Testimony of Greg Peterson P.E.

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

I am Greg Peterson, registered Professional Engineer in Oregon & Washington, with 40 years environmental engineering experience with environmental assessments, water processes, and cooling. I have modeled over fifty sites for private, EPA, and state clients. My resume is enclosed. After my initial testimony, I spent 980 hours examining all available data bases, spreadsheets, and analysis conducted as a part of the Ripstream process and offer a summary of this analysis, summarized by nine major limitations*;

1) **Needed all temperature data** Unfortunately, 35 % of the temperature data was suppressed or not gathered, and another 35% not used, and when coupled with even less flow data, left the study with a "general paucity of data", unable to adequately address natural variability or natural variations caused by groundwater, tributaries, evapotranspiration, hot air, and other natural factors. RipStream simply did not have the data to separate the natural and anthropogenic causes affecting temperature change. Matters were made worse by Ripstream's policy decision to only consider the two years after harvest and their erroneous interpretation of DEQ's Temperature Standard Implementation Directive, justifying the use of only 1 pre-harvest year and 1 post-harvest year for calculating PCW exceedance. Eleven private sites were left with one pre-harvest or one post-harvest year, which greatly increased natural variability. Two state sites had no pre-harvest data, and two private sites had both one year pre-harvest <u>and</u> one year post-harvest. These Ripstream policy decisions led to the misrepresentation of site conditions and threw all scientific accuracy tenets to the wind.

2) **Needed all stream flows** Groundwater and tributaries affected all sites, affecting temperature and natural variability. Normal practice on similar studies is 3 to 4 measurements/season. Very low flow (equivalent to a garden hose) plagued half of the sites, with flow measured during only 21% of the seasons. This invaluable data showed that Station 2W to 3W flow at State sites increased 6:1, private sites 3:1, and 30:1 at Buck Cr. Ripstream did not use this, nor special station flows, but instead made the unprecedented assumption that natural variation between stations 2W and 3W was addressed in the control reach between stations 1W and 2W. This was unfounded, particularly since conditions and lengths in each reach differed substantially. Sites with significant tributary/groundwater input have complex hydrology, should have been modeled as stream networks, rather than single stream segments. Failure to do so, significantly understated natural source variation.

3) **Needed actual site air temperatures** High air temperature is a natural variation known to increase stream temperature, as recognized in the PCW, which allows exemptions. Site air temperature data, reflecting unique site microclimates and diurnal change, from 7 sites was put aside, despite reviewer objections, and RAWS weather station data from up to 40 miles away was substituted. The '03 to '06 seasons were unusually hot at these stations, with '05 being +5.5°F above normal. 91% of the '05 monitoring days were above the historic 90th percentile air temperature. Nearly all '05 & '06 maximum stream temperatures occurred when air temperatures were at or above the 90th percentile** . Abnormal weather is a natural variation that exaggerates the difference between pre-H & post-H years, and coupled with the use of RAWS weather data, created a significant bias affecting stream temperatures. Despite numerous requests, Ripstream was unable to provide any backup showing how high air temperature was addressed.

4) **Needed similar conditions to compare sites** Dec '05, Jan '06, & Nov '06, storms caused multiple 50-year floods. Two sites had landslides, and three others gained beaver dams during this period. Argue Cr & Buck Creek, which already had buffer gaps, added significant logjams, and midseason flows dwindled to 0, resulting in no credible post-H data within 2 years after harvest. Expert reviewers said that such fundamentally different conditions warranted suppression of these two sites, but their suggestions were dismissed, and the sites kept in the study. They account for +0.22°C of the reported average temperature change for all private sites. Putting them aside, as recommended, would substantially change all Ripstream findings.

5) **To compare sites side-by-side, schedules must be synchronized.** Studies designed for direct site comparison have synchronized schedules to avoid additional variables due to weather and precipitation extremes, such as those occurring in '05 and '06. Ripstream harvests were staggered over 4 years, so few sites had comparable schedules, which significantly reduced accuracy when data was compared side-by-side or commingled into a data pool.

6) **Needed to know the cause of temperature change** The inability to analyze the cause of temperature change caused natural variation effects to be inappropriately combined with harvest effects. Knowing the actual cause is essential, since its definition gives critical insight into the appropriate solution for the portion that is harvest-related.

7) **Needed to recognize significant cooling below harvests** Cooling 300m downstream was greater than the private site temperature change, even though the average harvest length was 150% longer. The cooling rate was 9 times greater than the rate of 2W to 3W temperature change at one-sided harvests and 3 times greater at two-sided harvests. This is an important fact when determining the real-world impact of any PCW exceedance.

8) **Needed consistent data sources** During the detailed review of four Ripstream data sources, the average private site temperature change was found to range from +0.50°C to +0.78°C/site. Between these four data sources, Argue Cr varied 2.1°C, Toad Salmonberry varied 1.3°C, with other sites having discrepancies of between 0 and 0.9°C. These were discussed with Ripstream at our 10/27/15 meeting, but no explanation was offered, nor has one been since. Since there's only one set of field data, the only plausible explanation is that such discrepancies originate from within the model. Pending a suitable explanation, temperature change would be more appropriately stated as a range of values, rather than a single value.

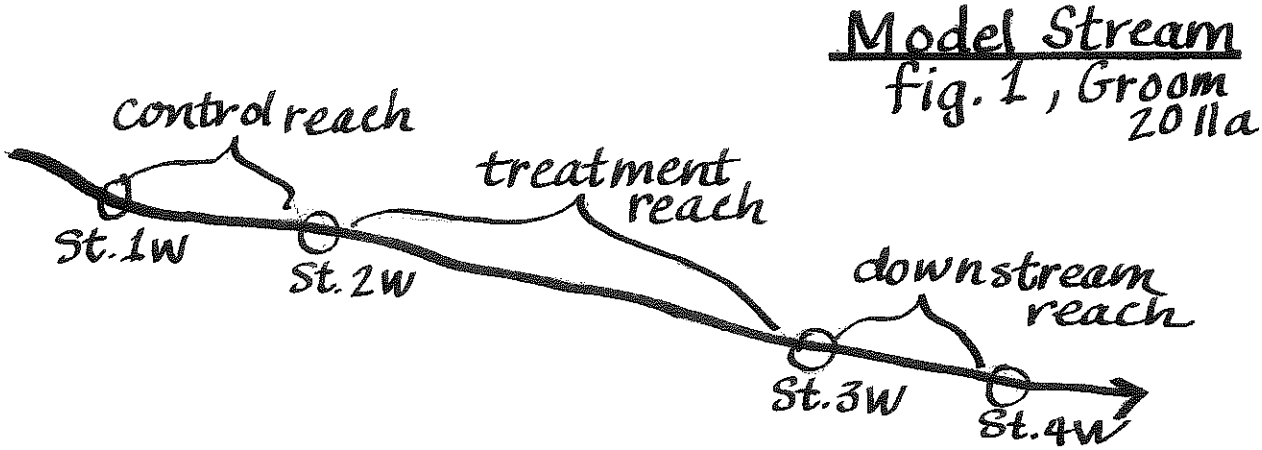
9) **State Sites also had temperature change** Four State sites exceeded +0.3°C temperature change, resulting in a 26% probability, rather than the reported 5% probability of exceeding +0.3°C. The range of temperatures for the state sites was +2.6°C to -0.5°C, with an average of +0.21°C/site. This can only be attributed to non-shade natural confounding factors, since there was no harvest within 100 feet of the stream. Such natural variation should have been addressed and was likely comparable to private site natural variation between 2W to 3W. Failure to adequately address the cause of temperature increase on the state sites was a major omission.

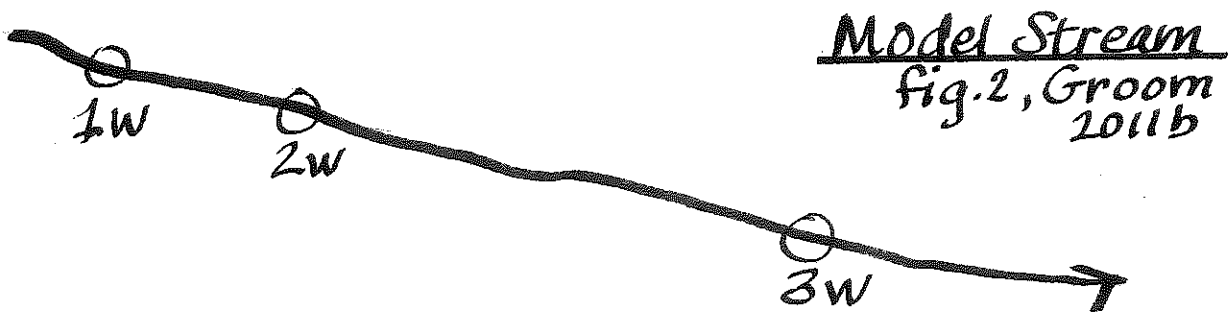
These nine limitations shed significant doubt on the basis and accuracy of the Ripstream model and its conclusions.

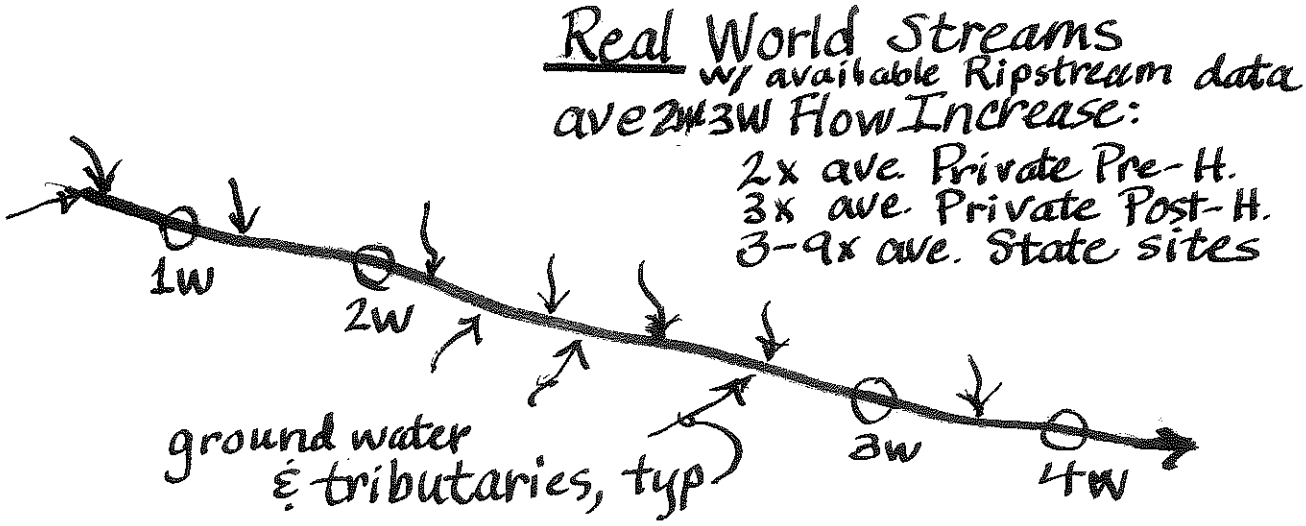
* Supporting details can be found in OSWA's submittal.

* * At Wilkerson Ridge and Clay Creek RAWS weather stations, all the of the '05 & '06 maximum stream temperatures occurred when air temperatures were at or above the 90th percentile. At South Fork RAWS, 40% were above.

Ripstream Model vs. Real World Streams







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CAREER SUMMARY

Skilled project manager with 40 years experience in a wide range of environmental systems. Dupont awarded Mr. Peterson with its highest honor, the Shield of Irene, for excellence in the assessment and design of its world-class environmental facility in Victoria, Texas.

PROFESSIONAL EXPERIENCE

Glumac International **2012 to 2013**

Lead Process Engineer for the study and design of ultrapure water systems, ultrapure gas systems, waste water & waste solvent collection systems, bulk chemical systems,and 12 pump stations. The design included state-of-the-art instrumentation and control, the development of proprietary software for analyzing system hydraulics, and 3D Revit modeling, for a new 500,000sf wafer fab and laboratory building at Intel's Hillsboro campus.

Peterson Engineering LLC **2002 to current**

Principal of a civil engineering firm providing water/wastewater and civil design. Example projects include;

- Member of DEQ Technical Working Group for Mid-Coast Implementation-Ready Temperature TMDL, Local Stakeholder Advisory Committee.
- Expert review and testimony for the water supply and the discharge of cooling tower blowdown at three California Energy Commission power plants, including CEQA permit review, water supply, storm water management, soil resources, and onsite waste treatment systems.
- The assessment and design of cooling water and wastewater systems for three pulp & paper mills to enable mill expansions, within current permit limits, involving river discharge
- Design of a storm water collection, detention, and wetlands treatment system for a two-mile highway upgrade.
- Expert testimony for the hydraulic capacity of a 1000 ft x 72-inch diameter gravity pipeline under a commercial site.
- Expert testimony for water treatment and remedial costs at six industrial sites, involving point and non-point discharge
- Site civil design for an enviromentally sensitive ocean-front development, including site roadways and two major retaining walls, and stormwater collection, and discharge

Valmont Industries **1999 to 2001**

Engineering Manager for the design and construction of wastewater treatment and land application systems for difficult to treat wastes, such as landfill leachate, gas exploration wastes, power plant wastes, and a wide range of industrial wastes. Most projects included multiple treatment process, retention ponds, multiple pump stations, and long underground pipe networks, all of which were integrated with state-of-the-art control systems, frequently with remote telemetry. The success of these systems, helped to build Valmont's reputation and allowed it to become the world leader in land application systems.

Peterson Process Engineering **1997 to 1999**

Principal of a process design company specializing in the water/wastewater systems. Example projects include;

- The design of dredging and dewatering systems for a 10 MGD combined municipal and industrial wastewater facility. The treatment kinetics and hydraulics of a 35-acre detention pond were modeled and treatment processes modified to enable the removal of 80,000 cubic yards of dioxin-contaminated sludge without impairing effluent quality. The sludge was fully dewatered to a dry cake, enabling highway transport in conventional tractor-trailers, resulting in significant savings over other alternatives.
- The design of a storm water collection and treatment system for a 600 acre industrial site.