State of Oregon, Board of Forestry

Testimony of Dr. Michael Newton regarding Stream Regulations

July 23, 2015

I am Dr. Michael Newton, Professor Emeritus of Oregon State University College of Forestry, where I have been engaged nearly full time in forest and stream research since 1960. In the past 24 years, including 15 years of retirement, my focus has been on how solar radiation influences streams and their temperature, and effects of local warming of water on downstream environment of fish.

I have published 12 refereed publications on various aspects of stream management, mostly relating to stream temperature and its response to stream environments. I led a major research project for ODF on stream features and temperature management, 1994-6.

Stream temperature became an issue following the work by Krygier and Brown, in the early 1960s. In that study, now identified as the Alsea Watershed Study (AWS), three headwater streams in the Coast Range, tributaries of Drift Creek, were used as examples of consequences of harvesting on stream temperature. One of these was left untouched. One was clearcut with buffers, and one was clearcut without buffers. The last, Needle Branch, was completely de-forested, the stream was cleared out with bulldozers that skimmed down to bedrock, and the entire approach was dependent on maximum disturbance.

The uncut, and also the buffered stream, did not warm appreciably. The completely clearcut stream did warm a great deal, largely owing to very shallow fully exposed water flowing across flat bedrock. These two observations, without qualification, provided the basis for the stream rules as we see them today, requiring buffers. This research was grossly inadequate as a basis for today's stream rules. They launched a program of regulating stream temperature rather than net fish productivity.

The AWS derived temperature data based on practices prohibited today, and relied on data from only one abused stream totally non-representative of modern silvicultural practices. It led to practices that require two-sided buffers, half of which have no influence on shade or temperature. They shade over streams to prevent warming, and *which obscures the light that leads to stream productivity*. The modern regulatory focus for forest streams is temperature control. The focus is on shade. Conversion of streams to maximum shade is the worst possible outcome for fish. It fails to accommodate the historically-wide variation in temperature.

The shade is being provided by putting Forest Practices buffers on both sides of a fish bearing streams. Our research has made clear that trees that do not shade the stream, i.e. all those north of water and more than 40 feet from the water, have no effect on stream temperature. Our data from seven intensively monitored streams reveals that these sun-sided buffers allow some diffuse radiation for primary production, but exclude direct sun equal to two-sided buffers of any width.

The current riparian rules are based on one sea-level stream, yet are being enforced on all privately-owned fish bearing streams, at all elevations. There are many fish-bearing streams far colder than optimum, all being buffered. Their biological productivity is being kept low. The focus on riparian rules must be modified to emphasize fish nutrition as well as temperature, and need to be made to match the ranges of environments of Oregon streams. Some variation is obviously well within the natural environments of this fishery. It must be allowed.

Work by Bateman (OSU Watershed Research Coop) shows that fish respond markedly to reduction of shade, with gains increasing for several years. Strangely, a similar observations was made in Needle Branch (AWS) a few years after bulldozing the creek-bed. It takes several years for a hatch of fish to provide a big run of adults. We know that now, but the rules based on AWS have not changed appreciably since enactment.

The Protecting Cold Water Standard is flawed. Several observations from the various Watershed Research studies stand out as having been ignored:

1. Once warmed, streams lose the excess heat in a matter of hours downstream, meaning that within a half-mile to a mile downstream, that heat is no longer detectable unless there had been a huge infusion of energy, beyond normal harvests without buffers. Accumulation of heat is generally a non-problem except in the warmest climates.
2. Primary production of food for fish is provided by photosynthesis, and a food chain of phytoplankton and macro-invertebrates. Dark streams are not productive.
3. Fish can tolerate much higher temperatures, and prosper in so doing, as long as peak temperatures do not persist more than a few hours per day. Over a dozen scientific references attest to the abundance of fish in clearings. These reports include observations in our study streams. Fish also acclimate to warm temperatures as long as well fed. Newton has these references, mostly by Brett et al, (1982 and a dozen others.)
4. No data were provided in support of this very strange demand through the Governor's office. It must be rejected as non-compatible with natural fish habitat, and for potentially decreasing fish abundance, all without data support. This is bad administration, apparently contrary to stated goals of the Forest Practices Act.

There are many references to abundant fish in open reaches of streams over a wide array of conditions:

1. Brett and his team (1982, and other publications) have observed that salmonids tolerate a wide array of temperatures. Whereas ideal temperature may be centered around 62-64°F, they have been observed, as in our work, to tolerate much higher temperatures for a few hours in large numbers, allowing them to feed in morning and

evening. In our work, a complete clearcut where water reached 71.7°F. supported the largest numbers of fish of any treatment in census of six test-buffer treatments on one of our study streams recorded by ODFW. Fish abundance was greatest in the complete clearcut, then Partial buffer, then harvest with ODF BMP buffers, then the three uncut units in that study stream had the lowest numbers. We had similar findings in two other streams of our study for which we were able to obtain census data on six treatments.

2. Brett et al, 1982, also showed that even though salmonid habitats appear ideal at about 60-62°F, as food availability increases, their tolerance of higher temperatures is remarkable:

    a. Mortality of salmonids in free-flowing mountain streams is rare, even when very warm as such streams go.
    b. Fish that slow their feeding rate at high temperatures can and do feed when temperature drops, leading to little if any loss of growth.
    c. Fish kept at elevated temperature develop a tolerance for the higher temperature even when held at a steady 70°F.
    d. Mortality of salmonids did not begin until continuous temperature exceeded 74°; temperatures in the low 80s were tolerated for a matter of hours.

2. The shade-intolerance of Doulas-fir attests to the need for complete clearing in order to survive and grow above the brush. The even-aged nature of forests, and prevalence of Douglas-fir west of the Cascades is persuasive evidence that these fish have evolved in river systems where the periodically burned land was cleared for decades, often repeatedly, between which maturing forests leading to prolonged dense shade were intervals of cool water. All of our anadromous fish have evolved with both extremes on a scale infinitely larger than that provided by scattered harvest units with cooling between.

4. The need for continuous closed-canopy forest cover over streams provides limited nutrition for fish. Open buffers or periodic clearings are justified in maintaining fish.

5. Numerous reports cite evidence of best fish populations occurkng in clearings. To the best of my knowledge, the only incentive for maximum shade is regulatory convenience, at the expense of fish.

6. Research to define where buffers are or are not needed is a critical need.

In 1994-6, I led a relevant research contract funded by ODF to evaluate stream temperature patterns in Coast Range streams. It was roughly a $140,000 project, from which a detailed final report was submitted in July, 1996.

This report described the thermal behavior of 16 streams, grouped in various ways to see if there were patterns of warm vs. cold streams, temperature downstream from various silvicultural activities, and temperature patterns downstream of units where warming was observed. Streams always warmed from source on down. High-discharge/acre streams warmed at different rates. Cold streams warmed, and warm streams warmed, at different rates. Much of the water in these streams was transpired (lost) before it went very far. The important part of this contract was the determination that streams vary enough to question the wisdom of applying a single temperature standard. We also showed water warmed and cooled in reaches often less than 500 feet long. Our recent work corroborates this.

For unknown reason, my recent research on stream temperatures and buffers was not used by the RipStream team. It would have defined some limits on interpretation of RipStream data.

Papers by Zwieniecki and Newton, 1999, and Cole and Newton, 2013, provided details of an approach to temperature management requiring less than half of the buffer cover now required in the FPA. These two papers provide all the necessary information needed to justify using the Partial Buffer (40 feet wide, mostly south) as the standard for control of solar heating.

At no point has there been evidence that buffers wider than a total of 40 feet, located on the sun-side of a stream, improve fish habitat. I am not aware of any study anywhere indicating that buffers wider than 40 feet, on streams of any size, are needed for healthy fish.

The colder streams at higher elevations now require buffers. This is absurd, and very costly*.

The State has recently made no attempt to determine effects of buffers on the fishery. These oversights need remedy. State funding of the RipStream study harnessed excellent scientific leadership, but failed to ask the critical questions about fish. Interesting, but pointless.

I strongly believe that the fishery will be enhanced once narrower buffers are maintained or not required, depending on cold status of streams. Where buffers are needed, consider 10% of reach lengths to be open to the sky to enhance primary productivity if requested by owners. On very warm streams e.g. Willamette Valley and southwest Oregon, openings would not be permitted, but Partial buffers would provide some improvement of primary production.

These actions are all in keeping with literature on where fish populations are reported to be high, and with my personal experience in studies of roles of shading on streams.

I urge ODF and ODFW to remedy the absence of fish and temperature data for cold streams and high-elevation streams and their relation to cover, and to revise buffer requirements to Partial Buffers as a maximum. I also urge ODF to convert management of all streamside habitat to focus on fish rather than buffer quantity. At this time, there is zero justification for more, and a good bit of justification for having no buffers at higher elevations.

*Categories of stream temperatures must be defined by data surveys for all of western Oregon.