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Detecting an Exceedance of Water Quality Standards for Temperature Due to Harvesting: It Should Be So Simple

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Oregon's Administrative Rule standard for Protecting Cold Water (OAR 340-041-0028[11]) prohibits anthropogenic disturbances, such as timber harvest, from raising stream temperatures in certain locations by $> 0.3^{\circ}\text{C}$. In addition, temperature exceedance exemptions within the rule indicate that assessments are to be done per each rolling 7-day moving mean of the daily maximum, not on a seasonal, basis. The rule asserts that timber harvest conducted in accordance with Oregon's Forest Practices Act will be considered in compliance so long as monitoring indicates that forest harvest procedures sufficiently meet the standard. The Department of Forestry's RipStream monitoring project was in part developed to test the efficacy of the Forest Practices Act at meeting this temperature requirement.

The RipStream project involves quantifying the effect of timber harvest along 33 small or medium streams in Oregon's coastal range (www.oregon.gov/ODF/PRIVATE_FORESTS/docs/fp/RipStreamProposal.pdf). Streams are monitored for seven years. Along each stream there is an upstream control reach (no harvest) and an adjacent downstream treatment reach along which timber harvest occurred after year 2. A sub-set of sites also have a downstream control reach. At this time the project is more than halfway completed, with all sites providing at least one year of post-harvest water temperature data.

We designed a Generalized Least Squares (GLS) regression procedure to determine whether our sites exhibited any 0.3°C increases. The GLS regression procedure allowed us to account for data autocorrelation while modeling main effects. We are comparing pairs of years, both pre-harvest to pre-harvest and pre-harvest to post-harvest, to determine background as well as harvest-related exceedance values and frequencies. Depending on assumptions regarding the effects of timber harvest on the relationship between control and treatment reach temperatures, we are using the regression model's intercept values for year 2 data and slope values for year 1 or 2 to calculate prediction intervals. We compare year 2 temperature values against the regression's upper prediction interval $+ 0.3^{\circ}\text{C}$. We consider values above that threshold to be in exceedance. Results from this procedure will be used to determine whether exceedances took place and report patterns of exceedances observed under different riparian management strategies.