Testimony of Dr. George Ice

For the record, I am George Ice, a retired forest hydrologist. I have more than 40 years of study and research on forest watersheds and how to protect water quality. I have degrees in forest management and wildland resource science from the University of California at Berkeley and a Ph.D. in forest hydrology from Oregon State University. I am an accredited professional hydrologist with the American Institute of Hydrology and a Certified Forester by the Society of American Foresters. Prior to my retirement I served on numerous technical advisory committees for the Oregon Department of Forestry, including a technical advisory committee for the RipStream Study.

While there is general agreement about the quality of the research and analysis conducted as part of the RipStream Study, there is disagreement about the interpretation of those results. This is especially true for the Protect Cold Water (PCW) water quality standard. My interpretation of the changes measured as part of RipStream, Hinkle Creek, and the Alsea Watershed studies, as well as other studies in nearby states, is that they show changes of limited magnitude, duration, frequency, and extent. I have three points I wish to make to the Board of Forestry.

Minimal risk to fish from these temperature changes: First, far from a crisis, these findings show that temperature impacts from contemporary forest practices are greatly reduced from historic levels and likely do not negatively impact the fish. The stream water temperature changes being observed from multiple studies are, on average, a little more than 0.5°C. These temperature changes are often difficult to detect, requiring extensive pre-treatment data and controls. Pre-Forest Practices Act watershed studies found stream temperature increases of 10-16°C (Ice 2008). Data from the pre-treatment period of the original Alsea Watershed Study, beginning in 1959, showed year to year differences in maximum stream temperatures of more than 2°C (Ice 2008). Different headwater tributaries for the Hinkle Creek Study pre-treatment period exhibited a range of 3-4°C between streams and years. We also see large changes in temperature related to natural disturbances, like wildfires, that can result in increased fish productivity (Heck 2004). The supporting biological data from Hinkle Creek and the Alsea Watershed Study Revisited show positive fish response following timber harvesting with the current Riparian Management Area rules. This is consistent with other findings where channels are protected from wood removal (Mellina and Hinch 2009). It is my professional opinion that the magnitude of changes from application of the current Riparian Management Areas (RMAs) does not create a measurable threat to fish populations, especially given the rapid recover that occurs over time and downstream.

Unachievable Water Quality Standards: Second, I believe that much of this debate is generated by the commendable efforts of the Board of Forestry to have forest practice rules which achieve state water quality standards; specifically the PCW Standard. There is currently an on-going technical, legal, and political debate about the extent of Water of the United States where water quality standards are applicable (See for example

http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters_guidesum.cfm) . This debate is about how headwaters connect and influence downstream reaches and if there is a "significant nexus" or connection. Much of my research was designed to understand the water quality patterns of forest headwater streams and how those streams influence downstream reaches. One of the key findings is that headwaters tend to have water quality that is highly variable; influenced by the site-specific geology, vegetation, and climate as well as disturbance events (Ice and Schoenholtz 2003). Perhaps the best example of this is the elevated nitrate-N concentrations observed in streams draining watersheds with nitrogen-fixing plants like red alder (*Alnus rubra*). Another key finding is that all pollutants, including heat, are non-conservative. That means they are attenuated downstream by multiple processes including heat exchange, mixing, and time-of-travel and flow pathway effects. As water quality standards are applied to ever higher reaches we are finding that natural conditions can make these standards, developed primarily for mainstem reaches, unachievable (Ice et al. 2004, Loehle et al. 2014).

Protect Coldwater Standard doesn't fit forest management: Finally, the Protect Coldwater Standard (PCWS) for temperature change related to human activity represents a type of regulation termed an anti-degradation standard. Forest management is poorly represented by anti-degradation standards because forest management activities are treated like point-sources of pollution that create persistent changes without considering the full scope of management over time. Forests are managed in rotations or cutting cycles where disturbance is limited to a few events over decades of management. The PCWS has been interpreted without considering this shifting mosaic of disturbance and then long-term recovery.

Recommendation: While it is not the Board of Forestry's responsibility, I believe that the Environmental Quality Commission (EQC) will have to ultimately deal with two problems as water quality standards are pushed higher into the headwaters: naturally unachievable standards, and interpretation of the anti-degradation standards for non-point source land-use activities like forestry. The Board of Forestry and forest watershed professionals need to work with EQC to make sure the water quality standards, as applied to forestlands, are achievable and realistic. I have two suggestions to address this issue: (1) adopt state policies similar to those in other states where small, brief, and infrequent exceedances of water quality standards do not trigger classifications of water bodies as impaired (Ice et al. 2007) and (2) for non-point source activities, characterize human impacts, not just for immediate response, but over the full rotation or cutting cycle.

References

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