Detecting Change in Paired Watersheds--Water Quality Impacts from Prescribed Fire

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Abstract. Water quality changes in watersheds are often difficult to detect because of the high natural variability in the systems of interest. One possible remedy for this problem is the use of predictor variables, such as observations of the water quality variable of interest on a similar, but un-impacted watershed. The paired-watershed approach, implemented statistically via linear regression, can detect smaller changes than a single-watershed approach when there is a strong correlation between the variable of interest and a predictor variable. This paper discusses the power of detecting changes using a paired-watershed approach and an analysis of covariance model.

An application is presented with the goal to evaluate a sampling program to detect changes in water quality due to prescribed fire in a system with high natural variability. Increases in nutrients and metals in receiving waters have been documented after wildfire. However, water quality impacts from prescribed fire are not as well known. To study the impact of prescribed fire on water quality, two small (< 3 km^2) watersheds have been selected in the Cache La Poudre watershed in Northern Colorado. One of the watersheds will remain unburned while the other will experience a typical prescribed fire. The unburned watershed will be used as a predictor to determine changes in the linear relationship between the pre and post-fire datasets for the paired watersheds. The sampling program will be evaluated using the analysis of covariance model to determine the number of post-fire samples needed to detect a change within a selected statistical power.