HETEROGENEOUS CHARACTERISTICS OF WATER MOVEMENT THROUGH RIVERBED SEDIMENTS OF THE TOUCHET RIVER, SOUTHEASTERN WASHINGTON, USA

Abstract

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Traditionally, the streambed has been treated as a layer of uniform thickness and low hydraulic conductivity in surface- and ground-water research. Recent studies have shown a high level of spatial heterogeneity within streambed sediments. In this study, a detailed field investigation of three-dimensional hydraulic conductivity K was conducted in two representative reaches in the Touchet River, a typical salmon spawning stream in arid Eastern Washington, U.S.A. In-stream slug tests were conducted to obtain K following the Bouwer and Rice method. These tests were performed at 30, 60, 90 and 120-cm depths over a 50 × 9 m grid at each reach. Additionally, differential water levels were measured to determine vertical hydraulic gradient and to estimate specific discharge, which was in turn used to predict the probability of salmon egg survival.

Results from this study indicate that for the upper reach, hydraulic conductivity and specific discharge were substantially higher than in the lower reach and interstitial flow was predominantly upwelling. The percent area favorable for salmon spawning was higher in the upper reach at 41% compared to 35% for the lower reach.

Detailed characterization of the streambed, as done in this study, is essential to our understanding of surface and ground-water interaction and evaluation of streambed habitat, and is recommended as a monitoring procedure to assess natural and impacted streambeds in the future. The streambed is widely recognized as an important component of the stream corridor, yet little is know about its properties or about methodologies for monitoring. Characterization of water movement through the hyporheic zone is critical in stream rehabilitation and restoration in order to reestablish sustainable aquatic and riparian habitats.