Predicting Flow Regime for Ungauged Streams in the Western United States

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Abstract. An extensive set of physical and biological river data from first through fourth order streams in the western US is being used to develop a hydrogeomorphic stream classification system that attempts to predict aquatic ecosystem health at a site. Previous studies have indicated that flow regime is a key geomorphic and ecological driver but few of the study sites are gauged. Accordingly, models will be constructed to predict ecologically relevant flow regime metrics from key regional physical and climatic characteristics determined from remotely sensed data. The study area is comprised of diverse climatic, topographic, and geologic patterns in Colorado, Washington and Oregon. USGS gauges in relatively undisturbed watersheds have been identified in each study region. Models will be developed by first fitting time series models to the flow records of gauged sites and computing a several non-redundant metrics describing magnitude, frequency, duration, and timing of both low and high flows. Because of the substantial variation in hydrologic response among the study streams, streamflow variables and time series model parameters will be used in a cluster analysis to group gauges with similar flow regimes. Ungauged sites can then be assigned to clusters with discriminant analysis using watershed and climatic characteristics. With significant, stable clusters in place, predictive models can then be derived. Multiple regression analysis can relate the streamflow metrics and time series parameters to the physical and climatic characteristics of the basin. Monthly flows can then be generated stochastically and streamflow metrics can be estimated at ungauged sites. Withholding discharge data from gauged sites and examining differences between the actual and predicted flows will test model validity, accuracy and reliability.

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