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## **Linking Base Flow to Perennial and Ephemeral Stream through Comparative Analysis.**

Streams are categorized into ephemeral and perennial streams based on flow durations. Ephemeral and intermittent streams, occurs once or more each year and is a response to individual rainfall event. Perennial stream is the basic network and is governed by groundwater flow and therefore depends upon mean annual precipitation as modified by watershed characteristics. Therefore connections between ephemeral or perennial streams and runoff generation at the mean annual and event scales exist. At the mean annual scale, the partitioning of precipitation into runoff and evaporation on the first order is characterized by the Budyko hypothesis which quantifies the ratio of evaporation to precipitation as a function of climate aridity index. Through comparative analysis on 185 watersheds in the United States, perennial stream density monotonically decreases with climate aridity index which demonstrates that perennial stream is mainly controlled by mean climate like precipitation partitioning. Similarity between perennial stream ratio (perennial stream length to total stream length) and base flow ratio (mean annual base flow to precipitation) shows the co-evolution of drainage density and water balance. At the event scale, base flow recession is linked to ephemeral and perennial streams through the transition from early to late recessions. Both groundwater hydraulics and contraction of ephemeral streams are important controlling factors on early recessions; however, at the late recession when perennial stream groundwater is the main contribution to the base flow, perennial stream groundwater hydraulics dominates the base flow recession behavior.