Mangyeong River Hydraulic Modeling Analysis

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Abstract. There is an increase in environmental concerns about rivers and stream in South Korea. Mangyeong River is one of the main watersheds on the western central region of South Korea. When Mangyeong River was channelized in the early 1933's, an abandoned channel was formed. The detailed study reach is 4.25 kilometers of Mangyeong River from station 104+000 to the tributary of Soyang Stream at 87+000. The hydraulic parameters using HEC-RAS were examined with discharge of 255 m^3/s and reach-averaged spatial trends were analyzed for various discharge. The results showed that the top width is 244m, the mean flow depth is 1.11m, the width/depth ratio is 277, the channel velocity is 1.18 m/s, Froude number is 0.42. The cross sectional area was changed most as a result of changes in various discharges. The hydraulic parameters had sudden changes in the vicinity of the three sills. The median particle diameter is investigated to 36 mm. The sediment load was measured and the total load was obtained with the Modified Einstein method. When the discharge of 255 m^3/s is applied, the total load is 6.54 thousand tons per day and the equivalent sediment concentration is 240 mg/l. The equilibrium channel width and slope were examined with respect to return intervals. Julien-Wargadalam and Lacey gave an equilibrium width of 83 m and 77m respectively compared with HEC-RAS result of 239m at the discharge of 255 m^3/s. For high discharge, the results of those two methods were closer to the HEC-RAS results. The equilibrium slope was determined by Julien-Wargadalam's method as 0.00111 m/m, compared to the actual channel slope of 0.00230 m/m. The changes in channel planform geometry were analyzed using aerial photographs from 1967 to 2003. Based on aerial photographs the channel geometry changed from meandering to straight. The methods of Leopold and Wolman, Henderson, and Schumm and Khan are the best methods for identifying the planform geometry for Mangyeong River as a straight channel. This occurred because of the channelization and levee construction on the stream banks. The channel sinuosity is analyzed to 1.03. The thalweg and mean bed elevation profile were analyzed using field measurement in 1976, 1993, and 2009. Both measured profiles indicated that the channel has degraded about 2 m since 1976.

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