**Declaration of H. Thomas Davis**

I, H. Thomas Davis declare and state as follows:

## Qualifications

1. I have over 35 years experience as a hydrologist and Environmental/Water Resources Engineer, including 20 years with consulting firms and 15 years in staff positions with local, state, federal and regional agencies. I have an MSCE degree in Water Resources Engineering and hydrology – University of Idaho, 1967. My thesis was on the relationships between surface water and groundwater. I am a registered Civil and Environmental Engineer in Oregon.

2. My specific experience includes:

- Forest practices, soil disturbance, erosion and stream-sedimentation projects for ODEQ, US EPA, Pacific Northwest Regional Council, the City of Ashland, Oregon and the Flathead 208 Council.
- Seven water quality management plans, including cost/economic analyses for five, local Oregon jurisdictions.
- Staff manager for the Idaho Water Resources Board of statewide studies by three Idaho agencies of streamflow needs for a) fish, b) recreation and c) water quality in all major Idaho Rivers.
- Management of flood plain hydrology-hydraulic studies in Oregon, Washington and Idaho.
- Idaho State Coordinator - Federal-State Wild & Scenic Rivers Studies; '71 – '75.
- Watershed, erosion-sedimentation, forest management and water quality analysis of the Ashland Municipal Watershed as a consultant to the City of Ashland, Oregon.
- Project manager of numerous water quality and flood control designs, master plans and cost estimates as the Stormwater Design Section Supervisor and Environmental Planning Division Manager for the Portland Bureau of Environmental Services.
- Construction management inspection at a large federal water project in Montana.
- Consultant and staff manager of numerous drinking water and water quality planning studies in Oregon, Idaho and Nevada.
- Maximum flood hydrology evaluation for nine potential dam sites in the Umatilla Basin, and irrigation water availability budgets for the Yakima project while with the Bureau of Reclamation ('62 – '66).
- Primary author for over 100 technical reports, papers, articles and work plans.

## Analysis

3. In preparing this declaration, I have reviewed the "State Forester Report for Board GPV and Planning Rule Determination" (the "State Forester Report" or the "report"). Based on my review I have determined that the report relies on selective references and does not incorporate the best available science. The report makes a number of vague and unsupported commitments. As a result, I have determined that the changes that the Board of Forestry ("BOF") made to the forest plan and that the Department of Forestry ("ODF") plans to implement do not ensure a "high probability of maintaining and restoring properly functioning aquatic habitat for salmonids, and other native fish and wildlife."

4. Based on my review of the State Forester Report, I do not believe that the ODF or BOF will meet the mandate to use the "best science available" and it is unlikely that the "Greatest Permanent Value" ("GPV") for the people of Oregon will be achieved by the implementation of this plan.

5. The ODF selectively used information and ignored other significant information. For example, it is the total amount of logging in a watershed, not just riparian area logging that impacts stream temperature. In a February 2009 paper on the correlations among stream temperature, riparian harvest and total harvest in a watershed, a team of scientists concluded: "stream temperature increase was correlated with both the total amount of timber harvest in a watershed and the total amount of riparian forest harvest in a watershed." These findings underscore how significant increases in the levels of logging in the revised rule will impact the aquatic environment. STREAM TEMPERATURE RELATIONSHIPS TO FOREST HARVEST IN WESTERN WASHINGTON" by Michael M. Pollock, Timothy J. Beechie, Martin Liermann, and Richard E. Bigley. http://www3.interscience.wiley.com/cgi-bin/fulltext/121663614/PDFSTART
The conclusions in this paper include:

> "We observed that watersheds with 25-100% of their total area harvested had higher stream temperatures than watersheds with little or no harvest. The magnitude of stream temperature increase was correlated with both the total amount of timber harvest in a watershed and the total amount of riparian forest harvest in a watershed. ... Our study lends support to the hypothesis that *forest activities beyond the immediate upstream riparian environment can influence stream temperatures* and is consistent with other studies that demonstrate a *correlation between the total amount of timber harvest or total riparian harvest in a basin and stream temperature increases* (Beschta and Taylor, 1988; Bourque and Pomeroy, 2001). Several causal mechanisms related to timber harvest activity can lead to increased stream temperatures that are sustained for decades or longer. These include widening and shallowing of the channel, widening of the above-channel canopy opening, loss of LWD and alluvium, which reduces hyporheic storage and retention times, and warming of shallow groundwater outside of the riparian zone."

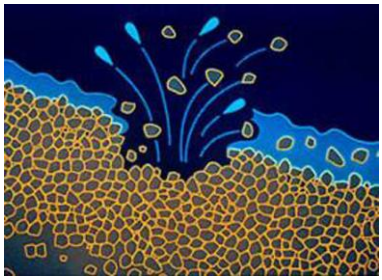
6. Readily available scientific research tells us that protecting riparian areas is particularly important for many aspects of maintaining and restoring properly functioning aquatic habitat for salmonids, and other native fish and wildlife. Current available information indicates that the protections for riparian areas utilized by the ODF must be improved. In a July 21, 2009 letter from the National Marine Fisheries Service (NMFS) to the ODF regarding the Elliott State Forest Habitat Conservation Plan, the NMFS stated:

> "The DEIS stated that the proposed action would result in site-specific temperature increases lasting up to a few years in fish-bearing streams. Other information from the U.S. Environmental Protection Agency (EPA), Oregon Department of Environmental Quality (DEQ), and Washington Department of Ecology indicate that the proposed strategies will have greater cumulative impact than the DEIS. Because elevated temperatures have acute consequences on coho salmon, NMFS is concerned with any management related effect. The NMFS believe that at least 90% of the site potential shade on perennial streams needs to

be protected during management activities to meet the needs of our trust resources.

The NMFS' Northwest Fisheries Science Center (NWFSC) reviewed the Elliot riparian strategies, comparing them to other modeling and experiences on similar forest management actions, and concluded the thinning treatments are so aggressive that they would delay the recovery of streams by up to 100 years and could prohibit mature forest conditions from ever being reached.

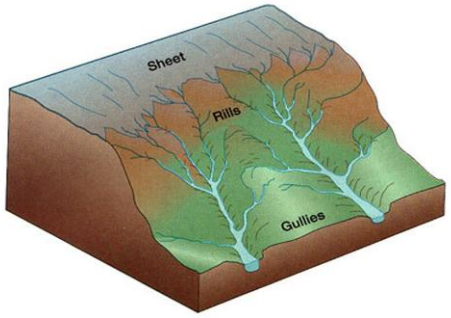
After reviewing your March 23, 2009 letter, and in light of the other information that has become available during and after the public comment period of the DEIS, the NMFS still does not consider the strategies proposed by ODF in the Elliott State Forest HCP consistent with the ESA 10(a)(2)(B) issuance criteria for OC coho salmon."



7. In the State Forester Report, the ODF addresses the damage caused by debris flows and landslides (two forms of mass erosion) and channel erosion, but the ODF ignores surface/sheet erosion, which is also of high importance.

8. There are three distinct types of erosion: mass (e.g. landslides), channel and surface/sheet. The first two are easily observed, but surface/sheet erosion, which begins with soil detachment by raindrop splash (see graphic) or velocity force on relatively smooth soil surfaces or rills, is difficult to see and understand.

9. The soil detachment is followed by the transport (routing) of the eroded soil through the watershed and sediment delivery to water bodies, sometimes over long time periods. The resulting rivulets and rills are more easily observed (see graphic). There is a large body of research on sheet erosion done by the US Forest Service (FS).

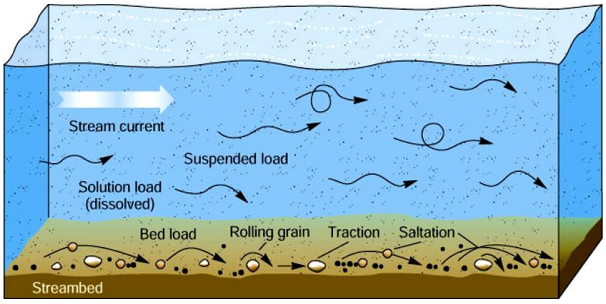



FS Road Erosion list: http://forest.moscowfsl.wsu.edu/cgi-bin/engr/library/searchpub.pl
FS Slope Stability list: http://forest.moscowfsl.wsu.edu/cgi-bin/engr/library/searchpub.pl
FS Erosion Modeling List: http://forest.moscowfsl.wsu.edu/cgi-bin/engr/library/searchpub.pl

10. Surface/sheet erosion can result in more sediment delivery than mass or channel erosion depending on conditions and it should not be dismissed or overlooked. The State Forester Report overlooks sheet/surface erosion. The impacts of this kind of erosion can be quantitatively evaluated by a number of readily available analytical tools, e.g. the FS "Water Erosion Prediction Project (WEPP) model: http://forest.moscowfsl.wsu.edu/engr/wepp0.html

11. The surface/sheet erosion from logging roads is a major source of erosion and sediment delivery, as the photo to the right illustrates.

12. Soil disturbance associated with logging roads, skid trails, and many aspects of forest harvest can cause serious sheet, mass and channel erosion. The eroded fine-grained silt and clay soils are very visible in streams because of high levels of suspended solids that make the stream appear "muddy". The erosion effects of relatively coarse soils that include sand and fine gravel are not as visible because the soil particles move along the stream substrate as bedload (see graphic above). The water in the stream may be clear during bedload movement, but the sediment is usually a serious aquatic habitat problem. While it may be difficult to observe, monitor or fit bedload movement within a water quality regulatory framework, it is a major threat to healthy salmonid populations. The Forest Service has produced a video which demonstrates the impacts of bedload movement and it can be found at "Viewing Bedload Movement in a Mountain Gravel-bed Stream" (http://www.stream.fs.fed.us/publications/videos.html#eastandwest)




13. Natural amounts of fresh gravel moving down a stream are essential for the health and vitality of spawning and alevin-rearing beds, but accelerated soil erosion provides excessive sediment. Clay, silt and sand sized sediments are particularly damaging to eggs and alevins through deposition from suspension in the water and bedload movement. Eggs and alevins of salmonids are in the gravel for two to eight months.

14. The graphic and the following description regarding alevins are taken from the U.S. Fish and Wildlife Service brochure entitled "Salmon of the Pacific Coast". "The eggs lie in the gravel through the winter, as the embryos within develop. In early spring, yolk-sac fry, or alevins, hatch. The tiny fish carry a food supply (a sac of egg yolk) attached to their bellies. They will not leave the protection of the gravel until the yolk is used up, 12 weeks or more. At that time, the young salmon, now called fry, swim up to the surface, gulp air to fill their swim bladders, and begin to feed."

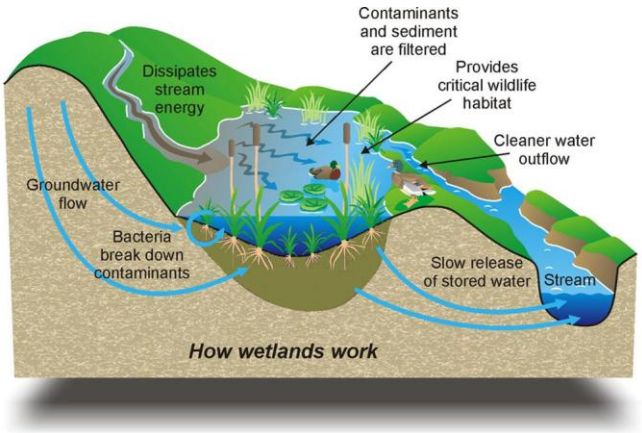
15. The filling of gravel interstices with fine sediments causes major salmonid reproduction problems. Eggs and alevins must develop for several months in gravel redds, and require sufficient flow of well-oxygenated water during the entire period.

16. A majority of the aquatic macroinvertebrates that provide forage for fish are produced within clean, silt-free gravel, cobble, and boulder substrates that can be severely impacted by sedimentation. The science on these points is clear.

17. A common misconception is that for erosion to result in sedimentation problems the disturbance has to occur relatively close to the stream, but such problems originate in erosion throughout the watershed. The term "hydrologically connected" is all too frequently misunderstood and misused to imply that if a disturbance is not close to a perennial water body there will be little or no sediment delivery. However, many eroded soil particles move beyond

the initial erosion plume and into rills, rivulets and gullies waiting for the next flow of water. The sediment transport will usually be restored after the initial settlement in a few years or a few decades depending on storm frequency and intensity. Only the time needed for the soil particles to arrive at a water body, or routing time, is affected by location. Top erosion specialists have completed studies that demonstrate that when there is a high degree of erosion in a watershed, from events like wildfire or logging practices from many decades ago, massive amounts of sediment are deposited in the streams and rivers in a watershed. For example, in Caspar Creek in Northern California the redwood forest was removed a century ago but the system is still delivering unusually large amounts of sediment even though the forest has now re-grown.

18. The State Forester Report that ODF relies upon does not describe specific, quantitative criteria to prohibit disturbances in the stream corridor. Water quality, floodplain function and aquatic life protection should be provided through no-disturbance stream corridors, which will also provide important habitat for aquatic and terrestrial insects that provide food for fish and other aquatic life. Many species of birds, mammals, reptiles, amphibians, and invertebrates also require healthy riparian habitat for nesting, hiding and birthing cover, travel corridors, thermal refuge, and forage.




19. The floodplains, riparian zones and adjoining wetlands define the stream corridor. Maps are needed of all perennial, intermittent and ephemeral floodplains. Intermittent streams are defined as a stream which carries water a considerable portion of the time, but which ceases to flow occasionally or seasonally because bed seepage and evapotranspiration exceed the available water supply. Ephemeral streams are defined as a stream channel, which carries water only during and immediately after periods of rainfall or snowmelt.

20. The floodplain maps can be determined by hydrologic analysis of the contributing watersheds using

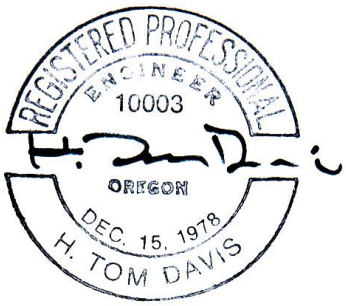
- HEC-HMS: http://www.hec.usace.army.mil/software/hec-hms/index.html or
- HSPF: http://www.epa.gov/ceampubl/swater/hspf/ and a stream hydraulics model such as
- HEC-RAS: http://www.hec.usace.army.mil/software/hec-ras/

21. All planned and existing upstream tree harvest areas and areas altered or proposed for alteration from natural conditions must be included in the hydrologic analysis of the contributing watershed, including roads. Inventories and maps of wetlands and riparian areas are also essential to determining the impacts of management activities.

22. Without providing the information discussed in paragraphs 19, 20, and 21, the ODF has not shown a high probability that it is maintaining and restoring properly functioning aquatic habitat.

Signed and stamped this 16th day of June 2010.

H. Tom Davis
Civil and Environmental Engineer

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