Rivers reflect the geologic setting and history of their watersheds. This reflection results from two related aspects: (1) The strong controls that watershed geology exerts on the present-day environment or "regime" of a river, including basic factors such as slope, sediment, and water. (2) The effects of specific past events, such as landslides, floods, and glaciation, which also affect rivers, sometimes overwhelming environmental gradients established by regional geologic conditions. Deciphering the relative role of present day geologic conditions vis-à-vis the cumulative effects of a river's history is often key to understanding a particular river, especially at time scales relevant to understanding the affects of major perturbations to river systems, such as emplacing or removing dams. For western North American rivers (at least all the rivers we have worked on), which mostly flow through diverse and geologically active environments, determining the balance between the past and present is a complicated endeavor requiring capabilities beyond GIS mapping analysis and channel classification. Despite the required investments, such in-depth case studies are warranted, mostly because of the unique geologic history of every watershed makes each river a unique large-scale experiment, but also because of the significant natural and cultural resources at stake.