Testimony of Dr. Michael Newton

At the Oregon State Board of Forestry Meeting, Nov, 5, 2015

Greetings, Members of the Board,

I am Michael Newton, Professor Emeritus of Forest Ecology at Oregon State University. I have been leader of research and active participant on stream temperature studies for over 20 years, and am co-author of numerous publications that investigate stream temperature fluctuation and its causes.

The effect of harvest on stream temperature, alone, can be shown only when *buffered* streams in harvest units warm more than uncut upstream waters *after eliminating other probable sources of variability.* In OSU research projects, we observed variation of temperature within harvest units, different air temperatures at stream-level and natural variation within harvest and adjacent units above and below. We absolutely required two or more years of data before and after harvest to define local variability. It takes years of data that capture all important influences to verify increases of 0.2°C with any degree of accuracy.

Air temperature near the water, as well as tributaries and groundwater inputs, have *primary* roles in water temperature and its variation. Did RipStream measure any of these? No. Does RipStream *know* that buffer width over 50 feet significantly reduces air temperature at the stream? No. One of our reports, Cole and Newton, 2013, shows several years of stream responses to climate, primarily in variation in water temperature. We did not show an effect from buffers beyond 40 feet. We also noted that 2004 and 2006 were extremely hot summers, leading to very high temperatures in air and water. This heated water above and below harvest units, markedly. Not necessarily the same.

When extra-hot years following harvest are part of the data implicating an exceedance, this is a *confounded comparison.* RipStream, hence models, did not have over-stream air temperature data, a deficiency increasing the probability of confounding.

Our OSU research streams varied in *uncut* forests by two or more degrees before harvest, caused by air temperature extremes along streams harvested one year before 2004 or 2006. Our streams showed a major increase in temperature in harvest units and also upstream. Response of harvested vs pre-harvested was partly or completely climatic. Is this a harvest effect with 50-foot buffers, or climate?

The implication taken from RipStream is that widening buffers will reduce or eliminate stream temperature rise over 0.3°. The above-cited data, confounded as they are, are not adequate to support that implication, especially in view of having no data from buffered streams 70-100 feet wide or with clearcut units less than 150 feet from water. RipStream models suffered from climate-confounded data, lack of within-stream data depth (multiple years), and failure to replicate years, before and after cutting.

ORAL COMMENTS BY MIKE NEWTON

BOARD OF FORESTRY MEETING, NOV. 5, 2015

MR. DECKER AND MEMBERS OF THE BOARD, I AM MIKE NEWTON, PROFESSOR EMERITUS AT OREGON STATE UNIVERSITY, WHERE I HAVE LED STREAM STUDIES SINCE 1995.

I HAVE SUBMITTED MY TECHNICAL COMMENTS ABOUT THE RIPSTREAM STUDY IN MY WRITTEN TESTIMONY. MY GENERAL STATEMENT IS THAT WEAK EXPERIMENTAL DESIGN INTRODUCED SERIOUS CONFOUNDING IN THE RIPSTREAM STUDY BY NOT RECORDING ESSENTIAL AND INFLUENTIAL INFORMATION.

RIPSTREAM APPARENTLY RELIED ON ONLY ONE YEAR OF STREAM TEMPERATURES BEFORE HARVESTING AND PERHAPS AFTERWARD TO EVALUATE COMPLIANCE WITH THE 0.3^{O} PCW STANDARD. THIS FAILS TO NOTE VARIABILITY, AN IMPORTANT QUALITY OF STREAMS. THIS FORECLOSED EFFORTS TO RECORD STREAM TEMPERATURE'S NATURAL YEAR TO YEAR VARIATION, AND ITS IMPORTANCE IN RULE MAKING.

OUR MOST RECENT STUDY OFFERS INSIGHTS ON VARIABILITY. WE EVALUATED FOUR STREAMS 2002 TO 2011 WITH 21 TO 24 TEMP RECORDERS PER MILE-LONG STUDY REACH. RECORDS FROM TWO YEARS BEFORE AND 4-5 YEARS AFTER HARVEST REVEALED A LOT OF YEAR TO YEAR VARIATION IN STREAM TEMP. THREE OF THE FOUR STREAMS OVER ALL VARIED *BEFORE* HARVEST FROM YEAR TO YEAR BY A DEGREE, MORE OR LESS; THE FOURTH VARIED BY MORE THAN THE 0.3^{O} PCW STANDARD. WATER ENTERING OUR STUDY REACHES HAD 7-DAY MAXIMUM TEMPERATURES THAT VARIED BY *OVER TWO DEGREES.* THIS KIND OF VARIABILITY COMPLICATES IDENTIFICATION OF CAUSE OF WATER WARMNG DUE TO HARVEST VERSUS OTHER SOURCES OF HEAT. IT ALSO SAYS THE PCW DOES NOT FIT ITS APPLICATION IN OUR MOUNTAIN STREAMS.

WHEN AIR TEMPERATURE IS MUCH HIGHER IN THE YEAR AFTER HARVEST THAN BEFORE, AS IN 2004 AND 2006, EFFECT OF HARVEST ALONE CANNOT EXPLAIN THE WARMER WATER. A VERY HOT SPELL FOLLOWING HARVEST WOULD INCORRECTLY IMPLICATE HARVEST'S ROLE. THAT SEEMS TO HAVE HAPPENED WITH MANY RIPSTREAM FINDINGS.

WITHOUT AIR TEMPERATURE DATA FROM NEAR THE STREAM, RIPSTREAM HAD NO INFORMATION ABOUT THE DIRECT ROLE OF AIR TEMP ON STREAM TEMPERATURE. THIS IS A MAJOR OVERSIGHT.

HAVING NOT ASKED SUCH IMPORTANT QUESTIONS, RIPSTREAM HAS NOT PROVIDED CREDIBLE EVIDENCE OF BUFFER DESIGN CHANGES NEEDED TO MEET PCW STANDARDS.

OUR RESEARCH STREAMS DID STUDY BUFFER DESIGN, OBSERVING NO CLEAR DIFFERENCES IN STREAM TEMPERATURE CONTROL BETWEEN 50-FOOT BUFFERS, BOTH SIDES, AND 40-FOOT BUFFERS ON THE SOUTH (DIURNAL SOLAR ARC) SIDE. THIS SUGGESTS THAT 40 FEET MAY BE CLOSE TO THE MAXIMUM FUNCTIONAL EFFECT OF BUFFER WIDTH AS A STREAM TEMPERATURE CONTROL OPTION.