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Flow Structure and Air Entrainment in Riparian Riffles

JIN-HONG KIM

Urban Flood Disaster Management Research Center, Chung-Ang University

Riparian riffles are the important fish habitats. Main reason for this is the existence of the abundant dissolved oxygen in the water. The riparian riffles are characterized by high flow velocity and shallow depth. They have high bed slopes and large size of gravels, and hence the oxygen transfer through the air entrainment is actively made into them. Dissolved oxygen will be made and with this effect, plenty of algae, aquatic insects and fishes can inhabit in the riffles. This paper presents the hydraulic analysis of the flow structure and the air entrainment, and the relationships between the efficiency of the oxygen transfer and the hydraulic parameters in the riparian riffles. Field survey on the flow structure and the measurements of the oxygen transfer in the riffles were performed. Air entrainment occurred more frequently in the edged gravels rather than in the round and edgeless ones, and it was formed mainly from behind the trailing edges of the gravels. Oxygen transfer was found to be proportional to the flow velocity, the flow discharge, and the Froude number, but to be not closely related to the particle diameter. Average value of oxygen transfer in the riffles of study area was about 0.085, which shows good efficiency compared with results of smooth chute.