldwater environments and existing summer temperature in western Oregon are for the greater part already exceed their biological optima.** These species attained their present distribution in cold waters as mountain and continental glaciers and snowfields were receding. Some of these species can persist in warmer waters, but for the most part at greatly reduced productivity that cannot support fisheries and severely reduces their ability to survive natural and human disturbances. **Considering the whole, any warming of summer maximum water temperature substantially harms coldwater species.** Cooling of winter temperatures and cumulative changes in spring temperatures can also disrupt life history and survival of these species, but riparian forest buffers sufficient to protect against summer time warming are for the most part sufficient to also mitigate impact to winter and summer stream temperatures.

Second, temperature standards to limit warming are applied on a per-action basis—in this case, a particular timber cutting unit. If measurable increases were allowed on this basis, the cumulative increase in summer temperature that could arise from multiple actions in the same watershed could produce much greater cumulative impact on stream temperatures. Of course, cumulative temperature increases arising from multiple projects remain a potential problem even with temperature increases at less than the PCW detection level of 0.3 degrees C, but at that level the potential for cumulative temperature effects emerging is greatly reduced. **Unless the State of Oregon is able and willing to adopt some sort of effective regulatory control of logging and other forest management actions at the watershed scale on private timberlands that also accounts for cutting history on adjacent pubic lands, a conservative coldwater protective standard will be necessary.**

2) The reports prepared by DOF give a very informed, substantive, and credible analysis of the likely effects of various proposed streamside logging prescriptions. In

my opinion **the core analysis of effects of tree removal on stream temperature is a state-of-art quantitative effort, well-grounded in field studies, that has never been paralleled.** The relative consistency of results in RipStream analyses across drafts I have seen in recent years is further evidence of the veracity of its findings. In other words, adding more data from more streams does not change the results. The results show, broadly speaking, that only two alternatives reduce violations of the PCW criterion to low levels of likely occurrence: The no cut buffer alternative of 90 feet or greater distance from stream margin, and the Oregon State Forests Management Plan. However, see my comments below regarding the sufficiency of the 90 foot distance.

3) However, it is alarming and objectionable that the documents prepared by DOF summarizing the temperature analysis presume, without evident technical or policy justification, that "average" temperature increases of 0.3 degrees C or less constitute compliance with Oregon's Protecting Cold Waters Criterion. In that case, around half of modeled sites and cases are in fact predicted to warm greater than 0.3 C and therefore violate the stream temperature standard. Biologically effective coldwater protection should logically protect all or at least nearly all affected waters from measureable warming. Although not reflected in the text, analyses and graphs presented by DOF in the memos for Board present well-developed, state-of-art information to ascertain the difference between "average compliance" and something nearer full compliance. Given the distribution of the data evident in those graphs, **"average" compliance means nearly half of affected streams will likely be measurably warmed by logging practices. Certainly other parties regulated by water quality standards in the state of Oregon do not routinely assume that they are in compliance if they meet the standards barely more than half the time.** I think the general public would find this notion outrageous.

The consequences of this magnitude of adverse impact need to be clearly recognized in the analysis, and the basis for using average responses as the measure of effectiveness requires justification. The difference is significant. For example, based on Figure 1 in the document "DETAILED ANALYSIS- PREDICTED TEMPERATURE CHANGE RESULTS" **to attain something nearer 95 percent compliance with PCW would require no-cut buffers of about 110 feet in width, compared to "average" compliance at 90 feet.** From Figure 8, attaining 95 percent compliance with the PCW would require a retained basal area of near 365 square feet per 1000 lineal feet of stream, rather than the average PCW attainment near 275 feet. In my opinion, it does no one good to "shave the numbers" in the text that interprets their significance for policy decisions, especially without a clearly articulated rationale and an explanation of what the consequences are likely to be on the ground. My point is that while the analysis and data graphs are excellent, the text of the report appears inappropriately phrased to blunt, if not distort, the full significance of the scientific information for the regulatory decision.

4) ODF's"DETAILED ANALYSIS" report notes that "the thermal protection offered by increasing buffer widths begins to decline beyond 50-60 feet.' Again, I am concerned some could be mislead by this rather casual characterization of the

relationship graphed in Fig. 1. Yes, the line fitted to the modeled data does begin to gently inflect beyond 60 feet, so that incrementally each additional foot of riparian area width confers somewhat less contribution to total shade. But the most important feature of the analysis in Fig. 1 is that it clearly shows that **as a percentage of total existing shade, the removal or loss of trees in the 100-120 feet from the stream still can measurably reduce shade and increase water temperature, even to the extent that the PCW is violated in many cases.** The text of the report in appropriately minimizes this very important finding.

5) In my opinion, this analysis does include sufficient information to conclude that **prescription alternatives that rely on staggered" alternate-stream-side logging with "four years of greenup" to recover shade would be woefully inadequate to attain PCW compliance.** For example, the analysis in Fig. 1 of the "DETAILED ANALYSIS" report makes it abundantly clear: trees at greater than 90-100 feet distance are contributing shade that significantly influences stream warming. Thus we can infer that tall, large trees standing at some distance from the streams are contributing that effective shade. If a prescription allows those large, tall streams in beyond 60 or 75 feet to be cut, it will not be four years before that shade is replaced by equally tall—rather it will be 20-40 years. Staggered prescription concept appears to be based on a fundamental misunderstanding and unrealistic assumptions about the science of thermally effective forest shade contribution. Interested parties need to recognize that ODF's RipStream research gives us a relatively fine-grained and well-informed understanding of shade contribution and that contravenes many long-held, simplistic beliefs about stream shade, many of which were based on short-term studies with small sample size, inadequately controlled or characterized treatments, and loosely contrived thermal response criteria.

6) **It appears very likely that the relative strong influence of trees beyond 75 feet from the stream to shade and stream warming demonstrated in the RipStream study results in part from the legacy of past logging impacts.** The study sites incorporated are representative of riparian areas of western Oregon riparian that remain to an extreme extent depleted of mature and old growth stands and trees from first and sometimes second-rotation logging. Because large, mature trees remain relatively depleted in the immediate streamside zone, more of those trees standing farther from the stream now more often make up some of the shade that was formerly provided by near-stream trees. It's important to note the same historical effect prevails with large wood recruitment. That is, trees standing farther from the stream may be proportionately more important for wood debris contribution and other stream ecosystem and habitat functions than they formerly might have been when abundant large confers occurred in the near-stream zone.

After a century or more of riparian forest recovery-- assuming riparian forests are fully protected to allow for natural successional processes--options could re-emerge for selective harvest of trees 50-120 feet from streams with much lesser incremental impact on water temperature and wood debris recruitment. The take-home message is that present-day rules must be more far-reaching because past logging and timber

management practices failed to be adequately protective of streamside forests. **Future rules could need to be even more restrictive if today we do not adopt practices that successfully promote the full natural successional recovery of riparian forests.**

7) **Fully protective streamside rules should be applied to all of western Oregon including the Siskiyou region.** I have conducted stream temperature and related stream habitat studies in this region, as well as elsewhere in western Oregon. Despite geologic, climate, and vegetation differences, nothing about the hydrology and physics of forest shade and stream warming changes significantly or consistently within that region compared to western Oregon as a whole.

8) To be fully protective, to provide broadly for restoration of riparian and aquatic habitats and water quality (including not just temperature but sediment and nutrient concerns), **a riparian rule sufficient to ensure attainment of the PCW should be applied to all small and medium streams in western Oregon, not just those stream segments considered to contain salmon, steelhead, or bull trout** (SSBT). While there seems to be continuing ambiguity about the specific proportion of streams in western Oregon that would be protected if a new riparian rule would only be applied to SSBT stream segments, it is clear that most small and many medium streams are not SSBT waters. It is highly likely in most field situations some magnitude of thermal impact in headwater streams propagates downstream (either via surface or subsurface pathways); this is the logical and most defensible assumption based on first principles of physics and a wide range of scientific literature. Hence, logging upstream from SSBT segments can warm SSBT waters beyond the PCW standard. Anecdotal accounts from a few small-watershed paired basin studies should not be relied on to assume that temperature impacts do not propagate downstream, because in most cases their design does not allow for unambiguous conclusions about incremental warming. Moreover, warming less that that readily detectable in headwater streams can still accumulate to detectable levels in downstream receiving waters (it may be more accurate to characterize the most biologically important effect as a reduction of the cooling influence of headwaters on receiving waters).

A conservative coldwater protective standard applied to streams contributing to SSBT waters will be necessary to assure compliance with the PCW. Unless the State of Oregon is able and willing to adopt some sort of effective regulatory control of the pattern, extent, and sequence of logging and other forest management actions at the watershed on private timberlands that also accounts for cutting history on adjacent pubic lands, a conservative coldwater protective standard applied to contributing segments to SSBT waters (both fish and non-fish) will be necessary to assure PCW compliance.