Predicting Functional Flows at Ungauged Locations

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Abstract

The dependence of riverine biota on streamflow variability, including the timing, magnitude, duration and frequency of flows, is now well-recognized among river scientists and managers. A multitude of hydrologic metrics have been developed to describe the attributes of natural flow regimes, quantify flow alteration, and provide the hydrologic foundation for the development of environmental flow standards. Many applications require the use of models to predict expected values of hydrologic metrics, for example, when estimating flows at ungauged sites or at sites that have been altered by human land- and water-use activities. We demonstrate how hydrologic models can be used to predict functional flow metrics at streams in California, by relating observed flow patterns at U.S. Geological Survey reference gages with physical basin characteristics, including topography, soils, geology, and climate. We evaluate model uncertainty in predicting different functional components of the flow regime and consider how these models can be used to support environmental flow management.